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Reservoir Quality Determined from High-Resolution Images in OBM of Channel and Highly Laminated Sands

Cost-effective downlogging acquisition with Quanta Geo service obtains borehole images and dip in a 12¼-in wellbore, North West Shelf, Australia

CHALLENGE

Efficiently assess reservoir quality and determine the depositional environment of the Mungaroo Formation in the North West Shelf through texture, fabric, and sedimentological analyses.

SOLUTION

Acquire high-resolution borehole images in oil-base mud (OBM) by using Quanta Geo* photorealistic reservoir geology service with visualization and interpretation in the Techlog* wellbore software program.

RESULTS

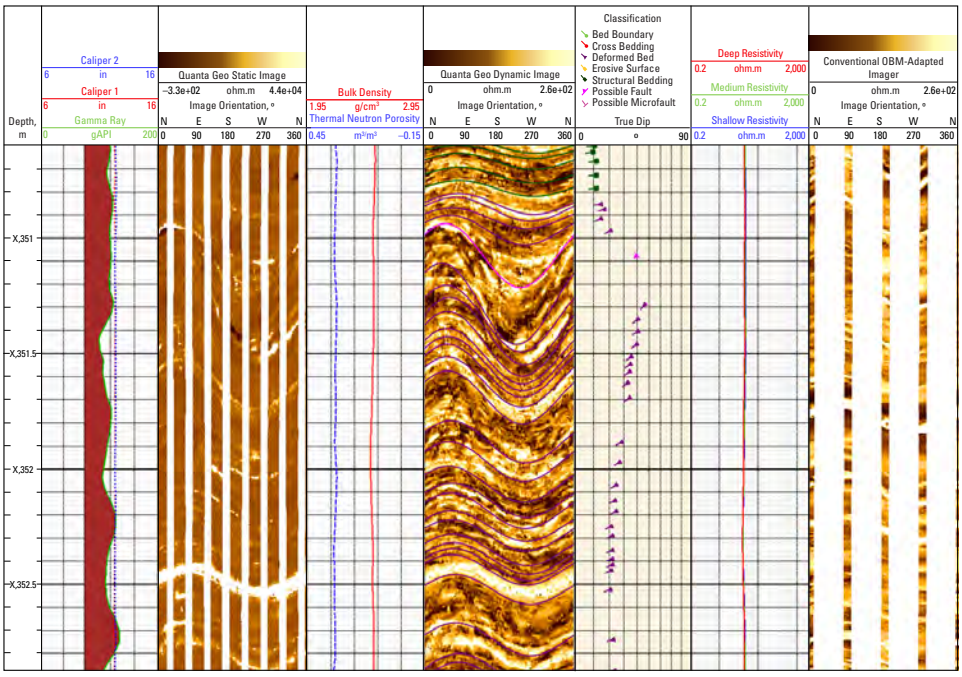
Conducted a cost-effective, detailed geological interpretation of key sedimentary and structural features identified along a 2,000-m interval to support formation evaluation of the targeted reservoirs and bounding beds.

Unknown reservoir quality

An operator in the North West Shelf offshore Australia needed to assess the potential economic value and reservoir quality of the Upper Mungaroo Formation (Cretaceous to Triassic), including determination of the depositional environment, reservoir presence, connectivity of nonchannel facies, and structural features. Cutting conventional core would be a lengthy and expensive operation whereas sidewall coring would provide only scattered data. Full-coverage borehole images were the most efficient approach, but the well was drilled with OBM and a large bit size. Both of these conditions would severely limit the imaging capability of conventional OBM-adapted imagers.

High-resolution imaging in oil-base mud

Quanta Geo photorealistic reservoir geology service uses completely new physics enabled by a new electronic and mechanical design to deliver superb resolution and nearly complete coverage in 8-in boreholes. The resulting microresistivity images are a true visual representation of the formation geology. Image interpretation is optimized by customized apps and workflows in the Techlog wellbore software platform, making it possible for geologists to readily perform tasks such as distinguishing channels and measuring their orientation. Facies can be identified and correlated with precision and confidence that were previously possible only from core.

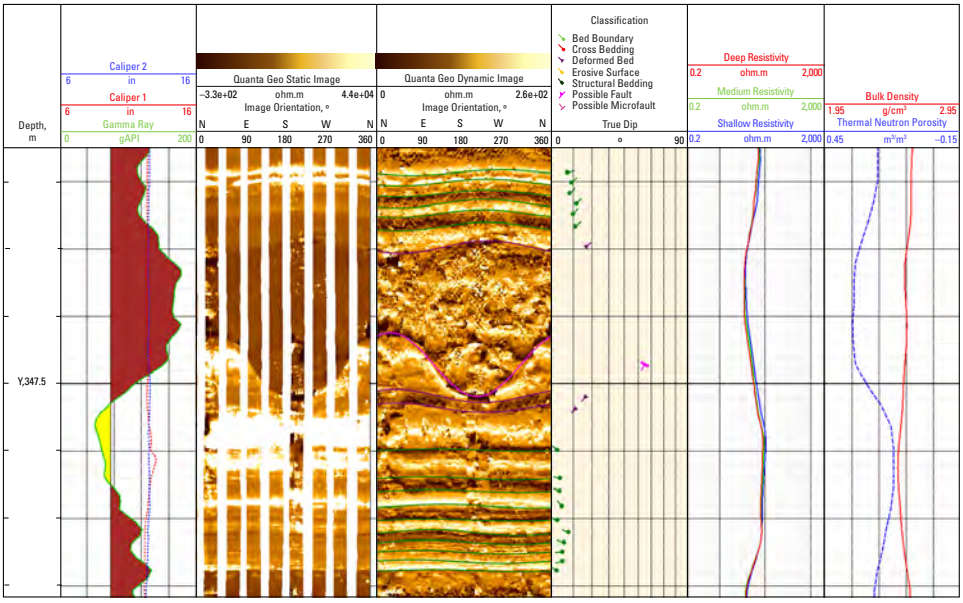


Compared with conventional OBM-adapted images in Track 7, the high-resolution images acquired by Quanta Geo service in Track 2 deliver 3 times as much coverage. The Quanta Geo service's images were processed with the Discovery 360 app in Track 4 complete the picture by realistically populating the image gaps in the 12¼-in borehole, resulting in a much clearer representation of the formation geology for accurately identifying features and their orientation from the dip data in Track 5.

Unambiguous identification of geological features and their depositional environment

Coverage in the large 12¼-in borehole by Quanta Geo service was 64%, which is more than 3 times that of conventional OBM imagers at 21% and more than sufficient to image highly dipping events such as natural fractures and faults. The eight independently applied pads all returned highly detailed images despite the challenging hole conditions. Discovery 360 multipoint statistic (MPS) progressing was run to populate the image gaps. Acquiring the images by downlogging efficiently and cost-effectively provided comprehensive information early in the logging program to save rig time and additional runs.

The continuous, high-resolution images logged by Quanta Geo service over a 2,000-m interval revealed faults, cross bedding, indications of soft sediment deformation, thickly bedded shales, and highly laminated sandstones, which enabled the operator to develop an in-depth understanding of the environment of deposition and determine reservoir quality.



Processing with the Techlog wellbore software platform flagged this distinctively imaged fault zone, which exhibits chaotic texture and nonplanar features. The beds above and below the fault dip in opposite directions.

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