COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1961-158

MOUNT MORGAN GEOPHYSICAL SURVEYS, QUEENSLAND 1949

by

J. Daly and H.A. Doyle

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ABSTRACT

The report describes surveys using magnetic, self-potential, and gravity methods at Mount Morgan and Moonmera. The surveys were made under severe disadvantages, and can be considered only as tests of the methods. A self-potential anomaly near Mount Morgan, and a magnetic anomaly at Moonmera, are considered as possibly significant, and recommendations are made for further investigation and testing of these anomalies.

1. INTRODUCTION

The town of Mount Morgan is 25 miles south-south-west of Rockhampton. Gold was discovered in 1882, and in the early stages Mount Morgan was famous as an extremely rich gold mine. As mining progressed in depth the copper mineralisation was discovered, and development proved a low-grade copper-gold ore-body; this body is mined on a large scale by open-cut methods.

The first attempt to apply geophysical methods in the search for ore at Mount Morgan was made in 1936, when a survey using electromagnetic and magnetic methods was made by a private contractor (Aktiebolaget Elektrisk Malmletning, Stockholm). The areas surveyed are shown on Plate 1. It is considered that the results of this survey were sufficient to indicate certain concealed geological boundaries but gave no indications of the presence of mineralisation that were sufficiently definite to warrant recommendations for testing.

At the request of the operating company, the Bureau of Mineral Resources, Geology and Geophysics conducted surveys on the area around the mine (to be called the mine area) and at Moonmera, about four miles north of Mount Morgan. The surveys were made in 1948 and 1949, but can be considered only as tests, and gave no results of immediate economic value. A draft report was prepared by H.A. Doyle, but not issued. It is considered that the results should be placed on record, notwithstanding their tentative character, both because they will be of value in connexion with any geophysical surveys in this area which may be contemplated in the future, and because in connexion with the survey, mineragraphic determinations of nine samples were made by Dr. F.L. Stillwell of C.S.I.R.O., the results of which are of general geological interest.

The present report is a summary of Doyle's draft report, but incorporates some amendments to the geological description, based on more recent published material, together with suggestions for a reconsideration of some of the results.

2. GEOLOGY

(a) Mount Morgan area

The geology of the Mount Morgan deposit is extremely complex, and present ideas are the result of detailed mapping by a number of geologists at intervals extending over many years. A convenient summary of modern views is given by Staines (1953), in which reference to earlier work may be found. The following notes are based on the report by Staines.

It was thought at one time that the mine contained two ore-bodies, the main ore-body and the Sugarloaf ore-body, but recent testing has shown that these form a single large body. The ore-body occurs in a long narrow belt occupied by lavas and sediments, and known as the Mount Morgan Corridor, which is bounded on both sides by intrusive granitic rocks (Mount Morgan granite to the west and Town granite to the east). West of the Mount Morgan granite there is a series of sediments, tuffs, and agglomerates, known as the "Andesite series". The contact between the Andesite series and the granitic rocks is obscured along much of its length by a thick capping of sandstone of Mesozoic age. Near the ore-body all rocks except the Mesozoic have been intruded by a swarm of dykes of many rock types; of these the andesite and porphyrite dykes are considered to be pre-ore, and the dolerite and diorite dykes post-ore. The area is disturbed by a great number of faults of various ages.

The general distribution of rock types (excepting the dykes) is shown on Plate 1, based on information supplied by the company. The rocks of the Mount Morgan Corridor are referred to as the Morgan series. They have been divided into four layers, as follows, (beginning at the top):-

Layer 1. Quartz porphyry

Layer 2. Sedimentary beds (chert and limestone) developed to varying extents in different parts of the area, over-lying felsites.

Layer 3. Quartz porphyry

Layer 4. Similar to Layer 2

The thickness of each layer is generally a few hundred feet. As far as is known, the layers are generally horizontal over most of the Corridor, except around the ore-body.

Two faults are present near the mine; namely the Linda fault, which crops out north-east of the mine and dips flatly to the south-west, and the Slide, which crops out west of the mine, and has a moderate dip to the east. In the block bounded by these faults, the beds of the Morgan series have been compressed into two very tight anticlines, with a deep syncline between them. The beds in the lower part of the syncline have been mineralised with pyrite, chalcopyrite, and gold. The localisation of the mineralisation in considered to be determined by the relative incompetence of the sedimentary and felsite beds, in comparison with the quartz porphyry. The Linda fault forms the bottom of the ore-body. The Slide, although a boundary to the mine structure, does not limit the mineralisation. At the surface, ferruginous material occurs over an area surrounding the ore-body, and although referred to as "gossan" may be largely a superficial occurrence of lateritic nature.

(b) Moonmera area

The only geological information available on the Moonmera area is contained in Dunstan (1904).

Moonmera Railway Station is four miles north of Mount Morgan. Copper-gold mineralisation occurs west of the railway line, in foot-hills and slopes adjacent to very steep hills, capped by sandstone of Mesozoic age. Most of the rocks in the area are granitic rocks of various types, and have been grouped under the general title of Moonmera granite. The rocks in the mineralised region are not known in detail, but in one area the rocks are considered to belong to the Andesite series. Copper carbonates occur sporadically in rocks at the surface, and copper carbonates and chalcopyrite have been found in old shafts and adits. Production has been slight. The known distribution of rock types is shown on Plate 1, but this must be regarded as a very great over-simplification because the geological structure, though not yet mapped in any detail, is known to be extremely complex.

Rock specimens selected from the mineralised area were submitted to Dr. F.L. Stillwell, of the C.S.I.R.O., for mineragraphic investigation. The results of his examination, together with the results of assays made by Mount Morgan Ltd are given in Appendix 1.

3. TECHNICAL DETAILS

Gravity, magnetic, and self-potential methods were used on the surveys. For the purpose of this report a discussion of the methods in general is not required, but certain details of their application in the Mount Morgan area are relevant.

To test the possible applicability of the gravity method, density determinations were made on a number of samples. The density of specimens of ore from the open cut averaged about 4.3g/c.c. and of country rocks generally about 2.5. It would be expected, therefore, that an ore-body of the dimensions of the Mount Morgan body would be associated with a positive gravity anomaly.

The applicability of the magnetic method is not so clear. Tests on hand samples showed that some but not all of the rocks, both mineralised and unmineralised, are magnetic. There is, therefore, no basis for expecting that the ore-body would have magnetic properties differing from those of the country rock.

The surveys using the various methods were subject to severe disadvantages. Owing to the extremely rough topography, and the disturbing features associated with the operation of a large working mine, it was quite impossible to run traverses regularly spaced over the main ore-body. The layout of traverses is shown on Plate 2. The tests made cannot be considered as representative of the ore-body, as a considerable proportion of the body has been removed by mining operations. Also, for the use of the gravity method, terrain corrections are essential in such rough topography. Although station levels were taken, sufficient survey information was not available to enable terrain corrections to be computed with the desired accuracy, particularly near the open cut. A contour map at 50-ft intervals was constructed based on air-photos, controlled by the levels of the stations. Using this as a basis, terrain corrections were applied to some, but not all, readings. The gravity survey was made with a Heiland gravity meter; this meter is inconvenient to use in such rough country, and its accuracy is somewhat impaired by the inevitable rough usage.

4. RESULTS

(a) Gravity results

The gravity method was applied mainly near the mine. No gravity work was done at Moonmera.

The results of the gravity survey around the mine area are shown as profiles on Plate 3 and as contours on Plate 4. The contours have been derived from the profiles, after allowance has been made for the effect of the material removed from the open cut. They are therefore an attempt to estimate the gravitational field as it was before large-scale mining began. The main feature of the profiles is the well-defined regional gradient, increasing to the south-west. Superimposed on this, the contour plan shows a positive anomaly of about 0.4 mgal, coinciding generally in position with the Sugarloaf ore-body. From the density measurements mentioned earlier, it was expected that such an anomaly would be present. However, the results are not sufficient to establish the anomaly beyond doubt.

It will be noted from Plate 3 that there is a strong negative correlation between gravity and topographic profiles, although the gravity profiles have been corrected for elevation using a density of 2.5 g/c.c. The existence of this correlation suggests that the density value chosen may be too high. Recalculation of some profiles using a density of 2.2 reduces the correlation greatly and it might have been more correct to use the lower density.

The anomaly corresponding to the Sugarloaf ore-body appears most definitely on Traverse XYWS at the top of Plate 3, centred at W15; and on Traverse XYR at the bottom of Plate 3, centred at R4. On Traverse XYWS, the anomaly shows no correlation with the topographic profile, but the fact that no terrain corrections could be applied to this traverse introduces a considerable uncertainty. On Traverse XYR, the correlation with topography is strong. Terrain corrections have been applied to this traverse, and their effect has been to remove most of the anomaly.

Summarising the above discussion, the contours shown on Plate 4 represent one method of reducing the results. There is room for considerable doubt as to whether this method is the best one. It is possible that an anomaly due to the Sugarloaf ore-body is present, but this cannot be considered as proved. The indefiniteness of the results arises from the difficulty of applying the gravity method in such rugged terrain.

(b) Magnetic results

Magnetic surveys have been made both at Mount Morgan and Moonmera.

(i) Mount Morgan

The results of the Mount Morgan survey are shown as profiles of vertical intensity on Plate 5, together with the various rock types crossed by the traverses. The most noticeable feature of the results is the well-marked magnetic character of the Morgan series, which shows strong irregular variations. Exceptions to this occur where traverses cross the known ore-bodies. The positions of such crossings are marked on the profiles, and these are characterised by smoother profiles and lower values of vertical intensity. There is no reason to suppose that this has any connexion with the mineralisation of the ore-bodies, but the fact may have some diagnostic value.

The magnetic character of the granites is not consistent, although, in general, the profiles over them appear to be somewhat less disturbed than those over the Morgan series.

(ii) Moonmera

The results of magnetic surveys at Moonmera are shown as profiles of vertical intensity on Plate 6, and as contours on Plate 7. The magnetic character of the Morgan series in this area, as exemplified by Traverse ZA, for instance, is similar to that observed near Mount Morgan mine.

Over the Moonmera granite generally, the profiles are weakly disturbed. It is considered that the difference in magnetic properties between Morgan series and Moonmera granite is sufficiently distinctive to enable the contact between these rock types to be located, even under the cover of Mesozoic sandstone. The approximate position of the contact, located in this way, is shown on Plate 7.

The most interesting feature of the results, however, is a negative anomaly, characterised by very smooth profiles, whose position is shown by the contours on Plate 7. It is impossible to account for this anomaly on the basis of present geological knowledge, but it is possibly significant that most of the known showings of mineralisation lie within the area of the anomaly.

(c) Self-Potential results

Self-potential measurements were made on all areas. No results of significance were obtained around the Mount Morgan workings, or at Moonmera. In the Mount Morgan Corridor, north of the mine, a very weak but reasonably well-defined anomaly was located. This is shown in detail on Plate 8. The cause of the anomaly is not known. It coincides generally with a tongue of Town granite intruded into the Morgan series. It is possible that the anomaly is due to a topographic effect, but information is not available to check this. The possibility that it is due to sulphide mineralisation appears remote, but cannot be completely ruled out.

5. CONCLUSIONS AND RECOMMENDATIONS

The magnetic method offers a reasonable possibility of distinguishing between certain rock types under cover. For instance, it could be used to trace the boundaries of the Morgan series under the capping of Mesozoic sandstone, if that were considered desirable.

As far as results of immediate economic significance are concerned, there are only two possibilities:

(1) The self-potential anomaly shown on Plate 8 may be due to sulphide mineralisation.

(2) The large magnetic anomaly at Moonmera may indicate the presence of an ore-body of Mount Morgan type in this area.

By the standards usually employed in interpreting geophysical data, the results are quite inadequate to support any recommendation for further work. Usually, a recommendation for testing a geophysical indication is justified only if the indication can be attributed to some source of possible economic interest, consistent with available geological information. However, an argument can be developed that, in the special circumstances at Mount Morgan, a different criterion is justified.

It is a truism that an exploration campaign can only be based on sound geological knowledge. The Mount Morgan ore-body has been explored by mining development and drilling to a greater degree than most Australian ore-bodies. Even with these opportunities of obtaining information, it has taken many years of work by geologists of high reputation to bring the knowledge of the geology to its present state. It is certain that, if the knowledge of geology had had to be based on surface evidence along, the resulting geological picture would have borne no resemblance to the present one. There is no reason to suppose that the geology is any less complicated in other parts of the district, and therefore it must be accepted that there is no possibility of checking the significance of a geophysical indication by deductions from surface geological mapping. The conclusion must be accepted that targets for an exploration campaign in the Mount Morgan area must be based on evidence that would be considered quite inadequate in many other areas (with, of course, a greatly increased risk of unproductive expenditure).

Accordingly, the two indications mentioned above may be given somewhat greater weight. Considering firstly the self-potential anomaly, the only point in favour of this is the fact that it is of a type that could be due to weak sulphide mineralisation, although it could equally well be due to a topographic effect. Against it are its weakness and the fact that it occurs mainly in granite, which is not known to be a favourable rock type for mineralisation in this area. It is considered that, before any further investigation is contemplated, the possibility of the anomaly being due to topographic causes should be tested. This may be done by comparing the self-potential profiles with topographic profiles. If there is a strong correlation between the two, with self-potential minima corresponding to high ground, the anomaly is probably due to topography, and no further consideration is warranted. If such correlation is obviously absent, the cause of the anomaly should be tested by drilling. It should be kept in mind that the prospects of this anomaly must be regarded as extremely weak judged by any standards, and therefore expenditure should be kept to the minimum. In the first instance, one vertical hole should be drilled to 200 ft, at 5000N/1225E. If this shows no evidence of sulphide mineralisation, further work is not warranted.

With regard to the magnetic anomaly at Moonmera, the main points in favour are that (i) the characteristics of the profiles (low intensity and smoothness) are similar to those of profiles across the known ore-bodies at Mount Morgan, and (ii) most of the known showings of mineralisation lie within the boundary of the anomaly.

The main point against the anomaly is its large extent. It is considered that the anomaly possibly warrants testing, but that such testing should not be based on magnetic results alone, both because there is no reason to expect that magnetic "highs" or "lows" correspond to the best mineralised portions (if any) and because it is impossible to determine from the magnetic results the depth to which testing should be taken.

It is possible that the gravity method may help to define targets within the area covered by the anomaly. Evidence from the tests over known ore-bodies is not conclusive either for or against the association of gravity anomalies with ore-bodies at Mount Morgan. However, a mineralised body of sufficient size should cause a positive gravity anomaly. Part of the Moonmera area is better suited to gravity work than Mount Morgan, though serious difficulty would be experienced in extending the work to the west. Also, modern gravity meters, such as the Worden, would be much more convenient to use in this area than the Heiland meter was. It seems that a detailed gravity survey over the accessible portions of the Moonmera layout might give results of importance. If any well established gravity "highs" can be located within the boundary of the magnetic anomaly, they should be tested by drilling; not with any great confidence, but with the knowledge that such an indication is as definite as can be expected in this area.

Magnetic anomalies of the type encountered at Moonmera should be readily detectable by aerial magnetometer surveys. If testing suggests that this anomaly is a reliable indication of the presence of mineralisation, consideration should be given to the use of airborne surveys to discover any other similar anomalies which may be present in the district.

It is recommended that:

(a) the possibility of the self-potential anomaly being a topographic effect be tested as described above.

(b) if this possibility can be definitely ruled out, the anomaly be tested by a vertical drill-hole 200 ft deep at 5000N/1225E. If this drill-hole fails to disclose sulphide mineralisation, no further work be done.

(c) if this drill-hole shows that the anomaly is associated with sulphide mineralisation, another 200-ft vertical hole be put down at 4900N/2400E.

(d) unless one or both of these drill-holes show mineralisation of economic grade, no further testing be done on the anomaly.

(e) a detailed gravity survey be made over the Moonmera area, covering the whole of the layout as far as possible.

(f) if this gravity survey shows gravity "highs" within the boundary of the magnetic anomaly, they should be tested by drilling.

6. REFERENCES

DUNSTAN, B	1904	Moonmera, its minerals and copper mines, and a study of its rock formations. Geol. Sur. Q. Pub. 195.
STAINES, H.R.E.	1953	Mount Morgan Copper & Gold Mine. GEOLOGY OF AUSTRALIAN ORE DEPOSITS, 732 et seq. A.I.M.M., Melbourne.

APPENDIX 1

Mineragraphic Investigations and Assays of Samples from Moonmera, Mount Morgan Area

1. List of samples selected by Mr. L. Richardson, with assays carried out by Mount Morgan Limited.

Sample:

M No. 1 Granitic Rock with Cu. Carb. near MN20
Au 1.2 dwt, Cu 1.18%.

M No. 2 Granitic Rock with pink felspar and Cu. Carb. near MO32
Au 0.4 dwt, Cu 0.69%

M No. 3 Weathered granitic Rock with Cu. Carb. near MO32
Au 0.3 dwt, Cu 0.63%

M No. 4 'Acid' Granitic Rock with segregation near ML46.

M No. 5 Biotite Granite near MN20

M No. 6 Drill Core C4 hole 43 ft depth (Mount Morgan)

M No. 7 Mineralised Granitic Rock from No. 2 Tunnel workings

M No. 8 Mineralised Granitic No. 2 Shaft workings

M No. 9 'A-F' Rock from S91 (Mount Morgan).

2. Mineragraphic Investigations of the Commonwealth Scientific and Industrial Research Organisation

Report No. 423 University of Melbourne

10th October 1949.

Rock Specimens from Moonmera Area, Mount Morgan District, Queensland

Nine rock specimens have been submitted for petrological examination by the Bureau of Mineral Resources, Geology and Geophysics. Seven of these specimens come from the Moonmera area approximately four miles north of Mount Morgan. Specimen No. 6 is a sample of ore from Mount Morgan drill hole C4, depth 43 feet. Specimen No. 9 is an outcrop specimen of a rock locally referred to as A-F rock which forms part of the Morgan series of volcanic rocks.

Moonmera Area

Specimen No. 1 is a pale coloured, medium grained augite diorite. It contains colourless augite, pale green hornblende and abundant andesine as the principal minerals. Numerous small crystals of sphene and occasional apatite are present along with subsidiary amounts of altered biotite, epidote and quartz. A little malachite has been formed along the cleavage and around the ferromagnesian crystals, more especially augite.

Specimen No. 2 is an even, coarse grained pink granite in which the lime felspars have undergone more alteration than the potash felspars. Quartz is abundant, orthoclase common, biotite has been converted to chlorite and oligoclase has been largely replaced by clusters of secondary muscovite. Apatite, hematite and occasional small zircons are accessory minerals. A little rutile and anatose have been formed along the cleavage directions in the chloritised biotite. A small amount of malachite is also associated with the altered biotite. The accessory hematite has been formed from magnetite and often contains residual particles of magnetite.

Specimen No. 3 is a composite rock which is characterised by more malachite than specimens Nos 1 and 2. The additional copper and its composite character suggests that it may correspond to the copper bearing breccia mentioned by Dunstan (Geol. Surv. of Q'ld. Pub. No. 195, 1904). It consists partly of pink granitic fragments similar to specimen No. 2 and partly of finer-grained portions which are suggestive of xenoliths partially incorporated in the granite. The finer grained portion contains abundant green chlorite and occasional malachite. The quartz grains are both fine and coarse, though never as coarse as in the pink granite. Some of the quartz grains are fine mosaics. Secondary muscovite is abundant and has been derived from the altered felspar which is turbid throughout. Zircon and apatite are also present.

Specimen No. 4 is a quartz felspar porphyry in which phenocrysts of quartz, felspar and biotite are set in a fine grained felspathic groundmass. The phenocrysts of quartz up to 0.5 cm are often corroded and embayed, the felspar phenocrysts are largely replaced by muscovite and the original biotite has been altered to white mica, iron stained chlorite with a little sphene and rutile along the cleavage traces. Clots of secondary iron-stained chloritic material are common and pass into limonite at the weathered surface.

Specimen No. 5 is a hornblende granodiorite with black ferro-magnesian minerals dispersed through the quartz and felspar. The thin section shows that quartz and oligoclase comprise the greater part of the colourless minerals. Hornblende and biotite are about equally developed and are accompanied by occasional sphene, apatite and magnetite. A polished section shows that the magnetite is slightly altered to hematite around the margins and along the octahedral planes.

Specimen No. 7 collected from an old mine dump, is a composite specimen consisting partly of a dense fine grained quartz felsite and partly of a quartz felspar porphyry with narrow irregular veinlets containing quartz, chalcopyrite and molybdenite along the contact. The felsite is fine grained though distinctly coarser in texture than the groundmass of the quartz felspar porphyry, though it contains an occasional quartz or felspar crystal which is a little larger than the main bulk of the fine crystals in the felsite. The quartz felspar porphyry consists of phenocrysts of quartz, oligoclase and altered biotite set in a microcrystalline groundmass. A polished surface shows the sulphides mainly at the contact of the felsite and the porphyry but also in veinlets in the porphyry and the felsite. Chalcopyrite is the most common sulphide and shows slight alteration covellite. A few small crystals of pyrite accompany the chalcopyrite. Molybdenite is also present and some veinlets are composed wholly of molybdenite.

d

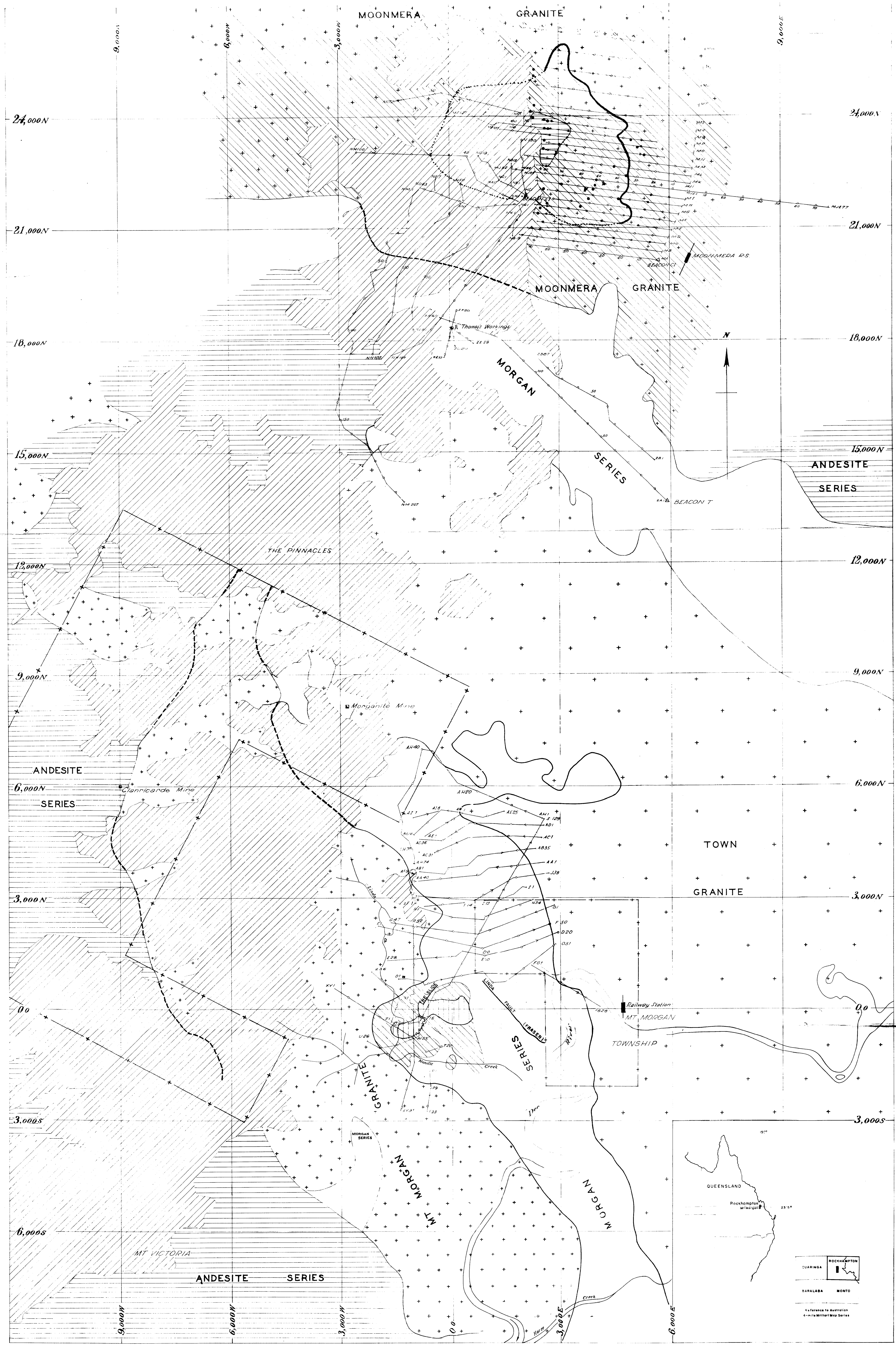
Specimen No. 8 from an old mine dump is a quartz felspar porphyry which is less altered than No. 4 and carries small sporadic particles of chalcopyrite and a few small mica-rich xenoliths. It is similar to the porphyritic rock in Specimen No. 7 and generally resembles Specimen No. 4 although Specimen No. 8 and 4 appear different in the hand specimens. Specimen No. 8 is greyish while Specimen No. 4 is pinkish and the difference is due to the weathered condition of Specimen No. 4. A polished surface reveals narrow discontinuous veinlets of chalcopyrite with occasional pyrite, and scattered particles of hematite and rutile.

Mount Morgan

Specimen No. 6 is a sample of ore from D.D. hole C4 at a depth of 43 feet and has strong magnetic properties. A thin section suggests that the rock is a highly altered tuff or breccia which has been partly carbonated and partly silicified. Chloritic areas and quartz mosaics are studded with numerous pyrite crystals and magnetite particles. A little chalcopyrite is also present.

Specimen No. 9 is an outcrop specimen of a rock locally referred to as A-F rock. It is a dark, fine-grained andesitic rock in which the felspathic base is essentially unaltered while the ferromagnesian minerals, except for some traces of biotite, are completely altered to chlorite and sericite. Numerous small particles of ilmenite and magnetite sometimes intergrown, are disseminated through the rock and have been identified in a polished section. The rock is intersected by narrow veinlets of quartz containing pyrite and occasional particles of chalcopyrite. A little quartz also appears to be intergrown with the felspars.

PLATE I



LEGEND

- Morgan Series
- Mt Morgan Granite
- Mesozoic Sandstone
- Town Granite
- Moonmera Granite
- Andesite Series
- 3,000S Mine Grid Co-ordinates
- Plan Projection of Mineralisation
- Gossan
- Boundary of Magnetic Anomaly
- Probable Boundary of Magnetic Anomaly
- Geological Contact Under Cover Inferred From Geophysical Survey
- Areas surveyed by Aktiebolaget Elektrisk Malmletning, 1936
- Mineralization Visible in Outcrop
- Geological Boundary

SCALE
1,000 0 1,000 2,000 3,000 FEET

H. Doyle
Geophysicist
19.12.50

GEOPHYSICAL SURVEY AT MOUNT MORGAN QLD.

GENERAL LOCATION MAP.

SHOWING

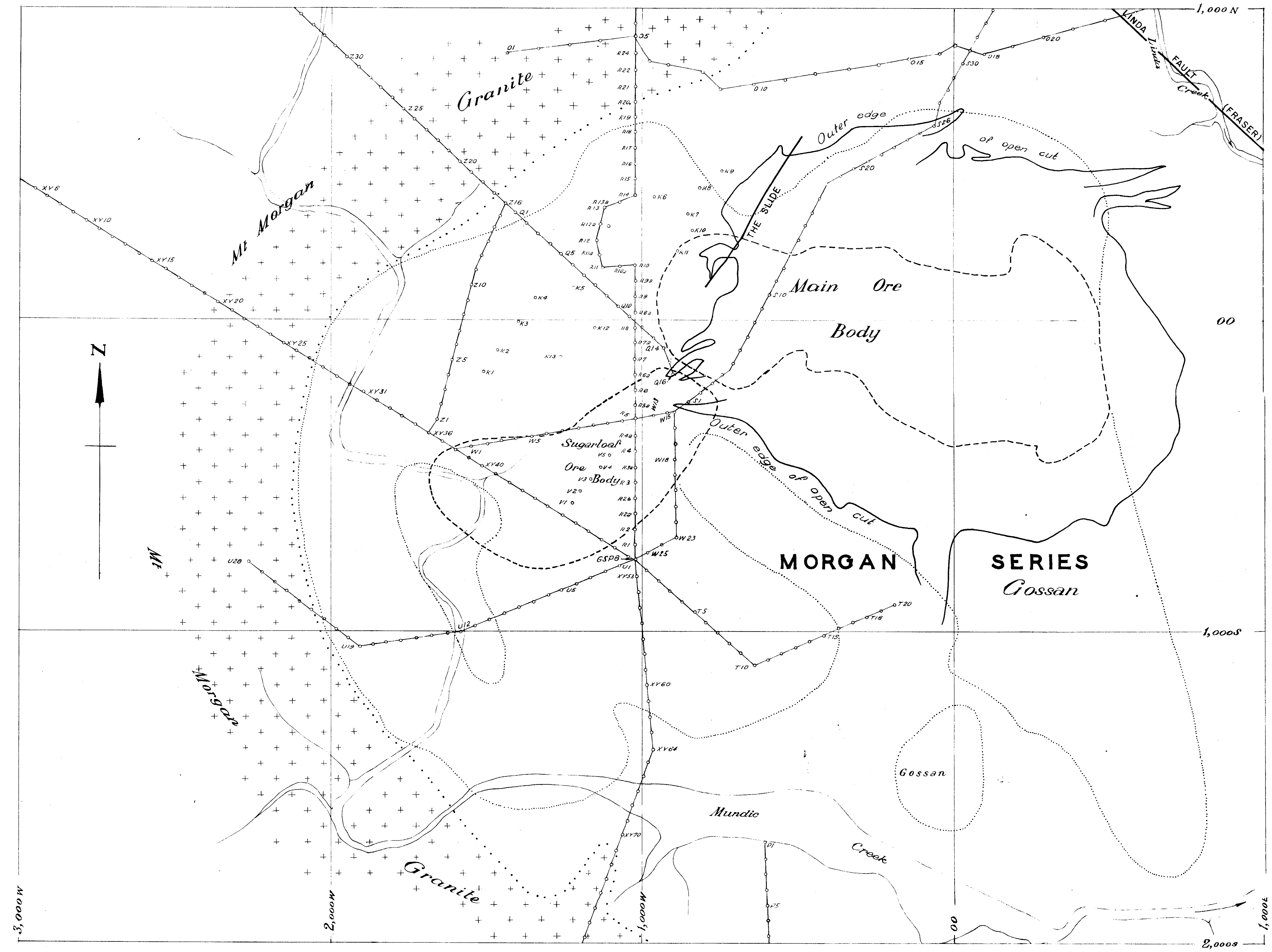
GEOLOGY AND GEOPHYSICAL LAYOUTS

G 59-3

Geophysical Section, Bureau of Mineral Resources Geology & Geophysics.

To Accompany Record No 1961-158

PLATE 2



GEOPHYSICAL SURVEY AT MOUNT MORGAN, QLD

MINE AREA

GEOLOGY & GEOPHYSICAL LAYOUTS

G59-5

LEGEND

- Morgan Series
- Mt Morgan Granite
- Plan Projection of Ore Bodies
- Gossan Boundary.
- Geological Boundary
- Geophysical Traverse
- 1,000 S Mine Grid Co-ordinates

SCALE

200 0 200 400 600 FEET

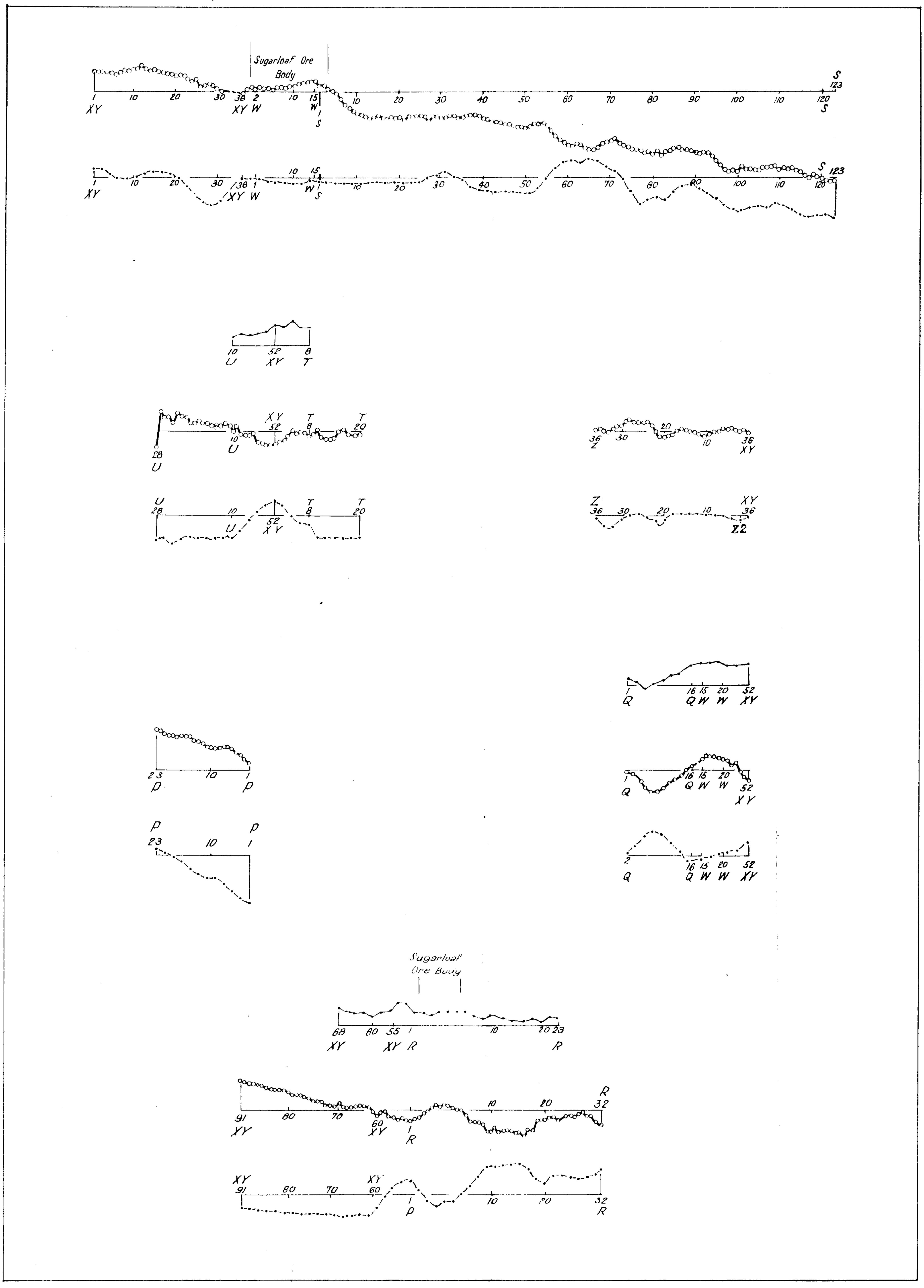
Geophysicist

19·12·50

Geophysical Section, Bureau of Mineral Resources Geology & Geophysics.

To Accompany Record No 1961-158

PLATE 3



SCALES

Vertical: 4 — 0 — 4 — 8 Milligals; 400 — 0 — 400 — 800 Feet

Horizontal: 1,000 — 0 — 1,000 — 2000 Feet

LEGEND

Gravity profile after terrain, latitude & elevation corrections

Gravity profile after latitude & elevation corrections

Topographic profile

GEOPHYSICAL SURVEY AT MOUNT MORGAN, QLD

MINE AREA

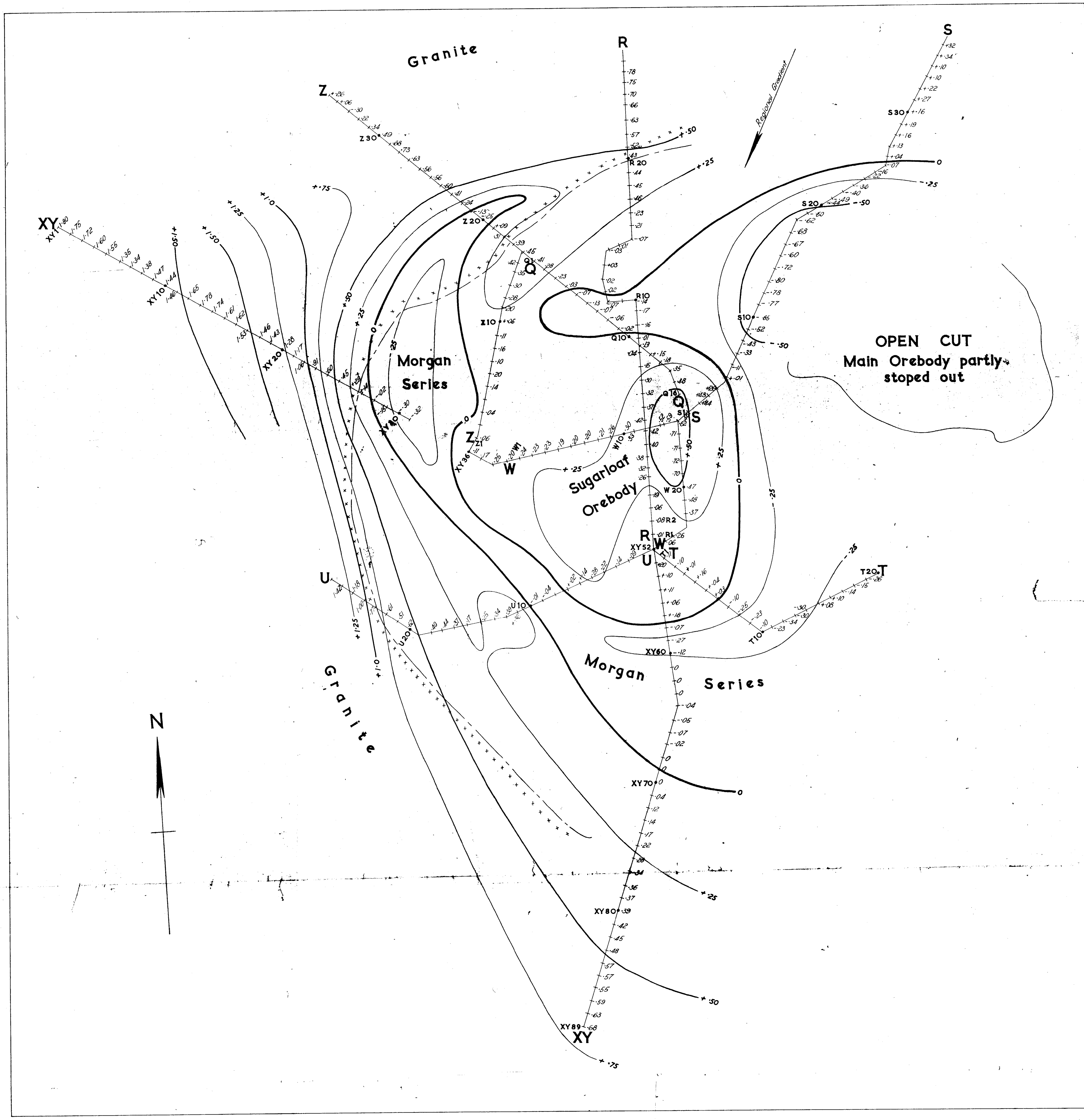
GRAVITY PROFILES

G 59-7

W. A. Doyle
Geophysicist
19.12.59

Geophysical Section, Bureau of Mineral Resources Geology & Geophysics

To Accompany Record No 1961-158



SCALE IN FEET

100 0 100 200 300 400 500 600

MORGAN SERIES

CONTACT

x x x x GRANITE

J. Moretto
Geophysicist
11-7-51

GEOPHYSICAL SURVEY AT MOUNT MORGAN, QLD

MINE AREA

CONTOUR LINES OF GRAVITY ANOMALIES

DERIVED FROM PROFILES ON PLATE 3, AFTER ALLOWANCE FOR THE EFFECT OF MATERIAL REMOVED FROM OPEN CUT

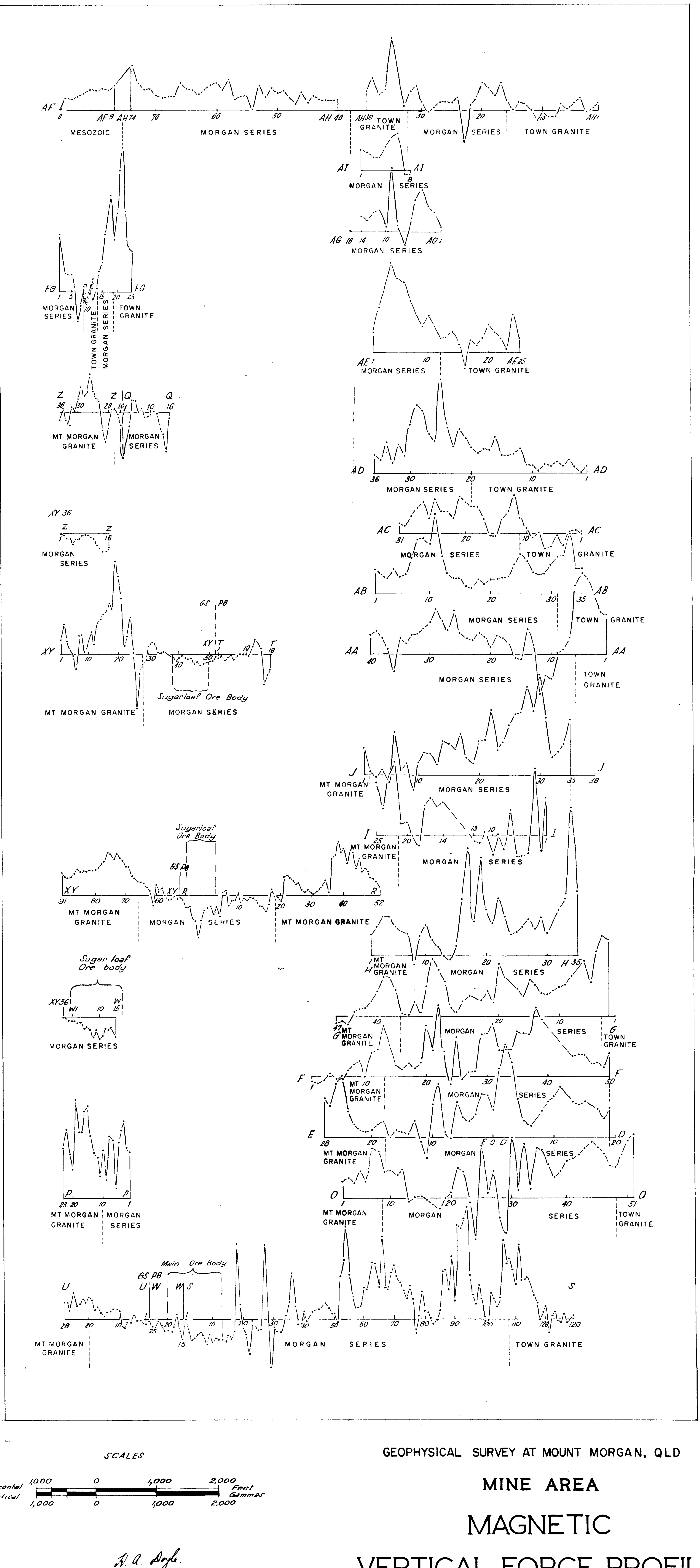
CONTOUR INTERVAL 0·25 MILLIGALS

G59-10

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

To Accompany Record No. 1961-158

PLATE 5



SCALES

Horizontal	*1,000*	*0*	*1,000*	*2,000*	*Feet*
Vertical	*1,000*	*0*	*1,000*	*2,000*	*Gammas*

H. A. Doyle
Geophysicist
19·12·50

GEOPHYSICAL SURVEY AT MOUNT MORGAN, QLD

MINE AREA

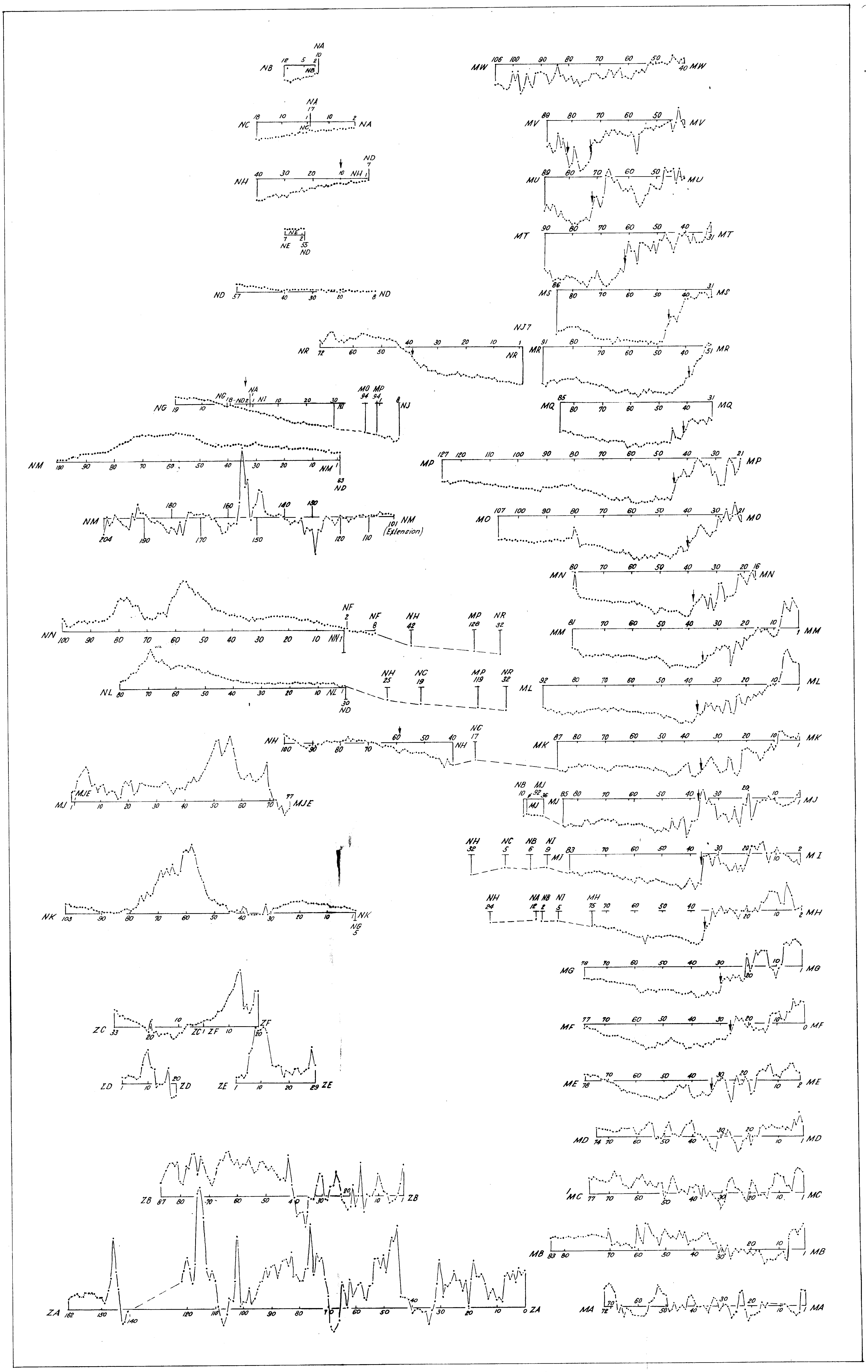
MAGNETIC
VERTICAL FORCE PROFILES

G59-6

Geophysical Section, Bureau of Mineral Resources Geology & Geophysics

To Accompany Record No 1961-158

PLATE 6



SCALES

Horizontal 1,000 0 1,000 2,000 3,000 Feet

Vertical 1,000 0 1,000 2,000 3,000 Gammas

Arrow indicates Boundary of Magnetic Anomaly

H. A. Doyle
Geophysicist
19 · 12 · 50

GEOPHYSICAL SURVEY AT MOUNT MORGAN, QLD

MOONMERA AREA

MAGNETIC VERTICAL FORCE PROFILES

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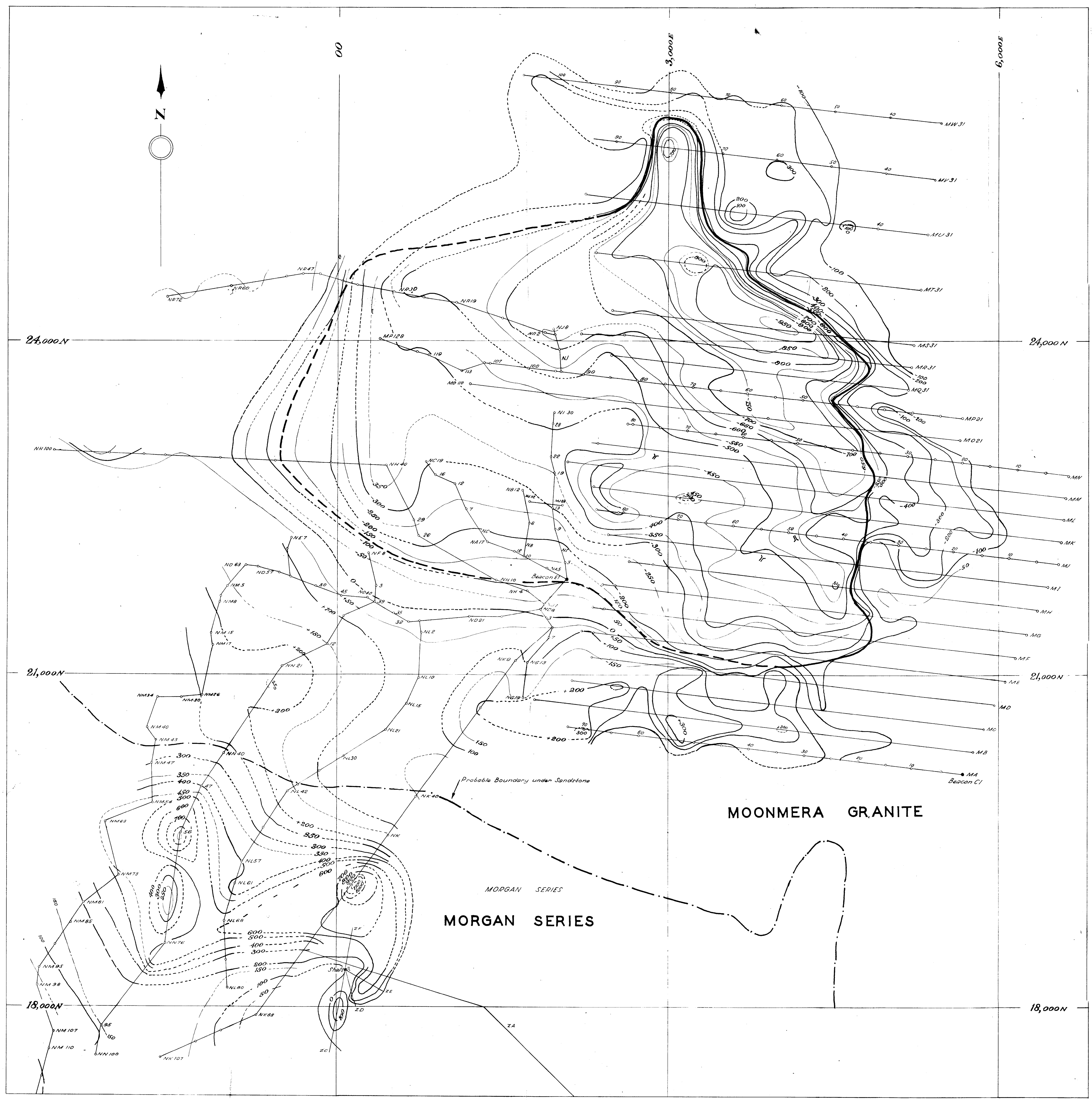
G59-9

To Accompany Record No. 1961-158

PLATE 7



LEGEND

Boundary of Magnetic Anomaly
Probable Boundary of Magnetic Anomaly
Geological Boundary
Geophysical Traverse
18,000N Mine Grid Co-ordinate

SCALE

400 0 400 800 1200 1600 Feet

N. Boyle
Geophysicist
19.12.50

GEOPHYSICAL SURVEY AT MOUNT MORGAN, QLD

MOONMERA AREA

SHOWING

GEOPHYSICAL LAYOUT & MAGNETIC VERTICAL FORCE CONTOURS.

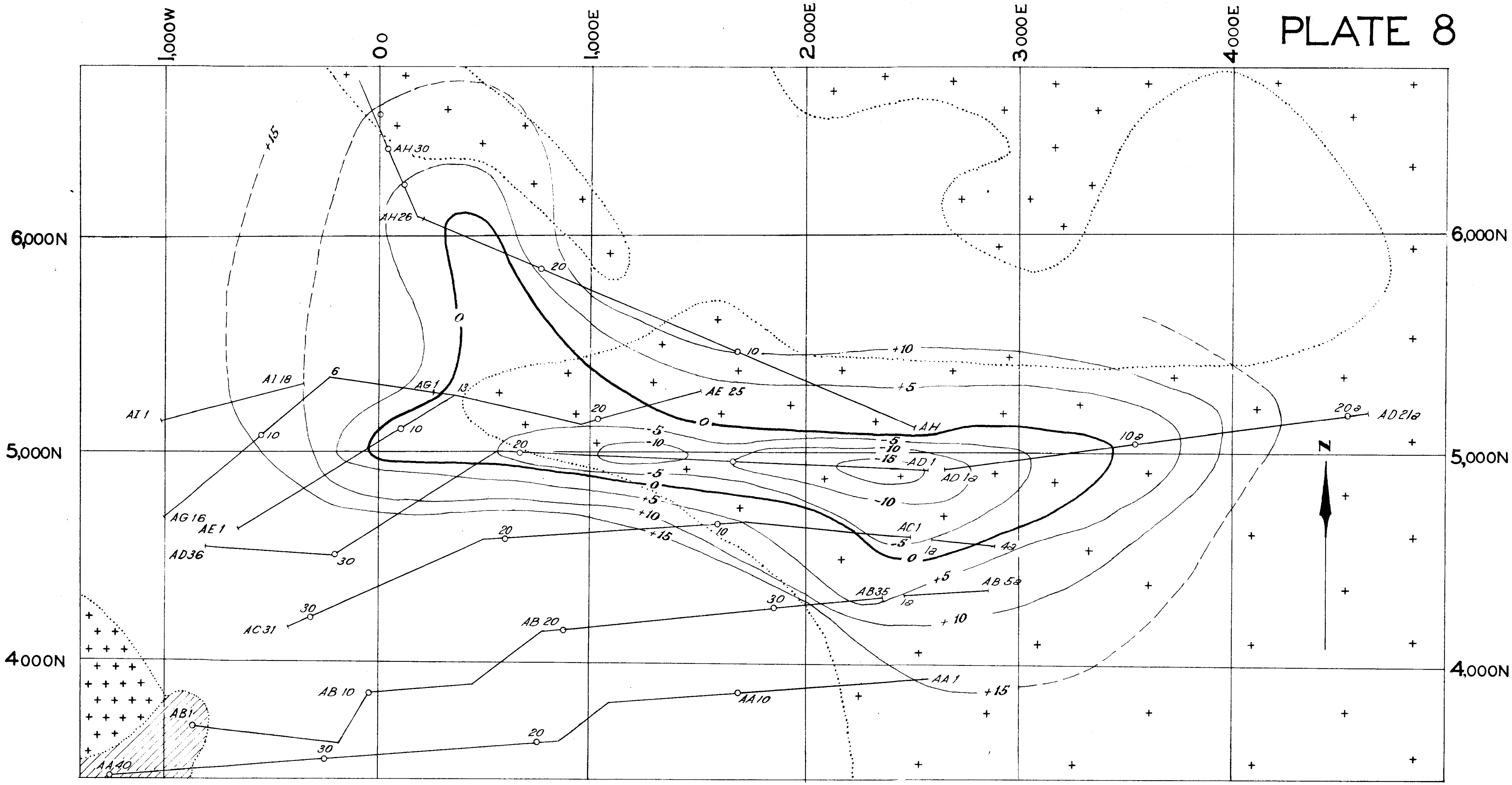
PREPARED FROM SMOOTHED PROFILES. CONTOUR INTERVAL 50 OR 100 γ

G59-4

Geophysical Section, Bureau of Mineral Resources Geology & Geophysics.

To Accompany Record No. 1961-158

PLATE 8



LEGEND

Morgan Series
Town Granite
Mt Morgan Granite
Mesozoic Sandstone
Geological Boundary
4000 N Mine Grid Co-ordinate

SCALE

400 0 400 800 1200 Feet

Contour Interval 5 Millivolts

H. A. Doyle
Geophysicist
19.12.50

GEOPHYSICAL SURVEY AT MOUNT MORGAN, QLD

MINE AREA

SELF-POTENTIAL ANOMALY

G59-8

Geophysical Section, Bureau of Mineral Resources Geology & Geophysics.

To Accompany Record No 1961-158