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THE APPLICATION OF DETAILED RESERVOIR GEOLOGICAL STUDIES IN THE D18 FIELD, BALINGIAN PROVINCE, OFFSHORE SARAWAK

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The D18 Field is located 56 miles north-west of Bintulu in sub-block 4Q-15 of the Balingian Province, offshore Sarawak. The productive reservoirs comprise Lower Miocene age (Cycle II) lower coastal and delta plain deposits. The field is a tectonically complex structure, bounded to the south by a high angle reverse fault and is fault and dip closed to the north, west and east. The internal geometry is complicated by the presence of numerous cross cutting ENE/WSE and N/S trending faults.

The field was discovered in 1981 and following encouraging appraisal of the eastern part, an eight slot mini-production platform was installed. Five development wells were drilled and the field came on stream in 1986. The field produced at a peak rate of 5300 BOPD although a rapid production decline was observed in some of the wells. The poorer than expected results combined with the presence of several different fluid contacts and variable sand distribution raised uncertainties about the lateral extent and degree of interconnectedness of the reservoir sands.

A detailed reservoir geological study (including some 1400 ft of core and ten wells) was therefore undertaken to develop a geological model for the Cycle II sediments which could be used to determine he characteristics (sand quality/ heterogeneity) and architecture (geometry/lateral extent/connectedness) of the reservoir sands. This was integrated with the results of a 3D seismic study which was primarily undertaken to determine the extent of reservoir level faulting, but also supported an Intra Cycle II reservoir correlation and assisted in defining sandbody geometry.

The Cycle II deposits have been sub-divided into an Upper, Middle and Lower Interval. The main productive reservoirs occur in the Middle Cycle II. Four genetic sandbody types are identified namely; fluvial/distributary channel, crevasse, mouthbar and shallow marine sands. A geological model was proposed which envisages the north-west to north-easterly progradation and abandonment of small delta lobes in a river dominated lower delta plain setting.

Detailed log correlation in the Middle Cycle II interval indicated the considerable lateral extent of both the shallow marine sands which occur field wide (> 22,000 ft), and the crevasse and mouthbar sands which can be correlated over distances of 3,000 to 10,000 ft. These sands are thin (10 to 30 ft) and exhibit a wide range in reservoir quality depending upon their location relative to either the proximal or distal parts of the abandoned delta lobe margin (shallow marine sands) or the active distributary channel (crevasse and mouthbar sands). The thicker (30 to 50 ft) and better reservoir quality fluvial/distributary channel sands are of more restricted lateral extent (typically 800-2,500 ft) and can only occasionally be correlated between wells on the current well spacing.

The geological model has provided an improved understanding of the distribution of the reservoir sands and recoverable reserves in the D18 Field. The study has indicated that different fluid contacts observed in laterally extensive sands are probably the result of offset by sealig faults. These faults compartmentalise the D18 field into several fault bounded blocks each containing isolated reservoir sands capable of supporting their own fluid columns. Detailed mapping of the reservoir sands within the fault bounded blocks has enabled more accurate determinations of hydrocarbon volumes, predictions of ultimate well recoveries and production potential of the D18 Field.