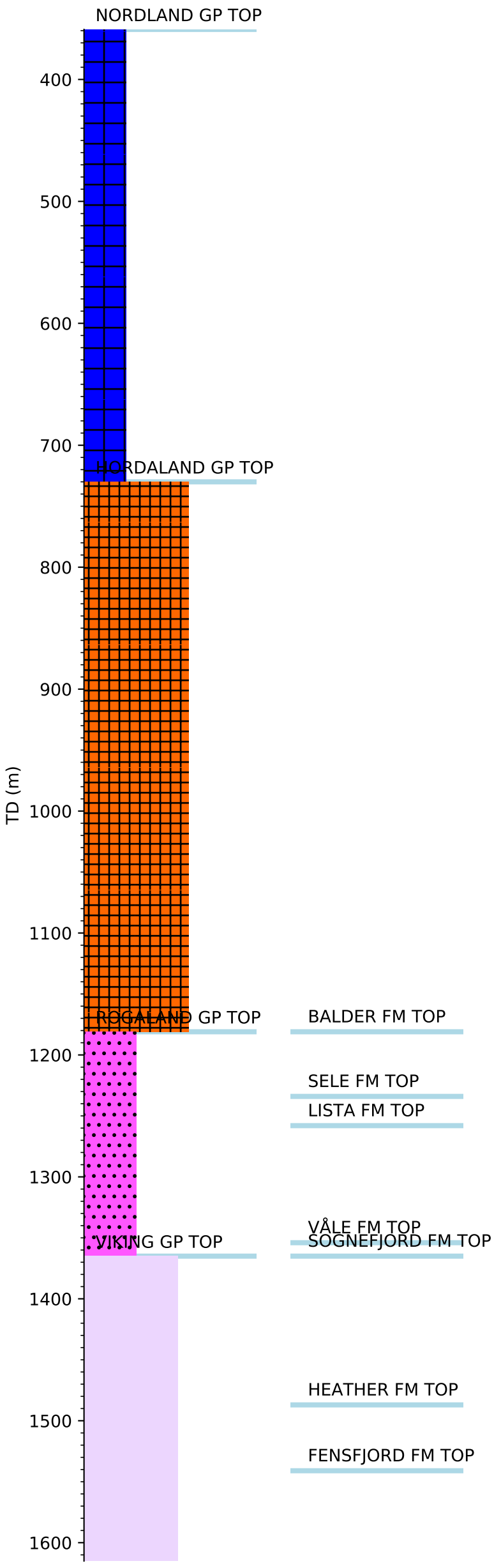
Groups

Formation Tops



Wellbore History

GENERAL

Well 31/2-12 was drilled as an appraisal well in the Troll West oil province in the Northern North Sea. The main objectives were to evaluate various techniques for gas production wells in the Troll field, to establish the reservoir quality in the central part of the Troll field gas accumulation, and to provide additional data point for the correlation and mapping of the depositional units.

OPERATIONS AND RESULTS

Well 31/2-12 was spudded with the semi-submersible installation Borgny Dolphin on 26 May 1983 and drilled to TD at 1615 m in the Middle Jurassic Fensfjord Formation. On 4 June, after running the BOP-stack, operations were interrupted by a labour dispute. After the strike ended on 17 June problems with the BOP lead to a further 4 days delay before normal drilling operations were resumed. Some instability problems and well kicks were encountered while drilling and testing in the reservoir. The well was drilled with Seawater and gel down to 807 m, with KCl/polymer mud from 807 m to 1338 m, and with CaCl2/CaCO3/polymer mud from 1338 m to TD.

Top reservoir in well 31/2-12 was encountered at 1365 m. The formations were interpreted to be gas bearing all through the Sognefjord Formation, the Heather Formation (1487 - 1541 m), and down to a clear GOC at 1570.5 m in the Fensfjord Formation. The upper part of the Sognefjord Formation consisted of generally clean sandstones. Below 1455 m the sands were micaceous and silty. Tight calcareous streaks occurred over the whole section. Oil was interpreted from 1570.5 m down to 1581.0 m, where an abrupt drop in resistivity was interpreted as the oil/water contact. The contact was somewhat obscured however by a change in lithology from clean, but rather tight, sandstone to micaceous sandstone. No movable oil was calculated below this depth, but shows (fluorescence and cut) was observed on sidewall cores down to 1608 m.

Ten cores were cut in the Late Jurassic Sognefjord reservoir section. From a total of 89.5 m in the intervals 1366 - 1424 m and 1427 - 1458.5 m 86.7 m core (97%) was recovered. All cores were taken using fibreglass sleeve techniques to achieve better recovery in the poorly consolidated sands. Two gas samples were recovered from the uppermost reservoir section during RFT run 1. Recovery of an oil sample during RFT run 2 failed because of plugging by chalk particles in the mud cake. During a separate run with a modified "long nose" RFT probe an oil sample from the thin oil column at 1576 m was obtained.

The well was permanently abandoned on 9 September 1983 as an oil and gas appraisal well.

TESTING

Two intervals in the clean sands were tested. From 1428 to 1452 m the well bore was underreamed to 16 inch and completed with an external gravel pack (E6P). This test (PT1) produced 563700 Sm3 gas/day through a 17.5" choke. A second test (PT-2) used an internal gravel pack (IGP) over the interval from 1385 to 1405 m. During this test the well took a kick and had to be closed in. The production-string was cut and the well killed. After fishing out the production string a successful gravel pack test was performed. This test produced 684100 Sm3 gas/day through a 17.5" choke. The gas produced in the tests was dry (gas gravity = 0.61) with a gas/condensate ratio of 35622 Sm3/Sm3. The condensate produced had a gravity of 51 degAPI. The gas contained 1.5% N2, 0.6% C02 and 0.05 ppm H2S. The maximum down-hole temperatures measured in the two tests were 62.8 and 61.7 deg C in PT1 and PT2, respectively.

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 31/2-12