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STRATIGRAPHIC DIPMETER CURVATURE ANALYSIS (STRAT-SCAT) FOR RESERVOIR SIMULATION / CHARACTERIZATION OF NORTHWEST STEVENS (A3-A6) SANDS, ELK HILLS FIELD, CALIFORNIA

The A3-A6 reservoir at Elk Hills is composed of channelized Miocene turbidites and debris flows, folded into the doubly plunging Northwest Stevens Anticline. The reservoir was discovered in 1973; production peaked at 13MBOPD. Water injection commenced in 1983.

In 2002 a seismic stratigraphic interpretation of 3D data over Elk Hills was done and yielded a new model for reservoir simulation. It confirmed that A3-A6 sands were sourced from the southeast. TheA1-A2 sands were confirmed as western sourced. and a continuation of the 24Z sands. A major unconformity separates the A1-A2 from theA3-A6.

Well confirmation of these gross directions of transport and much more detailed sand transport direction maps were done with STRAT–SCAT. This technique required calculation of the structural dip with SCAT, and subtracting this vector from the raw dipmeter data. This produced the pre-deformation, original stratigraphic dip. Integrating a map showing these azimuths of stratigraphic dip with sand isopachs yielded a flowline map. Comparison with petrophysically derived permeability maps indicates that the permeability, as expected, follows the direction of sand transport and the flowlines.

A reservoir flow model was constructed incorporating the flowline maps. Model inputs included interpretations from Geology, Geophysics, Petrophysics, and Reservoir Engineering. The model was built using Petrel software to construct an integrated 3D geologic model and then exported to the Eclipse black oil simulator.

Following construction of the model, the history matching phase was completed with a good match. Using water cut as the primary matching parameter, the overall field match was excellent with roughly 85% of all wells having a good or acceptable match. Flow simulation with the new geologic model revealed some potential, which included banked oil along a fault and unswept oil in tight areas. The reservoir model will also be used to further our geologic understanding for characterization and surveillance.