# APPENDIX

# PALYNOLOGICAL ANALYSIS OF DRUMMER-1, GIPPSLAND BASIN

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## INTERPRETATIVE DATA

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## INTRODUCTION

Twenty seven sidewall cores were processed and examined for spore-pollen and dinoflagellates. Yields and preservation were adequate to make confident age-determinations for most samples.

Lithological units and palynological zones from the base of the Lakes Entrance Formation to T.D. are summarized below; anomalous and unusual occurrences of taxa are listed in Table 2. Basic data are given in Table 3.

## SUMMARY

| AGE | UNIT | SPORE-POLLEN ZONE | DINO ZONE | DEPTH (m) |
|---|---|---|---|---|
| Oligocene/ Miocene | Lakes Entrance Fm. | P. tuberculatus | - | 2431.5m |
| | | log break at 2432.0m | | |
| Oligocene? | "Fortescue Shale" | P. tuberculatus | - | 2433.0m |
| | | log break at 2434.5m | | |
| Late Eocene | Gurnard Fm. equivalent | Middle N. asperus | C. incompositum | 2435.0m |
| | | Middle N. asperus | - | 2436.5-2438.5m |
| Middle Eocene | | Lower N. asperus | A diktyoplokus | 2441.5-2443.5m |
| Middle Eocene | | Lower N. asperus | T. pandus | 2446.7m |
| | | log break at 2447.0m | | |
| Early-Middle Eocene | "Opah Channel Fill" | Lower N. asperus/ P. asperopolus | T. pandus/ T. asteris | 2448.2-2450.2m |
| | | log break at 2451.5m | | |
| Early Eocene | Latrobe Group coarse clastics | Lower M. diversus | - | 2485.5m |
| | | Lower M. diversus | A. hyperacantha? | 2487.8m |
| | | Upper L. balmei | A. homomorpha | 2493.5-2541.0m |

T.D. 2571m

GEOLOGICAL COMMENTS

1. Drummer-1 contains a thick sequence of Paleocene-Early Eocene, Upper L. balmei to Lower M. diversus Zone, sediments that are unconformably overlain by a thin condensed sequence of Early to Late Eocene, P. asperopolus to Middle N. asperus Zone, siltstones.

2. The condensed interval, picked on gamma log response as occurring between 2434.0m and 2451.5m, is capped by a glauconitic claystone containing good P. tuberculatus Zone palynofloras but lacking forams. On the basis of the driller's depth, the lowermost P. tuberculatus Zone sample (SWC 27, 2433.0m) was taken in the thin shale corresponding to the log spike between 2432.0 and 2434.0m. This shale is provisionally equated with the P. tuberculatus Zone unit which has been informally referred to as "Fortescue Shale" (Oligocene Wedge), present above approx. 2492.5m in Rockling-1 and in other wells in the southwestern portion of the Fortescue-Cobia-Halibut Field. Carbonates in the overlying Lakes Entrance Formation at 2429.0m and 2431.5m, are recrystallized and these samples contain only trace amounts of glauconite (M.J. Hannah, pers. comm.).

3. Three biostratigraphically and lithologically distinct units can be recognized within the condensed sequence below the "Fortescue Shale" (carbonate values based on geochemical analyses, D. Hill, pers. comm.):-

   (a) a Middle N. asperus Zone, highly calcareous (40-63%) siltstone unit, between 2435.0 and 2440.0m. Glauconite occurs in the uppermost sample at 2435.0m, which also contains dinoflagellates diagnostic of the C. incompositum Zone. The unit may be part of a poorly (log) defined coarsening upwards sequence and is likely to represent a lower shoreface environment.

   (b) a Lower N. asperus Zone, moderately calcareous (25-30%) siltstone unit, between 2440.0 and 2447.0m. This unit comprises sediments deposited during A. diktyoplokus and T. pandus Zone times (see Partridge 1976, 1985). T. pandus Zone sediments are stratigraphically separated from the (younger) A. diktyoplokus Zone sediments by an unzoned interval in Marlin-A1 but it is not yet clear how these zones relate to regional changes in sea level within the basin during the Middle Eocene.

   (c) a slightly calcareous (6-7%) siltstone unit, between 2447.0 and 2451.5m. This unit contains indicator species of both the P. asperopolus/T. asteris and Lower N. asperus/T. pandus Zones (see Biostratigraphy Section). Whether the unit represents a T. asteris

Zone sediment that is in situ but burrowed (as is likely in any condensed sequence), or whether the sediment as a whole has been reworked during T. pandus Zone times, is unclear.

The condensed sequence as a whole displays the typical 'Gurnard Formation' log response of high density, high neutron porosity. Glauconite is absent except at 2443.5 and 2446.7m (M.J. Hannah, pers. comm.). The log character is probably due to ferruginized shale pellets (2435.0, 2436.5, 2439.0m) and ferric cements (2443.5, 2446.7m). High neutron porosity values indicate a high clay content. It is not clear how much of the carbonate occurs as a calcitic or dolomitic cement.

4. The Middle and Lower N. asperus Zone units are provisionally equated with the Gurnard Formation, widely developed across the basin during this time. Alternatively, and supported by the abundance of carbonate, the Middle N. asperus Zone unit between 2435.0 and 2440.0m resembles the "Bullseye Marl" unit of glauconitic marls and claystones deposited in the area west of Kingfish during the Late Eocene-Early Oligocene.

5. Sediments of Middle N. asperus Zone age are absent in both Rockling-1 and Tailor-1; a Lower N. asperus/A. diktyoplokus Zone unit occurs immediately below the "Fortescue Shale" in Rockling-1 whilst the youngest Latrobe Group sediments in Tailor-1 are Lower N. asperus/T. pandus Zone in age. This situation, in which the most complete sequence of Middle-Late Eocene sediments is preserved in the middle of a sequence of three wells aligned (Rockling-1 to Tailor-1) along the direction of depositional downdip is unusual. It may be as much a consequence of the very low depositional rates and subtle changes on relief on the paleoseafloor as of differential erosion.

6. The P. asperopolus/T. asteris unit in Drummer-1 is correlated with the "Opah Formation" in Opah-1 and Tailor-1 (Limbert et al. 1983, Partridge 1985). The channel fill in Drummer-1 (3.3m) is thinner than that present in Tailor-1 (4.5m).

7. The occurrence of Lower M. diversus Zone sediments in Rockling-1 and Drummer-1, but not (structurally updip) in Tailor-1, confirms the geological prognosis that the thick M. diversus Zone sand unit between 2452.5 and 2476.5m in Drummer-1 subcrops against the base of the P. asperopolus channel between Drummer-1 and Tailor-1.

8. Shales underlying this sand unit contain Lower M. diversus Zone palynofloras containing dinoflagellates, but not species diagnostic of the A. hyperacanthum Zone marine transgression. Nevertheless the presence of

Apectodinium hyperacanthum believed to be caved into Upper L. balmei Zone sediments at 2499.0m indicates that A. hyperacanthum Zone sediments may be present in Drummer-1. A possible source is the shale between (gamma log depths) 2485.5 and 2492.5m. This unit occurs between the 52.5 Myr and 54 Myr unconformities picked at approx. 2484 and 2499m respectively (V. Labutis pers. comm.). Note that frequent Apectodinium hyperacanthum occurs at 2562.5m in Rockling-1, above the 52.5 Myr unconformity, picked at approx. 2568m.

9. Except for the sample at 2531.5m, which corresponds to the log depth of the highest coal encountered in Drummer-1, samples within the Upper L. balmei Zone contain low numbers of A. homomorpha Zone dinoflagellates. This indicates a lagoonal/estuarine, rather than an open marine, environment existed at the wellsite during the Paleocene. The well is likely to have reached total depth still within in Upper L. balmei Zone sediments.

BIOSTRATIGRAPHY

Zone boundaries have been established using criteria proposed by Stover & Partridge (1973) and subsequent proprietary revisions.

Upper Lygistepollenites balmei Zone: 2493.5-2541.0m

Samples within this interval contain Proteacidites - gymnosperm dominated palynofloras in which the nominate species is usually frequent. Many samples contain species restricted to the L. balmei Zone, e.g. Polycolpites langstonii, or which range no higher than the Upper L. balmei Zone, e.g. Gambierina rudata and Australopollis obscurus. Occurrences of Banksieaeidites lunatus, Malvacipollis diversus, M. subtilis, Proteacidites annularis and Integricorpus antipodus at 2541.0m provide a confident Upper L. balmei Zone age for this, the lowest sidewall core sample taken. Cyathidites gigantis occurs at 2539.0, 2534.2, and 2504.5m. The dinoflagellate Apectodinium homomorpha is present throughout but is mostly rare. The upper boundary is picked at 2493.5m, the highest sample containing Banksieaeidites lunatus and Proteacidites annularis with Lygistepollenites balmei, Australopollis obscurus and Gambierina rudata.

Lower Malvacipollis diversus Zone: 2478.8-2487.8m

Four samples are assigned to this zone. The lowermost, at 2487.8m, contains Spinizonocolpites prominatus. Although Apectodinium homomorpha only was recorded, the sample may represent the A. hyperacantha transgression. A single specimen of Apectodinium hyperacantha was found caved into Upper L. balmei/A. homomorpha Zone sediments at 2499.0m. Spinizonocolpites prominatus occurs with Proteacidites kopiensis at 2485.5m. The uppermost sample, at 2478.8m, lacks species diagnostic of a Lower M. diversus Zone age. The sample is provisionally assigned to this zone on the basis of relatively frequent occurrences of Tetracolporites multistrixus, Malvacipollis subtilis and Proteacidites grandis. Nevertheless the sample also contains Conbaculites apiculatus and Anacolosidites acutullus, species which only very rarely extends below the P. asperopolus and Middle M. diversus Zones respectively. The Paleocene-Early Eocene dinoflagellate Palaeoperidinium bassensis dominates the palynoflora.

Lower Nothofagidites asperus (Tritonites pandus)/
Proteacidites asperopolus (Tritonites asteris) Zone: 2448.2-2450.2m

Samples within this interval contain typical P. asperopolus Zone spore-pollen assemblages including Conbaculites apiculatus, and at 2448.2m, species which range no higher than the P. asperopolus Zone, e.g. Myrtaceidites tenuis, Homotryblium tasmaniense and the very rare acritarch Tritonites asteris ms. However Tritonites pandus, a rare species not known to range below the Lower N. asperus/T. pandus Zone, occurs at both 2448.2 and 2450.2m. Two explanations exist: (i) T. pandus first appears within the P. asperopolus Zone, suggesting the possibility that a hitherto unrecognized zone defined by the simultaneous occurrence of T. asteris and T. pandus occurs between the P. asperopolus/T. asteris Zone and the Lower N. asperus/T. pandus Zone (cf. Partridge 1985) or (ii) the interval represents a body of P. asperopolus/T. asteris Zone sediments burrowed into or reworked during T. pandus Zone times. The sample at 2448.2m contains reworked Lygistepollenites balmei

Lower Nothofagidites asperus/Tritonites pandus Zone: 2446.7m

One sample is provisionally assigned to this zone. Tritonites pandus is present but because of the small size and extreme rarity of T. asteris, it is not possible to be certain that this latter species is not also present.

Lower Nothofagidites asperus/Areosphaeridium diktyoplokus Zone: 2441.5-2443.5m

The two samples within this interval contain frequent Nothofagidites, including N. falcatus at 2443.5m, and rare specimens of Areosphaeridium diktyoplokus. The Early Eocene dinoflagellate Homotryblium tasmaniense occurs at 2443.5m, suggesting some reworking. The same dinoflagellate is also recorded in a Lower N. asperus zone assemblage at 2495.5m in Rockling-1.

Middle Nothofagidites asperus Zone: 2435.0-2438.5m

Except at 2435.0m samples within this interval lack species restricted to the Middle N. asperus Zone spore-pollen. The base of the zone is provisionally picked at 2438.5m because of the similarity of spore-pollen species in this sample (frequent Nothofagidites, Myrtaceidites verrucosus) with palynofloras at 2436.5 and 2435.0m. A stripped specimen of either Proteacidites asperopolus or P. pachypolus is present. Nothofagidites falcatus shows the sample at 2438.5m is no older than Lower N. asperus Zone. Proteacidites rectomarginis, a species which first appears in the Middle N. asperus Zone occurs at 2436.5m. The sample at 2435.0m contains the Middle N. asperus Zone indicator dinoflagellate, Corrudinium incompositum.

Proteacidites tuberculatus Zone: 2431.5-2433.0m

Samples within this interval are dominated by dinoflagellates. The zone indicator species Cyatheacidites annulatus is present throughout.

TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

DRUMMER-1



| SAMPLE NO. | DEPTH (m) | SPORE-POLLEN ZONE | DINOFLAGELLATE ZONE | AGE | CONFIDENCE RATING | COMMENTS |
|---|---|---|---|---|---|---|
| SWC 30 | 2427.5 | Indeterminate | - | - | - | barren |
| SWC 28 | 2431.5 | P. tuberculatus | - | Oligocene/Miocene | 0 | C. annulatus |
| SWC 27 | 2433.0 | P. tuberculatus | - | Oligocene/? | 0 | C. annulatus |
| SWC 26 | 2435.0 | Middle N. asperus | C. incompositum | Late Eocene | 1 | C. incompositum |
| SWC 25 | 2436.5 | Middle N. asperus | - | Late Eocene | 1 | P. rectomarginis, M. verrucosus |
| SWC 24 | 2438.5 | Middle N. asperus | - | Late Eocene | 2 | C. corrugatum, M. verrucosus |
| SWC 22 | 2441.5 | Lower N. asperus | A. diktyoplokus | Middle Eocene | 1 | A. diktyoplokus |
| SWC 21 | 2443.5 | Lower N. asperus | A. diktyoplokus | Middle Eocene | 0 | N. falcatus, A. diktyoplokus |
| SWC 19 | 2446.7 | Lower N. asperus | T. pandus | Middle Eocene | 1 | T. pandus |
| SWC 18 | 2448.2 | Lower N. asperus/P. asperopolus | | Early/Middle Eocene | - | T. asteris, T. pandus, M. tenuis, C. apiculatus, H. tasmaniense |
| SWC 17 | 2450.2 | Lower N. asperus/P. asperopolus | | Early/Middle Eocene | - | T. pandus, C, apiculatus |
| SWC 16 | 2478.8 | Lower M. diversus | - | Early Eocene | 2 | T. multistrixus freq., C. apiculatus A. acutullus |
| SWC 15 | 2481.2 | Indeterminate | - | - | - | barren |
| SWC 14 | 2485.5 | Lower M. diversus | - | Early Eocene | 1 | S. prominatus, P. kopiensis |
| SWC 13 | 2487.8 | Lower M. diversus | ?A. hyperacantha | Early Eocene | 1 | S. prominatus, A. homomorpha |
| SWC 12 | 2493.5 | Upper L. balmei | A. homomorpha | Paleocene | 1 | L. balmei, G. rudata, A. obscurus, P. annularis, B. lunatus, A. homomorpha |

TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

DRUMMER-1



| SAMPLE NO. | DEPTH (m) | SPORE-POLLEN ZONE | DINOFLAGELLATE ZONE | AGE | CONFIDENCE RATING | COMMENTS |
|---|---|---|---|---|---|---|
| SWC 11 | 2496.0 | Upper L. balmei | A. homomorpha | Paleocene | 1 | L. balmei freq., P. annularis, A. homomorpha |
| SWC 10 | 2499.0 | Upper L. balmei | A. homomorpha | Paleocene | 2 | L. balmei, M. diversus, A. homomorpha |
| SWC 9 | 2500.2 | Upper L. balmei | A. homomorpha | Paleocene | 1 | L. balmei, M. diversus, M. subtilis |
| SWC 8 | 2502.5 | Upper L. balmei | A. homomorpha | Paleocene | 1 | P. langstonii, A. homomorpha |
| SWC 7 | 2504.5 | Upper L. balmei | - | Paleocene | 0 | L. balmei freq., C. gigantis, P. grandis, P. langstonii, M. diversus |
| SWC 6 | 2509.0 | Upper L. balmei | A. homomorpha | Paleocene | 1 | L. balmei freq., M. diversus, A. homomorpha |
| SWC 5 | 2511.5 | Upper L. balmei | A. homomorpha | Paleocene | 1 | L. balmei common, B. lunatus, A. homomorpha |
| SWC 4 | 2531.5 | Upper L. balmei | - | Paleocene | 1 | B. lunatus, P. langstonii |
| SWC 3 | 2534.2 | Upper L. balmei | A. homomorpha | Paleocene | 0 | C. gigantis, P. langstonii, A. homomorpha |
| SWC 2 | 2539.0 | Upper L. balmei | A. homomorpha | Paleocene | 0 | C. gigantis, P. langstonii, A. homomorpha |
| SWC 1 | 2541.0 | Upper L. balmei | - | Paleocene | 0 | I. notabilis, B. lunatus, M. diversus |

## TABLE 2

### ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN TAXA IN DRUMMER-1



| SAMPLE NO. | DEPTH(m) | ZONE | TAXON | COMMENTS |
|---|---|---|---|---|
| SWC 25 | 2436.5 | Middle N. asperus (1) | Myrtaceidites verrucosus | Rare sp. assoc. with P. rectomarginis |
| SWC 24 | 2438.5 | Middle N. asperus (2) | Myrtaceidites verrucosus | Rare sp. |
| SWC 24 | 2438.5 | Middle N. asperus (2) | Proteacidites unicus | Rare ms. sp. |
| SWC 22 | 2441.5 | Lower N. asperus (1) | Myrtaceidites eucalyptoides | Rare sp. (A. diktyoplokus Zone) |
| SWC 22 | 2441.5 | Lower N. asperus (1) | Haloragacidites verrucato harrisii | Rare sp. (A. diktyoplokus Zone) |
| SWC 22 | 2441.5 | Lower N. asperus (1) | Phyllocladidites palaeogenicus | Rare sp. (A. diktyoplokus Zone) |
| SWC 22 | 2441.5 | Lower N. asperus (1) | Matonisporites ornamentalis | Uncommon in this zone |
| SWC 21 | 2443.5 | Lower N. asperus (1) | Cunoniaceae 3-p | Modern taxon (A. diktyoplokus Zone) |
| SWC 21 | 2443.5 | Lower N. asperus (1) | Parvisaccites catastus | Uncommon sp. |
| SWC 21 | 2443.5 | Lower N. asperus (1) | Podocarpidites ostentatus | Uncommon ms. sp. |
| SWC 19 | 2446.7 | Lower N. asperus/T. pandus | Cunoniaceae 2-p | Modern taxon |
| SWC 19 | 2446.7 | Lower N. asperus/T. pandus | Tritonites pandus | Rare ms. acritarch sp. |
| SWC 18 | 2448.2 | Lower N. asperus/ P. asperopolus | Tritonites pandus & T. asteris | Rare ms. acritarch spp. assoc. with M. tenuis |
| SWC 18 | 2448.2 | Lower N. asperus/ P. asperopolus | Cunoniaceae 3 & 2-p | Modern taxa |
| SWC 18 | 2448.2 | Lower N. asperus/ P. asperopolus | Gothanipollis bassensis | Rare sp. |
| SWC 18 | 2448.2 | Lower N. asperus/ P. asperopolus | Proteacidites reticulatus | Uncommon sp. |
| SWC 18 | 2448.2 | Lower N. asperus/ P. asperopolus | Dryptopollenites semilunatus | Rare sp. |

## TABLE 2

**ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN TAXA IN DRUMMER-1**



| SAMPLE NO. | DEPTH(m) | ZONE | TAXON | COMMENTS |
|---|---|---|---|---|
| SWC 18 | 2448.2 | Lower N. asperus/ P. asperopolus | Beaupreadites trigonalis | Rare sp. |
| SWC 17 | 2450.2 | Lower N. asperus/ P. asperopolus | Tritonites pandus | Not previously recorded below T. asteris, assoc. with C. apiculatus |
| SWC 16 | 2478.8 | Lower M. diversus | Conbaculites apiculatus | V. rare below P. asperopolus Zone |
| SWC 16 | 2478.8 | Lower M. diversus | Anacolosidites acutullus | V. rare below Middle M. diversus Zone |
| SWC 16 | 2478.8 | Lower M. diversus | Banksieaeidites lunatus | Uncommon in this zone |
| SWC 14 | 2485.5 | Lower M. diversus (1) | Dryptopollenites semilunatus | Rare sp. |
| SWC 14 | 2485.5 | Lower M. diversus (1) | Parvisaccites catastus | Rare sp. |
| SWC 13 | 2487.8 | Lower M. diversus (1) | Tricolporites angurium | Rare in Early Eocene |
| SWC 11 | 2496.0 | Upper L. balmei (1) | Amosopollis cruciformis | Uncommon sp. |
| SWC 10 | 2499.0 | Upper L. balmei (2) | Phyllocladidites paleogenicus | Uncommon sp. |
| SWC 10 | 2499.0 | Upper L. balmei (2) | Banksieaeidites elongatus | Caved? |
| SWC 10 | 2499.0 | Upper L. balmei (2) | Apectodinium hyperacantha | Caved |
| SWC 8 | 2502.5 | Upper L. balmei (1) | Foveogleicheniidites sp. | Apiculate var. of rare ms. genus |
| SWC 8 | 2502.5 | Upper L. balmei (1) | Tricolpites waiparaensis | V. rare above Upper T. longus Zone |
| SWC 6 | 2509.0 | Upper L. balmei (1) | Triporopollenites ambiguus | Rare Paleocene occurrence |
| SWC 5 | 2511.5 | Upper L. balmei (1) | Triporopollenites ambiguus | Rare Paleocene occurrence. Also at 2539.0 & 2541.0m |
| SWC 5 | 2511.5 | Upper L. balmei (1) | Anacolosidites acutullus | V. rare Paleocene occurrence |
| SWC 5 | 2511.5 | Upper L. balmei (1) | Rouseisporites reticulatus | Appears in situ (Late K sp.) |

## TABLE 2

### ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN TAXA IN DRUMMER-1



| SAMPLE NO. | DEPTH(m) | ZONE | TAXON | COMMENTS |
|---|---|---|---|---|
| SWC 4 | 2531.5 | Upper L. balmei (1) | Beaupreadites verrucosus | Appears in situ (Eocene sp.) |
| SWC 4 | 2531.5 | Upper L. balmei (1) | Tetracolporites textus | Rare sp. |
| SWC 3 | 2534.2 | Upper L. balmei (0) | Tetracolporites textus | Rare sp. assoc. with C. gigantis |
| SWC 2 | 2539.0 | Upper L. balmei (0) | Tetracolporites textus | Rare sp. assoc. with C. gigantis |
| SWC 2 | 2539.0 | Upper L. balmei (0) | Jaxtacolpus pelratus | Rare sp. |
| SWC 1 | 2541.0 | Upper L. balmei (0) | Integricorpus antipodus | Rare sp. |
| SWC 1 | 2541.0 | Upper L. balmei (0) | Banksieaeidites elongatus | ?not previously recorded in this zone |
| SWC 1 | 2541.0 | Upper L. balmei (0) | Proteacidites wahooensis | Late Cretaceous sp. |

## TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

### DRUMMER-1



| DIVERSITY - | low | medium | high |
|---|---|---|---|
| S & P | less than 10 | 10-30 | greater than 30 |
| D | 1-3 | 3-10 | 10 |

| SAMPLE NO. | DEPTH (m) | YIELD | | DIVERSITY | | PRESERVATION | LITHOLOGY | PYRITIZATION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| | | SPORE-POLLEN | DINOS | SPORE-POLLEN | DINOS | | | | |
| SWC 30 | 2427.5 | - | - | - | - | - | Clyst., calc., glau. | - | Barren 57% carbonate |
| SWC 28 | 2431.5 | Low | Low | Low | Low | Poor | Clyst., calc., glau. | - | 36.4% |
| SWC 27 | 2433.0 | V. low | Low | Low | Medium | Poor | Clyst., calc., glau. | - | 32% carbonate |
| SWC 26 | 2435.0 | Low | Low | Medium | Medium | Good | Slst., calc., glau. | - | 40.5% carbonate |
| SWC 25 | 2436.5 | Low | Low | Medium | Low | Fair | Slst., calc., sandy | - | |
| SWC 24 | 2438.5 | Low | Low | Medium | Low | Fair | Slst., calc., sandy | - | 62.9% carbonate |
| SWC 22 | 2441.5 | Low | Low | Medium | Medium | Fair | Slst., calc., coaly | - | 24.5% carbonate |
| SWC 21 | 2443.5 | Low | Low | Medium | Medium | Poor | Slst., glau., calc. | - | 30.7% carbonate |
| SWC 19 | 2446.7 | V. low | Low | Low | Medium | Poor | Ss., coaly | - | 32.8% carbonate |
| SWC 18 | 2448.2 | Low | Low | High | High | Good | Sh., carb., coaly | - | 6.4% carbonate |
| SWC 17 | 2450.2 | Low | V. low | Medium | Low | Poor | Sh., carb., coaly | - | |
| SWC 16 | 2478.8 | Fair | Fair | High | Low | Fair | Sh., carb. | Minor | |
| SWC 15 | 2481.2 | - | - | - | - | - | Slst. | - | Barren |
| SWC 14 | 2485.5 | V. low | - | Medium | - | Good | Slst. | Minor | |
| SWC 13 | 2487.8 | Low | V. low | Medium | Low | Poor | Slst. | Moderate | |
| SWC 12 | 2493.5 | Low | Low | High | Low | Fair | Ss., carb. | Moderate | Contaminated |
| SWC 11 | 2496.0 | Low | Good | Medium | Low | Fair | Sh., carb. | - | |
| SWC 10 | 2499.0 | Good | Fair | Medium | Low | Poor | Sh., carb. | Strong | Contaminated |

## TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

## DRUMMER-1



| DIVERSITY - | low | medium | high |
|---|---|---|---|
| S & P | less than 10 | 10-30 | greater than 30 |
| D | 1-3 | 3-10 | 10 |

| SAMPLE NO. | DEPTH (m) | YIELD | | DIVERSITY | | PRESERVATION | LITHOLOGY | PYRITIZATION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| | | SPORE-POLLEN | DINOS | SPORE-POLLEN | DINOS | | | | |
| SWC 9 | 2500.1 | Low | V. low | Medium | Low | Poor | Slst., carb. | Moderate | |
| SWC 8 | 2502.5 | Fair | Low | Medium | Medium | Fair | Ss. | Moderate | |
| SWC 7 | 2504.5 | Fair | - | Medium | - | Poor | Sh., carb. | - | |
| SWC 6 | 2509.0 | V. good | V. low | Medium | Low | Poor | Ss., carb. | Strong | |
| SWC 5 | 2511.5 | Fair | - | Medium | - | Fair | Sh., carb. | Minor | |
| SWC 4 | 2531.5 | Fair | - | Medium | - | Poor | Slst. | - | |
| SWC 3 | 2534.2 | Low | Low | Medium | Medium | Fair | Sh., carb. | Minor | |
| SWC 2 | 2539.0 | Good | V. low | Medium | Low | Poor | Sh., pyr. | Moderate | |
| SWC 1 | 2541.0 | Good | Low | Medium | Low | Poor | Slst. | - | |

# PALYNOLOGY DATA SHEET

BASIN: Gippsland

WELL NAME: Drummer-1

ELEVATION: KB: +21.0m GL: -74.0m

TOTAL DEPTH: 2571m

| AGE | PALYNOLOGICAL ZONES | HIGHEST DATA Preferred Depth | Rtg | Alternate Depth | Rtg | Two Way Time | LOWEST DATA Preferred Depth | Rtg | Alternate Depth | Rtg | Two Way Time |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NEOGENE | *T. pleistocenicus* | | | | | | | | | | |
| | *M. lipsis* | | | | | | | | | | |
| | *C. bifurcatus* | | | | | | | | | | |
| | *T. bellus* | | | | | | | | | | |
| | *P. tuberculatus* | 2431.5 | 0 | | | | 2433.0 | 0 | | | |
| PALEOGENE | Upper *N. asperus* | | | | | | | | | | |
| | Mid *N. asperus* | 2435.0 | 0 | | | | 2438.5 | 2 | 2436.5 | 1 | |
| | Lower *N. asperus* | 2441.5 | 1 | | | | 2446.7 | 1 | | | |
| | Lower *N. asperus*/ *P. asperopolius* | 2448.2 | - | | | | 2450.2 | - | | | |
| | Upper *M. diversus* | | | | | | | | | | |
| | Mid *M. diversus* | | | | | | | | | | |
| | Lower *M. diversus* | 2478.8 | 2 | 2485.5 | 1 | | 2487.8 | 1 | | | |
| | Upper *L. balmei* | 2493.5 | 1 | | | | 2541.0 | 0 | | | |
| | Lower *L. balmei* | | | | | | | | | | |
| LATE CRETACEOUS | Upper *R. longus* | | | | | | | | | | |
| | Lower *R. longus* | | | | | | | | | | |
| | *T. lilliei* | | | | | | | | | | |
| | *N. senectus* | | | | | | | | | | |
| | *T. apoxyexinus* | | | | | | | | | | |
| | *P. mawsonii* | | | | | | | | | | |
| | *A. distocarinatus* | | | | | | | | | | |
| EARLY CRET. | *P. pannosus* | | | | | | | | | | |
| | *C. paradoxa* | | | | | | | | | | |
| | *C. striatus* | | | | | | | | | | |
| | *C. hughesi* | | | | | | | | | | |
| | *F. wonthaggiensis* | | | | | | | | | | |
| | *C. australiensis* | | | | | | | | | | |

COMMENTS: The following dinoflagellate zones are recognized: C. incompositum 2435.0m; A. diktyoplokus 2441.5-2443.5m; T. pandus 2446.7m; T. pandus/T. asteris 2448.2-2450.2m; A. hyperacantha? 2487.8m; A. homomorpha 2493.5-2541.0m

CONFIDENCE RATING:
- 0: SWC or Core, Excellent Confidence, assemblage with zone species of spores, pollen and microplankton.
- 1: SWC or Core, Good Confidence, assemblage with zone species of spores and pollen or microplankton.
- 2: SWC or Core, Poor Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.
- 3: Cuttings, Fair Confidence, assemblage with zone species of either spores and pollen or microplankton, or both.
- 4: Cuttings, No Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: M.K. Macphail DATE: 21/1/86

DATA REVISED BY: DATE: