

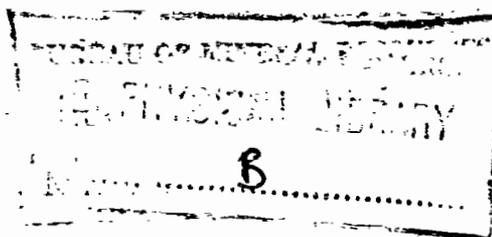
1960/24

COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.  
BUREAU OF MINERAL RESOURCES  
GEOLOGY AND GEOPHYSICS.

RECORDS.

1960/24



GLENBURGH 4-MILE GEOLOGICAL SERIES SHEET G50-6  
AUSTRALIAN NATIONAL GRID EXPLANATORY NOTES.

Compiled by

M.A. Condon.

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GLENBURGH 4-MILE GEOLOGICAL SERIES  
SHEET G50-6 AUSTRALIAN NATIONAL GRID  
EXPLANATORY NOTES

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The Glenburgh 4-mile sheet lies between latitudes  $25^{\circ}$  and  $26^{\circ}$ S. and between longitudes  $115^{\circ}30'$  and  $117^{\circ}$ E.

GEOLOGICAL INVESTIGATIONS

A. Gibb Maitland carried out a reconnaissance survey of the country between Northhampton and Peak Hill in 1897. The results were reported briefly in 1898 and in more detail in 1909. Brief references were made in other publications (1907, 1912 and Maitland and Montgomery 1924). The limestone at Wyndham River (Callytharra Formation) was described and some of its fossils listed; a boulder bed of glacial origin in the Wyndham River and Wooramel River was named "Lyons Conglomerate" and the Precambrian rocks between Coordewandy and K-32 were described.

Woolnough (1928) examined the Wooramel River area and recommended further investigation. Talbot carried out a rapid geological survey in 1928 and reported this in 1929. Feldtmann (1930) reported on a joint visit with Woolnough and Talbot. Hobson (1936) surveyed "Talbot's Dome".

Hossfeld (1931) after a joint visit with Talbot and Hobson recommended a semi-detailed investigation. In 1932 Dee and Rudd carried out a survey for Oil Search Ltd. This work was reported by Condit (1935) and Condit, Raggatt and Rudd (1936). Raggatt (1936) described the sequence in the Wyndham River area.

Waterford, about 1937, carried out a reconnaissance survey

between Byro Plains and Mount Sandiman. His collection of fossils was report on by Crespin (1937).

McWhae, Parry and Stanley (1954) did a reconnaissance survey of the area surrounding the Carrandibby Range.

Konecki, Condon, Dickins and Quinlan defined new rock units in the Wooramel River area in McWhae et al 1958.

Konecki, Dickins and Quinlan (1958) described the geology of the sheet as part of a larger area.

Fossils from the Lyons Group in the sheet area have not been described. Dickins (1957) described molluscs from and Dickins and Thomas (1960) listed the fauna of the Carrandibby Formation (incorrectly included by them in the Lyons Group).

Bretnall (1926) described bryozoa from Daurie Creek, and Fossil Hill. Glauert (1926) listed fossils from Byro Station.

Etheridge (1903), Hosking (1931, 1932, 1933), Prendergast (1943), Coleman (1957), and Crespin (1958) have described fossils from the Callytharra Formation.

Glauert (1910) listed fossils from the "Carboniferous" of Wooramel River.

Hosking (1931), Prendergast (1943), Coleman (1957) and Crespin (1958) have described fossils from the Byro Group of the sheet area.

The age of the Permian formations has been discussed by Raggatt and Fletcher (1937), Teichert (1951 and 1952), Thomas and Dickins (1954), Konecki, Dickins and Quinlan (1958), **Dickins and Thomas (1960)**.

Thyer (1951) and Chamberlain, Dooley and Vale (1954) reported the Bureau of Mineral Resources geophysical work in the Carnarvon Basin; this included reconnaissance gravity survey of the western part of the Glenburgh Sheet.

Geologists of the Bureau mapped the Glenburgh sheet in 1953 and 1955 (Konecki, Dickins and Quinlan, 1958). Condon did some additional mapping in 1959.

The Bureau has completed aeromagnetic survey over the northern part of the sheet area: total magnetic intensity contour maps have been prepared but no report has been produced.

The Bureau carried out stratigraphic drilling at Mt. Madeline and Daurie Creek (Mercer, 1959).

### PHYSIOGRAPHY

The area consists of three main physiographic divisions: the eastern area of undulating lateritic plateau up to about 1,700 feet above sea level, a central strongly dissected area; and the western area of low relief over the sedimentary rocks. The western area includes the strongly dissected Carrandibby Range.

The area is drained by the Wooramel River and the Gascoyne River; the drainage divide between them runs east-west near the middle of the sheet. The Murchison River drains the south-eastern corner of the sheet.

### STRATIGRAPHY

#### PRECAMBRIAN

No detailed work has been done on the Precambrian rocks of the area. The distribution of rock types shown on the map results from photo-interpretation based on a few traverses by Bureau geologists and on the reconnaissance of Johnson (1950).

Precambrian rocks crop out in a central north-south belt and in the Carrandibby Range; they probably form the floor of the Palaeozoic sedimentary basin.

Crystalline schists cover the greater part of the outcrop area: quartz schist, biotite schist, quartz-felspar-biotite schist (or micro-gneiss), amphibolite schist, tremolite schist and sericite schist are among the types represented.

Discordant granite crops out north-west and south-east of Erong Homestead.

Dykes of basic igneous rock and of quartz are numerous.

Johnson (1950, Plate 5) divides the Precambrian of the eastern Glenburgh sheet into Talbot Gneiss, sedimentary series, and granite. The "sedimentary series" includes "quartzite, jaspilite, andalusite and kyanite-bearing quartzites, sillimanite-garnet gneiss, quartz mylonite gneiss, muscovite quartzite, hornblende-felspar quartzite, epidote-diopside hornfels, calcite-felspar-chlorite hornfels, quartz-mica schist, chert, knotenschiefer, graphite schist and phyllite". This series grades into the Talbot Gneiss. As Johnson's boundaries are very indefinite and cannot be related to any photo-pattern the whole of the metamorphic rocks has been mapped as a single unit.

Sedimentary rocks at Earilier Hill were regarded by Konecki, Dickins and Quinlan (1958, p.10) as similar to the Badgeradda Beds. Condon examined them in 1959 and found them to belong to the Coyango Formation of the Lyons Group.

#### PERMIAN

Maitland (1900, p.15) called all the Permian strata of the Carnarvon Basin "the Gascoyne Beds" and "the Gascoyne River beds". The name has not been used in this sense since. As there are several unconformities and disconformities in the sequence no single rock body term is applicable and Maitlands name therefore is invalid.

#### Sakmarian

The Lyons Group (Maitland, 1912; Raggatt, 1936; Condon, 1954) rests unconformably on the Precambrian schist and gneiss. Its formations can be mapped near Wyndham River and Daurie Creek but elsewhere because of poor exposure they cannot be distinguished with certainty. All the known formations crop out on the sheet area.

The Austin Formation (Condon, 1960) consists of alternating members of quartz greywacke and sandy (tillitic) siltstone with few boulder beds. Its rests unconformably on Precambrian

schist and gneiss and is conformably overlain by the Coyango Greywacke. It crops out in the north-western part of the sheet between Wyndham River and Bush Creek and was penetrated in P. . . . ., mt. Madeline, between 1805 feet and total depth 3,004 feet. No fossils have been found in outcrop but marine fossils were found in the Austin Formation in BMR 8: J.M. Dickins (personal communication) identified crinoid fragments and Neospirifer sp. ind. from Core 30 (2,790 feet) and Astartila(?) sp., Pseusosyrinx(?) sp. and a rhynchonellacean from Core 32 (3,000 ft.).

The Austin Formation is about 1,000 feet thick 7 miles north-north-west of K-33 (near the northern margin of the sheet) and more than 1,200 feet thick in Bore BMR 8. These are the only thicknesses of the formation known on the Glenburgh sheet; in both sections the characteristic alteration of arenaceous and shaly members is evident. In the northern area the Austin Formation abuts unconformably on Precambrian schist and gneiss and is overlain conformably by the Coyango Formation or unconformably by the Koomberan Greywacke. In Bore BMR 8 the base is not reached; the Austin Formation is overlain by the Carrandibby Formation.

The rhynchonellacean brachiopod at 3,000 feet in BMR 8 has ribbing like that of one from the Dumbardo Siltstone near Moogooree Homestead (Condon, 1960). This tends to confirm the Sakmarian age of the Austin Formation, previously included in the Sakmarian Stage because of its conformity with the Sakmarian Dumbardo Siltstone and its strong unconformity on Lower Carboniferous and older rocks.

The Coyango Greywacke (Condon, 1960) is the formation of quartz greywacke with minor boulder beds and siltstone beds and members conformable between the Austin Formation below and the Dumbardo Siltstone above. On the Glenburgh sheet it is identified between the north margin of the sheet and the Gascoyne River, in the embayment 3 to 6 miles east of Coordewandy Homestead, 4 to 5 miles north-east of Mt. Madeline and at Earilier Hill.

It probably approaches the surface in the Wooramel River embayment but its outcrop is hidden by strongly developed laterite.

In the Wyndham River area the Coyango Greywacke is truncated by a depositional unconformity developed at a line: only about 500 feet of the lower part of the formation is exposed. In the Daurie Creek embayment the Coyango Greywacke is unconformable on a surface of strong relief on the Precambrian schist and gneiss: only 320 feet of the upper part of the formation is exposed. North-east of Mt. Madeline about 1,200 feet of pebbly quartz greywacke with boulder beds and thin tillitic siltstone beds rests unconformably on Precambrian schist and gneiss and is overlain unconformably by Monument Formation, Keogh Formation and Madeline Formation. This was mapped by Konecki, Dickins and Quinlan (1958, Plate 2) as Monument Formation, but I re-examined it in 1959. Earilier Hill is formed of silicified quartzwacke with thin beds of tillitic siltstone and thin boulder beds. The exposed thickness in Earilier Hill is about 2,500 feet: this thickness predominantly of quartz greywacke, and the stratigraphic position low in the Lyons Group identify this sequence as Coyango Greywacke.

No fossils have been found in the Coyango Greywacke on Glenburgh sheet but as part of the Lyons Group it is Sakmarian in age.

The Dumbardo Siltstone (Condon, 1960) consists dominantly of tillitic siltstone with tillitic boulder beds, conformable between the Coyango Greywacke and the Koomberan Greywacke. On the Glenburgh sheet it crops out in a small area on the northern margin south of the Arthur River, and  $\frac{3}{4}$  mile to  $5\frac{1}{2}$  miles east of Coordewandy Homestone where it is 1,300 to 1,600 feet thick: it rests conformably on Coyango Greywacke and unconformably on Precambrian schist and gneiss and is conformably overlain by Koomberan Greywacke. Elsewhere on the sheet its outcrop is masked by laterite or Quaternary deposits.

No fossils have been found in the Dumbardo Siltstone on this sheet but its age is established by marine fossils farther north in the Carnarvon Basin as Sakmarian.

The Koomberan Greywacke (Condon, 1960) consists mainly of quartz greywacke with several tillitic boulder beds and few siltstone beds. It is conformable between the Dumbardo Siltstone and Mundarie Siltstone. On the Glenburgh sheet it crops out near the north-western corner in a belt about 4 miles long between the Arthur and Wyndham Rivers, and in another belt from the northern sheet margin to the Gascoyne River: in this belt it is 650 feet thick. In a north-trending belt  $\frac{1}{2}$  mile east of Coordewandy Homestead the Koomberan Greywacke is 185 feet thick. It may crop out in **Bilung** Creek downstream from **Bilung** Pool but its identity there is not certain. Farther south laterite covers the area where it might crop out.

No fossils have been found in the Koomberan Greywacke on this sheet but by its position in the Lyons Group it is Sakmarian in age.

The Mundarie Siltstone (Condon, 1960) is the formation of tillitic siltstone with tillitic boulder beds conformable between the Koomberan Greywacke below and the Thambrong Formation above. On this sheet it crops out south-eastward from the north-west corner to the Wyndham River; in this belt it is about 530 feet thick. In another outcrop belt from the north edge of the sheet across the Wyndham River to the Gascoyne River the Mundarie Siltstone is 500 feet thick. At the south end of this outcrop belt the Mundarie Siltstone is truncated and unconformably overlain by the Callytharra Formation. In the north-south belt passing Coordewandy Homestead the Mundarie Siltstone is 430 feet thick; it includes 110 feet of varved siltstone/shale and siltstone/sandstone in the middle part of the formation. The Mundarie Siltstone crops out in the valley of the Wooramel River and Bilung Creek, where it is 580 feet thick including a varved member 60 feet thick. Farther south the Mundarie Siltstone does

not crop out because of the thick laterite.

No fossils have been found in the Mundarie Siltstone on the Glenburgh sheet. By reference to the fossils in the Mundarie Siltstone on the Kennedy Range sheet, its age is Sakmarian.

The Thambrong Formation (Condon, 1960) consists of alternating members of quartz greywacke and tillitic siltstone with minor **varved** sediments and tillitic boulder beds. It rests unconformably between the Mundarie Siltstone and the Weedarra Shale and is commonly overlain unconformably by the Callytharra Formation. On this sheet the Thambrong Formation crops out in the north-western corner, between the Arthur River and Wyndham River: there it is 360 feet thick and unconformably overlain by the Callytharra. Six miles to the east, another outcrop belt crosses the Wyndham River - the Thambrong is 800 feet thick; at the south end it is truncated by an unconformity, with the Callytharra Formation above. In a north-trending belt  $\frac{1}{4}$  mile to  $1\frac{1}{2}$  miles west of Coordewandy Homestead the Thambrong Formation is overlain unconformably by the Callytharra Formation; it is 690 feet thick. In the valleys of Bilung Creek and Wooramel River it is 400 feet thick and overlain unconformably by the Carrandibby Formation. It does not outcrop south of the Wooramel River: deep laterite masks the area where it might be expected.

No fossils have been found in the Thambrong Formation on this sheet but it is Sakmarian in age by reference to fossils found farther north.

The Weedarra Shale (Condon, 1960) consists of sandy shale, tillitic siltstone and tillitic boulder beds with a quartz greywacke member in the middle part of the formation. It rests conformably on the Thambrong Formation and is unconformably overlain by the Carrandibby Formation or Callytharra Formation.

On this sheet it crops out in a belt crossing the Wyndham River. At the north end it rests unconformably on Mundarie

Siltstone and Thambrong Formation and at the south end is truncated by the unconformity beneath the Callytharra Formation: its maximum thickness in this area is 850 feet. It does not crop out south of the Gascoyne River but was penetrated for 894 feet in Bore BMR9 (Daurie Creek) from 1,405 feet to total depth (2,299 feet).

No fossils have been found in the Weedarra Shale on this sheet. By reference to the fossiliferous Weedarra Shale farther north in the Carnarvon Basin its age is Sakmarian.

Raggatt (1936, p.105, 110) used the name "Gascoyne Series" for the Permian sequence above the "Lyons Series" in the Carnarvon Basin. He ignored Maitland's use of the name (1900) for the whole Permian sequence. As Raggatt's sequence is broken by an unconformity and several disconformities it cannot be named as a rock unit.

#### Sakmarian or Artinskian

The Carrandibby Formation (Konecki, Condon, Dickins and Quinlan, in McWhae et al. 1958, p.72) consists of shale, calcilutite and sandstone. It is unconformable on the Lyons Group and overlain, possibly disconformably, by the Callytharra Formation. The type locality is on the Wooramel River just west of the west margin of the Glenburgh sheet.

It crops out on the south side of the Wooramel River 1,000 yards north-east of Callytharra Spring: it is only 25 feet thick. In small outcrop  $\frac{3}{4}$  mile north of Gap Pool, Wooramel River, the Carrandibby Formation is 33 feet thick. In Bore BMR8 (Mt. Madeline) the Carrandibby Formation is 320 feet thick (1,485 to 1,805 feet depth) and in BMR9 (Daurie Creek) it is 315 feet thick (1,090 to 1,405 feet depth). In BMR8 it overlies the Austin Formation and in BMR9 the Weedarra Shale.

Few fossils have been found in the Carrandibby Formation on this sheet except in the bores. The fauna so far determined in the type locality includes a few species at present

restricted to the Carrandibby Formation:-

Astartila? obscura Dickins, Pachymyonia occidentalis Dickins and Leiopteria? carrandibbiensis Dickins; some range downwards into the Lyons Groups:- Eurydesma playfordi Dickins, Deltopecten lyonsensis Dickins, Aviculopecten tenuicollis (Dana), Keoneia carnarvonensis Dickins, Peruvispira umariensis (Reed) and Trigonotreta sp. nov.; some range upwards into higher formations:- Nuculana darwini (de Koninck) and Stutchburia variabilis Dickins. The fauna is transitional between the Sakmarian Lyons Group and the Artinskian Callytharra Formation. Dickins and Thomas (1960) incorrectly include the Carrandibby Formation in the Lyons Group and do not discuss its fauna or age separately. A larger number of species ranges down into the Lyons Group than up into the Callytharra Formation but this may be in part controlled by environment: the Lyons Group and Carrandibby Formation faunas are dominated by molluscs which are a minor part of the Callytharra fauna. There is a very large unconformity between the Lyons Group and Carrandibby Formation; there is a sharp change in lithology between the Carrandibby and Callytharra Formations and, in Bilung Creek, some suggestion of a disconformity. At present the evidence is insufficient to decide whether the Carrandibby Formation should be referred to the Sakmarian or Artinskian Stage. Because of the nature of its two boundaries it is more likely to be close in age to the Callytharra Formation than to the Lyons Group and therefore is referred to as possibly Artinskian in age.

#### Artinskian

Fairbridge (1953, p.vll/13) "restricted" Maitland's (1900) and Raggatt's (1936) use of the name Gascoyne to a "Gascoyne Group" consisting of the Callytharra Formation and the present Wooramel Group. This is invalid as there is an unconformity in this sequence.

The Callytharra Formation (Condit, 1935; Condon, 1954;

1960) consists of fossiliferous hard and friable sandy and silty calcarenite and calcilutite, siltstone and quartz greywacke overlying the Carrandibby Formation probably disconformably or formations of the Lyons Group and Precambrian schist unconformably and overlain unconformably by formations of the Wooramel Group. The type locality on the south bank of Wooramel River  $\frac{1}{2}$  mile west of Callytharra Spring is on the western margin of the sheet. The Callytharra Formation crops out in the following areas on Glenburgh sheet: from near the north-west corner of the sheet south-east to the Gascoyne River; westward along the north side of that river and across the river at Pells Creek in the north end of Pells Range. In this area the Callytharra Formation is unconformable on a truncated surface of Lyons Group formations and is overlain unconformably by Moogooloo Sandstone; it is 150 to 200 feet thick. At the north margin of the sheet, north of the Wyndham River, an outlier of Callytharra Formation 210 feet thick is unconformable between Lyons Group and Moogooloo Sandstone. South of the Gascoyne River between Daurie Creek and Congo Creek is an outcrop belt of Callytharra Formation; interrupted in places by Quaternary deposits: this ends at an unconformity. The outcrop is offset southward to the east of the unconformity and extends eastward for about 4 miles. In both of these outcrop belts the Callytharra rests unconformably on Lyons Group and is unconformably overlain by Moogooloo Sandstone. The Callytharra Formation outcrops around the north, west and south sides of the Bush Creek syncline, unconformable between the Congo Formation above and the Lyons Group below; it is 85 feet thick three miles east of Dairy Creek Homestead. On the east side of Bush Creek syncline the Callytharra Formation appears as steeply dipping lenses between the Precambrian schist and the Congo Formation. South of Congo Creek there are two outcrop belts around the north end of two synclines. The western one ends four miles south at an unconformity, the eastern one continues to 3 miles south-west of Coordewandy Homestead

where it is masked by laterite. West of Coordewandy in this belt the Callytharra is 235 feet thick, unconformable on Thambrong Formation and unconformably overlain by Monument Formation. In the area north and south of the Wooramel River near the junction with Bilung Creek the Callytharra is 200 feet thick, probably disconformably overlying the Carrandibby Formation and disconformably overlain by Monument Formation. Near Plant Well on Daurie Creek a poorly exposed area of Callytharra Formation with some structure complications continues into a western narrow belt and a wider eastern belt on the flanks of the Plant Well syncline. The Callytharra is unconformable on Lyons Group and Precambrian schist, disconformably overlain by Monument Formation, and in the eastern belt is about 180 feet thick. East of this, the Callytharra crops out at the north end of a small syncline. Small lenses of Callytharra Formation, unconformable on Precambrian schist and unconformably overlain by Wooramel Group or Madeline Formation, crop out 5 to 7 miles north-east of Mt. Madeline. One and a half miles north-west of Gap Pool, Wooramel River, the Callytharra rests conformably on Carrandibby Formation and is disconformably overlain by Nunnery Sandstone; it is 380 feet thick. There are two small lenses, steeply dipping, between Lyons Group or Carrandibby Formation and Nunnery Sandstone on the south side of Wooramel River between Nunnery Pool and the mouth of One Gum Creek. Lateral equivalents of the Callytharra Formation have been penetrated in BMR8 Bore (1,110 to 1,485 feet depth), BMR9 Bore (825 to 1,090 feet depth) and Deep Bore (1,236 to 1,956 feet depth, approximately); in all three bores the lateral equivalent is finer grained than the Callytharra Formation and more carbonaceous.

The Callytharra Formation is richly fossiliferous including many species of foraminifera (Crespin, 1958), bryozoa (Crockford, 1944a and b), corals (Hill, 1937, 1942, 1957), crinoids (Teichert, 1949), blastoids, brachiopods (productids (Coleman, 1957), orthotetids (Thomas, 1958), spiriferids, etc.), pelecypods,

gastropods, nautiloids (Teichert, 1951, p.83); and an ammonoid (Thomas and Dickins, 1954). Algae and Gangamopteris (Teichert, 1942) are also present.

The ammonoid, brachiopods and pelocypods have strong affinities with those of the Artinskian Lower Productus Limestone of the Salt Range, India and Bitauuni Beds of Timor. A minor element of the fauna ranges down into the Sakmarian. The age of the Callytharra Formation is low in the Artinskian.

The Wooramel Group (Condit, 1935; Konecki, Condon, Dickins and Quinlan, 1958, p.72) consists in the type locality of the Nunnery Sandstone (at base), One Gum Formation and Keogh Formation. It rests unconformably on the Callytharra Formation and is conformably overlain by the Madeline Formation of the Byro Group. Elsewhere on the Glenburgh sheet the Wooramel Group includes as lateral variants of the type formations the Monument Formation, Congo Formation, Moogooloo Sandstone and Billidee Formation.

The Nunnery Sandstone (Konecki, Condon, Dickins and Quinlan, 1958, p.72) is the formation predominantly of quartz sandstone unconformable on the Callytharra Formation and conformably overlain by One Gum Formation. The type section 545 feet thick is three miles north-east of Nunnery Pool, Wooramel River. It is known only in the area 8 miles downstream from Gap Pool, Wooramel River, and in Bore BMR8, Mt. Madeline, where it is 580 feet thick (530 to 1,110 feet depth). It contains no fossils but its age is determined as Artinskian by its position between the Artinskian Callytharra and Madeline Formations.

The One Gum Formation (Konecki, Condon, Dickins and Quinlan, 1958, p.73) consists of quartz greywacke, quartz sandstone and minor conglomerate and siltstone. In the type section 5 miles east-north-east of the mouth of One Gum Creek the formation is 180 feet thick; four miles west of that section it is 135 feet thick. It is known only to the south of the Nunnery Sandstone outcrop, in Bore BMR8, where it is

235 feet thick (235 to 470 feet depth), in the Daurie Creek area where it is 45 feet thick, and in Bore BMR9 Daurie Creek where it is 75 feet thick (390 to 465 feet depth). Marine fossils have been found in the basal siltstone member at several localities; they include hexagenellidae, fenestellids, polyporids, Strophalosia sp., Neospirifer sp., Cleiothyridina sp., Pseudo-syrinx sp., Permorthotetes sp., and Deltopecten sp. Plant stems are found in a siltstone bed about the middle of the formation. The fauna has closer relationships to that of the Callytharra Formation than the Madeline Formation. The age of the One Gum Formation is Artinskian.

In Bore BMR8 the basal siltstone member is absent and coaly shale beds take the place of siltstone higher in the formation. Between the One Gum Formation and the Nunnery Sandstone is 60 feet of fossiliferous calcarenite not observed in outcrop on this sheet. It is almost certainly the equivalent of the calcareous formation between the Moogooloo Sandstone and Billidee Formation, 9½ miles west of Jimba Jimba Homestead (Wooramel 4-mile sheet).

The Keogh Formation (Ke necki, Condon, Dickins and Quinlan, 1958, p.73) consists of interlaminated fine-grained quartz greywacke and siltstone with few thin beds of coarse quartz greywacke. It is 145 feet thick in the type locality 2½ miles east of Nunnery Pool, Wooramel River. The outcrop continues from there southward to the south margin of the sheet and northward beyond the Wooramel River. Keogh Formation crops out 1½ and 4 miles north-east of Gap Pool, Wooramel River, around Mt. Madeline where in outcrop and Bore BMR8 it is 240 feet thick (surface to 235 feet depth), and 3½ and 8 to 10 miles north-east of Mt. Madeline. In these outcrops the Keogh Formation rests conformably on Monument Formation or unconformably on Precambrian schist and is conformably overlain by Madeline Formation. It overlies Monument Formation in the Plant Well syncline and One Gum Formation in Monument Syncline. In outcrop there it is

110 feet thick but in Bore BMR9 in the axial part of the syncline it is absent having changed laterally into siltstone. It outcrops on the eastern flank of the Bogadi Syncline from the Wooramel River to the south margin of the sheet; at Wooramel River it is about 200 feet thick.

The Keogh Formation contains Glossopteris sp. and many invertebrate burrows and trails. In a few places marine fossils are found near the top; they include Astartila blatchfordi (Hosking), Pracundulomya cf. concentrica Dickins, Aviculopecten sp. ind., ?Atomodesma mytiloides Beyrich (Dickins, 1956). The Keogh Formation is Artinskian because of its position between the Callytharra and Madeline Formations.

The Monument Formation (Konecki, Dickins and Quinlan, 1958) is the dominantly arenaceous formation unconformably overlying the Callytharra Formation and overlain conformably by the One Gum Formation or Keogh Formation. It is the lateral equivalent of the Nunnery Sandstone and all or part of the One Gum Formation. In the type locality in Daurie Creek it is 400 feet thick, in Bore BMR9 Daurie Creek it is 360 feet thick, between One Gum Formation and Callytharra equivalent. It crops out in Daurie Syncline (700 feet thick on northern end, 400 feet thick on eastern flank) in the Monument Syncline (310 to 490 feet thick on eastern flank), in Plant Well syncline, in the Wooramel River  $1\frac{1}{2}$  miles downstream from the mouth of Bilung Creek (270 feet thick), and 4 and 5 miles north-east and 6 miles south-west of Mt. Madeline. No marine fossils have been found in the formation; invertebrate trails and burrows and plant stems are fairly common.

The age of the Monument Formation, determined by its position between the Artinskian Callytharra and Madeline Formations, is Artinskian.

The Congo Formation (Konecki, Dickins and Quinlan, 1958, p. 37) consists of quartz greywacke, thin beds of conglomerate and thin to thick beds of siltstone. It is unconformable on the

Callytharra Formation, Lyons Group or Precambrian schist; it is conformably overlain by the Madeline Formation. It crops out only in the Bush Creek syncline and is 175 feet to 200 feet thick. Fossil wood has been found in several places and marine fossils in four localities: forms include fenestellid bryozoa, brachiopods, pelecypods, gastropods, and a nautiloid. The species have not been determined but the assemblage and the lithology of the fossil bed at the top of the formation are very like the bed at the top of the Billidee Formation (Condon, 1960). Because of its position between the Callytharra and Madeline Formations the Congo Formation is Artinskian in age. It is a stratigraphic equivalent of the Monument and Keogh Formations and of the Moogooloo Sandstone and Billidee Formation.

The Moogooloo Sandstone (Craig, 1950; Condon, 1958) is the formation consisting predominantly of medium grained quartz sandstone resting unconformably on the Callytharra Formation and conformably below the Billidee Formation.

The Moogooloo Sandstone is the unit incorrectly called "Wooramel Sandstone" by Raggatt (1936) and Condon (1954).

On the Glenburgh sheet it crops out southward from the northern margin near the north-west corner where it is unconformable on Callytharra Formation and Koomberan Greywacke and overlain by Billidee Formation; it is 85 feet thick. The Moogooloo Sandstone crops out in the area between Wyndham River and Gascoyne River; it rests unconformably on a rock-stack surface of the Callytharra Formation with local relief of about 50 feet and is overlain by Billidee Formation; it is 70 to 120 feet thick. In the area between Bush Creek and Daurie Creek south of Red Hill the Moogooloo Sandstone is 80 to 100 feet thick.

No fossils have been found in the Moogooloo Sandstone on the Glenburgh sheet. Its stratigraphic position between the Artinskian Callytharra and Newman Formations fixes its age as Artinskian. Konecki, Dickins and Quinlan (1958, pp.31 and 34).

regard the Moogooloo Sandstone as being equivalent to both the Nunnery Sandstone and One Gum Formation or to the Monument Formation, but I consider, on the basis of comparison of siltstone members in the Wooramel Group, that the Moogooloo Sandstone is the equivalent of the Nunnery Sandstone.

The Billidee Formation (Condon, 1960) consists of quartz greywacke (calcareous in places) with beds and members of siltstone, conformable between the Moogooloo Sandstone below and Newman Formation above. On the Glenburgh sheet it crops out only in the north-western part of the sheet. Near the north margin the Billidee Formation crops out in a syncline; it is 250 feet thick. Between the Wyndham and Gascoyne Rivers the Billidee is about 200 to 300 feet thick: the upper boundary is not well exposed. The lower part only of the Billidee Formation, with a maximum thickness of about 150 feet, is exposed in the area east and south of Congo Well on Congo Creek.

Marine fossils (brachiopods and pelecypods) and fossil wood have been found in the northern outcrop and fossil wood between Wyndham River and Gascoyne River.

The age of the Billidee Formation, based on the Artinskian age of the Callytharra Formation and Newman Formation, is Artinskian.

The Billidee Formation is the equivalent in the Bidgenia Basin of the One Gum and Keogh Formations of the Byro Basin.

The Byro Group (Condit, 1935, p.870; Konecki, Dickins and Quinlan, 1958, p.43) is the sequence of siltstone, shale and quartz greywacke that, in the type locality, rests on and grades laterally into the Wooramel Group and consists of the Madeline Formation (at base), Bogadi Greywacke and Warrawarringa Formation. Raggatt (1936) and Condon (1954) included the whole sequence between the Wooramel Group and Kennedy Group in the Byro Group. Condon (1960) restricted the Byro Group to the

sequence of the type locality and its equivalents. The Byro Group contains many fossils which establish its Artinskian age.

The Madeline Formation (Konecki, Condon, Dickins and Quinlan, 1958, p.73) consists of carbonaceous siltstone and fine-grained quartz greywacke, calcareous in places. It is conformable between the Keogh Formation and Bogadi Greywacke and in places grades laterally into the Keogh Formation and the One Gum Formation.

In the type locality west of Madeline Creek the Madeline Formation is 395 feet thick. It has a lower part of siltstone shale and evaporites and an upper part of interbedded quartz greywacke and siltstone. The outcrop of the Madeline Formation extends from the north part of the Dauric and Monument Synclines to the south margin of the sheet. There is also an area of outcrop in the Bush Creek syncline, where the Madeline Formation is 110 feet thick. In the Dauric Syncline it is 160 feet thick. On Dauric Creek, in the Monument Syncline, the Madeline Formation is 285 feet thick; the lower part is a lateral variant of the Keogh Formation. In Bore BMR9, Dauric Creek, the Madeline Formation is 320 feet thick (70 to 390 feet depth). At the Wooramel River 3 miles northward from Dilba Bore the Madeline is about 280 feet thick and east-south-east of Bogadi outcamp it is about 500 feet thick. No thickness could be obtained in the south-western part of the Bogadi Syncline because of poor outcrop and irregular structure.

Fossils are common in the Madeline Formation including foraminifera, bryozoa, crinoids (Calceolispongia), brachiopods - Neospirifer spp., Linoproductus (Cancrinella) sp., Strophalosia prideri Coleman, Permorthotetes sp., Aulosteges ingens Hosking, Kiangsiella condoni Thomas, Pseudosyrinx sp., "Chonetes" spp., Cleiothyridina sp., "Martiniopsis" sp., Streptorhynchus sp. "Dielasma" sp. - pelecypods - Astartila blatchfordi (Hosking), Glyptoleda sp., Aviculopecten cf. subquinquelineatus (McCoy),

Pseudomyalina sp., Praeundulomya concentrica Dickins,  
Atomodesma mytiloides Beyrich, Streblochondria sp., Chaenomya sp.,  
Heteropecten sp., Stutchburia sp., and Schizodus sp. -  
gastropods Baylea? sp., Mourlonia? sp., Ptychomphalina maitlandi  
Etheridge, Stachella? sp., Warthia sp., Macrocheilus? sp.,  
Bellerophon sp. - nautiloids, Conularia sp., and Glossopteris sp.  
and Equisetales stems (Dickins, 1956). The age of the  
Madeline Formation based on the affinities of the brachiopods  
and pelecypods with those of the Artinskian Lower Productus  
Limestone of the Salt Range, India and Bitauni Beds of Timor  
is Artinskian. The faunal assemblage has sufficient specific  
differences clearly to distinguish it from the Callytharra  
assemblage and from the Wandagee-Cundlego assemblage of the  
Merlinleigh Basin.

The Madeline Formation correlates with all or part of the  
Newman Formation and perhaps with the lower part of the Mallens  
Greywacke (Konecki, Dickins and Quinlan, 1958, p.46).

The Newman Formation (Condon, 1960) consists of  
fossiliferous siltstone and fine-grained quartz greywacke both  
calcareous in places, conformable between the Billidee Formation  
and the Mallens Greywacke. It is the upper part of the sequence  
formerly called Coyrie Formation (Condon, 1954).

On the Glenburgh Sheet it crops out only in the area  
between Wyndham and Gascoyne Rivers, where it is about 700 feet  
thick. In that area two beds low in the formation contain  
marine fossils (bryozoa, Calceolispongia sp., Neospirifer sp.,  
Aulosteges sp., Strophalosia sp. and pelecypods).

The age of the Newman Formation, based on the affinities  
of its brachiopods and pelecypods, is Artinskian. It correlates  
with the Madeline Formation of the Byro Basin.

The Bogadi Greywacke (Konecki, Condon, Dickins and  
Quinlan, 1958, p.74) is the formation, consisting predominantly  
of fine- to medium-grained quartz greywacke with few calcareous

beds and few beds of carbonaceous siltstone, conformable between the Madeline Formation below and the Warrawarringa Formation above. It crops out as an outlier in the Bush Creek Syncline, where it is 240 feet thick with an erosion surface at the top. Outliers in the Daurie Syncline have a maximum thickness, up to the erosion surface, of about 50 feet. In the Monument Syncline the maximum thickness, eroded, is about 200 feet. The main outcrop area is in the Bogadi Syncline for 8 miles east-north-east of Mt. Madeline around both flanks to 3 miles south-south-west of Bogadi outcamp. This outcamp includes the type section in Madeline Creek and Wooramel River where the Bogadi Greywacke is 200 feet thick. On the northern plunge the thickness is about 300 feet  $\pm$  50 feet (exposures are poor and dip determination difficult). On the north east flank the Bogadi Greywacke is 120 feet thick, on the north-west flank 350 feet. It is 300 feet thick on the south western flank, 250 feet thick on the southern plunge and 200 feet at Bogadi Outcamp.

Marine fossils are found sporadically; Neospirifer sp. is most abundant; Conularia sp., pectinids, gastropods and fish remains are rare; abundant conical mounds with festoon striations are probably worm burrows. The few species are similar to those found in the Madeline Formation. The Bogadi Greywacke is Artinskian in age because of its faunal similarity to the Madeline. It may possibly correlate with the Mallens Greywacke (Condon, 1954) of the Merlinleigh Basin, although there is a possibility also that it is equivalent to part of the Newman Formation (Condon, 1960).

The Warrawarringa Formation (Konecki, Condon, Dickins and Quinlan, 1958, p.74) consists of siltstone, shale and fine-grained quartz greywacke, conformable on the Bogadi Greywacke. The top of the formation is an erosion surface. The Warrawarringa Formation crops out only in the central part

of the Bogadi Syncline, from the Wooramel River to 1 mile south-west of Bogadi Outcamp. Exposures generally are poor and reliable dips hard to determine; therefore reliable thickness measurements have not been obtained. The thickness of the type section (120 feet) is almost certainly less than the maximum thickness as younger beds occur farther north.

A few marine fossils, including foraminifera, bryozoa, pelocypods and gastropods, have been found but not described. As there is no break in sedimentation between the Madeline Formation and the Warrawarringa Formation the latter is almost certainly Artinskian. It possibly may be correlated with the Bulgadoo Shale of the Merlinleigh Basin although there is some possibility that it correlates with the upper part of the Newman Formation.

#### MESOZOIC

No Mesozoic rocks crop out in the Glenburgh sheet.

#### TERTIARY

##### ?Eocene

The Pindilya Formation (Konecki, Condon, Dickins and Quinlan, 1958, p.130) consists of quartz greywacke, siltstone and conglomerate overlying Permian formations unconformably and has a lateritized erosion surface at its top. Its thickness varies depending on the relief of the basal unconformity; the greatest measured thickness (90 feet) is in the type locality two miles south-west of Callytharra Spring. No fossils have been found in the formation but chalcidonic fossils found loose on the surface of the One Gum Formation not far from a mesa capped by Pindilya Formation are of the same preservation and similar type to fossils found in the Eocene Merlinleigh Sandstone of the Merlinleigh Basin. On this basis the Pindilya Formation probably correlates with the Merlinleigh Sandstone and is Eocene in age.

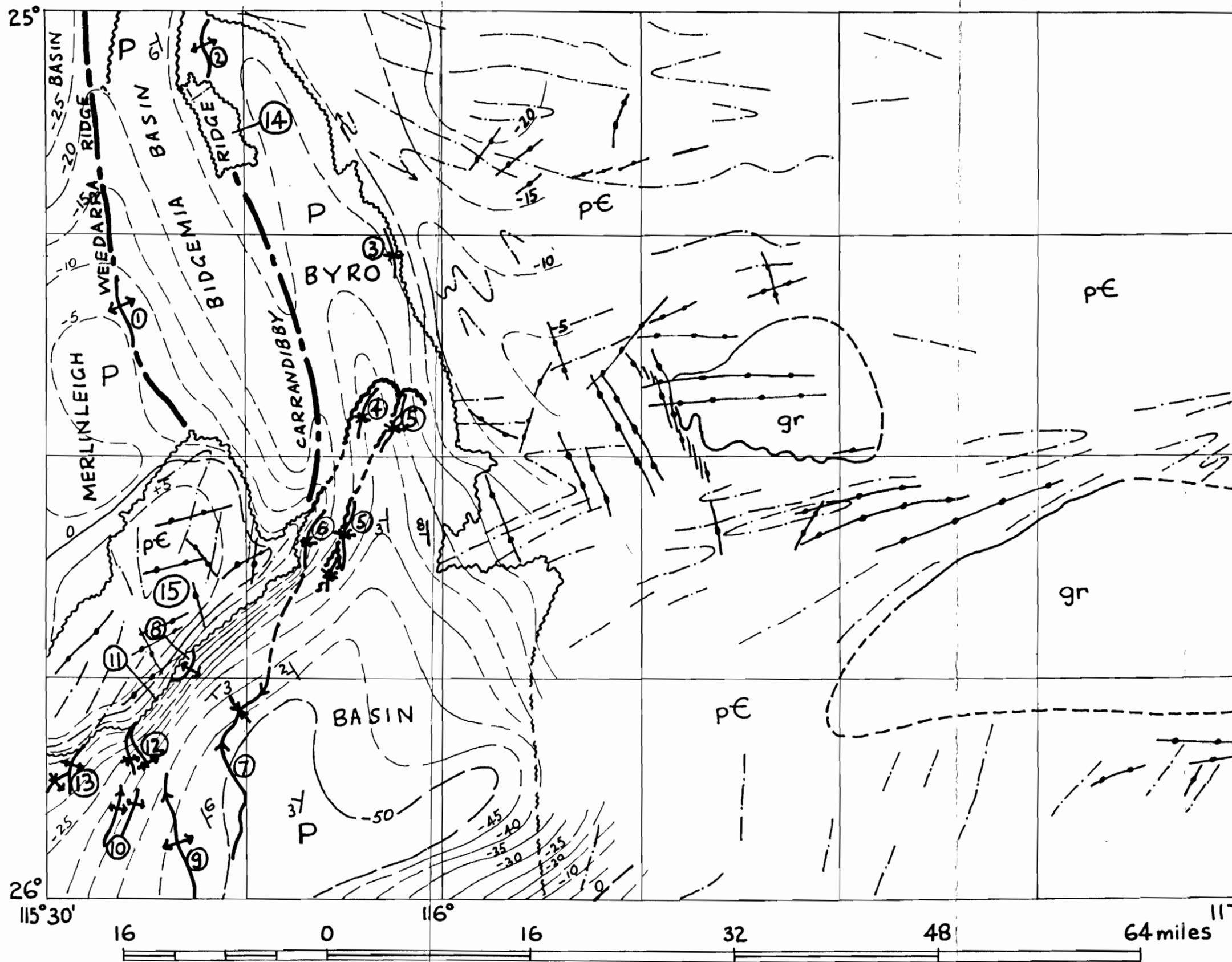
### Upper Tertiary

Laterite profiles are developed over Precambrian schist, gneiss and basic dykes, Permian and ?Eocene sediments. On Glenburgh sheet the laterite is in process of dissection and all stages in the dissection are evident. The undissected laterite covers large areas of the eastern part of the sheet and is commonly covered by lateritic red soil (Tus); its surface is gently undulating but has a major relief of about 300 feet from the drainage divide to the bed of the Wooramel River and the alluvium of the Gascoyne River. In the upper reaches of the Wooramel River the stream has not cut through the laterite and a continuous unbroken laterite surface extends from the valley floor over the drainage divide. In the area between Congo Creek and the western south margin of the sheet, the laterite is dissected or entirely removed. In places siliceous "billy" is developed near the top of the laterite profile and forms resistant mesa caps and, on dissection, rough gibber plains.

There are several small outcrops of lacustrine sediments of the Nadarra Formation (Condon, 1958, p.129) between Dalgety Brook and Daurie Creek. White or pale green chalcedonic limestone with sandstone containing detrital laterite pisolites at the base is found in hollows in the laterite surface. It obviously post-dates the main development of the laterite profile but the lime and silica of this formation may have been derived from ground water leaching the laterite profile, perhaps at a late stage in its development. No fossils have been found in the Nadarra Formation but as it is dissected by post lateritic erosion it is probably older than Quaternary.

### QUATERNARY

High level terraces of river deposits along the valleys of some of the larger rivers are referred to the Joolabroo Formation (Condon, 1954). As well as the areas shown, there



## REFERENCE

- Basement Ridge
- Unconformity
- Anticline
- Syncline
- Regional Dip
- Monocline
- Trend in Precambrian
- Dyke
- Bouguer Gravity Anomaly contour - interval 5mgal: adapted from B.M.R. drawing G 98-20 (unpubl.).

## STRUCTURES

- 1 Pells Creek Anticline
- 2 Wyndham River Anticline
- 3 Bush Creek Syncline
- 4 Daurie Syncline
- 5 Monument Syncline
- 6 Plant Well Syncline
- 7 Bogadi Syncline
- 8 Madeline Anticline
- 9 Ballythanna Hill Anticline
- 10 One Gum Creek Anticlines
- 11 Madeline "Fault"
- 12 Cap Pool Monoclines
- 13 Callytharra Spring Monoclines
- 14 Minginoo Inlier
- 15 Carrandibby Range Inlier



are narrow but thick deposits in the gorge of the Wooramel River near Pandara Pool and in Nyarra Creek.

In areas where the lateritic soil had a large sand content, the sand has been wind-blown into long dunes, probably during an arid period in the Pleistocene. This wind-blown sand is regarded as Pleistocene (Qps) although it originated in the upper part of the laterite profile.

Recent deposits, related to the present climate and drainage system, include alluvium (Qra) in the valley floors, wash (Qrw) - a thin layer of sand and gravel overlying bedrock, sand (Qrs) from the weathering of sandy formations and scree (Qrb) from the dissection of duricrust.

#### STRUCTURE

The main structural elements of the Glenburgh sheet and the Bouguer gravity anomaly contours from a Bureau of Mineral Resources unpublished map No. G.98-38 are shown in Figure I.

The Precambrian schist trends generally east-west except in the Carrandibby Fange, south from Mt. Dalgety and south of Wooramel River where the trend is northward. Folds are apparent in several places and probably are more plentiful than shown. Major faulting is suggested in several places by displacement of trends or by sharp divergence in trend. Granite intrudes the schist in the central part of the sheet: the granite margin transgresses the trends of the schist but the trends continue into the granite suggesting "granitization" or lit-par-lit intrusion. Dykes of basic rock have two main trends - east and south-east and a minor, north-east, trend. The margin of the Carnarvon Basin appear to be controlled more by these trends than by the structure of the schist.

Parts of three basins - Merlinleigh, Bidgemia and Byro - and their separating basement ridges - Weedarra and Carrandibby -

Ridges - are included on the Glenburgh sheet.

Sediments of the Lyons Group are anticlinal over the Weedarra Ridge between Gascoyne River and Carrandibby Range and over the Carrandibby Ridge north of the Gascoyne River.

Anticlines in Permian sediments include the Madeline and Ballythanna Hill Anticlines (Konecki, Dickins and Quinlan, 1958, p.66-68); the Ballythanna Hill Anticline extends much farther north than shown by Konecki et al. (Plate 2) to about two miles south of the Wooramel River. There are two small asymmetrical north-plunging anticlines 5 and 6 miles east-south-east of Callytharra Spring and gentle undulations including small anticlines in the Bogadi Greywacke in Wooramel River near Middle Camp.

The Permian sediments form synclines in the area north of the Gascoyne River as well as those named by Konecki, Dickins and Quinlan (1958, p.67). It is very likely that the Plant Well and Bogadi Synclines are one.

The nature of many of the linear stratigraphic and structural discontinuities is in doubt. Condon (1956) considers almost all of them unconformities whereas Konecki et al. (1958) regard most of them as faults. Bore BMR8, Mt. Madeline was drilled 3,600 feet east of the outcrop contact of Permian sediments with the Precambrian schist to total depth 3,004 feet without reaching the schist: the contact therefore has an average slope at this place steeper than 40°.

## ECONOMIC GEOLOGY

### Water

The only mineral of economic importance produced on the Glenburgh sheet is underground water for sheep and cattle. Ground water is contained in the more permeable Permian formations in the laterite, and in dykes and fracture zones

in the Precambrian schists. The Permian formations are Austin Formation (good to brackish, generally small supplies), Coyango Greywacke (good stock water, good to small supplies, e.g. Mums Bore, Coordewandy), Koomberan Greywacke (stock water, small supplies), Thambrong Formation (good stock water, fair to small supplies), sandstone member of Weedarra Shale (good water, good supplies, e.g. Bore BMR9). Nunnery Sandstone (good water and supply, e.g. Bore BMR8), Monument Formation (good stock water, small supply; e.g. Monument Bore, Bogadi Bore), Moogooloo Sandstone (good water and supply, e.g. Congo Well).

The following rocks and minerals of possible future economic significance have been found: limestone (for road surfacing, concrete aggregate, cement and lime manufacture, agricultural lime) in the Callytharra Formation and Nadarra Formation; gypsum and possibly other evaporites in the basal part of the Madeline Formation  $2\frac{1}{2}$  miles north-east of Gap Pool, Wooramel River; shale (for brick-making, portland cement manufacture) in the Dumbarco Siltstone, Mundarie Siltstone, Madeline Formation and Warrawarringa Formation.

The following have not been found in the area but geological evidence suggests that they may be found: Salts - the presence of outcropping evaporite gypsum at the base of the Madeline Formation and of salt efflorescence on the outcrop of Bogadi Greywacke suggests the possibility of evaporite salts in the Byro Group below the water table.

Petroleum - The Permian sequence has a thickness of about 10,000 feet and includes formations of both source-bed and reservoir type. Capped reservoir formations likely to be in contact with source bed formations include Koomberan Greywacke, Thambrong Formation, sandstone member in Weedarra Shale and Wooramel Group. One or more of these should be present in the Ballythanna Hill and Mt. Madeline Anticlines and the Weedarra Ridge Anticline. Stratigraphic traps may be formed against

abutment unconformities to the east of Carrandibby Range and along the eastern margin of the basin.

No metallic minerals have been reported from this area.

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TABLE I  
ROCK UNITS, GLENBURGH FOUR-MILE SHEET

AGE	GROUP	FORMATION AND MAP SYMBOL	LITHOLOGY	FOSSILS	THICKNESS (feet)	STRUCTURE	TOPOGRAPHY	ECONOMIC GEOLOGY (u - undeveloped; ? - not proved).	PRINCIPAL REFERENCES
RECENT		Alluvium (Qra)	Sand, silt, clay, gravel		to 20	Lenticular	Flats in valley floor	Shallow ground water	Konecki, Dickins & Quinlan, 1958.
		Wash (Qrw)	Sand, gravel		to 5	Sheet	Plain		
		Sand (Qrs)	Brown sand		to 10	<b>Residual</b>	<b>Hummocky plain</b>		
		Scree (Qrb)	Gravel, rubble, clay		to 20	Scarp slopes and base			
PLEISTOCENE		Joolabroo Fm.	Sand, silt, gravel		10-50	Lenticular	Terraces in valleys	Shallow ground water (u)	
		Sand (Qps)	Red aeolian sand		to 50		Self & braided dunes		
UPPER TERTIARY		Nadarra Fm. (Tun)	White chalcedonic limestone, sandstone with detrital laterite		10-30	Lenticular	Mesa or stream rock-bar	Road aggregate (u)	Condon, 1958 Konecki et al. 1958, p.57.
		Lateritic soil (Tus)	Red loamy soil		to 10	Sheet	Gently undulating		
		Billy (Tub) Laterite (Tul)	<b>Hard grey siliceous billy</b> Pisolitic ironstone and leached rock		to 6 10-200	Sheet Irregular sheet	Mesa cap Gently undulating, strongly dissected	Shallow ground water (u)	Condon 1954, p.133 Condon, 1954, p.131
EO-CENE		Pindilya Fm. (Tep)	Quartz greywacke, siltstone, conglomerate	Corals, bryozoa	10-90	Irregular sheet	Plain; scarp top; mesa top		Konecki et al. 1958, p.55
BYRO		Warra Warringa Fm. (Pap)	Siltstone, shale, fine-grained quartz greywacke	Few foraminifera, bryozoa, molluscs	to 200	Gentle syncline	Plain	Brick shale (u)	Konecki et al. 1958, p.48.
		Bogadi Greywacke (Paf)	Fine- to medium-grained quartz greywacke	<u>Neospirifer</u> , pectinids, worms	120-350	Synclines; low dips	Plain or mesa		Konecki et al. 1958, p.46.
		Madeline Fm. (Pal)	Fossiliferous siltstone & fine quartz greywacke, evaporite gypsum	Foraminifera, bryozoa, crinoids, brachiopods, molluscs, plants	110-500	Synclines; low dips; monoclines	Plain	Brick shale (u) ? Salts; ?Petroleum cap, ?Petroleum source	Konecki et al. 1958, p.43.
		Newman Fm. (Paj)	Fossiliferous siltstone & fine & medium quartz greywacke, some calcareous	Bryozoa, crinoids, brachiopods, pelecypods.	100	Gently dipping monocline	Plain	Brick shale (u)	Condon, 1960
ARTINSKIAN (PERMIAN)	WOORAMEL	Keogh Fm. (Pah)	Fine-grained quartz greywacke, siltstone, minor coarse quartz greywacke	Plants pelecypods	to 240	Synclines and anti-clines; low dips; monoclines	Dissected; mesas		Konecki et al. 1958, p.35
		One Gum Fm. (Pao)	Quartz greywacke, quartz <b>sandstone, siltstone</b> , minor conglomerate.	Plants, brachiopods, pectinids	45-235	Gentle homocline; monoclines	Dissected; mesas		Konecki et al. 1958, p.31.
		Nunnery Sandstone (Pay)	Quartz sandstone, minor conglomerate	Invertebrate trails	545-500	Gentle homocline; monoclines	Dissected; mesas	Potable water (u) ? Petroleum reservoir	Konecki et al. 1958, p.29.

AGE	GROUP	FORMATION AND MAP SYMBOL	LITHOLOGY	FOSSILS	THICKNESS (in feet)	STRUCTURE	TOPOGRAPHY	ECONOMIC GEOLOGY (u - undeveloped; ? - not proved).	PRINCIPAL REFERENCES
ARTINSKIAN (PERMIAN)	WOORAMEL (Cont'd)	Billidee Fm. (Pae)	Quartz greywacke (some calc.) & siltstone	Plants, brachiopods, pelecypods	150-300	Synclines & homoclines; low dips	Dissected; mesas		Condon, 1960
		Moogooloo Sandstone (Paw)	Quartz sandstone		70-120	Synclines & homoclines; low dips	Dissected; mesas	Potable water (u) ? Petroleum reservoir	Condon, 1958, p.66 Condon, 1960.
		Congo Fm. (Paz)	Quartz greywacke, siltstone, minor conglomerate	Plants, bryozoa, brachiopods, molluscs	to 200	Syncline	Dip slopes; dissected		Konecki et al. 1958, p.37.
		Monument Fm. (Pat)	Quartz greywacke, quartz sandstone, minor siltstone	Plants, invertebrate trails	270-700	Synclines & homoclines; low dips	Dissected; some mesas	Stock water ? Petroleum reservoir	Konecki et al. 1958, p.34.
		Callytharra Fm. (Pac)	Fossiliferous calcarenite, calcilutite, siltstone & fine quartz greywacke	Plants, foraminifera, bryozoa, crinoids, brachiopods, molluscs	to 380	Synclines and homoclines; low dips	Plains	Limestone (u) ? Petroleum source and cap	Konecki et al. 1958, p.23 Condit et al. 1936.
?		Carrandibby Fm. (P(a)a)	Shale, calcilutite and sandstone	Pelecypods, gastropods, brachiopods, foraminifera	to 320	Homoclines; low dip	Shallow dissection	Brick shale (u) ? Petroleum source	Konecki et al. 1958, p.22.
SARMATIAN (PERMIAN)	LYONS	Weedarra Shale (Psw)	Sandy shale, tillitic siltstone, boulder beds; quartz greywacke member		to 900	Synclines	Plain	Brick shale (u) ? Petroleum source Stock water in sandstone (u)	Condon, 1960.
		Thambrong Fm. (Pst)	Quartz greywacke & tillite siltstone; minor varves & boulder beds		360-300	Homoclines; low dip	Plain; low hills	Stock water (u)	Condon, 1960.
		Mundarie Siltstone (Psm)	Tillitic siltstone; boulder beds		430-580	Homoclines; low dip	Plain	Brick shale (u) ? Petroleum source and cap.	Condon, 1960.
		Koomberan Greywacke (Psk)	Quartz greywacke; boulder beds; minor siltstone		185-650	Homoclines; low dip	Plain; low hills	Stock water (u) ? Petroleum reservoir	Condon, 1960.
		Dumbardo Siltstone (Psd)	Tillitic siltstone; boulder beds		130-1600	Homoclines; synclines; anticlines.	Plain	Brick shale (u) ? Petroleum source and cap	Condon, 1960.
		Coyango Greywacke (Psc)	Quartz greywacke; boulder beds; minor siltstone		220-280	Homocline, synclines.	Low hills	Stock water (u)	Condon, 1960.
		Austin Fm. (Psa)	Quartz greywacke & tillitic siltstone; boulder beds.		100-1200+	Homocline	Low hills	Stock water (u) ? Petroleum source and reservoir.	Condon, 1960.
PRECAMBRIAN		(pe sed)	Sandstone, slate			Steep dips	High hills		
		(pe g)	Granite			Discordant	Dissected		
		(pe sch)	Schists, quartzite, gneiss			Strongly foliated & faulted.	Dissected		

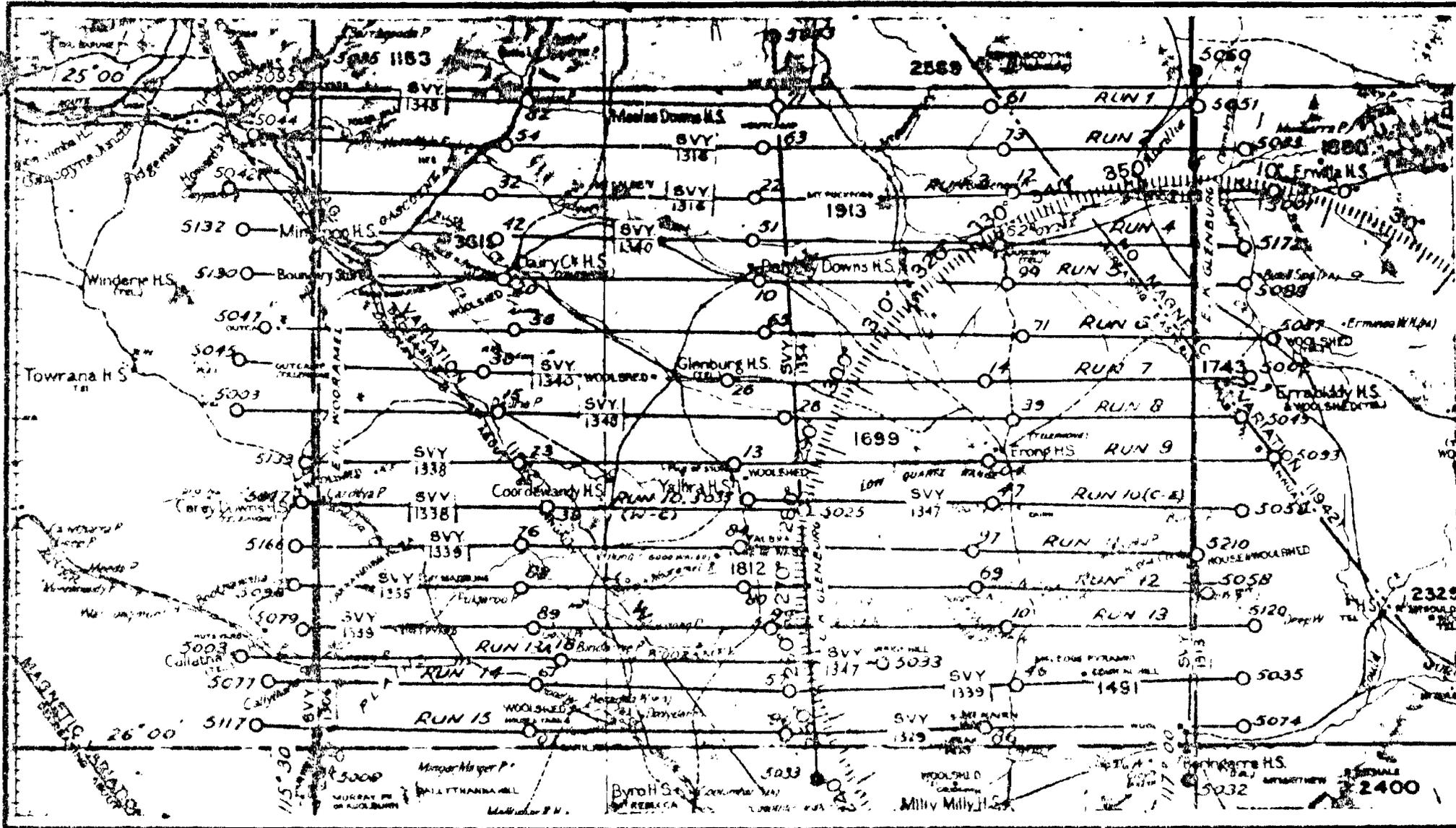


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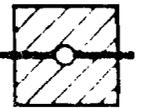
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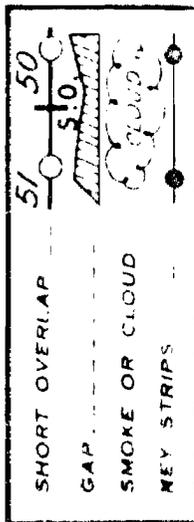
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AREA COVERED BY ONE PHOTOGRAPH



Scale: Miles 7 14 21



INDEX NO	DATE	CAMERA	HEIGHT	F.L.	SCALE	FILM
SVY.1348	21.3.52	K.17	25,000	153.8mm	1.50000	
SVY.1349	18.3.52	K17	25,000	154.2mm	1.50000	
SVY.1340	18.3.52	K.17	25,000	154.2mm	1.50000	
SVY.1339	14.3.52	K.17	25,000	153.8mm	1.50000	
SVY.1339	14.3.52	K.17	25,000	154.2mm	1.50000	
SVY.1335	27.3.52	K17	25,000	154.2mm	1.50000	

INDEX NO	DATE	CAMERA	HEIGHT	F/L	SCALE
SVY.1329	13.3.52	K.17	25,000	152.8mm	1.50000
SVY.1347	21.3.52	K.17	25,000	154.2mm	1.50000
SVY.1313	14.3.52	030	25,000	153.26mm	1.50000
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SVY.1317	14.3.52	017	25,000	157.8mm	1.50000

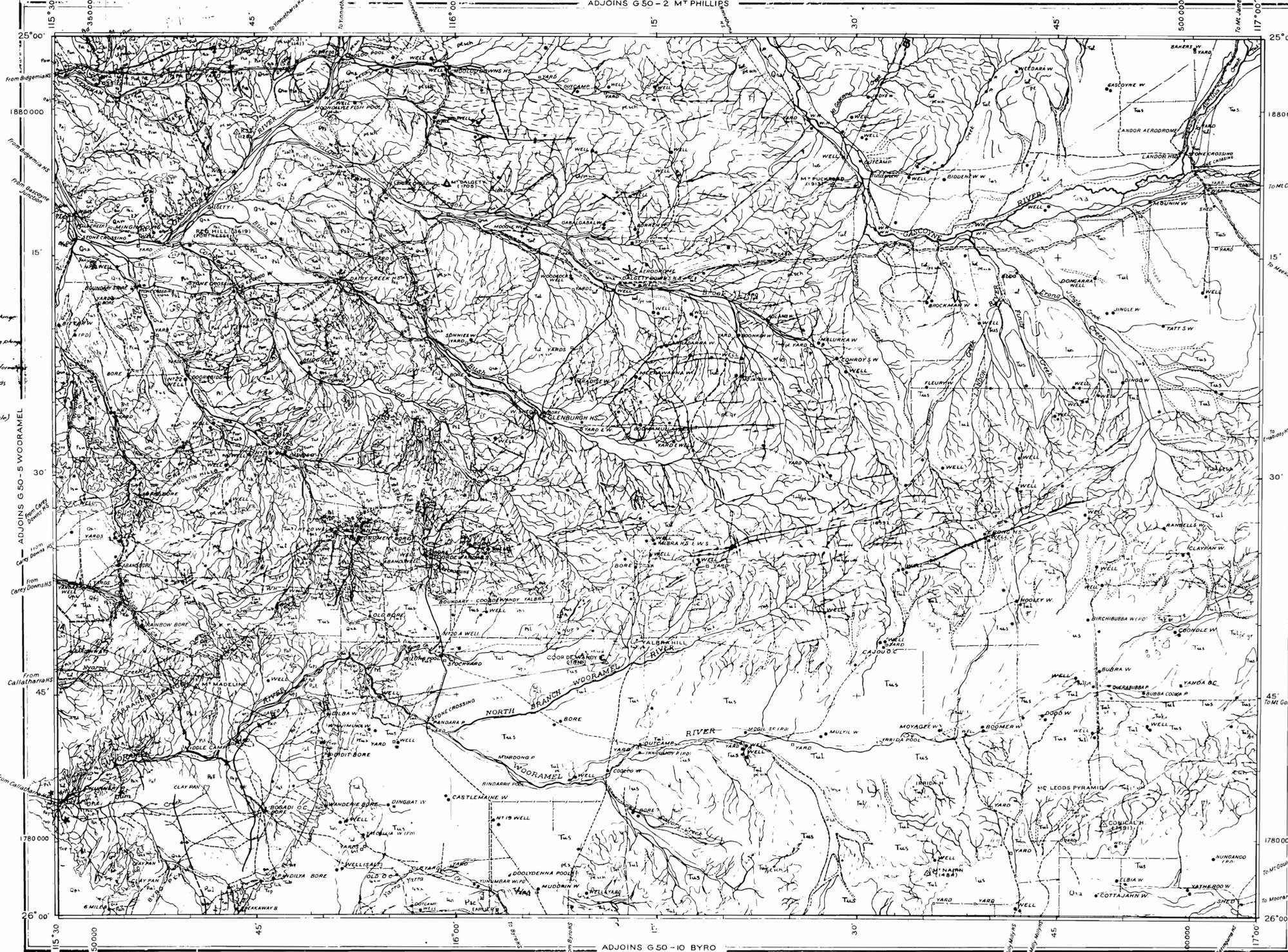
# GLENBURGH

WESTERN AUSTRALIA  
ADJOINS G 50-2 MT PHILLIPS

4 MILE GEOLOGICAL SERIES SHEET G 50-6

FIRST EDITION 1959

AUSTRALIA 1:253,440



### Reference

- Geological**
- Boundaries
    - Established - position accurate
    - Established - position approximate
    - Probable - photo-interpretation
    - Doubtful
  - Structure
    - Strike & dip, inclined strata
    - Horizontal strata
    - Strike & dip, foliation
    - Trend lines - photo-interpretation
    - Established subhorizontal crest showing change
    - Position accurate
    - Established synclinal trough showing change
    - Position accurate
    - Position approximate
    - Inferred under younger formation
    - Uncertainly
    - Position accurate, U open towards younger formation
    - Monocline
    - Significant small outcrop (not to scale)

### Topography

- Watercourse (all streams intermittent)
- Pool, semi-permanent
- Trig point, height in feet
- Spot height

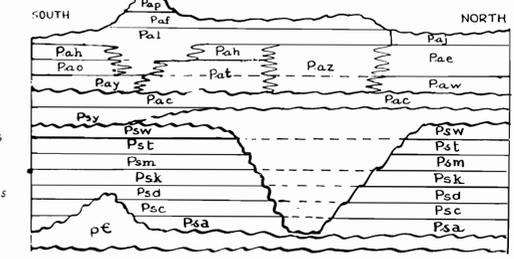
### Culture

- Road
- Vehicle track
- Fence
- Telephone
- along fence
- ERONG Mts Homestead
- OC Outcamp
- Yard
- Aerodrome
- Bore
- Dug Well
- Bore or Well with Windmill
- Abandoned Bore or Well
- Spring

### Reference

Qa	Alluvium
Qw	Wash
Qs	Sand
Qsb	Soree
<b>QUATERNARY</b>	
<b>RECENT</b>	
<b>PLEISTOCENE</b>	
Qnj	Sand, gravel, fluvial (old river deposits)
Qps	Aeolian sand
<b>TERTIARY</b>	
<b>EOCENE</b>	
Tun	Limestone, chert, sandstone
Tus	Lafertic soil
Tub	Billy
Tul	Lafertic
Tep	Silty sandstone, siltstone
<b>ARTINSKIAN</b>	
<b>WOORAMEL GROUP BYRD GROUP</b>	
Pap	Siltstone, shale, quartz greywacke
Paf	Quartz greywacke, marine fossils
Paj	Siltstone, shale, quartz greywacke, evaporites fossils
Pan	Siltstone, quartz greywacke, fossils
Pah	Quartz greywacke, siltstone, conglomerate
Pao	Quartz greywacke, conglomerate, siltstone, fossils
Pax	Quartz greywacke, siltstone, conglomerate
Pae	Quartz greywacke, siltstone, plant & marine fossils
Pay	Quartz greywacke, quartz sandstone, siltstone
Paw	Quartz sandstone
<b>UNCONFORMITY</b>	
Pac	Fossiliferous calcarenite, calcilite, siltstone
Pca	Shale, siltstone, calcilite, fossils
<b>UNCONFORMITY</b>	
Psw	Quartz greywacke, silty siltstone, boulder beds
Pst	Quartz greywacke, silty siltstone, boulder beds
Psm	Sandy siltstone, varved siltstone/shale/sand, boulder beds
Psk	Quartz greywacke
Psd	Sandy siltstone, boulder beds, quartz greywacke
Psc	Quartz greywacke, boulder beds
Psa	Quartz greywacke, boulder beds, siltstone
Psl	Sandy siltstone, quartz greywacke, boulder beds
<b>UNCONFORMITY</b>	
pesc	Sediments: quartzite, slate
pég	Granite
pésch	Schist and Gneiss
<b>PERMIAN</b>	
<b>SAKMARIAN</b>	
<b>UNCONFORMITY</b>	
<b>PRECAMBRIAN</b>	

### STRATIGRAPHIC DIAGRAM - PERMIAN FORMATIONS



Compiled by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development. Topographic base compiled by Division of National Mapping from vertical small scale air photographs by the Royal Australian Air Force. Published by the Division of National Mapping.

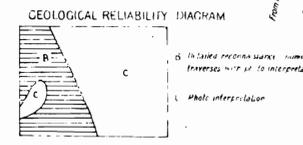
**DIVISION OF NATIONAL MAPPING**  
BASE COMPILATION  
1:253,440  
Compiled to MAY 1957 N.M.R. 57/59

Not identified on photos  
Doubtful features

INDEX TO ADJOINING SHEETS

Showing Magnetic Declination	
FENNIEY	MT
PHILLIPS	MT
ROBINSON	RAIJE
YARRA	BYRE
BELELL	

Scale 4 Miles to 1 inch



Geology by M. A. Conington, M. C. Konecki, M. H. Johnson, J. M. Dicks, T. Quinn, D. Moore, K. C. Smith, W. J. Perry, W. M. Burnet.  
Compiled by M. A. Conington.

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