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Title

SOURCE ROCK EVALUATION OF STATOIL 34/10-18 WELL

STATOIL
EXPLORATION & PRODUCTION
LABORATORY

by

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9.03.21 A

SOURCE ROCK EVALUATION OF STATOIL 34/10-18 WELL

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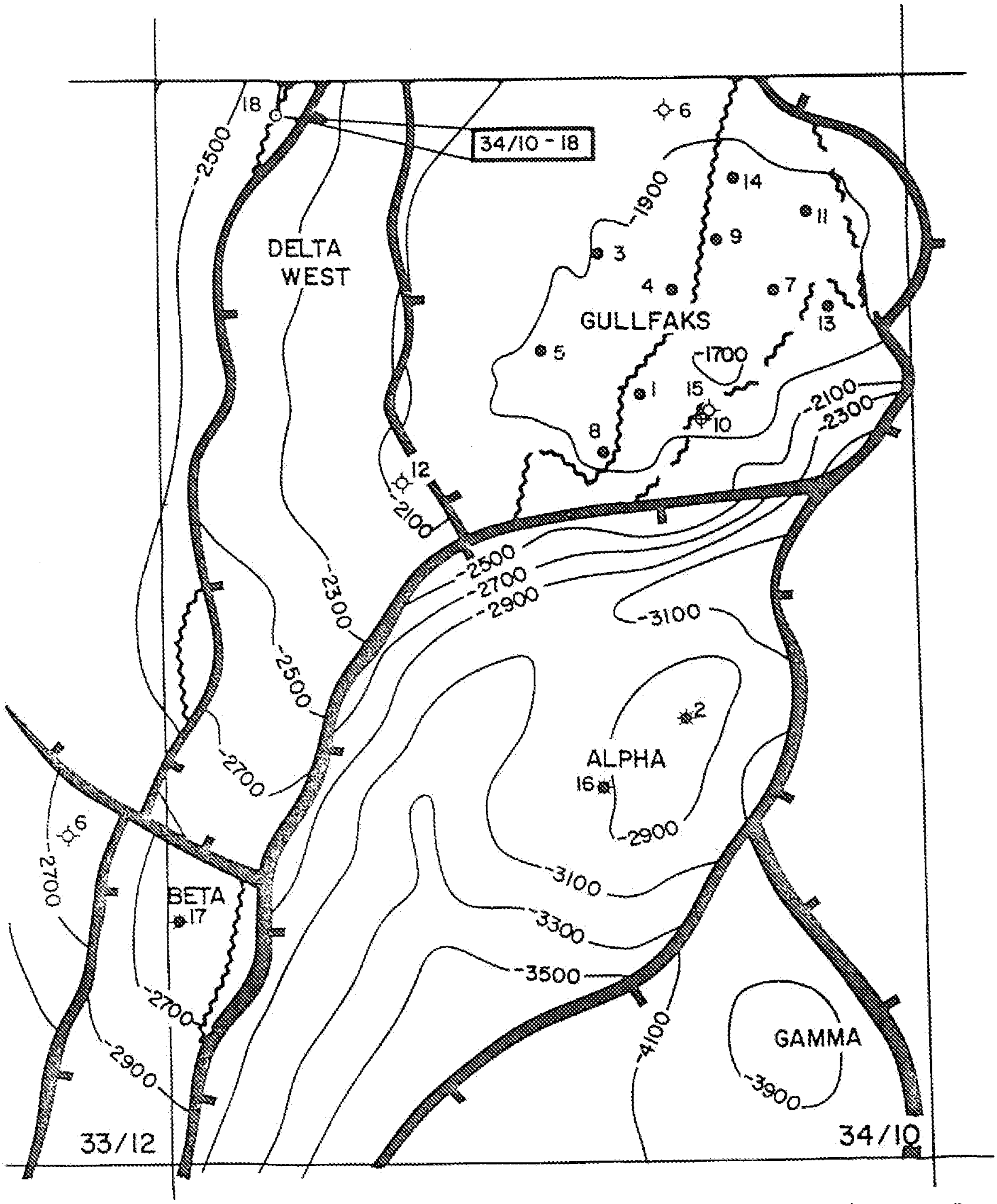
LOCATION MAP 34/10-18



SUMMARY

The sequence is immature above 2600m and marginally mature below this level, becoming early oil mature by TD. Peak generation (0.75 % Ro) in the area is estimated to be reached by 3700m.

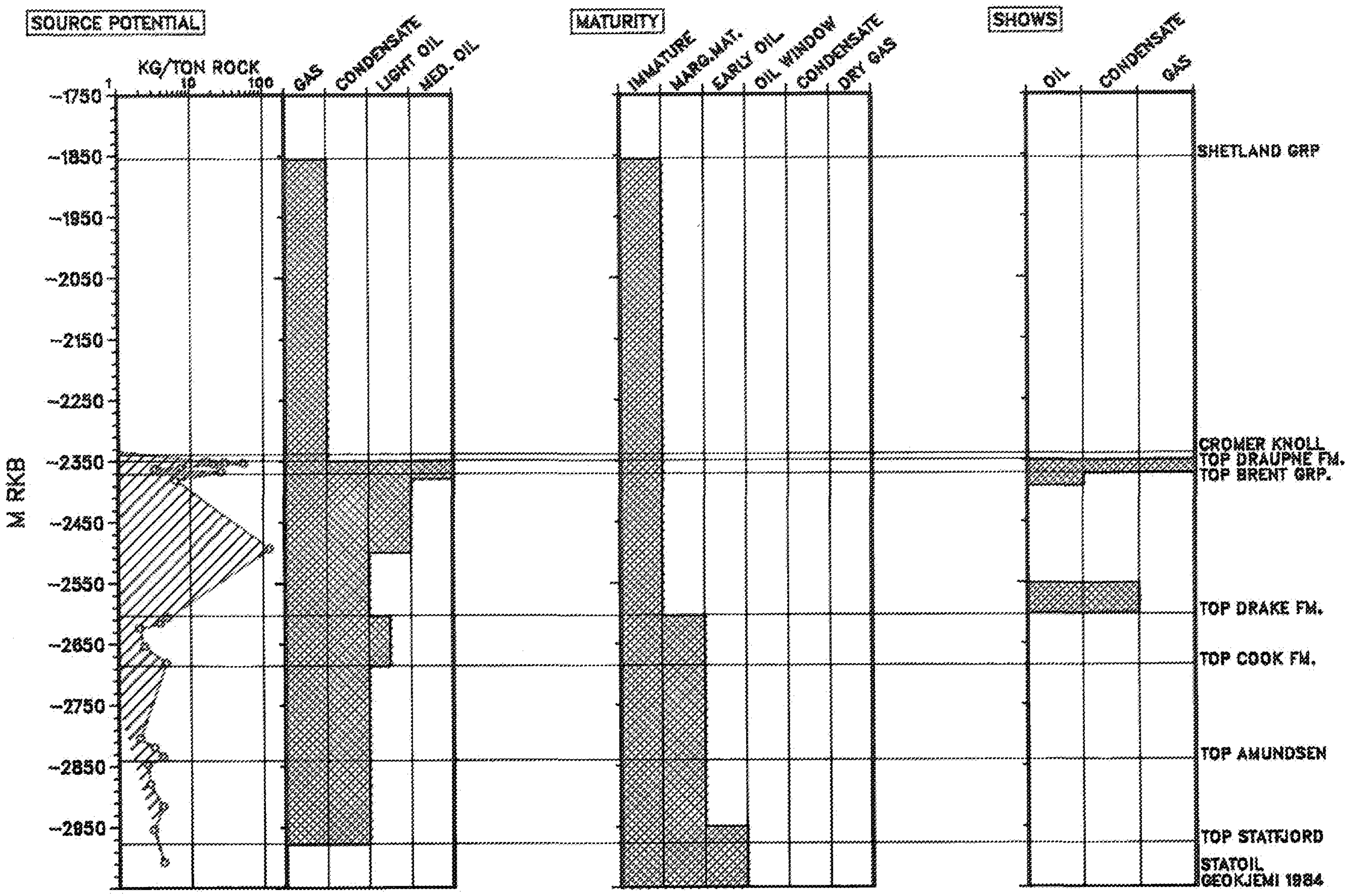
The DRAUPNE formation is the best source rock unit containing around 5 wt% total organic carbon and having a petroleum potential of up to 28kg hydrocarbons per ton of rock. It has predominant potential for OIL but GAS/CONDENSATE will be expected at high maturity levels.

Subsidiary source rocks include the BRENT COALS which in this well, unfortunately, are not present in significant amounts.
The DRAKE, COOK and AMUNDSEN formations have between 1 and 2 wt% total organic carbon and an average petroleum potential of 3.1 kg hydrocarbons per ton of rock. Expected hydrocarbons are dominantly GAS and minor LIGHT OIL.

MIGRATED HYDROCARBONS were detected at the boundary of the DRAKE SHALES and BRENT SANDSTONES.

Please refer to the summary diagram on the next page.

GEOCHEMICAL EVALUATION SUMMARY WELL 34/10-18



INTRODUCTION

This report presents a geochemical evaluation of well 34/10-18, (see location map) which terminated in the Statfjord Formation at 3025m and is recorded dry. The aims of the project were to identify and evaluate potential source rock intervals and to document shows of hydrocarbons. The interval between 2108m and 3008m was investigated according to the following analytical programme:

TABLE I ANALYTICAL PROGRAMME

ANALYSIS	NUMBER OF SAMPLES			
	Cuttings	SWC	Core	Total
Headspace and occluded gas	20			
Total organic carbon	8	7	4	19
Rock eval pyrolysis	8	7	4	19
Vitrinite reflectance		9	10	19
Kerogen description and TAI		9	10	19
Extraction, MPLC and GC	2	3	3	8

Most analyses were carried out at Statoils laboratory. The vitrinite reflectance and kerogen descriptions were done at IKU. Further checks on vitrinite reflectance were made by T. Throndsen at I.F.E.

Maturity was assessed using vitrinite reflectance, TAI, Tmax, headspace and occluded gas amounts and extraction data. Table II defines the interpretation of maturity used in this report.

TABLE II INTERPRETATION OF MATURITY PARAMETERS

MATURITY	PARAMETERS			
	Ro	TAI	Tmax	
Marginally mature	0.45	2-	430	
Early oil generation	0.50	2	435	(= Signif.mature)
Peak oil generation	0.75	2		
Condensate window	1.00	3-	450	
Dry gas	2.00	3		

Source rock potential is based on TOC, rock eval pyrolysis, visual kerogen analysis, and gas chromatograms of saturate components. Table III defines the interpretation of source rock potential used in this report.

TABLE III INTERPRETATION OF SOURCE POTENTIAL PARAMETERS

QUALITY	TOC	S1+S2	HC(ppm)
Poor source rock	0.5%	1	100
Fair source rock	0.5-1%	1-5	100-250
Medium good source rock	1.0-2%	5-10	
Good source rock	2.0-4%	10-25	250 500
Very good source rock	4 -12%	25-50	> 500
Oil shale or Coal	> 12%	> 50	

Migrated hydrocarbons were identified using headspace and occluded gas results, extraction data, and rock eval pyrolysis data.

Details of the results are presented in Tables 1 to 10 which follow the interpretation. Figures 1 to 8 follow the tables, and details of experimental procedures appear in the appendix at the back of the report.

RESULTS AND INTERPRETATION

MATURITY

The indicator of maturity most usually used is vitrinite reflectance. The values obtained from IKU are generally too high compared to TAI and the regional trend (Figure 1). Much of this vitrinite data is therefore unreliable (Figures 1 and 2).

TAI measurements suggest early oil maturity is reached by 2300m at Draupne Formation level. This is consistent with the regional trend and the better Ro values. TAI never reaches levels high enough to indicate peak generation maturity at depths penetrated by the well. The high values in the Brent sequence are due to reworking.

The amount of hydrocarbons in extracted material indicates that the Draupne has not begun to generate significant hydrocarbons. Yields are not higher at the base of the well possibly because kerogen type is poorer (Tables 4 and 5).

The Tmax values (Table 3) in the Draupne and Heather formations and the Brent group (above 2600m Rkb), being less than 430° C, suggest this part of the sequence is immature to marginally mature,. The Drake and Cook formations have a Tmax greater than 430° C and Tmax reaches 435° C at the deepest sample suggesting that early oil maturity is reached at 3000m in the Amundsen Formation. This value may be affected by kerogen type. The vitrinite reflectance measurements were checked by T.Throndsen at I.F.E. The same prepared sample blocks were measured after repolishing. The results from I.F.E. are

very diffrent from I.K.U's.(Figures 1 and 2), they are much lower and in accordance with the regional trend and the Tmax data.
These vitrinite reflectance measurements support the onset of marginal maturity at about 2600 m, and early oil maturity at about 3000m.

To conclude, the sediments are marginally mature below 2600m, and early oil mature at TD. Peak maturity 0,75 % Ro is estimated, from the regional trend, to be reached below 3700m.

SOURCE ROCK POTENTIAL

The headspace and occluded gas and C15+ concentrations suggest the presence of significant source rocks in the Draupne Fm., Dunlin Gp.- and Statfjord Fm. (Figure 3).

The Shetland group consists of interbedded grey-brown shales and claystones which contain Type IV kerogen. The hydrogen index is 50 which indicates very little hydrocarbon potential. The organic matter is composed of predominantly reworked wood, wood and spores, with some algal and amorphous material. There is very poor potential for gas.

The Draupne formation consists of dark grey-brown shales and claystones which contain Type II/III kerogen with a rich potential to generate hydrocarbons. The kerogen is a mixture of algal-amorphous material with some wood, reworked wood and pollen imparting potential for oil and minor gas. At high levels of maturity the Draupne has rich potential for gas/condensate. This is the best source rock with organic content between 4 and 7 wt % and petroleum potential up to 28 kg hydrocarbons per ton rock.

The Heather formation consists of interbedded dark grey shales which contain Type III/IV kerogen with poor potential for hydrocarbons. The kerogen is made up of dominantly wood and reworked wood, some pollen and spores and minor amorphous material and cysts. It has potential for light oil and gas.

The Brent group consists of interbedded carbonaceous shales with poor hydrocarbon potential and hydrogen rich coals with rich potential. The coals can contain as much as 34 wt % total organic carbon and can generate up to 118 kg. hydrocarbons per ton rock. However, coals form only a small proportion of the sequence. The kerogen consists of wood, cuticle, pollen and spores with minor algae and thus will generate light oil and gas.

The Drake formation consists of variegated grey shale and claystone which contain Type III kerogen with fair hydrocarbon potential. The organic content is between 1 and 2 wt % and the petroleum potential between 1,9 and 4,6 kg hydrocarbons per ton rock. The kerogen contains wood, reworked wood, pollen and spores with minor algae. The formation therefore has the potential to generate gas and minor light oil.

The Cook formation consists of interbedded grey-brown shales with coal stringers and off-white sandstones. The shales contain Type III kerogen with fair potential for hydrocarbons. The organic content is about 1,8 wt % and petroleum potential between 1,9 and 3,9 kg hydrocarbons per ton rock. The kerogen is composed of wood, cuticle, pollen and spores, with minor algae and amorphous material. Thus there is potential to generate gas with minor amounts of oil.

The Amundsen formation consists of interbedded grey-brown claystones and minor white sandstone. The claystones contain Type III kerogen with fair potential to generate hydrocarbons. Total organic carbon varies between 0,9 and 2,1 wt % and petroleum potential between 2.4 and 2,9 kg hydrocarbons per ton rock. The kerogen contains dominantly algae and amorphous material with wood, reworked wood and cuticle giving potential to generate gas with minor oil.

The Statfjord formation includes dark grey-brown shales containing Type III kerogen. Only one sample has been analysed and it has total organic carbon of 1.5 wt % and petroleum potential of 4.0 kg hydrocarbons per ton rock. This implies fair potential for gas and possibly minor oil.

The Rock Eval pyrolysis data is presented in Figure 4 and in Table 3. Kerogen descriptions are presented in Tables 8 and 9 and Table IV shows a summary of kerogen typing parameters and oil/gas potential.

TABLE IV SUMMARY OF KEROGEN TYPING PARAMETERS

FORMATION	DEPTH (mKB)	KEROGEN TYPE	KEROGEN DESCRIPTION	POTENTIAL
Shetland Gp	1878-2340	IV/III	WR,W,P,Am,Al	poor gas
Draupne Fm	2351-2355	II/III	Al,Am,W,P	good, oil/gas
Heather Fm	2355-2372,5	III	W,WR,P,S,Am,Al	fair oil/gas
Brent Gp	2372,5-2604	III/II	W,Cut,P,S,Al	rich light oil from coals/gas
Drake Fm	2604-2687,5	III/II	W/WR,S,P,Al	fair-good gas with minor light oil
Cook Fm	2687,5-2842,5	III/II	W,Cut,P,S,Al,Am	fair gas with minor oil
Amundsen Fm	2842,5-2978	III/II	Al,Am,W,Cut	fair oil and gas
Statfjord Fm	2978-3025	II/III	N.D.	fair gas minor oil

KEY: W=wood, WR=reworked wood, P=pollen, S=spores, Cut=cuticle, Al=algae, Am=amorphous.

Gas chromatograms of the saturate fraction of extracts clearly show the contrast in kerogen types between the Draupne and other formations. The Draupne (2353m) has a typical light oil n-alkane distribution with characteristically high pristane/nC17 and phytane/nC18. The n-alkane distribution is uni-modal with low proportions of higher weight compounds. The Drake on the other hand contains high amounts of heavier weight n-alkanes which have a strong odd over even preference typical of terrestrial organic matter. The Cook and Amundsen formations contain a mixture of the two types with chromatograms of intermediate character. The Statfjord again has a dominant terrestrial component. The gas chromatograms are presented in Figures 5 to 8. Extraction data is presented in Tables 4 to 7.

MIGRATED HYDROCARBONS

The Shetland Group (only one sample analysed) has a high production index but S1 is too low to suggest migrated hydrocarbons in the sequence. The high gas content in this sample could be gas coming from the Draupne formation which is 20m below. The Draupne formation has a good to rich organic carbon content, which accounts for the high amounts of hydrocarbons in this formation.

There is Rock-eval data from two coal samples in the Brent group which do not indicate the presence of migrated hydrocarbons. Extracted sandstone core from the Brent where oil stains were recorded yielded very low amounts of C15+ hydrocarbons. The chromatogram indicates traces of stripped oil and contamination of the core sample visible due to the low extract content Figure 5. The stripped oil could indicate the previous presence of oil which has been stripped by migrating gas.

The Drake formation consists mostly of shale, but grades into sandstone at the top. There is a high concentration of gas and the production index is also high. This indicates migrated hydrocarbons.

The analysis of the samples from Cook, Amundsen and Statfjord formations does not give any indication of migrated hydrocarbons.

CONCLUSIONS

The Draupne formation is a good source rock for oil and gas. It is marginally to early oil mature in this well and contains shows of gas generated in situ.

The Brent group contains occasional coals which have rich potential for light oil and gas. They are marginally mature.

The Drake formation has fair to good potential to generate gas and possibly minor amounts of light oil.

The Cook, Amundsen and Statfjord formations have fair potential for gas with minor oil. The Cook and Amundsen formations are marginally mature. The Statfjord formation is early oil mature.

No significant hydrocarbons have been generated in this well but peak hydrocarbon generation will take place at depths below 3700m off structure. Residual hydrocarbons suggest that oil and gas have migrated through the reservoir section.

- LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS -

- TABLE IA - CANNED CUTTINGS - WELL 34/10-18 -

SAMPLE	DEPTH		TOC	LITHOLOGY
S39	2300-15 m	> 2mm		50% CLYST: gry,slty,non calc, micromica 45% MRL: lt gry-wh 5% DOL: brn, hd tr: SST, SLST, PYR
		> 125μ		a/a Contaminated by fiber,black "flakes"(mudadditatives?) metal
S40	2315-30 m	> 2mm	,79	95% SLST: gry, sl.calk 5% DOL tr: PYR nod
		> 125μ		a/a Contaminated by asfalt, fiber, metal, "flakes of paint"
S41	2610-25 m	> 2mm	1,66	95% CLYST/SHL: med-lt gry, non calc, occ slty tr: SST crs grns, PYR nod, DOL
		> 125μ		50% SD: cs grns 45% CLYST/SHL a/a tr: PYR nod, DOL, LCM (+ asfalt, fiber)
S42	2625-40 m	> 2mm		95% CLYST/SHALE: gry-med gry, slty, micromica tr: SST,SLST,COAL
		> 125μ		a/a tr: a/a + LST, mica
S43	2640-55 m	> 2mm	1,71	100% CLYST : dk-med gry slty, sl calc tr:LST, DOL, PYR nod, SST, COAL
		> 125μ		95% CLYST: a/a tr:a/a

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SAMPLE	DEPTH		TOC	LITHOLOGY
S44	2655-70 m	> 2mm		100% SHL/CLYST :gry-med gry, sl calc, slty tr:a/a
		> 125µ		95% SHL/CLYST: a/a tr:a/a
S45	2670-85 m	> 2mm		a/a tr: LST/CALC
		> 125µ		95% SHL/CLYST: a/a tr: SST, LST
S46	2775-90 m	> 2mm		60% CLYST: med gry, sl cslc, gry- grn, ls slty 40% SST : calc tr: calc cly, SLST, PYR nod, COAL (asfalt)
		> 125µ		70% SD, SST 30% CLYST: a/a tr: a/a, mica, asfalt, fiber
S47	2790-05 m	> 2mm	1,84	90% CLYST: gry-lt gry, sl slty, micromica 10% SST : calc tr: LST, DOL, PYR nod,(+asfalt)
		> 125µ		50% CLYST: a/a 45% SD, SST tr: a/a
S48	2805-20 m	> 2mm	1,96	100% CLYST :lt/med gry-gry brn, sl slty, micromica tr: LST, DOL, SST
		> 125µ		95% CLYST: a/a tr: a/a (+ asfalt, fiber)
S49	2820-35 m	> 2mm	1,64	100% CLYST: a/a tr: a/a
		> 125µ		95% CLYST: a/a tr: a/a (Contamination look at 2815 M in completion report)

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SAMPLE	DEPTH		TOC	LITHOLOGY
S50	2835-50 m	> 2mm		100% CLYST: gry/gry-brn, sl calc, micromica tr: SD,LST
		> 125µ		a/a
S51	2850-65 m	> 2mm		100% CLYST: gry, sl calc, micromica tr: SLST, LST
		> 125µ		95% CLYST: a/a 5% LST: glauconitic tr:PYR, SD, COAL
S52	2865-80 m	> 2mm	1,39	100% CLYST/SHL : med- lt gry, gry brn, sl slty, micromica tr: LST, SST slty, COAL
		> 125µ		95% CLYST: a/a tr: a/a + PYR nod (Contaminated by asfalt + fiber)
S53	2880-95 m	> 2mm		100% CLYST: gry, grybrn, sl calc, micromica tr: SLST, SST
		> 125µ		95% CLYST: a/a tr: a/a + PYR nod, LST
S54	2895-10 m	> 2mm		100% CLYST: a/a tr: SLST, LST
		> 125µ		95% CLYST: a/a 5% LST
S55	2910-25 m	> 2mm		100% CLYST:a/a tr: LST
		> 125µ		95% CLYST: a/a 5% LST, SD, PYR
S56	2925-40 m	> 2mm		100% CLYST: a/a tr : LST (+ asfalt)
		> 125µ		90% CLYST: a/a 5% LST tr: SD, PYR (+ asfalt)

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SAMPLE	DEPTH	TOC	LITHOLOGY
S57	2940-55 m > 2mm	2,12	100% CLYST: med gry-gry brn, slty, micromica tr: LST, DOL, SLST, SST, COAL
	> 125µ		95% CLYST: a/a tr: LST, DOL, PYR nod, SST,COAL
S58	2955-70 m > 2mm		100% CLYST: a/a tr: LST, SST
	> 125µ		80% CLYST: a/a 15% SST 5% LST tr: SD, PYR

- LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS -

- TABLE IB - SIDEWALL CORES -

SAMPLE	DEPTH		TOC	LITHOLOGY
S64	2494	m	34.08	COAL, blk, brittle, shiny, pyr
S65	2607	m	2.17	CLYST/SH.,v.dk.gry/brn, slty, carb, pyr, micromic , hd, non calc, coaliferous,dull.
S66	2616	m	1.99	CLYST: v. dk gry-blk, sli slty, micromic carb hd, non calc.
S67	2682	m	1.10	CLYST: dk gry, only finely slty, v.micromic frm-mod hd, non calc.
S68	2847	m	1.10	Clyst: med gry/brn. slty, mic, micromic sub non-fis calc.
S69	2916	m	0.92	SHL: med gry/brn,slty, mic, micromic frm, sub fiss, sli calc.
S70	3008	m	1.52	SHL: dk gry brn, slty, v. micromic, fm-hd, non-sli calc.

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- LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS -

- TABLE IC - CORE SAMPLES -

SAMPLE	DEPTH	TOC	LITHOLOGY
S71	2351.5 m	4.21	SHL: lt grn- gry, hd, mod calc, shiny, cleavage, micromic, glauc.
S72	2353 m	6.90	SHL: blk, shiny ,mod hd, brittle,striations, non calc, slty, mic and micro mic.
S73	2363 m	2.72	SHL: dk gry-blk, to gry, hd-frm sub fiss, slty, pyr, coaliferous.
S74	2382 m	10.29	COAL
S79	2390.1 m		SST: oil stained

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TABLE 2 CONCENTRATION (μ L GAS/KG ROCK) OF C1-C7 HYDROCARBONS.

DEPTH	C1	C2	C3	IC4	NC4	C5+	IC4/NC4	WETNESS
SHETLAND GP. 1878-2340 m								
2315	7134	1628	3242	848	1952	2402	.43	51.81
2330	63362	13538	24442	6156	14593	14268	.42	48.10
DRAKE FM. 2604.0-2687.5 m								
2625	22598	10327	7775	1131	1366	626	.83	47.69
2640	2563	1411	1914	368	686	560	.54	63.08
2655	1542	524	1064	264	509	582	.52	60.49
2670	892	271	758	230	449	638	.51	65.69
2685	1017	377	665	248	386	764	.64	62.24
COOK FM. 2687.5-2842.5 m								
2790	10947	3162	2433	532	666	1345	.80	38.29
2805	8928	2921	2593	574	689	1233	.83	43.15
2820	15875	5286	3720	869	1075	2344	.81	40.82
2835	5865	2153	1948	506	454	1327	1.11	46.32
AMUNDSEN FM. 2842.5-2978 m								
2850	493	223	471	206	296	144	.70	70.81
2865	3431	1034	888	258	274	539	.94	41.70
2880	4130	1260	1229	348	539	1158	.65	44.98
2895	4400	1184	1288	459	465	931	.99	43.56
2910	506	126	164	76	91	269	.84	47.46
2925	176	28	52	29	40	141	.72	45.85
2940	3243	896	917	315	336	683	.94	43.18
2955	5424	1148	1144	395	441	920	.90	36.58
2970	3401	1216	925	205	303	523	.68	43.79

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TABLE 3 DATA FROM ROCK EVAL PYROLYSE

DEPTH	S1	S2	S3	TOC	HI	OI	PP	PI	TMAX
SHETLAND GP. 1878-2340 m									
2330	.06	.39	.48	.79	49	60	.4	.13	428
DRAUPNE FM. 2351-2355 m									
2351	2.71	13.41	.39	4.21	318	9	16.1	.17	416
2353	2.76	25.95	.97	6.90	376	14	28.7	.10	417
2354	3.66	48.18	2.12	11.21	429	18	51.8	.07	415
HEATHER FM. 2355-2372 m									
2355	2.82	17.36	1.85	7.25	239	25	20.2	.14	416
2361	1.26	5.95	1.74	4.43	134	39	7.2	.17	431
2363	.55	2.62	.82	2.72	96	30	3.2	.17	422
2365	.86	2.52	.92	2.41	104	38	3.4	.25	423
2368	3.04	22.34	2.21	9.98	223	22	25.4	.12	416
BRENT GP. 2372.5-2604 m									
2382	.74	5.29	2.29	10.29	51	22	6.0	.12	423
2494	9.80	108.40	6.47	34.08	318	18	118.2	.08	429
DRAKE FM. 2604.0-2687.5 m									
2607	1.05	3.62	.58	2.17	166	26	4.7	.22	429
2616	.30	3.34	1.02	1.99	167	51	3.6	.08	432
2625	.08	1.82	.21	1.66	109	12	1.9	.04	432
2655	.08	2.13	.51	1.71	124	29	2.2	.04	432
2682	.62	3.77	.54	1.10	342	49	4.4	.14	431
COOK FM. 2687.5-2842.5 m									
2805	.06	1.77	.41	1.84	96	22	1.8	.03	432
2820	.11	2.94	.57	1.96	150	29	3.0	.04	431
2835	.17	3.67	.58	1.64	223	35	3.8	.04	430

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DEPTH	S1	S2	S3	TOC	HI	OI	PP	PI	TMAX
AMUNDSEN FM. 2842.5-2978 m									
2847	.14	2.34	.98	1.09	214	89	2.5	.06	433
2880	.10	2.46	.53	1.39	176	38	2.6	.04	432
2916	.39	3.48	.61	.92	378	66	3.9	.10	433
2955	.11	2.75	.53	2.12	129	25	2.9	.04	432
STATFJORD FM. 2978.0-TD									
3008	.52	3.46	.29	1.52	227	19	4.0	.13	435

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TABLE 4 - AMOUNT OF EOM AND CHROMATOGRAPHIC FRACTIONS - - (IN PPM OF ROCK)

		HYDROCARBONS				
DEPTH	EOM	SAT	ARO	HC	NON.HC	TOC
DRAUPNE FM. 2351-2355 m						
2353	4817	870	1335	2205	2612	6.90
BRENT GP. 2372.5-2604 m						
2390	67	6	3	9	58	
DRAKE FM. 2604.0-2687.5 m						
2616	526	141	78	219	307	1.99
2682	1590	273	215	488	1102	1.10
COOK FM. 2687.5-2842.5 m						
2835	1823	423	404	827	996	1.64
AMUNDSEN FM. 2842.5-2978 m						
2880	798	265	248	513	285	1.39
STATFJORD FM. 2978.0-TD						
3008	991	183	119	302	689	1.52

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- TABLE 5 - AMOUNT OF EOM AND CHROMATOGRAPIC FRACTIONS-

- (IN MG/G TOC) -

DEPTH	EOM	HYDROCARBONS SAT	ARO	HC	NON HC
DRAUPNE FM. 2351-2355 m					
2353	69.81	12.61	19.35	31.96	37.84
BRENT GP. 2372.5-2604 m					
2390	n.d	n.d	n.d	n.d	n.d
DRAKE FM. 2604.0-2687.5 m					
2616	26.43	7.09	3.92	11.01	15.43
COOK FM. 2687.5-2842.5 m					
2682	144.55	24.82	19.55	44.36	100.19
2835	111.16	25.79	24.63	50.43	60.73
AMUNDSEN FM. 2842.5-2978 m					
2880	57.41	19.06	17.84	36.91	20.50
STATFJORD FM. 2978.0-TD					
3008	65.20	12.04	7.83	19.87	45.33

TABLE 6 COMPOSITION OF EXTRACTED MATERIAL.

DEPTH	% SAT	% ARO	% HC	% NON HC	SAT/ARO	HC/NHC
DRAUPNE FM. 2351-2355 m						
2353	18.1	27.7	45.8	54.2	.7	.8
BRENT GP. 2372.5-2604 m						
2390	9.0	4.5	13.4	86.6	2.0	.2
DRAKE FM. 2604.0-2687.5 m						
2616	26.8	14.8	41.6	58.4	1.8	.7
2682	17.2	13.5	30.7	69.3	1.3	.4
COOK FM. 2687.5-2842.5 m						
2835	23.2	22.2	45.4	54.6	1.1	.8
AMUNDSEN FM. 2842.5-2978 m						
2880	33.2	31.1	64.3	35.7	1.1	1.8
STATFJORD FM. 2978.0-TD						
3008	18.5	12.0	30.5	69.5	1.5	.4

WELL 34/10-18

TABLE 7 TABULATION OF DATA FROM GASCHROMATOGRAMS

DYBDE	CPI	PRIS/PHY	PRIS/C-17	PHY/C-18
DRAUPNE FM. 2351-2355 m				
2353	1.3	1.4	1.3	1.36
BRENT GP. 2372.5-2604 m				
2390	.9	5.5	2.9	.08
DRAKE FM. 2604.0-2687.5 m				
2616	1.8	3.6	1.1	.43
2682	1.9	3.9	1.4	.49
COOK FM. 2687.5-2842.5 m				
2835	1.5	1.8	1.7	1.36
AMUNDSEN FM. 2842.5-2978 m				
2880	1.6	2.0	1.3	.86
STATFJORD FM. 2978.0-TD				
3008	1.4	5.7	2.7	.45

TABLE 8 VITRINITE REFLECTANCE AND MATURATION INDEX.

SAMPLE NO.	DEPTH (M)	VITRINITE REFLECTANCE (IKU)	(T.T)	THERMAL MATURATION INDEX
S160	2108	.54	*	1+
S161	2234	.60	.38	1+/2-
S162	2334	.55	.45	1+,1+/2-,2
DRAUPNE FM. 2351-2355 m				
S163	2351	.58	.35	1+,1+/2-,2-
S72	2353	.61	.42	1+,1+/2-
S166	2354	.52	.20	1+
S167	2355	.58	.39	1+,1+/2-,2
HEATHER 2355-2372 m				
S168	2361	.71	.40	1+,1+/2-,2
S73	2363	.63	.43	1+/2-
S169	2366	.71	.43	2
S170	2368	.65	.41	1+,2,2+
BRENT GP. 2372.5-2604 m				
S74	2382	.64	.39	2,2+
S171	2388	.60	.35	1+/2-
S163	2451	.69	.36	2-,2-/2,2
S64	2494	.49	.47	1+/2-,2,2/2+
DRAKE FM. 2604.0-2687.5 m				
S65	2607	.66	.42	2
COOK FM. 2687.5-2842.5 m				
S164	2787	.77	.38	1+,1+/2-
AMUNDSEN FM. 2842.5-2978 m				
S69	2916	.61	.49	1+/2-
S165	2977	.62	.52	1+/2-

* 0.66 for inertinite, no vitrinite present T.T

WELL 34/10-18

MICROSCOPIC ANALYSIS - REFLECTED LIGHT (NORMAL + U.V)

Table no.: 9
Well no.: 34/10-18

IKU No.	Depth m/ft	Dominant lithology	Ro value (%)	Population size	Dominant maceral type	Liptinites UV Fluorescence	Liptinites Content	Additive	Bitumen	Cave
B-4561 swc	2108.0	Kerogen Isolate	0.54	22	Vitrinite + Bitumen					
B-4562 swc	2234.5	Kerogen Isolate	0.60	10	Vitrinite (reworked?)					
B-4563 swc	2334.0	Kerogen Isolate	0.55	15	Vitrinite + Liptinite					
B-4564 core	2351.5	Kerogen Isolate	0.58	6	Liptinite + Amorphous material					
B-4565 core	2353.0	Kerogen Isolate	0.61	19	Liptinite + Amorphous material					
B-4566 core	2354.0	Kerogen Isolate	0.52	5	Liptinite					
B-4567 core	2355.2	Kerogen Isolate	0.58	23	Amorphous material					
B-4568 core	2361.0	Kerogen Isolate	0.71	15	Vitrinite (reworked?)					
B-4569 core	2363.0	Kerogen Isolate	0.63	4	Vitrinite (reworked?)					
B-4570 core	2366.0	Kerogen Isolate	0.71	21	Vitrinite (reworked?)					
B-4571 core	2368.0	Kerogen Isolate	0.65	19	Vitrinite (reworked?) + Amorphous material					
B-4572 core	2382.8	Kerogen Isolate	0.64	6	Vitrinite					
B-4573 core	2388.5	Kerogen Isolate	0.60	32	Liptinite					
B-4574 swc	2451.0	Kerogen Isolate	0.69	31	Liptinite + Amorphous material					
B-4575 swc	2494.5	Kerogen Isolate	0.49	11	Liptinite + Vitrinite					

137/H/jbl/1

MICROSCOPIC ANALYSIS – REFLECTED LIGHT (NORMAL + U.V)

Table no.: 9
Well no.: 34/10-18

IKU No.	Depth m/ft	Dominant lithology	Ro value (%)	Population size	Dominant maceral type	Liptinites UV Fluorescence	Liptinites Content	Additive	Bitumen	Cave
B-4576 swc	2607.0	Kerogen Isolate	0.66	12	Vitrinite (reworked?) + Amorphous material					
B-4577 swc	2787.0	Kerogen Isolate	0.77	33	Vitrinite (reworked?) + Liptinite					
B-4578 swc	2916.0	Kerogen Isolate	0.61	21	Amorphous material + Vitrinite					
B-4579 swc	2977.0	Kerogen Isolate	0.62	11	Amorphous material + Vitrinite					

```
[illegible] 4521 [illegible]108.05 34/10-18
    |
14- |
    |
12- |
    |          U
10- |          U
    |          U
 8- |          U*
    |          U
 6- |          U
    |          U  u
 4- |          UU u
    |         UUUUu
 2- |         UUUUu  u
    |        UUUUUu  u        u
 0--+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

PP LOW HIGH LIT #VAL MEAN STDV
Y 0.44 0.64 ALL   22 0.54 0.05
          OVERALL 30 0.60 0.15

ORDERED VALUES FOLLOW:

 0.44U 0.47U 0.48U 0.49U 0.50U 0.50U 0.51U 0.51U 0.53U 0.54U 0.54U 0.54U 0.54U
 0.54U 0.54U 0.58U 0.59U 0.59U 0.59U 0.62U 0.62U 0.63U 0.65u 0.66u 0.67u 0.67u
 0.67u 0.83u 0.84u 1.24u
```

[illegible]

```
   |
14-|
   |
12-|
   |
10-|
   |
 8-|
   |
 6-|
   |                  u  u
 4-|             U    uu u
   |             U    uu u    u
 2-|          U UU  u uu u  u u
   |         UUUUU uuuuuuuuuuuuuu
 0-+----+----+----+----+----+----+----+----+----+----+---
  0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
PF LOW HIGH LIT #VAL MEAN STDV
Y 0.48 0.70 ALL    10 0.60 0.08
       OVERALL 39 0.94 0.26
```

ORDERED VALUES FOLLOW:

```
0.48U 0.50U 0.52U 0.56U 0.63U 0.63U 0.66U 0.68U 0.69U 0.69U 0.76u 0.81u 0.81u
0.85u 0.90u 0.91u 0.91u 0.92u 0.94u 0.95u 0.96u 0.98u 0.99u 1.01u 1.05u 1.06u
1.06u 1.07u 1.07u 1.10u 1.15u 1.21u 1.22u 1.29u 1.30u 1.32u 1.33u 1.39u 1.43u
```

```
    i
14-i
    i
12-i
    i
10-i
    i
 8-i
    i
 6-i
    i                  u
 4-i          U    u u  u u
    i        U U U u u  u u
 2-i       UU UUU uuu  u u
    i       UUUUUU uuuuuuuuu       u
 0-----------+-------+-------+-------+-------+-------+-------+-------+-------+-------+-------+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
FP LOW HIGH LIT #VAL MEAN STDV
Y 0.41 0.68 ALL    15 0.55 0.09
          OVERALL 39 0.81 0.26
```

ORDERED VALUES FOLLOW:

```
 0.41U 0.43U 0.46U 0.46U 0.47U 0.51U 0.55U 0.56U 0.57U 0.59U 0.60U 0.64U 0.65U
 0.66U 0.67U 0.76u 0.76u 0.78u 0.79u 0.80u 0.84u 0.86u 0.86u 0.87u 0.87u 0.90u
 0.98u 1.00u 1.01u 1.02u 1.03u 1.04u 1.09u 1.10u 1.12u 1.12u 1.12u 1.19u 1.53u
```

```
    |
14- |
    |
12- |
    |
10- |
    |
 8- |
    |
 6- |
    |
 4- |
    |              U  uu
 2- |              U  uu u  u
    |           UU UUuuuuu uu u
 0--+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+---
    0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
FP LOW HIGH LIT #VAL MEAN STDV
Y 0.48 0.66 ALL     6 0.58 0.07
          OVERALL 20 0.80 0.20
```

ORDERED VALUES FOLLOW:

0.48U 0.50U 0.60U 0.62U 0.64U 0.65U 0.71u 0.75u 0.76u 0.78u 0.81u 0.82u 0.84u
0.88u 0.91u 0.94u 1.04u 1.07u 1.08u 1.19u

```
[illegible]
    i
 14-i
    i
 12-i
    i
 10-i
    i
  8-i
    i
  6-i              U    u
    i             UUU    u
  4-i             UUU    u
    i             UUU   uu
  2-i             UUU uuuuu   u
    i           UUUUUUuuuuu uuu     uu
  0--+-------+-------+-------+-------+-------+-------+-------+-------+-------+-------+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

FF LOW HIGH LIT #VAL MEAN STDV
Y 0.49 0.72 ALL    19 0.61 0.06
          OVERALL 40 0.80 0.23

ORDERED VALUES FOLLOW:

 0.49U 0.51U 0.55U 0.55U 0.55U 0.56U 0.58U 0.60U 0.61U 0.61U 0.63U 0.64U 0.66U
 0.66U 0.67U 0.67U 0.67U 0.68U 0.71U 0.75u 0.75u 0.82u 0.83u 0.84u 0.85u 0.86u
 0.87u 0.89u 0.89u 0.89u 0.90u 0.91u 0.96u 0.97u 1.08u 1.12u 1.13u 1.18u 1.38u
 1.42u
```

IKU

[illegible]

```
   |
14-|
   |
12-|
   |
10-|
   |
 8-|
   |
 6-|
   |
 4-|
   |
 2-|         U      u
   |       UUU  U   u
 0-+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
PF LOW HIGH LIT #VAL MEAN STDV
Y 0.43 0.69 ALL     5 0.52 0.10
          OVERALL   7 0.61 0.16
```

ORDERED VALUES FOLLOW:

```
 0.43U 0.47U 0.51U 0.53U 0.68U 0.80u 0.83u
```

[illegible]

```
    i
14-i
    i
12-i
    i
10-i
    i
 8-i
    i
 6-i             A
    i             AAA a
 4-i             AAA a  a
    i          A  AAA a  a
 2-i          A AAAA a aa
    i          AAAAAAAaaaaa aa    a
 0--+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
FP LOW HIGH LIT #VAL MEAN STDV
Y 0.40 0.71 ALL   23 0.56 0.09
          OVERALL 39 0.72 0.20
```

ORDERED VALUES FOLLOW:

```
0.40A 0.42A 0.42A 0.45A 0.52A 0.53A 0.56A 0.56A 0.57A 0.59A 0.59A 0.59A 0.60A
0.60A 0.63A 0.63A 0.63A 0.65A 0.66A 0.67A 0.68A 0.69A 0.70A 0.75a 0.77a 0.78a
0.78a 0.78a 0.82a 0.85a 0.87a 0.93a 0.93a 0.93a 0.94a 0.96a 1.05a 1.13a 1.34a
```

```
   |
14-|
   |
12-|
   |
10-|
   |
 8-|
   |
 6-|
   |                  a
 4-|               AA aa
   |              AAA aaaa aa
 2-|              AAAAaaaa aa a
   |            AA AAAAaaaa aa a a a
 0--+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

FP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.54	0.81	ALL	15	0.71	0.06
			OVERALL	40	0.93	0.22

ORDERED VALUES FOLLOW:

0.54A 0.55A 0.67A 0.68A 0.68A 0.70A 0.72A 0.73A 0.74A 0.76A 0.77A 0.79A 0.79A
0.80A 0.80A 0.87a 0.88a 0.88a 0.88a 0.93a 0.93a 0.93a 0.94a 0.94a 0.95a 0.96a
0.96a 1.01a 1.01a 1.02a 1.10a 1.12a 1.12a 1.16a 1.18a 1.18a 1.26a 1.29a 1.39a
1.45a

[illegible]

```
   i
14-i
   i
12-i
   i
10-i
   i
 8-i
   i
 6-i
   i
 4-i                  a    a
   i                 aaa  aa a
 2-i                A aaaa  aaaa
   i               AAA aaaaaaaaaa
 0-+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
FP LOW HIGH LIT #VAL MEAN STDV
Y 0.59 0.67 ALL     4 0.63 0.03
          OVERALL  30 0.95 0.19
```

ORDERED VALUES FOLLOW:

0.59A 0.61A 0.64A 0.66A 0.75a 0.77a 0.81a 0.83a 0.83a 0.87a 0.88a 0.88a 0.89a
0.91a 0.92a 0.94a 0.98a 1.01a 1.05a 1.05a 1.07a 1.10a 1.10a 1.13a 1.14a 1.19a
1.19a 1.21a 1.21a 1.23a

```
      i
 14-i
      i
 12-i
      i
 10-i
      i
  8-i
      i
  6-i
      i                    A aa
  4-i                      A aa
      i                 AAAA aa a a
  2-i             A    AAAAAAaa aaa
      i          AAA AAAAAAAaa aaa a
  0--+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
PP LOW HIGH LIT #VAL MEAN STDV
Y 0.40 0.90 ALL    21 0.71 0.14
          OVERALL 40 0.67 0.21
```

ORDERED VALUES FOLLOW:

```
0.40A 0.49A 0.50A 0.50A 0.60A 0.68A 0.69A 0.69A 0.71A 0.72A 0.72A 0.75A 0.76A
0.77A 0.81A 0.81A 0.81A 0.84A 0.84A 0.87A 0.89A 0.91a 0.91a 0.92a 0.92a 0.94a
0.96a 0.96a 0.96a 0.96a 0.99a 1.05a 1.07a 1.08a 1.14a 1.14a 1.19a 1.19a 1.19a
1.26a
```

[illegible]

```
   i
14-i
   i
12-i
   i
10-i
   i
 8-i
   i
 6-i                A
   i                A
 4-i                A  a  a
   i               AAA aa a
 2-i             AAAAAAaaaaaaaa
   i            AAAAAAAaaaaaaaa
 0--+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+---
  0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

PP LOW HIGH LIT #VAL MEAN STDV
Y 0.46 0.79 ALL   19 0.65 0.09
          OVERALL 40 0.82 0.19

ORDERED VALUES FOLLOW:

 0.46A 0.51A 0.51A 0.56A 0.57A 0.60A 0.64A 0.64A 0.66A 0.66A 0.67A 0.68A 0.68A
 0.69A 0.73A 0.73A 0.74A 0.78A 0.78A 0.80a 0.81a 0.82a 0.84a 0.85a 0.86a 0.88a
 0.90a 0.91a 0.97a 0.97a 0.98a 0.99a 1.02a 1.02a 1.06a 1.08a 1.10a 1.11a 1.17a
 1.17a
```

[illegible]

```
   i
14-i
   i
12-i
   i
10-i
   i
 8-i
   i
 6-i
   i
 4-i
   i                    a
 2-i                  a a    a
   i         A AAAAAaaaaa a aa aa
 0--+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
PF LOW HIGH LIT #VAL MEAN STDV
Y 0.46 0.78 ALL     6 0.64 0.10
          OVERALL 20 0.96 0.27
```

ORDERED VALUES FOLLOW:

0.46A 0.59A 0.63A 0.69A 0.71A 0.77A 0.84a 0.87a 0.91a 0.91a 0.99a 1.00a 1.04a
1.04a 1.13a 1.20a 1.26a 1.28a 1.38a 1.41a

```
14-i
   i
12-i
   i
10-i
   i
 8-i
   i            A A
 6-i         A  A A
   i         A  A A
 4-i         A  AAA
   i        AA AAAA
 2-i        AA AAAA a  a
   i        AAAAAAAAaaaa      a
 0--+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
PP LOW HIGH LIT #VAL MEAN STDV
Y 0.40 0.77 ALL   32 0.60 0.11
         OVERALL 39 0.66 0.18
```

ORDERED VALUES FOLLOW:

0.40A 0.42A 0.43A 0.45A 0.47A 0.47A 0.49A 0.49A 0.49A 0.50A 0.55A 0.55A 0.57A
0.60A 0.61A 0.62A 0.62A 0.63A 0.63A 0.63A 0.65A 0.67A 0.68A 0.68A 0.70A 0.70A
0.71A 0.71A 0.72A 0.72A 0.73A 0.76A 0.81a 0.83a 0.86a 0.90a 0.96a 0.98a 1.32a

[illegible]

```
   |
14-|
   |
12-|
   |
10-|
   |
 8-|
   |
 6-|           AA
   |           AA
 4-|           AAA
   |         A AAAAA
 2-|       AAAAAAAAA a
   |       AAAAAAAAAaaaaa  a
 0--+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.45	0.89	ALL	31	0.69	0.12
			OVERALL	38	0.76	0.18

ORDERED VALUES FOLLOW:

0.45A 0.45A 0.50A 0.51A 0.57A 0.59A 0.59A 0.61A 0.64A 0.66A 0.66A 0.66A 0.67A
0.68A 0.69A 0.70A 0.71A 0.72A 0.73A 0.74A 0.74A 0.75A 0.76A 0.77A 0.78A 0.82A
0.83A 0.83A 0.85A 0.88A 0.88A 0.94a 0.95a 0.97a 1.03a 1.05a 1.11a 1.29a

[illegible]

```
   |
14-|
   |
12-|
   |
10-|
   |
 8-|
   |
 6-|
   |
 4-|        A       a  a
   |        AA      a  aa
 2-|        AA A  aaa  aaa   a
   |        AAAAAaaaaaaaaaaa aa
 0--+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
PP LOW HIGH LIT #VAL MEAN STDV
Y 0.43 0.64 ALL   11 0.49 0.06
         OVERALL 36 0.82 0.27
```

ORDERED VALUES FOLLOW:

0.43A 0.44A 0.44A 0.44A 0.47A 0.48A 0.49A 0.50A 0.55A 0.56A 0.63A 0.69a 0.72a
0.73a 0.75a 0.76a 0.81a 0.81a 0.83a 0.84a 0.86a 0.94a 0.96a 0.96a 0.98a 0.98a
1.01a 1.04a 1.04a 1.05a 1.05a 1.12a 1.19a 1.26a 1.28a 1.30a

```
[illegible]  2507.0M 34/10-18
    |
 14-|
    |
 12-|
    |
 10-|
    |
  8-|
    |
  6-|
    |
  4-|              A  aa
    |              A  aa
  2-|            A AAAaa aa      a
    |           AAAAAAaaaaaaa    aa
  0--+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

PP LOW HIGH LIT #VAL MEAN STDV
Y 0.53 0.76 ALL   12 0.66 0.07
          OVERALL 30 0.86 0.22

ORDERED VALUES FOLLOW:

 0.53A 0.58A 0.59A 0.64A 0.65A 0.66A 0.67A 0.69A 0.72A 0.74A 0.75A 0.75A 0.80a
 0.81a 0.82a 0.84a 0.86a 0.86a 0.87a 0.87a 0.92a 0.97a 0.97a 1.01a 1.04a 1.07a
 1.14a 1.30a 1.34a 1.38a
```

[illegible]

```
    |
14-|
    |
12-|
    |
10-|
    |                 A
 8-|                 A
    |                AA
 6-|                AA
    |                AA
 4-|                AAA
    |              AAAAA
 2-|            A AAAAAA a aa
    |          AAA AAAAAAAa aa
 0--+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

PF	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.46	0.97	ALL	33	0.77	0.11
			OVERALL	39	0.82	0.16

ORDERED VALUES FOLLOW:

0.46A 0.53A 0.55A 0.59A 0.66A 0.67A 0.69A 0.71A 0.72A 0.73A 0.75A 0.75A 0.76A
0.76A 0.77A 0.78A 0.79A 0.80A 0.80A 0.80A 0.81A 0.81A 0.81A 0.82A 0.82A 0.84A
0.85A 0.87A 0.88A 0.89A 0.92A 0.93A 0.96A 1.00a 1.02a 1.10a 1.13a 1.15a 1.16a

```
   |
14-|
   |
12-|
   |
10-|
   |
 8-|
   |
 6-|          A
   |          A
 4-|          A A  A  a a
   |          A A  A  a a
 2-|         AA AAAA aaaa a
   |        AAA AAAAaaaaaaa aa     a
 0--+----+----+----+----+----+----+----+----+----+----+---
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
FP LOW HIGH LIT #VAL MEAN STDV
Y 0.40 0.80 ALL    21 0.61 0.12
         OVERALL  40 0.81 0.26
```

ORDERED VALUES FOLLOW:

0.40A 0.47A 0.47A 0.50A 0.50A 0.50A 0.50A 0.54A 0.54A 0.60A 0.61A 0.63A 0.63A
0.66A 0.68A 0.71A 0.73A 0.76A 0.77A 0.79A 0.79A 0.82a 0.87a 0.89a 0.90a 0.91a
0.93a 0.94a 0.95a 0.98a 1.01a 1.03a 1.03a 1.04a 1.05a 1.12a 1.13a 1.24a 1.25a
1.50a

```
     |
 14-|
     |
 12-|
     |
 10-|
     |
  8-|
     |
  6-|
     |
  4-|
     |       A          a
  2-|      A AA AAaaa a aa a
     |      A AA AAaaa aaaaaaaa
 0--+----+----+----+----+----+----+----+----+----+----+--
   0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
```

```
PP LOW HIGH LIT #VAL MEAN STDV
Y 0.47 0.76 ALL    11 0.62 0.10
          OVERALL 30 0.91 0.27
```

ORDERED VALUES FOLLOW:

0.47A 0.48A 0.56A 0.56A 0.57A 0.60A 0.64A 0.70A 0.73A 0.75A 0.75A 0.81a 0.83a
0.85a 0.87a 0.91a 0.94a 1.04a 1.04a 1.05a 1.10a 1.13a 1.14a 1.15a 1.19a 1.24a
1.25a 1.26a 1.33a 1.38a

IKU

Visual Kerogen Analysis

TABLE NO.: 10
WELL NO.: 34/10-18

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
B-4561	2108.0 swc	WR!,W,P/Am,Algal	F-M		immature	Abundant acid resistant minerals. Very few palynomorphs. Some grey amorphous.
B-4562	2234.0 swc	WR!,W,P/Am,Algal	F-M	fair to good	1+/2-	As above. In screened residue enrichment of small rounded aggregates. Some grey amorphous.
B-4563	2334.0	W,WR!,P/Am,Algal	F-M	fair to good	1+,1+/2-,2	As above. Grey amorphous and etched dark woody material.
B-4564	2351.5 core	W,P,WR!/Am,Cy,Algal	F-M	fair	1+,1+/2-,2-	Strongly degraded woody material, small aggregates. Abundant pyrite.
B-4565	2353.5 core	W,WR!,P/Am,Algal	F-M	fair	1+,1+/2-	Mostly strong degradation. Acid resistant minerals stick to and obscure organic particles.
B-4566	2354.0 core	Algal,Am/W,P	F-M	fair	1+	Strongly degraded material. Algal/fungal remains include small rounded bodies that dominate together with degraded wood. Tasmanites.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	RI	Reworked	L	Large

52

135/W/ah/3

IKU

Visual Kerogen Analysis

TABLE NO.: 10
WELL NO.: 34/10-18

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
B-4567	2355.2 core	Algal,Am,W,P,S	F-M	fair	1+,1+/2-,2	Similarity with 2354m.
B-4568	2361.0 core	W,WR,P/Am,Algal	F-M	fair	1+,1+/2-,2	Increase of woody material especially of dark structured particles.
B-4569	2363.0	W,WR!,P/Am,Algal	F-M	fair	1+/2-	Black angular acid resistant minerals (hematite) obscure organic material. Composition tentatively as above, but less strong degradation and a more greyish colour quality.
B-4570	2366.0 core	WR!,W/Am,Cy	F-M	fair	2	Reworked structured, dark woody material and degraded wood together with algal/fungal remains. Some grey colour quality.
B-4571	2368	W,WR!,P,S/Am,Cy	F-M	fair-good	1+,2,2+	Loose aggregates of material rich in acid resistant minerals. Structured woody fragments. Staining of palynomorphs.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

135/W/ah/4

IKU

Visual Kerogen Analysis

TABLE NO.: 10
WELL NO.: 34/10-18

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
B-4572	2382.8	W,WR!/Algal,Am	F-M	fair	2,2+	Strongly degraded "grey" material as dense aggregates. Algal/fungi obscure palynomorphs present.
B-4573	2388.5 core	W,P,S/Algal	F-M	fair-good	1+/2-	In parts strongly degraded woody remains. Rare light-coloured palynomorphs (pollen and spores). Botryococcus.
B-4574	2451.0 swc	W,WR!,Cut,P,S/Algal	F-M-L	fair to good	2-,2-/2,2	Woody and degraded woody material (vitrinite) dominate. Algal/fungal remains as loose aggregates. Well preserved cuticles.
B-4575	2499.5 swc	W,Cut,S,P/Algal	F-M-L	fair to good	1+/2-,2,2/2+	As above but more woody material. Smooth trilete spores.
B-4576	2607.0 swc	W,WR!,S,P/Algal	F-M	fair to good	2	Strongly degraded. Mostly algal/fungal remains as aggregates of some "greyish" colour.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	RI	Reworked	L	Large

135/W/ah/5

Visual Kerogen Analysis

TABLE NO. 10
WELL NO.: 34/10-18

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
B-4577	2787.0 SWC	W,Cut,P,S/Algal,Am	F-M-L	fair good	1+,1+/2-	Strong degradation of woody material. Abundant algal/fungal remains.
B-4578	2916.0	Algal,Am/W,Cut	F	fair	1+/2-	Strong degradation.
B-4579	2977.0 SWC	Am,Algal/W,WRI,Cut	F-M	fair	1+/2-	Grey amorphous aggregates embedding small dark woody fragments. Occasional cuticles and thin but fairly well preserved sheets of organic material.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	RI	Reworked	L	Large

55

135/W/ah/6

Analyses in Transmitted Light

Material from well 34/10-18 was analysed on the basis of 19 samples selected by Statoil for kerogen isolation.

Stratigraphic tops were given as following:

Upper Cretaceous 1885m: Samples 2108m, 2234m and 2334m. Colour index (TAI): 1+ indicates immature material.

Lower Cretaceous 2336m: No samples cover this interval.

Upper Jurassic 2350m: Eight samples represent Upper Jurassic. Colour index (TAI): 1+ was evaluated for the entire interval although colours vary dependant of the lithology/environment of deposition. Woody material and algae/fungi dominate.

Middle Jurassic 2372m: Samples 2382.8m, 2388.5m, 2451m and 2494.5m. Colour index (TAI): 1+/2- was evaluated for the interval. Colours vary from sample to sample and may be dependant on the lithology/environment of deposition. Cuticles and palynomorphs are generally better preserved than recorded for the Upper Jurassic.

Lower Jurassic 2604m: Samples 2607m, 2787m, 2916m, 2977m. Colour index (TAI): 1+/2-. As in the Upper Jurassic, degradation is stronger than in the Middle Jurassic.

Remarks: The results obtained indicate that microscopic algae and/or fungi are common to abundant in most samples. "Algal" as a term is here used for discrete globular to elongate bodies and for irregular light-coloured supposed algal fragments less than 10μm.

Description of samples

2108m swc, 2234.0m swc, 2334.0m swc: The residues consist of fine material. "Grey amorphous" material occurs as small aggregates which embed woody particles. Dark (reworked and oxidised) woody particles are common especially in the uppermost sample. Palynomorphs are rare.

2351.1m c, 2353.5m c: Strongly degraded woody material dominates the residues. Palynomorphs are rare or obscured. Particles smaller than 10µm include algal/fungi/bacteria.

2354.0m c, 2355.2m c: Strongly degraded material as above, but algae/-fungi/bacteria account for a major part of the organic residue. Pollen and spores are rare.

2361.0m c, 2362.0m c: Degraded woody material dominates. The variable input of structured, woody material and the acid resistant black angular minerals (hematite?) suggest more oxidative conditions. Palynomorphs seem to show staining and are more common than in the overlying layers.

2382.8m c: Strongly degraded "grey" material occurs as dense aggregates embedding abundant algae/fungi. Palynomorphs seem rare in this residue.

2388.5m c, 2451.0m swc, 2494.5m swc: Woody material dominates and includes degraded as well as oxidised forms. Well preserved spores and cuticles are present together with the some algal/fungal remains as observed throughout this well.

2607.0m swc, 2787.0m swc, 2916.0m swc, 2977.0m swc: The residues consist of strongly degraded material where woody remains account for 40% or less. The samples have a grey amorphous character and remaining structured particles are fairly thin.
Colour index: 1+/2- may represent a low estimate based on pollen affected by heat induced or chemically induced changes of wall material.

Fig.1 COMPARISON OF WELL 34/10–18, WITH OTHER 34/10 WELLS

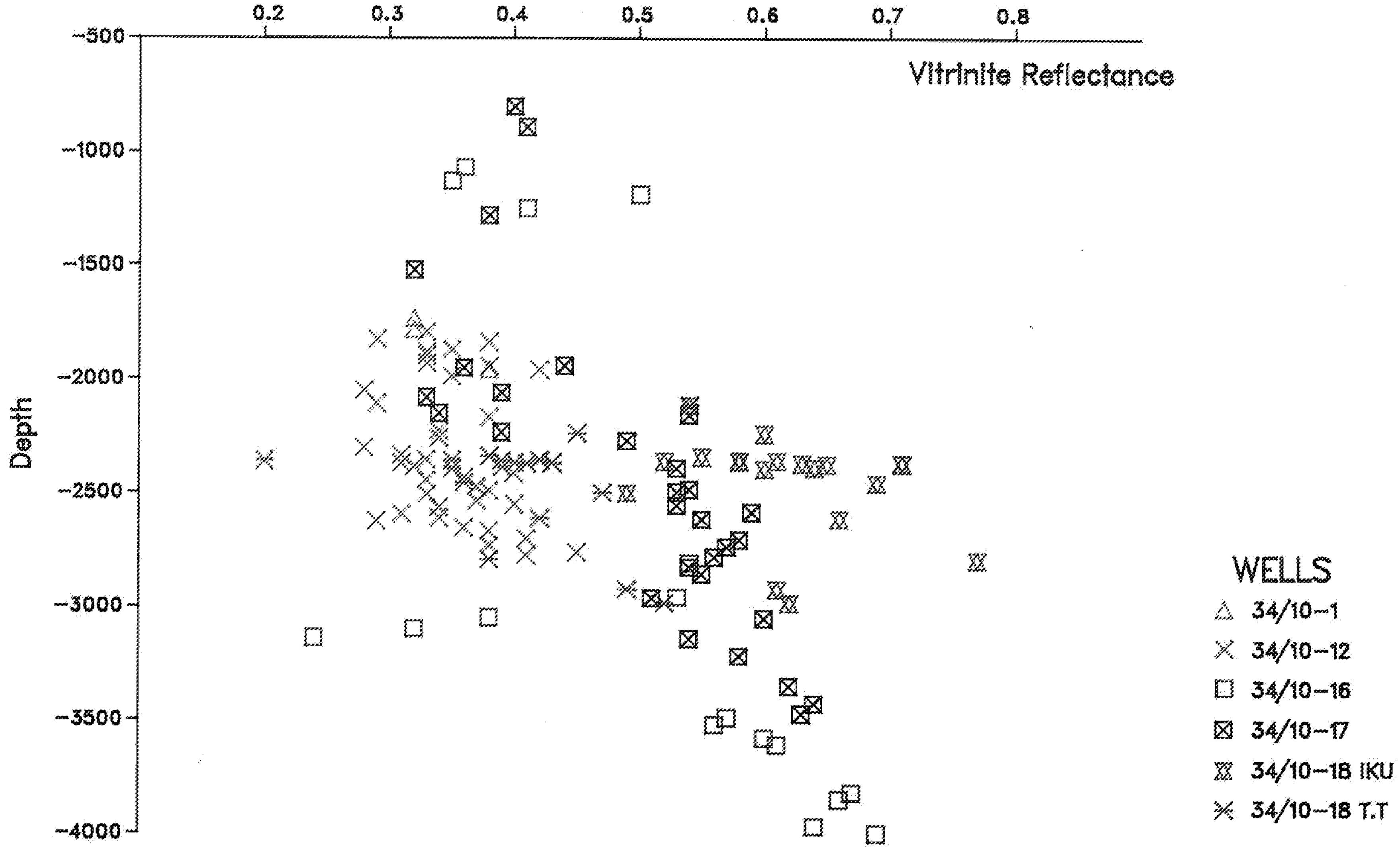
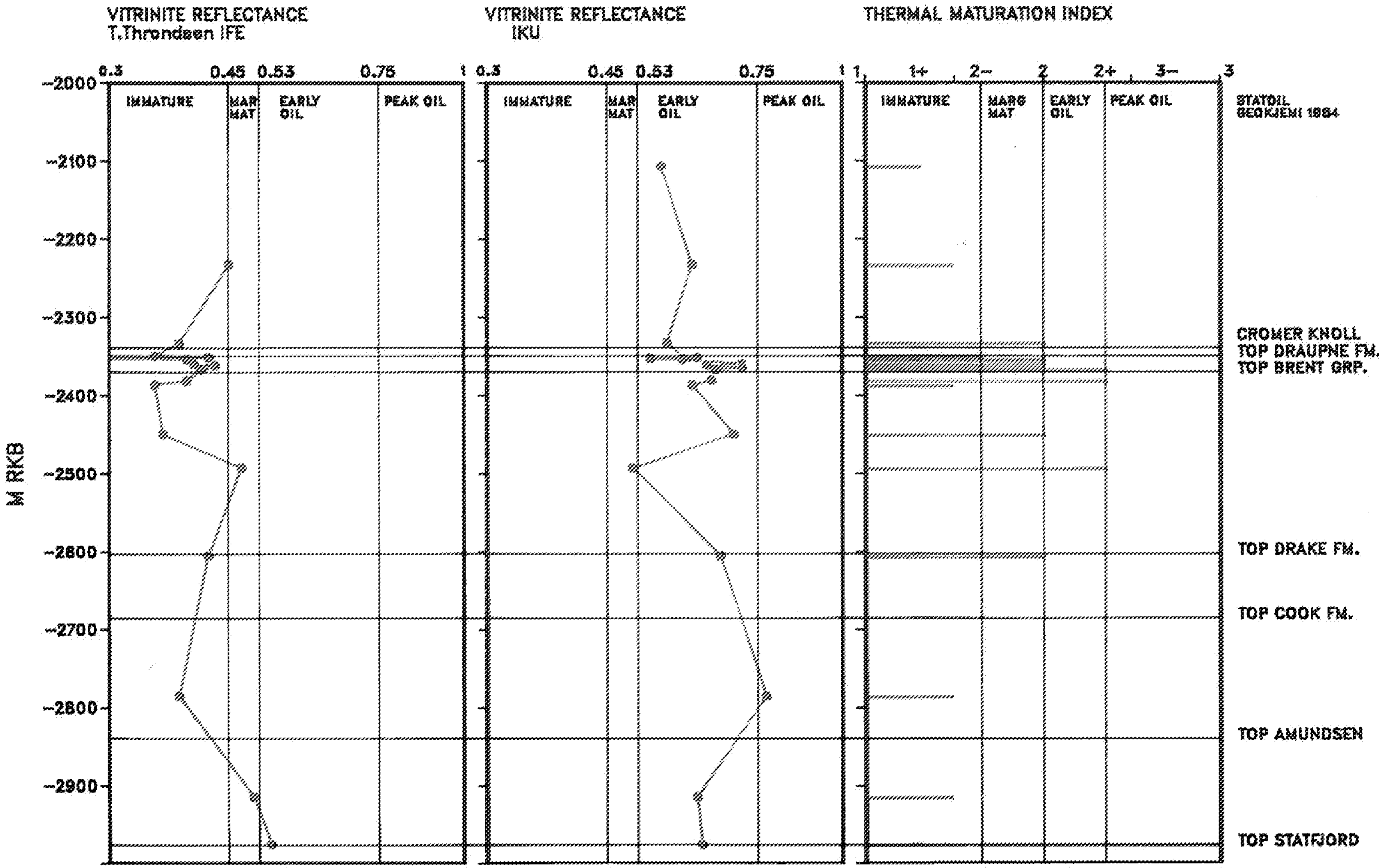


Fig.2

MATURITY DATA PLOT well 34/10-18



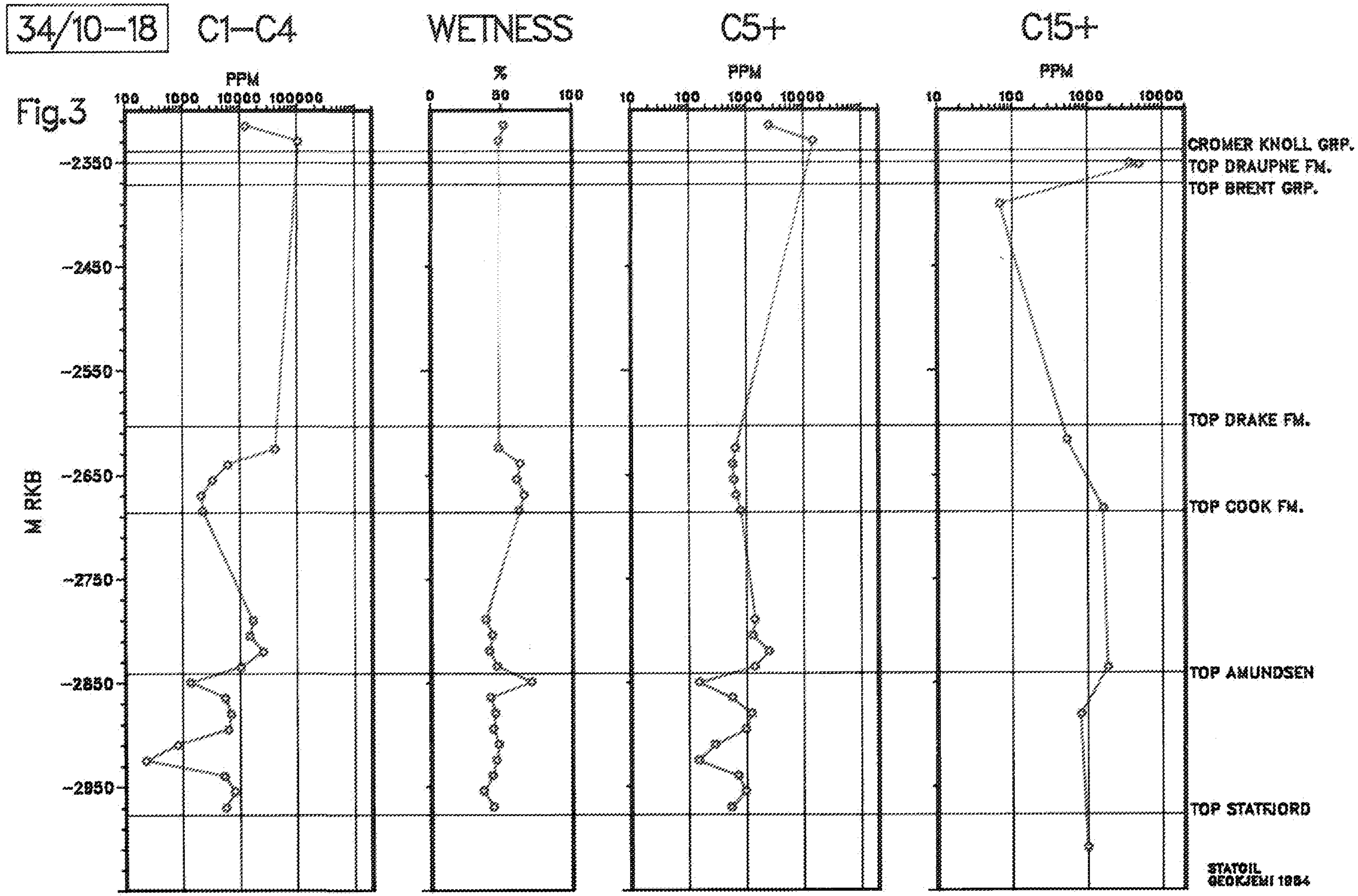

34/10-18
C1-C4
WETNESS
C5+
C15+
Fig.3
PPM
%
PPM
PPM
100 1000 10000 100000
0 50 100
10 100 1000 10000
10 100 1000 10000
M RKB
-2350
-2450
-2550
-2650
-2750
-2850
-2950
CROMER KNOLL GRP.
TOP DRAUPNE FM.
TOP BRENT GRP.
TOP DRAKE FM.
TOP COOK FM.
TOP AMUNDSEN
TOP STATFJORD
STATOIL
GEOKJEMI 1984

Fig.4 WELL 34/10-18 DATA FROM ROCK EVAL PYROLYSIS

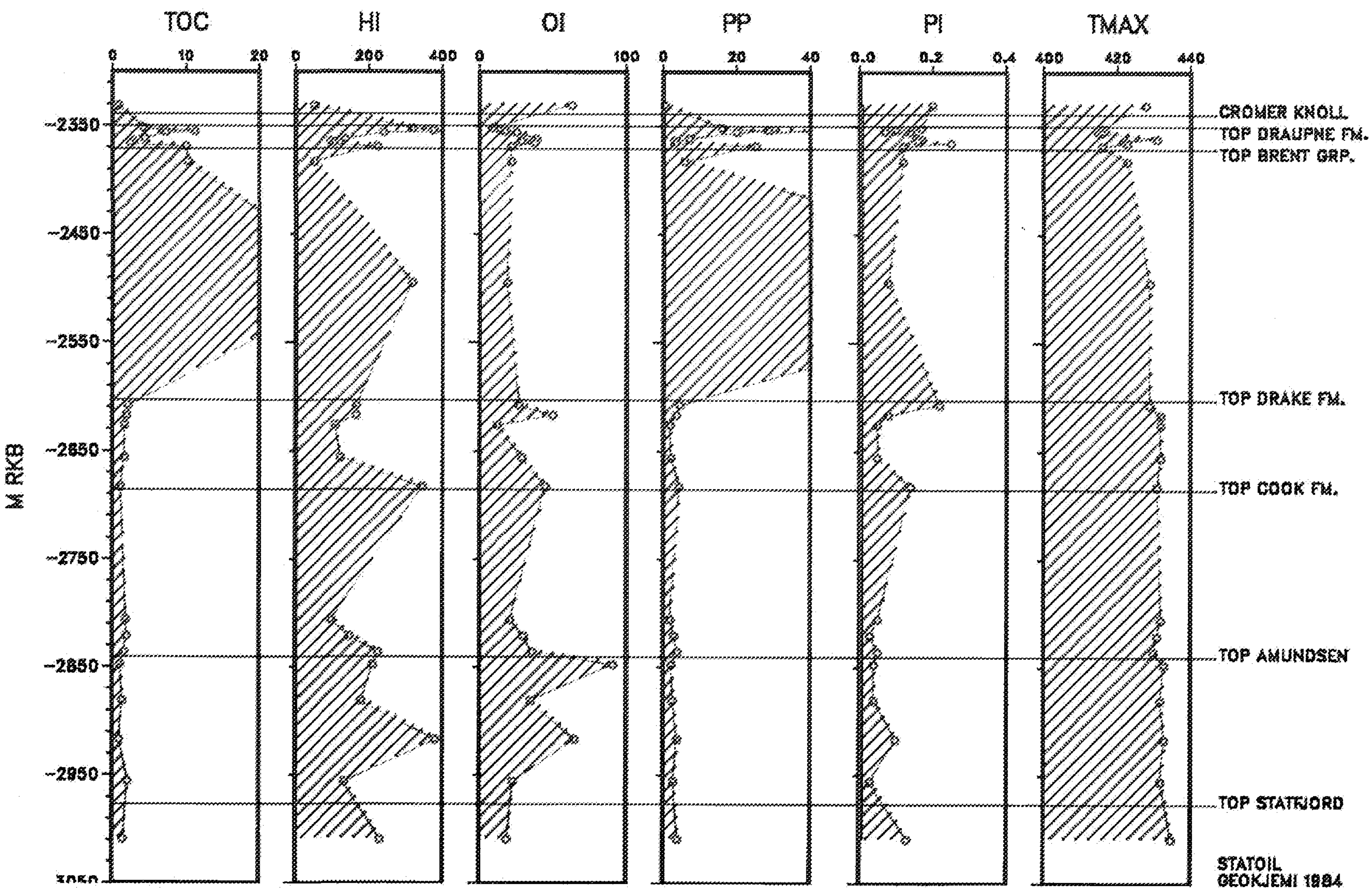


FIGURE 5 Chromatogram of C15+ saturates Draupne Fm (a) and Brent sandstone(b)

a)

b)

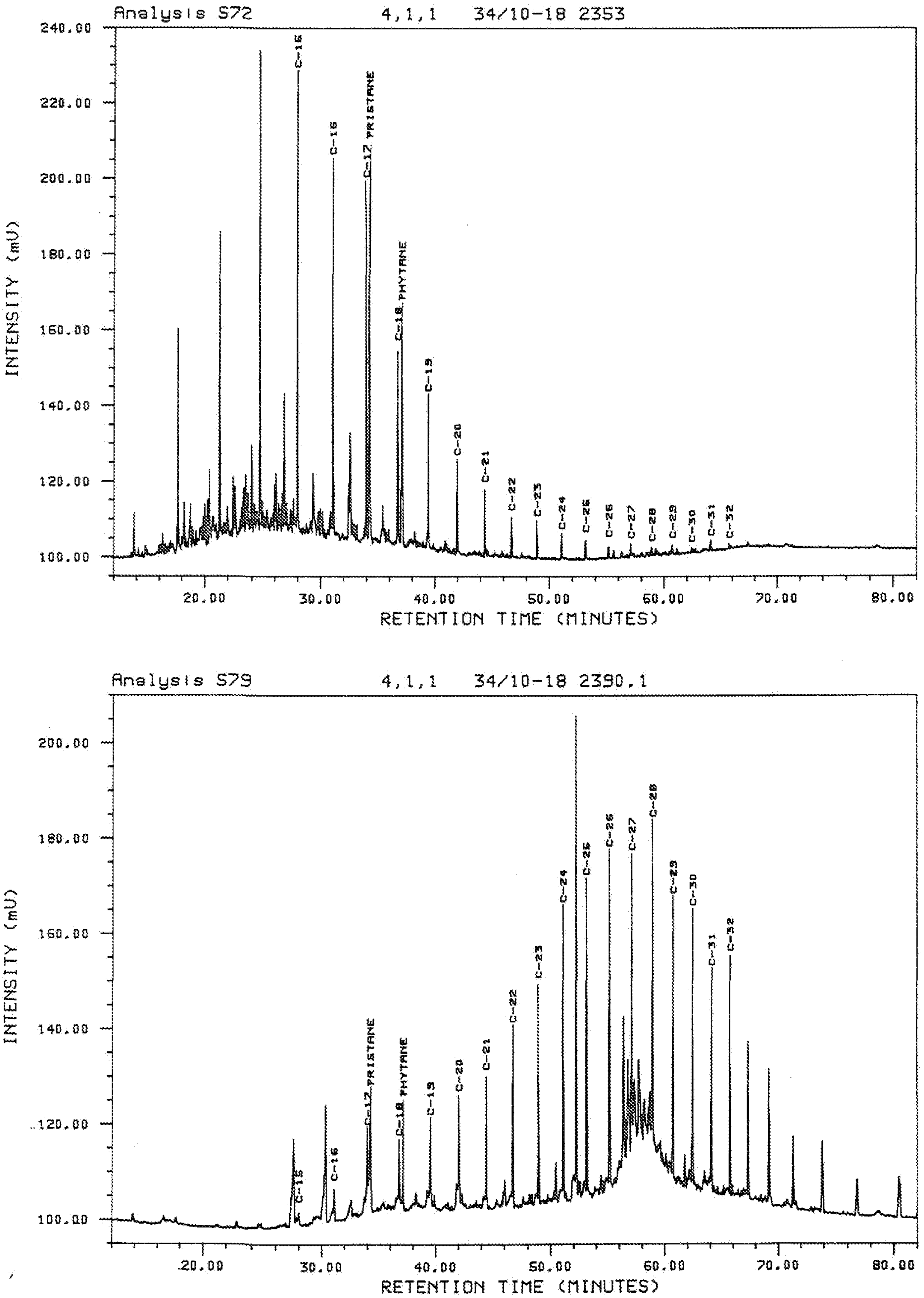
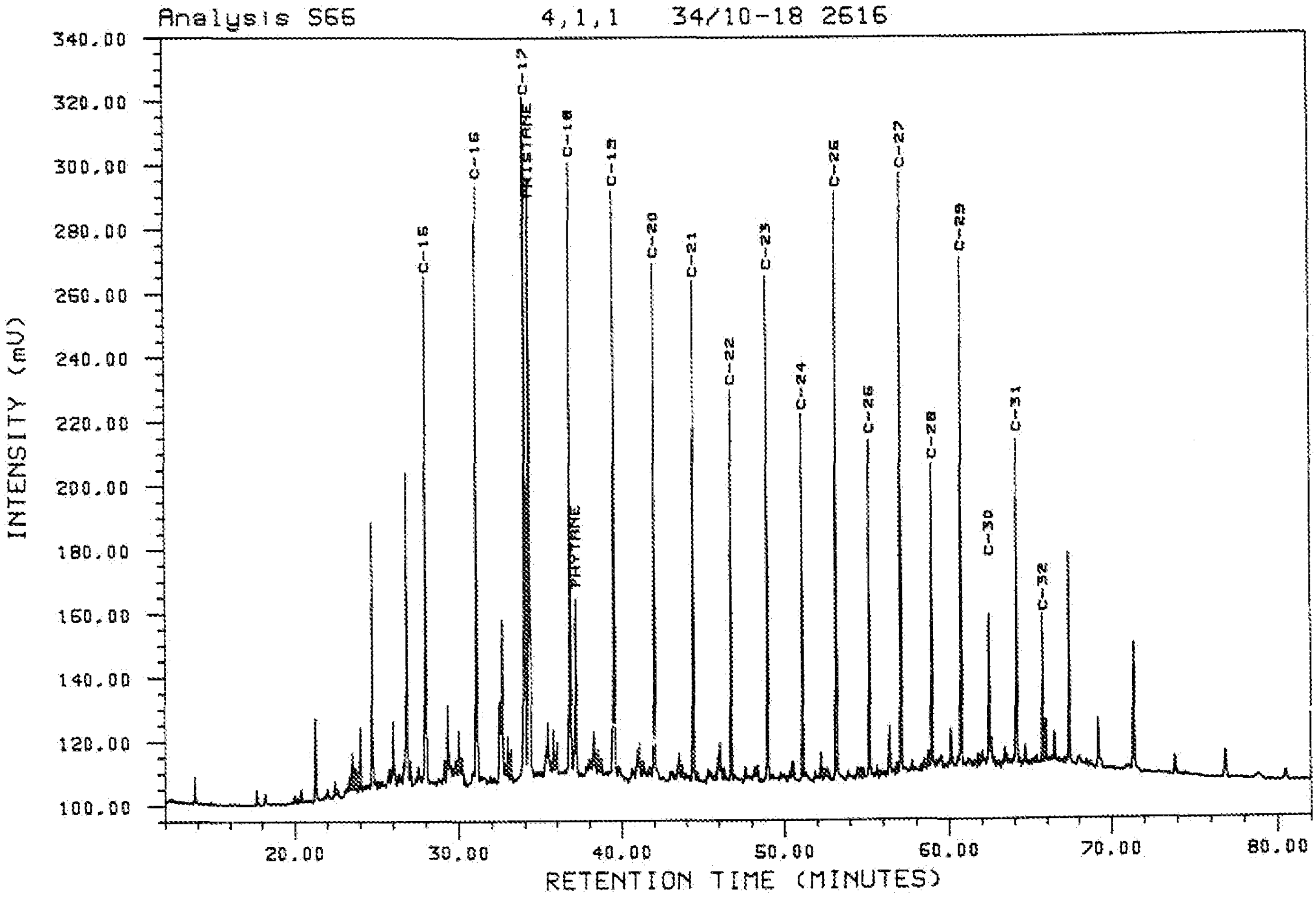


FIGURE 6 Chromatogram of C15+ saturates Drake Fm



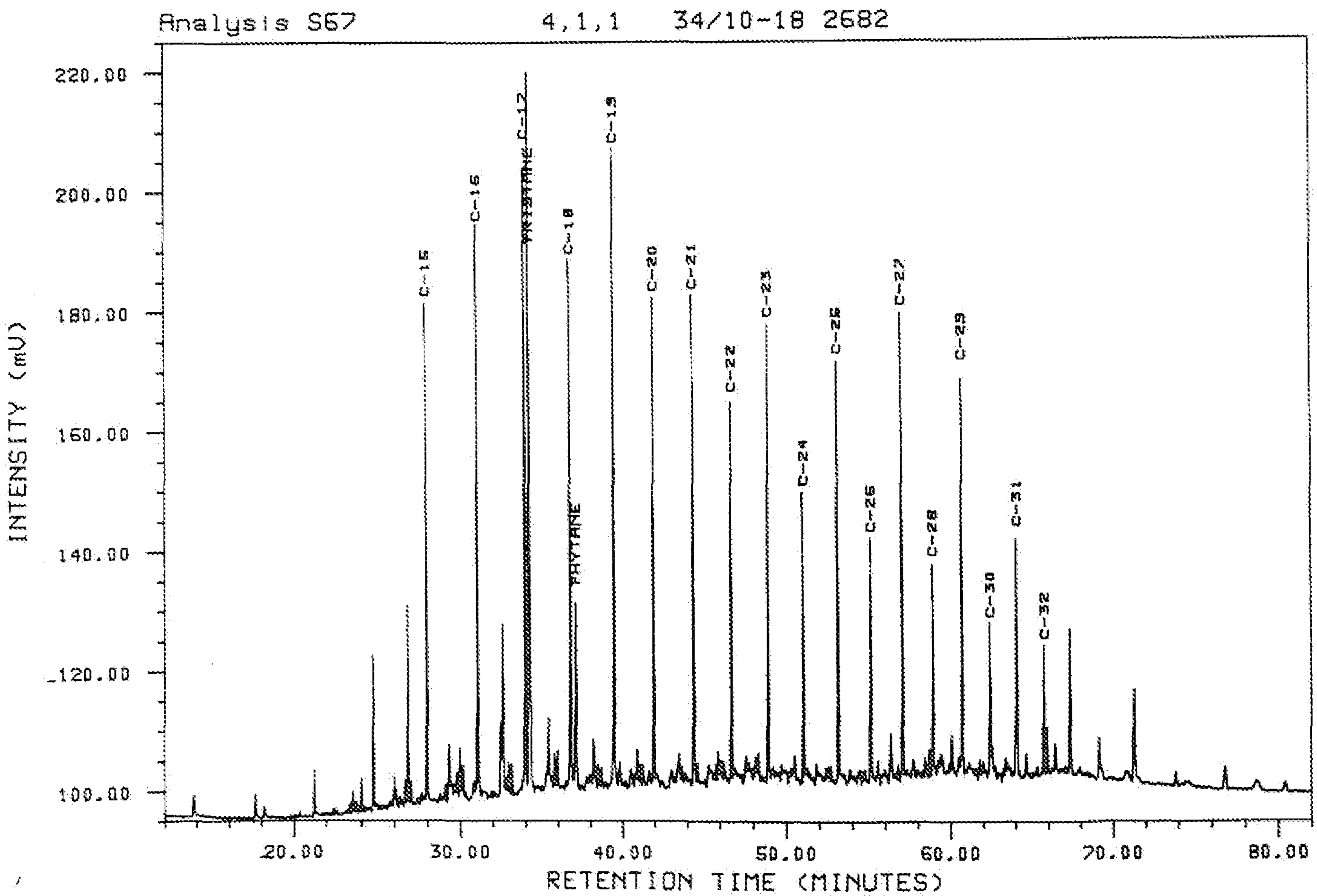
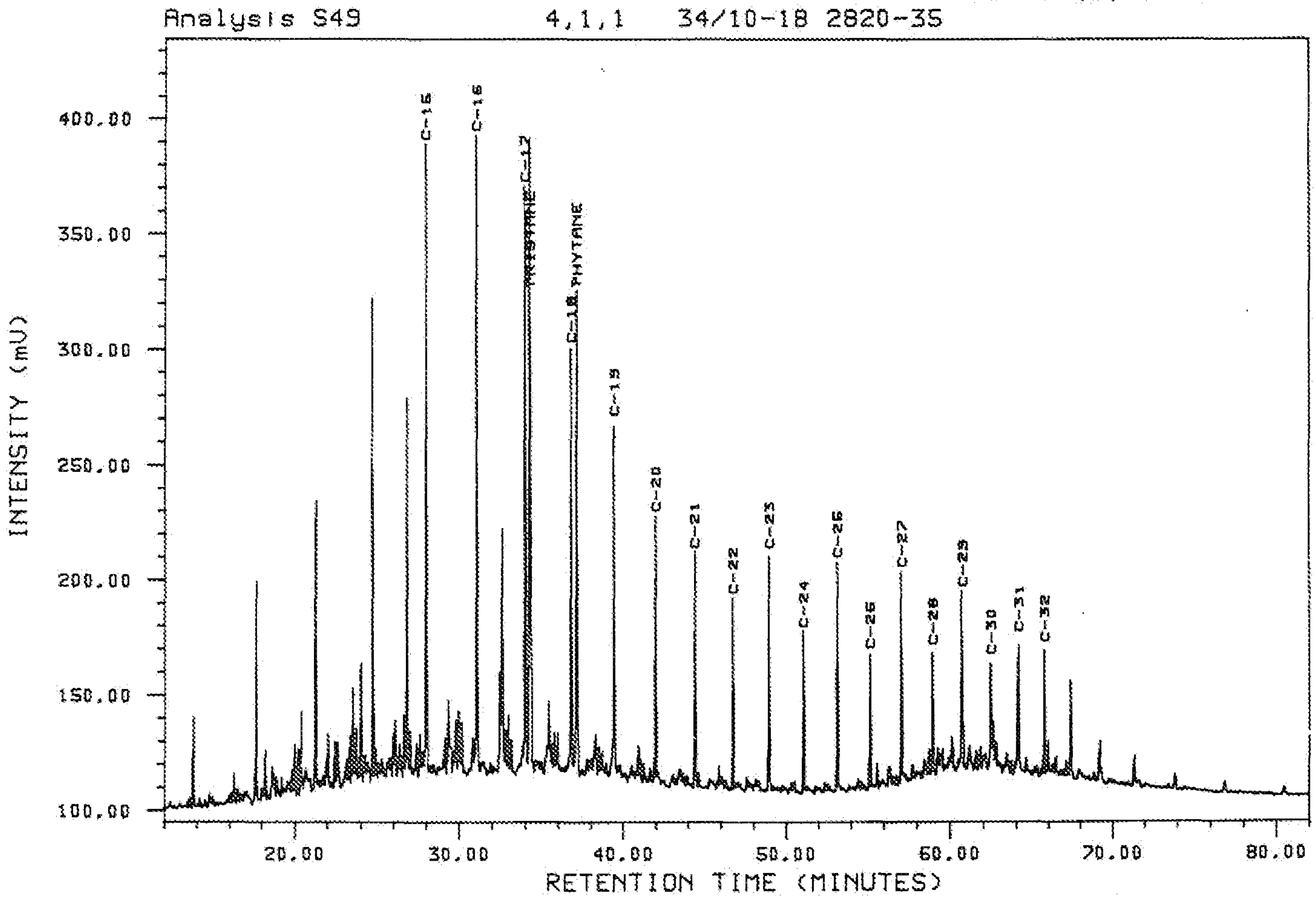


FIGURE 7 Chromatogram of C15+ saturates Cook (a) and Amundsen (b) Fm's

a)



b)

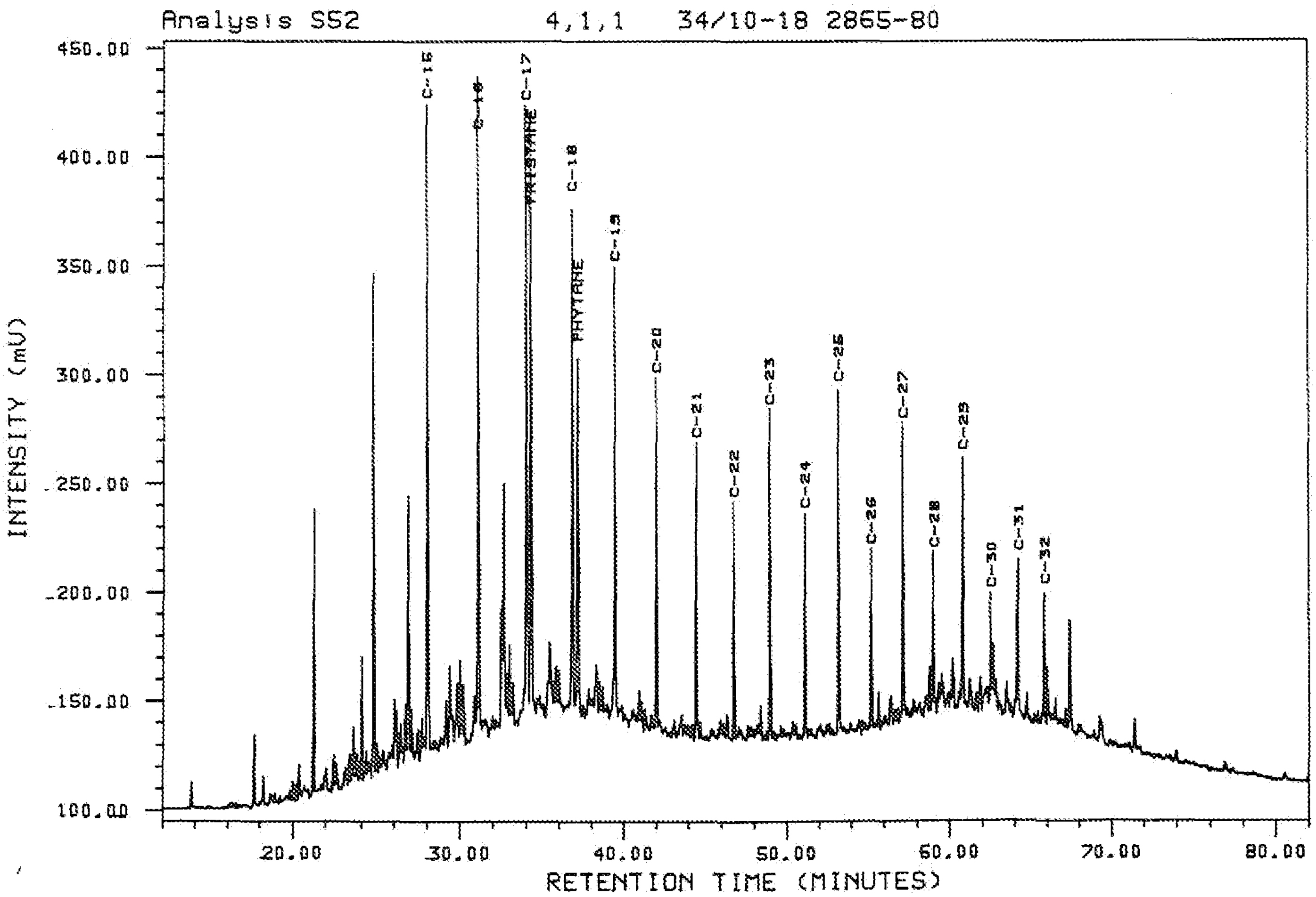
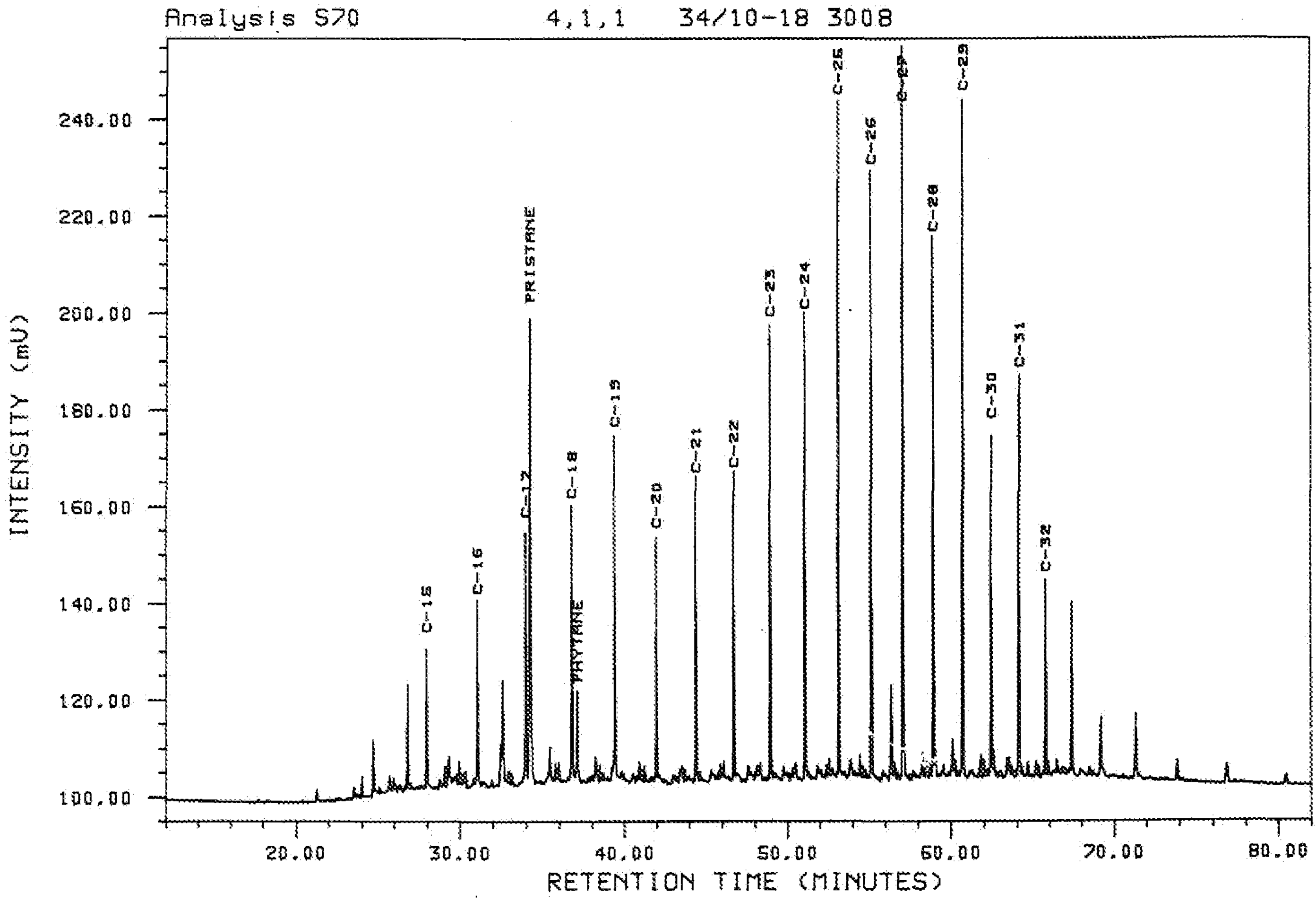


FIGURE 8 Chromatogram of C15+ saturates Statfjord Fm



APPENDIX

ANALYTICAL PROCEDURES

C_1 - C_7 LIGHT HYDROCARBON ANALYSIS

a) Headspace gas analysis

1.5 ml of the gas in each of the cans was analysed for light hydrocarbons, C_1 up to n-C_4 in separate peaks and C_5^+ as one peak.

The gas was analysed on a Perkin Elmer Sigma 3B, equipped with two column and backflush of the first column after n-C_4 had passed through.

Chromatographic conditions:

Column	:	The first column is 1.5 m and the second is 9.1 m long. Both with 30 % DC-200 on Chromosorb P,A/W, 60-80.
Carrier gas	:	Helium, 33 ml/min.
Detector	:	Flame ionisation, temp. 170°C.
Injector	:	1.5 ml loop injection.
Temp. program	:	120°C isothermal.

The cans were opened and the volume of gas determined . The cuttings were washed with temperate water on 4, 2 and 0.125 mm sieves to remove drilling mud and thereafter dried at 35°C and weighed. Using an external standard the hydrocarbons in the cans are reported in concentration as µl gas/kg rock.

b) Occluded gas

Before drying about 20 g of the 2-4 mm fraction of each samples was crushed for 10 min. in water using a airtight ball mill. 2 ml of the headspace was analysed under some conditions as the headspace gas analysis.

TOTAL ORGANIC CARBON (TOC)

The samples were crushed in a centrifugal mill for 30 seconds, weighed in Leco crucibles and treated with HCl to remove the carbonate. Afterwards they were washed with distilled water several times and dried. The samples were then analysed in a stream of oxygen by a LECO EC12 carbon analyser. The total organic carbon results are presented in weight percent.

ROCK-EVAL PYROLYSIS

Approximately 100 mg crushed samples were weighed and analysed in platinum crucibles by a Rock-Eval pyrolyser. Conditions (cycle 1)

- purged with preheating to 450°C and cooled down to 300°C within 3-5 minutes.
- 300°C initial isotherm for 3 minutes.
- 25°C/min. temperature gradient.
- 390°C CO_2 trap shut off.
- 550°C isotherm for 2 minute.

EXTRACTABLE ORGANIC MATTER (EOM)

About 100 g fine crushed rock, 500 ml dichloromethane and a few mg copper were added to a stainless steel flask. The solution was extracted using a high speed mixer, 9000 RPM, for 10 min. The sample was then centrifuged, filtered, through a 0.5 µm filter, rotavaporated and dried under N_2-stream. The sample was then weighed.

CLASS SEPARATION

Asphaltene

Precipitation of asphaltenes was done by adding 40 times as much pentane as material, vibrated in an ultrabath for three min. and left to stand at room-temperature for at least 8 hours. The solution was then filtered through a preweighed 0.5 µm filter and washed several times. After air-drying, the filter was weighed and the differences in weight taken to be the amount of asphaltene.

Saturates aromatics and NSO-compounds

To separate the extract into saturates, aromatics and NSO-compounds the samples were diluted with hexane to 1 ml and the whole amount was injected into a medium pressure liquid chromatograph (Radke, M. et al., Anal. Chem., 52, 406-411, 1980). The fractions were rotavaporated and dried under vacuum before weighing.

Gas chromatography

The saturated fractions were analysed on a Perkin Elmer Sigma 2000 gas chromatograph under following conditions:

Column	:	Vitreous silica bonded phase BP 1 from SGE.
Temp. program:		$50^{o}C$ isothermal in 4 min., $4^{o}C$/min. to $300^{o}C$ and isothermal in 20 min.
Injector	:	Splittless injection, temp. $320^{o}C$.
Detector	:	Flame ionisation, temp. $320^{o}C$.