

000

257001

18-1209

PHOTOGEOLOGICAL STUDY OF THE BLUE TIER AREA  
NORTH-EASTERN TASMANIA

Desk

**MICROFILMED**

Undertaken on behalf of

RENISON LIMITED

February 1979

**OPEN FILE**

Hunting Geology and Geophysics (Australia) Pty. Limited  
P.O. Box 25  
Barker Centre  
Canberra, ACT 2603

GA. 37/78

001

257002

CONTENTS

I.	INTRODUCTION	1
II.	PROCEDURE	3
III.	PRESENTATION	4
IV.	RESULTS	5
V.	REFERENCES	10
	LIST OF AERIAL PHOTOGRAPHS USED	11

002

A detailed photogeological study of the Blue Tier area, north-eastern Tasmania, was carried out during December 1978 and January 1979 by R. F. Loxton, Hunting and Associates Pty. Limited (now Hunting Geology and Geophysics (Australia) Pty. Limited) on behalf of Renison Limited.

The object of the study was the attempted definition of hidden, i. e. subsurface, cupolas of potentially mineralised younger phase granite within the Blue Tier Batholith through the photogeological identification of previously unrecognised geological relationships, including patterns of fracturing, sill-like granite intrusions and discrete chronological or compositional phases within the granite. The above relates to the dominant interest in large low-grade deposits of primary cassiterite in the region; a secondary objective was the identification of any causal relationship between structural features, such as fractures, and hydrothermal-type tin mineralisation.

The study-area is located in the St. Helens district of north-eastern Tasmania, some 80 km ENE of Launceston, and the area of detailed photo-study comprises approximately 280 sq km of undulating to mountainous country covered largely by dense temperate myrtle rainforest (see Fig. 1). The area is well known as an earlier tin mining centre and for Renison's purposes it would be superfluous to recapitulate the geology or the details of mining.

A considerable amount of prospecting and exploration has been done in the Blue Tier area over the last decade but the elusive large low-grade primary tin deposit in greisenised (or other) granite, as at the old Anchor Mine, remains undiscovered. It was considered worthwhile both by this company and by Renison Limited, on the basis of sound photogeological experience, that the application of diligent photogeological study might provide

003

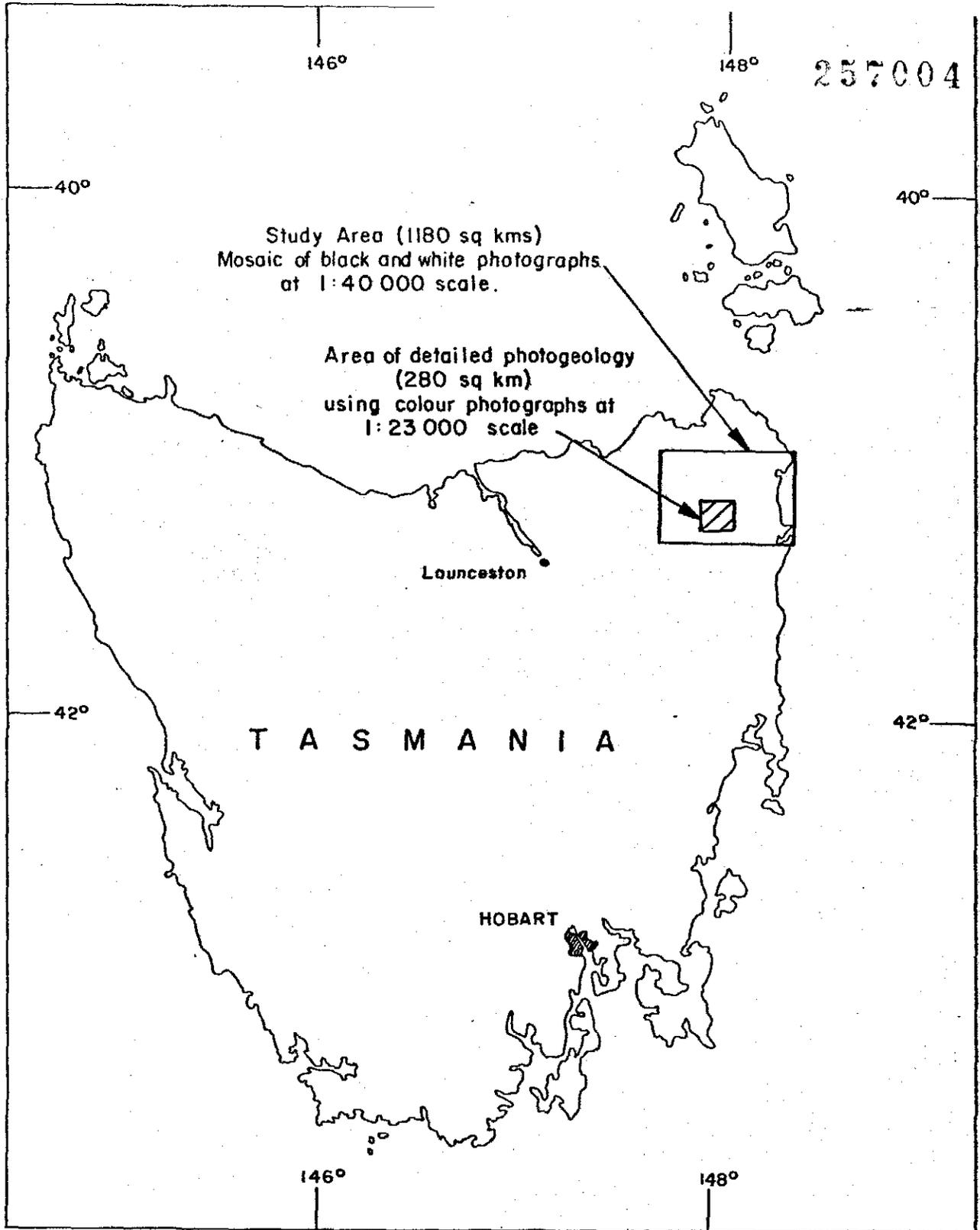


Figure 1.

LOCATION DIAGRAM

5 cm

004

an overview which would facilitate the recognition of significant geological details and relationships not easily recognisable during routine field exploration.

The results of the study have been disappointing. The individual granitic bodies exert little or no definitive influence on the vegetation or landscape and the tracing of lithological contacts between various granite subtypes has proved a well-nigh impossible task. The attempt was nevertheless justified, for elsewhere in equally difficult terrain, for example, Papua New Guinea, experience has indicated that the possibility does exist to differentiate between composite granite bodies. Effort, diligence and photogeological experience were not wanting; the problems encountered during the study were attributable to lack of natural diversification and cultural disturbance. A major structural zone was however tentatively identified solely as a consequence of the photogeological overview; if real, this zone may have a significant impact on future exploration philosophy and strategy. We have been explicitly instructed not to prognosticate on conclusions or recommendations, but to leave this aspect of the study to Renison's geologists who know the area much better than we do. This report therefore summarises the procedure and briefly elucidates the photogeological map which is the main outcome of the work.

## II. PROCEDURE

Forty-one colour aerial photographs (scale 1:23 000; forward and aft overlap 60 per cent) were interpreted under a Zeiss N2 mirror stereoscope fitted with x6 magnification optics. Annotation of photogeological detail was carried out in ink directly onto two clear-acetate drainage-bases prepared from the enlargement to photoscale of standard 1:50 000 topographic maps covering the study area. Because of scale variations related to relief changes in the easternmost part of the 280 sq km area, this sector was annotated separately and the detail was later transferred onto the drainage bases using a Bausch and Lomb Zoom Transfer Scope.

A larger area of approximately 1150 sq km which includes the study-area (see Fig. 1) was studied briefly on sixty-five black and white photographs (scale 1:40 000) to provide an overview of fracture patterns and to help place the Blue Tier area in its broader geomorphic and geological context. The smaller scale photographs were studied in both monoscopic and stereoscopic format, the former exercise taking the form of an uncontrolled mosaic interpretation.

The total time devoted to the study of the photography was twenty-five days, of which about one-fifth of the time was allocated to routine reannotation following a field visit of four days in January 1979 in the company of Mr. A. Ross of Renison Limited.

During the photogeological study continuous reference was made to existing geological maps published by the Tasmanian Geological Survey, initially in an attempt to reconcile photogeologic observation with the characteristics of the many mapped granitic bodies and other lithotypes, and later in analysis of office and field observations which indicate existing geological maps, geomorphology, vegetation and other photo-elements are all unreliable indicators of the bedrock geology in this area, especially in the granite terrain.

## III. PRESENTATION

1. Neat, final undrafted photogeological maps presented as two work-sheets, at a scale of 1:23 000 (3 coloured copies of each).
2. Corresponding set of work-sheets photographically enlarged to a scale of 1:20 000.
3. Work-sheet map of fracture traces in the larger study-area; scale 1:40 000 (3 uncoloured copies).
4. Published geological maps, aerial photographs and the 1:40 000 scale mosaic are returned with the report.

NB PLANS CONTAINED IN POCKETS  
ARE THE ONLY PLANS INCLUDED  
WITH THIS REPORT.  
NO OTHERS ON MICROACHE.

## IV. RESULTS

The disjointed nature and brevity of this section reflects the dearth of definitive conclusions and geological data which have resulted from what was, nevertheless, an intensive stereoscopic exercise. Comment is best made in point form as there is little to collate into a useful exploration philosophy.

1. The basaltic cappings have been mapped in more detail than shown by earlier maps, while the distribution and shape of individual remnants is probably accurate relative to the boundaries of granitic bodies in which the degree of confidence is poor, with the exception of the body north of Murdoch's Hill in the eastern part of the study-area.
  
2. The landforms over the older-phase granites (Dg. 15 and Dg. 6) are often smoother than the younger phases (Dg. 1) and are, as a very general rule, not quite as bouldery. On this basis three granitic units may tentatively be distinguished in the granite complex, out of a total of eight lithological units delineated by the photogeological mapping. It is to be questioned however whether this differentiation is in fact a function of the subtle petrological variation between the granitic subtypes recognised by Groves, Cocker and Jennings (1977), or the result of other geomorphic processes. Outcrops are most extensive in the central part of the study-area, where elevation is higher, and tors well developed in the vicinity of Emu, Masher, Australia and Michael Hills. Elsewhere rock outcrops are distributed irregularly and distant from each other.

In the eastern part of the study-area, a residual whitish gravelly soil consisting of coarse quartz and felspar crystals is invariably related to the older coarse-grained porphyritic granite (Dg. 6).

103

In the field two subphases were noted within the younger granite (Dg. 1):

- (i) an equigranular medium-grained granite as at Mount Michael and Australia Hill, which is similar to that found at the Anchor Mine.
- (ii) a fine-grained, occasionally porphyritic, subphase as at Platt's Lookout in the eastern part of the study-area.

The two varieties are indistinguishable on the aerial photographs and conceivably represent different levels of erosion in the one body of granite.

3. Two kilometres north of field-site 17 on Sun Flats Road, a vegetation anomaly consisting of tall unhealthy trees was noted under the stereoscope. The area is about 200 m x 300 m in extent, and its significance is unknown but warrants mention in relation to a possible relationship with bedrock type or geochemistry.
4. Subtle geomorphic features that may be relevant to tin exploration include the following :
  - (i) an erosional feature 2 km SE of the Anchor Mine is reminiscent of the mine area where the mineralised top of the younger intrusive granite (Dg. 1) is exposed and linked to subhorizontal greisen and pegmatite zones.
  - (ii) apparent gentle doming in the younger granite (Dg. 1) with a pegmatite phase along the contact with the older intrusive granite (Dg. 6) seen at locality 20 on the map, in the vicinity of the abandoned gravel suction pump 1 km WNW of Australia Hill.

- (iii) a slight elongate depression some 140 m in width produced by a dyke of younger granite (Dg. 1) and wall rock alteration seen at locality 19 (see map).

No other specific geomorphic features indicative of structural irregularities in the roof zones of granite sheets or significant changes in mineralogy such as the presence of tourmaline or sulphides, have been recognised either in the field or on the aerial photographs.

5. Faults and fractures, as portrayed on the map, emphasise the following azimuths:  $295^{\circ}$ ,  $315^{\circ}$ ,  $005^{\circ}-010^{\circ}$ , and  $025^{\circ}-030^{\circ}$ . Sub-ordinate trends are oriented  $355^{\circ}$ ,  $055^{\circ}$  and  $085^{\circ}$ . Trends underlined and  $055^{\circ}$  are the 'regional' directions displayed on the 1:40 000 scale mosaic.

The  $005^{\circ}-010^{\circ}$  direction relates to the dyke of younger granite (Dg. 1) seen at locality 10, and to narrow, rich tin-mineralised quartz veins, observed at locality 25. The old Cambria workings and the western boundary of the younger granite (Dg. 1) at Platt's Lookout appear to be related to the above trend which, if the observations made at locality 25 are consistent throughout the study-area, would be an early direction offset by all other trends.

The  $025^{\circ}-030^{\circ}$  direction is related to the elongation of a window of younger granite (Dg. 1) in the Anchor Mine area. It is almost orthogonal to the  $295^{\circ}$  trend, which is well displayed in the eastern part, but more discrete in the western part of the study-area. The  $295^{\circ}$  trend appears to control a few boundaries of younger granite, is sometimes occupied by quartz as at locality 15, and is generally offset by the  $315^{\circ}$  direction.

It appears that a major lineament, probably a diffuse zone of splay faulting which follows in part the course of the Weld River, crosses the study-area from NW to SE, traversing a distance in excess of 15 km. The strike of this lineament is about  $315^{\circ}$  (see map). Field evidence

for the lineament exists solely in the presence of rare quartz-veins up to 0.3 m thick, as seen near locality 25, and dislocations with weak copper mineralisation in the southern part of the Anchor open-cut mine. A number of granite masses (Dg. 1) appear to be influenced by this feature in the sense that the relevant boundary is linear suggesting displacement. Fractures which trend  $295^{\circ}$ ,  $055^{\circ}$  and  $010^{\circ}$  appear also to have been offset. The stereoscopic study of the coloured photographs tends to give the impression that a large zone of dislocation and splay faulting does trend through the Weld River-Anchor area. Where the lineament follows the headwaters of Chid Creek a right-lateral movement is apparent, if the mapped contact between granites Dg. 1 and Dg. 6 is correct. Field confirmation of the latter is warranted.

6. The age of the Weld River-Anchor area lineament is not known with certainty, but appears to postdate the basalt cover of assumed Tertiary age. The relative elevation of the unconformity is approximately 480 m in the west rising to a maximum of 780 m near Mount Littlechild and 380 m in the east near Platt's Lookout. The structure that is implied is however purely speculative and could well indicate a gently arched basement configuration prior to the outpouring of the lava. Alternatively, and more likely, late faulting with a western upthrow as indicated by the basalt capping could imply that levels of erosion relative to any younger granites (hidden or otherwise) are different on either side of the fault zone. The relative paucity of younger granite and abundance of alluvial tin in the western part of the study-area could further substantiate the concept of displacement along the Weld River-Anchor area lineament.
7. A disturbing aspect of the inferred Weld River-Anchor 'fault' is the fact that the major lineament is only apparent on the larger scale colour photographs; experience and intuition would suggest easier detection on the smaller 1:40 000 scale mosaic. Clearly the existence of the lineament/fault zone is suspect but is important enough to warrant a careful study of field and other data, such as geophysical records, which could throw light on the matter.

8. Empirical evaluation of 'anomalies' in the patterns of fracturing on both the 1:23 000 scale photogeological work-sheets and the 1:40 000 scale mosaic has been assiduously avoided. No indisputable diagnostic patterns such as fracture traces were observed however, and it is suggested that the authenticity of the major fault zone discussed above be established before assessing the significance of the observed fracture patterns.

Once the regional pattern of brittle deformation is elucidated, a framework may be established wherein the roles of first, second and third order fractures relative to mineralisation may be considered.

012

V. REFERENCES

Gee, R.D., and Groves, D.I., 1971      Structural features and mode of  
 emplacement of part of the Blue Tier  
 Batholith in Northeast Tasmania.  
 J. geol. Soc. Aust., 18 (1), p. 41-56.

Groves, D.I., 1972      The Geochemical Evolution of Tin-  
 Bearing Granite in the Blue Tier  
 Batholith, Tasmania. Econ. Geol.,  
 67 (4), p. 445-457.

Groves, D.I., Cocker, J.D.  
 and Jennings, D.J., 1977      The Blue Tier Batholith. Bull. geol.  
 Surv. Tas. Dep. Mines, 55, 171p.

013

257014

LIST OF AERIAL PHOTOGRAPHS USED

Colour photographs on the scale of 1:23 000

Source : Renison Limited / AAM

Job name : Blue Tier

<u>Job No.</u>	<u>Run</u>	<u>Date</u>	<u>Quality</u>	<u>Print Nos.</u>	<u>No. of Prints</u>
AAM 1217c	1*	13.12.77	Good	506-516	11
AAM 1217c	2*	13.12.77	Good	517-526	10
AAM 1217c	3*	13.12.77	Good	527-537	11
AAM 1217c	4**	13.12.77	Good	538-546	<u>9</u>
					<u>41</u>

\* East-West runs

\*\* North-South tie run

Black and white photographs on the approximate scale of 1:40 000

Source: Department of Lands, Tasmania

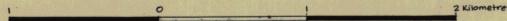
Job name : Forester-Georges Bay

<u>Job No.</u>	<u>Run</u>	<u>Date</u>	<u>Quality</u>	<u>Print Nos.</u>	<u>No. of Prints</u>
T 664	1	8.12.74	Good	155-168	14
T 701	2	8.12.74	Good	18-30	13
T 701	3	8.12.74	Good	46-57	12
T 672	4	10. 2.75	Good	62-74	13
T 672	5	10. 2.75	Good	89-101	<u>13</u>
					<u>65</u>



BLUE TIER PROJECT, WESTERN SHEET

Scale 1:23,000

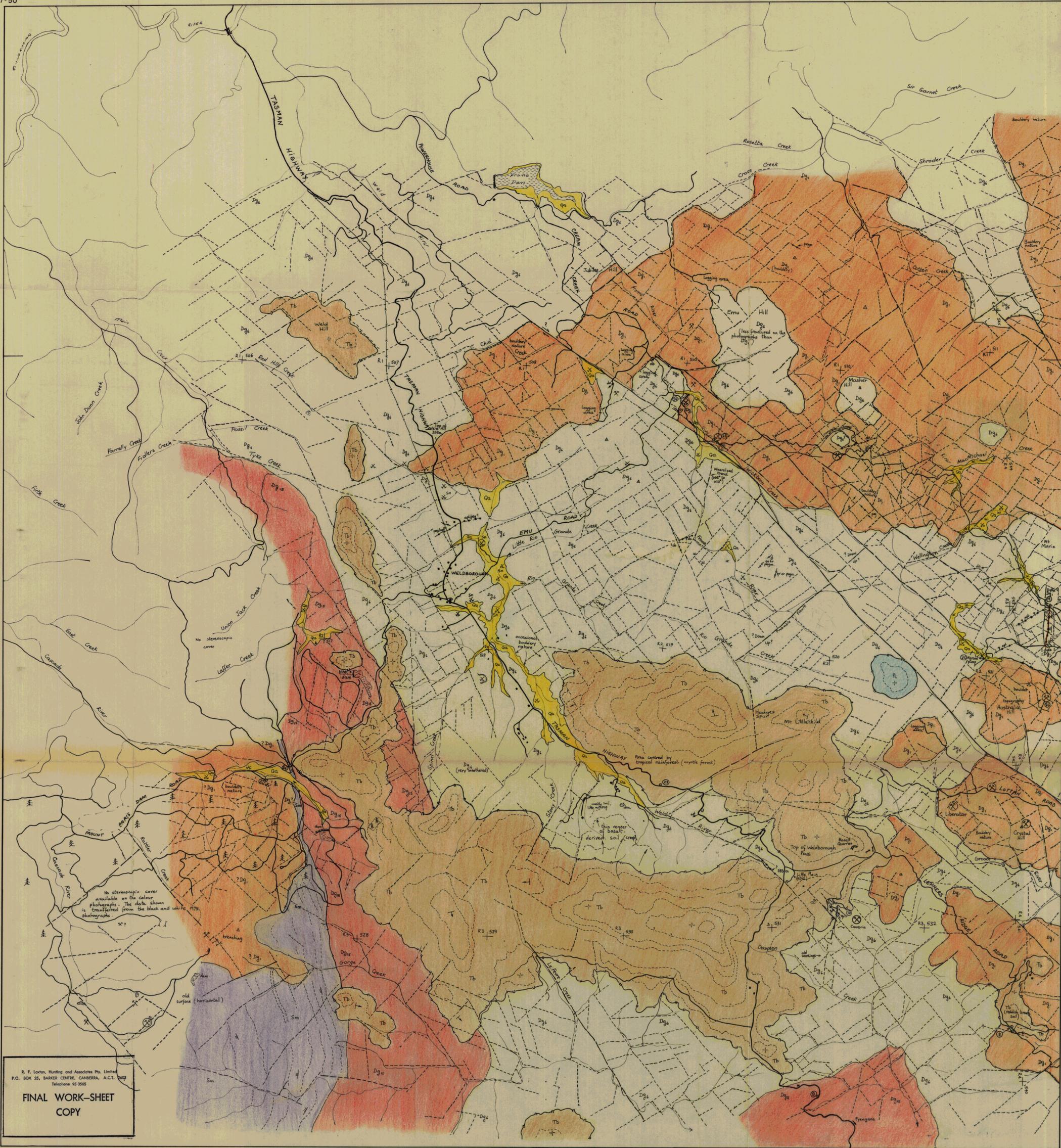


147°50'

148°00'

41°10'

41°10'



R. F. Laxton, Hunting and Associates Pty. Limited  
P.O. BOX 25, BARKER CENTRE, CANBERRA, A.C.T. 2609  
Telephone 93 2565  
**FINAL WORK-SHEET  
COPY**

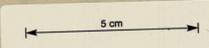
R.F. Laxton, Hunting and Associates Pty Ltd

GA 37/78

These maps were compiled photogeologically from 41 colour aerial photographs at a nominal scale of 1:23,000. 4 days were spent in the field. The drainage bases were enlarged from 1:50,000 Derby (B415-1) and Fraser (B515-1V) topographic sheets produced by the Lands Department Tasmania; detail of drainage was amended and revised where necessary.

78-1269

257016

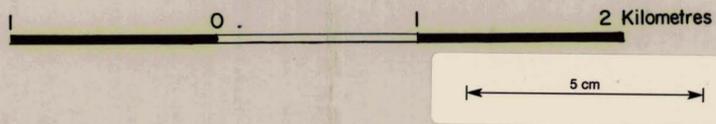


1213

# LEGEND TO ACCOMPANY PHOTOGEOLOGICAL WORKSHEETS OF THE BLUE TIER BATHOLITH, NORTH EASTERN TASMANIA

Prepared on behalf of RENISON LIMITED, by  
R.F. Loxton, Hunting and Associates, Pty. Limited  
CANBERRA, January 1979. G.A. 37/78

Scale 1:23 000 approx



## LEGEND

QUATERNARY	{	Qa	Alluvium; swamp and marsh deposits; eluvium
TERTIARY	{	Tb	Basalt; subordinate agglomerate and tuff
PERMO-TRIASSIC	{	Pc	Conglomerate and sandstone
UPPER DEVONIAN to LOWER CARBONIFEROUS	{	Dg <sub>1</sub>	Fine to medium-grained biotite and muscovite granite and gneiss
	{	Dg <sub>2</sub>	Coarse to medium grained granite/adamellite; commonly porphyritic
	{	Dg <sub>1B</sub>	Biotite - hornblende granodiorite
SILURO- DEVONIAN	{	Sm	Greywacke; quartzite; subordinate siltstone

	Creek; dam; swampy area.		Boundary of superficial deposits
	Road; track		Trace of bedding plane
	Building; homestead		Geological boundary, position approximate
	Power line		Geological boundary, position inferred
	Mine; old workings, prospect (principal workings are encircled)		Unconformity, position approximate
	Old alluvial workings		Horizontal
	Costean		Strike and dip of bedding estimated under the stereoscope
	Centre point of aerial photograph, showing run and print number		
	Area visited in the field		
	Top of hill		Jointing; fracturing
			Fault; probable fault (Showing relative movement)
			Dyke

## ABBREVIATIONS

apl	aplite
do	dolerite
peg	pegmatite
qv	quartz vein

Hunting Geology and Geophysics  
(Australia) Pty. Limited  
P.O. BOX 25, BARKER CENTRE, CANBERRA, A.C.T. 2603  
Telephone 95 3565

**FINAL WORK-SHEET  
COPY.**

These maps were compiled photogeologically from 41 colour photographs at a nominal scale of 1:23,000. 4 days were spent in the field. The drainage bases were enlarged from 1:50 000 Derby (8415-1) and Fraser (8515-IV) topographic sheets produced by the Lands Department Tasmania; detail of drainage was amended and revised where necessary.





 Tas Lands Dept Project F 431, Film 672  
 Black and White, 21 500', 1:40 000  
 Flown 10-2-75  
 A.A.M. Blue Tiers Project, Film A.A.M. 1217c  
 Colour, 3850 m, 1:22 000  
 Flown 13-12-77

SCALE 1:100000

5 cm

257010

INDEX TO ADJOINING MAPS



FORESTER  
SHEET 8415  
TASMANIA  
EDITION 1

1210

PRODUCED by the Survey Branch, Land Department, Hobart, for the Division of National Mapping, Department of Natural Resources as part of the national mapping programme.  
 PRINTED by authority of the Minister for Natural Resources 1976.  
 DISTRIBUTED by the Department of Natural Resources. A later edition is available from the Land Department Hobart.  
 MAP ACCURACY: The average accuracy of this map is ± 25 metres in the horizontal position and ± 10 metres in the vertical position.  
 MAP RELIABILITY: Topographic information shown on this map is correct to 1976.  
 ROAD CLASSIFICATION: Roads are classified according to their intended function as part of the national road system.

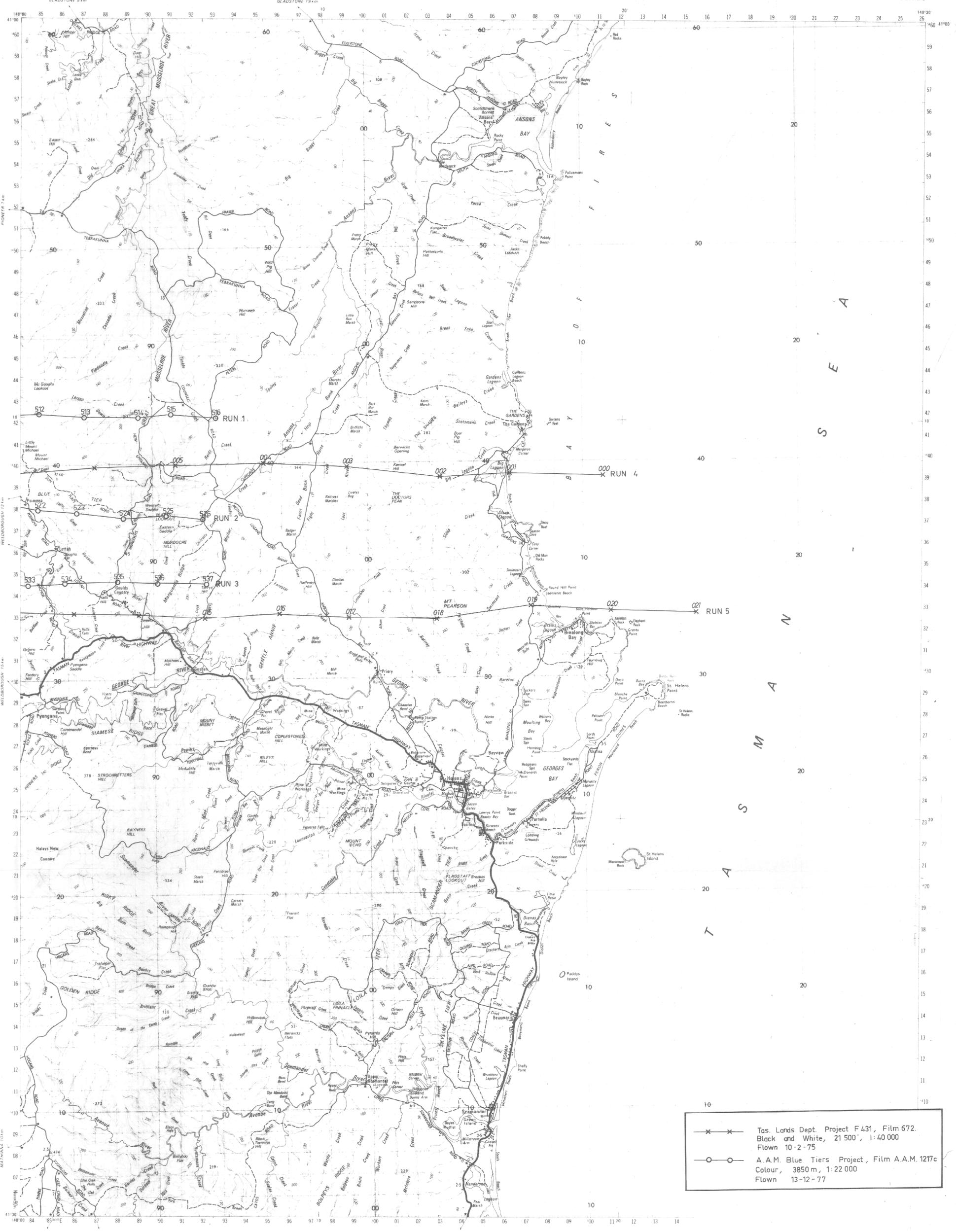
**GRID REFERENCE**  
 TO GIVE A UNIQUE REFERENCE ON THIS SHEET TO NEAREST 100 METRES  
 IGNORE THE SMALLER figures of any grid number these are for finding the full 100 metres. Use ONLY THE LARGER figures of the grid number e.g. 43 51  
 SAMPLE POINT 732 2, Cuckoo Hill  
 8415  
 53  
 34  
 5  
 8415-532345

Built up area National route marker  
 Principal road and highway Cutting  
 Secondary road Embankment  
 Minor road Road bridge  
 Vehicular track  
 Gate Cattle grid  
 Railway multiple track Station Railway bridge  
 Railway single track Railway tunnel  
 Light railway or tramway  
 Power transmission line

Fence Levee or bank  
 Mine Windmill Yard Quarry  
 Building's Church Ruin Drive in theatre  
 Trig station Bench mark Spot elevation  
 DMI Contour with value Depression contour  
 Forest dense medium scattered  
 Scrub dense medium scattered  
 Tropical rainforest Pine plantation  
 Orchard plantation or vineyard Mangrove  
 Woodbreak

Lake perennial Stream perennial  
 Lake intermittent Stream intermittent  
 Lake mainly dry Stream mainly dry  
 Swamp perennial intermittent  
 Land subject to inundation Rice field  
 Bore or well Spring Tank or small dam  
 Breakwater Pier Wharf  
 Weck exposed Lighthouse  
 Rock bare or washed Foreshore flat Sand  
 Reef Rock ledge

TRUE NORTH GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE ENTIRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1976 AND MOVES EASTWARD BY 0.1 IN ABOUT TWO YEARS.



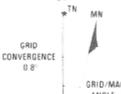
— x — Tas. Lands Dept. Project F431, Film 672.  
Black and White, 21 500', 1:40 000  
Flown 10-2-75

— o — A.A.M. Blue Tiers Project, Film A.A.M. 1217c  
Colour, 3850 m, 1:22 000  
Flown 13-12-77

SCALE 1:100 000

257020

5 cm



PRODUCED by the Survey Branch, Lands Department, Hobart for the Division of National Mapping, Department of National Resources as part of the national mapping programme.  
PRINTED by authority of the Minister for National Resources, 1977.  
DISTRIBUTED by the Department of National Resources. A state edition is available from the Lands Department, Hobart.

MAP ACCURACY: The average accuracy of this map is 1:25 metres in the horizontal position of well defined detail and 1:5 metres in elevation.

MAP RELIABILITY: Topographic information shown on this map is correct to 1975.

ROAD CLASSIFICATION: Roads are classified according to their intended function as part of the national road system.

BLACK NUMBERED GRID LINES ARE 1000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID. ZONE 55  
GRID VALUES ARE SHOWN IN FULL ONLY AT THE SOUTH WEST CORNER OF THE MAP  
HORIZONTAL DATUM AUSTRALIAN GEODETIC DATUM 1986  
VERTICAL DATUM AUSTRALIAN HEIGHT DATUM  
TRANSVERSE MERCATOR PROJECTION  
CONTOUR INTERVAL 20 METRES  
ELEVATIONS IN METRES

- |  |   |   |
|--|---|---|
| — Built-up area, National route marker             | — Fence, Level or bank                          | — Lake, perennial; Stream, perennial        |
| — Principal road and highway, Cutting              | — Mine, Windmill, Yard, Quarry                  | — Lake, intermittent; Stream, intermittent  |
| — Secondary road; Embankment                       | — Building; Church, Room, Drive-in theatre      | — Lake, mainly dry; Stream, mainly dry      |
| — Minor road; Road bridge                          | — Trig station; Bench mark; Spot elevation      | — Swamp, perennial, intermittent            |
| — Vehicular track                                  | — Cliff, Contour with value; Depression contour | — Land subject to inundation; Rice field    |
| — Gate, Cattle grid                                | — Forest; dense, medium, scattered              | — Bore or well; Spring, Tank or small dam   |
| — Railway, multiple track, Station, Railway bridge | — Scrub; dense, medium, scattered               | — Breakwater; Pier, Wharf                   |
| — Railway, single track, Railway tunnel            | — Tropical rainforest; Pine plantation          | — Wreck, exposed; Lighthouse                |
| — Light railway or tramway                         | — Orchard, plantation or vineyard; Mangrove     | — Rock, bare or awash; Foreshore flat; Sand |
| — Power transmission line                          | — Windbreak                                     | — Reef, Rock ledge                          |

GRID REFERENCE  
TO GIVE A UNIQUE REFERENCE ON THIS SHEET TO NEAREST 100 METRES

IGNORE THE SMALLER figures of any grid number, these are for finding the full 100 metres. Use ONLY the LARGER figures of the grid number, e.g. 0000

SAMPLE POINT 14.4 THE GARDENS

1 Locate this 1:100 000 map sheet 8515

2 Locate first VERTICAL grid line to LEFT of point and read LARGE figures

3 Estimate tenths from grid line to point 07

4 Locate first HORIZONTAL grid line BELOW point and read LARGE figures

5 Estimate tenths from grid line to point 42

SAMPLE REFERENCE 8515 07421

78-1269