The main challenge of this well was to reduce rig time while drilling and running the casing/liner in a high pressure, high temperature formation. The well reached a depth of 4,820 meters, and Bottomhole Static Temperature (BHST) was up to 170°C. The high pressure environment and the narrow pore pressure/fracture gradient window were significant concerns. The Operator needed accurate modeling of the pressure losses, hole cleaning and surge and swab pressure predictions.

High fluid losses on a previous vertical well in the area were observed while running and circulating the production casing. These losses were caused by the combination of excessive rheological properties of the fluid and high surge pressures while running the casing and breaking circulation.

Prior to running a 273 mm (10 ¾”) intermediate casing in the 311.1 mm (12 ¼”) open hole, surge pressure simulations were conducted to identify the best balance of fluid losses versus rig time.

Surge pressures were also calculated prior to running a 193.7 mm (7 5/8”) casing in the 222.2 mm (8 ¾”) hole. The initial plan had called for 5 m/min running speed in both the casing and open hole. However, the surge pressure simulations from DFG indicated that a 10 m/min ROP would be a safe running speed for the intermediate casing to a depth of 2400 meters, followed by a reduction to 5 m/min for the open hole section from 2400 m to 3400 m. Adhering to these guidelines, the operator was able avoid significant fluid loss.
During drilling, DFG™ with DrillAhead® Hydraulics modeled ECD and hole cleaning for the 165.1 mm (6 ½") horizontal section. Fluid density was modeled at 2050 kg/m³ (17.1 ppg), and the operator stayed within the narrow pore pressure/fracture gradient window. This helped prevent fracture formations and down hole losses.

Surge pressures were again modeled prior to running the 114.3 mm (4 ½") liner in the 165.1 mm (6 ½") hole. Safe running speeds were identified as 8 m/min from the surface to 3000m and 4 m/min from 3000m to 4820m, and fluid losses were negligible when compared to a 70m³ loss previously measured on an offset well.

**ECONOMIC VALUE CREATED** – Modeling of surge pressures prior to running the 193.7 mm (7 5/8") casing provided detailed ROP simulations. These simulations gave the Operator confidence to accept Baroid’s recommendation to increase the running speed from 5 m/min to 10 m/min inside the intermediate casing. As a result, total casing running time was reduced by 6 hours. Rig time cost savings were estimated to be $18,500 (based on $75,000/day spread).