General information

Wellbore name	16/2-21
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Press release	link to press release
Factmaps in new window	link to map
Main area	NORTH SEA
Field	JOHAN SVERDRUP
Discovery	16/2-6 Johan Sverdrup
Well name	16/2-21
Seismic location	LN0902-inline 2351 & xline 6672
Production licence	501
Drilling operator	Lundin Norway AS
Drill permit	1441-L
Drilling facility	BREDFORD DOLPHIN
Drilling days	34
Entered date	05.05.2013
Completed date	07.06.2013
Release date	07.06.2015
Publication date	07.06.2015
Purpose - planned	APPRAISAL
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	LATE JURASSIC
1st level with HC, formation	INTRA DRAUPNE FM SS
Kelly bushing elevation [m]	25.0
Water depth [m]	112.0
Total depth (MD) [m RKB]	2070.0
Final vertical depth (TVD) [m RKB]	2070.0
Maximum inclination [°]	1.4
Oldest penetrated age	LATE TRIASSIC
Oldest penetrated formation	SKAGERRAK FM
Geodetic datum	ED50
NS degrees	58° 46' 40.76'' N
EW degrees	2° 36' 38.77'' E
NS UTM [m]	6515546.49
EW UTM [m]	477492.98

UTM zone	31
NPDID wellbore	7169

Wellbore history

General

Well 16/2-21 was drilled to appraise the central part of the Johan Sverdrup discovery on the Utsira high in the North Seas. The hydrocarbon column height was predicted to be 14 m in the well location. The main objectives of the well were to investigate the reservoir sequence, facies and thickness in the central part of the discovery and to find the free water level (FWL).

Operations and results

Appraisal well 16/2-21 was spudded with the semi-submersible installation Bredford Dolphin on 5 May 2013 and drilled to TD at 2070 m in the Late Triassic Skagerrak Formation. A 9 7/8" pilot hole was drilled from the seabed to 706 m due to slight shallow gas warnings. No shallow gas was seen. Drilling was efficient with little NPT. The NPT was caused mostly by mud losses in the Skagerrak Formation reservoir section. The well was drilled with seawater and hi-vis pills down to 706 m and with Performadril water based mud from 76 m to TD.

The top of the reservoir came in as prognosed at 1935 m, overlain by a 4 m thick Draupne Formation shale. An oil column of 12 meter entirely within the late Jurassic Intra-Draupne sandstones was proven. The well proved excellent development of these sandstones in the central part of the Johan Sverdrup discovery. The total thickness of the Intra-Draupne Formation sandstone was 12 m. No sediments of middle Jurassic age were found, but 17 m of water filled early Jurassic Eriksson Formation was encountered below the Draupne Formation. The well results show an oil water contact at 1947 m, but with residual oil saturations of 20-30% down to ca 1955 m.

Above the reservoir, increasing amounts and wetness of mud gas down through the lowermost part of the Cromer Knoll Group suggested the possibility of leakage from the reservoir. However, no oil shows were observed in the Cromer Knoll Group; the only oil shows in the well were recorded on the cores from 1935 to 1945 m, and 1953 to 1955 m, within the Intra-Draupne and Eriksson Formation sandstones.

Three cores were cut in the interval 1907 m in the Cromer Knoll Group to 1976.6 m in the Skagerrak Formation with close to 100% total recovery. MDT fluid samples were taken at 1937.02 m (oil), 1946.62 m (oil), 1947.11 m (oil), 1947.71 m (water), 1953.79 m (water), and 1975.55 m (water).

The well was permanently abandoned on 7 June 2013 as an oil appraisal well.

Testing

No drill stem test was performed.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
720.00	2070.00

Cuttings available for sampling?	YES

Cores at the Norwegian Offshore Directorate

Core sample number	Core sample - top depth	Core sample - bottom depth	Core sample depth - uom
1	1907.0	1922.3	[m]
2	1922.6	1949.5	[m]
3	1949.6	1976.2	[m]

Total core sample length [m]	68.8
Cores available for sampling?	YES

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
MDT		1946.60	0.00	OIL	27.05.2013 - 00:00	NO
MDT		1937.00	0.00	OIL	27.05.2013 - 00:00	NO

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
137	NORDLAND GP
795	UTSIRA FM
870	UNDIFFERENTIATED
912	HORDALAND GP
912	SKADE FM
1048	NO FORMAL NAME
1396	NO FORMAL NAME
1424	ROGALAND GP
1424	BALDER FM
1446	SELE FM
1456	LISTA FM
1532	VÅLE FM
1542	SHETLAND GP

1542	EKOFISK FM
1553	TOR FM
1641	HOD FM
1755	BLODØKS FM
1769	SVARTE FM
1806	CROMER KNOLL GP
1806	RØDBY FM
1895	SOLA FM
1906	ÅSGARD FM
1932	VIKING GP
1932	DRAUPNE FM
1935	INTRA DRAUPNE FM SS
1948	STATFJORD GP
1948	EIRIKSSON FM
1965	HEGRE GP
1965	SKAGERRAK FM

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CMR XPT	1885	2051
FMI PPC MSIP PPC GR	1355	2063
LS ADT HRLA PEX HNGS	1876	2060
MDT	1953	1937
MDT PACKER	0	0
MWD - ARC PUP SON	130	701
MWD - ARC PUP SON SADN GVR	695	1882
MWD - ECO PUP SON	1876	2065
MWD - GVR PUP	1880	1910
VSP	200	2040
WI-ROCK	1944	2013
XI-ROCK	1888	1999

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	215.0	36	215.0	0.00	
INTERM.	20	698.0	26	706.0	1.60	FIT

PILOT HOLE		706.0	9 7/8	706.0	0.00	
INTERM.	9 5/8	1876.0	12 1/4	1882.0	1.72	LOT
OPEN HOLE		2070.0	8 1/2	2070.0	0.00	

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
450	1.41	28.0		Water Based	
1907	1.20	34.0		Water Based	
2070	1.15	36.0		Water Based	
2070	1.41	27.0		Water Based	