## REFERENCE

QUATERNARY — CAINOZOIC

Qa Qb Qk Qs

Qa Alluvial deposits — reddish sand and clay in channels and floodplains
Qb Black-soil deposits — brown clayey gilgai soil
Qk Calcrete and tufa
Qs Sand — unconsolidated eolian and residual sands; minor clay; includes low vegetated dunes

TERTIARY — MIOCENE

Cz Alluvial and colluvial deposits

Ti LAWFORD FORMATION: crudely bedded lacustrine siltstone, sandstone, and chalcedonic limestone

PERMIAN

Pl LIVERINGA GROUP: well-bedded shallow-marine to fluvial sandstone and siltstone; ferruginous in part

Pn NOONKANBAH FORMATION: well-bedded deltaic to shallow-marine sandstone, siltstone, and shale; minor dolomite

Pp POOLE SANDSTONE: well-bedded, fine-grained marine sandstone

PG GRANT GROUP: crudely bedded marine sandstone and siltstone; porty glacigene; includes boulder-bearing tillite

CARBONIFEROUS — TOURNAISIAN

DCF FAIRFIELD GROUP: shale, sandstone and fossiliferous limestone

DEVONIAN — FRASNIAN AND FAMENNIAN — Devonian reef complexes

Dw WINDJANA LIMESTONE: reef-margin subfacies: massive dolomite and microbial reef limestone (stratigraphic relationships diagram)

Dl NULLARA LIMESTONE: back-reef subfacies: well-bedded fenestral and peloidal limestone; locally sandy, with some interbedded sandstone and siltstone

Dlx Conglomerate, sandstone, and siltstone. Larrowa area

Du BUGLE GAP LIMESTONE: fore-reef subfacies: crudely bedded, pale-grey limestone with some allochthonous blocks of reef limestone

Dr VIRGIN HILLS FORMATION: marginal-slope and basin facies: grey limestone, thick- to thin-bedded, and sandstone; includes some allochthonous blocks of reef limestone

Dd SADLER LIMESTONE: marginal-slope and basin facies: grey limestone, thick- to thin-bedded, with scattered allochthonous blocks of reef limestone, some debris-flow deposits, and common silicified fossils

DEVONIAN — GIVETIAN AND FRASNIAN

Dg GOGO FORMATION: basin facies and lower fore-reef subfacies: grey, weathering yellow, siltstone, shale, and silty limestone

Dgb Basin facies: siltstone, shale, and minor silty limestone, includes horizons with abundant cannon-ball concretions

Dgf Basin facies and lower fore-reef subfacies: siltstone and shale, with thin interbeds of silty limestone containing some platform-derived debris

Dp PILLARA LIMESTONE: platform facies: undivided, mainly back-reef subfacies with some reef-flat subfacies: white to light-grey and yellow, medium-bedded, stromatoporoid, coralline, and fenestral limestone; locally sandy and grading into calcareous sandstone

Dpr Reef-margin and reef-flat subfacies: white to light-grey and yellow, massive to thick-bedded stromatoporoid and microbial reef limestone, with subordinate coralline limestone

Dpp + Allochthonous blocks of PILLARA LIMESTONE (reef) in marginal-slope and basin facies

GIVETIAN

Dz CADJEBUT FORMATION: evaporitic facies: siltstone, shale, sandstone, dolomite, and evaporites, leached in outcrop; coastal sholi and hypersaline lagoon deposits

GIVETIAN — FAMENNIAN — Devonian conglomerates

Dcg BOBS BORE CONGLOMERATE: siliciclastic conglomerate and sandstone; submarine-fan deposits

Dcgs SPARKE CONGLOMERATE: siliciclastic conglomerate and sandstone, with minor limestone and dolomite; alluvial-zone, fan-delta, and submarine-fan deposits

Gelen Member: cyclic sequences, coarsening-upwards, commonly from marine siltstone or sandstone at the base to subaerial boulder conglomerate at the top

Dcgss Sheared conglomerate, limestone, and dolomite

ORDOVICIAN

OP PRICES CREEK GROUP: undivided (section and stratigraphic relationship diagram)

OPg GAP CREEK FORMATION: shallow-marine dolomitic sandstone and siltstone

OPe EMANUEL FORMATION: shallow-marine siltstone, shale, and limestone, with lesser sandstone

PROTEROZOIC — PALAEOPROTEROZOIC

E Proterozoic rock, undivided (section and stratigraphic relationships diagram)

1835–1790 Ma

Ew Sedimentary rock and dolerite

1885–1852 Ma

Eg Granitoid rock

Ew WHITEWATER VOLCANICS: volcanic and sedimentary rocks

1893 Ma

1870–1840 Ma

Em Metamorphic rock

## SYMBOLS

Geological boundary
exposed
concealed

Fault
observed
concealed
normal, tick on downthrow side
showing relative lateral displacement

Fold, showing direction of plunge
anticline; exposed
syncline; exposed

Bedding
horizontal
inclined, showing strike and dip
overturned
trend from aerial photography

Palaeocurrent direction

Anpholo lineament

Nagutnuin dyke or major joint

Highway with national route marker, bridge

Formed road

Track

Aboriginal Community

Homestead

Aboriginal Name — Lowungu

Building

Yard

Microwave repeater station

Horizontal control, major, minor

Watercourse

Spring, waterhole

Bore, well

Windpump

Dam, tank

Abandoned — and

Position doubtful — (PD)

Petroleum exploration or stratigraphic well
dry, abandoned — Gap Creek 1

Mine — Goongewo
abandoned — Coobbold
Prospect

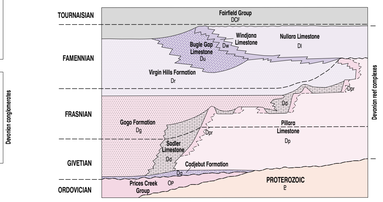
Quarry

Treatment plant

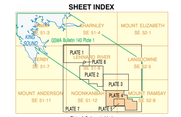
Mining area

Mineral occurrence
Lead — Pb
Road metal — Rm
Zinc — Zn

## STRATIGRAPHIC RELATIONSHIPS OF THE DEVONIAN REEF COMPLEXES




## SHEET INDEX



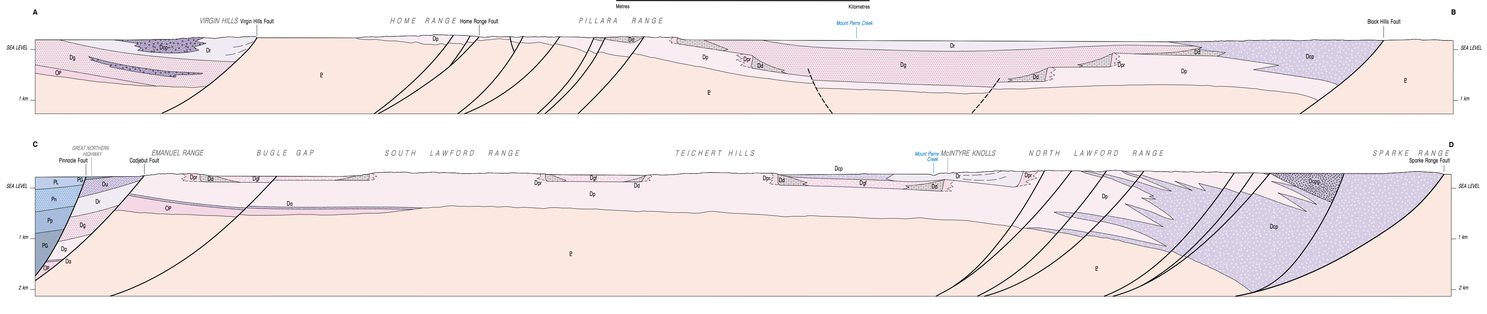

Plates 1–7 drawn in black
102/06 main drawn in brown
Project map drawn in green

See current GSWA map catalogue for full range of published maps

## DIAGRAMMATIC SECTIONS

NATURAL SCALE (MAP SCALE x 2)

1000 Metres 0 1 2 3 4 Kilometres 1:50 000




Compiled by R. M. Hocking and P. E. Playford

Devonian geology by P. E. Playford 1961–1995, R. M. Hocking 1993–1995, A. E. Cockbain 1968, D. C. Lowry 1961–1962, V. A. Pedone 1985–1986

Precambrian geology modified from Tyler, Griffin, Playford, and Hocking, 1998, and Griffin and Tyler, 1995

Edited by N. Tetlow, D. Ferdinando, F. Apidopoulos, and G. Loon

Cartography by S. Craiciuti, E. Green, T. Lemone, and K. Greenberg

Topography from the Department of Land Administration with modifications from geological field survey

Published by the Geological Survey of Western Australia. Copies available from the Information Centre, Department of Minerals and Energy, 100 Plain Street, East Perth, WA 6004. Phone (08) 9222 3459. Fax (08) 9222 3444

This map is also available in digital form

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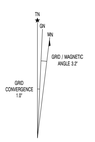


True north, grid north and magnetic north are shown diagrammatically for the centre of the map. Magnetic north is correct for 1998 and moves easterly by about 0.1° in 8 years.

DEPARTMENT OF MINERALS AND ENERGY
L. C. RANFORD, DIRECTOR GENERAL

GOVERNMENT OF WESTERN AUSTRALIA
HON. NORMAN MOORE, M.L.C.
MINISTER FOR MINES

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
DAVID BLIGHT, DIRECTOR

SCALE 1:100 000

1000 Metres 0 1 2 3 4 5 6 7 8 9 10 Kilometres

TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM: AUSTRALIAN GEODETIC DATUM 1984
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM

Grid lines indicate 1000 metre interval of the Australia Map Grid Zone 51 and 52

# PILLARA RANGE — EMANUEL RANGE SPARKE RANGE AREA

## DEVONIAN REEF COMPLEXES OF THE CANNING BASIN

BULLETIN 145 PLATE 4

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