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1959, NO. 1

GEOPHYSICAL SURVEY OF NYMAGEE COPPER FIELD, NEW SOUTH WALES

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by

W.H. OLDHAM

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FOREWORD

The survey described in this report was carried out in 1948 at the request of North Broken Hill Ltd. The results were made available immediately to the Company which, however, relinquished the area soon after the completion of the geophysical survey and before a final report on the work could be prepared. It has now been decided to issue the report as a permanent record of the work carried out.

ABSTRACT.

At the request of North Broken Hill Ltd., the Bureau of Mineral Resources carried out a geophysical survey, using the magnetic and self-potential methods over and near a known copper ore-body at Nymagee, N.S.W. The ore body is a sulphide one, containing pyrrhotite and magnetite.

Both methods revealed well-defined anomalies coinciding in position with the known main ore body, and showed that the methods are suited to the search for similar deposits in the area. No indications were observed in the surveyed areas where it could be attributed to a deposit previously unknown.

1. INTRODUCTION.

Nymagee is situated in Central New South Wales, fifty miles south-east of Cobar and forty-five miles south of Hermidale, the nearest railway station. Copper was discovered at Nymagee in 1880 and mining took place during various periods from then until 1916. The recorded production from the Nymagee Copper Mine is 422,630 tons ore which yielded 24,408 tons of copper (Kenny, 1923). It is stated that considerable tonnages of ore of low grade are still available in the upper levels of the mine.

During 1948, the North Broken Hill Company commenced an examination of the area and the Bureau was asked to carry out geophysical surveys over an area surrounding the known deposits.

2. GEOLOGY

The geology of the Nymagee mine has been described in various official publications of the N.S.W. Department of Mines, notably that by Carne (1908). A brief summary given by Kenny (1923) is sufficient for the present purpose.

The Nymagee lode occurs in rocks of sandy slate, which resemble those of the Cobar district. These rocks crop out on a minor hill on which, also, the copper lode crops out. The strike of the mineralisation is about 343 degrees magnetic. For some miles north and south of the hill referred to, the topography is flat and there are few outcrops.

The main copper lode dips almost vertically. The mineralisation is similar in type to that of the Great Cobar Copper Mine, and contains chalcopyrite, pyrite, pyrrhotite and some magnetite. The width of the lode stoped averaged about 20 feet, and the length of the main lens is about 700 feet. It has been mined to a depth of 800 feet. A smaller body of copper ore lies to the south of the main lens and has been tested by mining to a depth of 600 feet. Several prospecting shafts were unk to the north of the main lens, apparently with unsuccessful results.

3. OUTLINE OF OPERATIONS.

Geophysical work commenced in June, 1948, and terminated in December, 1948. The pegging of traverses was carried out by Messrs. P. Braham and L. Rosenbrock, of North Broken Hill Ltd. The early operations were confined to magnetic surveys employing Watts vertical force variometers Nos. 57139 and 57140, the property of North Broken Hill Ltd. The work was carried out by W.H. Oldham, geophysicist. Later, when the party was strengthened by the arrival of W.G. Morgan, geophysicist, the self-potential method was used also. The field work was under the supervision of L.A. Richardson, Superintending Geophysicist.

4. CHOICE OF METHODS.

In common with most of the ore bodies of the Cobar field, the known orebody at Nymagee is a sulphide body, containing pyrrhotite and magnetite. There is no reason to expect that the country rock contains magnetic minerals. It would be expected, therefore, that undiscovered ore bodies, if any exist, might give rise to magnetic anomalies, and, if

they reach ground-water level, to self-potential anomalies. For this reason, magnetic and self-potential methods were used in the survey.

5. RESULTS OF SURVEY

(a) Magnetic Survey.

This method was applied in detail over the area of known ore occurrence and later was extended, in a less detailed manner, for a distance of about 1½ miles to the north and one mile to the south. The positions of the traverses are shown on Plate 1, which also shows the main surface features of the area. The survey over the area of known occurrence could not be completed due to the presence of slag, which is strongly magnetic.

The profiles show numerous slight irregularities, especially on the soil-covered and alluviated parts. Most of the minor irregularities may be attributed to small concentrations of magnetic material in the alluvium, and are therefore of no significance as indicators of ore-bodies.

The magnetic results are shown as contours of vertical intensity on plate I, over the features of the area where profiles were regular enough to permit of contouring. The outstanding feature of the results is the well-defined anomaly extending from traverse 400N to traverse 1200N. The relation of this anomaly to the known mineralisation is shown on Plate 2. It will be noted that the position of the axis of the anomaly agrees closely with the position in plan of the main copper ore-body. Due to the presence of slag, the complete form of this anomaly could not be determined and the survey is therefore incomplete in the vicinity of the southern lens near the Office shaft and Hardie's shaft.

It seems clear that the magnetic anomaly is due entirely to the mineralisation forming, or associated with, the known Nymagee Copper Lode. It is of considerable interest as a demonstration of the manner in which magnetic surveys may detect the presence of an orebody in this field. The form of the anomaly suggests that the top of the body causing it is at a depth of about 150 feet, and therefore just below the oxidised zone. This estimate of depth is in accordance with expectations, because the oxidised products would probably be relatively non-magnetic.

The weak anomaly centred at 2000N/100W is near old shaft workings and the anomaly suggests the possible existence of a magnetic body of very limited extent. At 2800N/1700W there is a slightly increased intensity, but the significance of this feature is uncertain because of the presence of irregularities of shallow-seated origin.

Apart from the anomalies mentioned, the magnetic survey results show no features which could reasonably be attributed to magnetic bodies of economic interest.

(b) Self-Potential Surveys

This method was applied in detail over the area of the known occurrence and in less detailed manner for some distance to the north and south. The potential measurements were not as seriously affected by the slag as were the magnetic

ones and consequently the self-potential survey could be performed over the whole area of known occurrences. The results are shown as contours on Plate 3.

A well-defined S.P. anomaly was found near the main lens, and Plate 4 shows the position of the axis of this anomaly in relation to the mine workings. Minor anomalies were recorded at the other known mineralised zones to the north and south of the main lens. There is also an anomaly of low intensity and indefinite form to the south of the Mine Dam.

The S.P. results in the area to the south of the main lens suggest that there are two sulphide bodies, one corresponding to the lens which has been mined from the Office and Hardie's shafts and the other about 250 ft. to the north-east, corresponding, perhaps, to a smaller lens which has been mined from a small open-cut. The S.P. evidence at the northern end of the surveyed area is similar to that of the magnetic survey in that an anomaly of low intensity and limited extent is present near the old prospecting shafts.

The indefinite anomaly near the Mine Dam is on alluviated ground and could be due to a sulphide body.

6. CONCLUSIONS

Magnetic and self-potential surveys over areas of known mineral occurrence at Nymagee have revealed the existence of definite anomalies which can safely be attributed to sulphide bodies forming, or associated with copper ore. The extension of the survey 1½ miles to the north and one mile to the south over alluviated areas failed to reveal other anomalies likely to indicate worthwhile prospecting targets.

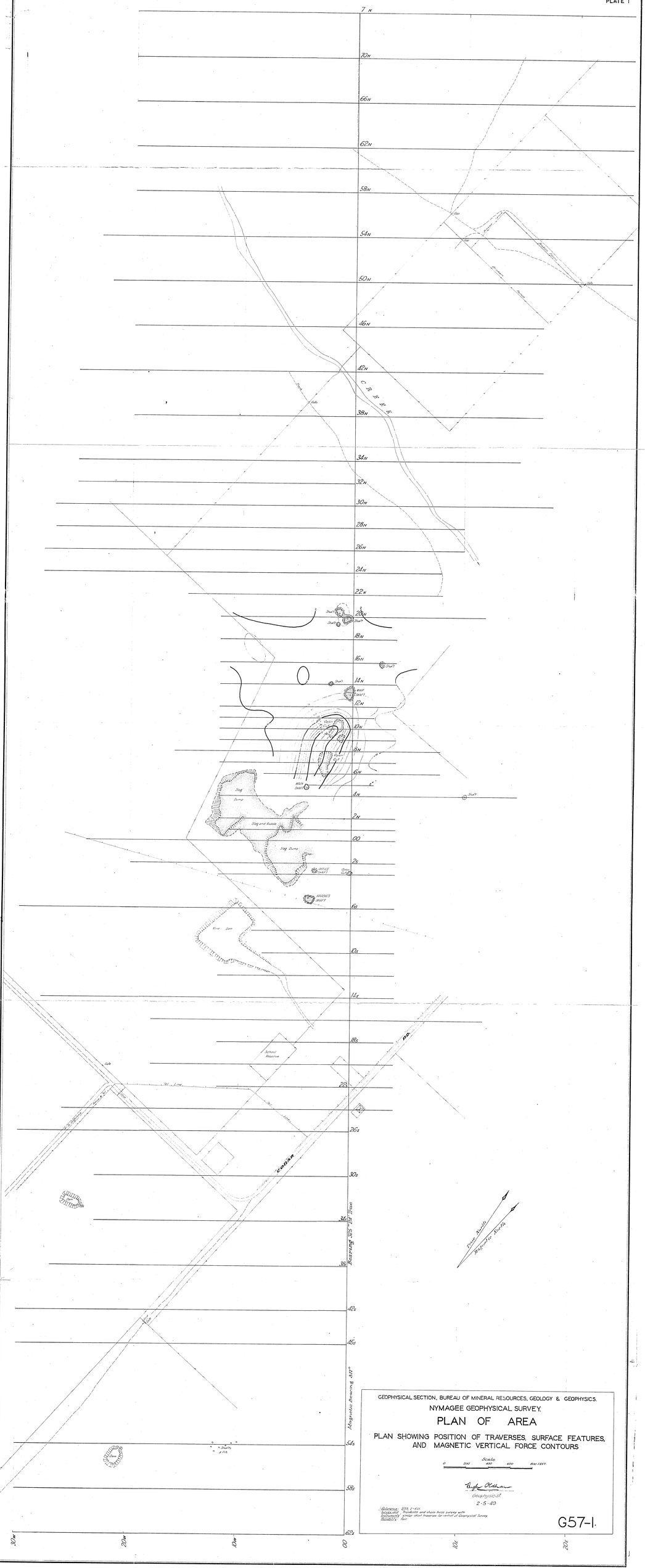
Well pronounced anomalies were obtained over the main Nymagee ore-body, which showed that the magnetic and self-potential methods of geophysical survey are well suited to the search for additional deposits of like nature. It appears that an airborne magnetometer survey of the field followed by self-potential surveys over any anomalies detected offers reasonable prospects of discovering orebodies similar to the Nmyagee lode, if any such exist.

7. BIBLIOGRAPHY

Carne, J.E., 1908 - The Copper Mining Industry in New South Wales. New South Wales Mines Dept. Min. Resour. 6 (2nd. Ed.)

Kenny, E.J., 1923 - Copper. New South Wales Mines Dept. Bull.3

PLATE I



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

NYMAGEE GEOPHYSICAL SURVEY.

PLAN OF AREA

PLAN SHOWING POSITION OF TRAVERSES, SURFACE FEATURES, AND MAGNETIC VERTICAL FORCE CONTOURS

Scale
0 200 400 600 800 FEET.

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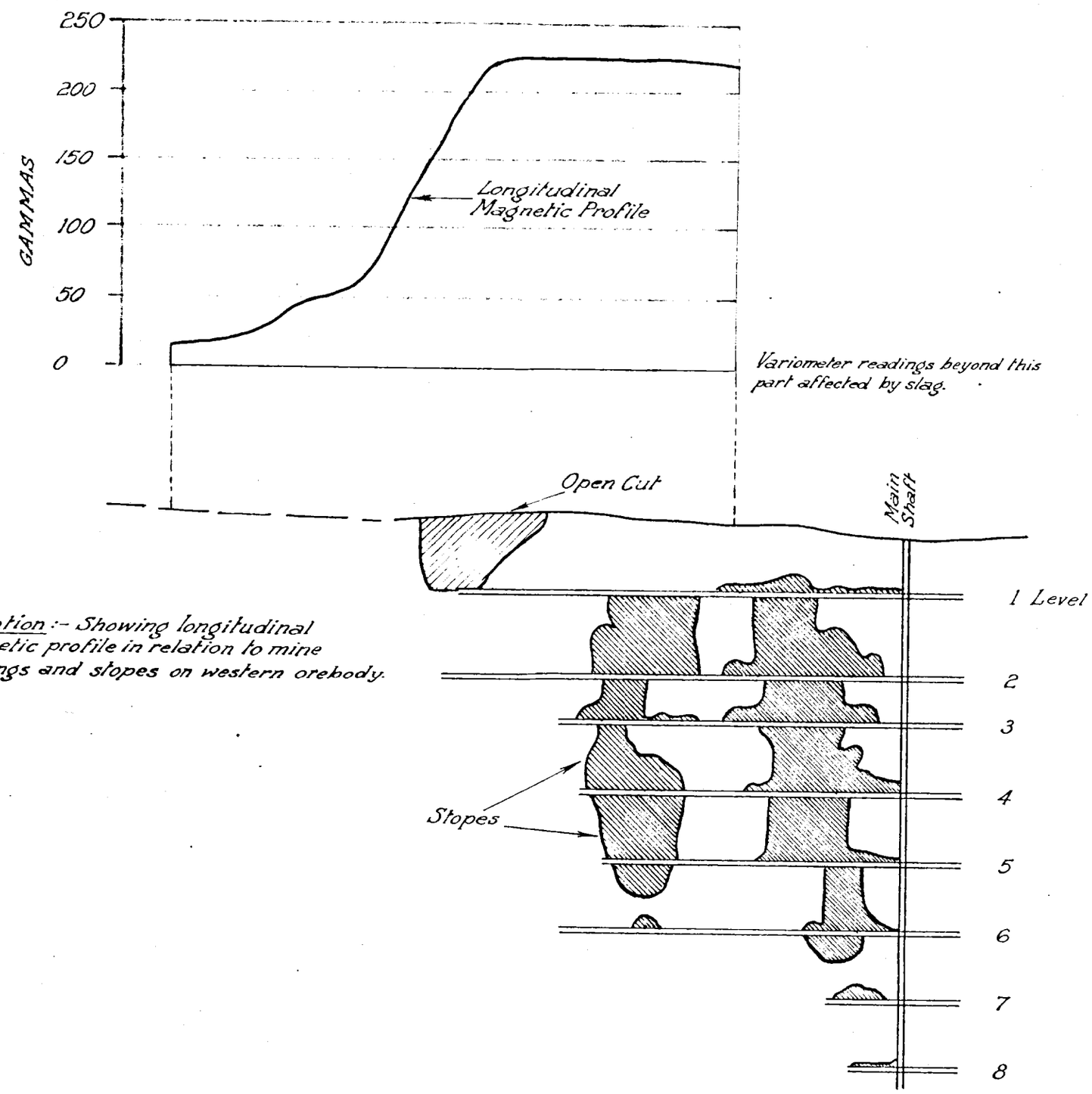
2·5·49

Reference: I/55, 2-621.
Survey and Instruments: Theodolite and chain base survey with similar offset traverses for control of Geophysical Survey.
Reliability: Fair.

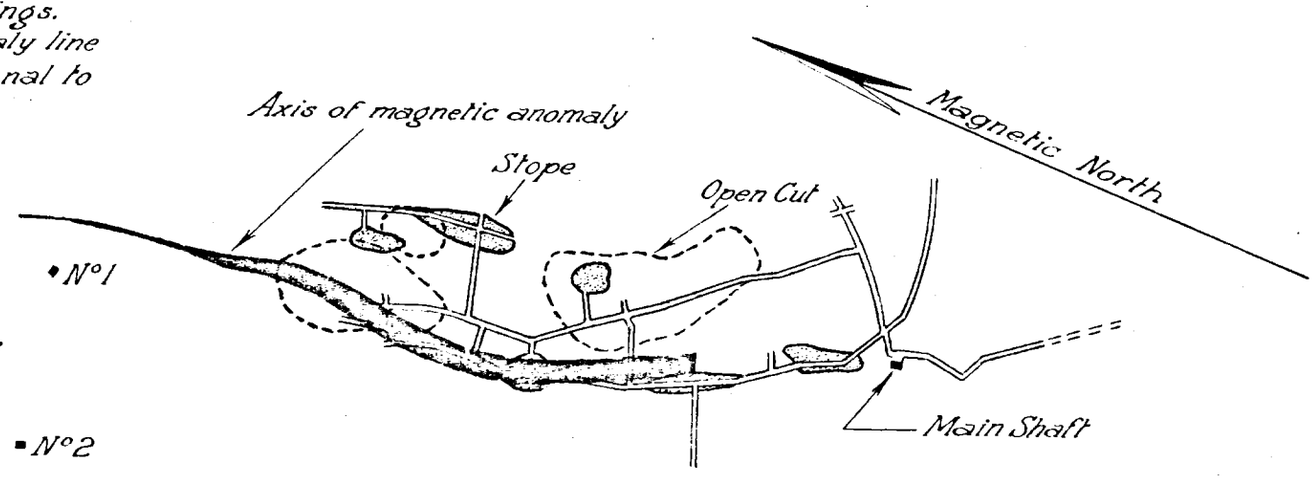
G57-I.

PLATE 2



Elevation :- Showing longitudinal magnetic profile in relation to mine workings and stopes on western orebody.

Plan :- Showing axis of magnetic anomaly in relation to mine workings.
Note :- Thickness of anomaly line approximately proportional to intensity of anomaly.



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0 100 200 400 600 800 1000 Feet

NYMAGEE GEOPHYSICAL SURVEY

Diagrams showing relation between Magnetic Anomaly and known Mineralisation.

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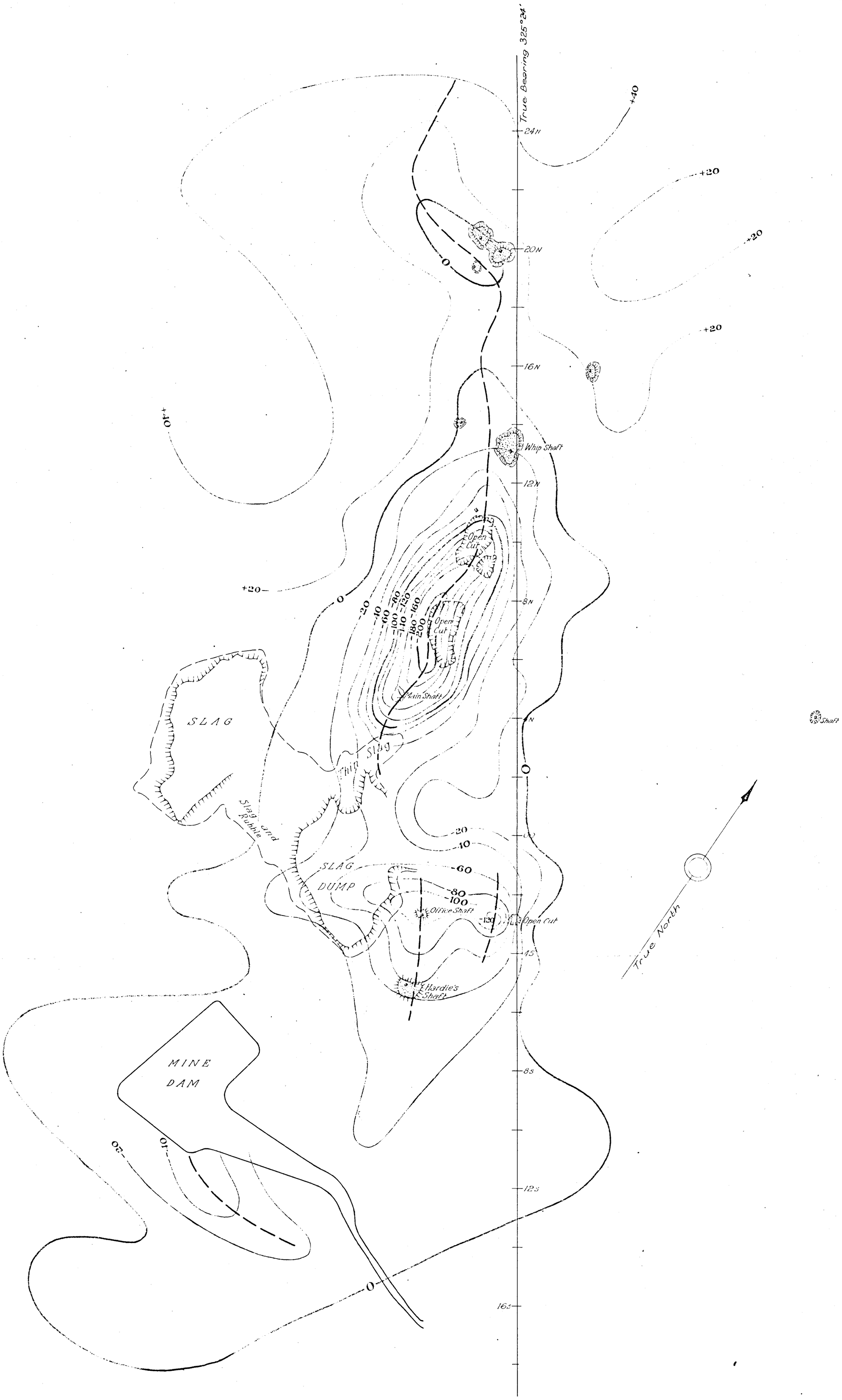
PLATE 3



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0 100 200 400 600 800 1000 Feet

Contour interval 20 Millivolts.
Axis of Anomalies shown - - - - — —

NYMAGEE GEOPHYSICAL SURVEY

SELF-POTENTIAL CONTOURS AND SURFACE FEATURES

G 57-6

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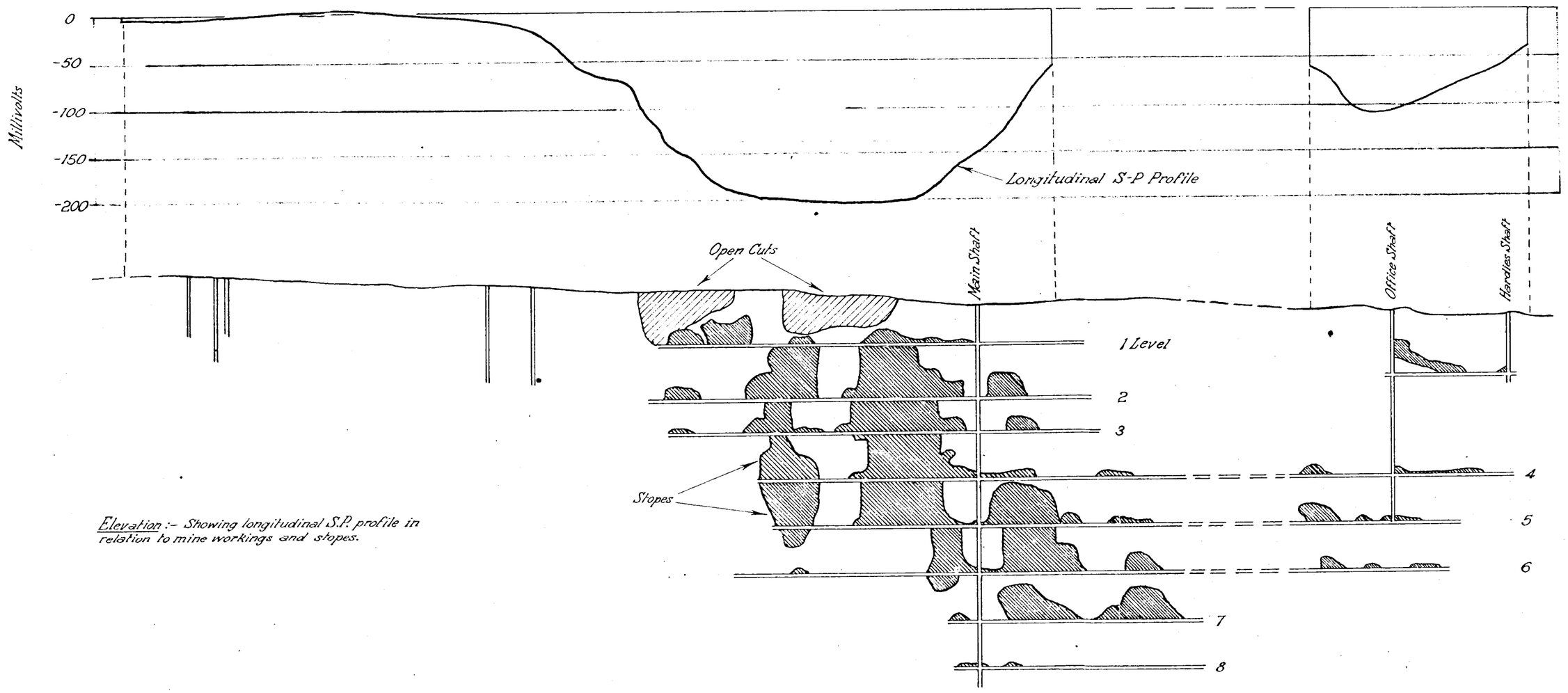
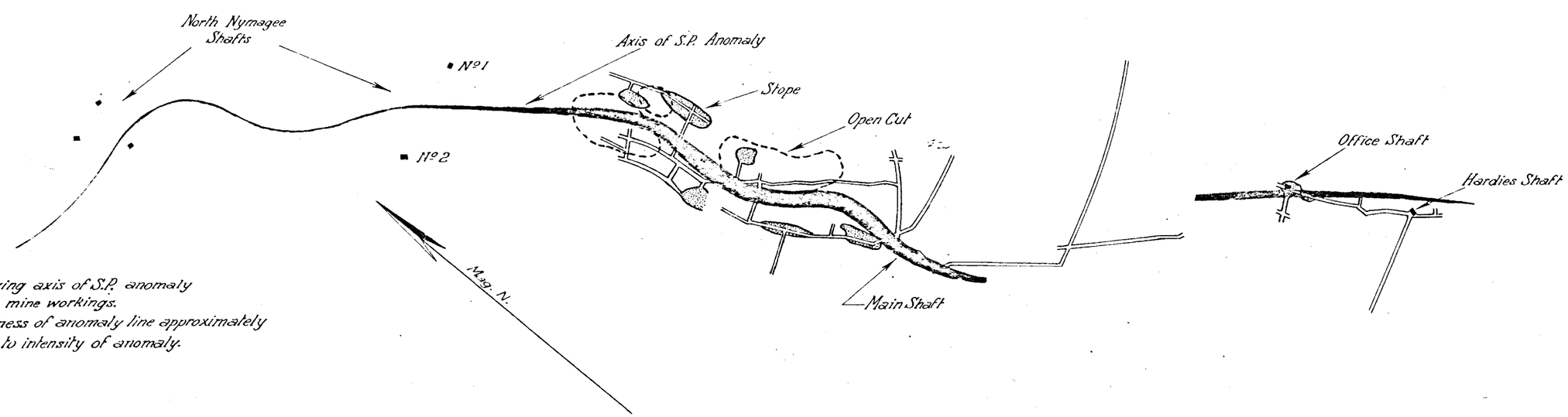


Elevation :- Showing longitudinal S.P. profile in relation to mine workings and stopes.



Plan :- Showing axis of S.P. anomaly in relation to mine workings.
Note :- Thickness of anomaly line approximately proportional to intensity of anomaly.

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Geophysicist.
2.5.49

0 200 400 600 800 1000 1200 Feet

NYMAGEE GEOPHYSICAL SURVEY

Diagrams showing relation between Self-Potential Anomalies and known Mineralisation.

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