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DEFINITIONS OF NEWLY NAMED AND REVISED PRECAMBRIAN STRATIGRAPHIC AND INTRUSIVE ROCK UNITS IN THE DUCHESS AND URANDANGI 1:250 000 SHEET AREAS, MOUNT ISA INLIER, NORTHWESTERN QUEENSLAND

by

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ABSTRACT

The new nomenclature results from a detailed reconnaissance survey of the Precambrian parts of the Duchess and Urandangi Sheet areas carried out between 1975 and 1980 by geologists from the Bureau of Mineral Resources and the Geological Survey of Queensland. Forty stratigraphic and intrusive rock units are defined. All definitions have been approved by the Queensland Stratigraphic Nomenclature Sub-Committee.

INTRODUCTION

The definitions of newly named and revised stratigraphic and intrusive rock units in the Precambrian terrain of the Duchess and Urandangi 1:250 000 Sheet areas given in this report are arranged in alphabetical order. All definitions have been approved by the Queensland Stratigraphic Nomenclature Sub-Committee, and are in accordance with the International Stratigraphic Guide (Hedberg, 1976). The new nomenclature results from a detailed reconnaissance survey of the southern part of the Precambrian Mount Isa Inlier carried out jointly by geologists from the Bureau of Mineral Resources (BMR) and the Geological Survey of Queensland (GSQ) between 1975 and 1980.

In the following text 'Sheet area' refers only to a 1:250 000 Sheet area; names shown in upper case letters are those of 1:100 000 Sheet areas.

The units defined are more fully described in map commentaries accompanying the following 1:100 000 scale geological maps: Duchess region (DUCHESS and E part of OBAN), by Bultitude & others (in press); Dajarra (DAJARRA), by Blake & others (in press); Selwyn region (SELWYN and W half of MOUNT MERLIN), by Blake & others (in prep. a); Ardmore (ARDMORE), by Bultitude (in prep.); Kuridala region (MOUNT ANGELAY and W half of MALBON), by Donchak & others (in prep.).

Geological terms used are generally as defined by Gary & others (1972). Sandstones are classified according to the scheme of Pettijohn & others (1972). The classification recommended by Streckeisen & others (1973) is used for plutonic rocks. Terms describing metamorphic facies are as defined by Turner & Verhoogen (1960).

All the granitic plutons mapped as Williams Granite and Wimberu Granite by Carter & others (1961) and Carter & Öpik (1963) in the eastern part of the Duchess Sheet area are grouped together as the Williams Batholith (a new structural term).

All isotopic dates quoted have been obtained by R.W. Page, BMR, using the U-Pb zircon method.

GR in text refers to Australian Map Grid Reference, Zone 54 (metric).

DEFINITIONS OF UNITS

Agate Downs Siltstone

(redefinition)

Proposers. D.H. Blake and P.J.T. Donchak (in Blake & others, in prep. a; Donchak & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Agate Down outstation, GR 388382, in MALBON, Duchess Sheet area.

Distribution. The unit crops out as a linear N-trending belt 25 km long and up to 2.5 km wide, extending from GR 398189 in NE part of MOUNT MERLIN to GR 413420 in SE part of MALBON, Duchess Sheet area.

Type section. From GR 378324 east for 1 km, to GR 388324, a point 5 km WNW of the Tip Top mine, MALBON. This is the part of the type section for the Staveley Formation of Carter & others (1961) which comprises the former Agate Downs Siltstone Member, now Agate Downs Siltstone formation. Ridge-forming brown and grey siltstone, fine-grained arenite, and fine quartzite, and less resistant phyllite are exposed here.

Lithology. Consists of siliceous, ferruginous, and less commonly calcareous siltstone and fine-grained arenite, together with quartzite, phyllite, and minor slate and breccia.

Thickness. Maximum probably more than 500 m.

Relationships. The unit overlies the Staveley Formation, apparently conformably.

Age. Proterozoic.

Synonymy. Termed the Agate Downs Siltstone Member of the Staveley Formation by Carter (1959) and Carter & others (1961), but not shown on any published map.

Remarks. Cross-bedding and ripple marks indicate that the unit is preserved as a complex isoclinal syncline, and that it overlies the Staveley Formation rather than forming the lower part of this formation, as stated by Carter & others (1961). For this reason, and because it has a distinctive mappable lithology, the Agate Downs Siltstone is upgraded to formation status.

Answer Slate

(revised definition of formation originally defined by Carter, 1959)

Proposer. D.H. Blake (in Blake & others, in prep. a; Donchak & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Named after the Answer copper mine, GR 340035, MOUNT MERLIN, Duchess Sheet area.

Distribution. Crops out in a belt up to 6 km wide extending from 13 km NNW of Kuridala southwards for 72 km to 18 km SSE of the Answer mine, MALBON and MOUNT MERLIN, Duchess Sheet area.

Type section. According to Carter (1959) and Carter & others (1961), it is south of Limestone Creek, MOUNT MERLIN, extending for 5.6 km west from Lat. 21°23'S, Long. 140°22'E; however, this latitude is in MALBON, well to the north of Limestone Creek. The proposed revised type section is just south of Limestone Creek, 13 km N of the Answer mine, extending west from GR 339182 (about Lat. 23°33'20"S, Long. 140°21'53") for 5.3 km. This section traverses gently undulating terrain developed on interbedded slate and siltstone, some banded quartz-hematite and cherty rocks, and intrusive metadolerite. It extends from a poorly exposed concordant contact with the Staveley Formation in the east to a gradational contact, partly obscured by metadolerite, with the Mitakoodi Quartzite to the west.

Lithology. Main rock types are interbedded pale to dark grey (graphitic) or iron-stained slate, metasiltstone, and phyllite; also present are fine mica schist, thin beds of fine quartzite and feldspathic quartzite, chert, dolomitic and calcareous metasiltstone, schistose metagreywacke, and ridge-forming quartz-hematite bands. Quartz veins are common throughout.

Thickness. Uncertain because of tight folding, but maximum may be more than 1000 m.

Relationships. The formation conformably overlies the Mitakoodi Quartzite and Overhang Jaspilite, and may be overlain by the Staveley Formation either conformably or unconformably. It is faulted against the Agate Downs Siltstone and probably also against the Double Crossing Metamorphics, is intruded by metadolerite, Gin Creek Granite, and Wimberu Granite, and is overlain unconformably by flat-lying Cambrian Mount Birnie Beds and Mesozoic sediments.

Age. Proterozoic.

Synonymy. None.

Remarks. The Answer Slate is possibly a correlative of the Marimo Slate to the north (Carter & others, 1961). However, Blake & others (in prep. b) and Donchak & others (in prep.) consider that the Answer Slate may be overlain unconformably by the Staveley Formation, a probable lateral equivalent of the Marimo Slate, and hence may be an older unit.

Birds Well Granite
(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. Named after Birds Well (GR 725318), about 11 km SW of Duchess, DUCHESS, Duchess Sheet area.

Distribution. The granite forms an elongate pluton W of Birds Well, and crops out over an area of about 70 sq. km in southern central DUCHESS, Duchess Sheet area.

Type section. About 13 km SSW of Duchess, from GR 672340 to GR 710340, DUCHESS. Extends from Wills Creek due W across the McPhee Hills almost to a track N of Mountain Paddock Tank. Mainly medium to coarse-grained, slightly to markedly porphyritic, leucocratic, weakly foliated to gneissic granite is exposed here.

Lithology. The granite is commonly extensively recrystallised and includes some medium to coarse-grained, locally garnetiferous quartzofeldspathic gneiss and augen gneiss. Biotite is the main mafic mineral in most samples, but hornblende predominates, locally. The unit also includes some aplite, leucocratic biotite microgranite and pegmatite, mainly as thin veins. The granite contains scattered mafic xenoliths, inclusions up to about 1 m in diameter of medium-grained gneissic granodiorite, diorite and quartz-feldspar-biotite gneiss that resemble units mapped as part of the Kalkadoon Granite and, south of Belle White Tank (GR 673421), small pendants or screens of strongly foliated medium-grained calc-silicate rocks.

Relationships. The granite intrudes the Leichhardt Volcanics, Magna Lynn Metabasalt, Argylla Formation, and Kalkadoon Granite. It is cut by numerous nonfoliated to foliated amphibolitic metadolerite dykes.

Age. Proterozoic.

Synonymy. Previously mapped as Kalkadoon Granite (Carter & Öpik, 1963), which is now known to be older than the Magna Lynn Metabasalt and Argylla Formation (Page, 1978).

Remarks. The Birds Well Granite forms a discrete pluton geographically isolated from other granitic intrusions.

Blackeye Granite
(new name)

Proposer. D.H. Blake (in Blake & others, in prep. a).

Definition approved. 10/12/80.

Derivation of name. Blackeye Creek, which drains NE to join the McKinlay River near Answer Downs Homestead (at GR 995045), in the E of SELWYN, Duchess Sheet area. The outcrop area of the granite is drained by a branch of Blackeye Creek.

Distribution. The Blackeye Granite forms a clearly defined N-trending outcrop 1.6 km long and 0.4 km wide centred at GR 905977, 6 km WNW of Glenholme homestead, eastern central SELWYN, Duchess Sheet area.

Type locality. Central part of outcrop area, at GR 905977, SELWYN, where medium to fine-grained leucocratic granitic rocks are exposed along an eastward-draining creek.

Lithology. Medium to fine-grained, even-grained, foliated, leucocratic granodiorite; minor quartz-feldspar pegmatite. The granodiorite contains about 5 percent dark minerals (amphibole ± biotite ± clinopyroxene).

Relationships. Intrudes the Doherty Formation.

Age. Proterozoic.

Synonymy. Like all other granites in the eastern part of the Duchess 1:250 000 Sheet area, the Blackeye Granite was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. The Blackeye Granite forms a well-defined intrusive body geographically separated from other granitic intrusives. It is probably related to the petrographically similar but more heterogeneous Cowie and Maramungee Granites to the W and N, respectively, and is part of the Williams Batholith.

Bottletree Formation

(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press; Blake & others, in press).

Definition approved. 10/12/80.

Derivation of name. Bottletree Hummock (GR 532756), in the NW part of DUCHESS, Duchess Sheet area.

Distribution. The formation forms a N-trending belt about 30 km west of Duchess, in DUCHESS, and extends S into DAJARRA, and SW into ARDMORE, Duchess and Urandangi Sheet areas.

Type section. From GR 514542 to GR 518540, DUCHESS. Here the formation is about 400 m thick. The track between Bushy Park and Mount Guide homesteads crosses the formation about 1 to 2 km N of the type section. The lower part of the section, in the E, consists mainly of schistose amygdaloidal and massive metabasalt and interlayered lenses of quartzite which are commonly epidotic. The overlying sequence contains foliated, rhyolitic to dacitic metavolcanics and interlayered, metamorphosed greywacke, greywacke conglomerate, arkose and conglomeratic arkose, and some schistose amphibolite. Clasts in the conglomeratic rocks are well-rounded to angular, up to 1 m (but generally less than 20 cm) across, and consist mainly of felsic metavolcanics, amphibolite, granite, and quartzite. The uppermost part of the formation consists of schistose metabasalt similar to that in the lower part.

Lithology. The formation consists mainly of sparsely to richly porphyritic, rhyolitic to dacitic lava flows and ash-flow deposits, and interlayered beds of greywacke and greywacke conglomerate and grit. Sheared, schistose, amygdaloidal to massive metabasalt, is common at or near the base and top of the formation. Other rock types present include arkose, arkosic grit, bedded tuff?, siltstone, ?agglomerate, meta-arenite, quartzite, epidotic quartzite, and laminated para-amphibolite.
The formation has been regionally metamorphosed, mainly to the amphibolite facies.

Thickness. Very variable; a maximum of about 3000 m is attained in the NW of DUCHESS. The variable thickness may be attributed partly to localised volcanism and partly to deposition on an irregular surface.

Relationships. The Bottletree Formation unconformably overlies the Kalkadoon Granite and undivided Tewinga Group, and appears to be conformably overlain by the Yappo Member of the Mount Guide Quartzite. Conglomeratic metasediments similar to those in the Bottletree Formation make up much of the Yappo Member.

Age. Dated by the U-Pb-zircon method at 1790^{+10}_{-8} m.y. and 1808^{+22}_{-17} m.y. (Page, in preparation).

Synonymy. Previously mapped as Leichhardt Metamorphics, Argylla Formation and Mount Guide Quartzite (Carter & Öpik, 1963), and as part of the informal Rifle Creek Beds (Bultitude & others, 1977). The sequence extends north into the southwestern part of MARY KATHLEEN, where it has been mapped as Argylla Formation by Derrick & others (1977).

Bowlers Hole Granite
(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. Bowlers Hole Dam, GR 771635, in NE of DUCHESS, Duchess Sheet area.

Distribution. The granite forms an elongate pluton 11 km long and up to 3.5 km wide extending from GR 781756 to GR 762635, and some small satellitic pods, north of Bowlers Hole Dam, northeastern DUCHESS, Duchess Sheet area.

Type area. About 9.5 km north of Bowlers Hole Dam, from GR 766740 to GR 798718, DUCHESS. This area is 1.5 to 5 km W of the Duchess-Fountain Springs track and is drained by an unnamed tributary of the Malbon River. Mainly foliated, pink, medium to coarse-grained, slightly porphyritic, biotite-hornblende granite is exposed here.

Lithology. Consists mainly of foliated, slightly porphyritic, biotite-hornblende granite. Minor rock types include gneissic biotite granite, microgranite, aplite, pegmatite, and some mafic-rich ?contaminated granite. The granite contains mafic xenoliths and inclusions of probable extensively recrystallised felsic metavolcanics and coarse-grained granite.

Relationships. The granite intrudes the Magna Lynn Metabasalt and Leichhardt Volcanics. Some pegmatite veins thought to be related to the granite cut the Argylla Formation. The granite is intruded by dykes of metadolerite, now mainly schistose amphibolite.

Age. Proterozoic.

Synonymy. Mapped as Kalkadoon Granite by Carter & Öpik (1963), but is now known to intrude units significantly younger than Kalkadoon Granite (Page, 1978).

Remarks. The Bowlers Hole Granite is geographically isolated from other granite bodies in the region.

Bushy Park Gneiss
(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. Bushy Park pastoral lease, NW of Duchess township, DUCHESS, Duchess Sheet area.

Distribution. The gneiss is confined to a narrow N-trending belt W of Duchess, DUCHESS, Duchess Sheet area.

Type locality. Railway cutting W of Duchess-Myubee track, 11 km NW of Duchess township, at GR 750460, DUCHESS. Here the unit consists mainly of medium to coarse quartzofeldspathic gneiss and foliated to gneissic granite containing pink feldspar megacrysts, but also includes minor finer grained leucocratic biotite granite.

Lithology. The main rock types are medium to coarse-grained hornblende-biotite-quartz-feldspar orthogneiss and augen gneiss which locally form large massive to bouldery outcrops, and slightly foliated to gneissic, porphyritic biotite-hornblende granite. Minor rock types present include fine-grained leucocratic gneiss, medium to coarse leucocratic granite, and tourmaline-bearing pegmatite.

Relationships. The gneiss forms a series of intrusive pods and elongate lenses interlayered with rocks of the Corella Formation, Magna Lynn Metabasalt, and Argylla Formation.

Age. Proterozoic.

Synonymy. Previously mapped as Argylla Formation, Corella Formation, and Kalkadoon Granite (Carter & Öpik, 1963).

Remarks. The Bushy Park Gneiss may represent intensely deformed, pre or syntectonic stocks and dykes, and may be equivalent to similar units in the Wonga Granite north of DUCHESS (Derrick & others, 1977).

Cowie Granite
(new name)

Proposer. D.H. Blake (in Blake & others, in prep. a).

Definition approved. 10/12/80.

Derivation of name. Cowie prospect, GR 862890, 10 km ESE of Squirrel Hills homestead, SELWYN, Duchess Sheet area.

Distribution. Crops out in belt up to 3 km wide trending NNE for 11.5 km from a point 4.5 km W of Cowie prospect, eastern central SELWYN, Duchess Sheet area. The outcrop area is centred on GR 855940.

Type area. In the vicinity of GR 855937, 5 km NNW of Cowie prospect, SELWYN, where the unit forms undulating terrain with extensive low rocky and rubbly exposures of heterogeneous, leucocratic, granitic rocks.

Lithology. The unit consists of heterogeneous, biotite-bearing leucocratic granite, granodiorite and tonalite. The granitic rocks range from fine-grained to pegmatitic, and from massive to foliated; they are commonly xenolithic, but not porphyritic.

Relationships. The Cowie Granite intrudes and locally forms migmatitic complexes with the Soldiers Cap Group and also intrudes the Doherty Formation. It is inferred to be intruded by Squirrel Hills Granite to W, and is cut by porphyritic microgranite considered to be related to the Squirrel Hills Granite.

Age. Proterozoic.

Synonymy. Like all other granites in the eastern part of the Duchess Sheet area, the Cowie Granite was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. The Cowie Granite differs petrographically from, and is inferred to be older than, the adjacent Squirrel Hills Granite to W. It is separated geographically from the petrographically similar and probably related Blackeye Granite to the E and the Maramungee Granite to the N. It forms part of the Williams Batholith.

Doherty Formation

(new name)

Proposers. D.H. Blake and P.J.T. Donchak (in Blake & others, in prep. a; Donchak & others, in prep.).

Definition approved. 18/3/81.

Derivation of name. Doherty Waterhole, situated on the Florence River at GR 603531, MOUNT ANGELAY, Duchess Sheet area.

Distribution. The formation crops out in a N to NNW-trending belt up to 21 km wide extending from the eastern central part of SELWYN (about 21°49'S, 140°56'E) northwards for more than 100 km through MOUNT ANGELAY, Duchess Sheet area, and into the southern part of the CLONCURRY, Cloncurry Sheet areas.

Type section. Along the gorge of the Maramungee River from GR 874186, 19 km NW of Answer Downs Homestead, where calc-silicate breccia of the Doherty Formation is in contact with schist of the Soldiers Cap Group, west for 2.7 km to an outcrop of unnamed granite, which intrudes the formation, at GR 851181, SELWYN. There are continuous exposures of the predominant rock types of the formation - banded calc-silicate granofels and calc-silicate breccia, in about equal proportions - together with some intrusive metadolerite, along this gorge section.

Lithology. The formation consists predominantly of thinly banded calc-silicate granofels and massive calc-silicate breccia which are variably calcareous, feldspathic, amphibolitic, diopsidic, siliceous, and scapolitic. Minor rock types locally present include massive calc-silicate granofels, metarhyolite, metabasalt, banded quartz-tourmaline rock, mica schist, black slate, and variably calcareous feldspathic quartzite.

Thickness. Probably several thousand metres, but uncertain because of tight folding, faulting and lack of facing evidence.

Relationships. Contacts between the Doherty Formation and adjacent non-intrusive Precambrian units (Soldiers Cap Group, Kuridala Formation, Staveley Formation, Marimo Slate) are generally marked by faults and breccia zones, hence the stratigraphic relationships of the formation are uncertain. The formation may overlie the Soldiers Cap Group, either conformably or disconformably, may be similar in age to the Kuridala Formation, and may be older than the Staveley Formation (Blake & others, in prep.; Donchak & others, in prep.). It is intruded by amphibolite, metadolerite, dolerite, and by granites of the Williams Batholith (Wimberu, Saxby, Mount Angelay, Squirrel Hills, Cowie, and Blackeye Granites, all new names, and unnamed granite), and is overlain unconformably by flat-lying Mesozoic sediments.

Age. Proterozoic; in SELWYN the formation includes metarhyolite, thought to be extrusive, which has been dated at 1720 $\pm$ 7 m.y. by the U-Pb zircon method (Page, in preparation).

Synonymy. The Doherty Formation was previously mapped as part of the Corella Formation (Carter & others, 1971; Carter & Öpik, 1963). However, it is geographically separated from the belt of Corella Formation containing the type section (in MARRABA), it is in contact with units which cannot be correlated with any confidence with those adjacent to the type section Corella Formation; and it is probably at least 20 m.y. younger than the type section Corella Formation, which is intruded by the Burstall Granite (Derrick, 1980), isotopically dated by the U-Pb zircon method at 1720-1740 m.y. (Page, 1979 and 1980).

Remarks. The Doherty Formation has been regionally metamorphosed to amphibolite grade, and is relatively resistant to erosion, forming hilly terrain throughout its outcrop area. It forms a mostly well-defined and readily mappable unit which is easily distinguished from adjacent stratigraphic units, but not always from irregular granitic intrusions.

Double Crossing Metamorphics
(new name)

Proposer. D.H. Blake (in Blake & others, in prep. a).

Definition approved. 10/12/80.

Derivation of name. Double Crossing Bore, GR 305056, MOUNT MERLIN, Duchess Sheet area.

Distribution. Crops out 5 km to 12 km SE of Double Crossing Bore, E and W of Gin Creek, covering about 30 km^2 in MOUNT MERLIN, Duchess Sheet area.

Type section. From a point 1.3 km E of the Answer Mine east for 2.5 km to GR 377032, MOUNT MERLIN. This section traverses undulating terrain formed of Double Crossing Metamorphics from a concordant, possibly faulted, contact with phyllite and fine schist of the Answer Slate to the W to a similar contact with fine-grained mica schist and schistose meta-arenite of the Staveley Formation to the E. It consists of medium to coarse schist, gneiss, migmatite, feldspathic quartzite, amphibolite, and abundant concordant to cross-cutting granite veins.

Lithology. Rock types present are micaceous and felsic gneiss and schist, migmatitic gneiss with leucosome 'sweats', amphibolite, quartzite, banded quartz-hematite and quartz-tourmaline rocks, meta-arkose, and many concordant to cross-cutting veins and veinlets of pegmatite, leucogranite, and quartz.

Thickness. Unknown, because of tight folding and because no stratigraphic sequences have been determined within the formation, but probably at least 1000 m.

Relationships. The formation is intruded by and intimately associated with Gin Creek Granite. Its relationships to adjacent Answer Slate and Staveley Formation are uncertain - it may be exposed in the core of an anticline, in which case it is probably partly overlain unconformably by, and partly faulted against, these two formations.

Age. Proterozoic; the formation may be part of the Early Proterozoic basement of the Mount Isa Inlier.

Synonymy. None; included as part of the Williams Granite by Carter & Öpik (1963).

Remarks. The rocks of the Double Crossing Metamorphics are of higher metamorphic grade than those of adjacent formations, and are different in composition, being predominantly quartzofeldspathic, rather than pelitic. Hence they form a distinctive mappable unit.

Garden Creek Porphyry
(new name)

Proposer. D.H. Blake (in Bultitude & others, in press; Blake & others, in press).

Definition approved. 10/12/80.

Derivation of name. Garden Creek, which flows SE to join Wills Creek E of Dajarra, DAJARRA, Duchess Sheet area.

Distribution. The unit forms a discontinuous N-trending band up to 250 m wide within the range of Mount Guide Quartzite N of Dajarra; it extends for 37 km from GR 501035, NW DAJARRA, to GR 516407, SW DUCHESS, Duchess Sheet area.

Type locality. 5.5 km NE of Dajarra, at GR 503039, DAJARRA. Here the Garden Creek Porphyry, consisting of porphyritic microgranite, is exposed mainly as small spheroidal boulders on a low ridge separated from higher strike ridges of Mount Guide Quartzite to the east and west by narrow depressions developed on poorly exposed amphibolitic metadolerite.

Lithology. Massive to locally sheared pink to grey microgranite containing euhedral to subhedral plagioclase and K-feldspar phenocrysts, some more than 1 cm across, and smaller rounded phenocrysts of glassy quartz; also contains small dark biotite-rich inclusions.

Thickness. 0-250 m.

Relationships. The unit intrudes the Mount Guide Quartzite more or less concordantly; is commonly flanked by metadolerite.

Age. Proterozoic; postdates the Mount Guide Quartzite.

Synonymy. Previously mapped as Kalkadoon Granite (e.g., Carter & Öpik, 1963), which pre-dates the Mount Guide Quartzite.

Remarks. The unit forms a steeply dipping intrusive tabular body which may represent the central part of a composite sheet.

Gin Creek Granite

(previously named, but not defined)

Proposer. D.H. Blake (in Blake & others, in preparation a).

Definition approved. 10/12/80.

Derivation of name. Gin Creek, a tributary of the Mort River, and Gin Creek Bore (at GR 378988), MOUNT MERLIN, Duchess Sheet area. Gin Creek and its tributaries drain much of the outcrop area of the unit.

Distribution. Restricted to E part of MOUNT MERLIN, Duchess Sheet area. Main outcrop, 24 km long (N to S) and up to 6 km wide, lies E of Gin Creek bore. A few small outcrops are present to the west.

Type area. Low hilly country 4 km NE of Gin Creek Bore, in vicinity of GR 412022, MOUNT MERLIN. The three main granitic types making up the unit are exposed in this area: mainly foliated xenolithic biotite granite and fine-grained to pegmatitic leucogranite in the western part, and mainly non-foliated biotite granite containing feldspar phenocrysts up to 5 cm across in the eastern part.

Lithology. Main rock types exposed are medium to coarse-grained and locally porphyritic biotite granite; fine to coarse-grained, xenolithic, commonly porphyritic, weakly foliated to gneissic biotite granite (which predominates on the W and N sides of the main outcrop); and fine-grained to pegmatitic leucogranite containing tourmaline and muscovite. Minor fine-grained biotite granite, aplite and greisen are also present.

Relationships. Gin Creek Granites intrudes Double Crossing Metamorphics, Answer Slate, Staveley Formation, Kuridala Formation, and metadolerite, and is overlain by flat-lying Mesozoic sediments. Tourmaline-muscovite granite locally cuts the other two main granitic types.

Age. Proterozoic.

Synonymy. Named Gin Creek Granite and briefly described in an unpublished report by White (BMR Record 1957/94), and referred to as Gin Creek Granite by Brooks (1960). Like all other granites in the eastern part of the Duchess Sheet area, it was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. Gin Creek Granite consists of three spacially associated types of granite, and may represent three or more separate intrusions. It forms part of the Williams Batholith.

Jayah Creek Metabasalt

(new name)

Proposer. R.J. Bultitude (in Bultitude, in preparation).

Definition approved. 10/12/80.

Derivation of name. Jayah Creek, whose tributaries drain part of the northern outcrop area, ARDMORE, Urandangi Sheet area.

Distribution. The sequence forms a NNW-trending belt in the central part of ARDMORE, Urandangi Sheet area. It extends S and N into the Glenormiston Sheet area and OBAN, respectively.

Type section. From GR 291069 to GR 343114, about 17 km NW of Dajarra, ARDMORE. The old main road between Dajarra and Mount Isa via Sulieman Bore and an abandoned railway track cross the western part of the type section. A complete section from the base to the top of the sequence is not exposed. The formation (including the Timothy Creek Sandstone Member) in the type section consists mainly of foliated to schistose fine-grained amygdaloidal and massive metabasalt, and numerous interlayered lenses of quartzose, sericitic and feldspathic meta-arenite and quartzite, glassy and epidotic quartzite, and muscovite quartzite. Minor rock types include marble, muscovite schist, and quartz-biotite schist. The Timothy Creek Sandstone Member is a relatively thick unit of mainly pebbly meta-arenite (see p. 64).

Lithology. Mainly foliated to schistose, fine-grained, amygdaloidal and massive metabasalt, fine to medium-grained amphibole schist, quartz + muscovite + biotite ± feldspar ± cordierite schist and gneiss, quartzite, muscovite quartzite, and quartzose, sericitic, and feldspathic meta-arenite and quartzite. Minor rock types include para-amphibolite, siliceous and micaceous metasiltstone, pebbly labile meta-arenite and quartzite, marble, quartz-muscovite-biotite rock (at GR 299858) containing numerous cordierite poikiloblasts, calcareous meta-arenite, laminated biotite-rich rocks (? mafic tuffs) and conglomerate (rare).

The sequence is characterised by numerous metasedimentary units, interlayered with the metabasalts and ranging in thickness from less than 1 m up to about 2000 m (Timothy Creek Sandstone Member). In the NW argillaceous metasediments are very common, whereas in the central and southern parts of the belt arenaceous and ?tuffaceous metasediments are relatively common.

Thickness. Unknown; the sequence appears to be about 6200 m thick in the type section, and has an apparent maximum thickness of about 15 000 m, 20.5 km SW of Dajarra.

Relationships. The Jayah Creek Metabasalt is truncated by the Wonomo Fault in the east and by the Rufus Fault Zone in the west. The contact between Jayah Creek Metabasalt and Sulieman Gneiss about 23 km SW of Dajarra may be gradational. However, coarse chlorite rock developed in the Sulieman Gneiss in places adjacent to this contact may indicate that the contact is faulted; alternatively, as the chlorite is generally closely associated with northerly trending pegmatite veins, its formation may have been related to the intrusion of the pegmatites, some of which may have been intruded along a fracture zone separating the two formations. About 6 km W of Rundle Bore (GR 391829) the formation may be unconformably overlain by a poorly exposed sequence of relatively little metamorphosed meta-arenite, metasiltstone, and shale tentatively assigned to the Mount Isa Group. It is unconformably overlain by flat-lying to gently dipping Middle Cambrian and ?Mesozoic sediments in the S, and is cut by numerous pods and dykes of metadolerite, by granite mapped as Sybella Granite, and by numerous veins of quartz, and quartz + feldspar + muscovite ± tourmaline pegmatite. The formation is also cut by dykes less than 20 m thick of quartz porphyry and quartz-feldspar porphyry.

Age. Precambrian, probably Proterozoic.

Synonymy. Mapped as Eastern Creek Volcanics by Noakes & others (1959), and described by Joplin (1955; page 38) as an 'older metamorphic complex'. Extensions to the north in OBAN have been mapped as Eastern Creek Volcanics (Bultitude & others, in press).

Remarks. The regional metamorphic grade increases from east to west and may be attributed to relatively low-pressure high-temperature metamorphism associated with the emplacement of the Sybella Granite batholith. The presence of co-existing hornblende and plagioclase more calcic than An_{17} in metabasalt, and of cordierite in argillaceous metasediments in the west indicates amphibolite facies of regional metamorphism (Winkler, 1976). Joplin (1955) recorded cordierite, andalusite, and sillimanite in a gneiss collected a few metres west of the old Dajarra-Mount Isa road, about 10.5 km NW of Sulieman Bore (GR 323027).

The Jayah Creek Metabasalt may be equivalent to the regionally metamorphosed, lithologically similar sequence mapped as Eastern Creek Volcanics west of the Mount Isa Fault, in MOUNT ISA to the north (BMR, 1978). However, it is shown as a separate formation in ARDMORE because it has several characteristics not shared with rocks mapped as Eastern Creek Volcanics to the eastern - for example, conglomeratic sediments containing abundant felsic volcanic clasts are very common in the east, whereas in the Jayah Creek Metabasalt conglomerate is very rare and no pebbles of felsic volcanics have been positively identified. Meta-argillite, para-amphibolite, and ?tuffaceous metasediments are abundant in places in the Jayah Creek Metabasalt, but are scarce or absent in the Eastern Creek Volcanics to the east. Such differences may be the result of facies variations from east to west, or they may indicate that the two formations are not equivalent.

Kallala Quartzite

(new name)

Proposer. R.J. Bultitude (in Bultitude, in preparation).

Definition approved. 10/12/80.

Derivation of name. QT Kallala Bore, located about 36 km SSW of Ardmore homestead, ARDMORE, Urandangi Sheet area.

Distribution. The Kallala Quartzite forms a narrow N-trending belt in the far S of the central part of ARDMORE, Urandangi Sheet area, and extends into the Glenormiston Sheet area.

Type section. From GR 173681 to GR 189672, in the S of ARDMORE, about 1.5 km to 3.5 km NW of the Pinnacles Dam. Most of the section consists of ridge-forming thin to medium-bedded, medium to coarse-grained, glassy quartzite, feldspathic quartzite, and muscovite quartzite. The section also contains minor hornblende ± biotite schist and gneiss, at least some of which probably represents metadolerite. No facing evidence has been found in the quartzites.

Lithology. The rocks are generally as in the type section.

Thickness. Unknown, probably at least 350 m. The formation has been tightly folded and dips are steep to vertical.

Relationships. The formation appears to have a concordant and probably conformable contact with the Sulieman Gneiss, and, to the west, a concordant and possibly conformable contact with a sequence of schistose amphibolite (metabasalt) and interlayered metasediments tentatively mapped as Jayah Creek Metabasalt. It may be younger than the Sulieman Gneiss and older than the Jayah Creek Metabasalt.
The Kallala Quartzite is intruded by the Sybella Granite and by quartz and pegmatite veins.

Age. Precambrian.

Synonymy. Mapped as Eastern Creek Volcanics by Noakes & others (1959).

Remarks. Bedding trends in the quartzite are mainly northerly, and dips are moderately steep to vertical. Trend lines and variations in the direction of dip indicate that the sequence has been tightly folded about mainly north to northeast-trending axes. A northerly-trending axial-plane fracture cleavage is well developed in the hinge zones of folds. The sequence has been regionally metamorphosed to amphibolite grade.

Leichhardt Volcanics

(revision in the Duchess 1:250 000 Sheet area of Leichhardt Metamorphics of Carter & others, 1961, and Derrick & others, 1976)

Proposers. D.H. Blake and R.J. Bultitude (in Blake & others, in prep; Bultitude & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Named after the Leichhardt River (Carter & others, 1961).

Distribution. In the Duchess Sheet area the formation crops out in a series of N-trending belts up to 6 km wide extending from the northern border of DUCHESS south to the southern border of DAJARRA, where it forms low hilly to gently undulating terrain. It also crops out extensively in sheet areas to the N (Carter & others, 1961).

Type section. In PROSPECTOR, Cloncurry Sheet area, extending W from the Referee copper mine (GR 797531) for about 8 km to the gorge on Doughboy Creek (GR 718524): here metamorphosed felsic volcanics of the Leichhardt Metamorphics are extensively intruded by granite and dolerite dykes (Carter & others, 1961; Derrick & others, 1976).

Lithology. As mapped in the Duchess Sheet area, the formation consists mainly of massive rhyolitic volcanics containing quartz and feldspar phenocrysts enclosed in a very fine-grained groundmass commonly showing primary igneous textures. Most of the volcanics are probably ignimbrites, but some flow banded lavas are also exposed; minor rock types present locally include feldspar porphyry, volcaniclastic arenite, bedded tuff, and altered basaltic volcanics. The felsic volcanics generally appear to be little affected by regional metamorphism, and are foliated and schistose at only a few localities.

Reference section for the Leichhardt Volcanics. Along the Dajarra/The Monument road E of Wills Creek, from GR 670840, 24 km ESE of Dajarra east for 7 km, to GR 740890, in DAJARRA, Duchess Sheet area. In this section pink to grey felsic volcanics containing quartz and feldspar phenocrysts, the characteristic rock types of the formation, are exposed, together with a thin arenite

bed (in the W) and minor feldspar porphyry, and the formation is seen to be intruded by leucocratic Wills Creek Granite and dolerite. The volcanics here form undulating terrain.

Thickness. Unknown, but probably more than 1000 m in the Duchess Sheet area.

Relationships. The formation is overlain disconformably by the Magna Lynn Metabasalt and unconformably by the Makbat Sandstone and Stanbroke Sandstone. It overlies the One Tree Granite and is intruded by the Wills Creek, Birds Well and Woonigan Granites and mafic dykes. Its relationship to adjacent Kalkadoon Granite and gneissic metavolcanics mapped as undivided Tewinga Group is uncertain.

Age. Early Proterozoic; two samples have been isotopically dated at 1875^{+26}_{-19} m.y. (Page, in preparation) using the U-Pb zircon method. This age is statistically indistinguishable from the 1865 ± 3 m.y. age for the Leichhardt Metamorphics to the north (Page, 1978).

Synonymy. Mapped as Leichhardt Metamorphics by Carter & Öpik (1963); informally termed Standish volcanics in Blake (1980).

Remarks. The formation Leichhardt Volcanics, as mapped in DUCHESS and DAJARRA, is equivalent to all or most of the Leichhardt Metamorphics mapped in sheet areas to the north, hence is part of the Tewinga Group of Derrick & others (1976a). In the Duchess Sheet area, the formation consists predominantly of readily recognisable felsic volcanic rocks, not metamorphic rocks. To designate them 'metamorphics' is misleading, in that almost all other stratigraphic units in the southern part of the Mount Isa Inlier are either equally metamorphic or more so. Also, a term such as 'metamorphics' conceals the essential volcanic nature of the unit. Clearly, the name Leichhardt Volcanics is more informative than Leichhardt Metamorphics and is a more accurate lithologic description for the formation in the Duchess Sheet area. Outcrop belts containing extensively recrystallised and gneissic felsic volcanics to the west in the Duchess Sheet area, previously mapped as Leichhardt Metamorphics (Carter & Öpik, 1963), but now mapped as undivided Tewinga Group (Bultitude & others, in press; Blake & others, in press), may belong to an older sequence, as suggested by Blake (1980), but could include some metamorphosed equivalents of the Leichhardt Volcanics.

Mairindi Creek Granite

(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. Mairindi Creek, which drains the country adjacent to the SE margin of the granite, 7 km NW of Duchess, DUCHESS, Duchess Sheet area.

Distribution. The granite crops out over about 20 sq. km, 9 km northwest of Duchess, DUCHESS, Duchess Sheet area.

Type area. 0.5 km to 4.5 km E of main Duchess-Mount Isa road, from GR 725390 to GR 753400, DUCHESS. Here the unit consists mainly of foliated, medium to coarse-grained, patchily and sparsely porphyritic biotite granite, cut by aplite and quartz veins and numerous metadolerite dykes.

Lithology. Medium to coarse-grained, foliated, biotite granite containing scattered phenocrysts of pink microcline, quartz and rare plagioclase, and traces of muscovite, hornblende, opaque oxide, allanite and fluorite; minor aplite (as veins). The granite is cut by thin quartz veins. The well-developed, steeply dipping to vertical, NW-trending foliation is defined mainly by the parallel alignment of biotite flakes and aggregates, and is crenulated in places.

Relationships. The granite intrudes the Magna Lynn Metabasalt and Argylla Formation, and is cut by numerous mainly NW-trending metadolerite dykes.

Age. Proterozoic.

Synonymy. Previously mapped as Kalkadoon Granite (Carter & Öpik, 1963). However, the Kalkadoon Granite is now known to be significantly older than the Argylla Formation (Page, 1978).

Remarks. The Mairindi Creek Granite forms a small discrete pluton.

Maramungee Granite
(new name)

Proposer. D.H. Blake (in Blake & others, in prep. a).

Definition approved. 10/12/80.

Derivation of name. Maramungee Creek, branches of which drain the NE part of the outcrop area of the unit, in SELWYN, Duchess Sheet area. Maramungee Creek is an E-flowing tributary of the McKinlay River.

Distribution. Forms NNE-trending outcrop 5 km long and up to 1 km wide in NE of SELWYN, centred at GR 905130, Duchess Sheet area.

Type area. In the vicinity of GR 905130, 13 km NW of Answer Downs homestead, on either side of a north-draining tributary of Maramungee Creek, SELWYN. Here there are extensive, mainly bouldery exposures of heterogeneous leucocratic granitic rocks in low hilly terrain. Intrusive contacts with metamorphic rocks of the Soldiers Cap Group are exposed 400 m to the E and W.

Lithology. The unit consists of heterogeneous, mainly medium to fine-grained leucocratic granitic rocks - granite, granodiorite, and tonalite - but also includes some pegmatite. The granitic rocks range from massive to strongly foliated, and generally contain less than 5 percent dark minerals - mostly partly altered biotite.

Relationships. The granite intrudes the Soldiers Cap Group and is cut by an E-trending non-metamorphosed dolerite dyke.

Age. Proterozoic.

Synonymy. Like all granites in the E part of the Duchess Sheet area, it was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. The Maramungee Granite forms a well-defined intrusive body geographically separated from other granitic intrusions. It is probably related to the petrographically similar Blackeye and Cowie Granites to the S, and it forms part of the Williams Batholith.

Mount Angelay Granite

(new name)

Proposer. P.J.T. Donchak (in Donchak & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Mount Angelay, a prominent mesa at GR 763535, situated 7.5 km to E of the granite, MOUNT ANGELAY, Duchess Sheet area.

Distribution. The granite forms an elongate body 29 km long, trending NNW and covering about 200 km^2, W of the Cloncurry Fault in the central part of MOUNT ANGELAY, Duchess Sheet area.

Type area. Hilly terrain in the vicinity of GR 635555, 2.5 km NE of Eureka homestead, MOUNT ANGELAY. Here there are extensive exposures of partly foliated, pink hornblende-biotite granite and minor biotite-rich granite and pegmatite.

Lithology. Consists of pinkish, locally foliated, medium to coarse-grained, mainly even-grained but locally porphyritic granite containing hornblende and/or biotite and/or clinopyroxene, and minor leucogranite, porphyritic microgranite, contaminated grey mafic-rich granite, aplite and pegmatite.

Relationships. The granite intrudes the Doherty Formation and the Soldiers Cap Group, is cut by E-trending non-metamorphosed dolerite dykes, and is overlain by flat-lying Mesozoic sediments. Intrusive contacts with the Doherty Formation are locally highly irregular and in places the granite cannot easily be distinguished from calc-silicate rocks.

Age. Proterozoic.

Synonymy. Like all other granites in the E part of the Duchess Sheet area, the Mount Angelay Granite was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. The granite forms a large, mostly well-defined and hence readily mappable, intrusive body geographically separated from, but probably related to, the petrographically similar Saxby Granite to NE and the Squirrel Hills Granite to S. It forms part of the Williams Batholith.

Mount Cobalt Granite
(new name)

Proposer. D.H. Blake (in Blake & others, in prep. a).

Definition approved. 10/12/80.

Derivation of name. Mount Cobalt mine, GR 475957, MOUNT MERLIN, Duchess Sheet area. This mine is situated 5 km SW of the granite.

Distribution. The granite forms an isolated oval intrusive body about 1 km long from N to S, centred at GR 508002, in the W of SELWYN, Duchess Sheet area.

Type locality. Central part of the outcrop area, in the vicinity of GR 508002, 5 km NE of Mount Cobalt mine and 19 km S of Selwyn, SELWYN. Here pink, mainly medium-grained granite is well exposed as tors and spheroidal boulders.

Lithology. The unit consists of massive (non-foliated), pink, medium to fine-grained biotite granite and minor aplite.

Relationships. The granite intrudes the Kuridala Formation and metadolerite.

Age. Proterozoic.

Synonymy. Like all other granites in the E part of the Duchess Sheet area, it was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. The granite is given a separate name as it forms a well-defined though small intrusive body geographically separated from other granites in the area. It is probably closely related to the petrographically similar Mount Dore and Yellow Waterhole Granites, to the N and S, respectively, and forms part of the Williams Batholith. It is distinctive in being surrounded by a metamorphic aureole about 100 m wide.

Mount Dore Granite
(new name)

Proposer. D.H. Blake (in Blake & others, in prep. a).

Definition approved. 10/12/80.

Derivation of name. Mount Dore copper mine, GR 474043, MOUNT MERLIN, Duchess Sheet area; this mine is near the SW margin of the granite body.

Distribution. The granite crops out S and SE of Selwyn, covering an area 14 km long from SW to NE and up to 7 km wide in NW SELWYN and NE MOUNT MERLIN, Duchess Sheet area.

Type area. From a point 2.7 km N of Mount Dore mine, at GR 473070, E for 2 km, in MOUNT MERLIN and SELWYN. Spheroidal boulders, tors, and mesas capped by weathered bedrock here are formed of pink, medium to coarse, even-grained to slightly porphyritic granite cut by some irregular aplite veins and a few thin sheet-like veins of hematite.

Lithology. The unit consists of massive (non-foliated), even-grained to slightly porphyritic medium to coarse biotite and hornblende-biotite granite, and minor fine-grained granite, aplite, pegmatite, and greisen.

Relationships. The granite intrudes the Kuridala Formation and is overlain by flat-lying Mesozoic sediments.

Age. Proterozoic.

Synonymy. Like all other granites in the E part of the Duchess Sheet area, it was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. The unit is a homogeneous body of granite forming a well-defined, mappable intrusion which is separated geographically from other granites in the area. It is probably closely related to the petrographically similar Mount Cobalt, Squirrel Hills and Yellow Waterhole Granites, and forms part of the Williams Batholith.

Mount Erle Igneous Complex

(new name)

Proposer. D.H. Blake (in Bultitude & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Mount Erle, GR 825296, DUCHESS, Duchess Sheet area. Mount Erle lies within the outcrop area of the Mount Erle Igneous Complex.

Distribution. The unit crops out over about 30 km^2 in a northerly elongated area from 2 km N to 12 km S of Duchess, in DUCHESS, Duchess Sheet area.

Type locality. Railway cutting 300 m WNW of Duchess post office, at GR 818378, DUCHESS. Here there are exposures of granite, dolerite, and some hybrid rocks.

Lithology. The complex consists of pink granite which is commonly foliated, dolerite, gabbro, heterogeneous dioritic hybrid rocks, and minor aplite, feldspar porphyry, quartz-feldspar pegmatite, and calc-silicate rocks. The mafic rocks occur as large masses and as smaller angular fragments and rounded pillow-like bodies enclosed in and veined by granite (Blake, 1981).

Relationships. The unit intrudes the Corella Formation, which surrounds it.

Age. Proterozoic.

Synonymy. None.

Remarks. Exposures of the unit near Duchess were mapped as unnamed granite by Carter & Öpik (1963).

Mount Philp Breccia

(revision of Mount Philp Agglomerate defined by Carter & others, 1961, and revised by Derrick, Wilson & Hill, 1977).

Definition approved. 10/12/80.

Derivation of name. Mount Philp, in S of MARY KATHLEEN, Cloncurry Sheet area (Carter & others, 1961).

Distribution. The main outcrop of the unit covers about 15 km^2 in SE corner of MARY KATHLEEN and NE corner of DUCHESS; other outcrops are present to the S, in the E part of DUCHESS; Cloncurry and Duchess Sheet areas.

Type area. In MARY KATHLEEN, as selected by Carter & others (1961), the type section for the Mount Philp Agglomerate is from the edge of the unit, southeast of Ballara, to the waterhole at Lat. 20°58'25"S, Long. 139°59'20"E. Derrick & others (1977), in their revision of the unit, stated that the type section extends 2.5 km SE from the edge of the outcrop of the formation, about 0.5 km SE of the abandoned township of Ballara, to a large waterhole on Read Creek. However, the waterhole referred to by Carter & others is probably Pelican Waterhole rather than one on Read Creek some 2 km to the north. Pelican Waterhole is at about Lat. 20°59'00"S, Long. 139°58'20"E, GR 932792, MARY KATHLEEN. The best exposures of the unit are rock platforms at Pelican Waterhole and for about 200 m upstream to the west, and it is proposed that these exposures be considered the type area for the Mount Philp Breccia. Here the unit consists of angular to slightly rounded fragments, mostly of amphibolitic metabasalt, calc-silicate rocks, and pegmatite, enclosed in a bright pink fine-grained igneous-textured rock containing small euhedral amphibole phenocrysts.

Lithology. The unit consists of breccia formed of disoriented and mainly angular fragments, some several metres across, of varied rock types - metabasalt, amphibolite, banded and massive calc-silicate granofels, quartzite, micaceous schist, albitite, quartz-feldspar pegmatite - enclosed in a pink to red igneous-textured groundmass formed of small euhedral amphibole phenocrysts and fine-grained subhedral albite laths. Most of the rock types present as fragments in the breccia can be matched with rock types present in adjacent Corella Formation.

Relationships. The breccia cuts banded calc-silicate rocks mapped as Corella Formation.

Age. Proterozoic.

Synonymy. Mapped as Mount Philp Agglomerate by Carter & others (1961), Carter & Öpik (1963), and Derrick & others (1977).

Remarks. Fragments in the breccia are mostly derived from the adjacent Corella Formation, and were metamorphosed before being incorporated in the breccia. The unit is therefore much younger than the Corella Formation, and is no longer regarded as part of the Mary Kathleen Group. Textures and field relationships indicate an intrusive rather than an extrusive origin (Blake & others, in prep. b). For these reasons the name of the unit is changed from Mount Philp Agglomerate (which implies a volcanic origin) to Mount Philp Breccia (a descriptive, rather than genetic, lithological designation).

Myubee Igneous Complex

(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. Myubee railway siding on the Mount Isa-Townsville railway line, about 13.5 km NW of Duchess, DUCHESS, Duchess Sheet area.

Distribution. The complex forms a small circular outcrop, 1.5 to 2 km in diameter, 9 km NE of Myubee railway siding, DUCHESS, Duchess Sheet area.

Type area. About 16.5 km N of Duchess, from GR 775546 to GR 798535, DUCHESS. Here the complex consists of an outer zone of foliated, medium-grained biotite-hornblende granite with some aplite, leucogranite and pegmatite (mainly as veins), and an inner zone of gabbro; the lithologies are described below.

Lithology. The complex consists of a gabbro plug or stock, partly encircled by granite similar to the Revenue and Overlander Granites. The gabbro contains olivine, orthopyroxene, clinopyroxene, hornblende, plagioclase, primary biotite and opaque minerals, and, locally, large inclusions of calc-silicate rocks. It is differentiated from olivine-rich norite through pyroxene gabbro, hornblende gabbro and hornblende leucogabbro containing small segregations of pegmatoidal diorite rich in coarse green hornblende and white feldspar grains, to pegmatoidal hornblende diorite. At contacts with granite the gabbro is locally converted to medium-grained amphibolite, and is cut by veins of aplite, biotite leucogranite, foliated biotite granite, and pegmatite.

The granite associated with the gabbro is porphyritic (in feldspar) to even-grained, medium-grained, generally strongly foliated and locally relatively rich in hornblende and especially biotite. It contains rare inclusions of coarse-grained granite and some large pendants of calc-silicate rocks.

Relationships. The Myubee Igneous Complex intrudes the Corella Formation and is cut by an apparently unmetamorphosed dolerite dyke.

Age. Proterozoic.

Synonymy. Mapped as dolerite and Wonga Granite by Carter & Öpik (1963).

Remarks. The gabbro of the complex may be correlated with the dolerite of the Mount Erle Igneous Complex to the south, and with the Lunch Creek Gabbro in MARRABA to the northeast (Derrick, 1980). It and the granite, which may be a correlative of the Revenue and Overlander Granites, form a net-veined complex.

One Tree Granite

(new name)

Proposer. D.H. Blake (in Blake & others, in press).

Definition approved. 10/12/80.

Derivation of name. One Tree Tank, which is situated within the outcrop area of the unit 16 km SE of Stanbroke Homestead, at GR 760010, DAJARRA, Duchess Sheet area.

Distribution. The unit crops out in a broad band 40 km long and up to 10 km wide trending N to NNW in the central part of DAJARRA, Duchess Sheet area.

Type area. In the vicinity of GR 733037, about 1 km W of a vehicle track, 12 km SSE of Stanbroke Homestead and 3 km NW of One Tree Tank, DAJARRA. Here a southerly draining creek, a tributary of Boundary Creek, marks an approximate contact between the two main rock types of the unit: pink medium to coarse biotite granite, which forms tors and boulder-strewn hills to the west, and grey finer-grained biotite-rich granite forming more subdued terrain to the east.

Lithology. Consists mainly of grey, foliated, medium to fine-grained biotite-rich granite, which commonly contains small feldspar phenocrysts, and pinkish, massive to locally foliated, commonly porphyritic coarser biotite granite; both are commonly xenolithic. Some microgranite, aplite, and pegmatite are also present.

Relationships. The granite is inferred to intrude the Plum Mountain Gneiss and may also intrude undivided Tewinga Group. It is intruded by mafic and porphyritic felsic dykes, and probably by Wills Creek Granite, and is overlain by Leichhardt Volcanics and Cambrian sediments.

Age. Early Proterozoic; it pre-dates overlying Leichhardt Volcanics, which are isotopically dated at about 1875 m.y. (Page, in preparation).

Synonymy. Previously mapped as Kalkadoon Granite (Carter & Öpik, 1963).

Remarks. One Tree Granite is petrographically similar to parts of the Kalkadoon Granite. However, it forms a large, well-defined, separate intrusion, consisting of two main rock types, and is a distinctive, readily mappable unit, hence it is mapped separately from other granite bodies mapped as Kalkadoon Granite.

Oroopo Metabasalt
(new name)

Proposer. R.J. Bultitude (in Bultitude, in preparation).

Definition approved. 10/12/80.

Derivation of name. Oroopo Waterhole (GR 319893) on Sulieman Creek, ARDMORE, Urandangi Sheet area.

Distribution. Exposed mainly in the SW of ARDMORE, Urandangi Sheet area, and extends S into the Glenormiston Sheet area. Some small outcrops in the central-north of ARDMORE are also tentatively regarded as forming part of this formation.

Type section. From GR 158792 to GR 124747, in the SW of ARDMORE. The section extends from about 2 km S of the track extending west from Rufus Tank in a SW direction to a major unnamed tributary of Quita Creek. A complete section from the base to the top of the formation has not been found. The type section consists mainly of amygdaloidal and massive metabasalt and interlayered lenses of meta-arenite and quartzite. It also contains some flow-margin breccia and scoriaceous metabasalt.

Lithology. The rocks are generally as in the type section. The formation also contains beds of recrystallised limestone, calcareous meta-arenite, ?dolomite, and metasiltstone.

Thickness. Unknown; probably at least 1300 m. A complete section has not been found and there is a general absence of facing evidence and a lack of useful marker beds.

Relationships. The unit appears to concordantly overlie the Saint Ronans Metamorphics; however, the contact is poorly exposed. It is cut by metadolerite dykes, and by rare veins of pegmatite and non-foliated to foliated, porphyritic to non-porphyritic biotite granite similar to the Sybella Granite elsewhere in ARDMORE. The Oroopa Metabasalt is unconformably overlain by Cambrian sedimentary rocks of the Georgina Basin succession.

Age. Precambrian, probably Proterozoic.

Synonymy. Mapped as Eastern Creek Volcanics and Sybella Granite by Noakes & others (1959).

Remarks. The Oroopo Metabasalt is confined to within, and W of, the Rufus Fault Zone, which forms part of a major right-lateral fracture system extending to the SW and NNE (the Gorge Creek-Mount Remarkable Fault of Derrick & others, 1980).

The Oroopo Metabasalt closely resembles the Eastern Creek Volcanics in the E part of ARDMORE. However, one of the noteworthy differences is the presence in the Eastern Creek Volcanics of abundant conglomerate and conglomeratic sediments containing clasts of felsic volcanics. Also, the Eastern Creek Volcanics apparently conformably overlie the Mount Guide Quartzite, a thick sequence of quartzose, feldspathic, and sericitic meta-arenite, whereas the Oroopo Metabasalt appears to be concordant on a sequence of mainly argillaceous metasediments and felsic and mafic metavolcanics (Saint Ronans Metamorphics). Such differences may be the result of facies variations from east to west, or they may indicate that the two formations are not equivalent.

Overlander Granite
(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. The Overlander group of prospects and small mines in NE of DUCHESS, Duchess Sheet area.

Distribution. The granite forms several discrete elongate plutons in the NE of DUCHESS, the largest of which has an area of about 10 sq. km, Duchess Sheet area.

Type locality. From about GR 850745 to GR 859743, DUCHESS, where the granite is well exposed in the gorge out by the Malbon River. Here the unit consists mainly of medium-grained foliated biotite leucogranite commonly showing well-developed joints. The granite contains scattered small feldspar phenocrysts away from contacts with country rocks.

Lithology. The Overlander Granite is white, pink or grey, leucocratic, medium to coarse-grained, even-grained to slightly porphyritic, massive to foliated, and commonly partly recrystallised. The main mafic minerals are biotite and hornblende.

Swarms of tourmaline-bearing, graphic, quartz-pink feldspar pegmatite dykes in the adjacent Corella Formation are thought to be related to the Overlander Granite, because, although some pegmatite veins cut the plutons and were obviously intruded after the granite was emplaced, a few appear to be marginal facies of the granite and merge into it.

Relationships. The Overlander Granite intrudes the Corella Formation and some amphibolitic metadolerite bodies. It is cut by an apparently unmetamorphosed dolerite dyke.

Age. Proterozoic.

Synonymy. Mapped as Wonga Granite by Carter & Öpik (1963).

Remarks. The Overlander Granite may be equivalent to the Burstall Granite to the north and to the Revenue Granite to the south, and also to the granite of the Myubee and Mount Erle Igneous Complexes, DUCHESS.

Plum Mountain Gneiss

(new name)

Proposers. P.J.T. Donchak and D.H. Blake (in Bultitude & others, in prep., Blake & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Plum Mountain, GR 750239, DAJARRA, Duchess Sheet area.

Distribution. The formation crops out in a band up to 9 km wide extending NNE from the SE part of DAJARRA into the S central part of DUCHESS, Duchess Sheet area.

Type area. Low hills and ridges and undulating terrain on S side of the track from Stanbroke Homestead east to Twin Tank, from GR 692140 to GR 755130, DAJARRA. Massive to banded quartzofeldspathic gneiss and augen gneiss the characteristic rock types of the formation, together with irregular bodies of weakly to strongly foliated granite, are well exposed, though somewhat weathered, in this area.

Lithology. The formation consists mainly of massive to banded, leucocratic to mafic quartzofeldspathic gneiss and augen gneiss, but also includes micaceous, arkosic and quartzitic meta-arenites, mica schist, calc-silicate gneiss, amphibolite, metabasalt, and numerous irregular bodies of weakly to strongly foliated granite.

Thickness. Unknown, but probably several thousand metres.

Relationships. The Plum Mountain Gneiss is intruded by the One Tree, Birds Well? and Saint Mungo Granites, possible Bushy Park Gneiss, and mafic dykes. It has concordant contacts with metasediments mapped as the Corella Formation to the east (e.g., east of The Monument), and is overlain unconformably by flat-lying Cambrian sediments in the south.

Age. Older than the Leichhardt Volcanics, isotopically dated at about 1875 m.y. (Page, in preparation), which overlie One Tree Granite.

Synonymy. Previously mapped as Kalkadoon Granite with metamorphic remnants (Carter & Öpik, 1963).

Remarks. The Plum Mountain Gneiss is a complex metamorphic formation forming a readily mappable coherent unit bounded by faults, granites, and the Corella Formation. It is probably a correlative of some similar gneissic rocks mapped as undivided Tewinga Group further west in the Duchess Sheet area.

Revenue Granite

(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. The Revenue group of mines and prospects about 9 km NNW of Duchess, DUCHESS, Duchess Sheet area.

Distribution. The granite crops out mainly as an elongate pluton, up to 3.5 km wide, about 6 to 18 km N of Duchess, DUCHESS, Duchess Sheet area. A small pod of granite mapped as part of this unit about 4 km NW of Duchess may be part of the main body displaced along the Saint Andrews Fault.

Type area. About 11.5 km N of Duchess, from GR 813496 to GR 823496, DUCHESS. In this area, drained by unnamed tributaries of the Little Burke River, the granite consists of medium to coarse-grained, foliated biotite leucogranite and some non-foliated aplite and pegmatite (mainly around its margins).

Lithology. Mainly medium to coarse-grained, even-grained to slightly porphyritic, foliated, commonly partly recrystallised biotite leucogranite. In places, for example, at GR 793456, the marginal zone of the unit consists of pink non-foliated aplite which grades inwards into pink foliated leucogranite. The granite contains sparse mafic xenoliths and larger inclusions and pendants of mainly calc-silicate rocks probably derived from the enclosing Corella Formation.

A gneissic foliation developed in the granite NE of the Revenue group of mines shows crenulations with wavelengths of about 30 cm and amplitudes of about 15 cm. The assertions by Joplin & Walker (1961) that this crenulated gneissic granite represents metasomatised calc-silicate rocks seems unlikely, because contacts between calc-silicates of the Corella Formation and crenulated granite are sharp (resolvable within 1 to 2 cm) and appear cross-cutting.

Swarms of tourmaline-bearing, graphic quartz-feldspar pegmatite dykes in the adjacent Corella Formation have been mapped as part of the Revenue Granite.

Relationships. The Revenue Granite intrudes the Corella Formation and some amphibolitic metadolerite bodies.

Age. Proterozoic.

Synonymy. Previously mapped as Wonga Granite (Carter & Öpik, 1963).

Remarks. The Revenue Granite may be a correlative of the Burstall and Overlander Granites and of the granites of the Myubee and Mount Erle Igneous Complexes in DUCHESS. Calc-silicates of the Corella Formation adjacent to the granite SE of Green Creek Tank (GR 795521) have been extensively metasomatised and converted to skarns.

Saint Mungo Granite
(new name)

Proposers. D.H. Blake and P.J.T. Donchak (in Blake & others, in press).

Definition approved. 10/12/80.

Derivation of name. Saint Mungo copper mine, GR 808080, DAJARRA, Duchess Sheet area.

Distribution. Outcrops trend NNW and cover about 90 km^2 in the vicinity of The Monument and to the N, in E part of DAJARRA, Duchess Sheet area.

Type area. The vicinity of Saint Mungo mine, GR 808080, DAJARRA. Here pinkish richly porphyritic gneissic granite forms rocky hills, tors and spheroidal boulders.

Lithology. Consists mainly of weakly to strongly foliated, medium to coarse-grained, hornblende-biotite granite crowded with pink equant megacrysts of microcline up to 3 cm across. Also includes minor foliated porphyritic biotite granite, aplite, and quartz-feldspar pegmatite.

Relationships. The granite is inferred to intrude the Plum Mountain Gneiss and the Corella Formation. It is cut by mafic dykes and overlain by flat-lying Cambrian sediments.

Age. Proterozoic.

Synonymy. Previously mapped as part of the Kalkadoon Granite (Carter & Opik, 1963).

Remarks. The Saint Mungo Granite is geographically separated and petrographically different from other named granites in DAJARRA. It may be related to part of the Bushy Park Gneiss in DUCHESS.

Saint Ronans Metamorphics
(new name)

Proposer. R.J. Bultitude (in Bultitude, in prep.).

Definition approved. 10/12/80.

Derivation of name. Saint Ronans Creek, whose tributaries drain much of the outcrop area in ARDMORE, Urandangi Sheet area.

Distribution. The metamorphics are most extensively exposed in the central part of ARDMORE, S and E of Ardmore Homestead, Urandangi Sheet area. A small outcrop in the far N of ARDMORE has also been tentatively assigned to this unit. The metamorphics are confined to the area W of the Rufus Fault Zone, which forms part of a major right-lateral fracture system extending to the SW and NNW (the Gorge Creek-Mount Remarkable Fault of Derrick & others, 1980).

Type area. From GR 170860 to GR 209857, at the head of Saint Ronans Creek - Wet Branch, about 9.5-13 km W of Steeles Tank, ARDMORE. In this area the unit consists mainly of extensively recrystallised felsic metavolcanics, fine-grained schistose metabasalt, fine-grained quartz + muscovite (or sericite) ± biotite schist, and quartz + biotite + feldspar + muscovite gneiss. Minor rock types include quartzite, epidotic quartzite, and quartzose and sericitic meta-arenite.

Lithology. The rocks are generally as in the type area. Andalusite porphyroblasts are locally common in schist. Minor rock types present elsewhere include biotite schist, quartz-biotite schist locally containing small

scattered muscovite porphyroblasts, muscovite quartzite, para-amphibolite, chlorite schist, and schistose micaceous metasiltstone. Small-scale cross-beds and ripple laminations are preserved in some meta-arenite units. The Saint Ronans Metamorphics have a generally steeply dipping foliation trending mainly N to NW, more or less parallel to the lithological layering; small crenulations and kink bands are common, but few major folds have been positively identified. In the S, about 6 km NNW of Rufus Tank (GR 202786) foliation and rare bedding have easterly trends, dip generally steeply southwards, and are cut by a prominent N-trending cleavage.

Relationships. The metamorphics are intruded by veins, pods, and larger bodies of granite and pegmatitic granite and by swarms of pegmatite dykes, interpreted as part of the Sybella Granite batholith. They are also cut by numerous non-schistose to schistose amphibolitic metadolerite dykes and ?sills, some of which are cut by granite and pegmatite veins.
The relationship between the Saint Ronans Metamorphics and Oroopo Metabasalt is uncertain, due largely to poor exposures. The two formations appear concordant, and no major break has been recognised between them. Cross-bedding in both units near GR 126763 indicate that the Saint Ronans Metamorphics underlie the Oroopo Metabasalt.

Age. Precambrian, probably Proterozoic.

Synonymy. Mapped as Eastern Creek Volcanics by Noakes & others (1959).

Remarks. The general obliteration of bedding, the widespread development of schistose rocks, the presence of andalusite porphyroblasts in some meta-argillites, the extensive recrystallisation of the felsic and mafic volcanic rocks, and the presence of co-existing hornblende and plagioclase more calcic than An_{17} in the unit are interpreted as indicating mainly amphibolite grades of regional metamorphism. Metamorphic grade appears to decrease to the south.

Saxby Granite
(new name)

Proposer. P.J.T. Donchak (in Donchak & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Saxby Waterholes on the Williams River at GR 789691, MOUNT ANGELAY, Duchess Sheet area.

Distribution. The main outcrops of this unit are in the northern part of MOUNT ANGELAY, mainly in the catchment area of the Williams River east of the Cloncurry Fault, where they cover a total area of about 180 km^2. The unit is also taken to include small outcrops of petrographically similar granite east of the Cloncurry Fault to the S, between the Fullarton River and Boorama Creek, MOUNT ANGELAY, Duchess Sheet area.

Type area. Vicinity of Saxby Waterholes on the Williams River, GR 789691, MOUNT ANGELAY. Here there are extensive exposures - rocky hills, tors and spheroidal boulders - of pink, medium to coarse, porphyritic biotite granite.

Lithology. The unit consists mainly of medium to coarse, porphyritic and even-grained granite containing biotite and/or hornblende (and clinopyroxene near contacts with calc-silicate rocks). It also includes minor leucogranite, granodiorite, diorite, monzonite, aplite and pegmatite.

Relationships. Saxby Granite intrudes the Soldiers Cap Group and the Doherty Formation, and is cut by E-trending dolerite dykes. It is overlain unconformably by Mesozoic sediments.

Age. Proterozoic.

Synonymy. Like all other granites in the eastern part of the Duchess Sheet area, the Saxby Granite was mapped as part of the Williams Granite (by Carter & Öpik, 1965).

Remarks. The granite forms a group of closely spaced intrusives separated geographically from other named granites in the area by the Cloncurry Fault zone. It forms part of the Williams Batholith, and is probably related to the petrographically similar Mount Angelay Granite and Squirrel Hills Granite.

Squirrel Hills Granite

(new name)

Proposer. D.H. Blake (in Blake & others, in prep. a; Donchak & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Squirrel Hills Homestead, GR 765920, SELWYN, Duchess Sheet area.

Distribution. The unit has an outcrop area about 100 km long and up to 25 km wide extending NNW across SELWYN, SW part of MOUNT ANGELAY, and SE part of MALBON, Duchess Sheet area.

Type locality. Granite hills 0.8 km ESE of Squirrel Hills Homestead, at GR 770915, SELWYN. Tors and spheroidal boulders here are formed of medium-grained pinkish granite, most of which contains abundant feldspar phenocrysts, some more than 2 cm across.

Lithology. The unit consists of massive, mainly pink, medium to coarse-grained, porphyritic and subordinate non-porphyritic granite, minor porphyritic microgranite and aplite, and rare pegmatite. The granite typically contains 5 to 15 percent biotite and/or hornblende and/or clinopyroxene and 2 percent or more of sphene and magnetite.

Relationships. Squirrel Hills Granite intrudes the Soldiers Cap Group, Corella Formation, Kuridala Formation, and metadolerite, and is also inferred to intrude the Cowie Granite. It is cut by E-trending dolerite dykes and is overlain by flat-lying Mesozoic sediments.

Age. Proterozoic.

Synonymy. Like all other granites of the eastern part of the Duchess Sheet area, it was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. The granite forms a large, well-defined and probably composite body. It is probably closely related to the petrographically similar Wimberu, Mount Dore, Mount cobalt, Yellow Waterhole, Mount Angelay, and Saxby Granites, from which it is separated geographically. It forms part of the Williams Batholith.

Stanbroke Sandstone

Proposer. D.H. Blake (in Bultitude & others, in press.; Blake & others, in press).

Definition approved. 10/12/80.

Derivation of name. Stanbroke Homestead, 25 km NE of Dajarra, at GR 676145, DAJARRA, Duchess Sheet area.

Distribution. Crops out in narrow N-trending synclinal and down-faulted zones in DUCHESS and DAJARRA, Duchess Sheet area.

Type section. Across W limb of syncline from GR 660143 to GR 667143, 1 km WSW of Stanbroke Homestead, DAJARRA, Duchess Sheet area. Here the formation is represented by ridge-forming cross-bedded and ripple-marked quartz arenite and feldspathic arenite about 200 m thick, dipping east at about 30° and overlying Magna Lynn Metabasalt, and a conformably overlying sequence about 100 m thick of mainly greywacke, siltstone, calcareous arenite, and limestone.

Lithology. Consists of quartz arenite, feldspathic arenite and calcareous arenite, mainly in lower part, and micaceous greywacke, limestone, dolomite, and siltstone, mainly in upper part: a basal conglomerate containing felsic volcanic clasts is present locally, as also is arkose.

Thickness. Maximum about 300 m, in type section.

Relationships. Stanbroke Sandstone unconformably overlies the Leichhardt Volcanics, Magna Lynn Metabasalt, Argylla Formation, undivided Tewinga Group and probably the Wills Creek Granite.

Age. Proterozoic; younger than the Argylla Formation, which is isotopically dated at about 1780 m.y. (Page, 1978 and in preparation).

Synonymy. Previously mapped as part of the Argylla Formation (Carter & Öpik, 1963).

Remarks. The formation may be a correlative of the Makbat Sandstone to the S and the Ballara Quartzite to the N, but is separated geographically from these two units, and differs from them in generally containing some interbedded calcareous and dolomitic sediments.

Staveley Formation

(revised definition of formation originally defined by Carter, 1959, and Carter & others, 1961)

Proposers. D.H. Blake and P.J.T. Donchak (in Blake & others, in prep. a; Donchak & others, in prep.).

Definition approved. 10/12/80.

Derivation of name. Parish of Staveley, in which much of the outcrop area of the formation lies, in the Duchess Sheet area.

Distribution. As mapped by Blake & others (in prep. a) and Donchak & others (in prep.), the Staveley Formation crops out in a belt up to 14 km wide extending from 2 km north of Gin Creek Bore (from GR 380018, MOUNT MERLIN) northwards for at least 75 km, to the northern edge of MALBON and MOUNT ANGELAY, Duchess Sheet area. This belt contains most of the outcrops mapped as Staveley Formation by Carter & others (1961) and Carter & Opik (1963), and also includes outcrops in the north which they mapped as Marimo Slate and Corella Formation.

Type section. The type section given by Carter & others (1961) extends from a point 1.6 km north of the Tip Top mine (from GR 434324) west for a distance of about 6.4 km, MALBON, Duchess Sheet area. However the western part of this type section is the type section for the Agate Downs Siltstone, now defined as a formation rather than as a member of the Staveley Formation. The type section has therefore been revised to extend from GR 434324 (1.6 km

north of the Tip Top mine) west for 4.6 km (to GR 388324), MALBON. From east to west this section passes across strike from a contact with ridge-forming schist of the Kuridala Formation in the east through the following map units - Ꝑks of the Staveley Formation, 100 m; $Ꝑks_{br}$ of the Staveley Formation, 450 m; Ꝑks, 600 m; alluvium, 400 m; Ꝑks, 600 m; metadolerite, 700 m; Ꝑks, 400 m; ridge-forming siltstone and slate mapped as Kuridala Formation, 250 m; Ꝑks, 150 m; $Ꝑks_{br}$, 400 m; metadolerite, 200 m; and $Ꝑks_{br}$, 500 m; to ridge-forming Agate Downs Siltstone. Unit Ꝑks forms gently undulating terrain and consists of interbedded, variably calcareous, ferruginous, feldspathic, micaceous and siliceous fine-grained arenite, siltstone, and phyllite, and some impure limestone. Unit $Ꝑks_{br}$ is more upstanding and commonly forms bouldery exposures; it consists of breccia formed of mainly angular fragments of Ꝑks rocks enclosed in a sandy to silty matrix which is generally calcareous and ferruginous. These rocks are mainly shades of grey, brown or red-brown.

Lithology. The formation consists of interbedded, variably calcareous, ferruginous, feldspathic, micaceous, and siliceous arenite, siltstone, and phyllite, impure limestone (marble), and lenses of breccia, as exposed in the type section, together with schist and banded calc-silicate rocks (mainly near granite), and minor basalt lava, conglomerate, and banded quartz + hematite ± magnetite rock. Sedimentary structures commonly present, in many cases outlined by heavy mineral laminae, include convolute to recumbent bedding, cross-bedding, graded bedding, and ripple marks; halite casts are present locally.

Thickness. The formation may have a maximum thickness of more than 2000 m, but this is uncertain because of tight to isoclinal folding.

Relationships. The Staveley Formation has concordant contacts with the Double Crossing Metamorphics, Kuridala Formation, Answer Slate, and Overhang Jaspilite, which it may overlie disconformably, and with the Agate Downs Siltstone, Marimo Slate, Toby Barty Sandstone Member, and Roxmere Quartzite?, which overlie it, apparently conformably. The Agate Downs Siltstone and part of the Marimo Slate may be stratigraphic equivalents of part of the Staveley Formation. The formation is faulted against the Doherty Formation in the north. It is intruded by the Gin Creek Granite, Wimberu Granite, Squirrel Hills Granite, unnamed granite, metadolerite, and

feldspar porphyry. Flat-lying Mesozoic sediments overlie the Staveley Formation unconformably.

Age. Proterozoic.

Synonymy. The Staveley Formation, as defined here, is similar to the Staveley Formation of Carter & others (1961) except that it extends further north, does not include the Agate Downs Siltstone, and is thought to overlie, rather than underlie, the Kuridala Formation.

Remarks. Blake & others (in prep. a) and Donchak & others (in prep.) regard the Staveley Formation as part of the Marimo Slate sequence, which may have been laid down unconformably in the north on cherty and ferruginous breccia, representing a fossil regolith, mapped as part of the Overhang Jaspilite. To the south the formation possibly overlaps into Answer Slate; the contact could be a low-angle unconformity rendered apparently concordant by subsequent isoclinal folding.

Sulieman Gneiss
(new name)

Proposer. R.J. Bultitude (in Bultitude, in prep.).

Definition approved. 10/12/80.

Derivation of name. Named after Sulieman Creek, whose tributaries drain much of the area in which the unit is exposed, ARDMORE, Urandangi Sheet area.

Distribution. The unit forms a narrow N-trending belt in the central part of ARDMORE, Urandangi Sheet area, and extends S into the Glenormiston Sheet area.

Type area. From GR 196702 to GR 223696, about 39 km SW of Dajarra, ARDMORE. The type area extends E and W of the track between Rufus Tank and The Pinnacles Dam and is drained by Spring Creek and its tributaries. The main lithologies present in the type area are interlayered medium-grained quartz + biotite + microcline + plagioclase ± garnet ± muscovite gneiss and augen gneiss, hornblende schist and amphibolite, and recrystallised, medium to

coarse-grained glassy quartzite and muscovite quartzite. Minor rock types present include banded garnetiferous calc-silicate gneiss and granofels, para-amphibolite, quartz-mica schist, quartz-feldspar pegmatite, and feldspar metaporphyry. Trends are mainly northerly and dips are fairly steep to vertical. Foliation and lithological layering commonly show small-scale folds and crenulations.

Lithology. The rocks are generally as in the type section.

Thickness. Unknown; the unit has been complexly folded, and its base is apparently not exposed. Bedding is very poorly preserved.

Relationships. The unit appears to have a concordant, possibly gradational, contact with metasediments assigned to the Jayah Creek Metabasalt (which is interpreted to overlie the gneiss), and a gradational contact with the Kallala Quartzite - thin lenses of glassy recrystallised quartzite and muscovite quartzite occur in the Sulieman Gneiss adjacent to the contact. The Kallala Quartzite may overlie the Sulieman Gneiss, but no facing evidence has been found in either unit.
The gneiss is extensively intruded by Sybella Granite, and is also cut by pegmatite veins of at least two different ages and by granite veins that may be of several different ages.

Age. Precambrian, probably Proterozoic.

Synonymy. Previously mapped mainly as Eastern Creek Volcanics and partly as Sybella Granite (Noakes & others, 1959).

Remarks. The Sulieman Gneiss has been regionally metamorphosed to amphibolite grade - the rocks are medium-grained, extensively recrystallised, and hornblende + calcic plagioclase and clinopyroxene are common in the amphibolites and calc-silicates, respectively. The common occurrence of minor chlorite (mainly replacing biotite, rarely amphibole) and sericite (replacing plagioclase) indicate that the formation has undergone a later low (greenschist) grade retrogressive regional metamorphism.
The Sulieman Gneiss may be equivalent, at least partly, to the May Downs Gneiss mapped in MOUNT ISA to the north (Derrick & others, 1976b; BMR, 1978). However, hornblende schist, garnet-bearing gneiss and schist,

para-amphibolite and calc-silicates have not been reported in the May Downs Gneiss by Derrick & others (1976b).

Timothy Creek Sandstone Member
(new name) (of the Jayah Creek Metabasalt)

Proposer. R.J. Bultitude (in Bultitude, in prep.).

Definition approved. 10/12/80.

Derivation of name. Timothy Creek, which drains part of the outcrop area west of Dajarra, ARDMORE, Urandangi Sheet area.

Distribution. The member forms a NNE-trending belt of prominent ridges and hills in the E of ARDMORE, and extends N into OBAN, Urandangi Sheet area.

Type section. About 17 km NW of Dajarra, from GR 314089 to GR 332104, ARDMORE. The lower part of the member here consists of mainly sericitic meta-arenite which grades up into quartzose, feldspathic and sericitic meta-arenite and minor quartzite and rare quartz-muscovite schist in the upper part. Scattered rounded pebbles and thin pebbly beds occur in the sequence. Cross-beds and ripple marks are common in the meta-arenites and quartzites, many of which (especially the sericitic meta-arenites) are friable.

Lithology. The predominant lithologies in the member are similar to those described above. Minor rock types present include micaceous metasiltstone, dark grey fine-grained quartzite, fine-grained quartz-sericite schist, labile meta-arenite, and fine to medium-grained quartz-biotite-muscovite schist.

Thickness. The member is about 2000 m thick in the type section. It appears to be significantly thicker in the far N of ARDMORE, but the sequence has been extensively deformed there and may be partly repeated by folding, or faulting, or both.

Relationships. The member is overlain and underlain, apparently conformably, by mafic metavolcanics and interlayered metasediments of the Jayah Creek Metabasalt. It is cut by numerous, mainly northerly-trending dykes and pods of metadolerite.

Age. Precambrian, probably Proterozoic.

Synonymy. Mapped as Eastern Creek Volcanics by Noakes & others (1959).

Remarks. The member forms a continuous, relatively thick, and in most places relatively little-deformed unit. It may be equivalent to the Lena Quartzite Member of the Eastern Creek Volcanics (Derrick & others, 1976b), or possibly to the Mount Guide Quartzite - the predominant rock types in all three units are very similar.

Wills Creek Granite
(new name)

Proposer. D.H. Blake (in Blake & others, in press).

Definition approved. 10/12/80.

Derivation of name. Wills Creek, the main watercourse in the western part of the Duchess Sheet area.

Distribution. The granite crops out at several localities in the central part of DAJARRA, Duchess Sheet area, covering about 50 km^2 mainly E of Wills Creek.

Type area. N of the Dajarra-The Monument road, in the vicinity of GR 682892, DAJARRA. Here the unit crops out as low rocky ridges of pink medium to coarse leucocratic granite which is cut by some quartz veins and mafic dykes, and is seen to intrude and thermally metamorphose quartz-feldspar porphyry of the Leichhardt Volcanics.

Lithology. The unit consists of pale pink leucocratic, biotite granite, which is mainly medium to coarse-grained and even-grained, and minor aplite.

Relationships. The granite intrudes the undivided Tewinga Group and Leichhardt Volcanics and is cut by mafic dykes.

Age. Proterozoic.

Synonymy. None; the granite was included within outcrops mapped as Argylla Formation and Kalkadoon Granite by Carter & Opik (1963).

Remarks. The Wills Creek Granite differs petrographically from other granitic units in DAJARRA by being made up predominantly of leucocratic, non-foliated, and non-porphyritic granite.

Woonigan Granite
(new name)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 10/12/80.

Derivation of name. Woonigan railway siding on the main Mount Isa to Townsville railway line, about 25 km NW of Duchess, DUCHESS, Duchess Sheet area.

Distribution. The granite crops out as small discrete plutons and pods on the margins of the Kalkadoon Granite Belt in DUCHESS, Duchess Sheet area. It is most extensively exposed NE of Woonigan railway siding.

Type area. About 5.5 to 6 km NE of Woonigan railway siding, from GR 687599 to GR 704591, DUCHESS, in an area drained by unnamed tributaries of Alligator Creek. In this area the unit consists of mainly medium to coarse-grained, even-grained to sparsely porphyritic, leucocratic biotite granite, together with minor fine-grained leucocratic, porphyritic biotite granite adjacent to some contacts with country rocks.

Lithology. The main rock types present in the larger bodies are non-foliated, coarse to fine, even-grained to slightly porphyritic biotite leucogranite and leucocratic porphyritic biotite microgranite. Many small pods and marginal zones of the larger plutons comprise mainly non-foliated leucocratic porphyritic microgranite in which quartz and feldspar phenocrysts are set in a fine-grained groundmass containing small scattered aggregates of biotite grains. In a few places relatively thick (10-15 m) veins of leucogranite intrude Kalkadoon Granite; these veins are characterised by foliated marginal zones (foliation generally parallel to contacts) containing small feldspar and quartz phenocrysts in a fine-grained groundmass, and

coarser, more even-grained central parts. However, many even-grained leucogranite veins presumed to be related to the Woonigan Granite are not foliated.

Relationships. The Woonigan Granite intrudes the Kalkadoon Granite and Leichhardt Volcanics. It is cut by numerous non-foliated to foliated amphibolitic metadolerite dykes, many of which show relict igneous textures, and by scattered dykes of grey, porphyritic granophyre (which also cut the Leichhardt Volcanics).

Age. Proterozoic.

Synonymy. Previously mapped as Kalkadoon Granite and Leichhardt Metamorphics (Carter & Öpik, 1963).

Remarks. Possible equivalents of the Woonigan Granite are the Wills Creek Granite in DAJARRA to the south, and leucocratic granite mapped as part of the Kalkadoon Granite ($\mathcal{E}gk_2$) in MARY KATHLEEN to the north. The Woonigan Granite has not been isotopically dated and consequently its age is uncertain.

Yappo Member

(new name) (of the Mount Guide Quartzite)

Proposer. R.J. Bultitude (in Bultitude & others, in press).

Definition approved. 18/3/81.

In the Duchess and Urandangi Sheet areas, two units have been delineated within the Mount Guide Quartzite as defined by Carter & others (1961). The basal unit is characterised by abundance of regionally metamorphosed greywacke, greywacke conglomerate and grit, and arkose, and is defined as the Yappo Member. The overlying sequence of mainly meta-arenite and quartzite forming the upper part of the Mount Guide Quartzite has not been formally named.

Derivation of name. Yappo Creek, the headwaters of which drain part of the outcrop area in DUCHESS and OBAN, Duchess and Urandangi Sheet areas.

Distribution. The member is exposed in N-trending belts and forms undulating to hilly country in the W parts of DUCHESS and DAJARRA and the E parts of adjoining ARDMORE and OBAN, Duchess and Urandangi Sheet areas.

Type section. From GR 449769 to GR 486754, about 3 km N of Mount Guide, in the NW corner of DUCHESS. Here the formation consists mainly of grey pebbly metagreywacke, and metagreywacke conglomerate and grit, together with minor meta-arkose, and labile, sericitic, feldspathic, and quartzose meta-arenite and quartzite containing heavy mineral-rich laminae.

Lithology. The rocks are generally as in the type section. Locally, meta-arkose and conglomeratic meta-arkose are common to predominant rock types. Other, less abundant, rock types present locally are sericite schist, muscovite-biotite schist, metasiltstone, epidotic quartzite, metabasalt and pink to grey felsic tuff?.

The unit has undergone greenschist to amphibolite grade regional metamorphism, and a N-trending axial plane cleavage or schistosity is present in many areas.

Thickness. The Yappo Member displays marked thickness variations. In DUCHESS it is about 2750 m thick in the type section; locally less than 100 m thick in the central west, and about 700 m thick in the SW.

Relationships. The Yappo Member overlies the Kalkadoon Granite and undivided Tewinga Group unconformably and the Bottletree Formation apparently conformably. Both the Yappo Member and Bottletree Formation contain similar sedimentary rock types, and the arbitrary boundary between them is placed so as to exclude all but very minor volcanic layers from the Yappo Member. The Yappo Member has a gradational contact with the overlying upper member of the Mount Guide Quartzite, the boundary being placed at the marked topographic break between undulating and hilly terrain formed on the Yappo Member and upstanding ridges formed on the overlying meta-arenites and quartzites.

The member is cut by rare quartz-feldspar porphyry dykes, by a small quartz-feldspar body tentatively assigned to the Garden Creek Porphyry, and by numerous dykes and small pods of amphibolitic metadolerite.

Age. Precambrian. The member overlies the Bottletree Formation, which contains felsic metavolcanics isotopically dated at about 1790 m.y. (Page, in preparation).

Synonymy. Mapped mainly as Mount Guide Quartzite by Carter & Öpik (1963), and included as part of the Rifle Creek beds (informal name) by Bultitude & others (1977).

Remarks. The Yappo Member is equivalent to the lower part of the Mount Guide Quartzite as defined by Carter & others (1961) but, as the unit contains very little quartzite and is readily mappable, it has been referred to a separate member.

Yellow Waterhole Granite

(new name)

Proposer. D.H. Blake (in Blake & others, in prep. b).

Definition approved. 10/12/80.

Derivation of name. Yellow Waterhole, GR 558865, 3 km to S of the granite outcrop area, SELWYN, Duchess Sheet area.

Distribution. The unit crops out as elongate body 19 km long and up to 2.5 km wide trending E in SW SELWYN and SE MOUNT MERLIN, Duchess Sheet area.

Type locality. Tors and spheroidal boulders of pink, non-foliated, weakly porphyritic, medium to coarse biotite granite at GR 533910, close to the Selwyn/Hamilton River road 29 km SSE of Selwyn, SELWYN.

Lithology. The unit consists of massive (non-foliated), even-grained to porphyritic, fine to coarse biotite granite and hornblende-biotite granite, and minor aplite.

Relationships. The granite intrudes the Kuridala Formation and is overlain by flat-lying Mesozoic sediments.

Age. Proterozoic.

Synonymy. Like all other granites in the eastern part of the Duchess Sheet area, the Yellow Waterhole Granite was mapped as Williams Granite by Carter & Öpik (1963).

Remarks. Yellow Waterhole Granite forms a well-defined intrusive body strongly oblique to the northerly trends of adjacent country rocks. It is probably closely related to the petrographically similar Squirrel Hills Granite to the east, and belongs to the Williams Batholith.

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