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GEOCHEMICAL REPORT

NORSK HYDRO

NORWAY

6407/7-2

87-0650-BA
- 8 MAI 1987
REGISTRERT
OLJEDIREKTORATET

EXPLORATION LOGGING NORGE A/S

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EXPLORATION LOGGING NORGE A/S

5TH MARCH 1987

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WELL AND RIG DATA

Company	:	Norsk Hydro
Well Name	:	6407/7-2
Well Type	:	Exploration
Location	:	Norwegian North Sea
Position	:	Latitude 64 Deg 15 Min 25.80 Sec N
		Longitude 07 Deg 10 Min 42.10 Sec E
RKB-MSL	:	23m
Spud Date	:	20th November 1986
Completion Date	:	21th January 1987
Total Depth	:	3320m
Rig	:	Polar Pioneer /Semi-Sub
Exploration Logging Unit	:	Geochemistry Unit #175
Geochemists	:	Nick Tapper, Phil Haynes.

INTRODUCTION

Geochemical Screening using the Oil Shows Analyser was performed on 76 cuttings samples, 110 core samples and 75 sidewall core samples. The material was received as pre-dried cuttings or core chips and analysed as an air dried ground powder. Two and three metre composite samples were received with the argillaceous material being picked for crushing and subsequent analysis. Pure sand or sandstone samples were not analysed.

All the samples were analysed in the Windsor, UK laboratory,and as such care must be taken in interpreting the free hydrocarbon data generated for this well.

Results and Interpretation

The pyrolysis geochemical data generated for the well 6407/7-2 is used to divide the analysed section from 1716 to 3315m into four organic facies based upon lithological changes and organic matter content.

Organic Facies I : 1716m - 2638m

This consists of a massive section of grey to brown claystone with thin horizons of argillaceous limestone and very fine grained friable sandstone. Both cuttings and sidewall core samples indicate that organic content is fair to good with values averaging around 1.2%. Only five values exceed 2%, the highest organic content of 8.05% recorded from a dark claystone sidewall core sample at 2587m Pyrolysis S2 yields are generally very poor averaging 1.50 mgHC/g rock and matching the fluctuations in total organic content. Only two values exceed 5 mgHC/g rock with the highest value of 29.77 mgHC/g rock, suggesting excellent source potential, recorded from the sidewall core sample at 2587m. Hydrogen indices are scattered reflecting the variable and low TOC and S2 figures. Values range from 31 to 370 but indicate an average of around

100, suggesting largely gas prone organic material comprising of terrestrially derived organic matter of type III Kerogen (see HI/Tmax crossplot). Consideration of the free hydrocarbon indicators (SO, SI and TPI) suggests no significant accumulations of free oil, the highest value of 1.98 mgHC/g rock recorded from the sidewall core sample at 2587m. It must also be noted that reductions in free hydrocarbon values may be likely due to heat drying of the samples at the wellsite prior to receipt in the laboratory.

Organic Facies II :II2638m - 2679m

The second facies is marked by the appearance of an argillaceous limestone and a sequence of dark grey to green claystones. Organic matter content increases significantly with this section representing the richest part of the well. Values range between 0.78 and a maximum of 8.0% from a claystone sidewall core sample at 2650m. Organic richness is reflected in the pyrolysis S2 yields, ranging from 0.76 mgHC/g rock to a maximum of 37.66 mgHC/g rock at 2650m. Generally excellent organic content and source potential is indicated for the interval. Hydrogen indices range between 100 and 488 with an average of 300 suggesting good quality organic material capable of generating significant quantities of oil and gas. Organic matter is suggested as being of a mixed terrestrial and marine origin of a Type II kerogen. Free hydrocarbon values are generally high between 1.00 and 3.5 mgHC/g rock, although a reduction in the production index may indicate that as these sediments are probably marginally mature with respect to oil generation that migration of hydrocarbons away from the zone may have occured.

Organic Facies III : 2679m - 2934m

This third organic facies is composed of a mixed clastic sequence predominantly of sandstone with thin claystone, shale and coal interbeds. As such considerable variation in organic richness is demonstrated. The majority of the interval analysed consists of core samples, the sandstones, when analysed,

containing as expected very little organic material. Values from non - sandstone samples range from 0.50% to a maximum of 49.76% from a coal core sample at 2889m. In general the claystones have good organic content averaging 1.5%. Consideration of the geochemical log (Appendix D) suggests that organic content decreases generally through the section then increases from around 2839m with the appearance of thin hydrogen rich coal interbeds within the massive sandstone. The variability of organic content is matched by the pyrolysis S2 yields. Values average 2mgHC/g rock from the claystones suggesting generally poor to fair source potential. The highest values, up to a maximum of 461.16 mgHC/g rock, were obtained from the coal horizons between 2839 and 2934m, suggesting excellent source potential. The hydrogen indices are, as expected, very variable although an average of around 200 is indicated. This suggests that the organic matter is predominantly of terrestrial origin with a minor marine component. Type II/III Kerogen is therefore indicated suggesting that minor quantities of gas and oil could be produced if sufficient quantities of thermally mature material was present. A general increase in the hydrogen indices is noted towards the base of the section suggesting an improvement in organic quality. The coals appear to be hydrogen rich with hydrogen indices around 500. Free hydrocarbon indicators suggest an increase in free oil within this section, with accumulation of oil within the sandstones , especially between 2700 and 2730m and 2770 and 2840m. The coals have a very high S1 content but the production index tends to suggest the samples are depleted in expected free hydrocarbon quantities.

Organic Facies IV : 2934m - 3315m

This last section is composed of massive sandstones with interbeds of claystone and is marked by a significant reduction in organic content. The highest value of 1.14% is recorded from a claystone sidewall core sample at 3177m. The average value is around 0.20% suggesting poor organic content for the section. Pyrolysis S2 yields are similarly low averaging 0.20 mgHC/g rock suggesting

little or no source potential for this predominantly sandstone zone. Hydrogen indices are as such unreliable giving little information to organic matter quality. Free hydrocarbon indicators suggest no accumulation of free oil, with the scattered total production index simply a reflection of the very low free hydrocarbon and source potential values.

Maturity Data

Tmax data for the analysed well section is scattered, reflecting the large variations in clastic lithology and organic matter content. However from good pyrolysis S2 yields a general maturity trend is evident, suggesting that the section from around 2600m is marginally mature with respect to oil generation, with Tmax figures around 432 degrees. A sharp decrease followed by a subsequently sharp increase in Tmax figures is noted between 2627 and 2637m. This was similarly noted on well 6407/7-1 and appears to co-incide with the sharp increase in organic content and source potential below this depth. Significant quantities of free hydrocarbons are evident within the section and it is probable that the organic matter quantity and quality evident in this well is sufficient, at this level of maturity, to have produced oil and gas and also have a further potential for production.

SUMMARY AND CONCLUSIONS

The well has been divided into four sections (organic facies) based upon lithological variations and organic matter content.

The first section from 1716 to 2637m consists of massive claystones with fair organic content but generally poor source potential and organic matter quality.

The second section from 2638 to 2679m is organically the richest complete section of the well. Source potential is very good to excellent with good organic quality and marginal maturity suggested.

The third section from 2679 to 2934m is characterized by sandstones containing significant quantities of free hydrocarbons. Claystones and coals within the section yield good pyrolysis values with the thin coal interbeds generally having excellent source potential and generative capacity.

The forth section from 2934 to 3315m consists of sandstones and claystone interbeds with very poor organic content and source potential. Free hydrocarbon values are very low.

In conclusion:-

1) Organic matter content is good to excellent for the argillaceous sediments between 2638 and 2934m. The richest sections occur between 2638 and 2679m and the coals between 2839 and 2934m.

2) Source potential reflects the organic matter content variations and is generally good to excellent for the zones indicated above.

3) Hydrogen indices average 100 within the organically leaner upper and lower sections and around 250 through the interval between 2638 and 2934m. This suggests a predominance of mixed terrestrial marine origin organic matter of a gas and oil prone nature.

4) The interval is generally marginally mature with respect to oil generation. Significant quantities of free oil suggests that generation may have already occured and that organic matter quality may have been higher before generation.

5) Free hydrocarbon indicators suggest the presence of free oil especially between 2700 and 2740m and 2770 and 2840m. Values may have been reduced by the effects of sample heating during the

preperation of the samples at the wellsite prior to receipt in the laboratory.

APPENDIX A

SAMPLE PREPARATION

SAMPLE CONTAMINATION

DESCRIPTION OF ANALYTICAL EQUIPMENT

PRESENTATION OF RESULTS

INTERPRETATION OF OSA DERIVED PARAMETERS

SAMPLE PREPARATION

Small samples of ditch cuttings are taken and thoroughly washed in cold water through a 2.36mm sieve and collected in a 180 micron sieve to remove cavings. Any large quantities of contaminants such as lost circulation material are removed at this stage. The washed material is then examined under a binocular microscope and any further contaminants removed. The samples are then air dried at room temperature to prevent the loss of 'free hydrocarbons' and then ground to a homogenous powder in preparation for pyrolysis. However for 6407/7-2, samples were received from the wellsite as pre-dried well cuttings without the usual system of preparation performed by the geochemist.

SAMPLE CONTAMINATION

The effects of contamination, if unrecognized, can lead to misleading geochemical data. The major contaminants usually encountered at the wellsite include paint chips, lost circulation material (mica, nuthulls, etc.), steel fragments, and pipe dope. In the 6407/7-2 well these were removed by picking in the laboratory from the pre-dried sample.

Organic mud additives, especially those used for water loss control, can also cause serious contamination problems.

Another source of contamination to be aware of is caused by migrated hydrocarbons. The presence of migrated oil or bitumen in a rock can give a major response in the vicinity of 300 degrees centigrade on the pyrogram (S1) while solid bitumen and the 'heavy end' fraction of petroleum has been found to produce a measurable response in the region 300-550 degrees centigrade. This is the same temperature range in which kerogen is cracked releasing hydrocarbons during pyrolysis. Thus large quantities of bitumen or migrated petroleum in rocks can affect the size and maximum temperature (Tmax) of the (S2) peak and cause non-source rocks to be falsely identified as source rocks as reported by Clementz (1979)*.

The problems encountered as a result of hydrocarbon contamination may be overcome by solvent extraction using a 50:50 solution of trichloroethane and acetone. As a guideline, samples with high S1 values (greater than 1.0 mgHC/g rock) are solvent extracted and reanalysed to obtain more valid values for S2 and Tmax. The S1 value obtained in the first analysis remains a useful indicator of oil accumulations, and degree of contamination.

* Clementz, D. 1979, 'Effect of Oil and Bitumen Saturation on Source Rock Pyrolysis', A.A.P.G. Bull., Vol 62 (12).

DESCRIPTION OF ANALYTICAL EQUIPMENT

Principle of Operation

Small quantities of sample (approx. 100 mg) are analysed by programmed pyrolysis in an inert Helium atmostphere. Any evolved hydrocarbons are detected by a Flame Ionisation Detector. The output from this sensor provides the peak data for the S0, S1 and S2 indices. In addition, the temperature, Tmax, for maximum generation of cracked hydrocarbons is measured by a probe monitoring oven temperature.

On completion of the pyrolysis cycle the sample is transferred to a second oven. The sample is heated in air and any carbonaceous material remaining is converted to carbon dioxide, this is detected by a thermal conductivity detector (TCD), the output of which is the S4 peak. The Oil Shows Analyser thus derives the Total Organic Carbon content from the sum of the pyrolysed carbon (S0+S1+S2) and the residual carbon (S4).

The Oil Shows Analyser used the following analytical cycle:-

Pyrolysis:

Carrier gas	:	Helium
Initial Isotherm	:	90 deg. C
Isothermal Hold	:	2 minutes
Second Isotherm	:	300 Deg. C
Isothermal Hold	:	2 minutes
Temperature Ramp	:	30 deg/min
Final Temperature	:	600 deg. C

Oxidation:

Oxidation Gas	:	Air (after removal of CO2)
Oven Temperature	:	600 deg. C
Oxidation Time	:	5 minutes

The equipment was calibrated using a standard supplied by Exploration Logging Overseas, Inc. A quality control sample was run routinely every ten unknown samples, or every 24 hours if less than ten samples were analysed during this period.

PRESENTATION OF RESULTS

The processed data is expressed in terms of:-

SO	:	Low temperature gas yield (mgHC/g rock)
S1	:	Low temperature oil yield (mgHC/g rock).
S2	:	High temperature hydrocarbon yield (mgHC/g rock).
Tmax	:	Temperature at which maximum emission of hydrocarbons occurs.
T.O.C.	:	Total Organic Carbon (weight percent of whole rock) comprised of S4 (residual organic carbon) plus 82% of the quantity SO+S1+S2.
T.P.I.	:	Total Production Index (SO+S1/SO+S1+S2).
H.I.	:	Hydrogen Index (S2/TOC).

INTERPRETATION OF OSA DERIVED PARAMETERS

Total Organic Carbon (T.O.C.) - Organic Richness

The T.O.C. value represents the total organic content in a rock and is a simple measure of organic richness. It is also used in subsequent calculations to estimate the type of hydrocarbon which might be generated from a mature source rock. As a very general guideline, samples with less than 0.5% T.O.C. are regarded as being organically too lean to yield sufficient hydrocarbons to form commercial deposits and are considered non-sources. Samples with 0.5 to 1% T.O.C. are considered marginal in source quality and those with greater than 1% have good possibilities.

The following guidelines are suggested to interpret T.O.C. data:

TOC Value (%Wt)	Organic Richness
0.0 - 0.5	poor - fair
0.5 - 2.0	fair - good
2.0 +	good - excellent

S0 and S1 : Low Temperature Hydrocarbon Yield

S0 and S1 represent the hydrocarbons that are driven off at low temperatures (90°C and 30°C respectively) from the inherent gas/bitumen content of source rocks. They are termed "free hydrocarbons" and are measured in mgHC/g rock. Significant contributions to S0 and S1 also result from increasing maturity as hydrocarbons are generated from kerogen, and from 'out of place' hydrocarbons which have migrated from another source.

S2 : Source Potential

S2 corresponds to the hydrocarbons evolved from the sample as a result of the thermal cracking of kerogen. By simulating a gradual increase in maturity by means of a progressively increasing temperature gradient, an assessment of the overall source potential of the sediments can be made, i.e. the maximum amount of hydrocarbon which could be produced given sufficient temperature to permit thermal cracking of all kerogen present.

The following guidelines are suggested to interpret S2 values:-

S2 Value (mgHC/g rock)	Source Rock Potential
0.0 - 2.5	poor - fair
2.5 - 5.0	fair
5.0 - 10.0	good
10.0 +	excellent

Tmax : Maturity

Tmax is the analytical temperature at which the rate of thermal degradation of kerogen present in a sample is at a maximum and gives an indication of the overall maturity of the sample.

The expected onset of oil generation can be related to Tmax to delineate the 'oil window'. This is currently described as occurring approximately between 440 and 470 degrees centigrade. It is important to consider the overall trends of Tmax data as opposed to data points in isolation.

Consideration must also be given to values obtained from lean samples when it is difficult to determine the exact temperature at which the maximum rate of kerogen cracking occurred. Generally for S2 values of less than 0.2 mgHC/g rock, Tmax does not appear to be a reliable indicator of maturity and interpretations made from such results may be suspect. In addition the shape of the S2 peak is important in that sharp peaks give more reliable Tmax values.

Guidelines for interpreting maturity from Tmax are:-

Tmax Values (deg. C)	Maturity
Less than 440	immature
440 - 470	oil window
470 - 500	gas window
500 +	post mature or barren

H.I. : Hydrogen Index

The Hydrogen Index (S2/TOC) reflects the hydrogen content of the kerogen. The Hydrogen Index can be plotted against the Oxygen Index and Tmax to classify kerogen type, and thus the expected type of hydrocarbon that may be generated from a mature source.

The following guidelines are suggested in interpreting S2/TOC data:-

Hydrogen Index (S2/TOC)	Expected hydrocarbon type Generated from mature source
0 - 200	gas
200 - 300	gas and oil
300 +	oil

With increasing maturity more kerogen will be converted to hydrocarbons causing a decrease in the hydrogen index.

T.P.I. : Total Production Index (S0+S1/S0+S1+S2)

The Total Production Index, also known as the transformation ratio, looks at the fraction of hydrocarbons that exist as free hydrocarbons. Any local increase in T.P.I. values may indicate the presence of migrated hydrocarbons or contamination. A decrease may be indicative of hydrocarbon expulsion. T.P.I. values will normally increase with maturity as hydrocarbons are generated by the cracking of kerogen.

ORGANIC MATTER TYPES

It is important to determine the type of organic matter in a sample, for two reasons. Firstly, different types of organic matter have different hydrocarbon generating potentials due to the variation in the chemistry of the organic matter. Secondly, as different types of organic matter are deposited in characteristic environments, some information can be obtained as to the conditions of deposition.

Four types of organic matter are described:-

Type I - Pure Type I kerogens are rare, they usually consist of structured algal material. Their favoured depositional environments are closed basins, lagoons and lakes. They are strongly oil prone.

Type II - Usually consists of sapropelic organic matter. This is derived from algal or other planktonic remnants and some higher plant material such as spores and pollen. A marine transgression over a broad shelf is a typical environment of deposition. Type II kerogens may be oil and gas prone.

Type III - Usually consists of humic, coaly material derived from continental higher plants. A delta, well supplied with terrestrial organic matter is a favourable environment for Type III organic matter. Type III organic matter is usually gas prone. However, coals are believed to be the source for oil in many of the Tertiary basins of S.E. Asia where coastal plain peats developed in an everwet tropical climate. In such environments waterflow and reworking can concentrate liptinitic kerogen in preference to vitrinitic kerogen as documented by Teichmuller and Durand (1983)*. These liptinite-rich deposits are the precursors of hydrogen rich, oxygen poor coals with good source potential for oil generation.

Type IV - Organic matter which has no generative potential. Kerogens of this type may result from (i) severley oxidised organic matter; or, (ii) post mature organic matter. Pyrobitumens and inertinite are often described as Type IV kerogens.

* Teichmuller, M. and Durand, B., 1983. Fluorescence Microscopical Rank Studies on Liptinites and Vitrinites in Peak and Coals, and Comparison with Results of Rock Eval Pyrolysis: Int. Jour. Coal Geol., V.22, pt.. 1, p. 165-178.

APPENDIX B

TABULATION OF ANALYTICAL DATA

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 6407/7-2

Printed at : 11:14
: 6 Mar 1987

		SOURCE BED EVALUATION				FREE HYDROCARBS		
LITHOLOGY	DEPTH m	TOC %wt	S2 mg/g	TMAX degC	S2/TOC HI	S0 mg/g	S1 mg/g	TPI
Cuttings Samples								
	2560.00	.42	.84	415	200	0.00	.67	.44
	2565.00	.46	.95	416	207	0.00	.33	.26
	2567.00	.49	.63	415	129	0.00	.40	.39
	2570.00	2.16	1.94	427	90	0.00	.69	.26
	2572.00	1.47	1.40	427	95	0.00	.59	.30
	2575.00	1.21	1.26	423	104	0.00	.74	.37
	2577.00	.91	.88	423	97	0.00	.60	.41
	2580.00	.97	.94	426	97	0.00	.56	.37
	2582.00	.73	.77	421	105	0.00	.55	.42
	2585.00	.92	.82	427	89	0.00	.63	.43
	2587.00	.96	.60	427	62	0.00	.45	.43
	2590.00	.93	.64	425	69	0.00	.37	.37
	2592.00	1.00	.85	420	85	0.00	.68	.44
	2595.00	1.07	.39	430	36	0.00	.33	.46
	2597.00	.86	.42	426	49	0.00	.35	.45
	2600.00	.77	.46	401	60	0.00	.41	.47
	2602.00	2.16	.81	431	38	0.00	.36	.31
	2605.00	1.22	.39	430	32	0.00	.26	.40
	2607.00	1.09	.34	429	31	0.00	.31	.48
	2610.00	1.34	.43	430	32	0.00	.31	.42
	2612.00	4.23	8.03	431	190	0.00	1.30	.14
	2615.00	1.50	.52	431	35	0.00	.30	.37
	2617.00	1.30	.56	432	43	0.00	.38	.40
	2620.00	1.90	.85	436	45	0.00	.42	.33
	2622.00	2.02	1.11	430	55	0.00	.51	.31
	2625.00	1.21	.55	428	45	0.00	.41	.43
	2627.00	1.25	.64	427	51	0.00	.47	.42
	2630.00	1.04	.46	424	44	0.00	.24	.34
	2632.00	.37	.21	412	57	0.00	.24	.53
	2635.00	.36	.20	416	56	0.00	.23	.53
	2637.00	.31	.17	420	55	0.00	.17	.50
	2640.00	2.30	4.71	429	205	0.00	.66	.12
	2642.00	4.52	14.32	428	317	0.00	1.28	.08
	2645.00	4.70	15.03	429	320	.03	1.39	.09
	2647.00	4.68	14.18	428	303	.04	1.42	.09
	2650.00	4.79	14.79	430	309	.05	1.63	.10
	2652.00	4.49	12.63	430	281	.05	1.38	.10
	2655.00	4.31	11.48	430	266	.06	1.45	.12
	2657.00	3.94	10.75	432	273	.05	1.24	.11
	2660.00	3.82	8.07	431	211	.02	1.14	.13
	2662.00	4.11	7.49	432	182	.03	1.08	.13
	2665.00	4.35	8.00	432	184	.03	1.12	.13

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 6407/7-2

Printed at : 11:56
: 6 Mar 1987

		SOURCE BED EVALUATION				FREE HYDROCARBS		
LITHOLOGY	DEPTH m	TOC %wt	S2 mg/g	TMAX degC	S2/TOC HI	SO mg/g	S1 mg/g	TPI
Cuttings Samples								
_____	2667.00	4.05	7.97	431	197	.03	1.25	.14
_____	2672.00	4.87	7.30	431	150	.03	1.51	.17
_____	2690.00	1.76	3.80	430	216	0.00	.61	.14
_____	2692.00	2.40	2.78	432	116	0.00	.53	.16
_____	2695.00	.95	.49	427	52	.02	.26	.36
_____	2702.00	1.82	1.09	435	60	0.00	.34	.24
_____	2705.00	1.17	.99	435	85	0.00	.35	.26
_____	2707.00	.94	.91	434	97	0.00	.33	.27
_____	2710.00	1.47	1.07	435	73	0.00	.36	.25
_____	2712.00	1.01	.82	433	81	0.00	.31	.27
_____	2715.00	.85	.89	431	105	0.00	.38	.30
_____	2740.00	1.01	.73	432	72	0.00	.29	.28
_____	2742.00	.82	1.55	433	189	0.00	.51	.25
_____	2745.00	.73	1.10	434	151	0.00	.33	.23
_____	2747.00	.59	1.10	433	186	.12	.46	.35
_____	2750.00	.67	1.48	434	221	.06	.43	.25
_____	2752.00	.69	1.34	436	194	.04	.43	.26
_____	2755.00	.57	1.20	432	211	.03	.43	.28
_____	2760.00	.81	1.65	434	204	.02	.51	.24
_____	2832.00	1.39	1.34	423	96	0.00	.76	.36
_____	2835.00	2.02	5.05	433	250	0.00	3.97	.44
**********	2840.00	28.08	125.71	426	448	0.00	14.08	.10
_____	2865.00	1.31	1.11	423	85	0.00	1.89	.63
_____	2867.00	.99	1.53	431	155	0.00	1.09	.42
_____	2995.00	.18	.26	436	144	0.00	.05	.16
_____	2997.00	.40	.79	413	198	0.00	.18	.19
_____	3000.00	.06	.06	0	100	0.00	.05	.45
_____	3002.00	.27	.14	0	52	0.00	.06	.30
_____	3005.00	.11	.07	0	64	0.00	.06	.46
_____	3020.00	.15	.25	0	167	0.00	.05	.17
_____	3022.00	.11	.10	0	91	0.00	.03	.23
_____	3030.00	.01	0.00	0	0	0.00	0.00	0.00
_____	3032.00	.07	.01	0	14	0.00	.01	.50
_____	3042.00	.04	0.00	0	0	0.00	0.00	0.00

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 6407/7-2

Printed at : 10:10
: 11 Mar 1987

		SOURCE BED EVALUATION				FREE HYDROCARBS		
LITHOLOGY	DEPTH m	TOC %wt	S2 mg/g	TMAX degC	S2/TOC HI	S0 mg/g	S1 mg/g	TPI
Core Samples								
	2673.00	.99	1.34	432	135	.01	.42	.24
	2674.00	1.50	2.28	433	152	.01	.57	.20
	2675.00	2.00	3.59	431	179	0.00	.62	.15
	2676.00	.78	.76	435	97	0.00	.35	.32
	2677.10	2.63	2.80	431	106	0.00	.79	.22
	2678.00	4.88	11.22	426	230	.02	1.31	.11
	2678.80	4.89	11.40	428	233	.04	1.28	.10
	2679.00	5.90	23.05	424	391	.06	1.98	.08
	2680.00	1.82	1.70	431	93	.08	.49	.25
	2681.00	3.05	5.92	430	194	.04	.94	.14
	2681.75	2.77	5.69	434	205	.02	.60	.10
	2682.00	2.15	3.76	435	175	.04	.48	.12
	2683.00	1.26	2.48	434	197	.02	.31	.12
	2684.00	1.15	2.21	431	192	.02	.34	.14
	2684.65	1.15	2.43	434	211	0.00	.32	.12
	2685.00	1.44	3.17	431	220	.02	.37	.11
	2685.40	1.36	2.09	433	154	0.00	.28	.12
	2686.00	1.23	2.23	431	181	.02	.33	.14
	2686.10	.95	1.21	430	127	0.00	.41	.25
	2701.00	2.43	1.55	433	64	.02	.89	.37
	2702.00	.17	.48	0	282	.02	.62	.57
	2703.00	1.91	2.13	432	112	.02	1.62	.44
	2704.00	1.51	2.40	433	159	.02	1.15	.33
	2705.00	.83	1.94	427	234	.04	2.58	.57
	2706.00	.99	1.59	431	161	.04	1.40	.48
	2707.00	.65	1.47	418	226	.03	2.53	.64
	2708.00	.55	1.42	426	258	.02	2.17	.61
	2708.90	1.55	2.36	431	152	.01	2.08	.47
	2710.00	1.09	1.17	434	107	.01	.58	.34
	2711.00	2.03	2.39	434	118	.01	1.06	.31
	2712.00	1.40	2.00	434	143	0.00	.70	.26
	2714.00	1.42	1.88	433	132	0.00	.67	.26
	2715.00	1.51	2.98	433	197	0.00	.89	.23
	2716.00	2.10	3.39	434	161	.01	.90	.21
	2717.00	.69	.79	431	114	0.00	.47	.37
	2717.90	.72	.88	429	122	.01	.81	.48
	2718.40	.07	.09	460	129	0.00	.17	.65
	2718.50	.73	1.64	430	225	0.00	2.02	.55
	2718.80	.67	1.68	427	251	.01	2.06	.55
	2723.00	.41	.46	433	112	.02	.56	.56
	2724.00	.25	.76	435	304	0.00	.34	.31
	2725.00	.17	.27	430	159	0.00	.47	.64
	2726.00	.17	.36	434	212	0.00	.31	.46

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 6407/7-2

Printed at : 12:05
: 6 Mar 1987

		SOURCE BED EVALUATION				FREE HYDROCARBS		
LITHOLOGY	DEPTH m	TOC %wt	S2 mg/g	TMAX degC	S2/TOC HI	S0 mg/g	S1 mg/g	TPI
Core Samples								
	2728.00	1.33	.27	432	20	0.00	.28	.51
	2729.00	.44	.06	427	14	0.00	.17	.74
	2730.00	.24	.55	432	229	0.00	.37	.40
	2732.00	.28	.23	433	82	0.00	.20	.47
	2733.00	.54	1.83	436	339	0.00	.48	.21
	2735.00	.84	2.29	436	273	0.00	.42	.15
	2735.01	1.23	2.36	436	192	0.00	.35	.13
	2738.00	2.51	8.20	434	327	.01	1.07	.12
	2739.40	2.73	7.43	437	272	0.00	.70	.09
	2739.50	1.86	5.31	434	285	.03	.78	.13
	2775.00	1.08	2.72	432	252	0.00	4.21	.61
	2777.00	1.38	3.28	437	238	.02	.96	.23
	2779.00	1.37	3.00	435	219	.01	1.18	.28
	2781.00	1.09	2.44	423	224	.08	8.88	.79
	2783.00	1.04	2.80	422	269	.15	8.78	.76
	2785.00	1.11	2.94	426	265	.19	9.32	.76
	2786.00	.99	2.54	437	257	.12	1.28	.36
	2787.00	1.15	3.16	420	275	.12	9.10	.74
	2791.50	1.42	4.23	419	298	.21	11.16	.73
	2792.00	2.05	5.05	437	246	.21	3.66	.43
	2793.00	1.23	3.21	426	261	.21	9.22	.75
	2795.00	2.41	6.66	423	276	.22	8.22	.56
	2796.00	.13	.69	585	531	.16	.50	.49
	2798.00	3.25	6.73	430	207	.11	3.12	.32
	2799.00	.50	1.04	437	208	.12	.67	.43
	2800.00	1.76	3.99	437	227	.06	2.05	.35
	2800.75	2.14	5.68	439	265	0.00	.68	.11
	2801.00	1.44	3.91	426	272	.17	11.76	.75
	2804.50	1.43	4.05	432	283	.03	1.23	.24
	2806.00	1.36	3.32	424	244	.12	9.78	.75
	2808.00	.85	2.05	435	241	.10	1.36	.42
	2810.00	1.28	3.45	411	270	.12	10.92	.76
	2812.00	.67	1.92	417	287	.15	4.28	.70
	2813.70	2.47	8.07	435	327	.10	2.07	.21
	2815.00	1.61	4.18	425	260	.15	10.35	.72
	2817.00	1.15	3.12	426	271	.23	6.95	.70
	2819.00	.78	2.35	411	301	.19	5.24	.70
	2821.00	1.11	3.31	422	298	.19	8.81	.73
	2823.00	1.19	3.49	425	293	.02	9.76	.74
	2823.30	8.84	22.14	424	250	.17	8.32	.28
	2823.50	.20	.89	587	445	.16	.56	.45
	2824.00	2.20	6.88	436	313	.21	4.26	.39
	2827.00	2.18	4.60	437	211	.11	3.09	.41
	2829.00	1.38	4.48	0	325	.11	9.82	.69

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 6407/7-2

Printed at : 12:11
: 6 Mar 1987

		SOURCE BED EVALUATION				FREE HYDROCARBS		
LITHOLOGY	DEPTH m	TOC %wt	S2 mg/g	TMAX degC	S2/TOC HI	S0 mg/g	S1 mg/g	TPI
Core Samples								
	2831.00	1.12	3.24	419	289	.18	7.06	.69
	2833.00	1.17	3.49	424	298	.21	9.02	.73
	2834.00	1.28	3.96	433	309	.19	4.11	.52
	2835.00	2.07	4.45	429	215	.19	4.75	.53
	2836.00	.88	1.94	432	220	.14	1.50	.46
	2837.50	1.24	2.59	439	209	0.00	.33	.11
	2838.00	1.36	3.59	436	264	.09	.95	.22
	2839.60	22.18	143.25	431	646	.35	40.99	.22
	2840.00	16.40	48.22	427	294	.11	9.02	.16
	2840.90	1.29	2.70	420	209	.23	4.16	.62
	2848.70	40.71	136.95	424	336	0.00	17.61	.11
	2849.40	14.12	69.76	423	494	0.00	12.35	.15
	2880.00	2.25	3.71	433	165	0.00	.32	.08
	2888.10	13.98	149.54	412	1070	0.00	18.69	.11
	2889.00	49.76	461.16	506	927	0.00	16.33	.03
	2889.10	38.27	185.18	433	484	.22	17.68	.09
	2889.20	1.58	1.21	443	77	0.00	.21	.15
	2891.60	1.10	.21	455	19	0.00	.06	.22
	2893.50	1.62	.93	454	57	0.00	.23	.20
	2905.30	28.32	105.32	426	372	.19	6.03	.06
	2913.00	17.46	91.96	421	527	0.00	7.35	.07

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 6407/7-2

Printed at : 12:15
: 6 Mar 1987

		SOURCE BED EVALUATION				FREE HYDROCARBS		
LITHOLOGY	DEPTH m	TOC %wt	S2 mg/g	TMAX degC	S2/TOC HI	SO mg/g	S1 mg/g	TPI
Sidewall Core Samples								
	1716.00	1.35	2.85	426	211	0.00	.21	.07
	1775.00	1.82	1.91	419	105	0.00	.25	.12
	1824.00	1.86	3.09	431	166	0.00	.27	.08
	1956.50	1.49	.71	422	48	0.00	.40	.36
	1958.00	1.04	.38	422	37	0.00	.12	.24
	1975.00	.70	.87	424	124	0.00	.50	.36
	2008.50	1.00	.78	428	78	0.00	.15	.16
	2025.00	1.12	1.44	427	129	0.00	.38	.21
	2050.00	1.06	1.30	430	123	0.00	.17	.12
	2075.00	1.04	1.63	429	157	0.00	.37	.18
	2100.00	.83	1.19	430	143	0.00	.37	.24
	2139.00	.73	.56	425	77	0.00	.07	.11
	2225.00	.82	.57	429	70	0.00	.18	.24
	2251.00	.95	.75	431	79	0.00	.15	.17
	2275.00	1.29	1.04	431	81	0.00	.20	.16
	2300.00	1.15	1.03	433	90	0.00	.16	.13
	2349.00	1.05	.67	428	64	0.00	.24	.26
	2425.00	1.09	.87	429	80	0.00	.43	.33
	2474.50	.96	.74	427	77	0.00	.53	.42
	2522.50	.80	.38	423	48	0.00	.26	.41
	2550.00	.75	.45	423	60	0.00	.33	.42
	2553.00	.12	.33	450	275	0.00	.01	.03
	2575.00	1.15	2.09	503	182	0.00	.04	.02
	2587.00	8.05	29.77	425	370	0.00	1.98	.06
	2611.00	1.63	.67	523	41	0.00	.05	.07
	2622.00	.28	.18	0	64	0.00	.06	.25
	2625.00	.03	.03	0	100	0.00	.04	.57
	2631.00	.03	.03	0	100	0.00	0.00	0.00
	2632.50	.07	0.00	0	0	0.00	0.00	0.00
	2638.00	5.04	22.24	428	441	.10	1.79	.08
	2640.00	7.56	36.93	425	488	.19	2.66	.07
	2647.00	.87	.89	425	102	0.00	.33	.27
	2650.00	8.00	37.66	425	471	.07	3.53	.09
	2653.00	3.34	9.84	427	295	.02	.89	.08
	2661.00	5.12	14.15	430	276	.10	1.91	.12
	2673.00	2.74	6.08	463	222	0.00	.80	.12
	2690.00	1.09	.86	457	79	0.00	.40	.32
	2693.00	1.47	1.26	462	86	0.00	.32	.20
	2695.00	.48	1.32	437	275	0.00	.15	.10
	2698.00	.55	5.67	497	1031	.03	.96	.15
	2750.00	.80	1.42	434	177	0.00	.17	.11
	2755.00	.75	3.06	439	408	0.00	.31	.09
	2760.00	1.10	3.99	437	363	0.00	.32	.07
	2768.00	.84	2.90	439	345	0.00	.43	.13
	2772.00	1.56	5.73	440	367	.13	.74	.13

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 6407/7-2

Printed at : 12:19
: 6 Mar 1987

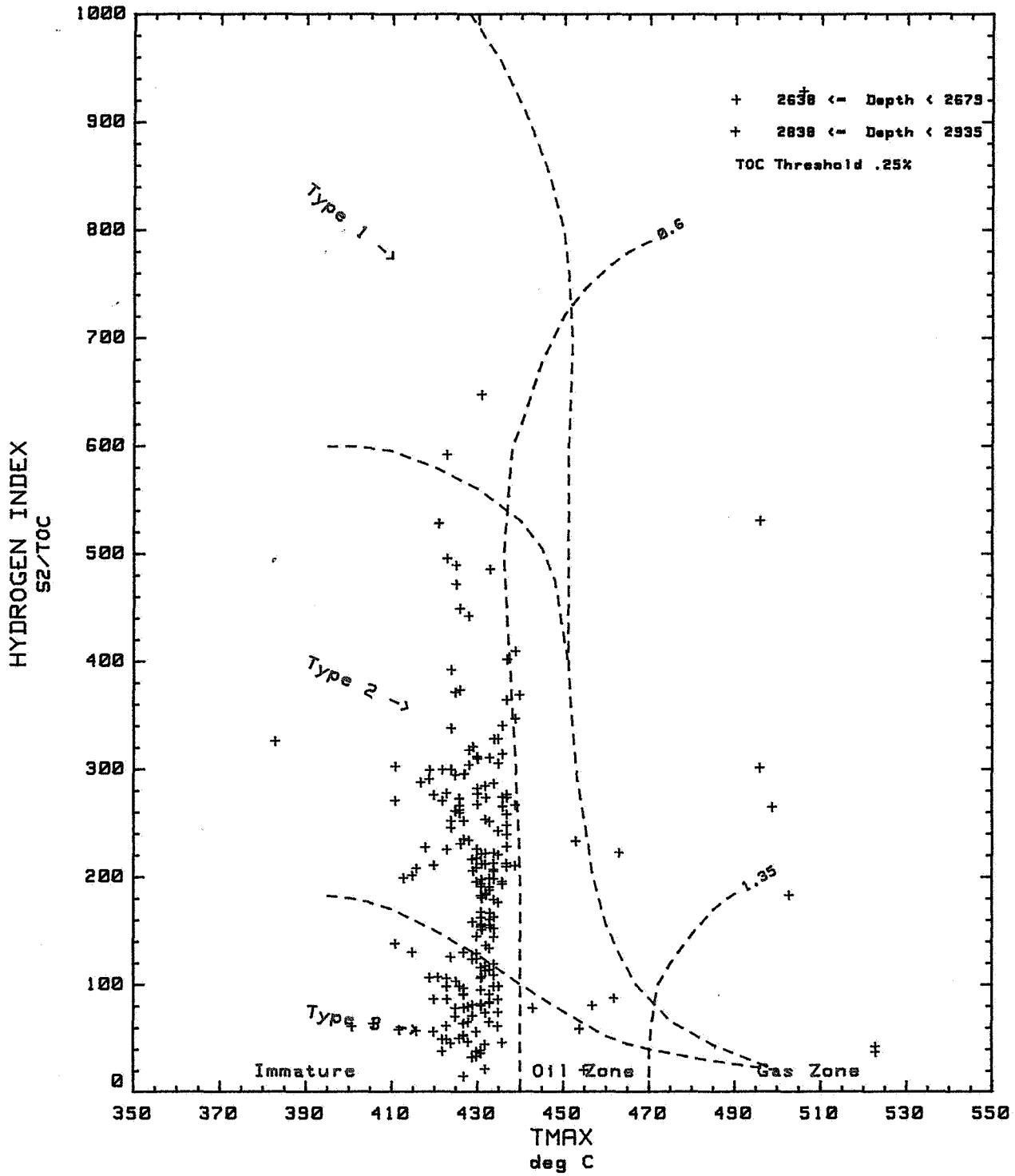
		SOURCE BED EVALUATION				FREE HYDROCARBS		
LITHOLOGY	DEPTH m	TOC %wt	S2 mg/g	TMAX degC	S2/TOC HI	S0 mg/g	S1 mg/g	TPI
Sidewall Core Samples								
	2871.00	1.17	3.51	496	300	.54	8.00	.71
	2872.00	1.18	1.61	411	136	.36	10.32	.87
	2873.00	2.59	8.03	430	310	0.00	1.27	.14
	2874.00	1.06	5.61	496	529	.27	5.33	.50
	2875.00	.41	.95	453	232	.05	2.32	.71
	2876.00	.71	1.87	499	263	.28	3.86	.69
	2878.00	.33	3.86	0	1170	.06	.06	.03
	2880.00	.11	.78	0	709	0.00	0.00	0.00
	2923.00	.23	.55	483	239	0.00	.03	.05
	2934.00	13.36	53.47	437	400	0.00	2.60	.05
	2952.00	.04	.24	515	600	0.00	0.00	0.00
	2996.50	.06	.29	0	483	.02	.02	.12
	3032.00	.15	.16	433	107	0.00	0.00	0.00
	3040.00	.06	.03	0	50	0.00	.01	.25
	3042.00	.01	.07	484	700	0.00	.06	.46
	3097.00	.02	.02	0	100	0.00	.03	.60
	3105.00	.06	.14	0	233	0.00	0.00	0.00
	3109.50	.05	.02	0	40	0.00	0.00	0.00
	3120.00	.11	.26	557	236	.03	.03	.19
	3128.00	.01	0.00	0	0	0.00	.01	1.00
	3177.00	1.14	.41	523	36	0.00	.03	.07
	3243.00	.88	.55	406	63	0.00	.37	.40
	3263.00	.23	.42	0	183	.05	.04	.18
	3268.00	.22	.05	0	23	0.00	0.00	0.00
	3272.50	.21	.03	0	14	0.00	.02	.40
	3276.00	.34	.03	0	9	0.00	0.00	0.00
	3283.00	.05	0.00	0	0	0.00	0.00	0.00
	3298.00	.24	.15	0	62	.02	.02	.21
	3305.00	.11	.21	429	191	0.00	.01	.05
	3315.00	.21	.05	434	24	0.00	.01	.17

APPENDIX C

HYDROGEN INDEX/TMAX CROSSPLOTS

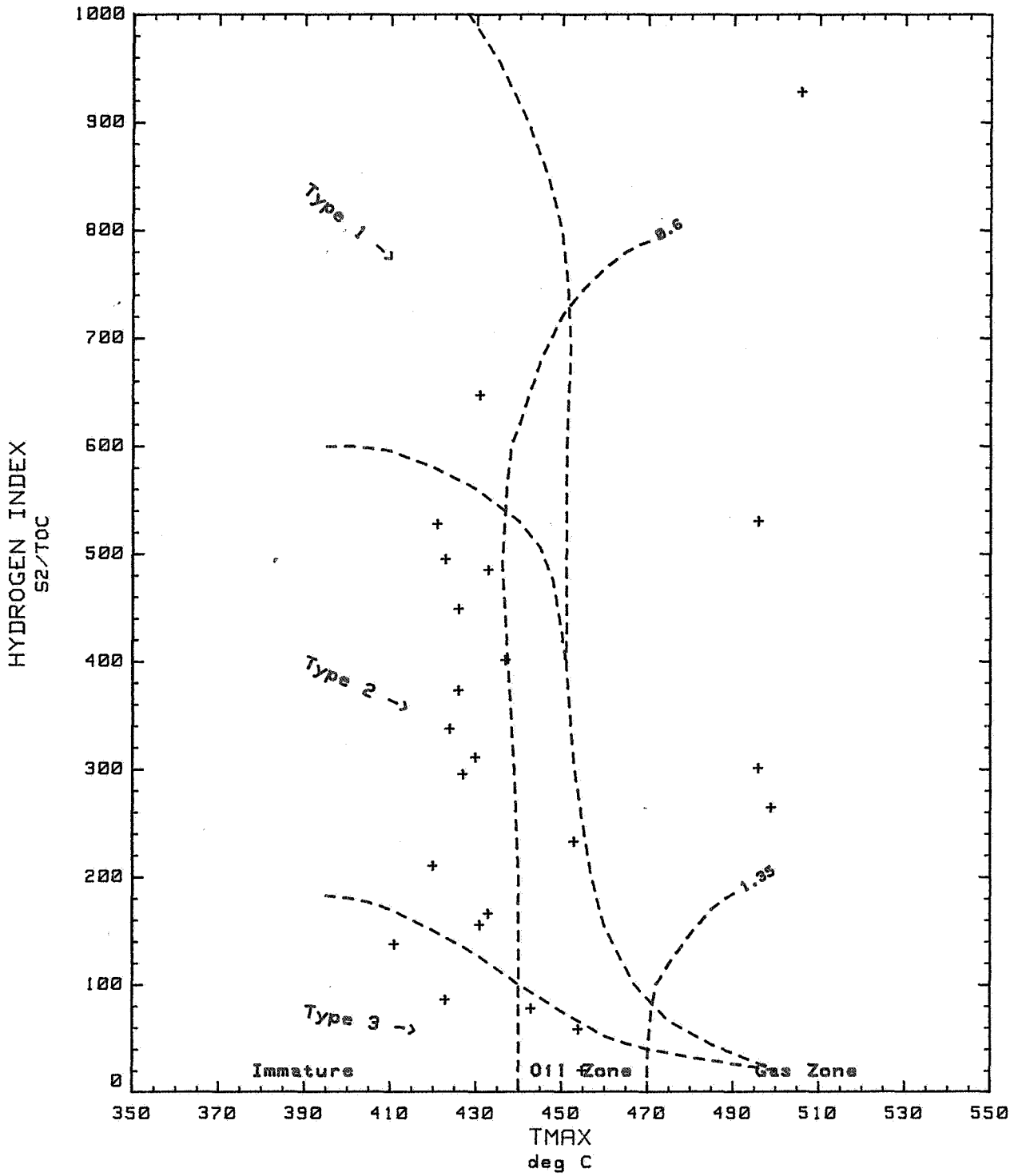
EXLOG®

PYRO-ANALYSIS CROSS PLOT
HYDROGEN INDEX vs TMAX
6407/7-2
1716 to 3315 m
10 Mar 1987



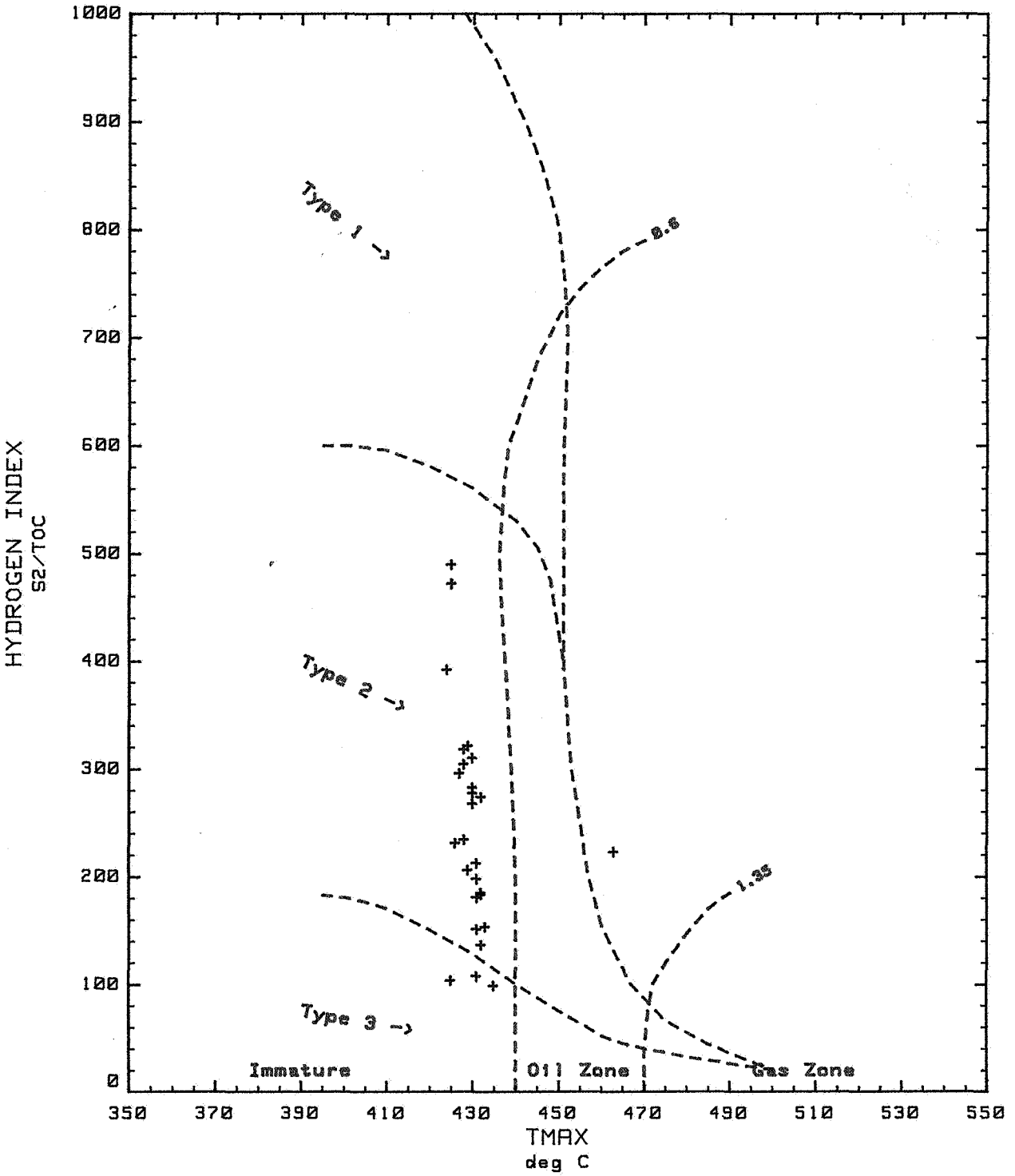
EXLOG®

PYRO-ANALYSIS CROSS PLOT
HYDROGEN INDEX vs TMAX
6407/7-2
2838 to 2935 m
6 Mar 1987



EXLOG®

PYRO-ANALYSIS CROSS PLOT
HYDROGEN INDEX vs TMAX
6407/7-2
2638 to 2679 m
6 Mar 1987



APPENDIX D

GEOCHEMICAL EVALUATION LOG 1 : 10,000