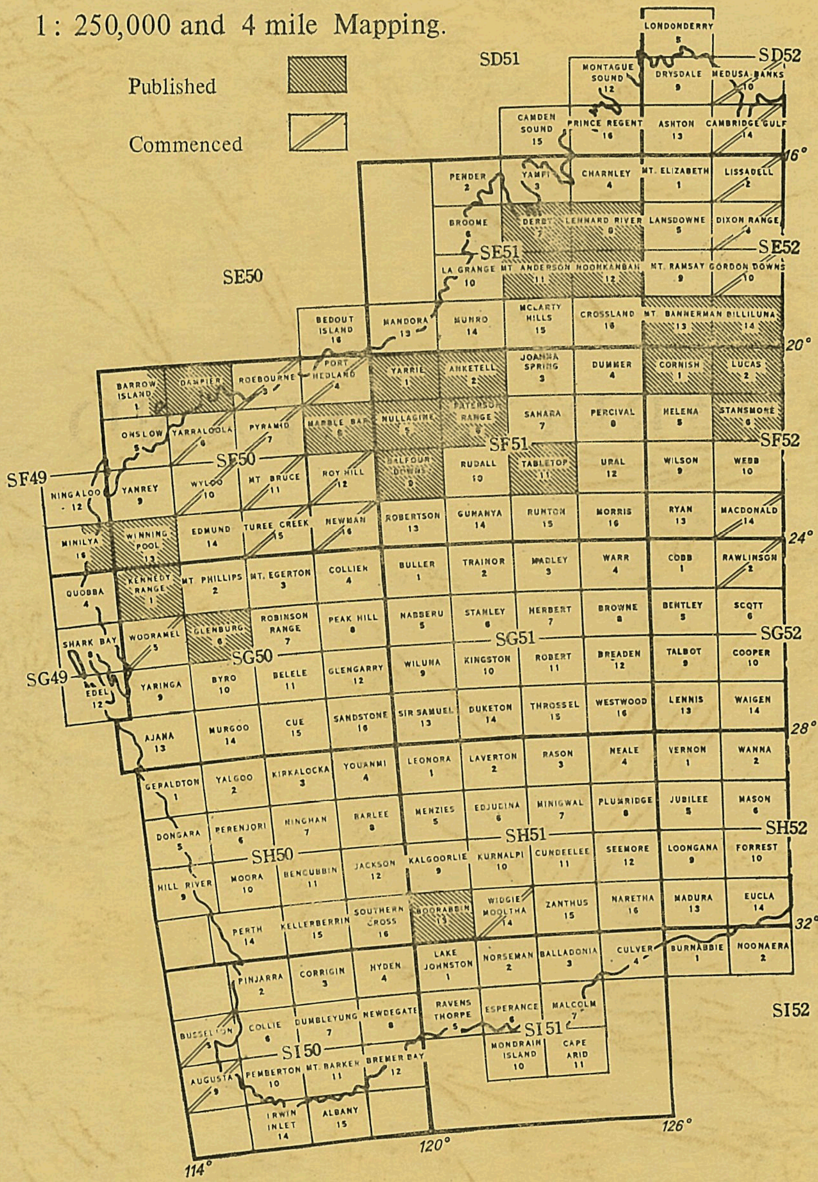
1:250,000
GEOLOGICAL SERIES
EXPLANATORY NOTES

DAMPIER
AND
BARROW ISLAND
WESTERN AUSTRALIA

Sheets SF/50–2 and SF/50–1

1: 250,000 and 4 mile Mapping.



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

1 : 250,000 GEOLOGICAL SERIES

EXPLANATORY NOTES

DAMPIER

AND

BARROW ISLAND

WESTERN AUSTRALIA

Sheets SF/50–2 and SF/50–1

Compiled by M. Kriewaldt

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DEPARTMENT OF MINES, WESTERN AUSTRALIA

Minister : THE HON. A. F. GRIFFITH, M.L.C.

Under Secretary : A. H. TELFER, I.S.O.

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

Director : J. H. LORD

Explanatory Notes on the Dampier and Barrow Island Geological Sheets

Compiled by M. Kriewaldt

INTRODUCTION

This geological map is of an area bounded by latitude 20° S. and 21° S. and longitude 115° 15' E. and 117° E. The boundaries are those of the Dampier 1 : 250,000 Map Sheet, SF/50–2 of the International Grid with the addition of portion of the Barrow Island 1 : 250,000 Map Sheet, SF/50–1. The location is shown in Figure 1. The North-West Coastal Highway passes centrally through the area and connects the small towns of Onslow and Roebourne.

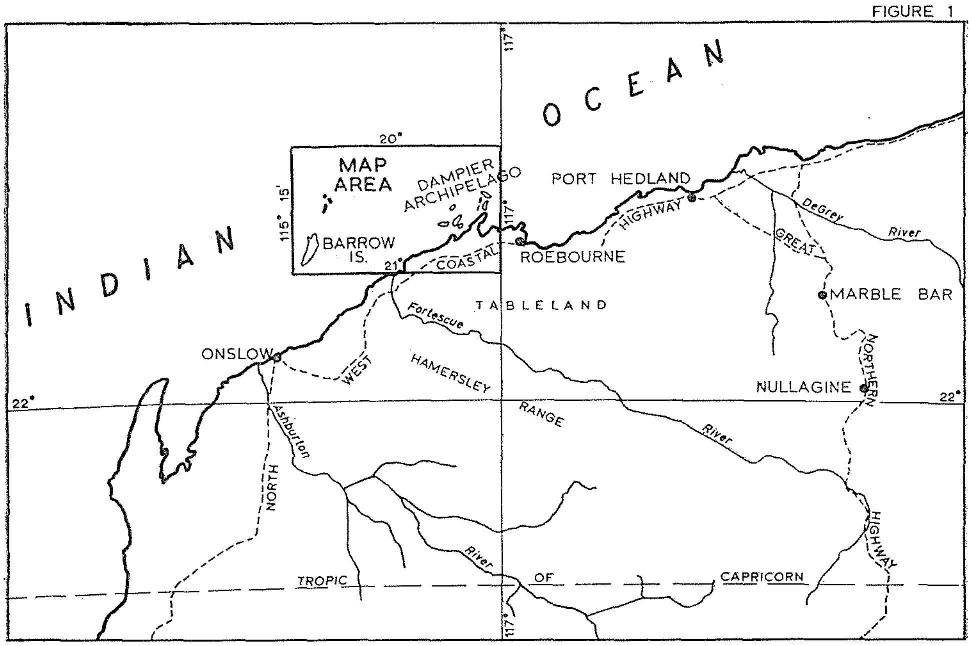
Physiography

The larger part of the area is low coastal plain, lying between a tableland to the south and the Indian Ocean to the north. Much of the coastline is backed by extensive flats subject to tidal inundation and to seasonal river flooding. (The tidal range is up to 18 feet at spring tides.) The coastline of the Dampier Archipelago is bold and irregular, as is also the coastline at the headlands of Cape Preston and James Point. The streams and rivers are non-perennial. The larger rivers have anastomosic channels and pass through gaps in the low ranges which break the plain.

Although the area is in the tropics, the climate is arid with consistently high temperatures and a low, unreliable rainfall. A little of the rain falls during the winter months, but most of it comes between December and March in deluges brought by the extremely violent storms known locally as willy-willys.

Geological Investigations

The geological map was compiled in 1962 by the Geological Survey of Western Australia as part of the 1 : 250,000 Geological Series. The project was supervised by R. C. Horwitz and the field work and compilation directed by G. R. Ryan. Field mapping in the Nickol Mine area and the area from Cape Preston to Mount Wilkie is mainly the work of R. C. Horwitz and W. M. Bock, the remainder of the mainland being mapped by M. Kriewaldt ; and the compilation of the island geology is largely the work of G. R. Ryan. The geology of Barrow Island has been described briefly in " The Stratigraphy of Western Australia " (McWhae and others, 1958, p. 128), and in an unpublished report for West Australian Petroleum Pty. Ltd., written in 1962. The information on the Barrow Island area is taken from this unpublished source with the addition of Quaternary geology from photo-interpretation. The geology of the Montebello Islands is from photo-interpretation, and the geology of the Dampier Archipelago from reconnaissance mapping. Rock specimens from the area have been described by A. F. Trendall, and palaeontological determinations were made by H. S. Edgell. Line-compilation maps prepared by the Western



LOCALITY PLAN

SCALE OF MILES

80 60 40 20 0 80 160

Australian Lands and Surveys Department were used in the preparation of the geological map, and the submarine contours are based on Admiralty hydrographic charts numbers 917, 1055 and 3186. Previously the area had been investigated in 1907 and 1909 in the course of examinations of the West Pilbara Goldfield (Maitland, 1909 ; Woodward, 1911).

Acknowledgments

The management of West Australian Petroleum Pty. Ltd. is thanked for providing unpublished information on Barrow Island.

STRATIGRAPHY

The stratigraphic sequence is shown in Table 1. The oldest rocks, considered to be Archaean, are overlain with marked angular unconformity by volcanic and sedimentary rocks which are part of the provincial Nullagine Series as mapped in the Pilbara Goldfield and here considered to be Proterozoic. Sofoulis (1962), has suggested that these rocks may be Lower Proterozoic. Granite and gabbro are intrusive into the Archaean rocks, while gabbro, dolerite and granophyre are intrusive also into the Proterozoic in this area. Sedimentary rocks of the Mesozoic and the upper part of the Palaeozoic may be present beneath the Tertiary limestones of Barrow Island. Small outcrops of laterite (assumed Tertiary) are present. On the coastal plains there are Quaternary terrestrial and paralic sediments.

TABLE 1

DAMPIER AND BARROW ISLAND 1 : 250,000 GEOLOGICAL SERIES

STRATIGRAPHIC COLUMN

Age			Map Symbol	Name or Short Description	Thickness (feet)	Lithology	Remarks	Relationship to Underlying Unit
CAINOZOIC	QUATERNARY	Recent	Qr	Alluvium	0 to 50	Terrestrial and littoral gravel and silt, eluvial, alluvial and aeolian	Deposits of tidal flats, mangrove swamps, sand dunes, creeks ; sheet flood and piedmont slope areas	Rests on eroded surface
CAINOZOIC	QUATERNARY	Recent	Qra	Alluvium	0 to 20	Sand, gravel, silt and loam with *Anadara* sp.	Distribution controlled by pattern similar to present-day pattern	Rests on eroded surface
CAINOZOIC	QUATERNARY	Pleistocene	Qph	High level alluvium	0 to 10	Sand, gravel, loam		Veneers old surface of erosion and deposition
CAINOZOIC	QUATERNARY	Pleistocene	Qp	Cemented deposits and red clay	10 to 50	Lime cemented dune sand and beach conglomerate, kunkar in sheet, over bedrock and red clay	Correlated with Coastal Limestone	Rests usually at much lower level, on eroded surface
CAINOZOIC	TERTIARY		T	Laterite	10 to 30	Ferruginised bedrock and valley-fill with fossil wood fragments. Grey billy, lateritic rubble and gravel	Probably younger Tertiary	Rests with angular unconformity on Precambrian basement
CAINOZOIC	TERTIARY	Lower Miocene	Tm	Trealla Limestone	Exceeds 100	Hard, poorly bedded, crystalline, fossiliferous marine limestone	Burdigalian (Indonesian f_1). Biostratigraphic correlation with formation in Carnarvon Basin	Disconformity
CAINOZOIC	TERTIARY	Upper Eocene	Te	Giralia Calcarenite	Not known	Hard, poorly bedded, crystalline, fossiliferous marine limestone	Priabonian (Indonesian b). Biostratigraphic correlation	Not exposed
PROTEROZOIC			Pi	Banded iron formation	4,000	Jaspilite, hematite, chert ; red shale, siltstone	Correlated with Brockman Iron Formation	Not exposed, conformable in strike
PROTEROZOIC			Pv Ps	Volcanic rocks and Sedimentary rocks	3,000 to 10,000	Basaltic and andesitic lavas, intercalated with red siltstones, sandstones and tuffs. Local basal arkose	Correlated with Mount Jope Basalt	Rests with angular unconformity
ARCHAEAN			Ai	Iron formation and shale	1,000	Interlaminated jaspilite, chert, hematite and shale ; siltstone, manganese stains	Correlated with Gorge Creek Formation	Conformable
ARCHAEAN			Av	Basic volcanic rocks	2,000 to 4,000	Tough, blue, fine-grained basic rocks ; spilites, pillow lavas ; quartz-amphibole schist	Basic volcanic rocks occur throughout this part of the sequence	Overlies conformably and passes laterally
ARCHAEAN			Asv	Volcanic and clastic rocks	Exceeds 5,000	Recrystallised, epidotised, basic volcanic rocks with interbedded blue chert, siliceous shale and siltstone, and acid volcanic rocks		Passes laterally
ARCHAEAN			As	Amphibole schists with chert, dolomite and clastic sedimentary rocks	500 to 3,000	Amphibole schists, quartz-mica schists, quartzite, ferruginous shale, chert, dolomite, prase, fuchsite, nickel stains, conglomerate		Passes laterally. Locally unconformable on volcanics
ARCHAEAN			Aa	Amphibolites	Exceeds 1,000	Massive and schistose ; altered dolomite, siltstone and basic volcanic rocks		Concordant. Believed to be a metamorphic and metasomatic boundary
ARCHAEAN			Am	Undifferentiated metamorphic rocks	Not known	Massive, foliated, and layered acid, basic, and hybrid rocks associated with granite		

INTRUSIVE ROCKS

Age	Map Symbol	Name or Short Description	Lithology	Remarks	Relationship to Adjoining Rocks
	d	Dolerite	Generally altered basic igneous rock, varying in coarseness of texture. Hard, massive	Occurs in long narrow dykes and in sills. Not always distinguished on map from older basic igneous rocks	Intrudes all Precambrian units of the area
PROTEROZOIC	Pa	Granophyre and xenolithic dyke-rock	Acid igneous rock. Grey dyke rock, packed with xenoliths. Purple and black granophyre, layered as well as massive	Petrologically similar to acid extrusive rocks of the Woongarra Dacite in the Hamersley Range. Granophyre occurs in large sill	Granophyre intrudes at contact between Proterozoic and Archaean
PROTEROZOIC	Pb	Dolerite, and gabbro	Coarse and medium grained, basic, igneous rock. Hard massive, bold outcrops	Gabbro occurs in large sill on Dolphin Island and nearby mainland	Underlies granophyre at Dolphin Island with relationship uncertain
	b	Dolerite	Altered basic rock	Occurs in sills	Intrudes Archaean rocks ; has not been observed in contact with Proterozoic strata. Broadly concordant with base of Proterozoic
ARCHAEAN	Ag	Granitic gneiss and pegmatite	Coarse and medium grained acidic rocks. Strongly foliated and banded gneiss and massive hornblende granite	Granite occurs as deepest unit	Intrusive and gradational contacts. Clearly intrusive in western part of area
ARCHAEAN	Aa	Dolerite	Altered basic igneous rock. Fine and medium grained	Dyke or discordant sill. Contorted and folded with Archaean	Intrusive into Archaean volcanics but truncated at local unconformity within Archaean strata

ARCHAEAN

Archaean Succession

In the Dampier area the Archaean succession from top to bottom (with map symbols shown) is as follows :

Ai Iron formation and shale : Interlaminated jaspilite, chert, hematite and shale ; red and purple shale and siltstone ; manganese stains. Correlated with Gorge Creek Formation.* In this unit there are restricted occurrences of dolerites concordant with bedding ; possibly sills and post-Archaean.

Av Basic volcanic rocks : Tough, blue, fine-grained basic rocks ; spilites, pillow lavas ; thin beds of chert, shale and siltstone, with calcareous and ferruginous beds ; quartz-amphibole schist.

Asv Volcanic and clastic rocks : Recrystallised, epidotised basic volcanic rocks, with intercalated blue chert, siliceous shale and siltstone, and acid volcanic rocks.

As Amphibole schists with chert, dolomite and clastic sedimentary rocks : Hornblende, actinolite, and tremolite schist ; quartz-mica schist ; quartzite ; ferruginous shale ; dolomite ; chert with ferruginous bands ; prase, fuchsite and green (nickeliferous) dolomite beds ; thin beds of blue chert. Conglomerate and coarse-grained feldspathic sandstone above local unconformity.

Aa Amphibolites : Massive and schistose ; altered dolomites, siltstones and basic volcanic rocks.

Am Undifferentiated metamorphic rocks : Massive, foliated and layered acid, basic and hybrid rocks associated with granite. A metamorphic, metasomatic and intrusive complex with remnants of acid and basic igneous rocks, calcareous sedimentary rocks, and amphibolites.

The following points complement this sequence :

(a) Granites and granitic gneisses are usually restricted to the bottom of the succession, although they have been seen intrusive into all but the highest unit. Remnants of amphibolite, green chert and fuchsite schist are contained, in places, in the granitic gneiss, and the granites have basic xenoliths. Also intruding the sequence, and probably Archaean, are large dykes of quartz, restricted in outcrop to areas of gneiss, granite and metamorphic rocks.

(b) The lower part of the succession is complicated by metamorphism, metasomatism and intrusion. Above this lower part are amphibolite, chert, dolomite and shale with local occurrences of prase, fuchsite, and nickeliferous dolomite. These beds with their distinctive lithologies, good outcrop and continuity are a good marker.

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* See Page 7

(c) Tough blue-coloured volcanic rocks overlie the marker beds. In addition to being in the position shown previously, the basic volcanic rocks are lateral facies equivalents of the amphibole schists with chert and dolomite ; as is also the thickened sequence of intercalated volcanic and clastic rocks which outcrop to the southeast of Mount Sholl. Intrusive into the volcanic rocks and folded with them are dykes of uralitised dolerite. Near the mouth of the Nickol River in this stratigraphic position there is a local unconformity with conglomerate, arkose and feldspathic sandstone resting on basic volcanic rocks ; a dolerite, intrusive into the volcanic rocks, being truncated at this unconformity. Laterally from the unconformity, the clastic sedimentary rocks and underlying volcanic rocks, pass into an unbroken sequence of jaspilites and calcareous rocks ; and further along strike into a sequence of bedded amphibolite with rare jaspilite.

(d) The uppermost beds of the Archaean succession are jaspilite and shale, in places stained with manganese. These beds are well-defined and consistent and indicate a stable environment of deposition and an absence of vulcanicity as contrasted with the earlier unstable conditions.

(e) The thickness of the Archaean succession in the Dampier area is between 5,000 feet and 10,000 feet, there being large variations in the thicknesses of the several components (see Table 1).

Archaean Structure

The structural trend is northeasterly, the layered sequence being folded between major granitic bodies.

In the west, between two areas of granitic gneiss, a tight, long and narrow syncline has been recognised on the basis of the stratigraphic succession. To the east (5 miles south of Mount Marie) a narrow anticline separates a major syncline in the south from a complex region to the north. This northern structure is made up of an asymmetrical syncline to the south with the axis passing through Mount Marie, a large anticlinal pod in the centre, and a syncline to the north. The anticlinal pod is an elongate dome with a core of granitic and metamorphosed rocks mantled by layered rocks dipping from 30° to 50° off the flanks. This domal structure extends from north of Mount Prinsep to the northeast of the Nickol Mine. Associated with the closure to the west is a major drag structure with left-hand offset to the east of Mount Regal, traced by a fairly continuous outcrop of ferruginous shale, dolomite and chert with prase and fuchsite. At the eastern end, the dome is stepped to the left through a linking syncline with small domes and basins. This eastern closure is complicated by an interfingering of volcanic with clastic sedimentary rocks and the structure lines do not parallel rock-unit boundaries.

Gneissosity of the granitic gneisses is generally concordant with the layering in the adjacent rock units, and with the boundary between them and the gneisses. Of the granites, some are massive with no obvious mineral orientation, while others have a foliation due to the alignment of biotite plates. Many of the metamorphosed rocks at the bottom of the sequence have a strong schistosity.

Cleavage is noticeably absent, except in some of the ferruginous shales which are well cleaved. Jaspilite and chert beds are brecciated in places, more particularly where folded, suggesting that the breccias are tectonic breccias related to folding. Apparently-random contortions in the same beds are considered to be due to tectonic deformation of plastic material.

Archaean Correlations

The Dampier sequence is considered to be part of the Pilbara System (Noldart and Wyatt, 1962) and to be Archaean. Similarities in lithology, photo-pattern and stratigraphic position suggest a correlation of the upper jaspilite and shale beds of the Dampier area with the Gorge Creek Formation (Noldart and Wyatt, 1962) of the Pilbara System.

The suggestion (Maitland, 1904, p. 10 ; Noldart and Wyatt, 1962) that part of the Archaean gneisses may be older than the Pilbara System, is considered to be applicable to the Dampier area, where the structural disposition of the layered rocks around the gneisses is strongly reminiscent of the mantled gneiss domes of Eskola (1949), even though some of the gneisses are known to be younger.

PROTEROZOIC

Stratigraphy, Correlations and Structure

Basaltic flows and tuffaceous and terrigenous sedimentary rocks of the Proterozoic unconformably overlie the Archaean sequence in the Dampier area. Maitland (1909) correlated these overlying rocks with similar rocks in the Pilbara Goldfield where he had previously called them the Nullagine Series (Maitland, 1904).

The successions mapped in the Dampier Archipelago, at Mount Wilkie, and at Cape Preston are shown in Table 2.

TABLE 2

LOCAL SUCCESSIONS IN THE PROTEROZOIC

Dampier Archipelago	Mount Wilkie	Cape Preston
		Banded iron formation
	Basaltic lavas	
	probable unconformity	probable unconformity
Tuffaceous rocks, minor sandstone and shale	Arkose Agglomerates, ash beds, siltstones and sandstones	Basaltic lavas, minor sedimentary rocks
Acidic rocks, relationships uncertain		
Basaltic lavas and minor agglomerate	Basaltic lavas and siltstone	
Basal arkose lenses	Basal arkose lenses	Basal arkose lenses
	unconformity	
	Archaean	

In the Dampier Archipelago there are some 4,000 feet of basaltic lavas with some agglomerates. Arkose is present locally at the basal unconformity and also as lenses in the lavas. On Goodwin and Malus Islands there are acidic igneous rocks with the microscopic characteristics of lavas. At the top of the succession on Rosemary Island are bedded and cross-bedded, pale-green, fine-grained, tuffaceous rocks with white quartz sandstone and purple and green shales.

At Mount Wilkie in the southwest of the area the thickness of basaltic lavas overlying the unconformity is between 1,500 feet and 8,000 feet. At the base are local arkose lenses and intercalated in the lavas are thin beds of yellow tuffaceous siltstone with contorted bedding due to preconsolidation movement. The lavas pass upwards into agglomerates and ash beds followed by red siltstones and sandstones with arkosic and tuffaceous beds and an uppermost arkose ; in all, a thickness of some 1,500 feet of sediments. Above the sediments are further basaltic lavas with thin intercalations of sedimentary rocks. Possibly there is a minor unconformity between the sediments and the upper lavas.

To the west at Cape Preston and James Point, up to 7,000 feet of andesitic and basaltic flows overlie the Archaean with lenses of arkose at the base. Thin beds of banded iron formation as well as dolomitic, micaceous and tuffaceous slates and pisolitic shales are intercalated in the volcanic sequence. Apparently overlying these volcanics to the west is some 4,000 feet of a sedimentary sequence, with poorly outcropping kaolinitic sandstone and cherts at the bottom and with banded iron formation, chert, red shale and siltstone at the top.

The successions of the Dampier area are correlated with the rock units described by MacLeod and others (1963) from the Hamersley Range to the south as follows :

(a) The iron formation at James Point is correlated with the Brockman Iron Formation.

(b) The other successions are considered to belong to the Fortescue Group, and are probably all part of the Mount Jope Basalt.

In the Dampier Archipelago, rock units of the Proterozoic dip from 10° to 30° in a northerly direction ; in the west at Cape Preston they dip from 30° to 60° westerly ; in the south at Mount Wilkie and Mount Leopold the dips are southerly from 10° to 30° ; the structure being a broad anticline closing to the west with a steeper western limb. The northern limb has a large right-hand drag structure passing through Enderby Island, and minor flexures are indicated by outliers of Proterozoic rocks five miles north of Mount Wilkie. There are small drag folds at Mount Wilkie.

POST-ARCHAEAN INTRUSIVES

The Proterozoic rocks of the Dampier area have been intruded by granophyre, a xenolithic dyke-rock related to the granophyre, gabbro and dolerite. Other gabbros, also not affected by Archaean metamorphism, but which have contacts with Archaean rocks only, are quite probably related to those gabbros which do intrude the Proterozoic.

Granophyre in the Dampier Archipelago is intruded at the unconformity between Archaean granitic rocks and overlying gently dipping basaltic lavas of the Proterozoic. At the top of the granophyre, metasomatised by it, are small lenses of altered arkose, basal to the lava. The marginal granophyre is light-coloured. Small dykes, apparently offshoots of the granophyre, intrude the overlying basalt on Enderby Island. One variety of granophyre is a purple and green rock with spherulitic quartz-feldspar intergrowths, which look like phenocrysts in hand specimen. Associated with this purple variety is a blue variety ; the two varieties being interlayered on Dolphin Island. The petrology of these intrusive rocks and their affinities with similar extrusive rocks in the Hamersley Range to the south have been commented on by A. F. Trendall (1963).

Related to the granophyre is a dyke, 10 feet to 20 feet wide, extending irregularly over a length of 50 miles, which is packed with xenoliths of quartzose and granitic material.

The relative ages of the various post-Archaean gabbros are uncertain. Some are possibly contemporaneous with the granophyres, others with the younger dolerite dykes. A body of dolerite on the north of Rosemary Island is considered to be a sill of analogy with a large sill to the south of Roebourne. Possible feeders of the sills are the long, broad, dolerite dykes in the southeast of the area. Younger than these and apparently the youngest igneous rocks of the area, are the very long, narrow dolerite dykes.

PALAEOZOIC AND MESOZOIC

Palaeozoic and Mesozoic rocks are not known in the Dampier area, but they may well be present offshore and beneath Barrow Island and Montebello Islands. The most reliable estimate of depth to Precambrian basement beneath Barrow Island, based on aeromagnetic data flown in 1956, is in excess of 7,000 feet, although there is a possibility that the depth may exceed 20,000 feet. This is far greater than the thickness which can be expected from known Tertiary and Cretaceous sequences of the Carnarvon Basin.

TERTIARY

Limestones

Tertiary marine limestones on Barrow Island are fossiliferous, have a varying content of quartz sand and are hard and crystalline. Two distinct assemblages of microfauna (mainly Foraminifera) were recognised in surface samples from Barrow Island by H. S. Edgell. They are assigned by him to the Upper Eocene, Priabonian Stage (b stage of Indonesian letter classification), and to the upper part of the Lower Miocene in the Burdigalian Stage (Indonesia f_1 stage) and they characterise the Giralia Calcarenite and the Trealla Limestone respectively. The faunas are indicative of marine shallow-neritic to littoral facies.

The limestones are gently folded into an elongate dome, with axis trending northerly along Barrow Island.

Laterite

Small outcrops of pisolitic limonite, here called laterite, are present through the area. Where the rocks underlying the laterites are exposed, they are bleached Precambrian bedrock. The laterites contain replaced fossil wood. Scree of laterite rubble surrounds laterite-capped mesas and there are also several low-lying deposits of detrital laterite. Grey billy (a siliceous capping) overlying kaolinised granitic rocks with a limonitic ironstone gravel veneer, is confined to one small area on the mainland southwest of Nickol Bay.

QUATERNARY

The Quaternary deposits have been divided into three chronologically significant groupings.

The oldest are beds of red and mottled clay, cemented beach conglomerates and cemented dune rock. The clay beds underlie most of the coastal plain but are obscured by glazed-gravel veneers, red sands and a thin layer of water-borne and wind-borne deposits, so that exposure is limited to areas of pediment and in creek banks. Kunkar, a concretionary calcium carbonate deposit, occurs as cappings on Precambrian rocks and as sheet layers on the red clay. It is also present at shallow depths beneath low-lying areas (crabhole flats) on the plain. In addition there are lime-cemented creek conglomerates, outwash-fan deposits and dune sands. The lime-cemented beach conglomerates have pebbles of quartz and in places, laterite pebbles, in a quartz-sand matrix ; they contain marine shells. Overlying the beach conglomerate is lime-cemented dune rock, in all ways similar to rocks of the Coastal Limestone (see Fairbridge, 1953, pt. XII, pp. 25–28). A correlation of both the beach conglomerate and the dune rock with the Coastal Limestone is suggested. The late Pleistocene age suggested for the Coastal Limestone by Fairbridge (1953) is accepted. However, on the basis of microfacies, stratigraphic position and identified species of *Peneroplis* and *Rotalia,* H. S. Edgell has considered that the calcareous conglomerate would appear to be Pliocene-Pleistocene.

Younger than these beds are deposits of sand and loam. The taxodont pelecypod *Anadara* sp. identified by H. S. Edgell, is abundant in some of the beds and as concentrations on the surface of these beds. Two facies within this unit have been recognised : an inland riverine loam without *Anadara* and a paralic sandy loam with *Anadara.* The deposits, which are arranged in a general way parallel to the present day coastline and along old drainage lines are dissected by present day fluviatile erosion. *Anadara* has been recorded from beds in a comparable stratigraphic position in Victoria and South Australia (Horwitz, 1962, p. 6 ; Sprigg, 1952, p. 71) and also from much older beds near Perth, Western Australia (Fairbridge, 1953, pt. XII, p. 28).

The youngest of the three groupings is still being deposited and has terrestrial, paralic and marine facies.

These two younger units are considered to be Recent.

ECONOMIC GEOLOGY

Underground Water

Underground water of good quality and in fair supply is present as unconfined groundwater, mainly in the oldest of these Quaternary deposits. The quality and supplies are better near the hills than near the coast. Water for stock is pumped by windmills from some 80 wells. Most of the wells are near perennial watercourses. Information on the depth of the wells and the depth to the water in the wells is summarised in Table 3.

TABLE 3

DEPTH OF WELLS AND DEPTH TO WATER

(Number of wells in various classes)

Depth to Water (feet below collar)	Depth of Wells (feet below collar)					
	9–17	18–26	27–35	36–44	45–53	9–53
9–17	6	8	5	4	....	23
18–26	....	15	20	10	6	51
27–35	....	....	....	1	2	3
9–35	6	23	25	15	8	77

Metals

Gold, copper and iron mineralisation are known in the Dampier area. Only gold is being worked at present (at the Nickol and Lydia) and that in a small way. The Upper Nickol workings (several shallow shafts) for gold in a quartz reef are abandoned. Copper, as malachite, azurite and cuprite (tile ore variety) has been prospected by small pits and shafts at several localities. Iron deposits (laterite, jaspilite and banded iron formation) are not considered to be of ore grade.

Petroleum

For petroleum the most prospective part of the area is believed to be Barrow Island. This is a large anticline in Tertiary limestones near the northern end of the Carnarvon Basin and is thought to be underlain by a substantial thickness of marine sediments. West Australian Petroleum Pty. Ltd. has announced that a test well will be drilled on the island in 1964. If the results are encouraging, further prospecting will be justified in the adjacent areas of the continental shelf and on the Montebello Islands.

The petroleum prospects of the mainland part of the Dampier area are regarded as nil, owing to the proximity of Precambrian rocks to the surface throughout this area.

Industrial Minerals and Rocks

The Quaternary deposits (clays, sands and gravels) can be used for fill, ballast, aggregate and road metal. The tidal flats could possibly be used for salt production ; however, the natural deposits are very small.

Some of the Precambrian rocks have been used as building stone and could be quarried for this purpose and for ballast, aggregate and road metal.

White, green and black cherts are being won from the Archaean rocks for semi-precious jewellery stones.

Some chrysotile asbestos has been produced from two small gougings.

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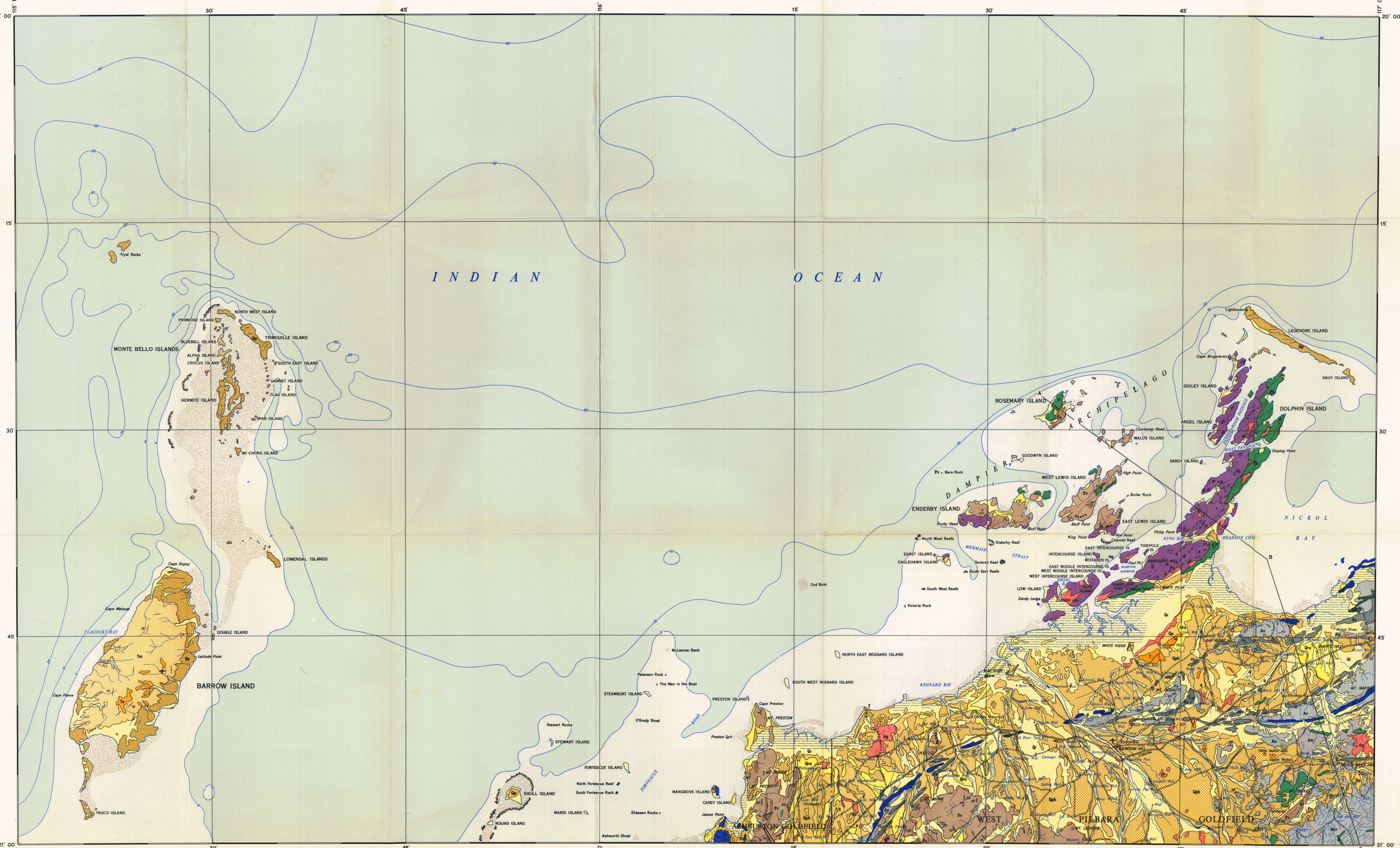
ALEX B. DAVIES, Government Printer, Western Australia 82573/4/64—1M

DAMPIER AND BARROW ISLAND

AUSTRALIA 1 : 250,000 GEOLOGICAL SERIES

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

SHEET SF 50-2 AND PART OF SHEET SF 50-1

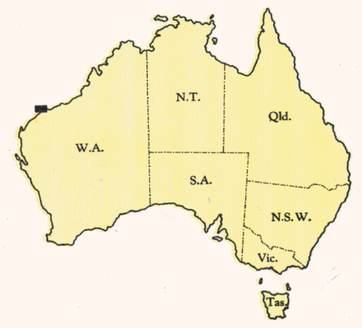


Compiled and published by Geological Survey of Western Australia. Cartography by Geological Drafting Section, Mines Department. Topographic base from compilations by Lands and Surveys Department. Printed by Govt. Printing Office, Perth, 1964.

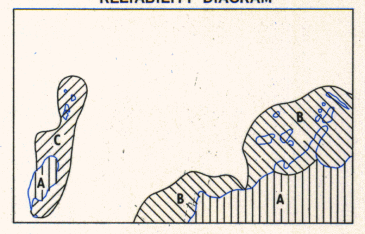
Copies of this map may be obtained in Perth from the Geological Survey of Western Australia or the Bureau of Mineral Resources, Geology and Geophysics in Canberra, A.C.T.

HON. A. F. GRIFFITH, M.L.C.
MINISTER FOR MINES
J. H. LORD, DIRECTOR, GEOLOGICAL SURVEY

Geology by M. Kriewaldt, R. C. Horwitz, G. R. Ryan and W. M. Bock.
Geology of Barrow Island by West Australian Petroleum Pty. Ltd.



RELIABILITY DIAGRAM



A Detailed mapping
B Photo-interpretation with traverses
C Photo-interpretation

SCALE 1 : 250,000

TRANSVERSE MERCATOR PROJECTION
ZONE 1 AUSTRALIA SERIES

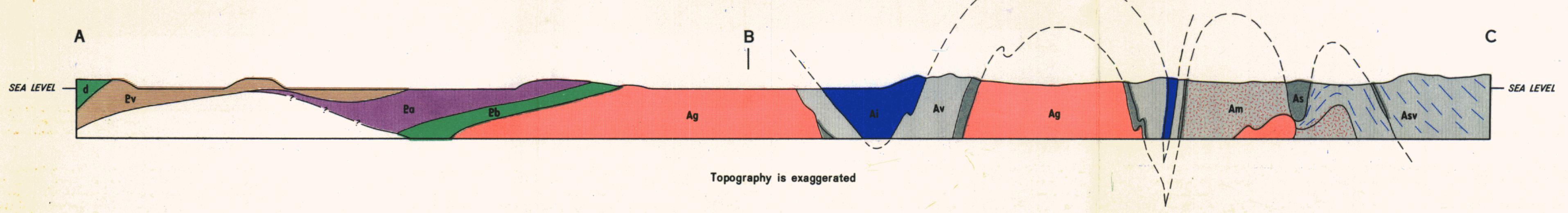
INDEX TO ADJOINING SHEETS

INDIAN	OCEAN	
BARROW ISLAND SF 50-1	DAMPIER SF 50-2	ROEBOURNE SF 50-3
ONSLOW SF 50-5	YARRALOOLA SF 50-6	PYRAMID SF 50-7

DECLINATION DIAGRAM

Annual change is negligible

DIAGRAMMATIC SECTION A - B - C



Topography is exaggerated

REFERENCE

CAINOZOIC

QUATERNARY — RECENT

- Qr — Alluvium and coastal deposits: silts of tidal flats; creek deposits; downwash and sheet-flood deposits; beach and aeolian sands
- Qra — Dissected deposits: dune sand; downwash gravels; silt along old drainage lines containing *Anadara* sp.

QUATERNARY — PLEISTOCENE

- Qph — Gravel or sand: fossil outwash gravels and aeolian sands; probably contains products of decalcification of underlying units
- Qp — Dune limestone: lime-cemented dune sand. Correlated with COASTAL LIMESTONE
- Calcareous conglomerate: lime-cemented beach conglomerate. Correlated with COASTAL LIMESTONE
- K — Kunkar: calcareous sheet-deposits and local accumulations over bedrock
- Clay: red and mottled clay with some loam and sheet kunkar. Forms high level plain

TERTIARY

- T — Laterite: ferruginised bedrock and valley-fill (with replaced wood fragments). Lateritic gravels
- Si — Grey billy: siliceous cappings overlying kaolinised granitic rocks
- Tm (LOWER MIOCENE) — TREALLA LIMESTONE: hard, poorly bedded, sandy, fossiliferous crystalline marine limestone
- Te (UPPER EOCENE) — GIRALIA CALCARENITE: medium to hard, brown to yellow, ferruginous sandy fossiliferous marine limestone

PROTEROZOIC

- Pi — Banded iron formation: jaspilite, hematite, chert and shale with red shale and siltstone. Correlated with BROCKMAN IRON FORMATION
- Pv — MOUNT JOPE BASALT: massive, amygdaloidal scoriaceous and vesicular basic and intermediate lavas; locally with columnar jointing, interbedded pyroclastic rocks and basal arkoses
- Ps — Tuffaceous clastic rocks: coarse-grained to fine-grained red and green sandstone, siltstone and shale with a high proportion of volcanic material
- Basal arkose

ARCHAEAN

- Ai — Iron formation and shale: interlaminated jaspilite, chert, hematite and shale; red and purple shale and siltstone; manganese stains. Correlated with GORGE CREEK FORMATION
- Av — Basic volcanic rocks: tough, blue, fine-grained basic rocks; spilites, pillow lavas; thin beds of chert, shale and siltstone with calcareous and ferruginous beds; quartz-amphibole schist
- Asv — Volcanic and clastic rocks: recrystallised epidotised basic volcanic rocks, with intercalated blue chert, siliceous shale and siltstone and acid volcanic rocks
- As — Amphibole schists with chert, dolomite and clastic sedimentary rocks: hornblende, actinolite and tremolite schist; quartz-mica schist; quartzite; ferruginous shale; dolomite; chert with ferruginous bands, prase, fuchsite and green (nickeliferous) dolomite beds; thin beds of blue chert. Conglomerate and coarse-grained feldspathic sandstone above local unconformity
- Aa — Amphibolites: massive and schistose; altered dolomite, siltstone and basic volcanic rocks
- Am — Undifferentiated metamorphic rocks: massive, foliated and layered acid, basic and hybrid rocks associated with granite. A metamorphic, metasomatic and intrusive complex with remnants of acid and basic igneous rocks, calcareous sedimentary rocks and amphibolites

INTRUSIVE ROCKS

PROTEROZOIC

- Dolerite dykes
- d — Dolerite sills
- Dolerite
- Pa — Xenolith dyke rock: acidic rock with abundant quartzose xenoliths. Intrudes all Precambrian units except dolerite dykes
- Pa — Granophyre: massive and layered acid intrusive complex; red, green, purple, blue and light-coloured; even grained to "porphyritic" and spherulitic, and with granophyric texture. Contains rafts and blocks of granitic gneiss, PROTEROZOIC arkose and lava in various stages of assimilation. Intruded at the unconformity between PROTEROZOIC and ARCHAEAN. Petrologically similar to acid extrusive rocks of the WOONGARRA DACITE
- Pb — Gabbro: massive, underlies granophyre at Dolphin Island. Relationships uncertain
- b — Basic rocks: widely altered, medium-grained to coarse-grained; as dykes, sills and stocks. Not known to intrude PROTEROZOIC rocks

ARCHAEAN

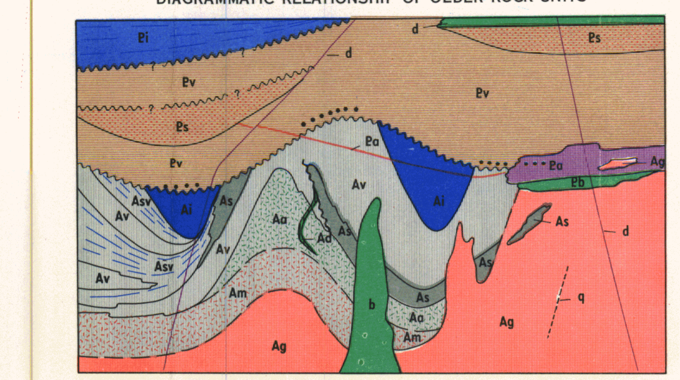
- Ag — Granite, gneiss and pegmatite: coarse-grained acidic rocks ranging from strongly foliated and banded quartz-feldspar gneiss (containing, in places, remnants of basic rock, amphibolite, green chert and fuchsite schist) to massive intrusive hornblende granite and biotite granite with basic xenoliths
- Ad — Dolerite: altered; truncated at local unconformity and folded with Archaean

SYMBOLS

- Geological boundary
- Strike and dip of sediments
- Strike of vertical sediments
- Strike and dip of sediments from photo-interpretation
- Plunge of drag fold
- Generalised plunge of fold axes
- Facing (volcanic rocks)
- Strike and dip of foliation
- Vertical foliation
- Goldfield boundary
- Highway
- Road, track
- Landmark feature — MT. SHOLL
- Trigonometrical station, Major, Minor
- High water areas
- Fathom line
- Geological section
- Strike and dip of lavas
- Strike of vertical lavas
- Strike of lavas, dip unknown
- Strike and dip of lavas from photo-interpretation
- Trend lines from photo-interpretation
- Joint pattern from photo-interpretation
- Fault
- Quartz veins
- Sand dunes
- River or stream
- Pool — Cardan Pool
- Bore, well or waterhole — Lowes Well
- Bore or well with windpump — Cold Well
- Soak — Slopers Soak
- Dam
- Foreshore sand
- Landing ground

Mine — Gold Au — Copper Cu

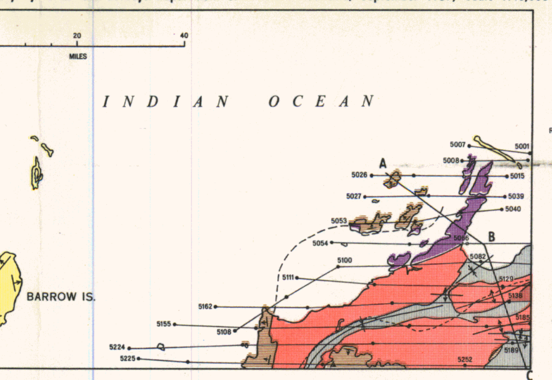
DIAGRAMMATIC RELATIONSHIP OF OLDER ROCK UNITS



- Unconformity
- Unconformity inferred
- Arkose

TECTONIC SKETCH AND FLIGHT DIAGRAM

Air Photography by Lands and Surveys Department of Western Australia, September 1957, Scale 1:40,000



- CAINOZOIC
- PROTEROZOIC
- ARCHAEAN
- Anticline
- Syncline
- Strike and dip
- Position of Geological Section
- Flight line and photo numbers
- North West Coastal Highway

DAMPIER AND BARROW ISLAND

SHEET SF 50-2 AND PART OF SHEET SF 50-1

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