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Record 1978/54

Field Work Report, McArthur Basin Project, 1977.

by

M.J. Jackson, M.D. Muir, K.A. Plumb, D.E. Large, M.C. Brown, & K.J. Armstrong.

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ABSTRACT

This report is primarily a compilation of data gathered in the field by the BMR McArthur Basin geological field party in 1977, together with some preliminary interpretations.

The main work undertaken during the field season was the measuring of detailed sections through formations of the McArthur Group. Graphic logs of 24 measured sections are presented, plus notes on each of the formations studied.

In addition to the section measuring, the party also mapped in detail three small areas within the Mallapunyah 1:100 000 Sheet area. The report details the stratigraphic basis for the mapping and the results.

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INTRODUCTION

In 1977, the BMR commenced a long-term study of the McArthur Basin with the aim of obtaining a better understanding of the geological evolution of the basin, particularly its stratigraphy, and sedimentary and tectonic history. The results will be applied to the exploration for, and study of the basin's mineral deposits. The project is outlined by Plumb (1977).

From July to September 1977, four geologists and support staff carried out field work in the southern part of the McArthur Basin (Fig. 1), and, within the context of Plumb's proposal, carried out the following:-

1. detailed section measuring through formations of the McArthur Group, aimed at establishing criteria for lithostratigraphic and chronostratigraphic correlation, and at identifying the environments of deposition of the units;
2. detailed mapping of selected areas using 1:25 000 colour air photographs, to investigate whether re-mapping at this more detailed scale would provide maps significantly better than the existing 1:250 000 scale geological maps;
3. collecting material for micropalaeontology for biostratigraphic and palaeoenvironmental analysis.

D.E. Large (Technical University of Braunschweig in co-operation with the West Gernam Federal Institute for Geosciences and Natural Resources) collected rock samples from most of the measured sections, and from known mineral occurrences for geochemical analyses. The results of this work will be reported separately.

To assess whether future systematic stream-sediment sampling programs might produce useful results, a pilot program over selected formations was also carried out.

An airborne magnetic and radiometric survey of the southern and central parts of the McArthur Basin was flown by a party from the Geophysical Branch of BMR between June and September 1977.

Rock samples were collected from the measured sections in the Kilgour Gorge for magnetostratigraphic studies by members of the BMR Palaeomagnetic Group. The results of these surveys will be presented separately.

Ground gravity and magneto-telluric surveys that had been planned for 1977 were postponed until 1978.

PROGRAM

The party consisted of four geologists, M.J. Jackson and M.D. Muir (BMR), M.C. Brown (Canberra College of Advanced Education), and D.E. Large (Technical University of Braunschweig, West Germany). K.A. Plumb joined the party in late August and early September. Support staff included K.J. Armstrong and B. Jones (Technical Officers).

During the first four weeks the party concentrated on detailed section measuring in the Kilgour Gorge and in the northern part of the Batten 1:100 000 Sheet area (Fig. 1). Between 15 and 28 August, K.A. Plumb led a geological tour through the McArthur Basin from near Westmoreland in the east to the base camp, during which the most important features of the regional stratigraphy were examined. The tour party consisted of 14 geologists and three field assistants: K.A. Plumb, the fourmembers of the McArthur Basin party, and A.R. Jensen, C. Simpson, J. Truswell, M.R. Walter, A. Wells (BMR), I.B. Lambert (Baas-Becking Geobiological Laboratory), D. Sangster (Geological Survey of Canada), M. Neudert, R. Logan, and N. Williams (Australian National University). Following the tour, Brown, Jackson and Large concentrated on detailed mapping in the Top Crossing area whilst Muir and Plumb continued detailed section measuring and mapping of part of the Batten Subgroup and overlying units north, east and west of the Abner Range. Towards the end of the field season, Tawallah, McArthur and Roper Group sequences in the Mount Young Sheet area were examined and compared with those seen in the south of the basin.

This report summarises the field data and preliminary interpretations made. Results of laboratory data are not included.

Classifications and terminologies used are as follows: sandstone classification follows Pettijohn, Potter & Siever (1972), bedding terminology follows Ingram (1954), stromatolite descriptions follow Walter (1976). The classification of carbonates follows suggestions by M.C. Brown.

A basic grainsize terminology is adopted in which 'dololutite' is composed of silt and clay-size dolomite, 'dolarenite' of sand-size dolomite grains, and 'dolorudite' of carbonate grains larger than 2 mm. These names are then modified by a suitable adjective (adding compositional or textural terms), e.g. poorly sorted intraclast dolarenite. 'Dolostone' is used for a rock composed mainly of recrystallised dolomite; and dolomite is a more-specific, general term for a rock composed mainly of dolomite of unspecified grainsize.

The stratigraphic correlation chart of the McArthur Group (from Plumb & Brown, 1973, fig. 3) is reproduced here (Fig. 2) for reference.

RESULTS FROM MEASURED SECTIONS

Twenty-four sections were measured; twelve within well exposed sequences of the Umbolooga Sub-group in the Kilgour Gorge, and the remainder further north in areas west and northeast of the Abner Range. Previously measured sections, by M.D. Muir and J.W. Smith, through the Amelia Dolomite in the Leila Creek area which are not published elsewhere have been included in this report, and interpretations based on them used in the text.

The measured sections are numbered sequentially from the 1:100 000 Topographic Sheet areas within which they are located. Copies of the original field logs, at a scale of 1:200, are available from BMR; generalised summary logs, at a scale of 1:400, are reproduced here as Figures 8-39 in Appendix I. Details of sections i.e., location, thickness measured, stratigraphy encountered, etc., are listed in Table 2 in Appendix I.

Samples collected from the measured sections for laboratory studies are listed in Appendix II.

MALLAPUNYAH FORMATION

The Mallapunyah Formation is the oldest stratigraphic unit in the McArthur Group. In the Kilgour Gorge, the Mallapunyah Formation consists of an interbedded sequence of mainly red and brown siltstone, shale, and fine-grained sandstone, which appears to overlie the Masterton Formation conformably. Intervals of stromatolitic dololutite occur in the lowermost and uppermost parts of the section.

Two sections (Kilgour 10 and 11, Figs. 23, 24) were measured in the southern part of the Kilgour Gorge: Kilgour 11 (Fig. 24) records a complete section through the Mallapunyah Formation from the underlying Masterton Formation through to the overlying Amelia Dolomite; Kilgour 10 (Fig. 23) only intersected the upper 70 m of the Mallapunyah Formation.

In Kilgour 11, the base is marked by a silcrete horizon, containing poorly preserved stromatolites (probably Conophyton). This is overlain by a monotonous sequence of poorly bedded dolomitic siltstone and fine-grained silty sandstone with sedimentary structures such as desiccation cracks, pinch-and-swell, ripple-marks, scours, and halite casts. Thin beds of cross-stratified coarse dolomitic sandstone which are present throughout the sequence attest to periods of increased current activity. Small vugs, containing euhedral crystals of dolomite and barite, are common in the lower part of the sequence and, although their origin is not clear, they may be related to the replacement of evaporite minerals.

Towards the top of the formation (i.e. above 130 m in Kilgour 11, and most of Kilgour 10) the dolomitic sandstone and siltstone contains numerous thin green or pink beds that resemble tuffs, and botryoidal quartz nodules with bladed outer surfaces ('cauliflower cherts') which have been interpreted as replaced diagenetic anhydrite nodules (Walker et al., 1977).

In both sections several metres of stromatolitic dolostone followed by dolomitic sandstone with intraclasts and halite casts mark the contact between the fine clastic sediments of the Mallapunyah Formation and the stromatolitic dololutites of the overlying Amelia Dolomite.

AMELIA DOLOMITE

Two sections of the Amelia Dolomite were measured in the Kilgour Gorge. A section in the central part of the Gorge, Kilgour 10, provided an almost complete sequence from the underlying Mallapunyah Formation through 150 m of Amelia Dolomite, into the overlying Tatoola Sandstone. The other section, Kilgour 12, was measured approximately 4 km south of Kilgour 10. The upper part of this measured section represents the lower 40 m of the Amelia Dolomite.

The Amelia Dolomite in Kilgour 10 consists mainly of thinly interbedded and interlaminated fine dolarenite and dololutite with various sedimentary structures (e.g. flake breccias, intraclasts, ripples etc.). Three

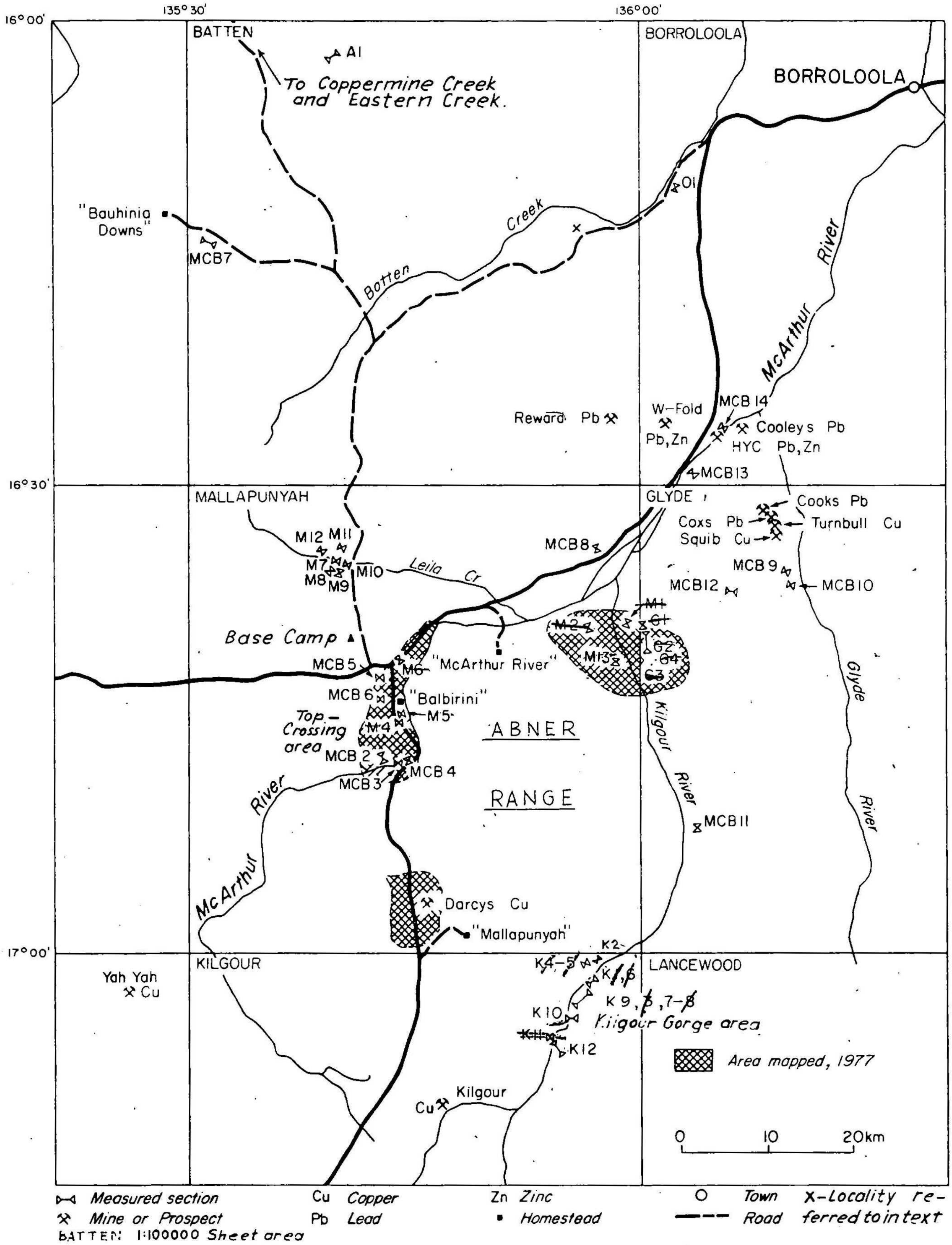

FIG. 1 Measured sections, mineral prospects and areas mapped in 1977.

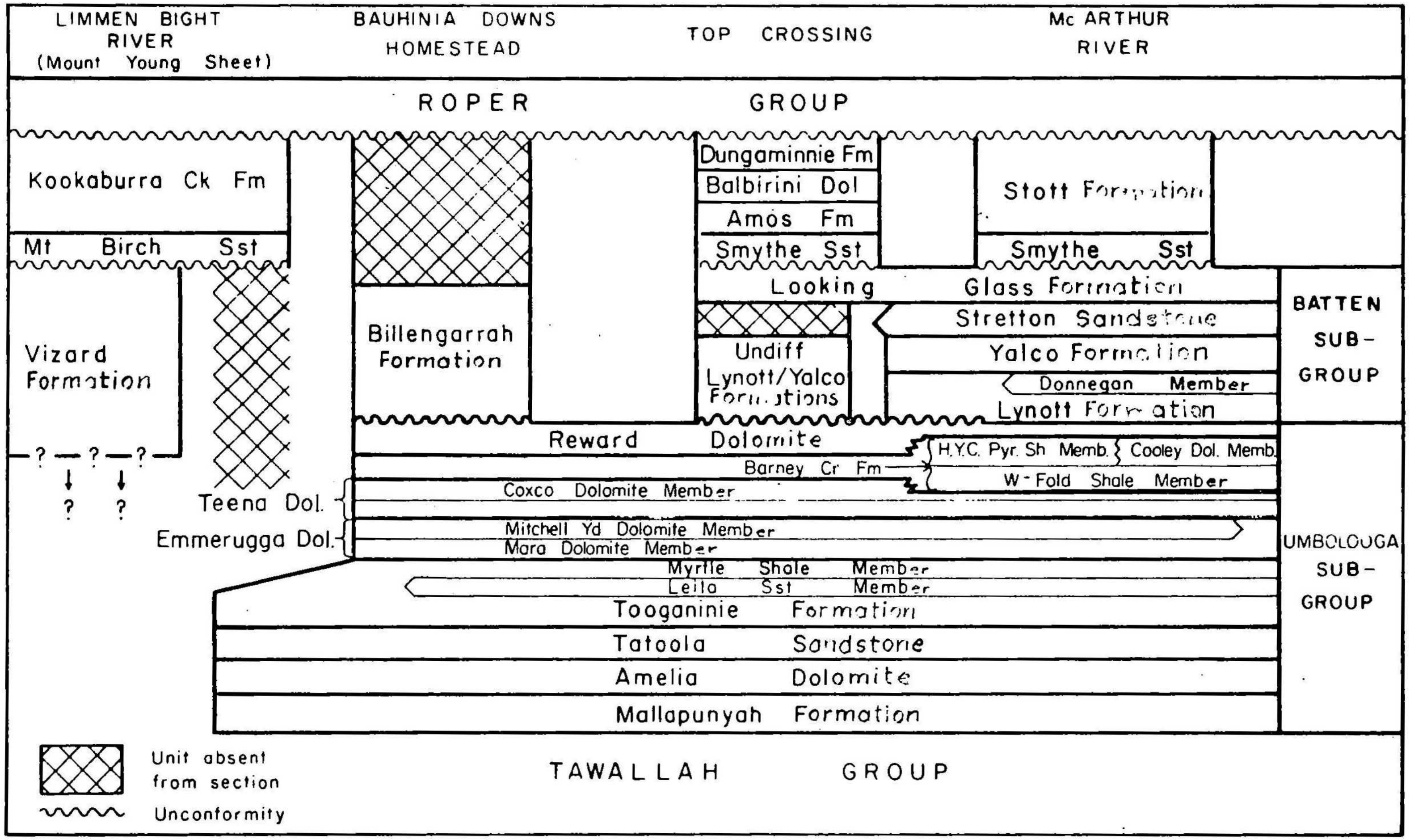

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Fig 2 Correlation chart, McArthur Group, McArthur River region. (from Plumb & Brown, 1973.)

intervals are distinctly oolitic, i.e. 88 to 94 m, 110 to 132 m and 160 to 173 m. The upper 35 m contains numerous sandy beds and intraclasts are common. Several kinds of stromatolites are present between the base of the Amelia Dolomite (at about 70 m) and 184 m. In contrast, the sequence above 184 m lacks stromatolites except at the very top where small columnar forms are preserved. Nine levels contain the stromatolite Conophyton; some preserved in hard recrystallised dolomite, and therefore forming prominent topographic benches, others preserved as cherty patches in dololutite.

The base of the Amelia Dolomite in Kilgour 12 was taken at the bottom of a bed of columnar stromatolites, overlying a siltstone/fine sandstone sequence with abundant halite casts which marks the top of the Mallapunyah Formation. These columnar stromatolites were not observed in Kilgour 10, and may have been faulted out. The two thin Conophyton beds at 84 m in Kilgour 12 are tentatively correlated with two similar Conophyton beds at 82 m in Kilgour 10. This implies that Kilgour 12 only intersected about the lower one-third of the formation as seen in Kilgour 10.

Five sections of Amelia Dolomite were measured by Muir in 1975 (Mallapunyah 7 - 11) in the Leila Creek 1st Crossing area, and also one section (A1) in the Tawallah Pocket, 60 km north of Leila Creek, and near to the site of CEC diamond drill hole, Tawallah No. 1.

In this northern area the Amelia Dolomite is about 200 m thick and can be divided up into five parts (Table 1); these can be correlated with the Kilgour Gorge section.

In the northern sections, scattered pseudomorphs after evaporite minerals occur in all units of the Amelia Dolomite, but the only evidence for former evaporites at Kilgour Gorge are rare gypsum and halite pseudomorphs at the base of the Amelia Dolomite in Kilgour 10. At Leila Creek, the upper and lower evaporite units contain considerable thicknesses (up to 50 m) of sideritic marbles (largely or entirely siderite) which have been shown to be late-diagenetic replacements of previous anhydrite and gypsum laminites (Walker et al., 1977 (which themselves appear to have replaced early Carbonates). Distribution of sulphate pseudomorphs is patchy; it varies between complete replacement of all the early carbonates by sulphates and no replacement at all. Sideritic marble can disappear along strike in a single bed, and two sections in one of them (Mallapunyah 10; Fig. 37), and considerable replacement in the other (Mallapunyah 9; Fig. 36).

Table 1. Correlation of Amelia Dolomite: Kilgour River to Leila Creek.

KILGOUR RIVER		INFORMAL STRATIGRAPHIC UNITS		LEILA CREEK
Lithology	Thickness (m)		Thickness (m)	Lithology
		Tatoola Sandstone		Local unconformity
Mainly flake breccia with some oolites; dolarenite with stratiform, domal, & columnar stromatolites	56	Upper Dolomite	60	Oolites, oncolites, abundant flake breccia; dolarenite with stratiform, domal, & columnar stromatolites
Stratiform and domal stromatolites with Conophyton	27	Upper Evaporite	30	Sideritic marble with stratiform and domal stromatolites. Some Conophyton
Oolitic, oncolitic dolarenite and dololutite with stratiform stromatolites and flake breccia	30	Middle Dolomite	60	Oolitic and oncolitic dolarenite with stratiform stromatolites and flake breccia
Stratiform and domal stromatolites with abundant Conophyton	32	Lower Evaporite	40	Siderite marble with stratiform stromatolites and abundant Conophyton
Shaley dolarenite & dololutite, red and green shale & fine sandstone, tuff beds; stratiform stromatolites	16	Lower Dolomite	30	Flaggy dololutite, flake breccia green and purple mudstone and shale; stratiform stromatolites
		Mallapunyah Formation		

AMELIA DOLOMITE

The depositional and diagenetic sequence of events in the Amelia Dolomite was probably as follows:

1. Deposition of aragonite or calcite in supratidal to high intertidal environments, with abundant algal activity. Some precipitation of fine-grained primary gypsum crystals.
2. Formation of very early-diagenetic, fine-grained dolomite.
3. Partial silicification of the dolomite (almost contemporaneously with (2) above) to preserve abundant microfossils in very fine-grained early-diagenetic cherts, and also some of the primary gypsum crystals. Sulphate reduction at this stage.
4. Diagenetic and phreatic interstitial replacement by relatively coarse-grained gypsum and anhydrite under (geological) sabkha conditions. Possible interstitial halite in laminites.
5. Late-diagenetic (burial) alteration of sulphates to siderite, and, either at this stage or later, replacement of early-diagenetic dolomite (2) with magnesite (although not in every case: coarse-grained late-diagenetic dolomite also occurs in many samples).
6. Late (Cretaceous or Tertiary?) phreatic silicification (silcrete) of specific horizons (or parts of horizons, or fault or joint planes). This is occasionally accompanied by the precipitation of hematite and barite. The source of the barite is unknown, but the hematite could have formed by oxidation of the siderite.

TATOOLA SANDSTONE

The Tatoola Sandstone conformably overlies the Amelia Dolomite, and is conformably overlain by the Tooganinie Formation. A complete section through 67 m of the Tatoola Sandstone was measured in Kilgour Gorge (Fig. 22). The lower contact is sharp and is located at the top of the highest stromatolitic dololutite within the Amelia Dolomite. In contrast the change from the Tatoola Sandstone to the Tooganinie Formation is gradational over an interval of some 70 m. The contact is taken at the base of the prominent Conophyton bed at 80 m in Kilgour 9. The lower part of the Tatoola Sandstone consists of very fine to medium-grained flaggy quartz and dolomitic sandstone with abundant ripple-marks and tool marks. Small channels are present at

26, 37, and 42 m. A gradual increase in current activity (and shallowing?) is suggested by the upwards increase in abundance of clay and shale flakes, amount and larger scale of cross-stratification, and the coarser grainsize. Halite casts occur throughout the section, but are more numerous towards the top where they are accompanied by barite in small vugs.

TOOGANINIE FORMATION

An incomplete section of Tooganinie Formation was measured in the central part of the Kilgour Gorge. Sections Kilgour 9, 7, and 3 (Figs. 22, 20, 16 respectively) provide a continuous sequence from the base of the formation through 300 m of Tooganinie Formation: however, some of the upper part of the section, including the Leila Sandstone Member, is faulted out.

A transitional contact between the dominantly clastic Tatoola Sandstone and the overlying more dolomitic Tooganinie Formation is evidenced by the 70-m-thick interval of interbedded sandstone and dolomite between 80 m in Kilgour 9, and 55 m in Kilgour 7. We tentatively place the contact at the 2-m-thick Conophyton bed at the base of this interbedded sequence (at 80 m in Fig. 22), but detailed work elsewhere may establish a more genetically significant break that we may be able to relate to a specific part of this transitional boundary. Overlying this 70-m-thick mixed carbonate-clastic sequence is an interval, 85 m thick, of thin bedded to laminated shale and dolomitic shale with sparse thin beds of sandy dolarenite and rare large domal stromatolites. This is succeeded (Kilgour 3, 0 to 50 m) by an interbedded sequence of dolarenite and dololutite with evidence of increased current activity, i.e. oolite beds, cross stratification, and intraclastic dolarenite. Above about 50 m(Fig. 16), cherty and silty dololutite with domal stromatolites becomes more abundant than dolarenite, but thin coarse sandy and oolitic beds do still occur. Although elsewhere the Tooganinie Formation is characterised by the presence of numerous halite clasts, they were only found in one bed near the top of this section. The 300 m measured in this section contrasts with 640 m for the Tooganinie Formation (excluding the Leila Sandstone and Myrtle Shale Members) at the type section, 30 km to the west, thus suggesting that a significant interval of the upper part of the formation could be faulted out in this part of the gorge.

Leila Sandstone Member and Myrtle Shale Member

The Leila Sandstone Member and Myrtle Shale Member form the upper part of the Tooganinie Formation. They are underlain by undifferentiated Tooganinie Formation, and conformably overlain by the Emmerugga Dolomite. The Myrtle Shale Member is usually very poorly exposed, but one section (Kilgour 8) is well exposed in a cliff face in the central part of the Kilgour Gorge (Fig. 21). No detailed sections were measured through the Leila Sandstone Member, but several were paced through the Leila Sandstone Member-Myrtle Shale Member sequence during mapping of the Top Crossing area (see below).

The upper 2 m of Leila Sandstone Member is measured section Kilgour 8 consists of cross-stratified, coarse-grained glauconitic and dolomitic sandstone. This is overlain by 58 m of Myrtle Shale Member which comprises a sequence of thin bedded to laminated red and brown mudstone and very fine sandstone, containing abundant well-preserved halite casts. A distinctive bed of coarse oolitic sandstone overlain by slumped mudstone is present in about the middle of the sequence (at 32 m). The upper 10 m of the member is characterised by interbedded mudstone and dololutite, reflecting a gradation into the overlying Emmerugga Dolomite. In this section, we have placed the contact between the Myrtle Shale Member and the Emmerugga Dolomite at 62 m, which is the base of the lowest stromatolite-chert cycle in the Emmerugga Dolomite. The solution-collapse breccia of Brown et al. (in press) was not observed here.

EMMERUGGA DOLOMITE

During the first traverse of the 1977 season, five sections (Kilgour 1, 2, 4, 5, & 6) were measured in the central part of the Kilgour River Gorge ('Goat Canyon'), through the Emmerugga Dolomite and an overlying as yet unnamed unit. Duplication of sections from both sides of the gorge was done to allow section measuring techniques to be assessed, and to compare descriptions of features recorded by different party members, on what were expected to be identical stratigraphic sections. It also provided an insight into any rapid facies variations which may be present.

Localities of the five measured sections and their stratigraphic relationships are shown in Fig. 3. Kilgour 4, 5, and 2 are located on the left bank, whilst sections Kilgour 1 and 6 are on the right bank of the gorge.

Kilgour 1 has a brecciated siltstone at its base, which probably equates with the breccia that Plumb & Brown (1973) use to define the base of the Emmerugga Dolomite; exposure in Kilgour 4 does not extend this far down. Kilgour 1 is also better exposed than Kilgour 4. There is a gap between Kilgour 1 and 6, but the equivalent interval was measured on the left bank of the gorge in Kilgour 5.

About 70 m of the lower part of Kilgour 6 is not exposed. However, correlation of marker beds between there and Kilgour 2 (Fig. 3) suggests that a major thickening of the unit occurs, or that the paced thickness of 70 m is inaccurate.

A good composite section for the Emmerugga Dolomite and the overlying unit was obtained by combining information from the sections on the two sides of the gorge. Lithological comparisons with published descriptions of the Emmerugga Dolomite from farther north (Plumb & Brown, 1973; Brown, & others, 1978) show that only part of the Mara Member of the Emmerugga Dolomite is preserved in the gorge. The thickness of the Mara Member 1.5 km southwest of Top Crossing is 240 m (Brown & others, 1978); therefore up to 80 m of Mara Member and the overlying Mitchell Yard Member was either eroded or not deposited in this area.

In Kilgour 1, the lower part of the Emmerugga Dolomite (Fig. 14, 5 to 37 m) contains nine well preserved sedimentary cycles. Each is between 2 and 4 m thick and comprises three parts; a lower laminated siltstone, overlain by cherty dololutite with domal to bulbous stromatolites, overlain by a thin layer of white sucrosic chert (Fig. 14); similar cycles are present in Kilgour 4, but not so well exposed. Identical cycles were also identified in the Emmurugga Dolomite in the Top Crossing area. Each cycle is tentatively interpreted as indicating a shallowing sequence, the thin sucrosic chert being a replacement after a deflated halite crust (similar halite crusts are present in the Coorong (S.A.) in Holocene carbonates). A distinctive bed of medium sandstone at 58 m in Kilgour 1 is represented by discontinuous wedges of quartz sand in Kilgour 4 at 54 m (Fig. 17). Above this the Emmerugga Dolomite consists mainly of laminated dololutite with a few

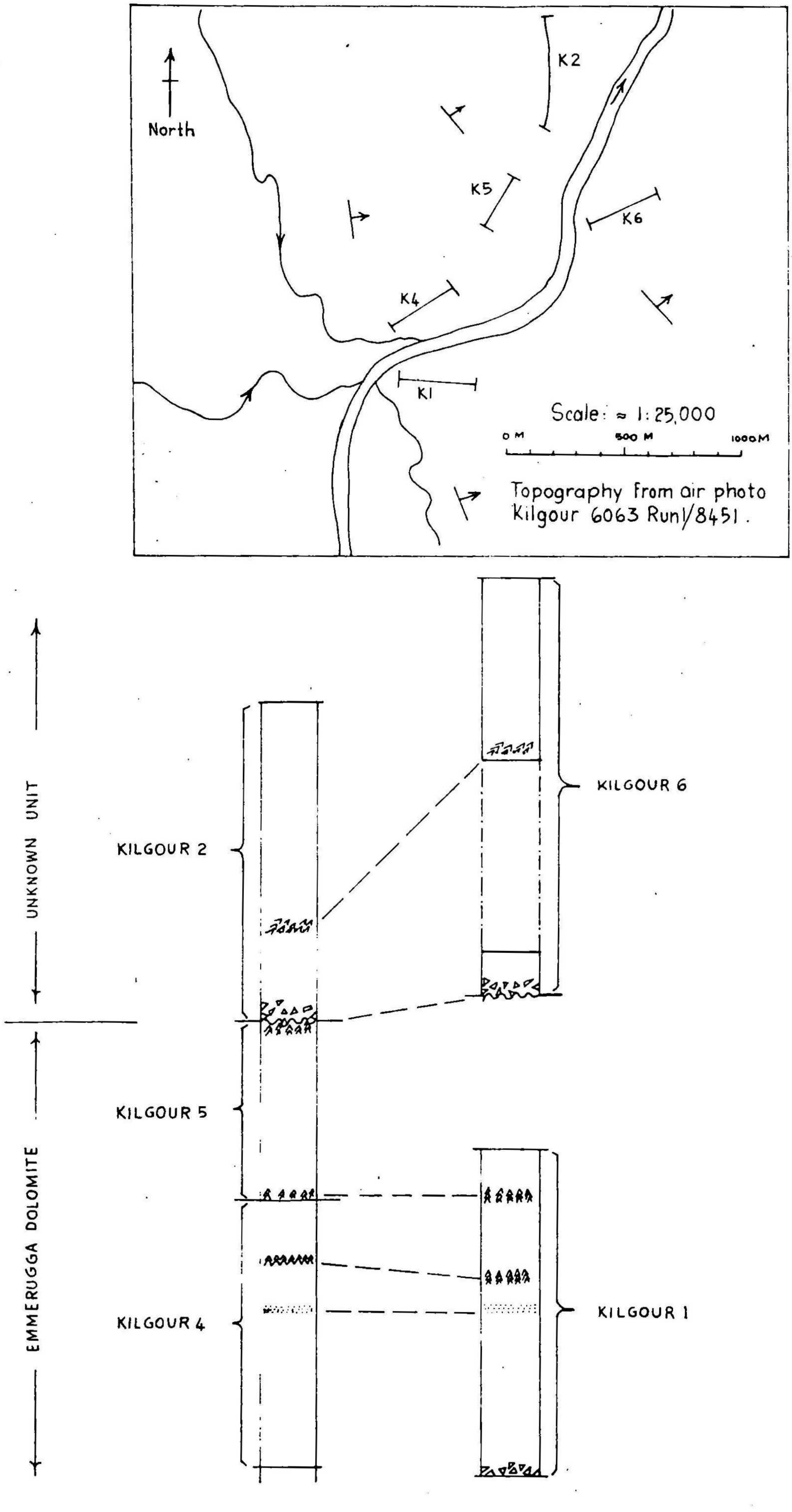

Fig. 3. *Relationship of the Emmerugga Dolomite and an unnamed formation in Kilgour Gorge*

stromatolites, and interbedded poorly exposed siltstone, but it also includes massive dolarenite forming topographic benches. Three distinctive beds of Conophyton are present in the sequence exposed in Kilgour 4 and 5 (Fig. 17, 18), only the lower two are preserved in Kilgour 1 (Fig. 14). These beds are excellent markers, especially over short distances (see Fig. 3).

The Emmerugga Dolomite is truncated by a prominent unconformity recognised on both sides of the gorge. In Kilgour 2 the overlying sequences has a 4-m-thick breccia at its base containing angular blocks of Emmerugga Dolomite, up to 40 cm in size, set in a cherty-dolomite matrix and resting on an irregular erosion surface cut into a bed of large Conophyton. In Kilgour 6 the unconformity is only marked by an erosion surface overlain by an imbricated chert-pebble conglomerate. The overlying unit consists mainly of wavy-laminated to intraclastic dololutite, silty dololutite, and fine dolarenite, and is characterised by features such as flame, pinch and swell, and pull apart structures. It also contains a bed of Conophyton with stromatolite columns inclined towards the west at an angle of 70°. With the presently available information the unit is tentatively correlated with the Dungaminnie Formation.

TEENA DOLOMITE

This formation was not investigated in detail, but a section was examined north of Leila Yard. Here, the Teena Dolomite consists predominantly of thick-bedded dololutite with abundant pink tuff beds. Subhedral gypsum pseudomorphs occur within the Teena Dolomite, at Barney Creek, for example, but are rare. The Coxco Dolomite Member which occurs at the top of the Teena Dolomite, consists of laminated dololutite which characteristically contains radiating acicular gypsum pseudomorphs. See Brown & others (1978) for details.

BARNEY CREEK FORMATION

A thin interval of Barney Creek Formation was measured in the lower part of the measured section Glyde 1 (Fig. 9). It consists of poorly outcropping tuffaceous and carbonaceous, dolomitic shale with grey 'wispy' laminae and float of brecciated and silicified shale and dolomite. It is conformably overlain by cherty dololutite of the Reward Dolomite. Several detailed sections have previously been measured through the Barney Creek Formation elsewhere and summary logs are available in Brown & others (1978).

REWARD DOLOMITE

The Reward Dolomite is one of the most laterally variable units in the McArthur Group. It contains a variety of dololutites and dolarenites, most of which are detrital in origin. Only one short section was measured through the formation (Glyde 1, Fig. 9), during 1977, in the area northeast of the Abner Range as several sections have been measured previously (Brown, & others, 1978). In Glyde 1, the formation consists of flat-bedded or contorted dololutite and dolarenite, grading into dolorudite breccias. Sedimentary structures include small ripple cross-lamination, graded bedding and flake breccias. Rapid deposition of material with consequent slumping is inferred throughout the sequence. Chert spheres up to 2 cm diameter, which are characteristic of the Reward Dolomite throughout the sequence but are of unknown significance, are common at 15 m to 20 m, and 58 m. The upper 5 m of the formation is sandy and extremely intraclasted. Stromatolites were not seen in this section, but in other sections to the west (Brown, & others, 1978) the Reward Dolomite is commonly stromatolitic.

LYNOTT FORMATION

Three sections were measured in the Lynott Formation, in the area northeast of the Abner Range (Fig. 1). Glyde 2 is a complete section 625 m thick; Mallapunyah 1 and 2 to the west are partial sections from the lower part of the formation.

Three subdivisions (two informal) are recognised (Fig. 4): the lower unit is 160 m thick in Glyde 2; an overlying upper unit is 330 m thick; and the Donnegan Member is 135 m thick.

These sections are in more deeply dissected terrain than that of the main outcrop of Lynott Formation, northwest of the McArthur River. The measured sequences seem to be more dolomitic and a different facies to that

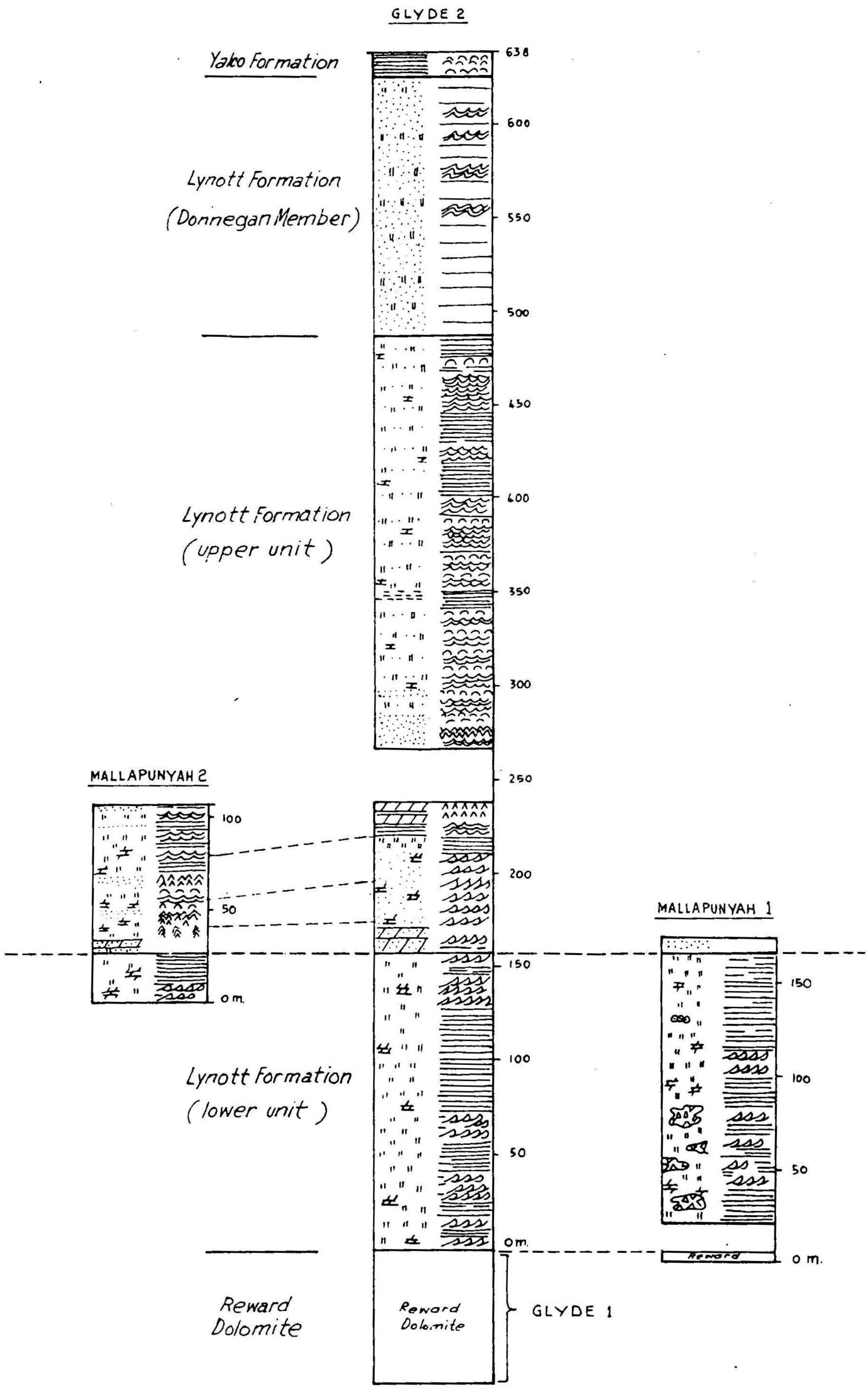

Fig. 4 : Correlation Diagram of Measured Sections, Mallapunyah 1 and 2 and Glyde 2. (for explanation of symbols see figure 5)

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described from the northwestern area, during the 1960-61 regional mapping, but this difference may be more apparent than real, owing to deep weathering and leaching of the outcrops in the northwest.

The lower unit (Fig. 10) comprises a uniform succession of thin and irregularly-bedded dolomitic siltstone and hematitic (after pyrite) siltstone, with abundant slump folds throughout. More uniform lamination and ripple-marks characterise the upper part of the unit. The unit is tentatively interpreted as being a subtidal turbidite.

The equivalent sequence in Mallapunyah 1 (Fig. 26) is similar in thickness (165 m) and rock type but contains several lenses of breccia, which pass rapidly along strike into undisturbed siltstone. The breccias contain angular fragments of dolomite and chert from underlying units, and siltstone similar to the host rock. The contact between the lower unit and the underlying Reward Dolomite, in Mallapunyah 1, is markedly discordant with bedding, over an interval of about 35 m, and both units show extensive syndepositional brecciation along the contact.

In Mallapunyah 2 (Fig. 27), the contact between the lower and upper limits of the Lynott formation is at 23 m and again it is discordant with bedding, over an interval of about 2 m, with slumping along the contact and through the succeeding 5 m of sequence. The lower part of the upper unit is coarse dolomitic sandstone, grading up into dolomitic siltstone. Elsewhere, this lower interval is a thick deeply weathered chert breccia with relicts of coarse dolomitic sandstone. These features may represent a form of palaeokarst.

The overlying upper unit (23 m to 103 m, Fig. 27) is characterised, particularly in the lower half, by regularly alternating cycles of thin-bedded red-brown to purple-brown dolomitic siltstone to fine sandstone, and buff to purple-brown stromatolitic ololutite; higher in the section the siltstone and sandstone becomes progressively more dominant. The siltstone and fine sandstones are characterised by alternating plane bedding, small-ripple cross-lamination, and lenticular bedding. Coarse-grained cross-bedded dolomitic sandstone are common in places. Stromatolites generally range from stratiform to small domes, and the domes are commonly elongated approximately east-west. Some beds of Conophyton occur in the lower part of the sequence. From the overall characteristics, the upper unit east of the Abner

Range is provisionally interpreted as being largely an intertidal deposit, with a large component of terrigenous detritus, and with intervals of lagoon and lacustrine deposits.

The overall sequence of rock types in the Lynott Formation is basically consistent over strike lengths of about 10 km, in the area mapped, although a facies change is evident between Mallapunyah 2 and Glyde 2. The interval 35 - 60 m in Mallapunyah 2 (Fig. 27) has several beds of stromatolites (branching Conophyton and bulbous domes) interbedded with dolomitic siltstones. In Glyde 2 (Fig. 10) the equivalent interval (170 - 200 m) is composed entirely of ripple-bedded dolomitic sandstone and siltstone. A marker bed of massive white siltstone with ball-and-pillow lower bedding surfaces occurs near the top of these two intervals (51 - 54 m in Mallapunyah 2, and 192 - 195 in Glyde 2).

Above this facies change both sections have similar ripple-bedded dolomitic siltstones and sandstones. Distinctive marker beds of dololutite with small non-stromatolitic conical structures, 1 cm high, interpreted as beach travertine or wave-splash rock, occur at 75 m in Mallapunyah 2 and at 220 m, 231 m, and about 235 m in Glyde 2.

The Donnegan Member in Glyde 2 consists of purple-brown, thin-bedded dolomitic siltstone or fine sandstone, with alternating small-ripple cross-lamination and plane lamination, and is characterised by abundant small botryoidal quartz nodules with bladed outer surfaces (cauliflower cherts). These cauliflower cherts are identical to those in the Mallapunyah Formation, although smaller in size, and are interpreted as replacing diagenetic anhydrite nodules (Walker & others 1977) in a sabkha environment.

YALCO FORMATION

In the Explanatory Notes to the Bauhinia Downs 1:250 000 Sheet (Smith, 1964), the Yalco Formation is described as laminated, white, cherty siltstone, shale, and chert. Exposures of the formation occur extensively to the east of the Tawallah Fault and have almost invariably undergone intense surface silicification giving the unit its distinctive photopattern. During the mapping in 1977 exposures of less silicified Yalco Formation were identified, and these have radically revised the interpretation of the unit. Five sections were measured, which provide a more-or-less complete stratigraphic section: Glyde 2, 3, and 4, and Mallapunyah 13 were measured in the area northeast of the Abner Range (Figs 10-13, 32) and were complemented with one particularly well-preserved section southwest of Borroloola, which was measured in greater detail (section 01, Fig. 1).

The fresh rocks of the Yalco Formation consist of dololutite and dolarenite with abundant nodules and laminae of chert, and minor quartz sandstone. The dolomite and chert has an unusual 'nobbly' appearance, which is the result of the interbanding of the components, coupled with the large amount of nodular chert. Some of the dolomites are stromatolitic, comprising usually small domes which are almost globular in shape, and which are almost invariably preferentially silicified. Other dolomites are detrital in origin, and range from fine ripple-marked dololutites to flake breccias. The clasts in the flake breccias are commonly chert, but it is difficult to determine whether they were deposited as chert flakes, or whether they were carbonate flakes which were later silicified. Mud cracks and other desiccation features are common in the carbonate rocks. Discoidal casts up to 1 cm long which may be pseudomorphs after gypsum crystals are also present.

The quartz sandstone is usually fine-grained with low-angle cross bedding, and occurs in lenticular beds, commonly with conglomeratic lenses with cobbles up to 20 cm in diameter. Erosional contacts between sandstone and dolomite are present.

Although the rock types are fairly consistent throughout the formation as a whole, the upper part of the section in the Abner Range area is characterised by very finely interlaminated tabular dolomite and chert which is interbedded with stromatolitic dolomite and clean quartz arenite. The dehydration phenomena typical of the lower part of the section (described below) are absent. In the northern area near Ryan Bend, this upper part of the section is invariably silicified, presumably because of the large amount of silica in the cherty dololutite and quartz arenite.

The lower part of the Yalco Formation contains sedimentary structures which enable a detailed environmental interpretation to be made:

1. Unstratified polygons - these are commonly four to six-sided, with straight to slightly sinuous sides, and are between 50 and 400 mm in diameter. The intervening cracks are filled with unstratified mud that has been deposited from above.

2. Stratified larger polygons - these are between 400 and 3000 mm in size and the material filling the intervening cracks has a complex stratified structure and it is commonly capped by a ridge of small domal stromatolites. In contrast to (1), material filling the cracks has originated by upward percolation of carbonate-rich groundwater.
3. Lenticular fine-grained sandstone - occurs in channels with erosional bases.

The unstratified polygonal structures are interpreted as being simple mud cracks; they are relatively small presumably becuase of the fine grainsize of the sediment.

The larger stratified polygons appear to be identical to teepee structures, and seem to have been produced by upward movement of groundwater from within the sediment pile; identical structures are found in some of the ephemeral lakes of the Coorong Lagoon and at Marion Lake (Yorke Peninsula) in South Australia, where domal stromatolites have developed along the margins of Holocene polygons, which are sometimes crowned by teepee ridges.

The sandstones in the Yalco Formation are interpreted as being channel sands (on various scales) indicating higher depositional energy at times during sedimentation.

By analogy, therefore, the lower part of the Yalco Formation is considered to be a fossil Coorong Lagoon or Marion Lake. The scarcity of crystal casts after gypsum argues in favour of a comparison of the Yalco with the Coorong rather than Marion Lake where sulphate evaporites are abundant. The areal extent of the Coorong, and its inland sub-fossil equivalents, is comparable to that of the Yalco Formation. The Coorong deposits are strongly diachronous, and their present geographical distribution consists of an alternation of lake carbonates with dune sands in strips parallel to the present coastline. The Yalco Formation is almost certainly diachronous as well, but the Coorong analogues are always found at the base of the succession. The flat-bedded, thinly laminated sediments with stromatolite horizons in the upper part of the Yalco Formation may represent a quiter, deeper-water phase.

STRETTON SANDSTONE

The Stretton Sandstone is a widespread uniform clastic unit that crops out north and east of the Abner Range. A detailed section was measured through the formation east of the Abner Range (upper part of Glyde 3, Fig. 11). A similar section was also inspected in the eastern part of the Batten 1:100 000 Sheet area (locality X, Fig. 1).

At both localities, the formation consists of fine to medium-grained quartz sandstone which is distinctly parallel-bedded to laminated, and commonly flaggy or fissile. It contains numerous sedimentary features diagnostic of subaqueous deposition; ripple marks, parting lineations, streaming lineations, prod and groove casts, and dewatering structures. A large erosion channel at 204 m in Glyde 3 (Fig. 11) is filled by slumped coarse-grained sandstone. A marker bed of ferruginous concretions was recorded in about the middle of the section (240 m), and clay clasts are very abundant from here to the top of the formation.

AMOS FORMATION

The Amos Formation crops out west of Balbirini Homestead in a north-westerly trending belt. A detailed section, Mallapunyah 3, was measured through the formation in this area (Fig. 28). The lower part of the Amos Formation consists of red and purple, siltstone, shale, and sandstone, which are poorly exposed, but which become more dolomitic and better exposed up section. These are overlain by flat-laminated dololutite and dolarenite which contain a few pink tuff beds of irregular thickness. The upper part of the Amos Formation consists of an unusual, massive, stylolitic dolarenite and dololutite with abundant oncolites, ranging in size from 1 to 20 cm. This dolarenite has an extremely distinctive photopattern and contains a number of sink holes. It appears to contain clasts of brownish (?stromatolitic) dolarenite in a matrix of structureless grey dolarenite, but the contacts between the 'clasts' and the matrix are invariably stylolitic. Although the dolarenite could be interpreted as a dolomite cobble conglomerate, a complex diagenetic history is indicated and a detailed petrographic study will be needed before an adequate interpretation of its origin can be made. This unit was lithified and eroded before deposition of the overlying red shale and siltstone (lower part of measured section Mallapunyah 4). These overlying lutites were previously considered to be part of the Amos Formation. However, the boundary between the Amos Formation and Balbirini Dolomite is now placed at the unconformity at the base of the red shales (i.e. at the zero mark on measured section Mallapunyah 4). (see following discussion in 'Balbirini Dolomite').

BALBIRINI DOLOMITE

The Balbirini Dolomite overlies the Amos Formation in the area west of Balbirini Homestead. Here a sequence of laminated dolarenites, with prominent stromatolitic beds is well exposed and a detailed section was measured (Fig. 29). The Bauhinia Downs 1:250 000 Geological Sheet (Smith, 1964) shows this sequence as Emmerugga Dolomite, but Plumb and Brown (1973) redefined this unit as the Balbirini Dolomite. The detailed section that was measured in 1977 follows that measured during the 1960 regional mapping. Plumb & Brown (1973) quoted a total thickness of 579 m but we measured a total of 927 m including 65 m of section that had previously been included in the underlying Amos Formation. In the past, the base of the Balbirini Dolomite had been taken at the point where dolomite became the predominant rock type (at about 65 m on Fig. 29). This corresponded to a regionally prominent break in slope, with the Balbirini Dolomite cropping out as more prominent hills. We, however, identified a marked discontinuity at the top of the massive stylolitic dolomite which characterises the Amos Formation (top of Fig. 28), and we use this as the base of the Balbirini Dolomite. As the massive dolomite of the Amos Formation contains large oncolites that have been lithified, and then eroded before deposition of terrigenous red and purple shale, we consider that this is a more logical point at which to place the contact between Amos Formation and Balbirini Dolomite.

The lower one-sixth of the Balbirini Dolomite in the measured section (Fig. 29, 0 to about 200 m) consists mainly of interbedded dolarenites and red shales with abundant evidence of evaporitic conditions. Near the base of the section (43 m), small botryoidal quartz nodules are common in a sequence of reddish brown fine sandstone. Discoidal pseudomorphs after gypsum occur in a number of dolomite beds above this, and halite casts occur in some of the siltstones. Massive replacement of evaporite beds by sideritic marble is not common (cf. Amelia Dolomite) but occurs patchily near the top of this unit. Along strike, to the north of the track running from the highway to Balbirini Homestead, this part of the section is extremely altered. In some places, it is silicified, whilst in others it is converted to an ironstone which resembles a gossan. The association of the ironstone with the evaporites is interesting from the point of view of mineralisation, especially since in this area the Balbirini Dolomite shows signs of considerable tectonic disturbance (vertical to overturned bedding, kink and periclinal folding). These tectonic disturbances are probably related to fault movement.

The remainder of the Balbirini Dolomite in the measured section (200 m to 890 m) consists essentially of dolarenite and flake breccia, with very minor amounts of shale, sandstone, and dololutite. Prominent horizons of stromatolitic dolomite that can be traced along strike for several kilometres are also present. Some of the dolarenite is recrystallised but traces still remain of relict sedimentary structures. One particularly prominent interval (572 to 745 m) is a pink to mottled pink and green dolarenite which contains laminations interpreted as cross-bedding, ripple-drift lamination, stratiform and domal stromatolites, and Conophyton. This interval also contains beds with small cuspate structures, and very small (5 mm diameter) stromatolites, which have many of the morphological features of a dripstone or splash travertine deposit.

There are three principal stromatolite marker beds. The lowermost of these (at 300 m) was traced for at least 10 km in this area and is a complex unit with large low domes (100 x 10 cm) at the base, overlain by branching columnar stromatolites, which are then succeeded by a bed of divergently branching Conophyton. The unit is frequently completely silicified. It was also identified 29 km to the east within a similar sequence of carbonates in a similar structural and stratigraphic setting and therefore may be a good marker horizon right around the Abner Range.

The next prominent stromatolite bed (from 528 m to 550 m) contains walled columnar stromatolites (ranging from large columns, up to 30 cm across, to small 2 cm columns) overlain by a sequence of stacked domal stromatolites. This unit is very distinctive, and can be traced for at least 6 km along strike, but is easily weathered and in a number of places occurs only as poor rubbly outcrop in valley bottoms. At Eastern Creek, in Mount

Young 1:250 000 Sheet area (136°26'E: 15°50'S), 100 km north of Balbirini, these walled columnar stromatolites can be recognised in the Kookaburra Creek Formation, which is the stratigraphic equivalent of the Balbirini Dolomite. This correlation is particularly interesting because at Eastern Creek, the Kookaburra Creek Formation is host to lead-barite mineralisation.

The stratigraphically highest marker bed with stromatolites is between 860 and 873m, and contains forms somewhat similar in morphology to the walled forms at 528 to 550 m. When fresh, the rock is a blue dolarenite, but it weathers to a very distinctive chocolate brown.

The tuff bed (at 77 m) is distinctive, and is accompanied by two thinner similar beds. They are all pink, weathering orange, massive rocks, lacking any form of internal lamination, and contain cubic crystal casts up to 1 cm in size. However, the metre-thick bed at 77 m has a ripple-marked top, indicating some surface reworking under water. The original (1960) mapping showed these to be useful marker beds.

Outcrop samples from the Balbirini Dolomite have been used for micropalaeontological studies (M.D. Muir, D.Z. Oehler), but fresher material is essential if biostratigraphic studies are to be carried out. Samples of fresh dolomite with abundant black chert laminae were collected from a roadstone quarry near Balbirini Homestead, and these are expected to provide good material for micropalaeontological studies.

DUNGAMINNIE FORMATION

Two sections through the Dungaminnie Formation have been measured: Mallapunyah 5 (Fig. 30), which continues on from Mallapunyah 4, (located near Balbirini Homestead) and intersected about 120 m of the formation, and Mallapunyah 6 (Fig. 31), about 5 km to the north, which intersected about 240 m of the Formation (c.f. 150 m quoted by Plumb & Brown, 1973, Table 2).

In Mallapunyah 6, the Dungamminie Formation can be divided into a lower arenaceous sequence up to 100 m thick (Fig. 31, 40 to 140 m), and an overlying carbonate sequence 102 m thick (Fig. 31, 140 to 242 m). The base of the unit was not seen, and the lower unit could be at least 40 m thicker. The arenaceous unit consists mainly of red and purple fine-grained sandstone and siltstone, but a distinctive 3-m interval of cross-stratified conglomerate and oolitic sandstone with slump and load structures at 78 m, and an interval of sandy dolomite between 94 and 110 m are also present. Bedding-plane structures such as parting lineations, current lineations, clay clasts, and ripple marks are common, but slumping, load casting and brecciation are also present.

The upper carbonate unit consists mainly of laminated sandy dolarenite, between 140 and 170 m, which grade up into thin-bedded fine dolarenite and dololutite. A very distinctive marker horizon containing large Conophyton, which all lean consistently at about 67^o to bedding towards the west, is present at 150 m. The upper part of the sequence contains numerous slump structures, erosional breaks, and dewatering features. A channel about 30 m wide and 1 m deep, containing disoriented blocks of stromatolitic dolomite, is present at 227 m.

The 120 m of Dungaminnie Formation measured in Mallapunyah 5, consists mainly of red and brown siltstone and sandstone, and therefore is probably equivalent to the lower part of Mallapunyah 6; the upper unit must have been eroded away before deposition of the Limmen Sandstone of the Roper Group. Here again the contact with the underlying Balbirini Dolomite is covered by alluvium from the McArthur River.

In both sections the Dungaminnie Formation is unconformably overlain by a thick-bedded well-sorted quartz sandstone (Limmen Sandstone) which in places oversteps the Dungaminnie Formation to rest directly on the Balbirini Dolomite. In the Mount Young Sheet area, the Limmen Sandstone rests directly on the lower part of the Tooganinie Formation.

RESULTS OF DETAILED MAPPING

Detailed mapping, using 1:250 000-scale colour aerial photographs was carried out in three areas (cross-hatched in Fig. 1). In two of them, the geological structure is simple and routine photo-interpretation with ground checking was carried out: the mapping in the northeastern area was done mainly to correct earlier regional mapping and select suitable sections to measure through the Batten Sub-group; the area west of Mallapunyah was mapped in order to determine the stratigraphic position of the Darcy's-Copper King copper prospect. The third area (Top Crossing), is structurally more complex, and contains a greater density of geological information. Mapping in this area was carried out (1) to determine more accurately the geology of a central key area; (2) to compare the results of detailed mapping with those of the original 1:250 000 survey; (3) to test 1:100 000 scale as a suitable scale for final publication. The geological results are described below; mapping per se and map scales are discussed under 'Recommendations'.

TOP CROSSING AREA

Mapping in the Top Crossing area concentrated on the upper part of the Umbolooga Sub-group (Emmerugga Dolomite to Reward Dolomite) but other formations above and below this interval were also mapped. The Batten Sub-group cannot be subdivided in this area yet and is provisionally mapped as Billengarah Formation; it is equivalent to the undivided Batten Sub-group Plumb & Brown, (1973). Particular attention was paid to the following; 1) lateral facies variation within the Barney Creek Formation; 2) the vertical transition from the Barney Creek Formation to the Reward Dolomite; 3) the presence of a possible 'sub-basin' in the southwest of the area; and 4) folding and faulting in the Tooganinie Formation and the Balbirini Dolomite.

The following features (using the definitions of Brown & others 1978) were used to map the boundaries between stratigraphic units:

Emmerugga Dolomite (Ṗme)

Mara Dolomite Member (Pmea). The base of the Mara Dolomite Member was taken to be the base of a distinctive brecciated dolomite (the 'solution collapse breccia' of Brown, & others 1978), overlying a sequence of purple-weathering dolomitic siltstones (Myrtle Shale Member). Within the Mara Member, a distinctive bed replaced by chert and containing branching *Conophyton* (laminae with relief up to 1 m) proved to be a useful marker on the western side of the Top Crossing structure.

Mitchell Yard Dolomite Member (Pmei). The contact between the Mara Dolomite Member and the Mitchell Yard Dolomite Member is transitional; the boundary is taken at the top of the highest *Conophyton* bed of the Mara Dolomite Member. The Mitchell Yard Dolomite Member is distinguished by massive bedding, patches of sparry dolomite, a total absence of stromatolites, and a general lack of chert. The member varies laterally in thickness: in the southeast it is about 30 m thick but throughout the rest of the Top Crossing structure it is only 4 - 6 m thick and could not be differentiated on the map.

Teena Dolomite (Ᵽmp)

The Teena Dolomite may be divided into two units: the unnamed lower Teena Dolomite at the base, and the Coxco Dolomite Member at the top.

Lower Teena Dolomite (Ᵽmp). This unit, consisting of khaki-cream weathering, thinly-bedded dololutite and dolarenite, with stromatolites, irregular nodules and lenses of chert, and intraformational flake breccias, provides a useful marker between the relatively massive Mitchell Yard and Coxco Dolomite Members. The unit is 8 - 12 m thick. Where the Mitchell Yard Dolomite Member is absent or poorly developed, it is difficult to distinguish the lower Teena Dolomite from the Mara Dolomite Member. The top and bottom of the lower Teena Dolomite is commonly marked by thin beds of *Conophyton*.

Coxco Dolomite Member (Ᵽmc). The base of the Coxco Dolomite Member is marked by a change into massive to thick-bedded dololutite and dolostone, containing distinctive clusters of radiating pseudohexagonal needles after gypsum (Walker & others, 1977). Chert is patchy and sucrosic in texture.

In the southern part of the Top Crossing area the member is about 70 m thick (Brown & others 1978). Farther north, in the steeply dipping strike ridge to the west of Balbirini homestead, where the overlying Barney Creek Formation is markedly thinner than in the south, the Coxco Dolomite Member is about 100 - 120 m thick.

Barney Creek Formation (Ᵽmq)

Although subdivided near the H.Y.C. prospect, the constituent members of the Barney Creek Formation could not be mapped in the Top Crossing area. The base of the Barney Creek Formation here is characterised by a transition zone, about 6 m thick, of interbedded fine dolarenite and ferruginous (red-weathering) silty dololutite. Above this, the Barney Creek Formation typically consists of finely laminated dolomitic siltstone and silty dolomite. ?Tuff beds (2 - 10 cm thick) are characteristic of the transition zone between the Coxco Dolomite Member and the Barney Creek Formation. Attempts to trace individual beds along strike were unsuccessful; it therefore seems unlikely that individual ?tuffs can be used as marker beds. The significance of this transition zone in terms of chronostratigraphy is uncertain until the true origin of these pink K-rich ?tuffs is further investigated (they may be products of potassium diagenesis of carbonates rather than tuffs).

The Barney Creek Formation grades into the overlying Reward Dolomite, and the boundary is difficult to define. A distinctive 'paper shale', commonly exposed in 4 - 6 m high cliffs, was used as the top of the Barney Creek Formation in the southern Top Crossing area, but this lithology was not found in the north. Here the boundary has been placed at the transition from finely laminated dololutite with ?tuffs to a sequence of wavy laminated and stromatolitic dololutite.

Reward Dolomite (Ꞓmx)

As described above, the base of the Reward Dolomite is placed at the change from the laminated shales and shaley dolomites of the Barney Creek Formation to the mainly dolomite sequence which characterises the Reward Dolomite. The boundary appears to be diachronous, but lateral relationships are obscured by soil cover, deep weathering, and structure; the base of the Reward Dolomite appears to be older in the northern area.

In the north the lower part of the Reward Dolomite consists of dolomite with wavy lamination, columnar domal stromatolites, and columnar *Conophyton* containing radiating gypsum needle pseudomorphs. In the south, the basal Reward Dolomite consists of thin-bedded to laminated dololutite, with thin impersistent chert bands and nodules; an identical sequence overlies the basal stromatolitic sequence in the north.

Above this cherty dolomite marker, the Reward Dolomite consists of thick-bedded dololutite with irregular sparry patches, intraclast dolarenite, flake breccias, and stromalitic dolomite with domal stromatolites and some *Conophyton*, all with abundant chert bands and nodules throughout. Much of the exposure, particularly in the north, is heavily silcreted. Overall, there is an upwards increase in sand and mica content, and of sedimentary structures indicative of higher energy environments. A distinctive 1 - 3 m thick pink ?tuff bed occurs within sandy and silty dolarenites near the top of the formation.

Billengarrah Formation (Ᵽmb)

The contact between the Reward Dolomite and the overlying units, provisionally mapped as Billengarrah Formation, is obscured by silicrete. The boundary mapped at present, in the south, is the approximate upper limit of the cherty dolomite of the Reward Dolomite, and its inferred continuation into the completely silcreted outcrops in the north. Alternative boundaries could be placed at the top of the pink ?tuff marker bed, or at the base of the first quartz sandstone of the overlying sequence.

Two traverses through the Billengarrah Formation permitted the recognition of two sub-units. The lower sub-unit (Ᵽmb$_1$) consists of interbedded siltstone, dolomitic siltstone, dololutite, dolarenite, and dolomitic sandstone; These are overlain by a prominent strike ridge of highly silcreted rocks (Ᵽmb$_2$), apparently after cherty stromatolitic dolomite, sandy dolomite, and sandstone.

West of Balbirini homestead, fragments of 'cauliflower chert' and chert containing long bladed gypsum pseudomorphs were found in a scree slope just below Ᵽmb$_2$. This may indicate that Ᵽmb$_1$ and Ᵽmb$_2$ represent the Lynott and Yalco Formations respectively. Mapping is planned during 1978 between these sections and the better delineated Batten Sub-group exposures to the northeast.

Structure

A sub-basin of Barney Creek Formation was identified in the southwestern part of the Top Crossing area; principal features of this sub-basin are:

1. The sub-basin is bounded by a zone of brecciation, in which rounded fragments and blocks of Coxco, Mitchell Yard, and Mara Dolomite Members are set in a matrix of silty dolostone. Adjacent to the sub-basin, the underlying Coxco Dolomite Member shows <u>in</u>

situ brecciation. The breccias resemble talus slope breccias recently described at the H.Y.C. mine (Walker & others in press).

2. The Barney Creek Formation dips steeply (70^o - 90^o) at the margins of the sub-basin. The margins are often faulted, with Barney Creek Formation in contact with rocks from various underlying units (to as low down as Emmerugga Dolomite); elsewhere the margin is indicated by a sudden steepening of dip within the Barney Creek Formation.

3. Within the sub-basin, the Barney Creek Formation has a 'double-monoclinal' structure, with steeply dipping beds on the flanks and shallow-dipping to horizontal beds in the core (Fig. 5).

4. Slump folds occur within the Barney Creek Formation and indicate sediment movement into the sub-basin from the margins.

5. No mineralisation was found, apart from traces of galena in the brecciated Coxco Dolomite Member and weathered pyritic siltstone in the Barney Creek Formation.

Movements may have occurred on the bounding faults, contemporaneously with sedimentation, to produce the resulting depression with formation of the talus slope breccias at the margins and slumping of shale within the sub-basin. Alternatively, the relief necessary for formation of the talus slope breccia may be due to a palaeokarst topography, perhaps with solution collapse below the sub-basin producing slumping of the shales. Both alternatives require further investigation.

Mapping in the area east of the Abner Range, between sections Glyde 1 and Mallapunyah 1, has also revealed a similar sub-basin of Barney Creek Formation, although relationships are obscured by poor outcrop. The underlying Coxco Dolomite Member is complexly folded (locally overturned), whereas the overlying Reward Dolomite forms a simple strike ridge dipping about 5^o south.

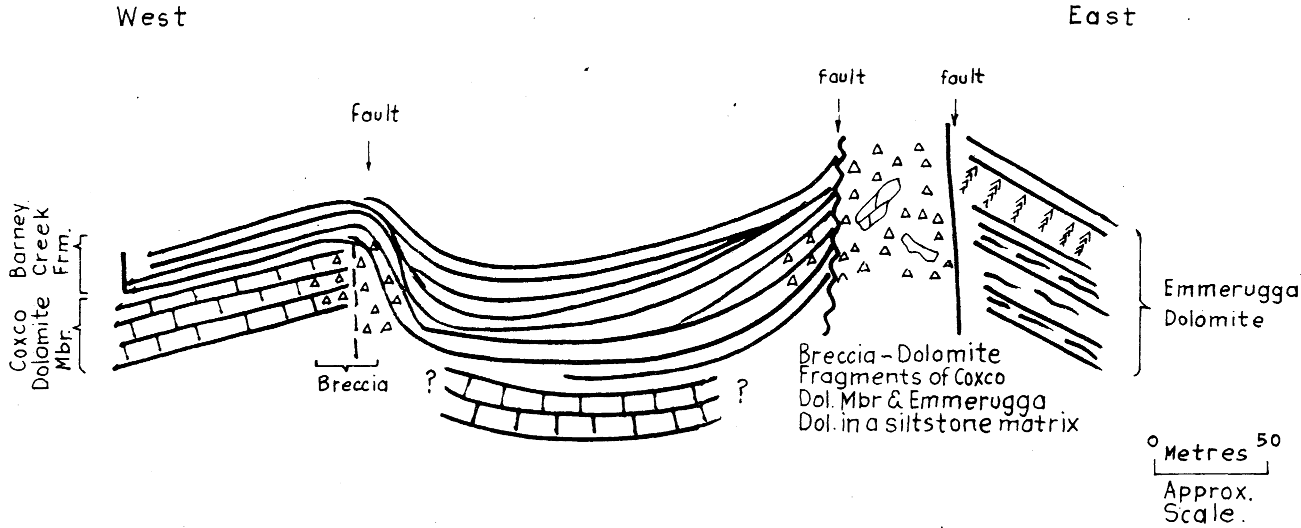
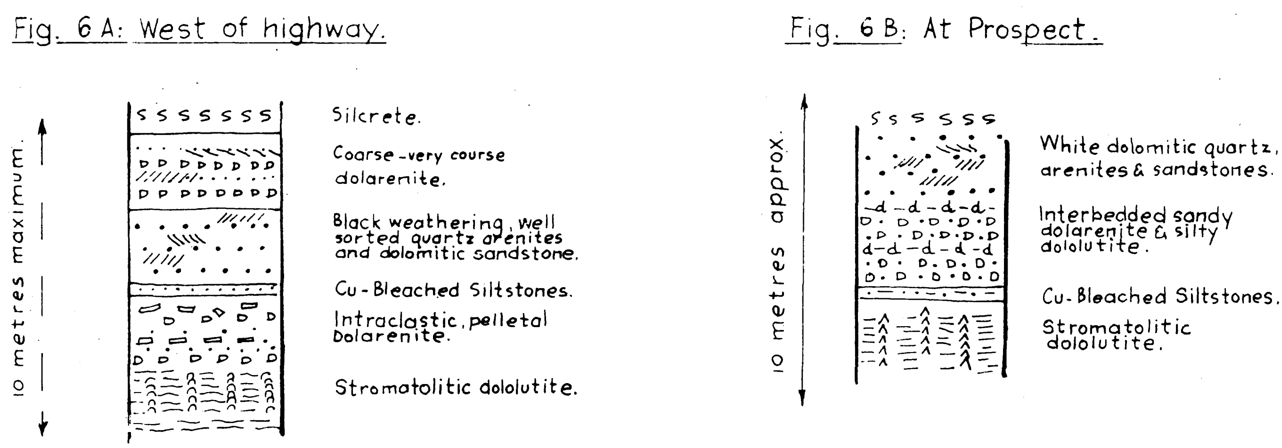


Fig. 5 : Schematic section showing structural interpretation of southwest Top Crossing area.



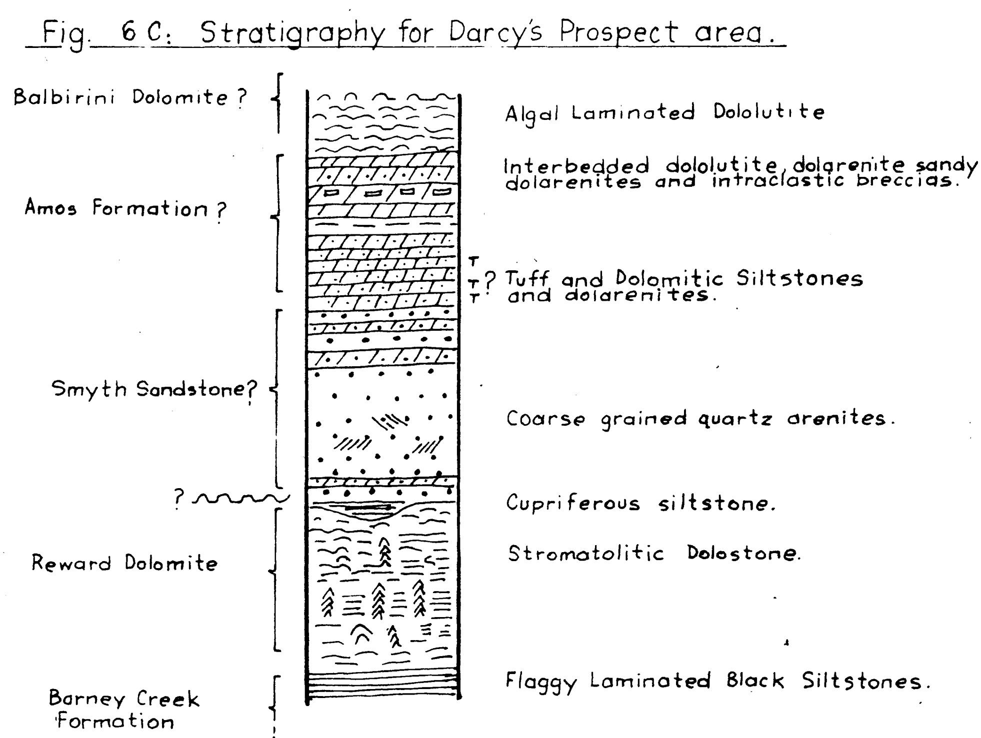


Fig. 6 : Stratigraphic interpretation of setting of Darcy's Copper Prospect.

MINERAL PROSPECTS VISITED

Apart from the mines and prospects visited on the first geological tour, the Coppermine Creek, Kilgour, Darcy's, and Yah Yah copper prospects and the Eastern Creek lead-barite prospect were visited and examined in some detail.

Kilgour

At the Kilgour prospect (17°09'S, 135°47E,), there are a number of diggings in stromatolitic Amelia Dolomite. The mineralisation is mainly malachite and azurite, which has penetrated particularly permeable horizons; for example, malachite staining is frequently observed along stromatolite laminae. Some specimens of cuprite, chalcocite, and bornite were also obtained. The mineralisation okcurs in elongate parallel bodies, and is discordant, and not apparently stratigraphically controlled. It bears a strong resemblance to deposits controlled by karstic weathering.

Coppermine Creek

The Coppermine Creek prospect (15°57'S, 135°32'E) in the Mount Young 1:250 000 Sheet area occurs along a fault between Amelia Dolomite and Limmen Sandstone. The fault displacement is probably not great, because in this area the Limmen Sandstone rests on the lower parts of the Tooganinie Formation and other units of the Umbolooga Sub-group. The principal copper mineral is malachite, secondary after chalcopyrite and bornite, and it occurs in jaspers associated with the fault zone. The Amelia Dolomite is here a sideritic marble after evaporites. In nearby Tawallah Pocket the Amelia Dolomite sideritic marble contains widespread chalcopyrite, and these marble horizons are generally copper-rich.

Darcy's Copper Prospect

Two days were spent mapping the geology to the west of the Darcy's copper prospect (135°46'E, 16°57'S), (Fig. 1), in an attempt to determine its stratigraphic position and to locate any further traces of mineralisation.

The mineralisation at Darcy's prospect is poorly exposed in six pits (each about 4 m deep) over a strike length of 200 m. The mineralisation consists of large crystalline masses of chalcocite, and cuprite, malachite, and azurite. The local stratigraphy is summarised in Figure 6. Previous company work (on Open File in Mines Branch, Darwin) postulated fault control for the mineralisation. We consider that the mineralisation is stratabound within a 20 - 40 cm thick bed of highly bleached and weathered dolomitic siltstone, containing veinlets of malachite; we see no evidence of faulting. This bed crops out only in the immediate vicinity of the prospect but it may continue to the east beneath an area of no exposure. A similar sequence crops out close to the main road, 2 km west of the mine, where a bleached, laminated siltstone containing traces of malachite overlies a sequence of interbedded dolarenite and stromatolitic dolostone, and is overlain by a sequence of cross-bedded, coarse quartz sandstone and dolarenite (Fig. 6).

Within the area mapped, the stratigraphy can be traced up from the Coxco Dolomite Member of the Teena Dolomite, through a thin succession of Barney Creek Formation into the Reward Dolomite. The Reward Dolomite is almost identical to that mapped in the Top Crossing area: massive dololutite which commonly contains stratiform stromatolites, vertical columnar stromatolites (20 cm relief), and Conophyton (30 cm relief) with radiating clusters of gypsum pseudomorphs between the algal laminae. The bleached cupriferous siltstone immediately overlies the Reward Dolomite.

Identification of the sequence overlying the cupriferous siltstone (Fig. 6) is uncertain; mapping is programmed for 1978 to resolve the problem. A sudden change occurs immediately above the siltstone into interbedded coarse quartz sandstone and dolarenite. The sandstone contains scattered clay pellets and fragments of pink ?tuff. Asymmetrical ripple marks are common. The sandstone gradually become finer and more dolomitic up sequence, and intraclastic pelletal dolarenite and dololutite become the dominant rock type. Within this transition zone, pink-cream-weathering beds of reworked tuffaceous(?) sediment are common. The uppermost beds are stromatolitic dololutites, which commonly contain irregular chert lenses, and discoidal gypsum crystal pseudomorphs.

Although this sequence is tentatively identified as Symthe Sandstone-Amos Formation-Balbirini Dolomite, it is substantially different from the type sections farther north. Other alternatives still to be resolved are Batten Sub-group equivalents, or Dungaminnie Formation.

Yah Yah

The mineralisation at Yah Yah (17°02'S, 135°25'E) occurs in a similar setting to Darcy's. The original mapping (Wallhallow 1:250 000 Sheet) is wrong.

The mineralisation is again stratabound in a cupriferous siltstone, overlain by a thin pink ?tuff. This is underlain by distinctive purple-brown dololutite ('Tooganinie Formation' on the 1:250 000 Sheet), with a variety of stromatolite types, which is now thought likely to be equivalent to the Reward Dolomite of the Top Crossing area. The cupriferous siltstone is impersistent. These beds are then overlain by a poorly outcropping sequence of ferruginous sandstones with chert fragments, thin stromatolitic dololutites, cherts, and siltstones, which at this stage cannot be positively identified. Finally, the whole sequence is overlain by the Limmen Sandstone, the base of the Roper Group.

Darcy's and Yah Yah prospects have many features in common. In both prospects, mineralisation occurs in an impersistent siltstone that overlies a carbonate succession, and is overlain by a sandstone, apparently unconformably.

The Eastern Creek lead-barite prospect

The prospect occurs in the McArthur Group Kookaburra Creek Formation (Mount Young 1:250 000 Sheet, 135°32'E, 15°57'S), near where the formation is unconformably overlain by the basal conglomerate of the Roper Group. The Kookaburra Creek Formation is the stratigraphic equivalent of the Balbirini Dolomite.

The deposit contains two forms of mineralisation. The first consists of small cubes of galena and occasional wisps of barite, distributed parallel to stromatolite laminae. The second form of mineralisation consists of cross-cutting veins of barite.

C.R.A.E. drilled the prospect in 1972 and 1973 and their interpretation of the stratigraphy is summarised below:

Basal sandstone of Limmen Sandstone (Roper Group)

unconformity

*Stromatolitic dolomite Laminated dolomite and chert with flake breccia	Kookaburra Creek Formation (≡ Balbirini Dolomite)
Sandstone with some dololutite interbeds, dolomite with halite casts at base	Mount Birch Sandstone
Stromatolitic and laminated dolomite	Emmerugga Dolomite

The stratabound mineralisation occurs just below the top stromatolitic dolomite (*) of the Kookaburra Creek Formation. However 1977 McArthur Basin mapping and section measuring in the Balbirini Dolomite in the type area gave a better understanding of the stratigraphy of the formation. The stromatolite beds (*) above the mineralisation at Eastern Creek can be correlated with a stromatolite horizon at 528 - 550 m in the Balbirini Dolomite section at Balbirini. The so-called Mount Birch Sandstone 180 m below the stromatolite beds (*) may be correlated with a sandstone 160 m below the stromatolite beds in the Balbirini Dolomite measured section. Both sandstones are associated with shale, potassium rich mudstone, and dololutite with mud-cracks and halite casts. The bottom parts of both sandstone units consist of sandy dolarenite, flake breccia and conglomerate. The underlying 40 m of so-called Emmerugga Dolomite at Eastern Creek correlate well with the underlying beds in the Balbirini Dolomite. These new lithological correlations will be checked by a re-examination of the C.R.A.E. diamond drill core early in the 1978 field season.

REVISION OF BAUHINIA DOWNS 1:250 000 GEOLOGICAL SHEET

Since the 1:250 000 geological sheets of the region were published during the 1960s, new field information has resulted in new interpretations of the geological relationships within the McArthur Group, and much of the information on the published maps (particularly Bauhinia Downs) is now wrong

(Plumb & Brown, 1973). Although the changes can be anticipated in most cases, much of the area has not yet been mapped, so publication of 2nd Edition Sheets is not planned until completion of the current project.

As an interim measure, a revised preliminary Bauhinia Downs Sheet has been prepared by M.C. Brown (Pl. 1), from information available to date, to conform with the revised stratigraphy (Plumb & Brown, 1973). Most of the area is still subject to revision by detailed mapping.

Data sources are:

(a) detailed mapping by Carpentaria Exploration Company Pty Ltd during the 1960s, in the area roughly bounded by the Emu and Tawallah Faults, the Abner Range in the south, and the H.Y.C. area in the north;

(b) air-photo interpretation and reconnaissances by Brown in 1967-69, during his study of the Emmerugga Solomite, Barney Creek Formation, and Reward Dolomite;

(c) detailed mapping by the McArthur Basin Party during 1977.

The revised areas can be identified by the different drafting style; full-line geological boundaries have been used to enhance the contrast.

Some areas shown as Balbirini Dolomite include Amos Formation and Dungaminnie Formation: and some areas shown as Barney Creek Formation may include some Reward Dolomite, particularly in the north-south-trending belt passing to the east of Bauhinia Downs homestead.

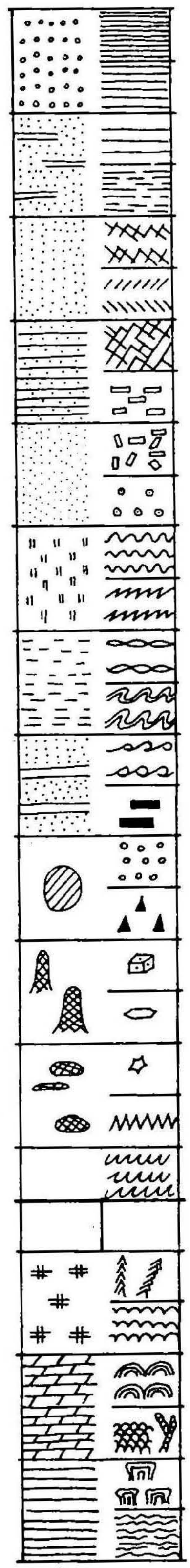
APPENDIX I

SUMMARY LOGS OF MEASURED SECTIONS (Figs 7-39)

(listed in Table 2)

Lithology

- Conglomerate
- Dolomitic coarse sandstone
- Coarse sandstone
- Sandy dolarenite
- Fine sandstone
- Siltstone
- Mudstone or shale
- Interbedded siltstone & dololutite
- Massive silicified crust
- Chert in shape of Conophyton
- Chert
- (Sample locality)
- No outcrop
- Recrystallised dolostone
- Dolarenite
- Dololutite



Sedimentary Structures

- Laminated to thin-bedded (Wavy if bedding is wavy)
- Medium-bedded
- Thick-bedded
- Discontinuous bedding
- Cross-stratification/bedding
- Fine-scale cross-stratification/bedding
- Large-scale cross-stratification/bedding
- Intraclasts sub-parallel to bedding
- Intraclasts & disorganised flakes (usually called flake breccia).
- Oolites
- Symmetrical ripples
- Asymmetrical ripples
- Lenticular bedding
- Ripple-drift cross lamination
- Slumping
- Tuff ?
- Concretions
- Breccia
- Halite (?) cast
- Gypsum(?) cast
- Mud- cracks
- Teepee structures
- Convolute bedding
- No outcrop
- Vertical and leaning Conophyton
- Low small domes
- Steeper larger domes
- Columnar and branching columnar stromatolites
- Domes with overturned sides
- Algal lamination or stratiform stromatolites

FIGURE 7. SYMBOLS USED IN SUMMARY LOGS OF THE MEASURED SECTIONS.

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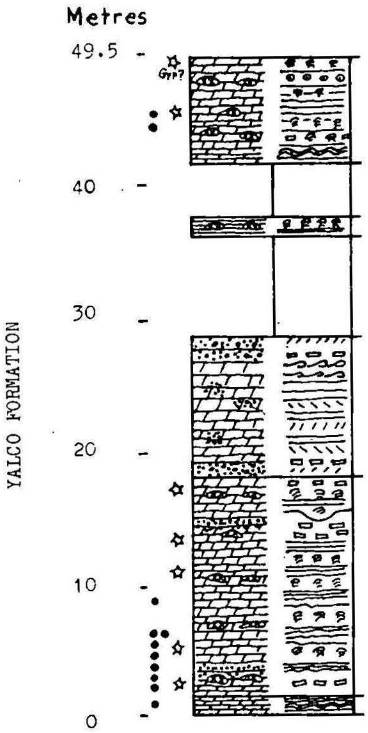
Record 1978/54



Stromatolitic cherty dololutite, with oncolites and domal stromatolites, and possible gypsum casts in mud-cracked units.

Interbedded dololutite and chert with abundant small domal stromatolites.

Dolomitic quartz arenite. Shallow-dipping cross-bedding. Ferruginous concretions become common at the top of the unit. Between 18.5 and 19.5 m is a channel sandstone replacing cherty dololutites, which, at this level, contains intraclasts and cherty dololutite pebbles. Herring-bone cross-lamination in the arenite.

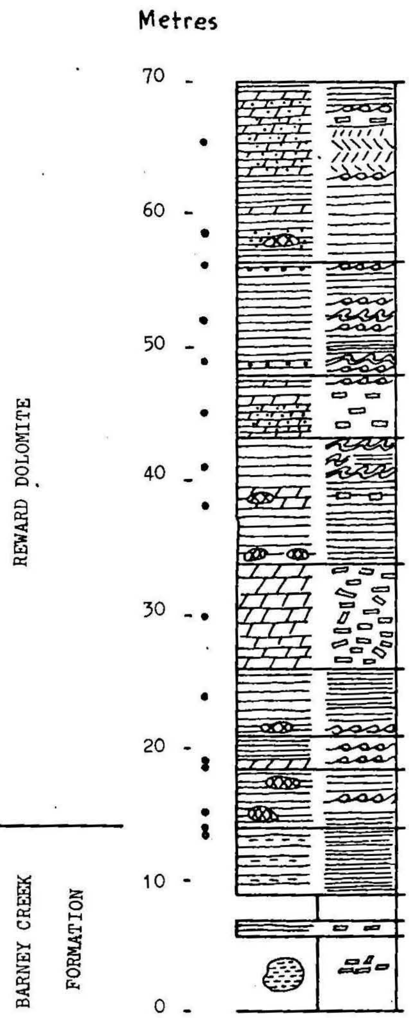
Cherty dololutites, with stromatolites, stratiform and domal, mud-cracked algal mat, teepee structures on various scales, and lensoid quartz arenite bodies, probably channel sands. Flake breccia also abundant.

Thin-bedded dolarenite with ripple-drift cross-lamination.

AUS 1/652

FIGURE 8. MEASURED SECTION <u>BORROLOOLA 1</u>.

Continues along strike in Section GLYDE 2.



Dolarenite, sandy in places, with intraclast horizons. Ripple-drift cross-lamination, and some upwards-fining sequences. Slumping in top part of section. Chert spheres at base.

Dololutite with ripple-drift cross-lamination, graded-bedding, upwards-fining sequences and slump structures.

Sandy dolarenite with flake breccia, graded-bedding and slumping.

Dololutite with graded-bedding and ripple-drift cross-lamination. Some flake breccia and chert spheres. Abundant chert bands in places.

Massive slump breccia. Angular fragments of dololutite and chert in dolarenite matrix.

Flat-bedded dololutite with frequent chert bands at base, and slumped bed at base.

Clastic dolomite slump breccia. Angular blocks of dololutite & chert in dololutite matrix. 20cm band of buff dolarenite at base.

Medium-thin-bedded dololutite with chert bands and spheres. Occasional slump beds.

Tuffaceous dolomitic shale. Grey wispy laminae. Carbonaceous.

Breccia. Dololutite fragments in dololutite matrix.

No exposure, but float of brecciated and silicified shale.

AUS 1/653

FIGURE 9. MEASURED SECTION GLYDE 1.

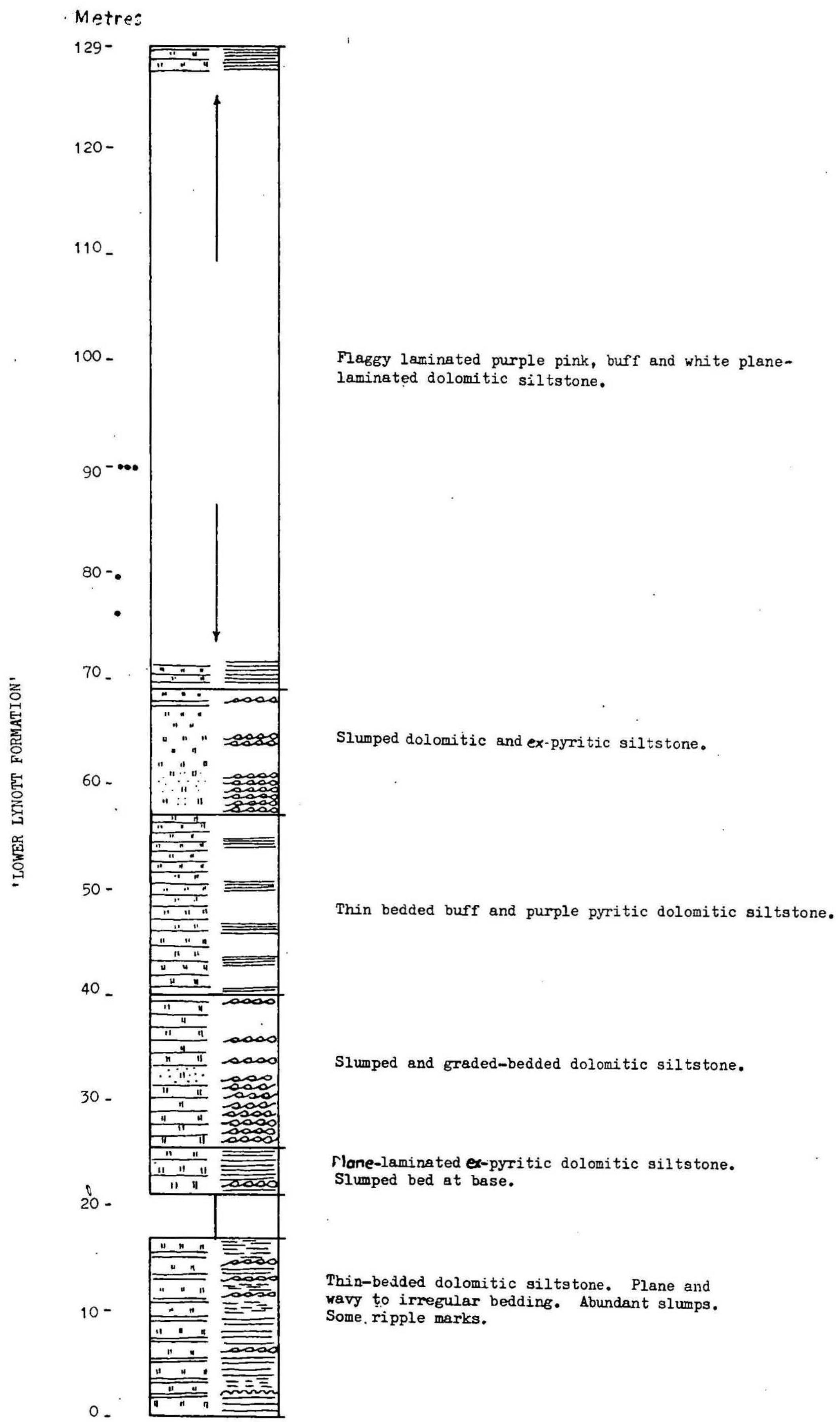
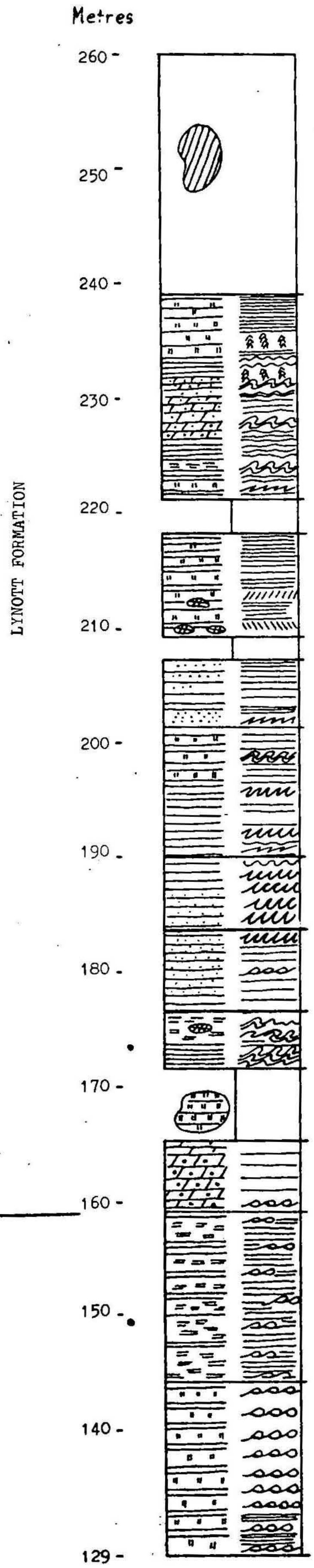


FIGURE 10. MEASURED SECTION GLYDE 2.



Silicified outcrop. Possibly stromatolitic.

Thin-bedded and laminated dolomitic siltstone and shale with sandy dolarenite interval. Small-ripple cross-laminated and lenticular bedding grading up to plane-laminated. Intervals of small conical structures - beach travertine or wave splash rock?

Thinly laminated purple-brown dolomitic siltstone interbedded with chert breccia.

Interbedded medium, coarse and fine-grained silicified dolomitic sandstone. Medium to thick bedded. Asymmetric ripples.

Dolomitic sandstone grading upwards into dolomitic siltstone. Alternating plane lamination and small-ripple cross-lamination

Massive fine-grained dolomitic sandstone and shale. Diagnostic convolute bedding and ball-and-pillow lower surfaces.

Small-ripple cross-laminated fine-grained dolomitic sandstone.

White cherty shale. Occasional ripple marks.

Thin-bedded dololutite with small-ripple cross-bedding.

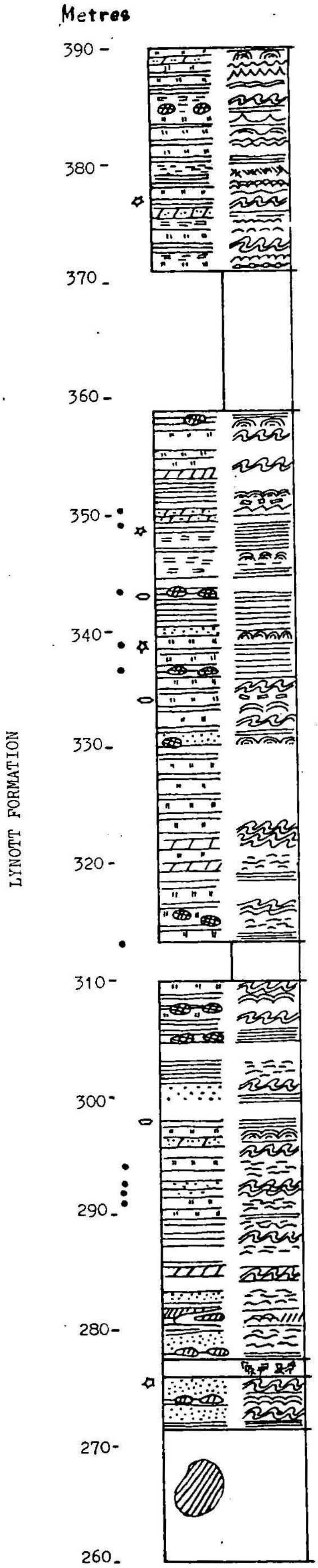
No exposure. Pink dolomitic siltstone in float.

Silicified dolarenite, with coarse sand grains.

Grey dolomitic shale with interbedded thin slumped beds.

Massive slumping in thin-bedded siltstone and shale.

FIGURE 10 (cont.)



As below. Red-brown and green dolomitic fine sandstone and siltstone - small ripple-cross-lamination, plane lamination, lenticular bedding; alternating with stromatolitic dololutite. Teepee structures about 385 m.

Upward-fining sequences.

Cyclically alternating dolomitic siltstone and sandstone and stromatolitic dololutite, as below. Small-ripple cross-lamination lower part; mostly plane lamination in upper part.

Beach rock, or wave-splash travertine?

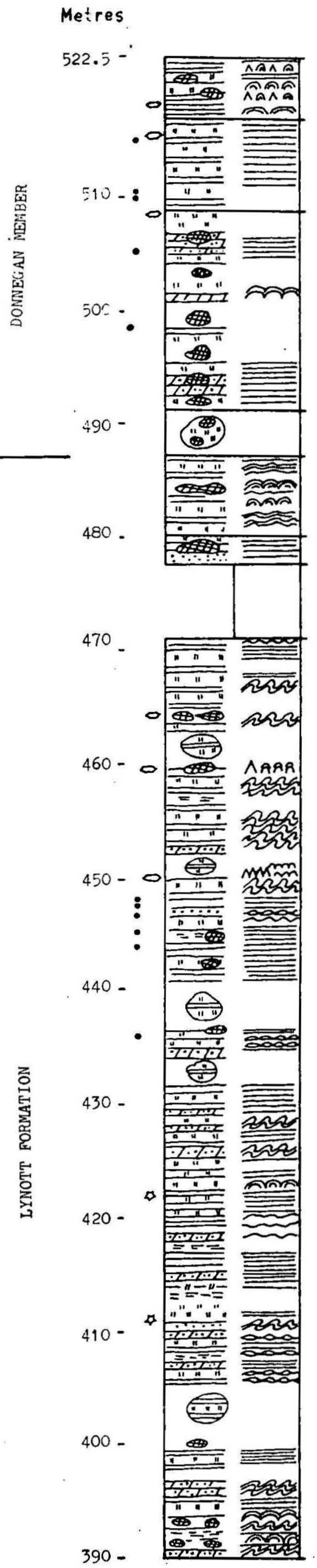
Regularly alternating cycles: red-brown to green dololutite, dolomitic siltstone, some sandstone,-alternating small-ripple cross-lamination, and plane lamination, upward-fining cycles; pass up into stromatolitic dololutite, low elongate domes to stratiform stromatolites.

Branching Conophyton.

Fine-grained sandstone with small-ripple cross-lamination. Occasional dololutite interbeds.

Silicified outcrop. Possibly stromatolitic.

FIGURE 10 (cont.)



Cherty dololutite with small domal and stratiform stromatolites, anhydrite casts and teepee structures.

Red & purple dolomitic siltstone & fine sandstone. Thin-bedded.

Thin-bedded dolomitic siltstone; some fine and medium dolomitic sandstone. Botryoidal quartz nodules throughout section, some of which coalesce to form beds. Crystal casts of anhydrite and barite at top of section.

Silicified siltstone, fine sandstone and dolostone, with domal & stratiform stromatolites. Some teepee structures.

Silicified sandstone and chert breccia. Fine botryoidal quartz nodules.

Domal stromatolites and teepees; anhydrite core.

Domal stromatolites and teepees; anhydrite core.

Dolomitic siltstone and fine sandstone. Thin-bedded. Lenticular bedding, small-ripple cross-lamination, and plane lamination. Subordinate stromatolitic dololutite. Fine botryoidal quartz nodules, 432m,442m.

Upward-coarsening cycles.

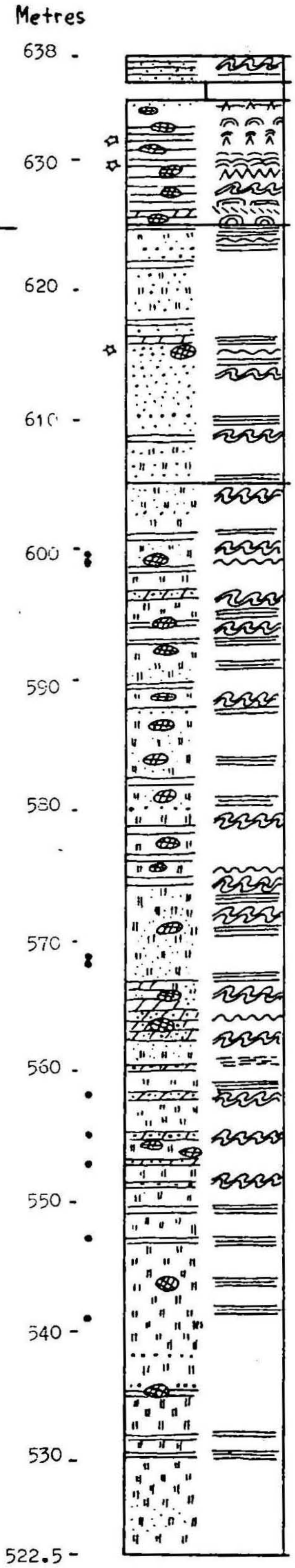
FIGURE 10 (cont.)

YALCO Fm.

Grey-green & purple fine-grained sandstone and siltstone. Some coarse granules.

Cherty dololutite with small domal stromatolites, stratiform stromatolites, mud cracks and teepee structures.

Purple-brown dolomitic fine sandstone to siltstone. Scattered coarse grains in places. Alternating plane-laminated and small-ripple cross-laminated. Some mud-cracks, botryoidal quartz nodules.

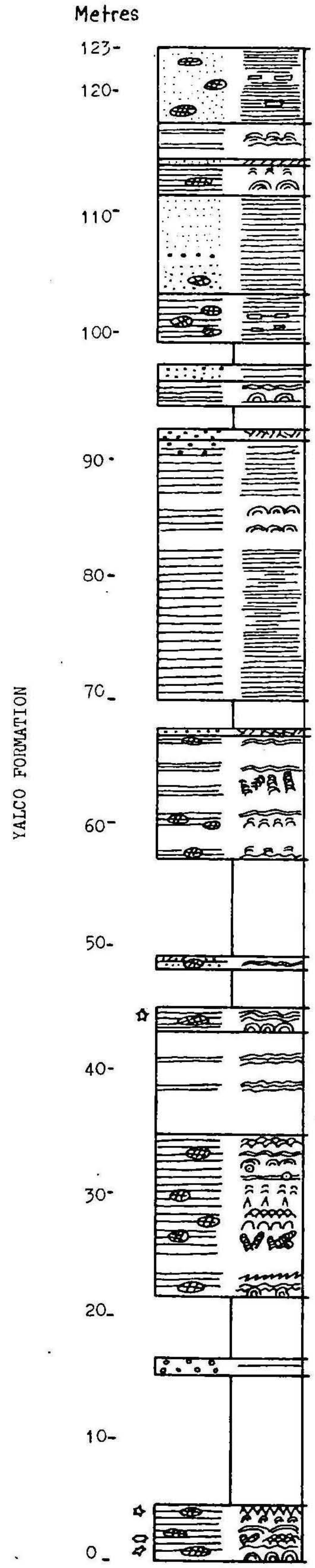


DONNEGAN MEMBER OF LYNOTT FORMATION

Purple-brown and grey-green fine sandstone to siltstone, usually dolomitic. Alternating pland laminated and small-ripple cross-laminated; various ripple marks. Abundant botryoidal quartz nodules at numerous levels. Scattered coarse quartz grains in places.

FIGURE 10 (cont.)

(5 of 5) AUS 1/654



Finely interlaminated sandy dolarenite and chert. Occasional intraclasts.

Stratiform and domal stromatolites.
Fine-grained quartz sandstone. Low angle tabular cross-beds.
Small and large domal stromatolites.

Thin-bedded clean-washed quartz sandstone with conglomeratic lens. Low-angle tabular cross beds.

Thin-bedded dololutites and cherts with chertified intraclasts sub-parallel to bedding.
Medium-thick bedded, fine quartz sandstone. Indistinct lamination.
Dololutite with domal and stratiform stromatolites.

Pebbly cross-bedded coarse sandstone.

Finely interlaminated dololutite and chert with domal stromatolites between 84 and 86 m and oncolites or pisolites at 83 m.

Fine-grained quartz sandstone with low-angle cross beds.

Cherty dololutite with abundant domal, stratiform and pseudo-columnar stromatolites.

Dolarenite and quartz arenite with pebbles and chert intraclasts. Stratiform stromatolites at base.

Dololutite with stratiform, small domal and parasitic stromatolites.

Poor exposure but some stratiform stromatolites preserved in silcrete.

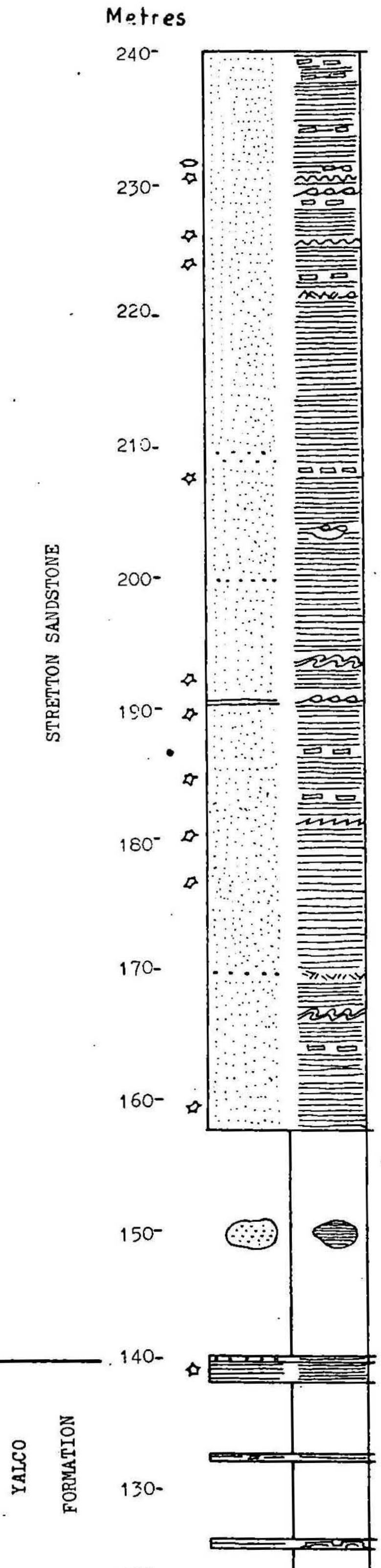
Cherty dololutites with abundant stromatolites - stratiform domal and columnar branching. Teepee and dewatering structures. Flake breccia, and slumped stromatolite beds.

Massive bedded, ferruginous fine quartz sandstone.

No exposure. Small in situ block contains teepee structures.

Cherty dololutite with abundant stromatolites - stratiform, domal, and columnar branching. Teepee and dewatering structures. Pseudohexagonal gypsum casts and mudcracks.

FIGURE 11. MEASURED SECTION GLYDE 3.



Thin bedded, greenish weathering fine to medium-grained quartz sandstone with abundant clay clasts, and groove and scrape marks on bottoms of beds, distorted mud-cracks (? dewatering structures). Ripple drift cross-lamination. Large erosional channel at 204 m with coarse slumped sand body. Occasional coarse sands at intervals through section, impersistent laterally. Possible swash marks at one horizon.

Scree of thin-bedded, flaggy, micaceous sandstone.

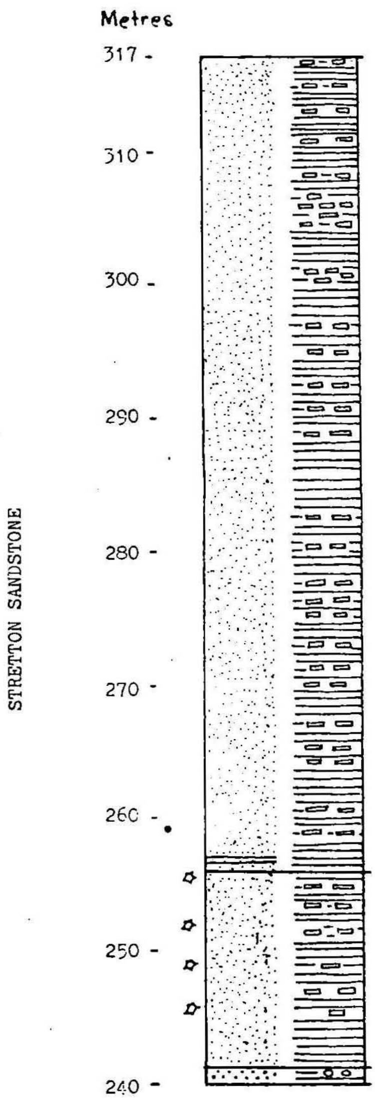
Very coarse, thin-bedded sandstone.
Thin-laminated silicified dololutite with some mudcracks.

Thin-bedded dolomitic fine sandstone.

Dololutite with large low stromatolitic domes.

FIGURE 11 (cont.)

(2 of 3) AUS 1/655

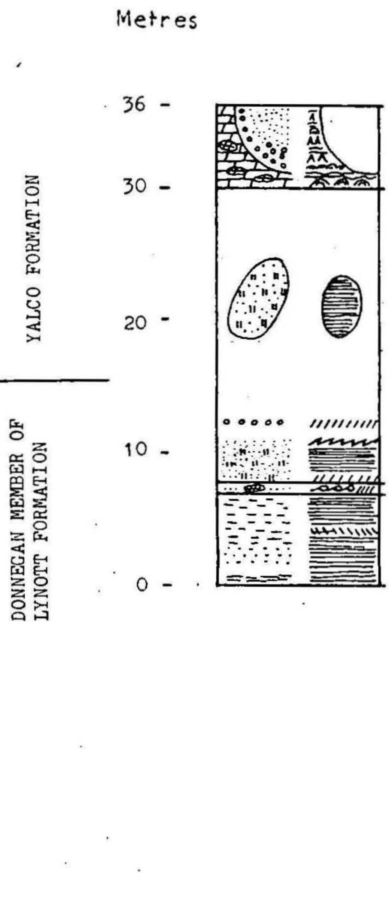


Thin-bedded, greenish weathering fine to medium-grained quartz sandstone with abundant clay clasts and groove and scrape marks on bottoms of beds. Ripple-drift lamination.

Thin-bedded, greenish weathering fine to medium-grained quartz sandstone with abundant clay clasts and distorted mud-cracks (? dewatering structures). Ripple-drift lamination.

Medium-grained sandstone with dolomitic or ferruginous concretions. Low-angle cross beds.

FIGURE 11 (cont.)



Cherty dolomites with small domal and stratiform stromatolites, teepee structures and mud-cracks. Cross cut by massive steep-sided channel sandstone with erosional base, coarse conglomerates with chert and dololutite pebbles of Yalco lithology. Channel steep-sided on E, shallower on W. Overtopped at 35 m by small domal stromatolites in cherty dolomite. Coarsest-grained material on E side of channel. Pebbles up to 20 cm. Some deformed, some not.

Very poor exposure of red and purple fine-grained sandstone and siltstone.

Cross-bedded fine red sandstone. Slump structures at top. Botryoidal quartz nodules up to 2 cm in diameter.

Red and purple cross-bedded silty sandstones.

FIGURE 12. MEASURED SECTION GLYDE 4a (PARTIAL EQUIVALENT TO GLYDE 4).

AUS 1/666

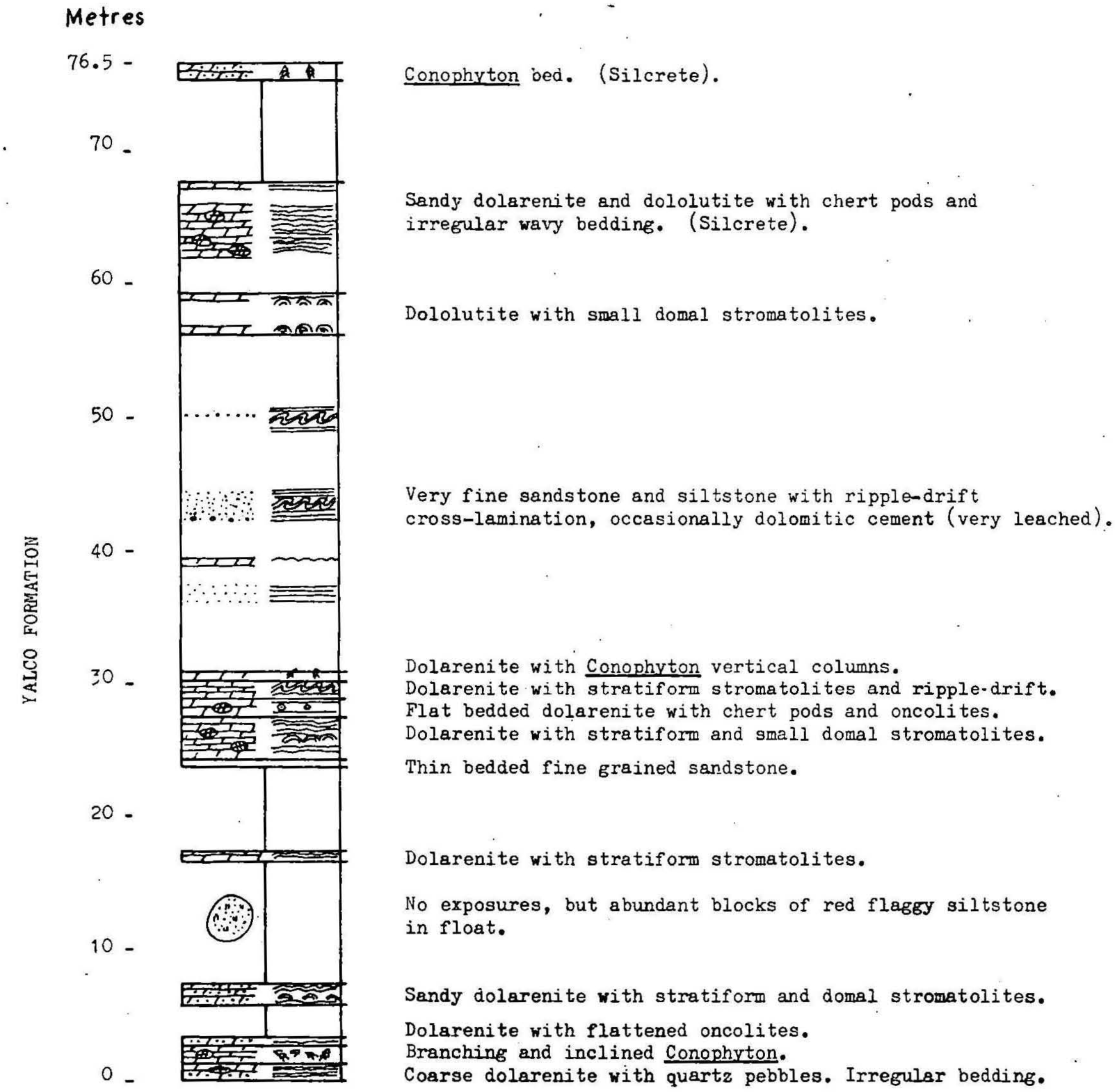


FIGURE 13. MEASURED SECTION GLYDE 4 (PARTIAL EQUIVALENT TO GLYDE 4a).

AUS 1/857

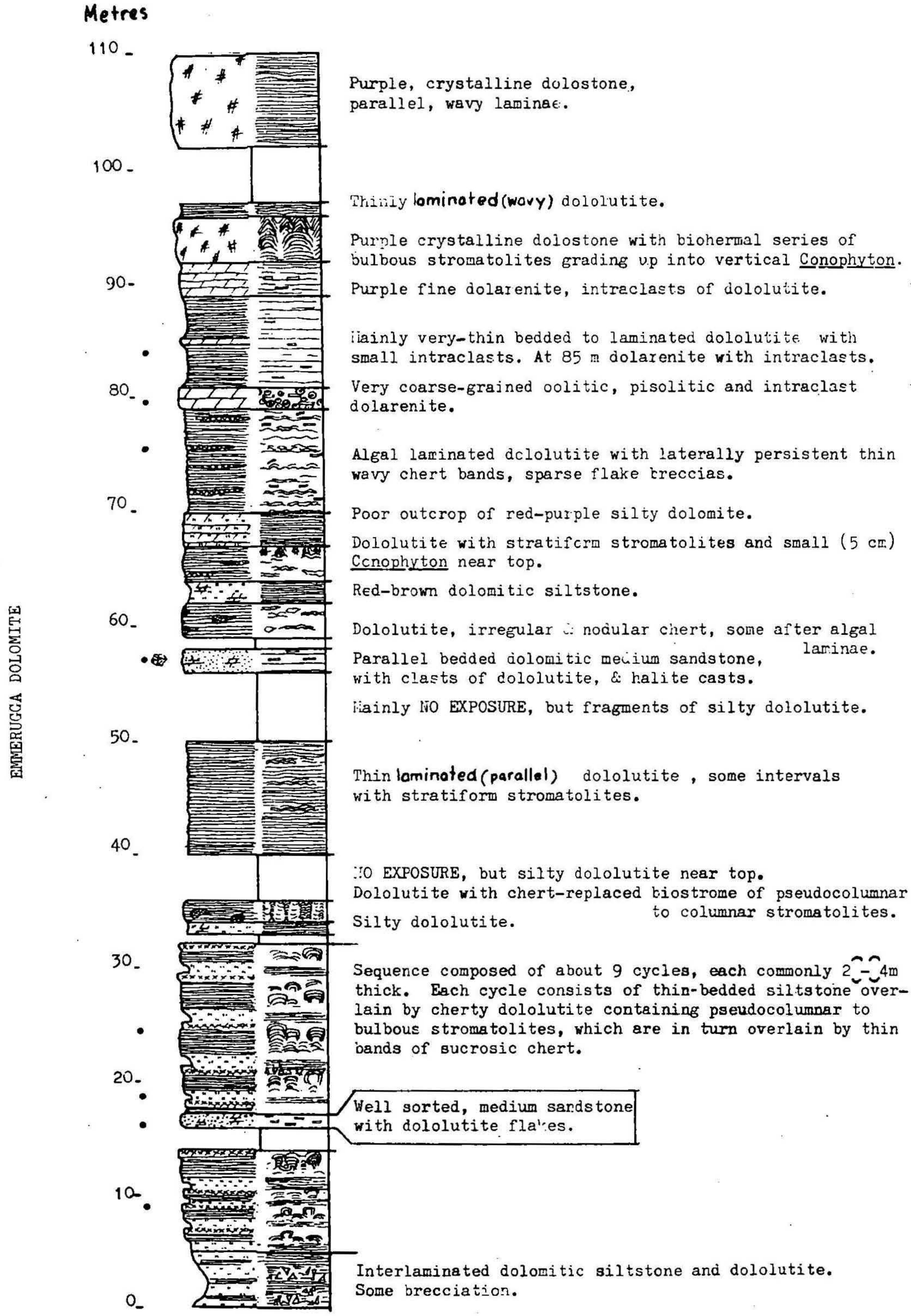
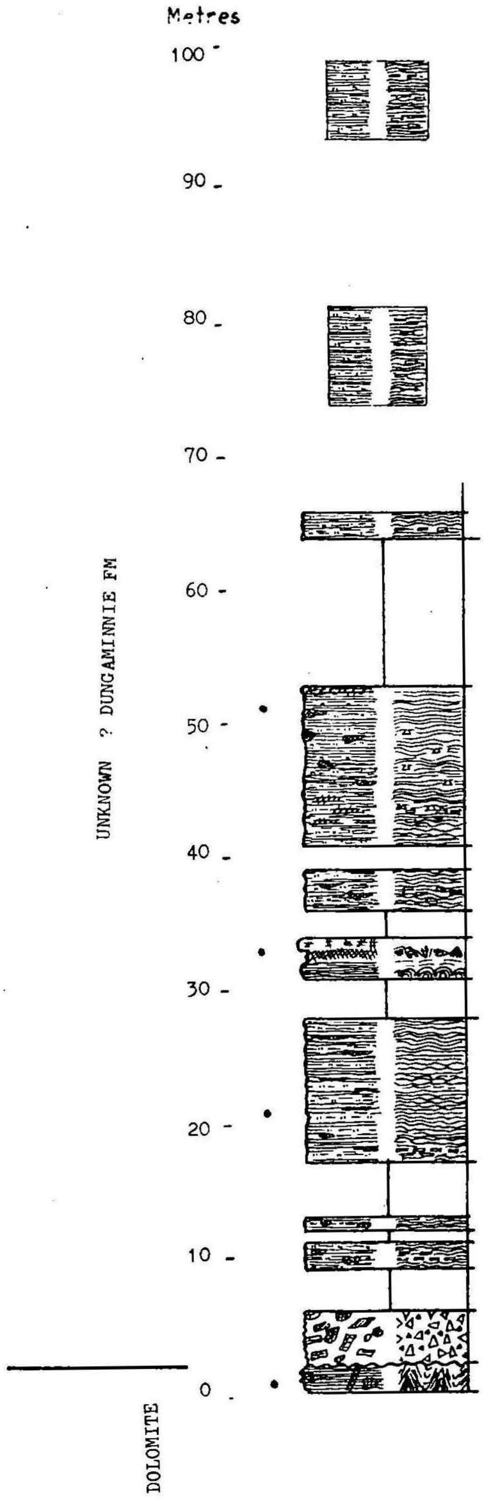


FIGURE 14. MEASURED SECTION KILGOUR 1.



Above 70 m, the rocks are as below: and section was paced, not measured.

Laminated dololutite and silty dololutite, commonly intraclastic. Irregular chert pods. Intervals of wavy bedding with pinch and swell.

Fine dolarenite.

Recrystallised dolostone, overlying brecciated chert with contorted Conophyton. These overlie massive dololutite with large bulbous stromatolites.

Laminated dololutite and silty dololutite, commonly intraclastic. Irregular chert pods. Intervals of wavy bedding with pinch and swell.

Breccia-conglomerate. Angular clasts of dolomite and chert up to 40 cm.

U N C O N F O R M I T Y

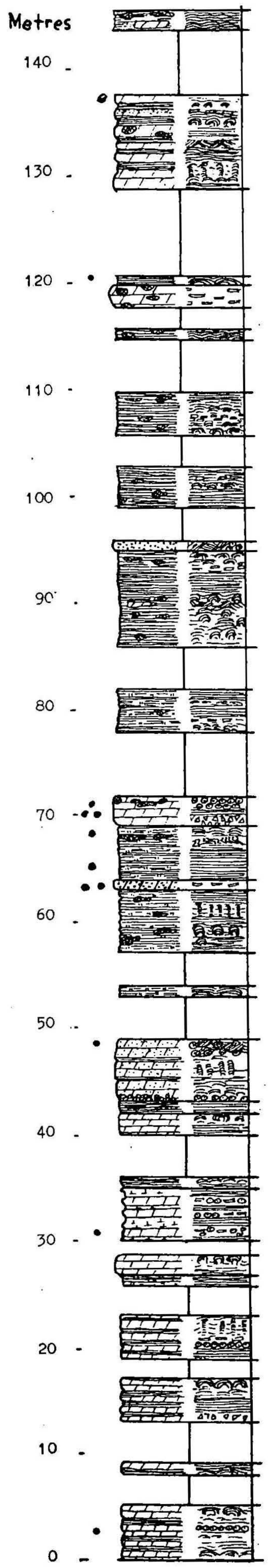
Dololutite, irregular chert bands/veins, large Conophyton.

FIGURE 15. MEASURED SECTION KILGOUR 2.

Record 1978/64

AUS 1/659

TOOGANINIE FORMATION



Interbedded intraclast dolarenites and dololutites. Domal and pseudocolumnar stromatolites. Irregular & nodular cherts. Quartz grains at 137 m.

Massive or laminated dololutite, thin dolarenite beds, irregular laminar or nodular chert. Large low domal stroms. Thick bedded dolarenite with large chert nodules.

Massive or laminated dololutite, thin dolarenite beds, irregular laminar or nodular chert. Intraclast breccias common at 107-108m, Small and large domal stromatolites.

Very coarse cross-bedded quartz & oolitic sandstone with dololutite clasts.

Massive or laminated dololutite, thin dolarenite beds, irregular laminar or nodular chert. Small or large domal stromatolites.

Laminated silty dololutite, sparse flake breccia beds. Domal to pseudocolumnar stromatolites.

Coarse dolarenites and flake breccias capped by 1 m bed of oolitic dolarenite. Minor dololutite. Chert nodules.
Thinly laminated silty dololutite, low domal stromatolites near top, slumped flake breccia at 68 m.
Very coarse quartz dolarenite grading to intraclast breccia.

Flaggy silty dololutite with bulbous and pseudocolumnar stromatolites. Chert in pods, nodules, & stromatolites.

Silty dololutite with large domal stromatolites.

Mainly fine/medium quartz oolitic dolarenite. Thin interbeds of dololutite, domal & columnar stromatolites. Basal conglomerate, cross-bedding at top of unit.
Laminated dololutite with discontinuous chert laminae.
Fine dolarenite with thin dololutite beds; internally laminated near base. 20-cm-high bulbous stromatolites.

Fine dolarenite with undulose laminae developing into bulbous stromatolites near the top.
Fine to medium oolitic & intraclastic dolarenite, thinly interbedded with thin shaley 'calcrete'.

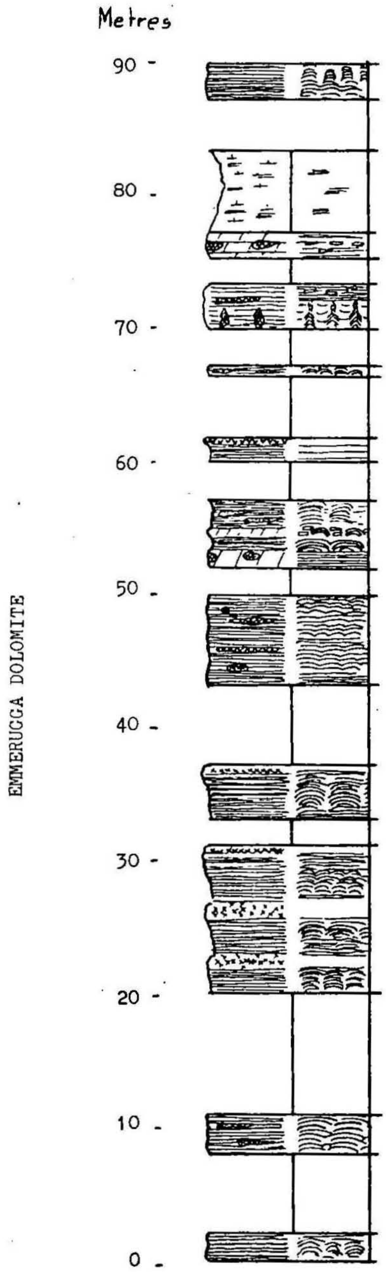
Medium dolarenite with bulbous to columnar stromatolites.

Laminated shaley grey silty dololutite.

Mainly fine to medium dolarenite with thin interbeds of wavy laminated dololutite. Dololutites contain pseudocolumnar and bulbous stromatolites which commonly contain chert. Sparse thin oolitic dolomitic beds. Intraformational dololutite breccia at 13.5 m.

FIGURE 16. MEASURED SECTION KILGOUR 3.

AUS 1/660



Stromatolitic dolomite with small to large domal stromatolites, Conophyton, and some stratiform stromatolite horizons. Minor amounts of dolarenite and flake breccia. Tabular and nodular chert in lower part of section.

Thin-bedded dololutite with flake breccias.

Thin pink vitric tuff bed.

Dololutites and dolarenites with flake breccias, and some quartz sand in wedges. Domal stromatolites. Chert nodules.

Dololutite with chert nodules and stratiform stromatolites.

Cyclic sequences of stratiform and domal stromatolites with chert laminae, followed by plane-laminated dolarenite with lenses, wisps, and stringers of sucrosic chert. Cycle is repeated.

Stromatolitic dolomite. Large domes with some thin chert laminae. Pseudohexagonal pseudomorphs, possibly after aragonite.

FIGURE 17. MEASURED SECTION KILGOUR 4.

AUS 1/661

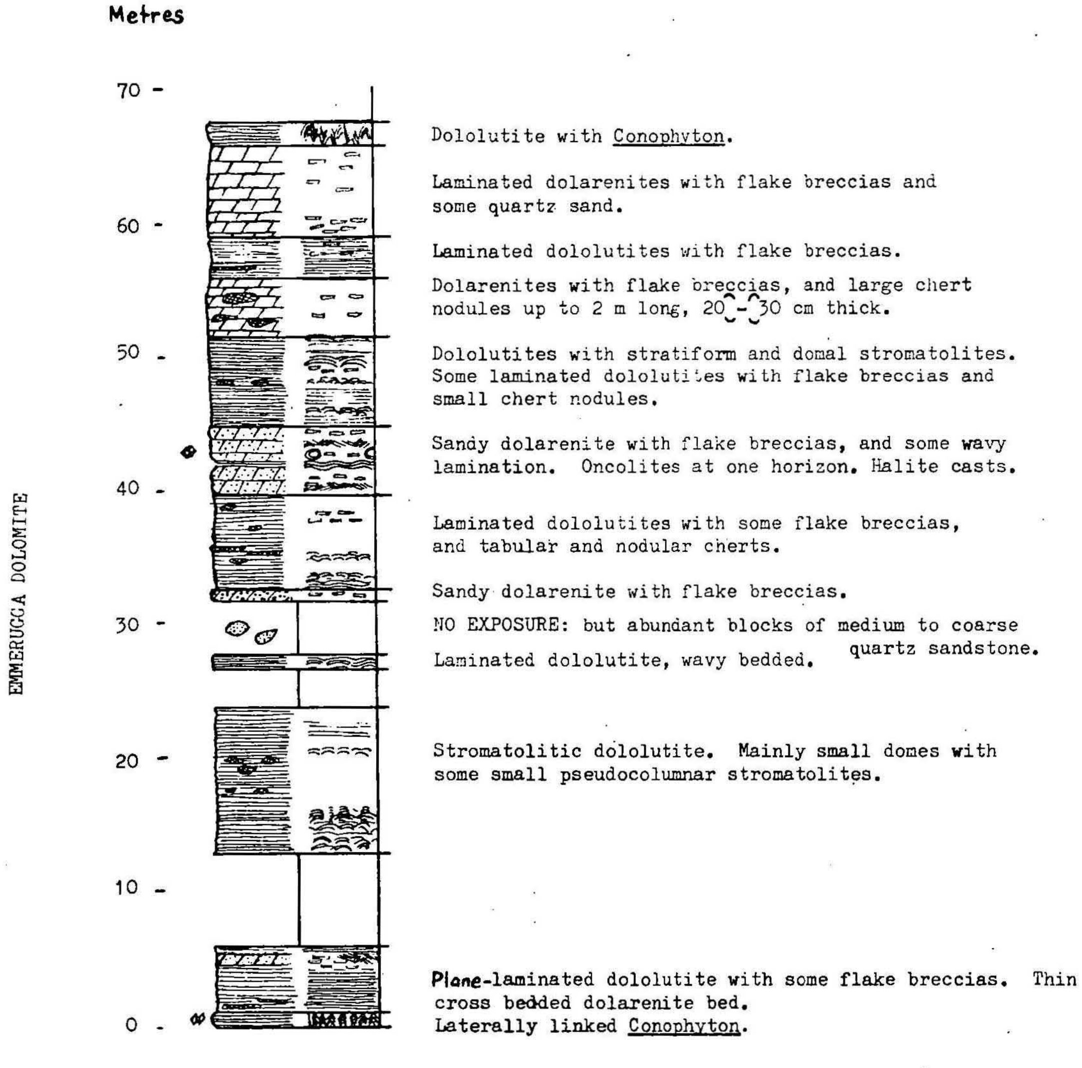


FIGURE 18. MEASURED SECTION KILGOUR 5.

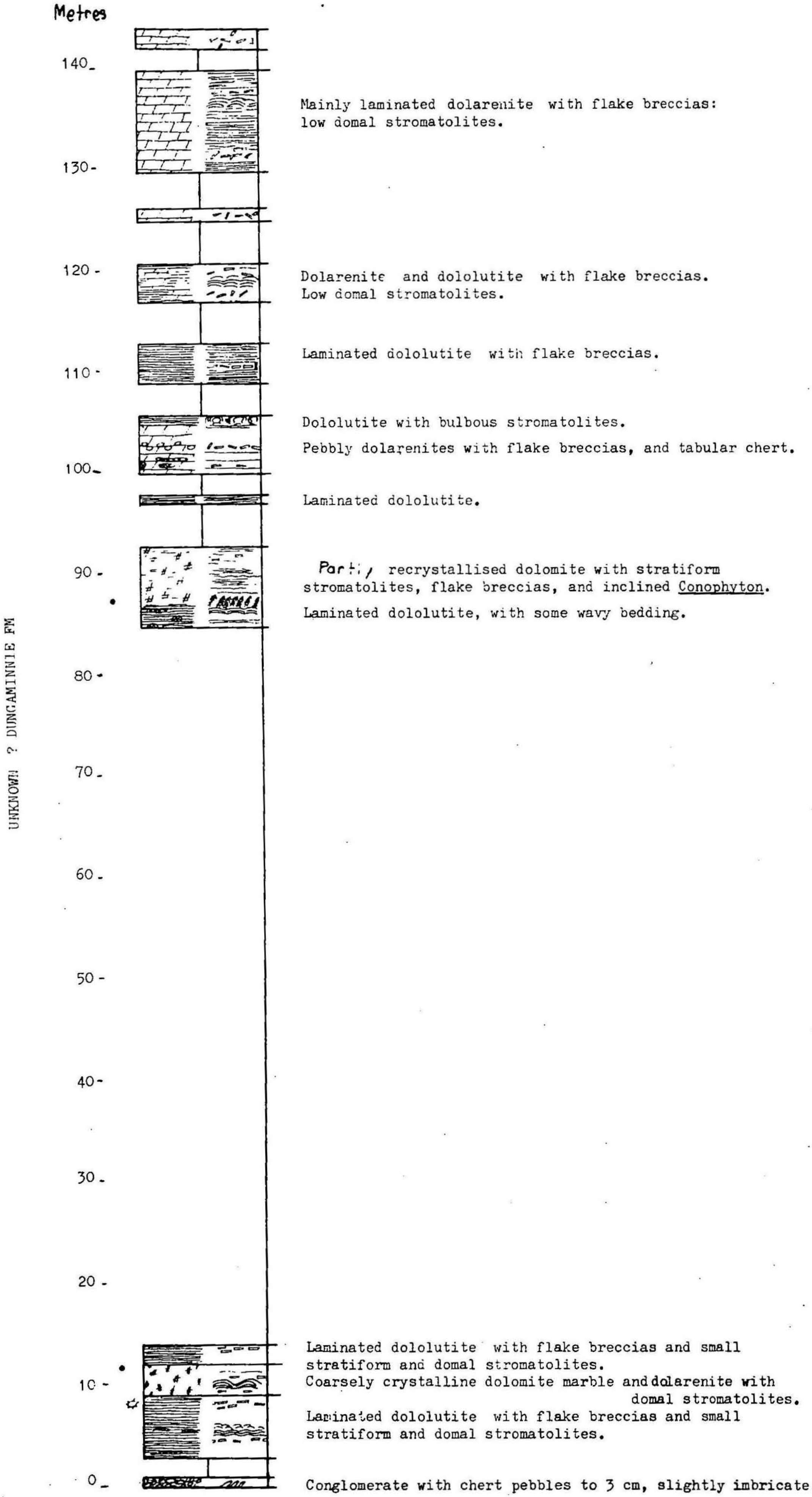


FIGURE 19. MEASURED SECTION KILGOUR 6.

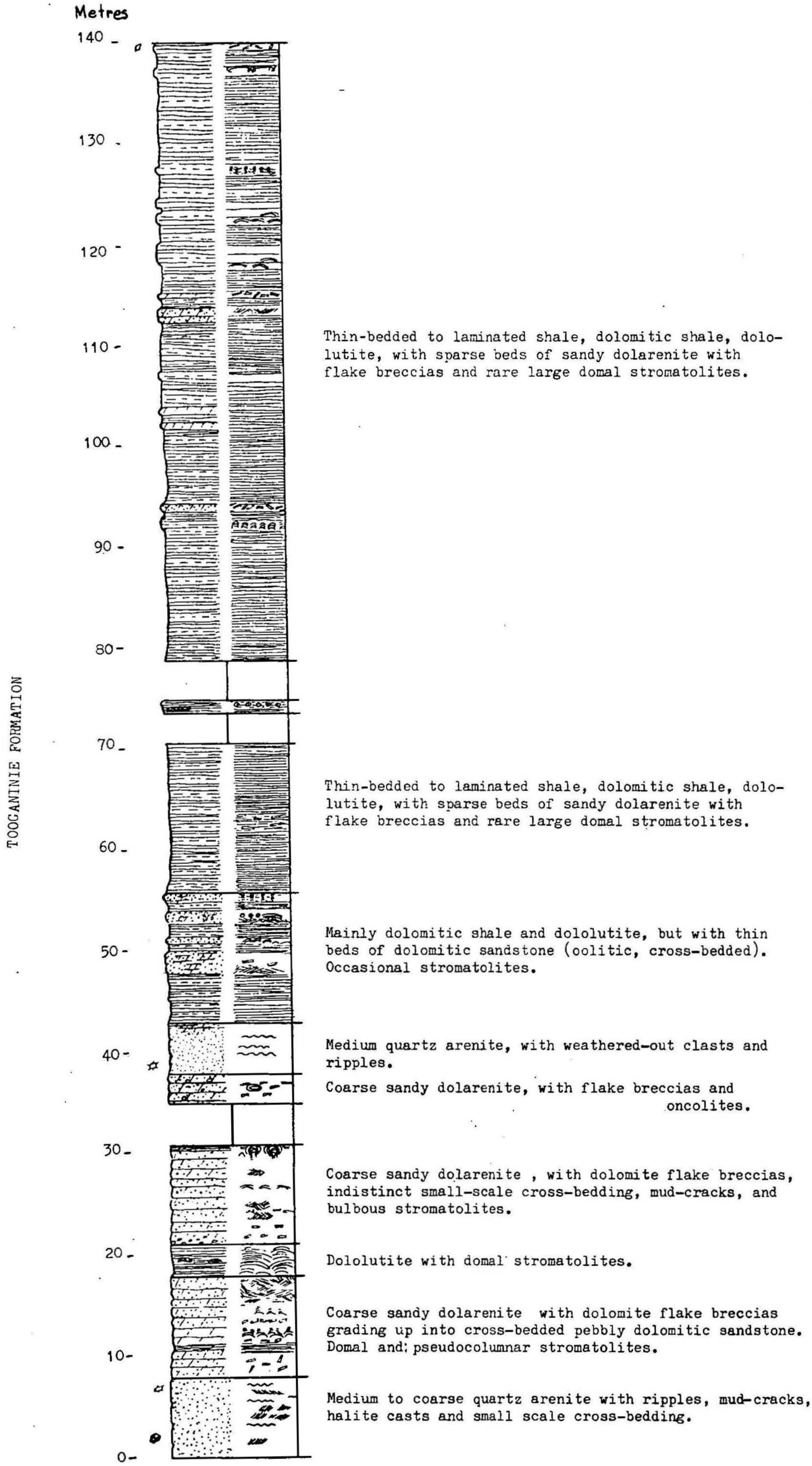


FIGURE 20. MEASURED SECTION KILGOUR 7.

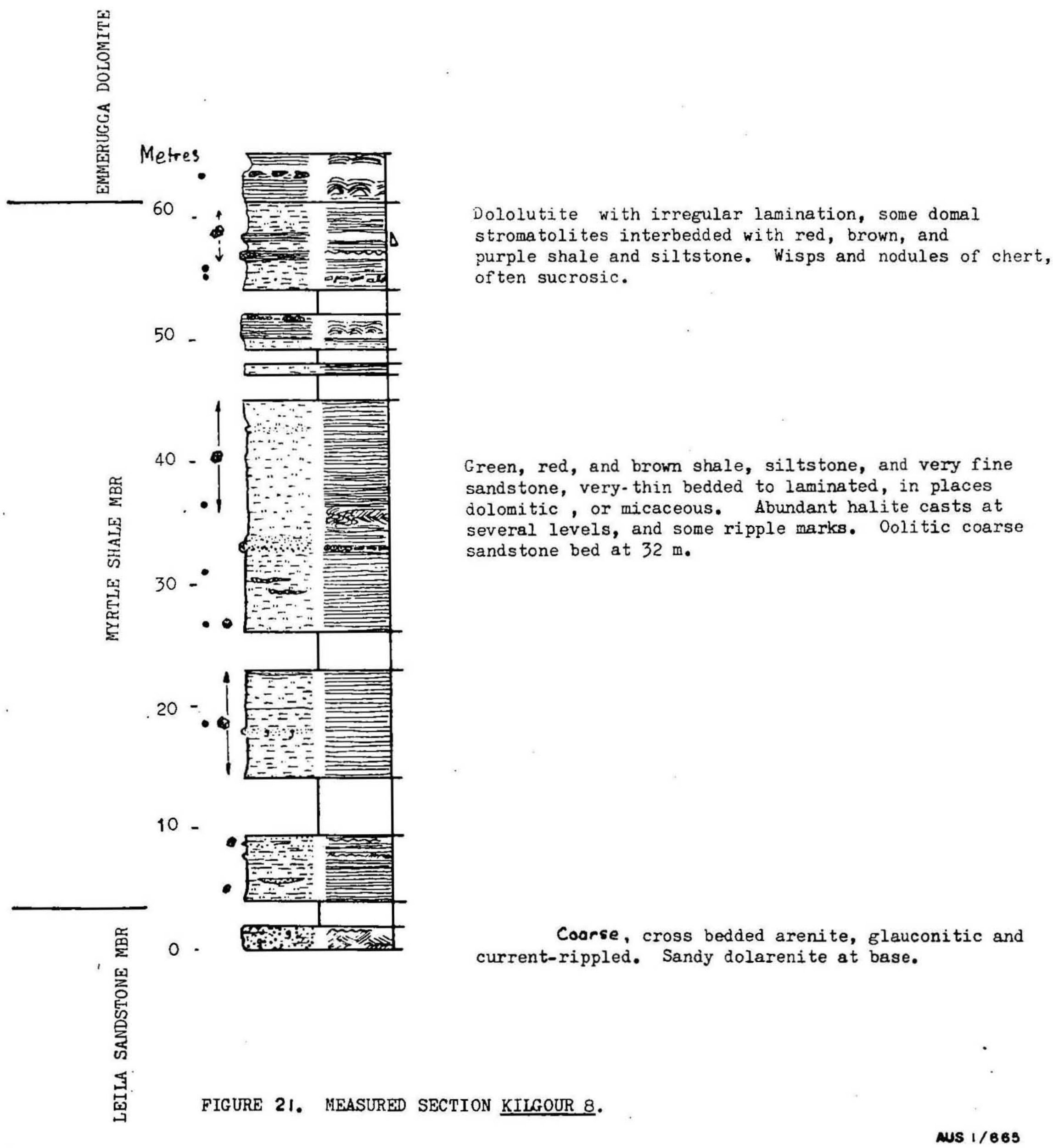


FIGURE 21. MEASURED SECTION <u>KILGOUR 8</u>.

AUS 1/665

Record 1978/54

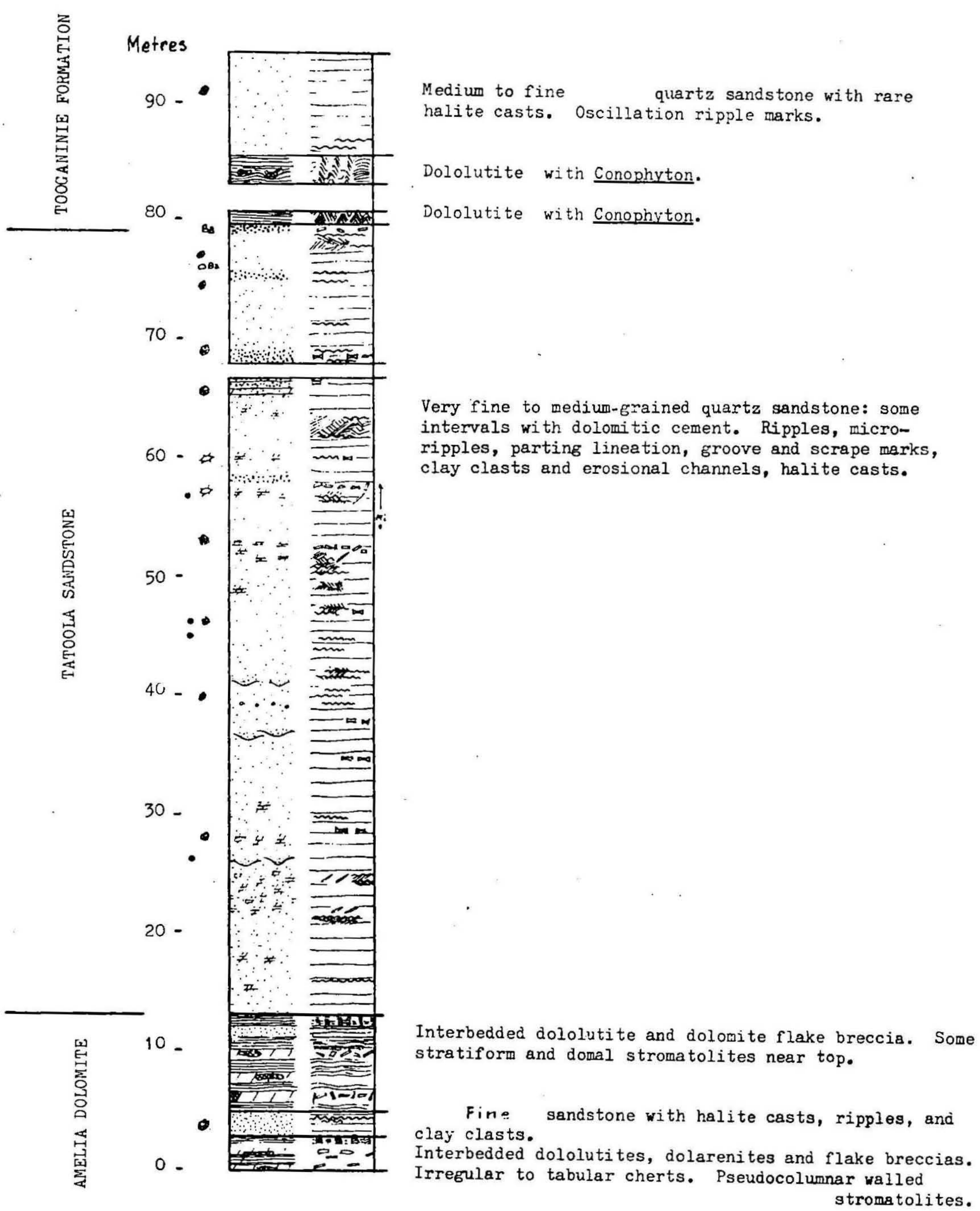
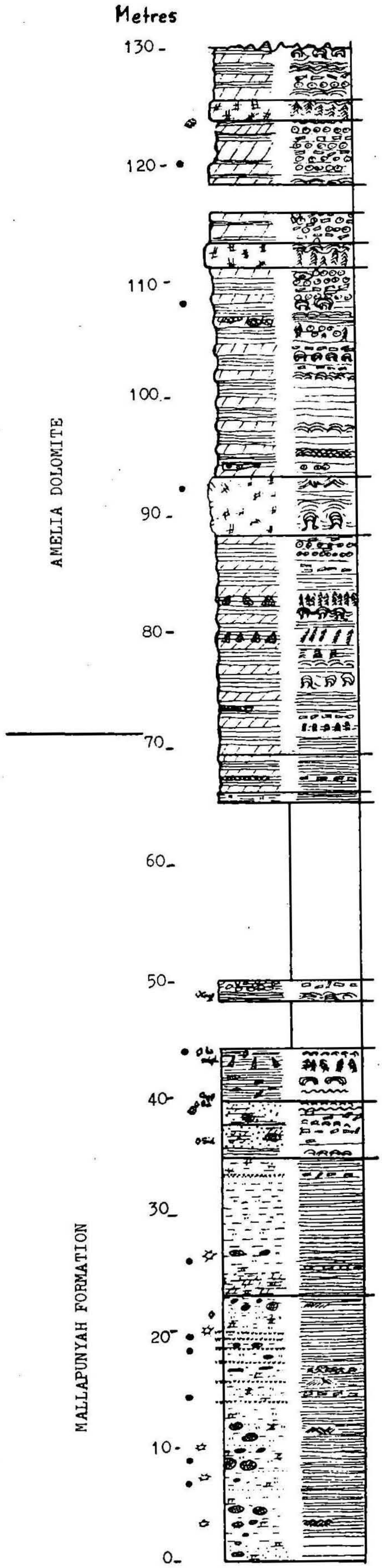


FIGURE 22. MEASURED SECTION KILGOUR 9.



Dolarenite with oolites and flake breccia. Domal and bulbous stromatolites.
Crystalline dolostone with Conophyton.

Rippled shaley dololutite on top. Mainly oolitic dolarenite and flake breccia, with thin interbeds of algal laminated dololutite. Intraclasts common.

Purple crystalline dololutite with Conophyton overlain by domal stromatolites.

Purple, thinly interbedded fine dolarenites and dololutites, sparse very coarse dolarenites, large dololutite flakes. Pseudocolumnar and domal stromatolites. Isolated, rare Conophyton at 106, and oncolites at 110 m.

Crystalline dolostone with bulbous and domal stromatolites near base, and cuspate forms near the top.

Purple, thinly interbedded fine dolarenites and dololutites, sparse very coarse dolarenite beds with large flakes. Pseudocolumnar and domal stromatolites. Two beds of crystalline dolostone with chertified Conophyton, and two beds of chertified oolitic dolarenite with oncolites at the top.

Thinly interlaminated fine dolarenites and dololutites, irregular cherty laminae: possible gypsum pseudomorphs.
Laminated silty dololutite.

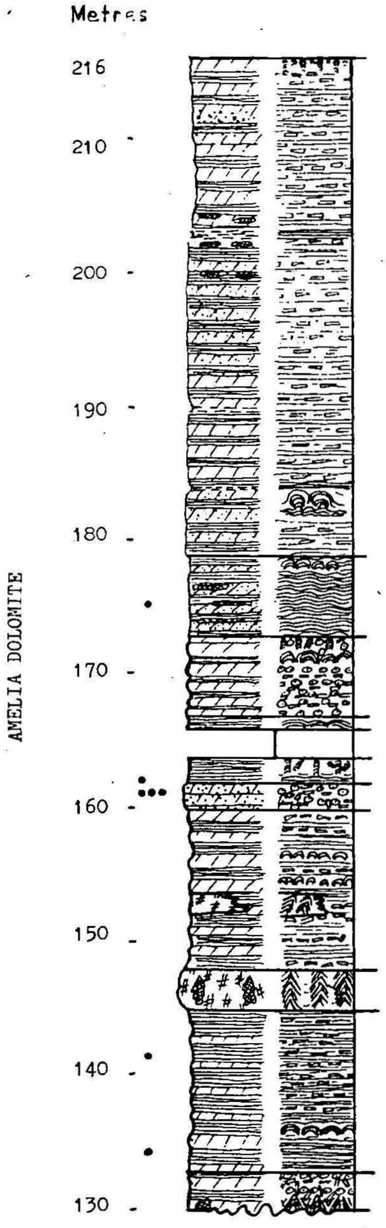
Dololutite with silicified dolomite conglomerate.
Low domal stromatolites, and gypsum casts.

Dololutite with stratiform and domal stromatolites, chert and quartz nodules and veins. Bed of inclined Conophyton.
Sandy dolarenite, flake breccia, and stromatolitic dololutite, numerous chert nodules, barite, gypsum and halite casts at 37 m, siderite at 36 m.

Interbedded red, purple and brown shale, silt, and fine sand, with abundant mud cracks. Dolomitic cement near the base, and occasional flake breccia.

Interbedded red, purple and brown shale, silt, and fine sandstone, commonly dolomitic with botryoidal quartz nodules at a number of horizons ranging up in maximum diameter to 60 cm. Some mud cracks and crystal casts.

FIGURE 23. MEASURED SECTION KILGOUR 10.



Laminated to thinly interbedded dolarenite, dololutite, and flake breccia, with some sandy intervals. Thin beds of shaley dololutite. Bulbous stromatolites near base, columnar forms on top. Chert abundant at some horizons.

Thin wavy laminated dololutite and fine sandy dolarenite; tabular cherts, rare domal stromatolites.

Fine to coarse oolitic dolarenite with intraclasted dololutite beds. Bulbous and pseudocolumnar stromatolites.

Dololutite with bulbous and branching columnar stromatolites.

Sandy, very coarse dolarenite and flake breccia.

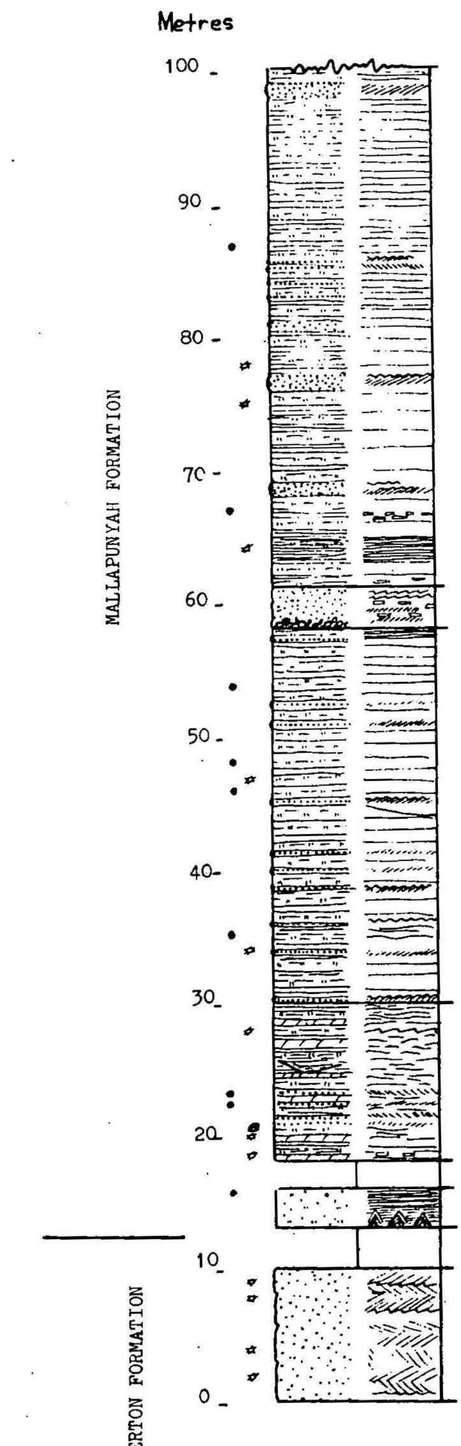
Interbedded, oolitic dolarenite , flake breccias and intraclasted dololutite. Rare domal stromatolites. Inclined Conophyton bed in crystalline dolostone at 153 - 154 m (impersistent along strike).

Purple crystalline dolostone, with vertical and inclined Conophyton.

Thinly bedded and laminated dololutite and fine dolarenite , extensively intraclasted, with rare domal stromatolites.

Dolarenite with oolites and flake breccia. Domal and bulbous stromatolites, and Conophyton bed at 130 m.

FIGURE 23 (cont.)



Mainly red and purple dolomitic siltstone and fine-grained silty sandstone containing coarse sand grains. Dominantly thin-bedded, but intervals of thick and medium bedding, and intervals with irregular and wavy bedding. Sedimentary structures include: clay and dololutite clasts, desiccation cracks, pinch and swell, ripples, erosion and scour structures, & rare halite casts. Sequence contains thin (10 cm to 1 m thick) beds of medium to coarse dolomitic quartz sandstone, which is commonly cross-bedded and rippled (see log). Vuggy nodules containing crystalline barite and dolomite are commonly present.

Pebble conglomerate of chert and dolomite pebbles in graded coarse sandstone; overlain by coarse, rippled quartz dolomitic sandstone.

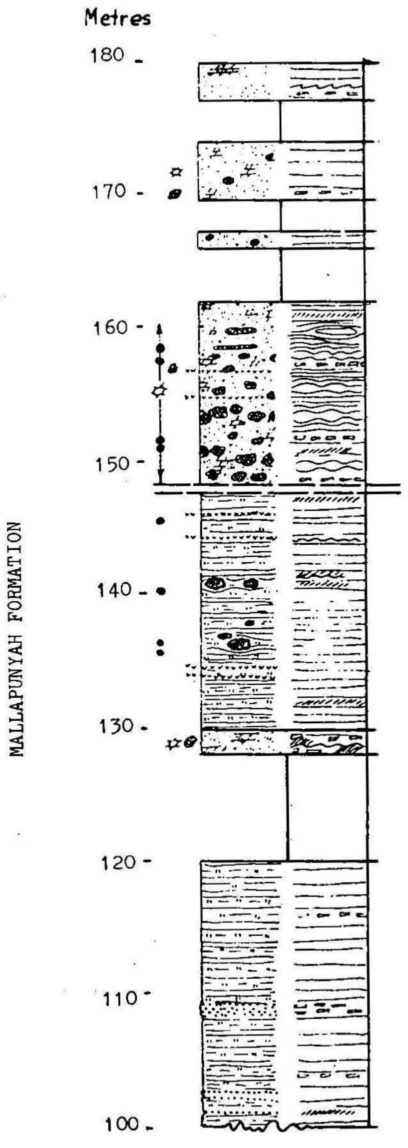
Thin to medium and irregularly bedded purple fine dolarenite and silty dololutite , with dolomitic and quartz sandstone interbeds near base; ripples, scours, cross-bedding and desiccation cracks; halite casts at 20 m.

Hematitic sandstone and siltstone with silicified Conophyton bed at base.

Medium to coarse-grained quartz sandstone; patchy dolomitic and ferruginous cement. Large-scale cross-bedding, ripples and flaser bedding, desiccation cracks.

FIGURE 24. MEASURED SECTION KILGOUR 11.

(1 of 2) AUS 1/668



Medium-grained dolomitic quartz sandstone , ripple-marked with purple dolomite clasts.

Thinly bedded, dolomitic fine sandstone and siltstone, purple, red and brown in colour. Occasional very small <1 cm diameter botryoidal quartz nodules, mud cracks, & halite casts.

Thinly bedded, purple, red, green, and brown, dolomitic fine to medium sandstone and siltstone, dololutite intraclasts. Mud-cracks and ripple lamination. Large botryoidal quartz nodules very abundant, forming tabular beds in places. Two thin vitric tuff beds.

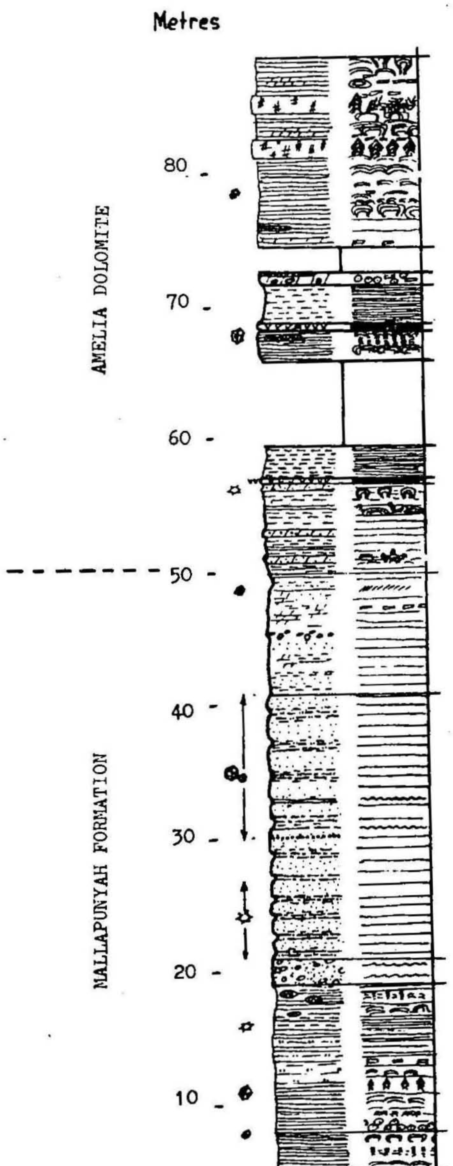
Change of location here: correlation approximate.

Thinly bedded dolomitic fine sandstone, siltstone, and shale with botryoidal quartz nodules, and thin chert bands (? tuffs). Rare cross-lamination and ripples.

Medium to fine dolarenite with intraclasts, ripples, halite casts and desiccation cracks.

Mainly red and purple dolomitic siltstone and fine grained silty sandstone, containing coarse sand grains. Dominantly thin-bedded, but intervals of thick and medium bedding, and intervals with irregular wavy bedding. Sedimentary structures include: clay and dololutite clasts, desiccation cracks, pinch and swell, ripples, erosion, & scour structures, and rare halite casts.
Sequence contains thin (10 cm to 1m thick) beds of medium to coarse quartz sandstone, and vuggy nodules.

FIGURE 24 (cont.)



Mainly stromatolitic dololutite but with thin intervals of dolarenite with flakes and oncolites. Stromatolites are domal to bulbous with overturned sides; two beds of crystalline dolostone with Conophyton.

Dolarenite with dololutite pebbles, ooids and flakes, Poorly exposed dolomitic shale. Tabular chert. Buff, flinty dolomitic (?) tuff. Dololutite with domal stromatolites.

Green mudstone, laminae of limonitic sand. Khaki indurated mudstone (probably tuffaceous).

Interbedded sandy dolomite and dolomitic siltstone. Dolomite with bulbous and columnar branching stromatolites. No halite casts, desiccation cracks at top.

Thinly interbedded fine sandstone and silty mudstone. Bedding distinct, parallel, and laterally persistent. Sequence crowded with halite casts up to 4 cm across. Gradually upwards increasing dolomite content.

Thinly interbedded fine sandstone and silty mudstone. Bedding distinct, parallel and laterally persistent. Sequence crowded with halite casts up to 4 cm across, commonly as sole structures in sandy beds. Desiccation cracks, coarse sand laminae with silt clasts, ripples also present.

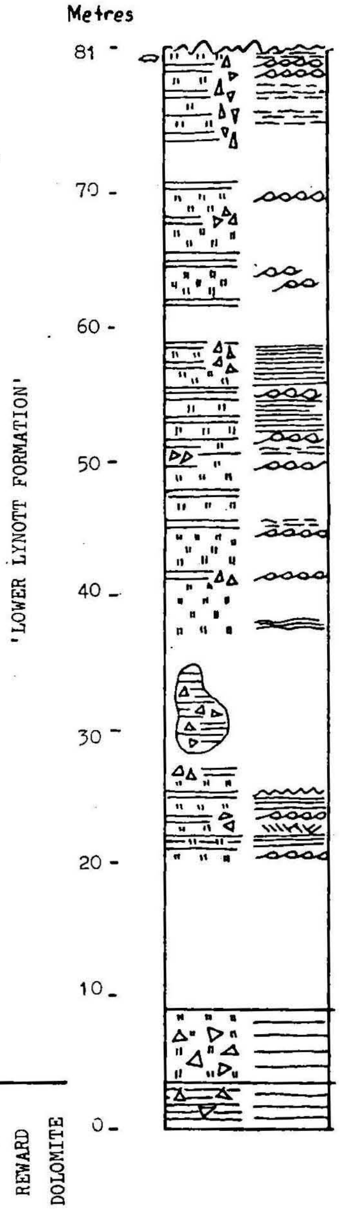
Dolomite conglomerate with quartz matrix and ripples.

Mainly stromatolitic dololutite, but with interbeds of siltstone and oolitic dolarenite. Skeletal halite, desiccation cracks and flake breccias. Stromatolites low, large, and smaller hemispherical domes; silicified Conophyton.

Purple dololutites with very large domal and pseudocolumnar stromatolites, tabular chert. Two 1 m thick beds of pebbly very coarse dolomitic, ferruginous sandstone with cross bedding, ripples and barite nodules.

FIGURE 25. MEASURED SECTION KILGOUR 12.

AUS 1/669

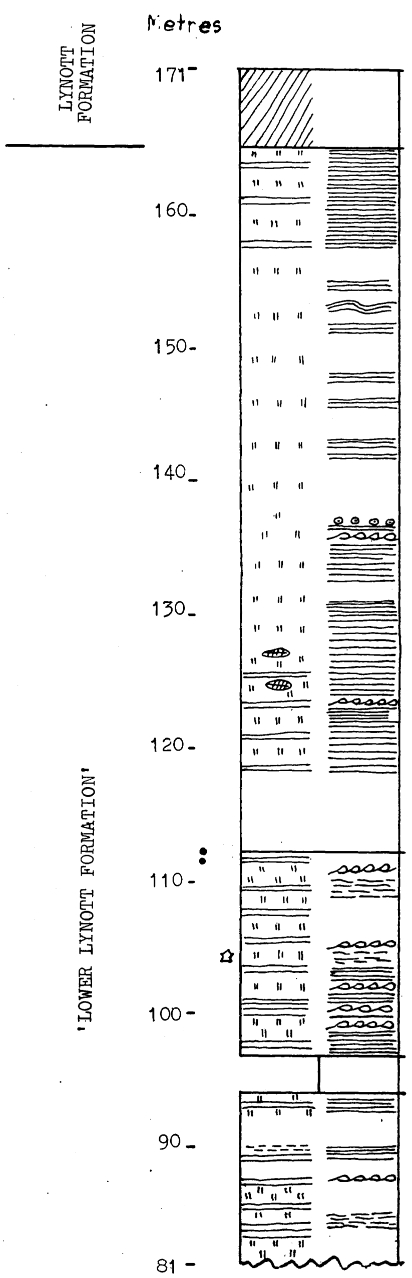


Thin-bedded, generally leached, dolomitic siltstone. Pyritic in places. Slump folds. Discontinuous lenses of massive slump breccia (?) pass along strike into undisturbed siltstone. Angular to subrounded blocks of dolomite, chert, and siltstone, up to 30 cm, in dolomite or siltstone matrix.

Slumped dolomitic siltstone passes along strike into <u>in situ</u> brecciated Reward Dolomite over the interval 10 - 35 m. Irregular slumped transgressive boundary.

Massive <u>in situ</u> brecciated dololutite, grading into unbrecciated dololutite (Reward Dolomite); grades (at about 3.5 m) into massive slump (?) breccia - dolomitic siltstone blocks, up to 40 cm, in dolomitic siltstone matrix - "Lower" Lynott. Slumped irregular contact.

FIGURE 26. MEASURED SECTION <u>MALLAPUNYAH 1</u>.



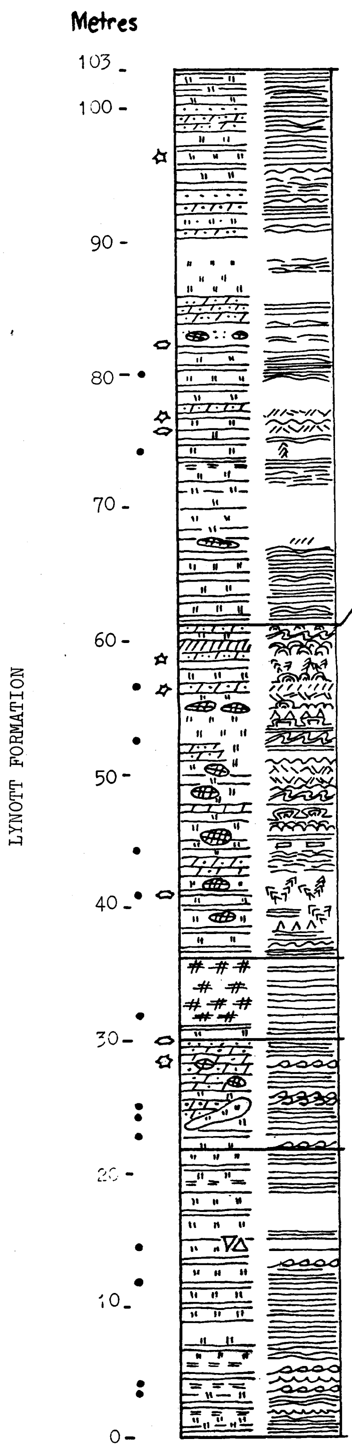
Massive silicified crust. In part silicified sandstone. Some silt-grade material.

Thin-bedded to massive dolomitic siltstone, often leached. Some chert beds and occasional thin slumped beds. Mostly plane-bedded.

Thin oolite bed.

Laminated to thin-bedded dolomitic siltstone, often leached. Pyritic in places. Mostly plane-bedded. Slump beds common.

FIGURE 26 (cont.)



Upward-fining sequences 90-97 m; 97-102m.

Thin-bedded dolomitic siltstone and fine to coarse-grained dolomitic sandstone. Lenticular bedding and various ripple bedding throughout. Some mud-cracks and gypsum casts.

Small (1 cm) conical structures (beach travertine ?) at 74 m.

Interbedded dolomitic sandstone and dolomitic siltstone; ripple and cross-bedded. Discontinuous stromatolites - domes and Conophyton - 40-47 m and 55-60 m. Abundant gypsum casts 45-51 m. Massive white siltstone marker, ball-and-pillow surface, 51-54 m.

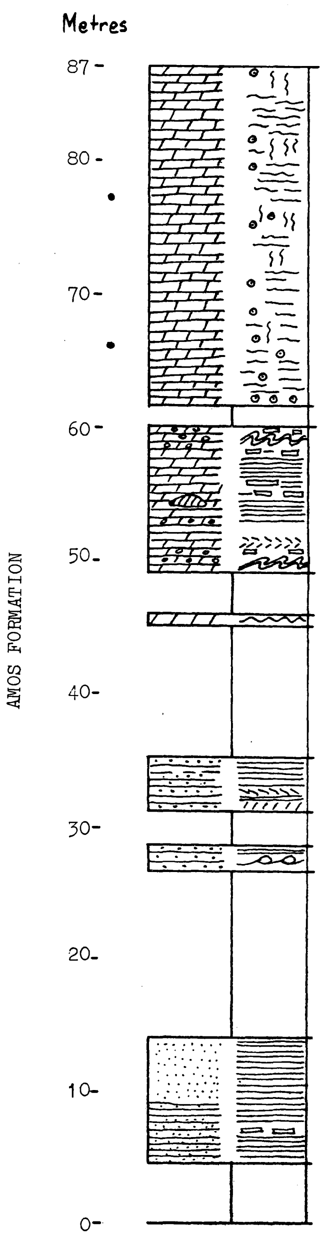
Coarse to medium-grained recrystallised dolomite. Internal structure obscure, but possible steeply convex to conical laminations, which may be Conophyton relict laminae.

Upward-fining dolomitic sandstone-dololutite sequences. Ripple and plane cross-lamination.

Interdigitated, slumped contact, 23 m, Lynott and 'Lower' Lynott Formation. Coarse dolomitic sandstone overlies dolomitic siltstone.

Thin-bedded to laminated dolomitic siltstone; some shale. Mostly plane laminated. Abundant slump folds and ripple marks.

FIGURE 27. MEASURED SECTION MALLAPUNYAH 2.



Massive bedded dolomite with abundant stylolites parallel and perpendicular to bedding, and also at more or less random angles to bedding. Beds are characterised by presence of tangentially laminated oncolites ranging from 0.5 - 20 cm in diameter, and from round to ellipsoidal. Beds also contain irregular clasts up to 50 cm in diameter, some of which also are unevenly internally laminated. Oncolites and clasts tend to be brownish, matrix is grey dolomite. Contacts of oncolites and clasts tend to be stylolytic.

Dolarenite with quartz and chert pebbles, and thin beds of dololutite. Ripple drift lamination and flake breccias. Thin pink (?) tuff beds.

Rippled dolarenite, capped by pink (?) tuff bed.

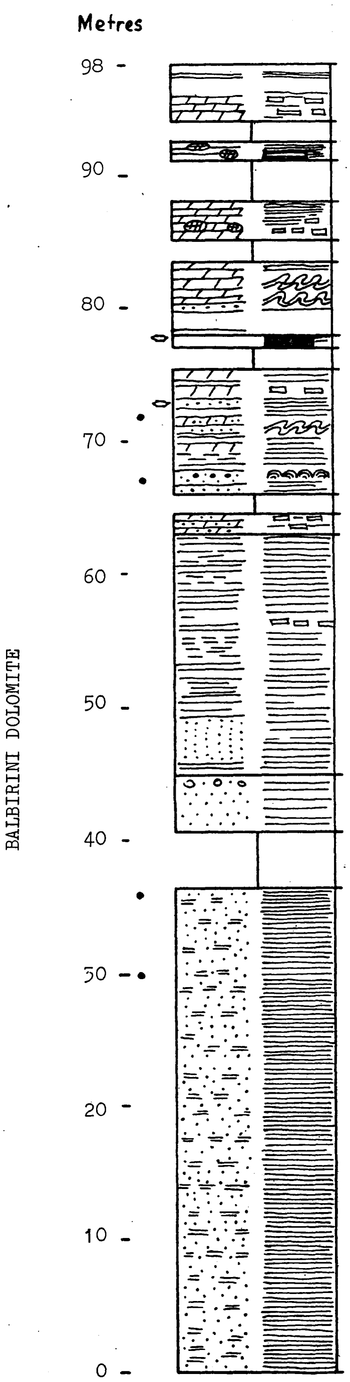
Red and purple very ferruginous dolomitic fine sandstone and siltstone. Some cross bedding and slump structures.

Medium-bedded ferruginous dolomitic sandstone with cross-bedding.

Zero mark is at the presumed base of the Amos Formation.

FIGURE 28. MEASURED SECTION <u>MALLAPUNYAH 3</u>.

AUS 1/672



Thin parallel bedded dolarenite with abundant intraclasts. Thin tuff beds at 96 and 89 m. Ripple-drift and cross-lamination, chert nodules.

Massive tuff bed. Top is ripple marked.

Alternations of red and purple shale and sandy dolarenite with intraclast horizons. Abundant crystal casts.

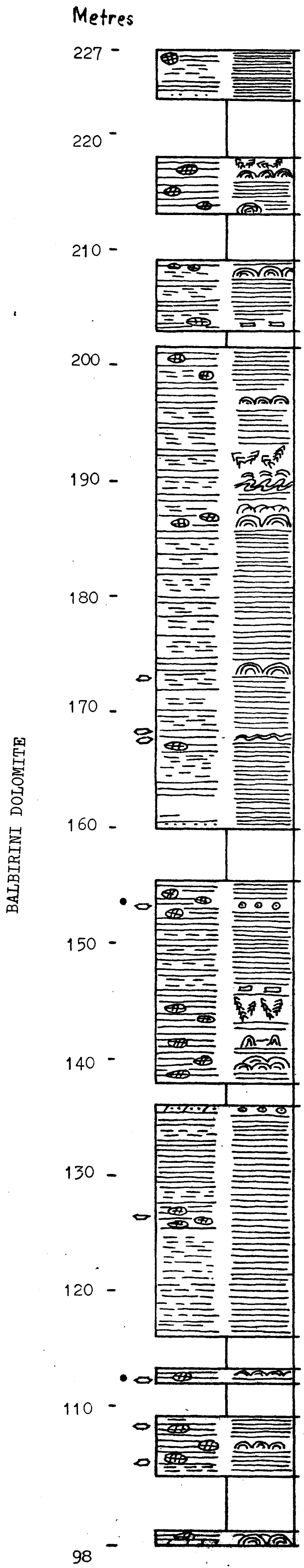
Laminated red and purple shaley siltstone with rare dololutite interbeds, grading up into shaley dolomite.

Botryoidal quartz nodules.

Laminated red and purple fine sandstone and siltstone. Tuff beds at 34 and 40 m.

Unconformable contact with Amos Formation.

FIGURE 29. MEASURED SECTION MALLAPUNYAH 4.

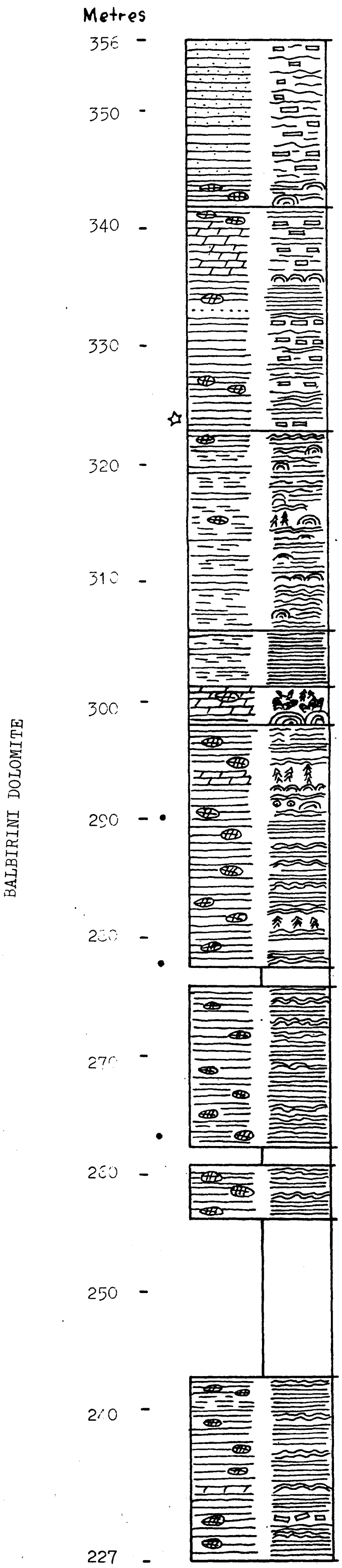


Dolomitic shale and thin-bedded dololutite.

Branching Conophyton on top of domal stromatolites.

Mainly laminated red and purple dolomitic shale with stromatolitic dolomite beds containing domal, columnar and stratiform stromatolites, and Conophyton. Gypsum and halite casts abundant. Coarse oolitic dolarenite at 135 m, some levels with conspicuous chert.

FIGURE 29 (cont.)



Sandy dolarenite and dolomitic sandstone.
Some flake breccia.

Mainly dololutite with chert laminae and nodules, abundant flake breccia. Some stratiform stromatolites. Thin medium grained sandstone at 334 m.

Botryoidal quartz nodules and halite casts.

Wavy laminated dololutite with stratiform and rare domal stromatolites. In places, small <u>Conophyton</u> occur between domes.

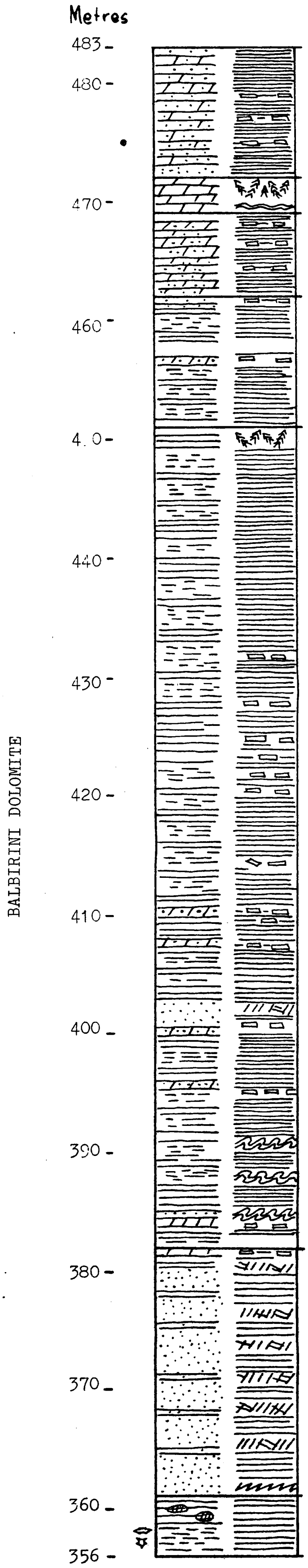
Dolomitic shale and thin-bedded dololutite.

Stromatolitic dolomite with large domes at base, overlain by branching columnar stromatolites, then branching <u>Conophyton</u>.

Thin-bedded dololutite with chert nodules and laminae, and stratiform stromatolites. Occasional small <u>Conophyton</u> horizons.

FIGURE 29 (cont.)

(3 of 8) AUS 1/673



Thin-bedded sandy dolarenite with flake breccias.

Two beds of branching *Conophyton*.

Sandy dolarenite with dololutite flake breccias. Thin cross-laminated quartz sandstone at 463 m.

Thin-bedded dololutite and dolomitic shale with some flake breccia.

Inclined, branching *Conophyton*.

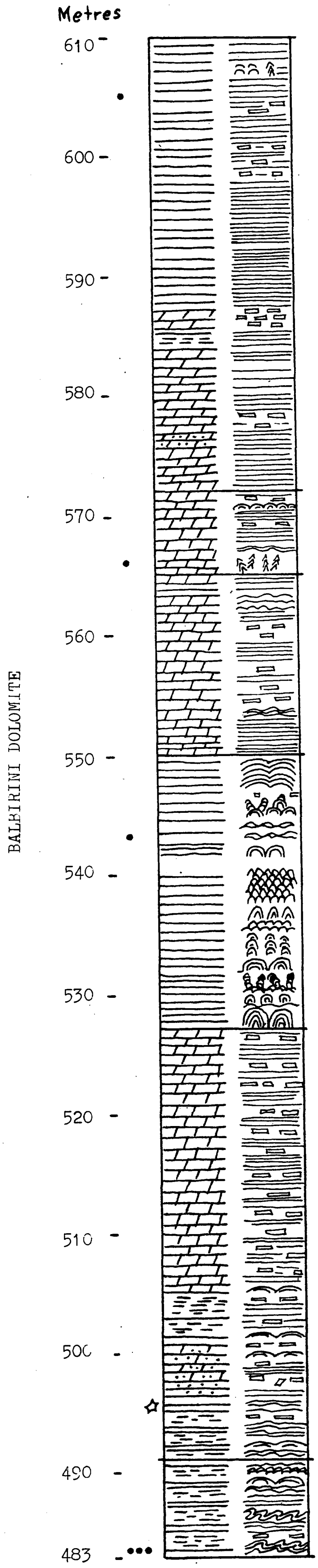
Thin-bedded dololutite and dolomitic shale with some flake breccia, and sandy intervals.

Thin-bedded, low-angle small-scale cross-bedded, fine-grained sandstone, dolomitic at some levels.

Red and purple shale and dololutite with halite and gypsum casts, and mud-cracks.

FIGURE 29 (cont.)

(4 of 8) AUS 1/673



Thick to very thick-bedded pinkish green dolarenite, recrystallised. Residual sedimentary structures include: ripple marks, cross bedding, flake breccias, domal stromatolites, and possible <u>Conophyton</u>. Thin interbeds of grey, plane -laminated dolarenites with occasional intraclasts.

Stromatolitic dolarenite containing abundant small conical stromatolites, and small branching <u>Conophyton</u>, and some small columnar stromatolites. Some thin bedded dolarenite with intraclasts.

Thin bedded dololutite and dolarenite with flake breccia interbeds. Some stratiform stromatolites.

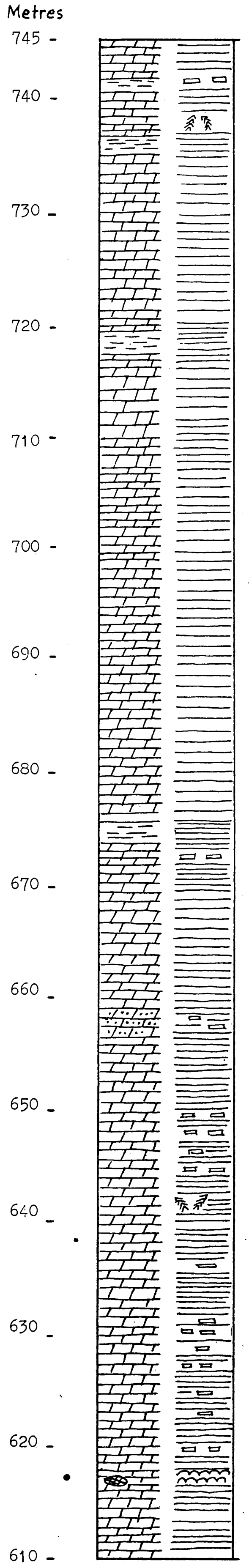
Beige to brown weathering stromatolitic dololutite. Very large domal stromatolites at base overlain by sequences of large and small walled columnar stromatolites. The synoptic height of the stromatolites declines towards the top of the sequence, giving rise to stratiform stromatolites.

Thin-bedded dolarenite with dololutite intraclasts and some stratiform and low domal stromatolites.

Thin-bedded dolarenite and dololutite with interbeds of cuspate small stromatolites.

FIGURE 29 (cont.)

BALBIRINI DOLOMITE



Thick to very-thick-bedded pinkish green dolarenite, recrystallised. Residual sedimentary structures include: ripple marks, cross-bedding, flake breccias, domal stromatolites, and possible Conophyton. Thin interbeds of grey, plane-laminated dolarenites with occasional intraclasts.

FIGURE 29 (cont.)

(6 of 8) AUS I/673

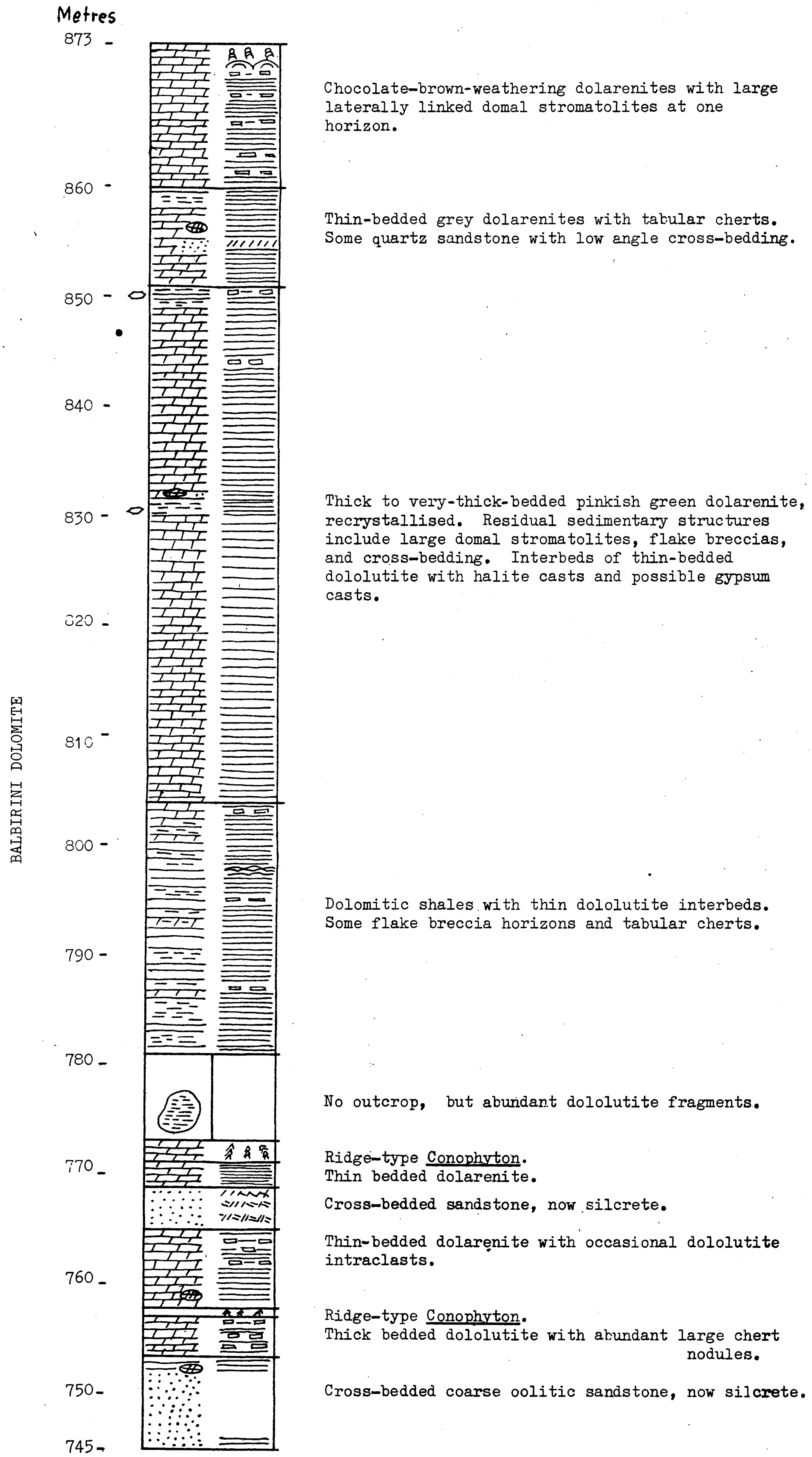
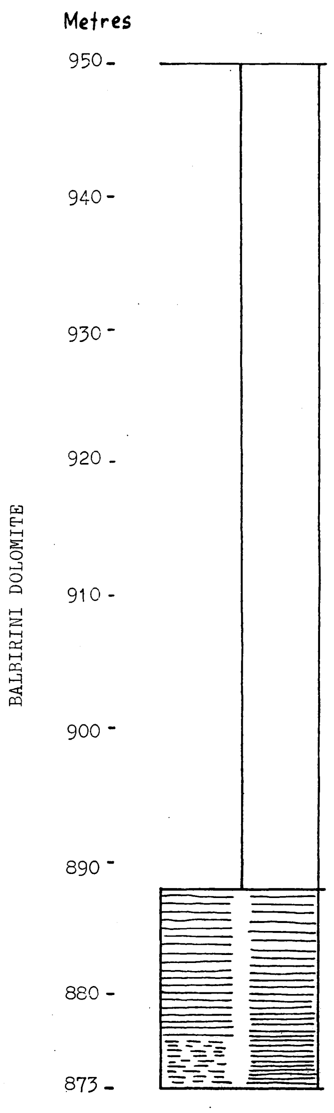


FIGURE 29 (cont.)

(7 of 8) AUS I/673



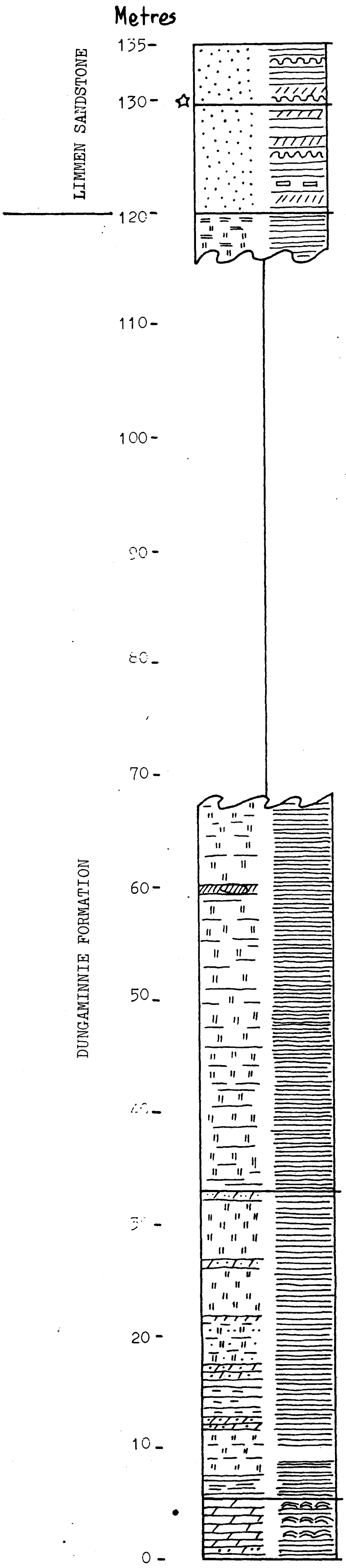
No exposure to the base of the Dungaminnie Formation section Mallapunyah 05 for 70 m.

Thin-bedded, plane-laminated dololutites, green siltstone and shale.

FIGURE 29 (cont.)

(8 of 8) AUS 1/673

Record 1978/54



Clean white quartzite with purple mud partings at base. White quartz-filled mud-cracks in purple mudstone.

Very-thick-bedded reddish sandstone with some thinner-bedded micaceous partings.

Poorly exposed red and purple siltstone, fine sandstone and shale.

Red and brown siltstone and fine sandstone with occasional thin beds of sandy dolarenite.

Purplish red dolarenite with medium grained quartz sand. Plane-laminated at base, stratiform stromatolites after 1 m.

70 m of stratigraphic section missing between the Dungaminnie Formation (Mallapunyah 05), and top of Balbirini Dolomite (Mallapunyah 04).

FIGURE 30. MEASURED SECTION MALLAPUNYAH 5.

AUS 1/674

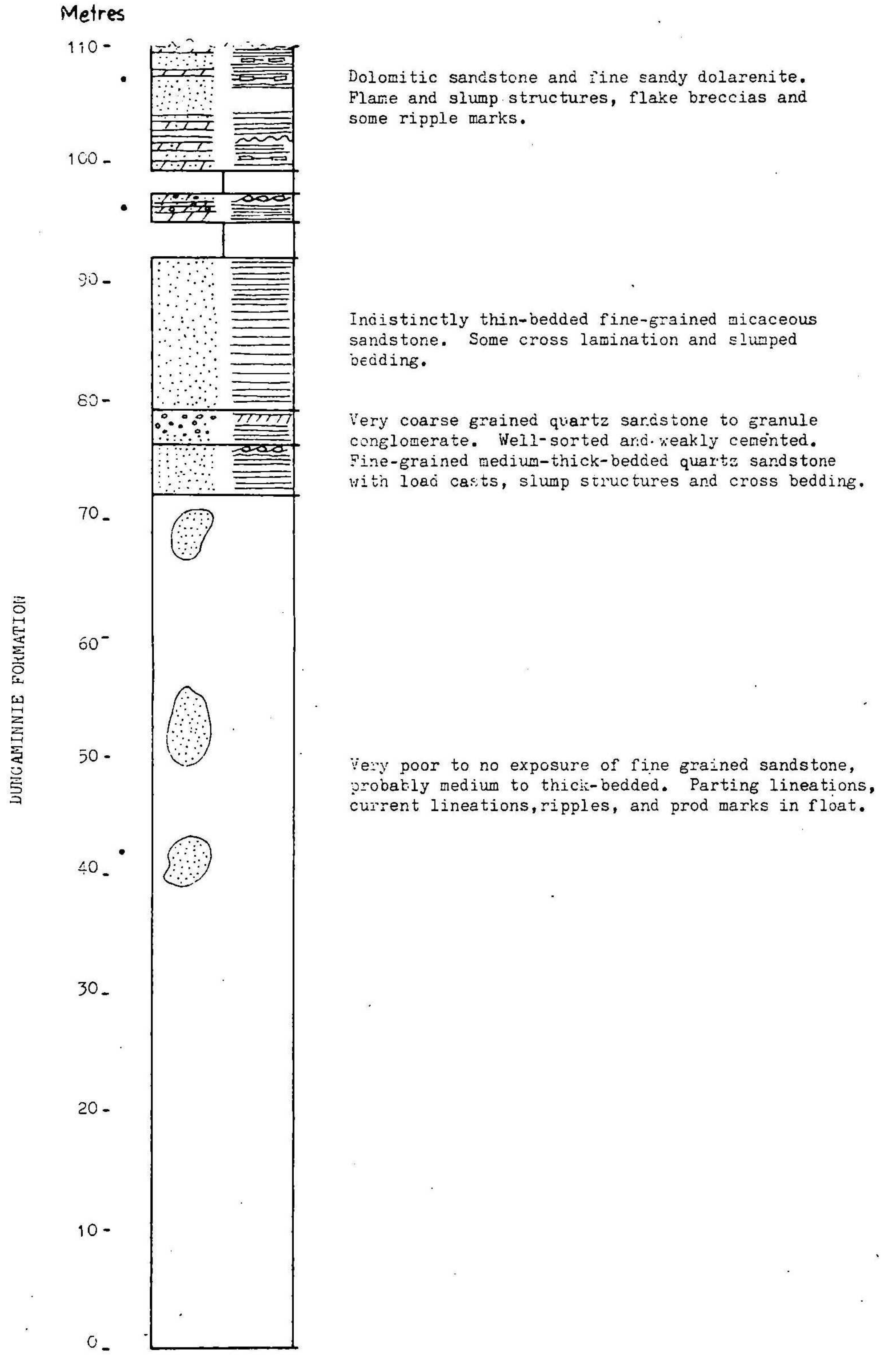
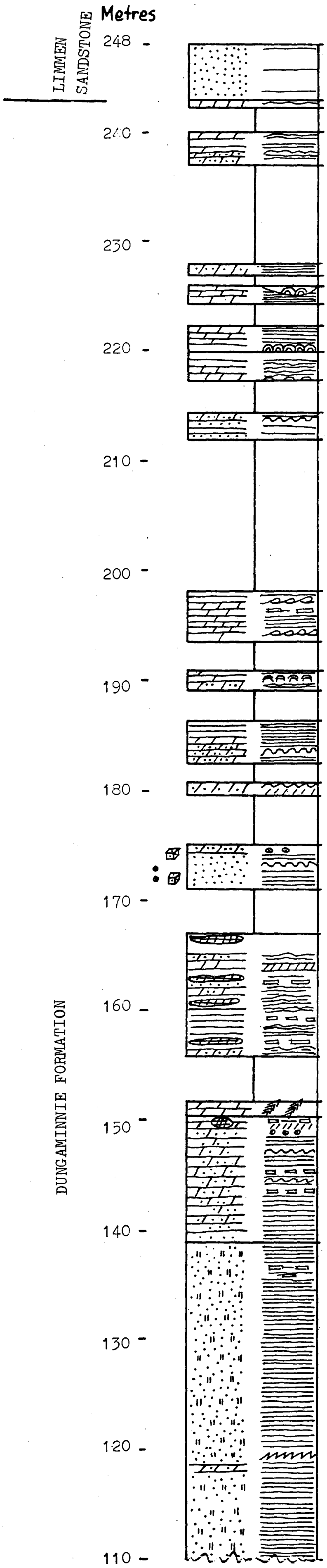


FIGURE 31. MEASURED SECTION MALLAPUNYAH 6.

(1 of 2) AUS 1/675

Record 1978/54



Well-sorted, white quartz sandstone, fine to very-fine-grained, very thick bedded.

Dolarenite with stratiform and domal stromatolites. Very-fine-grained sandstone at base, load casts.

Plane-laminated dolarenite with erosional channel at base. Large (60 cm^3) blocks of tumbled and disoriented stromatolitic cherty dololutite. Dewatering structures.

Fissile thin-bedded dolarenite with small domal stromatolites in slumped bed at base.

Thin-bedded dololutite and dolarenite with ripple marks, slump structures and erosional features, and (?) distorted slumped small domal stromatolites.

Fine sandstone with dolomitic oolite at top. Halite casts throughout, including in the dolomitic oolite.

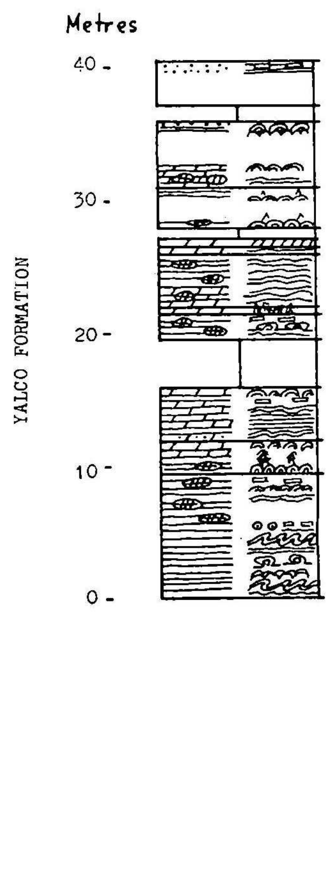
Sandy dolarenite with stratiform stromatolites. Prominent whitish chert beds.

Large Conophyton columns, at least 80 cm high. Consistently inclined at 67° towards the west.

Laminated sandy dolarenite with abundant flake breccia. Rare cross-lamination and ripple drift. Some oolites near top.

Red and purple fine grained sandstone and siltstone poorly exposed. Flaggy parting, clay clasts.

FIGURE 31 (cont.)



Very-fine-grained quartz sandstone with tabular cross-beds and clay clasts.

Stratiform stromatolites with oncolites and chert nodules.

Cherty dolomites with teepee structures and polygons.
Cross-bedded fine-grained dolomitic sandstone.
Finely laminated dolarenite.

Dololutites with stratiform and small domal stromatolites.
Divergently branching Conophyton.
Stratiform & domal stromatolites in dololutites, slumping in stromatolite horizons.

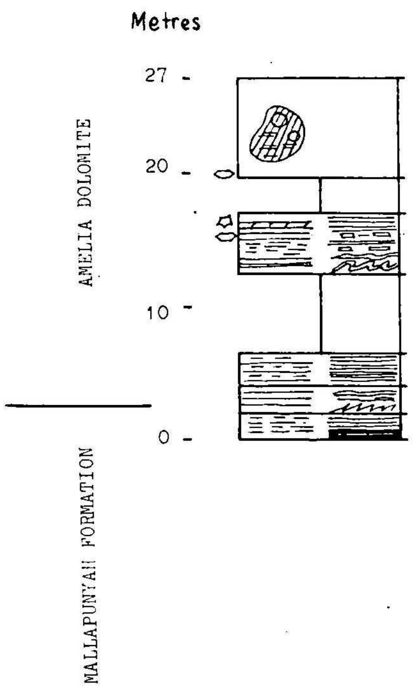
Thin-bedded dololutite and dolarenite with flake breccia, stratiform stromatolites & occasional domes with parasitic domes on top.
Stromatolite complex with domes, and Conophyton.

Dololutite & dolarenite with abundant tabular and nodular chert. Ripple-drift cross-bedding, flake breccia, slumped stromatolite beds. Small domes and stratiform stromatolites.

FIGURE 32. MEASURED SECTION MALLAPUNYAH 13.

AUS 1/676

Record 1978/34



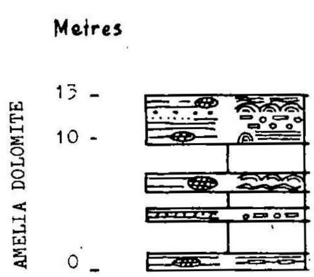
Sideritic marble with massive gypsum and anhydrite pseudomorphs. Laminar and nodular chert.

Dololutite with stratiform stromatolites and occasional flake breccias. Scattered gypsum pseudomorphs in crystal 'felts'.

Laminated dolomitic green shales.
Laminated dololutite with stratiform stromatolites and some sand lenses. Some graded laminae.
Tuffaceous shales with some shards. Purple and green shales.

FIGURE 33. MEASURED SECTION BATTEN 1.

AUS 1/677



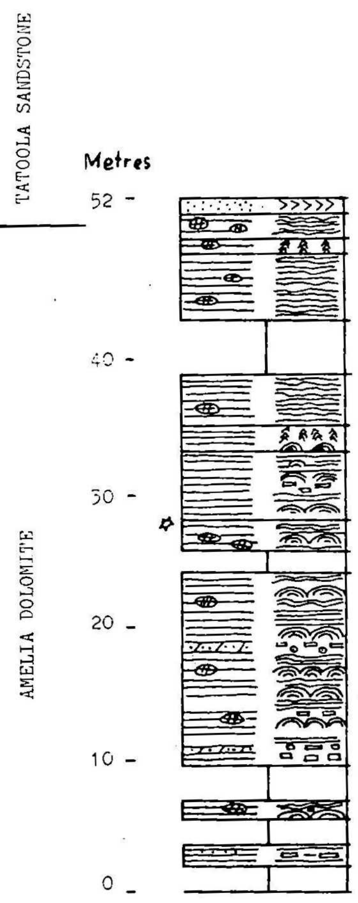
Domal and columnar stromatolites with chert nodules.
Oolite Marker Bed. 3 sub-units in sandy dolarenite.

Dololutite with stratiform and domal stromatolites.

Sandy dolarenite with oncolites and flake breccia.

Flat laminated dololutite with nodular chert.

FIGURE 34. MEASURED SECTION MALLAPUNYAH 7.



Thick-bedded, medium-grained sandstone. Local unconformity.

Dololutite with stratiform stromatolites.

Dololutite with Conophyton.

Dololutite with stratiform stromatolites.

Dololutite with stratiform stromatolites.

Dololutite with Conophyton on top of domal stromatolites.

Dololutite with stratiform stromatolites, flake breccia, and plane bedded dololutite.

Dololutite with domal and stratiform stromatolites.

Oolite Marker Bed. 3 sub-units in dolarenite.

Dololutite with domal and stratiform stromatolites.

Dolarenite with oncolites and stratiform stromatolites.

Dololutite with stratiform stromatolites and chert nodules.

Dololutite with flake breccia.

FIGURE 35. MEASURED SECTION MALLAPUNYAH 8.

AUS 1/679

Record 1978/54

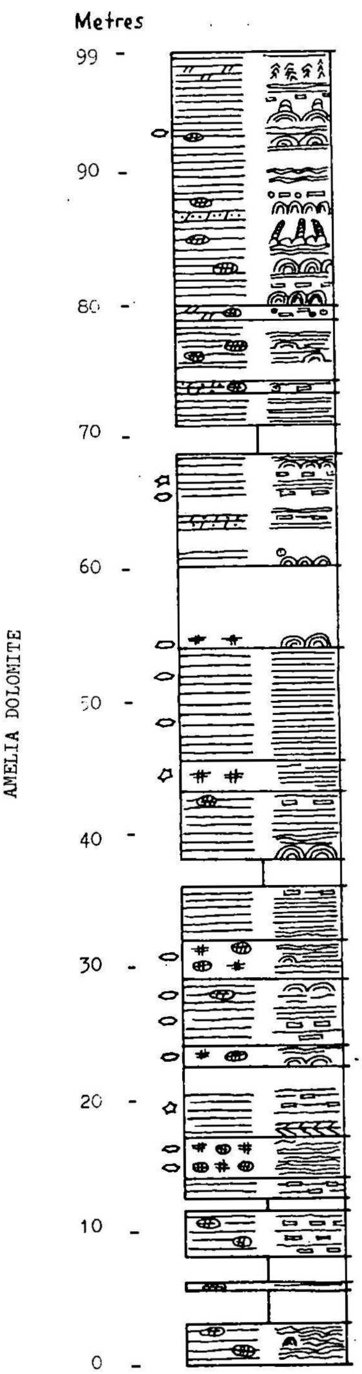
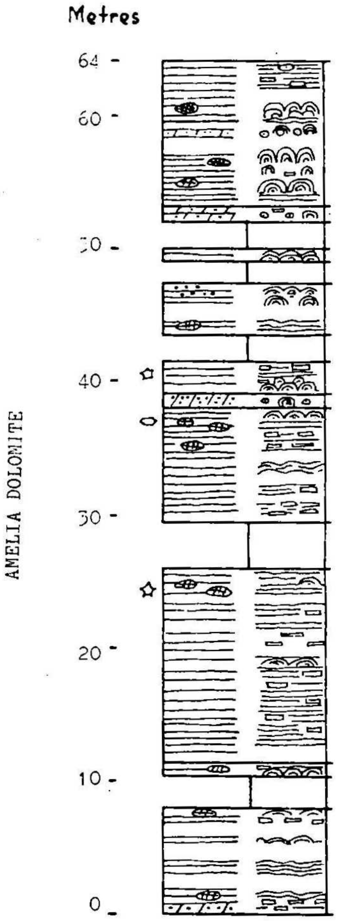


FIGURE 36. MEASURED SECTION MALLAPUNYAH 9.



Stromatolitic complex with domal and stratiform stromatolites. Oncolites and ooliths also present associated with coarse sandy dolarenite. Flake breccia occurs in beds and between stromatolites. Abundant laminar and nodular chert.

Oolite Marker Bed. 3 Sub-units in dolarenite.

Dololutite with stratiform, domal and small columnar stromatolites. Some flake breccias.

Dolarenite with oncolites and oolites.

Dololutite with some stratiform and domal stromatolites. Abundant flake breccias and plane-laminated dololutite.

Dololutite with stratiform and domal stromatolites and some flake breccia horizons.

FIGURE 37. MEASURED SECTION MALLAPUNYAH 10.

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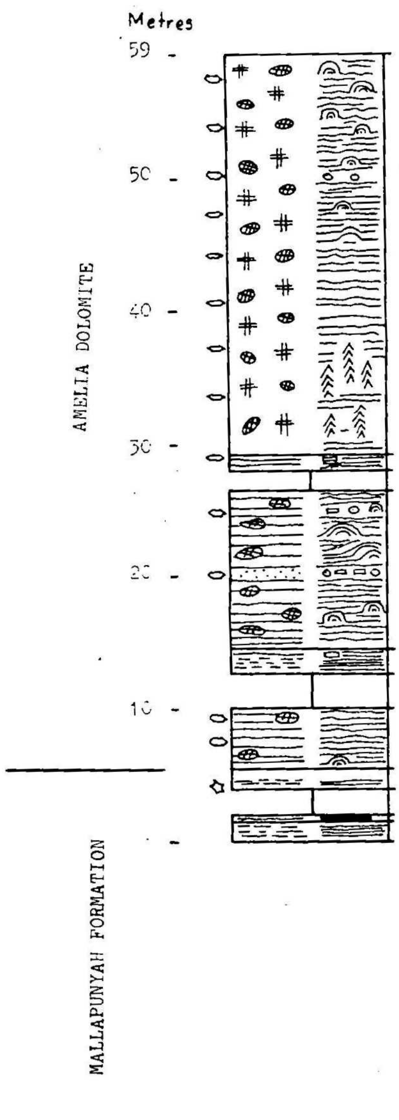
Record 1978/54



Sideritic marble with massive gypsum and anhydrite pseudomorphs. Laminar and nodular chert. Stratiform stromatolites and <u>Conophyton</u> totally replaced.

Dololutite with stratiform and domal stromatolites. Ooliths and flake breccias occasionally, and scattered small gypsum pseudomorphs.

Purple and brown shales.

Massive dololutite with stratiform stromatolites. Scattered small gypsum pseudomorphs and roundish chert nodules (? after anhydrite). Greenish purple mudstone at base.

Vitric tuff beds.

Black and purple shales with nodules of carbonate.

FIGURE 38. MEASURED SECTION <u>MALLAPUNYAH 11</u>.

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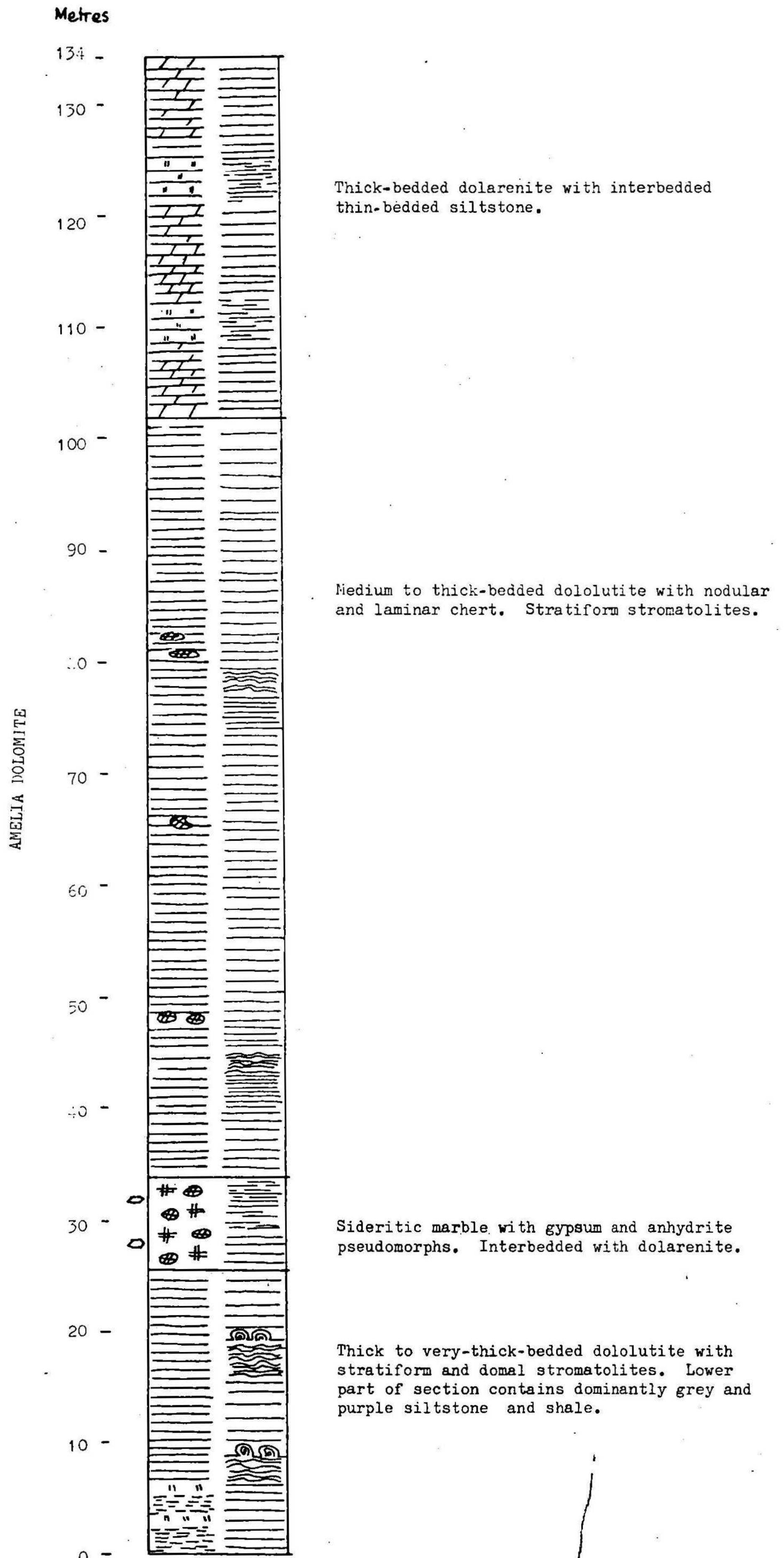
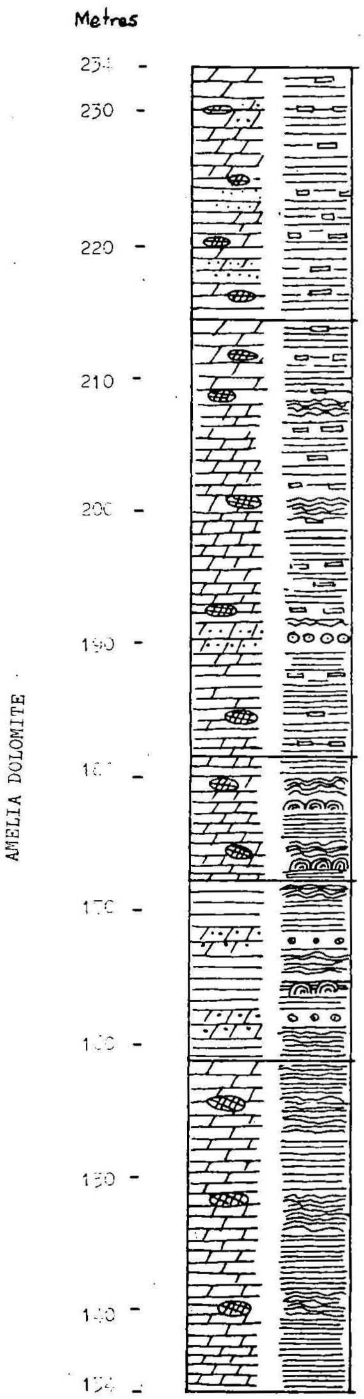


FIGURE 39. MEASURED SECTION MALLAPUNYAH 12. (1 of 2) AUS 1/683

Record 1978/54



Brown, thin to medium-bedded quartz sandstone, with minor bands of flaggy dolomite and chert. Dololutite flake breccia in places.

Grey dolarenite with abundant flake breccia. Stratiform stromatolites with chert bands.

Oolite Marker Bed. 3 sub-units in dolarenite.

Dolarenite with stratiform and domal stromatolites. Laminar and nodular chert.

Dololutite with several oolith beds, some chert bands. Stratiform and domal stromatolites.

Dolarenite with quartz sand intercalations. Stratiform stromatolites with laminar and nodular chert.

FIGURE 39 (cont.)

(2 of 2) AUS 1/683

APPENDIX II McARTHUR BASIN PROJECT 1977

List of samples from measured sections selected for detailed examination (e.g. petrology, palaeontology, mineralogy, or chemistry).

NOTES

1) Registered No.: refers to BMR registered specimen number in which the first two digits refer to year submitted, the third and fourth (10) refer to the project number, and the last four to a specific locality; each specimen at the locality is then identified by a letter of the alphabet.

2) M/S No.: Field number.

3) Level: refers to mark (white or red paint) appropriate to this point on rock at section (usually in 1.5 m intervals).

4) Height: height in metres above base of section.

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
					BORROLOOLA 1 (Fig. 8)
77100096A	A	1	.5		Thin-bedded dolarenite with ripple-drift cross-lamination.
77100096B	B	1.2	2.0		
" C	C	1.5	2.5	YALCO	Cherty dololutites, with stromatolites, stratiform and domal, mud-cracked algal-mat, teepee structures on various scales, and lensoid quartz arenite bodies, probably channel sands. Flake breccia also abundant.
" D	D	2.5	3.4		
" E	E	2.8	4.1		
" F	F	3.4	5.3		
" G	G	4.1	6.2		
" H	H	"	"		
" I	I	5.5	8.5		
" J	J	27.8	45		Stromatolitic cherty dololutite, with oncolites and domal stromatolites, and possible gypsum casts in mud-cracked units.
" K	K	29.5	44		
					GLYDE 1 (Fig. 9)
77100555	1/1	8	12	BARNEY CREEK	Tuffaceous dolomitic shale. Grey wispy laminae. Carbonaceous.
" 0556	1/2	9	14		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100557	1/3	10	15		Medium-thin-bedded dololutite with chert bands and spheres. Occasional slump beds.
" 0558	1/4	12	18		Clastic dolomite slump breccia. Angular blocks of dololutite and chert in doloultite matrix. 20-cm band buff dolarenite at base.
" 0559	1/5	13	19.5		
" 0560	1/6	16	24		Flat-bedded dololutite with frequent chert bands at base, and slumped bed at base.
" 0561	1/7	20	30	REWARD DOLOMITE	Massive slump breccia. Angular fragments of dololutite and chert in dolarenite matrix.
" 0562	1/8	26	39		Dololutite with graded-bedding and ripple-drift cross-lamination. Some flake breccia and chert spheres. Abundant chert bands in places.
" 0563	1/9	28	42		
77100564	1/10	30	45		Sandy dolarenite with flake breccia, graded-bedding and slumping.
77100565	1/11	32	48		Dolarenite, with ripple-drift cross-lamination, graded-bedding, upwards-fining sequences and slump structures.
" 0566	1/12	35	52		
" 0567	1/13	37	56		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100568	1/14	39	58.5	REWARD DOLOMITE	Dolarenite, sand in places, with intraclast horizons. Ripple-drift cross-lamination, and some upwards-fining sequences. Slumping in top part of section. Chert spheres at base.
" 0569	1/15	44	66		

GLYDE 2 (Fig. 10)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100570	2/1	50.5	76	LOWER LYNOTT FORMATION	
77100571	2/2	53	79		Flaggy-laminated purple pink, buff and white plane-laminated dolomitic ex-pyritic siltstone.
77100572	2/3	60	90		
" 0573	2/4	60	90		
" 0574	2/5	60	90		
" 0575	2/6	100	149		Grey dolomitic shale with interbedded thin slumped beds.
" 0576	2/7	116	174	LYNOTT FORMATION	White cherty shale. Occasional ripple marks. Thin-bedded dololutite with ripple-drift cross-bedding.
" 0577	2/9	193	291		Dolomitic red, purple, and green fine sandstone and siltstone. Cherty dololutite interbeds with domal stromatolites. Some quartz arenites.
" 0578	2/10	194	292		
" 0579	2/11	195	294		
" 0580	2/12	196	294		
" 0581	2/13	224	336		Dolomitic red, purple, and green fine sandstone and siltstone. Occasional botryoidal quartz nodules. Ripple-
" 0582	2/14	208	312		
" 0583	2/15	225	339		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
" 0584	2/16	229	343	LYNOTT FORMATION	drift cross-lamination, occasional mud cracks. Small domal stromatolites and teepee structures in interbedded cherty dololutites.
" 0585	2/17	232	348		
" 0586	2/18	234	351		
" 0587	2/20	290	435		
" 0588	2/21	296	444		
" 0589	2/22	297	446		
" 0590	2/23	297	446		
" 0591	2/24	298	447		
" 0592	2/25	298	447		
77100593	2/26	332	498	DONNEGAN MEMBER OF LYNOTT FORMATION	Dolomitic siltstone and some sandy dolarenite with no obvious internal lamination. Botryoidal quartz nodules throughout section, some of which coalesce to form beds. Crystal casts of anhydrite and barite at top of section.
77100594	2/27	337	505		
77100595	2/28	340	510		Red and purple dolomitic siltstone and fine sandstone.
" 0596	2/29	340	510		
" 0597	2/30	344	516		
77100598	2/31	361	541		Fine sandstone and siltstone, purple and brown, cross-laminated, ripple-marked. Dolomitic cement at some horizons, abundant red, massive, botryoidal quartz nodules at numerous horizons. Some convolute bedding and upward-fining sequences.
" 0599	2/32	365	547		
" 0600	2/33	368	552		
" 0601	2/34	369	554		
" 0602	2/35	372	558		
" 0603	2/36	374	568		
" 0604	2/37	379	569		
" 0605	2/38	379	598		
" 0606	2/39	399	598		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
					GLYDE 3 (Fig. 11)
77100520A	A	125	187	STRETTON SANDSTONE	Thin-bedded, greenish weathering fine to medium-grained quartz sandstone with abundant clay clasts, and groove and scrape marks on bottom of beds, distorted mud cracks (?dewatering structures). Ripple-drift cross-lamination. Large erosional channel at 204 m. with coarse slumped sand body. Occasional coarse sands at intervals through section, impersistent laterally. Possible swash marks at one horizon.
77100520B	B 172	258			Thin-bedded, greenish-weathering fine to medium-grained quartz sandstone with abundant clay clasts and groove and scrape marks on bottoms of beds. Ripple-drift lamination.
					KILGOUR 1 (Fig. 14)
77100036A	(1)	6	9	EMMERUGGA DOLOMITE	Sequence composed of about 9 cycles, each commonly 2-4 m thick. Each cycle consists of thin-bedded siltstone overlain by cherty dololutite containing pseudo-columnar to bulbous stromatolites, which are in turn overlain by thin bands of sucrosic chert.
" 0036C	(3)	12	18		
" 0036D	(8)	16	24		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100036B	(2)	10	16	EMMERUGGA DOLOMITE	Well-sorted, medium sandstone with dololutite flakes.
" 0037A	(4)	37	56		Parallel-bedded, dolomitic medium sandstone, with clasts of dololutite, and halite casts.
" 0038C	(5)	50	75		Algal laminated dololutite with laterally persistent thin wavy chert bands, sparse flake breccias.
" 0038B	(6)	53	80		Very-coarse-grained oolitic, pisolitic, and intraclast dolarenite.
" 0038A	(7)	55	83		Mainly very-thin bedded to laminated dololutite with small intraclasts. At 85 m, dolarenite with intraclasts.
		KILGOUR 2	(Fig. 15)		
77100045A	45A	5	75	EMMERUGGA DOLOMITE	Dololutite, irregular chert bands/ veins large Conophyton.
77100047A	47A	14	21		Laminated dololutite and silty dololutite, commonly intraclastic. Irregular chert pods, intervals of wavy bedding with pinch and swell.
77100047B	47B	22	33	UNKNOWN? DUNGAMINNIE FORMATION	Recrystallised dolostone, overlying brecciated chert with contorted Conophyton. These overlie massive dololutite with large bulbous stromatolites.

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100049A	49A	34	51	UNKNOWN? DUNGAMINNIE FORMATION	Laminated dololutite with silty dololutite, commonly intraclastic. Irregular chert pods. Intervals of wavy bedding with pinch and swell.
			KILGOUR 3 (Fig. 16)		
77100051A	51A	3	2	TOOGANINIE FORMATION	Mainly fine-to-medium dolarenite with thin interbeds of wavy laminated dololutite. Dololutites contain pseudocolumnar and bulbous stromatolites which commonly contain chert. Sparse thin oolitic dolomitic beds. Intraformational dololutite breccia at 13.5m.
77100051B	51B	20	30.5		Fine to medium oolitic and intraclastic dolarenite, thinly interbedded with thin shaley 'calcrete'.
77100053A	53A	33	48.5		Mainly fine/medium quartz oolitic dolarenite. Thin interbeds of dololutite, domal and columnar stromatolites. Basal conglomerate, cross-bedding at top of unit.
77100053D	53D	42	63		Very coarse quartz dolarenite grading
77100053C	53C	42	63		to intraclast breccia.
77100053E	53E	43	65		Thinly laminated silty dololutite, low
77100053F	53F	45	68		domal stromatolites near top, slumped flake breccia at 68 m.

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100053H	53H	47	70	TOOGANINIE FORMATION	Coarse dolarenites and flake breccias capped by 1 m bed of oolitic dolarenite. Minor dololutite. Chert nodules.
" 53I	53I	47	70		
" 53G	53G	48	71		
77100076A	76A	81	121		Massive or laminated dololutite, thin dolarenite beds, irregular laminar or nodular chert. Large low domal stromatolites.

<u>KILGOUR 6</u> (Fig. 19)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100064A	(1)	7.5	11	UNKNOWN? DUNGAMINNIE FORMATION	Coarsely crystalline dolomite marble and dolarenite with domal stromatolites.
77100064B	(2)	2	87.5		Partly recrystallised dolomite with stratiform stromatolites, flake breccias, and inclined <u>Conophyton</u>. Laminated dololutite, with some wavy bedding.

<u>KILGOUR 8</u> (Fig. 21)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100071H	8	12	18	MYRTLE SHALE MEMBER	Green, red, and brown shale, siltstone, and very fine sandstone, very thin-bedded to laminated, in places dolomitic, or micaceous. Abundant halite casts at several levels, and some ripple marks. Oolitic coarse sandstone bed at 32 m.
" 0071B	2	17.5	27		
" 0071C	3	20.5	31		
" 0071G	7	25.5	38		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100071D	4	36	54	MYRTLE SHALE MEMBER	Dololutite with irregular lamination, some domal stromatolites interbedded with red, brown, and purple shale and siltstone. Wisps and nodules of chert, often sucrosic.
" 0071E	5	36	55		
77100071F	6	42	63	EMMERUGGA DOLOMITE	Sucrosic tabular cherts.

KILGOUR 9 (Fig. 22)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100073D	D	18	27	TATOOLA SANDSTONE	Very fine-to-medium-grained quartz sandstone: some intervals with dolomitic cement. Ripples, micro-ripples, parting lineation, groove and scrape marks, clay clasts and erosional channels, halite casts.
" E	E	30	45		
" F	F	31	46		
" G	G	38	57		

KILGOUR 10 (Fig. 23)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100080A	A	4.5	7	MALLAPUNYAH FORMATION	Interbedded red, purple, and brown shale, silt, and fine sandstone, commonly dolomitic with botryoidal quartz nodules at a number of horizons ranging up in maximum diameter to 60 cm. Some mud cracks and crystal casts.
" 80B	B	6.5	9.5		
" 80C	C	9.5	14		
" 80D	D	12	18		
" 80E	E	13	19		
77100080F	F	17	26		Interbedded red, purple, and brown shale silt, and fine sand, with abundant mud cracks. Dolomitic cement near the base and occasional flake breccia.

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100080G	G	29	44	MALLAPUNYAH FORMATION	Dololutite with stratiform and domal stromatolites, chert and quartz nodules and veins. Bed of inclined Conophyton.
77100079A	79A	23	92	AMELIA DOLOMITE	Crystalline dolostone with bulbous and domal stromatolites near base, cuspate forms near the top.
77100081B	81B	33	108		Purple, thinly-interbedded fine dolarenites and dololutites, sparse very coarse dolarenites, large dololutite flakes. Pseudo-columnar and domal stromatolites. Isolated, rare Conophyton at 106m and oncolites at 110 m.
77100081C	81C	41	120		Rippled shaley dololutite on top. Mainly oolitic dolarenite and flake breccia, with thin interbeds of algal laminated dololutite. Intraclasts common.
77100081D	81D	51	134		Thinly bedded and laminated dololutite and fine dolarenite, extensively interclasted, with rare domal stromatolites.
" E	81E	56	142		
77100081F	81F	69	161.5		Sandy, very coarse dolarenite and flake breccia.
" I	81F	69	161.5		
" K	81K	69	161.5		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100081H	81H	70	162	AMELIA DOLOMITE	Dololutite with bulbous and branching columnar stromatolites.
77100081J	81J	79	175	AMELIA DOLOMITE	Thin wavy laminated dololutite and fine sandy dolarenite; tabular cherts, rare domal stromatolites.

KILGOUR 11 (Fig. 24)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100106A	A	11	16	MALLAPUNYAH FORMATION	Hematitic sandstone and siltstone with silicified Conophyton bed at base.
77100106B	B	15	23	MALLAPUNYAH FORMATION	Thin to medium and irregularly bedded purple fine dolarenite and silty dolo-ulite, with dolomitic and quartz sandstone interbeds near base; ripples, scours, cross-bedding and desiccation cracks; halite casts at 20 m.
" C	C	15	22.5		
77100106D	D	23	35	MALLAPUNYAH FORMATION	Pebble conglomerate of chert and dol-omite pebbles in graded coarse sand-stone; overlain by coarse, rippled quartz dolomitic sandstone.
" E	E	30.5	46		
" F	F	32	48		
" G	G	36	54		
" H	H	45	67.5		
" I	I	58	87.5		
77100108A	A	104.5	135		Thinly-bedded dolomitic fine sand-stone, siltstone and shale with botryoidal quartz nodules, and thin chert bands (tuffs). Rare cross-lamination and ripples.
" B	B	105	136		
" C	C	107.5	140		
" D	D	112	146		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100110A	A	206	151	MALLAPUNYAH FORMATION	Thinly-bedded, purple, red, green, and brown dolomitic fine to medium sandstone and siltstone, dololutite intraclasts. Mud cracks and ripple lamination. Large botryoidal quartz nodules very abundant, forming tabular beds in places. Two thin vitric tuff beds.
" B	B	206	152		
" C	C	211	157		
" D	D	211	158		
					MALLAPUNYAH 1 (Fig. 26)
77100607	3/1	74	112	LOWER LYNOTT FORMATION	Thinly-bedded to massive dolomitic siltstone, often leached. Pyritic in places. Slumped beds and some syneresis cracks.
77100608	3/2	74	112.5		
					MALLAPUNYAH 2 (Fig. 27)
77100609	4/0	2	3.5	LYNOTT FORMATION	Thinly-bedded dolomitic siltstone and shale slumping common near the base of the section. Ripple marks and upwards-fining sequences near top. Some interdigitation of slumped and undisturbed siltstone. Contact between Lynott and Lower Lynott is at about 23 m.
" 0610	4/1	2	4		
" 0611	4/2	8	12		
" 0612	4/3	10	14.5		
" 0613	4/4	15	23		
" 0614	4/5	16	24.5		
" 0615	4/6	17	25.5		
77100667	4/7	22	32.5		Coarse-to-medium-grained recrystallised dolomite. Internal structure obscure but possible steeply convex to conical laminations, which may be Conophyton relict laminae.

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100616	4/8	28	41	LYNOTT FORMATION	Stromatolitic unit with <u>Conophyton</u> at top and base, and domal and stratiform stromatolites common throughout.
" 0617	4/9	29	44		Dololutites with chert nodules and lenses. Abundant crystal casts in centre of unit, and occasional mud cracks and ripples.
" 0618	4/10	35	52.5		
" 0619	4/11	38	56.5		
77100620	4/12	49	74		Sandy to silty dololutites. Some mud cracks and fining-upwards sequences and abundant crystal casts. Ripple lamination of various kinds is typical of this unit.
77100621	4/13	53	80		

<u>MALLAPUNYAH 3</u> (Fig. 28)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100326A	A	44	66	AMOS FORMATION	Massive dolomite with abundant stylolites parallel to and perpendicular to bedding, and also at more or less random angles to bedding. Beds are characterised by presence of tangentially laminated oncolites ranging from 0.5 to 20 cm. in diameter, and from round to ellipsoidal. Beds also contain irregular clasts up to 50 cm in diameter, some of which also are unevenly internally laminated. Oncolites and clasts tend to be brownish. Matrix is grey dolomite. Contacts of oncolites and clasts tend to be stylolytic.
77100326B	B	49-52	78		

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
					MALLAPUNYAH 4 (Fig. 29)
77100328A	A	20	30		Laminated red and purple fine sandstone and siltstone. Tuff beds at 34 and 40 m. Alternations of red and purple shale and sandy dolarenite with intraclast horizons. Abundant crystal casts.
" B	B	24	36		
" C	C	45	67		
" D	D	48	72		
77100330A	A	27	113		
7710030M	M	54	154		
77100330B	B	127	263		Thin-bedded dololutite with chert nodules and laminae, and stratiform stromatolites. Occasional small <u>Conophyton</u> horizons.
" C	C	137	277		
" D	D	145	290		
77100330E	E	267	475	BALBIRINI DOLOMITE	Thin-bedded sandy dolarenite with flake breccias.
77100330F	F	274	484		Thin-bedded dolarenite and dololutite with interbeds of cuspate small stromatolites.
" G	G	274	484		
" H	H	274	484		
77100330N	N	313	543		Beige-to-brown-weathering stromatolitic dololutite. Very large domal stromatolites at base overlain by sequences of large and small walled columnar stromatolites. The synoptic height of the stromatolites declines towards the top of the sequence, giving rise to stratiform stromatolites.

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100330I	I	329	566		Stromatolitic dolarenite containing abundant small conical stromatolites and small branching Conophyton and some small columnar stromatolites. Some thin-bedded dolarenite with intraclasts.
77100330J	J	355	605	BALBIRINI DOLOMITE	Thick-to-very-thick-bedded pinkish green dolarenite, recrystallised. Residual sedimentary structures include ripple marks, cross-bedding, flake breccias, domal stromatolites, and possible Conophyton. Thin interbeds of grey, flat-laminated dolarenites with occasional intraclasts.
" K	K	366	617		
77100330L	L	516	847		Thick-to-very-thick-bedded pinkish green dolarenite, recrystallised. Residual sedimentary structures include large domal stromatolites, flake breccias, and cross-bedding. Interbeds of thin-bedded dololutite with halite casts and possible gypsum casts.

MALLAPUNYAH 5 (Fig. 30)

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
77100439A	A	2	3	DUNGAMINNIE FORMATION	Purplish red dolarenite with medium-grained quartz sand, flat-laminated at base, stratiform stromatolites after 1 m.

Reg'd No.	M/S No.	Level	Height	Unit	Lithology
					MALLAPUNYAH 6 (Fig. 31)
77100479A	A	28	42	DUNGAMINNIE FORMATION	Very poor to no exposure of fine-grained sandstone, probably medium-to-thick-bedded. Parting lineations, current lineations, ripples and prod marks in float.
77100479B	B	64	96		?
77100479C	C	71	107		Dolomitic sandstone and fine sandy dolarenite. Flame & slump structures, flake breccias and some ripple marks.
77100479D	D	115	173		Fine sandstone with dolomitic oolite at top, Halite casts throughout, including in the dolomitic oolite.
" E	E	115	173		
77100479F	F	162	243		Massive white quartz sandstone.

Table 2. Information on measured sections.

Measured section No.	Figure No.	Thickness measured (m)	Stratigraphic units measured	Measured by	Relationship
Borroloola 1	8	50	Yalco Fm	Muir	approx equivalent to Glyde 3 (lower part)
Glyde 1	9	70	Barney Creek Fm & Reward Dol	Plumb	overlain by Mallapunyah 1
Glyde 2	10	638	Lynott Fm & lower Yalco Fm	Plumb	part equivalent of Mallapunyah 1 & 2
Glyde 3	11	317	Yalco Fm & Stretton Sst	Muir	lower part equivalent to Borroloola 1
Glyde 4	13	77	Yalco Fm	Muir	approx equivalent to Mallapunyah 13
Kilgour 1	14	110	lower Emmerugga Dol	Jackson, Large	approx equivalent to Kilgour 4 & 5
Kilgour 2	15	108	Unknown: overlies Emmerugga Dol	Jackson, Large	approx equivalent to Kilgour 6, overlies K 5
Kilgour 3	16	147	upper Tooganinie Fm	Jackson, Large, Brown	overlain by Kilgour 8
Kilgour 4	17	90	lower Emmerugga Dol	Muir	approx equivalent to Kilgour 1
Kilgour 5	18	61	Emmerugga Dol	Muir	approx equivalent to Kilgour 1
Kilgour 6	19	144	unknown: overlies Emmerugga Dol	Muir, Brown	approx equivalent to Kilgour 2
Kilgour 7	20	140	lower Tooganinie Fm	Muir, Brown	overlies Kilgour 9, overlain by Kilgour 3
Kilgour 8	21	63	Leila Sst Mbr & Myrtle Sh Mbr	Jackson, Muir	overlain by Kilgour 1

Table 2 (Continued)

Measured section No.	Figure No.	Thickness measured (m)	Stratigraphic units measured	Measured by	Relationship
Kilgour 9	22	94	Tatoola Sst	Muir, Brown	overlies Kilgour 10, overlain by Kilgour 7
Kilgour 10	23	216	Mallapunyah Fm & Amelia Dol	Brown, Jackson, Large, Muir	overlies Kilgour 9
Kilgour 11	24	180	Mallapunyah Fm	Large, Muir	overlain by Kilgour 12
Kilgour 12	25	88	Amelia Dol	Brown, Jackson	overlies Kilgour 11
Mallapunyah 1	26	170	lower Lynott Fm	Plumb	overlies Glyde 1
Mallapunyah 2	27	103	upper Lynott Fm	Plumb	part equivalent of Glyde 2
Mallapunyah 3	28	87	Amos Fm	Muir	overlain by Mallapunyah 4
Mallapunyah 4	29	950	Balbirini Dol	Muir	overlain by Mallapunyah 5
Mallapunyah 5	30	135	Dungaminnie Fm & lower Limmen Sst	Muir	part equivalent of Mallapunyah 6
Mallapunyah 6	31	243	Dungaminnie Fm & lower Limmen Sst	Muir, Jackson	part equivalent of Mallapunyah 5
Mallapunyah 13	32	41	Yalco Fm	Muir	

Table 3. Information on measured sections: sections measured previously, not available elsewhere

Measured section No.	Figure No.	Thickness measured (m)	Stratigraphic units measured	Measured by	Relationship
Baten 1	33	27	Mallapunyah Fm & Amelia Dol	Muir (1975)	approx equivalent of Mallapunyah 11
Mallapunyah 7	34	15	Amelia Dol	Muir (1975)	part equivalent of Mallapunyah 8, 9, 10
Mallapunyah 8	35	52	Amelia Dol	Muir (1975)	part equivalent of Mallapunyah 9, 10
Mallapunyah 9	36	99	Amelia Dol	Muir (1975)	equivalent of Mallapunyah 10
Mallapunyah 10	37	64	Amelia Dol	Muir (1975)	equivalent of Mallapunyah 9
Mallapunyah 11	38	59	Mallapunyah Fm & Amelia Dol	Muir (1975)	approx equivalent of Batten 1
Mallapunyah 12	39	235	Amelia Dol (Type Section)	Smith (1960)	complete section of Amelia Dolomite, Leila Creek area.

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NORTHERN TERRITORY

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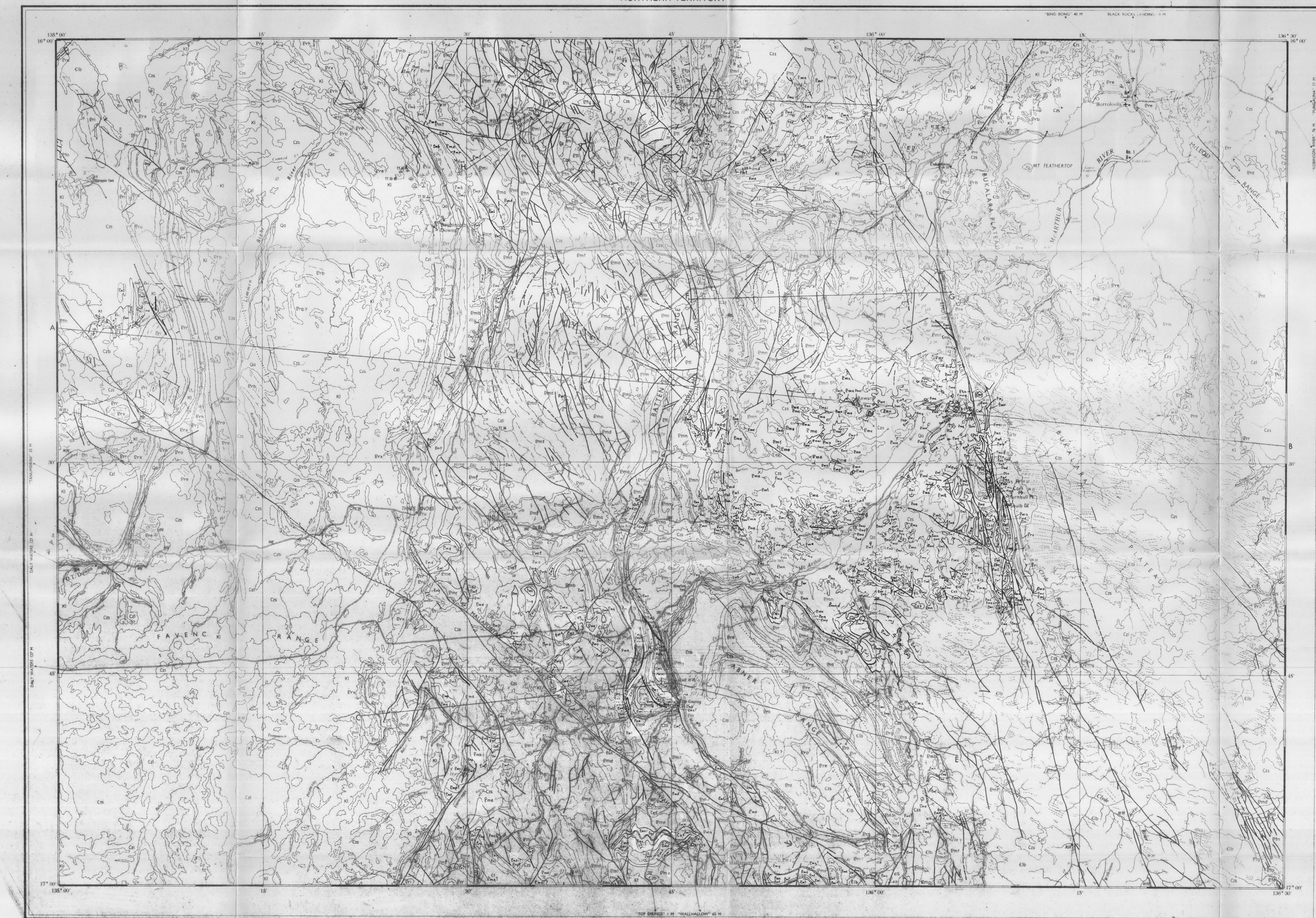

Reference

Geological boundary
Syncline
Anticline
Fault
Where location of boundaries, folds and faults is approximate, line is broken; where inferred, queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes.
Strike and dip of strata
Vertical strata
Horizontal strata
Overturned strata
Trend of bedding, showing direction of dip
Horizontal strata
Joint pattern
(air-photo interpretation)
Macrofossil locality
Plant fossil locality
Fossil wood locality
Fossil locality, showing reference number
Mine or prospect
Unexploited deposit
Minor mineral occurrence
Barite
Copper
Iron
Lead
Manganese
Zinc
Bore
Spring
Rockhole
Waterhole
Swamp
Road
Vehicle track
Fence
Homestead
Ford
Landing ground
Astronomical station
Height in feet, barometric—datum: mean sea level

Reference

CAINOZOIC			Qa	Alluvium
			Czs	Soil, sand, ferruginous ...
			Czb	Black soil
			Czl	Laterite, lateritic soil
	TERTIARY	Golliger Beds	Tg	Massive limestone
MESOZOIC	LOWER CRETACEOUS	Undifferentiated	Kl	Friable yellow clayey sandstone, massive white quartz sandstone and conglomerate, white leached ...
PALAEOZOIC	LOWER TO MIDDLE CAMBRIAN ?	Top Springs Limestone	Ct	Massive limestone, laminated cherty limestone
	LOWER CAMBRIAN?	Bukalara Sandstone	Cb	Massive medium to coarse-grained sandstone, usually feldspathic
PRECAMBRIAN	UPPER (?) PROTEROZOIC	Roper Group: Undifferentiated	Pr	Sediments
		Cobanbirini Formation	Prb	Flaggy siltstone, medium-grained quartz sandstone
		Bessie Creek Sandstone	Pre	Jointed, medium-grained quartz sandstone
		Corcoran Formation	Pro	Flaggy brown siltstone, medium-grained quartz sandstone, ferruginous sandstone
		Abner Sandstone	Pra	Jointed, medium-grained quartz sandstone, minor siltstone, ferruginous sandstone, fine conglomerate
		Hodgson Sandstone Member	Prh	Strongly jointed, medium-grained quartz sandstone
		Jalboi Member	Prj	Purple ferruginous sandstone, minor shale bands
		Arnold Sandstone Member	Prx	Strongly jointed, medium-grained quartz sandstone, siltstone
		Crawford Formation	Prr	Thickly flaggy glauconitic sandstone, feldspathic sandstone; flaggy, purple micaceous siltstone
		Mainoru Formation	Pru	Flaggy purple and green micaceous siltstone, fine-grained glauconitic sandstone, feldspathic sandstone, shale
		Kilgour Sandstone Member	Prg	Fine to medium-grained sandstone, siltstone
		Limmen Sandstone	Pri	Fine to medium-grained quartz sandstone, flaggy micaceous sandstone and siltstone, conglomerate
	PROTEROZOIC (CARPENTARIAN)	McArthur Group: Karns Dolomite	Pmk	
		Dungaminnie Formation	Pmg	
		Balbirini Dolomite	Pmz	
		Amos Formation	Pmm	
		Stott Formation	Pms	
		Smythe Sandstone	Pmy	
		Batten Subgroup: Billengarah Formation	Pmb	
		Looking Glass Formation	Pmo	
		Stretton Sandstone	Pmr	
		Yalco Formation	Pmj	
		Lynott Formation	Pmn	
		Donnegan Member	Pmnd	
		Umbolooga Subgroup: Reward Dolomite	Pmx	
		Barney Creek Formation	Pmq	
		Teena Dolomite	Pmp	
		Coxco Dolomite Member	Pmc	
		Emmerugga Dolomite	Pme	
		Mitchell Yard Dolomite Member	Pmei	
		Tooganinie Formation	Pmt	
		Myrtle Shale Member	Pmf	
		Leila Sandstone Member	Pmi	
		Tatoola Sandstone	Pmd	
		Amelia Dolomite	Pma	
		Mallapunyah Formation	Pml	
			Ps	Microsyenite, syenite
		Tawallah Group: Undifferentiated	Pt	Sediments, volcanics
		Mulholland Sandstone	Ptm	Flaggy white to grey, fine to medium-grained quartz sandstone
		Masterton Formation	Ptn	Blocky, purple and white, medium-grained quartz sandstone, siltstone ferruginous sandstone, conglomerate; minor intermediate-basic volcanics and lapilli tuff
		Gold Creek Volcanic Member	Ptg	Basalt, trachyte
		Wollogorang Formation	Pto	Flaggy grey and pink finely crystalline dolomite, dolarenite, dolomitic siltstone, dolomitic sandstone, sandstone, chert
		Settlement Creek Volcanics	Pte	Basalt, siltstone, tuff
		Rosie Creek Sandstone	Ptr	Flaggy very coarse to fine-grained quartz sandstone, ferruginous sandstone, feldspathic sandstone, glauconitic sandstone, boulder conglomerate
		Sly Creek Sandstone	Ptl	Blocky white to pink medium-grained quartz sandstone; some pebbly bands; minor ferruginous siltstone
		Peters Creek Volcanics	Ptp	Amygdaloidal basalt, minor trachyte
		Yiyintyi Sandstone	Pty	Blocky white medium to coarse-grained quartz sandstone; minor pebble to boulder conglomerate
		Scrutton Volcanics	Pts	Porphyritic dacite; minor basalt, feldspathic sandstone, siltstone, shale, tuff, minor basic intrusives

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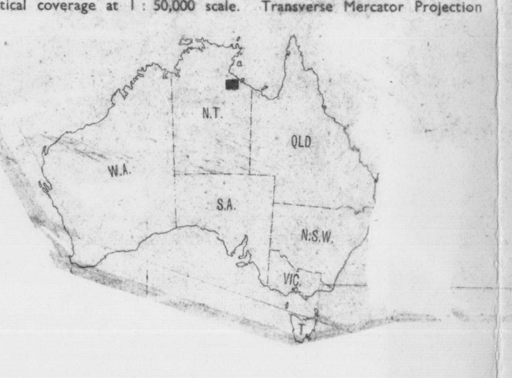

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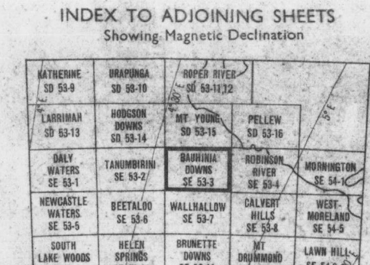

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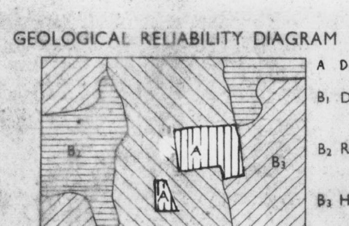

A Detailed mapping
B₁ Detailed reconnaissance — numerous traverses and air-photo interpretation
B₂ Reconnaissance — some traverses and air-photo interpretation
B₃ Helicopter traverses and air-photo interpretation

Geology, 1960-61, by: J. W. Smith, H. G. Roberts, K. A. Plumb, A. W. Webb
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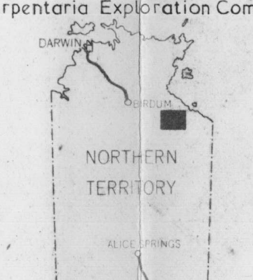
Drawn, 1963, by: Queensland Aerial Survey Company Pty. Ltd.
Revised geology of McArthur Group compiled, 1977, by M.C. Brown from mapping by Carpentaria Exploration Company, M.C. Brown, K.A. Plumb, M.J. Jackson, D.E. Large, and M.D. Muir.



DIAGRAMMATIC RELATIONSHIP OF ROCK UNITS

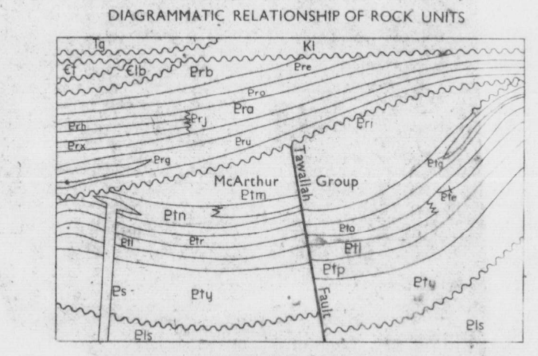


Plate 1. REVISED GEOLOGY BAUHINIA DOWNS SHEET

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