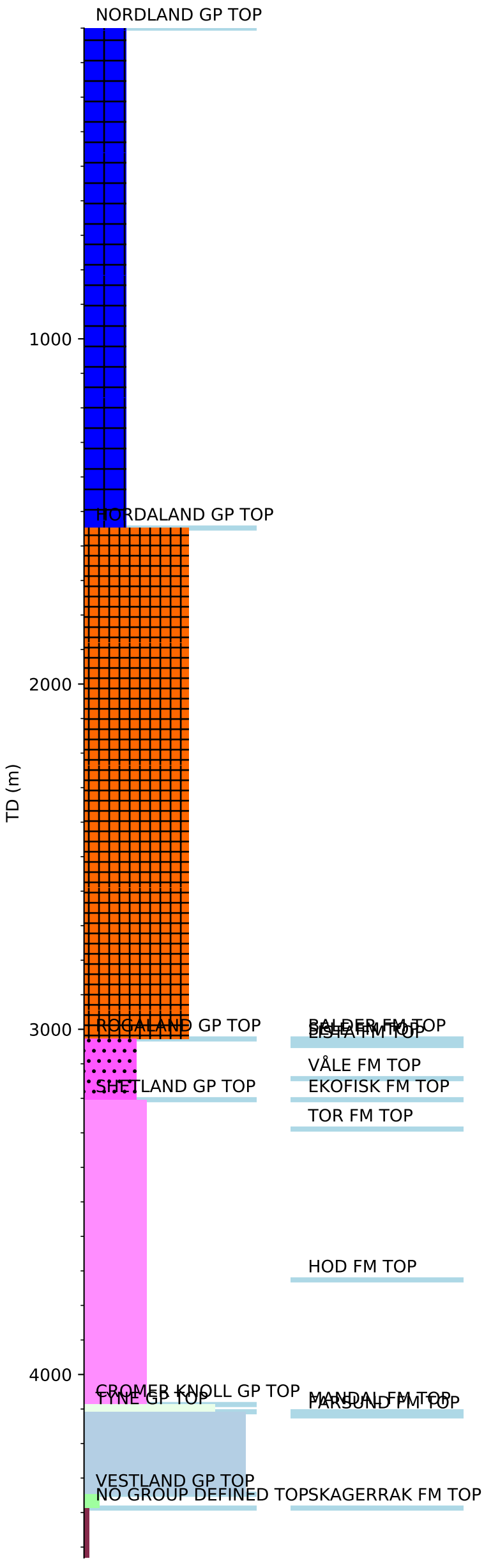

Wellbore History

GENERAL

Wildcat well 2/5-7 is located ca 9 km North of the Tor Field in the southern Norwegian North Sea. The primary objective was to test Late Jurassic and Middle Jurassic/Triassic sandstones on top of a gentle salt-induced dome structure. Secondary objectives were Late Cretaceous chalk and Paleocene sandstones.

OPERATIONS AND RESULTS

Well was spudded with the jack-up installation Neddrill Trigon on 11 August 1983 and drilled to TD at 4531 m in the Triassic Skagerrak Formation. During drilling of the 17 1/2" hole several tight spots and problems with cavings were experienced. While tripping out of the hole at 3956 m, the drill string parted and 193 m of the bottom hole assembly was left in the hole. The fish was recovered after some problems due to tight hole conditions. When pressure testing the 9 5/8" casing the float collar sheared out causing the casing to jump. After re-landing, the casing was found to have dropped a couple of inches. Repair of the casing took 35 days extra rig time. A drilling break occurred at 4161 m where a 1.5 m thick marl was encountered. Maximum gas reading at bottoms-up was 30 %, and slight oil shows were observed in the mud. A kick was taken at 4519 m with an influx of 2.5 m3 water. The well was drilled with seawater and gel down to 862 m, with KCl/polymer mud from 862 m to 2254 m, with lignosulphonate mud from 2254 m to 3529 m, and with gel/lignosulphonate mud from 3529 m to TD.

Only traces of sandstone were encountered in the Late Paleocene, and there were no indications of hydrocarbons. Porous chalk was encountered in the Ekofisk Formation at 3204 m and in the Tor Formation at 3289 m. Both formations tested oil, but the oil flow in the Ekofisk test was interpreted to originate from the Tor Formation (see below). The matrix permeability in these zones is low, but the results from the production tests indicated that fracture permeability is significant. No hydrocarbons were found in the Late Jurassic Ula Formation. The silty/sandy interval in the Ula Formation is thin and of poor reservoir quality. A total of 144 m of Triassic sediments with two sandy intervals of reasonable porosity was penetrated. However, the sands were water bearing. Five cores were cut in the Late Cretaceous sequence. Core no 4 recovered only 7 cm due to junk in the 12 1/4" hole. A segregated RFT sample was taken at 3321 m. It recovered only mud and mud filtrate.

The well was permanently abandoned on 24 February 1984 as an oil discovery.

TESTING

After the well was plugged back to 3501 m three production tests were carried out: PT-1 at 3300 - 3335 m in the Tor Formation, PT-2 at 3263 - 3287 m in the Ekofisk Formation, and PT-3 at 3210 - 3225 m in the Ekofisk Formation.

The Maastrichtian interval had extremely low oil saturation as evidenced by petrophysical data. Oil shows had been detected while drilling this section and the core samples showed oil in the fracture/fissure system. RFT pressure data indicated an oil gradient over the producing zone. The PT-1 produced after acidization 120 Sm3 oil and 189 m3 water /day (water cut = 61%) on a 20/64" bean at a FTHP = 780 psig. The GOR was 27 Sm3/Sm3, the oil gravity was 42 deg API, and the separator gas gravity was 0.83 (air = 1). The gas contained no H2S and 3.5% CO2. The test results suggested an average permeability of some 3 mD, which was an order of magnitude higher than the core measured values and thus indicated a significant flow contribution from a fracture/fissure system.

PT-2 produced after acidization 121 Sm3 oil and 146 m3 water (water cut = 56%) on a 36/64" choke at FTHP = 295 psig. The GOR was 48 Sm3/Sm3, the oil gravity was 41 deg API, and the gas gravity varied between 0.96 and 1.02 (air =1). The gas contained no H2S and 5% CO2. PT-2 was interpreted to have flown from the underlying Maastrichtian after acid fracturing had established communication.

PT-3 showed an essentially tight and only water-bearing formation. Accurate temperature measurements in this test gave a mid-perforation temperature of 124.5 deg C.

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 2/5-7