DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OPEN FILE

REPT. BK. NO. 83/3

REPORT NO.7 OF THE OFFICER BASIN STUDY GROUP. REPORT ON 1979 HELICOPTER GEOLOGICAL SURVEY, WESTERN OFFICER BASIN OF SOUTH AUSTRALIA.

GEOLOGICAL SURVEY

by

G.M. PITT

JANUARY, 1983.

D.M.E. NO. 305/79

CONTENTS PAGE

FIGURES

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 83/3
DME No. 305/79
Disk No. 124

REPORT ON 1979 HELICOPTER GEOLOGICAL SURVEY, WESTERN OFFICER BASIN OF SOUTH AUSTRALIA

REPORT No. 7 OF THE OFFICER BASIN STUDY GROUP

ABSTRACT

In July-August, 1979, a helicopter-based geological survey was conducted over the western part of the South Australian Officer Basin, with the objective of examining the Palaeozoic stratigraphy of the area to further define the hydrocarbon potential of the basin.

Four Palaeozoic units were recognised, and correlated with the Cambrian Observatory Hill Beds, the Lennis Sandstone and Wanna Beds, and the Ordovician Mount Chandler Sandstone. Tertiary units overlie the Palaeozoic in the south, consisting of the Eocene Pidinga Formation and the Miocene Nullarbor Limestone. To the north, the ?Plio-Pleistocene Mangatitja Limestone occupies palaeodrainage lows in the present landscape. Calcrete and surficial materials veneer the area.

With the exception of the porous Mount Chandler Sandstone the Palaeozoic sandstones have a generally poor visual porosity in outcrop, but this may improve with depth, beyond the influence of Tertiary weathering. Red-brown and white claystone interbeds reflect oxidising depositional conditions and are expected to be poor source-beds; they may however function as adequate caprocks.

The survey failed to discern any closed structures or reliable reversals of dip. It is concluded that deformation in this part of the basin is largely confined to low-relief seismic structures. LANDSAT imagery of the "Ooldea Sand Range" (southern Officer Basin) shows curvilinear and possibly closed structures, within the range, of unknown origin. These structures should be investigated for their implications on hydrocarbon exploration and regional tectonic studies.

The present extensive outcrop distribution of the Wanna Beds in this area may indicate an inadequate burial and thermal history for the generation of hydrocarbons in the Observatory Hill Beds and accumulation in the overlying Lennis Sandstone and Wanna Beds. An alternative, which may hold more promise, is the possibility of accumulation in deeper structures such as stratigraphic traps within the Observatory Hill source beds or structural and wedgeout traps in underlying porous sandstone bodies such as the "Murnaroo Sandstone".

2. INTRODUCTION

In 1979 a helicopter-based geological survey was conducted over the poorly-known western half of the South Australian Officer Basin. The geographic limits of the survey were the Western Australian border, latitude 28° (the southern edge of the then Pitjantjatjara Nucleus Lands), the latitude of Emu Field, and the Nullarbor Plain (Fig. 1). The Maralinga Defence Reserve was not visited, and the total area covered by the survey approximates 60,000 km^2. The main objectives of the survey were to (a) extend into this area the rock unit sequences defined for the Officer Basin in Western Australia and the northeastern part of the basin in South Australia and (b) examine the rock types in the area to assess their degree of deformation with a view to further defining the petroleum potential of the basin.

A preliminary account of the results of the survey was presented in Pitt et al. (1980).

3. PHYSIOGRAPHY, NAVIGATION

With the exception of the northern margin of the Nullarbor Plain, the survey worked entirely within the Great Victoria Desert. In general, this area consists of 10-20 m high longitudinal dunes, vegetated with mulga, Acacia and spinifex. Flat sand-plains are present to the east, north of Maralinga

(Fig. 1). These may be relatively open, or heavily mulga-forested.

Large playa-lake systems such as Lakes Maurice and Dey-Dey and the Wyola Lakes exist in the south of the survey area. Elsewhere, playa lakes are rare and relatively small, occupying swales between dunes. The remarkable Serpentine Lakes system transects the dune-covered country along the Western Australian border: it represents the trunk channel of a Tertiary to early Quarternary palaeodrainage system.

The so-called "Ooldea Sand Ridge" (Pitt, 1979) is the most prominent geomorphic feature in the south of the survey area. It is, in fact, a subtle curvilinear rise covered mainly with calcrete and sand plains but free from dunes, which are present to either side. A smaller concentric feature, the "Barton Sand Range", is seen on LANDSAT imagery, to the northeast of Maralinga. The origin of both is still unknown: some speculation is contained in Pitt (1979).

Navigable tracks in the area are shown in Fig. 1. The extensive Serpentine Lakes No. 1 and No. 2 seismic spreads, cut in the 1960's, are overgrown but navigable in parts with difficulty. However, for reconnaissance geological survey purposes, their use is impractical and inefficient. Similarly, cross-country travel in the dune-covered areas would be the most difficult and least productive way of obtaining more geological data. While cross-country work on the sand-plains is a better prospect, accurate ground-based airphoto navigation away from claypans is likewise very difficult or impractical. Helicopter-based airphoto navigation relied on the recognition of dune patterns from 300 to 1 000 m altitude and on sunny days proved a simple matter once the initial difficulties of navigation at high

speed had been overcome. Pilot cooperation proved invaluable especially on long traverses. However, navigation became extremely difficult during overcast weather due to lack of shadow and colour contrast on the dune patterns. This problem should be anticipated in any future airborne work.

4. OPERATIONS REPORT

4.1 Establishment of base camp.

A base camp was established at Vokes Corner, a site central to the survey area. This locality is approximately 1 000 km by road from Adelaide. Fuel and water supplies totalling some 65 drums were transported by Fiat semitrailer to a point 80 km north of Cook. Thereafter they were ferried by two Chevrolet K20's to Vokes Corner after establishment of the base camp. Helicopter fuel dumps of 2-4 drums each were made near the Wyola Lakes, the Serpentine Lakes and on the Emu Road.

All daily flights were made from the Vokes Corner camp; overnight fly-camps were found to be unnecessary largely due to the speed and range of the Bell 206 B Jetranger.

4.2 Personnel

T.R. Watts	(Geologist IV)
G.M. Pitt	(Geologist II)
B. Atterton	(Field Assistant)
F. Heath	(Mechanic)
C. Lipscome	(pilot)

4.3 Aircraft characteristics

Aircraft: Bell 206 B Jetranger (callsign SWH).

Operator: Lloyd Aviation Pty. Ltd. (ex-Adelaide).

Useful load: 300 kg (840 lbs): this is equivalent to three passengers, plus a load in the cargo hold. Seating arrangements

are 2 x 2, with a single passenger beside the pilot, and room for two others in the rear. Effective navigation was restricted to the front passenger. Despite the capacity for several passengers, often only one geologist would accompany the pilot on long traverses - a second geologist was found to be redundant, for on such traverses inter-locality distances made "leap-frogging" impractical. Furthermore, the deletion of the second passenger allowed the greater fuel load required for such traverses. Conversely, "leap-frogging" of two geologists was highly efficient along the Serpentine Lakes, where outcrops are numerous.

Operating range: normal range is 450 km (280 miles) or two hours safe flying, with reserves. The carriage of only one geologist and extra fuel extended the range to four hours, and the presence of fuel dumps allowed camp-to-camp flights of six hours or more when required.

Normal fuel capacity: 295 litres (65 gallons).

Fuel Consumption: Anticipated: 105 litres (23 gal.)/hour.

Actual: 80 litres (17.5 gal.)/hour.

Although actual fuel consumption was 2.5 hours per 200 litre drum, it is recommended that the lower figure of 2 hours per 200 litre drum be used to estimate fuel requirements.

Average flying speed: 200 K.P.H.; 120 M.P.H.; 105 knots.

Warm-up and shut-down times: two minutes each. Note, however, that after shut-down, the engine requires ½ hour shut-off before re-starting. In view of the hourly/daily charges, therefore, shut-down was avoided where possible.

Fuel type: Jet Al (AVTUR) aviation kerosene.

Jet 11 016 - 10 litres per 100 flying hours.

4.4 Aircraft rates and summary of costs

A chargeable total of 74.81 hours were flown in 12 days with 198 landings for geological purposes.

Rates:

Positioning and return:	$1 500.00
Helicopter hire:	$ 450.00 per day
Hourly charge:	$ 140.00 per hour

On this scale of charges, a 3-hour flying day equates to $290.00 per hour compared to a 6-hour day at $215 per hour. Obvious economies can therefore be made by maximising daily use of the helicopter. In fact, planning flight times on this basis allowed for a total of 75 hours of helicopter time, instead of the planned 50 hours, while still remaining within the original budget.

Summary of costs

15 day's flying at $450.00 per day	$ 6 750.00
74.81 flying hours at $140.00 per hour	10 473.40
Positioning and return	750.00*
Fuel 35 drums x 200 litres at $0.25c/litre	1 750.00
	$19 723.40
Ministerial authorization	$21 000.00
Balance	$ 1 276.60 CREDIT

* Note: Positioning costs are charged at half-rate, the other half being charged to the 1979 Tallaringa Gravity Survey.

4.5 Vehicles, camp equipment:

2 x Chevrolet K20 4 x 4 light trucks

1 x Landrover (long wheelbase)

1 x Fiat semi-trailer (fuel delivery to Cook area).

The two Chevrolet trucks proved to be satisfactory for the job after the trays had been strengthened, having sufficient power to transport heavy fuel and equipment loads to Vokes Corner. These vehicles are strongly recommended as the "work-horse" for load-carrying in this region in the future.

Delivery of caravan accommodation to this area is impractical and near-impossible. The camp was therefore entirely "under canvas". A 3KVA generator supplied all power needs, including the running of a small freezer. A larger refrigerator was gas-powered.

4.6 Supply of consumables

All non-perishable and some perishable foodstuffs were brought in at the initial establishment of the camp. Two subsequent stores runs were made to Cook (a two-day round trip) to collect perishables and spare parts ordered by radio and dispatched on the Adelaide-Perth train per AUSTRAIL at Port Augusta. This form of re-provisioning worked particularly well and is recommended for future surveys in the area.

Sufficient drinking water, in plastic-lined 200 litre drums, was delivered to the camp at the start of the project to avoid further water runs.

4.7 Communications

Two single side-band transceivers were used: one served for base-camp communications with Adelaide, while the other travelled with vehicles for emergency use on supply or fuel dump runs. Signal transmission to and from Adelaide was invariably good.

4.8 Permits

Three organisations were contacted with regard to permits to work in the area concerned. They are as follows (see also Fig. 1):

(1) Department for the Environment: permission was obtained to work in the Northwestern Unnamed Conservation Park (Serpentine Lakes area);

(2) Department of Defence (Woomera): country in the vicinity of Maralinga or within 50 km of Emu Field was to be avoided;

(3) Department for Community Welfare (Adelaide), Pitjantjatjara Legal Service (Alice Springs) and Aboriginal Lands Trust (Adelaide): due care to be observed if sites were encountered; certain localities were to be avoided.

4.9 Services supplied to other parties

A team from the Department for the Environment (Ecological Survey Unit) conducted a faunal and floral survey programme in the Northwestern Unnamed Conservation Park at the same time as the geological survey described herein. The SADME party provided support in the form of delivery of fuel and water from Adelaide to the Serpentine Lakes, and limited radio communications with Adelaide. In addition, 150 litres of fuel were left at Vokes Corner at the conclusion of the geological survey, for use by a Ministerial party from the Department for the Environment.

Four drums of fuel were transported to the Serpentine Lakes for the Yalata Community Inc. The community was later visited and informed of the fuel location. Acting upon a request from Yalata Community Inc. a search by helicopter was conducted for a sacred site on southern NOORINA 1:250 000 map sheet area.

4.10 Clean-up procedures

Campsites and fuel dumps were thoroughly cleared of all debris; empty fuel drums were back-loaded to Cook for rail shipment to Adelaide.

Removal of drums of fuel and water supplied to the Department for the Environment remained their responsibility.

4.11 Aircraft and vehicle performance

Both the helicopter and pilot performed admirably during the survey. It may appear that the Jetranger was overspecified in terms of passenger capability. However, an aircraft of lower specifications - such as the Bell 47-G, with which the writer has had experience - would lack the speed and range to accomplish the work. The capabilities of other helicopters such as the Hughes 500 may well be considered for any future regional survey work.

Heavy frosts and fogs served to delay morning departures on a number of days, costing some two day's work in all. Overcast conditions complicated airphoto navigation, as described earlier in this report. It is interesting to note that during the survey, the area covered received most of its cloudy weather from the western Great Australian Bight, in marked contrast to the warm cloud-free days prevalent in the northeastern part of the Great Victoria Desert. Such factors should be considered in planning for future work in this area, and provision made for 10-15% down-time due to adverse weather and poor navigation conditions during winter.

4.12 Diary of Operations

DATE	ACTIVITY
9.7.1979) 10) 11) 12)	Mechanic, field assistant leave Adelaide with fuel, equipment and camp supplies.
13) 14) 15) 16) 17) 18)	Camp at Vokes Corner established. Fuel ferried from semi-trailer fuel dump, located immediately north of Cook, to Vokes Corner.

(Contd)

DATE	ACTIVITY
19.7.1979)	Geologists drive from Adelaide to Vokes Corner.
20)	
21)	
22)	Helicopter arrives, flights commence.
23)	
24)	
25)	Geological Survey flights.
26)	
27)	
28)	
29)	Rest day (Pilot).
30)	Geological survey flights.
31)	
1.8.1979)	
2)	100 hours helicopter service at Cook.
3)	
4)	
5)	Geological survey flights.
6)	Helicopter released 6.8.1979
7)	Party returns to Cook
8)	Geologists return to Adelaide, 9.8.1979
9)	
10)	Mechanic and field asst. return to Adelaide, 10.8.79

Total engine hours: 74.81
Average engine hours/day: 4.98
Average engine hours/flying day: 6.23

Total landings for geological observations: 198

5. GEOLOGICAL REPORT

5.1 Introduction

This section will take the form of a summary description of the rock units examined in the survey area. Original site descriptions contributing to the summary are contained in Appendix 1.

Four units ascribed to the Palaeozoic of the Officer Basin were recognised in the survey area, along with sundry Tertiary and surficial rocks. Contacts between the Palaeozoic units were observed only in one instance (Unit 3/Unit 2), but an appreciation of the regional basin structure allows a sequence to be erected with confidence.

To facilitate discussion, conclusions with respect to correlation are listed in Table 1. The units are thereafter described in more detail.

TABLE 1

Mapping unit	Lithology	Correlation
	CAINOZOIC	
9	aeolian sand, clayey sand	-
8	calcrete	-
7	chalcedonic carbonate carbonate	Mangatitja Limestone Nullarbor Limestone
6	silcrete	-
5	pebbly, gritty sandstone	Pidinga Formation
	PALAEOZOIC (OFFICER BASIN)	
4	orange, quartzitic sandstone	Mt. Chandler Sandstone

(Table 1 contd)

3	white, crossbedded micaceous sandstone, red and white claystone	Wanna Beds
2	red-khaki micaceous sandstone, claystone	Lennis Sandstone
1	siltstone, shale, carbonate, nodular chert.	Observatory Hill Beds

5.2 Stratigraphy

Unit 1

Correlation: Observatory Hill Beds

General:

The type section of the Observatory Hill Beds is the only one to lie within the survey area. Sediments exposed in the type section consist of "red, green and grey micaceous siltstones and silty shales, frequently calcareous; brown, fine to medium-grained greywacke and thin carbonate-chert beds. The main characteristics are high contents of K-feldspar in the clastics, extremely thin parallel bedding of the greywacke and concentric multicoloured chert nodules and chert breccias associated with the carbonates" (Wopfner, 1969).

Beds at the very top of the type section are sandy and regionally pass up into white, crossbedded sandstones (discussed later in this report). The type section therefore represents the uppermost 25 m of the Observatory Hill Beds. A nearby stratigraphic well, SADME Murnaroo 1 (Gatehouse, 1979), intersected the remainder of the succession to a depth of 317 m, where it passed into underlying sandstone. The type section and the top of the Murnaroo-1 intersection are correlable, and the thickness of Observatory Hill Beds is therefore locally about 310 m.

Lithotypes, mud crack impressions and the presence of gypsum indicate the Observatory Hill Beds were deposited under evaporitic conditions. Coarse, authigenic scapolite is also present, reflecting a high soda content. Further evidence for the environment of deposition comes from the recognition by the present writer and co-workers of the distinctive cherts in this unit as being of "magadi-type" (Eugster, 1969; Surdam et al., 1972). Such cherts are formed from a sodium silicate precursor, magadiite, which is precipitated as a gel in, specifically, alkaline lakes.

The formation of hyperalkaline waters through evaporation can only take place in a nonmarine environment: the open circulation implicit in a marine evaporative system permits the development of hypersalinity but not the hyperalkalinity required to dissolve silica and subsequently precipitate magadiite. Therefore, while the identification of the well-known and distinctive Observatory Hill Beds cherts as magadi-type confirms the previously postulated evaporitive conditions, it also suggests the beds are non-marine wherever the cherts have been found.

Palaeontological studies of Observatory Hill Beds' equivalents in stratigraphic well SADME Wilkinson 1 and in the Mt. Johns area have concluded they are of Early Cambrian age (Benbow, 1980).

Survey results:

The distinctive cherts of the Observatory Hill Beds were observed at three localities, apart from the type section: localities 27, 32 and 34 on sheets 5138 and 5139 (see Table 1, Appendix 1). However, an early reconnaissance geological report by McKenzie (1959) clearly records such cherts ("Lake Maurice

Cherts") along the the western side of Lake Maurice, between localities 59 and 29-30 of the present survey. North of these localities only the overlying white (or black when ferruginised) sandstones crop out. The upper outcrop boundary of the Observatory Hill Beds is thus reasonably well defined from the type section to western Lake Maurice (see Fig. 4).

At localities where the Observatory Hill Beds were conclusively identified they consisted of thin-bedded to laminated white, grey or maroon, micaceous, clayey siltstones to very fine-grained sandstones. Clay intraclast beds were common, while chert nodules and plates were recorded as described above. Possible trace fossils were recorded at locality 28, and pebbles of a dark "oolitic" carbonate would indicate the presence of that lithology in nearby Observatory Hill Beds subcrop. This distinctive lithology has also been recorded in the northeastern Officer Basin near "Wallatinna" O.S.

The stratigraphic identity of localities 29-30 and 59 are in doubt: both contain massive but micaceous green to brown claystone which may be Observatory Hill Beds or a Tertiary unit with affinities to the Etadunna Formation and equivalents.

One specific objective of the work in this area was to establish the presence or continuity of the Observatory Hill Beds in the southern Officer Basin, beyond the so-called Ooldea Sand Range. This point was not settled conclusively. A linear group of claypans on northern Chilbinga sheet (4938; WYOLA) lies immediately south of the Ooldea Sand Range and presented the best opportunity to find outcrops of the Beds. All claypans in this group were examined and only two such outcrops recorded, at localities 62 and 63-198. Massive ironstone replaces an originally layered rock and underlies probable Tertiary limestone

at locality 62. At locality 63-198, silicified ?Tertiary sands overlie micaceous, very fine-grained sands to clays, which are thinly layered to laminated and have a shaley parting. The writer is of the opinion that these probably represent the Observatory Hill Beds, but there is no absolute proof of this.

A short distance from the Western Australian border, at locality 69, the writer observed nodular calcrete overlying a flat-lying, well-bedded to laminated, buff-coloured, sandy carbonate. This lithology resembled Burra Group dolomites of the Adelaide Geosyncline, but not Tertiary carbonates of the Eucla Basin. It is therefore considered to most likely be part of the late Precambrian or Cambrian sequence of the Officer Basin. Conclusive identification of this outcrop will await future regional mapping of the basin. Two possible avenues of study might be the examination of Officer Basin units, such as the Ilma Beds, (Jackson and van de Graaff, 1979) immediately to the west, and a search for microfossils such as acritarchs, within samples of the carbonate.

All other possible outcrops of the Observatory Hill Beds south of the Ooldea Sand Range were examined, with no success. However, the group of claypans discussed above straddles the Cook-Vokes Corner track and access to them is relatively easy. It is therefore recommended that they be examined in detail during any future ground-based regional mapping.

Unit 2

Correlation: Lennis Sandstone

General:

The Lennis Sandstone was defined by Lowry et al (1972), from a 320 m interval in Hunt Oil Yowalga 2 on LENNIS in Western Australia. A detailed description also appears in Jackson and

van de Graaff (1979). The latter describes the unit as a red-brown, fine to medium grained, feldspathic, micaceous sandstone with red micaceous siltstone interbeds up to 3 m thick in some areas. Medium to large scale cross-bedding is usually present.

The sandstone overlies the Western Australian Table Hill Volcanics and, by implication, their equivalents, the Kulyong Volcanics in South Australia. In Western Australia it is overlain conformably (or, in part, possibly disconformably - see Jackson and van de Graaff, 1979) by the white Wanna Beds.

It is important to distinguish the "original" red and red-brown colouration of the Lennis Sandstone from the later effects of Tertiary weathering and ferruginisation. The latter is distinguished by the presence of a zonation or gradation of ferruginisation colours within the exposed section, or by the presence of such ferruginisation at a particular point in the present landscape. Thus black, ferruginised Wanna Beds in lake floors or red and yellow-coloured Wanna Beds in cliff sections are not be confused with the homogeneous red-brown colouration of the Lennis Sandstone.

Pitt et al. (1980), as well as previous workers, have postulated a correlation between the Lennis Sandstone and the lower "red" member of the Cambrian Trainor Hill Sandstone of the Mt. Johns area. Correspondingly, the Wanna Beds would correlate to the upper "white" member. On this basis, both would be regarded as Cambrian in age.

Survey results:

By reference to the mapped distribution of the Wanna Beds in Western Australia (Jackson and van de Graaff, 1979) there is little doubt that the spectacular, white or multi-hued sandstone outcrops of the Serpentine Lakes should be correlated to them.

This unit will be discussed later. However, to the south of the Serpentine Lakes, on northwestern WYOLA, a series of outcrops (localities 157, 158, 159, 160, 161) expose such a white sandstone overlying a thinner bedded, dark brown to khaki or buff-coloured, fine-grained, lithic, cross-bedded sandstone of poor to moderate visual porosity in weathered section. Dark, ferruginous, clastic grains indicate the colour is original and not of Tertiary origin. Dark red-brown micaceous claystone-siltstone interbeds are also present. On the basis of such characteristics and relationships to the interpreted Wanna Beds equivalents, these rocks are correlated with the Lennis Sandstone.

It is interesting to note that white "Wanna" sandstones occur in all directions around these particular outcrops, thus the Lennis Sandstone in this area may be regarded as being exposed in a small erosional "window".

Two other outcrops of brown-khaki sandstone correlated with the Lennis Sandstone, occur to the south at localities 70 and 71. It is significant that some kilometres still further south at locality 69, an outcrop of carbonate with possible affinities to the Observatory Hill Beds was observed (described earlier in this report). There is thus an apparent sequence of units in this area which youngs northwards.

Unit 3

Correlation: Wanna Beds

General:

Lowry et al. (1972) defined the Wanna Beds as a unit of white-weathering, micaceous, feldspathic sandstone, displaying large scale cross-bedding. Type and reference sections are on WANNA sheet and in BMR Neale 1 respectively, and a detailed

description of the unit is contained in Jackson and van de Graaff (1979). The Wanna Beds overlie the Lennis Sandstone with a transitional contact in Waigen 6 and BMR Neale 1 wells, while field relationships on WAIGEN and COOPER sheets suggests a disconformable relationship.

Survey results:

Jackson and van de Graaff (1979) record the Wanna Beds as extending in outcrop eastwards along the broad axial zone of the Officer Basin and infer that they are present in the equivalent area in South Australia, on NOORINA and WYOLA. The present survey appears to confirm this: throughout NOORINA and northern WYOLA non-surficial outcrops consist entirely of massive to thin-bedded or spectacularly cross-bedded, micaceous, lithic or kaolinitic, fine to medium grained sandstones. In general the colour is white, except where vari-coloured by Tertiary ferruginisation. Porosity of the rock in the weathered state is low, but may improve at depth where lithic grains are possibly discrete and have not been kaolinised. White or red-brown micaceous silt-clay beds may be present. The best outcrops occur along the Serpentine Lakes with innumerable cliff exposures of up to 30 m. There is little doubt that these sediments represent the South Australian extension of the Wanna Beds.

The sandstones described above extend further eastwards across MAURICE and WELLS. On southwestern WELLS they appear to directly overlie the Observatory Hill Beds near the type section, as the intervening Lennis Sandstone was not recorded. This may be a function of poor outcrop or it may reflect the ?disconformity that Jackson and van de Graaff (1979) suspect exists in Western Australia. In the Emu area, on the adjacent GILES sheet, this unit is that termed the "Emu Sandstone" by

Wopfner (1969) and other earlier workers. Black, ferruginised sandstones in the floor of Lake Dey Dey and in the floors and banks of the Wyola Lakes are also correlated to the same unit. The correspondence of the black ferruginisation to the present lake-floor level suggests that the ferruginisation is of relatively recent origin. (If the ferruginisation is of Tertiary age, then the lake floor must be of that age also. However, the writer is of the opinion that these relationships provide evidence of more recent, perhaps still-active ferruginisation related to stable, exposed-watertable levels).

One further feature of Wanna Beds exposures in lake beds is of note: erosion of ferruginised, very large scale cross-bed foresets results in the appearance of simple 10°-20° dipping beds, thereby suggesting tectonic deformation. These beds remain parallel and with substantial dip over an area of up to 50 m (along "strike") by 10 m, such is the scale of the cross-bed sets. The field geologist should beware of their misleading appearance, particularly from the air. Furthermore, the size of these structures emphasises the problem of obtaining a true bedding orientation, for even the bases of such cross-bed sets are not necessarily parallel to "true bedding". In the final analysis, a reliable survey of true dips of the Wanna Beds was not possible for this reason, though many apparent current directions were obtained from such exposures in Lake Dey Dey and the Serpentine Lakes.

Unit 4

Correlation: Mount Chandler Sandstone

General:

Krieg (1973) describes the Mount Chandler Sandstone from the EVERARD area as a fine to medium, well sorted, white to reddish

quartzitic or slightly feldspathic sandstone. Diagnostic features which may distinguish it from the underlying Trainor Hill Sandstone are the presence of Scolithus ("pipe-rock") and Diplocraterion burrows, and a lower lithic, feldspathic and mica content.

In Western Australia, the Wanna Beds unconformably underlie the Permian Paterson Formation. The Mount Chandler Sandstone is considered to be lower to middle Ordovician, on the basis of recent geochronology of the overlying Indulkana Shale. In view of the hypothesised correlation of the Cambrian Trainor Hill Sandstone with the Lennis Sandstone and Wanna Beds, the Mount Chandler Sandstone would appear to be confined to the northeastern parts of the Officer Basin.

Survey results:

White, clayey, micaceous sandstone mapped as Unit 3 and correlated with the Wanna Beds crops out from the Western Australian border-Serpentine Lakes area eastwards beyond the eastern margin of the survey area, near Emu. In the northeastern corner of the survey area, however, the sparse interdunal outcrops of Wanna Beds equivalents are replaced by a cleaner, even-grained sandstone correlated with the Mount Chandler Sandstone.

In contrast to the low scarp-edge outcrops of the Wanna Beds equivalents, this unit crops out as dark, well-defined, rounded, interdunal rises. The sandstone is porous in outcrop (when unsilicified), fine to medium-grained, light orange-grey to orange-brown, with thin to thick bedding. The texture is usually even and saccharoidal, and cross-bedding is absent. At a few localities the sandstone was clayey, but claystone interbeds, such as those seen in the underlying unit, were not recorded.

Trace fossils were, however, recorded in the form of an intersecting "tangle" of (?)worm tubes on bedding planes and probable Diplocraterion burrows, as at localities 8, 9, and 187.

Possible structuring was observed at locality 8, where an aerial view of bedding trends suggested a subtle northwest dip. The textural and compositional maturity of the sandstone would indicate that the moderate to good visual porosities observed in outcrop are also present at depth.

Unit 5

Correlation: Tertiary sands (?Pidinga Formation)

General:

Along the southern margins of the survey area the cross-bedded sandstones of the Wanna Beds equivalents are often heavily ferruginised and overlain by a younger, though equally ferruginised sandstone. By lithological correlation with similar sandstones in central and western inland South Australia, these are considered to be of probable Early Tertiary age and therefore represent the marginal Pidinga Formation (Lindsay and Harris, 1975) of the Eucla Basin.

In constrast to the even-grained, spectacularly cross-bedded Palaeozoic sandstones, these rocks are massive and medium to coarse grained, with a bimodal grit to pebble-sized component. At first sight, typical claypan-floor outcrops, such as localities 48 and 196, represent a single unit. On closer examination such examples consist of large scale foresets in an even-grained, ferruginised Wanna Beds equivalent sandstone (displaying the "pseudo-dips" discussed earlier), overlain, with irregular contact, by a ferruginous, unstructured gritty to pebbly sandstone of interpreted Tertiary age. Less commonly, outcrops consisting only of ferruginised Tertiary sands (e.g.

locality 26) were recorded. In both such cases, the bimodality of grainsize and/or presence of a basal quartz-pebble conglomerate is the key to the identification of the younger unit.

Rarely is more than a metre of the Tertiary sandstone preserved. In exposure along the sides of claypans the Tertiary is overlain by nodular calcrete and/or recent aeolian sands.

Unit 7

Correlation: Nullarbor Limestone, Etadunna Formation and equivalents; Mangatitja Limestone.

General:

Tertiary to early Quaternary limestones of inland South Australia are generally classified in two groupings:

1) the Etadunna Formation (Wopfner, 1974), Namba Formation, (Callen and Tedford, 1976), Garford Formation (Benbow and Pitt, 1978) and equivalents are recognised as Miocene and are often associated with an underlying or interbedded clay sequence. The limestone component of such units is usually cream-coloured and fine grained with little chalcedonic veining or replacement.

The Nullarbor Limestone (Lindsay and Harris, 1975), a marine unit of the Eucla Basin, has a well-established Miocene age and may be regarded as a time-equivalent of the Etadunna, Namba and Garford formations.

2) The Mangatitja (Major, 1973), Mt. Willoughby (Nichol, 1971) and Cadelga (Wopfner, 1974) limestones are aphanitic to earthy in character, often highly chalcedonic, and overlie a thin sequence of ferruginous and calcareous clastics that may be formally included within or excluded from the respective units. Present workers regard them as late Tertiary to early Quaternary but no absolute proof of age is available.

In the most recent paper published on the subject, Wopfner (1974), by implication, considers both sets of units to form a single Miocene grouping, on a basis now considered spurious. However this point has never been taken further in print.

Survey results:

The occurrence of thin, surficial carbonates in the survey area may be discussed under three geographical headings:

1) Northern Eucla Basin:

At locality 62, a buff-coloured, clean aphanitic limestone, variably ferruginised and silicified, overlies heavily ferruginised (?)Cambrian; at locality 69, calcreted fossiliferous limestone overlies a Cambrian or possible Precambrian carbonate. Both occurrences are considered to represent altered Miocene Nullarbor Limestone.

Localities 164 and 165, also south of the Ooldea Sand Range, expose chalcedony of the Mangatitja Limestone style.

Such occurrences of Mangatitja lithologies so far south were unexpected. The question of the identity of these outcrops has not been satisfactorily resolved: they may represent previously unrecorded remnants of Late Tertiary carbonates overlying the Miocene Nullarbor Limestone, or alternatively, the Nullarbor Limestone may be rarely chalcedonic, thus appearing lithologically indistinguishable from the Mangatitja Limestone.

2) Wyola Lakes area:

Thin cream-coloured limestones overlie exposures of ferruginised Wanna Beds equivalents at four localities (43, 44, 45, 47) in the Wyola/Halinor Lakes area. Though silicified they have greater lithological affinities with the Miocene limestones than with the Mangatitja Limestone, and are therefore correlated with the former.

3) NOORINA, WELLS area:

Carbonates which are confidently regarded as Mangatitja Limestone were recorded on NOORINA and WELLS sheets. They consist of pale-coloured, earthy to aphanitic carbonates which are partly or wholly replaced by a white to clear agate-like silica. Most are exposed in lows reflecting Tertiary palaeodrainage topography, and a few occurrences (e.g. localities 110 and 120) are conformably underlain by fragmental, ferruginous and calcareous rocks of Doorbara Formation style. Such a sequence is commonly observed in the Stuart Range and Cadelga areas.

Some outcrops such as locality 120 are significant in that they occur as broad interdunal mounds of "valley calcrete" of the type described by Mann and Horwitz (1979) in Western Australia. Such mounds, Mann and Horwitz suggest, grew (and still are growing) in a "mushroom" manner, by precipitation of carbonates at the water table. The important calcrete uranium occurrences of Western Australia are associated with these features. Analogous South Australian drainage-related carbonates have appeared, to date, to be eroded, "fossil", examples. The present observations are the first examples of intact (and possibly "live") valley calcrete structures in South Australia.

Unit 8

Correlation: Quaternary calcretes.

To avoid misunderstanding, calcretes described here are "soil" or "skin" calcretes, to be distinguished from the valley calcretes of Western Australia. (Mangatitja Limestone would fall into the latter category).

Nodular, rubbly and massive calcretes occurred both as a veneer to Palaeozoic outcrops and as an alteration product of the

Mangatitja-type carbonates. In both cases, no correlation is made with the calcrete units of formal stratigraphy, such as the Bakara or Ripon Calcretes.

Units 9 and 6

Surficial materials and silcretes.

Silcretes were recorded only on the high cliffs along the Serpentine Lakes and in some southern localities such as locality 29-30 at Lake Maurice. In the former instance, the Palaeozoic rocks form the host rock, while at Lake Maurice, clean Tertiary sands are silicified to form a massive but brittle silcrete of orthoquartzitic texture. No evidence is available to correlate the latter with either the hypothesised Eocene or Miocene age silcretes in the Stuart Range to the east (Barnes and Pitt, 1976, 1977, and Wopfner, 1974).

No silcretes were recorded east of the Serpentine Lakes and north of Lake Maurice, though some may be present. It is probable that the late Tertiary-Quaternary palaeodrainage system which produced the "fossil" topography seen today was responsible for stripping most of the silcrete from this area.

The survey area is veneered with longitudinal sand dunes and flat sand plains. Both display a two-part subdivision consisting of a core or substrate of compacted red-brown clayey sands overlain by paler-coloured, unconsolidated sands. On the longitudinal dunes such sands are semi-mobile while elsewhere they are usually fixed by grasses.

5.3 Structure

Folding

All suitable outcrops were examined critically for dips which might have indicated some structural deformation. In a few

cases, such as locality 32, a reliable, shallow dip (5° or less) was recorded. Elsewhere, however, dips were either:

(a) flat, or so nearly flat that the perception of a dip was subjective and unreliable, or

(b) measured from the bases of cross-bed sets and therefore unreliable, since they could not be proven to be parallel to "true" beddings.

"Pseudo"-dips on lake-bed exposures of cross-bed foresets were carefully avoided.

For these reasons no folding was recognised. This is not to say that low-relief structures do not exist - seismic work associated with the Birksgate-1 drilling (Henderson and Tauer, 1976) appears to outline such structures, for instance. It would appear, however, that only seismic surveys and detailed lithological correlation of such wells as may be drilled in the future may be capable of outlining potentially significant structures.

Lineaments, current directions

An outcrop lineament forms a long, low, 080°-trending, south-facing scarp near locality 10 on northeastern WELLS, while vegetation photolineaments trending 010-030° were recorded on northwestern WYOLA. These appear to reflect fault and joint structures, respectively. In addition, joints in outcrop were observed at locality 13 (Observatory Hill Beds type section) trending 000°-030°, and at locality 51, trending 120° and 160°.

The examination of foreset dips in the Wanna Beds as an indicator of a dominant current direction was not conclusive, for numerous dip directions could be obtained from a single exposure. The significance of a slight predominance of southwest to southeasterly trending recordings is debatable.

"Ooldea Sand Range"

The survey failed to discern any closed structures or reliable reversals of dip and it would seem that deformation of much of the basin is confined to low relief structures such as that on which Birksgate-1 was drilled. The "Ooldea Sand Range" is possibly anomalous in this respect. A brief description of the "range" is necessary (see Fig. 4): the structure is a subtle, comparatively narrow, curvilinear topographic high extending from the Pidinga Lakes some 40 km into Western Australia near the Serpentine Lakes. It is, however, not described in any Western Australian literature. The "range" has a total length of 420 km, width of 30 km and relative height of up to 60 m. Apart from the southeastern end, which is covered by longitudinal dunes, the remaining 95% consists of flat sand plains and calcrete rises. Its origin is unknown: geological surveys (including the present one) have recorded only surficial calcrete, with no evidence of the substrate. Results of drilling near Maralinga (Ludbrook, 1961) are equivocal. As the ridge marks the northern edge of the Eucla Basin (sensu stricto), beach-ridge models have been invoked to explain it. However for various reasons this seems overly simplistic (see further discussion in Pitt, 1979).

Examination of LANDSAT false colour composite images has revealed for the first time linear and curvilinear structures within the Ooldea Sand Range between Maralinga and the Serpentine Lakes, and even apparent closures immediately south of the latter (Fig. 3). Larger scale aerial colour photography depicts the apparent closures as lines of sand-filled sinkholes which have centres of heavy tree growth. The impression from the LANDSAT imagery is that of a possibly dipping and/or folded substrate

outlined by surficial calcrete and sinkhole distributions. Such a conclusion has important implications for hydrocarbon exploration and regional geological/tectonic studies. It is therefore considered vital that further study be made of this feature, its origin and subsurface structure.

5.4 Synthesis

Summary of stratigraphy

In essence, the survey confirmed previous concepts of the distribution of South Australian-defined Palaeozoic units, and extrapolated Western Australian Palaeozoic sandstone units into the survey area.

Four such units are recognised and have been correlated with formal stratigraphic nomenclature. They are as follows:

Unit 1:

The oldest unit in the survey area, the Observatory Hill Beds, were traced from the type section to south of Lake Maurice. Possible westwards occurrences are present south of the Ooldea Sand Range. A carbonate on the Western Australian border (locality 69) may be Cambrian or Precambrian. The Observatory Hill Beds consist of micaceous red-green to maroon shale and siltstone with some carbonate and nodular chert, deposited under variably evaporative conditions. Outcrops both at the type section and in the northeastern Officer Basin indicate that the Beds pass conformably into the overlying sandstone.

Studies in the eastern part of the basin indicate the unit is of Early Cambrian age.

Unit 2:

Red-brown to khaki sandstone and minor interbedded claystone is correlated with the Lennis Sandstone and occurs only near

the Western Australian border on WYOLA. The apparent absence of the unit elsewhere may be a function of poor outcrop or the result of a Lennis Sandstone/Wanna Beds disconformity suggested by Jackson and van de Graaff (1979). Correlation with the lower "red" member of the Trainor Hill Sandstone would imply the Lennis Sandstone is of Early-Middle Cambrian age.

Unit 3:

White, cross-bedded, lithic and micaceous sandstone, cropping out in much of the survey area, is correlated with the Wanna Beds. Red or white claystone beds, up to a few metres thick, have been recorded. Correlation to the upper member of the Trainor Hill Sandstone indicates an Early-Middle Cambrian age.

Unit 4:

Orange, clean, fine to medium-grained, often saccharoidal sandstone in the northeastern corner of the survey area represents the Early to Middle Ordovician Mount Chandler Sandstone. It extends north and eastwards beyond the survey area.

Unit 5:

Gritty to pebbly and usually ferruginised sandstones which occur immediately to the north and south of the Ooldea Sand Range, near the the Wyola Lakes, are correlated with the Eocene Pidinga Formation.

Unit 7:

Nullarbor Limestone (Miocene) was recorded in the area immediately south of the Ooldea Sand Range. In addition, to the north of the range, probable time-equivalents occur around the southern margin of the Wyola Lakes.

Mangatitja Limestone was recorded in palaeodrainage lows in the northern half of the survey area.

Unit 6, 8, 9:

Quaternary calcretes occur as an alteration product of Tertiary limestone, and as thin veneers on Palaeozoic outcrops. Silcrete was recorded in the cliffs along the Serpentine Lakes and in the Wyola Lakes and Lake Maurice areas. It was notably absent in the central part of the survey area. Consolidated and unconsolidated Quaternary sands veneer most of the survey area.

5.5 Comments on petroleum potential

Unit 1: Observatory Hill Beds

Outcrops of the Beds were invariably too deeply weathered to allow sampling for organic analytical work. Scree from locality 32(a) would indicate the presence of distinctive oolitic carbonates in subcropping Observatory Hill Beds. Identical lithologies are observed in the northeastern part of the basin associated with organic-rich shales and it is therefore possible that such facies may extend to the southern and southwestern parts of the basin.

Unit 2: Lennis Sandstone

Sandstone within this unit is clayey and of moderate to poor visual porosity. Claystone interbeds are numerous. Porosity and permeability of the sandstone may improve at depth where the effects of Cainozoic weathering of the lithic component are absent.

The red-brown colouration of both sandstone and claystone beds is regarded as original (or at most early-diagenetic) and would argue for an oxidising content in the sediment. The

source-rock potential of the claystone interbeds is thus regarded as low.

Unit 3: Wanna Beds

Sandstone within the Beds has a generally moderate to poor visual porosity, due largely to kaolinisation of lithic components. At depth, therefore, as with the Lennis Sandstone, porosity and permeability may improve.

Claystone interbeds would offer poor source-rock potential, for the same reason as those within the Lennis Sandstone. All other conditions being favourable, however, these beds could comprise suitable caprocks to structural traps.

Unit 4: Mount Chandler Sandstone.

Examination of outcrop material suggests moderate to good porosity and permeability may be expected at depth. Suitable caprocks in the form of claystone interbeds were not recorded. This may, however, be a function of the very sparse outcrop in the region. The overlying Indulkana Shale may form a suitable caprock, but only towards the Munyarai-1 area where both it and the Mount Chandler Sandstone occur at depth.

Discussion

The main problem with respect to the potential for hydrocarbon accumulation in the western half of the Officer Basin in South Australia is one of depth of burial and therefore thermal history. The Mount Chandler Sandstone crops out only as far west as 130°30'. South and west of these areas, Trainor Hill Sandstone, Wanna Beds and Lennis Sandstone crop out. The burial and thermal history of these source and reservoir beds may therefore be inadequate for the generation and accumulation of hydrocarbons. Nevertheless one possibility to hold promise is that of hydrocarbon generation in the Observatory Hill Beds with

accumulation in stratigraphic traps within the Beds, or in a variety of traps in underlying porous sediments. Such an example is the "Murnaroo Sandstone" (informal name), intersected beneath Observatory Hill Beds in SADME Murnaroo-1, which may wedge out against a basement ridge immediately to the southeast of the well.

5.6 Recommendations for future work

1. Hydrocarbon exploration: The contribution that future ground mapping can make to hydrocarbon exploration in this basin, apart from the refining of regional stratigraphic correlation, is essentially minimal. Stratigraphic and exploration wells plus further seismic work will necessarily comprise the next phase of petroleum exploration. In particular, stratigraphic well data is needed in the southern and southwestern parts of the basin (in South Australia) to further examine the source-rock potential of the Observatory Hill Beds, and to define the potential for stratigraphic traps in or beneath that unit. In view of the interest generated by 1976-1979 SADME stratigraphic drilling in the Officer Basin, such future work would appear to be in the hands of private operators.

2. Regional geological mapping: Recommendations have been sought by Supervising and Senior Geologists, Regional Geology, for the conduct of a future regional mapping survey of MAURICE, WELLS, WYOLA and NOORINA. Details are contained in a submission in Docket DME 305/79.

In summary, the recommendations are:

(i) a reconnaissance field trip to examine Officer Basin units in Western Australia and along the state border, on the basis of the stratigraphy and maps contained in Jackson and Van

de Graaff (1979). The importance of such a trip cannot be over-emphasised;

(ii) the detailed pre-field season photointerpretation of all four sheets incorporating all data to hand at present;

(iii) A 6-8 week's mapping survey around a permanent base camp established near the Wyola Lakes to conduct ground mapping of only sand-plain (i.e. non-dune) areas such as the Wyola Lakes and Lake Maurice-Observatory Hill areas, with a concurrent helicopter survey (50-60 flying hours; 10-12 flying days) working from the permanent base camp and covering NOORINA and WELLS.
N.B. (Apart from a traverse of the Serpentine Lakes, ground work on those two sheets is to be avoided at all costs, on the basis of an insufficient return of geological data for effort expended).

(iv) the personnel should consist of a coordinator/leader and 3-4 geologists, with a driver/mechanic and a field assistant as additional field personnel. A strong case should be made for including a geophysicist as a permanent team member.

(v) the duration of the project should be one calendar year, mapping being completed to the pre-colour rough stage, with texts for explanatory notes well in hand.

6. CONCLUSIONS

The 1979 helicopter geological survey of the western Officer Basin in South Australia accomplished its primary objectives of examining the stratigraphy and all significant outcrops in the area, and assessing further the hydrocarbon potential in that part of the Officer Basin.

As a consequence of detailed preparatory planning and good spirits and hard work on the part of the survey team there were no logistical problems, despite the remoteness and

inaccessibility of the area. Once the helicopter arrived on site, work proceeded on or ahead of schedule. Flying longer hours per day resulted in 50% greater flying hours than planned, while remaining within the original budget. This gave the latitude to examine certain areas in more detail where it was considered warranted.

The survey essentially upheld previous ideas of the regional stratigraphy while extending the known distribution of certain units.

With regard to the hydrocarbon potential of the area, the geological conclusions of the survey emphasised the problem of possibly insufficient depth of burial of sandstone units overlying the potential source-rocks of the Observatory Hill Beds. Structural traps in this stratigraphic interval will hold more promise in the deeper parts of the basin, to the northeast of the survey area. On the other hand, the potential for structural or particularly stratigraphic traps within or below the Observatory Hill Beds in the survey area should be carefully considered in future work. Likewise, it is strongly recommended that some study be made of the apparent closures and lineaments within the western Ooldea Sand Range and of the possible implications on basin deformation.

GMP:DP

for G.M. PITT

REGIONAL GEOLOGY

REFERENCES

Barnes, L.C. and Pitt, G.M., 1976. Silcrete, sediments and stratigraphy. S. Aust. Dept. Mines report 76/119 (unpublished).

Barnes, L.C. and Pitt, G.M., 1977. The Mount Sarah Sandstone. Quart. geol. Notes., Geol. Surv. S. Aust., 1-8.

Benbow, M.C., 1980. Report on mapping, Mt. Johns Range. S. Aust. Dept. Mines and Energy report in preparation (unpublished).

Benbow, M.C. and Pitt, G.M., 1978. The Garford Formation. Quart. geol. Notes., Geol. Surv. S. Aust., 68:8-15.

Callen, R.A. and Tedford, R.H., 1976. New late Cainozoic rock units and depositional environments, Lake Frome area, South Australia. Trans. Roy. Soc. S. Aust., 100 (3): 125-168.

Eugster, H.P., 1969. Inorganic bedded cherts from the Magadi area, Kenya. Contr. Mineral. and Petrol., 22: 1-31.

Gatehouse, C.G., 1979. Well completion report for Murnaroo No. 1. S. Aust. Dept. Mines and Energy report 78/152 (unpublished).

Henderson, S.W. and Tauer, R.W., 1967. Birksgate No. 1 well, South Australia, stratigraphic drilling project. Well completion report, for Continental Oil Company of Aust. Ltd. S. Aust. Dept. Mines and Energy open file Env. 768. (unpublished).

Jackson, M.J. and van de Graaff, W.J.E., 1979. Geology of the Officer Basin area in Western Australia. Bull. Bur. Miner. Resour. Geol. Geophys. Aust. (in press).

Krieg, G.W. (Compiler), 1973. EVERARD, South Australia. Explanatory Notes, 1:250 000 geological series. Sheet SG/53-13. Geol. Surv. S. Aust.

Lindsay, J.M. and Harris, W.K., 1975. Fossiliferous marine and nonmarine Cainozoic rocks from the eastern Eucla Basin, South Australia. Mineral Resour. Rev., S. Aust., 138: 29-42.

Lowry, D.C., Jackson, M.J., van de Graaff, W.J.E. and Kennewell, P.J., 1972. Preliminary results of geological mapping in the Officer Basin, Western Australia, 1971. Geol. Surv. W. Aust. Ann. Report for 1971, 50-56.

Ludbrook, N.H., 1961. Subsurface stratigraphy of the Maralinga area, South Australia. Trans. Roy. Soc. S. Aust., 84: 51-59.

Major, R.B., 1973. The Mangatitja Limestone. Quart. geol. Notes, Geol. Surv. S. Aust., 47: 5-9.

Mann, A.W. and Horwitz, R.C., 1979. Groundwater calcrete deposits in Australia: some observations from Western Australia. J. Geol. Soc. Aust., 26(6): 293-304.

McKenzie, K.G., 1959. A geological reconnaissance of the Woomera-Maralinga area, for Exoil N.L. S. Aust. Dept. Mines and Energy open file Env. 59 (unpublished).

Nichol, D., 1971. The Mount Willoughby Limestone. Quart. geol. Notes, Geol. Surv. S. Aust., 39: 1-2.

Pitt, G.M., 1979. Palaeodrainage systems in western South Australia: their detection by LANDSAT imagery, stratigraphic significance and economic potential. In Proceedings of LANDSAT Symposium, Sydney, May, 1979 (in press).

(Presently available as: S. Aust. Dept. Mines and Energy report 79/114, unpublished).

Pitt, G.M., Benbow, M.C. and Youngs, B.C., 1980. A review of recent geological work the Officer Basin, South Australia. Aust. Pet. Explor. Assoc. J., 20: 209-220.

Surdam, R.C., Eugster, H.P. and Mariner, R.H., 1972. Magadi-type chert in Jurassic and Eocene to Pleistocene rocks, Wyoming. Bull. Geol. Soc. Am., 2261-2266.

Wopfner, H., 1969. Lithology and distribution of the Observatory Hill Beds, eastern Officer Basin. Trans. Roy. Soc. S. Aust., 93: 169-185.

Wopfner, H., 1974. Post-Eocene history and stratigraphy of northeastern South Australia. Trans. Roy. Soc. S. Aust., 98(1): 1-12.

APPENDIX 1

SITE DESCRIPTIONS

KEY TO TABLE 1

Qrs	dune sand
Qrg	gypsum, gypsite
Tfe	ferricrete
Qca	calcrete
T-Q	Mangatitja Limestone and equivalents
Tml	Nullarbor Limestone and equivalents
Tep	Pidinga Formation and equivalents
Ts	Tertiary sands (undifferentiated)
Mz	undifferentiated Mesozoic sediments
Omc	Mount Chandler Sandstone
Ꞓw	Wanna Beds
Ꞓl	Lennis Sandstone
Ꞓo	Observatory Hill Beds

WAN	WANNA	1:250 000 sheet
MAS	MASON	"
NOO	NOORINA	"
WYO	WYOLA	"
LIN	LINDSAY	"
WEL	WELLS	"
MAU	MAURICE	"
GIL	GILES	"

Specimens are housed in the SADME Core Library, Glenside. They are identified by unique "R.S." (Rock Specimen) numbers quoted in the site descriptions in this Appendix. Similarly, numbered transparencies are stored in the Technical Information Section, Head Office.

TABLE 1

Site No.	1:250 000 sheet	1:100 000 sheet	Units recorded or interpreted
1	WEL	5041	Ꞓw
2	WEL	5141	Ꞓw
3	WEL	5141	?Omc
4	WEL	5141	Qca
5	WEL	5140	Ꞓw
6	WEL	5240	Qca/?Ꞓw
7	WEL	5241	Qca/?Ts
8	WEL	5241	Omc
9	WEL	5241	Omc
10	WEL	5241	?Omc
11	GIL	5340	Ꞓw
12	WEL	5240	Ꞓw
13	WEL	5240	Ꞓo
14	WEL	5240	Ꞓw
15	WEL	5240	Ꞓw
16	WEL	5240	Ꞓw
17	WEL	5240	Ꞓw
18	WEL	5240	Ꞓw or El?
19			Deleted
20	WEL	5140	Ꞓw
21	WEL	5140	Ꞓw
22	MAU	5239	Ꞓw
23	MAU	5239	Ꞓw
24	MAU	5239	?Ts/?Ꞓw/Ꞓo
25	MAU	5239	Ts/Ꞓo
26	MAU	5238	Qca/TsC?Tep/Ꞓo
27	MAU	5138	Qca/Ts(?Tep)/Ꞓo
28	MAU	5139	Ꞓw
29-30	MAU	5038	Qca/Ts/? Ꞓo
31	MAU	5138	Qrg
32	MAU	5138	Ꞓo
32a	MAU	5138	Ts/Ꞓo
33	MAU	5138	Org/Ꞓo
34	MAU	5139	Qrs/Ꞓo
35	MAU	5039	?Ꞓw
36	MAU	5039	?Ts
37	WYO	4939	Ꞓw
38	WYO	4939	Ꞓw
39	WYO	4939	Ꞓw
40	WYO	4939	Ꞓw
41	WYO	4939	Ꞓw
42	WYO	4939	Tml/?Tep/Ꞓw
43	WYO	4939	?Tml/Ꞓw
44	WYO	4939	?Tml/Ꞓw
45	MAU	5039	?Tml/Ꞓw
46	WYO	4939	Ꞓw
47	WYO	4939	?Tml/Ꞓw
48	MAU	5039	Tfe/Ts/Ꞓw
49	MAU	5039	Qrg/Ts
50	NOO	4940	Ꞓw
51	NOO	4940	Ꞓw
52	NOO	4941	Ꞓw
53	NOO	4941	Ꞓw

Site No.	1:250 000 sheet	1:100 000 sheet	Units recorded or interpreted
54	NOO	4841	Ꞓw
55	NOO	4940	Ꞓw
56	NOO	4940	Ꞓw
57			Deleted
58	MAU	5039	Ꞓw
59	MAU	5039	Tml
60	MAU	5038	Qca
61	MAU	5038	Qca
62	WYO	4938	?Tml/Ts or Ꞓ?
63	WYO	4938	Ts/?Ꞓo
64	NOO	4940	Ꞓw
65	WYO	4839	Qca/Tml/Ꞓw or Ts
66	WYO	4839	?Ꞓw
67	WYO	4839	Ts(?Tep)/Ꞓw
68	WYO	4839	Qca/T-Q/?Tep/Ꞓl
69	WYO	4739	Qca/Tml/?Ꞓo or PꞒ
70	MAS	4639	Ꞓl?
71	WYO	4739	Ꞓl or Ꞓl-Ꞓo
72	WYO	4739	Qca
73	WYO	4839	Ꞓw
74	WYO	4839	Ꞓw
75	WYO	4939	Tep/Ꞓw
76	WYO	4939	Tep/Ꞓw
77	WYO	4939	?Tep/Ꞓw
78	WAN	4641	Ꞓw
79	WAN	4641	Ꞓw
80	WAN	4641	Ꞓw
81	WAN	4641	T-Q
82	WAN	4641	Qrg
83	NOO	4741	Tfe
84	WAN	4641	T-Q
85	NOO	4740	Qrg
86	NOO	4740	Ꞓw
87	NOO	4740	Ts/Ꞓw
88	NOO	4740	Ts/Ꞓw
89	NOO	4740	Ꞓw
90	NOO	4740	Ꞓw
91	NOO	4740	Ꞓw
92	NOO	4740	Ꞓw
93			Deleted
94	WAN	4640	Ꞓw
95	WAN	4640	Ꞓw
96	WAN	4640	Ꞓw
97	WAN	4640	Ꞓw
98	NOO	4740	Ꞓw
99	NOO	4740	Ꞓw
100	NOO	4740	Ꞓw
101	NOO	4740	Ꞓw
102	NOO	4740	Ꞓw
103	NOO	4740	Ꞓw
104	NOO	4740	Ꞓw
105	NOO	4840	T-Q
106	NOO	4740	Ꞓw
107	NOO	4740	Ꞓw

Site No.	1:250 000 sheet	1:100 000 sheet	Units recorded or interpreted
108	NOO	4740	Ew
109	NOO	4740	Qca/T-Q/Ew
110	NOO	4741	T-Q
111	NOO	4741	T-Q,Tfe/Ew
112	NOO	4741	T-Q
113	NOO	4740	Ew
114	NOO	4841	Tfe
115	NOO	4841	Ew
116	NOO	4741	Ts/(Tep?)/Ew
117	NOO	4741	Ew
118	NOO	4741	Qrg
119	NOO	4741	T-Q
120	NOO	4741	T-Q
121	NOO	4741	Ew
122	NOO	4940	Ew
123	NOO	4940	Qca
124	NOO	4940	Qca/T-P
125	NOO	4940	Ew
126	NOO	4940	Ew
127	NOO	4940	Qrg
128	NOO	4740	Ew
129	NOO	4740	Ew
130	NOO	4740	Ew
131	NOO	4740	Ew
132	NOO	4740	Ew
133	NOO	4740	Ew
134	NOO	4740	Ew
135	WYO	4739	Ew
136	NOO	4740	Ts/Ew
137	NOO	4740	Ew
138	NOO	4740	Ew
139	NOO	4740	Ew
140	NOO	4740	Ts/Ew
141	NOO	4740	Ew
142	NOO	4740	Ew
143	NOO	4740	Ew
144	WYO	4739	Ew
145	WYO	4739	Qca/Ew
146	WAN	4640	Ew
147	WAN	4640	Ew
148	WYO	4739	Ew
149	WYO	4739	Ew
150	WYO	4739	Ew
151	WYO	4739	Ew
152	WYO	4739	Ew
153	WYO	4739	Ew
154	WYO	4739	Ew
155	WYO	4739	Qca/Ew
156			Deleted
157	WYO	4739	Ew/El
158	WYO	4739	El
159	WYO	4739	El
160	WYO	4739	Ew/El
161	WYO	4739	Ew
162	WYO	4739	Ew

Site No.	1:250 000 sheet	1:100 000 sheet	Units recorded or interpreted
163	WYO	4739	Ꞓw
164	WYO	4839	T-Q/Ꞓw
165	WYO	4839	Qca/T-Q/Ꞓw
166	WYO	4839	Ꞓw
167	WYO	4839	Ꞓw
168	WYO	4839	?T-Q
169	NOO	4941	Qca
170	WEL	5041	Ꞓw or Omc?
171	WEL	5041	Ꞓw or Omc?
172	WEL	5041	Ꞓw or Omc?
173	LIN	5142	Omc
174	WEL	5141	Omc
175	WEL	5141	Qca
176	WEL	5240	Qrs
177	WEL	5240	T-Q/?Ts or Mz
178	WEL	5140	Qca
179	WEL	5240	Q/Qca/T-Q
180	WEL	5240	Qca/T-Q
181	WEL	5240	Qca/T-Q
182	WEL	5241	Qca/Tfe/? ew or Omc
183	WEL	5240	Qrs, Q
184	GIL	5340	Qrg/?
185	GIL	5340	ew
186	GIL	5341	Omc
187	GIL	5341	Omc
188	GIL	5341	Qrs/Qca
189	GIL	5341	Qca/T-Q
190	WEL	5241	ew
191	WEL	5240	Qca, T-Q
192	WYO	4938	Qca, Qrs
193	WYO	4839	Qca/Tml/Ts or Ꞓw
194	WYO	4839	Ts(?Tep)/?Ꞓo
195	WYO	4839	Qca/?Tml/Tep or Ꞓ?
196	WYO	4839	Ts/?Ꞓw
197	WYO	4839	Qca/Ts/?Tep/Ꞓl
198	WYO	4938	Ts/?Ꞓo

WANNA

Caesar 4641

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WANNA

		Caesar 4641
		4640

Locality: 78 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2131/4/262/1 WANNA, Caesar

Geologist: GMP, TRW Date: 28/7/79

Description: 10 m cliff exposing sandstone, med.-fi.gr., sl. clayey, micaceous, well sorted, large scale planar cross-beds, off-white to pink-red mottles, passing up into black ferricrete and orange-red silcrete at top. Mod. thinly bedded, with cross-bed sets 0.05-2.0 m. Silcrete has no grit component and is therefore inferred to be developed in Cambrian sands, rather than a Tertiary sand veneer.

Interpretation: Ferruginised and silicified Wanna Beds.

Specimens: 4641RS1

Photographs: 15421, 15422, 15423

*****

Locality: 79 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2131/4/262/3 WANNA, Caesar

Geologist: GMP, TRW Date: 28/8/79

Description: Outcrop forms small cliffs up creeks in this area. Ferricreted sandstone, micaceous.

Interpretation: Wanna Beds

Specimens: 4641RS2

Photographs: None

*****

Locality: 80 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2131/4/262/2 WANNA, Caesar

Geologist: GMP, TRW Date: 28/7/79

Description: 7-8 m cliff exposing sandstone: white, subangular to subrounded quartz in a well-consolidated clay matrix. Large-scale cross-beds.

Interpretation: Wanna Beds

Specimens: 4641RS3

Photographs: None

Locality: 81 (W. Aust.; see airphoto for location plot)

Airphoto no./map sheet: 2130/2/092/1 WANNA, Caesar

Geologist: GMP, TRW Data: 28/7/79

Description: "Mangatitja" - type chalcedony, very well developed, overlain by calcrete/limestone.

Interpretation: Mangatitja Limestone equivalent.

Specimens: 4641RS4

Photographs: None

*****

Locality: 82 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2130/2/092/2 WANNA, Caesar

Geologist: GMP, TRW Date: 28/7/79

Description: Gypsum; no other outcrop.

Interpretation: Quaternary gypsum

Specimens: None

Photographs: None

*****

Locality: 84 (W. Aust.; see airphoto for location plot)

Airphoto no./map sheet: 2130/1/086/1 WANNA, Caesar

Geologist: GMP, TRW Date: 28/7/79

Description: Red/green mottled clays overlying Doonbara-like ferruginous clastics. Scree at base of slope consists of limestone/calcrete with much fine chalcedonic veining. This resembles a Doonbara-Mt. Willoughby Limestone sequence, but as with all other limestone outcrops could (less likely) be altered Miocene rather than Plio-Pleistocene carbonates.

Interpretation: Sequence (poorly developed) of chalcedonic carbonates and underlying clastics, probably equivalent to the Plio-Pleistocene carbonates seen elsewhere in northern S. Aust.

Specimens: 4641RS5

Photographs: None

Note: Regarding photointerpretation of the northern Serpentine Lakes area, all worthwhile outcrops were visited. They are very few and far between, and despite apparent outcrops seen on airphotos, consist usually of gypsum, claypan clays, and dune sand and rubbly ferricretes. No Palaeozoic sandstone outcrops could be found in the area extending from southwest of Loc. 117 to the border.

WANNA

Melrose 4640

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WANNA

		4641
		Melrose 4640

Locality: 94 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2133/6/056/6 WANNA, Melrose

Geologist: GMP Date: 28/7/79

Description: Sandstone, white, thin bedded, capped by orange-brown silicified sand. Sandstone is med-fi.gr., micaceous, slightly kaolinitic or lithic, slightly to moderately porous, and has large planar, tabular cross-beds. Excellent outcrop in large valley.

Interpretation: Wanna Beds

Specimens: 4640RS9

Photographs: None

*****

Locality: 95 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2133/7/050/1 WANNA, Melrose

Geologist: TRW Date: 28/7/79

Description: 7 m sandstone section beside claypan; white, grading to grey-pink towards base. Good cross-bedding.

Interpretation: Wanna Beds

Specimens: 4640RS10,11

Photographs: 15529

*****

Locality: 96 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2133/5/506/5 WANNA, Melrose

Geologist: TRW Date: 28/7/79

Description: Exposure in cliff, 7 m approx. consisting predominantly of sandstone, thin-bedded, white to pink with excellent cross-bedding.

Interpretation: Wanna Beds

Specimens: 4640RS12

Photographs: None

Locality: 97 (W. Aust.; see airphoto for locality plot)

Airphoto no./map sheet: 2133/050/2 WANNA, Melrose

Geologist: GMP Date: 28/7/79

Description: Sandstone, med-fi. gr., slightly indurated, white to pale pink. Good planar cross-bed sets up to 1 m thick, dipping cross-beds are outlined by pink iron staining. No dip or strike visible. Slightly micaceous, kaolinitic; 5 m section exposed; minor Tertiary silicification and calcrete on top.

Interpretation: Wanna Beds

Specimens: 4640RS13

Photographs: None

*****

Locality: 146 (W. Aust.; see airphotos for plot)

Airphoto no./map sheet: 2220/1/084/2 WANNA, Melrose

Geologist: GMP Date: 31/7/79

Description: Sandstone, cross-bedded with tabular foresets, thin-bedded, micaceous, lithic grains. Scouring at base of foresets is well displayed, but there is no predominant dip or foreset direction. A 0.2-0.6 m thick clay band occurs at the base of one set. Ferruginisation colours foresets yellow/orange, outlining alternate ones.

Interpretation: Wanna Beds

Specimens: 4640RS14

Photographs: None

*****

Locality: 147 (W. Aust.; see airphotos for plot)

Airphoto no./map sheet: 2220/1/084/1 WANNA, Melrose

Geologist: TRW Date: 31/7/79

Description: 4 m cliff exposing white, friable, med.-fi. gr. sandstone.

Interpretation: Wanna Beds

Specimens: 4640RS15

Photographs: None

MASON

Forest Lakes 4639

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

MASON

		Forest Lakes 4639
		4638

Locality: 70

Airphoto no./map sheet: 2246/4/069/2 MASON, Forest Lakes

Geologist: GMP Date: 27/7/79

Description: Red, maroon, white sandstone, med. gr., cross-bedded, micaceous, with coarse kaolinitic grains (probably feldspar or lithic), and trains or beds of granules and clasts up to 2 cm scattered throughout. Interbedded with thin, very shaley layers of highly micaceous siltstone, and contains numerous mud-gall pebbles.

Interpretation: Probably Palaeozoic, due to mica content; possibly Lennis Sandstone equivalent.

Specimen: 4639RS1,2

Photographs: 15509, 15510, 15511

NOORINA

Warregal 4741

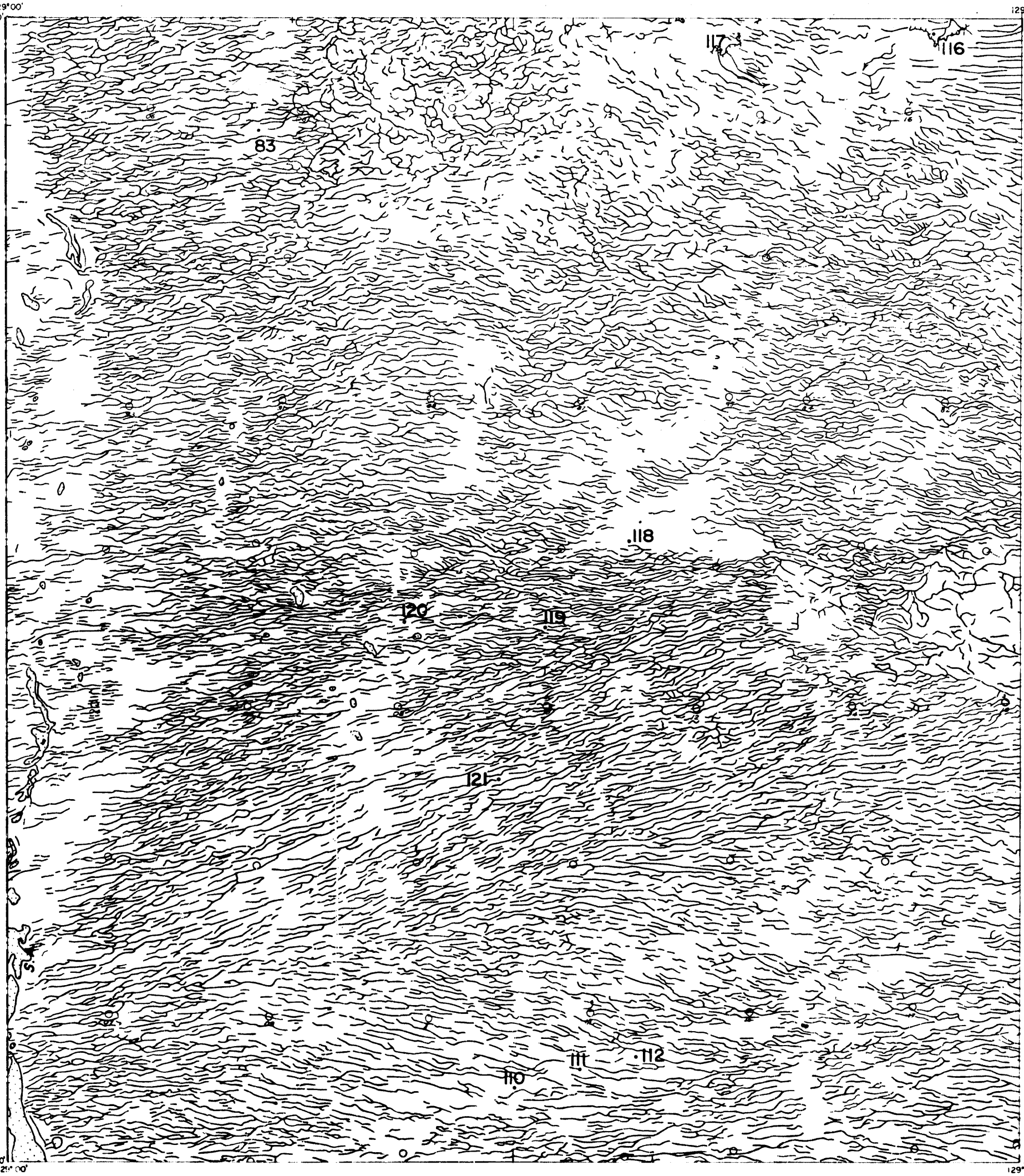
W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

NOORINA

Warregal 4741	4841	4941
4740	4840	4940

129°00'
28°00'

129°30'
28°00'



28°30'
129°00'

28°30'
129°30'

SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

WARREGAL 4741

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-533

Job No 2097

Locality: 83

Airphoto no./map sheet: 2130/1/082/1 NOORINA, Warregal

Geologist: GMP, TRW Date: 28/7/79

Description: Ferricrete, conglomeratic. Possibly includes some highly ferruginised sandstone.

Interpretation: Tertiary ferricrete

Specimens: 4741RS3

Photographs: None

*****

Locality: 110

Airphoto no./map sheet: 2131/4/256/1 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: Side of palaeochannel valley. "Jelly potch" chalcedony presumed equivalent to 'Mangatitja Limestone'. Chalcedony mainly present - little limestone found. Overlies a basal pisolitic ferricrete.

Interpretation: Mangatitja Limestone equivalent, infilling palaeochannel and subsequently re-incised to form present-day outcrop.

Specimens: 4741RS4

Photography: None

*****

Locality: 111

Airphoto no./map sheet: 2131/4/254/1 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: At base of section is a poor outcrop of even-grained sandstone, probably Palaeozoic, overlain by a mixture of ferricrete and carbonate with "Mangatitja" chalcedony.

Interpretation: Altered Wanna Beds overlain by Cainozoic palaeochannel "Mangatitja"-type carbonates.

Specimens: 4741RS5

Photographs: None

Locality: 112

Airphoto no./map sheet: 2131/4/256/2 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: "Mangatitja"-type chalcedony as before, generally little remnant carbonate is present. Some chalcedony is vuggy; a little green staining also present (origin unknown).

Interpretation: Mangatitja Limestone equivalent

Specimens: 4741RS6

Photographs: None

*****

Locality: 116

Airphoto no./map sheet: 2130/1/074/1 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: Sandstone, thin bedded, med.-fi. gr., white/off-white, micaceous, kaolinitic/lithic, cross-bedded (not well displayed). Well rounded quartz pebbles are shed around base of scarp, probably from Tertiary sands capping the Palaeozoic sandstone. 15 m vertical exposure.

Interpretation: Silicified pebbly Tertiary sands overlying Wanna Beds.

Specimens: 4741RS7

Photographs: None

*****

Locality: 117

Airphoto no./map sheet: 2130/1/076/1 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: Small amphitheatre 100 m across, 15 m vertical exposure, consisting of 5 m of thin, well-bedded, micaceous, lithic/kaolinitic, fi. gr. sandstone, overlain by 10 m of highly micaceous, largely non-bedded siltstone/claystone with white, lithic, coarser grained flecks. Colour is off-white to yellow/orange at top, passing down to red/brown or maroon at base. Section topped by a silcrete which consists of silicified sandstone which still retains bedding structures, etc. The latter is probably still Palaeozoic, not Tertiary.

Interpretation: Wanna Beds, with a major interbedded claystone/siltstone horizon.

Specimens: 4741RS8,9 Rock Box A060 17

Photographs: None.

*****

Locality 118

Airphoto no./map sheet: 2130/2/098/1 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: Gypsum only

Interpretation: Quaternary gypsum

Specimens: 4741RS10

Photographs: None

*****

Locality: 119

Airphoto no./map sheet: 2130/2/098/2 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: "Mangatitja"-style chalcedony, with some "moss-agate" veining; some unreplaced carbonate present, of which that at base of the section has good layering and/or lamination. Section approx. 3 m.

Interpretation: Mangatitja Limestone equivalent

Specimens: None

Photographs: None

*****

Locality: 120

Airphoto no./map sheet: 2130/2/098/3 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: This locality, as with some other "Mangatitja"-style outcrops forms isolated low mounds over which sand-dunes pass. This resembles the W. Aust. calcrete mounds of Horwitz et al. At this locality, mainly sandy Mangatitja Limestone at the top, underlain by chalcedony, which sheds on lower slopes, in turn underlain by some grey-red Doonbara-like ferruginous clastics which pass down to compacted red-brown sands.

Interpretation: Mangatitja Limestone equivalent, underlain by Doonbara-type clastics.

Specimens: 4741RS11

Photographs: 15535, 15536, 15537

*****

Locality: 121

Airphoto no./map sheet: 2131/3/272/1 NOORINA, Warregal

Geologist: GMP Date: 30/7/79

Description: Sandstone, white kaolinitic, med.-fi. gr., even gr., no bedding structures, poor outcrop. Some Tertiary carbonate scree.

Interpretation: Wanna Beds

Specimens: 4741RS12

Photographs: None

NOORINA

Wurrana 4841

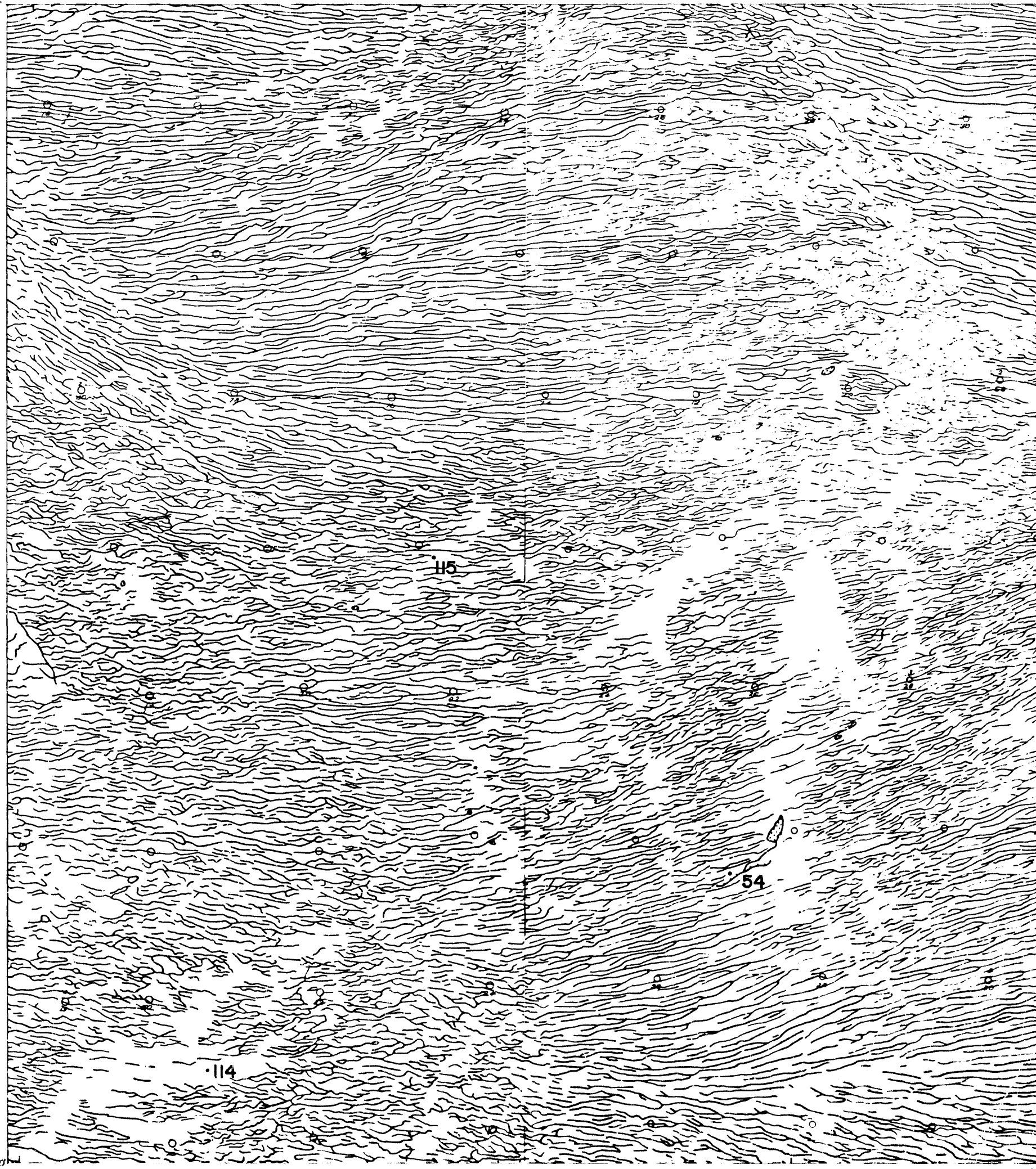
W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

NOORINA

4741	Wurrana 4841	4941
4740	4840	4940

129° 30'
28° 00'

130° 00'
28° 00'



28° 30'
129° 30'

28° 30'
130° 00'

SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....:123

Job No 2097

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
WURANA 4841

COMPILED	G.P.
DRAWN	
DATE	
CHECKED BY	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-536

Locality: 54

Airphoto no./map sheet: 2131/3/286/1 NOORINA, Wurrana

Geologist: TRW Date: 26/7/79

Description: Very good outcrop forming cliff over 300 m long on side of salt pan. Height varies 5 to 15 m, east to west. Sandstone, white, fi. gr., well sorted, subangular to subrounded quartz in sparse clay matrix. Bedding 3-10 cm thick at top 3 m of section, becoming thinner-bedded (1-3 cm) down-sequence. Isolated outcrop in claypan is finely bedded and v. fi. gr. Ferruginisation increases downwards. Overall, similar lithology over whole section with some downwards fining, and variable ferruginisation. No sedimentary structures seen; possible dip 5° towards 135°?

Interpretation: Wanna Beds

Specimens: 4841RS1,2,3

Photographs: None

*****

Locality: 114

Airphoto no./map sheet: 2131/4/246/1 NOORINA, Wurrana

Geologist: GMP Date: 30/7/79

Description: Small scarp exposing 2 m of nodular/pisolitic laterite. No sign of underlying material.

Interpretation: Tertiary laterite

Specimens: 4841RS4

Photographs: None

*****

Locality: 115

Airphoto no./map sheet: 2130/2/110/1 NOORINA, Wurrana

Geologist: GMP Date: 30/7/79

Description: Sandstone, med-fi. gr., even gr., micaceous, lithic/kaolinitic, thin-bedded, probably cross-bedded (no vertical outcrop). Some iron staining.

Interpretation: Wanna Beds

Specimens: 4841RS5

Photographs: None

NOORINA

Warroo 4941

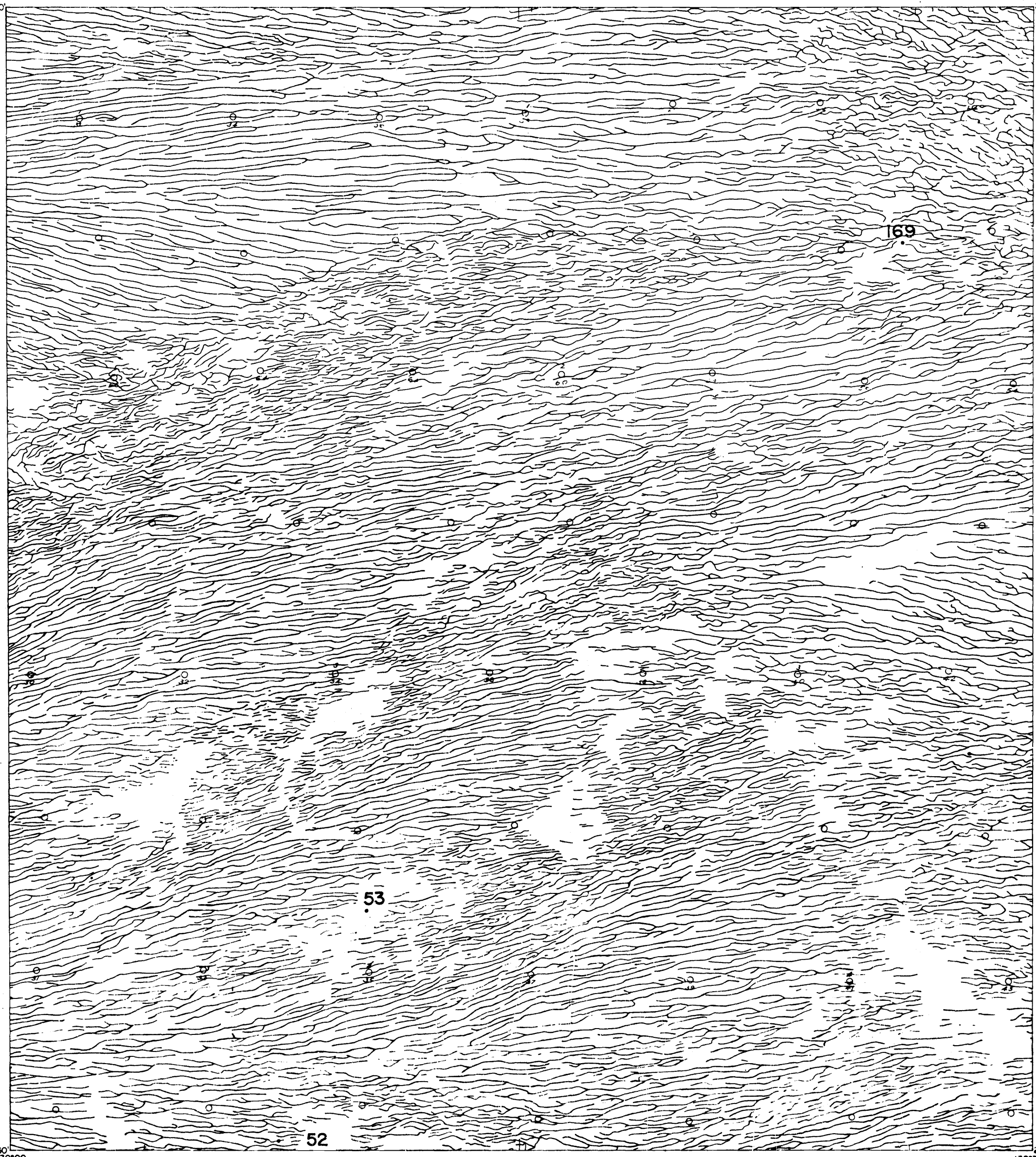
W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

NOORINA

4741	4841	Warroo 4941
4740	4840	4940

130°00'
28°00'

130°30'
28°00'



28°30'
130°00

28°30'
130°30'

SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....:123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

WARROO 4941

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-540

Job No 2097

Locality: 52

Airphoto no./map sheet: 2132/5/130/2 NOORINA, Warroo

Geologist: TRW Date: 26/7/79

Description: Abundant drift of ferruginised sandstone, minor outcrop of white-light grey sandstone.

Interpretation: Wanna Beds

Specimens: 4941RS1

Photographs: None

*****

Locality: 53

Airphoto no./map sheet: 2131/4/230/1 NOORINA, Warroo

Geologist; TRW Date: 26/7/79

Description: Poor outcrop, some drift. Sandstone, fi. gr. to fi.-med. gr., cross-bedded.

Interpretation: Wanna Beds

Specimens: 4941RS2

Photography: None

*****

Locality: 169

Airphoto no./map sheet: 2130/1/052/1 NOORINA, Warroo

Geologist: TRW Date: 4/8/79

Description: Patches of calcrete, rubbly, along side of ridge; possibly replaces sandstone.

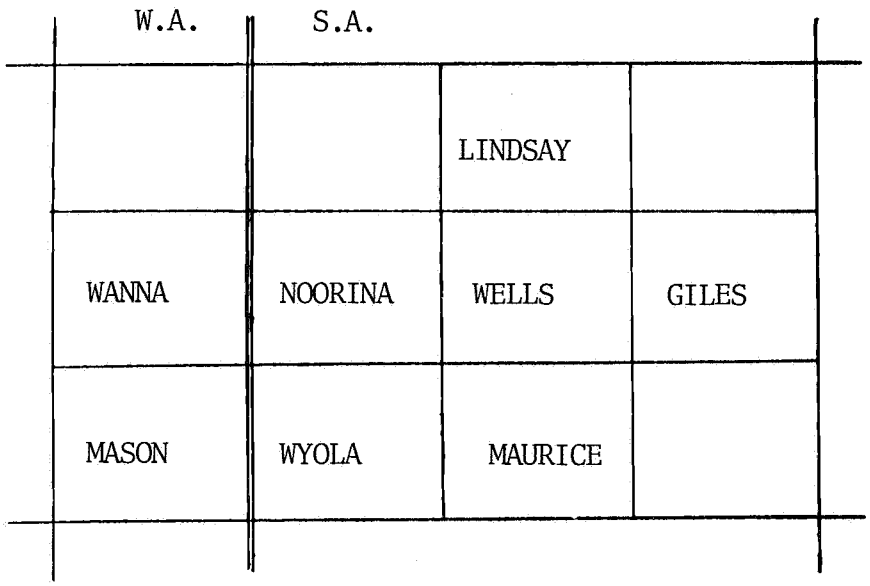
Interpretation: Quaternary calcrete

Specimens: 4941RS3

Photography: None

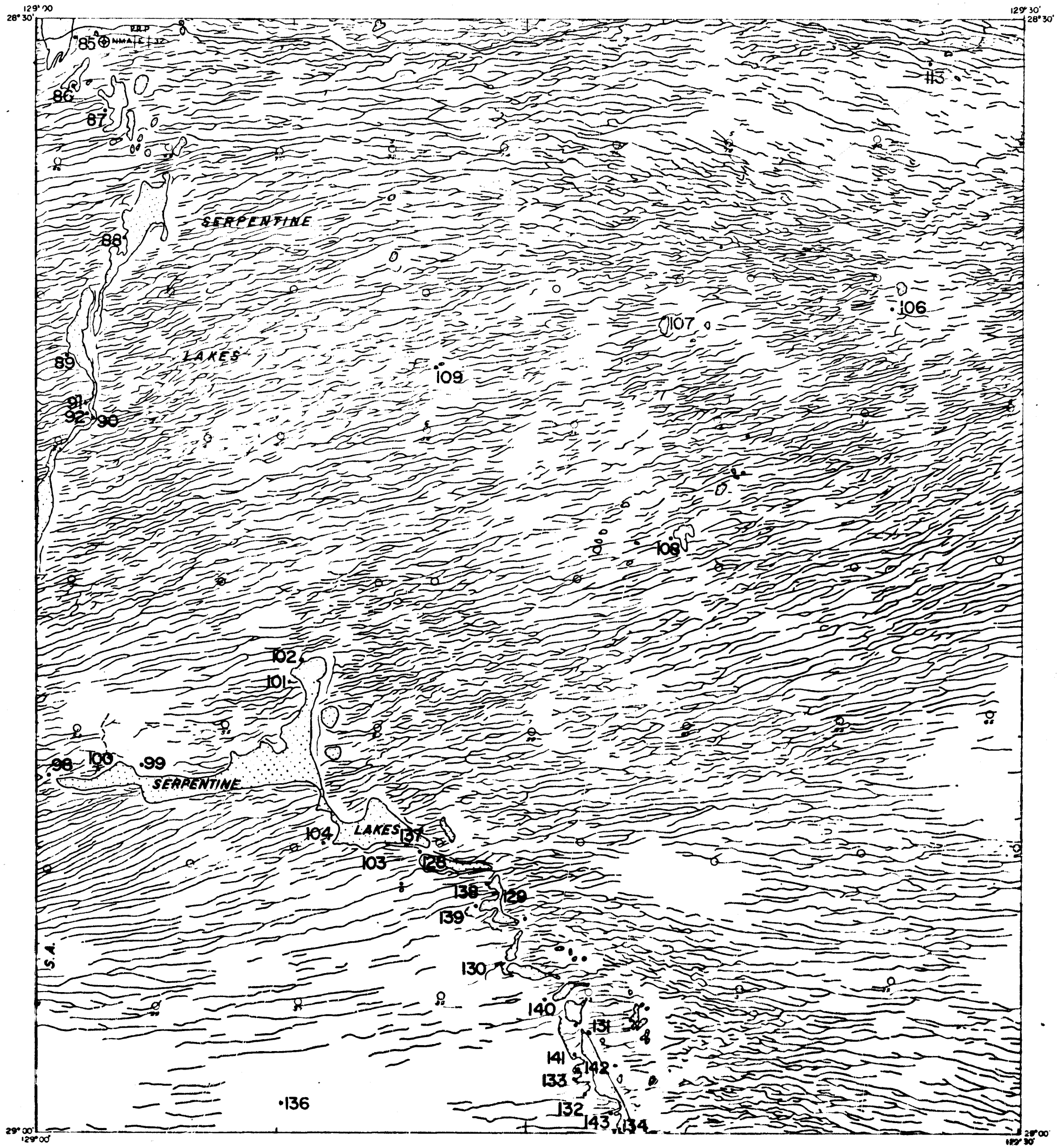
NOORINA

Monoro 4740



NOORINA

4741	4841	4941
Monoro 4740	4840	4940



SCALE - KILOMETRES

0 10 20

SITE LOCALITIES ..... • 123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

MONORO 4740

COMPILED	G.P
DRAWN	
DATE	
CHECKED	
CDD DATE	
SCALE	1:250 000
PLAN NUMBER	80-532

Job No 2097

Locality: 85

Airphoto no./map sheet: 2132/5/154/3 NOORINA, Monoro

Geologist: GMP, TRW Date: 28/7/79

Description: Gypsite dune

Interpretation: Quaternary aeolian gypsum

Specimens: 4740RS11

Photographs: None

Note: Airstrip at Serpentine Lakes is in quite good condition and could be used with care for light aircraft.

*****

Locality: 86

Airphoto no./map sheet: 2132/5/154/1 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: Sandstone, white, fi.-med. gr., well sorted, subangular to subrounded quartz in clay matrix, pink mottling, poor porosity, micaceous, fine-scale cross-bedding.

Interpretation: Wanna Beds

Specimens: None

Photographs: 15525, 15526, 15527

*****

Locality: 87

Airphoto no./map sheet: 2132/5/154/2 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: Sandstone, white, fi.-med. gr., well sorted, poor porosity, quartz (subrounded to subangular) in kaolin matrix, some pink-red mottling and ferruginisation at base of section. Probably flat-lying, cross-bedded. Tertiary sand veneers top of section.

Interpretation: Thin Tertiary sand overlying Wanna Beds

Specimens: 4740RS12,13

Photographs: None

Locality: 88

Airphoto no./map sheet: 2132/5/154/4 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: Outcrop in lake bed trending 060°. Ferricreted sandstone, fi.-med. gr., occasional cap of gritty ferricrete. No visible dip.

Interpretation: Rare minor remants of ferricreted Tertiary gritty sands overlying Wanna Beds.

Specimens: 4740RS14

Photographs: None

*****

Locality: 89

Airphoto no./map sheet: 2133/6/056/1 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description 8 m scarp, exposing sandstone, white, fi.-med. gr., becoming sl. pink toward base. Basal 5 m are thickly bedded (20-50cm). Ferricrete outcrops in lake have linear trends derived from dipping foreset beds.

Interpretation: Wanna Beds

Specimens: 4740RS15

Photographs: None

*****

Locality: 90

Airphoto no./map sheet: 2133/6/056/2 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: Two sandstone cliffs either side of isthmus, both 15-20 m high. Sandstone, white, fi-med. gr., massive to thinly- bedded. Cross-bedding visible in western outcrop.

Interpretation: Wanna Beds

Specimens: 4740RS16

Photographs: None

Locality: 91

Airphoto no./map sheet: 2133/6/056/3 NOORINA, Monoro

Geologist: GMP Date: 28/7/79

Description: 12-15 m section of sandstone, off-white to orange-maroon, silicified and ferruginised at the top. Spectacular large-scale cross-beds up to 2 m thick and 12-15 m long.

Interpretation: Wanna Beds

Specimens: 4740RS17

Photographs: None

*****

Locality: 92

Airphoto no./map sheet: 2133/6/056/4 NOORINA, Monoro

Geologist: GMP Date: 28/7/79

Description: Similar to Loc 91; 6 m exposed, poorly cross-bedded.

Interpretation: Wanna Beds

Specimens: 4740RS18

Photographs: None

*****

Locality: 98

Airphoto no./map sheet: 2133/7/050/3 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: 7 m section of sandstone, white, thinly bedded (1-5 cm), becoming yellow with red-pink mottling at base of section. Cross-beds dip southeast.

Interpretation: Wanna Beds

Specimens: 4740RS19

Photographs: None

Locality: 99

Airphoto no./map sheet: 2133/7/050/5 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: Sandstone breakaway, 7 m of section, sandstone is micac., massive, fi.-v.fi. gr., with moderate clay content.

Interpretation: Wanna Beds

Specimens: 4740RS20

Photographs: None

*****

Locality: 100

Airphoto no./map sheet: 2133/7/050/4 NOORINA, Monoro

Geologist: GMP Date: 28/7/79

Description: Small amphitheatre exposing sandstone, slightly kaolinitic, micaceous, red to pink with white salt efflorescence on the rock surface. Cross-bedding is spectacular; large planar-tabular cross-beds in sets 1-2 m thick, beds themselves 5-10cm thick. Foresets dip in all directions; this cross-bed style should be quite diagnostic as to environment of deposition. Outcrop is excellent and worth visiting.

Interpretation: Wanna Beds

Specimens: 4740RS21

Photographs: None

*****

Locality: 101

Airphoto no./map sheet: 2133/7/046/2 NOORINA, Monoro

Geologist: GMP Date: 28/7/79

Description: Large amphitheatre with vertical sides, approx. 150 m across, exposing 20 m of sandstone, white to pink, med.-fi. gr., slightly porous, clayey and micaceous. Large tabular cross-bed sets are 0.5-1.0 m thick. Appears to be flat-bedded, overall.

Interpretation: Wanna Beds

Specimens: 4740RS22

Photographs: None

Locality: 102

Airphoto no./map sheet: 2133/7/046/1 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: 100 m - long section exposing 15 m of sandstone, pink-red mottled, with good cross-bedding.

Interpretation: Wanna Beds

Specimens: 4740RS23

Photographs: None

*****

Locality: 103

Airphoto no./map sheet: 2133/7/046/4 NOORINA, Monoro

Geologist: TRW Date: 28/7/79

Description: Exposure of sandstone, very clayey at base, with white clay beds up to 6 cm thick.

Interpretation: Wanna Beds

Specimens: 4740RS24

Photographs: None

*****

Locality: 104

Airphoto no./map sheet: 2133/7/046/3 NOORINA, Monoro

Geologist: GMP Date: 28/7/79

Description: Sandstone, slightly clayey and micaceous, med.-fi. gr., even gr., cross-bedded in med.-sized sets of 0.1-0.5 m thickness, thin-bedded foresets. At least one set has at its base a layer of elongate, micaceous white clay intraclasts up to 4 x 0.5 cm.

Interpretation: Wanna Beds

Specimens: 4740RS25

Photographs: None

Locality: 106

Airphoto no./map sheet: 2133/6/068/1 NOORINA, Monoro

Geologist: GMP Date: 30/7/79

Description: Small, low-angle scarp on edge of vegetated claypan exposes highly ferruginous, micaceous, thin-bedded, fine-grained sandstone at the claypan level, passing up to white, micaceous, thin-bedded, fi. gr. and even gr. sandstone, overlain then by med. gr. white sandstone. Probably flat-lying.

Interpretation: Variably ferruginised Wanna Beds.

Specimens: 4740RS26

Photographs: None

*****

Locality: 107

Airphoto no./map sheet: 2133/6/064/1 NOORINA, Monoro

Geologist: GMP Date: 30/7/79

Description: 6 m exposed: sandstone, white, fi.-med. gr., faintly and thinly bedded, v.fi. gr., micaceous and kaolinitic. Some orange ferruginisation and silicification at top.

Interpretation: Wanna Beds

Specimens: 4740RS27

Photographs: None

*****

Locality: 108

Airphoto no./map sheet: 2133/6/064/2 NOORINA, Monoro

Geologist: GMP Date: 30/7/79

Description: Sandstone, thin-bedded but massive outcrop, med.-fi. gr., micaceous, lithic, kaolinitic, even gr., rare 0.5 m long, 10 cm high tabular cross-bed sets. 6 m exposed, of which lower 4 m is white, non-silicified, top 2 m is silicified, grey, with white clay beds and intraclastic layers.

Interpretation: Wanna Beds

Specimens: 4740RS28

Photographs: None

Locality: 109

Airphoto no./map sheet: 2133/6/062/1 NOORINA, Monoro

Geologist: GMP Date: 30/7/79

Description: 5 m exposure (low angle) of moderately silicified sandstone as described for Loc. 108, with clay intraclasts and beds. Overlain by calcrete at top, with some chalcedony and with embedded ferricrete clasts.

Interpretation: Calcreted chalcedonic Tertiary limestone overlying Wanna Beds.

Specimens: 4740RS29

Photographs: None

*****

Locality: 113

Airphoto no./map sheet: 2132/5/146/1 NOORINA, Monoro

Geologist: GMP Date: 30/7/79

Description: 5 m section exposing sandstone, thin-bedded, cross-bedded, med.-fi. gr., kaolinitic and lithic, buff-maroon to off-white. Overlies about 3 m of maroon to red-brown micaceous massive (unbedded) siltstone.

Interpretation: Wanna Beds

Specimens: 4740RS30,31

Photographs: None

*****

Locality: 128

Airphoto no./map sheet: 2133/7/046/6 NOORINA, Monoro

Geologist: TRW Date: 31/7/79

Description: Bluff extending into lake; outcrop on both sides: sandstone, white, fi.-med. gr., clayey matrix, some beds contain intraclasts of pure, white clay, up to 4 cm x 0.2 cm.

Interpretation: Wanna Beds

Specimens: 4740RS32

Photographs: None

Locality: 129

Airphoto no./map sheet: 2131/8/424/2 NOORINA, Monoro

Geologist: TRW Date: 31/7/79

Description: Sandstone, even gr., no clay clasts, poor porosity, well indurated, rare pink and red mottling.

Interpretation: Wanna Beds

Specimens: 4740RS33

Photographs: None

*****

Locality: 130

Airphoto no./map sheet: 2131/8/424/4 NOORINA, Monoro

Geologist: TRW Date: 31/7/79

Description: 20 m section in amphitheatre exposing sandstone, white, med. gr., subangular quartz grains in a clay matrix, abundant cross-bedding in 1-5 m sets.

Interpretation: Wanna Beds

Specimens: 4740RS34

Photographs: None

*****

Locality: 131

Airphoto no./map sheet: 2131/8/424/6 NOORINA, Monoro

Geologist: TRW Date: 31/7/79

Description: 7 m sandstone section; slightly iron-stained, well sorted, outcrop face covered with rubble.

Interpretation: Wanna Beds

Photographs: None

Locality: 132

Airphoto no./map sheet: 2131/8/422/3 NOORINA, Monoro

Geologist: TRW Date: 31/7/79

Description; Sandstone, white, friable, thinly bedded (1-5 cm), excellent cross-bedding development. Underlain sharply by yellow-white claystone (0.3 m) then 1.3 m of red/green clays. Sandstone at lake level underlies these clays.

Interpretation: Wanna Beds

Specimens: 4740RS36,37

Photographs: None

*****

Locality: 133

Airphoto no./map sheet: 2131/8/422/4 NOORINA, Monoro

Geologist: Wanna Beds Date: 31/7/79

Specimens: 4740RS38

Photographs: None

*****

Locality: 134

Airphoto no./map sheet: 2131/8/422/5 NOORINA, Monoro

Geologist: TRW Date: 31/7/79

Description: 10 m section: basal 5 m consists of limonitic and gypsiferous, pink to red-mottled claystone overlying sandstone which forms claypan floor at foot of section. Claystone overlain (with sharp contact) by 5 m of med.-fi. gr. sandstone.

Interpretation: Wanna Beds

Specimens: 4740RS39,40

Photographs: None

Locality: 139

Airphoto no./map sheet: 2131/8/424/3 NOORINA, Monoro

Geologist: GMP Date: 31/7/79

Description: 15 m section exposing white sandstone topped by light orange to brown silcrete. Med. gr., well sorted and reasonably clean, large-scale cross-bedded, with micaceous and lithic grains. Some zones of disrupted bedding with 0.1-1.0 m thick siltstone interbeds: large sandstone blocks appear to "float" on siltstone interbeds which inject the former.

Interpretation: Wanna Beds

Specimens: 4740RS45,46

Photographs: 15541, 15542

*****

Locality: 140

Airphoto no./map sheet: 2131/8/424/5 NOORINA, Monoro

Geologist: GMP Date: 31/7/79

Description: Ferruginised Tertiary grit overlying 7 m section of sandstone, med. gr., slightly lithic and micaceous. Shale intraclast bed present. Near base is a deep red-brown, highly micaceous claystone/siltstone bed.

Interpretation: Tertiary clastics overlying Wanna Beds.

Specimens: 4740RS47

Photographs: 15543

*****

Locality: 141

Airphoto no./map sheet: 2131/8/422/1 NOORINA, Monoro

Geologist: GMP Date: 31/7/79

Description: Sandstone, med.-fi. gr., reasonably clean, micaceous, thin-bedded, ferruginised to red-brown and orange colours, rarely white. Spectacular cross beds.

Interpretation: Wanna Beds

Specimens: 4740RS48

Photographs: 15544

Locality: 136

Airphoto no./map sheet: 2220/1/082/5 NOORINA, Monoro

Geologist: TRW Date: 31/7/79

Description: Small scarp exposing sandstone, micaceous and lithic, reasonably well consolidated. Drift of Tertiary conglomerate.

Interpretation: Thin Tertiary clastics overlying Wanna Beds.

Specimens: 4740RS41,42

Photographs: None

*****

Locality: 137

Airphoto no./map sheet: 2133/7/046/5 NOORINA, Monoro

Geologist: GMP Date: 31/7/79

Description: Sandstone, lithic, micaceous, med. gr., porous, thin-bedded, even grained. Top 3 m of section is cross-bedded, with yellow-orange mottles over white background. Basal 1 m appears to have soft sediment disruption with large red-brown mottles over white background. Some white clay intraclasts.

Interpretation: Wanna Beds

Specimens: 4740RS43

Photographs: 15538

*****

Locality: 138

Airphoto no. map/sheet: 2131/8/424/1 NOORINA, Monoro

Geologist: GMP Date: 31/7/79

Description: 15-20 m scarp exposing white sandstone (minor yellow-orange ferruginisation), cross-bedded with 0.5 m sets. Lower 5 m is notably finer (fi.-v.fi. gr.) and quite clayey. Flat-bedded.

Interpretation: Wanna Beds

Specimens: 4740RS44

Photographs: 15539, 15540

Locality: 142

Airphoto no./map sheet: 2131/8/422/2 NOORINA, Monoro

Geologist: GMP Date: 31/7/79

Description: Sandstone, white, thin-bedded, med.-fi. gr., micaceous, lithic, planar cross-beds; some large (3 m long) "roll slumps". Total section 20-25 m.

Interpretation: Wanna Beds

Specimens: 4740RS49

Photographs: 15545

*****

Locality: 143

Airphoto no./map sheet: 2131/8/422/6 NOORINA, Monoro

Geologist: GMP Date: 31/7/79

Description: Sequence of tabular cross-bedded sandstone, med.-fi. gr., micaceous, lithic, indurated and multicoloured to form a light orange to brown silcrete at the top of the section. Rest of section is white, becoming dark red-brown to maroon at the base. 9 m exposed.

Interpretation: Wanna Beds

Specimens: 4740RS50

Photographs: None

NOORINA

Noorina 4840

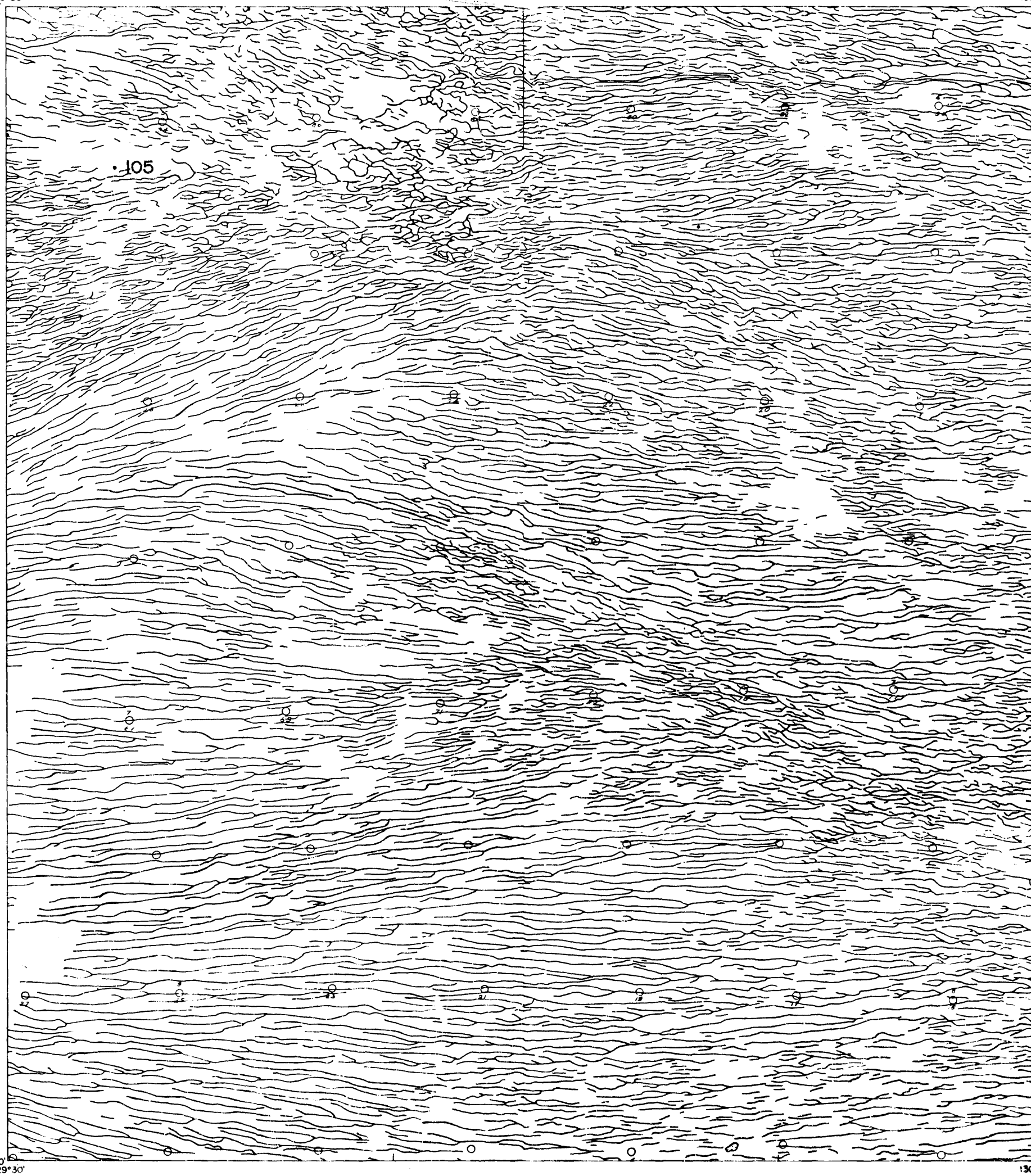
W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

NOORINA

4741	4841	4941
4740	Noorina 4840	4940

129°30'
28°30'

130°00'
28°30'



29°00'
129°30'

29°00'
130°00'

SCALE - KILOMETRES

0 10 20

SITE LOCALITIES ..... • 123

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

NOORINA 4840

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-535

Job No 2097

Locality: 105

Airphoto no./map sheet: 2132/5/142/1 NOORINA, Noorina

Geologist: GMP Date: 30/7/79

Description: Gentle 10 m rise exposing outcrop and scree of "Mangatitja" - type chalcedony, overlain by rubbly, calcreted limestone.

Appears to represent a re-incised silicified valley limestone sequence.

Interpretation: Chalcedonic limestone (probably Mangatitja Limestone).

Specimens: 4840RS6

Photographs: None

NOORINA

Churina 4940

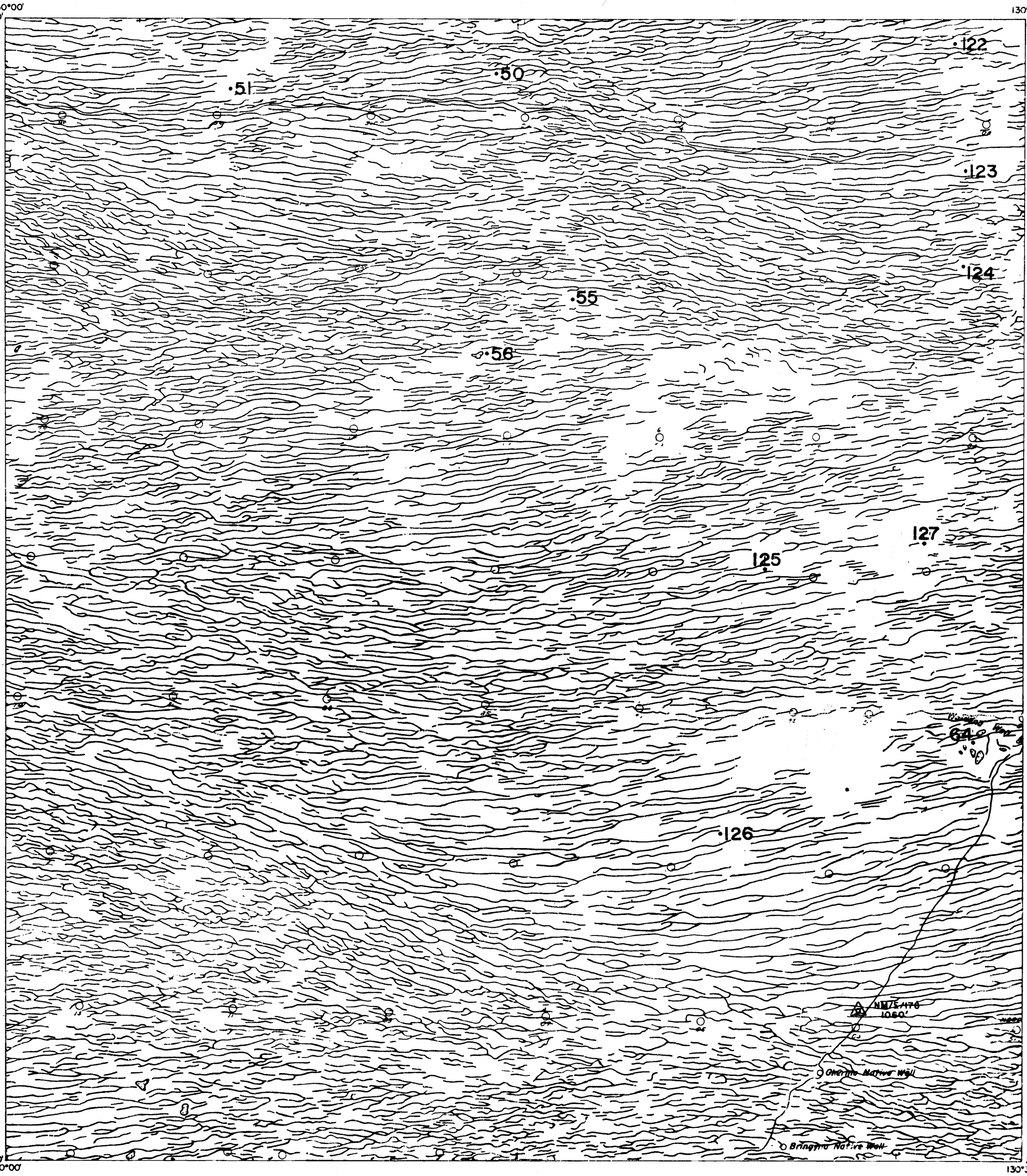
W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

NOORINA

4741	4841	4941
4740	4840	Churina 4940

130°00'
28°30'

130°30'
28°30'



29°00'
130°00'

29°00'
130°30'

SCALE - KILOMETRES

0 10 20

SITE LOCALITIES ..... • 123

Job No 2097

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

CHURINA 4940

COMPILED	G.P
DRAWN	
DATE	
CHECKED	PK
CDO DATE	
SCALE	1:250 000
PLAN NUMBER	80-539

Locality: 50

Airphoto no./map sheet: 2132//5/126/1 NOORINA, Churina

Geologist: TRW Date: 26/7/79

Description: 1-2 m section of well exposed sandstone, white, fi.-med. gr., well sorted, subangular to subrounded quartz in kaolin matrix. Poor to moderate porosity, thinly bedded (1-5 cms) with some slump structures. Doubtful dip 5° towards 220°.

Interpretation: Wanna Beds

Specimens: 4940RS7

Photographs: None

*****

Locality: 51

Airphoto no./map sheet: 2132/5/130/1 NOORINA, Churina

Geologist: TRW Date: 26/7/79

Description: Series of claypans with good outcrop and drift throughout. Sandstone, white-lt. grey, hard, porosity poor, thinly bedded (2-10 cms), partly silicified. Joints trend 120°, 160°. Possible bedding dip of 3° towards 270°.

Interpretation: Wanna Beds

Specimens: 4940RS8

Photographs: None

*****

Locality: 55

Airphoto no./map sheet: 2132/5/126/2 NOORINA, Churina

Geologist: TRW Date: 26/7/79

Description: Small rise of drift capped by silcrete. Minor outcrops on side of hill expose sandstone, white fi.-med. gr., well sorted.

Interpretation: Wanna Beds

Specimens: 4940RS9

Photographs: None

Locality: 56

Airphoto no./map sheet: 2133/6/084/1 NOORINA, Churina

Geologist: TRW Date: 26/7/79

Description: Low outcrop on lake edge, white sandstone, fi.-med. gr., well sorted.

Interpretation: Wanna Beds

Specimens: 4940RS10

Photographs: None

*****

Locality: 64

Airphoto no./map sheet: 2133/7/012/1 NOORINA, Churina

Geologist: GMP Date: 27/7/79

Description: Bulldozer trench beside airstrip encountered sandstone, white to slightly (ferruginised) orange, med.-fi. gr., even gr., micaceous, reasonably clean and slightly porous. No exposure now in trench, lithology described from spoil.

Interpretation: Wanna Beds

Specimens: 4940RS11

Photographs: None

Note: Airstrip overgrown with low (0.4 m) bushes, but a light aircraft could land in an emergency. Strip could be rehabilitated for use.

*****

Locality: 122

Airphoto no./map sheet: 2132/5/120/1 NOORINA, Churina

Geologist: GMP Date: 30/7/79

Description: Cream-grey calcrete and calcreted sandy limestone: rubbly to nodular. Locs. 122-124 are marginal to a palaeodrainage depression.

Interpretation: Calcrete and/or calcreted palaeochannel limestone (Tertiary-Quaternary, ?Mangatitja Limestone).

Specimens: 4940RS12

Photographs: None

Locality: 123

Airphoto no./map sheet: 2132/5/120/2 NOORINA, Churina

Geologist: GMP Date: 30/7/79

Description: 5 m section of rubbly calcrete overlying dark red-brown, somewhat indurated Cainozoic sands.

Interpretation: Quaternary calcrete developed in or on Cainozoic sand.

Specimens: 4940RS13

Photographs: None

*****

Locality: 124

Airphoto no./map sheet: 2132/5/120/3 NOORINA, Churina

Geologist: GMP Date: 30/7/79

Description: Rubbly to nodular calcrete.

Interpretation: Quaternary calcrete or calcreted palaeochannel limestone (Tertiary-Quaternary).

Specimens: 4940RS14

Photographs: None

*****

Locality: 125

Airphoto no./map sheet: 2133/7/016/1 NOORINA, Churina

Geologist: GMP Date: 30/7/79

Description: No vertical exposure; outcrop poor. Sandstone very ferruginised, med.-fi. gr., even gr., lithic and micaceous. Outcrop style suggests it was cross-bedded.

Interpretation: Wanna Beds

Specimens: 4940RS15

Photographs: None

Locality: 126

Airphoto no./map sheet: 2133/7/016/2 NOORINA, Churina

Geologist: GMP Date: 30/7/79

Description: Sandstone, med. gr., white, slightly kaolinitic and lithic, moderate-scale cross beds in 0.1-0.4 m sets.

Interpretation: Wanna Beds

Specimens: 4940RS16

*****

Locality: 127

Airphoto no./map sheet: 2133/7/016/3 NOORINA, Churina

Geologist: GMP Date: 30/7/79

Description: Gypsum exposed in creek gutters; no other outcrop. Rare pebbles on surface consist of well rounded reef quartz, and some soft, bleached siltstone. Origin of the latter must be very local.

Interpretation: Quaternary "lunette"-style gypsum.

Specimens: None

Photographs: None

WELLS

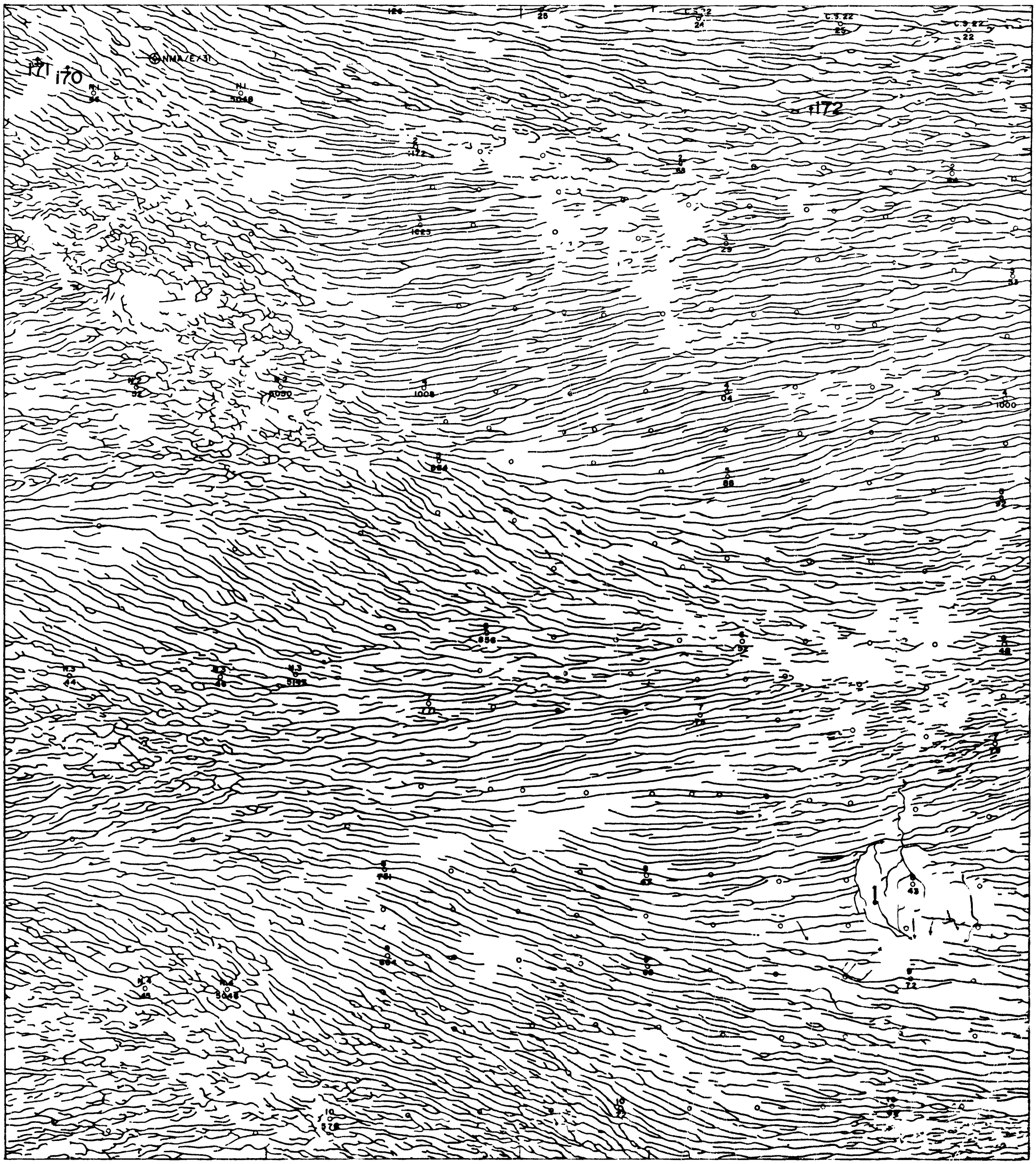
Niarrie 5041

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WELLS

Niarrie 5041	5141	5241
5040	5140	5240

130°30'
28°00'
131°00'
28°00'



28°30'
130°30'
28°30'
131°00'

SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....123

Job No 2097

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

NIARRIE 5041

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-543

Locality: 1

Airphoto no./map sheet: 2131/4/212/1 WELLS, Niarrie

Geologist: GMP, TRW Date: 22/7/79

Description: Sandstone, porous, med. gr., with "sparkles" due to preserved crystal faces, interbedded with an intraclastic sandstone layer, and with a finer micaceous, thin-bedded sandstone. Well cross-bedded.

Interpretation: Wanna Beds

Specimens: 5041RS1

Photographs: None

*****

Locality: 170

Airphoto no./map sheet: 2130/1/048/1 WELLS, Niarrie

Geologist: TRW Date: 4/8/79

Description: Sandstone, fi.-med. gr., well sorted, quartz sand in clay matrix. Texture obscured by silicification, ferruginisation and calcrete; pink-red to yellow-brown coloured. Roll/circular structured outcrop 2 m across due to ?sediment slumping or solution?

Interpretation: Wanna Beds or Mount Chandler Sandstone?

Specimens: 5041RS2

Photographs: None

*****

Locality: 171

Airphoto no./map sheet: 2130/1/048/2 WELLS, Niarrie

Geologist: TRW Date: 4/8/79

Description: Small rises, with scattered drift and poor outcrop: sandstone as for Loc. 170.

Interpretation: Wanna Beds or Mount Chandler Sandstone

Specimens: 5041RS3

Photographs: None

Locality: 172

Airphoto no./map sheet: 2130/1/040/1 WELLS, Niarrie

Geologist: TRW Date: 4/8/79

Description: Fair outcrop along ridge: sandstone, white, pink and red mottled, fi.-med. gr., well sorted, thin-bedded in part (1-2 cm).

Interpretation: Wanna Beds or Mount Chandler Sandstone?

Specimens: None

Photographs: None

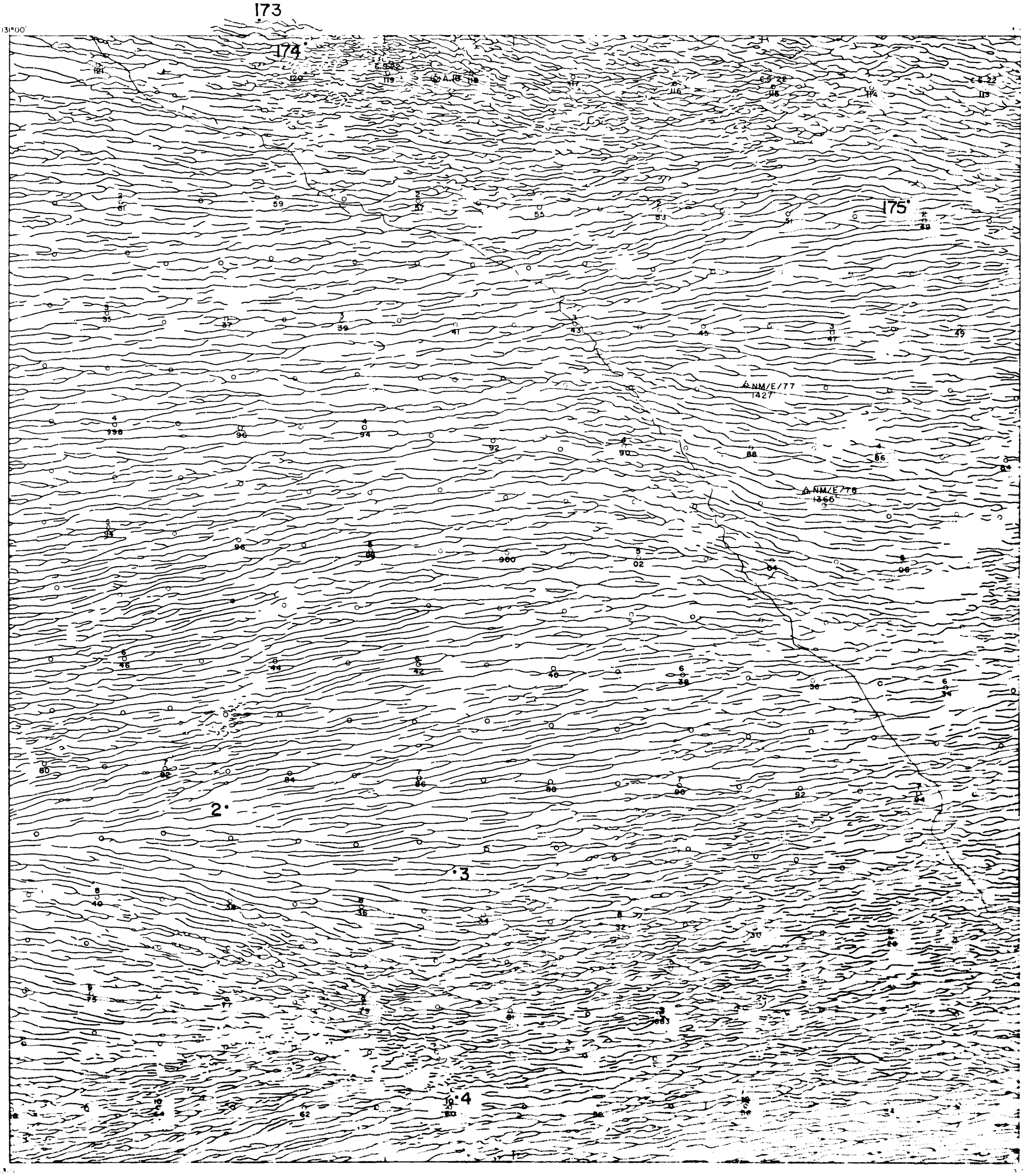
WELLS

Pupilla 5141

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WELLS

5041	Pupilla 5141	5241
5040	5140	5240



SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

PUPILLA 5141 & Portion WRIGHT 5142

	G.P
	DATE
	1 250 000
PLAN NUMBER	80-547

Job No 2097

Locality: 2

Airphoto no./map sheet: 2131/3/316/1 WELLS, Pupilla

Geologist: GMP, TRW Date: 22/7/79

Description: Sandstone, thin-bedded, kaolinitic/lithic, med. gr., kaolinitic laminations, probably cross-bedded, no dip or strike.

Interpretation: Wanna Beds

Specimens: 5141RS1

Photographs: None

*****

Locality: 3

Airphoto no./map sheet: 2131/3/320/1 WELLS, Pupilla

Geologist: GMP Date: 22/7/79

Description: Sandstone, relatively clean, med. gr., generally thick-bedded, partly ferrug. and silicified, ?worm tubes.

Interpretation: ?Mount Chandler Sandstone

Specimens: 5141RS2,3,4

Photographs: None

*****

Locality: 4

Airphoto no./map sheet: 2131/4/202/1 WELLS, Pupilla

Geologist: GMP Date: 22/7/79

Description: Calcrete and/or highly calcreted unidentified sands. Mainly cream-coloured, lesser grey; generally massive, lesser nodular.

Interpretation: Quaternary calcrete

Specimens: 5141RS5

Photographs: None

Locality: 174

Airphoto no./map sheet: 2130/1/036/2 WELLS, Pupilla

Geologist: TRW Date: 4/8/79

Description: As for Loc. 173

Interpretation: Mount Chandler Sandstone.

Specimens: None

Photographs: None

*****

Locality: 175

Airphoto no./map sheet: 2130/1/028/1 WELLS, Pupilla

Geologist: TRW Date: 4/8/79

Description: Rubbly outcrop of calcrete on gentle rise between sand dunes. No "hard rock".

Interpretation: Quaternary calcrete

Specimens: 5141RS6

Photographs: None

WELLS

Ungoolya 5241

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WELLS

5041	5141	Ungoolya 5241
5040	5140	5240

131°30'
132°00'
28°00'
28°30'

10
9
8
7
NM/E/79
1257'
NM/E/80
1195'
182
190

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES.....123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
UNGOOLYA 5241

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-551

Job No 2097

Locality: 7

Airphoto no./map sheet: 2131/4/192/1 WELLS, Ungoolya

Geologist: GMP Date: 23/7/79

Description: Calcreted sandstone with limonite grains, minor calcrete.

Interpretation: Calcreted ?Tertiary sands.

Specimens: 5241RS1

Photographs: None

*****

Locality: 8

Airphoto no./map sheet: 2131/4/192/2 WELLS, Ungoolya

Geologist: GMP Date: 23/7/79

Description: Sandstone, porous, med. gr. and even gr., brown-orange, saccharoidal. Possible rootlet holes; outcrop as low rises between dunes; doubtful 0-5° dip outwards the west or northwest. Probable intersecting "worm tube" trace fossils on bedding planes.

Interpretation: Mt. Chandler Sandstone

Specimens: 5241RS2

Photographs: None

*****

Locality: 9

Airphoto no./map sheet: 2131/3/330/1 WELLS, Ungoolya

Geologist: GMP Date: 23/7/79

Description: Similar to Loc. 8. Sandstone, brown-orange, grey where silcreted, even-textured, med. gr., some moderately thin bedding preserved, no beds of finer material present; probably flat lying. Numerous irregular "worm tubes" which may be original or of Tertiary origin, and rare, probably genuine vertical pipes of Diplocraterion type.

Interpretation: Mount Chandler Sandstone

Specimens: 5241RS3

Photographs: None

Locality: 10

Airphoto no./map sheet: 2130/2/160/1 WELLS, Ungoolya

Geologist: GMP Date: 23/7/79

Description: Sandstone, ferruginised and silicified, some lithologies as for Loc. 9, also sandstone, white, thin to well-bedded, med. gr., slightly lithic, kaolinitic. Joints trend mostly N-S, others parallel to gross outcrop trend; may represent minor fault line scarp trending approx. 080°.

Interpretation: Mount Chandler Sandstone, but some lithologies atypical.

Specimens: 5241RS4

Photographs: None

*****

Locality: 182

Airphoto no./map sheet: 2132/1/094/12 WELLS, Ungoolya

Geologist: TRW, GMP Date: 4/8/79

Description: Ferricrete replacing sandstone; some calcrete.

Specimens: 5241RS5,6

Photographs: None

*****

Locality: 190

Airphoto no./map sheet: 2132/1/082/04 WELLS, Ungoolya

Geologist: GMP Date: 5/8/79

Description: 2 -3 cm scarp exposing sandstone, fi.- med. gr., even gr., with cse. gr. micas. Highly micaceous in places. Variably thick to thin-bedded with tabular cross-beds. Two units exposed: 1 m of cross-bedded moderately micaceous sandstone, overlain by 1-2 m of thickly bedded, highly micaceous sandstone.

Interpretation: Wanna Beds

Specimens: 5241RS7

Photographs: 15554

WELLS

Waldana 5040

No localities

W.A.	S.A.		
		LINSDAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WELLS

5041	5141	5241
Waldana 5040	5140	5240

WELLS

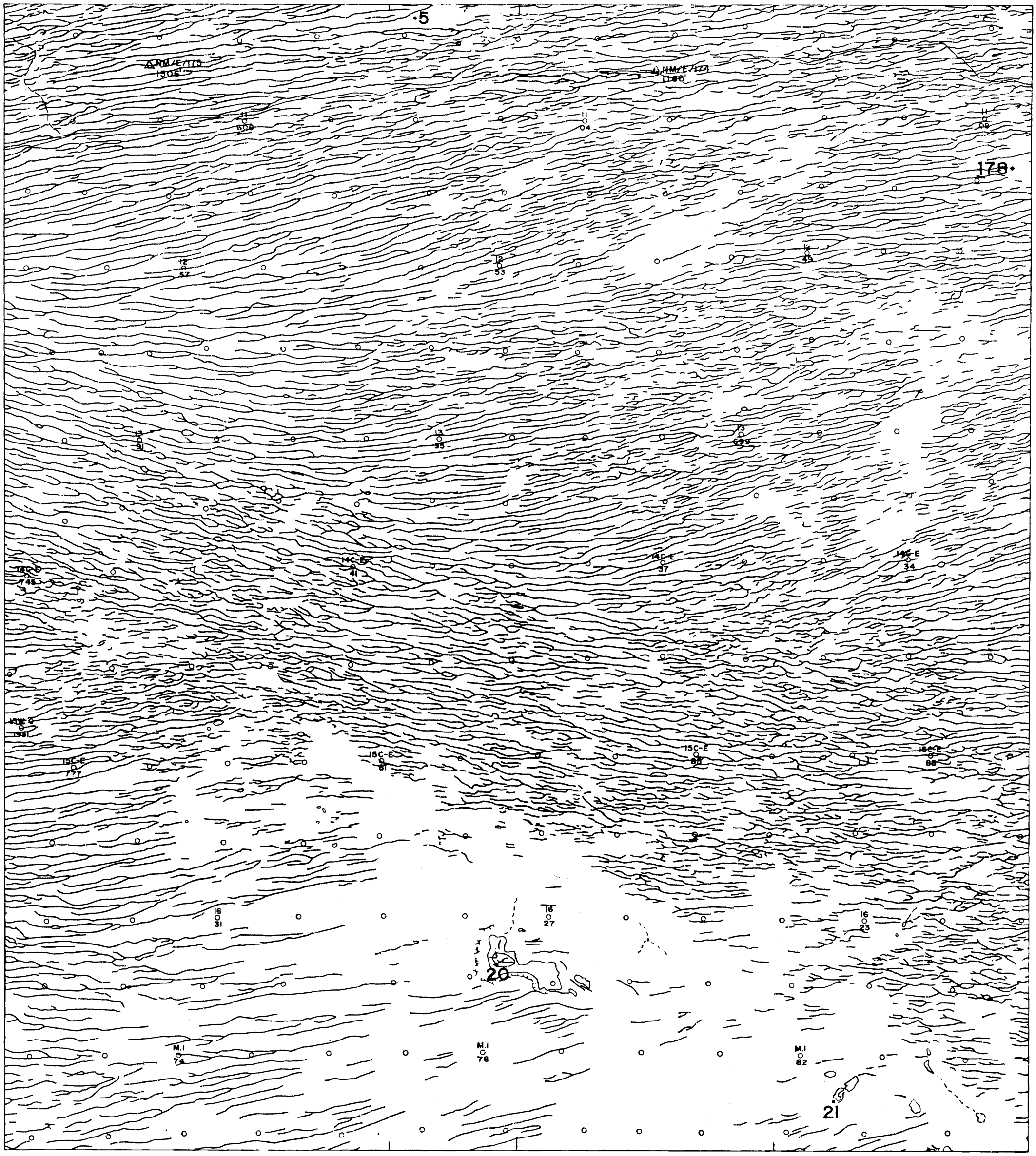
Mena 5140

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WELLS

5041	5141	5241
5040	Mena 5140	5240

131°00'
28°30'
131°30'
28°30'



29°00'
131°00'
29°00'
131°30'

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES ..... · 123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
MENA 5140

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	RJ
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-546

Job No 2097

Locality: 5

Airphoto no./map sheet: 2131/4/204/1 WELLS, Mena

Geologist: GMP Date: 22/7/79

Description: Outcrop poor. Sandstone, med. gr., ferrug., interbedded with siltstone.

Interpretation: Probable Wanna Beds equivalent.

Specimens: 5140RS1

Photographs: None

*****

Locality: 20

Airphoto no./map sheet: 2130/4/368/1 WELLS, Mena

Geologist: GMP Date: 23/7/79

Description: Sandstone, fi.-med. gr., white, minor orange ferruginisation, ?non-micaceous, thin-bedded, cross-bedded, kaolinitic, 5 m. exposed.

Interpretation: Wanna Beds

Specimens: 5140RS2

Photographs: None

*****

Locality: 21

Airphoto no./map sheet: 2130/4/364/1 WELLS, Mena

Geologist: GMP Date: 24/7/79

Description: Sandstone, porous, med.-fi. gr., slightly kaolinitic, non-micaceous, medium-scale cross-bedding, possible very shallow dip towards 140°, well sorted, thin-bedded.

Interpretation: Wanna Beds

Specimens: 5140RS3

Photographs: None

Locality: 178

Airphoto no./map sheet: 2132/1/094/3 WELLS, Mena

Geologist: TRW Date: 4/8/79

Description: No outcrop, calcrete only.

Interpretation: Quaternary calcrete

Specimens: None

Photographs: None

WELLS

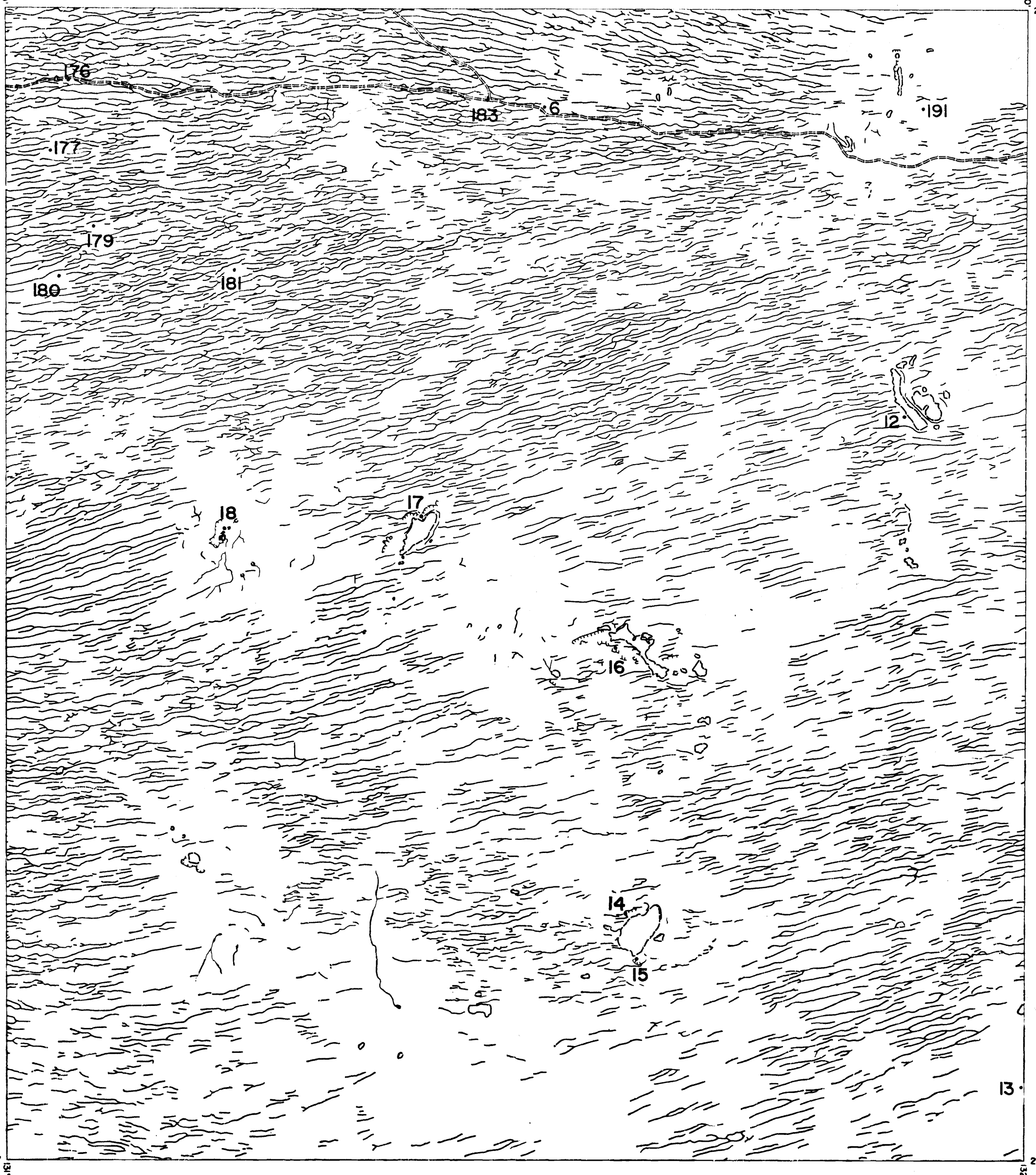
Leemurra 5240

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WELLS

5041	5141	5241
5040	5140	Leemurra 5240

131°30'
132°00'
28°30'
29°00'



SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....123

Job No 2097

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

LEEMURRA 5240

COMPILED	G.P
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80 - 550

Locality: 6

Airphoto no./map sheet: 2132/1/090/1 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: Poor exposure on track: "pillowy" to nodular calcrete-appears to cement a fine sandstone or silt. No strike or dip.

Interpretation: Quaternary calcrete overlying (?)?Palaeozoic.

Specimens: None

Photographs: None

*****

Locality: 12

Airphoto no./map sheet: 2133/2/128/1 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: Sandstone, med. gr., thin-bedded, kaolinitic, v. micaceous, large scale cross-beds or slumps, 2-3 m vertical exposure.

Interpretation: Wanna Beds

Specimens: 5240RS2

Photographs: None

*****

Locality: 13

Airphoto no./map sheet: 2130/4/346/1 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: Observatory Hill Beds type section: interbedded crystalline limestone, calc. sandstones and purple-grey micaceous siltstones. Flaggy to thin-bedded (refer to Wopfner 1969 for detailed description). Mudcracks and chert nodules noted; joints trend N-S; dip possibly a few degrees towards S.W.

Interpretation: Observatory Hill Beds

Specimens: 5240RS3

Photographs: 15482, 15483, 15484, 15485, 15486, 15487

Locality: 14

Airphoto no./map sheet: 2130/4/350/1 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: Spectacular 15-20 m exposure of sandstone on edge of claypan: porous, cross-bedded, med. gr., kaolinitic, ?"slump rolls", possible strike 160° with dip of 4°, but may be influenced by cross bedding.

Interpretation: Wanna Beds

Specimens: 5240RS4

Photographs: 15488, 15489

*****

Locality: 15

Airphoto no./map sheet: 2130/4/350/2 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: As for Loc. 14, but Observatory Hill Beds may underlie at a shallow depth.

Interpretation: Wanna Beds

Specimens: 5240RS5

Photographs: None

*****

Locality: 16

Airphoto no./map sheet: 2132/3/166/1 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: Sandstone, thin bedded to "paper" sandstone, med.-fi. gr., kaolinitic, some cross-beds, very well developed leisengang rings cutting across bedding; well sorted sand component; white or ferruginised orange to pink in colour.

Interpretation: Wanna Beds

Specimens: 5240RS6

Photographs: 15491

Locality: 17

Airphoto no./map sheet: 2133/2/122/1 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: Sandstone, white, med. gr., cross-bedded, thin-bedded, micaceous. Apparent dip 10° towards 030° (later comment: may be a foreset dip).

Interpretation: Wanna Beds

Specimens: 5240RS7

Photographs: None

*****

Locality: 18

Airphoto no./map sheet: 2133/2/120/1 WELLS, Leemurra

Geologist: GMP Date: 23/7/79

Description: Sandstone, lithic (now kaolinitic), muscovitic and biotitic, med. gr., porous, thin-bedded with mica and kaolin-rich laminae. Outcrops as 1-3 m steps over 5-6 m vertical exposure; N-S jointing; red to white-coloured, non-calcareous. No discernable dip.

Interpretation: Probably Wanna Beds, but may represent small area of Lennis Sandstone.

Specimens: 5240RS8

Photographs: None

*****

Locality: 176

Airphoto no./map sheet: 2132/1/094/2 WELLS, Leemurra

Geologist: GMP Date: 4/8/79

Description: Proposed site of Mena-1, marked with steel star-dropper and flagging. No outcrop, sited between dunes on a soft sandy flat, 40 m from a large, prominent black oak.

Locality: 177

Airphoto no./map sheet: 2132/1/094/1 WELLS, Leemurra

Geologist: GMP Date: 4/8/79

Description: Calcrete/limestone with minor chalcedony; scree of angular quartz and quartzite pebbles of unknown origin.

Interpretation: Weathered Mangatitja Limestone equivalent. Scree may indicate unrecognised Tertiary or Mesozoic remnants in the area, as such material is not known in the Officer Basin sediments.

Specimens: None

Photographs: None

*****

Locality: 179

Airphoto no./map sheet: 2132/1/094/4 WELLS, Leemurra

Geologist: GMP Date: 4/8/79

Description: Calcrete/limestone overlain by hard red-brown sandy clay; no other outcrop.

Interpretation: Compacted Quaternary sandy clay overlying weathered Mangatitja Limestone.

Specimens: None

Photographs: None

*****

Locality: 180

Airphoto no./map sheet: 2132/1/094/5 WELLS, Leemurra

Geologist: GMP Date: 4/8/79

Description: Sandy cream-coloured calcrete/limestone; no vertical exposure, no other outcrop.

Interpretation: Weathered (calcreted) Mangatitja Limestone equivalent.

Specimens: 5240RS9

Photographs: None

Locality: 181

Airphoto no./map sheet: 2132/1/092/1 WELLS, Leemurra

Geologist: GMP Date: 4/8/79

Description: Small rise between dunes exposing rubbly calcreted limestone.

Interpretation: Calcreted Mangatitja Limestone equivalent.

Specimen: None

Photographs: None

*****

Locality: 183

Airphoto no./map sheet: 2132/1/090/2 WELLS, Leemurra

Geologist: GMP, TRW Date: 4/8/79

Description: Giles Corner: no outcrop. Water bore on south side of junction, probably dry/collapsed.

*****

Locality: 191

Airphoto no./map sheet: 2132/1/082/5 WELLS, Leemurra

Geologist: GMP Date: 5/8/79

Description: Limestone, hard, aphanitic, cream-coloured, karst-weathering; surrounded by patches of softer calcrete/carbonate.

Interpretation: Mangatitja Limestone equivalent with some calcrete.

Specimens: 5240RS10

Photographs: None

LINDSAY

Wright 5142

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

LINDSAY

	Wright 5142	

Locality: 173

Airphoto no./map sheet: 2130/1/036/1 LINDSAY, Wright

Geologist: TRW Date: 4/8/79

Description: Poor outcrop on two small rises: sandstone, red-brown, fi.-med. gr., even gr.

Interpretation: Mount Chandler Sandstone

Specimens: 5142RS3

Photographs: None

GILES

Meramangye 5341

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

GILES

Meramangye 5341		
5340		

132° 00'
132° 30'
28° 00'
28° 30'

Numerous Small Sandhills
Claypans
Claypan
Native Well
Sand
Lakes
Clumps
Spinifex
Country
With
Sandy
Soft
Small Native Sock
LAKE MERAMANGYE
Salt
SANDRIDGES AND MULGA

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES ..... • 123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
MERAMANGYE 5341

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-553

Job No 2097

Locality: 186

Airphoto no./map sheet: 1829/3/044/1 GILES, Meramangye

Geologist: GMP Date: 5/8/79

Description: Sandstone, even gr., fi. gr., non micaceous, clean, thick-bedded, slightly silicified, ferruginised orange. 20 m of section, no biogenic structures. Very distinct from the micaceous, white, thin-bedded sands to the south.

Interpretation: Mt. Chandler Sandstone

Specimens: 5341RS3

Photographs: None

*****

Locality: 187

Airphoto no./map sheet: 1829/3/044/2 GILES, Meramangye

Geologist: GMP Date: 5/8/79

Description: Sandstone, clayey, white, even grained, rough and flaggy outcrop, some calcrete veins. Distinctive "worm tube" trace fossils on horizontal bedding planes.

Interpretation: Mt. Chandler Sandstone, with "worm tube" trace fossils.

Specimens: 5341RS4

Photographs: None

*****

Locality: 188

Airphoto no./map sheet: 2131/4/182/1 GILES, Meramangye

Geologist: GMP Date: 5/8/79

Description: Gentle slope exposing only nodular and relatively soft calcrete beneath aeolian sands.

Interpretation: Quaternary sands overlying calcrete.

Specimens: 5341RS5

Photographs: None

Locality: 189

Airphoto no./map sheet: 2131/4/182/2 GILES, Meramangye

Geologist: GMP Date: 5/8/79

Description: Rubbly to nodular calcrete (cream-coloured) drift on surface; minor amounts of more solid, greyer carbonate probably representing less-altered original limestone.

Interpretation: Quaternary calcrete overlying Tertiary-Quaternary limestone.

Specimens 5341RS6

Photographs: None

GILES

Emu 5340

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

GILES

5341		
Emu 5340		

132° 00'
132° 30'
28° 30'
29° 00'

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES ..... •123

Job No 2097

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
EMU 5340

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-552

Locality: 11

Airphoto no./map sheet: 2132/1/082/1 GILES, Emu

Geologist: GMP Date: 23/7/79

Description: Sandstone, fi.-med. gr., micaceous, kaolinitic, thin to very thin-bedded, some layers almost "slatey" and ferruginised, generally white to light grey. No visible cross-beds or dip. 4 m vertical exposure.

Interpretation: Wanna Beds

Specimens: 5340RS8

Photographs: None

*****

Locality: 184

Airphoto no./map sheet: 2132/1/082/2 GILES, Emu

Geologist: GMP Date: 5/8/79

Description: Small breakaway at southern end of claypan. Gypsum lunette overlying v.fi. gr. sandstone to siltstone, white to mauve/purple where slightly ferruginised and indurated. No layering seen.

Interpretation: Quaternary aeolian gypsum overlying unidentified sandstone-siltstone.

Specimens: 5340RS9

Photographs: None

*****

Locality: 185

Airphoto no./map sheet: 2132/1/082/3 GILES, Emu

Geologist: GMP Date: 5/8/79

Description: Excellent 4-5 m section of red-orange to white, lithic sandstone overlying deep red-brown, very micaceous, fi.gr. sandstone to siltstone which grades to a micaceous claystone/siltstone. Shaley to "papery" bedded. Possible dip 1-3° towards the S.W.

Interpretation: Sandstone-claystone sequence within the Wanna Beds.

Specimens: 5340RS10

Photographs: None

WYOLA

Purlana 4739

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WYOLA

Purlana 4739	4839	4939
4738	4838	4938

Locality: 69

Airphoto no./map sheet: 2246/4/069/1 WYOLA, Purlanna

Geologist: GMP Date: 27/7/79

Description: Nodular - pisolitic calcrete 1-2 m thick. One of the embedded nodules has a gastropod in the centre. The calcrete overlies a well-bedded, buff-coloured, v.fi.-gr. sandstone/limestone or dolomite. This resembles the dolomites of the Burra Group in the Adelaide Geosyncline, but it may be part of the Observatory Hill Beds.

Interpretation: Calcreted Tertiary limestone (Miocene Nullarbor Limestone) overlying a bedded carbonate which may be Observatory Hill Beds or Precambrian. It would appear too lithified to be Tertiary.

Specimens: 4739RS1,2

Photographs: None

*****

Locality: 71

Airphoto no./map sheet: 2245/3/081/1 WYOLA, Purlanna

Geologist: GMP Date: 27/7/79

Description: Sandstone, thin-bedded, fi.-med. gr., even-gr., med.-to light brown, interbedded with layers of non-shaley, highly micaceous siltstone to v.fi.gr. sandstone. Some material is possibly slightly calcareous, and laminations in the siltstone resemble the limestone of Loc. 69 and may reflect a related lithology.

Interpretation: Lennis Sandstone or gradational Lennis Sandstone/Observatory Hill Beds equivalent.

Specimens: 4739RS3

Photographs: None

*****

Locality: 72

Airphoto no./map sheet: 2245/3/089/1 WYOLA, Purlanna

Geologist: GMP Date: 27/7/79

Description: Rubbly, nodular calcrete only; no substrate outcrop.

Interpretation: Quaternary calcrete.

Specimens: 4739RS4

Photographs: None

Locality: 135

Airphoto no./map sheet: 2220/1/078/3 WYOLA, Purlanna

Geologist: TRW Data: 31/7/79

Description: 10 m cliff exposing white sandstone, ferruginised red in basal 2 m. Well cross-bedded.

Interpretation: Wanna Beds

Specimens: 4739RS5

Photographs: None

*****

Locality: 144

Airphoto no./map sheet: 2220/1/078/1 WYOLA, Purlanna

Geologist: GMP Date: 31/7/79

Description: 7 m cliff section. 5 m of tabular cross-bedded, med.- fi. gr. white sandstone with mica and lithic grains. Overlain by 2 m of structureless yellow to dark brown highly micaceous claystone/siltstone, with greenish alteration mottling along joints.

Interpretation: Probably Wanna Beds, with red clayey siltstone units interbedded within the white kaolinitic sandstone.

Specimens: 4739RS6

Photographs: 15546

Locality: 145

Airphoto no./map sheet: 2220/1/087/2 WYOLA, Purlanna

Geologist: GMP Date: 31/7/79

Description: 18 m section of porous med.-fi. gr. sandstone, off-white, passing down to yellow, orange and red-brown. 0.5 to 1.0 m cross-bed sets with clay layers forming 1-5 cm thick foreset interbeds. Passes up into rubbly calcrete which is developed in the dipping foresets. One layer is rich in clay intraclasts.

Interpretation: Quaternary calcrete overlying Palaeozoic sandstone, probably Wanna Beds.

Specimens: 4739RS7

Photographs: 15547

*****

Locality: 148

Airphoto no./map sheet: 2220/1/082/1 WYOLA, Purlanna

Geologist: GMP Date: 31/7/79

Description: Sandstone, white, thin-bedded, micaceous, grades to a clayey sandstone and silty claystone. Overall dip flat; 10 m vertical exposure.

Interpretation: Wanna Beds

Specimens: 4739RS8

Photographs: None

*****

Locality: 149

Airphoto no./map sheet: 2220/1/082/4 WYOLA, Purlanna

Geologist: TRW Date: 31/7/79

Description: Good section down gully: white sandstone, thin bedded, kaolinitic matrix, becomes ferruginised downsection, micaceous.

Interpretation: Wanna Beds

Specimens: 4739RS9

Photographs: None

Locality: 150

Airphoto no./map sheet: 2220/1/082/7 WYOLA, Purlanna

Geologist: Date: 1/8/79

Description: Section down gulley exposes thin-bedded, cross-bedded, white sandstone grading to siltstone.

Interpretation: Wanna Beds

Specimens: 4739RS10

Photographs: None

*****

Locality: 151

Airphoto no./map sheet: 2220/1/082/8 WYOLA, Purlanna

Geologist: TRW Date: 1/8/79

Description: Sandstone, white, fi.-med. gr., becoming finer down-section with an increasing clay fraction. At the base of section are beds with soft, crumbly intraclasts of white clay and beds of white clay.

Interpretation: Wanna Beds

Specimens: None

Photographs: None

*****

Locality: 152

Airphoto no./map sheet: 2220/1/082/10 WYOLA, Purlanna

Geologist: TRW Date: 1/8/79

Description: Sandstone, white, fi.-med. gr., clay matrix, becomes ferruginous towards base.

Interpretation: Wanna Beds

Specimens: 4739RS11

Photographs: None

Locality: 153

Airphoto no./map sheet: 2220/1/082/12 WYOLA, Purlanna

Geologist: TRW Date: 1/8/79

Description: Sandstone, white, becoming clayey at base; generally fi.-med. gr., approx. 4 m cliff exposure.

Interpretation: Wanna Beds

Specimens: 4739RS12

Photographs: None

*****

Locality: 154

Airphoto no./map sheet: 2245/2/067/1 WYOLA, Purlanna

Geologist: GMP Date: 1/8/79

Description: Sandstone, white to pale brown, cross-bedded, even gr., med.-fi. gr., thin to well-bedded. Foresets dip south. 3 metres exposed.

Interpretation: Wanna Beds

Specimens: 4739RS13

Photographs: None

*****

Locality: 155

Airphoto no./map sheet: 2245/2/063/1 WYOLA, Purlanna

Geologist: GMP Date: 1/8/79

Description: Sandstone, white to orange, some fissile micaceous claystone interbeds. Overlain by calcrete which incorporates clasts of ferruginised silcified Tertiary grit.

Interpretation: Quaternary calcrete overlying Wanna Beds.

Specimens: 4739RS14,15

Photographs: None

Locality: 157

Airphoto no./map sheet: 2220/1/082/2 WYOLA, Purlanna

Geologist: GMP Date: 31/7/79

Description: 15 m section of slightly silicified and ferruginised but generally white cross-bedded sandstone, passing down to a basal 8 m section of micaceous, fi.-gr. to v.fi. gr., lithic sandstone which is v. finely bedded to shaley, and dark brown to khaki in colour. A dark red-brown micaceous siltstone/claystone occurs at the very base. It is clear that this is a distinct unit from the white sandstones.

Interpretation: Wanna Beds overlying Lennis Sandstone.

Specimens: 4739RS16,17

Photographs: 15548

*****

129°00'
29°00'
129°30'
29°00'

163
153
162
152
161
151
160
150
159
149
157
158
148
144
145
135
155
154
72
69
AUSTRALIA
SOUTH
NMA/E/15
PRP

29°30'
129°00'
29°30'
129°30'

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES.....•123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
PURLANNA 4739

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-531

Job No 2097

Locality: 158

Airphoto no./map sheet: 2220/1/082/3 WYOLA, Purlanna

Geologist: GMP Date: 31/7/79

Description: Gully section exposing 8 m of fi. gr. sandstone, thin-bedded to very fissile, micaceous and lithic, with cross-beds indicated by highly variable dips. Light khaki to buff colour.

Interpretation: Lennis Sandstone.

Specimens: 4739RS18

Photographs: 15549

*****

Locality: 159

Airphoto no./map sheet: 2220/1/082/6 WYOLA, Purlanna

Geologist: GMP Date: 1/8/79

Description: 200 m. section along gully. Sandstone, thin-bedded, khaki to orange brown, fi.-med. gr., tabular cross-bedded, with 0.5 m sets which are well defined.

Interpretation: Lennis Sandstone

Specimens: 4739RS19

Photographs: None

Locality: 160

Airphoto no./map sheet: 2220/1/082/9 WYOLA, Purlanna

Geologist: GMP Date: 1/8/79

Description: 200 m gully, approx. 20 m vertical exposure. Sandstone, mod. thin-bedded, med.-fi. gr., white or ferruginised to a banded yellow-orange. Passes down rapidly to a sandstone which is notably thinner bedded, ubiquitously khaki to light brown, fi. gr. and cross-bedded, with dark ferruginous flecks.

Interpretation: Wanna Beds overlying Lennis Sandstone.

Specimens: 4739RS20

Photographs: None

*****

Locality: 161

Airphoto no./map sheet: 2220/1/082/11 WYOLA, Purlanna

Geologist: GMP Date: 1/8/79

Description: Excellent section exposed in a "stepped" cliff, approx. 25 m total. Top half consists of sandstone, white, micaceous, med.-fi. gr., cross-bedded, minor iron staining. Grades rapidly into khaki, red-brown, fi.-med. gr., pervasive and probably original.

Interpretation: Wanna Beds (white) overlying Lennis Sandstone (khaki).

Specimens: None

Photographs: 15550, 15551, 15552

*****

Locality: 162

Airphoto no./map sheet: 2220/1/082/13 WYOLA, Purlanna

Geologist: GMP Date: 1/8/79

Description: Iron-stained sandstone, generally white, thin to well-bedded, med.-fi.gr., micaceous, even gr., lithic, 0.5 m thick sets of tabular cross-beds.

Outcrop does not seem to go down far enough to expose the Lennis Sandstone seen further to the south.

Interpretation: Wanna Beds

Specimens: 4739RS12

Photographs: None

Locality: 163

Airphoto no./map sheet: 2220/1/082/14 WYOLA, Purlanna

Geologist: GMP Date: 1/8/79

Description: Sandstone, ferruginised to off-white, light orange-brown, med. gr., micaceous, slightly lithic, thin to moderately well-bedded, tabular cross-beds.

Interpretation: Wanna Beds

Specimens: 4739RS22

Photographs: None

*****

WYOLA

Warranga 4839

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WYOLA

4739	Warranga 4839	4939
4738	4838	4938

129° 30'
130° 00'
29° 00'
29° 30'

168
166
74
164
165
167
NURRARI
LAKES
73
68,197
67,196
66,194
195
65,193

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES.....123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
WARRANGA 4839

COMPILED G.P.
DRAWN
DATE
CHECKED RG
CDO DATE
SCALE 1:250 000
PLAN NUMBER
80-534

Job No 2097

Locality: 65

Airphoto no./map sheet: 2246/4/045/1 WYOLA, Warranga

Geologist: GMP Date: 27/7/79

Description: Massive nodular calcrete with some ?limestone overlying multicoloured red/black ferruginised medium-fine gr. sands which contain white "clasts" (1-2 mm), and are micaceous.

Interpretation: Quaternary calcrete, ?reworking Tertiary limestone overlying either Wanna Beds or Tertiary sand which is derived largely from the Palaeozoic sandstones.

Specimens: 4839RS1

Photographs: None

*****

Locality: 66

Airphoto no./map sheet: 2246/4/047/1 WYOLA, Warranga

Geologist: GMP Date: 27/7/79

Description: Sandstone ferruginised and silicified, medium grained, very micaceous in part, probably originally lithic.

Interpretation: Wanna Beds?

Specimens: 4839RS2

Photographs: None

Locality: 165

Airphoto no./map sheet: 2245/2/059/2 WYOLA, Warranga

Geologist: GMP, TRW Date: 1/8/79

Description: 30 m, low-angle slope with chalcedonic and calcreted Tertiary - Quaternary limestone, white to lt. grey, fi.-med. gr., subangular quartz grains and lithics, clay matrix and some mica. Flat-bedded.

Interpretation: Tertiary-Quaternary chalcedonic and calcreted limestone overlying Wanna Beds.

Specimens: 4839RS8,9

Photographs: None

*****

Locality: 166

Airphoto no./map sheet: 2245/2/055/1 WYOLA, Warranga

Geologist: TRW Date: 1/8/79

Description: Sandstone, well devel. cross-beds, thinly bedded (1-5 cm); occasional slump rolls at top of outcrop section. One white clay/silt bed 5 cm thick.

Interpretation: Wanna Beds

Specimens: 4839RS10

Photographs: None

*****

Locality: 167

Airphoto no./map sheet: 2245/2/055/2 WYOLA, Warranga

Geologist: TRW Date: 1/8/79

Description: 5 m section exposing sandstone, cross-bedded, purple/red mottling and staining; interbedded with sandstone with abundant white clay, grading to sandy claystone. Interlaminated with thin clay intraclast beds.

Interpretation: Wanna Beds

Specimens: 4839RS11

Photographs: None

Locality: 73

Airphoto no./map sheet: 2245/2/051/1 WYOLA, Warranga

Geologist: GMP Date: 27/7/79

Description: Spectacular outcrop exposing about 30 m of sandstone, med.-fi. gr., even gr., micaceous, slightly lithic, kaolinitic, sl. to mod. porous. Very well developed tabular to asymmetric crossbedding with at least one "roll-slump" structure. Cross-bedded parts of the sequence are often scoured out to form well-shaped channels infilled with structureless sands which become cross-bedded higher up.

Interpretation: Wanna Beds

Specimens: 4839RS5

Photographs: 15512, 15513, 15514, 15515, 15516

*****

Locality: 74

Airphoto no./map sheet: 2245/2/051/2 WYOLA, Warranga

Geologist: GMP Date: 27/7/79

Description: Outcrop very similar to Loc. 73, but lightly ferruginised to off-white and orange.

Interpretation: Wanna Beds

Specimens: 4839RS6

Photographs: None

*****

Locality: 164

Airphoto no./map sheet: 2245/2/059/1 WYOLA, Warranga

Geologist: GMP, TRW Date: 1/8/79

Description: Chalcedonic limestone (Mangatitja-type) with, at base of slope, heavily ferruginised, even gr. sandstone with some relict bedding.

Interpretation: Chalcedonic Tertiary limestone overlying Wanna Beds.

Specimens: 4839RS7

Photographs: None

Locality: 168

Airphoto no./map sheet: 2220/1/066/1 WYOLA, Warranga

Geologist: TRW Date: 1/8/79

Description: Mangatitja - type chalcedony; minor calcrete and limestone.

Interpretation: Chalcedonic Tertiary-Quaternary limestone possibly equivalent to the Mangatitja Limestone. Less likely to be silicified Miocene Limestone.

Specimens: 4839RS12

Photographs: None

*****

Locality:193 (repeated visit to Loc. 65).

Airphoto no./map sheet: 2246/4/054/1 WYOLA, Warranga

Geologist: GMP, TRW Date: 6/8/79

Description: Spectacular outcrop of pisolitic calcrete which contains fragments and large blocks of aphanitic limestone (?Nullarbor Limestone). This is white/grey on one side of claypan but ferruginised black on the other. They are considered to be the same unit.

Interpretation: Quaternary calcrete reworking ?Nullarbor Limestone, overlying clayey sands which may be Tertiary or Palaeozoic.

Specimens: 4839RS13

Photographs: None.

*****

Locality: 194 (repeat visit to Loc. 66)

Airphoto no./map sheet: 2246/4/047/1 WYOLA, Warranga

Geologist: GMP, TRW Date: 6/8/79

Description: Micaceous lithic sandstone as per previous description. Some fragments of an aphanitic limestone found downsection - possibly Palaeozoic, not Tertiary (worth testing for acritarchs). Overlain by Tertiary ferruginous sandstone.

Interpretation: ?Palaeozoic sandstone or even Observatory Hill Beds equivalents overlain by Tertiary (?Eocene Pidinga Fm.) sands.

Specimens: 4839RS14

Photographs: None

Locality: 195

Airphoto no./map sheet: 2246/4/049/3 WYOLA, Warranga

Geologist: GMP, TRW Date: 6/8/79

Description: Calcrete/limestone at top of a 5 m section, overlying poorly outcropping, brown-green blocky and platey-fracturing clays. These overlie sands at the base of the section which are medium-grained lithic but not micaceous and range from white to ferruginised orange-brown.

Interpretation: Tertiary-Quaternary calcrete/limestone overlying clays which may also be Tertiary (Miocene) or, less probably, Cambrian, in turn overlying sands which are Tertiary (Pidinga Fm.) or Cambrian.

Specimens: 4839RS15

Photographs: None

*****

Locality: 196 (repeat visit to Loc. 67)

Airphoto no./map sheet: 2246/4/049/1 WYOLA, Warranga

Geologist: GMP, TRW Date: 6/8/79

Description: Sandstone, v. well rounded, cse.gr., ferruginised black with quartz clasts up to 2-3 cms. Possible unconformity with even grained sands beneath it. If so, only 0.5 m thickness of Tertiary is preserved.

Interpretation: Tertiary arenites unconformably overlying Palaeozoic arenites.

Specimens: 4839RS16

Photographs: None

Locality: 197 (repeat visit to Loc. 68)

Airphoto no./map sheet: 2246/4/049/2 WYOLA, Warranga

Geologist: GMP, TRW Date: 6/8/79

Description: Sandstone, dark brown to khaki, moderately well-bedded to thin-bedded, even gr., and micaceous. Forms large trough-shaped cross-beds; outcrops at the foot of a scarp which sheds well rounded pebbles. Red-brown sands (unconsol.) outcrop poorly in the scarp and are overlain by calcrete.

Interpretation: Quaternary calcrete overlying (?) Tertiary-Quaternary sands and possibly Tertiary Pidinga Formation. This sequence in turn overlies interpreted Lennis Sandstone.

Specimens: 4839RS17

Photographs: None

*****

Locality: 37

Airphoto no./map sheet: 2220/1/050/1 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Sandstone, white, medium-fine gr., even gr., kaolinitic or lithic, micaceous, low angle cross-beds, thinly bedded. No discernable strikes or dips.

Interpretation: Wanna Beds

Specimens: 4939RS4

Photographs: None

*****

Locality: 38

Airphoto no./map sheet: 2220/1/050/2 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Sandstone, medium grained, highly ferruginised, vuggy weathering surface, black and micaceous. Possibly foresets (non-diagnostic), no strikes or dips. Outcrop covers much of lake bed at this locality.

Interpretation: Ferruginised Wanna Beds

Specimens: 4939RS5

Photographs: None

WYOLA

Wyola 4939

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WYOLA

4739	4839	Wyola 4939
4738	4838	4938

130°00'
29°00'
130°30'
29°00'

NURRARI LAKES
75
76
77
WYOLA LAKE
40
39
38
37
41
46
HALINOR LAKE
44
42
47
43
NUMEROUS SHALLOW DEPRESSIONS
NM/E/179
848'
NM/E/180
862'
NM/E/181
833
29°30'
130°00'
29°30'
130°30'

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES.....:123

Job No 2079

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
WYOLA 4939

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	PA
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-538

Locality: 39

Airphoto no./map sheet: 2220/1/050/3 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Sandstone, orange-red, fine-medium gr., micaceous, thin-bedded, large-scale cross-beds. 8 m vertical exposure is lightly ferruginised, becomes heavily ferruginised at base, passing out onto lake floor. Large scale planar foresets are possibly superimposed on a shallow (less than 4°) dip towards the north-west.

Interpretation: Ferruginised Wanna Beds

Specimens: 4939RS6

Photographs: None

*****

Locality: 40

Airphoto no./map sheet: 2220/1/052/1 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Sandstone, medium grained, well sorted, ferruginised to an orange or maroon colour, moderately thickly bedded, micaceous. Silica and iron induration has produced a very hard sandstone. Moderate-scale cross-beds superimposed on a doubtful dip of 3-4°, strike 050°.

Interpretation: Ferruginised Wanna Beds

Specimens: 4939RS7

Photographs: None

*****

Locality: 41

Airphoto no./map sheet: 2219/2/176/5 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Sandstone, med.-fi. gr., grey to lt. orange, clean, even grained. Large scale cross-beds exposed in an excellent 20 m section.

Interpretation: Wanna Beds

Specimens 4939RS8

Photographs: None

Locality: 42

Airphoto no./map sheet: 2219/2/176/6 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Sandstone, porous, micaceous, maroon, even gr., fi.-med. gr., with large-scale tabular asymmetrical foresets. A scree of highly ferruginised sandstone/grit at the base of section possibly represents Tertiary sands. The 15 m section is topped by 1 m of dense limestone/carbonate, which resembles Etadunna Formation.

Interpretation: Tertiary (?Miocene) carbonates and (?)Eocene Pidinga Formation, overlying Wanna Beds.

Specimens: 4939RS9,10,11

Photographs: 15499

*****

Locality: 43

Airphoto no./map sheet: 2245/3/113/1 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Limestone with opaline veining overlies sandstone, med. gr., even gr., brown to orange/red, ferruginised, micaceous, large-scale cross-beds. Highly micaceous red clay/siltstone lens near base of section. Floor of claypan is formed of crossbedded sandstone with foresets dipping southeast.

Interpretation: Silicified Tertiary limestone which includes a clay lens, overlying Wanna Beds.

Specimens: None

Photographs: 15500, 15501

Locality: 44

Airphoto no./map sheet: 2245/3/113/2 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Limestone, silicified, at top of section, overlying sandstone, friable, lithic, micaceous, brown to red/orange, med. and even gr., well-formed cross-beds. Foresets dip in various directions.

Interpretation: Silicified Tertiary limestone (?Miocene) overlying Wanna Beds.

Specimens: 4939RS12

Photographs: None

*****

Locality: 46

Airphoto no./map sheet: 2219/2/172/1 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Sandstone, orange-red to red-brown ferruginised, med.-fi. gr., large-scale cross-beds. Becomes a massive black sandstone in claypan floor. Foresets dip to southeast; leisegang banding present, cross-cutting bedding.

Interpretation: Ferruginised Wanna Beds.

Specimens: 4939RS13

Photographs: 15502

*****

Locality: 47

Airphoto no./map sheet: 2245/3/111/1 WYOLA, Wyola

Geologist: GMP Date: 25/7/79

Description: Friable orange/red to maroon, very micaceous, even grained sandstone, med.-fi. gr., cross-bedded. Foresets generally dip northeast. Overlain by Tertiary limestone.

Interpretation: Wanna Beds, heavily ferruginised, overlain by Tertiary (?Miocene) limestone.

Specimens: 4939RS14

Photographs: None

Locality: 75

Airphoto no./map sheet: 2220/1/058/1 WYOLA, Wyola

Geologist: GMP Date: 27/7/79

Description: Sandstone, med. gr., even gr., white and orange to pink, overlain sharply and unconformably by sands, grits and conglomerate which is very heavily (black to red) ferruginised. Basal conglomerate has clasts up to 10 cm.

Specimens: 4939RS15

Photographs: 15517

*****

Locality: 76

Airphoto no./map sheet: 2220/1/058/2 WYOLA, Wyola

Geologist: GMP Date: 27/7/79

Description: Rubbly, nodular calcrete overlying blocky silcrete (silicified slightly gritty sandstone) which passes down into indurated medium, even gr. grey sandstone with rare well rounded granules. These unconformably overlie maroon, red or black, ferruginised, medium gr., cross-bedded, even gr. sandstones, clayey near base of exposure. A good cross-cut contact is exposed between the two units.

Interpretation: Tertiary Pidinga Formation overlying Wanna Beds.

Specimens: None

Photographs: None

Locality: 77

Airphoto no./map sheet: 2245/2/043/1 WYOLA, Wyola

Geologist: GMP Date: 27/7/79

Description: Sandstone, med.-fi. gr., even gr., off-white to light grey/maroon; cross bedded with planar, tabular foresets. Overlain by 2 m of slightly gritty sandstone, entirely silicified to an orange-brown silcrete which is rubbly and nodular at places with some infusing of calcrete into joints.

Interpretation: Wanna Beds possibly overlain by Tertiary (?Pidinga Fm.) sands.

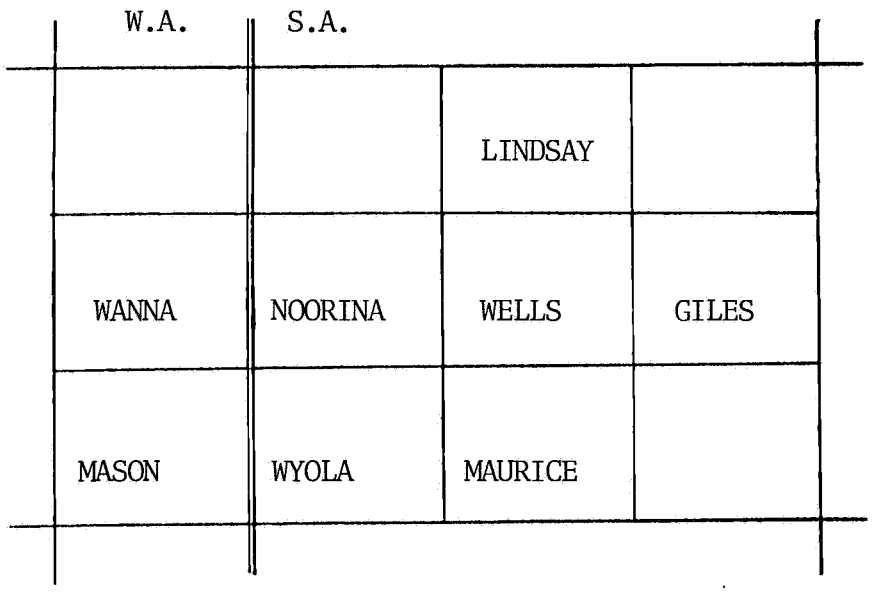
Specimens: 4939RS16,17

Photographs: None

WYOLA

Tadlanya 4738

No Localities



WYOLA

4739	4839	4939
Tadlanya 4738	4838	4938

WYOLA

Tallara 4838

No Localities

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WYOLA

4739	4839	4939
4738	Tallara 4838	4938

WYOLA

Chilbinga 4938

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

WYOLA

4739	4839	4939
4738	4838	Chilbinga 4938

Locality: 62

Airphoto no./map sheet: 2219/092/1 WYOLA, Chilbinga

Geologist: GMP Date: 27/7/79

Description: Massive ironstone replacing an originally layered rock - could have been either Tertiary or Cambrian. Scattered remnants (scree) of toffee-coloured chalcedony replacing limestone, and some aphanitic toffee-coloured pure limestone.

Interpretation: Heavily ferruginised Tertiary (Eocene) or Palaeozoic sediments, overlain by silicified Tertiary limestone, possibly Miocene Nullarbor Limestone.

Specimens: 4938RS1,2

Photographs: None

*****

Locality: 63

Airphoto no./map sheet: 2219/5/158/1 WYOLA, Chilbinga

Geologist: GMP Date: 27/7/79

Description: Thick, broken orthoquartzitic silcrete (silicified sandstone), 2-3 m thick, with ropy texture on surface and a bimodal, cse. gr. fraction. Overlies a damp, friable, slightly shaley-parting, micaceous, clayey, v.fi.gr. sand grading to a sandy clay (brown, green, grey).

Interpretation: Silicified Tertiary sand overlying possible Cambrian Observatory Hill Beds equivalents; however, there are few diagnostic features and other correlations are possible.

Specimens: 4938RS3

Photographs: None

*****

Locality: 192

Airphoto no./map sheet: 2246/4/043/1 WYOLA, Chilbinga

Geologist: GMP Date: 6/8/79

Description: Small scarp exposing nodular calcrete overlying deep red compacted clayey sand.

Interpretation: Quaternary calcrete developed in or over Quaternary sand.

Specimens: 4938RS4

Photographs: None

130° 00'
29° 30'
130°30'
29° 30'

192

NM/E/182
734'

63
198

62

NM/E/183
586'

Worldorie Perkeliedga R.H.
P.D.

NM/E/184
549'

Chookrooring R.H
P.D

30° 00'
130° 00'
30° 00'
130° 30'

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES..... •123

Job No 2097

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
CHILBINGA 4938

COMPILED	G.P
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-537

Locality: 198

Airphoto no./map sheet: 2219/5/158/2 WYOLA, Chilbinga

Geologist: GMP, TRW Date: 6/8/79

Description: White, silicified, orthoquartzitic Tertiary silcrete and gritty ferruginised sands. Overlies thinly layered to laminated, friable, highly micaceous sands, ferruginised to an off-white to red/orange. Some quite ferruginised portions still preserve the mica.

Interpretation: Tertiary silicified sands overlying possible upper Observatory Hill Beds. High content of mica supports a probable Cambrian Officer Basin correlation, rather than Tertiary, for the latter.

Specimens: 4938RS5

Photographs: None

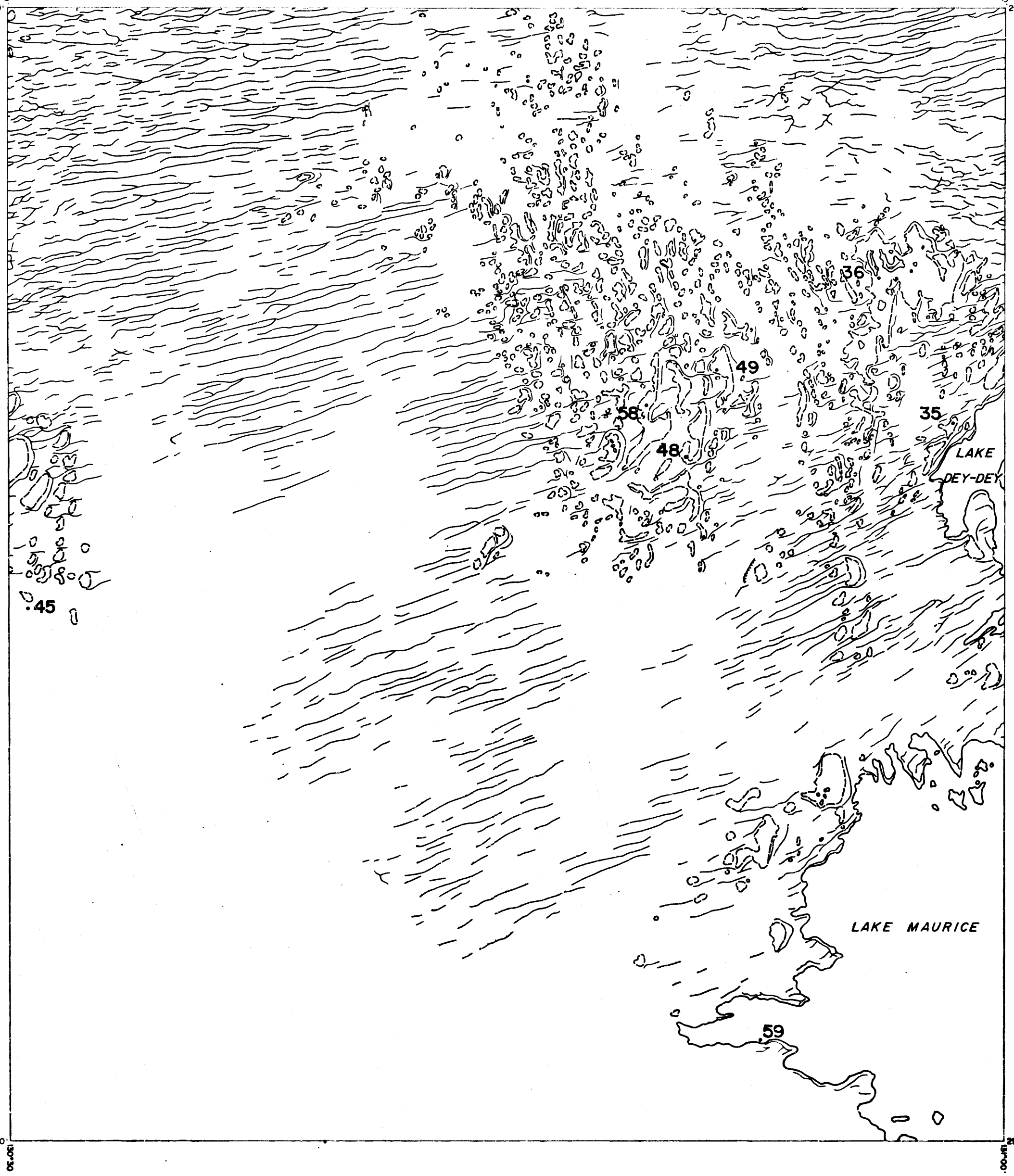
MAURICE

Maurice 5039

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

MAURICE

Maurice 5039	5139	5239
5038	5138	5238



SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....123

Job No 2097

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

MAURICE 5039

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	PA
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-542

Locality: 35

Airphoto no./map sheet: 1510/2/024/1 MAURICE, Maurice

Geologist: GMP Date: 24/7/79

Description: Exposure in floor of claypan. Appears to be a highly ferruginised sandstone with a perceptible dip (0°-5°) to the northwest. Later outcrops suggest this may be a cross-bed foreset dip, not true bedding dip.

Interpretation: Outcrops in the region suggest it may be ferruginised Wanna Beds, but no specific evidence at this locality.

Specimens: 5039RS1,2

Photographs: 15497

*****

Locality: 36

Airphoto no./map sheet: 1510/2/024/2 MAURICE, Maurice

Geologist: GMP Date: 24/7/79

Description: Extensive outcrop in claypan floor (see photo 1511/024). Sandstone, massively ferruginised, black, poorly sorted (e.g. sand and clay components). Reminiscent of outcrops in eastern Lake Wilkinson. Poorly sorted nature/grain size suggests it may not be Palaeozoic, but rather Tertiary or Mesozoic, possibly the former. Relationship to Loc. 35 not known.

Interpretation: ?Tertiary sandstone.

Specimens: 5039RS3

Photographs: None

*****

Locality: 45

Airphoto no./map sheet: 2245/3/115/1 MAURICE, Maurice

Geologist: GMP Date: 25/7/79

Description: Limestone overlying sandstone, med.-fi. gr., pink to off-white, thin to very thin-bedded, micaceous, slightly kaolinitic. Very few cross-beds.

Specimens: 5039RS4

Photographs: None

Locality: 48

Airphoto no./map sheet: 1510/2/018/1 MAURICE, Maurice

Geologist: GMP Date: 25/7/79

Description: Sandstone, med.gr., even gr., well bedded (thinly), highly ferruginised to red/black. Exposure consists largely of a single cross-bed set of which the foresets dip 20° towards 205°. Unconformably overlying it is a ferruginised, silicified sandstone with a grit/granule component, representing small remnants of Tertiary arenites (up to 0.5 m thick) "plastered" over the Palaeozoic "pseudo-dips" and the unconformably overlying Tertiary.

Interpretation: Heavily ferruginised Tertiary arenites unconformably overlying cross-bedded Wanna Beds.

Specimens: 5039RS5,6

Photographs: 15503, 15504

*****

Locality: 49

Airphoto no./map sheet: 1510/2/018/2 MAURICE, Maurice

Geologist: GMP Date: 25/7/79

Description: Gypsum overlying a ferruginised gritty sandstone (probably Tertiary).

Interpretation: Quaternary gypsum overlying Tertiary arenite (?Eocene Pidinga Fm. equivalent).

Specimens: 5049RS7

Photographs: None

*****

Locality: 58

Airphoto no./map sheet: 1510/2/018/3 MAURICE, Maurice

Geologist: GMP Date: 27/7/79

Description: Sandstone, ferruginised, red/black, even gr., med. gr., "sparkles" due to preservation of crystal faces. Outcrop forms a linear feature across claypan bed due to apparently dipping beds which are actually foresets (160° and 250° dip directions).

Interpretation: Cross-bedded, heavily ferruginised Wanna Beds.

Specimens: 5039RS8

Photographs: 15505, 15506

Locality: 59

Airphoto no./map sheet: 1511/2/160/1 MAURICE, Maurice

Geologist: GMP Date: 27/7/79

Description: 3-4 m exposure on edge of lake. Sandstone, silicified, med.gr., even gr., ferruginised to orange-brown and black. Overlies green and brown pearly-lustered claystone, no bedding. More closely resembles Etadunna Formation than Cambrian clays.

Interpretation: ?Miocene limestone

Specimens: 5039RS9

Photographs: None

MAURICE

Dey Dey 5139

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

MAURICE

5039	Dey Dey 5139	5239
5038	5138	5238

131°00'
131°30'
29°00'
29°30'

LAKE DEY-DEY

LAKE MAURICE

28

34

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES.....•123

Job No 2097

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
DEY-DEY 5139

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	PA
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-545

Locality: 28

Airphoto no./map sheet: 1511/4/148/1 MAURICE, Dey Dey

Geologist: GMP Date: 24/7/79

Description: Sandstone, fi.-v.fi.gr., white to ferruginised orange-black, very thinly layered, cross-bedded, micaceous and kaolinitic with clay intraclast layers. No cherts; occassional very iron-rich, black layers. Possible trace fossils, see specimens.

Interpretation: Probable Wanna Beds equivalents, likely to be near the base of that unit.

Specimens: 5139RS1

Photographs: None

*****

Locality: 34

Airphoto no./map sheet: 1511/4/154/1 MAURICE, Dey Dey

Geologist: GMP Date: 24/7/79

Description: v.fi.gr. sandstone to quartz siltstone, v.fi. layering, fissile, micaceous, silicified to some degree. Rare pieces chert. One part has been disrupted with bedding at all angles (probably early intraformational disruption). Overlain by dune sand, 2-3 m exposure (poor) on edge of the playa.

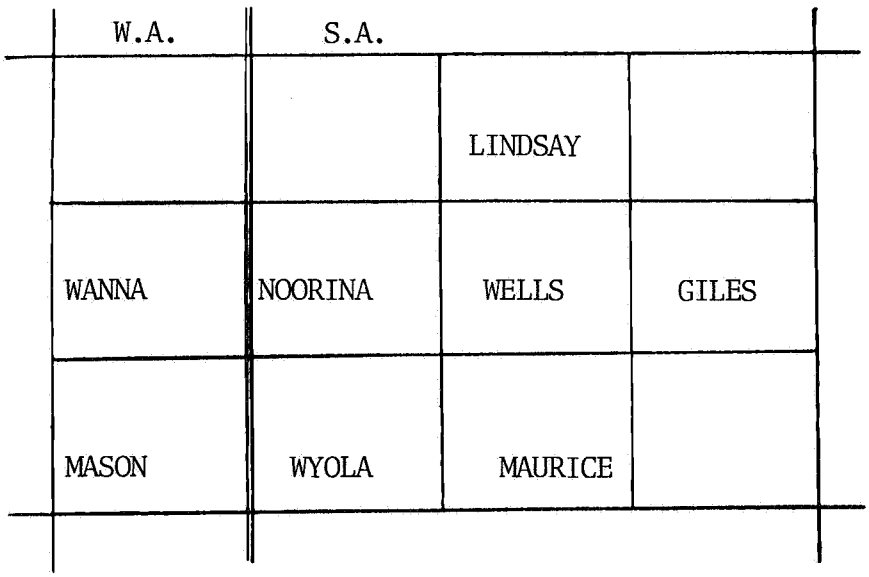
Interpretation: Quaternary aeolian sand overlying Observatory Hill Beds.

Specimens: 5139RS2

Photographs: 15496

MAURICE

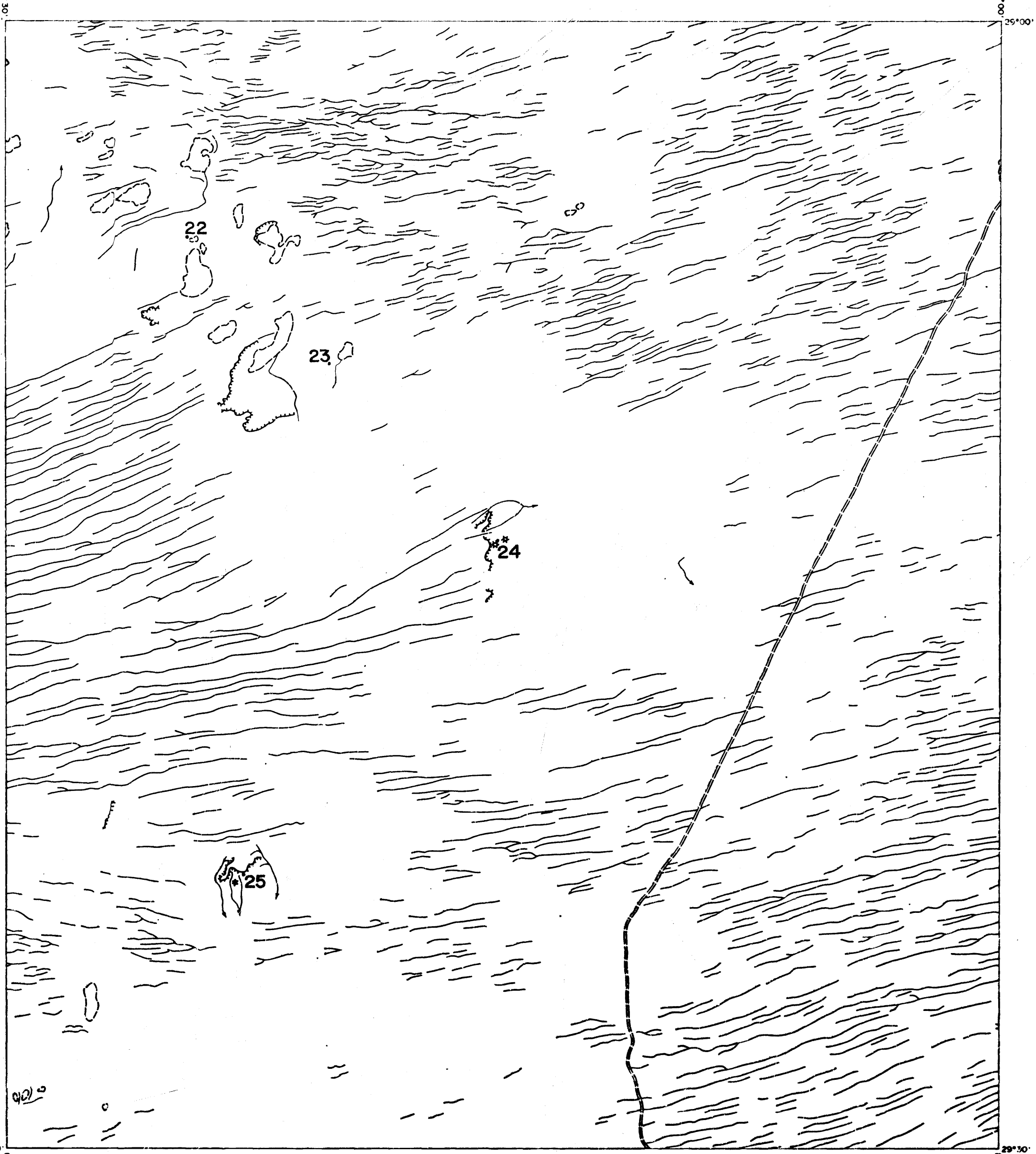
Punthanna 5239



MAURICE

5039	5139	Punthanna 5239
5038	5138	5238

131° 30'
132° 00'
29° 00'
29° 30'



SCALE - KILOMETRES

0 10 20

SITE LOCALITIES.....123

Job No 2097

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
PUNTHANNA 5239

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80 - 549

Locality: 22

Airphoto no./map sheet: 1510/1/064/2 MAURICE, Punthanna

Geologist: GMP Date: 24/7/79

Description: Sandstone, med.-fi. gr., sl. kaolinitic, thin cross-beds, planar to asymptotic foresets, even gr., white. No discernable strike or dip.

Interpretation: Wanna Beds

Specimens: 5239RS1

Photographs: 15492, 15493

*****

Locality: 23

Airphoto no./map sheet: 1510/2/040/1 MAURICE, Punthanna

Geologist: GMP Date: 24/7/79

Description: Sandstone, sl. kaolinitic, med.-fi.gr., thin cross-beds with planar to asymmetric foresets. Possible dip towards southwest?

Interpretation: Wanna Beds equivalents.

Specimens: 5239RS2

Photographs: 15494

*****

Locality: 24

Airphoto no./map sheet: 1510/2/042/1 MAURICE, Punthanna

Geologist: GMP Date: 24/7/79

Description: Mesa section: at base 4 m siltstone, kaolinitic, massive to thin-bedded, micaceous, pale grey to maroon. Overlain with sharp unconformable contact by sandstone as per Locs. 22-23. This sandstone alternates with white siltstone for 5-6 m to top of mesa where it is capped by 0.5 m of silicified angular sandy grit (Tertiary or ?Mesozoic).

Interpretation: Lower siltstone probably represents uppermost Observatory Hill Beds. White sands may represent Wanna Beds equivalents. If so, Lennis Sandstone equivalents are absent, and the unconformable contact may be stratigraphically significant in the "pinching" out of the Lennis Sandstone.

Specimens: 5239RS3,4

Photographs: None

Locality: 25

Airphoto no./map sheet: 1511/4/140/1 MAURICE, Punthanna

Geologist: GMP Date: 24/7/79

Description: Siltstone, thinly layered, slightly silicified, white, laminated. Overlain by silicified, orange, sandy grit (unconformably). Latter has clasts of the siltstone, as well as well rounded to angular quartz grains.

Interpretation: Silicified Tertiary unconformably overlying what is probably uppermost Observatory Hill Beds.

Specimens: 5239RS5,6

Photographs: 15495

MAURICE

Hambidge 5038

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

MAURICE

5039	5139	5239
Hambidge 5038	5138	5238

130° 30'

131° 00'

29° 30'

29° 30'

LAKE MAURICE

60

30

61

30° 00'

30° 00'

130° 30'

131° 00'

SCALE - KILOMETRES

0 10 20

SITE LOCALITIES..... 123

Job No 2097

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

HAMBIDGE 5038

COMPILED	G.P.
DRAWN	
DATE	
CHECKED	BA
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-541

Locality: 29-30

Airphoto no./map sheet: 1511/186/1-2 MAURICE, Hambidge

Geologist: GMP Date: 24/7/79

Description: 100 m of cliff exposure, S.W. side of Lake Maurice, up to 15-20 m high. Fissile, v.fi.gr.-fi.gr. micaceous sandstones pass down to brown, fissile, muscovitic and biotitic siltstones, with "flaser"-like cross-beds, and form a small outlier rise near the cliff. Beds on this rise dip at 5° towards 340°, under the cliff exposures. The latter display a sequence of 1-2 m of brown micaceous siltstones and claystone, overlain by a green, alternately micaceous and non-micaceous siltstone to pure claystone (2-3 m), and then v.fi.gr. red-brown and white "flaser" cross-bedded sandstone to siltstone (1-2 m lenses). This sequence is overlain by a columnar/nodular silcrete with a lens of black, silicified, even-grained, ferruginous sandstone with nodular calcrete forming the top of the section. The green claystone resembles Etadunna Formation, but is micaceous and is overlain by the v.fi.gr. "flaser" sandstone, so it is concluded that the whole pre-silcrete sequence is Observatory Hill Beds.

Interpretation: Quaternary calcrete, overlying Tertiary silicified sand, overlying ?Observatory Hill Beds.

Specimens: 5138RS1, 5038RS1,2,3

Photographs: None

*****

Locality: 60

Airphoto no./map sheet: 1511/1/184/1 MAURICE, Hambidge

Geologist: GMP Date: 27/7/79

Description: Nodular calcrete only, exposed in creek bed.

Interpretation: Quaternary calcrete.

Specimens: 5038RS4

Photographs: None

Locality: 61

Airphoto no./map sheet: 1511/2/218/1 MAURICE, Hambidge

Geologist: GMP Date: 27/7/79

Description: Platey to nodular calcrete occurring as broken-up outcrop and scree. No sign of parent lithology.

Interpretation: Quaternary calcrete

Specimens: 5038RS5

Photographs: None

MAURICE

Yadina 5138

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

MAURICE

5039	5139	5239
5038	Yadina 5138	5238

131°00'
131°30'
29°30'
29°30'
30°00'
30°00'

LAKE MAURICE

27.
33
31a
29
32
32a

SCALE - KILOMETRES
0 10 20

SITE LOCALITIES.....123

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

OFFICER BASIN
1979 HELICOPTER SURVEY
SITE LOCALITIES
YADINA 5138

COMPILED G.P.
DRAWN
DATE
CHECKED
CDO DATE
SCALE 1:250 000
PLAN NUMBER
80-544

Job No 2097

Locality: 27

Airphoto no./map sheet: 1511/144/2 MAURICE, Yadina

Geologist: GMP Date: 24/7/79

Description: Maroon, thin-bedded v.fi.gr. sandstone interlayered with micaceous, slightly silicified white to grey siltstone - v.fi.gr. sandstone with fine "flaser" cross-beds; chert nodules and layers; very good outcrop of Observatory Hill Beds. Overlain by nodular calcrete; scree of large quartz cobbles possibly shed from eroded (?early) Tertiary sands.

Interpretation: Quaternary calcrete and Tertiary conglomeratic sands overlying Observatory Hill Beds.

Specimens: None

Photographs: None

*****

Locality: 31

Airphoto no./map sheet: 1511/186/3 MAURICE, Yadina

Geologist: GMP Date: 24/7/79

Description: Gypsum and gypseous sand; no "hard rock" outcrop.

Interpretation: Quaternary gypsum

Specimens: 5138RS2,3

Photographs: None

*****

Locality: 32

Airphoto no./map sheet: 1511/1/186/4 MAURICE, Yadina

Geologist: GMP Date: 24/7/79

Description: Siltstone/claystone, cream to green-grey, partly silicified, 10 cm layer of (?) chert intraclasts. Dip 5°-10° towards 000°-030°.

Interpretation: Observatory Hill Beds.

Specimens: 5138RS4

Photographs: None

Locality: 32a

Airphoto no./map sheet: 1511/1/186/5 MAURICE, Yadina

Geologist: GMP Date: 24/7/79

Description: Sandstone, gritty, med.gr., poorly sorted, silicified, thick-bedded to unstructured, forms a small platform or terrace marginal to a claypan. Probably silicified Tertiary; less likely to be Mesozoic sands. One pebble of "ooid" limestone found on the claypan floor is clearly a typical Observatory Hill Beds lithology, but the local outcrop shedding it was not found.

Interpretation: Silicified Tertiary sands, overlying Observatory Hill Beds carbonates.

Specimens: None

Photographs: None

*****

Locality: 33

Airphoto no./map sheet: 1511/1/186/6 MAURICE, Yadina

Geologist: GMP Date: 24/7/79

Description: Gypsum/gypcrete, earthy to crystalline and sandy, forming a 6 m vertical section on edge of claypan. Overlies a gypsum-indurated claystone at claypan level, the affinities of which are not known, but possibly represents subcropping Observatory Hill Beds.

Interpretation: Quaternary gypsum overlying ?Observatory Hill Beds.

Specimens: 5138RS5

Photographs: None

MAURICE

Paling 5238

W.A.	S.A.		
		LINDSAY	
WANNA	NOORINA	WELLS	GILES
MASON	WYOLA	MAURICE	

MAURICE

5039	5139	5239
5038	5138	Paling 5238

OFFICER BASIN

1979 HELICOPTER SURVEY

SITE LOCALITIES

PALING 5238

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED	G.P
DRAWN	
DATE	
CHECKED	
CDO	DATE
SCALE	1:250 000
PLAN NUMBER	80-548

Job No 2097

Locality: 26

Airphoto no./map sheet: 1511/144/1 MAURICE, Paling

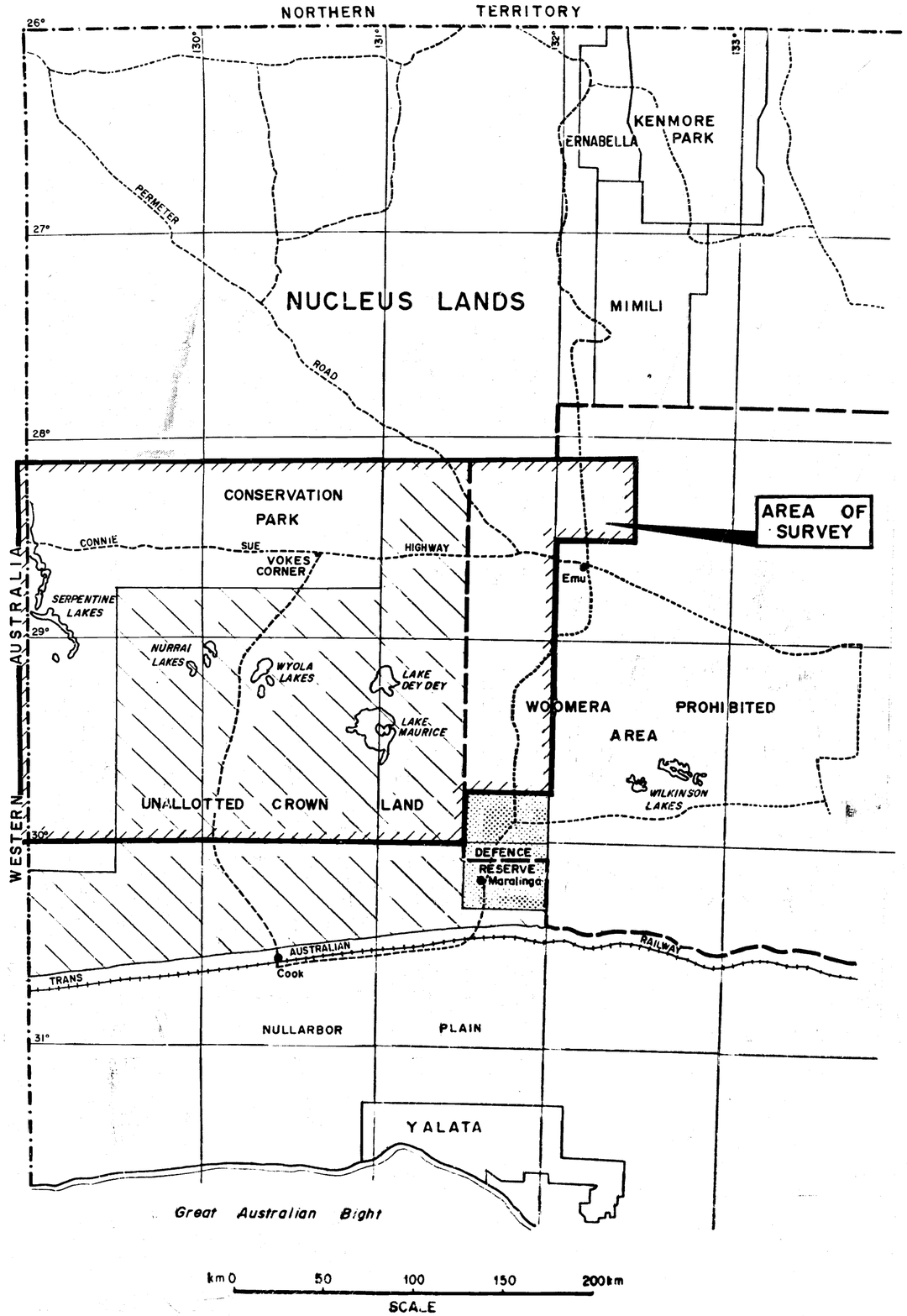
Geologist: GMP Date: 24/7/79

Description: Thick, nodular calcrete (1-2 m) with intraclasts of ferruginous jasper, overlying highly ferruginised, laminated fi.gr. sandstone/siltstone presumed to be Observatory Hill Beds, but no chert seen. Drift (lag) of large quartz pebbles at break of slope, representing contact between the (?) Observatory Hill Beds and overlying calcrete, is probably shed from thin layer of basal (?) early Tertiary arenite.

Interpretation: Quaternary calcrete overlying thin, pebbly Tertiary arenite, overlying probable Observatory Hill Beds.

Specimens: 5238RS1

Photographs: None.



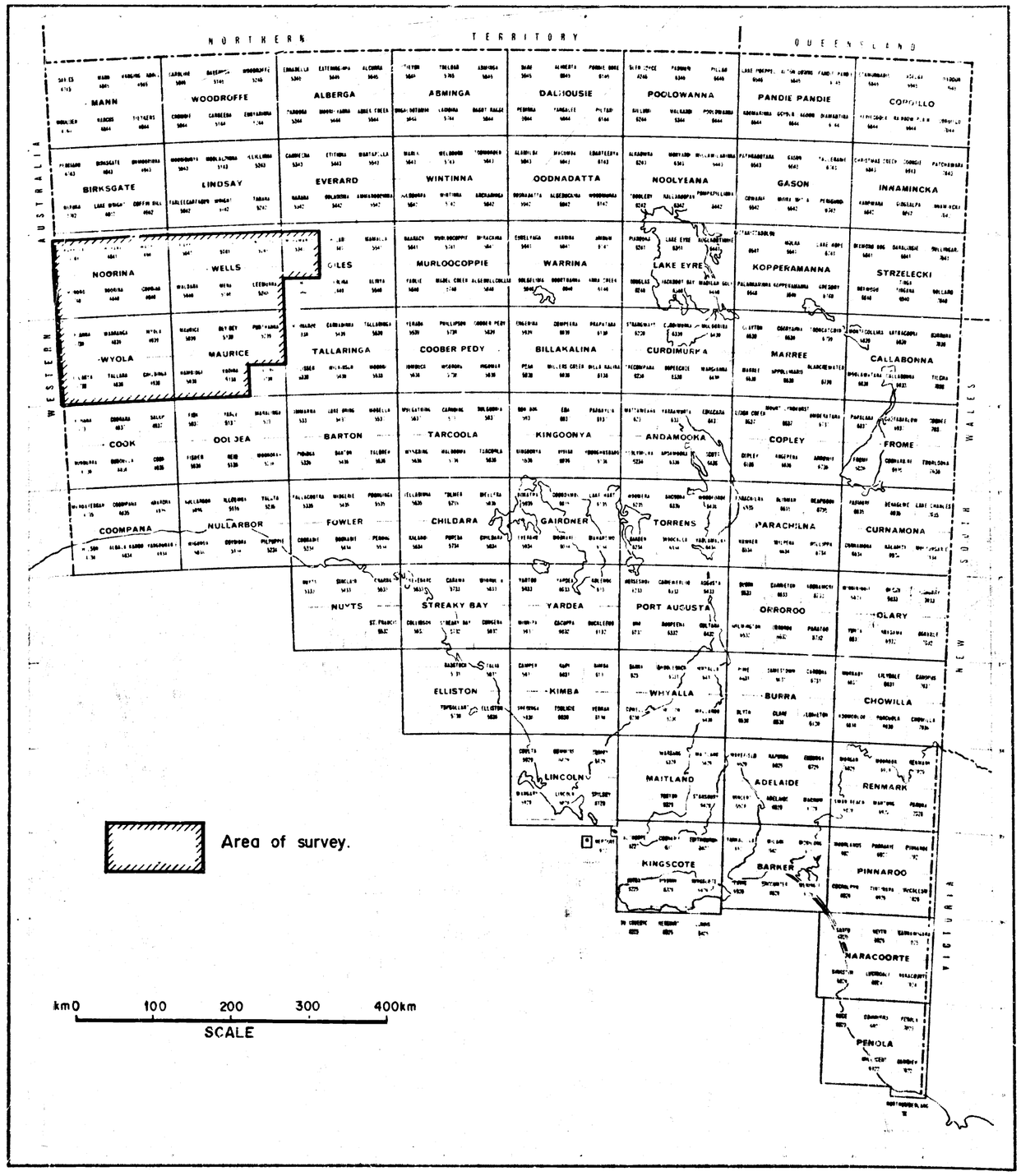


FIG. 1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	
1979 HELICOPTER SURVEY, OFFICER BASIN LOCALITY AND TENURE OF SURVEY AREA	DRAWN S.R. · DATE 14/8/80 · CHECKED · G.P. · LDR 25 2 83 · SCALE 1:6300000 approx 1:3000000approx · PLAN NUMBER 80-556

2120

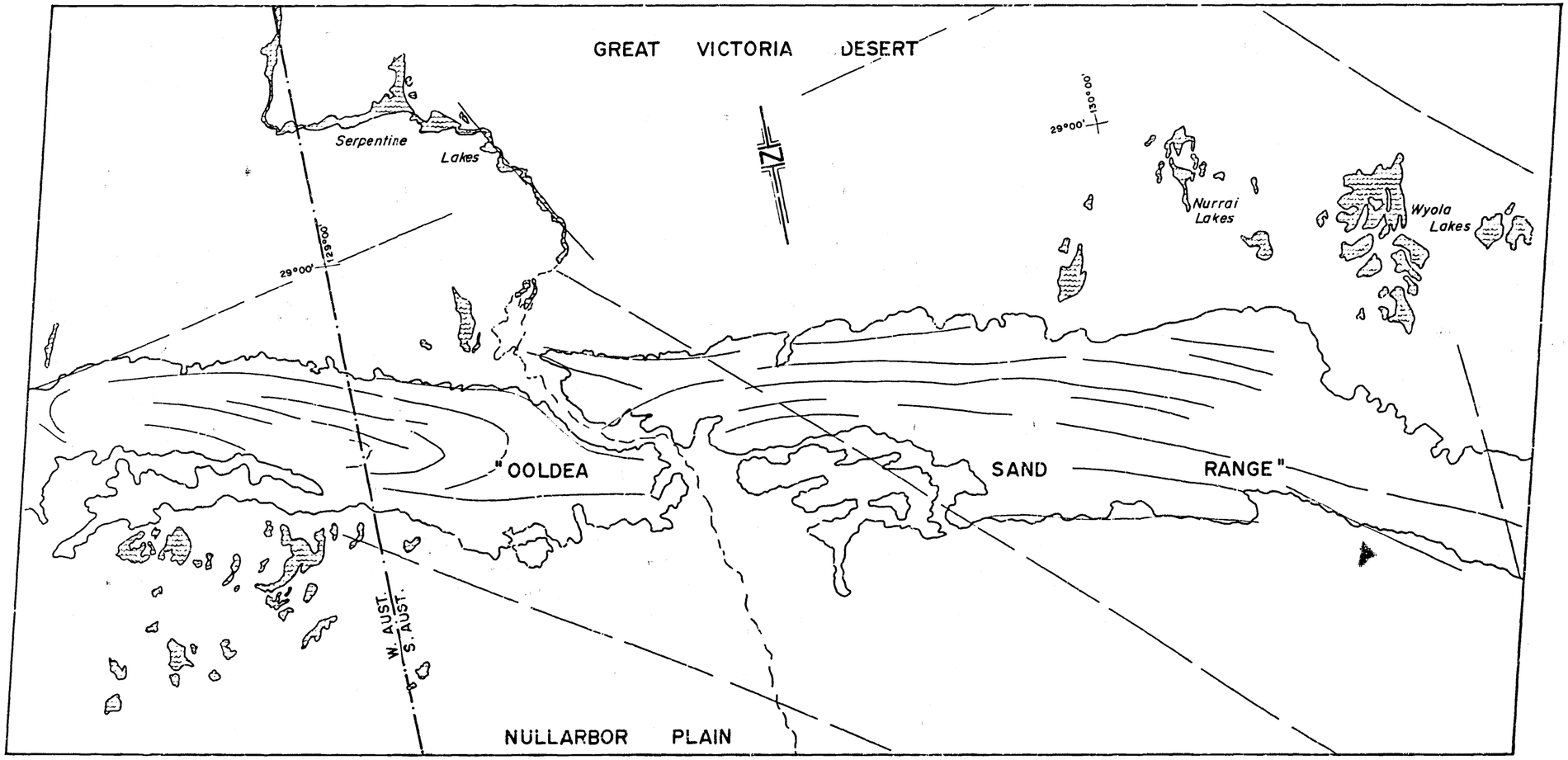
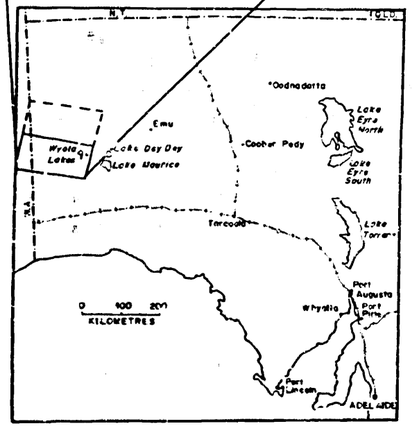


IMAGE 1176-0040-7

Area shown at left



LEGEND

Photolineaments within "Ooldea Sand Range".

Regional photolineaments outside "Ooldea Sand Range".

Playa lakes.

KILOMETRES 10 0 10 20 30 40 50 KILOMETRES
SCALE

FIG. 2

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

1979 HELICOPTER SURVEY, OFFICER BASIN
LANDSAT IMAGE 1176-0040-7
KEY TO SOUTHERN HALF

G.P. 75 7 A5
S.R. 1:500 000
2/9/80
80-591

2120

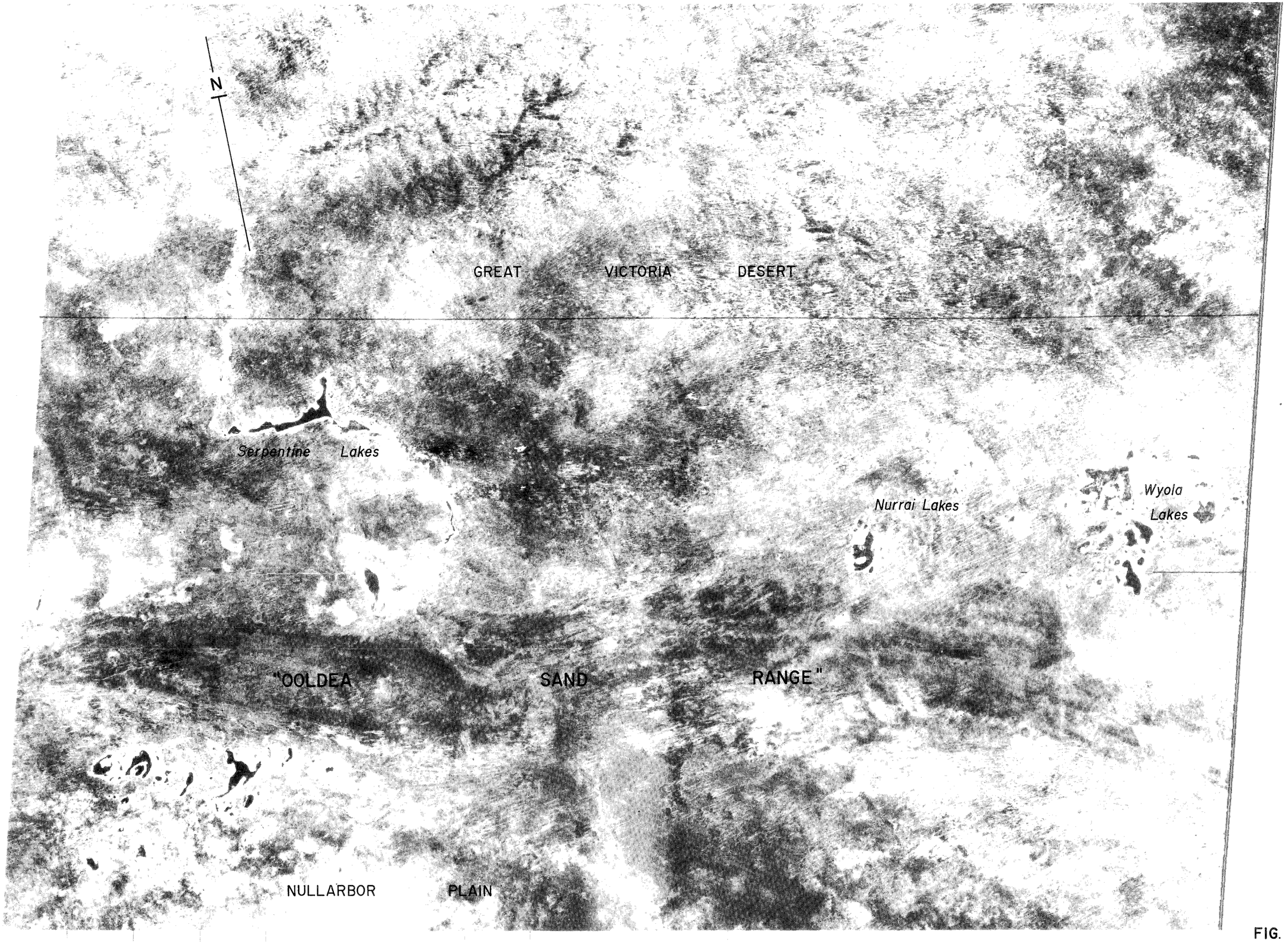


FIG. 3

50 KILOMETRES (APPROXIMATE)

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

1979 HELICOPTER SURVEY-OFFICER BASIN

LANDSAT IMAGE Nº 1176-0040-7

COMPILED G.P.	C.D.O. 25.2.83 DATE
DRAWN S.R.	SCALE 1:500 000 Approx.
DATE 14-1-83	PLAN NUMBER 83-27
CHECKED	

2120

WESTERN AUSTRALIA

GREAT VICTORIA DESERT

NULLARBOR PLAIN

VOKES CORNER (Base camp)

GILES CORNER

Lake Meramangye

Emu

OBSERVATORY HILL

"OOLDEA

Nurrai Lakes

Wyola Lake

Helinor Lake

LAKE DEY-DEY

LAKE MAURICE

Wilkinson Lakes

Yarle Lakes

Lake Bring

Maralinga

SAND DUNES

"OOLDEA SAND RANGE"

SAND

Ooldea

Watson

O'Malley

Fisher

Cook

Hughes

Denman

Immarna

Bates

Barton

Mungala

TRANS AUSTRALIAN RAILWAY

Omc

€w

€o

€t

€l

?€o

?

A

A'

1 Observatory Hill Beds Type Section
2 Exoil Emu – 1
3 S.A.D.M.E. Murnaroo – 1
4 Outback Oil Denman – 1

LEGEND

HELICOPTER SITE NO. eg. 123	INTERPRETED UNIT	SYMBOL
○	Cainozoic (undifferentiated)	—
□	Mt. Chandler Sandstone	Omc
●	Wonna Beds	€w
▲	Lennis Sandstone	€l
—	€l and €w (undifferentiated)	€t (section only)
■	Observatory Hill Beds	€o
●■	Units observed in juxtaposition	
?●□	Identification doubtful; alternatives shown	

GEOLOGICAL REFERENCE

- Quaternary sand and clay.
- Claystone.
- Siltstone.
- Sandstone
- Limestone, dolomite.
- c Chert nodules

Land surface profiled from gravity survey barometric altitudes.

NORTHERN TERRITORY
QUEENSLAND
WESTERN AUSTRALIA
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
SOUTHERN OCEAN
Area shown at left

Kilometres 10 0 10 20 30 40 50 kilometres

A
OUTBACK OIL DENMAN-1
G.L. 135m approx.
NULLARBOR PLAIN
Miocene 24
Eocene 69
Upper Cretaceous
Lower Cretaceous 247
? Cambrian 364
399
452
549 T.D
EUCLA BASIN
?F
H/V - 125
"OOLDEA SAND RANGE" (No €o outcrop, substrate unknown)
LAKE MAURICE
S.A.D.M.E. MURNAROO-1 (projected) G.L. 234m
EXOIL EMU-1 G.L. 263m
316
627·5 T.D
457
347·5
417·5 T.D
"MURNAROO SANDSTONE"
A'
ELEVATION (metres m.s.l.)
360 320 280 240 200 160 120 80 40 M.S.L. 40 80 120 160

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

1979 HELICOPTER SURVEY OFFICER BASIN

REGIONAL GEOLOGICAL SYNTHESIS AND SECTION

FIG. 4
COMPILED G.P.
DRAWN S.R.
DATE 17/9/80
CHECKED
C.D.O. DATE 19.2.85
SCALE 1:250 000
PLAN NUMBER 80-630