

## RESEARCH CENTRE

SUNBURY - ON - THAMES

MIDDLESEX

#### EXPLORATION AND PRODUCTION DIVISION

TECHNICAL NOTE

AUGUST 1978

EPR/TN 7041

EXPLORATION LIBRARY

**RESTR'CTED** 

GEOCHEMICAL STUDY OF NOCS WELL 7/12-4. W25, Copy No, 1

by

by J.A. Miles.

#### SUMMARY

A geochemical study was undertaken on 39 sidewall cores and 4 wet cuttings samples from this well. Conventional maturity indicators were of poor specificity, but suggested that the oil generation threshold was at a depth of approximately 3400m. Rocks of Portlandian age had the highest Total Organic Carbon (TOC) contents, but rocks of Eocene age were also considered to be of good quality.

Good oil prone source rocks were identified at 2675m in the Palaeocene and at 3350m, 3380m, and 3440m in the "Kimmeridge Clay Formation" of the Portlandian. A good gas source was evident in a sample from 2640m in the Eocene.

The information contained in this document is the property of The British Petroleum Company Limited. Due acknowledgement should be made if it is desired to refer to this information in publications or discussions with third parties.

#### A) INTRODUCTION

NOCS Well 7/12-4 was the third appraisal well of the 7/12-2 oil find. Significant quantities of gas, and traces of fluorescence were noted from 3312m downwards in the well, but the reservoir proper was encountered at 3445m in Jurassic sandstones. Traces of hydrocarbons were recorded in sidewall cores (swc) down to TD at 3623m. A geochemical study of 39 swc and 4 canned wet cuttings samples of Eocene to Triassic (?) age was undertaken, and the results summarised in an abbreviated format in April 1978 (1).

#### B. ANALYSES PERFORMED BY GEOCHEMISTRY BRANCH, BP SUNBURY.

The Degree of Organic Diagenesis (DOD) of the samples was determined by vitrinite reflectance measurements on small pieces of swc and "picked" cuttings. Samples were mounted in resin, polished and the reflectance of dispersed vitrinite determined by standard oil immersion techniques. Spore fluorescence in UV light proved helpful in characterising the autochthonous vitrinite reflectance distributions.

Spore colour in transmitted white light and kerogen type analysis were determined by microscope examination of specially prepared organic concentrates. Samples were examined by two separate laboratories undertaking this type of work.

Ground core samples were extracted with dichloromethane to obtain Total Soluble Extracts (TSE). These extracts were then separated into an alkane fraction (SAC) and aromatic and resin fractions by Low Pressure Liquid Chromatography (LPLC). The SAC fractions were analysed by capillary column gas/liquid chromatography to determine the normal alkane distributions and their Carbon Preference Indices together with the acyclic hydrocarbon distribution patterns. The solvent extracted, ground samples were then decarbonated to remove inorganic carbonates and Total Organic Carbon (TOC) contents determined on the residues.

#### C) RESULTS

#### (i) Vitrinite Reflectance Results

Vitrinite reflectance values are summarised in Table 3. The results were considered to be of very poor specificity and no extrapolations with depth were attempted. The main reason for the lack of usable results was the virtual absence of indigenous (autochthonous) vitrinite in the samples examined. Most of the vitrinite present appeared to be reworked i.e. allochthonous. Spore fluorescence in UV light indicated a maturity level equivalent to a reflectance of about 0.5%. No changes in fluorescence colours were noted over the interval examined i.e. 2580 - 3620m. Some sections contained bitumen and hydrocarbons which could have lowered the reflectance of the vitrinite. These intervals were mainly associated with the reservoir section of the well. An oil generation threshold of approximately 3400m was suggested from the results.

#### (ii) Visual Kerogen Descriptions

The results from these analyses are summarised in Table 4. Kerogen typing was undertaken in two separate laboratories so it was possible that slight differences between the two sets of results existed. The first set of samples from 3350m, 3380m, 3440m in the Kimmeridge Clay Formation were all described as having good oil potential, although no TOC results were available to check the organic carbon contents. Spore colours recorded for this set of results were given scale values of 3, but it was suggested that this might be a little low and that the sample DOD could even be approaching that equivalent to peak oil generation levels.

- 2 -

The second set of results from 2580 to 3275m indicated only the sample from 2675m as having any good oil potential, and that from 2640m as having possible good gas potential.

Unfortunately duplicate samples for comparative purposes were not sent to the two laboratories which undertook these visual kerogen studies.

#### (iii) Basic Source Rock Parameters

Carbonate and organic carbon contents of the swc samples are summarised in Tables 1 and 2. The highest carbonate contents were found in rocks of Valanginian age in the Valhal Formation (3312 - 3347m), where acid soluble material ranged from 19.7 to 39.5% wt. Other carbonate contents were rather lower and ranged from 4.3 to 15.6% wt.

39 samples were analysed for TOC contents. The values obtained were in the range 0.05 - 9.50% wt., with the richest source rocks being in the "Kimmeridge Clay Formation" of the Portlandian. Good TOC contents were also observed in the Eocene from 2610 to 2640m.

TSE/TOC and SAC/TOC indices supported observations that the rocks were either gas prone or immature down to 3275m, but showed that contamination of the sediments by migrated hydrocarbons had probably occurred below this depth. The SAC/TSE indices supported the view that this contamination was probably crude oil.

The Carbon Preference Index (CPI) suggested that rocks below 2785m were marginally mature, but this was considered to be more related to the kerogen being of marine origin.

A summary of all the geochemical results is shown in Figure 1.

#### D. CONCLUSIONS

(1) Conventional maturity indicators were of poor specificity, vitrinite reflectance measurements being complicated by large amounts of reworked material. An oil generation threshold of approximately 3400m was suggested by the results obtained. (2) Visual kerogen descriptions indicated that good oil prone kerogen could be recognised at 2675m, 3350m, 3380m and 3440m. A good gas prone source rock was recognised at 2640m. Spore colour measurements indicated that the section examined approached the oil generation threshold at about 3200m but could be slightly more mature, possibly reaching peak oil generation at 3350 to 3440m.

(3) Basic source rock parameters supported vitrinite reflectance and spore colour maturity indications. This data also suggested that contamination by migrated hydrocarbons had occurred below 3275m, which corresponded to the known reservoir interval.

E. REFERENCES

**u** and the

Sedimentary Petroleum Geochemistry Report No. 13

"The Geochemistry of Sidewall Cores and Cuttings Samples from 7/12-4" by S.P. Lowe and L.A. Perry. TABLE 1

BASIC SOURCE ROCK DATA NOCS WELL 7/12-4

												<del></del>		
					IDOMA T	መርማሌ ተ			TSE					
SAMPLE	AGE		SAMPLE* TYPE/ MAIN LITHOLOGY	CARBONATE HCl SOLUBLES	ORGANIC CARBON (TOC)	SOLUBLE EXTRACT (TSE)	<u>TSE</u> TOC INDEX	SAC TOC INDEX	SATURATE ALKANE CONTENT (SAC)	CARBON PREFERENCE INDEX	PRISTANE PHYTANE RATIO	ASPHALITENE CONTENT		
			* All swc	%wt	%wt	%wt	%0	Яo	%wt	(CPI)	pr/ph	%wt		
		•												
60	Eocene	2580	Calc. Mudst.	20.2	0.1	0.004	39	7.7	19.7	-	-			
58	Eocene	2630	Silt. St.	-	1.3 ?	0.043	33	5.5	16.7	1.14	3.3			
51	Palaeocene	2710	Mudst/Siltst	8.7	0.71	0.018	26	4.4	16.8	1.24	0.6			
46	Palaeocene	2785	Limestone	. –	-	0.010	-	-	2.2	1.06	·			
42	Palaeocene	2845	Limestone		-	0.004	<u> </u>	анан санан сана Санан санан сан	34.7	1.02	-			
30	Valanginian	3192	Mudstone	7.6	0.26	0.013	51	8.3	16.2	-	0.8			
25	Valanginian	3215	Mudstone	11.8	0.22	0.005	23	7.9	34.4	1.05	0.8			
18	Valanginian	3275	SH/Mudstone	12.1	0.40	0.014	34	3.4	9.9	1.02	1.7			
12	Valanginian	3335	SH/Mudstone	21.5	0.55	0.177	324	173	53.5	1.07	1.8			
3	Portlandian	3357		9.3	4.57	0.884	193	73	37,8	1.09	1.6			
62	Jurassic/ Triassic	3615	Mudstone	7.2	0.15	0.013	89	28	31.0		-			
											· · ·			
	60 58 51 46 42 30 25 18 12 3	60Eocene58Eocene51Palaeocene46Palaeocene42Palaeocene30Valanginian25Valanginian18Valanginian12Valanginian12Valanginian3Portlandian62Jurassic/	m   60 Eocene 2580   58 Eocene 2630   51 Palaeocene 2710   46 Palaeocene 2785   42 Palaeocene 2845   30 Valanginian 3192   25 Valanginian 3215   18 Valanginian 3275   12 Valanginian 3335   3 Portlandian 3357   62 Jurassic/ 3615	SAMPLEAGETYPE/ MAIN LITHOLOGY * All swc60Eocene2580Calc. Mudst.58Eocene2630Silt. St.51Palaeocene2710Mudst/Siltst46Palaeocene2785Limestone42Palaeocene2845Limestone30Valanginian3192Mudstone25Valanginian3215Mudstone18Valanginian3275SH/Mudstone12Valanginian3357Carbonaceous Mudstone3Portlandian3357Carbonaceous Mudstone62Jurassic/3615Mudstone	SAMPLEAGETYPE/ MAIN LITHOLOGYHC1 SOLUBLES60Eocene2580Calc. Mudst.20.258Eocene2630Silt. St51Palaeocene2710Mudst/Siltst8.746Palaeocene2785Limestone-42Palaeocene2845Limestone-30Valanginian3192Mudstone11.818Valanginian3215Mudstone11.812Valanginian3355SH/Mudstone21.53Portlandian3357Carbonaceous9.362Jurassic/3615Mudstone7.2	SAMPLEAGETYPE/ MAIN LITHOLOGYHC1 SOLUBLESORAMIC CARBON (TOC)60Eocene2580Calc. Mudst.20.20.158Eocene2630Silt. St1.3 ?51Palaeocene2710Mudst/Siltst8.70.7146Palaeocene2785Limestone42Palaeocene2845Limestone30Valanginian3192Mudstone11.80.2218Valanginian3215Mudstone12.10.4012Valanginian3355SH/Mudstone21.50.553Portlandian3357Carbonaceous9.34.5762Jurassic/3615Mudstone7.20.15	SAMPLE AGE DEPTH SAMPLE' TYPE/ m CARBONATE SOLUBLES ORGANIC CARBON (TOC) SOLUBLE EXTRACT (TSE)   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.004   58 Eocene 2630 Silt. St. - 1.3 ? 0.043   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018   46 Palaeocene 2785 Limestone - - 0.004   30 Valanginian 3192 Mudstone 7.6 0.26 0.013   25 Valanginian 3215 Mudstone 11.8 0.22 0.005   18 Valanginian 3275 SH/Mudstone 21.5 0.55 0.177   3 Portlandian 3357 Carbonaceous 9.3 4.57 0.884   62 Jurassic/ 3615 Mudstone 7.2 0.15 0.013	SAMPLE AGE DEPTH SAMPLE CARBONATE TYPE/ MAIN CARBONATE SOLUBLES ORGANIC CARBON (TOC) SOLUBLE EXTRACT (TSE) TOC INDEX   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.004 39   58 Eocene 2630 Silt. St. - 1.3 ? 0.043 33   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018 26   46 Palaeocene 2785 Limestone - - 0.004 -   30 Valanginian 3192 Mudstone 7.6 0.26 0.013 51   25 Valanginian 3215 Mudstone 11.8 0.22 0.005 23   18 Valanginian 3275 SH/Mudstone 21.5 0.55 0.177 324   3 Portlandian 3357 Carbonaceous 9.3 4.57 0.884 193   62 Jurassic/ 3615 Mudstone 7.2 0	SAMPLE AGE DEPTH SAMPLe* m CARBONATE TYPE/ m ORGANIC CARBON LITHOLOGY SOLUBLE CARBON (TOC) SOLUBLE EXTRACT (TSE) TOC TWDEX MAC   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.004 39 7.7   58 Eocene 2630 Silt. St. - 1.3 ? 0.043 33 5.5   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018 26 4.4   46 Palaeocene 2755 Limestone - - 0.004 - -   42 Palaeocene 2855 Limestone - - 0.004 - -   30 Valanginian 3192 Mudstone 11.8 0.22 0.005 23 7.9   18 Valanginian 3215 SH/Mudstone 21.5 0.55 0.177 324 173   3 Portlandian 3357 Carbonaceous Mudstone 9.3 4.57 0.884 </td <td>SAMPLE AGE DEPIH SAMPLS* TYEE/ MAIN CAMBONATE HCI SOLUBLES ORGANIC CARBON SOLUBLE EXTRACT SOLUBLE TOC (TSE) SAU TOC INDEX SAU CO ALXANE NDEX SAUTATE ALXANE ALXANE   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.004 39 7.7 19.7   58 Eocene 2630 Silt. St. - 1.3 ? 0.043 33 5.5 16.7   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018 26 4.4 16.8   46 Palaeocene 2785 Limestone - - 0.004 - - 34.7   30 Valanginian 3192 Mudstone 7.6 0.26 0.013 51 8.3 16.2   25 Valanginian 3215 Mudstone 11.8 0.22 0.005 23 7.9 34.4   18 Valanginian 3355 SH/Mudstone 21.5 0.55 0.177 324 173<td>SAMPLE AGE DEPTH m SAMPLe* TYPE/ Main LITHOLOGY CARBONATE HC1 SOLUBLES TOTAL ORDANTC (TCC) TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES SAC SAC SATURATE ALXANE FWC CARBON MAIXANE SWT CARBON SOLUBLES   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.0004 39 7.7 19.7 -   58 Eocene 2630 Silt. St. - 1.3 ? 0.043 33 5.5 16.7 1.14   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018 26 4.4 16.8 1.24   46 Palaeocene 2785 Limestone - - 0.004 - - 34.7 1.02   30 Valanginian 3192 Mudstone 7.6 0.26 0.013 51 8.3 16.2 -   25 Valanginian 3215 Mudstone 11.8 0.22 0.005 23<!--</td--><td><math display="block"> \begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td></td></td>	SAMPLE AGE DEPIH SAMPLS* TYEE/ MAIN CAMBONATE HCI SOLUBLES ORGANIC CARBON SOLUBLE EXTRACT SOLUBLE TOC (TSE) SAU TOC INDEX SAU CO ALXANE NDEX SAUTATE ALXANE ALXANE   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.004 39 7.7 19.7   58 Eocene 2630 Silt. St. - 1.3 ? 0.043 33 5.5 16.7   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018 26 4.4 16.8   46 Palaeocene 2785 Limestone - - 0.004 - - 34.7   30 Valanginian 3192 Mudstone 7.6 0.26 0.013 51 8.3 16.2   25 Valanginian 3215 Mudstone 11.8 0.22 0.005 23 7.9 34.4   18 Valanginian 3355 SH/Mudstone 21.5 0.55 0.177 324 173 <td>SAMPLE AGE DEPTH m SAMPLe* TYPE/ Main LITHOLOGY CARBONATE HC1 SOLUBLES TOTAL ORDANTC (TCC) TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES SAC SAC SATURATE ALXANE FWC CARBON MAIXANE SWT CARBON SOLUBLES   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.0004 39 7.7 19.7 -   58 Eocene 2630 Silt. St. - 1.3 ? 0.043 33 5.5 16.7 1.14   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018 26 4.4 16.8 1.24   46 Palaeocene 2785 Limestone - - 0.004 - - 34.7 1.02   30 Valanginian 3192 Mudstone 7.6 0.26 0.013 51 8.3 16.2 -   25 Valanginian 3215 Mudstone 11.8 0.22 0.005 23<!--</td--><td><math display="block"> \begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td></td>	SAMPLE AGE DEPTH m SAMPLe* TYPE/ Main LITHOLOGY CARBONATE HC1 SOLUBLES TOTAL ORDANTC (TCC) TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES TOTAL SOLUBLES SAC SAC SATURATE ALXANE FWC CARBON MAIXANE SWT CARBON SOLUBLES   60 Eocene 2580 Calc. Mudst. 20.2 0.1 0.0004 39 7.7 19.7 -   58 Eocene 2630 Silt. St. - 1.3 ? 0.043 33 5.5 16.7 1.14   51 Palaeocene 2710 Mudst/Siltst 8.7 0.71 0.018 26 4.4 16.8 1.24   46 Palaeocene 2785 Limestone - - 0.004 - - 34.7 1.02   30 Valanginian 3192 Mudstone 7.6 0.26 0.013 51 8.3 16.2 -   25 Valanginian 3215 Mudstone 11.8 0.22 0.005 23 </td <td><math display="block"> \begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td>	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		

## TABLE 2

TOTAL ORGANIC CARBON AND CARBONATE CONTENTS

NOCS WELL 7/12-4

SAMPLE DEPTH (m)	TOTAL ORGANIC CARBON CONTENT %	CARBONATE "HC1 SOLUBLE" CONTENT %
2610	2.06	11.9
2640	1.92	6.7
2675	1.07	8.2
2680	0.84	5.5
2685	0.69	13.9
2690	0.64	7.5
3197	0.26	11.2
3302	0.27	15.6
3210	0.18	10.1
3220	0.25	10.7
3225	0.16	7.6
3245	0.31	13.9
3255	0.29	12.5
3288	0.28	11.9
3312	0.21	39.5
3327	0.35	19.7
3339	0.89	32.9 ?
3345	3.45	23.1
3347	0.71	25.9
3349	2.53	12.0
3351	9.50	7.4
3583	-	
3595	0.05	< 51
3610	2.50	11.7
3620	0.08	4.3

.

.

## TABLE 3

## NOCS WELL 7/12-4

## VITRINITE REFLECTANCE MEASUREMENTS

DEPTH		MEAN VITRINITE REF	LECTANCE	
m	AUTOCHTHONOUS	ALL	OCHTHONOUS	
2580	0.42(2)			1.01(4)
2640	0.41(16)	0.57(2)		<b>\\</b>
2675	0.43(10)	$0.54_{(9)}$ $0.68_{(1)}$		
2680	-	0.53(20)		
2685	0.44(8)	(20)		
2690	0.38(4)	0.53(16)		
2710	0.34(5)	0.51(9)		
3202	0.40(1)			1.80(15)
3210	0.41(1)		0.89(1)	1.17(1)
3215	0.44(1)			(1)
3245	(1) 0.4 to 0.64(5)			
3275	0.38(4)	$0.51_{(2)}$ $0.61 - 1.$	0,0	
3312	(4) 0.47(1)	(2) 0.73 <sub>(2)</sub>	(9)	
3339	(1)	0.65(2)	(4) 0.81(1)	
3345	0.43(11)	(2)	(1)	
3347	0.51(6)	0.73(1)		
3349	0.50(3)	0.63(2)		
3350	0.52(4)	(2)		
3351	0.51 <sub>(19)</sub>	0.75(1)		
3357	0.42(19)			
3380	0.55(11)			
3610	0.65(15)			
3620	0.67(7)		0.84(14)	
			(14)	
			•	

Figures in parenthesis are the number of separate determinations.

h -

#### BRITISH PETROLEUM RESEARCH CENTRE

EXPLORATION AND PRODUCTION DIVISION

VISUAL KEROGEN DESCRIPTIONS.

NOCS WELL 7/12-4

TABLE 4

	Y											-				_																1						<b>—</b>			<del></del>			ستشمع		
SAMP	LES												VA	sc	UL	.ÅI	R	PL	A N	T	DEI	BRI	15									C	DLC							IRCE						
	1			6										I									1					5 400			e?'		. •	141	'UR	AT	ION	IPC	STEI	NTIA	AL E	ENV	/IRC	JNM	1E	AL.
			55RC	RES	1		1		ASM	AH				_								_					-	20 <sup>0</sup>		RE	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~															
	1		_ جوت				<u>`</u> `	*	PSH	5			CLE	-	റ്	NN 10 00 11			c <del>+</del> «		INEL ISSE	7 7 0		84.	<u>ר</u>	.(	Stree.	5		اکم ا	0											2				
		41			9	4	+ _	6	. <sup>4</sup> 1	0		CN,	•	18	8- 6	$\circ$		<u>مرم</u>	00	4	N.S.F	J.	SP	5	er	64	GP			7.											ŀ	at				
.cs					10	P.	01	લ						2	4 . A	NIE.		20	PL	0	12.4	50	26	<b>Y</b>		15	× .											1			ſ	Ĩ		ž,		
etr	1				4	<u></u>	HIL.	× [						L	`\°`			<i>رب</i> آ	14	13	7 b.													1								Ľ,	•	Ē.		
ε		1			N.	SWB	OIN NITI				ŝ			$\Gamma$				55	<b>Y</b> -																			1						Ĕ	ē.	
Depth in metres	]			Abundant	145					Т.	Reworking											.											T hreshold	Ī								p c	2	ະ		Ê,
th	3	N U	Common	p c							ş			ļ								]										1.		<u>s</u>				1				ສ · ພ		ê i		ja v
se p	Type	Trace	5	• • •							3											·	<b>.</b>									ľ	2									Ē	E. '	Ĩ	5.1	į
		1																			2	·								fair	poor									- ,		Marine undifferentiated	Open marine	Near-Shore marine Bustricted marine	n 1	Von-marine Unknown
}	ļ	1-2	3 4	5	<u>h-2</u>		4	5	1 2	3		1-2	3 4-	_		3 4-	5 1-	2 3	4-!	51-:	23	4-5	1-2	3 4	-	_	3	4 5			ă	1	2		4 !	5 6	5 7	1					_			
_2580	SWC_					•				4				1	-	_	<u> </u>	<u> </u>	-							•	-			_	<u> </u>			•	_		-	+-		•	_		•			
2630	- 11	$\left  - \right $	•			-		•		+		•				4			2		╞	$\vdash$	-			•				_	+	+		-+				╧				•	-	+	+	- <b>-</b>
2640					•					+-		$\rightarrow$		-+	+			4-		·	+	$\left  - \right $	$\vdash$			$ \rightarrow $	-+-					╀╧┥	•					+	• • •			+	-+-	0	4	<u>-</u>
2675		++		+	$\vdash$	•	•			+				+			4-		+-	·	-	<u> </u> →	$\vdash$			•	$\rightarrow$		┥	•	1	-		÷	-+		+	+			-+	+	- -		+	
2710 3192					$\left  \cdot \right $				-+-	-				Ī			+	0	-	-[	<b>┼</b> ─┦					-			-		<b>Y</b>						+	+		فيصمدهم		•	+		-+-	
3210				+	┼╌┤			+	-	+		-+				+-	- -	0	_		+	<u></u>  −	$\left  - \right $				-+			•		$\vdash$		•†	-	+		+				•	-+	+-		
3210 3275	11	-+			$\vdash$	-+						-+				+-	╋	Ĭ		1-	╋╾┥				-+	-+	-+-	+		0				-	•			╋			-17		+	+-	+-	
3350	cttg	· · · · · · ·		+		-	•		+			-+		Ĩ		-	+-	Ĭ			┨─┦	$\vdash$		•	-		•											+-	Oi		-1-	+	-+-	_	╋	- <del> </del>
3380	11	Ť		1-			Ō	-		•				┤╴	-	╈	┢	Ĭ			-			ŏ	-1					T	•			•	+	-	+	+	Oi			+		1	+	-
3350 3380 3440	11	•		+		-	Ō			Ī		$\neg$			$\uparrow$	+	1-	Ō	_	1-	+			Ō	-†	-			1		<u> </u>			ŏ		1	-1-	1	01	1	1	+	-	-		1
			-					1	1			-†		1-	T	1	1-	$\uparrow$	1					-							T				-			1			1	T			T	-
				1				-1-				-1		T	$\uparrow$	1-	T		1	1	$\square$	$\square$	$\square$		-	1					T	$\square$						T							T	T
						1		1						T	1	$\top$	1	1	1-		$\square$		П						Τ		1					Τ	T	T				T				1
								Τ																			ŀ						-					T							T	
			_													1																														
																				<u> </u>											<u> </u>															
											Ι					Γ										Ţ					<u> </u>		Τ	T			1				1					
				1																1						_					1							L						1		
																				1_				_				1											· · · · · ·			1				
·												_					$\bot$	$\bot$	1	<b> </b>					_		_							_				L				$\bot$			L	
			_	<b> </b>		_								_	1_	4-	1	1_	4		$\vdash$			_		_	-	<u> </u>		<b>_</b>		$  \downarrow \rangle$		_	1		4	L		-	4.		4	-	4-	
				<b> </b>	$\square$	<b></b>							_	-	1_		-	-	-	1	<b>↓</b> _	$\left  - \right $	1	_	4	-				4-	1	╞╼┨	_	÷		4.	- <b> </b>	-			+		4-	+	4-	
		┝╼┥┙	_	<b> </b>		-+				╞╧┨					-	+					<u>  </u>	┝╾┨	┝╾┨	+		-						-		+			-		ی کر <del>این مسلمان</del> د		━━┤╤		+	_ <u>_</u>	+-	
				<u> </u>			<u> </u>		1			<u> </u>		1_	L		1_	1	1			أسبا	للب					1	<u>ا.                                    </u>				. I		<u>.  </u>	1		L	-	-		L	1	<u> </u>	1_	

# NOCS 7/12-4

# SUMMARY GEOCHEMICAL LOG

SOURCE ROCK QUALITY	LOG	MATURITY INDICATORS	SUMMARY
TOTAL ORGANICVISUAL KEROGEN ROCK EVAL CARBON % KEROGEN TYPE CUTT'85 SWC 2 0	×H4 ₽	SPORE COLOUR VITRINITE REFLECTANCE GENERATION CARBON % INDICES PREFERENCE 0 0/00 INDEX	SOURCE HYDROCARBON QUALITY POTENTIAL
	JGY IGRA		MMATURE
CUTTOS SWC U J S CUTTOS S CUTT	LITHOLOGY AGE STRATIGRAPHY DEPTH (Metres )		FOOR MODERAJ GOOD OIL/GAS OIL/GAS GAS/OIL
	E 2580		
	E 2600		
	PC 40		
	60		
	80		
	2700	• • • •	
	20		
	60		
	80		
	2800		
	40		
	K, 3180		
	7777 <b>3200</b>		
	20	│ │ │ <sup>■</sup> │ │ <del> </del> ┤ │ │ │	
	60		
	80	•   •      =       •	
	3300-		
	₩ <sup>20</sup>		
100ETERMINATE			
	50 60		
	3560		
	J <sub>U</sub> 80		
	7600 Ru 3600		
	····· ? 20		
	40		

FIG.1