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No. 6945

EL 1365, EL 1366, EL 1367 AND EL 1368

WINTINNA HILL, WELBOURN HILL HOMESTEAD, SOUTH NEALES RIVER AND MOUNT WILLOUGHBY HOMESTEAD

PROGRESS REPORTS FOR THE PERIOD 11/11/86 TO 10/11/87

Submitted by
Roebuck Resources NL
1988

CONTENTS ENVELOPE 6945

TENEMENT: E.L.'s 1365, 1366, 1367, 1368 Wintinna.

TENEMENT HOLDER: Roebuck Resources N.L.

N.B. Reports for E.L.' 1366, 1367 and 1368 are identical to those for E.L. 1365 and have therefor not been microfilmed.

ROEBUCK RESOURCES N.L.
EXPLORATION LICENCE 1365
WINTINNA
SOUTH AUSTRALIA
QUARTERLY REPORT FOR PERIOD
11TH NOVEMBER 1986
TO
10TH FEBRUARY 1987

Prepared by
P.D. Allchurch

TECHNICAL REPORT NO. 82
PERTH, JANUARY 1988

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1. INTRODUCTION

Exploration Licence (EL) 1365 was granted on the 11th November, 1986 for a period of 1 year. The licence is one of a group of four EL's 1365, 1366, 1367, 1368 granted on the same day and together with 1328 and 1329 form a contiguous tenement block as the basis for the Todmorden Sulphur Joint Venture. The Joint Venture was initially formed to explore for native sulphur deposits associated with salt domes in the Todmorden (EL 1328) area. The joint venture was extended west of Todmorden to include the area now covered by EL's 1365 to 1368, where recently released oil exploration data from Comalco indicated traces of native sulphur and widely distributed stratiform evaporites.

2. EXPLORATION

Much of the quarter was spent researching geological records in the general Wintinna 1:250,000 Sheet area. Mines Department records were examined and Comalco records were examined in detail. Comalco would not allow data on their petroleum permit to be reproduced or taken from their office.

Drill cores were examined at the Mines Department Core Library in Adelaide.

Geological consultants, R. Dalgarno and Renison Petroleum Consultants were contracted to conduct the research programme. Renison Petroleum consultants worked mainly on the Comalco data while R. Dalgarno worked on Geological Survey and all available petroleum exploration data. A copy of R. Dalgarno's research report is attached as Appendix 1.

The Manya 6 petroleum exploration core hole drilled near the centre of EL 1365 by Comalco intersected 700 m of anhydritic dolomites from 600 m to 1300 m followed by 400 m of halite bearing dolomites and massive halite beds. Many joints and vugs in grey dolomite betwen 1200 and 1240 m contain small crystals of native sulphur usually associated with white crystalline calcite. The age of the dolomite/halite sequence has not been established but based on comparison with Cootanoorina No. 1 Core is likely to be Cambrian.

The general rock association is similar to those hosting bioepigenetic strata bound sulphur deposits in the USA (Ruckmick et.al. 1979). The source of the sulphur is the biogenic reduction of gypsum in the presence of petroleum. The small quantities of sulphur present in Manya 6 and the lack of "cap rock" alteration calcite indicate that insuffīcent water and petroleum have passed through the rock to form major deposits at this location. Nevertheless the basic conditions for sulphur formation have undoubtedly been present.

Further exploration will be directed towards locating areas where the evaporitic section is closer to surface and cut by major faults. Faulting would allow greater access by groundwater and petroleum to the evaporitic beds to localise sulphur formation to potentially economic size.

P.D. ALLCHURCH

3. EXPENDITURE

STATEMENT OF EXPENDITURE

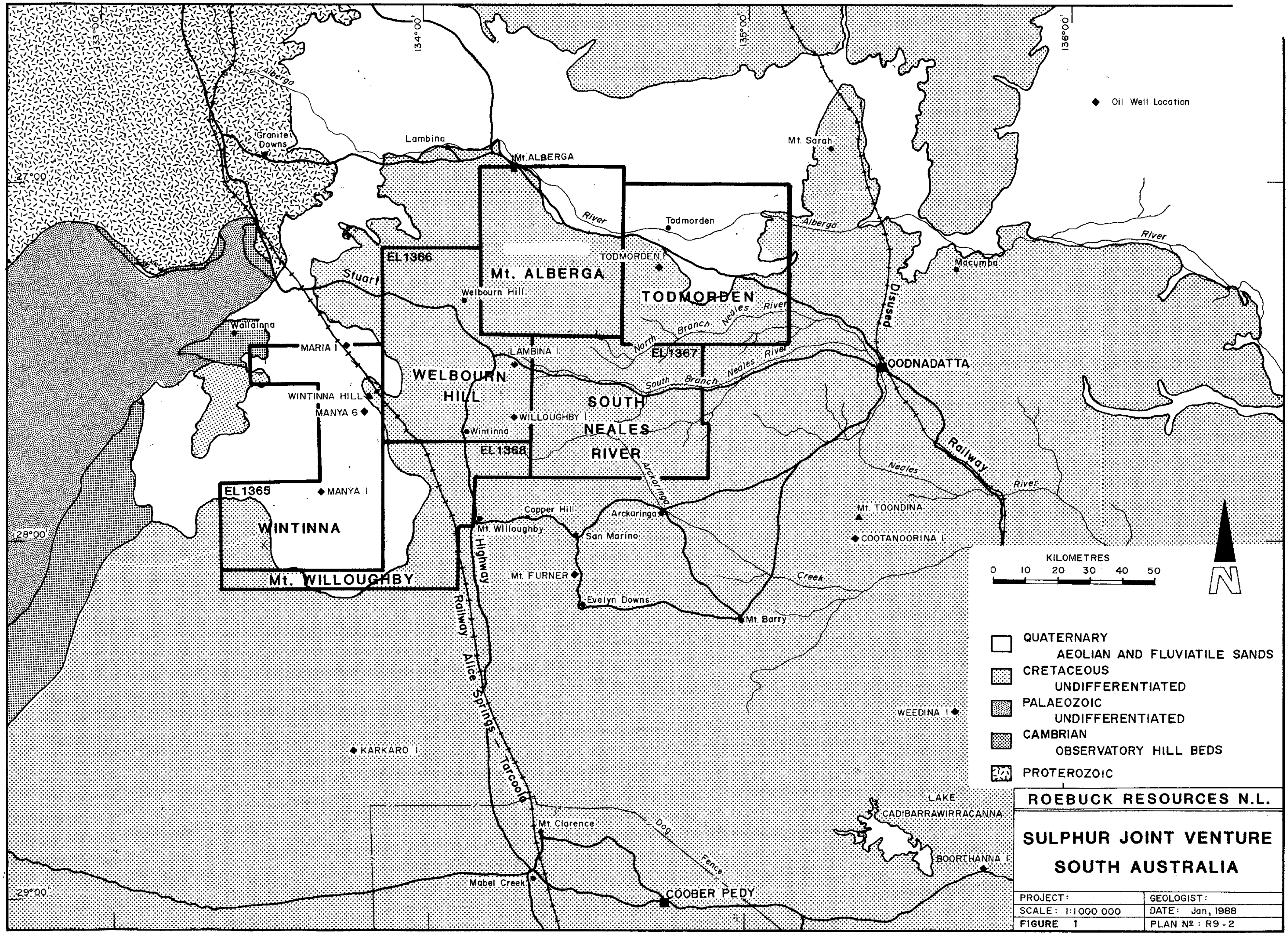
EXPLORATION LICENCE 1365

11.11.86 TO 10.2.87

Geologist - In House		615
Mines Department Fees		4800
Mining Tenements - Admin		24
Printing & Stationery		28
Stamp Duty		4
Vehicle Expenses		36
	TOTAL:	$ 5507

4. REFERENCES

Ruckmick. J.C. Wimberley B.H. Edwards, A.F. 1979 - "Classification and Genesis of Biogenic Sulphur Deposits". Economic Geology Vol 74 pp 469-474.



ROEBUCK RESOURCES N.L.

SULPHUR JOINT VENTURE
SOUTH AUSTRALIA

PROJECT:	GEOLOGIST:
SCALE: 1:1000 000	DATE: Jan, 1988
FIGURE 1	PLAN No: R9-2

APPENDIX 1

Report on Potential Sulphur Targets
Wintinna, South Australia - R. Dalgarno

REPORT ON
POTENTIAL SULPHUR TARGETS, WINTINNA S. AUST

R. Dalgarno
Consultant Geologist
Adelaide

LIST OF FIGURES

REPORT ON POTENTIAL SULPHUR TARGETS, WINTINNA S.AUST.

CONCLUSIONS

Drilling of a second hole on the Wintinna Sheet area, EL 1328 (Todmorden) should proceed when the low cost gravity survey by SADME is complete. Target definition may not be changed by these results but greater confidence of the outline of the structure should be achieved by the gravity data.

Interpretation of the seismic structure is fairly confidently related to piercement or diapirism. Alternative possibilities are:

Salt domes cored by Cambrian salt and gypsum related to the Chandler or Ouldburra evaporite basins. Both have known associated hydrocarbons, hence offer favourable conditions for sulphate reduction.

Complex thrust or decollement zones similar to the Undandita Structure of the N.T.
These structures involve repetition of the Cambrian (incl. Pacoota Sst.) and hence involve this gas prone unit in structural preparation and fracturing. This is favourable for leakage of H/C gases into lubricating evaporite layers and will result in fault controlled gypsum reduction to sulphur.

The quartzitic unit cored in the first hole lithologically compares to the sequence in Cootanoorinna #1 which has a Devonian date put on a shale break above evaporitic carbonates (?Cambrian).
Other Devonian is confirmed in Munyarai #1 but the favoured correlation for the lower part of Cootanoorinna is with the ~~Caladeena~~ Kalladeina Fm in Weedina #1, now confirmed by Gravestock as Cambrian.

Evaporite occurrences which might develop more significantly in the Todmorden area have been intersected in the Early Cambrian of Manya #6 and further southwest at Wilkinson. Other evaporite minerals of the Observatory Hill Beds appear to be related to non-marine environments. Gypsum/anhydrite may still occur although thickness would be too small for pillow formation and salt-dome formation.

Diapiric structures cored by Adelaidean Callanna Beds are likely explanations for the Todmorden structures. These are favourable sulphur targets.

Seimic structures of diapir type have been drilled by Comalco and shown to be upfaulted blocks of metamorphic basement squeezed in thrust/wrench fault systems related to ENE-WSW trends. (Fig.9).

RECOMMENDATIONS

The statistics of salt dome drilling in the Gulf Coast region of U.S.A. indicate that only 5% of holes yield sulphur intersections.

It is thus necessary to drill a significant number of exploration holes on confirmed diapiric targets, or particularly on gypsum/anhydrite deposits associated with faulted seals and potential hydrocarbons.

The Amadeus Basin presents the best known targets of this type with the sulphates confirmed by large areas of surface outcrop, particulary related to the Gillen Member of the Bitter Springs Formation. At least ten breached cores of such piercement structures have been mapped by the B.M.R. in the western Amadeus.

The Madley diapiric structures in the Western Australian part of the Officer Basin present further confirmed targets of this type. Only limited drilling of these structures has been carried out.

The age of the Bitter Springs Formation is no handicap for association with hydrocarbons, particularly methane and H/C gases. The facies are favourable for source beds and kerogen evolution is overmature where known. Methane is the favoured agent for bacterial associated reduction of gypsum to sulphur.

The Flinders Ranges diapiric structures are also potentially interesting targets. The exposures of over 100 structures show the entire range of features related to sulphur in fault controlled and salt dome settings.

The dolomitic breccias in such structures as the Blinman Dome, Beltana etc., and certain of the breccia zones of the Willouran Ranges probably represent surface cap-rock carbonates developed above anhydrite and halite cores. There may be appreciable shale mantles related to these structures which would render evaporite intersections less likely. No previous drilling has been carried out to depth in these exposed domes and conditions are likely to be favourable for sulphur occurrences to depths of as much as 400 metres. The cap rocks have been developing since pre-Permian and thus extensive in situ alteration will have occurred.

Hydrocarbon generation is almost certain related to sapropel units such as the base of the Tapley Hill Fm and the Cambrian carbonates are known as mega rafts within the diapiric breccias and overthrust against their margins. The two factors necessary for sulphur are thus present.

It is recommended that further search involve satellite imagery assessment of exposed diapir cores, both related to the Bitter Springs Fm and the Callanna Beds in South Australia in an effort to locate sulphate areas and related reflectance/botanical anomalies. C.S.I.R.O. remote sensing group and Mr Nick Lemon at Univ. of Adel. have expertise in these areas.

Mr P Allchurch
Managing Director
Roebuck Resources
16 Emerald Terrace
West Perth 6005

I have examined the data available with respect to the program you have initiated for sulphur search on EL's 1328, 1329, WINTINNA Sheet Area in northern South Australia.

At this time the first drillhole is completed at SP 1340 on seismic line 84XAH and I understand the second hole is scheduled as soon as access is possible after recent rains at circa SP 1378 on the same structure and within the low gravity feature. Mike Renison has advised me today that a low cost gravity survey will now be carried out prior to drilling by SADME.

The grey quartzitic rock type intersected in core at 406 metres in the first hole has been processed unsuccess for microfossils and as we noted it has affinities with both Palaeozoic and Late Precambrian evaporitic sequences known from northern South Australia.
Your own comparison of this lithology with Cores 9 and 10 (respectively 3040ft and 3100ft) from Cootanoorina # 1 Hole logged by you in 1967 tend to support correlation with a sequence now accepted as of Devonian age based on spores. (See attached log).

I first examined the gypsum/anhydrite occurrences of the Ringwood area east of Alice Springs and the diapiric structures following the axial trend of the western Amadeus Basin from the Illamurta Complex WNW to the Johnstone Hills (where there is a gypsum glacier above a breeched diapir) with a BMR party (Wells, Ranford Cook, Forman et al) in 1964. I have followed ideas and literature since that time and published myself in the AAPG Memoir 8 "Diapirs and Diapirism" with reference to the similarities of these structures resulting from piercement of the Late Precambrian Bitter Springs Fm and the Willouran units of the Flinders Ranges in South Australia. I am not aware of actual diapiric structures related to the Palaeozoic evaporites. There are accumulation structures related to sliding during thrusting in the eastern Amadeus and this style of structuring should have given rise to favourable conditions for fault controlled sulphate reduction.

The latest age data on the Willouran indicates that the type area is comparable in absolute age to the Bitter Springs Formation (ca 850ma) and the nature of the structures in the Amadeus Basin and the Flinders Ranges
is so similar in their gradual or episodic growth during Late Precambrian and Early Palaeozoic history that the two tectonic regimes must be regarded as one and the same. (Compare the history of the Illamurta Structure as described by Cook with that of the Wirrealpa Diapir in Dalgarno and Johnson 1967).

The contiguous nature of the depositional belt between the Amadeus Basin and the Adelaide Geosyncline is supported by the unit for unit correlations reconised as early as the 1960's. These are of course strengthened by the recognition of two glacial sequences in both areas in the Late Precambrian sequences and by specific distinctive lithological units and sequences (Note the included correlation chart based on litho sequences drawn in 1964).

Over the years this correlation has held good or in fact progressively firmed as the datings on the Callanna Beds obtained last year have demonstrated that this sequence of evaporitic aspect so well developed in the Peak and Denison Ranges is closely related age-wise to the Bitter Springs Formation.

I make this point so that the gross generalizations which follow will perhaps have more weight. Without defining the detail of individual arguements I wish to draw together some of the major features of the Late Precambrian and Early Palaeozoic geology of the Wintinna "Trough", the Amadeus and Adelaidean basins and the Warburton and Officer Basins with respect to their potential for sulphate evaporites and hydrocarbons in structural settings suitable for the development of native sulphur deposits.

The early rift development of 850 Ma ago followed WNW-ESE trends exemplified by the axial gypsum cored diapirs of the western Amadeus and the structural grain of the Willouran Ranges.

By Late Sturtian (ca 700ma ago) accumulation of the evaporitic sequence into pillow anticlines and actively rising domes had taken place in both areas, eg., Areyonga Formation in the Goyders Pass "trapdoor structure" and the evidence of the Willouran Ranges, Northern Flinders Ranges and Blinman, Oraparinna and Worumba Structures which points to growth of anticlines during deposition.

Continued growth and piercement occurred through Late Precambrian into the early Palaeozoic in both areas as illustrated by the Illamurta and say Beltana, Enorama and Wirrealpa Diapirs. These represent the salt dome columnar and tear-drop stages of piercement characteristic of the Gulf Coast diapirs. All the features are present except that there is no significant deep drilling and there is no significant thickness of halite demonstrated in either region. Many lines of evidence now suggest that these structures are shale mantled evaporite diapirs with thick carbonate (and underlying anhydrite?) caprock zones. Certainly Mount and Lemon in their pHD studies regard the Flinders Ranges structures as salt diapirs.

The Amadeus Basin reveals at least ten examples of massive, deformed gypsum in the cores of anticlines associated with the Bitter Springs Formation. This offers potential for residual sulphur but the problem is one of statistics of drill tests as only a few percent of holes over diapiric cores in the Gulf Coast region intersect sulphur bodies.

The notable tectonic event of the latest Precambrian and Early Cambrian of central Australia is the so called Petermann Ranges Orogeny. This is represented in the southern Amadeus Basin by hiatus and coarse clastic sediments and in northern South Australia by absence of the latest Precambrian beneath the Relief Sandstone and its correlatives. Only minor lacunae occur in the Adelaide Geosyncline itself but perhaps major regression is indicated by the starved basin environment of the Bunyeroo Formation and the submarine canyon cutting phase of the Wonoka Formation in the Flinders Ranges.

the Stuart Shelf and Curnamona Cratons show hiatus for the latter part of the Wilpena Group so that the Cambrian transgression results in a "steer's horned basin" in cross section through BLinman. At this stage many of the Central Flinders Ranges diapirs were eroded mud islands and the resultant breccias of the cores of such structures as Wirrealpa, Mt Frome, Puttappa etc are interpreted as salt glaciers onlapped by the Early marine Cambrian. (See Palaeogeographic maps).

The Early Cambrian is interpreted by a number of people as exemplifying continental breakup. Thus cross-section from the Officer Basin through the Bitchera Ridge to the Warburton Basin shows a progression with supposed "break-up unconformity" beneath the Relief Sandstone and Cambrian successions of continental evaporite facies in the west through the barred basin and intermittantly marine cabonate-halite suite of the early Cambrian of the southern part of the Amadeus Basin into the volcanic welt of the Warburton Basin underlying the Pedirka and Cooper Basins.

The comparable cross-section further south through the Adelaide Geosyncline, Curnamona Shelf and Bancannia/Wonnaminta belts is developed on a grander scale and is more marine in character. There is however a Late Lower Cambrian evaporite and reef mound building phase in the Wirrealpa Embayment of the Arrowie Basin. Evaporites were drilled and are exposed as dolomitized palisade gypsum beds in two locations. (Delhi's Moorowie Drillhole and sections at Chambers Gorge and Mt Billy Creek east).

The significant evaporite development of the northeastern Officer Basin and southeastern Amadeus is developed at the same time as this minor phase in the south and appears to be the latest part of the Lower Cambrian.

In the Amadeus Basin this corresponds to the halite basin of the Chandler Formation while in northern South Australia it is the silled basin and sabkha facies of the Ouldburra Formation. Throughout South Australia and in the western Amadeus Basin this phase is followed by red evaporitic and continental clastics (Billy Creek Formation, Observatory Hill Beds, Tempe Formation, etc.
In the eastern Amadeus Basin there is a passage to marine shelf conditions represented by the Giles Creek Dolomite.

The most significant structural event of the central Australian region was the Alice Springs Orogeny of the late Palaeozoic. This resulted from reactivation of the Musgrave and Arunta Blocks which occurred episodically from the Late Precambrian and culminated in complex thrusting of the margins of the Amadeus and Officer Basins with notable southward directed thrusts on the northern margins of both structures localized along W-E and WSW-ENE directed trends. Components of this are represented by wrench faults with dextral component in the Wintinna region.

A tectonic sketch prepared for this province indicates the interference of major crustal trends, including fundamental gravity "corridors" of O'Driscoll in the region of the inferred diapirs of the WINTINNA Sheet area.

Further to the south R A Gerdes of SADME has interpreted residual gravity lows as possible diapiric structures and seismic for Delhi and partners has identified features of salt dome character in the Arckaringa Sub-basin west of the Peak and Denison Ranges.

The significant feature of the deformation of the Amadeus Basin are the two levels of decollement which develop at the Bitter Springs Formation and the Cambrian Chandler Formation. These result in unique styles of deformation depending upon the dominance of the slip surfaces. Thus in the western Amadeus the diapiric piercement and detachment near the base of the sequence tends to dominate while in the east the effects of the early Cambrian salt layer are more pronounced.

The AAPG Atlas of Seismic Sections illustrates the character of superimposed thrusts which are interpreted in sections where both the Bitter Springs and Cambrian slide planes are developed. (See figures). These give rise to seismic patterns resembling salt domes and in certain cases do result in actual piercement features.

In the section illustrated in the western Amadeus Basin the Late Cambrian/Ordovician Pacoota Sandstone hosts gas as in the Mereenie Field. Conditions are favourable for the biogenic development of sulphur from sulphate evaporite minerals where gas leakage occurs along thrusts overlapped by the Pacoota Formation. Thus in the illustrated section a favourable situation for sulphur occurrence would exist where sole thrusts are exposed above fractured Pacoota. Such a situation could exist around S.P.170. This is the classic style of fault controlled sulphur occurrence in structurally breached hydrocarbon host rocks overlain by gypsum/anhydrite.

Similarity is apparent between this seismic section and the Line 84XAH on WINTINNA Sheet Area in South Australia. It is notable that there are alternative interpretations for the structure drilled in EL1328 in that the localized poor record is variously interpreted as columnar salt dome or a fault complex. The interval of core from the first hole is not distinctive in lithology and could be derived from Palaeozoic or Precambrian sediments. A further test by drilling of the structure within a refined gravity anomaly is supported in anticipation of intersecting evaporite minerals either in the sole of a thrust or in cap rock of a diapir.

Results of microfossil examination of the first core are negative. The lithology is not definitive even though there is a comparison with the demonstrated Devonian of Cootanoorina. Other possibilities of deformed Ordovician, Cambrian or Willouran are equally likely. The general setting of the Cambrian in northern S.Aust and the Amadeus Basin is favourable for the coexistence of evaporites and hydrocarbons. The included figures illustrate palaeogeography of the Early and Mid Cambrian of southern Australia and the respective wells providing source data. Although Comalco have evidence that the Ammoridina Inlier separated continental and marine conditions in the Early Cambrian there is no evidence of a thick development of evaporites south of the N.T. border.

Widespread carbonate platforms, both continental playas and marginal marine sabkhas, developed west of the Torrens Lineament in the Early Cambrian, particularly in the north of South Australia. Marine conditions were dominant at this time in the Flinders Ranges notably in the Arrowie depocenter. Marginal to this zone a diapir belt or possible salt "wall" analogous to the present day Gulf Coast continental slope was dotted with emergent bald-cap domes (eg., Puttappa, Angepena, Wirrealpa, Mt John, Mt Frome Diapirs and the Oraparinna Graben.

The only known evaporite occurrences are related to the Edeowie Member of the latest Lower Cambrian from the three last.named areas and from the equivalent aged Ramsay Limestone in the Minlayton Stratigraphic Bore on Yorke Peninsula. (Ordian diagram). No sulphur is reported associated with these occurrences which are bedded gypsum. Hydrocarbons are anticipated in the underlying dark lagoonal facies of the type Parara Limestone on Yorke Peninsula. Shows were reported in the late 50's in the Early Cambrian at Wilkatana north of Port Augusta and also in the recently drilled Moorowie #1 near Mt Frome in the Arrowie Basin.

Potential for sulphur associated with the Cambrian in the southern part of South Australia is thus relatively low, the best direct target being for bedded sulphur derived from the evaporite facies which overlies the Oraparinna reefoid facies. A synthetic down to graben growth fault and an associated antithetic fault provide structural preparation for the evaporite layer which is disharmonically deformed (detached on a small scale).

An alternative target is the drilling of the crestal zones of the exposed diapirs such as the Blinman or Beltana structures. Statistically sulphur occurrences in diapirs are related to calcitic and dolomitic residuals above anhydrite altered zones overlyingsalt. It may therefore be possible to identify anomalous zones in these exposed structures by use of satellite imagery. N. Lemon at Adelaide University is versed in the massaging of these data and may provide a useful clue for potential sulphur targets.

Hydrocarbons have not been demonstrated in the Callanna sequence but adequate organic matter in the form of algal mat etc., occurs in the sabkha-style sediments associated with the halite-casted muds to provide source for methane etc. Faults marginal to the diapirs tend to have barytes veins with minor sulphide mineral association (bornite, chalcopyrite, pyrite) suggesting mobilization from an underlying sulphate zone. On these grounds I consider that there is a statistical target in the Flinders Ranges diapirs which may be upgraded by remote sensing studies. .

The playa environments of the Officer Basin have been explored for trona and sodium carbonate deposits by Comalco. Halite is known in the Early Cambrian (eg., Wilkinson #1) but significant sulphate sequences are not known. Dead oil and bitumen-filled vughs occur in the Early Cambrian of Byilkaoora #1 so that favourable conditions are likely in this province east of the Torrens Hinge Zone. One factor necessary for concentration, viz., solution of large volumes of mixed evaporites is not yet proven for the Cambrian sequence in South Australia.

The dominant evaporite basin of the late Early Cambrian is the Chandler Limestone Basin of the Ordian. I believe this correlates with the late phase of the Ouldburra Formation where marine sabkhas with probable halite evaporites and occasional open sea archaeocyatha reefal mounds are developed. The extent of this evaporite basin in South Australia is not known but its development in the Amadeus Basin is well documented by drilling. Extensive gypsum/anhydrite facies is not known to be associated with the Chandler Limestone evaporitic sequence and the existence of halite alone is a possible negative factor for the Cambrian evaporites as a potential source of sulphur in the absence of diapirism. An alternative accumulation of evaporites by thrust stacks as develop south of the Arunta Block may account for the Winntinna structures and provide favourable structural settings for sulphur.

The significant hole with respect to a potential Early Cambrian evaporite basin in northern South Australia is Amerada McDills #1 located just north of the Territory border. This hole intersected dark brown fractured and pyritic dolomite with anhydritic shale partings and glauconite in the upper part of thick sequence of Lower Cambrian fossiliferous marine sediments. These dolomites are older than the middle Cambrian carbonates, shales and tuffs which are underlain by volcanics in Kalladeina #1 in the central Pedirka Basin in South Australia. McDills #1 would appear to indicate shallow open marine (possibly restricted) conditions comparable to the Todd River Dolomite in the Amadeus Basin. No equivalent of the Chandler Limestone or its evaporitic facies has been intersected in the Pedirka Basin in South Australia. This would tend to downgrade the possibility of extensive salt deposits in the early Cambrian of northern South Australia.

Mount Crispe #1 has a sequence reminiscent of the southern Amadeus Basin with a red-bed clastic sequence commencing with Arumbera Formation equivalent verlain by Pertaoorta Group units comparable to the Tempe, Illara, Deception, Petermann and Goyder Formations. This tends to indicate that a Chandler evaporite-bearing basin may have been limited in areal extent to the Amadeus Basin in the Northern Territory and separated from southern areas by the inferred Andado Ridge north of McDills.

(Note Cootanoorina #1 now has identified Middle to Late Devonian sporites in a shale parting above the anhydritic dolomite sequence which resembles the core cut in the first test hole. Comalco geologists and Gravestock of SADME favour a Cambrian correlation for the lowest units of the hole.

In overview it leaves a wide range of possibilities, from Devonian to Precambrian for the age of the grey siltstone/sandstone cut in the first core and leaves open the age interpretation of the structures on the WINTINNA Sheet area.

The balance of evidence suggests to me that there will be only moderate chance of extensive Cambrian evaporites in the WINTINNA sheet area.

The possibility of look-alike structures to the Undandita sections illustrated in seismic profiles from the western Amadeus Basin is quite real. Ordovician sediments in South Australia have been indentified in Dullingari #1 and Pandieburra #1 in the Cooper Basin and inferred by extrapolation in some 80 wells in the Warburton Basin. The Ordovician is considered to be relatively strongly deformed with load metamorphism and well developed fractures and joints. This may imply disharmonic folding (decollement) with respect to less deformed Cambrian beneath and would add credence to the Undandita model for the WINTINNA Sheet structures.

With respect to the poor record in the northern extension of seismic line 84XAH it may be noted that the Warbuton basin has a significant Middle Cambrian or older volcanic suite as exemplified in Kalladeina #1 where felsic volcanics underlie an extensive fossiliferous dolomitic and shaly sequence. These volcanics may be extensively developed and result in non stratified record.

A trend as significant as the Moorilyanna Graben may well host a significant early Palaeozoic (?Mid Cambrian) igneous suite. Palaeozoic granite occurs in the Peak and Denison Ranges and also in drill holes in the Cooper Basin so that metamorphosed Palaeozoic is possible. On the other hand evidence of an unmetamorphosed sequence typical of the Amadeus Basin in Mount Crispe #1 strongly suggests that this poor seismic record indicates shallow Older Precambrian basement.

In summary I recommend the following for sulphur search:

Complete a further test of the Wintinna Structures

Examine detail of other inferred diapiric structures in the Arckaringa Sub-basin (Gerdes SADME).

Field check the circumstances of the Flinders Ranges Cambrian evaporite units for bedded sulphur deposits

Develop a program to test known gypsum diapirs and fault complexes of the Undandita type in the western Amadeus Basin.

Assess the possibility of sulphur associated with weathered caprock of the Adelaidean diapirs of the Flinders Ranges.

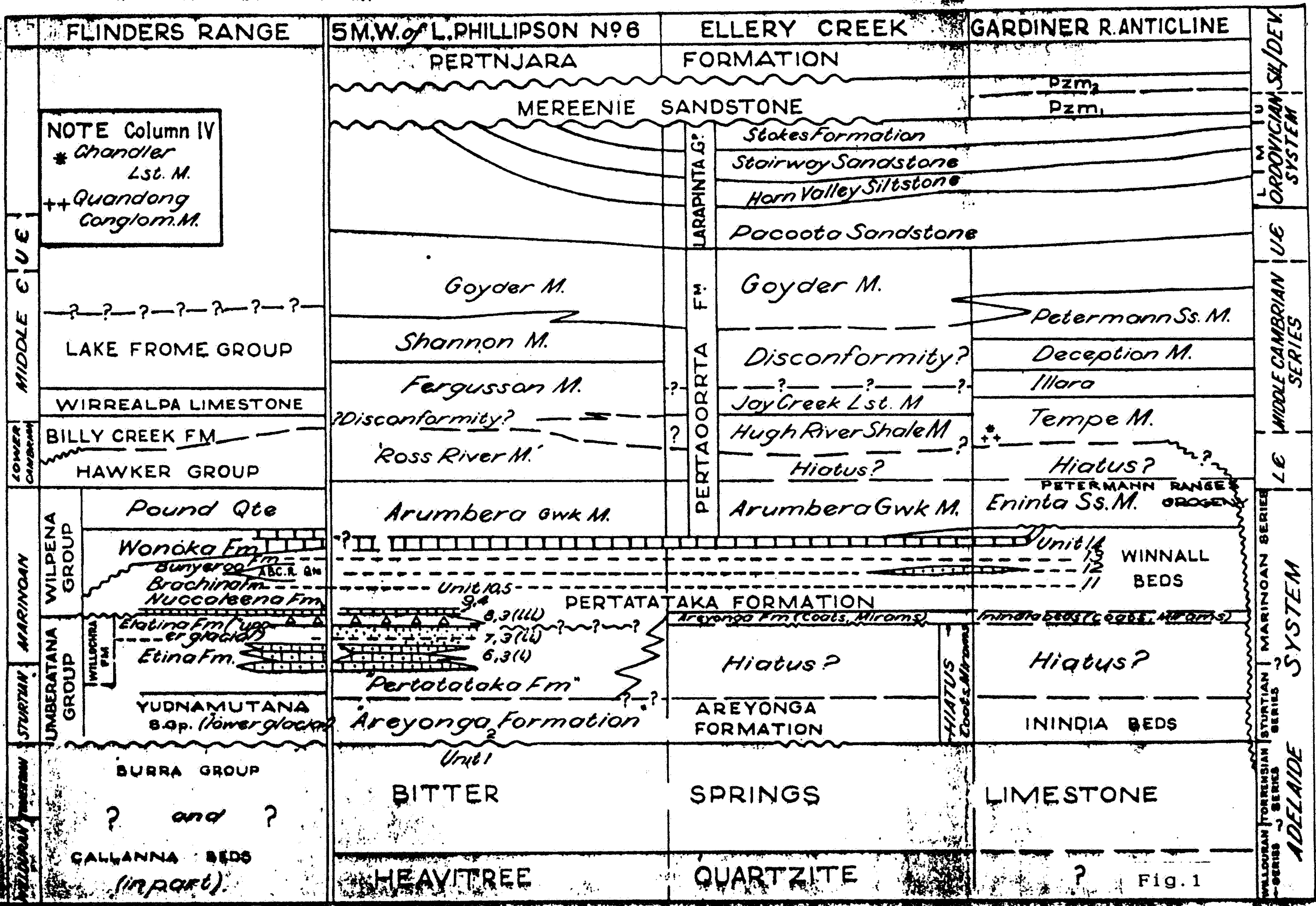
Information on Amadeus Basin modified slightly from Fig 4 BMR record 1964/35

To accompany report by R Dalgarno

ROCK RELATIONSHIP DIAGRAM OF AMADEUS BASIN AND ADELAIDE GEOSYNCLINE

S3942

Fig. 1



023

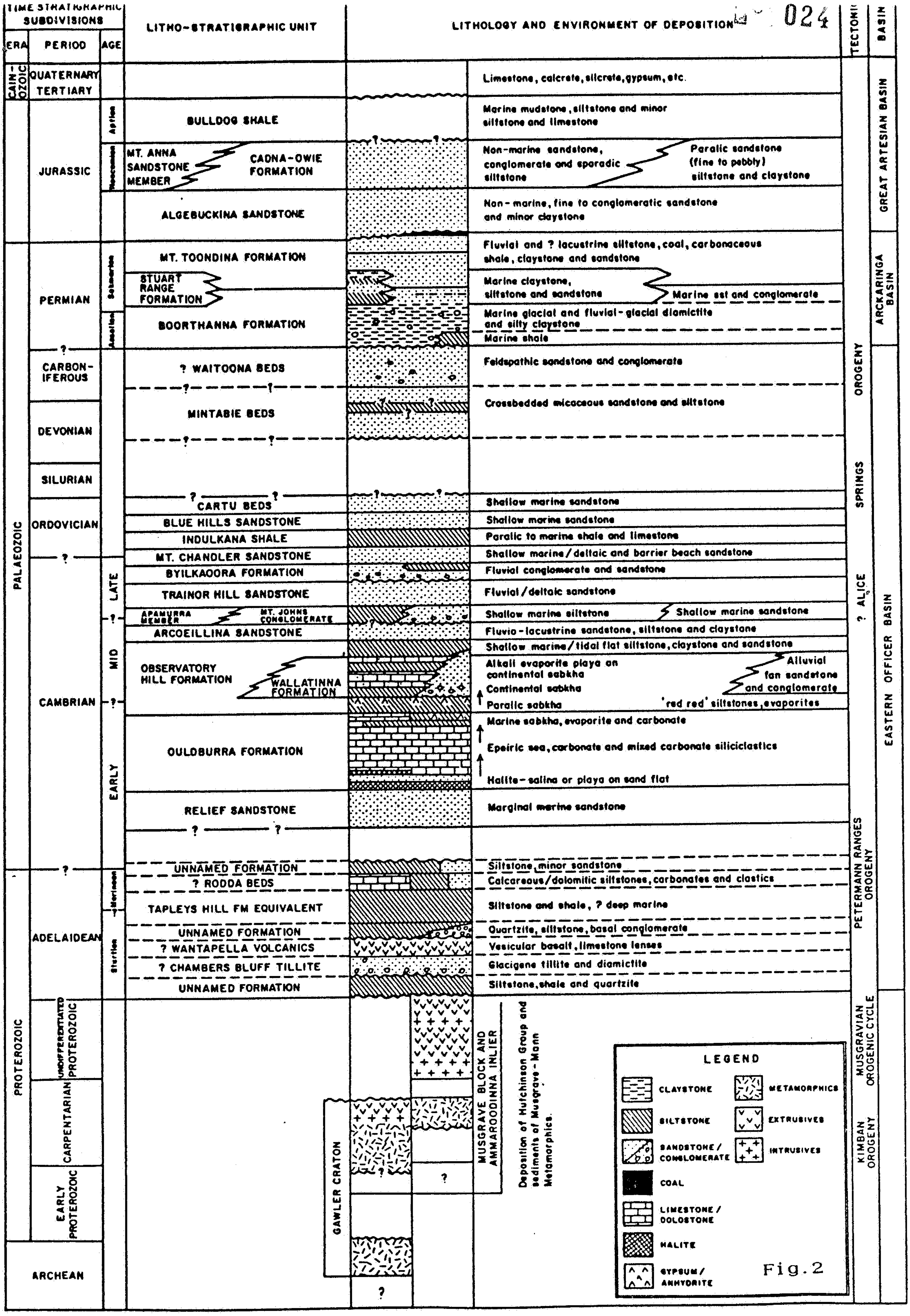


FIGURE 2: COMPOSITE STRATIGRAPHY OF THE NORTHEASTERN OFFICER BASIN.
NOT TO SCALE. (after Benbow (1982); Hibburt (1984); Krieg (1973); and Pitt *et al.* (1980)).

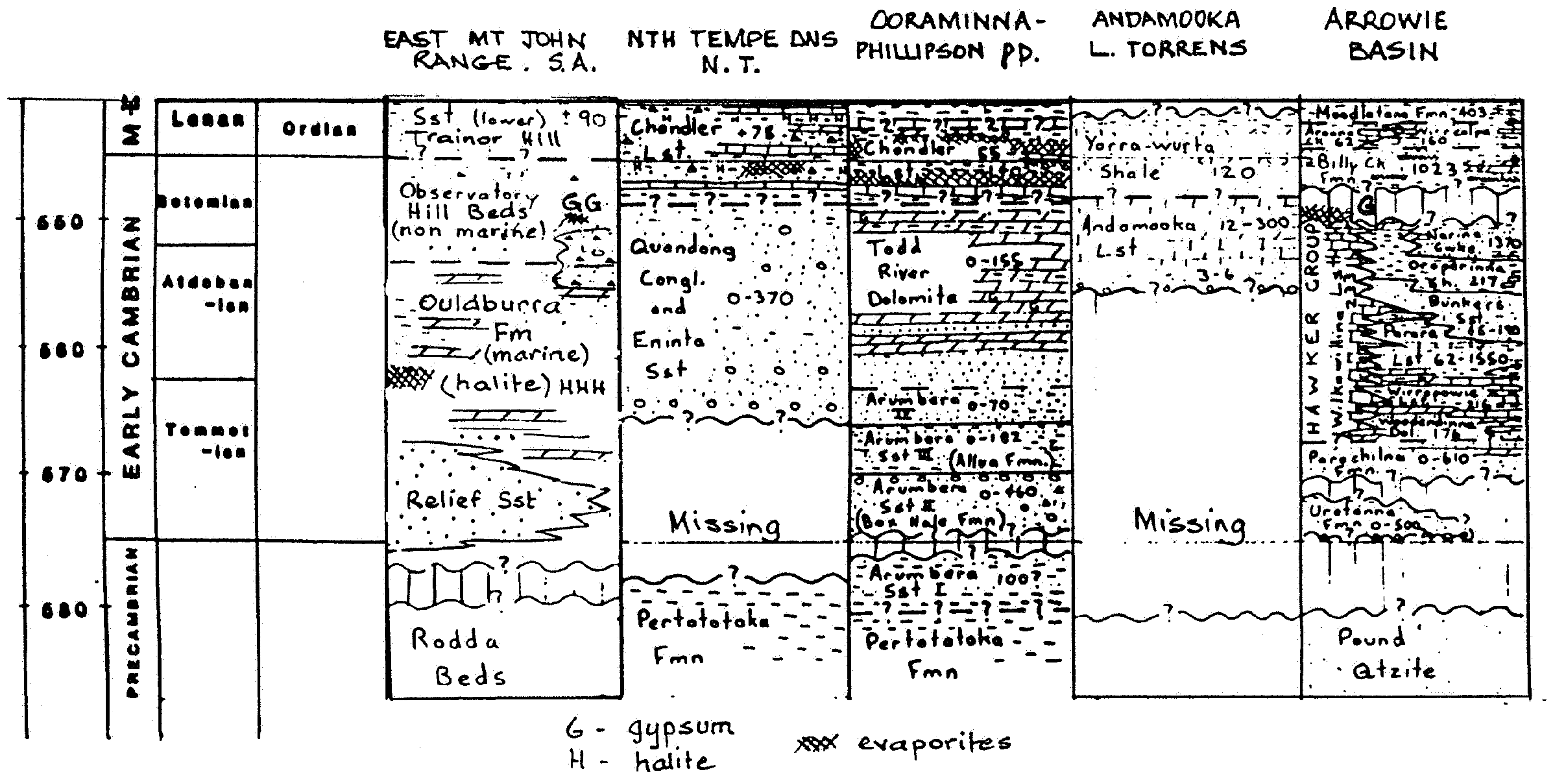


Fig.3 CORRELATION CHART FOR THE EARLY CAMBRIAN OF CENTRAL AND SOUTH AUSTRALIA

DATA SOURCES

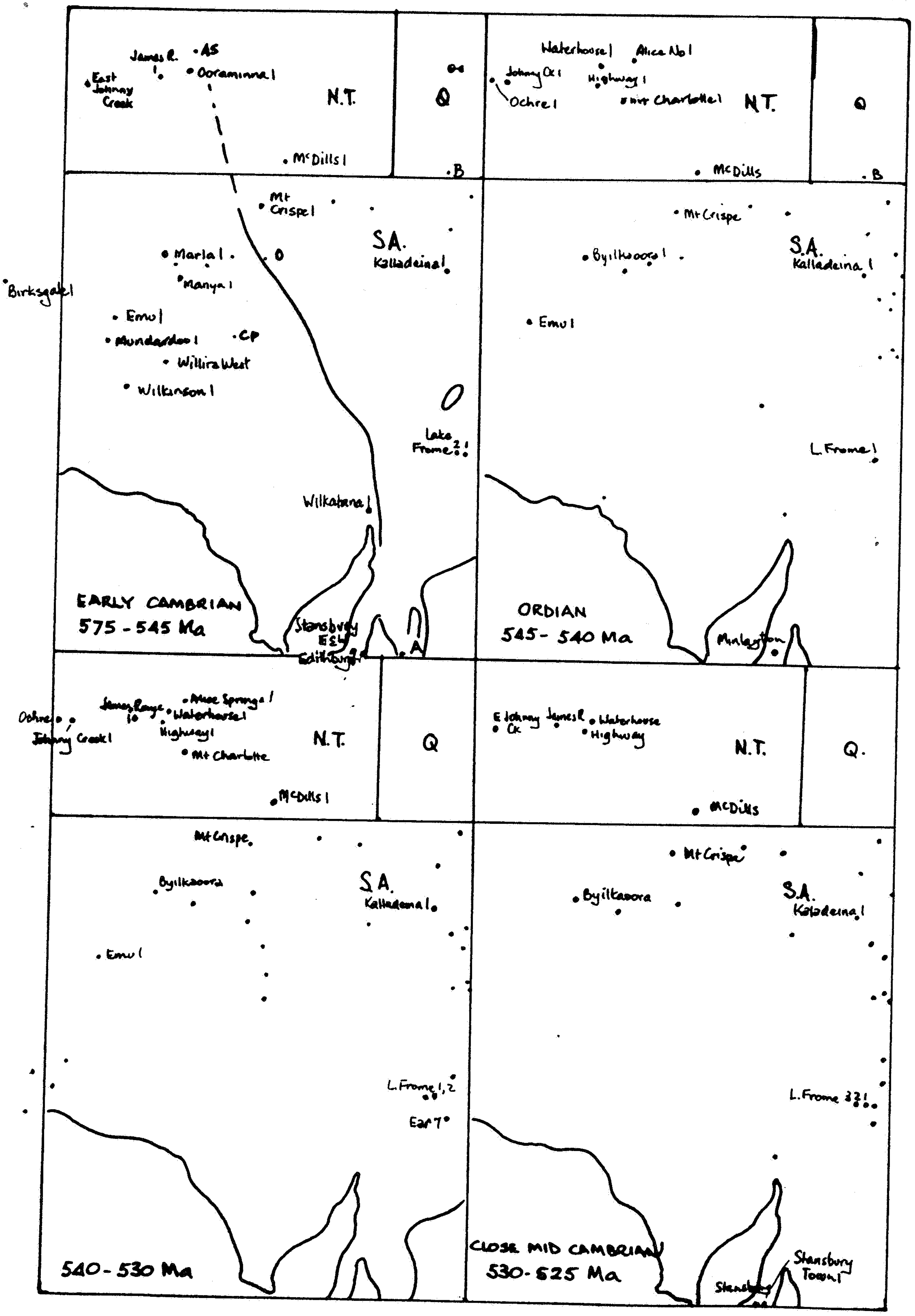


Fig.4

DATA SOURCES

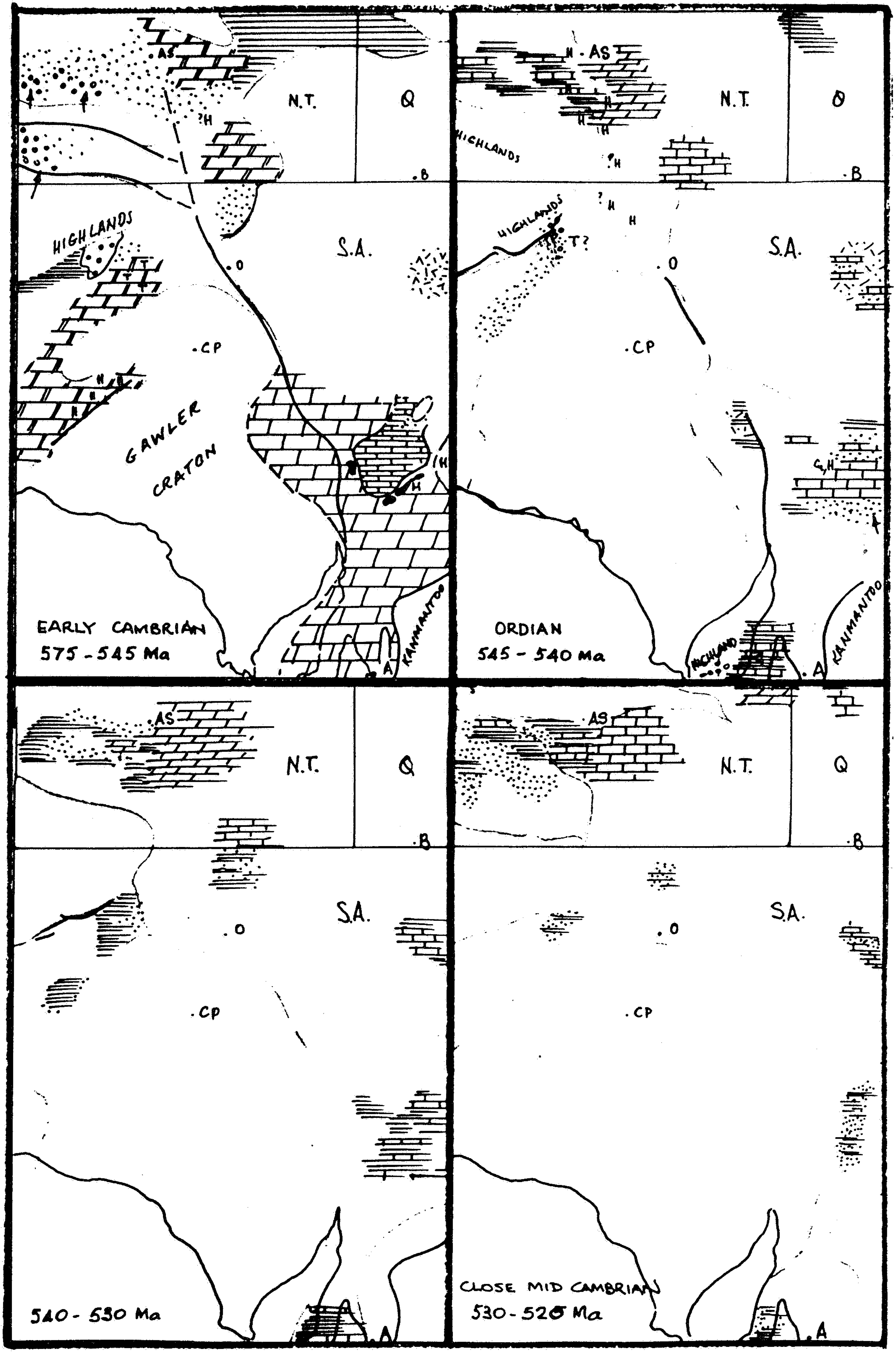


Fig 5

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

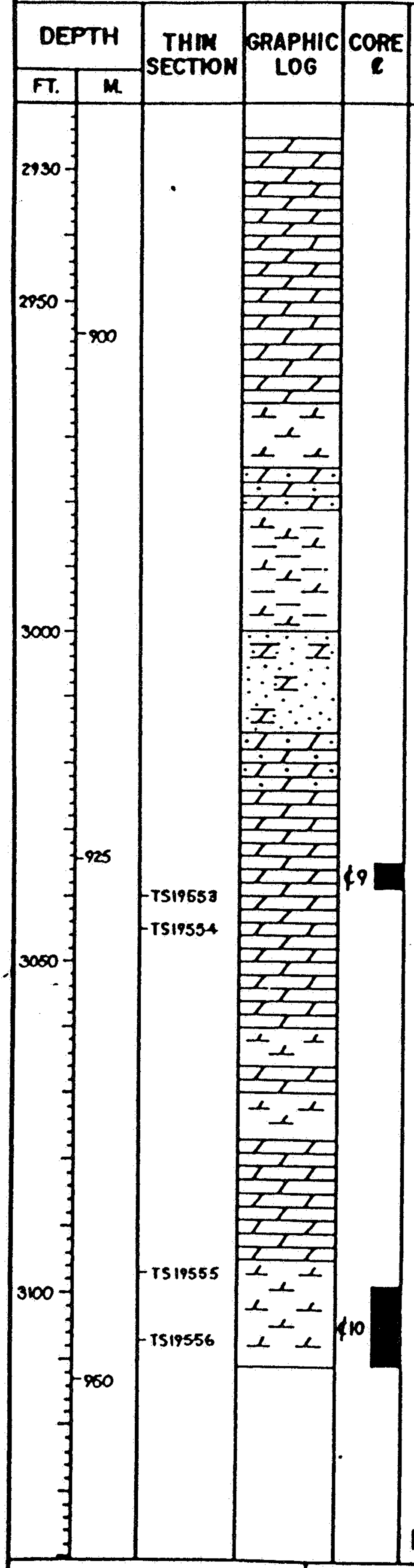
PETROLEUM WELL LOG

028

WELL NAME COOTANOORINA 1

UNIT NO. 5941000SW00004 ENVELOPE NO. DM1510/67 LAT 28°00'30"S LONG 135°20'00"E

K.B. 108·2m T.D. 948m INTERVAL: TOP 892m BOTTOM 948m DRILLED 1968



LITHOLOG

DOLOMITE : Pale grey, sandy, interbedded with shale, green grey ; ANHYDRITE, pink ; minor grey, plastic SHALE.

ANHYDRITIC

ANHYDRITIC

SANDSTONE : Dolomitic, white, fine grained.

DOLOMITE : Pale grey, sandy, interbedded with dolomitic SHALE : Green grey, ANHYDRITE, pink.

ANHYDRITIC

ANHYDRITIC

ANHYDRITIC

For legend of graphic log see plan

PALAEONTOLOGY

MIDDLE TO
LATE
DEVONIAN

GEMINOSPORA LEMURATA
GRANULOSPORITES
cf G. PHILLIPSI
CONVOLUTISPORA
FROMENSIS
EMPHANISPORITES sp.
RETUSOTRILETES sp.
RETICULATISPORITES
TEXTILUS
?DIAPHANOSPORA sp.
?LEIOZONOTRILETES

Compiled C.G.G.	Traced M.F.L. Date 1 · 12 · 82	Checked C.D.O.	Sheet 1 of 1 Plan No.

Fig. 6

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

PETROLEUM WELL LOG

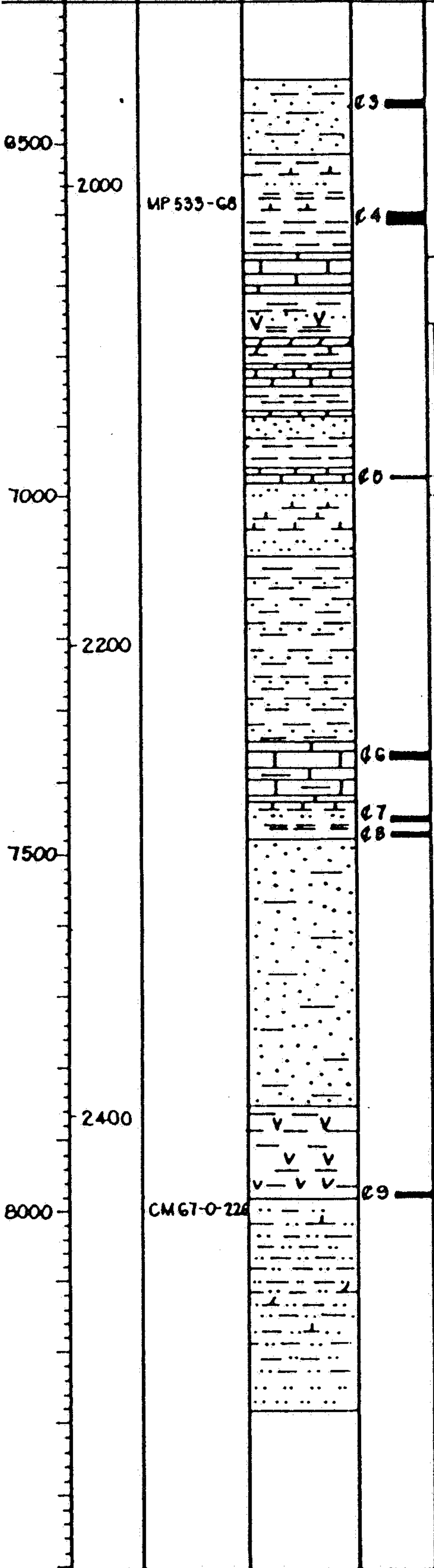
029

WELL NAME KALLADEINA 1

UNIT NO. 67420005W00002 ENVELOPE NO. 813 LAT 27°39'29"S LONG 139°24'00"E

K.B. 32·45m T.D. 3764m INTERVAL: TOP 1957m BOTTOM 3761m DRILLED 1967

DEPTH FT. / M.	THIN SECTION	GRAPHIC LOG	CORE ¢	LITHOLOG	PALAEONTOLOGY



SANDSTONE: buff, grey-green, very fine grained, micaceous, siliceous, dolomitic, kaolinitic. Dip 5°-9°.

Interbedded SILTSTONE, SHALE, limestone and minor sandstone. Siltstone, micaceous, calcareous, glauconitic shale: micaceous, siliceous, calcareous green limestone: sparry, tuffaceous, oolitic, vein calcareous.

SANDSTONE: grey, very fine grained, subangular to subrounded, quartzitic, siliceous matrix, micaceous, glauconitic.

LIMESTONE: buff, grey, tuffaceous.

SILTSTONE, SANDSTONE, SHALE: Siltstone: micaceous, calcareous, siliceous. Sandstone: very fine grained, subangular siliceous matrix, calcareous. Shale: micaceous, calcareous.

DOLOMITE: micritic. LIMESTONE: micritic, tuffaceous, dolomitic, oolitic.

DOLOMITE: dip indet.

LIMESTONE: sparry, oolitic, siliceous, dolomitic. SHALE: micaceous, calcareous, dolomitic. SANDSTONE: grey, green, very fine and fine grained, dolomitic.

SILTSTONE: siliceous, calcareous, quartzitic, micaceous. SHALE and SANDSTONE.

LIMESTONE: grey, brown, micritic-sparry, oolitic, dolomitic, siliceous, with minor shale.

LIMESTONE as above. SANDSTONE: very fine and fine grained glauconitic, siliceous, calcareous. SILTSTONE calcareous, micaceous.

SANDSTONE grey, buff, very fine - fine grained, siliceous matrix, calcareous, micaceous.

SHALE and SILTSTONE: siliceous, micaceous, carbonaceous. Dip horizontal.

CM67-0-226 (Quartz 75%, chlorite 10%, musc. 10%, graphite 5%)

Interbedded TUFF, SHALE, SILTSTONE: Tuff, buff welded. Shale multicoloured, micaceous, chloritic, siliceous.

SILTSTONE: micaceous, calcareous, siliceous.

SHALE: dark grey, micaceous, siliceous, calcareous, dolomitic.

SANDSTONE: red, brown, very fine to fine grain, quartzitic, siliceous, calcareous.

TUFF, LIMESTONE: micrite, sparite, dolomitic

DOLOMITE: micritic. Dip horizontal.

For legend of graphic log see plan 82-644

HYOLITHES
PHOSPHATIC BRACHIOPODS
RICHARDSONELLIDAE
AGAPHID TRILOBITE

PHOSPHATIC BRACHIOPODS

PHOSPHATIC BRACHIOPODS

?HYDROIDS

PAYNTONIAN - TREMP.

MINDYALLAN ?

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Sheet 1 of 3
Plan No.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

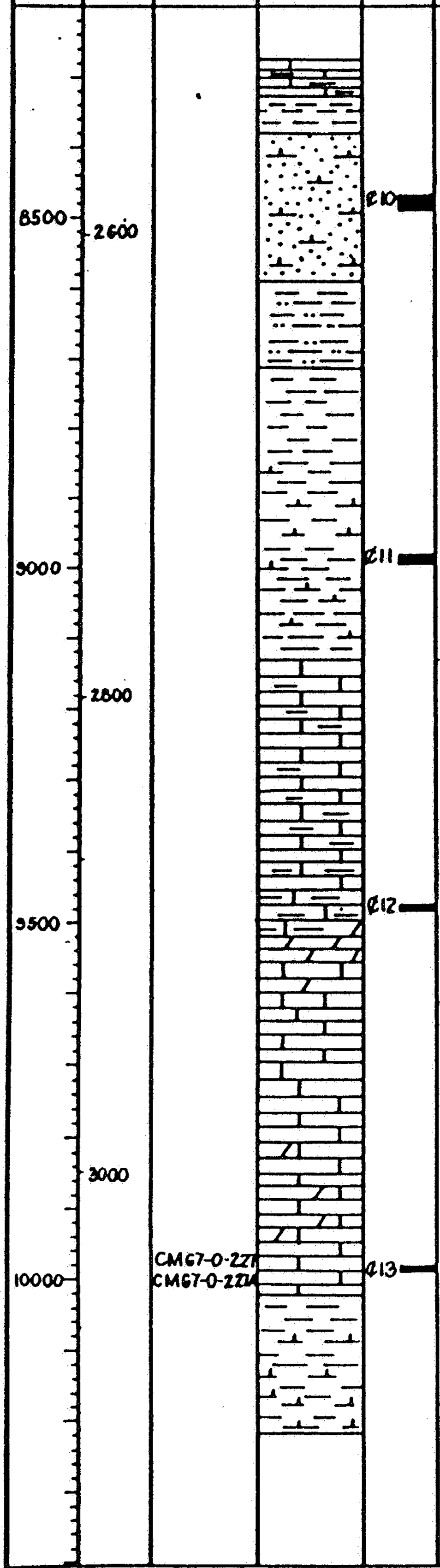
PETROLEUM WELL LOG

WELL NAME KALLADEINA 1

UNIT NO. 67420005W00002 ENVELOPE NO. 813 LAT 27°39'29"6 LONG 139°24'00"E

K.B. 32·45m T.D. 3764m INTERVAL: TOP 1957m BOTTOM 3764m DRILLED 1967

DEPTH FT.	DEPTH M.	THIN SECTION	GRAPHIC LOG	CORE ¢	LITHOLOG	PALAEONTOLOGY



LIMESTONE: sparite, micrite, dolomitic.
SHALE: calcareous, micaceous.
SHALE: siltstone.
SANDSTONE: very fine to fine grained, siliceous matrix, calcareous, micaceous.
LIMESTONE micrite-sparite. Dip horizontal.

SHALE: calcareous, micaceous.
LIMESTONE: dark grey, micritic.

Dip horizontal

LIMESTONE: grey, green, multicoloured, micritic—microsparry, dolomitic.
SHALE: green, brown, calcareous, micaceous minor.
SILTSTONE

LIMESTONE: white, micritic, silty, dolomitic, shaley.
Dolomitic LIMESTONE. Dip horizontal.

LIMESTONE: micritic, pyritic, dolomitic.

LIMESTONE: white to dark grey, micritic, pyritic.
Dolomitic LIMESTONE: grey, micaceous, pyritic. SHALE: calcareous, pyritic.
CM 67-0-227 (Calcite 50%, quartz 40%, musc. 5%, graphite 3%, accessaries 2%)
Dip 0°-5°
SHALE: medium grey, micaceous, pyritic, calcareous.
LIMESTONE: micritic.

For legend of graphic log see plan 82-644

MINDYALLAN ?

PHOSPHATIC BRACHIOPODS
HOMAGNOSTUS

HYDROIDS
PSEUDAGNOSTUS
LITAGNOSTUS
ERIXANIUM ?

MINDYALLAN

MICROMITRA
ACROTRETA
LINGULELLA
PERONOPSIS
PSEUDAGNOSTUS
CLAVAGNOSTUS
CHANCELLORIA

ACROTRETA
ACROTHELE
LINGULELLA
DOLICHOMETOPID ?
SPONGE SPICULES.

Compiled C.C.C.
Traced S.R.
Date 2/12/82
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C.D.O.
Sheet 2 of 3
Plan No.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

PETROLEUM WELL LOG

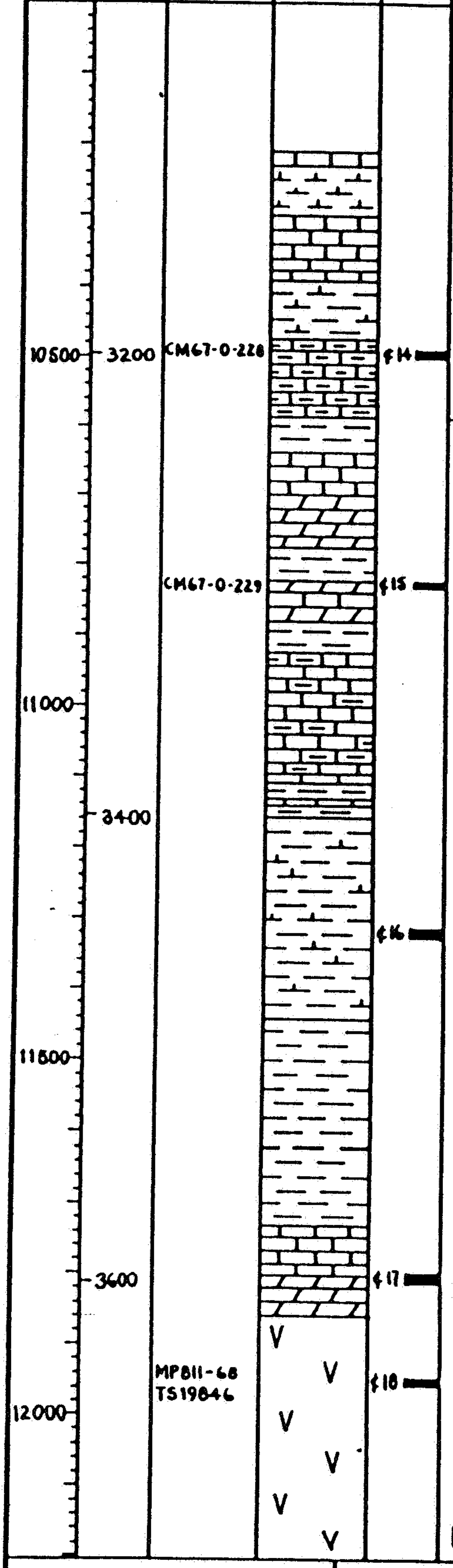
031

WELL NAME KALLADEINA-1

UNIT NO. 67420008W00002 ENVELOPE NO. 813 LAT 27°39'29" S LONG 139°24'00" E

K.B. 32·45 m T.D. 3764 m INTERVAL: TOP 1957 m BOTTOM 3764 m DRILLED 1967

DEPTH FT.	DEPTH M.	THIN SECTION	GRAPHIC LOG	CORE ¢	LITHOLOG	PALAEONTOLOGY



LIMESTONE: White, micritic.
SHALE: With interbedded limestone.

LIMESTONE: Micritic, microsparite, pyritic, slightly argillaceous.

SHALE: Light-dark grey, micaceous, with minor siltstone and limestone.
CM67-0-228, (calcite 58%, quartz 20%, muscovite 10%, accessories 2%). Dip 5°, slumps, microfolds.
SHALE, LIMESTONE, SILTSTONE.
SHALE: Micaceous, pyritic
LIMESTONE, SHALE and siltstone. Trace sandstone
DOLOMITE and SHALE

SHALE
DOLOMITE and LIMESTONE micritic, white to dark grey.
SHALE

LIMESTONE: White to medium grey, micritic, pyritic, quartzitic. Minor shale.

LIMESTONE: With interbeds of SHALE, pyritic, micritic.

SHALE: With minor LIMESTONE, dolomitic.

SHALE: Pyritic, dolomitic

LIMESTONE and minor SHALE. Dip 7-10°
Limestone micritic, quartzose, pyritic.
DOLOMITE: Micritic, with conglomeratic pebbles of volcanic rock.

VOLCANICS: Red-brown, weathered, with glass shards. Green matrix. Tuff, rhyolite, rhyodacite. Dip ?

TOTAL DEPTH 3764m (12,341ft)

For legend of graphic log see plan 82-644

ANOMOCARELLA
HYDROIDS
BRACHIOPODS
ARCHAEOSTRACA
HYOLITHES

BARREN

HYOLITHES
NEPEIDAE
XYSTRIDURA
DIPLAGNOSTUS
PERONOPSIS

FLORAN

BICONULITES

Compiled G.G.G.
Traced M.F.L.
Date 8 · 1 · 83
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C.D.O.
Sheet 3 of 3
Plan No.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

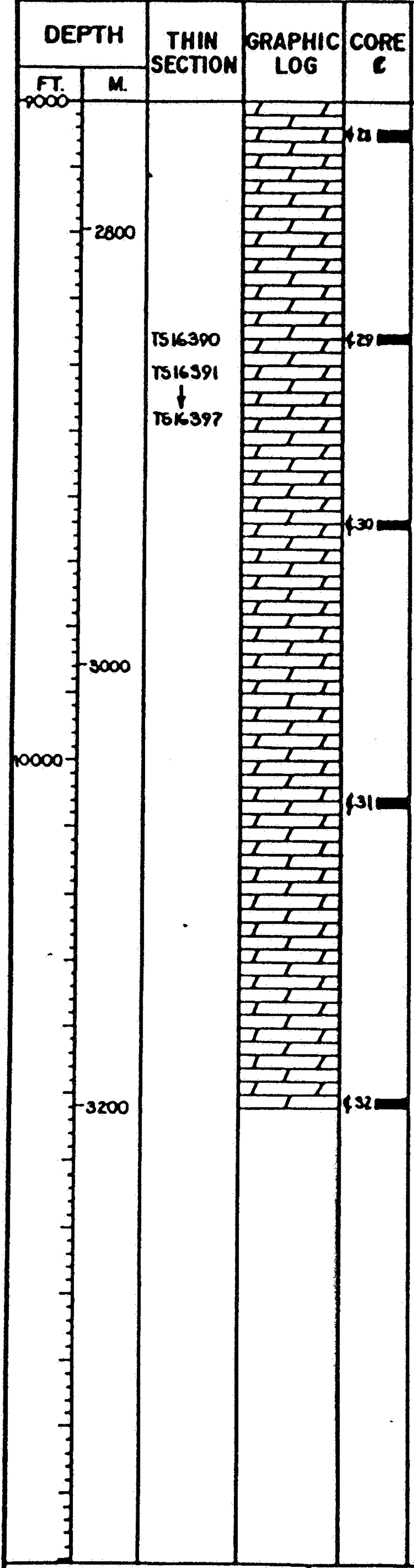
PETROLEUM WELL LOG

.032

WELL NAME McDILLS 1

UNIT NO. 6046000PW00001 ENVELOPE NO. 673 LAT 25° 43' 50" S LONG 126° 47' 25" E

K.B. .... T.D. 3205m INTERVAL: TOP. 2750.5m BOTTOM 3205m DRILLED 1965



LITHOLOG	PALAEONTOLOGY
DOLOMITE: Dark grey, micro crystalline, dense argillaceous, Interbeds of limestone, dark shale partings, anhydrite in fractures, upper part glauconitic. Dip 20° - 30°	
DOLOMITE: Dark brown, dark grey, microcrystalline, dense, argillaceous, calcareous, anhydrite, glauconite, pyrite. Dip 30°	NO FOSSILS
LIMESTONE: Light to dark grey, microcrystalline, dense, with sandy lenses. Dark lenses, argillaceous, pyrite and anhydrite. Fossiliferous. Dip 20°, with shale partings.	'MICROMITRA' ETHERIDGEI 'NISUSIA' COMPTA
DOLOMITE: Dark grey, finely crystalline, hard, tight, with thin black shale laminae. Dip 10° relative to core.	
DOLOMITE: Grey, microcrystalline, micaceous	NO FOSSILS

For legend of graphic log see plan 82-644

Compiled C.G.G. ....

Traced M.F.L. ....
Date 8 : 11 : 82

Checked ....
C.D.O. ....

Sheet 1 of 1
Plan No.

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

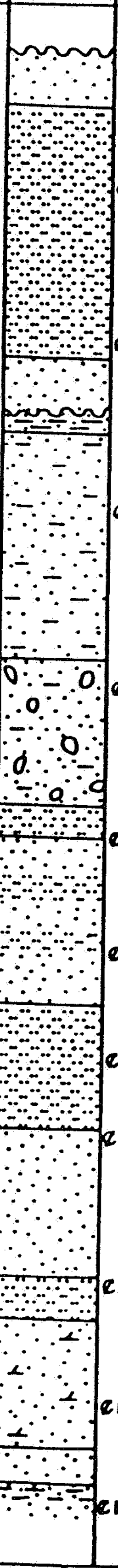
PETROLEUM WELL LOG

033

WELL NAME MOUNT CRISPE 1

UNIT NO. 5945000PW00008 ENVELOPE NO. 626 LAT 26°26'43"S LONG 135°22'36"E

K.B 131·4m T.D. 1721·2m INTERVAL: TOP 465·7m BOTTOM 1721·2m DRILLED 1966



DEPTH FT.	DEPTH M.	THIN SECTION	CORE €	LITHOLOG
	500		€2	Stairway sandstone equivalent. QUARTZITE-grey, fine-grained, slightly pyritic, with green clay pellets, poorly bedded. Siltstone and quartzite, interbedded.
				SILTSTONE: dark grey, fossiliferous.
2000			€3	QUARTZITE: grey, pink, green, fine grained.
			€4	SANDSTONE: white, fine grained, subrounded.
				SANDSTONE: dark grey, pink, pale grey, white, quartzitic with shaley siltstone interbeds
3000			€5	SANDSTONE: red-brown, very fine grained, silty, and shaley, grading to siltstone in places, with interbeds of grey, pink, and green quartzitic sandstone. Non poroue.
	1000	AK757-760	€6	SANDSTONE: pale grey, white, with irregular green patches, fine grained, poorly sorted, coarse rounded quartz scattered throughout, rare thin siltstone beds.
		AK761-764	€7	SILTSTONE: sandy, red-brown, with scattered quartz grains. SANDSTONE: fine grained, poorly sorted, some large rounded grains, interbeds of red silt increasing down hole.
4000		AK765-768	€8	
		AK769-773	€9	SILTSTONE: red brown, with scattered coarse rounded quartz grains.
		AK774-776	€10	SANDSTONE: white, pale grey, fine-medium grained, poorly sorted, occaesional coarse, with minor red-brown siltstone beds.
5000	1500	AK777-784	€11	SILTSTONE and SANDSTONE: red brown, medium grained sandstone with sandy siltstone. SANDSTONE: grey, very fine to fine grained, dolomitic, minor siltstone interbeds.
			€12	SANDSTONE: red-brown, fine-medium grained with scattered, coarse, rounded, quartz grains.
		AK785-789 TS17734- TS17736	€13	SANDSTONE: red-brown, poorly sorted, argillaceous, with green patches.

For legend of graphic log see plan 82-644

PALAEONTOLOGY

ACRITARCHS
LEIOSPHAERIDS
?ORTHOCERATID

STAIRWAY SANDSTONE

PERTAOORTA FORMATION EQUIVALENT

PETERMANN AND COYDER MEMBER EQUIVALENT

DECEPTION MEMBER EQUIVALENT

ILLARA EQ.

TEMPE EQ.

ARUMBERA FORMATION EQUIVALENT

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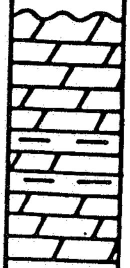
DEPARTMENT OF MINES AND ENERGY—SOUTH AUSTRALIA

PETROLEUM WELL LOG

ELL NAME. MOUNT WILLOUGHBY

IIT NO. 5742000SW00031 .... ENVELOPE NO. DM 612/70 ..... LAT 27°39'40"S .. LONG 134°16'39"E ...

3.. 242 m ... T.D. 639·8 m ... INTERVAL: TOP 623·6 m ... BOTTOM 639·8 m ... DRILLED 1970 ......

DEPTH		THIN SECTION	GRAPHIC LOG	CORE €	LITHOLOG	PALAEONTOLOGY	
T.	M.						
	620 630 640				DOLOMITE: ① pale grey, fine to medium crystallised, ② green-grey dolomicrite. With minor shale and dolomicrite; with minor shale and dolomite sandstone. Increasingly more uniform with depth. Algal stromatolites and concretions.	COOTANOORINA FORMATION	

For legend of graphic log see plan 82-644

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Sheet .. 1 .. of .. 1 ......

Plan No.

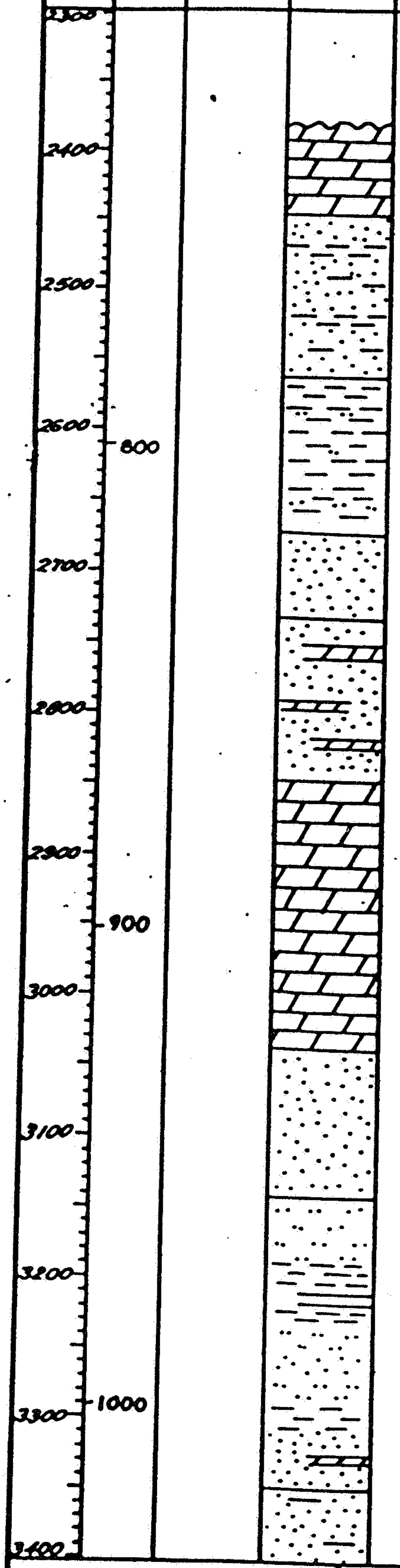
DEPARTMENT OF MINES AND ENERGY—SOUTH AUSTRALIA

PETROLEUM WELL LOG

035

WELL NAME WEEDINA -1
UNIT NO. 6041000SW00038 ENVELOPE NO. 1374 LAT 28°28'31"S LONG 135°39'20"E
K.B. 100·3m T.D. 1624·2m INTERVAL: TOP 726·3m BOTTOM 1624·2m DRILLED 1970

DEPTH FT.	DEPTH M.	THIN SECTION	GRAPHIC LOG	CORE ℭ	LITHOLOG	PALAEONTOLOGY



DOLOMITE: Red/brown with abundant quartz grains grades to very fine grained-Pyritic sandstone: Siliceous.

SANDSTONE: Red/brown, grey, grey/green, very fine to fine grained, silicified, with **shale** and siltstone interbeds: blue/grey, red/brown, micaceous, pyritic, with abundant unsorted quartz grains throughout.

SHALE: grey, blue/grey, red dolomitic, micaceous with scattered quartz grains, minor interbeds of siltstone.

SANDSTONE: pale grey, very fine to fine-grained, silicified, with interbedded **Siltstone**: grey/green, pyritic, micaceous; **SHALE** micaceous, pyritic, traces of carbonaceous material.

SANDSTONE: with interbedded dolomite and minor siltstone.

DOLOMITE: pale grey, grey/green, red/brown grey/brown, microcrystalline, argillaceous, silty, sandy, minor pyrite, carbonaceous, green chloritic fragments, with **SHALE** **SILTSTONE**, traces of Anhydrite.

SANDSTONE: grey/green, red/brown, very fine-grained, silty, argillaceous, dolomitic, pyritic, miclomicaceous.

SILTSTONE; **SANDSTONE**, **SHALE**, minor dolomite. All grey/green, essentially as above for each lithology.

SANDSTONE: light grey, grey/green, very fine to fine grained. Subangular/rounded, clear quartz, dolomitic, pyritic, carbonaceous.

For legend of graphic log see plan 82-644

kalladeina
~~CALLADEENA~~ FORMATION (CAMBRIAN)

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Date
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Sheet 1 of 3
Plan No.

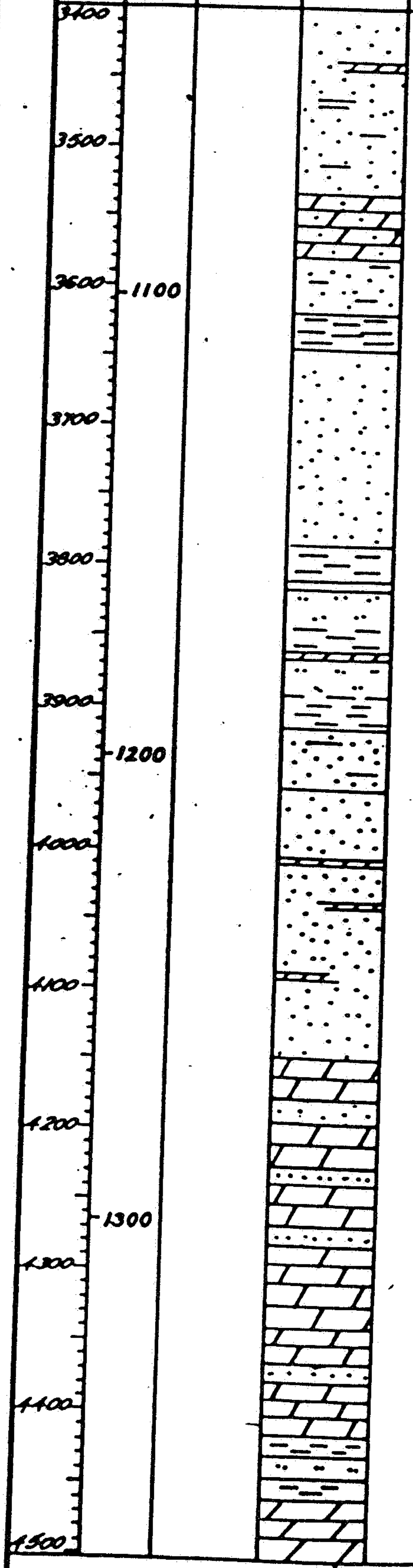
DEPARTMENT OF MINES AND ENERGY—SOUTH AUSTRALIA

PETROLEUM WELL LOG

036

WELL NAME WEEDINA -1
UNIT NO. 6041000SW00038 ENVELOPE NO. 1374 LAT 28°28'31"S LONG 135°39'20"E
K.B. 100·3 m T.D. 1624·2 m INTERVAL: TOP 726·3 m BOTTOM 1624·2 m DRILLED 1970

DEPTH (FT. | M.) | THIN SECTION | GRAPHIC LOG | CORE € | LITHOLOG | PALAEONTOLOGY



with minor interbedded dolomite. brown, microcrystalline, finely crystalline, pyrite with quartz grains— with traces SILTSTONE and SHALE.

DOLOMITE: brown, argillaceous, very pyritic minor SANDSTONE.

SANDSTONE: grey/green, very fine grained, silicified, – minor SILTSTONE.

SHALE: dark grey, dolomitic, micaceous, silty, pyritic.

SANDSTONE and minor SILTSTONE.

SHALE, dolomite, siltstone, interbedded. Lithologies as above.

SANDSTONE: grey/green, very fine to fine grained, angular-subangular, clear quartz, dolomitic, pyritic, minor SHALE.

SANDSTONE: white, grey/green, red, very fine to fine grained, occasionally medium to coarse grained, angular-sub-rounded quartz; minor DOLOMITE, pale brown, microcrystalline, quartz grains, pyritic, minor shale.

DOLOMITE, pale grey, tan, microcrystalline, abundant clear quartz grains, pyritic, carbonaceous material: with interbedded SANDSTONE: white, pale grey:— fine to medium grained, of angular to subrounded.

DOLOMITE, interbedded with SANDSTONE
DOLOMITE white, pale grey, brown, microcrystalline, abundant quartz grains, grades to SANDSTONE with minor SILTSTONE and SHALE, traces of ANHYDRITE.

For legend of graphic log see plan 82-644

CALLADEENA FORMATION (CAMBRIAN)

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Traced D.W.W.
Date
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C.D.O.
Sheet 2 of 3
Plan No.

DEPARTMENT OF MINES AND ENERGY—SOUTH AUSTRALIA

PETROLEUM WELL LOG

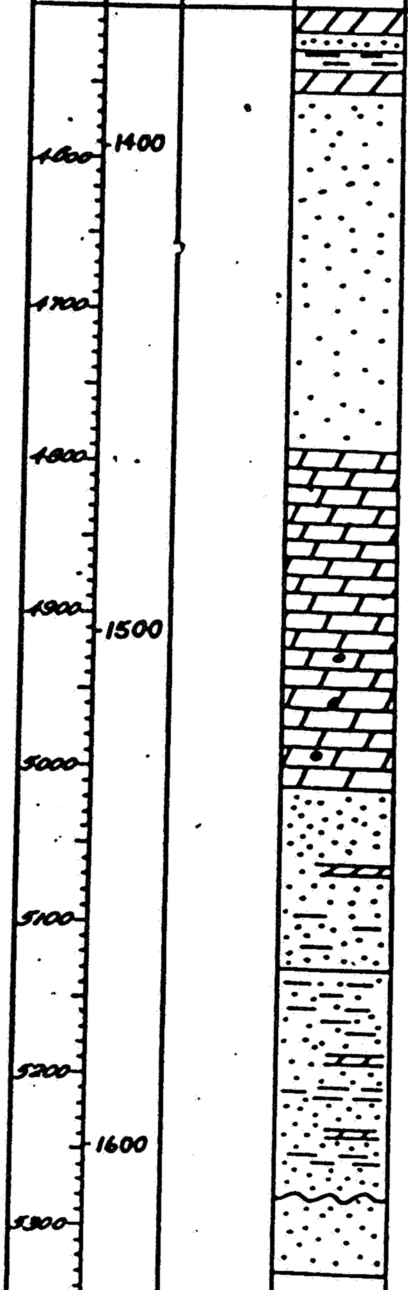
037

WELL NAME WEEDINA - 1.

UNIT NO. 6041000SW00038 ENVELOPE NO. 1374 LAT 28°26'31"S LONG 135°39'20"E

K.B. 100·3m T.D. 1624·2m INTERVAL: TOP 726·3m BOTTOM 1624·2m DRILLED 1970

DEPTH FT.	DEPTH M.	THIN SECTION	GRAPHIC LOG	CORE €	LITHOLOG	PALAEONTOLOGY



SANDSTONE, pale grey, brown, very fine to fine grained, occasionally medium to coarse grained, dolomitic; DOLOMITE, white/grey, tan, mottled, microcrystalline, pelletal, with quartz grains. Chert traces of ANHYDRITE, minor SILTSTONE and SHALE

DOLOMITE, pale grey, pale brown, microcrystalline, scattered clear quartz grains, grading to SANDSTONE, dolomitic, pyritic; SILTSTONE, grey, dolomitic, siliceous, SHALE, micaceous, with quartz grains; traces of ANHYDRITE.

DOLOMITE, medium to dark brown, microcrystalline, oolitic, with medium to coarse quartz grains, pyritic, anhydritic.

SANDSTONE, pale to medium brown, very fine to fine grained, grading to siltstone, with quartz grains, dolomitic (medium-dark brown, oolitic). Traces of SHALE and SILTSTONE.

SHALE, medium to dark grey, red, green, micaceous, abundant pyrite, dolomitic, with interbedded SANDSTONE, pale to medium brown.

QUARTZITE, pale grey, very fine grained, micaceous, argillaceous with carbonaceous grains

CALLADEENA FM. (CAMBRIAN)

For legend of graphic log see plan 82-644

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Sheet 3 of 3
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TECTONIC SKETCH

WESTERN AMADEUS BASIN SHOWING EXPOSED GYPSUM CORES IN DIAPIRIC STRUCTURES.

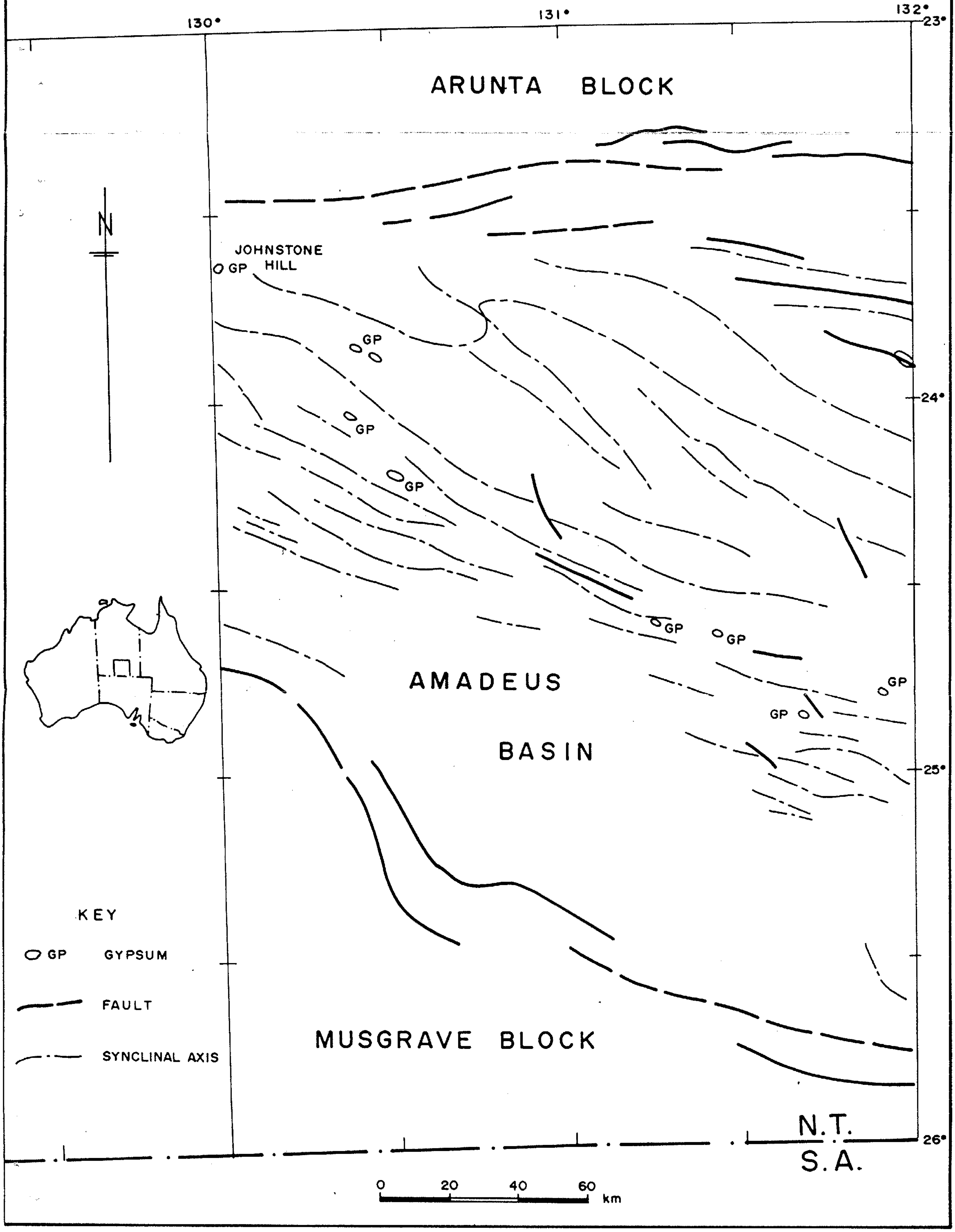


Fig. 7

STRUCTURAL INTERPRETATION OF LINE P81-U4, AMADEUS BASIN, NORTHERN TERRITORY, AUSTRALIA

R. J. Schroder
Pancontinental Petroleum Limited

REGIONAL SETTING

The Amadeus Basin is an intracratonic basin of some 50,000 sq km (19,305 sq mi) at the geographic center of Australia. Line P81-U4 is a dip line over a faulted anticlinal feature close to the McDonnell ranges, which fringe the northern margin of the basin. Hydrocarbons were discovered within the basin at Mereenie oil field, Palm Valley gas field, Ooraminna-1, and Dingo-1.

Line P81-U4 is located 50 km (31 mi) northeast of the Mereenie oil field. The reservoir rock at Mereenie is the Pacoota Sandstone. The locality diagram shows the seismic line with respect to mapped outcrop.

GEOLOGIC SETTING

Stratigraphic section in the Amadeus basin is of late Proterozoic to Early Paleozoic age. The Bitter Springs Formation to Base Mereenie Sandstone is an interbedded paralic and deep marine sequence containing clastics, evaporites, carbonates, and glacigene sediments. Formations that have a major bearing on the structural style are the evaporitic Bitter Springs and Chandler formations (Wells et al, 1970). Evidence for Bitter Springs diapirism is documented at Stokes Pass Diapir (McNaughton et al, 1968) with which the Undandita anticlinal anomaly is on trend.

STRUCTURAL STYLE

From outcrop mapping close to Line P81-U4 there is evidence of: (1) anticlinal development on the footwall of an overthrust fault; and (2) thinning of the middle-Late Ordovician section on the hanging wall of the fault. Line P81-U4 has been tied to outcrop. Nearest well control, with which the seismic can be tied is Tyler-1 some 50 km (31 mi) to the east.

Line P81-U4 shows a thinning sequence between the Mereenie Sandstone and Pacoota Sandstone, which onlaps the latter. This thinning is coincident with the thickening of a unit, interpreted to be the Chandler Salt, which is early Cambrian in age. A swell may also have occurred at Bitter Springs level but data quality is not good enough to demonstrate this.

Late movement occurred during the Alice Springs Orogeny, of Late Devonian age (Playford et al, 1976).

The two shallow faults shown on line P81-U4 separate the outcropping Pacoota Sandstone on the hanging wall from deeper Pacoota, on the footwall, in a potential trapping situation. The faults which are initially quite steep, sole out along the Chandler Salt which acts as a decollement surface. Faulting at Bitter Springs level could be interpreted to steepen with depth. Such an interpretation would disagree with conventional wisdom that ascribes an overthrust, decollement style, to the tectonism in this part of the basin. A wrench style is suggested for the deeper section and this is currently being investigated.

DATA QUALITY

Within the synclines, data quality is the best one could hope for from a seismic system. Data quality deteriorates markedly over the structural high. This is caused by low signal-to-noise due to absorption and/or scattering of the seismic signal, and highly complex structuring.

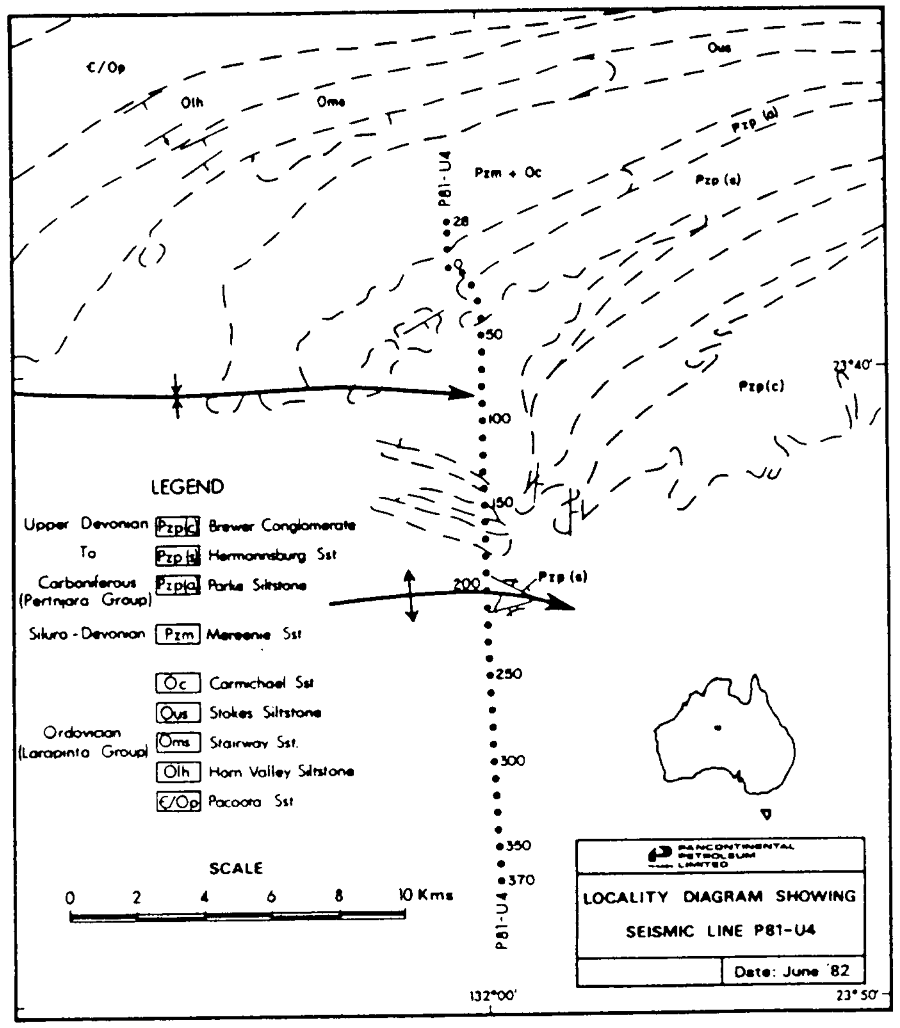
Experience has shown that the data quality is improved by using longer sweeps with a low frequency range of between 12-50 Hz, using a coherency filter prior to migration, and using wave equation migration in preference to FK migration due to the unreliability of seismic velocities in this very high velocity regime.

REFERENCES

McNaughton, D. A., et al, 1968, The evolution of salt anticlines and salt domes in the Amadeus basin, Central Australia: Geol. Soc. America Spec. Paper 88, p. 229-247.

Playford, G., B. G. Jones, and E. M. Kemp, 1976, Palynological evidence for the age of the synorogenic Brewer Conglomerate, Amadeus basin, Central Australia: Alcheringa-1, p. 235-243.

Wells, A. T., et al, 1980, Geology of the Amadeus basin, Central Australia: Bur. Mineral Resources, Australia, Bull. 100.



UNDANDITA
LINE P81-U4 and U4 Ext

S P 's 28-0-370

RECORDING AND PROCESSING DATA

Energy Source Vibroseis
Stacking Multiplicity 12 Fold
Number of Channels Recorded 48
Interval Between Input Channels 100m
Minimum Offset Distance 175m
Maximum Offset Distance 1325m
Static Corrections Elevation Weathering Surface Consistent and Trim
Deconvolution Predictive
Frequency Filtering 12/16 - 60/70
Source of Velocities for Processing Constant Velocity Stacks
Migration Wave Equation

SCALE 1 50000

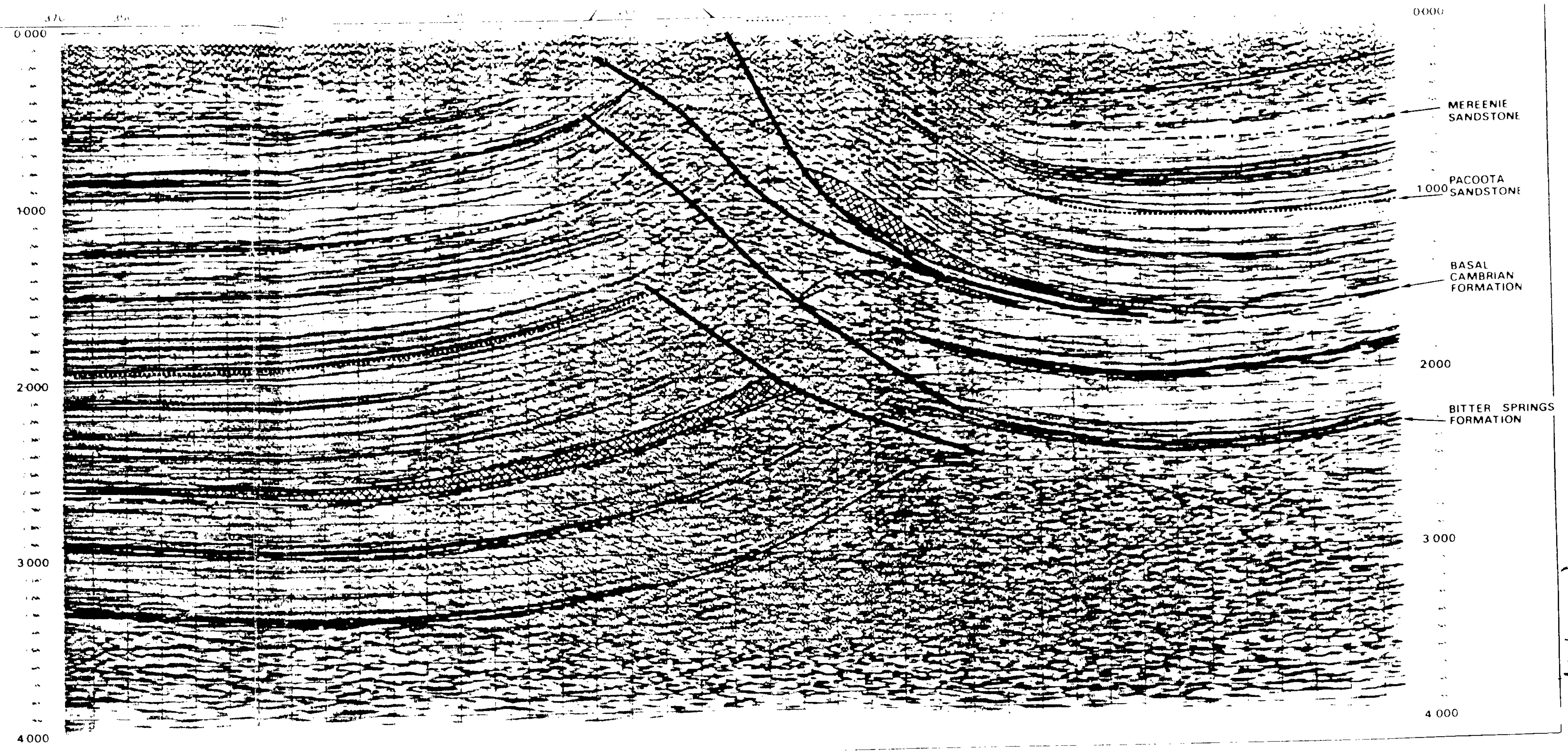
0 1 2 3
Miles

0 1 2 3 4
Kilometres

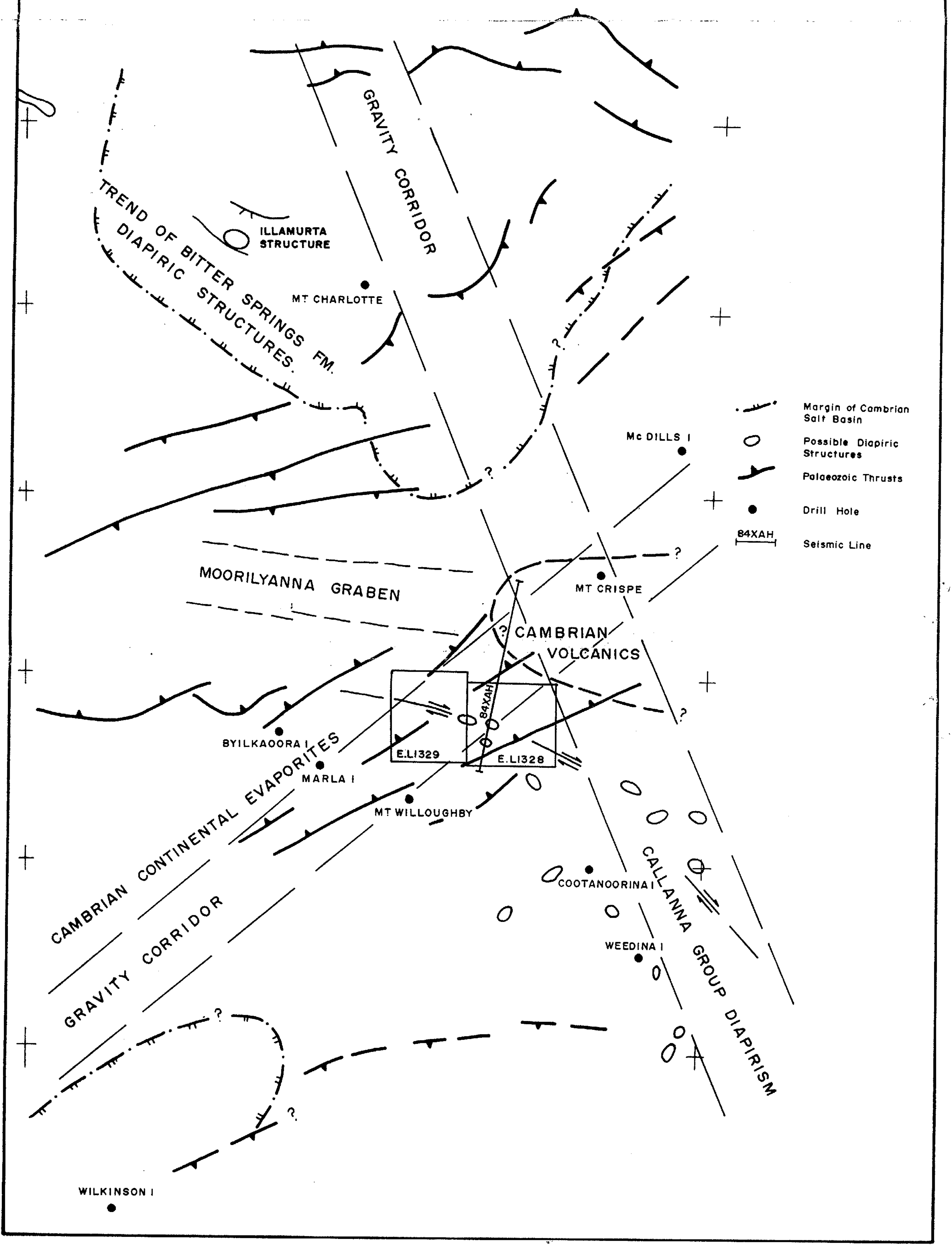
PANCONTINENTAL PETROLEUM LIMITED

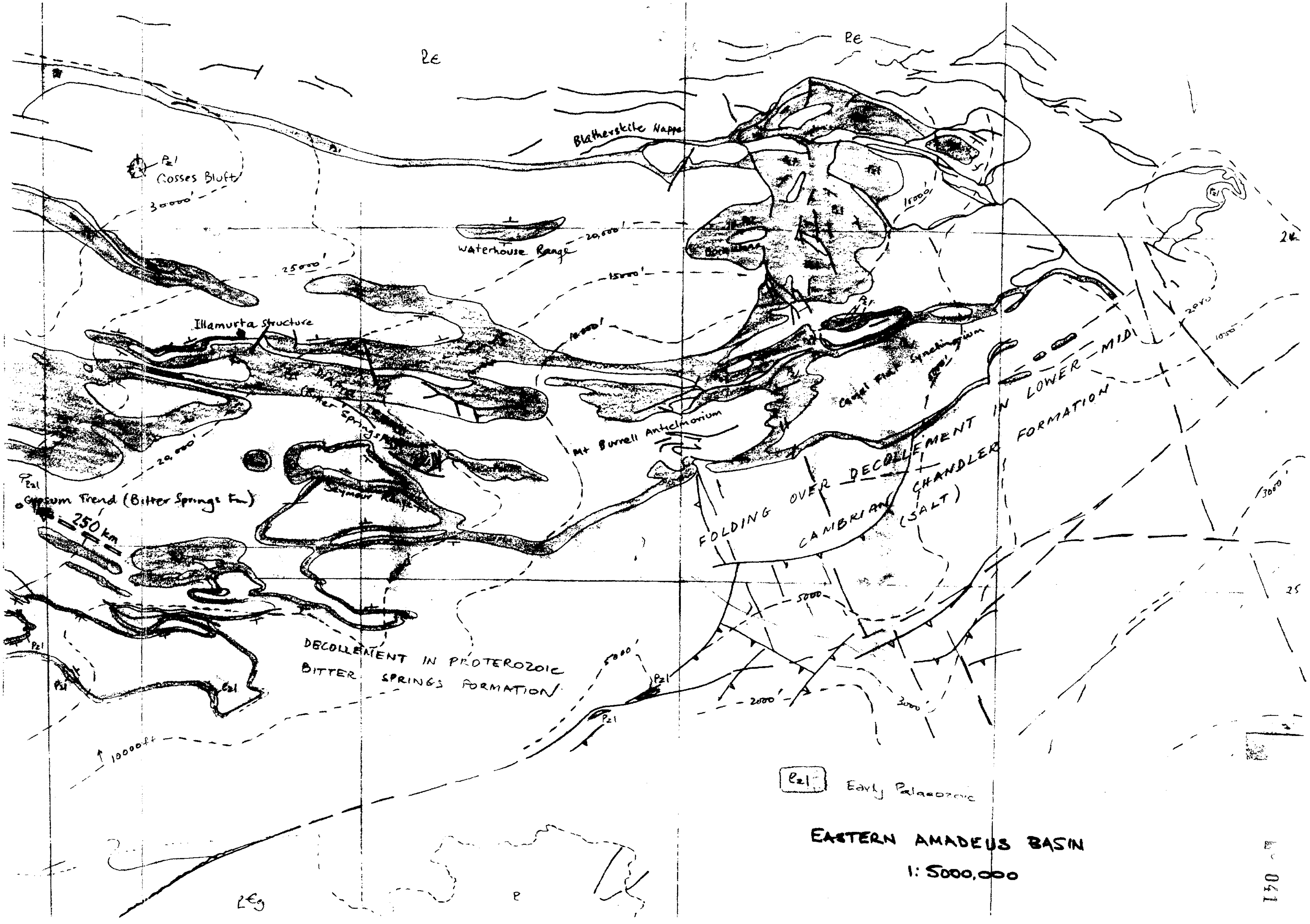
Interpreted Section Showing
Superimposed Thrusting
on Early Cambrian Salt
Features in Amadeus Basin

Author	Date Recorded
- R.J.Schroder	- April 1981



LOCATION SKETCH
E.L's 1328, 1329
WINTINNA SHEET AREA





EASTERN AMADEUS BASIN

1: 5000,000

TECTONIC SKETCH
EASTERN AMADEUS BASIN AND NORTHERN SOUTH AUSTRALIA

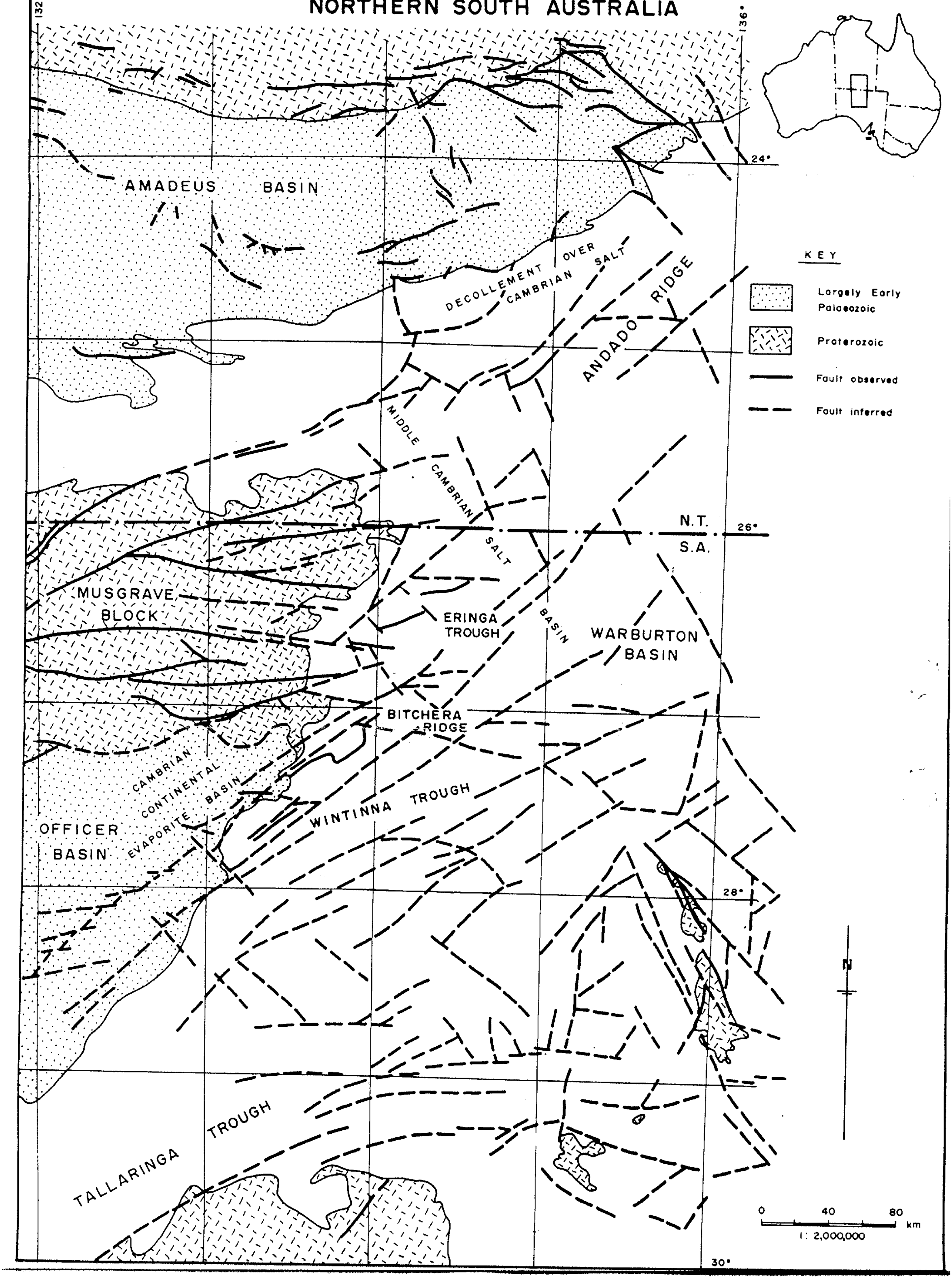


FIG. 8 1200% STRUCTURAL STACKS

UNDANDITA
LINE P81-U4 and U4 Ext.
S.P.'s 28-0-370

RECORDING AND PROCESSING DATA

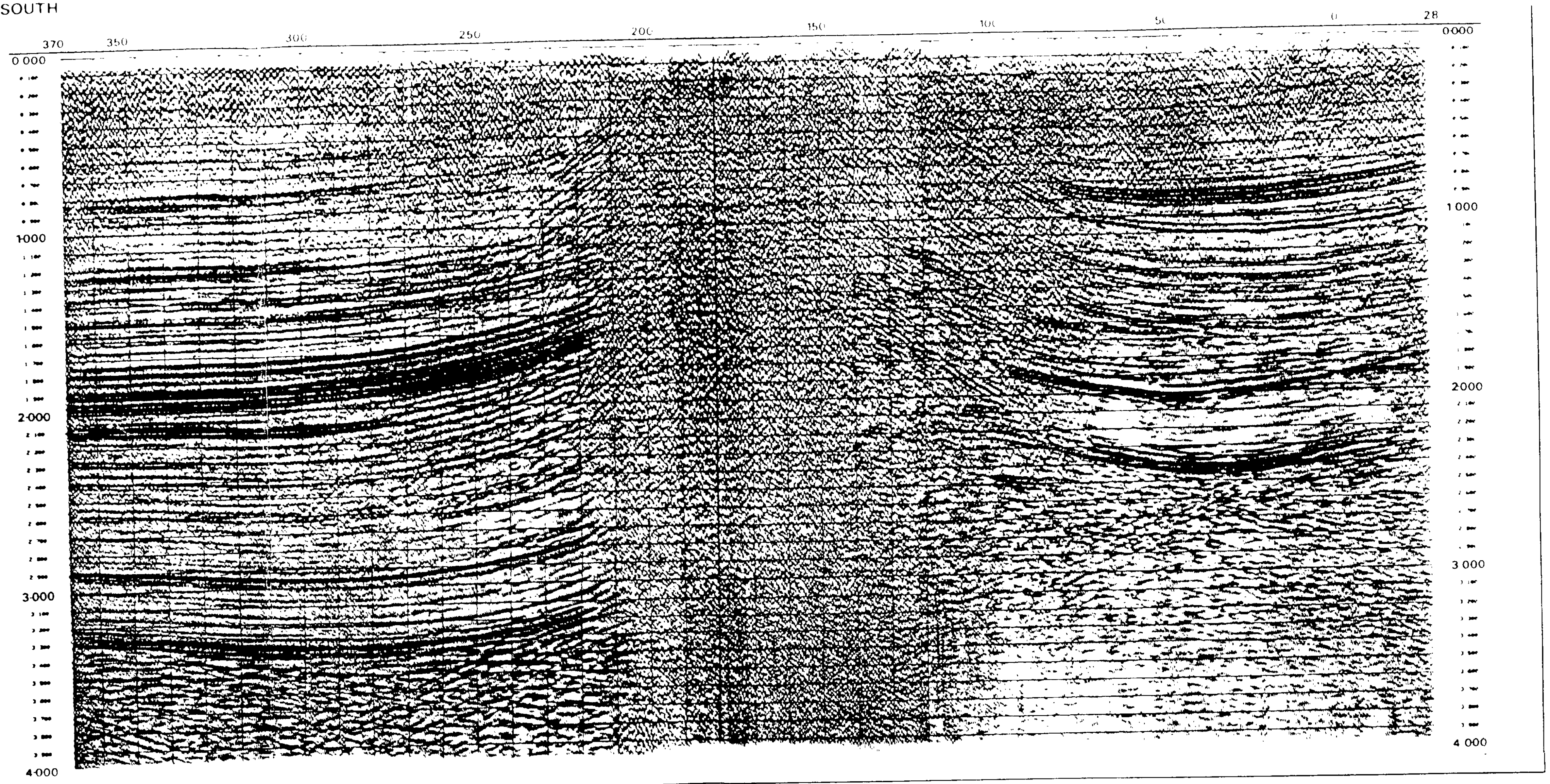
Energy Source Vibroseis
Stacking Multiplicity 12 Fold
Number of Channels Recorded 48
Interval Between Input Channels 100m
Minimum Offset Distance 175m
Maximum Offset Distance 1325m
Static Corrections Elevation, Weathering, Surface Consistent and Trim
Deconvolution Predictive
Frequency Filtering 12/16 - 60/70
Source of Velocities for Processing: Constant Velocity Stacks

SCALE 1:50000
0 1 2 3
Miles
0 1 2 3 4
Kilometres

PANCONTINENTAL PETROLEUM LIMITED

Superimposed Thrusting on Early Cambrian Salt Features in Amadeus Basin

Author	Date Recorded
- R.J.Schroder	- April 1981



Detached Sediments Decollements Tectonics [illegible] Subduction

3.4.1.80

Schroder

1200% MIGRATED STACK

UNDANDITA
LINE P81-U4 and U4 Ext.
S.P.'s 28-0-370

RECORDING AND PROCESSING DATA

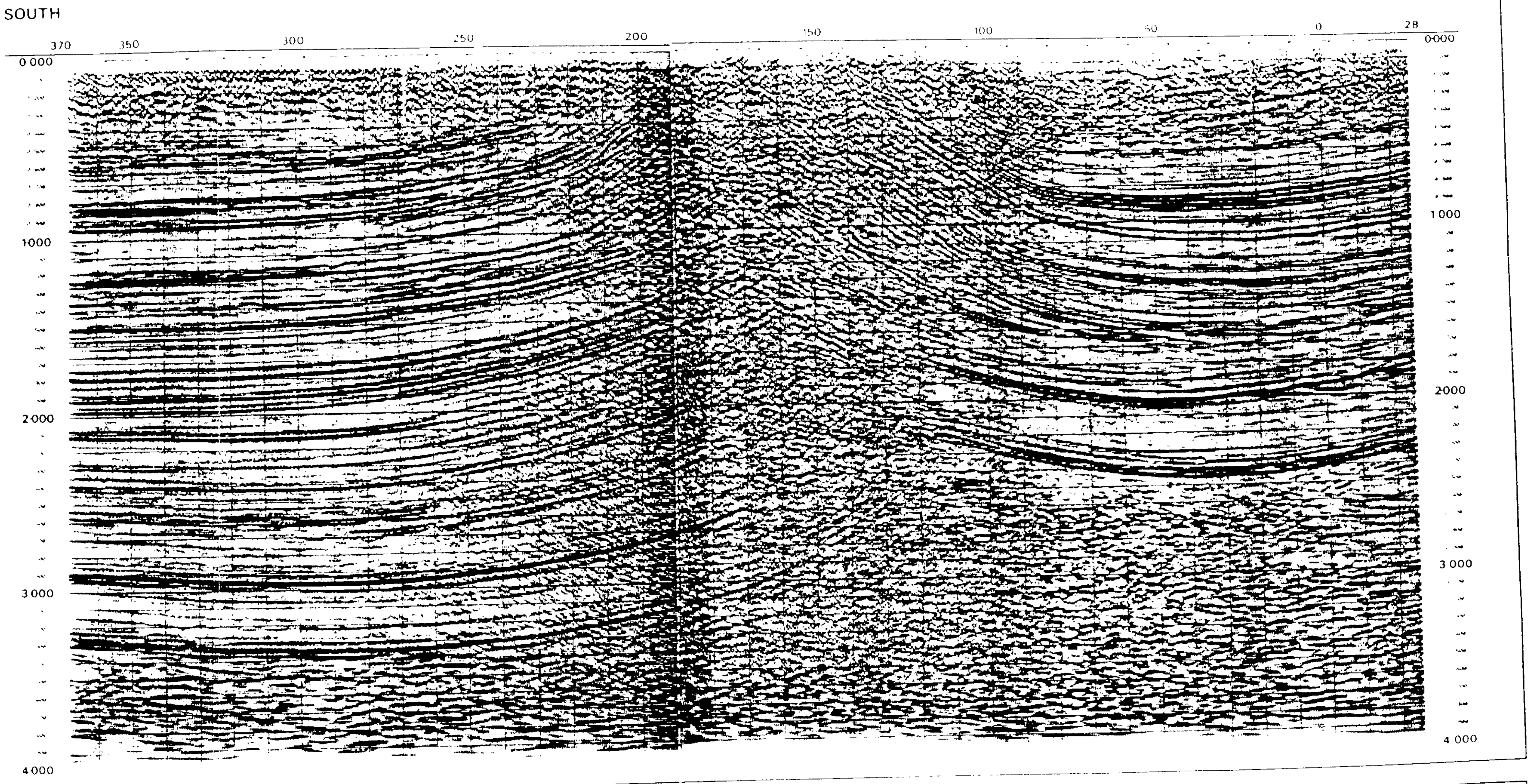
Energy Source Vibroseis
Stacking Multiplicity 12 Fold
Number of Channels Recorded 48
Interval Between Input Channels 100m
Minimum Offset Distance 175m
Maximum Offset Distance 1325m
Static Corrections Elevation Weathering, Surface Consistent and Trim
Deconvolution Predictive
Frequency Filtering 12/16 - 60/70
Source of Velocities for Processing Constant Velocity Stacks
Migration Wave Equation

SCALE 1:50000
0 1 2 3
Miles
0 1 2 3 4
Kilometres

PANCONTINENTAL PETROLEUM LIMITED

Superimposed Thrusting on Early Cambrian Salt Features in Amadeus Basin

Author	Date Recorded
- R.J Schroder	- April 1981



[illegible]

3.4.1.80

Schroder

D.83

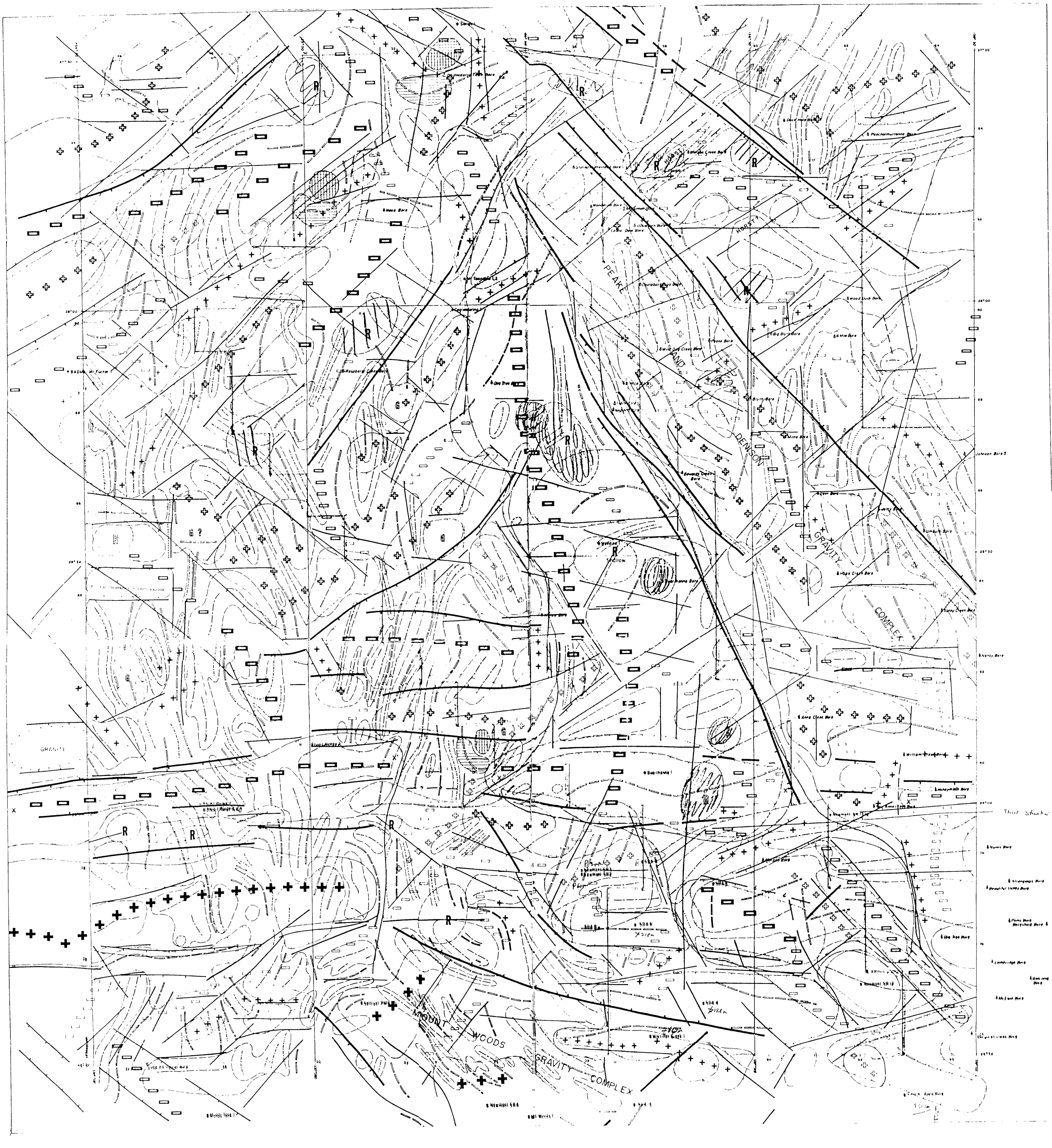


Fig 10 COMPOSITE GRAVITY & MAGNETIC FEATURES ARCKARINGA BASIN

0 50 km
1:500,000

Bouger Gravity (Density) trends
+ve First order +++
Second order ✚✚✚+++
-ve First order ▬▬▬
Second order ▭▭▭

Density Lineament with gradient direction
Major ┴──┴──
Minor ┴──┴──

Magnetic trends
First order — — — —
Second order — · — · —
Third order -·-·-·-·-
Fourth order ....

Also Shown are Magnetic & Bouger density zones
for details refer SADME Geophysical Branch
Poss. assoc. c low density sediments.

eg (R) Residual Gravity High - possible basement piercement
(R) Residual Gravity Low - possible diapiric structure ?salt.

after R. Gerdes S.A.D.M.E.

6945-1


24
25
26°
26
+ Purni 1
+ Mokari 1
CUR3
Mt Crispe
Witcherrie 1
CUR5
27
NICHOLSON
N2
B1
B2
B3
EL 1070
Marla
M5
LAMBINA 1
EL 1073
OODNADATTA
Mt Willoughby
6
EL 1069
Toodla 1
MANYA
M3
2
MTW3
M4
28
Cootanoorina
Mt Furner
potential piercements.
EMU 1
Karkaro 1
Unedina 1
9
Borthanna 1
8
29
7
1
133
Wallira 2
134°
Wallira West 1
Wallira 1
L. Phillipson 1
135°
Warriner Creek 1
136°
3
11
12
Wilkinson 1
2
30
1:1000000

6945-2

ROEBUCK RESOURCES N.L.
(Incorporated in N.S.W.)
16 EMERALD TERRACE, WEST PERTH 6005
WESTERN AUSTRALIA
TELEPHONE 324 1233
FACSIMILE 324 1224

Our Ref: 2105:771:100:PDA:km

January 20th, 1988

The Director General
Department of Mines & Energy
PO Box 151
EASTWOOD SA 5063

Dear Sir,

Exploration Licence 1365
Quarterly Report for period 11th February, 1987 to 10th May, 1987

Activity during the quarter consisted of continued study of Comalco data obtained from research at the Comalco Adelaide office.

Discussions were also held with representatives of two international elemental sulphur producers with a view to a joint venture to explore the whole of the Todmorden Sulphur Joint Venture tenement group. No arrangements were finalised but talks are continuing.

An expenditure report for the period is attached.

Yours faithfully,
ROEBUCK RESOURCES N.L.

P.D. ALLCHURCH
Managing Director

Encl.

RECEIVED
22 JAN 1988
DEPT. OF MINES AND ENERGY
SECURITY
6945

ROEBUCK RESOURCES N.L.

(Incorporated in N.S.W.)

16 EMERALD TERRACE, WEST PERTH 6005
WESTERN AUSTRALIA
TELEPHONE 324 1233
FACSIMILE 324 1224

Our Ref:

EXPLORATION EXPENDITURE
EXPLORATION LICENCE 1365
11.2.87 TO 10.5.87

- NIL -

ROEBUCK RESOURCES N.L.

(Incorporated in N.S.W.)

16 EMERALD TERRACE, WEST PERTH 6005
WESTERN AUSTRALIA
TELEPHONE 324 1233
FACSIMILE 324 1224

Our Ref: 2106:771:100:PDA:km

January 20th, 1988

The Director General
Department of Mines & Energy
PO Box 151
EASTWOOD SA 5063

Dear Sir,

<u>Exploration Licence 1365</u>
<u>Quarterly Report for period 11th May, 1987 to 10th August, 1987</u>

During the quarter negotiations with North American companies to form a joint venture to explore the licence together with the adjoining licences of the Todmorden sulphur joint venture proved unsuccessful.

No field work was undertaken during the quarter.

An exploration report for the period is attached.

Yours faithfully,
ROEBUCK RESOURCES N.L.

P.D. ALLCHURCH
Managing Director

Encl.

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(Incorporated in N.S.W.)

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WESTERN AUSTRALIA
TELEPHONE 324 1233
FACSIMILE 324 1224

Our Ref:

EXPLORATION EXPENDITURE
EXPLORATION LICENCE 1365
11.5.87 TO 10.8.87

- NIL -

ROEBUCK RESOURCES N.L.

(Incorporated in N.S.W.)

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WESTERN AUSTRALIA
TELEPHONE 324 1233
FACSIMILE 324 1224

Our Ref: 2107:771:100:PDA:km

January 20th, 1988

The Director General
Department of Mines & Energy
PO Box 151
EASTWOOD SA 5063

Dear Sir,

Exploration Licence 1365
Quarterly Report for period 11th August, 1987
to 10th November, 1987

No exploration was carried out during the quarter and the partners resolved to terminate the joint venture.

The permit expired on the 11th November, 1987 and was not renewed.

Yours faithfully,
ROEBUCK RESOURCES N.L.

P.D. ALLCHURCH
Managing Director

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22 JAN 1988
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SECURITY
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ROEBUCK RESOURCES N.L.

(Incorporated in N.S.W.)

16 EMERALD TERRACE, WEST PERTH 6005
WESTERN AUSTRALIA
TELEPHONE 324 1233
FACSIMILE 324 1224

Our Ref:

EXPLORATION EXPENDITURE
EXPLORATION LICENCE 1365
11.8.87 TO 10.11.87

- NIL -