BALFOUR DOWNS

AUSTRALIA 1 : 250 000 GEOLOGICAL SERIES

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

SHEET SF 51-9

SYMBOLS

Geological boundary
Fault
- accurate; q = quartz, m = mylonite
- approximate
- inferred
- shear zone
- photo lineament

Fold (axial trace)
- anticline, showing plunge
- syncline, showing plunge
- plunge of minor anticline
- plunge of minor syncline
- asymmetrical(dextral and sinistral vergence)
- multiple

Bedding
- inclined
- vertical
- horizontal
- overturned
- photo interpreted dip direction
- trend line

Primary way up indicated by
- cross-bedding
- pillow lava

Foliation
- inclined
- vertical

Gneissic banding
- inclined
- vertical

Lineation (mineral alignment)
- direction and plunge

Stromatolite locality
Oncolite locality
Isotopic age determination site

Mineral field district boundary
Highway with national route marker
Road
Track
Telegraph line
Homestead — Norwesa Downs
Landing ground
Horizontal control; major, minor
Vertical control, height accurate — 20.47
Sand dune
Sinkhole

Watercourse, intermittent
Pool
Pipeline
Well
Bore
Windpump
Dam
Rockhole
Soak
Spring
Tank
Waterhole
Abandoned — (abd)
Position doubtful — (PD)

Mine, minor (abd) — Romney Find
Open cut (abd)
Alluvial workings (abd)
Mineral occurrence
- Gold — Au
- Copper — Cu
- Manganese — Mn
- Iron — Fe
- Tin — Sn
- Tantalite — Ta
- Corundum — Cn
- Prase — Pr
- Road metal — Rm
- Beryl — Be

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True bearing = magnetic bearing + variation (E)
+ mean declination + add correction
– mean declination + west and correction must be subtracted from compass bearing to give true bearing
Annual change is – 7' westerly

HON. DAVID PARKER, M.L.A.
MINISTER FOR MINERALS AND ENERGY
D.R. KELLY, DIRECTOR GENERAL OF MINES

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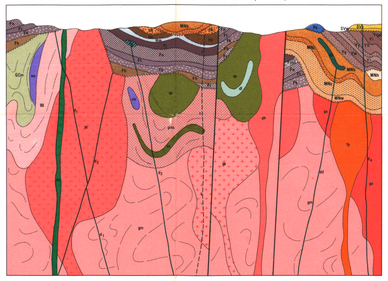
I.R. Williams 1984

DIAGRAMMATIC RELATIONSHIP OF ROCK UNITS (SECTION)



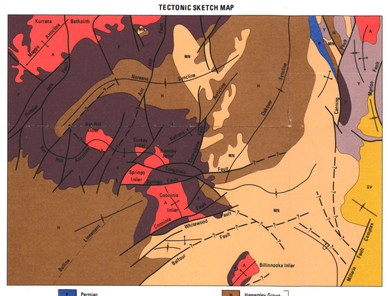
P.E. PLAYFORD
DIRECTOR, GEOLOGICAL SURVEY
OF WESTERN AUSTRALIA

SCALE 1 : 250 000

5000 0 5 10 15 20 25 30
Metres — Kilometres

TRANSVERSE MERCATOR PROJECTION
ZONE 51 AUSTRALIAN MAP GRID

TECTONIC SKETCH MAP



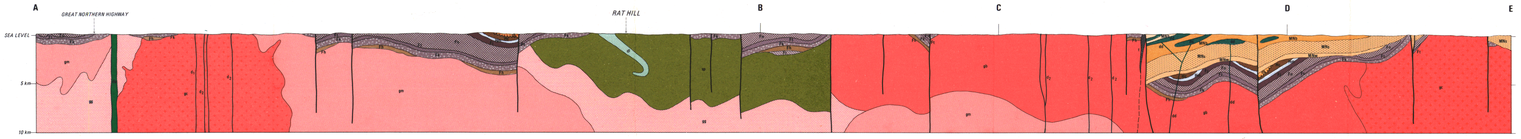
- P — Permian
- SY — Savory Group — SAVORY BASIN
- Y — Yeneena Group — PATERSON OROGEN
- MN — Mangrove Group — BANGEMALL BASIN
- H — Hamersley Group
- F — Fortescue Group — HAMERSLEY BASIN
- A — PILBARA CRATON
- Overturned anticline

Scale 1 : 1 000 000
0 10 20 30 40 50
KILOMETRES

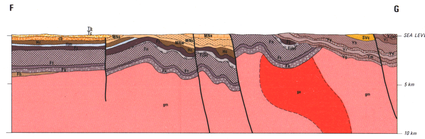
DIAGRAMMATIC SECTIONS

NATURAL SCALE

SECTION A-E



SECTION F-G



REFERENCE

PHANEROZOIC — CAINOZOIC — QUATERNARY

Qa Alluvium — clay, silt, sand, gravel, in drainage channels and adjacent flood plains
Ql Lacustrine deposits — clay, silt, saline in part
Qd Mixed lacustrine and eolian deposits — clay, silt, sand
Qs Eolian sand — in sheets and longitudinal (seif) dunes
Qp Eolian sand mixed with ironstone pebbles derived from Tr and Tc

Qr Colluvium — mixed gilgai and gravel flood plains; low slope deposits
Qb Eluvium — gilgai; swelling clay soils characterised by "crabholes"; derived from basalt, dolerite or shale
Qw Colluvium and alluvium — silt, sand, gravel in broad, striped, sheet wash areas
Qc Colluvium and minor alluvium — sand, gravel on slopes adjacent to bedrock
Qe Colluvium and alluvium — clay hardpan, partly ferruginised silt, sand, gravel derived from and overlying Tc and Ts
Qt Colluvium and alluvium — gravel, boulder deposits, clay matrix; derived from **PATERSON FORMATION**

Qck Calcrete, sandy limestone — in sheets and lenses; old valley fill

CAINOZOIC — TERTIARY

Tc Colluvium — consolidated, ferruginised silt, sand, gravel; dissected by present drainage
Tl Laterite — massive, nodular and pebble
Td Ferruginous duricrust overlying **MARRA MAMBA FORMATION**
Ts Mixed siliceous caprock and colluvium; secondary siliceous breccia, jasperoidal chalcedony over ultramafic rocks
Tp Pisolitic limonite, goethite, hematite deposits; in old drainage lines

Tg **OAKOVER FORMATION** : ruggy white opaline silica and calcareous sandstone, sandy limestone

Pu **PATERSON FORMATION** : basal polymictic conglomerate and siltite overlain by cross-bedded sandstone, conglomerate and laminated claystone

PALAEOZOIC — PERMIAN

q Quartz veins, various ages
q_1 Dolerite dyke

Savory Group — SAVORY BASIN

Sv Coonsira Formation : massive and flaggy quartz sandstone characterised by large cross-beds, some pebble bands
Sv(w) Quartz wacke, lithic wacke
Sww **WATCH POINT FORMATION** : laminated siltstone, shale and fine-grained sandstone

Yeneena Group — PATERSON OROGEN — c. 890 Ma

Yi **ISDELL FORMATION** : fine-grained, laminated and coarse-grained clastic carbonate rocks, stromatolitic dolomite, minor sandstone and conglomerate
Yi(s) Quartz sandstone and pebble conglomerate
Yh **CHOORUN FORMATION** : interbedded shale, micaceous siltstone, silicified quartz sandstone
Yy **YANDANUNYAH FORMATION** : interbedded laminated dolomite, calcareous siltstone and shale
Yr **BROWNRIGG SANDSTONE** : cross-bedded, floggy siliceous quartz sandstone
Yw **WARONGUNYAH FORMATION** : laminated and stromatolitic dolomite, interbedded shale, siltstone and quartz sandstone
Ys **GOOGHENAMA CONGLOMERATE** : conglomerate with interbedded quartz sandstone

Mangrove Group — BANGEMALL BASIN

d_2 **DAVIS DOLERITE** : fine to medium-grained dolerite in sills and dykes

MNb **WHITEWOOD FORMATION** : interbedded coarse-grained lithic sandstone and conglomerate
MNq **BALFOUR FORMATION** : pale-grey to grey-green shale, fine-grained micaceous, calcareous and glauconitic sandstone interbedded with chocolate, purple to red-brown shale, micaceous siltstone containing brownie pellets
MNe **ENACHEDDONG DOLOMITE** : laminated and massive dolomite; minor shale
MNs **STAG ARROW FORMATION** : interbedded sandstone, siltstone, shale, conglomerate, dolomite and chert
MNs(s) Medium and coarse-grained sandstone
MNs(c) Interbedded quartz sandstone and conglomerate
MNs(d) Massive and laminated dolomite
MNs(c) Massive and weakly banded chert
MNs(s) Shale and micaceous siltstone
MNs(l) Laminated fine-grained sandstone interbedded with shale and siltstone
MNs(i) Stromatolitic dolomite
MNw **WOBLEGUN FORMATION** : light-grey, maroon and green shale, interbedded fine-grained micaceous sandstone
MNw(s) Medium and coarse-grained quartz sandstone
MNw(c) Polymictic conglomerate
MNw(c) Chert

c. 1050 Ma

MNc **COONDOON FORMATION** : poorly sorted conglomerate, coarse-grained lithic sandstone, quartz wacke, glauconitic sandstone, minor dolomite interbedded red-brown manganiferous shale

Ts **PINJIAN CHERT BRECCIA** : chert breccia, poorly banded chert, commonly capped with secondary, silicified breccia Ts, overlies **CARAWINE DOLOMITE**

Microcline biotite-trachyte, lamprophyre; in dykes and small irregular bodies

Hamersley Group — HAMERSLEY BASIN

Hc **CARAWINE DOLOMITE** : massive and weakly banded recrystallised grey, brown dolomite, minor chert; stromatolitic dolomite
Hm **MARRA MAMBA IRON FORMATION** : green-grey banded chert, thin banded iron-formation, shale

d_2 Fine to coarse-grained dolerite sills and dykes

Fortescue Group — Mount Bruce Supergroup — PILBARA CRATON

Fj **JEERINAH FORMATION** : shale, chert, jaspilite, mudstone, sandstone, dolomite; minor pillow lava and felsic volcanic lava and tuff
Fy **Roy Hill Shale Member** : leached white shale; silicified; pyrite balls
Fw(d) Dolomitic unit in **Warri Member** interbedded blue chert
Fw **Warri Member** : interbedded shale, mudstone, chert, thin bedded dolomite
Fw(c) Disconformous pillowed basalt flows, some amygdaloidal; carbonate-rich; intermediate tuff and porphyritic flows, pisolitic tuff north east of Canning Bore
Fp **Woodiana Sandstone Member** : lithic sandstone, grey-green mudstone, pebble conglomerate
Fx **NYMERINA BASALT** : dark green to grey amygdaloidal, vesicular and massive basalt; amygdales of agate and carnelian common
Fx(p) Pyroclastic and sedimentary units in **NYMERINA BASALT**
Ft **TUMBIANA FORMATION** : pisolitic tuff, tuff, mudstone, lithic sandstone, dolomite with stromatolites
Ftc **Maartheena Carbonate Member** : banded dark-grey dolomite, limestone with biohems of stromatolite
Ftd **Mingah Tuff Member** : interbedded tuff, pisolitic tuff, mudstone, lithic sandstone
Fk **KYLENA BASALT** : dark-green amygdaloidal, vesicular and massive basalt; minor pillowed basalt
Fk(a) Agglomerate
Fh **HARDEY SANDSTONE** : quartz, lithic and feldspathic sandstone, minor tuffaceous shale, pisolitic tuff
Fh(c) Very coarse boulder conglomerate in poorly sorted matrix
Fr **MOUNT ROE BASALT** : massive and amygdaloidal basalt

c. 2760 Ma

d_3 q_1 b q_2

d_3 Gabbro and coarse-grained dolerite dykes
q_1 Melanocratic dolerite, gabbro, pyroxenite dykes
b Felsic dyke; aplite
q_2 Dolerite dyke

fp di

fp Foliated fine-grained felsic porphyry with rounded feldspar phenocrysts
di Layered mafic intrusion; pyroxenite to gabbro

gr gn gn

gr Medium to coarse-grained biotite syenogranite and monzogranite
gn Fine to coarse-grained biotite syenogranite and monzogranite, weak foliation
ge Medium to coarse-grained leucocratic syenogranite and monzogranite

gs gn gm gmx

c. 2800 – 3300 Ma

gs Strongly deformed schistose and well foliated syenogranite and monzogranite
ge Strongly deformed granitic augen gneiss
gm Fine to medium-grained biotite granitic gneiss; flaser gneiss, some migmatitic phases
gmx Meta-sedimentary and meta-volcanic xenoliths and granitic rocks in approximately equal proportions

Gregory Creek Group — Whundo Group

GCm **MOSQUITO CREEK FORMATION** : greywacke, pelite, psammite, minor conglomerate
GCm(c) Chert

c. 3000 Ma

qz gn ge gs

qz Quartzite, fuchsite quartzite
gr Banded quartz-magnetite rock, jaspilite
sp Pelitic schist; muscovite-garnet-andalusite (staurolite) assemblages
sr Corundum-muscovite-rutile assemblages; some crystalline diaspore

An Amphibole-plagioclase schist

ue ue ue

ue Ultramafic rock (unassigned); tremolite-chlorite-talc assemblages
se Serpentinite, some talc; after peridotite
ue Coarse-grained pyroxenite; pyroxene generally altered to amphibole

Regional metamorphism drama granulite facies

PRECAMBRIAN — PILBARA CRATON — HAMERSLEY BASIN — BANGEMALL BASIN — PATERSON OROGEN — SAVORY BASIN

Low grade regional metamorphism (local metamorphism)

BALFOUR DOWNS
SHEET SF 51-9

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