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Elf Aquitaine Norge A/S
Reservoir Department
311E-R 85/330/JM/gmr

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Well 25/1-8 Preliminary Reservoir Report

WELL FILE

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CONTENTS

PLATES

I - MAIN RESULTS

1.1 REMINDER

Well 25/1-8 was the second remote control well to be drilled on the Frigg Field. Main purposes:

- delineate the gas-fluid contact and ensure remaining produceable gas accumulation.

- refine the geological scheme and correlations.

- improve knowledge about windows in permeability barriers used in reservoir model computation and their possible continuity to the north east of the DP2 platform

- provide a matching point for numerical simulations and a dynamic pressure gradient between the Frigg and Cod sands.

- check the DGMN structural map and perform VSP to improve further seismic interpretation.

1.2 MAIN RESULTS

	m RKB	m MSL (1)
Top of Frigg reservoir	1930.2	-1853.0
Gas/water contact	1979.9	-1901.5
Top of triphasic zone	1988.0	-1909.3
Initial gas/oil contact	2028.0	-1948.2
*Initial oil/water contact (estimated)	2035.9	-1955 9
Bottom of residual oil zone	2062.0	-1981.1

Rise of waterlevel since field start-up	:	54.4 meters
Rise of gas-liquid contact since field start-up:		46.7 meters
Thickness of gas/water column	:	7.8 meters
Thickness of triphasic zone	:	46.6 meters

Pressure in Frigg sands at -1900 m MSL	:	152.2 bars abs
Pressure in Cod sands at -2191 m MSL	:	190.4 bars abs

Both pressures for a cumulative production of 116.75 x 10^9 std m^3 of gas for the Frigg field.

(1) The main sea level depths have been calculated using the gyro-survey run inside the 7" liner.

* Initial WOC has been estimated taking into account wells 25/1-A22 and 25/1-7.

PRELIMINARY GEOLOGICAL UNITS:

Top of Tuff zone	:	2242.0 m RKB	-2153.3 m MSL
Top of Sele formation	:	2329.7 m RKB	-2236.5 m MSL
Top of Lista formation	:	2532.0 m RKB	-2430.9 m MSL
Total depth of well	:	2650.0 m RKB	-2545.2 m MSL

Thickness of Tuff zone	:	87.7 meters

COMMENTS

As seen from the main results there exists a nearly 8 meters thick water swept gas zone that was not expected from the reservor simulations. Preliminary log interpretation shows a trapped gas saturation of around 25 % (for a porosity of 30 %) which is in line with the values achieved from the other wells. However, a thin oil-layer is seen at 1982 m RKB (2 m below the observed gas-water contact) both from the laterologs and the cores, which in fact may indicate a fingering effect caused by edge water drive. This could also explain the thick triphasic zone (46.6 meters) in this well.

The remaining gas-pay is quite shaly (α = 0.65) with a 2 meters thick shale/sandstone layer right above the gas/water contact. As RFT measurements do not give any pressure drop across this layer, future TDT logging will give the answer as to wether this layer is a barrier or not. The well has been temporarily abondened for the purpose of monitoring the rise of gas/water contact.

RFT pressure measurements prove several shale layers to be pressure barriers in the Frigg and Balder formations above the Tuff zone. A total pressure loss of 6.0 bars was found between the gas/water contact and the top of the tuffitic zone.

The very thick Tuff-zone (more than 80 meters) shows a pressure drop of 2.6 bars, which is quite different from the other wells where this zone has showed not to be a pressure barrier (however, these wells have a much thinner Tuff zone).

Below Tuff, in the Sele formation, several small pressure barriers have been found giving a total Δ p of 3.3 bars in this formation.

A total Δp of 11.9 bars can be seen from the RFT-measurements (Pl. 3).

II - LOG INTERPRETATION

A preliminary log interpretation has been done using EAN's DIALOG programme. This interpretation gives a good indication of the parameters to be used with more advanced log interpretation methods (like for example GLOBAL) and of the results one can expect regarding water saturation and porosity.

The main parameters used in the interpretation are:

R_w = 0.076 ohm m at 60°C
a = 0.82
m = 1.84

The cementation exponent has been changed to match the water saturation in the waterzone. Otherwise the parameters are the same as in well 10/1-A25 where we have good core analysis.

DEPTH m RKB	AVERAGE WATERSATURATION	AVERAGE POROSITY	ZONE
1930.2 - 1979.9	6.1 %	28 9 %	GAS
1979.9 - 1988.0	74.9 %	30.3 %	GAS/WATER
1988.0 - 2028.7	51.5 %	29.6 %	GAS/OIL/WATER
2028.7 - 2062.0	88.2 %	29.8 %	OIL/WATER
2062.0 - 2150.0	99.7 %	30.7 %	WATER

As cores have been cut in the whole reservoir section a new log interpretation will be done upon receiving the core results.

Compared to the other wells drilled recently on Frigg the trapped gas saturation is in line with the 10/1-A25 and 25/1-A14 results (10/1-A25: S_{gr} = 24 %, Ø = 30.1 %, 25/1-A14: S_{gr} = 26 %, Ø = 30.1 %) well 10/1-5 is still an exeption with 14 % trapped gas saturation (Ø = 31.8 %).

III - PRESSURE MEASUREMENTS (Pl. 3)

56 RFT pressure measurements were recorded on three different runs. Intermediate run; 15 recordings, final run; 24 recordings before the tool got stuck and then another 17 pressure measurements when re-entering the well.

Gas gradient : 0.10 bars/10 m TVD
Water gradient : 1.02 bars/10 m TVD

A plot of the measurements is presented in Pl. 3.

Due to the very clean sand below the gas/water contact no pressure barrier is evident before 90 meters below the contact. In the interval from 2070 - 2160 m RKB however, no less than seven pressure barriers exists giving a total p of 6 bars.

Across the Tuff zone (2242 - 2330 m RKB) just one pressure measurement was taken at the base of the section, giving a p of 2.6 bars. The Tuff zone is well developed in this area with a lot of shaly intervals and is therefore different from what has been seen from the other wells, and it is also the only one showing the Tuff zone to be a pressure barrier.

In the Sele formation which consists of shaly sand interbedded with shale layers a total pressure drop of 3.3 bars is seen.

Totally, a pressure drop of 11.9 bars from the Frigg sand to the base of Sele formation has been found.

The pressure recorded in the gas sands is in line with the DP2 area pressure indicating a good sweep of this area by the producing wells.

IV - CORING

A total of nine cores have been cut in the interval 1939.0 - 2112.0 m RKB covering the whole Frigg gas sands and the fluid contacts. Below is a rundown of the cores taken, giving also an indication of the lithology.

CORE NO.	DEPTHS m RKB	LITHOLOGY	RECOVERY FACTOR
1	1939 - 1950	Sand, with sst/sh at bottom	0.93
2	1950 - 1952.2	Shale, sand shale	1.00
3	1952.2 - 1970	Sand with interbedded shale/sandstone	0.93
4	1970 - 1997	Sand w/shale-sst, sand	1.00
5	1997 - 2025	Sand (fiberglass tube unscrewed)	0.09
6	2025 - 2053	Sand	0.65
7	2053 - 2080.5	Sand, sand/sst	0.65
8	2080.5 - 2098.5	Sand with some sst/shale layers	0.79
9	2098.5 - 2112	Sand/sandstone	0.90

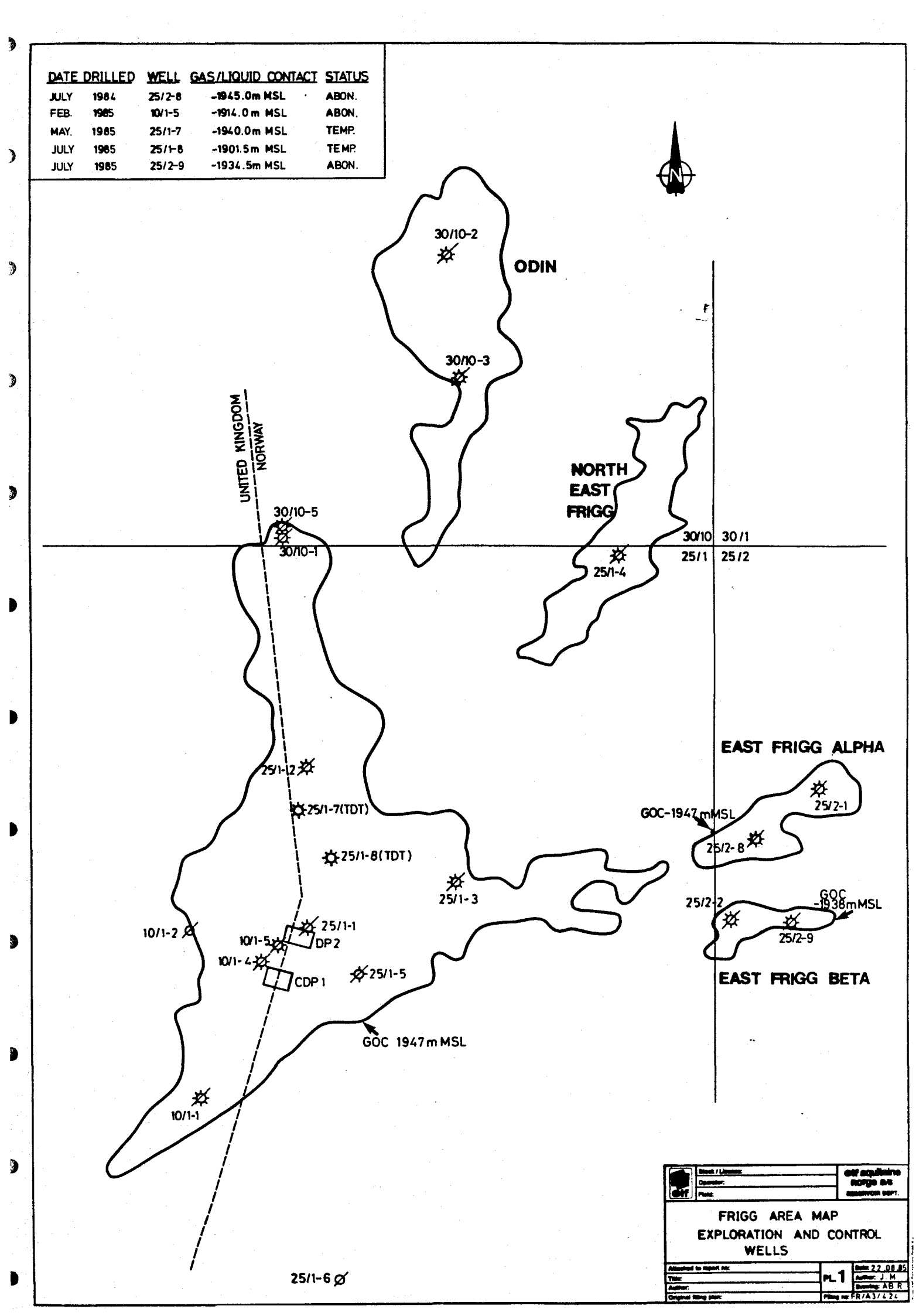
The cores have been sent to Geco for petrophysical analysis and natural gamma ray tie-in, while all geological and mineral analysis will be performed in France.

Sidewall cores

51 sidewall cores were sampled in the interval 1982.0 - 2566 m RKB recovering 48 cores.

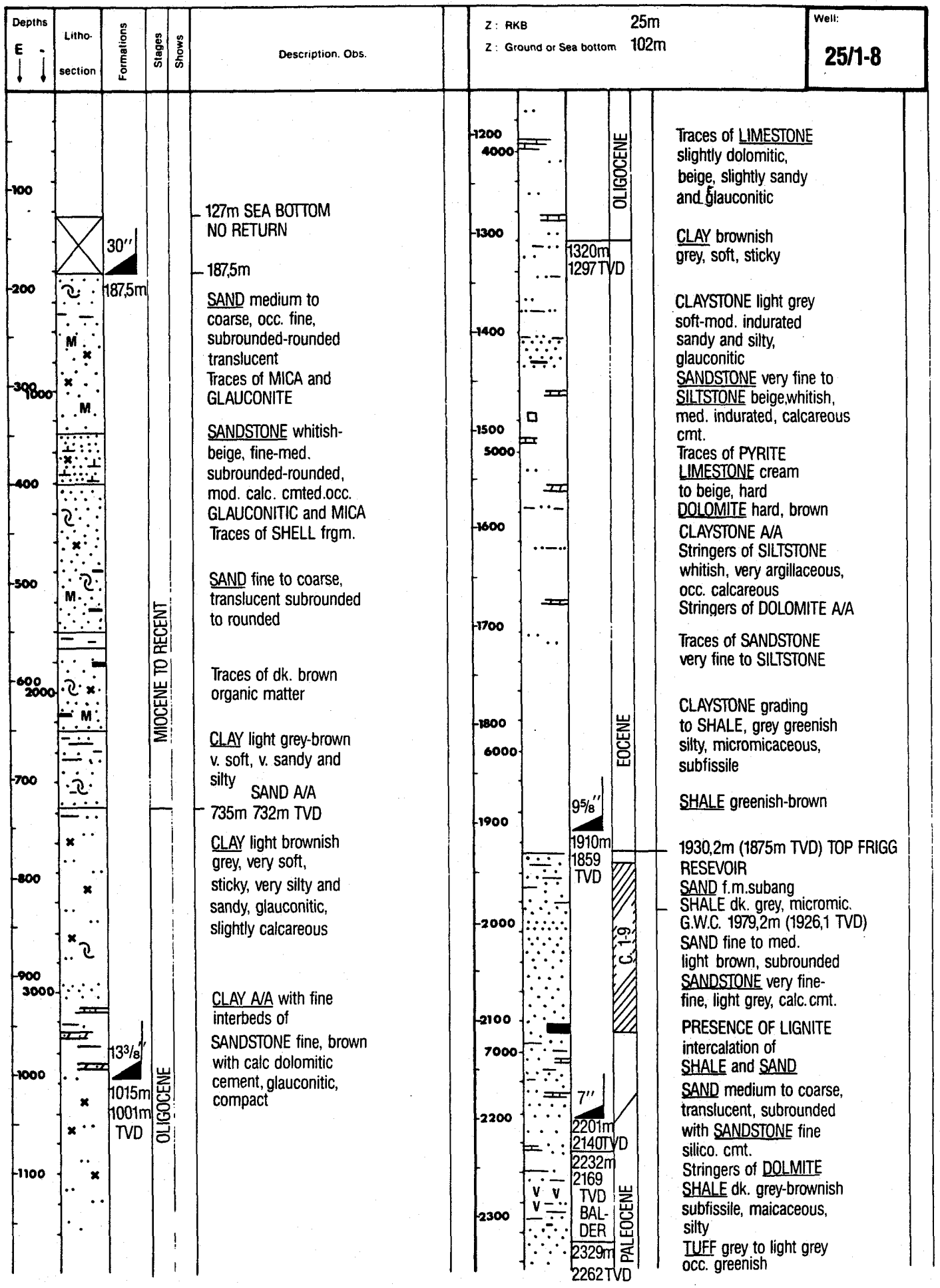
The one at 1982.0 m RKB has been sent to Geco for hydrocarbon content analysis in order to possibly prove the oil-string towards the top of the gas/water zone. No results available yet.

DATE DRILLED	WELL	GAS/LIQUID CONTACT	STATUS
JULY 1984	25/2-8	-1945.0m MSL	ABON.
FEB. 1985	10/1-5	-1914.0 m MSL	ABON.
MAY. 1985	25/1-7	-1940.0m MSL	TEMP.
JULY 1985	25/1-8	-1901.5m MSL	TEMP.
JULY 1985	25/2-9	-1934.5m MSL	ABON.

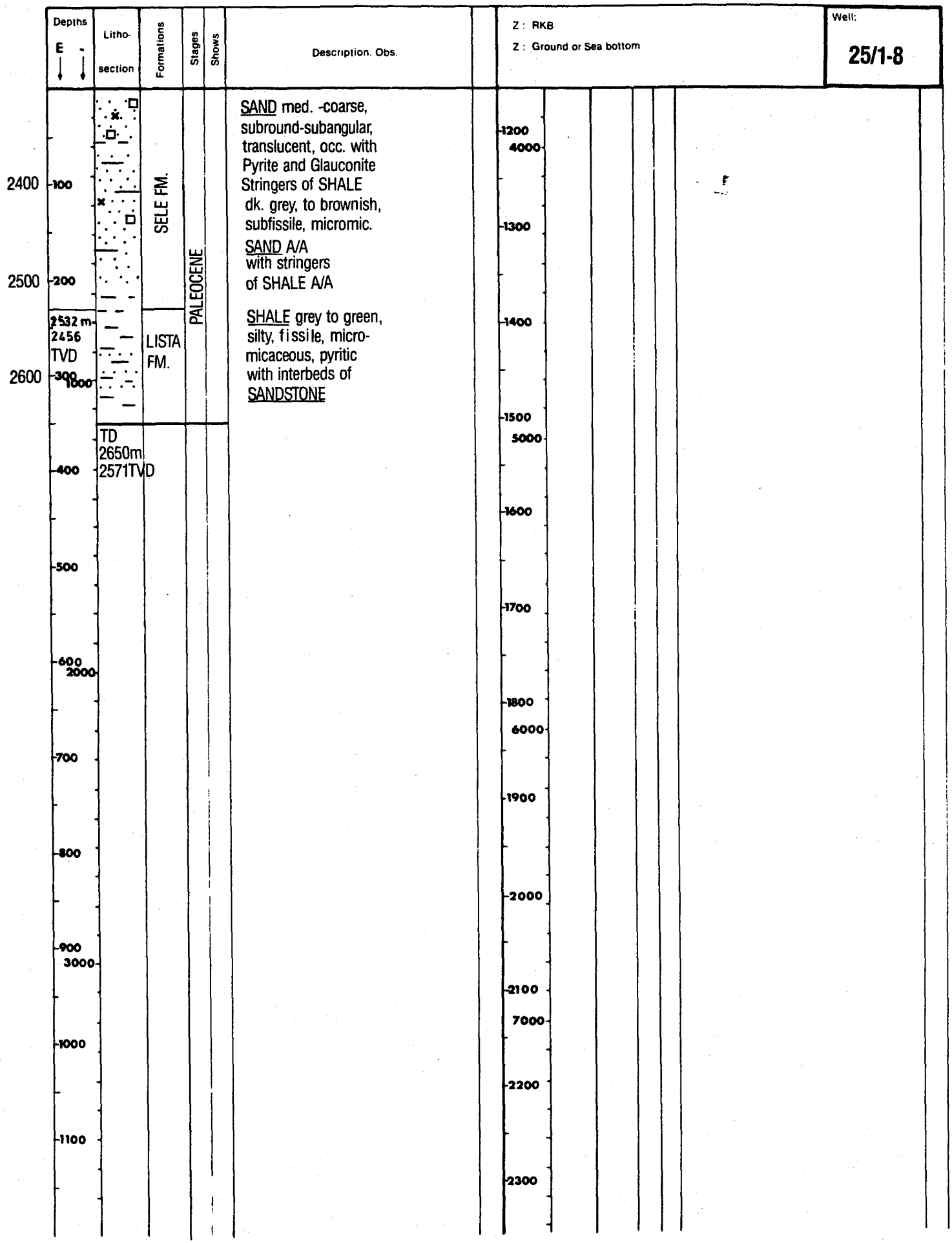


FRIGG AREA MAP
EXPLORATION AND CONTROL WELLS

PL 1



Form 133 Randaberg Trykk A.S



Form 133 Randaberg Trykk A.S

PL.3 | Date 19.08.85 | Author J. M/ABR | N°FR/A3/425

Reservoir Department
elf aquitaine norge a/s

Well 25/1-8

Pressure Measurements

DEPTH mRKB | LITHOLOGY | DEPTH mMSL

Gas gradient : .10 bars / 10m

Water gradient : 1.02 bars / 10m

GAS/WATER CONTACT (1901.5m MSL)

TOP TRIPHASIC ZONE (1909.3m MSL)

INITIAL GAS/OIL CONTACT (1948.2m MSL)

BOTTOM OF RESIDUAL OIL ZONE (1981.1m MSL)

TOP OF TUFFITIC ZONE

TOP OF SELE FORMATION

BARRIERS	
No.	P (bars)
I	1.0
II	0.3
III	0.3
IV	1.2
V	0.4
VI	0.9
VII	1.9
VIII	2.2
IX	0.4
X	0.2
XI	0.3
XII	0.6
XIII	0.6
XIV	1.6

⊙ Intermediate log 09.07.85
× Final log I 14-15.07.85
⊡ Final log II 18.07.85

Pressure (bars abs)

ELF AQUITAINE NORGE A/S

25^1-8

FRIGG FORMATION

OPERATOR : ERN	FIELD/BLOCK : FRIGG 25/1	LICENCE : 024
RESERVOIR : FRIGG FORMATION		SCALE : 1:200

RIG COORDINATES x : 449 800
y :6640 871
zg : +25m
ORIGIN DEPTH MEASURED FROM RKB
RIG : BYFORD DOLPHIN
OBJECTIVE : HEIMDAL EQUIVALENT
LOGGING COMPANY : SCHLUMBERGER
CORRECTION OF HOLE DEVIATION :
14DEGR. THROUGH RESERVOIR
TOTAL DEPTH : 2645m RKB

LOGLAYOUT:
LOGFILE :25^1-8FRIGG
PROGRAM :

PL 4 | Date : 17.07.85 | Author : JM / AB.R | Filing :

RESERVOIR DEPARTMENT

RKB DEPTH | GAMMA-RAY | FLUIDS | LITHOLOGY | RFT | LATEROLOGS | INDUCTION LOGS | POROSITY LOGS | NATURAL GR | SONIC | CORES | MSL DEPTH | RKB DEPTH

GAMMA-RAY (GR) 0 API 100
CALIPER (CAL) 6 inch 16
SPONT.POL. (SP) -80 mv 20
LATEROLOG DEEP (LLD) .1 ohmm 10000
LATEROLOG SHALLOW (LLS) .1 ohmm 10000
MICRO SFL (MSFL) .1 ohmm 10000
INDUCTION DEEP (ILD) .1 ohmm 10000
INDUCTION MEDIUM (ILM) .1 ohmm 10000
SFL (SFL) .1 ohmm 10000
DENSITY (D) 1.75 g/cm3 2.75
NEUTRON POROSITY (NP) .57 p.u. -.030
URANIUM (URAN) 0 ppm 10.00
POTASSIUM (POTA) 0 .1
THORIUM (THOR) 0 ppm 10
SONIC (DT-45) 140 mc/f 40

RFT # 1 Run 1 P.Seal Failure
RFT # 1 Run 2 P=151.4 Bars a
RFT # 2 Run 2 P=151.4 Bars a
RFT # 2 Run 1 P=151.3 Bars a
RFT # 1 Run 3 P=151.4 Bars a
RFT # 3 Run 2 P=151.6 Bars a
RFT # 3 Run 1 P=151.7 Bars a
RFT # 4 Run 1 P=151.7 Bars a
RFT # 4 Run 2 P=151.8 Bars a
RFT # 5 Run 2 P=151.9 Bars a
RFT # 2 Run 3 P=151.9 Bars a
RFT # 6 Run 2 P=151.8 Bars a
RFT # 7 Run 2 TIGHT
RFT # 5 Run 1 P=152.2 Bars a
RFT # 8 Run 2 P=152.2 Bars a
RFT # 3 Run 3 P=152.2 Bars a
RFT # 6 Run 1 P=152.9 Bars a
RFT # 9 Run 2 P=152.8 Bars a
RFT # 7 Run 1 P=154.2 Bars a
RFT # 8 Run 1 P=155.2 Bars a
RFT # 10 Run 2 P=155.6 Bars a
RFT # 9 Run 1 P=156.3 Bars a
RFT # 10 Run 1 P=159.3 Bars a
RFT # 11 Run 2 P=160.8 Bars a
RFT # 4 Run 3 P=161.2 Bars a
RFT # 11 Run 1 P=161.1 Bars a
RFT # 12 Run 1 P=162.4 Bars a
RFT # 12 Run 2 P=163.2 Bars a
RFT # 13 Run 1 P=163.3 Bars a
RFT # 13 Run 2 P=168.0 Bars a
RFT # 14 Run 1 P=164.8 Bars a
RFT # 15 Run 1 P=166.9 Bars a
RFT # 16 Run 1 P=167.4 Bars a
RFT # 14 Run 2 P=168.0 Bars a
RFT # 15 Run 2 P=168.5 Bars a
RFT # 16 Run 2 P=170.5 Bars a
RFT # 5 Run 3 P=170.5 Bars a
RFT # 17 Run 2 P=172.5 Bars a
RFT # 18 Run 2 P=175.4 Bars a

TOP OF FRIGG RESERVOIR
GAS WATER CONTACT
TOP OF TRIPHASIC ZONE
INITIAL GAS / OIL CONTACT
INITIAL WATER / OIL CONTACT
BOTTOM OF RESIDUAL OIL ZONE

CORE # 1 (1939 - 1950) RECOVERY 39 %
CORE # 2 (1950 - 1952.2) RECOVERY 100 %
CORE # 3 (1952.2 - 1970.0) RECOVERY 93 %
CORE # 4 (1970 - 1997) RECOVERY 100 %
CORE # 5 (1997 - 2025) RECOVERY 9 %
CORE # 6 (2025 - 2053) RECOVERY 89 %
CORE # 7 (2053 - 2080.5) RECOVERY 65 %
CORE # 8 (2080.5 - 2098.5) RECOVERY 79 %

1853.0
1901.5
1909.3
1948.2
1955.9
1981.1

1925 1950 1975 2000 2025 2050 2075 2100 2125 2150