

## Reduced Rig Time and Cost Savings Realized With RECON Open-Hole Logging Services

With rig rental costs rising and the attempts to minimize costs, the need for fast, efficient and accurate log acquisition is becoming more prevalent. Logging services are faced with the task of minimizing impact to rig time and cost of logging programs, thereby increasing the overall efficiency and economics of the drilling and completion process.

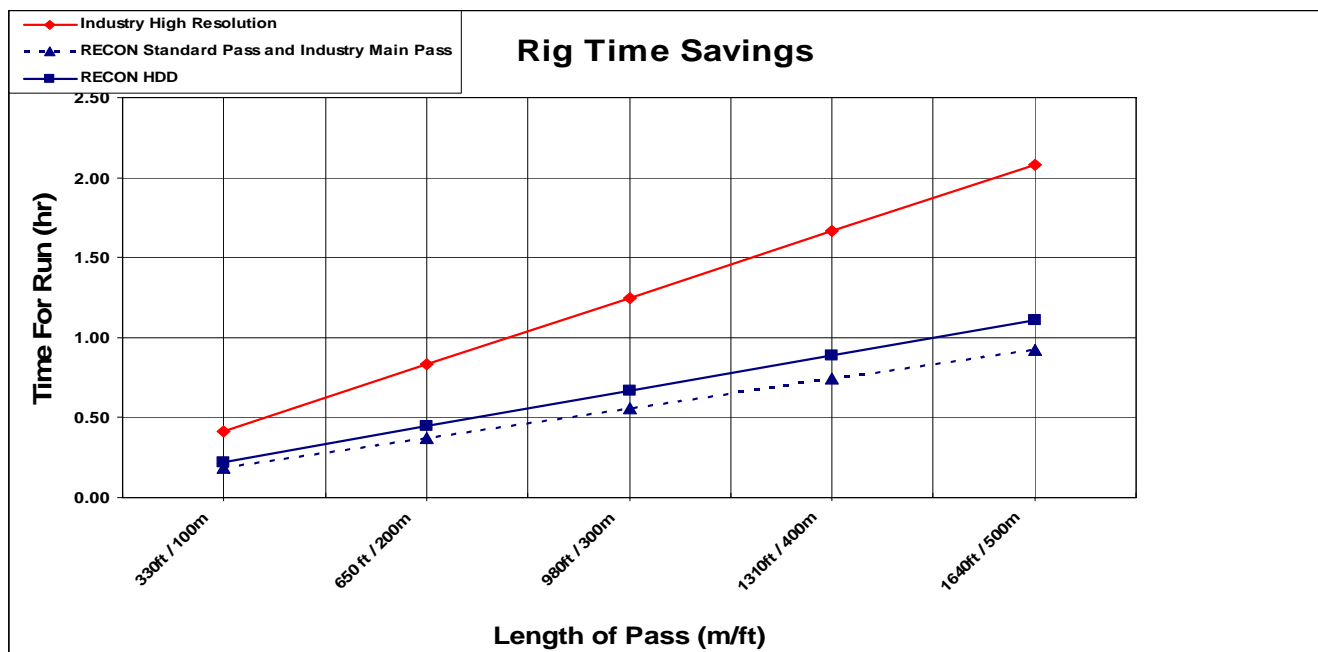
RECON HDD™ samples at 40 samples per foot (132 samples per meter), which is nearly four times greater than industry's standard 9-12 samples per foot (28-40 samples per meter) for high resolution logs, and sixteen times more than industry standard 2-3 samples per foot (8-10 samples per meter) for main pass logs. RECON Standard non-HDD™ main pass logging resolution is 10 samples per foot (33 samples per meter), equivalent to the industry standard for high resolution logs.

Typical logging speed for industry standard main pass resolution logs is 1,800 feet per hour (9 meters per minute). RECON Standard pass logs, which are the equivalent of industry standard high resolution logs, are run at 1,800 feet per hour (9 meters per minute) Industry high resolution logs are run at ~800 feet per hour (4 to 5 meters per minute). In comparison, RECON HDD™ logs are run at ~1,500 feet per hour (~7 1/2 meters per minute). These advantages mean more data for the same/less amount of rig time, equating to better reservoir understanding and operational cost savings. The speeds presented throughout this paper are averages and can vary between service companies based on; tools being run, portion of hole being logged (zone of interest, up-hole / non-interest zone), and hole conditions (variability likely seen in main pass / Standard logging passes). Generally high resolution and HDD™ are run through zones of interest and speeds are kept constant as the data is required to have a high degree of statistical repeatability.

Industry established main pass logging speeds are a function of safety, communication efficiency, hole conditions and measurement statistics. Logging speeds are by no means the same for each type of logging tool; the speed of the slowest logging tool in the stack determines the overall logging speed. Safety concerns are logging cable tensions and the risk of damage to pad-type logging tools. Communication efficiencies relate to the amount and type of data being transmitted up-hole and the surface computers' ability to strip signal efficiently without losing data. Hole conditions, chiefly rough or rugose boreholes, can affect certain types of log data quality including pad-type measurements and sonic data; baseline 'chattering' may be seen when sonic tools are logged too fast in rough boreholes. The most prevalent function of logging speed is the measurement statistics relating to the acquisition of nuclear logging data. Since natural and induced radio-active phenomena are statistically random by nature, adequate count data must be obtained to ensure measurement precision and repeatability. RECON realizes that it is not always required to log an entire well at high resolution quality data, however particular zones of interest may benefit from this type of data set. In order to quantify savings for logging passes over intervals of interest we have broken down the cost savings into 330ft (100m), 650ft (200m), 980ft (300m), 1310ft (400m) and 1640ft (500m) intervals. If high resolution data is required or would be of interest over a particular zone, incurred cost savings by using RECON open hole logging services can be realized and quantified.

Length Of Pass (ft / m)	"Time in Hole" (hr)			
	Industry Main (1800 ft/hr) (9 m/min)	Industry High Res (780 ft/hr) (4 m/min)	RECON Main (1800 ft/hr) (9 m/min)	HDD™ (1500 ft/hr) (7 1/2 m/min)
330ft / 100m	0.19	0.42	0.19	0.22
650 ft / 200m	0.37	0.83	0.37	0.44
980ft / 300m	0.56	1.25	0.56	0.67
1310ft / 400m	0.74	1.67	0.74	0.89
1640ft / 500m	0.93	2.08	0.93	1.11

**Table 6.** Estimated "Time in Hole" for Enhanced Resolution Logging services.



**Figure 4.** Rig time used for each length of pass obtaining Enhanced Resolution Data.

Length Of Pass (ft / m)	Average Rig Cost Per Length of Pass (\$1500 Per Hour Rig + Rental Costs)			
	Industry Main (2-3 samples/ft) (8-10 samples/m)	Industry High Res (12 samples/ft) (40 samples/m)	RECON Main (10 samples/ft) (33 samples/m)	HDD™ (40 samples/ft) (132 samples/m)
330ft / 100m	\$278	\$625	\$278	\$333
650 ft / 200m	\$556	\$1,250	\$556	\$667
980ft / 300m	\$833	\$1,875	\$833	\$1,000
1310ft / 400m	\$1,111	\$2,500	\$1,111	\$1,333
1640ft / 500m	\$1,389	\$3,125	\$1,389	\$1,667

**Table 7.** Estimated incurred cost of rig time used for Enhanced Resolution Logging services.

Length Of Pass (ft / m)	Rig Time Cost Savings (Including Rentals and Standby Equipment)		
	Industry Main vs RECON Standard	Industry High Resolution vs RECON Standard	Industry High Resolution vs RECON HDD™
	2-3 samples/ft, 8-10 samples/m (Industry Main) vs 10 samples/ft, 33 samples/m (RECON Standard)	12 samples/ft, 40 samples/m (Industry) vs 10 samples/ft, 33 samples/meter (RECON Standard)	<b>Unmatched 40 samples/ft, 132 samples/m</b>
330ft / 100m	Equal Cost With Superior Data	\$347	\$292
650 ft / 200m	Equal Cost With Superior Data	\$694	\$583
980ft / 300m	Equal Cost With Superior Data	\$1,042	\$875
1310ft / 400m	Equal Cost With Superior Data	\$1,389	\$1,167
1640ft / 500m	Equal Cost With Superior Data	\$1,736	\$1,458

**Table 8.** Cost savings when acquiring RECON Standard and HDD™ data vs. industry high resolution for selected interval lengths.

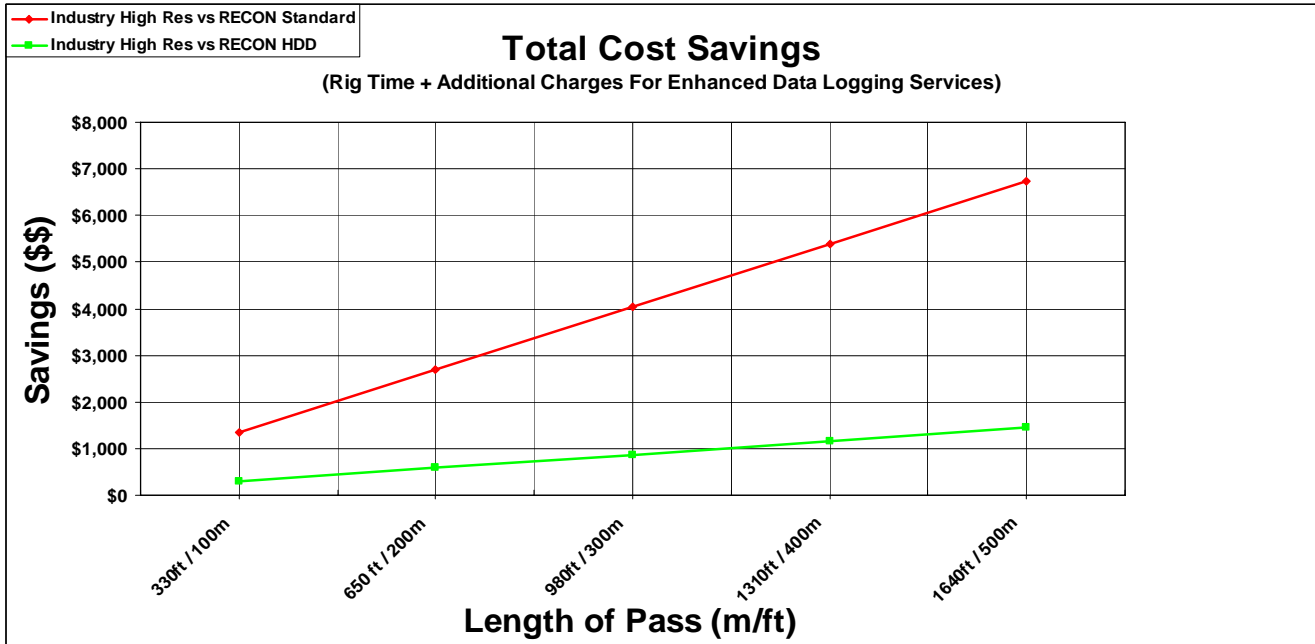
Length Of Pass (ft / m)	Average Additional Charges For Enhanced Resolution Logging Services		
	Industry High Resolution (12 samples/ft) (40 samples/m) \$3.00 /ft (\$10.00 /m)*	RECON Standard (10 samples/ft) (33 samples/m) No Charge	HDD™ (40 samples/ft) (132 samples/m) \$3.00 /ft (\$10.00 /m)*
330ft / 100m	\$1,000	\$0	\$1,000
650 ft / 200m	\$2,000	\$0	\$2,000
980ft / 300m	\$3,000	\$0	\$3,000
1310ft / 400m	\$4,000	\$0	\$4,000
1640ft / 500m	\$5,000	\$0	\$5,000

\* HDD™ and High Resolution cost based on known published book price, subject to discount

**Table 9.** Cost incurred by running high resolution data logs, and HDD™ logs over intervals of interest. RECON Standard data acquisition of 10 samples/ft (33 samples/m) shows a marked savings over industry high resolution data acquisition.

Length Of Pass (ft / m)	Rig Time and Logging Services Cost Savings		
	Industry Main vs RECON Standard	Industry High Resolution vs RECON Standard	Industry High Resolution vs RECON HDD™
	2-3 samples/ft, 8-10 samples/m (Industry Main) vs 10 samples/ft, 33 samples/m (RECON Standard)	12 samples/ft, 40 samples/m (Industry) vs 10 samples/ft, 33 samples/meter (RECON Standard)	<b>Unmatched 40 samples/ft, 132 samples/m</b>
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**Table 10.** Resulting cost savings of using RECON Standard logging services over industry high resolution logs. Resulting cost savings using RECON HDD™ logging services over industry high resolution logs; this service provides Operators with 4x more reservoir resolution with a significant savings in rig time costs incurred.



**Figure 5.** Marked increase in costs savings “All In” using RECON Standard pass and RECON HDD™ pass over industry high resolution data acquisition for selected intervals lengths.

RECON strives to obtain the most accurate data at the industry’s highest standard sampling rate (10 samples/ft, 33 samples/m), all the while having the lowest impact to Operator rig time and logging program costs. RECON is also the industry’s only true provider of HDD™ (40 samples/ft, 132 samples/m) which offers unmatched reservoir characterization with substantially less economic impact than industry standard high resolution logging (12 samples/ft, 40 samples/m). When it comes to fast, accurate and superior well log data, RECON Petrotechnologies is the clear leader.

**Written By:**

Jarett Gough, P.Geol. – Corporate Development Manager, **RECON**

**Contributions:**

James Ablett – Technical and Training Manager, **RECON**

For more information regarding RECON Open Hole, Cased Hole and Production Logging Services and *HDD™* logs please visit:

[www.reconpetro.com](http://www.reconpetro.com)

**RECON “The New STANDARD in Well Logging”**