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DEPARTMENT OF MINES

SOUTH AUSTRALIA

EXPLORATION GEOPHYSICS SECTION GEOLOGICAL SURVEY

MT. COMPASS GRAVITY AND SEISMIC SURVEY

Hundred of Nangkita

by J. McG. Hall, Geophysicist.

D.M. 1781/64

DEPARTMENT OF MINES SOUTH AUSTRALIA

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J. McG. Hall, Geophysicist, EXPLORATION GEOPHYSICS SECTION, GEOLOGICAL SURVEY.

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DEPARTMENT OF MINES SOUTH AUSTRALIA

MT. COMPASS GRAVITY AND SEISMIC SURVEY <u>Hundred of Nangkita</u>

ABSTRACT

A seismic refraction survey and a detailed gravity survey were carried out at Mt. Compass over an area covered by an earlier ground magnetic survey.

A drilling site has been suggested on the basic of these, and the earlier magnetic results.

The reliability of the data was affected to some extent by the state of the ground surface and the difficulty of access to some parts of the area.

PART I GRAVITY

INTRODUCTION

A detailed gravity survey was carried out at Mount Compass in the Hundred of Nangkita on the 18th, 19th, 20th, 22nd and 25th of January, using World Wide Gravity Meter No. 38. This work was done for Australian Development No Liability over an extension of the grid used for the magnetic survey described in report G.S. 2996. Plan 65-193 contains the locality plan and the gravity grid.

OPERATIONAL PROCEDURE

Gravity readings were taken at stations along 16 traverses, 100 feet apart, extending from 20,000N to 21,500N. Generally, readings were taken at 100 foot intervals along the traverses except over the centre of the anomaly where the spacing was 50 feet. In length, the traverse extended from 20,000E to 21,500E with the exception of traverse 20,700N which was lengthened to 18,500E and 23,000E to the west and east respectively in order to obtain an estimate of the regional gravity.

As can be seen from plan 65-193, the grid was not completed due to:

(a) A large pine plantation

(b) Two farm houses and outbuildings.

(3) Areas of swamp caused by a creek and numerous springs which run through the centre of the area.

Because the anomaly was expected to be small (of the order of 10 to 20 gravity units where 1 gravity unit is $\frac{1}{10}$ milligal) meter drift checks were made approximately every hour.

RESULTS

After a correction for drift of the meter, the field readings were converted to gravity units using a conversion factor of 1.127 gravity units/dial division.

Station 20,500N, 20,500E was taken as a base and assigned an arbitary observed gravity value of 100 gravity units. All other station values were evaluated relative to this.

An average density of 2.67 gms/cc. was taken which gave an elevation correction factor of .6 gravity units/foot for each station. (Station elevations are relative to M.S.L. at Port Adelaide).

Latitude corrections were made using station 20,500N, 20,500E as a base. This station was assigned zero latitude correction and all other stations were corrected with respect to it.

Corrected gravity values were plotted on plan 65-194 and contoured at intervals of one gravity unit. In addition, the values along traverses 20,600N, 20,700N and 20,800N are presented in profile on plan L65-56.

INTERPRETATION

Two traverses were used for interpretation - 20,700N and the artificial traverse (traverse A on 65-193) between 21,000N, 20,000E and 20,700N, 20,950E (extrapolated to 21,500E).

An estimate of the regional gravity was made from the long traverse 20,700N and removed from both traverses. The residual profiles obtained were used for interpretation.

Both profiles suggest that the anomalies may be caused by two bodies which can be approximated by vertical circular cylinders, or by a single body approximated by a vertical cylinder deformed by a bulge on the northern side. A third anomaly, centred at about 21,300E is indicated on traverse A. As there is no corresponding magnetic anomaly, it is assumed that this gravity anomaly has a different cause from the other two anomalies. Also, the values over the anomaly were extrapolated as there were no stations over this section of the grid. For these reasons, the anomaly has been ignored entirely.

The seismic results (see part II) indicate a depth of 125 feet to the base of the fluvio-glacial sediments. A basic assumption of the gravity and magnetic interpretation is that the top of the ore-body causing the anomaly is at the base of the fluvio-glacials, i.e. the top of the ore-body is 125 feet below the surface. This estimate could be subject to an error of 10%.

Using the above figure for depth and a regional gravity as shown in plan 65-224, a possible interpretation of the main anomaly is that it is caused by a body approximately 1,000 feet thick, of radius 500 feet, and with the top buried 125 feet below the surface. The centre of the body would be approximately below 20,700N, 21,100E.

A density contrast of .6 gm/cc. between the ore body and the surrounding rock was used in the interpretation. This was computed from rock densities supplied by Australian Development from previous work in the same general area.

The magnetic results, interpreted for the same type of body as the gravity, indicate a depth to the top of the anomalous body of about 150 feet. Also, a comparison of the magnetic and residual gravity profiles of traverse 20,700N shows a displacement of the magnetic peak of about 300 feet in a northerly direction. At these latitudes, this indicates a depth of 550-650 feet to the centre of the anomalous body. This is compatible with the above interpretation.

CONCLUSION

The above interpretation is considered the most likely on the basis of the available gravity, magnetic and seismic data. A vertical hole, drilled from 20,700N, 21,100E is recommended.

PART II SEISMIC

INTRODUCTION

A shallow seismic refraction survey was carried out on the 21st of January along traverse 20,700N of the gravity grid. The portable p19 refraction equipment was used for the survey.

OPERATIONAL PROCEDURE

An auger drill was used to drill 10 foot holes at stations 19,900E, 20,500E, 20,800E and 21,850E along the traverse. Another hole was drilled to 5 feet by hand auger at 21,150E as the drill could not reach this station due to swamp.

Geophones were laid out at 50 foot invervals in two separate spreads with 12 geophones to each spread.

With the spread between 20,200E and 20,750E inclusive, shots were fired from 19,900E, 20,800E and 21,150E.

With the spread between 20,850E and 21,400E inclusive, shots were fired from 20,500E, 20,800E and 21,850E.

In addition, a weathering spread was laid between 20,670E and 20,790E inclusive with geophones at 10 foot intervals. Two shots were fired from 20,670E and 20,790E.

The data obtained was adversely affected as the state of the surface made it impossible to place the shots and their respective geophone spreads in the most advantageous positions.

RESULTS

The times recorded at the geophones from each shot were plotted against the distance of the geophones from the shot point and straight lines fitted to the points by least squares. Two separate velocities were indicated of approximately 5,000 ft/sec. and 15,000 ft/sec. It was considered that these velocities indicated an overburden of velocity 5,000 ft/sec. underlain by a high speed refracting layer of 15,000 ft/sec. velocity. The weathering spread indicated a weathered layer of velocity 1,000 ft/sec. with an average depth of 5 feet. These figures were used to compute weathering and elevation corrections for the recorded times.

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The corrected travel times from the high speed refractor were again plotted against distance from the shot point and straight lines fitted to those points corresponding to the same subsurface section of the refractor when shot from opposite ends of the spread. These corrected travel-time curves are shown on plan 65-208.

The apparent velocities from these curves were used to compute the sollowing true refractor velocities:

- (a) From 20,450E to 20,750E 17,200 ft./sec.
- (b) From 20,850E to 21,400E 15,200 ft./sec.

CONCLUSION

Using a method described by Hales, an approximate refractor profile was constructed and shown in plan 65-208. The refractor is assumed to be Archaean. From this, it appears that the depth to the Archaean varies from about 160 feet below the ground surface at 20,450E to 125 feet below the surface at 21,400E. At the centre of the main gravity anomaly, the depth to the Archaean also appears to be about 125 feet.

> J. McG. Hall, Geophysicist, EXPLORATION GEOPHYSICS SECTION

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	HP NANGKITA
	CORRECTED TIME-DISTANCE CURVES AND INTERPRETATION
	Interpretation : J.M°G.Hall Date : 6-3-65
	To accompany report by JM

