GSB51

TASMANIA DEPARTMENT OF MINES

1971

GEOLOGICAL SURVEY BULLETIN No. 51

GRAVITY SURVEY OF THE TERTIARY BASINS IN NORTHERN TASMANIA

by M. J. LONGMAN, B.Sc.
and D. E. LEAMAN, B.Sc., Ph.D.

ISSUED UNDER THE AUTHORITY OF THE HONOURABLE
LEONARD HUBERT BESSELL, M.H.A.
MINISTER FOR MINES FOR TASMANIA

T. J. HUGHES, GOVERNMENT PRINTER, HOBART, TASMANIA

57260

PREFACE

This detailed gravity survey, the first to cover a large area of northern Tasmania, was carried out during 1966-67 concurrently with regional geological mapping and underground water resources surveys; the accompanying maps of total and residual Bouguer anomaly were prepared at the end of 1967. It has provided much information on the structure of the Tertiary basins and the thickness of their deposits.

The interpretation of the gravity data has been greatly simplified by the use of new graphical methods which will be described in detail in another publication.

The geological information used in the interpretation has been derived from regional geological mapping and is incomplete in the case of the Frankford and Lake River Quadrangles. The geology of the area is represented in simplified form on the residual Bouguer anomaly map.

J. G. Symons
Director of Mines

CONTENTS

FIGURES

MAPS

ABSTRACT

A detailed gravity survey of the major Tertiary basins of northern Tasmania has revealed up to 2,500 ft (762 m) of Tertiary sediment deposited in fault- and erosion-produced depressions. Faulting of Tertiary age associated with the Launceston and Oaks-Westbury basin consistently downthrows to the E. The faults are rejuvenated Jurassic, or older, structures.

A Jurassic dolerite feeder of pipe-like form was located at Mt Arnon and several basic-ultrabasic intrusive complexes of Cambrian age are inferred in the folded rocks SW of the Tiers Fault.

INTRODUCTION

Gravity surveys are suitable in structural problems where some aspect of the structure represents a mass deficiency or excess. In this case the anomalous bodies fall into two catagories: light Tertiary sediments and dense igneous rocks, which are contrasted against Palaeozoic or Mesozoic sedimentary rocks.

An earlier gravity survey (Hinch, 1965, under the direction of R. Green) covered the central portion of the Oaks-Westbury basin. His survey has been adjusted and considerably extended and the station density increased. The extension of the survey into the pre-Tertiary rocks has enabled the removal of many of the anomaly variables and permitted greater control of the interpretation.

The principal problem has been to determine the shape, depth and structural origin of the Tertiary basins and to assess any Jurassic structural factors.

The survey covers an area of 1,400 square miles (3,600 km^2) with a total of 1,100 stations. The area surveyed is for the most part a broad plain. The location of stations is shown in Map 1.

Little geophysical work has been attempted other than the gravity survey of Hinch (1965) and the present survey. Limited success has been obtained using seismic and resistivity methods near the basin margins, and such methods can reveal shallow basement, gravel beds or lateritised horizons.

Drilling results provide most of the present information about the rock types within the basins. Johnston (1888) records a deep coal bore hole (894 ft; 272 m) at Longford (Section 3). Shallow bores (500 ft; 152 m) for water and test purposes have been drilled over much of the Oaks-Westbury basin. All reveal a monotonous sand/clay sequence. The only drilling to reach pre-Tertiary rocks in the deeper portion of the basin is that by C. Sulzberger, for oil, at Port Sorell, Bracknell and Hagley.

Acknowledgement is given to W. R. Moore and W. L. Matthews for their assistance in most phases of the work and also to B. Marshall, A. B. Gulline for useful discussions on the geological problems of the area.

GEOLOGY

GENERAL

The first detailed structural assessment was given by Carey (1947). He mapped the region around Launceston and considered that the basic structure was a pair of grabens, one in the Tamar Valley and the other west of Carrick separated by the Hummocky Hills horst. Blake (1959) followed this interpretation in mapping the Longford Quadrangle. Longman *et al.* (1964) revised both the mapping and structural concepts showing that no graben was present in the Lower Tamar valley. During the period 1965-1969 detailed mapping of the Tertiary sediments and the basin margins was undertaken by W. R. Moore and W. L. Matthews. Further information about the basins is given by McKellar (1957), Wells (1957), Burns (1965), Gee (in press) and Barton *et al.* (1970), although the mapping of McKellar and Wells has been considerably revised.

STRATIGRAPHY

Precambrian. Quartz-muscovite schist and phyllite, and banded quartzite occur NW of Golden Valley. Dolomite of unknown thickness occurs in the region of Parknook and Connorville.

Cambrian. The Precambrian rocks are unconformably overlain by a greywacke rich sequence, as at Golden Valley, which is intruded by, and interlayered with, basic igneous rocks, acid volcanics and quartz-feldspar porphyries. A major exposure of sheared basic igneous rocks occurs at Connorville (Everard, 1968).

Ordovician. Siliceous conglomerate and sandstone unconformably overlie the Cambrian sequence. A variable thickness of Gordon (?) Limestone is also present at Dairy Plains and Golden Valley, W of Deloraine. The principal exposures of Ordovician rocks are SW of Deloraine.

Silurian. Sandstone, considered to be Silurian in age by Barton *et al.* (1970), conformably (?) overlies the Ordovican succession W of Deloraine. The Mathinna Beds which are possibly of this age form the dominant suite of pre-Permian rocks E of the River Tamar. They form a monotonous series of sandstone, mudstone, slate and greywacke which is often intensely folded (see also Longman *et al.* 1964; Marshall, 1970).

Devonian. Granitic stocks and batholiths intrude the Mathinna Beds. Most economic interest is associated with the accompanying mineralisation. The major bodies are relatively uniform in composition although there are marginal differentiates of small volume which may be intermediate or basic in composition.

Permian. Permian rocks, composed alternatively of fossiliferous mudstone and sandstone and unfossiliferous siltstone and mudstone, all of which may be pebbly, lie unconformably on Devonian and Silurian rocks E of the River Tamar and on any pre-Permian rocks W and S of the main Oaks-Westbury basin. Details of the stratigraphical sequence are given by Clarke (1968) and Barton *et al.* (1970). The total thickness of such rocks is of the order of 2,000 ft (610 m) although this figure varies depending on the thickness of the basal Stockers Tillite.

Triassic. In most cases, continental Triassic rocks consisting of quartz sandstone and mudstone overlie Permian rocks. The Triassic sandstones may be divided into two sequences, one of Lower Triassic age is a quartz sequence with subsidiary feldspar and mica while the second of Upper Triassic—Rhaetic age is a lithic sequence containing feldspar and rock fragments. Coal has been worked NE of Longford. The total thickness is unkown but is of the order of 1,000 ft (305 m) for the quartz sequence and 500 ft (152 m) for the lithic sequence (see also McKellar, 1957).

Jurassic. Tholeiitic dolerite has intruded the Permian and Triassic rocks as large sills and dykes in excess of 1,000 ft (305 m) thick. In most places the dolerite appears as a capping on the Great Western Tiers and other remnant peaks. Longman (1966) has inferred a centre at Patersonia while Carey (1958) also suggested centres at Billop and Golden Valley. The mapping of Barton *et al.* (1970) and the present gravity survey clearly show that no centre is present at Golden Valley and that any feeder at Billop must be small.

Tertiary. Tertiary sediments fill the eroded depressions produced by faulting commencing in pre-Eocene times, as suggested by leaf remains and basalts found at low levels within the basins. The dominant sediment is a sandy clay often bearing lignite beds. Minor quantities of coarse gravel, lithic sandstone, laterite and siliceous conglomerate also occur. In many cases basalt overlies, or is interbedded with, the sediments. Few volcanic centres have been located (e.g. Western Junction).

Quaternary. The predominant Quaternary rocks are alluvial deposits in the broad river valleys and scree and talus deposits along the Tiers escarpment.

STRUCTURE

The major faults in the area appear to have been in existence in Lower Palaeozoic times and have been rejuvenated subsequently. The Tiers Fault has been proven, E of Connorville, to be Jurassic or pre-Jurassic in age with little or no movement in the Tertiary. There has been considerable movement along the Mt Arnon fault in Jurassic times and reverse movement during the Tertiary. The structure of the basins is controlled by horst and graben structures, originating in association with the Jurassic dolerite intrusions, with tilting and step-faulting superimposed during the Tertiary period. The faults associated with the step-faulting consistently downthrow to the E with the largest movement, of over 3,000 ft (914 m), associated with the Bracknell Fault which parallels the Tiers Fault.

The sediments in the basins are dominantly sandy clays with minor lignite and sandy bands indicating quiet deposition in relatively deep(?) water. No evidence has been found of any connection between the Cressy Basin and the Bass basin during Tertiary times.

GRAVITY FIELD

METHODS OF SURVEY AND ACCURACY OF RESULTS

Gravity observations were made with Worden gravity meters no. 169 and 273 with scale factors of 0.1010, 0.1008 mgal/division, respectively. A station spacing of one mile (1.6 km) was considered adequate to define anomalies produced by the structures under examination. Traverses along roads have provided the bulk of the station coverage with some stations along vehicular tracks. In relatively accessible areas a station spacing greater than two miles (3.2 km) has not been tolerated. There are gaps in the station coverage around the margins of the Tertiary plains where access by vehicle is negligible.

The base station for the entire survey is BMR base no. 6491.0171, value 980.27566 gal, at Launceston Airport. All stations have been corrected for instrumental drift and loop errors. The drift of the meters used was less than one division in two hours. The accuracy of the observed gravity results is better than $\pm$ 0.05 mgal.

Elevations have been determined barometrically using Askania micro-barometers, surveying aneroid or Mechanism digital aneroid barometers. Control of elevations is based on all available State Permanent Marks and Lands Department spot heights. The accuracy of the determination is independent of instruments used or weather patterns. However, traverses from the plains into elevated hilly country resulted in variability of readings, even though the ends of such traverses were accurately controlled. This effect was particularly noticeable E of Devonport and implies inclined pressure discontinuities in the lower atmosphere. Using local control points for all parts of the survey an accuracy is claimed of one metre in the plains and two metres in hilly areas. This results in an error of $\pm$ 0.2, $\pm$ 0.4 mgal respectively in the Bouguer anomaly.

The location of all stations has been fixed to within 50 m, using 1 : 15,840 base maps, and thus the error in the theoretical gravity is $\pm$ 0.05 mgal.

Calculation of the latitude correction was made using the equation of the international ellipsoid (Heiskanen and Vening Meinesz, 1958, p. 78).

The area surveyed may be divided topographically into two parts. The greater part is nearly level land with a relief less than 400ft (122m). The 3,000 ft (914 m) high escarpment of the Great Western Tiers lies to the SW. Away from the foot hills the terrain correction is never more than 1.5 mgal; across the plains it is about 0.2 mgal. The largest correction made was about 6 mgal on the face of the escarpment. Careful station placing minimized the need for corrections. The maximum possible correction for a station on the Tiers slope, away from deep gully effects, is about 10 mgal. Corrections less than 0.2 mgal. have not been added. The maximum topographic error is thus 0.2-0.3 mgal. as the method (Hammer, 1939) is accurate to 0.1 mgal. Terrain corrections have been computed to a radius of 6 miles (10 km). The only stations terrain corrected are those on or near profiles used for interpretation and the maps therefore do not show corrected values.

The total error, due to lack of precision in the data, is about 0.4 mgal (RMS).

RESULTS

The results are presented in Map 1 (Total Bouguer anomaly) and Map 2 (Geology and Residual Bouguer anomaly). Individual station data are presented in Appendix 1. All data, including that of Hinch (1965), have been geometrically contoured. All data reduction was made by Elliot 503 Computer, University of Tasmania, using a Bouguer density value of 2.67 g/cm^3.

INTERPRETATION

Rock Densities

Density measurements have been made of rock types represented in the area. Fresh samples were obtained from drill cores and varied between 150 and 2,000 g in mass. All results are bulk wet densities, and are presented in the table below. Where lithological variation results in varying densities within a formation of rock system a weighted average is given.

The density of the Tertiary sediments has been assumed to be 2.00 g/cm^3. Tertiary volcanic rocks, while having a density of 2.90-3.00 g/cm^3 if present as massive basalt flows, are generally of little consequence as their total mass is small.

BULK WET DENSITIES

Rock Unit	Density Range g/cm³	Average Density g/cm³	Weighted Average g/cm³	Published Data
Tertiary				
clay, sandy clay	1.82–2.00	1.92		
Jurassic				
dolerite				2.75–2.95 *a* 2.90 (average) *b*
Triassic				
lithic sequence:	2.36–2.48	2.43	2.46	
sandstone, mudstone	2.49–2.52	2.51		
quartz sequence:	2.30–2.43	2.37	2.40–2.42	2.43 *c*
sandstone, mudstone	2.44–2.54	2.49		
Permian				
Ferntree Mudstone	2.37–2.58	2.50–2.52	2.55	2.58 *d*, 2.58 *e*
Liffey Sandstone		2.37		
Golden Valley Group	2.55–2.61	2.59		
Quamby Mudstone	2.58–2.60	2.60		2.58 *e*
Carboniferous (?)				
tillite		2.66		2.59 *e*
Silurian				
Mathinna Beds	2.53–2.82	2.67		
Ordovician				
Gordon Limestone	2.70–2.74	2.72		
other siliceous rocks	2.50–2.65	2.60		
Cambrian				
sedimentary rocks	2.65–2.74	2.72		
basic/ultrabasic rocks	2.43–3.20			
Precambrian				
dolomite	2.84–2.91			
quartzite, phyllite, schist	2.59–2.70	2.65–2.67		

a McDougall (1962), *b* Jaeger (1964), *c* Hydro-Electric Commission Testing Department, *d* McDougall and Stott (1961), *e* Leaman and Naqvi (1968).

The samples measured are relatively near-surface and compaction with depth would increase the value (Holmes, 1965, p. 1025). The average overall density of the Triassic rocks has been taken as 2.42 g/cm³ using proportions of sandstone and mudstone considered a 'norm'. The average density of dolerite, in large scale flat-lying differentiated bodies is 2.90 g/cm³ (Jaeger, 1964).

The variation in results for the Ferntree Mudstone is thought to be due to weathering and variation in pyrite and siderite content. The value of 2.50 g/cm³ is low compared with that obtained by other workers, but this may reflect a different rock composition as other measurements were made in the Hobart district. The estimated overall density for Permian rocks is 2.55 g/cm³, although parts of the succession are denser.

Most pre-Permian rocks have densities in the range 2.65-2.72 g/cm^3 with the major units and Precambrian rocks in the range 2.65-2.67 g/cm^3. A density of 2.67 g/cm^3 has been assumed for Precambrian basement rocks and this value was used in the Bouguer reduction. This means that any anomalies observed are principally related to structures of the post-Carboniferous rocks. The density contrasts between the overlying rocks and the basement are:

Tertiary — 0.67 g/cm^3	Permian — 0.12 g/cm^3
Triassic — 0.25 g/cm^3	Jurassic dolerite + 0.23 g/cm^3

The density contrast between the Lower Palaeozoic rocks and the basement is generally about ± 0.05 g/cm^3.

Regional Effects

The total Bouguer anomaly values show a NE-SW trend in the E of the area and a N-S trend in the W. The values show a steady decrease inland. This trend in the Bouguer anomaly, due to crustal features, is known as the regional trend.

The regional effect, as shown in the area surveyed, is a result of mantle depression due to the plateau of central Tasmania; Tasmania being broadly compensated isostatically. This effect would be expected to roughly parallel the coastline and thus gradients would be nearly N-S through the central N of Tasmania. However, a very large negative anomaly related to the granites in NE Tasmania has considerably distorted the normal gradient to a NE-SW trend.

Two procedures were employed to resolve the magnitude of the regional gradient. The first required selection of profiles showing maximum gradient. A mean gradient was then produced graphically from these profiles. The second method was to calculate the average value of the Bouguer anomaly at points on a three mile (4.8 km) grid using all stations within a radius of six miles (9.7 km). The average values were then contoured. Using both sets of reductions an estimate of the regional trend was possible and this is shown on the map of total Bouguer anomaly (map 1).

Residual Anomalies

Map 2 presents the residual anomalies obtained by subtraction of the estimated regional field from that of the total Bouguer anomaly.

The principal negative anomalies coincide with Tertiary basins. The largest anomalies are in the Oaks-Westbury region (— 19 mgal at Hadspen and — 16 mgal SW of Oaks). Anomalies of — 10 mgal occur at Windermere in the Tamar basin and at Port Sorell. The contours around the margins of the Tertiary basins are irregular and correspond to river valleys in the pre-Tertiary rocks.

Positive anomalies up to 7 mgal are related to exposed dolerite bodies, for example at Mt Arnon. Other anomalies of 5-11 mgal are to found SW of the Tiers fault and occur on Precambrian, Cambrian and Lower Permian rocks. These anomalies are aligned along the axis of Precambrian rocks and probably also the axis of Cambrian and Tabberabberan folding.

Anomalies between these extremes reflect regions where both positively and negatively attracting materials are present in roughly equal proportions.

Methods of Interpretation

All interpretation has been undertaken using the residual Bouguer anomalies (map 2). Several profiles have been drawn across the area and theoretical profiles matched against the observed anomaly. Calculations have been based on the attraction produced by two dimensional rectangular prisms.

The attraction, at a point P, of a prism is:

$$g = 2G\rho\left[x \ln \frac{r_1 r_4}{r_2 r_3} + b \ln \frac{r_2}{r_1} + D\ (\phi_2 - \phi_4) - d\ (\phi_1 - \phi_3)\right]$$

[Parasnis, 1962]

where G is the gravitational constant, ρ is the density and the other parameters are as shown in Figure 1 (p. 16). The anomaly is obtained by substituting the density contrast δ for ρ.

Templates were produced showing the attraction of standard sized prisms at different positions relative to the point P using this equation. The Elliott 503 Algol computer programme used for these calculations is given in Appendix 2. Templates for prisms of 1,320 x 264 ft (402 x 81 m) section and 2,640 x 264 ft (810 x 81 m) section are shown in Figures 2 and 3. It was found that most geological conditions could be estimated with blocks of this size. Smaller prisms were needed to fit exposure and surface irregularities.

Thus by dividing the model into horizontal rectangular slices 264 ft (81 m) thick it was possible to overlay the template and sum the attraction at any point along a traverse. Each total is made up of individual components determined by density contrast. This method takes a little longer than the preparation for fully computerized models but permits rapid adjustment of the model.

Profiles have been drawn approximately perpendicular to the strike of any anomalies. Most anomalies have a length more than five times their width and thus the error in using two dimensional methods is less than 5% (Nettleton, 1940, p. 117).

Interpretation of Selected Profiles

The profiles discussed below are shown in Figure 4. Profiles for Port Sorell and Launceston are standards, against which the residual values have been checked, as both cross regions in which the structures are well known from deep drilling.

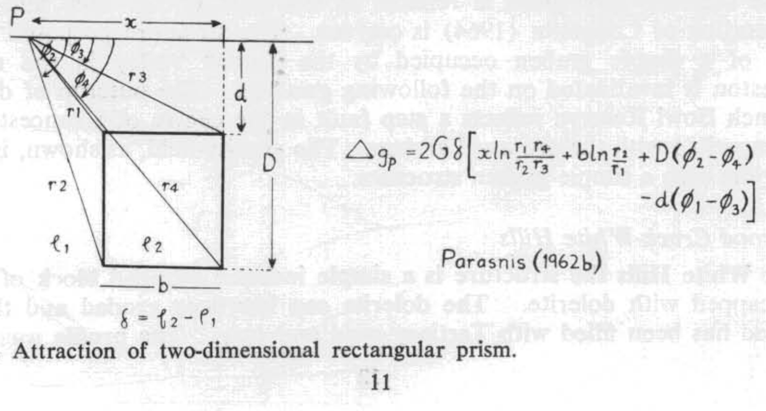


FIGURE 1. Attraction of two-dimensional rectangular prism.

Port Sorell

A negative anomaly of 10 mgal corresponds with the outcrop of Tertiary sediments. There is a very small positive anomaly E of Port Sorell where the basal Permian and underlying Cambrian and Precambrian rocks are exposed.

Drilling S of Port Sorell revealed 1,100 ft (335 m) of Tertiary sediments and basalts. Each hole encountered dolerite at depth. As dolerite was drilled for more than 500 ft (152 m) in one hole, and also crops out nearby, it appears that the downfaulted Port Sorell block contains an eroded sill. This sill is more clearly exposed S and W of Port Sorell where it is intrusive into Lower Permian rocks.

The model (map 2) probably contains too great a thickness of Permian rocks beneath the sill N of the southern boundary fault. Removal of Permian rocks would improve correlation of the profiles. Calculation of the profile also revealed a deep trench NW of Port Sorell. Dolerite is exposed at Port Sorell township and along the coast toward Devonport. However, if this were a continuous block the anomaly would have been about — 1 mgal. The value of 5 mgal suggests a deep narrow ravine filled with light sediments. There are in fact no outcrops in this zone. (Burns, 1965; Gee, in press).

A very much larger negative anomaly, of which that at Port Sorell is a tongue, passes N-S through Northdown Beach, W of Port Sorell. The thickness of Tertiary sediments at Pardoe Beach is estimated at 1,700 ft (518 m). This basin also appears to occupy a downfaulted block (see also Burns, 1965).

Launceston

The Launceston section is based on the mapping of Longman *et al.* (1964). The thickness of the Tertiary sediments suggested is based on drilling information. The primary unkown is the thickness of dolerite beneath the Tertiary cover. Examination of the profiles shows that the thickness of Jurassic dolerite probably increases markedly close to the Trevallyn fault, since there is no other way to account for the excess mass close to a negative anomaly. A westward transgression of the dolerite from this fault is implied and it is not unlikely that a small feeder exists there. The calculated profile E of the fault suggests that too great a thickness of Tertiary sediments has been included, or that the underlying dolerite body has transgressed from the W, thinning eastward. This latter conclusion is compatible with the westward transgression across the fault and supports the implication of a feeder.

Elsewhere in the section there is good agreement between profiles, suggesting that the regional separation is reliable in this part of the area and that the interpretation of Longman (1964) is correct. The structure proposed by Carey (1947) of a simple graben occupied by the Tamar Valley in the region of Launceston is invalidated on the following grounds. The outcrop of dolerite in the Punch Bowl Reserve reflects a step fault in the centre of Launceston which is incompatible with the proposed graben. The gravity field, as shown, is also not compatible with a simple graben structure.

Blackwood Creek-White Hills

At White Hills the structure is a simple inclined dropped block of Permian rocks capped with dolerite. The dolerite cap has been eroded and the wedge produced has been filled with Tertiary sand and clay. The profile was matched in this part of the section without difficulty as information to the N and S indicated the amount of dolerite present (Longman *et al.* 1964) and some drilling has been undertaken in the Tertiary W of White Hills.

The anomaly of + 7 mgal at Mt Arnon is related to dolerite. There are outcrops of undifferentiated Permian sediments N of Perth with underlying dolerite. Comparison with the sediments adjacent to Mt Arnon suggests that dilation has occurred and that the dolerite is thick. However for the anomaly to be produced by a purely sheet-like body, such a sheet would need to be at least 2,500 ft (762 m) thick and would not give the distinctly peaked anomaly on this scale. It is also an exceptional size for Tasmanian dolerite bodies (Dolerite Symposium, 1958; Leaman, 1970). The model shows a large feeder branching laterally into a sheet 1,000-1,500ft (305-457 m) in thickness. This mass distribution best fits the observed anomaly profile. The feeder may be narrower than drawn, provided the density contrast extends well into the crust, which is likely. To produce the breadth of attraction a feeder extending infinitely in depth with a minimum width of half a mile (0.8 km) would be required.

A basalt feeder is also suggested along the Trevallyn Fault at Breadalbane (see contours, map 2).

On the SW side of the Pateena Fault, Upper Triassic Coal Measures are exposed at the surface. These sediments are above the sheet which is intruded fairly consistently at the base of the Triassic System around the basin. Although the wedge dips W, the anomaly does not and a single dolerite sheet on this column does not satisfy the mass requirements. This block is the only one in this section to show two dolerite bodies (see Hummocky Hills section), and it is also the only downfaulted block, all other faulting steps down to the E. The Pateena fault is considered to have moved in the Jurassic and this has resulted in a graben structure when the Tertiary movements were superimposed on the adjacent block to the W.

West of the Tiers Faults a positive anomaly of 6 mgal corresponds with a basement high. Such an anomaly could be partly produced by a dolerite dyke intruded along the Tiers Fault. However, the centre of the anomaly is some distance W of the fault and it is suggested that the source of the anomaly is an ultrabasic intrusion. This anomaly is upstrike from that observed at Billop (see also p. 15).

There is a negative anomaly of 2 mgal between Blackwood Creek and Billop. The source of this deficiency is unknown as the basement is close and not obviously anomalous. It suggests that dolerite feeders are absent even though dolerite is found nearby in basal Permian rocks.

Hummocky Hills

The section shows step-faulting with Tertiary sediments occupying wedges against faults, and more than one dolerite sill is required to satisfy the mass distribution. This requirement is clearly seen at Hummocky Hills and at Deddington. At Hummocky Hills, the exposure shows more than 1,000 ft (305 m) of dolerite intruded in Upper Triassic Coal Measures. Drilling around Hummocky Hills shows further dolerite beneath these rocks (W. L. Matthews, pers. comm.). Dolerite is intruded low in the Triassic around the Oaks-Westbury basin. Assuming a sill near this horizon and a further sill in the Coal Measures the mass requirements are satisfied. The anomaly pattern is not compatible with configurations involving dykes.

The two sills are slightly transgressive and are connected by a cross-dyke at Deddington. There is some discrepancy in the profiles at this point, but this may be due to incorrect removal of the regional effects at the margin of this area and also the finite length of prisms required.

Windermere

Little geological information is available regarding the Windermere section as much of the surface is dolerite or water covered and it is not possible to give reliable estimates of the thickness of dolerite. A borehole drilled at Native Point reached dolerite at 218 ft (66 m) below the surface after passing through Tertiary sediments. There is good agreement of profiles. In the region of Exeter, where the dolerite thickness is known, the remainder of the profile is a direct fit. An increased thickness of Tertiary rocks would require a greater thickness of dolerite beneath them. However, the limited drilling control supports the section as drawn. East of Windermere a further deep channel is indicated. This is reflected in both geology and gravity field on an areal scale.

Golden Valley-Deloraine

The Golden Valley-Deloraine-Parkham area is characterized by significant positive anomalies over basal Permian, Cambrian and Precambrian rocks. Small negative anomalies are related to Tertiary-filled valleys covered with basalt. The limbs of the fold are steep although the core is broad. The western limb is faulted.

The maximum anomaly along the profile is $+9$ mgal. The possible sources of this anomaly are:

(1) Cambrian sediments and 'volcanics'. As the maximum thickness of these rocks in this area is about 2,000 ft (610 m) they could produce an anomaly of only 2 mgal with an estimated maximum contrast of $+0.1$ g/cm^3. The term 'volcanics' here refers principally to the acid and basic rock suite so typical of Middle Cambrian rocks in Tasmania.

(2) Precambrian rocks could not produce this anomaly, as they normally have no contrast with the standard density of 2.67 g/cm^3. The dolomite which occurs at the top of the Precambrian rocks at Billop could produce this anomaly but it would have to be folded into the core of the fold and be at least 3,000 ft (914 m) thick. There is no evidence of dolomite of this thickness in the Precambrian rocks at Golden Valley or at Parkham. Pyritic slates and shales seen N of Frankford could again produce this anomaly. Assuming 10% pyrite, giving a density of 2.93 g/cm^3 a thickness of 3,000 ft (914 m) would be required. None of these rocks have been seen within 20 miles (32 km) of these anomalies. Amphibolites such as are present in the Precambrian rocks at Savage River could produce this anomaly. However none have been seen in this area and those mapped elsewhere are not of sufficient size to produce such a large anomaly.

(3) Jurassic dolerite could produce anomalies of this magnitude. However, the anomalies are peaked, aligned and occur over a large area. If the anomalies represent dolerite feeders in the fold cores these should have penetrated the fold or else it is necessary to assume a very large volume of dolerite restricted to fold cores. At Golden Valley there are only three plug-like bodies exposed and these have a total outcrop of 0.1 square miles (0.26 km^2). Such bodies would not produce the anomaly. Similar anomalies at Billop and Parkham cannot be related directly to dolerite even though it may be nearby, as at Billop. It is considered unlikely that large scale intrusion into the fold axes could have occurred and been halted, particularly when axial faults are present.

1·5795	0·0531	0·0178	0·0089	0·0054	0·0036	0·0026	0·0019	0·0015	0·0012	0·0010	0·0008	0·0007	0·0006	0·0005	0·0005	0·0004	0·0004	0·0003	0·0003
1·3741	0·1523	0·0527	0·0266	0·0160	0·0107	0·0076	0·0057	0·0045	0·0036	0·0029	0·0024	0·0021	0·0018	0·0015	0·0013	0·0012	0·0011	0·0009	0·0008
1·1866	0·2338	0·0856	0·0438	0·0265	0·0177	0·0127	0·0095	0·0074	0·0059	0·0049	0·0041	0·0034	0·0029	0·0026	0·0022	0·0020	0·0017	0·0016	0·0014
1·0317	0·2933	0·1152	0·0600	0·0366	0·0246	0·0177	0·0133	0·0104	0·0083	0·0068	0·0057	0·0048	0·0041	0·0036	0·0031	0·0028	0·0025	0·0022	0·0020
0·9005	0·3320	0·1409	0·0752	0·0464	0·0331	0·0226	0·0170	0·0133	0·0106	0·0087	0·0073	0·0062	0·0053	0·0046	0·0040	0·0035	0·0031	0·0028	0·0025
0·7928	0·3539	0·1623	0·0891	0·0556	0·0378	0·0273	0·0206	0·0161	0·0129	0·0106	0·0089	0·0075	0·0064	0·0056	0·0049	0·0043	0·0038	0·0034	0·0031
0·7045	0·3632	0·1796	0·1016	0·0642	0·0440	0·0319	0·0242	0·0189	0·0152	0·0125	0·0104	0·0088	0·0076	0·0066	0·0058	0·0051	0·0045	0·0041	0·0036
0·6317	0·3640	0·1929	0·1125	0·0722	0·0499	0·0363	0·0276	0·0217	0·0175	0·0143	0·0120	0·0102	0·0087	0·0076	0·0066	0·0059	0·0052	0·0047	0·0042
0·5712	0·3590	0·2027	0·1220	0·0795	0·0554	0·0406	0·0310	0·0246	0·0196	0·0162	0·0135	0·0115	0·0099	0·0086	0·0075	0·0066	0·0059	0·0053	0·0048
0·5204	0·3504	0·2094	0·1300	0·0817	0·0606	0·0447	0·0342	0·0270	0·0218	0·0179	0·0150	0·0128	0·0110	0·0095	0·0084	0·0074	0·0066	0·0059	0·0053
0·4773	0·3398	0·2136	0·1366	0·0921	0·0654	0·0485	0·0373	0·0295	0·0239	0·0197	0·0165	0·0141	0·0121	0·0105	0·0092	0·0082	0·0073	0·0065	0·0059
0·4405	0·3280	0·2157	0·1419	0·0973	0·0698	0·0522	0·0403	0·0319	0·0259	0·0214	0·0180	0·0153	0·0132	0·0115	0·0100	0·0089	0·0079	0·0071	0·0064
0·4087	0·3158	0·2160	0·1461	0·1019	0·0739	0·0556	0·0431	0·0343	0·0279	0·0231	0·0194	0·0165	0·0142	0·0124	0·0109	0·0096	0·0086	0·0077	0·0069
0·3809	0·3036	0·2151	0·1492	0·1058	0·0776	0·0587	0·0458	0·0365	0·0300	0·0247	0·0208	0·0177	0·0153	0·0133	0·0117	0·0104	0·0092	0·0083	0·0075
0·3565	0·2917	0·2131	0·1515	0·1092	0·0809	0·0617	0·0483	0·0387	0·0316	0·0263	0·0222	0·0189	0·0163	0·0142	0·0125	0·0110	0·0099	0·0089	0·0080
0·3351	0·2801	0·2104	0·1529	0·1119	0·0838	0·0644	0·0507	0·0407	0·0334	0·0278	0·0235	0·0201	0·0174	0·0152	0·0133	0·0118	0·0105	0·0095	0·0085
0·3160	0·2690	0·2071	0·1537	0·1142	0·0864	0·0669	0·0529	0·0427	0·0351	0·0293	0·0248	0·0212	0·0184	0·0160	0·0141	0·0125	0·0112	0·0100	0·0091
0·2988	0·2586	0·2034	0·1538	0·1160	0·0887	0·0691	0·0550	0·0456	0·0367	0·0307	0·0260	0·0223	0·0193	0·0169	0·0149	0·0132	0·0118	0·0106	0·0096
0·2834	0·2486	0·1994	0·1535	0·1174	0·0907	0·0712	0·0569	0·0463	0·0383	0·0321	0·0272	0·0234	0·0203	0·0177	0·0156	0·0139	0·0124	0·0112	0·0101
0·2695	0·2392	0·1952	0·1528	0·1184	0·0924	0·0731	0·0587	0·0480	0·0398	0·0334	0·0284	0·0244	0·0212	0·0186	0·0164	0·0146	0·0130	0·0117	0·0106
0·2568	0·2304	0·1909	0·1517	0·1191	0·0938	0·0747	0·0604	0·0495	0·0412	0·0347	0·0296	0·0255	0·0221	0·0194	0·0171	0·0152	0·0136	0·0122	0·0111
0·2453	0·2221	0·1866	0·1504	0·1194	0·0949	0·0762	0·0619	0·0510	0·0425	0·0359	0·0307	0·0264	0·0230	0·0202	0·0178	0·0159	0·0142	0·0128	0·0116
0·2348	0·2142	0·1822	0·1488	0·1195	0·0959	0·0774	0·0633	0·0523	0·0438	0·0371	0·0317	0·0274	0·0239	0·0210	0·0186	0·0165	0·0148	0·0133	0·0121
0·2250	0·2069	0·1780	0·1471	0·1194	0·0966	0·0786	0·0645	0·0536	0·0450	0·0382	0·0327	0·0283	0·0247	0·0217	0·0192	0·0172	0·0154	0·0139	0·0125
0·2161	0·1999	0·1737	0·1452	0·1190	0·0971	0·0795	0·0656	0·0547	0·0461	0·0392	0·0337	0·0292	0·0255	0·0225	0·0199	0·0178	0·0159	0·0144	0·0130
0·2079	0·1933	0·1696	0·1432	0·1185	0·0975	0·0803	0·0667	0·0558	0·0472	0·0402	0·0346	0·0301	0·0263	0·0232	0·0206	0·0184	0·0165	0·0149	0·0135
0·2002	0·1872	0·1656	0·1411	0·1178	0·0976	0·0810	0·0676	0·0568	0·0481	0·0412	0·0355	0·0309	0·0271	0·0239	0·0212	0·0189	0·0170	0·0154	0·0139
0·1931	0·1813	0·1616	0·1389	0·1170	0·0977	0·0816	0·0684	0·0577	0·0491	0·0421	0·0364	0·0317	0·0278	0·0246	0·0218	0·0195	0·0176	0·0159	0·0144
0·1865	0·1758	0·1578	0·1368	0·1161	0·0976	0·0820	0·0690	0·0585	0·0499	0·0429	0·0372	0·0324	0·0285	0·0252	0·0224	0·0201	0·0181	0·0163	0·0148
0·1803	0·1706	0·1541	0·1346	0·1151	0·0974	0·0823	0·0696	0·0592	0·0507	0·0437	0·0380	0·0332	0·0292	0·0259	0·0230	0·0206	0·0186	0·0168	0·0153

FIGURE 2. Template 1. Block 1,320 x 264 ft.

1·6326	0·0268	0·0089	0·0045	0·0027	0·0018	0·0013	0·0009	0·0007	0·0006
1·5264	0·0794	0·0267	0·0133	0·0080	0·0054	0·0038	0·0029	0·0024	0·0018
1·4234	0·1293	0·0422	0·0224	0·0134	0·0089	0·0064	0·0048	0·0037	0·0030
1·3250	0·1752	0·0613	0·0310	0·0187	0·0125	0·0089	0·0067	0·0052	0·0042
1·2325	0·2161	0·0771	0·0396	0·0239	0·0160	0·0114	0·0086	0·0067	0·0054
1·1467	0·2515	0·0934	0·0479	0·0291	0·0195	0·0140	0·0105	0·0082	0·0065
1·0677	0·2812	0·1082	0·0561	0·0341	0·0229	0·0164	0·0124	0·0096	0·0077
0·9957	0·3054	0·1221	0·0640	0·0391	0·0263	0·0189	0·0142	0·0111	0·0089
0·9302	0·3247	0·1350	0·0716	0·0440	0·0297	0·0214	0·0161	0·0125	0·0101
0·8708	0·3394	0·1468	0·0789	0·0487	0·0330	0·0238	0·0179	0·0140	0·0112
0·8171	0·3502	0·1575	0·0858	0·0534	0·0362	0·0261	0·0197	0·0154	0·0124
0·7685	0·3576	0·1672	0·0924	0·0578	0·0394	0·0285	0·0215	0·0168	0·0135
0·7245	0·3621	0·1758	0·0986	0·0621	0·0425	0·0308	0·0233	0·0182	0·0147
0·6845	0·3643	0·1834	0·1045	0·0663	0·0455	0·0331	0·0251	0·0196	0·0158
0·6482	0·3646	0·1900	0·1100	0·0703	0·0484	0·0353	0·0268	0·0210	0·0169
0·6152	0·3633	0·1958	0·1151	0·0741	0·0513	0·0375	0·0285	0·0224	0·0180
0·5850	0·3608	0·2006	0·1198	0·0778	0·0541	0·0396	0·0301	0·0237	0·0191
0·5574	0·3572	0·2047	0·1241	0·0813	0·0568	0·0417	0·0318	0·0250	0·0202
0·5320	0·3529	0·2081	0·1281	0·0846	0·0594	0·0437	0·0334	0·0263	0·0212
0·5087	0·3480	0·2108	0·1318	0·0877	0·0618	0·0457	0·0350	0·0276	0·0223
0·4872	0·3426	0·2128	0·1351	0·0907	0·0643	0·0476	0·0365	0·0289	0·0234
0·4674	0·3370	0·2143	0·1381	0·0935	0·0666	0·0495	0·0381	0·0301	0·0244
0·4490	0·3311	0·2154	0·1407	0·0961	0·0688	0·0513	0·0395	0·0313	0·0254
0·4319	0·3250	0·2159	0·1431	0·0986	0·0709	0·0530	0·0410	0·0325	0·0264
0·4160	0·3189	0·2161	0·1452	0·1008	0·0729	0·0547	0·0424	0·0337	0·0274
0·4012	0·3128	0·2160	0·1470	0·1030	0·0749	0·0564	0·0437	0·0349	0·0284
0·3874	0·3066	0·2155	0·1486	0·1049	0·0767	0·0580	0·0451	0·0360	0·0293
0·3744	0·3006	0·2147	0·1499	0·1070	0·0784	0·0595	0·0464	0·0371	0·0302
0·3623	0·2946	0·2137	0·1510	0·1084	0·0801	0·0610	0·0477	0·0382	0·0312
0·3509	0·2887	0·2125	0·1519	0·1099	0·0816	0·0624	0·0489	0·0392	0·0321

FIGURE 3. Template 2. Block 2,640 x 264 ft.

(4) Cambrian ultrabasics and associated basic lavas could produce this anomaly and need not penetrate Cambrian rocks. The environment for intrusion is also in keeping with that found elsewhere as it is marginal to a geanticlinal block in the Cambrian. Serpentinite has been recorded a few miles to the W, and sheared and altered dunite, pyroxenite and gabbro occur to the SE along the strike of the structure and the anomaly (e.g. at Connorville). The anomaly at Billop is directly related to such rocks. An aeromagnetic survey (Finney and Shelley, 1966) did not show any anomaly in this region which could be related to ultrabasics. However no profile actually crossed an anomalous body and comparison with other profiles shows that there is little anomaly unless the traverse crossed directly over an outcropping anomalous body.

The source of the anomaly is thus considered to be a nearly concordant, lenticular ultrabasic suite intruded close to the base of the Cambrian rocks.

The negative anomaly at Deloraine reflects Tertiary sediments in a basalt valley. The proportion of basalt to sediment is about 1 : 1.

The Cambrian rocks in the section have been shown as thinning to the N since they lap onto the basement rocks at Parkham. The positive anomaly N of Deloraine is thus related to the body of dolerite intruded low in the Permian succession.

CONCLUSIONS

With the exception of the Port Sorell graben structure, the Tertiary sediments occupy step-faulted wedge-shaped depressions. The largest basin, in areal extent and depth, is the Oaks-Westbury basin which has a maximum possible thickness, under the assumptions made, of 2,600 ft (792 m). Drilling SE of Oaks [911703]* by C. Sulzberger has revealed over 1,800 ft (550 m) of Tertiary sediment in this part of the basin. There is also a further 300 ft (90 m) of material of probable Tertiary age. A second hole, at Hagley [81258550]* verified more than 2,100 ft (640 m) of Tertiary sediment. Both holes bottomed in dolerite. It is not clear whether deposition, faulting and erosion proceeded concurrently but considerable erosion is implied throughout much of the area now covered and filled with sediment. The margins of the basins are irregular in character due to large tongues of sediment filling tributary valleys. There appears to be a bar along the Tamar S of Launceston between the basins E and W of Hummocky Hills and also between the Deloraine and Westbury basins.

The Jurassic dolerite has intruded the area as two sub-parallel sheets. There is a large feeder near Mt Arnon. There is no evidence for substantial feeders, elsewhere although there are plugs, or possibly small feeders, at Golden Valley and Billop which do not produce any significant anomaly. There is a thin, discontinuous development of dolerite at the Permian-Precambrian uncomformity at Billop which may be related to a small centre there. There was some movement along the Pateena fault in Jurassic times related to the dolerite centre at Mt Arnon.

The fundamental character of the Tiers fault has been stressed by this survey. Southwest of it lies the elevated country with the Tabberabberan fold belt clearly exposed. The fault itself may represent rejuvenation of a fracture marginal to the Tyennan geanticline. The anticlinal fold axis nearest the fault is intruded by concordant, lenticular ultrabasic piles from Billop to W of Sheffield (see also Sheehan, 1969).

* Kiloyard grid, Quamby 1-inch sheet.

APPENDIX 1

GRAVITY DATA : TIE STATIONS

Station	Location	Observed Gravity (*gal*)	Altitude (*m*)
BRACKNELL 6450.0782	East Bracknell. Bridge, Liffey River	980.26298	178.3
CAMPBELL TOWN 6751.1001	SPM 764, S wall and corner of Council Chambers	980.29328	201.2
CRESSY 6450.0543	BM 3760, N Cressy	980.27162	158.0
CRESSY-POATINA 6450.0682	SPM 1821, road junction Poatina/Cressy/Bracknell	980.27342	179.3
DELORAINE 6751.0300	BM 725, mile post, Launceston 30	980.24719	239.8
ELIZABETH TOWN 6751.0544	Post Office entrance	980.24997	210.3
EXETER 6751.0507	BM 4358	980.27424	53.64
EXETER HIGHWAY 6751.0500	Westbury Junction	980.24932	202.4
LAUNCESTON 6751.1173	Tamar Bridge rail crossing, W side	980.30207	1.5
NILE 6751.1113	North end of E side of Nile Bridge. Bench mark set in concrete	980.28235	178.9
OAKS 6450.0766	Railway Station	980.25097	177.3
PERTH 6450.0505	West Perth. Longford-Perth railway crossing	980.28109	162.1
PORT SORELL 6751.0612	Road Junction Hartford/Port Sorell/Devonport/Hawley. Signpost	980.28903	21.6
6751.0571	Road Junction Frankford Highway/Bakers Beach Road. Signpost	980.32421	15.5
POWRANNA 6751.0424	Midland Highway, Poatina turnoff. Signpost	980.27309	184.1
ROCHERLEA 6751.0206	SPM 1455, at northern PMG control column opposite Lilydale Road turnoff	980.27906	96.01
WESTBURY 6751.1225	Frankford Road rail crossing	980.25627	172.5
WESTERN JUNCTION 6751.1088/6450.0501	Western Junction-Evandale Road. Rail crossing at Western Junction Station	980.27734	161.8
WHITE HILLS 6751.1107	Relbia/White Hills/ Evandale junction, centre of road	980.29678	49.99

APPENDIX 2

ALGOL PRISM ATTRACTION PROGRAMME

Algoltext : *Elliott 503*

```
Rectangular two dimensional prism attraction programme, U974;
begin   real d, g, arcd, arcD;  integer x, dd, D, t, tT, b, z, x0, T;
        sameline; topofform;
        read reader(1), x0, t, b, z, T;
        tT: = T − t;
        for dd : = 0 step t until tT do
           begin if dd = 0 then d : = 0.0001 else d : = dd;   D : = d + t;
                for x : = x0 step b until z do
                    begin if x = b then arcd : = arcD : = 1.5708 else
                              begin arcd : = arctan(d/(x − b));
                                    arcD : = arctan(D/(x − b));
                              end;
                         g : = 0.004066*(x*ln(sqrt(d*d + (x − b)*(x − b))*sqrt(D*D + x*x)/(sqrt(d*d + x*x)*sqrt(D*D + (x − b)*(x − b))))
                              + b*ln((sqrt(D*D + (x −b)*(x − b)))/(sqrt(d*d + (x − b)*(x − b))))
                              + D*(arcD − arctan(D/x))−d*(arcd − arctan(d/x)));
                         print scaled (5), g
                    end
                print ££l??
           end
end of program;
```

REFERENCES

BARTON, C. M.; BRAVO, A. P.; GULLINE, A. B.; LONGMAN, M. J.; MARSHALL, B.; MATTHEWS, W. L.; MOORE, W. R.; NAQVI, I. H.; PIKE, G. P. 1970. Geological atlas 1 mile series. Zone 7 sheet 46 (8214N). Quamby. *Department of Mines, Tasmania.*

BLAKE, F. 1959. Geological atlas 1 mile series. Zone 7 sheet 47. Longford. *Department of Mines, Tasmania.*

BURNS, K. L. 1965. One mile geological map series. K/55-6-29. Devonport. *Explan. Rep. geol. Surv. Tasm.*

CAREY, S. W. 1947. Geology of the Launceston district. *Rec. Qn Vict. Mus.* 2(1): 31-46.

CAREY, S. W. 1958. The isostrat, a new technique for the analysis of the structure of the Tasmanian dolerite, *in*: *Dolerite. A symposium*: 130-164.

CLARKE, M. J. 1968. A reappraisal of a Lower Permian type section, Golden Valley, Tasmania. *Rec. geol. Surv. Tasm.* 7.

DOLERITE SYMPOSIUM. 1958. *Dolerite. A symposium.* Department of Geology, University of Tasmania: Hobart.

EVERARD, G. 1968. Notes on specimens collected at various localities. Lake River area - Connorville. *Tech. Rep. Dep. Mines Tasm.* 12: 122-126.

FINNEY, W. A.; SHELLEY, E. P. 1966. Tasmania aeromagnetic survey 1966. *Rec. Bur. Miner. Resour. Geol. Geophys. Aust.* 1966/139.

GEE, R. D. in press. Geological atlas 1 mile series. Zone 7 sheet 30 (8215N). Beaconsfield. *Explan. Rep. Dep. Mines Tasm.*

HAMMER, S. 1939. Terrain corrections for gravimeter stations. *Geophysics* 4:184-194.

HEISKANEN, W. A.; VENING MEINESZ, F. A. 1958. *The earth and its gravity field.* McGraw-Hill: New York.

HINCH, A. J. 1965. *A gravity survey of the Cressy area, northern Tasmania.* B.Sc. Thesis. University of Tasmania: Hobart.

HOLMES, A. 1965. *Principles of physical geology.* 2 ed. Nelson: London.

JAEGER, J. G. 1964. The value of measurements of density in the study of dolerites. *J. geol. Soc. Aust.* 11: 133-140.

JOHNSTON, R. M. 1888. *Systematic account of the geology of Tasmania.* Government Printer: Hobart.

LEAMAN, D. E. 1970. *Dolerite intrusion, Hobart district Tasmania.* Ph.D. Thesis. University of Tasmania: Hobart.

LEAMAN, D. E.; NAQVI, I. H. 1968. Geology and geophysics of the Cygnet district. *Bull. geol. Surv. Tasm.* 49.

LONGMAN, M. J. 1966. One mile geological map series. K/55-7-39. Launceston. *Explan. Rep. geol. Surv. Tasm.*

LONGMAN, M. J.; MATTHEWS, W. L.; ROWE, S. M. 1964. Geological atlas 1 mile series. Zone 7 sheet 39 (8315S). *Department of Mines, Tasmania.*

MCDOUGALL, I. 1962. Differentiation of the Tasmanian dolerites: Red Hill dolerite-granophyre association. *Bull. geol. Soc. Am.* 73: 278-316.

MCDOUGALL, I.; STOTT, P. M. 1961. Gravity and magnetic observations in the Red Hill area, southern Tasmania. *Pap. Proc. R. Soc. Tasm.* 95: 7-15.

MCKELLAR, J. B. A. 1957. Geology of portion of the Western Tiers. *Rec. Qn Vict. Mus.* N.S. 7.

MARSHALL, B. 1970. Geological atlas 1 mile series. Zone 7 sheet 31 (8315N) Pipers River. *Explan. Rep. geol. Surv. Tasm.*

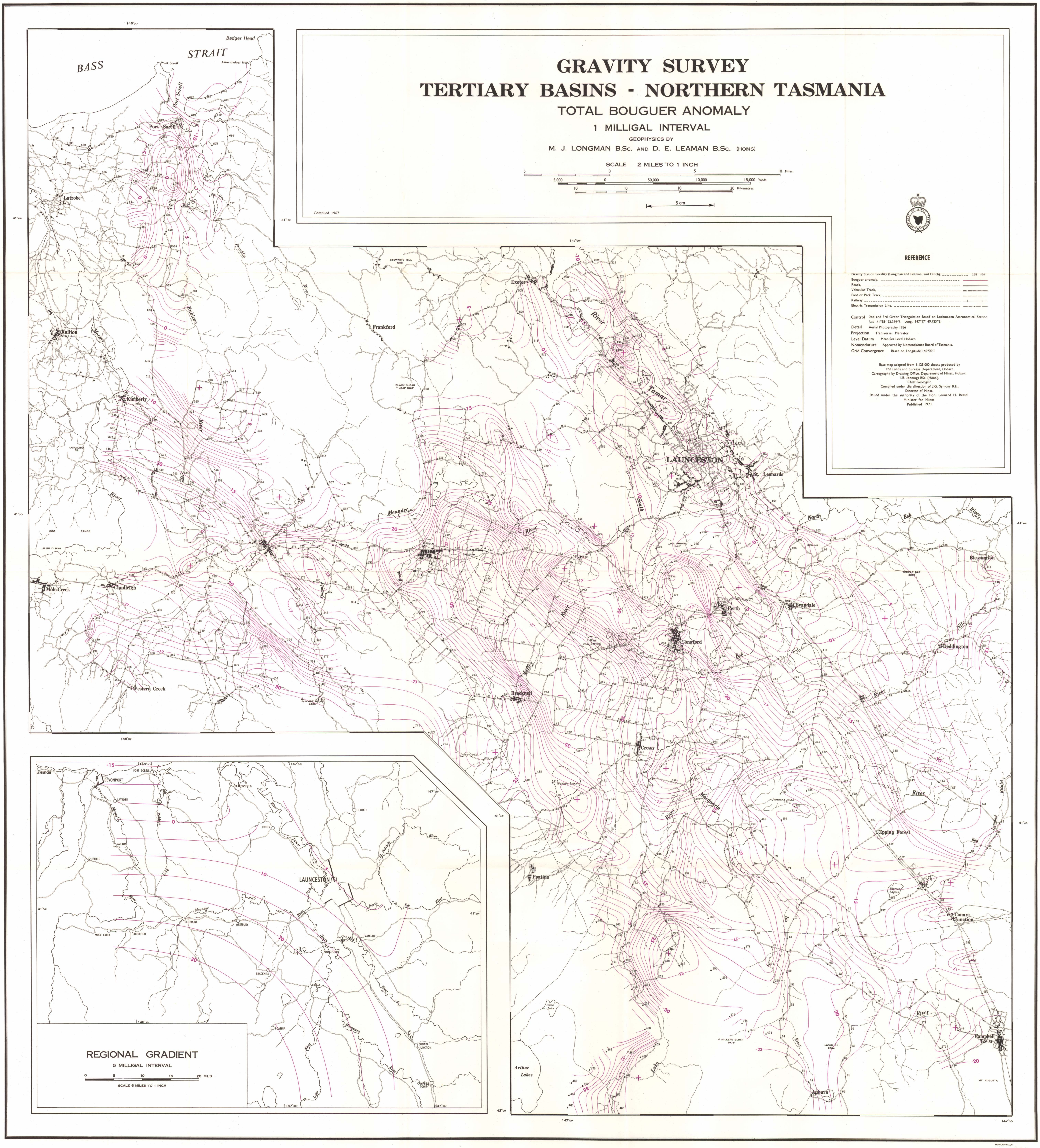
NETTLETON, L. L. 1940. *Geophysical prospecting for oil.* McGraw-Hill: New York.

PARASNIS, D. S. 1962. *Principles of applied geophysics.* Methuen: London.

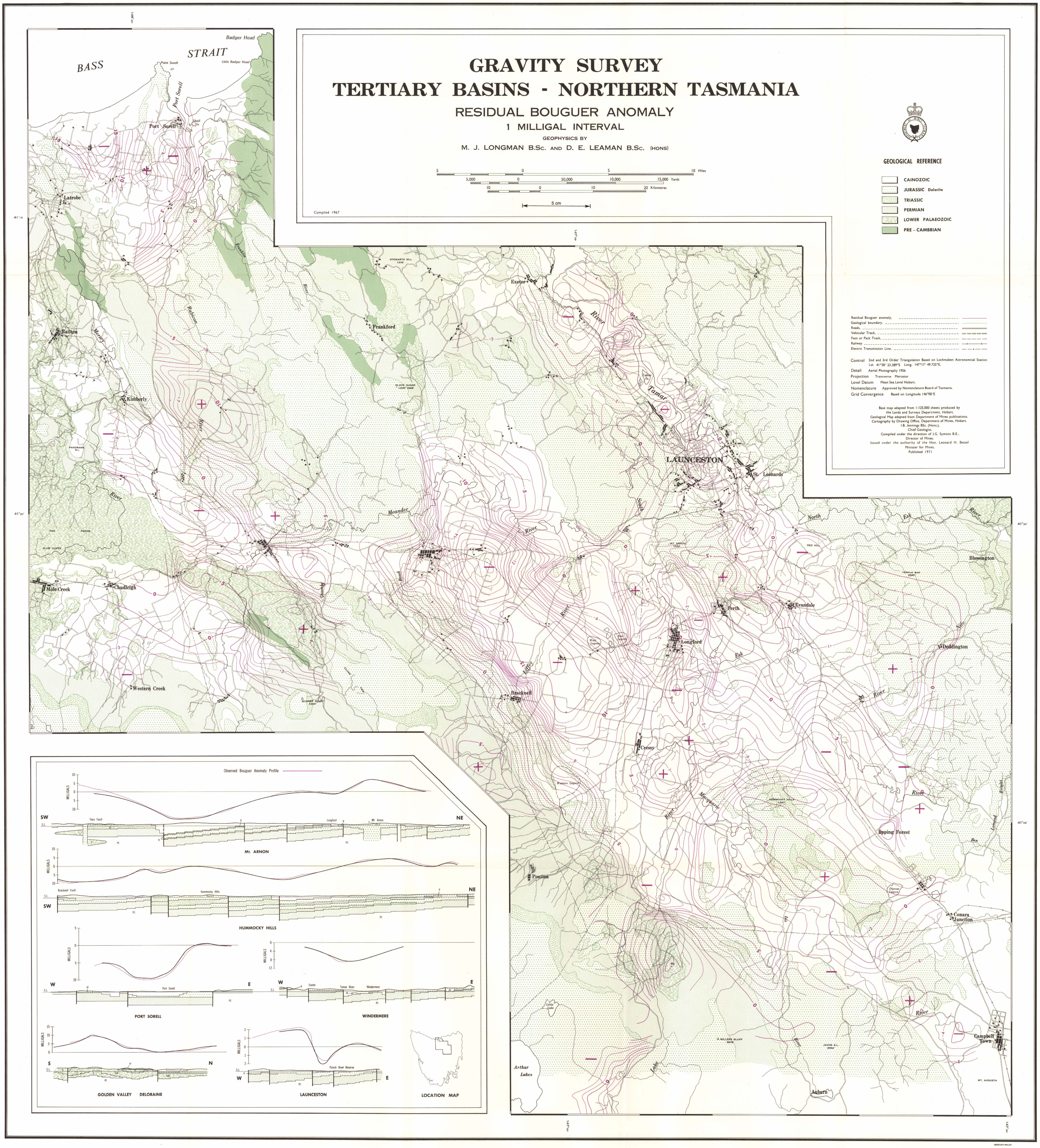
SHEEHAN, M. 1969. *Gravity field of the Sheffield area.* B.Sc. Thesis. University of Tasmania: Hobart.

WELLS, A. T. 1957. Geology of the Deloraine-Golden Valley area, Tasmania. *Rec. Qn Vict. Mus.* N.S. 8.

MAP 1



GRAVITY SURVEY
TERTIARY BASINS - NORTHERN TASMANIA
TOTAL BOUGUER ANOMALY
1 MILLIGAL INTERVAL
GEOPHYSICS BY
M. J. LONGMAN B.Sc. AND D. E. LEAMAN B.Sc. (HONS)
SCALE 2 MILES TO 1 INCH
Miles
Yards
Kilometres
5 cm
Compiled 1967
DEPARTMENT OF MINES TASMANIA
REFERENCE
Gravity Station Locality (Longman and Leaman, and Hinch). 138 450
Bouguer anomaly,
Roads,
Vehicular Track,
Foot or Pack Track,
Railway
Electric Transmission Line.
Control 2nd and 3rd Order Triangulation Based on Lochmaben Astronomical Station Lat 41°38′ 23.389″S Long. 147°17′ 49.725″E.
Detail Aerial Photography 1956
Projection Transverse Mercator
Level Datum Mean Sea Level Hobart.
Nomenclature Approved by Nomenclature Board of Tasmania.
Grid Convergence Based on Longitude 146°00′E
Base map adapted from 1:125,000 sheets produced by the Lands and Surveys Department, Hobart.
Cartography by Drawing Office, Department of Mines, Hobart.
I.B. Jennings BSc. (Hons.),
Chief Geologist.
Compiled under the direction of J.G. Symons B.E.,
Director of Mines.
Issued under the authority of the Hon. Leonard H. Bessel
Minister for Mines
Published 1971
BASS STRAIT
Badger Head
Port Sorell
Latrobe
Railton
Kimberly
Chudleigh
Mole Creek
Western Creek
Frankford
Exeter
LAUNCESTON
St. Leonards
Perth
Evandale
Longford
Bracknell
Cressy
Deddington
Blessington
Epping Forest
Conara Junction
Campbell Town
Poatina
Arthur Lakes
REGIONAL GRADIENT
5 MILLIGAL INTERVAL
SCALE 6 MILES TO 1 INCH


GRAVITY SURVEY
TERTIARY BASINS - NORTHERN TASMANIA
RESIDUAL BOUGUER ANOMALY
1 MILLIGAL INTERVAL
GEOPHYSICS BY
M. J. LONGMAN B.Sc. AND D. E. LEAMAN B.Sc. (HONS)
5 0 5 10 Miles
5,000 0 50,000 10,000 15,000 Yards
10 0 10 20 Kilometres
5 cm
Compiled 1967
GEOLOGICAL REFERENCE
CAINOZOIC
JURASSIC Dolerite
TRIASSIC
PERMIAN
LOWER PALAEOZOIC
PRE - CAMBRIAN
Residual Bouguer anomaly,
Geological boundary.
Roads,
Vehicular Track,
Foot or Pack Track,
Railway
Electric Transmission Line.
Control 2nd and 3rd Order Triangulation Based on Lochmaben Astronomical Station Lat 41°38′ 23.389″S Long. 147°17′ 49.725″E.
Detail Aerial Photography 1956
Projection Transverse Mercator
Level Datum Mean Sea Level Hobart.
Nomenclature Approved by Nomenclature Board of Tasmania.
Grid Convergence Based on Longitude 146°00′E
Base map adapted from 1:125,000 sheets produced by the Lands and Surveys Department, Hobart.
Geological Map adapted from Department of Mines publications.
Cartography by Drawing Office, Department of Mines, Hobart.
I.B. Jennings BSc. (Hons.), Chief Geologist.
Compiled under the direction of J.G. Symons B.E., Director of Mines.
Issued under the authority of the Hon. Leonard H. Bessel Minister for Mines.
Published 1971
BASS
STRAIT
Badger Head
Port Sorell
Latrobe
Railton
Kimberly
Exeter
Frankford
LAUNCESTON
St. Leonards
Mole Creek
Chudleigh
Western Creek
Bracknell
Perth
Evandale
Longford
Blessington
Deddington
Cressy
Poatina
Epping Forest
Conara Junction
Campbell Town
Arthur Lakes
Auburn
Observed Bouguer Anomaly Profile
MT. ARNON
HUMMOCKY HILLS
PORT SORELL
WINDERMERE
GOLDEN VALLEY DELORAINE
LAUNCESTON
LOCATION MAP