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BURIAL AND THERMAL HISTORY MODELLING AND SOURCE ROCK DISTRIBUTION OF THE OTWAY BASIN, SOUTH AUSTRALIA

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There are numerous source rocks throughout the late Jurassic to Tertiary section of the western Otway Basin. Current knowledge of the source potential of the Crayfish Group sediments is restricted to the area north of the Tartwaup Hingeline. These source rocks are nonmarine, Type III to IV kerogen type derived from land plants with some non-marine Type II algal rich shales occurring, especially in the early rift succession. Sediments of the Crayfish Group tend to be overmature for oil generation in the deeper portions of halfgraben and mature for gas. On the flanks of these troughs they tend to be early mature to mature for oil whilst on basement highs they are immature to marginally mature for oil generation.

Basal coals of the Eumeralla Formation are the most prospective rocks of the Otway Supergroup but are mostly immature in the area north of the Tartwaup Hingeline. To the south however, this prospective source horizon is mature for oil and early mature for gas, principally in the offshore and the deeper onshore portions of the Voluta Trough.

By comparison, the source potential of the Late Cretaceous section is generally low and is restricted to the area south of the Tartwaup Hingeline. Shales tend to be dominated by Type IV (inertinitic) kerogens and improve marginally in the offshore Voluta Trough. Another contributing factor to the overall low prospectivity of the Late Cretaceous succession is the marginal maturity for oil. The Belfast mudstone, which represents the major source rock does not attain peak generation for Type III organic material until depths in excess of 4000 m are reached. Of the wells drilled to date, only in the base of Breaksea Reef 1 are the sediments sufficiently mature for peak oil generation. A thin low grade oil leg within intra Belfast Mudstone sands in Breaksea Reef 1 may have been sourced from Late Cretaceous source rocks although in all likelihood an Early Cretaceous source seems more probable.

Maturation profiles are strongly influenced by the thickness of Tertiary carbonates of the Heytesbury Group. The source potential of the Tertiary section is not discussed here due to limited analyses and its obvious lack of maturity.

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INTRODUCTION

This report details work undertaken as part of the South Australian Exploration Initiative (SAEI) Project 968: Otway Basin Source Rock Study. The aims of this study were to:

1. Compile, review and interpret existing source rock data
2. Propose additional source rock data
3. Model the thermal and burial history of the basin

It provides a synopsis of new and existing source rock analytical data, including biomarker characteristics and source affinities of oils, condensates and bitumens for the western Otway Basin, South Australia. These data were incorporated into WinBury (version 1.4b), a modular software program developed by PALTECH Pty Ltd., to model the thermal and burial history of the basin.

The approach taken in this review is to detail the major source rocks within the western Otway Basin, in some instances extending this knowledge to the eastern Otway Basin. Each structural province within the basin shows highly variable source rock distribution, richness, kerogen type and quality.

PREVIOUS INVESTIGATIONS

TOC, Rock-Eval and vitrinite reflectance analyses are available for core samples and cuttings from the majority of wells, both in the onshore and offshore portions of the western Otway Basin. These data, representing the work of numerous investigators are consolidated in respective modules of PEPS-SA*, a software package designed and maintained by the Petroleum Division of MESA. Additional key references on the organic geochemistry of the basin are provided by Tupper et al. (1993), Padley et al. (1995), Struckmeyer (19??), McKirdy (198?) and ....

GEOLOGY

The geology of the western Otway Basin has been described by Morton & Drexel (1995) from which a brief summary follows.

The Robe and Penola Troughs (Fig. 1) are Early Cretaceous depocentres containing up to 5800 and 5000 m, respectively, of Early Cretaceous non-marine (Crayfish and Otway Group) sediments overlain by a thin veneer of Late Cretaceous deltaic-marine (Sherbrook Group) and Tertiary (Wangerrip and Heytesbury Group) sediments ranging in thickness from 232 to 830 m (Fig. 2).

To the south of the Tartwaup Hingezone, this thin Late Cretaceous-Tertiary veneer thickens dramatically. However, in the survey area, especially along the northern margins of the Basin, the Late Cretaceous succession is absent and Tertiary seals are poorly developed. Consequently, reactivated faulting in this region during the Tertiary has led to a number of Early Cretaceous faults piercing the near surface aquifers.

Economic gas has been recovered predominantly from Early Cretaceous Pretty Hill Formation (Crayfish Group) and to a lesser extent the Windermere Sandstone Member of the Eumeralla Formation (Otway Group), to the east of the study area, in the Katnook-Ladbroke Grove region. Gas has also been recovered from unnamed sands of the Eumeralla Formation. Regional seals in this area are Laira Formation (Crayfish Group) and Eumeralla Formation.

HYDROCARBON OCCURRENCE

Coastal bitumen strandings

There is direct and indirect evidence for hydrocarbons in the western Otway Basin. Indirect evidence is provided by strandings of crude oil, referred to locally as coastal bitumen, along the coastlines of southeastern South Australia, which have been recorded for at least 150 years and were used as circumstantial evidence for the promotion of oil exploration since the late 19th century.

Characterisation of the bitumen strandings by McKirdy and Horvath (1976) identified these crudes as high wax, low API and sulphur, paraffinic-napthenic crudes that originated from submarine seeps. Detailed analysis of ocean currents using drift bottles, coupled with the degree of alteration of the crude suggested a localised seep near the outer edge of the continental shelf directly off southeastern South Australia (i.e. either sourced from the Duntroon or Otway Basin) and possibly linked to earthquake activity.

Based on their low pristine/phytane ratios, these crudes were considered to be immature and derived from source beds of terrigenous organic matter deposited in freshwater to paralic environments (McKirdy and Horwath, 1976). Subsequent resampling (McKirdy, 1985) revealed that the bitumens were all derived from an algal source and fell into four distinct oil families, three of which were high wax crudes, the other a non waxy asphaltite. The identification of botryococcane, including the freshwater green algae *Botryococcus braunii* in the bitumens (McKirdy *et al.*, 1986) suggested that the parent oils were generated from source rocks deposited in stratified lakes under anaerobic conditions.

Padley *et al.* (1993) re-examined existing and new samples, collected by MESA during 1990-1991, and identified two distinct types of bitumen; waxy bitumen and asphaltite. They concluded that the majority of samples probably originated in Indonesia from Tertiary Basins and were transported by surface ocean currents, notably the Leewin Current to South Australian waters, a conclusion first proposed by Currie *et al.* (1992) for coastal bitumens in Western Australia.

The waxy bitumens contain trace amounts of Oleanane (derived from angiosperms) and bicadinanes (derived from fossil resins of tropical dipterocarp trees). Similar biomarkers are found in Tertiary sourced oils from the Minas Field, Sumatra.

In contrast, large pieces of some of the asphaltite bitumen may have a local origin. The high sulphur content and molecular isotopic signatures are diagnostic of a marine source rock and may be sourced from a distal facies of the Belfast Mudstone of the Otway Basin or the Wigunda Formation of the Duntroon Basin, although definitive oil-source correlations have yet to be established (McKirdy *et al.*, 1994).

Given their nature as bottom drifters and the direction of bottom currents across the continental shelf of southeastern Australia, such a hypothesis is supported by the stranding patterns of asphaltite in South Australia and western Tasmania (McKirdy *et al.*, 1994).

Hydrocarbon gases - offshore

In 1983, a 1 600 km marine hydrocarbon detection survey was conducted by Shoreline Exploration Company and located hydrocarbon "seepages" thought to be the source of the coastal bitumens. One large anomaly, located about 16 km south of Port MacDonnell (Fig.

3), was geographically coincident with "clouds of gas bubbles" observed on sonar records (Ducharme, 1983). Subsequent analysis of the gas indicates that Peak Propane is about half Peak Methane indicating an oil rather than gas source. Low Ethylene appears to rule out a biogenic source and iso-butane/n-butane ratios suggest a mature source of hydrocarbons. These results contrast significantly with those obtained from a 1987 geochemical and geological sampling programme conducted by the Bureau of Mineral Resources aboard R/V *Rig Seismic* (Heggie *et al.*, 1988). These authors identified nine locations (Fig. 3) that were found to contain thermogenic gases. Furthermore, all anomalies are located above major faults. The highest gas concentrations occur in the western Voluta Trough where faulting extends almost to the seafloor. However, all locations contained relatively 'dry gas' with the driest anomalies occurring in the central Voluta Trough where maturation modelling predicts that Early Cretaceous source rocks are overmature. Gas wetness increases to the east in the vicinity of the Mussel Platform where Early Cretaceous source rocks lie within the oil window (Heggie *et al.*, 1988). These authors concluded that from their limited dataset, molecular composition of hyrocarbon gases from seafloor sediments reflects variations in the maturity of the deeply buried source rocks and suggested that the Early Cretaceous sequence appears to be the primary source of the anomalies. The conflicting results between these surveys in the Voluta Trough may simply be related to variations in depth of burial of the Early Cretaceous source rocks as opposed to variations in source quality or a different source interval (? Late Cretaceous).

Hydrocarbon gases - onshore

In 1988, Petrofocus Pty Ltd. conducted a soil gas alkane survey over the Katnook area for Ultramar Australia Inc. (Petrofocus,1988). This reconnaissance survey identified areas with anomalous and elevated concentrations of light alkanes. However, subsequent drilling coincident with these anomalies (with the exception of Ladbroke Grove 1) failed to intersect hydrocarbons (Fig. 4). Hungerford 1, a dry hole, showed no geochemical expression at the surface although a downdip anomaly has been mapped.

In January 1993, 15 water bores were sampled by MESA in the South East for headspace gas analysis of which 7 provided sufficient hydrocarbons for compositional analysis (Hill, 1995a). Methane values ranged from 25% to 92% of the total gas for these bores with nitrogen and oxygen accounting for the remainder of the gas with varying levels of carbon dioxide. Only minor concentrations of C_{2+} hydrocarbons were detected, making determination of the maturity of the gas difficult. Significantly, the most favourable gas shows encountered during an earlier survey by MESA in 1987 could not be validated due to insufficient yield. Six samples taken from the 7 bores were analysed for stable carbon isotopic composition using $\delta^{13}C$ for methane and carbon dioxide to provide an estimate of the ratio of biogenic to thermogenic gas. With the exception of one sample, all gases are of bacterial origin although associated CO_2 is clearly thermogenic, possibly derived from a volcanic source.

The remaining sample from a water bore close to Kingston SE on the northern margin of the Otway Basin has a significantly less negative stable carbon isotopic composition, indicative of methane generation from a low maturity sapropelic (possibly marine) source, although there remains a possibility that the methane may represent a mixture of gas generated from a combination of terrestrially derived organic matter and bacterially derived (biogenic) gas. Given the predominantly terrestrial origin of source intervals in this area, in particular extensive lignites of the Early Eocene Dilwyn Formation, this second scenario seems more likely.

Oil, gas and condensates from discovered fields

Direct evidence for hydrocarbons in the western Otway Basin is provided by the commercial gas and associated condensate discoveries at Katnook Field, Ladbroke Grove and Haselgrove. Non commercial gas is also known from Troas-1, whilst numerous wells contain residual gas (e.g. Crankshaft-1, within a tested water column). Non commercial oil has been recovered from fractured basement in Sawpit-1 and from Early and Late Cretaceous reservoirs in Wynn-1 and Caroline-1 respectively, the latter as a contaminant associated with the CO_2 produced from the Waarre Sandstone (Morton & Drexel, 1995). In addition a probable oil leg occurs within an intraformational sandstone of the Belfast Mudstone in Breaksea Reef 1.

Residual oil from the Pretty Hill Formation in Crayfish A1 (McKirdy *et al.*,1986) and high production Index (PI) values from Rock Eval for a number of wells further indicate migration of hydrocarbons from deeper sources.

All of these hydrocarbons were derived from nonmarine ? Late Jurassic to Early Cretaceous source rocks and are discussed in relation to their respective sources and maturity in the following section.

In the Western Otway Basin of Victoria, crude oils have also been recovered from Port Campbell 4, Lindon-1 and Windermere-1 and 2, all sourced from the Eumeralla Formation.

Evidence of hydrocarbon generation from Late Cretaceous source rocks is lacking. The reason for this is threefold:

(1) Most drilling to date has been concentrated in Early Cretaceous depocentres where the Late Cretaceous succession is condensed and thermally immature.

(2) Whilst TOC values are fair to good, their potential yield (S_1+S_2) is marginal to moderate.

(3) The majority of wells drilled to test a thick Late Cretaceous succession lack thermal maturity for hydrocarbon generation.

Biomarker characteristics and source affinity

Padley *et al.* (1995) have assigned the oils, condensates and bitumens discovered in Crayfish Group reservoirs in the Robe and Penola and to a lesser extent the Chama Terrace to three groups based on their source-dependent biomarker signatures. These are:

* Group 1 Katnook Field condensate, Sawpit 1 and Wynn 1 oils;
* Group 2 Troas 1 condensate; and
* Group 3 Crayfish A1 and Zema 1 reservoir bitumens

A fourth group of oils not discussed by these authors but included below is associated with oils discovered predominantly in the eastern Otway Basin (Victoria) and sourced from the Eumeralla Formation:

* Group 4 Caroline 1 oil/CO_2 (SA), Lindon 1, Port Campbell 4 and Windermere 1 & 2 oils

Source affinity, maturity, oil-oil and oil-source correlations are discussed below for each of these groups.

Group 1

On the basis of biomarker data, Padley *et al.* (1995) concluded that Group 1 oils and condensates are sourced from algal-rich, bacterially degraded siliclastic sediments deposited in either a suboxic fluvial or lacustrine environment. Whilst these oils and condensate have similar biomarker distributions, minor differences exist suggesting generation from multiple source rocks or alternatively from laterally heterogeneous source facies. Based on the limited available data, the freshwater lacustrine Casterton Formation sampled at Sawpit 1 is the most likely source of Group 1 oils. Slight variations between biomarker assemblages of the oils and their indicated source rock can be attributed to variations of the organic facies of the Casterton Formation. However, it is instructive to note that an extract from Casterton Formation in Casterton 1 (Victoria) differs markedly from both the Sawpit 1 (Casterton Formation) extract and the Group 1 oils (Padley et al.,1995). The sterane biomarker signatures of the Group 1 oils and the Casterton Formation at Sawpit 1 (2501 m) are similar although Price (1993) suggested that the Sawpit oil has been sourced from a deep lacustrine facies of which the Casterton Formation at Sawpit 1 represents a marginal facies. Padley *et al.* (1995) recognised similarities between biomarker signatures of the 'Unnamed basal shale' and Laira Formation at Sawpit 1 and the Group 1 oils and concluded that they could also be a possible source.

The Pretty Hill Formation condensates from the Katnook Field range in composition from light (51 - 53° API gravity), paraffinic-napthenic to heavier (48° API gravity) aromatic-intermediate crudes with little evidence of alteration in the reservoir by water action or biodegradation. They are non-waxy and are relatively immature as indicated by their low heptane and isoheptane values. The Katnook gases are relatively dry (Family 2 gases) with a high methane content (88-93%) and only negligble concentrations of the non-hydrocarbon contents, nitrogen, carbon dioxide and helium (Parker,1992). The maturity of the gases increase with depth and they appear to have probably originated from intra Pretty Hill Formation shales (ie. more or less *in situ* - MPI-derived maturities Rv calc=0.79-0.92%). These oils, reservoired within the Crayfish Group, differ markedly from the younger Eumeralla Formation sourced oils and condensates which were generated from bacterially reworked land-plant remains preserved in coaly facies (Padley *et al*;1995).
The maturity of Group 1 oils consistently fall within the convential oil-condensate window (Rvcalc=0.5-1.2%)

In contrast, condensate recovered from Windermere Sandstone Member of the Eumeralla Formation in Katnook 1 is more paraffinic and less mature (Rv calc=0.62%). The determination of the likely source for this condensate is equivecol. Based on these maturity measurements it would appear that the condensate has been generated *in situ* rather than sourced from the Crayfish Group. Furthermore, its biomarker assemblage is more similar to oils sourced from the Eumeralla Formation (ie. Lindon 1, Port Campbell 4 and Windermere 1 & 2) than oils from Group 1 (Fig. 5). However, the pristane/n-heptadecane and phytane/n-octadecane ratios are indicative of a higher maturity (Katnook 1; Watson & McKirdy,1988). Moreover, comparison of i-pentane/n-pentane ratio with the headspace gas suggests that it may have originated from depths below 2500 m in Katnook 2 where maturities exceed Rv=0.9%. This would suggest that the condensate has migrated from a mature source kitchen basinward of Katnook 1, most probably from the lower Laira Formation or possiby intra Pretty Hill Formation shales.
In Sawpit 1, migrated hydrocarbons have been identified in the Laira Formation (Sawpit 1; 1526 m) by Price (1993). Based on aromatic maturity indicators, these hydrocarbons more closely match condensates from the Pretty Hill Formation of the Katnook Field than the underlying sediment extracts (ie Casterton Formation and 'Unnamed basal shale') in Sawpit 1. However, Price (1993) highlighted the difficulty in genetically characterising light hydrocarbons and was unable to conclusively prove this correlation.

Group 2

Group 2 oils are represented by condensate reservoired in undifferentiated Crayfish Group sediments at a depth of 2698 m in Troas 1. Padley *et al.* (1995) have assigned a mixed land-plant, algal and bacterial source affinity to this condensate, similar to Group 1 oils, but in this case the algae contributing to the parent kerogen included marine species. These authors have identified reliable markers for marine organic matter (C_{30} sterane (24-*n*-propylcholestane) and C_{30} 4-methylsteranes) that provide evidence for its marine source affinity. 30-Norhopanes, a class of biomarker commonly found in oils from marine carbonate source rocks, are abundant in the Troas 1 condensate but are not detected in Group 1 oils. A calcareous marine mudstone deposited in a near shore environment is the likely source rock of the Troas 1 condensate (Padley *et al.*,1995). Possible source intervals are either carbonaceous shales of the Eumeralla Formation or the Undifferentiated Crayfish Group. Evidence for marginal marine conditions during deposition of the Eumeralla Formation is provided by the occurrence of marine dinoflagellates in Lucindale 1 (564 m) and Troas 1 (2340-2345 m). Elsewhere, the Eumeralla Formation is regarded as a fluvial-lacustrine succession. Padley *et al.*(1995) suggest that the low proportion of dinoflagellates and limited species diversity indicate a near shore depositional environment (ie. back barrier lagoon, lower delta plain estuaries) with less than normal marine salinities. In Lucindale 1, this marine incursion is thought to have been short lived and possibly resulted from a spillover from the Murray Basin to the north. Biomarker assemblages of extracts in Troas 1 indicate that marine algae contributed to the kerogen in the Eumeralla Formation at this location. Proximity of Troas 1 to the Tartwaup Hingeline, which is coincident with a significant southward thickening of the Eumeralla Formation, may provide the reason for the development of marine conditions as the basin sagged prior to continental breakup (Padley *et al.*(1995). Marine influences within sediments of the Crayfish Group have been recognised in Robertson 1 (1747-1750 m; 1710-1713 m) and in Troas 1 (2569-3466 m). Extracts of the Undifferentiated Crayfish Group in Troas 1 have a more marine geochemical signature when compared with the Eumeralla Formation in this well. Comparison of source specific biomarkers of both these extracts and the condensate show that the Troas 1 condensate originated from a marginal marine source similar to, but more mature than that sampled at 2569 m (Undifferentiated Crayfish Group) in Troas 1. However, Padley *et al.*(1995) could not conclusively determine if the condensate in Troas 1 was sourced from a more mature Eumeralla Formation south of the Tartwaup Hingeline or from the underlying Crayfish Group.

Group 3

Padley *et al.* (1995) have assigned bitumens recovered from Undifferentiated Crayfish Group and Pretty Hill Sandstone in Crayfish A1 and Zema 1 respectively, to Group 3 oils. These authors note that the biomarker assemblages of this group, especially the presence of gammacerane, would indicate derivation from hypersaline, microbial, organic matter deposited in a playa lake environment. Whilst this interpretation of the depositional environment is a departure from the commonly held view that Crayfish Group sediments were deposited in a fluvio-lacustrine setting, it is not inconceivable that isolated graben lakes lacking external drainage may have developed in the devel.ping rift basin and which became hypersaline. The C_{27}:C_{28}:C_{29} sterane distribution plot (Fig. 5) for Group 3 oils indicates that they can be subdivided into two groups, the other being derived from lacustrine source rocks. A high thermal maturity (Rvcalc=0.9-1.3%) derived from MPI-1 data for these reservoir bitumens may support the notion that they originated from basal Crayfish Group shales or Casterton Formation.

Group 4

Waxy crudes recovered from intra Eumeralla Formation sands and Windermere Sandstone member

of the Eumeralla Formation in Windermere 1 and 2 respectively, Pebble Point Formation in Lindon 1 and Waarre Sandstone from Port Campbell 4 ,all drilled in Victoria, are believed to have been sourced from carbonaceous shales and coals of the lower Eumeralla Formation (McKirdy et al.,1994). The geological habitat of these oils is described by Kopsen and Scholefield (1990). Oil associated with CO_2 production from the Caroline Plant is also thought to be sourced from the Eumeralla Formation with the CO_2 acting as a solvent to strip hydrocarbons. The oil in Caroline 1 comprises 50% aromatics and has a specific gravity of 17° API (McKirdy, 1986). The maturity this of this oil (Rvcalc=0.71%) is in agreement with a Eumeralla source (Rv=0.70%; 3200 m).
The oils typically have a low sulphur content (Tupper *et al.*, 1993) and have molecular signatures consistent with derivation fro terrigenous organic matter. Extracts from the *C.hughesi* hydrocarbon source interval of the Eumeralla Formation confirm that land plants are the major contributors of organic matter. High pristane/phytane ratios are consistent with deposition in peat swamps (Tupper *et al.*,1993; Fig 5).

CASTERTON FORMATION

Source richness

Source rocks geochemical data for the Casterton Formation are summarised in Table 1.
In general, organic richness is good with Total Organic Carbon (TOC) values commonly exceeding 1.5%. Genetic potential (S_1+S_2) is moderate (mean 1.92 kg hydrocarbons per tonne). However, individual values vary considerably with locally excellent source quality (Casterton 1: 2389-2396m; TOC = 45.90, S_1+S_2 = 100.86). Although thin, these intervals are capable of generating significant quantities of oil where mature. There are insufficient source rock data to conclude that source quality and richness improve away from the volcaniclastic rich section intersected in Casterton 1.

Kerogen Type and source potential

Hydrogen Index (HI) values in Sawpit 1 are commonly low (~100) with correspondingly high Oxygen Index (OI) (~300) indicating oxidised and/or Type III kerogen. However, in the basal Casterton Formation there is an observed increase in source potential (Sawpit 1; SWC 2501 m) and a terrestrial Type II/III kerogen is inferred. Pyrolysis gas chromatography (PGC) results indicate a prominence of mid range (C_5-C_{14}) aliphatic compounds for this sidewall core (SWC) suggesting a capacity to source light oil or condensate.

In Casterton 1, HI values (mean 128 mg S_2/g TOC) range from 35-459 (Table 1) suggesting that some intervals have the capacity to source oil, although in general the formation is gas and oil prone. The richest source intervals also occur towards the base of the unit, possibly reflecting the localised nature of the early rift lakes receiving high concentrations of terrestrial detritus . As the rift became more extensive, these lakes presumably would have widened and the amount of terrestrial detritus entering the lake systems would have been diluted and dispersed.

Table 1. Rock-Eval pyrolysis data, Casterton Formation.

Well	Depth (m KB)	TOC (%)	Genetic Potential (S_1+S_2)	Oxygen Index	Hydrogen Index

Casterton 1	2211	1.01	0.75	57	111
	2281	1.80	3.23	10	153
	2302	3.65	5.90	56	143
	2323	1.30	2.48	62	175
	2360	1.07	1.30	59	108
	2363	2.10	1.34	63	59
	2389	45.90	100.86	5	192
	2396	1.35	2.47	48	151
	2422	0.44	2.29	59	459
Sawpit 1	2482	1.46	1.95	32	107
	2501	1.29	3.21	33	216
	2505	0.70	1.21	501	139

Organic Petrology

Samples at 2498 and 2505 m in Sawpit 1 have up to 40% lipid rich detritus (i.e. land plant derived) that is partly degraded and oxidised (Price, 1992). The prominence of fresh planktonic algae supports the notion of a deeper anaerobic water system (i.e. deep rift lake). Minor oxidisation of the lipids possibly occurred during transport and the restricted diversity of the aquatic flora suggests specialised water nutrient conditions, possibly dystrophic. Lamalginite is common to abundant. Dispersed organic matter (DOM) is abundant with inertinite and liptinite common to abundant and vitrinite rare. Oil drops fluorescing greenish yellow with a rare oil haze were observed in the sidewall core at 2498m.

Maturity and timing of hydrocarbon migration

The maturity of the Casterton Formation has been assessed by vitrinite reflectance, Rock Eval, T_{max} and biomarker parameters established from sediment extracts. Maturity data are summarised in Table 2 and Figures 7 and 8.

Table 2. Maturity data, Casterton Formation.

Well	Depth (m KB)	Rv max (%)	Rv range (%)	Rvcalc (MPI) (%)	Maturity Windows
Casterton 1	2362-2365	0.69			Early-Mature (oil)
Sawpit 1	2473	0.67	0.51-0.88		"
	2498	0.60	0.52-0.77		"
	2501			0.74	Mid-Mature (oil)

In Sawpit 1, Rock Eval Tmax indicates that the Casterton Formation is early mature for oil generation although there is a reversal in the vitrinite reflectance trend below 2400 m reflecting a greater proportion of low reflective (~ Rv 0.55%) vitrinite in the sample populations. The lower mean values

in Table 2 may be understating the maturity of the Casterton Formation, especially as the basal Pretty Hill Formation section from 2000-2400 m is probably a true representative of the maturity (Rv 0.69 to 0.79%).
This is supported by biomarker maturity parameters which give an observed Rv of 0.75% at a depth of 2501 m, a figure more consistent with the overlying Pretty Hill Formation (Price,1992).
A solitary Rv value of 0.69% in Casterton 1 (Victoria) is comparable with that observed in Sawpit 1.

Thermal history modelling of the Penola Trough indicates that on the flanks of the Penola Trough the Casterton Formation is early mature for oil generation (Rv 0.5-0.7%) between depths of 1400 and 2200 metres and entered the mid-mature oil window (Rv 0.7-1.0%) at approximately 107 ma (Fig. 25). In the deeper portions of the Penola Trough in the Katnook-Ladbroke Grove region, below depths of ~5000 metres, the formation entered the zone of peak oil generation (Rv 1.0-1.3%) at 128 ma and remained in that window until 124 ma (ie. early Barremian). It remained mature for gas from 107 to 86 ma and since then has been overmature for gas generation (Fig. 24).

PRETTY HILL FORMATION

The source potential of the Pretty Hill Formation is discussed here in two parts: The basal section is predominantly shalier and referred to informally as the 'unnamed basal shale'. Lovibond *et al.* (1995) refer to it as C. australiensis shale. The remainder of the formation comprises interbedded sandstone, siltstone and shale with rare coal laminae.

Unnamed basal shale

Source richness

The source richness of the unnamed basal shale is highly variable between wells and even within individual sections. For example, in Robertson 1, about 10% of the cuttings between 1749-1765 in depth are oil shale of which telaginite and lamalginite are major constituents (McKirdy *et al.*, 1994). These authors noted that the oil shale lithofacies is quite thin, located between 1762 and 1765 m, and is interbedded with siltstone containing high concentrations of Types III/IV dispersed organic matter (DOM). Within this zone, TOC values of 7% (i.e. excellent source richness) have been recorded although the mean for the 'Unnamed basal shale' in Robertson 1 is 2.81%. Likewise, the Genetic Potential for this thin oil shale is 37 kg hydrocarbons/tonne (i.e. excellent source richness and quality) compared with a mean of 8 kg hydrocarbons/tonne for the entire unit.
With the exception of Robertson 1, where it appears that selective sampling gives a weighted bias, the remaining wells that have intersected this shale have good source richness (Mean TOC = 1.44%) and marginal to at best moderate source quality (mean Genetic Potential = 1.61 kg hydrocarbons/tonne). Source richness and quality are summarised in Table 3.

Kerogen type and source potential

In terms of the DOM composition, the humic, inertinitic rich sediments of the 'Unnamed basal shale' are organically lean (excluding the thin oil shale zones in Robertson 1 and Penola 1) and are considered to be gas prone.

The oxidised, humic gas prone nature of the section is supported by Rock-Eval data (Table 3). HI values are commonly less than 100 with oxygen index (OI) values mostly in excess of 300, indicating oxidised Type III kerogen (Fig. 9).

Oil shales in Robertson 1 and Penola 1 have excellent potential to generate oil and are typically of a Type II kerogen (Fig. 9). Kerogen type and source potential parameters are summarised in Table 3.

Table 3. Rock-Eval pyrolysis data, unnamed basal shale.

Well	Depth (m KB)	TOC (%)	Genetic Potential (S_1+S_2)	Oxygen Index	Hydrogen Index
Camelback 1	1683	0.79	1.04	339	108
	1710	0.81	0.74	308	79
	1753	1.26	1.31	271	88
Sawpit 1	2450	1.56	2.03	462	108
	2458	1.89	2.72	112	490
	2461	1.88	2.70	422	118
Lake Hawdon 1	1981	1.46	1.54	108	89
	2002	1.67	1.17	532	57
	2048	1.43	1.22	806	71

Organic petrology

The organic matter is dominated by humic detritus, often finely divided and the lipid rich detritus fraction rarely exceeds 25% of the residue. In Sawpit 1, the lipid detritus tend to be partly degraded and oxidised.

Maturity and timing of hydrocarbon migration

Where intersected by wells located on the flanks of the Penola Trough, the 'Unnamed basal shale' of the Pretty Hill Formation is marginally early mature for oil (i.e. Rv=0.5-0.7%). In the deeper portions of the Penola Trough the unit is mature for gas. It entered the early-mature oil window at 128 Ma, reaching peak maturity (ie late-mature) for oil at 109 Ma. It entered the gas window at 73 Ma and has remained within that window until present day. Maturity data are summarised in Table 4 and Figures 9 and 10.

Table 4. Maturity data, unnamed basal shale.

Well	Depth (m KB)	Vitrinite Reflectance %	Maturity Windows
Camelback 1	1622	0.60	Early Mature (oil)
	1734	0.66	"
Lake Hawdon 1	1990	0.60	"
	2031	0.57	"
Robertson 1	1750-1762	0.59	"
	1786-1798	0.62	"

Sawpit 1	2455	0.63	"

Other source intervals

There are numerous potential source rock intervals within the Pretty Hill Formation other than the 'Unnamed basal shale' although the majority tend to be thin and difficult to correlate over large distances. However, on seismic evidence, the thickest source interval occurs in the Penola Trough (Morton & Drexel, 1995) and has only been intersected by Sawpit 1, on the northern flank, over the interval 2024 to 2290m. Characteristics of this potential source interval, referred to informally here as the 'intra Pretty Hill shale' are summarised below.

Source richness

The source richness of the Intra Pretty Hill shale is fairly uniform and constitutes a good source rock (Mean TOC=1.22%). Source quality is marginal to moderate (Mean Genetic Potential=1.84 kg hydrocarbons/tonne). By comparison, mean TOC values for the Pretty Hill Formation across the Basin are highly variable (Fig. 11)

Kerogen type and source potential

There is little variation in kerogen type and source potential between the 'Unnamed basal shale' and the 'Intra Pretty Hill shale'. The shale is slightly less oxidised (Mean OI=220) and Hydrogen Index values are quite consistent (Mean HI=131), both indicating a humic rich, gas prone Type III kerogen.

Organic petrology

The organic matter in the sampled section is dominated by humic detritus, often finely divided (Price, 1993). Inertinite dominates almost all sample with vitrinite common to abundant and liptinite sparse. Lamalginite, cutinite and sporinite are sparse.

Maturity and timing of hydrocarbon migration

Two vitrinite reflectance values (Rv=0.73; 2046 and 2181m) indicate that the 'Intra Pretty Hill shale' in Sawpit 1 lies just within the zone of mid-mature (oil) generation (0.7-1.0% Rv). Maturity data for the Pretty Hill Formation are summarised in Figure 12.

LAIRA FORMATION

Source richness

The source potential of the Laira Formation has been studied by Austin (1992). Its prospectivity as a potential source rock has been elevated as a result of high TOC and Genetic Potential values which correspond to discrete zones containing high yields of the the algal acritarch *microfasta evansii* identified in side wall cores (SWCs) and cuttings in the Katnook-Ladbroke Grove region (Morgan, 1992)

These algal rich zones, which correspond to lake maxima, occur in five mappable units (Fig. 13) and

3 of 2

are best developed in the upper Laira Formation. They reflect a transition from the fluvial coastal plain depositional environment of the Pretty Hill Formation and lower Laira Formation to shallow lacustrine in the upper Laira Formation. In Ladbroke Grove 1, *microfasta evansii* comprisis between 40% to 70% of the fossil assemblage in some SWCs in the upper Laira Formation. These algal maxima are correlatable over the Katnook-Ladbroke Grove-Laira-Zema region and have fair to excellent source richness. They reach a maximum near the top of the formation, presumably in response to a broadening of the lake system prior to uplift and adjustment of the basin associated with the transition from rift to sag phase culminating in the unconformity at the top of the Crayfish Group.

Mean TOC values vary from 0.25% to 2.02% (i.e. poor to good source richness) with the richest source rocks occurring along the axes of the troughs (Fig. 14). Genetic potential (S_1+S_2) values range from poor to moderate and follow a similar trend to source richness, with the best quality source rocks occurring in the Chama Terrace and eastern Penola Trough. There are indications that source richness and quality improve in the eastern Otway Basin.

Kerogen type and source potential

HI values indicate that the Laira Formation is predominantly of Type IV grading to at best Type III kerogen and is considered to be predominantly gas prone (Fig. 15). Oxygen index values are commonly low.

In the Ladbroke Grove–Katnook region, intervals coincident with algal maxima have HI values in excess of 150 and are of Type III kerogen capable of generating some liquids potential, although these zones have limited thickness and variable source richness and quality. In Ladbroke Grove 1, algal maxima constitute 9 % (66m) of the total Laira Formation.

Maturity and timing of hydrocarbon charge

Maturity data for the Laira Formation are summarised in Figure 15.

The top of the Laira Formation, which coincides with the best source potential, is marginally early mature for oil (i.e. Rv 0.5-0.7%) in the centre of the Penola Trough between depths of 1900 m and 2800 m. It entered the top of the oil window (early mature) in the Cenonanian (i.e. post breakup) at approximately 96 Ma with a gradual increase in maturity until 65 Ma and has remained in that window to present day.

In the Chama Terrace, the Laira Formation is mature for oil generation with the top of the oil window occurring below depths of 2100 m. The top of the Laira Formation entered the oil window at approximately 105 ma and has remained mature for oil since 95 Ma. Elsewhere in the basin, the Laira Formation is immature (i.e. Rv <0.5%).

Migrated hydrocarbons

Rock-Eval pyrolysis results indicate that significant amounts of migrated hydrocarbons are present in the Laira Formation in Katnook 3 over the interval 2200 to 2800 metres, and to a lesser extent in Chama 1A, Katnook 2, Zema 1 and Sawpit 1. In Sawpit 1, a Gas Chromatography (GC) trace for a sample at 1526m indicates that the extract is significantly more mature than the underlying sediment extracts (Price, 1992) and is more closely matched to condensates from the Katnook Field although evidence for this is still equivocal.

EUMERALLA FORMATION

Introduction

The source potential of the Eumeralla Formation has been investigated by Struckmeyer & Felton (1990) and Tupper *et al.* (1993). These authors identified a thick potential source sequence within the lower Eumeralla Formation characterised by thin bituminous coal seams up to 1 metre thick and which constitute about 30 per cent of the total source interval.

Tupper *et al.* (1993) identified two broad source intervals in the Chama Terrace region (Fig. 16). The lowermost source interval occurs within the *Cyclosporites hughesii* palynological zone and has a maximum thickness of 140 metres in Geltwood Beach 1 and Chama 1A. It is absent from wells drilled close to the basin margin. The second source interval is less well developed and occurs at the base of the *Crybelosporites striatus* zone. It has a maximum thickness of 120 metres in Geltwood Beach 1. Of these two intervals, coal is best developed in the *C. hughesii* source interval.

Source richness

TOC and Rock-Eval analyses have been summarised by McKirdy and Padley (1992) and Hill (1995). These data consistenty demonstrate marked differences in kerogen type between the lower Eumeralla source intervals and the silstone and mudstone dominated upper Eumeralla Formation. In the Chama Terrace region, coal is best developed in the *C.hughesii* source interval (Tupper *et al.*,1993) where TOC values (mean=31%) and potential yields (mean $S_1+S_2=85$ kg hydrocarbons/tonne) indicate excellent source richness and generation potential. By contrast, upper Eumeralla source rocks have low to moderate organic richness (mean TOC=1% and poor to fair generation potential (mean $S_1+S_2=1.1$ kg hydrocarbons/tonne).

Kerogen type and source quality

Hydrogen indices for the *C.hughesii* source interval are high (mean HI = 244 $mgS_2/gTOC$), consistent with TypeII/III kerogen and potentially capable of generating oil and gas (Fig. 17). Source quality in the upper Eumeralla Formation deteriorates and is predominantly poor (mean HI=59) indicating a gas prone Type IV kerogen.

The most basin-ward intersection of the Eumeralla Formation occurs at the southern margin of the Chama Terrace where the sedimentary package thickens and improves in source quality. The extent and likely direction of source quality improvement, however, is unknown although the observed thickening of the fluvio-lacustrine sequence to the south may provide a clue. The Songliao Basin of northeastern China (Yang *et al.*, 1985) is a Cretaceous rift basin with significant oil fields producing from reservoirs charged from thick fluvio-lacustrine source rocks deposited during the sag phase following abandonment of the rift. Source rock quality changes from Type IV at the basin margin where the sediments are predominantly fluvial, grading to Type II/III and eventually a Type I kerogen associated with lacustrine sediments at the basin centre. The difficulty with predicting source quality for the Eumeralla Formation is determining its depocentre, given that current well coverage appears to be restricted to the rift shoulder. This of course assumes that a lacustrine setting may lie at the depocentre which is not necessarily the case.

Organic petrology

The *C. hughesii* source interval maceral assemblage is dominated by vitrinite with variable amounts of liptinite and subordinate inertinite. Exasudanite, a secondary maceral that develops from the lipid constituents of liptinites and whose genesis is related to that of petroleum generation, can be seen infilling fractures and open cell lumens in inertinite (Tupper *et al.*,1993). Solid bitumen and oil oozing from cracks in detrovitrinite are also observed in Chama 1A (2502-2505m) and Crayfish A1 (1539-1542m). The *C. striatus* hydrocarbon source interval comprises mostly siltstone with low to moderate amounts of DOM of mixed algal-plant origin. Vitrinite and liptinite are the major maceral types with lesser amounts of inertinite.

Maturity and timing of hydrocarbon charge

The maturity of Eumeralla sourced oils and condensates have been studied by Watson (1990), McKirdy and Chivas (1992) and Tupper *et al.*(1993). Their findings, coupled with recognition of bitumen, exsudatinite and live oil within the *C. hughesii* hydrocarbon source interval at a maturity of about 0.8% Rv, suggest that oil expulsion has occurred over the range 0.7 to 1.2 % Rv. Tupper *et al.*(1993) conclude that mid-mature oil and/or wet gas generation from the lower Eumeralla Formation can be expected from 0.7 to 1.0% Rv; peak oil and wet gas generation from 1.0 to 1.3% Rv; and dry gas generation from 1.3% Rv and onwards. Maturation data for the lower Eumeralla Formation are summarised in Figures 17 and 18.

Thermal modelling of Chama 1A (Fig. 29) indicates that the lower Eumeralla Formation source interval has not yet reached the zone of peak oil generation but has been early mature for oil since ~ 96 ma. Only in the Voluta Trough to the south of the Chama Terrace ,where there is a substantial thickening of Sherbrook Group sediments, does the lower Eumeralla Formation source interval enter the zone of peak oil generation. Thermal modelling in the inner Voluta Trough (Fig. 30) indicates that the lower Eumeralla Formation entered the oil window (Rv=0.7%) in the Late Albian (~ 100 ma) , reaching a peak maturity for oil (Rv= 1.0 %) at the close of the Sherbrook Group depositional period and has increased only marginally in maturity from the Tertiary to present day. This highlights the importance of a thick Sherbrook Group as a mechanism for elevating and retaining heatflow. For structures on the Chama Terrace to have the optimum opportunity to receive charge from lower Eumeralla source rocks on the downthrown side of the Tartwaup Hingeline (Fig. 19), the trap would need to have been in position at or near the close of deposition of the Sherbrook Group (ie approximately 66 ma). Tupper *et al.* (1993) suggest that such structures would have both gas and oil potential with less likelihood for dilution or displacement by dry gas.

BELFAST MUDSTONE

Source richness

Total Organic Carbon (TOC) range from 2.40 to 3.0 % (i.e. fair to very good) with an observed increase in source richness to the south in the vicinity of Breaksea Reef 1 (mean TOC = 1.5%). The Genetic Potential (S_1+S_2) of the Belfast mudstone ranges from poor to moderate with the richest source rocks also occurring in the vicinity of Breaksea Reef 1 (mean S_1+S_2 = 2.63; range 0.30-5.92) 2.63) where moderate to good source rock quality is observed (Fig. 20).
This confirms the view that both source quality and richness improve to the south and that more favourable source rocks could occur in the deeper offshore areas of the Voluta Trough.

Kerogen type and source potential

Gravestock *et al.* (1986) liken the Sherbrook Group to the Tertiary succession of the Niger Delta. In terms of source potential, however, there is limited similarities with this analogue.
Geochemical data indicate a Type IV (inertinitic) grading to at best Type III kerogen type (Fig. 21). Under optical examination, the Belfast Mudstone is composed of terrigenous dispersed organic matter

(DOM) rich in inertinite (I = 75-90%) and lean in vitrinite (V ≤ 20%). Moreover, the majority of inertinite is reworked (AMDEL, 1984). Exinite remains a minor component of DOM (E ≤ 5%). AMDEL (1984) highlighted an obvious discrepancy between the highly inertinitic character of the DOM within the Belfast Mudstone and the overall Type III kerogen composition in Breaksea Reef 1. A possible explanation may be provided by the widespread occurrence of trace oil and bitumen in the cuttings which would elevate the S_2 peak in Rock Eval.
By contrast, prodelta muds of the Niger Delta are commonly of Type III and to a lesser extent Type II kerogen. A key to the viability of the Belfast mudstone as an oil source may be to delineate a more distal facies to the south of Breaksea Reef 1, which has the best source quality of the wells that have intersected the unit in South Australia.

Hydrogen Index (HI) values are highly variable and indicate that the Belfast Mudstone is predominantly gas prone (ie HI < 100). Within the Voluta Trough, in the vicinity of Breaksea Reef 1, HI values range between 17 and 181 mg/g TOC. Although considered to be predominantly gas prone, discrete intervals frequently have HI values exceeding 150 indicating some potential to generate liquids.

Gas shows encountered during the drilling of the Belfast Mudstone in Breaksea Reef 1, with components up to C_7 and extract gas chromatograms with significant n-alkane components up to C_{30} testify to the liquids potential of the Belfast Mudstone.

Significant overpressuring appears to be coincident with the intervals of highest HI values in Breaksea Reef 1, especially in the interval 3310-4362 m.

Maturity and timing of hydrocarbon migration

Tmax, vitrinite reflectance data and maturity modelling indicate that the Belfast Mudstone is mid-mature for oil generation only in the offshore Voluta Trough in the vicinity of Breaksea Reef 1 and Argonaut 1, whilst Copa 1 is immature (Fig. 22). The top of the oil window ranges between 3500 and 4500 m throughout the central Voluta Trough (Fig. 30) with peak generation for oil (VR> 1.0%) occurring in the deeper parts of the trough (Fig 22). The Belfast Mudstone entered the base of the oil window at approximately 70 Ma, continuing until 50 Ma with only a minor change in maturity since then (Fig. 30).

A feature of deltaic systems is the rapid shift in depocentre resulting from the system getting out of equilibrium. As a consequence, sediments can have quite distinct thermal histories resulting from the isolation of discrete sand bodies encompassed by prodelta mudstones. Severe overpressuring, common in productive deltas can lead to enhanced temperature gradients, creating 'hot spots' where the generative window is elevated closer to these isolated sands.
For this reason, variations to the regional model of maturation trends can be expected for the Belfast Mudstone (Fig. 22).

Migrated hydrocarbons

Possible indications of migrated hydrocarbons are provided by high Rock Eval production indices (PI) where PI exceeds 0.2. Wells that have PI values in excess of this figure are summarised in Table 5.

Table 5. Migrated hydrocarbons, Belfast Mudstone.

Well	Interval (m)	Production Index (range)
Argonaut 1A	3066 - 3527	0.20 - 0.47
Breaksea Reef 1	3194 - 3276	0.20 - 0.32
	3638 - 3677	0.67 - 0.72
	4075 - 4173	0.30 - 0.31
Copa 1	2405 - 2700	0.21 - 0.31

In Breaksea Reef 1, high PI values between 3638-3677 m are coincident with a possible low grade oil leg within intraformational sands of the Belfast Mudstone. A resistivity anomaly over the interval 3664 and 3669 m provides further evidence of an oil/gas leg although no fluorescence was observed during the drilling of this zone.
Two distinct types of oil occur below 3275 m in Breaksea Reef 1 (McKirdy *et al.*, 1984). Two types of bitumen were also recorded, one with moderate fluorescence and low reflectance (< 0.2%) and the other with dull fluorescence and high reflectance (0.4 - 0.6%).

Within the Belfast Mudstone there are numerous overpressured intervals that are overlain by normally pressured shales giving rise to the fracturing of seal due to thermal expansion of pore fluids and hydrocarbons generation.
In the deeper parts of the Voluta Trough, expulsion rates should be more efficient due to higher levels of maturity and lower porosity values.

MATURITY MODELLING

Geohistory and maturation modelling of the Western Otway Basin has been undertaken using version 1.4b of WinBury*, a modular software program developed by PALTECH Pty Ltd.
A summary of the thermal history of each major structural province follows.

Penola Trough

The Penola Trough contains up to 8 km of sedimentary section. However, the deepest well in the area is Katnook 2 (TD 3478m). On seismic evidence, basement occurs at approximately 5380 m in Katnook 2 deepening to 6180 m in Ladbroke Grove 1. Estimates of maturity and burial history models of the basal Crayfish Group sequence in the deeper regions rely on extrapolation with wells that fully or partially penetrated this sequence on the flanks of the Penola Trough (eg. Sawpit 1 and Robertson 1).

Within the Penola Trough, 5 unconformities are recognised:

1/ Top Casterton Formation -slight ?angular unconformity. Amount of erosion unknown.
2/ Top Crayfish Group - widespread angular unconformity, more defined on the flanks of the

Penola Trough where up to 1 km of erosion is assumed (Hill *et al.*,1994).

3/ Top Eumeralla Formation - Break-up unconformity. Minimal erosion with only slight angularity observed.

4/ Top Sherbrook Group - nature of unconformity masked by condensed nature of Sherbrook Group. Minimal erosion.

5/ Top Wangerrip Group

Of these, only the Crayfish Unconformity is considered significant with respect to the thermal modelling of the region.
The heat flow model used for the Katnook region was based on a generalised heat flow curve for a rift basin with an exponentially increasing heat flow that peaked at the Top Crayfish Unconformity, remaining elevated during the sag-phase and then gradual cooling from continental break-up (~65 ma) until present day. The tectonic subsidence history of the Robe and Penola Troughs is detailed in Figure 23.
The thermal and burial history of the Katnook region, representing the deeper portion of the Penola Trough, are summarised in Table 6 and Figure 24. The Sawpit 1 well is used to represent the burial and thermal history of the northern flank of the Penola Trough (Table 7; Fig. 25). Migration pathways for the Penola Trough are illustrated in Figure 26.

Table 6. Hydrocarbon maturity - Katnook region

Formation	Vitrinite Reflectance	Maturity Window	Depth (m SS)
Lower Eumeralla Fm Windermere Sst Member Katnook Sst Laira Fm	0.5	Early- Mature (Oil)	~ 1700
Laira Fm	0.7	Mid-Mature (Oil)	~ 2300
Pretty Hill Fm	1.0	Late-Mature (Oil)	~ 3050
Basal Pretty Hill Fm Intra Pretty Hill Shale McEachern Sst Unnamed Basal Shale Casterton Fm	1.3	Main Gas Generation	~ 3800
Basal Casterton Fm	2.6	Overmature	~ 5200

Table 7. Hydrocarbon maturity - Sawpit region

Formation	Vitrinite Reflectance	Maturity Window	Depth (m SS)
Laira Fm Pretty Hill Fm	0.5	Early- Mature (Oil)	~ 1350
Basal Pretty Hill Fm Intra Pretty Hill shale McEachern Sst Unnamed basal shale Casterton Fm	0.7	Mid-Mature (Oil)	~ 1900

Robe Trough

Thermal and burial history of the Robe Trough is examined here in three parts. Information on the onshore portion is provided by wells that are largely located on regional highs (eg. Camelback 1, Lake Hawdon 1) where significant erosion (up to 1500 m) at the Top Crayfish Unconformity has occurred (Fig. xx). Offshore wells that have penetrated the Crayfish Group appear to have been less affected by this erosional event. For the offshore Robe, two areas are summarised: the Crayfish Platform and Chama Terrace.

Camelback region

This region incorporates Lucindale 1, Camelback 1 and Lake Hawdon wells, the latter two of which provide the deepest intersection. Approximately 1500 m of sediment has been eroded in Camelback 1 and 1250 m in Lake Hawdon 1 from the top of the Crayfish Group (Katnook Sandstone, Laira Formation and upper Pretty Hill Formation). The thermal and burial history of the region, is summarised in Table 8 and Figure 27.

Table 8. Hydrocarbon maturity - Camelback region

Formation	Vitrinite Reflectance	Maturity Window	Depth (m SS)
Pretty Hill Fm Unnamed basal shale	0.5	Early- Mature (Oil)	~ 1380

Crayfish Platform

The burial and thermal history of Crayfish A1 is used here as a summary for the Crayfish Platform which includes Trumpet 1 and Neptune 1 wells (Table 9; Fig. 28).

Table 9. Hydrocarbon maturity - Crayfish Platform

Formation	Vitrinite Reflectance	Maturity Window	Depth (m SS)
Lower Eumeralla Fm Katnook Sst Laira Fm	0.5	Early- Mature (Oil)	~ 1200
Upper Pretty Hill Fm	0.7	Mid-Mature (Oil)	~ 1900
Lower Pretty Hill Fm	1.0	Late-Mature (Oil)	~ 2900
Basal Pretty Hill Fm Intra Pretty Hill Shale McEachern Sst Unnamed Basal Shale Casterton Fm	1.3	Main Gas Generation	~ 3600

Chama Terrace

The thermal and burial history of the Chama Terrace is provided by Troas 1 which successfully tested the Eumeralla-sourced play concept of Tupper et al.(1993) and is summarised in Table 10 and Figure 29.

Table 10. Hydrocarbon maturity -Chama Terrace

Formation	Vitrinite Reflectance	Maturity Window	Depth (m SS)
Upper Eumeralla Fm	0.5	Early- Mature (Oil)	~ 1500
Lower Eumeralla Fm Undifferentiated Crayfish	0.7	Mid-Mature (Oil)	~ 2100
Undifferentiated Crayfish	1.0	Late-Mature (Oil)	~ 2650
Undifferentiated Crayfish	1.3	Main Gas Generation	~ 3000
Undifferentiated Crayfish	2.5	Overmature	~ 4350

Voluta Trough

Copa 1, Argonaut A1 and Breaksea Reef 1 are the only wells that have been drilled in the Voluta Trough in the western Otway Basin. The thermal and burial history of the Voluta Trough is based on the modelling of Breaksea Reef 1 well due to its considerable depth (4468 m). Results are summarised in Table 11 and Figure 30.

Table 11. Hydrocarbon maturity -Voluta Trough

Formation	Vitrinite Reflectance	Maturity Window	Depth (m SS)
Paarratte Fm	0.5	Early- Mature (Oil)	~ 2700
Paarratte Fm Belfast Mudstone	0.7	Mid-Mature (Oil)	~ 3500
Belfast Mudstone Flaxman Fm Waarre Sst Upper Eumeralla Fm	1.0	Late-Mature (Oil)	~ 4500
Upper Eumeralla Fm Lower Eumeralla Fm Windermere Sst Mbr Undifferentiated Crayfish	1.3	Main Gas Generation	~ 4900
Undifferentiated Crayfish	2.5	Overmature	~ 6000

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Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	797.05	Timboon Sst	2.06									11	46
Argonaut 1A	805.28	Timboon Sst	1.92	430								15	57
Argonaut 1A	805.59	Timboon Sst	2.06	424								9	67
Argonaut 1A	816.86	Timboon Sst	9.05	417	0.72	2.00	20.07	2.72	0.26	0.10	0.22	22	221
Argonaut 1A	847.34	Timboon Sst	11.60	419	0.68	2.41	18.91	3.09	0.22	0.13	0.25	20	163
Argonaut 1A	923.54	Timboon Sst	9.30	412	0.62	1.82	12.93	2.44	0.25	0.14	0.20	19	139
Argonaut 1A	981.46	Timboon Sst	5.10	393	2.94	2.94	12.07	5.88	0.50	0.24	0.49	57	236
Argonaut 1A	1033.27	Timboon Sst	2.12	416	0.20	0.36	2.71	0.56	0.36	0.13	0.04	16	127
Argonaut 1A	1051.56	Timboon Sst	1.45	423	0.25	0.38	1.76	0.63	0.40	0.22	0.05	26	121
Argonaut 1A	1136.90	Timboon Sst	0.08	368	0.14	0.13	0.27	0.27	0.52	0.48	0.02	162	337
Argonaut 1A	1274.06	Timboon Sst	0.06	270	0.09	0.03	0.31	0.12	0.75	0.10	0.01	50	516
Argonaut 1A	1305.15	Timboon Sst	1.44	358	0.07	0.21	0.87	0.28	0.25	0.24	0.02	15	60
Argonaut 1A	1392.94	Timboon Sst	0.09	280	0.07	0.05	0.33	0.12	0.58	0.15	0.01	55	366
Argonaut 1A	1453.90	Timboon Sst	1.17	420	0.18	0.35	2.24	0.53	0.34	0.16	0.04	29	191
Argonaut 1A	1472.18	Timboon Sst	1.11	427	0.21	0.33	2.80	0.54	0.39	0.12	0.04	29	252
Argonaut 1A	1472.18	Timboon Sst	2.57	432								9	31
Argonaut 1A	1474.32	Timboon Sst	1.78	382	0.02	0.22	1.19	0.24	0.08	0.18	0.02	12	67
Argonaut 1A	1545.34	Timboon Sst	0.30	382	0.11	0.10	0.49	0.21	0.52	0.20	0.01	33	163
Argonaut 1A	1566.67	Timboon Sst	0.24	370	0.13	0.09	0.73	0.22	0.59	0.12	0.01	37	304
Argonaut 1A	1627.63	Timboon Sst	0.56	324	0.15	0.24	0.97	0.39	0.38	0.25	0.03	42	173
Argonaut 1A	1638.30	Timboon Sst	4.17	426								6	36
Argonaut 1A	1639.52	Timboon Sst	0.58	292	0.01	0.05	0.52	0.06	0.17	0.10	0.00	9	90
Argonaut 1A	1716.02	Timboon Sst	0.20	280	0.19	0.15	0.49	0.34	0.56	0.31	0.02	75	245
Argonaut 1A	1761.74	Timboon Sst	1.07	366	0.35	0.26	1.77	0.61	0.57	0.15	0.05	24	165
Argonaut 1A	1801.37	Timboon Sst	0.12	306	0.11	0.09	0.67	0.20	0.55	0.13	0.01	75	558
Argonaut 1A	1805.64	Timboon Sst	0.84	315	0.01	0.06	0.61	0.07	0.14	0.10	0.00	7	73
Argonaut 1A	1853.18	Timboon Sst	0.32	343	0.10	0.08	1.35	0.18	0.56	0.06	0.01	25	421
Argonaut 1A	1981.20	Timboon Sst	0.92	428	0.69	1.52	2.81	2.21	0.31	0.54	0.18	165	305

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	2020.82	Timboon Sst	0.39	419	0.21	0.36	2.31	0.57	0.37	0.16	0.04	92	592
Argonaut 1A	2109.22	Timboon Sst	0.20	422	0.14	0.16	0.32	0.30	0.47	0.50	0.02	80	160
Argonaut 1A	2151.89	Timboon Sst	2.47									51	29
Argonaut 1A	2161.03	Timboon Sst	1.95	427	0.67	2.48	1.99	3.15	0.21	1.25	0.26	127	102
Argonaut 1A	2173.22	Timboon Sst	1.39	426	0.30	1.20	1.49	1.50	0.20	0.81	0.12	86	107
Argonaut 1A	2212.85	Timboon Sst	0.11	428	0.06	0.07	0.34	0.13	0.46	0.21	0.01	63	309
Argonaut 1A	2226.26	Timboon Sst	0.10	276	0.02	0.04	0.18	0.06	0.33	0.22	0.00	40	180
Argonaut 1A	2246.38	Timboon Sst	0.13	402	0.11	0.15	1.51	0.26	0.42	0.10	0.02	115	1161
Argonaut 1A	2304.29	Timboon Sst	0.46	353	0.11	0.15	1.25	0.26	0.42	0.12	0.02	32	271
Caroline 1	1250.90	Timboon Sst	1.80										
Mount Salt 1	1121.66	Timboon Sst	1.54	362	0.11	0.29	2.90	0.40	0.27	0.10	0.03	19	188
Mount Salt 1	1127.76	Timboon Sst	2.07	424								28	46
Mount Salt 1	1217.07	Timboon Sst	2.15									46	53
Mount Salt 1	1217.37	Timboon Sst	2.36	436	0.04	0.96	3.43	1.00	0.04	0.28	0.08	41	145
Mount Salt 1	1286.26	Timboon Sst	1.80	420	0.08	0.51	2.13	0.59	0.14	0.24	0.04	28	118
Mount Salt 1	1287.78	Timboon Sst	5.84	448								27	25
Mount Salt 1	1383.79	Timboon Sst	0.47	377	0.03	0.07	3.83	0.10	0.30	0.02	0.00	15	815
Mount Salt 1	1460.60	Timboon Sst	2.44	445								23	54
Mount Salt 1	1461.52	Timboon Sst	2.62	421	0.05	0.20	6.68	0.25	0.20	0.03	0.02	8	255
Mount Salt 1	1506.93	Timboon Sst	0.65	357	0.01	0.05	1.89	0.06	0.17	0.03	0.00	8	291
Mount Salt 1	1508.76	Timboon Sst	1.99	427	0.11	0.24	2.57	0.35	0.31	0.09	0.02	12	129
Mount Salt 1	1536.19	Timboon Sst	1.86	369	0.09	0.24	2.01	0.33	0.27	0.12	0.02	13	108
Mount Salt 1	1583.44	Timboon Sst	1.59	344	0.08	0.29	1.84	0.37	0.22	0.16	0.03	18	116
Mount Salt 1	1679.45	Timboon Sst	0.84	299	0.08	0.18	1.14	0.26	0.31	0.16	0.02	21	136
Mount Salt 1	1722.12	Timboon Sst	1.92	446								17	76
Mount Salt 1	1764.79	Timboon Sst	0.96	335	0.08	0.26	0.78	0.34	0.24	0.33	0.02	27	81
Mount Salt 1	1860.80	Timboon Sst	0.15	276	0.03	0.02	0.33	0.05	0.60	0.06	0.00	13	220
Mount Salt 1	1889.76	Timboon Sst	2.40	442								22	26

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Mount Salt 1	1926.34	Timboon Sst	2.14	442								17	29
Mount Salt 1	1950.72	Timboon Sst	0.83	367	0.10	0.23	0.89	0.33	0.30	0.26	0.02	28	107
Mount Salt 1	2036.06	Timboon Sst	0.03	276	0.01	0.00	1.07	0.01	1.00	0.00	0.00	0	3567
Mount Salt 1	2042.16	Timboon Sst	0.49	382	0.04	0.07	0.63	0.11	0.36	0.11	0.00	14	129
Mount Salt 1	2084.83	Timboon Sst	1.85	444								29	34
Mount Salt 1	2191.51	Timboon Sst	2.17	442								20	22
Mount Salt 1	2228.09	Timboon Sst	2.07	446								23	19

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	2374.39	Paaratte Fm	5.73	430								37	17
Argonaut 1A	2377.44	Paaratte Fm	2.44	425	0.45	1.06	1.88	1.51	0.30	0.56	0.12	43	77
Argonaut 1A	2429.26	Paaratte Fm	0.89	460	0.17	0.35	3.80	0.52	0.33	0.09	0.04	39	426
Argonaut 1A	2447.54	Paaratte Fm	0.69	442	0.14	0.26	2.80	0.40	0.35	0.09	0.03	37	405
Argonaut 1A	2475.28	Paaratte Fm	0.22	307	0.01	0.03	0.17	0.04	0.25	0.18	0.00	14	77
Argonaut 1A	2508.50	Paaratte Fm	0.54	428	0.07	0.20	1.11	0.27	0.26	0.18	0.02	37	205
Argonaut 1A	2538.98	Paaratte Fm	3.30	437								41	22
Argonaut 1A	2548.13	Paaratte Fm	0.37	476	0.11	0.21	3.00	0.32	0.34	0.07	0.02	57	811
Argonaut 1A	2578.61	Paaratte Fm	0.90	430	0.26	1.08	3.81	1.34	0.19	0.28	0.11	120	423
Argonaut 1A	2581.66	Paaratte Fm	2.38	437								22	34
Argonaut 1A	2590.80	Paaratte Fm	0.58	448	0.13	0.24	2.23	0.37	0.35	0.11	0.03	43	398
Argonaut 1A	2627.38	Paaratte Fm	1.39	435	0.17	0.41	3.12	0.58	0.29	0.13	0.04	29	224
Argonaut 1A	2627.38	Paaratte Fm	2.40	435								31	24
Argonaut 1A	2636.52	Paaratte Fm	1.15	443	0.09	0.19	3.72	0.28	0.32	0.05	0.02	17	323
Argonaut 1A	2651.76	Paaratte Fm	1.68	435	0.17	0.65	1.85	0.82	0.21	0.35	0.06	39	110
Argonaut 1A	2667.00	Paaratte Fm	1.19	435	0.18	0.50	1.48	0.68	0.26	0.34	0.05	42	124
Argonaut 1A	2670.05	Paaratte Fm	2.48	437								39	17
Argonaut 1A	2691.38	Paaratte Fm	0.99	445	0.12	0.19	1.56	0.31	0.39	0.12	0.02	19	158

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	2724.91	Paaratte Fm	0.44	435	0.13	0.23	0.78	0.36	0.36	0.29	0.03	52	177
Argonaut 1A	2727.96	Paaratte Fm	0.73										
Argonaut 1A	2733.45	Paaratte Fm	2.20	433	0.01	0.82	0.51	0.83	0.01	1.61	0.06	37	23
Argonaut 1A	2773.68	Paaratte Fm	1.09	435								24	26
Argonaut 1A	2779.78	Paaratte Fm	1.55	442	0.13	0.23	1.38	0.36	0.36	0.17	0.03	15	89
Argonaut 1A	2813.30	Paaratte Fm	3.12	432	0.34	1.69	1.54	2.03	0.17	1.10	0.16	54	49
Argonaut 1A	2825.50	Paaratte Fm	1.04	445	0.11	0.17	1.88	0.28	0.39	0.09	0.02	16	181
Argonaut 1A	2828.54	Paaratte Fm	3.03	439								25	24
Argonaut 1A	2874.26	Paaratte Fm	1.65	423	0.49	1.61	0.99	2.10	0.23	1.63	0.17	98	60
Argonaut 1A	2877.31	Paaratte Fm	1.99										
Argonaut 1A	2913.89	Paaratte Fm	1.68	428	0.32	1.09	0.93	1.41	0.23	1.17	0.11	65	55
Argonaut 1A	2932.18	Paaratte Fm	1.39	430								56	23
Argonaut 1A	2941.32	Paaratte Fm	1.20	429	0.16	0.37	1.24	0.53	0.30	0.30	0.04	31	103
Argonaut 1A	2965.70	Paaratte Fm	1.21										
Argonaut 1A	2968.75	Paaratte Fm	1.25	425	0.20	0.75	1.32	0.95	0.21	0.57	0.07	60	106
Argonaut 1A	2990.09	Paaratte Fm	1.68	425	0.20	0.85	1.58	1.05	0.19	0.54	0.08	51	94
Argonaut 1A	2999.23	Paaratte Fm	2.02	438	0.15	0.51	2.03	0.66	0.23	0.25	0.05	25	100
Argonaut 1A	2999.23	Paaratte Fm	1.39	433								33	30
Argonaut 1A	3026.66	Paaratte Fm	1.45	434	0.20	0.61	1.34	0.81	0.25	0.46	0.06	42	92
Argonaut 1A	3032.76	Paaratte Fm	1.16										
Argonaut 1A	3040.08	Paaratte Fm	1.70	431	0.03	0.43	0.29	0.46	0.07	1.48	0.03	25	17
Argonaut 1A	3048.00	Paaratte Fm	1.34	431	0.25	0.88	0.81	1.13	0.22	1.09	0.09	66	60
Argonaut 1A	3057.14	Paaratte Fm	1.35	429	0.36	1.25	1.00	1.61	0.22	1.25	0.13	93	74
Caroline 1	1840.99	Paaratte Fm	1.74	440								24	19
Caroline 1	1898.90	Paaratte Fm	2.57	444								19	15
Caroline 1	1950.72	Paaratte Fm	1.72	445								21	24
Caroline 1	2014.73	Paaratte Fm	1.61	448								31	30
Caroline 1	2045.21	Paaratte Fm	2.54	446								23	21

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Caroline 1	2075.69	Paaratte Fm	1.55	437								17	25
Caroline 1	2161.03	Paaratte Fm	1.81	440								30	23
Lake Bonney 1	1889.76	Paaratte Fm	5.65	435								84	44
Lake Bonney 1	1923.29	Paaratte Fm	3.72	439								61	40
Lake Bonney 1	1962.91	Paaratte Fm	2.68	442								37	44
Lake Bonney 1	2002.54	Paaratte Fm	3.57	440								54	62
Lake Bonney 1	2069.59	Paaratte Fm	2.11	443								31	42
Lake Bonney 1	2142.74	Paaratte Fm	2.39	438								29	33
Mount Salt 1	2276.86	Paaratte Fm	0.25	276	0.04	0.02	0.18	0.06	0.67	0.11	0.00	8	72
Mount Salt 1	2279.90	Paaratte Fm	1.75	445								20	21
Mount Salt 1	2313.43	Paaratte Fm	2.13	449								20	21
Mount Salt 1	2346.96	Paaratte Fm	2.18	447								23	19
Mount Salt 1	2380.49	Paaratte Fm	1.87	444								16	22
Mount Salt 1	2419.20	Paaratte Fm	2.12	422	0.07	0.31	1.70	0.38	0.18	0.18	0.03	15	80
Mount Salt 1	2419.50	Paaratte Fm	2.14	436								19	27
Mount Salt 1	2420.11	Paaratte Fm	2.53	445								18	14
Mount Salt 1	2420.11	Paaratte Fm	2.82	438								13	9
Mount Salt 1	2421.33	Paaratte Fm	2.38	445								16	11
Mount Salt 1	2421.64	Paaratte Fm	1.75	432	0.02	0.30	0.52	0.32	0.06	0.58	0.02	17	30
Mount Salt 1	2493.26	Paaratte Fm	3.05	448								20	18
Mount Salt 1	2529.84	Paaratte Fm	3.37	449								19	16
Mount Salt 1	2569.46	Paaratte Fm	2.14	437	0.05	0.83	0.84	0.88	0.06	0.99	0.07	39	39
Mount Salt 1	2570.07	Paaratte Fm	2.78	442								22	21
Mount Salt 1	2602.38	Paaratte Fm	3.01	442								21	22
Mount Salt 1	2633.47	Paaratte Fm	1.55	444								24	25
Mount Salt 1	2670.05	Paaratte Fm	1.04	444								25	31
Mount Salt 1	2703.58	Paaratte Fm	1.22	445								25	18
Mount Salt 1	2720.34	Paaratte Fm	0.35	443	0.01	0.05	0.22	0.06	0.17	0.23	0.00	14	63

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Mount Salt 1	2801.11	Paaratte Fm	1.40	447								37	24
Mount Salt 1	2843.78	Paaratte Fm	1.62	442								35	18
Mount Salt 1	2872.74	Paaratte Fm	1.01	429	0.03	0.26	0.38	0.29	0.10	0.68	0.02	26	38
Mount Salt 1	2875.79	Paaratte Fm	1.30	443								40	23
Mount Salt 1	2972.71	Paaratte Fm	1.13	445								56	31
Mount Salt 1	2997.40	Paaratte Fm	1.43	435	0.05	0.51	0.28	0.56	0.09	1.82	0.04	36	20
Mount Salt 1	3001.98	Paaratte Fm	2.21	443								22	5
Mount Salt 1	3002.58	Paaratte Fm	1.49	444								42	8
Mount Salt 1	3004.72	Paaratte Fm	2.12	443								34	21
Mount Salt 1	3005.33	Paaratte Fm	0.89	428	0.06	0.30	0.03	0.36	0.17	10.00	0.03	34	3
Mount Salt 1	3035.81	Paaratte Fm	1.39	444								36	14
Mount Salt 1	3058.06	Paaratte Fm	1.08	442								25	18
Mount Salt 1	3058.67	Paaratte Fm	1.53	437	0.02	0.42	0.15	0.44	0.05	2.80	0.03	27	10
Mount Salt 1	3059.28	Paaratte Fm	1.17	447								24	12

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	3066.29	Belfast Mdst	1.12	440	0.19	0.30	1.60	0.49	0.39	0.19	0.04	27	143
Argonaut 1A	3066.29	Belfast Mdst	1.17	429								30	26
Argonaut 1A	3105.91	Belfast Mdst	0.80										
Argonaut 1A	3130.30	Belfast Mdst	0.79	430	0.11	0.19	0.98	0.30	0.37	0.19	0.02	24	124
Argonaut 1A	3139.44	Belfast Mdst	0.71	377	0.12	0.28	0.69	0.40	0.30	0.41	0.03	39	97
Argonaut 1A	3139.44	Belfast Mdst	0.91	436								51	29
Argonaut 1A	3148.58	Belfast Mdst	0.90	420	0.19	0.47	1.05	0.66	0.29	0.45	0.05	52	117
Argonaut 1A	3163.82	Belfast Mdst	0.94	426	0.41	0.96	1.74	1.37	0.30	0.55	0.11	102	185
Argonaut 1A	3172.97	Belfast Mdst	0.95	440								21	32
Argonaut 1A	3179.06	Belfast Mdst	0.71	438	0.11	0.15	1.10	0.26	0.42	0.14	0.02	21	155
Argonaut 1A	3188.21	Belfast Mdst	1.16	434	0.22	0.89	1.39	1.11	0.20	0.64	0.09	76	120
Argonaut 1A	3198.27	Belfast Mdst	0.74	437								35	36

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	3200.40	Belfast Mdst	0.82	433	0.20	0.49	1.04	0.69	0.29	0.47	0.05	60	127
Argonaut 1A	3206.50	Belfast Mdst	1.00	438								40	31
Argonaut 1A	3209.54	Belfast Mdst	0.91	430	0.23	0.40	1.33	0.63	0.37	0.30	0.05	44	146
Argonaut 1A	3224.78	Belfast Mdst	1.20	433	0.22	0.64	1.48	0.86	0.26	0.43	0.07	53	123
Argonaut 1A	3230.88	Belfast Mdst	1.19	432	0.23	0.52	1.79	0.75	0.31	0.29	0.06	44	150
Argonaut 1A	3240.02	Belfast Mdst	0.87	442								24	41
Argonaut 1A	3243.07	Belfast Mdst	0.84	409	0.11	0.15	1.70	0.26	0.42	0.09	0.02	18	202
Argonaut 1A	3252.22	Belfast Mdst	0.95	330	0.12	0.16	1.55	0.28	0.43	0.10	0.02	17	163
Argonaut 1A	3261.36	Belfast Mdst	0.96	317	0.13	0.19	1.76	0.32	0.41	0.11	0.02	20	183
Argonaut 1A	3273.55	Belfast Mdst	0.94	433	0.18	0.34	1.74	0.52	0.35	0.20	0.04	36	185
Argonaut 1A	3273.55	Belfast Mdst	0.86	445								31	34
Argonaut 1A	3285.74	Belfast Mdst	0.98	429	0.19	0.32	1.46	0.51	0.37	0.22	0.04	33	149
Argonaut 1A	3294.89	Belfast Mdst	1.03	430	0.18	0.43	1.45	0.61	0.30	0.30	0.05	42	141
Argonaut 1A	3300.98	Belfast Mdst	0.93	439	0.13	0.25	1.86	0.38	0.34	0.13	0.03	27	200
Argonaut 1A	3304.03	Belfast Mdst	0.94									38	30
Argonaut 1A	3307.08	Belfast Mdst	0.83	338	0.16	0.23	1.64	0.39	0.41	0.14	0.03	28	198
Argonaut 1A	3331.46	Belfast Mdst	0.96	358	0.18	0.31	1.75	0.49	0.37	0.18	0.04	32	182
Argonaut 1A	3337.56	Belfast Mdst	0.98	441								37	57
Argonaut 1A	3340.61	Belfast Mdst	1.31	422	0.50	1.95	1.58	2.45	0.20	1.23	0.20	149	121
Argonaut 1A	3355.85	Belfast Mdst	1.07	431	0.23	0.66	1.44	0.89	0.26	0.46	0.07	62	135
Argonaut 1A	3374.14	Belfast Mdst	1.02	434	0.16	0.53	1.47	0.69	0.23	0.36	0.05	52	144
Argonaut 1A	3374.14	Belfast Mdst	0.97	436								31	29
Argonaut 1A	3392.42	Belfast Mdst	0.84	445	0.15	0.10	2.46	0.25	0.60	0.04	0.02	21	293
Argonaut 1A	3404.62	Belfast Mdst	1.04	431	0.16	0.46	1.63	0.62	0.26	0.28	0.05	44	157
Argonaut 1A	3407.66	Belfast Mdst	0.93	438								33	24
Argonaut 1A	3419.86	Belfast Mdst	0.90	437	0.17	0.38	1.87	0.55	0.31	0.20	0.04	42	208
Argonaut 1A	3432.05	Belfast Mdst	0.86	382	0.13	0.17	1.98	0.30	0.43	0.09	0.02	20	230
Argonaut 1A	3441.19	Belfast Mdst	0.94	439								24	27

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	3444.24	Belfast Mdst	1.01	432	0.18	0.20	1.70	0.38	0.47	0.12	0.03	20	168
Argonaut 1A	3449.73	Belfast Mdst	1.02	439								39	13
Argonaut 1A	3450.34	Belfast Mdst	1.10	440	0.01	0.35	0.20	0.36	0.03	1.75	0.03	32	18
Argonaut 1A	3471.67	Belfast Mdst	1.00	434	0.18	0.39	1.66	0.57	0.32	0.23	0.04	39	166
Argonaut 1A	3480.82	Belfast Mdst	0.94	440								31	21
Argonaut 1A	3493.01	Belfast Mdst	0.95	438	0.19	0.30	1.38	0.49	0.39	0.22	0.04	32	145
Argonaut 1A	3517.39	Belfast Mdst	0.82	441								37	26
Argonaut 1A	3520.44	Belfast Mdst	0.89	368	0.18	0.22	1.77	0.40	0.45	0.12	0.03	25	199
Argonaut 1A	3526.54	Belfast Mdst	0.91	435	0.24	0.45	1.79	0.69	0.35	0.25	0.05	49	197
Caroline 1	2161.03	Belfast Mdst	1.81	440								30	23
Caroline 1	2167.13	Belfast Mdst	1.07	434								27	48
Caroline 1	2197.61	Belfast Mdst	1.87	433								46	24
Caroline 1	2228.09	Belfast Mdst	1.02	438								46	67
Caroline 1	2258.57	Belfast Mdst	1.89	434								47	18
Caroline 1	2316.48	Belfast Mdst	2.12	438								52	21
Caroline 1	2380.49	Belfast Mdst	0.86	447								43	43
Caroline 1	2410.97	Belfast Mdst	0.92	447								35	38
Lake Bonney 1	2401.82	Belfast Mdst	2.74	440								43	44
Lake Bonney 1	2432.30	Belfast Mdst	2.36	442								39	36
Lake Bonney 1	2514.60	Belfast Mdst	2.48	440								52	30

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	3557.02	Flaxman Fm	0.93	436	0.14	0.47	0.67	0.61	0.23	0.70	0.05	51	72
Argonaut 1A	3566.16	Flaxman Fm	0.91	434	0.19	0.46	1.36	0.65	0.29	0.34	0.05	51	149
Argonaut 1A	3569.21	Flaxman Fm	1.06	443								34	21
Argonaut 1A	3590.54	Flaxman Fm	0.93	434	0.21	0.37	1.34	0.58	0.36	0.28	0.04	40	144
Argonaut 1A	3599.69	Flaxman Fm	0.93	407	0.18	0.30	1.56	0.48	0.37	0.19	0.04	32	168
Argonaut 1A	3605.78	Flaxman Fm	0.83	444								42	18

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	3608.83	Flaxman Fm	0.94	438	0.18	0.40	1.41	0.58	0.31	0.28	0.04	43	150
Argonaut 1A	3621.02	Flaxman Fm	0.92	434	0.17	0.44	1.37	0.61	0.28	0.32	0.05	48	149
Argonaut 1A	3627.12	Flaxman Fm	0.91	435	0.22	0.58	1.31	0.80	0.27	0.44	0.06	64	144
Caroline 1	2474.98	Flaxman Fm	2.04	436								45	20
Caroline 1	2505.46	Flaxman Fm	3.04	439								56	17
Caroline 1	2618.23	Flaxman Fm	2.72	438								52	17
Caroline 1	2654.81	Flaxman Fm	1.05									43	34
Caroline 1	2685.29	Flaxman Fm	1.21	448								44	37
Caroline 1	2715.77	Flaxman Fm	1.52	440								49	23
Caroline 1	2779.78	Flaxman Fm	1.95	441								46	21
Lake Bonney 1	2557.27	Flaxman Fm	1.63	438								48	22
Lake Bonney 1	2606.04	Flaxman Fm	1.67	442								43	20
Lake Bonney 1	2667.00	Flaxman Fm	3.74	438								136	13
Lake Bonney 1	2703.58	Flaxman Fm	1.63	449								44	27
Lake Bonney 1	2715.77	Flaxman Fm	3.25	441								79	26
Lake Bonney 1	2719.73	Flaxman Fm	0.90	442								29	19

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Argonaut 1A	3639.31	Waarre Sst	0.97	430	0.14	0.49	1.24	0.63	0.22	0.40	0.05	0.51	128
Argonaut 1A	3651.50	Waarre Sst	1.15	431	0.20	0.88	1.34	1.08	0.19	0.66	0.09	77	117
Argonaut 1A	3663.70	Waarre Sst	1.12	429	0.22	0.85	0.92	1.07	0.21	0.92	0.08	76	82
Argonaut 1A	3666.74	Waarre Sst	1.14	441								37	21
Argonaut 1A	3675.89	Waarre Sst	0.99	431	0.09	0.42	1.00	0.51	0.18	0.42	0.04	42	101
Argonaut 1A	3688.08	Waarre Sst	0.98	434	0.13	0.68	0.83	0.81	0.16	0.82	0.06	69	85
Argonaut 1A	3700.88	Waarre Sst	0.12	448	0.01	0.00	0.81	0.01	1.00	0.00	0.00	0	675
Argonaut 1A	3704.23	Waarre Sst	0.86	438								43	41
Caroline 1	2840.74	Waarre Sst	1.97	440								63	19

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Chama 1A	481.58	Sherbrook	2.32	403	0.39	0.81	9.15	1.20	0.32	0.09	0.10	34	394
Chama 1A	640.08	Sherbrook	0.17	434	0.16	0.08	2.50	0.24	0.67	0.03	0.02	47	1470
Chama 1A	682.75	Sherbrook	0.13	367	0.20	0.10	1.17	0.30	0.67	0.09	0.02	76	900
Geltwood Beach	709.57	Sherbrook	3.31	435								22	65
Geltwood Beach	903.73	Sherbrook	2.49									34	4
Geltwood Beach	1011.02	Sherbrook	5.07	426								28	45
Geltwood Beach	1161.29	Sherbrook	2.33									30	75
Kalangadoo 1	764.70	Sherbrook	1.80										
Katnook 1	477.01	Sherbrook	1.05	445	0.11	0.74	0.68	0.85	0.13	1.09	0.07	70	65
Katnook 1	484.63	Sherbrook	1.15	436	0.12	0.83	0.73	0.95	0.13	1.14	0.07	72	63
Katnook 1	487.68	Sherbrook	1.58	436	0.14	2.39	0.81	2.53	0.06	2.95	0.21	151	51
Katnook 1	504.44	Sherbrook	0.85	436	0.14	1.01	0.51	1.15	0.12	1.98	0.09	119	60
Katnook 1	505.97	Sherbrook	0.89	437	0.12	1.24	0.62	1.36	0.09	2.00	0.11	139	70
Katnook 1	507.49	Sherbrook	1.52	435	0.20	2.82	0.60	3.02	0.07	4.70	0.25	186	39
Katnook 1	509.02	Sherbrook	2.35	436	0.20	4.12	0.54	4.32	0.05	7.63	0.36	175	23
Katnook 1	510.54	Sherbrook	8.05	431	0.54	21.35	1.09	21.89	0.02	19.59	1.82	265	14
Katnook 1	522.73	Sherbrook	1.10	438	0.10	1.18	0.21	1.28	0.08	5.62	0.10	107	19
Katnook 1	531.88	Sherbrook	2.85	432	0.20	5.28	1.04	5.48	0.04	5.08	0.45	185	36
Katnook 1	547.12	Sherbrook	8.25	431	0.35	17.71	0.69	18.06	0.02	25.67	1.50	215	8
Katnook 1	557.78	Sherbrook	3.60	434	0.20	5.47	1.35	5.67	0.04	4.05	0.47	152	38
Ladbroke Grove	610.21	Sherbrook	0.72	435	0.08	0.66	0.83	0.74	0.11	0.80	0.06	91	115
Ladbroke Grove	641.91	Sherbrook	3.15	430	0.31	6.31	0.77	6.62	0.05	8.19	0.55	200	24
Ladbroke Grove	642.21	Sherbrook	0.76	437	0.13	0.95	0.88	1.08	0.12	1.08	0.09	125	115
Ladbroke Grove	645.57	Sherbrook	2.30	433	0.17	2.79	0.95	2.96	0.06	2.94	0.24	121	41
Ladbroke Grove	646.18	Sherbrook	2.00	433	0.14	2.03	0.81	2.17	0.06	2.51	0.18	101	40

Late Cretaceous: Sherbrook Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Ladbroke Grove	671.17	Sherbrook	0.59	443	0.12	0.37	0.38	0.49	0.24	0.97	0.04	62	64
Ladbroke Grove	700.00	Sherbrook	1.02	427	0.09	0.27	1.27	0.36	0.25	0.21	0.03	26	124
Ladbroke Grove	700.13	Sherbrook	0.81	440	0.15	0.64	0.69	0.79	0.19	0.93	0.06	79	85

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Greenways 1	1360.00	Katnook Sst	0.34	444	0.01	0.05	0.65	0.06	0.17	0.08	0.00	14	191
Katnook 1	1905.00	Katnook Sst	0.52	425	0.09	0.38	0.66	0.47	0.19	0.58	0.03	73	127
Katnook 1	1935.00	Katnook Sst	0.79	437	0.15	0.76	0.66	0.91	0.16	1.15	0.07	96	84
Katnook 3	1900.00	Katnook Sst	0.41	436	0.08	0.47	0.08	0.55	0.15	5.87	0.04	114	19
Reedy Creek 1	1713.50	Katnook Sst	1.32	436	0.60	1.12	0.30	1.72	0.35	3.73	0.14	85	23
Reedy Creek 1	1754.00	Katnook Sst	1.07	399	0.24	0.70	0.40	0.94	0.26	1.75	0.08	65	37
Reedy Creek 1	1800.00	Katnook Sst	0.51	355	0.15	0.13	0.39	0.28	0.54	0.33	0.02	25	76
Reedy Creek 1	1879.00	Katnook Sst	0.64	412	1.28	0.51	0.41	1.79	0.72	1.24	0.15	80	64
Reedy Creek 1	1906.00	Katnook Sst	0.49	429	0.32	0.13	0.44	0.45	0.71	0.30	0.04	27	90
Reedy Creek 1	1918.00	Katnook Sst	0.16	341	0.10	0.11	0.68	0.21	0.48	0.16	0.02	69	425
Trumpet 1	1338.07	Katnook Sst	0.17	432	0.07	0.04	0.12	0.11	0.64	0.33	0.00	24	71
Trumpet 1	1350.26	Katnook Sst	0.09	362	0.05	0.07	0.11	0.12	0.42	0.64	0.01	78	122
Trumpet 1	1362.46	Katnook Sst	0.12	321	0.05	0.04	0.02	0.09	0.56	2.00	0.00	33	17
Trumpet 1	1380.74	Katnook Sst	0.14	367	0.07	0.08	0.07	0.15	0.47	1.14	0.01	57	50
Trumpet 1	1386.84	Katnook Sst	0.15	438	0.20	0.55	0.46	0.75	0.27	1.20	0.06	367	307
Trumpet 1	1411.22	Katnook Sst	1.23	437	0.11	0.83	0.77	0.94	0.12	1.08	0.07	67	63
Trumpet 1	1423.42	Katnook Sst	0.48	451	0.12	0.13	0.60	0.25	0.48	0.22	0.02	27	125
Trumpet 1	1441.70	Katnook Sst	0.71	436	0.12	0.41	0.38	0.53	0.23	1.08	0.04	58	54
Trumpet 1	1447.80	Katnook Sst	0.51	384	0.06	0.11	0.48	0.17	0.35	0.23	0.01	22	94
Trumpet 1	1456.94	Katnook Sst	0.60	434	0.16	0.37	0.42	0.53	0.30	0.88	0.04	62	70
Trumpet 1	1472.18	Katnook Sst	0.59	435	0.15	0.39	0.44	0.54	0.28	0.89	0.04	66	75
Trumpet 1	1487.42	Katnook Sst	0.73	440	0.17	0.53	0.45	0.70	0.24	1.18	0.05	73	62
Trumpet 1	1502.66	Katnook Sst	0.85	441	0.20	0.61	0.50	0.81	0.25	1.22	0.06	72	59
Trumpet 1	1517.90	Katnook Sst	0.73	441	0.11	0.33	0.70	0.44	0.25	0.47	0.03	45	96
Trumpet 1	1533.14	Katnook Sst	1.24	440	0.16	0.81	0.49	0.97	0.16	1.65	0.08	65	40
Trumpet 1	1548.38	Katnook Sst	0.69	427	0.08	0.40	0.35	0.48	0.17	1.14	0.04	58	51
Trumpet 1	1563.62	Katnook Sst	0.73	441	0.11	0.51	0.32	0.62	0.18	1.59	0.05	70	44
Trumpet 1	1578.86	Katnook Sst	0.54	443	0.10	0.17	0.20	0.27	0.37	0.85	0.02	31	37

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Trumpet 1	1594.10	Katnook Sst	0.61	439	0.12	0.30	0.22	0.42	0.29	1.36	0.03	49	36
Trumpet 1	1609.34	Katnook Sst	0.34	453	0.09	0.09	0.16	0.18	0.50	0.56	0.01	26	47
Trumpet 1	1624.58	Katnook Sst	0.30	380	0.11	0.10	0.42	0.21	0.52	0.24	0.01	33	140
Trumpet 1	1639.82	Katnook Sst	0.74	440	0.21	0.50	0.21	0.71	0.30	2.38	0.05	68	28
Trumpet 1	1655.06	Katnook Sst	0.45	379	0.18	0.37	0.45	0.55	0.33	0.82	0.04	82	100
Trumpet 1	1670.30	Katnook Sst	1.00	436	0.12	0.52	0.38	0.64	0.19	1.37	0.05	52	38
Trumpet 1	1685.54	Katnook Sst	0.71	439	0.12	0.28	0.35	0.40	0.30	0.80	0.03	39	49
Trumpet 1	1700.78	Katnook Sst	0.81	443	0.17	0.51	0.27	0.68	0.25	1.89	0.05	63	33
Trumpet 1	1716.02	Katnook Sst	0.56	378	0.17	0.23	0.36	0.40	0.42	0.64	0.03	41	64
Trumpet 1	1731.26	Katnook Sst	1.10	451	0.21	0.60	0.46	0.81	0.26	1.30	0.06	55	42
Trumpet 1	1746.50	Katnook Sst	0.44	450	0.20	0.61	0.53	0.81	0.25	1.15	0.06	139	120
Trumpet 1	1761.74	Katnook Sst	0.63	408	0.12	0.37	0.37	0.49	0.24	1.00	0.04	59	59
Trumpet 1	1776.98	Katnook Sst	1.06	442	0.21	1.08	0.61	1.29	0.16	1.77	0.10	102	58
Trumpet 1	1792.22	Katnook Sst	0.85	442	0.17	0.52	0.46	0.69	0.25	1.13	0.05	61	54
Trumpet 1	1807.46	Katnook Sst	0.86	441	0.08	0.36	0.44	0.44	0.18	0.82	0.03	42	44
Trumpet 1	1822.70	Katnook Sst	0.73	442	0.09	0.36	0.28	0.45	0.20	1.29	0.03	49	38
Trumpet 1	1837.94	Katnook Sst	0.58	455	0.07	0.21	0.27	0.28	0.25	0.78	0.02	36	47
Trumpet 1	1853.18	Katnook Sst	0.56	371	0.14	0.22	0.34	0.36	0.39	0.65	0.03	39	61
Trumpet 1	1868.42	Katnook Sst	0.70	343	0.14	0.19	0.49	0.33	0.42	0.39	0.02	27	70
Trumpet 1	1883.66	Katnook Sst	0.92	449	0.14	0.40	0.77	0.54	0.26	0.52	0.04	43	84
Trumpet 1	1898.90	Katnook Sst	0.66	442	0.07	0.44	0.59	0.51	0.14	0.75	0.04	67	89
Trumpet 1	1914.14	Katnook Sst	0.71	436	0.04	0.27	0.67	0.31	0.13	0.40	0.02	38	94

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Bool Lagoon 1	670.56	Laira Fm	0.76	418	0.22	0.58	1.41	0.80	0.27	0.41	0.06	76	185
Bool Lagoon 1	688.85	Laira Fm	1.16	426	0.20	0.79	2.69	0.99	0.20	0.29	0.08	68	231
Bool Lagoon 1	710.18	Laira Fm	0.75	426	0.35	1.00	3.14	1.35	0.26	0.32	0.11	133	418
Bool Lagoon 1	731.52	Laira Fm	0.31	436	0.10	1.23	2.17	1.33	0.08	0.57	0.11	396	700

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Bool Lagoon 1	758.95	Laira Fm	0.33										
Chama 1A	2627.38	Laira Fm	1.60	440	0.43	1.63	1.36	2.06	0.21	1.20	0.17	101	85
Chama 1A	2633.47	Laira Fm	1.51	443	0.29	1.13	2.28	1.42	0.20	0.50	0.11	74	150
Chama 1A	2642.62	Laira Fm	1.31	444								63	12
Chama 1A	2660.90	Laira Fm	4.65	436	1.09	7.24	0.78	8.33	0.13	9.28	0.69	155	16
Chama 1A	2670.05	Laira Fm	1.30	443	0.35	1.20	1.11	1.55	0.23	1.08	0.12	92	85
Chama 1A	2676.14	Laira Fm	1.37	439								96	13
Chama 1A	2679.19	Laira Fm	1.90	442	0.41	1.92	1.28	2.33	0.18	1.50	0.19	101	67
Chama 1A	2691.38	Laira Fm	2.08	439	0.44	2.20	1.19	2.64	0.17	1.85	0.22	105	57
Chama 1A	2700.53	Laira Fm	1.64	443	0.32	1.35	1.70	1.67	0.19	0.79	0.13	82	103
Chama 1A	2709.67	Laira Fm	3.92	434	1.09	6.20	0.81	7.29	0.15	7.65	0.60	158	29
Chama 1A	2709.67	Laira Fm	0.63	447								80	18
Chama 1A	2718.82	Laira Fm	1.26	438	0.48	1.35	1.39	1.83	0.26	0.97	0.15	107	110
Chama 1A	2727.96	Laira Fm	0.84	444	0.29	0.78	1.47	1.07	0.27	0.53	0.08	92	175
Chama 1A	2737.10	Laira Fm	1.07	442	0.32	1.00	1.63	1.32	0.24	0.61	0.11	93	152
Chama 1A	2746.86	Laira Fm	0.18										
Chama 1A	2747.77	Laira Fm	0.43										
Greenways 1	1390.00	Laira Fm	0.44	392	0.09	0.23	0.94	0.32	0.28	0.24	0.02	52	213
Greenways 1	1414.00	Laira Fm	0.67	429	0.13	0.43	0.89	0.56	0.23	0.48	0.04	64	132
Greenways 1	1441.00	Laira Fm	1.54	440	0.12	3.69	0.72	3.81	0.03	5.12	0.31	239	46
Greenways 1	1450.00	Laira Fm	0.66	433	0.05	0.47	0.59	0.52	0.10	0.80	0.04	71	89
Greenways 1	1459.00	Laira Fm	0.97	438	0.06	0.80	0.53	0.86	0.07	1.51	0.07	82	54
Greenways 1	1480.00	Laira Fm	0.57	436	0.11	0.50	0.85	0.61	0.18	0.59	0.05	87	149
Katnook 1	1985.00	Laira Fm	0.78	437	0.14	0.58	1.86	0.72	0.19	0.31	0.06	74	238
Katnook 1	2020.00	Laira Fm	0.74	437	0.20	0.68	0.83	0.88	0.23	0.82	0.07	92	112
Katnook 1	2085.00	Laira Fm	1.17	438	0.14	1.35	1.28	1.49	0.09	1.05	0.12	115	109
Katnook 1	2135.00	Laira Fm	1.11	440	0.19	1.65	2.03	1.84	0.10	0.81	0.15	149	183
Katnook 1	2195.00	Laira Fm	0.88	439	0.11	0.85	0.95	0.96	0.11	0.89	0.08	97	108

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Katnook 1	2325.00	Laira Fm	0.63	443	0.11	0.35	1.30	0.46	0.24	0.27	0.03	56	206
Katnook 1	2375.00	Laira Fm	0.77	440	0.19	0.86	1.30	1.05	0.18	0.66	0.08	112	169
Katnook 1	2435.00	Laira Fm	1.05	443	0.14	0.32	0.62	0.46	0.30	0.52	0.03	30	59
Katnook 1	2490.00	Laira Fm	0.50	444	0.12	0.38	0.85	0.50	0.24	0.45	0.04	76	170
Katnook 1	2495.00	Laira Fm	0.69	443	0.09	0.42	0.60	0.51	0.18	0.70	0.04	61	67
Katnook 1	2505.00	Laira Fm	0.66	419	0.07	0.27	0.47	0.34	0.21	0.57	0.02	41	71
Katnook 2	2250.00	Laira Fm	0.76	440	0.14	0.66	0.58	0.80	0.17	1.14	0.06	86	76
Katnook 2	2380.00	Laira Fm	0.42	439	0.14	0.42	0.83	0.56	0.25	0.51	0.04	100	197
Katnook 2	2500.00	Laira Fm	0.53	444	0.14	0.55	0.50	0.69	0.20	1.10	0.05	103	94
Katnook 2	2600.00	Laira Fm	0.73	443	0.21	0.88	0.31	1.09	0.19	2.84	0.09	120	42
Katnook 2	2700.00	Laira Fm	0.76	440	0.32	0.67	3.08	0.99	0.32	0.22	0.08	88	405
Katnook 2	2800.00	Laira Fm	0.74	453	0.19	0.54	0.29	0.73	0.26	1.86	0.06	72	39
Katnook 3	2000.00	Laira Fm	0.61	441	0.07	0.49	0.10	0.56	0.12	4.90	0.04	80	16
Katnook 3	2100.00	Laira Fm	1.45	440	0.35	3.10	0.28	3.45	0.10	11.07	0.28	213	19
Katnook 3	2200.00	Laira Fm	0.70	440	0.57	0.83	0.18	1.40	0.41	4.61	0.11	118	25
Katnook 3	2300.00	Laira Fm	1.00	439	1.05	1.16	0.22	2.21	0.48	5.27	0.18	116	22
Katnook 3	2400.00	Laira Fm	0.69	432	0.82	0.87	0.16	1.69	0.49	5.44	0.14	126	23
Katnook 3	2500.00	Laira Fm	0.94	443	0.98	1.06	0.14	2.04	0.48	7.57	0.17	112	15
Katnook 3	2600.00	Laira Fm	1.32	443	1.04	0.81	0.21	1.85	0.56	3.86	0.15	61	16
Katnook 3	2700.00	Laira Fm	0.92	441	1.24	1.00	0.22	2.24	0.55	4.55	0.18	108	24
Katnook 3	2800.00	Laira Fm	0.78	450	0.43	0.78	0.26	1.21	0.36	3.00	0.10	100	33
Killarney 1	667.51	Laira Fm	0.86	437	0.11	1.13	0.14	1.24	0.09	8.07	0.10	131	16
Killarney 1	722.38	Laira Fm	1.84	432	0.05	1.99	9.24	2.04	0.02	0.22	0.17	108	502
Ladbroke Grove	1902.00	Laira Fm	0.88	435	0.16	1.08	0.64	1.24	0.13	1.69	0.10	122	72
Ladbroke Grove	2042.00	Laira Fm	1.41	461	0.16	2.51	0.63	2.67	0.06	3.98	0.22	178	44
Ladbroke Grove	2050.00	Laira Fm	3.50	463	0.22	3.92	1.49	4.14	0.05	2.63	0.34	112	42
Ladbroke Grove	2084.00	Laira Fm	5.75	460	0.50	13.00	1.02	13.50	0.04	12.75	1.12	226	17
Ladbroke Grove	2092.00	Laira Fm	1.90	464	0.12	1.70	0.85	1.82	0.07	2.00	0.15	89	44

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Ladbroke Grove	2347.50	Laira Fm			0.52								
Ladbroke Grove	2530.00	Laira Fm	0.60	442	0.13	0.53	0.36	0.66	0.20	1.47	0.05	88	60
Laira 1	1985.00	Laira Fm	0.82	440	0.02	0.65	1.85	0.67	0.03	0.35	0.05	79	225
Laira 1	2035.00	Laira Fm	0.80	438	0.05	0.89	0.75	0.94	0.05	1.19	0.07	111	93
Laira 1	2177.00	Laira Fm	0.55	441	0.06	0.37	0.54	0.43	0.14	0.69	0.03	67	98
Laira 1	2220.00	Laira Fm	0.59	443	0.04	0.53	0.73	0.57	0.07	0.73	0.04	89	123
Laira 1	2275.00	Laira Fm	0.60	441	0.10	0.70	0.35	0.80	0.12	2.00	0.06	116	58
Laira 1	2322.00	Laira Fm	0.61	445	0.08	0.47	0.43	0.55	0.15	1.09	0.04	77	70
Laira 1	2420.00	Laira Fm	0.61	444	0.08	0.41	0.28	0.49	0.16	1.46	0.04	67	45
Laira 1	2462.00	Laira Fm	0.90	444	0.11	1.10	0.10	1.21	0.09	11.00	0.10	122	11
Laira 1	2520.00	Laira Fm	0.65	447	0.06	0.36	0.21	0.42	0.14	1.71	0.03	55	32
Laira 1	2620.00	Laira Fm	0.73	449	0.08	0.35	0.54	0.43	0.19	0.65	0.03	47	73
Lucindale 1	719.02	Laira Fm	1.60	432	0.05	1.19	1.86	1.24	0.04	0.64	0.10	74	116
Lucindale 1	745.85	Laira Fm	2.00	434	0.05	0.90	0.81	0.95	0.05	1.11	0.07	45	40
Lucindale 1	954.02	Laira Fm	0.48	424	0.04	0.23	0.37	0.27	0.15	0.62	0.02	47	77
Reedy Creek 1	1930.00	Laira Fm	0.63	430	0.17	0.79	1.19	0.96	0.18	0.66	0.08	125	188
Reedy Creek 1	1940.00	Laira Fm	0.57	429	0.31	0.22	0.35	0.53	0.58	0.63	0.04	39	61
Reedy Creek 1	1965.00	Laira Fm	0.60	442	0.07	0.76	0.72	0.83	0.08	1.06	0.06	126	120
Reedy Creek 1	1980.00	Laira Fm	0.78	436	0.08	0.48	0.35	0.56	0.14	1.37	0.05	62	45
Reedy Creek 1	2030.00	Laira Fm	0.69	436	0.15	0.81	1.07	0.96	0.16	0.76	0.08	117	155
Reedy Creek 1	2052.00	Laira Fm	0.29	242	0.06	0.00	0.33	0.06	1.00	0.00	0.00	0	114
Robertson 1	993.04	Laira Fm	11.10	432	0.31	17.64	6.69	17.95	0.02	2.64	1.49	158	60
Robertson 1	1029.92	Laira Fm	0.29	438	0.04	0.14	0.63	0.18	0.22	0.22	0.01	48	217
Robertson 1	1158.24	Laira Fm	0.61	352	0.09	0.25	1.18	0.34	0.26	0.21	0.02	40	193
Robertson 1	1438.96	Laira Fm	0.77	432	0.08	0.41	1.72	0.49	0.16	0.24	0.04	53	223
Sawpit 1	1259.00	Laira Fm	1.19	437	0.10	1.11	3.81	1.21	0.08	0.29	0.10	93	320
Sawpit 1	1526.30	Laira Fm	0.25	422	0.21	0.30	1.90	0.51	0.41	0.16	0.04	120	760
Sawpit 1	1564.50	Laira Fm	0.73	436	0.12	0.65	0.28	0.77	0.16	2.32	0.06	89	38

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Sawpit 1	1669.50	Laira Fm	0.74	436	0.11	0.80	0.41	0.91	0.12	1.95	0.08	108	55
Sawpit 1	1771.30	Laira Fm	0.59	438	0.08	0.72	0.20	0.80	0.10	3.60	0.07	122	34
Sawpit 1	1798.00	Laira Fm	0.54	440	0.22	0.74	1.79	0.96	0.23	0.41	0.08	137	331
Sawpit 1	1845.50	Laira Fm	0.55	445	0.07	0.41	0.65	0.48	0.15	0.63	0.04	75	118
St Clair 1	1999.50	Laira Fm	0.08										
St Clair 1	2030.00	Laira Fm	0.66	440	0.20	1.21	4.10	1.41	0.14	0.29	0.11	183	621
St Clair 1	2105.00	Laira Fm	0.27										
St Clair 1	2119.50	Laira Fm	0.51	391	0.23	0.60	0.25	0.83	0.28	2.40	0.06	117	49
St Clair 1	2144.00	Laira Fm	0.41	410	0.23	0.51	2.96	0.74	0.31	0.17	0.06	124	721
St Clair 1	2157.00	Laira Fm	0.93	442	0.14	1.29	1.28	1.43	0.10	16.12	0.11	138	137
St Clair 1	2181.00	Laira Fm	0.92	442	0.22	0.97	0.76	1.19	0.19	1.27	0.09	105	82
St Clair 1	2209.00	Laira Fm	0.22										
St Clair 1	2245.00	Laira Fm	1.36	444	0.28	1.75	2.38	2.03	0.14	0.73	0.16	128	175
St Clair 1	2278.50	Laira Fm	0.47	441	0.19	0.65	0.44	0.84	0.23	1.47	0.07	138	93
St Clair 1	2304.50	Laira Fm	0.39	357	0.20	0.45	1.21	0.65	0.31	0.00	0.05	115	310
St Clair 1	2336.50	Laira Fm	1.04	442	0.98	1.42	1.62	2.40	0.41	0.87	0.20	136	155
St Clair 1	2378.00	Laira Fm	0.10										
Trumpet 1	1929.38	Laira Fm	0.67	443	0.04	0.24	0.64	0.28	0.14	0.38	0.02	36	96
Trumpet 1	1944.62	Laira Fm	0.80	407	0.04	0.27	0.66	0.31	0.13	0.41	0.02	34	82
Trumpet 1	1959.86	Laira Fm	0.68	408	0.04	0.25	0.41	0.29	0.14	0.61	0.02	37	60
Trumpet 1	1975.10	Laira Fm	0.86	371	0.08	0.25	0.54	0.33	0.24	0.46	0.02	29	63
Trumpet 1	1990.34	Laira Fm	0.78	443	0.09	0.41	0.38	0.50	0.18	1.08	0.04	53	49
Trumpet 1	2005.58	Laira Fm	0.65	444	0.02	0.22	0.55	0.24	0.08	0.40	0.02	34	85
Trumpet 1	2020.82	Laira Fm	0.65	438	0.04	0.28	0.59	0.32	0.13	0.47	0.02	43	91
Trumpet 1	2036.06	Laira Fm	0.67	442	0.04	0.32	0.50	0.36	0.11	0.64	0.03	48	75
Trumpet 1	2051.30	Laira Fm	0.79	425	0.02	0.13	0.80	0.15	0.13	0.16	0.01	16	101
Trumpet 1	2066.54	Laira Fm	0.77	355	0.02	0.21	0.56	0.23	0.09	0.37	0.01	27	73
Trumpet 1	2081.78	Laira Fm	1.08	441	0.31	0.61	0.75	0.92	0.34	0.81	0.07	56	69

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Trumpet 1	2097.02	Laira Fm	0.72	451	0.02	0.24	0.71	0.26	0.08	0.34	0.02	33	99
Trumpet 1	2112.26	Laira Fm	0.76	446	0.03	0.29	0.58	0.32	0.09	0.50	0.02	38	76
Trumpet 1	2127.50	Laira Fm	0.64	410	0.01	0.19	0.59	0.20	0.05	0.32	0.01	30	92
Trumpet 1	2142.74	Laira Fm	0.72	332	0.01	0.17	0.45	0.18	0.06	0.38	0.01	24	63
Trumpet 1	2157.98	Laira Fm	0.73	300	0.02	0.03	0.90	0.05	0.40	0.03	0.00	4	123
Trumpet 1	2173.22	Laira Fm	0.90	444	0.03	0.37	0.30	0.40	0.07	1.23	0.03	41	33
Trumpet 1	2188.46	Laira Fm	0.00	454	0.00	0.00	0.00	0.00			0.00	0	0
Trumpet 1	2203.70	Laira Fm	0.66	439	0.03	0.28	0.27	0.31	0.10	1.04	0.02	42	41
Trumpet 1	2218.94	Laira Fm	0.75	444	0.05	0.29	0.31	0.34	0.15	0.94	0.02	39	41
Trumpet 1	2234.18	Laira Fm	0.79	443	0.04	0.36	0.40	0.40	0.10	0.90	0.03	46	43
Trumpet 1	2252.47	Laira Fm	0.55	454	0.02	0.05	0.73	0.07	0.29	0.07	0.00	9	133
Zema 1	1932.00	Laira Fm	1.40	437	0.12	1.81	0.95	1.93	0.06	1.91	0.16	129	68
Zema 1	2004.00	Laira Fm	0.46	221	0.02	0.00	0.04	0.02	1.00	0.00	0.00	0	8
Zema 1	2029.00	Laira Fm	0.77	407	0.13	0.27	0.42	0.40	0.32	0.64	0.03	35	54
Zema 1	2199.00	Laira Fm	0.73	379	0.00	0.09	0.79	0.09	0.00	0.11	0.00	12	108
Zema 1	2244.00	Laira Fm	0.88	440	0.25	0.38	0.51	0.63	0.40	0.75	0.05	53	58
Zema 1	2328.00	Laira Fm	1.03	443	0.54	0.38	0.50	0.92	0.59	0.76	0.07	36	49
Zema 1	2360.00	Laira Fm	0.62	287	0.00	0.00	0.07	0.00		0.00	0.00	0	12

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Camelback 1	862.58	Pretty Hill Fm	10.80	447	0.12	1.37	1.12	1.49	0.08	1.22	0.12	13	10
Camelback 1	1013.46	Pretty Hill Fm	0.75	433	0.08	0.87	1.10	0.95	0.08	0.79	0.07	116	147
Camelback 1	1171.96	Pretty Hill Fm	0.71	450	0.10	0.82	0.34	0.92	0.11	2.41	0.07	115	48
Camelback 1	1438.66	Pretty Hill Fm	1.30	436	0.17	1.46	1.00	1.63	0.10	1.46	0.13	112	77
Camelback 1	1622.15	Pretty Hill Fm	1.23	437	0.17	1.45	1.81	1.62	0.10	0.80	0.13	118	147
Crayfish 1A	1633.73	Pretty Hill Fm	1.27	436	0.19	1.35	0.80	1.54	0.12	1.69	0.12	106	63
Crayfish 1A	1667.26	Pretty Hill Fm	1.36	434	0.15	0.35	1.77	0.50	0.30	0.20	0.04	26	130

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	1676.40	Pretty Hill Fm	1.45	436	0.20	1.06	1.13	1.26	0.16	0.94	0.10	73	78
Crayfish 1A	1749.55	Pretty Hill Fm	75.40	445	33.46	554.28	3.75	587.74	0.06	147.81	49.06	735	5
Crayfish 1A	1770.89	Pretty Hill Fm	1.24	437	0.33	1.95	0.95	2.28	0.14	2.05	0.19	157	77
Crayfish 1A	1792.22	Pretty Hill Fm	1.53	435	0.65	2.59	1.78	3.24	0.20	1.46	0.27	169	116
Crayfish 1A	1807.46	Pretty Hill Fm	0.30	437	0.10	0.26	0.73	0.36	0.28	0.36	0.03	87	243
Crayfish 1A	1831.85	Pretty Hill Fm	0.77	434	0.41	1.28	1.36	1.69	0.24	0.94	0.14	166	177
Crayfish 1A	1840.99	Pretty Hill Fm	0.80	440	0.23	0.84	1.29	1.07	0.21	0.65	0.08	105	161
Crayfish 1A	1850.14	Pretty Hill Fm	1.17	441	0.25	1.64	1.73	1.89	0.13	0.95	0.15	140	147
Crayfish 1A	1857.76	Pretty Hill Fm	1.78	434	1.10	3.41	1.54	4.51	0.24	2.21	0.37	192	87
Crayfish 1A	1877.57	Pretty Hill Fm	0.85	440	0.17	0.77	1.07	0.94	0.18	0.72	0.07	91	126
Crayfish 1A	1892.81	Pretty Hill Fm	0.72	450	0.25	0.43	0.65	0.68	0.37	0.66	0.05	60	90
Crayfish 1A	1923.29	Pretty Hill Fm	1.02	440	0.18	1.03	0.84	1.21	0.15	1.23	0.10	101	82
Crayfish 1A	1935.48	Pretty Hill Fm	0.74	439	0.15	0.63	0.75	0.78	0.19	0.84	0.06	85	101
Crayfish 1A	1990.34	Pretty Hill Fm	0.86	436	0.34	1.00	0.94	1.34	0.25	1.06	0.11	116	109
Crayfish 1A	2017.78	Pretty Hill Fm	1.58	437	3.27	3.00	1.18	6.27	0.52	2.54	0.52	190	75
Crayfish 1A	2100.07	Pretty Hill Fm	0.88	441	0.22	0.74	1.13	0.96	0.23	0.65	0.08	84	128
Crayfish 1A	2118.36	Pretty Hill Fm	0.64	440	0.15	0.48	0.92	0.63	0.24	0.52	0.05	75	144
Crayfish 1A	2145.79	Pretty Hill Fm	0.93	443	0.14	0.53	0.87	0.67	0.21	0.61	0.05	57	94
Crayfish 1A	2188.46	Pretty Hill Fm	0.66	436	0.34	0.80	0.67	1.14	0.30	1.19	0.09	121	102
Crayfish 1A	2221.99	Pretty Hill Fm	1.79	442	0.42	3.00	0.56	3.42	0.12	5.36	0.28	169	31
Crayfish 1A	2234.18	Pretty Hill Fm	0.94	439	0.24	1.20	0.81	1.44	0.17	1.48	0.12	128	86
Crayfish 1A	2249.42	Pretty Hill Fm	1.30	441	0.14	1.07	0.51	1.21	0.12	2.10	0.10	82	39
Crayfish 1A	2258.57	Pretty Hill Fm	0.91	441	0.10	0.45	0.46	0.55	0.18	0.98	0.04	49	51
Crayfish 1A	2276.86	Pretty Hill Fm	0.75	429	1.30	3.19	0.69	4.49	0.29	4.62	0.37	425	92
Crayfish 1A	2286.00	Pretty Hill Fm	0.57	440	0.11	0.30	0.46	0.41	0.27	0.65	0.03	53	81
Crayfish 1A	2304.29	Pretty Hill Fm	2.12	432	3.19	5.96	1.08	9.15	0.35	5.52	0.76	281	51
Crayfish 1A	2310.38	Pretty Hill Fm	1.59	433	0.25	2.80	1.51	3.05	0.08	1.85	0.26	176	94
Crayfish 1A	2319.53	Pretty Hill Fm	1.26	433	0.28	1.87	1.04	2.15	0.13	1.80	2.15	146	81

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	2325.62	Pretty Hill Fm	0.95	436	0.13	0.88	1.09	1.01	0.13	0.81	0.09	92	114
Crayfish 1A	2325.62	Pretty Hill Fm	1.18	434	0.44	2.11	0.88	2.55	0.17	2.40	0.21	179	75
Crayfish 1A	2334.77	Pretty Hill Fm	0.98	435	0.13	0.56	1.02	0.69	0.19	0.55	0.69	57	104
Crayfish 1A	2334.77	Pretty Hill Fm	1.08	436	0.22	1.10	0.78	1.32	0.17	1.41	0.11	102	72
Crayfish 1A	2343.91	Pretty Hill Fm	0.63	429	0.13	0.39	0.79	0.52	0.25	0.49	0.04	61	125
Crayfish 1A	2343.91	Pretty Hill Fm	0.81	439	0.17	0.55	0.67	0.72	0.24	0.82	0.06	68	83
Crayfish 1A	2353.06	Pretty Hill Fm	0.69	441	0.16	0.49	0.75	0.65	0.25	0.65	0.06	71	125
Crayfish 1A	2359.15	Pretty Hill Fm	1.04	431	0.31	1.19	1.12	1.50	0.21	1.06	0.13	114	107
Crayfish 1A	2392.68	Pretty Hill Fm	0.71	430	0.28	0.98	1.03	1.26	0.22	0.95	0.11	138	145
Crayfish 1A	2392.68	Pretty Hill Fm	1.17	432	0.87	3.04	0.72	3.91	0.22	4.22	0.32	260	62
Crayfish 1A	2414.02	Pretty Hill Fm	0.84	433	0.15	0.78	0.87	0.93	0.16	0.90	0.07	83	93
Crayfish 1A	2414.02	Pretty Hill Fm	1.64	431	2.39	5.71	0.70	8.10	0.30	8.16	0.67	348	43
Crayfish 1A	2429.26	Pretty Hill Fm	1.01	437	0.18	1.03	0.75	1.21	0.15	1.37	0.10	101	74
Crayfish 1A	2429.26	Pretty Hill Fm	1.59	430	0.78	3.55	0.61	4.33	0.18	5.82	0.36	223	38
Crayfish 1A	2438.40	Pretty Hill Fm	1.20	431	0.26	1.43	1.07	1.69	0.15	1.34	0.15	119	89
Crayfish 1A	2441.45	Pretty Hill Fm	2.48	429	1.88	7.91	0.74	9.79	0.19	10.69	0.81	319	30
Crayfish 1A	2450.59	Pretty Hill Fm	1.15	433	0.29	1.28	0.83	1.57	0.18	1.54	0.13	111	72
Crayfish 1A	2459.74	Pretty Hill Fm	0.66	442	0.09	0.26	0.55	0.35	0.26	0.47	0.02	39	83
Crayfish 1A	2467.05	Pretty Hill Fm	0.89	445	0.20	0.74	0.21	0.94	0.21	3.52	0.08	83	23
Crayfish 1A	2468.88	Pretty Hill Fm	0.78	437	0.21	0.40	0.42	0.61	0.34	0.95	0.05	51	54
Crayfish 1A	2468.88	Pretty Hill Fm	1.17	443	0.16	1.09	0.18	1.25	0.13	6.06	0.10	93	15
Crayfish 1A	2469.49	Pretty Hill Fm	41.14	447	19.79	112.37	3.60	132.16	0.15	31.21	11.01	273	8
Crayfish 1A	2469.95	Pretty Hill Fm	1.46	444	0.33	2.14	0.39	2.47	0.13	5.49	0.20	146	26
Crayfish 1A	2470.40	Pretty Hill Fm	13.01	442	2.91	48.60	1.51	51.51	0.06	32.19	4.29	373	11
Crayfish 1A	2470.71	Pretty Hill Fm	1.57	447	0.25	1.19	0.21	1.44	0.17	5.67	0.12	75	13
Crayfish 1A	2487.17	Pretty Hill Fm	0.83	436	0.28	0.66	0.75	0.94	0.30	0.88	0.09	79	90
Crayfish 1A	2487.17	Pretty Hill Fm	1.32	439	0.19	1.37	0.42	1.56	0.12	3.26	0.13	104	32
Crayfish 1A	2496.31	Pretty Hill Fm	0.68	437	0.18	0.43	0.57	0.61	0.30	0.75	0.05	63	83

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	2499.36	Pretty Hill Fm	1.01	437	0.24	1.16	0.41	1.40	0.17	2.83	0.11	115	41
Crayfish 1A	2502.41	Pretty Hill Fm	0.81	442	0.14	0.54	0.45	0.68	0.21	1.20	0.06	66	55
Crayfish 1A	2511.55	Pretty Hill Fm	0.89	439	0.19	0.59	0.51	0.78	0.24	1.16	0.06	66	57
Crayfish 1A	2514.60	Pretty Hill Fm	2.16	428	3.97	8.03	0.63	12.00	0.33	12.75	1.00	372	29
Crayfish 1A	2517.65	Pretty Hill Fm	1.30	432	0.48	2.07	0.75	2.55	0.19	2.76	0.23	159	58
Crayfish 1A	2523.74	Pretty Hill Fm	0.88	430	0.22	1.00	0.83	1.22	0.18	1.20	0.11	114	94
Crayfish 1A	2523.74	Pretty Hill Fm	2.18	429	1.69	7.16	0.66	8.85	0.19	10.85	0.73	328	30
Crayfish 1A	2529.84	Pretty Hill Fm	1.11	435	0.31	1.40	0.76	1.71	0.18	1.84	0.14	126	70
Crayfish 1A	2529.84	Pretty Hill Fm	1.20	434	0.12	0.81	0.82	0.93	0.13	0.99	0.08	68	68
Crayfish 1A	2532.89	Pretty Hill Fm	0.83	437	0.20	0.89	0.61	1.09	0.18	1.46	0.09	107	73
Crayfish 1A	2542.03	Pretty Hill Fm	0.92	433	0.13	1.07	0.84	1.20	0.11	1.27	0.11	116	91
Crayfish 1A	2542.03	Pretty Hill Fm	1.27	431	0.42	1.46	0.78	1.88	0.22	1.87	0.15	115	61
Crayfish 1A	2548.13	Pretty Hill Fm	1.41	437	0.18	1.45	1.05	1.63	0.11	1.38	0.15	103	74
Crayfish 1A	2548.13	Pretty Hill Fm	2.04	434	1.44	3.55	1.13	4.99	0.29	3.14	0.41	174	55
Crayfish 1A	2554.22	Pretty Hill Fm	1.28	440	0.14	0.88	1.21	1.02	0.14	0.73	0.09	69	94
Crayfish 1A	2560.32	Pretty Hill Fm	1.11	441	0.12	0.69	1.01	0.81	0.15	0.68	0.08	62	91
Crayfish 1A	2560.32	Pretty Hill Fm	1.22	437	0.24	1.09	0.97	1.33	0.18	1.12	0.11	89	80
Crayfish 1A	2578.61	Pretty Hill Fm	0.64	438	0.12	0.70	0.69	0.82	0.15	1.01	0.17	109	108
Crayfish 1A	2578.61	Pretty Hill Fm	0.88	430	0.43	1.91	0.96	2.34	0.18	1.99	0.19	217	109
Crayfish 1A	2584.70	Pretty Hill Fm	0.59	436	0.18	0.54	0.62	0.72	0.25	0.87	0.06	92	105
Crayfish 1A	2599.94	Pretty Hill Fm	1.20	428	0.74	3.90	0.73	4.64	0.16	5.34	0.38	325	61
Crayfish 1A	2609.09	Pretty Hill Fm	1.07	430	0.48	2.60	0.88	3.08	0.16	2.95	0.25	242	82
Crayfish 1A	2618.23	Pretty Hill Fm	2.36	428	0.47	6.93	1.78	7.40	0.06	3.89	0.63	294	75
Crayfish 1A	2618.23	Pretty Hill Fm	15.50	427	15.46	94.02	6.18	109.48	0.14	15.21	9.12	607	40
Crayfish 1A	2624.33	Pretty Hill Fm	1.21	434	0.23	1.84	1.29	2.07	0.11	1.43	0.19	152	107
Crayfish 1A	2626.16	Pretty Hill Fm	0.70	439	0.06	0.23	0.29	0.29	0.21	0.79	0.02	33	39
Crayfish 1A	2633.47	Pretty Hill Fm	5.30	432	10.09	29.47	1.81	39.56	0.26	16.28	3.04	499	34
Crayfish 1A	2635.30	Pretty Hill Fm	1.85	431	1.01	5.50	1.89	6.51	0.16	2.91	0.54	297	99

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	2639.57	Pretty Hill Fm	1.99	431	0.48	2.49	1.61	2.97	0.16	1.55	0.24	125	80
Crayfish 1A	2651.76	Pretty Hill Fm	0.57	436	0.13	1.16	0.90	1.29	0.10	1.29	0.12	203	158
Crayfish 1A	2651.76	Pretty Hill Fm	1.32	423	1.33	3.81	1.22	5.14	0.26	3.12	0.42	289	92
Crayfish 1A	2667.00	Pretty Hill Fm	0.60	431	0.06	0.36	0.59	0.42	0.14	0.61	0.03	60	98
Crayfish 1A	2667.00	Pretty Hill Fm	1.25	433	0.18	2.58	0.72	2.76	0.07	3.58	0.23	206	58
Crayfish 1A	2679.19	Pretty Hill Fm	0.66	430	0.13	0.51	0.63	0.64	0.20	0.81	0.05	77	95
Crayfish 1A	2679.19	Pretty Hill Fm	0.85	426	0.14	0.85	0.48	0.99	0.14	1.77	0.08	100	56
Crayfish 1A	2691.38	Pretty Hill Fm	0.75	434	0.17	0.80	0.48	0.97	0.18	1.67	0.08	107	64
Crayfish 1A	2700.53	Pretty Hill Fm	0.68	434	0.13	0.47	0.53	0.60	0.22	0.89	0.05	69	78
Crayfish 1A	2700.53	Pretty Hill Fm	1.02	432	0.55	1.81	0.43	2.36	0.23	4.21	0.19	177	42
Crayfish 1A	2709.67	Pretty Hill Fm	0.72	437	0.09	0.44	0.69	0.53	0.17	0.64	0.05	61	95
Crayfish 1A	2709.67	Pretty Hill Fm	0.90	433	0.37	1.53	0.68	1.90	0.19	2.25	0.15	170	76
Crayfish 1A	2718.82	Pretty Hill Fm	0.58	439	0.06	0.32	0.51	0.38	0.16	0.63	0.03	55	89
Crayfish 1A	2727.96	Pretty Hill Fm	1.57	437	0.13	0.42	0.45	0.55	0.24	0.93	0.04	27	29
Crayfish 1A	2737.10	Pretty Hill Fm	0.68	439	0.09	0.39	0.49	0.48	0.19	0.80	0.04	57	72
Crayfish 1A	2746.25	Pretty Hill Fm	1.62	438	0.25	1.50	0.46	1.75	0.14	3.26	0.14	93	28
Crayfish 1A	2764.54	Pretty Hill Fm	0.53	441	0.08	0.27	0.49	0.35	0.23	0.55	0.03	50	92
Crayfish 1A	2785.87	Pretty Hill Fm	1.19	432	0.42	2.46	0.71	2.88	0.15	3.46	0.25	207	60
Crayfish 1A	2788.92	Pretty Hill Fm	1.00	441	0.18	0.89	0.44	1.07	0.17	2.02	0.09	89	44
Crayfish 1A	2788.92	Pretty Hill Fm	1.90	432	1.22	5.44	0.62	6.66	0.18	8.77	0.55	286	33
Crayfish 1A	2798.06	Pretty Hill Fm	1.02	442	0.19	0.81	0.23	1.00	0.19	3.52	0.08	79	22
Crayfish 1A	2801.11	Pretty Hill Fm	0.91	441	0.12	0.46	0.50	0.58	0.21	0.92	0.05	51	55
Crayfish 1A	2807.21	Pretty Hill Fm	0.81	438	0.13	0.78	0.42	0.91	0.14	1.86	0.08	96	52
Crayfish 1A	2813.30	Pretty Hill Fm	1.10	438	0.23	1.01	0.43	1.24	0.19	2.35	0.10	92	39
Crayfish 1A	2816.35	Pretty Hill Fm	0.97	447	0.17	0.76	0.36	0.93	0.18	2.11	0.08	78	37
Crayfish 1A	2822.45	Pretty Hill Fm	0.70	441	0.13	0.42	0.40	0.55	0.24	1.05	0.04	60	57
Crayfish 1A	2822.45	Pretty Hill Fm	0.97	435	0.33	1.11	0.50	1.44	0.23	2.22	0.12	114	52
Crayfish 1A	2837.69	Pretty Hill Fm	0.58	441	0.14	0.45	0.47	0.59	0.24	0.96	0.05	76	81

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	2843.78	Pretty Hill Fm	1.31	442	0.31	2.87	1.75	3.18	0.10	1.64	0.27	219	134
Crayfish 1A	2843.78	Pretty Hill Fm	4.05	425	5.66	20.91	1.62	26.57	0.21	12.91	2.21	516	40
Crayfish 1A	2865.12	Pretty Hill Fm	0.80	423	0.30	2.01	1.39	2.31	0.13	1.45	0.20	251	174
Crayfish 1A	2868.17	Pretty Hill Fm	0.56	435	0.09	0.50	0.30	0.59	0.15	1.67	0.04	89	54
Crayfish 1A	2883.41	Pretty Hill Fm	0.74	436	0.16	0.97	0.43	1.13	0.14	2.26	0.09	131	58
Crayfish 1A	2883.41	Pretty Hill Fm	2.38	427	1.97	10.01	1.14	11.98	0.16	8.78	0.99	421	48
Crayfish 1A	2889.50	Pretty Hill Fm	0.61	434	0.20	1.00	0.64	1.20	0.17	1.56	0.10	164	105
Crayfish 1A	2898.65	Pretty Hill Fm	0.88	435	0.14	1.11	0.45	1.25	0.11	2.47	0.10	126	51
Crayfish 1A	2910.84	Pretty Hill Fm	0.89	438	0.15	0.62	0.37	0.77	0.19	1.68	0.06	70	42
Crayfish 1A	2911.30	Pretty Hill Fm	1.24	457	0.15	0.91	0.00	1.06	0.14		0.08	73	0
Crayfish 1A	2911.45	Pretty Hill Fm	1.52	453	0.18	1.11	0.04	1.29	0.14	27.75	0.10	73	3
Crayfish 1A	2923.03	Pretty Hill Fm	0.83	448	0.14	0.66	0.19	0.80	0.17	3.47	0.06	80	23
Crayfish 1A	2926.08	Pretty Hill Fm	0.99	432	0.37	1.43	0.34	1.80	0.21	4.21	0.15	144	34
Crayfish 1A	2935.22	Pretty Hill Fm	0.64	448	0.11	0.33	0.15	0.44	0.25	2.20	0.03	52	23
Crayfish 1A	2941.32	Pretty Hill Fm	1.11	439	0.16	1.04	0.27	1.20	0.13	3.85	0.10	94	24
Crayfish 1A	2947.42	Pretty Hill Fm	1.77	450	0.28	1.90	0.19	2.18	0.13	10.00	0.18	107	11
Crayfish 1A	2947.42	Pretty Hill Fm	3.42	433	1.48	8.32	0.57	9.80	0.15	14.60	0.81	243	17
Crayfish 1A	2953.51	Pretty Hill Fm	1.23	444	0.11	0.55	0.28	0.66	0.17	1.96	0.05	45	23
Crayfish 1A	2962.66	Pretty Hill Fm	0.69	438	0.14	0.52	0.31	0.66	0.21	1.68	0.05	75	45
Crayfish 1A	2962.66	Pretty Hill Fm	1.06	430	0.87	2.91	0.56	3.78	0.23	5.20	0.29	275	53
Crayfish 1A	2968.75	Pretty Hill Fm	1.37	428	0.24	2.52	0.46	2.76	0.09	5.48	0.23	184	34
Crayfish 1A	2974.85	Pretty Hill Fm	0.78	444	0.16	0.40	0.20	0.56	0.29	2.00	0.04	51	26
Crayfish 1A	2974.85	Pretty Hill Fm	4.60	429	2.66	27.62	0.63	30.28	0.09	43.84	2.52	600	14
Crayfish 1A	2999.23	Pretty Hill Fm	0.99	441	0.18	0.71	0.26	0.89	0.20	2.73	0.07	72	26
Crayfish 1A	2999.23	Pretty Hill Fm	1.37	432	0.86	3.18	0.31	4.04	0.21	10.26	0.33	232	23
Crayfish 1A	3008.38	Pretty Hill Fm	2.09	435	0.49	3.12	0.61	3.61	0.14	5.11	0.30	149	29
Crayfish 1A	3017.52	Pretty Hill Fm	0.80	437	0.22	0.84	0.35	1.06	0.21	2.40	0.08	105	44
Crayfish 1A	3017.52	Pretty Hill Fm	1.52	428	1.64	4.34	0.48	5.98	0.27	9.04	0.49	286	32

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	3034.44	Pretty Hill Fm	1.20	460	0.17	0.59	0.05	0.76	0.22	11.80	0.06	49	4
Crayfish 1A	3037.33	Pretty Hill Fm	1.00	461	0.14	0.43	0.05	0.57	0.25	8.60	0.04	43	5
Crayfish 1A	3044.95	Pretty Hill Fm	0.91	441	0.28	0.69	0.23	0.97	0.29	3.00	0.08	76	25
Crayfish 1A	3044.95	Pretty Hill Fm	1.02	442	0.24	0.67	0.21	0.91	0.26	3.19	0.07	66	21
Crayfish 1A	3054.10	Pretty Hill Fm	0.58	450	0.15	0.31	0.21	0.46	0.33	1.48	0.03	53	36
Crayfish 1A	3060.19	Pretty Hill Fm	0.81	433	0.27	0.75	0.42	1.02	0.26	1.79	0.08	93	52
Crayfish 1A	3066.29	Pretty Hill Fm	0.90	441	0.24	0.55	0.31	0.79	0.30	1.77	0.06	61	34
Crayfish 1A	3066.29	Pretty Hill Fm	0.93	438	0.47	0.96	0.40	1.43	0.33	2.40	0.11	103	43
Crayfish 1A	3075.43	Pretty Hill Fm	1.10	448	0.19	0.53	0.19	0.72	0.26	2.79	0.06	48	17
Crayfish 1A	3081.53	Pretty Hill Fm	0.79	444	0.10	0.16	0.47	0.26	0.38	0.34	0.02	20	59
Crayfish 1A	3081.53	Pretty Hill Fm	0.86	429	0.14	0.61	0.48	0.75	0.19	1.27	0.06	71	56
Crayfish 1A	3093.72	Pretty Hill Fm	0.99	439	0.25	0.84	0.30	1.09	0.23	2.80	0.09	85	30
Crayfish 1A	3093.72	Pretty Hill Fm	2.74	425	2.58	11.94	0.50	14.52	0.18	23.88	1.21	436	22
Crayfish 1A	3099.82	Pretty Hill Fm	0.86	446	0.23	0.59	0.20	0.82	0.28	2.95	0.06	69	23
Crayfish 1A	3105.91	Pretty Hill Fm	0.76	437	0.14	0.46	0.25	0.60	0.23	1.84	0.05	61	33
Crayfish 1A	3105.91	Pretty Hill Fm	1.49	432	0.54	2.40	0.48	2.94	0.18	5.00	0.24	161	32
Crayfish 1A	3112.01	Pretty Hill Fm	1.02	441	0.16	0.48	0.22	0.64	0.25	2.18	0.05	47	22
Crayfish 1A	3118.10	Pretty Hill Fm	0.93	431	0.28	1.66	0.35	1.94	0.14	4.74	0.16	178	38
Crayfish 1A	3124.20	Pretty Hill Fm	0.81	435	0.17	0.47	0.20	0.64	0.27	2.35	0.05	58	25
Crayfish 1A	3130.30	Pretty Hill Fm	1.01	430	0.15	1.18	0.44	1.33	0.11	2.68	0.11	117	44
Crayfish 1A	3130.30	Pretty Hill Fm	1.98	430	0.90	7.66	0.52	8.56	0.11	14.73	0.71	387	26
Crayfish 1A	3136.39	Pretty Hill Fm	0.99	435	0.12	0.85	0.25	0.97	0.12	3.40	0.08	86	25
Crayfish 1A	3142.49	Pretty Hill Fm	1.12	448	0.20	0.80	0.35	1.00	0.20	2.29	0.08	71	31
Crayfish 1A	3142.49	Pretty Hill Fm	27.60	464	6.66	41.07	3.33	47.73	0.14	12.33	3.97	149	12
Crayfish 1A	3148.58	Pretty Hill Fm	0.92	440	0.18	0.59	0.15	0.77	0.23	3.93	0.06	64	16
Crayfish 1A	3154.68	Pretty Hill Fm	0.72	443	0.16	0.27	0.18	0.43	0.37	1.50	0.03	38	25
Crayfish 1A	3154.68	Pretty Hill Fm	2.04	433	0.61	4.13	0.52	4.74	0.13	7.94	0.39	202	25
Crayfish 1A	3160.78	Pretty Hill Fm	0.89	452	0.19	0.65	0.17	0.84	0.23	3.82	0.07	73	19

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	3166.87	Pretty Hill Fm	0.72	440	0.17	0.52	0.20	0.69	0.25	2.60	0.05	72	28
Crayfish 1A	3169.92	Pretty Hill Fm	1.08	438	0.26	1.82	0.32	2.08	0.13	5.69	0.15	150	30
Crayfish 1A	3172.97	Pretty Hill Fm	0.74	440	0.16	0.55	0.17	0.71	0.23	3.24	0.05	74	23
Crayfish 1A	3179.06	Pretty Hill Fm	0.98	433	0.43	1.11	0.40	1.54	0.28	2.77	0.12	113	41
Crayfish 1A	3179.06	Pretty Hill Fm	1.95	430	1.55	8.02	0.49	9.57	0.16	16.37	0.79	409	25
Crayfish 1A	3186.38	Pretty Hill Fm	0.54	433	0.33	0.69	0.41	1.02	0.32	1.68	0.08	128	76
Crayfish 1A	3188.21	Pretty Hill Fm	1.74	428	1.12	4.65	0.58	5.77	0.19	8.02	0.48	267	33
Crayfish 1A	3194.61	Pretty Hill Fm	0.97	470	0.09	0.34	0.03	0.43	0.21	11.33	0.03	35	3
Crayfish 1A	3195.52	Pretty Hill Fm	1.62	473	0.12	0.79	0.05	0.91	0.13	15.80	0.07	49	3
Greenways 1	1561.00	Pretty Hill Fm	0.12										
Katnook 2	3065.00	Pretty Hill Fm	0.54	427	0.28	0.43	0.56	0.71	0.39	0.77	0.05	79	103
Katnook 2	3400.00	Pretty Hill Fm	0.14	315	0.09	0.13	0.24	0.22	0.41	0.54	0.01	92	171
Katnook 2	3462.00	Pretty Hill Fm	0.34	423	0.28	0.33	0.76	0.61	0.46	0.43	0.05	97	223
Katnook 3	2975.00	Pretty Hill Fm	0.35	444	0.20	0.14	0.15	0.34	0.59	0.93	0.06	40	43
Katnook 3	3015.00	Pretty Hill Fm	0.24										
Katnook 3	3055.00	Pretty Hill Fm	0.24										
Katnook 3	3065.00	Pretty Hill Fm	0.38	448	0.20	0.20	0.08	0.40	0.50	2.50	0.09	53	22
Katnook 3	3080.00	Pretty Hill Fm	0.37	377	0.03	0.20	0.11	0.23	0.13	1.82	0.10	54	29
Ladbroke Grove	2600.00	Pretty Hill Fm	0.54	437	0.10	0.40	0.44	0.50	0.20	0.91	0.04	74	81
Ladbroke Grove	2790.00	Pretty Hill Fm	4.90	443	0.64	5.91	3.52	6.55	0.10	1.68	0.54	120	71
Ladbroke Grove	2912.00	Pretty Hill Fm	0.40	453	0.27	0.21	0.27	0.48	0.56	0.78	0.04	52	67
Ladbroke Grove	3005.00	Pretty Hill Fm	0.41	462	0.12	0.21	0.27	0.33	0.36	0.78	0.02	51	65
Ladbroke Grove	3120.00	Pretty Hill Fm	0.17										
Ladbroke Grove	3207.50	Pretty Hill Fm	0.27										
Ladbroke Grove	3295.00	Pretty Hill Fm	0.11										
Ladbroke Grove	3402.50	Pretty Hill Fm	0.24										
Laira 1	2720.00	Pretty Hill Fm	0.37	400	0.09	0.20	0.77	0.29	0.31	0.26	0.02	54	209
Laira 1	2807.00	Pretty Hill Fm	0.33	444	0.09	0.29	0.28	0.38	0.24	1.04	0.03	87	84

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Laira 1	2835.00	Pretty Hill Fm	0.29										
Laira 1	2930.00	Pretty Hill Fm	0.17										
Laira 1	3003.00	Pretty Hill Fm	0.27	277	0.11	0.06	0.28	0.17	0.65	0.21	0.01	22	103
Reedy Creek 1	2115.00	Pretty Hill Fm	0.43	340	0.10	0.12	0.32	0.22	0.45	0.38	0.02	28	74
Reedy Creek 1	2151.50	Pretty Hill Fm	0.65	435	0.18	0.47	0.19	0.65	0.28	2.47	0.05	72	29
Reedy Creek 1	2170.00	Pretty Hill Fm	0.38	432	0.10	0.27	1.46	0.37	0.27	0.18	0.03	71	384
Reedy Creek 1	2170.50	Pretty Hill Fm	0.14	274	0.05	0.00	0.37	0.05	1.00	0.00	0.00	0	264
Reedy Creek 1	2184.00	Pretty Hill Fm	0.78	427	0.18	0.39	0.21	0.57	0.32	1.86	0.05	50	27
Reedy Creek 1	2372.00	Pretty Hill Fm	1.52	438	0.32	1.18	0.28	1.50	0.21	4.21	0.12	78	18
Reedy Creek 1	2552.50	Pretty Hill Fm	0.65	439	0.11	0.23	0.23	0.34	0.32	1.00	0.03	35	35
Reedy Creek 1	2591.00	Pretty Hill Fm	1.24	439	0.25	0.89	0.35	1.14	0.22	2.54	0.09	72	28
Sawpit 1	2028.00	Pretty Hill Fm	1.21	438	0.23	1.49	2.71	1.72	0.13	0.55	0.14	123	224
Sawpit 1	2102.00	Pretty Hill Fm	1.42	440	0.20	1.92	2.55	2.12	0.09	0.75	0.18	135	180
Sawpit 1	2132.00	Pretty Hill Fm	0.73	439	0.27	0.97	1.59	1.24	0.22	0.61	0.10	133	218
Sawpit 1	2158.00	Pretty Hill Fm	1.36	438	0.22	1.72	1.65	1.94	0.11	1.04	0.16	126	121
Sawpit 1	2203.00	Pretty Hill Fm	1.04	440	0.16	1.22	2.06	1.38	0.12	0.59	0.11	117	198
Sawpit 1	2227.00	Pretty Hill Fm	1.28	439	0.24	1.67	2.84	1.91	0.13	0.59	0.16	130	222
Sawpit 1	2257.00	Pretty Hill Fm	1.41	438	0.32	1.96	4.70	2.28	0.14	0.42	0.19	139	333
Sawpit 1	2274.00	Pretty Hill Fm	1.24	438	0.36	1.71	4.93	2.07	0.17	0.35	0.17	138	398
Sawpit 1	2287.50	Pretty Hill Fm	1.26	441	0.21	1.69	1.12	1.90	0.11	1.51	0.16	134	89
Sawpit 1	2320.50	Pretty Hill Fm	1.32	439	0.37	1.85	4.88	2.22	0.17	0.38	0.18	140	370
Sawpit 1	2385.00	Pretty Hill Fm	1.46	443	0.35	1.64	4.60	1.99	0.18	0.36	0.17	112	315
Sawpit 1	2393.00	Pretty Hill Fm	1.56	437	0.41	1.75	5.54	2.16	0.19	0.32	0.18	112	355
Sawpit 1	2398.00	Pretty Hill Fm	1.98	443	0.52	2.41	2.11	2.93	0.18	1.14	0.24	122	107
St Clair 1	2407.00	Pretty Hill Fm	1.08	443	0.03	0.32	0.55	0.35	0.09	0.58	0.02	29	50
St Clair 1	2437.50	Pretty Hill Fm	1.53	444	0.31	1.99	1.31	2.30	0.13	19.90	0.19	130	86
St Clair 1	2546.50	Pretty Hill Fm	0.59	445	0.21	0.90	2.48	1.11	0.19	0.36	0.09	152	420
St Clair 1	2604.50	Pretty Hill Fm	0.83	447	0.33	1.17	3.05	1.50	0.22	0.38	0.12	140	367

Early Cretaceous: Crayfish Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
St Clair 1	2705.50	Pretty Hill Fm	1.04	447	0.21	1.22	1.15	1.43	0.15	1.06	0.11	117	110
St Clair 1	2969.00	Pretty Hill Fm	0.61	452	0.16	0.65	0.88	0.81	0.20	0.73	0.06	106	144
St Clair 1	2978.00	Pretty Hill Fm	1.08	449	0.23	1.11	1.87	1.34	0.17	0.59	0.11	102	173
St Clair 1	3080.00	Pretty Hill Fm	2.60	466	0.54	1.95	3.75	2.49	0.22	0.52	0.20	75	144
St Clair 1	3177.00	Pretty Hill Fm	1.90	467	0.68	1.89	4.23	2.57	0.27	0.44	0.21	99	222

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Camelback 1	1734.31	Basal Shale	1.63	438	0.12	1.54	2.57	1.66	0.07	0.60	0.13	94	158
Robertson 1	1748.94	Basal Shale	2.60	434	0.23	4.89	2.60	5.12	0.04	1.88	0.42	188	100
Robertson 1	1749.55	Basal Shale	3.08	435	0.22	6.67	2.99	6.89	0.03	2.23	0.57	216	97
Robertson 1	1752.60	Basal Shale	1.94	432	0.16	1.60	3.34	1.76	0.09	0.48	0.14	82	172
Robertson 1	1755.65	Basal Shale	2.14	432	0.16	2.03	3.71	2.19	0.07	0.55	0.18	94	172
Robertson 1	1758.70	Basal Shale	1.55	432	0.17	1.80	3.21	1.97	0.09	0.56	0.16	116	207
Robertson 1	1761.74	Basal Shale	7.05	432	0.89	36.37	1.77	37.26	0.02	20.55	3.10	515	25
Robertson 1	1764.79	Basal Shale	2.40	435	0.25	7.32	2.26	7.57	0.03	3.24	0.63	305	94
Sawpit 1	2450.00	Basal Shale	1.56	442	0.35	1.68	7.20	2.03	0.17	0.23	0.17	108	462
Sawpit 1	2458.00	Basal Shale	1.89	439	0.61	2.11	9.27	2.72	0.22	0.23	0.23	112	490
Sawpit 1	2461.50	Basal Shale	1.88	441	0.48	2.22	7.94	2.70	0.18	0.28	0.22	118	422

Well	Top	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Sawpit 1	2482.20	Casterton Fm	1.46	442	0.39	1.56	0.47	1.95	0.20	3.32	0.16	107	32
Sawpit 1	2501.00	Casterton Fm	1.29	440	0.43	2.78	0.43	3.21	0.13	6.47	0.27	216	33

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Bool Lagoon 1	387.10	Eumeralla Fm	0.44	382	0.17	0.39	0.96	0.56	0.30	0.41	0.40	88	210
Bool Lagoon 1	432.82	Eumeralla Fm	0.63	315	0.12	0.19	0.88	0.31	0.39	0.22	0.02	30	139
Bool Lagoon 1	487.68	Eumeralla Fm	0.28										
Bool Lagoon 1	539.50	Eumeralla Fm	0.67	436	0.10	1.81	1.55	1.91	0.05	1.17	0.15	270	231
Bool Lagoon 1	594.36	Eumeralla Fm	3.10	434	0.12	7.79	2.41	7.91	0.02	3.23	0.65	251	78
Bool Lagoon 1	637.03	Eumeralla Fm	3.21	434	0.11	7.31	2.26	7.42	0.01	3.23	0.61	228	70
Camelback 1	630.94	Eumeralla Fm	12.70	430	0.73	25.04	3.87	25.77	0.03	6.47	2.14	197	30
Camelback 1	707.14	Eumeralla Fm	0.16										
Camelback 1	772.67	Eumeralla Fm	3.20	432	0.18	5.04	1.24	5.22	0.03	4.06	0.43	158	39
Caroline 1	2923.03	Eumeralla Fm	1.80	439								65	17
Caroline 1	2953.51	Eumeralla Fm	0.98	455								53	32
Caroline 1	2987.04	Eumeralla Fm	1.26	442								50	19
Caroline 1	3017.52	Eumeralla Fm	1.69	443								50	15
Caroline 1	3066.59	Eumeralla Fm	0.85	450								76	9
Caroline 1	3078.48	Eumeralla Fm	0.89									43	32
Caroline 1	3108.96	Eumeralla Fm	1.27	446								54	20
Caroline 1	3139.44	Eumeralla Fm	0.80	454								43	23
Caroline 1	3169.92	Eumeralla Fm	1.45	445								47	10
Caroline 1	3230.88	Eumeralla Fm	1.54	444								64	13
Caroline 1	3291.84	Eumeralla Fm	1.72	446								52	17
Caroline 1	3355.85	Eumeralla Fm	1.35	445								48	17
Caroline 1	3368.65	Eumeralla Fm	1.02	460								54	9
Caroline 1	3369.87	Eumeralla Fm	0.33										
Chama 1A	1030.22	Eumeralla Fm	1.40	420	0.84	1.01	2.64	1.85	0.45	0.38	0.15	72	188
Chama 1A	1030.22	Eumeralla Fm	12.00	413	2.69	9.58	13.49	12.27	0.22	0.71	1.02	79	112
Chama 1A	1082.04	Eumeralla Fm	0.88	418	0.92	0.91	1.83	1.83	0.50	0.50	0.15	103	207
Chama 1A	1121.66	Eumeralla Fm	1.97	419	2.23	2.93	3.35	5.16	0.43	0.87	0.43	148	170
Chama 1A	1185.67	Eumeralla Fm	0.40	395	0.39	0.36	2.30	0.75	0.52	0.16	0.06	90	575

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Chama 1A	1249.68	Eumeralla Fm	2.72	422	2.14	1.76	3.04	3.90	0.55	0.58	0.32	64	111
Chama 1A	1274.06	Eumeralla Fm	0.14	404	0.15	0.02	2.61	0.17	0.88	0.01	0.01	14	1864
Chama 1A	1328.93	Eumeralla Fm	0.27										
Chama 1A	1338.07	Eumeralla Fm	0.37	434	0.54	0.32	2.90	0.86	0.63	0.11	0.07	86	783
Chama 1A	1383.79	Eumeralla Fm	0.64	461								39	205
Chama 1A	1411.22	Eumeralla Fm	0.43	321	0.00	0.00	0.00	0.00			0.00	0	0
Chama 1A	1466.09	Eumeralla Fm	0.51	263	0.00	0.00	0.00	0.00			0.00	0	0
Chama 1A	1539.24	Eumeralla Fm	0.31	416	0.48	0.68	2.25	1.16	0.41	0.30	0.09	219	725
Chama 1A	1572.77	Eumeralla Fm	0.59	435	0.33	0.42	2.02	0.75	0.44	0.21	0.06	71	342
Chama 1A	1694.69	Eumeralla Fm	0.55	439	0.34	0.37	1.31	0.71	0.48	0.28	0.05	67	238
Chama 1A	1694.69	Eumeralla Fm	0.36										
Chama 1A	1752.60	Eumeralla Fm	0.73	386	0.23	0.25	1.11	0.48	0.48	0.23	0.04	34	152
Chama 1A	1798.32	Eumeralla Fm	0.73	457								37	33
Chama 1A	1801.37	Eumeralla Fm	38.20	430	3.90	85.14	7.14	89.04	0.04	11.92	7.42	222	18
Chama 1A	1804.42	Eumeralla Fm	2.70	434	0.62	3.57	1.51	4.19	0.15	2.36	0.34	132	55
Chama 1A	1804.42	Eumeralla Fm	58.10	430	10.49	143.66	9.90	154.15	0.07	14.51	12.84	247	17
Chama 1A	1859.28	Eumeralla Fm	1.52	438	0.32	1.47	1.08	1.79	0.18	1.36	0.14	96	71
Chama 1A	1871.47	Eumeralla Fm	0.53	459								46	33
Chama 1A	1883.66	Eumeralla Fm	0.87	437	0.26	0.58	1.11	0.84	0.31	0.52	0.07	66	127
Chama 1A	1895.86	Eumeralla Fm	0.95	436	0.23	0.81	1.03	1.04	0.22	0.79	0.08	85	108
Chama 1A	1905.00	Eumeralla Fm	0.55	456								36	39
Chama 1A	1908.05	Eumeralla Fm	0.53	447	0.24	0.28	0.89	0.52	0.46	0.31	0.04	52	167
Chama 1A	1944.62	Eumeralla Fm	0.51	435	0.30	0.50	1.37	0.80	0.37	0.36	0.06	98	268
Chama 1A	1965.96	Eumeralla Fm	0.86	440	0.23	0.47	1.67	0.70	0.33	0.28	0.05	54	194
Chama 1A	1999.49	Eumeralla Fm	0.67	435	0.23	0.45	0.81	0.68	0.34	0.56	0.05	67	120
Chama 1A	2020.82	Eumeralla Fm	0.68	438	0.22	0.49	0.84	0.71	0.31	0.58	0.05	72	123
Chama 1A	2042.16	Eumeralla Fm	0.96	445								46	30
Chama 1A	2045.21	Eumeralla Fm	1.53	434	0.41	1.93	1.11	2.34	0.18	1.74	0.19	126	72

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Chama 1A	2060.45	Eumeralla Fm	1.56	432	0.39	1.84	1.23	2.23	0.17	1.50	0.18	117	78
Chama 1A	2072.64	Eumeralla Fm	2.48	432	0.45	3.63	1.35	4.08	0.11	2,69	0.34	146	54
Chama 1A	2075.69	Eumeralla Fm	4.25	444								95	23
Chama 1A	2093.98	Eumeralla Fm	1.91	437	0.51	1.30	1.50	1.81	0.28	0.87	0.15	68	78
Chama 1A	2093.98	Eumeralla Fm	31.20	435	3.13	39.31	9.70	42.44	0.07	4.05	3.53	125	31
Chama 1A	2112.26	Eumeralla Fm	1.69	466								68	24
Chama 1A	2121.41	Eumeralla Fm	1.55	435	0.58	1.62	1.02	2.20	0.26	1.59	0.18	104	65
Chama 1A	2133.60	Eumeralla Fm	2.18	438	0.50	1.85	1.13	2.35	0.21	1.64	0.13	84	51
Chama 1A	2145.79	Eumeralla Fm	0.85	446								30	22
Chama 1A	2161.03	Eumeralla Fm	2.18	438	0.46	1.51	0.89	1.97	0.23	1.70	0.16	69	40
Chama 1A	2161.03	Eumeralla Fm	36.50	437	3.75	58.75	8.36	62.50	0.06	7.03	5.20	160	22
Chama 1A	2167.13	Eumeralla Fm	2.78	433	0.51	2.71	0.77	3.22	0.16	3.52	0.26	97	27
Chama 1A	2179.32	Eumeralla Fm	3.43	442								86	22
Chama 1A	2182.37	Eumeralla Fm	3.88	434	0.53	4.61	1.04	5.14	0.10	4.43	0.42	118	26
Chama 1A	2194.56	Eumeralla Fm	1.20	436	0.35	1.20	0.89	1.55	0.23	1.35	0.12	100	74
Chama 1A	2212.85	Eumeralla Fm	1.64	436	0.35	1.61	0.79	1.96	0.18	2.04	0.16	98	48
Chama 1A	2212.85	Eumeralla Fm	0.17	438	0.15	1.17	0.50	1.32	0.11	2.34	0.11	688	294
Chama 1A	2212.85	Eumeralla Fm	1.16	440								47	15
Chama 1A	2221.99	Eumeralla Fm	1.36	436	0.33	1.37	0.68	1.70	0.19	2.01	0.14	100	50
Chama 1A	2221.99	Eumeralla Fm	34.10	433	8.63	93.15	2.94	101.78	0.08	31.68	8.48	273	8
Chama 1A	2237.23	Eumeralla Fm	1.44	433	0.37	1.68	0.53	2.05	0.18	3.17	0.17	116	36
Chama 1A	2246.38	Eumeralla Fm	1.59	448								90	28
Chama 1A	2249.42	Eumeralla Fm	2.58	433	0.57	4.08	0.69	4.65	0.12	5.91	0.38	158	26
Chama 1A	2261.62	Eumeralla Fm	0.86	437	0.24	0.71	0.51	0.95	0.25	1.39	0.07	82	70
Chama 1A	2273.81	Eumeralla Fm	1.28	436	0.28	1.22	0.56	1.50	0.19	2.18	0.12	95	43
Chama 1A	2279.90	Eumeralla Fm	1.02	443								46	23
Chama 1A	2282.95	Eumeralla Fm	2.98	436	0.43	5.36	0.94	5.79	0.07	5.70	0.48	179	31
Chama 1A	2292.10	Eumeralla Fm	5.60	438	1.49	10.11	0.75	11.60	0.13	13.48	0.96	180	13

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Chama 1A	2301.24	Eumeralla Fm	1.51	438	0.36	1.48	0.81	1.84	0.20	1.83	0.15	98	53
Chama 1A	2313.43	Eumeralla Fm	1.45	434	0.41	1.92	0.81	2.33	0.18	2,37	0.19	132	55
Chama 1A	2313.43	Eumeralla Fm	32.40	437	7.98	84.42	2.21	92.40	0.09	38.20	7.70	260	6
Chama 1A	2313.43	Eumeralla Fm	9.60	442								179	11
Chama 1A	2331.72	Eumeralla Fm	1.71	432	0.55	2.45	0.87	3.00	0.18	2.82	0.25	143	50
Chama 1A	2340.86	Eumeralla Fm	3.22	435	0.66	4.97	0.91	5.63	0.12	5.46	0.46	154	28
Chama 1A	2346.96	Eumeralla Fm	1.34	445								69	18
Chama 1A	2353.06	Eumeralla Fm	2.44	436	0.98	3.75	0.72	4.73	0.21	5.21	0.39	135	29
Chama 1A	2365.25	Eumeralla Fm	1.34	439	0.43	1.36	0.98	1.79	0.24	1.39	0.14	101	73
Chama 1A	2374.39	Eumeralla Fm	2.40	435	0.69	3.06	0.85	3.75	0.18	3.60	0.31	127	35
Chama 1A	2374.39	Eumeralla Fm	21.00	436	5.20	53.70	1.50	58.90	0.09	35.80	4.90	255	7
Chama 1A	2383.54	Eumeralla Fm	1.13	438	0.23	1.68	0.67	1.91	0.12	2.51	0.15	149	59
Chama 1A	2389.63	Eumeralla Fm	2.38	439	0.61	3.05	1.03	3.66	0.17	2.96	0.30	128	43
Chama 1A	2389.63	Eumeralla Fm	43.50	442	9.62	104.62	2.83	114.24	0.08	36.97	9.52	240	6
Chama 1A	2398.78	Eumeralla Fm	38.50	442	8.66	97.80	2.66	106.46	0.08	36.77	8.87	254	6
Chama 1A	2404.87	Eumeralla Fm	28.20	441	5.60	64.67	2.24	70.27	0.08	28.87	5.85	229	7
Chama 1A	2410.97	Eumeralla Fm	3.06	439	0.69	4.01	0.81	4.70	0.15	4.95	0.39	131	26
Chama 1A	2410.97	Eumeralla Fm	34.90	441	8.53	83.43	2.35	91.96	0.09	35.50	8.16	256	6
Chama 1A	2423.16	Eumeralla Fm	34.30	443	8.67	84.48	1.83	93.15	0.09	46.16	7.76	246	5
Chama 1A	2432.30	Eumeralla Fm	36.60	443	8.26	89.51	2.40	97.77	0.08	37.30	8.14	244	6
Chama 1A	2435.35	Eumeralla Fm	25.30	442	5.08	50.50	1.69	55.58	0.09	29.88	4.63	199	6
Chama 1A	2441.45	Eumeralla Fm	54.00	440	14.64	128.12	2.50	142.76	0.10	51.25	11.89	237	4
Chama 1A	2447.54	Eumeralla Fm	2.58	440	0.67	3.33	0.74	4.00	0.17	4.50	0.33	129	28
Chama 1A	2447.54	Eumeralla Fm	23.20	441	5.49	57.43	1.62	62.92	0.09	35.45	5.24	247	6
Chama 1A	2447.54	Eumeralla Fm	31.00	444	8.34	63.39	1.55	71.73	0.12	40.90	5.97	204	5
Chama 1A	2453.64	Eumeralla Fm	1.90	442	0.50	2.43	0.75	2.93	0.17	3.24	0.24	127	39
Chama 1A	2453.64	Eumeralla Fm	23.10	440	6.02	60.95	1.67	66.97	0.09	36.50	5.58	263	7
Chama 1A	2468.88	Eumeralla Fm	5.90	438	1.13	9.44	0.93	10.57	0.11	10.15	0.88	160	15

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Chama 1A	2474.98	Eumeralla Fm	2.82	449								134	7
Chama 1A	2478.02	Eumeralla Fm	25.40	442	7.18	69.72	1.72	76.90	0.09	40.53	6.40	274	6
Chama 1A	2487.17	Eumeralla Fm	3.42	439	0.79	4.30	0.88	5.09	0.16	4.89	0.42	125	25
Chama 1A	2487.17	Eumeralla Fm	24.90	440	6.45	64.00	1.70	70.45	0.09	37.65	5.87	257	6
Chama 1A	2487.17	Eumeralla Fm	19.60	443	3.52	38.61	1.28	42.13	0.08	30.16	3.51	196	6
Chama 1A	2499.36	Eumeralla Fm	6.50	439	1.81	12.82	0.90	14.63	0.12	14.24	1.21	197	13
Chama 1A	2502.41	Eumeralla Fm	8.83	442	1.67	14.83	1.02	16.50	0.10	14.54	1.37	168	12
Chama 1A	2508.50	Eumeralla Fm	4.32	441								15	10
Chama 1A	2523.74	Eumeralla Fm	19.20	445	4.67	44.87	1.49	49.54	0.09	30.11	4.12	233	7
Chama 1A	2532.89	Eumeralla Fm	32.60	447	7.98	75.19	2.21	83.17	0.10	34.02	6.93	230	6
Chama 1A	2542.03	Eumeralla Fm	0.49										
Chama 1A	2548.13	Eumeralla Fm	3.32	440	0.80	4.13	0.89	4.93	0.16	4.64	0.41	124	26
Chama 1A	2548.13	Eumeralla Fm	49.60	444	13.45	127.57	2.80	141.02	0.10	45.56	11.75	257	5
Chama 1A	2557.27	Eumeralla Fm	4.55	437	1.17	6.31	0.95	7.48	0.16	6.64	0.62	138	20
Chama 1A	2575.56	Eumeralla Fm	6.75	443	1.57	10.74	1.03	12.31	0.13	10.43	1.02	159	15
Chama 1A	2575.56	Eumeralla Fm	0.51	445								35	29
Chama 1A	2587.75	Eumeralla Fm	5.15	440	0.97	7.17	0.97	8.14	0.12	7.39	0.67	139	18
Chama 1A	2587.75	Eumeralla Fm	5.21	441	0.65	8.12	1.26	8.77	0.07	6.44	0.73	155	24
Chama 1A	2596.90	Eumeralla Fm	4.20	441	0.70	4.48	1.36	5.18	0.14	3.29	0.43	106	32
Chama 1A	2606.04	Eumeralla Fm	1.86	442	0.43	1.83	1.13	2.26	0.19	1.62	0.18	98	60
Chama 1A	2609.09	Eumeralla Fm	1.48	446								61	15
Chama 1A	2615.18	Eumeralla Fm	1.75	442	0.32	1.35	1.93	1.67	0.19	0.70	0.13	77	110
Crayfish 1A	490.73	Eumeralla Fm	0.33	430	0.09	0.13	1.77	0.22	0.41	0.07	0.01	39	536
Crayfish 1A	521.21	Eumeralla Fm	0.47	343	0.07	0.08	1.36	0.15	0.47	0.06	0.01	17	289
Crayfish 1A	542.54	Eumeralla Fm	0.37	327	0.15	0.05	1.44	0.20	0.75	0.03	0.01	14	389
Crayfish 1A	551.69	Eumeralla Fm	0.45	270	0.04	0.00	2.15	0.04	1.00	0.00	0.00	0	478
Crayfish 1A	585.22	Eumeralla Fm	0.36	232	0.05	0.00	1.14	0.05	1.00	0.00	0.00	6	317
Crayfish 1A	597.41	Eumeralla Fm	0.65	323	0.04	0.07	1.58	0.11	0.36	0.04	0.00	11	243

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	612.65	Eumeralla Fm	0.38	273	0.03	0.00	0.70	0.03	1.00	0.00	7.00	0	184
Crayfish 1A	630.94	Eumeralla Fm	0.80	305	0.05	0.06	1.67	0.11	0.45	0.04	0.00	8	209
Crayfish 1A	652.27	Eumeralla Fm	0.73	344	0.05	0.13	0.98	0.18	0.28	0.13	0.01	18	134
Crayfish 1A	685.80	Eumeralla Fm	0.86	430	0.05	0.25	1.06	0.30	0.17	0.24	0.02	29	123
Crayfish 1A	694.94	Eumeralla Fm	0.38	359	0.09	0.10	5.16	0.19	0.47	0.02	0.01	26	1358
Crayfish 1A	707.14	Eumeralla Fm	0.44	265	0.09	0.04	0.70	0.13	0.69	0.06	0.01	9	159
Crayfish 1A	722.38	Eumeralla Fm	0.34	265	0.07	0.02	0.61	0.09	0.78	0.03	0.00	6	179
Crayfish 1A	743.71	Eumeralla Fm	0.35	250	0.07	0.01	4.96	0.08	0.87	0.00	0.00	3	1417
Crayfish 1A	771.14	Eumeralla Fm	0.56	443	0.16	0.35	2.12	0.51	0.31	0.17	0.04	62	379
Crayfish 1A	798.58	Eumeralla Fm	0.41	370	0.09	0.16	2.01	0.25	0.36	0.08	0.02	39	490
Crayfish 1A	832.10	Eumeralla Fm	0.73	433	0.11	0.31	2.09	0.42	0.26	0.15	0.03	42	286
Crayfish 1A	859.54	Eumeralla Fm	0.56	434	0.16	0.34	1.48	0.50	0.32	0.23	0.04	61	264
Crayfish 1A	880.87	Eumeralla Fm	0.52	386	0.14	0.26	1.13	0.40	0.35	0.23	0.03	50	217
Crayfish 1A	914.40	Eumeralla Fm	0.46	359	0.08	0.22	0.88	0.30	0.27	0.25	0.02	48	191
Crayfish 1A	938.78	Eumeralla Fm	0.70	355	0.11	0.21	1.26	0.32	0.34	0.17	0.02	29	174
Crayfish 1A	966.22	Eumeralla Fm	0.57	376	0.11	0.21	1.26	0.32	0.34	0.17	0.02	37	221
Crayfish 1A	996.70	Eumeralla Fm	0.51	403	0.13	0.33	1.19	0.46	0.28	0.28	0.03	65	233
Crayfish 1A	1036.32	Eumeralla Fm	0.39	299	0.11	0.04	0.63	0.15	0.73	0.06	0.01	10	162
Crayfish 1A	1072.90	Eumeralla Fm	0.60	373	0.09	0.16	0.58	0.25	0.36	0.28	0.02	27	97
Crayfish 1A	1103.38	Eumeralla Fm	0.58	343	0.10	0.18	1.05	0.28	0.36	0.17	0.02	31	181
Crayfish 1A	1127.76	Eumeralla Fm	0.50	346	0.09	0.11	0.71	0.20	0.45	0.15	0.01	22	142
Crayfish 1A	1155.19	Eumeralla Fm	0.62	437	0.11	0.32	0.89	0.43	0.26	0.36	0.03	52	144
Crayfish 1A	1188.72	Eumeralla Fm	0.62	449	0.08	0.18	0.62	0.26	0.31	0.29	0.02	29	100
Crayfish 1A	1216.15	Eumeralla Fm	1.22	439	0.08	0.72	0.79	0.80	0.10	0.91	0.06	59	65
Crayfish 1A	1231.39	Eumeralla Fm	3.58	433	0.24	5.72	2.38	5.96	0.04	2.40	0.49	160	66
Crayfish 1A	1249.68	Eumeralla Fm	0.99	438	0.07	0.51	0.66	0.58	0.12	0.77	0.04	52	67
Crayfish 1A	1283.21	Eumeralla Fm	0.62	438	0.06	0.25	0.54	0.31	0.19	0.46	0.02	40	87
Crayfish 1A	1318.26	Eumeralla Fm	1.10	438	0.04	0.41	0.70	0.45	0.09	0.59	0.03	37	64

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Crayfish 1A	1341.12	Eumeralla Fm	0.55	417	0.07	0.25	0.73	0.32	0.22	0.34	0.02	45	133
Crayfish 1A	1368.55	Eumeralla Fm	0.91	439	0.10	0.51	0.87	0.61	0.16	0.59	0.05	56	96
Crayfish 1A	1453.90	Eumeralla Fm	2.98	437	0.27	5.06	1.44	5.33	0.05	3.51	0.44	170	48
Crayfish 1A	1478.28	Eumeralla Fm	0.97	437	0.18	0.93	1.19	1.11	0.16	0.78	0.09	96	123
Crayfish 1A	1508.76	Eumeralla Fm	1.75	435	0.42	1.72	1.23	2.14	0.20	1.40	0.17	98	70
Crayfish 1A	1539.24	Eumeralla Fm	57.30	433	11.19	201.73	7.39	212.92	0.05	27.30	17.74	352	13
Crayfish 1A	1563.62	Eumeralla Fm	16.00	434	1.11	27.77	3.98	28.88	0.04	6.98	2.40	174	25
Crayfish 1A	1584.96	Eumeralla Fm	18.30	429	2.05	33.43	6.07	35.48	0.06	5.51	2.95	183	33
Geltwood Beach	1246.63	Eumeralla Fm	0.22	361	0.00	0.00	0.16	0.00		0.00	0.00	0	72
Geltwood Beach	1248.16	Eumeralla Fm	1.68	439								28	13
Geltwood Beach	1250.29	Eumeralla Fm	2.24	438								31	13
Geltwood Beach	1258.82	Eumeralla Fm	0.20										
Geltwood Beach	1292.35	Eumeralla Fm	0.21										
Geltwood Beach	1325.88	Eumeralla Fm	0.56									18	55
Geltwood Beach	1342.03	Eumeralla Fm	0.56									33	24
Geltwood Beach	1356.36	Eumeralla Fm	0.40										
Geltwood Beach	1377.39	Eumeralla Fm	1.39	490								18	15
Geltwood Beach	1378.00	Eumeralla Fm	0.26	250	0.00	0.00	0.18	0.00		0.00	0.00	0	69
Geltwood Beach	1389.89	Eumeralla Fm	0.39										
Geltwood Beach	1417.32	Eumeralla Fm	0.75									18	43
Geltwood Beach	1454.81	Eumeralla Fm	1.80									4	3
Geltwood Beach	1456.94	Eumeralla Fm	0.50									23	44
Geltwood Beach	1520.95	Eumeralla Fm	0.47										
Geltwood Beach	1542.29	Eumeralla Fm	0.53									43	25
Geltwood Beach	1554.48	Eumeralla Fm	0.25										
Geltwood Beach	1597.15	Eumeralla Fm	0.36										
Geltwood Beach	1625.50	Eumeralla Fm	0.33	311	0.01	0.05	0.21	0.06	0.17	0.24	0.00	15	63
Geltwood Beach	1625.80	Eumeralla Fm	0.36										

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Geltwood Beach	1648.97	Eumeralla Fm	0.43										
Geltwood Beach	1682.50	Eumeralla Fm	0.22										
Geltwood Beach	1716.02	Eumeralla Fm	0.39										
Geltwood Beach	1724.25	Eumeralla Fm	0.51	433								71	12
Geltwood Beach	1731.26	Eumeralla Fm	0.31	229	0.02	0.00	0.33	0.02	1.00	0.00	0.00	0	106
Geltwood Beach	1749.55	Eumeralla Fm	0.46										
Geltwood Beach	1783.08	Eumeralla Fm	0.34										
Geltwood Beach	1831.85	Eumeralla Fm	0.50									27	15
Geltwood Beach	1854.40	Eumeralla Fm	0.49	437	0.01	0.71	0.14	0.72	0.01	5.07	0.06	144	28
Geltwood Beach	1855.01	Eumeralla Fm	0.04										
Geltwood Beach	1865.38	Eumeralla Fm	0.27										
Geltwood Beach	1986.99	Eumeralla Fm	0.26	443	0.00	0.00	0.18	0.00		0.00	0.00	0	69
Geltwood Beach	1987.91	Eumeralla Fm	0.23										
Geltwood Beach	2026.92	Eumeralla Fm	0.40										
Geltwood Beach	2060.45	Eumeralla Fm	0.20										
Geltwood Beach	2093.98	Eumeralla Fm	0.57	438								41	20
Geltwood Beach	2133.60	Eumeralla Fm	0.23										
Geltwood Beach	2144.27	Eumeralla Fm	0.07	442	0.01	0.01	0.14	0.02	0.50	0.07	0.00	14	200
Geltwood Beach	2144.27	Eumeralla Fm	0.23										
Geltwood Beach	2167.13	Eumeralla Fm	0.25										
Geltwood Beach	2200.35	Eumeralla Fm	0.27										
Geltwood Beach	2249.42	Eumeralla Fm	0.30										
Geltwood Beach	2282.95	Eumeralla Fm	0.24										
Geltwood Beach	2316.48	Eumeralla Fm	0.27										
Geltwood Beach	2350.01	Eumeralla Fm	0.38										
Geltwood Beach	2381.10	Eumeralla Fm	0.65	437								32	12
Geltwood Beach	2414.02	Eumeralla Fm	1.09	439								59	12
Geltwood Beach	2447.54	Eumeralla Fm	0.64	440								24	10

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Geltwood Beach	2487.17	Eumeralla Fm	0.55	441								29	11
Geltwood Beach	2520.70	Eumeralla Fm	0.48										
Geltwood Beach	2560.02	Eumeralla Fm	0.76	434								44	8
Geltwood Beach	2583.48	Eumeralla Fm	0.33	273	0.02	0.06	0.11	0.08	0.25	0.55	0.00	18	33
Geltwood Beach	2593.85	Eumeralla Fm	1.04	441								42	10
Geltwood Beach	2614.88	Eumeralla Fm	2.65	438	0.06	0.81	1.99	0.87	0.07	0.41	0.07	30	75
Geltwood Beach	2630.42	Eumeralla Fm	0.75	440								38	14
Geltwood Beach	2670.05	Eumeralla Fm	0.68	441								36	13
Geltwood Beach	2703.58	Eumeralla Fm	0.41										
Geltwood Beach	2724.61	Eumeralla Fm	0.73	441	0.01	0.28	0.10	0.29	0.03	2.80	0.02	38	13
Geltwood Beach	2749.30	Eumeralla Fm	0.59	440								28	14
Geltwood Beach	2782.82	Eumeralla Fm	1.02	441								50	11
Geltwood Beach	2807.21	Eumeralla Fm	0.68	450								22	20
Geltwood Beach	2828.85	Eumeralla Fm	0.79	439	0.09	0.14	0.62	0.23	0.39	0.23	0.01	17	78
Geltwood Beach	2837.69	Eumeralla Fm	0.52	438								32	36
Geltwood Beach	2874.26	Eumeralla Fm	0.52									31	19
Geltwood Beach	2901.70	Eumeralla Fm	0.52	394	0.05	0.23	0.22	0.28	0.18	1.05	0.02	44	42
Geltwood Beach	2902.00	Eumeralla Fm	1.67	439	0.08	0.80	1.19	0.88	0.09	0.67	0.07	47	71
Geltwood Beach	2913.89	Eumeralla Fm	0.44										
Geltwood Beach	2929.13	Eumeralla Fm	1.67	439	0.12	4.02	0.89	4.14	0.03	4.52	0.34	240	53
Geltwood Beach	2956.56	Eumeralla Fm	0.55	461	0.03	0.13	0.18	0.16	0.19	0.72	0.01	23	32
Geltwood Beach	2956.56	Eumeralla Fm	0.80	443								41	13
Geltwood Beach	2974.85	Eumeralla Fm	0.59	444	0.01	0.21	0.17	0.22	0.05	1.24	0.01	35	28
Geltwood Beach	2990.09	Eumeralla Fm	1.16	450								57	13
Geltwood Beach	3044.95	Eumeralla Fm	0.65	446								42	14
Geltwood Beach	3062.94	Eumeralla Fm	33.50	440	4.69	61.42	21.78	66.11	0.07	2.82	5.50	183	65
Geltwood Beach	3078.48	Eumeralla Fm	1.12	450								53	9
Geltwood Beach	3112.01	Eumeralla Fm	0.87	445								51	10

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Geltwood Beach	3144.32	Eumeralla Fm	1.45	446								69	8
Geltwood Beach	3169.92	Eumeralla Fm	20.10	454	0.49	14.09	2.98	14.58	0.03	4.73	1.21	70	14
Geltwood Beach	3176.02	Eumeralla Fm	2.34	450								84	8
Geltwood Beach	3203.14	Eumeralla Fm	40.30	441	9.14	93.08	24.58	102.22	0.09	3.79	8.51	230	61
Geltwood Beach	3209.54	Eumeralla Fm	0.76	444								54	14
Geltwood Beach	3243.07	Eumeralla Fm	1.17	443								80	9
Geltwood Beach	3276.30	Eumeralla Fm	0.92									42	13
Geltwood Beach	3287.88	Eumeralla Fm	0.62		0.04	0.11	0.50	0.15	0.27	0.22	0.01	172	81
Geltwood Beach	3310.13	Eumeralla Fm	1.40	451								66	8
Geltwood Beach	3343.66	Eumeralla Fm	0.71	447								47	13
Geltwood Beach	3377.18	Eumeralla Fm	0.72	450								66	11
Geltwood Beach	3410.71	Eumeralla Fm	1.85	450								56	10
Geltwood Beach	3417.11	Eumeralla Fm	48.70	450	10.19	30.48	90.67	40.67	0.25	0.34	7.55	165	63
Geltwood Beach	3419.86	Eumeralla Fm	5.92	451	0.66	15.01	2.67	15.67	0.04	5.62	1.30	254	45
Geltwood Beach	3424.12	Eumeralla Fm	0.89		0.06	0.28	0.61	0.34	0.18	0.46	0.02	31	69
Geltwood Beach	3444.24	Eumeralla Fm	1.56	458								60	11
Geltwood Beach	3456.13	Eumeralla Fm	1.22	444	0.19	0.34	0.79	0.53	0.36	0.43	0.04	27	65
Geltwood Beach	3477.77	Eumeralla Fm	0.88	448								54	13
Geltwood Beach	3493.62	Eumeralla Fm	1.26	449	0.28	1.38	0.18	1.66	0.17	7.67	0.13	109	14
Geltwood Beach	3493.92	Eumeralla Fm	25.60	451	5.67	42.45	14.08	48.12	0.12	3.01	4.01	165	55
Geltwood Beach	3511.30	Eumeralla Fm	0.47										
Geltwood Beach	3525.01	Eumeralla Fm	1.48	445	0.18	0.63	0.93	0.81	0.22	0.68	0.06	42	63
Geltwood Beach	3544.82	Eumeralla Fm	0.34										
Geltwood Beach	3578.05	Eumeralla Fm	0.76	451	0.05	0.12	0.61	0.17	0.29	0.20	0.01	15	80
Geltwood Beach	3578.35	Eumeralla Fm	0.47	462	0.07	0.08	0.08	0.15	0.47	1.00	0.01	17	17
Geltwood Beach	3584.45	Eumeralla Fm	0.71	456								42	8
Geltwood Beach	3616.15	Eumeralla Fm	0.40										
Geltwood Beach	3648.46	Eumeralla Fm	0.66	457								22	19

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Geltwood Beach	3681.98	Eumeralla Fm	0.32										
Geltwood Beach	3715.51	Eumeralla Fm	0.64	468								34	5
Geltwood Beach	3728.01	Eumeralla Fm	2.20	439	0.17	2.63	1.34	2.80	0.06	1.96	0.23	119	61
Greenways 1	991.00	Eumeralla Fm	0.69	434	0.03	0.28	0.63	0.31	0.10	0.44	0.02	40	91
Greenways 1	1093.00	Eumeralla Fm	1.05	433	0.11	1.10	1.07	1.21	0.09	1.03	0.10	104	101
Greenways 1	1267.00	Eumeralla Fm	3.67	433	0.31	7.23	0.79	7.54	0.04	9.15	0.62	197	21
Hatherleigh 1	1809.00	Eumeralla Fm	0.94	435	0.04	0.68	0.31	0.72	0.06	2.19	0.06	72	33
Kalangadoo 1	1717.20	Eumeralla Fm	0.75										
Kalangadoo 1	1866.60	Eumeralla Fm	0.75										
Katnook 1	665.00	Eumeralla Fm	3.60	463	0.06	1.11	4.12	1.17	0.05	0.27	0.09	31	114
Katnook 1	700.00	Eumeralla Fm	0.46	376	0.06	0.21	0.42	0.27	0.22	0.50	0.02	46	91
Katnook 1	810.00	Eumeralla Fm	0.98	433	0.07	0.44	1.43	0.51	0.14	0.31	0.04	45	146
Katnook 1	900.00	Eumeralla Fm	0.66	435	0.03	0.46	0.84	0.49	0.06	0.55	0.04	70	127
Katnook 1	1020.00	Eumeralla Fm	0.87	404	0.08	3.08	0.31	3.16	0.03	9.94	0.26	354	66
Katnook 1	1115.00	Eumeralla Fm	0.54	324	0.04	0.25	0.61	0.29	0.14	0.41	0.02	46	113
Katnook 1	1205.00	Eumeralla Fm	0.54	332	0.06	0.29	0.55	0.35	0.17	0.53	0.02	54	102
Katnook 1	1275.00	Eumeralla Fm	0.49	325	0.07	0.29	0.41	0.36	0.19	0.71	0.03	59	64
Katnook 1	1300.00	Eumeralla Fm	0.93	430	0.11	0.48	1.32	0.59	0.19	0.36	0.04	52	142
Katnook 1	1395.00	Eumeralla Fm	0.57	393	0.08	0.39	0.63	0.47	0.17	0.62	0.03	68	111
Katnook 1	1460.00	Eumeralla Fm	0.65	352	0.07	0.32	0.39	0.39	0.18	0.82	0.03	49	60
Katnook 1	1480.00	Eumeralla Fm	0.91	434	0.09	0.92	0.63	1.01	0.09	1.46	0.08	101	89
Katnook 1	1835.00	Eumeralla Fm	8.90	431	0.56	17.97	2.71	18.53	0.03	6.63	1.54	202	30
Katnook 1	1875.00	Eumeralla Fm	1.14	438	0.09	1.02	0.71	1.11	0.08	1.44	0.09	89	62
Katnook 2	710.00	Eumeralla Fm	0.20	356	0.03	0.07	1.78	0.10	0.30	0.04	0.00	35	890
Katnook 2	800.00	Eumeralla Fm	0.63	392	0.04	0.26	2.88	0.30	0.13	0.09	0.02	41	457
Katnook 2	900.00	Eumeralla Fm	0.68	347	0.11	0.28	1.79	0.39	0.28	0.16	0.03	41	263
Katnook 2	1000.00	Eumeralla Fm	0.56	314	0.03	0.19	1.17	0.22	0.14	0.16	0.01	33	208
Katnook 2	1100.00	Eumeralla Fm	0.28	433	0.05	0.20	0.84	0.25	0.20	0.24	0.02	71	300

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Katnook 2	1300.00	Eumeralla Fm	0.56	416	0.12	0.40	4.44	0.52	0.23	0.09	0.04	71	792
Katnook 2	1400.00	Eumeralla Fm	1.35	431	0.24	2.32	2.47	2.56	0.09	0.94	0.21	171	182
Katnook 2	1500.00	Eumeralla Fm	0.70	433	0.14	0.69	1.14	0.83	0.17	0.61	0.06	98	162
Katnook 2	1600.00	Eumeralla Fm	2.00	432	0.28	3.70	1.13	3.98	0.07	3.27	0.33	185	56
Katnook 2	1700.00	Eumeralla Fm	0.77	436	0.12	0.81	0.65	0.93	0.13	1.25	0.07	105	84
Katnook 2	1870.00	Eumeralla Fm	1.23	442	0.15	0.63	0.28	0.78	0.19	2.25	0.06	51	22
Katnook 3	1000.00	Eumeralla Fm	0.47	447	0.01	0.11	0.06	0.12	0.08	1.83	0.01	23	12
Katnook 3	1100.00	Eumeralla Fm	0.36										
Katnook 3	1200.00	Eumeralla Fm	0.48	401	0.02	0.18	0.10	0.20	0.10	1.80	0.01	37	21
Katnook 3	1300.00	Eumeralla Fm	0.88	433	0.07	0.90	0.20	0.97	0.07	4.50	0.08	102	23
Katnook 3	1400.00	Eumeralla Fm	0.98	437	0.07	0.88	0.30	0.95	0.07	2.93	0.07	89	31
Katnook 3	1500.00	Eumeralla Fm	0.63	436	0.09	0.57	0.15	0.66	0.14	3.80	0.05	90	24
Katnook 3	1600.00	Eumeralla Fm	1.25	438	0.11	2.05	0.28	2.16	0.05	7.32	0.18	164	22
Katnook 3	1700.00	Eumeralla Fm	2.65	435	0.21	4.88	1.06	5.09	0.04	4.60	0.42	184	40
Katnook 3	1800.00	Eumeralla Fm	1.06	440	0.11	0.91	0.22	1.02	0.11	4.14	0.08	85	21
Killarney 1	638.86	Eumeralla Fm	1.79	437	0.08	2.09	1.18	2.17	0.04	1.77	0.18	117	66
Ladbroke Grove	732.13	Eumeralla Fm	1.16	441	0.30	1.12	0.70	1.42	0.21	1.60	0.11	96	60
Ladbroke Grove	800.00	Eumeralla Fm	0.35	341	0.04	0.15	2.17	0.19	0.21	0.07	0.01	42	620
Ladbroke Grove	915.00	Eumeralla Fm	0.46	302	0.06	0.19	0.89	0.25	0.24	0.21	0.02	41	193
Ladbroke Grove	975.00	Eumeralla Fm	0.88	430	0.08	0.38	0.87	0.46	0.17	0.44	0.03	43	98
Ladbroke Grove	1100.00	Eumeralla Fm	0.49	343	0.08	0.35	0.42	0.43	0.19	0.83	0.03	71	85
Ladbroke Grove	1110.00	Eumeralla Fm	0.45	344	0.04	0.32	0.50	0.36	0.11	0.64	0.30	71	111
Ladbroke Grove	1194.00	Eumeralla Fm			0.50								
Ladbroke Grove	1205.00	Eumeralla Fm	0.40	331	0.17	0.36	1.01	0.53	0.32	0.36	0.04	90	252
Ladbroke Grove	1405.00	Eumeralla Fm	0.43	373	0.06	0.29	0.23	0.35	0.17	1.25	0.02	673	53
Ladbroke Grove	1452.00	Eumeralla Fm			0.38								
Ladbroke Grove	1502.00	Eumeralla Fm	0.72	433	0.08	0.99	0.14	1.07	0.07	7.07	0.08	137	19
Ladbroke Grove	1600.00	Eumeralla Fm	0.76	432	0.08	0.56	0.45	0.64	0.13	1.24	0.05	73	59

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Ladbroke Grove	1700.00	Eumeralla Fm	1.54	434	0.17	1.98	0.24	2.15	0.08	8.25	0.17	128	15
Ladbroke Grove	1800.00	Eumeralla Fm	2.05	437	0.16	3.37	0.31	3.53	0.05	10.87	0.29	164	15
Laira 1	900.00	Eumeralla Fm	0.74	277	0.04	0.15	0.74	0.19	0.21	0.20	0.01	20	100
Laira 1	1000.00	Eumeralla Fm	0.75	333	0.10	0.56	2.08	0.66	0.15	0.27	0.05	74	277
Laira 1	1150.00	Eumeralla Fm	0.35										
Laira 1	1200.00	Eumeralla Fm	0.36	320	0.02	0.07	0.94	0.09	0.22	0.07	0.00	19	261
Laira 1	1307.00	Eumeralla Fm	0.46	427	0.05	0.35	0.63	0.40	0.13	0.56	0.03	76	136
Laira 1	1447.00	Eumeralla Fm	0.86	433	0.20	1.27	1.63	1.47	0.14	0.78	0.12	147	189
Laira 1	1500.00	Eumeralla Fm	0.39	430	0.11	0.47	1.35	0.58	0.19	0.35	0.04	120	346
Laira 1	1600.00	Eumeralla Fm	0.96	436	0.09	0.70	0.93	0.79	0.11	0.75	0.06	72	96
Laira 1	1700.00	Eumeralla Fm	0.92	437	0.09	0.84	1.16	0.93	0.10	0.72	0.07	91	126
Laira 1	1800.00	Eumeralla Fm	0.91	437	0.07	0.67	0.80	0.74	0.09	0.84	0.06	73	87
Laira 1	1902.00	Eumeralla Fm	1.77	440	0.10	1.49	0.53	1.59	0.06	2.81	0.13	84	29
Lake Bonney 1	2724.91	Eumeralla Fm	1.66	451								37	33
Lake Bonney 1	2791.97	Eumeralla Fm	1.54	449								39	28
Lake Bonney 1	2807.21	Eumeralla Fm	0.68	450								22	20
Lake Bonney 1	2825.50	Eumeralla Fm	1.15	443								55	27
Lake Bonney 1	2837.69	Eumeralla Fm	0.52	438								32	36
Lake Bonney 1	2859.02	Eumeralla Fm	1.35	450								38	26
Lake Bonney 1	2874.26	Eumeralla Fm	0.52									31	19
Lake Bonney 1	2892.55	Eumeralla Fm	1.39	447								36	23
Lake Bonney 1	2907.49	Eumeralla Fm	0.81	447								46	16
Lucindale 1	502.62	Eumeralla Fm	0.68	437	0.03	0.26	0.67	0.29	0.10	0.39	0.02	38	98
Lucindale 1	619.05	Eumeralla Fm	1.68	435	0.04	0.95	1.19	0.99	0.04	0.80	0.08	569	70
Reedy Creek 1	618.00	Eumeralla Fm	0.64	316	0.06	0.08	0.24	0.14	0.43	0.33	0.01	13	38
Reedy Creek 1	635.00	Eumeralla Fm	0.28	237	0.06	0.00	0.37	0.06	1.00	0.00	0.00	0	132
Reedy Creek 1	858.00	Eumeralla Fm	0.52	274	0.10	0.08	0.41	0.18	0.56	0.20	0.18	15	79
Reedy Creek 1	1056.70	Eumeralla Fm	0.36	274	0.06	0.09	0.71	0.15	0.40	0.13	0.01	25	197

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
Reedy Creek 1	1199.70	Eumeralla Fm	0.57	421	0.11	0.34	0.23	0.45	0.24	1.48	0.04	60	40
Reedy Creek 1	1330.00	Eumeralla Fm	0.98	430	0.14	0.93	0.36	1.07	0.13	2.58	0.09	95	37
Reedy Creek 1	1467.00	Eumeralla Fm	5.46	433	0.72	18.29	0.46	19.01	0.04	39.76	1.58	335	8
Reedy Creek 1	1530.30	Eumeralla Fm	2.51	434	0.29	6.56	0.49	6.85	0.04	13.39	0.57	261	20
Reedy Creek 1	1554.50	Eumeralla Fm	2.82	432	0.28	8.74	0.67	9.02	0.03	13.04	0.75	310	24
Reedy Creek 1	1587.00	Eumeralla Fm	1.55	434	0.36	1.82	0.43	2.18	0.17	4.23	0.18	117	28
Reedy Creek 1	1624.00	Eumeralla Fm	4.32	432	0.90	10.90	0.46	11.80	0.08	23.70	0.98	252	11
Reedy Creek 1	1650.00	Eumeralla Fm	1.22	433	0.16	2.79	2.58	2.95	0.05	1.08	0.24	228	211
Reedy Creek 1	1653.50	Eumeralla Fm	11.33	429	1.52	39.00	0.70	40.52	0.04	55.71	3.38	344	6
Reedy Creek 1	1690.00	Eumeralla Fm	1.54	436	0.21	3.28	1.59	3.49	0.06	2.06	0.29	212	103
Robertson 1	630.94	Eumeralla Fm	0.65	317	0.04	0.13	0.75	0.17	0.24	0.17	0.01	20	115
Robertson 1	801.93	Eumeralla Fm	5.50	430	0.25	8.24	3.57	8.49	0.03	2.31	0.70	149	64
Robertson 1	893.06	Eumeralla Fm	3.10	425	0.13	2.77	3.90	2.90	0.04	0.71	0.24	89	125
Sawpit 1	1192.00	Eumeralla Fm	0.12										
St Clair 1	672.00	Eumeralla Fm	0.34										
St Clair 1	687.00	Eumeralla Fm	0.21										
St Clair 1	697.50	Eumeralla Fm	0.15										
St Clair 1	775.00	Eumeralla Fm	0.20										
St Clair 1	851.50	Eumeralla Fm	0.19										
St Clair 1	929.50	Eumeralla Fm	0.61	421	0.18	0.65	6.19	0.83	0.22	0.10	0.06	106	1014
St Clair 1	1060.50	Eumeralla Fm	0.16										
St Clair 1	1162.00	Eumeralla Fm	0.46	368	0.09	0.34	3.33	0.43	0.21	0.10	0.03	73	723
St Clair 1	1287.00	Eumeralla Fm	0.68	423	0.15	0.63	0.59	0.78	0.19	1.06	0.06	92	86
St Clair 1	1366.50	Eumeralla Fm	0.31										
St Clair 1	1450.00	Eumeralla Fm	0.23										
St Clair 1	1549.50	Eumeralla Fm	0.31										
St Clair 1	1635.50	Eumeralla Fm	0.32										
St Clair 1	1685.00	Eumeralla Fm	0.60	422	0.12	0.60	1.28	0.72	0.17	0.46	0.06	100	213

Early Cretaceous: Otway Group

Well	Top (m)	Formation	TOC	TMax	S1	S2	S3	PY	PI	SQ	PC	HI	OI
St Clair 1	1924.00	Eumeralla Fm	0.55	386	0.43	0.58	0.33	1.01	0.43	1.75	0.08	105	60
St Clair 1	1970.50	Eumeralla Fm	0.16										
Trumpet 1	1069.85	Eumeralla Fm	0.81	463	0.21	0.30	0.88	0.51	0.41	0.34	0.04	37	109
Trumpet 1	1088.14	Eumeralla Fm	0.90	435	0.15	0.41	0.62	0.56	0.27	0.66	0.04	46	69
Trumpet 1	1106.42	Eumeralla Fm	0.91	445	0.16	0.21	0.89	0.37	0.43	0.24	0.03	23	98
Trumpet 1	1124.71	Eumeralla Fm	0.75	434	0.19	0.17	1.00	0.36	0.53	0.17	0.03	23	133
Trumpet 1	1143.00	Eumeralla Fm	1.10	444	0.16	0.46	0.90	0.62	0.26	0.51	0.05	42	82
Trumpet 1	1161.29	Eumeralla Fm	0.90	445	0.23	0.51	0.77	0.74	0.31	0.66	0.06	57	86
Trumpet 1	1179.58	Eumeralla Fm	0.83	458	0.25	0.43	0.92	0.68	0.37	0.47	0.05	52	111
Trumpet 1	1197.86	Eumeralla Fm	0.94	439	0.21	0.70	0.66	0.91	0.23	1.06	0.07	74	70
Trumpet 1	1216.15	Eumeralla Fm	0.81	437	0.14	0.42	0.80	0.56	0.25	0.52	0.04	52	99
Trumpet 1	1231.39	Eumeralla Fm	1.33	433	0.28	0.48	1.09	0.76	0.37	0.44	0.06	36	82
Trumpet 1	1249.68	Eumeralla Fm	1.85	445	0.15	0.66	1.30	0.81	0.19	0.51	0.06	36	70
Trumpet 1	1267.97	Eumeralla Fm	4.00	436	0.21	3.61	2.51	3.82	0.05	1.44	0.31	90	63
Trumpet 1	1283.21	Eumeralla Fm	0.90	443	0.13	0.54	0.93	0.67	0.19	0.58	0.05	60	103
Trumpet 1	1298.45	Eumeralla Fm	0.60	439	0.11	0.20	0.42	0.31	0.35	0.48	0.02	33	70
Zema 1	1644.00	Eumeralla Fm	0.64	221	0.01	0.00	0.04	0.01	1.00	0.00	0.00	0	6
Zema 1	1734.00	Eumeralla Fm	4.51	433	0.47	7.82	2.84	8.29	0.06	2.75	0.69	173	63
Zema 1	1794.00	Eumeralla Fm	6.52	430	1.07	10.81	4.63	11.88	0.09	2.33	0.99	165	71
Zema 1	1824.00	Eumeralla Fm	9.69	432	0.61	16.77	7.95	17.38	0.04	2.11	1.44	173	82
Zema 1	1854.00	Eumeralla Fm	5.04	433	0.35	9.73	2.82	10.08	0.03	3.45	0.84	193	56

One large anomaly ~16 km south of Port MacDonnell (Fig. 7.26) was geographically coincident with 'clouds of gas bubbles' observed on sonar records (Ducharme, 1983). Subsequent analysis of the gas indicated that peak propane is about half peak methane indicating an oil rather than gas source. Low ethylene appears to rule out a biogenic source and iso-butane/n-butane ratios suggest a mature source of hydrocarbons.

These results contrast significantly with those obtained from a 1987 geochemical and geological sampling program conducted by the Bureau of Mineral Resources aboard *RV Rig Seismic* (Heggie *et al.*, 1988). These authors identified nine locations (Fig. 7.26) that contain thermogenic gases; all anomalies are located above major faults. The highest gas concentrations occur in the western Voluta Trough where faulting extends almost to the seafloor. However, all locations contained relatively 'dry gas', with the driest anomalies occurring in the central Voluta Trough where maturation modelling predicts that Early Cretaceous source rocks are overmature. Gas wetness increases to the east in the vicinity of the Mussel Platform where Early Cretaceous source rocks lie within the oil window (Heggie *et al.*, 1988). These authors concluded that from their limited data set, molecular composition of hydrocarbon gases from seafloor sediments reflects variations in the maturity of the deeply buried source rocks and suggested that the Early Cretaceous sequence appears to be the primary source of the anomalies. The conflicting results between these surveys in the Voluta Trough may simply be related to variations in depth of burial of the Early Cretaceous source rocks as opposed to variations in source quality, or to a different source interval (?Late Cretaceous).

Oil, gas and condensate shows and discoveries

Direct evidence for hydrocarbons in the western Otway Basin is provided by the commercial gas and associated condensate discoveries at Katnook, Ladbroke Grove and Haselgrove. Non-commercial gas is also known from Troas 1, whilst numerous wells contain residual gas (e.g. Crankshaft 1, within a tested water column). Non-commercial oil has been recovered from fractured basement in Sawpit 1 and from Early and Late Cretaceous reservoirs in Wynn 1 and Caroline 1, respectively, the latter as a contaminant associated with the CO_2 produced from the Waarre Sandstone (see Ch. 10). In addition, a possible oil leg occurs within an intraformational sandstone of the Belfast Mudstone in Breaksea Reef 1.

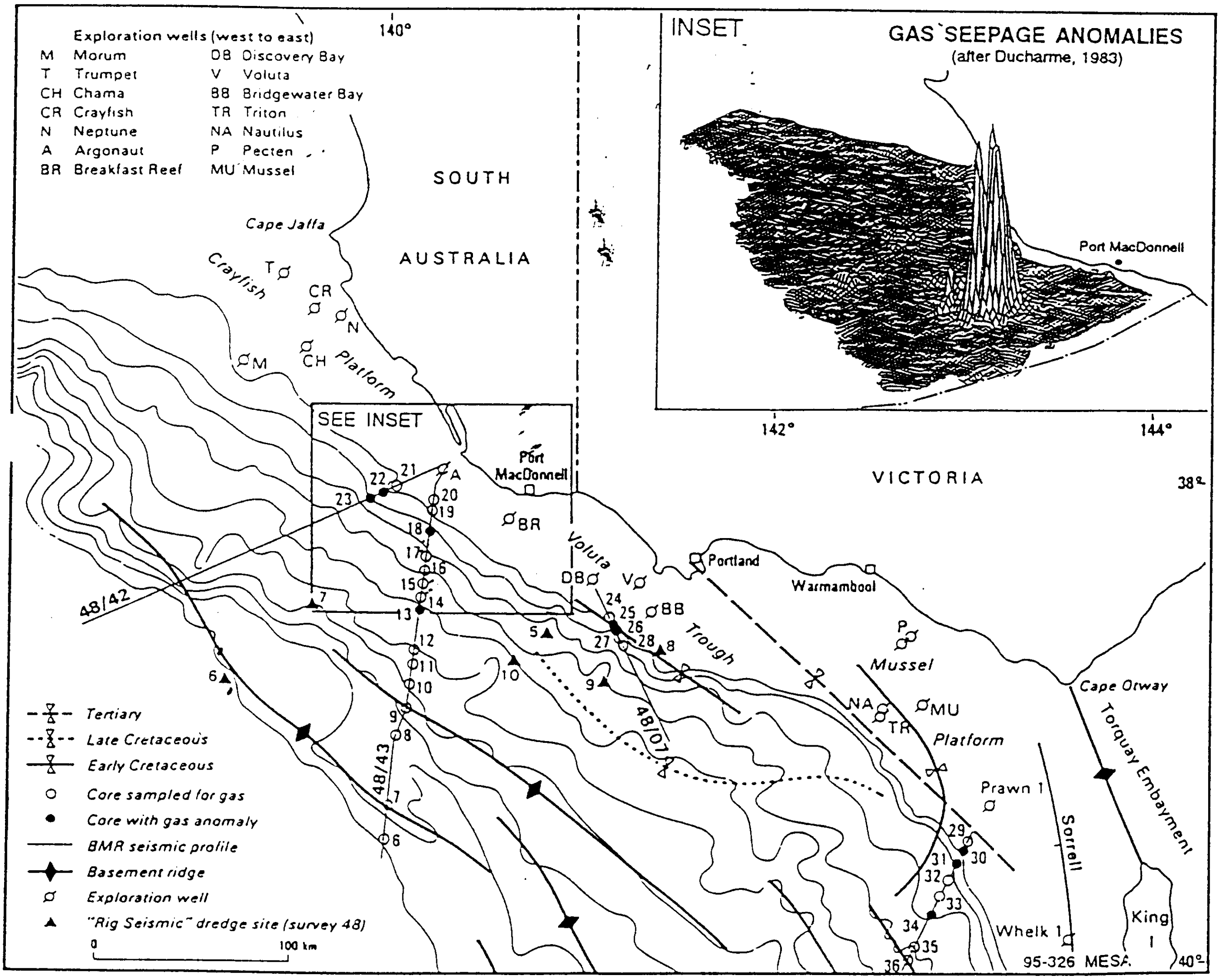

Fig. 7.26 *Offshore gas anomalies, Voluta Trough (after Heggie et al., 1988).*

4

nes) that provide evidence for its marine source affinity. 30-norhopanes, a class of biomarker commonly found in oils from marine carbonate source rocks, are abundant in the Troas 1 condensate but are not detected in Group 1 oils. A calcareous marine mudstone deposited in a near-shore environment is the likely source rock of the Troas 1 condensate (Padley *et al.*, 1995). Possible source intervals are either carbonaceous shales of the Eumeralla Formation or the undifferentiated Crayfish Group. Evidence for marginal marine conditions during deposition of the Eumeralla Formation is provided by the occurrence of marine dinoflagellates in Lucindale 1 (564 m) and Troas 1 (2 340-2 345 m). Elsewhere, the Eumeralla Formation is regarded as a fluviolacustrine succession. Padley *et al.* (1995) suggested that the low proportion of dinoflagellates and limited species diversity indicate a near-shore depositional environment (i.e. back barrier lagoon, lower delta-plain estuaries) with less than normal marine salinities. In Lucindale 1, this marine incursion is thought to have been short lived and from the Murray Basin to the north.

Biomarker assemblages of extracts in Troas 1 indicate that marine algae contributed to the kerogen in the Eumeralla Formation at this location. Proximity of Troas 1 to the Tartwaup Hingeline, which is coincident with a significant southward thickening of the Eumeralla Formation, may provide the reason for the development of marine conditions as the basin sagged prior to continental break-up (Padley *et al.*, 1995). Marine influences within sediments of the Crayfish Group have been recognised in Robertson 1 (1 747-1 750 m, 1 710-1 713 m) and in Troas 1 (2 569-3 466 m). Extracts of the undifferentiated Crayfish Group in Troas 1 have a more marine geochemical signature when compared with the Eumeralla Formation in this well. Comparison of source specific biomarkers of both these extracts and the condensate show that Troas 1 condensate originated from a marginal marine source similar to, but more mature than that sampled at 2 569 m (undifferentiated Crayfish Group). However, Padley *et al.* (1995) could not conclusively determine if the condensate in Troas 1 was sourced from more mature Eumeralla Formation south of the Tartwaup Hingeline or from the underlying Crayfish Group.

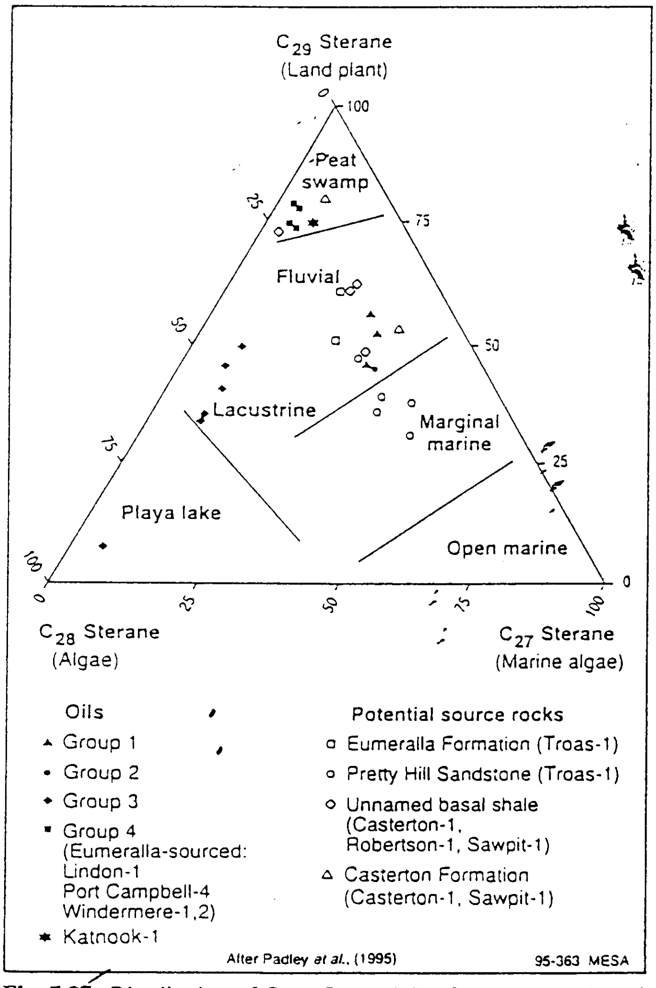

Fig. 7.27 *Distribution of C_{27}, C_{28} and C_{29} 5(H)-steranes for oil groups and the inferred depositional environment of their source rocks, Early Cretaceous succession, Otway Basin (after Padley et al., 1995).*

Group 3

Padley *et al.* (1995) assigned bitumens recovered from the undifferentiated Crayfish Group and Pretty Hill Sandstone in Crayfish 1A and Zema 1, respectively, to Group 3 oils. These authors noted that the biomarker assemblages of this group, especially the presence of gammacerane, would indicate derivation from hypersaline, microbial, organic matter deposited in a playa lake environment. Whilst this interpretation is a departure from the commonly held view that Crayfish Group sediments were deposited in a fluviolacustrine setting, it is not inconceivable that isolated graben lakes lacking external drainage may have formed in the developing rift basin and became hypersaline. The C_{27}:C_{28}:C_{29} sterane distribution plot (Fig. 7.27) for Group 3 oils indicates that they can be sourced from playa lake or lacustrine environments. High thermal maturity ($R_v$calc=0.9-1.3%) derived from MPI-1 data may support the notion that these reservoir bitumens originated from basal Crayfish Group shales or Casterton Formation.

Group 4

Waxy crudes recovered from intra-Eumeralla Formation sands and the Windermere Sandstone Member of the Eumeralla Formation in Windermere 1 and 2 respectively, Pebble Point Formation in Lindon 1, and Waarre Sandstone from Port Campbell 4, all drilled in Victoria, are believed to have been sourced from carbonaceous shales and coals of the lower Eumeralla Formation (McKirdy *et al.*, 1994). The geological habitat of these oils is described by Kopsen and Scholefield (1990). Oil associated with CO_2 produced by the Caroline Plant is also thought to be sourced from the Eumeralla Formation, with the CO_2 acting as a solvent to strip hydrocarbons. The oil in Caroline 1 comprises 50% aromatics and has a specific gravity of 17° API (McKirdy, 1986). The maturity of this oil ($R_v$calc=0.71%) is in agreement with a Eumeralla source (R_v=0.70%, 3 200 m). The oils typically have a low sulphur content (Tupper *et al.*, 1993) and have molecular signatures consistent with derivation from terrigenous organic matter. Extracts from the *P. notensis* source interval of the Eumeralla Formation confirm that land plants are the major contributors of organic matter. High pristane/phytane ratios are consistent with deposition in peat swamps (Tupper *et al.*, 1993; Fig. 7.27).

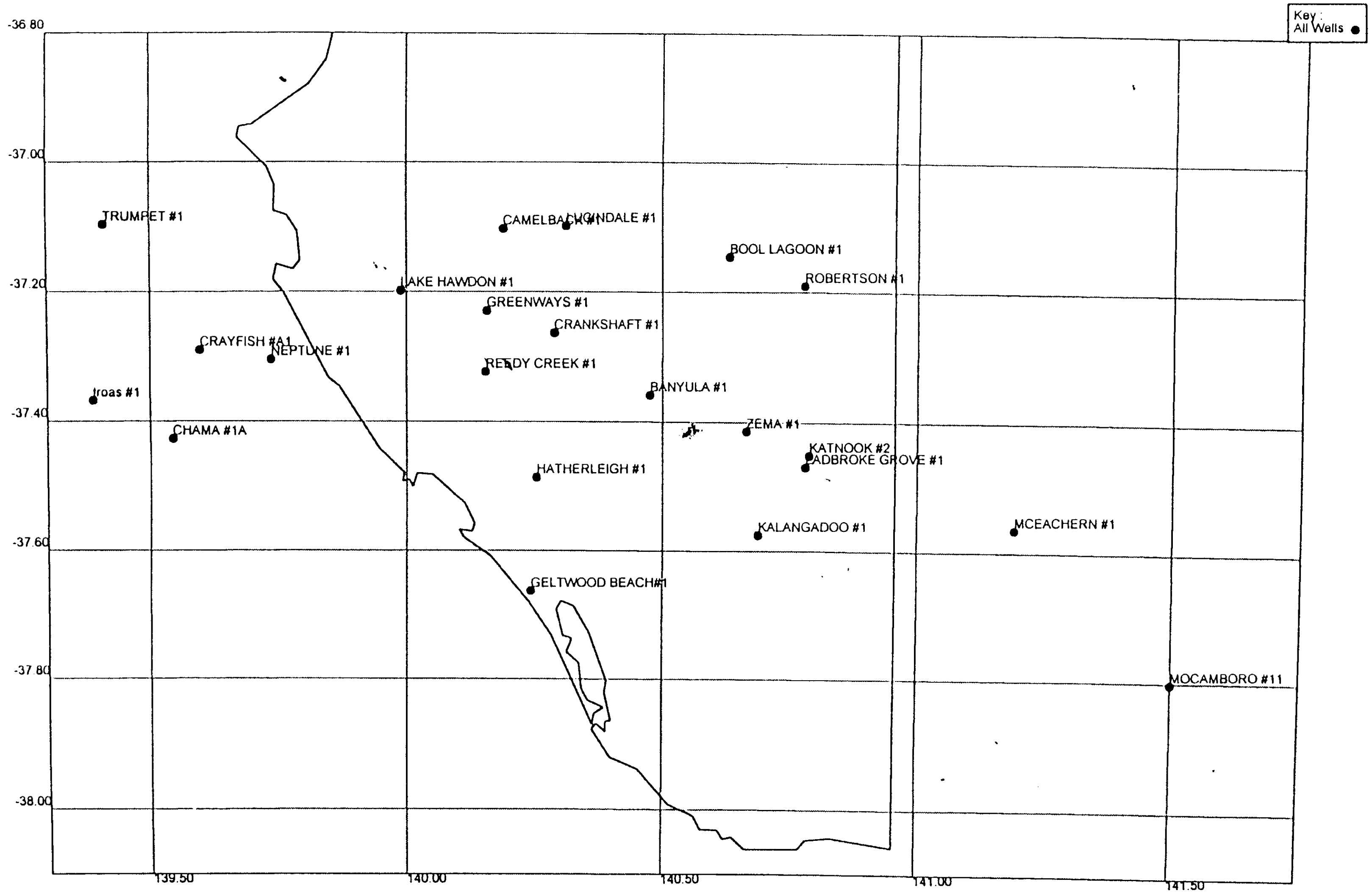

Fig 6. Wells modelled in Winbury.

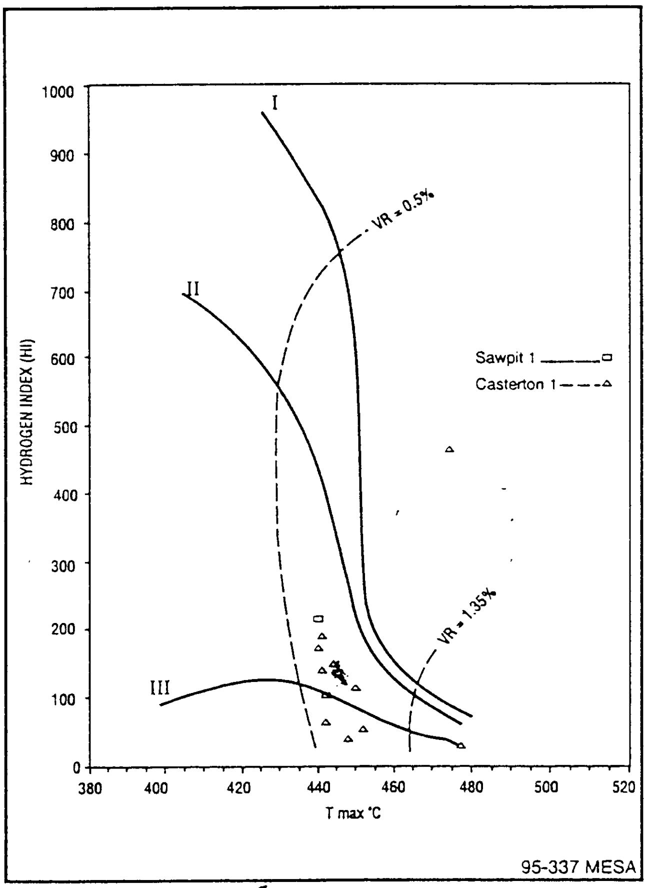

Figure 7.1 HI vs T max °C Casterton formation

PRETTY HILL FORMATION

The source potential of the Pretty Hill Formation is discussed in two parts. The basal section is predominantly shalier and referred to informally as the 'unnamed basal shale'; Lovibond *et al.* (1995) referred to it as *C. australiensis* shale. The remainder of the formation comprises interbedded sandstone, siltstone and shale with rare coal laminae.

UNNAMED BASAL SHALE

Source richness

The source richness of the unnamed basal shale is highly variable between wells and even within individual sections. For example, in Robertson 1, ~10% of cuttings between 1 749 and 1 765 m are oil shale with telaginite and lamalginite as major constituents (McKirdy *et al.*, 1994). These authors noted that the oil shale lithofacies is quite thin, located between 1 762 and 1 765 m, and is interbedded with siltstone containing high concentrations of Type III-IV DOM. Within this zone, TOC values of 7% (i.e. excellent source richness) have been recorded although the mean for the unnamed basal shale in Robertson 1 is 2.81%. Likewise, the genetic potential for this thin oil shale is 37 kg hydrocarbons/tonne (i.e. excellent source richness and quality) compared to a mean of 8 kg hydrocarbons/tonne for the entire unit.

With the exception of Robertson 1, where it appears that selective sampling has given a weighted bias, the remaining wells that have intersected this shale have good source richness (mean TOC=1.44%) and marginal, to at best moderate, source quality (mean genetic potential=1.61 kg hydrocarbons/tonne). Source richness and quality are summarised in Table 7.3.

Kerogen type and source potential

In terms of the DOM composition, the humic, inertinite-rich sediments of the unnamed basal shale are organically lean (excluding the thin oil shale zones in Robertson 1 and Penola 1) and are considered to be gas prone. The oxidised, humic-rich, gas-prone nature of the section is supported by Rock-Eval data (Table 7.3). HI values are commonly <100 with OI values mostly >300, indicating oxidised Type III kerogen (Fig. 7.3).

Oil shales in Robertson 1 and Penola 1 have excellent potential to generate oil and are typically Type II kerogen (Fig. 7.3). Kerogen type and source potential parameters are summarised in Table 7.3.

Organic petrology

Organic matter is dominated by humic detritus, often finely divided, and the lipid-rich detritus fraction rarely exceeds 25% of the residue. In Sawpit 1, the lipid detritus tend to be partly degraded and oxidised.

Maturity and timing of hydrocarbon migration

Where intersected by wells located on the flanks of the Penola Trough, the unnamed basal shale of the Pretty Hill Formation is marginally early mature for oil (i.e. R_v=0.5-

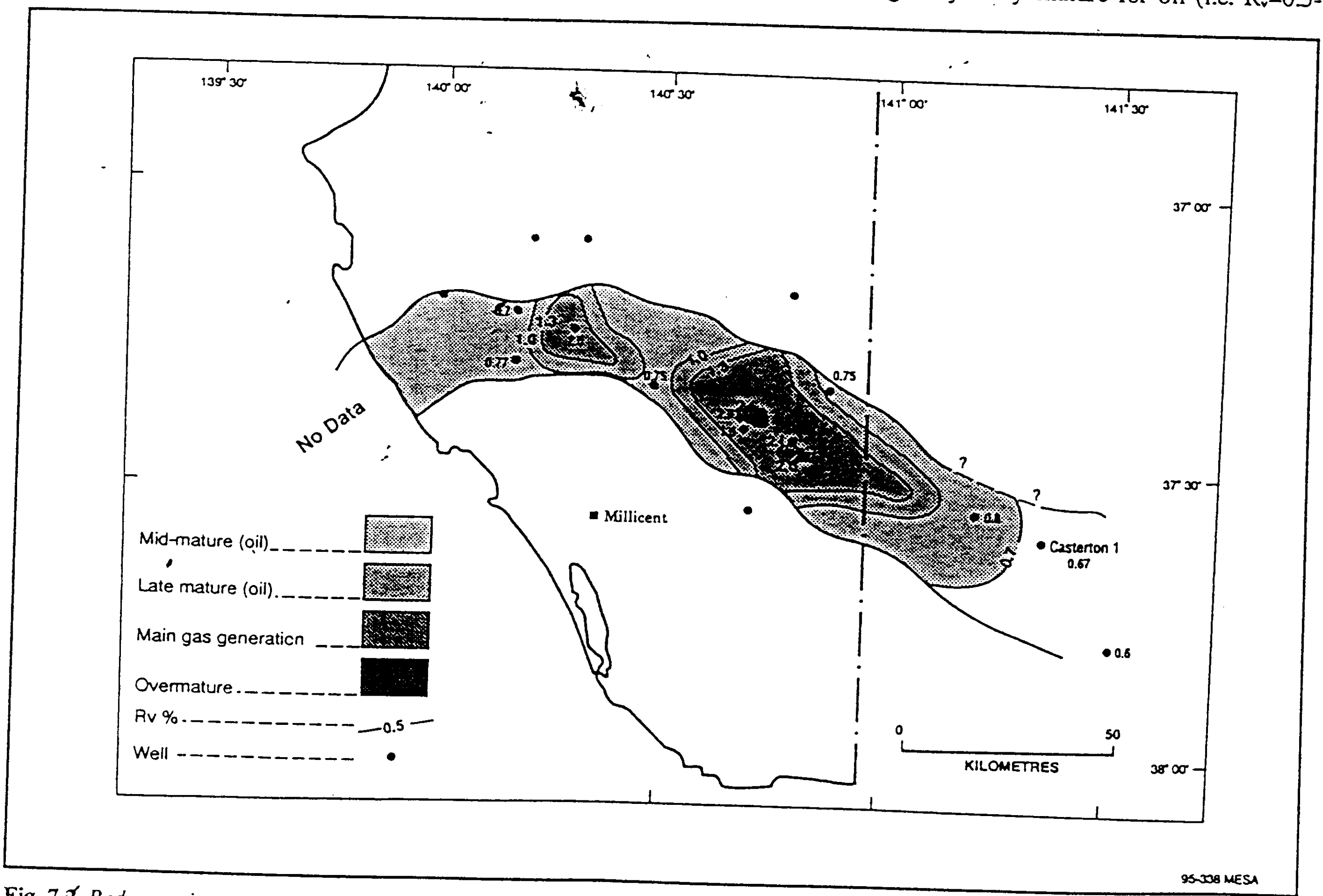

Fig. 7.2 *Bed maturity map, top Casterton Formation, western Otway Basin.*

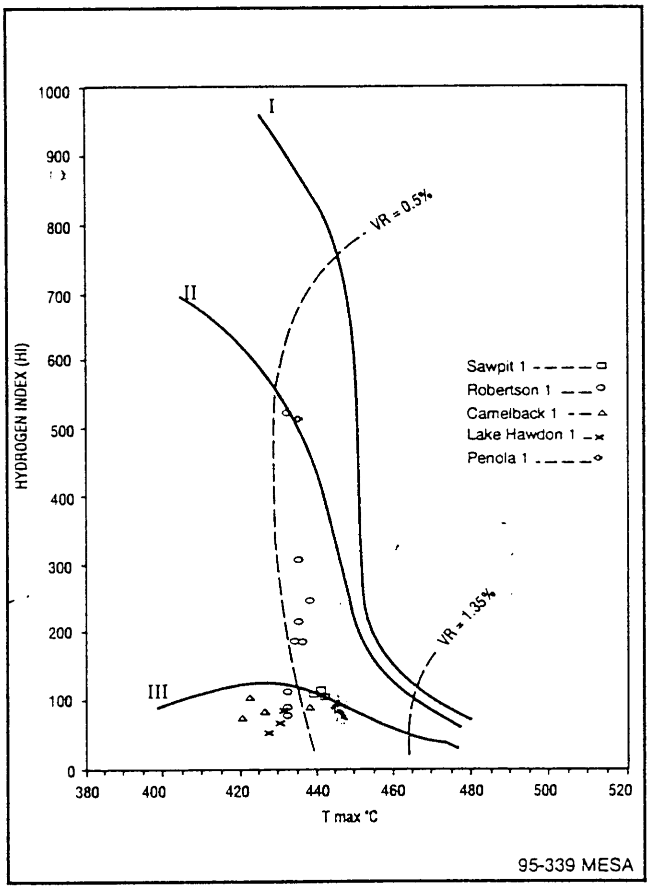

Figure 7.3 HI vs T max °C basal unnamed shale

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LAIRA FORMATION

Source richness

The source potential of the Laira Formation has been studied by Austin (1992) and Hill (1995). Its prospectivity has been elevated as a result of high TOC and genetic potential values which correspond to discrete zones containing high yields of the acritarch *Microfasta evansii* identified in sidewall cores and cuttings in the Katnook-Ladbroke Grove region (Morgan, 1993).

Algal-rich zones, which correspond to lake maxima, occur in five mappable units (Fig. 7.8) and are best developed in the upper Laira Formation. They reflect a transition from the fluvial coastal plain depositional environment of the Pretty Hill Formation and lower Laira Formation to a shallow lacustrine environment in the upper Laira Formation. In Ladbroke Grove 1, *M. evansii* comprises 40-70% of the fossil assemblage in some sidewall cores in the upper Laira Formation. These algal maxima are correlatable over the Katnook-Ladbroke Grove-Laira-Zema region (Hill, 1995) and have fair to excellent source richness. They reach a maximum near the top of the formation, presumably in response to a broadening of the lake system prior to uplift and adjustment of the basin associated with the transition from rift to sag phase, culminating in the unconformity at the top of the Crayfish Group.

Mean TOC values vary from 0.25 to 2.02% (i.e. poor to good source richness) with the richest source rocks occurring along the axes of troughs (Fig. 7.9). Genetic potential values range from poor to moderate and follow a similar trend to source richness, with the best quality source rocks occurring in the Chama Terrace and eastern Penola Trough.

Kerogen type and source potential

HI values indicate that the Laira Formation is predominantly Type IV grading to at best Type III kerogen and is mainly gas prone (Fig. 7.10); OI values are commonly low. In the Ladbroke Grove–Katnook region, intervals coincident with algal maxima have HI values >150 and contain Type III kerogen capable of generating some liquids, although these zones have limited thickness and variable source richness and quality. In Ladbroke Grove 1, algal maxima constitute 9% (66 m) of the total Laira Formation.

Maturity and timing of hydrocarbon charge

Maturity data for the Laira Formation are summarised on Figures 7.10 and 7.11. The top of the Laira Formation, which coincides with the best source potential, is marginally early mature for oil (i.e. R_v=0.5-0.7%) in the centre of the Penola Trough between depths of 1 900 and 2 800 m. It entered the top of the oil window (early mature) in the Cenomanian (i.e. post-breakup) at ~96 Ma, with maturity gradually increasing until 65 Ma where it has remained to the present day.

In the Chama Terrace, the Laira Formation is mature for oil generation, with the top of the oil window occurring below depths of 2 100 m. The top of the Laira Formation entered the oil window at ~105 ma and has remained mature for oil since 95 Ma. Elsewhere in the basin, the Laira Formation is immature (i.e. R_v<0.5%).

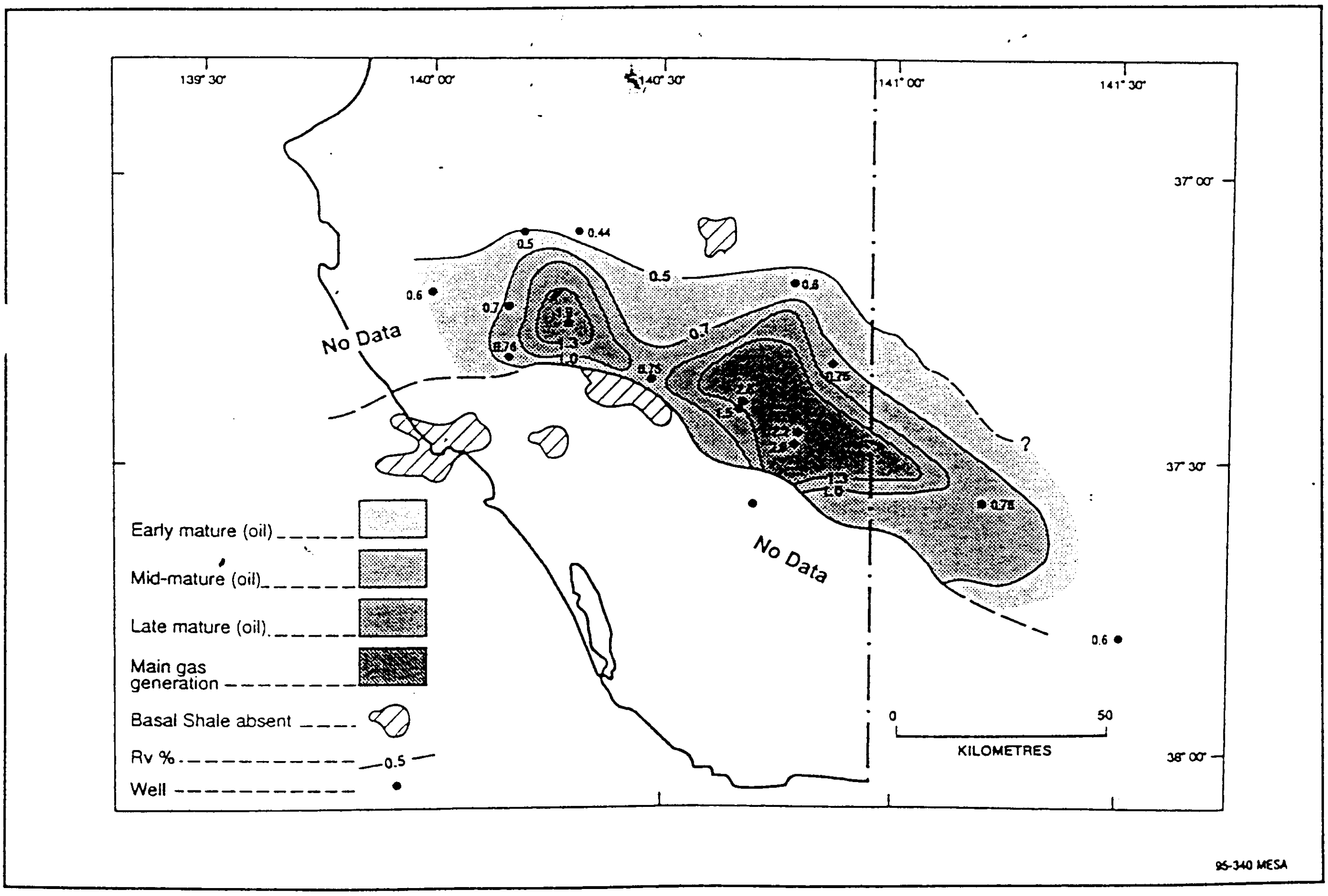

Fig. 7.4 *Bed maturity map, top 'basal unnamed shale', Pretty Hill Formation, Otway Basin.*

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Migrated hydrocarbons

Rock-Eval pyrolysis results indicate that significant amounts of migrated hydrocarbons are present in the Laira Formation in Katnook 3 over the interval 2 200 to 2 800 m and, to a lesser extent, in Chama 1A, Katnook 2, Zema 1 and Sawpit 1. In Sawpit 1, extract from a sample at 1 526 m is significantly more mature than the underlying sediment extracts (Price, 1993) and more closely matches condensates from the Katnook Field, although evidence for this is equivocal.

EUMERALLA FORMATION

The source potential of the Eumeralla Formation has been investigated by Struckmeyer and Felton (1990) and Tupper *et al.* (1993). These authors identified a thick potential source sequence within the lower Eumeralla Formation characterised by thin bituminous coal seams up to 1 m thick which constitute ~30% of the total source interval.

Two broad source intervals were identified by Tupper *et al.* on the Chama Terrace (Fig.7.12). The lower occurs within the *Pilosisporites notensis* palynological zone and has a maximum thickness of 140 m in Geltwood Beach 1 and Chama 1A. It is absent from wells drilled close to the basin margin. The upper interval is less well developed and occurs at the base of the *Crybelosporites striatus* zone. It has a maximum thickness of 120 m in Geltwood Beach 1.

Source richness

TOC and Rock-Eval analyses have been summarised by McKirdy and Padley (1992) and Hill (1995). These data consistently demonstrate marked differences in kerogen type between the lower Eumeralla source intervals and the siltstone and mudstone dominated upper Eumeralla Formation. In the Chama Terrace, coal is best developed in the *P. notensis* source interval (Tupper *et al.*, 1993) where TOC values (mean=31%) and potential yields (mean $S_1+S_2=85$ kg hydrocarbons/tonne) indicate excellent source richness. In contrast, upper Eumeralla source rocks have low to moderate organic richness (mean TOC=1% and poor to fair genetic potential (mean $S_1+S_2=1.1$ kg hydrocarbons/tonne).

Kerogen type and source quality

Hydrogen indices for the *P. notensis* source interval are high (mean HI=244 mg S_2/g TOC), consistent with Type II-III kerogen and potentially capable of generating oil and gas (Fig. 7.13). Source quality in the upper Eumeralla Formation deteriorates (mean HI=59) indicating gas-prone Type IV kerogen.

The most basinward intersection of the Eumeralla Formation occurs at the southern margin of the Chama Terrace where the sedimentary package thickens and improves in source quality. The extent and likely direction of source quality improvement, however, is unknown although the

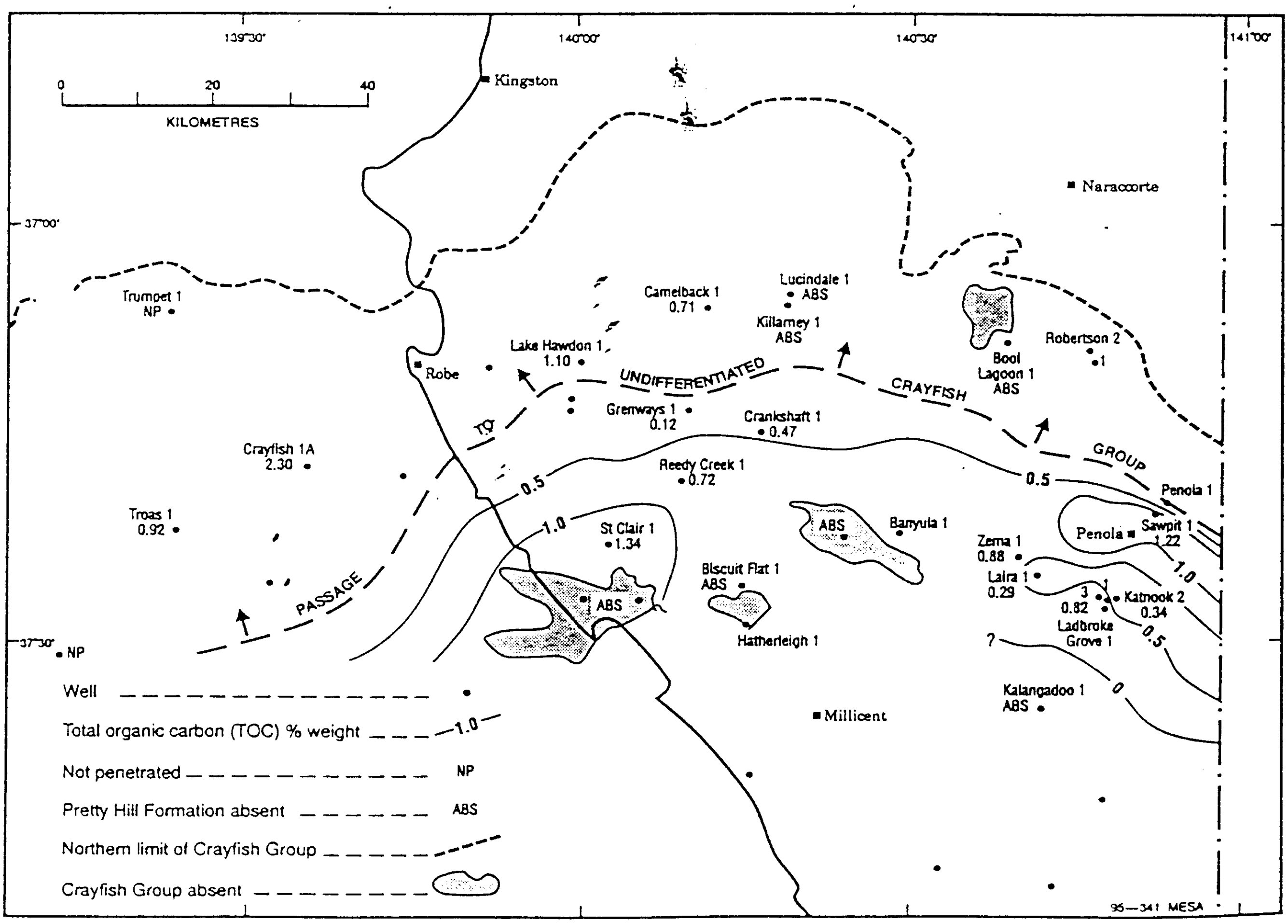

Fig. 7.5 *Mean TOC, Pretty Hill Formation, Otway Basin.*

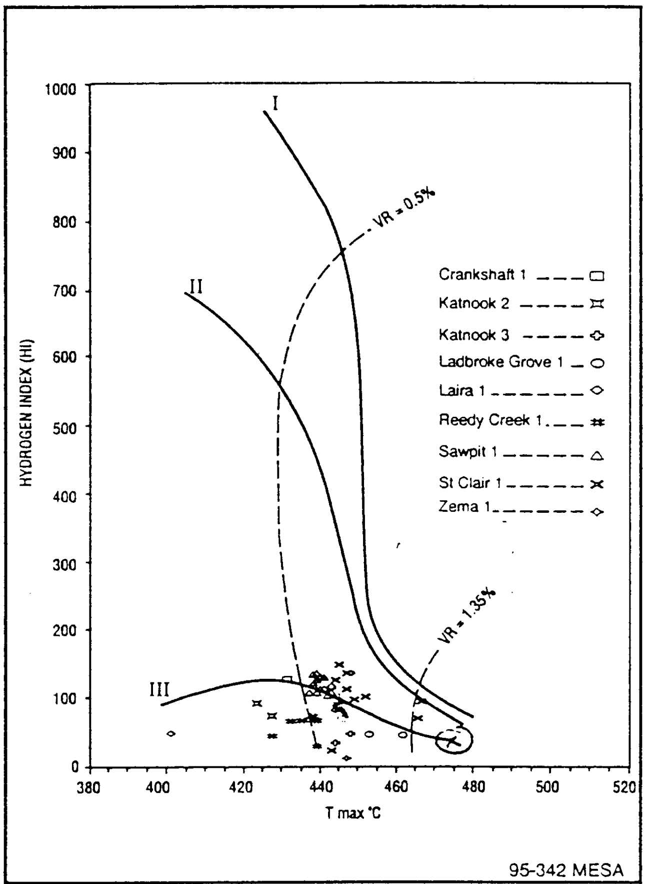

Figure 7.6 HI vs T max °C Pretty Hill formation

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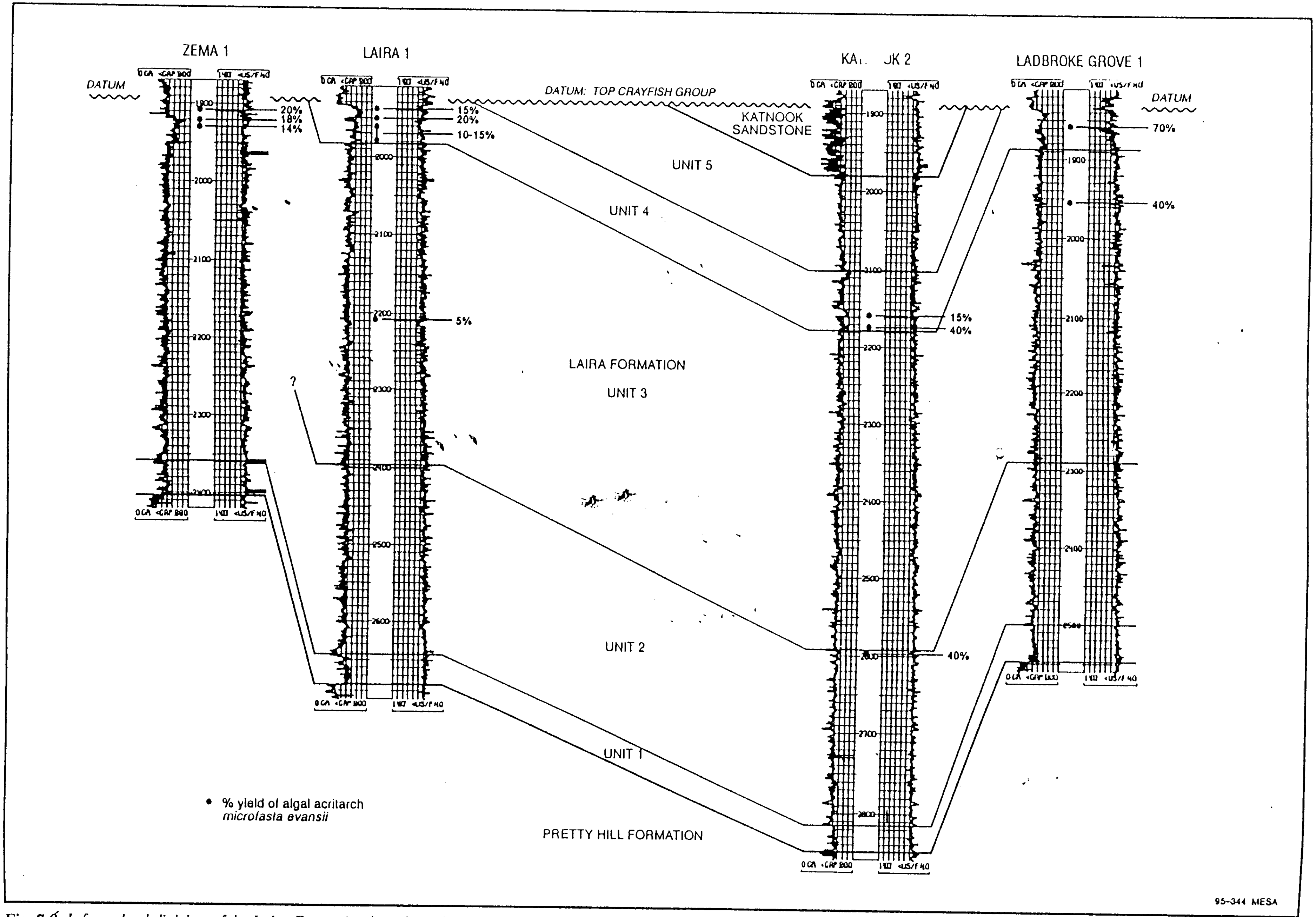

Fig. 7.8 *Informal subdivision of the Laira Formation based on algal maxima, Penola Trough.*

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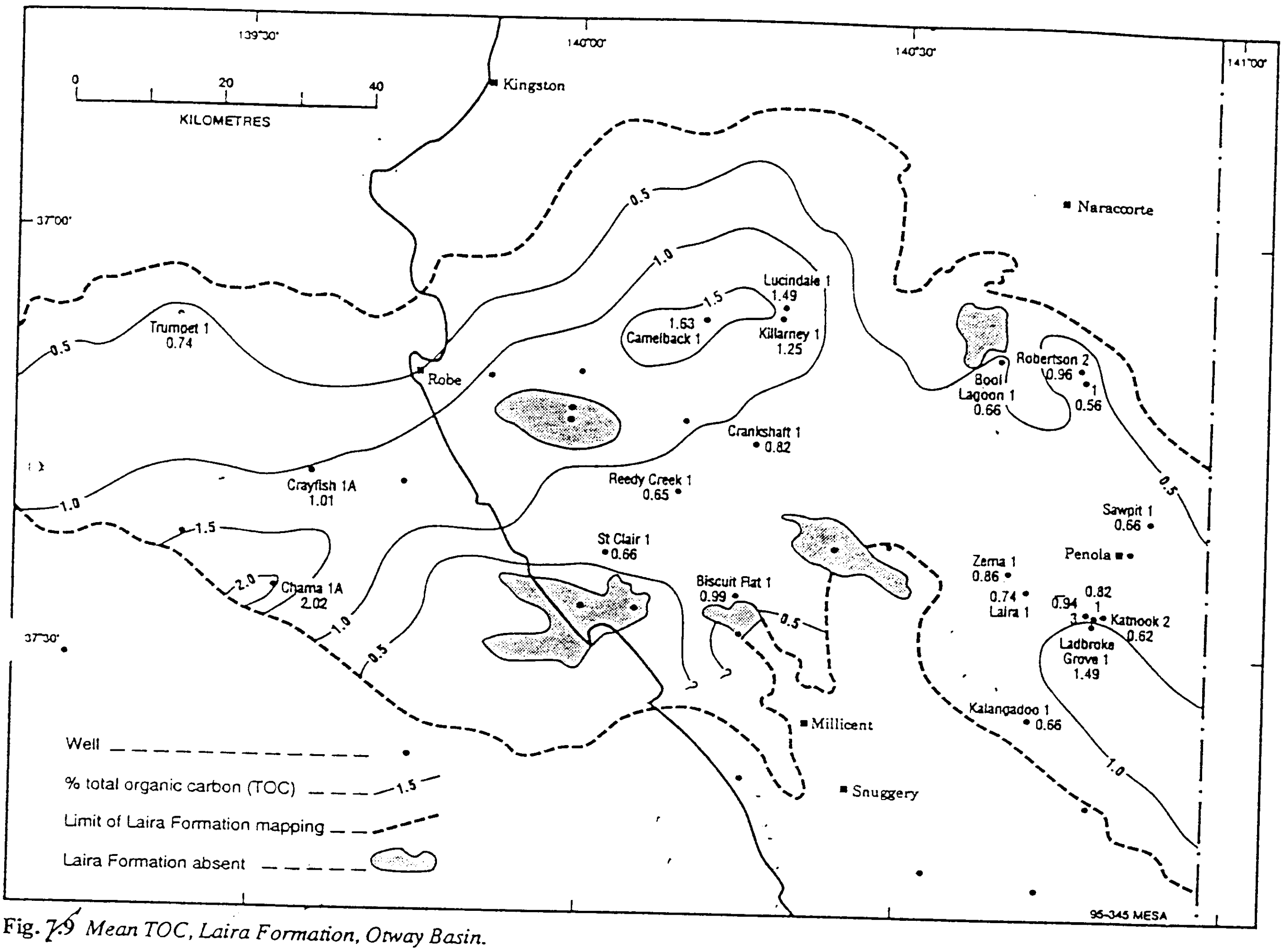

Fig. 7.9 *Mean TOC, Laira Formation, Otway Basin.*

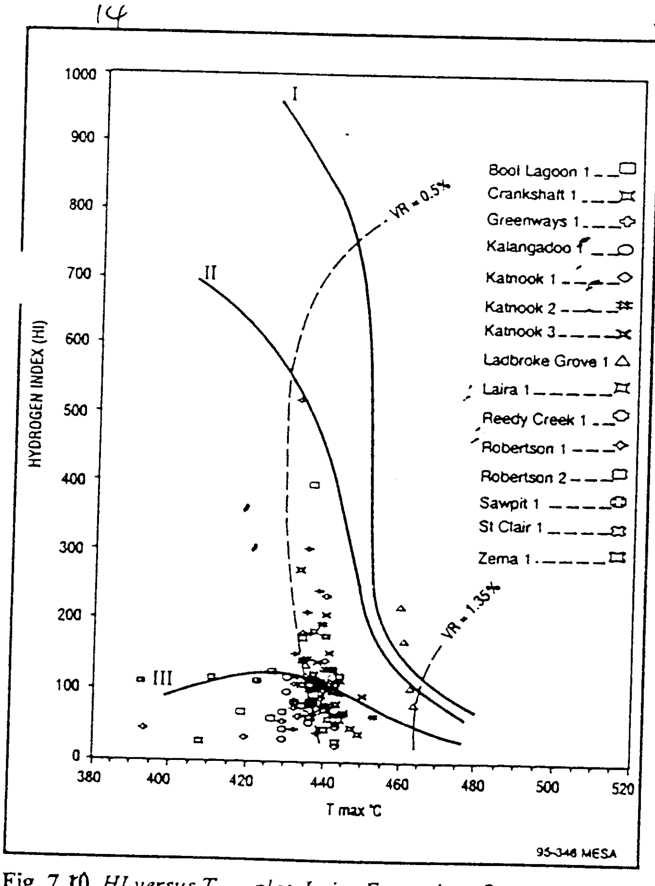

Fig. 7.10 *HI versus Tmax plot, Laira Formation, Otway Basin.*

recognition of bitumen, exsudatinite and live oil within the *P. notensis* source interval at a maturity of R_v~0.8%, suggest that oil expulsion has occurred over the range R_v=0.7-1.2%. Tupper *et al.* (1993) concluded that mid-mature oil and/or wet gas generation from the lower Eumeralla Formation can be expected from 0.7 to 1.0% R_v, peak oil and wet gas generation from 1.0 to 1.3% R_v, and dry gas generation from 1.3% R_v onwards. Maturation data for the lower Eumeralla Formation are summarised on Figures 7.13 and 7.14.

Thermal modelling of Troas 1 (Fig. 7.24) indicates that the lower Eumeralla Formation source interval has not yet reached peak oil generation but has been early mature for oil since ~96 Ma. Only in the Voluta Trough to the south of the Chama Terrace, where there is a substantial thickening of Sherbrook Group sediments, does the lower Eumeralla Formation source interval enter the zone of peak oil generation. Thermal modelling in the inner Voluta Trough (Fig. 7.25) indicates that the lower Eumeralla Formation entered the oil window (R_v~0.7%) in the Late Albian (~100 Ma), reaching peak maturity for oil at the close of the Sherbrook Group deposition, and has increased only marginally in maturity from the Tertiary to the present day. This highlights the importance of a thick Sherbrook Group as a mechanism for elevating and retaining heat flow. For structures on the Chama Terrace to have the optimum opportunity to receive charge from lower Eumeralla source rocks on the downthrown side of the Tartwaup Hingeline (Fig. 7.15), the trap would need to have been in position at or near the close of

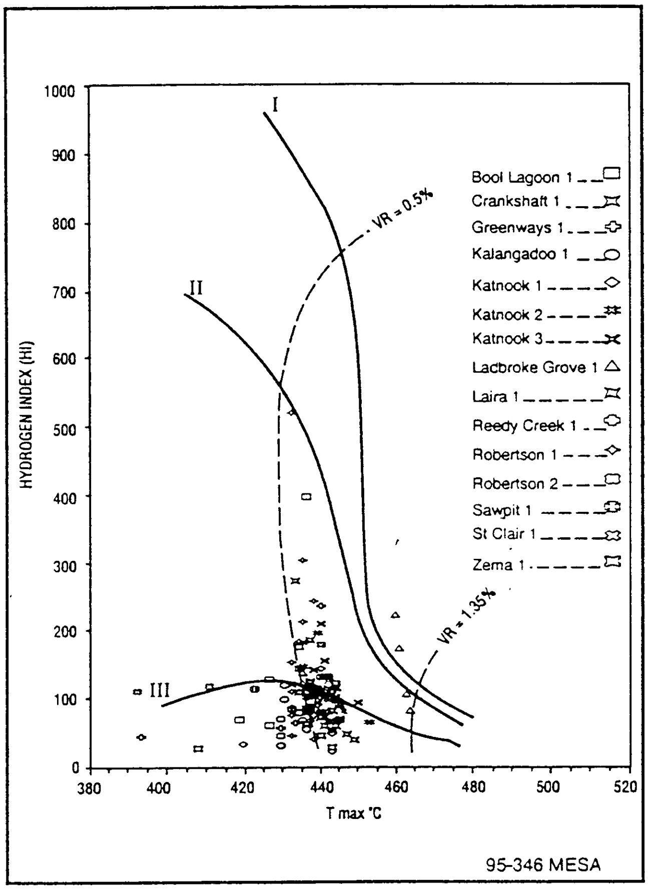

Figure ~~7-10~~ HI vs T max °C Laira formation

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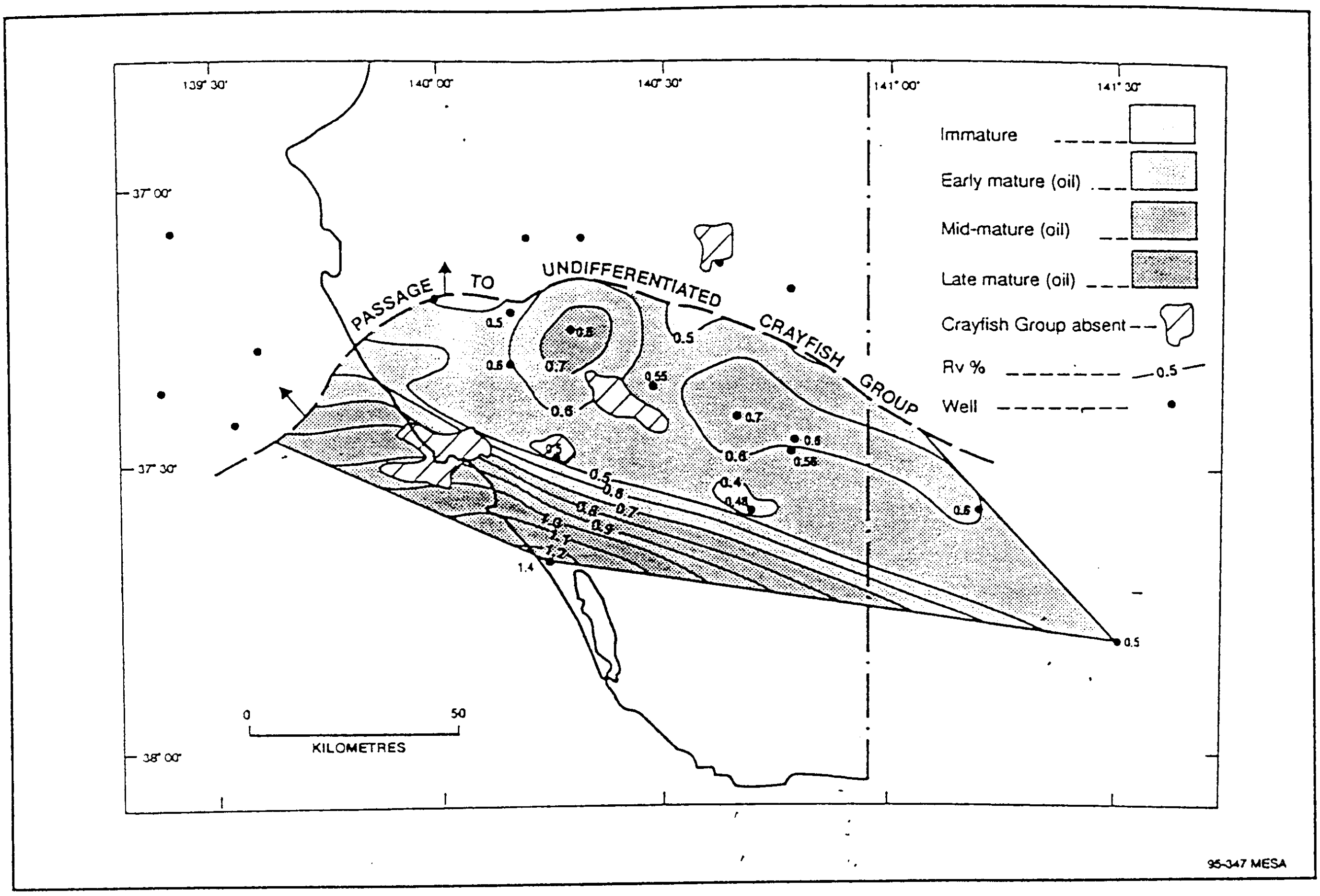

Fig. 7.11 *Bed maturity map, top Laira Formation, Otway Basin.*

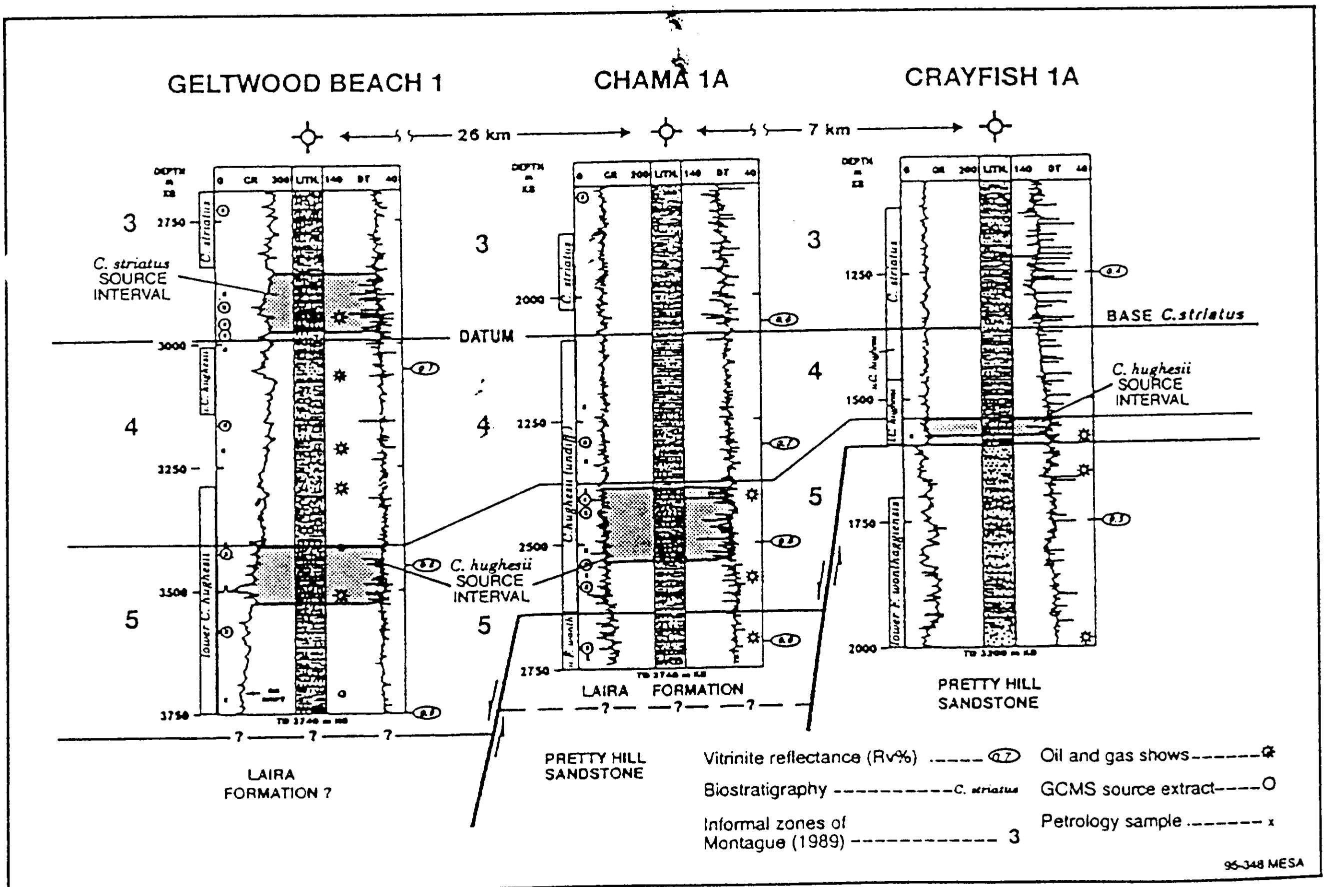

Fig. 7.12 *Source rock development within the lower Eumeralla Formation, northwestern Otway Basin (after Tupper et al., 1993).*

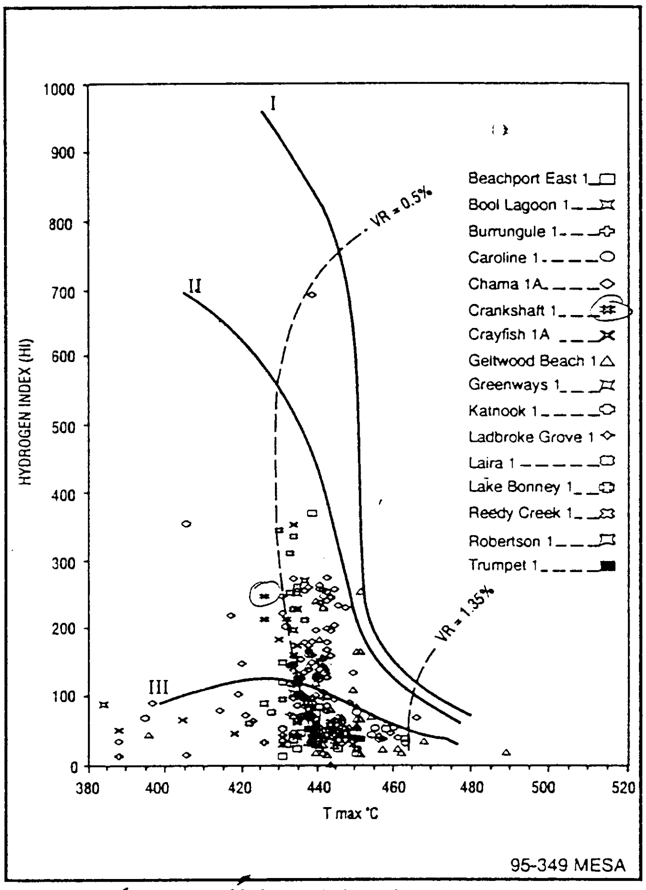

Figure 7.13 HI vs T max °C Eumeralla formation

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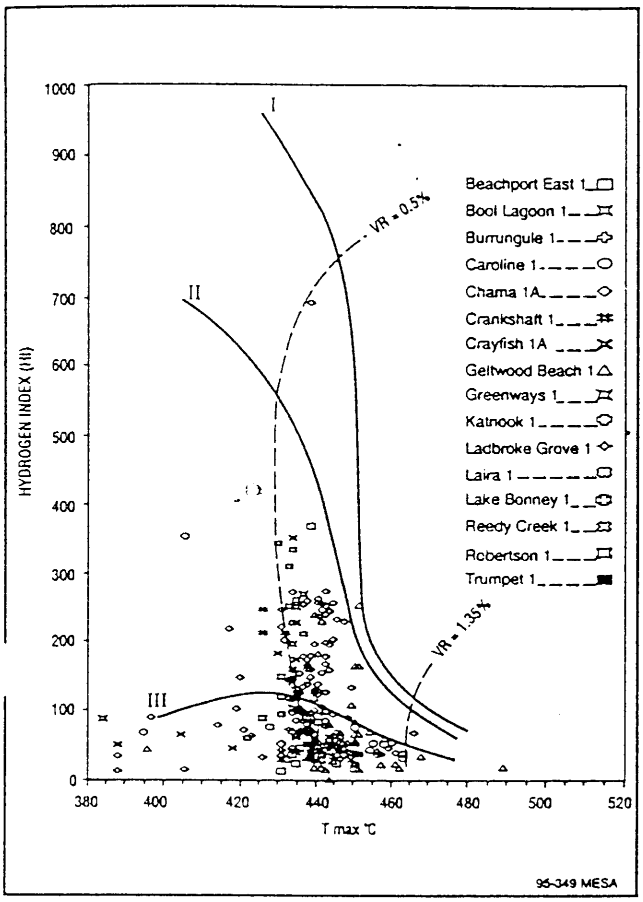


Fig. 7.13 *HI versus T_{max} plot, Eumeralla Formation, Otway Basin.*

Sherbrook Group deposition (i.e. ~65 Ma). Tupper *et al.* (1993) suggested that such structures would have both gas and oil potential with less likelihood for dilution or displacement by dry gas.

BELFAST MUDSTONE

Source richness

TOC ranges from 2.40 to 3.0% (i.e. fair to very good) with an observed increase in source richness to the south in the vicinity of Breaksea Reef 1 (mean TOC=1.5%). The genetic potential of the Belfast Mudstone ranges from poor to moderate, with the richest source rocks occurring in the vicinity of Breaksea Reef 1 (mean S_1+S_2=2.63, range 0.30-5.92; Fig. 7.16). This confirms the view that both source quality and richness improve to the south and that more favourable source rocks could occur in the deeper offshore areas of the Voluta Trough.

Kerogen type and source potential

Gravestock *et al.* (1986) likened the Sherbrook Group to the Tertiary succession of the Niger Delta. In terms of source potential, however, there is limited similarity with this analogue. Geochemical data indicate a Type IV (inertinitic) grading to at best Type III kerogen (Fig. 7.17). The Belfast Mudstone is composed of terrigenous DOM rich in inertinite (I=75-90%) and lean in vitrinite (V≤20%). Moreover, the majority of inertinite is reworked (McKirdy *et al.*, 1984). Exinite remains a minor component of DOM (E≤5%).

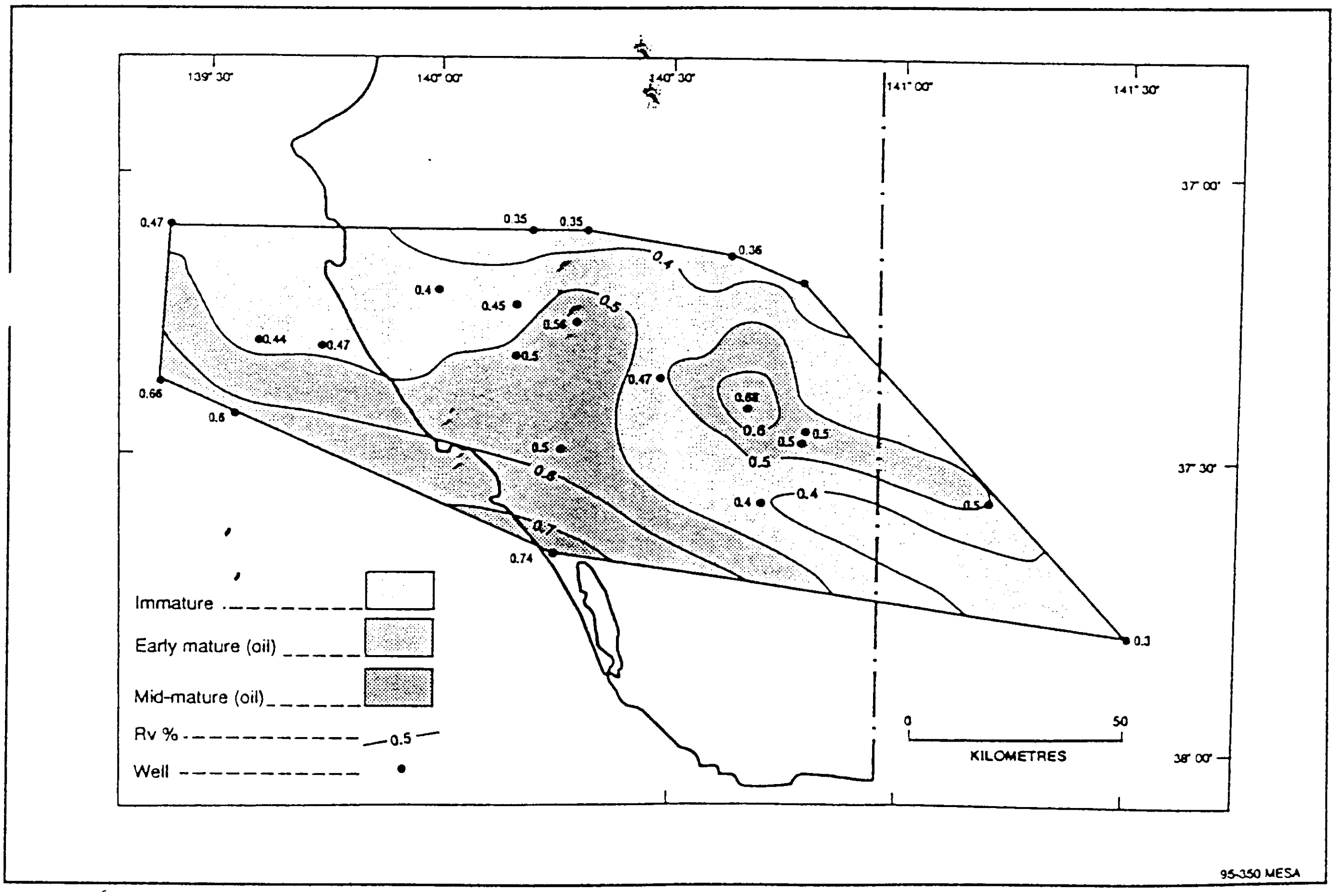


Fig. 7.14 *Bed maturity map, top lower Eumeralla Formation, Otway Basin.*

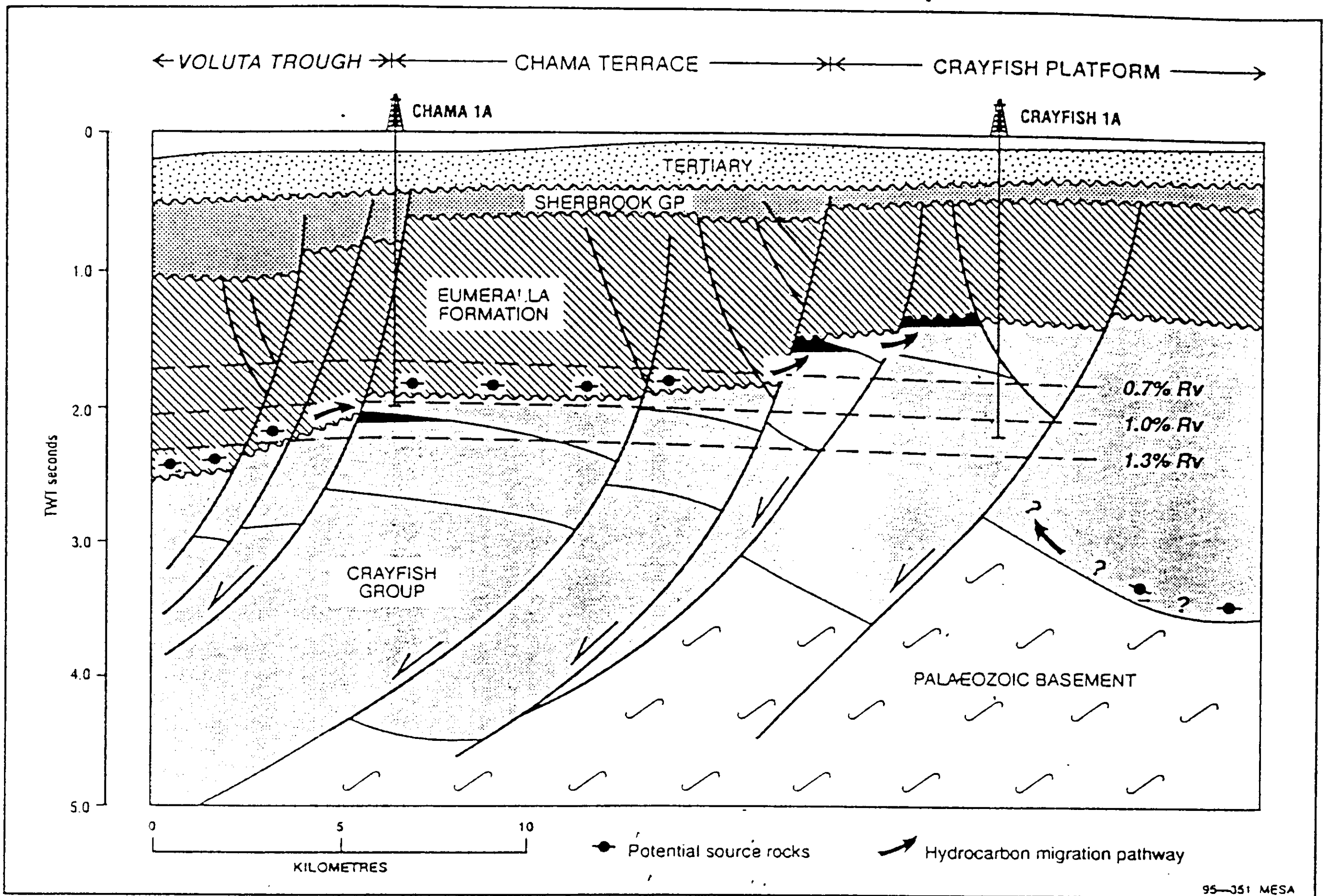


Fig. 7.15 19 *Eumeralla-sourced play concept, offshore Robe Trough (after Tupper et al., 1993).*

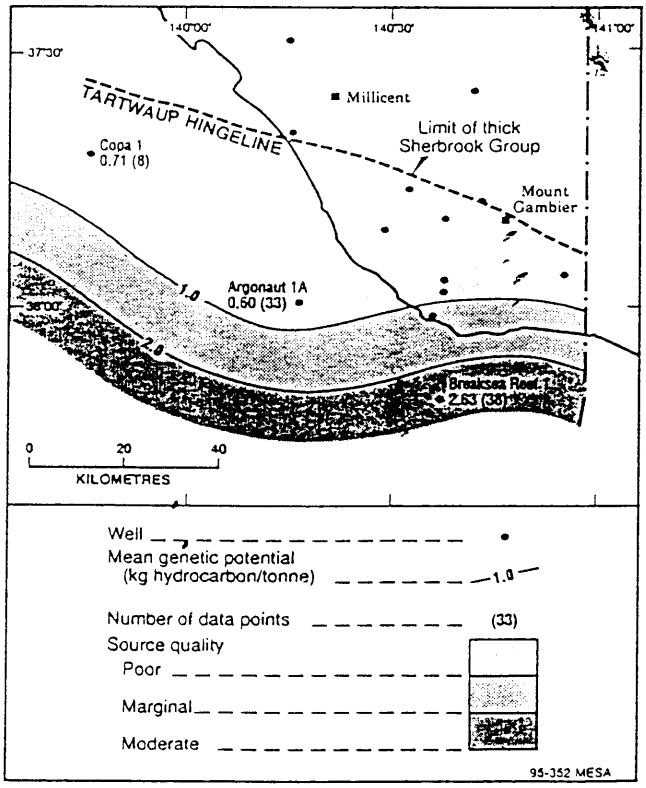


Fig. 7.16 20 *Mean genetic potential, Belfast Mudstone, Otway Basin.*

McKirdy *et al.* (1984) highlighted an obvious discrepancy between the highly inertinitic character of the DOM within the Belfast Mudstone and the overall Type III kerogen composition in Breaksea Reef 1. A possible explanation may be provided by the widespread occurrence of trace oil and bitumen in the cuttings which would elevate the S_2 peak on pyrolysis. In contrast, prodelta muds of the Niger Delta are commonly of Type III and to a lesser extent Type II kerogen. A key to the viability of the Belfast Mudstone as an oil source may be to delineate a more distal facies to the south of Breaksea Reef 1.

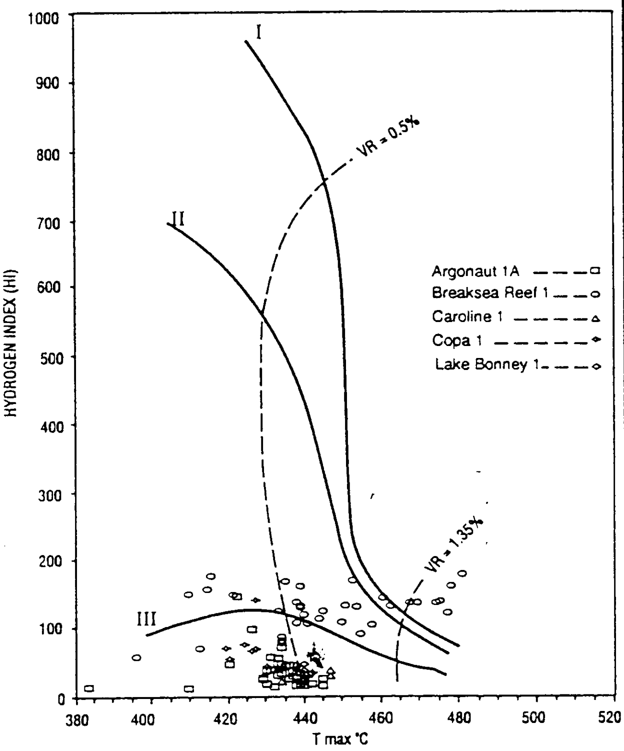
HI values are highly variable and indicate that the Belfast Mudstone is predominantly gas prone (i.e. HI<100). Within the Voluta Trough, in the vicinity of Breaksea Reef 1, HI values range between 17 and 181 mg S_2/g TOC. Although considered to be predominantly gas prone, HI values frequently exceed 150, indicating some potential to generate liquids.

Gas shows in Breaksea Reef 1 yielded components up to C_7 and extract gas chromatograms with significant n-alkane components up to C_{30}, testifying to the liquids potential of the Belfast Mudstone.

Significant overpressuring appears to be coincident with the highest HI values in Breaksea Reef 1, especially in the interval 3 310-4 362 m.

Maturity and timing of hydrocarbon migration

T_{max}, R_v data and maturity modelling indicate that the Belfast Mudstone is mid-mature for oil generation only in the



95-353 MESA

Figure ~~7.17~~ HI vs T max °C Belfast mudstone

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top Crayfish unconformity, remained elevated during the sag-phase, and then gradually cooled from continental break-up until present day.

The thermal and burial history of the Katnook area, representing the deeper portion of the Penola Trough, is summarised in Table 7.6 and Figure 7.19. Sawpit 1 is used to represent the burial and thermal history of the northern flank of the Penola Trough (Table 7.7; Fig. 7.20). Migration pathways for the Penola Trough are illustrated on Figure 7.21.

ROBE TROUGH

Thermal and burial history of the Robe Trough is examined in three parts. Information onshore is provided by wells largely located on regional highs (e.g. Camelback 1, Lake Hawdon 1) where significant erosion (up to 1 500 m) at the top Crayfish unconformity has occurred. Offshore wells that have penetrated the Crayfish Group appear to have been less affected by this erosional event. Two areas are summarised for the offshore Robe Trough — the Crayfish Platform and Chama Terrace.

Table 7.6 *Hydrocarbon maturity, Katnook Field.*

Formation	Rv (%)	Maturity window	Depth (m subsea)
Lower Eumeralla Formation, Windermere Sandstone Member, Katnook Sandstone, Laira Formation	0.5	Early mature (oil)	~1 700
Laira Formation	0.7	Mid-mature (oil)	~ 2 300
Pretty Hill Formation	1.0	Late mature (oil)	~3 050
Basal Pretty Hill Formation, Intra-Pretty Hill shale, Unnamed basal shale, Casterton Formation	1.3	Main gas generation	~3 800
Basal Casterton Formation	2.6	Overmature	~5 200

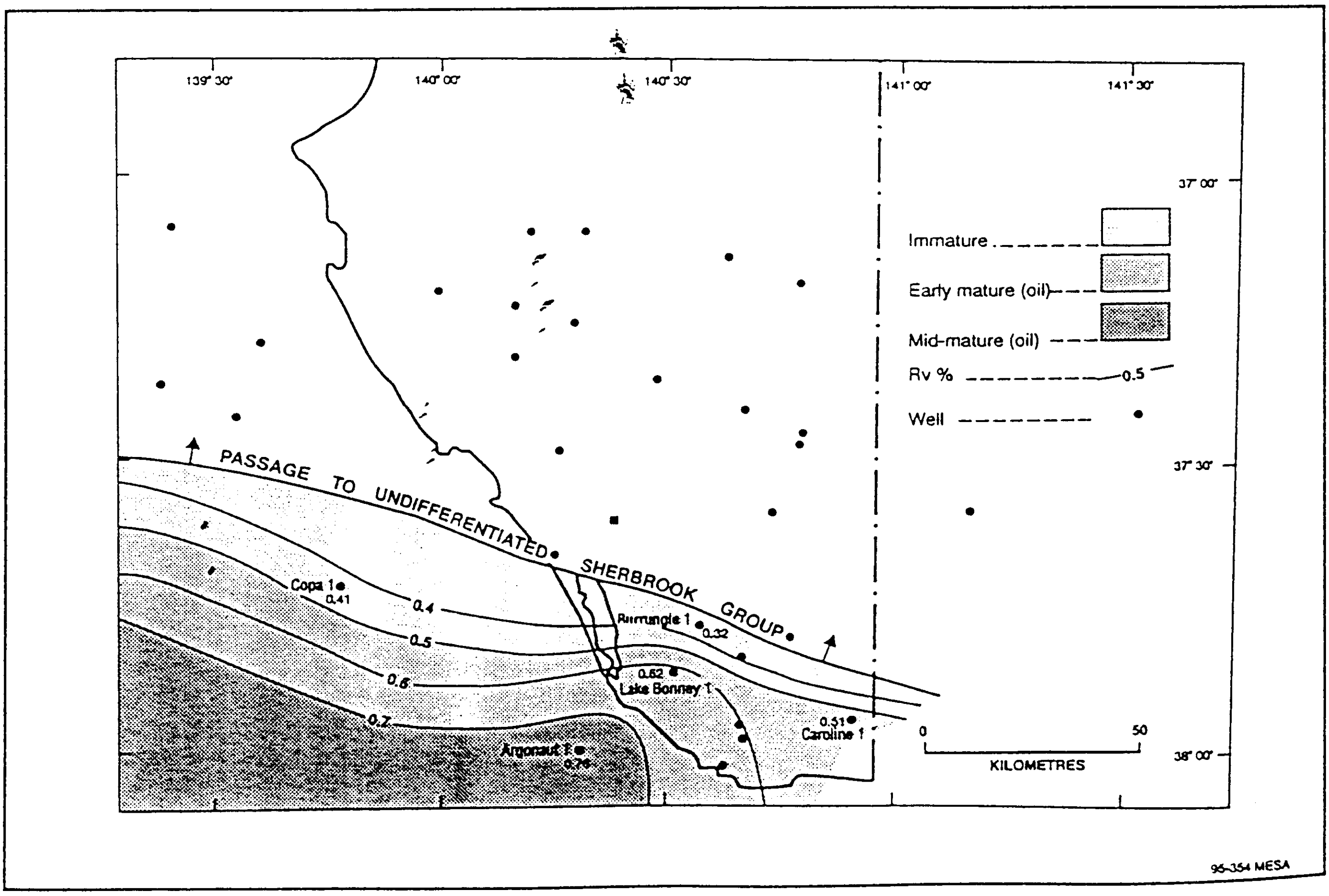

Fig. 7.18 *Bed maturity map, top Belfast Mudstone, Otway Basin.*
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Table 7.7 *Hydrocarbon maturity, Sawpit area.*

Formation	R_v (%)	Maturity window	Depth (m subsea)
Laira Formation, Pretty Hill Formation	0.5	Early mature (oil)	~1 350
Basal Pretty Hill Formation, Intra-Pretty Hill shale, Unnamed basal shale, Casterton Formation	0.7	Mid-mature (oil)	~1 900

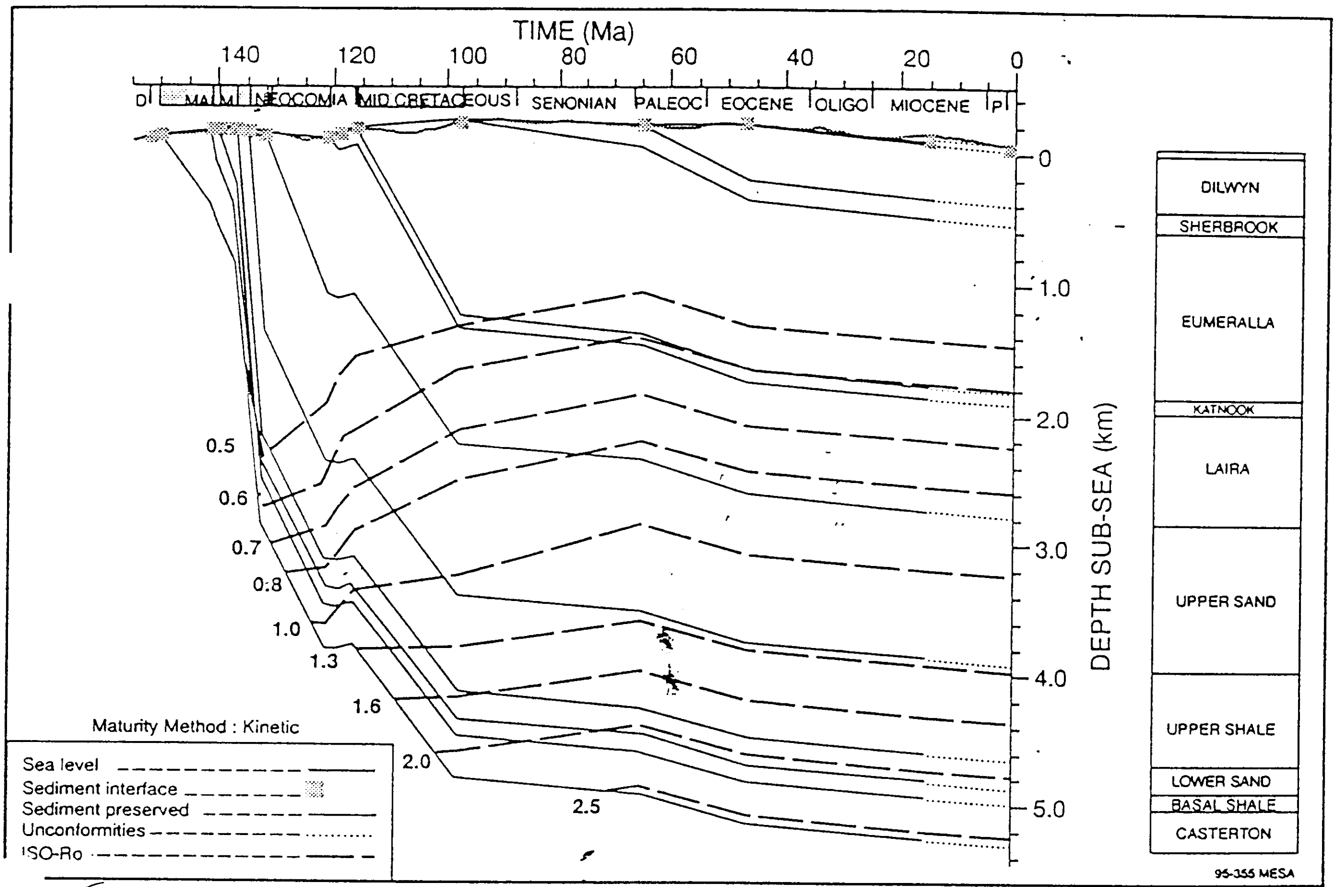

Fig. 7.19 *Geohistory plot, Katnook 2, Penola Trough.*

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Camelback area

This area incorporates Lucindale 1, Camelback 1 and Lake Hawdon 1, the latter two of which provide the deepest intersections. Approximately 1 500 m of sediment have been eroded in Camelback 1 and 1 250 m in Lake Hawdon 1 from the top of the Crayfish Group (Katnook Sandstone, Laira Formation and upper Pretty Hill Formation). Thermal and burial history are summarised in Table 7.8 and Figure 7.22.

Table 7.8 *Hydrocarbon maturity, Camelback area.*

Formation	R_v (%)	Maturity window	Depth (m subsea)
Pretty Hill Formation, Unnamed basal shale	0.5	Early mature (oil)	~1 380

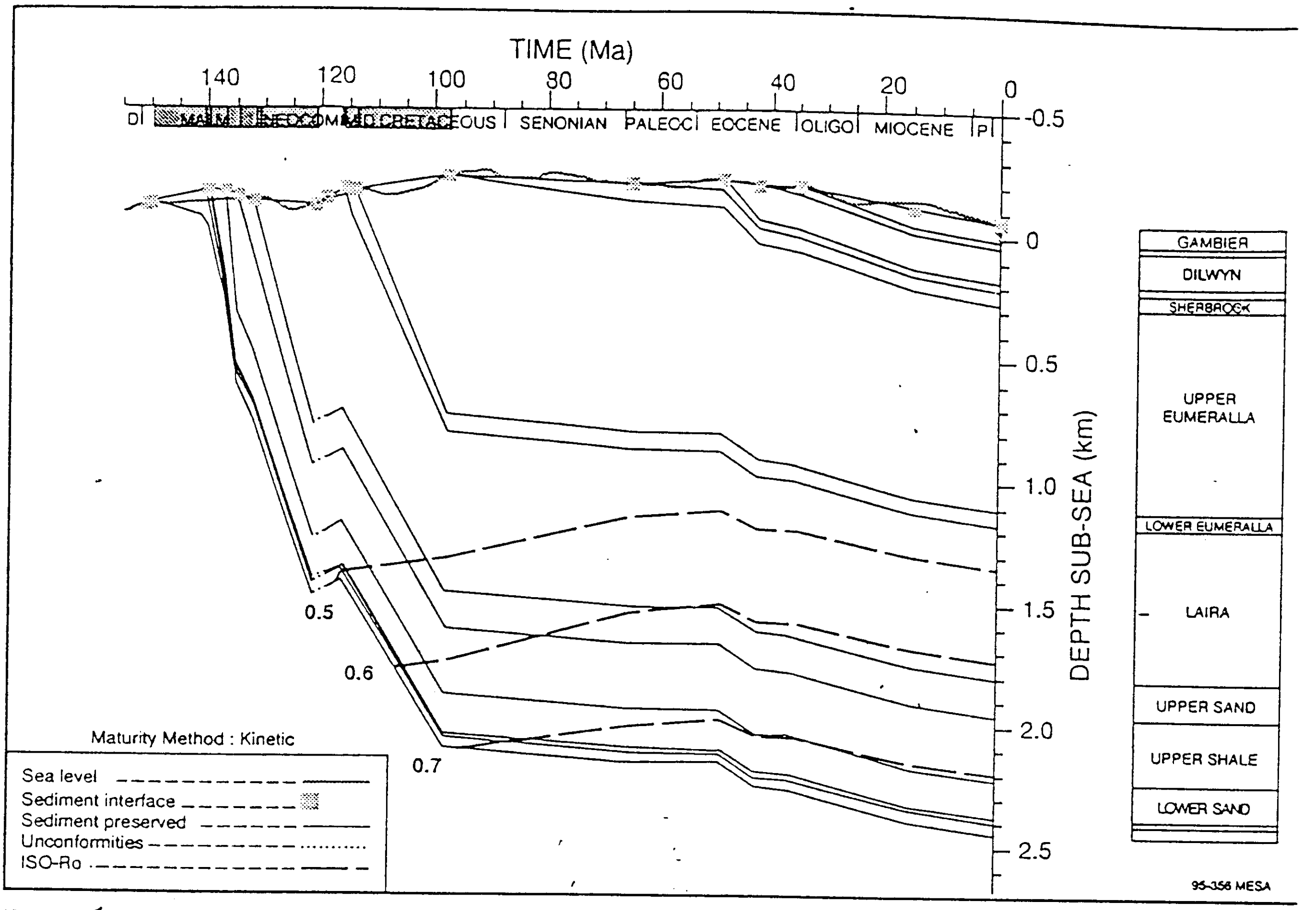

Fig. 7.20 *Geohistory plot, Sawpit 1, northern Penola Trough.*

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Crayfish Platform

The burial and thermal history of Crayfish 1A is used here as a summary for the Crayfish Platform which includes Trumpet 1 and Neptune 1 (Table 7.9; Fig. 7.23).

Chama Terrace

The thermal and burial history of the Chama Terrace is provided by Troas 1, which successfully tested the Eumeralla-sourced play concept of Tupper *et al.* (1993). Results are summarised in Table 7.10 and Figure 7.24.

Table 7.9 *Hydrocarbon maturity, Crayfish Platform.*

Formation	R_v (%)	Maturity window	Depth (m subsea)
Lower Eumeralla Formation, Katnook Sandstone, Laira Formation	0.5	Early mature (oil)	~1 200
Upper Pretty Hill Formation	0.7	Mid-mature (oil)	~1 900
Lower Pretty Hill Formation	1.0	Late mature (oil)	~2 900
Basal Pretty Hill Formation, Intra-Pretty Hill shale, Unnamed basal shale, Casterton Formation	1.3	Main gas generation	~3 600

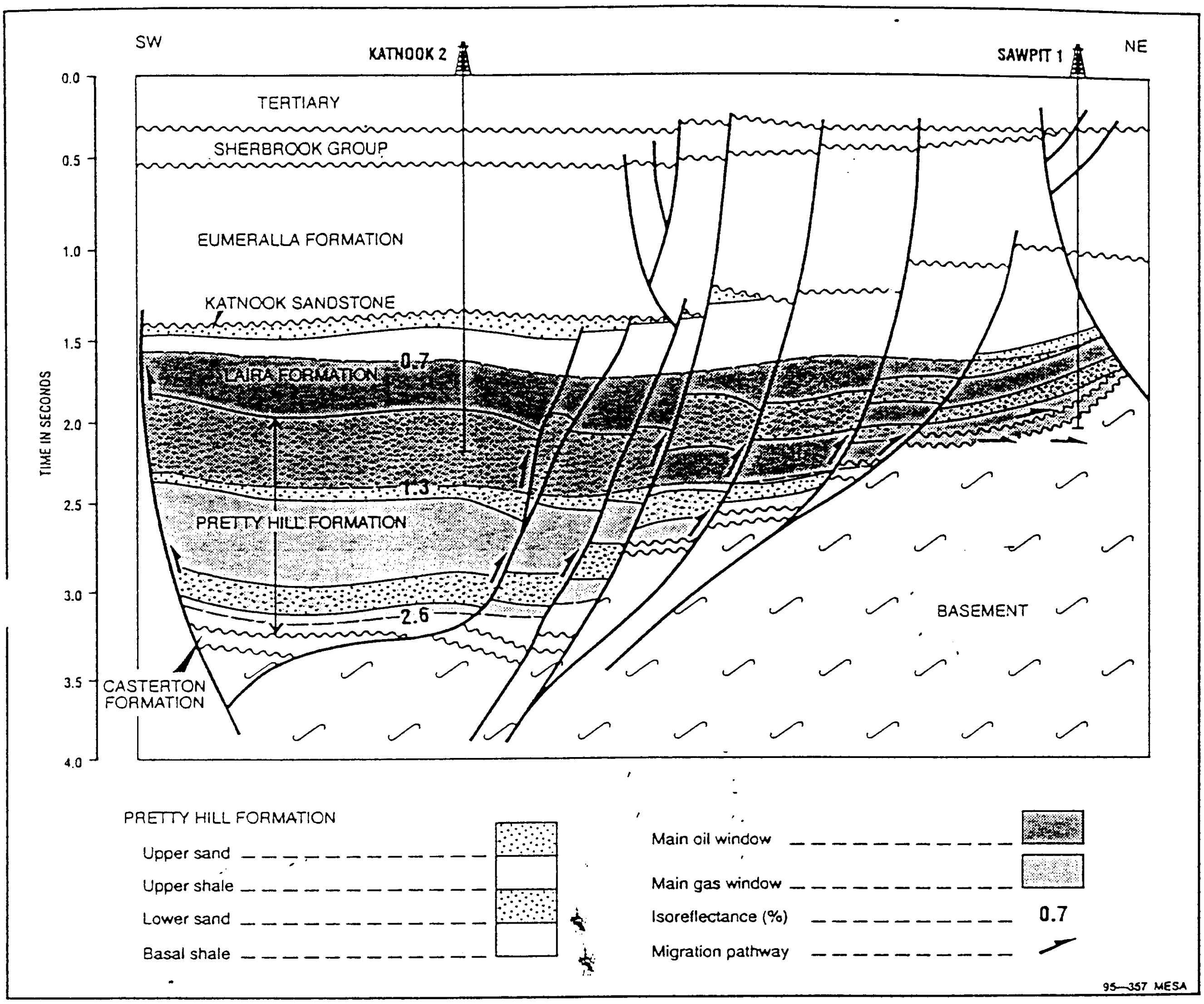

Fig. 7.21 Schematic cross-section through Katnook 2 and Sawpit 1, showing hydrocarbon migration pathways and isoreflectance contours.

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Table 7.10 *Hydrocarbon maturity, Chama Terrace.*

Formation	R_v (%)	Maturity window	Depth (m subsea)
Upper Eumeralla Formation	0.5	Early mature (oil)	~1 500
Lower Eumeralla Formation, Undifferentiated Crayfish Group	0.7	Mid-mature (oil)	~2 100
Undifferentiated Crayfish Group	1.0	Late mature (oil)	~2 650
Undifferentiated Crayfish Group	1.3	Main gas generation	~3 000
Undifferentiated Crayfish Group	2.5	Overmature	~4 350

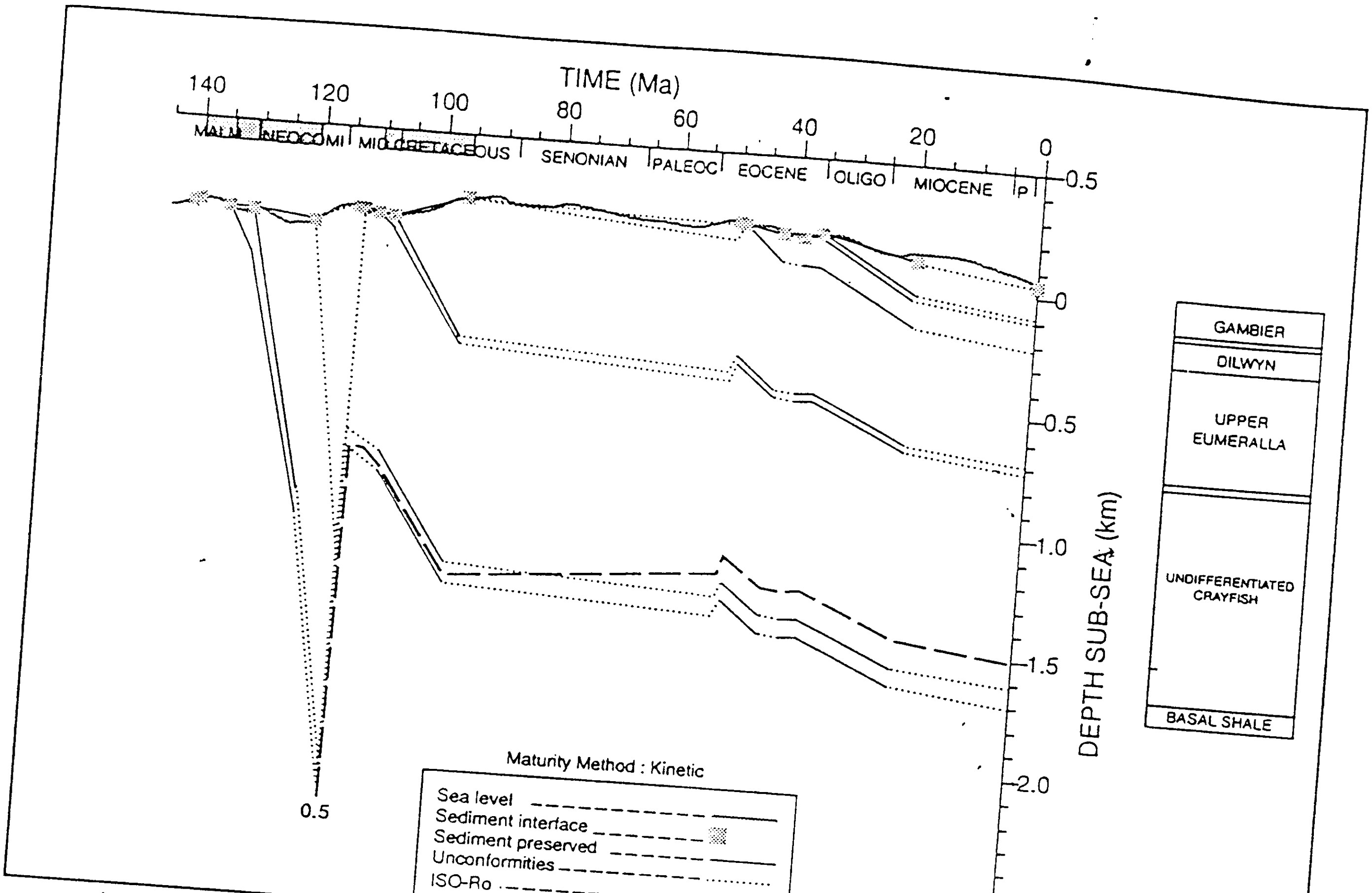

Fig. 7.~~22~~ 27 *Geohistory plot, Camelback 1, onshore Robe Trough.*

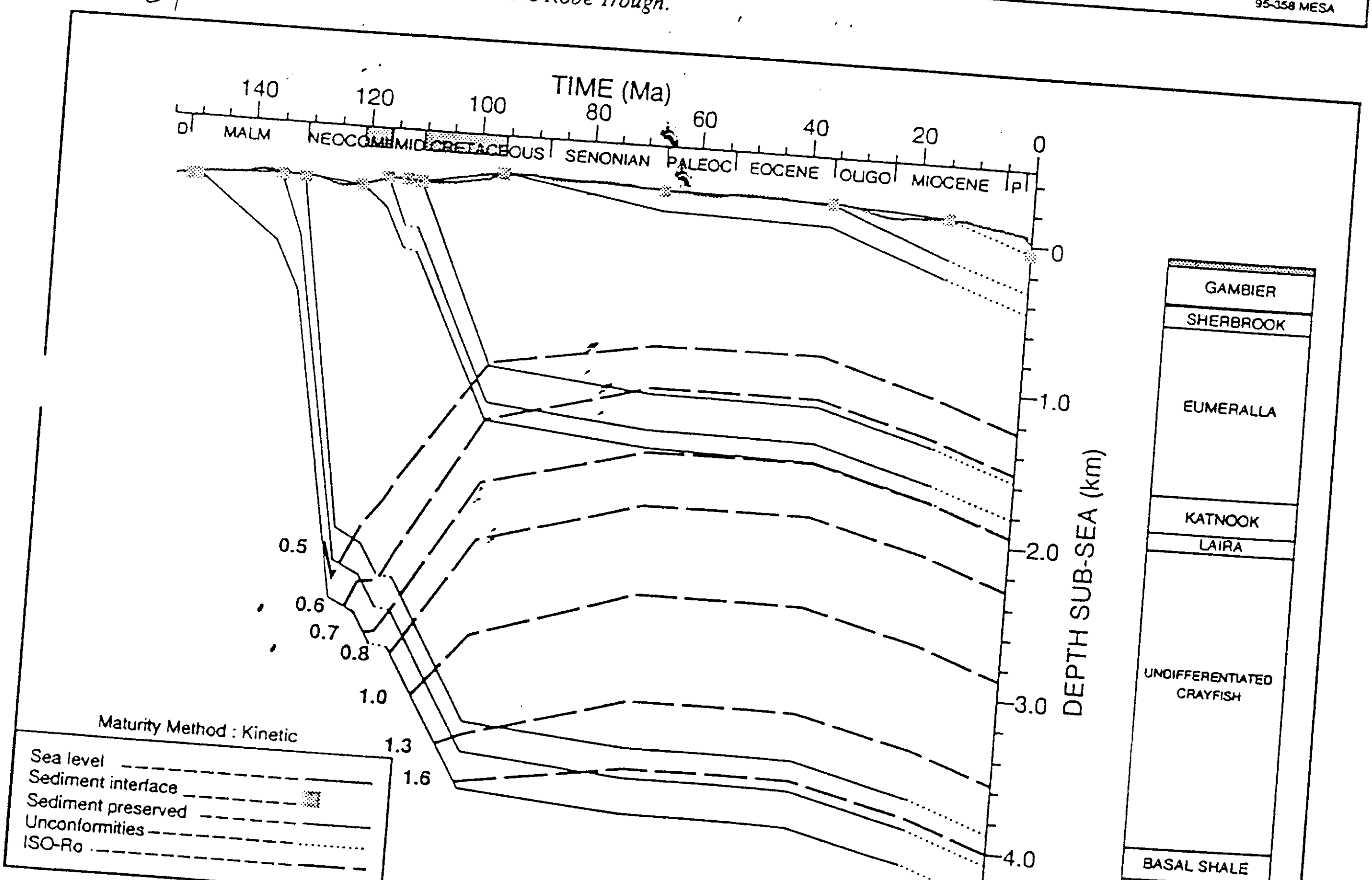

Fig. 7.~~23~~ 28 *Geohistory plot, Crayfish 1A, Crayfish Platform.*

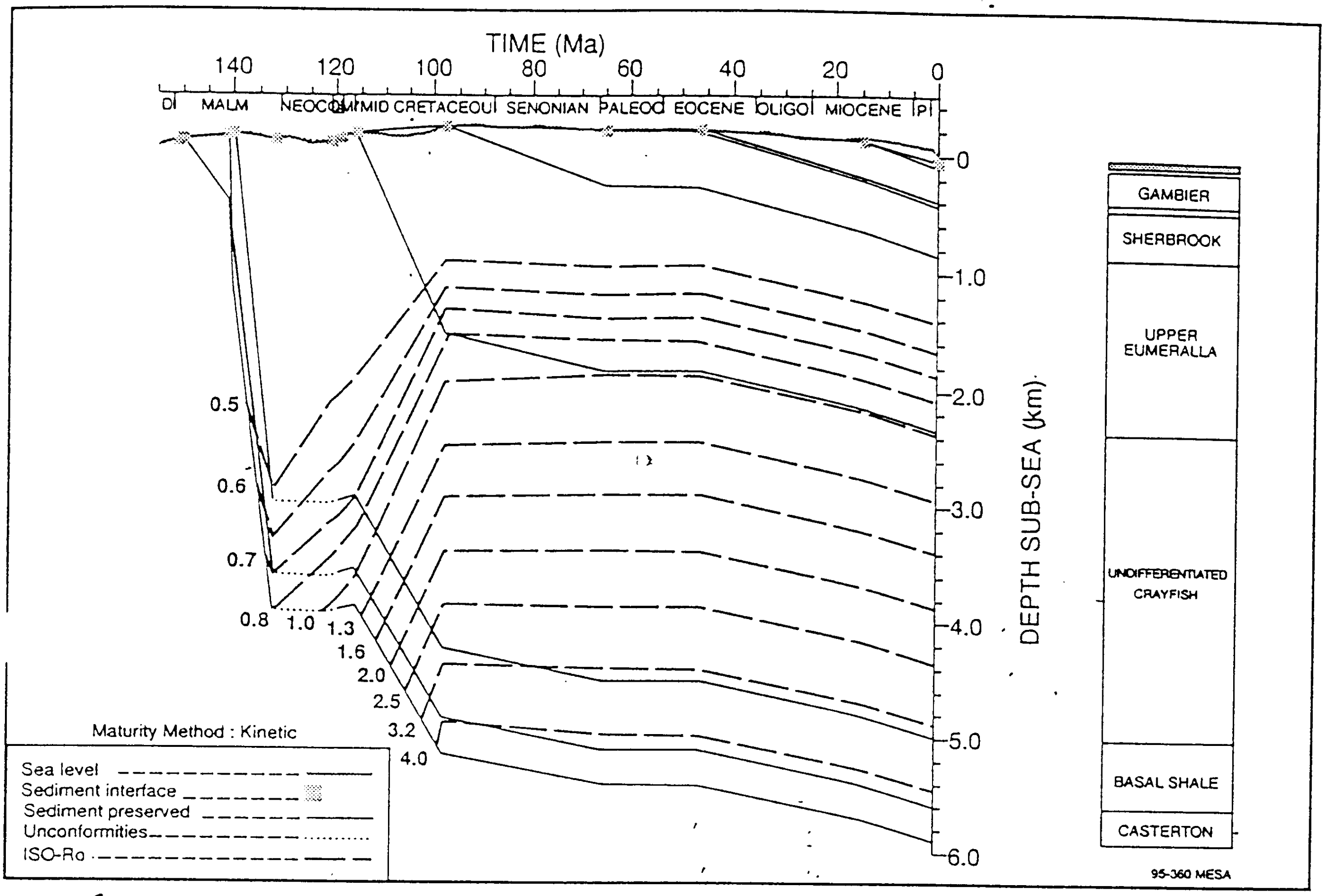

Fig. 7.29 *Geohistory plot, Troas 1, Chama Terrace.*

Voluta Trough

Copa 1, Argonaut 1A and Breaksea Reef 1 are the only wells drilled in the Voluta Trough in the western Otway Basin. The thermal and burial history of the Voluta Trough is based on modelling of Breaksea Reef 1 due to its considerable depth (4 468 m). Results are summarised in Table 7.11 and Figure 7.25.

Table 7.11 *Hydrocarbon maturity, Voluta Trough.*

Formation	R_v (%)	Maturity window	Depth (m subsea)
Paaratte Formation	0.5	Early mature (oil)	-2 700
Paaratte Formation, Belfast Mudstone	0.7	Mid mature (oil)	-3 500
Belfast Mudstone, Flaxman Formation, Waarre Sandstone, Upper Eumeralla Formation	1.0	Late mature (oil)	-4 500
Upper Eumeralla Formation, Lower Eumeralla Formation, Windermere Sandstone Member, Undifferentiated Crayfish Group	1.3	Main gas generation	-4 900
Undifferentiated Crayfish Group	2.5	Overmature	-6 000

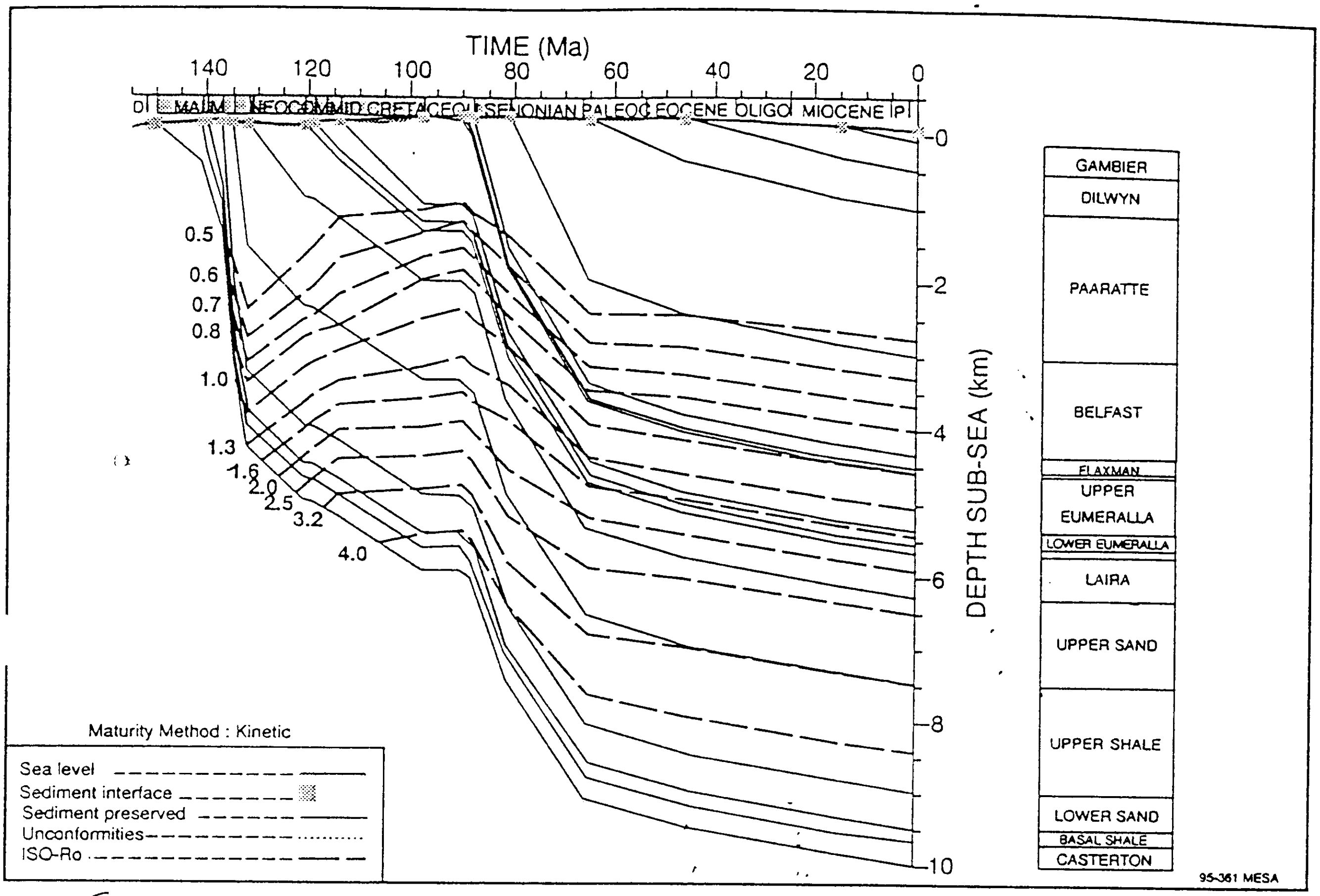

Fig. 7.30 *Geohistory plot, Breaksea Reef 1, Voluta Trough.*

HYDROCARBON OCCURRENCE

Coastal bitumen strandings

There are numerous indications of direct and indirect evidence for hydrocarbon occurrence in the Otway Basin. Indirect evidence is provided by strandings of crude oil, referred to locally as coastal bitumen, along the South-East coastline. Strandings have been recorded for at least 150 years and were used as circumstantial evidence for the promotion of oil exploration in the late 19th century. McKirdy and Horvath (1976) identified these as high wax, low API, low sulphur, paraffinic-naphthenic crudes that originated from submarine seeps. Analysis of surface ocean currents using drift bottles, coupled with the degree of alteration of the crude, suggested a localised seep near the outer edge of the continental shelf (i.e. sourced from either the Duntroon or Otway Basin) and possibly linked to earthquake activity.

Based on their low pristine/phytane ratios, these crudes were considered to be immature and derived from terrigenous organic matter deposited in freshwater to paralic environments (McKirdy and Horvath, 1976). Subsequent resampling (McKirdy, 1985) revealed that the bitumens were all derived from an algal source and fell into four distinct oil families, three of which were high wax crudes, the other a non-waxy asphaltite. The identification of botryococcane, derived from the freshwater green alga *Botryococcus braunii* in the bitumens (McKirdy *et al.*, 1986), suggested that the parent oils were generated from source rocks deposited in stratified lakes under anaerobic conditions.

Padley *et al.* (1993) re-examined existing and new samples collected by MESA during 1990-1991, and identified two distinct types, waxy bitumen and asphaltite. The authors concluded that the majority of samples probably originated in Indonesia from Tertiary basins and were transported by surface ocean currents, notably the Leeuwin Current, to South Australian waters, a conclusion first proposed by Currie *et al.* (1992) for coastal bitumens in Western Australia.

The waxy bitumens contain trace amounts of oleanane (derived from angiosperms) and bicadinanes (derived from fossil resins of tropical dipterocarp trees). Similar biomarkers are found in Tertiary sourced oils from the Minas Field in Sumatra.

In contrast, large pieces of some of the asphaltite may have a local origin. The high sulphur content and molecular isotopic signatures are diagnostic of a marine source rock, possibly from a distal facies of the Belfast Mudstone of the Otway Basin or the Wigunda Formation of the Duntroon Basin, although definitive oil-source correlations have yet to be established. Given their nature as bottom drifters and the direction of bottom currents across the continental shelf, such a hypothesis is supported by the stranding patterns of asphaltite in South Australia and western Tasmania (McKirdy *et al.*, 1994).

Offshore hydrocarbon gases

In 1983, a 1 600 km marine hydrocarbon detection survey conducted by Shoreline Exploration Co. located hydrocarbon 'seepages' thought to be the source of the coastal bitumens.