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APPENDIX VI

PALYNOLOGICAL REPORT

ON VOLUTA-1 WELL,

4,151 FEET - 13,020 FEET,

by

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ENCLOSURE (No. 7 of Voluta-1 well
completion report).

Preservation and zonal attribution of plant microfossil assemblages in
Voluta-1 (4,151 feet - 13,020 feet).

PALYNOLOGICAL REPORT ON VOLUTA-1 WELL,

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Dr. M.E. Dettmann

The present account incorporates the documentation and evaluation of the microfloral succession observed in sediments between 4151 feet and 13,020 feet in Shell Voluta-1 well. From within this interval, a total of 63 samples including conventional cores, sidewall cores, junk basket samples, and cuttings have been studied. All samples were found to contain carbonaceous matter including usually abundant wood and cuticular fragments intermixed with sparse to abundant spores and pollen grains. Microplankton, although rarely common, are of fairly consistent occurrence in the sections between 4151 feet - 5086 feet and 5885 feet - 11,989 feet; however, they were not observed in sediments between 5214 feet and 5773 feet.

The method by which the plant microfossils were extracted from the enclosing sediments comprises initial treatment in cold hydrofluoric acid followed by mineral separation with zinc bromide. The resultant residues were then examined and the quality of preservation of the contained microfossils was ascertained (Encl. 7). Residues obtained from sediments between 4151 feet and 8901 feet were subjected to additional treatment with Schulze solution for five to fifteen minutes, followed by dilute ($< \frac{1}{4}\%$) ammonium hydroxide before the microfloras were specifically analysed. This maceration treatment, however, was found to be unsatisfactory for the poorly preserved palynological floras preserved in sediments at and below 9962 $\frac{1}{2}$ feet, because the walls of the spore-pollen-microplankton forms became disorganised and their morphological characters were partially or completely destroyed. Thus, the microfloras enclosed in sediments between 9962 $\frac{1}{2}$ feet and 13,020 feet were specifically analysed after the initial hydrofluoric acid - zinc bromide treatment.

The spore-pollen-microplankton suites identified in the sample are tabulated below with reference to their qualitative and quantitative content; the quantitative estimates are expressed in the following terms: Ab (abundant) - numerical representation of a particular species totals at least 5% of microflora, C (common) - numerical representation of a species forms 1-5% of total microflora, and R (rare) - numerical representation forms less than 1% of total microflora.

As outlined below Voluta-1 well contains several distinct microflora suites that conform with plant microfossil assemblages delineated by Harris (1965), Evans (1966), and Dettmann and Playford (1968) in Upper Cretaceous and Lower Tertiary sequences of the Otway Basin. On this basis the section between 4151 feet and 11,989 $\frac{1}{2}$ feet in Voluta-1 well is shown to range in age from Paleocene to Turonian. Sediments at and below 12,634 feet contain only extremely poorly preserved palynological floras that provide insufficient evidence for firm age determinations.

DISCUSSION AND AGE OF MICROFLORAL ASSEMBLAGES

A. 4151 feet

The sidewall core from 4151 feet provided an excellently preserved microfloral assemblage consisting of good concentrations of spores and pollen grains together with extremely rare microplankton. Species identified include:

Spores:	<u>Cyathidites minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>Lycopodiumsporites</u> sp.	R
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Dacrydiumites florinii</u> Cookson & Pike	R

	<u>Duplopollis orthoteichus</u> (Cookson & Pike)	R
	<u>Malvacipollis diversus</u> Harris	C
	<u>Myrtaceidites parvus</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	R
	<u>Nothofagidites emarcidus</u> (Cookson)	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>P. marwickii</u> Couper	R
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Polyporina fragilis</u> Harris	C
	<u>Proteacidites crassus</u> Cookson	C
	<u>P. dilwynensis</u> Harris	R
	<u>P. cf. rectomarginus</u> Cookson	R
	<u>P. reticulosabratus</u> Harris	R
	<u>P. subscabratus</u> Couper	Ab
	<u>P. spp.</u>	R
	<u>Tricolpites cf. fissilis</u> Couper	R
	<u>Triorites harrisii</u> Couper	Ab
	<u>Tricolporites prolata</u> Cookson	R
Microplankton:	<u>Baltisphaeridium</u> sp.	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

The microflora contains Duplopollis orthoteichus together with Proteacidites dilwynensis and is accordingly assigned to Harris's (1965) Duplopollis orthoteichus Assemblage of Upper Paleocene age. The D. orthoteichus Assemblage was recorded from Nerita-1 well at 2570 feet (Dettmann 1967a).

B. 4267 feet - 4370 feet

4267 feet (sidewall core)

A small residue containing a few representatives of the following forms of spores, pollen, and microplankton was extracted from the sample:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)
	<u>Cyathidites australis</u> Couper
	<u>Gleicheniidites circinidites</u> (Cookson)
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)
Pollen:	<u>Microcachryidites antarcticus</u> Cookson
	<u>Proteacidites subscabratus</u> Couper
	<u>Triorites edwardsii</u> Cookson & Pike
Microplankton:	<u>Baltisphaeridium liniferum</u> Cookson & Eisenack
	<u>Cordosphaeridium bipolare</u> Cookson & Eisenack
	<u>Deflandrea dartmooria</u> Cookson & Eisenack
	<u>D. cf. dartmooria</u>
	<u>D. cf. dilwynensis</u> Cookson & Eisenack
	<u>Wetzelliella hyperacantha</u> Cookson & Eisenack

4370 feet (sidewall core)

The following well preserved spore, pollen, and microplankton occur in the sample:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>Cyathidites australia</u> Couper	C
	<u>C. minor</u> Couper	Ab
	<u>C. splendens</u> Harris	C
	<u>Kraeuselisporites papillatus</u> Harris	R
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	C
	<u>Lycopodiumsporites cf. austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C

Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Dacrydiumites balmei</u> Cookson	C
	<u>D. ellipticus</u> Harris	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Nothofagidites emarcidus</u> (Cookson)	R
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Polyporina fragilis</u> Harris	R
	<u>Proteacidites crassus</u> Cookson	C
	<u>P. subscabratus</u> Couper	Ab
	aff. <u>Triorites edwardsii</u> Cookson & Pike	R
	<u>Triorites harrisii</u> Couper	R
Microplankton:	<u>Deflandrea bakeri</u> Deflandre & Cookson	R
Remanié:	<u>Aequitriradites spinulosus</u> (Cookson & Dettmann) - Lower Cretaceous	
	<u>Nuskoisporites</u> sp. - Permian	

The sample from 4370 feet contains aff. Triorites edwardsii, Dacrydiumites balmei and Deflandrea bakeri which collectively suggest a Middle Paleocene age and assignment of the horizon to Harris's (1965) Triorites edwardsii Assemblage Zone. The sediment at 4267 feet is also referred to this zone on the basis of T. edwardsii, although the microplankton suite shows certain features in common with the Middle-Upper Paleocene assemblage described by Cookson and Eisenack (1967) from the Rivernook Member. Cookson and Eisenack's sample came from below Harris's Triorites edwardsii - Duplopollis orthoteichus Concurrent Range Zone and apparently lacked both T. edwardsii and D. orthoteichus (p.255). They do not document the total spore-pollen content of the sample, but note (p.254) the presence of Proteacidites pachypolus Cookson & Pike, a form which is considered by Harris to make its first appearance in the Upper Paleocene D. orthoteichus Assemblage Zone.

C. 4566 feet - 4587 feet

4566 feet (sidewall core)

A well preserved assemblage of the following species of spores, pollen grains, and microplankton was extracted from the sample:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	C
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Dacrydiumites balmei</u> Cookson	R
	<u>D. florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Nothofagidites emarcidus</u> (Cookson)	C
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. reticulosabratus</u> Harris	R
	<u>P. parvus</u> Cookson	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Triorites edwardsii</u> Cookson & Pike	R
	aff. <u>T. edwardsii</u>	C
	<u>Triorites harrisii</u> Couper	R
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. lillei</u> Couper	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

4587 feet (sidewall core)

The following forms of well preserved spores and pollen grains were identified:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>C. bullatus</u> Harris	R
	<u>C. sp.</u>	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Krauselisporites papillatus</u> Harris	R
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Dacrydiumites ellipticus</u> Harris	R
	<u>D. florinii</u> Cookson & Pike	R
	<u>Nothofagidites emarcidus</u> (Cookson)	C
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. annularis</u> Cookson	R
	<u>P. subscabratus</u> Couper	Ab
	<u>P. scaboratus</u> Couper	C
	<u>Tricolpites gillii</u> Cookson	R
	<u>Triorites edwardsii</u> Cookson & Pike	R
	aff. <u>T. edwardsii</u>	R
Remanié:	<u>Nuskoisporites sp.</u> - Permian	

The sample from 4566 feet contains the earliest observed occurrences of Dacrydiumites balmei and the last appearances of both Tricolpites lillei and Proteacidites amolosexinus. These features suggest an uppermost Cretaceous or lowermost Tertiary age and characterise the microflora present in Pecten 1-A well at 3735 feet (Dettmann 1967c). The microflora extracted from Voluta-1 well at 4587 feet also appears to be of late Cretaceous or early Tertiary aspect.

D. 4620 feet - 7099 feet

4620 feet (sidewall core)

The well preserved assemblage extracted from the sample includes the following species of spores, pollen, and microplankton:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cyathidites australis</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	R
	<u>Krauselisporites papillatus</u> Harris	R
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
Pollen:	<u>Cycadopites sp.</u>	R
	<u>Dacrydiumites ellipticus</u> Harris	R
	<u>D. florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Nothofagidites emarcidus</u> (Cookson)	R
	<u>N. senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites parvus</u> Cookson	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Triorites edwardsii</u> Cookson & Pike	R
	aff. <u>T. edwardsii</u>	C
	<u>Tricolpites pachyexinus</u> Couper	R
Microplankton:	<u>Deflandrea pellucida</u> Cookson & Eisenack	R

4631 feet (core 5)

The well preserved spores and pollen grains identified in the sample include:

Spores:	<u>Camazonosporites bullatus</u> Harris	R
	<u>Ceratosporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Kraeuselisporites papillatus</u> Harris	R
	<u>Lycopodiumsporites</u> cf. <u>circolumen</u> Cookson & Dettmann	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Cycadopites</u> sp.	R
	<u>Dacrydiumites florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites emarcidus</u> (Cookson)	R
	<u>N. senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	C
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. lillei</u> Couper	R
	<u>T. pachyexinus</u> Couper	R
	aff. <u>Triorites edwardsii</u> Cookson & Pike	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

4648 feet (core 5)

Abundant spores and pollen grains and rare microplankton were extracted from the sample. Species observed include:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Kraeuselisporites papillatus</u> Harris	R
	<u>Laevigatosporites major</u> (Cookson)	C
	<u>L. ovatus</u> Wilson & Webster	Ab
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Nothofagidites emarcidus</u> (Cookson)	C
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Polyporina fragilis</u> Harris	R
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	C
	<u>P. scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. lillei</u> Couper	R
	<u>T. pachyexinus</u> Couper	R
	<u>Triorites edwardsii</u> Cookson & Pike	R
	aff. <u>T. edwardsii</u>	C
Microplankton:	? <u>Trichodinium</u> sp.	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

4782 feet (sidewall core)

The sample yielded the following well preserved assemblage of spores, pollen, and microplankton:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>C. sp.</u>	R
	<u>Cyathidites minor</u> Couper	Ab
	<u>C. splendens</u> Harris	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Amospollis cf. cruciformis</u> Cookson & Balme	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Polyporina fragilis</u> Harris	R
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites lillei</u> Couper	R
	<u>Triorites edwardsii</u> Cookson & Pike	R
Microplankton:	<u>Deflandrea pellucida</u> Cookson & Eisenack	R
	<u>D. spp.</u>	R
	<u>Epicephalopyxis indentata</u> Deflandre & Cookson	R
Remanié:	<u>Nuskoisporites sp.</u> - Permian	

4806 feet (sidewall core)

Fair concentrations of the following species of spores, pollen, and microplankton were extracted from the sample:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>C. sp.</u>	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>S. viriosus</u> Dettmann & Playford	R
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Dacrydimites florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Triorites edwardsii</u> Cookson & Pike	R
	aff. <u>T. edwardsii</u>	R
Microplankton:	<u>Deflandrea pellucida</u> Cookson & Eisenack	R
	<u>Epicephalopyxis indentata</u> Deflandre & Cookson	R
	? <u>Trichodinium sp.</u>	R
Remanié:	<u>Nuskoisporites sp.</u> - Permian	

4878 feet (sidewall core)

Only spores and pollen grains were observed in the residue which contains the following well preserved forms:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>C. bullatus</u> Harris	R
	<u>Ceratosporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Dacrydiumites florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>Triorites edwardsii</u> Cookson & Pike	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

4912 feet (Sidewall core)

The sample yielded a minute residue in which only the microplankton species, Epicephalopyxis indentata Deflandre & Cookson was observed.

4952 feet (core 6)

The following well preserved forms of spores, pollen, and microplankton were extracted from the sample:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Cyathidites minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Dacrydiumites florinii</u> Cookson & Pike	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>Triorites edwardsii</u> Cookson & Pike	R
Microplankton:	<u>Epicephalopyxis indentata</u> Deflandre & Cookson	C
	? <u>Trichodinium</u> sp.	R

4958 feet (core 6)

The following species of well preserved spores, pollen and microplankton were observed in the residue:

Spores:	<u>Cyathidites australis</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Laevigatosporites ovatus</u> Wilson & Webster	R
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Cycadopites cf. nitidus</u> (Balme)	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. lillei</u> Couper	R
	<u>T. pachyexinus</u> Couper	R
Microplankton:	<u>Epicephalopyxis indentata</u> Deflandre & Cookson	R

5085 feet (sidewall core)

The sample provided a well preserved assemblage of the following forms of spores, pollen, and microplankton:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>C. bullatus</u> Harris	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	C
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Dacrydiomites florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	Ab
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	R
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	R
Microplankton:	<u>Baltisphaeridium</u> sp.	R
	<u>Deflandrea</u> sp.	R
	? <u>Trichodinium</u> sp.	R

5214 feet (sidewall core)

The well preserved spores and pollen grains observed include:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Ornamentifera sentosa</u> Dettmann & Playford	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Classopollis</u> cf. <u>classoides</u> Pflug	R
	<u>Microcachryidites antarcticus</u> Cookson	R
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	C
	aff. <u>Triorites edwardsii</u> Cookson & Pike	R

5307 feet (sidewall core)

Spores and pollen grains extracted from the sediment constitute the following assemblage:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	C
	<u>C. bullatus</u> Harris	R
	<u>Cyathidites minor</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Ceratosporites</u> sp.	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R

Pollen:	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
	<u>Dacrydiomites florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	C
	aff. <u>Triorites edwardsii</u> Cookson & Pike	C
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

5332 feet (sidewall core)

Low concentrations of the following species of spores and pollen grains occur in the sample:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>Cyathidites minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Cycadopites nitidus</u> (Balme)	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	C
	<u>Triorites edwardsii</u> Cookson & Pike	R

5481 feet (core 7)

The following species of spores and pollen grains were observed in the sample:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Cycadopites nitidus</u> (Balme)	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	C
	<u>Triorites edwardsii</u> Cookson & Pike	R

5481 feet (core 7)

The following species of spores and pollen grains were observed in the sample:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Cycadopites nitidus</u> (Balme)	R
	<u>Microcachrydites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. sabulosus</u> Dettmann & Playford	C
	<u>Triorites edwardsii</u> Cookson & Pike	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

5498 feet (core 7)

The spore-pollen suite identified in the sample includes the following species:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>C. sp.</u>	R
	<u>Cyathidites australis</u> Couper	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Kraeuselisporites papillatus</u> Harris	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Dacrydiumites florinii</u> Cookson & Pike	R
	<u>Microcachrydites antarcticus</u> Cookson	C
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

5530 feet (sidewall core)

Poor concentrations of the following species of well preserved spores and pollen grains occur in the sample:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Ceratosporites</u> sp.	R
	<u>Cyathidites minor</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	R

T. sabulosus Dettmann & Playford

C

5567 feet (sidewall core)

The reasonably well preserved spores and pollen grains identified in the residue include:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>C. bullatus</u> Harris	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	C

5630 feet (sidewall core)

As assemblage composed of the following reasonably well preserved spores and pollen grains was extracted from the sample:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>C. bullatus</u> Harris	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	C
Remanié:	<u>Contignisporites</u> sp. - Lower Cretaceous or Jurassic	
	<u>Nuskoisporites</u> sp. - Permian	

5773 feet (sidewall core)

A restricted microflora containing the following forms of spores and pollen grains was identified:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>C. ohaiensis</u> (Couper)	R
	<u>Cyathidites australis</u> Couper	C
	<u>Densóisporites velatus</u> Weyland & Krieger	R
	<u>Laevigatosporites ovatus</u> Wilson & Webster	Ab
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C

Pollen:	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	C
Remanie:	<u>Nuskoisporites</u> sp. - Permian	

5885 feet (core 8)

The following fairly well preserved assemblage of spores, pollen, and microplankton was extracted from the sample:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Cycadopites nitidus</u> (Balme)	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	R
	<u>T. spp.</u>	C
	<u>T. sabulosus</u> Dettmann & Playford	C
Microplankton:	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
	<u>Xenikoon australis</u> Cookson & Eisenack	R

5898 feet (core 8)

An abundant microflora containing the following species of spores, pollen grains, and microplankton was extracted from the sample:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>C. bullatus</u> Harris	R
	<u>Ceratosporites</u> sp.	R
	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>C. splendens</u> Harris	R
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Dacrydiumites florinii</u> Cookson & Pike	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	R
	<u>Triorites edwardsii</u> Cookson & Pike	R
Microplankton:	<u>Xenikoon australis</u> Cookson & Eisenack	R

5971 feet (sidewall core)

The reasonably well preserved microflora contains rare microplankton together with common spores and pollen grains. Species identified include:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R	
	<u>Camarozonosporites amplus</u> (Stanley)	R	
	<u>C. sp.</u>	R	
	<u>Cyathidites australis</u> Couper	C	
	<u>C. splendens</u> Harris	R	
	<u>Gleicheniidites circinidites</u> (Cookson)	C	
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R	
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab	
	Pollen:	<u>Araucariacites australis</u> Cookson	R
		<u>Microcachryidites antarcticus</u> Cookson	C
<u>Nothofagidites senectus</u> Dettmann & Playford		C	
<u>Phyllocladidites mawsonii</u> Cookson		C	
<u>Proteacidites scaboratus</u> Couper		C	
<u>P. subscabratus</u> Couper		Ab	
<u>Tricolpites pachyexinus</u> Couper		C	
<u>T. sabulosus</u> Dettmann & Playford		C	
<u>T. sp.</u>		R	
Microplankton:		<u>Xenikoon australis</u> Cookson & Eisenack	R
Remanié:	<u>Aequitriradites spinulosus</u> (Cookson & Dettmann) - Lower Cretaceous		
	<u>Nuskoidisporites sp.</u> - Permian		

6054 feet (sidewall core)

A sparse microflora containing the following species of spores and pollen grains was extracted from the sample:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>C. sp.</u>	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	Ab
Pollen:	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>Araucariacites australis</u> Cookson	R
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. sabulosus</u> Dettmann & Playford	R
	<u>T. sp.</u>	R

6131 feet (sidewall core)

The following species of spores, pollen grains, and microplankton were observed:

Spores:	<u>Cyathidites minor</u> Couper	C
	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Densoisporites velatus</u> Weyland & Krieger	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	Ab
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab

Pollen:	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. sabulosus</u> Dettmann & Playford	R
	<u>Triorites minor</u> Couper	R
Microplankton:	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
	<u>Xenikoon australis</u> Cookson & Eisenack	R

6277 feet (core 9)

The following species of spores, pollen, and microplankton were extracted from the sample:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	R
	<u>Proteacidites scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites sabulosus</u> Dettmann & Playford	C
Microplankton:	<u>Xenikoon australis</u> Cookson & Eisenack	R

6302 feet (core 9)

The reasonably well preserved microflora includes common spores and pollen grains and rare microplankton. Species identified include:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	C
	<u>Ceratosporites</u> sp.	R
	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	C
	<u>Kraeuselisporites papillatus</u> Harris	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	R
Microplankton:	<u>Xenikoon australis</u> Cookson & Eisenack	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

6482 feet (sidewall core)

The residue contains reasonably well preserved spores and pollen grains intermixed with a considerable amount of plant tissue. Microplankton are of rare occurrence. The following species were observed:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Ceratosporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	Ab

	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>S. viriosus</u> Dettmann & Playford	R
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. sabulosus</u> Dettmann & Playford	C
	<u>Stephanoporopollenites obscurus</u> Harris	C
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
	<u>Xenikoon australis</u> Cookson & Eisenack	R

6562 feet (sidewall core)

Abundant spores and pollen grains and rare microplankton were observed in the residue. Species identified include:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>C. ohaiensis</u> (Couper)	R
	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Krauselisporites papillatus</u> Harris	R
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	C
	<u>Lycopodiumsporites</u> sp.	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>S. viriosus</u> Dettmann & Playford	R
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Cycadopites nitidus</u> (Balme)	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Proteacidites scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	R
	<u>T. sabulosus</u> Dettmann & Playford	R
	<u>T. spp.</u>	R
Microplankton:	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
	<u>Odontochitina porifera</u> Cookson	R
	<u>Xenikoon australis</u> Cookson & Eisenack	R
Remanie:	<u>Dulhuntyispora</u> sp. - Permian	

6680 feet (core 10)

The sample contains fairly common spores and pollen grains and rare microplankton. Forms present include:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Cyathidites australis</u> Couper	R
	<u>C. minor</u> Couper	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R
	<u>P. scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>T. spp.</u>	C
Microplankton:	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
	<u>Xenikoon australis</u> Cookson & Eisenack	R

6684 $\frac{1}{2}$ feet (core 10)

Reasonable concentrations of spores, pollen grains, and microplankton were extracted from the sample. Species identified include:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	R
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites gillii</u> Cookson	R
	<u>T. pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
	<u>Palambages</u> Form A Manum & Cookson	R
	<u>Xenikoon australis</u> Cookson & Eisenack	C

6793 feet (sidewall core)

The reasonably well preserved microflora includes fairly common spores and pollen grains associated with rare microplankton. The following forms were observed:

Spores:	<u>Ceratosporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	Ab
	<u>C. minor</u> Couper	C
	<u>Krauselisporites papillatus</u> Harris	R
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>S. viriosus</u> Dettmann & Playford	R
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Nothofagidites senectus</u> Dettmann & Playford	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Proteacidites amolosexinus</u> Dettmann & Playford	R

	<u>P. scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	C
	<u>T. spp.</u>	R
Microplankton:	<u>Xenikoon australis</u> Cookson & Eisenack	R

6917 feet (sidewall core)

Reasonably well preserved spores, pollen grains, and microplankton were extracted from the sample. Species identified include:

Spores:	<u>Cyathidites australis</u> Couper	Ab
	<u>C. minor</u> Couper	C
Pollen:	<u>Gleicheniidites circindites</u> (Cookson)	Ab
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>Araucariacites australis</u> Cookson	Ab
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>T. sabulosus</u> Dettmann & Playford	R
	<u>T. spp.</u>	C
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
	<u>Xenikoon australis</u> Cookson & Eisenack	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

7099 feet (core 11)

The microflora extracted from the sample includes commonly occurring spores and pollen grains that exhibit fair to poor preservation, together with rare microplankton. The following types were observed:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	C
	<u>Ceratosporites</u> sp.	R
	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cyathidites australis</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	R
	<u>Lycopodiumsporites</u> sp.	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	Pollen:	<u>Araucariacites australis</u> Cookson
<u>Microcachryidites antarcticus</u> Cookson		Ab
<u>Phyllocladidites mawsonii</u> Cookson		C
<u>Podocarpidites ellipticus</u> Cookson		C
<u>Proteacidites scaboratus</u> Couper		R
<u>P. subscabratus</u> Couper		C
<u>P.?amolosexinus</u> Dettmann & Playford		R
<u>Stephanoporopollenites obscurus</u> Harris		C
<u>Tricolpites pachyexinus</u> Couper		R
<u>T.? sabulosus</u> Dettmann & Playford		R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

Microfloras present in samples between 4620 feet and 6917 feet are assigned to the uppermost Cretaceous (Santonian and later) Nothofagidites Microflora on the basis of their content of Nothofagidites senectus together with Tricolpites pachyexinus, T. lillei, T. sabulosus, Proteacidites amolosexinus, Ornamentifera sentosa, and Stereisporites viriosus. The microflora from 7099 feet is not certainly referred to the Nothofagidites Microflora since only doubtful specimens

of the two diagnostic species, T. sabulosus and P. amolosexinus, were observed.

The Nothofagidites Microflora has been recorded from Pecten-1 well between 3908 feet and 5078 feet and from Nerita-1 well between 4245 feet and 4782 feet (Dettmann 1967a,c,d). In both these sequences and in Voluta-1 well, Triorites edwardsii and aff. T. edwardsii is restricted to the upper horizons (Pecten-1, down to 4493 feet; Nerita-1 well down to 4660 feet; and Voluta-1 well down to 5898 feet). Future subdivision of the Nothofagidites Microflora could be based upon the distribution of T. edwardsii and aff. T. edwardsii. Moreover; in all three well sequences record has been made of the earlier inception of Tricolpites sabulosus than Nothofagidites senectus; sediments containing T. sabulosus prior to the first appearance of N. senectus include Pecten-1 at 5078 feet, Nerita-1 at 4782 feet, and Voluta-1 at 6917 feet and (?) 7099 feet. The incoming of T. sabulosus prior to that of N. senectus may facilitate the distinction of a further biostratigraphic unit between the Tricolpites pachyexinus Zone and sediments containing the Nothofagidites Microflora.

Microplankton are associated with the Nothofagidites Microflora in Voluta-1 well between 4620 feet and 5086 feet and between 5885 feet and 7099 feet, but have not been observed in horizons between 5214 feet and 5773 feet. In the upper interval Deflandrea pellucida, Epicephalopyxis indentata, and ?Trichodinium sp. are represented; D. pellucida occurs between 4620 feet and 4806 feet and the sediments are accordingly assigned to Evan's (1966) "Deflandrea pellucida" Zone. Horizons between 5885 feet and 6917 feet yielded the index of the Xenikoon australis Zone of Evans.

E. 7101 feet - 8901 feet

7101 feet (core 11)

Reasonably well preserved spores, pollen grains, and microplankton were recognized in the sample as follows:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Krauselisporites papillatus</u> Harris	R
	<u>Laevigatosporites ovatus</u> Wilson & Webster	Ab
	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>S. viriosus</u> Dettmann & Playford	R
Pollen:	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	R
	<u>Proteacidites scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>T. spp.</u>	C
Microplankton:	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
	<u>Odontochitina porifera</u> Cookson	R

7103 feet (core 11)

The reasonably well preserved microflora contains spores, pollen grains and rare microplankton.

Spores:	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Krauselisporites papillatus</u> Harris	R
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C

	<u>Lycopodiumsporites austroclavatidites</u> (Cookson)	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
	<u>S. viriosus</u> Dettmann & Playford	R
Pollen:	<u>Cycadopites nitidus</u> (Balme)	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	Ab
	<u>Tricolpites pachyexinus</u> Couper	C
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
	<u>Nelsoniella aceras</u> Cookson & Eisenack	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

7320 feet (sidewall core)

A sparse microflora containing the following spore, pollen, and microplankton species was extracted from the sample:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Ceratosporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	Ab
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Alisporites</u> sp.	R
	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Proteacidites subscabratus</u> Couper	C
	<u>Tricolpites pachyexinus</u> Couper	R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
	<u>Deflandrea cretacea</u> Cookson	R

7598 feet (sidewall core)

The following forms of fairly preserved spores, pollen, and microplankton were observed:

Spores:	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	Ab
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	Ab
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Proteacidites scaboratus</u> Couper	C
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites pachyexinus</u> Couper	C
	<u>Triorites minor</u> Couper	R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	C

7598 feet (core 12)

Spores, pollen, and microplankton identified include:

Spores:	<u>Camarozonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C

Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites pachyexinus</u> Couper	C
Microplankton:	<u>Deflandrea cretacea</u> Cookson	C
	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	C

7612 feet (core 12)

The sparse microflora includes the following forms of spores, pollen, and microplankton:

Spores:	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Cyathidites minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	Ab
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Microcachryidites antarcticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>Tricolpites pachyexinus</u> Couper	R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
Remanic:	<u>Nuskoisporites</u> sp. - Permian	

7755 feet (sidewall core)

Reasonably preserved spores, pollen grains and microplankton were extracted from the sample. Forms identified include:

Spores:	<u>Balmeisporites glenelgensis</u> Cookson & Dettmann	R
	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Ceratosporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Cicatricosisporites</u> sp.	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Proteacidites subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites</u> sp.	R
Microplankton:	<u>Gymnodinium nelsonense</u> Cookson	R
	<u>Hexagonifera vermiculata</u> Cookson & Eisenack	R
	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R

7971 feet (sidewall core)

The sediment yielded the following species of reasonably preserved spores, pollen, and microplankton:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab

	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	C
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. spp.</u>	R
Microplankton:	<u>Hexagonifera vermiculata</u> Cookson & Eisenack	C
	<u>H. glabra</u> Cookson & Eisenack	C
	<u>Hystriospheraidium heteracanthum</u> Deflandre & Cookson	C
	<u>Odontochitina striatoperforata</u> Cookson & Eisenack	R

8085 feet (core 13)

Reasonably preserved plant microfossils include the following species of spores, pollen grains, and microplankton:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	C
	<u>Camazonosporites amplus</u> (Stanley)	C
	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cicatricosisporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>L. ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	R
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	Ab
	<u>Triorites minor</u> Couper	R
Microplankton:	<u>Deflandrea cretacea</u> Cookson	R
	<u>Hystriospheraidium heteracanthum</u> Deflandre & Cookson	C
	<u>Odontochitina porifera</u> Cookson & Eisenack	R
	<u>O. sp.</u>	R

8224 feet (sidewall core)

The assemblage preserved in the sample contains the following spore, pollen, and microplankton types:

Spores:	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cyathidites minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Laevigatosporites major</u> (Cookson)	R
	<u>Lycopodiumsporites</u> sp.	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	C
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. spp.</u>	C
Microplankton:	<u>Deflandrea cretacea</u> Cookson	R
	<u>Hystriospheraidium heteracanthum</u> Deflandre & Cookson	R
	<u>Odontochitina</u> sp.	R

8387 feet (sidewall core)

The following species of fairly preserved spores, pollen, and microplankton were identified:

Spores:	<u>Cyathidites australis</u> Couper	R
	<u>C. minor</u> Couper	C
	<u>C. cf. splendens</u> Harris	R
	<u>Cicatricosisporites</u> sp.	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Lycopodiumsporites</u> sp.	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites subscabratus</u> Couper	C
	<u>P. scaboratus</u> Couper	R
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. spp.</u>	R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R
	<u>Odontochitina</u> sp.	R
Remanié:	<u>Nuskoisporites</u> sp. - Permian	

8438 feet (sidewall core)

Fairly preserved spores, pollen, and microplankton are preserved in the sample. The following forms were identified:

Spores:	<u>Camarozonosporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	R
	<u>C. minor</u> Couper	C
	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	Ab
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	R
	<u>Tricolpites</u> sp.	R
Microplankton:	<u>Hexagonifera vermiculata</u> Cookson & Eisenack	C
	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	C
	<u>Odontochitina porifera</u> Cookson	R

8617 feet (core 14)

Fairly preserved spores, pollen grains and microplankton constitute the following diverse assemblages:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Cicatricosisporites</u> sp.	R
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Lycopodiumsporites</u> sp.	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. spp.</u>	R
	<u>Triorites minor</u> Couper	R
Microplankton:	<u>Hexagonifera ?vermiculata</u> Cookson & Eisenack	R
	<u>H. glabra</u> Cookson & Eisenack	R
	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	C
	<u>Odontochitina porifera</u> Cookson	R

8623 feet (sidewall core)

The sample yielded a restricted microflora containing the following forms of fair to poorly preserved spores, pollen, and microplankton:

Spores:	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cyathidites minor</u> Couper	C
Pollen:	<u>Gleicheniidites circinidites</u> (Cookson)	Ab
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>Microcachrydites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	Ab
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites subscabratus</u> Couper	C
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. spp.</u>	C
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R

8768 feet (core 15)

Poor concentrations of generally poorly preserved spores, pollen grains and microplankton were observed in the residue:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Camazonosporites amplus</u> (Stanley)	R
	<u>Cyathidites australis</u> Couper	Ab
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Kraeuselisporites papillatus</u> Harris	R
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachrydites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	C
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites subscabratus</u> Couper	C
	<u>Tricolpites cf. pannosus</u> Dettmann & Playford	R
Microplankton:	<u>Deflandrea victoriensis</u> Cookson & Manum	R
	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	C

8779 feet (sidewall core)

The following species of fair to poorly preserved spores, pollen and microplankton were observed in the residue:

Spores:	<u>Camazonosporites sp.</u>	R
	<u>Clavifera triplex</u> (Bolkhovitina)	C
	<u>Cyathidites australis</u> Couper	C
	<u>C. minor</u> Couper	Ab
	<u>Baculatisporites comaumensis</u> (Cookson)	R
Pollen:	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachrydites antarcticus</u> Cookson	Ab
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	R
	<u>Podosporites microsaccatus</u> (Couper)	R
	<u>Proteacidites scaboratus</u> Couper	R
	<u>P. subscabratus</u> Couper	C
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. spp.</u>	R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R

8901 feet (sidewall core)

Fair to poorly preserved spores, pollen grains, and microplankton were recovered from the sample. Species identified include:

Spores:	<u>Cyathidites australis</u> Couper	Ab
	<u>C. minor</u> Couper	C
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	C
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachrydites antarcticus</u> Cookson	Ab
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites scaboratus</u> Couper	R
	<u>Stephanoporopollenites obscurus</u> Harris	R
	<u>Tricolpites pachyexinus</u> Couper	R
	<u>T. spp.</u>	R
	<u>Triorites minor</u> Couper	R
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R

The spore-pollen suites obtained from sediments between 7101 feet and 8901 feet contain Tricolpites pachyexinus with Proteacidites scaboratus and Camarozonosporites amplus and lack species diagnostic of the Nothofagidites Microflora. The sediments are accordingly assigned to the Santonian Tricolpites pachyexinus Zone. This zone is represented in Pecten-1 well between 5182 feet and 5650 feet (Dettmann 1967d).

Microplankton occur throughout the T. pachyexinus Zone in Voluta-1 well. In the lower horizons (8779 - 8901 feet) Hystrichosphaeridium heteracanthum, a long ranging species within the Upper Cretaceous, was observed. Deflandrea cretacea occurs at and above 8224 feet and Nelsoniella aceras at 7101 - 03 feet; The presence of these species indicates the representation of both the D. cretacea and N. aceras Zones in Voluta-1 well. However, the precise limits of these zones in the Voluta sequence is difficult to determine. Using Evan's (1966) criteria the D. cretacea Zone would embrace sediments between the first appearances of D. cretacea and N. aceras, i.e. between 7320 feet and 8224 feet. However, a downward extension of the zone to 8617 feet is testified by the presence of Hexagonifera glabra at this level.

Nelsoniella aceras first occurs at 7103 feet, thus implying that the horizon represents the base of the N. aceras Zone; however a possible extension of the zone to 7755 feet is suggested by the last appearances at this horizon of Hexagonifera vermiculata. This species is considered by Evans (1966) to range throughout the D. cretacea Zone into the base of the N. aceras Zone. On the basis of this evidence, the N. aceras Zone is tentatively suggested to occur between 7101 feet and 7755 feet, and the D. cretacea Zone between 7971 feet and 8617 feet.

F. 9962 $\frac{1}{2}$ feet - 11,989 $\frac{5}{6}$ feet

9962 $\frac{1}{2}$ feet (core 16)

Poorly preserved spores, pollen grains, and microplankton were extracted from the sample in low concentrations. The following forms were identified:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Clavifera triplex</u> (Bolkhovitina)	R
	<u>Cyathidites australis</u> Couper	Ab
	<u>C. minor</u> Couper	Ab
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Laevigatosporites ovatus</u> Wilson & Webster	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C

Pollen:	<u>Amosopollis cruciformis</u> Cookson & Balme	R
	<u>Araucariacites australis</u> Cookson	C
	<u>Phyllocladidites mawsonii</u> Cookson	R
	<u>Podocarpidites ellipticus</u> Cookson	C
	<u>Proteacidites subscabratus</u> Couper	C
	<u>Tricolpites</u> spp.	C
Microplankton:	<u>Hystrichosphaeridium heteracanthum</u> Deflandre & Cookson	R

10,472 5/6 feet (core 17)

The following poorly preserved forms of spores, pollen, and microplankton were observed in the residue:

Spores:	<u>Baculatisporites comaumensis</u> (Cookson)	R
	<u>Clavifera triplex</u> (Bolkhovitina)	C
	<u>Cyathidites minor</u> Couper	Ab
	<u>Gleicheniidites circinidites</u> (Cookson)	C
	<u>Kraeuselisporites ?jubatus</u> Dettmann & Playford	R
	<u>Rouseisporites</u> sp.	R
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	C
Pollen:	<u>Amosopollis cruciformis</u> Cookson & Balme	R
	<u>Araucariacites australis</u> Cookson	C
	<u>Microcachryidites antarcticus</u> Cookson	Ab
	<u>?Phyllocladidites mawsonii</u> Cookson	R
	<u>Proteacidites subscabratus</u> Couper	C
	<u>Stephanoporopollenites obscurus</u> Harris	R
Microplankton:	<u>Hystrichosphaeridium cf. complex</u> (White)	R
	<u>H. heteracanthum</u> Deflandre & Cookson	R

10,904 3/4 feet (core 18)

The poorly preserved and fragmented forms of spores, pollen grains, and microplankton preserved in the sediment include:

Spores:	<u>Cicatricosisporites</u> sp. indet.	
	<u>Cyathidites australis</u> Couper	
	<u>C. minor</u> Couper	
	<u>Gleicheniidites circinidites</u> (Cookson)	
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	
Pollen:	<u>Alisporites</u> sp. indet.	
	<u>Araucariacites australis</u> Cookson	
	<u>Microcachryidites antarcticus</u> Cookson	
	<u>Phyllocladidites mawsonii</u> Cookson	
	<u>Tricolpites</u> spp. indet.	
Microplankton:	<u>Hystrichosphaeridium cf. complex</u> (White)	
	<u>H. heteracanthum</u> Deflandre & Cookson	

11,512 1/2 feet (core 20)

The sample yielded abundant fragmented plant microfossils. The following types were identified:

Spores:	<u>Cyathidites australis</u> Couper	
	<u>C. minor</u> Couper	
	<u>Gleicheniidites circinidites</u> (Cookson)	
	<u>Rouseisporites</u> sp. indet	
	<u>Stereisporites antiquasporites</u> (Wilson & Webster)	
Pollen:	<u>Amosopollis cruciformis</u> Cookson & Balme	
	<u>Araucariacites australis</u> Cookson	
	<u>Podocarpidites</u> sp. indet	
	<u>Tricolpites</u> sp. indet.	
Microplankton:	<u>Hystrichosphaeridium cf. complex</u> (White)	
	<u>H. heteracanthum</u> Deflandre & Cookson	

11,989 5/6 feet (core 21)

A high yield of fragmented spores, pollen grains, and microplankton was obtained from the sample. Types represented include:

- Spores: Baculatisporites comaumensis (Cookson)
Balmeisporites ?glenelgensis Cookson & Dettmann
Clavifera triplex (Bolkhovitina)
Cicatricosisporites sp. indet
Gleicheniidites circinidites (Cookson)
Klukisporites ?scaberis Cookson & Dettmann
- Pollen: Alisporites sp. indet
Araucariacites australis Cookson
Cycadopites sp.
Microcachryidites antarcticus Cookson
Tricolpites spp. indet
- Microplankton: Baltisphaeridium sp.
Odontochitina ?operculata (Wetzel)

Plant microfossils extracted from sediments between 9962 $\frac{1}{2}$ feet and 11,989 5/6 feet are poorly preserved and fragmented, especially in the lower portion of the section. Because the majority of fossils present in samples at and below 10,904 $\frac{3}{4}$ feet are unidentifiable at generic or specific level, quantitative estimates have not been given in the microfloral lists. Species identified in the sediments include Clavifera triplex, Stephanoporopollenites obscurus, Phyllocladidites mawsonii, and Amosopollis cruciformis. The presence of these forms and the apparent absence of diagnostic species of the Tricolpites pachyexinus Zone suggest that the sediments may be referred to the Turonian - ?Coniacian Clavifera triplex Zone. This zone is represented in Pecten-1 well at 5735 feet (Dettmann 1967d).

Microplankton were observed in all samples and the presence at 11,989 5/6 feet of possible representatives of Odontochitina operculata is of some significance. This species is, in its last occurrences, an associate of the nominate species of Evans's (1966) Ascodinium parvum Zone. As outlined by Dettmann and Playford (1968), the uppermost horizons of the A. parvum Zone correspond to the basal part of the C. triplex Zone.

G. 12,634 feet - 13,020 feet

12,634 feet (junk basket sample)

The sample yielded much carbonaceous material including extremely badly preserved and fragmented spore-pollen exines, most of which are unidentifiable at generic level. Generic groups represented include Cyathidites, Cicatricosisporites, and Stereisporites. In addition some well preserved examples of Xenikoon australis, Nothofagidites senectus, and Tricolpites sabulosus were observed; these species are obviously contaminants from higher horizons.

12,767 feet (junk basket sample)

The sample also yielded very badly preserved spore-pollen forms. Taxa identified include Cyathidites, Appendicisporites, and Cicatricosisporites.

13,010-20 feet (cuttings)

Carbonaceous matter was extracted from the sample and spore-pollen fragments observed. However, none was sufficiently well preserved for identification.

CONCLUSIONS

Sediments between 4151 feet and 11,989 5/6 feet in Voluta-1 well range in age from Upper Paleocene to Turonian on the basis of their spore-pollen content. The Paleocene sequence extends from 4151 feet to 4370 feet, and includes the Upper Paleocene Duplopollis orthoteichus Assemblage Zone (4151 feet) and the Middle Paleocene Triorites edwardsii Assemblage Zone (4267 - 4370 feet). Spore-pollen suites suggestive of an early Tertiary - late Cretaceous age occur between 4566 feet and 4587 feet. The Upper Cretaceous (Santonian and later) Nothofagidites Microflora occurs in sediments between 4620 feet and 6917 feet and is probably represented in the horizon at 7099 feet. Underlying horizons between 7101 feet and 8901 feet are referred to the Santonian Tricolpites pachyexinus Zone, and those between 9962 $\frac{1}{2}$ feet and 11,989 5/6 feet are probably representatives of the Clavifera triplex Zone (Turonian - ?Coniacian). The lowest horizons investigated (between 12,634 feet and 13,020 feet) yielded extremely badly preserved microfloras that provide insufficient basis for age determination.

Microplankton occur throughout much of the sequence and support the age determinations based upon spore-pollen taxa. Species associated with the Triorites edwardsii Assemblage Zone in Voluta-1 well occur within or immediately above the zone at its "type" locality (Pebble Point Formation and Rivernook Member). Several microplankton suites were recognized within the Upper Cretaceous section of Voluta-1 well. The youngest suite contains forms diagnostic of Evan's (1966) "Deflandrea pellucida" Zone and is associated with the youngest occurrences (between 4620 and 4806 feet) of the Nothofagidites Microflora. No diagnostic species were observed between 4878 feet and 5086 feet and the section between 5214 feet and 5773 feet lacked microplankton. Sediments within the interval 5885 - 6917 feet yielded forms indicative of the Xenikoon australis Zone of Evans (1966) together with the initial appearances of the Nothofagidites Microflora. Two microplankton zones were recognized within the Tricolpites pachyexinus Zone. The Nelsoniella aceras Zone of Evans (1966) is represented at 7101-03 feet and probably extends to 7755 feet; Evans's Deflandrea cretacea Zone seems to occupy most of the remaining (lower) portion of the T. pachyexinus Zone. The section referred to the Clavifera triplex Zone contains Upper Cretaceous microplankton assemblages; the one identified at 11,989 5/6 feet includes a form known from Evans's Ascodinium parvum Zone.

Recycled plant microfossils of Permian age occur in minor proportions throughout the Voluta sequence. In addition Lower Cretaceous spores were encountered in horizons at 4370 feet, 5630 feet, and 5971 feet.

The plant material extracted from the Paleocene sequence shows exceptional preservation and that enclosed in Upper Cretaceous sediments containing the Nothofagidites Microflora is generally well preserved. The horizon at 7099 feet yielded only fair or poorly preserved plant microfossils, but the underlying section between 7103 feet and 7971 feet contained reasonably well preserved plant material. The preservation quality of plant microfossils in sediments between 8085 feet and 13,020 feet ranged from fair in the upper horizons to extremely bad and fragmented in the lowest intervals.

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DEPTH (Feet)	YIELD	SPORE-POLLEN		MICROPLANKTON		WOOD		CUTICLE		SPORI
		Col	Pres	Col	Pres	Col	Pres	Col	Pres	
4151	C	LY	exo	LY	exo	Br-Bl	fair	Y-Br	good-fair	
4267	Sp	DY	exc-good	"	good	"	"	"	"	Dupl
4370	C	"	"	"	"	"	"	"	"	Tri
4566	Ab	Y-LBr	good	-	-	"	"	"	"	low
4587	C	"	"	-	-	"	"	"	"	upper
4620	C	"	"	Y-LBr	good	"	"	"	"	
4631	Ab	"	"	-	-	"	"	"	"	
4648	Ab	"	"	Y-LBr	good	"	fair-poor	"	"	
4782	C	"	"	"	"	"	"	"	"	
4806	"	"	"	"	"	"	"	"	"	
4878	"	"	"	-	-	"	"	"	"	
4912	Sp	"	"	Y-LBr	good	"	"	"	"	
4952	C	"	"	"	"	"	"	"	"	
4958	"	"	"	"	"	"	"	"	"	
5086	"	"	"	"	"	"	"	"	"	
5214	"	"	fair-good	-	-	"	"	"	fair	
5307	"	"	"	-	-	"	"	"	"	
5332	Sp	"	"	-	-	"	"	"	"	
5481	C	"	"	-	-	"	"	"	"	
5498	"	"	"	-	-	"	"	"	"	
5530	Sp	"	"	-	-	"	"	"	"	
5567	C	"	"	-	-	"	"	"	"	N
5630	"	"	"	-	-	"	"	"	"	
5773	Sp	"	"	-	-	"	"	"	"	
5885	C	"	"	Y-LBr	good	"	"	"	"	
5895	Ab	"	"	"	"	"	"	"	"	
5971	C	"	"	"	"	"	"	"	"	
6054	Sp	"	"	-	-	"	"	"	"	
6131	C	"	"	Y-LBr	good	"	"	"	"	
6277	Sp	"	"	"	"	"	"	"	"	
6302	C	"	"	"	"	"	"	"	"	
6482	"	"	"	"	"	"	"	"	"	
6562	Ab	"	"	"	"	"	"	"	"	
6680	C	"	"	"	"	"	"	"	"	
6684	"	"	"	"	"	"	"	"	"	
6793	"	"	"	"	"	"	"	"	"	
6917	"	"	"	"	"	"	"	"	"	
7099	"	Br	fair-poor	LBr	fair-poor	Br-Bl	poor	Br	poor	? N
7101	C	Y-LBr	fair-good	Y-LBr	fair-good	"	fair-poor	Y-LBr	fair	
7103	"	"	"	"	"	"	"	"	"	
7320	Sp	"	"	"	"	"	"	"	"	
7598 (S.W.C.)	C	"	"	"	"	"	"	"	"	
7598 (C.12)	"	"	"	"	"	"	"	"	"	
7612	Sp	"	"	"	"	"	"	"	"	T
7755	C	"	"	"	"	"	"	"	"	
7971	"	"	"	"	"	"	"	"	"	
8085	"	"	fair	"	fair	"	poor	"	fair-poor	P
8224	C	LBr	"	LBr	"	"	"	Br	"	
8387	"	"	"	"	"	"	"	"	"	
8438	"	"	"	"	"	"	"	"	"	
8617	"	L-DBr	fair-poor	L-DBr	fair-poor	Bl	poor-bod	"	poor	
8623	"	"	"	"	"	"	"	"	"	
8768	Sp	"	"	"	"	Br-Bl	"	"	"	
8779	C	"	"	"	"	"	"	"	"	
8901	"	"	"	"	"	"	"	"	"	
9962	Sp	"	poor	"	poor	Bl	"	"	poor-bod	
10,472	C	"	poor-frag	"	"	"	"	"	"	
10,904	"	"	"	"	"	"	"	"	"	? Cl
11,512	Ab	"	"	"	"	"	"	"	"	
11,989	"	"	"	"	"	"	"	"	"	
12,634	C	DBr	bad-frag	-	-	"	bad	Br	bad	
12,767	"	"	"	-	-	"	"	"	"	
13,010-20	"	"	"	-	-	"	"	"	"	

Yield expresses frequency of spores, pollen, and microplankton in the palynological residues as follows:-
Ab= abundant C= common Sp= sparse

Spore-pollen Zones after Harris (1965), Dettmann and Playford (1968)

Microplankton Zones after Evans (1966)

Colour and preservation. Spores, pollen are denoted by their colour (col) and a
LY= light yellow. DY= dark yellow. LBr=
Exc= excellent. good= good. fair=

PRESERVATION AND ZONAL ATTRIBUTION OF PLANT MICROFOS: VOLUTA-I, (4,151-13,020 Feet)

Drawing No: 2 2 3 6

MICROPLANKTON	WOOD		CUTICLE			SPORE - POLLEN - ZONE	MICROPLANKTON ZONE
	Pres	Col	Pres	Col	Pres		
excellent	Br-B1	fair	Y-Br	good-fair		Duplopollis orthoteichus	'Deflandrea pellucida'
good	"	"	"	"		Triorites edwardsii	
"	"	"	"	"		lowermost Tertiary- uppermost Cretaceous	
r good	"	"	"	"		Nothofagidites	
"	"	"	"	"			
r good	"	fair-poor	"	"			
"	"	"	"	"			
"	"	"	"	"			
r good	"	"	"	"			
"	"	"	"	fair			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
r good	"	"	"	"			
"	"	"	"	"			
good	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
fair-poor	Br-B1	poor	Br	poor		? Nothofagidites	
fair-good	"	fair-poor	Y-LBr	fair			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
fair	"	poor	"	fair-poor			
"	"	"	Br	"			
"	"	"	"	"			
fair-poor	B1	poor-bad	"	poor			
"	"	"	"	"			
"	Br-B1	"	"	"			
"	"	"	"	"			
"	"	"	"	"			
poor	B1	"	"	poor-bad			
"	"	"	"	"			
"	"	"	"	"			
"	"	"	"	"		? Clavifera triplex	
"	"	"	"	"			
"	"	bad	Br	bad		Indet.	
"	"	"	"	"			
"	"	"	"	"			

Microplankton in the palynological residues as follows:— *Colour and preservation.* Spores, pollen, microplankton, wood, and cuticle present in the residues are denoted by their colour (col) and quality of preservation (pres) thus:—
 LY=light yellow. DY=dark yellow. LBr=light brown. DBr=dark brown. B1=black.
 Exc=excellent. good=good. fair=fair. poor=poor. bad=bad. frag=fragmented.

STRATIGRAPHIC CONTRIBUTION OF PLANT MICROFOSSIL ASSEMBLAGES IN
 VOLUTA-I, (4,151-13,020 Feet) Encl: 7