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GEOCHEM LABORATORIES (U.K.) LIMITED

GEOCHEMICAL SERVICE REPORT

Prepared for

SAGA PETROLEUM A.S.

PARTIAL GEOCHEMICAL EVALUATION OF SAGA PETROLEUM'S 34/4-4 WELL, OFFSHORE NORWAY

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PARTIAL GEOCHEMICAL EVALUATION OF SAGA PETROLEUM'S 34/4-4 WELL, OFFSHORE NORWAY

SUMMARY

The mudstones within the interval 1150-1350 metres have good organic carbon values, although their actual source potential cannot be determined without further analyses.

With this possible exception, the entire section between 1040 metres and 3791 metres consists of poor source rocks with a primary potential, at least between 2100 metres and 2430 metres, for gas. Minor hydrocarbon generation has been initiated below 2300± metres but unfortunately, in this well, this is only of academic significance. However, significant hydrocarbon generation could be anticipated from good source rocks buried to below approximately 2780± metres.

The presence of better source rocks off-structure is suggested by the shows of light oil throughout the interval 2115-2285± metres and by the shows at 2285-2640± metres and particularly at 2597-2606(2633)± metres whose character was not investigated.

N.J.L. Bailey
GEOCHEM LABORATORIES (UK) LIMITED

INTRODUCTION

This report presents a partial geochemical evaluation of the section between 1040 metres and 3791 metres in Saga Petroleum's 34/4-4 well drilled in the Norwegian sector of the North Sea.

The analytical format was specified by the client and was designed to be compatible with previous studies on other Saga wells and to:

- investigate the hydrocarbon source potential of the section
- detect shows of migrated crude oil.

This project was authorised by T.O. Throndsen, Saga Petroleum A.S., Hovik.

A. ANALYTICAL

Two hundred and fifty one (251) canned samples, composited over twenty (20) metres above 1520 metres, ten (10) metres from 1520 metres to 2300 metres and nine (9) metres below this depth, were received for examination. No samples were submitted from 2435-2453 metres, 2549-2570 metres, 2606-2633 metres, 2696-2714 metres, 3179-3206 metres, 3233-3251 metres, 3484-3502 metres, 3538-3556 metres or 3619-3638 metres. A sample of the DST 4 crude oil was also included in the study. These samples were assigned the Geochem job number 693.

No significant contamination was observed during the sample preparation steps.

Geochem were instructed to screen the samples (using alternate samples below 1500 metres) with the light hydrocarbon and organic carbon analyses. Every sample was, in fact analysed and the additional data are included in this report free of charge. Mr. T.O. Throndsen then selected samples further analysis on the basis of the screen results. A total of one hundred and thirty eight light hydrocarbon analyses (authorised), one hundred and forty five organic carbon analyses (authorised), sixteen vitrinite reflectance and seven each of the kerogen, pyrolysis, pyrolysis-GC, C_{15+} extraction with chromatography and total alkane chromatogram analyses were performed in the source rock study.

The data are presented in tables 1 through 8 and graphically in figures 1 through 8. A brief description of the analytical techniques employed in this

study is included in the back of the report.

B. GENERAL INFORMATION

Ten (10) copies of this report, together with the kerogen slides prepared for this study, have been forwarded to T.O. Throndsen at Saga Petroleum A.S. in Hovik. A copy of the data has been retained by Geochem for future consultation with authorised Saga personnel.

A separate report has been prepared for the crude oil sample.

The remaining sample material will be handled as directed.

The results of this study are proprietary to Saga Petroleum A.S.

RESULTS AND INTERPRETATION

The hydrocarbon source potential of the interval 1040-3791 metres will be discussed in this report. A separate report has been prepared for the DST 4 crude oil sample.

No well logs were available for this study.

A. ZONATION

This zonation is based principally upon the lighter hydrocarbon (C_1-C_7) data. Eight (8) zones are recognised.

Zone A 1040 metres to 1150± metres consists of sand, particles of igneous rock (basalt ?), shell debris and minor light brownish grey mudstones.

The C_1-C_4 gaseous hydrocarbons range from 2628 ppm up to 6608 ppm and are very dry (less than 2% C_{2+}) whilst the heavier C_5-C_7 hydrocarbons are sparse at 1-4 ppm.

Zone B 1150± metres down to 1350± metres, is composed of very light olive grey mudstones.

Gas abundances reach 11394 ppm in the shallowest sample but otherwise, lie within the limits of 548-4423 ppm. The gases are very dry and the C_5-C_7 fraction does not exceed 7 ppm.

Zone C extends from 1350± metres to 1870± metres. This interval is dominated by mudstones which are, in general, grossly medium olive grey in colour although those from 1580-1650± metres are dark olive grey.

Within Zone C the gases vary rather erratically from 51 ppm up to 7215 ppm. They are however, leanest at the top of the unit and generally only exceed 1000 ppm below 1590± metres, whilst four samples exceed 5000 ppm. The richest intervals are at 1630-1670± metres and 1810-1820± metres. The gases are dry throughout but, below 1650± metres they tend to increase with depth from 2% to 10% C_{2+} in the total C_1-C_4 fraction. C_5-C_7

abundances are minimal above 1730± metres but then improve to (3)19-148 ppm.

Zone D lies between 1870± metres and 2115± metres. It consists of light grey mudstones with significant interbeds of medium olive grey mudstone above 1950± metres. Cavings appear to be a problem within this interval.

Gas abundances vary erratically between 234 ppm and 4099 ppm but reach 5321 ppm at 1950 metres and 8104-8530 ppm at 2060 metres and 2110 metres. These gases are commonly marginally wet (12-54% C_{2+}) above 2015± metres (tending to improve with depth), whilst below 2015± metres they are wet, with (47)56-77 (84)% C_{2+} in the total C_1-C_4 fraction. Their isobutane to normal butane ratios are low at approximately 1000 ppm at 1925± metres and, below this depth, lie within the limits of (1005)2033-3780(4678) but reach 5610 ppm and 6770 ppm in the two samples with the best gas abundances.

If the richer samples from 2060 metres and 2110 metres are ignored then, except at the top of the interval, Zone D does not exhibit increasing richness with depth, but it is wet below 2015± metres. Indeed, Zone D may be regarded as transitional between Zones C and E.

Zone E 2115± metres to 2285± metres. It comprises light grey mudstones passing, below 2145± metres to silty mudstones of the same colour and then, below 2205± metres, to medium grey shales with interbedded very pale yellowish brown (dolomitic) siltstones.

This interval is characterised by extremely wet gas (i.e. (83)89-97% of the C_{2+} fraction) with very low (0.2) butane ratios. Hydrocarbon abundances are somewhat enhanced relative to Zone D. Thus, the C_1-C_4 gases have a background level of 1891-5322 ppm but jump to 6435 ppm at 2170 metres and to 6847-7916(13872) ppm at 2240-2270± metres. The C_5-C_7 hydrocarbons normally lie within the limits of (1975)4382-7608 ppm but again, are enhanced at 2170(2170-2190) metres and 2240-2270± metres with values of 11427(8903-11427) ppm and 9841-13753 ppm respectively.

Zone F extends from 2285± metres down to 2640± metres. It consists of medium light to light grey mudstones and shales above 2420± metres. There is a medium greyish red mudstone at 2426 metres whilst the samples suggest that the underlying section is composed of interbedded medium light grey shales (at best partly caved), sands and dark greyish blackish red silty mudstones (or medium greyish brown shaly mudstones 2540-2600± metres). Below 2545± metres the samples suggest that sands are rather minor.

No fluorescence was detected.

Geochemically, Zone F is rather non-uniform, although it is leaner and "drier" than Zone E. The gaseous hydrocarbons range from 237 ppm up to 10267 ppm but seldom exceed 4000 ppm except at 2483-2492± metres (6730-8494 ppm) and at 2597-2606± metres (10267 ppm and 5718 ppm). They are always wet and over some intervals are extremely wet as at 2318 metres, 2363 metres, 2435-2504 metres, 2522-2540 metres and 2597-2633 metres. Butane ratios approximate 0.2 throughout this zone. There is also a wide range in the abundance of the C_5-C_7 hydrocarbons, but most of the samples fall within the limits of 480-3627 ppm. Significantly richer intervals are present at 2435 metres (6108 ppm), 2483-2492 metres (6380-7079 ppm), 2522-2540 metres (5125-7887 ppm) and especially below 2597± metres (16600-20577 ppm above 2620± metres, 8650-8676 ppm below).

Thus some intervals are particularly rich and wet. These are:- 2318 metres, 2435-2504± metres, 2522-2540± metres and particularly 2597-2606(2633)± metres.

Zone G^1 2640± metres to 3130± metres. A massive sand with minor interbeds of medium greyish brown siltstone and mudstone extends down to 2800± metres. This is underlain by very light grey calcareous siltstones and limestone and then, below 2920± metres, by sandstones with minor to significant proportions of medium grey shale (partly caved).

No fluorescence was detected.

Below 2735± metres, gas abundances drop from 1051-2528(3803) ppm to 169-909(2844) ppm with a slightly richer interval (1003-2241 ppm) at 3008-3098± metres.

The gases are marginally wet to wet at (22)28-63(73)% C_{2+}. They have low (0.2) butane ratios down to 2940± metres but, below this depth, the ratios vary from 0.2 to 0.6. The C_5-C_7 fraction decreases from approximately 9000 ppm at the top of Zone G to 5000 ppm at 2800± metres, whilst below this depth it lies within the limits of 1729-3982(5503) ppm.

Zone G^2 3130± metres down to 3791 metres, represents a continuation of the massive sandstone. Minor (occasionally significant) medium grey shale interbeds are suggested above 3265± metres. Minor medium brownish grey silty mudstones are present below 3240± metres, becoming abundant and grading to siltstones below 3650± metres. Lime mudstones also occur within the interval 3470-3620± metres and there are significant to major proportions of calcareous mudstones at 3670-3700± metres.

No fluorescence was observed.

Zone G^2 continues the geochemical trends established in Zone G^1 and is leaner and drier. The C_1-C_4 gases lie within the limits of 35-790(2844 ppm) but seldom exceed 450 ppm and are now only marginally wet (15-41(51)% C_{2+}) above 3525± metres and dry below this depth (4-28(45)% C_{2+}). C_5-C_7 abundances decrease from 2500 ppm at the top of Zone G^2 to 1000 ppm at 3400± metres and to approximately 300 ppm at the bottom of the well. It is believed that this reflects the cleansing of the mud from entrained hydrocarbons.

B. AMOUNT AND TYPE OF ORGANIC MATTER

The amount of organic matter within a sediment is measured by its organic carbon content. Average shales contain approximately one percent organic carbon, and this is the standard to which these samples will be compared.

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.

Organic matter type determinations were only authorised for selected samples from the interval 2100-2430 metres (i.e. bottom of Zone D into Zone F).

The minor mudstones of Zone A contain 0.55-0.97% organic carbon, whilst higher values of 1.31-2.19% apply to the Zone B mudstones.

In Zone C the mudstones are leaner at (0.16)0.23-0.53(0.70)% organic carbon whilst the medium greyish brown mudstones at 1630± metres are even leaner at 0.12-0.16%. There is a marginal improvement in Zone D. Thus, whereas the medium olive grey mudstones above 2000± metres have values of 0.24-0.46(0.54)%, the dominant light grey mudstones contain 0.47-0.66% organic carbon.

Zone E is significantly better with 0.89-1.30% organic carbon in the light grey silty mudstones above 2205± metres and 0.87-1.05% in the underlying medium grey shales, whilst the interbedded very pale yellowish brown siltstones have similar values of 0.68-1.00(1.18)% organic carbon.

The light grey mudstones above 2420± metres in Zone F contain (0.54)0.59-0.85(0.95)% organic carbon. Essentially identical values apply to the medium light grey shales but the interbedded greyish red mudstones below 2410± metres are significantly leaner at 0.16-0.27(0.35)% organic carbon.

In Zone G^1 the interbeds of medium grey shale contain 0.36-0.67(0.80)% organic carbon whilst the medium greyish brown shaly mudstones, the very light grey calcareous siltstones and the limestones all lie within the low range of 0.13-0.23% organic carbon. Zone G^2 is similar as the medium grey shales have values of (0.34)0.47-0.60(0.73)% and the pale brown siltstones and shaly mudstones and the lime and calcareous mudstones are lean at 0.05-0.25% organic carbon.

The organic matter in the analysed mudstones and shales from below 2100± metres in Zone D, throughout Zone E and above 2430± metres in Zone F is all very similar, consisting dominantly of inertinitic and woody debris accompanied by significant proportions of the herbaceous and algal kerogens but very sparse (to absent) amorphous material.

C. LEVEL OF THERMAL MATURATION

Maturity determinations based upon spore colouration were restricted to the section between 2100 metres and 2430 metres but vitrinite reflectance measurements were authorised from 1000 metres down to 2430 metres.

The spore colouration technique indicates that a thermal index of 2- is achieved at 2340± metres. Above this depth the section is immature but below 2340± metres minor hydrocarbon generation can be anticipated from amorphous, herbaceous±algal debris. As the available data suggest that the organic matter within this part of the section is dominantly inertinitic and woody in type, only very limited hydrocarbon generation can have occurred.

Good vitrinite populations were measured above 1400 metres. Some contamination from drilling-introduced lignite is evident below 2000 metres but this can be recognised by comparison with the lignite measured from 2200 metres. When the lignite populations are eliminated, there is a good trend of increasing reflectivity against depth which reaches 0.45% Ro at 2280± metres and, by projection 0.53% Ro at 2780± metres. As a reflectivity of 0.45% Ro should be equivalent to a thermal index of 2-, there is a good correlation between the two methods.

The vitrinite data indicate extensive reworking throughout Zones D, E and F. It would appear that the section is presently at its maximum depth of burial.

D. SOURCE RICHNESS

A preliminary assessment of potential source richness can be obtained from the organic carbon contents. Based upon this parameter, the minor mudstones within Zone A are rated as fair whilst Zone B is good. Zones C and D are classified as potentially poor to fair source rocks. Zone E has a fair to good potential and Zone F is fair although it is suspected that only the leaner lithologies are in-situ below 2430± metres.

C_{15+} analyses were authorised for the interval 2100-2430± metres. However, the analysed samples contain non-indigenous hydrocarbons (see Section E) and hence the measured abundances do not accurately reflect source richness. Clearly however, the sample from 2408 metres which yielded only 152 ppm C_{15+} hydrocarbons is, allowing for the presence of non-indigenous hydrocarbons, only

a poor source rock. This is probably also true of the sample from 2309 metres (232 ppm).

Pyrolysis analyses were run on samples from the same interval in order to determine the source richness of the sediments under conditions of optimum maturity. Yields of 45-2041 ppm pyrolysate were obtained, thus indicating that these sediments have only a poor source potential. Chromatograms were prepared of their pyrolysate fractions. Most of these chromatograms consist of a methane peak with very little additional character and hence, are gas prone. However, the sample from 2200 metres will yield gas and condensate.

Based upon the available data therefore, it would appear that Zones E and F are actually only poor source rocks for gas or occasionally, for gas and condensate. Hence it is fairly certain that the entire interval represented by Zones C through F has a poor source potential for hydrocarbons.

E. MIGRATED HYDROCARBONS

The light hydrocarbon (C_1-C_7) data indicate weak shows throughout Zone E with stronger shows at 2170± metres and at 2240-2270± metres. Traces of migrated hydrocarbons are also suspected up to approximately 1925± metres in Zone D. There is a good show at 2597-2606(2633)± metres in Zone F with shows at 2318 metres, 2435-2504± metres and 2522-2540± metres and apparently, traces of migrated hydrocarbons throughout the rest of Zone F.

Zone G^1 is more problematical as the gases tend to be fairly low in abundance and not definitively high in wetness, but the C_5-C_7 hydrocarbons are moderately abundant. Thus we could be dealing either with sands which were flushed during drilling or with hydrocrbons entrained in, and introduced from the mud system. If the first explanation is correct, then oil might have been present down to very approximately 2790± metres, although there is also a break in the data at 2735± metres.

All of these shows are mature and oil-like in composition.

Heavy (C_{15+}) hydrocarbon analyses were only authorised for the interval 2100-2430± metres (i.e. base of Zone D, Zone E, top half of Zone F). The samples analysed from 2100-2345 metres all have moderately high proportions of hydrocarbons in the total extract (40-60%) and high hydrocarbon to organic carbon ratios, suggesting the presence of non-indigenous hydrocarbon species.

Hydrocarbon yields increase from 279 ppm at 2100 metres to 938-1233 ppm at 2150-2200 metres and then drop back to 634-743 ppm at 2260-2345 metres (but 222 ppm at 2309 metres). Contamination is evident in many of the chromatograms (isoparaffins, background envelopes, normal paraffin distributions) but nevertheless, a show of light oil is indicated at 2150-2200± metres whilst weaker shows, presumably of the same oil, are suggested in the other samples (together with contamination and source-indigenous hydrocarbons). The sample from 2408 metres is leaner at 152 ppm C_{15+} hydrocarbons and has a lower hydrocarbon to total extract ratio. Oil could contribute to this sample but, if so, it could only be in trace amounts.

In summary therefore:

- there are shows of light oil throughout Zone E.
- traces of migrated hydrocarbons are suspected up to approximately 1925± metres in Zone D. Based upon the limited available data, it would appear that these also involve a light oil.
- a good show was detected at 2597-2606(2633)± metres in Zone F with shows at 2318 metres, 2435-2504± metres and 2522-2540± metres, with traces throughout the rest of Zone F. Unfortunately, detailed follow-up analyses were not authorised for the more interesting intervals but the shows could involve the same (or a similar) light oil as in Zone E.
- it is possible that oil was present in, but has been flushed from, the Zone G sands down to approximately (2735)2790± metres. However, in the absence of further data, it is believed more likely that these hydrocarbons were introduced from the mud system.

F. CONCLUSIONS

Eight (8) zones are recognised in this partial geochemical evaluation of 34/4-4. Detailed analyses (apart from vitrinite reflectance) were only authorised over the interval 2100-2430± metres.

Zone A (1040-1150± metres) consists of sands, basalt(?) fragments, shell debris and minor light brownish grey mudstones. Which contain 0.55-0.97% organic carbon. This interval is not only immature but also has only a minimal source potential for hydrocarbons.

The mudstones of Zone B (1150-1350± metres) are much richer at 1.31-2.19% organic carbon. They are however immature and no hydrocarbon generation has occurred.

In Zone C (1350-1870± metres) the mudstones are much leaner, containing (0.16)0.23-0.53(0.70)% organic carbon. These sediments are immature but, even in a mature state, would probably only be poor source rocks for gas.

Zone D (1870-2115± metres) is slightly improved as, although the interbedded medium olive grey mudstones above 1950± metres resemble those of Zone C, the dominant light grey mudstones have values of 0.47-0.66% organic carbon. Nevertheless, they are still immature and potentially poor source rocks for gas.

The assorted mudstones, shales and siltstones of Zone E (2115-2285± metres) all lie within the limits of 0.68-1.30% organic carbon. Their organic matter is dominantly inertinitic and woody in type although significant proportions of herbaceous and algal debris are also present. Reworked organic matter is common (as it is in Zones D and F). On structure, these sediments are immature but, even if mature, they would only be poor source rocks for gas or occasionally, for gas and condensate.

However, there are shows of light oil throughout Zone E and traces of migrated hydrocarbons are believed to extend up to approximately 1925± metres in Zone D. There is a good show at 2597-2606(2633)± metres in Zone F (see below) with shows at 2318 metres, 2435-2504± metres and 2522-2540± metres and traces throughout the rest of Zone F. Detailed analyses were not authorised for the more interesting intervals in Zone F but the shows could involve a similar (or the same) light oil to that in Zone E.

Above 2420± metres in Zone F (2285-2640± metres) the mudstones and shales contain 0.54-0.85(0.95)% of organic matter which is largely inertinitic and woody in type. It is believed that the medium light grey shales in the samples from below 2420± metres are caved but that the lean (0.16-0.35%) greyish red silty mudstones and medium greyish brown shaly mudstones are in-situ. Minor hydrocarbon generation has occurred below 2300± metres but these sediments are only poor source rocks for gas, whilst below 2420± metres their potential for hydrocarbons is minimal.

The siltstone and mudstone laminae and intervals within the massive sand units of Zones C^1 (2640-3130± metres) and C^2 (3130-3791± metres) are very lean at

0.05-0.25% organic carbon and, although marginally mature, have a negligible source potential for hydrocarbons.

It is believed that the hydrocarbons present above (2735)2790± metres in the Zone Q^1 sands were introduced from the mud system, although no analyses were run to test this hypothesis.

The section penetrated in this well is characterised by poor source rocks. Significant hydrocarbon generation could be anticipated from good source rocks buried to below approximately 2780± metres.

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)
693-001	1040m	A 45% Sand, unconsolidated, fine to medium, occ. coarse, mostly subrounded, light greenish to yellowish grey	5GY8/1-5Y8/1	
		B 35% Igneous (possibly basalt!), fine grained, crystalline, hard, med. dark grey	N4	
		C 10% Shell fragments		
		D 10% LCM - drilling mud, lignite		
		Minor shale		
693-002	1060m	A 40% Sand, as 693-001A	5GY8/1-5Y8/1	
		B 20% Igneous, as 693-001B	N4	
		C 20% Shell fragments, as 693-001C		
		D 20% LCM, as 693-001D		
693-003	1080m	A 30% Sand, as 693-001A	5GY8/1-5Y8/1	
		B 30% Mudstone, blocky, soft to mod. hard, calc., abundant caving, light brownish to med. light grey	5YR6/1-N6	0.97
		C 20% Shell fragments, bivalves, ostracods, scaphapods, etc.		
		D 10% Igneous (granitic), quartz, biotite		
		E 10% LCM - 693-001D		
693-004	1100m	A 65% Igneous, as 693-001B	N4	
		B 15% Sand, as 693-001A	5GY8/1-5Y8/1	
		C 15% LCM, as 693-001D		
		D 5% Shell fragments, as 693-003C		
		Minor mudstone		
693-005	1120m	A 45% Sand, as 693-001A	5GY8/1-5Y8/1	
		B 30% Igneous, as 693-001B	N4	
		C 15% LCM - mud, lignite		
		D 10% Mudstone, as 693-003B	5YR6/1-N6	0.55
		Minor pyrite, shell fragments		
693-006	1140m	A 55% Igneous, as 693-003D		
		B 20% Sand, as 693-001A	5GY8/1-5Y8/1	
		C 20% LCM - drilling mud and lignite		
		D 5% Shell remains		
		Minor mudstone		
693-007	1160m	A 98% Mudstone, blocky, soft to mod. hard, sl. micaceous, rare black inclusions, non-calc. to sl. calc., mod. caving. light olive yellowish to light olive grey	5Y7/1-5Y6/1	1.33
693-008	1180m	A 98% Mudstone, as 693-007A, mod. caving	5Y7/1-5Y6/1	1.48
		Minor limestone, igneous, LCM		
693-009	1200m	A 98% Mudstone, as 693-007A, mod. caving	5Y7/1-5Y6/1	1.78, 1.76
		Minor granite, LCM		

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)
693-010	1220m	A 95% Mudstone, blocky, soft to mod. hard, sl. micaceous, rare black inclusions, non-calc. to sl. calc., light olive yellowish to light olive grey	5Y7/1-5Y6/1	1.96
		B 5% LCM - cement, mud, mica		
		Minor granite		
693-011	1240m	A 98% Mudstone, as 693-010A, minor caving	5Y7/1-5Y6/1	1.85
		Minor igneous		
693-012	1260m	A 98% Mudstone, as 693-010A, minor caving	5Y7/1-5Y6/1	2.19
		Minor igneous		
693-013	1280m	A 98% Mudstone, as 693-010A, minor caving	5Y7/1-5Y6/1	1.93
		Minor LCM		
693-014	1300m	A 98% Mudstone, as 693-010A, minor caving	5Y7/1-5Y6/1	1.85
		Minor LCM		
693-015	1320m	A 98% Mudstone, blocky, soft to mod. hard, sl. micaceous, minor caving, light olive to light grey	5Y6/1-N7	1.75,1.81
693-016	1340m	A 98% Mudstone, blocky, mod. hard, rare black inclusions, non-calc., mod. caving, yellowish to light olive yellowish grey	5Y8/1-5Y7/1	1.31
		Minor limestone, LCM and other mudstone		
693-017	1360m	A 75% Shaly mudstone, blocky to platy, soft, subfissile, non-calc., possible rare black inclusions, light olive to med. olive grey	5Y6/1-5Y5/1	0.47
		B 25% Mudstone, as 693-016A, sig. caving	5Y8/1-5Y7/1	1.49
		Minor limestone		
693-018	1380m	A 85% Shaly mudstone, as 693-017A, minor cavings	5Y6/1-5Y5/1	0.49
		B 15% Mudstone, as 693-017B, sig. caving	5Y8/1-5Y7/1	0.65,0.65
		Minor LCM, limestone		
693-019	1400m	A 98% Shaly mudstone, blocky to platy, mod. hard, subfissile, non-calc., med. olive to olive grey	5Y5/1-5Y4/1	0.42
		Minor other mudstone, LCM		
693-020	1420m	A 80% Shaly mudstone, as 693-017A, sig. caving, minor iron staining	5Y6/1-5Y5/1	0.45
		B 20% Mudstone, as 693-017B, mostly caved	5Y8/1-5Y7/1	
		Minor LCM, limestone, igneous		
693-021	1440m	A 95% Shaly mudstone, as 693-019A, minor caving	5Y5/1-5Y4/1	0.45
		B 5% Mudstone, as 693-017B, caved	5Y8/1-5Y7/1	
		Minor LCM, igneous		

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)
693-022	1460m	A 98% Shaly mudstone, blocky to platy, mod. hard, subfissile, non-calc., med. olive to olive grey, mod. caving Minor other mudstone, limestone, LCM	5Y5/1-5Y4/1	0.33
693-023	1480m	A 98% Mudstone (shaly?), flaky, soft, non-calc., olive grey Minor LCM, other mudstone	5Y4/1	0.41
693-024	1500m	A 98% Shaly mudstone, platy to blocky, mod. hard, brittle, non-calc., sig. caving, med. olive grey Minor mudstone, limestone, LCM	5Y5/1	0.38,0.37
693-025	1520m	A 98% Shaly mudstone, platy to blocky, soft to mod. hard, minor black inclusions, non-calc, mod. caving, med. olive to olive grey Minor LCM, limestone, mudstone	5Y5/1-5Y4/1	0.35
693-026	1530m	A 98% Shaly mudstone, platy to blocky, soft to mod. hard, non-calc., mod. caving, med. olive to light olive grey Minor other mudstone, LCM	5Y5/1-5Y6/1	0.44
693-027	1540m	A 98% Shaly mudstone, as 693-026A, mod. caving Minor other mudstone, LCM	5Y5/1-5Y6/1	0.29
693-028	1550m	A 98% Shaly mudstone, as 693-026A, mod. caving Minor limestone, LCM, other mudstone	5Y5/1-5Y6/1	0.31
693-029	1560m	A 98% Shaly mudstone, as 693-025A, mod. caving Minor limestone	5Y5/1-5Y4/1	0.26,0.28
693-030	1570m	A 95% Mudstone, blocky to platy, mod. hard, non-calc., sig. caving, olive grey	5Y4/1	0.26
		B 5% Mudstone, blocky, mod. hard, non-calc., caved, light olive yellowish to yellowish grey	5Y7/1-5Y8/1	
693-031	1580m	A 98% Shaly mudstone, platy to blocky, soft to mod. hard, non-calc., soapy texture, minor caving, dark olive to dark brownish grey Minor other mudstone, LCM	5Y3/1-5YR3/1	0.49
693-032	1590m	A 85% Shaly mudstone, as 693-031A, mod. caving	5Y3/1-5YR3/1	0.70
		B 15% Shaly mudstone, as 693-030A, mod. caving	5Y4/1	0.44,0.43
693-033	1600m	A 98% Shaly mudstone, as 693-030A, mod. caving Minor other mudstone, LCM	5Y4/1	0.57
693-034	1610m	A 98% Shaly mudstone, as 693-030A, mod. caving Minor limestone, other mudstone	5Y4/1	0.50

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)
693-035	1620m	A 98% Shaly mudstone, blocky to platy, mod. hard, non-calc., mod. caved, olive grey	5Y4/1	0.31
		Minor limestone and other mudstone		
693-036	1630m	A 55% Shaly mudstone, blocky to subfissile, soft to mod. hard, non-calc., mod. caved, dark olive to dark brownish grey	5Y3/1-5YR3/1	0.32,0.37
		B 45% Mudstone, blocky, soft to mod. hard, v. sl. calc. to non-calc., minor cavings, greyish pale brown	5YR4/2	0.16
		Minor limestone and other mudstone		
693-037	1640m	A 95% Shaly mudstone, as 693-036A, abundantly caved	5Y3/1-5YR3/1	0.27
		B 5% Mudstone, as 693-036B, minor cavings	5YR4/2	0.12
		Minor limestone and other mudstone		
693-038	1650m	A 95% Shaly mudstone, as 693-036A, mod. to abundantly caved	5Y3/1-5YR3/1	0.26
		B 5% Mudstone, as 693-036B, mod. caved	5YR4/2	0.12,0.13
		Minor limestone and other mudstone		
693-039	1660m	A 60% Mudstone, blocky, soft, non-calc., pale inclusions, minor cavings, light olive to greenish grey	5Y6/1-5GY6/1	0.16
		B 35% Shaly mudstone, subfissile to blocky, soft to mod. hard, non-calc., mod. to abundantly caved, olive grey	5Y4/1	0.41
		C 5% Mudstone, blocky, soft to mod. hard, non-calc., mod. caved, greyish pale brown to pale brown	5YR4/2-5YR5/2	0.14
		Minor limestone and other mudstone		
693-040	1670m	A 50% Mudstone, as 693-039A, mod. caved	5Y6/1-5GY6/1	0.23
		B 45% Shaly mudstone, as 693-039B, mod. to abundantly caved	5Y4/1	0.47,0.44
		C 5% Mudstone, as 693-039C, mod. caved	5YR4/2-5YR5/2	0.14
		Minor other mudstone and limestone		
693-041	1680m	A 55% Mudstone, blocky, soft, non-calc., minor cavings, light olive grey	5Y6/1	0.38
		B 25% Shaly mudstone, as 693-039B, mod. caved	5Y4/1	0.42
		C 20% Mudstone, as 693-039A, mod. caved	5Y6/1-5GY6/1	0.23
		Minor other mudstone		
693-042	1690m	A 55% Mudstone, as 693-041A, mod. caved	5Y6/1	0.33,0.34
		B 25% Shaly mudstone, as 693-039B, mod. caved	5Y4/1	0.55
		C 20% Mudstone, as 693-039A, mod. caved	5Y6/1-5GY6/1	0.24
		Minor other mudstone		
693-043	1700m	A 75% Mudstone, as 693-041A, mod. caved	5Y6/1	0.27
		B 25% Shaly mudstone, as 693-039B, mod. caved	5Y4/1	0.41
		Minor other mudstone		

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)
693-044	1710m	A 65% Mudstone, blocky, soft, non-calc., mod. caved, light olive grey	5Y6/1	0.27,0.28
		B 35% Shaly mudstone, platy to blocky, soft to mod. hard, non-calc., mod. caved, olive grey	5Y4/1	0.35
		Minor other mudstone		
693-045	1720m	A 60% Mudstone, as 693-044A, mod. caved	5Y6/1	0.28
		B 40% Shaly mudstone, as 693-044B, mod. caved	5Y4/1	0.34
		Minor other mudstone		
693-046	1730m	A 70% Mudstone, as 693-044A, mod. caved	5Y6/1	0.33
		B 30% Shaly mudstone, as 693-044B, mod. caved	5Y4/1	0.54,0.52
		Minor other mudstone		
693-047	1740m	A 60% Mudstone, blocky, soft to mod. hard, non-calc., mod. caved, light olive grey	5Y6/1	0.77
		B 40% Shaly mudstone, platy to subfissile, soft to mod. hard, v. sl. calc. to non-calc., mod. caved, olive grey	5Y4/1	0.93
		Minor other mudstone		
693-048	1750m	A 60% Mudstone, as 693-047A, mod. caved	5Y6/1	0.35
		B 40% Shaly mudstone, as 693-047B, mod. caved	5Y4/1	0.29
		Minor other mudstone		
693-049	1760m	A 80% Mudstone, as 693-047A, mod. caved	5Y6/1	0.36
		B 20% Shaly mudstone, as 693-047B, mod. caved	5Y4/1	0.36,0.37
		Minor other mudstone		
693-050	1770m	A 50% Mudstone, blocky to subfissile, soft to mod. hard, non-calc., mod. caved, med. olive to med. brownish grey	5Y5/1-5GY5/1	0.34
		B 50% Mudstone, as 693-047A, mod. caved	5Y6/1	0.29
		Minor other mudstone and pyrites		
693-051	1780m	A 50% Mudstone, as 693-050A, mod. caved	5Y5/1-5GY5/1	0.42
		B 50% Mudstone, as 693-047A, mod. caved	5Y6/1	0.36
		Minor other mudstone and pyrites		
693-052	1800m	A 65% Mudstone, as 693-050A, mod. caved	5Y5/1-5GY5/1	0.30,0.31
		B 35% Mudstone, as 693-047A, mod. caved	5Y6/1	0.38
		Minor other mudstone and pyrites		
693-053	1810m	A 60% Mudstone, blocky to subfissile, soft to mod. hard, non-calc., mod. to abundantly caved, med. olive to med. dark greenish grey	5Y5/1-5GY5/1	0.29
		B 40% Mudstone, blocky, soft to mod. hard, non-calc. to sl. calc., mod. caved, light olive yellowish grey	5Y7/1	0.40
		Minor pyrites and other mudstone		

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)
693-054	1820m	A 60% Mudstone, blocky to subfissile, soft to mod. hard, non-calc., mod. to abundantly caved, med. olive to med. dark greenish grey	5Y5/1-5GY5/1	0.23,0.23
		B 40% Mudstone, blocky, soft to mod. hard, non-calc. to sl. calc., mod. to abundantly caved, light olive yellowish grey	5Y7/1	0.53
		Minor other mudstone and pyrites		
693-055	1830m	A 70% Mudstone, as 693-054A, mod. to abundantly caved	5Y5/1-5GY5/1	0.32,0.33
		B 30% Mudstone, as 693-054B, mod. caved	5Y7/1	0.41
		Minor other pyrites and mudstone		
693-056	1840m	A 60% Mudstone, blocky, soft to mod. hard, non-calc., mod. to abundantly caved, light olive to light olive yellowish grey	5Y6/1-5Y7/1	0.36
		B 40% Mudstone, blocky, soft to mod. hard, non-calc., mod. to abundantly caved, olive to med. olive grey	5Y4/1-5Y5/1	0.29
		Minor other mudstone, mostly caved		
693-057	1850m	A 60% Mudstone, as 693-056A, mod. caved	5Y6/1-5Y7/1	0.34,0.33
		B 40% Mudstone, as 693-056B, mod. caved	5Y4/1-5Y5/1	0.35
		Minor other mudstone and pyrites		
693-058	1860m	A 75% Mudstone, as 693-056A, mod. caved	5Y6/1-5Y7/1	0.29
		B 25% Mudstone, as 693-056B, mod. caved	5Y4/1-5Y5/1	
		Minor other mudstone and pyrites		
693-059	1880m	A 65% Mudstone, as 693-056A, mod. caved	5Y6/1-5Y7/1	0.47
		B 35% Mudstone, as 693-056B, mod. caved	5Y4/1-5Y5/1	0.24
		Minor other mudstone and pyrites		
693-060	1890m	A 60% Mudstone, blocky, soft, non-calc to v. sl. calc., mod. caved, light to light olive yellowish grey	N7-5Y7/1	0.55,0.54
		B 40% Mudstone, blocky, soft, non-calc., mod. caved, med. olive grey	5Y5/1	0.35
		Minor caved mudstone and pyrites		
693-061	1900m	A 65% Mudstone, as 693-060A, mod. caved	N7-5Y7/1	0.57
		B 35% Mudstone, as 693-060B, mod. caved	5Y5/1	0.42
		Minor other mudstone and pyrites		
693-062	1910m	A 60% Mudstone, as 693-060A, mod. caved	N7-5Y7/1	0.54,0.55
		B 40% Mudstone, as 693-060B, mod. caved	5Y5/1	0.42
		Minor other mudstone and pyrites		
693-063	1920m	A 65% Mudstone, as 693-060A, mod. caved	N7-5Y7/1	0.51
		B 35% Mudstone, as 693-060B, mod. caved	5Y5/1	0.35
		Minor other mudstone and pyrites		

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)
693-064	1930m	A 70% Mudstone, blocky, soft to mod. hard, sl. calc., mod. caved, light grey	N7	0.53
		B 30% Mudstone, blocky, soft to mod. hard, non-calc., mod. caved, med. olive grey	5Y5/1	0.44,0.43
		Minor other mudstone and pyrites		
693-065	1940m	A 70% Mudstone, as 693-064A, mod. caved	N7	0.56
		B 30% Mudstone, as 693-064B, mod. caved	5Y5/1	0.40
		Minor other mudstone and pyrites		
693-066	1950m	A 80% Mudstone, as 693-064A, mod. caved	N7	0.56
		B 20% Mudstone, as 693-064B, mod. caved	5Y5/1	0.46
		Minor other mudstone and pyrites		
693-067	1960m	A 80% Mudstone, as 693-064A, mod. caved	N7	0.57,0.59
		B 20% Mudstone, as 693-064B, mod. to abundantly caved	5Y5/1	0.54
		Minor other mudstone and pyrites		
693-068	1970m	A 75% Mudstone, as 693-064A, mod. to abundantly caved	N7	0.58
		B 25% Mudstone, as 693-064B, abundantly caved	5Y5/1	0.35
		Minor other mudstone and pyrites		
693-069	1980m	A 80% Mudstone, as 693-064A, abundantly caved	N7	0.59,0.59
		B 20% Mudstone, as 693-064B, mostly caved	5Y5/1	0.44
		Minor other mudstone and pyrites		
693-070	1990m	A 80% Mudstone, blocky, soft to mod. hard, sl. calc., mod. to abundantly caved, light grey	N7	0.59
		B 20% Mudstone, blocky, soft to mod. hard, non-calc., mostly caved, med. olive grey	5Y5/1	0.29
		Minor other mudstone and pyrites		
693-071	2000m	A 85% Mudstone, as 693-070A, mod. to abundantly caved	N7	0.62
		B 15% Mudstone, as 693-070B, mostly caved	5Y5/1	0.42
		Minor other mudstone		
693-072	2010m	A 95% Mudstone, as 693-070A, abundantly caved	N7	0.59
		B 5% Mudstone, as 693-070B, caved	5Y5/1	
		Minor other mudstone		
693-073	2020m	A 90% Mudstone, as 693-070A, abundantly caved	N7	0.65,0.65
		B 10% Mudstone, as 693-070B, caved	5Y5/1	
		Minor other mudstone		
693-074	2030m	A 95% Mudstone, blocky, soft, sl. calc. to non-calc., mod. to abundantly caved, light to light olive yellowish grey	N7-5Y7/1	0.57
		B 5% Mudstone, as 693-070B, caved	5Y5/1	
		Minor other mudstone		
693-075	2040m	A 95% Mudstone, as 693-074A, mod. to abundantly caved	N7-5Y7/1	0.59

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)
693-075	2040m	B 5% Mudstone, blocky, soft to mod. hard, non-calc., caved, med. olive grey Minor other mudstone	5Y5/1	
693-076	2050m	A 90% Mudstone, blocky, soft, sl. calc. to non-calc., mod. to abundantly caved, light to light olive yellowish grey	N7-5Y7/1	0.65
		B 10% Mudstone, as 693-075B, caved Minor other mudstone - caved	5Y5/1	
693-077	2060m	A 90% Mudstone, blocky to platy, soft, sl. calc., mod. to abundantly caved, light to light olive yellowish grey	N7-5Y7/1	0.64,0.64
		B 10% Mudstone, as 693-075B, caved Minor pyrites and other mudstone	5Y5/1	
693-078	2070m	A 98% Mudstone, as 693-077A, mod. caved Minor other mudstone (caved) and pyrites	N7-5Y7/1	0.64
693-079	2080m	A 98% Mudstone, as 693-077A, mod. caved Minor other mudstone (caved) and pyrites	N7-5Y7/1	0.64
693-080	2090m	A 98% Mudstone, as 693-077A, mod. caved Minor other mudstone (caved) and pyrites	N7-5Y7/1	0.51
693-081	2100m	A 98% Shaly mudstone, blocky to subfissile, soft to mod. hard, v. sl. calc. to non-calc., mod. caved, med. light to light olive grey Minor caved mudstone and siltstone	N6-5Y6/1	0.59
693-082	2110m	A 98% Shaly mudstone, as 693-081A, mod. caved Minor caved mudstone	N6-5Y6/1	0.59,0.56
693-083	2120m	A 85% Mudstone, blocky to subfissile, soft to mod. hard, v. sl. calc. to non-calc., mod. caved, light grey	N7	0.94
		B 15% LCM - cement Minor other mudstone		
693-084	2130m	A 98% Mudstone, as 693-083A, mod. caved Minor other mudstone Minor LCM - cement	N7	0.89
693-085	2140m	A 90% Mudstone, as 693-083A, mod. caved	N7	0.93
		B 10% Chert, blocky, hard, pale yellowish brown to very pale orange Minor other mudstone	10YR7/2	
693-086	2150m	A 90% Silty mudstone, blocky to subfissile, soft, non-calc., mod. caved, light grey	N7	0.94,0.94
		B 10% Chert, as 693-085B Minor other mudstone and sand	10YR7/2	
693-087	2160m	A 85% Silty mudstone, as 693-086A, mod. caved	N7	0.90
		B 10% Chert, as 693-085B	10YR7/2	

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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)
693-096	2250m	A 70% Shale, platy to thinly fissile, sl. silty, mod. hard, non-calc., mod. caved, med. to med. light grey	N5-6	0.91
		B 30% Siltstone, blocky, hard, dolomitic, minor cavings, pale yellowish brown to very pale orange to very pale orange Minor chert Minor LCM	10YR7/2-10YR8/2	0.76
693-097	2260m	A 75% Shale, as 693-096A, mod. caved	N5-6	0.97
		B 25% Dolomitic siltstone, blocky, hard, pale yellowish brown to very pale orange to very pale orange Minor chert Minor LCM	10YR7/2-10YR8/2	1.18
693-098	2270m	A 70% Shale, as 693-096A, mod. caved	N5-6	0.95,0.96
		B 30% Dolomitic siltstone, as 693-097B, minor cavings Minor chert, minor LCM	10YR7/2-10YR8/2	0.68
693-099	2280m	A 60% Shale, platy, mod. hard, non-calc., mod. caved, med. to med. light grey	N5-6	0.98
		B 25% Dolomitic siltstone, as 693-097B	10YR7/2-10YR8/2	0.73
		C 15% LCM - lignite		
693-100	2290m	A 65% Shale, as 693-099A, mod. caved	N5-6	0.92
		B 25% Dolomitic siltstone, as 693-097B	10YR7/2-10YR8/2	1.05,0.98
		C 10% LCM - lignite		
693-101	2300m	A 75% Mudstone, blocky, soft, v. sl. calc. to non-calc., minor cavings, light grey	N7	0.73
		B 15% Dolomitic siltstone, as 693-097B	10YR7/2-10YR8/2	
		C 10% LCM - lignite		
693-102	2309m	A 85% Mudstone, as 693-101A, minor cavings	N7	0.67
		B 10% Dolomitic siltstone, as 693-097B	10YR7/2-10YR8/2	
		C 5% LCM - lignite Minor shale (caved)		
693-103	2318m	A 75% Mudstone, as 693-101A, minor cavings	N7	0.54
		B 15% Shale, platy to subfissile, soft to mod. hard, non-calc., mod. caved, med. light to light grey	N6-7	0.73
		C 5% Dolomitic siltstone, as 693-097B, mod. caved	10YR7/2-10YR8/2	
		D 5% LCM - lignite		
693-104	2327m	A 50% Mudstone, as 693-101A, minor cavings	N7	0.66
		B 25% Shale, as 693-103B, mod. caved	N6-7	0.77
		C 25% LCM - lignite Minor siltstone		
693-105	2336m	A 45% Shale, as 693-103B, mod. caved	N6-7	0.74,0.72
		B 35% Mudstone, as 693-101A, minor cavings	N7	0.80

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)
693-087	2160m	C 5% LCM - lignite Minor other mudstone		
693-088	2170m	A 55% Silty mudstone, blocky to subfissile, soft, non-calc., mod. caved, light grey	N7	1.01
		B 25% LCM - lignite, brick, plastic		
		C 20% Siltstone, blocky, soft to mod. hard, dolomitic, light olive yellowish grey	5Y6/2	1.27
693-089	2180m	A 65% Silty mudstone, as 693-088A, mod. caved	N7	1.14
		B 20% LCM - lignite, brick, plastic		
		C 15% Chert, blocky, hard, pale yellowish brown to very pale orange Minor siltstone, sand and oil stained sandstone	10YR7/2	
693-090	2190m	A 55% Silty mudstone, as 693-088A, mod. caved	N7	1.09,1.05
		B 25% LCM - lignite, coal and brick		
		C 20% Chert, as 693-089C Minor siltstone and sand	10YR7/2	
693-091	2200m	A 50% Silty mudstone, as 693-088A, mod. caved	N7	1.30
		B 25% LCM - lignite and brick		
		C 25% Chert, as 693-089C Minor other mudstone (caved) and siltstone	10YR7/2	
693-092	2210m	A 60% Shale, platy to thinly fissile, sl. silty, mod. hard, non-calc., mod. caved, med. to med. light grey	N5-6	0.95
		B 20% Chert, as 693-089C	10YR7/2	
		C 15% Siltstone, blocky, hard, dolomitic, pale yellowish brown to very pale orange to very pale orange	10YR7/2-10YR8/2	0.91
		D 5% LCM - lignite and brick		
693-093	2220m	A 65% Shale, as 693-092A, mod. caved	N5-6	0.87
		B 20% Siltstone, as 693-092C, minor cavings	10YR7/2-10YR8/2	1.00
		C 10% Chert, as 693-089C	10YR7/2	
		D 5% LCM - lignite and plastic Minor mudstone		
693-094	2230m	A 70% Shale, as 693-092A, mod. caved	N5-6	1.05
		B 30% Siltstone, as 693-092C, minor cavings	10YR7/2-10YR8/2	0.90
		Minor chert and mudstone Minor LCM - lignite		
693-095	2240m	A 65% Shale, as 693-092A, mod. caved	N5-6	1.00
		B 35% Siltstone, as 693-092C, minor cavings	10YR7/2-10YR8/2	0.83,0.85
		Minor chert and mudstone Minor LCM - lignite		

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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)
693-105	2336m	C 20% LCM - lignite Minor siltstone		
693-106	2345m	A 55% Shale, platy to subfissile, soft to mod. hard, non-calc., mod. caved, med. light to light grey	N6-7	0.59
		B 25% LCM - lignite		
		C 20% Mudstone, blocky, soft, v. sl. calc. to non-calc., minor cavings, light grey Minor siltstone	N7	0.59
693-107	2354m	A 60% Shale, platy to thinly fissile, soft to mod. hard, non-calc., mod. caved, med. light to light grey	N6-7	0.64
		B 20% Mudstone, blocky, soft, non-calc. to v. sl. calc., mod. caved, light grey	N7	0.82
		C 20% LCM - lignite Minor siltstone		
693-108	2363m	A 65% Shale, as 693-107A, mod. caved	N6-7	0.63
		B 25% Mudstone, as 693-107B, mod. caved	N7	0.76,0.76
		C 10% LCM - lignite Minor siltstone		
693-109	2372m	A 65% Mudstone, blocky, mod. hard, v. sl. calc. to non-calc., mod. caved, med. light to light grey	N6-7	0.85
		B 25% Shale, as 693-107A, minor cavings	N6-7	0.62
		C 10% LCM - lignite Minor siltstone		
693-110	2381m	A 55% Mudstone, as 693-109A, mod. caved	N6-7	0.82
		B 30% Shale, as 693-107A, mod. caved	N6-7	0.77
		C 15% LCM - lignite		
693-111	2390m	A 45% Mudstone, as 693-109A, mod. caved	N6-7	0.95,0.94
		B 40% Shale, as 693-107A, mod. caved	N6-7	0.65
		C 15% LCM - lignite		
693-112	2399m	A 40% Mudstone, as 693-109A, mod. caved	N6-7	0.67
		B 30% Shale, as 693-107A, mod. caved	N6-7	0.64
		C 30% LCM - cement and lignite		
693-113	2408m	A 95% Shale, platy to subfissile, mod. hard, non-calc. to v. sl. calc., mod. caved, med. to med. light grey	N5-6	0.60
		B 5% Mudstone, as 693-109A, mod. caved Minor LCM - lignite Minor pyrites	N6-7	
693-114	2417m	A 65% Shale, as 693-113A, mod. caved	N5-6	0.65,0.67
		B 15% Mudstone, blocky, soft to mod. hard, non-calc. to v. sl. calc., minor cavings, med. grey	N5	0.77
		C 10% Mudstone, blocky, soft, v. sl. calc., minor cavings, pale greyish red	10R5/2	0.35
		D 10% LCM - lignite		

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)
693-115	2426m	A 55% Mudstone, blocky, soft, v. sl. calc., mod. caved, pale greyish red	10R5/2	0.23
		B 35% Shale, platy to subfissile, mod. hard, non-calc. to v. sl. calc., mod. caved, med. to med. light grey	N5-6	0.62
		C 10% LCM - lignite Minor other mudstone. Minor drilling mud		
693-116	2435m	A 55% Sand, unconsolidated, fine-medium grained, subangular to subrounded, fairly well sorted, clear, white to pale greyish orange pink	N9-5YR8/2	
		B 20% Shale, subfissile to platy, mod. hard, non-calc., mod. to abundantly caved, med. to med. light grey	N5-6	0.81
		C 15% Shaly mudstone, blocky, mod. hard, non-calc., mod. caved, greyish red	5R4/2	0.17,0.16
		D 10% LCM - lignite and paint Minor mudstone and lime mudstone		
693-117	2453m	A 55% Shale, as 693-116B, mod. to abundantly caved	N5-6	0.66
		B 25% LCM - lignite and paint		
		C 15% Sand, as 693-116A	N9-5YR8/2	
		D 5% Shaly mudstone, as 693-116C, mostly caved	5R4/2	
		Minor other mudstone		
693-118	2462m	A 60% Shale, as 693-116B, mod. caved	N5-6	0.80
		B 30% Sand, unconsolidated, fine-medium grained, subrounded to subangular, fairly well sorted, clear, white	N9	
		C 5% Shaly mudstone, as 693-116C, mostly caved	5R4/2	
		D 5% LCM - lignite Minor other mudstone		
693-119	2483m	A 55% Shale, as 693-116B, mod. caved	N5-6	0.71
		B 20% Sand, as 693-118B	N9	
		C 15% LCM - lignite		
		D 10% Shaly mudstone, as 693-116C, mod. to abundantly caved	5R4/2	0.17
		Mod. to abundantly caved		
693-120	2492m	A 50% Shale, platy to subfissile, mod. hard, non-calc., mod. to abundantly caved, med. light to light grey	N6-7	0.69
		B 25% Sand, as 693-118B	N9	
		C 15% Silty mudstone, blocky, soft, non-calc., mod. caved, dark greyish red	5R3/2	0.22,0.23
		D 10% LCM - lignite Minor other mudstone		
693-121	2504m	A 60% Shale, as 693-120A, abundantly caved	N6-7	0.67
		B 25% Silty mudstone, as 693-120C, mod. caved	5R3/2	0.16
		C 15% LCM - lignite and brick Minor sand and other mudstone		

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)
693-122	2513m	A 45% Shale, platy to subfissile, mod. hard, non-calc., mod. caved, med. light to light grey	N6-7	0.67
		B 35% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, clear, white	N9	
		C 20% Silty mudstone, blocky, soft, non-calc., mod. caved, dark greyish red Minor LCM - lignite	5R3/2	0.25
693-123	2522m	A 65% Shale, as 693-122A, mod. caved	N6-7	0.72,0.72
		B 20% Sand, as 693-122B	N9	
		C 15% Silty mudstone, as 693-122C, mod. caved Minor LCM - lignite	5R3/2	0.20
693-124	2531m	A 85% Sand, as 693-122B	N9	
		B 10% Silty mudstone, as 693-122C, mod. caved	5R3/2	0.21
		C 5% Shale, as 693-122A, mod. caved Minor other mudstone LCM - lignite	N6-7	0.89
693-125	2540m	A 65% Sand, as 693-122B	N9	
		B 20% Shale, thinly fissile to subfissile, mod. hard, v. sl. calc. to non-calc., mod. caved, med. light grey	N6	0.89,0.88
		C 15% Shaly mudstone, sl. silty, blocky to subfissile, mod. hard, sl. calc., mod. caved, pale greyish brown Minor LCM - lignite	5YR4/2	0.22
693-126	2549m	A 60% Shale, as 693-125B, mod. caved	N6	0.71
		B 25% Shaly mudstone, as 693-125C, mod. caved	5YR4/2	0.22
		C 15% Sand, as 693-122B Minor LCM - lignite	N9	
693-127	2570m	A 60% Shale, platy to thinly fissile, soft to mod. hard, brittle, non-calc., sig. caved, med. light grey	N6	0.68
		B 30% Shaly mudstone, blocky to subfissile, sl. silty, soft, non-calc., mod. caved, pale greyish brown	5YR4/2	0.27
		C 10% Sand, unconsolidated, fine grained, subrounded to subangular, fairly well sorted, clear, white LCM - lignite and paint	N9	
693-128	2579m	A 55% Shale, thinly fissile to platy, soft to mod. hard, non-calc., mod. caved, med. grey	N5	0.65
		B 30% Shaly mudstone, as 693-127B, mod. caved	5YR4/2	0.22,0.22
		C 15% Sand, as 693-127C Minor other shale LCM - lignite and paint	N9	

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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)
693-129	2588m	A 35% Shale, platy to thinly fissile, soft to mod. hard, non-calc., sig. caved, med. light grey	N6	0.68
		B 35% Shaly mudstone, blocky to subfissile, sl. silty, soft, non-calc., mod. caved, pale greyish brown	5YR4/2	0.22,0.22
		C 15% Sand, unconsolidated, fine grained, subrounded to subangular, fairly well sorted, clear, white	N9	
		Minor other shale LCM - lignite and paint		
693-130	2597m	A 60% Shale, as 693-129A, sig. caved	N6	0.78
		B 35% Shaly mudstone, as 693-129B, mod. caved	5YR4/2	0.20,0.20
		C 5% Sand, as 693-129C	N9	
		Minor other shale LCM - paint and lignite		
693-131	2606m	A 85% Shale, thinly fissile to platy, soft to mod. hard, brittle, non-calc., sig. caved, med. light grey	N6	0.65
		B 10% Shaly mudstone, blocky to subfissile, sl. silty, soft to mod. hard, sl. calc. to non-calc., mod. caved, pale greyish brown	5R4/2	0.22
		C 5% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, clear, white	N9	
		Minor other shale Minor LCM		
693-132	2633m	A 55% Shale, platy to thinly fissile, soft to mod. hard, v. sl. calc., abundantly caved, med. dark to med. grey	N4-5	0.64
		B 40% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, clear, white	N9	
		C 5% Shaly mudstone, as 693-131B, abundantly caved	5R4/2	0.18,0.18
		Minor other shale. Minor LCM		
693-133	2642m	A 95% Sand, as 693-132B	N9	
		B 5% Shale, as 693-132A, mostly caved	N4-5	0.54
		Minor siltstone. Minor mica		
693-134	2651m	A 90% Sand, unconsolidated, fine-medium grained, subrounded, well sorted, clear, light brown moderate orange pink to white	5YR7/4-N9	
		B 10% Shale, as 693-132A, caved	N4-5	
		Minor siltstone - caved. Minor mica		
693-135	2660m	A 98% Sand, as 693-134A	5YR7/4-N9	
		Minor caved shale and siltstone		
693-136	2669m	A 98% Sand, as 693-134A	5YR7/4-N9	
		Minor caved shale and siltstone		

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomitic, Fluorescence, forsminifera, 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)
693-137	2678m	A 90% Sand, unconsolidated, fine-medium grained, subrounded, well sorted, clear, light brown moderate orange pink to white	5YR7/4-N9	
		B 10% Siltstone, blocky, soft, non-calc., mostly caved, pale greyish brown Minor caved shale	5YR4/2	0.19
693-138	2687m	A 98% Sand, unconsolidated, fine grained, subrounded, well sorted, clear, white Minor caved shale and siltstone	N9	
693-139	2696m	A 98% Sand, as 693-138A Minor caved shale and siltstone	N9	
693-140	2714m	A 75% Sand, as 693-138A	N9	
		B 20% Shaly mudstone, sl. silty, platy to subfissile, soft to mod. hard, non-calc., mod. caved, greyish brown	5YR3/2	0.16
		C 5% Shale, subfissile, mod. hard, sl. calc., mod. to abundantly caved, med. light grey Minor other shale	N6	0.47
693-141	2723m	A 80% Sand, as 693-138A	N9	
		B 15% Shaly mudstone, as 693-140B, mod. caved	5YR3/2	0.19
		C 5% Shale, as 693-140C, caved Minor sandstone	N6	
693-142	2732m	A 85% Sand, as 693-138A	N9	
		B 15% Shaly mudstone, as 693-140B, mod. caved Minor shale and sandstone	5YR3/2	0.16,0.17
693-143	2741m	A 85% Sand, unconsolidated, fine-medium grained, subrounded, well sorted, clear, white	N9	
		B 10% Sandstone, blocky, fine-medium grained, calc. matrix, white	N9	
		C 5% Shaly mudstone, as 693-140B, caved Minor caved shale	5YR3/2	
693-144	2750m	A 85% Sand, as 693-143A	N9	
		B 15% Shaly mudstone, sl. silty, platy to subfissile, soft to mod. hard, v. sl. calc., mostly caved, pale greyish brown Minor caved shale and sandstone	5YR4/2	0.18
693-145	2759m	A 85% Sand, as 693-143A	N9	
		B 10% Shaly mudstone, as 693-144B, mod. caved	5YR4/2	0.15
		C 5% Shaly mudstone, subfissile, mod. hard, v. sl. calc., mostly caved, med. light grey Minor sandstone	N6	0.36
693-146	2768m	A 80% Sand, as 693-143A	N9	
		B 20% Shaly mudstone, as 693-144B, mostly caved Minor sandstone and other mudstone	5YR4/2	0.17,0.19

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)
693-147	2777m	A 90% Sand, unconsolidated, fine grained, subrounded, well sorted, clear, white	N9	
		B 10% Sandstone, blocky, fine grained, subrounded, non-calc. matrix, very light grey	N8	
		Minor mudstone - caved		
693-148	2786m	A 65% Sand, as 693-147A	N9	
		B 15% Shale, thinly fissile to subfissile, soft to mod. hard, non-calc., mod. caved, med. light grey	N6	0.51
		C 10% Shale, sl. silty, platy to subfissile, soft to mod. hard, v. sl. calc., minor cavings, pale greyish brown	5YR4/2	0.20
		D 10% Sandstone, as 693-147B	N8	
		Minor other shale		
693-149	2795m	A 75% Sand, as 693-147A	N9	
		B 10% Shale, as 693-148B, mod. caved	N6	0.39
		C 10% Sand, as 693-147B	N8	
		D 5% Shale, as 693-148C, mostly caved	5YR4/2	
693-150	2810m	A 85% Calc. siltstone, blocky, soft, minor cavings, very light grey	N8	0.15,0.18
		B 15% Shale, thinly fissile to platy, soft to mod. hard, non-calc., mod. caved, med. grey	N5	0.57
		Minor other shale and sand		
693-151	2819m	A 80% Calc. siltstone, as 693-150A, mod. caved	N8	0.13
		B 20% Shale, as 693-150B, mod. caved	N5	0.61
		Minor other shale (caved) and sand		
693-152	2828m	A 65% Calc. siltstone, as 693-150A, mod. caved	N8	0.17,0.14
		B 25% Shale, as 693-150B, mod. caved	N5	0.75
		C 10% Sand, unconsolidated, clear, fine grained, subrounded, well sorted, white	N9	
		Minor other shale		
693-153	2837m	A 45% Shale, thinly fissile to platy, mod. hard, brittle, non-calc., mod. caved, med. grey	N5	0.57
		B 35% Calc. siltstone, blocky, soft, mod. caved, very light grey	N8	0.12
		C 10% Shale, platy to subfissile, sl. silty, soft to mod. hard, non-calc., minor cavings, med. brownish grey	5YR5/1	0.43
		D 10% Sand, as 693-152C	N9	
		Minor LCM - metal		
693-154	2846m	A 85% Calc. siltstone, as 693-153B, mod. caved	N8	0.17,0.15
		B 10% Shale, as 693-153A, sig. caved	N5	0.60
		C 5% Sand, as 693-153D	N9	
		Minor other shale		
		Minor LCM		

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)
693-155	2855m	A 85% Calc. siltstone, blocky, soft, mod. caved, very light grey	N8	0.14
		B 15% Shale, thinly fissile to platy, mod. hard, brittle, non-calc., sig. caved, med. grey	N5	0.56
		Minor sand and other shale		
693-156	2864m	A 90% Limestone, blocky, soft, silty in part, minor cavings, light brownish pinkish to pinkish grey	5YR7/1-5YR8/1	0.16
		B 10% Shale, as 693-155B, sig. caved	N5	0.60,0.63
		Minor other shale		
693-157	2873m	A 90% Limestone, as 693-156A, minor cavings	5YR7/1-5YR8/1	0.15
		B 10% Shale, thinly fissile to platy, mod. hard, brittle, non-calc., mod. caved, med. to med. olive grey	N5-5Y5/1	0.54
		Minor other shale		
		Minor LCM		
693-158	2882m	A 95% Limestone, as 693-156A, minor cavings	5YR7/1-5YR8/1	0.15
		B 5% Shale, as 693-157B, mostly caved	N5-5Y5/1	0.53
		Minor LCM		
693-159	2891m	A 98% Limestone, as 693-156A, minor cavings	5YR7/1-5YR8/1	0.16,0.17
		Minor shale. Minor LCM		
693-160	2900m	A 98% Limestone, as 693-156A, minor cavings	5YR7/1-5YR8/1	0.16
		Minor shale. Minor LCM		
693-161	2909m	A 65% Sand, unconsolidated, fine to medium grained, subangular to subrounded, poorly sorted, clear, white	N9	
		B 35% Limestone, as 693-156A, minor cavings	5YR7/1-5YR8/1	0.16
		Minor caved shale		
693-162	2918m	A 95% Limestone, blocky, soft, sl. silty in part, minor cavings, pinkish grey	5YR8/1	0.17
		B 5% Shale, platy, soft to mod. hard, non-calc., caved?, med. to med. olive grey	N5-5Y5/1	0.57
		Minor sand. Minor LCM		
693-163	2927m	A 90% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, clear, white	N9	
		B 5% Limestone, as 693-162A, minor cavings	5YR8/1	
		C 5% LCM - cement and metal		
		Minor caved shale		
693-164	2936m	A 65% Sand, as 693-163A	N9	
		B 25% Limestone, as 693-162A, minor cavings	5YR8/1	0.24,0.22
		C 10% LCM - cement and metal		
		Minor limestone and caved shale		
693-165	2945m	A 45% Sand, as 693-163A	N9	

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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)
693-165	2945m	B 40% Limestone, blocky, soft, sl. silty in part, minor cavings, pinkish grey	5YR8/1	0.18
		C 10% LCM - cement and drilling mud		
		D 5% Shale, platy, brittle, non-calc., mostly caved, med. dark to med. grey	N4-5	0.53
		Minor other shale		
693-166	2954m	A 55% Sand, unconsolidated, fine-medium grained, subrounded to subangular, well sorted, clear, white	N9	
		B 40% Limestone, blocky, soft, minor cavings pinkish grey	5YR8/1	0.19
		C 5% Shale, as 693-165D, caved	N4-5	
		Minor LCM		
693-167	2963m	A 90% Sand, as 693-166A	N9	
		B 10% LCM - cement		
		Minor limestone and shale		
693-168	2972m	A 80% Sand, as 693-166A	N9	
		B 20% LCM - cement/drilling mud and metal		
		Minor limestone and shale		
693-169	2981m	A 65% Sand, as 693-166A	N9	
		B 35% LCM - cement		
		Minor limestone and shale		
693-170	2990m	A 80% Sand, unconsolidated, fine-medium grained, subrounded to subangular, fairly well sorted, clear, white	N9	
		B 10% Limestone, blocky, soft, minor cavings, pinkish grey	5YR8/1	
		C 5% LCM - cement and metal		
		D 5% Shale, platy, mod. hard, non-calc., caved?, med. grey	N5	
693-171	2999m	A 75% Sand, as 693-170A	N9	
		B 15% Limestone, as 693-170B	5YR8/1	0.18
		C 5% Shale, platy, mod. hard, brittle, mod. to abundantly caved, med. grey	N5	0.67,0.67
		D 5% LCM - cement		
693-172	3008m	A 90% Sand, unconsolidated, fine to medium grained, subrounded to subangular, fairly well sorted, clear, white	N9	
		B 5% Shale, subfissile to platy, mod. hard, non-calc., sig. caved, med. grey	N5	0.50
		C 5% LCM - cement		
		Minor limestone and evaporite		
693-173	3017m	A 65% Sand, as 693-172A	N9	
		B 20% Shale, as 693-172B, sig. caved	N5	0.67
		C 15% LCM - lignite and cement		
		Minor evaporite and limestone		
693-174	3026m	A 65% Sand, as 693-172A	N9	
		B 20% LCM - cement and lignite		
		C 15% Shale, as 693-172B, sig. caved	N5	0.60
		Minor evaporite amd limestone		

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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)
693-175	3035m	A 65% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, clear, white	N9	
		B 25% LCM - cement and lignite		
		C 10% Shale, platy, mod. hard, non-calc., sig. caved, med. grey	N5	0.53
693-176	3044m	A 65% Sand, as 693-175A	N9	
		B 25% LCM - cement and lignite		
		C 10% Shale, as 693-175C, sig. caved	N5	0.56,0.59
693-177	3053m	A 40% LCM - cement		
		B 40% Sand, unconsolidated, fine grained, subrounded to subangular, white	N9	
		C 20% Shale, platy to subfissile, soft to mod. hard, non-calc., mostly caved, med. grey	N5	0.52
		Minor siltstone and other shale		
693-178	3062m	A 75% Sand, as 693-177B	N9	0.59
		B 15% LCM - cement and metal		
		C 10% Shale, as 693-177C, mostly caved	N5	
		Minor other shale		
693-179	3071m	A 60% Sand, as 693-177B	N9	
		B 20% LCM - cement and metal		
		C 20% Shale, as 693-177C, mostly caved	N5	0.52
		Minor sandstone and other shale		
693-180	3080m	A 50% LCM - cement		
		B 35% Sand, as 693-177B	N9	
		C 15% Shale, as 693-177C, mostly caved	N5	0.58
		Minor siltstone		
693-181	3089m	A 55% LCM - cement		
		B 25% Sand, unconsolidated, fine grained, subrounded to subangular, clear, white	N9	
		C 20% Shale, platy to thinly fissile, brittle, non-calc., mod. to abundantly caved, med. grey	N5	0.54,0.52
		Minor siltstone		
693-182	3098m	A 50% LCM - cement		
		B 30% Sand, as 693-181B	N9	
		C 20% Shale, as 693-181C, mostly caved	N5	0.80
		Minor siltstone and other shale		
693-183	3107m	A 60% Sandstone, mostly unconsolidated, v. fine grained, non-calc. matrix, very light grey to white	N8-9	
		B 20% LCM - cement		
		C 20% Shale, thinly fissile to platy, birttle, non-calc., mod. to abundantly caved, med. grey	N5	0.65
		Minor siltstone		
693-184	3116m	A 55% Sandstone, as 693-183A	N8-9	
		B 30% Shale, as 693-183C, mod. to abundantly caved	N5	0.61

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)
693-184	3116m	C 15% LCM - cement Minor siltstone		
693-185	3125m	A 55% Sandstone, mostly unconsolidated, v. fine grained, non-calc. matrix, very light grey to white	N8-9	
		B 25% Shale, thinly fissile to platy, brittle, non-calc., mod. to abundantly caved, med. grey	N5	0.57,0.62
		C 20% LCM - cement Minor siltstone and other shale		
693-186	3134m	A 75% Sand, unconsolidated, fine grained, subangular, clear, white	N9	
		B 15% Shale, platy, mod. hard, brittle, non-calc., sig. caved, med. grey	N5	0.56
		C 10% LCM - cement and fibre Minor siltstone and other shale		
693-187	3143m	A 60% Sand, as 693-186A	N9	
		B 15% Shale, as 693-186B, sig. caved	N5	0.56
		C 15% Mudstone, blocky, soft, non-calc., pale brown	5YR5/2	0.23
		D 10% LCM - cement and fibre Minor siltstone		
693-188	3152m	A 70% Sand, as 693-186A	N9	
		B 15% Shale, as 693-186B, sig. caved	N5	0.67
		C 10% LCM - cement and fibre		
		D 5% Mudstone, as 693-187C Minor siltstone	5YR5/2	
693-189	3161m	A 75% Sand, fine grained, subangular to subrounded, clear, white to moderate orange pink	N9-5YR8/4	
		B 15% Shale, platy to subfissile, brittle, non-calc., mostly caved, med. grey	N5	0.53,0.58
		C 10% LCM - cement Minor siltstone		
693-190	3170m	A 75% Sand, as 693-189A	N9-5YR8/4	
		B 15% Shale, as 693-189B, mostly caved	N5	0.55
		C 10% LCM - cement Minor siltstone and mudstone		
693-191	3179m	A 70% Sand, unconsolidated, fine-grained, subangular, fairly well sorted, white to moderate orange pink	N9-5YR8/4	
		B 20% LCM - cement		
		C 10% Shale, subfissile, mod. hard, non-calc., minor to sig. cavings, med. to med. olive grey	N5-5Y5/1	0.34
		Minor siltstone		
693-192	3206m	A 80% Sand, unconsolidated, fine grained, subangular, well sorted, moderate orange pink	5YR8/4	
		B 15% Shale, as 693-191C, sig. caved	N5-5Y5/1	0.48
		C 5% LCM - drilling mud and cement		

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)
693-193	3215m	A 90% Sand, unconsolidated, fine grained, subangular, well sorted, moderate orange pink	5YR8/4	
		B 10% Shale, subfissile, mod. hard, non-calc., sig. caved, med. to med. olive grey	N5-5Y5/1	0.56
		Minor other shale and siltstone Minor LCM		
693-194	3224m	A 90% Sand, as 693-193A	5YR8/4	
		B 10% Shale, as 693-193B, sig. caved	N5-5Y5/1	0.38
		Minor dolomite and other shale Minor LCM		
693-195	3233m	A 85% Sand, as 693-193A	5YR8/4	
		B 15% Shale, as 693-193B, sig. caved	N5-5Y5/1	0.59,0.61
		Minor dolomite and other shale Minor LCM		
693-196	3251m	A 35% Sand, unconsolidated, fine grained, subangular, moderate orange pink to white	5YR8/4-N9	
		B 30% Shale, platy to subfissile, mod. hard, non-calc., sig. caved, med. to med. olive grey	N5-5Y5/1	0.69
		C 25% LCM - metal, fibre, paint and cement		
		D 10% Shale, platy to subfissile, mod. hard, non-calc., minor cavings, pale greyish brown	5YR4/2	0.40
		Minor siltstone		
693-197	3260m	A 45% Sand, as 693-196A	5YR8/4-N9	
		B 25% Shale, as 693-196B, sig. caved	N5-5Y5/1	0.73
		C 15% LCM - metal, fibre and paint		
		D 15% Silty shale, blocky to subfissile, mod. hard, non-calc., minor cavings, pale greyish brown	5YR4/2	0.18
		Minor siltstone		
693-198	3269m	A 95% Sand, unconsolidated, fine grained, light brown moderate orange pink to white	5YR7/4-N9	
		B 5% Shale, platy to subfissile, mod. hard, non-calc., sig. caved, med. to med. olive grey	N5-5Y5/1	0.52
		Minor siltstone. Minor LCM		
693-199	3277m	A 95% Sand, as 693-198A	5YR7/4-N9	
		B 5% Shale, as 693-198B, sig. caved	N5-5Y5/1	0.44,0.50
		Minor siltstone and limestone. Minor LCM		
693-200	3286m	A 95% Sand, as 693-198A	5YR7/4-N9	
		B 5% Shale, as 693-198B, sig. caved	N5-5Y5/1	
		Minor siltstone and limestone Minor LCM		

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)
693-201	3295m	A 98% Sand, unconsolidated, fine-medium grained, subrounded to subangular, fairly well sorted, light brown morderate orange pink to white Minor shale. Minor LCM	5YR7/4-N9	
693-202	3304m	A 95% Sand, unconsolidated, fine-medium grained, subrounded to subangular, fairly well sorted, white to light brown moderate orange pink	N9-5YR7/4	
		B 5% Silty mudstone, blocky, soft, non-calc., minor cavings, pale brown Minor shale and limestone Minor LCM	5YR5/2	0.18
693-203	3313m	A 90% Sand, as 693-202A	N9-5YR7/4	
		B 10% Silty mudstone, as 693-202B, sig. caved Minor shale and limestone Minor LCM	5YR5/2	0.17
693-204	3322m	A 98% Sand, as 693-202A Minor mudstone and shale Minor LCM	N9-5YR7/4	
693-205	3331m	A 95% Sand, as 693-202A	N9-5YR7/4	
		B 5% Silty mudstone, as 693-202B, sig. caved Minor shale and limestone Minor LCM	5YR5/2	0.16
693-206	3340m	A 50% Sand, as 693-202A	N9-5YR7/4	
		B 20% LCM - metal, fibre, paint and rubber		
		C 15% Silty mudstone, as 693-202B, sig. caved	5YR5/2	0.18,0.20
		D 15% Shale, subfissile, mod. hard, non-calc., caved?, med. to med. olive grey Minor other shale	N5-5Y5/1	0.49
693-207	3349m	A 90% Sand, unconsolidated, fine grained, subrounded to subangular, fairly well sorted, light brown moderate orange pink	5YR7/4	
		B 10% Shale, as 693-206D, caved? Minor silty mudstone	N5-5Y5/1	0.50
693-208	3358m	A 98% Sand, as 693-207A Minor shale and mudstone Minor LCM	5YR7/4	
693-209	3367m	A 95% Sand, as 693-207A	5YR7/4	
		B 5% Silty mudstone, blocky, soft, non-calc., sig. caved, pale brown Minor shale - caved Minor LCM	5YR5/2	
693-210	3376m	A 95% Sand, as 693-207A	5YR7/4	
		B 5% Silty mudstone, as 693-209B, sig. caved. Minor shale and limemudstone. Minor LCM	5YR5/2	0.13

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)
693-211	3385m	A 90% Sand, unconsolidated, fine grained, subrounded to subangular, fairly well sorted, light brown moderate orange pink	5YR7/4	
		B 10% Silty mudstone, blocky, soft, non-calc., sig. caved, pale brown Minor shale and lime mudstone	5YR5/2	0.13,0.15
693-212	3394m	A 95% Sand, as 693-211A	5YR7/4	
		B 5% Silty mudstone, as 693-211B, sig. caved Minor shale and lime mudstone Minor LCM	5YR5/2	0.12
693-213	3412m	A 95% Sand, unconsolidated, v. fine grained, subangular to subrounded, well sorted, clear, white	N9	
		B 5% Shale, subfissile, mod. hard, non-calc., sig. caved, med. grey Minor LCM	N5	0.49
693-214	3421m	A 85% Sand, unconsolidated, v. fine grained, subangular to subrounded, well sorted, white to moderate orange pink	N9-5YR8/4	
		B 5% Shaly mudstone, blocky, mod. hard, non-calc., sig. caved, pale brown	5YR5/2	0.21
		C 5% Shale, as 693-213B, sig. caved	N5	
		D 5% LCM - metal		
693-215	3430m	A 95% Sand, unconsolidated, fine grained, subangular to subrounded, well sorted, light brown moderate orange pink	5YR7/4	
		B 5% Mudstone, as 693-214B, caved? Minor shale and mudstone Minor LCM	5YR5/2	
693-216	3439m	A 98% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, white to moderate orange pink Minor shale and mudstone	N9-5YR8/4	
693-217	3448m	A 98% Sand, as 693-216A Minor shale and mudstone	N9-5YR8/4	
693-218	3457m	A 90% Sand, as 693-216A	N9-5YR8/4	
		B 10% Silty mudstone, blocky, soft, non-calc., sig. caved, pale brown Minor shale and mudstone Minor LCM	5YR5/2	0.14
693-219	3466m	A 95% Sand, as 693-216A	N9-5YR8/4	
		B 5% Silty mudstone, as 693-218B, sig. caved Minor shale and mudstone Minor LCM	5YR5/2	0.22,0.23
693-220	3475m	A 80% Sand, as 693-216A	N9-5YR8/4	
		B 10% Silty mudstone, as 693-218B, sig. caved	5YR5/2	0.25

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)
693-220	3475m	C 10% Lime mudstone, blocky, soft, white Minor shale Minor LCM	N9	0.13
693-221	3484m	A 85% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, white to moderate orange pink	N9-5YR8/4	
		B 15% Lime mudstone, blocky, soft, white Minor shale and other mudstone	N9	0.12,0.11
693-222	3502m	A 75% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, white to pale greyish orange	N9-10YR8/4	
		B 20% Lime mudstone, as 693-221B, minor cavings	N9	0.12
		C 5% Silty mudstone, blocky, soft, non-calc., sig. caved, pale brown Minor other shale	5YR5/2	0.12
693-223	3511m	A 65% Sand, as 693-222A	N9-10YR8/4	
		B 25% Silty mudstone, as 693-222C, sig. caved	5YR5/2	0.13
		C 10% Lime mudstone, as 693-221B, minor cavings Minor shale. Minor LCM	N9	0.14
693-224	3520m	A 80% Sand, as 693-222A	N9-10YR8/4	
		B 15% Lime mudstone, as 693-221B, minor cavings	N9	0.12,0.14
		C 5% Silty mudstone, as 693-222C, sig. caved Minor shale. Minor LCM	5YR5/2	0.21
693-225	3529m	A 98% Sand, as 693-222A Minor mudstone and shale Minor LCM	N9-10YR8/4	
693-226	3538m	A 85% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, white to moderate orange pink	N9-5YR8/4	
		B 15% Lime mudstone, blocky, soft, minor cavings, white Minor other mudstone and shale Minor LCM	N9	0.14
693-227	3556m	A 85% Sand, as 693-226A	N9-5YR8/4	
		B 15% Lime mudstone, as 693-226B, minor cavings Minor shale and other mudstone Minor LCM	N9	0.11
693-228	3565m	A 90% Sand, as 693-226A	N9-5YR8/4	
		B 10% Lime mudstone, as 693-226B, minor cavings Minor shale and other mudstone Minor LCM	N9	0.12

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)
693-229	3574m	A 95% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, clear, white to moderate orange pink	N9-5YR8/4	
		B 5% Lime mudstone, blocky, soft, minor cavings, white	N9	
		Minor shale. Minor LCM		
693-230	3583m	A 85% Sand, as 693-229A	N9-5YR8/4	
		B 15% Lime mudstone, blocky, soft, minor cavings, white	N9	0.14
		Minor shale and other mudstone		
		Minor LCM		
693-231	3592m	A 98% Sand, as 693-229A	N9-5YR8/4	
		Minor shale and mudstone		
		Minor LCM		
693-232	3601m	A 70% Sand, as 693-229A	N9-5YR8/4	
		B 30% Lignite, blocky, brittle - additive?, greyish black	N2	
		Minor shale and mudstone		
693-233	3610m	A 60% Sand, as 693-229A	N9-5YR8/4	
		B 25% Calc. mudstone, blocky, soft, minor cavings, greyish orange pink	5YR7/2	0.21,0.21
		C 5% Shale, platy to subfissile, mod. hard, non-calc., med. to med. olive grey	N5-5Y5/1	0.42
		D 5% LCM - metal and fibre		
		E 5% Lignite, as 693-232B	N2	
693-234	3619m	A 65% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, white to moderate orange pink	N9-5YR8/4	
		B 20% Lignite, as 693-232B	N2	
		C 10% Lime mudstone, blocky, soft, minor cavings, white	N9	0.15
		D 5% LCM - fibre and metal		
		Minor shale		
693-235	3638m	A 98% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, white to moderate orange pink	N9-5YR8/4	
		Minor shale		
693-236	3647m	A 98% Sand, as 693-235A	N9-5YR8/4	
		Minor shale and mudstone		
693-237	3656m	A 60% Sand, as 693-235A	N9-5YR8/4	
		B 40% Siltstone, blocky, soft, non-calc., grades to fine sandstone, pale brown occ. white	5YR5/2 occ. N9	0.08
		Minor mudstone and shale		
693-238	3665m	A 60% Sand, as 693-235A	N9-5YR8/4	
		B 40% Siltstone, as 693-237B, minor cavings	5YR5/2 occ. N9	0.05
		Minor mudstone		
693-239	3674m	A 40% Siltstone, as 693-237B, minor cavings	5YR5/2 occ. N9	0.07,0.07

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)
693-239	3674m	B 40% Calc. mudstone, blocky, soft, light brown	5YR6/4	0.16
		C 15% Sand, unconsolidated, fine grained, subrounded to subangular, well sorted, white to moderate orange pink	N9-5YR8/4	
		D 5% Lignite, blocky, - additive?, greyish black	N2	
		Minor other mudstone		
693-240	3683m	A 50% Calc. mudstone, as 693-239B	5YR6/4	0.12
		B 40% Siltstone, blocky, soft, non-calc., - grades to fine sandstone, pale brown occ. white, minor to sig. cavings	5YR5/2 occ. N9	0.08
		C 10% Sand, as 693-239C	N9-5YR8/4	
		Minor other mudstone		
		Minor LCM		
693-241	3692m	A 60% Siltstone, blocky, soft to mod. hard, sl. calc., sig. caved, pale brown	5YR5/2	0.09
		B 40% Calc. mudstone, blocky, soft, minor cavings, greyish orange pink	5YR7/2	0.14,0.10
		Minor sand		
693-242	3701m	A 70% Sand, unconsolidated, fine grained, subangular to subrounded, well sorted, white to moderate orange pink	N9-5YR8/4	
		B 30% Siltstone, as 693-241A, sig. caved	5YR5/2	0.09
		Minor mudstone		
		Minor LCM		
693-243	3710m	A 65% Sand, as 693-242A	N9-5YR8/4	
		B 35% Siltstone, as 693-241A, sig. caved	5YR5/2	0.16
		Minor mudstone. Minor LCM		
693-244	3719m	A 65% Siltstone, as 693-241A, sig. caved	5YR5/2	0.10
		B 35% Sand, as 693-242A	N9-5YR8/4	
		Minor mudstone and sandstone		
		Minor LCM		
693-245	3728m	A 60% Siltstone, blocky, soft, non-calc., grades to fine sandstone, sig. caved, pale brown	5YR5/2	0.11
		B 25% Sand, unconsolidated, fine grained, subangular to subrounded, well sorted, white to moderate orange pink	N9-5YR8/4	
		C 15% LCM - lignite and fibre		
		Minor shale		
693-246	3746m	A 75% Sand, as 693-245B	N9-5YR8/4	
		B 15% LCM - lignite and fibre		
		C 10% Siltstone, as 693-245A, sig. caved	5YR5/2	
		Minor mudstone		
693-247	3755m	A 70% Silty mudstone, blocky, soft, non-calc, minor cavings, pale brown to pale greyish brown	5YR5/2-5YR4/2	0.13,0.11
		B 15% Sand, as 693-245B	N9-5YR8/4	
		C 15% LCM - lignite and fibre		
		Minor other mudstone and shale		

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)
693-248	3764m	A 75% Sandstone, blocky, fine grained, subangular, sl. micaceous, non-calc., cement, pinkish grey to moderate orange pink	5YR8/1-5YR8/4	
		B 15% Silty mudstone, blocky, soft, non-calc., minor cavings, pale brown to pale greyish brown	5YR5/2-5YR4/2	0.16
		C 10% LCM - lignite and fibre Minor shale and other mudstone		
693-249	3773m	A 75% Sandstone, as 693-248A	5YR8/1-5YR8/4	
		B 15% Silty mudstone, as 693-248B, sig. caved	5YR5/2-5YR4/2	
		C 10% LCM - lignite and fibre Minor shale and other mudstone		
693-250	3782m	A 75% Silty mudstone, blocky, soft, non-calc. to v. sl. calc., sig. caved, pale brown to pale greyish brown	5YR5/2-5YR4/2	0.14
		B 20% Sandstone, as 693-248A	5YR8/1-5YR8/4	
		C 5% LCM - lignite and fibre Minor other mudstone		
693-251	3791m	A 90% Sandstone, as 693-248A	5YR8/1-5YR8/4	
		B 10% Silty mudstone, as 693-250A, sig. caved	5YR5/2-5YR4/2	
		Minor other mudstone Minor LCM - lignite		

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

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-001	1040	3889	6	4	0	0	3899	10	0.3	1	0.94
693-002	1060	3341	5	1	0	0	3347	6	0.2	0	0.47
693-003	1080	1551	2	1	0	0	1553	2	0.2	0	0.45
693-004	1100	3840	4	1	0	0	3845	5	0.1	0	0.00
693-005	1120	4161	5	2	0	0	4168	7	0.2	0	0.00
693-006	1140	2440	3	1	0	0	2445	5	0.2	0	0.31
693-007	1160	4836	6	1	0	0	4844	8	0.2	0	1.41
693-008	1180	2083	3	2	0	0	2087	5	0.2	0	0.94
693-009	1200	148	1	1	0	0	150	1	0.9	0	0.00
693-010	1220	2031	5	4	0	0	2040	9	0.4	0	0.47
693-011	1240	6	0	0	0	0	6	0	3.5	0	0.00
693-012	1260	2221	8	8	1	2	2241	20	0.9	1	0.47
693-013	1280	2001	6	7	1	1	2017	16	0.8	0	0.73
693-014	1300	2963	6	5	0	1	2975	12	0.4	1	0.60
693-015	1320	785	3	2	0	0	791	6	0.7	1	0.66
693-016	1340	439	0	0	0	0	439	0	0.0	0	0.00
693-017	1360	0	0	0	0	0	0	0	0.0	0	0.00
693-018	1380	10	0	0	0	0	11	0	3.9	0	0.00
693-019	1400	713	2	1	0	1	717	4	0.6	0	0.56
693-020	1420	96	1	1	0	0	98	2	2.2	0	0.00
693-021	1440	30	2	1	0	0	33	3	7.9	0	0.00
693-022	1460	50	0	0	0	0	50	1	1.1	1	0.00
693-023	1480	14	0	1	0	0	15	1	7.4	0	0.00
693-024	1500	18	0	1	0	0	19	1	5.8	0	0.00
693-025	1520	1600	3	1	0	0	1605	4	0.3	0	0.98
693-026	1530	427	2	1	0	0	430	3	0.7	0	0.98
693-027	1540	145	1	0	0	0	146	1	0.7	0	0.00
693-028	1550	7	0	0	0	0	7	0	4.3	0	0.00
693-029	1560	2033	9	1	0	0	2044	10	0.5	0	0.49
693-030	1570	37	0	0	0	0	37	0	0.7	0	0.00

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-031	1580	3	1	0	0	0	5	2	35.5	0	0.31
693-032	1590	1409	18	3	1	1	1431	23	1.6	1	0.47
693-033	1600	2012	20	3	0	1	2036	24	1.2	0	0.31
693-034	1610	1573	15	2	0	1	1591	18	1.1	0	0.31
693-035	1620	34	1	0	0	0	35	1	2.8	0	0.00
693-036	1630	4035	37	3	1	0	4077	42	1.0	0	2.49
693-037	1640	2848	35	4	1	1	2889	41	1.4	1	0.75
693-038	1650	4474	45	4	1	1	4525	51	1.1	1	0.78
693-039	1660	5636	97	14	5	1	5754	118	2.0	1	4.80
693-040	1670	3603	78	11	4	1	3698	95	2.6	1	2.93
693-041	1680	1198	28	5	1	1	1233	35	2.8	1	2.10
693-042	1690	840	23	5	2	1	870	30	3.5	1	1.76
693-043	1700	24	1	0	0	0	25	1	5.5	0	0.00
693-044	1710	1624	30	7	1	1	1662	39	2.3	1	0.73
693-045	1720	2641	49	11	3	4	2707	66	2.4	5	0.64
693-046	1730	2638	54	14	5	7	2718	80	3.0	8	0.65
693-047	1740	1771	44	11	3	5	1834	63	3.4	6	0.56
693-048	1750	1399	40	13	2	5	1459	60	4.1	5	0.44
693-049	1760	32	4	2	1	1	40	8	20.4	0	0.58
693-050	1770	9	1	0	0	0	10	1	12.5	0	0.00
693-051	1780	6	1	0	0	0	7	1	13.3	0	0.00
693-052	1800	1094	37	16	5	10	1163	69	5.9	17	0.49
693-053	1810	4045	47	36	10	18	4155	111	2.7	29	0.56
693-054	1820	2987	101	33	9	15	3145	158	5.0	22	0.61
693-055	1830	1871	57	19	5	11	1963	92	4.7	18	0.52
693-056	1840	145	5	2	0	1	153	8	5.4	1	0.41
693-057	1850	52	9	1	0	0	63	10	16.4	1	0.00
693-058	1860	170	9	3	0	2	184	14	7.7	2	0.21
693-059	1880	28	3	1	0	0	32	4	14.0	0	0.00
693-060	1890	1263	59	36	12	28	1399	136	9.7	53	0.41

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-061	1900	1074	54	34	10	26	1198	123	10.3	55	0.39
693-062	1910	52	3	3	0	1	59	7	12.2	3	0.17
693-063	1920	1965	136	90	25	63	2279	314	13.8	130	0.39
693-064	1930	2499	180	136	43	110	2968	469	15.8	255	0.40
693-065	1940	644	87	80	26	63	900	256	28.4	133	0.41
693-066	1950	3402	265	234	75	193	4170	767	18.4	456	0.39
693-067	1960	170	35	32	9	39	284	114	40.3	1563	0.23
693-068	1970	13	2	2	1	2	20	7	34.1	6	0.39
693-069	1980	10	3	2	1	2	17	7	40.4	4	0.40
693-070	1990	363	45	58	16	43	524	162	30.8	91	0.38
693-071	2000	0	0	0	0	0	0	0	0.0	0	0.00
693-072	2010	2016	269	356	91	230	2962	946	31.9	414	0.40
693-073	2020	30	7	10	3	7	59	28	48.3	10	0.42
693-074	2030	26	6	10	3	8	52	27	51.3	11	0.42
693-075	2040	1170	164	230	72	164	1799	629	35.0	238	0.44
693-076	2050	44	4	10	3	8	70	26	36.8	7	0.43
693-077	2060	2759	534	911	235	648	5087	2328	45.8	691	0.36
693-078	2070	0	0	0	0	0	0	0	0.0	0	0.00
693-079	2080	272	149	346	164	507	1437	1166	81.1	898	0.32
693-080	2090	74	52	153	59	181	520	445	85.7	296	0.33
693-081	2100	3	1	4	2	4	14	11	78.5	18	0.39
693-082	2110	2824	749	1481	357	1144	6556	3731	56.9	1256	0.31
693-083	2120	3	1	3	1	3	11	8	75.4	10	0.41
693-084	2130	1	0	0	0	0	1	0	0.0	0	0.00
693-085	2140	0	0	0	0	0	0	0	0.0	0	0.00
693-086	2150	6	1	3	1	4	15	8	56.8	17	0.25
693-087	2160	1	0	0	0	0	1	0	0.0	0	0.00
693-088	2170	19	53	327	112	461	971	952	98.1	738	0.24
693-089	2180	25	9	36	12	54	137	112	81.4	173	0.23
693-090	2190	10	3	5	2	9	28	18	64.1	36	0.18

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-091	2200	0	0	0	0	0	0	0	0.0	0	0.00
693-092	2210	26	22	54	11	49	163	136	83.7	117	0.23
693-093	2220	15	21	25	4	19	84	69	81.9	118	0.20
693-094	2230	10	9	27	7	31	85	74	87.8	87	0.23
693-095	2240	0	0	0	0	0	0	0	0.0	0	0.00
693-096	2250	48	31	64	10	31	184	136	74.0	33	0.33
693-097	2260	223	141	257	39	129	789	566	71.7	97	0.30
693-098	2270	4	6	14	3	12	38	34	90.7	26	0.22
693-099	2280	2	1	2	0	2	7	5	67.4	8	0.22
693-100	2290	2	0	1	0	1	4	2	51.1	3	0.20
693-101	2300	8	3	5	1	4	21	13	62.8	6	0.25
693-102	2309	97	28	38	5	21	189	92	48.4	19	0.26
693-103	2318	9	4	8	1	6	27	19	68.9	6	0.24
693-104	2327	4	0	1	0	1	6	3	40.9	3	0.25
693-105	2336	8	1	1	0	2	12	4	31.3	1	0.07
693-106	2345	8	2	1	0	1	12	4	34.8	6	0.12
693-107	2354	971	297	351	44	136	1799	828	46.0	94	0.32
693-108	2363	5	2	2	0	1	9	4	46.9	1	0.29
693-109	2372	2	0	0	0	0	2	1	28.2	1	0.12
693-110	2381	2	0	0	0	0	3	1	37.9	0	0.23
693-111	2390	7	4	6	0	1	19	12	61.5	1	0.07
693-112	2399	5	1	1	0	1	8	3	32.6	1	0.09
693-113	2408	1493	425	583	83	276	2860	1367	47.8	200	0.30
693-114	2417	450	133	158	19	73	833	383	46.0	55	0.26
693-115	2426	1053	231	263	37	111	1695	642	37.9	92	0.33
693-116	2435	13	4	7	1	7	33	20	59.9	17	0.21
693-117	2453	5	18	48	14	58	144	138	96.2	77	0.24
693-118	2462	402	291	476	87	328	1583	1181	74.6	398	0.27
693-119	2483	8	12	25	5	15	65	57	87.6	20	0.31
693-120	2492	291	904	1281	152	535	3163	2872	90.8	413	0.28

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-121	2504	9	15	30	5	18	77	68	88.3	19	0.30
693-122	2513	3	2	2	1	4	12	9	74.1	26	0.21
693-123	2522	5	2	7	3	14	32	26	83.0	54	0.25
693-124	2531	407	228	550	153	604	1942	1535	79.0	1497	0.25
693-125	2540	8	3	5	1	6	24	16	67.2	28	0.24
693-126	2549	9	3	2	0	3	17	8	47.5	17	0.17
693-127	2570	653	221	390	66	230	1560	907	58.2	316	0.29
693-128	2579	520	145	250	46	192	1153	633	54.9	344	0.24
693-129	2588	805	205	301	51	194	1556	751	48.3	427	0.26
693-130	2597	411	142	695	275	1227	2749	2338	85.0	1928	0.22
693-131	2606	132	73	343	134	693	1375	1243	90.4	1790	0.19
693-132	2633	132	40	97	44	246	559	427	76.3	1115	0.18
693-133	2642	1017	629	748	38	172	2603	1586	60.9	944	0.22
693-134	2651	847	78	51	21	132	1130	282	25.0	797	0.16
693-135	2660	428	45	34	15	93	615	187	30.4	634	0.16
693-136	2669	279	23	14	9	63	388	109	28.2	444	0.15
693-137	2678	311	28	16	6	39	401	90	22.4	260	0.17
693-138	2687	368	47	28	9	65	518	150	28.9	701	0.14
693-139	2696	221	22	10	4	22	279	57	20.6	182	0.16
693-140	2714	364	24	11	5	37	440	76	17.3	347	0.14
693-141	2723	455	35	16	5	35	547	91	16.7	314	0.15
693-142	2732	836	92	48	9	51	1036	200	19.3	450	0.18
693-143	2741	203	22	16	4	30	274	72	26.2	522	0.15
693-144	2750	247	35	25	5	27	339	92	27.2	456	0.17
693-145	2759	10	1	1	0	1	13	3	22.8	12	0.22
693-146	2768	2	1	1	0	1	5	2	51.7	24	0.21
693-147	2777	453	40	29	5	28	554	102	18.4	438	0.18
693-148	2786	185	16	16	4	25	247	61	24.9	561	0.16
693-149	2795	520	125	115	14	55	828	308	37.2	727	0.25
693-150	2810	84	25	48	11	40	207	123	59.4	451	0.27

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-151	2819	153	57	85	14	48	356	203	57.1	519	0.29
693-152	2823	82	31	33	5	16	167	85	51.1	239	0.32
693-153	2837	125	39	40	6	22	231	106	45.9	580	0.27
693-154	2846	187	37	54	8	27	313	126	40.3	298	0.31
693-155	2855	142	35	43	6	19	245	103	41.9	289	0.31
693-156	2864	101	9	9	2	8	129	28	21.9	278	0.22
693-157	2873	162	14	12	2	10	200	38	18.9	231	0.24
693-158	2882	193	12	6	2	9	222	29	13.0	350	0.22
693-159	2891	1	1	0	0	0	3	1	54.9	181	0.25
693-160	2900	124	9	5	1	7	147	23	15.5	456	0.21
693-161	2909	87	8	5	1	6	107	20	18.4	314	0.23
693-162	2918	74	8	5	1	7	95	21	22.0	301	0.19
693-163	2927	174	18	12	3	10	217	43	19.6	395	0.33
693-164	2936	95	8	6	2	7	118	23	19.3	411	0.27
693-165	2945	119	6	6	2	8	141	22	15.3	342	0.30
693-166	2954	71	10	9	7	11	107	37	34.2	597	0.60
693-167	2963	160	11	7	3	11	192	32	16.6	719	0.30
693-168	2972	154	20	15	4	11	203	50	24.5	461	0.32
693-169	2981	144	15	9	2	7	177	33	18.8	339	0.32
693-170	2990	98	15	8	1	5	127	29	23.1	455	0.28
693-171	2999	105	34	28	5	13	185	80	43.3	649	0.42
693-172	3008	324	128	78	15	25	570	246	43.2	574	0.58
693-173	3017	774	189	86	15	25	1089	315	28.9	304	0.59
693-174	3026	292	173	124	27	40	655	363	55.5	283	0.67
693-175	3035	431	206	144	30	44	853	423	49.6	364	0.68
693-176	3044	267	180	151	22	35	655	388	59.2	388	0.62
693-177	3053	141	42	42	11	18	254	113	44.4	413	0.59
693-178	3062	766	232	116	25	33	1172	406	34.6	205	0.76
693-179	3071	212	215	205	56	79	768	556	72.4	383	0.71
693-180	3080	297	109	66	17	27	517	220	42.5	332	0.65

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-181	3089	295	223	154	38	52	763	468	61.3	279	0.73
693-182	3098	351	225	163	38	55	831	481	57.8	636	0.68
693-183	3107	134	82	79	20	32	347	213	61.3	395	0.63
693-184	3116	105	31	34	7	13	189	84	44.3	265	0.55
693-185	3125	88	16	17	4	9	134	46	34.2	306	0.43
693-186	3134	82	8	7	2	4	101	20	19.7	213	0.42
693-187	3143	0	0	0	0	0	0	0	0.0	0	0.00
693-188	3152	76	8	7	1	5	96	20	20.8	384	0.19
693-189	3161	81	7	4	0	2	94	13	14.3	401	0.22
693-190	3170	111	7	5	1	4	128	18	13.8	204	0.29
693-191	3179	30	6	4	0	2	42	12	28.7	255	0.10
693-192	3206	70	5	3	0	2	80	10	12.8	133	0.27
693-193	3215	105	7	4	2	2	120	15	12.4	135	0.65
693-194	3224	163	10	4	0	2	180	17	9.2	190	0.15
693-195	3233	39	9	4	1	2	55	16	28.7	129	0.34
693-196	3251	1453	182	45	3	10	1693	240	14.2	226	0.31
693-197	3260	72	19	7	1	2	100	28	28.4	189	0.38
693-198	3269	56	15	6	0	1	78	22	28.7	219	0.19
693-199	3277	30	6	2	0	1	40	10	25.1	74	0.59
693-200	3286	23	2	1	0	1	27	4	15.7	30	0.28
693-201	3295	22	2	1	0	0	26	3	13.0	122	0.47
693-202	3304	17	3	1	0	0	21	4	18.1	78	0.32
693-203	3313	31	3	1	0	1	36	5	14.3	55	0.19
693-204	3322	69	5	2	2	5	84	15	17.4	222	0.44
693-205	3331	14	4	1	0	0	20	5	27.8	114	0.24
693-206	3340	182	37	7	1	3	231	49	21.1	180	0.15
693-207	3349	57	11	2	1	1	72	14	19.9	117	0.84
693-208	3358	27	6	1	0	0	34	7	20.5	167	0.00
693-209	3367	17	4	1	0	0	21	5	22.4	101	0.00
693-210	3376	11	2	0	0	0	14	3	19.7	110	0.00

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-211	3385	28	4	1	0	0	34	5	16.3	172	0.00
693-212	3394	28	4	0	0	0	33	4	13.0	109	0.00
693-213	3412	18	4	1	0	0	24	5	22.0	105	0.00
693-214	3421	36	3	1	0	0	40	5	11.6	129	0.00
693-215	3430	75	6	2	0	0	82	8	9.2	183	0.00
693-216	3439	32	3	0	0	0	36	3	9.5	125	0.00
693-217	3448	26	2	1	0	0	29	3	10.3	114	0.00
693-218	3457	44	3	1	0	0	48	4	8.3	88	0.00
693-219	3466	52	4	0	0	0	56	4	7.1	114	0.00
693-220	3475	41	4	2	0	0	46	6	12.5	94	0.00
693-221	3484	55	6	1	0	0	61	6	10.0	136	0.00
693-222	3502	61	4	1	0	0	67	5	8.0	90	0.00
693-223	3511	38	3	1	0	0	42	4	9.6	91	0.00
693-224	3520	49	3	1	0	0	52	3	6.2	76	0.00
693-225	3529	53	2	1	0	0	56	3	5.3	72	0.00
693-226	3538	55	3	1	0	0	59	3	5.7	67	0.00
693-227	3556	240	5	1	0	0	247	6	2.6	65	0.00
693-228	3565	40	1	0	0	0	41	1	2.0	16	0.00
693-229	3574	70	1	0	0	0	71	1	1.9	61	0.00
693-230	3583	105	8	2	0	0	115	10	9.0	83	0.00
693-231	3592	34	2	1	0	0	36	3	7.0	46	0.00
693-232	3601	65	2	1	0	0	67	2	3.2	194	0.00
693-233	3610	27	1	0	0	0	28	1	3.3	66	0.00
693-234	3619	65	3	0	0	0	69	3	4.7	162	0.00
693-235	3638	118	10	2	0	0	130	12	9.1	235	0.00
693-236	3647	11	1	1	0	0	13	2	14.9	9	0.00
693-237	3656	37	2	1	0	0	40	3	7.4	137	0.00
693-238	3665	20	2	0	0	0	23	2	9.5	44	0.00
693-239	3674	21	2	1	0	0	23	3	11.0	94	0.00
693-240	3683	4	0	0	0	0	5	1	14.9	2	0.00

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-241	3692	190	13	3	0	0	206	16	7.8	69	0.00
693-242	3701	21	3	1	0	0	25	4	15.4	102	0.00
693-243	3710	32	2	1	0	0	35	3	8.6	116	0.00
693-244	3719	26	2	1	0	0	29	3	11.1	71	0.00
693-245	3728	1	0	0	0	0	1	0	0.0	0	0.00
693-246	3746	18	1	0	0	0	19	1	7.3	77	0.00
693-247	3755	438	5	0	0	0	444	5	1.2	83	0.00
693-248	3764	11	3	1	0	0	14	3	24.3	30	0.00
693-249	3773	46	4	1	0	0	50	4	8.5	56	0.00
693-250	3782	17	1	1	0	0	19	2	9.8	41	0.00
693-251	3791	6	3	0	0	0	9	3	33.6	62	0.00

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-001	1040	2674	20	13	0	0	2708	34	1.3	4	0.94
693-002	1060	607	12	4	0	1	625	18	2.9	3	0.45
693-003	1080	2148	7	1	0	0	2157	8	0.4	1	0.00
693-004	1100	757	10	5	0	1	773	16	2.1	3	0.30
693-005	1120	803	12	8	0	0	824	20	2.5	2	0.00
693-006	1140	345	18	14	1	4	381	37	9.6	3	0.19
693-007	1160	6526	18	5	0	0	6549	24	0.4	1	0.47
693-008	1180	306	26	19	4	3	358	52	14.5	6	1.34
693-009	1200	507	13	7	0	1	528	21	4.0	2	0.47
693-010	1220	470	3	4	0	0	477	7	1.6	1	0.00
693-011	1240	1222	15	13	1	3	1254	32	2.6	3	0.40
693-012	1260	879	13	12	1	2	906	27	3.0	5	0.38
693-013	1280	1603	11	12	2	4	1632	29	1.7	3	0.55
693-014	1300	1425	10	10	1	2	1448	23	1.6	3	0.33
693-015	1320	260	1	1	0	0	262	2	0.9	2	0.00
693-016	1340	105	2	2	0	0	109	3	3.2	1	0.00
693-017	1360	46	2	2	0	1	51	5	9.2	1	0.49
693-018	1380	55	2	2	0	0	61	5	8.8	1	0.00
693-019	1400	129	3	1	0	0	134	5	3.7	1	0.00
693-020	1420	22	0	0	0	0	22	0	0.0	0	0.00
693-021	1440	48	3	2	0	0	53	5	9.7	1	0.00
693-022	1460	46	3	2	0	0	51	5	10.0	2	0.00
693-023	1480	52	5	1	0	0	58	6	10.7	2	0.00
693-024	1500	44	3	1	0	0	49	5	9.3	1	0.00
693-025	1520	374	6	2	0	0	383	8	2.2	3	0.98
693-026	1530	77	2	1	0	0	81	4	4.8	2	0.98
693-027	1540	205	2	1	0	0	209	4	2.0	2	0.00
693-028	1550	123	2	2	0	0	127	3	2.7	1	0.00
693-029	1560	391	2	1	0	0	394	3	0.8	2	0.00
693-030	1570	166	3	1	0	0	170	5	2.7	2	0.00

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-031	1580	310	6	2	0	1	319	9	3.0	2	0.47
693-032	1590	330	8	2	0	1	341	12	3.4	2	0.47
693-033	1600	536	11	3	0	0	550	14	2.6	1	0.93
693-034	1610	247	8	1	0	0	257	10	3.9	1	0.93
693-035	1620	326	26	6	0	0	358	32	8.8	1	0.00
693-036	1630	319	6	2	1	0	328	9	2.9	1	1.87
693-037	1640	440	9	2	1	0	452	12	2.6	1	1.87
693-038	1650	523	8	2	0	0	534	11	2.0	2	0.00
693-039	1660	590	20	5	2	1	618	28	4.6	1	2.33
693-040	1670	851	49	7	13	10	931	80	8.6	7	1.34
693-041	1680	494	22	6	2	1	525	31	6.0	3	1.56
693-042	1690	206	13	2	2	0	224	17	7.7	2	3.73
693-043	1700	451	15	5	1	0	472	20	4.3	2	1.87
693-044	1710	311	11	3	1	0	326	15	4.5	2	1.87
693-045	1720	851	26	10	3	6	897	45	5.1	3	0.44
693-046	1730	359	14	5	2	3	383	23	6.1	15	0.47
693-047	1740	527	25	11	4	9	576	49	8.5	21	0.47
693-048	1750	252	11	5	1	3	273	20	7.4	3	0.40
693-049	1760	361	26	25	4	12	428	67	15.6	34	0.32
693-050	1770	277	23	22	6	16	342	66	19.2	43	0.34
693-051	1780	664	31	21	10	25	751	87	11.6	148	0.39
693-052	1800	314	26	24	5	15	385	71	18.4	82	0.31
693-053	1810	2746	111	92	56	55	3060	313	10.2	116	1.01
693-054	1820	1610	94	43	16	32	1794	185	10.3	87	0.50
693-055	1830	647	35	25	5	13	725	78	10.8	42	0.39
693-056	1840	236	16	10	4	3	269	33	12.4	18	1.20
693-057	1850	86	4	2	1	0	93	7	7.2	2	1.91
693-058	1860	112	11	3	1	2	129	17	13.0	29	0.38
693-059	1880	144	20	18	4	16	202	58	28.9	101	0.28
693-060	1890	163	15	12	6	21	216	54	24.8	131	0.27

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-061	1900	209	19	17	7	29	281	72	25.6	306	0.26
693-062	1910	95	16	35	20	68	234	139	59.3	549	0.29
693-063	1920	443	83	74	31	105	737	294	39.9	801	0.30
693-064	1930	495	164	113	41	141	955	459	48.1	2202	0.29
693-065	1940	658	180	144	60	187	1229	571	46.4	2554	0.32
693-066	1950	619	136	129	61	208	1152	533	46.3	2885	0.29
693-067	1960	251	70	57	22	70	469	219	46.6	1828	0.32
693-068	1970	331	53	94	46	151	675	344	51.0	2330	0.30
693-069	1980	441	116	139	50	144	891	450	50.5	2197	0.35
693-070	1990	501	131	172	55	202	1060	559	52.8	2843	0.27
693-071	2000	509	109	185	72	219	1094	585	53.5	2033	0.33
693-072	2010	447	141	201	77	271	1137	690	60.7	2940	0.28
693-073	2020	170	61	111	63	231	636	466	73.3	2318	0.27
693-074	2030	97	39	54	28	102	321	224	69.7	994	0.28
693-075	2040	694	200	300	115	417	1725	1031	59.7	2869	0.28
693-076	2050	194	93	170	84	333	874	679	77.8	3773	0.25
693-077	2060	772	313	689	246	996	3017	2244	74.4	4919	0.25
693-078	2070	336	108	255	119	490	1308	972	74.3	2917	0.24
693-079	2080	110	47	202	97	452	908	798	87.9	3780	0.21
693-080	2090	209	32	132	60	283	716	508	70.9	2641	0.21
693-081	2100	389	132	365	138	564	1587	1199	75.5	3162	0.25
693-082	2110	350	152	446	183	844	1975	1625	82.3	5515	0.22
693-083	2120	198	110	500	202	887	1897	1699	89.6	5228	0.23
693-084	2130	83	30	19	17	83	232	149	64.2	1975	0.21
693-085	2140	182	119	458	261	1176	2195	2014	91.7	6341	0.22
693-086	2150	127	87	447	233	1008	1903	1776	93.3	6434	0.23
693-087	2160	180	158	475	242	1040	2095	1915	91.4	6633	0.23
693-088	2170	180	185	1356	632	3112	5464	5284	96.7	10688	0.20
693-089	2180	205	187	945	459	2064	3860	3654	94.7	8730	0.22
693-090	2190	375	263	611	1148	2526	4923	4548	92.4	9917	0.45

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-091	2200	171	111	344	211	1053	1890	1719	90.9	6963	0.20
693-092	2210	317	189	645	291	1407	2850	2532	88.9	6833	0.21
693-093	2220	436	371	1480	534	2416	5238	4801	91.7	7490	0.22
693-094	2230	166	86	635	327	1546	2760	2594	94.0	5448	0.21
693-095	2240	620	537	2315	824	3620	7916	7296	92.2	9874	0.23
693-096	2250	306	416	1910	721	3592	6944	6639	95.6	9808	0.20
693-097	2260	1020	1164	4119	1192	5587	13083	12063	92.2	13656	0.21
693-098	2270	623	591	2016	633	2946	6809	6186	90.9	9833	0.21
693-099	2280	589	341	1039	282	1310	3562	2973	83.5	4374	0.22
693-100	2290	553	289	522	114	520	1999	1445	72.3	1796	0.22
693-101	2300	849	273	700	168	756	2746	1897	69.1	1846	0.22
693-102	2309	803	283	573	137	641	2436	1633	67.0	1386	0.21
693-103	2318	464	307	577	155	820	2323	1859	80.0	3375	0.19
693-104	2327	133	86	160	33	166	577	444	77.0	893	0.20
693-105	2336	122	57	104	38	204	525	403	76.8	1493	0.19
693-106	2345	699	317	431	74	297	1817	1119	61.6	1101*	0.25
693-107	2354	702	447	858	166	705	2879	2177	75.6	1561	0.24
693-108	2363	229	332	550	106	483	1701	1472	86.5	1033	0.22
693-109	2372	13	44	78	13	87	235	222	94.7	518	0.15
693-110	2381	213	49	182	33	195	672	459	68.3	681	0.17
693-111	2390	97	30	106	26	160	419	323	76.9	818	0.16
693-112	2399	168	84	133	31	153	569	400	70.4	1058	0.20
693-113	2408	263	198	369	91	354	1275	1012	79.3	860	0.26
693-114	2417	296	166	261	46	259	1026	731	71.2	491	0.18
693-115	2426	527	146	199	26	136	1033	507	49.0	388	0.19
693-116	2435	512	236	537	242	1255	2783	2271	81.6	6091	0.19
693-117	2453	208	127	465	211	1020	2030	1822	89.8	3377	0.21
693-118	2462	300	280	607	146	749	2081	1781	85.6	2291	0.19
693-119	2483	368	676	2313	620	2689	6665	6297	94.5	6360	0.23
693-120	2492	306	382	1683	555	2405	5331	5025	94.3	6666	0.23

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-121	2504	206	161	281	99	506	1254	1047	83.5	3608	0.19
693-122	2513	131	44	35	12	62	284	153	54.0	1131	0.20
693-123	2522	218	21	661	404	1774	3079	2861	92.9	7834	0.23
693-124	2531	402	96	310	155	695	1657	1255	75.8	5360	0.22
693-125	2540	340	102	428	210	942	2023	1682	83.2	5097	0.22
693-126	2549	214	56	220	81	419	990	776	78.3	2252	0.19
693-127	2570	356	163	432	123	592	1666	1310	78.6	2337	0.21
693-128	2579	169	72	124	34	201	600	431	71.8	1564	0.17
693-129	2588	298	121	255	94	422	1190	892	75.0	1652	0.22
693-130	2597	247	126	1108	902	5135	7518	7271	96.7	18649	0.18
693-131	2606	213	85	566	499	2980	4343	4131	95.1	14809	0.17
693-132	2633	240	80	188	175	1167	1850	1610	87.0	7561	0.15
693-133	2642	538	102	74	55	431	1200	662	55.2	7705	0.13
693-134	2651	436	107	107	87	662	1399	963	68.8	9416	0.13
693-135	2660	436	116	91	70	516	1229	793	64.5	6677	0.13
693-136	2669	313	72	50	52	422	909	596	65.6	7636	0.12
693-137	2678	476	107	80	53	395	1110	634	57.1	6075	0.13
693-138	2687	256	51	40	27	205	580	324	55.8	5692	0.13
693-139	2696	402	138	91	57	461	1149	748	65.1	7225	0.12
693-140	2714	269	39	38	27	238	611	342	56.0	6272	0.11
693-141	2723	618	126	80	38	293	1155	537	46.5	6060	0.13
693-142	2732	472	129	144	55	367	1168	695	59.5	6102	0.15
693-143	2741	209	105	47	11	104	477	268	56.2	4471	0.11
693-144	2750	219	67	82	27	171	567	348	61.3	4716	0.16
693-145	2759	319	77	89	27	156	668	349	52.3	4743	0.17
693-146	2768	251	66	40	13	83	453	202	44.7	4069	0.15
693-147	2777	415	111	91	21	150	788	373	47.4	6189	0.14
693-148	2786	313	91	50	12	79	546	232	42.6	4405	0.15
693-149	2795	217	71	97	28	134	548	330	60.3	4681	0.21
693-150	2810	105	41	42	16	73	278	173	62.2	2549	0.22

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-151	2819	147	69	57	14	60	349	201	57.7	2649	0.23
693-152	2823	188	99	78	15	57	437	249	57.0	1893	0.26
693-153	2837	157	51	35	9	46	297	141	47.3	3065	0.19
693-154	2846	225	112	102	28	109	576	351	61.0	3201	0.26
693-155	2855	120	65	65	18	68	336	216	64.3	2856	0.26
693-156	2864	103	35	18	5	28	190	87	45.7	2455	0.19
693-157	2873	198	131	52	4	40	425	227	53.4	2646	0.11
693-158	2882	129	63	26	2	14	234	105	44.9	2540	0.14
693-159	2891	123	24	8	2	10	167	43	26.0	1672	0.20
693-160	2900	120	26	11	2	9	167	47	28.2	1830	0.17
693-161	2909	247	63	33	4	28	375	129	34.3	2493	0.15
693-162	2918	127	58	32	4	25	247	119	48.4	2751	0.16
693-163	2927	267	61	22	4	22	376	109	28.9	2612	0.16
693-164	2936	153	31	11	7	26	227	74	32.6	2662	0.25
693-165	2945	90	29	98	154	248	618	528	85.5	3018	0.62
693-166	2954	168	74	20	3	13	278	110	39.5	1970	0.24
693-167	2963	316	65	21	4	28	433	117	27.0	3263	0.14
693-168	2972	229	80	45	6	30	389	160	41.2	3231	0.19
693-169	2981	118	62	84	18	45	327	209	63.9	1825	0.40
693-170	2990	203	55	20	3	16	298	94	31.6	2450	0.17
693-171	2999	122	85	47	11	30	294	172	58.6	2620	0.37
693-172	3008	501	134	231	87	170	1124	622	55.4	4356	0.51
693-173	3017	334	208	262	74	141	1019	685	67.2	3092	0.52
693-174	3026	187	149	174	76	138	724	537	74.1	2642	0.55
693-175	3035	649	218	253	85	182	1387	738	53.2	5139	0.47
693-176	3044	291	157	184	84	152	867	576	66.5	3321	0.55
693-177	3053	151	68	71	36	62	387	236	61.0	2006	0.57
693-178	3062	276	160	176	89	142	843	567	67.3	2131	0.63
693-179	3071	228	61	107	68	120	586	358	61.1	1417	0.57
693-180	3080	198	86	81	46	74	486	288	59.2	1397	0.62

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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_6 - C_7	$\frac{iC_4}{nC_4}$
693-181	3089	476	167	180	85	143	1051	575	54.7	2106	0.59
693-182	3098	142	54	67	34	57	354	212	59.9	1557	0.60
693-183	3107	247	86	94	46	89	562	315	56.0	1744	0.52
693-184	3116	192	45	60	30	66	393	201	51.2	2028	0.45
693-185	3125	213	54	41	19	45	373	160	42.8	2281	0.42
693-186	3134	172	55	26	5	19	276	104	37.7	2177	0.24
693-187	3143	180	76	46	3	26	331	152	45.8	2513	0.11
693-188	3152	193	66	30	3	14	306	112	36.7	2151	0.21
693-189	3161	178	91	39	7	12	327	149	45.5	2058	0.59
693-190	3170	241	44	19	1	6	311	70	22.6	2126	0.15
693-191	3179	206	35	13	2	9	265	60	22.5	1357	0.26
693-192	3206	157	33	14	2	7	212	55	26.1	1454	0.28
693-193	3215	160	57	28	7	13	264	105	39.6	1784	0.56
693-194	3224	240	120	46	5	16	426	187	43.8	2154	0.33
693-195	3233	218	60	20	1	4	304	85	28.1	1369	0.17
693-196	3251	741	214	124	18	54	1151	410	35.6	1658	0.33
693-197	3260	303	259	75	7	25	669	366	54.7	1896	0.29
693-198	3269	268	81	25	3	8	384	116	30.3	1432	0.43
693-199	3277	98	39	12	0	1	150	53	35.2	817	0.32
693-200	3286	164	90	22	6	7	289	126	43.4	1480	0.89
693-201	3295	222	40	10	0	1	273	52	18.9	1034	0.16
693-202	3304	223	98	23	2	11	357	133	37.4	1134	0.17
693-203	3313	147	33	9	1	2	193	45	23.6	873	0.32
693-204	3322	184	99	20	4	23	329	145	44.1	939	0.18
693-205	3331	127	50	13	0	2	193	66	34.0	980	0.16
693-206	3340	109	41	8	2	3	164	55	33.6	353	0.53
693-207	3349	174	55	10	0	1	240	66	27.6	683	0.47
693-208	3358	200	38	6	0	0	244	44	18.0	711	0.00
693-209	3367	175	28	3	0	0	206	30	14.7	542	0.00
693-210	3376	207	46	14	0	0	266	59	22.3	1093	0.00

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-211	3385	136	29	10	0	0	175	39	22.3	849	0.00
693-212	3394	124	40	10	0	0	174	50	28.7	857	0.00
693-213	3412	126	55	14	0	0	195	69	35.5	1126	0.00
693-214	3421	94	30	10	0	0	134	40	29.8	873	0.00
693-215	3430	86	42	10	0	0	138	52	37.6	832	0.00
693-216	3439	101	41	11	0	0	154	53	34.3	798	0.00
693-217	3448	129	83	18	0	0	229	100	43.8	1068	0.00
693-218	3457	90	43	10	0	0	143	53	37.3	623	0.00
693-219	3466	84	44	8	0	0	137	53	38.5	797	0.00
693-220	3475	92	31	7	0	0	130	38	29.4	651	0.00
693-221	3484	151	64	14	0	0	229	77	33.8	795	0.00
693-222	3502	116	41	8	0	0	165	49	29.7	835	0.00
693-223	3511	73	39	10	0	0	122	49	40.1	874	0.00
693-224	3520	95	54	11	0	0	161	66	40.9	694	0.00
693-225	3529	187	18	6	0	0	211	24	11.6	699	0.00
693-226	3538	97	26	5	0	0	129	31	24.3	527	0.00
693-227	3556	256	40	8	0	0	305	49	15.9	622	0.00
693-228	3565	200	51	10	0	0	262	62	23.5	843	0.00
693-229	3574	230	159	46	0	16	451	221	49.0	1021	0.00
693-230	3583	148	66	7	0	0	220	73	32.9	714	0.00
693-231	3592	159	31	6	0	0	196	37	18.9	624	0.00
693-232	3601	103	21	4	0	0	128	25	19.5	496	0.00
693-233	3610	82	5	3	0	0	90	8	8.4	399	0.00
693-234	3619	80	24	14	0	0	119	38	32.2	503	0.00
693-235	3638	170	24	7	0	0	201	31	15.5	523	0.00
693-236	3647	92	7	3	0	0	101	10	9.5	425	0.00
693-237	3656	108	5	3	0	0	116	8	6.5	467	0.00
693-238	3665	122	12	4	0	0	137	16	11.6	515	0.00
693-239	3674	107	15	10	0	0	131	25	18.8	568	0.00
693-240	3683	62	20	4	0	0	86	25	28.5	243	0.00

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-241	3692	546	23	15	0	0	584	39	6.6	612	0.00
693-242	3701	86	18	6	0	0	111	25	22.2	602	0.00
693-243	3710	82	29	12	0	0	123	41	33.4	403	0.00
693-244	3719	4	2	1	0	0	6	2	39.3	323	0.00
693-245	3728	108	24	9	0	0	141	33	23.5	442	0.00
693-246	3746	56	19	7	0	0	82	26	31.6	437	0.00
693-247	3755	285	17	8	0	0	310	25	8.2	464	0.00
693-248	3764	90	17	5	0	0	112	22	19.6	279	0.00
693-249	3773	106	6	6	0	0	118	12	10.5	320	0.00
693-250	3782	19	22	6	0	0	47	28	59.2	344	0.00
693-251	3791	108	25	7	0	0	139	31	22.5	417	0.00

TABLE 2 C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-001	1040	6563	26	17	0	0	6608	44	0.7	4	0.94
693-002	1060	3948	17	6	0	1	3972	24	0.6	3	0.45
693-003	1080	3699	9	2	0	0	3710	11	0.3	1	0.45
693-004	1100	4597	14	6	0	1	4619	22	0.5	3	0.30
693-005	1120	4965	17	10	0	0	4992	28	0.6	3	0.00
693-006	1140	2784	21	15	1	5	2826	42	1.5	3	0.20
693-007	1160	11362	24	6	0	1	11394	32	0.3	1	0.77
693-008	1180	2389	29	21	4	3	2445	56	2.3	7	1.33
693-009	1200	655	13	8	0	1	677	22	3.3	3	0.47
693-010	1220	2501	8	8	0	0	2518	17	0.7	2	0.47
693-011	1240	1228	15	13	1	3	1260	32	2.6	3	0.40
693-012	1260	3100	21	20	2	4	3147	47	1.5	6	0.42
693-013	1280	3605	17	19	3	5	3649	44	1.2	3	0.60
693-014	1300	4388	16	15	1	3	4423	36	0.8	4	0.39
693-015	1320	1045	4	4	0	1	1053	8	0.8	2	0.36
693-016	1340	544	2	2	0	0	548	3	0.6	1	0.00
693-017	1360	46	2	2	0	1	51	5	9.2	1	0.49
693-018	1380	66	3	3	0	0	71	6	8.0	1	0.00
693-019	1400	842	5	3	0	1	851	9	1.0	1	0.32
693-020	1420	118	1	1	0	0	120	2	1.8	0	0.00
693-021	1440	78	5	3	0	0	86	8	9.0	1	0.00
693-022	1460	96	4	2	0	0	102	6	5.6	3	0.00
693-023	1480	65	5	2	0	0	72	7	10.0	2	0.00
693-024	1500	62	4	2	0	0	68	6	8.3	2	0.00
693-025	1520	1974	9	3	0	0	1987	13	0.6	3	0.98
693-026	1530	505	5	1	0	0	511	7	1.3	3	0.98
693-027	1540	350	3	1	0	0	355	5	1.5	2	0.00
693-028	1550	130	2	2	0	0	134	4	2.8	1	0.00
693-029	1560	2424	12	2	0	0	2437	13	0.5	2	0.49
693-030	1570	203	4	1	0	0	207	5	2.3	2	0.00

TABLE 2 C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-031	1580	313	8	2	0	1	324	11	3.5	2	0.44
693-032	1590	1739	26	5	1	2	1773	34	1.9	2	0.47
693-033	1600	2548	31	6	1	1	2586	39	1.5	2	0.53
693-034	1610	1820	23	3	1	1	1848	28	1.5	1	0.53
693-035	1620	360	27	6	0	0	393	33	8.3	1	0.00
693-036	1630	4354	44	5	2	1	4406	52	1.2	1	2.15
693-037	1640	3288	44	6	1	1	3341	53	1.6	2	1.11
693-038	1650	4997	53	7	1	1	5059	62	1.2	2	1.23
693-039	1660	6226	117	20	7	2	6372	146	2.3	2	3.73
693-040	1670	4454	128	18	17	11	4629	175	3.8	8	1.53
693-041	1680	1692	50	11	3	2	1758	66	3.8	4	1.72
693-042	1690	1046	36	7	3	1	1094	47	4.3	2	2.39
693-043	1700	475	15	5	1	0	497	22	4.4	3	2.04
693-044	1710	1935	40	10	2	2	1988	53	2.7	3	1.01
693-045	1720	3492	74	21	6	11	3604	111	3.1	7	0.52
693-046	1730	2997	68	18	6	11	3101	104	3.3	22	0.59
693-047	1740	2298	69	22	7	14	2410	112	4.6	27	0.50
693-048	1750	1651	51	18	3	8	1732	80	4.6	7	0.43
693-049	1760	392	30	27	5	14	467	75	16.0	35	0.34
693-050	1770	286	24	22	6	16	353	67	19.0	43	0.35
693-051	1780	670	32	21	10	25	758	88	11.6	148	0.39
693-052	1800	1408	64	40	10	26	1548	140	9.0	99	0.38
693-053	1810	6791	158	128	66	73	7215	424	5.9	145	0.90
693-054	1820	4597	195	76	25	47	4940	343	6.9	108	0.54
693-055	1830	2518	92	44	11	24	2688	170	6.3	60	0.45
693-056	1840	380	21	12	4	4	422	42	9.8	19	1.05
693-057	1850	138	13	3	1	0	155	17	10.9	3	2.60
693-058	1860	282	19	7	1	4	313	31	9.9	31	0.31
693-059	1880	172	24	19	4	16	234	63	26.8	101	0.29
693-060	1890	1426	75	49	17	49	1615	190	11.7	184	0.35

TABLE 2C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-061	1900	1283	73	51	17	54	1479	196	13.2	361	0.32
693-062	1910	147	19	38	20	70	293	146	49.8	552	0.29
693-063	1920	2408	219	164	56	168	3016	607	20.1	930	0.33
693-064	1930	2995	344	249	84	251	3923	928	23.7	2457	0.34
693-065	1940	1302	266	225	86	250	2129	826	38.8	2687	0.34
693-066	1950	4021	401	363	136	400	5321	1300	24.4	3341	0.34
693-067	1960	420	105	89	31	109	753	333	44.2	3391	0.28
693-068	1970	344	55	96	47	153	695	351	50.5	2337	0.31
693-069	1980	452	119	141	51	146	909	457	50.3	2201	0.35
693-070	1990	864	175	230	71	245	1585	721	45.5	2934	0.29
693-071	2000	509	109	185	72	219	1094	585	53.5	2033	0.33
693-072	2010	2463	410	557	169	501	4099	1636	39.9	3355	0.34
693-073	2020	200	69	121	66	239	694	494	71.2	2328	0.28
693-074	2030	123	45	64	32	110	373	251	67.1	1005	0.29
693-075	2040	1864	363	529	187	580	3524	1660	47.1	3107	0.32
693-076	2050	239	97	180	87	341	944	705	74.7	3780	0.26
693-077	2060	3531	848	1601	481	1644	8104	4573	56.4	5610	0.29
693-078	2070	336	108	255	119	490	1308	972	74.3	2917	0.24
693-079	2080	381	196	549	260	959	2345	1964	83.8	4678	0.27
693-080	2090	283	85	285	119	464	1236	953	77.1	2937	0.26
693-081	2100	392	133	369	140	568	1601	1209	75.5	3180	0.25
693-082	2110	3174	901	1927	540	1988	8530	5356	62.8	6770	0.27
693-083	2120	201	111	503	203	890	1908	1708	89.5	5238	0.23
693-084	2130	84	30	19	17	83	233	149	64.0	1975	0.21
693-085	2140	182	119	458	261	1176	2196	2014	91.7	6341	0.22
693-086	2150	134	88	450	234	1012	1918	1784	93.0	6451	0.23
693-087	2160	181	158	475	242	1040	2095	1915	91.4	6633	0.23
693-088	2170	199	238	1683	744	3572	6435	6237	96.9	11427	0.21
693-089	2180	231	196	980	471	2118	3997	3766	94.2	8903	0.22
693-090	2190	385	265	616	1150	2535	4951	4566	92.2	9953	0.45

TABLE 2C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-091	2200	172	111	344	211	1053	1891	1719	90.9	6963	0.20
693-092	2210	344	211	699	302	1457	3013	2669	88.6	6950	0.21
693-093	2220	451	391	1505	538	2436	5322	4870	91.5	7608	0.22
693-094	2230	177	95	662	334	1577	2845	2668	93.8	5535	0.21
693-095	2240	620	537	2315	824	3620	7916	7296	92.2	9874	0.23
693-096	2250	353	446	1973	731	3623	7128	6774	95.0	9841	0.20
693-097	2260	1243	1305	4376	1231	5716	13872	12629	91.0	13753	0.22
693-098	2270	626	597	2030	635	2958	6847	6221	90.9	9859	0.21
693-099	2280	591	342	1041	282	1312	3569	2978	83.4	4382	0.22
693-100	2290	555	289	523	114	521	2002	1447	72.3	1799	0.22
693-101	2300	856	275	705	169	760	2766	1910	69.0	1852	0.22
693-102	2309	900	310	611	142	662	2625	1725	65.7	1406	0.21
693-103	2318	473	311	584	156	826	2350	1878	79.9	3381	0.19
693-104	2327	136	86	161	33	167	583	447	76.6	896	0.20
693-105	2336	130	58	105	38	206	537	407	75.7	1493	0.19
693-106	2345	707	319	433	74	298	1830	1123	61.4	1107	0.25
693-107	2354	1673	745	1209	210	841	4678	3005	64.2	1655	0.25
693-108	2363	234	334	552	106	484	1710	1476	86.3	1034	0.22
693-109	2372	14	44	78	13	88	237	223	94.0	519	0.15
693-110	2381	215	49	182	33	196	675	460	68.2	681	0.17
693-111	2390	104	35	112	27	162	439	335	76.2	820	0.16
693-112	2399	174	85	133	31	154	576	403	69.9	1060	0.20
693-113	2408	1756	623	951	174	630	4135	2379	57.5	1059	0.28
693-114	2417	745	298	419	64	332	1859	1114	59.9	546	0.19
693-115	2426	1580	377	462	63	247	2729	1149	42.1	480	0.25
693-116	2435	526	241	545	244	1262	2817	2291	81.3	6108	0.19
693-117	2453	213	145	512	225	1078	2174	1960	90.2	3454	0.21
693-118	2462	702	571	1083	233	1076	3664	2963	80.9	2689	0.22
693-119	2483	376	688	2338	624	2703	6730	6354	94.4	6380	0.23
693-120	2492	597	1286	2964	707	2940	8494	7897	93.0	7079	0.24

TABLE 2C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-121	2504	215	176	311	104	524	1330	1115	83.8	3627	0.20
693-122	2513	134	46	37	13	66	296	162	54.8	1157	0.20
693-123	2522	223	23	668	408	1788	3110	2887	92.8	7887	0.23
693-124	2531	809	324	860	307	1299	3599	2790	77.5	6857	0.24
693-125	2540	348	106	433	211	949	2047	1699	83.0	5125	0.22
693-126	2549	223	59	222	81	422	1007	784	77.8	2270	0.19
693-127	2570	1009	385	822	189	822	3227	2218	68.7	2654	0.23
693-128	2579	689	217	374	80	393	1753	1064	60.7	1908	0.20
693-129	2588	1103	326	556	145	616	2746	1643	59.8	2079	0.24
693-130	2597	658	267	1802	1177	6362	10267	9609	93.6	20577	0.18
693-131	2606	344	159	909	633	3672	5718	5374	94.0	16600	0.17
693-132	2633	372	120	285	219	1413	2409	2037	84.6	8676	0.15
693-133	2642	1555	731	822	92	603	3803	2248	59.1	8650	0.15
693-134	2651	1283	185	157	108	794	2528	1245	49.2	10214	0.14
693-135	2660	864	161	126	84	609	1844	980	53.1	7311	0.14
693-136	2669	591	94	64	62	485	1297	706	54.4	8080	0.13
693-137	2678	787	135	95	59	434	1511	724	47.9	6334	0.14
693-138	2687	625	98	69	37	270	1098	474	43.1	6392	0.14
693-139	2696	623	160	101	61	483	1428	805	56.4	7407	0.13
693-140	2714	633	62	49	32	275	1051	418	39.8	6619	0.12
693-141	2723	1073	160	95	44	329	1702	628	36.9	6374	0.13
693-142	2732	1308	222	192	64	418	2204	895	40.6	6552	0.15
693-143	2741	412	127	63	16	134	752	340	45.3	4993	0.12
693-144	2750	466	102	107	32	198	906	440	48.5	5172	0.16
693-145	2759	328	78	90	27	156	680	352	51.7	4755	0.17
693-146	2768	253	67	41	13	84	457	205	44.7	4094	0.15
693-147	2777	867	151	120	26	178	1342	475	35.4	6627	0.15
693-148	2786	499	107	67	16	104	792	294	37.1	4966	0.15
693-149	2795	737	196	212	42	188	1375	638	46.4	5409	0.22
693-150	2810	189	66	90	27	113	485	296	61.0	3000	0.24

TABLE 2C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-151	2819	300	126	142	28	108	705	405	57.4	3168	0.26
693-152	2823	270	130	111	20	73	604	334	55.3	2132	0.27
693-153	2837	282	90	74	15	68	529	247	46.7	3645	0.22
693-154	2846	412	149	156	36	136	889	477	53.7	3499	0.27
693-155	2855	262	101	108	24	87	581	319	54.9	3144	0.27
693-156	2864	204	45	27	7	36	319	115	36.1	2733	0.20
693-157	2873	360	145	63	7	50	624	264	42.3	2877	0.13
693-158	2882	322	75	32	4	23	456	134	29.4	2890	0.17
693-159	2891	125	24	8	2	10	169	45	26.5	1854	0.21
693-160	2900	243	35	15	3	16	313	70	22.2	2286	0.19
693-161	2909	334	71	38	6	34	482	148	30.8	2807	0.17
693-162	2918	202	66	37	5	32	342	140	41.1	3052	0.16
693-163	2927	442	79	34	7	32	593	151	25.5	3008	0.21
693-164	2936	249	39	17	9	33	346	97	28.0	3073	0.26
693-165	2945	209	34	104	156	256	759	550	72.5	3360	0.61
693-166	2954	239	83	29	10	25	386	147	38.1	2567	0.40
693-167	2963	476	75	28	7	39	625	149	23.8	3982	0.19
693-168	2972	383	99	61	9	41	593	210	35.5	3692	0.22
693-169	2981	262	77	93	20	52	504	243	48.1	2164	0.39
693-170	2990	301	70	28	4	22	425	124	29.1	2904	0.20
693-171	2999	227	118	74	17	43	479	252	52.7	3269	0.38
693-172	3008	825	262	309	101	196	1694	868	51.3	4931	0.52
693-173	3017	1108	397	349	88	165	2108	1000	47.4	3396	0.53
693-174	3026	479	322	298	102	177	1379	900	65.3	2926	0.58
693-175	3035	1079	424	397	115	226	2241	1161	51.8	5503	0.51
693-176	3044	558	337	335	105	187	1521	964	63.3	3709	0.56
693-177	3053	292	110	112	46	80	641	349	54.4	2419	0.58
693-178	3062	1042	392	292	114	175	2015	973	48.3	2337	0.65
693-179	3071	440	277	312	125	200	1354	914	67.5	1800	0.62
693-180	3080	496	196	148	63	101	1003	508	50.6	1729	0.63

TABLE 2C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-181	3089	771	390	335	123	196	1815	1043	57.5	2386	0.63
693-182	3098	493	279	230	72	112	1186	693	58.4	2193	0.64
693-183	3107	382	168	174	66	121	909	528	58.1	2139	0.55
693-184	3116	297	76	94	37	79	582	285	48.9	2293	0.46
693-185	3125	302	70	59	23	54	508	206	40.5	2587	0.42
693-186	3134	254	62	33	6	23	378	124	32.9	2390	0.27
693-187	3143	180	76	46	3	26	332	152	45.7	2513	0.11
693-188	3152	269	74	36	4	19	401	132	32.9	2535	0.20
693-189	3161	259	98	43	8	14	421	162	38.5	2459	0.54
693-190	3170	352	51	25	2	10	440	88	20.0	2329	0.21
693-191	3179	235	41	17	2	11	307	72	23.3	1612	0.23
693-192	3206	227	38	17	2	9	292	66	22.5	1586	0.27
693-193	3215	265	64	32	9	15	385	120	31.1	1918	0.58
693-194	3224	403	130	50	6	18	606	203	33.6	2344	0.30
693-195	3233	257	70	24	1	6	359	101	28.2	1497	0.23
693-196	3251	2194	396	169	21	64	2844	650	22.8	1883	0.32
693-197	3260	374	277	82	8	27	769	395	51.3	2085	0.30
693-198	3269	323	96	31	3	9	462	139	30.0	1652	0.40
693-199	3277	127	46	14	1	2	190	63	33.0	892	0.43
693-200	3286	187	92	23	6	8	316	130	41.0	1509	0.85
693-201	3295	244	43	11	0	1	299	55	18.4	1156	0.19
693-202	3304	241	100	24	2	11	378	137	36.3	1212	0.17
693-203	3313	178	36	11	1	3	229	51	22.1	928	0.29
693-204	3322	253	104	21	6	28	413	160	38.7	1160	0.23
693-205	3331	142	54	14	0	2	213	71	33.5	1094	0.16
693-206	3340	291	79	16	2	7	395	104	26.3	533	0.34
693-207	3349	231	66	12	1	2	312	81	25.9	800	0.66
693-208	3358	227	44	7	0	0	278	51	18.3	878	0.00
693-209	3367	192	32	3	0	0	227	35	15.4	643	0.00
693-210	3376	218	48	14	0	0	280	62	22.2	1202	0.00

TABLE 2 C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-211	3385	164	34	11	0	0	208	45	21.4	1021	0.00
693-212	3394	152	43	11	0	0	206	54	26.2	966	0.00
693-213	3412	144	59	15	0	0	218	74	34.1	1230	0.00
693-214	3421	130	34	11	0	0	175	45	25.6	1002	0.00
693-215	3430	161	48	11	0	0	220	59	27.0	1016	0.00
693-216	3439	133	44	12	0	0	190	56	29.6	924	0.00
693-217	3448	155	85	18	0	0	258	103	40.0	1182	0.00
693-218	3457	133	47	11	0	0	191	57	30.1	711	0.00
693-219	3466	136	48	9	0	0	193	57	29.3	910	0.00
693-220	3475	132	35	9	0	0	176	44	25.0	745	0.00
693-221	3484	207	69	14	0	0	290	84	28.8	931	0.00
693-222	3502	177	46	9	0	0	231	54	23.4	925	0.00
693-223	3511	111	42	10	0	0	164	53	32.3	965	0.00
693-224	3520	144	57	12	0	0	213	69	32.4	769	0.00
693-225	3529	240	20	7	0	0	267	27	10.3	771	0.00
693-226	3538	153	29	6	0	0	187	35	18.5	594	0.00
693-227	3556	497	46	9	0	0	552	55	10.0	686	0.00
693-228	3565	240	52	10	0	0	303	62	20.6	858	0.00
693-229	3574	300	160	46	0	16	522	222	42.6	1082	0.00
693-230	3583	252	74	9	0	0	335	83	24.7	797	0.00
693-231	3592	193	33	6	0	0	232	40	17.0	671	0.00
693-232	3601	167	23	4	0	0	195	27	13.9	691	0.00
693-233	3610	109	6	3	0	0	117	8	7.2	465	0.00
693-234	3619	146	27	14	0	0	187	41	22.1	665	0.00
693-235	3638	289	34	9	0	0	332	43	13.0	759	0.00
693-236	3647	103	8	3	0	0	114	12	10.1	434	0.00
693-237	3656	145	7	3	0	0	156	11	6.8	604	0.00
693-238	3665	142	14	4	0	0	160	18	11.3	558	0.00
693-239	3674	127	17	10	0	0	154	27	17.6	662	0.00
693-240	3683	66	21	5	0	0	91	25	27.8	246	0.00

TABLE 2 C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 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	$\frac{iC_4}{nC_4}$
693-241	3692	736	37	18	0	0	790	55	6.9	681	0.00
693-242	3701	107	21	7	0	0	136	28	20.9	704	0.00
693-243	3710	114	32	12	0	0	158	44	28.0	519	0.00
693-244	3719	30	4	2	0	0	35	6	16.2	394	0.00
693-245	3728	108	24	9	0	0	141	33	23.4	442	0.00
693-246	3746	74	20	7	0	0	101	27	27.0	514	0.00
693-247	3755	723	22	8	0	0	754	31	4.1	547	0.00
693-248	3764	101	20	5	0	0	127	25	20.1	309	0.00
693-249	3773	152	10	7	0	0	168	17	9.9	376	0.00
693-250	3782	37	23	7	0	0	66	30	44.9	385	0.00
693-251	3791	114	27	7	0	0	148	34	23.2	480	0.00

TABLE 3

KEROGEN TYPE AND MATURATION

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION INDEX
		TYPES 40%; 10–40%; 10%	REMARKS	REWORKED (%)	PARTICLE SIZE	PRESERV-ATION	
693-081A	2100m	I;W-H-Al;-	significant highly disseminated Am-like contaminant H at 2- and 2, dominant H at 2- to 2	75	F-M	F-G	1+ to 2-(?)
693-086A	2150m	I;W-H-Al;Am	disseminated Am-like contam-ination	65	M-C	G	1+ to 2-
693-091A	2200m	I-W;H-Al;-	dominantly atypical Am-like material believed to be contaminant H at 2- and 2- to 2	65	M	F	1+ to 2-
693-097A	2260m	I;W-H-Al;-	disseminated Am-like contam-inant H at 2-	65	F-C	F-G	1+ to 3-
693-101A	2300m	I;W-Al;H	frequent Am-like contaminant	80	M	F	1+ to 2-/2-
693-106A	2345m	I-W;Al;H-Am	disseminated Am-like contam-inant H at 2- to 2 lignite additive	50	F-C	F	2- max
693-113A	2408m	I;W;H-Al-Am	H at 2- to 2 and 2	90	F-M	G	2-

Algal, Amorphous, Herbaceous, Inertinite, Resin, Wood

postscript = coarse, cuticle, cysts, degraded, fine, other,. structured, spore-pollen, thick-walled, unstructured

TABLE 4

VITRINITE REFLECTANCE DATA

GEOCHEM SAMPLE NUMBER	DEPTH	SAMPLE TYPE	AVERAGE REFLECTIVITY Ro (%), (NUMBER OF PARTICLES)				REMARKS
			1	2	3	4	
693-003B	1080m	WR	0.31(19)	-	-	-	
693-010A	1220m	WR	0.27(19)	0.44(1)	-	-	
693-016A	1340m	WR	0.33(21)	-	-	-	
693-021A	1440m	WR	0.34(3)	0.59(7)	0.98(2)	-	
693-031A	1580m	WR	0.35(3)	0.57(2)	1.01(3)	-	
693-043B	1700m	WR	0.37(2)	-	-	-	
693-053B	1810m	WR	0.60(2)	1.05(23)	-	-	
693-064A	1930m	WR	0.59(11)	1.00(9)	-	-	
693-072A	2010m	WR	0.36(6)	0.70(19)	0.87(5)	-	
693-081A	2100m	WR	0.38(2)	0.56(4)	0.79(9)	0.98(4)	
693-086A	2150m	WR	0.42(2)	0.58(9)	0.95(16)	-	
693-091A	2200m	WR	-	0.43(4)	0.61(12)	-	
693-091B	2200m	WR	0.37(30)	-	-	-	
693-097A	2260m	WR	0.53(5)	0.80(32)	1.06(3)	-	
693-101A	2300m	WR	0.55(9)	0.74(14)	0.94(17)	-	
693-106A	2345m	WR	0.36(10)	0.46(16)	0.73(11)	0.94(3)	
693-113A	2408m	WR	0.49(1)	1.05(30)	1.33(18)	1.71(1)	

CT-ditch cuttings; CO-core; WR-whole rock; KC-kerogen concentrate. Colours - spore fluorescence. *Reworked

TABLE 5a

CONCENTRATION (PPM) OF EXTRACTED C_{15+} 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
693-081A	2100	549	166	113	279	136	82	40	12
693-086A	2150	2034	465	473	938	465	436	161	34
693-091A	2200	2595	749	485	1233	749	388	115	110
693-097A	2260	1424	361	273	634	366	280	114	30
693-102A	2309	555	121	101	222	158	83	56	35
693-106A	2345	1230	523	220	743	189	149	120	29
693-113A	2408	420	83	69	152	133	98	26	11

TABLE 5b

COMPOSITION (NORMALISED %) OF C_{15+} MATERIAL EXTRACTED FROM ROCK

GEOCHEM SAMPLE NUMBER	DEPTH	HYDROCARBONS		NON HYDROCARBONS			
		Paraffin – Naphthenes	Aromatics	Precipitd. Asphaltenes	Eluted NSO's	Non eluted NSO's	Sulphur
693-081A	2100	30.32	20.57	24.73	14.98	7.25	2.14
693-086A	2150	22.89	23.25	22.89	21.42	7.90	1.65
693-091A	2200	28.86	18.68	28.86	14.94	4.41	4.24
693-097A	2260	25.35	19.15	25.71	19.68	7.98	2.13
693-102A	2309	21.76	18.29	28.47	15.05	10.19	6.25
693-106A	2345	42.50	17.88	15.35	12.14	9.78	2.36
693-113A	2408	19.83	16.47	31.60	23.36	6.22	2.52

TABLE 6

SIGNIFICANT RATIOS (%) OF C_{15+} FRACTIONS AND ORGANIC CARBON

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC CARBON (wt. %)	HYDROCARBONS / TOTAL EXTRACT	HYDROCARBONS / ORG. CARBON	TOTAL EXTRACT / ORG. CARBON	P-NAPHTHENES / AROMATICS
693-081A	2100	0.44	50.89	6.35	12.47	1.47
693-086A	2150	0.70	46.14	13.40	29.05	0.98
693-091A	2200	1.04	47.54	11.86	24.95	1.55
693-097A	2260	0.87	44.50	7.29	16.37	1.32
693-102A	2309	0.78	40.05	2.85	7.11	1.19
693-106A	2345	0.77	60.37	9.65	15.98	2.38
693-113A	2408	0.71	36.30	2.15	5.91	1.20

TABLE 7

PYROLYSIS RESULTS

GEOCHEM SAMPLE NUMBER	DEPTH	WT. % ORGANIC CARBON (OC)	WT. PPM		RATIOS		Tmax (°C) Pyrolysate
			Thermal Bitumen (P1)	Pyrolysate (P2)	$\frac{P1}{P1+P2}$	$\frac{P2}{OC}$	
693-081A	2100	0.59	27	717	0.04	0.12	428
693-086A	2150	0.94	46	1408	0.03	0.15	431
693-091A	2200	1.30	177	1230	0.13	0.09	432
693-097A	2260	0.97	68	1088	0.06	0.11	428
693-101A	2300	0.73	158	1274	0.11	0.17	426
693-106A	2345	0.59	35	2041	0.02	0.35	424
693-113A	2408	0.60	30	452	0.06	0.08	428

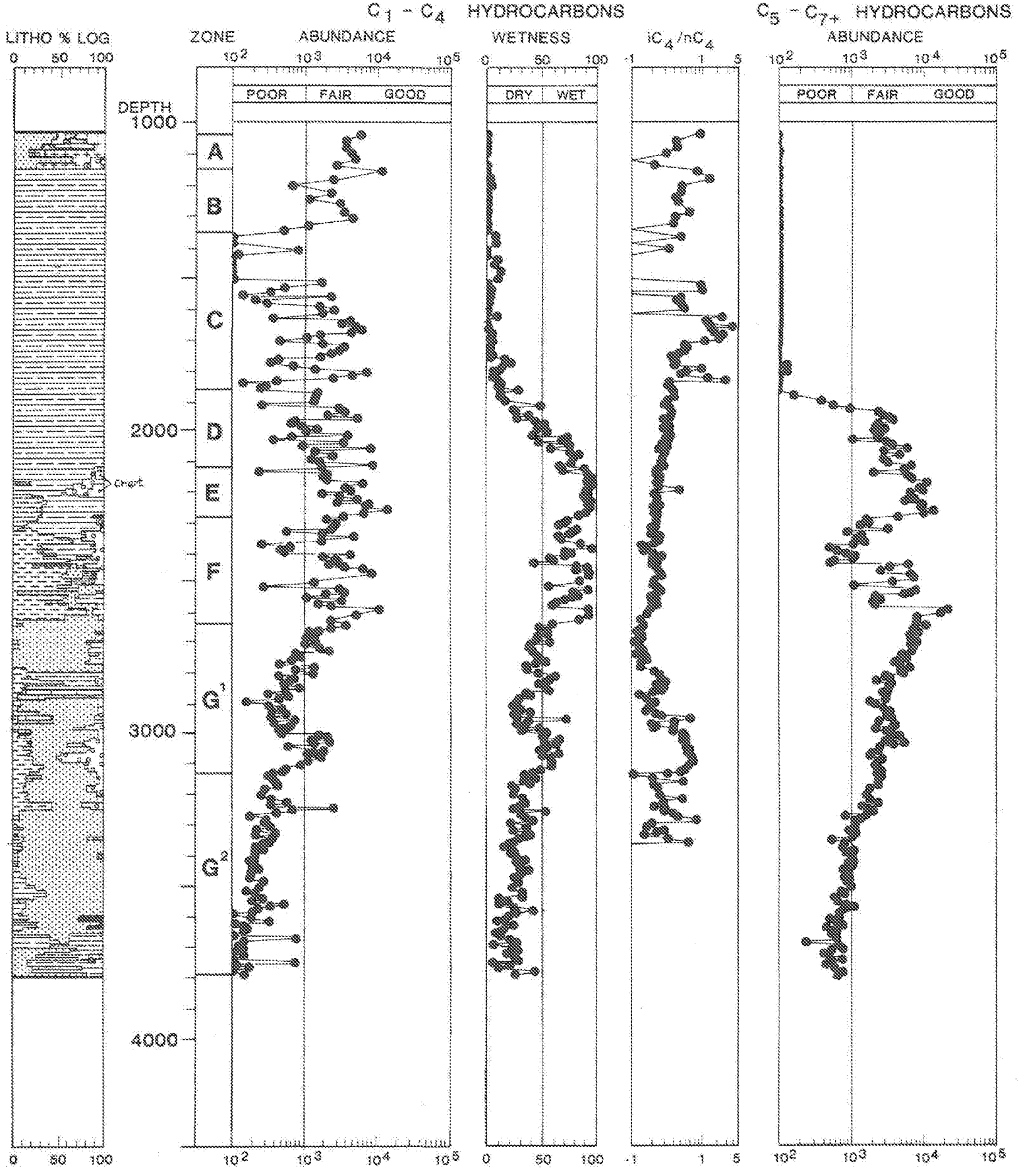
Thermal Bitumen (Peak 1) evolved up to 340°C. Pyrolysate (Peak 2) evolved 340 – 550°C.

TABLE 8

COMPOSITION (NORMALISED %) OF C_{15+} PARAFFIN – NAPHTHENE HYDROCARBONS

GEOCHEM SAMPLE NUMBER	-081A	-086A	-091A	-097A	-102A	-106A	-113A
DEPTH	2100m	2150m	2200m	2260m	2309m	2345m	2408m
SAMPLE TYPE							
nC_{15}	6.30	8.62	11.17	11.50	18.01	4.39	8.63
nC_{16}	8.45	9.92	12.93	13.45	16.90	10.82	13.10
nC_{17}	8.75	9.38	12.24	12.80	12.60	11.43	12.39
nC_{18}	9.19	8.85	11.26	11.71	10.94	12.96	12.28
nC_{19}	8.52	8.31	9.21	10.63	8.31	11.02	9.64
nC_{20}	8.30	8.16	7.74	8.79	6.37	9.49	8.53
nC_{21}	6.82	7.63	6.86	6.83	5.26	8.06	6.90
nC_{22}	7.34	6.71	6.46	6.07	4.71	6.94	6.60
nC_{23}	6.45	6.33	5.78	4.66	4.16	6.53	4.79
nC_{24}	6.23	6.03	5.29	4.66	3.74	6.22	5.18
nC_{25}	5.86	5.57	4.02	3.36	3.19	4.90	4.06
nC_{26}	5.11	4.58	2.94	2.39	2.35	3.06	2.44
nC_{27}	4.30	3.59	1.76	1.30	1.39	1.73	1.62
nC_{28}	3.56	2.82	1.08	0.65	0.97	0.92	1.02
nC_{29}	2.45	1.75	0.49	0.22	0.28	0.41	0.61
nC_{30}	1.11	0.84	0.20	0.22	0.28	0.20	0.30
nC_{31}	0.59	0.38	0.20	0.22	0.14	0.20	0.20
nC_{32}	0.22	0.15	0.10	0.22	0.14	0.20	0.20
nC_{33}	0.15	0.15	0.10	0.11	0.14	0.20	0.20
nC_{34}	0.15	0.15	0.10	0.11	0.14	0.20	0.20
nC_{35}	0.15	0.08	0.10	0.11	0.00	0.10	0.10
PARAFFIN	34.63	41.98	48.95	34.90	40.52	42.10	33.87
ISOPRENOID	4.67	4.64	6.71	7.57	7.18	6.36	6.12
NAPHTHENE	60.69	53.38	44.34	57.53	52.30	51.55	60.01
CPI INDEX A	0.96	1.03	0.99	0.96	1.00	1.03	1.01
CPI INDEX B	1.07	1.07	1.09	1.06	1.01	1.17	1.18
PRISTANE/PHYTANE	1.27	1.30	1.41	1.41	1.61	1.24	1.44
PRISTANE/nC_{17}	0.86	0.67	0.66	0.99	0.87	0.73	0.86

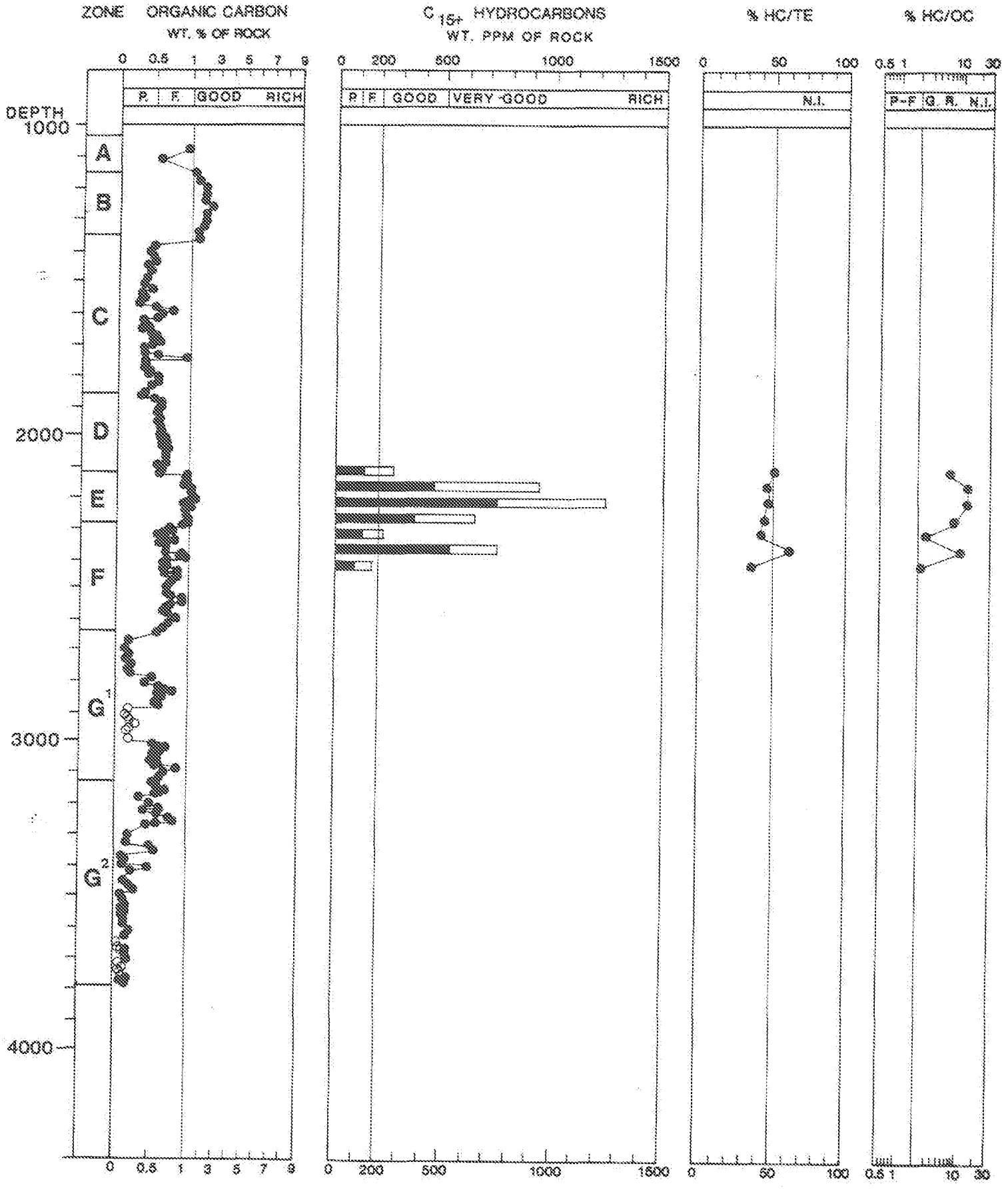
FIGURE 1 $C_1 - C_7$ HYDROCARBONS WELL 34/4-4



LIMESTONE
DOLOMITE
SHALE
MUDSTONE/ CLAYSTONE
COAL
SILTSTONE
SANDSTONE
EVAPORITE
IGNEOUS
L.C.M.

iC_4 - ISOBUTANE
nC_4 - NORMAL BUTANE
ABUNDANCE - VOLUME PPM OF ROCK
WETNESS - % C_2-C_4 IN C_1-C_4

FIGURE 2 **RICHNESS** WELL 34/4-4



● SHALE
○ OTHER LITHOLOGIES

P - N -- PARAFFIN - NAPHTHENES
AROM - AROMATICS

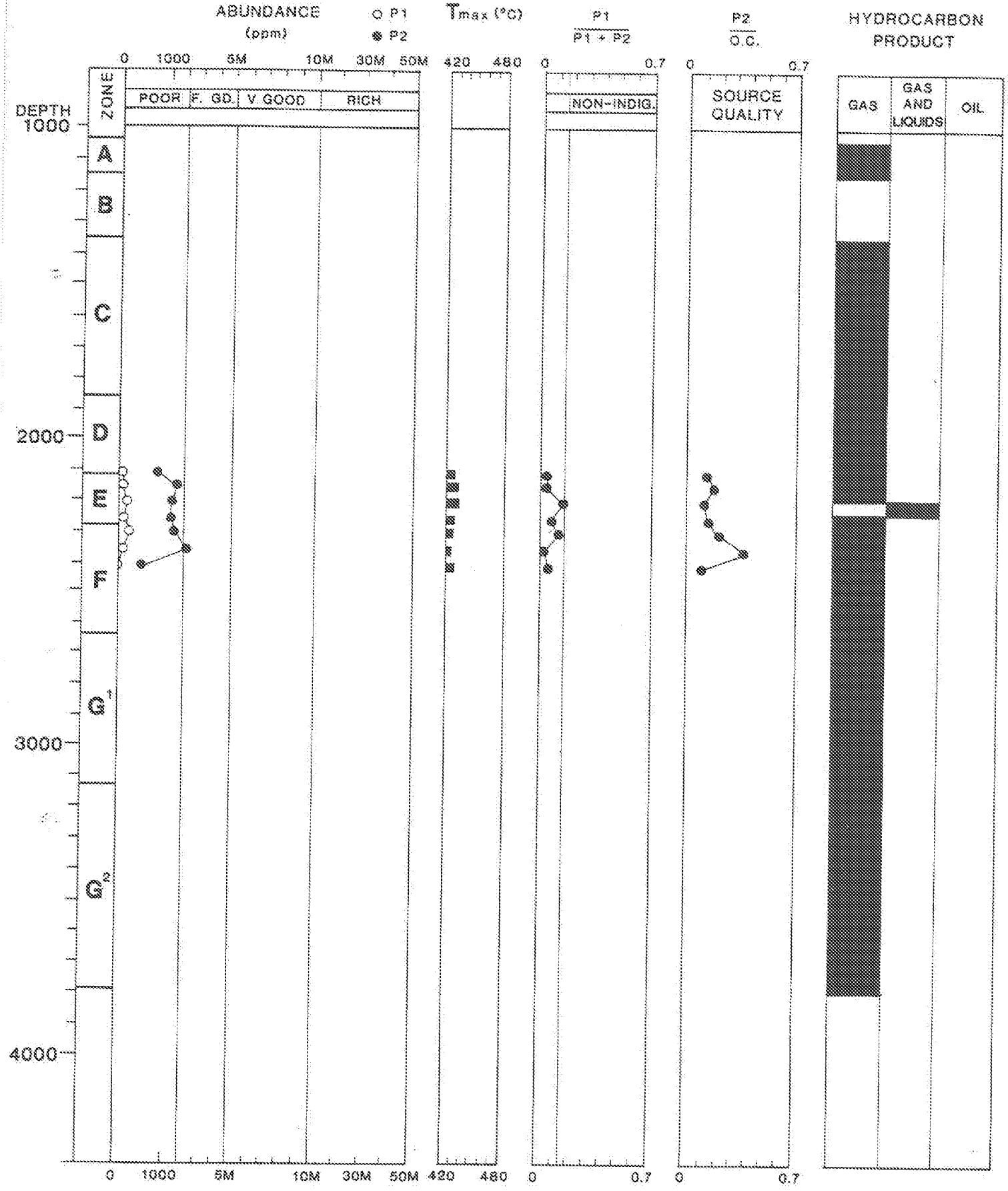
HC - C_{15+} HYDROCARBONS
OC - ORGANIC CARBON
TE - TOTAL C_{15+} EXTRACT

P - POOR
F - FAIR
G - GOOD
R - RICH
N.I. - NON-INDIGENOUS HYDROCARBONS

FIGURE 3

PYROLYSIS

WELL 34/4-4



M = 1000

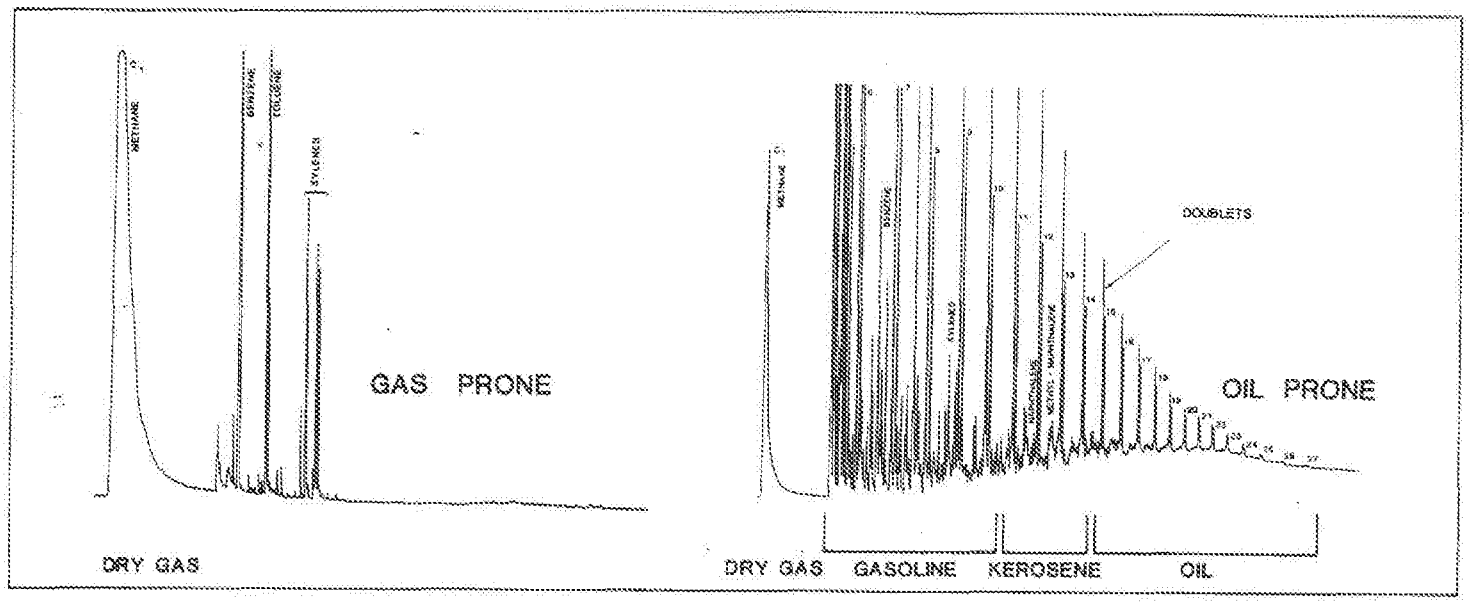
P1 — THERMAL BITUMEN

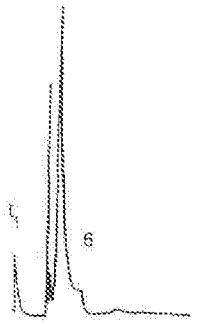
P2 — PYROLYSATE

O.C. — ORGANIC CARBON

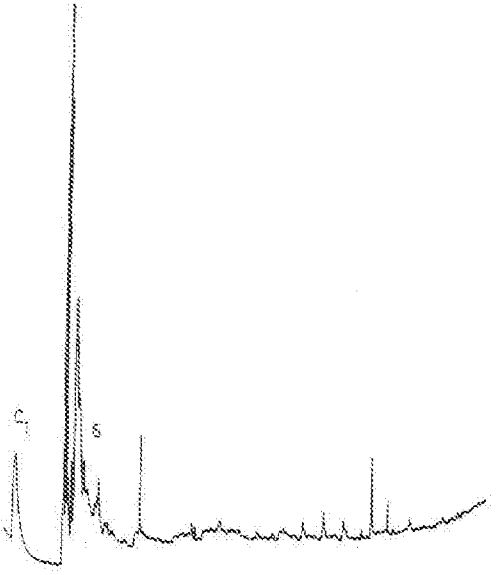
NON-INDIG. — NON-INDIGENOUS HYDROCARBONS (SHOWS OR CONTAMINATION)

FIGURE 4a **PYROLYSIS GC** WELL 34/4-4

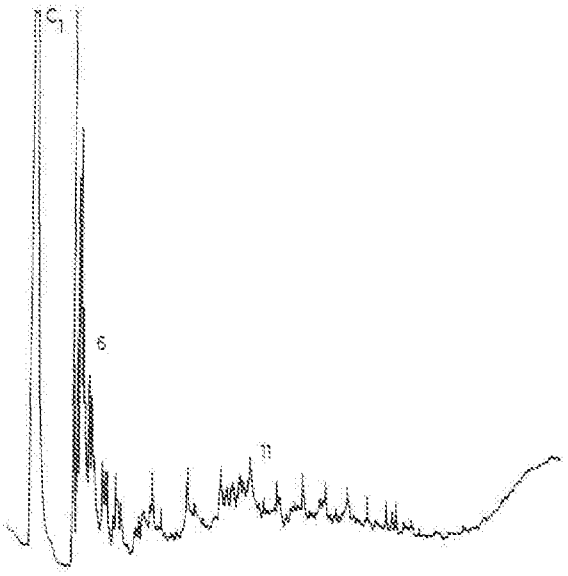




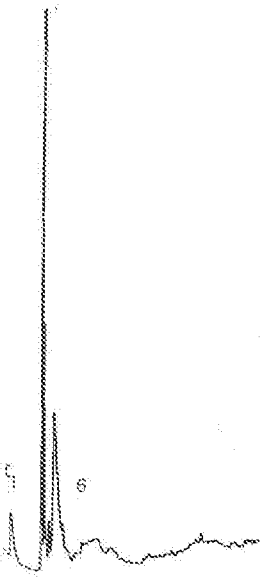
2100m A



2150m A

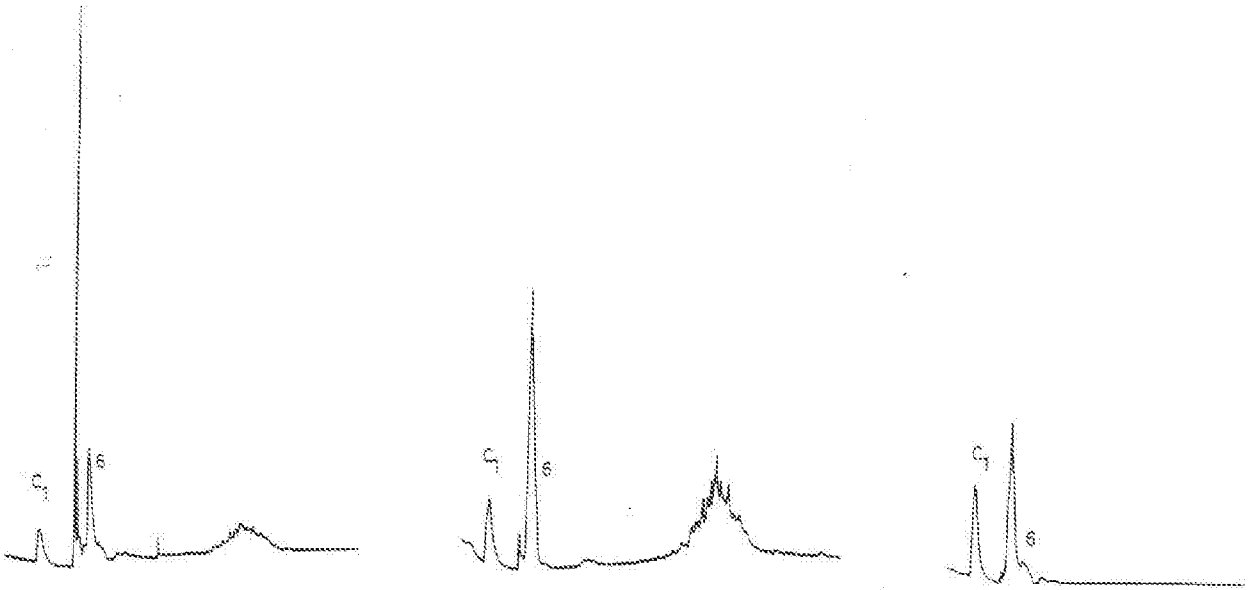


2200m A



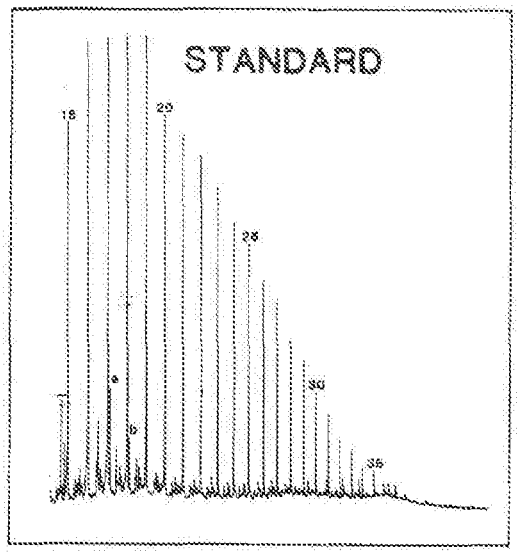
2260m A

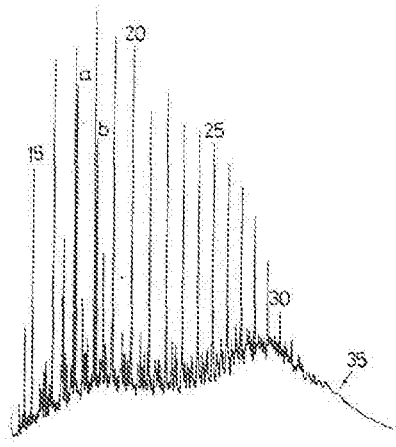
FIGURE 4b **PYROLYSIS GC** WELL 34/4-4



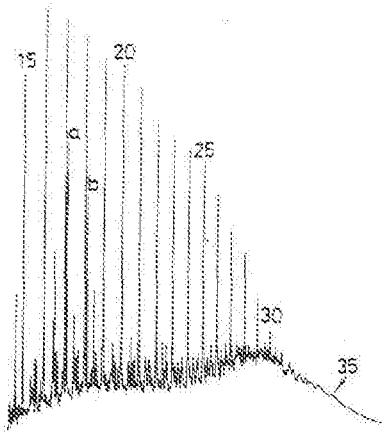
2300m A 2345m A 2408m A

FIGURE 5 C_{15+} PARAFFIN-NAPHTHENES WELL 34/4-4

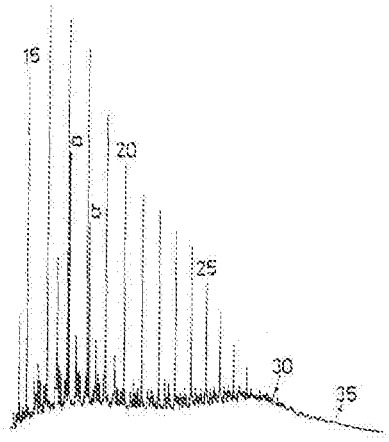




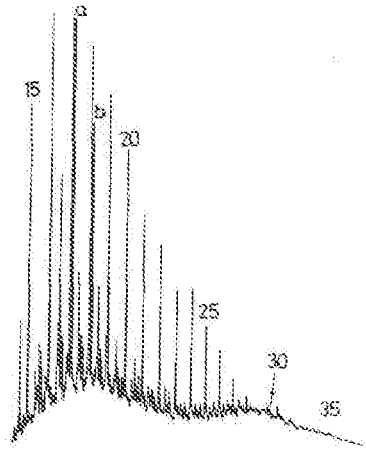
2100m A



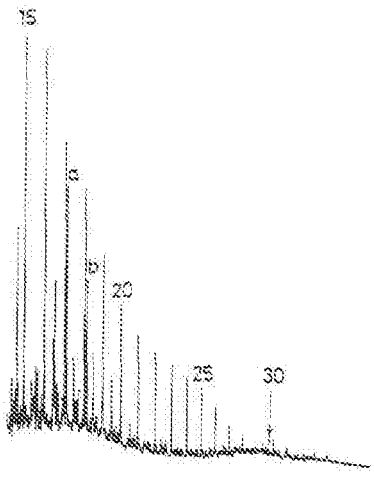
2150m A



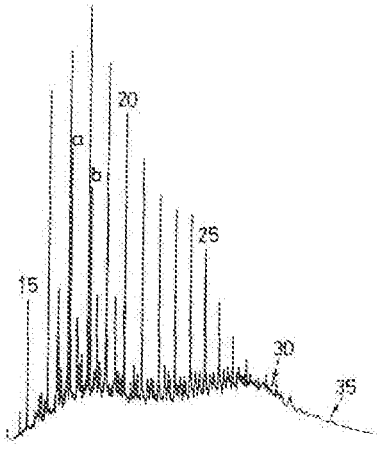
2200m A



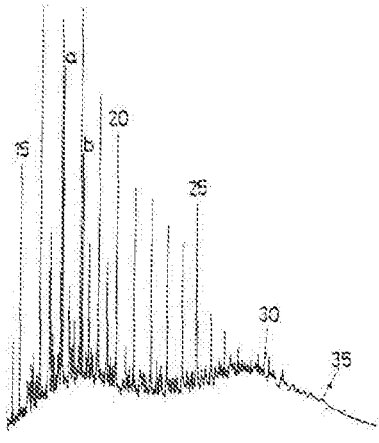
2260m A



2309m A



2345m A



2408m A

a - PRISTANE
b - PHYTANE

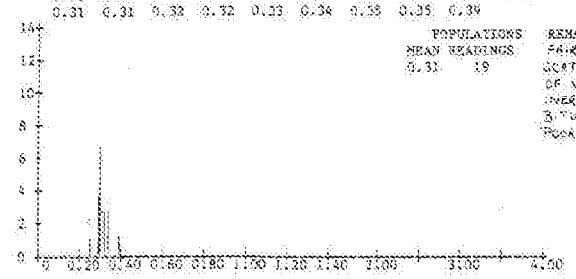
CARBON NUMBERS OF NORMAL PARAFFINS INDICATED (20 - nC_{20})

FIGURE 6a VITRINITE REFLECTANCE WELL 34/4-4

SAMPLE 693-003B DEPTH 1080 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.25 0.29 0.29 0.29 0.29 0.30 0.30 0.30 0.31 0.31
0.31 0.31 0.32 0.32 0.33 0.34 0.35 0.35 0.39

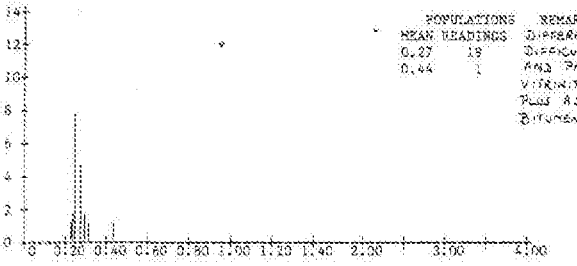
POPULATIONS MEAN READINGS		REMARKS
0.31	19	FAIRLY LEAN. SCATTERED PARTICLES OF VITRINITE AND INERTINITE. PLUS BITUMEN STAINING. POOR SAMPLE.



SAMPLE 693-010A DEPTH 1220 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.23 0.24 0.24 0.25 0.25 0.25 0.25 0.25 0.26 0.26
0.27 0.28 0.28 0.28 0.28 0.28 0.30 0.30 0.32 0.44

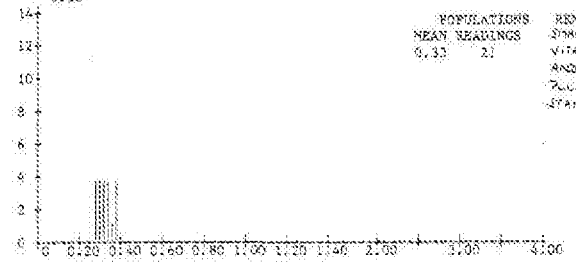
POPULATIONS MEAN READINGS		REMARKS
0.27	19	DIFFERENTIATION DIFFICULT. INERTS AND PARTICLES OF VITRINITE APPARENT, PLUS ASSOCIATED BITUMEN STAINING.
0.44	1	



SAMPLE 693-016A DEPTH 1340 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.28 0.29 0.29 0.29 0.30 0.30 0.31 0.31 0.32 0.32
0.32 0.33 0.34 0.35 0.35 0.35 0.36 0.36 0.38 0.38
0.38

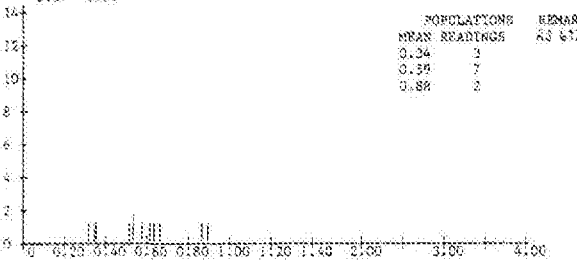
POPULATIONS MEAN READINGS		REMARKS
0.33	21	SMALL IMMATURE VITRINITE GRAINS AND PARTICLES PLUS BITUMEN STAINING.



SAMPLE 693-021A DEPTH 1440 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.32 0.35 0.36 0.52 0.54 0.55 0.58 0.62 0.64 0.67
0.87 0.90

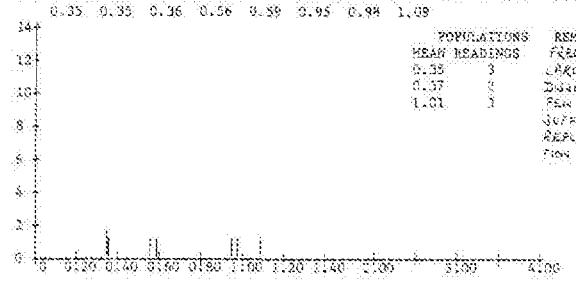
POPULATIONS MEAN READINGS		REMARKS
0.34	3	AS 693-003A
0.56	7	
0.88	2	



SAMPLE 693-031A DEPTH 1580 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.35 0.35 0.36 0.56 0.59 0.95 0.99 1.09

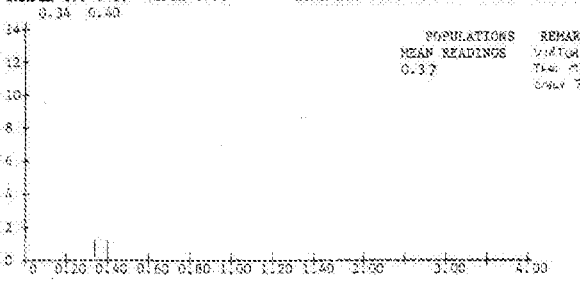
POPULATIONS MEAN READINGS		REMARKS
0.35	3	FREQUENTLY FINE, LARGELY UNRECOGNISABLE DISINTEGRATED DEBRIS. FEW PARTICLES OF SUFFICIENT SIZE FOR REFLECTANCE DETERMINATION APPARENT
0.57	5	
1.01	3	



SAMPLE 693-043B DEPTH 1700 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.34 0.40

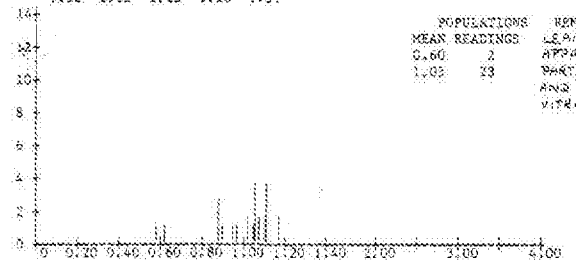
POPULATIONS MEAN READINGS		REMARKS
0.37		VITRINOID BARREN. TOO MEASUREMENTS ONLY POSSIBLE.



SAMPLE 693-053B DEPTH 1810 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.58 0.62 0.88 0.88 0.89 0.90 0.95 0.97 1.02 1.03
1.05 1.06 1.06 1.07 1.07 1.08 1.09 1.11 1.11 1.12
1.12 1.13 1.13 1.18 1.19

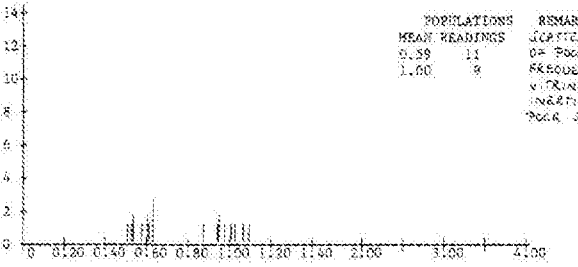
POPULATIONS MEAN READINGS		REMARKS
0.60	2	LEAN. APPARENTLY EXCLUSIVELY PARTICLES OF INERTINITE AND REWORKED VITRINITE.
1.05	23	



SAMPLE 693-064A DEPTH 1930 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.51 0.53 0.54 0.55 0.56 0.61 0.61 0.62 0.64 0.65
0.65 0.88 0.95 0.96 0.98 0.98 1.02 1.04 1.08 1.11

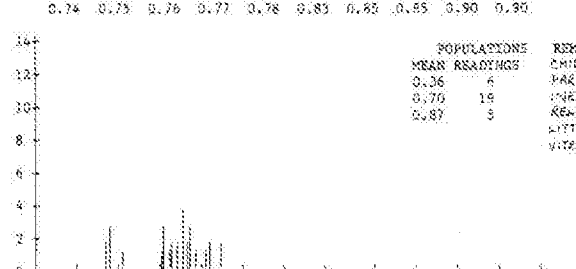
POPULATIONS MEAN READINGS		REMARKS
0.59	11	SCATTERED PARTICLES OF POOR QUALITY. FREQUENTLY REWORKED VITRINITE AND INERTINITE. POOR SAMPLE.
1.00	9	



SAMPLE 693-072A DEPTH 2010 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.34 0.35 0.36 0.36 0.36 0.62 0.62 0.62 0.62 0.62
0.65 0.66 0.67 0.69 0.69 0.72 0.72 0.72 0.72 0.76
0.76 0.75 0.76 0.77 0.78 0.85 0.85 0.85 0.90 0.90

POPULATIONS MEAN READINGS		REMARKS
0.36	6	CHIEFLY POOR PARTICLES OF INERTINITE AND REWORKED VITRINITE. LITTLE INDIGENOUS VITRINITE APPARENT.
0.70	19	
0.87	5	



SAMPLE 693-081A DEPTH 2100 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.38 0.38 0.54 0.55 0.57 0.60 0.70 0.76 0.77 0.79
0.81 0.81 0.82 0.82 0.82 0.89 0.94 1.03 1.06

POPULATIONS MEAN READINGS		REMARKS
0.38	2	AS 693-072A
0.56	4	
0.79	9	
0.98	4	

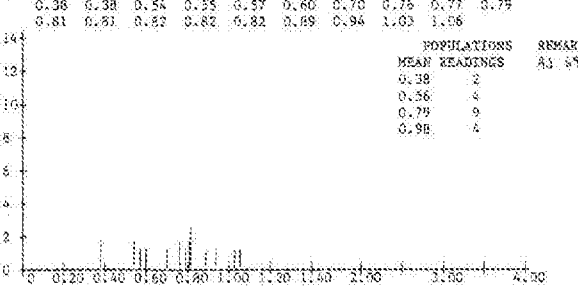


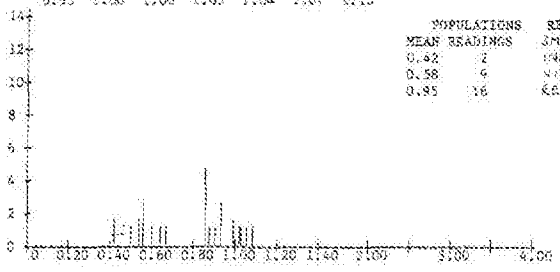
FIGURE 6b VITRINITE REFLECTANCE WELL 34/4-4

SAMPLE 693-086A DEPTH 2150 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.42	0.42	0.50	0.54	0.55	0.56	0.56	0.57	0.60	0.64
0.67	0.86	0.87	0.87	0.87	0.87	0.88	0.91	0.94	0.95
0.95	1.00	1.00	1.03	1.04	1.07	1.10			

POPULATIONS MEAN READINGS	
0.42	2
0.58	9
0.95	16

REMARKS: SMALL PARTICLES OF INERTINITE AND VITRINITE OF VARIABLE REFLECTANCE

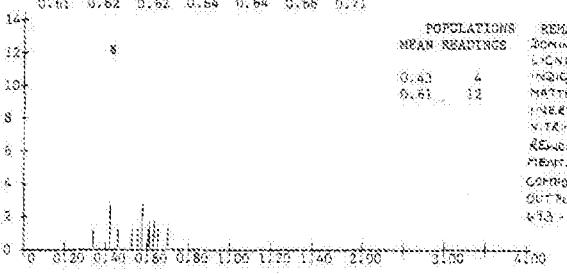


SAMPLE 693-091A DEPTH 2200 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

		0.42	0.42	0.42	0.46	0.53	0.56	0.58	0.59	0.59
0.61	0.62	0.62	0.64	0.64	0.66	0.71				

POPULATIONS MEAN READINGS	
0.63	4
0.61	12

REMARKS: DOMINATED BY LIGNITE CUTTINGS, INDIGENOUS ORGANIC MATTER CONSISTS OF INERTINITE AND VITRINITE. FREQUENTLY REWORKED. MEASUREMENTS ON THE LIGNITE COMPONENT OUTNOTTED AS 693-091B

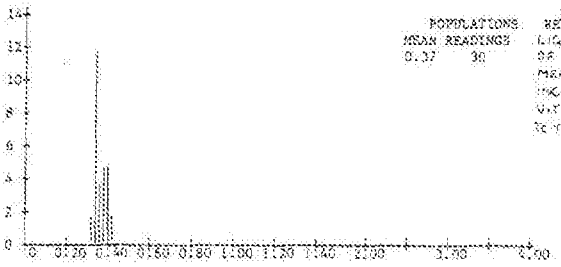


SAMPLE 693-091B DEPTH 2200 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.32	0.32	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.36
0.36	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.38	0.38
0.38	0.39	0.39	0.40	0.40	0.40	0.40	0.41	0.42	0.42

POPULATIONS MEAN READINGS	
0.37	30

REMARKS: LIGNITE COMPONENT OF SAMPLE 091A. MEASUREMENTS MAY INCLUDE VALUES FOR VITRINITE INDIGENOUS TO THE SHALE.

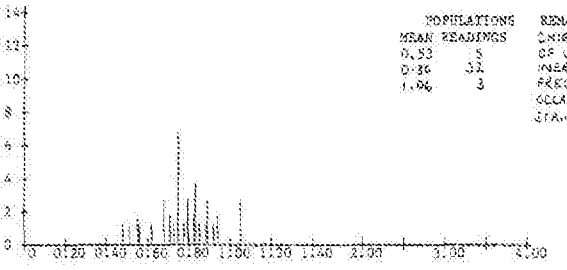


SAMPLE 693-097A DEPTH 2260 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.48	0.51	0.53	0.55	0.56	0.62	0.68	0.68	0.69	0.71
0.71	0.73	0.75	0.76	0.77	0.77	0.77	0.77	0.77	0.78
0.80	0.80	0.80	0.83	0.83	0.84	0.85	0.85	0.85	0.86
0.89	0.90	0.90	0.91	0.93	0.95	0.95	1.06	1.06	1.07

POPULATIONS MEAN READINGS	
0.53	5
0.86	33
1.06	3

REMARKS: LARGELY PARTICLES OF VITRINITE AND INERTINITE. FREQUENT REWORKING, OCCASIONAL DIFFICULT STAINING.

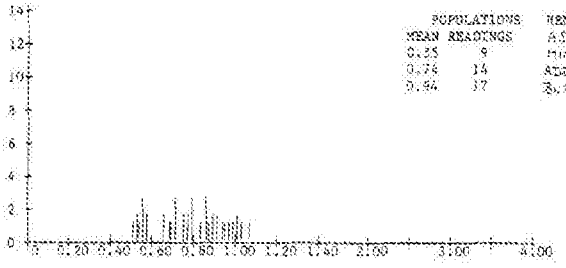


SAMPLE 693-101A DEPTH 2300 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.51	0.53	0.53	0.54	0.56	0.57	0.57	0.58	0.59	0.66
0.67	0.69	0.70	0.72	0.73	0.73	0.75	0.76	0.78	0.79
0.80	0.86	0.80	0.84	0.87	0.87	0.87	0.88	0.90	0.90
0.92	0.93	0.93	0.96	0.98	1.00	1.02	1.03	1.04	1.08

POPULATIONS MEAN READINGS	
0.55	9
0.76	14
0.94	17

REMARKS: AS 693-091A MINOR LIGNITE ADDITIVE APPARENT BUT NOT MEASURED

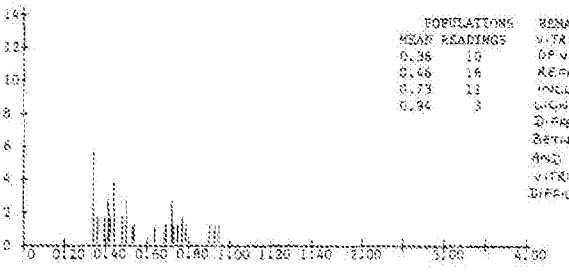


SAMPLE 693-106A DEPTH 2345 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.34	0.34	0.35	0.35	0.35	0.35	0.36	0.36	0.39	0.39
0.41	0.41	0.41	0.42	0.43	0.44	0.44	0.44	0.44	0.48
0.48	0.50	0.51	0.51	0.53	0.59	0.65	0.69	0.70	0.73
0.73	0.73	0.74	0.76	0.78	0.78	0.80	0.91	0.94	0.96

POPULATIONS MEAN READINGS	
0.36	10
0.46	16
0.73	13
0.94	3

REMARKS: VITRINITE PARTICLES OF VERY VARIABLE REFLECTANCE, INCLUDING TINY LIGNITE CUTTINGS. DIFFERENTIATION BETWEEN LIGNITE AND INDIGENOUS VITRINITE FREQUENTLY DIFFICULT



SAMPLE 693-113A DEPTH 2408 VITRINITE REFLECTANCE VALUES APPEARANCE IN UV

0.46	0.86	0.87	0.88	0.88	0.92	0.92	0.96	0.97	0.99
0.99	1.00	1.00	1.03	1.04	1.05	1.07	1.08	1.09	1.11
1.11	1.12	1.13	1.13	1.15	1.16	1.17	1.18	1.19	1.20
1.21	1.25	1.26	1.26	1.26	1.28	1.29	1.29	1.30	1.30
1.31	1.35	1.35	1.39	1.40	1.41	1.41	1.43	1.46	1.71

POPULATIONS MEAN READINGS	
0.46	1
1.05	30
1.33	18
1.71	1

REMARKS: AS 693-091A

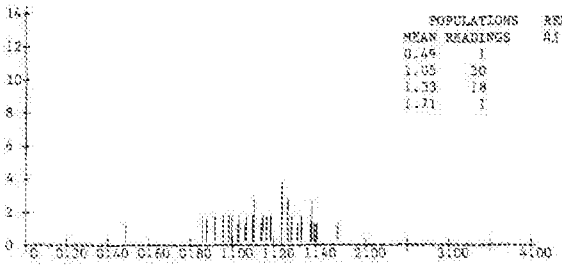


FIGURE 7 **ORGANIC FACIES & MATURITY** WELL 34/4-4

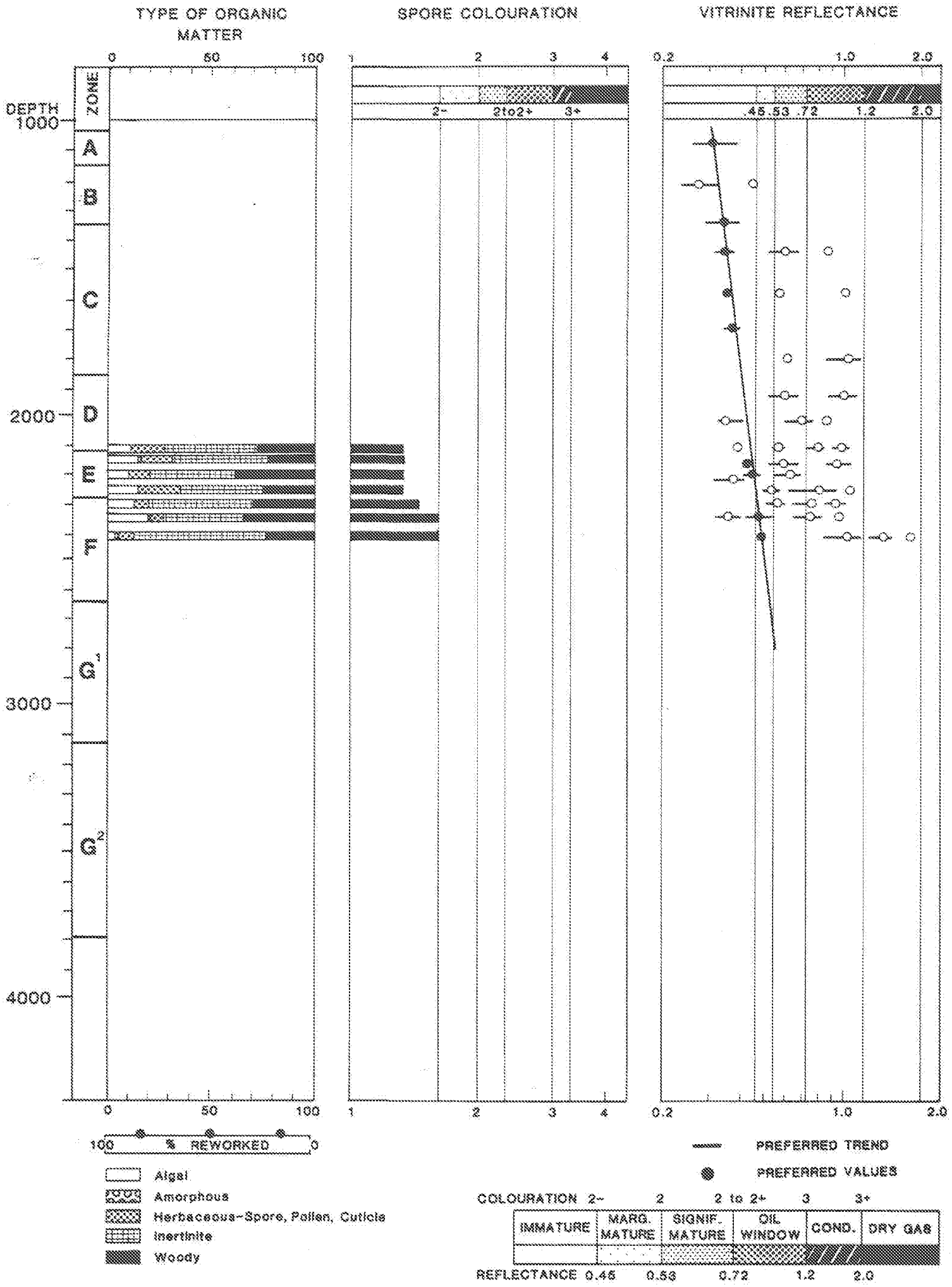
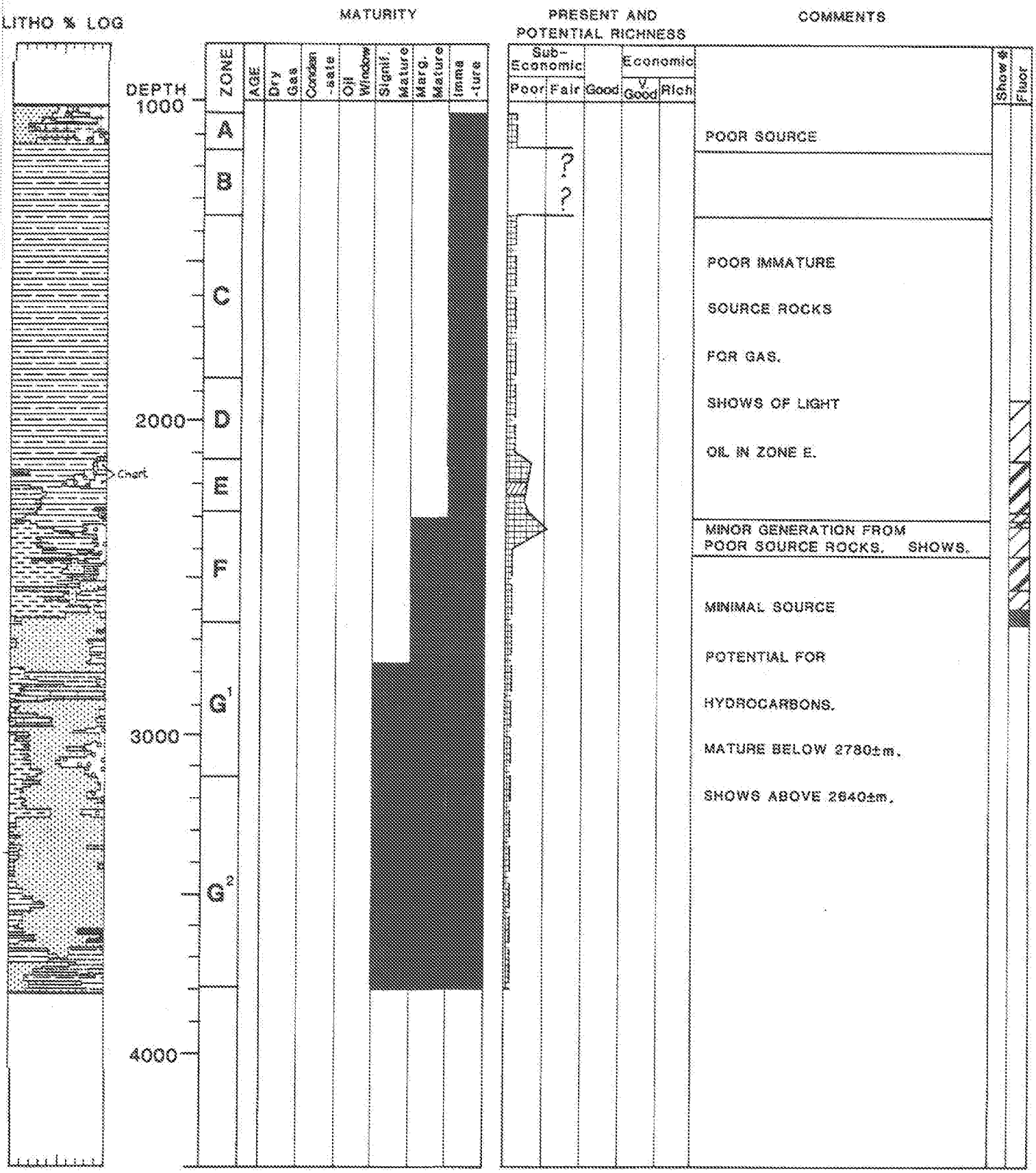


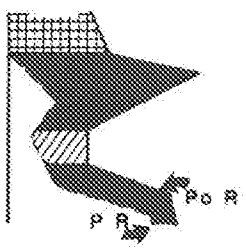
FIGURE 8

RATING

WELL 34/4-4



LIMESTONE
DOLOMITE
SHALE
MUDSTONE/ CLAYSTONE
COAL
SILTSTONE
SANDSTONE
EVAPORITE
IGNEOUS
L.C.M.



GAS PRONE
GAS AND CONDENSATE
OIL PRONE
Shows Recognised by Analysis
Po R Potential Richness
PR Present Richness

BRIEF DESCRIPTION OF THE ANALYSES PERFORMED BY GEOCHEM

"Screen Analyses" are described in sections A, C and D, "Sample Preparation" in section B, "Follow-up Analyses" in sections E through K and "Correlation Studies" in section L. The analyses can be run on either core or cuttings material with the proviso that samples must be canned for the C_1-C_7 analysis and should be canned (or at least wet) for the C_4-C_7 analysis. The other analyses can be run on both canned and bagged samples.

A) C_1-C_7 LIGHT HYDROCARBON ANALYSIS

The abundance and composition of the C_1-C_7 hydrocarbons in sediments reflects their source richness, maturity and the character of the hydrocarbons they can yield. Most importantly, it is extremely sensitive to the presence of migrated hydrocarbons and is an excellent method for their detection. As it provides the information on most of the critical parameters and is also economical, this analysis is excellent for screening samples to decide which of them merit further analysis.

During the time which elapses betwwen the collection of the sample at the wellsite and its analysis in the laboratory, a fraction of the total gas passes from the rock to the air space at the top of the can. For this reason, both the air space and the cuttings are analysed.

The analysis involves the gas chromatographic separation of the individual C_1-C_4 gaseous hydrocarbons (methane, ethane, propane, isobutane and normal butane) and a partial resolution of the C_5-C_7 gasoline-range hydrocarbons (for their complete resolution see Section E). The ppm abundance of the five gases and of the total C_5-C_7 hydrocarbons are calculated from their electronically integrated peak areas (not from peak height) by comparison with a standard.

In the report, the following data are tabulated: the abundance and composition of the air space gas, of the cuttings gas and of the combined air space and cuttings gases. The combined results are also presented graphically.

B) SAMPLE WASHING AND HAND PICKING

All of the analyses described in subsequent sections are run on washed and hand picked samples.

Cuttings are washed to remove the drilling mud, care being taken not to remove soft clays and fine sand during the washing procedure. Using the C_1-C_7 hydrocarbon data profile of the well, or the organic carbon profile (if this analysis is used for screening), electric logs (if supplied) and the appearance of the cuttings under the binocular microscope, samples are selected to represent the lithological and geochemical zones penetrated by the well. These samples are then carefully hand picked and the lithology of the uncaved material is described. It is these samples which are submitted for further analysis.

Sample material remaining after analysis is retained for six months. Unless instructions are received to the contrary, Geochem Laboratories may then destroy the samples.

Our reports incorporate a gross lithological description of all the samples which have been analysed and litho percentage logs. As screen analyses are recommended at narrow intervals, a complete lithological profile is obtained.

C) ORGANIC CARBON ANALYSIS

The organic carbon content of a rock is a measure of its total organic richness. Combined with the visual kerogen, C_1-C_7, C_4-C_7, pyrolysis and C_{15+} analyses, the organic carbon content is used to evaluate the potential (not necessarily actual) hydrocarbon source richness of the sediment. This analysis is an integral part of a total evaluation and it can also be used as an economical screen analysis for dry samples (when the C_1-C_7 analysis cannot be used).

Hand picked samples are dried, crushed and then acidised to remove the inorganic calcium and magnesium carbonates. The actual analysis involves combustion in a Leco carbon analyser. Blanks, standards and duplicates are run routinely for purposes of quality control at no extra cost to the client.

The data are tabulated and presented diagramatically in our reports in a manner which facilitates comparison with the gross lithology (see Section B) of the samples.

D) MINI-PYROLYSIS

An ideal screen analysis which provides a definitive measure of potential source richness upon those samples whose organic carbon contents suggest fair or good source potential. This is described in detail in section K.

E) DETAILED C_4-C_7 HYDROCARBON ANALYSIS

The abundance and composition of the C_4-C_7 gasoline-range hydrocarbons in sediments reflects their source quality, level of thermal maturation and organic facies. In addition, the data also reveal the presence of migrated hydrocarbons and can be used for crude oil-parent source rock correlation studies.

This powerful analysis, performed upon hand picked lithologies, is employed as a follow-up to confirm the potential of samples which have been selected using the initial screen analysis. It is used in conjunction with the organic carbon, visual kerogen and C_{15+} analyses.

The individual normal paraffins, isoparaffins, naphthenes and aromatics with between four and seven carbon atoms in the molecule (but also including toluene) are resolved by capillary gas chromatography and their peak areas electronically integrated.

Normalised compositions, selected ratios and the ppm abundance of the total gasoline-range fraction are tabulated in the report and also presented graphically.

F) KEROGEN TYPE AND MATURATION

Kerogen is the insoluble organic matter in rocks. Visual examination of the kerogen gives a direct measure of thermal maturity and of the composition of the organic matter (organic facies) and indicates the source quality of the sediment - which is confirmed using the organic carbon, light hydrocarbon, pyrolysis and C_{15+} analyses.

The type of hydrocarbon (oil or gas) generated by a source rock is a function of the types and level of thermal maturation of the organic matter which are present. Both of these parameters are measured directly by this method.

Kerogen is separated from the inorganic rock matrix by acid digestion and flotation methods which avoid oxidation of the organic matter. It is then mounted on a glass slide and examined at high and low magnifications with a Leitz microscope. Chemical methods measure the total kerogen population but, with this technique, individual particles can be selected for examination and spurious material identified. This is particularly valuable in reworked, contaminated and turbodrilled sediments.

The following data are generated: the types of organic matter present and their relative abundances, an estimate of the proportion of reworked material, preservation state, the thermal maturity of the non-reworked organic matter using the spore colouration technique.

Our maturation scale has been developed to digitise small but recognisable changes in organic matter colouration resulting from increasing maturity and to place particular emphasis upon the immature to mature transition. In the absence of a universal colouration scale, the most significant points on our scale have been calibrated against equivalent vitrinite reflectance values. The following maturation stages are recognised at the low end of the scale:-

a) immature; thermal index less than 2- (0.45% Ro)
b) marginally mature; indices between 2- and 2. Minor hydrocarbon generation from amorphous and herbaceous (± algal) organic matter
c) mature; indices between 2 (0.53% Ro) and 2 to 2+ (0.72% Ro), significant generation from amorphous, algal and herbaceous organic matter but wood only marginally mature
d) oil window; indices of 2 to 2+ (0.72% Ro) through to 3 (1.2% Ro). Peak hydrocarbon generation.

The condensate zone starts at a thermal index of 3 whilst indices of 3+ (2.0% Ro) and higher indicate the eometamorphic dry gas stage.

A total of fourteen types of organic matter are sought based upon the major categories of algal, amorphous, herbaceous (spore, pollen, cuticle), wood, inertinite and resin. This detail is essential for a proper understanding of hydrocarbon source potential as the different sub-groups within each category have different properties.

Upon completion of the study, the kerogen slides are sent to the client.

G) <u>VITRINITE REFLECTANCE</u>

Vitrinite reflectance is an alternative/confirmatory method for evaluating thermal maturation which is used in conjection with the <u>visual kerogen</u> analysis. The reflectivity of vitrinite macerals increases in response to thermal alteration and is used to define maturation levels and, by projection, to predict maturity at depth or the thicknesses of section removed by erosion.

Measurements are made upon kerogen separations in conjunction with polished whole rock samples. In general, this analysis is performed upon the same samples as the visual kerogen analysis, thus facilitating a direct comparison of the two sets of results.

If possible, forty to fifty measurements are taken per sample - unless the sediments are organically lean, vitrinite is sparse or only a single uniform population is present. The data are plotted in a histogram which distinguishes the indigenous vitrinite from possible reworked or caved material. Averages are calculated for each population. Comments upon exinite fluorescence and upon the character of the phytoclasts are noted on the histograms. The reports contain the tabulated data, histograms and the reflectivities plotted against depth.

The vitrinite and visual kerogen techniques provide mutually complementary information upon maturity, organic matter type and diagenesis.

H) C_{15+} EXTRACTION, DEASPHALTENING AND CHROMATOGRAPHIC SEPARATION

Sections "A" and "E" dealt with analyses covering the light end of the hydrocarbon spectrum. This section is concerned with the solvent extractable organic material in the rock with more than fourteen carbon atoms in the molecule (i.e. the heavy end). The amount and composition of this extract indicates source richness and type, the level of thermal maturation and the possible presence of migrated hydrocarbons.

These results are integrated with those derived from the pyrolysis, visual kerogen, organic carbon and light hydrocarbon analyses.

The techniques involved in this analysis employ pure solvents and have been designed to give reproducible results. Hand picked samples are ground and then solvent extracted in a soxhlet apparatus, or by blending, with dichloromethane (the solvent system can be adapted to client's specifications). After asphaltene precipitation, the total extract is separated by column chromatography or high pressure liquid chromatography into the following fractions: paraffin-naphthene hydrocarbons, aromatic hydrocarbons, eluted NSO's (nitrogen-, sulphur-, and oxygen- containing non-hydrocarbons) and non-eluted NSO's. Note that the non-hydrocarbons are split into three fractions and not reported as a gross value. These fractions can be submitted for further analyses (carbon isotopes, gas chromatography, high mass spectroscopy) including correlation studies.

For convenience and thoroughness, the data are reported in three formats: the weights of the fractions, ppm abundances and normalised percentage compositions. The data are also presented diagramatically.

J) GC ANALYSIS OF C_{15+} PARAFFIN-NAPHTHENE HYDROCARBONS

The gas chromatographic configurations of the heavy C_{15+} paraffin-naphthene hydrocarbons reflect source type, the degree of thermal maturation and the presence and character of migrated hydrocarbons or contamination.

Not only is this analysis an integral part of any source rock study but it also provides a fingerprint for correlation purposes and helps to define the geochemical/palynological environmental character of the source rocks from which crude oils were derived.

The paraffin-naphthene hydrocarbons obtained by column chromatography are separated by high resolution capillary chromatography. Excellent resolution of the individual normal paraffins, isoprenoids and significant individual isoparaffins and naphthenes is achieved. Runs are normally terminated at nC_{35}. A powerful in-house microprocessor system is being introduced to correct for the change in response factor with chain length.

The normal paraffin carbon preference indices (C.P.I.) indicate if odd (values in excess of 1) or even (values less than 1) normal paraffins are dominant. Strong odd preferences (* strong pristane peaks) are characteristic of immature land plant organic matter whilst even preferences (* strong phytane peaks) suggest a reducing environment of deposition. With increasing maturity, values approach 1.0 and oils are typically close to 1.0. The indices are calculated using the following formulae:

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

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

Chromatograms are reproduced in the report for use as visual fingerprints and in addition, the following data are tabulated: normalised normal paraffin distributions; proportions of paraffins, isoprenoids and naphthenes in the total paraffin-naphthene fraction; C.P.I_A and C.P.I_B; pristane to phytane ratio; pristane to nC_{17} ratio.

K) PYROLYSIS

The process of thermal maturation can be simulated in the laboratory by pyrolysis, which involves heating the sample under specified conditions and measuring the oil-like material which is freed/generated from the rock. With this analysis, the potential richness of immature sediments can be determined and, by coupling the pyrolysis unit to a gas chromatograph, the liberated material can be characterised. These results are correlated with those obtained from the organic carbon, kerogen and C_{15+} analyses.

Small amounts of powdered sample are heated in helium to release the thermal bitumen (up to 340°C) and pyrolysate (340-550°C). The thermal bitumen correlates with the solvent extractable material (see above) whilst the pyrolysate fraction does not exist in a "free" state but is generated from the kerogen, thus simulating maturation in the subsurface. Abundances (weight ppm of rock) are measured with a flame ionisation detector against a standard. Thermal bitumen includes source indigenous, contaminant and migrated hydrocarbons but the pyrolysate abundance is a measure of ultimate source richness. The capillary gas chromatogram of the pyrolysate is used to evaluate the character of the parent organic matter and whether it is oil or gas prone. Peak temperature(s) of pyrolysate evolution is recorded. Carbon dioxide can be measured if requested but is normally ignored as the separation of the organic and inorganic species has been found to be artificial and unreliable.

Pyrolysate yields provide a definitive measure of potential source richness which avoids the ambiguities of the organic carbon data and the problem of contamination. This analysis is also used to evaluate the quality and character of the organic matter and the degree to which it has realised its ultimate hydrocarbon potential. Geochem does not employ the pyrolysis technique to evaluate maturation, preferring the kerogen and vitrinite reflectance analyses which avoid the problem of reworking and hence, are more reliable.

Capillary chromatograms produced for the pyrolysate hydrocarbons range from C_1 (methane) out towards C_{35} but exhibit considerable variations. They are used to define whether a source rock will yield oil, condensate or gas. With this new technique, it is now possible to complete the evaluation of a source rock.

The data are tabulated and presented graphically. MINI-PYROLYSIS includes ppm thermal bitumen and ppm pyrolsate. PYROLYSIS also provides the above together with the temperature of peak pyrolysate evolution. The capillary chromatograms of the pyrolysate obtained by PYROLYSIS-GC are reproduced in the report. The Mini-Pyrolysis analysis is recommended as a screening technique.

L) CORRELATION STUDY ANALYSES

Oil to oil and oil to parent source rock correlation studies require high resolution analytical techniques. This requirement is satisfied by some of the analyses discussed above but others have been selected specifically for correlation work. Many of these analyses also provide information upon the character of the environment of deposition of the parent source rocks.

- detailed C_4-C_7 hydrocarbon (gasoline range) analysis. See Section E. Although these hydrocarbons can be affected by migrational/alteration processes, they commonly provide a very useful correlation parameter.
- capillary gas chromatography of the C_{15+} paraffin-naphthenes. See section J. The branched:normal paraffin distributions are used to "fingerprint" the samples.
- capillary chromatograms of whole oils and of the C_{8+} fraction of source rocks.
- capillary gas chromatography of C_{15+} aromatic hydrocarbons. Separate chromatograms of the hydrocarbons and of the sulphur-bearing species are reproduced.
- high pressure liquid chromatograms.
- mass spectrometric carbon isotope analyses of crude oil and rock extract fractions and of kerogen separations. A powerful tool for comparing hydrocarbons and correlating hydrocarbons to organic matter. With this technique the problem of source rock contamination can be avoided. The data are recorded on x-y or Galimov plots.
- mass fragmentograms (mass chromatograms) of fragment ions characteristic of selected hydrocarbon groups such as the steranes and terpanes. The fragmentograms provide a convenient and simple means of presenting detailed mass spectrometric data and are used as a sophisticated fingerprinting technique. This provides the ultimate resolution for correlating hydrocarbons and facilitates the examination of hydrocarbon classes.
- vanadium and nickel contents.

Suites of (rather than single) analyses are employed in correlation studies, the actual selection depending upon the complexity of the problem. See also section N.

M) ANALYSES FOR SPECIAL CASES

M-1) ELEMENTAL KEROGEN ANALYSIS

This analysis evaluates source quality, whether the sediments are oil or gas prone, the character of the organic matter and its level of thermal maturation. It is the chemical equivalent of the visual kerogen analysis. The pyrolysis analysis is generally preferred to this technique, both methods providing similar information.

M-2) SULPHUR ANALYSIS

The abundance of sulphur in source rocks and crude oils.

M-3) CARBONATE CONTENT

The mineral carbonate content of sediments is determined by acid treatment. These data are particularly useful when used in conjunction with organic carbon contents as a screening technique.

M-4) NORMAL PARAFFIN ANALYSIS

Following the removal of the branched paraffins and naphthenes from the total paraffin-naphthene fraction, a chromatogram of the normal paraffins is obtained. The resulting less complicated chromatogram facilitates the examination of normal paraffin distributions.

M-5) SOLID BITUMEN EVALUATION

Residual solid bitumen after crude oil is generated by three prime processes: the action of waters, gas deasphalting, thermal alteration. Thus it provides a means of determing the reservoir history of a crude and of evaluating whether adjacent traps will or will not be prospective for oil. In carbonate sections, where organic matter is sometimes sparse, this technique is also used to evaluate thermal maturation levels.

The analysis involves the determination of the solubility (in CS_2) of the solid bitumen and of the atomic hydrogen to carbon ratio of the insoluble fraction.

N) CRUDE OIL ANALYSIS

N-1) API GRAVITY

This can be performed upon large (hydrometer) and small (SG bottle, pycnometer) samples and even upon stains extracted from sediments (refractive index).

N-2) SULPHUR CONTENTS (ASTM E30-47)

N-3) POUR POINT (ASTM D97-66, IP15/67)

N-4) VISCOSITY (ASTM D445-72, IP71/75)

N-5) FRACTIONAL DISTILLATION

Graph of cumulative distillation yield against temperature. Five percent cuts taken for further analysis. Mass spectrometric studies of these fractions provide a detailed picture of the distribution of paraffins and of the various naphthene and aromatic groups within a crude, which is useful both for correlation and for refinery evaluation purposes.