Apache Maximizes Reservoir Contact by Landing Four Wells on Target in Australia

Real-time mapping service eliminates need for pilot holes and associated costs, risks

**CHALLENGE**
- Position well in complex reservoir 10-ft [3-m] TVD above reservoir top without drilling pilot holes.
- Determine reservoir thickness, fluid contacts, and formation properties for best development strategy.

**SOLUTION**
Reduce geological uncertainty in real time while landing using the deep resistivity measurements provided by the GeoSphere* reservoir mapping-while-drilling service.

**RESULTS**
- Mapped top of reservoir 33 ft [10 m] deeper than expected, leading to an optimized drilling trajectory to the landing point.
- Drilled well without pilot holes, eliminating associated risks and costs.
- Determined structure of reservoir top, dip, and base at distances reaching 82 ft [25 m] beyond wellbore.

**Map reservoir thickness, determine structural dips while landing well**

Apache set a goal of placing a well 10-ft [3-m] TVD above a reservoir sand body in Australia without intersecting it due to geomechanical issues associated with overexposure of the overburden. A secondary objective was to map the reservoir thickness and determine structural dips to make further decisions about planning the horizontal development section.

The challenges associated with drilling within these reservoir sands included a seismic uncertainty of ±66-ft [±20-m] TVD, a lack of geological markers in the overburden, an unconformity running through the area, and limited nearby offset wells from which to obtain comparison data.

**Identify subsurface boundaries to maximize reservoir contact**

Apache opted to avoid the risk and cost associated with drilling pilot holes and instead use the GeoSphere reservoir mapping-while-drilling service to aid in decision making during landing. Using deep, directional electromagnetic measurements, the GeoSphere service significantly reduces geological uncertainties and mitigates risks associated with entering the reservoir. With a depth of investigation exceeding 100 ft [30m], the service maps a reservoir’s position, geometry, and fluid contacts. This information enables operators to make prompt trajectory adjustments to optimize the landing and steering of the wellbore within the reservoir.

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![GeoSphere map](image)

*This real-time map from the GeoSphere service shows the detection of the top of the reservoir at 52-ft [16-m] TVD and the base of the reservoir at 82-ft [25-m] TVD below the well path.*
**CASE STUDY:** Apache lands four wells in Australia without drilling pilot holes, maximizing reservoir exposure

**Landed well in sweet spot, eliminated pilot holes**
The GeoSphere service mapped the reservoir, including its top, base, and dip at distances up to 82-ft [25-m] TVD below the well path in real time. It also detected the top of the reservoir 33-ft [10-m] TVD deeper than expected. As a result, Apache maintained the trajectory before geostopping the section 10-ft [3-m] TVD above the reservoir top.

Eliminating pilot holes reduced drilling costs and managed risks while also achieving Apache’s goals and objectives in this complex geological environment. The subsurface information recorded by the service during the four landing operations will be used by Apache for further field development.