COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORDS 1953, No. 63

GEOPHYSICAL SURVEY OF MAGNETITE DEPOSITS NEAR GULGONG, NEW SOUTH WALES

by

K. H. TATE

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ILLUSTRATIONS

S U M M A R Y.

On the recommendation contained in a preliminary report issued by the Bureau of Mineral Resources in 1952, a magnetic survey was made of several deposits of magnetite in the parishes of Puggoon and Tallawang, near Gulgong, N.S.W.

The magnetic results are compared with test results from the quarry at the nearby Tallawang deposit and it is shown that the small deposits studied are not likely to be of sufficient interest to the present lease-holders.

Attention is directed to the Tallawang deposit where it is possible that further development of the known ore-bodies, will expose additional reserves of magnetite. A detailed magnetic survey of the area is recommended.

1. INTRODUCTION.

Australian Magnetite Pty. Ltd. holds several leases in the Parishes of Puggoon and Tallawang, County of Bligh, and is at present mining magnetite from the old Tallawang Iron Ore Quarry, about 12 miles north-west of Gulgong. Because of increasing difficulties in mining this deposit, the best and most accessible part of which has already been mined, the company is desirous of opening up and developing other deposits south-east of the old quarry.

At the request of the company, a preliminary magnetic survey was made in August, 1952, over a lease held by the company in the Parish of Puggoon. Results of that preliminary survey are contained in a report by Horvath (1952), and his recommendations that the survey be extended led to the work described in the present report. This work, which was done in April, 1953, consisted of a more detailed magnetic survey, in which attention was concentrated on magnetite deposits in Portions 112 and 90, Parish of Puggoon, and on another deposit in Portions 60 and 99, Parish of Tallawang (see Plate 1). For comparison purposes, some observations were made at the Tallawang Iron Ore Quarry.

Mr. E.O. Rayner, Senior Geologist of the N.S.W. Mines Department, was with the geophysical party during the survey, which occupied approximately two weeks. For reference purposes the deposits in Portions 112 and 90, Parish of Puggoon, are called the Puggoon magnetite deposits, and that in Portions 60 and 99, Parish of Tallawang, is called the Tallawang South magnetite deposit.

2. GEOLOGY.

The geology of the deposits was described briefly by Jacquet (1901) and Andrews (1928), and a more recent report by Rayner (1953) contains all the geological data available to date. Due to the paucity of outcrops, the information is far from complete. The deposits are, in general, similar, consisting of pockets of ore in altered sediments. All deposits are close to the contact of the sediments with a large granite mass, and at each deposit there is evidence of a limited development of ultrabasic rocks, the association of which with the ore is not clear.

The following is a brief summary of the geology of the Tallawang and Puggoon areas as given by Rayner (1953). Particular emphasis is given to factors which may influence interpretation of the geophysical results.

Near the Tallawang deposit, a belt of Silurian sedimentary and volcanic rocks is in contact with a granite intrusion whose age is post-Silurian and probably Lower Carboniferous (Kanimblan epoch). Near the granite contact, which occurs outside the area surveyed, the sediments are altered and in places have a gneissic and granitised appearance. The beds have a general strike about 20° west of north and are folded into anticlines and synclines with dips ranging from 35° to 80°. The iron ore deposit can be regarded as of pyrometasomatic origin, and shows some evidence of emplacement in zones of shearing and fissuring. The ore is principally magnetite but contains pyrrhotite and pyrite at depth. It is closely associated with basic or utrabasic rocks, which are not of great extent and have not been noted away from the iron deposits. The basic rocks consist mainly of pyroxenite, altered in some places to amphibolite. On the western side of the quarry are two acid quartz-porphyry dykes of post-mineralisation age. On the western wall the iron ore has been worked largely to a joint

or fault plane striking north-north-west and dipping eastwards at about 70°. A slightly steeper plane with the same direction of strike is prominent on the eastern wall. At the southern end of the quarry, at about 120 feet below the surface rim, the ore body is approximately 70 feet wide. The northern end of the quarry is shallow and narrow, and its floor is covered by detritus and broken blocks of wall rock. Some ore can be seen near the dolerite dyke on the western side of the quarry and also beneath the haulage-way. Similar material appears to be present in the floor of the quarry near the southern end, but is largely obscured by silt and water. Deposits of good-quality ore projecting from the lower walls of the quarry are being mined.

The first evidence of pyrite occurred at a depth of 70 feet below the surface. The grey-black magnetite ore at present being mined contains much pyrrhotite and pyrite and traces of chalcopyrite. The sulphide content increases with depth.

A smaller body of iron ore occurs a quarter of a mile north of the Tallawang quarry and has been worked to a depth of about 20 feet.

At the Tallawang South deposit there is a small outcrop of magnetite, hematite and limonite projecting through a flat mantle of soil. The evidence of outcrop and rock fragments indicates that the length of the body is at least 150 feet and its width is at least 30 feet. The body appears to strike N 30° W.

At the Puggoon deposits, two lens-like outcrops of iron ore are present. Rayner refers to these outcrops as the Puggoon deposit and the Puggoon South deposit.

The Puggoon deposit crops out for 200 feet. It has a northerly strike and dips steeply to the east. The outcrop consists chiefly of magnetite and hematite. Some prospecting pits and costeans and a shaft have been put down. Geological assessment of the deposit and its mode of emplacement is hindered by paucity of outcrops but the surrounding soils and rock fragments indicate that it occurs within a band of clay-slates with mica schists on the west and altered schists, grits and gneisses on the east adjacent to a granite contact.

The Puggoon South deposit is a tabular or lens-shaped body similar in mineral composition to the Puggoon deposit. It strikes N 25° W and appears to be of similar length to, but narrower than, the Puggoon deposit. The dip may be vertical or steeply to the east. Prospecting has been confined to a small shaft and some pits. At the shaft some fragments of a greenish rock of basic appearance were recovered and petrological examination shows that a gabbro or dolerite may have been one of the rocks originally present.

3. MAGNETIC SURVEY OF TALLAWANG MAGNETITE DEPOSIT.

For purposes of comparison between the known and unknown deposits, a day was spent in pegging three traverses across the quarry at the Tallawang deposit and making magnetic observations of the most accessible parts of them. Values of the vertical component of the earth's magnetic field were recorded with a magnetic balance (sensitivity 30 gammas per scale division).

The vertical magnetic force profiles, with appropriate sections across the quarry, are shown on Plate 2, and Plate 3 is a map of the quarry with sketched vertical magnetic force contours superimposed. The profiles are smooth along each traverse and all show large positive anomalies greater than 10,000 gammas. The anomalies must be caused by a magnetite-rich body of considerable depth extent along steep easterly dip. The fact that the anomaly is so large on traverses B and C indicates that the deposit must extend at least 300 ft. north of the haulage way, where the quarry is shallower, but where its floor is covered by scree deposits from the steep walls. It is probable that close geological and/or geophysical examination would reveal places at which ore might be obtained by minor extension of the present workings. It is impossible to deduce the grade of ore from the magnetic results.

4. MAGNETIC SURVEY OF TALLAWANG SOUTH MAGNETITE DEPOSIT.

Values of both the vertical and horizontal components of the earth's magnetic field were recorded in the area around the Tallawang South deposit. The magnetic balance for recording the vertical field was the one used in the survey of the Tallawang deposit. The balance used to measure the horizontal component had a sensitivity of 15 gammas per scale division and was oriented in the direction of the traverse.

Profiles of the vertical and horizontal magnetic force are shown on Plate 4 and the contours of the vertical magnetic force only on Plate 5. These results indicate the presence of a magnetite-rich body pitching at a moderate angle to the north. The effects recorded could be caused by a pipe-like body whose depth extent is large compared with its dimensions in cross-section, and which has a magnetic pole at less than 100 ft. vertical depth at the point 00/00. Such a body would extend from the known outcrop to a depth greater than the limit for an open-cut. The maximum vertical force anomaly is about 5,000 gammas, which is much smaller than that recorded at the Tallawang deposit. Such a comparison is not of great help in determining the size of the deposit, however, as many other factors such as depth, strike, dip, magnetic inclination and susceptibility affect the magnitude of the anomaly.

Further information on the deposit could best be obtained by sinking a diamond drill hole about 150 ft. long at 125N/00, on a bearing of 150° magnetic and depressed at about 50°-60° to the horizontal. Such a drill hole would cut the body below the weathered zone and thus indicate the grade and width of the body in the primary zone.

5. MAGNETIC SURVEY OF THE PUGGOON MAGNETITE DEPOSITS.

(a) Puggoon deposit

The preliminary survey described by Horvath (1952) revealed a magnetic body extending nearly 200 ft. along the strike and dipping to the east. The present work comprised a more extensive survey to determine the extent of the body more accurately, and some check traverses with a horizontal balance. Plate 6 shows the position of the geophysical traverses at both the Puggoon and Puggoon South deposits, in relation to the topography of the area. The results of the survey are shown as profiles on Plate 7 and as magnetic contours on Plate 9.

No extensions of the anomaly recorded by Horvath were found. Results indicate that the body can be compared with a

narrow sheet of magnetic material of considerable depth extent, dipping at a moderate angle to the east. It is probable that the shaft shown on Plates 6 and 9 was sunk in the footwall of the lode and would not yield much information. If any further interest is taken in the deposit, short inclined drill holes from the eastern side of the outcrop should give valuable information regarding the thickness and grade of the body.

(b). Puggoon South deposit.

Horvath (1952) suggested that a magnetite body might exist about 200-300 yards south of the Puggoon deposit described above. The area was surveyed in April, 1953, and the results obtained are shown as magnetic profiles on Plate 8 and as magnetic contours on Plate 9. The anomaly shown on Plate 9 appears to be caused by a body irregular in shape along the strike, but which could be pipe-like, pitching steeply to the south. The strongest part of the anomaly is on Traverse D, where an old shaft had been sunk. This shaft should give all necessary information regarding the grade of the body. The value of the anomaly, about 4,000 gammas, is similar to that recorded at the Puggoon deposit, but is small when compared with that recorded at the Tallawang deposit.

6. CONCLUSIONS AND RECOMMENDATIONS.

The three test traverses at the Tallawang deposit revealed a major anomaly of the order of 10,000 to 15,000 gammas, the shape of the anomaly indicating a lenticular body, persistent in depth and dipping steeply to the east. These results must re-direct attention to the shallower parts of the quarry, in the search for an easily worked deposit.

The Tallawang South deposit presented an essentially geophysical problem, because of the smallness of the outcrop and the general cover of alluvium. The magnetic results indicate that the body is a pipe-like deposit, pitching moderately to the north, and probably of regular dimensions along its length. Its geological associations appear to be similar to those of the Tallawang deposit, but the magnitude of the anomaly is smaller.

The survey of the Puggoon deposit yielded little additional information to that obtained by Horvath (1952), although traverses and observation points were surveyed more accurately and some horizontal magnetic balance work was also done. The magnetic body appears to be very limited in extent along the strike, but is likely to persist in depth along moderate easterly dip. The Puggoon South body is less regular in shape and appears to be a steeply pitching pipe-like deposit of small diameter.

The results of the whole survey show that the most important deposit is that at Tallawang, followed in decreasing order of importance by the Tallawang South and Puggoon deposits. Attention should be concentrated on the Tallawang Iron Ore Quarry to find shallow portions of the body. A thorough survey with a less sensitive magnetometer of the Thalen-Tiberg type would probably provide additional information. The Tallawang South deposit should be tested by a drill-hole, as suggested, and the magnetic results re-examined in the light of the information provided by this drill hole.

Some light may be cast on the geological nature of the bodies by the observation that the magnetic profiles are

free from irregularities. Heiland (1946, p.413) states that "Magnetic anomalies on magnetic deposits formed by contact or dynamo-metamorphism are usually more regular in appearance than on deposits produced by magmatic differentiation".

7. REFERENCES

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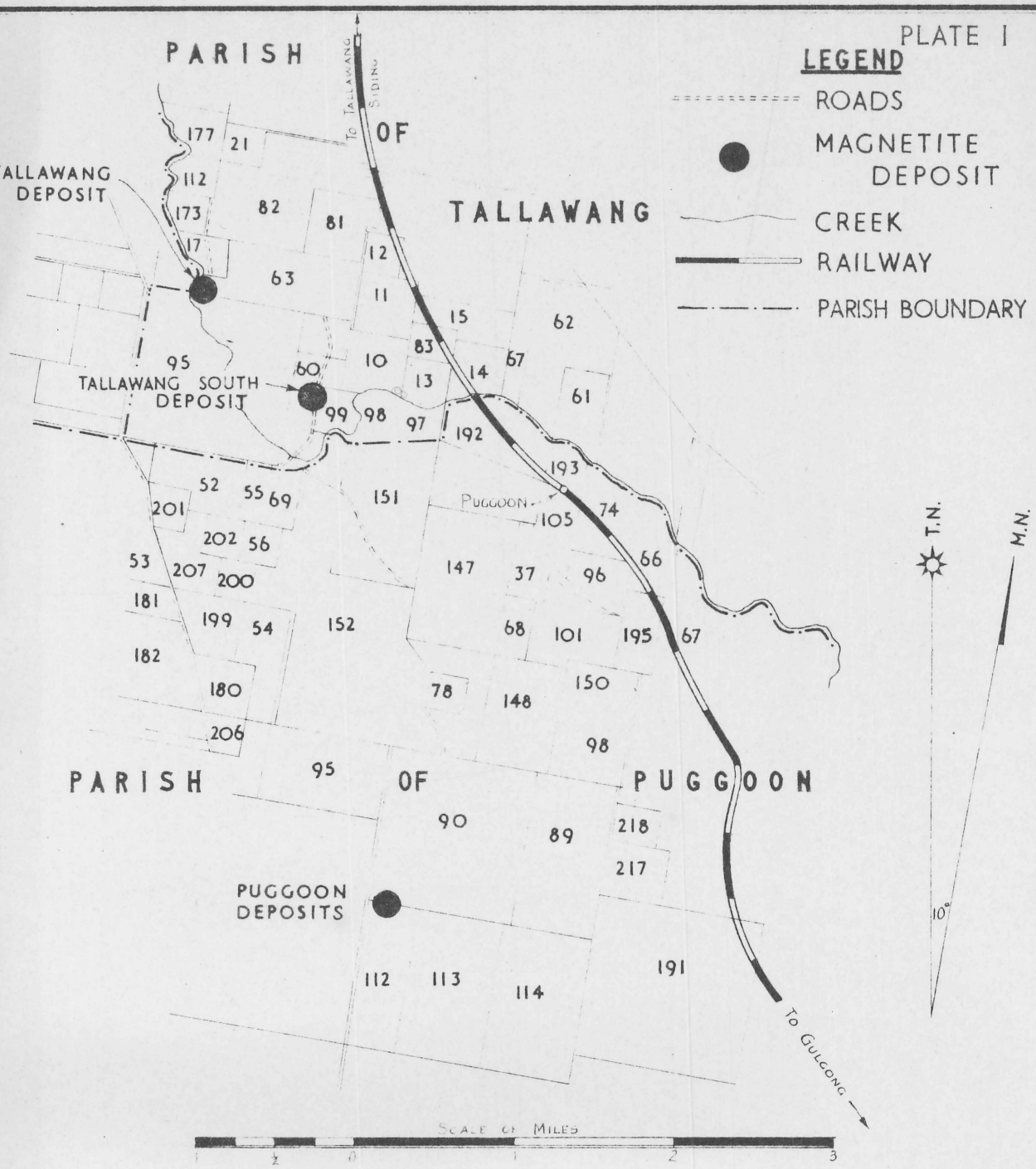
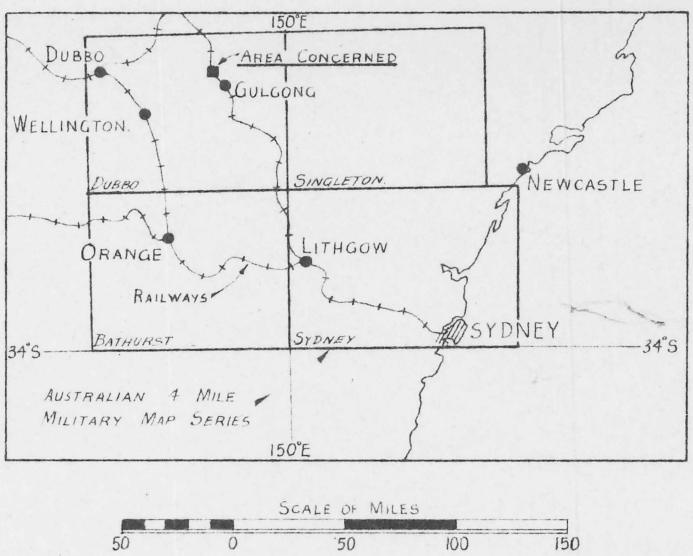
JACQUET, J.B., 1901 - The Iron Ore Deposits of New South Wales, Mem.Geol.Sur. N.S.W. Geology, No.2.

RAYNER, E.O., 1953 - Magnetic Deposits at Tallawang and Puggoon, Gulgong District. Geol.Surv. of N.S.W., Dept. of Mines.

PLATE I





GEOPHYSICAL SURVEY AT GULGONG, N.S.W.

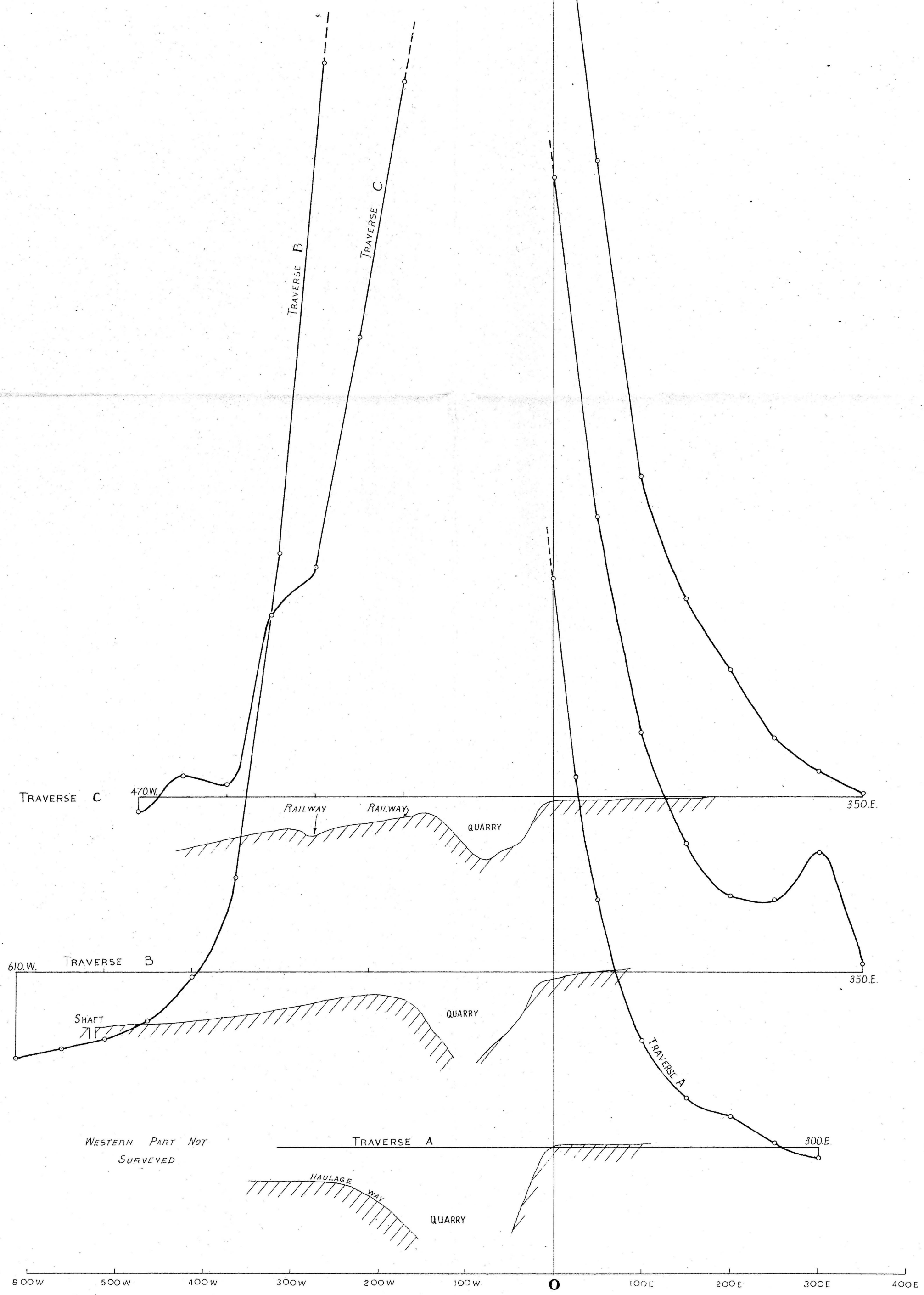
LOCALITY MAP

K H Tate
GEOPHYSICIST

G 122—11

GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

PLATE 2



SCALES

HORIZONTAL 100 50 0 100 200 300 FEET

VERTICAL 1000 500 0 1000 2000 3000 GAMMAS

NOTE VERTICAL SPACING OF PROFILES NOT TO SCALE

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GEOPHYSICAL SURVEY AT GULGONG, N.S.W.

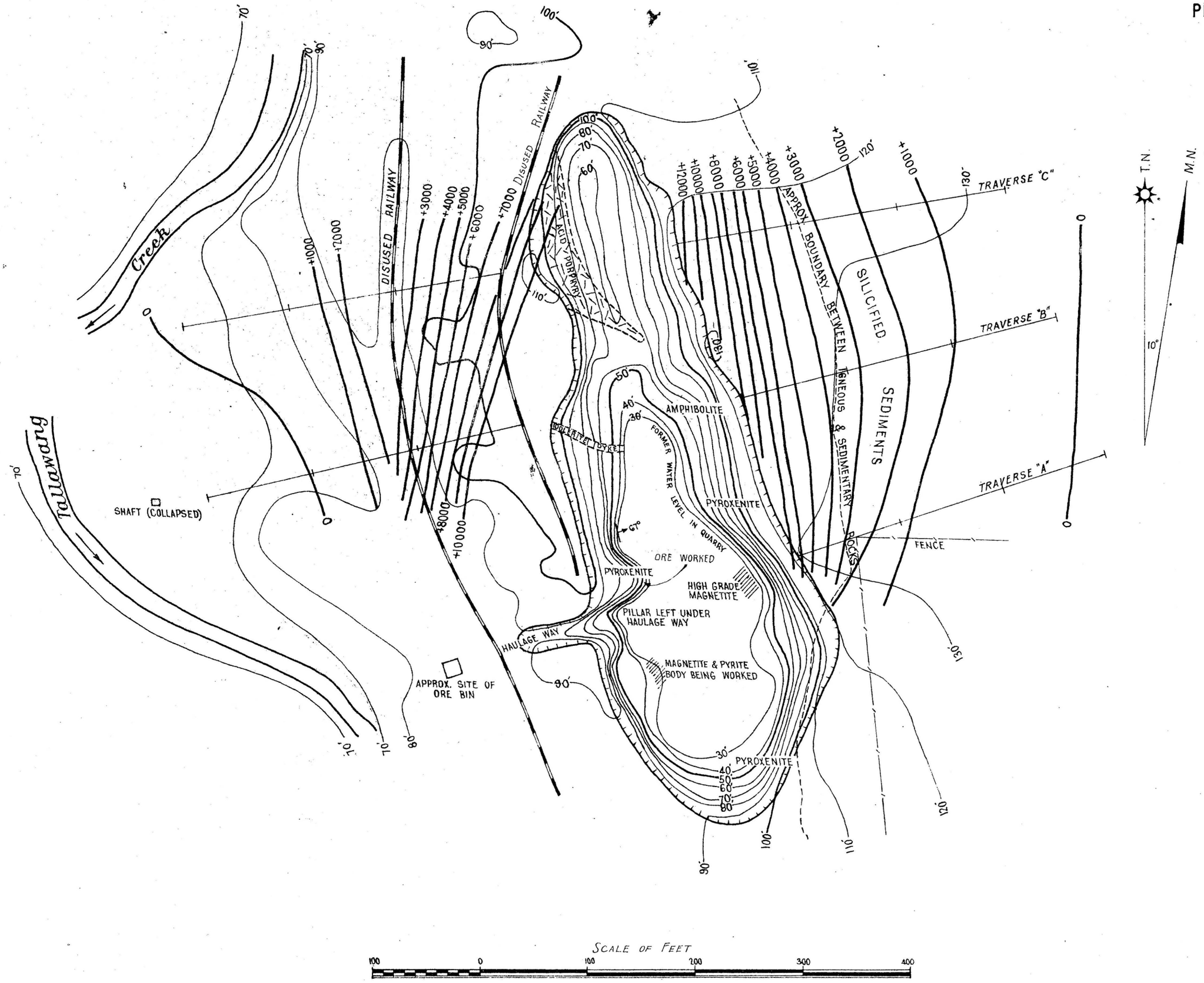
TALLAWANG MAGNETITE DEPOSIT

VERTICAL MAGNETIC FORCE PROFILES

G.122—3

GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

PLATE 3



+1000 MAGNETIC CONTOURS IN GAMMAS (CONTOUR INTERVAL 1000 GAMMAS)

80' LEVEL CONTOURS IN FEET (CONTOUR INTERVAL 10 FEET)

TEMPORARY PEGS

OLD RAILWAY BEDS

FENCE

SHAFT

CREEK

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GEOPHYSICAL SURVEY AT GULGONG, N S W

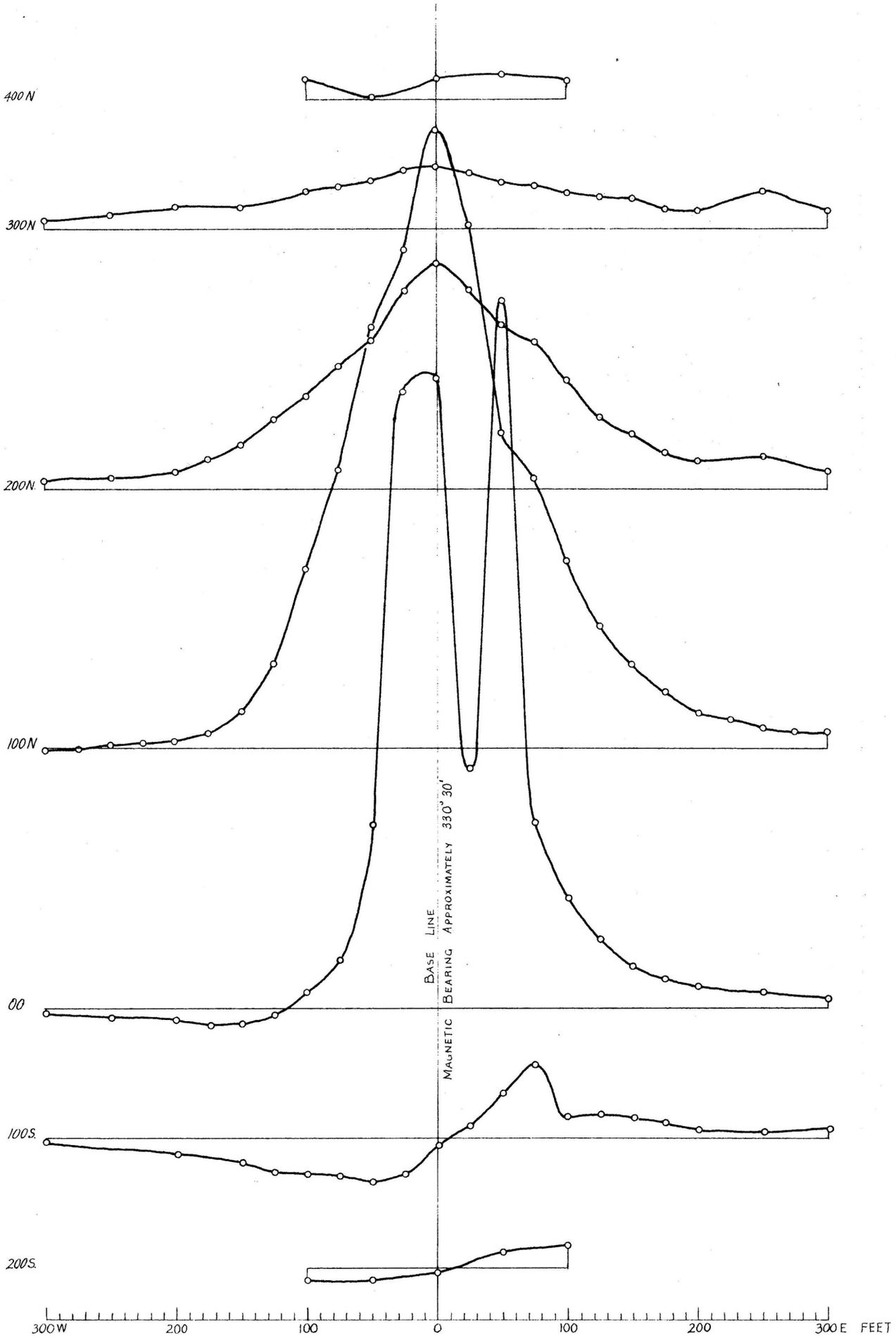
TALLAWANG MAGNETITE DEPOSIT

VERTICAL MAGNETIC FORCE CONTOURS

G. 122—4

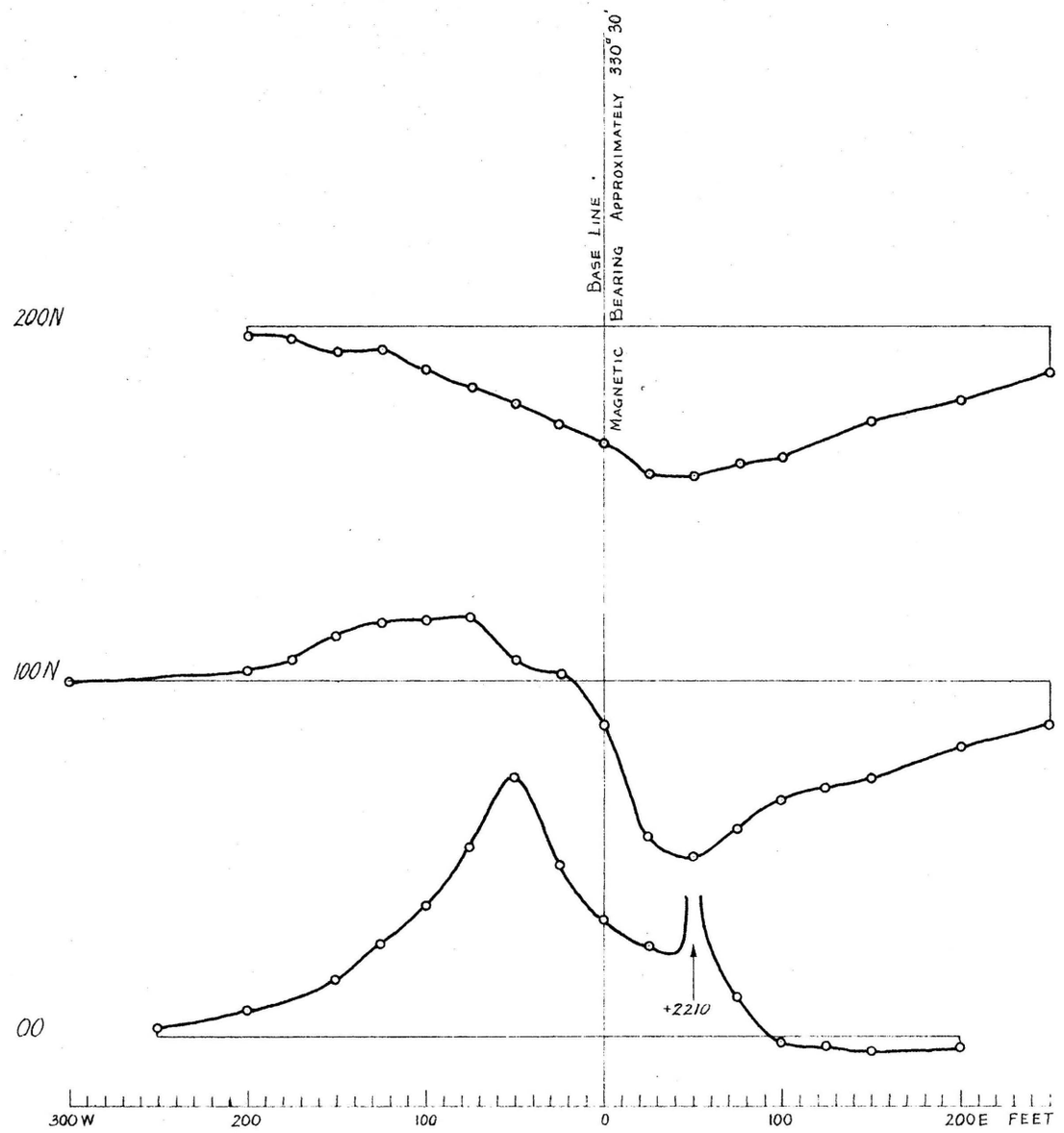
GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

PLATE 4



VERTICAL MAGNETIC FORCE PROFILES

NOTE. VERTICAL SPACING OF PROFILES NOT TO SCALE



HORIZONTAL MAGNETIC FORCE PROFILES

(COMPONENT IN PROFILE DIRECTION)

GEOPHYSICAL SURVEY AT GULGONG, N. S. W.

TALLAWANG SOUTH MAGNETITE DEPOSIT

VERTICAL AND HORIZONTAL

MAGNETIC FORCE PROFILES

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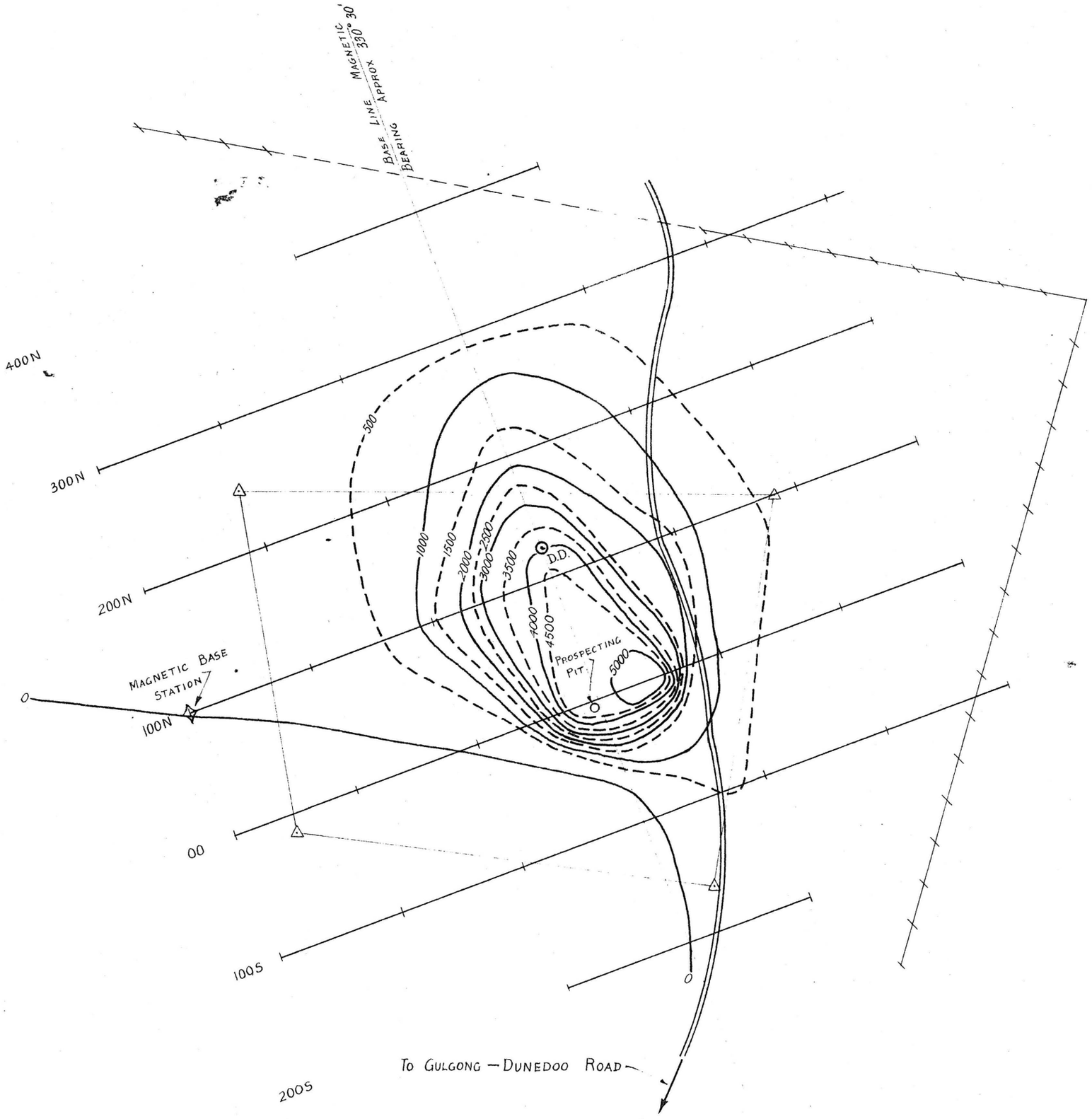
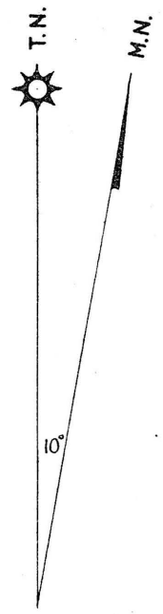
G. 122—5

GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

PLATE 5





SCALE

100 0 100 200 300 FEET

LEGEND

- GRID SURVEY PEGS
- 1000 MAGNETIC CONTOURS
- 500 CONTOUR INTERVAL 500 GAMMAS
- △ LEASE PEGS P.M.L. 8
- FENCE
- TRACK
- ⊙ D.D. PROPOSED DIAMOND DRILL HOLE

TERRAIN: — LEVEL

GEOPHYSICAL SURVEY AT GULGONG N. S. W.

TALLAWANG SOUTH MAGNETITE DEPOSIT

VERTICAL MAGNETIC FORCE CONTOURS

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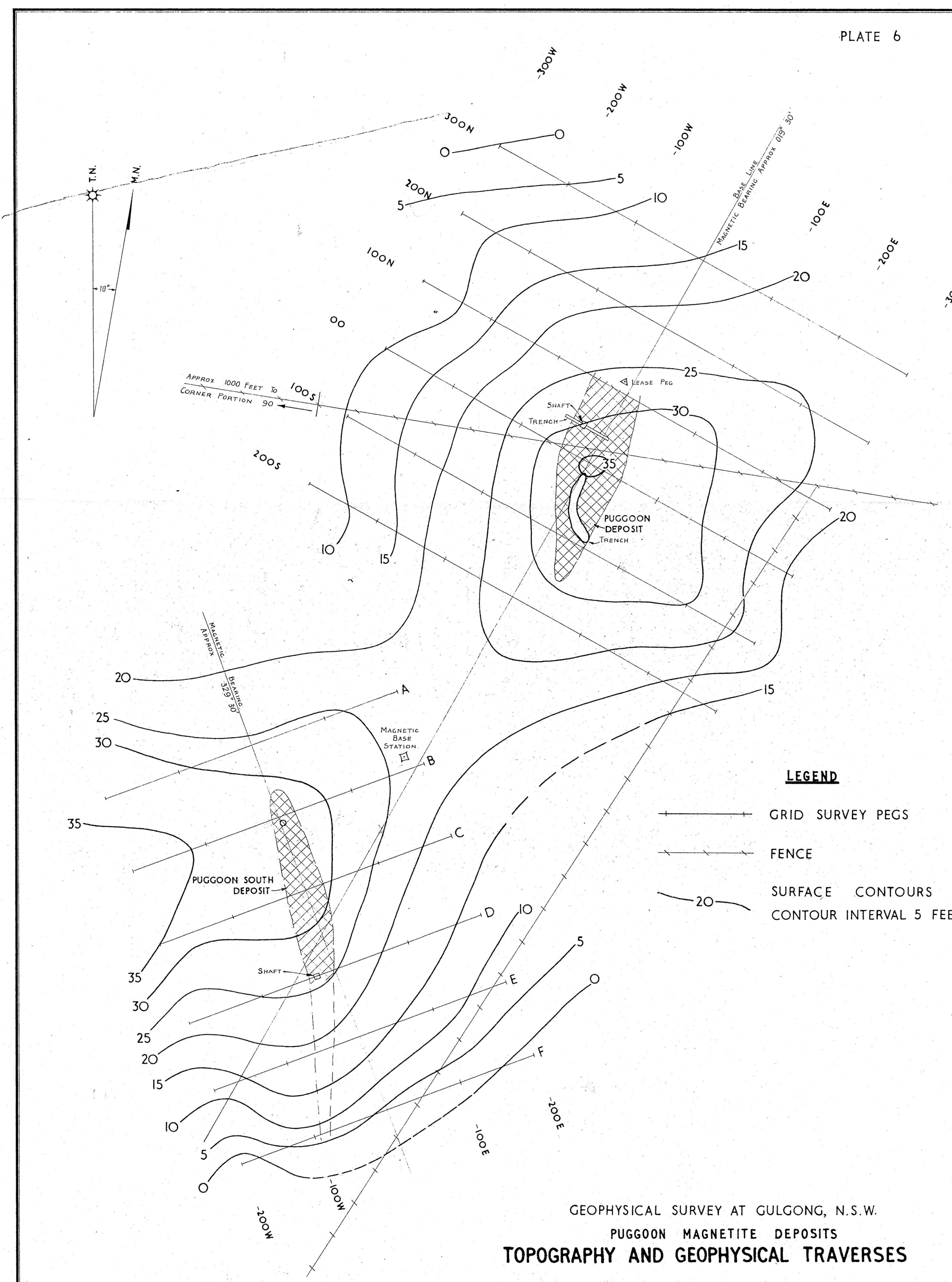
GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

PLATE 6



LEGEND

GRID SURVEY PEGS

FENCE

20 — SURFACE CONTOURS
CONTOUR INTERVAL 5 FEET

SCALE
100 0 100 200 300 FEET

GEOPHYSICAL SURVEY AT GULGONG, N.S.W.

PUGGOON MAGNETITE DEPOSITS

TOPOGRAPHY AND GEOPHYSICAL TRAVERSES

ARBITRARY DATUM LEVEL 300N. 300W

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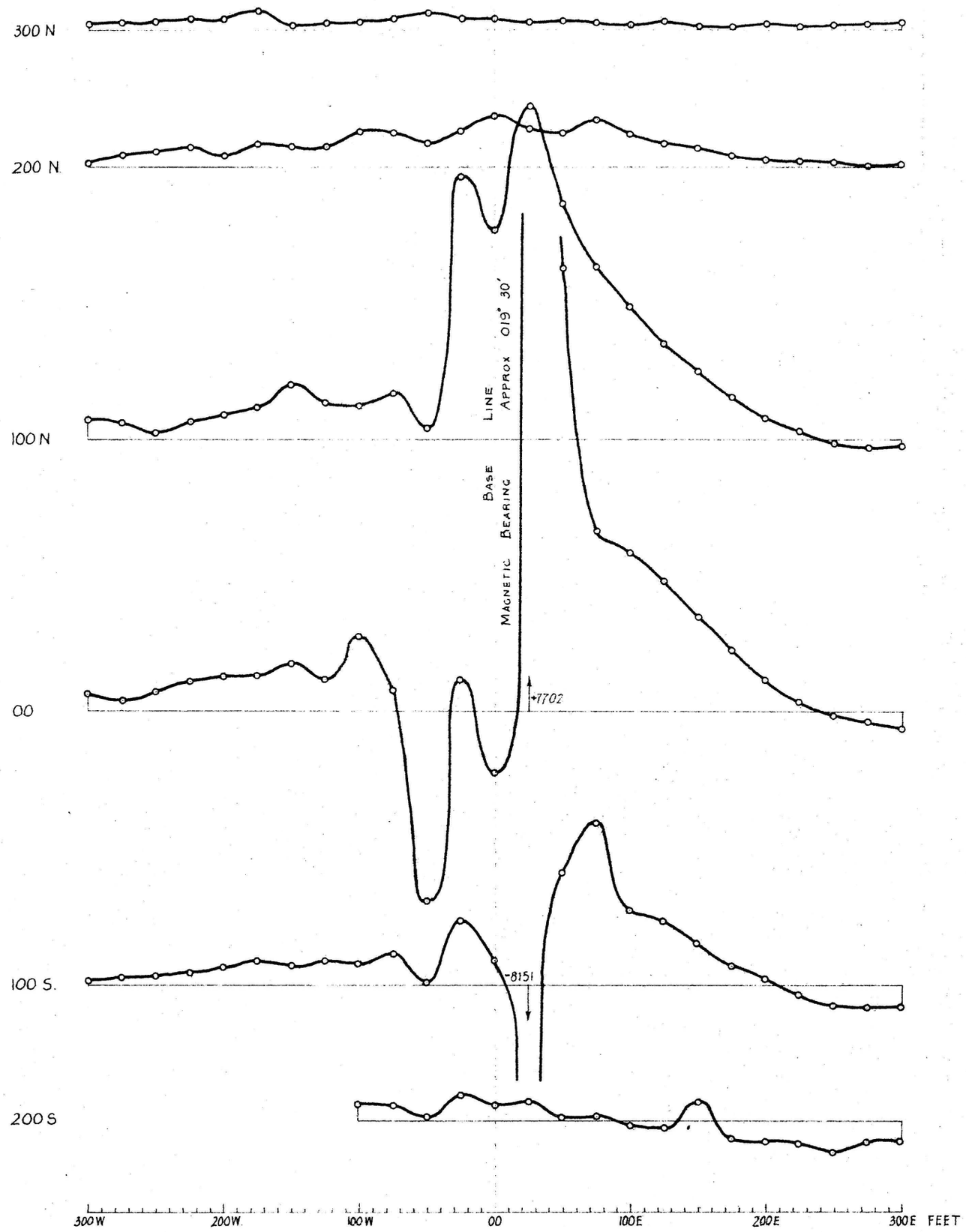
GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

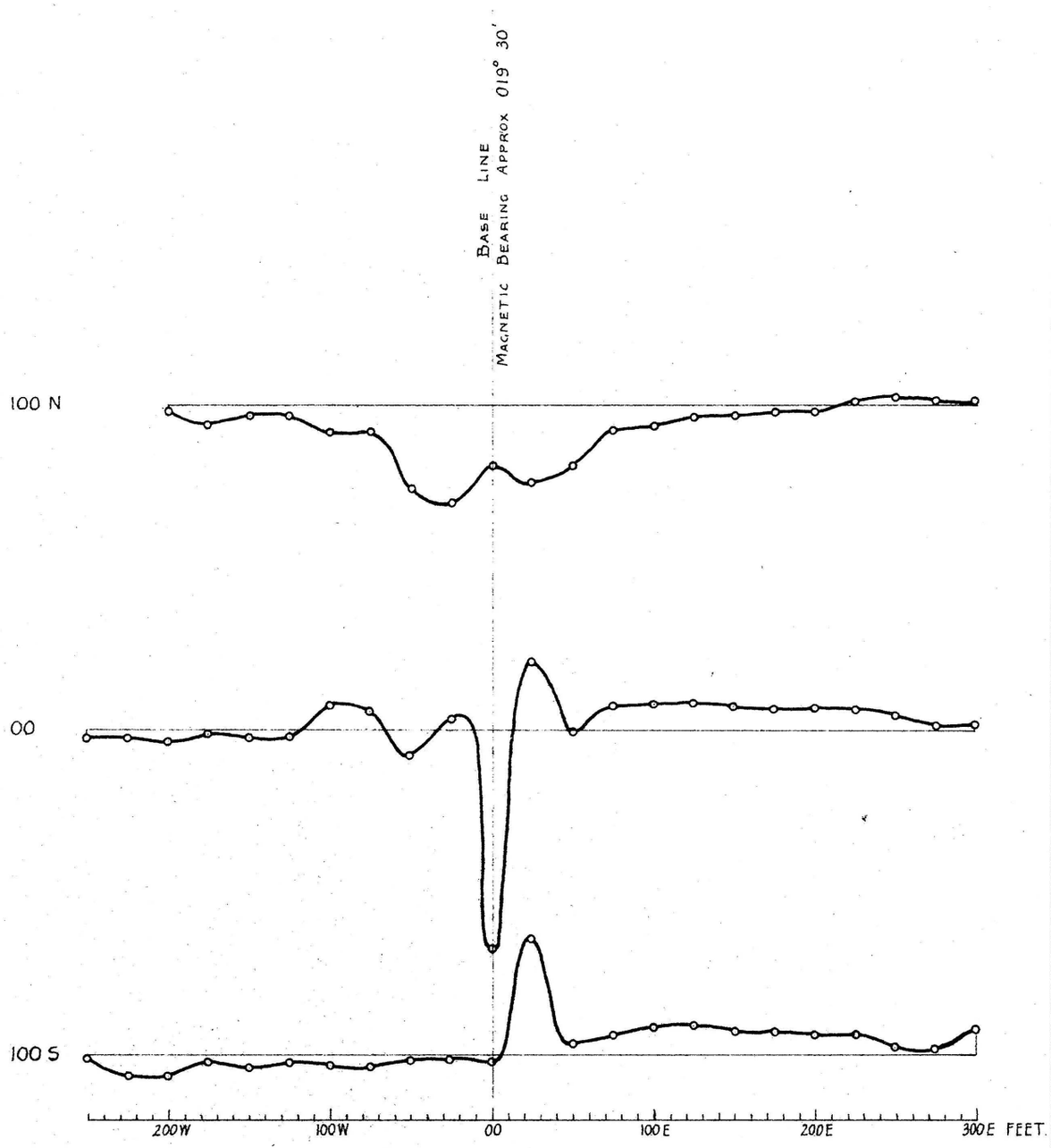
PLATE 7



VERTICAL MAGNETIC FORCE PROFILES

NOTE VERTICAL SPACING OF PROFILES NOT TO SCALE

K. H. Tate
GEOPHYSICIST



HORIZONTAL MAGNETIC FORCE PROFILES

(COMPONENT IN PROFILE DIRECTION)

GEOPHYSICAL SURVEY AT GULGONG, N.S.W.

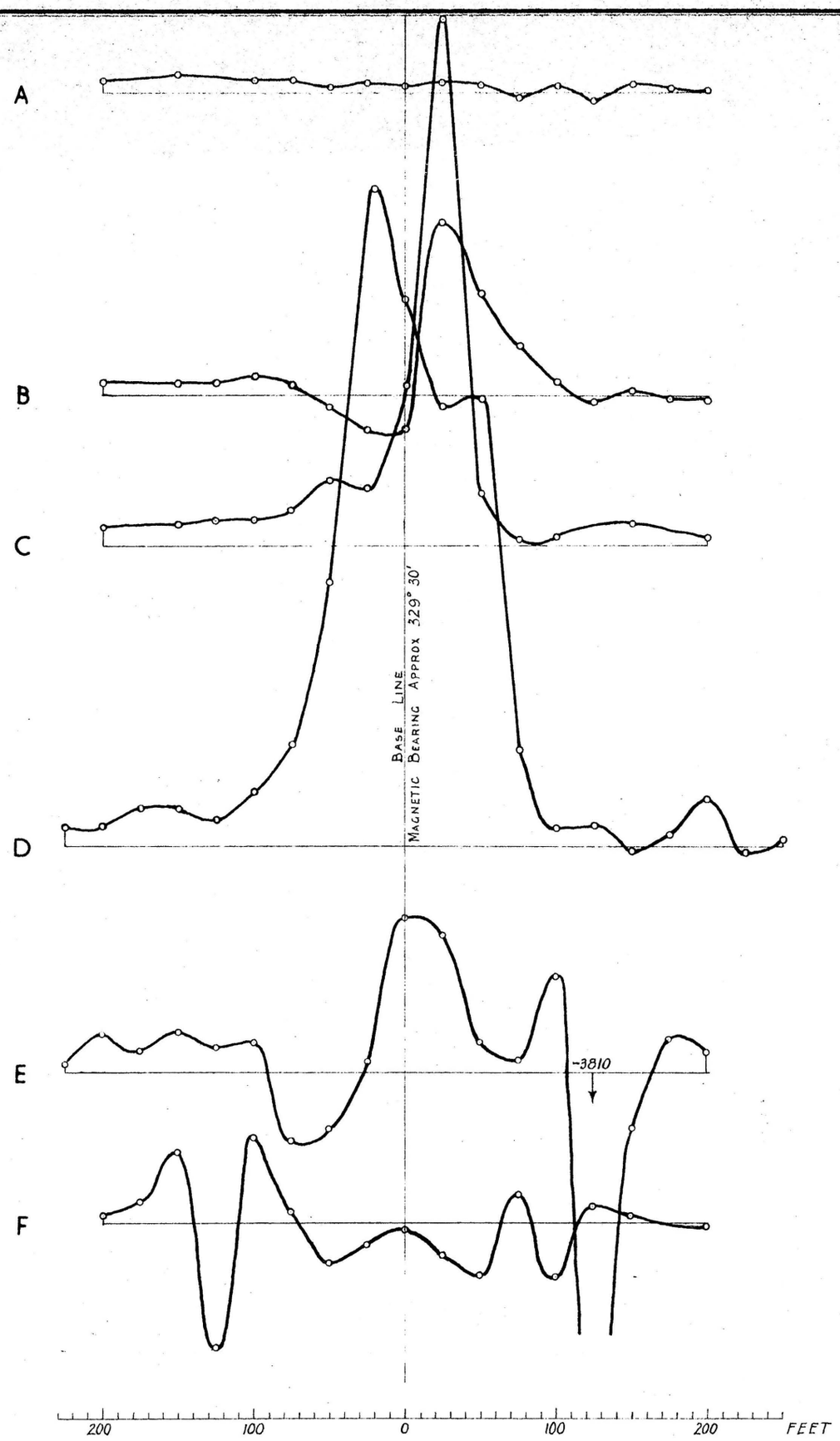
PUGGOON MAGNETITE DEPOSIT

VERTICAL AND HORIZONTAL MAGNETIC FORCE PROFILES

G 122—8

GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

PLATE 8



VERTICAL MAGNETIC FORCE PROFILES

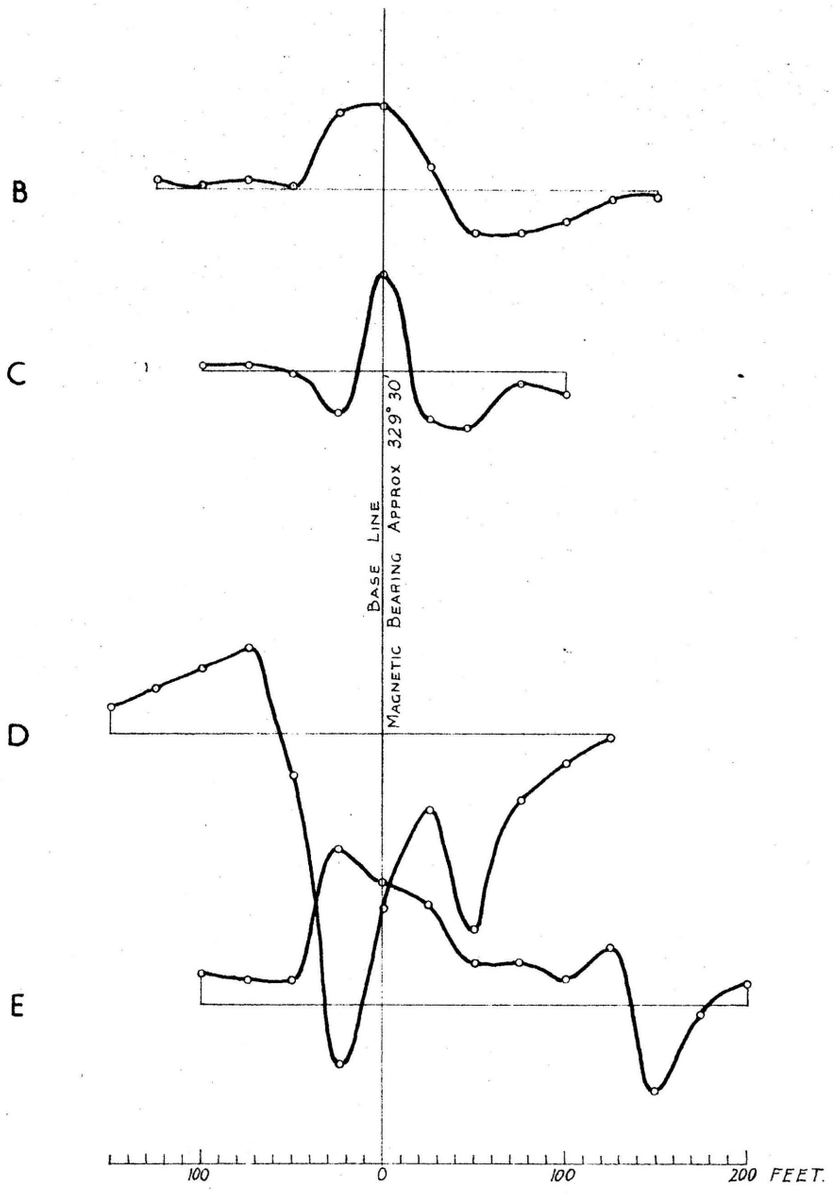
VERTICAL SCALE

1000 0 1000 2000 3000 GAMMAS

NOTE VERTICAL SPACING OF PROFILES NOT TO SCALE

K. H. Tate

GEOPHYSICIST



HORIZONTAL MAGNETIC FORCE PROFILES

(COMPONENT IN PROFILE DIRECTION)

GEOPHYSICAL SURVEY AT GULGONG, N.S.W.

PUGGOON SOUTH MAGNETITE DEPOSIT

VERTICAL AND HORIZONTAL MAGNETIC FORCE PROFILES

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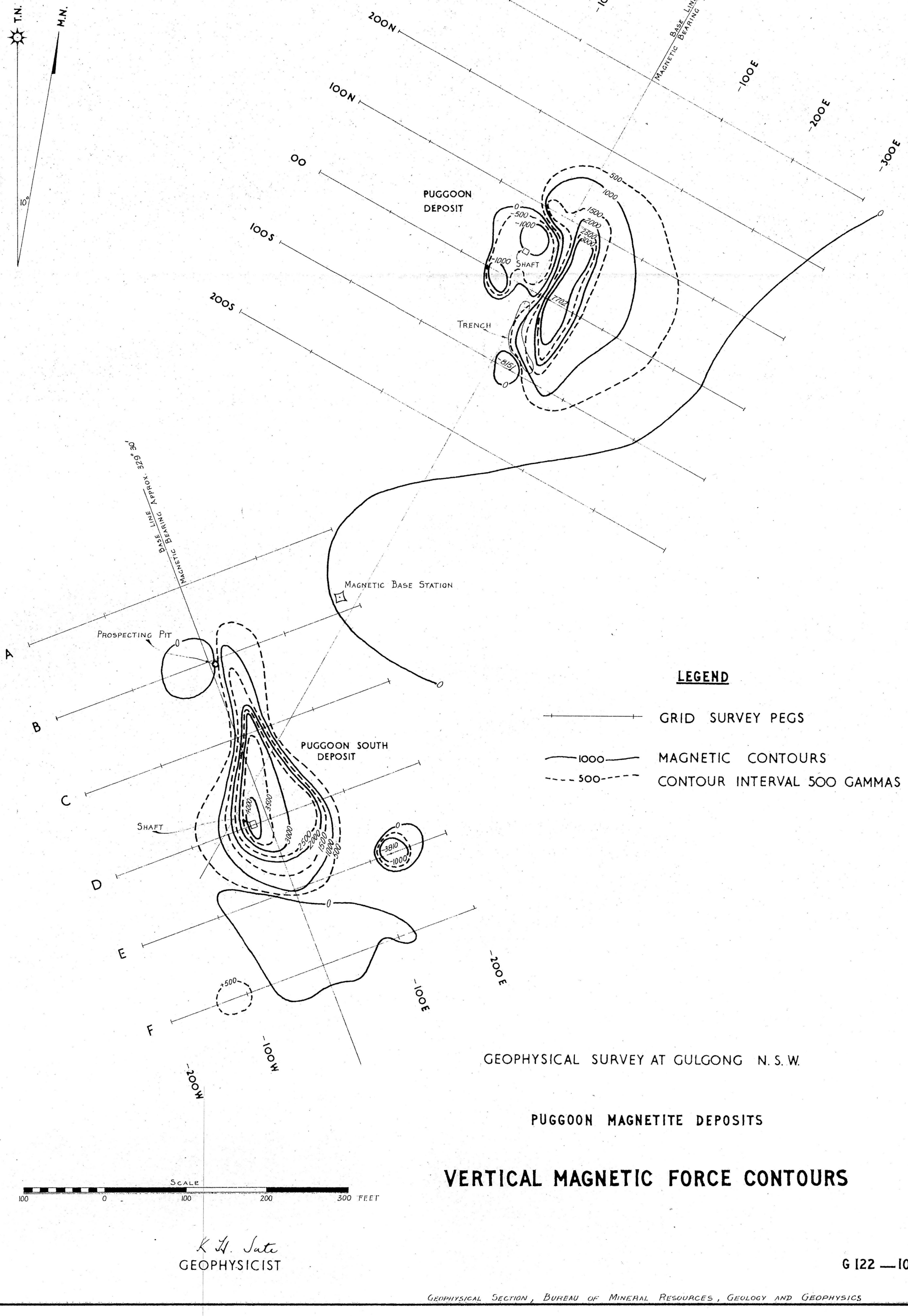
GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

PLATE 9



LEGEND

GRID SURVEY PEGS

1000 MAGNETIC CONTOURS

500 CONTOUR INTERVAL 500 GAMMAS

K H. Sato
GEOPHYSICIST

GEOPHYSICAL SURVEY AT GULGONG N. S. W.

PUGGOON MAGNETITE DEPOSITS

VERTICAL MAGNETIC FORCE CONTOURS

G 122 — 10

GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS