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DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1973/125

CAPTAINS FLAT METALLIFEROUS SURVEY, NEW SOUTH WALES, 1972

by

N. Sampath, R.D. Ogilvy, B.R. Spies

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SUMMARY

A metalliferous geophysical survey was carried out at several areas in the vicinity of Captains Flat, New South Wales. The methods used were magnetic, gravity, electromagnetic, self-potential, and induced polarization.

In the South Keatings area extensions of the main shear zone were outlined using the electromagnetic method. A magnetic survey over this area revealed no magnetic anomalies associated with the shear zones.

Only weak electromagnetic anomalies were obtained in the Golf Course area. These are associated with strong geochemical anomalies and weak to moderate IP anomalies.

In the Baldwin area magnetic, gravity, electromagnetic, and self-potential surveys were carried out but no anomalies that could be associated with mineralization were obtained.

In Gradys area the methods used were electromagnetic, self-potential, and induced polarization. Several anomalies which could be due to mineralization were found.

Drilling recommendations have been given to test the most favourable anomalies in the South Keatings area. Details of drilling by Electrolytic Zinc Company of Australasia on completion of geophysical work in the Golf Course and Gradys areas are also given.

1. INTRODUCTION

Captains Flat is 50 kilometres southeast of Canberra, and can be reached by sealed road from Queanbeyan.

Gossans were discovered at Captains Flat in 1874, and mining commenced in 1882. From 1882 to 1899 over 200,000 tonnes of ore were produced. Subsequent production was mainly that of Lake George Mines Pty Ltd, which from 1937 to 1962 produced over 4 million tonnes of ore with an average grade of 6% lead, 10% zinc, 0.67% copper and 550 g of silver and 1.7 g of gold per ton. The mine was closed in 1962 for economic reasons.

The present survey was planned in co-operation with the Electrolytic Zinc Company of Australasia (E.Z.) which has been carrying out detailed geological mapping, geophysical, and geochemical work in the area. The aim of the survey was to acquaint new members of the Metalliferous Section with the techniques used in metalliferous geophysical exploration while investigating the possibility of mineralization.

The survey commenced on 25 January 1972 and ended on 29 March. Personnel consisted of N. Sampath (Party Leader), F.N. Michail, R.D. Ogilvy, B.R. Spies, E.B. Wronski, and J.W. Williams (Technical Officer). J.W. Williams left the party on 22 February and H.G. Reith (Technical Assistant) joined the party on 21 February. I.G. Hone joined the party on 14 February and P.B. Bryan (Technical Assistant) joined on 6 March. The project was initiated by E.C.E. Sedmik who was with the party from 25 January until 10 February.

Work was done in the following areas: South Keatings, Golf Course, Baldwin and Gradys. The location of these areas is shown in Plate 1.

2. PREVIOUS GEOPHYSICAL WORK

The earliest geophysical work was carried out in 1949 by the NSW Department of Mines (Conaghan & Foskett, 1949). Self-potential surveys were done at South Keatings area and Roach's area (5 km southeast of the township). Anomalies of up to -500 mV were obtained at each area and were considered to be due to sulphide mineralization at South Keatings area and graphitic shales at Roach's area. Four magnetic traverses were done at Roach's area but no magnetic indications were obtained.

In 1960, BMR conducted a geophysical survey at Captains Flat in which electromagnetic, self-potential, and gravity were the main methods used (Sedmik, 1965). The areas surveyed were the South Keatings, Gourlay-Hickey, Golf Course, and Bollard (Plate 1). Weak electromagnetic anomalies were observed in the South Keatings area, but these were not confirmed by self-potential results. In the Gourlay-Hickey and Golf Course areas correspondence was obtained between electromagnetic, self-potential and geochemical anomalies. One of these anomalies was considered to be due to sulphide mineralization; the others were thought to be due to graphitic slate. Similar anomalies in the Bollard area were also attributed to graphitic slate. The gravity survey failed to show any anomalies that could be caused by large orebodies but did show up a large fault-type anomaly in the vicinity of the Lake George Mine.

In 1961, the NSW Department of Mines conducted a gravity survey to see if the gravity anomaly obtained by Sedmik continued northward (Gibbons, 1962). It did not do so but a second anomaly was defined about 300 metres east of the Mine.

In 1971, BMR carried out electromagnetic, induced polarization, self-potential, and gravity surveys at Captains Flat (Almond, 1971). The main areas surveyed were Elliotts, Vanderbilt, and Copper Dam, with isolated traverses in the Baldwin and Gourlay-Hickey areas (see Plate 1).

The gravity survey in the Elliotts area was carried out over the Molonglo Fault and had inconclusive results. Strong electromagnetic and IP anomalies were obtained in the Copper Dam area.

3. GEOLOGY

The Captains Flat orebody occurs in a similar geologic setting to numerous other small orebodies in the Lachlan Geosyncline, as noted by McClatchie (1970). These bodies consist generally of massive, fine-grained, and partly banded sulphides (mainly pyrite and sphalerite). Like the Captains Flat orebody, deposits at places like Wellington, Peelwood, Lewis Ponds, Sunny Corner, and Wisemans Creek occur in Middle to Upper Silurian acid volcanic sequences, often at the contact between flows and interbedded sediments, several kilometres from the nearest granite outcrop and mainly within the eastern segment of Silurian or Ordovician volcanic belts.

The Captains Flat area is part of a north-trending synclinorium of Silurian and Ordovician rocks which plunges to the north at a shallow angle. It is a graben bounded to the west by the Naronga Fault and to the east by the Ballallaba Fault. In the vicinity of the mine workings the western limb of the syncline is overturned to the west. The area has been affected by at least two major orogenies, both of which folded and sheared the Silurian sequences which contain the lode mineralization. The Silurian rocks consist of agglomerate, tuffaceous shale, sandstone, shale, limestone, and two large bands of volcanics which define the east and west limb of the syncline. These volcanics are mainly tuffs and andesitic to rhyolitic flows.

The sequences are intruded by both Silurian and younger dolerite dykes which strike either north or northwest.

The sediments and associated volcanics have been folded and sheared along north-south axes. The strongest zone of shearing, with which the orebodies are associated, divides the field into two structural units: the western or hangingwall unit, which is a complex closely-folded anticline, and the eastern or footwall unit, which is a more gently folded syncline.

Mineralization occurs over a strike length of approximately 1220 metres in two major orebodies (Keatings and Elliotts) which are up to 15 metres wide and were worked to a depth of 610 metres. The orebodies consist of massive banded sulphides with gangue minerals comprising quartz, calcite, dolomite, and sericite. The sulphides are mainly pyrite, galena, and chalcopyrite. Both syngenetic and epigenetic origins have been proposed for the Captains Flat orebody, but this is still a matter of contention. A detailed account of the geology of the area is given by Kenny & Mulholland (1941) and Glasson & Paine (1965).

Information about the local geology of the areas surveyed was given by the staff of E.Z.

The geology of the South Keatings area consists of a sequence of shale, sandstone, tuff, and volcanic flows which have been folded closely along a north south line and dip steeply. Petrological examination shows that the rocks are heavily sheared, forming quartz-sericite-chlorite schists. A major geological feature is the southern extension of the main lode shear (referred to as the Keatings Shear) on which the main orebodies occur.

In the Golf Course area, a succession of quartzite, shale, and volcanics (mostly dacite and rhyolite) is covered by a thin layer of alluvium.

The Baldwin area consists mainly of shale and volcanics. The eastern half of this area contains mainly volcanics, the western half mainly shale overlain by volcanics. Basalt float has been reported in the south of the area. A creek running across the area has considerable amounts of alluvium associated with it.

4. GEOPHYSICAL METHODS

The geophysical methods used at Captains Flat were magnetic, gravity, self-potential, electromagnetic, and induced polarization.

Magnetic method

Variations in the vertical component of the Earth's magnetic field were measured with a McPhar fluxgate magnetometer (M700), and an ABEM torsion magnetometer (MZ4) having a calibration factor of 11.3 gammas per scale division.

Electromagnetic method

The basic principle behind all electromagnetic methods is that currents are induced in subsurface conductors by an applied primary field. Various parameters of the resulting secondary electromagnetic field are measured.

The method is used for detecting subsurface conductors. Unfortunately, not all of these are associated with mineralization; e.g. graphitic shale, clay, and water saturated shear zones may give electromagnetic anomalies. Some examples of ore minerals that are good conductors are chalcopyrite, pyrite, pyrrhotite, and galena. The electromagnetic instruments used were VLF, Turam, and E.M. Gun.

VLF. In the VLF method the primary field is produced by very low frequency (VLF) radio stations. For work using the Ronka EM16 in Australia it is only possible to receive two stations: one is at North West Cape (NWC, 22.3 kHz) and one in Japan (NDT, 17.4 kHz). The signal from NDT was found to be too weak to read accurately, and therefore NWC was used. Unfortunately NWC is unfavourably situated in relation to the strike of Captains Flat mineralization. 'Cross-overs' in the results are not clearly defined but nevertheless anomalies are easily recognizable using the contouring method of Fraser (1969).

The VLF method measures the vertical in-phase and the quadrature components of the secondary field due to the conductor, expressed as percentage of the horizontal component of the total field. If the field is undisturbed there is no vertical component and so both the in-phase and quadrature readings are zero.

The instrument used was a Geonics Ronka-type EM16 VLF receiver. The results are displayed as profiles of vertical, in-phase component and quadrature component expressed in units of percent.

Turam. In this method the primary field is produced by an alternating current passing through a large rectangular loop or a grounded cable. During the present survey two layouts of a 610 m square loop were used and the results compared with these from a single 1220 by 610 m loop. The grounded-wire method was also used in which a 3000 m cable was grounded at both ends in a known shear zone with the aim of delineating the shear zone more accurately.

The receiver consists of two search coils a fixed distance apart, carried along the line of measurement. For each position of the coils the ratio of the amplitudes and phase differences between the field intensities induced in them are measured on a compensator bridge.

To correct for variation of the primary field with distance from the loop, the measured values are normalized.

The equipment used was an A.B.E.M. Turam 2S unit and generator driven by a 2.2 horsepower ILO petrol engine type L-75.

E.M. Gun. This is a moving source and receiver method in which the primary field is produced by a transmitting coil consisting of a transistorized oscillator and a coil with a ferrite core. Measurements are made with a receiving coil connected to a compensator-amplifier. The transmitting and receiving staffs are connected by means of a cable, which also serves to keep constant separation between the transmitter and receiver.

Appropriate corrections to the compensator readings must be applied to take into account the changes in the primary field at the receiver due to changes in the mutual orientation of the coils (e.g. caused by topography). On steep slopes an error of levelling of 1 metre causes a change in the corrected real component of 6%, and since anomalies are often of this magnitude care must be taken to measure accurate height differences between the staffs.

Gravity

The gravity surveying at Captains Flat was carried out with the aim of detecting orebodies and also structural features such as faults. The gravity readings were corrected for instrumental drift and elevation. The terrain correction was not applied as accurate topographic maps of the area were not available.

The instrument used was a Worden gravity meter (W 161) with a calibration factor of 0.102 milligals per scale division.

Self-potential

The self-potential method (S-P) measures the distribution of naturally-occurring earth potentials which are associated with electric currents in the ground. These potentials are partly constant and partly fluctuating (telluric). The S-P method is concerned with the constant potential set up by electrochemical action in surface rocks or bodies embedded in them.

Large negative potentials are obtained over sulphide orebodies, but S-P anomalies may also be present over clay, marl, and graphite.

The S-P instrument used was designed and constructed by BMR.

Induced polarization

The IP method is based on the overvoltage effect which mainly takes place at conducting grain-electrolyte interfaces. The frequency-domain method was used, in which the change in apparent ground resistivity with frequency is measured.

The equipment used was a McPhar IP unit model 2004, which employs frequencies of 0.3 Hz and 5Hz. The electrode configuration was dipole-dipole.

Results are presented as pseudo-sections of apparent resistivity (ρa), frequency effect (F.E.) and metal factor (M.F.).

The frequency effect is the percentage change in resistivity, and is calculated from

$$F.E. = \frac{\rho dc - \rho ac}{\rho ac} \times 100\%$$

The metal factor is the ratio of the frequency effect to the apparent resistivity multiplied by a constant

$$M.F. = \frac{2000\pi \times F.E.}{\rho ac} \text{ mhos/feet} \simeq \frac{2000 \times F.E.}{\rho ac} \text{ mhos/metre}$$

where ρdc = apparent resistivity at lower frequency

ρac = apparent resistivity at higher frequency.

Minerals which show an IP effect include pyrite, galena, magnetite, and graphite. Clays also give IP anomalies.

5. WORK DONE AND DISCUSSION OF RESULTS

SOUTH KEATINGS AREA

Geophysical work in this area was carried out on a grid laid by E.Z. using the magnetic and Turam methods.

Magnetic Method

The vertical component of the magnetic field was measured using a fluxgate and a torsion magnetometer along thirty-six east-west traverses, with a station spacing of 30 m (100 ft) or 15 m. The layout of the traverses is shown in Plate 2. The readings were reduced to a common base at station 1024N/1000E.

A contour map of -Z values is presented in Plate 2. The main feature is a magnetic high striking north from station 1000 E on Traverse 1024N. This disappears on Traverse 1032N but reappears as a localized anomaly on Traverse 1034N. The main anomaly is due to sheared volcanic outcrops containing magnetite. Susceptibility measurements made on several specimens taken from this area showed values of 2120 to 3800 x 10^{-6} emu/cm^3. The amplitude of the magnetic high is about 300 gammas, and it has a half-width of about 60 metres.

Localized anomalies occur on Traverses 1070N to 1075N. These are attributable to explosives magazines and to large iron water pipes of the old mine workings, and have no geological significance.

Turam

The Turam work was started by laying several loops. Two 610 m (2000 ft) square loops were used, one extending from 1055N to 1075N and 967E to 987E and the other adjacent from 1035N to 1055N.

Readings were taken on traverses to the east of the loop. Coil spacing was 30 m (100 ft) and station spacing was 15 m (50 ft). Station spacing was reduced to 7.5 m (25 ft) over anomalous areas. Traverses were 76 m (250 ft) apart.

A large loop, 1220 m by 610 m, was laid out covering the position of the two loops mentioned above. Nine traverses were surveyed and the results were found to be consistent with measurements taken with the smaller loops.

The Turam results are presented as phase contours in Plate 3. The strongest anomaly is centred at 1072.5N/1002.5E and extends over 700 metres to the south. This anomaly coincides with the 'Keatings Shear' with which the Keatings orebody was associated. The anomaly has a maximum amplitude ratio of 1.3 and phase differences of -18 degrees. It decreases in amplitude to the south and continues to Traverse 1052N. Quantitative interpretation was done on Traverse 1072.5N. The current concentration in the conductor occurs at a depth of approximately 130 metres at 1002E, as shown in Plate 5.

Other features of minor interest in Plate 3 are a series of weak anomalies in the eastern portion of the area. Two elongated anomalies along 1006E show a slight displacement at about 1050N. This could be due to a fault, which could also explain the termination of the main anomaly.

The southern portion of the area as indicated in Plate 3 was surveyed in 1960 (Sedmik, 1965). No significant anomalies were recorded by Sedmik using a frequency of 440 Hz. The anomaly at 1006E is too close to the energizing loop to have been delineated in the earlier survey. In the present survey, 660 Hz was used for the interpretation, as the higher frequency records more detail. Even so, only very weak anomalies were recorded in this portion of the area.

The Turam results using the grounded cable method are shown in Plate 4. The cable ran north-south along 987E, and was laid in the shape of a semicircle at each end where it was grounded in the shear zone. Six large iron spikes were used for the grounding; the co-ordinates of the grounded ends were 1080N/1001E and 1035N/1000.5E.

The survey was carried out in the central part of the area, between traverses 1045N and 1065N. Plate 4 shows that the position of the shear zone is emphasised using the grounded cable.

The main anomaly again extends south from 1065N/1002.5E and disappears at about 1050N. However, the maximum ratio is 1.8 and the phase difference exceeds -25 degrees, showing that a large current concentration occurs in the shear zone. There is also an elongated anomaly centred at 1060N/1006.5E which is probably caused by a second shear zone connected with the main shear zone. The ratio amplitude of 1.5 and phase difference up to 20 degrees implies that this zone also is a good conductor.

Strong phase anomalies occur also in the southeastern corner of Plate 4 at 1045N/1006.5E and 1045N/1008E. The increase in strength of these anomalies when a grounded cable is used as energizing source suggests electrical connexion to the main shear.

GOLF COURSE AREA

Electromagnetic, gravity, and IP methods were used on selected traverses of the grid laid down by E.Z.

Electromagnetic

Nine traverses from 1020N to 1029N were surveyed using the E.M. Gun equipment with coil separation of 61 m (200ft). The results are shown in Plate 6. Only the high-frequency (1760 Hz) results are presented, as no extra information was obtained from the low frequency (440 Hz) results. A weak anomaly is present at 1007E on traverses 1021, 1021.5, and 1022N, which consists of a -8% anomaly in the imaginary component. This corresponds with the Turam Anomaly 'D' reported by Sedmik (1965), but is not as well defined. The anomaly may be attributed to a weak shear or a geological contact.

The profiles show other small fluctuations in the real component. These are mostly due to terrain effects.

The area was surveyed also with the Ronka EM16 VLF equipment. It was found that there was too much interference from telephone wires and fences to give meaningful readings in this area and thus the results have not been presented.

Gravity

Five gravity traverses were surveyed in this area; the Bouguer profiles are shown in Plate 7. The main purpose was to determine whether a gravity survey would show any evidence of economic mineralization associated with the Turam Anomaly 'D', (Sedmik, 1965). The gravity profiles show small features of 0.2 mGal or less, which are probably due to differential weathering. There are no anomalies that could be attributed to orebodies.

Induced polarization

The IP work consisted of five traverses: 1018N, 1020N, 1022N, 1025N and 1027N. The results of the last three are presented in Plates 8-10.

Traverse 1018N showed only background noise. A shallow anomaly is present on Traverse 1020N centred at 1007E. Readings to the west of this were affected by a grounded fence at 1002E. A general trend on this traverse was that frequency effect increased from east to west.

Plate 8 shows the IP section for Traverse 1022N. Apparent resistivity and frequency effect increase with depth, so that there is no significant metal factor anomaly. The higher frequency effects to the west are probably caused by the proximity of the fence.

Traverse 1025N (Plate 9) shows a resistivity low centred at 1008.5E. This coincides with high frequency effects (up to 7%) in the western half of the traverse. A metal factor anomaly therefore occurs between stations 1005E and 1008E, but although the anomaly is close to the surface it may be associated with weak mineralization. A rabbit-proof fence near this traverse was removed by E.Z. so that IP measurements could be taken.

The IP section of Traverse 1027N is shown in Plate 10. There is a resistivity low centred at 1009E which does appear to have some depth extension. This coincides with moderate frequency effects but as the lowest resistivities occur close to the surface, the metal factor anomaly is also shallow.

The geophysical work carried out by BMR in this area was taken into consideration by E.Z. when it drilled DDH4 as shown in Plate 9. This hole intersected a shear zone but no economic mineralization.

BALDWIN AREA

Magnetic, electromagnetic, gravity, and S-P surveys were carried out in this area.

Magnetic

The area was surveyed with a torsion magnetometer. Traverses were 30 m apart and station spacing was 30 m. A contour map of -Z values is shown in Plate 11.

The main feature is an elongated anomaly extending across the southwestern portion of the area. It strikes northwest and has a maximum amplitude of 350 gammas at 1006E on Traverse 901N. The anomaly may be attributed to the presence of a basic dyke. Basalt floaters have been mapped in the area.

Another anomaly occurs at the edge of the area at 913N/1010E and has an amplitude of 350 gammas.

Electromagnetic

Three types of instruments were used: VLF, Turam, and E.M. Gun. VLF measurements were taken on the same grid as the magnetic work. The values were filtered using Fraser's method (Fraser, 1969), to produce the contour map shown in Plate 12. It can be seen that an elongated VLF anomaly coincides with the main magnetic anomaly mentioned above. Other than this, the VLF contour map shows no major anomalies.

For the Turam work a 610 m square loop was laid out to the west of the area from 898.5N to 917.5N and 970E and 990E. Readings were taken every 30 m (100 ft) from 995E to 1010E on all traverses. A contour map of the Turam Phase values is shown in Plate 13.

There are two main anomalies, one centred at 903N/1001E and the other at 914N/1005.5E. They are both elongated and strike about 30° east of north. The maximum ratio amplitude of 1.1 and phase difference -9° indicate a poor conductor. Both anomalies are probably caused by a water-saturated shear zone (a creek follows the line of the anomaly). There is a distinct displacement of the anomaly at 904N/1001E as shown in Plate 13. This coincides with the VLF and magnetic anomaly, and may be caused by a fault (having a strike slip of 35 metres) associated with a basic or ultra-basic dyke. This would explain both the magnetic and VLF anomalies.

The fact that there is no magnetic anomaly over the Turam anomaly can be explained by the postulated shear zone not being associated with any magnetic material. Also, there is no VLF anomaly associated with the Turam anomaly because the strike of the conductor is perpendicular to the direction of North West Cape.

Fifteen E.M. Gun traverses were surveyed from 901N to 815N. 30 m coil separation was used and readings taken every 30 m from 995E to 1010E. Four traverses were repeated with a coil spacing of 61 m. The E.M. Gun profiles are shown in Plate 14. There are no anomalies; the imaginary component profiles are almost flat. The features shown on the real component profiles are mainly terrain effects resulting from the difficulty in making accurate terrain corrections.

Gravity

Gravity readings were made over the area, on the 30 m (100 ft) grid. The readings were reduced to a common base at 907N/1000E and corrected for elevation. Bouguer corrections were made assuming a density of 2.65 g/cm^3. Terrain corrections were not applied as accurate topographic maps were not available.

The contour map presented in Plate 15 shows a broad gravity low following the trend of the Turam anomaly. It has a maximum amplitude of 0.8 mGal in the south. As mentioned before, the Turam anomaly coincides with a creek and is probably caused by a water-saturated shear zone. The low gravity values are probably due to the presence of alluvium and differential weathering in the shear zone. Other 'anomalous' values are probably due to the uncorrected terrain effects.

There is no gravity anomaly corresponding to the magnetic and VLF anomalies. Thus the postulated dyke is either very narrow or its density is approximately that of the surrounding rocks.

Self-potential

All traverses from 901N to 915N were surveyed using the S-P method. Readings were taken every 15 m on traverses 910N and 911N. As no significant S-P anomalies were observed the spacing was increased to 30 m for the other traverses. No S-P anomalies were obtained which could be attributed to mineralization. Selected profiles are given in Plate 16.

GRADYS AREA

This area is situated southeast of the Golf Course area and extends from 958N to 968N. Owing to a mistake in surveying there was a distance of 61 m between the pegged lines 964N and 965N, and so an extra line 964(A)N was surveyed.

In this area previous investigation by E.Z. had indicated the presence of geochemical and Turam anomalies and it was considered that further geophysical work was warranted. Electromagnetic, S-P, and IP surveys were done in the area.

Electromagnetic

VLF readings were taken on twelve traverses from 958N to 968N. Readings were taken every 15 m from 1046E to 1054E. Plate 17 shows a contour map of the filtered VLF readings.

A VLF anomaly extends across the area from 968N/1047.5E towards 960N/1052.5E. The maximum values occur at 968N/1047.5E and 962N/1051.5E. The northern half of this anomaly coincides with the geochemical and Turam anomalies reported by E.Z. These are shown in Plate 17.

Another VLF anomaly occurs at 964(A)N/1052.5E.

Self-potential

Three traverses were surveyed using this method: 963N, 965N, and 967N. The profiles are shown in Plate 18. A small anomaly occurs on each of the traverses. On Traverse 963N a -40 mV anomaly is centred at 1049E, on Traverse 965N a -50 mV anomaly is centred at 1047E and on Traverse 967N a -90 mV anomaly occurs at 1046.5E. The trend of these anomalies is similar to that of the main VLF anomaly.

Induced polarization

Traverses 963N and 966N were surveyed by IP, using a 30 m (100 ft) dipole length. Pseudo-sections are presented in Plates 19 and 20.

There is a low apparent resistivity zone centred at 1050E on Traverse 963N. However, there is no corresponding frequency effect anomaly and thus the low resistivity cannot be attributed to mineralization.

A stronger IP anomaly occurs on Traverse 966N (see Plate 20). The low apparent resistivity zone is centred at 1050E and has depth extension to the east. This is associated with moderate frequency effects of over 4% to give a metal factor anomaly of over 100 at 1050E, indicating that the anomaly could be associated with mineralization. However, the IP anomaly does not coincide with the VLF, S-P, or Turam anomalies, all of which occur 30 or more metres to the west.

Drilling was carried out by E.Z. in Gradys Area after completion of the BMR geophysical survey. The resulting geological section is shown in Plate 20. The near-surface disseminated mineralization intersected by DDH2 is probably the cause of the Turam, VLF, and geochemical anomalies near 1048E. Both DDH2 and DDH3 intersected banded pyritic mineralization at about 90 m (300 feet) below 1050E. It would appear that only the IP method has indicated the position of the main mineralization correctly.

6. CONCLUSIONS AND DRILLING RECOMMENDATIONS

In the South Keatings area, the extension of the Keatings Shear was traced out for 700 metres to the south. The anomaly is strongest at the north, becomes less pronounced towards the south, and disappears at 1052N. A drilling recommendation is shown in Plates 3 and 5. A diamond-drill hole (DDH 1) to a depth of about 190 m should be drilled from 1000E on traverse 1072.5N at an angle of depression of 62° to the east. If this drill hole strikes mineralization it may be worthwhile to test the extensions of the shear zone which occur farther east. Proposed drilling target in this area would be 1060N/1006.5E and 1045N/1006E.

Weak E.M. Gun anomalies were obtained in the Golf Course area. A weak IP anomaly was obtained on Traverse 1025N, and was subsequently drilled by E.Z. The drill hole intersected a shear zone but no economic mineralization.

No promising anomalies were obtained in the Baldwin area; the magnetic and VLF anomalies there are probably due to a thin basalt dyke and the Turam anomaly to a shear zone. It is unlikely that the shear zone is associated with mineralization as the anomaly indicates a poor conductor.

In the Gradys area there is coincidence between Turam, geochemical, and VLF anomalies on Traverse 966N at about 1048.5E. An IP anomaly is centred at about 1050E. Recent drilling by E.Z. in this area suggests that only the IP method has detected the main mineralization.

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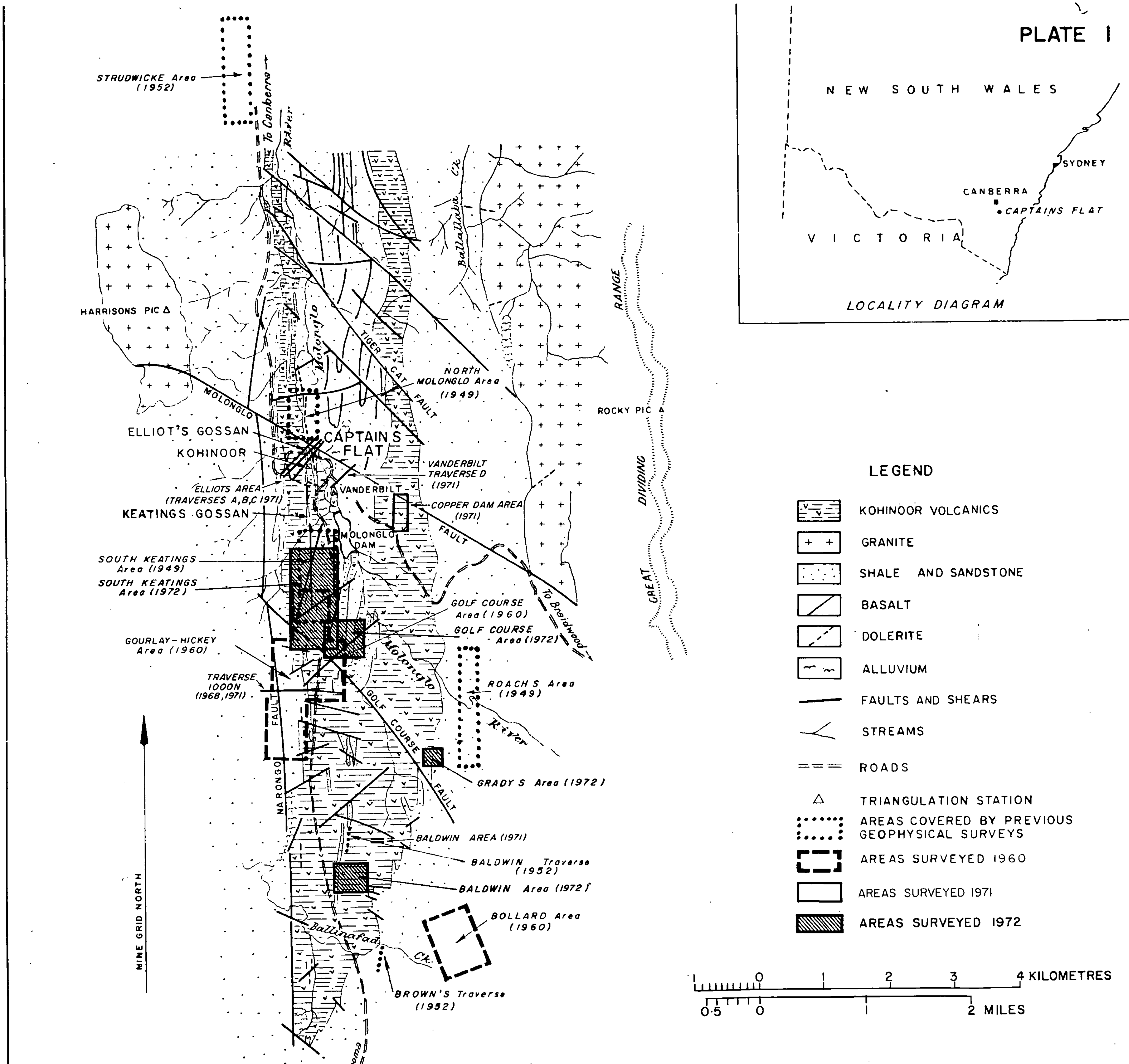


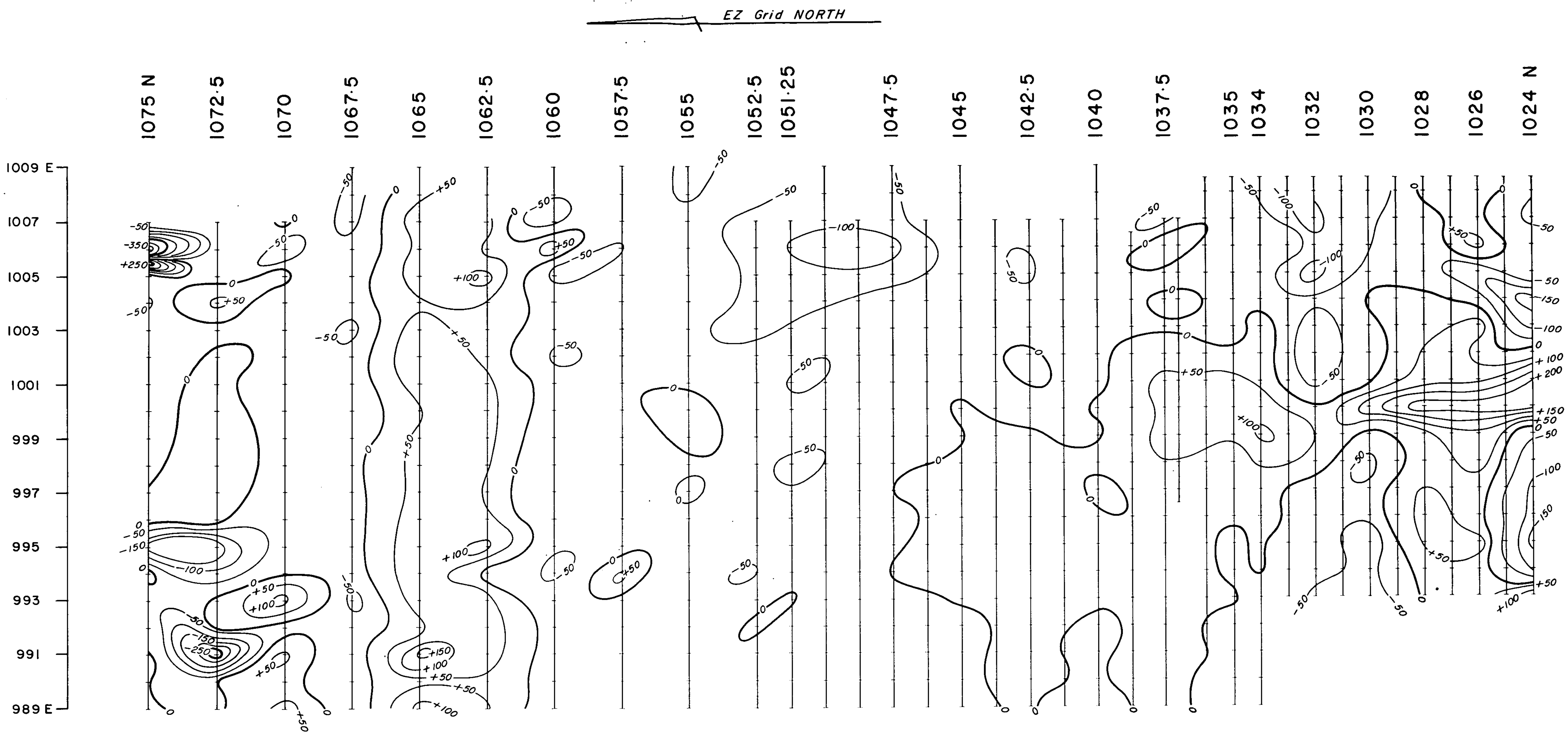
CAPTAINS FLAT GEOPHYSICAL SURVEY 1972

LOCALITY MAP

BASED ON I55/BI-21 To Accompany Record No. 1973/125

I55/B7-74-1

PLATE 2

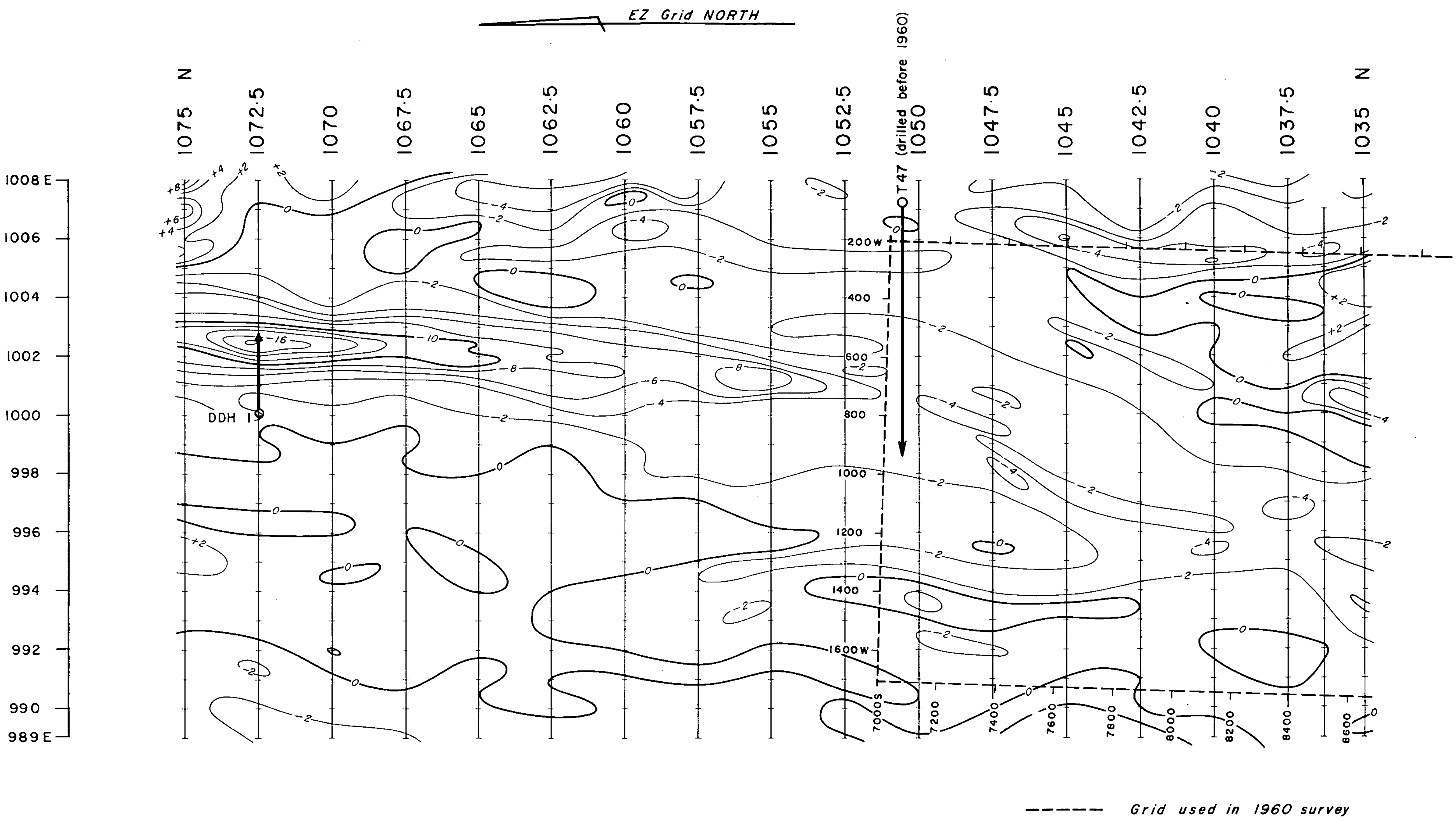


SOUTH KEATINGS AREA

CONTOURS OF VERTICAL COMPONENT OF MAGNETIC FIELD (-Z)(GAMMAS)

Contour interval 50 gammas

I55/B7-97



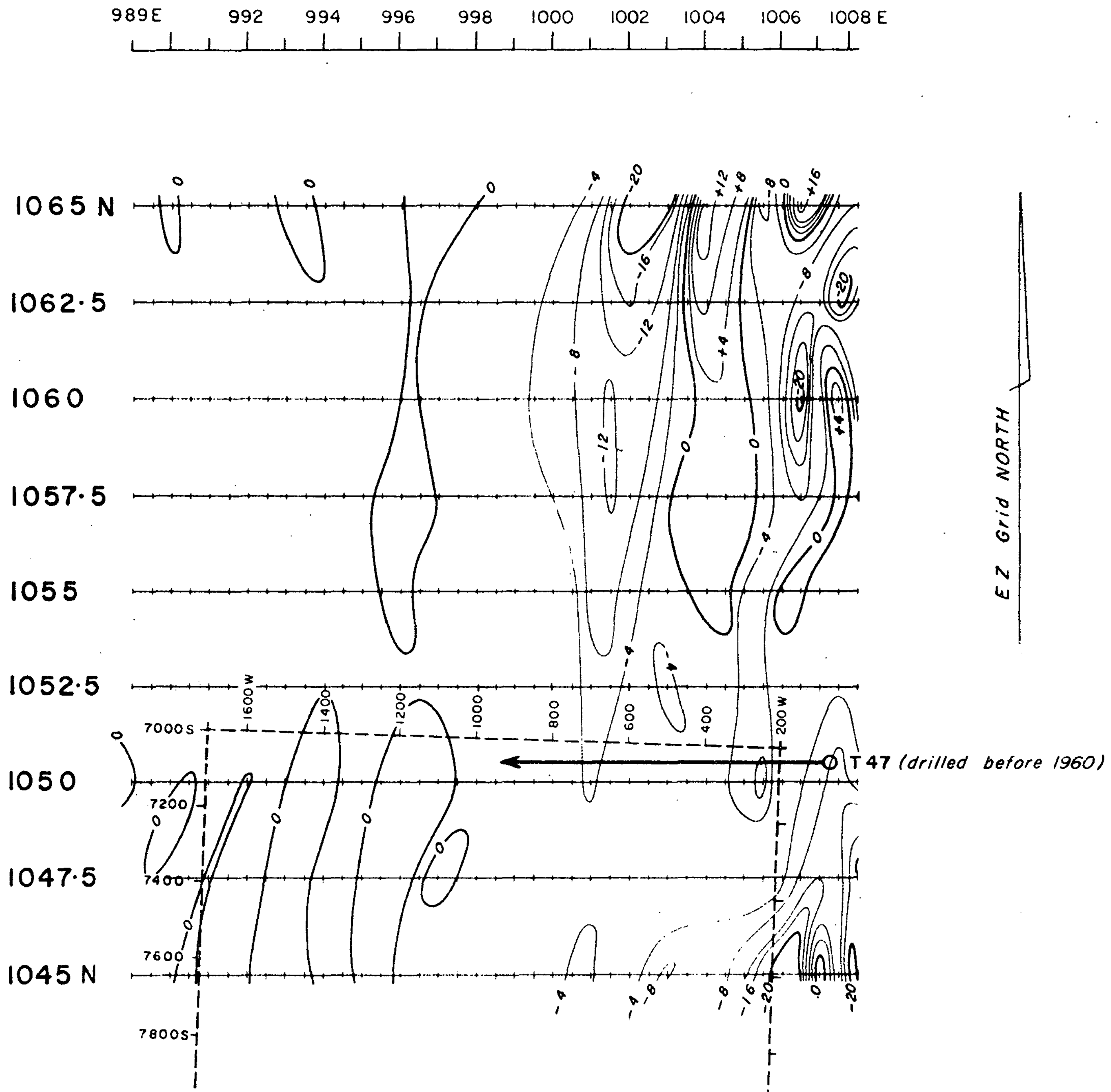
SOUTH KEATINGS AREA
TURAM PHASE
660 Hz

Contour interval 2°

To Accompany Record No. 1973/125

I55/B7-98

PLATE 4



------- *Grid used in 1960 survey*

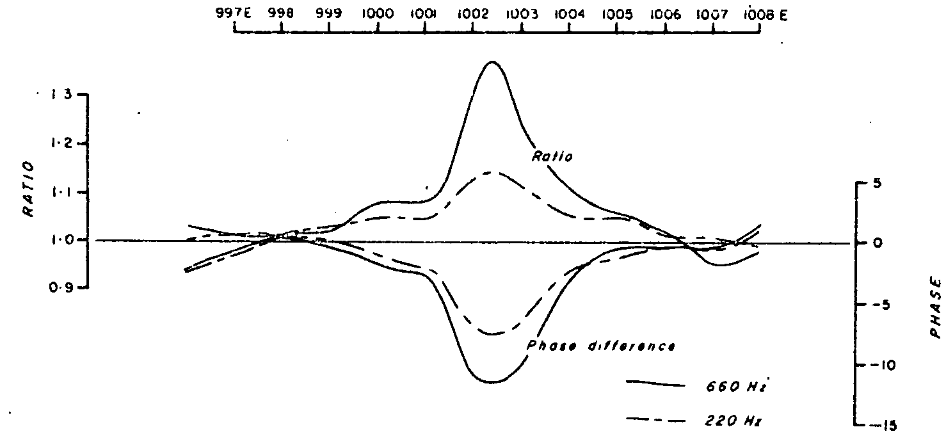
SOUTH KEATINGS AREA
TURAM PHASE CONTOURS
GROUNDED CABLE
660 Hz

100 0 100 200 METRES

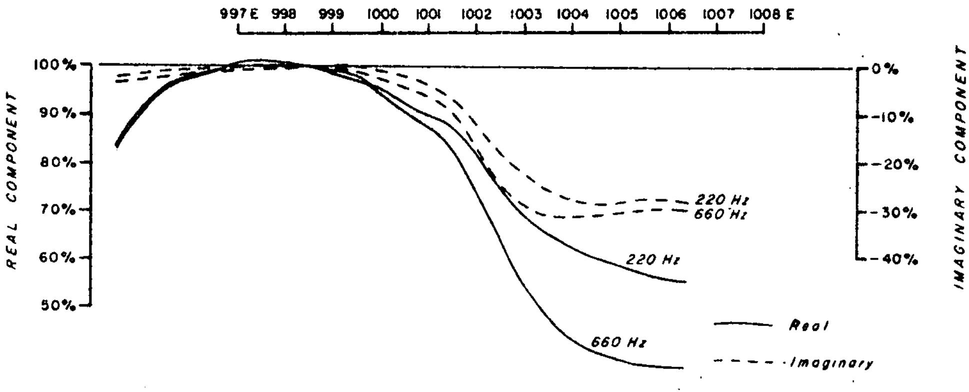
200 0 200 400 600 FEET

Contour interval 4°

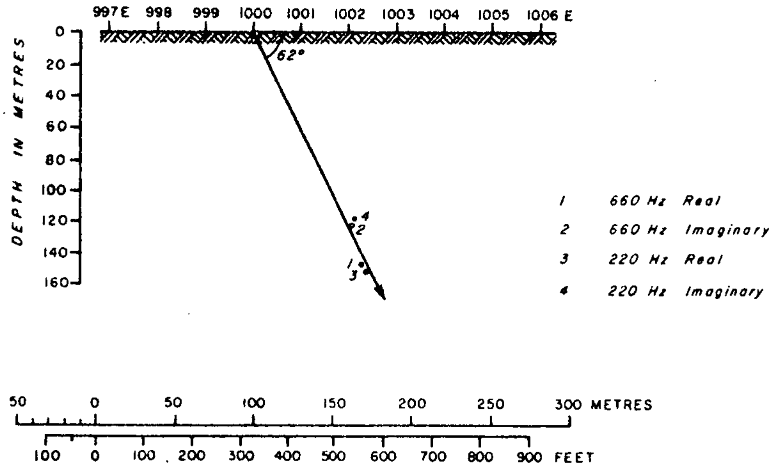
REDUCED RATIO AND PHASE DIFFERENCE



VERTICAL FIELD COMPONENTS



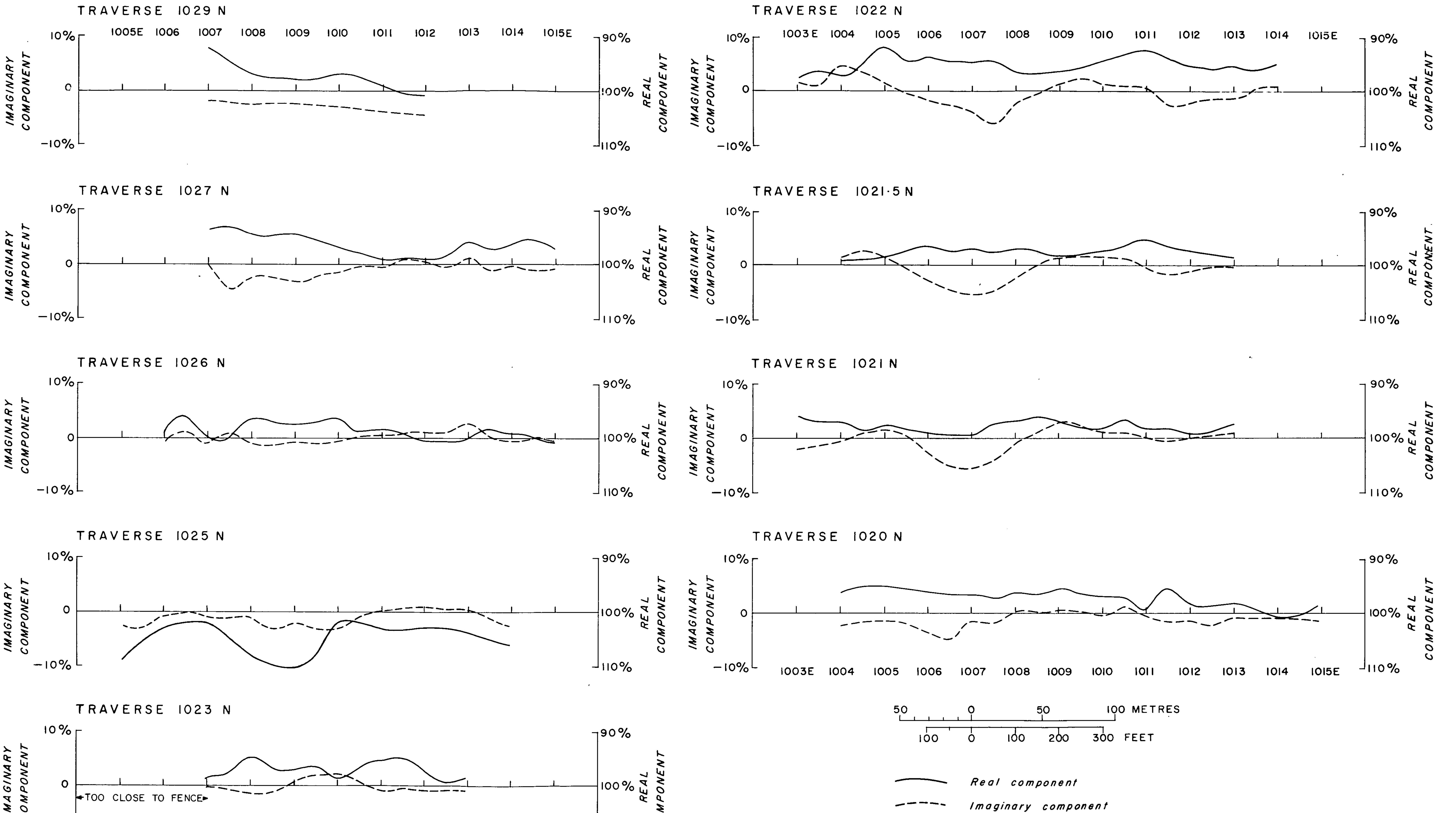
INTERPRETATION AND DRILLING TARGET



To accompany Record No. 1973/125

I55/B7-100A

PLATE 6



GOLF COURSE AREA

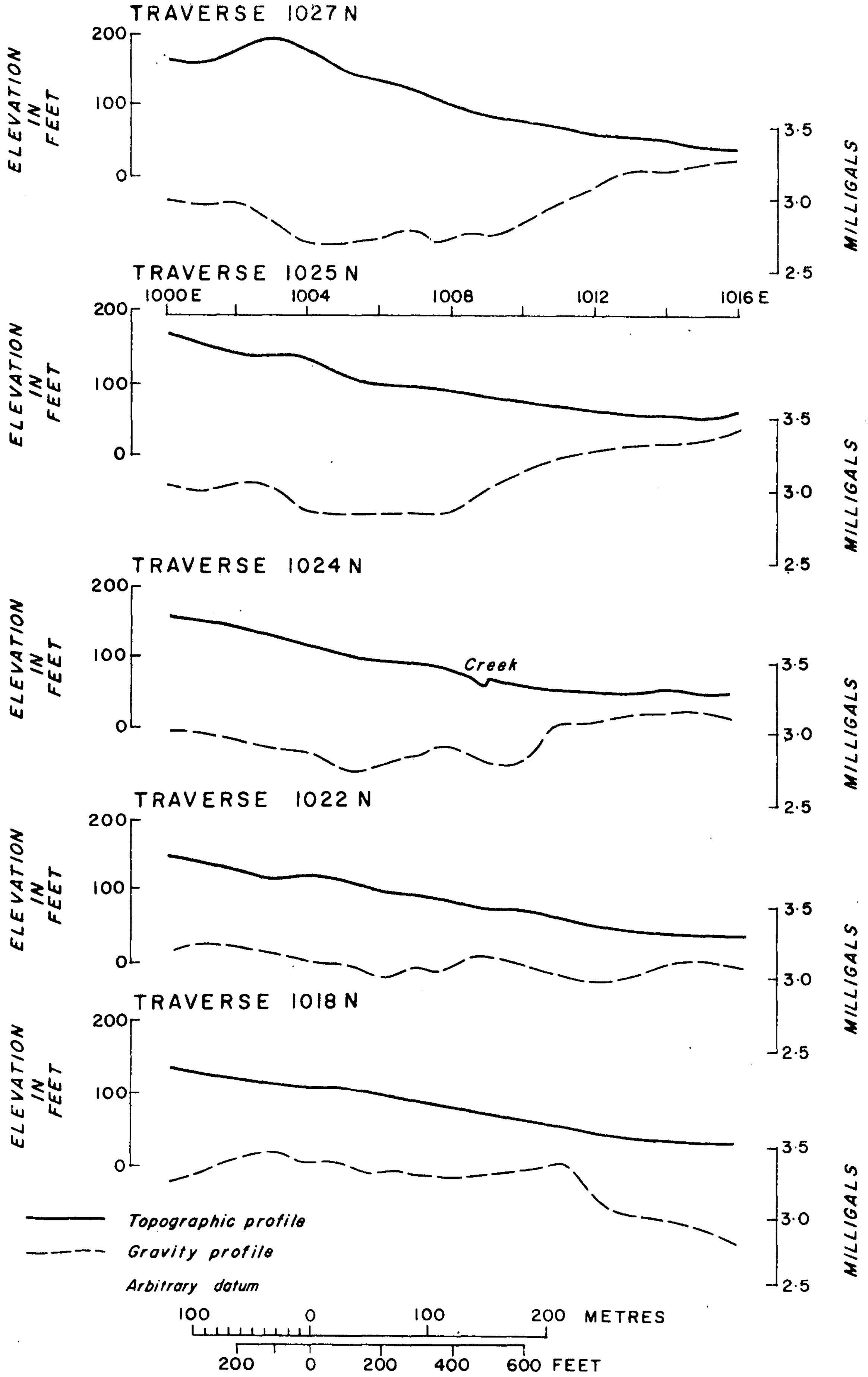
E.M. GUN PROFILES, 1760Hz

200' STAFF SEPARATION

To Accompany Record No. 1973/125

I55/B7-101

PLATE 7

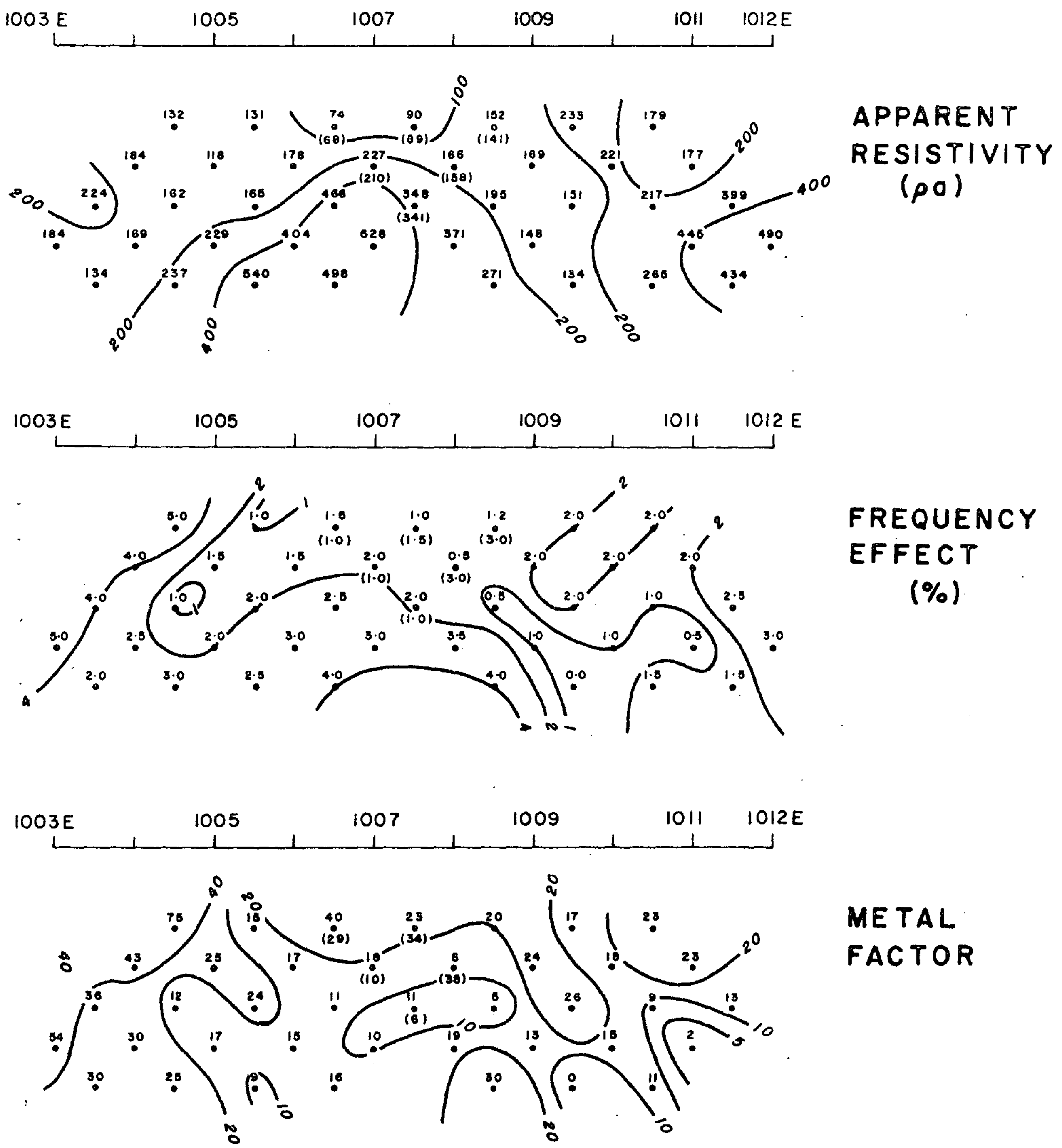


GOLF COURSE AREA

GRAVITY PROFILES

To Accompany Record No. 1973/125

I55/B7-102A

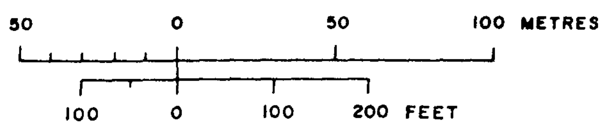


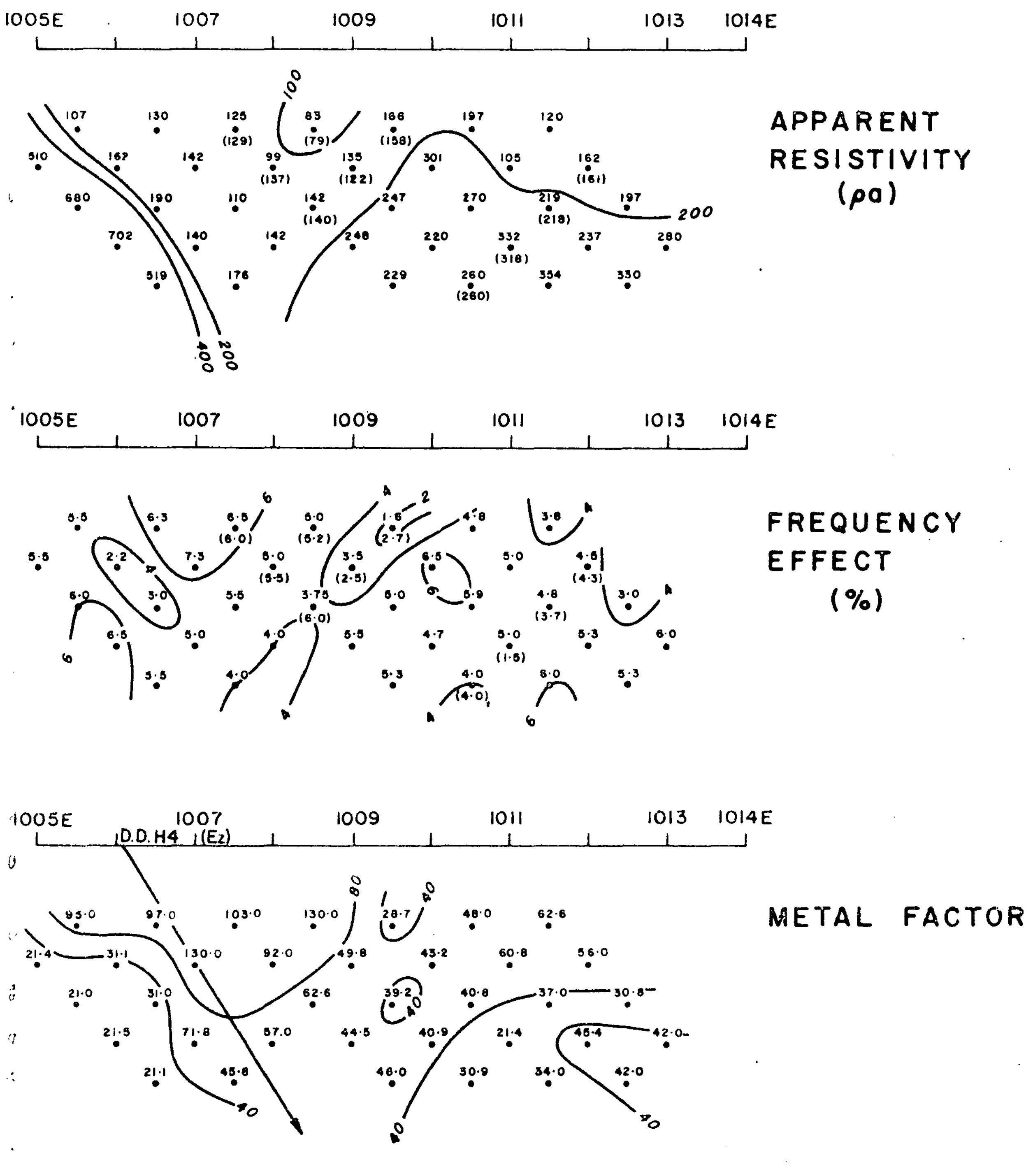
GOLF COURSE AREA

TRAVERSE 1022N

INDUCED POLARIZATION

30m (100 ft) DIPOLE





GOLF COURSE AREA
TRAVERSE 1025N
INDUCED POLARIZATION
30m (100 ft) DIPOLE

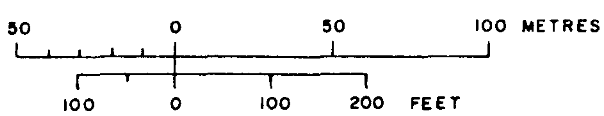
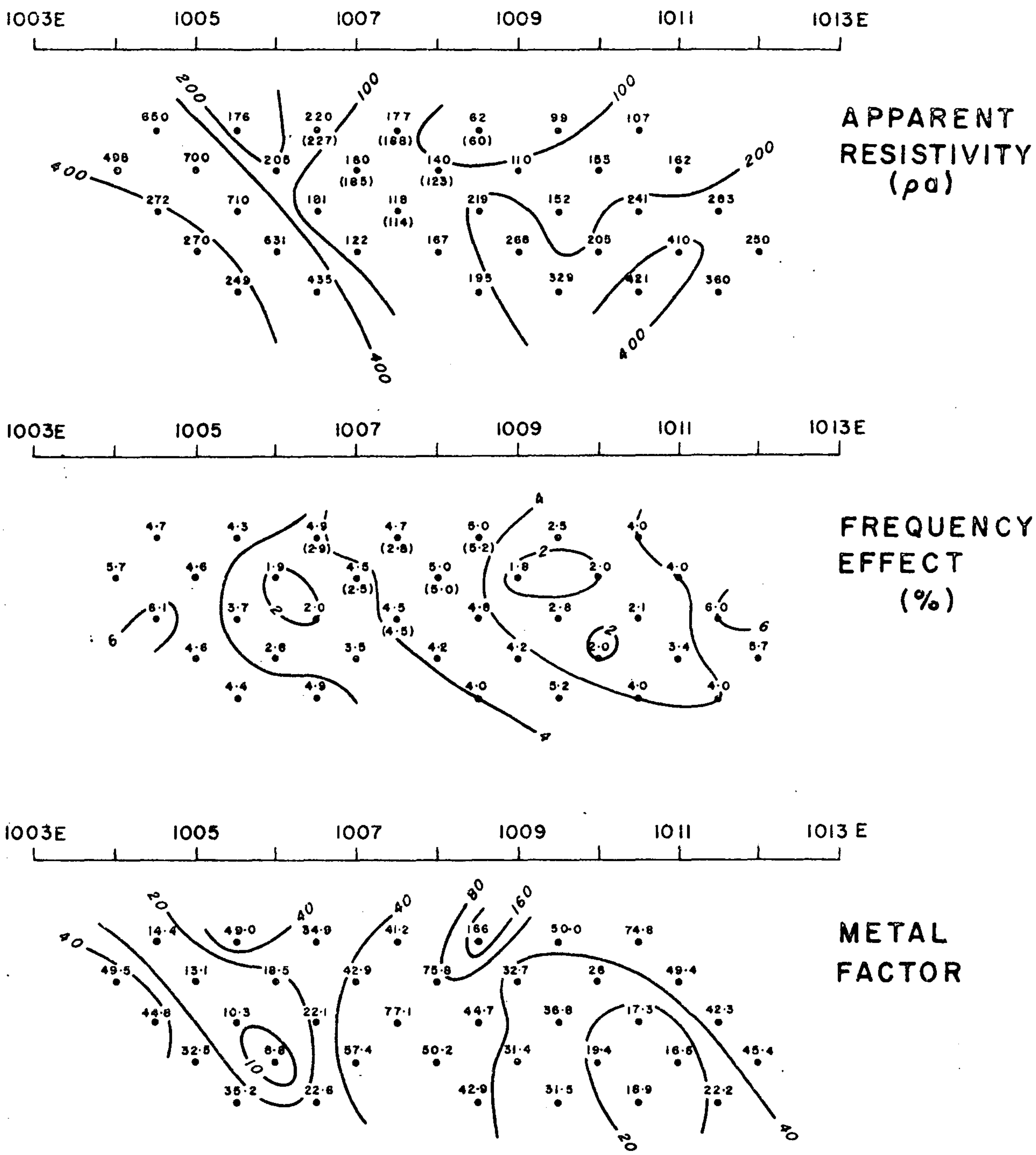


PLATE 10



GOLF COURSE AREA

TRAVERSE 1027N

INDUCED POLARIZATION

30m (100 ft) DIPOLE

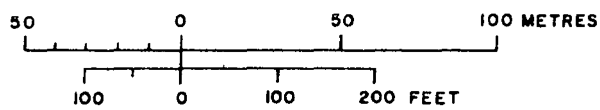
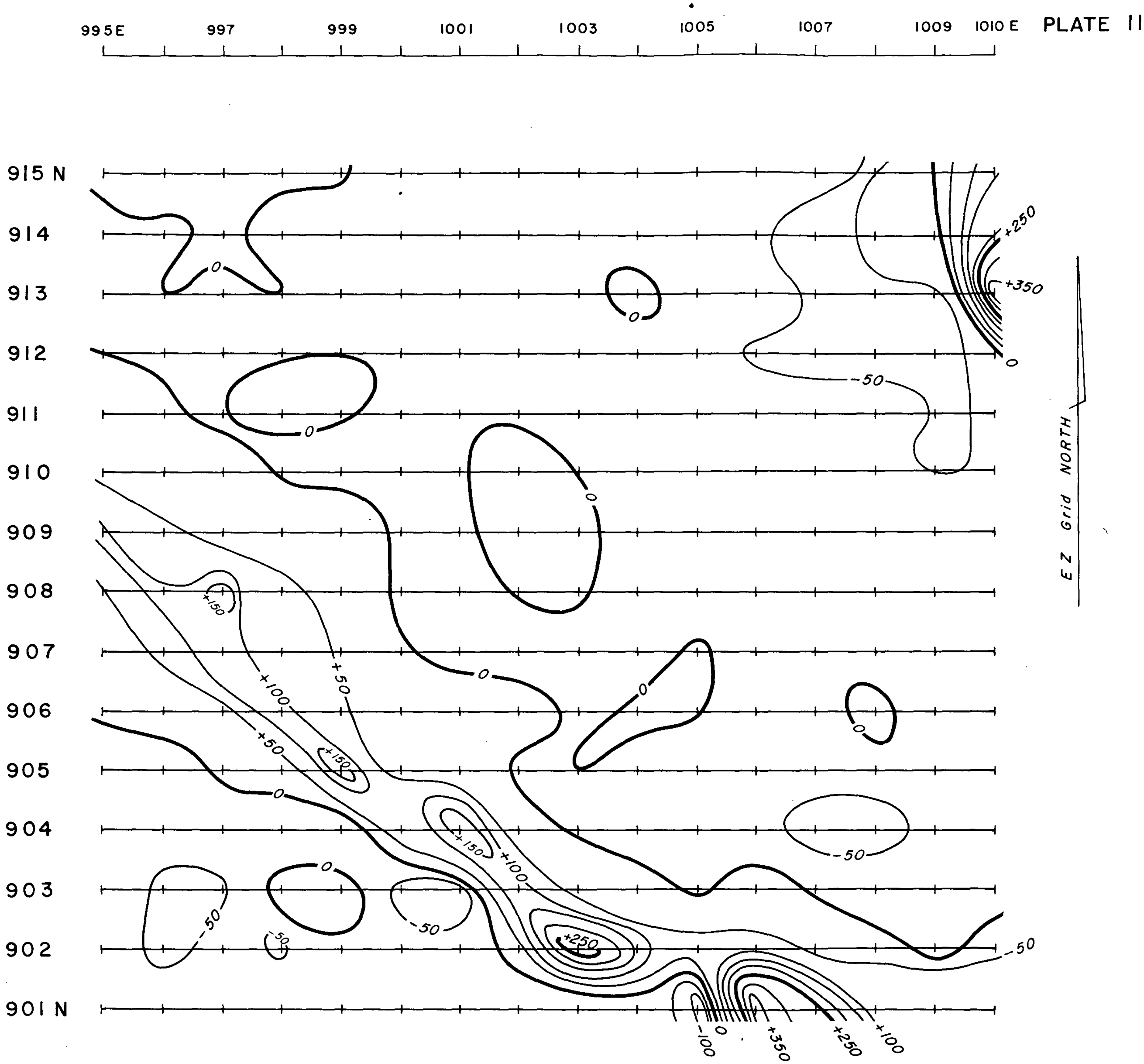


PLATE II



BALDWIN AREA

CONTOURS OF VERTICAL COMPONENT

OF MAGNETIC FIELD (-Z) GAMMAS

50 0 50 100 METRES

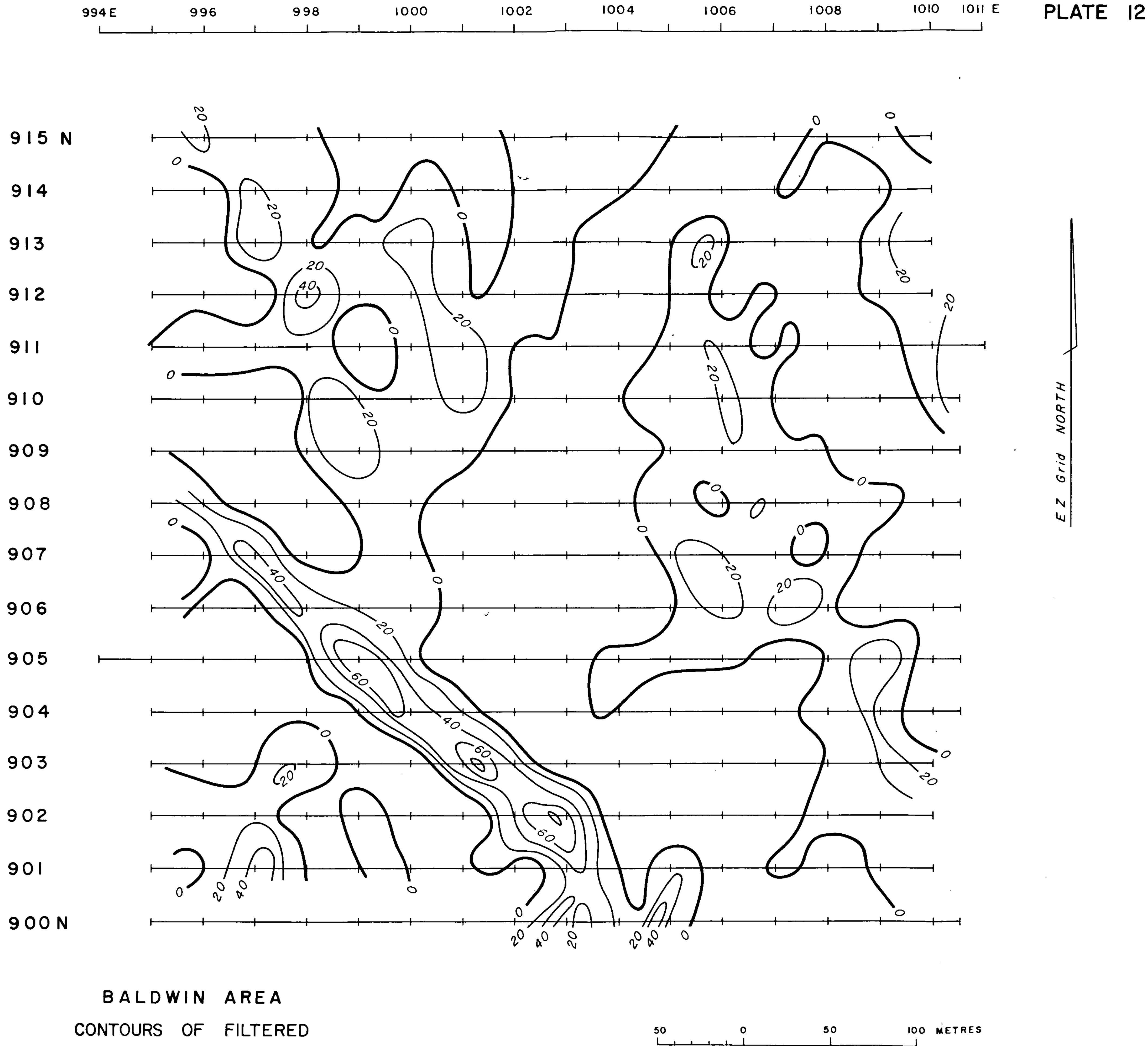
100 0 100 200 300 FEET

Contour interval 50 gammas

To Accompany Record No. 1973/125

I55/B7-106

PLATE 12



BALDWIN AREA

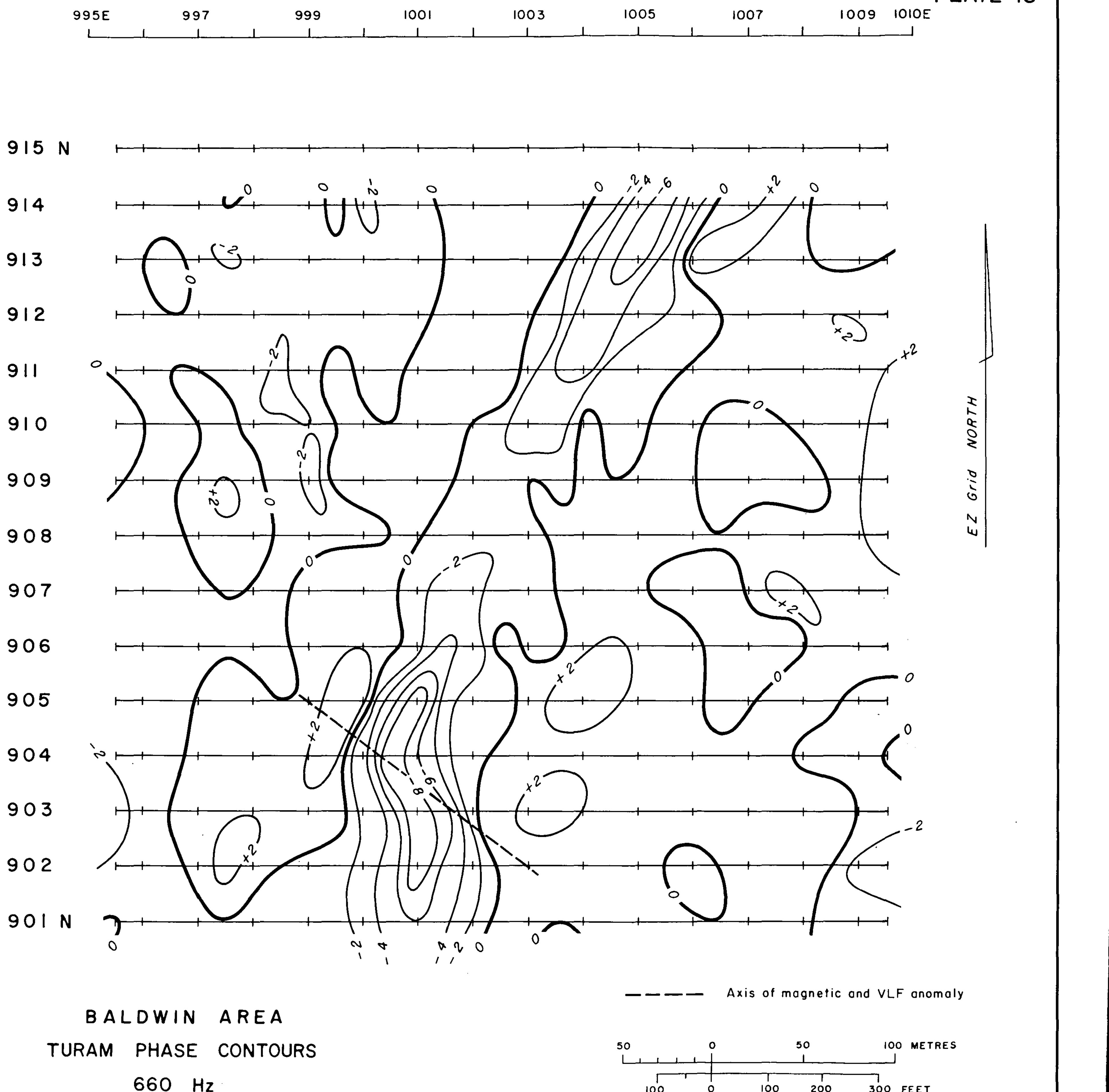
CONTOURS OF FILTERED

VLF IN-PHASE COMPONENT

NWC (NORTHWEST CAPE)

- To Accompany Record No. 1973/125

I 55/B7-107



BALDWIN AREA

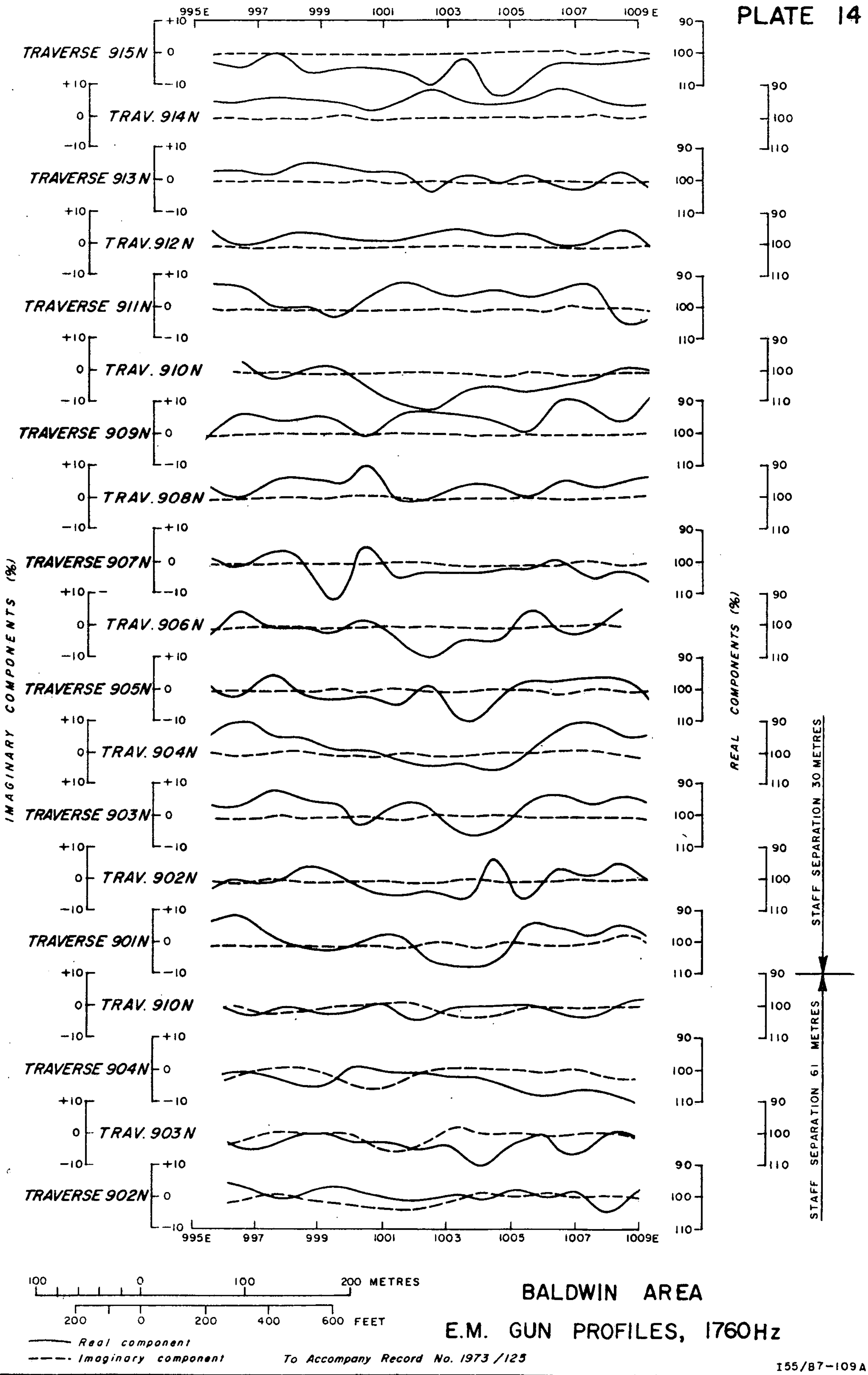
TURAM PHASE CONTOURS

660 Hz

To Accompany Record No. 1973/125

I 55/B7-108

PLATE 14



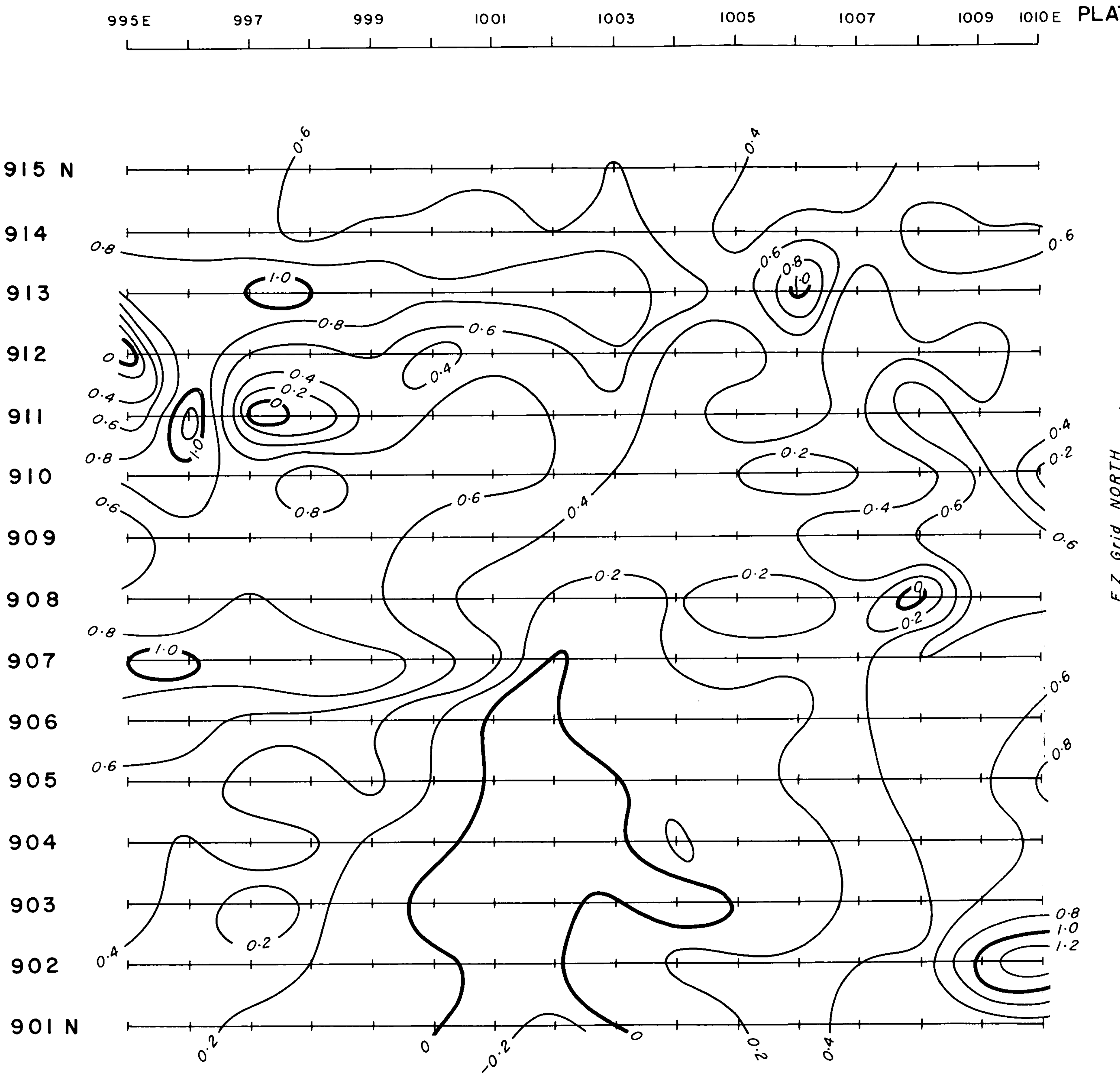
BALDWIN AREA

E.M. GUN PROFILES, 1760Hz

To Accompany Record No. 1973/125

I55/B7-109A

PLATE 15



BALDWIN AREA

GRAVITY CONTOURS

50 0 50 100 METRES

100 0 100 200 300 FEET

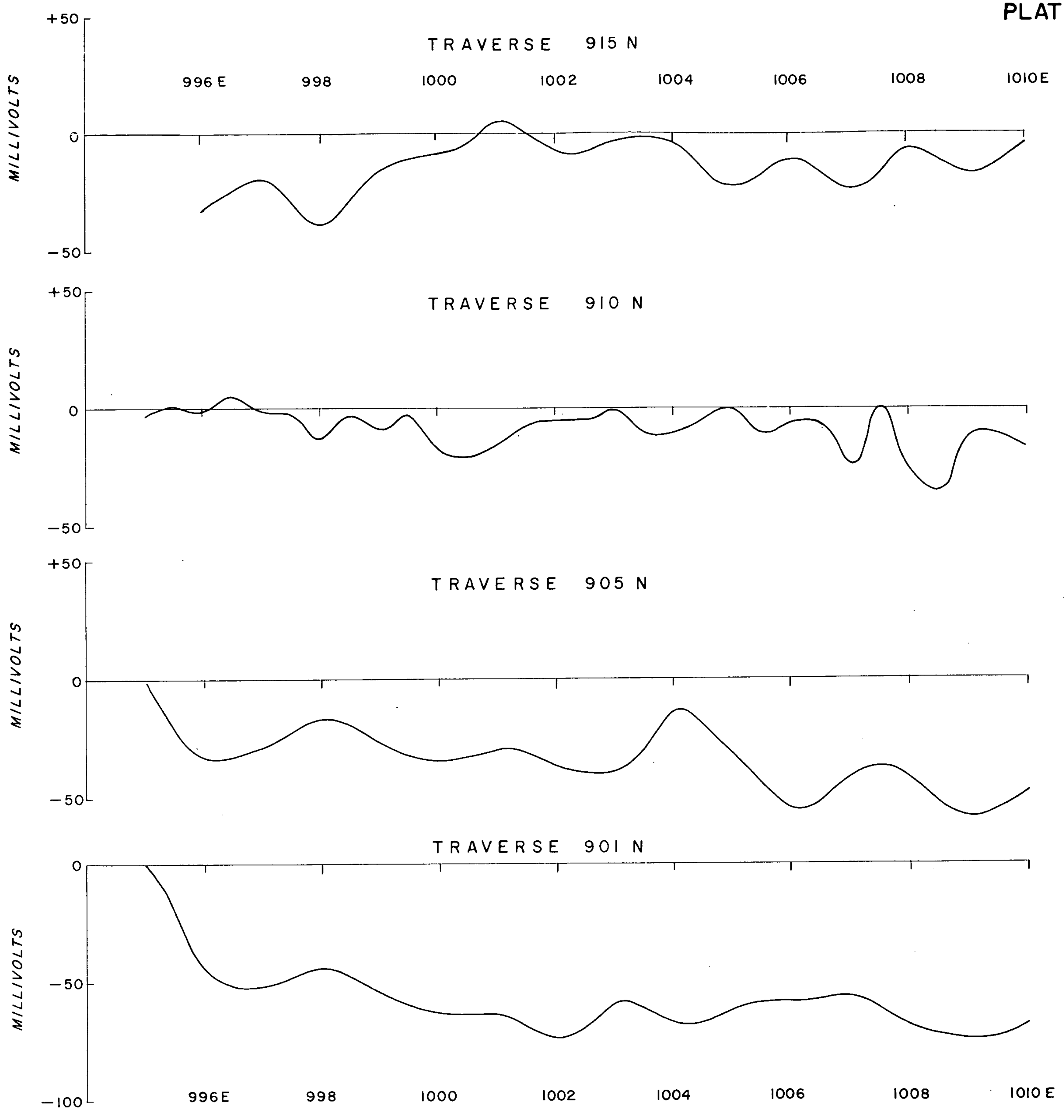
Contour interval 0·2 milligals

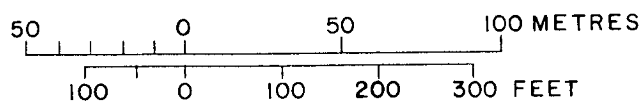
Arbitrary datum

To Accompany Record No. 1973/125

I 55/B7-110

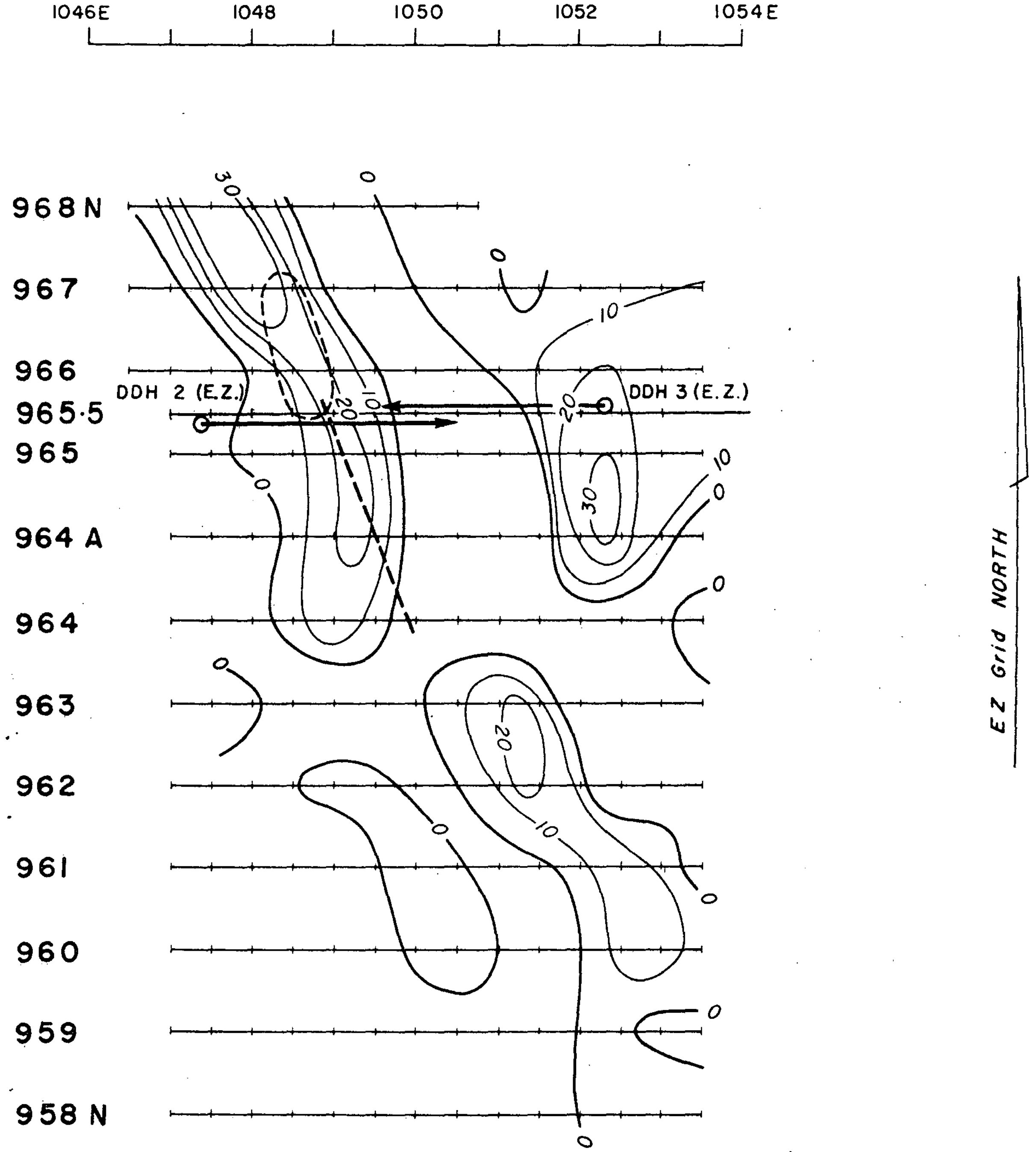
PLATE 16





BALDWIN AREA
SELECTED S-P PROFILES

PLATE 17



GRADYS AREA

CONTOURS OF FILTERED

VLF IN-PHASE COMPONENT

Axis of Turam anomaly } From Ez Surveys

Geochemical anomaly

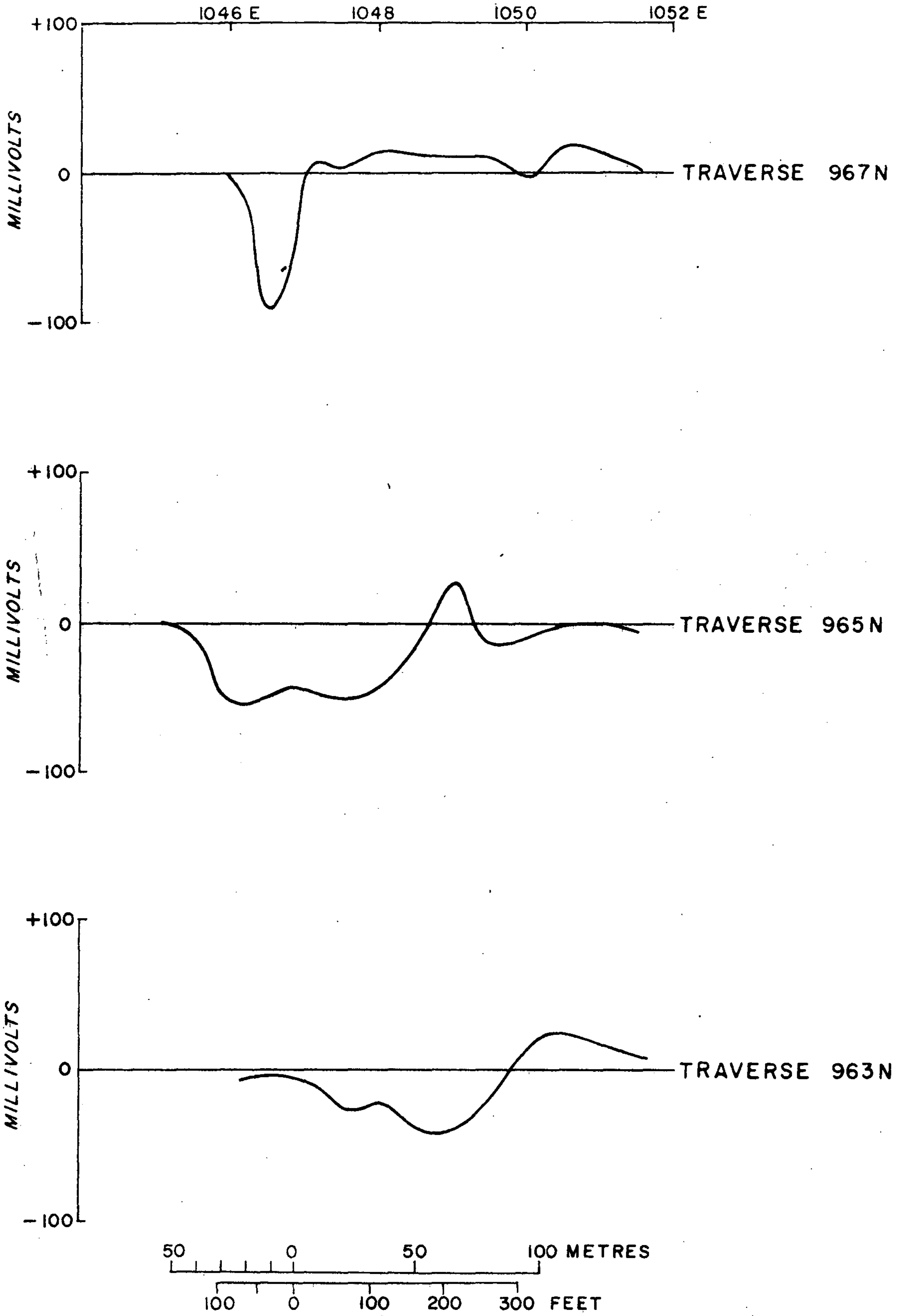
Scale: 50 0 50 100 METRES; 100 0 100 200 300 FEET

Contour interval 10

To Accompany Record No. 1973/125

I55/B7-112A

PLATE 18



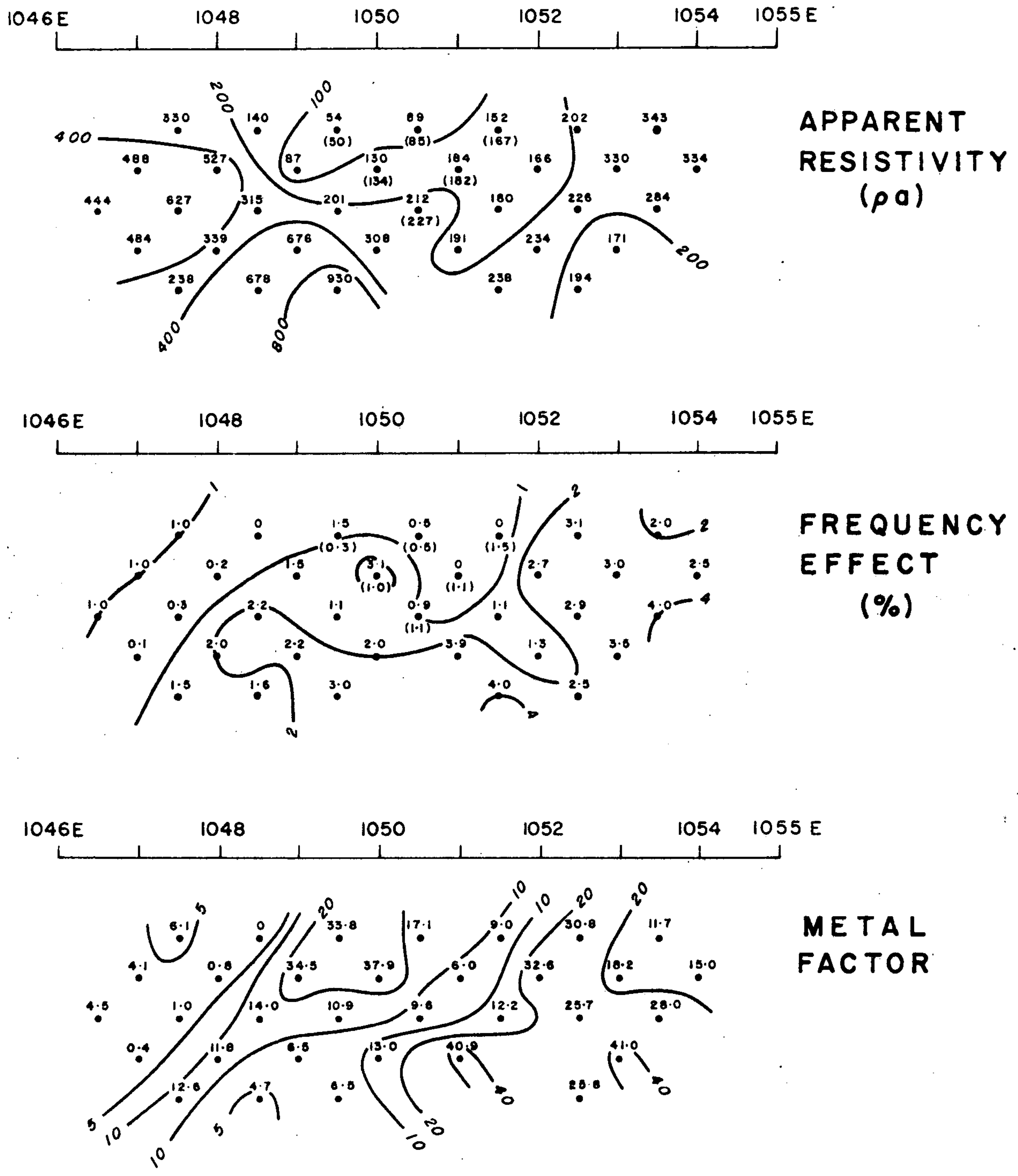
GRADYS AREA

S-P PROFILES

To Accompany Record No. 1973/125

I55/B7-113A

PLATE 19

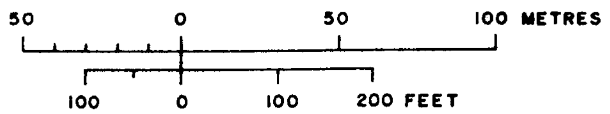


GRADYS AREA

TRAVERSE 963 N

INDUCED POLARIZATION

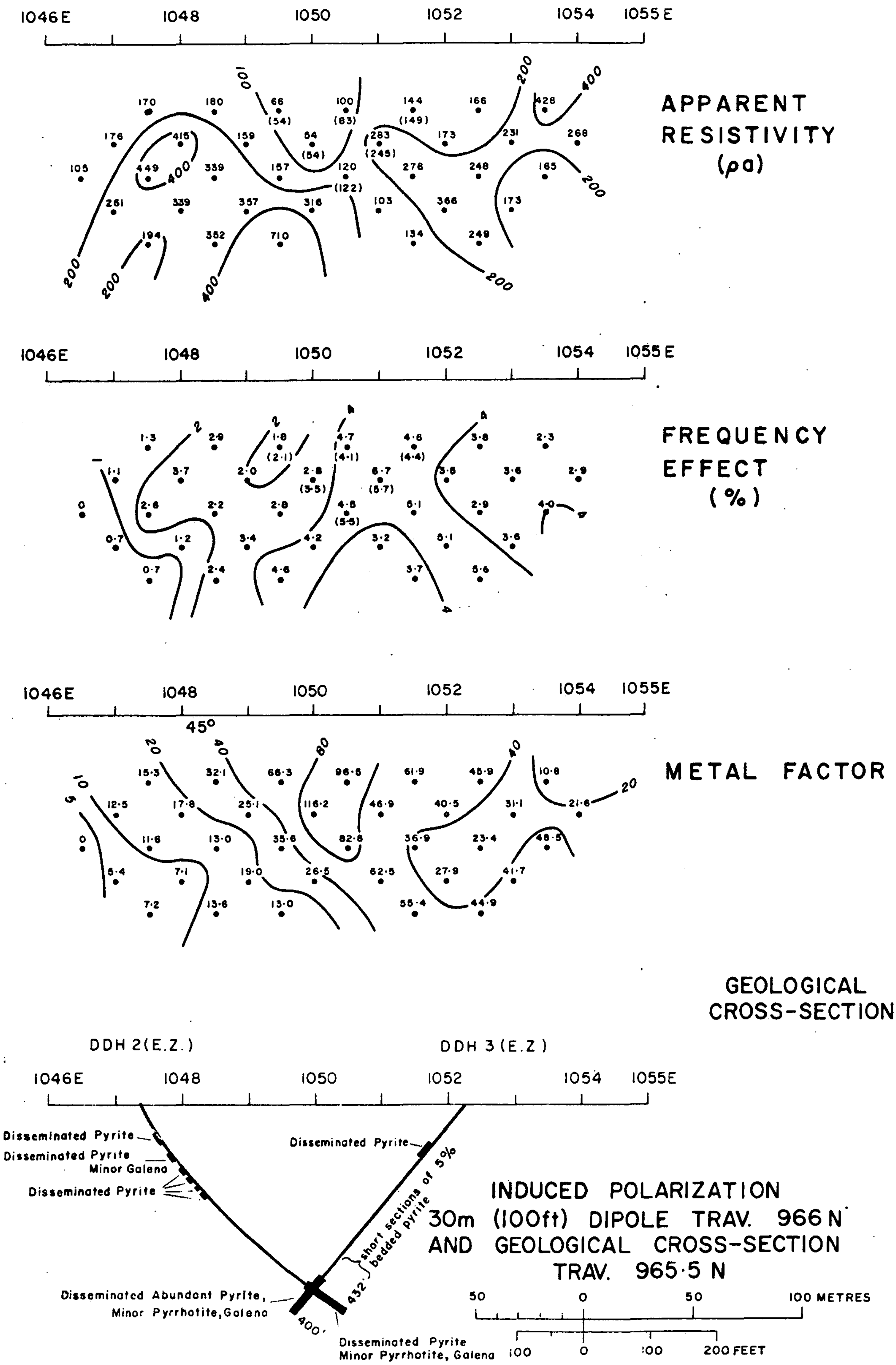
30m (100ft) DIPOLE



To Accompany Record No. 1973/125

I55/B7-114 A

PLATE 20



INDUCED POLARIZATION
30m (100ft) DIPOLE TRAV. 966N
AND GEOLOGICAL CROSS-SECTION
TRAV. 965·5 N