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FRANKFORD

by A. B. GULLINE, B.Sc.

DEPARTMENT OF MINES, GPO BOX 124B, HOBART, TASMANIA 7001

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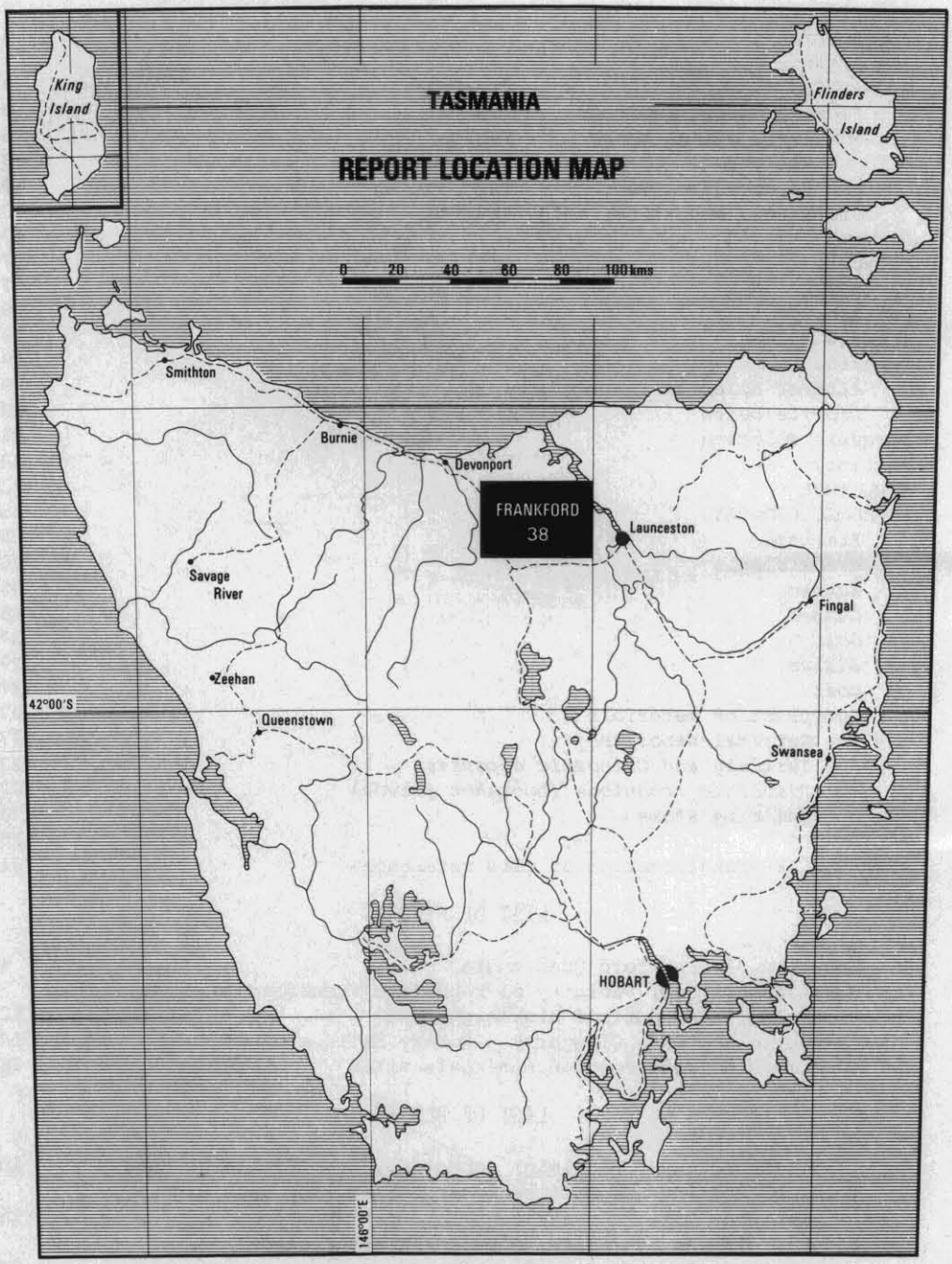


Figure 1. *Location of Frankford Quadrangle*

5 cm

INTRODUCTION

The Frankford Quadrangle covers an area of approximately 1150 km^2 of central northern Tasmania between longitude 146°30' and 147°00'E and latitude 41°15' and 41°30'S (fig. 1). Access to this quadrangle is gained by the West Tamar Highway from Launceston, by roads leading northwards from Westbury, and by roads leading eastwards from Latrobe and Devonport. The main township on the West Tamar Highway is Exeter, while the township of Frankford is centrally situated on the road from Exeter to Devonport. The Bass Highway runs through the western edge of the quadrangle, passing northwards through Elizabeth Town.

Previous mapping is limited to small areas, although a reconnaissance map was produced in 1961 for incorporation into a geological map of Tasmania.

Prospecting adjacent to the Beaconsfield mining district to the north revealed no promising mineralised areas and as a result development in the Frankford Quadrangle has been orientated towards agriculture and forestry. To the west and south bores seeking oil and oil shale have been sunk. Hills *et al.* (1922) briefly mention the Tertiary coal at Rosevale, while the Pandora copper mine between Holwell and Saxons Creek was the subject of short investigations and reports (*e.g.* Montgomery, 1893; Hughes, 1954). Barite has been evaluated in prospect pits near Observatory Hill south of the Franklin Rivulet. At present limestone is the only significant mineral deposit being exploited (plate 4).

Of the recently completed mapping programme, A.P. Bravo mapped some of the area along the Frankford Road and around Notley Hills, and I.H. Naqvi spent some time mapping the Exeter quarter sheet. W.R. Moore mapped a small area in the south-east corner of the sheet. The Frankford map sheet has been published at a scale of 1:63 360 to keep uniformity with the surrounding published map sheets.

Permian rock units, except for distinctive horizons, have been referred to in the broadest terms because of the intensity of faulting, lack of exposure, and facies variations due to the environment of deposition. Rock units of other periods have been correlated with formations defined for adjacent quadrangles to some extent, but unique facies changes appear to be present in the Ordovician to Devonian rocks. Poor exposure of Cambrian(?) aged sequences prevent any correlation with better known successions occurring in the Franklin Rivulet area and in the south-west corner adjacent to the Sheffield Quadrangle.

PHYSIOGRAPHY

Relief in the area is a direct result of the resistance to erosion of quartzitic or siliceous Precambrian and Lower Palaeozoic rocks, Jurassic dolerite, and Tertiary basalt. There is an overall north-westerly topographic trend in areas underlain by Permian and younger rocks, which results from the pre-Tertiary faulting being predominantly in this direction. The exhumed Late Mesozoic faults also govern the almost linear edges of hills underlain by folded Precambrian and Lower Palaeozoic rocks.

The siliceous rocks in the central part of the quadrangle form hills protruding through flat-lying Permian rocks. These represent the higher parts of a partly exhumed, rugged pre-Permian surface. Fault governed pre-Tertiary valleys were regions of Cainozoic sedimentation and these have formed flat areas except where subsequent erosion has exposed pre-Tertiary

rocks. Around Moltema, Tertiary valley-fill sediments are preserved due to considerable areas of basalt capping.

In the north-west corner of the quadrangle around Sassafras East, basalt cover has preserved thick, partly consolidated Tertiary deposits. At Parkham, a shallow basin of Tertiary deposits forms a flat area around a central ridge of north-westerly trending Permian strata. In the south-west corner of the quadrangle, part of another Tertiary basin exists; this is barred to the north, west, and east by dolerite. West of Exeter the Supply River system, draining the Lower Palaeozoic rocks of the central hills, has formed a basin of Quaternary sediment probably derived from pre-existing Tertiary deposits.

East of Exeter, the River Tamar has cut down through Tertiary deposits of the Launceston Tertiary basin and now flows in a moderately steep and high walled valley.

Drainage systems in the quadrangle are mainly consequent, following old faults and lines of weakness except on areas of Cainozoic deposits where meanders and wide flood plains are well developed. This is particularly so in the Meander River, south of Rosevale.

The Rubicon River and Franklin Rivulet systems drain much of the west and north-west of the quadrangle and flow northwards to Port Sorell. The south-west corner is drained by tributaries of the Mersey River.

Average annual rainfall in the quadrangle is generally in the 900-1100 mm range, although there is a marked decrease towards the south-east. Frankford, in the centre of the quadrangle, has an average annual rainfall of 1085 mm.

Vegetation varies considerably, with altitude, soil type, and aspect being the main controls. Regrowth after fire or intense logging operations has a fairly long-term effect. The vegetation is mainly sclerophyll or eucalypt forest, with small areas of rain forest in gullies running north from Notley Hills and valleys in the hills north and east of Frankford. Other valleys have a mixed forest. Fire and timber operations in the areas of Precambrian and Ordovician to Devonian rocks has resulted in impenetrable areas of ti-tree, bauera, and other scrub. Blackberries are widespread and completely overgrow many of the creeks.

STRATIGRAPHY

Precambrian

The main occurrence of Precambrian rocks is in the mid-north of the quadrangle where they underlie the southern end of the Dazzler Range and form an upfaulted elongate area south-west of the town of Frankford. Rock types noted are sandstone, slate, phyllite, and quartzwacke, which are similar to and correlated with the Badger Head Group of the Beaconsfield Quadrangle (Gee and Legge, 1974); in the Beaconsfield Quadrangle they are complexly folded and form a basement structural high.

Crenulated quartz-mica schist is exposed in a road cutting north of Elizabeth Town [48/513990] and is overlain to the north by Tertiary and Permian rocks and probably cut-off to the south by faulting along the flat land beside the Bass Highway.

The rocks in the Dazzler Range area strike in a north-westerly direction. In the area north of Frankford, Ordovician and Permian rocks

lap unconformably onto the eastern margin of the Precambrian. Some areas of the western edge have Permian onlaps, while in the north-western edge Cambrian rocks are in faulted contact with the Precambrian.

?Cambrian

What appear to be the earliest ?Cambrian rocks in the quadrangle are those in the Franklin Rivulet valley south of Port Sorell, which are in faulted contact with Precambrian [49/573197], Permian, and Jurassic rocks and overlain unconformably by areas of Lower Permian marine sedimentary rocks. The classification of these rocks as ?Cambrian is based on lithological similarities with probable Early Cambrian rocks in other localities, and the marked dis-similarities with the Badger Head Proterozoic rocks. These rocks are apparently unfossiliferous.

Some road cuttings in the area of the Franklin Rivulet bridge [49/545195] reveal contorted, thinly laminated black and white chert with dark, slaty, carbonaceous mudstone and siltstone layers. These are distinct from the adjacent pyritic black slate, carbonaceous slate, dolomitic siltstone, dolomitic conglomerate, and thin quartzite beds which crop out in the banks and bed of the Franklin Rivulet. The conglomerate pebbles are mainly quartzite with some chert, phyllite, and dolomite grains set in a silt and dolomite matrix. The slate sometimes weathers purple and greenish.

Dr G. Loftus-Hills (pers.comm.) has analysed some of the autochthonous pyrite in the slate and obtained the following cobalt and nickel values, which are considered relatively high:

Sample	Co (mg/*l*)	Ni (mg/*l*)
a	1561	996
b	1398	924
c	1004	829

Analyses by atomic absorption spectrophotometer.
All samples from 49/572155.

In one locality [49/566144], silicification and barite mineralisation has taken place. G.B. Everard, petrologist, made the following description of the rock:

'The hand specimen is a dark, greenish, glassy looking rock with a conchoidal fracture. A polished surface shows a streaked and mottled texture with elongated paler grains and patches up to 3 mm x 0.5 mm and dark wispy markings. Barite is present in small irregular veins.

In thin section, the streaked and mottled sheared texture can be seen in plane polarised light as dark, cloudy patches and a brownish mottling due to iron oxide. This, however, is mainly a palimpsest texture because on inserting the upper nicol, the section appears as a mosaic of interlocking grains of feldspar and quartz showing extensive recrystallisation and little relation to the texture shown in plane polarised light.

There are two distinct grain sizes averaging about 0.1 mm in diameter in the one instance and about 0.01 mm in the other. Some of the larger quartz grains are euhedral and some show crystalline outlines marked by lines of inclusions. Some of the feldspar grains retain an elongated

outline, but they are also recrystallised. Twinning is very irregular and the refractive index is greater than that of balsam. The rock is a hornfels.'

On weathering, the hornfels becomes light coloured and a distinct sheared texture is seen in the hand specimen. Holes and pits due to the removal of feldspar grains are numerous in the weathered sample.

South of Salisbury Hill and east of Flowery Gully is an area of dark grey slate and greywacke sandstone which is faulted against rocks of Ordovician age. In these Cambrian sedimentary rocks a body of igneous rock occurs which is apparently of the diorite suite. The rocks of this area are poorly exposed, but in addition to the slate and sandstone, several blocks of chert pebble conglomerate and purplish greywacke siltstone were seen which are typical of known Cambrian sequences elsewhere.

In the south-west corner of the quadrangle close to Dunorlan, proven Cambrian rocks occur unconformably below Ordovician conglomerate. The rocks are slaty siltstone and interbedded greywacke sandstone, mostly black coloured, and are correlated with the Gog Range Greywacke of the Sheffield Quadrangle with which they are in lateral continuity. No fossils have been found in the Salisbury Hill area.

Another occurrence of possible Cambrian sedimentary rock is in the Supply River near South Winkleigh. This exposure consists of a tightly folded section, which is in part overturned and composed of brown to black laminated siltstone.

Ordovician

Considerable lithological variation is suspected in the lower part of the Ordovician System. At Frankford and on Punchs Terror at Dunorlan, conglomerate was deposited on Cambrian or older rocks. Near Beaconsfield and Holwell-South Winkleigh, the basal members are not as coarse, being interbedded quartzite and granule conglomerate. The conglomerate occurs as a massive, three metre thick lenticular body in one exposure, but this could not be followed for more than 50 m along strike. In this interbedded sequence, which is generally soft and friable, weathering has obliterated sedimentary structures and depositional features and the facing of these sediments is based on doubtful evidence.

The succession is difficult to follow above the basal beds, as there are no marker horizons, there are faults parallel or almost parallel to the strike, and dense scrubby vegetation covers much of the area.

North of Frankford, a reddish coloured massive conglomerate unconformably overlies slate, phyllite, and orthoquartzite of Precambrian age. The rock is intensely cleaved and sheared, and all signs of bedding have disappeared. Following about 100 m of poor exposure of this rock, a more siliceous, less sheared, pinkish, cobble conglomerate extends over an apparent thickness of 360 m. Over the final 50 m of exposure, the rock becomes finer and interbedded with sandstone, terminating in white quartzite at the end of the outcrop. The lack of strike extension of any of these beds suggests faulting on each side of the ridge. Dense vegetation covers most of this north-west trending body of Ordovician rocks.

A finer pebble conglomerate occurs south of Winkleigh [49/778090] and is overlain by quartzite, sheared greenish siltstone, and fossiliferous sandstone. This section of fossiliferous strata may be a correlate of the Caroline Creek Sandstone, which occurs in the Beaconsfield Quadrangle as part of the Cabbage Tree Formation.

Overlying the conglomerate at the northern end of Bald Tier, east of Kellys Lookout [49/726130] is a white sandstone containing poorly preserved trilobite fragments and gastropod remains. Overlying this is a sheared greenish sandy siltstone underlying cleaved limestone which contains some crinoid columnal plates. This succession is very similar to the Cabbage Tree Formation and overlying Flowery Gully Limestone.

FLOWERY GULLY LIMESTONE

The type-section of this formation is defined as mapped in the Frankford Quadrangle. For economic reasons extensive investigations have been carried out on this limestone by Noakes, Burton, and Randal (1954), and Hughes (1957).

At the western edge of the limestone is a possibly conformable quartzite and siltstone sequence; this boundary is taken as the base of the limestone.

Noakes *et al.* (1954) divided the sequence into three zones based mainly on silica content, which ranges from 1% to 10% of the rock. Apart from black chert nodules, it was found that quartz occurs as sporadic grains, as rare ribbons in calcite veins, and more commonly as minute elongated rods and lenticules. The rods were possibly sponge spicules.

The three zones of Noakes *et al.* (1954) are as follows:

Lower silica zone

Approximately 300 m of limestone, well bedded, grey to black toward the base, with some shale, and slightly more massive grey limestone toward the top. Silica present at a concentration of 2 - 3% toward the base and 1 - 2% in the upper sections. Magnesia content high in basal beds.

The central portion of this zone was not exposed.

Chert zone

Approximately 150 m of limestone, mainly dark grey to black with lenses and patches of chert. Rock ranges from massive to well bedded. Silica content of limestone variable but relatively high, normally above 2% but between 5% and 10% in vicinity of chert.

Upper silica zone

Approximately 100 m in most exposures and consisting of (in ascending stratigraphic order):

(a) 40 m dark, massive but low silica (<1%) limestone with $MgCO_3$ content average about 5%.

(b) 8 m 'dolomite' bed (30% $MgCO_3$).

(c) 43 m (approx.) of very light coloured low silica limestone, mainly massive.

The thickness of the Flowery Gully Limestone is approximately 520 m. The subdivision was done on chemical characteristics because of the uniform appearance of the limestone in outcrop. Sheared and cleaved areas occur as a result of faulting and folding. Sinkholes are present in the area and drainage is mostly underground. Bedding is sometimes difficult to determine

where the rock is massive, but not in the dolomitic zones, thinly bedded zones, or the chert zones, where chert nodules and lenses are usually on the bedding planes.

The environment of deposition was considered to be shallow water (less than 100 m), if bioherms or stromatoporoids were present, as inferred by Noakes *et al.* (1954). The environment was marine, as shown by the presence of fragments of brachiopods, conodonts, crinoid remains, and reported nautiloids. Conditions must have been very quiet for the deposition to be so uniform.

SILTSTONE, SANDSTONE, AND QUARTZITE

At the top of the formation, at one exposure observed, the limestone passes rapidly into black slaty siltstone. Previous workers in this area observed an unconformity at this horizon due to erosion truncating some of the limestone beds prior to deposition of the slaty black siltstone (Noakes *et al.*, 1954).

In the lowest slate horizon are numerous organic remains which have been interpreted (Öpik, pers.comm.) as probably biserial graptolites in a scolariform attitude, and a gastropod with a high spire related to *Hormotoma*. Öpik considered these to be Middle to Late Ordovician in age.

Overlying the slate is a thin sandstone horizon overlain by thin arenaceous sediments with interbedded black slate (total thickness if no faulting is about 1200-1500 m) and then a series of beds of a hard, thin bedded quartzite (about 10 m thick) with some current bedding, indicating that the beds are right way up. The quartzite can be strike walked over about 3.2 km southwards from the vicinity of the old Salisbury mine workings (Beaconsfield Quadrangle). The quartzite is overlain by sandy siltstone, which in one area [49/771170] is quite rich in brachiopods. Numerous trilobite fragments are present south along the strike, together with a few brachiopods. The age of these fossils has been determined as undoubtedly post-Cambrian and most probably Ordovician (M.J. Clarke, pers.comm.; fossils collected by K.D. Corbett).

At Winkleigh a similar quartzite occurs south-west of the road, while about 400 m north-east is another fossil locality where slaty siltstone contains moulds of gastropods, cystoids, brachiopods, and trilobite fragments, all poorly preserved but thought to be Ordovician or younger. Further collecting may discover fossils of a definite age or zone.

A few crinoid columnal plates were recovered from a black slate south of Winkleigh [49/770115].

Peaked Hill, to the north of Flowery Gully, consists of greenish grey slaty siltstone and some thin white quartzite beds. The lower beds on this hill are conglomeratic, similar to those at Cabbage Tree Hill. These rocks are therefore considered Ordovician.

Permian

Basal Lower marine and Lower freshwater Permian sedimentary rocks lie unconformably on Lower Palaeozoic, Cambrian, and Precambrian rocks. These basement rocks formed a pre-Permian topography of immature development, with hills and valleys which were apparently inundated prior to the Permian sedimentation. The valleys and hills were subsequently filled and covered by Permian sediments. Erosion has since partly removed the Permian and younger

rocks and as a result some of the higher parts of the old topography protrude through the almost flat-lying Permian strata.

Close to these source areas, the characteristics of the Permian rocks are very different from the normal basin deposited rocks. There is a predominance of coarse sub-littoral conglomerate grade rocks which extend or can be traced for about one kilometre from the source areas, although in one case the sub-littoral effect extends up to 5 km from the source.

The highest identifiable Permian unit to rest on Lower Palaeozoic or older rocks is the Lower freshwater equivalent of the Liffey Sandstone. Younger Permian rocks undoubtedly rested on the basement, but have since been eroded or are not identifiable because the residuals are conglomeratic sub-littoral facies and not the usual rock type.

Permian rocks well away from the basement highs are generally similar to those occurring in the areas included in the Beaconsfield and Quamby Quadrangles (Gee and Legge, 1974; Pike, 1973).

The oldest Permian rock in this area is a glacially-derived tillite which crops out in several localities. The best exposure, three kilometres south-east of Frankford on the Frankford Road around 49/734059, shows tillite unconformably overlying probable Ordovician rocks. Excavation of the basement surface shows a general smoothness due to ice action, but no striation or other glacial effects were preserved owing to the fairly soft nature of the basement rock. Striated pebbles of quartzite were found. A further exposure of tillite along Birralee Road has interlayered mudstone which contains a dwarf fossil fauna.

Above the tillite is approximately 20 m of unfossiliferous dark grey mudstone, lithologically similar to Quamby Mudstone. It is suggested that, in contrast to other Tasmanian regions, the Quamby environment did not develop until late in the Early Permian in this area due to the peculiar environment produced in the proximity of basement highs.

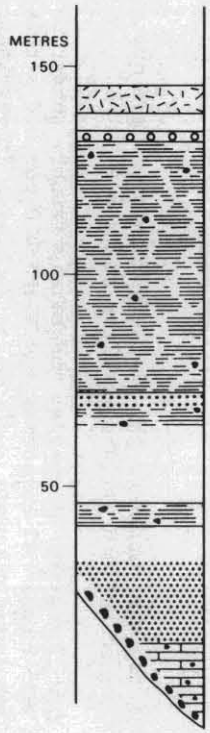
A further tillite deposit occurs to the west of Holwell, where it lies between ridges of Precambrian rock.

Upstream from the Franklin Rivulet bridge a poorly exposed section of Quamby-type mudstone crops out below bouldery fossiliferous Lower marine mudstone. At Winkleigh, dark grey Quamby-type mudstone occurs below a bouldery fossiliferous mudstone. Approximately 12 m below the fossiliferous unit at Winkleigh (fig. 2), a sandstone of varying purity and sorting occurs. In places it contains numerous casts and moulds of *Eurydesma* and *Keeneia*, but in some sections no fossils were apparent. The thickness varies between 1.5 m and 6 m and thins eastwards, and its presence is doubtful east of the Flowery Gully - Winkleigh road. Quamby-type mudstone occurs between the sandstone and the fossiliferous bouldery beds and below the sandstone to the bottom of the section at Winkleigh Road (fig. 2).

The top and bottom of the Winkleigh Sandstone are quite sharp, and allow it to be defined at this locality as being:

'that formation of coarse, moderately friable sandstone with numerous pebbles and occasional *Eurydesma* and *Keeneia* deposited within the top 12 m of the correlate of Quamby Mudstone at Winkleigh [co-ordinates 49/765120].' The best exposures are in the banks of a stream flowing southwards at the end of Winkleigh Road (plate 1) and between Hoods Road and the Supply River at South Winkleigh [49/765101].

PERMIAN SECTION, VICINITY OF ROAD FROM FRANKFORD TO HOLWELL



Jurassic dolerite.

Sandstone, friable medium grain, some mica. Conglomerate with white well rounded quartz grains and pebbles, clay matrix.

Cream sandy mudstone with some fine mudstone beds, all with associated dropstones from pebbles to boulders. No fossils, some wormcast beds.

Poorly sorted coarse quartz feldspar sandstone, pebbles at base. Thin sequence of bryozoan shaly mudstone.

Poor exposure

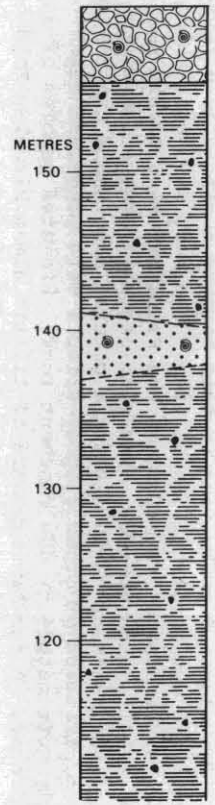
Buff coloured mudstone with some cobbles.

Sandy soil.

Poorly exposed massive to thinly bedded sandstone with traces of carbonaceous material. Very coarse sub-angular conglomerate on basement rock.

Dark grey impure limestone containing brachiopods and lamellibranch fossils plus pebbles and cobbles.

PART OF WINKLEIGH ROAD



Bouldery khaki mudstone, richly fossiliferous.

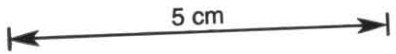
Black uniform mudstone with cobbles and pebbles.

Coarse sandstone, numerous pebbles and occasional casts and moulds of *Eurydesma and Keeneia?*

Dark grey to black uniform mudstone with occasional pebbles and cobbles.

Flowery Gully Road

Figure 2.



Directly overlying Ordovician rocks along the cliff top on Bald Tier west of Winkleigh are further outcrops of fine conglomerate containing *Eurydesma* moulds; this horizon was also mapped as Winkleigh Sandstone.

Other deposits of white quartz sandstone, similar to the Winkleigh Sandstone on Bald Tier, occur on Cambrian basement rocks near Flag Creek in the valley of the Franklin Rivulet [49/565150]. Some of these sandstones are unfossiliferous, while others contain *Eurydesma, Keeneia,* and *Martiniopsis*. These may be equivalent to Winkleigh Sandstone, but are too isolated to be named as this formation.

Fossiliferous conglomeratic mudstone occurs above the Winkleigh Sandstone at Winkleigh and at South Winkleigh, at the mouth of Franklin Rivulet, outside the Frankford Post Office, along Parkham Road, and on the Glengarry-Winkleigh road. Other occurrences of lithologically similar rocks were found marginal to the source areas. Therefore, these rocks can occur in any fossiliferous marine part of the Early Permian beds, and without continuous sections cannot be correlated lithologically with similar rocks at known levels in sections of the Quamby or other adjacent quadrangles.

Limestone rich in *Eurydesma* and *Martiniopsis* was found in three localities, and once again the relative position in the Early Permian marine succession could not be established.

Silicification of Early Permian fossil-rich marine strata occurs in some type sections not far below the Macrae Mudstone, and this was found in one section east of Glengarry [49/805095] (fig. 3). Unfossiliferous mudstone similar to Macrae Mudstone was found on the north-east flank of the valley south-east of Glengarry [49/809088], where it overlies the silicified zone. In areas near the pre-Permian land, the equivalent of Macrae Mudstone was not recognised. In the exposure thought to be equivalent to the Macrae Mudstone, about ten metres of rock occurs topping a ridge. Below it are about 90 m of Early Permian rocks not including Quamby-type mudstone or tillite.

Overlying Permian early marine strata is the correlate of the Liffey Sandstone. It is generally well developed, forms cliffs and prominent benches, but contains only a small quantity of carbonaceous material. Around 49/700100 a siliceous conglomerate, with up to one metre elongated assorted boulders, represents the onlap unconformity of this formation on sequences of Precambrian slate, phyllite, and quartzite of the Badger Head Group. Other successions close to pre-Permian land areas exhibit a much coarser grain size than typical, with conglomerate beds about 300 mm thick having been noted.

At 49/465100 the Liffey Sandstone correlate is a massive, medium-grained rock with randomly distributed assorted boulders, sometimes in aggregates. This is another atypical character. Close to 49/458110 coal bands up to 30 mm thick were observed in this formation in the banks of a small stream.

The Liffey Sandstone correlate is thin bedded with shaly partings, bedding planes carrying carbonaceous material, and mica flakes in the bottom part of the section with more massive coarser, and sometimes current bedded sandstone toward the top.

The topmost sandstone beds are of worm cast sand and are probably equivalent to the Creekton Formation of McKellar (1957). At 49/713035

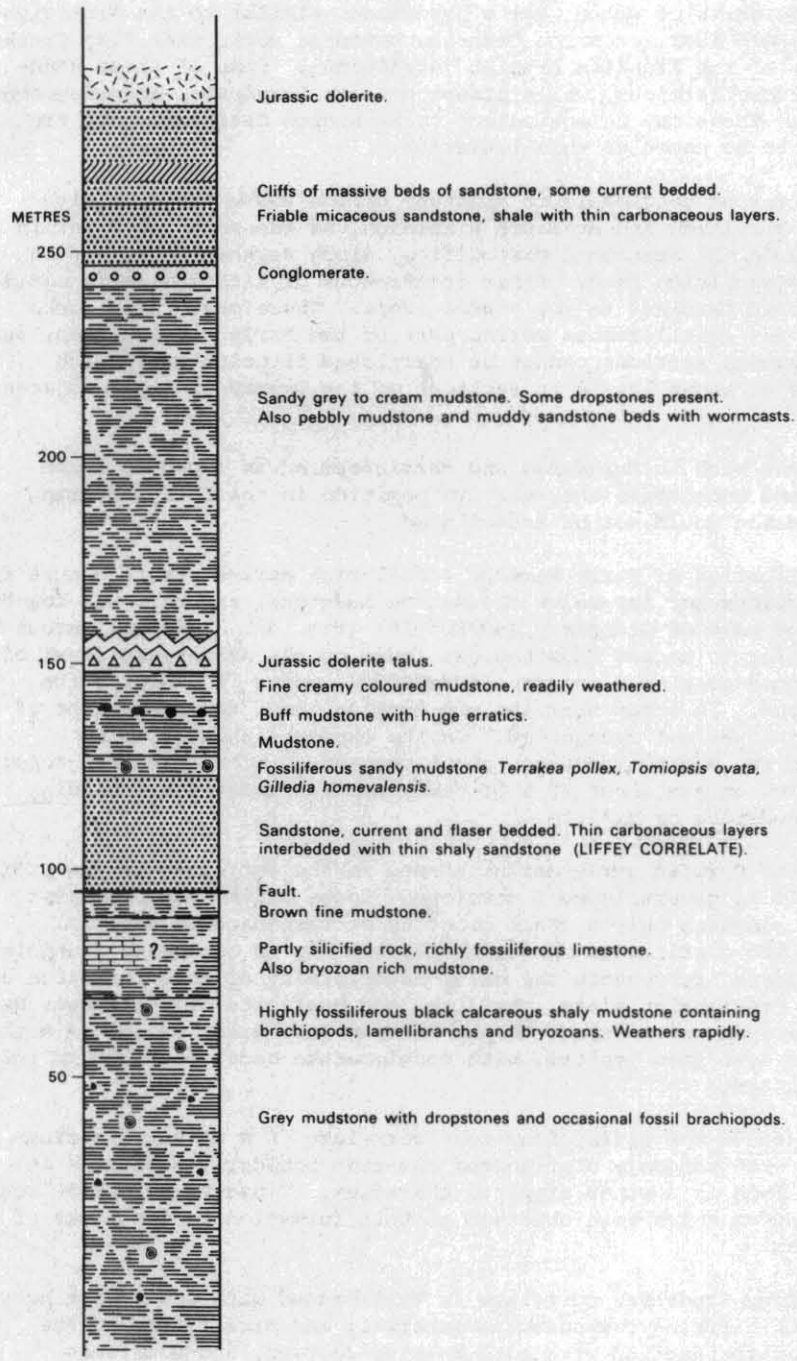


Figure 3. *Composite section, Glengarry-Notley Hills area.*

5 cm

several specimens of *Conularia* were found in the worm cast sandstone, indicating that the Permian upper marine sedimentation was beginning.

The thickness of Liffey Sandstone correlates varies from 49 m along Whites Creek to the fault scarp on Bald Tier, to about 33 m on the Bass Highway at The Long Hill [49/485070]. This particular road cutting exposure (plate 2) shows possible Permian faulting and an unconformity, together with soft sediment structures and other criteria of the depositional history (Banks, 1979). Other good exposures are at Holwell, South Winkleigh, Glengarry, and in the Franklin Rivulet.

Overlying the Liffey Sandstone correlate is a succession of interlayered mudstone, sandy mudstone, thin sandstone beds, and a thin conglomerate. All mudstone zones contain pebbles, cobbles, and boulders, which are sometimes very numerous in a number of horizons, but do not appear to persist laterally.

Directly overlying the Liffey Sandstone correlate is a mudstone which breaks down readily and is generally only recognised in fresh cuttings. A shale rich in bryoza occurs approximately 30 m above the Liffey Sandstone correlate. This also weathers rapidly, but is iron-stained orange-red and is usually recognisable. One fresh cutting in this rock type revealed limestone lenses at the base of the bryozoan shale. The limestone yielded a few brachiopods with *Dielasma?* being the most abundant.

At the head of the valley south from Glengarry [49/823050], sandy mudstone overlies the Liffey Sandstone correlate. This horizon contains a fossil fauna assemblage distinctly different to those seen at other localities at this stratigraphic level. M.J. Clarke described the assemblage as:

'At this locality a well preserved fauna includes *Terrakea pollex* Hill, *Martiniopsis ovata* (Campbell), and *Gilledia homevalensis* Campbell. These fossils indicate a Bernacchian age (Clarke and Farmer, 1976). Similar faunas have not been recognised in correlative lithostratigraphic sequences such as the West Arm Group in the Beaconsfield Quadrangle and the Poatina Group in the Quamby and Lake River Quadrangles. Alternated and discontinuous sedimentation from place to place is indicated by both the lithostratigraphic and biostratigraphic evidence (Clarke and Farmer, 1976, fig. 5).'

Above the fossiliferous horizon is a mudstone containing very large boulders or dropstones completely foreign to the area; most are granite and schist.

About 10 to 15 m above the bryozoan shale, the correlate of the Palmer Sandstone (McKellar, 1957) overlies a shaly mudstone. This correlate is a poorly sorted medium to coarse-grained quartz feldspar sandstone with dispersed pebbles throughout and a concentration of pebbles at the base. These pebbles are often flat or discoidal and of quartzite, schist, and slate. This member is about three metres thick (maximum) and is quite resistant, often forming small benches around spurs. Best outcrops are on Coates Hill at Parkham, and west of Brands Creek near Frankford.

Above the Palmer Formation correlate rocks become more sandy and harder, but are monotonously similar. Variations in the ratio of mud to sand cause different weathering characteristics. Dropstones are numerous and sometimes abundant, and are present throughout. Some beds near the top

Plate 1. *Cliff exposures of Winkleigh Sandstone, near Winkleigh Road*

Plate 2. *Permian faulting and soft sediment structures, Bass Highway, The Long Hill*

of this succession are bioturbated. These rocks are probably a correlate of the Drys Mudstone in the Quamby Quadrangle.

A conglomerate correlatable with Blackwood Conglomerate occurs near the top of the succession. In this quadrangle no exposure directly above the conglomerate was seen of a rock type similar to the preceding mudstone and sandy mudstone. The Blackwood Conglomerate correlate reaches a thickness of about 1.3 m (maximum), usually consisting of about four beds. It is composed of rock fragments, quartz grains with mostly high sphericity, white quartzite, and quartz pebbles cemented with clay and possibly rock flour.

Blackwood Conglomerate correlate was found in all areas where it could be expected to crop out, usually as blocks and boulders not far removed from the estimated position.

Above the Blackwood Conglomerate correlate is a sandy soil which is the decomposed equivalent of the Clog Tom Sandstone. In cuttings the sandstone is friable and consists of medium-grained micaceous sandstone, sometimes carbonaceous where minor thin shale occurs.

Only one exposure showed this sandstone directly overlying the correlate of Blackwood Conglomerate; this was under the power line west of the track to the old Pandora mine [49/668162]. Here sandstone rests conformably on conglomerate, with no shale visible in the four metre thick exposure. Jurassic dolerite overlies the sandstone, so shale may occur higher up the section. A hill at West Frankford [49/680115] has a small exposure of carbonaceous shale containing several centimetres of coal material interbedded with sandstone and again overlain by dolerite. At Notley Hills [49/846076], the interval between Blackwood Conglomerate and the first prominent sandstone outcrop higher up the hill is taken as the Clog Tom Sandstone equivalent, the sandstone cliffs being Triassic sandstone. This interval is about 16 m, but in the Bridgenorth area, the Clog Tom Sandstone may be up to 22 m thick (fig. 3).

Triassic

Triassic sandstone overlies the Clog Tom Sandstone correlate and the base is taken arbitrarily as the first massive cliff forming outcrops as at Notley Hills. Prominent cliffs of sandstone occur only in this area and east of Parkham. Small cliffs are often found below a dolerite capping. Shale is present in the Triassic section but was only seen north and east of Parkham and in the Coates Hill area, and these were poorly exposed outcrops. The maximum thickness of Triassic rocks in the quadrangle is estimated at approximately 130 metres.

Tertiary

In many areas Cainozoic rocks cover the underlying strata with varying depths of partially consolidated material. The most consolidated is probably that north of Moltema, where sandstone and coarse conglomerate are overlain by Tertiary basalt [48/485980]. These sediments may owe their hardness partly to the influence of the basalt.

Silcrete is a white, dense, siliceous, hard Tertiary rock which comprises sand, rock fragments, and pebbles, cemented by chemically precipitated chalcedony emanating from or mobilised by volcanic rocks. Large fragments and pebbles of Ordovician conglomerate are included in the silcrete south-west of Dunorlan on the flank of Punchs Terror [48/477908].

In all occurrences of silcrete mapped Tertiary basalt overlies the outcrop or can be deduced to have done so. It is considered that heat and magmatic solutions have mobilised silica which has precipitated in siliceous permeable deposits.

The most common Tertiary deposits are interbedded impure clay, gravel, and sand, which occur in the deeper basins. At Sassafras East [49/503170] two basalt flows are interbedded with the sediments at different levels. Near Rosevale [48/845990] and Bradys Lookout [49/906098] Tertiary volcanic rocks occur in the successions, whereas near Dunorlan, Moltema, and Deloraine basalt overlies Tertiary sediments.

At Saxons Creek on the Frankford Road lignite bands are interbedded with fine siltstone. A series of six proline auger holes were drilled along Bridgenorth Road in the Rosevale area (known to contain brown coal) and all penetrated coaly sediment at depths of up to nine metres after passing through clay and sandy clay.

A further mappable unit is clay with iron oxide pisoliths. This is generally found on dolerite and is often quarried for dressing gravel roads. The clay is grey-brown and contains numerous dark brown pisoliths. The concentration of pisoliths at the surface by washing away of the clay occurs naturally and lag deposits of pisoliths remain on the flatter areas. Pisoliths are common in and on soil over most dolerite areas.

Several areas of sand are present on hilltops at Sassafras East and are probably of windblown origin. Areas of fairly pure gravel and sand are also present and may represent the margins of Tertiary depositional basins where winnowing presumably occurred. Such areas occur near Exeter [49/875148], along the Rubicon River, and near the Franklin Rivulet bridge on the Frankford Road.

Ferricrete and laterite have developed on some dolerite and basalt areas. A ferricrete (or concretionary ironstone) deposit covers a small area about 4 km south-west of Bridgenorth [49/840010]; this was possibly overlain by basalt and may be the result of *in situ* lateritisation of basalt exposed during the Tertiary. A bauxitic laterite is poorly developed over a small area of dolerite at 48/822965 and on further small areas at 48/605900 and 49/483008. A large lateritised area of concretionary ironstone, clay, and bauxitic material occurs around 48/675935, where basalt overlying dolerite may have been lateritised.

Quaternary

Talus occurs in thick layers on several rock types, blanketing the underlying formations and contacts. The greatest development is around dolerite hills, with lesser basalt talus accumulations at such places as Bradys Lookout, Sassafras East, and south-west of Bridgenorth. Talus from Orodovician rocks is well developed on Punchs Terror near Dunorlan.

Lag gravel deposits occur near Frankford on the Ordovician rock hill-slopes. These gravels are probably reworked Tertiary deposits, originally derived from basement rocks which include Permian basal conglomerate in this area.

In the Rosevale area [48/870913] a flat topped hill is thinnly covered with blocks of quartz pebble ironstone conglomerate, presumably formed in Tertiary times, but which has since been eroded and broken up to remain as a Quaternary lag.

Alluvium, swamp, and marsh deposits are extensive, formed from Tertiary and older rocks washed down onto the flat and into stream and river valleys.

Considerable river terrace deposits occur on mature tracts of the Meander River, while some also occur on the Franklin Rivulet, and Supply Creek east of Winkleigh. At the latter area, old terraces of cobbles and gravel occur above the present flood plain.

IGNEOUS ROCKS

Cambrian

ALTERED DOLERITE

Several bodies of dolerite occur as intrusions in the Cambrian rocks in the Franklin Rivulet valley. These are intruded concordantly with the bedding, and also sometimes concordant to the cleavage. Intrusion is indicated by chilled margins and baked sediments.

The size of the bodies varies from almost 900 m down to about ten metres. Thickness was about 20 m in the one well exposed body in the Franklin Rivulet. Pyrite is common in the slate into which this body was intruded.

In hand specimen, this is a massive even grained greenish grey granular rock. In thin section, the rock consists of a network of saussuritised semi-opaque plagioclase (andesine) laths, with glomero-porphyritic tendencies, in a mosaic of hypidiomorphic hornblende with some alteration to chlorite. Skeletal crystals of magnetite-ilmenite partly altered to leucoxene are common. Ragged plates of brownish biotite also occur.

As the bodies are sometimes concordant to slaty cleavage, it is concluded that intrusion was post-folding.

DIORITE SUITE

In an area of very poor exposure approximately 2 km east of Flowery Gully [49/770182] a collection was made of what appeared to be igneous rocks. These rocks occur as boulders up to 300 mm diameter and as an outcrop in a creek 50 m to the west. No other occurrence of these rocks has been noted, nor have the rocks been seen in the boulders of the basal Permian rocks in this area.

The concentration of these boulders in the one locality suggests they were shed from an underlying body. The surrounding rocks are indurated mudstone, siltstone, greywacke sandstone, and several blocks of chert pebble conglomerate and purplish siltstone. These sedimentary rocks have been assumed to be Cambrian in age.

The igneous suite includes dynamothermally to plutonic metamorphosed rocks resulting from deep seated intrusion (G.B. Everard, pers.comm.). Diorite, granite, and amphibolite are described from this site, together with indurated mudstone.

Petrologist G.B. Everard made the following descriptions of these rocks:

71 - 195A

The hand specimen is a medium-grained rock consisting of irregular and distorted crystals of feldspar in a finer grained black, ferromagnesian matrix.

In thin section, the feldspars appear completely saussuritised, but multiple twinning can still be seen. The twin planes show some distortion and the outlines are vague and irregular. The interstices are filled with hornblende crystals, although some of them are nearly as big as the plagioclase crystals. The absorption and pleochroic scheme is Z (green) > Y (olive-green) > X (yellow-green).

A few fine wavy veinlets of albitic material cut both feldspar and hornblende.

The rock is a metamorphosed diorite.

71 - 195B

The hand specimen is a medium-grained leucocratic rock with rounded quartz grains several millimetres across and interstitial white opaque feldspar cyrstals. Weathering has produced a slight reddish discolouration by iron oxides.

In thin section, the quartz areas are mosaics of recrystallised grains about 0.1 mm diameter. Euhedral and subhedral crystals of feldspar completely altered mainly to sericite tend to occur in clumps and show simple twinning and what is possibly zoning.

Skeletal crystals of ilmenite altered to leucoxene are disseminated through the section.

The rock is a granite.

71 - 195C

The hand specimen is a medium to coarse-grained irregularly mottled, white and greenish rock. All the minerals are relatively soft and can be easily scratched with a knife. The rock is traversed by an irregular system of cracks, filled with weathering products, along which it breaks up.

In thin section, the dark green areas consist of a mosaic of hornblende crystals about 0.05 mm diameter with an occasional crystal of feldspar of similar size. The whitish areas consist of completely saussuritised feldspar.

The rock is a fine-grained hornblende granite.

71 - 195D

The hand specimen is a medium to almost coarse-grained greenish grey mesocratic rock, with crystals of soft altered feldspar and brownish-green ferromagnesians with a marked schiller.

In thin section, the texture is coarsely granular, consisting of completely saussuritised plagioclases and hornblende with irregular boundaries between the two. The feldspar is smoky brown and the hornblende, strongly pleochroic in green and olive-green, shows a schiller

so pronounced as to render some grains almost opaque.

The rock is a coarse grained hornblende granite.

71 - 195E

The hand specimen is a medium-grained pale greenish grey holocrystalline rock. The texture is equigranular and the minerals visible include a soft altered feldspar and a darker ferro-magnesian mineral.

In thin section, the rock is an equigranular mosaic of hypidiomorphic crystals. Feldspar is dark and cloudy with extensive alteration, largely to sericite, but still showing Carlsbad and albite twinning which indicate that the feldspar is andesine. Pyroxenes, both clino and ortho, are present in smaller equant crystals showing alteration to hornblende in parallel position and tremolite in ragged and lath-like crystals.

The rock is a fine to medium-grained diorite.

71 - 195F

The hand specimen is a medium to fine-grained leucocratic to mesocratic rock consisting largely of euhedral crystals of feldspar, many of which show zoning. Black lustrous ferro-magnesian crystals are also common, but most of this material is interstitial to the feldspars.

In thin section, euhedral crystals of feldspar altered to sericite, albite, *etc.* are the commonest feature. The crystals average about 1 mm in length and most show simple or no twinning, but multiple twinning may also occur, although it is difficult to see at the stage of alteration. Some zoning may also occur and most crystals have selvedges of albite. The crystals may be partly or wholly surrounded by quartz which appears to be interstitial, but as disconnected areas of quartz extinguish simultaneously the texture is really poikilitic or poikiloblastic. Brownish to green pleochroic hornblende is common in subhedral crystals and shows alteration to biotite, chlorite, and magnetite oxidised to limonite.

The rock is diorite.

71 - 195G

The hand specimen is a leucocratic, medium-grained rock with altered feldspars and ferro-magnesian minerals.

In thin section, great differences in grain size appear. Feldspar occurs in thoroughly altered rounded crystals in all sizes up to about 2 - 3 mm. Twinning is obscured by alteration to white mica, albite, garnet, *etc.* and only indistinct signs of simple twinning remain. About half the area of the section is occupied by a random structureless mixture of minute irregular fragments of more or less altered feldspar and hornblende in a matrix of fine dust of the same materials. Hornblende also occurs as subhedral crystals, ranging up to 2 mm in length, some of which are crushed and distorted. The specimen generally is a dynamically altered version of 195F. A little quartz is present.

The rock is an altered diorite.

71 - 195H

The hand specimen is a fine-grained sheared granular rock with porphyroblasts of pink feldspar about 2 mm long in a mottled dark green and whitish groundmass.

In thin section, the groundmass is a mosaic of brownish, partly sericitised plagioclase and green pleochroic hornblende with absorption scheme, Z (green) > Y (olive-green) > X (yellow). Small ragged patches of red iron oxide are common and the average grain size is 0.1 mm.

The porphyroblasts are also largely altered to a brownish sericitic material, although signs of simple and multiple twinning are still faintly visible. They also tend to be incompletely rimmed by crystals of hornblende.

The rock is an amphibolite.

71 - 195J

The hand specimen is a very fine-grained bleached grey rock with a few dark lithic fragments up to 1 mm long.

In thin section, the rock has a very fine-grained matrix of sericite and biotite containing angular quartz grains up to 0.1 mm long and a few dark lithic fragments.

The rock is an indurated mudstone.

Jurassic dolerite

This rock occupies about one-third of the quadrangle. It is a medium to coarse grained tholeiitic dolerite and occurs as hill cappings or hills where it has intruded Permo-Triassic rocks as sills. These are best observed along the Tamar Valley at Blackwall and south-west around Bridgenorth and Notley Hills, and around West Frankford.

Intrusions are predominantly into Upper Permian and Triassic sandstone and shale except at the following sites:

49/753173 into undifferentiated basal Permian
49/710165 into Liffey Sandstone correlate
49/685143 into Lower Permian marine mudstone
49/795131 into Liffey Sandstone correlate

A post-dolerite faulted contact showing intense slickensiding is exposed in a road cutting at 49/763027. Dolerite contacts are generally obscured by talus, but at about 49/483114 chilled dolerite is in contact with baked mudstone, indicating faulting contemporaneous with the dolerite intrusion. A steeply dipping intrusive contact between dolerite and Triassic sediments (plate 3) is exposed in a road cutting on Frankford Road near the Rubicon River bridge, one kilometre north of the quadrangle boundary.

Tertiary

The Tertiary igneous rocks are predominantly texturally variable olivine basalts which are distributed over many areas of the quadrangle as lava flows. Basanitic dolerite occurs near the River Tamar around Windermere and Bradys Lookout. The rock in these areas is probably present as a flow, as it overlies clayey sediments of presumed Tertiary age

at Bradys Lookout, but also occupies a valley in the Tertiary clay. The nature and occurrence of the basanitic dolerite near and at Bradys Lookout has been outlined by Sutherland (1971).

At least two periods of eruption occurred at Sassafras East as two distinct flows are separated by a thickness of Tertiary sediments. The two flows are probably the Thirlstane Basalt and Moriarty Basalt (Burns, 1965).

STRUCTURE

The rocks comprising the Badger Head Group in the Frankford Quadrangle are mostly a continuation of the rocks forming the Dazzler Range in the Beaconsfield Quadrangle, and are considered to be a structural high elongated in NW-SE direction. In the Beaconsfield Quadrangle, Gee and Legge (1974) consider the structure to be anticlinal, with concordant structural dislocations at the contacts with the flanking Lower Palaeozoic rocks, without traces of unconformity or sedimentary onlap that might have occurred along the contact. In the Frankford Quadrangle, the Ordovician rocks are considered to lie unconformably on the southern extension of the Dazzler Range, but appear to have concordant dislocation contacts; the folding style and axial direction are similar to those described by Gee and Legge (1974).

The structure south of Salisbury Hill is again a continuation and repetition of those Tabberabberan fold structures described by Gee and Legge in the Cabbage Tree Hill and Salisbury Hill areas. Steep reverse faulting or thrusting brings Cambrian rocks facing and dipping east between Lower Palaeozoic Ordovician sections facing and dipping in an easterly direction. There is also a repetition of Ordovician rocks south of Salisbury Hill, which all dip to the east as far as the east side of Bald Tier, but are separated by slices of Permian rocks which have been faulted by normal faults of post-Jurassic age.

Post-Jurassic faulting appears to be responsible for the remaining structures in the quadrangle. Stepped faulting, as illustrated by Longman (1966) in the Tamar Graben structure, occurs in the Blackwall-Glengarry-Bridgenorth area, where the fault blocks are tilted south-west. East of Blackwall the fault block appears to tilt eastwards into the Tamar Graben.

Intense post-Jurassic faulting exists in the area west of the Ordovician mass at Frankford and terminates with a horst block of Precambrian Badger Head Group rocks which are faulted against Jurassic dolerite [49/685055]. Faulting appears less intense to the south-west of this area.

The thick Tertiary deposits in the Sassafras East area appear to be restricted to the east by upfaulted Jurassic dolerite along the Rubicon River, and to the west by a fault downthrowing to the north-east [49/480118], but the spillover of Tertiary basin sediments and Tertiary basalt capping structures could be vital to this reconstruction.

Another large Tertiary basin with little obvious fault origin occurs in the south-east corner of the quadrangle and is almost completely surrounded by Jurassic dolerite. The large exhumed fault, which extends from the Precambrian north-west of Cottons Hill [49/710165] to possibly 49/764014 may extend further southwards and form the western limit of this basin.

Plate 3. *Steeply dipping intrusive dolerite/Triassic sandstone contact, Frankford Road*

Plate 4. *Quarry in Ordovician Flowery Gully Limestone, Flowery Gully*

5 cm

Another probable fault of large displacement may occur in the vicinity of Gannons Hill [48/513990] where Precambrian rock crops out only 2.5 km east of where Upper Permian rocks crop out at a lower elevation. As the Precambrian rocks are overlain by Lower Permian, this fault may have a throw in excess of the thickness of the Permian succession in this area.

Another structural feature is the uplifted wedge of Cambrian rocks occurring at the southern extent of Port Sorell and in the Franklin Rivulet, and which encloses a down-faulted wedge of Permian rocks.

Other main faulting directions appear to be north-east and north. Faults cutting Jurassic dolerite are usually masked by talus, but are often apparent when similar stratigraphic units occur at different elevations under adjacent north-westerly trending dolerite hills.

ECONOMIC GEOLOGY

LIMESTONE

Ordovician Flowery Gully Limestone occurs in the Flowery Gully area and in the fault scarp at Bald Tier to the east of Mt Careless [49/735125]. The deposit is quarried at Flowery Gully (plate 4) and agricultural limestone, limestone for chemical and metallurgical purposes, and burnt lime are produced. The deposit was investigated in detail by Noakes, Burton and Randal (1954), with a detailed summary given by Hughes (1957, p. 86-103).

Production for the year 1979 was 3413 t of limestone for agricultural purposes and 3442 t of limestone and lime for chemical and metallurgical purposes.

BRICK CLAY

A brick works once operated at Loira, 3 km north of Exeter alongside the West Tamar Highway. The clay used was derived from weathered pebbly mudstone of Upper Permian age. It has also been used in the manufacture of glazed tiles (Noldart and Threader, 1974).

BARITE

This mineral occurs in several small areas in the vicinity of 49/566144. It occurs as pockets at fracture intersections and as selvedges on fracture surfaces. Prospecting the directions of mineralisation has not revealed any economic quantity. The country rock is dense and siliceous hornfels, and the presence of breccia suggests that the mineralisation is in a fault breccia zone in Cambrian rocks.

COPPER

The Pandora copper mine was located on the eastern bank of Coppermine Creek [49/668162] about 8 km north-west of Frankford. The ore body was discovered in the eighteen eighties in Precambrian slate and schistose rock (Montgomery, 1893).

The deposit is in the form of irregular flat veins up to 1.2 m thick, but mostly thinner. The vein material is quartz containing copper pyrites, and iron oxide where iron pyrites was once present.

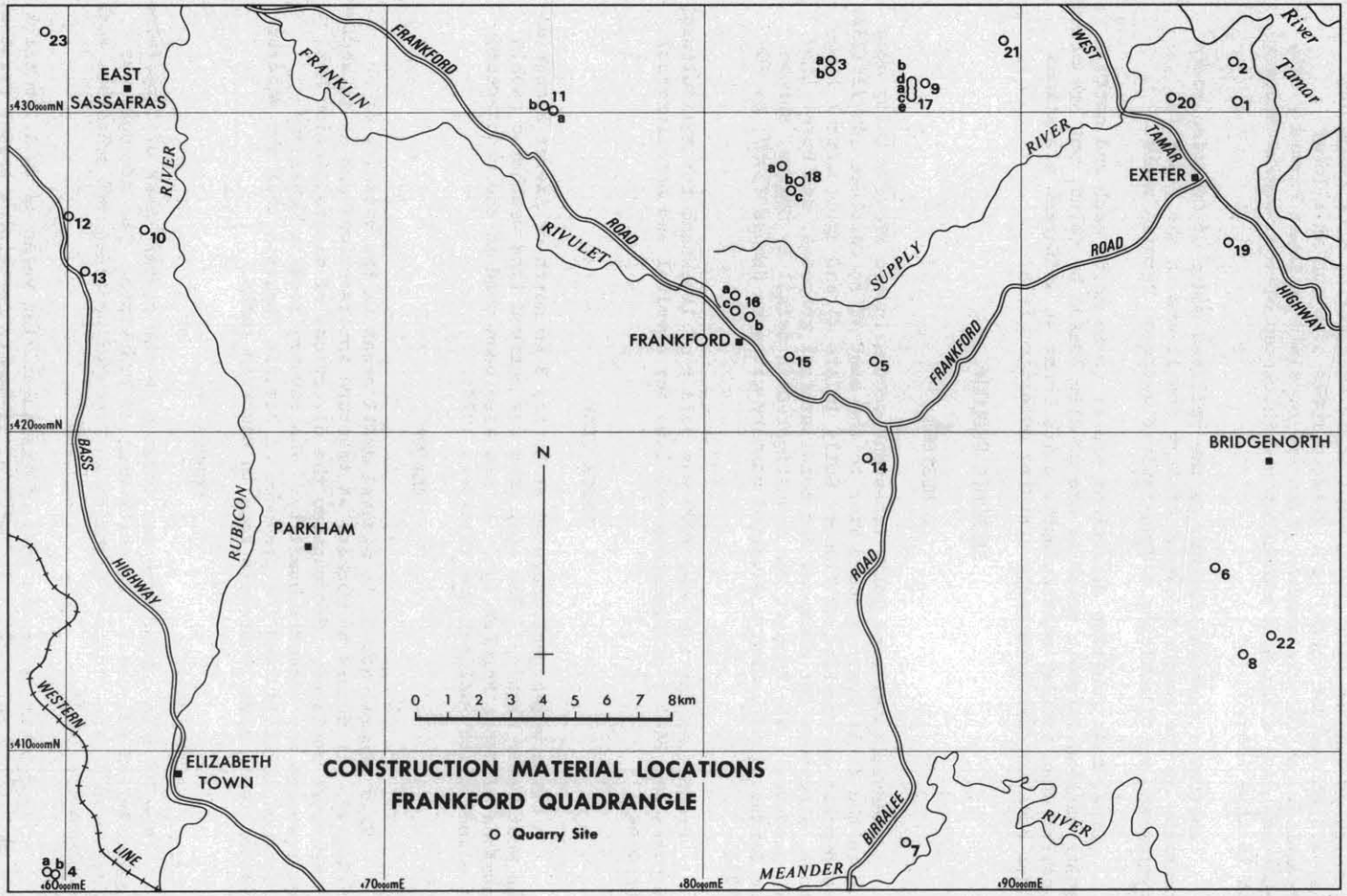

EAST SASSAFRAS
FRANKLIN
FRANKFORD
RIVER
RIVULET
ROAD
FRANKFORD
WEST TAMAR RIVER
River Tamar
EXETER
SUPPLY ROAD
HIGHWAY
BRIDGENORTH
BASS HIGHWAY
RUBICON
PARKHAM
ROAD
WESTERN LINE
ELIZABETH TOWN
BIRRALEE MEANDER RIVER
FRANKFORD
N
0 1 2 3 4 5 6 7 8km
5430000mN
5420000mN
5410000mN
460000mE
470000mE
480000mE
490000mE
CONSTRUCTION MATERIAL LOCATIONS
FRANKFORD QUADRANGLE
Quarry Site

Figure 4.

5 cm

The low grade and small quantity of ore resulted in the mine being abandoned about 1913. No production figures are available. A parcel of five tonnes of picked ore is reported to have assayed 7.5% copper (Hughes, 1954).

GOLD

Many prospect pits, costeans, and adits are present south of Salisbury Hill and it is assumed these were excavated in search for gold. There are no records of any discoveries.

SILICA

A lease (93M/69) covering the Ordovician rocks at Mt Careless was formerly held by the Broken Hill Proprietary Company for silica. The peaks of some of this mountain comprise decomposed and disaggregated quartz sandstone.

COAL

Hills *et al.* (1922, p. 242) reported that a 1.2 m thick seam of brown coal in Tertiary sediments had been opened up in the Rosevale district, and a few tonnes extracted and used for manurial purposes. The coal had not been used as a fuel. Analysis of the coal gave the following results:

Moisture	15.1%
Volatile combustible matter	39.1%
Fixed carbon	29.2%
Ash	16.6%

CONSTRUCTION MATERIALS

Detrital deposits

Weathered basement conglomerate and quartzite of Ordovician age, together with basal onlap beds of Permian conglomerate, are quarried at Frankford. The quarried products are screened into several sizes and used for various purposes but mainly in roadworks as a base course and surface course materials. Details of construction materials are given in Table 1* and Figure 4.

Tertiary and Cainozoic deposits

Areas of gravel are distributed through the quadrangle. These are mainly river terrace gravel, some possibly lacustrine, lag of reworked Tertiary sediment, and *in situ* Tertiary gravels. These are used in structural work, horticultural ornamental work, and as road course materials.

Pisolitic ironstone (buckshot gravel)

Deposits of this material occur on Black Sugarloaf, on hills west of Bradys Lookout, and on areas of dolerite in the south-eastern portion of the quadrangle. Where concentrated by natural processes (the removal of the clay and soil in which the pisoliths formed) the resulting deposit is used as top dressing for unsealed roads.

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* From Construction Materials Register, Tasmania Department of Mines

Table 1. SIZING ANALYSIS AND PHYSICAL PROPERTIES OF CONSTRUCTION MATERIALS, FRANKFORD QUADRANGLE.

No.+	AMG Reference	ANG Reference	Sizing Analysis Cumulative % passing (mm)									Status*
			53	37.5	26.5	19	9.53	4.76	2.36	0.425	0.075	
1	DQ968305	49/892162			100	96	70	56	45	29	19	D
2	DQ966316	49/880173			100	90	72	61	45	24	9	OW
3a	DQ840316	49/742176	100	97	91	84	70	56	48	40	32	OW
3b	DQ840314	49/742174										OW
4a	DQ596062	48/472901	100	96	92	88	75	60	50	35	18	FW
4b	DQ597061	48/473900	100	98	88	83	76	67	58	39	14	FW
6	DQ961157	49/871001				100	95	69	46	42	36	D
7	DQ866072	48/767909										
8	DQ970130	48/882970				100	98	84	73	69	35	OW
9	DQ870309	49/775168										OW
10	DQ623264	49/503122				100	96	84	68	30	11	OW
11a	DQ750301	49/644160	100	97	84	69	50	36	26	16	10	OW
11b	DQ752300	49/646159	97	79	73	63	50	40	33	22	14	OW
12	DQ600266	49/479125										D
13	DQ607246	49/485104		100	94	90	78	65	55	44	35	R
14	DQ853192	49/755040	100	97	87	77	57	44	38	26	9	OW
15	DQ828224	49/728076		100	92	86	70	49	34	26	9	OW
16a	DQ809243	49/706097	100	99	91	81	61	45	34	19	11	OW
16b	DQ814236	49/712088										D
16c	DQ810237	49/707089										FW
17a	DQ866307	49/770166	100	94	85	79	68	51	33	19	13	OW
17b	DQ866309	49/770168										OW
17c	DQ866306	49/770165										OW
17d	DQ867308	49/771167										OW
17e	DQ866305	49/770164										FW
18a	DQ824284	49/724140										FW
18b	DQ827276	49/728132	100	94	83	77	67	60	55	35	21	OW
18c	DQ830268	49/732123										OW
19	DQ967260	49/879113		100	97	96	95	87	66	43	38	OW
20	DQ948303	49/860161		100	99	97	89	64	42	36	31	OW
21	DQ896324	49/803184	100	93	82	70	52	37	29	16	10	OW
22	DQ979136	48/892978				100	99	92	67	48	41	OW
23	DQ593325	49/472189										OW

\+ Pit locations on Frankford construction materials map (fig. 4)

* D = disused, OW = occasionally worked, FW = frequently worked, R = rehabilitated.

Table 1. (continued)

No.	Name	Locality	Dust Ratio	Liquid Limit	Plast. Index	Linear Shrink	Classi-fication†	Material	Est.Prod. (m^3)	Res.x
1	Weiner	Gravelly Beach	0.67	71	51	17	GC	Quartz gravel	10-20 000	L
2	Jones	Paper Beach	0.38	43	28	11	GW-GC	Quartz gravel	1 500	M
3a	Pentlands	Flowery Gully	0.79	22	5	3	GM-GC	Siltstone	4 500	M
3b	Pentlands	Flowery Gully						Siltstone	4 000	M
4a	Macrow	Dunorlan	0.50		Non-plastic		SMD	Sandy quartzite	1 000 000 +	VL
4b	Atkins	Dunorlan						Sandy quartzite	500 000	L
5	Crown Land	Frankford	0.37		Non-plastic			Sandy quartzite	50 000 +	VL
6	Cartwright	Bridgenorth	0.87	39	21	10	SC-GC	Ironstone	500	Nil-VS
7										
8	D.H. Johnston	Bridgenorth	0.52	21	5	3	SM-SC	Gravelly loam	2 - 4 000	M
9	Assoc.Tree Farmers	Rookery Road						Siltstone, sandstone	10 000	VL
10	Crown Land	Smiths Road	0.35		Non-plastic		GW-GM	Quartz gravel	5 000	S
11a	Forestry Commission	Frankford Road	0.61	33	11	5	GP-GC	Mudstone	16 000	VL
11b	Forestry Commission	Frankford Road	0.66	41	19	6	GC	Mudstone	8 000	VL
12	DMR	Frankford Road						Dolerite	8 000	Nil-S
13	Padman, DMR	Parramatta Creek	0.79	51	28	10.5	GC	Claystone, siltstone	50 000	Nil
14	V. Lockwood	Birralee Road	0.34		Non-plastic		GP-GM	Quartz gravel	100 000	L
15	DMR	Frankford	0.36	20	0	0	GW-GM	Quartz gravel	30 000	L
16a	Philpott	Holwell Road	0.59	28	8	3	GP-GC	Slate, gravel	2 000	S-M
16b	DMR	Holwell Road						Quartzite, siltstone	6 000	
16c	DMR	Holwell Road						Conglomerate, schist	2 000	
17a	Pentland	Rookery Road	0.68	16	0	0	GMD	Siltstone, quartz sand	30 000	M
17b	Pentland	Rookery Road							800	VL
17c	Pentland	Rookery Road							3 000	S
17d	Pentland	Rookery Road							9 000	L
17e	Pentland	Rookery Road							3 000	L
18a	Gardner	Hodgetts Road							1 700	M
18b	Stubbs	Hodgetts Road	0.60		Non-plastic		GMD	Sand, quartz pebbles	30 000	VL
18c	DMR	Hodgetts Road						Quartz sand	8 000	L
19	Weiner	West Tamar Highway	0.89	39	21	11	SC	Ironstone	5 000	L
20	Partridge	'Burnlea'	0.86	26	8	4.5	GC	Ironstone gravel	20 000	L
21	Wright	West Tamar Highway	0.65	50	27	12	GP-GC	Mudstone	3 000	M
22	Jones	Ecclestone Road	0.85	26	7	3	SM-SC	Ironstone	2 000	M
23	Cartmore	Harford Road						Sand, clay	10 000	

† S = sand, C = clay, G = gravel, W = well graded, P = poorly graded, L = low plasticity, M = mixed non-clay fines, D = suitable plasticity.

x Reserves, L = large, M = moderate, S = small, V = very

Building stone

Very little building stone has been quarried as the rock types are generally unsuitable. A correlate of Liffey Sandstone at Winkleigh was examined as to its suitability (Threader, 1966).

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APPENDIX 1

Transformation of grid references

The Australian National Grid (ANG), in which coordinates are given in yards, is used on the Frankford geological map sheet and ANG references are given in this report. The ANG is now obsolete and has been superseded by the metric Australian Map Grid (AMG). When using this report in conjunction with later maps printed with the AMG the equivalent references may be found by consulting the following table:

ANG 100-yard reference	*AMG 100-metre reference*	*ANG 100-yard reference*	*AMG 100-metre reference*
48/477908	DQ601068	49/700100	DQ802246
48/485980	DQ607134	49/710165	DQ811306
48/513990	DQ633144	49/713035	DQ815187
48/605900	DQ718062	49/726130	DQ826274
48/675935	DQ781095	49/734059	DQ834209
48/822965	DQ915124	49/735125	DQ834269
48/845990	DQ936147	49/753173	DQ850313
48/870913	DQ960077	49/763027	DQ861180
49/458110	DQ581253	49/764014	DQ862168
49/465100	DQ588244	49/765101	DQ862248
49/480118	DQ601260	49/765120	DQ862265
49/483008	DQ605160	49/770115	DQ866261
49/483114	DQ604257	49/770182	DQ865322
49/485070	DQ606217	49/771170	DQ867311
49/503170	DQ622308	49/778090	DQ874238
49/545195	DQ660331	49/795131	DQ889276
49/565150	DQ678290	49/805095	DQ898243
49/566144	DQ679285	49/809088	DQ902236
49/572155	DQ685295	49/823050	DQ915202
49/573197	DQ685334	49/840010	DQ931165
49/668162	DQ772303	49/846076	DQ936226
49/680115	DQ784260	49/875148	DQ962292
49/685055	DQ789205	49/906098	DQ991247
49/685143	DQ788285		