

### Pliocene

During Pliocene time a tectonic movement uplifted southeastern Australia and the sea began to regress. Extensive volcanism also occurred resulting in extensive basaltic lava flows which now cover large areas of the onshore Otway Basin.

#### (5) Structure

Esso Prawn A-1 was located on the crest of a north-south trending anticline approximately 37 miles long and 12 miles wide. Maximum structural closure was mapped in excess of 2000 feet on the "Phantom Horizon" based on deep discontinuous seismic reflections which had been thought to be within pre-Upper Cretaceous strata. Thinning of beds represented by these reflections can be observed on pertinent seismic lines suggesting that most of the structural movement occurred during that time.

The drilling of Prawn A-1 revealed however that beds which were originally believed to be "pre-Upper Cretaceous" in age were actually Upper Cretaceous Strata of the Lower Cretaceous Otway Group were not encountered until a depth of 9660 feet.

In the Eocene-Paleocene interval the Prawn A-1 structure had been mapped as a broad southwest plunging nose. There was little evidence of thinning over structure in this interval.

#### (6) Relevance to the Occurrence of Petroleum

The primary objective of Prawn A-1, apart from stratigraphic evaluation was to determine the hydrocarbon potential of reservoir sands below the base of the Tertiary related to an anticlinal feature. The possibility of closure extending up into the basal Tertiary strata was also to be tested.

Pre-Tertiary strata below the basal Tertiary unconformity were found to be massive sandstones of Upper Cretaceous age and water saturated. Strata of Lower Cretaceous age, below 9660 feet, were impermeable. Basal Tertiary sands although porous were also water-saturated.

The absence of hydrocarbons in the Upper Cretaceous section is attributed to the absence of sufficient shale sections over structure which could have formed a "seal". The contact between the Tertiary and Upper Cretaceous sections was essentially a "sand over sand" contact with structural closure not present within the Tertiary section thereby eliminating trap possibilities at the top of the Upper Cretaceous sequence. The only shale within the Upper Cretaceous section of any consequence was the Belfast formation from 7137-7310 feet. The underlying Flaxmans-Belfast sandstones vary from impermeable to water-saturated. This might suggest the Belfast shale did not extend far enough over structure to entrap hydrocarbons.

The Waarre Formation and underlying Otway Group were impermeable. Similar Otway sediments were encountered by Shell Oil in their Pecten 1A and Nerita 1A wells.

#### (7) Porosity and Permeability of Section Penetrated

Porosity and permeability measurements were made on core samples by Exploration Logging. The results of these analyses are included as an appendix. The Upper Cretaceous sands exhibit good permeabilities and porosities. Values up to 1450 millidarcies permeability and 29.2% porosity were measured in this section. Porosity values calculated from logs also indicate the Upper Cretaceous sands to have good porosities. (Appendix 5). Porosity and permeabilities values could not be measured within the Tertiary section because of the porous and unconsolidated nature of the sand.

The Waarre Formation in Prawn A-1 as mentioned above consisted of an impermeable conglomerate in a calcareous sandstone matrix. The underlying Otway section was also impermeable.