THE INFLUENCE OF SEDIMENT DEPOSITIONAL PATTERNS AND SYN-SEDIMENTARY FAULTING ON THE DISTRIBUTION OF IAGIFU-KOI-IANGE RESERVOIR FACIES IN THE PAPUAN FORELAND BASIN (PNG)

by

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A thesis submitted in fulfilment of the requirements for the degree of

Master of Science

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February 2003

CERTIFICATE

I certify that this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text. I also certify that the thesis has been written by me, all sources used are indicated in this thesis.

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ABSTRACT

To assess the hydrocarbon potential of the prospective top Iagifu – Koi-Iange interval of the Middle Oxfordian – Middle Tithonian Papuan Foreland Basin, I have undertaken an integrated seismic – well study of an area of the foreland basin. Time structure contour and isochron maps for five major seismic horizons and intervals reveal the effects of structural movement on reservoir and related facies distribution along the Komewu Fault Zone (KFZ). The impact of this fault on the lateral distribution of reservoir facies during the Iagifu-Koi-Iange deposition interval is assessed to be negligible.

The Komewu Fault is the major structure in the Foreland Basin. It is part of a major crustal fracture that is thought to have formed as one of a series of extensional faults when the northern margin of the Australian plate was first rifted in the Mesozoic and has reactivated on several occasions as the plates interacted. The main extensional offset occurred during the Miocene. This final stage of extension led to deposition of abnormally thick carbonate above the Omati Trough (Darai Limestone).

In the study area, stratigraphic boundaries have been defined for the major lithostratigraphic units using wireline log character. The lithostratigraphy has been used as the basis for determining the relationship between depositional history and structural movement along the Komewu Fault Zone based on the twt-shape of selected horizons. Time structure contour maps for the five reflectors mapped were constructed. The reflectors recognised are, from the top downwards are: top Darai Limestone, base Darai Limestone, top Iagifu Formation, top Koi-Iange Formation and top Basement. These maps show the form of the reflector surface. The following isochron maps were created: Top Darai to Base Darai; Base Darai to Top Iagifu; Top Iagifu to Top Koi-Iange and

Top Koi-Iange to Top Basement. Isochron maps were used to assess the impact of offset across the Komewu Fault Zone (KFZ) both during and after sediment deposition. Together the maps show a long-lived depositional basin, the Omati Trough, which has undergone at least two extensional and two compressional phases of movement along the Komewu Fault.

The sediments of the interval between the top Iagifu and top Koi-Iange Formations contain sandstone that elsewhere in the Papuan Basin are bearing hydrocarbon. On the basis of gamma ray, sonic and spontaneous potential (SP) logs character, I have divided this interval into three seismic sequences, called J1, J2 and J3 in ascending chronostratigraphic order. Of these, only J1 is complete because it comprises well-defined lowstand, transgressive and highstand systems tracts. However, not all of the subdivisions are present in all wells. The identification of these sequence stratigraphic units (SSU) is essential for detailed understanding of the distribution of potential reservoirs. The main potential reservoir target can be deduced from the facies distribution in the J3 Lowstand Systems Tract.

The J1, J2 and J3 sequences have somewhat variable axes of deposition with J1 WSW to ENE, J2 SE to NW and J3 WNW to ESE. This pattern could be reconciled with major lobe switching on a prograding deltaic shoreline. The implications are that any model of reservoir distribution based on lithostratigraphy units will disclose a combinations based on average combinations of the two contributory sequences.

ACKNOWLEDGMENTS

I would like to firstly thank my principal supervisor Associate Professor Greg Skilbeck who originally suggested my project and has provided many helpful and valuable suggestions and contribution during my study. Especially without regular meetings with him and his help I could not have finished my study. I would like to thank my initial co-supervisor, Dr. Derecke Palmer for his help during the short courses I have taken with him and for his encouragement.

I want to send my special thanks to Mr. Harold Stead (Chief Geologist) at Oil Search Limited. He set up my project and provided copies of articles. At the same time I want to thank Dr. Shane Schofield at Oil Search Limited (External Supervisor) who has spent time in regular meetings helping progress the study.

Thanks are also extended to all staff and friends at the Department of Environmental Sciences Applied Geology of the University of Technology, Sydney for their encouragement and support, in particular, Professor Evan C. Leitch, Dr. Edgar Frankel, Dr. Grazella Caprarelli and Mr Boyd Dent.

My final appreciation goes to all members of my family in particular my brother Dr. Noori Abdulla, my sister in law Mrs Narmin Ali, my nieces Chra and Gazang and my nephew Zana for their moral and guidance, their advice and encouragement during my study.

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