



## RESEARCH CENTRE

SUNBURY - ON - THAMES

MIDDLESEX

EXPLORATION AND PRODUCTION DIVISIONTECHNICAL NOTEAUGUST 1978EPR/TN 7043**EXPLORATION LIBRARY**GEOCHEMICAL STUDY OF NOCS WELL 7/12-3 W25.2 Copy no. 1

by

J.A. Miles

SUMMARY

Seven sidewall core samples of Valanginian to Portlandian age were examined for source rock richness and maturity. Although maturation indications were variable, these parameters suggested that the interval examined was marginally mature. All of the sediments examined were of moderate source rock richness, but the 'Kimmeridge Clay Formation' of the Portlandian contained thin bands of shales, rich in Carbonaceous remains, which gave high Total Organic Carbon contents.

## INTRODUCTION

NOCS Well 7/12-3 was the first appraisal well of the 7/12-2 oil find. A good "wet" gas show was encountered at 3497 - 3507m, and oil stains were observed between 3603 and 3710m.

Seven sidewall core (swc) samples from the interval 3310 - 3555m were examined by Geochemistry Branch, Sunbury, for source rock richness (SRR) and Degree of Organic Diagenesis (DOD). These samples ranged from Valanginian to Portlandian in age.

## ANALYSES PERFORMED BY GEOCHEMISTRY BRANCH, BP SUNBURY

Total Organic Carbon (TOC) contents of the samples were determined from  $C_R/C_T$  measurements. The DOD of the samples was determined using vitrinite reflectance measurements. Small pieces of the cores were mounted in resin, polished, and the reflectance of dispersed vitrinite particles determined by standard oil immersion techniques. Spore fluorescence colours in UV light were used to characterise the autochthonous vitrinite reflectance populations.

No spore colour or kerogen typing was attempted by BP Sunbury, but a cursory examination was carried out of slides prepared by Geochem Laboratories UK for their own use.

Ground sidewall cores were extracted with dichloromethane to obtain Total Soluble Extracts (TSE). This extraction was performed sonically as the sample sizes were too small for conventional Soxhlet extractions. Where possible, the TSE's were separated into alkane (SAC) and aromatic and resin fractions by Low Pressure Liquid Chromatography (LPLC). The TSEs and SAC fractions, where possible, were analysed by capillary column chromatography to determine normal alkane distributions and Carbon Preference Indices (CPI). Limited Sterane and Pentacyclane distributions were determined by C-GC-MS for use in oil-source rock correlations (Figures 3 and 4).

The solvent extracted, ground residues were used for kerogen stable carbon isotope determinations.

## RESULTS

### Vitrinite Reflectance Results

These results are summarised in Table 1. Large amounts of reworked material (allochthonous) and bad distributions of autochthonous material made interpretation of the results difficult. No trends with depth were observed, but only a limited interval was examined. No reliable estimates of oil and gas generation thresholds could be made, but all samples appeared to be marginally mature. This suggests an oil generation threshold of 3300 - 3550m.

### Visual Kerogen Descriptions

All of the slides examined, except the one from 3555m, were found to be barren of organic material. The sample from 3555m appeared to contain moderate amounts of woody debris but was not considered to have good gas potential. DOD estimates from spore colour suggested that this sample was marginally mature.

### Basic Source Rock Parameters

These results are summarised in Table 1. Carbonate contents were low, 0.6 to 17.1% wt., confirming that the shales were only slightly calcareous.

TOC contents were moderate to very good for the samples analysed, falling in the range 0.63 - 8.04% wt.

Soluble extract parameters, TSE/TOC and SAC/TOC both suggested that the rocks were immature or gas prone.

Carbon Preference Indices (CPI) indicated that the rocks were mature.  $C_R/C_T$  measurements supported this indication.

### Stable Carbon Isotope Ratios

These results are summarised in Table 1. Kerogen stable carbon isotope ratios ( $\delta^{13}C_{PDB-1}$ ) indicated that the sediments were from a paralic environment.

### CONCLUSIONS

1. DOD parameters suggested that the samples from 3310 - 3555m were marginally mature. No trends with depth were noted over the interval examined, and the results were mainly averages of a wide range of values rather than population means.
2. No definite indications of kerogen types could be obtained from the kerogen preparations examined, but all samples appeared to be lean in organic material.
3. All samples examined were of moderate TOC but some horizons within the Kimmeridge Clay Formation of the Portlandian were very rich in organic carbon.

TABLE 1.

NOCS WELL 7/12-3  
BASIC SOURCE ROCK DATA

SAMPLE	AGE	DEPTH m	SAMPLE TYPE/ LITHOLOGY	KEROGEN CARBONISATION CR/CT	CARBONATE % wt (HCl SOLUBLE)	TOTAL ORGANIC CARBON (TOC) % WT	VITRINITE REFLECTANCE (AUTOCHTHONOUS)
79	HAUT	3310	swc Shale	0.46	12.6	0.63	
75	VALA	3474.8	swc Silty Shale	0.35	17.1	0.69	0.53 (2)
73	BERRI	3495	swc Shale	0.51	11.2	0.82	
72	BERRI	3498	swc Shale	0.51	9.6	3.09	0.52 (6)
71	PORT	3500	swc Shale	0.47	6.6	8.04	0.58 (6)
69	PORT	3525	swc Shale	0.59	10.8	2.08	
68	PORT	3555	swc Shale	0.59	13.1	0.63	

TABLE 1 (CONTINUED).

NOCS WELL 7/12-3

BASIC SOURCE ROCK DATA

SAMPLE	TOTAL SOLUBLE EXTRACT (TSE)% wt	TSE TOC INDEX %	SAC TOC INDEX %	TSE		KEROGEN STABLE CARBON ISOTOPE VALUE $\delta^{13}C$	n-ALKANE CARBON PREFERENCE INDEX CPI
				SATURATE ALKANE CONTENT (SAC)% wt	PRISTANE/PHYTANE RATIO pr/ph		
79	0.0361	57			1.4	- 25.9	1.05
75	0.0669	96			1.7	N/D	1.05
73	0.0136	16			1.2	- 26.4	1.05
72	0.0631	20	6	30	1.6	- 27.3	1.05
71	0.3622	45	14	32	1.6	- 28.6	1.04
69	0.0780	37			1.5	- 28.1	1.05
68	0.0503	79			1.6	- 25.9	1.1

FIGURE 3 STERANE DISTRIBUTIONS  
NOCS WELL 7/12-3

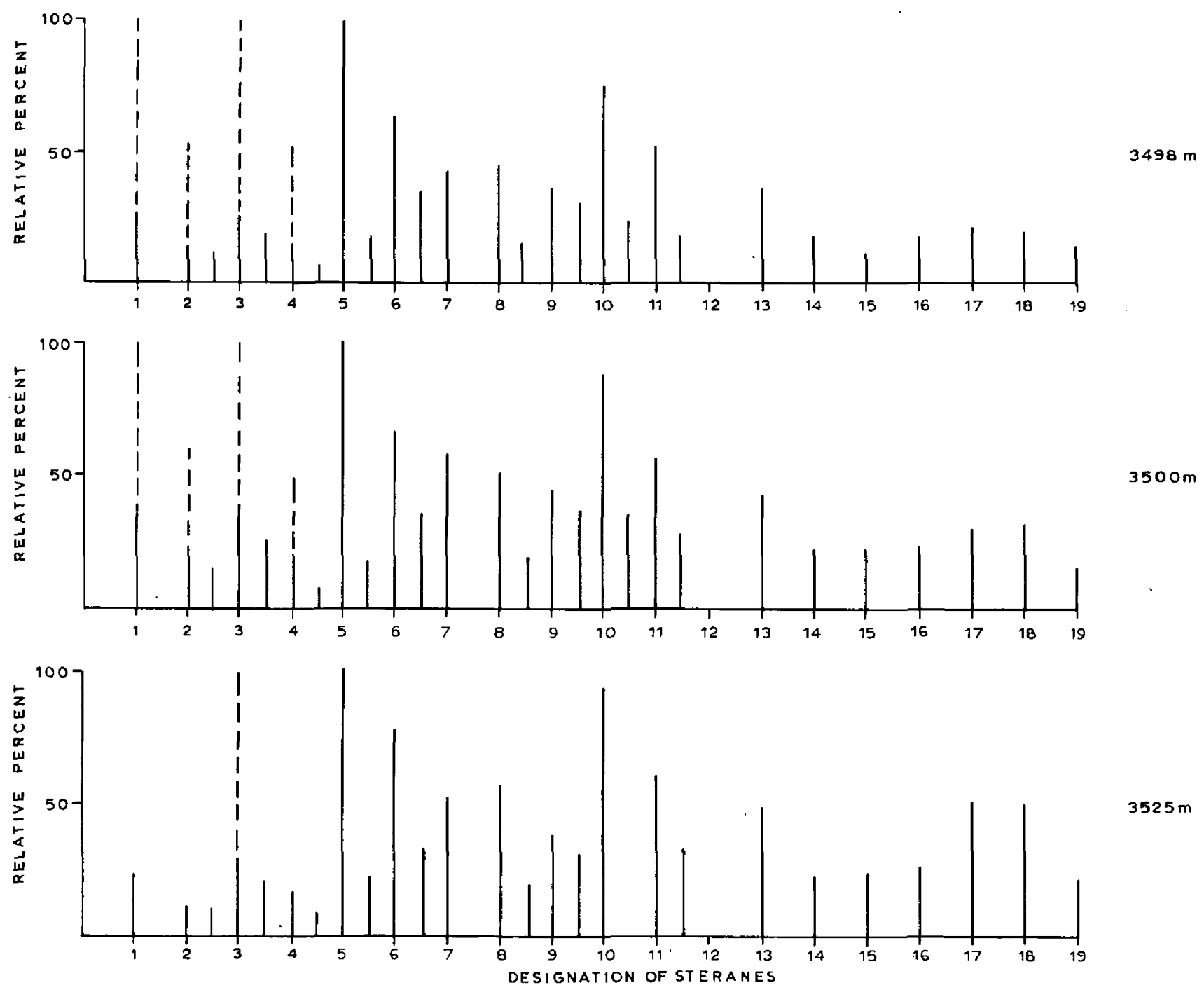


FIGURE 4 PENTACYCLANE DISTRIBUTIONS

NOCS WELL 7/12-3

