

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 86/25
REPORT ON MAPPING OF THE
NORTHERN SECTOR OF THE WANGIANNA
1:100 000 MAP SHEET AREA


GEOLOGICAL SURVEY

by

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OF THE WANGIANNA 1:100 000 MAP SHEET AREA

ABSTRACT

This report describes the mapping of the section of the Wangianna 1:100 000 map area north of the Oodnadatta Track. The Wangianna sheet is one of six that comprise the Curdimurka 1:250 000 map.

The lowermost unit outcropping in this area is the Bulldog Shale, comprising homogeneous and bioturbated claystone low in the sequence, grading to laminated clays, silts, and very fine sands toward the top. Overlying this unit is the Coorikiana Sandstone, a thin sequence of siltstone, sandstone and pebble conglomerate outcropping intermittently throughout the map area. Field observations indicate the presence of a number of facies occurring within the Coorikiana Sandstone, ranging from quiet water marine to shoreline and possibly fluvial. Above this sequence is a succession of siltstones, claystones and fine sandstones of the Oodnadatta Formation, which is often finely laminated.

Tertiary units observed include siltstone, sandstone, gravel and boulder beds of the Eyre Formation, and white to light pink limestones and dolomites, possibly equivalent to the Etadunna Formation. Horizons of palygorskite clays also occur near these carbonates. Silcreted surfaces occur extensively throughout this area, and are often associated with pallid zone silicified and kaolinized horizons. Ferruginization is also common.

A number of Quaternary units have been identified and mapped, including gypcreted gravel and pebbly sand units of probable Pleistocene age, low level gypseous surfaces, gilgais, gibber spreads, sheetwash units, and modern stream sediments.

INTRODUCTION

The Wangianna 1:100 000 map area (referred to below as Wangianna) is situated in the central northern region of South Australia just west of Marree (Fig. 1). It is one of six map sheets that comprise the Curdimurka 1:250 000 Geological Atlas Series map (referred to below as CURDIMURKA). Prominent features in or near Wangianna include Lake Eyre to the north, Alberrie Creek Plateau in the west, the Willouran Ranges to the south, and Marree and Attraction Hill to the east. Access is provided by the Oodnadatta Track which runs parallel to the disused and dismantled Ghan railway dividing the Wangianna 1:100 000 map area into two unequal segments. The area of enquiry (referred to below as the northern sector) lies immediately to the north of the track, and constitutes slightly less than one third of Wangianna.

The main topographic features of the northern sector are numerous mesas, dissected plateaus, watercourses, and broad plains. Alberrie Creek Plateau is located at the western margin and forms a large planation surface extending for over 10 km north to south. Another area of high relief lies between Wangianna Rail Siding and Poole Creek. This region consists of a series of high bluffs and mesas with gibber and scree slopes dissected by numerous stream courses. Mt Alford, a prominent mesa (258 m asl) occurs in the central eastern region of the map area, as does another series of mesas and bluffs. Several large streams run through the field area. Callanna, Davenport, Welcome and Poole Creeks (and tributaries) are all broad shallow ephemeral streams with sources in the Willouran Ranges that drain into Lake Eyre South. Vegetation is sparse, the main types being eucalypts along some of the water courses, mulga and native apricots growing on the high country, and saltbush on the plains, particularly near Wangianna Creek, Kenneberry Waterhole, and north of Poole Creek. A number of mound springs occur from Marree to Dalhousie in the far north of the state, with Welcome, Davenport, and Wangianna Springs being active south of the map area.

A total of five weeks in August, September and October 1985 was spent mapping the units in this area. This work was carried out as a contribution to the mapping of CURDIMURKA. The main

focus of attention was the Coorikiana Sandstone and its relationship with the other Mesozoic units. Data were collected from traverses, spot checking and vertical section analysis, and has been recorded on colour air photographs (1:40 000) Survey 2095.

STRATIGRAPHIC SETTING

The rock sequences in Wangianna are composed of Mesozoic and Cainozoic sediments deposited in the Eromanga and Lake Eyre Basins (Krieg, 1984; Callen, 1984). Folded Adelaidean basement rocks outcrop extensively south of the Oodnadatta Track (Willouran Ranges), as do Jurassic and basal Cretaceous units. No Palaeozoic rocks are known to outcrop in the Wangianna area.

The Mesozoic of the south western margin of the Eromanga Basin consists of a succession of Cretaceous transgressive and regressive units overlying terrestrial Jurassic sediments (Wopfner et al 1970). The lowermost formation is the Algebuckina Sandstone (Jurassic), which, in type section consists of a lower kaolinitic sandstone - cross bedded and poorly sorted, overlain by a well sorted current bedded sandstone (Wopfner et al 1970). This unit is overlain throughout much of the basin by a succession of Cretaceous sandstones, siltstones, claystones and occasional conglomerates, the lowermost of which is the Cadna-owie Formation. In type section it is comprised of fine to medium-grained sandstones with gritty interbeds overlain by a sequence of fine to very fine sandstones with thin shale and siltstone intercalations (Wopfner et al 1970).

In Wangianna the Algebuckina Sandstone and Cadna-owie Formation do not outcrop north of the Oodnadatta Track, but are thought to occur to the south, lapping on to the basement rocks in a number of areas (Krieg, 1984). The lowermost unit of these beds consists of a cross-bedded sandstone overlain by interbedded siltstones and claystones, which in turn are covered by an upper sequence of fine grained calcitic sandstones (Krieg 1984). This has been interpreted as a combination of Algebuckina Sandstone and Cadna-owie Formation equivalents (Krieg 1984), although separation into distinct units may now be possible (G Krieg, pers comm). Three Mesozoic formations were observed in the map area north of the Oodnadatta Track. They are the Bulldog Shale,

Coorikiana Sandstone and Oodnadatta Formation. The Wooldridge Limestone and Mt Alexander Sandstone Members of the Oodnadatta Formation, and the Winton and Mackunda Formations were not observed, but may be present further into the basin.

Cainozoic sediments observed in the field area include siltstone, fine to coarse sandstones and pebble conglomerates of the Eyre Formation, limestone and dolomite of unknown age but possibly equivalent to the Miocene Etadunna Formation, and numerous Quaternary units of varying abundance and significance. Silicification, ferruginization and gypsification have also occurred, resulting in the alteration of a number of units, and the formation of others.

The Eromanga Basin region has been fairly stable since the early Mesozoic. During this period there was a gentle north westerly regional dip, which was changed to south westerly in the mid Tertiary (Exon and Senior, 1976). This increase in tectonic activity in the Oligocene and Miocene changed the landscape from a relatively flat surface to one composed of a series of large synclines and anticlines (Wopfner, 1978). The present day landscape has resulted from the continuation of this tectonism, as indicated by faulting and folding coupled to erosion, deposition and weathering processes.

MESOZOIC

Bulldog Shale

The lowermost unit outcropping in the northern sector of Wangianna is the Bulldog Shale. It occurs from south of the Oodnadatta Track to roughly midway between it and the northern boundary of the map sheet area. Due to the shallow regional dip of the Mesozoic units, good outcrop is rare. The majority of exposures are strongly weathered, with the most useful outcrops occurring in the banks of shallow watercourses and under low cliffs.

In the northern sector, the Bulldog Shale is composed of light to predominately medium and dark green grey carbonaceous shale, mainly massive and bioturbated but becoming laminated up section. Ferruginization is common, ranging from a yellow brown staining to dark purple brown and black concretionary layers. These concretions often have a subvitreous exterior lustre and a

cryptocrystalline to microcrystalline interior with a boxwork habit. The zones of ferruginization range in thickness from a few millimetres to several tens of centimetres, and are laterally continuous for tens and even hundreds of metres. Calcareous concretionary horizons also occur, mainly in the southern part of the field area. These are similar in size to the ferruginous concretions, and are often associated with poorly developed cone in cone limestone. Fossil remains are also common, with Maccoyella sp. being quite abundant in some exposures low in the sequence. Another feature of the Bulldog Shale in this area is the occurrence of cobbles and boulders of well-rounded Adelaidean quartzite.

Silt and sand content increases up section, with fine-grained quartz fractions becoming quite common. Occurring with this change in grain size (and presumably energy of deposition) is an increase in the number of primary sedimentary structures. These include parallel, lenticular and low angle cross bedding, ripple cross laminations, cut and fill, and occasional ripple marks exposed on the tops of ferruginized fine grained sand layers.

The Bulldog Shale varies considerably in thickness, ranging from a few tens of metres near the basin margins where the top is eroded to more than 150 metres further into the basin. Over 20 metres of Bulldog Shale was encountered in the drill hole Alford 1 located near the "Muloorina" road although drilling did not penetrate the total thickness of the unit (P. Rogers, pers comm.).

Coorikiana Sandstone

The Coorikiana Sandstone is a thin, sheetlike, probably discontinuous unit composed of silts, sands and pebble conglomerates exposed around the margins of the Eromanga Basin (Moore & Pitt 1984). The boundary between it and the underlying Bulldog Shale is considered to be gradational (Moore & Pitt 1984), and is indicated by a change from massive and laminated clay, silt and fine sand to silt, fine to coarse sand and pebble conglomerate.

In type section the Coorikiana Sandstone is composed of fine grained feldspathic and glauconitic sandstone, with coarse grained sandstone and pebbly lenses (Forbes 1982). At Mt Arthur (on OODNADATTA), this unit consists of light to medium grey brown to buff sandstone, very fine to fine grained, moderately calcareous, and containing small cross beds and ripple marks. The Coorikiana Sandstone also outcrops near the shore of Lake Eyre South, near Curdimurka railway siding. At this location it consists of light to medium yellow brown and green grey sandstones, predominately fine to medium grained, and containing wavy ferruginous concretionary lenses, cross beds (tabular, low angle, and festoon), interference ripple marks, parallel laminations, and worm burrows. Also occurring at this location are coarse sandstones and conglomerates - well imbricated, angular in part, and containing clasts of reworked Mesozoic sediments, Adelaidean quartzite and fossil wood fragments. Fossil shark teeth have also been found in this area (P. Rogers, pers comm.). The Attraction Hill Sandstone has been mapped on the adjacent MARREE sheet, and is composed of lenticular coarse ferruginous sandstones, grits and conglomerates (Forbes 1966). It has more recently been termed an equivalent to the Coorikiana Sandstone (Forbes 1982).

In Wangianna, the Coorikiana Sandstone outcrops at a number of localities extending in a broad arc from Alberrie Creek Plateau in the west, to the north of Box Creek in the east (Fig. 4). Unfortunately, most of these exposures are strongly weathered, ferruginized or gypsified, resulting in the obliteration or alteration of many features. This unit is not laterally continuous; the best outcrops occur as discrete sections in creek banks and under resistant horizons capping mesas, scarps and plateaus.

One of the best exposures of the Coorikiana Sandstone occurs at the western margin of the northern sector, at Alberrie Creek Plateau. At this locality it outcrops discontinuously for nearly 3 km (perpendicular to strike), extending south from a low mesa about $1\frac{1}{2}$ km south west of Charles Angas Bore to approximately half way along the plateau. In this area, it is generally off white to light green grey and light to medium yellow brown, with sand grainsize ranging from very fine to coarse. Sorting is

generally poor, with coarse layers often being quite gritty, whilst carbonate content is also fairly low. Numerous siltstone and silty claystone interbeds are present in some places, as are thin lenses of pebble conglomerate. These conglomerates consist of quartz, quartzitic and ferruginized sandstone pebbles in a silty and sandy matrix. No strongly developed imbrication was observed and bed thickness ranges from a few centimetres to a few tens of centimetres. Sedimentary structures observed in the sandy and silty layers include crossbeds, cut and fill, ripple cross laminations, parallel laminations, ripple marks, and possible load casts and clay galls.

In exposures to the east of Alberrie Creek Plateau, the Coorikiana Sandstone is generally light to medium yellow brown, very fine to medium-grained, and slightly to moderately calcareous. Thin layers of coarse to very coarse sand and pebble conglomerate are often present, although they rarely exceed more than a few centimetres in thickness. Fossil wood fragments are not uncommon, but faunal remains seem rare, although numerous worm trails and burrows were observed. To the east of Alberrie Creek Plateau, the total observed thickness of this unit rarely exceeds more than a few metres, which may be due to paucity of outcrop, since most sections occur along the banks of shallow streams or under the caps of low gypsite bluffs. Another possible explanation is that of localized thinning of the unit due to non deposition or erosion. Other areas in the northern sector that may contain useful sections of Coorikiana Sandstone include the mesas near Wangianna Rail Siding and Poole Creek, Mt Alford, and the mesas and bluffs immediately to the north of Mt Alford. Unfortunately much of the slopes of these areas are covered by scree.

The Coorikiana Sandstone is generally considered to be a near shore to shoreface unit deposited in a shallow water marine environment, which is indicated by lithology, log character, and fossil content (Moore & Pitt, 1984). In general, the energy of deposition would seem to have been low, as evidenced by poor sorting and rounding of mineral grains, and a widespread lack of high energy sedimentary structures. However, there are a number of outcrops of coarse gritty sands and pebble conglomerates considered to be part of this unit; for example, at Alberrie

Creek Plateau, Lake Eyre South, and Attraction Hill. These may be fluvial remnants (e.g. channel lags) deposited upstream from the shoreline, or perhaps deposits formed in tidal channels. Input of newly transported (river fed) sediment is indicated by the increase in feldspar content of the Coorikiana Sandstone compared to the Bulldog Shale (G. Krieg, pers. comm.) and the low degree of rounding and sphericity. Another possibility is that they are remnants of debris flows, with mass sediment movement transporting near shore material further into the basin, and being blanketed at a later time by shoreline sediments as regression continued. The presence of mollusca (Macoyella sp) and shark teeth indicate a marine environment although it is possible that they may have been reworked from the Bulldog Shale.

The environments outlined above imply the presence of a wide variety of facies occurring within the Coorikiana Sandstone, ranging from possible floodplain and fluvial to shoreline and quiet water marine. This may be a valid model, with diachronous units being deposited around the margin of a contracting shallow water marine basin. Diachronism is already indicated to some extent by the separation of the Coorikiana Sandstone from the Wallumbilla Formation (Exon and Senior, 1976), an Aptian - Albian marine shale deposited partly at the same time as the Coorikiana Sandstone, but further into the basin. The lack of outcrop of a terrestrial nature implies that areas above the shoreline were in a phase of erosion, non deposition, or were removed by the next transgressive phase; and if so, there may be a disconformity within the Coorikiana Sandstone or between it and the overlying Oodnadatta Formation transgressive sequence.

Evidence of a disconformity may be present in the outcrop visited at Lake Eyre South. At this locality, vertical cracks filled with sediment were observed in strata originally thought of as being Bulldog Shale. These may be linear shrinkage cracks (subaqueous), or may be mudcracks formed by exposure to the atmosphere. If the latter is the case, it would imply a non depositional and in some cases a possibly erosional contact between the Bulldog Shale and the Coorikiana Sandstone. This seems unlikely as one is a marine shale and the other is a shallow marine and shoreline unit, both considered as having been deposited in the same sedimentological cycle. However, a period

of non deposition within the Coorikiana Sandstone, or between it and the Oodnadatta Formation would seem possible, since shoreline units often contain tidal to terrestrial components, and a transgressive marine unit would need to have been deposited on a surface that had been exposed to the atmosphere, at least in the marginal areas of a basin.

It therefore seems possible that the Coorikiana Sandstone may contain sediments of terrestrial as well as shoreline and shallow marine environments, and a disconformity could be present within it or between it and the overlying Oodnadatta Formation. This latter feature depends on whether the Coorikiana Sandstone is considered to be composed of sediments deposited in the first Mesozoic regressive phase, or whether it also contains sediments of the next transgression. This may in part account for the seemingly anomalous grainsize traces observed in the field, with fining up, coarsening up, and a combination of the two being recognised at various localities. The wide range of facies and the presence of possible disconformable surfaces may also help to explain the variation in thickness of the unit, with sequences of silt, fine to coarse sand and pebble conglomerate being present in some areas, whereas at others the Coorikiana Sandstone is eroded away or has lensed out or merged to become virtually indistinguishable from the Oodnadatta Formation.

Oodnadatta Formation

In the Wangianna field area, the Coorikiana Sandstone is considered to grade progressively into the overlying Oodnadatta Formation, which occurs in a broad band near the northern margin of the map area. Outcrop is poor, with good sections only occurring under resistant caps to bluffs and low ridges, and in creek banks. Even in these areas, outcrop is often strongly weathered, resulting in exposed strata having a white to very light grey crumbly and flaky surface appearance. Ferruginization and gypsification is also common, resulting in the near total alteration of many potentially significant outcrops.

The Oodnadatta Formation as observed in this area is composed of laminated light to medium grey and green grey claystone, siltstone and occasional fine-grained sandstone. Bed thickness is usually a few centimetres, ranging to approximately

0.1 metre. Sedimentary structures observed include horizontal parallel stratification, lenticular stratification, ripple cross laminae, and possible cut and fill. No fossil remains were observed, although fossils including ammonites, molluscs and fish remains are common in other areas (Krieg 1984, Forbes 1966).

Depositional Summary (Figs. 2 and 3)

Except for the basal unit, Algebuckina Sandstone, the sedimentary sequence on Wangianna has resulted from transgressions and regressions of the Cretaceous marine shoreline. The first transgression resulted in deposition of shoreline and marine sediments of the Neocomian-Aptian Cadna-owie Formation and the Aptian-Albian Bulldog Shale on terrestrial sediments of the Algebuckina Sandstone (Jurassic). A limited regression occurred in the early Albian resulting in deposition of shallow marine to possibly terrestrial sediments of the Coorikiana Sandstone. The second transgressive phase would have caused the shoreline to move to more marginal areas of the basin. These sediments may be preserved in the upper Coorikiana Sandstone and Oodnadatta Formation, quite possibly with reworking by wave and current action as the transgression progressed. The final regressive phase of sedimentation in the Eromanga Basin is recorded by deposition of the marginal marine Mackunda Formation and the predominately fluviatile Winton Formation (Moore & Pitt 1984).

TERTIARY

Tertiary sediments occur extensively in the northern sector of Wangianna. They are well exposed in high areas such as Alberrie Creek Plateau, near Poole Creek and Wangianna Rail Siding, at Mt Alford, and north and east of Mt Alford. In these areas, the Tertiary units are quite hard and form large expanses of resistant caprock, protecting the underlying softer Mesozoic sediments from erosion.

Eyre Formation

Resting disconformably on Mesozoic siltstones and claystones are layers of early to middle Cainozoic sandstone, siltstone, claystone and conglomerate, considered to be basal Eyre Formation

(Callen 1984). They are often ferruginized or silicified and occur extensively in areas to the north and east of Poole Creek, and in the Mt Alford region, being prominently exposed in high areas and under silicified bluffs and ridges.

The sediments comprising the basal Tertiary sequence consist of thinly bedded sands, silts, clays and conglomerates. Colour varies from off white and light grey to medium yellow brown. In a number of areas, silification and ferruginization have occurred, resulting in these beds being strongly cemented and resistant to erosion. The ferruginized layers are often dark yellow brown to black and are coated with a desert varnish. Sedimentary structures observed include parallel laminations, cut and fill, cross beds, ripple marks, and possible scour casts on the undersides of overhanging ledges. Fossil wood, leaf and seed casts are often well preserved, particularly in areas of silicification. Pebble, cobble and boulder conglomerates are commonly exposed (breccias less so), and generally form discrete beds up to a few 10's of centimetres in thickness. They consist of clasts of milky and (occasionally) clear quartz, Adelaidean quartzite and shale, and silcrete in a sandy and silty matrix. In outcrops visited in the area, the clasts are semi spherical, elongate and tabular, are quite well rounded, but do not exhibit a well developed imbrication.

Brecciated outcrop containing grey carbonate clasts up to 20 cm in length was observed north of the Poole Creek and Oodnadatta Track intersection. These clasts are predominately elongate, splintery and tabular, and show little evidence of a long transportation history, being poorly rounded, lacking imbrication, and having a low degree of sphericity. This breccia occurs at the same location and at a similar level to sandstone and pebble conglomerate as described above.

Silcrete pebbles occur less commonly than those composed of quartz and Adelaidean fragments, and there appears to be an increased abundance of milky quartz pebbles in layers considered to be at the base of the Tertiary section. Silcrete clasts seem to occur further up section, although the stratigraphic succession is poorly preserved in this area. At Mt Alford, there is a well-exposed section of Cainozoic sediments, consisting of interbedded layers of fine to coarse sandstone, claystone and

pebble conglomerate containing imbricated and slightly bent clasts of claystone (possibly intraformational) overlying weathered Mesozoic silts and clays. This and numerous other sequences have become progressively silicified up section, the tops of which are often altered to a massively silicified sandstone. The Eyre Formation would seem to have been affected by silcrete genesis on a large scale throughout this area.

Silcrete

A major feature of northern South Australia including Wangianna is the occurrence of silcreted surfaces. In the map area they form resistant caps to numerous mesas including Mt Alford, those near Poole Creek, and north and east of Mt Alford. Other exposures of silicified sediments occur in areas north of Poole Creek, between the dog fence and Charles Angas Bore, and east of Trig Hill Dam (Fig. 4).

Silcretes occur at a number of levels in the landscape and were observed to be of several forms. Wopfner (1978) considers silcrete to have formed in a number of periods in the earth's history, including the late Jurassic, early Cainozoic, and late Cainozoic, and has grouped them into categories depending on matrix composition, textural appearance, retention of host rock features, and thickness and type of profile. In Australia, the most widespread development of silcrete is thought to have occurred in the early Cainozoic, resulting in the formation of the Cordillo Silcrete (Wopfner 1978). Common styles of silcrete formed at this time include columnar, blocky, massive, platy, botryoidal, ropy, and rod-like, with a number of these styles often being present at the one location. Late Cainozoic silification is also considered to have occurred (Barnes & Pitt 1976, Wopfner 1978, Callen 1983), with silcrete forming in low lying areas caused by the downwarping of the Cordillo Surface (Wopfner 1978). These younger Cainozoic silcretes are composed of white to light grey clasts of Eyre Formation, Mesozoic sediments and Etadunna Formation floating in a red to purple silty matrix. Silicification in these outcrops is all pervasive, although bedding structures and fossil details are still well preserved (Wopfner 1978).

The silcretes observed in the northern sector have formed in rocks originally of the Eyre Formation. They are generally massive, blocky and platy, although a number of outcrops containing silcrete with a ropy surface texture were also observed. Silcretes of the first three forms are usually light grey to slightly yellow in colour, and are composed of quartz grains "floating" in a cryptocrystalline siliceous groundmass. Those with a ropy habit are predominately white to light pink and grey, and more closely resemble quartzite, with presilicification features being easily observed. Some "quartzitic" silcretes also have a blocky form. Sedimentary structures retained include parallel laminations, cut and fill, and possible ripple marks and lenticular cross stratification. Fossil wood, leaf, and plant casts also occur in a number of localities, and show well preserved fine detail features. This may indicate that organic matter was replaced by silica soon after deposition in a very low energy environment.

Also well exposed in a number of areas is the pallid zone alteration of sands, silts, clays and conglomerates. These horizons are usually white to light pink and purple in colour, and seem to have formed by intense weathering that affected both Cainozoic and Mesozoic units. The processes responsible for the formation of these horizons may be linked to silcrete genesis, since most outcrops of massive, blocky and platy silcrete occur above pallid zone sediments. At silcrete-capped mesas such as Mt Alford, a downward progression from massive and platy silcrete to silicified sands, silts and clays (porcellanitic), then to pallid zone kaolinized sediments, and finally into unweathered (Mesozoic) silts and clays was observed, which may be typical of early Cainozoic silcrete profiles.

The silcrete and pallid zone horizons examined in Wangianna may have formed by processes outlined by Wopfner (1978); namely leaching, local transportation and precipitation of silica, coupled to the removal of iron and aluminium under the influence of groundwater movements in a moist to semi arid environment. Silcrete containing plant casts is thought to have formed in an acidic water-saturated environment (Callen 1983), perhaps similar to the above, but below the level of water table fluctuations.

Calcareous Sediments - possible Etadunna Formation equivalents.

Carbonate units occur in a number of localities in the northern sector. The most extensive of these forms a caprock to Alberrie Creek Plateau at the western margin.

The capping to Alberrie Creek Plateau consists of limestone and dolomite, white to off white and occasionally light pink, microcrystalline to crystalline, and predominately massive and homogeneous. Vuggy infills are common in a number of areas, as are calcite veins and cherty and chalcedonic concretionary lenses. A light grey etched weathering surface has formed on a large proportion of the exposed surfaces, and slickensides are commonly developed on blocks that have broken away from the main surface and fallen downslope. An erosional contact between this unit and the underlying Mesozoic sediments was noted on the south eastern margin of the plateau as indicated by the presence of scour marks and possible flute casts.

Calcareous sediments also outcrop north of the intersection of the main Oodnadatta Track and Poole Creek. In this area, they consist of white to light pink microcrystalline to finely crystalline limestone and dolomite. Palygorskite is a common mineral occurring in claystone at approximately the same level as the carbonates. Similar calcareous sediments are also exposed in the banks of a small creek approximately 3 km north east of Mt Alford.

The limestone and dolomites of the Wangianna region are generally fine grained, flat lying, and show little evidence of bedding plane structures. These factors (and a possible association with palygorskite clays) indicate deposition in a relatively flat low energy basinal environment. Callen (1984) suggests precipitation of carbonates around the edge of an ancient equivalent to Lake Eyre, with waters being released from Finnis Springs at a time of increased groundwater movement. The presence of scour casts at the base of the limestone capping Alberrie Creek Plateau indicates that relatively strong currents were transporting sediment into the basin, in some areas at least.

It may be that the calcareous sediment exposed near Poole Creek and north east of Mt Alford were formed in a similar manner to those at Alberrie Creek Plateau. Sediment type and the general lack of high energy sedimentary structures would seem to indicate precipitation in a lacustrine environment, although the source of these sediments is open to question. The carbonates occurring in the map sheet area may have formed at the same time by similar processes with sediments from a common source, or they may be unrelated to each other in space and time. Numerous mound springs occur in this region today, and it is thought that they were discharging much greater volumes of carbonate-rich water in the past, as evidenced by the presence of very large (now extinct) mound springs at, for example Hamilton Hill and Beresford (further west on CURDIMURKA). These relict springs are thought to be of Pleistocene age (P. Rogers, pers. comm.), which implies that sediments derived from them must have been deposited relatively recently in relation to the surrounding units.

Alternatively these carbonate units may have formed before the mound springs became active, possibly in the middle Tertiary. The exposures observed may be the remnants of one major lake surface, with erosion being the main factor in the development of separate outcrops, or carbonate deposition may have occurred in a number of separate areas. These may have been a series of lakes or lagoons of the same age possibly linked by channels, or they may have formed at different times but were acted upon by essentially the same climatological and sedimentological regimes.

QUATERNARY

Introduction

Quaternary units mapped on the northern sector of Wangianna are:-

- Qpg - Pleistocene gypcreted gravels
- Qps - Pleistocene sands
- Qg - Younger gypseous deposits
- Qht - Gibber lags
- Qhs - Sheetwash deposits

- Qd - Sand dunes
- Qha - Modern stream sediments
- Q - Undifferentiated Quaternary

These units form an extensive and variable cover to the older formations. In some areas they occur in the form of thin unconsolidated cover, but in others they form important geomorphic and geologic horizons.

Qpg - Pleistocene gypcreted gravels.

This unit occurs extensively in a number of areas including near Marree and the Muloorina road in the east and between Cooranna Bore, Poole Creek and Charles Angas Bore in the central and western regions. It often forms prominent features in the landscape, such as steep bluffs, dissected plateaus, and broad plains. These features seem to occupy two levels in the landscape, both of which are considerably lower than the high Cordillo-type silcrete at Mt Alford, but higher than the plains of Mesozoic and younger Cainozoic sediments.

This unit comprises pebbles, cobbles and boulders of quartz, silcrete, Adelaidean rock fragments and ferruginous concretionary clasts in a gypsified sand and silt matrix. Sorting is generally poor, and no consistent imbrication was observed, although avalanche-front cross stratification was noted in one outcrop near the Muloorina road (Fig. 4). A number of these gravels have a lenticular form, with the lithology changing horizontally from gravels and conglomerates to gypseous sands and silts. Also occurring are horizons of medium to coarse-grained crystalline (up to 20 mm) gypsum, light orange to pink in colour, with a discoidal, radial and (in places) platy habit. Layers range in thickness from approximately 30 cm to more than 1 m. This variation in lithology may indicate the presence of a number of different facies occurring within this unit ranging from fluvial and lacustrine for the gravels and radial gypsites to interfluves and alluvial plains for the finer clastic facies. Formation of gypsum probably occurred by precipitation from groundwaters, with the variation in size and habit being caused by fluctuations of the water table. Radial and coarse-grained gypsum may have formed by precipitation under a lake bed or at least in the

phreatic zone, where stable chemical conditions may have favoured the growth of larger crystals.

Qps - Pleistocene sands

Outcrop of this unit is limited to an area near the dog fence in the central northern region of the field area (Fig. 4). It consists of a light to medium orange and pink clayey sandstone, fine to medium-grained and pebbly in part. These outcrops are too weathered for sedimentary structures to be observed, and are in the form of crumbly and rubbly mounds approximately 3 m high capped by fine grained and powdery gypsite crusts. Also exposed in nearby creek banks are interbedded sands and clays, light red brown and green in colour, and showing a distinctive mottling. Thickness of these layers is a few 10's of centimetres, with total exposed thickness being of the order in 0.5 metre.

Forbes (1971) describes the Tirari Formation on KOPPERAMANNA as being composed of reddish and occasionally greenish sandy clay, clayey sandstone, and sandstone. Also described is a pale gypseous sand with hard reddish mottles and a mottled clay. Correlation of this Pleistocene unit with the sediments observed on Wangianna would seem feasible. Deposition seems likely to have occurred in a floodplain or distal alluvial fan environment.

Qg - Younger gypseous deposits.

More recent gypseous deposits occur widely throughout the field area, often forming caps to low ridges and scarps of Mesozoic and Tertiary sediments. They are commonly developed at the base of high areas such as the mesas and bluffs at Poole Creek, the Mt Alford area, and Alberrie Creek Plateau, but also occur on the plains near the main water courses and below the older gypsified gravel spreads.

In the northern sector, the younger gypseous deposits are usually white to light yellow brown and pink in colour, powdery to finely crystalline, and occasionally medium to coarse-grained. They are generally massive and lack any form of layering, although clear platy gypsum is common in some areas. Thickness of these deposits varies from a few centimetres to a couple of metres. A white (fine to powdery) "cowpat" capping is

developed on the top of most outcrops, forming large polygonal tepee like plates with diameters up to 1 metre.

The ground surface related to these younger gypseous deposits commonly occurs below the higher level Pleistocene horizons, and in a number of places a series of these surfaces have formed at progressively lower levels in the landscape. They probably formed by reworking of the older Pleistocene surface and each subsequent surface by wind and water, although some of the very low gypseous crusts may have formed by precipitation from groundwaters.

Qht - Gibber lags

Gibber lags occur extensively throughout much of the map area, mainly on the slopes of silcrete bluffs and mesas, but also on the plains at a considerable distance from these high areas. These spreads consist of orange to red and light grey green silcrete pebbles, cobbles and boulders, usually overlying red brown clay and silt. Dark red brown and grey to black weathered surface finishes (desert varnish) are also common. Some of these clasts are fairly well rounded, which is probably more a reflection of their original habit and of weathering effects than of a long transport history. Other clasts are quite angular.

The formation of gibber spreads near present day silcrete surfaces would seem to have occurred by the erosion of those surfaces, with some downslope movement and the removal of finer grained sediment occurring, leaving a lag of boulders relatively close to their original position. Spreads developed some distance from present day surfaces may have formed by weathering and transportation of silcrete blocks with later removal of fines leading to the preferential accumulation of gibbers. In some areas, they may be the on site remnants of other silcrete outcrops that have been severely eroded.

Qhs - Sheetwash deposits

This unit includes sheetwash, floodplain and talus deposits, but excludes gibber spreads and modern fluvial sediments. It occurs extensively along the margins of modern drainage channels and in elevated valleys between silcrete and Pleistocene gravel scarps, and consists of sand, silt, clay and boulder beds, with

reworked gypsite being a common constituent in a number of places. They are considered to have formed by downslope movement of sediment during wet periods, although wind action may also contribute to sedimentation in some areas.

Qd - Sand dunes

Dunes occur to a limited extent in the map area, with the only sizeable example located just west of Callanna Creek and Callanna Rail Siding. Other very small dunes and sandspreads were observed approximately 4 km east of Trig Hill Dam, and on a small bluff near the Muloorina road, between Box Creek and Johns Dam. The dune near Callanna Rail Siding is a large elongate feature trending roughly north east-south west. Length is about 8 km, whilst width is generally about 200 m. It consists of a core of very hard coarse red brown sand with carbonate mottling (Callen 1984), covered by loose sand of similar colour and grain size, and seems to be fairly well stabilized.

Qha - Modern stream sediments

Ephemeral streams occur widely throughout the northern sector of Wangianna, some of which originate further south in the Willouran Ranges. These streams are predominately broad flat features cut by sporadic flood pulses, with channel widths ranging from a few metres to more than 2 km. Channel bank height is usually less than 3 metres. They have a typical ephemeral stream physiography, with numerous small sub parallel channels cut within the bounds of the main channel. Sediments deposited in these water courses consist of sand, silt, clay, gravel and boulder beds. Vegetation is much more abundant along the stream courses than in nearby areas, with leaves and branches often being swept along and incorporated in the sedimentary sequence. Sedimentary structures commonly observed include scour holes, cut and fill, microterraces, ripple marks, cross stratification and mud cracks.

Q - Undifferentiated Quarternary

This unit is composed of patterned ground horizons, and occurs extensively throughout much of the field area, being particularly well developed west of Callanna Rail Siding and

north of Poole Creek (Fig. 4). It consists of pebbles, cobbles and boulders of quartz, silcrete, Adelaidean and ferruginous rock fragments lying in or on red brown clay, silt and occasionally very fine sand. These clays are quite reactive, expanding and contracting with changes in moisture content, resulting in the clasts being worked into low heaps, forming an undulating and patterned effect. In the field area, gilgai features are probably best developed on the plains, but also occur in some of the higher areas, resulting in the formation of terraced slopes.

DISCUSSION

There are a number of problems relating to the stratigraphic succession in the field area that would benefit from more detailed study. One of these is the occurrence of pebble layers and large Adelaidean boulders in the Bulldog Shale. Two methods of emplacement that have been considered are downslope dislocation and rafting (ice or tree), although others may also be possible. A closer examination of outcrop from the upper Bulldog Shale to the lower Oodnadatta Formation would be useful, particularly for determining if terrestrial and deeper water marine sediments occur in the Coorikiana Sandstone, and also to establish whether there are unconformities within or between these units. It would also help to gain a better understanding of Coorikiana Sandstone and upper Aptian to lower Albian depositional environments.

Since outcrop in this area is so poor, drill hole investigations would be extremely useful in determining the degree of continuity and thickness of the Coorikiana Sandstone, as well as ascertaining whether this unit contains fining and/or coarsening upward sequences. This latter problem may be one of definition rather than of environment.

The Wangianna field area is also an excellent one in which to study silcretes, and more work may lead to a better understanding of silcrete genesis, including the problems of age and environment of silicification.

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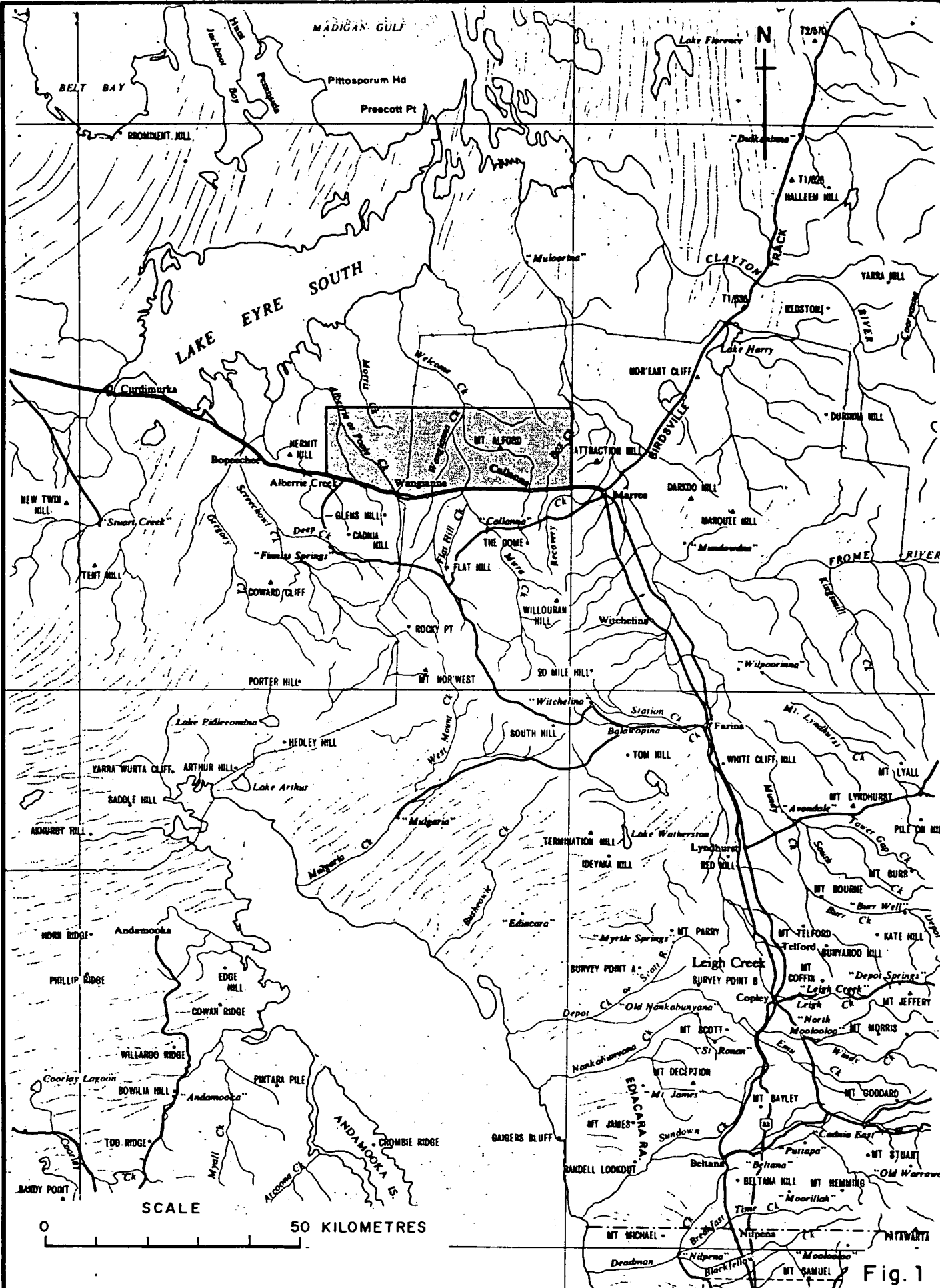


Fig. 1



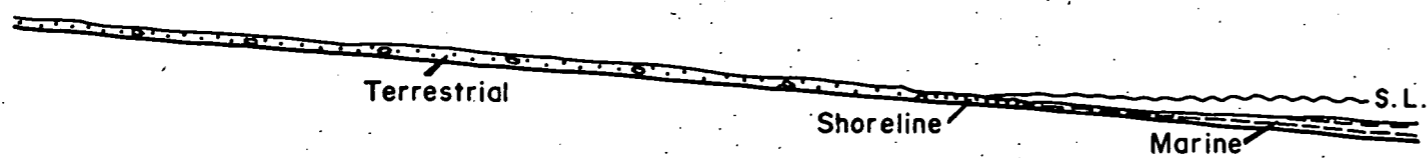
DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

WANGIANNA FIELD AREA
LOCALITY MAP

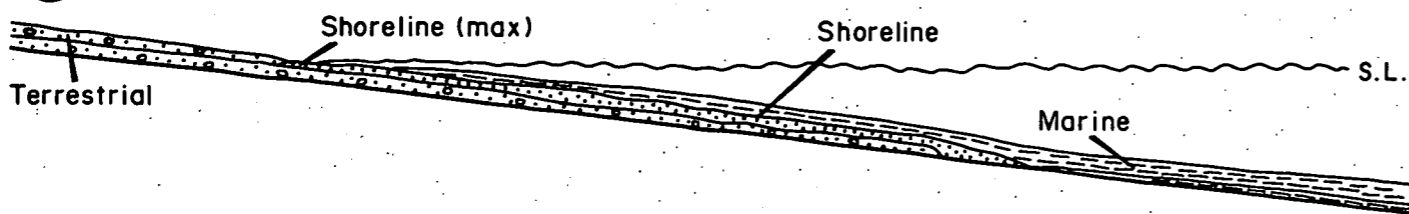
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SEQUENCE OF EVENTS - MESOZOIC SEDIMENTATION

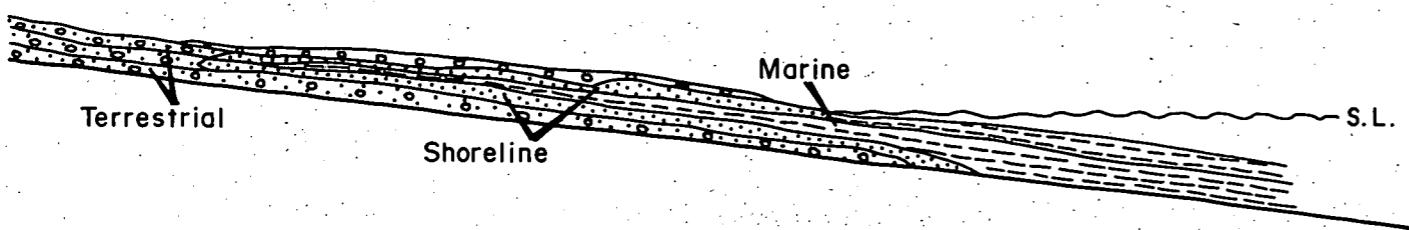
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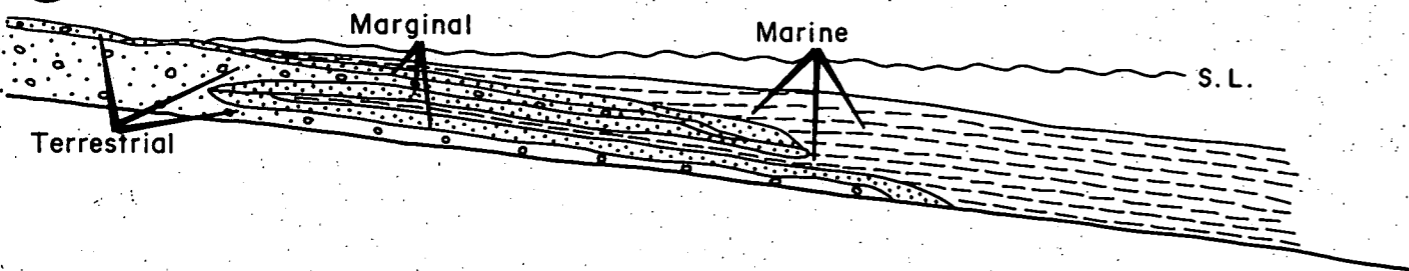
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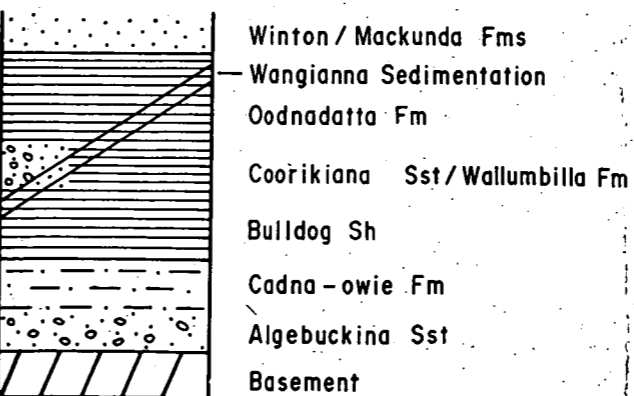
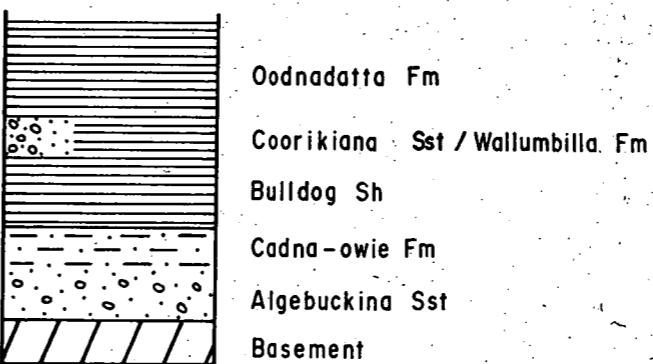
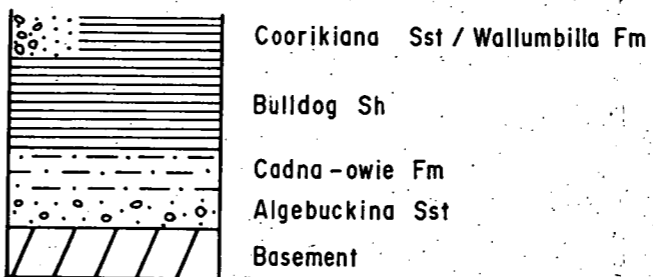
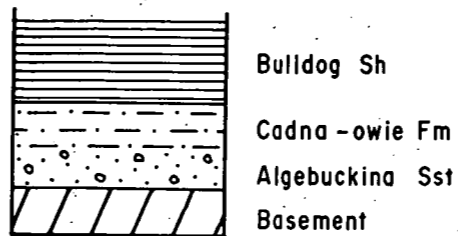
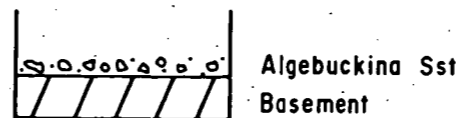
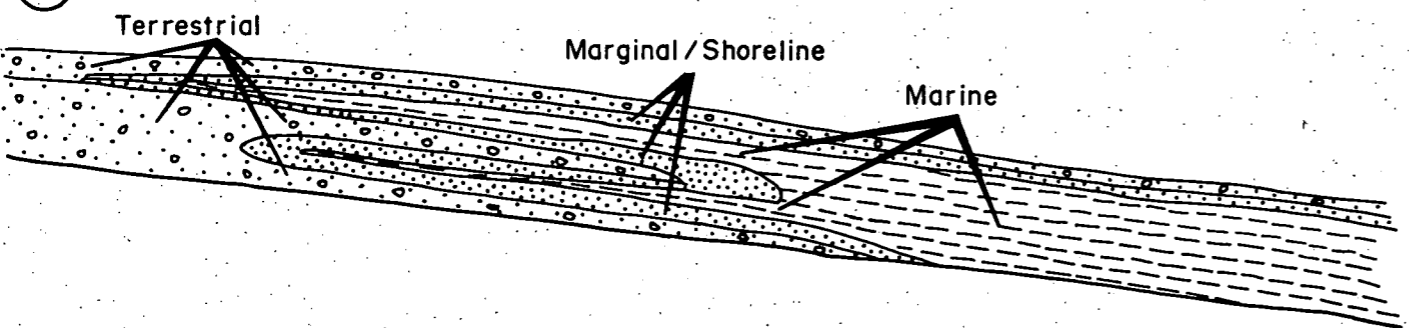
3. LIMITED REGRESSION



4. 2nd TRANSGRESSION

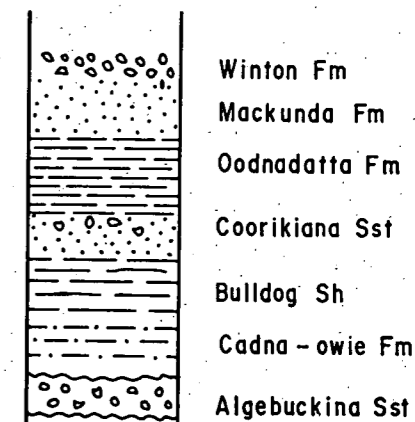


5. 2nd REGRESSION



STRATIGRAPHIC SECTIONS

MARGINAL



BASINAL

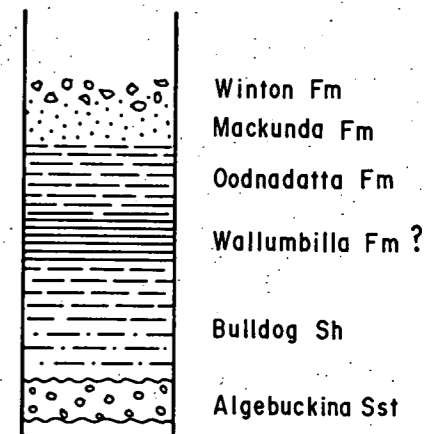


Fig. 2

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	DRAWN M.B.	SCALE
	DATE Jan '86	PLAN NUMBER
	CHECKED	86-45
WANGIANNA FIELD AREA		
SOUTH WEST EROMANGA BASIN - SEQUENCE OF EVENTS BASINAL AND MARGINAL STRATIGRAPHIC SECTIONS		

4016

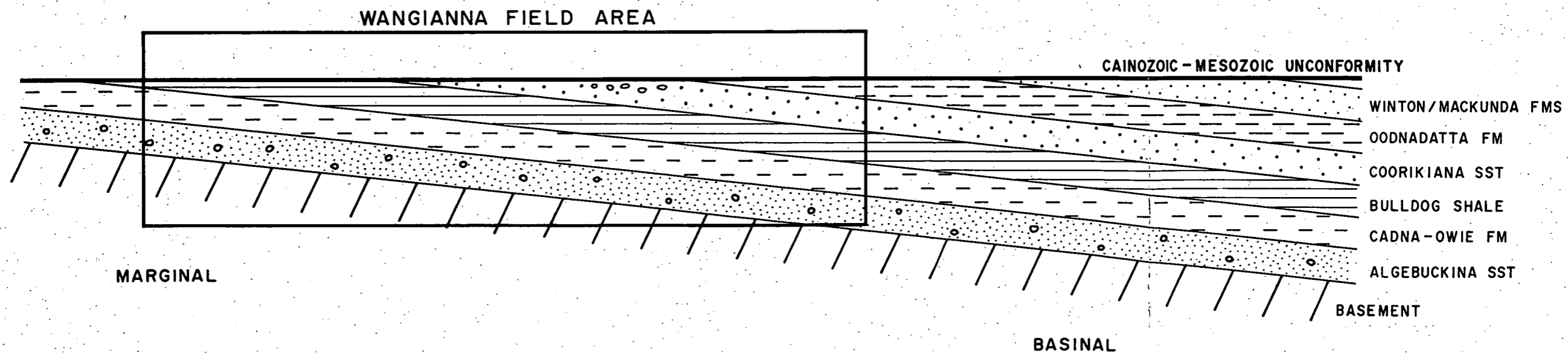
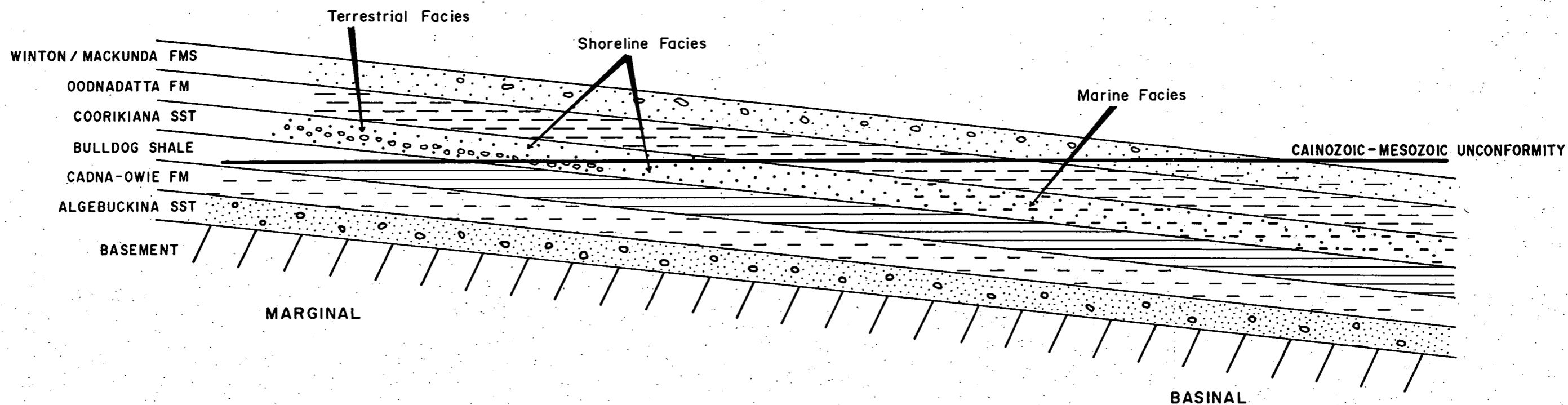

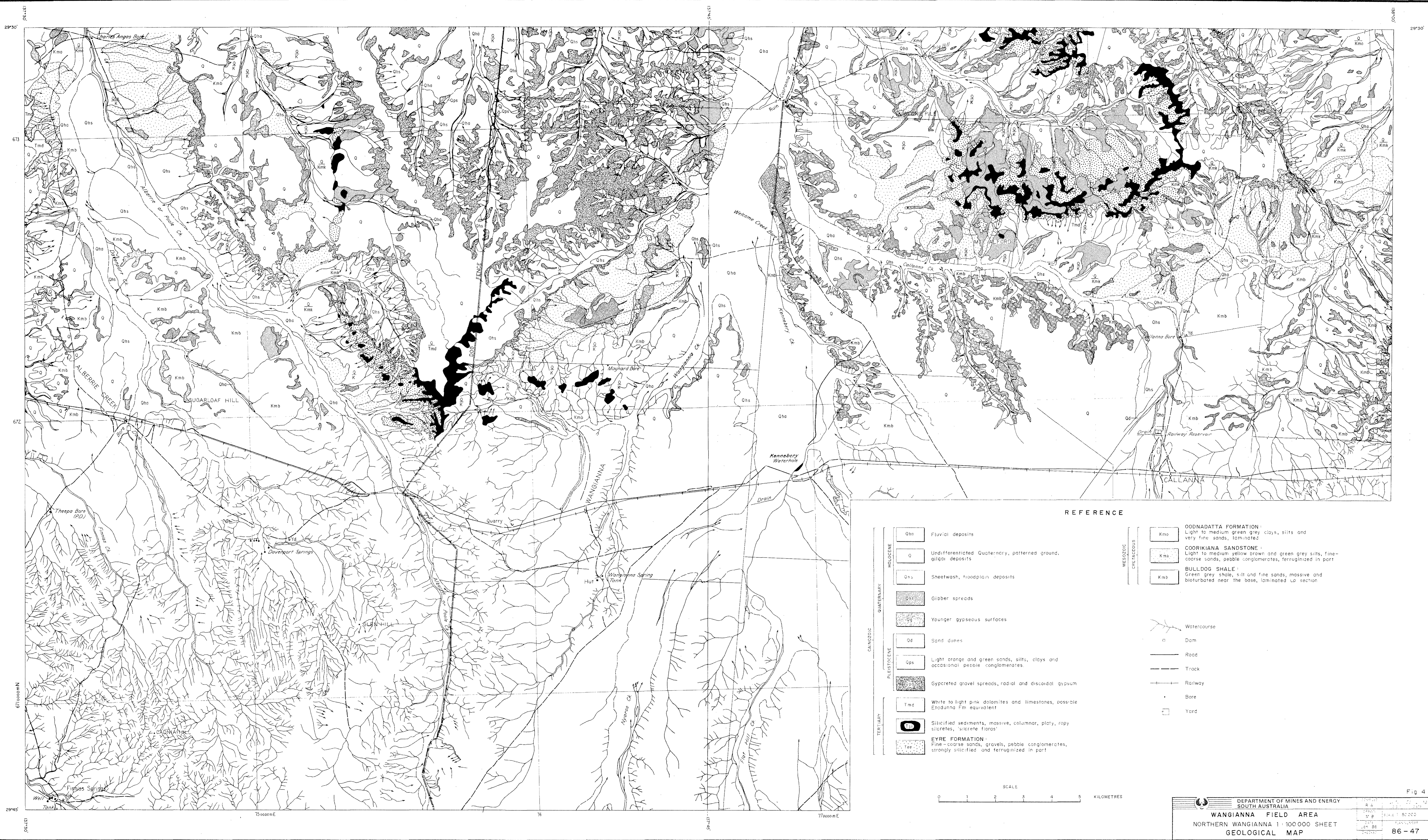


Fig. 3

 DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED R. A.	<i>WR</i> 25.6.86 C.D.O. DATE
	DRAWN M. B.	SCALE
	DATE Jan '86	PLAN NUMBER
	CHECKED	86 - 46

WANGIANNA FIELD AREA
SOUTH WEST EROMANGA BASIN - MESOZOIC
STRATIGRAPHY WITH SPECIAL REFERENCE TO WANGIANNA



QUATERNARY		MESOZOIC	
HOLOCENE	Qha Fluvial deposits	CRETACEOUS	Kmo OODNADATTA FORMATION: Light to medium green grey clays, silts and very fine sands, laminated
	Q Undifferentiated Quaternary, patterned ground, gilgai deposits		Kms COORIKIANA SANDSTONE: Light to medium yellow brown and green grey silts, fine-coarse sands, pebble conglomerates, ferruginized in part
	Qhs Sheetwash, floodplain deposits		Kmb BULLDOG SHALE: Green grey shale, silt and fine sands, massive and bioturbated near the base, laminated up section
	Qht Gliber spreads		
	Qg Younger gypseous surfaces		
	Qd Sand dunes		
PLEISTOCENE	Qps Light orange and green sands, silts, clays and occasional pebble conglomerates		
	Qp Gypcreted gravel spreads, radial and discoidal gypsum		
TERTIARY	Tmd White to light pink dolomites and limestones, possible Etadunna Fm equivalent		
	Te Silicified sediments, massive, columnar, platy, ropy siltstones, 'siltstone floras'		
	Te Eyre FORMATION: Fine-coarse sands, gravels, pebble conglomerates, strongly silicified and ferruginized in part		

REFERENCE

Watercourse

Dam

Road

Track

Railway

Bore

Yard

SCALE

0 1 2 3 4 5 KILOMETRES

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

WANGIANNA FIELD AREA

NORTHERN WANGIANNA 1:100 000 SHEET

GEOLOGICAL MAP

Fig 4

86-47