Generell informasjon

Brønnbane navn	1/5-3 S
Type	EXPLORATION
Formål	WILDCAT
Status	P&A
Faktakart i nytt vindu	lenke til kart
Hovedområde	NORTH SEA
Funn	1/5-3 S
Brønn navn	1/5-3
Seismisk lokalisering	CN1/93- INLINE 1237 & X-LINE 2433
Utvinningstillatelse	144
Boreoperatør	Conoco Norway Inc.
Boretillatelse	918-L
Boreinnretning	BYFORD DOLPHIN
Boredager	57
Borestart	10.06.1998
Boreslutt	06.08.1998
Frigitt dato	06.08.2000
Publiseringsdato	07.01.2003
Opprinnelig formål	WILDCAT
Gjenåpnet	NO
Innhold	OIL
Funnbrønnbane	YES
1. nivå med hydrokarboner, alder	MIOCENE
1. nivå med hydrokarboner, formasjon.	NO FORMAL NAME
Avstand, boredekk - midlere havflate [m]	25.0
Vanndybde ved midlere havflate [m]	69.0
Totalt målt dybde (MD) [m RKB]	1565.0
Totalt vertikalt dybde (TVD) [m RKB]	1565.0
Maks inklinasjon [°]	5.7
Temperatur ved bunn av brønnbanen [°C]	54
Eldste penetrerte alder	MIOCENE
Eldste penetrerte formasjon	HORDALAND GP
Geodetisk datum	ED50
NS grader	56° 41' 24.52'' N
ØV grader	2° 36' 54.13'' E

NS UTM [m]	6283101.44
ØV UTM [m]	476419.16
UTM sone	31
NPDID for brønnbanen	3257

Brønnhistorie

General

Block 1/5 is situated in the Norwegian Central Trough at the transition of the Feda Graben and the Breiflabb Basin. Well 1/5-3 S was planned as an exploration well with TD at 2910 m in the Tor Chalk Formation. The well was positioned in a seismically defined "gas chimney" on the crest of a salt induced diapir and was the first well drilled on this diapir. Similar cases have been drilled successfully by STATOIL on the Tommeliten Discovery 1/9-2 and 1/9-3 wells. The primary objective of well 1/5-3 S was to test the presence of moveable hydrocarbons in fractured, reservoir quality chalk of the Ekofisk and Tor formations along the southwestern flank of the diapir. A secondary potential objective was in the Paleocene Rogaland Group. A total depth of 1566 m was reached in the 12 1/4" hole section on June 29, 1998 before deciding to permanently abandon the well due to increasing pore pressure, without fulfilling any of the well objectives.

Operations and results

Exploration 1/5-3 S well was spudded with the semi-submersible "Byford Dolphin" on 10 June 1998 and drilled to TD at 1566 m in rocks of Late Miocene age (undifferentiated Nordland Group). The well was drilled with seawater and hi-vis pills down to 792 m and with Baroid "BARASILC" silicate / KCl glycol enhanced ("GEM GP") mud from 792 m to TD. Due to possible shallow gas hazard at 466 m, a 9 7/8" pilot hole was drilled below the 30" conductor to 780 m. The 9 7/8" hole was opened up to 26" at 792 m prior to setting 20" casing at 785 m. No shallow gas was observed from the MWD resistivity in this hole section.

Record setting overpressures were experienced in the 17 1/2" hole section in well 1/5-3 S. Abnormal pressures were indicated first at 700 - 800 m. Pore pressures built quickly to 1.4 g/cc due to gas just below 1000 m in. Having passed that depth, the hole drilled without problems until below 1200 m where it again became gassy. Mud weight was increased to 1.52 g/cc, thus reducing 30% gas to 5-10%. This weight was sufficient until below 1400 m when gas again increased. By 1450 m, the DXC was beginning to show signs of increasing pore pressure, as was the MWD resistivity. Below 1500 m, gas went off scale and an oil kick to 1.70 BMW was taken at 1544 m. Pressures of this magnitude were not forecast at all. Lost circulation was experienced during well control operations, which eventually lead to cementing of the BHA, and plugging back to sidetrack around the fish. The 17 l/2" hole was re-drilled as 1/5-3 S T2 from 1246 m to a revised 13 3/8" casing point at 1412 m. Although re-drilled with 1.60 g/cc mud weight versus the original 1.52 g/cc mud, the hole drilled nearly as gassy as the original hole. Following the 13 3/8" casing, an excellent leak-off was tested to nearly overburden gradient at 1.98 BMW.

The 12 1/4" drilling was done with Statoil's Tommeliten method which emphasized ignoring gas in favour of other pressure parameters while minimizing mud weight builds but this proved to be unsuccessful for 1/5-3S. After drilling out with 1.76 g/cc mud weight, the hole became so gassy (up to 50%) from limestone stringers oozing oil that it had to be circulated clean at 1494 m, and 1.80 g/cc mud was circulated around. This should have balanced the 1.7 BMW kick zone coming up at 1544 m, as well as leading to increased confidence, as gas and cuttings size would diminish. Although the cuttings remained small until growing to 7 cm splinters near TD, gas was again off scale. By 1566 m, only 22 m beyond the second kick zone, the well was shut-in. 1.86 g/cc mud weight

was required to balance the formation, and 1.90 g/cc mud weight was eventually circulated around on a dead well. Well 1/5-3 S T2 had transitioned from a pore pressure of 1.7 EMW at 1544 m to 1.86 EMW at 1566 m in only 22m of new hole. At this point the decision was taken to plug and abandon the well.

Three kicks taken were regional records for both overpressure magnitude and shallowness of depth. Statoil's Tommeliten Field in block 1/9 did not see anywhere near the overpressure magnitude and shallow onset; mud weight was able to control mud gas far more successfully on Tommeliten and multiple hydrocarbon kicks were not experienced. Conoco's 1/6-5 crestal diapir well also exhibited a lesser overpressure profile. In hindsight the most important methods to monitor the pressure during drilling were the MWD resistivity and the cuttings shape and size. Gas in the mud was carefully monitored and plotted in units of percent methane in air. Gas was commonly 5% in the claystones, some of which showed bleeding gas at the surface, and ran 30-50% and higher in the carbonate stringers, which bled oil at the surface. The gas chimney section drilled with high gas background all the way from the top of overpressure to the terminal kicks below 1500 m. While the mud gas gave a general indication of overpressure, the high background levels actually obscured both of the final two kicks.

Good trace of crude oil in the mud was observed from 1498m. At 1544 m, a kick was taken which resulted in crude oil being circulated up to the rig. Circulating gas varied between 40-100%, with peaks way above 100% caused by large amount of hydrocarbons. The crude oil collected at surface was dark yellowish brown and had a density of 0.84 g/cc (37 API) measured with a pressurised mud balance. Later laboratory analysis onshore gave a density of 0.80 g/cc (35.1 API).

No conventional or sidewall cores were taken in this well. The well was permanently abandoned as a junked well with minor oil on 6 August 1998.

Testing

No drill stem test was performed.

Borekaks i Sokkeldirektoratet

Borekaksprøve, topp dybde [m]	Borekaksprøve, bunn dybde [m]
800.00	1560.00

Borekaks tilgjengelig for prøvetaking?	YES

Litostratigrafi

Topp Dyb [mMD RKB]	Litostrat. enhet
94	NORDLAND GP
1309	HORDALAND GP

Spleisede logger

Dokument navn	Dokument format	Dokument størrelse [KB]
3257	pdf	0.21

Geokjemisk informasjon

Dokument navn	Dokument format	Dokument størrelse [KB]
3257_1	pdf	1.61

Dokumenter - rapportert av utvinningstillatelsen (frigitt ihht til regelverk)

Dokument navn	Dokument format	Dokument størrelse [KB]
3257_1_5_3_S_COMPLETION_LOG	.pdf	5.25
3257_1_5_3_S_COMPLETION_REPORT	.pdf	41.89

Logger

Type logg	Topp dyp for logg [m]	Bunn dyp for logg [m]
GR DPIL ZDL CN MAC TTRM	1246	1422
MWD - DGR EWR-S	792	1544
MWD - DIR	1246	1422
MWD - DIR DGR EWR PH4	167	780
MWD - DIR DGR EWR-S	1422	1566
TEMP CCL SONIAN	792	1544

Foringsrør og formasjonsstyrketester

Type utforing	Utforing diam. [tommer]	Utforing dybde [m]	Brønnbane diam. [tommer]	Brønnbane dyp [m]	LOT/FIT slam eqv. [g/cm3]	Type formasjonstest
CONDUCTOR	30	166.7	36	167.0	0.00	LOT
SURF.COND.	20	784.7	26	785.0	1.79	LOT
INTERM.	13 3/8	1412.0	17 1/2	1412.0	1.98	LOT
OPEN HOLE		1565.0	12 1/4	1565.0	0.00	LOT

Boreslam

Dybde MD [m]	Egenvekt, slam [g/cm3]	Viskositet, slam [mPa.s]	Flytegrense [Pa]	Type slam	Dato, måling
600	1.03	10.0		KCL/GEM GP	
930	1.27	12.0		KCL/PAC/GLYCOL	
1024	1.33	15.0		BARASILC	
1044	1.45	10.0		BARASILC	
1070	1.71	30.0		BARASILC	
1103	1.60	24.0		BARASILC	
1156	1.62	24.0		BARASILC	
1201	1.50	28.0		BARASILC	
1221	1.61	26.0		BARASILC	
1234	1.61	31.0		BARASILC	
1240	1.60	29.0		BARASILC	
1342	1.52	30.0		BARASILC	
1362	1.89	34.0		BARASILC	
1422	1.61	26.0		BARASILC	
1426	1.75	33.0		BARASILC	
1544	1.58	20.0		BARASILC	
1545	1.70	29.0		BARASILC	
1566	1.89	40.0		BARASILC	
1566	1.80	33.0		BARASILC	