

**General information**

Wellbore name	2/7-26 S
Type	EXPLORATION
Purpose	APPRAISAL
Status	RE-CLASS TO DEV
Factmaps in new window	link to map
Main area	NORTH SEA
Field	EMBLA
Discovery	2/7-20 Embla
Well name	2/7-26
Seismic location	PC-88 LINE 369 & COLUMN 1061
Production licence	018
Drilling operator	Phillips Petroleum Company Norway
Drill permit	674-L
Drilling facility	WEST DELTA
Drilling days	178
Entered date	20.03.1991
Completed date	13.09.1991
Release date	13.09.1993
Publication date	26.05.2009
Purpose - planned	APPRAISAL
Reclassified to wellbore	2/7-D-26
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	DEVONIAN
1st level with HC, formation	NO GROUP DEFINED
Kelly bushing elevation [m]	29.0
Water depth [m]	70.8
Total depth (MD) [m RKB]	4848.0
Final vertical depth (TVD) [m RKB]	4697.0
Maximum inclination [°]	24
Bottom hole temperature [°C]	167
Oldest penetrated age	DEVONIAN
Oldest penetrated formation	NO GROUP DEFINED
Geodetic datum	ED50
NS degrees	56° 19' 59.59" N
EW degrees	3° 14' 53.55" E
NS UTM [m]	6243333.20



EW UTM [m]	515347.49
UTM zone	31
NPDID wellbore	1756

Wellbore history

General

Well 2/7 26 S is located on the Embla Field in the Central Graben of the North Sea. It was designed to test the pre-Jurassic sandstones, which had shown commercial quantities of hydrocarbons in the 2/7-20, 2/7-21 S, and 2/7-23 S wells. The objective of the well was to confirm the presence of hydrocarbon bearing sandstones in the western fault block of the structure and to establish the productivity of this reservoir section through a program of well testing and coring. Well location and TD was chosen so that both the upper and lower sandstone members of the pre-Jurassic sequence would be penetrated. The target location was 300 m to the south of the 2/7-9 well at Base Cretaceous level. The reservoir section was expected to be highly fractured and over-pressured. Shallow gas was expected since gas had been encountered in all wells drilled from the template location over the 2/7-20 well.

Operations and results

Appraisal well 2/7 26 S was spudded with the semi-submersible installation West Delta on 20 March 1991 and drilled to TD at 4848 in Devonian rocks. The well was drilled deviated from a template located over the 2/7-20 well to penetrate the target reservoir section in the western fault block of the Embla structure. Minor shallow gas was detected in sandy zones with an increase in background gas from 4 to 64 units. Apart from some failures when logging and some stuck pipe experiences, drilling proceeded without significant problems. The well was drilled with seawater and hi-vis sweeps down to 575 m, with KCl/PAC mud from 575 m to 4125.5 m, and with Enviromul oil based mud from 4125.5 m to TD.

The 9 5/8" casing was set in claystones of the Lower Cretaceous, Rødby Formation. The remaining Lower Cretaceous section including Sola, Tuxen and Åsgård Formations was penetrated, followed by a Late Jurassic sequence consisting of 3 m Mandal Formation and 82 m Farsund Formation. The top of the reservoir sands were encountered at 4386 m (4226 m TVD), 58 m higher than prognosed. As in the other Embla wells the reservoir was undefined, Pre-Jurassic stratigraphy. Both the upper and the lower sandstone units were present in the well as predicted. The reservoir was oil bearing. No definite OWC was defined, however RFT pressure data, logs and DST results indicated oil-filled porous sandstones from top reservoir and down to at least 4606 m (4465 m TVD).

The cuttings in the intervals between 1520 - 1680 m and 1730 - 1830 m (Base Nordland Group / upper Hordaland Group) showed 30-100% pale to bright yellow fluorescence accompanied by oil in the mud. The cut was blooming to streaming yellow, and the odour was good to strong. Good to excellent oil shows were seen in the interval 3111.4 m to 3973 m with 35% fluorescence in marls/limestones from 3111.4 m and rapidly increasing to 70% by 3018.1 m. Shows up to 80%, with bright yellow fluorescence and yellow fast streaming cut, were seen from 3124.2 to 3230.9 m. Shows were also seen at 3550.9 m, 5% -10% with dull yellow fluorescence and hazy crushed cut. From 3627.1 to 3834.4 m shows of 20% to 80% with a dull fluorescence were seen. The cut was pale blue yellow and slightly streaming. Shows further down in the well, including the pre-Jurassic reservoir section were weak and most likely caused by the oil-based mud.

A total of 18 cores were cut in the well. The first was cut at 3200.4 - 3214.3 m in the Tor Formation. The second core was cut through the Mandal Formation and into the upper part of the Farsund Formation. A total of 16 cores were cut in the reservoir interval



including a core in the rhyolittic rocks at TD. A total of 90 sidewall cores were attempted and 28 sidewall cores were recovered. No wire line fluid samples were taken.

The well was suspended on 13 September 1991 as an oil appraisal well and reclassified to development well 2/7-D-26

Testing

Two DST tests were performed in this well.

DST 1 was conducted over the interval 4605.5 - 4696.9 m (4465.0 - 4552.2 m TVD). It flowed in the range of 48 Sm³ (300 STB) /day, with signs of unstable flow, at pressures less than 1000 psi.

DST 2 was conducted over a gross interval from 4309.8 - 4538.4 (4184 - 4401 m TVD). The well was tested on a 16/64" choke with flowing rates of 223 Sm³ oil and 61447 Sm³ gas/day. The GOR was 275 Sm³/Sm³, the oil density was 0.81 g/cm³ (43 deg API), and the gas gravity (air = 1) was 0.81 with 6% CO₂ and 20 ppm H₂S. A stable down-hole temperature of 160 deg C was measured in the test.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
579.00	4547.60

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	10500.0	10545.5	[ft]
2	14103.0	14153.9	[ft]
3	14417.0	14453.1	[ft]
4	14457.0	14480.8	[ft]
5	14481.0	14545.8	[ft]
6	14558.0	14581.6	[ft]
7	14586.0	14592.1	[ft]
8	14598.0	14635.6	[ft]
9	14636.0	14658.0	[ft]
10	14660.0	14693.6	[ft]
11	14696.0	14743.8	[ft]
12	14746.0	14807.2	[ft]
13	14807.0	14848.0	[ft]
14	14854.0	14903.6	[ft]
15	14903.0	14935.6	[ft]



16	15312.0	15403.6	[ft]
17	15404.0	15495.1	[ft]
18	15844.0	15907.7	[ft]

Total core sample length [m]	250.7
Cores available for sampling?	YES

Core photos



5480-5487ft



10500-10510ft



10510-10522ft



10522-10534ft



10534-10545ft



14103-14118ft



14118-14133ft



14133-14148ft



14148-14153ft



14417-14432ft



14432-14447ft



14447-14453ft



14457-14472ft



14472-14480ft



14481-14496ft



14496-14511ft



14511-14526ft



14526-14541ft



14541-14545ft



14558-14573ft



14573-14581ft



14586-14592ft



14598-14613ft



14613-14628ft



14628-14635ft



14636-14651ft



14651-14658ft



14660-14675ft



14675-14690ft



14790-14693ft



14696-14711ft



14711-14726ft



14726-14741ft



14741-14743ft



14746-14761ft



14761-14776ft



14776-14791ft



14791-14806ft



14806-14807ft



14807-14822ft



14822-14837ft



14854-14869ft



14869-14884ft



14884-14899ft



14899-14903ft



14903-14918ft



14918-14933ft



14933-14935ft



15312-15327ft



15327-15342ft



15342-15357ft



15357-15372ft



15372-15387ft



15387-15402ft



15402-15403ft



15404-15419ft



15419-15434ft



15434-15449ft



15449-15464ft



15464-15479ft



15479-15494ft



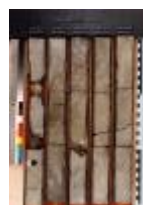
15494-15495ft



15844-15859ft



15859-15874ft



15874-15889ft



15889-15904ft



15904-15907ft

Oil samples at the Norwegian Offshore Directorate

Test type	Bottle number	Top depth MD [m]	Bottom depth MD [m]	Fluid type	Test time	Samples available
DST	DST 1	4605.50	4696.90		24.08.1991 - 00:00	YES
DST	DST 2	4309.80	4538.40		03.09.1991 - 00:00	YES

Lithostratigraphy



Top depth [mMD RKB]	Lithostrat. unit
100	NORDLAND GP
1606	HORDALAND GP
2966	ROGALAND GP
2966	BALDER FM
2983	SELE FM
3038	LISTA FM
3091	VÅLE FM
3118	SHETLAND GP
3118	EKOFISK FM
3200	TOR FM
3321	HOD FM
3981	BLODØKS FM
3989	HIDRA FM
4057	CROMER KNOLL GP
4057	RØDBY FM
4163	TUXEN FM
4182	ÅSGARD FM
4299	TYNE GP
4299	MANDAL FM
4302	FARSUND FM
4386	NO GROUP DEFINED

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

Document name	Document format	Document size [MB]
1756_01_WDSS_General_Information	pdf	0.58
1756_02_WDSS_completion_log	pdf	0.25

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

Document name	Document format	Document size [MB]
1756_2_7_26_S_COMPLETION_LOG	pdf	2.75
1756_2_7_26_S_COMPLETION_REPORT_2	pdf	38.80

Drill stem tests (DST)





Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	4606	4697	6.3
2.0	4310	4538	6.3

Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0				133
2.0				

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0	53	10123	0.819		191
2.0	223	61447	0.819	0.810	279

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CST GR	4145	4829
CST GR	4147	4777
DLL MSFL BHC GR AMS	2133	4104
FMS GR	3112	4083
LDL CNL GR AMS	3088	4070
LDL CNL NGL AMS	4256	4859
MWD - GR RES DIR	274	4394
OBDT GR	4120	4857
PIL ASL GR AMS	3977	4856
RFT GR	3134	3530
RFT GR	4174	4715
VELOCITY	2255	4800

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	158.0	36	160.0	0.00	LOT
INTERM.	20	571.0	26	573.0	0.00	LOT
INTERM.	13 3/8	2130.0	17 1/2	2133.0	1.91	LOT



INTERM.	9 5/8	4117.0	12 1/4	4120.0	2.16	LOT
INTERM.	6 5/8	4847.0	8 1/8	4848.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
118	1.05			WATER BASED	
160	1.05			WATER BASED	
180	1.05			WATER BASED	
294	1.05			WATER BASED	
576	1.20			WATER BASED	
694	1.32	35.0		OIL BASED	
1178	1.32	38.0		OIL BASED	
1628	1.56	42.0		OIL BASED	
1991	1.70	32.0		OIL BASED	
2143	1.70	26.0		OIL BASED	
2146	1.70	38.0		OIL BASED	
2288	1.70	18.0		OIL BASED	
2473	1.70	18.0		OIL BASED	
2630	1.70	20.0		OIL BASED	
2724	1.70	19.0		OIL BASED	
2874	1.73	21.0		OIL BASED	
2983	1.73	22.0		OIL BASED	
2987	1.73	22.0		OIL BASED	
2998	1.73	23.0		OIL BASED	
3047	1.73	21.0		OIL BASED	
3125	1.73	22.0		OIL BASED	
3138	1.73	22.0		OIL BASED	
3200	1.73	21.0		OIL BASED	
3219	1.73	26.0		OIL BASED	
3341	1.73	21.0		OIL BASED	
3385	1.73	20.0		OIL BASED	
3487	1.73	24.0		OIL BASED	
3498	1.73	24.0		OIL BASED	
3532	1.73	22.0		OIL BASED	
3625	1.73	26.0		OIL BASED	
3678	1.73	26.0		OIL BASED	
3749	1.73	27.0		OIL BASED	



3772	1.73	26.0		OIL BASED	
3778	1.73	26.0		OIL BASED	
3783	1.75	26.0		OIL BASED	
3987	1.75	24.0		OIL BASED	
3999	1.75	24.0		OIL BASED	
4062	1.75	26.0		OIL BASED	
4073	1.75	23.0		OIL BASED	
4113	1.93	35.0		WATER BASED	
4116	1.75	22.0		OIL BASED	
4126	1.76	26.0		OIL BASED	
4146	2.00	52.0		WATER BASED	
4208	2.02	53.0		WATER BASED	
4256	2.02	49.0		WATER BASED	
4279	2.04	46.0		OIL BASED	
4299	2.02	44.0		WATER BASED	
4314	2.02	44.0		WATER BASED	
4315	2.04	45.0		WATER BASED	
4331	2.04	45.0		WATER BASED	
4362	2.06	49.0		WATER BASED	
4394	2.06	50.0		WATER BASED	
4394	2.06	49.0		WATER BASED	
4407	2.04	55.0		WATER BASED	
4414	2.06	49.0		WATER BASED	
4436	2.06	50.0		WATER BASED	
4450	2.06	50.0		WATER BASED	
4468	2.06	49.0		WATER BASED	
4479	2.06	49.0		WATER BASED	
4523	2.06	54.0		WATER BASED	
4542	2.04	48.0		WATER BASED	
4553	2.04	53.0		WATER BASED	
4554	2.04	52.0		WATER BASED	
4602	2.04	46.0		WATER BASED	
4657	2.04	43.0		OIL BASED	
4723	2.04	46.0		WATER BASED	
4849	2.04	42.0		WATER BASED	
4849	2.04	42.0		OIL BASED	

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]
1756 Formation pressure (Formasjonstrykk)	pdf	0.22

