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5. Experimental gravity survey, Beulah barytes deposit.

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An experimental gravity survey was requested in order to assess the lower limit of applicability of gravity methods and to evaluate the Lower Beulah barytes-based ores. The area examined, currently under licence (E.L. 11/70), is about 1.5 km east of Lower Beulah on Sweetwater Creek.

Copper-zinc mineralisation with some pyrite is associated with thick veins of barytes. The mineralisation appears to be minor. The frequency of veins is unknown but in a cut along the creek bank there are 1 or 2 in every 10 m. Veins are present as coherent masses within 50 cm of the surface.

SURVEY DETAILS

A gravity survey cannot locate single veins of the scale observed in this area. However, if there are massive concentrations in localised zones then it might be possible to obtain an indication of this and where applicable the total mass of the vein system. If veins are variably and widely distributed no distinctive anomalies could be expected. In order to gain sufficient information observations were made at 5 m intervals along two approximately perpendicular traverses. All stations were levelled to better than 1 mm and positions are known to better than 10 cm. The major source of error was in the terrain correction but the overall accuracy of most stations is considered to be about 0.04 mgal and about 0.08 mgal for stations on the northern side of Sweetwater Creek where there is a moderate slope.

SURVEY RESULTS

The host rock for the mineralisation is the Gog Range Greywacke which has a density of 2600-2700 kg/m^3. Barytes has a density of 4300-4700 kg/m^3. Thus the minimum density contrast is about 1600 kg/m^3. The contribution that any sulphides might make to the total density has been ignored since these form only a small percentage of the ore.

The profiles show that there is a strong local gradient of about 1 mgal/150-200 m to the north-east, with increasing values in that direction. This regional effect could be related to an extension of the granite near Beulah to the south or to the fault mapped in Sweetwater Creek. The latter is more likely since the magnitude of the effect is not wholly compatible with a relatively distant body. In addition the trend is more consistent with the fault (Jennings *et al.*, 1959).

The Bouguer anomaly calculated along the profiles also shows a non-random scatter of up to 0.14 mgal which may represent semi-systematic accumulations of small errors or anomalous bodies. In order to provide an estimate of the anomalous mass in the area traversed the first possibility will be excluded and the error in each observation will be assumed to be of consistent magnitude and sign. Under these conditions use of the attraction-mass theorem provides the following results:

'Anomaly'	*Width*	*Minimum Anomalous Mass (tonnes)*	*Minimum Actual Mass*	*North Distance (m)*
1	25	500	1350	20
2	40	1800	4850	75
3	30	1000	2700	115
4	15	300	800	140
5	35	1000	2700	165

The distance quoted indicates the location of the anomaly peak with respect to the base station at the track junction near the old mill south of Sweetwater Creek. Anomaly 5 is situated at the creek. A borehole, angled to the north, has been drilled into the hill from a position on the peak of anomaly 5. All calculations of anomalous mass have presumed equi-dimensional anomalies. If the veins are laterally continuous and not lenticular then an end effect factor must be applied. A value of three for this factor is quite conservative and the figures for the minimum actual mass should be multiplied by it.

Thus on the basis of the many assumptions made the maximum ore mass indicated is about 37,000 tonnes within an area which extends not more than 200 m north of the old mill. Although the assumptions are reasonable their validity is unproved and the estimate given above must be treated with extreme caution. Indeed an end factor should only be applied if lateral continuity of the anomaly is proved.

CONCLUSION

The gravity survey gives no indication of a significant ore deposit at Sweetwater Creek. Traverses have covered the area in which prospecting has been most active. Such 'anomalies' as there are present are very small and possibly due to an accumulation of errors. Within the area covered a maximum ore mass of 37,000 tonnes may be indicated, most of which is barytes.

REFERENCE

JENNINGS, I.B.; BURNS, K.L.; MAYNE, S.J.; ROBINSON, R.G. 1959. Geological atlas 1 mile series. Zone 7 sheet 37. Sheffield. *Department of Mines, Tasmania*.

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