

**TASMANIA DEPARTMENT OF MINES  
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**NOTES ON THE GEOLOGY OF THE  
BLACKWOOD CREEK–DRYS BLUFF AREA**

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## **INTRODUCTION**

This report contains explanatory notes and discussion of the geology in the vicinity of Blackwood Creek and Drys Bluff. This area, situated in the SW corner of the Bracknell Sheet, includes all areas west of McRaes Hills bounded by Bluff Creek and the Liffey River. Field mapping was completed during the period June to November 1968 in conjunction with other regional mapping of the Quamby Quadrangle.

Relevant geology had been described in earlier reports by Wells (1957), McKellar (1957) and Clarke (1968). As the previous work of Wells (1957) at Golden Valley and McKellar (1957) at Poatina established stratigraphic subdivisions of the Permian System in this area major interest was centred on Permian stratigraphy. As a result of the work it has been possible to identify a number of sandstone formations that occur within the sequence and establish with certainty their stratigraphic relationship. Also, the grouping of several formations, within the Permian has been revised. (see Appendix 1).

## **GEOLOGICAL RESUME**

An incomplete section some 1,200 feet of Permian sediments is exposed along the steep slopes of the Great Western Tiers in this area. Rocks below the top of the Golden Valley Group have not been exposed but good sections above the Liffey Sandstone are available. Where outcrop is limited the benched nature of some component sandstone formations makes correlation possible.

The overlying Triassic sandstone and shale forms steep cliffs hanging on the slopes below the main escarpment face of Drys Bluff which is a remnant capping of Jurassic dolerite previously intruded as a thick sheet into Triassic sediments.

Considerable weathering and erosion has produced extensive scree and talus deposits along the northeast facing slopes below the escarpment. It appears that the valley of the Liffey River above the sawmill may have previously been filled with talus material that has now been deeply dissected by the present stream course. A lot of talus material and boulders has been re-sorted and distributed by creeks flowing off the Great Western Tiers, particularly in the Blackwood Creek area.

## **STRATIGRAPHY**

### **Permian System**

A summary of Permian stratigraphy in the Drys Bluff area is given below. It was found necessary, for reasons discussed in Bravo and Pike (1969), to make alterations to the stratigraphy of McKellar (1957) which over the ensuing years has been referred to frequently in the literature. It should be pointed out that apart from a minor change in grouping and consequent revision of the group nomenclature, the original formation names of McKellar have been retained and the overall stratigraphic sequence has not been changed.

<i>GROUP</i>	<i>FORMATION</i>	<i>THICKNESS (feet)</i>
	Jackey Formation	(?)
BOGAN SADDLE	Eden Mudstone	20
	Blackwood Conglomerate	3
	Drys Mudstone	327
	Palmer Sandstone	10
	Springmount Mudstone	225
POATINA	Garcia Sandstone	30
	Weston Mudstone	30
	Dabool Sandstone	23
	Meander Mudstone	202
LIFFEY	Liffey Sandstone & Shale	100
GOLDEN VALLEY	McRae Mudstone	100+

Apparently the Permian sequence from below the Golden Valley Group has not been exposed to any extent. However, it is reasonable to assume a complete sequence because drilling records from nearby Poatina indicate that basal Permian tillite is covered by soil and alluvium in that area. Also, a complete thickness of Quamby Mudstone is exposed on the road below Poatina township. Minor occurrences of grey mudstone probably belonging to the Quamby or Golden Valley Group were noted below Cainozoic sediments in Blackwood Creek. A trench-cut on the *Iveridge* property has exposed conglomerate overlain by grey mudstone and Matthews (pers. comm.) has mapped tillite to the east on the *Creekton* property.

The greatest thickness of Permian sediments exposed at any one locality throughout the area is about 1,300 feet while thicknesses above the base of the Liffey Group are generally about 1,000 feet.

### ***Golden Valley Group (Clarke, 1968)***

Exposures of the predominantly mudstone members of the Golden Valley Group are generally poor throughout this area. In addition, outcrop is usually found at the foot of slopes where the amount of exposure is limited by hillwash, making lithological identification difficult.

During the course of mapping, a grey, unfossiliferous mudstone, which readily disintegrates into lenticular fragments, was assumed to be equivalent to the McRae Mudstone. At least 100 feet of this formation is present below the base of the Liffey Sandstone near Brumbys Creek but a true thickness cannot be estimated. Only the occasional fossiliferous pebbly horizon, assumed to belong to the Billop Formation, could be proved with certainty and no true thickness for this formation can be given either. The best localities are on the road near Blackwood Creek and behind the holiday camp at Liffey (473.7E, 866.7N) where fossils have been noted.

### ***Liffey Group (McKellar, 1957)***

When Wells (1957) first named and defined the Liffey Sandstone he was followed by McKellar (1957) who referred instead to the Liffey Group, naming four formations which he considered were recognisable from field mapping and drill hole information. No attempt was made to distinguish any formation in the field. It was felt that this would in fact be difficult. While some of the lithologies may be grouped on the basis of their similar flaggy appearance some beds vary in thickness (McKellar, 1957) and may even be discontinuous (see also Clarke, 1968; p.17).

As a group the Liffey consists of predominantly sandstone with minor or occasional carbonaceous horizons and carbonaceous shale. In general, the lower parts of the sequence appear to contain a preponderance of flaggy beds (4–6" thick) of fine-grained sandstone with an occasional massive bed (1–3 feet thick) of creamy-white, medium-grained, clean sandstone. At some localities the sandstone becomes coarse grained as gritty sandstone and pebbly quartz conglomerate have been noted. About the middle of the sequence flaggy sandstone, siltstone and shales occur. The flaggy sandstones are cross-bedded and lenticular, suggesting a depositional environment of small basins and pools. The shales, which are finely laminated, split along bedding planes to reveal carbonised plant remains and abundant micaceous material that contributes to the fissility. The siltstones are usually carbonaceous and appear to have contained worm burrowings.

The carbonaceous sandstone and shale is usually capped by a massive sandstone bed which is followed, in turn, by silty, micaceous, mottled sandstone — probably the Creekton Formation of McKellar (1957). This apparently transitional sandstone lithology at the top of the Liffey Group varies upwards from tough, compacted, medium sandstone to a slightly more micaceous and silty sandstone with worm burrowings. Thin section examination (sections 68-221C, 68-222A, 68-222C) indicated that these rocks were fine to medium-grained sandstone which contained mainly quartzose material with some mica, altered mudstone and feldspar. The sandstones were moderately well-sorted and differed only in the amount of altered, muddy groundmass and the amount of secondary

silica cement which developed around the edges of the framework grains. Cylindrical structures, about 5 mm in diameter, containing evenly-grained silt and mud with an occasional lithic fragment scattered throughout, give the sandstones their mottled appearance.

It has generally been considered by Wells (1957) and by later workers that the flaggy and sometimes lenticular sandstones of the Liffey Group were suggestive of deposition in a freshwater environment. Banks (1962, p. 204) discusses the fact that these "worm-cast" sandstones may be marginal deposits between marine and non-marine conditions. However, throughout the transition from "worm-cast" Creekton Sandstone to the typical, grey mudstone of the Poatina Group no evidence for marine conditions was noted.

From a mapping point of view the apparent persistence of a grey, mottled sandstone (Creekton Formation) was found to be a useful horizon to take as the top of the Liffey Group.

### **Poatina Group (Bravo & Pike, 1969)**

The type section can be found along the road leading to the Poatina Power Station entrance tunnel which is outside the area of the Quamby Quadrangle. Nevertheless, good exposure of the Poatina Group, outside the type area, is available along the Liffey River at the site of Liffey Falls (469.5E, 865.0N). A formal definition of the group has been included at the end of this report.

In the type area, well sorted, micaceous, quartz sandstone and grey, worm-cast sandstone typical of the Liffey Group appears to be transitional to grey, weathering to buff-coloured siltstone characteristic of the Meander Formation at the base of the Poatina Group. In general, tough, non-fissile, sandy siltstone containing numerous angular and rounded rock fragments alternates with softer micaceous mudstone. Bedding is not well defined but is indicated by this alteration in lithology. In some cases the presence of a number of isolated boulders at approximately the same horizon is indicative of rudimentary bedding.

The mudstones fret more easily, while close-spaced vertical jointing in the sandy siltstone produces blocky fragments on weathering. Sporadic fossils were found throughout the lower part of the formation. The number of erratics varies throughout the sequence but occasional concentrations occur. Some boulders up to 6" across were noted. These were of varying rock type — schist, quartzite, sandstone and slate. Boulders with poor sphericity, such as bladed, disc and roller-shaped particles, had haphazard orientation of the longest axis. Towards the top of the formation a grey, mottled siltstone containing hydroplastic structures may be characteristic.

The Meander Formation is overlain by the Dabool Sandstone which is essentially a medium-grained, fossiliferous, quartz sandstone containing some pebbly beds and occasional boulders. The lower 3 to 4 feet of sandstone is apparently unfossiliferous but above this the sandstone contains a predominantly shelly fauna of which *Wyndhamia jukesi* (Etheridge), *Martiniopsis profunda* (Campbell), *Martiniopsis denmeadi* (Campbell), *Martiniopsis ovata* (Campbell), *Paraconularia derwentensis* (Johnston) and *Grantonia hobartensis* (Brown) are notable. The fossils occur abundantly in bands associated with the pebbly horizons which contain occasional rounded boulders to about 4".

There is no abrupt or distinctive boundary between the Dabool Sandstone and the overlying Weston Mudstone, only a change in lithology through sandy siltstone to fissile, thinly-laminated mudstone and silty mudstone. The dull-grey mudstone weathers orange-brown, contains the occasional rounded pebble to about 2" and a fauna of abundant fenestrate and stenoporid bryozoa.

In the type area, sandy mudstone, considered to be the top of the Weston Mudstone, is overlain by pebbly to gritty sandstone which contains a few brachiopods, some bryozoa and occasional boulders. This basal unit of the Garcia Sandstone becomes unfossiliferous higher up in the sequence where sandy siltstone is interbedded with medium-grained to gritty sandstone. The sandstone contains mainly quartz together with some altered feldspar, mudstone fragments and other lithic material, rounded to angular and only moderately sorted. Grain size varies from an average 0.2 mm up 6 mm. 68-220B is a similar rock collected from near Blackwood Creek. This sandstone is overlain by tough, grey siltstone difficult to distinguish from siltstone in the Meander Formation below.

The top of the Garcia Sandstone at Poatina could be called a conglomeratic sandstone. Most of the lithology consists of apparently poorly sorted coarse to granular sandstone. However, in places the sandstone contains well rounded, isolated boulders and cobbles of schist, slate, sandstone and quartzite (up to 12 centimetres across). There are layers containing an open framework of granules and small pebbles of rounded vein quartz as well as angular to rounded lithic fragments in the sandstone.

Reliable separation of the lowermost Garcia Sandstone and parts of the Dabool Sandstone can be achieved only where the approximately 30 feet thick bed by bryozoan-rich, fissile, Weston Mudstone is exposed between them. In addition, interbedded siltstones found in the Garcia Sandstone are similar lithologically to rocks of the Meander Formation. Therefore, the Garcia Sandstone has been grouped accordingly with the Meander, Weston and Dabool formations. This procedure was also found to be useful from a field-mapping point of view where the Garcia Sandstone forms topographic benches that are easy to locate. The first mapping above this was taken as the base of

the overlying Bogan Saddle Group.

### ***Bogan Saddle Group (Bravo & Pike, 1969)***

This group consists of predominantly unfossiliferous grey mudstone and siltstone with two thin formations, the Palmer Sandstone and Blackwood Conglomerate.

The mudstones, which are generally micaceous, differ from the siltstones in the amount of micaceous material and the fact that the siltstones usually have visible angular grains of clear quartz. The mudstones, which weather freely and disintegrate readily, contain occasional boulders and rounded, pebble-sized erratics. Some fossil brachiopod fragments have been collected from the mudstone about 10 feet below the base of the Palmer Sandstone. The mudstone from above the Palmer Sandstone (i.e. Drys Mudstone) becomes more sandy and weathers to a characteristic creamy-white colour. It is interesting to note that sandy mudstones with similar features have been noted at equivalent horizons in the Permian of the Frankford Sheet. So far, fossils have not been collected from these mudstones but there are worm casts and burrowings present.

Generally, the siltstones are structureless but in places they do have a distinctive texture which on weathering gives the rock a mottled, streaky appearance. In cut or polished section this is noticeable as wispy, involuted and drawn-out stringers of darker-coloured mudstone in the siltstone. The texture may be depositional but more likely it was the result of some post-depositional hydroplastic behaviour in the siltstone due to the physical process of load casting. Pods, knots and nodules of coarse-sand to granular material within the siltstone in many places also appear to have formed as a result of load casting. The nodular structures, which measure up to 6 cm across, have irregular boundaries. They contain aggregates of rounded, granular rock fragments, 2 to 3 mm in diameter, with angular to rounded quartz in a grey, fine-sandy matrix. Pebbles of slate, quartzite, quartz and mudstone (up to 3 cm in diameter) as well as incorporated fragments of siltstone give the overall impression of only moderate to poor sorting.

The Palmer Sandstone, in some localities where it has been weathered or leached, can appear similar in lithology to sandstones found in the Liffey. However, the Palmer Sandstone is easily distinguished by its stratigraphic position within the mudstone sequence, its thickness (10 feet) and the conglomerate nature of the basal 6 inches.

This basal layer consists of a generally open framework of sub-rounded to rounded boulders (mostly flat-lying) of shale, mudstone, quartzite, chert, granite and pyritic mudstone in a coarse to granular matrix of predominantly quartz with some rock fragments. Occasional boulders of granite, at least 2 feet in diameter, found near the foot of a hill below an outcrop of Palmer Sandstone at one locality along the Bogan Road, could have come from that horizon. The impression gained from the lithology of the basal layer was that at the time of deposition of the Palmer Sandstone these boulders could have been dumped directly onto the muds of the underlying formation.

Above the basal layer, where the boulders may be at up to 5 inches in diameter, there is a diminution in grain size in what could be a “fining-upwards” cycle which may or may not be grading. It is evident though that from the base upwards, the boulders became less frequent until absent altogether, the matrix becomes dominant as a coarse to gritty sandstone (granular in places) and this in turn passes upwards into a medium sandstone — the distinctive lithology of the Palmer Sandstone. Very few boulders are found above the concentration in the basal layer and only occasional pebbles occur within the sandstone higher-up.

When sectioned (68-220A), a typical, medium-grained sandstone from the Palmer above Blackwood Creek township was found to consist of moderately well-sorted quartz grains, 5% feldspar and altered mudstone fragments with about 2% groundmass. Average grain size was about 0.3 mm. Discernible overgrowths of secondary silica gave the well-rounded quartz grains an angular outline.

In general, the Palmer Sandstone appears to differ from the Garcia and Dabool sandstones in the degree of sorting, the higher feldspathic content and the lower amount of groundmass that it contains.

The Blackwood Conglomerate, which is only a few feet thick but apparently persistent, characteristically consists of a closed framework of well-rounded, white quartz pebbles in a tough matrix of poorly sorted sandstone or siltstone. The pebbles may be up to 3 or 4 cm in diameter while the matrix is usually typical of other silty sandstones within the Permian.

Unfortunately, in the Drys Bluff area, formations above the Blackwood Conglomerate have frequently been obscured by fallen sandstone boulders and the overall talus development making descriptions uncertain. The Jackey Formation in particular, seen elsewhere as a carbonaceous, shaly sandstone, could not be identified with any certainty. Nowhere was the Permo-Triassic boundary observed. For convenience sake the boundary has been placed at the foot of the first cliffs of well-sorted clean sandstone. Thicknesses above the Blackwood Conglomerate, to these first massive sandstone cliffs assumed to be Triassic, suggest that the Jackey Formation is in fact present. Consequently, Permian sediments have been represented on the map above the Blackwood Conglomerate as consisting of probably the Eden Mudstone and Jackey Formation.

## Triassic System

Looking from the Liffey Falls Road massive cliffs of Triassic sandstone can be seen as a distinctive feature high up on the slopes of Drys Bluff. In this area, where the Triassic sediments were accessible enough to be studied, they consisted mainly of thick, medium-grained, quartz sandstone. The well-sorted sandstones are generally massive but contain minor lenses of claystone and large-scale cross-bedding. Little can be said about the other lithologies, particularly the shale members which are usually poorly exposed. Because of the lack of detailed information available the Triassic sediments have not been grouped in any way.

## Cainozoic Deposits

### *Dolerite Boulder Beds (?Qd, Qag)*

Deposits of dolerite boulders beds of several types were mapped near Blackwood Creek township where Blackwood, Garcia and Brumbys creeks flow easterly off the Great Western Tiers.

In the area mapped as ?Qd large boulders of dolerite up to several feet across are scattered over the surface. It is evident, especially from the aerial photos, that this area has been modified by sheet-flood tributaries associated with the above creeks. Nicolls (1959) mapped and referred to soils developed on stony alluvial fans in this same locality.

Recent clearing and bulldozing of dams has turned up large boulders, cobbles and small gravels of dolerite in golden-yellow, gritty clay obviously formed from decomposition of the dolerite component. Some of the gritty matrix material is pisolitic ironstone, and occasional large blocks of weathered lateritic ironstone can be found. An interesting feature is that whereas most of the larger boulders have clean, unweathered skins with no surface pitting but only a thin coating of yellow clay the smaller gravels and cobbles have deep rotting skins.

A drainage trench, cutting across a paddock on the *Iveridge* property, shows the deposit to be a thin sheet overlying Permian mudstone and pebbly sandstone. It is not known if the deposit thickens as a wedge back to the foot of the Great Western Tiers. As exposed in the trench, the deposit consists of a closed framework of boulders of rotting dolerite in a matrix of decomposed dolerite material and pisolitic ironstone gravel.

The deposit has no demonstrable age relationship. In the Launceston area, Longman (1966) interpreted dolerite pebble conglomerates as Tertiary mudflow deposits containing limonitic material collected off adjacent hillslopes. At Strahan, similar deposits were deeply weathered as were the component dolerite boulders. It may be that the ?Qd is a Tertiary remnant covered by re-worked talus source material during sheet flood activity which has contributed the relatively unweathered boulders. The mixed nature of fresh and weathered boulders, limonitic pisolites and laterite fragments suggests rather the incorporation of re-worked Tertiary material during formation of mudflow deposits in the Pleistocene.

Behind Blackwood Creek Hall the soil consists of grey, sandy clay with weathered dolerite gravels as well as gravels out of the Poatina Group obviously brought down as hillwash during soil formation. This material is younger than the ?Qd and probably overlies it.

In the vicinity of Brumbys Creek, and similarly outside the area in Garcias Creek, deposits of wellrounded dolerite boulders, with an average diameter not greater than 5 inches, have been cut by the present streams. The stream deposits consist of a closed framework of apparently bimodal cobbles and boulders, which are well rounded, with a matrix of gritty clay. In places the boulders are imbricate. In the more arable areas the matrix may consist of light-brown sandy material especially on the flats where the deposits remain as ridges and mounds of boulders. These deposits have been mapped as Qag and are assumed to be younger than the ?Qd. They have probably been deposited since the Pleistocene as re-worked material brought down in creeks from the talus slopes behind, to this extent they (Qag) might be attributable to an alluvial fan deposit.

### *Talus Deposits (Qtd, Qts)*

During retreat of the Great Western Tiers scarp, an extensive mantle of talus material Qtd has accumulated on the upper slopes below the steep dolerite cliff, while distinctive tongues of talus have spread down some valleys to as low as 600 feet. The talus, which is probably all solifluction material, consists of some surface boulders together with other boulders of dolerite weathering with depth in a golden-yellow heavy clay matrix. Lower down the slope, below the cliffs of Triassic sandstone, boulders of this sandstone may be incorporated in the talus. Surface concentrations of blocks, in the form of scree, more recently eroded from the escarpment have not been differentiated on the map.

In this area the dolerite appears to have intruded only the Triassic sandstone. A talus deposit, on a marked bench above the Liffey Road just NW of Bullock Holes Creek, was assumed to be an accumulation on an old bench of Liffey Sandstone rather than a remnant deposit from previous dolerite exposure at the site.

In some localities, Liffey Sandstone and to some extent Triassic sandstone have contributed large volumes of sandstone to a talus deposit Qts. Large blocks of sandstone lie about on the surface and boulders of sandstone are contained within a profile of sandy loam. In some instances there was evidence of sorting.

### **Marsh deposits (Qm)**

Elongate areas in the form of depressions on top of the Drys Bluff plateau were probably formed as a result of glacial activity. Nicolls (1959), when describing the soils of the plateau top, referred to waterlogging, with marshy areas in shallow valleys between in situ exposures of dolerite. These areas have been differentiated on the map as Qm. McKellar (1957) reported that some of these Qm deposits are known to be underlain by tills. Some of the depressions were probably sites of former block stream deposits as well.

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## RELEVANT CATALOGUED THIN SECTIONS

<i>MINES DEP. CATALOGUE No.</i>	<i>ROCK SAMPLE</i>	<i>LOCALITY</i>
219	Palmer Sandstone	Along a track leading up to the Lake Highway from Bogan Road. 467.6E, 868.9N
68-220A	Palmer Sandstone	Up a track above Blackwood Creek township. 479.9E, 859.1N
68-220B	Garcia Sandstone	From below 68-220A, 480.2E, 859.4N.
68-221A	Meander Mudstone (soft mudstone equivalent)	Poatina Section
68-221B	Meander Mudstone (hard sandy siltstone)	Poatina Section
68-221C	Sandstone from the top of the Liffey Group	Poatina Section
68-222A	Mottled mudstone, Creekton–Meander Formation	Poatina Section
68-222C	Mottled sandstone from near the top of the Liffey Group	Track leading up from above Liffey Falls Reserve. 472.2E, 865.5N.

## APPENDIX 1

### Revised grouping of Permian formations

The amended groups to replace the former Woodbridge and Ferntree groups of McKellar (1957) were defined as follows.

The Poatina Group is that group of rocks consisting of the Meander Mudstone (at the base), Dabool Sandstone, Weston Mudstone and including the Garcia Sandstone (at the top), which has a total thickness of 86.9 m and lies conformably between the Liffey Group below and the Bogan Saddle Group above.

In the type area, beside the road leading to the Poatina Power Station entrance tunnel, the lithology consists of a sequence of poorly fossiliferous mudstone and sandstone (Meander Mudstone) overlain by fossiliferous sandstones (Dabool Sandstone, Garcia Sandstone) containing a shelly fauna which includes *Wyndhamia jukesi* (Etheridge), *Martiniopsis profunda* (Campbell), *Martiniopsis denmeadi* (Campbell), *Martiniopsis ovata* (Campbell), *Paraconularia derwentensis* (Johnston) and *Grantonia hobartensis* (Brown). These two sandstone formations are separated by the Weston Mudstone containing an abundance of fenestrate and stenoporid bryozoa.

**The Bogan Saddle Group** is that group of rocks consisting of the Springmount Mudstone (at the base), Palmer Sandstone, Drys Mudstone, Blackwood Conglomerate and Eden Mudstone (at the top), which has a total thickness of 178.4 m and lies conformably between the Poatina Group below and the Jackey Formation above.

The predominant rock type is sparsely fossiliferous, medium to dark grey, quartz and mica mudstone (Springmount, Drys, Eden Mudstone) containing a thin, unfossiliferous, conglomeratic sandstone (Palmer Sandstone) and a thin, unfossiliferous, quartz conglomerate (Blackwood Conglomerate).

The type area is in the vicinity of a track which climbs Bogan Saddle in a direction SSW to the Lake Highway.