

PETROLEUM TECHNOLOGY

Report no. 78/85
GEOLAB
Copy no.
No. of copies 10

Grading Confidential

GEOLGICAL
LABORATORIES

Title Geochemical evaluation of the Statoil 6406/6-1 Well		
Requested by Einar Undersrud	Project	86-5495-BA - 8 AUG. 1986 REGISTERET OLJEDIREKTORATET
Date 9.7.86	Number of pages 167	

Keywords Source rock, Maturation, shows, 6406/6-1, Haltenbanken, geochemistry

Abstract Approx. 50m of Nesna Fm. at a depth of over 4000m have reached peak maturity on structure, but with a mainly gas or condensate producing source rock quality. However, significant variations in the kerogen type have been identified. Depending on the actual maturity, these intervals might produce light oil/oil. The Engelvær Fm and in general the Halten Group shales have poor potentials for gas. Strong shows of gas/condensate/light oil, probably produced in situ, are located in the Nesna Fm. Decreasing concentrations of gas/condensate are present in deeper formations.

Prepared by Geochem Laboratories, Chester, England
Textoperator

Approved by

11/7-86 *Einar Undersrud*

11/7-86 *Paul Plummer*

GEOCHEMICAL EVALUATION OF THE STATOIL 6406/6-1 WELL

EXECUTIVE SUMMARY

The section between 600 metres and 4715 metres has been evaluated.

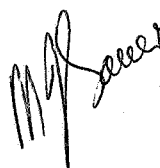
Apart from minor rich interbeds at 1900-2050± metres the Tertiary and Cretaceous claystones and shales are poor and gas prone source rocks. Minor hydrocarbon generation commences at 3100± metres and significant generation starts at approximately 3800± metres.

The Nesna Formation at 4002-4052 metres is dominated by rich dark olive grey silty shales. On structure they are at peak maturity and are generating gas-condensate and associated light crude oil.

Shales within the Engelvær (4052-4205 metres) have a poor potential for gas and because of their organic matter type are effectively mature (significant hydrocarbon) generation.

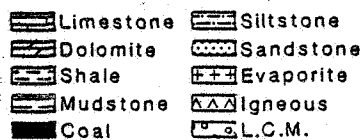
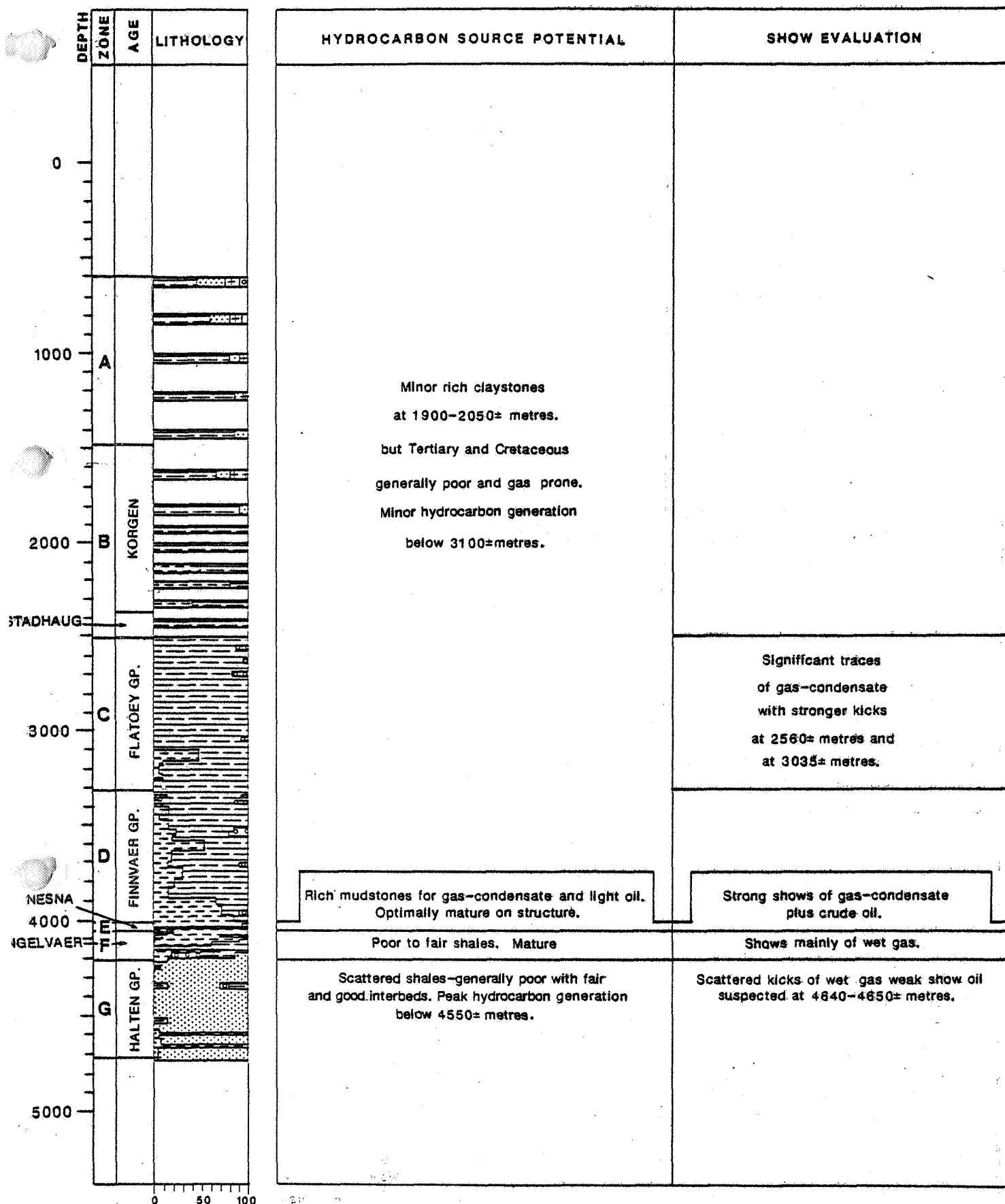
Scattered beds of shale occur within the sands of the Halten Group (below 4205± metres) but they are generally poor source rocks and good interbeds (e.g. at 4645± metres) are sparse.

Strong shows of wet gas-condensate and of a light-medium gravity crude oil were detected in the Nesna Formation shales. They are partly due to generation from the host sediments which are rich and optimally mature. Gas condensate is also present in the Engelvær shales but only traces of gas-condensate, with intermittent kicks, occur in the Halten Group sands. A weak shows of medium gravity crude oil is suspected at 4642-4651 metres.



M.J. Sauer

SUMMARY CHART



CONTENTS

	PAGE
EXECUTIVE SUMMARY	1
Text Figure 1 - Summary Chart	
INTRODUCTION	4
CONCLUSIONS	7
Text Figure 2 - Rating Diagram	
ZONATION	10
ORGANIC FACIES AND SOURCE RICHNESS	12
Text Figure 3 - Source Facies	
Text Figure 4 - Rockeval Pyrolysis	
Text Figure 5 - Source Richness	
THERMAL MATURITY	15
Text Figure 6 - Source Rock Maturity	
SHOW DETECTION AND CHARACTERISATION	17
Text Figure 7 - C ₁ -C ₇ Hydrocarbons	
Text Figure 8 - Show Detection	
CORRELATION STUDY	20
Text Figure 9 - Carbon Isotopes	
Text Figure 10 - Carbon Isotopes (Galimov Plot)	
BRIEF DESCRIPTION OF ANALYTICAL TECHNIQUES	

TABLES

- 1 Organic carbon results and gross lithologic descriptions
- 2a Concentration of C₁-C₇ hydrocarbons in head space gas
- 2b Concentration of C₁-C₇ hydrocarbons in cuttings gas
- 2c Total concentration of C₁-C₇ hydrocarbons (a + b)
- 3 Pyrolysis results
- 4 Gas-oil index
- 5 Kerogen type and maturation
- 6 Vitrinite reflectance data
- 7 Methylphenanthrene indices
- 8a Concentration (ppm) of extracted C₁₅₊ material in rock
- 8b Composition (norm. %) of C₁₅₊ material

CONTENTS - Cont'd.

- 8c Concentration (mg/g TOC) of C₁₅₊ material
- 9 Significant ratios (%) of C₁₅₊ fractions and organic carbon
- 10 Composition (norm. %) of C₁₅₊ saturated hydrocarbons
- 11 Carbon isotope compositions
- 12 Biomarker molecular ratios

APPENDIX FIGURES

- 11 Pyrolysis-GC
- 12 Vitrinite Reflectance Histograms
- 13 C₁₅₊ Saturates (Paraffin-Naphthene) Chromatograms
- 14 C₁₅₊ Aromatic Chromatograms
- 15 Mass Fragmentograms - Steranes m/z 217
- 16 Mass Fragmentograms - Steranes m/z 218
- 17 Mass Fragmentograms - Monoaromatic Steranes m/z 231
- 18 Mass Fragmentograms - Rearranged Steranes m/z 259
- 19 Mass Fragmentograms - Terpanes m/z 191
- 20 Mass Fragmentograms - Demethylated Hopanes m/z 177
- 21 Mass Fragmentograms - Methyl Hopanes m/z 205

INTRODUCTION

This report presents a geochemical evaluation of the section between 600 metres and 4711 metres (TD 4715 metres) in the 6406/6-1 well, drilled by Statoil on their Haltenbanken concession, Norwegian Sea.

The analytical format, specified by S. Ulvoen, was designed to evaluate the hydrocarbon potential of the section in terms of richness, maturity and potential for oil or gas. Further tests were specified to detect and characterise shows of migrated hydrocarbons.

Detailed discussion of the Organic Facies, Source Richness, Thermal Maturity, Show Detection and Characterisation are presented in the appropriate text chapters and have been integrated to form the Conclusions.

This study was authorised by S. Ulvoen, Statoil, Stavanger.

ANALYTICAL

A total of three hundred and eleven (311) canned ditch cuttings samples (composited at intervals of 50 metres), fifteen (15) sidewall cores and two sandstone core samples (at 4211± metres and 4237± metres) were received. The samples were assigned the Geochem job number 1286.

Geochem were advised (telex 22.2.86) of the following depths (in metres RKB).

<u>GROUP</u>	<u>FORMATION</u>	<u>DEPTH</u>
SKLINNA	KORGEN	1494
SKOMVAER	ALSTADHAUG	2377
FLATOEY		2514
FINNVAER		3322
GRIP	NESNA	4002.5
	ENGELVAER	4052
HALTEN	TOMMA	4205
	LEKA	4416.5
	ALDRA	4591

Casing Points 30": 331, 20": 953, 13 3/8": 2392,5, 9 5/8": 4156,5, 7" 4703.

Turbodrilled interval 3240-3853.



Geochem were also supplied with ISF-Sonic logs for this study.

No serious contamination was observed during the washing of these samples.

Geochem were initially instructed to analyse a total of thirty eight (38) samples (telex 24.3.86) and were subsequently requested to analyse the canned samples using the following programme (telex 14.4.86).

600 - 1800m	6 samples
1800 - 2512m	8 samples
2512 - 3500m	50 samples
3500 - 4715m	36 samples

This telex also instructed Geochem to concentrate upon source rock evaluation within the 2512-3500 metre interval. Two additional core samples from the Tomma Formation were received with instructions to extract hydrocarbons, to perform saturates analysis and, should there be sufficient material, isotopes and GC-MS analyses.

The total number of analyses performed in this study are listed below

ANALYSIS	NUMBER OF ANALYSES		
	CUTTINGS	SWC	CORE
Headspace and cuttings gas	106		
Sample preparation	103	15	2
Total organic carbon	192	15	
Pyrolysis	53	15	
Vitrinite reflectance	33	7	
Kerogen type and spore colouration	34	7	
C ₁₅₊ extraction and chromatography	20		
Capillary GC - paraffin-naphthenes	20		
Capillary GC - aromatics	20		
Pyrolysis-GC	8	7	
Carbon isotopes - extract fractions	34		
Carbon isotopes - kerogen	4		
GC-MS biomarker analysis	7		

The data are listed in tables 1 to 12 and presented graphically in figures 1 to 21. A brief description of the analytical techniques employed in this study is included in the back of this report.

GENERAL INFORMATION

Ten (10) copies of this report have been forwarded to S. Ulvoen, Statoil,



Stavanger, together with the kerogen slides, and a magnetic data tape of the analytical results. A copy of the data has been retained by Geochem for future consultation with authorised Statoil personnel.

The remaining sample material will be handled as directed.

All of the results of this study are proprietary to Statoil A.S.

CONCLUSIONS

The section between 600 metres and 4711 metres in the 6406/6-1 well has been divided into seven geochemical zones.

Zone A (600-1494 metres) is composed of light grey claystones within which are interbeds of igneous rock and sand. The claystones are lean (less than 0.51% organic carbon), immature and gas prone.

Zone B (1494-2514 metres) covers the Korgen and (below 2377± metres) the Alstadhaug formations. Yellowish brown claystones pass, below 2200± metres, to a sequence of light olive grey shales, shaly mudstone and claystones. Organic carbon values of 1.02-2.43% are common but values of 4.12-6.07% are achieved at 1900-2050± metres. The amorphous woody and herbaceous kerogen in the latter results in an excellent potential for gas and associated liquids but the leaner sediments containing mainly land plant debris are poor source rocks. Zone B is immature and apart from rich interbeds at 1900-2050± metres has a poor potential for gas.

Zone C (2514-3322 metres) is composed of claystones and shales from the Upper Cretaceous Flatoey Group. Organic carbon contents improve from 0.45-0.96% to 1.01-1.81% below 3050± metres but the organic matter, consisting mainly of land plant debris, has a limited potential for gas. Minor hydrocarbon generation commences below 3100± metres although the Zone C claystones and shales are, nonetheless, poor gas prone source rocks.

Zone D (3322-4002 metres) corresponds to the Finnvaer Group (Lower Cretaceous). The sediments are dominantly medium dark grey to medium grey shales and silty mudstones with lighter coloured interbeds down to 3420± metres. They generally have above average (0.63-1.42% organic carbon) contents of land plant derived organic matter but the pyrolysate yields (0.10-1.06 mg/g) indicate a negligible hydrocarbon potential. Zone D therefore lack effective source rocks. Were the sediments oil prone they would enter the "oil window" at 3800± metres but since they are gas prone they are effectively mature (significant hydrocarbon generation).

Zone E (4002-4052 metres) is equivalent to the Nesna Formation. The dominant dark grey to dark olive grey silty shales and mudstones have very good (4.09-



9.17%) organic carbon contents. Their organic matter, consisting of varying proportions of amorphous, algal, inertinitic, woody and herbaceous kerogen, has an excellent potential for gas - condensate or, at 4010± metres for example, gas and light medium gravity oil. These shales and mudstones are at peak maturity for hydrocarbon generation and should make associated reservoirs prospective.

Zone F (4052-4205 metres) consists of medium dark grey to medium grey shales, shaly mudstones and, below 4174 metres, beds of sandstone from the Engelvær Formation. The shales and mudstones generally contain less than 1.84% organic carbon and some of the richer sediments (e.g. 3.49% at 4065 metres) are believed to be caved from the Nesna. Pyrolysis yields of less than 2.08 mg/g indicate that the, mainly woody and inertinitic organic matter in these sediments has a poor potential, for gas. Due to the nature of their organic matter they are effectively mature (significant generation) on structure.

Zone G (4205-4711 metres) corresponds to the Halten Group - which includes the Tomma, Leka (at 4416.5-4591 metres) and Aldra formations. The dominant sandstones contain scattered interbeds of shale which generally have a poor potential for gas. There are, however, fair and good interbeds at 4205± metres and 4645± metres. Down to 4550± metres the shales are mature and peak generation of gas and associated light liquids commences below this depth.

Strong shows of wet gas - condensate were detected in the silty shales of the Nesna (4002-4052 metres). They are strongest above 4034± metres and are associated with a light - medium gravity crude oil. Weaker, but still good, shows of condensate were also observed in the Engelvær shales but the heavier hydrocarbons appear to be entrained material from the shows in the Nesna.

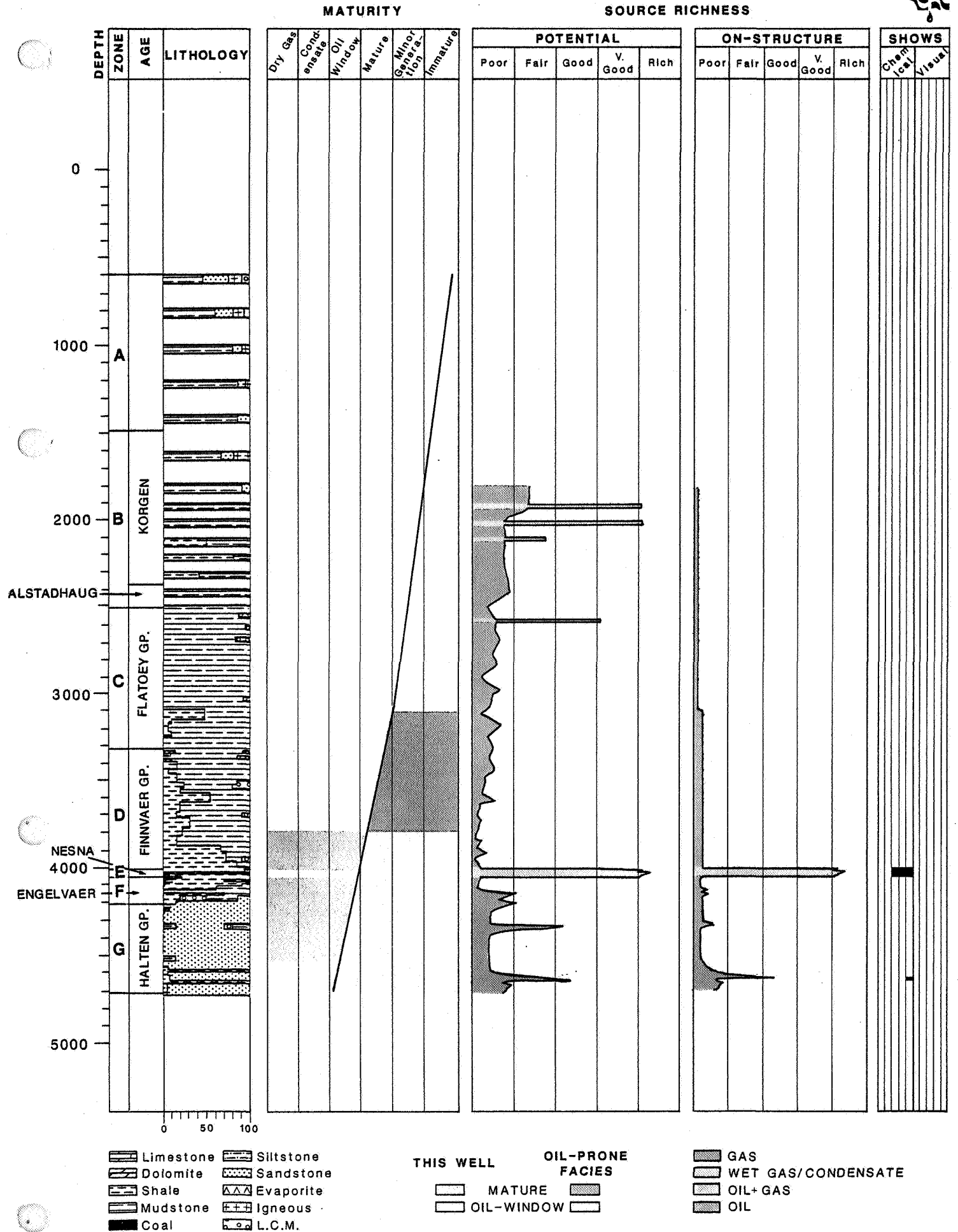
Kicks in the C_1 - C_4 hydrocarbons increase in strength below 4500± metres in the Halten Group sands although these gases are only moderately wet to wet and the gasolines comparatively sparse. The sandstone cores at 4211.25 metres and at 4237.7 metres yielded traces of C_{15+} hydrocarbons which resemble a waxy contaminant. The cuttings from this interval are variously affected by mud additives and entrained hydrocarbons and it is only at 4642-4651 metres that a weak show of medium gravity crude oil is suspected.



Detailed analyses of the shows in the Nesna Formation indicate that they are uniform in composition and derived from source rocks rich in a mixture of marine and land plant type organic matter.

The kerogen isolated from the Nesna shales has carbon isotope ratios of -24.99 to $-26.63^{\circ}/\text{oo}$ which are lighter (more negative) at the top of this unit. They are approximately $2^{\circ}/\text{oo}$ heavier than the shows in the Nesna and are therefore outside the limits normally acceptable for an oil-source rock correlation. An organic facies change in the Nesna shales within the drainage area of the structure is therefore suspected.

RATING DIAGRAM



ZONATION

The following formation tops (RKB) supplied by Statoil have been used in this study.

<u>GROUP</u>	<u>FORMATION</u>	<u>DEPTH</u>
SKLINNA	KORGEN	1494
SKOMVAER	ALSTADHAUG	2377
FLATOEY		2514
FINNVAER		3322
GRIP	NESNA	4002.5
	ENGELVAER	4052
HALTEN	TOMMA	4205
	LEKA	4416.5
	ALDRA	4591

This information has been combined with the geochemical data to give the following zones.

- ZONE A (600-1494 metres) consists of light grey claystones with interbeds of igneous rock and sand.
- ZONE B (1494-2514 metres) includes the Korgen and below 2377 metres, the Alstadhaug formations. This interval is dominated by yellowish brown claystones or, below 2200± metres, greenish grey shales, shaly mudstones and claystones.
- ZONE C (2514-3322 metres) corresponds to the (Upper Cretaceous) Flatoey Group. The dominant claystones, generally light grey to very light olive grey are interbedded with medium grey shales between 3090± metres and 3240± metres.
- ZONE D (3322-4002 metres) is equivalent to the Lower Cretaceous, Finnvaer Group. Medium dark grey to medium grey shales and silty mudstones predominate in this interval although lighter coloured interbeds are also present above 3420± metres.
- ZONE E (4002-4052 metres) corresponds to the Nesna Formation and is composed of dark grey to dark olive grey silty shales with lighter coloured interbeds below 4040± metres.



ZONE F (4052-4205 metres) represents the Engelvaer Formation which chiefly consists of medium dark grey to medium grey shales and shaly mudstones plus sands below 4174± metres.

ZONE G (4205-4711± metres) includes the Tomma, Leka (4416.5-4591 metres) and Aldra formations from the Halten Group. This interval is dominated by sands within which are scattered beds of medium dark grey silty shale (below 4500± metres).

ORGANIC FACIES AND SOURCE RICHNESS

The amount of organic matter within a sediment is measured by its organic carbon content. Average shales contain approximately one percent organic carbon.

Organic matter type influences not only source richness but also the character of the hydrocarbon product (oil, gas) and the response of the organic matter to thermal maturation. Richness and oiliness decrease in the order: amorphous-algal-herbaceous-woody. Wood has a primary (but not exclusive) potential for gas whilst inertinitic (oxidised, mineral charcoal) material has only a limited hydrocarbon potential. Pyrolysis-derived hydrogen indices increase with organic matter quality.

Hydrocarbon source richness has been evaluated from the yields of extractable C_{15+} hydrocarbons (C_{15+} HC) and of pyrolysate (S2) in association with the total organic carbon (TOC) contents. The following rating scheme has been employed:

	S2 ppm (mg/g)	C_{15+} HC (ppm)	TOC (%)
POOR SOURCE	below 2000 (2 mg/g)	below 100	below 0.5
FAIR SOURCE	2000-3000 (2-3 mg/g)	100-250	0.5-1.0
GOOD SOURCE	3000-5000 (3-5 mg/g)	200-500	1 - 3
VERY GOOD	5000-10,000 (5-10 mg/g)	500-1000	3 - 5
RICH SOURCE	over 10,000 (10 mg/g)	over 1000	over 5

The type of product (oil, gas) has been determined from the gas chromatograms of the pyrolysate (S2) fractions for which the gas-oil indices have also been calculated. Oil-prone sediments have indices of less than 20%, 20-35% indicates a mixed potential for oil and gas, 35-50% for condensate and values in excess of 50% are indicative of dry gas.

The solvent extractable C_{15+} hydrocarbons are commonly enhanced by non-indigenous species (see below) and hence are of limited value in evaluating source richness in this well.

Organic contamination, believed to be from the mud system is apparent in many of the leaner sediments whereas the kerogen types in the richer intervals (the Nesna for example) are difficult to differentiate.

The Zone A claystones are lean (less than 0.51% organic carbon) and their



organic matter consists of land plant derived woody, inertinitic and herbaceous kerogen - resulting in a minimal potential for gas and associated liquids. Within Zone B the Korgen and Alstadhaug claystones are somewhat richer with values of 1.02-2.43%, reaching 4.12-6.07% organic carbon at 1900-2050± metres. Organic matter in the richest sediments is a mixture of amorphous, woody and herbaceous debris. They have an excellent potential (11.56-12.52 mg/g pyrolysate) for gas and associated liquids. The leaner sediments contain mainly land plant material and they are poor, fair at best, source rocks.

Claystones from the Flatoey Group (2514-3322 metres) generally have below average (0.45-0.96%) organic carbon contents and the richer interbeds, with values of 1.01-1.89% organic carbon chiefly occur below 3050± metres. With one anomalous exception (5.18 mg/g at 2590± metres) pyrolysate yields of less than 1.39 mg/g confirm that the mainly woody and inertinitic kerogen in these claystones has a poor potential for gas.

Organic carbon values for the Finnvaer shales and mudstones rarely exceed 1% (0.63-1.42%) and their sparse land plant organic matter has a negligible (0.10-1.06 mg/g pyrolysate) hydrocarbon potential.

Within the Nesna (4002-4052 metres) the silty mudstones and shales, are rich (4.09-9.17% organic carbon) in organic matter which generally consists of land plant debris. There appears to be, however, a significant variation in kerogen type because there are interbeds where amorphous and algal kerogen is predominant. Pyrolysate yields of 5.08-16.61 mg/g indicate that these are mostly rich sediments and, since they are mature, are generating gas and condensate with associated light oil. The nature of the hydrocarbon products is, nonetheless, determined by the organic matter type.

The Engelvaer shales and mudstones commonly have organic carbon contents of 0.51-1.84% but the higher value of 3.49% at 4065± metres is attributed to caved material from the Nesna. Low pyrolysate yields (less than 2.08 mg/g) indicate poor source rocks which the pyrolysis-GC traces suggest are gas prone.

Scattered interbeds of shale and mudstone from the Halten group (below 4205 metres) have above average (0.98-2.79%, 3.9% at 4645± metres) organic carbon contents. Apart from occasional fair (2.15 mg/g pyrolysate at 4205± metres) and good (3.79 mg/g pyrolysate at 4645± metres) intervals the land plant debris



in these sediments has a poor potential for gas.

Summarising:

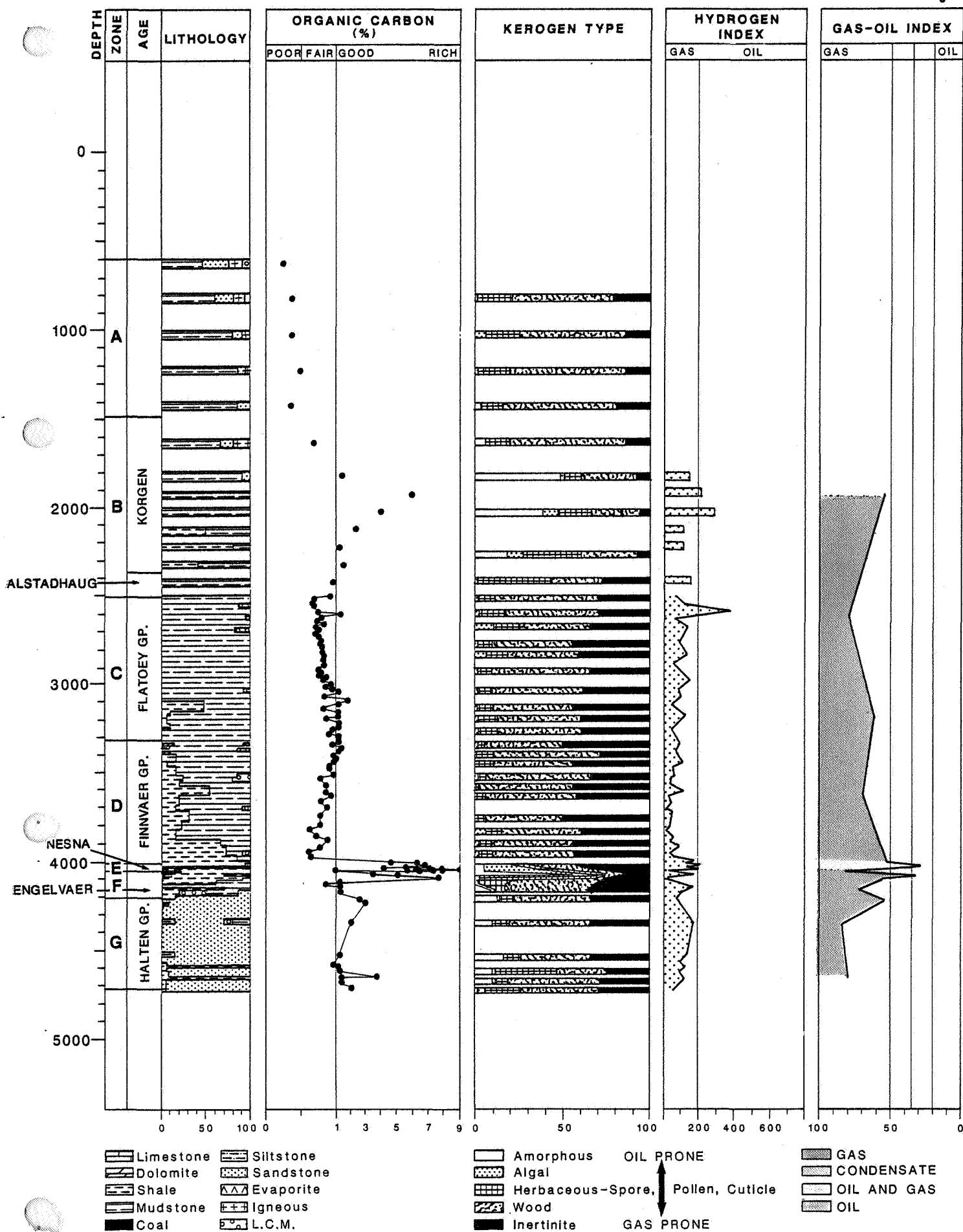
Tertiary and Cretaceous - generally poor gas prone source rocks with rich claystones at 1900-2050± metres.

Nesna (4002-4052 metres) - rich silty shales and mudstones have an excellent potential for gas-condensate and oil.

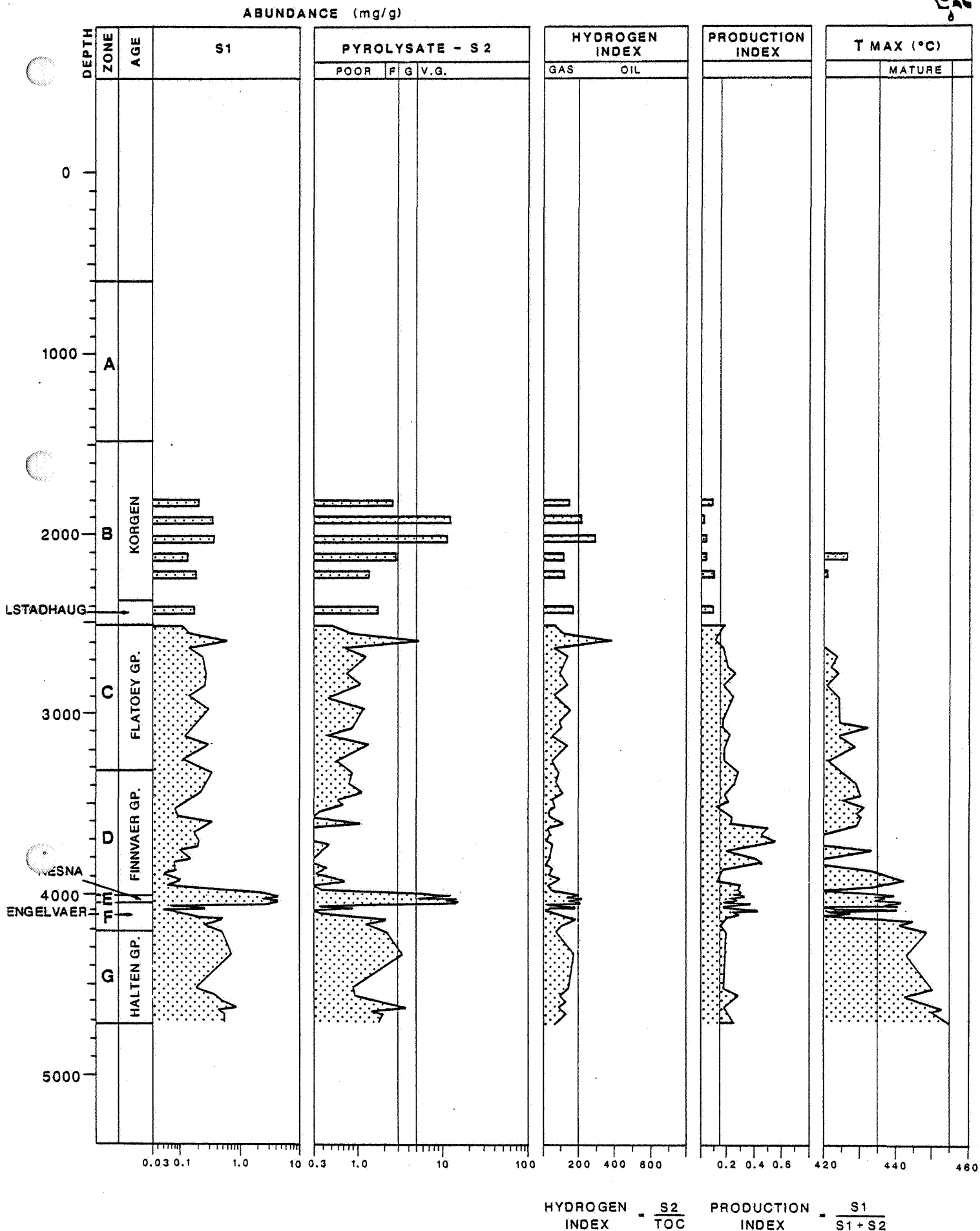
Engelvaer - shales generally poor and gas prone.

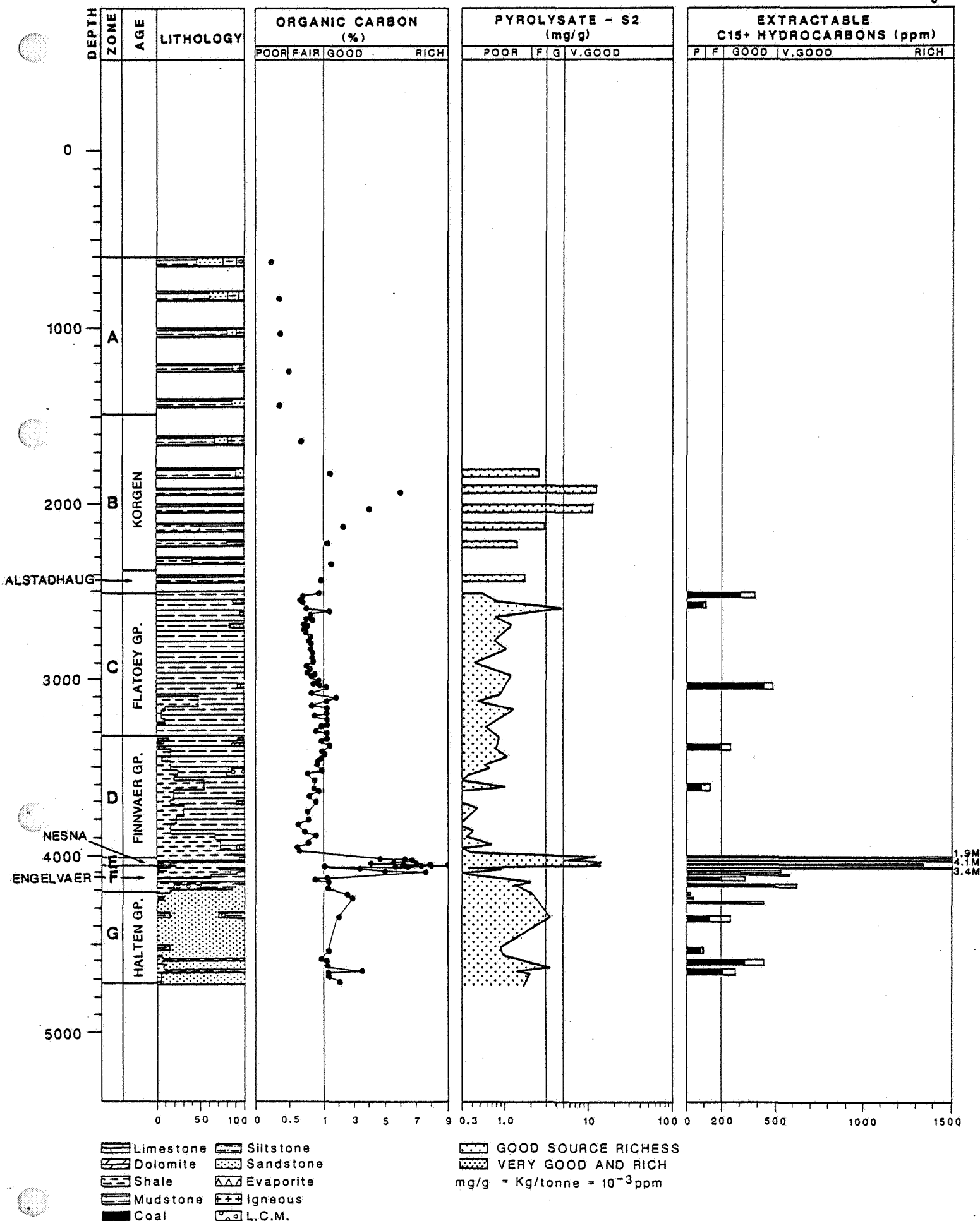
Halten Group (below 4205 metres) - scattered interbeds of poor shales with occasional good (e.g. at 4645± metres) intervals.

SOURCE FACIES



ROCKEVAL PYROLYSIS





THERMAL MATURATION

Thermal maturity has been evaluated with the spore colouration and vitrinite reflectance techniques. Pyrolysis Tmax data are also available but the methyphenanthrene indices cannot be employed as a maturity parameter due to the presence of non-indigenous hydrocarbons in most of the analysed samples.

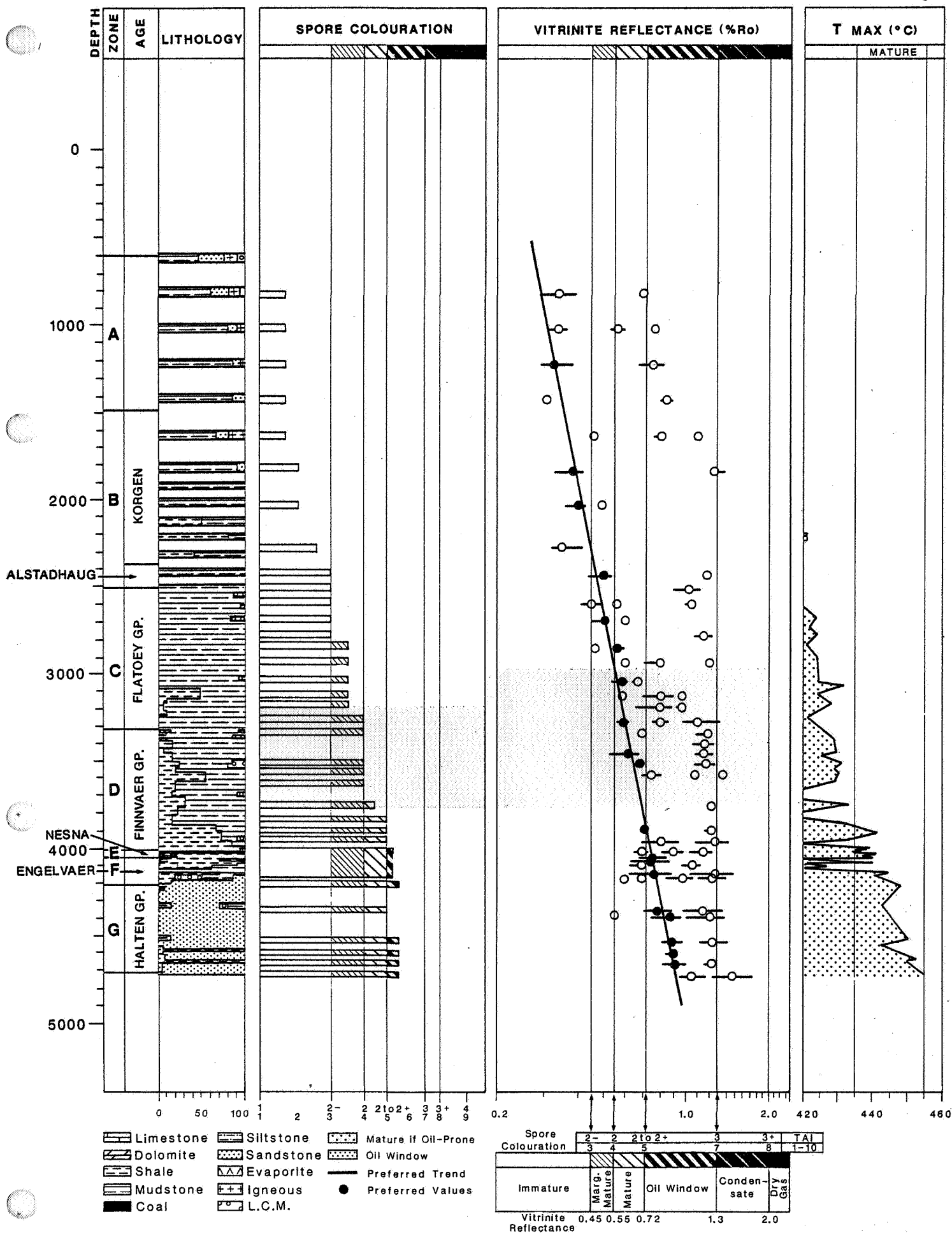
The correlation between spore colouration and vitrinite reflectance is shown in the following table, in which the maturation interpretations refer to oil-prone organic matter and the spore colouration and vitrinite reflectance values define the top of the relevant maturation zone. Spore colouration is reported both as thermal alteration indices (TAI) and on the equivalent 1-10 scale.

MATURATION STATE	SPORE COLOURATION		VITRINITE REFLECTANCE (% Ro)
	TAI	1-10	
IMMATURE	less than 2-	below 3	less than 0.45
MARGINALLY MATURE	2-	3	0.45
MATURE	2	4	0.55
OIL WINDOW	2 to 2+	5	0.72
GAS CONDENSATE	3	8	1.3
DRY GAS	3+	9	2.0

By definition, thermal hydrocarbon generation does not occur in immature sediments. Minor, non-economic generation is initiated with marginal maturity but significant hydrocarbon generation requires mature sediments. Peak oil generation is achieved within the oil window. The character of the hydrocarbon product changes with increasing maturity from young condensates and oils in marginally mature sediments to conventional crudes in mature sediments. With more advanced maturity, oil generation ceases and is replaced by gas condensate and then by dry gas. Gas-prone organic facies mature more slowly than oil-prone facies and peak gas generation is only initiated in the lower half of the oil window.

Maturation indices, based upon spore colour, reach 2- at approximately 2400± metres, 2 at 3180± metres, 2 to 2+ at 3800± metres and 2+ at 4550± metres. The herbaceous kerogen, upon which these assessments are made is generally sparse in the leaner sediments and difficult to identify in the richer ones. There is, therefore an element of uncertainty in the maturation trend based upon spore colour.

If vitrinite reflectance readings from suspected caved material and from



reworked woody organic matter (at over 0.8% Ro) are disregarded, there is a discernible trend through the remaining data points. This maturation trend increases from 0.33% Ro at 1250± metres to 0.45% Ro at 2375± metres, 0.55% Ro at 3000± metres, 0.72% Ro at 3800± metres and 0.9% Ro at approximately 4550± metres.

The depths at which significant transitions in the maturation trend occur are as follows:

ZONE	SPORE COLOURATION	VITRINITE REFLECTANCE	PREFERRED DEPTH
MARGINALLY MATURE	2400	2375	2380
MATURE	3180	3000	3100
OIL WINDOW	3800	3800	3800

When the quality of the spore colour maturation indices is considered the agreement between the two methods is good.

The Tertiary and Cretaceous sediments, containing mainly wood and inertinite, are immature or effectively so down to 3100± metres and only minor hydrocarbon generation has commenced at 3100-3800± metres. Significant generation of gas and associated liquids is, however, occurring in the basal 200± metres of the Cretaceous. The amorphous - algal fraction of the organic matter in the Nesna shales/mudstones (at 4002-4052± metres) is at peak maturity for the generation of condensate or crude oil. The associated woody kerogen, and that in the underlying sediments down to 3800± metres, is mature (significant gas-condensate generation) and does not reach optimum maturity until at least 4550± metres. On structure, the sediments remain within the "oil window" of peak hydrocarbon generation and do not enter the "gas-condensate" phase of hydrocarbon generation (1.3% Ro, maturation index 3).

SHOW DETECTION AND CHARACTERISATION

Shows of migrated wet gas, condensate and crude oil are most effectively detected with the light C_1 - C_7 hydrocarbons. Mature liquid hydrocarbons are characterised by high gas wetnesses and by low isobutane to normal butane ratios. Preliminary assessments of the character of the hydrocarbons in the shows can also be obtained from the light hydrocarbons but must be confirmed with the heavy C_{15+} hydrocarbon analyses, whilst the abundances of both fractions are used to determine the strength of the shows. The pyrolysis S1 parameter also detects shows but is severely affected by drilling-introduced contamination.

Down to the base of the Alstadhaug at 2514 metres the C_1 - C_7 hydrocarbon are relatively sparse and the gases (excluding the deepest sample) are dry. There is a kick of wet gas at 2500-2509± metres but only traces of liquid hydrocarbons were detected.

Within the Flatoey Group claystones the gaseous hydrocarbons are generally of fair abundance (322-8702 ppm) and are wet to very wet, containing up to 84.2% C_{2+} hydrocarbons. Stronger kicks of wet gas and gasolines were detected at 2560± metres (35767 ppm and 6352 ppm respectively) and at 3035± metres (20565 ppm and 3361 ppm). The heavier C_{15+} hydrocarbons from the intervals, however, are largely drilled introduced and the "shows" are, therefore, of wet gas - condensate.

Intermittent kicks of wet gas were detected in the Finnvaer Group claystones and shales at 3322-4002 metres but the gases within this interval are commonly of poor to fair abundance and only moderately wet. Below 3980± metres the gases are abundant (12876 ppm) and wet (68.4%); representing a diffusion halo from the shows in the Nesna. The C_{15+} hydrocarbons although fairly abundant (133-246 ppm), have low (33.2-38.4%) hydrocarbon to total extract ratios and are a mixture of indigenous (strong odd carbon paraffin preference) and contaminant species.

The Nesna (4002-4052 metres) silty mudstones and shales are characterised by strong shows (48582-84891 ppm) of very wet gas (59.4-86.0%) although the gasolines (at 927-6642 ppm) are relatively sparse. C_{15+} hydrocarbon yields are highest at 4002-4034± metres (1347-4138 ppm) and from the hydrocarbon to



total extract ratios (47.7-66.9%) are largely due to out of place hydrocarbons. Below 4034± metres the yields drop to 530-593 ppm although these hydrocarbons also contain non-indigenous species (48.0-48.7% hydrocarbon to total extract ratio). Chromatograms of the C₁₅₊ paraffins indicate that, in addition to gas - condensate, the shows in the Nesna contain a light - medium gravity crude oil - a significant proportion of which is derived from the mature host sediments.

Shows of wet gas within the Engelvær shales diminish from 35152 ppm at the top of 618 ppm at the base of this unit. The C₅-C₇ hydrocarbons (2674-36 ppm) show a similar trend. Significant traces (341 ppm C₁₅₊ hydrocarbons) of crude oil resembling that detected in the Nesna were extracted from the cuttings at 4129-4138 metres but the core sample at 4133 metres yielded 506 ppm C₁₅₊ hydrocarbons of a more waxy nature. The loss of lighter C₂₀₋ components in the latter may be due to water washing - suggesting proximity to the oil water contact - but contamination, due to grease from the sidewall core bullets is strongly suspected. If this is so then the cuttings are affected by entrained hydrocarbons from the mud system.

Gas wetness ranges from 39.2% up to 70.3% in the sandy Halten Group (below 4205 metres) sediments but apart from kicks of 10738-16785 ppm at 4520± metres and at 4580± metres the gases are of fair abundance only. The richest intervals contained 1526-2853 ppm C₅-C₇ hydrocarbons whereas elsewhere they are sparse indeed. A pale milky fluorescence was detected in most of the sands (excluding the core samples at 4211-25 metres and at 4237.7 metres) and contamination from the mud system is a possibility. Traces (6-32 ppm) C₁₅₊ hydrocarbons were extracted from the sandstone cores and they resemble a waxy contaminant. A strong odd carbon paraffin preference is visible in the saturates chromatograms from the mudstone extracts at 4240± metres and at 4330± metres; which is incompatible with the prevailing maturation levels and is believed to be from a lignosulphate mud additive. Only traces (94 ppm) C₁₅₊ hydrocarbons were extracted from the sands at 4520± metres and they are believed to be from the drilling mud. Contamination in the form of grease from the sidewall core bullets is suspected at 4133± metres. There is, however, evidence of a weak show of medium gravity crude oil at 4642-4651± metres.

Summarising:

Alstadhaug - kick wet gas at 2500± metres, otherwise traces of dry gas.



Flatoey Group - significant traces of wet gas - condensate with stronger kicks at 2560± metres and 3035± metres.

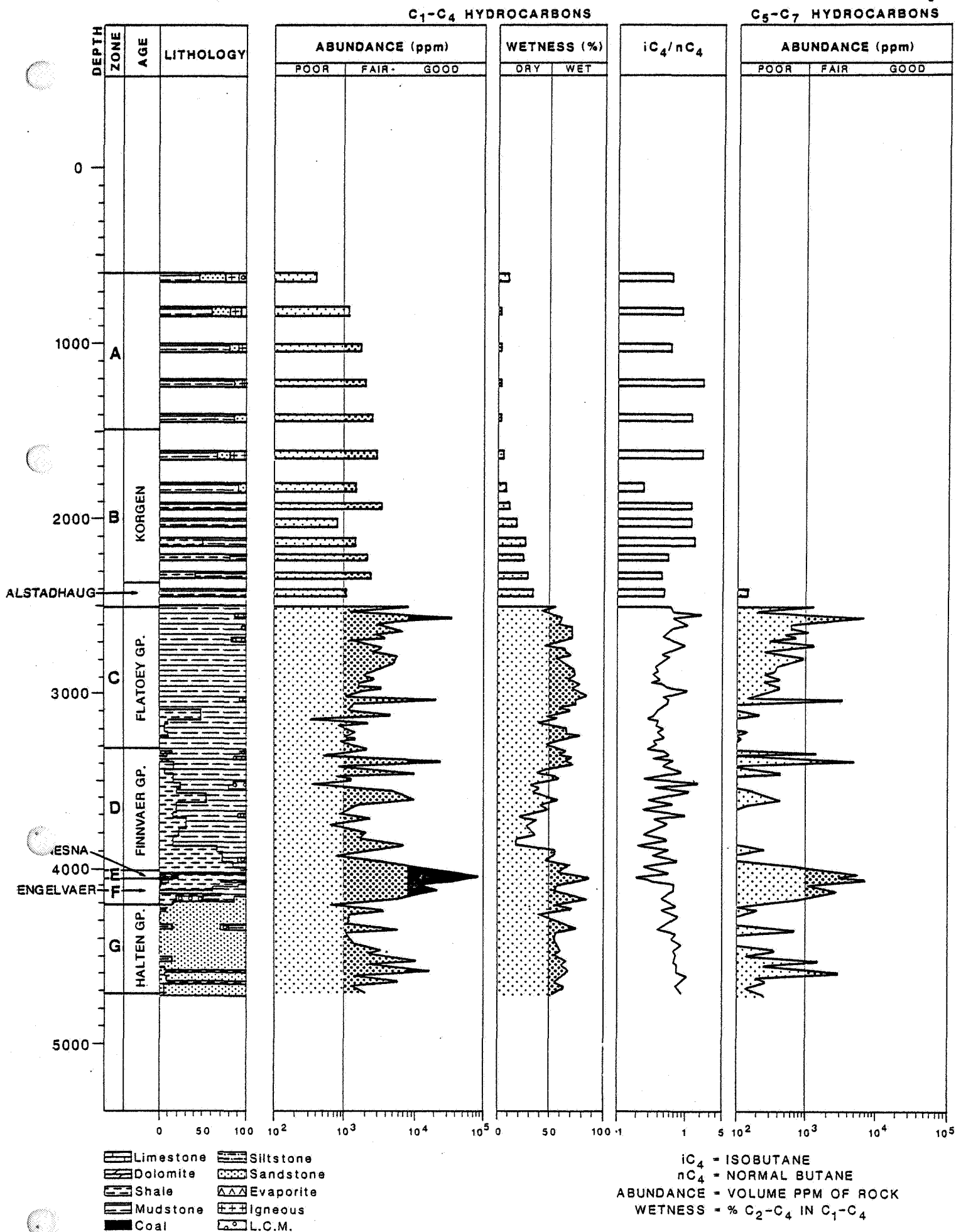
Finnvaer Group - traces of wet gas with intermittent kicks.

Nesna - strong shows gas - condensate and a light - medium gravity crude oil, notably at 4002-4034 metres.

Engelvaer - shows of wet gas decreasing in intensity, heavier hydrocarbons entrained from the Nesna.

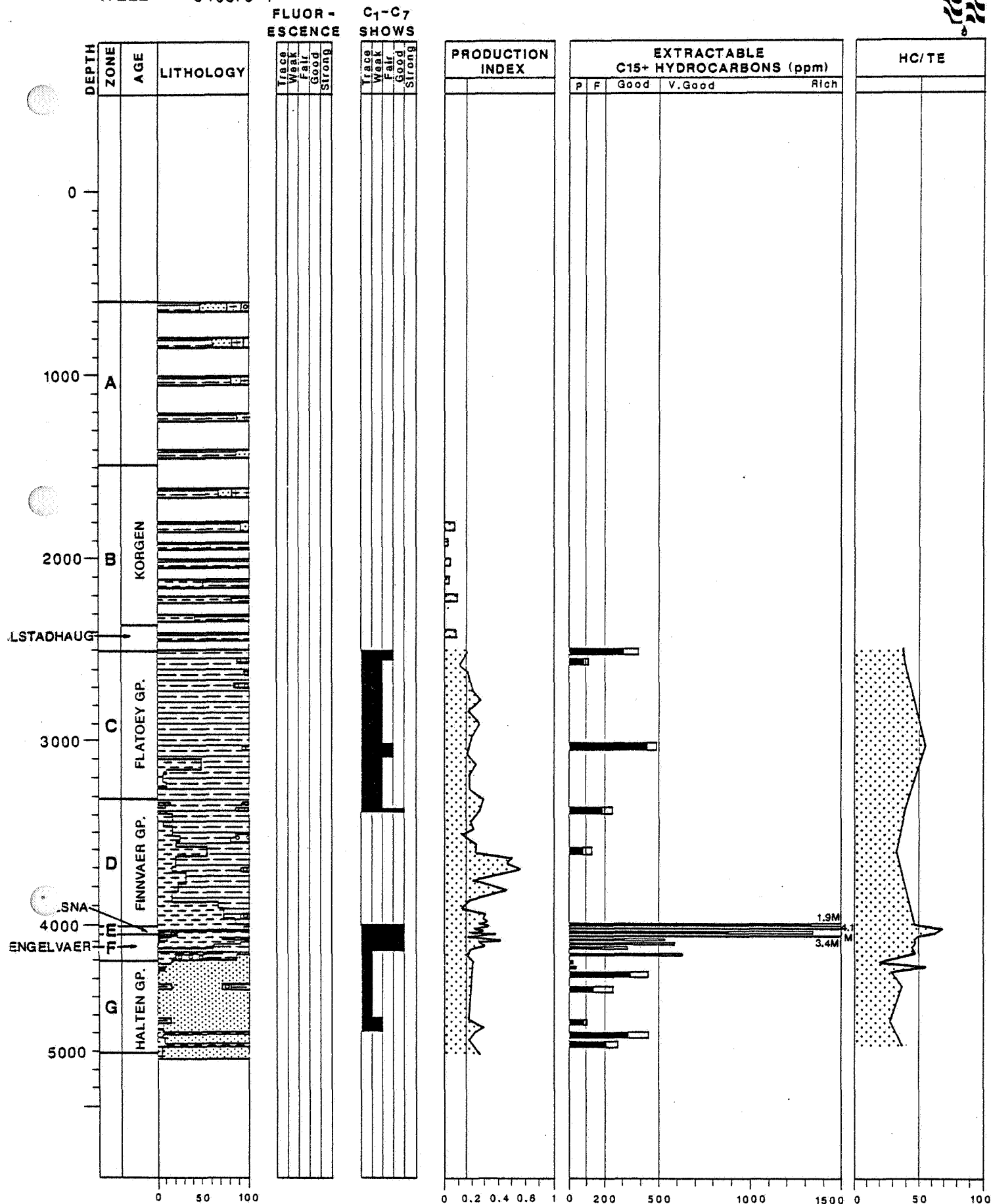
Halten Group - variable gas wetness, strongest kicks at 4520-4580± metres heavier hydrocarbons mainly drilling introduced but a weak show medium gravity oil suspected at 4642-4651 metres.

C₁-C₇ HYDROCARBONS





WELL 6406/6-1



Limestone Siltstone
 Dolomite Sandstone
 Shale Evaporite
 Mudstone Igneous
 Coal L.C.M.

CORRELATION STUDY

No oils were received from the analysed well section and the correlations are, therefore between the shows detected in the Nesna (and elsewhere) and their potential source rocks.

Chromatograms of the C_{15+} saturates indicate that the shows of light to medium gravity crude oil in the Nesna are relatively uniform in composition; although traces of drilling introduced hydrocarbons are also present. Similar hydrocarbon, detected at 4129-4138 metres in the Engelvaer, are believed to be entrained hydrocarbons from the mud system since the sidewall core sample at 4133 metres is unaffected by this material. There is, nonetheless, a weak show of oil resembling that in the Nesna at 4640-4650± metres in the Aldra Formation sands.

A similar relationship between the Nesna shows is also suggested by the C_{15+} aromatics chromatograms. There is little evidence of a correlation with the hydrocarbons extracted from the Engelvaer Formation or Halten Group sediments.

In more detail the m/z 191 mass fragmentograms clearly distinguish the hydrocarbons in the Nesna from those in the underlying sediments. The former are characterised by an intense C_{30} hopane peak (E), by an unidentified hopane (X) and by a strong series of higher hopanes. Tm/Ts and S/R isomer ratios suggest that the oils are derived from mature source rocks. There is little difference between m/z 217 fragmentograms within the Nesna which, with the m/z 218 traces, suggest that the condensates/light oils were derived from a mixture of marine and terrestrial organic matter.

Kerogen isolated from the Nesna shales has carbon isotope ratios which lie between $-24.99^{0}/_{\text{oo}}$ and $-26.63^{0}/_{\text{oo}}$. They are almost $2^{0}/_{\text{oo}}$ heavier than the values for the hydrocarbons from the shows in the Nesna shales. It would appear, therefore, that the host shales are not the sole source for these hydrocarbons and a mixing process involving hydrocarbons generated in isotopically lighter source rock kerogen down dip is suspected. An organic facies change within the Nesna shales off structure is therefore postulated.

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-007	600-650m	A 45% Claystone, blocky, soft, aren., calc., light grey to medium light grey B 30% Sand, unconsolidated, medium grained, N9 subangular, poorly sorted, white C 15% Igneous - granitic?, blocky, hard, N8-6 v. light grey to medium light grey D 10% LCM - cement Minor shell fragments	N7-6	0.28
1286-011	800-850m	A 60% Claystone, blocky, soft, aren., calc., light grey B 20% Sand, as 1286-007B C 15% Igneous - basaltic and granitic, blocky, hard, medium dark grey to v. light grey D 5% Shell fragments	N7 N9 N4-8	0.37,0.40
1286-016	1000-050m	A 80% Claystone, blocky, soft, sl. calc., minor to sig. cavings, light grey to medium light grey B 10% Igneous - granitic, blocky, hard, v. light grey to greyish pink C 10% Sand, as 1286-007B Minor glauconite	N7-6 N8- 5R8/2 N9	0.41
1286-020	1200-250m	A 85% Claystone, blocky, soft, sl. silty, sl. calc., minor cavings, light grey B 10% Sand/igneous, unconsolidated, medium grained, subangular, fairly well sorted, clear, white C 5% Igneous, as 1286-016B Minor glauconite and coal	N7 N9 N8- 5R8/2	0.51
1286-024	1400-450m	A 85% Claystone, blocky, soft, aren., sl. calc., minor cavings, light grey B 15% Sand, as 1286-020B Minor igneous and coal	N7 N9	0.39
1286-028	1600-650m	A 65% Claystone, blocky, soft, aren., sl. calc., minor cavings, light grey B 20% Igneous, blocky, mod. hard, light grey to v. light grey C 15% Sand/igneous?, unconsolidated, medium grained, angular, poorly sorted, clear, white	N7 N7-8 N9	0.71
1286-032	1800-850m	A 90% Claystone, blocky, soft, sl. silty, sl. calc., minor to sig. cavings, medium yellowish brown B 10% Sand, unconsolidated, medium grained, N9 subangular, poorly sorted, white Minor pyrites and igneous	10YR5/2 N9	1.50,1.51

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-034	1900-950m	A 55% Claystone, blocky to subfissile, soft, non-calc., sig. cavings, pale yellowish brown	10YR6/2	1.96
		B 45% Claystone, blocky, soft, non-calc., sl. micaceous, sig. cavings, v. dark yellowish brown	10YR3/2	6.07
1286-036	2000-050m	A 65% Claystone, subfissile, soft, non-calc., sig. to abundant cavings, medium yellowish brown	10YR5/2	1.44
		B 25% Claystone, blocky, soft, non-calc., sl. silty and micaceous, sig. cavings, v. dark yellowish brown	10YR3/2	4.12
		C 10% Claystone, blocky, soft, non-calc., minor cavings, light grey to medium light greenish grey	N7- 5GY7/1	0.69
1286-038	2100-150m	A 50% Shale, subfissile, soft to mod. hard, non-calc., minor to sig. cavings, v. dark yellowish brown	10YR3/2	2.42, 2.43
		B 25% Claystone, blocky, soft, non-calc., minor cavings, pale yellowish brown	10YR6/2	1.26
		C 15% Shaly claystone, subfissile, soft, non-calc., pale yellowish brown	10YR6/2	1.09
		D 10% Claystone, as 1286-036C, minor cavings	N7- 5GY7/1	0.42
1286-040	2200-250m	A 35% Shale, platy, soft to mod. hard, non-calc., minor cavings, light olive grey	5Y6/1	0.56
		B 30% Shale, platy, mod. hard, non-calc., minor cavings, medium olive grey	5Y5/1	1.30, 1.31
		C 20% Silty claystone, blocky, soft to mod. hard, non-calc., minor to sig. cavings, light grey to v. light olive grey	N7- 5Y7/1	1.37
		D 15% Silty shale, subfissile, soft to mod. hard, non-calc., sig. cavings, medium grey to medium olive grey Minor LCM	N5- 5Y5/1	2.41
1286-042	2250-300m	A 30% Shaly mudstone, subfissile, soft to mod. hard, non-calc., sig. cavings, greenish grey	5GY6/1	0.25
		B 30% Claystone, blocky to subfissile, soft, non-calc., minor cavings, light greenish grey	5GY8/1	0.18
		C 25% Silty shale, subfissile to blocky, soft to mod. hard, non-calc., sig. cavings, medium grey to medium brownish grey	N5- 5YR5/1	1.63
		D 15% Shale, subfissile, sl. silty, soft to mod. hard, non-calc., sig. cavings, medium grey to brownish grey Minor other mudstone	N4- 5YR4/1	1.23, 1.26

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomitic, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very

FIGURE
WELL

9

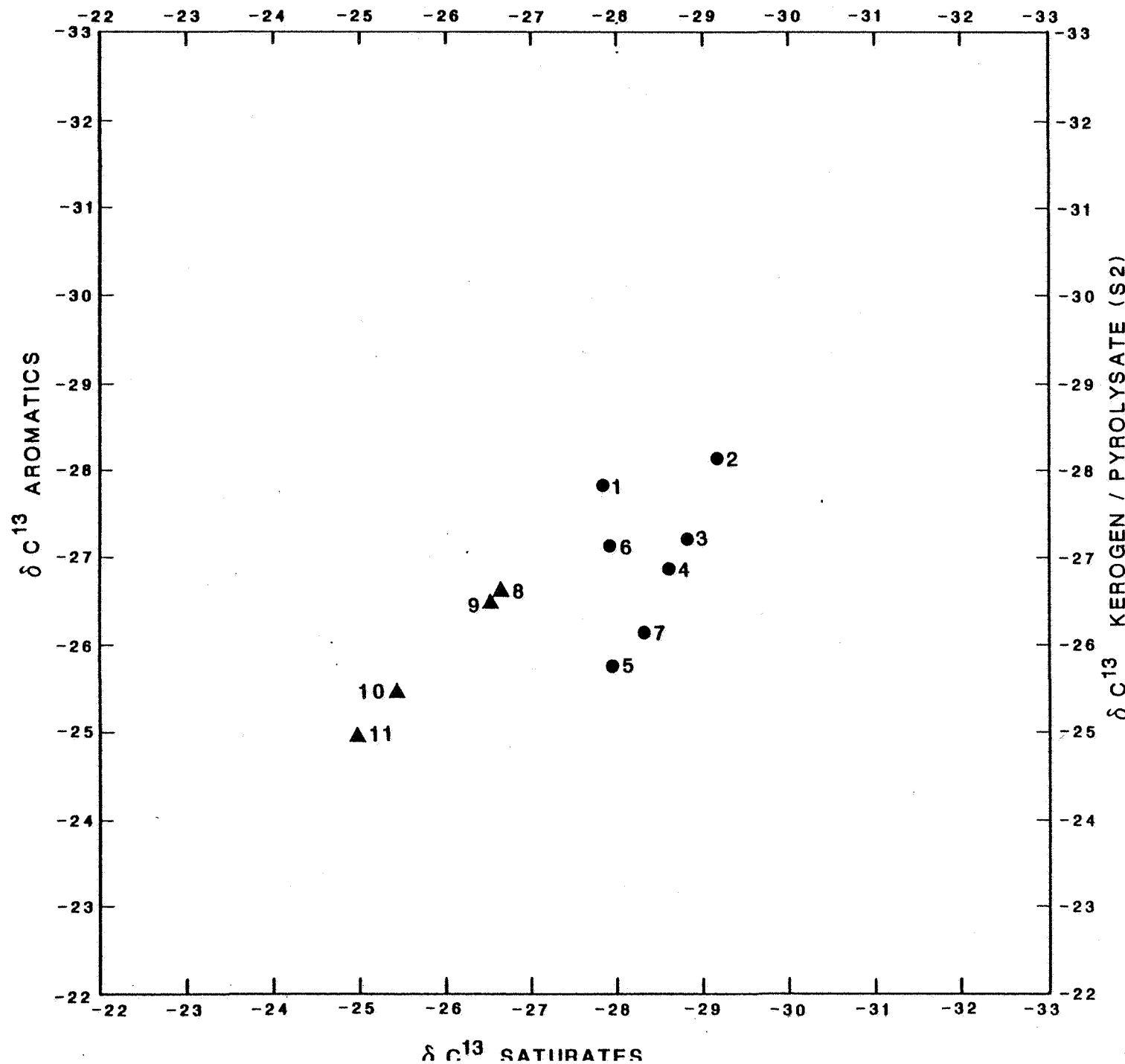
6406/6-1

δC^{13}

TOTAL EXTRACT/CRUDE

CARBON ISOTOPES

(‰ PDB)



LEGEND

SATURATES vs AROMATICS PLOT

- CRUDE OIL
- SOURCE ROCK
- ◐ EXTRACTED SHOW

TE/CRUDE vs KEROGEN / S2 PLOT

- TOTAL CRUDE
- TOTAL EXTRACT
- △ KEROGEN
- ▲ PYROLYSATE (S2)

- 1 3031-3040m
- 2 3382-3391m
- 3 4003-4006m
- 4 4012-4015m
- 5 4048-4051m
- 6 4237-4246m
- 7 4327-4336m
- 8 4003-4006m
- 9 4012-4015m
- 10 4036-4039m
- 11 4048-4051m

FIGURE 10
WELL 6406/6-1

GALIMOV CARBON ISOTOPE PLOT (‰, PDB)



- | | | |
|---|-------------|-----------|
| 1 | 3031-3040 m | ————— |
| 2 | 3382-3391 m | |
| 3 | 4003-4006 m | - - - - - |
| 4 | 4012-4015 m | ————— |
| 5 | 4048-4051 m | - - - - - |
| 6 | 4237-4246 m | ● ● ● ● ● |
| 7 | 4327-4336 m | ===== |
| 8 | 4036-4039 m | |

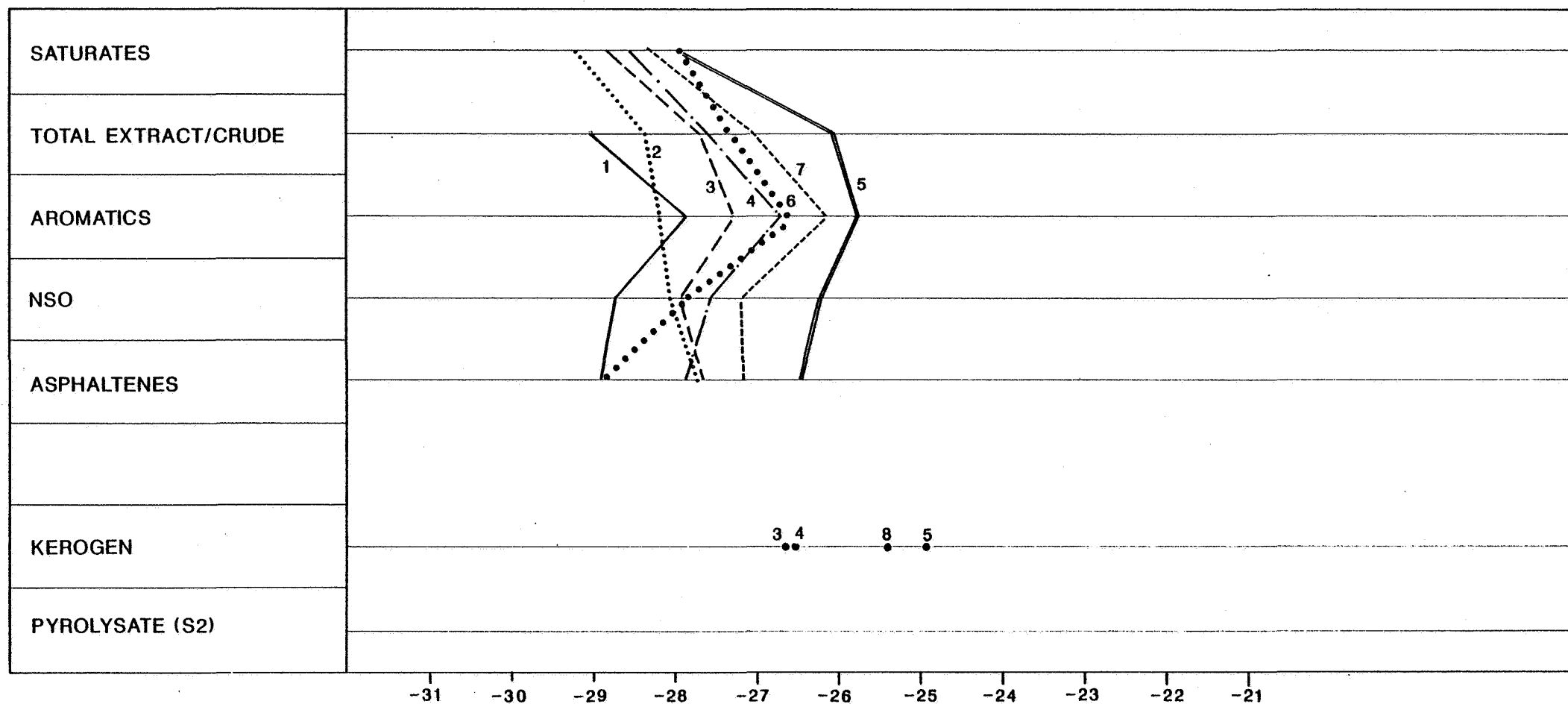




TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-044	2400-450m	A 55% Claystone, blocky, soft, non-calc., minor to sig. cavings, medium grey	N5	0.97
		B 25% Claystone, blocky, soft, sl. silty, non-calc., minor cavings, medium dark grey	N4	1.02
		C 10% Claystone, blocky to subfissile, soft to mod. hard, sl. silty, non-calc., sig. cavings, light greyish brown	5YR4/2	0.28
		D 10% Shaly claystone, subfissile, soft, non-calc., abundant cavings, light greenish grey	5GY8/1	0.20
1286-046	2500-509m	A 75% Claystone, subfissile, shaly, soft to mod. hard, non-calc., minor to sig. cavings, medium light grey to light olive grey	N6- 5Y6/1	0.89,0.92
		B 25% Claystone, blocky to subfissile, soft, non-calc., sig. cavings, medium olive grey Minor other caved mudstone	5Y5/1	0.56
1286-048	2518-527m	A 60% Claystone, blocky, soft, calc., minor cavings, light grey	N7	0.71
		B 40% Shaly claystone, subfissile, soft, calc., v. light olive grey Minor other claystone Minor LCM	5Y7/1	0.67
1286-050	2536-545m	A 55% Claystone, as 1286-048A, minor cavings	N7	0.69
		B 30% Shaly claystone, as 1286-048B, minor cavings	5Y7/1	0.48
		C 15% LCM - cement?		
1286-052	2554-563m	A 60% Claystone, as 1286-048A, minor cavings	N7	0.72,0.70
		B 40% Shaly claystone, as 1286-048B, minor cavings	5Y7/1	0.45
1286-054	2572-581m	A 65% Claystone, as 1286-048A, minor cavings	N7	0.77
		B 35% Shaly claystone, as 1286-048B, minor cavings Minor LCM	5Y7/1	0.51
1286-056	2590-599m	A 65% Claystone, as 1286-048A, minor cavings	N7	1.37,1.38
		B 20% Shaly claystone, as 1286-048B	5Y7/1	0.82
		C 15% LCM - cement?		
1286-058	2608-617m	A 95% Clay, blocky, soft, sl. calc., shaly in part, light grey to v. light olive grey	N7- 5Y7/1	0.81
		B 5% LCM - cement?		



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-060	2626-635m	A 60% Silty claystone, blocky, soft, non-calc., light grey	N7	0.76
		B 40% Shaly claystone, subfissile, soft, non-calc., v. light olive grey Minor other claystone	5Y7/1	1.10
1286-062	2644-653m	A 70% Silty claystone, as 1286-060A, minor cavings	N7	0.84,0.86
		B 30% Shaly claystone, as 1286-060B, sig. cavings	5Y7/1	0.77
1286-064	2642-671m	A 70% Silty claystone, as 1286-060A, minor cavings	N7	0.75
		B 30% Shaly claystone, as 1286-060B, sig. cavings	5Y7/1	0.63
1286-066	2680-689m	A 80% Silty claystone, blocky, soft, non-calc., v. light olive grey to olive grey	5Y7/1- 5Y6/1	0.77
		B 20% LCM? - cement? Minor other claystone		
1286-069	2707-716m	A 98% Silty claystone, as 1286-066A Minor other mudstone	5Y7/1- 5Y6/1	0.72
1286-071	2725-734m	A 98% Silty claystone, as 1286-066A Minor other mudstone	5Y7/1- 5Y6/1	0.77,0.79
1286-074	2752-761m	A 98% Claystone, blocky, soft, non-calc., minor cavings, medium light grey to light grey	N6-7	0.82
1286-076	2770-779m	A 98% Claystone, blocky, soft, non-calc., minor cavings, medium light grey Minor sandstone and caved claystone	N6	0.80
1286-079	2797-806m	A 98% Claystone, as 1286-076A, minor cavings Minor other caved claystone	N6	0.79,0.83
1286-081	2815-824m	A 98% Claystone, as 1286-076A, minor cavings Minor other caved claystone	N6	0.83
1286-084	2842-851m	A 98% Claystone, as 1286-076A, minor cavings Minor other caved claystone	N6	0.84
1286-086	2860-869m	A 98% Claystone, as 1286-076A, minor cavings Minor other claystone	N6	0.83
1286-089	2857-896m	A 75% Claystone, blocky, soft, non-calc., light grey	N7	0.85
		B 25% Shaly mudstone, subfissile, soft to mod. hard, non-calc., sig. to abundant cavings, light grey to v. light olive grey	N7- 5Y7/1	0.86,0.88

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomitic, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-091	2905-914m	A 70% Claystone, blocky, soft, non-calc., light grey	N7	0.79
		B 20% Shaly mudstone, subfissile, soft to mod. hard, non-calc., sig. to abundant cavings, light grey to v. light olive grey	N7- 5Y7/1	0.85
1286-093	2923-932m	A 85% Claystone, as 1286-091A	N7	0.81
		B 15% Shaly mudstone, as 1286-091B, sig. cavings Minor other mudstone	N7- 5Y7/1	0.89
1296-095	2941-950m	A 85% Claystone, as 1286-091A	N7	0.79
		B 15% Shaly mudstone, as 1286-091B, sig. cavings Minor other mudstone	N7- 5Y7/1	0.90, 0.90
1286-097	2958-968m	A 85% Claystone, as 1286-091A	N7	0.89
		B 15% Shaly mudstone, as 1286-091B, sig. cavings Minor other mudstone	N7- 5Y7/1	0.74
1286-099	2977-986m	A 95% Claystone, as 1286-091A	N7	0.84
		B 5% Shaly mudstone, as 1286-091B, sig. cavings Minor other mudstone	N7- 5Y7/1	0.76
1286-101	2995- 3004m	A 85% Claystone, blocky, soft, non-calc. to v. sl. calc., light grey	N7	0.90, 0.94
		B 15% Shaly claystone, subfissile, soft, non-calc., minor to sig. cavings, light grey Minor other claystone	N7	0.85
1286-103	3013-022m	A 90% Claystone, as 1286-101A, minor cavings	N7	0.89
		B 10% Shaly claystone, as 1286-101B Minor other claystone	N7	0.85
1286-105	3031-040m	A 75% Claystone, blocky, soft, non-calc., minor cavings, medium grey	N5	0.96
		B 20% Claystone, blocky, soft, non-calc., minor cavings, light grey	N7	0.86
		C 5% Sandstone, blocky, fine grained, subangular, well sorted, non-calc., minor glauconite?, v. light grey	N8	
1286-108	3058-067m	A 90% Claystone, blocky, soft, non-calc., minor cavings, light grey	N7	1.01
		B 10% Shaly claystone, subfissile, mod. hard, non-calc., sig. cavings, light grey Minor sand	N7	1.34



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-110	3076-085m	A 90% Claystone, blocky, soft, non-calc., minor cavings, light grey	N7	0.87,0.86
		B 10% Shaly claystone, subfissile, mod. hard, non-calc., sig. cavings, light grey Minor sand	N7	0.94
1286-112	3094-103m	A 50% Claystone, blocky, soft, sl. silty, v. sl. calc., light grey	N7	1.89
		B 50% Shale, thinly fissile, mod. hard, non-calc., medium grey to medium light grey Minor mudstone	N5-6	0.85
1286-115	3121-130m	A 50% Claystone, as 1286-112A, minor cavings	N7	1.19
		B 50% Shale, as 1286-112B, minor to sig. cavings	N5-6	0.79,0.80
1286-117	3139-148m	A 80% Claystone, blocky, soft, non-calc., medium light grey	N6	0.83
		B 20% Shale, platy to subfissile, mod. hard, non-calc., sig. cavings, medium grey	N5	0.83
1286-119	3157-166m	A 90% Claystone, as 1286-117A	N6	1.10
		B 10% Shale, as 1286-117B, sig. cavings	N5	0.87
1286-121	3175-184m	A 95% Claystone, as 1286-117A	N6	1.03
		B 5% Shale, as 1286-117B, sig. cavings	N5	0.95,0.95
1286-123	3193-202m	A 95% Claystone, as 1286-117A	N6	0.88
		B 5% Shale, as 1286-117B, abundant cavings	N5	
1286-125	3211-220m	A 95% Claystone, as 1286-117A	N6	1.13
		B 5% Shale, as 1286-117B, sig. cavings	N5	
1286-127	3229-238m	A 90% Claystone, as 1286-117A	N6	1.07
		B 10% Shale, as 1286-117B, abundant cavings	N5	1.02
		LCM - paint and pipe dope		
1286-129	3247-256m	A 65% Claystone, blocky, soft, non-calc., light grey	N7	0.96,0.97
		B 35% Shaly mudstone, subfissile, mod. hard, non-calc., sig. to abundant cavings, v. light olive grey Minor other caved mudstone	5Y7/1	0.65
1286-131	3265-224m	A 85% Claystone, as 1286-129A	N7	0.95
		B 15% Shaly mudstone, as 1286-129B, sig. cavings Minor other mudstone	5Y7/1	0.93
1286-133	3283-3292m	A 95% Claystone, as 1286-129A	N7	0.91
		B 5% Shaly mudstone, as 1286-129B, sig. cavings Minor other mudstone and evaporite?	5Y7/1	1.01



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-135	3301-310m	A 90% Claystone, blocky, soft, non-calc., light grey	N7	1.02,1.03
		B 10% Shaly mudstone, subfissile, mod. hard, non-calc., sig. to abundant cavings, v. light olive grey Minor sand	5Y7/1	0.77
1286-137	3319-328m	A 75% Claystone, blocky, soft to mod. hard, non-calc., medium dark grey	N4	1.06
		B 15% Sand, unconsolidated, medium grained, subangular, fairly well sorted, white	N9	
		C 10% LCM - cement? Minor caved shale		
1286-140	3346-355m	A 90% Claystone, blocky, soft, non-calc., medium grey	N5	0.95
		B 10% Shale, platy, mod. hard, non-calc., minor cavings, medium dark grey to medium grey Minor sand	N4-5	0.93
1286-142	3364-373m	A 85% Claystone, as 1286-140A	N5	1.42,1.43
		B 15% LCM - lignite Minor shale		
1286-144	3382-391m	A 75% Claystone, blocky, soft, non-calc., minor cavings, medium dark grey	N4	1.08,1.07
		B 15% Claystone, blocky, soft, non-calc., light grey	N7	0.63
		C 10% Sandstone, blocky, fine to medium grained, subangular, fairly well sorted, v. light grey Minor lignite and other claystone	N8	
1286-147	3409-418m	A 85% Claystone, blocky, soft, calc., medium light grey to light brownish grey	N6- 5YR6/1	0.98
		B 15% Shale, platy to subfissile, mod. hard, non-calc., sig. cavings, medium grey Minor limestone	N5	0.66
1286-149	3427-436m	A 85% Claystone, as 1286-147A	N6- 5YR6/1	1.00
		B 15% Shale, as 1286-147B, sig. cavings Minor LCM - cement Minor limestone	N5	0.72
1286-151	3445-454m	A 80% Claystone, blocky, soft, non-calc., medium grey	N5	0.98
		B 15% Silty claystone, blocky, mod. hard, non-calc., medium dark grey	N4	0.84
		C 5% Shale, platy, mod. hard, non-calc., medium grey	N5	1.05

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomitic, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS



GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-154	3472-481m	A 75% Claystone, blocky, soft, non-calc., medium grey	N5	0.89,0.90
		B 15% Shale, platy, mod. hard, non-calc., medium grey	N5	0.85
		C 10% Silty claystone, blocky, mod. hard, non-calc., medium dark grey Minor limestone LCM - cement?	N4	1.01
1286-156	3490-499m	A 75% Claystone, as 1286-154A	N5	0.90
		B 15% Shale, as 1286-154B	N5	0.83
		C 10% Silty claystone, as 1286-154C Minor limestone LCM - cement	N4	0.93
1286-158	3508-517m	A 60% Claystone, as 1286-154A, minor cavings	N5	0.96,0.98
		B 15% Shale, as 1286-154B, sig. cavings	N5	1.02
		C 15% LCM - lignite		
		D 10% Silty claystone, as 1286-154C	N4	1.04
1286-161	3535-544m	A 35% Shale, as 1286-154B, sig. cavings	N5	0.81
		B 35% Silty claystone, as 1286-154C	N4	0.78
		C 20% Claystone, as 1286-154A, sig. cavings	N5	0.86,0.86
		D 20% LCM - cement? and lignite		
1286-165	3571-580m	A 60% Claystone, blocky, soft, non-calc., medium grey	N5	0.89
		B 20% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey to medium grey	N4-5	0.98
		C 20% Silty mudstone, blocky, mod. hard, non-calc., minor cavings, medium dark grey Minor other mudstone and sandstone LCM - lignite	N4	0.86
1286-169	3607-616m	A 55% Shale, as 1286-165B, sig. to abundant cavings	N4-5	0.89
		B 30% Claystone, as 1286-165A, sig. cavings	N5	0.71
		C 15% Silty mudstone, as 1286-165C Minor other mudstone Minor LCM	N4	0.80
1286-172	3634-643m	A 45% Silty mudstone, as 1286-165C, minor cavings	N4	0.86
		B 35% Claystone, as 1286-165A	N5	0.95
		C 20% Shale, as 1286-165B, sig. cavings Minor lignite Minor other caved mudstone	N4-5	0.82

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomitic, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-176	3670-679m	A 60% Silty mudstone, blocky, mod. hard, non-calc., minor cavings, medium dark grey	N4	0.80,0.81
		B 20% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey to medium grey	N4-5	0.83
		C 20% Claystone, blocky, soft, non-calc., medium grey Minor other mudstone	N5	0.85
1286-179	3697-706m	A 45% Silty mudstone, as 1286-176A, minor cavings	N4	0.87
		B 30% Claystone, as 1286-176C	N5	1.01
		C 15% Shale, as 1286-176B, sig. cavings	N4-5	0.82,0.84
		D 10% LCM - lignite Minor other mudstone		
1286-182	3724-233m	A 55% Silty mudstone, as 1286-176A	N4	0.86
		B 30% Shale, as 1286-176B, sig. cavings	N4-5	0.83
		C 15% Claystone, as 1286-176C Minor other mudstone	N5	0.84,0.85
1286-186	3760-769m	A 70% Silty mudstone, blocky, mod. hard, non-calc., medium dark grey	N4	0.79
		B 30% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey Minor other mudstone Minor LCM - lignite	N4	0.82
1286-190	3796-805m	A 80% Silty mudstone, as 1286-186A, minor cavings	N4	0.79
		B 20% Shale, as 1286-186B, sig. cavings Minor other mudstone Minor LCM - lignite	N4	0.85
1286-193	3827-832m	A 85% Silty mudstone, as 1286-186A, minor cavings	N4	0.66
		B 15% Shale, as 1286-186B, sig. cavings Minor other mudstone Minor LCM - lignite	N4	0.90
1286-197	3859-868m	A 85% Silty mudstone, as 1286-186A, minor cavings	N4	0.75
		B 15% Shale, as 1286-186B, sig. cavings Minor other mudstone Minor LCM - lignite	N4	0.84
1286-200	3883-892m	A 65% Shale, platy to subfissile, mod. hard, non-calc., abundant to dominant cavings, medium dark grey	N4	0.90
		B 35% Shaly mudstone, blocky to subfissile, soft to mod. hard, non-calc., dominant cavings, medium light grey to light grey Minor sand and other mudstone Minor LCM - lignite	N6-7	0.86,0.86

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomitic, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-204	3928-937m	A 70% Shale, platy to thinly fissile, mod. hard, non-calc., sig. to abundant cavings, medium dark grey	N4	0.80
		B 30% Claystone, blocky, soft to mod. hard, sl. calc., medium grey Minor other mudstone	N5	0.99, 0.98
1286-207	3946-955m	A 70% Shale, platy to thinly fissile, mod. hard, non-calc., sig. to abundant cavings, medium dark grey to dark grey	N4-3	0.65
		B 15% Shaly mudstone, subfissile, soft to mod. hard, non-calc., minor to sig. cavings, medium grey	N5	0.85
		C 10% LCM - lignite		
		D 5% Mudstone, blocky, soft, non-calc., light olive grey Minor other mudstone	5Y6/1	0.63
1286-211	3982-991m	A 85% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey	N4	0.66
		B 15% Claystone, blocky, soft, non-calc., medium grey Minor lignite	N5	0.67
1286-214 SWC	4002m	A 98% Silty shale, subfissile, soft, sl. calc., medium dark grey to dark grey	N4-3	4.79
1286-215	4003-006m	A 40% Silty shale, subfissile, soft to mod. hard, non-calc., medium dark grey to dark grey	N4-3	
		B 35% Limestone, blocky, soft, v. light grey	N8	
		C 25% Shale, platy, mod. hard, non-calc., abundant cavings, medium dark grey	N4	
1286-218 SWC	4010m	A 98% Silty shale, subfissile, to blocky, soft, non-calc., dark grey to dark olive grey	N3- 5Y3/1	6.45, 6.36
1286-219	4012-015m	A 75% Silty shale, subfissile to blocky, soft, non-calc., minor cavings, dark grey to dark olive grey	N3- 5Y3/1	6.89
		B 20% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey to dark grey	N4-3	1.25
		C <5% Limestone, blocky, soft to mod. hard, v. light grey	N8	0.34
1286-222 SWC	4089m	A 98% Silty mudstone, subfissile to blocky, soft, non-calc., dark grey to dark olive grey	N3- 5Y3/1	5.54
1286-224 SWC	4024m	A 98% Silty mudstone, blocky, mod. hard, non-calc., dark grey	N3	4.09
1286-229 SWC	4034m	A 98% Silty shale, subfissile, soft to mod. hard, non-calc., dark grey	N3	7.09, 7.01

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomitic, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-230	4036-039m	A 75% Silty shale, subfissile, soft to mod. hard, non-calc., minor cavings, dark grey to dark brownish grey	N3- 5YR3/1	7.89
		B 25% Shale, thinly fissile, mod. hard, non-calc., sig. to abundant cavings, medium dark grey Minor other shale	N4	0.92
1286-231 SWC	4038m	A 98% Silty shale, subfissile soft to mod. hard, non-calc., dark grey to dark brownish grey	N3- 5YR3/1	7.91
1286-233 SWC	4041m	A 98% Silty shale, as 1286-231A	N3- 5YR3/1	9.17
1286-234 SWC	4042m	A 80% Silty shale, as 1286-231A	N3- 5YR3/1	6.38
		B 20% Siltstone, blocky, pyritic, non-calc., medium olive grey to light olive grey	5Y5/1- 5Y6/1	0.60
1286-236 SWC	4043m	A 98% Silty shale, subfissile to platy, soft, non-calc., medium dark grey to brownish grey	N4- 5YR4/1	7.42, 7.23
1286-237 SWC	4044m	A 98% Silty shale, subfissile, mod. hard, non-calc., dark grey to dark brownish grey	N3- 5YR3/1	5.64
1286-239	4048-051m	A 55% Silty shale, subfissile to blocky, soft to mod. hard, non-calc., minor cavings, dark grey to dark brownish grey	N3- 5YR3/1	6.60, 6.56
		B 45% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey Minor other shale Minor lignite	N4	1.02
1286-242 SWC	4055m	A 98% Silty shale, subfissile, soft, non-calc., medium dark grey to dark grey	N4-3	0.96
1286-245	4063-066m	A 45% Shale, thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey	N4	1.19
		B 30% Mudstone, blocky to subfissile, soft to mod. hard, sl. calc., medium dark grey to brownish grey	N4- 5YR4/1	3.49
		C 15% Shale, platy to subfissile, soft to mod. hard, non-calc., minor cavings, medium grey	N5	1.21
		D 10% Marl, grading to arg. limestone, blocky, soft, medium brownish grey	5YR5/1	1.19



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-248 SWC	4070m	A 98% Shale, subfissile, soft to mod. hard, sl. silty, non-calc., medium grey to medium dark grey	N5-4	0.51
1286-250	4075-078m	A 90% Shale, platy, mod. hard, non-calc., abundant cavings, medium dark grey	N4	0.77
		B 10% Silty mudstone, blocky, soft, non-calc., medium grey to medium dark grey Minor caved mudstone LCM - cement?	N5-4	1.29
1286-258	4111-120m	A 45% Shale, platy to subfissile, mod. hard, non-calc., minor cavings, medium grey to medium dark grey	N5-4	0.59,0.57
		B 40% Mudstone, blocky to subfissile, soft to mod. hard, non-calc., medium grey	N5	1.10
		C 15% Shale, thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey Minor other shale and limestone	N4	1.05
1286-260	4129-138m	A 70% Shale, platy to subfissile, mod. hard, non-calc., abundant cavings, medium grey	N5	
		B 30% Shaly mudstone, blocky, soft, non-calc., sig. cavings, light olive grey	5Y6/1	
1286-261 SWC	4133m	A 98% Shaly mudstone, subfissile, soft to mod. hard, non-calc., medium dark grey	N4	0.84,0.86
1286-263	4147-156m	A 55% Shale, platy, mod. hard, non-calc., abundant cavings, medium dark grey	N4	1.11
		B 20% Silty mudstone, blocky to subfissile, soft, non-calc., brownish grey	5YR4/1	1.76
		C 15% Shale, subfissile to blocky, soft to mod. hard, non-calc., minor to sig. cavings, medium light grey	N6	0.77
		D 10% Shaly mudstone, blocky, soft to mod. hard, non-calc., sig. cavings, greyish red Minor other mudstone	5R4/2	0.20
1286-266	4174-183m	A 35% Claystone/mudstone, blocky, soft, non-calc. to sl. calc., medium grey	N5	1.28
		B 30% LCM - wood, lignite and metal		
		C 20% Shale, platy to thinly fissile, mod. hard, non-calc., medium dark grey	N4	1.84
		D 15% Sand, unconsolidated, medium grained, subangular, well sorted, clear, white	N9	



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-269	4201-210m	A 85% Sandstone, mostly unconsolidated, medium grained, subangular, well sorted, v. pale milky cut, white to greyish orange	N9- 10YR7/4	
		B 15% Shale, subfissile to platy, soft to mod. hard, sl. silty, non-calc., minor cavings, medium dark grey to dark grey Minor mudstone and lignite	N4-3	2.93, 2.69
1286-328 CORE	4211.25- 4211.30m	A 98% Sandstone, massive, medium grained, subangular, fairly well sorted, v. light grey	N8	
1286-329 CORE	4237.70- 4237.75m	A 98% Sandstone, massive, medium grained, subangular, fairly well sorted, v. light grey	N8	
1286-272	4237-246m	A 95% Sandstone, mostly unconsolidated, medium grained, subangular, well sorted, v. pale milky cut, white to pinkish grey	N9- 5YR8/1	
		B <5% Shale, platy, mod. hard, non-calc., sig. to abundant cavings, medium dark grey	N4	2.95, 2.99
1286-275	4264-273m	A 98% Sandstone, mostly unconsolidated, medium grained, subangular, well sorted, v. pale milky cut, white to greyish orange Minor shale and lignite	N9- 10YR7/4	
1286-279	4300-309m	A 98% Sandstone, as 1286-275A, v. pale milky cut Minor shale and lignite	N9- 10YR7/4	
1286-282	4327-336m	A 55% Sandstone, blocky, medium grained, subangular, fairly well sorted, milky cut, pinkish grey	5YR8/1	
		B 20% Mudstone, blocky, soft, silty, non-calc., brownish grey	5YR4/1	2.03
		C 15% Shale, subfissile to platy, soft, non-calc., sl. silty, medium dark grey to brownish grey	N4- 5YR4/1	1.75
		D 10% LCM - metal		
1286-286	4363-372m	A 98% Sandstone, as 1286-282A, v. pale milky cut Minor mudstone and shale Minor LCM	5YR8/1	



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH		GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-289	4390-399	A 98%	Sandstone, mostly unconsolidated, medium grained, subangular, fairly well sorted, v. pale milky cut, pinkish grey to v. pale yellowish brown Minor lignite and shale	5YR8/1- 10YR7/2	
1286-293	4426-435m	A 98%	Sandstone, as 1286-289A Minor lignite and shale	5YR8/1- 10YR7/2	
1286-296	4453-462m	A 98%	Sandstone, mostly unconsolidated, medium grained, subangular, fairly well sorted, v. pale milky cut, light grey to pinkish grey	N7- 5YR8/1	
1286-300	4489-498m	A 98%	Sandstone, as 1286-296A Minor shale	N7- 5YR8/1	
1286-303	4516-525m	A 85%	Sandstone, mostly unconsolidated, medium grained, subangular, fairly well sorted, v. pale milky cut, pinkish grey to v. pale yellowish brown	5YR8/1- 10YR7/2	
		B 15%	Silty shale, platy, mod. hard, sl. silty, non-calc., minor to sig. cavings, medium dark grey	N4	1.28
1286-304	4525-534m	A 98%	Sandstone, mostly unconsolidated, medium grained, subangular, fairly well sorted, v. pale milky cut, pinkish grey to v. pale yellowish brown Minor shale	5YR8/1- 10YR7/2	
1286-310	4579-588m	A 95%	Sandstone, as 1286-304A, v. pale milky cut	5YR8/1- 10YR7/2	
		B 5%	Silty shale, platy, mod. hard, sl. silty, non-calc., sig. cavings, medium dark grey	N4	0.98
1286-311 SWC	4590m	A 98%	Silty shale, subfissile, soft to mod. hard, non-calc., minor sandy layers, medium grey	N5	1.02
1286-314	4606-615m	A 95%	Sandstone, as 1286-304A, v. pale milky cut	5YR8/1- 10YR7/2	
		B 5%	Silty shale, subfissile, soft, non-calc., medium grey to medium brownish grey	N5- 5YR5/1	1.27



TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
1286-318	4642-651m	A 90% Sandstone, mostly unconsolidated, medium grained, subangular, fairly well sorted, v. pale milky cut, pinkish grey to v. light brownish grey	5YR8/1- 5YR7/1	
		B 10% Silty shale, platy, mod. hard, sl. micaceous, non-calc., minor cavings, medium dark grey	N4	4.04, 3.78
1286-320 SWC	4660m	A 98% Silty shale, platy to subfissile, soft to mod. hard, micaceous, non-calc., medium dark grey	N4	1.31
1286-322	4669-678m	A 95% Sandstone, as 1286-318A, v. pale milky cut	5YR8/1- 5YR7/1	
		B 5% Silty shale, subfissile, soft to mod. hard, non-calc., sig. cavings, medium grey to medium brownish grey	N5- 5YR5/1	1.41
1286-326	4705-711m	A 95% Sandstone, mostly unconsolidated, medium grained, subangular, fairly well sorted, v. pale milky cut, pinkish grey	5YR8/1	
1286-326	4705-711m	B <5% Shale, platy to subfissile, soft to mod. hard, sl. silty and micaceous, non-calc., medium dark grey to dark grey	N4-3	2.15

TABLE 2A
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-007	600-650	140	6	3	0	0	149	10	6.4	24	0.85
1286-011	800-850	191	2	3	0	0	196	5	2.6	2	0.43
1286-016	1000-1050	1216	8	6	2	2	1235	19	1.5	6	0.75
1286-020	1200-1250	1434	9	5	2	1	1450	16	1.1	3	2.83
1286-024	1400-1450	1694	21	11	2	2	1729	36	2.1	4	1.07
1286-028	1600-1650	1685	44	36	9	4	1777	92	5.2	7	2.40
1286-032	1800-1850	333	7	4	1	1	346	13	3.7	2	0.62
1286-034	1900-1950	1290	27	21	6	2	1346	56	4.1	7	2.32
1286-036	2000-2050	441	19	24	10	6	500	59	11.8	6	1.88
1286-038	2100-2150	165	14	6	1	2	188	23	12.2	1	0.67
1286-040	2200-2250	1084	144	71	9	12	1319	235	17.8	1	0.73
1286-042	2300-2350	598	51	36	7	10	702	104	14.8	4	0.67
1286-044	2400-2450	7	3	6	3	8	27	20	73.8	6	0.36
1286-046	2500-2509	222	33	158	70	136	618	396	64.1	77	0.51
1286-048	2518-2527	88	15	35	9	8	155	67	42.9	25	1.16
1286-050	2530-2545	404	58	248	93	44	847	443	52.3	108	2.13
1286-052	2554-2563	1591	420	902	386	646	3945	2354	59.7	380	0.60
1286-054	2572-2581	35	9	19	20	23	106	71	66.7	24	0.88
1286-056	2590-2599	42	22	48	24	22	158	116	73.4	28	1.10
1286-058	2608-2617	146	37	135	44	69	430	284	66.1	3	0.64
1286-060	2626-2635	286	103	239	86	108	822	536	65.2	70	0.80
1286-062	2644-2653	59	24	53	19	22	176	117	66.5	20	0.89
1286-064	2662-2671	91	20	108	32	54	306	215	70.2	56	0.59
1286-066	2680-2689	95	18	9	28	43	193	98	50.9	49	0.66
1286-069	2707-2716	916	235	193	170	173	1686	771	45.7	1148	0.98
1286-071	2725-2734	878	267	442	301	446	2334	1455	62.4	155	0.67
1286-074	2752-2761	753	285	456	131	206	1831	1078	58.9	109	0.64
1286-076	2770-2779	441	140	236	58	114	989	548	55.4	45	0.51
1286-079	2797-2806	571	135	469	204	447	1826	1256	68.7	205	0.46
1286-081	2815-2824	450	124	174	52	101	900	450	50.0	39	0.52

TABLE 2A
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-084	2842-2851	418	97	161	47	87	810	392	48.4	40	0.54
1286-086	2860-2869	105	40	108	39	79	370	265	71.7	28	0.49
1286-089	2887-2896	99	47	97	35	76	354	255	72.0	22	0.46
1286-091	2905-2914	203	53	117	83	112	569	366	64.3	58	0.74
1286-093	2923-2932	79	21	51	35	49	234	156	66.4	23	0.71
1286-095	2941-2950	137	66	121	52	80	455	318	69.9	38	0.65
1286-097	2958-2968	411	160	234	83	107	994	584	58.7	58	0.77
1286-099	2977-2986	150	56	136	71	80	493	343	69.6	49	0.88
1286-101	2995-3004	110	64	144	52	68	438	327	74.8	41	0.77
1286-103	3013-3022	17	31	43	22	24	138	121	87.4	22	0.90
1286-105	3031-3040	1921	1138	1142	563	593	5358	3437	64.1	974	0.95
1286-108	3058-3067	228	92	105	43	33	501	273	54.6	11	1.30
1286-110	3076-3085	90	16	9	2	3	121	31	25.3	2	0.79
1286-112	3094-3103	124	38	46	7	13	228	104	45.7	24	0.57
1286-115	3121-3130	1193	214	188	46	96	1737	544	31.3	24	0.48
1286-117	3139-3148	35	6	23	9	13	86	52	59.9	6	0.67
1286-119	3157-3166	611	87	58	13	14	783	172	22.0	4	0.97
1286-121	3175-3184	23	6	12	2	3	46	23	49.4	1	0.71
1286-123	3193-3202	87	27	39	7	10	170	82	48.5	13	0.64
1286-125	3211-3220	40	19	77	6	11	154	113	73.8	46	0.55
1286-127	3229-3238	133	96	199	46	94	567	434	76.6	22	0.49
1286-129	3247-3256	400	108	267	79	175	1029	630	61.2	48	0.45
1286-131	3265-3274	230	10	86	34	82	441	212	48.0	24	0.42
1286-133	3283-3292	457	111	140	32	63	802	346	43.1	13	0.51
1286-135	3301-3310	327	94	120	28	42	611	284	46.5	9	0.67
1286-137	3319-3328	1793	552	712	612	1120	4790	2997	62.6	832	0.55
1286-140	3346-3355	168	29	75	30	61	362	195	53.7	20	0.48
1286-142	3364-3373	57	28	11	5	10	110	54	48.6	18	0.53
1286-144	3382-3391	4687	726	2124	1200	1433	10170	5483	53.9	1091	0.84

TABLE 2A
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-147	3409-3418	42	87	31	21	15	196	155	78.8	13	1.45
1286-149	3427-3436	793	93	142	46	87	1161	368	31.7	33	0.53
1286-151	3445-3454	5781	806	1310	627	668	9191	3411	37.1	325	0.94
1286-154	3472-3481	52	40	39	10	21	162	110	67.8	8	0.47
1286-156	3490-3499	13	2	3	2	2	21	9	40.4	2	0.80
1286-158	3508-3517	118	18	28	8	4	177	58	33.0	11	1.92
1286-161	3535-3544	569	93	66	15	28	771	203	26.3	13	0.53
1286-165	3571-3571	3343	554	621	246	207	4971	1628	32.8	145	1.19
1286-169	3607-3616	55	18	9	3	6	91	36	39.3	2	0.44
1286-172	3634-3643	357	75	88	21	27	568	211	37.1	12	0.79
1286-176	3670-3679	18	2	3	1	1	24	6	25.1	0	1.01
1286-179	3697-3706	170	22	21	6	5	223	54	24.0	3	1.04
1286-182	3724-3733	663	107	64	14	18	867	204	23.5	6	0.78
1286-186	3760-3769	21	6	5	1	1	33	12	37.2	1	1.60
1286-190	3796-3805	3	1	1	1	2	7	4	54.3	1	0.32
1286-193	3823-3832	29	5	5	1	1	42	13	30.3	0	1.05
1286-197	3859-3868	1398	78	43	6	13	1537	139	9.1	4	0.46
1286-200	3883-3892	614	49	36	7	7	714	100	14.0	4	0.96
1286-204	3928-3937	234	159	36	12	31	471	238	50.4	31	0.38
1286-207	3946-3955	1201	385	175	31	32	1823	623	34.2	12	0.96
1286-211	3982-3991	96	43	40	8	14	200	104	52.2	21	0.56
1286-219	4012-4015	2141	1378	1579	741	1360	7200	5059	70.3	544	0.55
1286-230	4036-4039	13305	17673	16640	1557	7520	56697	43392	76.5	1297	0.21
1286-239	4048-4051	711	852	1764	0	661	3988	3277	82.2	216	0.00
1286-245	4063-4066	5164	1988	2971	513	1210	11845	6681	56.4	371	0.42
1286-250	4075-4078	2783	1049	1137	257	678	5903	3121	52.9	188	0.38
1286-258	4111-4120	782	42	71	21	42	959	177	18.4	21	0.51
1286-263	4147-4156	1631	651	771	146	291	3489	1858	53.3	101	0.50
1286-266	4174-4183	67	46	134	35	61	343	276	80.5	31	0.58
1286-269	4201-4210	268	120	126	22	30	566	298	52.7	9	0.72

TABLE 2A
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-272	4237-4246	324	167	162	26	48	726	402	55.4	16	0.54
1286-275	4264-4273	112	23	20	3	6	164	52	31.5	3	0.54
1286-279	4300-4309	26	18	19	5	3	72	46	63.4	15	1.50
1286-282	4327-4336	157	70	116	34	59	436	279	63.9	29	0.57
1286-286	4363-4372	80	33	45	13	21	192	112	58.4	16	0.63
1286-289	4390-4399	131	78	44	4	3	260	129	49.5	11	1.15
1286-293	4426-4435	26	13	19	6	12	76	50	65.2	8	0.48
1286-296	4453-4462	499	220	244	68	115	1145	646	56.4	56	0.59
1286-300	4489-4498	220	88	77	22	24	431	211	48.9	13	0.90
1286-303	4516-4525	597	225	314	89	129	1354	758	55.9	54	0.69
1286-306	4525-4534	118	49	52	14	22	255	137	53.7	14	0.63
1286-310	4579-4588	2	2	3	1	3	11	8	78.3	8	0.44
1286-314	4606-4615	222	108	150	61	74	616	393	63.9	66	0.83
1286-318	4642-4651	317	161	108	17	27	631	314	49.8	20	0.65
1286-322	4669-4678	82	66	76	20	31	275	193	70.1	26	0.63
1286-326	4705-4711	58	32	20	11	12	133	75	56.5	35	0.89

TABLE 2B
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-007	600-650	223	11	10	3	4	251	28	11.3	14	0.62
1286-011	800-850	1058	12	14	2	2	1089	31	2.8	9	0.96
1286-016	1000-1050	470	4	7	1	2	484	14	2.9	6	0.43
1286-020	1200-1250	429	19	12	0	0	460	31	6.8	3	0.70
1286-024	1400-1450	730	15	12	3	2	761	31	4.1	9	1.44
1286-028	1600-1650	1064	12	31	11	6	1124	60	5.3	17	1.81
1286-032	1800-1850	1092	33	46	5	20	1196	104	8.7	28	0.24
1286-034	1900-1950	1781	85	131	42	33	2071	290	14.0	27	1.28
1286-036	2000-2050	178	21	29	11	11	251	72	28.8	22	1.03
1286-038	2100-2150	958	138	124	67	42	1330	371	27.9	40	1.58
1286-040	2200-2250	555	74	123	34	69	856	301	35.1	34	0.49
1286-042	2300-2350	1080	136	217	62	148	1642	562	34.2	79	0.42
1286-044	2400-2450	757	34	128	67	137	1124	367	32.6	142	0.48
1286-046	2500-2509	3531	227	1241	910	1485	7394	3863	52.2	1188	0.61
1286-048	2518-2527	632	82	207	72	114	1106	474	42.9	181	0.63
1286-050	2530-2545	1045	128	375	238	110	1896	851	44.9	368	2.15
1286-052	2554-2563	11790	1699	8699	3982	5651	31821	20031	62.9	5972	0.70
1286-054	2572-2581	2007	375	802	827	1065	5076	3069	60.5	1430	0.78
1286-056	2590-2599	1181	221	635	425	369	2830	1650	58.3	560	1.15
1286-058	2608-2617	925	141	1024	494	765	3349	2424	72.4	595	0.65
1286-060	2626-2635	1649	370	1812	708	1200	5738	4089	71.3	938	0.59
1286-062	2644-2653	807	128	912	321	551	2720	1913	70.3	458	0.58
1286-064	2662-2671	970	130	1169	419	881	3568	2598	72.8	630	0.48
1286-066	2680-2689	397	85	298	131	181	1092	695	63.7	237	0.73
1286-069	2707-2716	382	84	86	76	75	703	321	45.6	191	1.01
1286-071	2725-2734	378	119	197	153	287	1134	755	66.6	296	0.53
1286-074	2752-2761	202	71	257	112	186	828	626	75.6	150	0.60
1286-076	2770-2779	925	665	997	259	568	3414	2489	72.9	349	0.46
1286-079	2797-2806	1855	116	511	510	793	3785	1930	51.0	696	0.64
1286-081	2815-2824	1396	318	1150	406	973	4243	2847	67.1	472	0.42

TABLE 2B
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-084	2842-2851	793	233	886	291	830	3033	2241	73.9	344	0.35
1286-086	2860-2869	623	125	709	259	678	2395	1772	74.0	314	0.38
1286-089	2887-2896	418	85	443	168	521	1635	1216	74.4	236	0.32
1286-091	2905-2914	649	57	420	262	727	2115	1465	69.3	364	0.36
1286-093	2923-2932	334	74	375	144	497	1425	1091	76.6	223	0.29
1286-095	2941-2950	234	94	406	154	353	1242	1007	81.1	240	0.44
1286-097	2958-2968	510	277	785	268	559	2400	1890	78.7	349	0.48
1286-099	2977-2986	322	64	455	242	220	1302	980	75.3	260	1.10
1286-101	2995-3004	167	74	321	121	201	884	717	81.1	179	0.60
1286-103	3013-3022	150	80	321	113	260	924	774	83.7	145	0.44
1286-105	3031-3040	3409	1196	4672	1956	3974	15207	11799	77.6	2387	0.49
1286-108	3058-3067	140	143	335	99	229	946	806	85.2	78	0.43
1286-110	3076-3085	420	251	323	56	131	1180	761	64.4	46	0.43
1286-112	3094-3103	252	243	298	68	186	1048	796	76.0	59	0.37
1286-115	3121-3130	1118	290	605	164	524	2700	1583	58.6	202	0.31
1286-117	3139-3148	104	15	44	11	61	236	132	55.8	58	0.19
1286-119	3157-3166	634	200	263	41	120	1258	624	49.6	72	0.34
1286-121	3175-3184	344	128	195	36	102	804	460	57.2	65	0.35
1286-123	3193-3202	251	156	248	56	120	831	580	69.7	43	0.47
1286-125	3211-3220	483	63	404	126	335	1412	929	65.8	102	0.38
1286-127	3229-3238	84	26	189	57	154	509	425	83.4	35	0.37
1286-129	3247-3256	180	71	104	62	117	534	354	66.3	56	0.53
1286-131	3265-3274	166	78	83	33	113	473	307	64.9	54	0.29
1286-133	3283-3292	210	16	117	25	100	468	258	55.2	32	0.25
1286-135	3301-3310	479	159	391	67	296	1392	913	65.6	57	0.23
1286-137	3319-3328	1372	421	542	475	1103	3913	2541	64.9	678	0.43
1286-140	3346-3355	39	25	16	27	45	153	113	74.2	14	0.59
1286-142	3364-3373	302	107	385	89	269	1152	850	73.8	173	0.33
1286-144	3382-3391	4192	525	4508	2326	3886	15437	11244	72.8	3425	0.60

TABLE 2B
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-147	3409-3418	198	25	169	65	166	623	425	68.2	70	0.39
1286-149	3427-3436	428	129	300	131	239	1227	799	65.1	99	0.55
1286-151	3445-3454	460	39	79	49	106	732	272	37.1	103	0.46
1286-154	3472-3481	299	112	108	24	56	599	300	50.1	53	0.43
1286-156	3490-3499	560	209	288	63	244	1365	805	59.0	86	0.26
1286-158	3508-3517	128	21	14	11	7	181	53	29.3	20	1.70
1286-161	3535-3544	747	204	228	50	157	1386	639	46.1	47	0.32
1286-165	3571-3571	145	20	28	20	29	243	97	40.1	26	0.69
1286-169	3607-3616	3928	1459	1975	411	1433	9205	5278	57.3	415	0.29
1286-172	3634-3643	612	70	156	96	162	1096	484	44.1	132	0.59
1286-176	3670-3679	634	132	263	48	196	1273	638	50.2	66	0.25
1286-179	3697-3706	536	61	31	19	21	670	133	19.9	22	0.91
1286-182	3724-3733	773	215	228	40	136	1391	618	44.4	66	0.29
1286-186	3760-3769	429	52	45	24	45	595	166	27.9	34	0.53
1286-190	3796-3805	1316	270	279	36	136	2036	721	35.4	37	0.26
1286-193	3823-3832	1371	151	94	23	44	1683	312	18.5	42	0.52
1286-197	3859-3868	4258	436	397	52	253	5396	1138	21.1	72	0.21
1286-200	3883-3892	942	253	731	272	479	2676	1734	64.8	265	0.57
1286-204	3928-3937	103	16	58	18	57	251	148	59.1	23	0.32
1286-207	3946-3955	188	88	283	86	128	774	586	75.7	62	0.67
1286-211	3982-3991	3970	1915	3774	599	2418	12676	8706	68.7	687	0.25
1286-219	4012-4015	17586	1378	6045	5968	10404	41381	23795	57.5	4780	0.57
1286-230	4036-4039	4176	5702	9789	1305	7223	28195	24019	85.2	1630	0.18
1286-239	4048-4051	6418	3792	17610	4499	14453	46772	40354	86.3	6426	0.31
1286-245	4063-4066	2822	3321	9152	1864	6147	23307	20485	87.9	2163	0.30
1286-250	4075-4078	2069	582	852	909	981	5394	3325	61.6	886	0.93
1286-258	4111-4120	8614	740	4611	2113	3153	19231	10617	55.2	2653	0.67
1286-263	4147-4156	3521	357	2714	1192	2296	10080	6559	65.1	1716	0.52
1286-266	4174-4183	835	276	1843	656	1489	5099	4264	83.6	703	0.44
1286-269	4201-4210	18	12	10	5	7	52	34	65.7	27	0.74

TABLE 2B
CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-272	4237-4246	688	468	874	198	448	2675	1987	74.3	189	0.44
1286-275	4264-4273	623	88	154	80	101	1046	423	40.5	55	0.79
1286-279	4300-4309	370	237	317	55	127	1105	736	66.5	47	0.43
1286-282	4327-4336	1345	539	1507	478	1315	5184	3839	74.1	652	0.36
1286-286	4363-4372	396	95	219	68	91	870	474	54.5	72	0.75
1286-289	4390-4399	444	149	214	74	126	1006	563	55.9	61	0.59
1286-293	4426-4435	589	177	366	140	156	1428	839	58.8	75	0.90
1286-296	4453-4462	794	202	605	249	365	2216	1421	64.1	279	0.68
1286-300	4489-4498	704	301	376	127	191	1700	996	58.6	128	0.67
1286-303	4516-4525	3045	634	2516	1262	1927	9384	6339	67.6	1472	0.65
1286-306	4525-4534	766	233	572	205	284	2059	1293	62.8	218	0.72
1286-310	4579-4588	5396	804	5075	2382	3118	16775	11379	67.8	2845	0.76
1286-314	4606-4615	331	75	195	146	127	874	543	62.1	127	1.16
1286-318	4642-4651	2151	1294	938	307	397	5087	2936	57.7	241	0.77
1286-322	4669-4678	409	164	291	102	143	1109	700	63.1	108	0.72
1286-326	4705-4711	859	163	418	194	221	1854	995	53.7	195	0.88

TABLE 2 C
TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-007	600-650	363	17	13	3	5	400	38	9.4	38	0.63
1286-011	800-850	1249	14	17	2	3	1285	36	2.8	11	0.88
1286-016	1000-1050	1687	13	13	3	4	1720	33	1.9	12	0.60
1286-020	1200-1250	1862	28	16	2	1	1910	48	2.5	7	2.05
1286-024	1400-1450	2423	36	23	5	4	2490	67	2.7	14	1.26
1286-028	1600-1650	2749	56	66	20	10	2900	152	5.2	24	2.02
1286-032	1800-1850	1425	40	50	5	21	1542	117	7.6	30	0.26
1286-034	1900-1950	3070	112	152	47	35	3416	346	10.1	34	1.35
1286-036	2000-2050	620	40	52	22	17	751	131	17.5	28	1.32
1286-038	2100-2150	1123	151	131	68	44	1518	394	26.0	41	1.54
1286-040	2200-2250	1639	218	193	43	81	2174	536	24.6	35	0.53
1286-042	2300-2350	1678	186	252	69	159	2344	666	28.4	82	0.43
1286-044	2400-2450	764	37	134	69	145	1151	387	33.6	148	0.48
1286-046	2500-2509	3753	260	1398	980	1621	8012	4259	53.2	1265	0.60
1286-048	2518-2527	720	97	241	81	122	1261	541	42.9	206	0.66
1286-050	2530-2545	1449	185	624	331	154	2744	1294	47.2	476	2.14
1286-052	2554-2563	13382	2119	9601	4368	6297	35767	22385	62.6	6352	0.69
1286-054	2572-2581	2042	384	822	847	1088	5183	3140	60.6	1455	0.78
1286-056	2590-2599	1223	243	683	449	390	2988	1765	59.1	588	1.15
1286-058	2608-2617	1071	178	1159	538	834	3780	2709	71.7	598	0.65
1286-060	2626-2635	1935	473	2051	794	1307	6561	4625	70.5	1007	0.61
1286-062	2644-2653	866	152	965	341	573	2896	2030	70.1	478	0.59
1286-064	2662-2671	1061	149	1278	451	935	3874	2813	72.6	687	0.48
1286-066	2680-2689	492	104	307	159	223	1285	794	61.8	286	0.71
1286-069	2707-2716	1298	320	278	246	248	2389	1091	45.7	1339	0.99
1286-071	2725-2734	1257	385	638	454	733	3467	2210	63.8	450	0.62
1286-074	2752-2761	955	356	713	243	392	2659	1704	64.1	259	0.62
1286-076	2770-2779	1366	805	1233	317	682	4403	3037	69.0	394	0.46
1286-079	2797-2806	2426	251	980	714	1240	5611	3186	56.8	901	0.58
1286-081	2815-2824	1846	442	1323	458	1074	5143	3298	64.1	511	0.43

TABLE 2 C
TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	iC ₄ nC ₄
1286-084	2842-2851	1211	330	1047	338	918	3843	2633	68.5	384	0.37
1286-086	2860-2869	728	165	817	298	757	2764	2036	73.7	341	0.39
1286-089	2887-2896	518	131	540	203	597	1989	1471	74.0	258	0.34
1286-091	2905-2914	853	110	536	345	840	2683	1831	68.2	422	0.41
1286-093	2923-2932	413	96	426	179	546	1659	1246	75.1	246	0.33
1286-095	2941-2950	371	159	527	206	433	1697	1326	78.1	278	0.48
1286-097	2958-2968	921	437	1019	351	666	3394	2473	72.9	407	0.53
1286-099	2977-2986	471	119	591	312	300	1794	1323	73.7	309	1.04
1286-101	2995-3004	278	139	465	173	268	1322	1045	79.0	220	0.64
1286-103	3013-3022	168	111	364	135	284	1062	895	84.2	167	0.47
1286-105	3031-3040	5330	2333	5815	2520	4568	20565	15235	74.1	3361	0.55
1286-108	3058-3067	368	235	440	142	262	1447	1079	74.6	89	0.54
1286-110	3076-3085	510	268	332	58	134	1301	791	60.8	48	0.43
1286-112	3094-3103	375	281	344	76	200	1276	900	70.6	83	0.38
1286-115	3121-3130	2311	504	793	210	620	4438	2127	47.9	227	0.34
1286-117	3139-3148	139	21	68	20	74	322	183	56.9	64	0.27
1286-119	3157-3166	1245	287	322	54	134	2042	796	39.0	77	0.40
1286-121	3175-3184	367	134	206	38	105	850	483	56.8	66	0.36
1286-123	3193-3202	339	183	286	63	130	1001	662	66.1	56	0.48
1286-125	3211-3220	524	82	481	133	347	1566	1043	66.6	148	0.38
1286-127	3229-3238	217	121	387	103	248	1076	859	79.8	57	0.41
1286-129	3247-3256	580	179	371	141	293	1563	984	62.9	105	0.48
1286-131	3265-3274	396	88	168	67	195	914	518	56.7	78	0.34
1286-133	3283-3292	667	127	257	57	163	1271	604	47.5	44	0.35
1286-135	3301-3310	806	253	511	96	338	2003	1197	59.8	66	0.28
1286-137	3319-3328	3165	973	1254	1087	2223	8702	5537	63.6	1510	0.49
1286-140	3346-3355	207	54	91	56	107	515	308	59.8	34	0.53
1286-142	3364-3373	358	135	395	94	279	1262	904	71.6	192	0.34
1286-144	3382-3391	8880	1251	6632	3525	5319	25607	16727	65.3	4516	0.66

TABLE 2 C
TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-147	3409-3418	240	112	201	86	180	819	579	70.7	83	0.48
1286-149	3427-3436	1221	222	443	177	326	2388	1167	48.9	132	0.54
1286-151	3445-3454	6241	845	1389	676	774	9924	3683	37.1	428	0.87
1286-154	3472-3481	351	152	147	34	76	762	410	53.9	61	0.44
1286-156	3490-3499	573	211	291	65	246	1386	813	58.7	87	0.26
1286-158	3508-3517	246	39	42	20	11	357	111	31.2	30	1.79
1286-161	3535-3544	1316	297	294	65	185	2157	841	39.0	60	0.35
1286-165	3571-3571	3488	575	649	266	236	5214	1726	33.1	171	1.13
1286-169	3607-3616	3983	1477	1984	414	1439	9297	5314	57.2	417	0.29
1286-172	3634-3643	970	145	243	117	189	1664	694	41.7	143	0.62
1286-176	3670-3679	652	133	266	49	196	1296	644	49.7	66	0.25
1286-179	3697-3706	706	83	52	25	27	893	187	21.0	25	0.94
1286-182	3724-3733	1436	322	292	54	154	2258	822	36.4	72	0.35
1286-186	3760-3769	450	57	50	25	46	628	178	28.4	35	0.55
1286-190	3796-3805	1319	270	280	36	138	2043	724	35.5	38	0.26
1286-193	3823-3832	1400	156	99	24	46	1725	325	18.8	43	0.53
1286-197	3859-3868	5656	513	440	58	266	6934	1278	18.4	76	0.22
1286-200	3883-3892	1556	302	767	279	486	3390	1834	54.1	269	0.57
1286-204	3928-3937	336	175	93	30	88	722	386	53.4	53	0.34
1286-207	3946-3955	1388	473	458	116	160	2597	1208	46.5	73	0.73
1286-211	3982-3991	4066	1957	3814	607	2432	12876	8810	68.4	709	0.25
1286-219	4012-4015	19727	2756	7624	6709	11764	48581	28854	59.4	5324	0.57
1286-230	4036-4039	17481	23376	26430	2862	14743	84891	67410	79.4	2927	0.19
1286-239	4048-4051	7128	4644	19375	4499	15114	50760	43632	86.0	6642	0.30
1286-245	4063-4066	7986	5308	12123	2377	7357	35152	27166	77.3	2533	0.32
1286-250	4075-4078	4852	1631	1989	1166	1659	11297	6446	57.1	1074	0.70
1286-258	4111-4120	9396	782	4683	2134	3195	20190	10794	53.5	2674	0.67
1286-263	4147-4156	5152	1008	3485	1337	2588	13569	8417	62.0	1818	0.52
1286-266	4174-4183	902	322	1976	692	1549	5442	4540	83.4	734	0.45
1286-269	4201-4210	286	132	136	27	37	618	333	53.8	36	0.73

TABLE 2 C
TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C₁ - C₇ HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C ₁ Methane	C ₂ Ethane	C ₃ Propane	iC ₄ Isobutane	nC ₄ Butane	TOTAL C ₁ - C ₄	TOTAL C ₂ - C ₄	% GAS WETNESS	TOTAL C ₅ - C ₇	$\frac{iC_4}{nC_4}$
1286-272	4237-4246	1012	634	1036	224	495	3401	2390	70.3	204	0.45
1286-275	4264-4273	735	111	174	83	107	1210	475	39.2	58	0.78
1286-279	4300-4309	396	256	335	60	131	1178	781	66.4	63	0.46
1286-282	4327-4336	1502	609	1622	512	1374	5620	4118	73.3	681	0.37
1286-286	4363-4372	476	128	264	82	113	1062	587	55.2	88	0.73
1286-289	4390-4399	575	228	258	78	129	1266	691	54.6	72	0.60
1286-293	4426-4435	615	190	385	146	167	1504	889	59.1	82	0.87
1286-296	4453-4462	1293	422	849	317	480	3361	2068	61.5	335	0.66
1286-300	4489-4498	924	389	453	149	215	2131	1207	56.6	141	0.69
1286-303	4516-4525	3642	859	2830	1351	2056	10738	7097	66.1	1526	0.66
1286-306	4525-4534	884	282	624	219	306	2314	1430	61.8	233	0.72
1286-310	4579-4588	5398	806	5078	2383	3120	16785	11387	67.8	2853	0.76
1286-314	4606-4615	553	183	345	207	201	1490	937	62.9	193	1.03
1286-318	4642-4651	2468	1455	1046	325	424	5718	3250	56.8	261	0.77
1286-322	4669-4678	491	230	368	122	173	1385	893	64.5	134	0.70
1286-326	4705-4711	917	195	438	204	233	1987	1070	53.9	230	0.88

TABLE 3

ROCKEVAL PYROLYSIS DATA

GEOCHEM SAMPLE NUMBER	DEPTH	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	Production INDEX	Hydrogen INDEX	Oxygen INDEX	Tmax (%C)
1286-032A	1800-1850	0.20	2.31	1.52	0.08	154.0	101.3	419
1286-034B	1900-1950	0.32	12.52	3.40	0.02	206.3	56.0	416
1286-036B	2000-2050	0.34	11.56	2.00	0.03	280.6	48.5	418
1286-038A	2100-2150	0.13	2.79	1.41	0.04	114.8	58.0	426
1286-040B	2200-2250	0.17	1.45	1.01	0.10	110.7	77.1	421
1286-044A	2400-2450	0.17	1.72	0.81	0.09	177.3	83.5	419
1286-046A	2500-2509	0.11	0.51	0.89	0.18	57.3	100.0	415
1286-052A	2554-2563	0.15	0.82	0.82	0.15	115.5	115.5	417
1286-056A	2590-2599	0.56	5.18	1.13	0.10	375.4	81.9	419
1286-060B	2626-2635	0.14	0.72	0.81	0.16	65.5	73.6	420
1286-066A	2680-2689	0.22	1.03	1.30	0.18	133.8	168.8	423
1286-071A	2725-2734	0.25	0.92	1.25	0.21	117.9	160.3	422
1286-076A	2770-2779	0.26	0.75	0.86	0.26	93.8	107.5	424
1286-084A	2842-2851	0.25	1.11	1.23	0.18	132.1	146.4	421
1286-091B	2905-2914	0.15	0.45	0.88	0.25	57.0	111.4	424
1286-099A	2977-2986	0.28	1.23	0.98	0.19	146.4	116.7	424
1286-105A	3031-3040	0.19	0.93	1.38	0.17	96.9	143.7	424
1286-110A	3076-3085	0.16	0.87	1.14	0.16	100.0	131.0	432
1286-115B	3121-3130	0.13	0.46	0.81	0.22	57.5	101.2	424
1286-121A	3175-3184	0.28	1.39	0.82	0.17	135.0	79.6	428
1286-129B	3247-3256	0.12	0.55	1.12	0.18	57.3	116.7	421
1286-137A	3319-3328	0.32	0.88	0.91	0.27	83.0	85.8	425
1286-144A	3382-3391	0.26	0.77	0.57	0.25	71.3	52.8	428
1286-151A	3445-3454	0.22	1.02	0.69	0.18	104.1	70.4	430
1286-154A	3472-3481	0.14	0.56	1.23	0.20	62.2	136.7	425
1286-158B	3508-3517	0.09	0.65	0.51	0.12	67.0	52.6	431
1286-161A	3535-3544	0.08	0.36	0.40	0.18	44.4	49.4	429
1286-165C	3571-3580	0.09	0.30	0.65	0.23	34.9	75.6	430
1286-169A	3607-3616	0.32	1.06	0.78	0.23	119.1	87.6	429
1286-172A	3634-3643	0.21	0.21	0.80	0.50	24.4	93.0	425
1286-176A	3670-3679	0.17	0.21	0.79	0.45	26.2	98.7	376
1286-179A	3697-3706	0.19	0.16	0.49	0.54	18.4	56.3	326
1286-182A	3724-3733	0.19	0.47	0.63	0.29	54.7	73.3	379
1286-186B	3760-3769	0.10	0.39	0.26	0.20	49.4	32.9	433
1286-190A	3796-3805	0.16	0.23	0.43	0.41	29.1	54.4	387
1286-193A	3823-3832	0.08	0.10	0.35	0.44	15.2	53.0	309
1286-197B	3859-3868	0.08	0.43	0.31	0.16	51.2	36.9	433
1286-200A	3883-3892	0.05	0.32	0.26	0.14	35.6	28.9	437
1286-204A	3928-3937	0.10	0.74	0.50	0.12	92.5	62.5	442
1286-207A	3946-3955	0.06	0.14	0.21	0.30	21.5	32.3	434
1286-211A	3982-3991	0.14	0.36	0.37	0.28	54.5	56.1	351
1286-214A	4002	2.67	5.96	0.50	0.31	124.4	10.4	434
1286-218A	4010	3.86	11.60	1.14	0.25	181.0	17.8	439
1286-219A	4012-4015	4.31	12.57	0.80	0.26	182.4	11.6	435
1286-222A	4019	4.07	8.82	1.25	0.32	159.2	22.6	437
1286-224A	4024	2.32	5.08	1.13	0.31	124.2	27.6	434
1286-229A	4034	4.10	15.43	1.06	0.21	217.3	14.9	441
1286-231A	4038	3.99	11.38	1.00	0.26	143.9	12.6	437
1286-233A	4041	3.73	16.61	0.98	0.18	181.1	10.7	439
1286-236A	4043	3.14	15.62	1.06	0.17	213.4	14.5	440

TABLE 3

ROCKEVAL PYROLYSIS DATA

GEOCHEM

SAMPLE NUMBER	DEPTH	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	Production INDEX	Hydrogen INDEX	Oxygen INDEX	Tmax (°C)
1286-239B	4048-4051	0.28	0.48	0.50	0.37	6.1	6.3	384
1286-242A	4053	0.07	0.34	1.21	0.17	35.4	126.0	423
1286-245A	4063-4066	0.25	0.89	0.51	0.22	174.5	100.0	440
1286-248A	4070	0.05	0.07	0.38	0.42	13.7	74.5	421
1286-250A	4075-4078	0.09	0.29	0.39	0.24	37.7	50.6	427
1286-258A	4111-4120	0.13	0.34	0.44	0.28	57.6	74.6	386
1286-261A	4133	0.18	0.78	0.34	0.19	91.8	40.0	437
1286-263B	4147-4156	0.49	2.08	0.54	0.19	187.4	48.6	445
1286-266A	4174-4183	0.25	1.38	0.86	0.15	107.8	67.2	441
1286-269B	4201-4210	0.47	2.15	0.40	0.18	76.5	14.2	449
1286-282B	4327-4336	0.72	3.39	1.17	0.18	167.0	57.6	443
1286-303B	4516-4525	0.18	0.91	0.28	0.17	71.1	21.9	450
1286-311A	4590	0.36	0.92	1.11	0.28	90.2	108.8	442
1286-314B	4606-4615	0.44	1.65	0.39	0.21	129.9	30.7	448
1286-318B	4642-4651	0.81	3.79	0.52	0.18	96.9	13.3	453
1286-320A	4660	0.40	1.52	0.75	0.21	116.0	57.3	450
1286-322B	4669-4678	0.51	1.90	0.57	0.21	134.8	40.4	451
1286-326B	4705-4711	0.53	1.71	0.57	0.24	79.5	26.5	458

TABLE 4
GAS - OIL INDEX



GEOCHEM SAMPLE NUMBER	DEPTH	DRY GAS	WET GAS	GASOLINES KEROSENES	GAS OIL DISTILLATE	GAS-OIL INDEX
		% C ₁	% C ₂ - C ₅	% C ₆ - C ₁₄	% C ₁₅ +	% C ₁ - C ₅ TOTAL

1286-034B	1900-1950	12.30	42.28	40.73	4.69	54.58
1286-056A	2590-2599	13.61	65.88	20.50	0.00	79.50
1286-121A	3175-3184	25.11	38.15	36.27	0.48	63.25
1286-169A	3607-3616	27.50	41.84	28.61	2.05	69.34
1286-214A	4002	17.82	35.86	41.14	5.19	53.67
1286-218A	4010	17.61	12.37	45.26	24.76	29.98
1286-224A	4024	18.32	17.92	53.76	9.99	36.24
1286-229A	4034	11.51	70.23	17.63	0.63	81.74
1286-233A	4041	23.82	31.17	38.45	6.55	55.00
1286-236A	4043	14.46	18.85	57.79	8.91	33.31
1286-222A	4099	18.12	38.25	40.77	2.86	56.37
1286-263B	4147-4156	22.80	49.42	27.78	0.00	72.22
1286-269B	4201-4210	4.98	51.61	43.41	0.00	56.59
1286-282B	4327-4336	27.86	57.94	14.20	0.00	85.80
1286-318B	4642-4651	29.47	50.18	20.35	0.00	79.65

TABLE 5
KEROGEN TYPE AND MATURATION

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION	
		TYPES > 35%; 10-35%; < 10%	REMARKS	RE- WORKED (%)	PARTICLE SIZE	PRESERV- ATION	THERMAL ALTERATION INDEX	1 - 10 SCALE
1286-011A	800-850m	W; I-H; Al	minor contamination	30	F-M	F	1+	1.5
1286-016A	1000-050m	W; H-I; Al	minor contamination	30	F-M	F	1+	1.5
1286-020A	1200-250m	W; H-I; Al	minor contamination	20	F-M	F	1+	1.5
1286-024A	1400-450m	W; I-H; Al	contamination	30	F-M	F	1+	1.5
1286-028A	1600-650m	W; I-H; Al	significant contamination	20	F-M	F	1+	1.5
1286-032A	1800-850m	Am; W-H; I-Al		10	M	F	1+ to 2-	2
1286-036B	2000-050m	-, Am-W-H; Al-I	differentiation difficult	15	F-C	1+ to 2-		2
1286-040B	2200-250m	-, H-W-Am-Al; I		10	F-M	F	1+ to 2-/2-	2.5
1286-044A	2400-450m	H; W-I; Al	abundant fine pyrite	40	F-M	F	2- max	3
1286-046A	2500-509m	W-I; H; Al	contamination minor H at 1+ to 2-	45	F-M	F	2-	
1286-056A	2590-599m	W; I-H; Al	H at 1+ to 2-	60	F-M	F-G	2-	3
1286-066A	2680-689m	W-I; H-Al; -	H at 1+ to 2-	45	F-M	F-G	2-	3
1286-076A	2770-779m	W-I; -, H-Al	significant caving?	75	F-M	F	2-(?)	3(?)
1286-084A	2842-851m	W-I; H; Al	frequent contamination caving?	65	F-M	F	2- to 2(?)	3.5(?)
1286-091B	2905-914m	W-I; -, H-Al	caving	75	F-M	F-G	2- to 2	3.5
1286-105A	3031-040m	W-I; -, H-Al		80	F-M	F	2- to 2	3.5
1286-115B	3121-130m	W-I; -, H-Al	contamination minor H at 2	80	F-M	F-G	2- to 2	3
1286-121A	3175-184m	W-I; H; Al	contamination	75	F-M	F-G	2- to 2	3

Algal, Amorphous, Herbaceous, Inertinite, Resin, Wood

preservation = Poor, Fair, Good size = Fine, Medium, Coarse

TA1 SCALE	1	1 + to 2-	2-	2	2 to 2+	2+ to 3-	3	3+	4	5
1 - 10 SCALE	1	2	3	4	5	6	7	8	9	10



TABLE 5
KEROGEN TYPE AND MATURATION

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION	
		TYPES > 35%; 10-35%; < 10%	REMARKS	RE- WORKED (%)	PARTICLE SIZE	PRESERV- ATION	THERMAL ALTERATION INDEX	1 - 10 SCALE
1286-129B	3247-256m	W-I;H;Al		80	F-M	G	2 max	4 max
1286-137A	3319-328m	W-I;-;H-Al	abundant contamination	85	F-M	F-G	2	4
1286-144A	3382-391m	(W;I-H;-)	<u>lean, unreliable, very</u> dominantly contamination	--	F-M	P	---	--
1286-151A	3445-454m	(W-I;H;-)	<u>extremely lean, unreliable</u>	--	F-M	P	---	--
1286-158B	3508-517m	W-I;-;H-Al	good H at 2	50	F-M	F	2(?)	4(?)
1286-165C	3571-580m	W-I;-;H	abundant contamination	70	F-M	P-F	2(?)	4(?)
1286-172A	3634-643m	W;I;H	frequent contamination	50	F-M	F	2(?)	4(?)
1286-186B	3760-769m	I-W;-;H	contamination	85	F-M	F	2/2 to 2+	4.5
1286-193A	3827-832m	W-I;-;H	frequent contamination,	80	F-M	P-F	2 to 2+(?)	5(?)
1286-200A	3883-892m	W-I;-;H-Al	frequent contamination	85	F-M	F	2 to 2+	5
1286-207A	3946-955m	W-I;-;H-Al		70	M	G	2 to 2+	5
1286-214A	4002m SWC	I;W-Al;H-Am	differentiation difficult contamination good H at 2+	75	M-c	G	2 to 2+/2+(?)	5.2(?)
1286-224A	4024m SWC	-;I-Al-W;H-Am	differentiation extremely difficult, frequently unrecognisable good H at 2+	60	M	F-G	2 to 2+(?)	5(?)
1286-236A	4043m SWC	Am*;Al*-I-W;H	*includes material passing to amorphous	25	F-C	G	2 to 2+	5
1286-248A	4070m SWC	W;I-H;Al		40	F-C	F-G	2 to 2+	5
1286-261A	4133m SWC	W;I-H;Al	material at 2+ and greater	50	M	G	2 to 2+/2+	5.2

Algal, Amorphous, Herbaceous, Inertinite, Resin, Wood

preservation = Poor, Fair, Good size = Fine, Medium, Coarse

TA1 SCALE	1	1 to 2-	2-	2	2 to 2+	2+ to 3-	3	3+	4	5
1 - 10 SCALE	1	2	3	4	5	6	7	8	9	10



TABLE 5
KEROGEN TYPE AND MATURATION

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION	
		TYPES > 35%; 10-35%; < 10%	REMARKS	RE- WORKED (%)	PARTICLE SIZE	PRESERV- ATION	THERMAL ALTERATION INDEX	1 - 10 SCALE
1286-263B	4147-156m	W-I;-;H-Am-Al	contamination	65	F-M	F-G	2 to 2+/2+(?)	5.2(?)
1286-269B	4201-210m	W-I;Am*;H-Al	*degraded, includes disseminated material	--	F-M/C	F-G	2+ max(?)	5.5 max(?)
1286-282B	4327-336m	W-I;Am*-H;-	*finely disseminated, unrecognisable significant caving?	--	F-M	F-G	2 to 2+(?)	5(?)
1286-303B	4516-525m	W-I;Am*;H	*as 282B	--	F-M	F	2+ max(?)	5.5 max(?)
1286-311A	4590m SWC	-;H-W-I-Am*;Al	*grainy, unrecognisable	--	F-M	F-G	2+	5.5
1286-320A	4660m SWC	W;I-Am*;H-Al	*degraded, not prime quality	--	F-M/C	F-G	2+	5.5
1286-326B	4705-711m	W;I-H;Am-Al	differentiation difficult	--	M-C	G	2+	5.5

Algal, Amorphous, Herbaceous, Inertinite, Resin, Wood

preservation = Poor, Fair, Good size = Fine, Medium, Coarse

TA1 SCALE	1	1 + to 2-	2-	2	2 to 2+	2+ to 3-	3	3+	4	5
1 - 10 SCALE	1	2	3	4	5	6	7	8	9	10



TABLE 6
VITRINITE REFLECTANCE DATA

GEOCHEM SAMPLE NUMBER	DEPTH	SAMPLE TYPE	AVERAGE REFLECTIVITY Ro (%), (NUMBER OF PARTICLES)			REMARKS
			1	2	3	
1286-011A	800-850m	WR	0.34 (7)	0.70 (1)*		
1286-016A	1000-050m	WR	0.34 (3)	0.56 (2)	0.76 (1)*	
1286-020A	1200-250m	WR	0.33 (3)	0.75 (2)*		
1286-024A	1400-450m	WR	0.31 (2)	0.84 (2)*		
1286-028A	1600-650m	WR	0.46 (1)	0.80 (3)*	1.10 (2)*	
1286-032A	1800-850m	WR	0.38 (8)	1.29 (2)*		
1286-036B	2000-050m	WR	0.40 (3)	0.49 (2)		
1286-040B	2200-050m	WR	0.35 (5)			
1286-044A	2400-450m	WR	0.50 (5)	1.18 (2)*		
1286-046B	2500-509m	WR	1.02 (3)*			
1286-056	2590-599m	WR	0.45 (9)	0.56 (3)	1.03 (3)*	
1286-066	2680-689m	WR	0.50 (5)	0.59 (4)		
1286-076A	2770-779m	WR	1.15 (4)*			
1286-084A	2842-851m	WR	0.47 (2)	0.56 (15)		
1286-091B	2905-914m	WR	0.60 (1)	0.79 (5)*	1.19 (1)*	
1286-105A	3031-040m	WR	0.58 (11)	0.67 (4)*		
1286-115B	3121-130m	WR	0.58 (2)	0.79 (18)*	0.96 (2)*	
1286-121	3175-184m	WR	0.78 (18)*	0.96 (4)*		
1286-129B	3247-256m	WR	0.59 (2)	0.79 (3)*	1.09 (13)*	
1286-137A	3319-328m	WR	0.69 (2)	1.18 (14)*		
1286-144A	3382-391m	WR	1.16 (10)*			
1286-151	3445-454m	WR	0.62 (18)	1.15 (6)*		
1286-158B	3508-517m	WR	0.68 (3)	1.17 (12)*		
1286-165C	3571-580m	WR	0.74 (4)	1.07 (4)*	1.34 (1)*	
1286-172	3634-643m	WR	NO DETERMINATIONS POSSIBLE			
1286-186B	3760-769m	WR	1.24 (13)*			
1286-200A	3883-892m	WR	0.71 (2)	1.22 (14)*		
1286-207A	3946-955m	WR	0.81 (9)*	1.27 (13)*		
1286-214A	4002m SWC	WR	0.69 (7)	0.89 (8)	1.14 (5)*	
1286-224A	4024m SWC	WR	0.75 (15)			
1286-236A	4043m SWC	KC	0.74 (22)			
1286-248	4070m SWC	WR	0.64 (3)	0.71 (3)	1.05 (4)*	
1286-261A	4133m SWC	WR	0.75 (13)	1.27 (9)*		
1286-263B	4147-156m	WR	0.59 (1)	0.69 (3)	0.97 (12)*	1.22 (9)*
1286-282B	4327-336m	WR	0.77 (10)	1.14 (5)*		
1286-286	4363-372m	WR	0.55 (4)	0.86 (7)	1.20 (10)*	
1286-303B	4516-525m	WR	0.88 (10)	1.22 (4)*		

CT—ditch cuttings; CO—core; WR—whole rock; KC—kerogen concentrate.

Preferred values underlined. *Reworked



TABLE 6
VITRINITE REFLECTANCE DATA

GEOCHEM SAMPLE NUMBER	DEPTH	SAMPLE TYPE	AVERAGE REFLECTIVITY R _o (%), (NUMBER OF PARTICLES)			REMARKS
			1	2	3	

1286-311A	4590m SWC	WR	0.88 (5)			
1286-320A	4660m SWC	WR	0.90 (26)	1.22 (2)*		
1286-326B	4705-711m	KC	1.06 (30)*	1.46 (10)*		

TABLE 7

METHYL PHENANTHRENE INDEX

<u>GEOCHEM SAMPLE NUMBER</u>	<u>DEPTH</u>	<u>% AREA</u>	<u>% HEIGHT</u>
1286-046	2500-2509m	0.58	0.76
1286-052	2554-2563m	0.84	0.56
1286-105	3031-3040m	0.89	0.65
1286-144	3382-3391m	0.72	0.70
1286-169	3607-3616m	0.55	0.58
1286-214A	4002m	0.55	0.62
1286-215	4003-4006m	0.51	0.29
1286-219A	4012-4015m	0.48	0.31
1286-229A	4034m	0.49	0.61
1286-230A	4036-4039m	0.58	0.42
1286-239	4048-4051m	0.50	0.61
1286-260	4129-4138m	0.52	0.35
1286-261A	4133m	0.78	0.88
1286-328A	4211.25-.30m	0.55	0.38
1286-272	4237-4246m	0.58	0.75
1286-329	4237.70-.75m	0.56	0.71
1286-282	4327-4336m	0.51	0.69
1286-303	4516-4525m	0.81	0.87
1286-311A	4590m	0.57	0.56
1286-318	4642-4651m	0.92	0.71

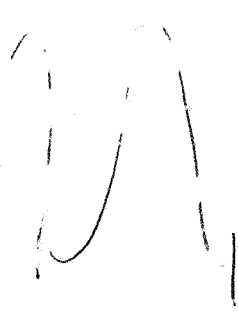


TABLE 8a
CONCENTRATION (PPM) OF EXTRACTED C₁₅₊ MATERIAL IN ROCK

GEOCHEM SAMPLE NUMBER	DEPTH	TOTAL EXTRACT	HYDROCARBONS			NON HYDROCARBONS			
			Paraffin- Naphthenes	Aromatics	TOTAL	Precipd. Asphaltenes	Eluted NSO's	Non-eluted NSO's	Sulphur
1286-046	2500-2509	1169	303	84	387	582	176	24	0
1286-052	2554-2563	311	92	19	111	142	55	3	0
1286-105	3031-3040	871	426	59	485	279	100	7	0
1286-144	3382-3391	639	183	62	246	222	165	7	0
1286-169	3607-3616	401	89	44	133	139	123	6	0
1286-214A	4002	4138	1327	646	1973	1131	929	104	0
1286-215A	4003-4006 X	6186	<u>2401</u>	<u>1737</u>	4138	1078	(920 + 51)		0
1286-219A	4012-4015 X	2075	<u>864</u>	<u>482</u>	1347	<u>413</u>	(299 + 16)		0
1286-229A	4034	6855	<u>1864</u>	1527	3391	2256	1145	63	0
1286-230A	4036-4039	1087	315	215	530	320	191	46	0
1286-239	4048-4051	1235	360	233	593	323	(305 + 14)		0
1286-260A	4129-4138	762	182	160	341	270	135	16	0
1286-261A	4133	1358	506	128	633	556	161	8	0
1286-328A	4211.25-	33	4	2	6	23	4	0	0
1286-272	4237-4246	811	344	86	430	238	132	11	0
1286-329A	4237.70-	112	23	9	32	58	21	2	0
1286-282	4327-4336	709	130	120	250	226	227	5	0
1286-303	4516-4525	342	58	35	94	185	62	2	0
1286-311A	4590	1374	339	94	433	760	152	29	0
1286-318	4642-4651	758	201	71	272	391	92	4	0

TABLE 8b
COMPOSITION (NORMALISED %) OF C₁₅+ MATERIAL EXTRACTED FROM ROCK

GEOCHEM SAMPLE NUMBER	DEPTH	HYDROCARBONS		NON HYDROCARBONS			
		Paraffin – Naphthenes	Aromatics	Preciptd. Asphaltenes	Eluted NSO's	Non eluted NSO's	Sulphur
1286-046	2500-2509	25.89	7.18	49.82	15.09	2.02	0.00
1286-052	2554-2563	29.62	6.16	45.50	17.77	0.95	0.00
1286-105	3031-3040	48.94	6.74	32.06	11.44	0.81	0.00
1286-144	3382-3391	28.66	9.77	34.75	25.78	1.04	0.00
1286-169	3607-3616	22.18	11.03	34.71	30.58	1.50	0.00
1286-214A	4002	32.06	15.62	27.34	22.46	2.52	0.00
1286-215A	4003-4006	38.81	28.08	17.42	14.87	0.82	0.00
1286-219A	4012-4015	41.65	23.24	19.90	14.43	0.77	0.00
1286-229A	4034	27.19	22.28	32.90	16.70	0.92	0.00
1286-230A	4036-4039	28.96	19.77	29.45	17.61	4.21	0.00
1286-239	4048-4051	29.14	18.90	26.15	24.66	1.14	0.00
1286-260A	4129-4138	23.84	20.96	35.36	17.76	2.08	0.00
1286-261A	4133	37.22	9.41	40.90	11.86	0.61	0.00
1286-328A	4211.25-	13.16	5.26	69.30	11.40	0.88	0.00
1286-272	4237-4246	42.44	10.59	29.31	16.24	1.41	0.00
1286-329A	4237.70-	20.06	8.09	51.46	18.45	1.94	0.00
1286-282	4327-4336	18.35	17.00	31.95	32.02	0.68	0.00
1286-303	4516-4525	17.02	10.35	53.90	18.01	0.71	0.00
1286-311A	4590	24.68	6.81	55.32	11.06	2.13	0.00
1286-318	4642-4651	26.47	9.37	51.54	12.13	0.48	0.00

TABLE 9
SIGNIFICANT RATIOS (%) OF C₁₅+ FRACTIONS AND ORGANIC CARBON

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC CARBON (wt. %)	HYDROCARBONS	HYDROCARBONS	TOTAL EXTRACT	P-NAPHTHENES
			TOTAL EXTRACT	ORG. CARBON	ORG. CARBON	AROMATICS
1286-046	2500-2509	0.75	33.07	5.16	15.59	3.60
1286-052	2554-2563	0.68	35.78	1.64	4.58	4.81
1286-105	3031-3040	0.78	55.68	6.22	11.16	7.27
1286-144	3382-3391	1.30	38.43	1.89	4.91	2.93
1286-169	3607-3616	1.20	33.21	1.11	3.34	2.01
1286-214A	4002	3.83	47.68	5.15	10.80	2.05
1286-215A	4003-4006	5.44	66.89	7.61	11.37	1.38
1286-219A	4012-4015	6.36	64.89	2.12	3.26	1.79
1286-229A	4034	4.72	49.47	7.19	14.52	1.22
1286-230A	4036-4039	7.32	48.73	0.72	1.49	1.47
1286-239	4048-4051	3.96	48.04	1.50	3.12	1.54
1286-260A	4129-4138	1.00	44.80	3.41	7.62	1.14
1286-261A	4133	0.81	46.63	7.82	16.77	3.96
1286-328A	4211.25-	0.07	18.42	0.86	4.65	2.50
1286-272	4237-4246	0.62	53.03	6.94	13.09	4.01
1286-329A	4237.70-	0.05	28.16	6.32	22.46	2.48
1286-282	4327-4336	2.77	35.35	0.90	2.56	1.08
1286-303	4516-4525	0.25	27.38	3.75	13.70	1.64
1286-311A	4590	0.96	31.49	4.51	14.32	3.62
1286-318	4642-4651	0.16	35.84	16.98	47.38	2.82

TABLE 10
COMPOSITION (NORMALISED %) OF C₁₅+ SATURATE (PARAFFIN – NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	-046	-052	-105	-144	-169	-214A	-215	-219A
DEPTH	2500- 2509m	2554- 2563m	3031- 3040m	3382- 3391m	3607- 3616m	4002m	4003- 4006m	4012- 4015m
SAMPLE TYPE								
nC ₁₅	19.38	11.15	21.58	4.05	3.02	0.38	17.54	8.58
nC ₁₆	19.05	24.80	22.31	3.53	7.02	1.37	15.53	10.40
nC ₁₇	17.34	21.25	20.81	8.24	8.31	6.96	6.67	10.22
nC ₁₈	15.42	14.06	15.17	8.16	9.69	10.47	1.79	8.94
nC ₁₉	10.03	5.22	7.72	7.43	7.47	10.96	8.82	8.03
nC ₂₀	4.91	3.25	3.11	7.25	6.82	10.35	7.66	7.03
nC ₂₁	1.87	2.73	1.62	6.71	5.04	9.90	6.78	6.61
nC ₂₂	1.35	2.07	1.22	5.98	4.55	9.12	5.67	6.20
nC ₂₃	1.20	2.20	0.99	6.45	4.70	7.22	4.96	5.38
nC ₂₄	1.08	1.81	0.89	5.03	4.15	6.63	3.88	4.79
nC ₂₅	1.28	1.65	0.91	6.05	7.37	5.63	3.51	4.20
nC ₂₆	0.96	1.31	0.71	4.41	3.76	4.62	3.25	3.79
nC ₂₇	1.45	1.39	0.63	5.36	7.67	3.68	2.92	3.24
nC ₂₈	0.82	1.50	0.53	3.75	2.52	2.77	2.46	2.78
nC ₂₉	1.21	1.86	0.53	4.70	5.93	2.70	2.04	2.46
nC ₃₀	0.59	0.94	0.28	2.88	2.72	2.07	1.83	2.05
nC ₃₁	0.77	1.10	0.30	3.21	3.56	1.57	1.56	1.51
nC ₃₂	0.40	0.55	0.18	2.44	3.96	1.25	1.15	1.32
nC ₃₃	0.44	0.47	0.18	1.79	1.04	1.02	0.95	0.96
nC ₃₄	0.18	0.39	0.16	1.64	0.40	0.78	0.47	0.91
nC ₃₅	0.26	0.26	0.14	0.95	0.30	0.54	0.56	0.59
PARAFFIN	25.07	36.24	31.83	34.89	17.26	34.20	24.98	33.02
ISOPRENOID	5.59	6.03	6.92	2.61	1.66	5.34	5.65	4.05
NAPHTHENE	69.33	57.73	61.25	62.50	81.09	60.47	69.37	62.93
CPI INDEX 1	1.04	1.07	0.97	1.18	1.47	1.00	1.04	1.00
CPI INDEX 2	1.53	1.24	1.19	1.32	1.88	1.06	1.02	1.00
CPI INDEX 3	1.62	0.99	1.02	1.31	2.44	1.00	1.02	0.99
PRISTANE/PHYTANE	1.41	1.89	1.64	1.66	1.52	0.70	1.13	1.54
PRISTANE/nC ₁₇	0.75	0.51	0.65	0.57	0.70	0.93	1.80	0.73
Ph/C ₁₈							0.48	0.54

$$C.P.I. 1 = \frac{1}{2} \frac{C_{21}+C_{23}+C_{25}+C_{27}}{C_{20}+C_{22}+C_{24}+C_{26}} + \frac{C_{21}+C_{23}+C_{25}+C_{27}}{C_{22}+C_{24}+C_{26}+C_{28}}$$

$$C.P.I. 2 = \frac{1}{2} \frac{C_{25}+C_{27}+C_{29}+C_{31}}{C_{24}+C_{26}+C_{28}+C_{30}} + \frac{C_{25}+C_{27}+C_{29}+C_{31}}{C_{26}+C_{28}+C_{30}+C_{32}}$$

$$C.P.I. 3 = \frac{2 \times (C_{27})}{C_{26}+C_{28}}$$

TABLE 10
COMPOSITION (NORMALISED %) OF C₁₅+ SATURATE (PARAFFIN – NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	-229A	-230A	-239	-260	-261A	-328	-272	-329
DEPTH	4034m	4036- 4039m	4048- 4051m	4129- 4138m	4133m	4211.25 -.30m	4237- 4246m	4237.70 -.75m
SAMPLE TYPE								
nC ₁₅	10.83	10.25	13.08	13.64	0.29	0.20	11.54	0.21
nC ₁₆	11.99	11.68	11.32	13.56	0.27	0.23	9.26	0.23
nC ₁₇	10.45	10.16	11.36	10.67	0.58	0.28	7.12	0.47
nC ₁₈	9.53	9.18	9.06	8.57	4.01	0.39	6.55	2.15
nC ₁₉	7.81	8.45	8.27	6.98	8.84	1.15	4.78	5.20
nC ₂₀	7.00	7.30	6.76	6.25	10.21	2.91	8.01	7.53
nC ₂₁	6.97	6.21	6.05	5.62	9.60	5.38	7.38	7.91
nC ₂₂	5.19	5.55	5.86	5.08	9.71	6.60	2.86	8.93
nC ₂₃	5.16	5.23	4.58	4.34	8.99	7.39	3.59	8.35
nC ₂₄	4.59	4.65	4.22	4.04	8.72	6.97	3.12	8.79
nC ₂₅	3.51	3.99	3.14	4.09	8.25	6.60	5.46	7.91
nC ₂₆	3.41	3.55	3.03	3.49	6.12	6.58	3.28	6.97
nC ₂₇	3.31	2.99	2.78	3.03	5.70	6.74	6.97	6.20
nC ₂₈	2.26	2.55	2.38	2.40	4.28	6.78	2.18	5.15
nC ₂₉	2.22	2.32	2.34	2.48	3.92	7.81	5.20	4.99
nC ₃₀	1.37	1.77	1.53	1.53	2.64	6.46	2.13	4.22
nC ₃₁	1.40	1.22	1.17	1.47	2.96	6.86	2.91	4.03
nC ₃₂	0.96	0.89	0.81	0.85	1.55	6.93	3.85	3.31
nC ₃₃	1.03	0.89	0.97	0.98	1.58	5.63	1.40	3.33
nC ₃₄	0.63	0.84	0.68	0.63	1.14	4.74	0.73	2.57
nC ₃₅	0.39	0.35	0.59	0.30	0.65	3.36	1.66	1.54
PARAFFIN	27.12	31.20	32.59	29.88	28.13	62.83	11.16	30.39
ISOPRENOID	3.45	4.04	3.78	2.49	0.25	0.41	1.14	0.37
NAPHTHENE	69.43	64.76	63.62	67.62	71.62	36.76	87.70	69.24
CPI INDEX 1	1.08	1.00	0.95	1.02	1.03	1.05	1.70	0.98
CPI INDEX 2	1.10	1.02	1.03	1.15	1.19	1.05	1.86	1.05
CPI INDEX 3	1.17	0.98	1.03	1.03	1.09	1.01	2.55	1.02
PRISTANE/PHYTANE	1.71	1.82	1.94	2.09	0.28	0.78	1.37	0.21
PRISTANE/nC ₁₇	0.77	0.82	0.67	0.63	0.33	1.04	0.83	0.45
Ph/18			0.48					

$$C.P.I. 1 = \frac{1}{2} \frac{C_{21}+C_{23}+C_{25}+C_{27}}{C_{20}+C_{22}+C_{24}+C_{26}} + \frac{C_{21}+C_{23}+C_{25}+C_{27}}{C_{22}+C_{24}+C_{26}+C_{28}}$$

$$C.P.I. 2 = \frac{1}{2} \frac{C_{25}+C_{27}+C_{29}+C_{31}}{C_{24}+C_{26}+C_{28}+C_{30}} + \frac{C_{25}+C_{27}+C_{29}+C_{31}}{C_{26}+C_{28}+C_{30}+C_{32}}$$

$$C.P.I. 3 = \frac{2x (C_{27})}{C_{26}+C_{28}}$$

CT – ditch cuttings CO – core SWC – sidewall core

TABLE 10
COMPOSITION (NORMALISED %) OF C₁₅+ SATURATE (PARAFFIN – NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	-282	-303	-311	-318
DEPTH	4327- 4336m	4516- 4525m	4590m	4642- 4651m
SAMPLE TYPE				
nC ₁₅	12.57	8.46	0.15	10.82
nC ₁₆	12.17	10.89	0.20	11.59
nC ₁₇	11.01	12.81	0.27	11.08
nC ₁₈	10.26	12.17	2.27	11.69
nC ₁₉	8.13	9.74	8.19	9.98
nC ₂₀	6.77	8.14	11.45	7.88
nC ₂₁	6.11	6.66	13.62	7.21
nC ₂₂	4.32	5.64	11.35	5.86
nC ₂₃	4.66	5.00	10.61	4.72
nC ₂₄	3.40	4.23	8.76	3.98
nC ₂₅	4.52	3.78	7.31	3.25
nC ₂₆	2.27	2.82	5.58	2.31
nC ₂₇	4.30	2.43	5.16	2.27
nC ₂₈	1.96	1.60	3.96	1.54
nC ₂₉	3.29	1.54	3.27	1.15
nC ₃₀	1.01	0.90	2.34	0.92
nC ₃₁	0.54	0.90	1.86	1.19
nC ₃₂	0.52	0.64	1.44	0.75
nC ₃₃	1.09	0.64	1.18	0.73
nC ₃₄	0.41	0.51	0.80	0.49
nC ₃₅	0.70	0.51	0.25	0.58
PARAFFIN	34.95	32.64	35.99	40.60
ISOPRENOID	1.52	3.24	0.19	2.13
NAPHTHENE	63.53	64.12	63.81	57.27
CPI INDEX 1	1.40	1.05	1.11	1.07
CPI INDEX 2	1.83	1.18	1.09	1.16
CPI INDEX 3	2.03	1.10	1.08	1.18
PRISTANE/PHYTANE	1.82	1.42	0.21	1.74
PRISTANE/nC ₁₇	0.25	0.46	0.36	0.30

$$\text{C.P.I. 1} = \frac{1}{2} \frac{\text{C}_{21}+\text{C}_{23}+\text{C}_{25}+\text{C}_{27}}{\text{C}_{20}+\text{C}_{22}+\text{C}_{24}+\text{C}_{26}} + \frac{\text{C}_{21}+\text{C}_{23}+\text{C}_{25}+\text{C}_{27}}{\text{C}_{22}+\text{C}_{24}+\text{C}_{26}+\text{C}_{28}}$$

$$\text{C.P.I. 2} = \frac{1}{2} \frac{\text{C}_{25}+\text{C}_{27}+\text{C}_{29}+\text{C}_{31}}{\text{C}_{24}+\text{C}_{26}+\text{C}_{28}+\text{C}_{30}} + \frac{\text{C}_{25}+\text{C}_{27}+\text{C}_{29}+\text{C}_{31}}{\text{C}_{26}+\text{C}_{28}+\text{C}_{30}+\text{C}_{32}}$$

$$\text{C.P.I. 3} = \frac{2 \times (\text{C}_{27})}{\text{C}_{26}+\text{C}_{28}}$$

CT – ditch cuttings CO – core SWC – sidewall core

NBS 22 STANDARD

TABLE 11
CARBON ISOTOPE COMPOSITIONS (‰, PDB)

GEOCHEM SAMPLE NUMBER	DEPTH	TOTAL EXTRACT WHOLE OIL	SATURATES	AROMATICS	NSO	ASPHALTENES	KEROGEN	PYROLYSATE S2
1286-105A	3031-040m	-29.01	-	-27.85	-28.72	-28.92	-	
1286-144A	3382-391m	-28.30	-29.23	-28.18	-28.08	-27.74	-	
1285-215A	4003-006m	-27.66	-28.82	-27.27	-27.93	-27.71	-26.63	
1285-219A	4012-015m	-27.60	-28.58	-26.90	-27.53	-27.83	-26.52	
1285-230A	4036-039m	-	-	-	-	-	-25.41	
1285-239	4048-051m	-26.03	-27.93	-25.77	-26.23	-26.47	-24.99	
1285-272	4237-246m	-27.83	-27.98	-27.12	-27.83	-28.91	-	
1285-282	4327-336m	-27.03	-28.30	-26.14	-27.18	-27.15	-	



TABLE 12a

GC-MS DATA INTEGRATED PEAK AREAS

STERANES MZ 217

<u>GEOCHEM</u> <u>SAMPLE</u> <u>NUMBER</u>	<u>DEPTH</u>	<u>A</u>	<u>B</u>	<u>Q</u>	<u>R</u>	<u>S</u>	<u>T</u>
1286-105	3031-040m	1881	1313	744	883	964	1154
1286-144	3382-391m	2129	1454	560	674	667	982
1286-215	4003-006m	1054	857	261	464	457	176
1286-219	4012-015m	3142	2059	692	857	925	506
1286-239	4048-051m	1327	987	329	553	510	240
1286-272	4237-246m	1608	1543	1336	2441	2404	1585
1286-282	4327-336m	674	562	382	629	646	644



TABLE 12b

GC-MS DATA INTEGRATED PEAK AREASSTERANES MZ 218

<u>GEOCHEM SAMPLE NUMBER</u>	<u>DEPTH</u>	<u>A+B</u>	<u>C+D</u>	<u>E+F</u>
1286-105	3031-022m	2302	2204	1898
1286-144	3382-391m	1717	1417	1732
1286-215	4003-006m	884	824	779
1286-219	4012-015m	2899	2279	2333
1286-239	4048-051m	1253	1001	1567
1286-272	4237-246m	2186	2264	2561
1286-282	4327-336m	1064	1156	2096



TABLE 12c

GC-MS DATA INTEGRATED PEAK AREASTERPANES MZ 191

<u>GEOCHEM</u> <u>SAMPLE</u> <u>NUMBER</u>	<u>DEPTH</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>X</u>	<u>Z</u>	<u>G</u>	<u>H</u>
1286-105	3031-040m	1177	3157	6391	2719	11622	3269	832	3753	6193	7082
1286-144	3382-391m	1259	4859	7478	2891	12892	3641	1079	849	8752	21228
1286-215	4003-006m	1976	1054	1171	218	5590	509	1516	-	2242	1787
1286-219	4012-015m	4189	2009	2150	391	12134	937	3311	-	4327	3681
1286-239	4048-051m	2366	1770	1508	-	6949	697	2531	-	2823	2584
1286-272	4237-246m	1844	3111	6622	1334	8174	1672	409	1597	4829	17735
1286-282	4327-336m	524	1012	1792	644	2084	431	236	-	1807	18558



TABLE 12d

GC-MS DATA INTEGRATED PEAK AREASTERPANES MZ 177

<u>GEOCHEM</u> <u>SAMPLE</u> <u>NUMBER</u>	<u>DEPTH</u>	<u>A</u>
1286-105	3031-040m	2294
1286-144	3382-391m	-
1286-215	4003-006m	-
1286-219	4012-015m	-
1286-239	4048-051m	-
1286-272	4237-246m	-
1286-282	4327-336m	-