

**General information**

Wellbore name	33/9-9
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Factmaps in new window	link to map
Main area	NORTH SEA
Field	STATFJORD
Discovery	33/12-1 Statfjord
Well name	33/9-9
Seismic location	
Production licence	037
Drilling operator	Mobil Exploration Norway INC
Drill permit	179-L
Drilling facility	BORGNY DOLPHIN
Drilling days	114
Entered date	27.07.1977
Completed date	17.11.1977
Release date	17.11.1979
Publication date	03.10.2011
Purpose - planned	APPRAISAL
Reentry	NO
Content	OIL/GAS
Discovery wellbore	NO
1st level with HC, age	MIDDLE JURASSIC
1st level with HC, formation	BRENT GP
2nd level with HC, age	EARLY JURASSIC
2nd level with HC, formation	DUNLIN GP
3rd level with HC, age	EARLY JURASSIC
3rd level with HC, formation	STATFJORD GP
Kelly bushing elevation [m]	25.0
Water depth [m]	145.0
Total depth (MD) [m RKB]	3100.0
Final vertical depth (TVD) [m RKB]	3098.0
Maximum inclination [°]	5.2
Bottom hole temperature [°C]	96
Oldest penetrated age	LATE TRIASSIC
Oldest penetrated formation	STATFJORD GP
Geodetic datum	ED50



NS degrees	61° 17' 10.19" N
EW degrees	1° 54' 26.05" E
NS UTM [m]	6795313.86
EW UTM [m]	441428.36
UTM zone	31
NPDID wellbore	414

Wellbore history

General

Well 33/9-9 was drilled in the northern part of the Statfjord field, about 1.6 km southeast of 33/9-3 well on the Tampen Spur in the northern North Sea. The objectives were to provide structural and stratigraphic control on the Brent reservoirs, and to provide stratigraphic control and to establish an oil/water contact for the Statfjord reservoir.

Operations and results

Appraisal well 33/9-9 was spudded with the semi-submersible installation Borgny Dolphin on 27 July 1977 and drilled to TD at 3100 m in Late Triassic sediments in the Statfjord Formation. The well was drilled with seawater down to 486 m and with a seawater/lignosulphonate mud system from 486 m to 1993 m. At 1993 m, TD in the 17 1/2" section, the hole was displaced to a freshwater/Lignosulphonate mud system. At the same point diesel was added to free the 13 3/8" casing which had become differentially stuck. After that the mud contained initially 5% diesel decreasing to traces of diesel at to 2489 m. From 2489 m to final TD the freshwater/Lignosulphonate mud system was without measurable diesel.

No hydrocarbon shows were reported above the Brent Group. The Brent Group was found at 2413 m, 77.5 m deeper than prognosed 44.0 m thinner than anticipated in comparison to 33/9-3. Good oil shows were encountered at the top of the Brent Formation and continued throughout the reservoir down to top Dunlin Group at 2504 m. The entire Brent Group was oil-filled and it was above the field oil/water contact of 2609.1 m (2584.1 MSL). Log calculations showed that of the 87.0 m of gross oil section 84.6 m was net sand with 27.5% average porosity and 13.1% average water saturation. The Dunlin Group came in at 2504 m and log interpretation indicated a 23.2 m gross oil bearing reservoir between 2528.4 and 2551.6 m with 17.9 m net oil sand. The interval had 20.2% average porosity and 34.6% water saturation. Oil shows were reported from ditch samples and side wall cores in the Dunlin sand between 2535 and 2575 m. No OWC was established in the Dunlin Group. It was assumed that Brent and Dunlin had a common OWC at 2609.1 m (2584.1 MSL), outside well position. The Early Jurassic Statfjord Formation was penetrated at 2715.0, only 5.0 m deep to prognosis confirming that the Statfjord seismic reflector is a reliable mapping horizon. Good oil shows were reported from the top down to about 2850.0 m. The lowest potential pay sand indicated on the CPI log occurs between 2847.5 and 2852.5 m, but a test in this interval, DST No. 2, produced water with only trace oil. The anticipated oil/water contact was not found. The lowest-known-oil in the well at 2815.0 m (2790.0 m MSL) is 13.1 m above the lowest-known-oil previously established in the 33/12-2, which falls within a section of tight sands and shales in 33/9-9.

A total of 23 cores were cut in the well. Cores no 1 to 8 were taken through the Brent reservoir and into the shaly top of Dunlin, while cores no 9 to 23 were cut in the Statfjord Formation. A significant error in core depth is noted for the first 16 cores. For these 11.3 m must be added to the registered core depths in order to match with the logger's depth. The last seven cores had core-log mismatch within +/- 2 m.



The well was permanently abandoned on 17 November 1977 as n oil and gas appraisal well.

Testing

Six separate zones were successfully tested, requiring a total of nine attempts. The purpose of the tests was to obtain information from six separate zones in the Brent, Dunlin and Statfjord Sands in order to further evaluate the reservoirs. The tests for the first two zones were designed primarily for production data, bottom hole pressures and formation fluid samples, with sustained sand production expected only if very thin unconsolidated sand stringers were present. The last four zones where sand bonding was weak, as calculated from the well log data, had the additional test requirement of measuring the oil rate at which the formation sand broke down.

DST 1 in the interval 2847.5 to 2852.5 m in the Statfjord Formation was a misrun.

DST 2 in the interval 2847.5 to 2852.5 m in the Statfjord Formation produced 215 Sm³ water and only trace oil /day through a 3/4" choke. The recorded bottom hole temperature was 91.1 deg C. Sand was produced throughout the test, at rates from 1200 to 300 pounds/thousand barrels (ptb)

DST 3 in the interval 2800.0 m to 2803.5 m in the Statfjord Formation produced in the final flow period 254 Sm³ oil /day through a 1/4" choke. The GOR was 82 Sm³/Sm³ and the oil gravity was 39.0 deg API. The recorded bottom hole temperature was 86.1 deg C. After the initial cleanup flow no sand was produced.

DST 4 in the interval 2742.0 m to 2745.0 m in the Statfjord Formation was a misrun.

DST 5 in the interval 2742.0 m to 2745.0 m in the Statfjord Formation produced in the final flow period 513 Sm³ oil /day through a 5/16" choke. The GOR was 93 Sm³/Sm³ and the oil gravity was 38.7 deg API. The recorded bottom hole temperature was 89.4 deg C. Sand was produced after each rate change (20 ptb), but cleaned up rapidly. Sand began producing more or less continuously, in bursts, on 5/8" choke (40 ptb) indicating formation was breaking down.

DST 6 in the interval 2742.0 m to 2745.0 m in the Statfjord Formation produced in the final flow period 299 Sm³ oil /day through a 1/4" choke. The GOR was 129 Sm³/Sm³ and the oil gravity was 38.6 deg API. The recorded bottom hole temperature was 89 deg C. No sand was observed other than a few grains upon initial cleanup on 7/16" choke.

DST 7 in the interval 2531.0 m to 2537.0 m in the Dunlin Group produced in the final flow period 442 Sm³ oil /day through a 23/64" choke. The GOR was 117 Sm³/Sm³ and the oil gravity was 34.4 deg API. The recorded bottom hole temperature was 82.8 deg C. On 1 1/4" choke sand production was observed on a continuous basis at about 120 ptb.

DST 8 in the interval 2458.0 m to 2460.7 m in the Brent Group produced in the final flow period 525 Sm³ oil /day through a 24/64" choke. The GOR was 144 Sm³/Sm³ and the oil gravity was 37.6 deg API (measured in the first flow period). The recorded bottom hole temperature was 80.1 deg C. Only small amounts of sand were produced.

DST 9 in the interval 2426.0 m to 2432.8 m in the Brent Group produced in the final flow period 416 Sm³ oil /day through a 22/64" choke. The GOR was 170 Sm³/Sm³ and the oil gravity was 38.5 deg API (measured in the first flow period). No temperature was recorded due to malfunction in the temperature gauge. Small amounts of sand were produced throughout the test. No measurable sand was produced on the highest flow rate (50/64" adjustable choke).

Cuttings at the Norwegian Offshore Directorate



Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
254.00	3101.00

Cuttings available for sampling?	YES
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Cores at the Norwegian Offshore Directorate

Core sample number	Core sample - top depth	Core sample - bottom depth	Core sample depth - uom
1	2414.0	2421.9	[m]
2	2432.3	2444.3	[m]
3	2444.3	2444.8	[m]
4	2446.3	2455.3	[m]
5	2455.3	2468.3	[m]
6	2468.3	2482.3	[m]
7	2482.3	2500.6	[m]
8	2500.6	2517.8	[m]
9	2719.0	2722.3	[m]
10	2722.3	2732.3	[m]
11	2732.3	2740.3	[m]
12	2740.3	2754.8	[m]
13	2754.8	2768.6	[m]
14	2768.8	2774.3	[m]
15	2774.3	2786.6	[m]
16	2786.6	2793.0	[m]
17	2793.0	2807.5	[m]
18	2807.5	2818.4	[m]
19	2818.4	2826.2	[m]
20	2826.2	2837.5	[m]
21	2837.5	2853.5	[m]
22	2853.5	2866.0	[m]
23	2866.0	2876.5	[m]

Total core sample length [m]	249.2
Cores available for sampling?	YES

Core photos



24414-2416m



2416-2419m



2419-2421m



2421-2424m



2424-2426m



2426-2429m



2429-2432m



2432-2432m



2432-2434m



2434-2437m



2437-2439m



2439-2443m



2442-2444m



2444-2446m



2446-2448m



2448-2451m



2451-2453m



2453-2455m



2455-2458m



2458-2460m



2460-2463m



2463-2465m



2465-2465m



2468-2470m



2470-2473m



2473-2475m



2475-2478m



2478-2480m



2480-2481m



2481-2484m



2484-2487m



2487-2490m



2490-2492m



2492-2495m



2495-2498m



2498-2500m



2500-2503m



2503-2505m



2505-2508m



2508-2522m



2511-2513m



2513-2516m



2516-2516m



2719-2722m



2722-2725m



2725-2727m



2727-2732m



2732-2734m



2734-2737m



2737-2740m



2740-2742m



2742-2745m



2742-2745m



2745-2748m



2748-2750m



2750-2754m



2754-2757m



2757-2760m



2760-2762m



2762-2765m



2765-2768m



2768-2774m



2774-2776m



2776-2779m



2779-2782m



2782-2784m



2784-2786m



2786-2789m



2789-2791m



2791-2793m



2793-2795m



2795-2798m



2798-2807m



2807-2810m



2810-2812m



2812-2815m



2815-2818m



2818-2821m



2821-2823m



2823-2826m



2826-2828m



2828-2831m



2831-2834m



2834-2837m



2837-2840m



2840-2842m



2842-2845m



2845-2847m



2847-2850m



2850-2853m



2853-2856m



2856-2858m



2861-2863m



2863-2866m



2866-2868m



2868-2871m



2871-2874m



2874-2876m



2858-2861m

Palynological slides at the Norwegian Offshore Directorate

Sample depth	Depth unit	Sample type	Laboratory
2420.3	[m]	C	LAP
2420.3	[m]	C	OD
2431.1	[m]	C	OD
2431.1	[m]	C	LAP
2433.8	[m]	C	LAP
2433.8	[m]	C	OD
2434.4	[m]	C	OD
2434.4	[m]	C	LAP
2436.1	[m]	C	LAP
2436.1	[m]	C	OD
2436.5	[m]	C	OD
2436.5	[m]	C	LAP
2437.2	[m]	C	LAP
2437.2	[m]	C	OD
2437.8	[m]	C	OD
2437.8	[m]	C	LAP
2438.6	[m]	C	LAP
2438.6	[m]	C	OD
2438.7	[m]	C	OD
2438.7	[m]	C	LAP
2440.9	[m]	C	LAP
2440.9	[m]	C	OD
2442.8	[m]	C	OD



2442.8	[m]	C	LAP
2443.0	[m]	C	LAP
2443.0	[m]	C	OD
2443.0	[m]	C	OD
2443.0	[m]	C	LAP
2443.5	[m]	C	LAP
2443.5	[m]	C	OD
2444.5	[m]	C	OD
2444.5	[m]	C	LAP
2446.3	[m]	C	LAP
2446.3	[m]	C	OD
2446.9	[m]	C	LAP
2448.6	[m]	C	LAP
2448.6	[m]	C	OD
2448.8	[m]	C	OD
2448.8	[m]	C	LAP
2448.9	[m]	C	LAP
2448.9	[m]	C	OD
2450.3	[m]	C	OD
2450.3	[m]	C	LAP
2451.8	[m]	C	LAP
2451.8	[m]	C	OD
2453.3	[m]	C	OD
2453.3	[m]	C	LAP
2455.0	[m]	C	LAP
2455.0	[m]	C	OD
2455.3	[m]	C	OD
2455.3	[m]	C	LAP
2456.6	[m]	C	LAP
2456.6	[m]	C	OD
2459.3	[m]	C	OD
2459.3	[m]	C	LAP
2469.3	[m]	C	LAP
2469.3	[m]	C	OD
2486.0	[m]	C	LAP
2489.0	[m]	C	LAP
2494.0	[m]	C	LAP
2497.0	[m]	C	LAP
2500.0	[m]	C	LAP
2502.0	[m]	C	LAP



2503.0	[m]	C	LAP
2504.0	[m]	C	LAP
2507.0	[m]	C	LAP
2512.0	[m]	C	LAP
2516.0	[m]	C	LAP

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
170	NORDLAND GP
997	HORDALAND GP
1660	ROGALAND GP
1660	BALDER FM
1693	LISTA FM
1848	SHETLAND GP
2396	CROMER KNOLL GP
2413	BRENT GP
2504	DUNLIN GP
2504	DRAKE FM
2528	COOK FM
2558	BURTON FM
2715	STATFJORD GP

Geochemical information

Document name	Document format	Document size [MB]
414 1	pdf	1.24

Documents - older Norwegian Offshore Directorate WDSS reports and other related documents

Document name	Document format	Document size [MB]
414 01 WDSS General Information	pdf	1.90

Documents - reported by the production licence (period for duty of secrecy expired)





Document name	Document format	Document size [MB]
414 33 9 9 Biostratigraphical analysis charts	pdf	2.47
414 33 9 9 Biostratigraphic correlation	pdf	0.98
414 33 9 9 biostratigraphy of the interval 254m-3100m	pdf	2.33
414 33 9 9 Completion log	pdf	1.80
414 33 9 9 Completion Report	pdf	2.95
414 33 9 9 Conventional core analysis	pdf	0.82
414 33 9 9 Core analysis report	pdf	10.65
414 33 9 9 Core analysis report statfjord	pdf	6.73
414 33 9 9 Drilling program	pdf	1.31
414 33 9 9 final geological report	pdf	2.95
414 33 9 9 Final geological report appraisal	pdf	0.59
414 33 9 9 Paleontological and sedimentological studies	pdf	0.53
414 33 9 9 Palynofacies studies	pdf	0.87
414 33 9 9 Special core analysis	pdf	10.47
414 33 9 9 Special core analysis Final report	pdf	12.44
414 33 9 9 Special core analysis mobil exploration	pdf	3.03
414 33 9 9 Special core analysis statfjord field	pdf	6.89
414 33 9 9 Special core analysis study Core lab	pdf	1.64
414 33 9 9 Summary log	pdf	0.13
414 33 9 9 Well history operations report	pdf	3.67

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
2.0	2848	2853	19.0
3.0	2800	2804	19.0
5.0	2742	2745	15.9
6.0	2742	2745	11.0
7.0	2531	2538	30.0
8.0	2458	2461	19.0
9.0	2426	2433	0.0





Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
2.0				
3.0	30.000			
5.0	34.000			
6.0	38.000			89
7.0	24.000			
8.0	34.000			
9.0				

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
2.0					
3.0	1438		0.830		412
5.0	1206		0.830		545
6.0	863		0.830		618
7.0	1327		0.830		569
8.0	1468		0.830		1059
9.0					

Logs

Log type	Log top depth [m]	Log bottom depth [m]
DLL	2350	3100
FDC CNL	475	3100
GR SPECTRO	2350	3100
HDT	2300	3100
ISF SONIC	245	3100
LS SONIC	1990	3098
RFT	0	0
VSP	355	2955

Casing and leak-off tests

Casing type	Casing diam. [inch]	Casing depth [m]	Hole diam. [inch]	Hole depth [m]	LOT/FIT mud eqv. [g/cm3]	Formation test type
CONDUCTOR	30	244.0	36	249.0	0.00	LOT



SURF.COND.	20	475.0	26	486.0	0.00	LOT
INTERM.	13 3/8	1984.0	17 1/2	1993.0	0.00	LOT
INTERM.	9 5/8	3068.0	12 1/4	3100.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
249	1.07			waterbased	
760	1.14			waterbased	
1137	1.16			waterbased	
1568	1.25			waterbased	
1993	1.37			waterbased	
2421	1.72			waterbased	

Thin sections at the Norwegian Offshore Directorate

Depth	Unit
2748.45	[m]
2751.45	[m]
2756.30	[m]
2759.20	[m]
2764.55	[m]
2765.88	[m]
2782.55	[m]
2799.60	[m]
2809.30	[m]
2722.85	[m]

Pressure plots

The pore pressure data is sourced from well logs if no other source is specified. In some wells where pore pressure logs do not exist, information from Drill stem tests and kicks have been used. The data has been reported to the NPD, and further processed and quality controlled by IHS Markit.

Document name	Document format	Document size [MB]
414 Formation pressure (Formasjonstrykk)	PDF	0.22

