

1982/30. Petrography of eighteen Tertiary basalt samples, two altered dolerite samples, and a tuff sample from the Sorell Quadrangle.

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Abstract

Detailed petrographic examination of eighteen basalt samples from the Sorell Quadrangle shows that sixteen, mainly from the Copping and Dunalley areas, are similar to the olivine-bearing but chemically silica-saturated Cainozoic 'tholeiites' common in south-eastern Tasmania and the Midlands, and correspond to the 'Claremont Group' of Sutherland (1976). Textural variations, particularly in the groundmass, are attributed to different rates of cooling. The other two basalt samples from the Wattle Hill area are titanaugite-bearing alkali-olivine basalts and may belong to Sutherland's 'Risdon Group'.

Two altered dolerite samples, from near Copping and from Dunalley, and a fine crystal-vitric tuff from near Forcett, are also described.

INTRODUCTION

Twenty-one thin sections were cut of igneous rock specimens (eighteen of basalt, two of altered dolerite, and a tuff) collected by A.B. Gulline during detailed regional geological mapping of the Sorell Quadrangle. The specimens are from the Bream Creek, Copping, Dunalley, Murdunna, Forcett, and Wattle Hill areas, and from Black Jack Point on the Tasman Peninsula. The location of each sample is shown in Figure 1.

PETROGRAPHY

COARSE OPHITIC 'MIDLANDS TYPE' BASALT : BREAM CREEK AREA

BC33[EN685583]. This is a relatively fresh, fairly coarse-grained to almost porphyritic, holocrystalline basalt with no flow lamination. The rock consists of phenocrysts of olivine in an ophitic to sub-ophitic groundmass of plagioclase, augite, and opaque minerals.

Phenocrysts of olivine, typically 1-2 mm diameter, are oblong, crudely polygonal, or shortly prismatic subhedra and anhedral. Some are rounded, suggesting resorption into the magma. Olivine is colourless, biaxial negative with a large 2V (so $Fa > 13$) and has parallel extinction to (010) cleavage and faces where present. Alteration to dark red-brown iddingsite is confined to some margins and some of the larger irregular fractures.

Irregular, angular augite grains (500 μ m-2 mm) enclose or partly enclose many plagioclase laths. Individual grains are often clustered and twinned, and are best distinguished under crossed nicols. Augite is very pale yellow-green and non-pleochroic, biaxial positive with a moderate 2V, and has a maximum extinction angle to the slow ray of about 48°.

Plagioclase laths (150-400 μ m) are randomly oriented, both within augite grains and in plagioclase-rich parts of the groundmass. The mineral is labradorite (An₆₀₋₆₅) (maximum extinction angle of albite twins about 35°, optically positive).

Irregular, angular, equant opaque minerals (40-200 μ m diameter) are scattered sparingly throughout the section; they are probably ilmenite.

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Iddingsitised rims of, and cracks within, olivine phenocrysts sometimes contain a shortly fibrous outward radiating, length-slow mineral of high birefringence, probably anthophyllite.

Plagioclase and augite are generally unaltered.

M63[EN689603]. This fairly coarse-grained holocrystalline basalt is almost identical to BC33, consisting of olivine phenocrysts in an ophitic groundmass of calcic plagioclase, augite, and minor opaque minerals, and lacking any flow lamination. It differs in having slightly less augite and a greater degree of alteration.

Olivine is extensively rimmed and veined by poorly crystalline, deep red-brown iddingsite (?anthophyllite and iron oxides) and less commonly dirty green bowlingite (?chlorite and iron oxides). Augite is extensively replaced by a similar orange-red alteration, and plagioclase is sometimes cloudy, suggesting incipient replacement by fine-grained epidote (saussuritisation).

MB61[EN698588]. This is a very similar basalt, differing from BC33 in having a slightly finer, subophitic matrix with somewhat less augite, and more extensive alteration, particularly iddingsitisation of olivine phenocrysts.

JB64[EN682598]. This rock is another somewhat altered, relatively coarse basalt, very similar to BC33, M63, and MB61. The rock consists of olivine phenocrysts in an ophitic to subophitic groundmass of labradorite, augite, and opaque minerals. Minor colourless, extremely birefringent carbonate, probably calcite, occurs as small irregular anhedral patches within the groundmass. Both plagioclase and augite are idiomorphic against carbonate, which appears to be a late stage igneous mineral rather than a diagenetic introduction.

CSR67[EN649600]. This slightly altered, medium to coarse-grained holocrystalline basalt lacks any flow lamination. It consists of red-brown, completely iddingsitised phenocrysts of olivine (typically 1 mm diameter, but ranging from 3 mm down to granules of a few tens of micrometres) in a subophitic groundmass of plagioclase, augite, former olivine granules, abundant to irregular opaque minerals, and analcite.

Augite occurs as angular to irregular crystals. Although ophitic inclusions of plagioclase are very abundant, individual grains can be recognised by crystallographic continuity over 1-2 mm in most cases. This augite is optically similar to other basaltic augite from this district (colourless to pale green-brown, non-pleochroic, biaxial positive with a moderate 2V). It is extensively altered to a colourless, microcrystalline to cryptocrystalline aggregate (possibly serpentine or chlorite, and epidote).

Narrow laths of plagioclase, 150-400µm long, are ophitic against both augite and analcite, and have a maximum extinction angle corresponding to labradorite (about An_{55}). Many show a partial to complete alteration to a finely microcrystalline to cryptocrystalline aggregate, possibly mainly fine epidote ('saussurite').

Analcite occurs as a late-stage, amygdaloidal filling of irregular vugs and vesicles typically 300µm to 1.5 mm long. The mineral is colourless and uniaxial positive with low relief, very low light grey birefringence, and poorly developed cleavage. Simple twinning, rectangular zoning,

and undulose to fanning extinction are common. A few analcite patches have kelpyitic rims 20-50µm wide of a finely fibrous length-slow mineral, probably natrolite.

The rock is similar to the other four ophitic 'Midlands-type' basalts, except for the presence of amygdaloidal analcite.

FINE INTERGRANULAR TO INTERSERTAL BASALT ('JORDAN'
AND ?'BRIDGEWATER' TYPES)

Copping and Benders Hill areas

CG69 [EN671577]. This almost unaltered black basalt consists of abundant phenocrysts, chiefly of olivine but also of augite, in a medium to coarse, inter-granular to pilotaxitic groundmass of laths and microlites of plagioclase, between which are granules of augite, opaque minerals, and minor(?) devitrified glass. A flow lamination, defined by the alignment of plagioclase laths, is locally well developed, but on thin-section scale there is only a vague overall flow direction.

Olivine phenocrysts, typically 200µm-1 mm diameter, are generally jagged to slightly rounded polygonal subhedra, or less commonly elongate length-slow laths. The mineral is biaxial negative with a large 2V. Incipient iddingsitisation around rims and along fractures and partings is common, particularly near glass patches of the groundmass.

The colourless, somewhat small polygonal augite phenocrysts are less abundant and are distinguished by their oblique extinction, smaller 2V, and positive optic sign.

Plagioclase laths (50-500µm long and 5-20µm wide) are compositionally labradorite (about An₆₀). Opaque minerals occur as abundant angular to oblong blebs (typically 2-10µm).

Sporadic, irregular orange-yellow cryptocrystalline to minutely fibrous patches, often with kelpyitic rims, within the groundmass are probably devitrified glass.

CSR68 [EN656604]. This fine-grained black basalt consists of phenocrysts of olivine and an intersertal to intergranular groundmass of plagioclase, finer olivine, augite, and abundant opaque granules and some devitrified glass. The rock is similar to CG69, but lacks flow lamination, has fewer and smaller phenocrysts, a finer grained groundmass, and a greater degree of alteration.

Olivine phenocrysts (length slow, biaxial negative, large 2V) are typically 200-700µm diameter and range in form from prismatic subhedral to equant, rounded to irregular subhedra, and anhedral. The smaller (50-200µm) grains and the rims of the larger phenocrysts are altered to orange-brown iddingsite.

Augite (very pale green, non-pleochroic, biaxial positive, oblique extinction) is much less abundant than olivine, and occurs as mottled, incipiently to partially altered polygonal euhedra and subhedra 100-200µm in diameter.

Short (100-400µm) narrow plagioclase laths (about An₇₀) are set in a black aggregate consisting of densely disseminated, fine (20µm to <1µm) equant rounded opaque blebs; subordinate, very small (<10µm) granules and microlites of augite; and a very fine mesostasis. Although superficially

a chaotic mixture of opaque dust and devitrified glass, when resolved under high power the mesotaxis appears to consist of opaque dust and numerous very small but birefringent plagioclase microlites, with little isotropic glass.

C48 [EN634583]. This fine-grained, weathered basalt is also similar to CG69. It is slightly more porphyritic, with fewer, larger (250µm-1.5 mm), largely iddingsitised olivine phenocrysts in a medium to fine-grained groundmass. A well developed flow lamination, enveloping the phenocrysts, is defined by alignment of small, narrow (20-200µm by 2-20µm) plagioclase laths. Under strong magnification, the groundmass is intergranular, with granules (typically 5-30µm) of augite and opaque minerals lying in the interstices between plagioclase laths. Little if any glass seems to be present, although it may be difficult to recognise because of the alteration and strong orange-red ferruginous staining of the groundmass.

An embayed, rounded xenocryst (1.5 mm x 0.5 mm) of quartz (low birefringence, uniaxial positive) is aligned with the flow lamination. It is surrounded by a reaction rim of ?augite, now largely altered to a poorly crystalline, fibrous orange-brown material (possibly 'iddingsite' or iron-rich chlorite).

K51 [EN677626]. This is another fine-grained basalt similar to those described above. A rather poorly developed flow lamination is present.

The rock consists of abundant, polygonal to rounded, subhedral phenocrysts of partially iddingsitised olivine (200µm-1 mm) and subordinate rectangular to polygonal, typically subhedral phenocrysts of augite (100µm-1 mm), in a fine-grained, intergranular groundmass of plagioclase laths (50-200µm) and microlites, augite granules (5-50µm), abundant opaque blebs (5-20µm), and minor devitrified glass.

The augite phenocrysts, some of which show partial alteration, are pale yellow-green to faintly purplish, weakly pleochroic and biaxial positive. They are probably more titaniferous than those of most other local basalts.

RT56 [EN688628]. This fine-grained basalt lacks any flow lamination and is the more altered equivalent of K51. Olivine phenocrysts and augite granules and phenocrysts are largely to completely altered to orange-red ('iddingsite') or greenish ('bowlingite'), finely crystalline aggregates. In the groundmass, plagioclase laths are largely saussuritised, and intergranular mafic granules and glass altered to greenish chloritic material.

Dunalley area

D2 (boulder) [EN663499]. This porphyritic, olivine-rich basalt lacks any flow lamination. It consists of phenocrysts of olivine set in a rather coarse, intergranular to subophitic groundmass of plagioclase laths, augite, olivine and opaque minerals.

Olivine phenocrysts (300µm-3 mm) are irregularly cracked, rounded to crudely polygonal equant subhedra and anhedra. The mineral is biaxial negative with a large 2V (so Fa > 13). Red-brown to greenish alteration is common, especially around fractures, and a few phenocrysts are completely altered.

Plagioclase laths (150-350µm), the most abundant constituent of the groundmass, are labradorite (about An₅₅). Cloudy, incipiently altered

grains of colourless to greenish-brown augite (50-200µm) are intergranular between, to supophitic against, plagioclase. They are distinguished by their cleavage and oblique extinction from olivine anhedral of similar size. Equant, angular opaque grains (3-15µm) are abundant.

D22[EN668504]. This very fine-grained basalt is otherwise similar to other local basalts such as K51 and T1. A poorly developed flow lamination is defined by a vague alignment of plagioclase laths.

Fresh to incipiently altered labradorite laths (100-500µm by 20-100µm) and rounded, oblong to crudely polygonal phenocrysts of largely iddingsitised olivine (100-400µm) are set in an altered, dirty brown-green mesostasis. This consists of finer, often saussuritised plagioclase laths and microlites, small granules of (?)augite (5-20µm), and densely disseminated small angular equant opaque minerals (3-15µm), and grades in size down to microcrystalline and cryptocrystalline devitrified basaltic glass.

D28A (dyke) [EN670528]. This strongly altered medium to fine-grained basalt has a good flow lamination.

Rounded to polygonal pseudomorphs after olivine (100-300µm) are now thoroughly altered to a yellow-orange to brown fuzzy cryptocrystalline aggregate, possibly consisting of iron oxides, carbonate, serpentine, and clay minerals. Finely fibrous, radiating /anthophyllite (length-slow, straight extinction) is also present.

Narrow laths of plagioclase (100-600µm by 20-120µm) are abundant and show incipient saussuritisation. The maximum extinction angle (33°) and large, negative 2V suggest a composition of about An₅₈ (labradorite).

The groundmass consists of disseminated, angular equant opaque minerals (3-30µm) and an altered, dirty green-brown microcrystalline to cryptocrystalline aggregate. This could have been derived from either an intergranular intergrowth of plagioclase and augite, as in other local basalts, or from the devitrification of basaltic glass.

D28B (dyke) [EN670528]. This strongly altered, fine-grained basalt differs from D28A, from the same outcrop, only in having somewhat smaller (50-200µm) iddingsitised pseudomorphs after olivine.

Traces of unaltered, colourless to pale violet clinopyroxene, with an extinction angle of about 40°, may be titaniferous augite.

An embayed, rounded xenocryst of plagioclase (1.5 mm by 0.9 mm) has very narrow (3-35µm) lamellar multiple twinning. The extinction angle is very low (6°), but in one crystal is of little diagnostic significance.

Murdunna area

M60[EN677426]. This coarsely porphyritic basalt consists of large phenocrysts (up to 5 mm) of olivine, and subordinate augite, set in a rather fine intergranular groundmass of plagioclase laths and microlites, augite and ?olivine granules, and densely disseminated opaque blebs. In places within the groundmass, very finely crystalline plagioclase aggregate may grade to devitrified glass. There is a poorly developed, variable flow lamination defined by local alignment of plagioclase laths.

Olivine phenocrysts range up to 5 mm and down to granules of a few

hundred micrometres, but are typically 1-2 mm long. Most are polygonal to prismatic irregularly cracked euhedra and subhedra, and some show slight embayment by the groundmass, suggesting resorption. The mineral is colourless and biaxial with a 2V close to 90°, possibly just positive, suggesting a relatively magnesian composition (Fa < 13). However some phenocrysts are zoned with a slightly higher birefringence and presumably more iron-rich composition around the rim. Incipient iddingsitisation or bowlingitisation, mainly around fractures, is common.

Augite phenocrysts, which are much less abundant than those of olivine, are smaller (500µm-1 mm), typically angular subhedra. Many are full of inclusions (i.e. poikilitic), especially of plagioclase, opaque minerals, and sometimes olivine. Augite has rewelded open fractures in olivine phenocrysts, and so is a relatively late-crystallised mineral. Augite is colourless to very pale green, non-pleochroic, and biaxial positive with a moderate 2V.

The intergranular groundmass consists of laths (40-200µm long) and acicular microlites of plagioclase (bytownite, about An75), granules of augite and possible olivine (<3µm), ranging up to the phenocrysts), and densely disseminated equant opaque blebs.

The relatively magnesian olivine and calcic plagioclase suggest that this flow is derived from relatively undifferentiated magma. Before extrusion, a period of slow cooling would be required to allow for crystallisation of large olivine and augite phenocrysts.

Black Jack Point, Tasman Peninsula

T1[EN531396]. This rock is a very fine-grained black basalt with a well developed flow lamination defined by dark streaks richer in fine-grained opaque minerals and, to a lesser extent, by alignment of plagioclase laths. The rock consists of irregular to polygonal phenocrysts (typically 100-600µm long) of former olivine, most of which are now completely iddingsitised, in a very fine intergranular matrix of narrow laths and microlites of plagioclase (length typically 20-70µm), granules of colourless ?augite (3-15µm), densely disseminated fine opaque blebs (mostly 5-20µm), and minor glass.

The rock is similar to the intergranular basalt of the Copping district, but finer grained and presumably more rapidly chilled.

ALKALI-OLIVINE BASALT : WATTLE HILL AREA

SC34[EN548654]. This medium-grained basalt has a moderately well developed flow lamination defined by alignment of plagioclase laths. The rock consists of abundant olivine phenocrysts in a somewhat altered, coarsely pilotaxitic to felty intergranular groundmass of plagioclase laths, titan-augite grains, opaque minerals, and minor ?apatite and ?perthitic feldspar.

Olivine phenocrysts are equant, rounded to polygonal subhedra and anhedral 100µm-1 mm diameter. The mineral is colourless and biaxial negative with a large 2V. Only incipient iddingsitisation is present.

The groundmass consists chiefly of crowded, intermatted to crudely aligned, narrow plagioclase laths and needles (50-100µm by 5-40µm). A cloudiness caused by incipient to partial saussuritisation largely masks the optical properties, but the plagioclase may be more sodic (possibly an andesine) than other basalts from the Sorell Quadrangle.

Titanaugite grains are small (50-250µm) irregular to oblong or lath-like subhedra. They display a weak to moderate pleochroism from pinkish-purple to pinkish-yellow, oblique extinction, and a biaxial negative figure with a moderate 2V (about 40°-50°). Coarse (30-100µm) angular equant opaque minerals are abundant.

Within the groundmass are some irregular, late-formed patches, a few hundred micrometres across, of a poorly crystalline substance with low relief and birefringence, similar to plagioclase. Extinction is uneven and undulose. This is probably finely crystalline (few tens of micrometres) microperthite.

Rods and needles (30-150µm long) of colourless, high relief (?)apatite are prominent in these microperthitic patches, and thus is probably a late-formed accessory mineral.

The presence of pleochroic titanaugite and the abundance of olivine phenocrysts suggest that this is an alkali-olivine basalt, but a chemical analysis would assist classification. Texturally the basalt shows some similarities to the 'Branxholm type' basalt described by Edwards (1950) and common in northern Tasmania.

W37 [EN547646]. This fine-grained titanaugite-bearing basalt is similar to SC34, but contains only a few phenocrysts. These include irregular, roughly equant anhedral up to one millimetre diameter of olivine (colourless, biaxial, large 2V) and clustered anhedral and subhedra (also up to 1 mm) of colourless to pale yellow-green, sometimes zoned augite (biaxial positive, moderate 2V). This phenocrystal augite appears to differ from groundmass titanaugite.

The great bulk of the rock is a pilotaxitic to finely ophitic groundmass of plagioclase, titanaugite, and opaque minerals.

Densely packed laths and less commonly irregular anhedral of plagioclase (100-300µm long) are crudely aligned to define a flow lamination. They are probably labradorite of about An₆₀ and form a finely ophitic to subophitic intergrowth with angular, irregular subhedra and anhedral (50-200µm) of titanaugite (pinkish purple to greenish, weak pleochroism, biaxial positive, moderate 2V). Equant angular opaque minerals (20-70µm) are also abundant in the matrix. Some fine-grained olivine may be present.

The rock is somewhat altered, with patches showing saussuritisation of plagioclase, red-brown iddingsite-like alteration of titanaugite and possible olivine, and ferruginous staining of the groundmass.

The relative lack of phenocrysts, compared to SC34, may be caused by crystal settling before extrusion. The rock is also an alkali-olivine basalt, texturally similar to the ophitic 'Burnie type' described by Edwards (1950).

HYPERSTHENE DOLERITE, DUNALLEY

DT75 [EN665518]. This rock is an altered, fine-grained dolerite with a strong orange-brown ferruginous staining largely obscuring the igneous texture. It consists of a subophitic to intergranular intergrowth of plagioclase, augite, hypersthene, and opaque minerals.

Both augite and hypersthene occur as irregular to oblong subhedra and anhedral, with extensive orange-brown alteration. Augite has extinction oblique to the cleavage and is biaxial positive with moderate 2V, whilst

hypersthene has parallel extinction and is biaxial negative with a rather low 2V (suggesting an intermediate composition near En₅₀Fs₅₀).

Plagioclase (labradorite, about An₆₀) forms stubby laths 100-300µm long, and less commonly equant subhedra and anheda. It is unaltered or shows incipient saussuritisation.

Opaque minerals, which are less abundant than in most of the local basalts, occur as large (40-200µm) irregular angular anheda.

The rock is a fine-grained, rapidly cooled tholeiitic dolerite. The presence of hypersthene rather than pigeonite suggests that it is relatively undifferentiated, and as neither quartz nor olivine were observed, it is probably just saturated.

QUARTZ DOLERITE, COPPING

CO45[EN647580]. This is a strongly altered, fine-grained rock with no phenocrysts. It consists of an ophitic intergrowth of short, narrow laths (50-200µm by 10-40µm) of plagioclase (about An₆₀) with angular, subhedral to anhedral equant grains (100-200µm) of augite (biaxial positive, 2V about 35°). Subordinate anhedral quartz is present often in quite large (100-500µm) grains. In contrast to the local basalt, very little primary opaque material is present.

Augite shows varying degrees of alteration to a dark brown, almost cryptocrystalline opaque aggregate.

The rock is an altered, fine-grained quartz dolerite. The apparent absence of hypersthene or pigeonite and the possible iron-rich nature of the augite suggest that it may be relatively differentiated.

FINE CRYSTAL-VITRIC TUFF, FORCETT AREA

F19[EN536587]. This tuff consists of pseudomorphs of iddingsite after olivine, narrow laths of feldspar, and flattened bubbles, beads, and shards of devitrified glass in a groundmass of black volcanic dust. A crude layering is defined by variations in the darkness of the groundmass, alignment of plagioclase laths, and flattening of shards.

Deep red-brown, completely iddingsitised olivine crystals (40-200µm) are characteristically crudely polygonal to oblong.

Laths and microlites (up to 150µm by 30µm, but typically much smaller) of feldspar, predominantly plagioclase, are much smaller and less abundant than in local basalt. Generally their long axes are randomly oriented, but sometimes they are subparallel to the depositional layering.

The glassy structures include nearly round, to more commonly flattened elliptical bubbles, typically 50-150µm in diameter with a surface thickness of 10-30µm. Their interiors are usually filled with fine black volcanic dust, although many of the smaller ones are glassy throughout (i.e. bead-like). These bubbles and beads grade, with increasing flattening, into crescent-shape or irregularly curved shards, the direction of flattening defining a depositional layering. All glassy structures are composed of a pale off-yellow cryptocrystalline devitrified glass.

The black groundmass contains myriads of tiny (10µm to <1µm) opaque blebs, granules of iddingsitised olivine and (?) augite, and much cryptocrystalline volcanic dust and (?) devitrified glass.

A few broken quartz anhedral grains are present. Most are a few hundred micrometres across, but one elongate, fractured grain is 2 mm long. These are probably reworked non-volcanogenic detrital grains from Triassic or Permian country rocks.

PETROLOGICAL CONCLUSIONS

In the absence of chemical analyses, a detailed discussion of the petrological relationships of these rocks is premature. However, these petrographic observations enable some tentative general observations to be made.

'Tholeiitic' Midlands and Jordan/Bridgewater type basalts

The majority of basalts described here contain olivine phenocrysts, sometimes showing signs of resorption, and less commonly also augite phenocrysts, in a groundmass of plagioclase, colourless to pale green non-pleochroic augite, and often a black, opaque-rich, sometimes glassy mesostasis. Tasmanian Cainozoic basalts of this type have been described as 'basalts with black glass' (Edwards, 1950), 'saturated olivine basalts' (Spry, 1962), 'olivine tholeiites' (Sutherland, 1977) and 'tholeiitic and transitional olivine basalts' (Sutherland, 1976). They appear to be widespread in Tasmania, particularly in the south-east and Midlands. Despite containing olivine phenocrysts, these basalts are chemically saturated, generally with a few per cent quartz in the CIPW norm. Olivine presumably was the first mineral to crystallise, and although in saturated magmas it becomes out of equilibrium with the magma with further cooling, these basalts cooled sufficiently fast after extrusion to preserve the olivine phenocrysts, although they are often embayed (McDougall, 1959). Although hypersthene is prominent in the norm, pigeonite is not common in basalt of this type, and none was seen in any of the rocks described here. Edwards (1950) and McDougall (1959) showed that this type of basalt was chemically intermediate between the alkali-olivine and tholeiitic basalt types (Kennedy, 1933), with probably stronger affinities to the latter.

Edwards (1950) described three textural varieties of such 'tholeiites', the Ouse (intersertal), Bridgewater (intergranular to intersertal), and Midlands (ophitic to intergranular), corresponding to decreasing abundance of glass and increasing crystallisation of the groundmass, caused by increasingly slow cooling. McDougall (1959) extended this scheme, adding the Pontville (subophitic) and Jordan (holocrystalline but intergranular) types. Such schemes are of limited use, particularly as there is a continuous gradation between types. However, the ophitic basalt from near Bream Creek (BC33, MB61, JB64 and M63) clearly belongs to the slowly cooled, more or less holocrystalline Midlands type, as does CSR67, an analcite-bearing variety. The remainder; from near Copping, Dunalley, Murdunna, and Black Jack Point; vary only slightly in the abundance and size of phenocrysts and groundmass grain size. Their intergranular texture probably places them in the Jordan type, but they also show similarities to the Bridgewater type. The distinction depends on what one describes as glass; here a relatively narrow usage has been adopted, and possibly others would describe a very fine-grained mesostasis of opaque dust and plagioclase (e.g. CSR68) as plagioclase microlites in devitrified glass. In any case, these intergranular basalts have probably cooled more rapidly than the Midlands type basalt, with crystallisation of finer augite and plagioclase commencing around numerous nuclei. Factors such as pre-extrusive crystal settling may account for variations in the abundance of phenocrysts.

One of the Jordan type basalts, K51, contains slightly pleochroic,

possibly titaniferous augite, and may be transitional to alkali-olivine basalt.

Alkali-olivine basalt

The two basalt specimens from the Wattle Hill area (SC34 and W37) contain pleochroic titanaugite and are thus similar to the Tasmanian alkali-olivine basalt. Edwards (1950) described five textural varieties of 'basalts with titanaugite'. Specimen SC34, with a finely intergranular groundmass texture is similar to the Branxholm type, whilst the ophitic groundmass of W37 places it in the more slowly cooled Burnie type. Edwards (1950) thought that alkali-olivine basalt was largely restricted to the north of Tasmania, but a number of small necks and flows occur in the south (McDougall, 1959; Sutherland, 1976, 1977).

Possible regional significance

Sutherland (1976, 1977) noted in the Hobart and Brighton Quadrangles that 'tholeiitic' basalts which form the largest flows are confined to the Derwent and Richmond fault troughs, and have flooded old valleys draining these troughs in the Bridgewater-Pontville and Richmond-Campania areas. He termed these basalts the Claremont Group. Alkali-olivine basalt (Risdon Group) occurs in small plugs and flows around and between these structural lows. Further to the south in the Hobart Quadrangle around Rokeby and Kingston is the Southern Hobart Group of more alkaline, oligoclase and andesine-bearing basalt (mugearites and hawaiites). On the basis of their xenoliths and strontium-isotope ratios, Sutherland (1974) suggested a mantle origin for the Risdon and Southern Hobart groups, whilst the 'tholeiitic' Claremont Group may have a higher level origin with some crustal contamination.

The 'tholeiitic' Midlands and Jordan/Bridgewater type basalts around Copping, Bream Creek, Dunalley, Murdunna, and Black Jack Point may represent a third, eastern major zone of Claremont Group basalt, whilst the Wattle Hill alkali-olivine basalt may correspond to an extension of the surrounding Risdon Group basalt. Chemical analyses, and perhaps further sampling, particularly around Sorell, Forcett and Wattle Hill in the western part of the Sorell Quadrangle, are required to test this hypothesis.

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[19 August 1982]

THOLEIITIC BASALT

Midlands type (ophitic texture) ■

- BC33 - EN685583
- JB64 - EN682598
- MB61 - EN698588
- M63 - EN689603
- CSR67 - EN659600

Jordan/Bridgewater type (intergranular texture) ▲

- T1 - EN531396
- MD60 - EN677426
- D2 - EN663499
- D22 - EN668504
- D28 - EN670528
- C48 - EN634583
- CSR68 - EN656604
- CG69 - EN671577
- K51 - EN677626
- RT56 - EN688628

ALKALI-OLIVINE BASALT ★

Branxholm type

- SC34 - EN548654

Burnie type

- W37 - EN547646

ALTERED DOLERITE ●

- CO45 - EN647580
- DT75 - EN665518

FINE CRYSTAL-VITRIC TUFF ◆

- F19 - EN536587

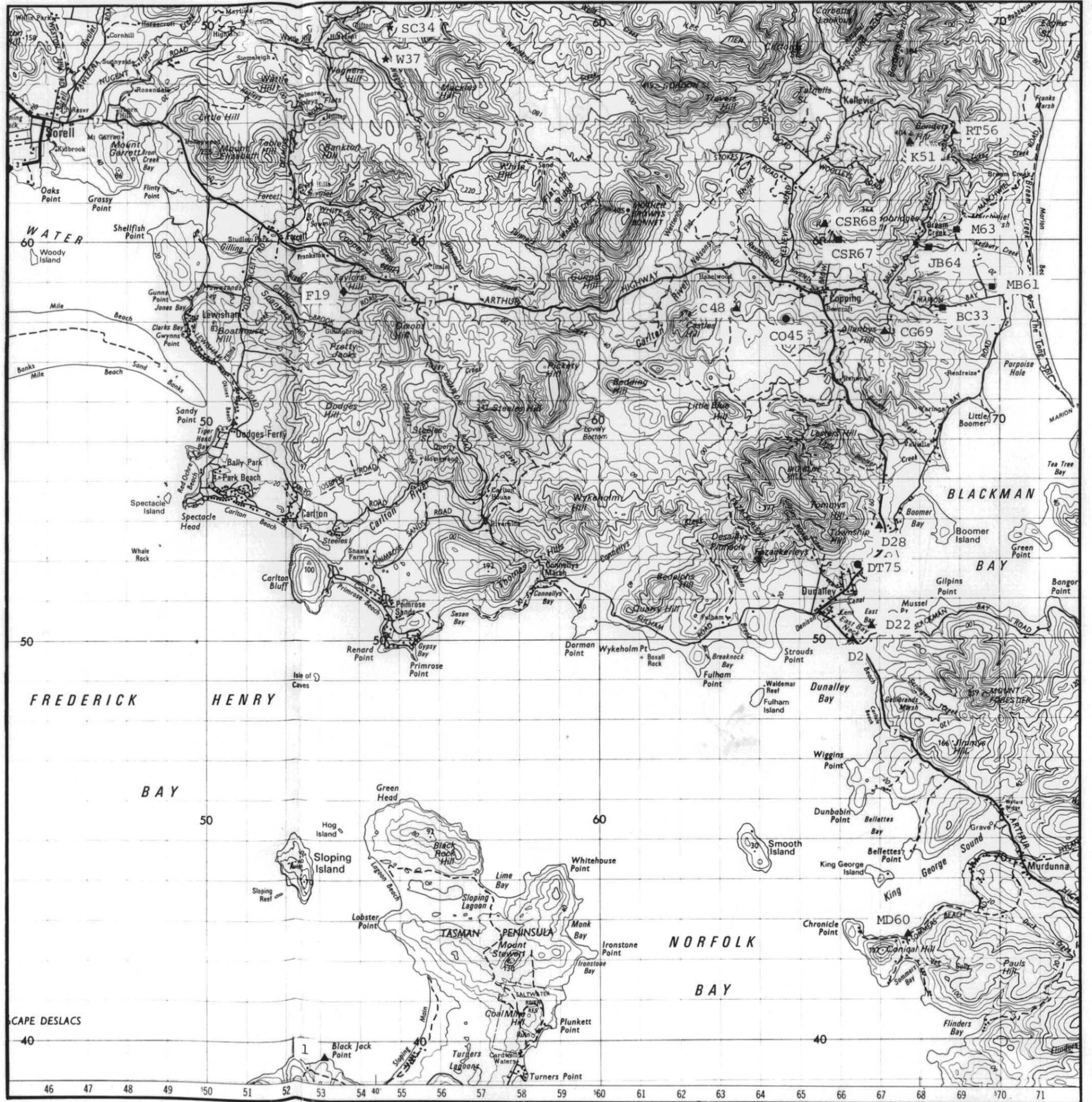
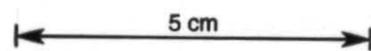


Figure 1. Location of sample sites.