COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1962/30

SCOTT RIVER GEOPHYSICAL SURVEY FOR BOG IRON, W.A. 1961

by

R.C. Stubbs

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SUMMARY

A ground magnetic survey was made by the Bureau of Mineral Resources at the Scott River iron deposit during February and March 1961.

Ten traverses totalling 34,000 ft were surveyed. The profiles obtained were those of a typical near-surface magnetic deposit, with high positive and negative values which alternated rapidly. Considerable flattening out of the profiles at the ends of the lines probably coincides with the boundary of magnetic ore; this may also be the boundary of economic ore.

Owing to the lack of geological information it is not yet possible to attempt any quantitative correlation between the magnetic intensity and the grade or thickness of the ore. Until such information is forthcoming it is not recommended that further geophysical work be done in the area.

1. INTRODUCTION

The Scott River iron deposit is situated on the northern side of the river, five miles north-east of Augusta, Western Australia (Plate 1). The journey to the area from Augusta is circuitous, and consists of 26 miles of sealed and gravel road. The deposit is accessible only in the summer months. Save for preliminary costeaning and shallow drilling on the actual deposit, no mining activity was in progress in the area at the time of the survey.

The geophysical survey was made by the Bureau at the request of Mineral Mining and Exports (W.A.) Pty Ltd and with the concurrence of the Western Australian Department of Mines. The geophysical party consisted of R.C. Stubbs (geophysicist) and one field assistant. Nearly all the topographical surveying was done by the geophysical party.

The survey was intended to be an exploratory one, to determine the suitability of geophysical work and hence to decide whether a more elaborate geophysical survey would be warrented.

Actual field work began on 27th February 1961 and was completed on 27th March.

2. GEOLOGY

Geological information about this area is rather meagre, and no assay reports or drilling logs were made available by the Company. The following information is derived from de la Hunty (1960) and from personal observations.

The topography is flat, with a slight gradient in the region of the river and with a few small sand dunes. The deposit consists of loosely-consolidated bog iron of Quaternary age. The outcrop is of fair to poor grade, and consists of a few boulders or partially sand-covered pavements.

Although the outcrop is not spectacular, the red colour of the sand is conspicuous enough to delineate the richest portion. As one moves farther north the red soil is replaced by white dunes and swamp vegetation, and the boundaries of the deposit become obscure.

The deposit is a mixture of goethite and maghemite, high grade oolitic or reniform at the surface and lower grade, massive, and crystalline at lower levels (below two or three feet); pockets of fine white sand are common. It is underlain at depths of 6 to 12 ft by sandstone. On the outskirts of the deposit the iron mixes with detrital quartz to form a ferruginous sandstone; small richer deposits occur within this. Secondary enrichment is probably extensive.

3. GEOPHYSICAL METHOD

Maghemite, Fe_2O_3, is an oxide of iron which may be derived from magnetite, Fe_3O_4, by slow oxidation at low temperature. It retains the magnetic properties of magnetite up to 500°C, at which temperature it reverts to non-magnetic haematite.

This property of magnetism can be measured with a magnetic variometer, which registers changes in intensity, from place to place, of the vertical magnetic field. The instruments used on the survey were an Askania Torsion Magnetometer, Type GFZ, and an Askania Vertical Balance, Type GF6, of Schmidt pattern.

A central north-south baseline was surveyed by theodolite (no compass bearings were taken) and ten irregularly spaced traverses were laid out over the greater part of the deposit, extending for 15,000 ft along this baseline. The traverses were so laid out that variations in magnetic intensity at the boundaries between magnetically disturbed and undisturbed areas could be measured. Most of the traverses were surveyed in pairs, 100 ft apart, to allow traverse-to-traverse correlation. Readings were taken every 50 ft, and all observations were related to a base station situated on the road north-west of the surveyed area.

It must be emphasized that geological information about the properties of the deposit is slight, and therefore it cannot be assumed that all of the iron minerals are magnetic. The magnetic boundary is not necessarily the boundary of iron mineralization; it is only the boundary of magnetic mineralization.

The magnetic variations are measured with a unit called the 'gamma' which is 1×10^{-5} gauss. Abnormal magnetic values, i.e. values which depart from the general level of magnetic intensity, are called magnetic 'anomalies'.

4. GEOPHYSICAL RESULTS

The magnetic profiles along Traverses 7000S and 7100S (Plate 2) illustrate the characteristic magnetic results obtained over the deposit. Although the anomalies are sharp and very intense, they rarely persist over a lateral distance greater than 50 ft. Only the largest anomalies and anomalies in the less disturbed areas can be correlated from traverse to traverse.

The profiles are those of a typical near-surface deposit; their extreme variation allows only a general interpretation.

Of particular interest is the unusually large and sustained anomaly on Traverse 7000S, east of costean No. 7, between 550E and 850E. The deposit here is evidently thicker or is richer in maghemite. (It may be argued that this assumption is invalid if the maghemite is simply a leached cap; however, it still follows that the deposit should be thicker because of the greater amount of virgin material required for leaching). It is believed that this is the richest part of the deposit surveyed.

Another point of interest is that the disturbed area near costean No. 8 is isolated from the main anomalies; there is apparently some splitting of the basin, perhaps by an inlet, or there may be two separate lagoons. Further mention of this will be made later. The limits of maghemite are evident around 3600W and 3700E, where the magnetic profiles become quite smooth. This is also where swamp country begins.

Traverses 4300S, 100S, and 00 give a similar picture. Traverse 4300S was intended to correlate the magnetic results with costeans 5 and 6, but as the geological information on these costeans is negligible, it must be omitted from the discussion until such information is available.

Traverses 100S and 00 have more uniformly disturbed profiles than 7000S and 7100S. A possible north-south trend is evident (e.g. at 700W). The geology indicates that the deposit here contains some undifferentiated quartz, which suggests that this may have been an active drainage area north of the main basin. The profiles show smaller anomalies, as would be expected from iron minerals diluted by non-magnetic quartz.

Traverses 5900N and 6000N are magnetically less disturbed than the more southerly traverses. The country here is sand-covered, and red soil is rare. The geology suggests that degradation to a low-grade deposit has occurred. The western boundary of the main basin is beyond the western ends of these traverses, but the eastern boundary lies at 1200E. East of this point the deposit diffuses into separate small basins which maintain a north-south trend. It is not known what material lies between the minor basins, or how far north these basins extend.

Attempts to find magnetic mineralization on the north-western part of the survey area met with varied success. Ferruginous material exists in cuttings by the road at least as far as Traverse A. Yet traverses 4000N and 4100N, located in sandy country, showed no magnetic disturbance. Neither did Traverse A on its pegged length (Traverse A was not formally numbered, because it was chained but not pegged for most of its length; locations of readings are therefore only approximate). A definite boundary was found on the unpegged part of the line, approximately 5500 west of the baseline; this may be the western limit of the main basin.

Some 1000 ft north of Traverse A and 200 or 300 ft west of the road, however, magnetic material was found in medium grade ore at the No. 1 bore. This seems to be another small isolated basin.

5. CONCLUSIONS

No estimate of tonnage or depth can be made for the deposit, because of the lack of sampling and assay information.

The geophysical results agree with the known geology. The northern and southern limits of the ore were not found in this preliminary survey; that was not its main purpose. It is, however, known that the richest mineralization is in a basin about 8000 ft wide (east-west) at 7000S. Near 6000N the deposit is of low grade, is less magnetic, and constitutes only a narrow northern continuation of the main basin, surrounded by isolated lagoon deposits of unknown extent.

The magnetic results on Traverses A, 4100N, and 4000N have suggested that some of the mineralization may be non-magnetic; it is therefore most important to ascertain whether the non-magnetic mineralisation is of commercial value.

The interpretation of the results could be improved by:

(1) Assay results from costeans 5, 6, 7, and 8 for correlation with magnetic profiles, to show whether larger magnetic anomalies correspond to thicker or higher-grade mineralization.

(2) Sampling along the length of Traverse 4000N to estimate the iron content of the material which gave no magnetic results.

(3) Costeaning at 700E on Traverse 7000S to test the grade and thickness of the material which causes this strong anomaly and to investigate the possibility that the anomaly was caused only by a cap of leached maghemite.

Until further geological information is available, therefore, the magnetic results are not fully understood. It is recommended that no further geophysical surveying be contemplated until such geological information is available.

6. REFERENCES

de la HUNTY, L.E. 1960 Report on a deposit of bog iron ore at the Scott River, South - West Land Division, Western Australia. geol. surv. W. Aust. (unpublished report).

PLATE I

Christmas bush

4254

4264

No. 1 BORE

Surface Sand and Ironstone

Open Plains

4263

Ironstone

Trav. A

Ck.

Wyvern

Jarrah

Two Chain Road

4261

Poor Country

Trav. 6000 N.

Trav. 5900 N.

4257

Plain

Jarrah

Trav. 4100 N.

4000 N.

Sandy Country

4262

Two Chain Road

4259

4260

Mag. North

True North

4°

2970

2971

2972

Jarrah

Redgum

Banksia

Sandy Plain

Trav. 00

Three Chain Road

No1 Costean (No3 Bore)

Trav. 100 S.

4153

Redgum

4168

No 2 Costean

4154

No3 Costean

2973

2974

No 4 Costean

No 6 Costean

4156

1129. 1.33

Trav. 4300 S.

No 5 Costean

4975

4155

No8 Bore

No 8 Costean

Trav. 7000 S.

Trav 7100 S.

No 7 Costean

GOVERNOR BROOME SWAMP

Banksia

Blackboys

No10 Costean

No9 Costean

Scott River

Sandy Plain

1344

Blackwood R.

Road To Busselton

Road To Nannup

W. A

PERTH

Karridale

Augusta

SURVEY AREA

Scott R.

Reference to Australian 4-Mile Military Map Series (Augusta sheet)

GEOPHYSICAL SURVEY OF THE SCOTT RIVER IRON DEPOSITS, W.A.

TRAVERSES AND COSTEANS

SCALE IN FEET

2000 0 2000 4000 6000

LEGEND

- Traverse
- o Costean
- 2972 Lease Number
- Magnetically Disturbed
- Road
- Track

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PLATE 2

4400 W | 4000 W | 3600 W | 3200 W | 2800 W | 2400 W | 2000 W | 1600 W | 1200 W | 800 W | 400 W | 0 | 400 E | 800 E | 1200 E | 1600 E | 2000 E | 2400 E | 2800 E | 3200 E | 3600 E | 4000 E | 4400 E

+10000 | +8000 | +6000 | +4000 | +2000 | 0 | -2000 | -4000 | -6000 | -8000

TRAVERSE 7000 S

NO MAGNETIC MATERIAL

SWAMP AREA

COSTEAN No 8
100-150 ft N, HIGH GRADE 0-2½ ft
LOW GRADE 2½-9 ft

NO MAGNETIC MATERIAL

COSTEAN No 7
50-100 ft N,
FLOODED

SANDY, FERRUGINOUS OUTCROP

NO MAGNETIC MATERIAL

SWAMP AREA

+6000 | +4000 | +2000 | 0 | -2000 | -4000 | -6000

TRAVERSE 7100 S

NO MAGNETIC MATERIAL

SWAMP AREA

NO MAGNETIC MATERIAL

NO MAGNETIC MATERIAL

SWAMP AREA

CENTRAL AREA CONSISTS OF RED DUST WITH ERRATIC SMALL OUTCROPS OF ORE

400 0 400 800 1200

HORIZONTAL SCALE IN FEET

BOUNDARY BETWEEN MAGNETICALLY DISTURBED AND UNDISTURBED PARTS OF PROFILES.

VERTICAL MAGNETIC FORCE PROFILES

TRAVERSES 7000 S / 7100 S

VERTICAL SCALE 1" = 2000 GAMMAS

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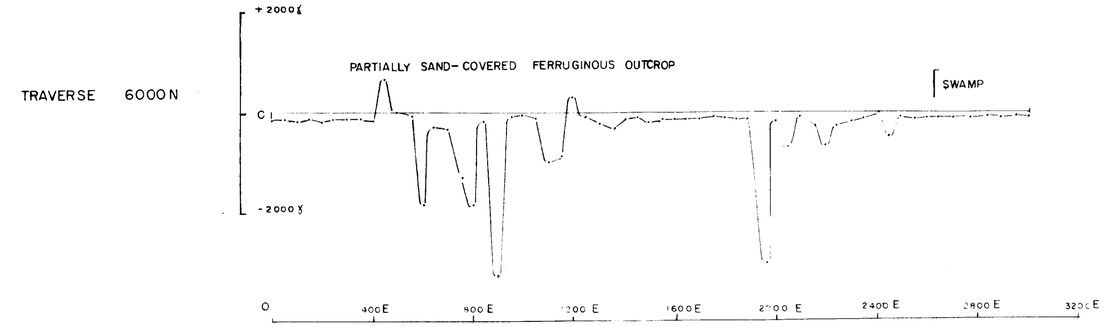
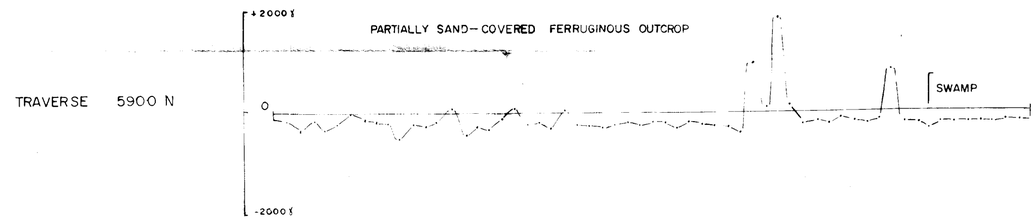
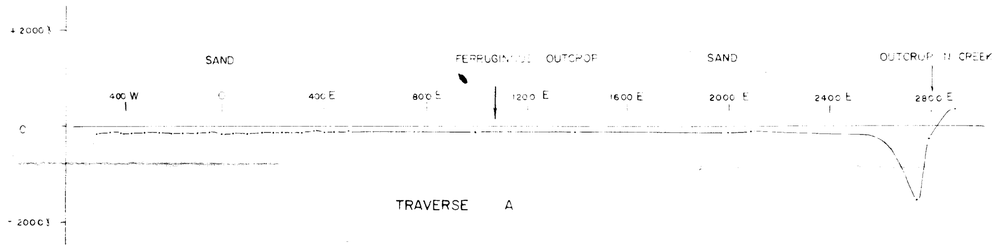
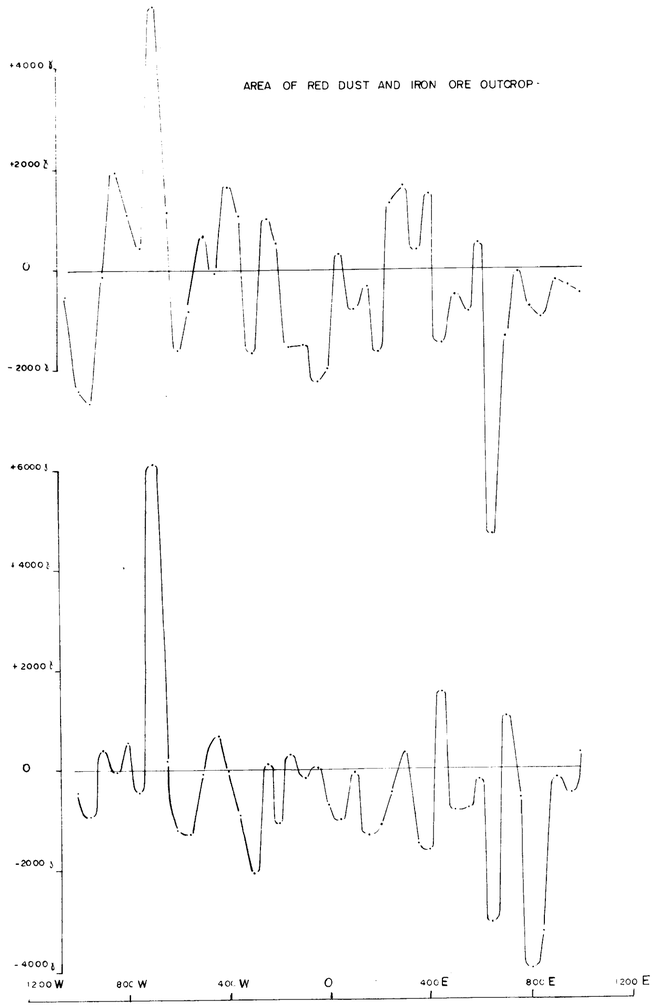
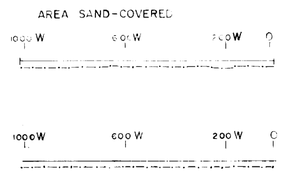
SCOTT RIVER, W.A.

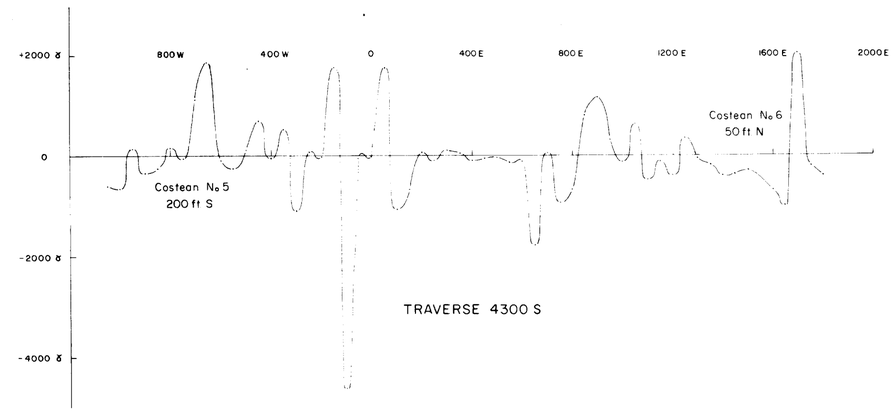


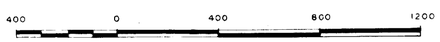












VERTICAL MAGNETIC FORCE PROFILES

SCALE 1" = 2000 GAMMAS

SCOTT RIVER, WA