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REPORT ON THE PERKINS PROSPECT
NEAR KINGMAN, ARIZONA.

14th April, 1970 Paul Gilmour

REPORT ON THE GEOLOGY AND ECONOMIC POTENTIAL OF THE PERKINS PROSPECT, NEAR KINGMAN, ARIZONA

on behalf of
Geochemical Surveys Inc.

CONTENTS

Paul Gilmour,
3838, Calle de Soto,
Tucson, Arizona
14th April, 1970

REPORT ON THE GEOLOGY AND ECONOMIC POTENTIAL OF THE PERKINS PROSPECT, NEAR KINGMAN, ARIZONA

INTRODUCTION

The portion of the Perkins prospect area chosen for the present study comprises portions of Sections 22, 23, 26 and 27 of T 25 N, R 21 W. The area is readily accessible by means of Highway 93, Cottonwood Road and 'dozer-cut trails, some of which are shown on the attached plate.

Relief in the mapped area varies from moderate to the southeast to fairly strong in the northwest, although the actual range in elevation is a mere 1000 feet.

The significant ground is controlled by a number of parties. Since the only land information available at time of writing was supplied by Geochemical Surveys, the details will be omitted here.

GENERAL GEOLOGY

According to published maps the area within which the prospect lies is underlain by schists and gneisses of Precambrian age: a "Laramide" granitic intrusion crops out approximately three miles to the north.

Mapping was carried out on coloured air-photos. An uncontrolled mosiac of the same photos was used as the base for the attached plate, the scale being derived from an enlargement of parts of the relevant 15-minute topographic quadrangles, namely Mt. Perkins and White Mountain.

The results of the field work confirmed, in a general way, the particulars shown on the published maps. In addition, a number of minor intrusions ranging in composition from mafic to felsic were recognized.

Precambrian metamorphic rocks were found in two parts of the map area. Near the northwestern portion of the area outcrops comprise coarse-grained gneiss made up of approximately equal proportions of felsic and mafic minerals, whereas to the southeast the rocks are fine-grained, dark-coloured - evidently consisting principally of mafic minerals - and, texturally, range from massive to schistose. The contrasting outcrops of schist and gneiss could signify that the area mapped overlies the (gradational?) contact between the major units of schist and gneiss shown on the published maps.

The central and southern portions of the prospect are underlain by granitic rocks. The "granite" tends to weather readily giving rise to a subdued topography containing only a few, ill-defined outcrops. The saprolitic "soils" over the granite tend to be stained with iron oxides. Where exposed the granite may be seen to vary considerably in texture and composition ranging from coarse-grained porphyritic to medium grained granitoid and from granite to monzonite (?field identification), respectively. The "rusty" colour of outcrops appears to have resulted from the oxidation of mafic rock-forming minerals rather than iron sulphides. In short, the rock strongly resembles the Precambrian "granite" which occurs throughout large parts of Arizona.

A relatively small body of diorite of unknown age crops out in the north-central part of the mapped area, where it has been further exposed by numerous 'dozer cuts and trails. The diorite in many of these man-made exposures is stained with oxidized copper minerals, making it appear the economically most important rock type to occur in the area. Like the granitic rocks described above, the diorite tends to weather readily and, consequently, does not form prominent outcrops. Also like the granite, the appearance of the diorite varies from place to place tending in particular, toward a medium-grained rock exhibiting diabasic texture. The diorite resembles rocks which have a wide geographical distribution in Arizona and range in age from Younger Precambrian to Early Tertiary.

Numerous minor intrusions of felsic composition cut all of the above rock types. Possibly, the distinction between dacite and rhyolite shown on the attached geologic map is more apparent than real, a consequence of variations in grain size rather than composition.

At any rate, a large, irregular, partly sheet-like body, mapped as dacite, occurs in the northwestern portion of the prospect area. Although the dacite intrudes Precambrian gneiss and, possibly, the diorite also, portions of the dacite may have been extrusive.

The southern and eastern parts of the prospect contains a number of intrusions of rhyolite porphyry making up bold outcrops. The intrusions are sill-like and dip to the east at angles varying from around 20 to 40 degrees giving rise to prominent scarps and dip slopes which resemble the surface expression of lava flows. The presence of crude, columnar-jointing heightens this impression. However, where exposed, intrusive relations can be seen on both contacts of the bodies of rhyolite porphyry. Since the southern and eastern portions of the area where the rhyolite intrusions occur lie at lower elevations than the northeastern segment containing the dacite, it is possible that the rhyolite represents the "roots", or downward extensions, of the intrusive/extrusive dacite complex which have been exposed by the deeper level of erosion prevailing in the south and east.

Three small bodies of latite porphyry were also noted.

The most striking structural feature of the prospect is the north-northwesterly "grain" clearly visible on airphotos and on the geologic map. The most obvious expression of this grain on the latter is, of course, made up of rhyolite outcrops, but on coloured air-photos the drainage channels and zones of contrasting colours both emphasize this feature.

The distribition of diorite outcrops as well as a few weakly-developed lineaments visible on the air photos suggests that a northeasterly-striking fault might cross the area in the vicinity of the visible copper mineralization.

The only significant mineralization consists of the oxidized copper minerals exposed in 'dozer cuts which was noted above. Malachite, neodosite and small amounts of chrysocolla and azurite were noted. No definite evidence of the presence of sulphides was observed.

In spite of the fact that it was remarked above that the iron oxide staining of the granite appears to have resulted from the oxidation of mafic minerals, a weak "colour anomaly" (after primary sulphides?) is visible both on the ground and on coloured air-photos in association with the diorite intrusion and the granite lying to the south. Possibly, weak pyritic mineralization has caused, or contributed to, this iron-staining.

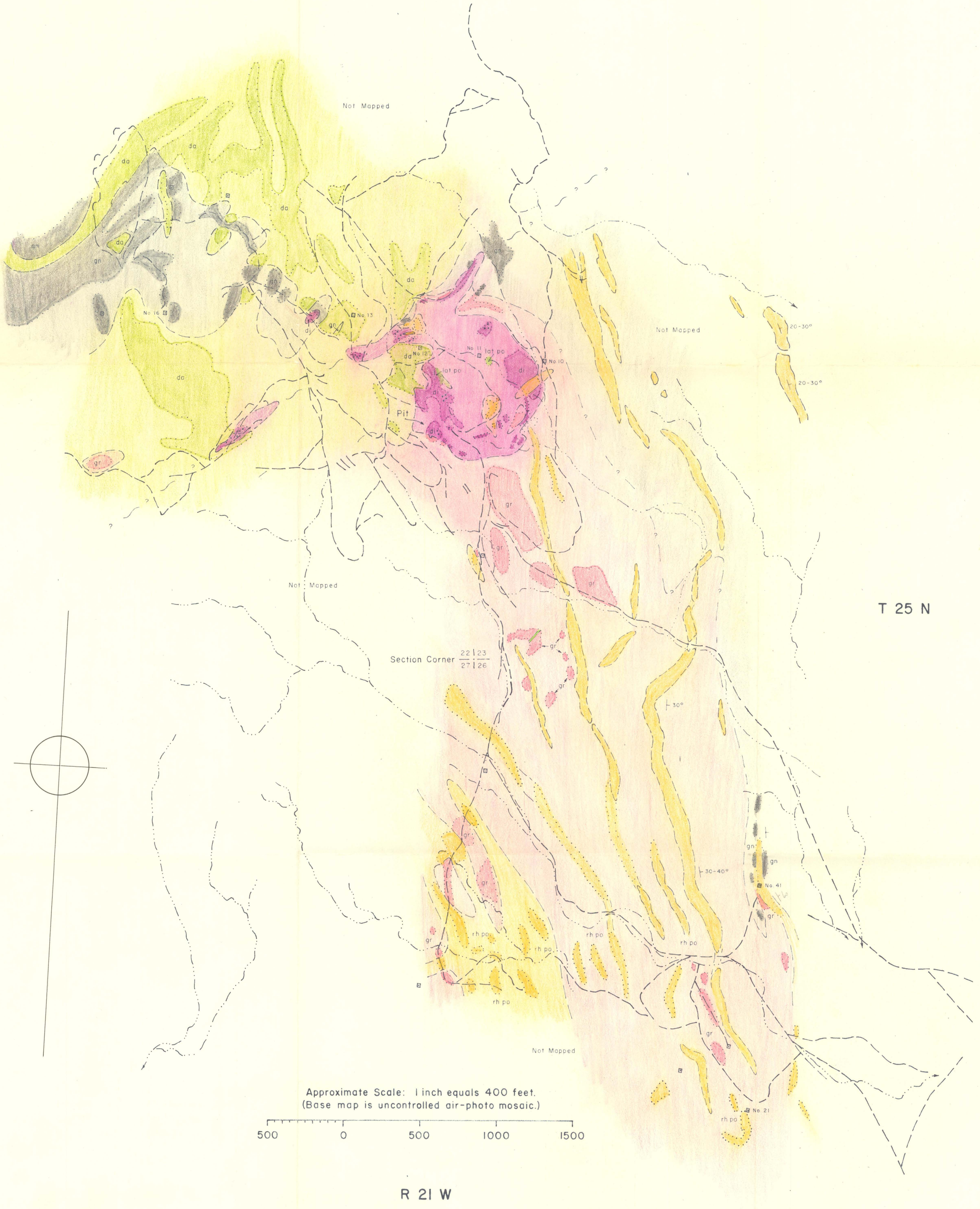
CONCLUSIONS AND RECOMMENDATIONS

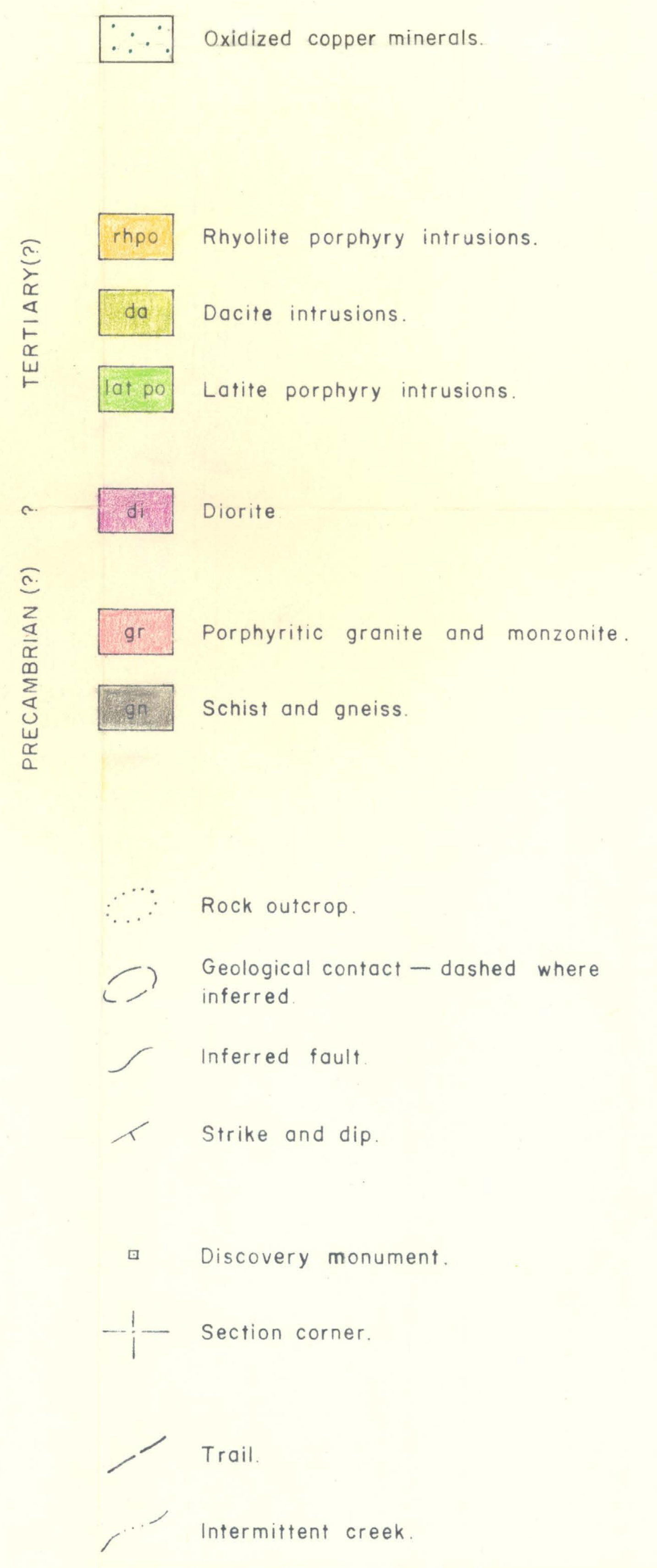
A few years ago a geologist would have been entirely justified in writing off the copper mineralization in the diorite on the Perkins property as being of no significance. It seems to the present writer, however, that since the discovery of the Sierrita orebody and the development of copper ore in diabase sills at Ray were announced, copper mineralisation in dioritic or diabasic rocks should not be dismissed lightly. So, although it is difficult to become enthusiastic about the Perkins prospect as it stands, it is proposed to try to enlist the help and advice of someone familiar with both Ray and Sierrita in the hope that their superior knowledge of the type of mineralization in question will permit a more definitive evaluation to be made.

Tucson, Arizona
14th April, 1970

Signed:

Paul Gilmour





Geochemical Surveys, Incorporated

KINGMAN PROJECT
Mt. Perkins Area

RECONNAISSANCE GEOLOGIC MAP
of parts of
SEC. 22, 23, 26 & 27, T 25 N, R 21 W

Paul Gilmour
Consulting Geologist
Tucson, Arizona

April 10th, 1970

Gunnex
Lost Basin
270-68

ELECTRICAL GEOPHYSICAL SURVEY

LOST BASIN AREA

MOHAVE COUNTY, ARIZONA

For

Gunnex Limited

Job #270-68

ELECTRICAL GEOPHYSICAL SURVEY

Using The

Dual Frequency Induced Polarization, Resistivity and

Self Potential Methods

LOST BASIN AREA

MOHAVE COUNTY, ARIZONA

September - October 1968

For

Gunnex Limited

Toronto, Canada

By

Heinrichs Geoexploration Company
P. O. Box 5671 Tucson, Arizona 85703
Phone: 623-0578 Area Code: 602

TABLE OF CONTENTS

GENERAL LOCATION
of
LOST BASIN AREA
for
GUNNEX LIMITED

ARIZONA

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GEOEXPLORATION COMPANY
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PH: 602 623-0578 CABLE: GEOEX, TUCSON
GEOPHYSICAL ENGINEERS
SYDNEY
VANCOUVER

INTRODUCTION

At the request of Dr. John Walker and on behalf of Gunnex Ltd. of Toronto, Canada, Heinrichs Geoexploration Company conducted a preliminary reconnaissance induced polarization (I.P.) and resistivity survey in the vicinity of the King Tut Placer Mine, Mohave County, Arizona. The field work was started and completed during the interim of September 5 to September 19, 1968.

Geoex extra heavy duty equipment, Mark 3 sender, Mark 3 receiver, and 15 KW generator was used. The dual frequency induced polarization technique was employed as described in the appended "Basis of the Induced Polarization Method", obtaining data utilizing the conventional collinear dipole-dipole electrode configuration. Electric current at frequencies of 0.05 and 3.0 Hz was usually used to energize the standard five electrode sending spread. At times 0.1 Hz was used to improve data quality when high noise conditions were present. This data was later mathematically reduced to 0.05 Hz so that all data is standardized at the same frequency for presentation.

One thousand foot dipoles were used for the survey, effectively exploring a layer or zone from about 200 to 1,200 feet deep below surface. A total of three 1,000 foot spreads, one 500 foot spread, and one 250 foot spread were obtained from four lines.

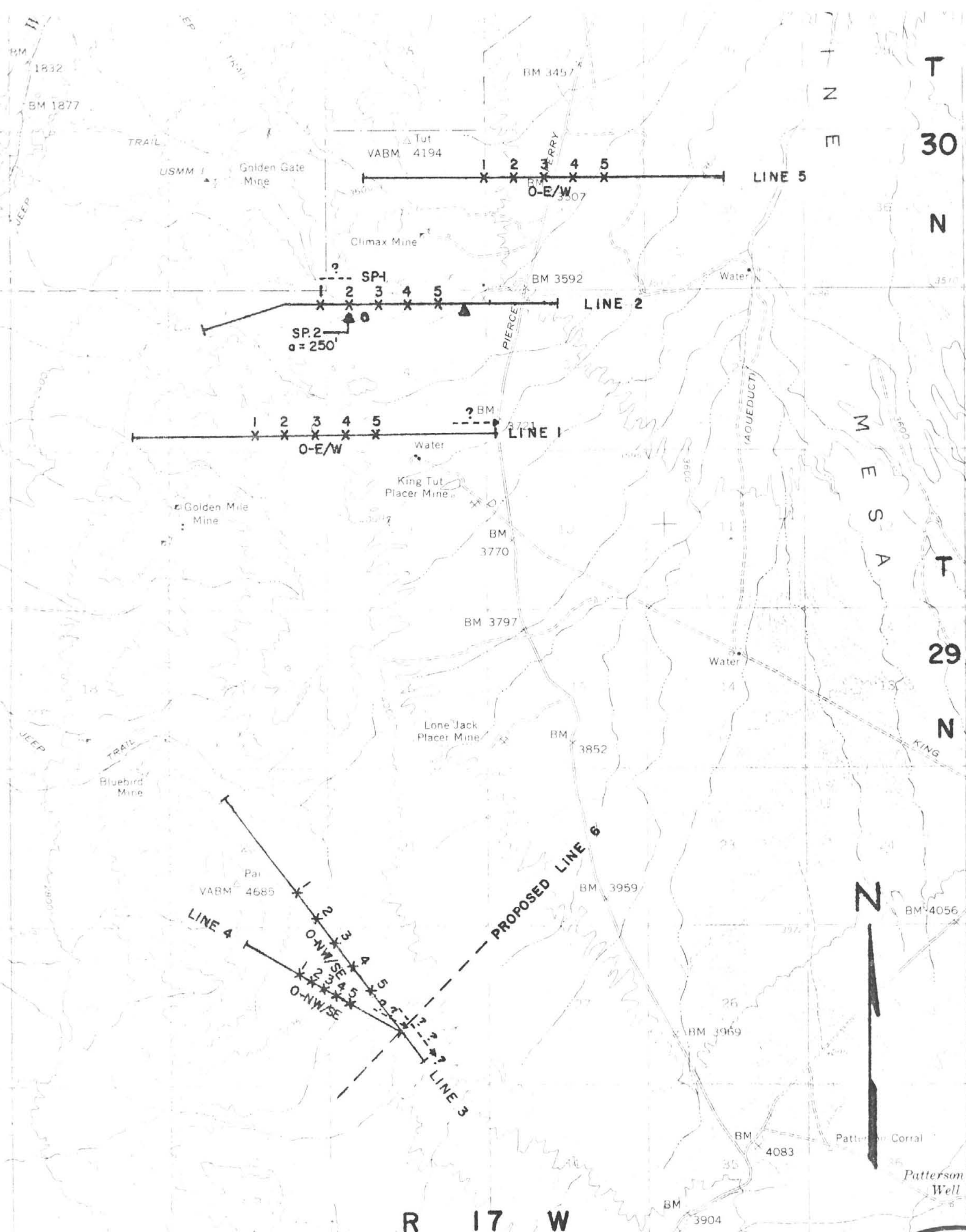
The data obtained and its interpretation is summarized on an adaptation of the Garnet Mountain Quadrangle. Detailed presentation of the data is shown on sectional data sheets, one for each spread with contoured apparent resistivity ($\rho a/2\pi$) percent frequency effect (PFE), and metallic conduction factor (MCF) plotted in accordance with the procedures discussed in the "Basis of the Induced Polarization Method". Also presented on the sectional data sheets is the self potential (SP) profile observed and recorded along with the I. P. work.

The Geoex personnel who worked on the project are: Mr. Donald Berglind, crew chief; Mr. Bill Rasmussen, sender operator; and Mr. Chris Dahlberg, field technician, with final interpretation and report under the direction of Mr. Paul Head, assisted by the Geoex, Tucson, Arizona staff.

CONCLUSIONS AND RECOMMENDATIONS

Only Line 2 detected any polarization effects that seem to relate to sulphide mineralization. This very weak anomaly is probably caused by small sulphide concentrations along a fault or fractures in the same drainage feature as the Golden Gate Mine. Additional geologic information here may indicate potential usefulness for additional geophysics. However, no additional I. P. work is recommended near Line 2 based solely on the data presently on hand.

An additional spread of 1,000 foot dipoles would be useful to determine if the questionable anomaly on Line 3 and 4 is definitely due to coupling effects. Proposed Line 6 is shown on the plan map is centered at 30.0 SE on Line 4 and is oriented approximately N 45 E. The data should be obtained using frequencies of 1.0 and 0.05 Hz for all stations on each side of center. In addition all four readings on the fourth station each side of center should be read using a frequency spectrum of 3.0, 1.0, 0.3, 0.1, and 0.05 Hz to more positively prove or disprove the presence of adverse coupling effects.



INDUCED POLARIZATION LOCATION PLAN
LOST BASIN AREA, ARIZ.
for
GUNNEX LIMITED

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Registered Professional Engineer
CERTIFICATE EXPIRES
WALTER E. HEINRICHS, JR.
DEC. 31, 19 68
ARIZONA, U.S.A.

SCALE 1:62500
SEPT. 1968

INTERPRETATION

Line 1, Spread 1, a = 1,000 feet

The generally higher resistivity schists are separated from the gravel to the east by an electrical interface at about 25.0 E. Very weak frequency effects were detected beginning at 30.0 E and continuing eastward off the survey. These I. P. effects are not considered anomalous because they could be accounted for by electromagnetic (E.M.) coupling effects introduced by the lower ~~conductivity~~ gravels.

Resistivity see letter from Mallory June 3, 69

Line 2, Spread 1, a = 1,000 feet

Line 2 has about the same resistivity features as Line 1 except for an apparent resistivity low at about 15.0 W. Associated with this is a slight S. P. low and some questionable frequency effects.

The east end of the line shows very slight frequency effects probably the result of E.M. coupling.

Line 2, Spread 2, a = 250 feet

This spread was centered at 10.0 W to check the anomaly on Line 2, Spread 1. A very weak anomaly is confirmed between 13.75 and 8.75 W. The S. P. anomaly was not confirmed.

Line 3, Spread 1, a = 1,000 feet

Quite a definite apparent resistivity interface at 5.0 SE separates low resistivity gravels on the east from the schists to west. The very weak questionable frequency effects are possibly explained by E.M. coupling. No significant S. P. anomalism was detected.

Line 4, Spread 1, a = 500 feet

Line 4, Station 30.0 SE is approximately equal to station 40.0 SE on Line 3 and is oriented as shown on the plan map. An increase in PFE values to the east is primarily due to electromagnetic coupling, however, there does seem to be very weak polarization effects not explained.

Line 5, Spread 1, a = 1,000 feet

All frequency effects detected on this line are easily explained by coupling effects over the low resistivity gravels in the basin.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Paul A. Head

Paul A. Head
Geophysicist

APPROVED: W. E. Heinrichs Jr.
Walter E. Heinrichs, Jr.
President & General Manager

Registered Professional Engineer
CERTIFICATE EXPIRES
WALTER E. HEINRICHS, JR.
DEC. 31, 19
ARIZONA, U. S. A.

BASIS OF THE INDUCED POLARIZATION METHOD

The induced polarization method is based on the electrical properties exhibited by electronic or metallic conductors embedded in an ionic or electrolytic conducting matrix. These properties are noticed in that the potential across a block of this dual conduction mode material will increase with time, approaching a constant value, when a constant current is made to flow through the block. This phenomenon occurs because at the boundaries between the two conductor types, electrolytic ions have to give up or take on electrons thereby requiring an additional force (overvoltage) over that which would be needed with only one mode of conduction; showing up as a building of potential across the block with time as more ions are backed up. This potential approaches a constant value when an equilibrium is established between the ions backed up at the boundaries and those flowing across the boundaries. Therefore, from the preceeding discussion, it is seen that the gross effect is quite similar to the charging of a leaky capacitor and for most applications, it is proper to use this model as a guide. These capacitive-like properties are normally measured by one of three different field techniques.

In the time domain (pulse) method, a steady direct current is imposed in the ground for a few seconds and abruptly terminated so that the resulting capacitive-like voltage decay (discharge) curve can be measured or recorded. Usually, the voltage decay curve is integrated with respect to time to give the area under the decay curve in units of volt-seconds. This value is then normalized by the primary voltage measured while the steady current is on. The more area determined, the more capacitance or polarization the ground exhibits.

In the frequency domain (dual frequency) method, the percentage difference between the impedance (AC resistance) offered to a lower and higher frequency is measured. A capacitor offers a lower impedance to a higher frequency than it does to a lower frequency, therefore, the percentage difference between the impedances will increase with increased polarization.

A third technique is to measure the phase angle or delay between an introduced current wave-form and the received voltage wave. This phase delay also increases as polarization increases.

Almost all metallic lustered minerals, including most sulfides, for example: pyrite, chalcopyrite, chalcocite, bornite, and molybdenite are electrical conductors. The rocks and groundwater, with which they permeate or are permeated, are also ionic conductors; therefore, if an electrical current is made to flow through a sulfide deposit, it will polarize and often can be detected by the three methods described above.

The induced polarization property is not entirely unique with sulfides since magnetite, graphite (which are both metallic lustered) and some clays will exhibit it; however, with sufficient geological and geophysical data, effects due to sulfides can generally be interpreted apart from non-sulfide anomalism. The type of sulfide however, say pyrite, as distinct from chalcopyrite, cannot yet be distinguished with present induced polarization techniques since all types give quite similar response.

The I.P. technique was developed primarily for porphyry type deposits and is perhaps the only reliable means of detecting hidden disseminated sulfides. However, the I.P. method works just as well or perhaps better on semi-massive to massive sulfides, contrary to some of the earlier thinking, for it generally gives increased response with increased volume percentage of sulfide.

FIELD TECHNIQUES AND INTERPRETATION

For routine exploration, we prefer and use the dual frequency system because of its greater simplicity of instrumentation, operation, and greater accuracy as well as simplicity of interpretation. However, all three methods give basically the same results and the choice is either a matter of opinion or highly technical reasons and therefore should be left to the particular application and the geophysicist's discretion.

The two frequencies we most commonly use are 0.05 and 3.0 cycles per second, or so called "D.C." and "A.C." modes respectively. Other frequencies are available with our equipment and are occasionally used when desired. The usual frequency range used is from about 0.01 cps to 10 cps. The lower frequency limit is due to naturally existing, time-varying, telluric (natural earth) currents, and electrode polarization. The upper limit is determined by electromagnetic coupling effects which increase rapidly with increasing frequency.

In our standard reconnaissance field practice, five equally spaced collinear current electrodes are placed in the ground by burying aluminum foil in pits wetted with brine to insure good electrical contact. Observations are made using a symmetrical dipole-dipole electrode configuration where the distance (a) between adjacent receiver (potential) electrode pairs (or dipoles) is kept equal to the distance between adjacent sender (or current) electrode pairs. Generally the receiving dipole is separated by one to six dipole units ("n" separation) from the sending dipole. Figures 1 and 2 indicate this configuration and resulting data plotting positions. A precisely controlled square wave current is sent through a sending dipole at 0.05 and 3.0 cycles per second from which, at the receiving dipole, a "D.C." and an "A.C." voltage is measured respectively. By knowing the geometry involved (the dipole length or spacing and the separation distance between the two receiving-sending dipole pairs), along with the two voltages, an apparent "D.C." and an "A.C." resistivity can be calculated. From these apparent resistivities, their percentage difference is determined, thus giving the Percent Frequency Effect (PFE). A third quantity porportional to PFE and inversely porportional to "D.C." resistivity, called Metallic Conduction Factor (MCF) is computed in order to somewhat normalize PFE for variations in ground conductivity purely as a technical interpretational aid. Formulas for these various quantities are given on page 5.

Selection of electrode spacings [(a) in Fig. 1] is determined by the objectives to be reached in a given survey. This spacing will range from very small (50 ft. or less) for very detailed and shallow surveys, up to 1,000 ft., or occasionally more, for broad, deep reconnaissance work. Other factors involved in the selection of spacing are concerned with the anticipated physical geometry of any possibly existing mineral occurrence. This includes consideration of expected depth of burial to the top of the deposit, the dimensions of the deposit itself, its orientation, strike and dip, etc., as well as its expected electrical properties.

In general, the greater the dipole spacing and "n" separation, the greater the depth penetration and the less the resolution. An average rule of thumb, with a good contrast of electrical properties, using the symmetrical co-linear dipole-dipole system, and having data from 1 through 4 in "n" separations, is that two times the dipole length is the maximum depth of detectable penetration for a body having two or three of its dimensions large in relation to the dipole spacing. However, a body having two or three of its dimensions less than the dipole spacing, and buried more than one spacing probably will not be detectable. A zone, regardless of orientation, having a dimension less than 0.1 the dipole spacing likely will not be detected. Also, zones differing by less than about 30% in electrical conductivity will not be very easily resolved by resistivity measurements, but may still be detected if a polarization contrast exists.

To illustrate the above in more concrete terms, consider a dipole spacing of 1,000 ft. for the following: An overburden of more than 2,000 ft. would likely not allow enough current penetration into bedrock to detect even a large and highly mineralized zone in the bedrock. Also, a sulfide zone lying completely within 200 ft. of the surface generally would not be detected. A spherical or elongated cylindrical body whose diameter is much less than 1,000 ft. would be just out of the range of detectability. A dike-like or sill-like zone whose width is less than

100 ft. probably would not be detected regardless of how it lies relative to the spread.

So far, only the maximum and minimum limits of detection and resolution relative to the various geological and geometrical configurations have been discussed, thus omitting optimum conditions. Generally, we attempt to make the dipole spacing one or two times the expected depth to the target in order to obtain a good electrical response. Of course, where it is suspected that the zone has a good depth extent, say two or three dipole spacings, as is typical of most porphyry type copper deposits, a spacing considerably more than two times the expected depth to sub-outcrop can be used to obtain broader and more rapid coverage, as long as we do not exceed the width. Because of these factors, we usually use 500 to 1,000 ft. dipole spacings in prospecting for porphyry-type deposits.

The field data are interpreted after plotting the PFE, MCF and resistivity as in Figures 1 and 2. These values are then contoured in sections, the resistivity and metallic conduction factor logarithmically (because of the usual large variations in magnitude) and the percent frequency effect on a constant interval. This two dimensional method of plotting gives an additional advantage over the standard profile methods in that easily recognizable patterns are associated with various subsurface geometrical configurations and that lateral variations can be separated from vertical effects. See the four appended examples of plotted field and theoretical sectional data sheets.

It should be realized that there is no definite relation between the vertical scale on these plots and actual subsurface depth. The data point values are a complexly weighted average of the electrical contrast distribution in the vicinity of the sending-receiving dipole pair and contain depth as well as lateral information. About all that can be said is that by increasing the dipole length and the dipole separation ("n" separation) more volume of ground is being affected and therefore more depth penetration.

There are cases where the depth to a subsurface feature can be determined fairly precisely as in the two horizontal layer situation. The field data is compared with theoretical type curves for various resistivity contrasts between the top and bottom layer and various thickness of the top layer until a close match is found. This enables the depth to the bottom layer in the field to be determined as well as the true resistivity of both layers. A major limitation of this interpretational technique is that only a few simple geometric cases related to a relatively few numbers of layers have been theorectically developed. However, extremely valuable information can still be derived in alluvial and lake bed applications for depth to bedrock and groundwater purposes, etc.

In interpreting PFE's, values of 0 to 4% are usually considered background, 4 to 8% marginally anomalous, and 8 to 40% plus definitely anomalous, but they must be considered in light of the associated resistivity. Very low resistivities give an increased background frequency effect due to an electromagnetic inductive coupling interference phenomenon that must be corrected for. The MCF tends to correct any high resistivity increased background effects, but tends to amplify the electromagnetic frequency effects making a correction imperative.

<u>FORMULAS:</u> $PFE = [\rho_{dc}/\rho_{ac}-1]\ 100$

Where PFE is Percent Frequency Effect, ρ_{dc} is the apparent resistivity at the lower frequency and ρ_{ac} is the higher frequency apparent resistivity.

$$\rho = 2\pi V K_n / I$$

Where ρ is either ρ_{dc} or ρ_{ac} depending on frequency of the current I which is measured in amperes. The potential V, arising from I, is measured in volts. K_n is the geometric factor given by:

$$K_n = \tfrac{1}{2}an(n+1)(n+2)$$ (Only for dipole-dipole arrays.)

Where "a" is the dipole spacing in feet and "n" is the number of dipoles separating the sending and receiving dipoles; this gives, for apparent resistivity:

$$\rho = [2\pi V/I][\tfrac{1}{2}an(n+1)(n+2)]$$

from which we see that ρ is in units of ohm-feet. However, the apparent resistivity usually is plotted: $\rho/2\pi$

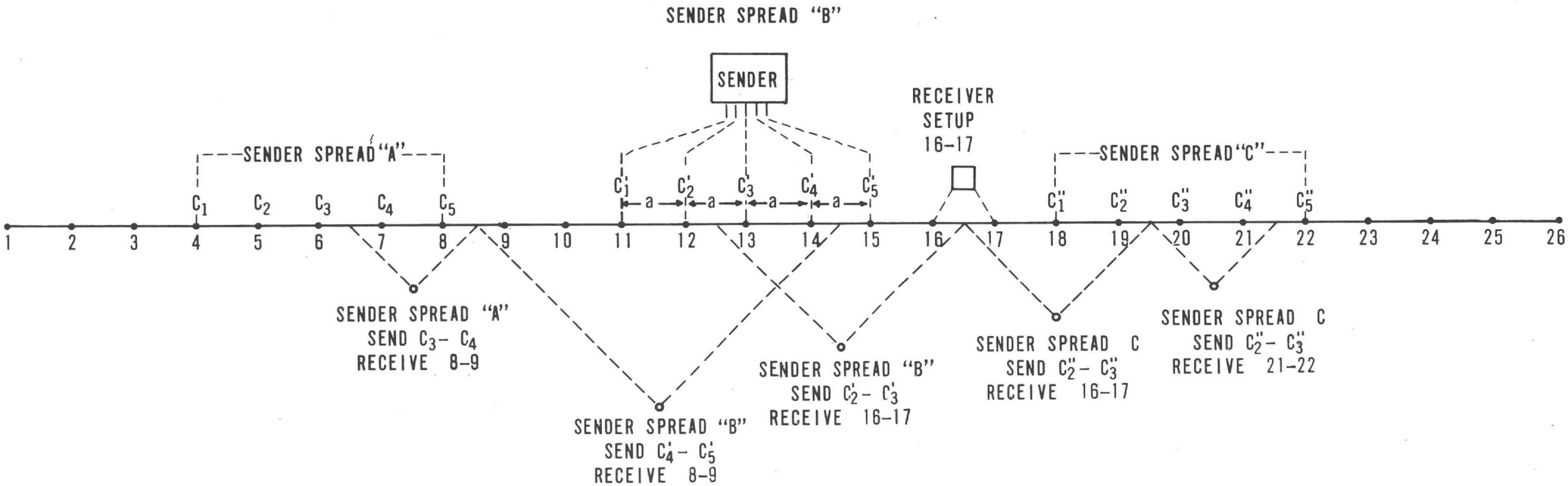
$$\rho/2\pi = VK_n/I = [V/I][\tfrac{1}{2}an\ (n+1)(n+2)]$$

$$MCF = 1000 \times PFE/[\rho_{dc}/2\pi]$$

Where MCF is the Metallic Conduction Factor and $\rho_{dc}/2\pi$ is apparent "D.C." resistivity.

References:
1. Wait, James R., "Overvoltage Research and Geophysical Applications", Pergamon Press, 1959.
2. "Mining Geophysics", Society of Exploration Geophysicists, Vol. I, Case Histories, October 1966.

Published by W. E. Heinrichs, Jr., et al., Engineering and Mining Journal, September 1967.

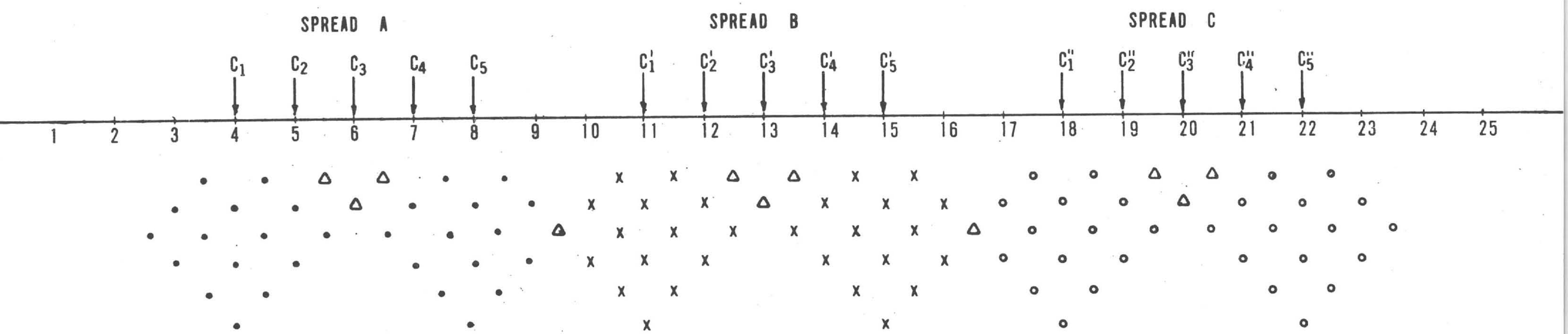


SCHEMATIC DIAGRAM ILLUSTRATING THE METHOD OF OBTAINING AND PLOTTING DIPOLE-DIPOLE I.P. DATA

Diagram shows three separate current electrode spreads along a traverse line. In normal procedure, there are three dipole separations between current electrode spreads. The receiver setups are moved outwards from the ends of each current electrode spread usually until three dipole spacings separate the potential electrode setup from the near end of the spread. Current is "sent" to each possible pair of electrodes for each receiver setup. For instance, in Sender Spread "B" when the receiver setup is between 14 and 15 only $C'_3 - C'_2$ and $C'_2 - C'_1$ can be "sent" so that data at 1 and 2 dipole separations is obtained respectively When the receiver is setup between 16 and 17; $C'_5 - C'_4$, $C'_4 - C'_3$, $C'_3 - C'_2$ and $C'_1 - C'_2$ are sent and data is obtained for 3, 4, 5 and 6 dipole separations respectively. Each sender spread provides 33 data points.

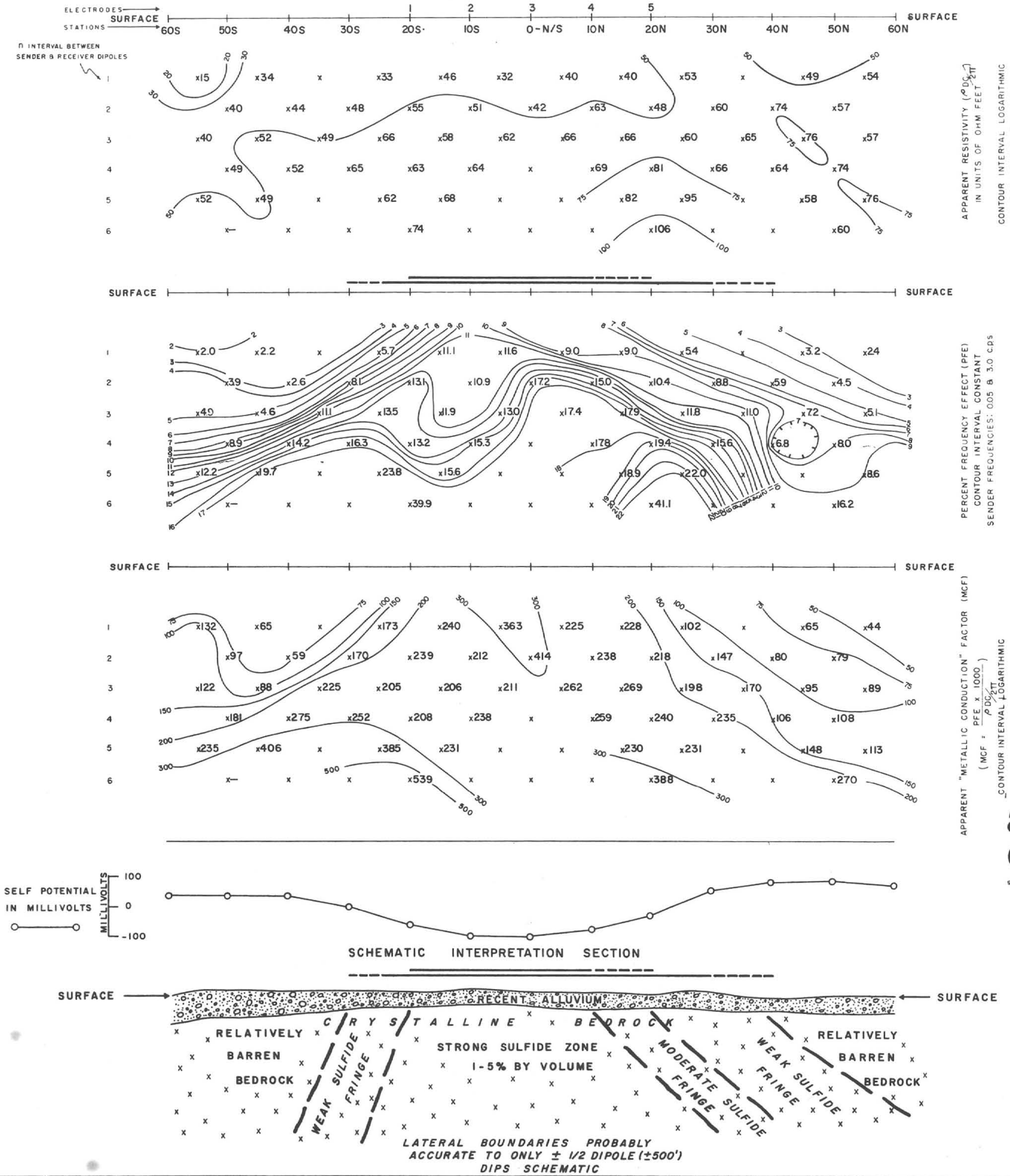
Fig. 1

(DATA POINTS OBTAINED FROM THE THREE SPREADS OF FIGURE 1)

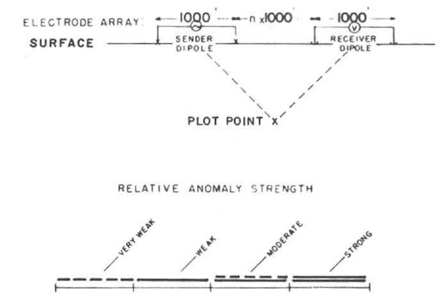


• SPREAD A
x SPREAD B
o SPREAD C
Δ RECIPROCAL VALUES (TIE POINTS)

Fig. 2



EXPLANATION



LOOKING WEST

PIMA MINING DISTRICT
PIMA COUNTY, ARIZONA

SECTIONAL DATA SHEET
LINE NO. —
INDUCED POLARIZATION TRAVERSE

SCALE: 1" = 1000' DATE: —

FOR ________

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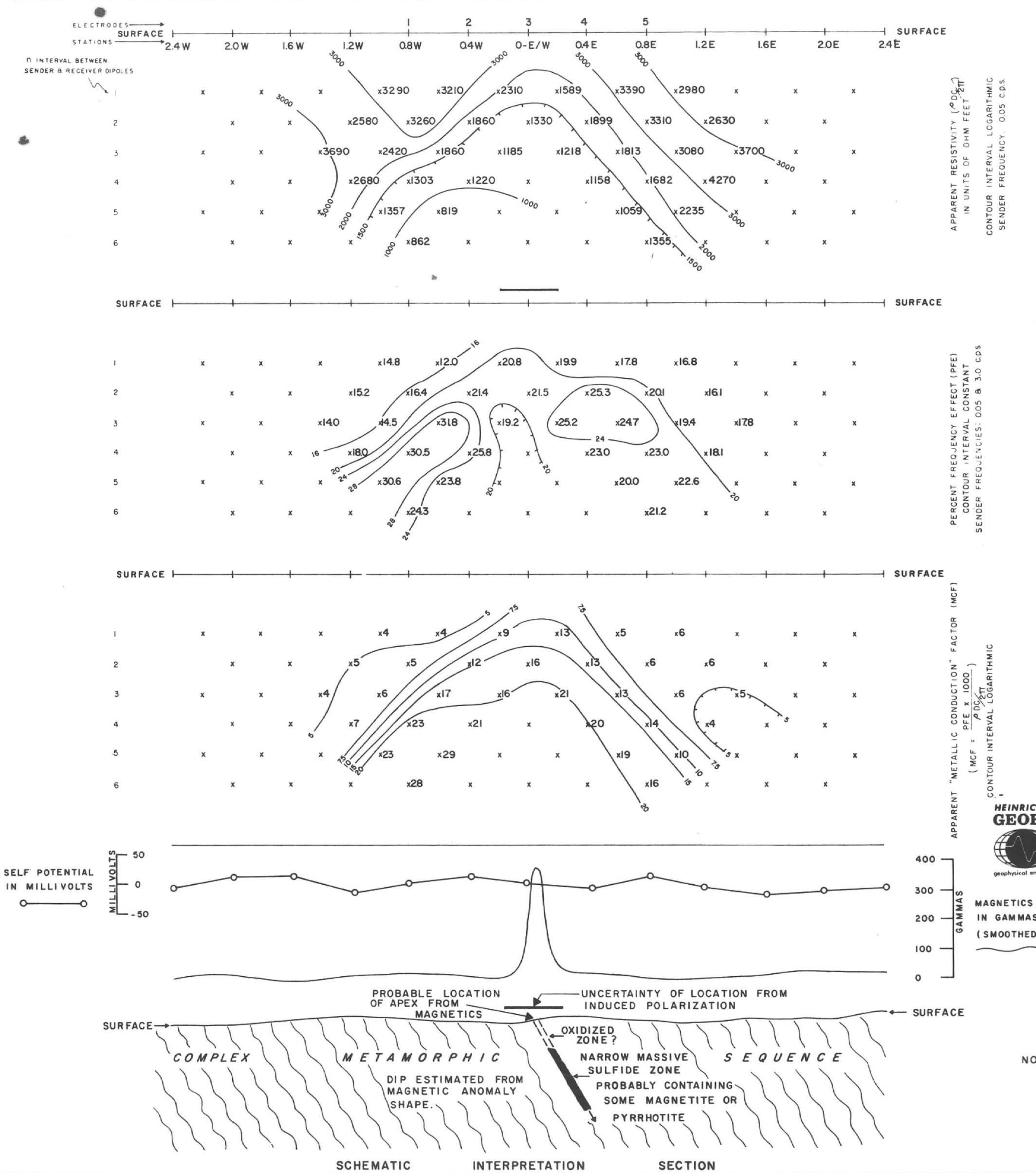
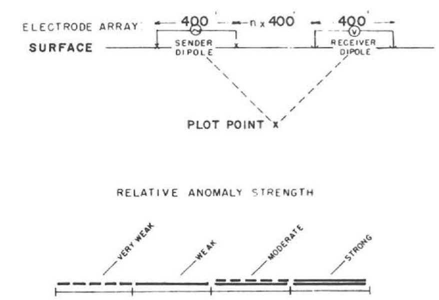
vancouver
sydney
geophysical engineers

ACTUAL FIELD EXAMPLE OF INDUCED POLARIZATION TRAVERSE OVER DISSEMINATED PORPHYRY TYPE SULFIDE MINERALIZATION



EXPLANATION



LOOKING NORTH

MASSIVE SULFIDE VEIN

APPALACHIAN SULFIDE DISTRICT

SECTIONAL DATA SHEET

LINE NO. —

INDUCED POLARIZATION TRAVERSE

SCALE: 1" = 400' DATE: —

FOR ________

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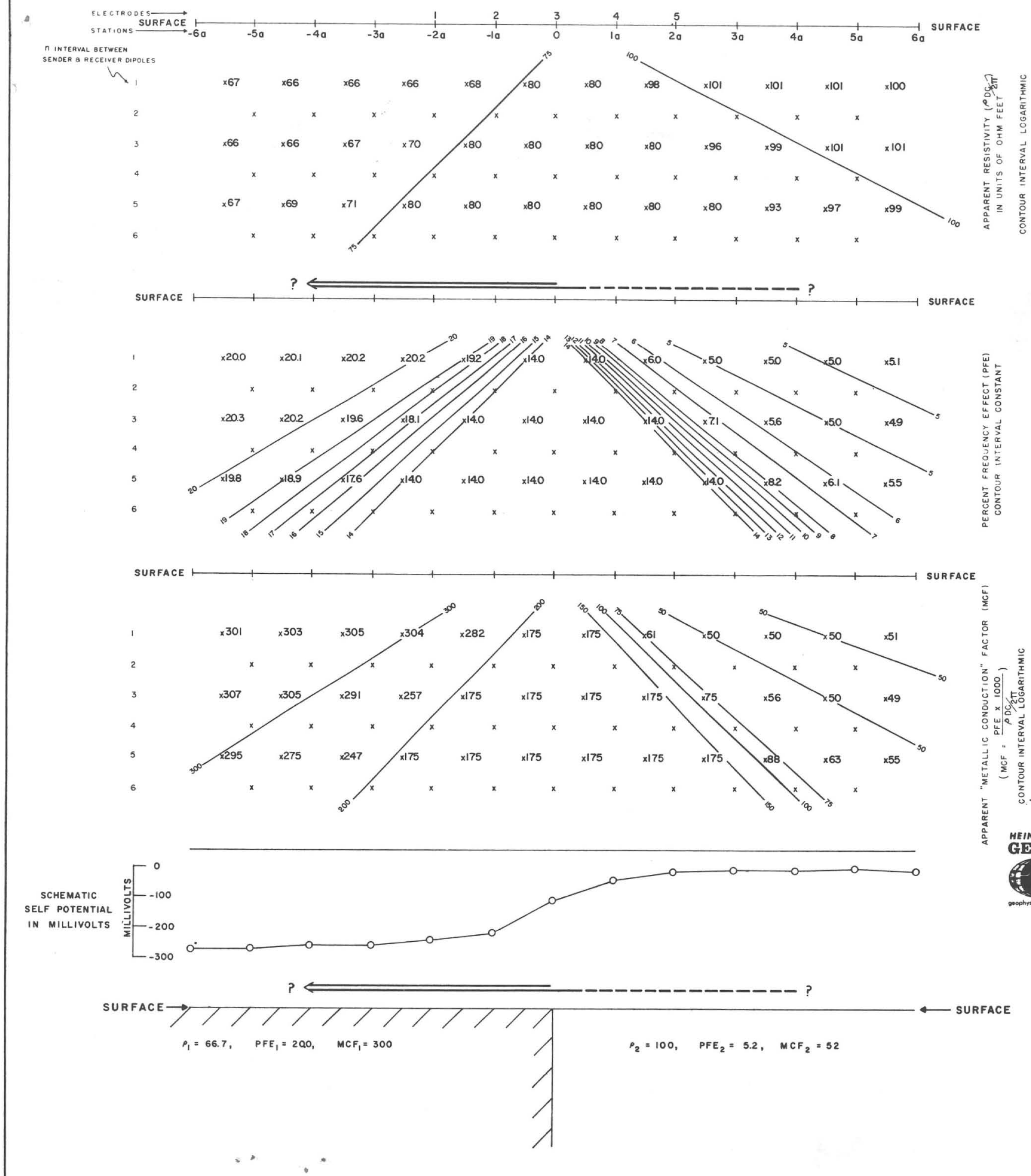
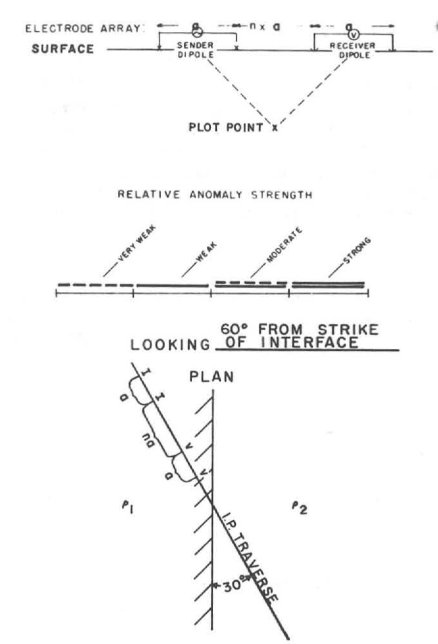
ACTUAL FIELD EXAMPLE OF COMBINED INDUCED POLARIZATION, RESISTIVITY, MAGNETIC AND SELF POTENTIAL SURVEY ACROSS A NARROW-STEEPLY DIPPING MASSIVE SULFIDE VEIN.

NOTE: INDUCED POLARIZATION ANOMALY ONLY INDICATES A STEEP BUT UNKNOWN DIP. DEPTH TO SULFIDES PROBABLY BETWEEN 200 AND 400 FEET BASED ON ROUNDED APPEARANCE OF INDUCED POLARIZATION ANOMALY AND LACK OF SELF POTENTIAL RESPONSE.



EXPLANATION



VERTICAL INTERFACE

SECTIONAL DATA SHEET

LINE NO. ——

INDUCED POLARIZATION TRAVERSE

SCALE: 1" = a DATE: ——

FOR ————

HEINRICHS GEOEXPLORATION COMPANY
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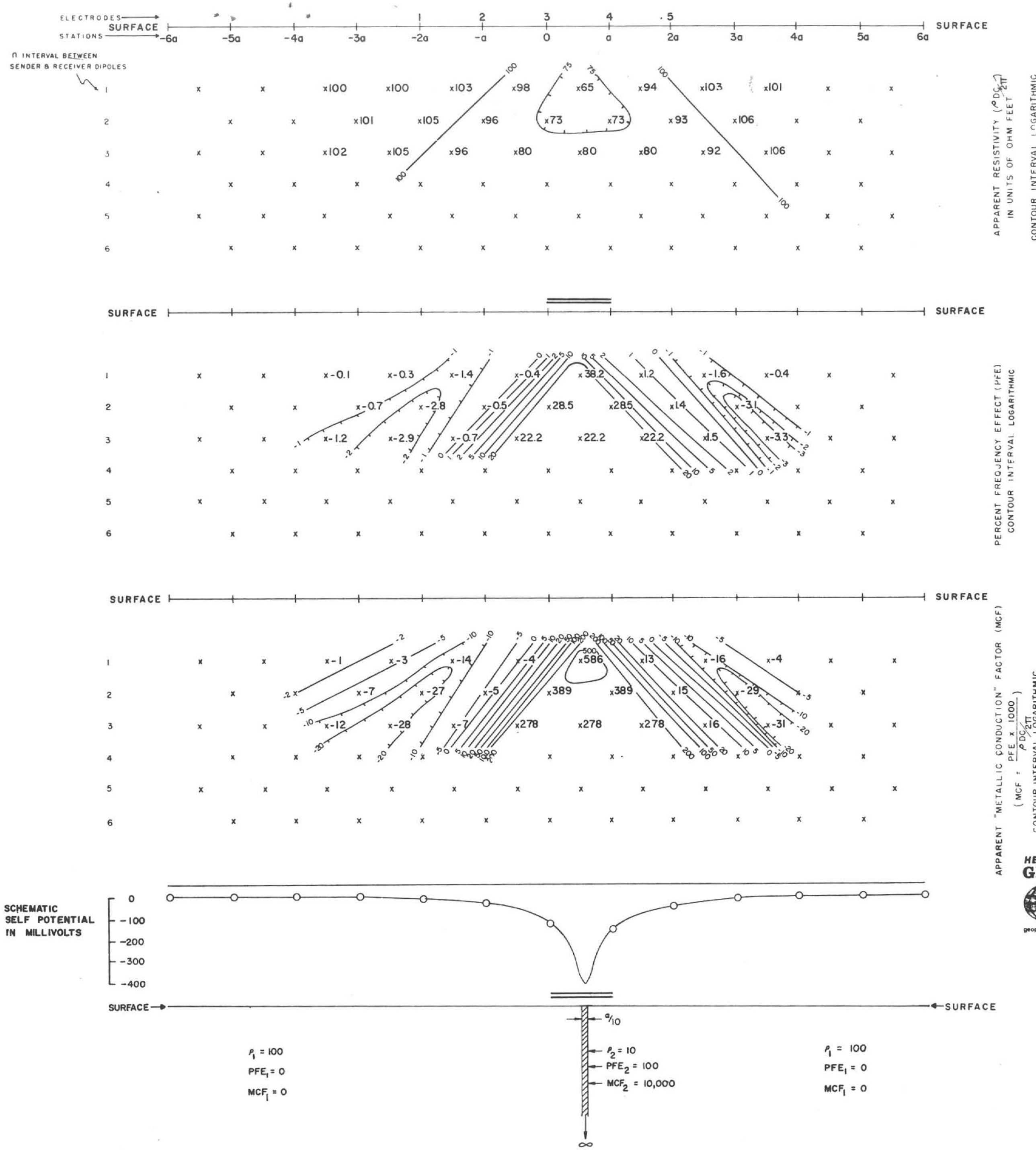
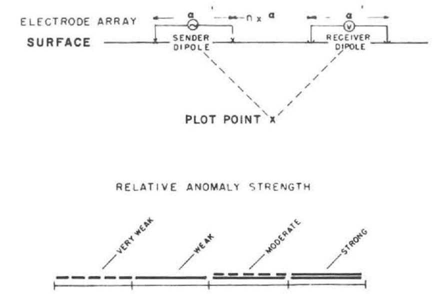
Phone: 602/623-0578 Cable: GEOEX, Tucson
vancouver
sydney
geophysical engineers

THEORETICAL INDUCED POLARIZATION TRAVERSE ACROSS A VERTICAL INTERFACE AT 30° – DIPOLE-DIPOLE ELECTRODE ARRAY.



EXPLANATION



LOOKING NORMAL TO STRIKE

VERTICAL

TABULAR BODY

SECTIONAL DATA SHEET

LINE NO. ——

INDUCED POLARIZATION TRAVERSE

SCALE: 1" = a DATE: ——

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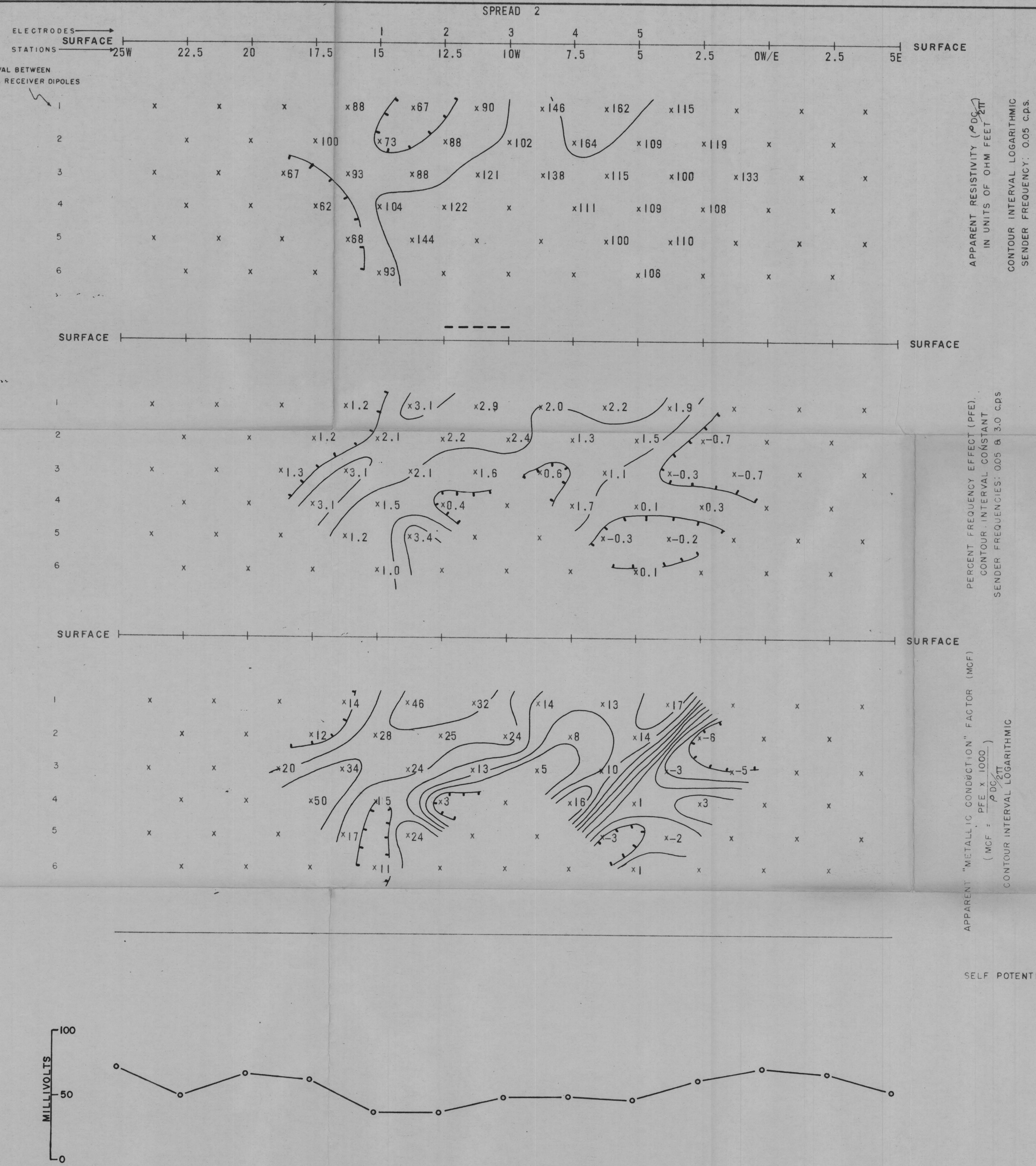
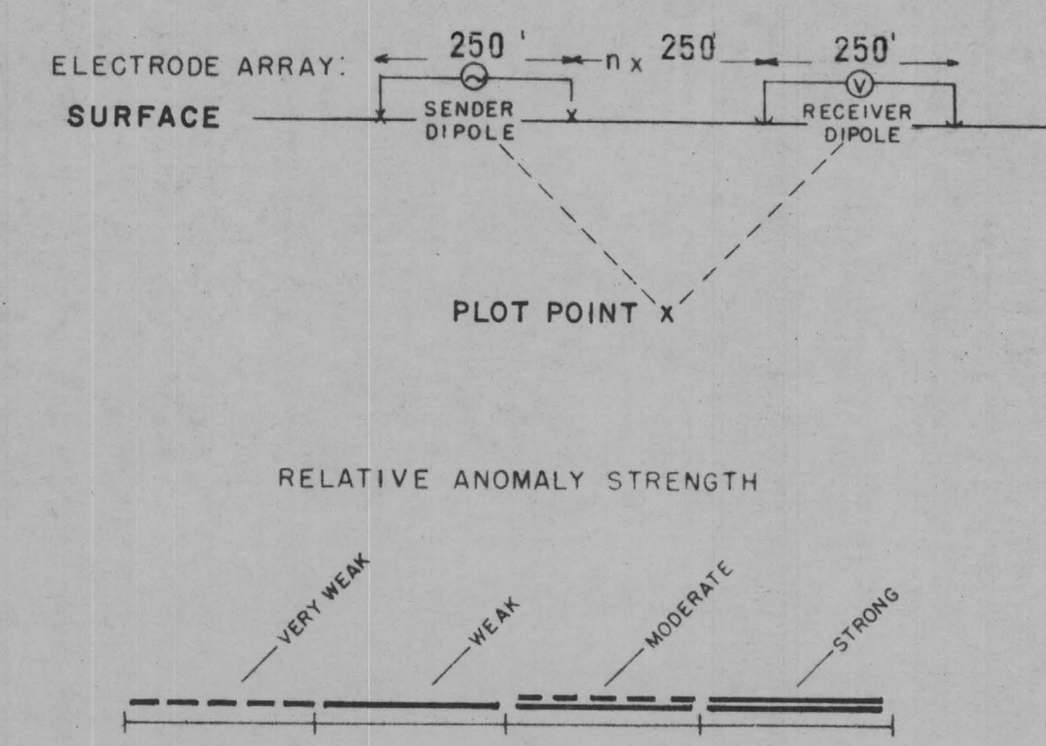
THEORETICAL DIPOLE-DIPOLE INDUCED POLARIZATION RESPONSE OVER A CONDUCTIVE VERTICAL TABULAR SULFIDE BODY CROSSED NORMAL TO THE STRIKE [HAVING A THICKNESS OF 1/10 THE ELECTRODE SPACING (a), A RESISTIVITY CONTRAST OF 10:1, A BACKGROUND RESISTIVITY (ρ_1) OF 100, A BACKGROUND PFE_1 OF 0, AND A PFE_2 OF 100 IN THE SULFIDE ZONE]



EXPLANATION



LOOKING NORTH

Registered Professional Engineer ... Certificate Expires Dec. 31, 1968 Arizona, U.S.A.

LOST BASIN AREA

SECTIONAL DATA SHEET
LINE NO. 2 (SPREAD 2)
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

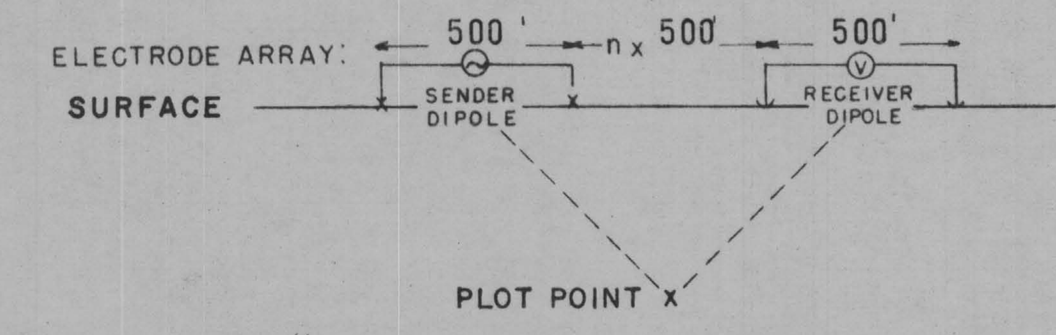
SCALE: 1" = 250'   DATE: SEP 1968

FOR

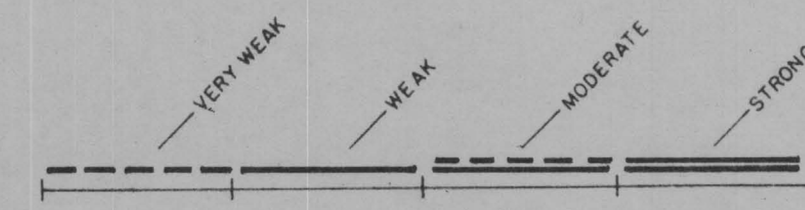
GUNNEX LIMITED

HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
Phone: 602/623-0578   Cable: GEOEX, Tucson
geophysical engineers   vancouver sydney

EXPLANATION



RELATIVE ANOMALY STRENGTH



LOOKING N 30° E

Registered Professional Engineer (Mining) — Certificate Expires Dec. 31, 1968 — Arizona, U.S.A.

LOST BASIN AREA

SECTIONAL DATA SHEET
LINE NO. 4 (SPREAD I)
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 500'   DATE: SEP 1968

FOR

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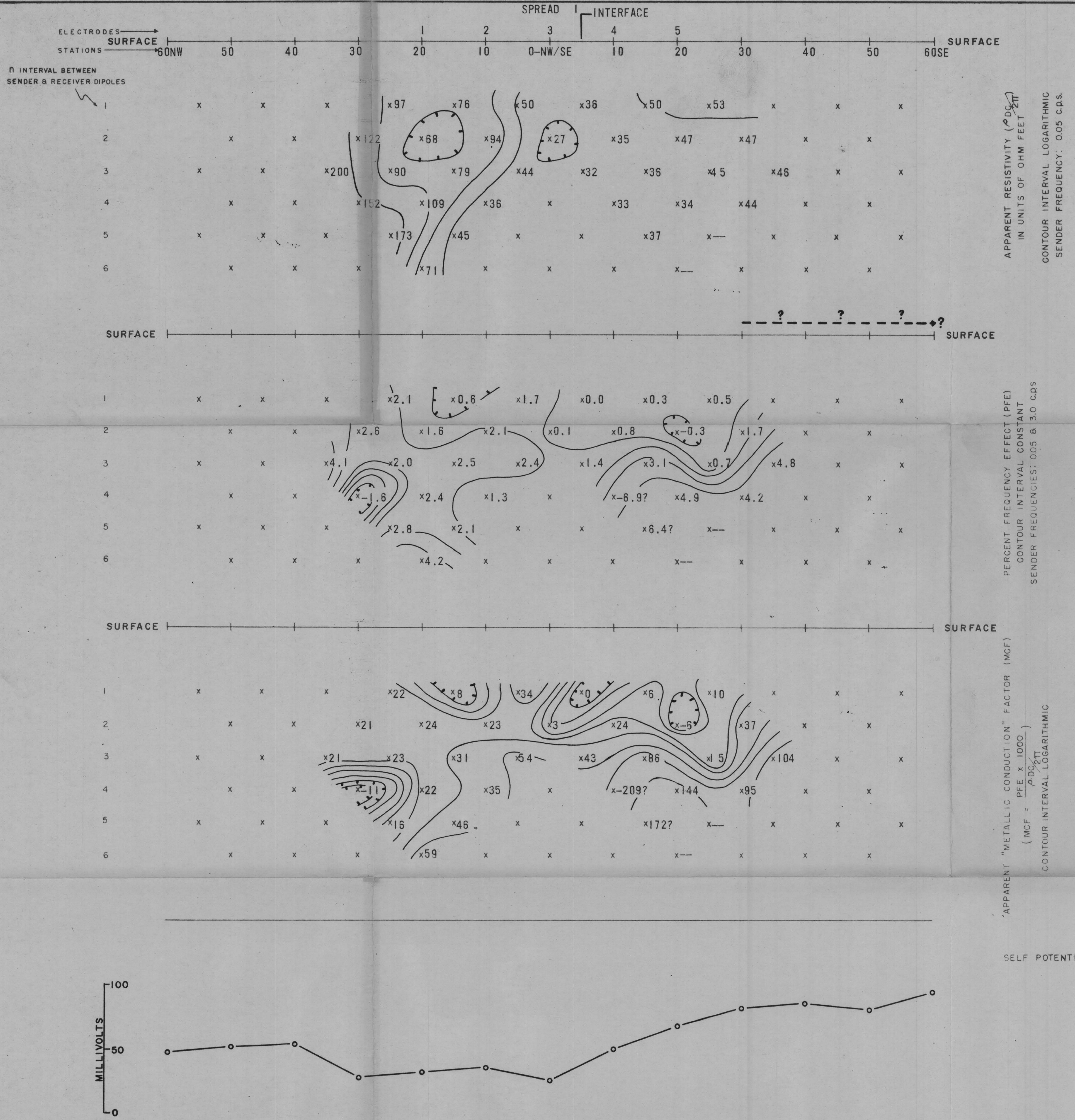
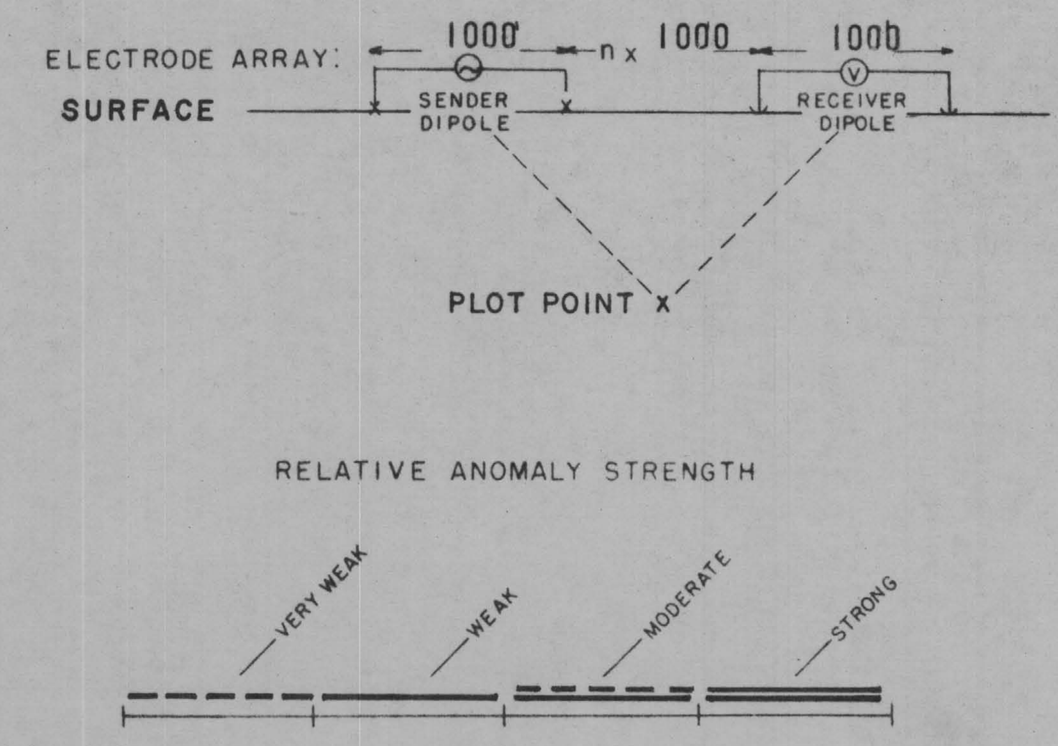


EXPLANATION



LOOKING N 45° E

Registered Professional Engineer
Certificate Expires
WALTER E. HEINRICHS, JR.
DEC. 31, 1968
ARIZONA, U. S. A.

LOST BASIN AREA

SECTIONAL DATA SHEET

LINE NO. 3 (SPREAD 1)

INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: SEP 1968

FOR

GUNNEX LIMITED

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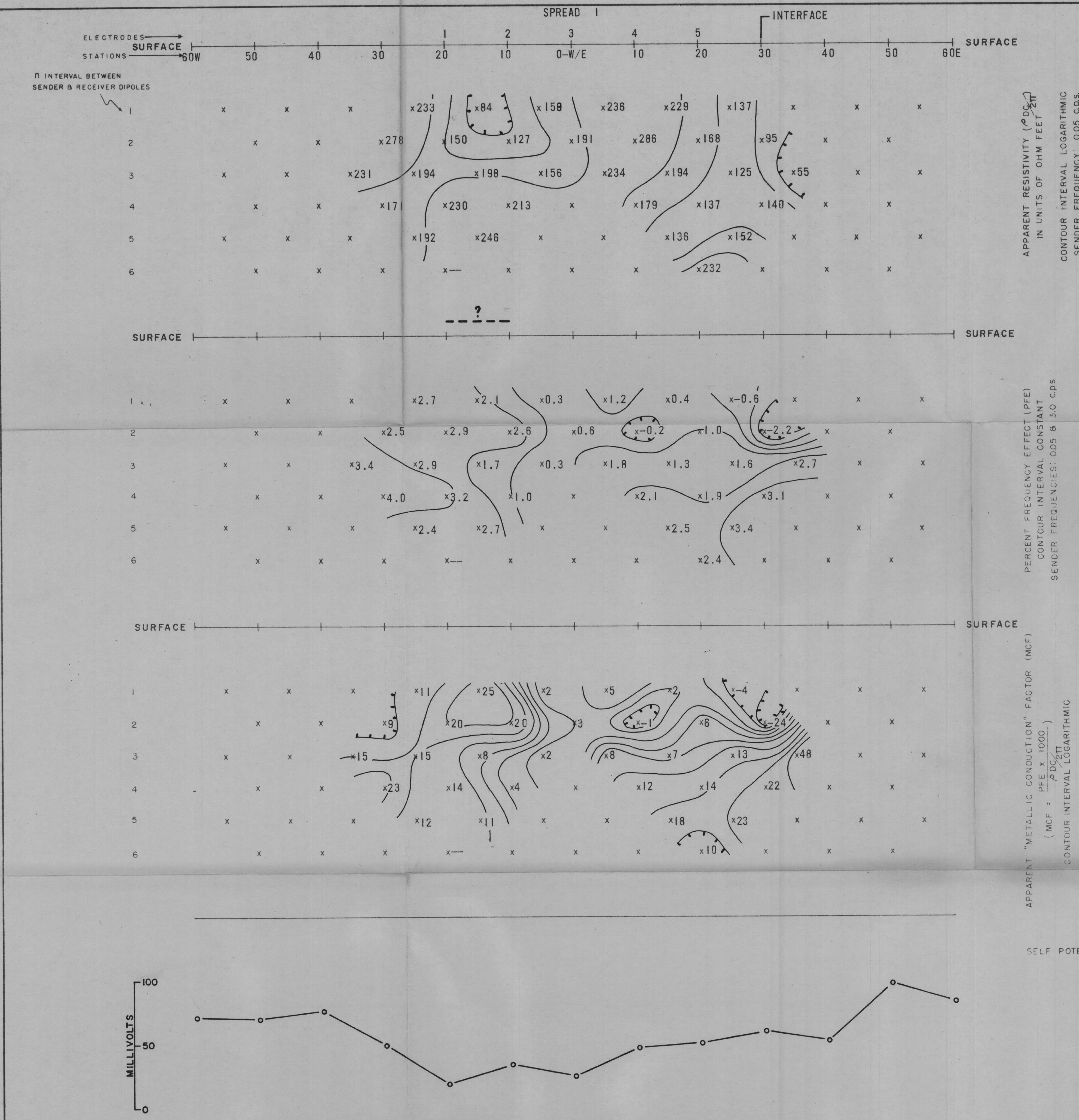

EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'

SURFACE — SENDER DIPOLE — RECEIVER DIPOLE

PLOT POINT x

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING NORTH

LOST BASIN AREA

SECTIONAL DATA SHEET

LINE NO. 2 (SPREAD 1)

INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: SEP 1968

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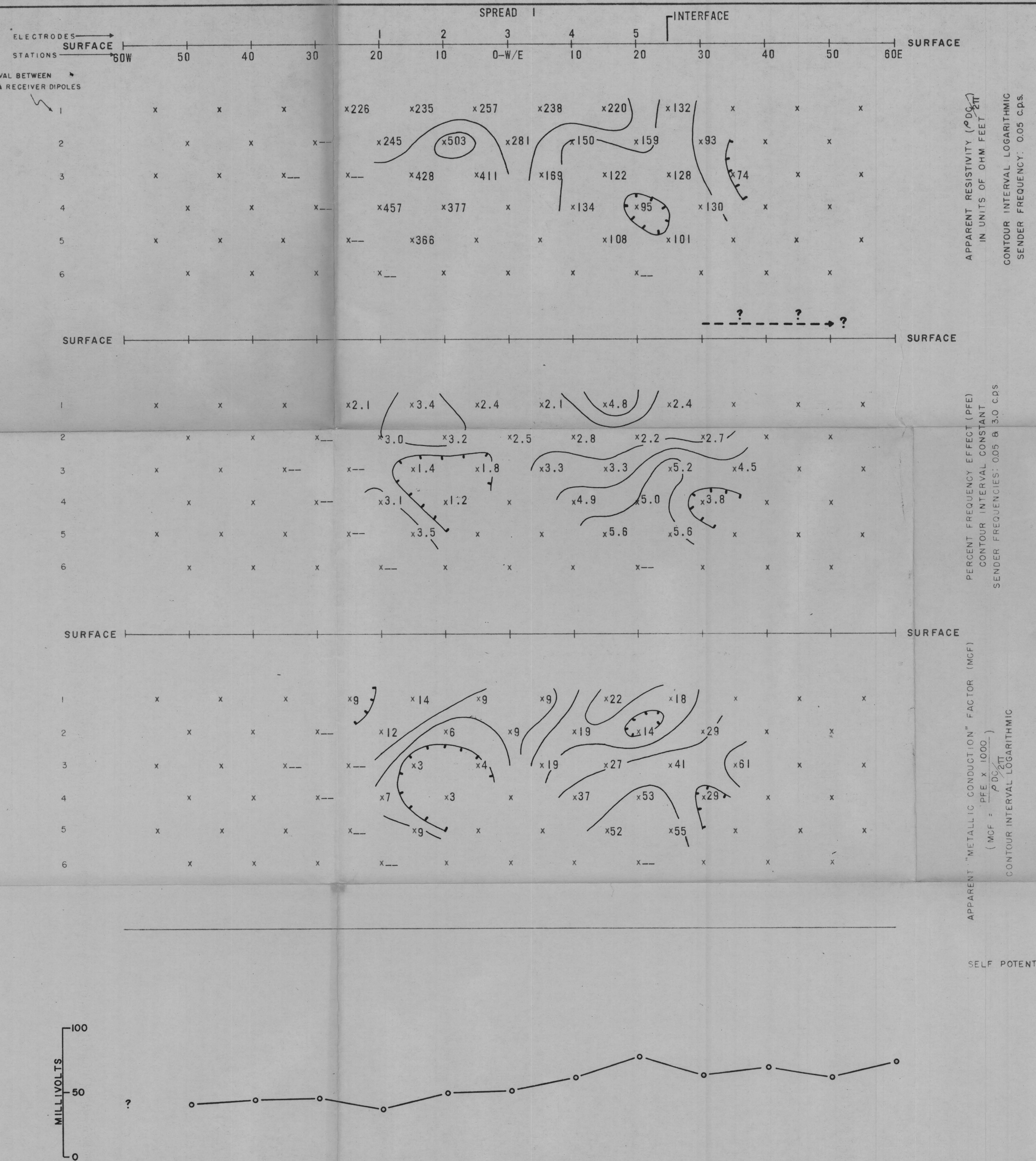

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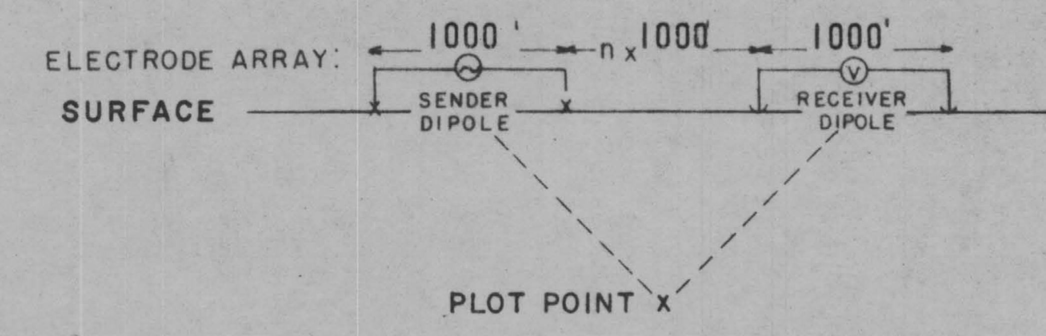
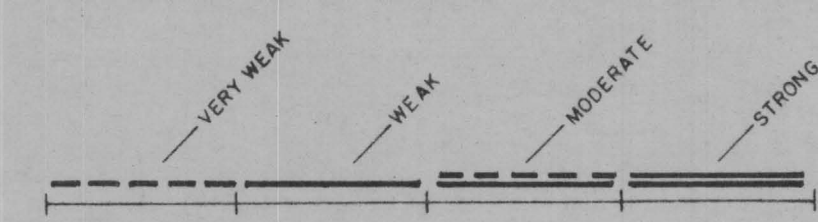


RELATIVE ANOMALY STRENGTH



LOOKING NORTH

Registered Professional Engineer
Certificate Expires
Walter E. Heinrichs, Jr.
Dec. 31, 1968
Arizona, U.S.A.

LOST BASIN AREA

SECTIONAL DATA SHEET

LINE NO. 1 (SPREAD 1)

INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000'   DATE: SEP 1968

FOR

GUNNEX LIMITED

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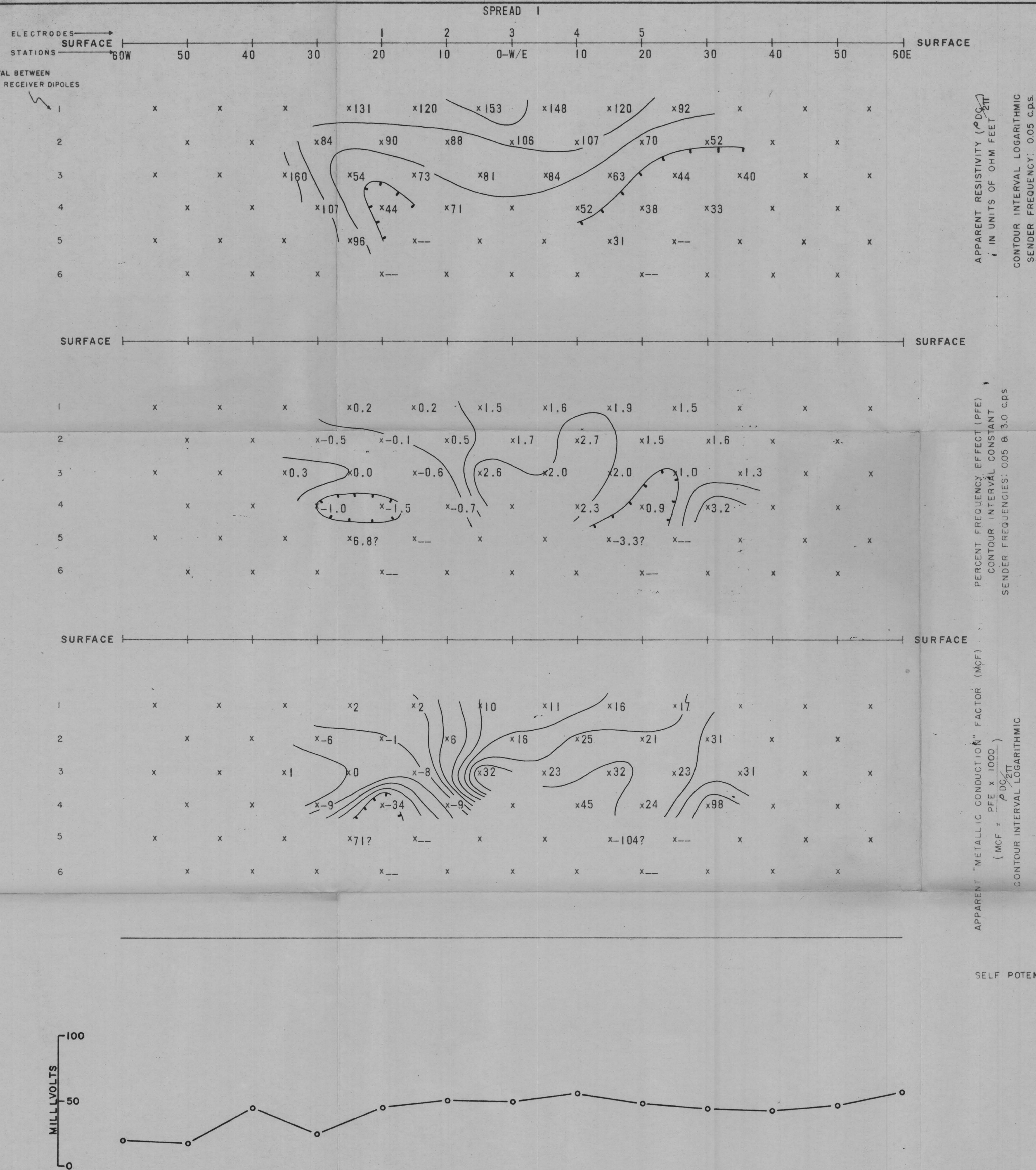

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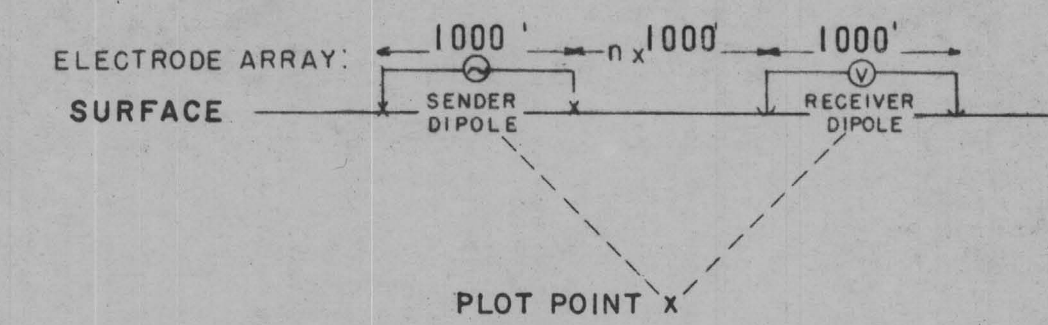
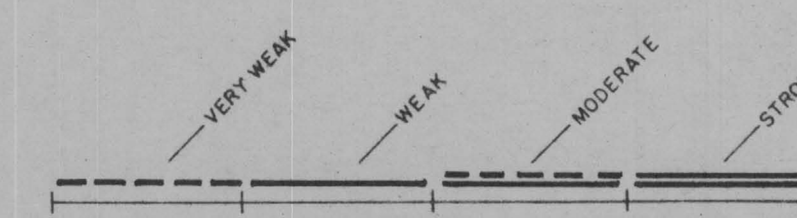


RELATIVE ANOMALY STRENGTH



LOOKING NORTH

LOST BASIN AREA

SECTIONAL DATA SHEET

LINE NO. 5 (SPREAD 1)

INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: SEP 1968

FOR

GUNNEX LIMITED

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