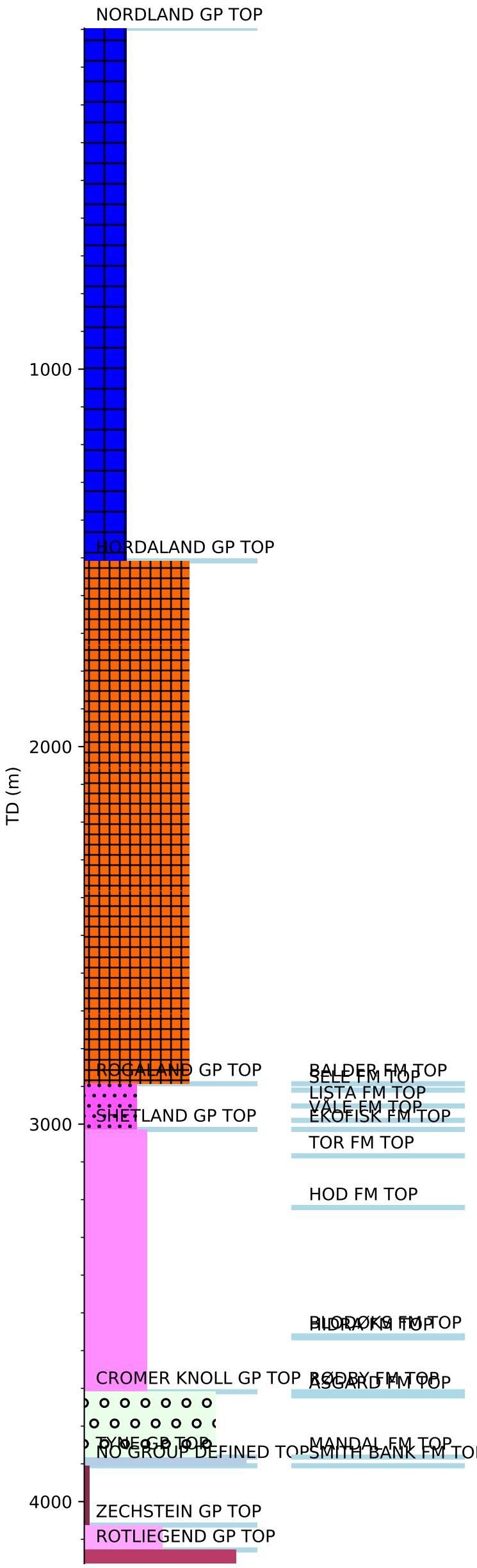
Groups

Formation Tops



Wellbore History

GENERAL

Well 2/10-2 is located in the western area of block 2/10 in PL163, in an inverted half graben structure at the Grensen Spur. The block, being the southernmost in the Norwegian North Sea sector, borders both the UK and Danish sector lines, and held only one previously drilled exploration well at the time of drilling

The main objective of the well was to test the hydrocarbon potential of Late Jurassic sandstones, prospect-A, a combined structural and stratigraphic trap located in the hanging wall of a half graben structure. The well should also test the prospectivity of the Shetland Group, which held oil in the Tor Formation in well 2/7-2; the reservoir potential of the Cromer Knoll Group in stratigraphic closures formed by pinch outs against Base Cretaceous Unconformity; and possible hydrocarbon potential of the pre-Triassic/Rotliegendes Group.

OPERATIONS AND RESULTS

Exploration well 2/10-2 was spudded with the semi-submersible installation "Treasure Saga" on 16 February and drilled to TD at 4164 m in rocks of undefined age. The well was drilled with spud mud down to 1169 m, with KCl mud from 1169 m to 3681 m, and with "HI TEMP" polymer mud from 3681 m to TD. The Tor and Hod limestones slowed down the penetration rate in the 12 1/4" section. Drill string vibrations and torque fluctuations were created which ruined several bits and resulted in one drill string failure.

The 8 3/8" section was surprisingly easy to drill. It was easy to achieve penetration rates of 15 m/hr, but due to geological and pressure control, the penetration rate had to be controlled through most of the section. The pore pressure increased very rapidly at top of the Mandal Formation, and the mud weight had to be adjusted accordingly. The mud weight was increased from 1.70 SG to 1.95 SG over an interval of approximately 30 m. Maximum estimated bottom hole static temperature was approximately 150°C based on Horner plot.

The predicted Late Jurassic sandstone section was not present in the well position, and no hydrocarbons were encountered. The possible sandy sequences within the Lower Cretaceous, Cromer Knoll Group, were also absent.

In the Nordland and Hordaland Groups the well penetrated mainly claystones with sandstone beds.

The Rogaland Group consisted of 4 formations, the Balder, Sele, Lista and the VåÅle Formations. The top of the Balder Formation was penetrated at 2893 m and consisted of tuffaceous claystones with minor traces of sandstones and dolomites/limestones. The Top Sele Formation was reached at 2910 m and the formation comprised claystones with minor sandstones. The Top Lista Formation was penetrated at 2952 m and the VÅle Formation at 2990 m. Both formations consisted of claystones with traces of limestone lamina.

The Shetland Group consisted of the Ekofisk, Tor, Hod, Blodøks, and Hidra Formations. In the Tor Formation cores showed limestones with weak shows in the upper part, from 3085 to 3086.63 m and 70 - 80 cm zone of residual oil from 3090 to 3091 m. Also cuttings from the Tor Formation showed minor shows, otherwise there were no significant hydrocarbon indications. Average log porosity in the Tor Formation was 20%. In general the formations in the Shetland Group comprised of limestones with minor traces of cherts and marl. At 3709 m the Cromer Knoll Group was penetrated. The Cromer Knoll Group consisted of the Røby and Åsgard Formations. The formations comprised claystones with minor marl beds. No shows were seen. The top Tyne Group was reached at 3882 m and consisted of the Mandal Formation. The lithology was claystones. The Smith Bank Formation was penetrated at 3905 m and comprised claystones alternating with siltstones. There were traces of sandstones and anhydrite beds. The Zechstein Group consisted of anhydrites. An undefined formation was penetrated at 4128 m and consisted of argillaceous sandstones with an average log porosity of 10.2%.

Four cores were cut during drilling of well 2/10-2. The first core was cut in the Tor Formation from 3085.0 - 3089.0 m. The core recovery was 1.63 m (41%). The second core was also cut in the Tor Formation from 3089.0 m - 3098.18 m. The core recovery was 9.18 m (100%). The third core was cut in an undefined formation from 4151.0 m - 4154.0 m. The

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 2/10-2