1977/27. Gravity survey of north-eastern Tasmania. Reinterpretation of the Gladstone section.

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Recent mapping of the Boobyalla Quadrangle has enabled significant modification of several key parts of the geological sketch map of Groves as included in the regional survey of Leaman and Symonds (1975). The rock types and distribution south and east of Tomahawk are not as indicated in earlier maps (fig. 1). This region is of particular interest since the two most obvious anomalies are included (see fig. 3, *op. cit*.). A section across this region was specially included in the regional interpretation in order to provide estimates on the causative features. The large negative anomaly was related to a deep Tertiary basin and the positive anomaly to a dense block of Siluro-Devonian rocks (see section EF, fig. 6, *op. cit.).* The interpreted section was based on the available geological information although it was noted that the included block was larger than mapped. It has since been found that most of the sedimentary rocks in this region are thermally metamorphosed and that a granodiorite mass, of which only the roof is partially exposed is included. As a result the section has been re-interpreted.

INTERPRETATION

The original interpretation (fig. 1) utilised a block of density 2750 kg/m^3. While such a density is possible for thermally metamorphosed rocks it is unlikely to be as high as this over the whole region (see discussions and contrasts observed by Leaman, 1977). Further, the inclusion of granodiorite (density ~2700-2720 kg/m^3) reduces the bulk density contrast and increases the volume of the corresponding anomalous mass. Thus the block volume occupied in Figure 1 is a minimum.

Figure 2 provides interpretations based on a density of 2720 kg/m^3 throughout, which must therefore approximate the maximum anomalous volume. No initial distinction is made between metamorphosed rocks and granodiorite. The three model classes presented in Figure 2 are considered to describe the basic options for the structural interpretation.

In the first, the main pluton margins dip toward the intruded material at a dip typical of the region (see Leaman, 1977) and toward each other. The result is a wedge. In the second, the margins are vertical. The third case is the geologically unlikely situation in which the margins dip outward. Regional studies indicate that the granodiorite is older than the main plutons and hence this relationship is most unlikely. The regional survey indicated that the granodiorite masses were up to 4 km thick (Leaman and Symonds, 1975) and this value has been used as a base.

The attraction of the three basic models is shown in Figure 2 where the maximum likely contrast is used. The sizes indicated are therefore minima but only a 20% variation is possible since the density contrast cannot be less than 80 kg/m^3. Also shown in Figure 2 are variations in which comparable anomalies are produced. Models 1 and 2 which incorporate denser blocks can present coherent reasonable structures. Model 3 fits simply with a decrease in thickness and with no allowance for contact rocks. The effect of contact metamorphism is uncertain and certainly variable and the solutions offered can be regarded as satisfactory but not unique. It is confirmed, however, that the included slab is about 4 km thick.

OTHER CONSIDERATIONS

Examination of Figure 1 (from Leaman and Symonds, 1975, fig. 3) will

show that the anomaly discussed above is concordant with the known distribution of granodiorite in the region (see revised sketch map, fig. 1, lower). The +40 $\mu m/s^2$ contour encloses the entire area of granodiorite and contact rocks. However, the overall trend of the anomaly is north-west toward Tomahawk into one of the major plutons. Thus while the peak of the anomaly coincides with granodiorite exposures, including the anomaly ridge toward the coast, the regional trend is unexplained unless the intruded slab is smaller and partly sunk in the pluton toward Tomahawk. Contact rocks are exposed at Tomahawk and smaller slabs may have been swallowed in, and between the multiple intrusions in this region. A leucogranite is exposed between the main mass and the contact rocks around the granodiorite (fig. 1) and a complex intrusion history is implied. It is also noteworthy that the strongest anomaly gradient lies over the granite-leucogranite contact. There is no evidence to suggest any significant density differentials between these rocks unless a slab of metamorphosed rocks lies adjacent to the contact at depth.

CONCLUSIONS

Recent revisions in the mapping of the area have provided a more realistic set of solutions for the Boobyalla anomaly east of Tomahawk. In the original version, a slab of sedimentary rock up to 2 km thick with density of 2750 kg/m^3 was proposed. The revised version suggests that the block consists largely of granodiorite and is about 4 km thick. The method cannot resolve, with the data available, the exact form of the block but it probably has very steeply dipping contact edges in the form of a wedge. The writer considers this the most reasonable solution in view of other contact dip data in the region.

REFERENCES

LEAMAN, D.E. 1977. Gravity survey of north-eastern Tasmania. Analysis of pluton margins. *Unpubl.Rep.Dep.Mines Tasm.* 1977/26.

LEAMAN, D.E.; SYMONDS, P.A. 1975. Gravity survey of north-eastern Tasmania. *Pap.geol.Surv.Tasm.* 2.

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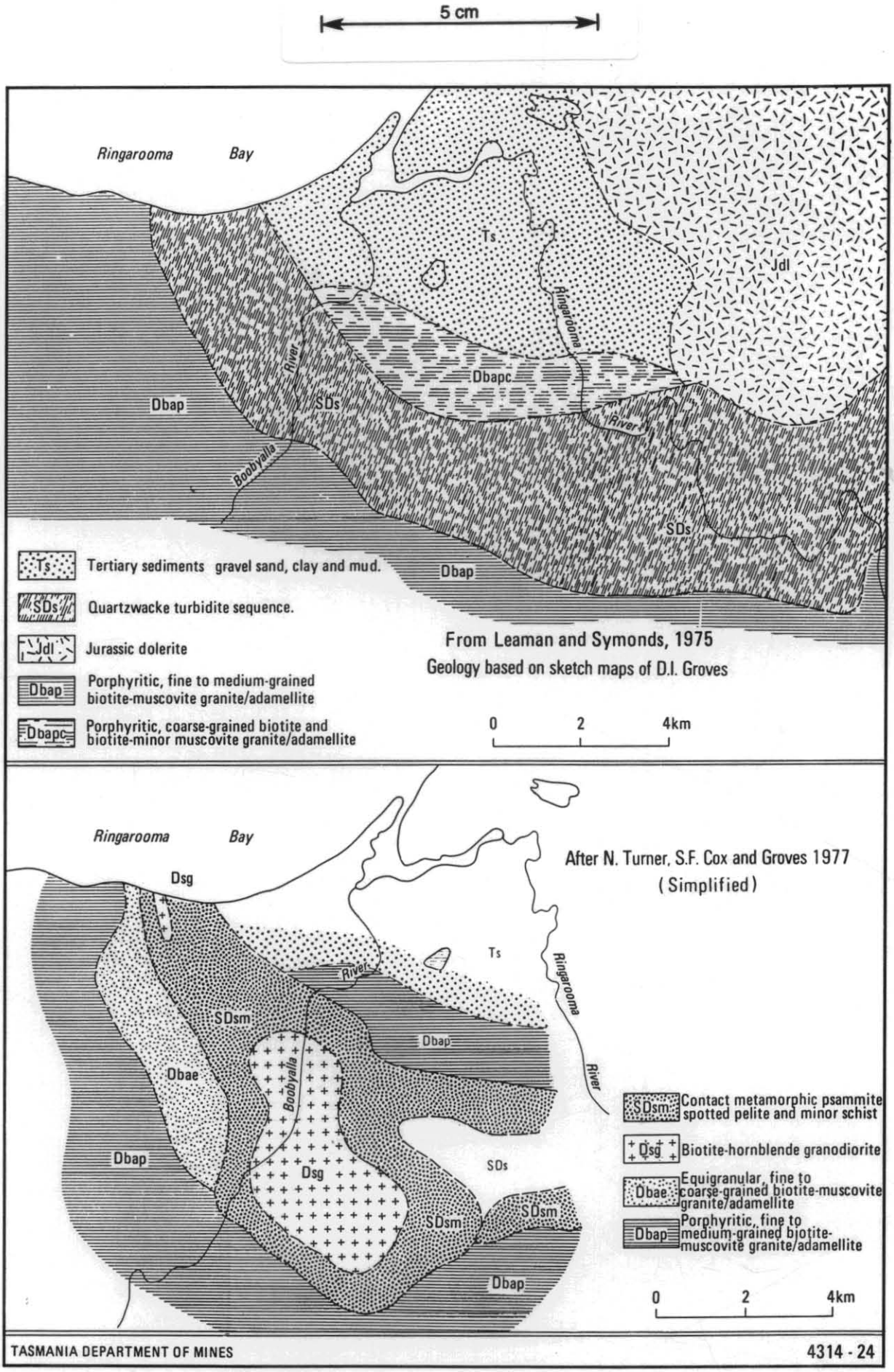

Figure 1. *Geological interpretations of the area north-west of Gladstone.*

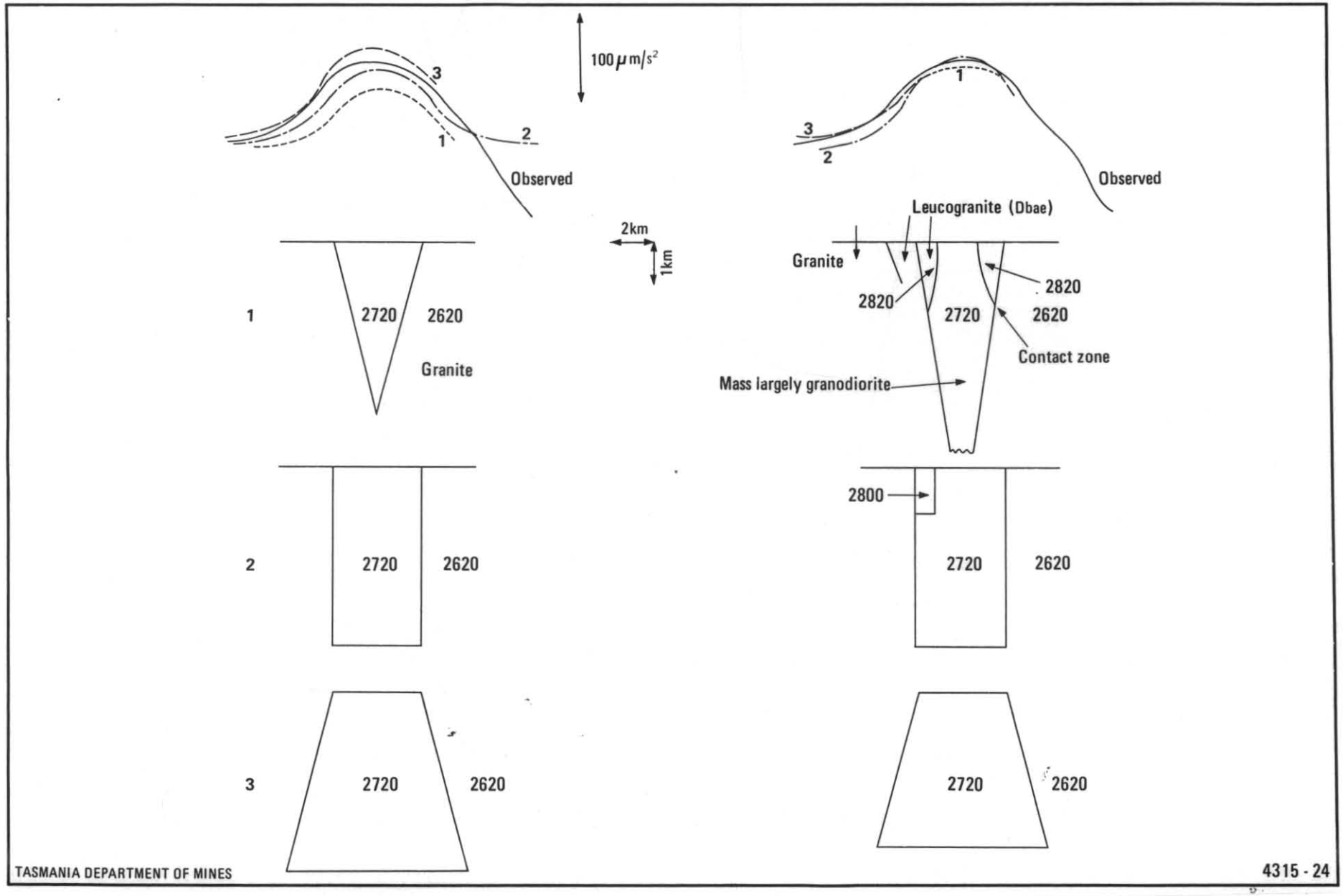

Figure 2. *Gravity profiles and models.*

5 cm