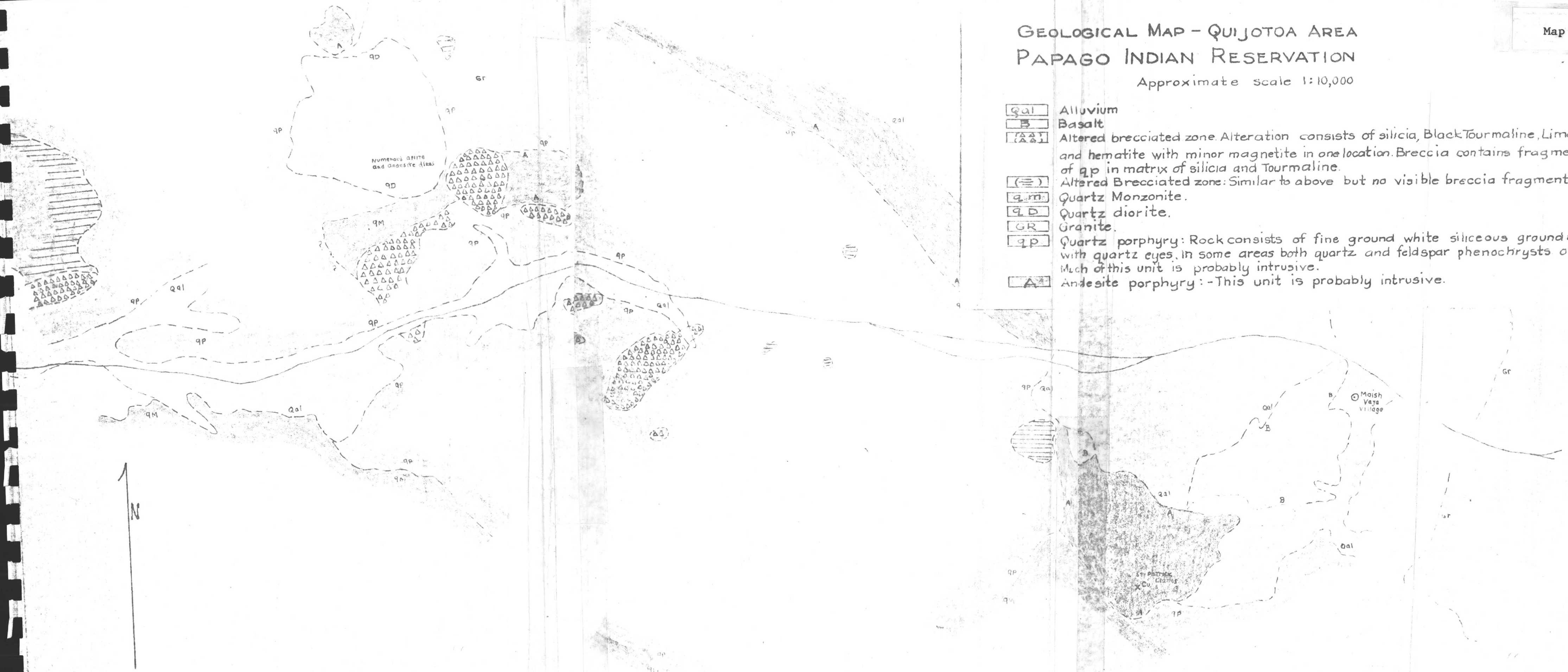
Geological Map - Quijotoa Area
Papago Indian Reservation

Approximate scale 1:10,000

Map #6



- Qal — Alluvium
- B — Basalt
- Altered brecciated zone. Alteration consists of silicia, Black Tourmaline, Limonite and hematite with minor magnetite in one location. Breccia contains fragments of qp in matrix of silicia and Tourmaline.
- Altered Brecciated zone: Similar to above but no visible breccia fragments.
- qm — Quartz Monzonite.
- qd — Quartz diorite.
- GR — Granite.
- qp — Quartz porphyry: Rock consists of fine ground white siliceous groundmass with quartz eyes. In some areas both quartz and feldspar phenochrysts occur. Much of this unit is probably intrusive.
- A — Andesite porphyry: - This unit is probably intrusive.

These results could be caused by sulphide mineralization of from 1% to 3% by volume at a depth of 45 feet to 150 feet. Copies of the resistivity and chargeability profiles together with an interpretation by E.B. Nichols are included in this report. (appendix #2).

At the request of Dr. James A. Noble, consultant to the Papago Exploration Co. a second induced polarization survey was carried out over the same area using variable frequency equipment This work was done by Heinrichs Geoexploration Co. using Geoscience equipment and the expanding dipole-dipole or Eltran electrode configuration. The results of this work correlate well with those of the previous survey.

The highest percent frequency effect is on line #2. The anomaly is interpreted as due to sulphide, which attenuates with depth and is therefore possibly a horizontal layer. Copies of the induced polarization data of this survey and an interpretation by F. Seward are included with this report. (appendix #3).

Application for Lease

Application is made for a lease in accordance with the terms of the Mineral Prospecting Permit No. 14-20-0450-3736.

The boundary of the lease area, a rectangle two miles east-west by 3/4 mile north-south, runs as follows:

From a point 1/8 mile south of the southwest corner of Sec. 19 T 14 S, R 2 E, it is ½ mile east to the northwest corner of the lease area.

From the northwest corner of the lease area 3/4 miles south to the southwest corner of the lease area.

From the southwest corner of the lease area two miles east to the southeast corner of the lease area.

From the southeast corner of the lease area 3/4 miles north to the northeast corner of the lease area.

From the northeast corner of the lease area two miles west to the northwest corner of the lease area (starting point).

This area is shown on the overlay to the geologic map.

From the lease area are withdrawn the following valid mineral claims which have prior rights.

	Sq. ft.
Part of Standard Gold # 1	262,500
Part of Standard Gold # 2	150,000
Part of Red Devil	600,000
Total	1,012,500 = 23.24 acres

Total area	960.00 acres
Less Claims	22.34
Net area of lease	936.76 acres

The claims are plotted on the overlay to the geologic map but their exact location is not known. The sections in the area have not been surveyed. There is a preliminary topogrpphic map (subject to correction) on a scale of 1:24,000 published by the U.S.G.S. as Quijotoa 4 N.W., Pima County, Arizona.

The claims and the lease area are subject to survey and the net area of the lease is subject to correction.

STEBBINS MINERAL SURVEYS INCORPORATED

APPENDIX #1.

Induced Polarization Survey Data.

Interpretation by H. O. Seigel

REPORT ON INDUCED POLARIZATION SURVEYS PAPAGO INDIAN RESERVATION, ARIZONA ON BEHALF OF STEBBINS MINERAL SURVEYS, INCORPORATED

INTRODUCTION

Over the period of June 10th - September 6th, 1963, a geophysical party under the direction of Mr. Robert Stemp, B.A.Sc., carried out induced polarization surveys in seven areas within the Papago Indian Reservation, Pinal County, Arizona. The areas are known by the following names: Anomaly # 17, Anomaly # 25, Sif Vaya, Lakeshore Mine, Vulture # 1 Area # 2, and Reward Mine Road.

The purpose of the present surveys was to map the distribution of metallic sulphide mineralization beneath the areas covered. In the present region these minerals may have a base metal association.

The reprint of the writer's recent paper entitled " Induced Polarization and its Role in Mineral Exploration", which is attached hereto, describes the phenomena involved and the methods of measurement and interpretation of this type of survey. For the present survey, high sensitivity Pulse or Transient type equipment was employed, with a current-on time of 1-1/2 seconds and a measuring time of 1/2 second.

The observed primary voltages are converted, by formula, to " resistivities", and are expressed in units of ohm metres. The secondary

(polarization) voltages are divided by the corresponding primary voltages to arrive at the "chargeability", the resulting polarization property characteristic of the region, and this is expressed in units of milliseconds, as explained in the accompanying paper.

Any transition in conduction from ionic to electronic, and vice-versa, will give rise to I. P. effects. For this reason all the metallic conducting sulphides, including pyrite, pyrrohtite, chalcopyrite and chalcocite, etc. and arsenides, will be detectible as well as graphite. The latter may be expected to occur primarily in carbonaceous shales and limestones, but not often in intrusive rocks. Occasionally abnormal I. P. effects may be experienced from magnetite concentrations and from serpentines. There is no way at present in which I. P. effects from any one of these sources may be differentiated from those arising from any of the others.

For the present survey, the equi-spaced three electrode array was employed with electrode spacings of 250', 500' and 1000'.

Geologic information has been provided by Mr. Q.G. Whishaw, of the Stebbins' staff on only the first mentioned area, namely Anomaly # 17.

DISCUSSION OF RESULTS

The results in each area will be discussed, in turn, below.

A) Anomaly # 17, Vekol Mountains Area

Ten lines at 1000' intervals were surveyed, oriented N 30° W, as well as two short intermediate lines. Electrode spacings of 250' and 500' were employed, with station intervals equal to the electrode spacing on the various lines. Both electrode spacings were employed on four lines.

Plate 1, on the scale of 1" = 500', presents the chargeability and resistivity results in profile form. The profile scales are 1" = 5 milliseconds for chargeability and 1" = 500 ohm metres for resistivity. The observed background chargeability range appears to be between 1 to 2 milliseconds. Values significantly above this range may be seen on a number of lines, with peaks of up to 11.0 milliseconds. Values of greater than 6 milliseconds are shown by shading on Plate 1 and peak locations are also shown.

Depth determinations have been made where two spacing profiles were carried out on anomalous areas and the interpreted results are as follows:

line 60 W, near 1750' N, depth of 250' - 300' to material of chargeability equivalent to an average of 3% - 6% metallic sulphides by volume.

line 40 W, near 500' N; 200' - 250' to material of 2% - 4% by volume equivalent average sulphides.

line 10 W, near 750' - 1500' N; up to 500' to material of as much as 10% sulphides by volume, equivalent.

line O, near 250' - 375' N; approximately 200' depth, to 3% to 5% sulphide equivalent.

Geological plans have been submitted, one on the scale of 1" = 830' covering the entire area, and a more detailed plan on the scale of 1" = 200' covering that portion east from line 20 W. A contour plan representing the results of a ground magnetometer survey of the latter area has also been submitted, together with the interpretation by R. W. Whipple, on the scale of 1" = 200'.

The various I. P. anomalous areas will be discussed, in turn, below.

a) Line 60 W, near 1750' N; This lies under overburden in a region between Pinal Schist to the south and sediments and quartz porphyry to the north. It is not far from the Guadalupe Mine. The anomalous area is still open to the west and north and would require additional geophysical surveying to determine its extent. If it were necessary to investigate this indication by drilling based only on the present information the following hole would be recommended:

Collar on line 60 W at 1750' N, drill vertically for 400'.

b) Line 40 W, near 500' N; This is an isolated, low order I. P. indication, whose chief merit is that it lies in an overburden covered area, with Pinal Schist to the south and quartz porphyry

to the north, about 400' east of a region marked " geochemical anomaly" on the geologic map.

No action is recommended on this indication at present, pending the results of drilling of some of the more prominent chargeability highs.

c) Line 10 W, 750' N and 1500' N. These peaks lie directly on local magnetic ridges of the order of 300 - 400 gammas peak amplitude, in an overburden covered area. Whereas the 500' spacing anomaly amplitude is not large (7.8 milliseconds) the very low response on the short spacing suggests that the depth of cover may be as much as 500'. Short flanking lines 600' away on either side show considerably lower amplitudes. The depths deduced to the magnetic anomalous material are much shallower, namely 250' on the south zone and 90' on the north. A hole to explore this anomalous area would be as follows:
Collar on line 10 W at 750' N, drill vertically for 600'.

d) Line O at 250' N; This is also directly on a magnetic ridge, of amplitude 300 gammas. In this case the magnetic depth is estimated at 40' and the I. P. depth at 200'. The I. P. anomaly peaks just south of an outcrop of quartzite containing some malachite stain.

A hole to explore this indication would be as follows:
Collar on line O at 300' N, drill vertically for 400'.

e) Lines 10 E and 20 E; Three local chargeability highs occur on the

250' spacing results and all are in overburden covered areas near outcrops of limestone showing varying amounts of skarn alteration, magnetite and minor copper mineralization. All lie on or near regions of magnetic activity. A suitable exploratory hole would be as follows:

Collar on line 10E at 1875' N; drill vertically for 400'.

In summary, therefore, at least six areas of moderately abnormal polarization response have been indicated by the present I. P. survey in the Anomaly # 17 region. Where magnetic data is available there is good agreement in location between the I. P. and magnetic anomalies, whereas the magnetically interpreted depths are invariably less than those deduced from the I. P.

The I. P. results could be caused by a number of zones of disseminated sulphides, ranging from 2% - 10% by volume in average content, which have been oxidized down to the depths indicated. As copper or iron oxides, carbonates and silicates give no I. P. response they could be present in the oxidized zone. The observed magnetic anomalies with which the I. P. indications often correlate, are likely due to magnetite of contact metamorphic origin. The intrusives which outcrop in the area e. g. at about 2900' N on line 20E, are only very very weakly magnetic.

The present I. P. lines are generally 1000' apart and therefore do not properly define the anomalous indications. In addition, the largest amplitude response, on line 60 W, is still open to the west and north, off

the survey area. If the exploratory drilling recommended above should develop any interest in this area, further fill in and extension I. P. lines would be desirable to guide additional drilling.

The location of the four recommended drill holes is shown on Plate 1.

B) Anomaly # 25 Area

Five lines, at approximately 2000' intervals, were traversed across this area, on a north-south strike. Electrode spacings of 500' were employed on three lines and 1000' on the two others. Station intervals were equal to the electrode spacings. The mean line length was approximately three miles.

Plate 2, on the scale of 1" = 1000', shows the results of these traverses, in profile form. The chargeability scale is 1" = 5 milliseconds, and the resistivity is 1" = 1000 ohm metres.

The observed chargeabilities are all less than 2.5 milliseconds, which can be considered to be in the low normal (i.e. non-electronic conducting) range.

The present geophysical results rule out the presence of at least the " porphyry copper" type of base metal deposit, in sulphide form, within at least a depth below surface equal to the electrode spacing employed.

C) Sif Vaya Area

Three lines, 2000' apart, were surveyed on a north-south orientation across this area. Electrode spacings and station intervals of 250' were

APPENDIX # 2.

Induced Polarization Survey Data.

Hunting Survey Corporation

INTRODUCTION

From September 7 to November 20, 1962 an Induced Polarization (I.P.) survey was carried out by Hunting Survey Corporation Limited over part of the Papago Indian Reservation, Arizona for Hunting Geophysical Services, Inc. The area surveyed is located approximately 130 miles southwest of Tucson, Arizona.

The survey was performed by a five-man crew. The geophysicist in charge of the survey was J. Lloyd of Hunting Survey Corporation Limited. Hunting Geophysical Services, Inc. supplied the I.P. assistants required.

The geophysical survey was carried out along chained picket lines. The lines surveyed lie in a northwest direction and are designated by numbers 1, 2, 3, 4, 5 and 6. In addition a cross line designated by the letter A was surveyed. This grid system provided a total of 44,250 feet or approximately 8.4 miles of profiles. The basic coverage of the survey consisted of readings at 500-foot intervals with additional readings being taken at 250-foot intervals wherever necessary.

The data was obtained with the "three-electrode array" configuration. This array consists of one current electrode (C_1), two potential electrodes (P_1 and P_2), the second current electrode (C_2) remaining fixed at "infinity". With this configuration C_1, P_1 and P_2 are moved in unison in 500-foot jumps. The values were plotted against the mid-point of C_1-P_1. Two electrode spacings, 250 feet and 500 feet, were used to

survey the lines.

The Hunting pulse-type instrument is similar in design and operation to those described by R. W. Baldwin in "A Decade of Development in Overvoltage Survey", A.I.M.E. Transactions, Vol. 214, 1959. Power is obtained from a Briggs and Stratton motor coupled to a 900 cycle generator which provides a maximum of 2,000 watts d. c. to the ground. The cycling rate is 1.5 seconds current on and 0.5 seconds current off, the pulses reversing continuously in polarity. The data collected in the field consists of careful measurement of the current (I) in amperes flowing through electrodes C_1 and C_2, the primary voltage (V_p) in volts appearing between P_1 and P_2 during the "current on" part of the cycle, and the secondary voltage or overvoltage appearing between electrodes P_1 and P_2 during the "current off" part of the cycle. The latter voltage is integrated electronically with respect to time, to provide a measurement of polarization (V_s) in millivolt-seconds. The "apparent chargeability" in milliseconds is calculated by dividing the polarization (V_s) by the primary voltage (V_p). The "apparent resistivity" in ohm-meters is proportional to the primary voltage (V_p) divided by the measured current (I), the proportionality factor depending on the geometry of the array used. The resistivity and chargeability obtained are called "apparent" as they are the values which that portion of the earth sampled by the array must have if it were homogeneous. As the earth sampled is usually inhomogeneous the calculated "apparent resistivity" and "apparent

chargeability" are functions of the "true" resistivities and chargeabilities of the various sections of the earth sampled and of the geometry of those sections.

The results of the survey are shown on the individual profiles in the Appendix of this report. These profiles have a horizontal scale of 1 inch to 250 feet. The "apparent chargeability" is plotted at a vertical scale of 2.0 milliseconds per inch. The "apparent resistivity" is plotted on a vertical logarithmic scale of 2 miles per logarithmic cycle. A map at a scale of 1 inch to 500 feet showing contours of chargeability at the 500-foot electrode spacing is located in the pocket at the rear of this report. The map is an enlargement of the 1 inch to 1,000 feet geological map provided by Hunting Geophysical Services, Inc. Some discrepancies in station location appear to exist between the map and the I.P. profiles. It has been necessary, therefore, to locate the profiles on the map by means of the highway. Each profile has the highway marked on it so that cross reference between the map and the profiles can be made.

INTERPRETATION

The technique used in the interpretation is based on the assumption of a layered earth. The complex problem of the combined effects of depth of burial, width, dip and true chargeability of a vertically mineralized zone plus the physical characteristics of the overburden and country rock have not been solved practically. However, certain rule-of-thumb plus the experience gained from test surveys over known ore bodies permit certain estimates to be made. Thus the maximum possible width of the causative bodies are indicated on the accompanying profiles, with the understanding that the body most probably is narrower than indicated. Rough depth estimates are possible in some cases, but it is necessary to know the electrode spacings at which maximum response is obtained; thus a minimum of three electrode spacings across the anomaly are usually required.

The interpretation of the survey data consists of a careful analysis of each individual profile. The results of this analysis are shown by appropriate symbols on the I.P. profiles in the Appendix of this report. These results are also transferred to the interpretation map in the pocket at the end of this report using the same symbols. Due to the high degree of complexity of the interpreted I.P. results and to the absence of geological data in certain parts of the area, caused by the presence of overburden, no attempt was made to outline in plan

form the various zones by use of contact or similar symbols. Instead, possible relationships between zones of different lines are shown by long arrows.

The symbols used warrant some further discussion. The "zones of special interest" (cross-hatched) represent the causative bodies of specifically recognizable anomalies measured from profiles observed with the shortest electrode spacings. Thus, the width indicated is the probable width nearest to the bedrock surface and need not represent the true width of the body at depth. The "zones of possible interest" (single-hatched) are anomalous zones which cannot be broken down into individual bodies, or zones which show lower chargeability (less mineralization) or greater depth. Special features of the I.P. data are indicated by arrows between limiting marks along the profile and are explained by notes, both on the profiles and on the map.

Estimated depth (h), or the limits thereof, are shown in feet. Where a maximum value of depth is shown, it is believed that more often than not the actual depth will be found to be one-half, or less, of the maximum shown. It is to be noted that these depths would be more properly called distances to the body, the distances being measured in a plane perpendicular to the line and to the ground surface. This is due to the fact that the I.P. method samples a certain volume of the earth and therefore the causative bodies do not necessarily lie beneath the lines surveyed but could be located to one or the other side of the line.

Such an occurrence is called a "side effect".

As previously explained, the mathematical problem of the relationship between the width, the depth and the true chargeability is not solved in the case of bodies of limited vertical cross sections. Thus, only a minimum chargeability in milliseconds is shown. Past experience shows that one percent sulphide by volume will cause a chargeability of 3 to 8 milliseconds. In other words, a minimum chargeability of 12 milliseconds indicates an absolute minimum sulphide content of 1.5%, but the sulphide content could also be greater than 4%. The sulphides may or may not be economical as the I.P. method does not differentiate between chalcopyrite and pyrite, for example.

The resistivity measurement remained fairly constant, throughout the area, at 180 to 300 ohm-meters. The weak variations observed are mainly due to changes in overburden properties and in its thickness and are not considered significant in the present problem.

The interpretation of the I.P. data based on all available data is presented in the following paragraphs.

The chargeability measurements indicate a fairly large anomalous zone lying approximately in an east-west direction. A normal background value of chargeability of 2 milliseconds is observed on all sides of the anomalous zone. Over the zone the chargeability reaches a maximum of 11.8 milliseconds on Line 5. The results obtained with the two electrode spacings show similar chargeabilities at each station indicating that the

causative body extends to depth.

Lines 1 and 2 indicated a fairly well defined anomaly extending from 0+00 to 3+75S giving a width of 2,375 feet. However there is a possibility that this anomaly consists of two zones. Calculations carried out indicate the true chargeability of the anomaly may be as high as 9.0 milliseconds and that the causative body is at a depth of approximately 100 feet.

The results obtained over Line 3 indicate only one anomalous zone extending from 5+00S to 17+50S. Calculations indicate the true chargeability for this portion of the anomaly to be a minimum of 7.5 milliseconds. The depth to the causative body is approximately 125 feet.

Line 4 indicates a widening of the anomalous zone. As Line 4 lies 500 feet to the east of Lines 1 and 2, this widening indicates that the two zones indicated on Lines 1 and 2 have apparently merged into one zone. The calculated true chargeability of this zone is 7.4 milliseconds and the depth of the body is less than 100 feet.

A fairly strong anomaly was located on Line 5 centered at 10+00S. To the north of this zone the chargeability remained fairly high indicating a probable change in the country rock. It is, however, possible that the mineralized zone swings to the north and is the cause of the high chargeability reading found on the north end of this line.

The results obtained along Line 6 indicated a fairly extensive zone extending from 27+50S to 5+00N. However this anomaly may be

found to consist of two zones. The true chargeability is found to be 8.0 milliseconds and the depth of the causative body is approximately 100 feet.

Line 'A', the cross line, indicates two main anomalous zones showing that the anomaly located by the north-south line is approximately 3,000 feet long. The high readings located between 12+50E and 20+00E are in all probability due to side effects from the anomalous zone as it extends eastward beyond the survey area of Line 'A'.

A magnetometer survey carried out over the same lines as was the I.P. survey indicated no magnetic anomaly. It is, therefore, thought that any magnetite present must be in small amounts and not sufficient to cause the I.P. anomaly.

Geologically the anomaly appears to be suitably located within the quartz porphyry. Zones of alteration and discolouration are to be found surrounding the anomalous zone. The breccia pipes do not appear to be the cause of the anomaly as many are located outside of it.

In general then, this large anomalous area, which is still open at both ends, appears to be suitably located and the chargeabilities indicate that the anomaly could be caused by a body containing 1% to 3% sulphides by volume. An expanding Wenner electrode configuration indicated the depth to the body to be approximately 50 feet. Other depths calculated from the I.P. profiles range from 50 to 150 feet. The accompanying profiles and interpretation map shows possible trend patterns based on information available. Although the trends may be considered to be

fairly well established, their lateral extent and position is still open to question due to the possibility of side effects. Thus, it must be remembered that the bodies indicated may or may not reach a specific line, and may become more or less significant in between lines.

SUMMARY AND RECOMMENDATIONS

An Induced Polarization survey was carried out over a small area in the Quijotoa Area of the Papago Indian Reservation, Arizona. A large anomalous zone was indicated, probably due to the presence of sulphides. This anomaly is approximately 2,000 feet wide and although it has been traced for a length of 3,000 feet, it is still open to the east and west. A number of calculations were carried out on each profile and the true chargeability of the zone varies from 6.6 milliseconds to 14 milliseconds. The depth to the causative body varies from 45 feet to 150 feet. The amount of sulphide mineralization present to cause an anomaly of this type varies from 1% to 3% by volume.

A magnetometer survey carried out over the same lines as the I.P. survey indicate no magnetic anomaly, and therefore there is no reason to suspect that magnetite is the cause of the I.P. response.

The anomaly is located within the quartz porphyry and is surrounded by areas of discolouration or alteration. It is, therefore, believed that the zone is suitably located and should be further investigated.

Insufficient I.P. work was carried out to completely outline the anomalous zone. It is recommended that further I.P. work be carried out to completely outline the causative body and to further investigate the high chargeability readings located on the north end of Line 5.

It is further recommended that the anomaly located to date be investigated by diamond drilling, as the economic significance of the zone must be determined by visual examination, the I.P. method cannot differentiate between economic and non-economic sulphide minerals. The following locations are recommended for diamond drill holes:

Lines 1 and 2 - vertical hole at 17+50N

Line 4 - vertical hole at 10+00S

In drilling, it must be remembered that due to the wide intervals (500 feet) between lines, it is possible that the causative body does not reach the particular line on which the anomaly is observed.

Should the results of the drilling prove encouraging then, of course, further work should be undertaken to completely outline the anomalous zone.

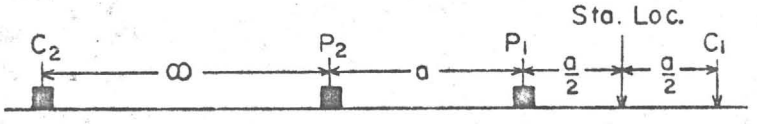
HUNTING SURVEY CORPORATION LIMITED

E. B. Nicholls,
Geophysicist.

APPENDIX

I. P. PROFILES : Lines - 1 & 2
3
4
5
6
"A"

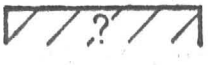
3 - ELECTRODE ARRAY

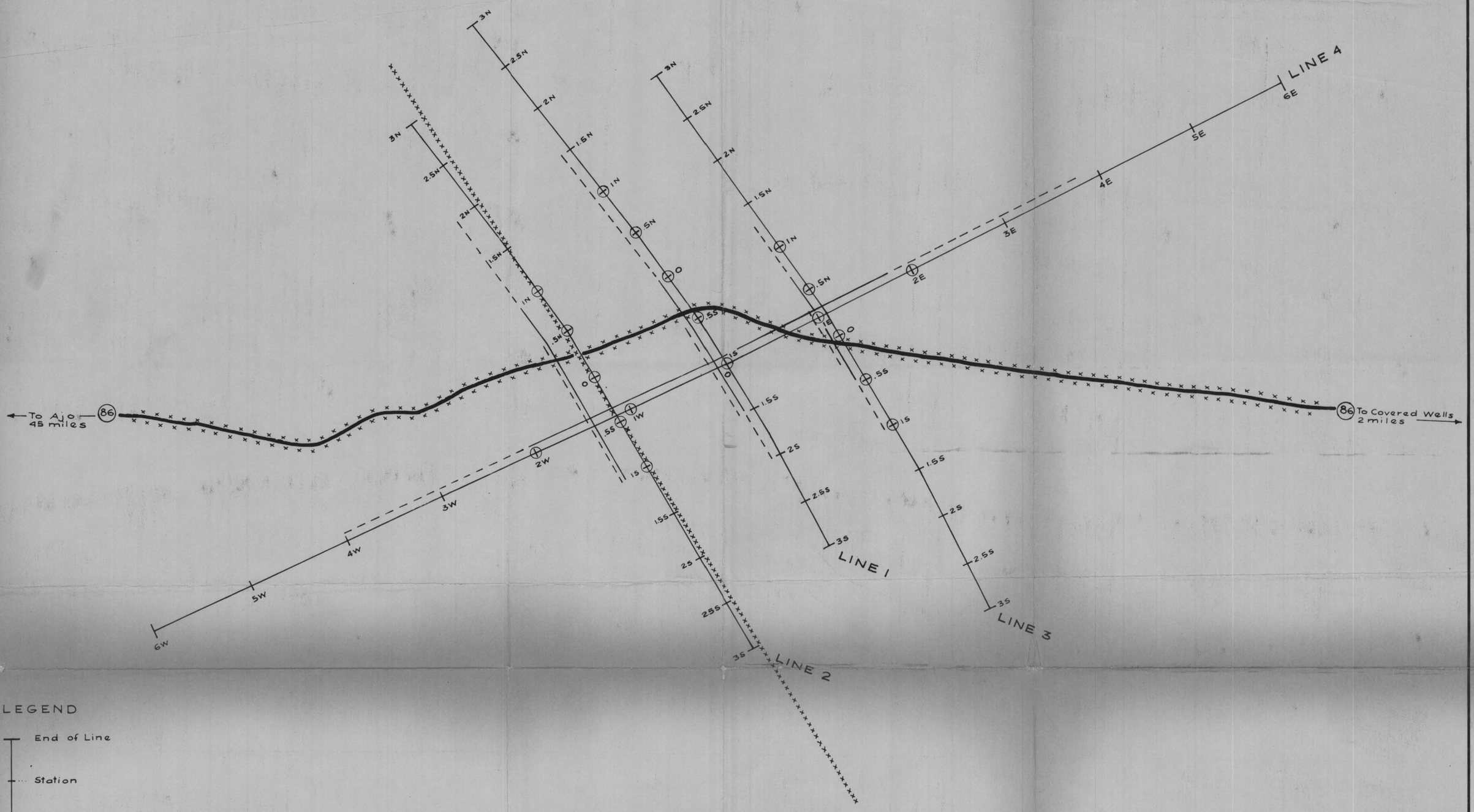


INTERPRETATION LEGEND

 -- Area of special interest

 --------Area of interest

 -- Area of possible interest



LEGEND

- End of Line
- Station
- Electrode
- No Anomaly
- Very Weak
- Weak
- Moderate
- Strong

xxxxx Grounded wire fence

From Base Map furnished by
Hunting Geophysical Services, Inc.

N

INDUCED POLARIZATION SURVEY

QUIJOTOA MINING DISTRICT

Papago Indian Reservation – Pima County, Arizona

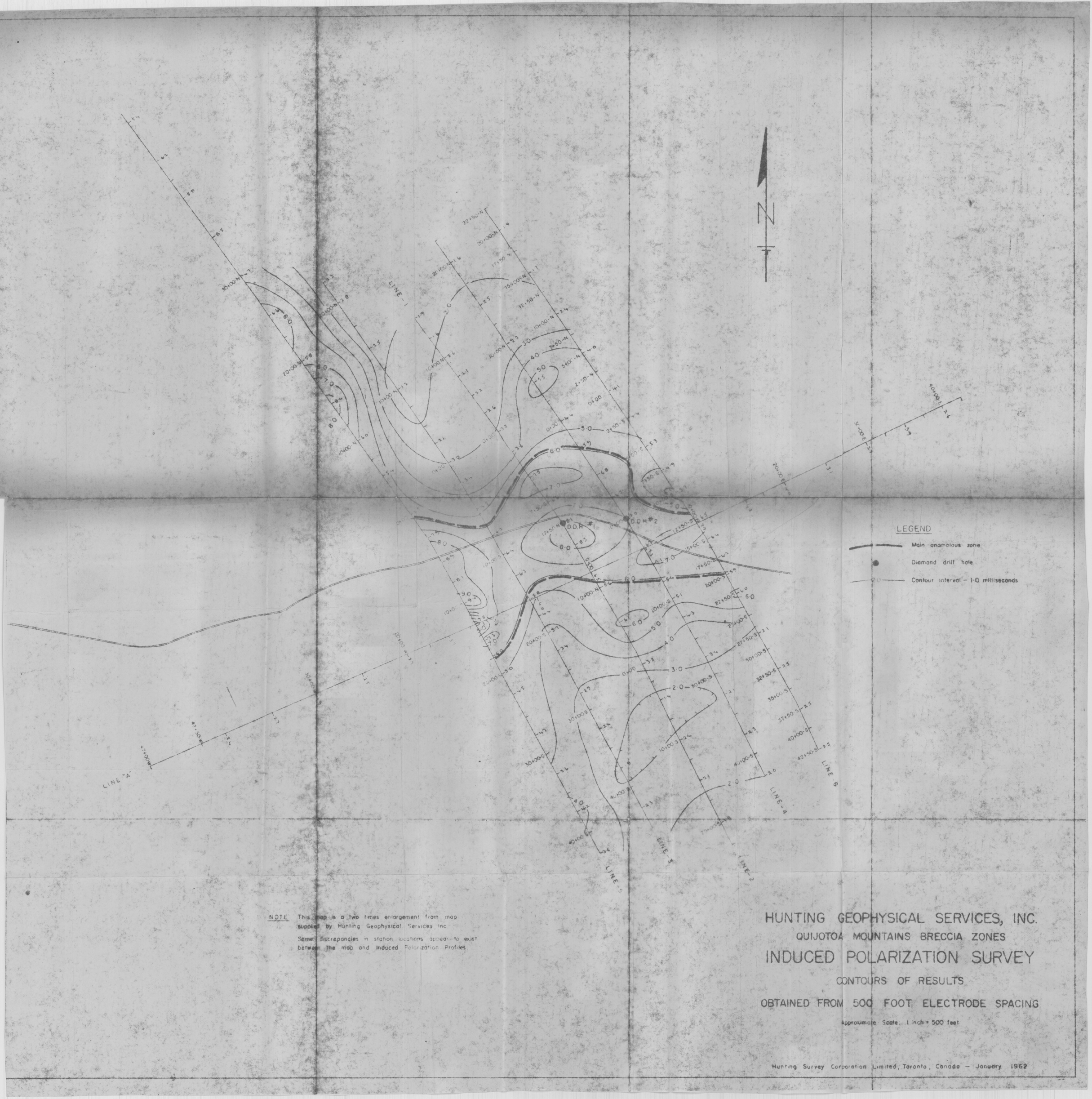
for

HUNTING GEOPHYSICAL SERVICES INC.

by

HEINRICHS GEOEXPLORATION CO.

Scale: 1" = 800' Jan. 1963



NOTE This map is a two times enlargement from map supplied by Hunting Geophysical Services Inc.

Some discrepancies in station locations appear to exist between the map and Induced Polarization Profiles.

HUNTING GEOPHYSICAL SERVICES, INC.

QUIJOTOA MOUNTAINS BRECCIA ZONES

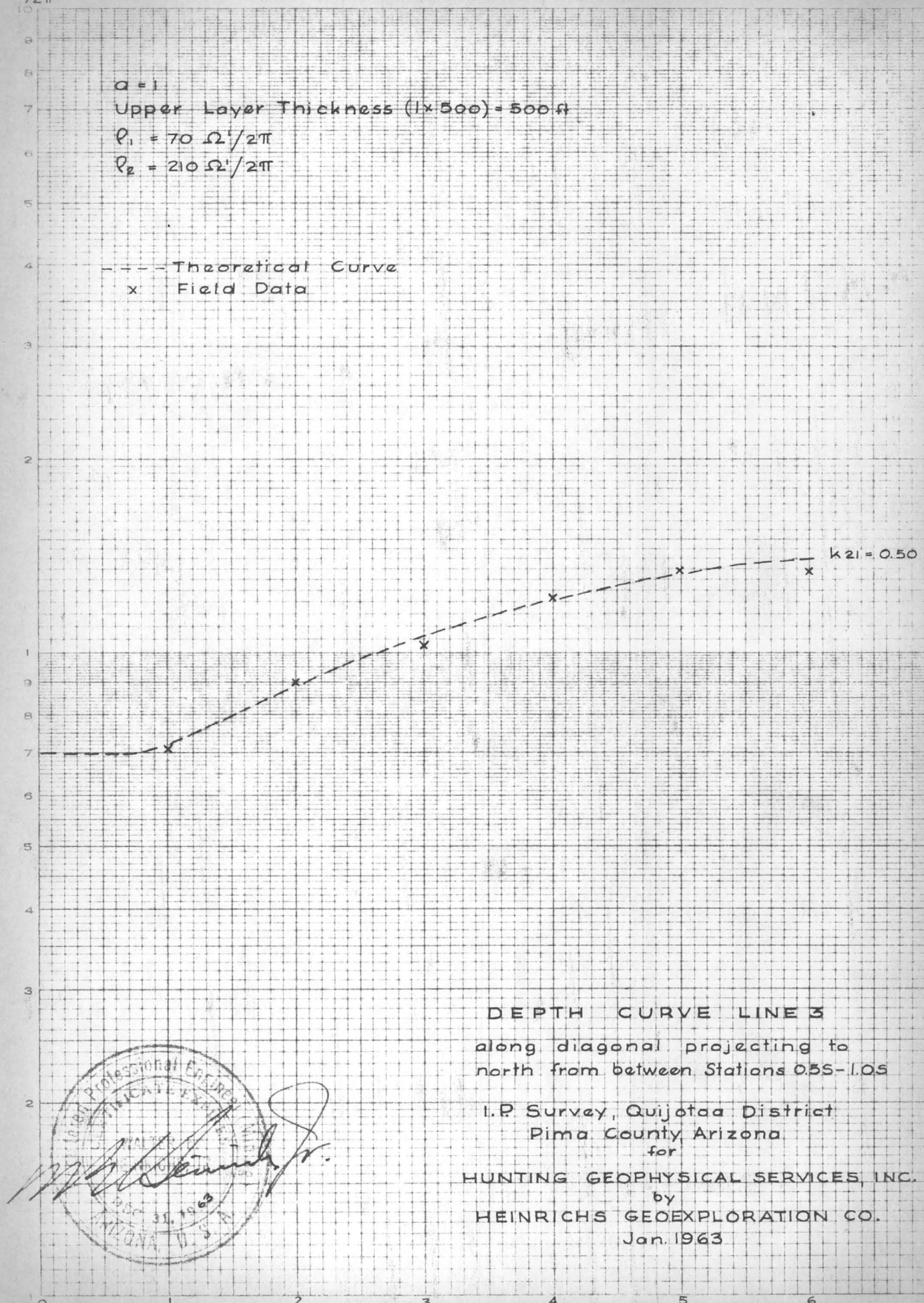
INDUCED POLARIZATION SURVEY

CONTOURS OF RESULTS

OBTAINED FROM 500 FOOT ELECTRODE SPACING

Approximate Scale – 1 inch = 500 feet

Hunting Survey Corporation Limited, Toronto, Canada – January 1962



DEPTH CURVE LINE 3

along diagonal projecting to north from between Stations 0.5S-1.0S

I.P. Survey, Quijotoa District
Pima County, Arizona
for
HUNTING GEOPHYSICAL SERVICES, INC.
by
HEINRICHS GEOEXPLORATION CO.
Jan. 1963

6W 5W 4W 3W 2W 1W 0 1E 2E 3E 4E 5E 6E feet

mv

+25
0
-25
-50

LINE 4

+25
0
-25
-50

LINE 3

+25
0
-25
-50

LINE 2

+25
0
-25
-50

LINE 1

Very Weak

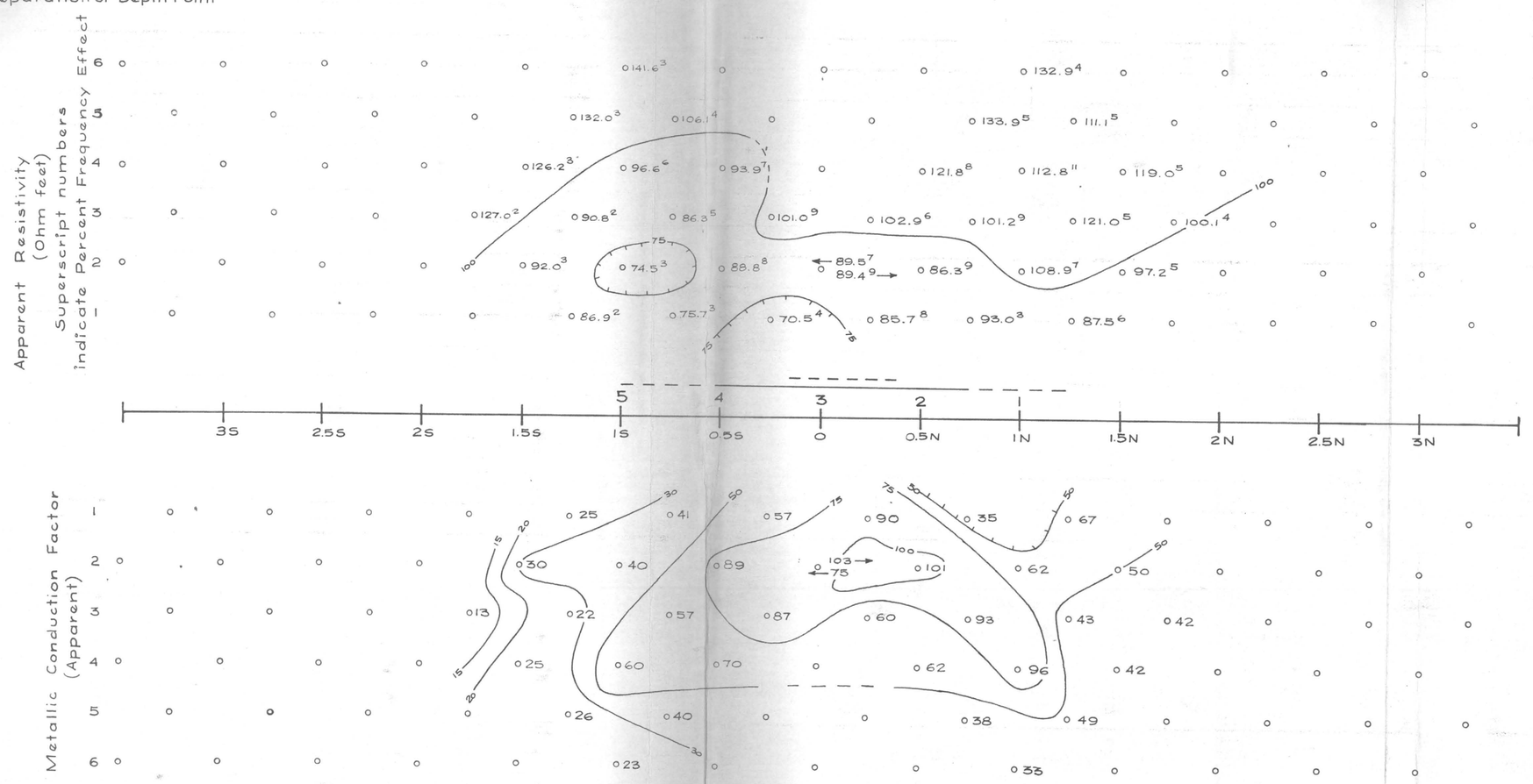
Weak

Moderate

Strong

I.P INTERPRETATION LEGEND

SELF POTENTIAL PROFILES
I.P. SURVEY, QUIJOTOA DISTRICT
PIMA COUNTY, ARIZONA
for
HUNTING GEOPHYSICAL SERVICES, INC.
by
HEINRICHS GEOEXPLORATION CO.
Hor. Scale: 1" = 1000'
Vert. Scale: 1" = 50 MV
Jan. 1963



LEGEND

- Electrode &/or Pot. Location & End of Line
- Station
- No Anomaly
- Very Weak
- Weak
- Moderate
- Strong

$\rho_{DC}/2\pi$

Contour Interval: Logarithmic

(( )) indicates questionable data

M.C.F.

QUIJTOA DISTRICT
PIMA COUNTY, ARIZONA

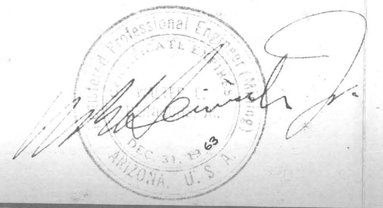
SECTIONAL DATA SHEET
for
HUNTING GEOPHYSICAL SERVICES INC.

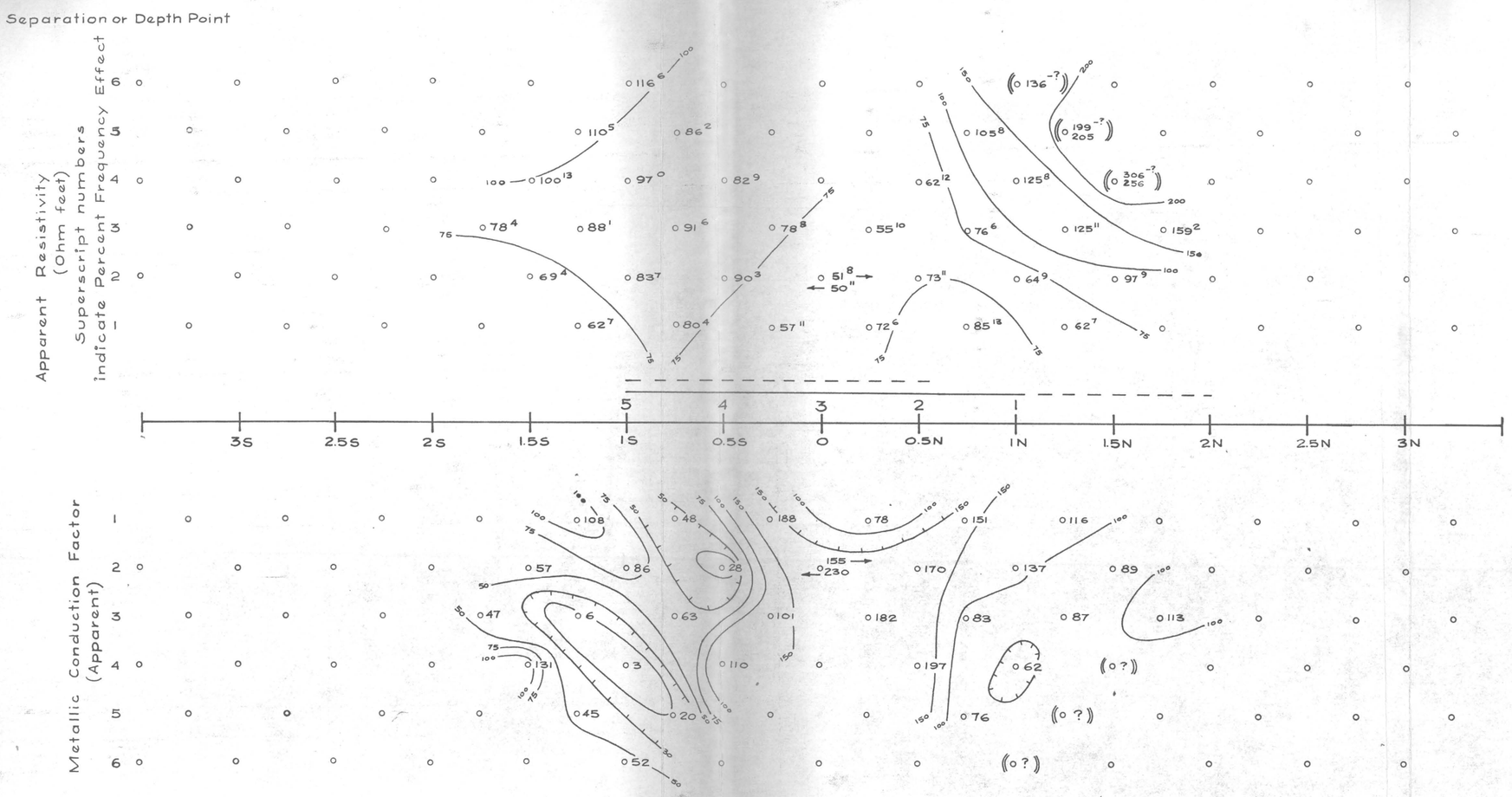
LINE No. 3

INDUCED POLARIZATION SURVEY

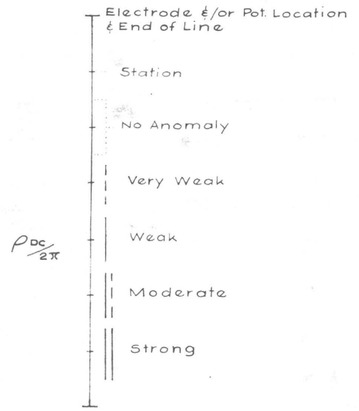
HEINRICHS GEOEXPLORATION CO.

Scale: 1" = 500'
Date: Jan. 1963





LEGEND



Contour interval: Logarithmic

(( )) indicates questionable data

M.C.F.

QUIJTOA DISTRICT
PIMA COUNTY, ARIZONA

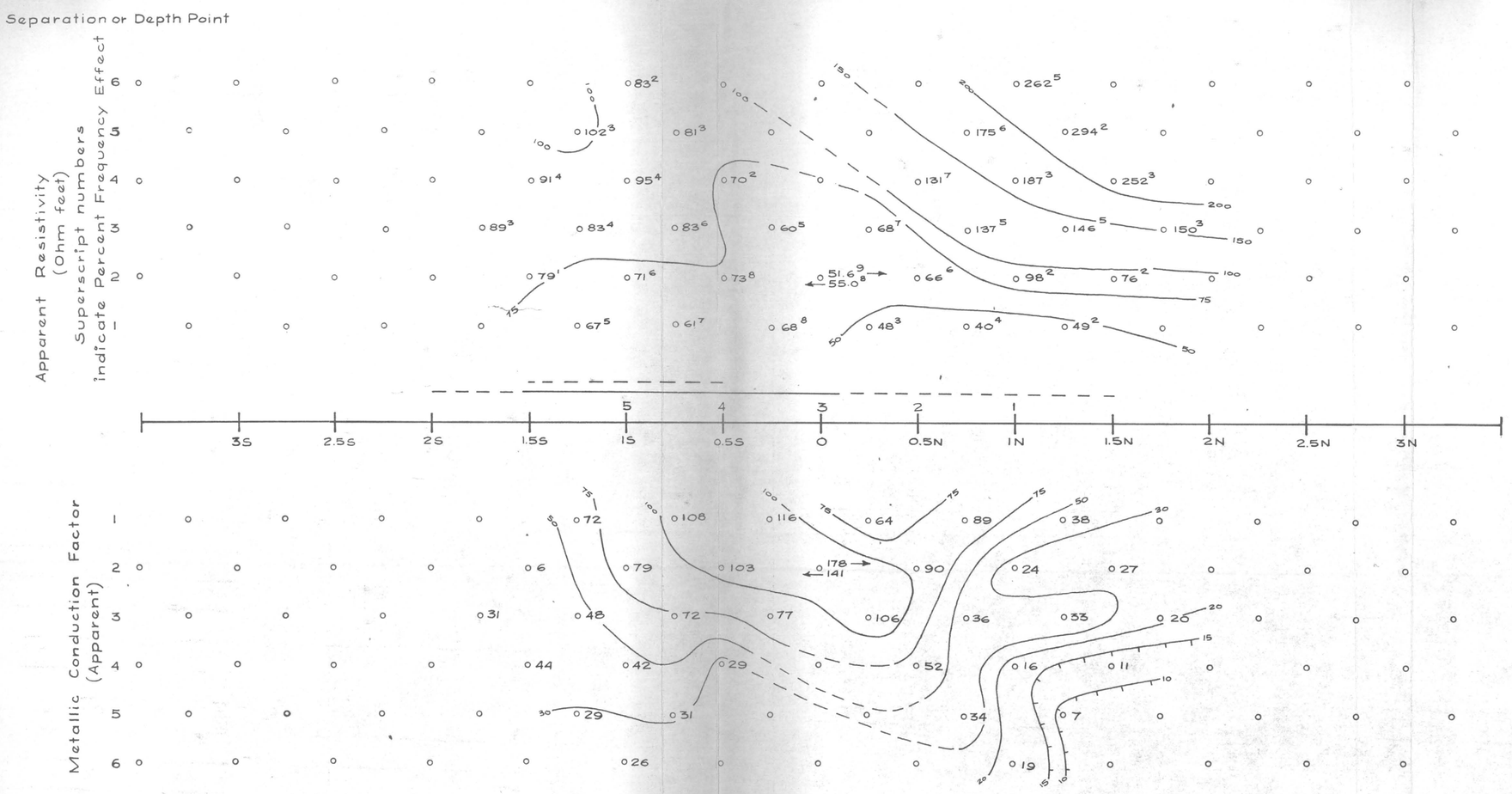
SECTIONAL DATA SHEET
for
HUNTING GEOPHYSICAL SERVICES INC.

LINE No. 2

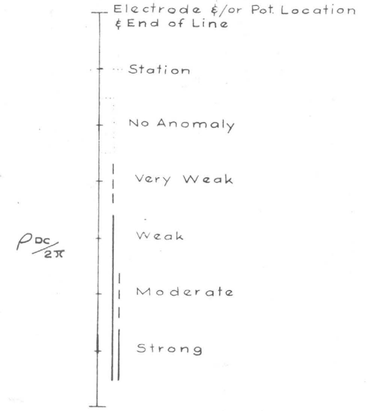
INDUCED POLARIZATION SURVEY

HEINRICHS GEOEXPLORATION CO.

Scale: 1" = 500'
Date: Jan. 1963



LEGEND



Contour interval: Logarithmic

(( )) indicates questionable data

M.C.F.

QUIJTOA DISTRICT
PIMA COUNTY, ARIZONA

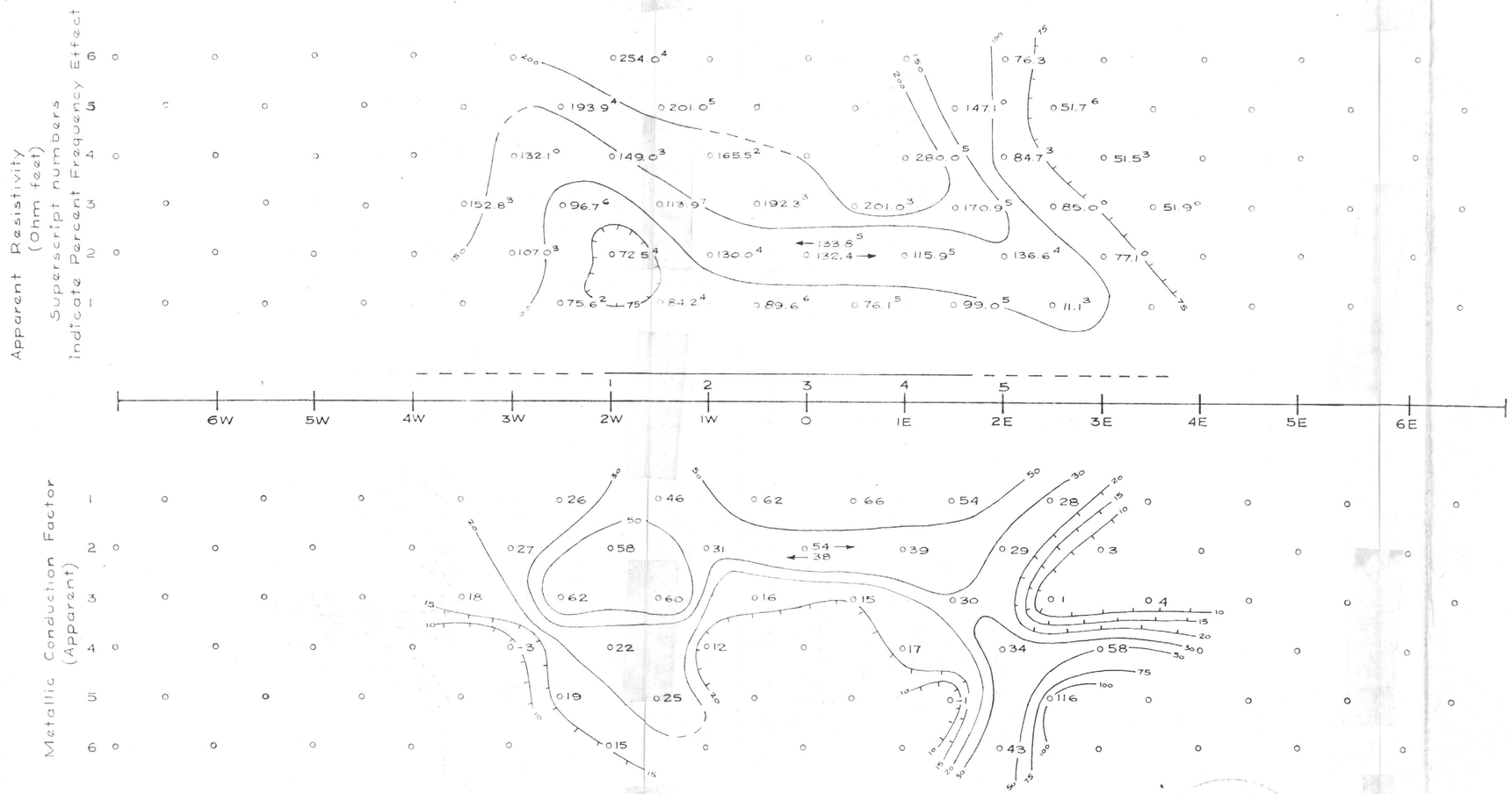
SECTIONAL DATA SHEET
for
HUNTING GEOPHYSICAL SERVICES INC.

LINE No. 1

INDUCED POLARIZATION SURVEY

HEINRICHS GEOEXPLORATION CO.

Scale: 1" = 500'
Date: Jan. 1963



LEGEND

Electrode &/or Pot Location & End of Line

Station

No Anomaly

Very Weak

Weak

Moderate

Strong

$\rho_{DC} = 2\pi$

Contour interval: Logarithmic

(( )) indicates questionable data

M.C.F.

QUIJTOA DISTRICT
PIMA COUNTY, ARIZONA

SECTIONAL DATA SHEET
for
HUNTING GEOPHYSICAL SERVICES INC.

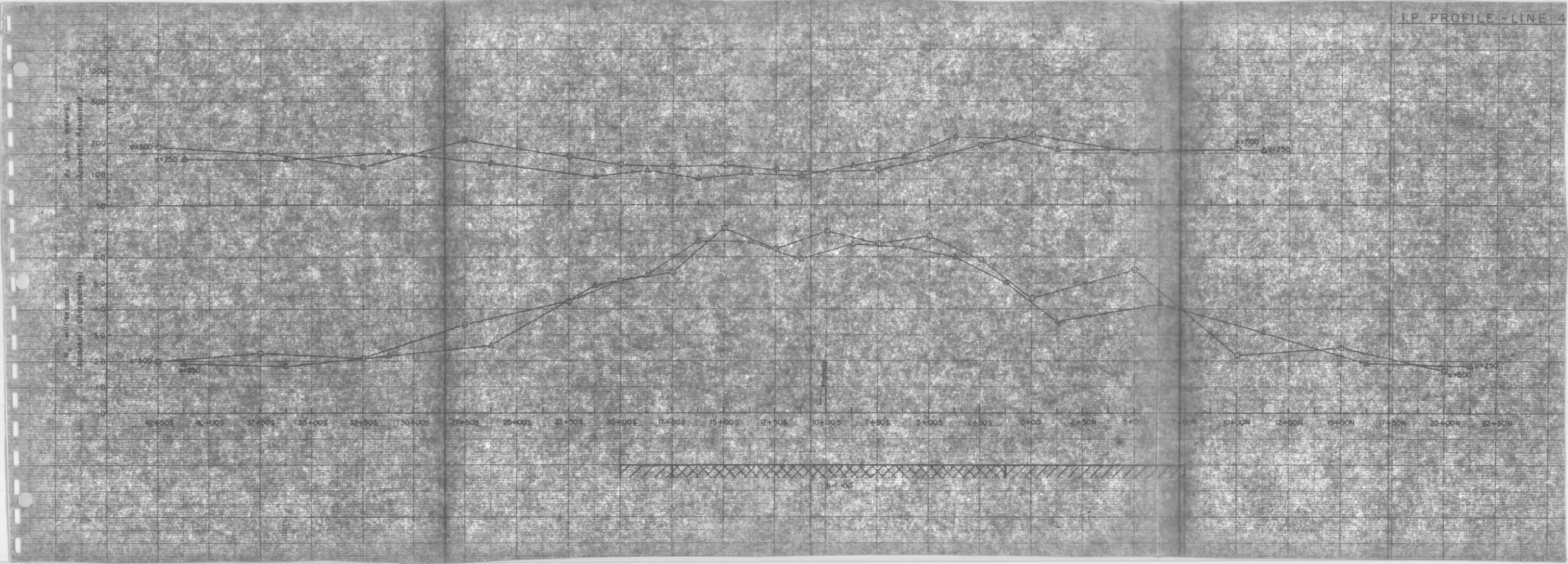
LINE No. 4

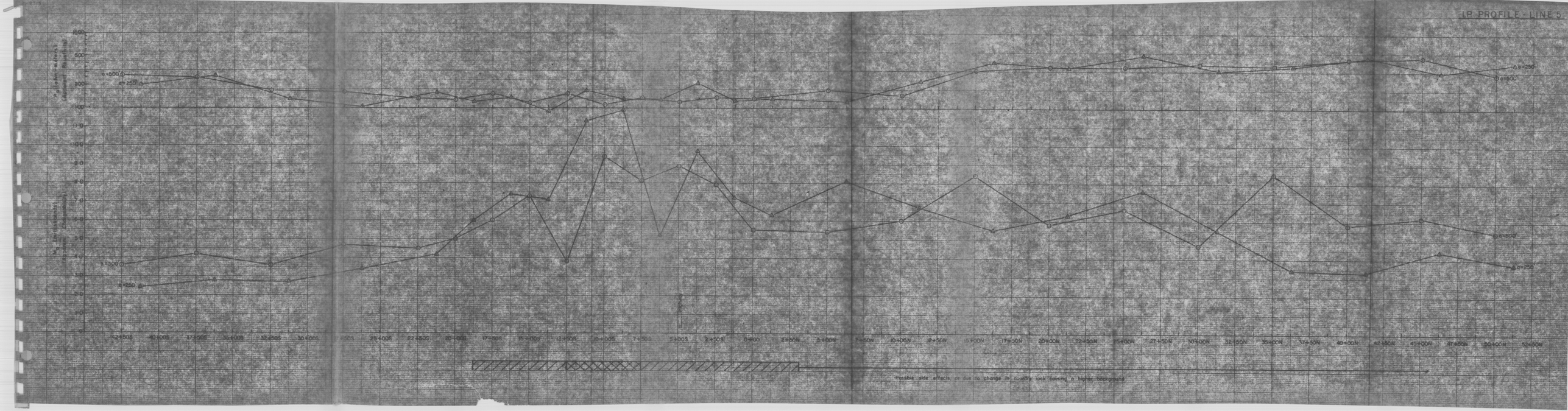
INDUCED POLARIZATION SURVEY

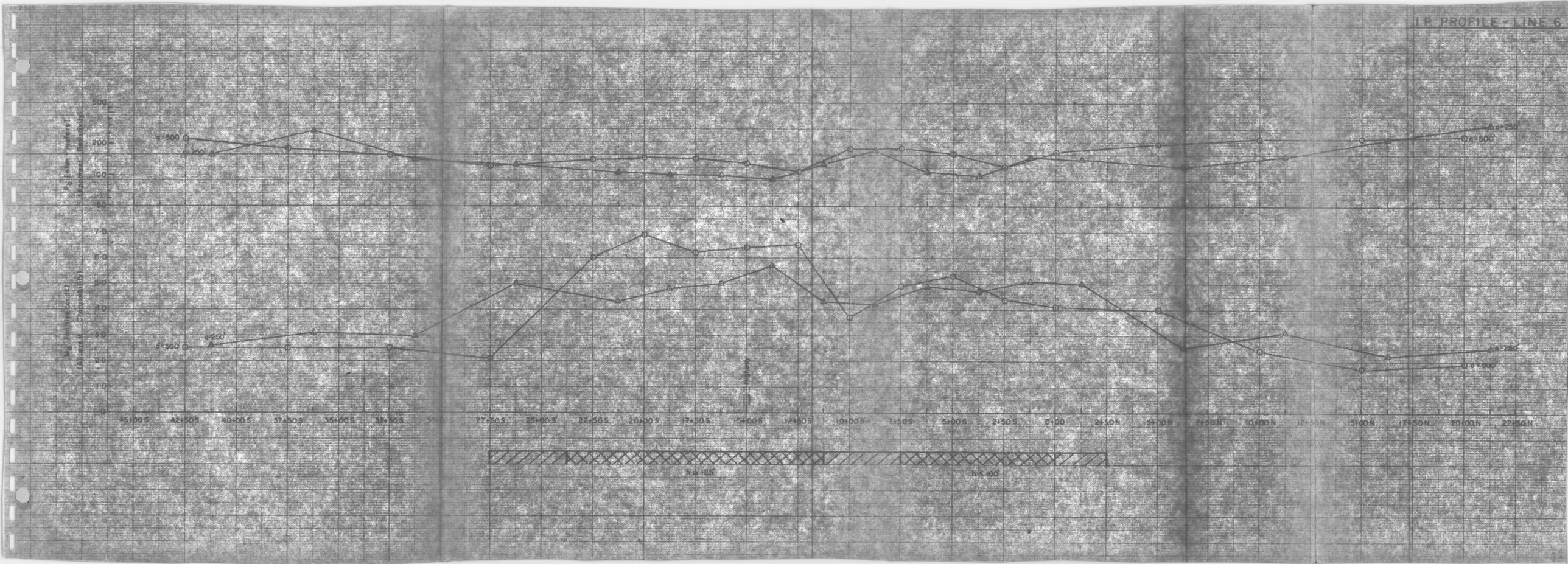
HEINRICHS GEOEXPLORATION CO.

Scale: 1" = 1000'
Date: Jan. 1963

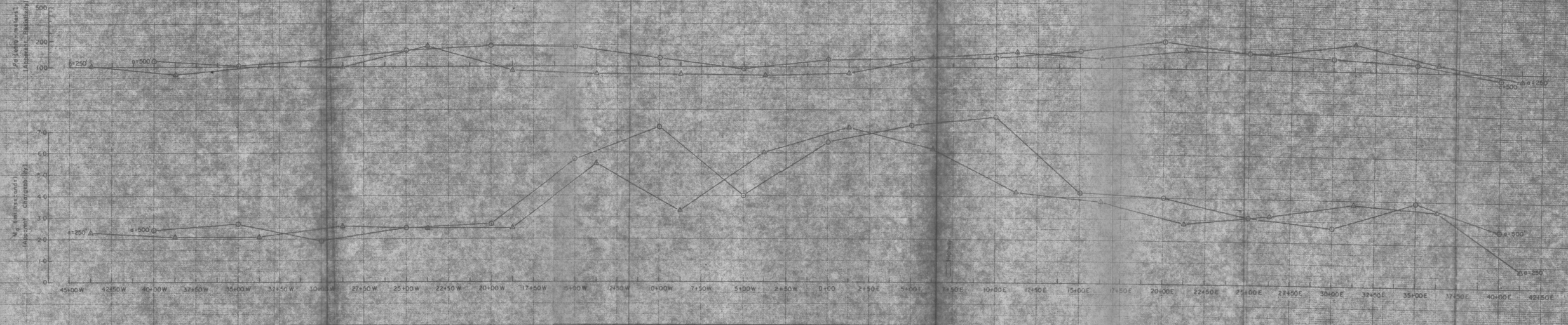
I.P. PROFILE - LINE 4




IP PROFILE - LINE 5
a = 500 ft
a = 250 ft
a = 200 ft
a = 150 ft
a = 250
a = 200
a = 150
-24+00S
-40+00S
-37+50S
-35+00S
-32+50S
-30+00S
-27+50S
-25+00S
-22+50S
-20+00S
-17+50S
-15+00S
-12+50S
-10+00S
-7+50S
-5+00S
-2+50S
0+00
2+50N
5+00N
7+50N
10+00N
12+50N
15+00N
17+50N
20+00N
22+50N
25+00N
27+50N
30+00N
32+50N
35+00N
37+50N
40+00N
42+50N
45+00N
47+50N
50+00N
52+50N
*Possible side effects or due to change in country rock causing a higher background


I.P. PROFILE - LINE 6
Pole-Dipole Method
Apparent Resistivity (Absolute Chargeability)
500
200
100
50
7.0
5.0
4.0
3.0
2.0
1.0
0
a=500'
a=250'
45+00S
42+50S
40+00S
37+50S
35+00S
32+50S
27+50S
25+00S
22+50S
20+00S
17+50S
15+00S
12+50S
10+00S
7+50S
5+00S
2+50S
0+00
2+50N
5+00N
7+50N
10+00N
12+50N
15+00N
17+50N
20+00N
22+50N
n=1
n=2
n=3
n=4
n=5
n=6
n=1.25
n=4.00

I.P. PROFILE - LINE "A"



APPENDIX # 3.

Induced Polarization Survey Data,

Heinrichs Geoexploration.

INTRODUCTION

From January 18 through January 25, 1963 Heinrichs Geoexploration Co. conducted induced polarization surveys over part of the Quijotoa Mining District, Papago Indian Reservation near Covered Wells, Arizona. This work was performed at the request of Mr. Quentin G. Whishaw of Hunting Geophysical Services, Inc., under the supervision of Mr. Franklin A. Seward, Jr., geophysicist, with E. Grover Heinrichs, Chris Ludwig and Floyd Hanly assisting.

The twofold purpose of this work was to first test an I. P. anomaly mapped by Hunting Geophysical Services and second to provide a direct comparison of the Hunting data which was obtained by the time domain or pulse method and the data of this report which utilized the multiple frequency technique.

Included with this report are sectional data sheets for each of the four lines surveyed and a plan location map, a depth curve profile on Line 3 and self potential profiles.

CONCLUSIONS AND RECOMMENDATIONS

1. The anomalism observed is definite, but considered to be of only moderate absolute magnitude. It is interpreted to be due to sulfide mineralization and compares with rather surprising similarity to the previous pulse results.

2. Data on Lines 1, 3 and 4 indicate definite attenuation of sulfide involvement at depth.

3. Data on Line 2 is suspect at least in part due to proximity of Line and electrodes to parallel fence.

4. Line 4 repeated with two end on spreads of 500 ft. dipoles would probably give much more definite east-west boundary interpretation.

5. Lateral resolution is best on Line 3 and least on Line 4

6. Lateral resistivity inhomogeneities preclude discrete depth analyses. One depth curve analysis on Line 3 indicates a thickness of the upper layer of 500 ft.

PROCEDURES

Lines 1, 2 and 3 were run along Hunting Geophysical Lines 2, 5 and 6 respectively, centered as indicated on the plan map, using a 500 ft. dipole spacing. Line 4 was run along Hunting Line 7 centered as indicated at 1.0 south on Line 1 and using a 1,000 ft. dipole spacing.

Observations were made from the expanding dipole-dipole or Eltran electrode configuration which has become standard in the industry for those using the frequency domain technique.

A D.C. frequency of .05 cps was used throughout the survey except when receiving the 5th and 6th separation data on Lines 2 and 3 and 3rd through 6th separation data on Line 4 where high telluric noise-to-signal ratio was minimized by using .15 cps. The A.C. frequency used was 3.0 cps.

INTERPRETATION

The interpretation is presented on the sectional data sheets and the plan maps as blank, dashed, single bar, single bar and dashed and double bar lines indicating the relative degree of anomalism observed and respectively, the terms very weak, weak, moderate and strong are used to indicate the strength. It should be emphasized that these terms are used in a relative sense only and may be only indirectly related to absolute degree of anomalism or intensity of mineralization.

The anomaly on each of the four lines correlates well with that mapped by Hunting. The highest absolute anomalism (with respect to the percent frequency effects) appears to exist on Line 2. On the other hand much if not all of these data are subject to question regarding degree of sulfide involvement because of the close proximity of this line and the current electrodes to a

parallel grounded wire fence. In fact it is almost certain that the data on the 2.5n to 3n dipole was strongly affected by the fence and it was not reasonable from the observations made to compute frequency effects or metal factors on the last three data points.

Line 1 shows a distinct anomaly from 1.0n to 2.0s with the strongest effects from 0.5s to 1.5s. The best pattern is observed on Line 3 which offers the highest degree of resolution although not necessarily the highest magnitude effects.

The 1,000 ft. dipole, Line 4 offers the least lateral resolution and the lowest magnitude anomalous data.

On all of the lines, with the possible exception of Line 2 (of the questionable data), the anomaly appears to attenuate with depth, indicating that perhaps the mineralized zone is a relatively horizontal layer.

A number of depth analyses were attempted on each of the lines, but in general lateral resistivity changes prevented any successful interpretation. One depth curve on Line 3, taken along the diagonal projecting to the north from between stations 0.5s to 1.0s, gives a depth to the top of the second layer of 500 ft, a resistivity of 70 ohm ft./2pi for the top layer and a resistivity of 210 ohm ft./2pi for the bottom layer.

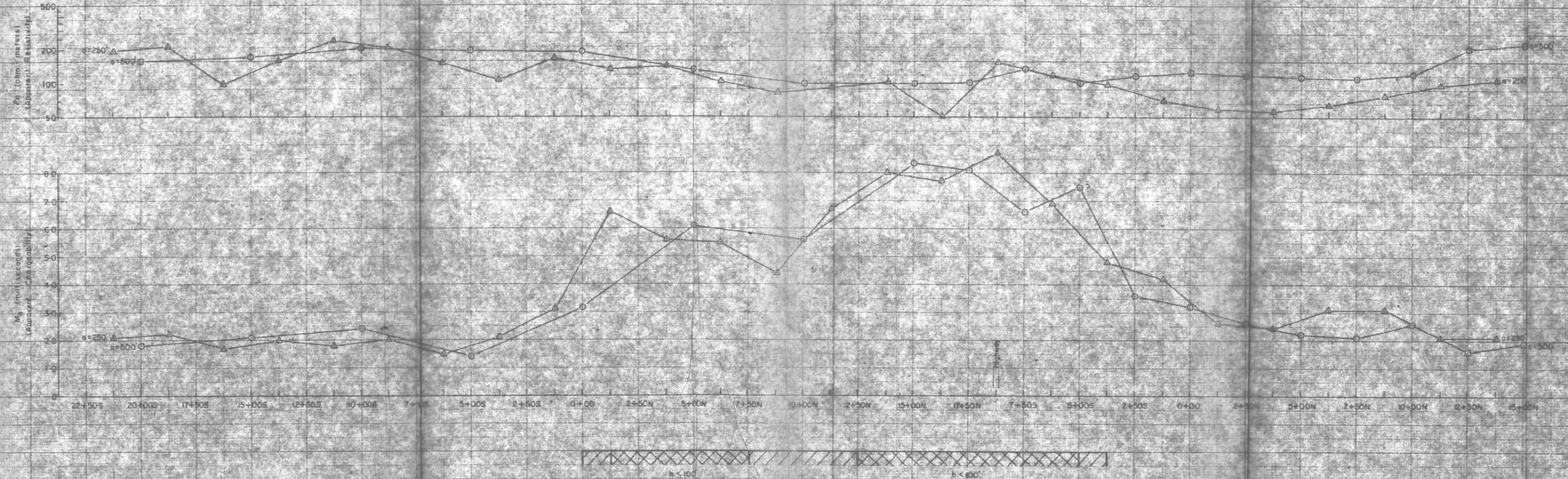
Respectfully submitted,
HEINRICHS GEOEXPLORATION CO.

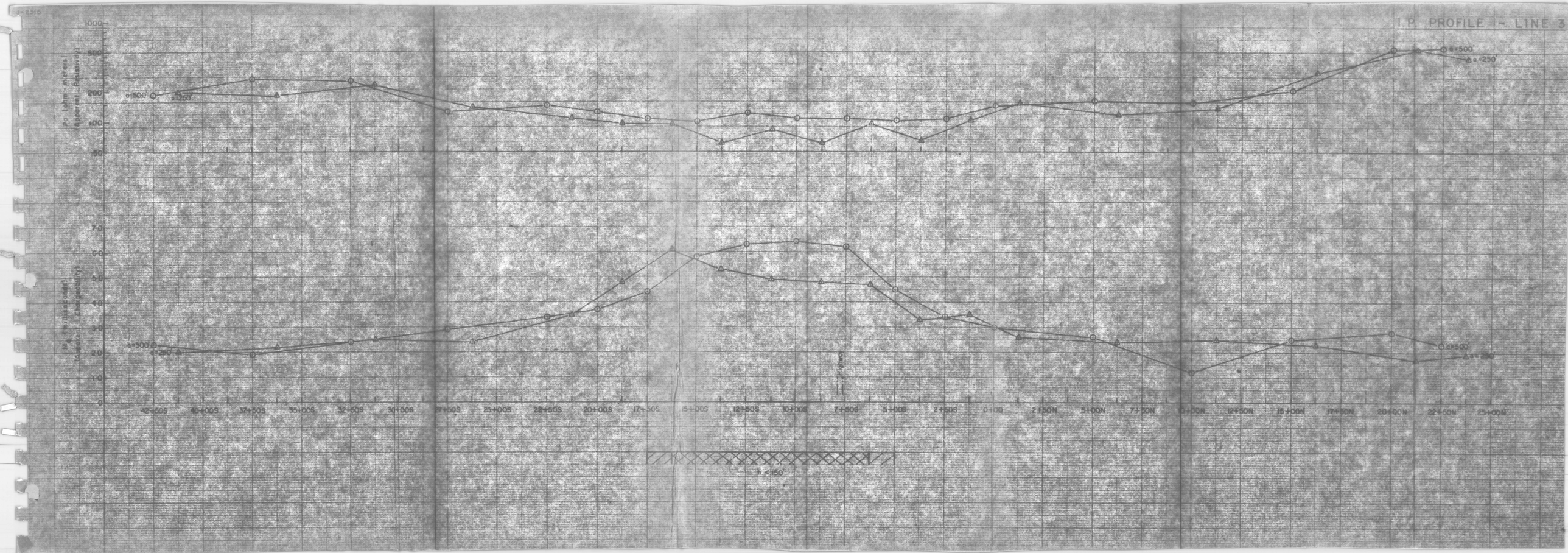
Franklin A. Seward, Jr.

Franklin A. Seward, Jr., Geophysicist
HEINRICHS GEOEXPLORATION COMPANY

January 30, 1963
P. O. Box 5671
Tucson, Arizona

I.P. PROFILE - LINES 1 & 2




I.P. PROFILE N. LINE 3
ρa (ohm-metres) (Apparent resistivity)
1000
500
200
100
50
a=500'
a=250'
(ohm-metres) (Apparent resistivity)
7·0
5·0
3·0
2·0
1·0
0
a=500'
a=250'
42+50S
40+00S
37+50S
35+00S
32+50S
30+00S
27+50S
25+00S
22+50S
20+00S
17+50S
15+00S
12+50S
10+00S
7+50S
5+00S
2+50S
0+00
2+50N
5+00N
7+50N
10+00N
12+50N
15+00N
17+50N
20+00N
22+50N
25+00N
Thickness
h <150'
a=500'
a=250'

Stebbins
Minerals

REPORT OF MINERAL EXPLORATION THROUGHOUT THE PAPAGO INDIAN RESERVATION, ARIZONA FOR THE PAPAGO EXPLORATION COMPANY SEPTEMBER, 1961 - OCTOBER, 1963

BY
STEBBINS MINERAL SURVEYS INCORPORATED
OLD GREENWICH, CONNECTICUT
NOVEMBER, 1963

STEBBINS MINERAL SURVEYS INCORPORATED

INDEX

STEBBINS MINERAL SURVEYS INCORPORATED

INTRODUCTION

In this report are summarized the results of a mineral exploration program carried out by Stebbins Mineral Surveys Incorporated for the Papago Exploration Company. The Reservation is located in southern Arizona (see map #2). The project was initiated September 16, 1961 and terminated October 31, 1963, and comprised geologic, geochemical and geophysical studies throughout the Reservation.

It is concluded that, with the exploration techniques currently available, the probability of finding a major mine within the Reservation is very low. In one area, however, the Quijotoa, a high risk drilling program is considered justified, but was not recommended in the face of opposition from the consultant to the Papago Exploration Company.

BACKGROUND

On August 9, 1961 Mineral Prospecting Permit Number 14-20-0450-3736 was authorized by the Secretary of the Interior which granted Hunting Geophysical Services, Inc., as contractors to the Papago Exploration Company, exclusive right to explore the Reservation for minerals other than hydrocarbons for three years. Excluded from the permit were areas where prior rights had been established, namely valid mining claims, the "Garcia Strip," and an area east of the Santa Rosa Wash. Minimum expenditures and a schedule of land relinquished were defined in the permit, along with other terms and conditions.

In the Spring of 1963, Hunting Geophysical Services, Inc. was reorganized and the name changed to Geo-Ventures, Inc. In the Summer of 1963, the company was again reorganized and the name was changed to Stebbins Mineral Surveys Incorporated.

ACKNOWLEDGMENTS

The field work was supervised by Quentin G. Whishaw, assisted at various times by Keith J. Droste, Donald C. Elkin, Max T. Evans, Morris A. Kaufman, Joseph A. LaRocque, Douglas G. McGoon, Jr., Philip Matter, Rana Modhi, Kenneth Pettigrew, and John J. Reiff. Secretarial work was carried out by Mrs. St. Ives Gray and Mrs. Janet Doidge.

Consultant to the Papago Exploration Company was James A. Noble, Noble and Ruckstick, Pasadena, California.

LOCATION MAP
STATE OF ARIZONA
showing
PAPAGO INDIAN RESERVATION

Scale of Miles

0 25 50 75 100 125 150 175 200

Fig 1

STEBBINS MINERAL SURVEYS INCORPORATED

Geochemical analyses were made by Geochemical Prospecting Laboratory, Golden, Colorado.

Assays were made by Hawley and Hawley, Tucson, Arizona.

Consulting geophysicist for the magnetic program was Ross W. Shipple, Salt Lake City, Utah.

Hunting Survey Corporation Limited, Toronto, Ontario was contractor for the seismic survey, provided the Varian airborne magnetometer and operator, and did 25.6 line miles of induced polarization survey.

Heinrichs Geo-Exploration Company, Tucson, Arizona was contractor for 5.0 line miles of induced polarization survey.

Canadian Aero Mineral Surveys Limited, Toronto, Ontario, was contractor for 36 line miles of induced polarization survey.

Pacific Air Industries, Inc., Long Beach, California was contractor for the color and black and white aerial photography.

Arizona Helicopters Incorporated, Chandler, Arizona was contractor for flying the aeromagnetic survey.

Diamond drilling was done by Boyles Brothers Drilling Company, Salt Lake City, Utah.

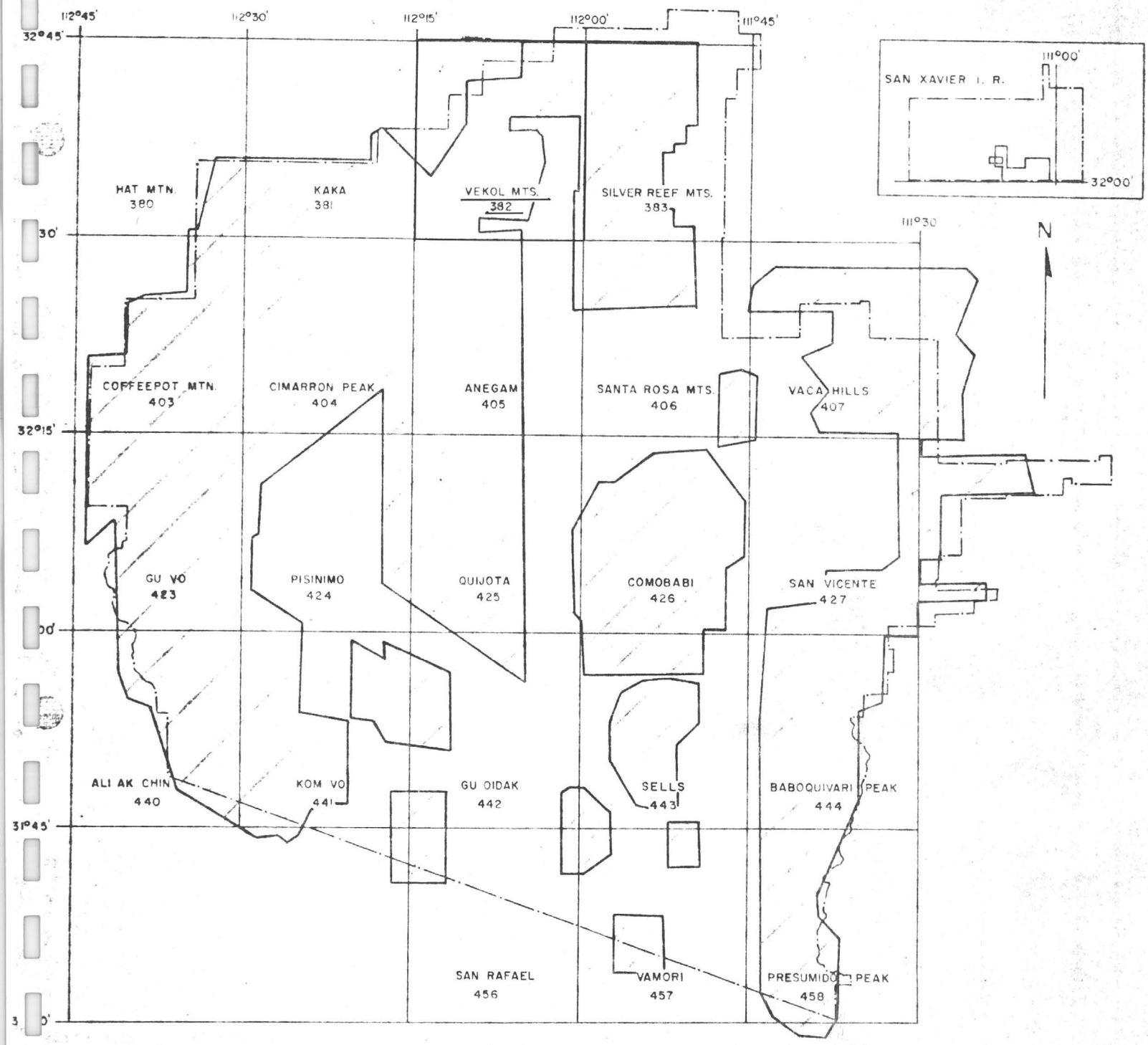
Fifty-seven thin sections were prepared by the University of Arizona and reported on by Charles Rattee, Geology Department.

The drafting was mostly done by Robert T. O'Haire.

The cooperation of the Bureau of Indian affairs and the Papago Tribal Council is gratefully acknowledged.

SUMMARY OF THE EXPLORATION PROGRAM

The Reservation comprises 4,355 square miles (2,774,000 acres). Between September 20 and November 14, 1961 all outcrop was photographed simultaneously in color and black and white as stereo pairs of aerial photography at a scale of 1:10,000 (1 inch equals 833 feet). The outcrop areas approximate 40 per cent of the Reservation (see map #4).



STEBBINS MINERAL SURVEYS INC.

PAPAGO INDIAN RESERVATION PROJECT
ARIZONA

MAP SHOWING U.S. GEOLOGICAL SURVEY
QUADRANGLE NAMES AND NUMBERS
PLUS OUTLINES OF AERIAL PHOTOGRAPHY

SCALE 1 INCH = 12 MILES

STEBBINS MINERAL SURVEYS INCORPORATED

From November 20, 1961 to August 9, 1962 a geologic study of the aerial photography combined with field investigations was completed. During this period, areas of no economic geologic interest were defined and relinquished, as specified by the permit, and areas warranting additional investigation were selected and assigned priorities. This mapping was compiled as 15-minute quadrangles at a scale of 1 inch equals two miles made from enlargements of the Arizona Bureau of Mines County Geologic Maps published at a scale of 1:375,000 (see map #7).

The remainder of the program (August, 1961 to October, 1963) comprised detailed geologic mapping, geochemical sampling, airborne and ground geophysics, and the drilling of one diamond drill hole. A total of 1499 geochemical samples were collected from which 3095 analyses were reported. Two miles of shallow seismic profiles were obtained, approximately 1,700 line miles of aeromagnetic survey were completed, 37 line miles of ground magnetic survey, and 65.4 line miles of induced polarization survey. The one diamond drill hole was drilled to a depth of 168 feet through 85 feet of alluvium.

Two geologic reports have been submitted to the Department of Interior (August, 1962 and February, 1963), in each case at the time land was relinquished as required by the permit.

PHYSIOGRAPHY

The Papago Indian Reservation lies in the Basin and Range Physiographic Province of Southern Arizona.

Elevations range from 1600 feet above sea level in the southern portion of the Great Plain to 7730 feet, the summit of Baboquivari Peak.

Generally speaking the ranges trend in a northerly direction and they occupy about 40 per cent of the total area. The basins occupy the remaining 60 per cent. They are generally flat gravel plains believed to be occupying structural depressions. The depth of unconsolidated gravel in some areas is greater than 1000 feet. The plain like surfaces were formed through combined deposition and erosion by sheet floods, meandering streams, and wind action.

The area is one of low rainfall (less than 10 inches per annum). Temperatures range from a few degrees below freezing on winter nights to 120 degrees Farenheit in the shade on summer days.

Vegetation is cactus and desert shrubs.

GENERAL GEOLOGY

Rocks from Archean to recent are exposed.

Precambrian rocks, schist, gneiss and intrusives outcrop at the extreme north of the Reservation.

Paleozoic rocks, chiefly represented by sediments are found in the Vekol Mountains in the north of the Reservation. Other small outcrops are found in the north and center. Mesozoic sediments and volcanics are wide spread in the central and eastern parts of the Reservation. Tertiary rocks, mostly andesite and basalt, form the mountains along the west boundary.

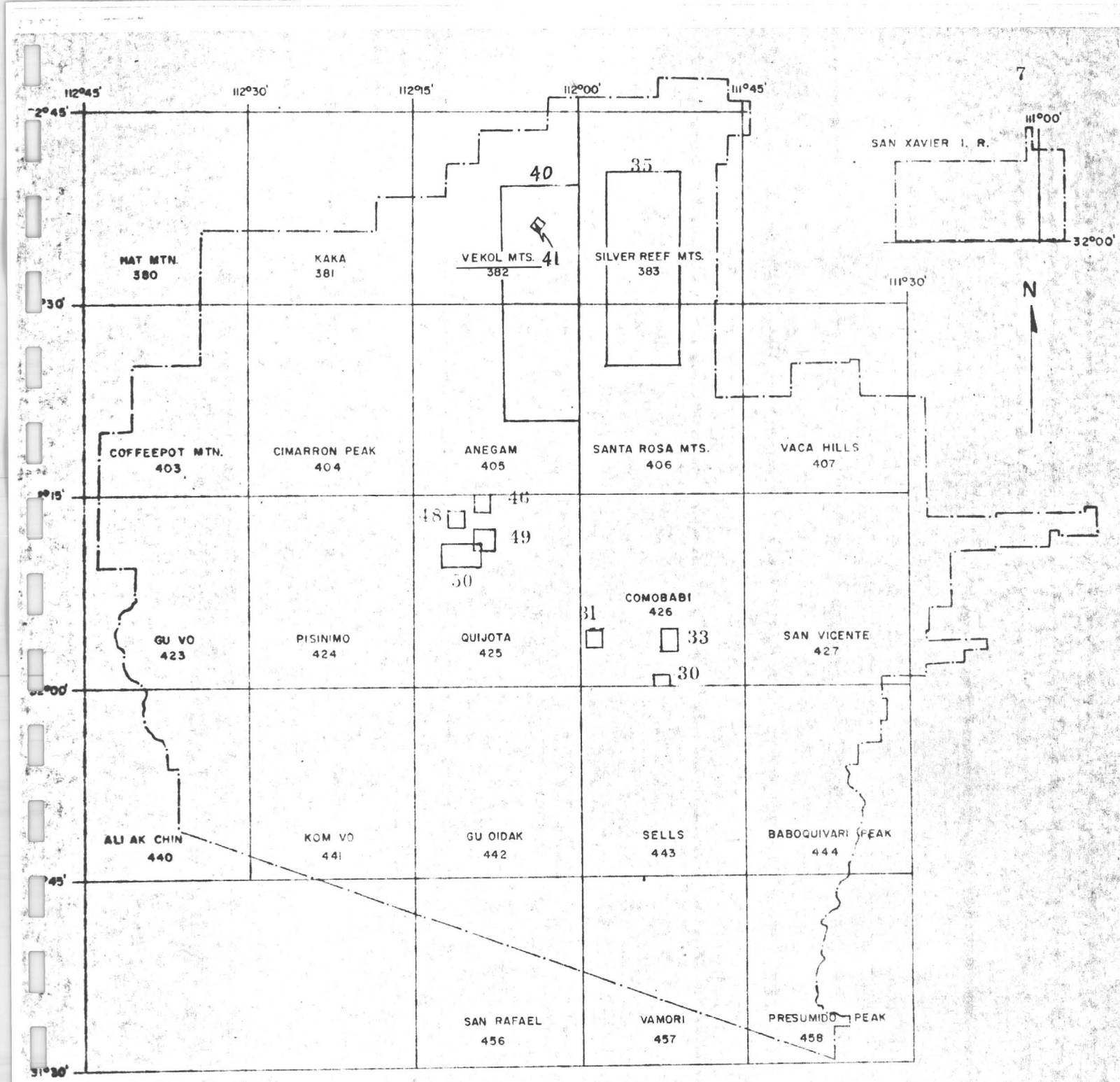
Quaternary volcanics and gravel can be seen in all areas.

All pre-Quaternary rocks are folded and faulted. Intrusives range in age from Precambrian to Tertiary.

RECONNAISSANCE GEOLOGIC MAPPING

The reconnaissance geologic mapping is compiled on 15-minute quadrangles at a scale of 1 inch equals 2 miles (see map #7 and quadrangle maps #9-29, 34, 37, 38, 45) made from enlarging the Arizona Bureau of Mines County Geologic Maps published at a scale of 1:375,000 (1 inch equals 6 miles approximately). Our alterations and modifications of the State Bureau's mapping have been incorporated in the quadrangle maps presented here except in the instances where complete remapping at a larger scale was accomplished. In those cases, the State mapping is simply reproduced on the quadrangle sheet and our mapping appears separately (see maps numbered 29-34, 36, 39-40).

The geology of each quadrangle is summarized below. The legend for all sheets appears as Map #8. The quadrangle name and number of each quadrangle corresponds to the U. S. Geological Survey nomenclature.



STEBBINS MINERAL SURVEYS INC.

PAPAGO INDIAN RESERVATION PROJECT

ARIZONA

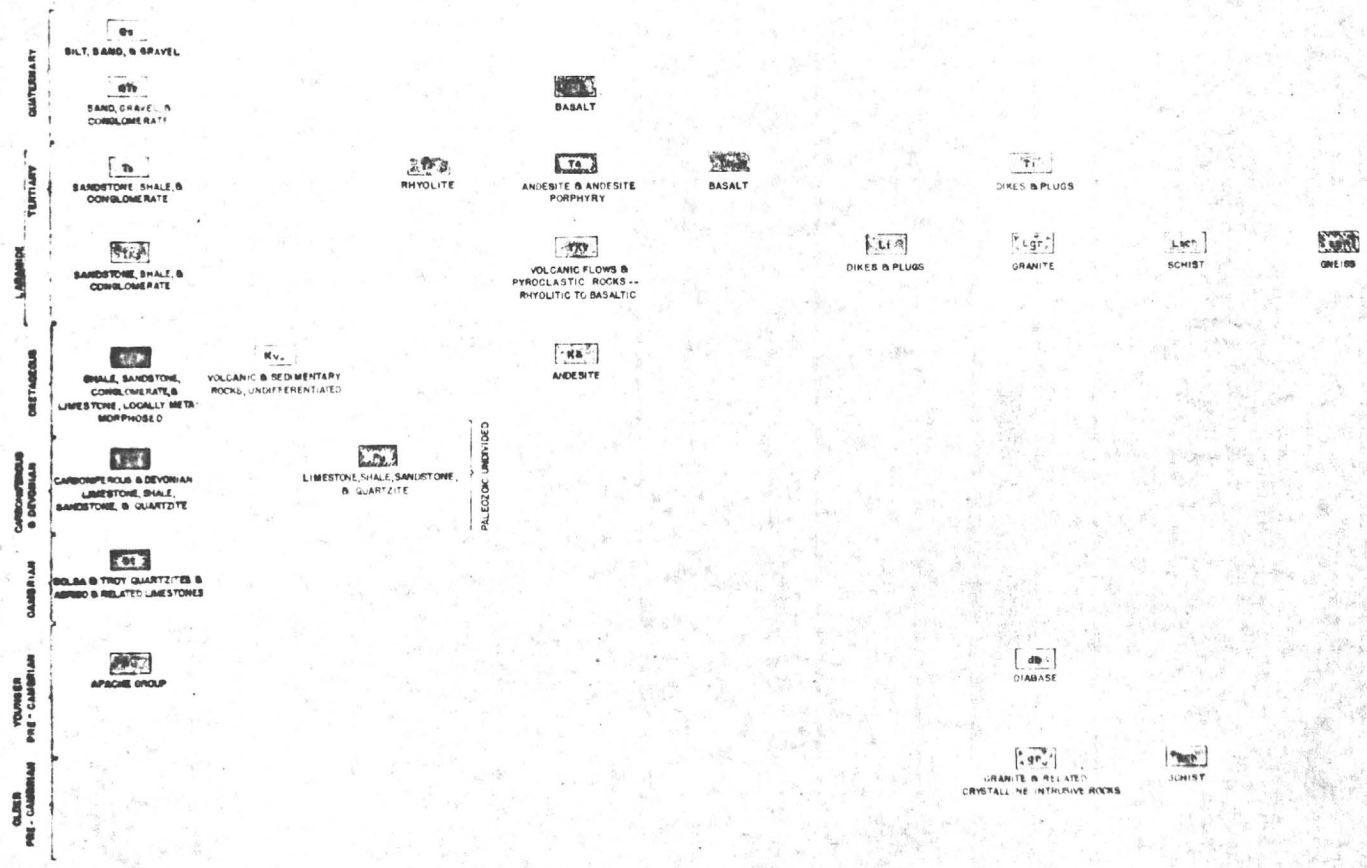
INDEX OF GEOLOGICAL MAPS

SCALE 1 INCH = 12 MILES

STEBBINS MINERAL SURVEYS INC.

LEGEND

FOR 15-MINUTE GEOLOGIC QUADRANGLES OF
THE PAPAGO INDIAN RESERVATION



CONTACT

FAULT, SHOWING DIP, U - UPTHROWN SIDE, D DOWNTHROWN SIDE

STRIKE & DIP OF BEDS

MINE

PROSPECT

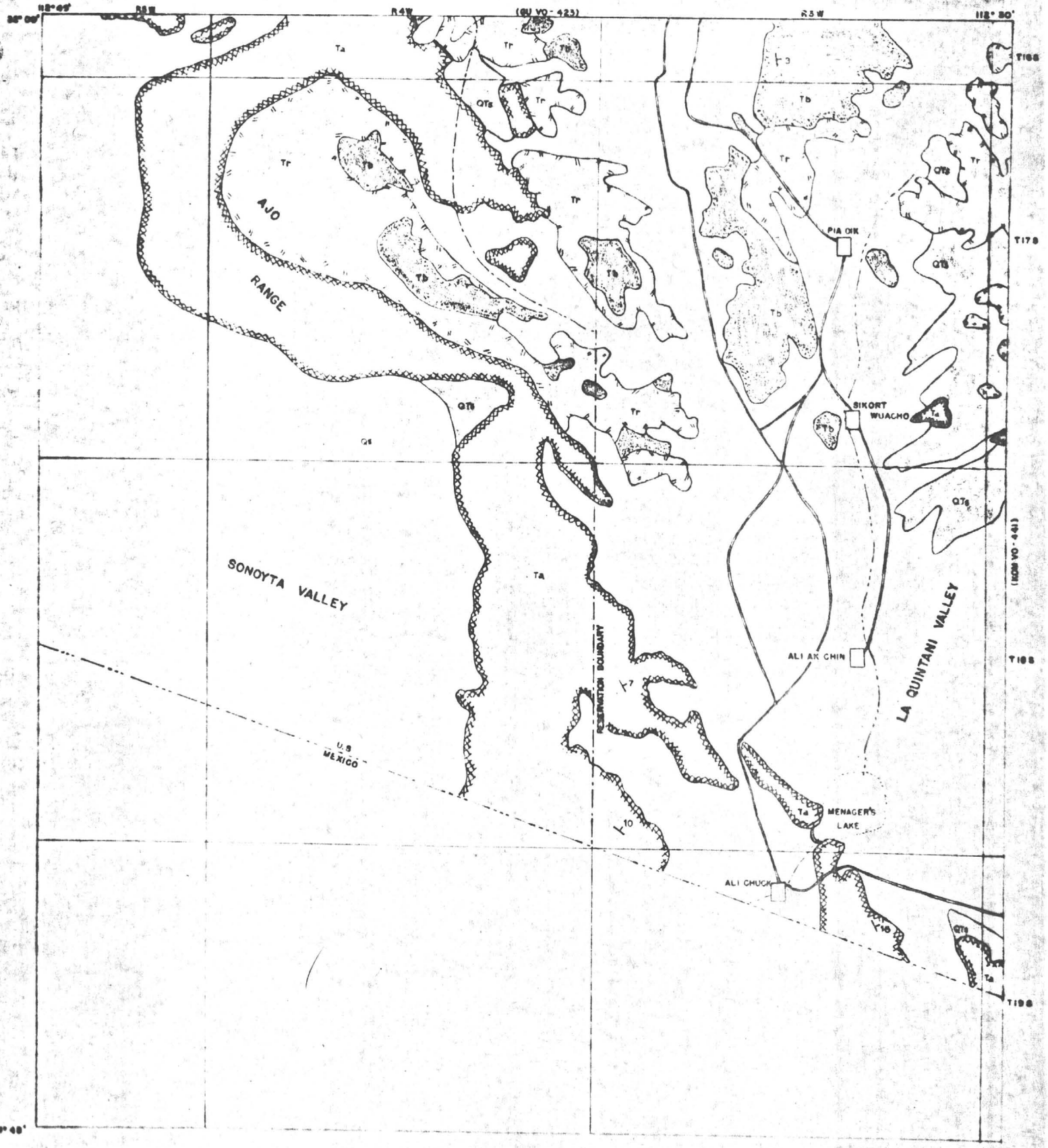
RESERVATION BOUNDARY

SCALE FOR ALL GEOLOGIC QUADRANGLES 1 INCH = 2 MILES

Ali Ak Chin Quadrangle (44c)

Ali Ak Chin quadrangle contains the southern end of the Ajo Mountains, the eastern portion of which is in the Reservation. The southern part of the range is composed of Tertiary andesite, gray, green and purple in color. No alteration or mineralization was found in the area.

In the northern half of the quadrangle the rocks are andesitic, overlain by rhyolite capped by basalt. Beds of white tuff, up to ten feet thick, occur at the base of the basalt. Wind has carved caves along the outcrop of the tuff. Beds of obsidian occur with the tuff. In many places a brick-red zone up to thirty feet thick occurs at the base of the basalt. No mineralization was observed in this area.



ALI AK CHIN

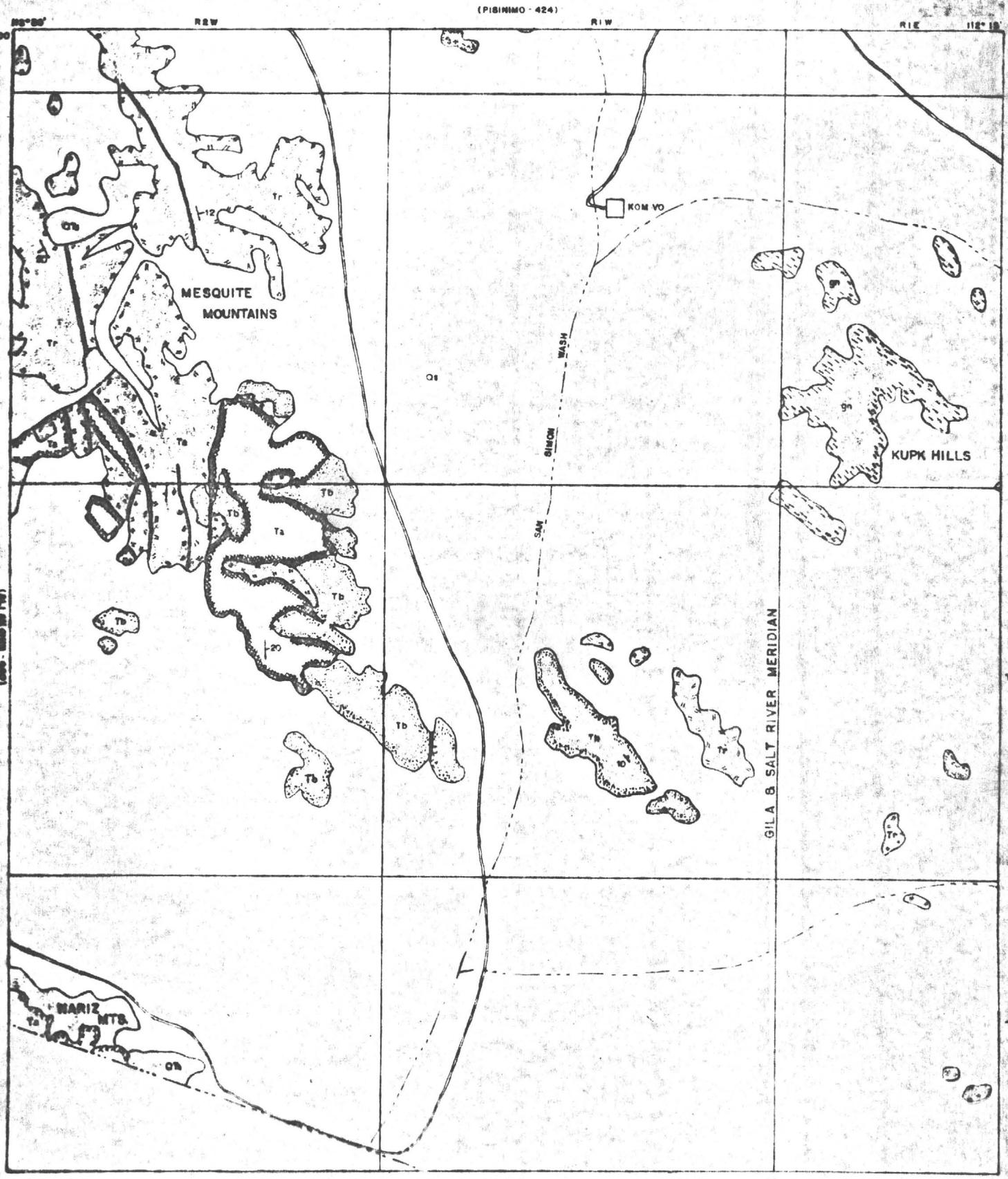
(440)

Kom Vo Quadrangle #441

This quandrangle contains the Mesquite, Maria and Kupk (Copeka) Mountains. Much of the area is occupied by recent gravel which forms the "Great Plain." The San Simon Wash drains the area.

The Mesquite Mountains are formed of Tertiary volcanics, andesite, rhyolite and basalt. Much of the basalt is highly magnetic due to inclusions of magnetite, which is estimated to comprise in places up to ten per cent of the rock. Minor Tertiary Quaternary sediments border the range. No hydrothermal alteration or commercial mineralization was seen in the area. The Maria Mountains are a southerly continuation of the Ajo Mountains and lie mostly south of the International Boundary. They consist of Tertiary andesite and Tertiary sediments, conglomerate, quartzite and grit. No hydrothermal alteration or mineralization was noted.

The Kupk Hills are an isolated range of low hills rising from the "Great Plain." They are composed of metamorphics, schist and gneiss. Metamorphism is believed to have taken place during the Laramide Orogeny. No significant alteration or mineralization was encountered and the area was not concidered worth further work.

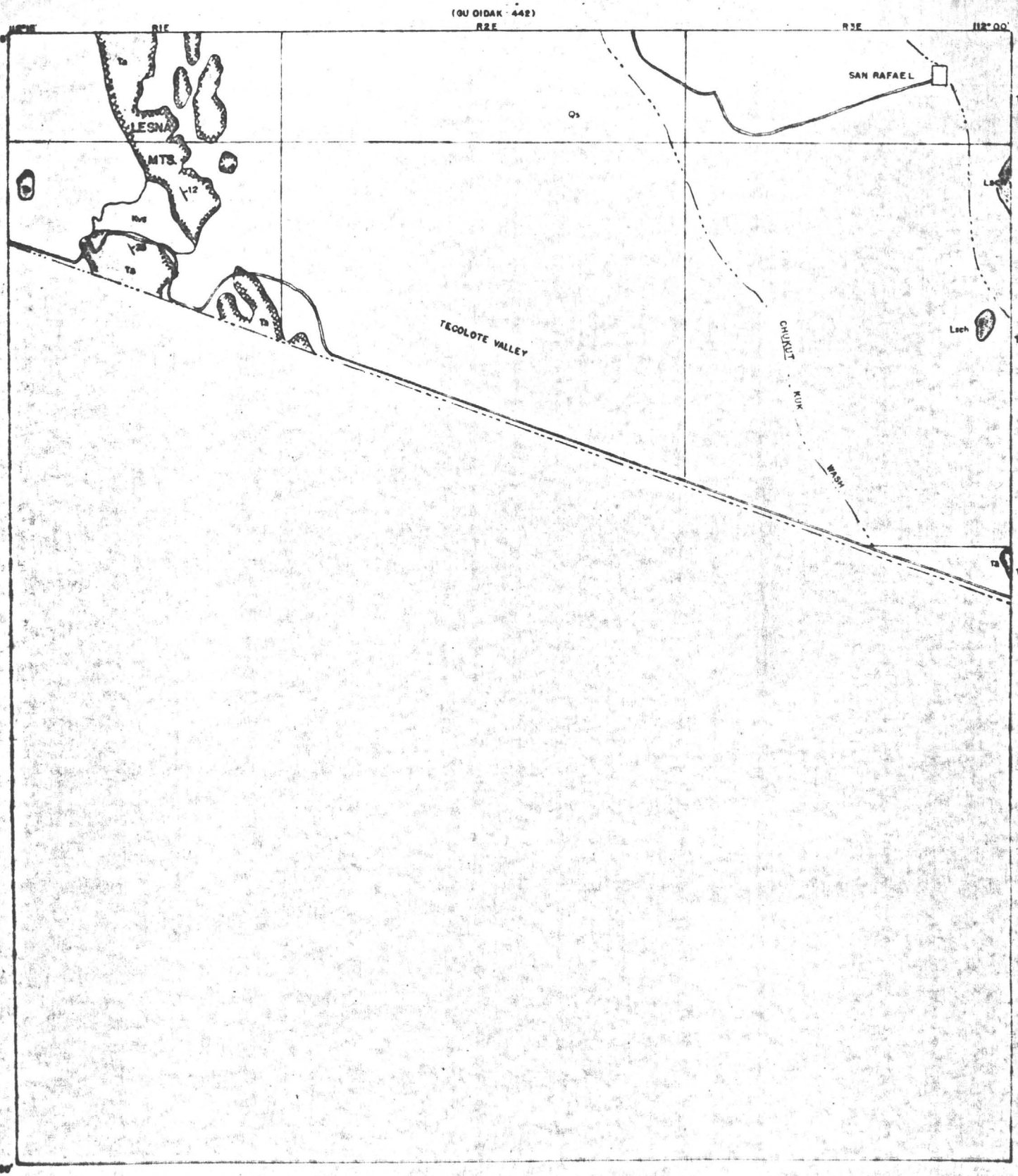

(PISINIMO - 424)
R2W
R1W
R1E
MESQUITE MOUNTAINS
KOM VO
SIMON WASH
SAN
KUPK HILLS
GILA & SALT RIVER MERIDIAN
T17S
T18S
T19S
MARIZ MTS.
Tr
Ta
Tb
Qs

KOM VO

(441)

San Rafael Quadrangle #456

Only the northern one third of this quadrangle is in the United States. The Lesna Mountains rise from the Tecolote Valley on the west border of the quadrangle. They are formed of Tertiary volcanics and Cretaceous sediments mostly conglomerate and quartzite. The Tertiary flows are of brown, coarse, porphyritic andesite. At the north end of the range, north striking vertical joints are prominent. This area is devoid of signs of commercial mineralization.



SAN RAFAEL

(456)