1:250 000 GEOLOGICAL SERIES—EXPLANATORY NOTES

WESTWOOD
WESTERN AUSTRALIA

SHEET SG/51-16 INTERNATIONAL INDEX

DEPARTMENT OF NATIONAL RESOURCES
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

DEPARTMENT OF MINES, WESTERN AUSTRALIA
GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

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COMPILED BY P. J. KENNEWELL

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Explanatory Notes on the Westwood Geological Sheet

Compiled by P. J. Kennewell

The Westwood 1:250 000 Sheet area lies in the Great Victoria Desert in central Western Australia, between latitudes 27° and 28°S and longitudes 124°30′ and 126°E.

Access to the area is by a road which extends from Cosmo Newberry Mission, 206 km to the southwest, to Warburton Mission, 175 km to the northeast. Road conditions are variable, particularly after rain, and local advice should be sought before the area is entered. Cross-country travel is possible using a four-wheel drive vehicle, but is made difficult by scrub, spinifex and sand dunes. There are no permanent settlements in the area, and the area supports no industries.

The climate is arid; the annual rainfall averages 180 mm, and the annual potential evaporation is 3200 mm. The daily maximum and minimum temperatures are 36° and 21°C in January and 20° and 6°C in July (Australia, 1970). Vegetation is typically xerophytic, with spinifex dominant on laterite plains, eucalypts and spinifex on sand plains, mulga scrub on hills and scree slopes, and saltbush in salt lake areas.

No extensive permanent surface water is known, but claypans and creeks in hilly areas may retain fresh water after heavy rain. Small gnamma holes containing fresh water are present in some rock outcrops.

Previous investigations

The first investigation of the Sheet area was by L. A. Wells, who led the Elder Scientific Exploring Expedition into the western part of the Sheet area in 1892 (Lindsay, 1893). Hann traversed the southern and western parts in 1903.

Utting (1955) described outcrops in the Sheet area, suggested a Permian age for the glacial sediments, and concluded that the petroleum potential of the Sheet area was small. Frome-Broken Hill Company Pty Ltd made an aerial reconnaissance (Weeger & McQueen, 1959) and a geological reconnaissance of the region (Leslie, 1961), during which Lower Cretaceous and Permian sediments were mapped. The Bureau of Mineral Resources (BMR) flew three lines of an aeromagnetic survey across the Sheet area in 1960 (Goodeve, 1961); the interpretation of the results indicated that over 1500 m of sedimentary rocks are present in parts of the Sheet area. Hunt Oil Company flew a reconnaissance magnetic survey of the Sheet area in 1961, which indicated that up to 6000 m of sediments are present (Jackson, 1966a). Photo-interpretation (Hinds & Kaltenbach, 1963) clearly showed the Westwood Fault Zone and that the Sheet area was underlain by undifferentiated Cretaceous and Permian sedimentary rocks. A detailed gravity survey of the northern part of the Sheet area, from 1963 to 1965 indicated that a thick sedimentary sequence was present (Bazhaw & Jackson, 1965). A reflection seismic survey was carried out along the 27th Parallel road (Campbell, 1964), and mapped two strongly reflecting horizons.

Daniels (1969) commented on sand dune distribution within the Great Victoria Desert.

Present investigations

The Westwood Sheet area was mapped jointly by BMR and the Geological Survey of Western Australia (GSWA), using vehicles in 1970 and a helicopter in 1971, as part of a reconnaissance geological survey of the Officer Basin (Jackson & van de Graaff, in prep.; Lowry, Jackson, van de Graaff & Kennewell, 1972; Bunting, van de Graaff & Jackson, 1974). Two stratigraphic drillholes, BMR Westwood 1 and 2, were completed by BMR in 1972.

Reconnaissance gravity coverage of the Sheet area was completed by BMR in 1971 (Fraser, 1973) and the final map, incorporating recomputed data from the Hunt Oil survey, is shown on the map Sheet. A seismic traverse and detailed gravity survey carried out in 1972 (Harrison & Zadoroznyj, in prep.) demonstrated that at least 12 000 m of almost flat-lying layered rocks are present in the northwest of the Sheet area.

Aerial photographs used for mapping were at a nominal scale of 1:80 000 and were flown in 1960; they are available from the Division of National Mapping, Canberra.

PHYSIOGRAPHY

Generally the Sheet area is a gently undulating plain about 450 m above mean sea level. The form lines shown on the map are based on widely spaced elevations from gravity and topographic surveys and, therefore, give only a broad indication of relief. Four physiographic divisions are recognized (Fig. 1):

Undulating laterite plains occupy most of the northern part of the Sheet area. Low rounded rises are partly bounded by breakaways up to 5 m high and flanked by gentle scree slopes.

Sand plains and dunes cover most of the area. The dunes are longitudinal, 100 m to 20 km long, and 2 to 15 m high. They are generally oriented east-west, although, locally, topography has affected direction and dune shape (Daniels, 1969).

Mesas and buttes and adjoining pediments are commonly capped by resistant beds of laterite or silcrete. The mesas and buttes are up to 30 m high and reach 500 m above mean sea level. A chain of them forms the Neil McNeill Hills. Pediments extend up to 10 km from the scarps, and small intermittent streams commonly cross them, dissipating in the sand plain at the base.

Salt lakes, claypans, and calcrete are present in the major depressions. Lake Yeo, a large salt lake, extends onto the southwest corner of the Sheet area and contains gypsum and halite. Gypsiferous sand dunes have formed around its edges, and the surface of these may be hardened by secondary gypsum cementation. Claypans are flat rounded features, seldom exceeding 1 km across. Calcrete forms minor karst areas with small rounded outcrops separated by shallow sand-filled depressions.

The present drainage is controlled mainly by a palaeodrainage system, which developed during an earlier and wetter period (Bunting et al., 1974). This earlier system is now largely buried by sand plain.

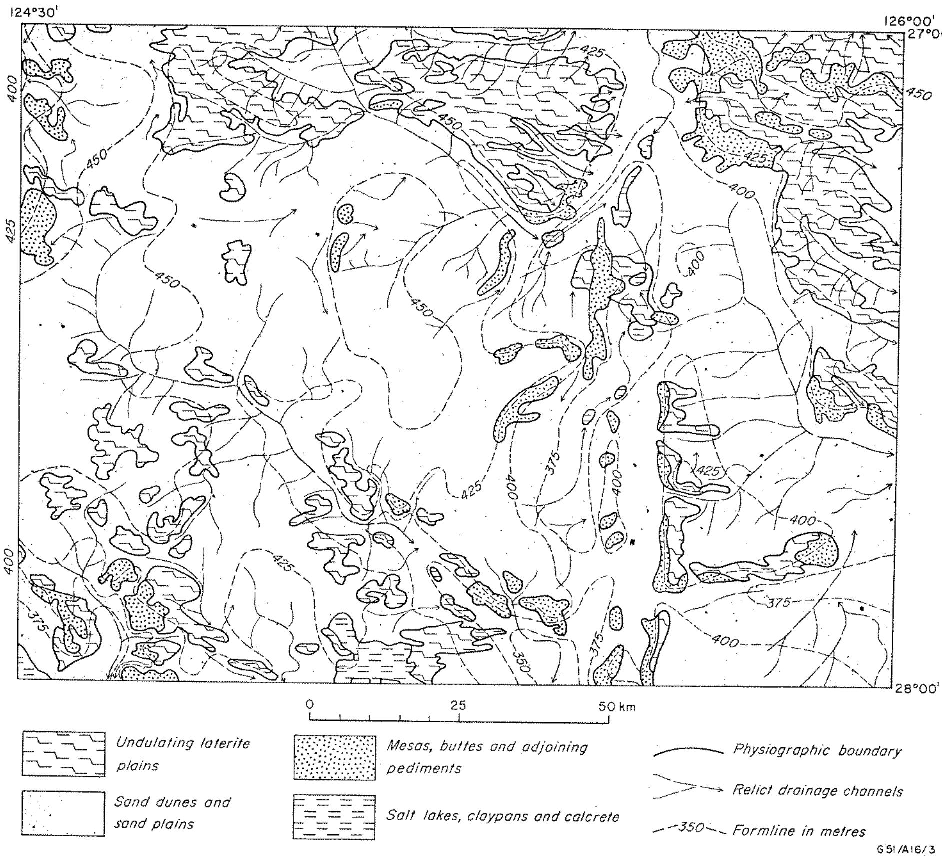

Fig. 1. Physiography.

STRATIGRAPHY

The Precambrian nomenclature in these Notes and on the accompanying map is that adopted by BMR. It is compared with that used by GSWA in Table 1. The stratigraphy of the Sheet area is summarized in Table 2.

TABLE 1. COMPARISON OF PRECAMBRIAN TIME SCALES

Geological Survey of Western Australia	*Bureau of Mineral Resources*
UPPER PROTEROZOIC	
—— 880 m.y. ——	ADELAIDEAN
MIDDLE PROTEROZOIC	—— 1400 m.y. ——
—— 1640 m.y. ——	CARPENTARIAN
LOWER PROTEROZOIC	—— 1800 m.y. ——
—— 2200 m.y. ——	LOWER PROTEROZOIC
ARCHAEAN	—— 2300 m.y. ——
	ARCHAEAN

TABLE 2. STRATIGRAPHY OF THE WESTWOOD SHEET AREA

		Rock unit and symbol	*Lithology*	*Approx. maximum thickness (m)*	*Distribution*	*Remarks*
CAINOZOIC	QUATERNARY	Ql	Clay, silt, sand, gypsum, halite	100	Throughout area in relict drainage channels	Poorly consolidated; lacustrine
		Qg	Gypsum and quartz sand	10	In southwestern and central parts of area surrounding salt lakes	Poorly consolidated; lake derived aeolian sand
		Qs	Red quartz sand	20	Throughout area	Poorly consolidated; aeolian sand
		Czc	Quartz sand, weathered rock fragments, clay and silt	20	Throughout area, flanking breakaways and mesas, and overlying gentle rises	Poorly consolidated; poorly sorted colluvium
		Czk	Dolomitic limestone with scattered quartz grains and siliceous concretions	30	Throughout area in relict drainage channels	Moderately to well consolidated; calcrete
		Czs	Fine to very coarse sand with fragments of ferruginized sediment and minor silt and clay	2	Throughout area	Poorly consolidated; lateritic plain deposits; deflated laterite soil profile
		Czl	Pisolitic nodular ferruginous laterite	1	Throughout area	Ironstone crust of laterite soil profile, usually well cemented
MESOZOIC	LOWER CRETACEOUS	Samuel Formation Kls	Siltstone, silty sandstone, sandstone, micaceous	30	In northern and eastern parts of area	Shallow marine; disconformable on Paterson Formation
PALAEOZOIC	LOWER PERMIAN	Paterson Formation Pa — Paf	Crossbedded angular sandstone, rare erratics	200	Throughout area, except in extreme northwest part of area	Fluvioglacial
		Pal	Interlaminated claystone, siltstone and fine sandstone, even textured sandstone and claystone, rare erratics; partly contorted			Lacustrine Unconformably overlies Palaeozoic and Proterozoic rocks
		Pag	Tillite			Glacigene
		Lennis Sandstone Pzl	Fine sandstone, siltstone; micaceous, arkosic, commonly red	400	No outcrop, but near surface in northwestern part of area; underlies northern and northeastern parts, but extent to south not known	Shallow marine or non-marine; disconformably to unconformably overlies Table Hill Volcanics and Proterozoic rocks

TABLE 2. STRATIGRAPHY OF THE WESTWOOD SHEET AREA—*continued*

		Rock unit and symbol	*Lithology*	*Approx. maximum thickness (m)*	*Distribution*	*Remarks*
PALAEOZOIC	LOWER CAMBRIAN	Table Hill Volcanics Ɛlt	Tholeiitic basalt, minor sandstone	120	No outcrop, but near surface in northwestern part of area; underlies northern and northeastern parts, but extent to south not known	Probably sub-aerial volcanic flows; unconformably overlies Proterozoic sedimentary rocks
PROTEROZOIC	ADELAIDEAN?	Undivided younger Proterozoic rocks	Uncertain; may include shale, siltstone, sandstone, claystone, boulder conglomerate, anhydritic dolomite, possibly gypsum, limestone	4000	No outcrop; underlies northern part of area, but extent to southeast not known.	Depositional environment uncertain; includes marine, glacigene and evaporitic rocks of Babbagoola Beds, Lefroy Beds, Lupton Beds, Townsend Quartzite, and possibly Browne Beds
	CARPENTARIAN OR ADELAIDEAN?	Undivided older Proterozoic rocks	Quartzose, feldspathic and glauconitic sandstone, stromatolitic and oolitic dolomite and limestone, red siltstone	not known	No outcrop; probably underlies whole area	In part marine; overlies crystalline basement; intruded by dolerite

Proterozoic

Seismic surveys show that up to 12 000 m of gently folded Proterozoic layered rock underlie the Sheet area. Two major subdivisions of the Proterozoic sequence, based on differences in seismic velocities, were recorded by Harrison and Zadoroznyj (in prep.). The lower sequence probably forms magnetic basement, as it is intruded by dolerite; its thickness is unknown, as reflections corresponding to crystalline basement have not been identified, although reflections were recorded to 12 000 m. The thickness of the upper sequence is probably indicated by depth to magnetic basement, which is up to 5000 m. The two sequences, shown on the map section only, are referred to as the older and younger Proterozoic rocks, respectively.

The *older Proterozoic rocks* do not crop out in the Sheet area, but they are shown in the subsurface on the western half of the cross-section. They are exposed in the neighbouring Robert and Throssell Sheet areas, where they are gently folded and intruded by dolerite. Quartzose, feldspathic and glauconitic sandstone is the main rock type, but beds of dolomite and limestone, and red siltstone are also present. These sediments were deposited in a shallow-water marine environment and probably form the lower part of the Proterozoic succession underlying the Westwood Sheet area. They may be equivalent to the Nabberu Basin sequence (Hall & Goode, 1975), which is probably early Proterozoic (Preiss et al., 1975).

Younger Proterozoic rocks do not crop out in the Sheet area, but quartzose sandstone, thought to be the basal unit of the sequence, crops out in the southeast of the adjoining Robert Sheet area, and is probably present beneath thin Cainozoic deposits in the extreme northwest of the Westwood Sheet area. It is probably a lateral equivalent of the Adelaidean Townsend Quartzite (Daniels, 1971) which crops out extensively to the northeast in the neighbouring Talbot Sheet area.

Palaeozoic

Tholeiitic basalt of the *Table Hill Volcanics* (Lowry et al., 1972) was intersected in BMR Westwood 1 and at shallow depths in shotholes drilled for the BMR seismic traverse; it is almost certainly present in the northern part of the Sheet area, but its extent to the south is uncertain. BMR Westwood 1 penetrated 72 m of tholeiitic basalt, in two flows separated by a 1 m sandstone bed. The basalt is red-brown, grey, and purple, fine to coarse-grained, very hard, and contains amygdales of quartz and chlorite (Jackson et al., 1975).

Seismic data indicate that the basalt is extensive and almost flat-lying; reflection profiles on adjoining Sheet areas show that it unconformably overlies gently folded layered rocks. Basalt of the Table Hill Volcanics, from Hunt Oil-Placid Oil Yowalga 2, in the Yowalga Sheet area, has given a Rb-Sr age of 575 $\pm$ 40 m.y. (Compston, 1974).

The *Lennis Sandstone* (Lowry et al., 1972) was intersected at shallow depth in seismic shotholes in the northwest of the Sheet area and overlies the Table Hill volcanics in the northern part of the area; its extent to the south is uncertain. It crops out as a thickly cross-bedded, white and red, fine-grained sandstone in the northeast of the neighbouring Robert Sheet area. The type section, in Hunt Oil-Placid Oil Yowalga 2, consists of 322 m of dark red, feldspathic to arkosic, micaceous sandstone.

The depositional environment is interpreted as shallow marine to non-marine. Fossils have not been found in the Lennis Sandstone, but, as it directly overlies the Early Cambrian Table Hill Volcanics and occurs beneath the Early Permian Paterson Formation, its age is in the range Early Cambrian to Early Permian.

Outcrops of the *Paterson Formation* (Traves et al., 1956) are present in most parts of the Sheet area. The formation is very weathered and exposed in breakaways less than 30 m high. Outcrop patterns on surrounding Sheet areas show that it unconformably overlies older rock units.

Glacigene, lacustrine and fluvioglacial sediments occur within this formation. Sandy siltstone and claystone with erratics up to 40 cm across, interpreted as tillite, crop out in the southern part of the Sheet area. Lacustrine sediments overlie tillite in several localities, and consist of regularly laminated to thinly bedded claystones and siltstones with sparse thick beds of claystone and fine-grained sandstone. Erratics are rare in the lacustrine sediments, but slumping and bioturbation are common. Coarse angular-grained and cross-bedded fluvial sandstone with rare erratics are common.

On the adjoining Yowalga Sheet area Hunt Oil-Placid Oil Yowalga 2 penetrated 312 m of Paterson Formation. An Early Permian (Sakmarian) age was established for the Paterson Formation from spores obtained in BMR stratigraphic holes drilled on neighbouring Sheet areas (Kemp, 1976).

Mesozoic

The *Samuel Formation* (Lowry et al., 1972) crops out in breakaways about 20 m high in the extreme northeast, and is shown on the map as a thin capping overlying the Paterson Formation in the northern and eastern parts of the Sheet area. Thinly interbedded sandstone and siltstone are characteristic of this formation in the Sheet area. The sandstone is fine-grained, clayey and cross-laminated in parts; the siltstone is sandy, fissile and highly micaceous. The Samuel Formation is 30 m thick at locality Westwood 12 (Grid Ref. 772011). BMR Browne 1 (Jackson et al., 1975), at Mt Beadell, 165 km north of the Sheet area, penetrated 79 m of Samuel Formation.

The Samuel Formation overlies the Paterson Formation disconformably. Skwarko (1967) identified the marine pelecypod *Fissilunula clarkei* in material collected by Hunt Oil Company from a gravity station at grid reference 794007, indicating that the formation is Early Cretaceous (Aptian). Although this is the only fossil locality known in the Sheet area, outcrops in Sheet areas to the north contain species which confirm the Early Cretaceous age. Some beds within the Samuel Formation closely resemble those of the Paterson Formation, as the constituent material was probably derived from that formation and transported only a short distance. Hence accurate location of the boundary between the two formations in the field is difficult and its depiction on the map is only approximate.

Cainozoic

Laterite (*Czl*) is developed throughout the area on an old erosion surface. An almost complete replacement of sediments by goethite and hematite has occurred, forming a pisolitic ironstone crust up to 3 m thick, which represents the upper zone of a laterite soil profile. The mottled zone is well exposed in many Samuel Formation outcrops, but the pallid zone, though probably present in many breakaways, cannot be distinguished, owing to recent weathering.

Much of the northern part of the Sheet area is covered by *laterite plain deposits* (*Czs, Czc*) which consist of poorly sorted, fine to very coarse-grained sand and angular to rounded granules and pebbles of highly ferruginized sediments. The greatest thickness recorded in stratigraphic drilling is 2 m (Jackson et al., 1975). The quartz and ferruginized sediment are derived from the underlying pisolitic and mottled zones of the laterite profile.

Large relict drainage channels contain calcrete (*Czk*), consisting of dolomitic limestone with scattered quartz grains and siliceous concretions. The calcrete overlies the ironstone crust of the laterite profile, and, south of the Sheet area, includes fragments of ferruginized sediment. Calcrete is a chemical deposit thought to have precipitated from ground and surface water in relict drainage channels.

Colluvium (*Czc*) forms slopes up to 10 km wide around breakaways and mesas. Quaternary *aeolian sand* (*Qs*) forms extensive plains and dune fields. It is unconsolidated, quartzose, iron-stained, well sorted and medium-grained, and contains sparse grains of ferruginized sediment. BMR Westwood 2 penetrated 1.5 m of sand, but BMR drilling to the south (Jackson et al., 1975) showed that similar deposits are up to 6 m thick in areas between sand ridges, which are up to 15 m high. The sand ridges were probably formed in several stages during the Quaternary arid cycles (King, 1960).

Lake-derived aeolian sand (*Qg*) forms ridges up to about 10 m high around the margin of Lake Yeo. These generally contain a high proportion of gypsum and may have a thick crust of secondary gypsum. Fluted weathering and fissures enlarged by solution are common.

Lacustrine deposits (*Ql*), consisting of clay, silt, and sand in claypans, and gypsum, halite, sand, silt, and clay in Lake Yeo, the only salt lake in the Sheet area, are developed in the relict drainage systems.

STRUCTURE

The Sheet area is underlain by at least three sedimentary sequences, each with different structural features.

The crystalline basement is overlain by the unit shown on the cross-section as undivided older Proterozoic rocks, which BMR seismic data suggest are gently folded.

The undivided younger Proterozoic rocks are shown to be almost flat lying by seismic sections in the northwest part of the Sheet area. They are intruded by salt diapirs, gently folded, and displaced by minor faults.

Dips in the Phanerozoic rocks are gentle and the Paterson and Samuel Formations are virtually flat-lying over large areas.

The Westwood Fault Zone is a series of prominent north-trending faults extending almost across the Sheet area. Many distinct fault traces curve and, in one instance, bifurcate; parallel traces occur in several places. The presence of a prominent scarp to the west, a depressed area immediately east of the fault zone (see Fig. 1), and the photointerpreted eastward dip of sediments exposed in the scarp indicate that the rocks are downthrown to the east. The sedimentary rocks immediately east of the fault zone are obscured by a thin Cainozoic deposit, but are shown on the pre-Cainozoic map as Samuel Formation. Throw on the fault zone is not known, but its effect on flat-lying Cretaceous sediments and the local topography suggest a maximum movement of several tens of metres since Cretaceous time.

A prominent line of breakaways, including the Neil McNeill Hills, is parallel to the Westwood Fault Zone. A relict channel is apparently uplifted over the northern extension of this line of breakaways (Fig. 1), suggesting that it is a fault scarp produced by a north-trending fault parallel to the Westwood Fault Zone. Upthrust on the eastern side of this fault would explain the absence of Samuel Formation outcrop in the scarp.

It is not known when the faulting on the Westwood Sheet commenced, but an earthquake of magnitude 4.4 with an epicentre near the northward extension of the Westwood Fault Zone was recorded in 1972 (Gregson & Smith, 1973), suggesting that movement is still taking place in the area.

GEOLOGICAL HISTORY

The oldest sediments known to overlie crystalline basement in the Sheet area were deposited during the Proterozoic. The dominantly sandstone sequence includes evaporites, and a marine origin is indicated by glauconite grains and stromatolitic dolomite beds. After a period of folding, uplift, and erosion, which left a gently undulating land surface, sedimentation resumed in the Palaeozoic with deposition of the Lennis Sandstone. Tholeiitic basalt flows, which covered large areas to the northeast during the early Cambrian, extend under part of the Sheet area.

Glaciation in the Early Permian resulted in the deposition of tillite and associated fluvial and lacustrine sediments. A short-lived marine transgression occurred in the Early Cretaceous, and silt, sand, and clay were deposited. Extensive silicification and ferruginization of sediments, resulting in the formation of silcrete and laterite, indicates a period of intense chemical weathering in a hot and humid climate. In the middle Miocene the climate gradually became drier, and, since then, the silcrete and laterite have been eroded from a considerable area, the main valleys of the early drainage system have been filling with rock debris eroded from higher areas, and salt lakes and claypans have been forming.

ECONOMIC GEOLOGY

Water

Calcretes are present in parts of the Sheet area and are probably a good source of water, as on Carnegie Station, 150 km to the northwest and Cosmo Newberry Mission, 200 km to the southwest.

Porous beds within the Cretaceous and Permian sediments are commonly lenticular, making location of aquifers difficult. Hunt Oil-Placid Oil Yowalga 1 on the adjoining Yowalga Sheet area produced 90 kl/day of water with 1230 TDS from a coarse kaolinitic sandstone between depths of 67 and 85 m in the Paterson Formation. Seismic shotholes and several stratigraphic holes up to 90 m deep in the south of the Sheet area did not produce water from Permian and Cretaceous rocks.

The groundwater potential of units below the Paterson Formation is untested.

Petroleum

The Phanerozoic sequence of the Sheet area is no more than 700 m thick, and its petroleum potential is small. The Samuel Formation, Paterson Formation, and Lennis Sandstone were penetrated on the crest of an anticline on the adjoining Yowalga Sheet area by Hunt Oil-Placid Oil Yowalga 2, but contained no hydrocarbons.

Construction materials

The ironstone crust of the laterite soil profile is widespread, and has been used in the area as a source of road construction material. It breaks into a pisolitic gravel when bulldozed, and when laid over sand helps consolidate a road surface. Basalt is present at a shallow depth in the northwest, and would make road and concrete aggregate if suitably crushed.

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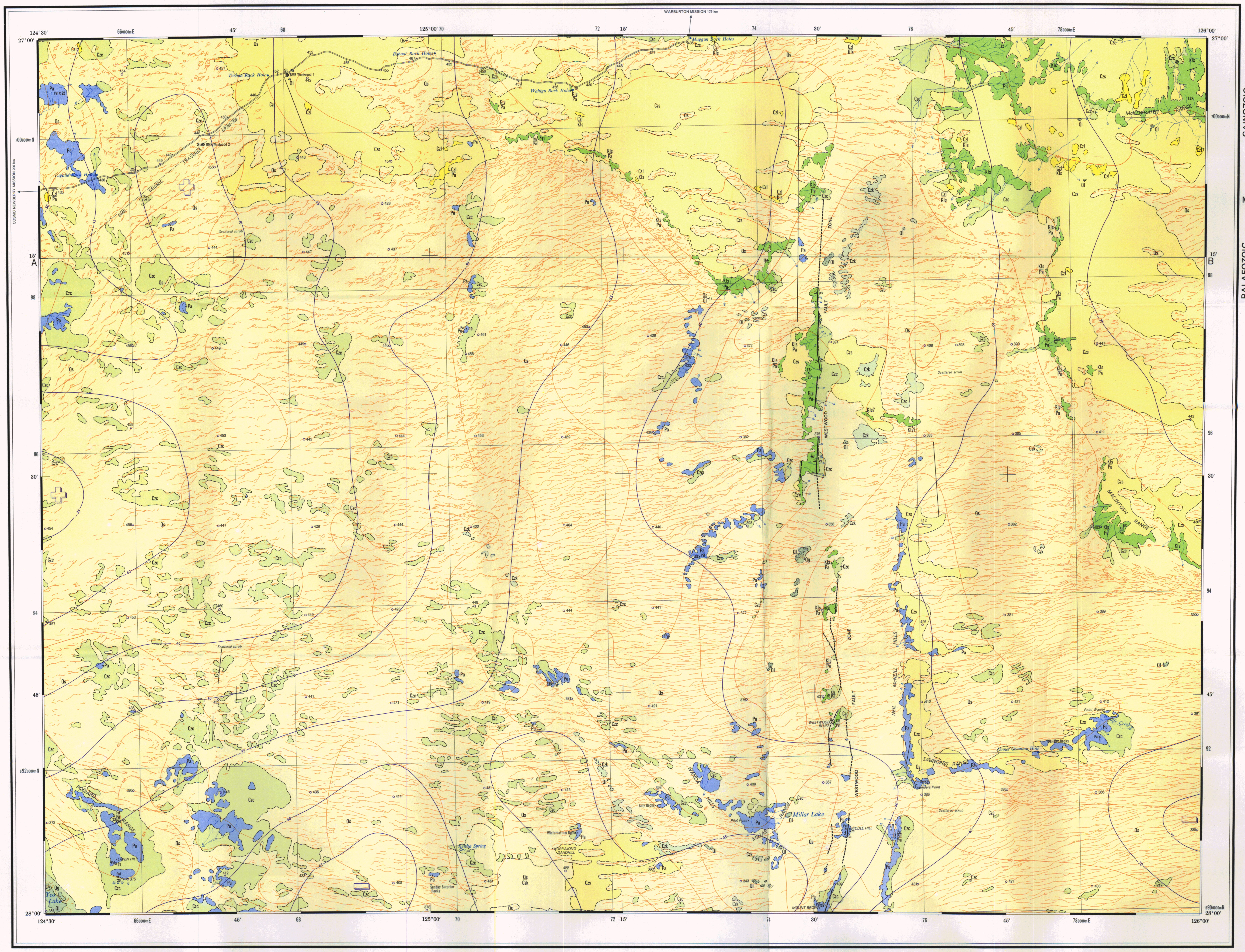
AUSTRALIA 1:250 000 GEOLOGICAL SERIES

WESTWOOD

WESTERN AUSTRALIA

SHEET SG 51-16



Reference

CAINOZOIC — QUATERNARY

- Ql — *Clay, silt, sand, gypsum, halite: lacustrine*
- Qg — *Gypsum and quartz sand; marginal to salt lakes: aeolian*
- Qs — *Red quartz sand, dunes and sand plains: aeolian*

CAINOZOIC

- Czc — *Quartz sand, weathered rock fragments, clay and silt: colluvium; minor alluvium*
- Czk — *Dolomitic limestone with scattered quartz grains and siliceous concretions: calcrete*
- Czs — *Fine to very coarse sand with fragments of ferruginized sediments, minor silt and clay; residual lateritic soil, in part deflated*
- Czl — *Pisolitic nodular ferruginous laterite*

MESOZOIC — LOWER CRETACEOUS — Samuel Formation

- Kls — *Siltstone, silty sandstone, sandstone; micaceous: marine*

PALAEOZOIC — LOWER PERMIAN — Paterson Formation

- Pa — *Undivided, includes one or more of the following facies*
  - Paf—*Crossbedded angular sandstone, rare erratics: fluvioglacial*
  - Pal—*Interlaminated claystone, siltstone and fine sandstone, even textured sandstone and claystone; rare erratics, partly contorted: lacustrine*
  - Pag—*Tillite: glacigene*

Lennis Sandstone

- Pzl — *Fine sandstone, siltstone; micaceous, arkosic, commonly red: shallow marine or non marine* (section only)

LOWER CAMBRIAN — Table Hill Volcanics

- Ꞓlt — *Tholeiitic basalt, minor sandstone: probably sub-aerial volcanic flows* (section only)

Geological boundary

Fault (D,U indicates relative movement down, up)

Where location of boundaries, folds and faults is approximate, line is broken, where inferred, queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes

Strike and dip of strata (20)

Dip<5° } *airphoto interpretation*

Lineament } *airphoto interpretation*

Macrofossil locality

x10 *Locality visited; number is authors reference*

St *Stratigraphic hole*

Ephemeral stream

Salt lake or claypan

Sand dunes

375 *Form line in metres*

Road

Astronomical station

•435 *Elevation in metres, approximate*

pa *Position approximate*

Seismic traverse line, position approximate

Magnetic basement (Jackson, 1966a) (section only)

Seismic reflecting horizon, good to fair (section only)

Seismic reflecting horizon, fair to questionable (section only)

4360 *Seismic refracting horizon showing velocity (m/sec)* (section only)

o365 *Gravity station, with elevation in metres; BMR reconnaissance survey only*

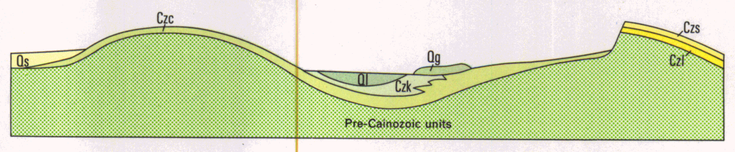
35 *Isogal*

Gravity anomaly—relative high

Gravity anomaly—relative low

Bouguer anomalies are based on the May 1965 observed gravity values at isogal gravity base stations in and near the area. For the calculation of Bouguer anomalies 2·2 g/cm³ has been adopted as an average rock density. The gravity data are preliminary only: refer to BMR gravity maps for more recent data

DIAGRAMMATIC RELATIONSHIP OF CAINOZOIC UNITS



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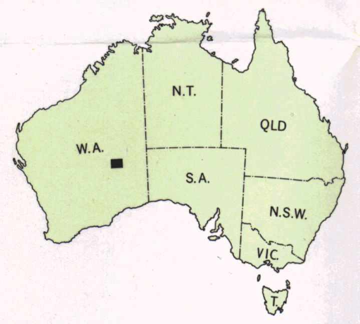

INDEX TO ADJOINING SHEETS

Showing magnetic declination 1970

STANLEY SG 51-6	HERBERT SG 51-7	BROWNE SG 51-8	BENTLEY SG 52-5	SCOTT SG 52-6
KINGSTON SG 51-10	ROBERT SG 51-11	YOWALGA SG 51-12	TALBOT SG 52-9	COOPER SG 52-10
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LAVERTON SH 51-2	RASON SH 51-3	NEALE SH 51-4	VERNON SH 52-1	WANNA SH 52-2
EDJUDINA SH 51-6	MINIGWAL SH 51-7	PLUMRIDGE SH 51-8	JUBILEE SH 52-5	MASON SH 52-6

Scale 1:250 000

5 0 5 10 15 20 25 KILOMETRES

GREY NUMBERED LINES ARE 20 000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID, ZONE 51

TRANSVERSE MERCATOR PROJECTION

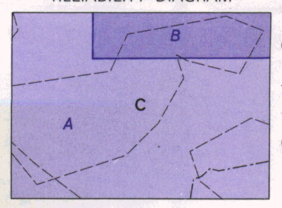
Section

Cainozoic sediments omitted

Scale: $\frac{V}{H} = 2$

Geology 1971 by M. J. Jackson, P. J. Kennewell, BMR
D. C. Lowry, W. J. E. van de Graaff, GSWA
Compiled 1971–72 by P. J. Kennewell and J. O. King
Gravimetry 1963, 1971 by Geophysical Branch, BMR
Cartography by Geological Branch, BMR
Drawn by Leigh-Mardon Pty. Limited, Melbourne
Printed by Leigh-Mardon Pty. Limited, Melbourne

RELIABILITY DIAGRAM



Geology C General reconnaissance: few traverses, mainly airphoto interpretation

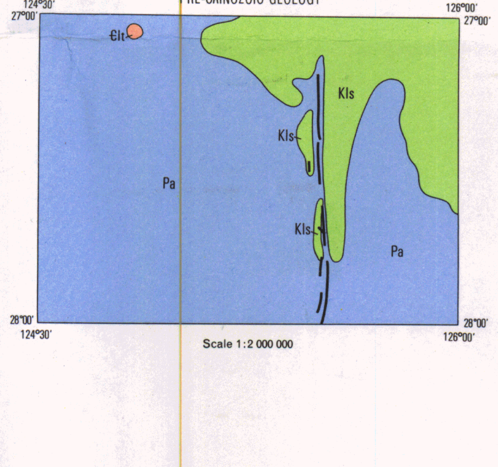
Helicopter traverse

Vehicle traverse

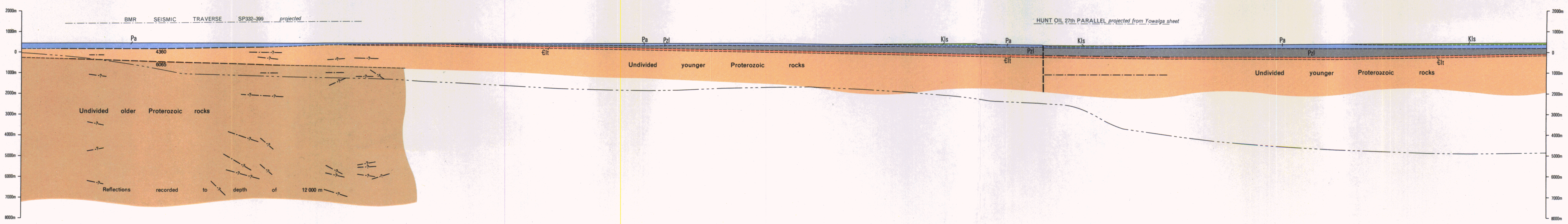
Gravity *A* Reconnaissance

B Detailed survey, Hunt Oil 1964

PRE-CAINOZOIC GEOLOGY



Scale 1:2 000 000



FIRST EDITION 1976

WESTWOOD

SHEET SG 51-16

Copies of this map may be obtained from the Bureau of Mineral Resources, Geology and Geophysics, Canberra, A. C. T., or the Geological Survey of Western Australia, Perth