2 DRILLING REPORT

2.1 Summary

2.1.1 24" Hole Section (467-1472 m MD, 466-1283,5 m TVD)

The section was drilled in one bit run, on a Navidrill 0,78° Mach 1C motor. Inclination was built to 53° and direction turned from 1° to 283°.

Seawater/PAC mud converted to KCl polymer mud was used drilling the section.

20" casing was set at 1467,5 m MD / 1281 m TVD.

2.1.2 17 1/2" Hole Section (1472-2870 m MD, 1283,5-2120 m TVD)

The section was drilled in 2 bit runs on a Navidrill 0,78° Mach 1P/1C motor.

The section was a tangent section with inclination 53° and direction 281°.
The bit trip was due to low penetration rate.

The section was drilled with KCl/PAC/XANVIS mud with weight 1,35 - 1,60 SG.

13 3/8" casing was set at 2865 m MD / 2117 m TVD.

2.1.3 12 1/4" Hole Section (2870-5065 m MD, 2120-3544 m TVD)

The section was first drilled in three bit runs from 2870 m to 4956 m, the first run with a Navidrill AKO MK1 XL motor. Run 2 and 3 was done with a pendulum BHA with Andergauge adjustable stabilizer as near bit stabilizer. The third run was caused by a MWD failure.
Due to promising results (logs/shows) it was decided to cut cores from the interval drilled. Open hole was cemented from 4956 m to 4530 m. Two attempts to sidetrack out of cement plugs were done at deeper depths before plugging back to 4530 m.

Due to promising results (logs/shows) it was decided to cut cores from the interval drilled. Open hole was cemented from 4956 m to 4530 m. Two attempts to sidetrack out of cement plugs were done at deeper depths before plugging back to 4530 m. Successful sidetracking out of cement plug was done with two drilling bits before drilling to core point with a third bit.
8 3/8" cores were cut from 4678 m to 4771 m and from 4868 m to 4873 m.
The hole was then opened up to 12 1/4" before commencing drilling to TD of section at 5065 m.

The section was a tangent down to 4350 m before dropping angle from 52° to 26° at TD. Inclination remained almost constant at 280°.

The section was drilled with 1,58 SG Anco Vert oilbased mud.

9 7/8" / 9 5/8" liner was set at 5064 m MD / 3543,5 m TVD. (Liner was tied back after setting 7" liner).

2.1.4 8 3/8" Hole Section (5065-5581 m MD, 3544-4049,5 m TVD)

The section was drilled in 3 runs. The first run with a Navidrill DTU M1P/HF motor. Due to stop in penetration both bit, MWD and motor was replaced. New motor was Navidrill MK1 XL1. Run 3 was due to a MWD failure but also motor was replaced with a Navidrill MK1/PHF. The BHA was shortened and run without stabilizers.
The direction turned from 280° to 230° and inclination dropped from 26° to 2° during the section.

The section was drilled with 1,40-1,54 SG Anco Vert oilbased mud.
(The mudweight had to be increased due to a gas influx during drilling)

TD of the well was decided because samples showed the formation to be from Trias period i.e. deeper than Statfjord Fm wich was not present.

7" liner was set at 5580 m MD / 4048,5 m TVD.

STATOIL

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Geochemical analysis of oil and gas from the DST1 of well 30/3-7S

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1 INTRODUCTION

Geochemical data from oil and gas samples from the DST1 in well 30/3-7S have been integrated with previous results from the Veslefrikk Field (Patience, 1995). The DST1 was perforated from 5050-5100m MD RKB (3474.26-3519.05m TVD MSL) Well 30/3-7S penetrated hydrocarbon bearing sandstones in several small fault blocks at the edge of the main Veslefrikk Field (Figure 1).

The oil and gas samples have been analysed by Geolab Nor, and the raw data can be found in the Appendix. The analyses have been performed according to the guidelines given in "The Norwegian Industry Guide to Organic Geochemical Analyses, 1993."

Table 1. Background information for fluid samples

Codes	Field/area	Well	Test	Top depth (mMD RKB/mTVD MSL)	Base depth (mMD RKB/mTVD MSL)		Test sample type	Notes	Specific gravity	API (oil or cond)	GOR (sm3/sm3)	Geochem data source	Anal. year	Samples analysed	
														oil/cond	gas
V7S	Veslefrikk	30/3-7S	DST1	5050/3474.26	5100/3519.05		oil/gas			40.45	164	GLN/IFE	1997	x	x
V	Veslefrikk	30/3-2	DST 2	2870	2874		oil/gas	GC params odd		39.8	85	?/IKU	1988	x	x
V	Veslefrikk	30/3-2	DST 1	2916	2923		oil/gas			38.8	81	?	?	x	x
V	Veslefrikk	30/3-4	DST 4	2866	2882		oil/gas			40.2	77	GLN	1991	x	x
VC	Veslefrikk	30/3-4	DST 1	3079	3096		oil/gas			41.1	121	GLN	1991	x	x
VC	Veslefrikk	30/3-A1	DST 2	3071	3088		oil/gas			37.2		IKU	1988	x	
VgS	Veslefrikk	30/3-A1	DST 1.1	3234	3250		gas/cond/oil?			45.6		GLN	1992	x	
V	Veslefrikk	30/3-A2	"oil"				oil/gas					GLN	1993	x	
V6S	Veslefrikk	30/3-6S	DST 1	/3229	/3242		oil/gas	TVD MSL		39.0	282	GLN/IFE	1994	x	x
V6Sg	Veslefrikk	30/3-6S	DST 2	/3164	/3185		gas/cond	TVD MSL				IFE	1994		x
VS	Veslefrikk	30/3-A19	sep. gas	/3196	/3202		oil/gas	TVD MSL; contains coned gas from cap		42.5	325	IFE	1994		x

Table 2. Biomarker parameters for DST1 from well 30/3-7S

Codes	Field/area	Well	Test	20S	bb	22S	Ts/Tm	Ttx	30D/H	30ab	%C27	%C28	%C29	C30
V7S	Veslefrikk	30/3-7S	DST1	0.54	0.70	0.60	7.63	10.09	0.54	0.95	36	30	34	0.08

Codes	Field/area	Well	Test	Dia/reg	28ab/H	3R/H	4R/H	35/34H	29/30H	Dem/H	O/H	G/H	Arom1	Arom2	Crack1	Crack2
V7S	Veslefrikk	30/3-7S	DST1	4.69	0.20	0.91	0.35	0.65	0.40			0.01		0.54	1.00	0.93

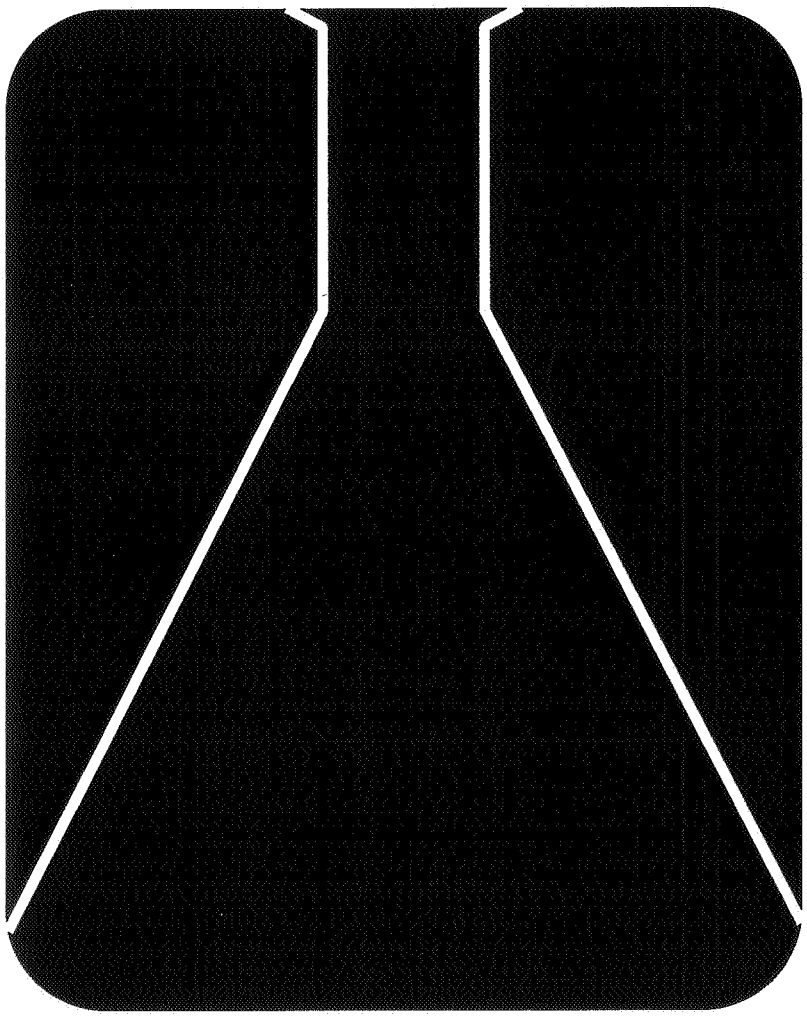
Table 3. Derivation of biomarker ratios reported in Table 2

Ratio	Derivation
22S	32αβS/(32αβS+32αβR)
Ts/Tm	27Ts/27Tm
TtX	30d/29βα
30D/H	30d/30αβ
29/30H	29αβ/30αβ
30αβ	30αβ/30αβ+30βα
28αβ/H	28αβ/30αβ
3R/H	(23/3)/30αβ
4R/H	(24/4)/30αβ
35/34H	(35αβR+35αβS)/(34αβR+34αβS)
Dem/H	25nor30αβ/30αβ
O/H	30O/30αβ
G/H	30G/30αβ
20S	29ααS/(29ααR+29ααS)
ββ	(29ββR+29ββS)/(29ββR+29ββS+29ααR+29ααS)
%C27	100*(27ββR+27ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)
%C28	100*(28ββR+28ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)
%C29	100*(29ββR+29ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)
C30/st	(30ββR+30ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)
Dia/reg	(27dβR+27dβS)/(27ααR+27ααS)
Arom 1	g1/((g1+H1b+I1) - (I1*f1/g1))
Arom 2	(a1+b1+c1+d1+e1+f1+g1)/(a1+b1+c1+d1+e1+f1+g1+A1+B1+C1+D1+E1+F1+G1+H1+I1)
Crack 1	a1/(a1+g1)
Crack 2	(a1+b1)/(a1+b1+c1+d1+e1+f1+g1)

APPENDIX

Data Report

Oil and Gas Samples from Well NOCS 30/3-7S



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Oil and Gas Samples from Well NOCS 30/3-7S

AUTHOR

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GEOLAB PROJECT NO.	DATE
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	FRONTPAGE

CONTENTS

COMMENTS

All analysis are performed according to "The Norwegian Industry Guide to Organic Geochemical Analysis, Third edition 1993". The analysis procedures are not included in this report.

No comments to the analysis of the sample.

ANALYTICAL PROGRAMME

Sample Depth & Type c= Cutt s= SWC p= Conv core/ plug m= Mud R= Reservoir S= Source	Bulk Comp.	GC Sat	GC Aro	Carbon Isotope	GCMS Sat	GCMS Aro	whole oil	Physical param.
Table nr	8	9	9	10	11	12	13	17
30/3-7S TEST 1	X	X	X	X	X	X	X	X

Table 8a: MPLC Bulk Composition: Weight of Oil and Fraction for NOCS 30/3-7S

Well	Description	Whole oil (mg)	Light (mg)	Topped (mg)	Sat (mg)	Aro (mg)	Asph (mg)	NSO (mg)	HC (mg)	Non-HC (mg)	Sample
30/3-7S	TEST 1	88.6	19.8	68.8	53.0	12.9	0.3	2.7	65.8	3.0	Q12/0001

Table 8c: MPLC Bulk Composition: Ratios in topped oil for NOCS 30/3-7S

Well	Description	Sat / Aro	HC / Non-HC	Asp / NSO	Sample
30/3-7S	TEST 1	4.12	22.24	0.11	Q12/0001

Table 9a: Quantitative Analysis of Saturated Fraction for well 30/3-7S

sample	nC15 mg/g sat	nC16 mg/g sat	iC18 mg/g sat	nC17 mg/g sat	Pr mg/g sat	nC18 mg/g sat	Ph mg/g sat	nC19 mg/g sat	nC20 mg/g sat	nC21 mg/g sat	nC22 mg/g sat	nC23 mg/g sat	nC24 mg/g sat	nC25 mg/g sat	nC26 mg/g sat	nC27 mg/g sat	nC28 mg/g sat	nC29 mg/g sat	nC30 mg/g sat	nC31 mg/g sat	nC32 mg/g sat	nC33 mg/g sat	nC34 mg/g sat
30/3-7S TEST1	22.84	20.49	9.58	19.30	13.94	15.87	7.84	13.66	12.50	10.40	9.63	8.33	7.48	6.89	5.06	3.87	2.87	2.53	1.87	1.55	1.29	1.61	1.49

Table 9Ca: Aromatic Hydrocarbon Ratios (peak area) for NOCS 30/3-7S

Well	Description	MNR	DMNR	BPhR	2/1MP	MPI1	MPI2	Rc	DBT/P	4/1MDBT	(3+2)/1MDBT	Sample
30/3-7S	TEST 1	1.61	3.38	0.17	1.31	0.85	1.15	0.91	-	-	-	Q12/0001

Table 10A: Tabulation of carbon isotope data on oils for NOCS 30/3-7S

Well	Descript.	Whole oil	Topped oil	Saturated	Aromatic	NSO	Asphaltenes	Sample
30/3-7S	TEST 1	-	-27.95	-27.93	-26.90	-26.57	-23.89	Q12/0001

Table 11a: Variation in Triterpane Distribution (peak height) SIR for NOCS 30/3-7S

Well	Descript.	Ratio1	Ratio2	Ratio3	Ratio4	Ratio5	Ratio6	Ratio7	Ratio8	Ratio9	Rat.10	Rat.11	Rat.12	Rat.13	Rat.14	Sample
30/3-7S	TEST 1	0.13	0.12	0.12	0.40	0.29	0.54	0.20	0.49	0.16	0.80	0.95	0.30	0.07	60.24	Q12/0001

Table 11b: Variation in Sterane Distribution (peak height) SIR for NOCS 30/3-7S

Well	Descript.	Ratio1	Ratio2	Ratio3	Ratio4	Ratio5	Ratio6	Ratio7	Ratio8	Ratio9	Ratio10	Sample
30/3-7S	TEST 1	0.83	53.62	82.17	1.46	0.81	0.62	0.47	0.70	1.16	4.97	Q12/0001

Table 11c: Raw triterpane data (peak height) m/z 191 SIR for Well NOCS 30/3-7S

Depth unit of measure: m

Well	Descript.	23/3	24/3	25/3	24/4	26/3	27Ts	27Tm	28aß	25nor30aß	Sample
		29aß	29Ts	30d	29ßa	30O	30aß	30ßa	30G	31aßS	
		31aßR	32aßS	32aßR	33aßS	33aßR	34aßS	34aßR	35aßS	35aßR	
30/3-7S	TEST 1	21003.9	18463.5	7580.2	8048.6	5957.3	25408.1	3329.9	4485.1	2318.8	0001-0
		9199.0	15614.0	12454.4	1234.5	0.0	22995.5	1169.2	2230.9	7416.8	
		5026.1	4762.5	3143.1	4307.2	2210.8	2150.5	1285.4	1348.9	872.1	

Table 11e: Raw sterane data (peak height) m/z 218 SIR for NOCS 30/3-7S

Well	Descript.	27ßßR	27ßßS	28ßßR	28ßßS	29ßßR	29ßßS	30ßßR	30ßßS	Sample
30/3-7S	TEST 1	22444.3	21134.4	14631.2	20675.4	20587.3	20123.7	4723.9	4952.4	Q12/0001

Table 11g: Amount of triterpanes (ppb) m/z 191 SIR for Well NOCS 30/3-7S

Depth unit of measure: m

Well	Descript.	23/3	24/3	25/3	24/4	26/3	27Ts	27Tm	28aß	25nor30aß	Sample
		29aß	29Ts	30d	29ßa	30O	30aß	30ßa	30G	31aßS	
		31aßR	32aßS	32aßR	33aßS	33aßR	34aßS	34aßR	35aßS	35aßR	
30/3-7S	TEST 1	40085.2	35236.9	14466.6	15360.5	11369.3	48490.4	6354.9	8559.6	4425.3	0001-0
		17555.8	29798.6	23768.7	2355.9	0.0	43886.0	2231.4	4257.6	14154.7	
		9592.2	9089.0	5998.6	8220.1	4219.2	4104.2	2453.1	2574.4	1664.4	

Table 11i: Amount of standard and weight of sample for NOCS 30/3-7S

Well	Descript.	Standard	Amount	Weight	Sample
30/3-7S	TEST 1	15346.8	0.700	23.9	Q12/0001

Table 12b: Variation in Monoaromatic Sterane Distribution (peak height) for NOCS 30/3-7S

Well	Descript.	Ratio1	Ratio2	Ratio3	Ratio4	Sample
30/3-7S	TEST 1	0.79	0.69	0.68	0.60	Q12/0001

Ratio1: A1 / A1 + E1
Ratio2: B1 / B1 + E1
Ratio3: A1 / A1 + E1 + G1
Ratio4: A1+B1 / A1+B1+C1+D1+E1+F1+G1+H1+I1

Table 12d: Raw triaromatic sterane data (peak height) m/z 231 for NOCS 30/3-7S

Well	Descript.	a1	b1	c1	d1	e1	f1	g1	Sample
30/3-7S	TEST 1	28685.1	30090.2	987.4	1716.1	810.1	845.1	0.0	Q12/0001

Table 13A: Light Hydrocarbons from Whole Oil GC for NOCS 30/3-7S

Well	Description	iC4	nC4	iC5	nC5	2,2DMC4	2,3DMC4	2MC5	3MC5	nC6	MCyC5	Benz	Sample
30/3-7S	TEST 1	-	-	-	-	0.06	-	-	-	7.00	3.61	2.29	Q12/0001

THOMPSON'S INDICES

$$A = \frac{\text{Benzene}}{\text{nC6}} \qquad B = \frac{\text{Toluene}}{\text{nC7}} \qquad X = \frac{\text{p/m-xylene}}{\text{nC8}} \qquad W = \frac{\text{Benzene} * 10}{\text{CyC6}}$$

$$C = \frac{\text{nC6} + \text{nC7}}{\text{CyC6} + \text{MCyC6}} \qquad I = \frac{\text{2MC6} + \text{3MC6}}{\text{1,3ciDMCyC5} + \text{1,3trDMCyC5} + \text{1,2trDMCyC5}} \qquad F = \frac{\text{nC7}}{\text{MCyC6}}$$

$$H = \frac{\text{nC7} * 100}{\text{CyC6} + \text{2MC6} + \text{2,3DMC4} + \text{3MC6} + \text{1,3ciDMCyC5} + \text{1,3trDMCyC5} + \text{1,2trDMCyC5} + \text{nC7} + \text{MCyC6}}$$

$$U = \frac{\text{CyC6}}{\text{MCyC5}} \qquad R = \frac{\text{nC7}}{\text{2MC6}} \qquad S = \frac{\text{nC6}}{\text{2,2DMC4}}$$

Table 17: Physical parameters for NOCS 30/3-7S

Well	Descript.	Sulphur (wt %)	Ni (ppm)	V (ppm)	°API	Sample
30/3-7S	TEST 1				40.45	Q12/0001

n.e. = Insufficient material for analysis
n.d. = Not detected
n.a. = Not analyzed due to high water content

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SUMMARY

Two gas samples from well 30/3-7S are analysed for gas and isotopic composition.

The work is done in accordance with the "The Norwegian Industry Guide to Organic Geochemical Analyses", Third Edition 1993.

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1 Introduction

Two gas samples from well 30/3-7S are analysed for gas and isotopic composition.

On the samples C_1 - C_5 and CO_2 are quantified. The $\delta^{13}C$ value is measured on methane, ethane, propane, the butanes and CO_2. In addition the δD value is measured on methane.

2 Analytical procedures

Aliquots of 0.5 ml are sampled with a syringe for analysis on a Poraplot Q column connected with flame ionisation (FID) and thermal conductivity (TCD) detectors. The detection limit for the hydrocarbon gas components is 0.01 µl/ml, for CO_2 0.2 µl/ml.

For the isotope analysis 5-10 ml of the gas is sampled with a syringe and then separated into the different gas components by a Carlo Erba 4200 gas chromatograph. The hydrocarbon gas components are oxidised in separate CuO-ovens in order to prevent cross contamination. The combustion products CO_2 and H_2O are frozen into collection vessels and separated.

The combustion water is reduced with zinc metal in sealed quarts tubes to prepare hydrogen for isotopic analysis. The isotopic measurements are performed on a Finnigan MAT 251 and a Finnigan Delta mass spectrometer.

IFEs value on NBS 22 is -29.77 ± .06‰ PDB.

The uncertainty in the $\delta^{13}C$ value is estimated to be ± 0.3‰ PDB and includes all the different analytical steps. The estimate is based on repeated analysis of a laboratory standard gas mixture. The uncertainty in the δD value is likewise estimated to be ± 5‰.

3 Results

The normalised volume composition of the gas samples is shown in Table 1. The stable isotope composition is shown in Table 2.

The molecular composition related to the carbon isotope variations in methane from the samples are plotted in Figure 1 (Schoell, 1983), the carbon and hydrogen variations in

methane are plotted in Figure 2 (Schoell, 1983) and the carbon isotope variations in ethane related to the carbon isotope variations in methane in Figure 3 (Schoell, 1983).

The $\delta^{13}C$ values of methane, ethane and propane are plotted in James maturity diagram (James, 1983), Figure 4. A source LOM in the range between 11 and 12 is indicated for the gas samples.

Table 1 Volume composition of gas samples (normalised values) from well 30/3-7S

Sample	IFE no GEO	C_1 %	C_2 %	C_3 %	iC_4 %	nC_4 %	iC_5 %	nC_5 %	CO_2 %	ΣC_1- C_5 %	Wet-ness	iC_4/ nC_4/
Test sep. 02.02.97 23:08	971169	73.6	8.9	6.5	0.90	3.8	1.2	2.2	2.8	97.2	0.24	0.24
Test sep. 02.02.97 23:17	971170	73.6	9.3	7.8	1.1	3.8	0.62	0.88	3.0	97.0	0.24	0.28

Table 2 Isotopic composition of gas samples from well 30/3-7S

Sample	IFE no GEO	C_1 $\delta^{13}C$ ‰ PDB	C_1 δ D ‰ SMOW	C_2 $\delta^{13}C$ ‰ PDB	C_3 $\delta^{13}C$ ‰ PDB	iC_4 $\delta^{13}C$ ‰ PDB	nC_4 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{18}O$ ‰ PDB
Test sep. 02.02.97 23:08	971169	-48.7	-234	-32.9	-30.7	-28.8	-30.5	-12.2	-11.7
Test sep. 02.02.97 23:17	971170	-48.9	-223	-32.9	-30.7	-26.9	-30.9	-12.3	-10.7

4 Literature

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