

# HDD™ Open Hole Logging Eliminates Need For Core Sample

## Case Study: HDD™ Open Hole Logging in Thin Laminated Heterogeneous Formation

### Challenge:

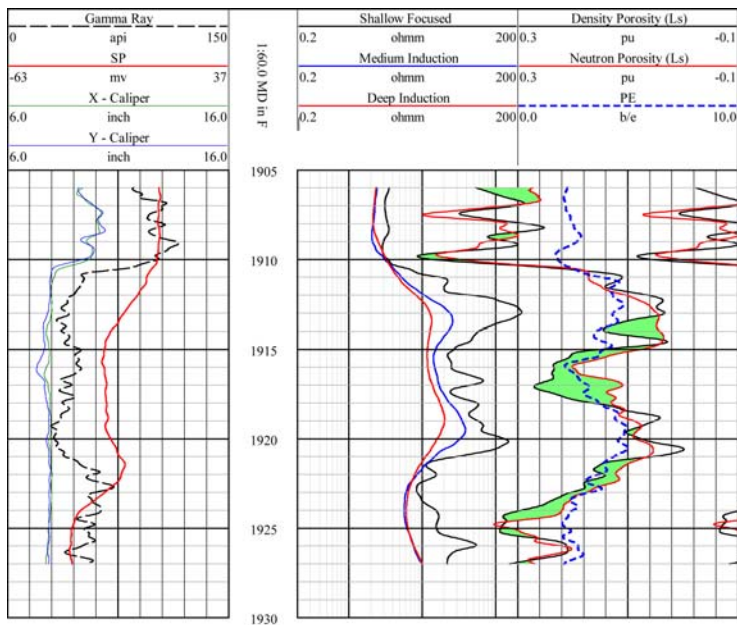
A South Texas customer wished to analyze a heterogeneous formation without taking cores. The well was in a region that often has non-carbonate laminations plunged between carbonate formations. The conventional method to accurately identify this uniqueness has been to core while drilling, or to take side-wall core samples while Open Hole logging. The customer had previous experience with high resolution sample rate Open Hole Logging of 10spf. The results however, did not produce the necessary log-data-to-core correlation that would allow for elimination of core sampling.

### Solution:

The client selected RECON's industry leading HDD™ 40 spf Open Hole logging technology to log this well. With a ten times greater data resolution than industry standard, HDD™ provides a level of "mathematical certainty" that is not achievable with high resolution logs at 10 spf.

### HDD™ Data (40 spf on 20 inch Log Presentation)

Depth: 1910 ft – 1924 ft



### Results:

RECON's HDD™ technology delivered the results needed for accurate formation evaluation and completions strategy development.

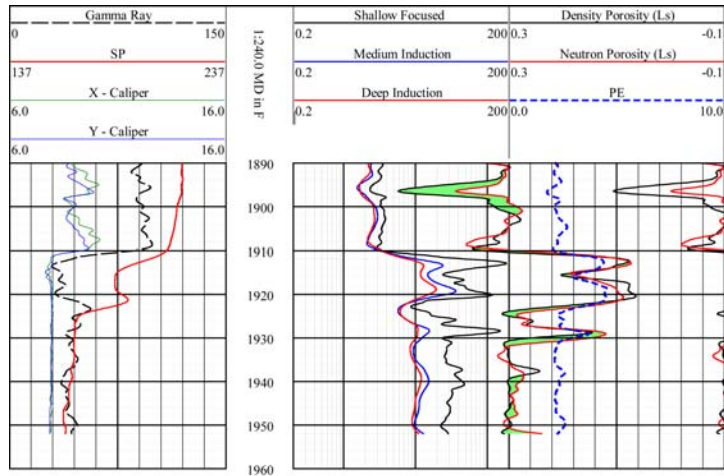
The customer realized over \$50,000 in savings. Down hole core sampling was not required.

The data was not only useful qualitatively in visually identifying the separate bedding, but also quantitatively, in making petrophysical calculations of the sand(target) with the Resistivity, GR, Density and Neutron data.

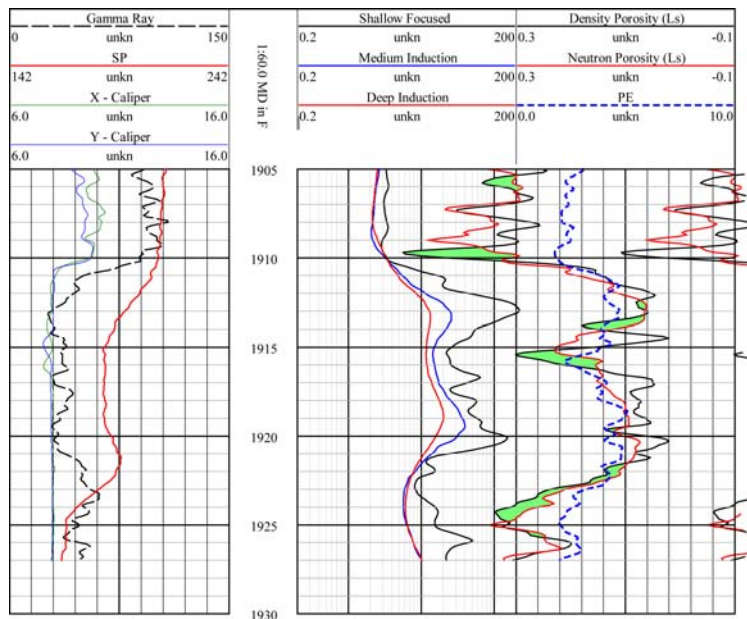
## Case History Data:

A section of the heterogeneous formation bed is seen below, first on standard resolution equivalent to 4 spf (5 inch vertical scale) and secondly, with RECON's Main Pass logging at 10 spf expanded to 20 inch vertical scale.

**Depth: 1910 ft – 1924 ft** (5 inch/100ft vertical scale)



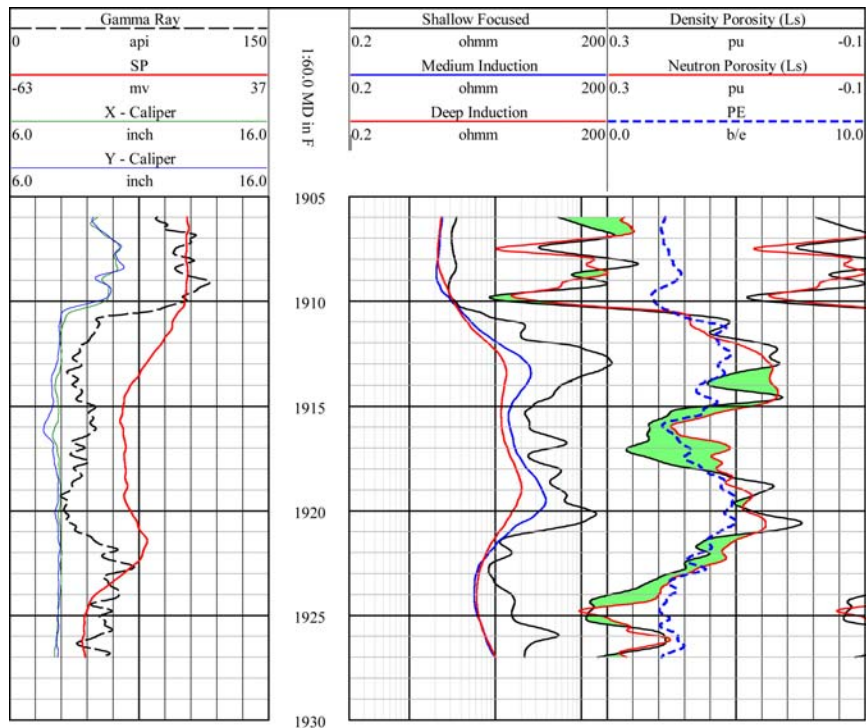
**Depths: 1910 ft – 1924 ft** (10 spf on 20 inch/100 ft vertical scale)



The log data taken at equivalent 4 samples/ft does not provide enough data for conclusive evaluation of the lamination between the limestone within the formation. RECON's standard Main Pass resolution of 10 samples/ft resolved on the expanded scale of 20 inch vertical scale for comparison purposes, does offer a slightly better resolution. It is still difficult however, to analyze the heterogeneity within the zone. This appears geologically to be a single carbonate formation, with a non-carbonate laminate bed plunged in between. In this particular field, there are numerous sections containing this type of heterogeneous formation. To properly evaluate, the client would essentially have to take an actual core of the rock, adding to risks and well costs.

## Solution: HDD™ Data (40 spf on 20 inch Log Presentation)

Depth: 1910 ft – 1924 ft



The HDD™ data taken at 40 spf over the same zone produced results that show, with a high level of certainty, that this zone is limestone with sand bedded in the middle. The Pe reads 5 on top and bottom, indicating a lithology of Limestone, with approximately 2 ft of sand where the Pe reads close to 2 in the middle (this sandstone is the production target). Additionally, with the HDD™ 40 spf data resolution, the client could calculate with higher confidence the Density Porosity and Neutron Porosity over the sand. The other data sets taken at equivalent 4 spf as well as the 10 spf present some difficulty in resolving the difference in the two porosity curves.

### Conclusion:

RECON's HDD™ technology helped this client achieve better results through more accurate formation evaluation. In this particular case, by running the HDD™ the client could eliminate down hole core sampling, thereby saving \$50,000. The HDD™ data was more than adequate, providing the client with the information needed to make the best decisions. The data was useful qualitatively in visually identifying the separate bedding; but also quantitatively, enabling the client to make some petrophysical calculations of the sand (target of production) with the Resistivity, GR, Density and Neutron data.

The HDD™ technology can be applied to other facets of formation evaluation such as natural vertical and horizontal fractures, laminate sand and shale sequential deposition, as well as many others.

### Presenter:

This Case Study was both researched and published through the efforts of Andrew Nguyen, a Professional Petroleum Engineer with RECON's Mansfield Texas Open Hole Logging base of operations.