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PALYNOLOGY OF ESSO CHAMA 1 AND 1A,

OFFSHORE OTWAY BASIN, SOUTH AUSTRALIA

BY

ROGER MORGAN

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CONTENTS

I SUMMARY

1225 ft. (373.4m) swc : Eocene, possibly middle N. asperus Zone : offshore marine

1235 ft. (376.4m) swc : lower N. asperus Zone : Middle Eocene : offshore marine

1265 ft. (385.6m) swc : indeterminate (poor yield)

P. asperopolus to N. senectus Zones (middle Eocene to Campanian) not seen, but may be partly present in the 389 ft. (118.6m) sample gap

1654 ft. (504.1m) swc-1689 ft. (514.8m) swc : upper T. pachyexinus Zone : Coniacian : marginally marine

1859 ft. (566.6m) swc-1950 ft. (594.4m) swc : lower T. pachyexinus Zone : Coniacian : marginally marine

1960 ft. (597.4m) swc-2520 ft. (768.1m) cutts, 2395 ft. (730.0m) swc : C. triplex Zone : Turonian : nearshore marine

A. distocarinatus Zone (Cenomanian) not seen

2600 ft. (792.5m) cutts-4760 ft. (1450.8m) cutts : P. pannosus - upper C. paradoxa Zones : Late Albian : non-marine to brackish

4904 ft. (1494.7m) swc-5304 ft. (1616.7m) swc : C. paradoxa Zone, subzone uncertain

5607 ft. (1709.0m) swc-5960 ft. (1859.3m) cutts : lower C. paradoxa to possibly part C. striatus Zone : mid Albian : non-marine

6100 ft. (1859.3m), 6350 ft. (1935.5m) swc-6700 ft. (2042.2m) cutts, 6350 ft. (1935.5m) swc : C. striatus Zone : early Albian : non-marine

6840 ft. (2084.8m) cutts-?8700 ft. (2651.8m) cutts, 8037m (2449.7m) swc : upper and middle C. hughesi Zone : Aptian : non-marine except slightly brackish at the top

8764 ft. (2671.3m) swc, ?8670 ft. (2642.6m) cutts-9014 ft. (2747.5m) core : lower C. hughesi Zone : late Neocomian : non-marine

II INTRODUCTION

Chevron Overseas Petroleum commissioned a palynological restudy of Esso Chama 1 and 1a in February 1986. They currently hold the offshore permit EPP 22. The main aims of the study were to clarify the basal part of the well to facilitate comparison with the basal part of Esso Crayfish-1 nearby, and also within the permit. Crayfish-1 has excellent reservoir sands and residual oil shows. Chama-1a has few sands and no oil shows.

The original 39 Esso palynological preparations (28 swcs, 2 from a single core, 9 cuttings) were borrowed from the South Australian Department of Minerals and Energy (SADME) and examined. These were reported by Evans (1970), in the well completion report, but no detailed range data was given. The quality of the existing samples was variable with many poor overoxidised samples and several large sample gaps. A further 23 cuttings samples and two core samples were therefore taken, processed and examined. Downhole contamination of the cuttings samples proved to be significant to severe, and oldest occurrences from cuttings therefore unreliable. Although the desired level of precision had not been acheived, further sampling was likely to be a waste of time and money.

This report summarised all the samples studied, and although not as precise as desired, provides a fairly firm basis for log correlation with the nearby Crayfish-1 well.

The zonation used in the Cretaceous is that most recently reviewed by Helby et al. (in press), incorporating all earlier work. In the Tertiary, the zonation used is that of Stover and Partridge (1973) as modified in Partridge (1976).

Figure 1 gives the regional Cretaceous geological framework of the

Otway Basin. Figure 2 gives a single page data summary sheet. Figure 3 gives my log correlation of Chama 1a and Crayfish-1, compatible with the new palynology.

Raw fossil occurrence data is given in Appendix I.

PALYNOLOGICAL DATA SHEET

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BASIN: OTWAY ELEVATION: KB: ______ GL: ______

WELL NAME: CHAMA 1 and 1a TOTAL DEPTH: ______

AGE		PALYNOLOGICAL ZONES	HIGHEST DATA				LOWEST DATA			
			Preferred Depth	Rtg	Alternate Depth	Rtg	Preferred Depth	Rtg	Alternate Depth	Rtg
NEOGENE	Pleis	T. pleistocenicus								
	Plio	M. lipsus								
	Mio.	C. bifurcatus								
		T. bellus								
		P. tuberculatus								
	Oligo	upper N. asperus								
PALEOGENE	L. Eo	mid N. asperus								
	M. Eo	lower N. asperus	?1225				?1225			
		P. asperopolus	1235	2			1235	1		
	E. Eo	upper M. diversus								
		mid M. diversus								
		lower M. diversus								
	Paleo	upper L. balmei								
		lower L. balmei								
LATE CRETACEOUS	Maast	T. longus								
		T. lillei								
	Camp.	N. senectus								
	Sant.	up. T. pachyexinus	1654	2			1689	1		
	Con.	lower T. pachyexinus	1859	2			1950	1		
	Turon	C. triplex	1960	2			2395	1	2520	3
	Ceno.	A. distocarinatus								
EARLY CRETACEOUS	Alb.	P. pannosus	2600	1						
		upper C. paradoxa					4760	1		
		lower C. paradoxa	5607	1			?			
		C. striatus	?		6100	1	6350	1	6700	3
	Apt.	upp. C. hughesi	6840	1						
		mid. C. hughesi					8037	1	8700	3
	l. Neo	low. C. hughesi	8764	2	8670	3	9014	1		
	e. Neo	up. C. australiensis								

Depths in feet, as drilled.

Figure 2 : CHAMA 1 AND 1A SUMMARY SHEET

III PALYNOSTRATIGRAPHY

A. 1225 ft. (373.4m) swc : Eocene, possibly middle N. asperus Zone

This assemblage is dominated by non zone diagnostic dinoflagellates with very few pollen, and can therefore not be confidently assigned to any zone. Dinoflagellates include Deflandrea heterophlycta, D. phosphoritica, Phthanoperidinium eocenicum, Lingulodinium machaerophorum and Heteraulacysta "paxilla", several of which are usually confined to the Eocene in southern Australia. Pollen are rare but are dominated by Nothofagidites emarcidus and include Proteacidites incurvatus, which is restricted to the middle Nothofagidites asperus and older Spore-Pollen Zones. Considering its close proximity (10 ft. or 3.0m) to the underlying lower N. asperus Zone sample, a middle N. asperus assignment is likely.

Offshore marine environments are indicated by the dominant and diverse dinoflagellates.

These conclusions are compatible with those of Evans (1970).

B. 1235 ft. (376.4m) swc : lower N. asperus Zone

Assignment to the lower N. asperus Zone is indicated by the dinoflagellate data. Pollen are scarce but are dominated by Nothofagidites spp., indicating assignment to the N. asperus or younger Spore-Pollen Zones.

Dinoflagellates include Impagidinium maculatum which indicates assignment to the Deflandrea heterophlycta Dinoflagellate Zone, correlative with the lower N. asperus Spore-Pollen Zone. Schematophora speciosa is also present, and confirms assignment to this interval, or the overlying basal _Vozzhennikova extensa_ Dinoflagellate Zone (correlative with the basal part of the middle _N. asperus_ Zone).

Offshore marine environments are indicated by the dominance and high diversity of the dinoflagellates.

These conclusions are compatible with those of Evans (1970).

C. 1265 ft. (385.6m) swc : indeterminate

This sample contains too few fossils to be accurately dated, and includes Cretaceous taxa (_Ceratosporites equalis_), Campanian to Paleocene taxa (_Phyllocladidites verrucosus_) and Miocene to recent taxa (_Compositae_ (_Tubulifloridae_)).

Evans (1970) was also unable to date this sample.

D. _P. asperopolus_ to _N. senectus_ : not seen

This interval, spanning the middle Eocene to Campanian was not seen. By correlation from Crayfish-1, it is likely that at least the Campanian part, and perhaps all the Late Cretaceous, may be present in the 389 ft. (118.6m) sample gap. Sandy lithologies suggest that cuttings sampling would not be worthwhile.

E. 1654 ft. (504.1m) swc-1689 ft. (514.8m) swc : upper _T. pachyexinus_ Zone

This interval is assigned to the upper part of the _Tricolpites pachyexinus_ Zone at the top on the absence of younger indicators, and at the base on oldest _Tricolpites confessus_ and _T. gillii_.

Dinoflagellates include Odontochitina cribropoda at 1654 ft. (504.1m) confirming a Nothofagidites senectus to Tricolpites pachyexinus assignment. Other age diagnostic dinoflagellates were not seen.

Marginal marine environments are indicated by the dominance of spores and pollen, and scarcity and low diversity of the dinoflagellates.

Evans (1970) also assigned these samples to the T. pachyexinus Zone, but apparently saw more age-diagnostic dinoflagellates, as he also assigned these samples to the I. cretacea Dinoflagellate Zone. I did not see such dinoflagellates, and they may be present on slides in the Esso collections.

F. 1859 ft. (566.6m) swc-1950 ft. (594.4m) swc : lower T. pachyexinus Zone

Assignment to the lower part of the T. pachyexinus Zone is indicated at the top by the absence of younger indicators, and at the base by the oldest T. pachyexinus. Amosopollis cruciformis is consistently present to the top of the interval, and its frequent presence at 1950 ft. (594.4m) confirms the lower part of the zone.

Scarce low diversity dinoflagellates are not age diagnostic and indicate marginal marine environments.

Evans (1970) assigned the uppermost sample to the T. pachyexinus Zone also, and assigned the lower two to the C. triplex Zone. Obviously, he did not see the specimens of T. pachyexinus seen in the present study. He, however, recorded dinoflagellates indicating the I. cretacea Dinoflagellate Zone from the upper sample, not seen in the present study. His data is not widely at variance with the present data.

G. 1960 ft. (597.4m) swc-2520 ft. (768.1m) cutts, 2395 ft. (730.0m) swc : C. triplex Zone

Assignment to the Clavifera triplex Zone is indicated at the top by the absence of younger indicators, and at the base by oldest Phyllocladidites mawsonii and Proteacidites spp. at 2400-2420 ft. (762.0-768.1m) cutts, and confirmed in sidewall cores at 2395 ft. (730.0m) by oldest Australopollis obscurus and Clavifera triplex. It is thus possible that the sample at 2500-20 ft. (762.0-768.2m) is dated too young due to downhole contamination. It cannot, however, be older than the Cenomanian A. distocarinatus Zone, as it lacks Coptospora paradoxa, first seen at 2600-10 ft. (792.5-795.5m).

Dinoflagellates are not age-diagnostic.

Nearshore marine environments are indicated by the presence of relatively common dinoflagellates (10-20% of palynomorphs) and their moderate diversity.

Evans (1970) assigned only the samples from 1960 ft. (597.4m) and 2091 ft. (637.3m) to the C. triplex Zone. The other sample samples were indeterminate except for 2395 ft., which he assigned to the A. distocarinatus Zone, but his reasons are not stated. Presumably, I saw diagnostic specimens not seen by him. The two data sets are not grossly in conflict.

H. A. distocarinatus Zone : not seen

The Appendicisporites distocarinatus Zone was not seen, although, as discussed in G above, the sample at 2500-20 ft. (762.1-768.1m) could be that old. That cuttings sample does contain A. distocarinatus, but this is not diagnostic of the Zone, as it is now known to occur up into the C. triplex Zone above.

I. 2600 ft. (792.5m) cutts-4760 ft. (1450.8m) cutts : P. pannosus - upper C. paradoxa Zones

Assignment to a combined Phimopollenites pannosus - upper Coptospora paradoxa interval is indicated at the top by youngest Coptospora paradoxa and at the base by the oldest Pilosisporites grandis without older indicators. Subdivision of the interval using the oldest occurrence of P. pannosus is not possible, as the sidewall core assemblages are too lean (overoxidised) to be sure that the absence of P. pannosus is real. All cuttings samples in this interval (and far beneath) contain P. pannosus indicating that the cuttings are too badly contaminated by caving, to be useful. P. grandis, P. pannosus, C. paradoxa and Balmeisporites holodictyus are all consistently present throughout the interval. Ephedripites sp. A was seen at 3980-4000 ft. (1213.1-1219.2m) cutts and 4060-70 ft. (1237.5-1240.5m), cutts.

Dinoflagellates are absent throughout. Non-marine (lacustrine) algal acritarchs (Schizosporis) are rare but consistent in many samples. Very rare spiny acritarchs (Micrhystridium sp.) occur only at 2720-40 ft. (829.0-835.2m) cutts, and 3507 ft. (1068.9m) swc, indicating very minor brackish influence.

Evans (1970) assigned the interval to the C. paradoxa Zone, with a possible P. pannosus Zone sample at the top. The paradoxa Zone subdivision was not recognised then. The relative abundance of P. pannosus in the cuttings studied herein, imply a significant thickness of the P. pannosus Zone in the well section.

J. 4904 ft. (1494.7m) swc-5304 ft. (1616.7m) swc : C. paradoxa Zone, subzone uncertain.

This interval is defined at the top by the absence of P. grandis above (which would indicate the upper C. paradoxa Zone) and of Pilosisporites notensis below (which would indicate the lower C. paradoxa Zone). Yields are not high, and samples at 4975 ft. (1516.4m) swc and 5304 ft. (1616.7m) swc are so lean as to be indeterminate. Fair yields and diversity exist at 4904 ft (1494.7m) swc and 5236 ft. (1595.9m) swc, but diagnostic species were not seen. No more sidewall core material is availble for study, and cuttings in this well are badly contaminated. It is thus not possibly to achieve higher resolution.

Dinoflagellates are absent from this interval and the dominant spores and pollen indicate mostly non-marine environments. Very rare spiny acritarchs occur only at 5236 ft. (1595.9m), indicating very slightly brackish environments.

Evans (1970) assigned this interval to the C. paradoxa Zone and so the two data sets are in total agreement.

K. 5607 ft. (1709.0m) swc-5960 ft. (1859.3m) cutts : lower C. paradoxa to possibly part C. striatus Zones

This interval is defined at the top by youngest P. notensis and at the base by oldest C. paradoxa which might be "in situ". At the top, P. notensis can be patchy in occurrence, but has not yet been seen above the lower C. paradoxa Zone. As a top range in cuttings, this pick is considered to be reliable. Youngest Coptospora striata at 5940-60 ft (1810.5-1816.6m) cutts supports the assignment. At the base, the C. paradoxa specimens seen show spore colours compatible with the rest of the assemblage, and they could therefore be "in situ" and this interval could be entirely lower C. paradoxa Zone. Alternatively, these specimens could also be caved a short distance (and part or all of this interval could belong to the C. striatus Zone). C. paradoxa below this point is lighter in colour than the presumed "in situ" assemblage, and so is considered caved. The only sidewall core in the interval is that at 5607 ft. (1709.0m).

Dinoflagellates and acritarchs are absent from the interval, which is therefore considered non-marine.

Evans (1970) assigned all of this interval to the C. paradoxa Zone and is therefore not in conflict with the present data.

L. 6100 ft. (1859.3m) cutts 6350 ft. (1935.5m) swc- 6700 ft. (2042.2m) cutts, 6350 ft. (1935.5m) swc : C. striatus Zone

Assignment to the Crybelosporites striatus Zone is indicated at the top by the absence of younger indicators (namely C. paradoxa "in situ"), and at the base by the absence of older indicators (namely Cyclosporites hughesi). The sidewall core at 6350 ft. (1935.5m) is firmly assigned to the zone, as it contains oldest C. striatus without C. paradoxa. Younger indicators in the cuttings samples are all obviously lighter in colour than the presumed "in situ" assemblage and are presumed caved. The top of the zone, as discussed above, may be slightly too low. The base of the zone may be slightly too high, as C. hughesi does occassionally occur up into the basal C. striatus Zone. However, the basal cuttings sample at 6680-6700 ft (2036.1m-2042.2m) appears to be quite clean C. striatus Zone, lacking any contamination from the paradoxa and pannosus Zones. This is probably due to the very rich yield of the "in situ" assemblage, effectively diluting any caved component. Thus, although these boundaries may be somewhat approximate, the lack of good swc assemblages and the generally contaminated nature of the cuttings preclude higher accuracy.

Dinoflagellates are absent and the only acritarchs present are the non-spiny Schizosporis spp., suggesting lacustrine environments. Plant cuticle is very common, with frequent amorphous liptinite. This is consistent with the coaly lithofacies indicated by the logs, and suggests that the interval may have significant source potential.

Evans (1970) assigned this interval to the C. paradoxa Zone. Presumably he saw C. paradoxa, but since no range data exists, his reasons are unknown. I also saw C. paradoxa in the cuttings samples (but considered it caved). We cannot determine if Evans (1970) saw C. paradoxa in sidewall cores, but I did not. I suspect that he considered his occurrences in cuttings to be "in situ", where I consider them caved. Notably, his oldest paradoxa sample is a cutting sample at 6600 ft. (2011.68m). This difference cannot be conclusively resolved without Evans' (1970) occurrence data.

M. 6840 ft. (2084.8m) cutts-?8700 ft. (2651.8m) cutts, 8037 ft. (2449.7m) swc : upper and middle C. hughesi Zone

Assignment to the upper and middle Cyclosporites hughesi Zone is indicated at the top on the youngest occurrence of C. hughesi, and at the base on the oldest occurrence of Pilosisporites notensis. As discussed above, the zone top is usually taken on oldest C. striatus above, and so may be slightly high. The zone base is taken on an oldest occurrence in cuttings, and is therefore probably too low. The first good sidewall core assemblage lacking P. notensis is at 8764 ft., (2671.m) defining the top of the underlying zone. P. notensis occurs in cuttings, but not swcs, beneath this, clearly indicating that it is caved in this well. Therefore, little trust can be placed on its oldest occurrence in cuttings at 8700 ft (2651.8m). From sidewall core data, its true oldest occurrence is between 8037 ft. (2449.7m) and 8764 ft. (2671.3m). It is quite consistent in cuttings down to 8670 ft. (2642.6m) cutts, but quite rare beneath. Also, the sample at 8670 ft. (2642.6m) contains the acritarch Microfasta evansii, which is usually restricted to the underlying lower C. hughesi Zone. Thus there is weak evidence to suggest that the boundary lies towards the base of this inconclusive interval and perhaps in the interval 8510 ft. (2593.8m) cutts to 8670 ft. (2642.6m) cutts, given the inconclusive (too lean) nature of the sidewall cores at 8594 ft. (2619.5m) swc (from which P. notensis was not seen). Caving from the pannosus Zone is seen as low as 7280-7300 ft. (2218.9-2225.0m) cutts and from the paradoxa and striatus Zones as low as 7632 ft. (2326m, swc) and 7850 ft. (2392.7m cutts), respectively clearly indicating the poor hole condition. Spore colours clearly indicate their caved condition.

Age diagnostic dinoflagellates were absent, but indications of slightly brackish marine conditions are provided by the dinoflagellate Cleistosphaeridium sp. at 6990-7100 ft. (2130.6-2164.0m) cutts and Micrhystridium sp. at 7100 ft. (2164.1m) cutts. Otherwise the interval is non-marine with very common cuticle fragments especially below 7850 ft. (2392.7m) cutts, associated with the coaly interval indicated by the logs. Lacustrine non-spiny algal acritarchs are rare and intermittent.

Evans (1970) assigned this interval to the C. hughesi Zone, and so is in agreement with the present work. However, the subdivision of the Zone was not recognised until 1976 and so was not used by Evans (1970).

N. 8764m (2671.3m) swc ?8670 ft. (2642.6m) cutts-9014 ft. (2747.5m) core : lower C. hughesi Zone

This interval is assigned to the lower Cyclosporites hughesi Zone at the top on the absence of younger indicators and at the base on oldest Dictyotosporites speciosus. As discussed above in detail, there is some uncertainty regarding the base of the overlying zone. Notably Microfasta evansii occurs between 8764 ft. (2671.3m) swc and 8985 ft. (2738.6m) swc and supports the pick for the top of the lowe C. hughesi Zone. It also occurs up to 8670 ft. (2642.6m) cutts, suggesting that the boundary could be as high as that.

Dinoflagellates were not seen, but the presence of non-spiny acritarchs (Schizosporis and Microfasta) in the upper part of the interval (8764 ft. (2671.3m) swc -8985 ft. (2738.6m) swc suggest lacustrine environments.

Evans (1970) assigned most of this interval to the C. hughesi Zone (in agreement with this work), but assigned the basal core to the underlying C. stylosus Zone, presumably on the presence of Crybelosporites stylosus. Current knowledge reveals that C. stylosus is not reliable, and that the oldest occurrence of Dictyotosporites speciosus is a more reliable datum. New work herein shows that D. speciosus occurs to the base of the well, and that therefore the C. stylosus Zone was not penetrated.

IV GEOLOGICAL DISCUSSION

A. TERTIARY

Too few data exist in Chama-1 or Crayfish-1 to make a comparison. The base Tertiary probably lies in Chama-1 at about 1280 ft. (390.1m) and in Crayfish-1 at about 1200 ft. (365.76m).

B. LATE CRETACEOUS

1. The Late Cretaceous in both wells is thin and sandprone. At least in Crayfish-1 it is almost certainly incomplete, with the Campanian and Maastrichtian N. senectus to T. longus Zones probably absent, although in Chama 1 and 1a, part of this section may be present in the unsampled interval.

2. The Coniacian T. pachyexinus Zone is present in both wells, although thicker in Chama-1a. The Turonian C. triplex Zone is seen in the thicker Chama-1a section, and may be present in the sample gap in Crayfish-1. This combined Coniacian-Turonian interval is apparently marked by low but very spiky sonic response, with its base being at 2400 ft. (731.5m) in Chama-1a and 1440 ft. (438.9m) in Crayfish-1.

3. The Cenomanian A. distocarinatus Zone was recognised in Crayfish-1 from sidewall cores, but not from cuttings in Chama-1a. Log correlation suggests that the interval of lowish but variable sonic response at 1440 ft (438.9m)-1560 ft. (475.5m) in Crayfish-1 (Cenomanian) corresponds to 2440 ft. (743.7m)-2570 ft. (783.3m) in Chama-1a.

C. EARLY CRETACEOUS

1. The late Albian P. pannosus Zone is confidently identified in Crayfish-1 where it corresponds to an interval characterised by frequent thin beds with high sonic velocities indicating thin hardbands at 1560 ft. (475.5m)-1700 ft. (518.2m). In Chama-1a, the P. pannosus Zone could not be distingquished but a thicker development is likely, and the log interval 3300 ft (1005.8m)-3470 ft. (1057.7m) is similar to that described above in Crayfish-1. If these are time equivalent, then the interval 2570 ft. (783.3m)-3300 ft. (1005.8m) in Chama-1a has probably been lost by erosion at the mid-Cretaceous unconformity in Crayfish-1.

2. The upper and lower C. paradoxa Zones are represented by relatively quiet sonic response steadily increasing with depth, and marked at the base by a sharp drop in sonic velocity. This interval comprises 1700 ft. (518.2m)-3600 ft. (1097.3m) or possibly 3700 ft. (1127.8m) in Crayfish-1, and 3470 ft. (1057.7m)-5340 ft. (1627.6m) in Chama-1a, about 2000 ft. (610m) in each well. The base of the interval is considered to be unconformable in these wells and widely throughout the basin. No whole zones are ever lost, but the thickness of the underlying C. striatus Zone is widely variable, and assumed to be due to erosion of its top on this unconformity.

3. The C. striatus Zone is well defined in Crayfish-1 but more approximately in Chama-1a. The interval is characterised at the top by the sonic break discussed above, and within, by thin both high and low spiky sonic response, presumably reflecting thin sands and coals in a mostly shale sequence. These intervals are at 3700 ft. (1127.8m)-4410 ft. (1344.2m) in Crayfis-1, and 5340 ft. (1627.6m)-6730 ft. (2051.3m) in Chama-1a. Notably, this interval is much thicker in the

downstructure Chama-la (1300 ft or 400m) than in Crayfish-1 (700 ft. or 210m). On regional experience, this thickness difference is usually due to erosion at the top of the interval, as discussed.

4. The middle and upper C. hughesi Zone is characterised in Chama-la by an upper interval with quiet sonic response 6730 ft. (2051.3m)-7840 ft. (2389.6m) and a lower interval with common thin spiky low sonic velocities 7840 ft. (2389.6m)-8320 ft. (2535.9m). This presumably corresponds to an upper shale sequence and a lower shale with coal sequence. In Crayfish-1, the upper sequence 4410 ft. (1344.1m)-5060 ft. (1542.3m) contains thin intervals of high sonic velocity, but is otherwise similar to that in Chama-1. This appears to reflect thin sands and may reflect a more sand prone location for Crayfish-1. In Crayfish-1, the coaly lower sequence 5060 ft. (1542.3m)-5236 ft. (1595.9m) is clearly recognisable. The upper sequence is thinner in Crayfish-1, 650 ft. (200m) compared with Chama-la, 1110 ft. (340m), but the lower sequence is very much thinner in Crayfish-1, 176 ft (55m) compared with Chama-la, 480 ft. (146m). This may reflect lost section at the "top Pretty Hill unconformity", with deposition recommencing at the upstructure Crayfish-1 location after recommencing at the more basinal Chama-la location.

5. The exact location of the "top Pretty Hill unconformity", (which is always located at the basal Aptian boundary between the lower C. hughesi Zone and the upper-middle C. hughesi Zone) cannot be precisely located in Chama-la due to the poor palynology data quality close to the boundary.

   Given this uncertainty, it could be taken at the base of the coaly sequence at 8320 ft. (2535.9m) at the slight sonic step at 8490 ft. (2587.8m) or at the top of the first good sand 8540 ft. (2603.0m). There is really little difference between these alternatives, as this interval has no obvious correlative in Crayfish-1, and the whole of the interval 8320 ft. (2535.9m)-8540 ft. (2603.0m) may be lost from Crayfish-1 on the unconformity.

6. The lower C. hughesi Zone in both wells is characterised by mixed sandstone and shale lithologies, as shown by the highly variable gamma response.

In Crayfish-1, an upper relatively shale rich unit 5236 ft. (1595.9m)-6670 ft. (2033.0m) overlies a relatively sand rich unit 6670 ft. (2033.0m)-8900 ft. (2712.7m). In Chama-1a, only a short part 8540 ft. (2603.0m)-9000 ft. (2743.2m) T.D. of the shale rich unit was penetrated before the well was terminated. Although it is true that the Chama-1a section contains less sand than its correlative in Crayfish-1, there are parts of the Crayfish-1 section that are as thick and similarly sand poor (for example 5460 ft. (1664.2m)-5900 ft. (1798.3m) and 6040 ft. (1841.0m)-6400 ft. (1950.7m)). Thus it is nonsense to argue that Chama-1 adequately tested for reservoir. If the top 220 ft. (70m) of the Crayfish-1 section 5236 ft. (1595.9m)-5460 ft. (1664.2m) had been removed by erosion on the "top Pretty Hill unconformity", and Crayfish-1 terminated at 5900 ft. (1798.3m), there would be nothing to pick between the reservoir quality of the two wells.

Obviously, the sand rich lower interval in Crayfish-1 was not drilled in Chama-1a. Calculations of depth to basement from seismic would give some idea of the thickness of potential reservoir at the Chama-1a location.

7. The C. stylosus Zone at Crayfish-1 is also mixed sandstone and shale and contains an upper blocky sand rich interval 8900 ft. (2712.7m)-9950 ft. (2032.8m) and a lower less sand rich interval 9950 ft. (3032.8m) to 10500 ft. (3200.4m) T.D. with frequent fining upward cycles. None of this good reservoir sequence was drilled at Chama-1a, which did not penetrate the C. stylosus Zone.

V CONCLUSIONS

A. Chama-1a did not adequately test for reservoir. Although it did penetrate the top of the reservoir sequence seen in Crayfish-1, it did not drill deep enough. It penetrated only the topmost, worst part of the Crayfish-1 reservoir sequence, and reservoir quality undrilled beneath the T.D. of Chama-1a could be at least equivalent to that at Crayfish-1. However, the lack of major sands in the drilled lower C. hughesi section, and the absence of very thin sands from the overlying middle and upper C. hughesi Zone (seen in Crayfish-1), suggest that Chama-1a is somewhat less sandprone than Crayfish-1. The reservoir potential of the area therefore remains largely untested, and could be considerable.

B. Regional unconformities at top lower hughesi (= "top Pretty Hill"), top striatus ("intra Eumeralla"), top pannosus (= "mid Cretaceous") and top Cretaceous can be recognised and provide a valuable framework to understanding of the regional depositional patterns.

C. The recognition of "coaly facies" within the Eumeralla Formation is seen to once again have regional log correlative value. Passing observations suggest that these coaly facies (hughesi to striatus Zones) may have good oil source potential here as in Banyula-1 and other locations.

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Partridge, A.D. (1976) The Geological Expression of Eustacy in the early Tertiary of the Gippsland Basin J. Aust. Petrol. Expl. Assoc. 16 : 73-79

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APPENDIX I

PALYNOMORPH DATA CHARTS

- SPORES AND POLLEN
- DINOFLAGELLATES

REVIEW : CHAMA #1 S/P

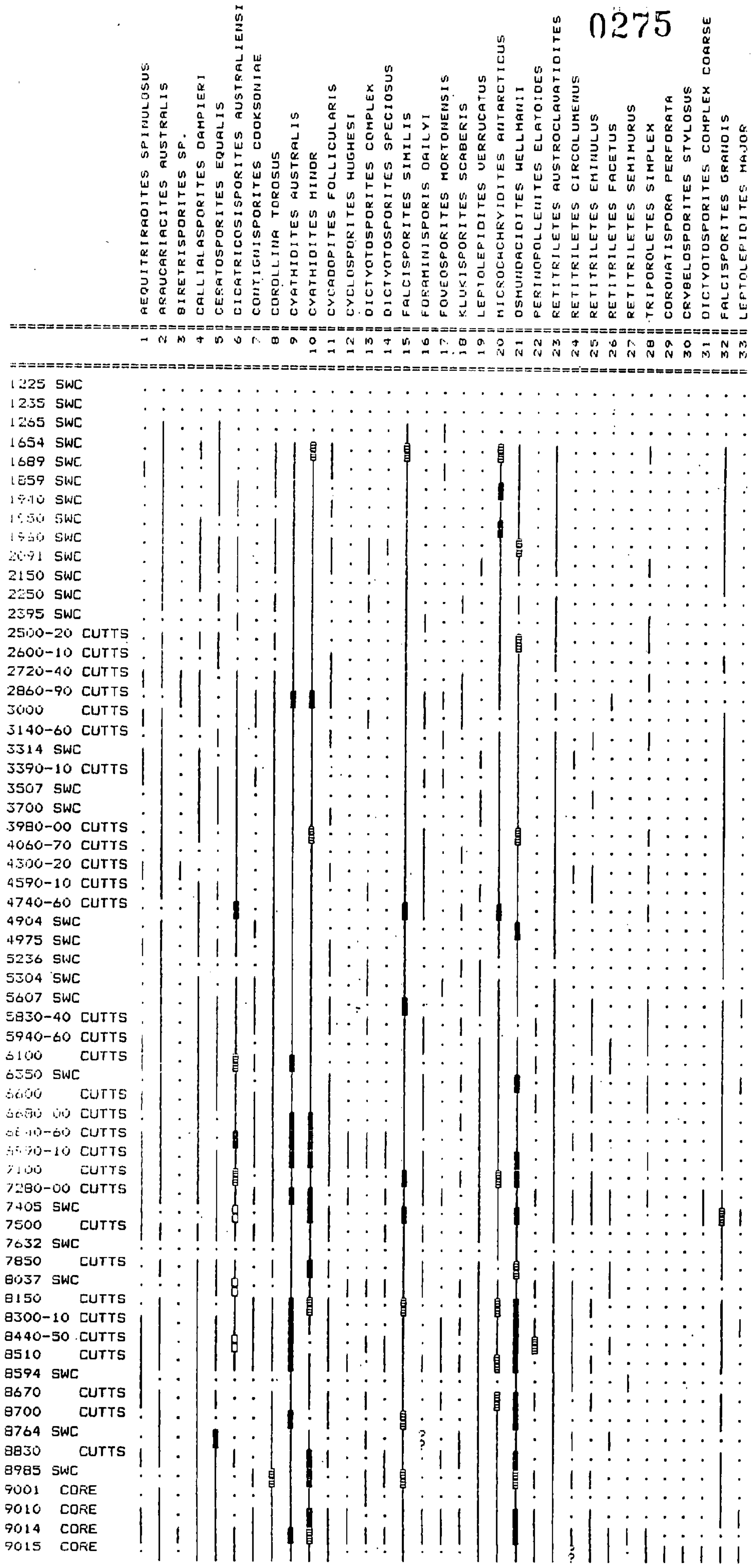
DESCRIPTION:

RESTUDY OF ORIGINAL ESSO PREPARATIONS PLUS NEW PROCESSING AND EXAMINATION FOR CHEVRON OVERSEAS PETROLEUM BY ROGER MORGAN. JUNE 1986.
ALL SAMPLE DEPTHS ARE IN FEET AS DRILLED.

CHECKLIST OF GRAPHIC ABUNDANCE BY LOWEST APPEARANCE

▌ = Abundant
▌ = Common
┃ = Few
│ = Rare
│ = Very Rare

? = Questionably Present
. = Not Present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4 CALLIALASPORITES DAMPIERI
5 CERATOSPORITES EQUALIS
6 CICATRICOSISPORITES AUSTRALIENSI
7 CONTIGNISPORITES COOKSONIAE
8 COROLLINA TOROSUS
9 CYATHIDITES AUSTRALIS
10 CYATHIDITES MINOR
11 CYCADOPITES FOLLICULARIS
12 CYCLOSPORITES HUGHESI
13 DICTYOTOSPORITES COMPLEX
14 DICTYOTOSPORITES SPECIOSUS
15 FALCISPORITES SIMILIS
16 FORAMINISPORIS DAILYI
17 FOVEOSPORITES MORTONENSIS
18 KLUKISPORITES SCABERIS
19 LEPTOLEPIDITES VERRUCATUS
20 MICROCACHRYIDITES ANTARCTICUS
21 OSMUNDACIDITES WELLMANII
22 PERINOPOLLENITES ELATOIDES
23 RETITRILETES AUSTROCLAVATIDITES
24 RETITRILETES CIRCOLUMENUS
25 RETITRILETES EMINULUS
26 RETITRILETES FACETUS
27 RETITRILETES SEMIMURUS
28 TRIPOROLETES SIMPLEX
29 CORONATISPORA PERFORATA
30 CRYBELOSPORITES STYLOSUS
31 DICTYOTOSPORITES COMPLEX COARSE
32 FALCISPORITES GRANDIS
33 LEPTOLEPIDITES MAJOR
1225 SWC
1235 SWC
1265 SWC
1654 SWC
1689 SWC
1859 SWC
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1960 SWC
2091 SWC
2150 SWC
2250 SWC
2395 SWC
2500-20 CUTTS
2600-10 CUTTS
2720-40 CUTTS
2860-90 CUTTS
3000 CUTTS
3140-60 CUTTS
3314 SWC
3390-10 CUTTS
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7280-00 CUTTS
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8037 SWC
8150 CUTTS
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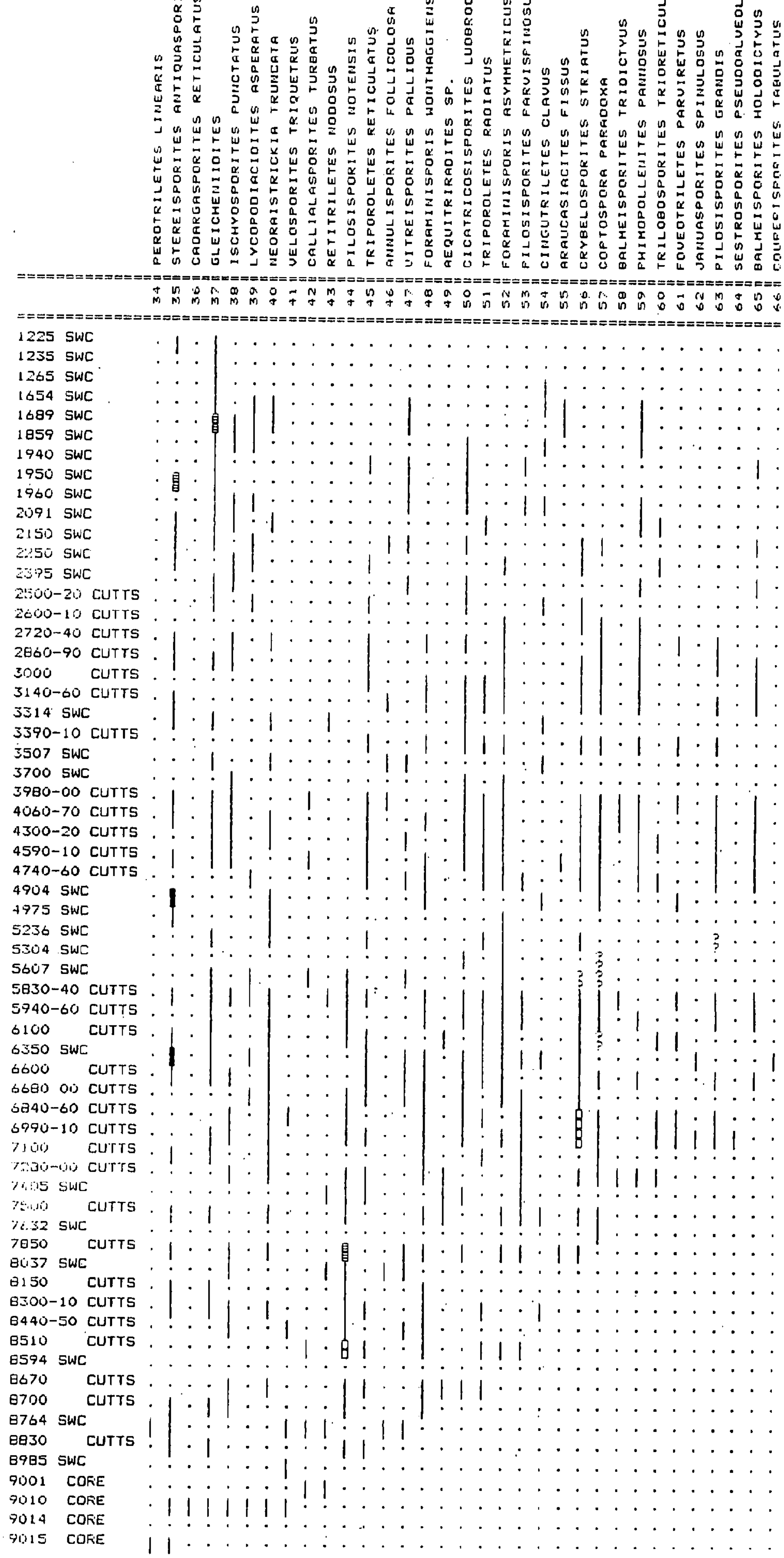
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39 LYCOPODIACIDITES ASPERATUS
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41 VELOSPORITES TRIQUETRUS
42 CALLIALASPORITES TURBATUS
43 RETITRILETES NODOSUS
44 PILOSISPORITES NOTENSIS
45 TRIPOROLETES RETICULATUS
46 ANNULISPORITES FOLLICULOSA
47 VITREISPORITES PALLIDUS
48 FORAMINISPORIS WONTHAGGIENSIS
49 AEQUITRIRADITES SP.
50 CICATRICOSISPORITES LUDBROOKIAE
51 TRIPOROLETES RADIATUS
52 FORAMINISPORIS ASYMMETRICUS
53 PILOSISPORITES PARVISPINOSUS
54 CINGUTRILETES CLAVUS
55 ARAUCARIACITES FISSUS
56 CRYBELOSPORITES STRIATUS
57 COPTOSPORA PARADOXA
58 BALMEISPORITES TRIDICTYUS
59 PHIMOPOLLENITES PANNOSUS
60 TRILOBOSPORITES TRIORETICULOSUS
61 FOVEOTRILETES PARVIRETUS
62 JANUASPORITES SPINULOSUS
63 PILOSISPORITES GRANDIS
64 SESTROSPORITES PSEUDOALVEOLATUS
65 BALMEISPORITES HOLODICTYUS
66 COUPERISPORITES TABULATUS
1225 SWC
1235 SWC
1265 SWC
1654 SWC
1689 SWC
1859 SWC
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2395 SWC
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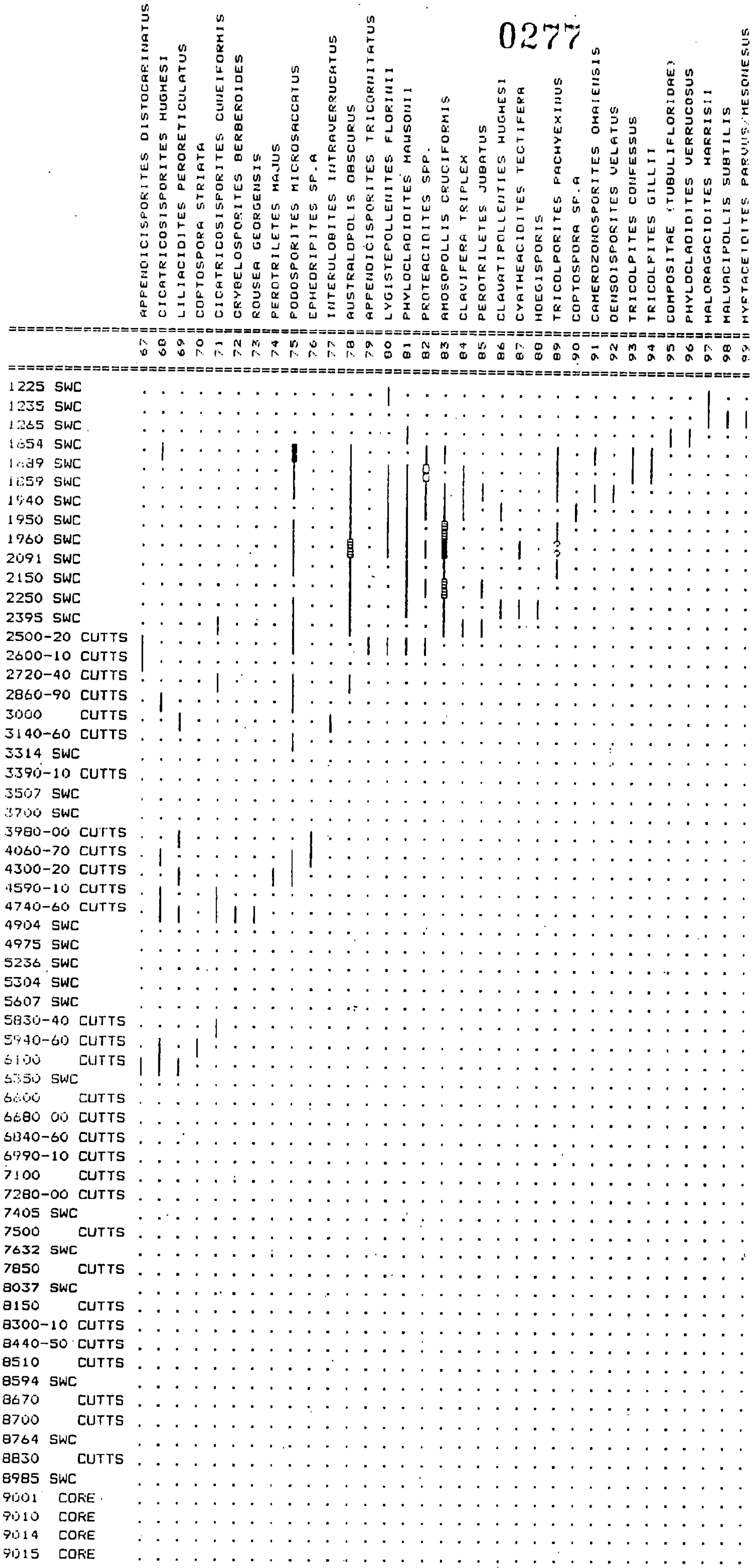
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72 CRYBELOSPORITES BERBEROIDES
73 ROUSEA GEORGENSIS
74 PEROTRILETES MAJUS
75 PODOSPORITES MICROSACCATUS
76 EPHEDRIPITES SP.A
77 INTERULOBITES INTRAVERRUCATUS
78 AUSTRALOPOLLIS OBSCURUS
79 APPENDICISPORITES TRICORNITATUS
80 LYGISTEPOLLENITES FLORINII
81 PHYLOCLADIDITES MAWSONII
82 PROTEACIDITES SPP.
83 AMOSOPOLLIS CRUCIFORMIS
84 CLAVIFERA TRIPLEX
85 PEROTRILETES JUBATUS
86 CLAVATIPOLLENITES HUGHESI
87 CYATHEACIDITES TECTIFERA
88 HOEGISPORIS
89 TRICOLPORITES PACHYEXINUS
90 COPTOSPORA SP.A
91 CAMEROZONOSPORITES OHAIENSIS
92 DENSOISPORITES VELATUS
93 TRICOLPITES CONFESSUS
94 TRICOLPITES GILLII
95 COMPOSITAE (TUBULIFLORIDAE)
96 PHYLOCLADIDITES VERRUCOSUS
97 HALORAGACIDITES HARRISII
98 MALVACIPOLLIS SUBTILIS
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1225 SWC
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9010 CORE
9014 CORE
9015 CORE

Sample	100 NOTHOFAGIDITES EMARCIDUS	101 PROTEACIDITES ANNULARIS	102 PROTEACIDITES ASPEROPOLUS	103 NOTHOFAGIDITES ASPERUS	104 NOTHOFAGIDITES BRACHYSPINULOSUS	105 NOTHOFAGIDITES FALCATA	106 PERIPOROPOLLENITES DEMARCATUS	107 PROTEACIDITES INCURVATUS
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9015 CORE	.	.	.	.	.	.	.	.

SPECIES LOCATION INDEX

Index numbers are the columns in which species appear.

INDEX NUMBER	SPECIES
49	AEQUITRIRADITES SP.
1	AEQUITRIRADITES SPINULOSUS
83	AMOSOPOLLIS CRUCIFORMIS
46	ANNULISPORITES FOLLICOLOSA
67	APPENDICISPORITES DISTOCARINATUS
79	APPENDICISPORITES TRICORNITATUS
2	ARAUCARIACITES AUSTRALIS
55	ARAUCASIACITES FISSUS
78	AUSTRALOPOLIS OBSCURUS
65	BALMEISPORITES HOLODICTYUS
58	BALMEISPORITES TRIDICTYUS
3	BIRETRISPORITES SP.
36	CADARGASPORITES RETICULATUS
4	CALLIALASPORITES DAMPIERI
42	CALLIALASPORITES TURBATUS
91	CAMEROZONOSPORITES OHAIENSIS
5	CERATOSPORITES EQUALIS
6	CICATRICOSISPORITES AUSTRALIENSIS
71	CICATRICOSISPORITES CUNEIFORMIS
68	CICATRICOSISPORITES HUGHESI
50	CICATRICOSISPORITES LUDBROOKIAE
54	CINGUTRILETES CLAVUS
86	CLAVATIPOLLENTIES HUGHESI
84	CLAVIFERA TRIPLEX
95	COMPOSITAE (TUBULIFLORIDAE)
7	CONTIGNISPORITES COOKSONIAE
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90	COPTOSPORA SP.A
70	COPTOSPORA STRIATA
8	COROLLINA TOROSUS
29	CORONATISPORA PERFORATA
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56	CRYBELOSPORITES STRIATUS
30	CRYBELOSPORITES STYLOSUS
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9	CYATHIDITES AUSTRALIS
10	CYATHIDITES MINOR
11	CYCADOPITES FOLLICULARIS
12	CYCLOSPORITES HUGHESI
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13	DICTYOTOSPORITES COMPLEX
31	DICTYOTOSPORITES COMPLEX COARSE
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15	FALCISPORITES SIMILIS
52	FORAMINISPORIS ASYMMETRICUS
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17	FOVEOSPORITES MORTONENSIS
61	FOVEOTRILETES PARVIRETUS
37	GLEICHENIIDITES
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77	INTERULOBITES INTRAVERRUCATUS
38	ISCHYOSPORITES PUNCTATUS
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85	PEROTRILETES JUBATUS
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81	PHYLOCLADIDITES MAWSONII
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75	PODOSPORITES MICROSACCATUS
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26	RETITRILETES FACETUS
43	RETITRILETES NODOSUS
27	RETITRILETES SEMIMURUS
73	ROUSEA GEORGENSIS
64	SESTROSPORITES PSEUDOALVEOLATUS
35	STEREISPORITES ANTIQUASPORITES
93	TRICOLPITES CONFESSUS
94	TRICOLPITES GILLII
89	TRICOLPORITES PACHYEXINUS
60	TRILOBOSPORITES TRIORETICULOSUS
51	TRIPOROLETES RADIATUS
45	TRIPOROLETES RETICULATUS
28	TRIPOROLETES SIMPLEX
41	VELOSPORITES TRIQUETRUS
47	VITREISPORITES PALLIDUS

REVIEW : CHAMA #1 DINOS

DESCRIPTION:

RESTUDY OF ORIGINAL ESSO PREPARATIONS PLUS NEW PROCESSING AND EXAMINATION FOR CHEVRON OVERSEAS PETROLEUM BY ROGER MORGAN. JUNE 1986.
ALL SAMPLE DEPTHS ARE IN FEET AS DRILLED.

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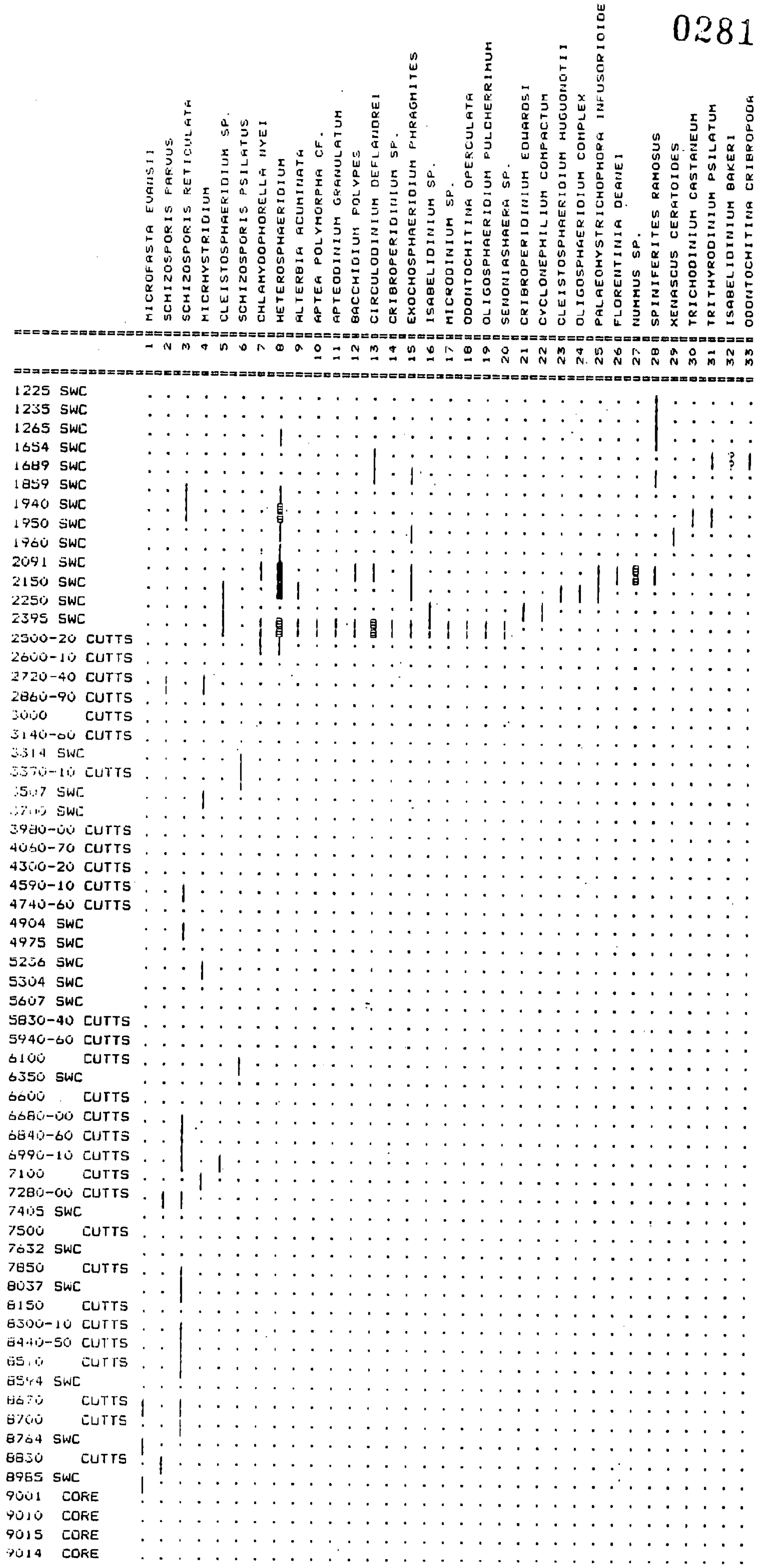
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3 SCHIZOSPORIS RETICULATA
4 MICRHYSTRIDIUM
5 CLEISTOSPHAERIDIUM SP.
6 SCHIZOSPORIS PSILATUS
7 CHLAMYDOPHORELLA NYEI
8 HETEROSPHAERIDIUM
9 ALTERBIA ACUMINATA
10 APTEA POLYMORPHA CF.
11 APTEODINIUM GRANULATUM
12 BACCHIDIUM POLYPES
13 CIRCULODINIUM DEFLANDREI
14 CRIBROPERIDINIUM SP.
15 EXOCHOSPHAERIDIUM PHRAGMITES
16 ISABELIDINIUM SP.
17 MICRODINIUM SP.
18 ODONTOCHITINA OPERCULATA
19 OLIGOSPHAERIDIUM PULCHERRIMUM
20 SENONIASHAERA SP.
21 CRIBROPERIDINIUM EDWARDSI
22 CYCLONEPHILIUM COMPACTUM
23 CLEISTOSPHAERIDIUM HUGUONOTII
24 OLIGOSPHAERIDIUM COMPLEX
25 PALAEOHYSTRICHOPHORA INFUSORIOIDE
26 FLORENTINIA DEANEI
27 NUMMUS SP.
28 SPINIFERITES RAMOSUS
29 XENASCUS CERATOIDES
30 TRICHODINIUM CASTANEUM
31 TRITHYRODINIUM PSILATUM
32 ISABELIDINIUM BAKERI
33 ODONTOCHITINA CRIBROPODA
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3314 SWC
3370-10 CUTTS
3507 SWC
3700 SWC
3980-00 CUTTS
4060-70 CUTTS
4300-20 CUTTS
4590-10 CUTTS
4740-60 CUTTS
4904 SWC
4975 SWC
5236 SWC
5304 SWC
5607 SWC
5830-40 CUTTS
5940-60 CUTTS
6100 CUTTS
6350 SWC
6600 CUTTS
6680-00 CUTTS
6840-60 CUTTS
6990-10 CUTTS
7100 CUTTS
7280-00 CUTTS
7405 SWC
7500 CUTTS
7632 SWC
7850 CUTTS
8037 SWC
8150 CUTTS
8300-10 CUTTS
8440-50 CUTTS
8510 CUTTS
8594 SWC
8670 CUTTS
8700 CUTTS
8764 SWC
8830 CUTTS
8965 SWC
9001 CORE
9010 CORE
9015 CORE
9014 CORE

	BATIACASPHAERA SP. RETICULATE	ACHILLEODINIUM BIFORMOIDES	APECTODINIUM SUMISSIMA	APTEODINIUM AUSTRALIENSE	CORRUDINIUM CORRUGATUM	DAPSILIDINIUM PASTIELSII	IMPAGIDINIUM DISPERTITUM	IMPAGIDINIUM MACULATUM	OPERCULODINIUM CENTROCARPUM	SCHEMATOPHORA SPECIOSUS	SYSTEMATOPHORA PLACACANTHA	TECTATODINIUM PELLITUM	CORDOSPHAERIDIUM INODES	DEFLANDREA HETEROPHLYCTA	DEFLANDREA PHOSPHORITICA	HETERAULACACYSTA PAXILLA	HYSTRICHOKOLPOMA EISENACKII	LINGULODINIUM MACHAEROPHORUM	PENTADINIUM LATICINCTUM	PTHANOPERIDINIUM EOCENICUM	SAMLANDIA CHLAMYDOPHORA
	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
1225 SWC	.	.	.	|	.	|	|	.	|	.	|	|	|	|	|	|	|	|	|	|	|
1235 SWC	|	|	|	|	|	|	|	|	|	|	|	|	.	.	.	.	.	.	.	.	.
1265 SWC	|	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1654 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1689 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1859 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1940 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1950 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1960 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2091 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2150 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2250 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2395 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2500-20 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2600-10 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2720-40 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2860-90 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3000 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3140-60 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3314 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3390-10 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3507 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3700 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3980-00 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4060-70 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4300-20 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4590-10 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4740-60 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4904 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4975 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5236 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5304 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5607 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5830-40 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5940-60 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6100 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6350 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6600 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6580-00 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6840-60 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6990-10 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7100 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7280-00 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7405 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7500 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7632 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7850 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8037 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8150 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8300-10 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8440-50 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8510 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8594 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8670 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8700 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8764 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8830 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8985 SWC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9001 CORE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9010 CORE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9015 CORE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9014 CORE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

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