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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORDS 1951, No. 29

FINAL REPORT ON THE GEOPHYSICAL SURVEY OF THE ASTROLABE MINERAL FIELD, PAPUA

by

K. H. TATE

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1. INTRODUCTION

This report deals with the work done by a field party of the Geophysical Section, Bureau of Mineral Resources, on leases in the Astrolabe Mineral Field held by Mandated Alluvials N.L. The work was done in the 1950 field season from March to December and was a continuation of the work done in 1949 and described in the first progress report (Oldham, 1950).

The Astrolabe Mineral Field is a broad belt of country lying at the western foothills of the Astrolabe Range in the Central District of Papua. At the time of the surveys, Mandated Alluvials N.L. had field headquarters at the Sapphire Creek Camp, seventeen miles by road east from Port Moresby, the administrative centre of the Territory of Papua-New Guinea. Port Moresby is the chief port of Papua and is connected with the Australian mainland by a daily air service and an irregular shipping service. The Sapphire Creek Camp was the field party's headquarters and a temporary camp was established in the Dubuna area. Locations of both camps are shown on Plate 1.

The field party consisted of the writer as party leader and I.A. Mumme, geophysicist, and N. Parker, field assistant. In August 1950, the writer returned to Melbourne and was replaced by W.J. Langron, geophysicist. N.G. Chamberlain, senior geophysicist, visited the field in July-August to supervise operations and plan later work. Acknowledgement is due to Messrs. Chamberlain and Langron for much help in the field work and in the preparation of this report.

The late A.K.M. Edwards, resident geologist at Port Moresby, and Haddon F. King, Chief Geologist of Zinc Corporation Ltd. visited the field to discuss geological aspects of the problem.

Mandated Alluvials N.L. gave all the assistance possible with equipment and unskilled labour. Twenty natives were provided by the company to assist the geophysical party. In the early part of the survey, Gosiagos from Goodenough Island, Fergusson Island and Normanby Island were employed and later, Chimbus from the Garoka District of the Central Highlands Division. It was found that the natives were not only indispensable for the clearing of traverse lines, but also could be trained to work as chainmen and could be entrusted with the safe carriage of instruments.

2. GEOLOGY

The geology of the Astrolabe Mineral Field has been described by Carne (1913), Stanley (1911, 1917), Hooper (1941) and Fisher (1941). Practically all the known ore-occurrences in the field have been described in a more recent report by King (1950), who summarised the work of the earlier writers and supplemented it with the results of his own examination of the field. However, there are no detailed geological maps of most of the mine areas and, with the exception of Laloki and Moresby King, the geological information shown on the plans presented with this report is based largely on the observations of the geophysical party. The resident geologist, the late Mr. Edwards, has worked in the area, and the following summary is based to some extent on discussions with him.

The Astrolabe area is occupied mainly by a large body of gabbro which is overlain by a succession of folded sediments. In parts of the area, for example in the neighbourhood of the Sapphire-Moresby King Mine, the sediments form roof pendants on top of the gabbro. It is generally considered that the gabbro is intrusive; King suggests thatthis is true of at least the fine-grained phase.

The sediments are tuffaceous in some places and calcareous in others; they are disturbed by much fracturing and shearing and, in consequence, their attitude is difficult to determine. The age of the sediments is uncertain.

Hooper (1941) reported that no more than 90,000 tons of ore had been won on the whole field. Examination of the available reports indicates that the probably ore reserves can be set at approximately 300,000 tons, of which Laloki contributes 265,000 tons (Fisher, 1941), Dubuna 28,500 tons (Hooper, 1941), Sapphire-Moresby King 9000 tons (Fisher, 1941) and Mount Diamond 2000 tons (Stanley, 1917). Minor areas such as Pari and Federal Flag could yield small parcels of ore.

In all the areas examined by the geophysical survey, the deposits consist of massive copper-bearing pyrite occurring within the sedimentary rocks. Ore-bodies are also known to exist in gabbro, for example at Mount Cook and Victoria Hampton (in part), which lie north of the Sapphire Creek Camp. "The possibility exists .... that any of the known deposits may persist along fractures in the gabbro either laterally or in depth. The probability of this is small in view of the many ore occurrences that do not extend into the gabbro." (King 1950).

Each of the ore-bodies is closely associated with a gabbro contact but there are no obvious major structural features of gabbro or sediments which mighthave controlled ore deposition. The ore bodies are generally lenticular with irregular outlines which produce rapid variations in size. Such features lead most observers to suggest that small showings could lead to ore-bodies comparable in size to Laloki.

The Astrolabe Range is prominent to the east due to a capping of horizontally-bedded volcanic agglomerate consisting mainly of andesitic fragments. There is no outcrop close to mineralised areas but huge boulders derived from this formation are scattered over the surface of the Laloki and Federal Flag areas. Many smaller ones are buried in transported soil.

3. GEOPHYSICAL METHODS

Magnetic Method

Fisher (1941) drew attention to the occurrence of pyrrhotite in the typical ores of the field and quoted a report from Dr. F.L. Stillwell recording magnetite from the Laloki ore. On this evidence the magnetic method was considered suitable for locating sulphide mineralisation at Laloki and other mines. Success of the method depends on the effect of the magnetic minerals of an ore-body in disturbing the earth's magnetic field. A marked contrast must exist between the magnetic properties of the ore-body and those of surrounding rocks.

Specimens of ore from all the areas examined were tested and found to be weakly magnetic. However, some strongly magnetic specimens rich in magnetite were observed in the Laloki ore-body and on dumps near the old workings at Dubuna. It is likely that concentrations of magnetite dispersed throughout the ore-bodies are mainly responsible for the magnetic anomalies observed. In all areas the gabbro was found to be weakly magnetic, with some moderately magnetic specimens particularly from the fine-grained chilled margin. In general, the intensity of magnetisation of the gabbro is approximately equal to that of the ores but the sedimentary rocks are relatively non-magnetic. Hence gabbro contacts are easily located by the magnetic method but useful prospecting for ore must be confined to the sedimentary roof-pendants. The intense magnetism of the scattered boulders of agglomerate tends to mask the magnetic effects of the Laloki and Federal Flag ore-bodies. However, other areas were not affected in this way.

The magnetic survey consisted of making relative measurements of the vertical intensity of the earth's magnetic field with a Watts vertical intensity magnetometer. Readings were taken at intervals of 25 feet along traverses at 100-foot separation. A typical magnetic anomaly is illustrated on Plate 21. The magnetic profile shows the variations of vertical intensity along section A-A' across the Mount Diamond ore-body. The profile calculated for an assumed magnetic body is shown for comparison with the observed profile along section A-A'. It will be noted that in each profile there is a strong positive peak and a strong negative trough. The form of the profile is due partly to the shape and dip of the ore-body but is mainly due to the inclination of the earth's field and the strike of the ore-body. In low magnetic latitudes, that is where the angle of inclination of the earth's field is small, a magnetised body will normally have a north (positive) polarity at its northern end and a south (negative) polarity at its southern end, and will therefore give rise to the type of anomaly illustrated.

Self-potential Method

The self-potential method is of value for the detection of a sulphide body which is intersected by the level of the water table. The portion of the body in the zone of circulating waters above that level undergoes oxidation and as a result of this process of oxidation the body becomes a source of small electric currents, which flow downwards within the body and then upwards and outwards through the surrounding earth. The current flow is investigated by making potential measurements on the surface. The usual effect observed over an oxidising sulphide body is a centre of negative potential.

In the self-potential work of the present survey, accurate and consistent measurements of the potentials were possible because of good ground contacts due to damp surface conditions, and although most of the self-potential anomalies observed were small it is considered that they should not be disregarded.

Equipotential-line Method

The ore-body at Laloki is an almost-pure massive sulphide body and can therefore be expected to have an electrical conductivity much greater than the surrounding tuffaceous rocks. Two methods of locating such a buried conductor were tried.

In the first, known as the equipotential-line method, an alternating current is applied to the ground through two electrodes and the flow of current between the electrodes is investigated by tracing equipotential lines on the surface between the electrodes. This is done by means of a pair of movable electrodes and an amplifier. A trial of the method on the Laloki area showed that it was not practicable to trace equipotential lines over a surface covered with either high kunai (grass) or thick vine-covered scrub, and that it would be necessary to use methods which confine the observations to previously cleared straight-line traverses.

Potential-drop-ratio Method

In this method the observations are made along straight-line traverses. Alternating current from a portable generator is applied to the ground through two power electrodes. The power electrodes are placed at a separation of three-quarters of a mile or more, so that the distant electrode is virtually at infinity and only the potential distribution due to the near electrode need be considered. The presence of a conducting body with a much higher conductivity than that of the surrounding country rock will produce an anomaly in the potential distribution at the surface. In practice, the potential distribution is investigated by comparing potential drops across successive intervals along a traverse. A set of three probe electrodes is used with an A.C. bridge circuit, which gives the ratio of the potential drop between the front and centre electrodes to the potential drop between the centre and rear electrodes. A potential ratio profile is obtained from measurements made at equal intervals along the traverse.

To illustrate the layout usually adopted for the method, reference may be made to the plan of the Laloki area (Plate 2), where, for example, E_1 represents the position of the near power electrode for the traverses included in Block 1, the distant power electrode being well removed to the west of the area shown. The results of the measurements, in the form of potential ratio profiles, are illustrated in Plate 7.

A disadvantage of the potential-drop-ratio method is its marked sensitivity to variations in the conductivity of near-surface formations. This disadvantage may be overcome by means of the return survey technique, which was used at Laloki for the traverses in Block 2. With the near power electrode at E2 the traverses were first read from west to east. Then, with both power electrodes moved to similar positions on the eastern side of the block of traverses (E2' shows the second position of the near power electrode) the traverses were read in the opposite direction to give a reverse profile of potential ratios. By taking the average of the forward and reverse profiles (as illustrated in Plate 7 for Block 2 of the Laloki profiles) the effects of near-surface variations should be eliminated and any anomalies remaining in the residual curve should be due only to deeper conducting bodies.

Electromagnetic Method

At the time of the survey, no electromagnetic equipment was available for use on this project although it was evident that the method might be usefully employed. It was thought that the other methods used would be adequate. In any further survey it would be advisable to use the electromagnetic method to supplement the results obtained by other methods, especially as the results from the equipotential line and potential methods were not particularly useful.

4. LALOKI AREA

Location and Geology

The Laloki lease is situated near the headwaters of Sapphire Creek about two miles south of the Sapphire Creek Camp. Gabbro is present about 1,000 feet north of the open-cut. The ore-body has been described in detail by Hooper and Fisher. It is exposed in the open-cut where its strike is roughly north-east and its dip averages 45° to the north-west. North of the open-cut, the strike changes to north as the body plunges into the hill. (Plates 2 and 3).

Results of 1949 Survey

During the 1949 season, a detailed magnetic survey was made of the Laloki area (Oldham, 1950). One strong magnetic anomaly was observed over the south-western end of the known ore-body and another well-defined anomaly of 120 gammas, referred to as the northern anomaly, was found centred at 205.5E/202N. The northern anomaly may be due to sulphides forming an extension of the known Laloki ore-body or to a mass of gabbro. The former possibility was favoured by Oldham because the anomaly appears to be separated from the strong anomalies caused by the gabbro to the north, and furthermore it is situated on the northern line of extension of the known ore-body (Plate 3). The southern limit of the gabbro is not known for certain but is probably shown by the line in Plate 2 marking the boundary of the irregular magnetic disturbances due to gabbro. No mineralisation has been reported near the northern anomaly. Costeans were dug on traverses 202N and 203N as shown in Plate 3, but these revealed only transported material to a depth of at least eighteen feet.

The magnetic survey showed also a strong anomaly at 193E on traverse 194N. There was no obvious explanation for this southern anomaly but it was considered worthy of further investigation.

The self-potential survey of the Laloki area in 1949 showed only one anomaly. This was observed over the ore exposed in the open cut. The remainder of the ore-body, probably because it was below the water table and therefore not undergoing oxidation, produced no self-potential effects (Plate 6).

Results of 1950 Survey

Magnetic Survey

The southern anomaly was examined further by taking magnetic readings along two additional traverses, 193N and 195N. These results are shown on Plate 4, together with the profiles of the 1949 survey. The additional results indicate that this anomaly extends from traverse 192N to traverse 195N. A small outcrop of the typical weathered form of the gabbro was found and was later shown to be more extensive (Plate 2), and the anomaly can be attributed with certainty to a lenticular mass of gabbro. Additional magnetic readings along traverse 195N gave no further information about the southern end of the Laloki ore-body.

Potential-ratio Survey

It was hoped that the high electrical conductivity of the massive sulphides of the Laloki ore-body would make it possible to determine the extent of the ore-body by application of the potential-ratio method. The portion of the Laloki area surveyed by this method is shown on Plate 2 and includes the known ore-body and the northern magnetic anomaly. The results are shown as potential-ratio profiles on Plate 7.

In Block 1 five traverses were read; the profiles show many irregular variations due probably to variations in the conductivity of the near-surface layers, and do not appear to show any useful correlation with the known ore-body, except

.. 6

possibly for the anomaly centred at 206E/197N, which could be caused by the lode outcrop in the open-cut.

The three traverses of Block 3 similarly show only irregular surface effects. The return survey technique was employed on the five traverses of Block 2. The residual curves obtained by averaging the forward and reverse profiles show that, with the surface effects eliminated, no significant features remain which could indicate a deeper conducting body.

The application of the method has failed to give any additional information with regard to the northern limits of the Laloki ore-body.

Summary of Results

The southern magnetic anomaly was shown to be caused by a lenticular mass of gabbro. The northern magnetic anomaly observed in 1949 may be regarded as indicating either a northerly extension of the Laloki ore-body or a body of gabbro. Although the potential-ratio method failed to locate any extension of the Laloki ore-body, it is believed that this is due to poor depth penetration caused by thick irregular layers of transported material on the surface. It is possible that the electromagnetic method might give useful results in this area. As equipment was not available for this survey, the method was not tested.

Drilling Recommendations

The only recommendation that can be made on the basis of the geophysical results is for the testing of the northern magnetic anomaly. A vertical drill-hole located at 205.5E/202N would be sufficient to show whether the anomaly is caused by gabbro or a sulphide body, and any additional drilling in the area would be largely determined by the results of this test hole.

5. MORESBY KING AREA

Geology

In this report, the name Moresby King is applied to the area shown in Plate 9, which includes both the Moresby King and the Sapphire workings. The geophysical work done in 1949 was supplemented during the 1950 season by a close geological examination of the gabbro contact. The mapping of this contact showed that gabbro encircles the area as shown in Plates 8 and 9.

The island of sedimentary rocks consists of impure limestones and tuffs which are fragmental in places. The sulphide mineralisation, which occurs along the upper slope of a ridge, was described by Fisher (1941) as showing a tendency to develop into large bulges in some places, with lesser ones in others. The lode is generally flat-lying, lenticular in habit, and is not continuous throughout the mineralised area. The underground workings are now inaccessible, but from the plans of Fisher (1941) and Hooper (1941) it has been deduced that the location of the known mineralisation is as shown in Plates 11 and 13.

Geophysical Results

General

Magnetic and self-potential surveys of the Moresby

King area were carried out in 1949. No additional geophysical observations were made in 1950 and the following discussion deals with the 1949 results, which have been re-examined and are presented in the form of magnetic and self-potential contour plans in Plates 11 and 13 respectively.

Magnetic Survey

The magnetic contour plan shows four weak magnetic anomalies. Anomaly I is centred at 153E/219N and, as pointed out by Oldham, could indicate either an apophysis of the gabbro or a sulphide body containing magnetic minerals. Anomaly II occurs over the known mineralised zone and is probably due to magnetic minerals included in the sulphide ore. Anomaly III can be correlated with the drilling information presented by Hooper (1941). The centre of the anomaly is located at 156.5E/228N. Borehole No. 3, south of the anomaly, passed through 10 feet of sulphide at 93 feet and borehole No. 5 passed through mineralised chert from 57 to 143 feet. It is likely that the anomaly is caused by a small zone of mineralisation. Anomaly IV, centred at 156.5E/232N, is superimposed on the more general magnetic gradient due to the underlying gabbro. This anomaly is of small extent and corresponds to a mineralised zone known from old Moresby King workings.

Self-potential Survey

Near the Sapphire workings, two small negative centres separated by an area of positive potential were observed. The negative centres are at 155E/224N and 157.5E/226N and they agree closely in position with magnetic anomaly II and with the known mineralisation. Another self-potential negative centre at 156.5E/232N similarly agrees in position with magnetic anomaly IV and with the mineralisation known from the Moresby King workings.

Summary of Results

Four small magnetic anomalies were observed, three of which (II, III and IV) can be related to known ore occurrences. Anomalies II and IV are accompanied by self-potential anomalies. The absence of a self-potential anomaly associated with magnetic anomaly III is explained by the fact that the mineralisation is shown by the drilling to be below the water table. By comparison with the results over the known occurrences or ore, magnetic anomaly I may be regarded as a possible indication of a sulphide body. The chance of the anomaly being caused by gabbro cannot however be ruled out.

Drilling Recommendations

The only possible evidence of a previously unknown ore-body is magnetic anomaly I, which should be tested by a vertical drill-hole at 152.9E/219N.

6. FEDERAL FLAG AREA

Location and Geology

The Federal Flag Area, formerly known as Astrolabe, is about one and a half miles east of Sapphire Creek Camp and about 300 yards south of Rouna Road, as shown in Plate 1. Small parcels of rich oxidised ore were won from Federal Flag, but owing to the present collapsed state of the workings and lack of mining records, no information is available as to the nature of the ore-body. The gossan shown in Plate 14 was mapped by the geophysical party and is identical with the east-striking lode outcrop reported by both Fisher (1941) and King (1950). It occurs in sediments which are bounded to the north, east and south by gabbro outcrops. Some scattered agglomerate boulders occur in the eastern part of the area.

Magnetic Results

The magnetic method only was used and four traverses bearing north and two traverses bearing east were surveyed. The profiles (Plate 14) show no anomalies which could be attributed to ore-bodies except possibly the two minor peaks at 97.75E/102N and 100E/101.5N which coincide with the gossan outcrop.

The magnetic results appear to be associated mainly with underlying gabbro. The strong magnetic gradient in the area suggests a north-easterly dip of the gabbro basement. Towards the northern ends of traverses 100E and 101E however, the magnetic values pass through a sharp minimum and then tend to rise suddenly, probably indicating a fault or escarpment in the gabbro which brings it close to the surface north-east of the workings. A line has been drawn on the plan to show the boundary of the magnetic disturbances apparently caused by near-surface gabbro.

No drilling recommendations are made for this area.

7. HECTOR AREA

Location and Geology

The Hector Area is about 13 miles east of Port Moresby and close to the junction of the Rigo and Rouna Roads as shown in Plate 1. It is the most accessible mining area in the Astrolabe field.

The mineralised areas exist in a sedimentary outcrop bounded to the east and west by gabbro outcrops (Plate 15). A zone of felspathised tuffs is adjacent to the western gabbro contact. The areas have been mined mainly for oxides.

The lode in the western mineralised area is reported by Carne (1913) to have been tested to a depth of 30 feet and over a length of 90 feet. The lode is described as striking N36°W and dipping at approximately 45° to the south-west; its width is reported to be from two to eight feet. The eastern mineralised area is not mentioned by Carne, but King (1950) reports that it persists for 800 feet. The plan of the Hector lease shown in Plate 15 is based on observations ~~of~~ by the geophysical party. It was not possible to locate the lode with certainty or to identify the mine workings described by Carne.

Geophysical Results

Magnetic Survey

Magnetic readings were made on five traverses. The results are shown in the form of profiles in Plate 16. The high values in the western part of the area are attributable to gabbro outcrops. In the eastern part of the area the readings are very disturbed and suggest a more extensive gabbro influence than the plotted outcrop would indicate. There is a strong magnetic gradient from high values in the west to low values in the east.

Although the results show mainly the effects of the gabbro, one anomaly has been observed which is probably due to an ore-body and not to gabbro. This anomaly is shown by the prominent peak at 99.75W on line 97S and less definitely by features on lines 98S and 100S. The axis of the anomaly strikes north-north-west, as shown in Plate 15. The anomaly may be closely correlated with gossan outcrops and the former workings and does not therefore indicate any hitherto unknown ore-body. Near the eastern workings the magnetic profiles are so disturbed by gabbro that an anomaly due to an ore-body would probably not be distinguished.

Self-potential Survey

Self-potential readings were made along five traverses. In general, the profiles are flat (Plate 17). A small negative anomaly is shown on traverses 97S and 98S and can be correlated with the gossan outcrops and the eastern workings as shown in Plate 15. No self-potential anomaly was obtained over the western workings, suggesting that the ore-body there lies entirely below the water table.

Summary of Results

A magnetic anomaly observed over the western workings is probably due to the known ore-body. Near the eastern workings a small self-potential anomaly was observed but the magnetic results show large irregular variations, probably due to the nearby gabbro. The survey has produced no evidence of additional ore-bodies and consequently no drilling recommendation is made for the area.

8. DUBUNA AREA

Geology

The Dubuna block of sediments is bounded to the south-west and north-east and probably underlain by the same type of gabbro that occurs throughout the Astrolabe field. The basalt dyke marked on an old plan by Carne (1913) is probably the chilled margin of the north-eastern gabbro mass shown in Plate 18. The south-western gabbro body crops out about 800 feet south-west of the main open-cut and is characterised by steep topography.

The workings referred to by Carne (1913) and Stanley (1911) have been obliterated by open-cutting, and the mine plans and records of later development have been lost. Carne described two lodes whose strikes converge to the north-west; No. 1, striking N40°W and dipping S50°W at a low angle, and No. 2, striking N60°W and dipping N30°E at 75°. By taking into account all the available surface evidence, the positions of these lodes have been determined approximately as shown in Plate 18. According to Stanley, the ore occurs in lenses which vary considerably in thickness, from a few inches up to 10 or 12 feet. Some reference is made by both Carne and Stanley to workings in Nabi's Gully.

Geophysical Results

Summary of Results of 1949 Survey

The 1949 survey consisted of magnetic and self-potential readings along traverses 194N to 203N and was described by Oldham (1950). A strong magnetic gradient due to the gabbro basement was found to persist throughout the area surveyed and tended to obscure some small anomalies which were observed in the vicinity of the old mine workings and considered to be due to sulphide ore. East of the workings the magnetic profiles became strongly disturbed and indicated a sharp boundary of intrusive gabbro probably associated with a fault or dyke.

The self-potential survey showed several anomalies, but most of them are very small. A definite anomaly at 101.5E/199N was located close to the floor of the open-cut and, together with smaller anomalies on traverses 200N and 201N, suggested a sulphide body extending in a northerly direction. There was evidence, from a collapsed adit, of previous workings in this locality. South of the open-cut, another series of anomalies suggested a second line of mineralisation, following roughly a line of old prospecting pits.

Magnetic Survey

The survey of the previous year was extended to examine the mining area north-west of traverse 203N, and an additional area to the south to cover the line of old prospecting pits, which extends into Nabi's Gully. The magnetic vertical force profiles have been included with those of the 1949 work and the ~~full~~ results for the whole area are shown in Plate 19. The additional profiles exhibit the fairly steep gradient due to underlying gabbro and in the north-east the irregular disturbances characteristic of gabbro suggest that a fault or dyke brings the gabbro close to the surface. The boundary of the near-surface gabbro inferred from the magnetic results is outlined in Plate 18.

An examination of the profiles for the area shows the presence of several small anomalies which are considered significant because they persist for considerable distances. Owing to the general magnetic gradient, the determination of the true breadth and magnitude of the anomalies is difficult and for this reason only the axes of the anomalies have been plotted on the plan (Plate 18). In deciding on the positions of the anomaly axes it has been necessary to take into account the fact (referred to in Section 3 of this report) that the anomaly due to a magnetised body in low altitudes will normally comprise a negative trough as well as a positive peak.

In the central part of the area, two anomalies (C and D) have been traced. The position of anomaly D agrees closely with the assumed position of the No. 2 lode described by Carne. Anomaly C (in part) strikes approximately parallel to Carne's No. 1 lode and extends to the south-west through a group of prospecting pits. These anomalies are probably related to previously known occurrences of sulphide ore.

Anomaly A has been traced for a distance of over 1,500 feet. It may be caused by an irregularity of the underlying gabbro or a gabbro dyke which comes close to the surface along this line. Carne refers to a "basalt" dyke west of the Nabi's Gully workings but does not indicate its position. No evidence of a dyke was found by a careful geological examination of the area and the possibility remains that the anomaly may be due to sulphides. The nature of the body causing the anomaly could be determined by shallow testing at a few selected points along the axis of the anomaly.

Although of only small intensity, Anomaly B has been mentioned because of its persistence for a distance of more than 200 feet. It is apparently caused by a shallow magnetic body and could be tested by costeaning. Anomaly E occurs near several old prospecting pits, in one of which sulphide specimens were observed, and may indicate shallow mineralisation.

Self-potential Survey

The previous self-potential survey was extended to include the additional traverses. The profiles along these traverses together with those of the 1949 survey are shown in Plate 20. The additional profiles show numerous small features, but it is considered that the only anomalies which may be of significance are those already referred to by Oldham (1950). These are marked on Plate 18 and, as they occur near the previous workings and prospecting pits, probably do not indicate any hitherto undiscovered ore-bodies.

Summary of Results

The magnetic results show to a considerable extent the influence of the underlying gabbro but five low-intensity magnetic anomalies have been observed which may be due to sulphide mineralisation. Three of the magnetic anomalies and two self-potential anomalies occur over or near the mine workings and appear to be related to the mineralisation reported by Carne and others. Of the other two magnetic anomalies, one shows persistence in length of over 1500 feet and is considered worthy of further investigation by costeaning or drilling.

Testing Recommendations

As the magnetic anomaly A appears to be due to a shallow seated body, it could probably be adequately tested by costeans located as follows :-

(1) Along traverse 196N centred at 95E; (2) along traverse 203N centred at 98.5E, and (3) along traverse 189N centred at 95E.

Drilling would not be recommended unless the costeaning failed to reveal the cause of the magnetic anomaly and the need arose for tests to greater depths, or unless sulphide bodies were discovered. In the latter event, a fairly comprehensive drilling programme would be needed to investigate the full extent of the bodies.

9. MOUNT DIAMOND AREA

Location and Geology

The Mount Diamond Area is situated three miles due south of Laloki on Maiberi Creek, as shown in Plate 1. Access from the Sapphire Creek Camp is by vehicle along Rouna and Rigo roads to the Dubuna track and thence to Chapman's farm. It is necessary to walk the remaining mile to the mine. The total distance from Sapphire Creek Camp is about thirteen miles.

The geological mapping and surface contouring carried out by the party is shown in Plates 21 and 22. The country rock is sedimentary and gabbro crops out to the south of the area. Carne (1913) described a body of sulphide about 30 feet thick, striking N77°E for a length of about 125 feet and dipping at 42° in a direction N17°W; it was not proved in length or depth. Mine workings indicate that some exploratory work was done after Carne and Stanley made their reports, but no records are available. The work may have outlined the whole body though only rich oxides were sought. Carne's original sections show the main tunnel to be 120 feet below the main shaft collar but this is difficult to reconcile with the surface contouring done by the geophysical party which shows that the main tunnel cannot be more than 80 feet below the present collar of the main shaft.

.. 12

Magnetic Survey

The traverses were pegged at right-angles to the reported strike of the ore-body and an area of 22 acres was surveyed. The magnetic profiles are shown in Plate 23. On traverse 101E a strong anomaly was observed over the known portion of the ore-body and there can be no doubt that the anomaly is caused by the ore-body. From an inspection of profiles 99E to 104E it is clear that there is a well-defined anomaly continuing for a distance of about 500 feet in a direction approximately at right angles to the traverses. The close correlation between the magnetic anomaly and the ore-body as mapped by Carne is shown in Plate 21 both by the magnetic contour plan and by the section A-A'. The fairly regular form of the profiles makes it unlikely that the anomaly is due to gabbro. Furthermore, no agglomerate boulders are present.

The magnetic contours indicate that the length of the ore-body along its strike is probably much greater than was reported by Carne. From examination of the typical magnetic profile along section A-A' across the centre of the anomaly it is concluded that the ore-body also has a greater depth extent than was proved by the former mining operations. The magnetic profile has been compared with theoretical profiles for different assumed magnetic bodies and it has been found that a close approximation to the observed profile would be produced by a uniformly magnetised body of considerable length and with a cross-section as shown in Plate 21. The assumed body dips to the north at 30°, has a thickness of 30 feet and a depth extent (measured in the direction of dip) of 100 feet. In calculating the theoretical profile, the effect of the surface topography has been taken into account.

By assuming that the magnetic body approximates to the form adopted in calculating the theoretical profile, the position of the axis of the body has been determined as shown in the magnetic contour plan (Plate 21). Vertical drill holes put down along this line should pass through the centre of the body. The length of this line indicates a probable length of the ore-body of approximately 500 feet.

Self-potential Survey

The results of the self-potential survey, presented in the form of profiles in Plate 24 and contours in Plate 21, show the presence of a strong well-defined anomaly consisting of a positive as well as a negative centre. The self-potential anomaly occupies practically the same position as the magnetic anomaly; it is elongated in the approximate direction of strike of the known ore-body and can be attributed with certainty to that ore-body. The self-potential contours confirm the magnetic evidence of an easterly extension of the ore-body beyond the limits mapped by Carne.

A detailed analysis of the profile along section B-B' has been carried out using the method of de Witte (1948) and applying corrections for topography in the manner described by Yungul (1950). This method of analysis gives a direct determination of the position in both plan and section, of the centre of the body responsible for the anomaly, and also the dip of the body. In practice, it is found that the centre of the body so determined is the mid-point of the section of the ore-body made by the plane of the water table. The corrections for topography applied in the analysis cannot be regarded as accurate as it has been necessary to calculate them on the assumption of a uniformly sloping plane for the ground surface.

An estimate of the depth extent of the self-potential body has been obtained by considering it to be a thin dipping sheet and by calculating theoretical profiles by the method described by Edge and Laby (1931). The centre of the body and the angle of dip were assumed to be those derived from de Witte's analysis and the length of the body along its strike was taken as 400 feet. Reasonable approximations to the observed curves were obtained by assuming the depth of the body measured down the dip to be 100 feet in section B-B'.

The self-potential body resulting from the above interpretation is shown in the section B-B' and the plan position of the axis of the body which has been traced for a distance of about 350 feet, is shown in the self-potential contour plan (Plate 21).

The probable ore-body deduced from the self-potential results is in virtually the same position as, but with a shallower dip than, the supposed magnetic body. It is also apparent that the magnetic axis extends about 150 feet further west than the self-potential axis.

The interpretations of the two methods differ in some respects; ~~but~~ the differences are not regarded as significant and are probably due to the limitations of the self-potential method which result from the dependence of the self-potential effects on the position of the water table in relation to the ore-body. The self-potential results are important in that they confirm the easterly extension of the ore-body and the extension down the dip to the north.

Summary of Results

Near the Mount Diamond mine workings, strong and well-defined magnetic and self-potential anomalies were observed and a detailed geophysical interpretation was possible. It has been shown that the anomalies can be accounted for by an ore-body striking east and dipping at about 20° into the hill in a northerly direction. It is likely that the body extends along the strike for about 500 feet and for about 100 feet down the dip or in other words to a level about 130 feet below the present collar of the main shaft.

Both the self-potential and magnetic anomalies are clearly related to the known ore-body and show that the ore-body extends for a greater distance along the strike and probably has a greater depth extent than would be expected from the existing reports on the mine. The geophysical results will provide definite targets for any future drilling programme designed to prove the full extent of the ore-body.

Drilling Recommendations

In order to test the geophysical results it is proposed that four vertical drill holes be put down in the following positions :-

	Co-ordinates of collar
P.D.H. 1	103.25E / 98.20S
P.D.H. 2	99.50E / 97.90S
P.D.H. 3	101.30E / 97.85S
P.D.H. 4	102.20E / 98.40S

Holes Nos. 1, 2 and 4 would test the longitudinal extent of the body and No. 3 its depth extent.

10. PARI AREA

Location and Geology

The lease known as Pari is approximately half-a-mile west of Mount Diamond. It is reached by a jeep-track which branches from the Dubuna Road and continues to Chapman's Farm. A walking track then continues for 440 yards to the mine-workings, as shown in Plate 22.

The area is heavily timbered and deeply dissected, resulting in very difficult surveying conditions. A gossan trending east lies roughly parallel to a nearby east-striking gabbro contact. The gossan has been prospected by a shaft and two tunnels and a 10-foot winze from the bottom tunnel is reported by Carne (1913) to have indicated sulphide at a position marked in Plate 25, and at a level of about 140 feet below the collar of the shaft. There is no evidence of ore having been encountered either in the shaft or in the top tunnel. Ore from dumps in the area was very weakly magnetic.

Geophysical Results

Magnetic Survey

Magnetic readings were made along five traverses each 1000 feet in length. The magnetic profiles show a strong gradient which probably indicates that gabbro underlies the whole area. The irregular disturbances observed on the southern parts of the traverses suggest that the gabbro extends at shallow depth for some distance into the area.

The only anomaly which may be due to ore is a weak anomaly which appears on traverses 102E, 103E and 104E north of the base-line. The axis of the anomaly extends from 102E/98.75S in a north-easterly direction to 104E/97.75S.

Self-potential Survey

The self-potential results are shown in the form of profiles and contours in Plate 25. Three weak negative centres were observed, centred at 102E/99.25S, 104E/99S and 104E/96S. The anomalies are too small and ill-defined for detailed analysis but they could be tested by shallow prospecting.

Summary of Results

No important anomaly was located by either the magnetic or self-potential method. However, some small anomalies from both methods are probably worth testing by shallow prospecting methods. The magnetic results give evidence of gabbro underlying the area.

11. ELVINA AREA

Location and Geology

The mine known as Elvina by the geophysical party is about one mile east of Mount Diamond on Maiberi Creek. This mine is identical with the one described as Elvina by King (1950).

The country rock is a highly-faulted and contorted tuff. There are no outcrops of gabbro in the vicinity. According to Carne (1913), several lodes occur in the area. The only ore-body which has been prospected to any extent is reported to be 32 feet wide, unproved in length, lenticular in form and to consist of massive sulphide. Carne has also referred to "two large pyritic lodes" exposed in the creek. The positions of these have been identified by ferruginous stains on the creek bank near a small waterfall and by a small sulphide lens which forms a bar across the creek 300 feet downstream from the waterfall (Plate 26).

Magnetic Results

Owing to the difficulty in reaching the area and the limited time available to the geophysical party, only two exploratory magnetic traverses were carried out. Each of the magnetic profiles shows a small anomaly which can be correlated with the occurrence of ore as known from the mine workings. The geophysical work was insufficient to outline the full extent of the ore-body.

12. SUMMARY AND CONCLUSIONS

During the 1950 field season the geophysical party carried out surveys on the following areas in the Astrolabe Field :- Federal Flag, Hector, Mount Diamond, Pari and Elvina. On three other areas, namely Laloki, Moresby King and Dubuna some additional work was done to supplement the investigations of the previous year, and in the discussion of these areas in this report the results of both years' work have been dealt with.

The methods principally used throughout the surveys were the magnetic and self-potential methods. It is likely that electromagnetic methods of prospecting could be used to advantage in this field but equipment was not available at the time to test its effectiveness. Although in general the sulphide ores of the Astrolabe Field are weakly magnetic and occur in non-magnetic sediments, the application of the magnetic method was found to be severely restricted by the fairly general occurrence of gabbro, which is also weakly magnetic. The known ore-bodies appear to be closely associated with the gabbro and to occur close to the contact of the gabbro with the sediments, and in practically all the areas surveyed the possibility of magnetic effects due to gabbro tends to introduce an ambiguity into the interpretation of the observed magnetic anomalies.

In all the areas (except Elvina) the effects of gabbro have been observed to varying extents either as steep magnetic gradients or irregular magnetic disturbances. From the magnetic surveys, supplemented by the mapping of outcrops, it has been possible to add considerably to the knowledge of the distribution of gabbro in the field. The tracing of the boundary of the gabbro mass by the magnetic method would be useful if the gabbro mass could be regarded as the limit of possible extension of the ore-bodies. Although this assumption is probably correct in most places, it is not generally applicable, as exceptions are known where the ore-bodies persist into fractures in the gabbro itself.

The anomalies observed with the self-potential method, except those at Mount Diamond, were all of very low intensity; some of them are related to known mineralisation, others may be related to ore not previously worked. The method is not well suited to the conditions in the Astrolabe field, probably because of the proximity of the water-table to the surface.

The most important results of the survey were obtained at Laloki and Mount Diamond. At Laloki, the magnetic survey directed attention to a possible northerly extension of the known ore-body. At Mount Diamond, both the magnetic and self-potential surveys showed strong and well-defined anomalies over the known ore-body and indicated that this ore-body is probably of much larger dimensions than was formerly supposed.

The only other areas where the geophysical results indicate the possibility of additional occurrences of ore are Moresby King, where a small magnetic anomaly was observed outside the known area of mineralisation, and Dubuna, where a line of shallow magnetic bodies has been traced for a distance of about 1,500 feet.

There is a marked lack of detailed geological information relating to the Astrolabe Field and except for the Laloki and Moresby King areas, records of the former mining developments are either non-existent or very incomplete. Any further geophysical work should be undertaken only after a detailed geological investigation has been made.

The geophysical survey has directed attention to certain localities where drilling or shallow prospecting may possibly reveal additional reserves of ore. Such prospects appear to be most favourable at Mount Diamond. The geophysical results thus provide the Company with several definite targets for testing. In any future geophysical survey, the use of the electromagnetic method, to supplement the magnetic and self-potential methods, is recommended.

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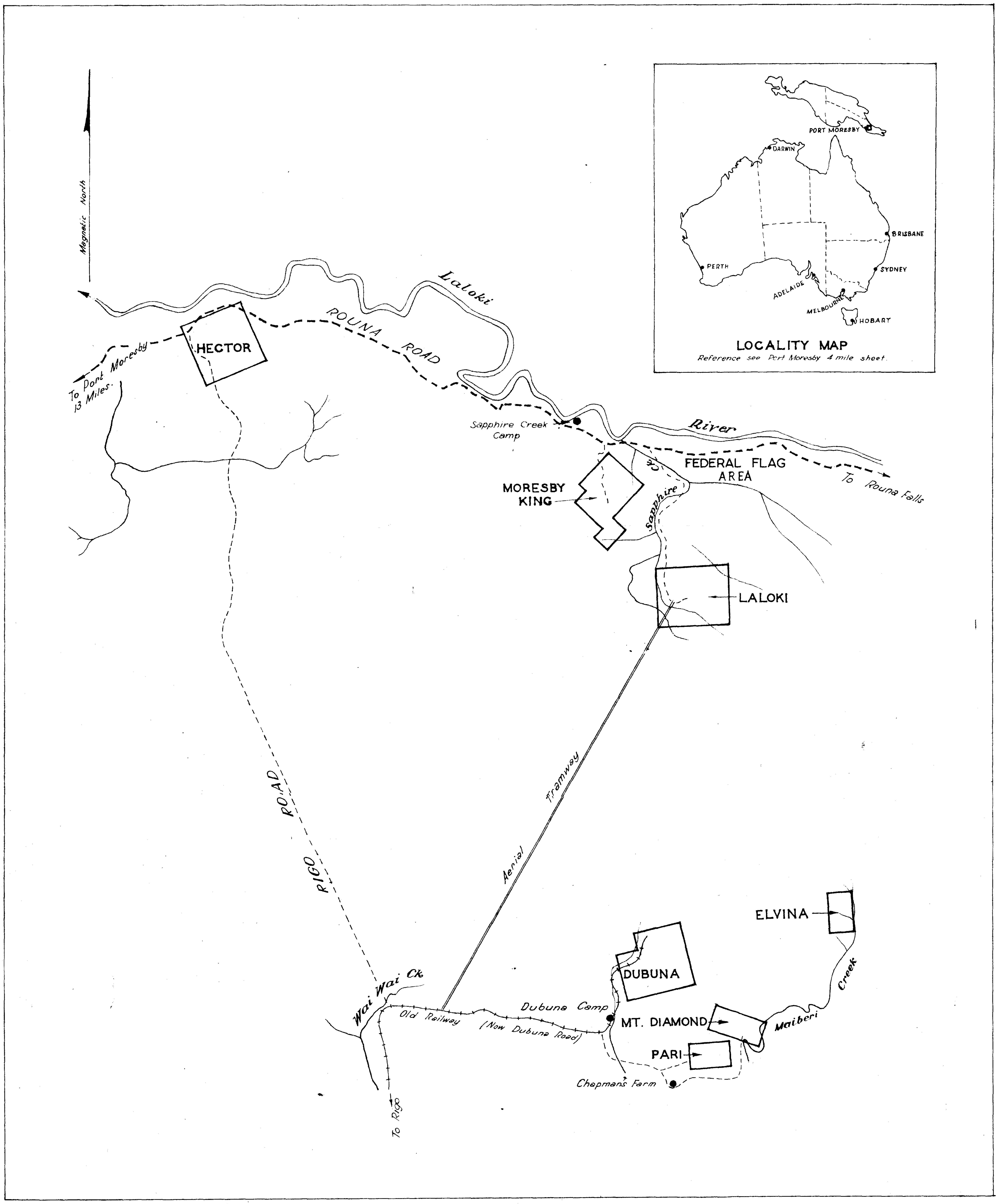

SCALE

½ 0 ½ 1 1½ MILES

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

SKETCH PLAN
SHOWING
ROUGH LOCATIONS OF LEASES

AFTER H. OLDHAM, 1950.

NOTE :- Positions and sizes of leases are approximate only, as all leases have been re-pegged but not subsequently surveyed.
Victoria Hampton "Eldorado" A & E & "Mt Cook" leases are north of the Laloki River, but have not been surveyed.

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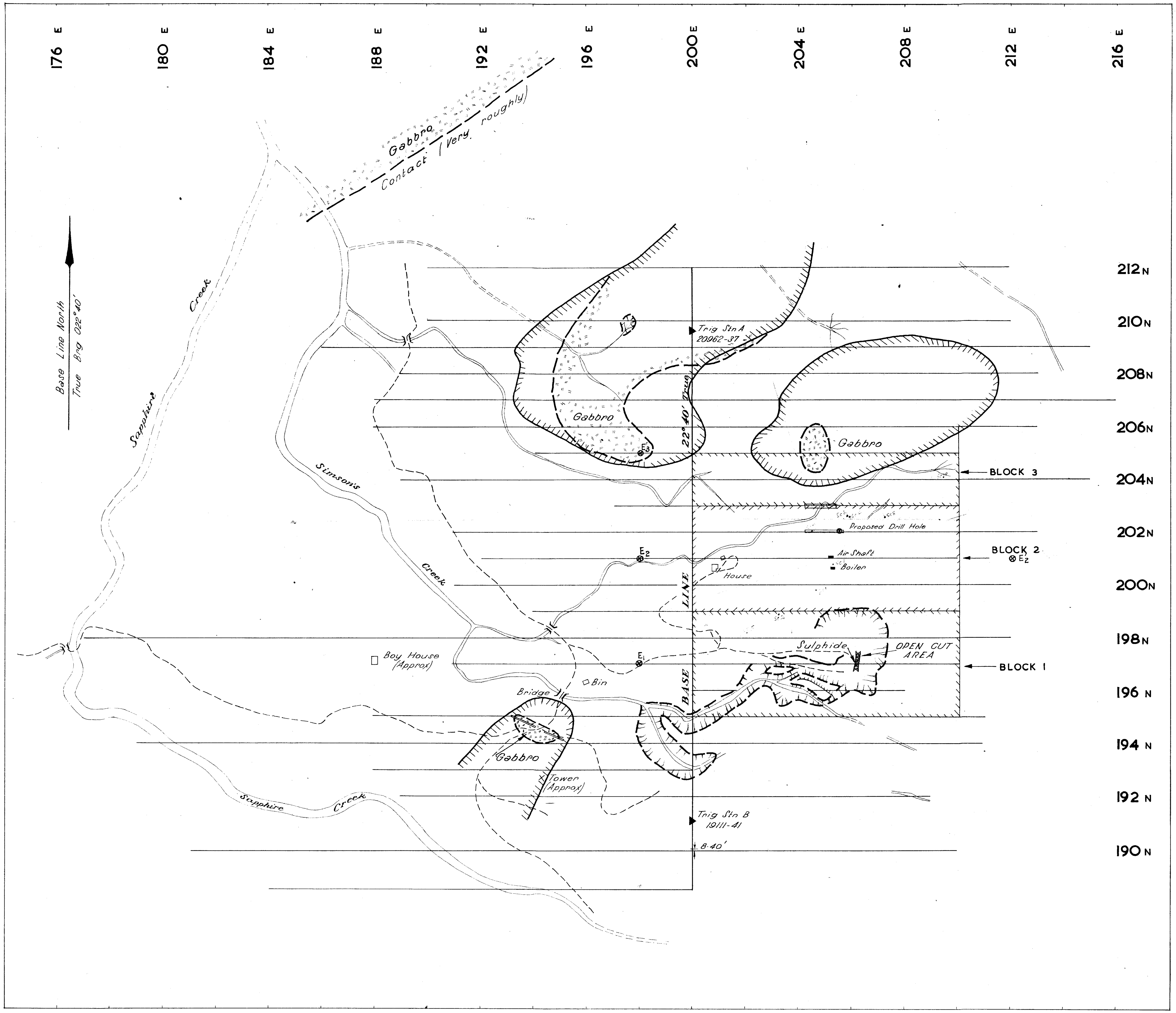
PLATE 2



LEGEND

- Creeks
- Roads
- Gabbro Outcrops
- Costeans
- Boundary of Irregular Magnetic Disturbances due to Gabbro.
- Area covered by Potential Drop Ratio Method.
- ⊗ Power Electrode Position.
- o Proposed Drill Hole.

SCALE

200 0 200 400 600 FEET

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GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

LALOKI AREA

PLAN SHOWING

GEOLOGY & GEOPHYSICAL GRID

(AFTER H. OLDHAM, 1950)

G73-16

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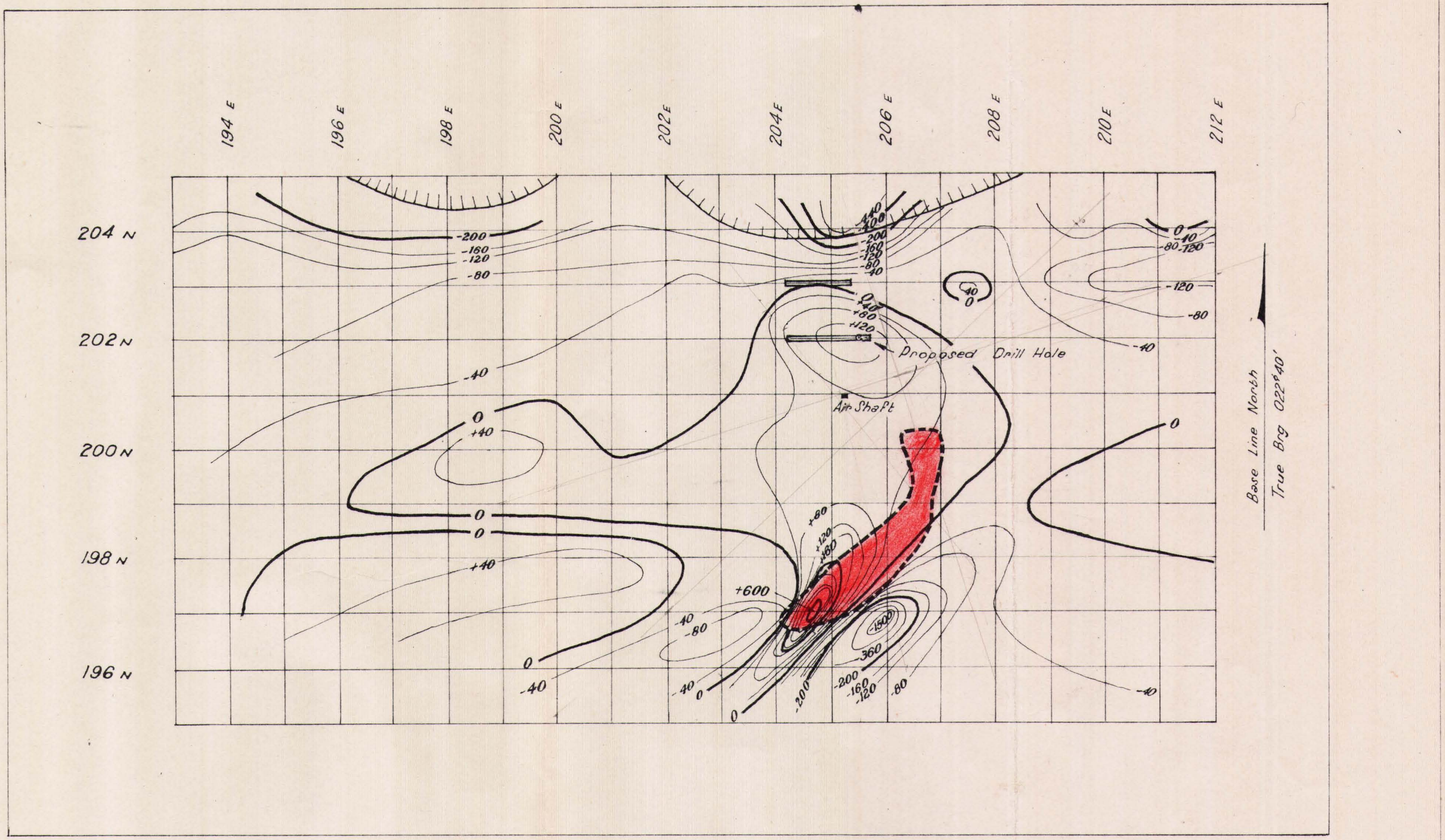
PLATE 3



LEGEND

- 80 — Magnetic Contours
- Outline of Ore-body
- Boundary of Irregular Magnetic Disturbances due to Gabbro.
- Costean
- Proposed Drill Hole

SCALE

200 0 200 400 FEET

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA

LALOKI AREA

PLAN SHOWING

MAGNETIC VERTICAL FORCE CONTOURS

IN RELATION TO

OUTLINE OF OREBODY AT 137 FT. LEVEL.

(AFTER H. OLDHAM, 1950.)

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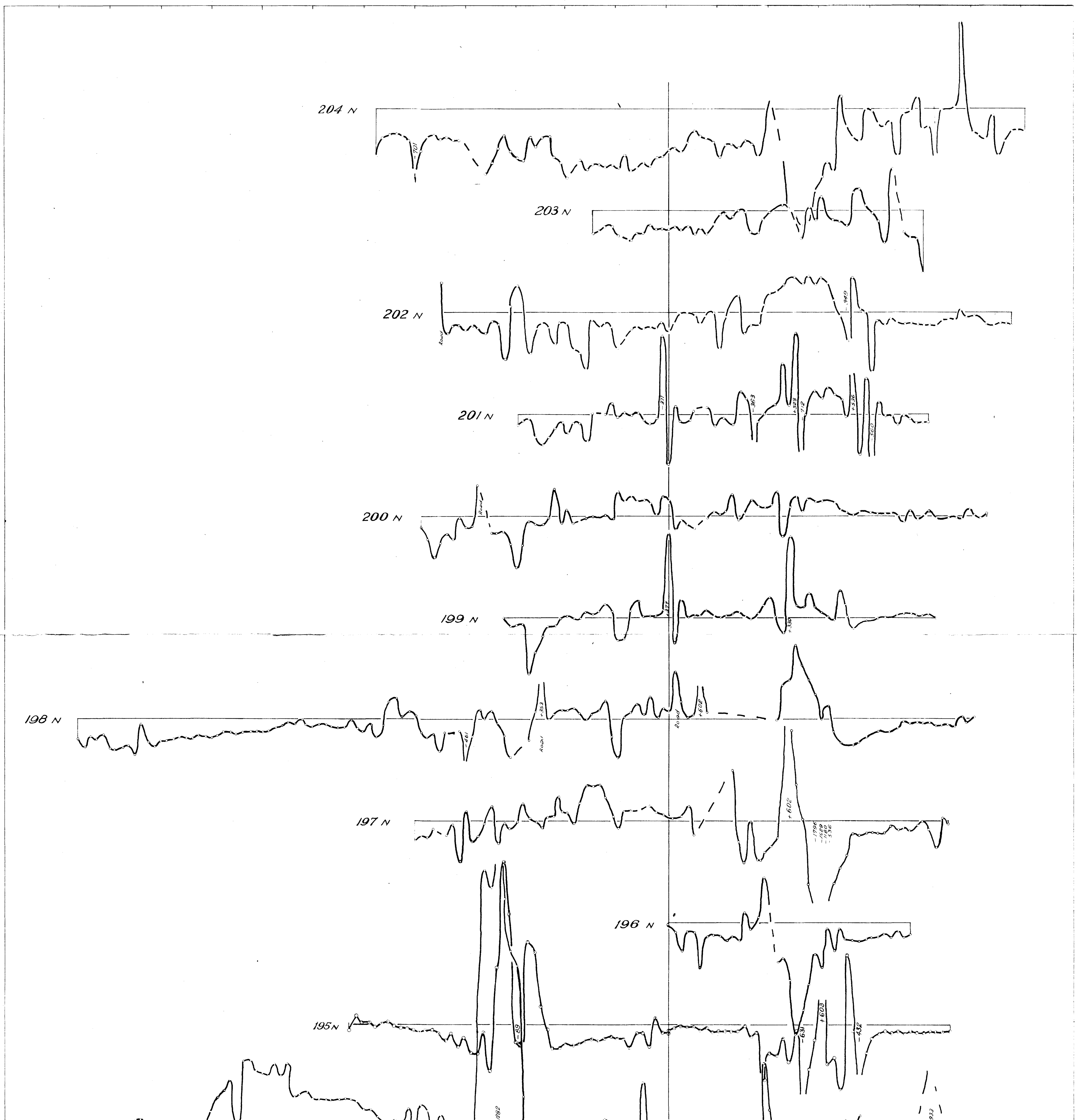

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA

LALOKI AREA

MAGNETIC VERTICAL FORCE PROFILES

ON TRAVERSES 18850 N TO 20400 N

(After H Oldham, 1950)

SCALES

Vertical: 200 0 200 400 600 800 Gammas

Horizontal: 200 0 200 400 600 800 Feet

Note:- Vertical spacing of profiles not to scale.

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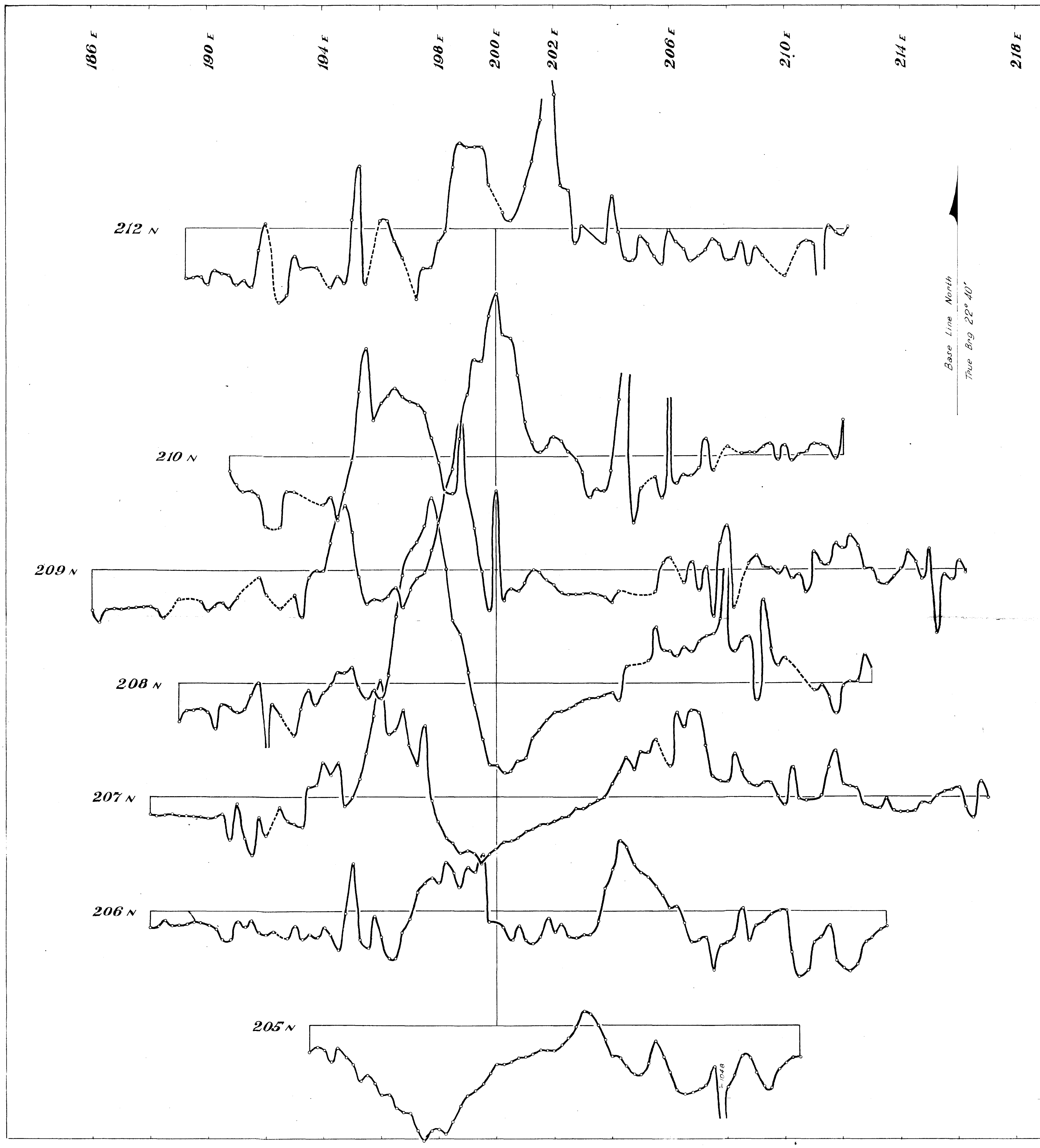

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

LALOKI AREA

SCALES

Horizontal 200 0 200 400 600 Feet
Vertical 500 0 500 1000 1500 Gammas

Note:- Vertical spacing of profiles not to scale.

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MAGNETIC VERTICAL FORCE PROFILES

ON TRAVERSES 205N TO 212N
(After H. Oldham, 1950.)

G.73–12

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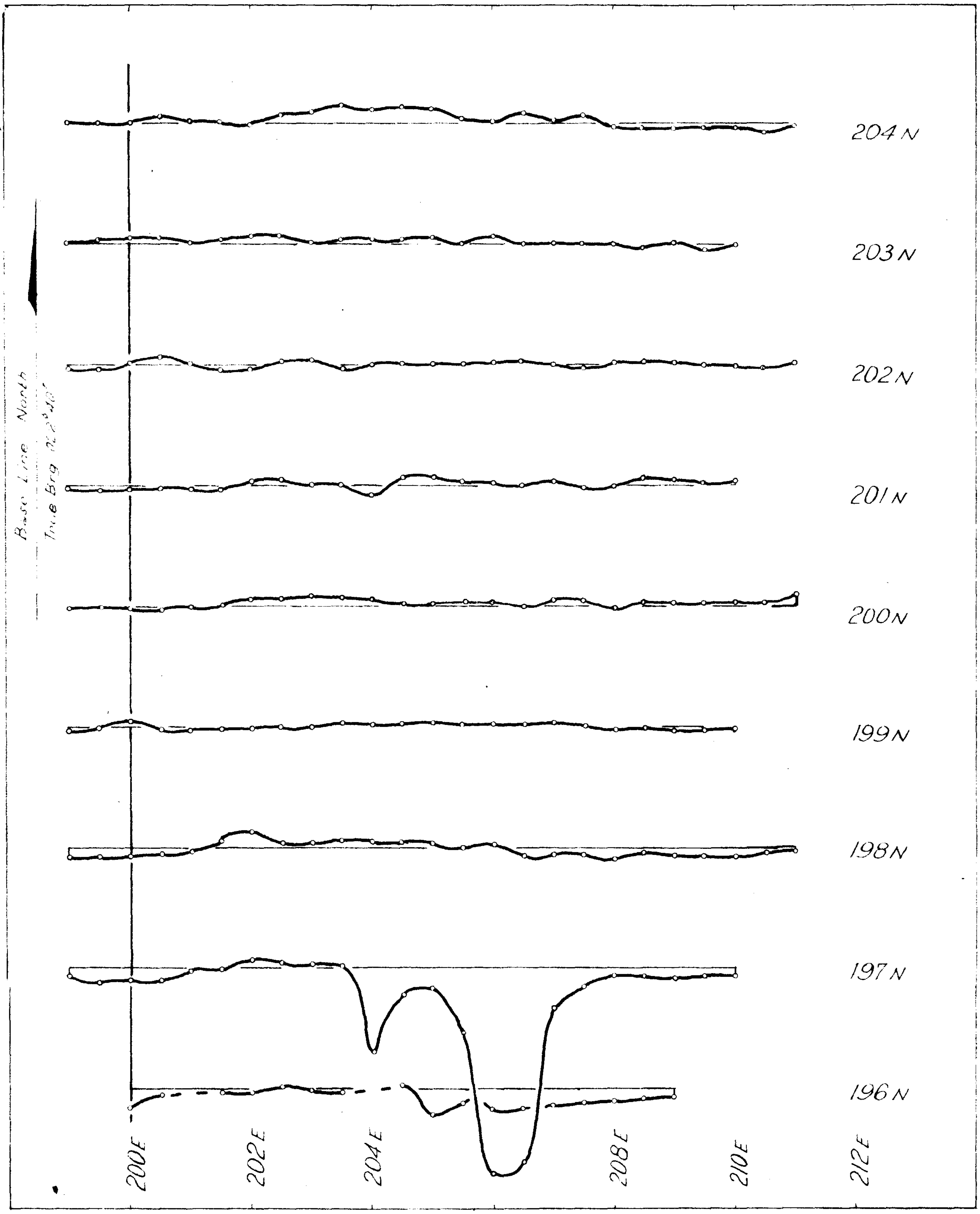
PLATE 6



GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

LALOKI AREA
SELF-POTENTIAL PROFILES

(AFTER H. OLDHAM, 1950)

SCALES

Horizontal 200 0 200 400 600 Feet

Vertical 50 0 50 100 150 Millivolts

Note: Profiles are double spaced vertically for clarity

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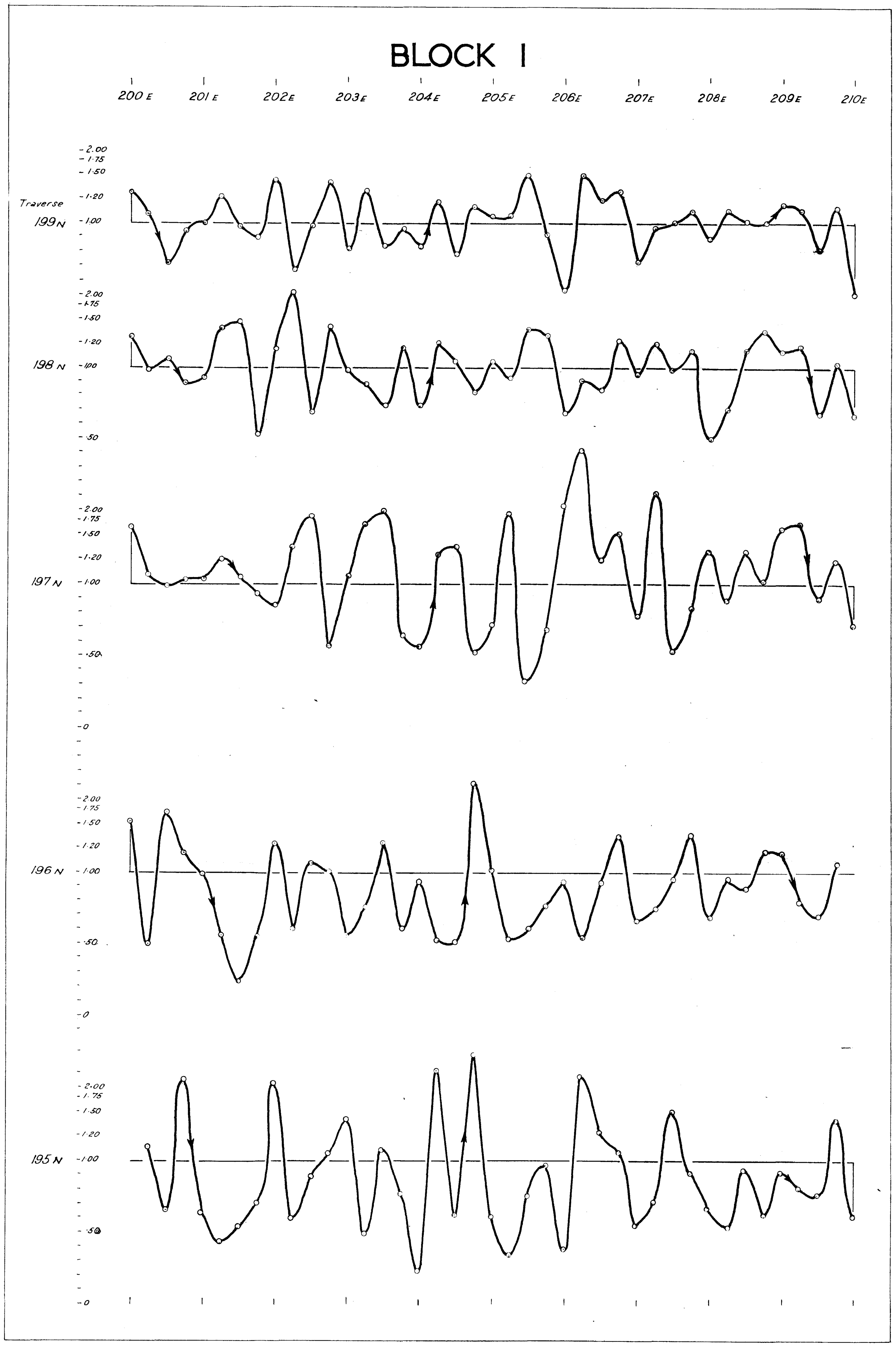
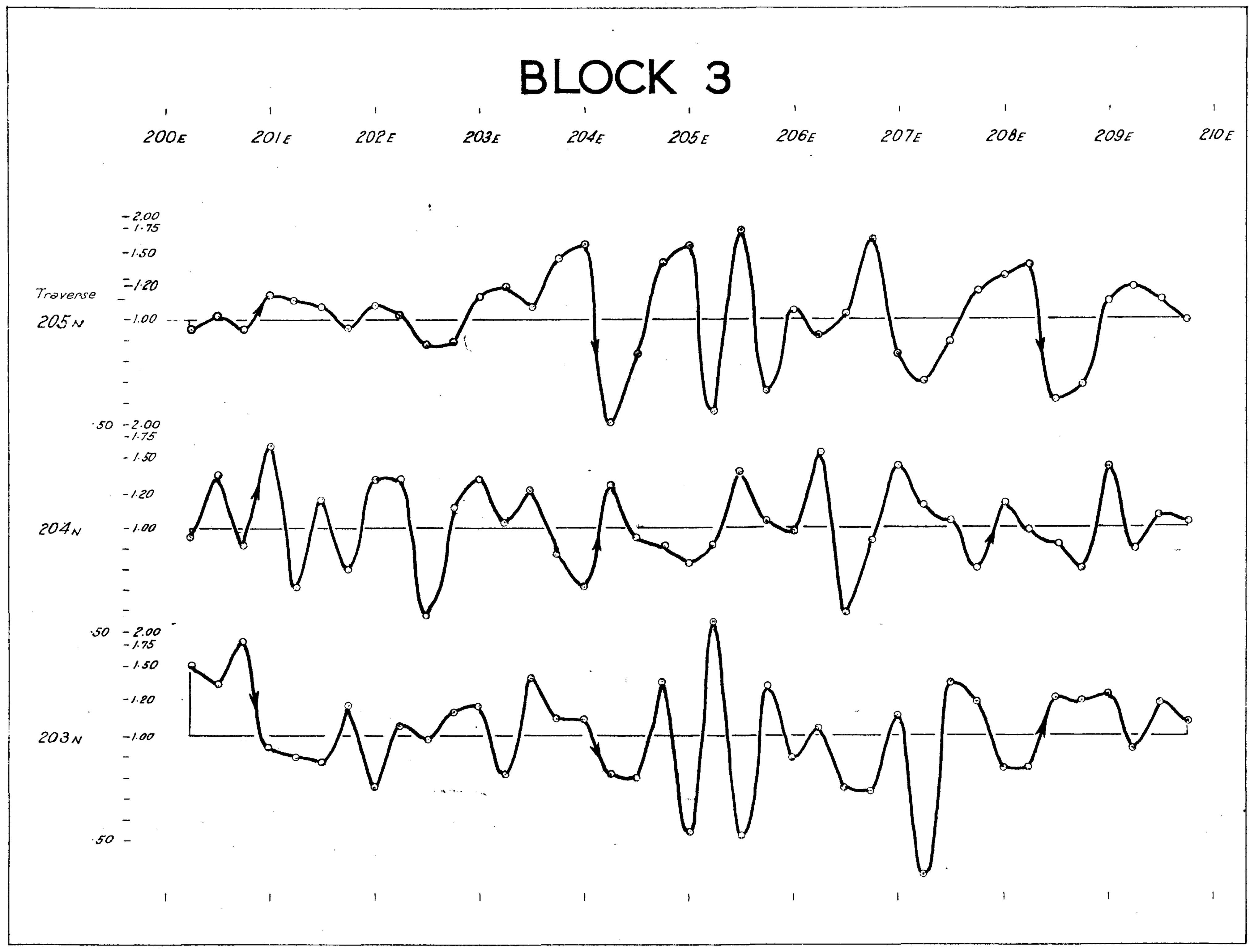
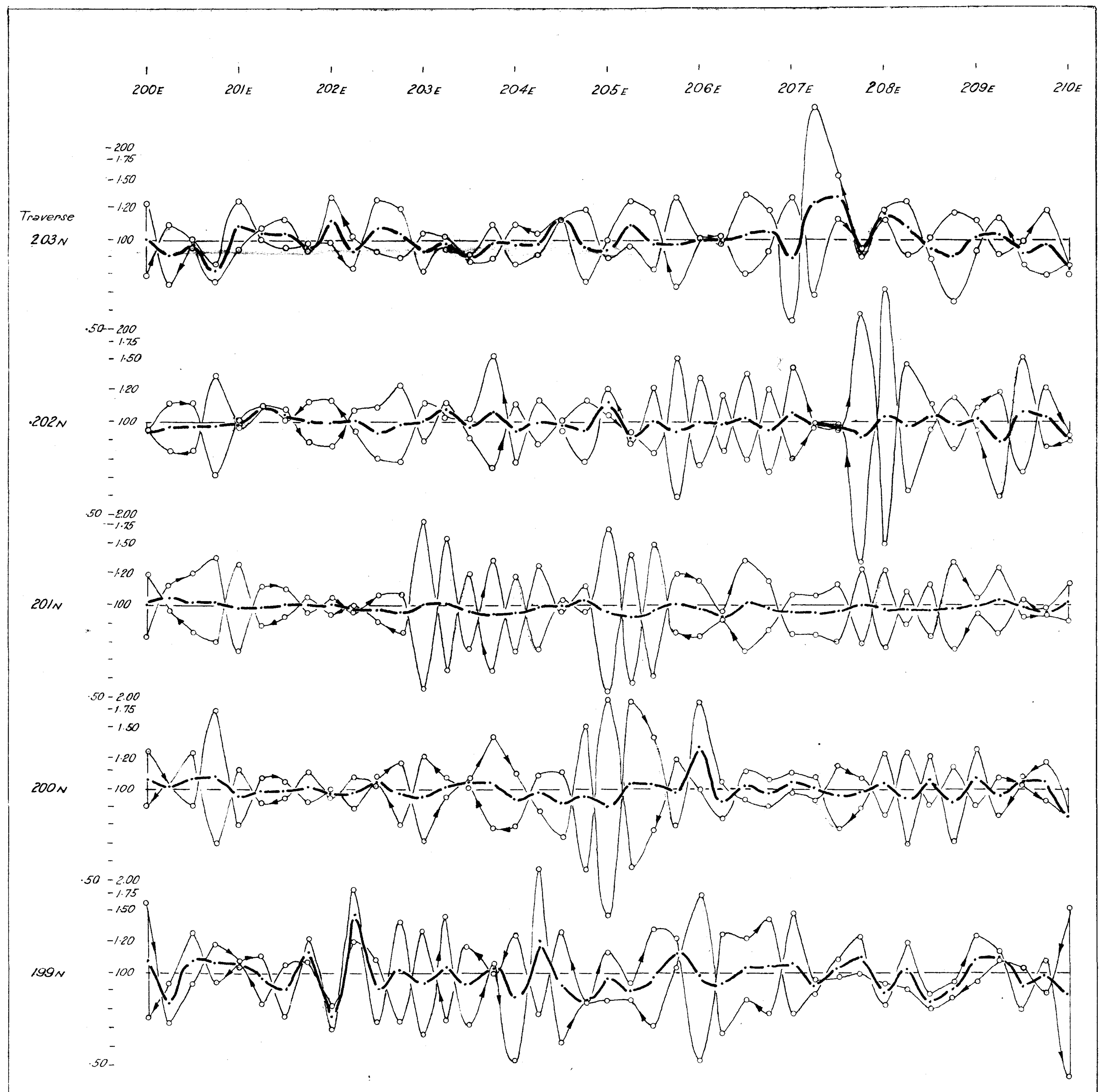
G.73–14







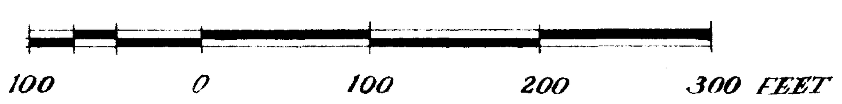
BLOCK 2 RETURN SURVEY

LEGEND

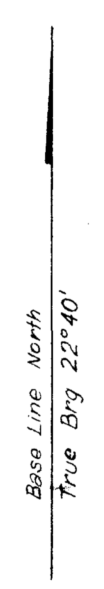
Potential Ratio Profile. Arrow indicates direction of traverse

Residual Profile

SCALE



Note:- Vertical Spacing of Profiles Not to Scale.



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GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

LALOKI AREA

POTENTIAL RATIO PROFILES

G73-17

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SCALE

660 0 660 1320 Feet

LEGEND

Gabbro

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA

LALOKI – MORESBY KING AREA

PLAN SHOWING LEASES AND GEOLOGY

AFTER HOOPER, 1941 & KING, 1950

WITH ADDITIONAL GEOLOGICAL NOTES

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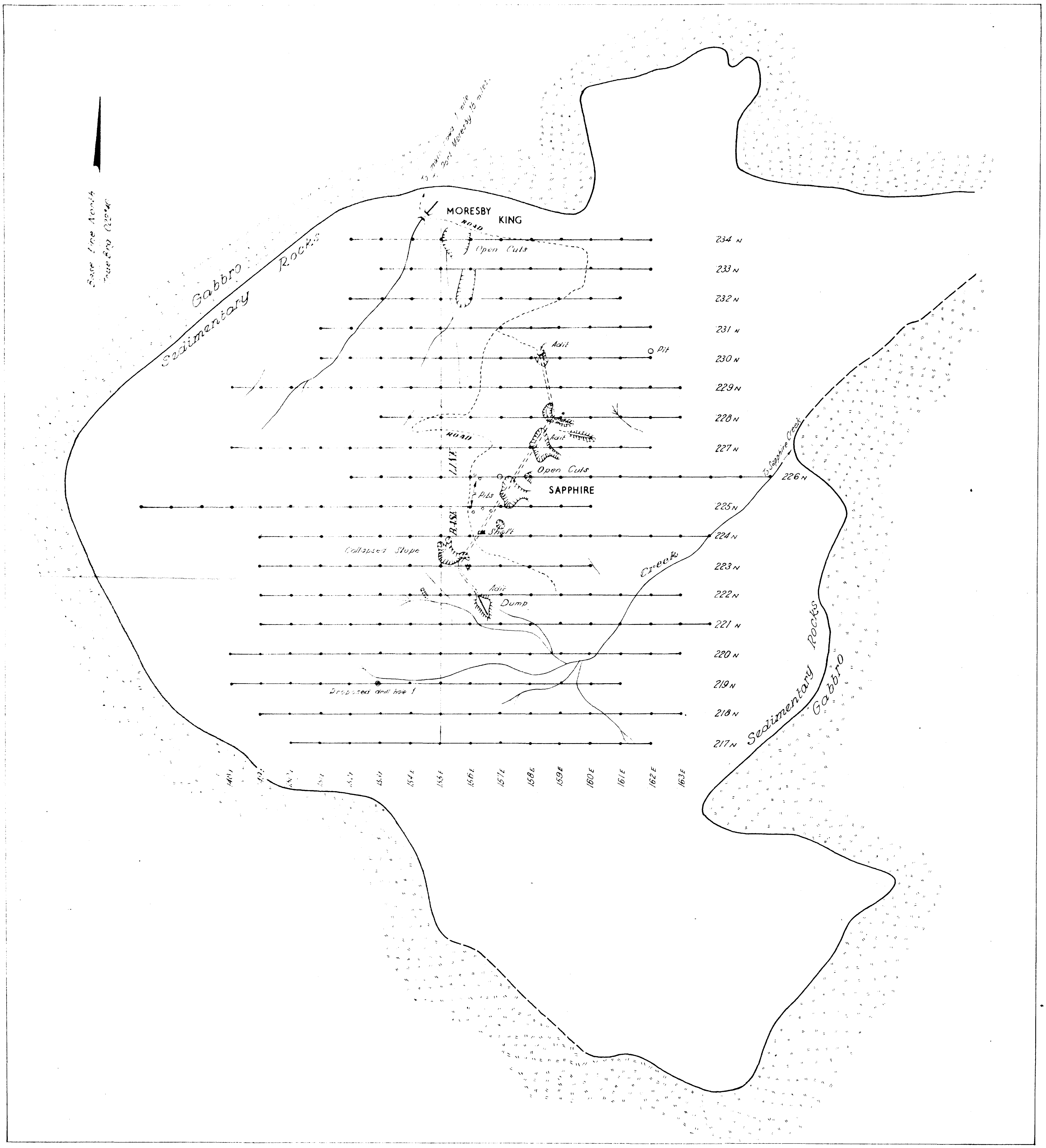

LEGEND

○ Proposed Drill-hole
Gabbro

SCALE

200 0 200 400 600 Feet

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

MORESBY KING AREA

PLAN SHOWING

GEOLOGY & GEOPHYSICAL GRID

(AFTER H. OLDHAM, 1950.)

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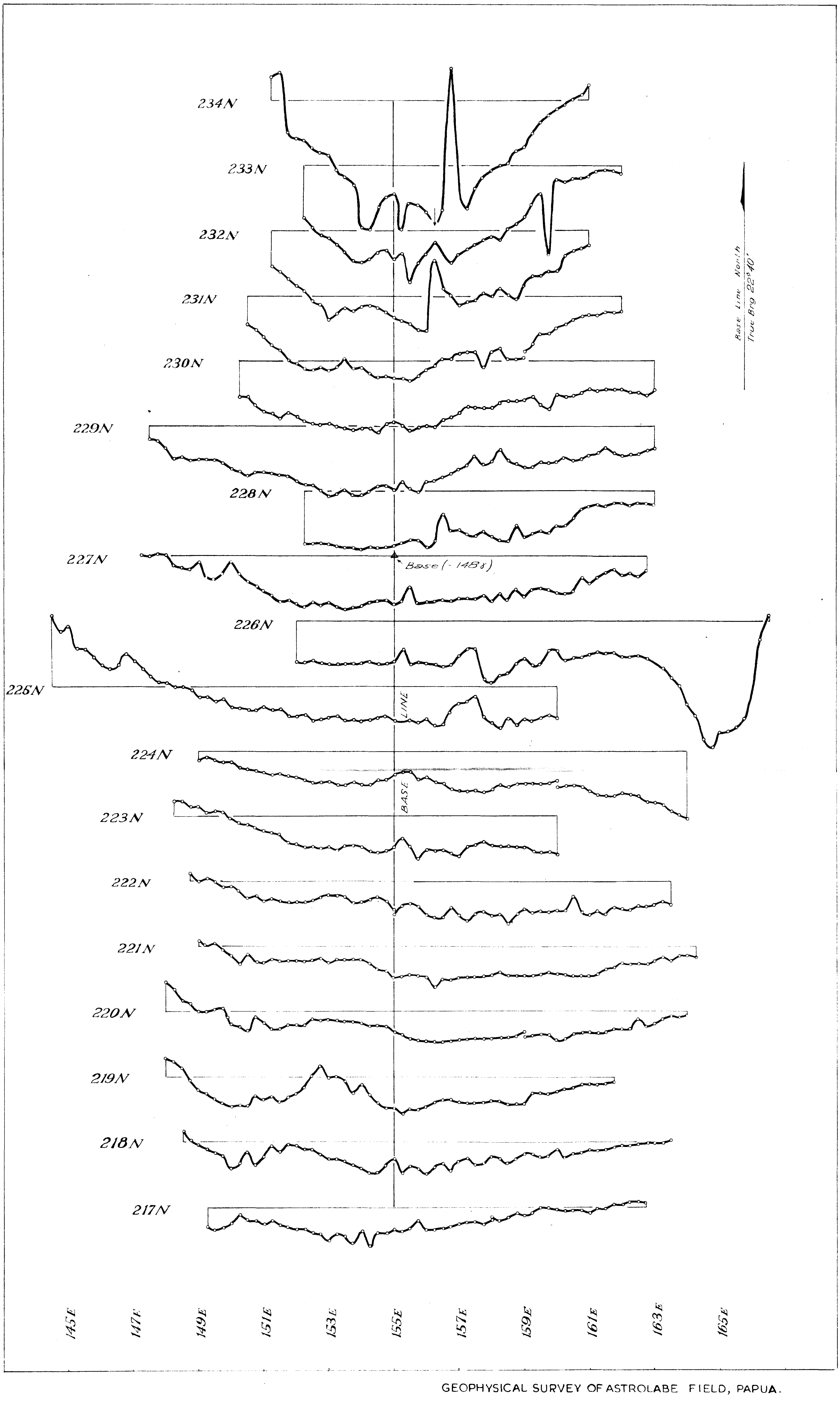
PLATE 10



SCALES
Horizontal 200 0 200 400 Feet
Vertical 200 0 200 400 Gammas
Note: Profiles are double spaced vertically for clarity

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GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

MORESBY KING AREA

MAGNETIC VERTICAL FORCE PROFILES

AFTER H. OLDHAM, 1950.

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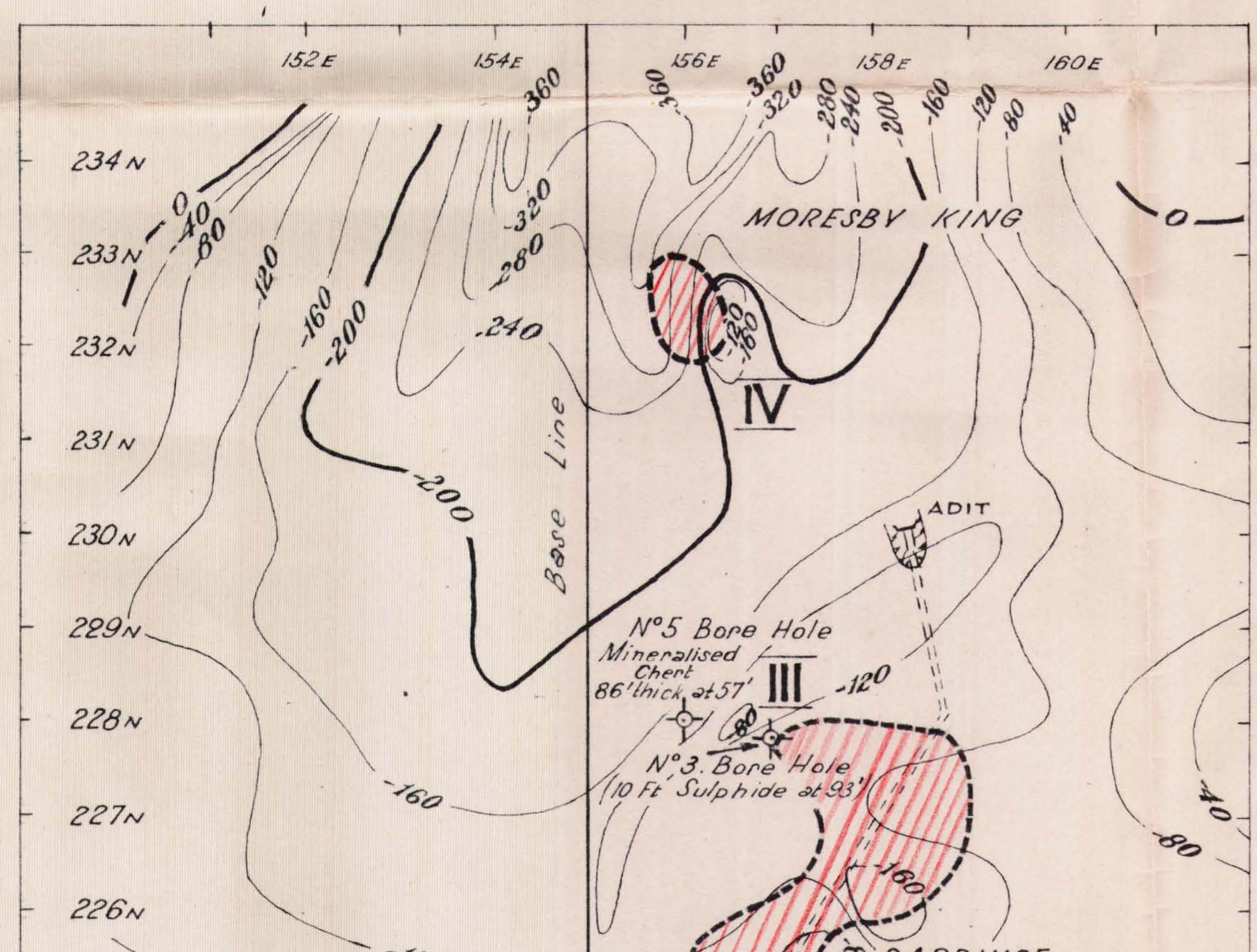
G.73–21

PLATE II



GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

MORESBY KING AREA

PLAN SHOWING

MAGNETIC VERTICAL FORCE CONTOURS

LEGEND

Known mineralised areas
Main Adit
Proposed drill-hole

SCALE

200 0 200 400 600 FEET

Contour interval 40 gammas.

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G73 - 25

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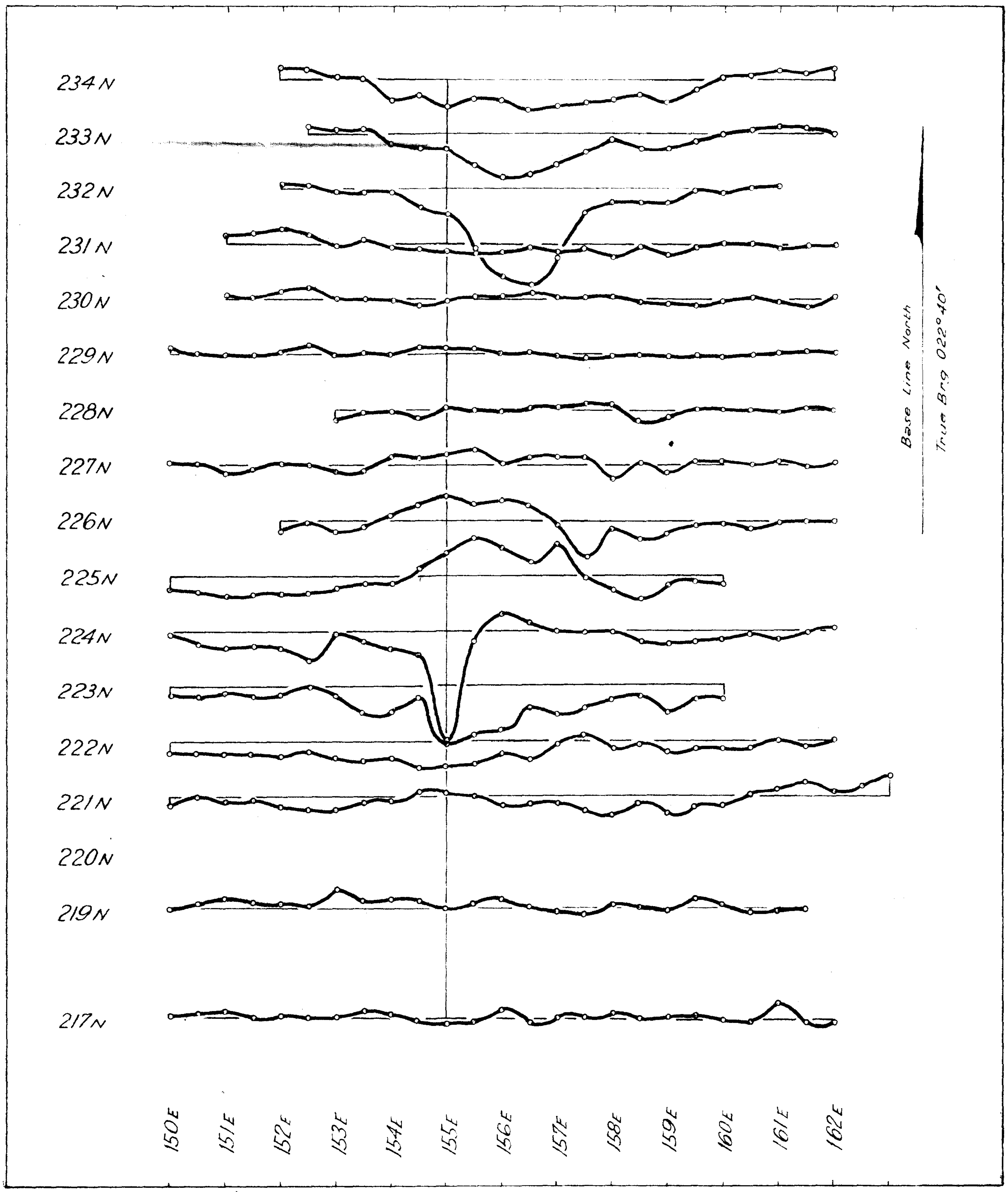
PLATE 12



GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

SCALES

Vertical 50 0 50 100 Millivolts
Horizontal 200 0 200 400 Feet

MORESBY KING AREA

SELF-POTENTIAL PROFILES.

AFTER H. OLDHAM, 1950.

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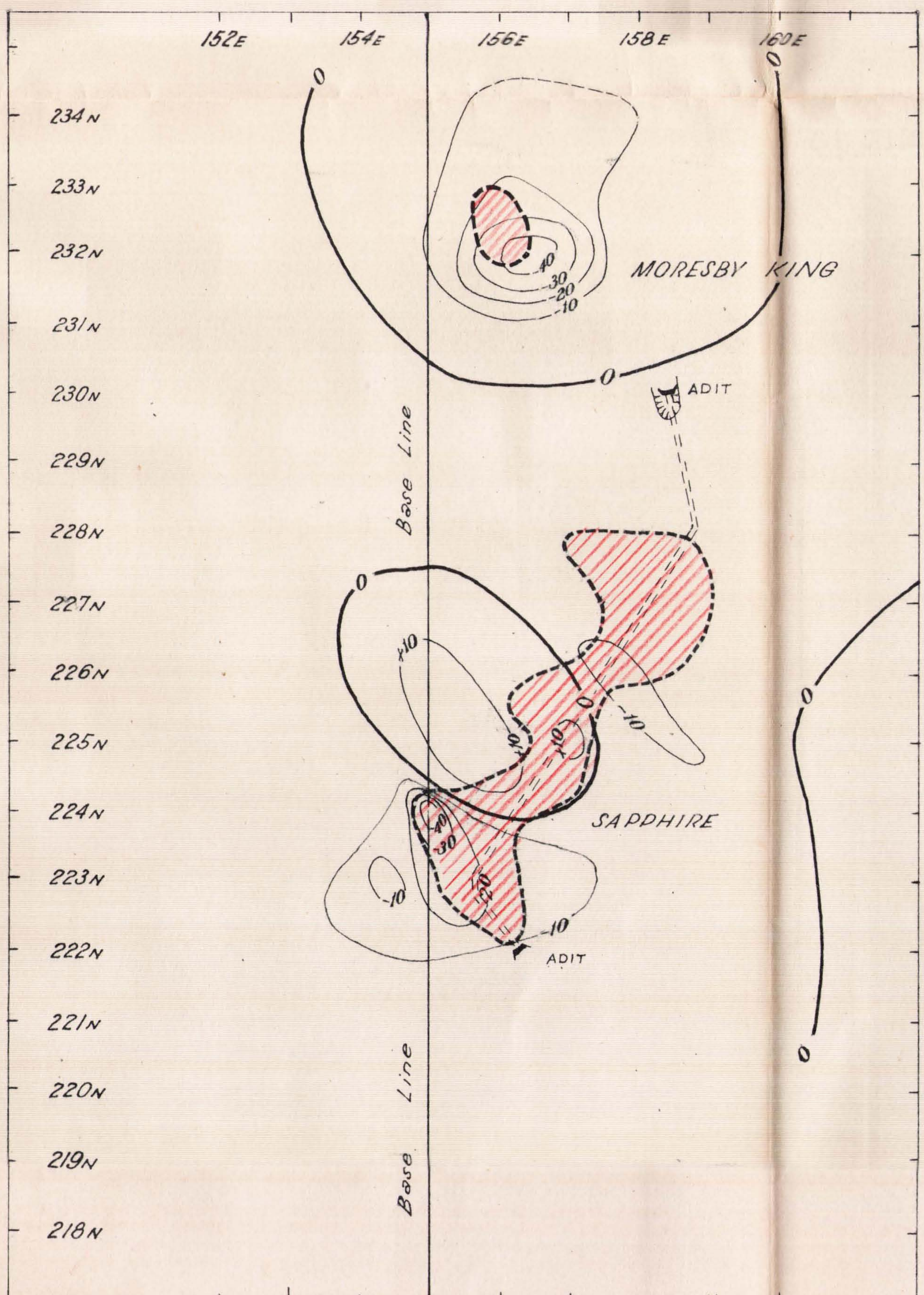
G.73–22

PLATE 13



GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

MORESBY KING AREA

PLAN SHOWING

SELF - POTENTIAL CONTOURS

LEGEND

- Known mineralised areas
- Main Adit
- Proposed drill-hole

SCALE

200' 0 200' 400' Feet

Contour Interval 10 Millivolts

K H Tate

Geophysicist

5 . 7 . 51

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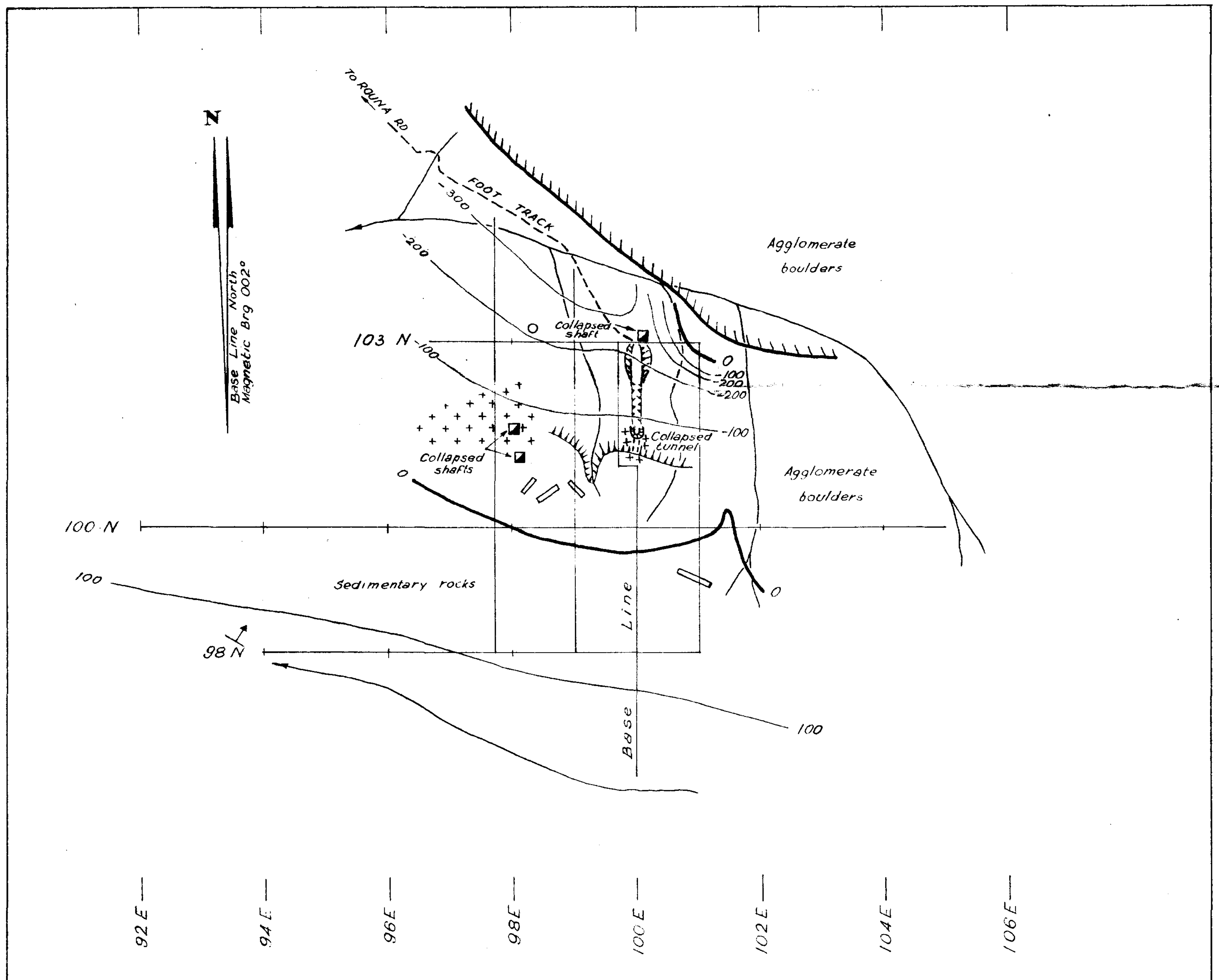


PLAN SHOWING

GEOLOGY, GEOPHYSICAL GRID AND MAGNETIC VERTICAL FORCE CONTOURS

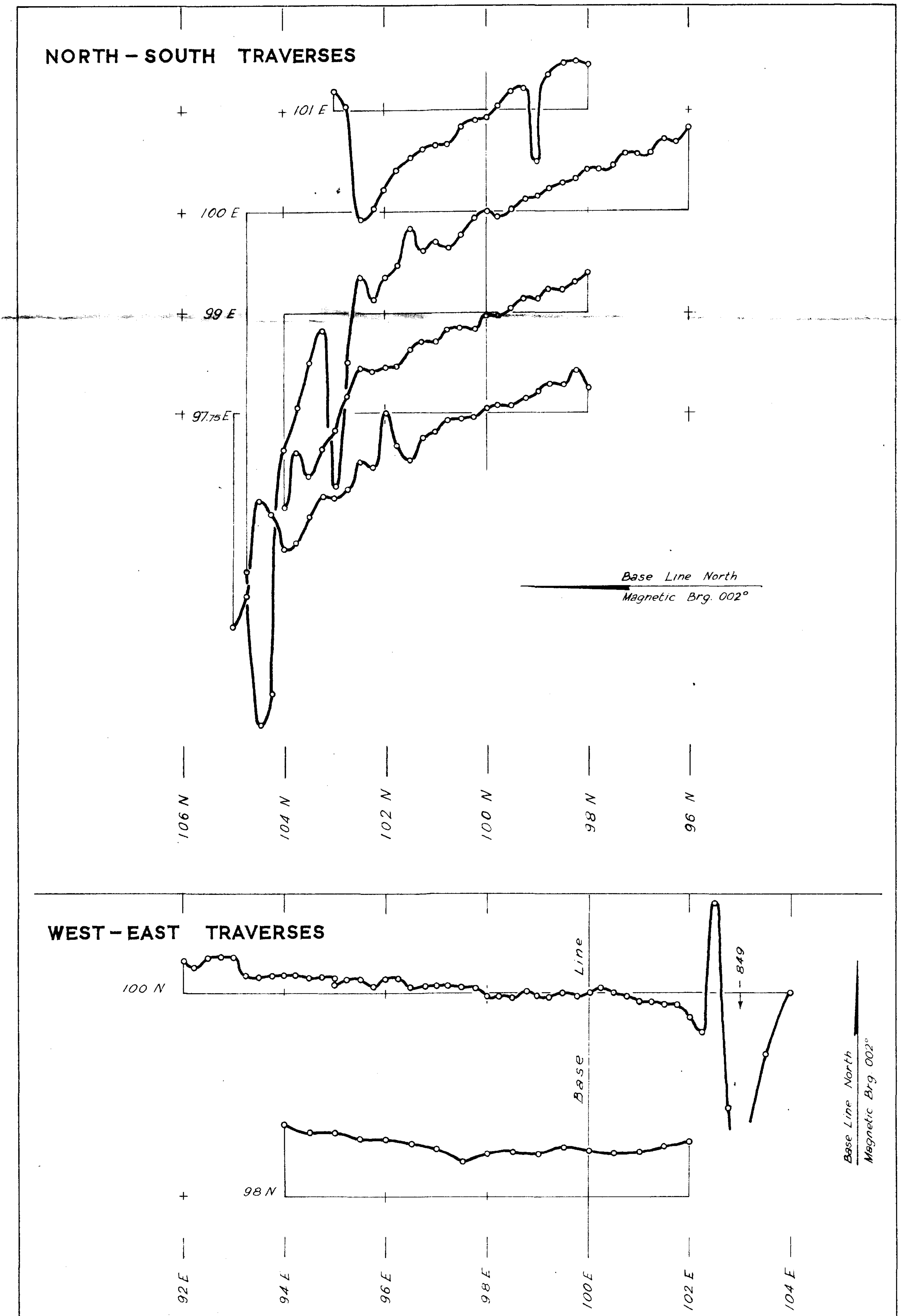
SCALE

200 0 200 400 Feet

Contour interval 100 Gammas

LEGEND

- Boundary of irregular magnetic disturbances due to near-surface gabbro
- Magnetic contours
- Gossan
- Sedimentary rocks
- Creek
- Track
- Costean
- Shaft
- Pit



MAGNETIC VERTICAL FORCE PROFILES

SCALES

Horizontal 200 0 200 400 Feet

Vertical 200 0 200 400 Gammas

Note: Vertical spacing of profiles not to scale

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA

FEDERAL FLAG AREA

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G 73–53

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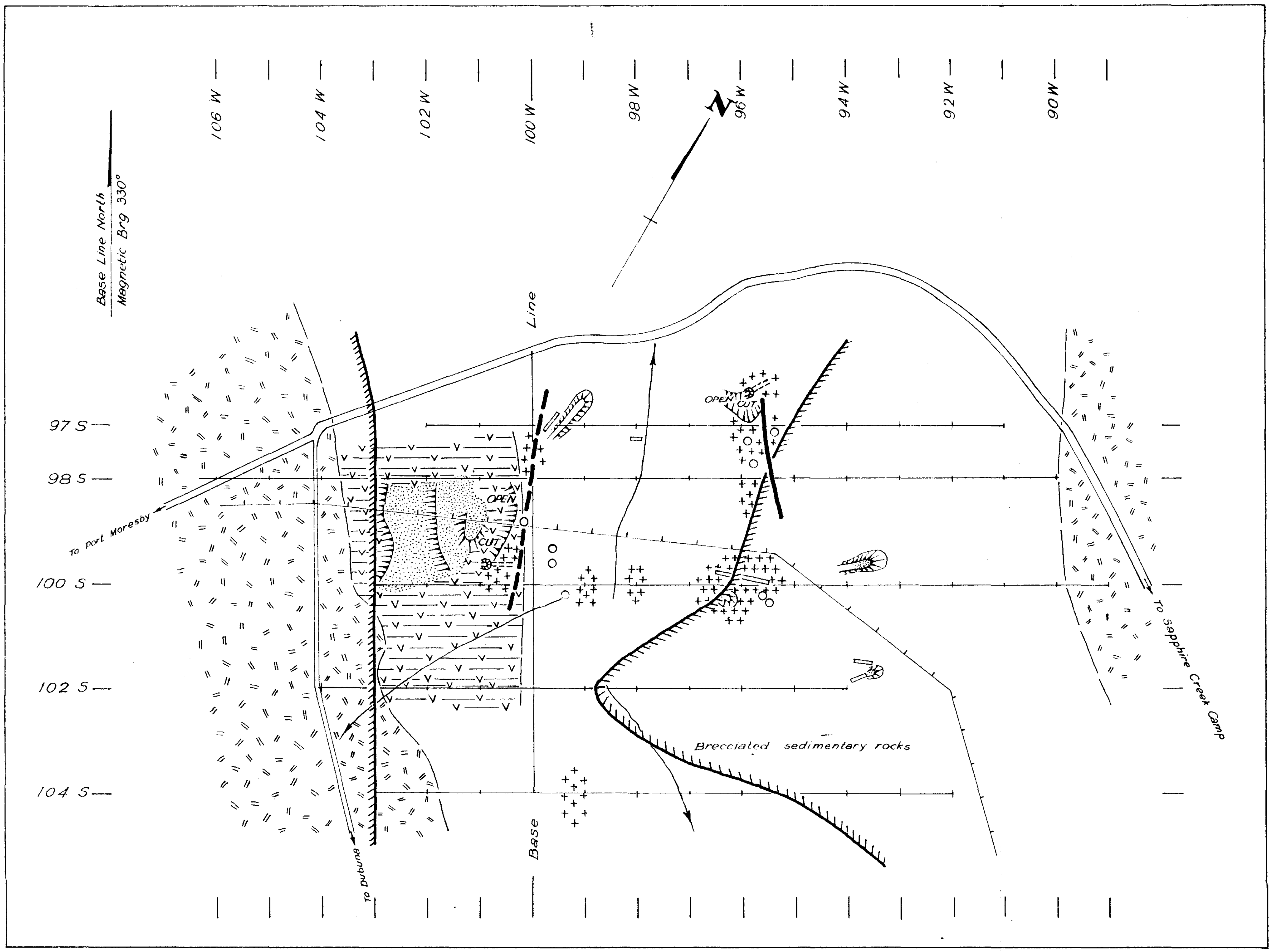
PLATE 15



SCALE

200 0 200 400 Feet

LEGEND

Axis of Self-Potential Anomaly

Axis of Magnetic Anomaly

Boundary of irregular magnetic disturbances due to gabbro

Gabbro

Gossan

Felspathised Tuffs

Sedimentary Rocks

Spoil

Telephone Line

Road

Creek

Pit

Costean

Tunnel

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA

HECTOR AREA

PLAN SHOWING

GEOLOGY, GEOPHYSICAL GRID, AND AXES OF GEOPHYSICAL ANOMALIES

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G 73-46

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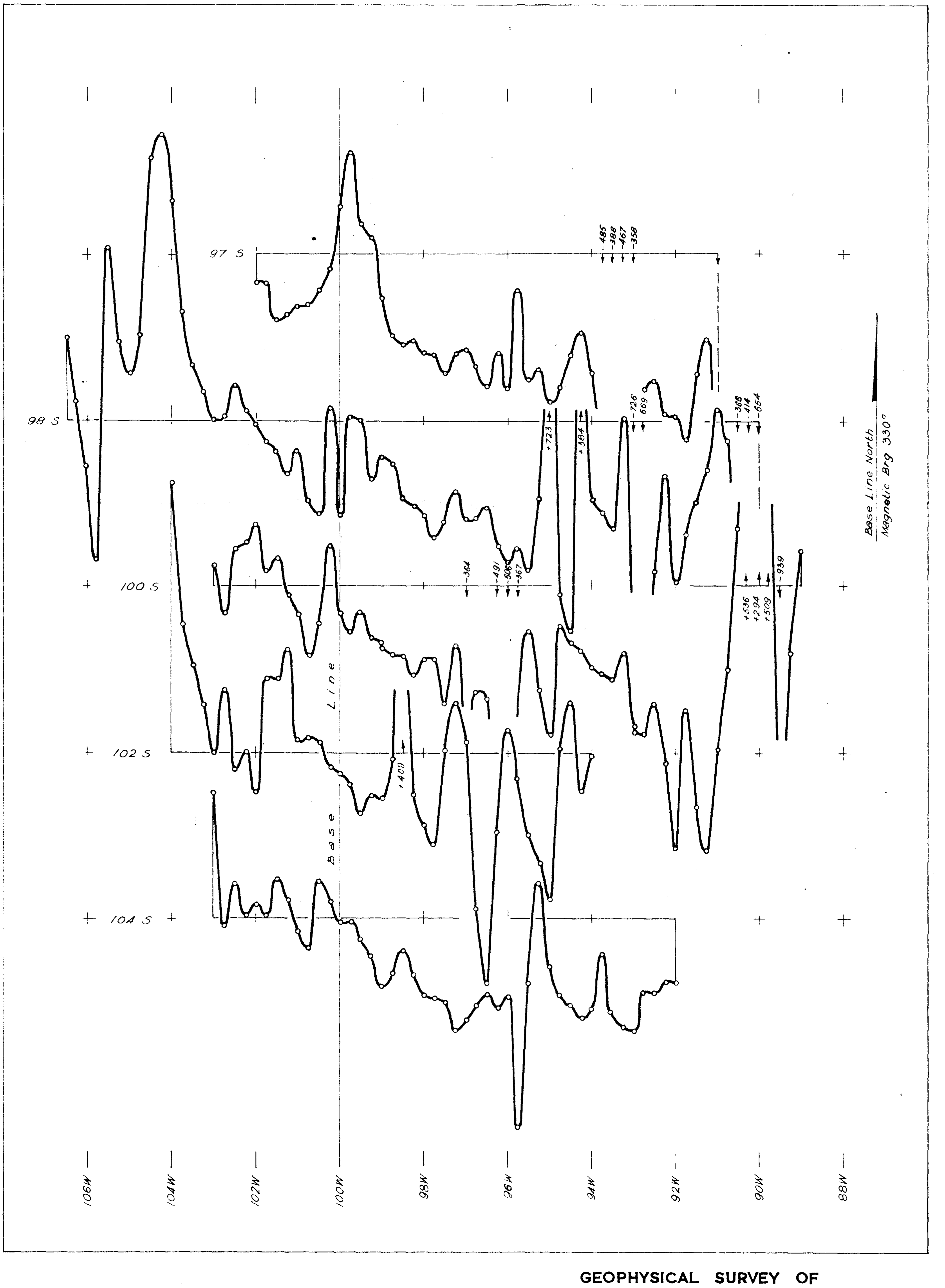

GEOPHYSICAL SURVEY OF
ASTROLABE FIELD, PAPUA

HECTOR AREA

MAGNETIC VERTICAL FORCE PROFILES

SCALES

Horizontal 200 0 200 400 FEET
Vertical 200 0 200 400 GAMMAS

Note: Vertical spacing of profiles not to scale

K. H. Sate
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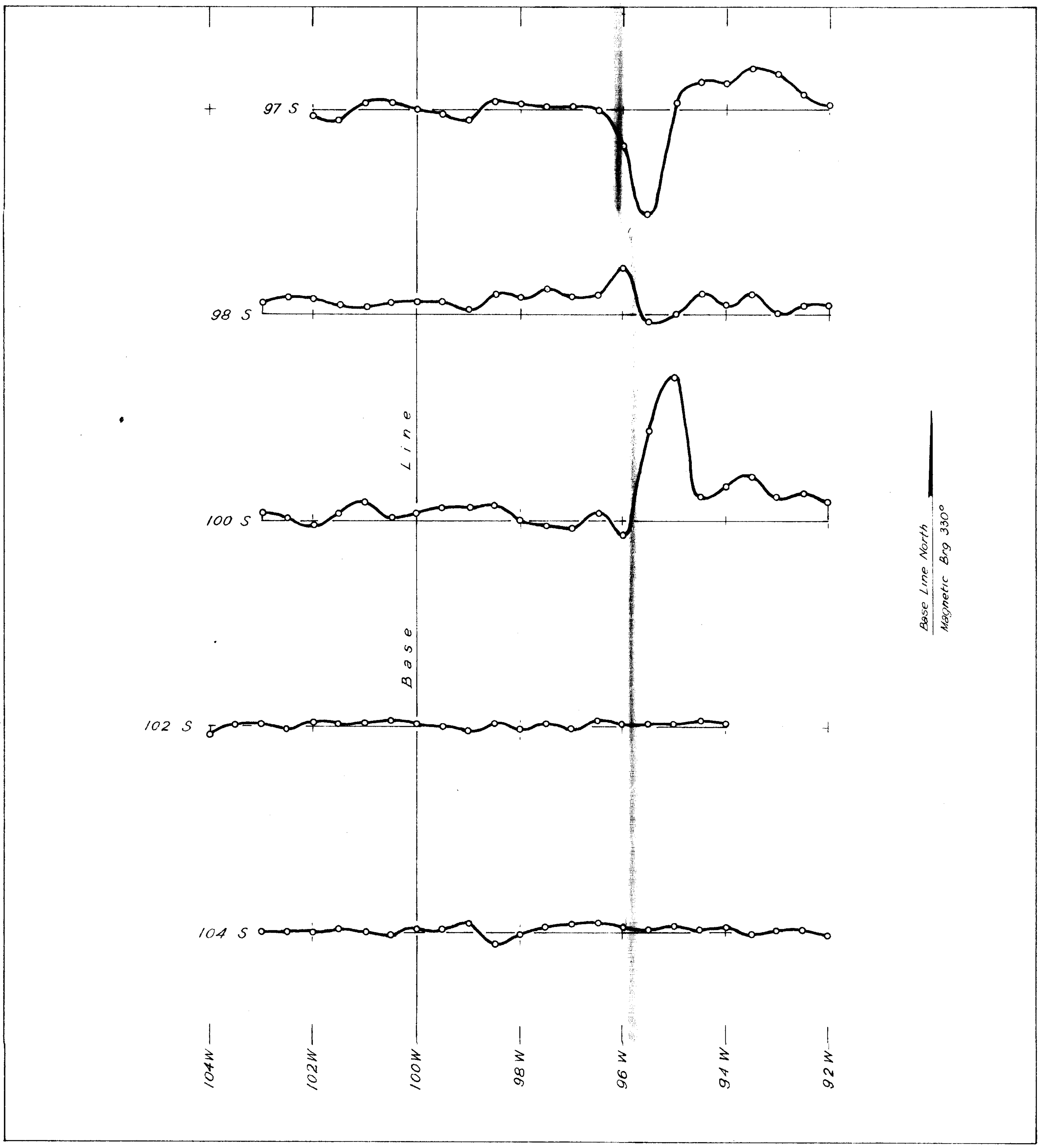
G 73 – 47

PLATE 17



SCALES

Horizontal	200	0	200	400	FEET
Vertical	50	0	50	100	MILLIVOLTS

Note · Vertical spacing of profiles not to scale

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GEOPHYSICAL SURVEY OF
ASTROLABE FIELD, PAPUA

HECTOR AREA

SELF-POTENTIAL PROFILES

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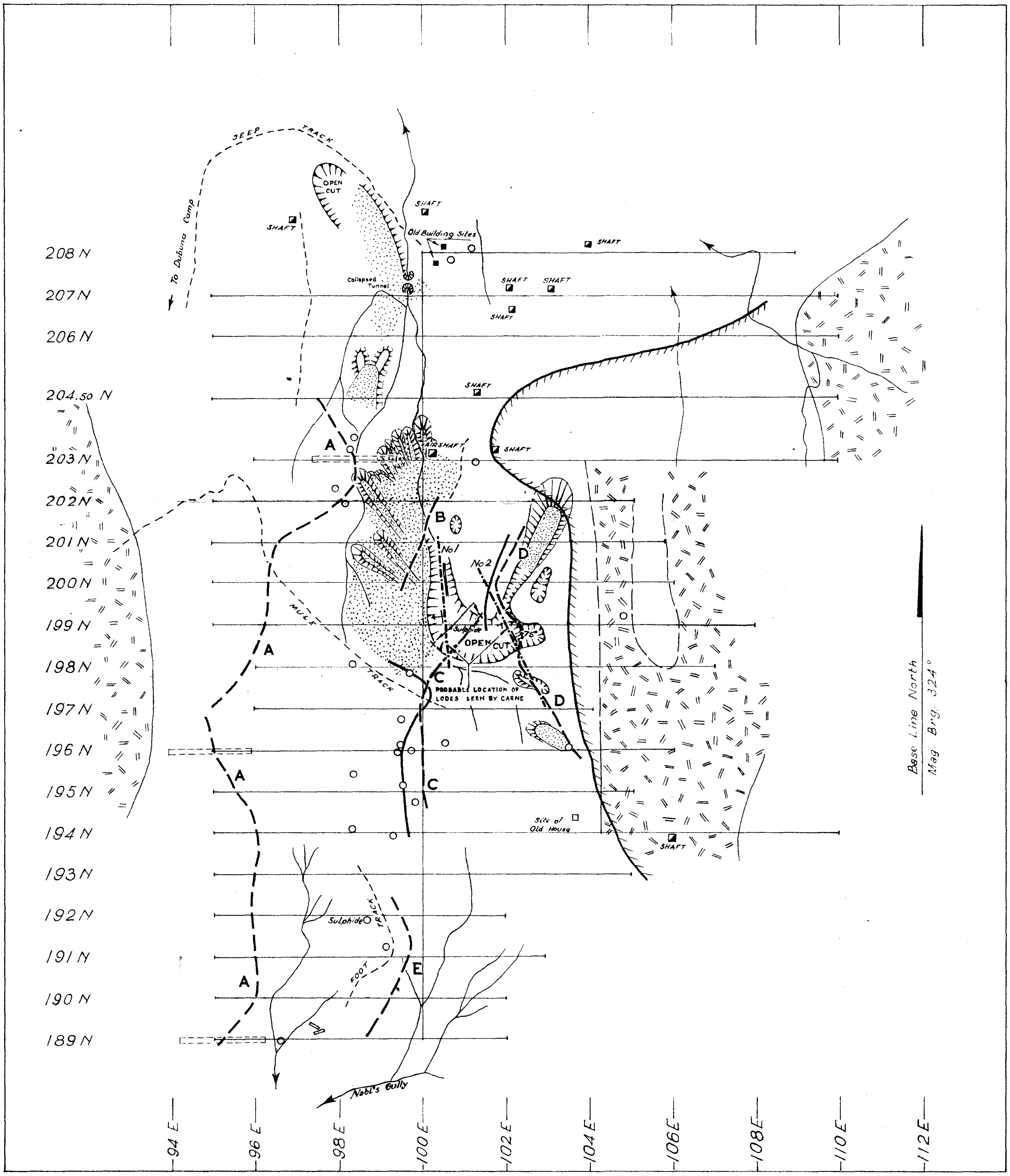

SCALE

200 0 200 400 FEET

GEOPHYSICAL SURVEY
OF
ASTROLABE FIELD, PAPUA

DUBUNA AREA

PLAN SHOWING

GEOPHYSICAL GRID, GEOLOGY &

AXES OF GEOPHYSICAL ANOMALIES

LEGEND

- Axis of Self-Potential Anomaly
- E Axis of Magnetic Anomaly
- Boundary of irregular magnetic disturbances due to gabbro
- Gabbro
- Sediments
- Spoil-covered areas
- Creeks
- Tunnel
- Tracks
- Pits
- Shafts
- Costeans
- Old Railway
- Proposed Costeans

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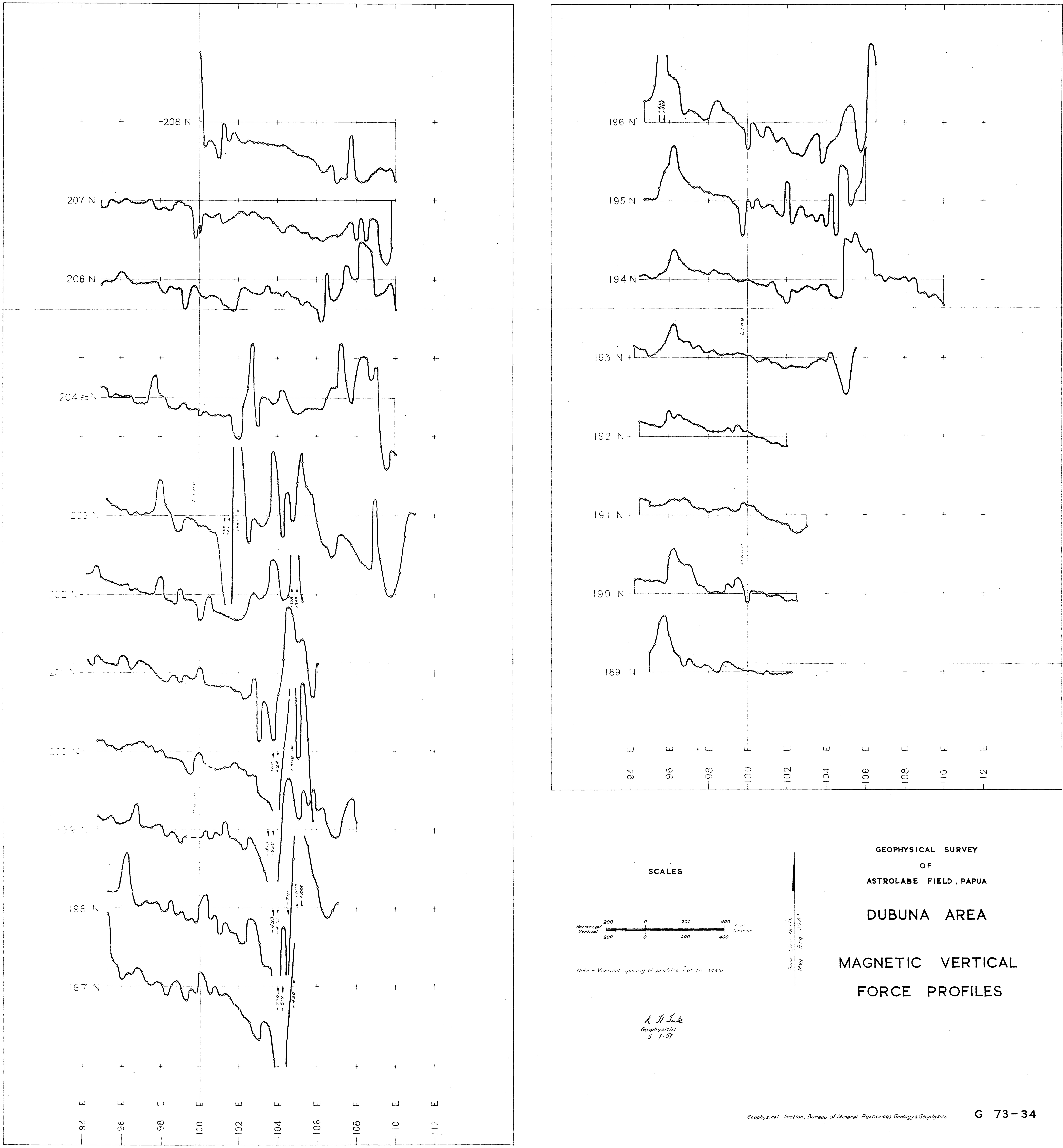
G 73 – 33



GEOPHYSICAL SURVEY
OF
ASTROLABE FIELD, PAPUA

DUBUNA AREA

MAGNETIC VERTICAL
FORCE PROFILES

K. H. Tate
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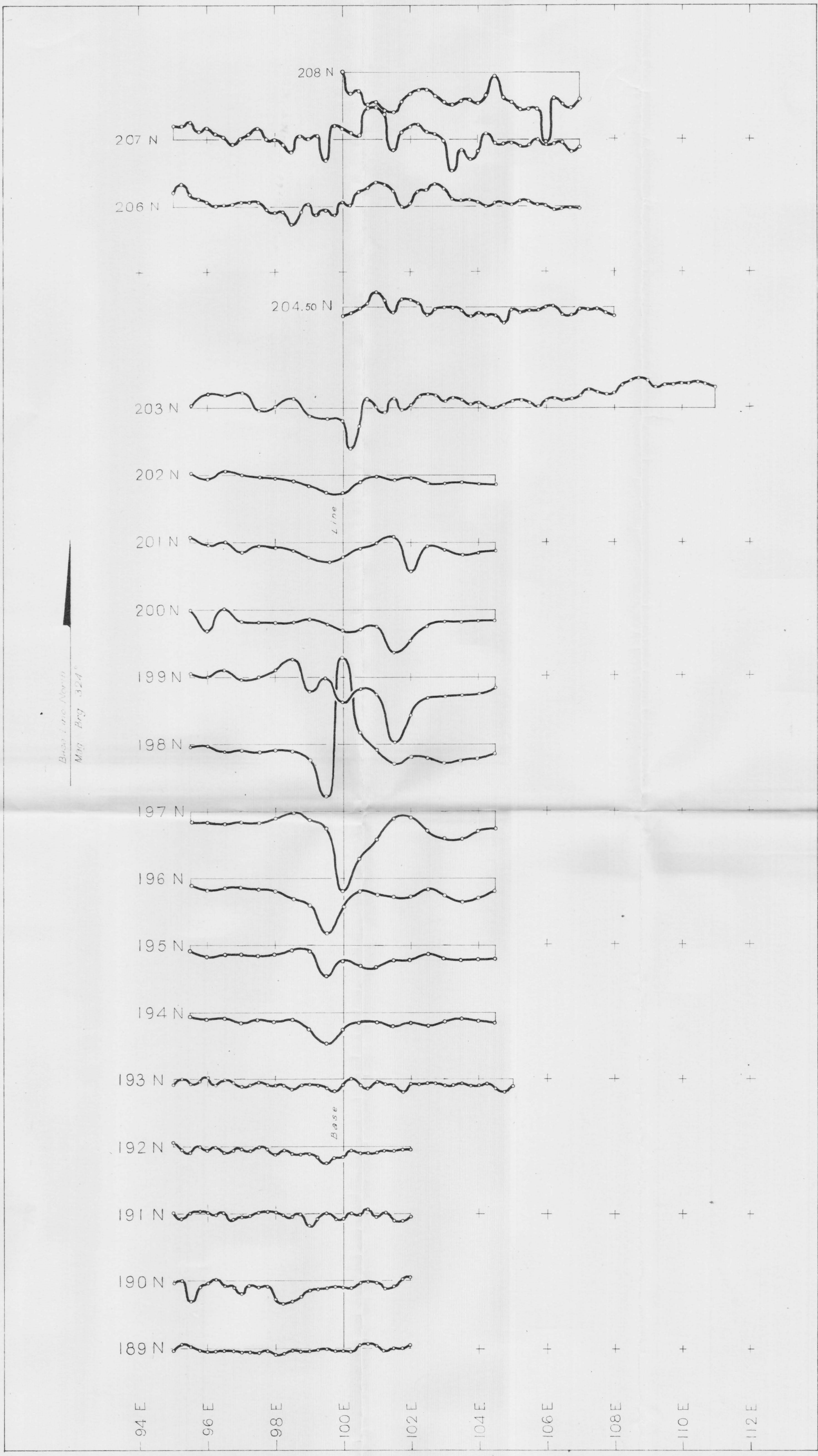
5-7-51

PLATE 20



SCALES

Vertical 50 — 0 — 50 Millivolts
Horizontal 200 — 0 — 200 Feet

Note – Profiles double spaced vertically for clarity

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GEOPHYSICAL SURVEY
OF
ASTROLABE FIELD, PAPUA

DUBUNA AREA

SELF-POTENTIAL PROFILES

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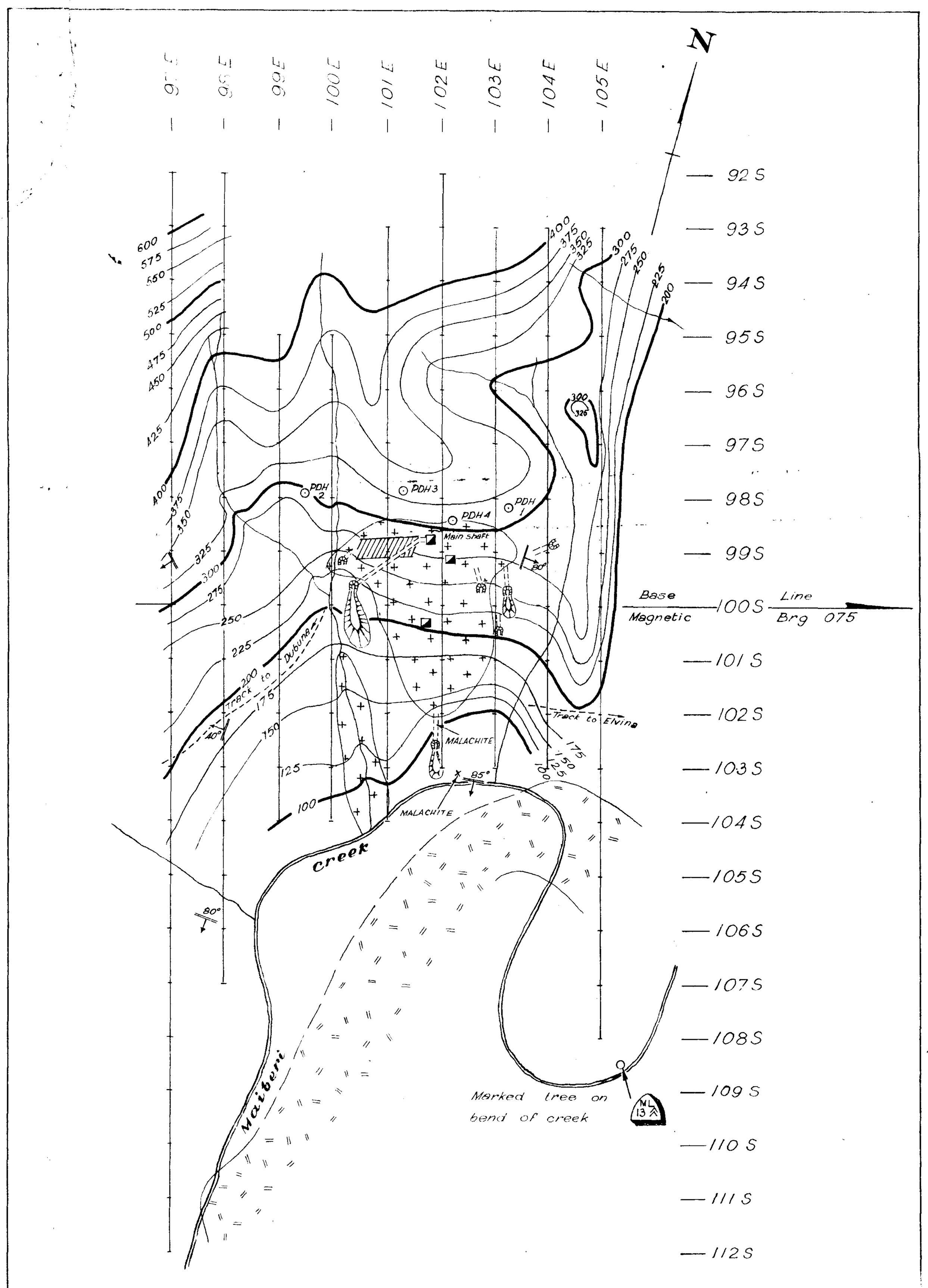
G 73–35



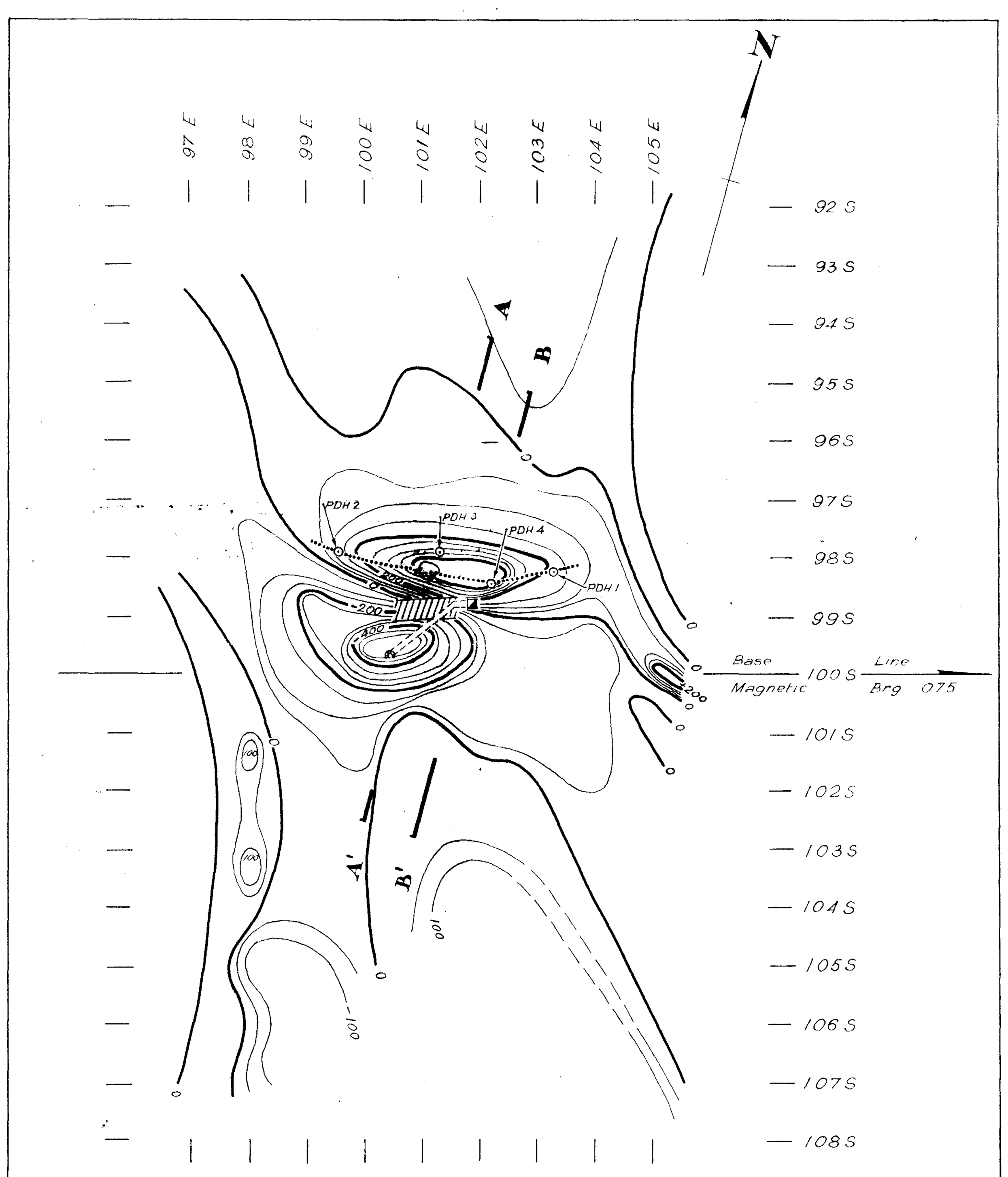
PLAN SHOWING

GEOPHYSICAL GRID AND GEOLOGY

SCALE: 200 0 200 400 FEET

Contour interval 25 feet
Level datum, 200 feet at Brg. 100S/100E

LEGEND
Shaft
Track
Creek
Tunnel
PDH 3 Proposed drill-hole
Sedimentary rocks
Gossan
Gabbro
Ore body at main tunnel level (after Carne 1913)



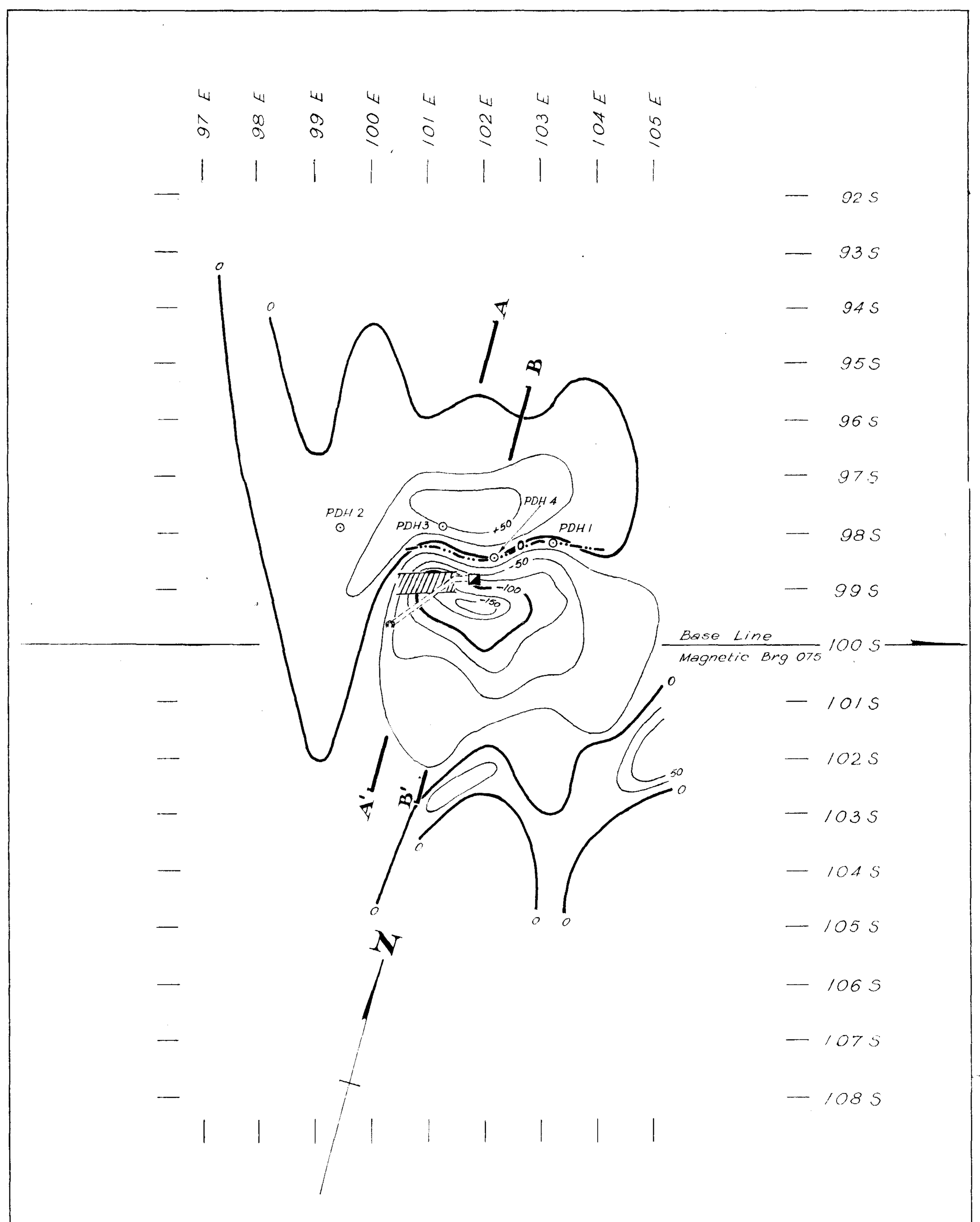
PLAN SHOWING

MAGNETIC VERTICAL FORCE CONTOURS

SCALE: 200 0 200 400 FEET

Contour interval 50 gammas

LEGEND
Main Shaft
Tunnel
PDH 3 Proposed drill-hole
Ore body at main tunnel level (after Carne 1913)
Probable longitudinal axis of magnetic body



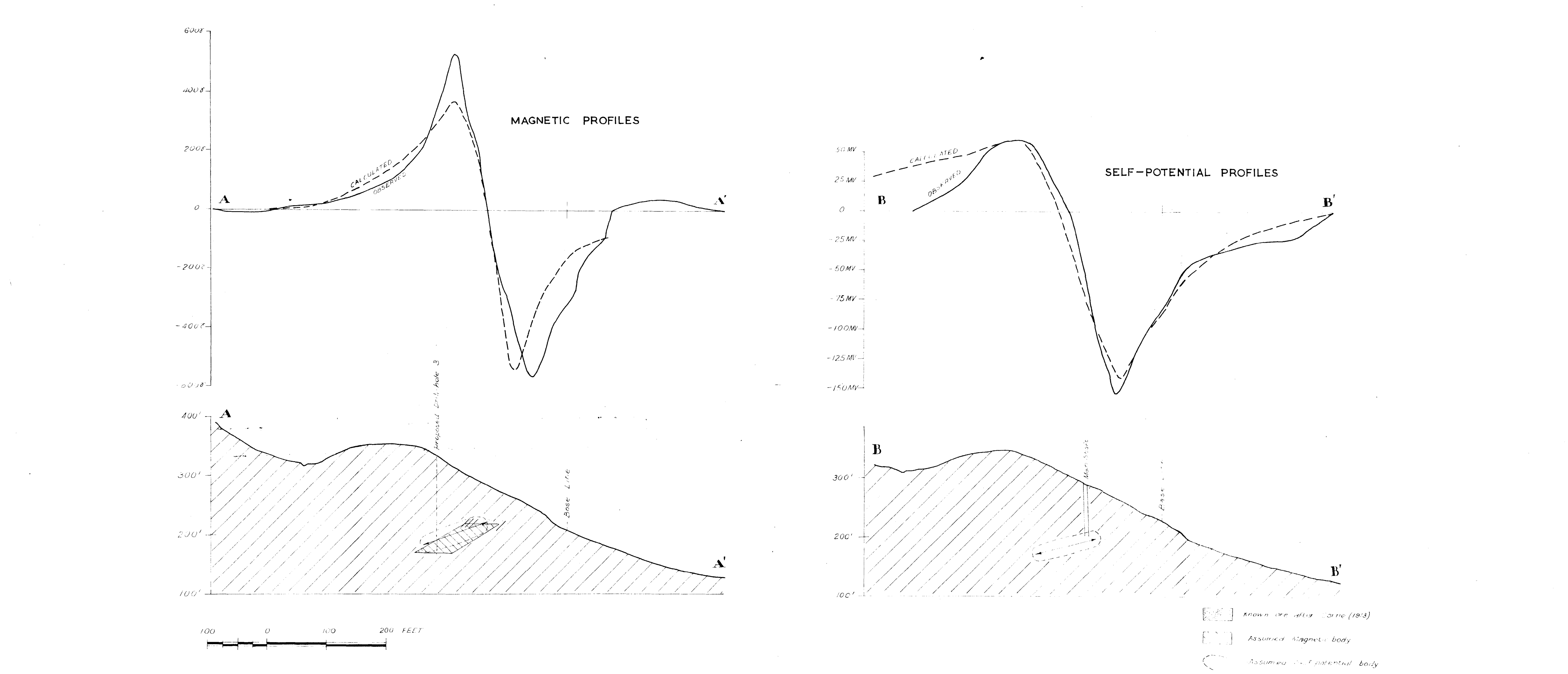
PLAN SHOWING

SELF-POTENTIAL CONTOURS

SCALE: 200 0 200 400 FEET

Contour interval 25 millivolts

LEGEND
Main Shaft
Tunnel
PDH 3 Proposed drill-hole
Ore body at main tunnel level (after Carne 1913)
Probable longitudinal axis of self-potential body



GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

MT. DIAMOND AREA

PLANS AND SECTIONS SHOWING GEOLOGY, GEOPHYSICAL RESULTS AND INTERPRETATION

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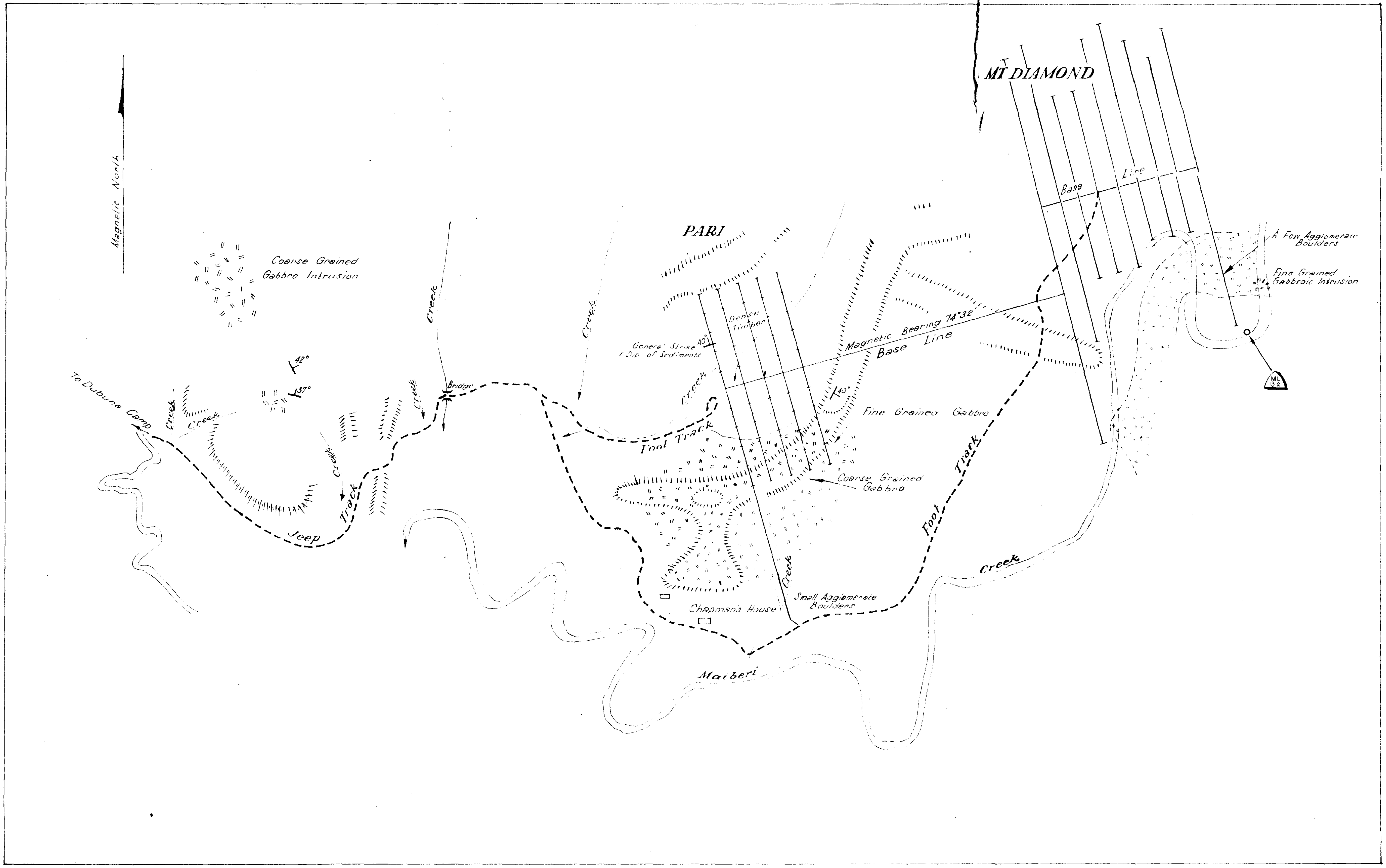
This plan supersedes G 73-41

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics

G 73 - 43



LEGEND

- Creeks
- Tracks
- Sedimentary Rocks
- Gabbro

SCALE

400 0 400 800 1200 FEET

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA.

PARI - MT DIAMOND AREA

PLAN SHOWING

GEOLOGY & GEOPHYSICAL GRIDS

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G73- 3

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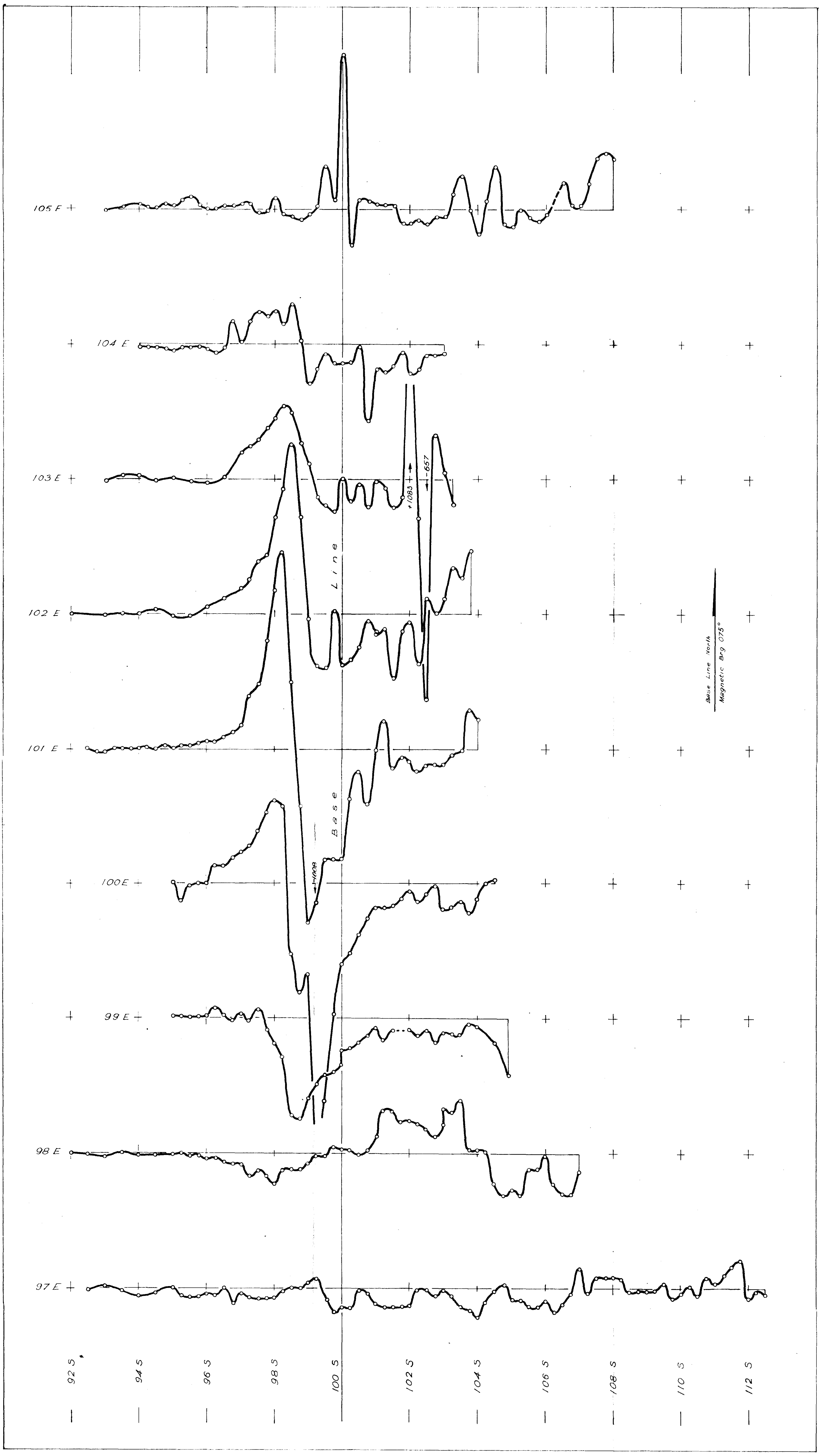

SCALES

Horizontal 200 0 200 400 FEET
Vertical 200 0 200 400 GAMMAS

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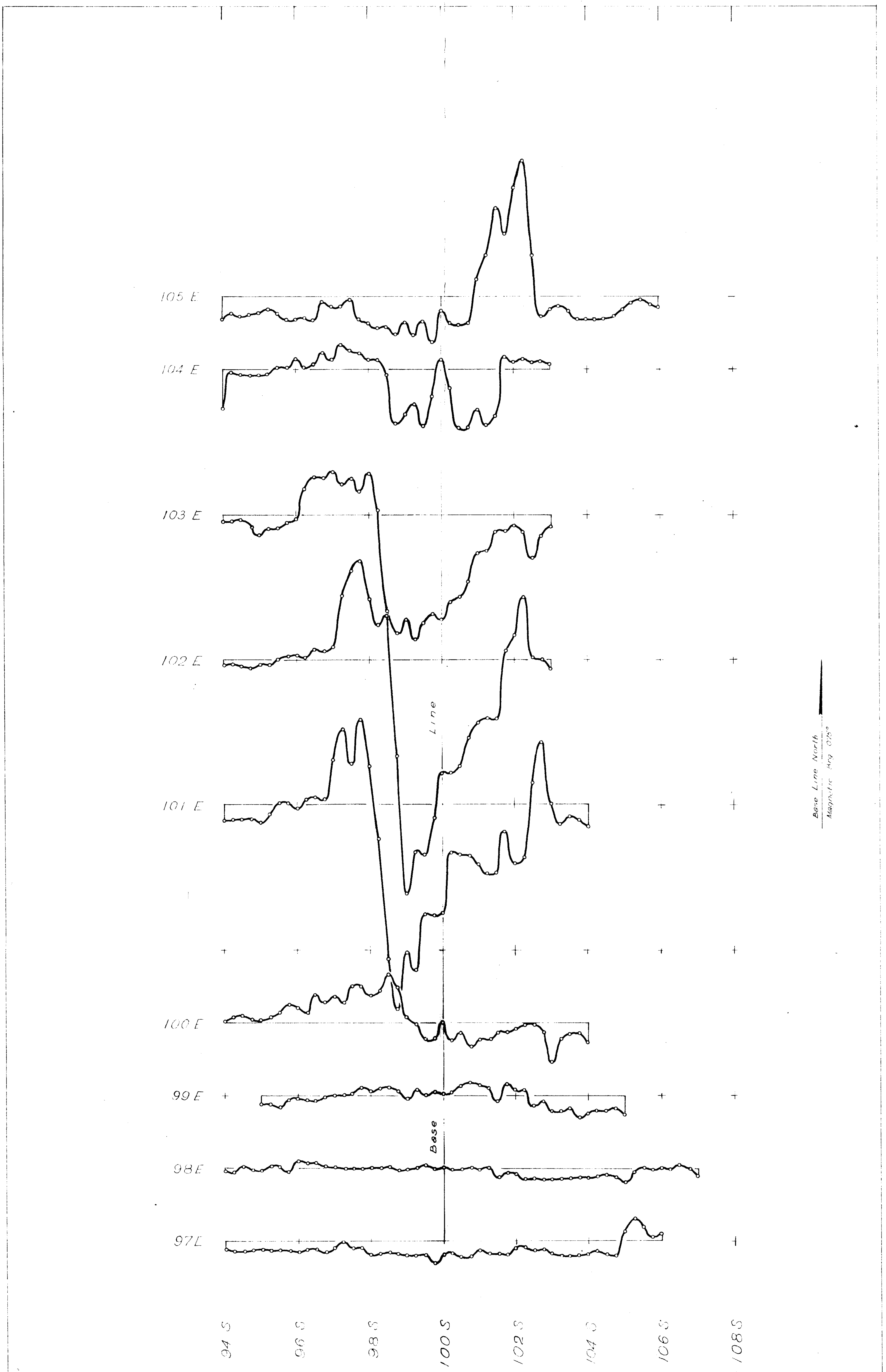
GEOPHYSICAL SURVEY
OF
ASTROLABE FIELD, PAPUA

MT. DIAMOND AREA

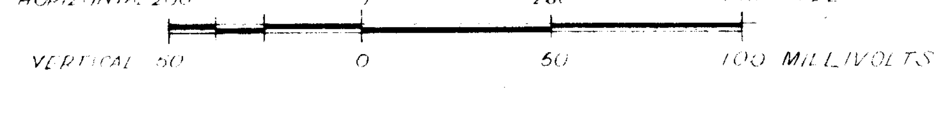
MAGNETIC VERTICAL FORCE PROFILES

Geophysical Section, Bureau of Mineral Resources Geology & Geophysics G 73-41

PLATE 24



SCALES



Note — Vertical spacing of profiles not to scale

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GEOPHYSICAL SURVEY
OF
ASTROLABE FIELD, PAPUA

MT. DIAMOND AREA

SELF-POTENTIAL PROFILES

G 73 – 42

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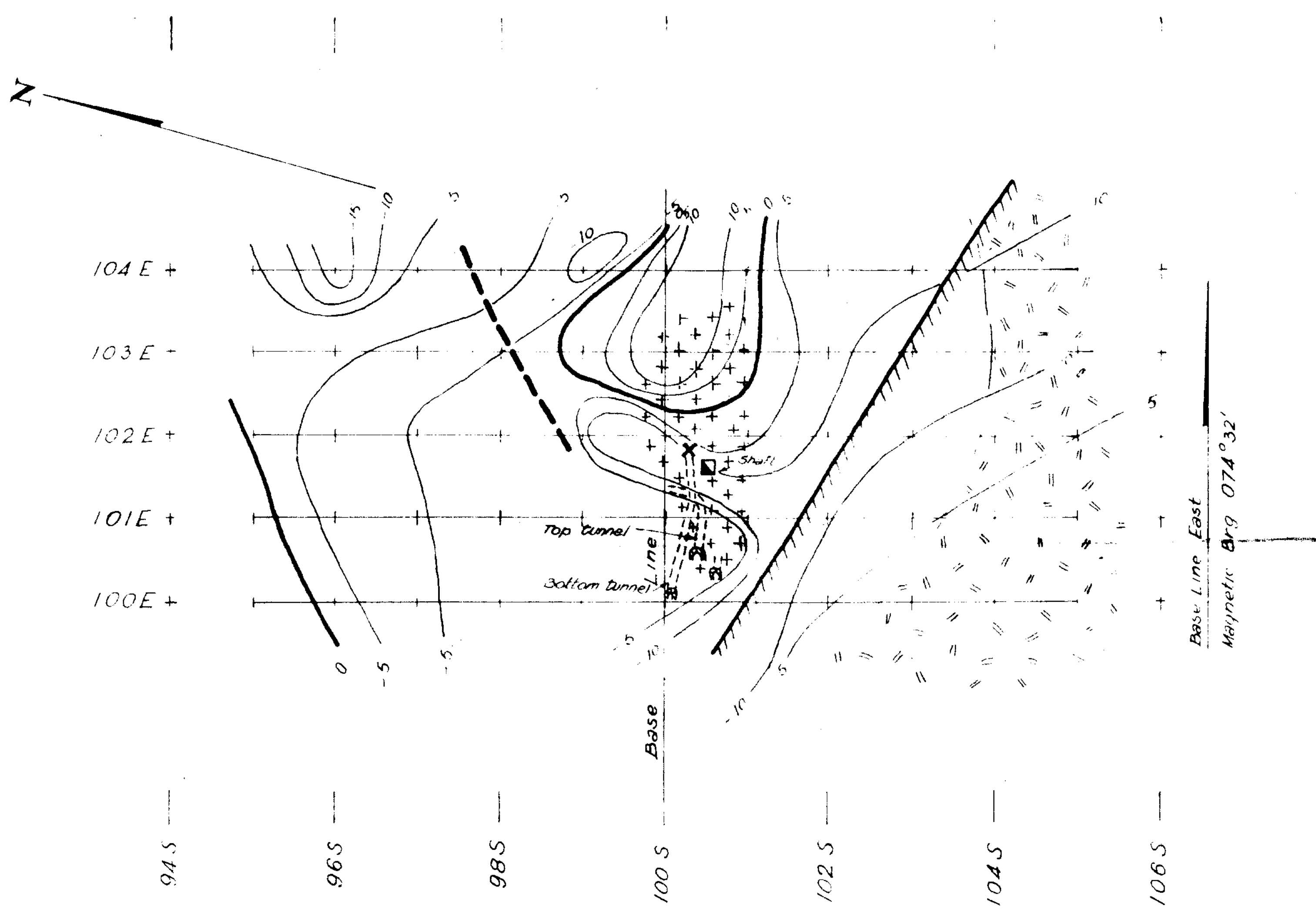


PLAN SHOWING

GEOLOGY, GEOPHYSICAL GRID, SELF-POTENTIAL CONTOURS AND AXIS OF MAGNETIC ANOMALY

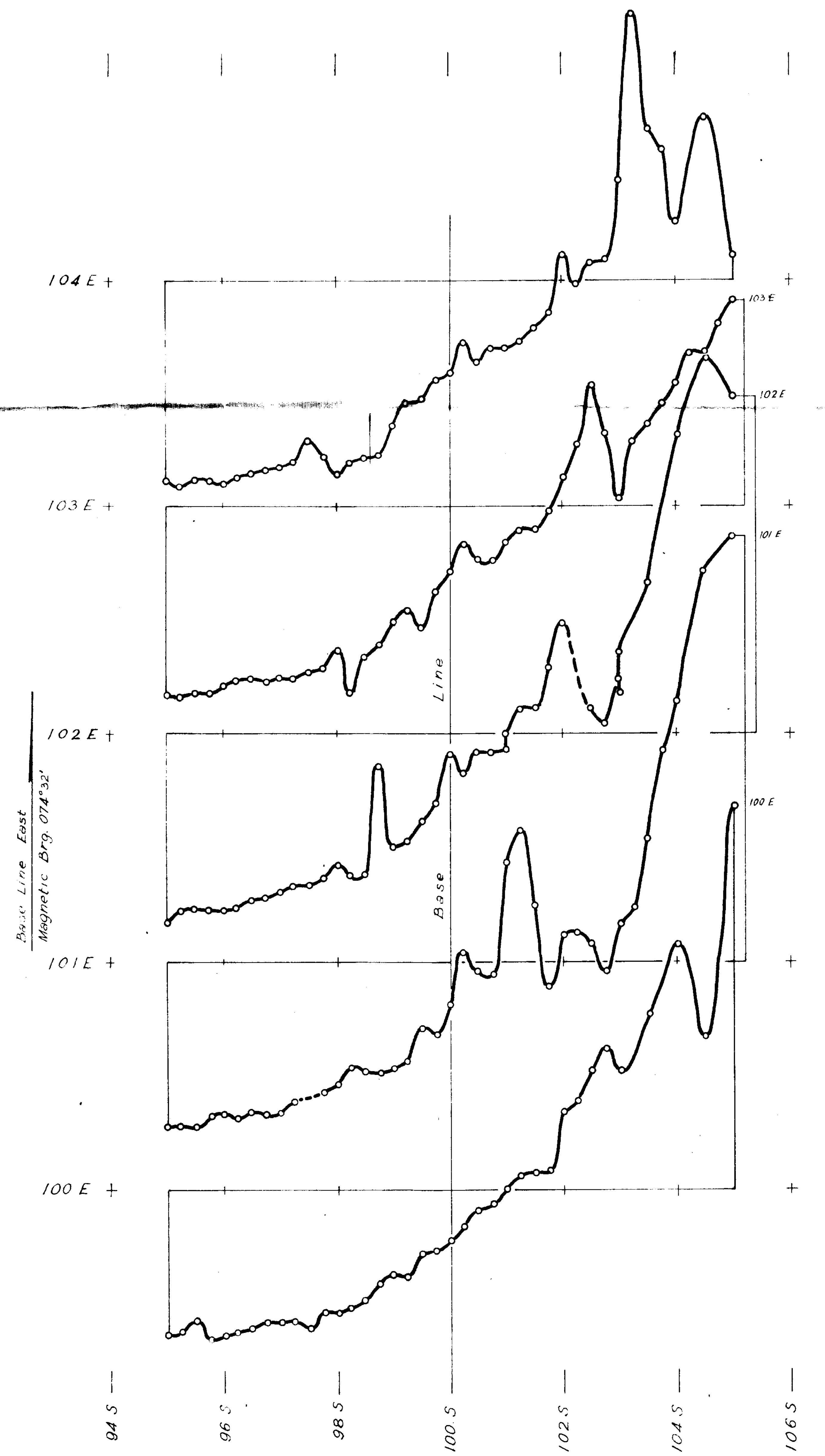
LEGEND

- Axis of very weak magnetic anomaly
- Boundary of irregular magnetic disturbances due to gabbro
- Gossan
- Gabbro
- Sedimentary rocks
- Tunnel
- Shaft
- Sulphide (after Carne, 1913)

SCALE

200 0 200 400 Feet

Contour interval 5 millivolts



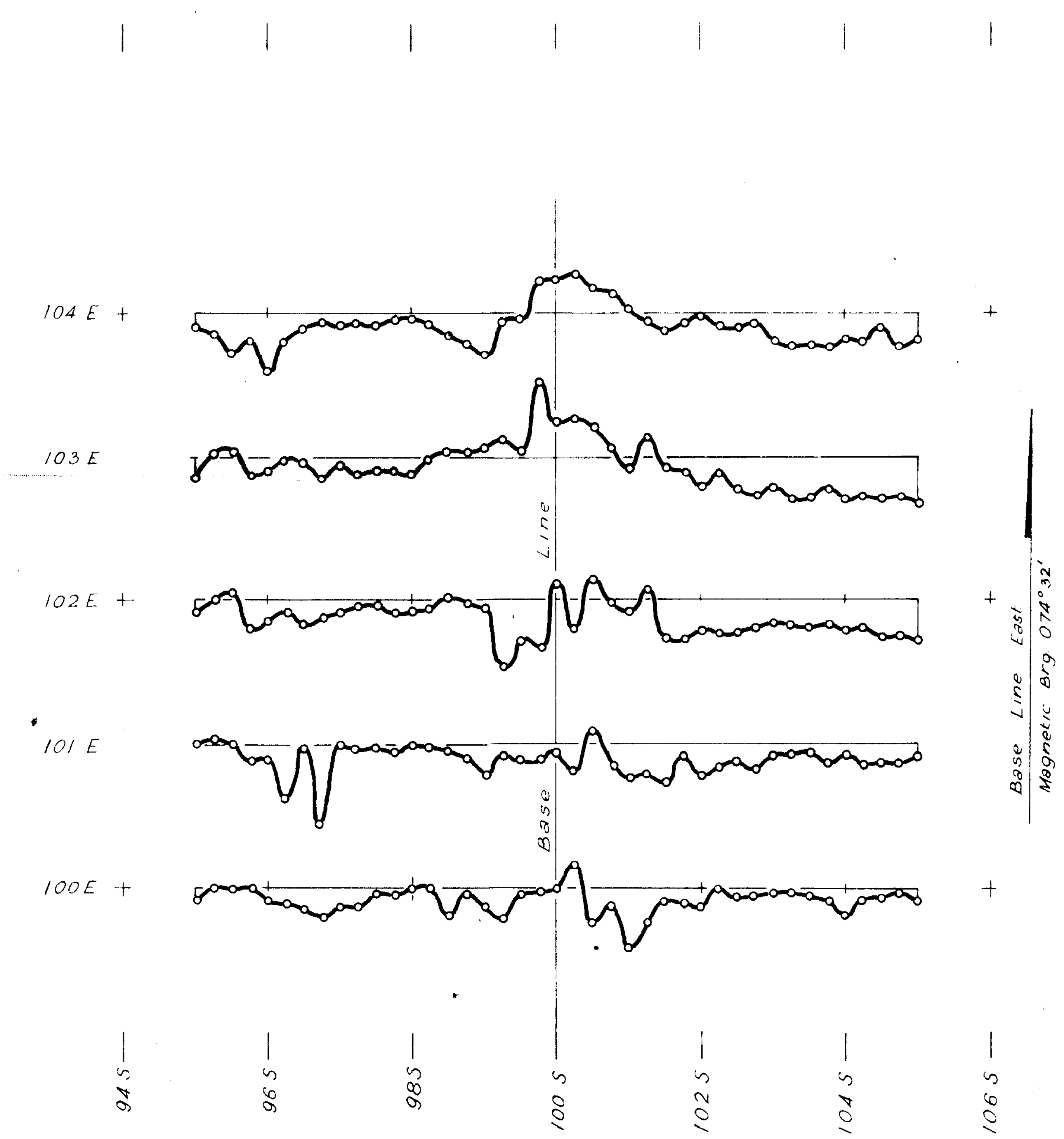
SCALES

Horizontal 200 0 200 400 Feet

Vertical 200 0 200 400 Gammas

Note: Vertical spacing of profiles not to scale

MAGNETIC VERTICAL FORCE PROFILES



SCALES

Horizontal 200 0 200 400 Feet

Vertical 50 0 50 100 Millivolts

Note Vertical spacing of profiles not to scale

SELF-POTENTIAL PROFILES

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA

PARI AREA

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G 73-56

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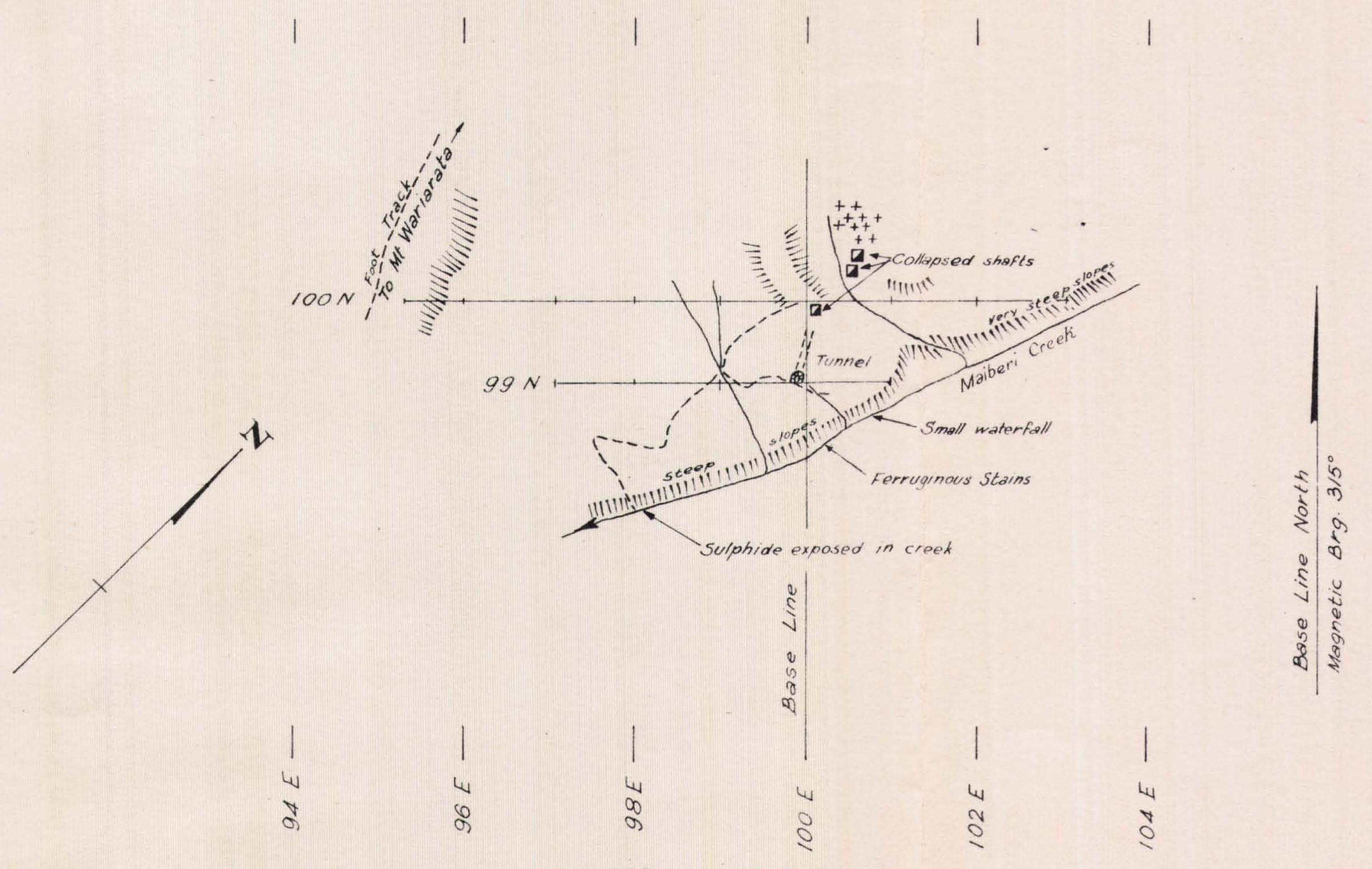


PLAN SHOWING

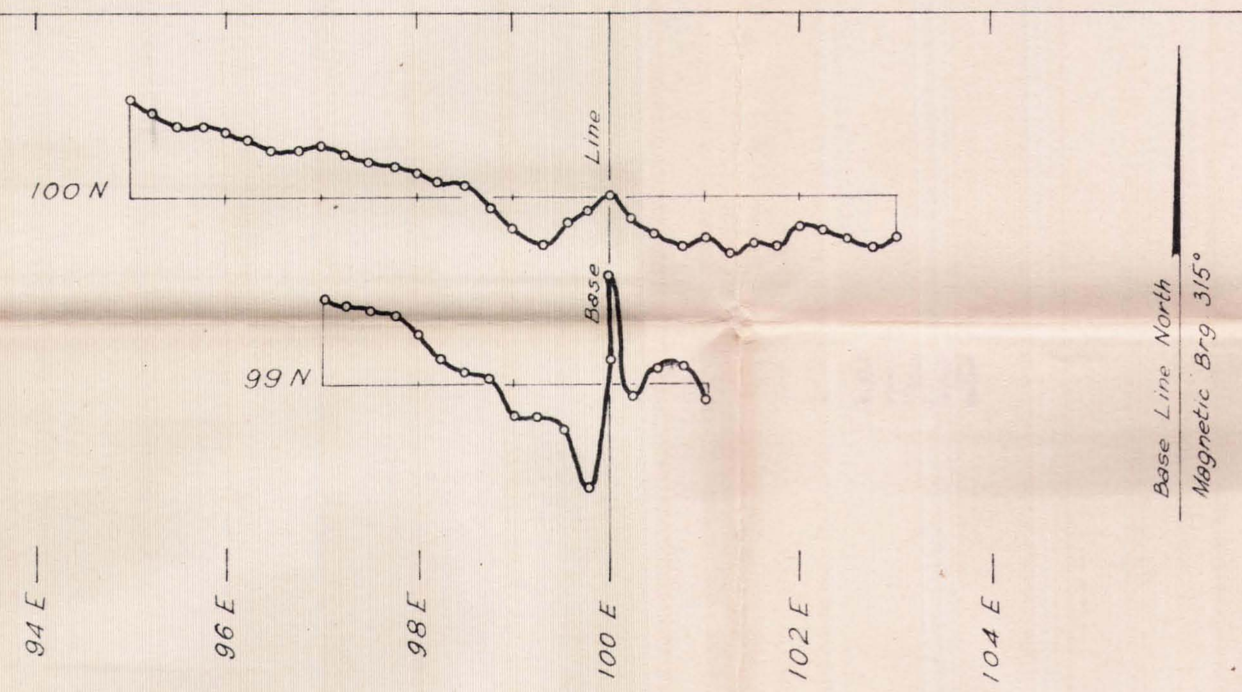
GEOLOGY AND GEOPHYSICAL GRID

SCALE

200 0 200 400 Feet

LEGEND

Gossan
Track
Creek
Tunnel
Shaft



MAGNETIC VERTICAL FORCE PROFILES

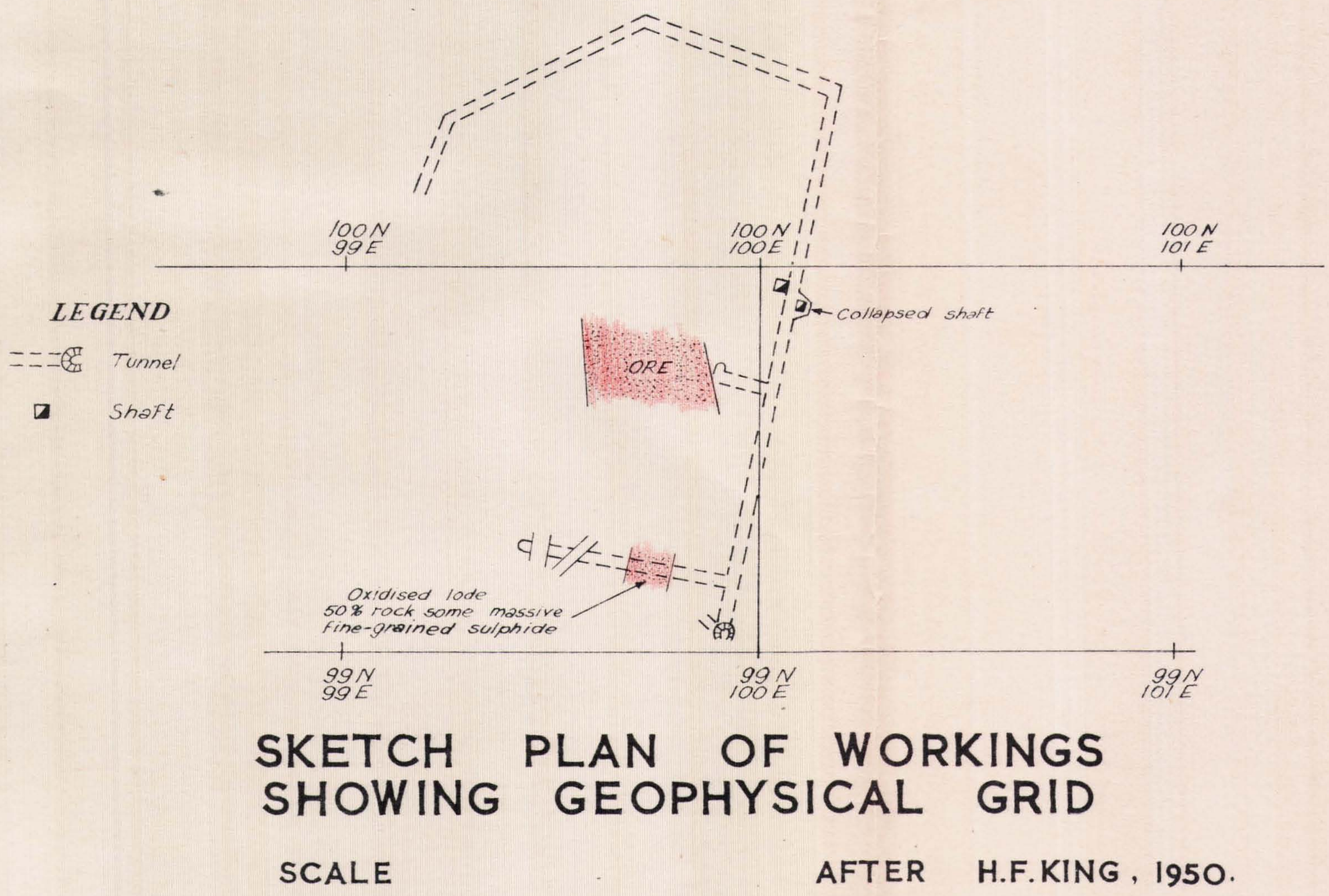
SCALES

Horizontal 200 0 200 400 Feet
Vertical 200 0 200 400 Gammas

Note: Vertical spacing of profiles not to scale

LEGEND

Tunnel
Shaft



SKETCH PLAN OF WORKINGS SHOWING GEOPHYSICAL GRID

SCALE

40 0 40 80 Feet

(Approximate)

AFTER H.F. KING, 1950.

GEOPHYSICAL SURVEY OF ASTROLABE FIELD, PAPUA

ELVINA AREA

L. H. Tate
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G 73 – 60

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