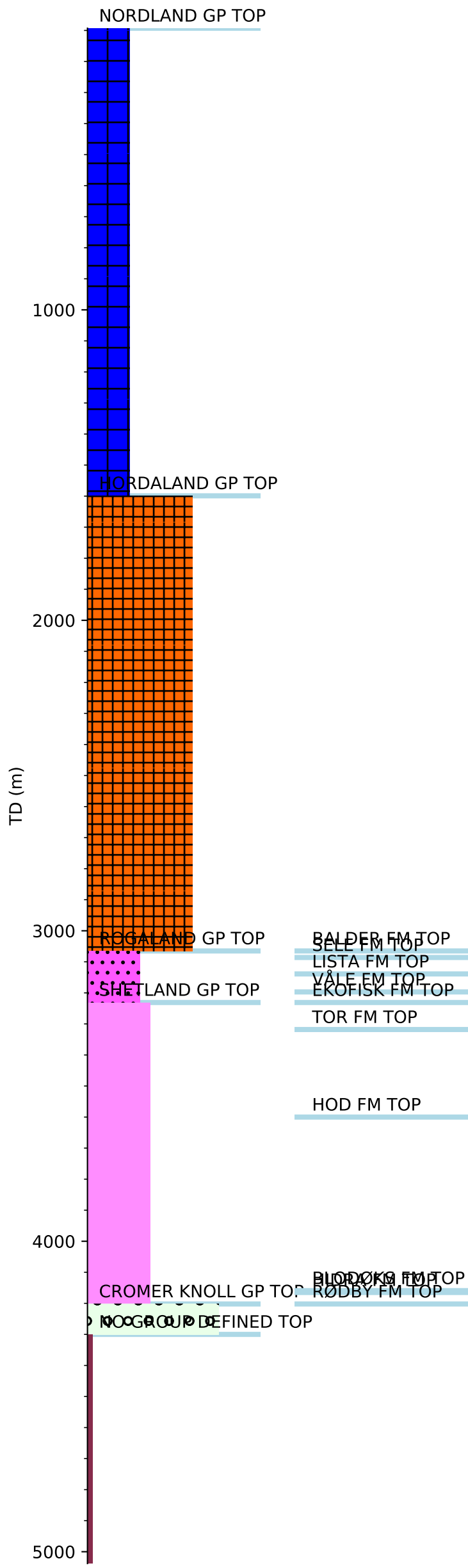
Groups

Formation Tops



Wellbore History

GENERAL

Well 2/7-21 S was drilled to appraise the "South Eldfisk structure", now known as the Embla Field, located in the Central Graben of the North Sea. It was the third well drilled on the structure, a pre-Cretaceous fault block forming the boundary between the Grensen Nose to the west and the Feda Graben to the east. The primary objective was to test the sandstones that tested oil in the 2/7-9 and 2/7-20 wells. It was anticipated that the proposed location would encounter reservoir quality sands similar in nature, thickness, and depth as in the 2/7-20 well. Closure of the structure is provided by normal down faulting to the North, South and West. Closure to the east is by the Lindesnes Ridge reverse fault. Vertical sealing is provided by the Early Cretaceous Shales. No shallow gas was expected in this area, and no major obstacles other than high formation pressure in the reservoir. If successful, the well was planned to constitute a second drainage point for future field development.

OPERATIONS AND RESULTS

Appraisal well 2/7-21 S was drilled deviated from a three-slot template located at the 2/7-20 well to a location 1020 m to the southeast. The well was spudded on the 21st June 1989 and drilled using the semi-submersible installation Ross Isle to a Total Depth of 5039 m (4706 m TVD RKB) in rhyolitic igneous rocks of probable Early Devonian age. The well was drilled without significant problems, except for MWD failures. Shallow gas was encountered at 586.7 m but caused no problems. The well was drilled without problem using SOLTEX Actaflow water based mud down to 4232 m at the base of the Cretaceous section, where 9 5/8" casing was set. The remaining 8 1/2" and 5 7/8" hole sections in the well were drilled using Invermul oil based mud.

Oil-bearing reservoir quality sands were encountered at 4313 m. No definitive oil-water contact could be seen. The section consisted of undefined lithostratigraphy of pre-Jurassic age. It could be broadly divided into ten intervals as follows:

Interval 1, 4299.5 - 4313 m, is an uncored, relatively muddy sequence of unknown affinity.

Interval 2, 4313 - 4339 m, is a partly cored, possible alluvial fan/braid plain sequence which is probably faulted at its base.

Interval 3, 4339 - 4386 m, is a sequence of fractured and brecciated, variably silty and sandy mudstones with thin sandstones. The upper part of this was cored.

Interval 4, 4386- 4453 m, is a broadly coarsening-upward sequence consisting of mudstones with thin interbedded sandstones at its base overlain by more abundant and thicker, cleaner sandstones towards the top. This interval is uncored.

Interval 5, 4453 - 4540 m, is an interval of conglomerates and pebbly sandstones locally interbedded with finer grained sandstones and mudstones. The upper part of this interval was cored.

Interval 6, 4540 - 4577 m, consists of interbedded sandstones and basic igneous rocks, which are either extrusive or shallow intrusive in nature. Only the lower part of this interval was cored.

Interval 7, 4577 - 4638 m, is a broadly coarsening-upward sequence of which only the uppermost part was cored.

Interval 8, 4638 - 4662 m, is a partly cored interval of highly fractured and brecciated sedimentary and igneous rocks. The igneous rocks have a broadly rhyolitic nature and are similar to those which occur below 4837. It is not clear whether this represents a genuinely interstratified sequence with extrusive volcanics, whether the igneous rocks are intrusive or whether it represents a complicated fault slice.

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 2/7-21 S

Interval 9, 4662 - 4837 m, is a further, broadly coarsening-upward sequence which was cored in its upper part. The lower part of the interval is poorly defined because of non-operation of wire line logs. Argillaceous ditch cuttings yielded a Frasnian (lower Late Devonian) age, similar to the lowermost part of the sandstone sequence in Auk and Argyll fields.

Interval 10, 4837 - 5039 m (TD) a partly cored, thick sequence of