

# LWD Solution Integrates High-Definition Dual-Physics Imager to Evaluate Low-Resistivity Pay

Combining TerraSphere and EcoScope services accelerates interpretation of laminated channel sand reservoir, Gulf of Mexico

**Integrated high-quality borehole images and petrophysical suite enabled successful and timely low-resistivity pay evaluation in a challenging oil-based mud (OBM) and while-drilling environment.**

## The operator's goal

Renaissance Offshore LLC needed to quickly perform a formation evaluation, identify the oil/water contact (OWC), and optimize the completion interval while drilling development wells in the Gulf of Mexico in an oil-based environment.

## What was tried first

Previous drilling of development wells showed that borehole instability limited the time window for keeping the hole open in a thinly laminated reservoir with low resistivity contrast. Speedy decisions dramatically increased the success of wells.

However, conventional triple-combo logs were not sufficient to accurately evaluate hydrocarbons in place and potential free fluid.

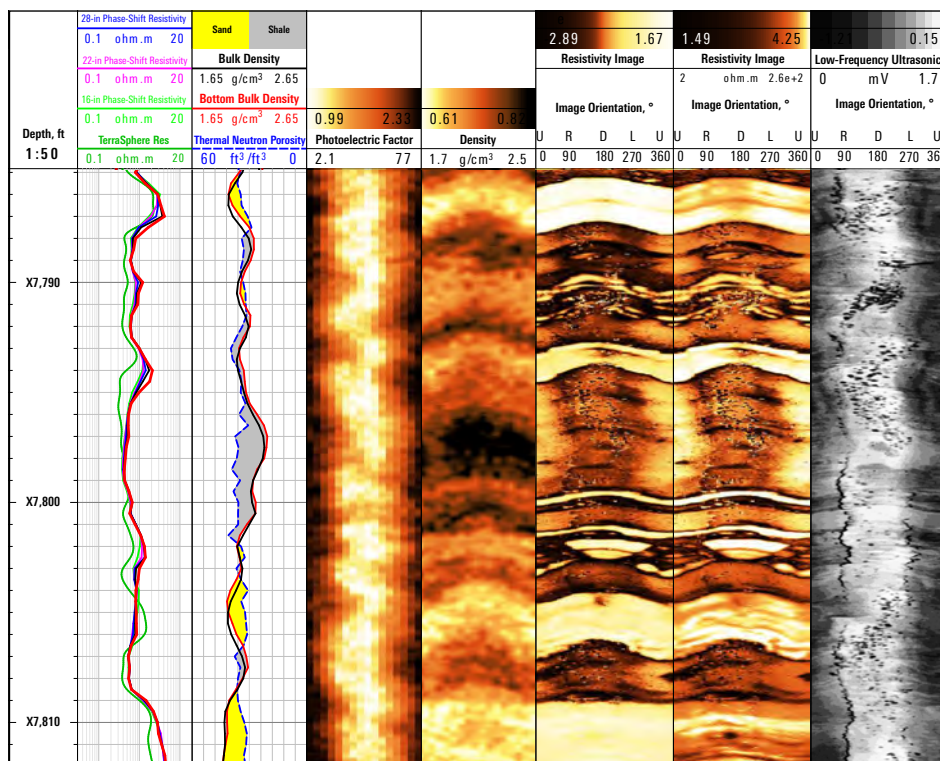
## What Schlumberger recommended

Schlumberger recommended using both TerraSphere\* high-definition dual-imaging-while-drilling service and EcoScope\* multifunction logging-while-drilling service† for a comprehensive logging suite in a deviated well to be drilled with OBM. This would enable real-time transmission of LWD triple-combo logs, spectroscopy, sigma, and resistivity images to identify reservoir sand intervals for making informed drilling decisions. It would also provide quick interpretation turnaround on the recorded-mode images to fully evaluate the reservoir structure, texture, fluid in place, and OWC for the completion design.

## What was achieved

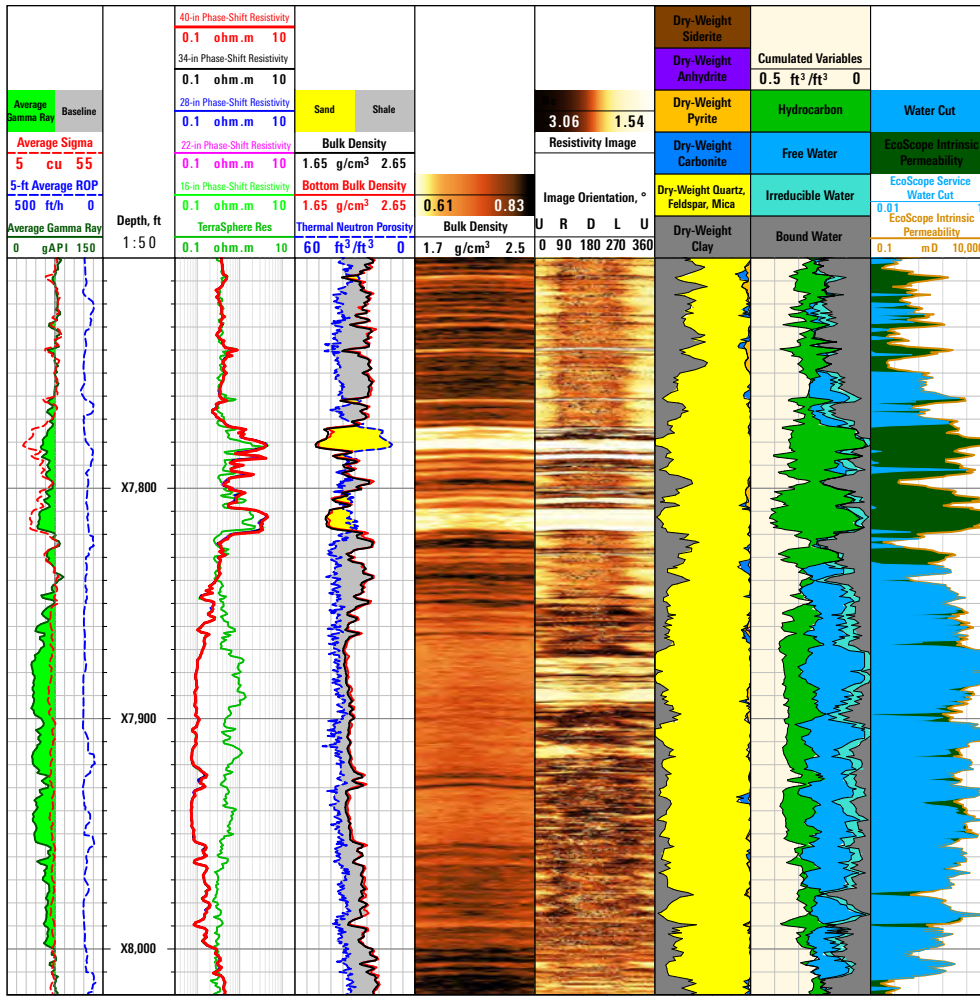
Geological interpretation and petrophysical evaluation of the lithofacies enabled understanding the reservoir architecture and its potential producibility. High-definition ultrasonic and resistivity recorded-mode image data helped define the geological structure, sand lamination, and sand texture—rather than the expected thin-bedded shaly sand.

Real-time logs confirmed the conventional hydrocarbon sands interval. Electromagnetic sensors of the TerraSphere service confirmed the OWC in the low-contrast laminated sand. Water saturation was used as the primary fluid volume estimation. And measurement from EcoScope service enabled the analysis of movable fluid in the formation in the drilling pass. Then the recorded-mode LWD logs were quickly interpreted and tailored to highlight completion intervals. Renaissance Offshore was pleased with how the combined solution quickly enabled optimization of the completion interval.



*Sedimentary and structural features are clearly observed on TerraSphere service image Tracks 5, 6, and 7, and a wealth of geological information is available. This reaffirms that detailed sedimentological and structural interpretation is best done on resistivity images shown in Tracks 6 and 7, while the ultrasonic image in Track 8 is helpful to evaluate potential irreducible water bounded by the sand interface with silt from low-energy deposition.*

# Case study: TerraSphere and EcoScope services accelerate pay evaluation



Anticorrelation of TerraSphere service's shallow apparent-resistivity with deep-resistivity from EcoScope service at X7,840 ft (Track 2, green and red curves, respectively) suggests that the movable water was replaced by oil filtrate. In shale and hydrocarbon-filled intervals, the resistivity curves correlate.

\*Mark of Schlumberger.  
 Other company, product, and service names are the properties of their respective owners.  
 † Japan Oil, Gas and Metals National Corporation (JOGMEC), formerly Japan National Oil Corporation (JNOC), and Schlumberger collaborated on a research project to develop LWD technology that reduces the need for traditional chemical sources. Designed around the pulsed neutron generator (PNG), EcoScope service uses technology that resulted from this collaboration. The PNG and the comprehensive suite of measurements in a single collar are key components of the EcoScope service that deliver game-changing LWD technology.  
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