

DEPARTMENT OF
MINERALS AND ENERGY



**BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS**

Record 1974/67

006543

DOWN-HOLE INDUCED POLARIZATION AND
ELECTRIC APPLIED POTENTIAL TESTS
AT BASIN CREEK NO. 1 PROSPECT, MEL 200, TUMUT,
N.S.W., 1973

by

R.D. Ogilvy



The information contained in this report has been obtained by the Department of Minerals and Energy as part of the policy of the Australian Government to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

Record 1974/67

DOWN-HOLE INDUCED POLARIZATION AND
ELECTRIC APPLIED POTENTIAL TESTS
AT BASIN CREEK NO. 1 PROSPECT, MEL 200, TUMUT,
N.S.W., 1973

by

R.D. Ogilvy

1

CONTENTS

	<u>Page</u>
SUMMARY	
1. INTRODUCTION	1
2. GEOLOGY	1
3. PREVIOUS GEOPHYSICAL INVESTIGATIONS	1
4. GEOPHYSICAL TECHNIQUES	2
4.1 IP Logging Method	2
4.2 Applied Potential Method	2
5. RESULTS	4
5.1 IP Logging	4
5.2 Applied Potential	7
6. CONCLUSIONS	11
7. REFERENCES	12

ILLUSTRATIONS

- Plate 1. Locality map.
- Plate 2. Surface plan of Basin Creek No. 1 Prospect, showing geology, grids and drillhole positions.
- Plate 3. IP, Single-point resistance, SP and gamma logs, DDH1.
- Plate 4. IP, SP and gamma logs, DDH5.
- Plate 5. IP, SP and gamma logs, DDH6.
- Plate 6. IP, Single-point resistance, SP and gamma logs, DDH8.
- Plate 7. Surface potentials with current source at drilling depth 190 ft. - 205 ft. in DDH1.
- Plate 8. Down-hole potentials with current source at drilling depth 190 ft. - 205 ft. in DDH1.
- Plate 9. Surface potentials with current source at drilling depth 245 ft. - 257 ft. in DDH8.
- Plate 10. Down-hole potentials with current source at drilling depth 245 ft. - 257 ft. in DDH8.
- Plate 11. Surface potentials with current source at drilling depth 437 ft. - 440 ft. in DDH8.
- Plate 12. Down-hole potentials with current source at drilling depth 437 ft. - 440 ft. in DDH8.
- Plate 13. Theoretical surface potentials.

SUMMARY

Between November 1972 and March 1973, the Bureau of Mineral Resources carried out several geophysical test surveys in A.O.G. Minerals Basin Creek No. 1 prospect, near Tumut in N.S.W. Down-hole induced polarization (IP), electrical, gamma-logging, and applied potential techniques were employed in selected drillholes. The work was primarily experimental, aimed at tracing the extent of massive chalcopyrite mineralization intersected by early drilling.

The down-hole IP logging was carried out in four drillholes, but owing to adverse geophysical conditions and instrumental problems, met with only limited success in detecting conductive and mineralized zones.

The applied potential technique involving measurements in three dimensions provided valuable information on the extent and structure of the mineralized zones investigated. Several prominent extensions to known mineralized zones were indicated and two drillholes have been recommended to test these findings.

The rugged terrain and the experimental nature of the applied potential survey did not permit more than a qualitative interpretation of results. Despite this, quite definite conclusions were obtained and the method's further development is recommended to assess the possibilities of more quantitative data evaluations.

1. INTRODUCTION

In co-operation with A.O.G. Minerals Pty Ltd, the Bureau of Mineral Resources carried out geophysical tests over the Basin Creek No. 1 prospect, within MEL200, near Tumut in New South Wales (Pl. 1).

Down-hole induced polarization (IP), electrical, and gamma-logging techniques were employed in selected drillholes. These and additional drillholes were subsequently used for a three-dimensional applied potential survey of the prospect to outline possible extensions to known mineralization and guide further exploratory drilling.

The work was carried out at suitable stages in conjunction with A.O.G.'s drilling program. In all, survey operations totalled 5 weeks in a period extending from 14 November 1972 to 31 March 1973.

2. GEOLOGY

The geology of the Basin Creek area, based on mapping by Nethery and Bailey, is presented in Plate 2. The rocks belong to the Tumut Pond Group. Chloritic phyllite, tuffaceous agglomerate, and medium to coarse-grained tuff are predominant and form part of a vertically dipping metasedimentary sequence. The basic volcanics and volcanic breccias, although conformable, are considered to be intrusive and possibly associated with the northern extensions of the Lobb's Hole-Talbingo ultrabasic belt.

Drilling shows both massive and disseminated sulphide mineralization to be closely associated with the intrusive volcanics and fine-grained chloritic phyllite. The mineralization appears to be of volcanogenic origin, with chalcopyrite the most abundant sulphide and only minor sphalerite, pyrite, and galena.

3. PREVIOUS GEOPHYSICAL INVESTIGATIONS

Previous geophysical work in the area includes a magnetic survey (Johnson, 1972) and an IP survey (Tyne, 1971). The magnetic survey proved useful in delineating structures, but owing to the small quantity of magnetite associated with chalcopyrite, found only a limited application in the direct detection of copper mineralization. The IP survey was successful in outlining broad zones of low-grade mineralization but failed to indicate any high-grade targets at depth. In particular the IP measurements did not indicate an anomaly to be associated with the high-grade massive sulphide mineralization

intersected by DDH1. In November 1972, BMR carried out Turam and transient electromagnetic (T.E.M.) measurements over the same sulphide intersection. Since no anomalous response was obtained, despite the relatively shallow depth of the sulphide intersection, the body is probably of small extent.

The failure of all conventional surface methods to record a diagnostic anomalous response over known massive sulphide mineralization led to the application of in-hole IP measurements and applied potential surveys in an attempt to trace extensions of mineralization.

4. GEOPHYSICAL TECHNIQUES

4.1 IP logging method

It was hoped that the down-hole IP measurements would extend the search for massive or disseminated sulphides to depths beyond the range of surface geophysics by detecting mineralization narrowly missed by drilling.

IP measurements were made using McPhar frequency domain equipment operating at 0.3Hz and 5Hz. Two logging probes were employed, one using 10-foot and the other 30-foot dipole-dipole electrode configurations. Down-hole readings were taken in both cases at 10-foot intervals. A detailed account of the method and instrumentation is given by Gillespie (1972).

Conventional S-P, single-point resistance, and gamma logging were also carried out to supplement the IP data and establish the physical properties of the rock formations.

4.2 Applied potential method

The applied potential technique was used in an attempt to establish the structure of known massive chalcopyrite mineralization encountered by drilling and to ascertain which of the different mineralized intersections were interconnected.

Theoretical considerations. The potential at the plane surface of a uniform semi-infinite isotropic earth due to a point source embedded in that earth is given by:

$$V =$$

$$\dots\dots\dots (1)$$

where V = voltage

= resistivity

I = current

r = distance to source

In an area of flat relief, therefore, the equipotential lines at the surface will form concentric circles around the point source. Departures from this response pattern would normally indicate the presence of a conductor.

In practice, a current electrode is earthed directly in the exposed mineralized body. In this way, the whole of a conducting body is energized and its various parts attain similar potentials. Mapping the resulting potential distribution at the surface, therefore, provides valuable information as to the body's overall shape, dip, and relationship to other mineralized zones in the area. A return current electrode is placed at some remote point such that its influence on the potential distribution in the area under investigation is negligible.

Field procedure. Three zones of mineralization were selected for detailed investigations with the applied potential method:

(1) A zone of high-grade massive chalcopryite, intersected between 190 feet and 205 feet in DDH 1.

(2) A similar zone of massive chalcopryite, intersected between 245 feet and 257 feet in DDH 8.

(3) A smaller zone of chalcopryite-hematite mineralization, intersected between 437 feet and 440 feet in DDH 8.

These conductive mineralized zones were energized successively and measurements made of the resulting surface potential distribution. In addition to this, measurements were made in ten drillholes to obtain a three-dimensional control over the potential distribution.

Surface potentials were observed at 50-foot intervals on grid lines originally used for the magnetic survey (see Pl. 2). The down-hole potentials were measured in millivolts per ampere of source current with respect to an arbitrary reference located at the observation point, M4/15.

The applied potential survey was carried out with the same equipment as was used for the IP measurements. The McPhar IP transmitter was used to pass commutated DC current between the down-hole and remote current electrodes. Surface and down-hole potentials were measured using the IP receiver. An S-P meter was connected to the receiver to allow corrections for S-P effects to be made, and to determine the polarity of the applied voltage. Porous pots filled with copper sulphate solution were used for receiving electrodes, necessitating the construction of a special probe for the down-hole measurements.

The down-hole current electrodes consisted of lengths of copper tubing positioned in the mineralized zones and connected to the IP transmitter by insulated cable. The remote electrode was about 800 m south of DDH 1.

Topographic limitations. As the observed voltage is inversely proportional to the distance from the source (equation 1), large topographic variations may introduce spurious potential gradients and distortions. The rugged relief of the Basin Creek area therefore, restricted the amount of information that could normally be derived from the mapping of surface potentials.

Although no practical terrain-correcting technique was available, theoretical potentials were computed using the exact distance of the observation point on the surface from the point current source in the drillhole. A comparison of the observed surface potentials with the theoretical contours provided a means to differentiate between potential distortions arising from possible topographic effects and those caused by subsurface zones of anomalous conductivity.

5. RESULTS

5.1 IP Logging

The down-hole IP results are presented in Plates 3, 4, 5, and 6, together with the results of the conventional S-P, single-point resistance, and gamma logs.

DDH 1. The hole was drilled to 497 feet but was accessible only to a depth of 215 feet. However, the low water-table level precluded electrical logging above 125 feet and therefore significant background variations could not be recorded. Despite this, the 10-foot dipole response does indicate a resistivity low of 10 ohm-metres in the massive sulphide zone encountered between drilling depths of 190 and 205 feet. Similar resistivity lows are associated with minor chalcopyrite and hematite-magnetite veining in phyllite, although they are not accompanied by marked rises in percentage frequency effects (P.F.E.'s). In the zone of massive mineralization, anomalous P.F.E.'s were recorded but had consistently negative values. Consequently metal factor values are not shown. Similar difficulties in measuring meaningful P.F.E.'s were experienced in DDH 5, DDH 6, and DDH 8. This problem is further discussed later.

The single-point resistance log correlated well with the dipole-dipole resistivity profile and known chalcopyrite mineralization. These data were valuable in

demonstrating that a strong resistivity contrast, in excess of 1:10, exists between the sulphide mineralization and the surrounding host rocks. The S-P log, run concurrently with the resistance log, shows anomalous troughs in the vicinity of the sulphide mineralization. These anomalous values may be attributed to metallic minerals undergoing oxidation, implying continuity of the mineralization to at least the base of oxidation.

The gamma log reveals only a limited correlation with the drillhole geology, but does indicate that the chloritic phyllite is more radioactive than the other lithological units encountered. It is interesting to note also that there is a marked absence of radioactivity associated with the massive chalcopryrite mineralization. A similar effect is evident in the gamma log of DDH 8.

DDH 5. This drillhole did not intersect any ore-grade mineralization. The IP profiles were generally flat, with only minor amplitude fluctuations. The frequency effect values were all generally less than 5%. A poorly defined resistivity low centred at 385 feet reflects the presence of minor chalcopryrite and sphalerite mineralization occurring as veinlets throughout the section 362 feet to 403 feet. As negative frequency effects were encountered with the 30-foot dipole probe, only the 10-foot dipole probe metal factor values are shown.

The S-P voltages did not show any diagnostic variations and background resistances were, in general, too high to record. The gamma log shows a slight yet distinctive change in intensity on passing from the coarse-grained tuff into the more radioactive phyllite.

The IP and S-P logs did not reveal any significant anomalies that could be ascribed to possible sulphide mineralization in the immediate proximity of DDH 5.

DDH 6. The results obtained with the 10-foot dipole probe show three distinct resistivity lows in association with moderate to high P.F.E. values. The corresponding metal factor anomalies are therefore thought to be indicative of sulphide mineralization, although the presence of mineralization is not apparent in the geological log. It seems probable that mineralization lies near the hole, but unfortunately it is not possible with the present mode of operation to ascertain in which direction. The 30-foot dipole measurements gave unreliable negative P.F.E.'s and were unable to substantiate these findings.

The S-P profile shows three ill-defined lows which correlate with the anomalous zones indicated by the IP measurements. The gamma log records a typically high level of gamma ray intensity in the chloritic phyllite but does

not exhibit any significant variations in the volcanic breccia or tuff.

DDH 8. This drillhole intersected massive chalcopyrite mineralization between 245 feet and 257 feet. A response to this is reflected by a distinct resistivity low of approximately 10 ohm-metres, in comparison with background resistivities of approximately 1000 ohm-metres as measured by the 10-foot dipole probe. The P.F.E. measurements, however, could not be accurately determined and were consistently negative in the massive chalcopyrite mineralization. Several other smaller IP/resistivity anomalies, such as the one at 437 feet, correlate reasonably well with scattered veinlets of chalcopyrite in the volcanic breccia sequence. A fairly broad resistivity low centred at about 120 feet cannot be explained by the geological log and the absence of anomalous P.F.E.'s downgrades the possibility of nearby conductive sulphides. The significance of the negative P.F.E.'s recorded with the 30-foot dipole probe in this zone is unknown.

The substantial resistivity contrast between the sulphides and surrounding wall rocks did not generally permit the use of the single-point resistance logger, which has a limited range of 0-200 ohms. This instrument was, however, modified for use in DDH 8 and the result is shown in Plate 6.

The S-P profile correlates moderately well with changes in lithology and shows typical troughs in the order of 100-200 mV over known mineralization. The gamma log records a fairly high level of radioactivity associated with the chloritic phyllite and a low level in the massive chalcopyrite. The significance of the absence of gamma ray activity in the zones of copper mineralization is unknown. This effect is worthy of further investigation as it may assist an understanding of the metallogenesis.

Discussion of the IP results

The down-hole IP measurements were only partly successful in detecting previously unknown zones of mineralization. The inability of the instrument to measure accurate P.F.E.'s in zones of massive chalcopyrite severely restricted its application and reliability. Difficulties were also experienced with high contact resistances and after logging DDH 8 further work with the IP equipment was discontinued.

A possible explanation for the negative P.F.E.'s may lie with the high conductivity of the copper mineralization. It was recognized in designing the equipment that inductive and capacitive coupling may exist

where current and potential cables are placed in the same hole (Gillespie, 1972). However, for most practical purposes and in a variety of mineralized environments, such coupling is negligible compared with the magnitude of the received signal - particularly for drillholes which encounter moderately resistive intersections of ore containing sphalerite or rock intervals which contain disseminated sulphides. In very low resistivity environments like those associated with the massive chalcopyrite in DDH 1 and DDH 8, inductive coupling may prevent the recording of meaningful readings. Further experimental work with the equipment is required to investigate this possibility.

5.2 Applied Potential

The applied potential results are presented as contour maps of surface and down-hole equipotentials (Pls 7 to 12). Theoretical surface potentials are presented in Plate 13.

Current electrode in DDH 1

Surface potentials: Plate 7 shows the potential distribution on the surface when current was introduced into the ore-grade mineralization encountered between 190 and 205 feet in DDH 1.

The outer equipotentials are elongated with a major axis striking about north-northwest. This correlates well with the known geological strike, but is not thought to represent a deeper extension of the sulphide zone. Possibly, the elongation reflects the presence of disseminated near-surface mineralization. Moreover, the potential values increase fairly rapidly in the immediate vicinity of the current electrode and the inner equipotentials become more circular. This shows that the mineralization richest in sulphide is relatively small, and that there are no prominent extensions of the mineralized zone.

The theoretical potentials (Pl. 13, Fig. 1) computed for the same point source contact in DDH 1 reveal that the slope of the terrain would normally displace the centre of the potential distribution at the surface some 50 feet northwards, this being the closest point to the source. A comparison with the observed equipotentials shows that this is not the case and suggests that the sulphide zone in DDH 1, although small, may have a minimum strike length of the order of 50 feet in a southerly direction, or alternatively extend vertically upwards towards the ground surface.

The distortion of the 500 mV/A contour near peg M6/13 (7N/2E) may be associated with the presence of a conductor not in electrical contact with the energized mineralization in DDH 1. The distortion does correlate well with a known conductive shear zone between pegs M6/13 and M6/15 (Pl. 2).

In view of the rugged terrain, no reliable information can be obtained from surface measurements on the dip or plunge of the sulphide zone.

Down-hole potentials: Plate 8 shows the equipotentials in the vertical plane through line M8 approximately 250 feet to the north and line 4.5 N approximately 170 feet to the south of DDH 1.

The equipotentials in the section through M8 do not centre around the massive chalcopryite in DDH 8, and this mineralization, therefore, is not in electrical contact with the mineralization in DDH 1. In addition, the mineralization in DDH 8 distorts the 150 mV/A contour in a manner expected of an unrelated conductive body by forcing the contour away from the mineralized zone. Instead the equipotential pattern centres roughly around the horizontal projection of the current electrode in DDH 1. In view of the low order of the potentials (only 450 mV/A) this potential maximum is not thought to represent a northerly extension of the sulphide zone in DDH 1 but can be explained as a simple geometrical effect.

Similarly the equipotentials in the vertical section through 4.5 N do not centre around any known mineralized horizon. In particular, the down-hole measurements indicate that the sulphides intersected in DDH 10 between 445 and 455 feet, although directly on strike, are not a continuation of the energized sulphide zone in DDH 1. These findings are of particular significance, since the geological evidence of a connection was ambiguous. The centre of the potential distribution appears to lie around a point at about 150 feet drill depth in DDH 5. This does not correspond to the horizontal projection of the current electrode and suggests a southerly updip extension of the mineralized zone in DDH 1. However, the low order of potentials measured in both vertical sections supports the conclusions drawn from surface observations, in that the ore-grade mineralization in DDH 1 does not extend far either to the north or south of its known location.

Current electrode in DDH 8 (upper mineralization)

Surface potentials: Plate 9 shows the equipotentials observed on the surface of the ground when current was introduced into the massive sulphide mineralization

intersected in DDH 8 between 245 and 257 feet.

The pattern is dominated by a strong elongated trend striking about north-northwest, and centred to the north of the mineralized intersection in DDH 8. The inner equipotentials are curved (convex to the west) and appear to reflect the shape of the mineralized zone. As indicated above the centre of this potential pattern does not coincide with the vertical projection of the current electrode as expected, but is displaced some 70 feet to the north-northeast. To a large extent this effect can be interpreted by simple geometrical considerations involving the severe slope of the terrain, as shown by Plate 13, Fig. 2. There are, however, no obvious surface conditions that would account for the observed elongation of the equipotential contours towards the north-northwest. This elongation is therefore attributed to a north-northwest extension of the mineralization.

Down-hole potentials: Plate 10 shows the potential distribution in the vertical plane through the traverse M8 (Fig. 2) and through the profile 10.5 N (Fig. 1) some 170 feet north of M8.

Figure 2 shows that the equipotential contours which surround the current source in DDH 8 are considerably elongated in the bedding-plane axis and are flattened along the horizontal axis. The pronounced ellipticity suggests that the mineralization is well developed in the bedding-plane axis and possibly along strike.

Structurally it appears the energized sulphide intersection in DDH 8 is related to the two small mineralized zones intersected in DDH 9 at depths of 650 feet and 677 feet. This is partly confirmed by the applied potential measurements, which, despite a potential gradient of about 1 V/A, do indicate a weak electrical continuity. Either side of this proposed mineralized zone, the potential values decrease rapidly, where country rocks of higher resistivity are encountered. Of particular significance is the marked change in potential gradient demonstrated by the increased spacing between the 2400 mV/A, 2200 mV/A, and 2000 mV/A countours. These equipotentials do not centre on the known sulphide intersection but reflect the presence of a broader conductive zone between drilling depths 100 and 247 feet. The IP measurements for this drillhole also indicate a broad unexplained resistivity low between 90 and 130 feet. These observations suggest that the massive sulphides intersected in DDH 8 could be part of a larger plunging sulphide mass located between DDH 8 and DDH 4. Such an interpretation would also be compatible with the surface distribution of potentials.

Figure 1 shows the equipotential pattern in the vertical plane through DDH 4 and provides additional evidence for the interpretation given above. The equipotential contours do not centre on the horizontal projection of the current electrode, as expected, but on a point about 80 feet uphole of this position. There is no indication of mineralization at this depth in DDH 4, but in view of the fairly high potentials, the mineralized horizon cannot fall far short of this point. A line connecting the potential distribution centres between the two vertical planes suggests a southerly plunge of between 15° and 20° with the horizontal.

Current electrode in DDH 8 (lower mineralization)

Surface potentials: Plate 11 shows the surface distribution of potentials when current was introduced into a small stringer of chalcopyrite mineralization intersected at a depth of 437 to 440 feet in DDH 8.

The equipotential distribution shows a similar pattern to that presented in Plate 9. The outer equipotentials, apparently unaffected by the energized zone of mineralization, are almost circular. The inner equipotentials however are curved (convex to the west) and have an elongated trend striking approximately north-northwest. The centre of the potentials potential distribution is displaced about 120 feet to the north of the vertical projection of the current electrode. This displacement is only partly explained as a geometrical effect caused by the slope of the terrain. Computed potentials, assuming a point source, indicate a possible shift downslope of 170 feet towards the northeast as shown in Plate 13, Fig. 3. It seems likely therefore that on the basis of surface measurements alone, the mineralization does extend northwards of the intersection in DDH 8.

Down-hole potentials: Plate 12 shows the equipotentials in the vertical plane through traverse M8 (Fig. 2) and through the profile 10.5 N (Fig. 1) about 170 feet to the north of M8.

The equipotentials in Figure 2 are elliptical, with a near vertical major axis passing through the current electrode. This suggests a thin vertically dipping conductive zone of mineralization. A similar pattern is evident in Figure 1. The potential maximum, however, does not correspond to the projection of the current electrode, but coincides exactly with a 5-foot wide mineralized zone intersected in DDH 4 at a depth of 360 feet. The horizontal projection of the current electrode is more than 70 feet away. Although the potential maximum is only 1.7 V/A, the

14

position of the centre strongly indicates that this mineralized section in DDH 4 has direct electrical continuity with the section in DDH 8, where the energizing electrode is situated, and fully supports the earlier conclusions, drawn from the surface observations, of an extended mineralized zone striking north-northwest.

The potential maxima in Figures 1 and 2 occur at depths of 437 feet and 360 feet respectively. This difference can be explained by assuming that the mineralized zone has a small plunge towards the south, in the order of 13° . It is interesting to note that in Figure 2 the 500 mV/A contour is noticeably distorted by the conductive sulphides encountered between 245 and 257 feet in the upper portion of DDH 8, showing that this is, as expected, an unrelated zone of mineralization.

Possible effects of anisotropy

The geophysical evidence indicates that the major extensions of the mineralized formations coincide with the strike and dip of the country rocks. It seems probable, however, that the elongation of the equipotentials, attributed to the influence of mineralization, may be due in part to a triaxial anisotropy in the barren country rock. This effect has not been fully investigated in the present survey, but in view of the large resistivity contrast between the host rocks and the conductive sulphides, the anisotropic effect should not detract significantly from the results.

6. CONCLUSIONS

The down-hole IP technique was partly successful in indicating conductive and mineralized zones, but because of adverse geophysical conditions and instrumental problems, found only a limited application in the present survey.

The applied potential measurements were found to be an effective tool for tracing the extent of the chalcopyrite mineralization. The ore-grade mineralization in DDH 1 was shown to be unrelated to the mineralized horizons in DDH 8 or DDH 9 and appears to be a relatively small occurrence with only a limited updip extension to the south. In contrast, the two mineralized zones in DDH 8 appear to have prominent extensions to the north of their present intersections.

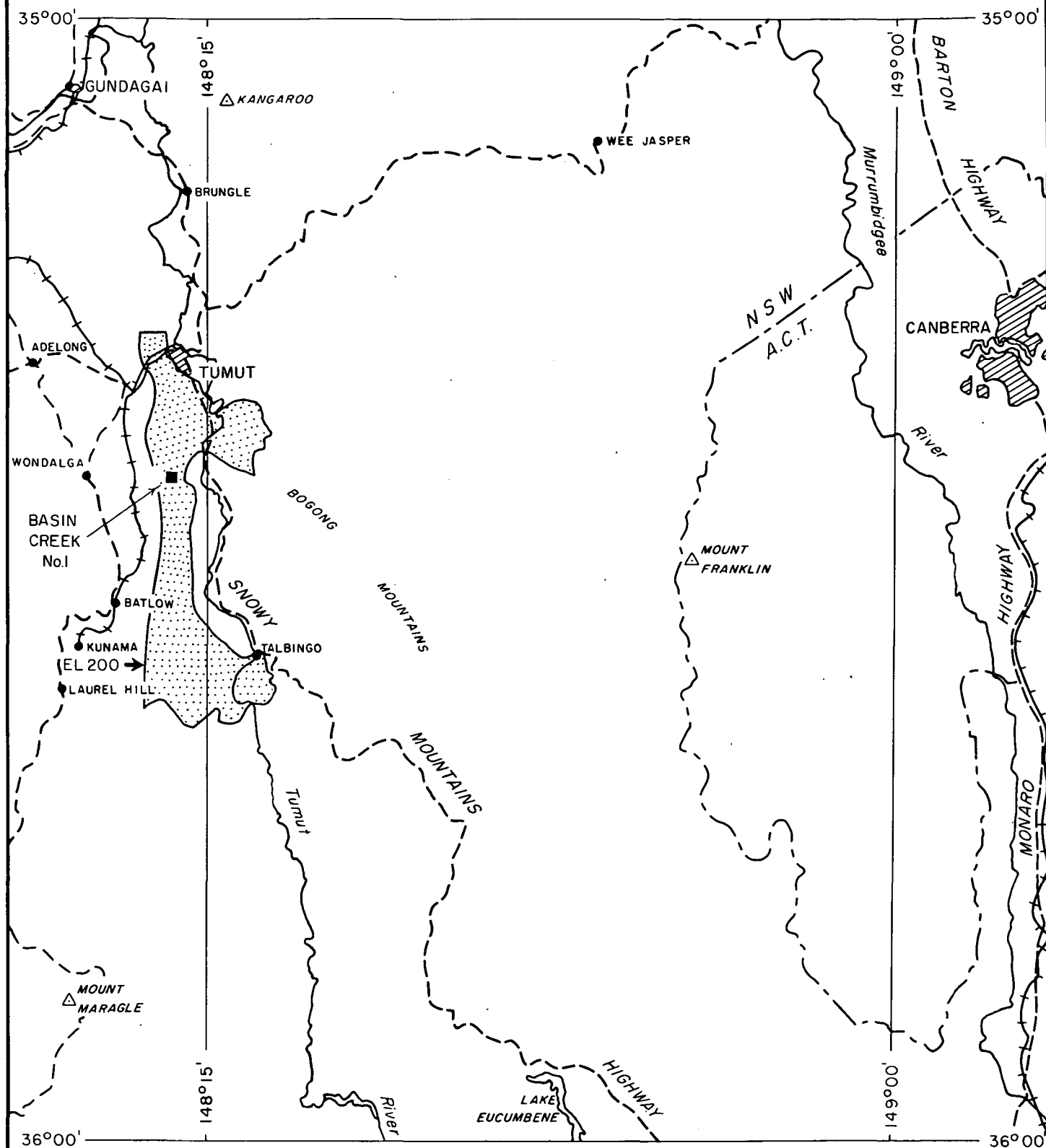
To test the proposed southerly extension of the massive chalcopyrite encountered by DDH 1, a drillhole should be sited not more than 50 feet to the south of DDH 1,

to intersect a target approximately 140 feet below the grid point 6 N/3.4 E. A suitable collar position for a drillhole of inclination 45° and bearing 242° would be at 6 N/4.8 E. A second drillhole sited at 9.8 N/6.4 E, inclined at 45° and with a bearing of 245° , would effectively test the postulated northerly extensions of the two main mineralized zones in DDH 8.

The rugged terrain and experimental nature of the measurements did not permit more than a qualitative evaluation of the applied potential data. Despite these limitations, quite definite results were obtained and it seems possible that with the further development and application of the method, quantitative interpretations may be carried out.

7. REFERENCES

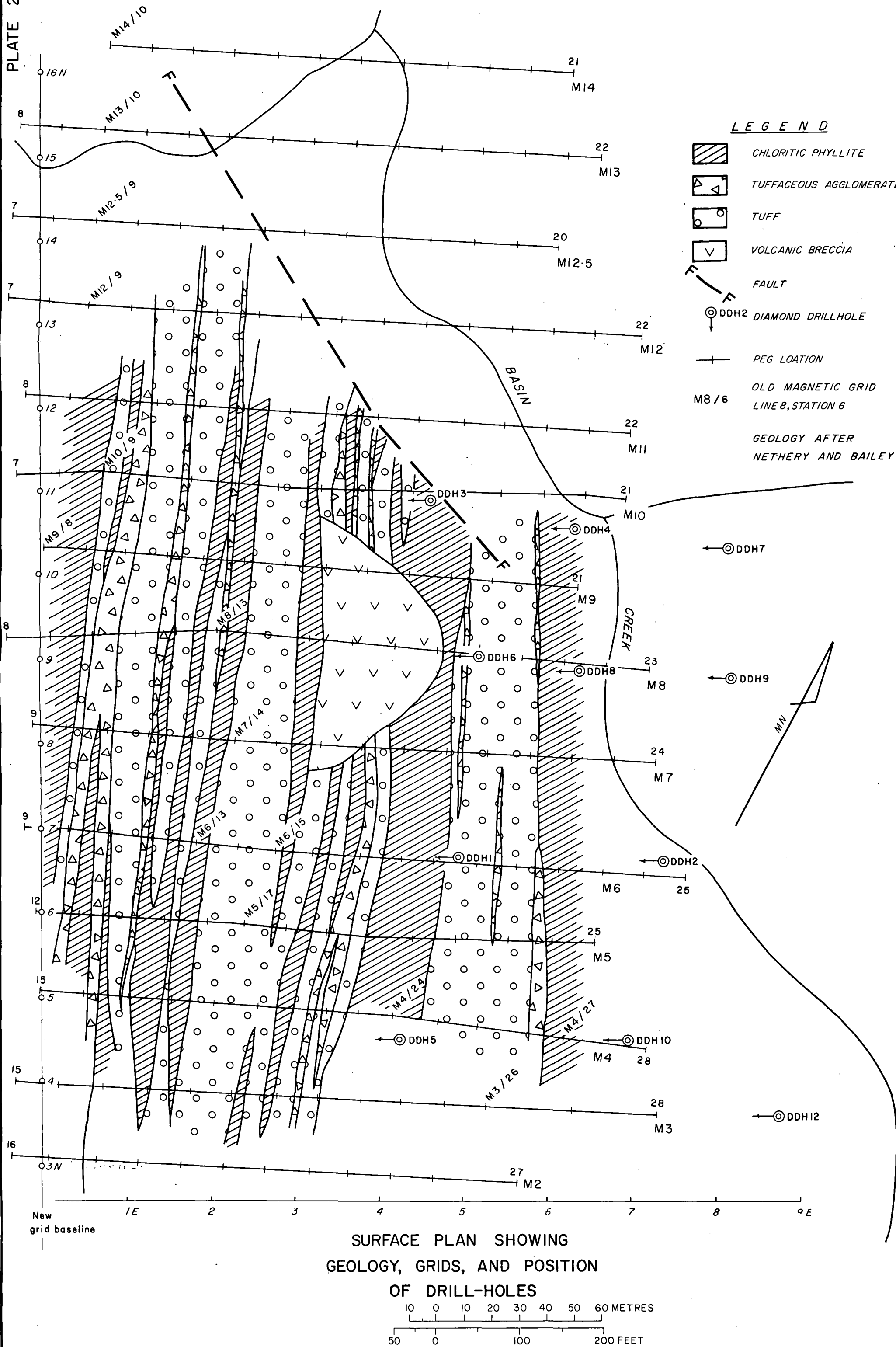
- GILLESPIE, P.J., 1972 - Down-hole induced polarization logging tests at Currawang, N.S.W. and Kowen Forest, A.C.T., 1971. Bur. Miner. Resour. Aust. Rec. 1972/29.
- JOHNSON, B.T., 1972 - Description and interpretation of surface magnetic survey, Basin Creek No. 1 Prospect, E.L. 200, Tumut, N.S.W. Rep. submitted to A.O.G. Minerals Pty Ltd, 29 May 1972 (unpublished).
- TYNE, E., 1971 - Induced polarization survey within MEL 200, near Tumut, N.S.W. Geol. Surv. N.S.W. Rep. No. GS 1971/722 (unpublished).

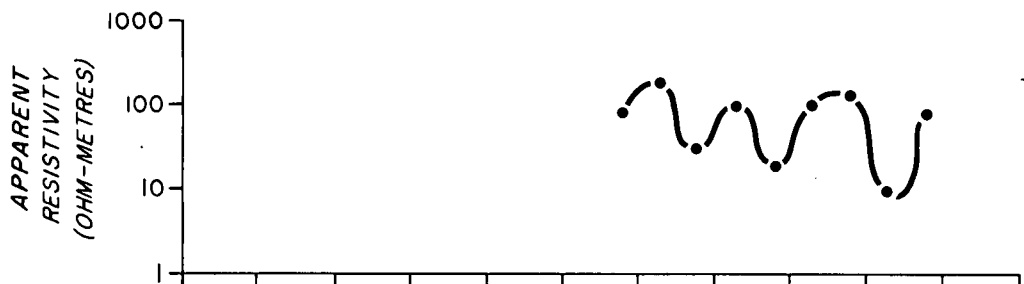
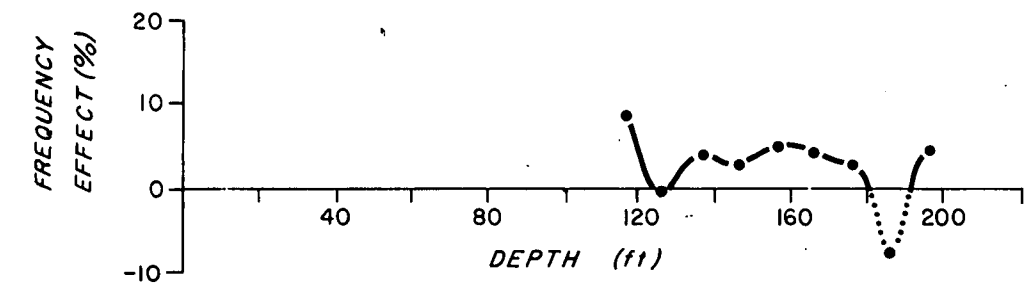


5 0 10 20 30
Kilometres

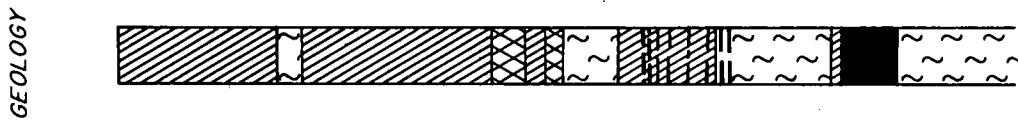
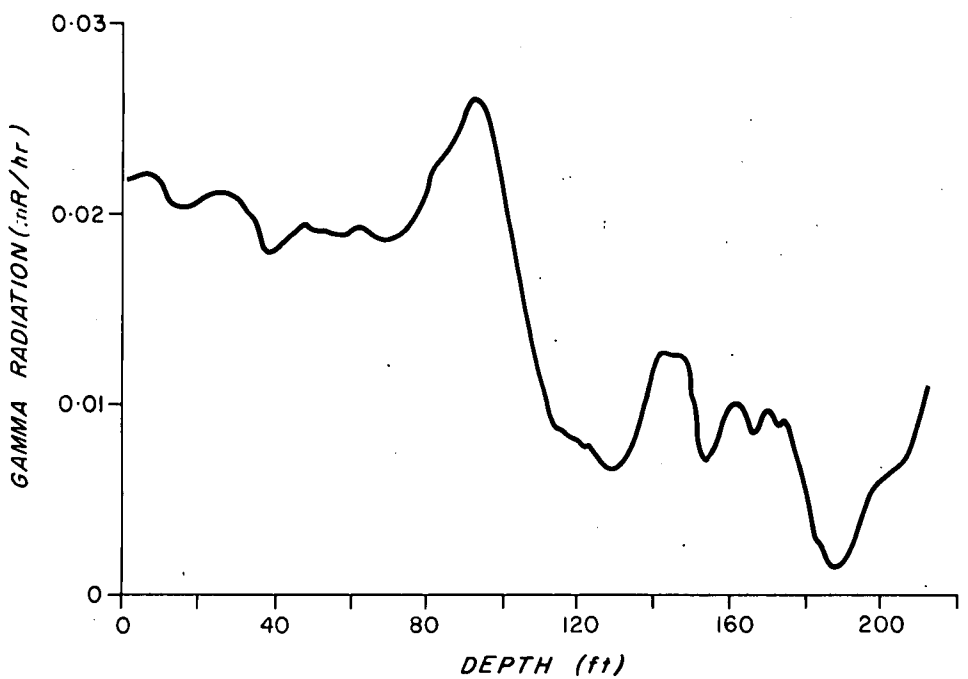
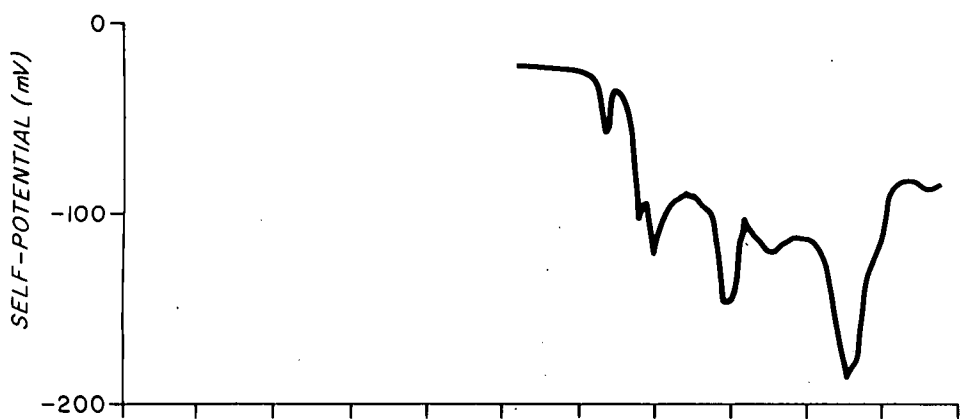
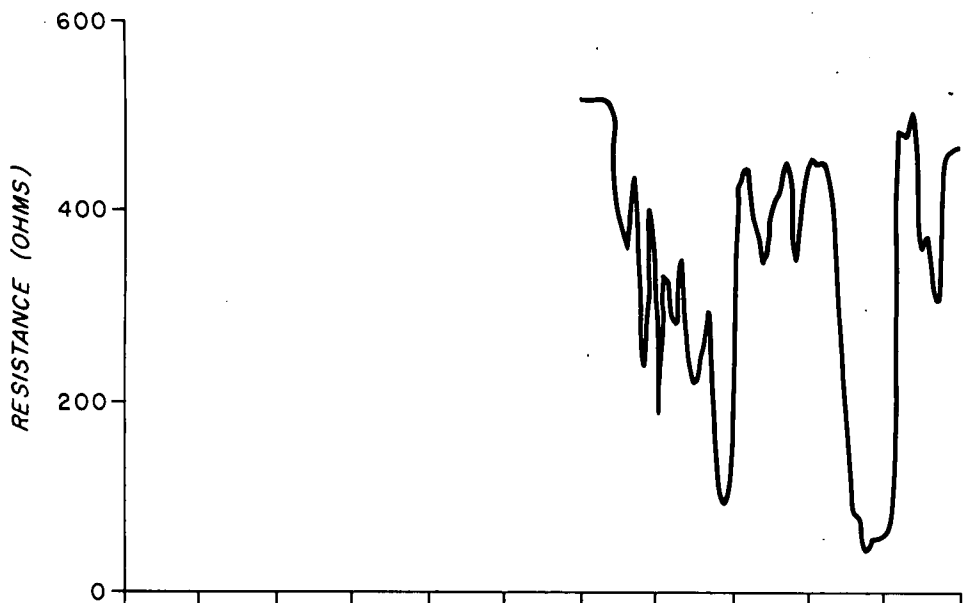
BASIN CREEK No. 1 PROSPECT
TUMAT, NSW 1973
LOCALITY MAP

17





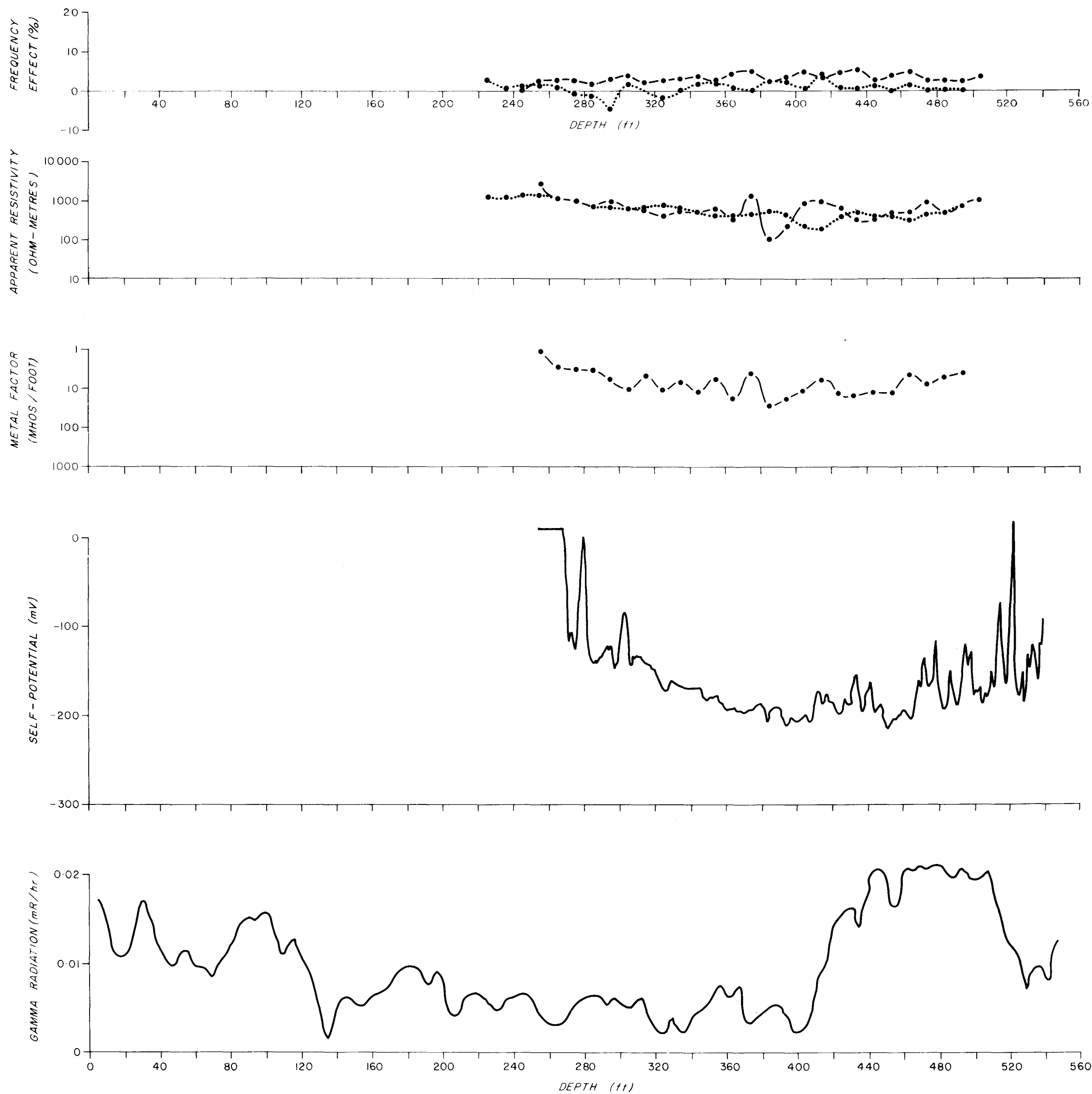
—•— 10' DIPOLE
30' DIPOLE READINGS NOT POSSIBLE OWING
TO INSUFFICIENT DEPTH OF DDH 1
..... INDICATES NEGATIVE P.F.E.



DDH 1
LOGGING RESULTS

LEGEND


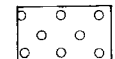

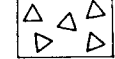

- PHYLLITE
- SCHIST
- SULPHIDES
- BRECCIATED ZONE
- MINOR CHALCOPYRITE
MAGNETITE HEMATITE VEINS



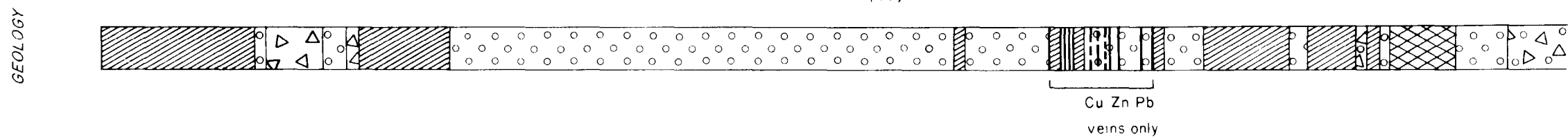
—•— 10' DIPOLE
 ...•... 30' DIPOLE

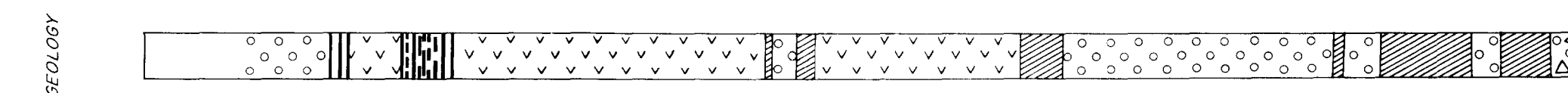
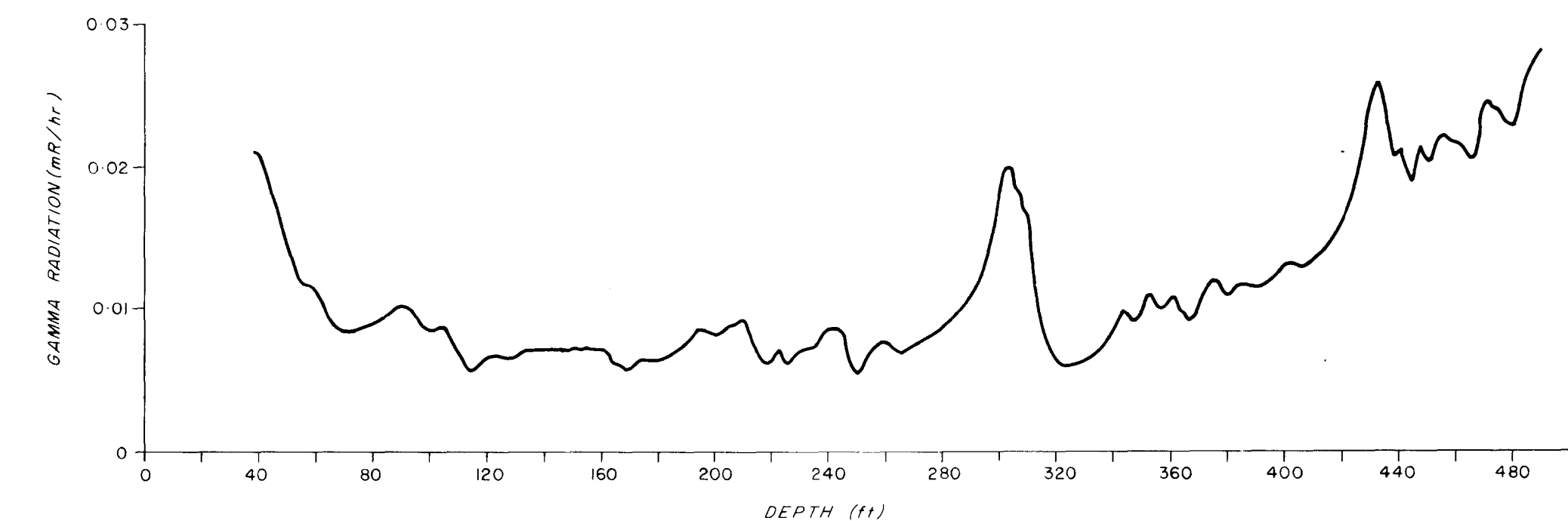
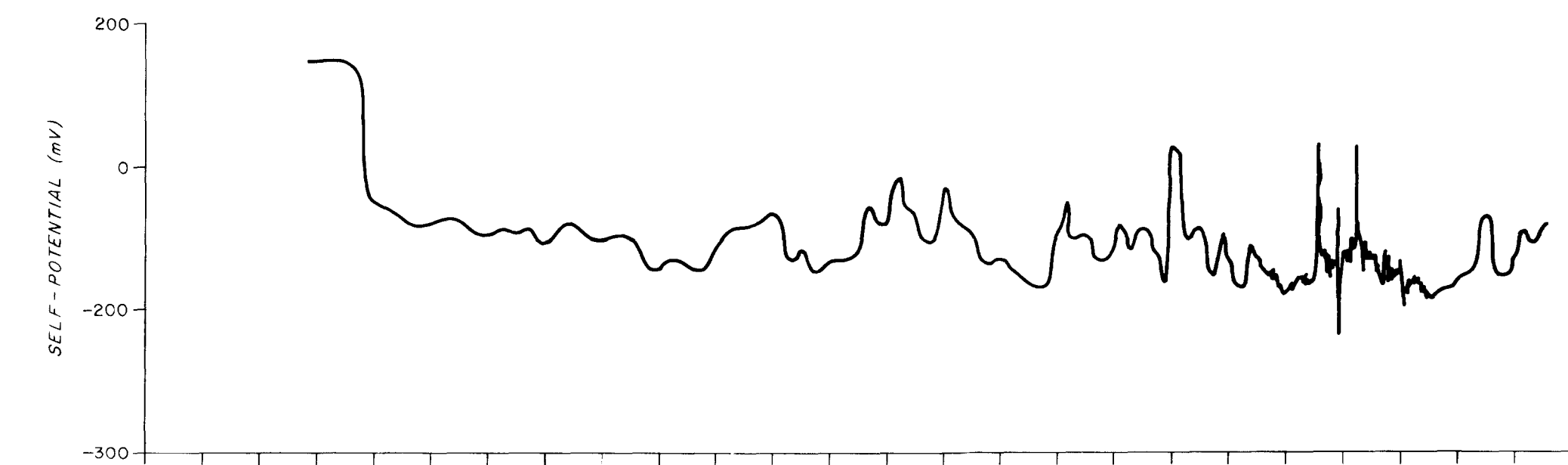
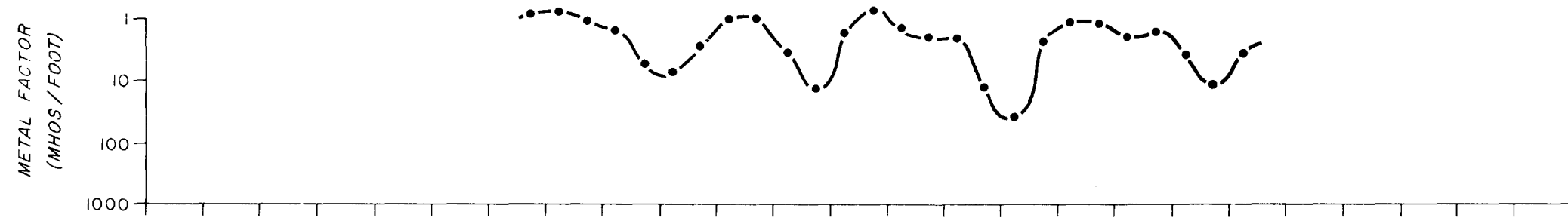
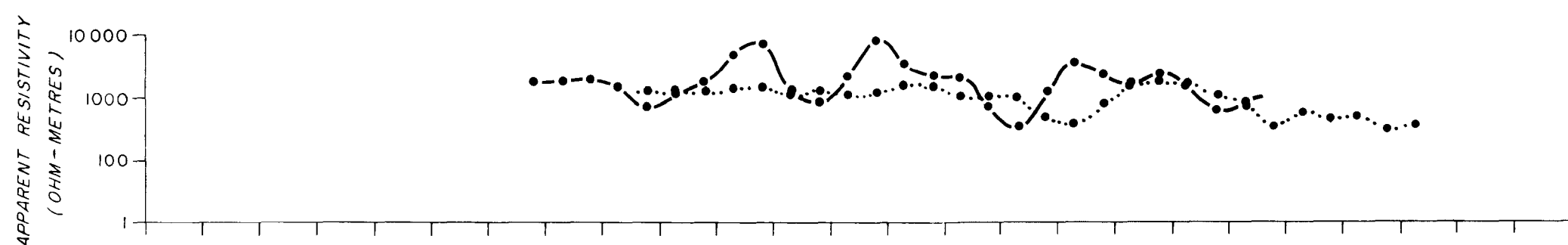
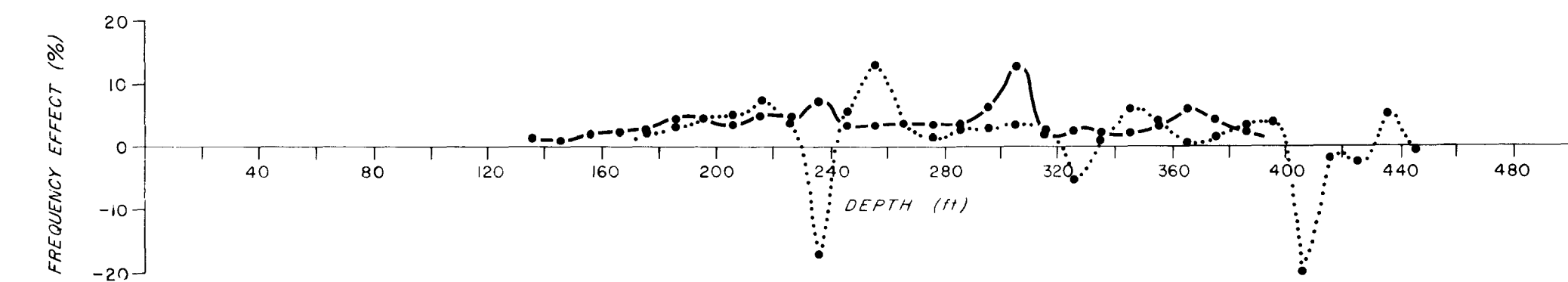
METAL FACTOR FOR 30'
 DIPOLE NOT PLOTTED OWING
 TO NEGATIVE P.F.E.'s

LEGEND

-  PHYLLITE
-  TUFF
-  MINOR SULPHIDES (VEINS ONLY)
-  AGGLOMERATE
-  BRECCIATED ZONE

DDH 5
 LOGGING RESULTS


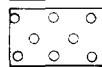

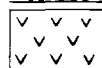
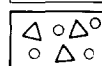




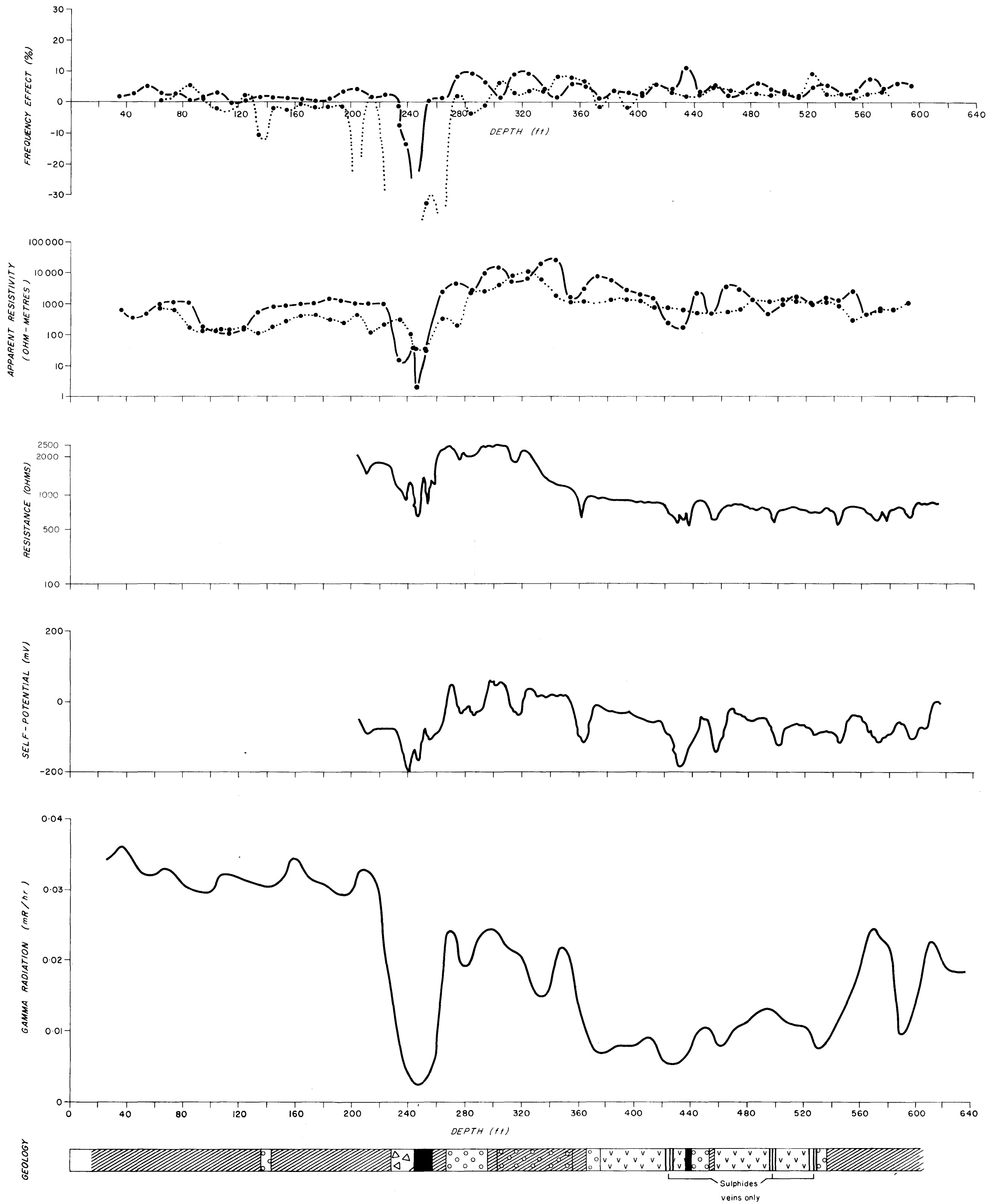
10' DIPOLE
30' DIPOLE

METAL FACTOR FOR 30'
DIPOLE NOT PLOTTED OWING
TO NEGATIVE P.F.E.'s

LEGEND

-  PHYLLITE
-  TUFF
-  DISSEMINATED SULPHIDES
-  VOLCANIC BRECCIA
-  CONGLOMERATE

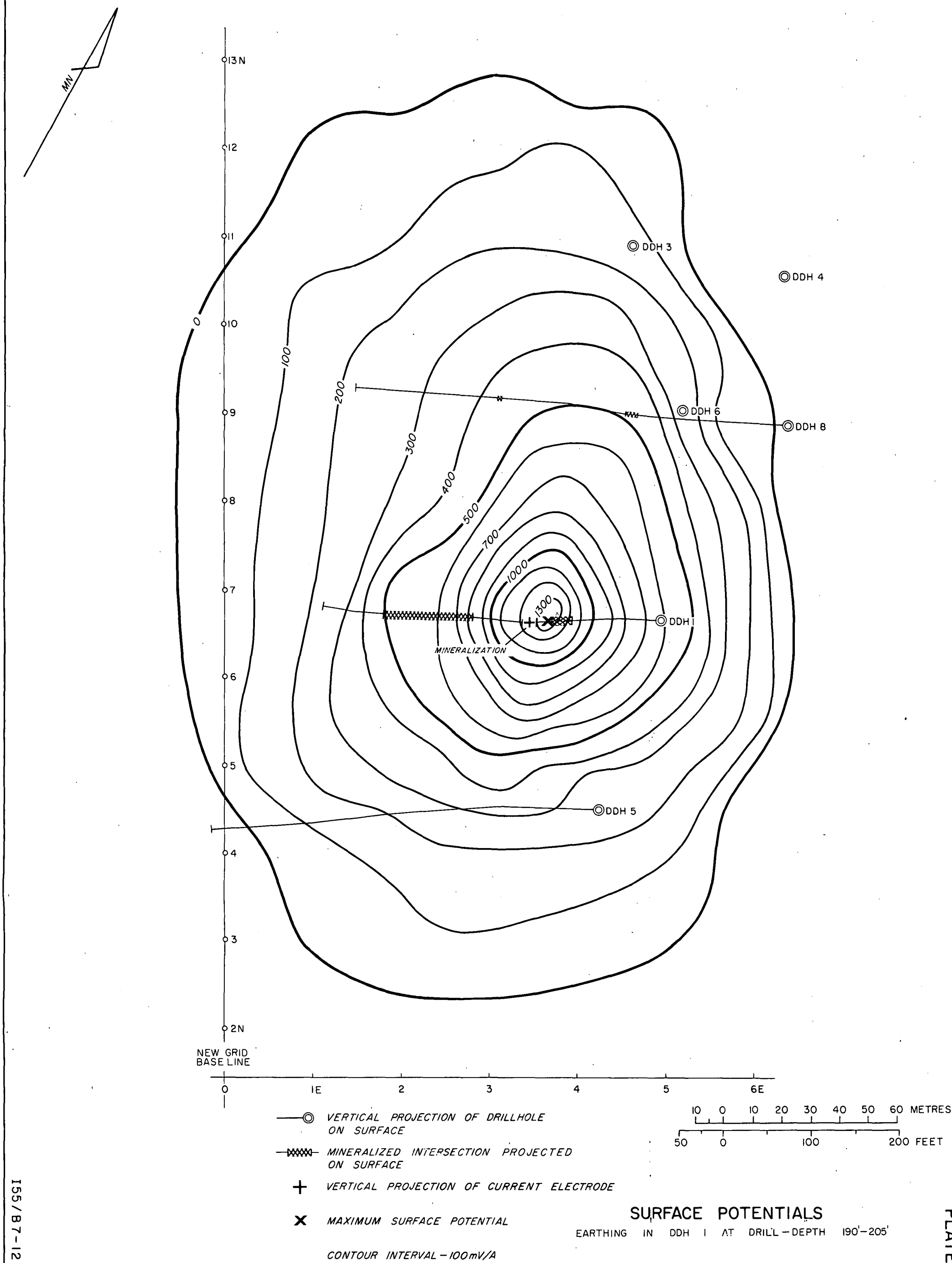
DDH 6
LOGGING RESULTS



—•— 10' DIPOLE
...•... 30' DIPOLE

- LEGEND
- PHYLLITE
 - TUFF
 - SULPHIDES
 - AGGLOMERATE
 - VOLCANIC BRECCIA

DDH 8
LOGGING RESULTS



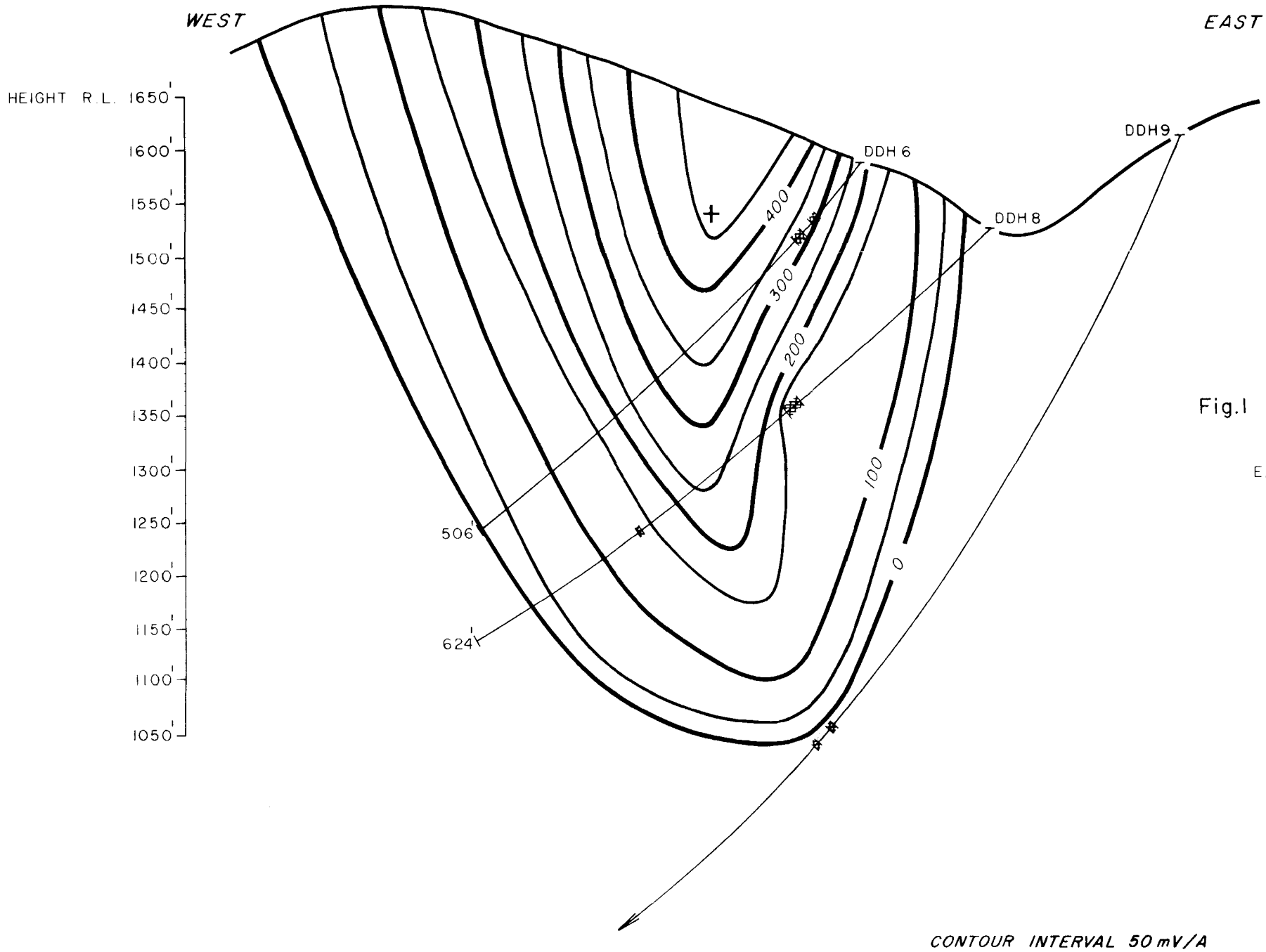


Fig.1 POTENTIALS IN THE VERTICAL
SECTION THROUGH M 8.
EARTHING IN DDH 1 AT 190'-205' DRILL DEPTH

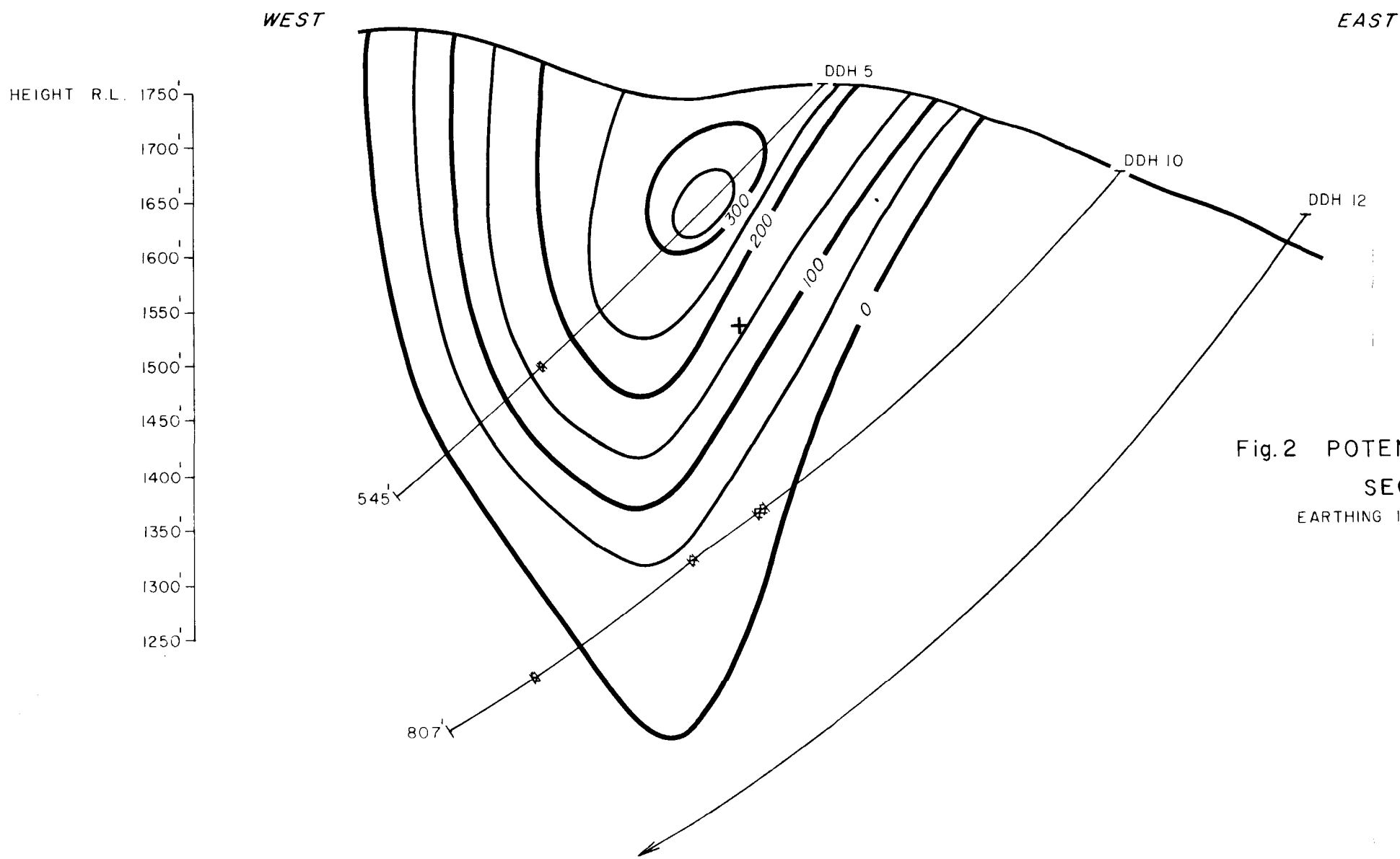
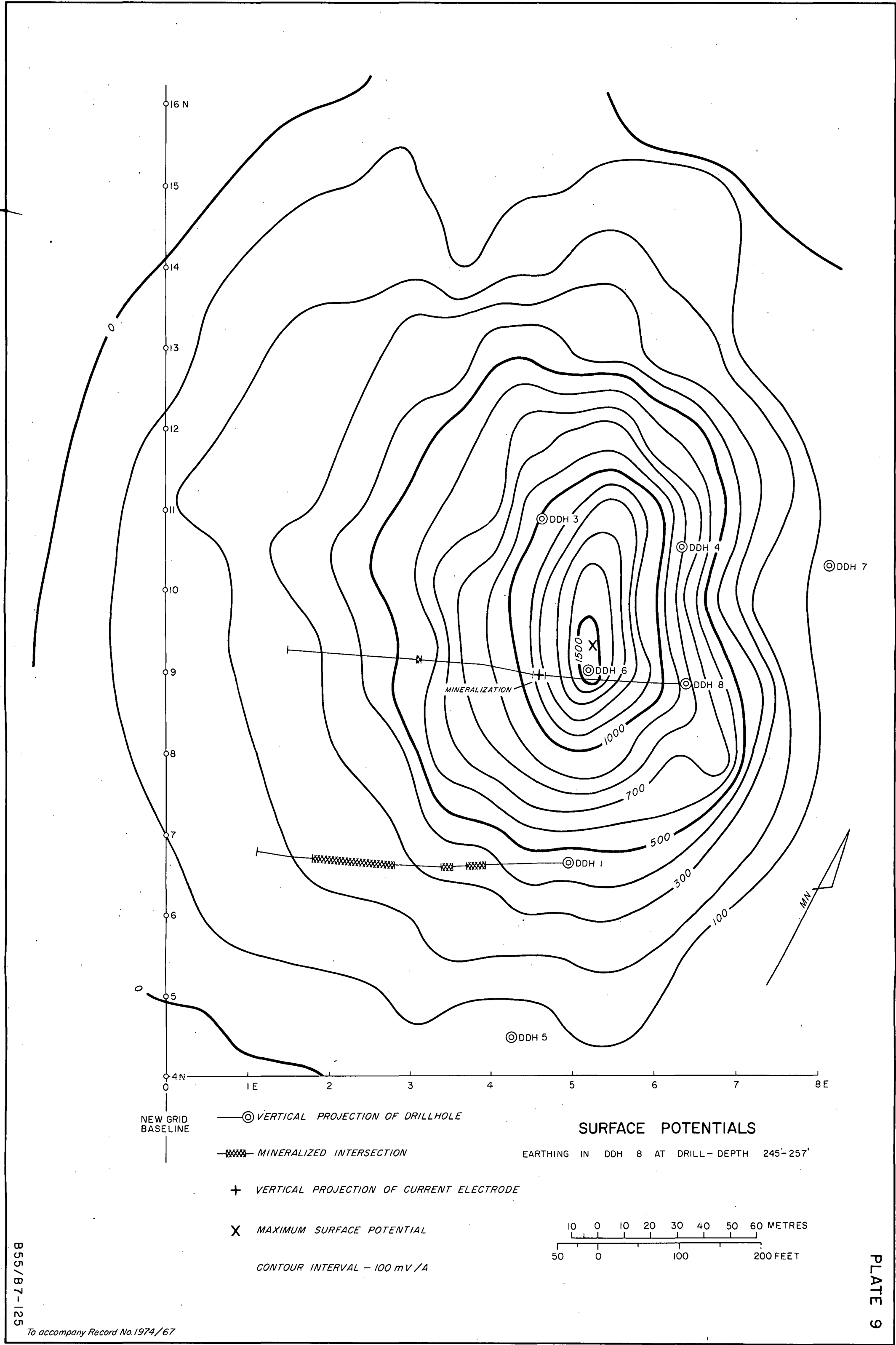


Fig.2 POTENTIALS IN THE VERTICAL
SECTION THROUGH 4.5N
EARTHING IN DDH 1 AT 190'-205' DRILL DEPTH

—→ HORIZONTAL PROJECTION OF DRILL HOLES
—⊗— MINERALIZED INTERSECTION
+ HORIZONTAL PROJECTION OF CURRENT
ELECTRODE IN DDH 1

10 0 10 20 30 40 50 60 70 80 90 METRES
50 0 100 200 300 FEET
N.B. ALL MEASUREMENTS IN FEET



B55/B7-125

To accompany Record No.1974/67

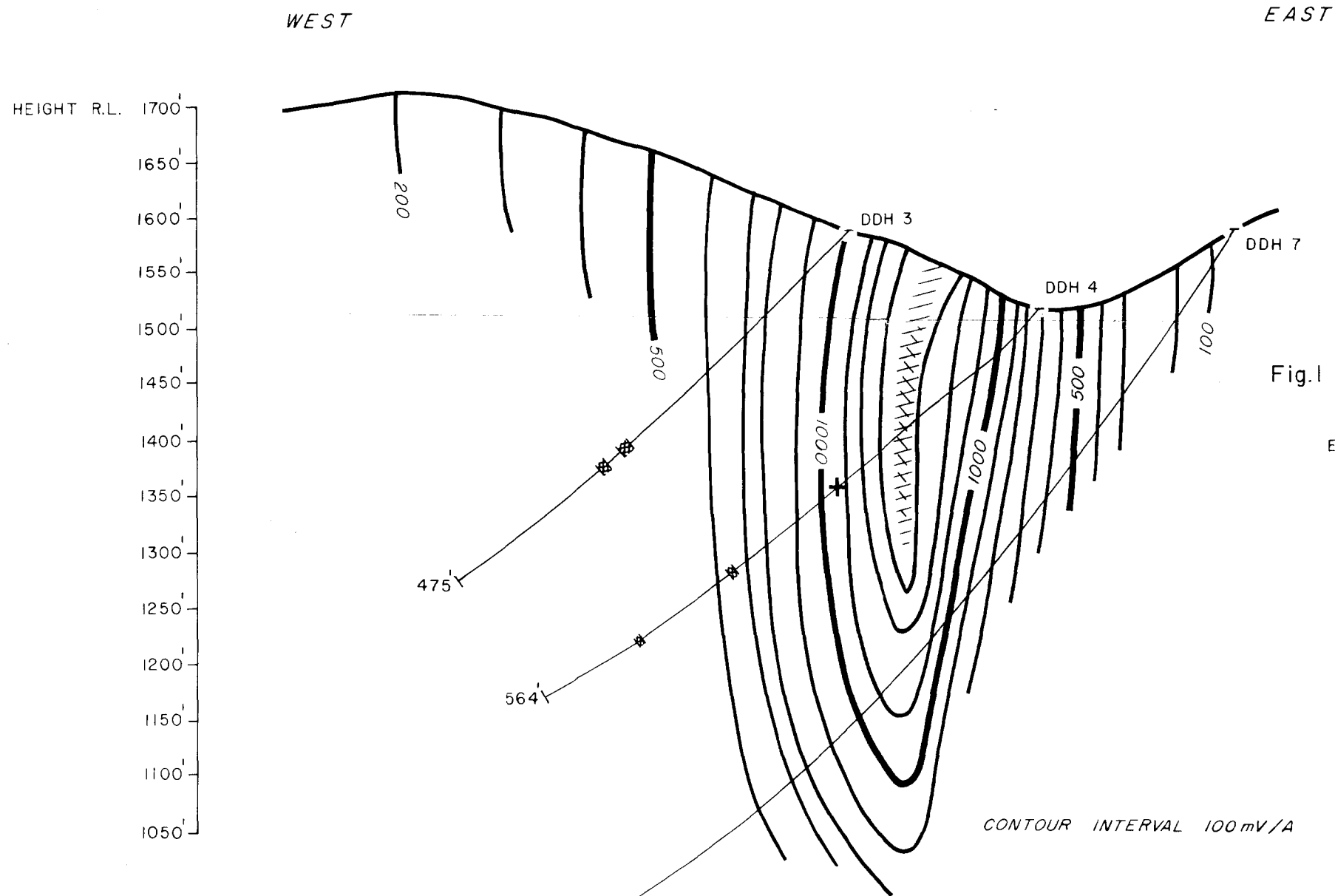


Fig.1 POTENTIALS IN THE VERTICAL
SECTION THROUGH IO-5N.
EARTHING IN DDH 8 AT 245-257 DRILL DEPTH

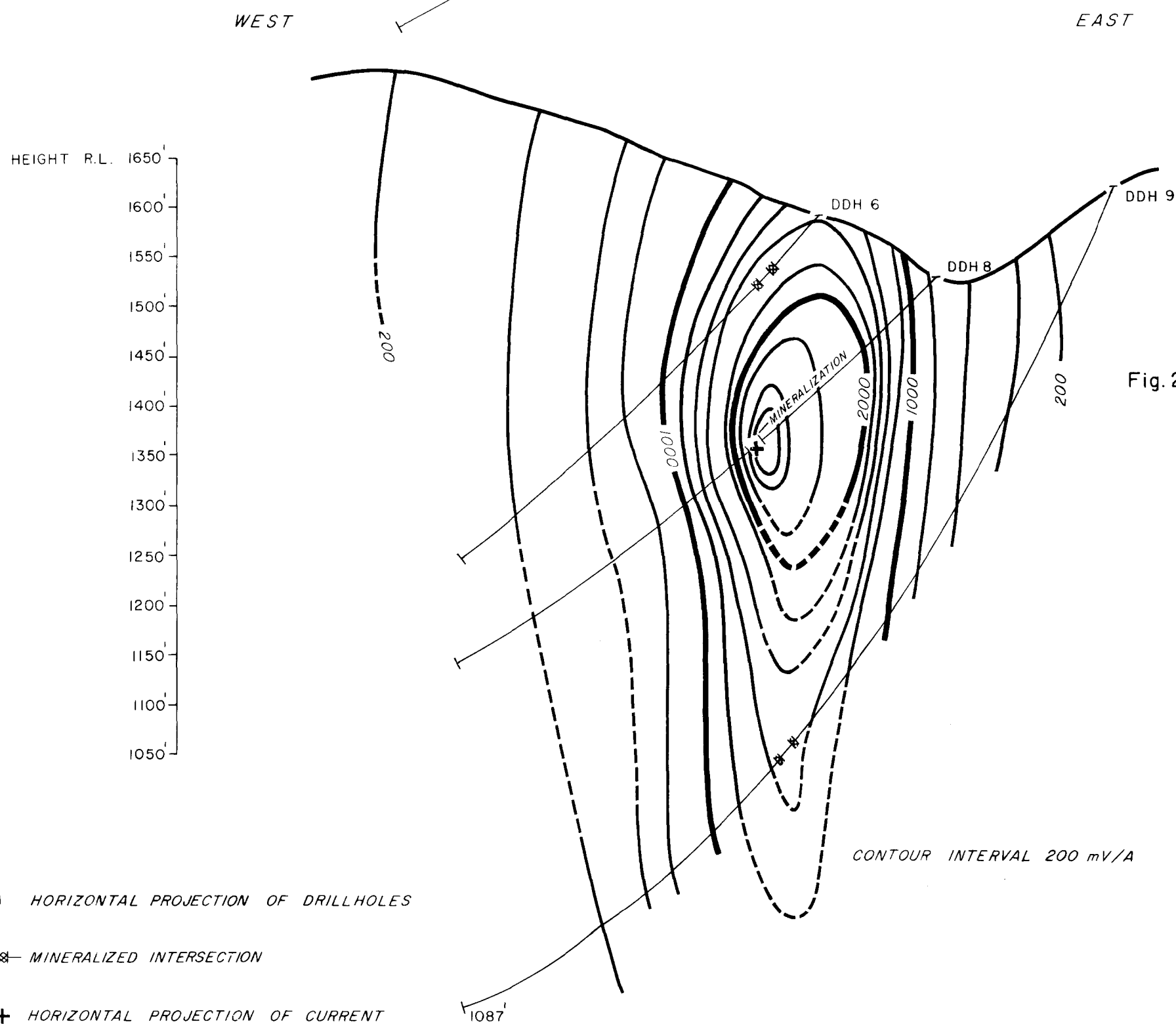
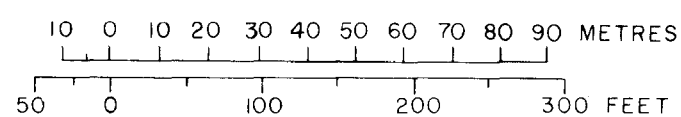


Fig.2 POTENTIALS IN THE VERTICAL
SECTION THROUGH M8.
EARTHING IN DDH 8 AT 247-257 DRILL DEPTH

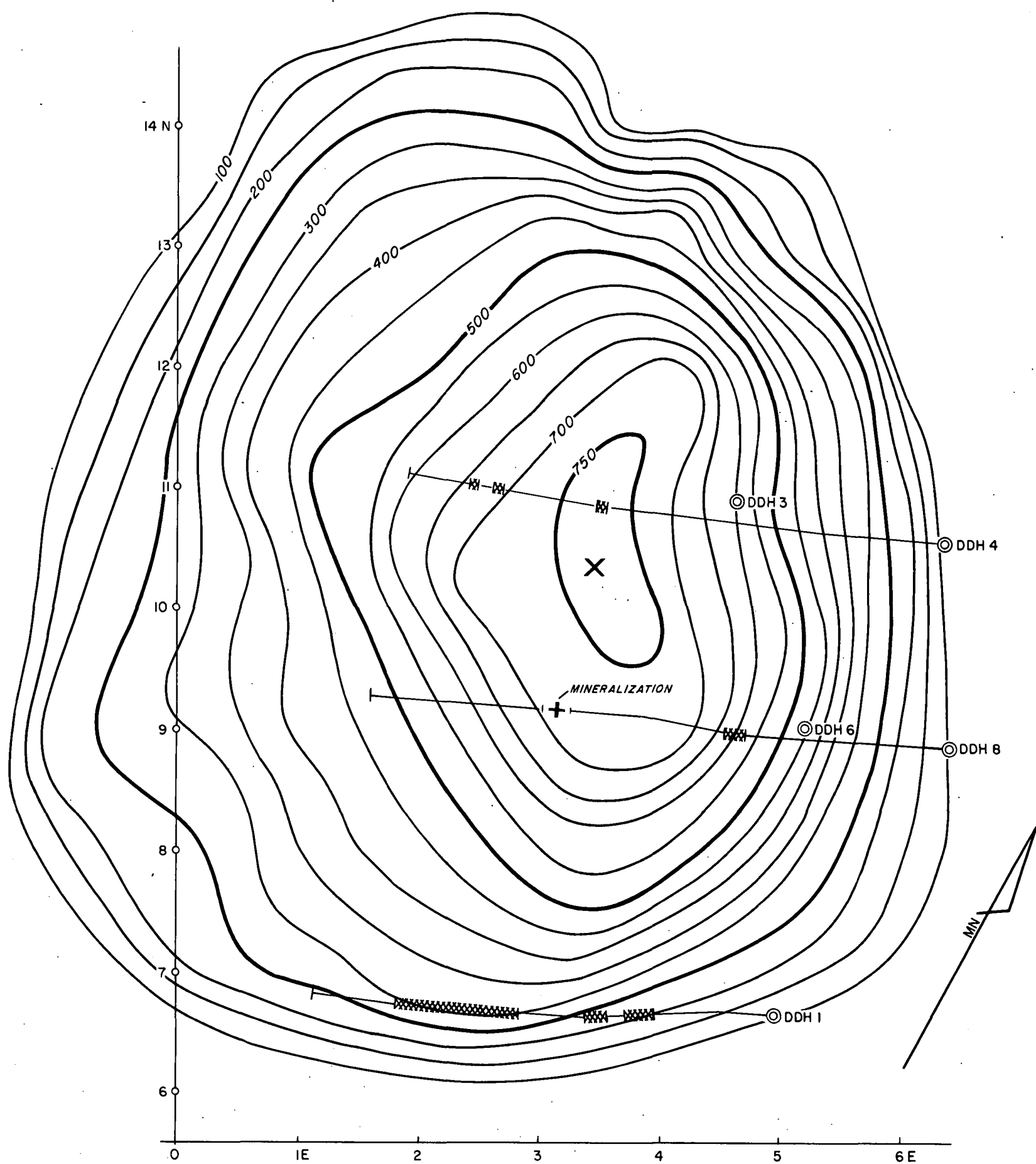
— HORIZONTAL PROJECTION OF DRILLHOLES

— MINERALIZED INTERSECTION

+ HORIZONTAL PROJECTION OF CURRENT
ELECTRODE IN DDH 8



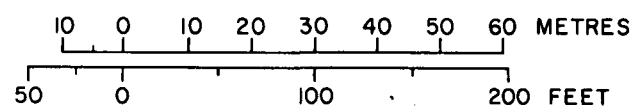
N.B. ALL MEASUREMENTS IN FEET



NEW GRID
BASE LINE

- VERTICAL PROJECTION OF DRILLHOLE
- MINERALIZED INTERSECTION
- +— VERTICAL PROJECTION OF CURRENT ELECTRODE
- X— MAXIMUM SURFACE POTENTIAL

CONTOUR INTERVAL - 50mV/A



SURFACE POTENTIALS

EARTHING IN DDH 8 AT DRILL DEPTH 437'-440'

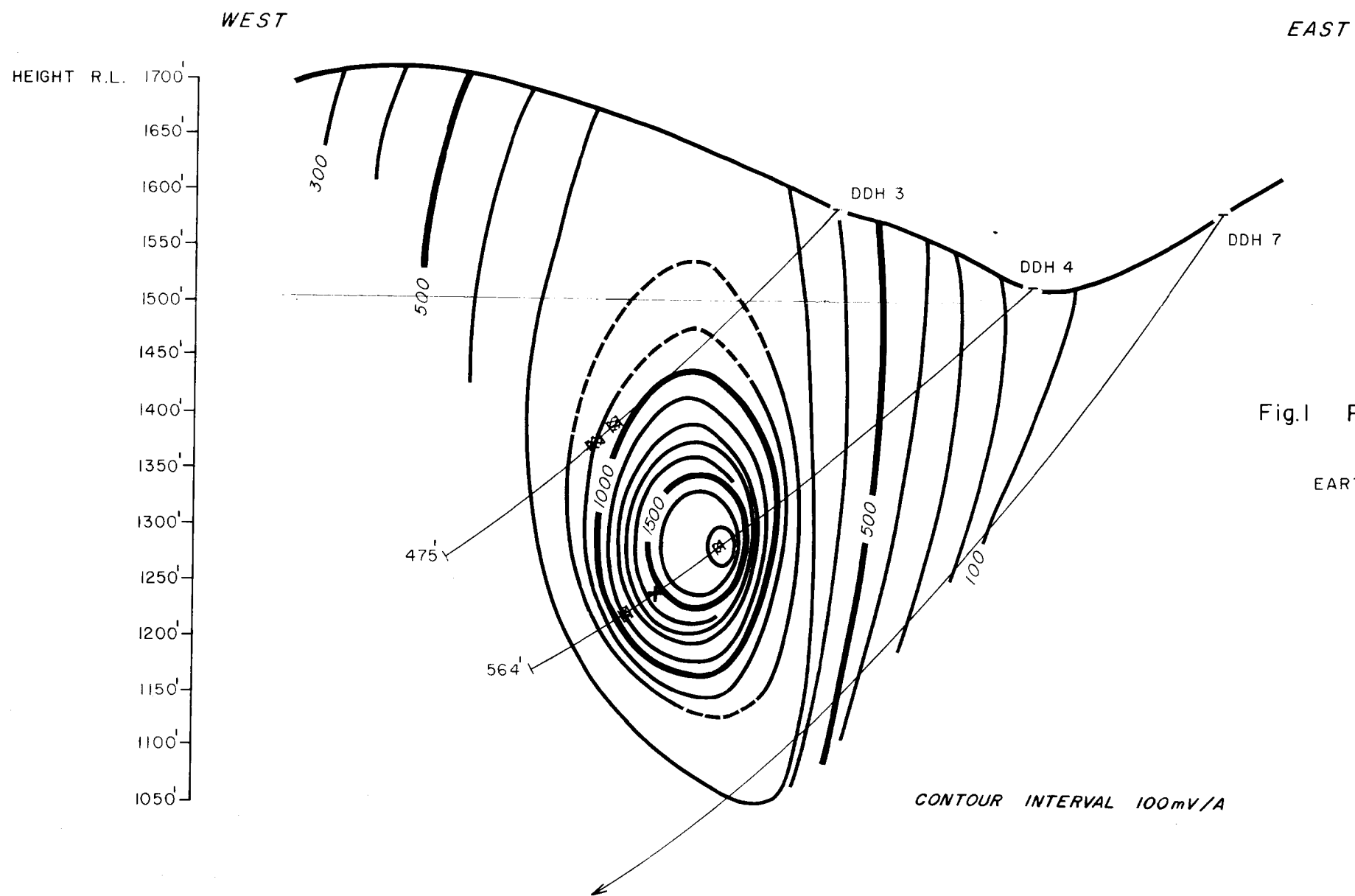


Fig.1 POTENTIALS IN THE VERTICAL
SECTION THROUGH IO·5N.
EARTHING IN DDH 8 AT 437'-440' DRILL DEPTH

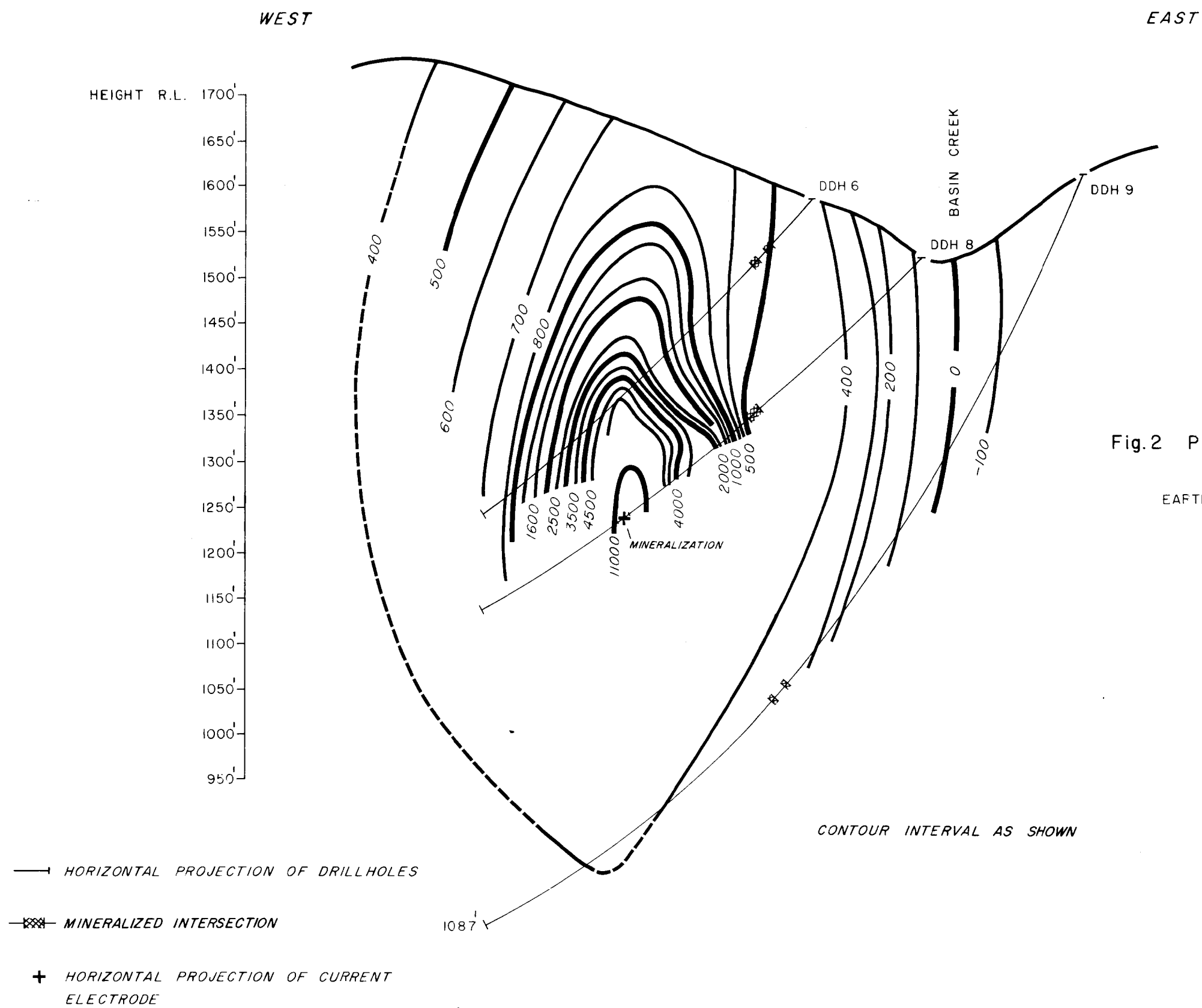


Fig.2 POTENTIALS IN THE VERTICAL
SECTION THROUGH M8.
EARTHING IN DDH 8 AT 437'-440' DRILL DEPTH

Fig.1 EARTHING IN DDH 1 AT
DRILL DEPTH 197'

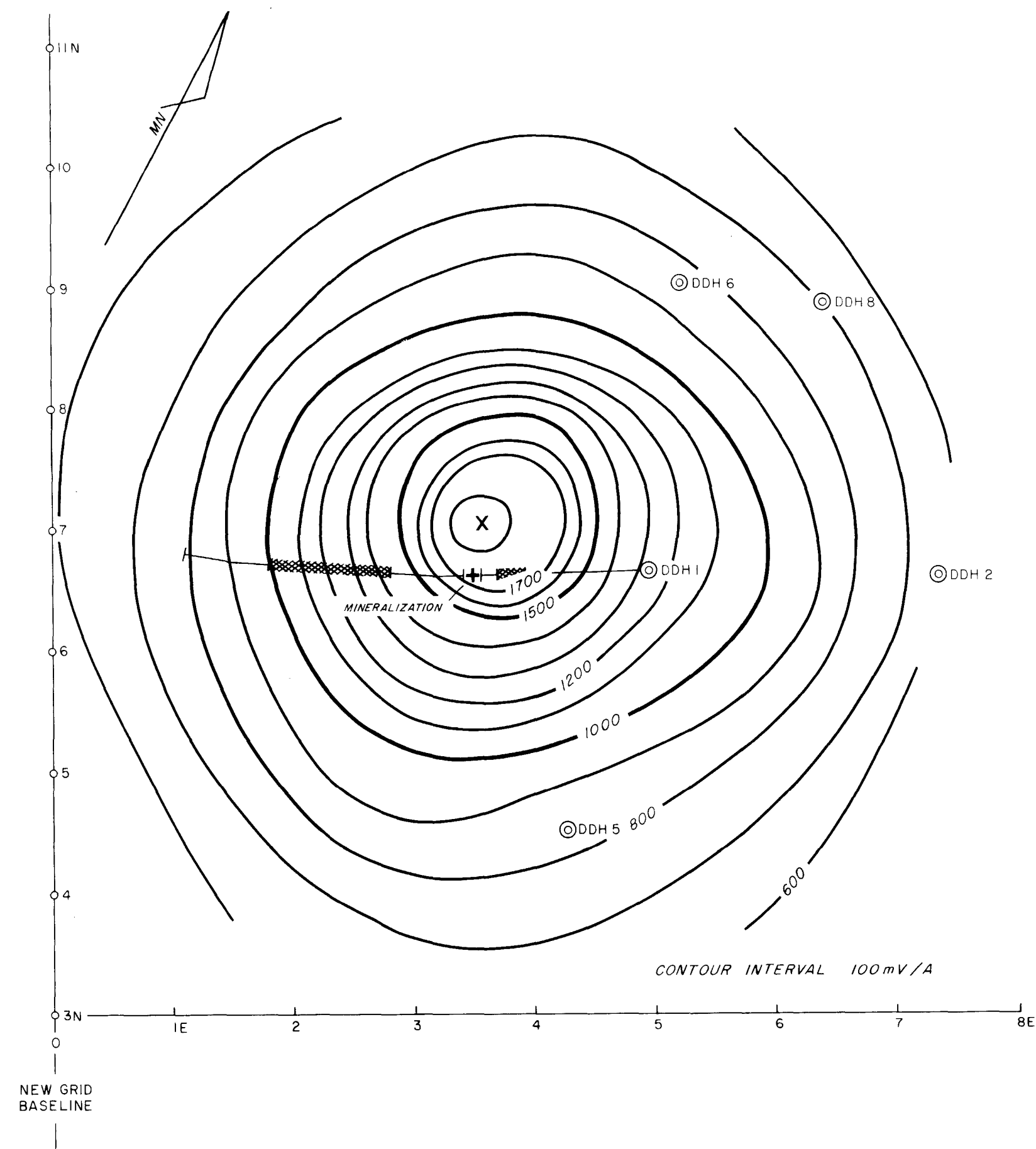


Fig. 2 EARTHING IN DDH 8 AT
DRILL DEPTH 252'

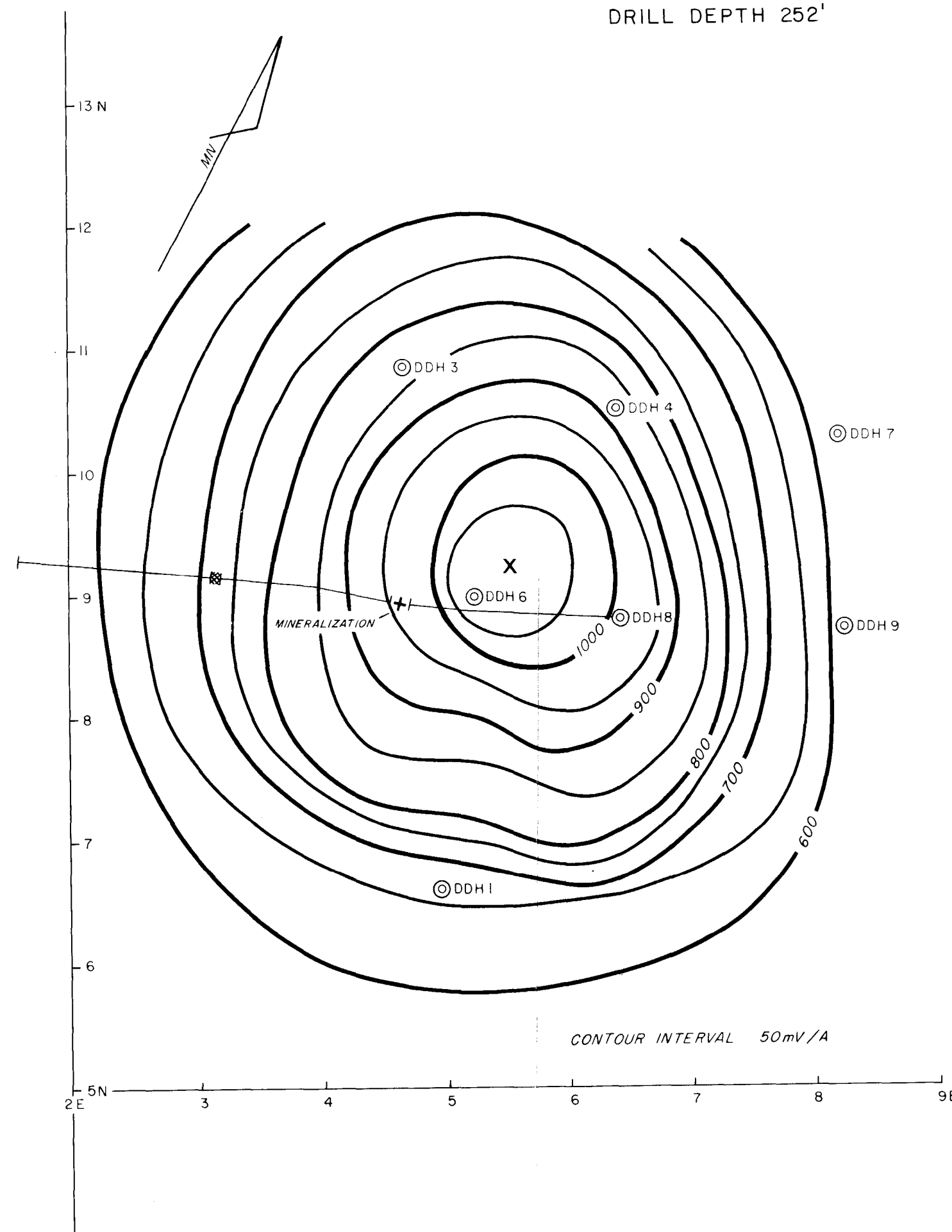
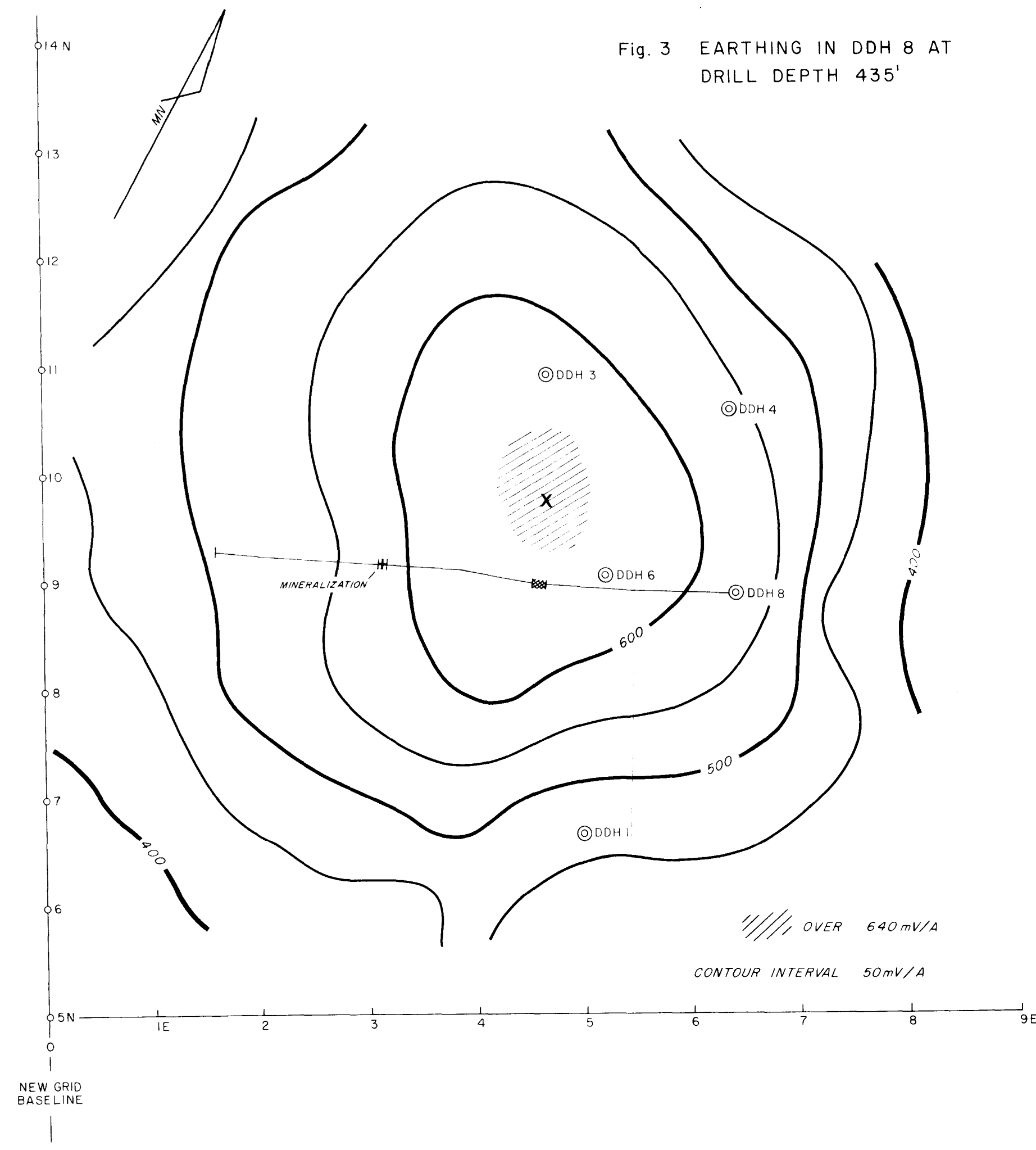
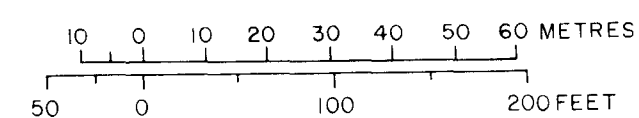


Fig. 3 EARTHING IN DDH 8 AT
DRILL DEPTH 435'



- VERTICAL PROJECTION OF DRILLHOLES
- MINERALIZED INTERSECTIONS
- + VERTICAL PROJECTION OF CURRENT ELECTRODE
- X MAXIMUM SURFACE POTENTIAL



THEORETICAL SURFACE
POTENTIALS