

## 12. Formation Multi Tester (FMT)-Summary

Formation testing with the Dresser Atlas "Formation Multi Tester" (FMT) tool was designed to obtain a pore pressure gradient to confirm a water bearing reservoir and to sample that formation water.

The results are listed in Table IV and plotted in Figure 16. A pore pressure gradient of 1.51 psi/m (0.46 psi/ft) was established in the Ula Formation sand. This is typical for saline water. The lowest pressure reading was below the shales at the base of the Ula Formation. It did not lie on the same pressure trend, and suggested that the pore pressure regime beneath the Ula Formation sands was slightly higher. The entire Ula Formation was, however, in pressure equilibrium.

### Sample Recovery

Two segregated samples were attempted, from 3011.5 m and 3073 m. Seal against the wellbore was lost on both occasions, but only near the conclusion of sampling at 3011.5 m, from which a tolerable clear, saline water sample was obtained. The oil-based mud filtrate contained no water, which may otherwise have contaminated the sample.

Measurements of total dissolved solids gave between 17% and 21% in different tests.

A 1 litre sample has been deposited with the Norwegian Petroleum Directorate.

A Benzene trace analysis was carried out to detect proximity to an oil accumulation updip. The result was negative, but the sample had been stored in a plastic container for several days prior to analysis.

TABLE IV

## FMT (Formation Multi Tester) SUMMARY

## WELL 2/3-4

Mud Weight: 13.0

File No.	Depth (m)	Final Build-Up		Mud Hydrostatic		Comments
		Uncorrected	Corrected	Uncorr. Before After	Corrected Before After	
1	3018.7					GR tie in 0.1 m deep
2	3017.7					GR tie in OK
3	3011.0			<u>6746</u>	<u>6758</u>	No seal
4	3010.5			<u>6749</u>	<u>6761</u>	No seal
5	3010.1			<u>6749</u>	<u>6761</u>	No seal
6	3021.0	6166	6171	<u>6773</u> <u>6773</u>	<u>6785</u> <u>6785</u>	
7	3009.0			<u>6745</u>	<u>6757</u>	No seal
8	3011.5	6152	5157	<u>6753</u> <u>6881</u>	<u>6765</u> <u>6894</u>	Lost seal when 2 3/4 gallon was nearly filled.
9	3073.0	6238	6244	<u>6879</u> <u>6881</u>	<u>6892</u> <u>6894</u>	Lost seal when opening 1 gallon chamber.
10	3108.0	6294	6300	<u>6960</u> <u>6961</u>	<u>6974</u> <u>6975</u>	
11	3117.0	6311	6318	<u>6983</u> <u>6983</u>	<u>6996</u> <u>6996</u>	
12	3162.0	6379	6386	<u>7083</u> <u>7084</u>	<u>7096</u> <u>7097</u>	
13	3215.5			<u>7198</u>	<u>7213</u>	No seal
14	3212.7			<u>7197</u>	<u>7212</u>	No seal
15	3218.5			<u>7214</u>	<u>7229</u>	No seal
16	3219.0			<u>7215</u>	<u>7230</u>	No seal
17	3279.0	6670	6677	<u>7347</u> <u>7348</u>	<u>7363</u> <u>7364</u>	
18	3312.0			<u>7423</u>	<u>7438</u>	No seal
19	3317.0			<u>7438</u>	<u>7455</u>	No seal
20	3346.0			<u>7506</u>	<u>7523</u>	No seal
21	3354.0			<u>7524</u>	7541	No seal

The Analysts.



# DAILY MUD PROPERTIES

DATE	DEPTH	WT.	VISCOSITY		CORR. 115 °F		GELS		pH	FLUID LOSS		CL <input type="checkbox"/>	ALKALINITY			RETORT			ACTIVITY		# Bbl	REMARKS	
			SEC.	CPS.	PV	YP	0	10		100 PSI API	500 PSI 300 °F HT-HP		BECK <input type="checkbox"/>	STRIP <input type="checkbox"/>	CACL <input type="checkbox"/>	NAACL <input type="checkbox"/>	PF	PM	MF	CA ppm			% OIL
27/6	2105	1.40	65	44	32	25	8	13			4.0	103 K				16	63	17	20				76/24
28/6	2487	1.42	65	52	39	27	12	19			3.4	115 K				18	64	19	17				71/29
29/6	2591	1.42	63	51	33	25	11	18			3.6	170 K				17.3	64	18	18				77/23
30/6	2743	1.42	59	46.5	34	25	10	15			3.9	108 K				17.2	63	17	20				76/24
1/7/84	2774	1.42	59	44	30	27	8	15			3.0	124 K				18.7	62	19	19				77/23
2/7	2787	1.42	60	43	32	22	7	11			2.8	116 K				18.5	62	18.5	19.5				76/24
3/7	2885	1.46	58	51	35	32	10	16			3.4	117 K				18.3	59	19	22				73/27
4/7	2968	1.48	62	51	35	32	12	18			5.2	128 K				20	59	22	19				76/24
5/7	2968	1.48	63	51	35	32	12	18			5.6	128 K				20	60	22	18				77/23
6/7	2968	1.48	62	54	38	33	11	17			4.8	128 K				20	60	22	18				77/23
7/7	2968	1.48	62	54	38	33	11	17			4.8	128 K				20	60	22	18				77/23
8/7	2968	1.48	66	57	39	36	9	16			3.6	115 K				18	59	21	20				75/25
9/7	2968	1.48	66	57	39	36	9	16			3.6	115 K				18	59	21	20				75/25
10/7	2968	1.54	66	51	36	31	7	11			4.6	120 K				18.8	59	22	19				76/24
11/7	3060	1.54	55	48	34	28	6	11			3.8	128 K				21	61	23	16				79/21
12/7	3125	1.53	51	44	33	22	6	10			3.0	130 K				—	61	23	16				79/21
13/7	3144	1.57	55	40	31	19	5	8			2.8	125 K				—	60	23	17				78/22
14/7	3185	1.57	54	44	34	20	6	10			2.6	140 K				—	60	24	16				79/21
15/7	3275	1.56	54	48	36	25	6	8			3.4	131 K				—	59	24	17				77/23
16/7	3378	1.56	55	46	35	22	7	10			2.6	141 K				22	59	26	15				79/21
17/7	3386	1.57	54	43	33	20	7	10			2.5	132 K				21	58	25	17				77/23
18/7	3386	1.57	58	41.5	32	19	6	9			2.6	140 K				22	58	25.5	16.5				78/22

DATE SPUD: 28/5/84

DATE T.D.: 17/7/84

B.H.T.

TABLE V  
CASING DETAILS

<u>HOLE SIZE/ MUD TYPE</u>	<u>CASING THREAD</u>	<u>SHOE</u>	<u>CEMENT</u>
36" Hole SW w/high visc. gel: pills	30" csg. X-56 Vetco ALT 2	183 m	1722 sx cmt class G 2% Cacl. w/5.2 gal/sx SW yield: 1.19 cu.ft/sx Dens.: 15.8 ppg.
26" Hole SW w/high visc.pills. (formation mud)	20" csg. X-52 (198 lb/ft.) Vetco LS.	645 m	<u>LEAD</u> 1712 sx cmt class G 16% Gel w/13.0 gal/sx SW Yield: 2.31 cu.ft/sx. Dens.: 12.7 ppg.  <u>TAIL</u> 405 sx cmt class G w/19 gal/sx SW Yield: 1.17 cu.ft/sx Dens.: 15.8 ppg.  <u>GROUT</u> 405 sx cmt class G w/5.19 gal/sx SW Yield: 1.17 cu.ft/sx Dens.: 15.8 ppg.
17½" Hole Oil mud	13 3/8" csg. 117 lb/ft.	1770.6 m	<u>LEAD</u> 2000 sx cmt class G w/16% Gel w/13 gal/sx SW 0.6% HR-7 Yield: 2.33 cu.ft/sx Dens.: 12.6 ppg.  <u>TAIL</u> 500 sx cmt class G 5/gal/sx FW Yield: 1.14 cu.ft/sx Dens.: 15.8 ppg.
12 1/4" Hole Oil mud	9 5/8" csg. N-80 70 lb/ft. Buttress	2964 m	<u>LEAD</u> 670 sx cmt class G w/16% Gel w/13 gal/sx 50/50 SW/FW 0.8% HR-7 Yield: 2.31 cu ft/sx Dens.: 12.7 ppg.  <u>TAIL</u> 500 sx cmt class G 5 gal/sx FW 0.7 Halad 22A 0.6% CFR-2 Yield: 1.14 cu.ft/sx Dens.: 15.8 ppg.



May 1994

BA-94-1343-1

ALCIS FILE

01/01/1994

**GEOCHEMICAL SOURCE SCREEN ANALYSES OF  
CONVENTIONAL CORE SAMPLES**

**WELL N 2/3-4**



## ANALYSES METHODOLOGY

All analyses were performed on instrumentation co-invented and/or developed by FINA.

### 1. SOURCE SCREEN ANALYSES

\* Rock-Eval : IFP/FINA Procedure. Rock-Eval 2 generation of equipment with TOC attachment employed. Analyses calibrated against IFP 55000 Standard. Analysis procedure conforms with that required by NIGOGA.

### 2. SOURCE DETAIL ANALYSES

\* Soxtec Extraction Procedure. Quantified analyses fulfil NIGOGA requirements.

\* Pyrolysis-Gas Chromatography : GEOFINA HYDROCARBON METER Procedure. Individual component quantified analyses calibrated against IFP 55000 Standard. Being the benchmark equipment, FINA's specification conforms and exceeds that required by NIGOGA.

### 3. C ISOTOPE ANALYSES

\* Kerogen/Kerogen Pyrolysate D<sup>13</sup>C analyses : GEOCHEM/FINA AUTOPIP™ Procedure. No equivalent NIGOGA specifications. Data reported vs NBS22 at D<sup>13</sup>C -29.8 ppt.

Source Screen and Source Detail analyses were performed by the Exploration Geochemistry Group, Petrofina Exploration and Production, c/o Fina Research, Zone Industrielle C, B-7181 Seneffe (Feluy), Belgium.

The C Isotope Analyses were performed by THE GEOCHEM GROUP, Chester Street, Chester CH4 8RD England.



## KEY TO SUMMARY DATA FILE PARAMETERS

TOC-Total Organic Carbon; S1-Productivity (free/thermovaporisable hydrocarbons); S2-Potential Productivity (hydrocarbons from kerogen/bitumen transformation); HI-Hydrogen Index (S2 normalised to TOC); R0 (mean vitrinite reflectance); TR-Production Index (S1 normalised to S1+S2); GI(S1)-Generation Index (100xS1 normalised to TKC); GI (TSE)-Generation Index (100xTSE normalised to TKC); Bitumen-Free Analyses : TKC-Total Kerogen Carbon; K2-Precision Potential Productivity; K3-Precision Kerogen CO2 Productivity; KPI-Kerogen Pyrolysis Index (Precision HI); OI-Precision Oxygen Index (100xK3 normalised to TKC); GOPR-Gas/Oil Production ratio (kerogen pyrolysis K2 product C1-5 gas content normalised to total pyrolysate); PI-Paraffin Index (kerogen pyrolysis K2/C9+alkane/alkene product normalised to TKC); TM-Rock-Eval Tmax (deg.C); TAI-Thermal Alteration Index (1-5 scale); TSE-Total Soluble Extract (rock bitumen); D-13C (K) (KPY) (TSE) - Stable Carbon Isotope Value of Kerogen, Kerogen Pyrolysate (K2) and Rock Bitumen (TSE), respectively.