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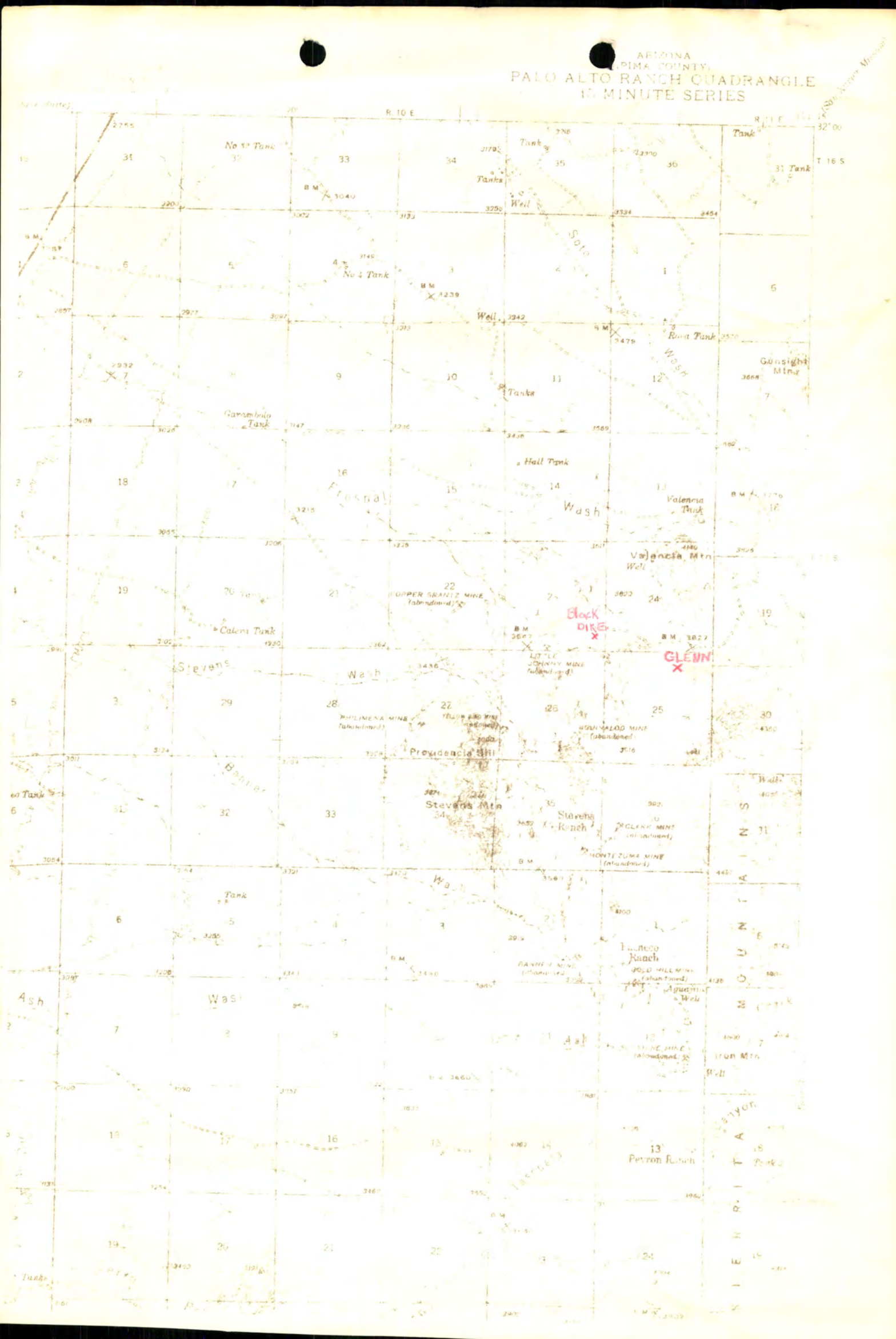
PIMA MINING COMPANY
3407 SOUTH PARK AVENUE
P. O. BOX 7005
TUCSON, ARIZONA

Fidelity Onion Skin
E Block
Fidelity Onion Skin

ARIZONA
(PIMA COUNTY)

PALO ALTO RANCH QUADRANGLE
15 MINUTE SERIES



Hole B-1 D Slate - shist, talc.

Qtzite LS - Mbl.

Breccia Fault Shist - Talc LS 60'

Cgl. at 400'

420

Hole B.D. #2 - 507

PIMA MINING COMPANY

August 16, 1954

EXPLORATION MEMORANDUM

URANIUM

Black Dike and Glenn Groups - N.S. Sierrita Mountains foothills, Pima County, Arizona

Owners and/or Locators: Col. Joe Moller(Moller's Ranch) covers part of the surface.

Glenn Allen
1904 South Norris - Phone: 4-6919

Albert Ybarra, prospector

Bryce Wilson?, promoter

Description:

Approximately 180 contiguous claims, mostly unpatented. 48 claims - State leased. Leased to Chicago group to run about 9 months as is. They have spent $50 to $70 thousand on development. Engineer in charge is from L. A.(a friend of Santa Fe's man, Evans, of Grants, New Mexico). No current plans - may abandon? Work done seemed to be concentrated only on quick ore. Not successful.

Access Directions:

3.0 miles south of "3 points"(Robles Junction) on Ajo-Tucson highway. Turn left at signs "O-J" Ranch and Schmedling's Sierrita Ranch; proceed 3.8 miles; take right fork to Moller's Ranch, 0.3 mile; keep left at Moller's Ranch, following plainer travelled road bearing generally SSE for 3.2 miles; take left fork, 1.7 miles to the mine. Alternate route - 7.8 miles south of Robles Junction. Turn left just beyond sign to Anvil Ranch. Follow plainer travelled road 4.7 miles to swing gate in fence; follow right fork 1.1 miles east and take left fork 1.6 ENE to mine.

Cambrian or pre-Cambrian complex with recent igneous schist, gneiss, sediments, extrusives and intrusives. Major structure N-S orientation. Moderate to flat terrain. Portions nearby are rugged.

Major surface features are a series of parallel black "dikes". Actually they are erosion-resistant ribs of manganese-stained ferruginous and sheared country rock. All these zones show a moderate increase in background count. Copper-staining is evident along a NE-SW trend of pits and in some of the main-shaft dump material. Considerable hematitic alteration, epidote, and some garnetization in surface rocks. Portions underground are well kaolinized.

Two drill 45° holes, one 400 feet, about 200 feet east of shaft and one, 600 feet, about 300 feet east of shaft, were drilled with supposed intent of intersecting below the shaft. These reportedly intersected at least two 4" zones of "high grade", depth not known.

One important unknown factor may be related to the decreased background count noted in the main shaft below 100 feet. There is some evidence of flat faulting.

Present water table at 200 to 300 feet. Pyrite, chalcopyrite and fluorite noted.

Facilities and Development:

Good camp for small crew. Small head frame, hoist, compressor, etc. and miscellaneous machinery, mine cars, etc. at main shaft(Black Dike Group) Approximately one mile east at

URANIUM page three -

Facilities and Development:(Cont.)

Glenn group one small headframe and shaft. Black Dike shaft 270 feet deep - 100 foot laterals. Glenn shaft 100 feet not accessible. Water on bottom level of both shafts. Numerous bulldozed cuts and old prospect pits.

Conclusions:

Abnormal high background count 0.03 MR/HR 100% above average for this part of Arizona over much of whole area(1 sq. mi. plus) is significant. Radiometric-isorod survey definitely warranted in conjunction with rough surface geology map - this followed by adequate sampling and possibly drilling. Significant surface-cut tonnage may be available. Important ore may also be at depth because some samples do not count when cut from "high count" outcrop. This suggests some leaching and associated radon from below.

Signed: Walter E. Heinrichs, Jr.

MADE IN U.S.A.
Gun Sight Mt. Papago Dist
N. West Sierritas, Pima County
Ariz - Flourite & U3O8.

SIERRITA - MOLLER & ALLEN

MAIN SHAFT & CAMP LOOKING SW AUG 54

SIERRITA - MOLLER & ALLEN

LOOKING SE FROM MAIN SHAFT

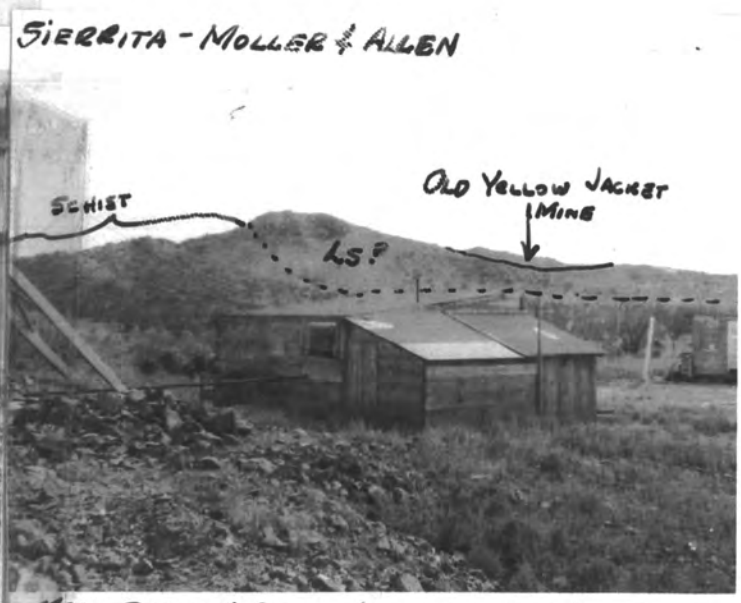
SIERRITA - MOLLER & ALLEN

MAIN SHAFT LOOKING S AUG 54

LEN

LOOKING SW AUG 54

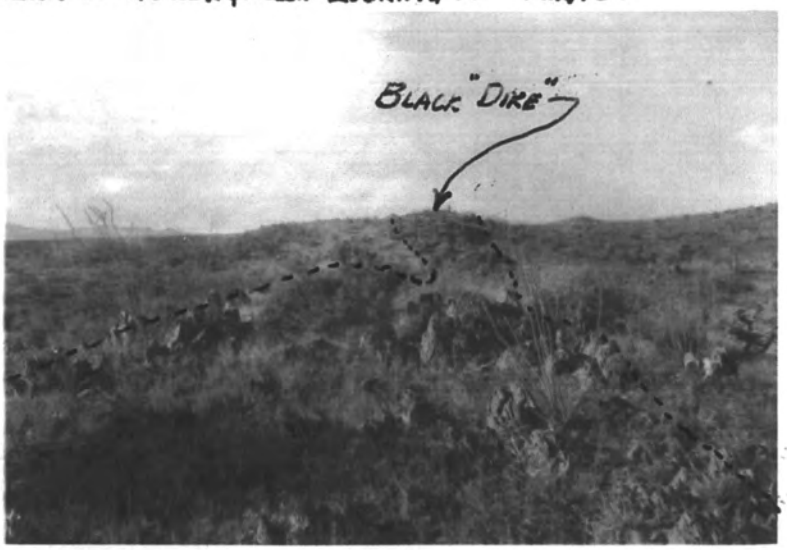
MAIN SHAFT LOOKING S AUG 54



MAIN SHAFT & CAMP LOOKING SW AUG 54

SIERRITA - MOLLER & ALLEN - GLENN GROUP - AUG 54 LOOKING NW.

SIERRITA - MOLLER & ALLEN - LOOKING N. AUG. 54



Call to Norm: 3/15/57

John Fetzer

Ann Rand Mins.

625 Giddes

Geo Rogers

Bell 71712

30 May 56

Chas Ray et al

Regga

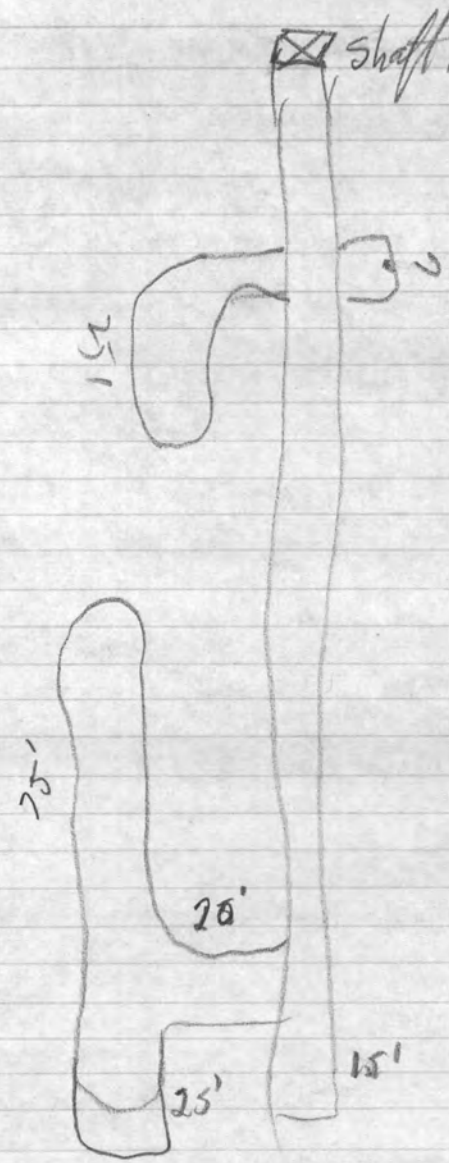
Triangle

MA-25716

Claims

Rio Motel

New Philadelphia?


Shaft collar.
3'
15'
25'
20'
25'
15'

Bearing qtz
& schist
Black-Red, Maroon Minerals,
Blue carbonate etc,
Tourmaline?
Mica?

W. E. HEINRICHS,

RECONNAISSANCE EXAMINATION & APPRAISAL

COPPER GLANCE PROSPECT & ASSOCIATED CLAIM GROUP

Walter E. Heinrichs Jr.

RECONNAISSANCE EXAMINATION & APPRAISAL

COPPER GLANCE PROSPECT

&

ASSOCIATED CLAIM GROUP

PAPAGO MINING DISTRICT PIMA COUNTY, ARIZONA

TUCSON, ARIZONA

26 MARCH 1957

by

WALTER E. HEINRICHS JR., REGISTERED ENGINEER

MINING EXPLORATION & DEVELOPMENT

CONCLUSIONS:

Exploration potential in this district for a relatively large and well-experienced mining concern is fair if carried out on a regional and long term basis. This view is based on possible general relationships between the Sierrita Mountains (uplift, if that is the case) and correlations in the surrounding area similar to the proven production on the east, northeast and southeast sides of the range. Localized, short term exploration by smaller groups would be relatively much less favorable in each case and extremely risky in the case of all three conditions occurring simultaneously. This conclusion is forced from the statistical lack of production of any consequence from the small operations conducted in the area to date.

Specifically, related to the Copper Glance property in particular, is the generally discouraging features of relatively marginal or submarginal tight quartz "veins" in schist. None of these, either alone or together, are very promising. Possibility of enrichment exists, but work at present water level (100' ± deep) does not suggest this will be significant and increased primary grade with depth seems even less probable.

The main favorable factor is that the observed mineralized structure, though possibly intermittent, may be quite persistent over considerable length and depth on the property. Competent and detailed geologic mapping, drilling and sampling would be necessary to confirm this observation.

RECOMMENDATIONS:

1. Endeavor to interest one of the local, larger, well-established exploration firms to purchase or undertake an option to explore and develop with a view toward eventual purchase out of production royalty. This should include some desirable research and legal opinion on exact title status of the property.

2. In lieu of the above, any future expenditure directly on the property should be small and confined to either high risk or exclusively tax capital. In this connection Government D. M. E. A. assistance may be possible through the U. S. Bureau of Mines.

If anything like this was contemplated, it should be initiated and continuously managed by an experienced mining engineer or geologist:

a. First step would be a rough reconnaissance geology map of the workings, claims and adjoining property, together with comprehensive sampling and assaying, plotted in both plan and section for all workings. Cost: $2,500.00 ±.

b. If results of these were favorable, this could be followed by surface and underground diamond drilling. Three, approximately 300', 45° - 60° angle holes calculated to completely penetrate the structure at about 200' - 250' below the surface and a few underground holes, also designed to penetrate the structure. If these results were favorable, a

known amount of proven and available tonnage and grade might be estimated. If not, no further expenditures should be made unless supported by new geological evidence or opinions.

Approximate cost: $10,000.00 - $15,000.00.

4. If comprehensive sampling, assaying and mapping results were favorable, (#2a), a possible alternative or supplement to #2b would be small exploratory drifting, sinking, and crosscutting from present workings as previously recommended by Dodge and Williams. Sampling, assaying and mapping of such work should be kept up constantly and under competent daily or at least weekly minimum supervision. Approximate cost: $10,000.00 plus.

5. Concern about market, etc. and facilities for production should await exploration developments and an engineering estimate of a certain minimum quantity and quality of material available to produce.

OBSERVATIONS:

The better part of two consecutive days were spent on the property and in the general area. No additional sampling or mapping were done.

Copper mineral occurrences observed on the property were associated mainly with massive, tightly cemented, brecciated quartz in a fairly extensive area of typical Southern Arizona schist (highly variable texture from slaty to gneissic but usually fine grained and micaceous) probably equivalent to the Pinal schist of pre-Cambrian age. The quartz is usually lenticular vein or dike-like in structure

varying in width from 1-20 feet. It stands nearly vertical or steep dipping and strikes north-south, roughly parallel to the major direction of schist foliation. Considerable local faulting is evident in the schist and along the altered schist margins of the quartz lenses. This faulting may be the cause of the lenticular nature of the quartz. Very little, if any, faulting within the quartz was noted, however, this may have been obliterated by late stage silic a which, along with some of the ore and gangue mineralization, apparently recemented the original quartz breccia. Some of the latter minerals and the quartz may be indigenous although some of the best copper occurs in definite narrow stringers (6" ±) of relatively pure mineral within the quartz "fissures". Major metallic minerals noted were oxides of copper manganese and iron and some copper sulphide in the form of chalcocite. There was very little or no pyrite.

Surface exposures indicate the quartz continues intermittently north and south to adjoining properties on either side. It does not appear to be continuous throughout this length and may actually be a series of parallel or echelon features.

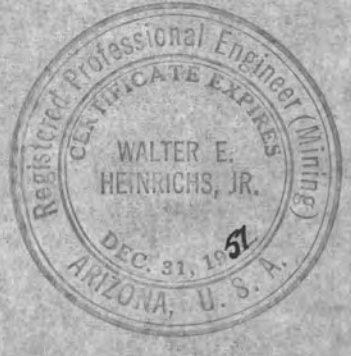
In general the over all alteration and mineralization intensity is weak. The only other important rock type observed near the property and adjacent to the schist is the granite exposed to the south. Here again, are small

cupiferous quartz veins or segregations which at the surface are almost identical in appearance to those in the Copper Glance schist. In some cases the surface quartz looks porphyritic on weathered surfaces, in other cases it looks like quartzite lenses.

Time did not permit a detailed examination of all of the property surface. Much of the area is covered by alluvium which gradually thickens toward the west. As far east as was noted the exposed rock is schist, however, farther east (probably beyond the property boundary) some unidentified exposures, probably partly sediments, were observed.

Respectfully submitted,

Walter E. Heinrichs Jr.,
Registered Engineer



26 March 1957
2943 East Chula Vista Drive
Tucson, Arizona
Phone East 6-4019

200
10
2000

$2500.00

5000 = 2

1000 = 4

3%

3.

20

25,000.00

$5000.00

10
3

300 cu/ft 10 holes + sampling.

30

6" = 15%

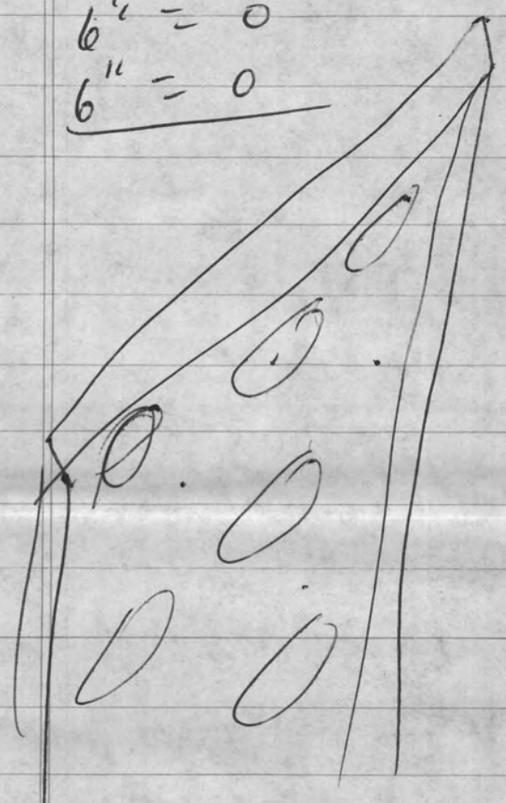
2

6" = 0

6" = 0

6" = 0

6" = 0



6" = 0

000
10.00
10,000.00

50
50
2500

Tom B. McGuirt
c/o Confederate Land Bldg.
Shev. La.

RECONNAISSANCE EXAMINATION & APPRAISAL

COPPER GLANCE PROSPECT

&

ASSOCIATED CLAIM GROUP

PAPAGO MINING DISTRICT PIMA COUNTY, ARIZONA

TUCSON, ARIZONA

26 MARCH 1957

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Walter E. Heinrichs Jr.,
Registered Engineer

Registered Professional Engineer (Mining) CERTIFICATE EXPIRES WALTER E. HEINRICHS, JR. DEC. 31, 19 51 ARIZONA, U.S.A.

26 March 1957
2943 East Chula Vista Drive
Tucson, Arizona
Phone East 6-4019

10 April 1957

Mr. Tom B. Mc Guirt
625 Giddens Lane Building
Shreveport, Louisiana

Dear Sir:

Enclosed herewith is my report on the Copper Glance group of mining claims located in Pima County, Arizona.

This represents work done at the request of Mr. Davis during his recent visit to Tucson and is being tendered to you as per his instructions.

Fee for this work, in the amount of $250.00, was paid by Mr. Davis in the form of check, receipt for which, ~~is~~ hereby acknowledged.

Very truly yours,

Walter E. Heinrichs, Jr.
Registered Engineer
Mining Exploration & Develppment.

WEH/w
Encl: 2 copies
report.

70

GEOPHYSICAL SURVEY OF THE SAN XAVIER MINE AREA PIMA DISTRICT, ARIZONA

August, 1953

GEOPHYSICAL SURVEY

OF THE SAN XAVIER MINE AREA

PIMA MINING DISTRICT, PIMA COUNTY, ARIZONA

for

THE EAGLE-PICHER COMPANY

MINING & SMELTING DIVISION

AUGUST 1953

by

United Geophysical Company, Incorporated

Pasadena, California

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22. Seven maps and nine profiles and sections. (Listed on map pocket under back cover)

GEOPHYSICAL SURVEY
OF THE SAN XAVIER MINE AREA
PIMA MINING DISTRICT, PIMA COUNTY, ARIZONA

ERASABLE
ONION SKIN

INTRODUCTION

This report covers a survey of the Eagle-Picher Company property nineteen (19) miles southwest of Tucson, Arizona made between February and August, 1953. All field work, including an experimental study, was conducted on San Xavier holdings. Previous results obtained by United Geophysical Company, Inc. and others were used in the interpretation. This included data from other nearby properties.

Purpose of the survey was to eliminate or suggest areas for further exploration, indicating possible extensions or new zones of mineralization, and to obtain additional structural information. Odds against achieving this purpose were considered high because of the known type of deposits and the complicated structure and rugged terrain involved. However, a comprehensive appraisal was desired and this could only be obtained from survey results.

Personnel used in the work included one or more crews and the staff of United's Tucson, Arizona office. Appreciation is expressed for the cooperation and assistance of the following Eagle-Picher personnel: John W. Chandler, Grover Duff, Jerry Irwin and Bill Loring.

RECOMMENDATIONS

Further direct exploration in the San Xavier mine area is recommended. From the results obtained in this survey, any new deposits found down to 500 feet deep, would be expected to be very similar to those already mined.

Before commencing any large program, a careful study and compilation should be made of all available underground, geological and drill hole information related to the geophysical results. It is suggested that this be done in a manner which will best analyze the three dimensional picture involved. This will be particularly important in work done solely to appraise the geophysical results and without other supporting objectives.

If exploration is done only by surface drilling, the more blind or wildcat anomalies, may require three equilateral spaced vertical holes before a negative appraisal is warranted. This is because of the lack of exact correlation between the results obtained from each geophysical method. Vertical holes are recommended in most cases for surface drilling because the dip is usually not too steep and vertical holes are cheaper to drill.

As exploration continues, it is strongly advised that the information obtained be used to revise the geophysical appraisal and interpretation. If this is done, the survey will attain its greatest value.

Large deposits associated with one or more of the major

anomalies, are possible but not probable. Odds are in favor of the magnetic effects having been caused by more basic igneous rocks. The electromagnetic and natural potential results indicate a probable combination of mineralization, structural, topographical, water and near surface effects.

The following locations warrant attention in the consideration of future exploration. Tentative drill hole locations are also suggested:

#6 Shaft Area:

One or more holes in the vicinity of station 2050' W - 75'S and along the south east, northwest electromagnetic trend and the natural potential low. Consideration should be made for one hole on the electromagnetic high ratio -low phase and natural potential low area near station 2300'W - 250'N, and the "EM" high-natural potential low at station 1200'W - 200'S. All three of the above zones suggest southeast rake. One hole at station 700'W - 450'N to test the EM high there. This zone may have a different structural attitude than the others in the area. It appears to be separated from the major natural potential low immediately to the west by a north-south steeply dipping fault.

Area Immediately East of #7 Shaft:

Three holes already exist here, but additional information is needed near station 1700'E - 350'S. Shallow information should be obtained between station 1400'E and 1700'E on line 0'N. At least one hole is recommended near station 1200'E - 800'S. Much of this area could be explored by underground drilling from the workings of

#7 shaft and the Wakefield shaft. Drilling should definitely precede any approach by drifting unless the drifting had another simultaneous purpose.

East Flank of Helmet Peak:

Drilling is recommended in this area around station 1275'W on line 6S, with a later objective of exploring this trend to the NW and SE. Vertical holes or careful correlation with the previous drilling results is advised.

Water Gap Area North of Helmet Peak:

One or more holes are suggested here in the vicinity of station 1150'N - 1150'W.

South Flank of Helmet Peak:

One hole each at station 3100'S - 1330'W (on the east side of Helmet Peak), and at station 2300'S - 2450'W (on the west side of Helmet Peak).

Miscellaneous Areas:

Five minor anomalous areas were delineated. These are located as follows:

Northern part of the Patterson claim, Vienna claim area, southern part of the Olivette #4 claim, the Olivette mine area and the west flank of Helmet Peak.

These probably involve relatively small and shallow mineralized zones or fissures of marginal significance. If such deposits are of interest, the areas of high electromagnetic closure should be investigated further by direct methods of exploration.

SUMMARY AND CONCLUSIONS

Physical property tests of various rock and ore samples from the San Xavier Mine were conducted. Of these, none showed high magnetic susceptibility. Most of the ore samples were highly conductive with the exception of some of the zinc ores. On the basis of these tests it appeared that an electromagnetic method would be the most successful geophysical approach. Because of the proximity of the Mineral Hill and Alpha ore bodies, which have associated magnetite, there was a possibility of the existence of similar deposits in the San Xavier area. This suggested that magnetometer reconnaissance coverage should be obtained, along with magnetometer detail of the anomalies indicated in the previous Frost survey.

The natural potential method was used as a final check on both the magnetic and electromagnetic results.

Reconnaissance coverage was obtained over almost all of the San Xavier claims. Smaller areas were then detailed as seemed warranted. No work was done in the past producing area around #7 shaft.

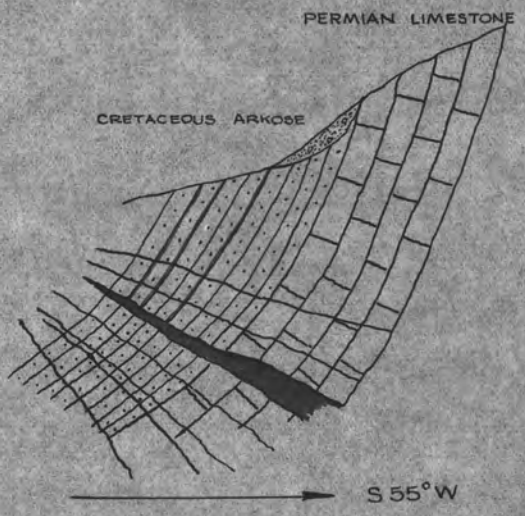
Three major anomalous zones were indicated by the electromagnetic method. Magnetometer detail over the three zones showed very little direct magnetic correlation. The natural potential method, however, did confirm anomalous conditions in all three areas.

Some strong magnetic anomalies seem to be caused by highly magnetic igneous rocks which are concentrated between line "0" and line "20E", forming a north-south trending belt. This igneous belt may lie in a former zone of structural weakness and probably represents a large dike or series of plugs.

In the #6 shaft area, a weak natural potential low corresponds to the electromagnetic high. However the largest natural potential low lies about 300 feet to the north. Numerous small anomalies were also noted in this area. This could be due to the existence of many small veins, or partially due to poor electrode contact caused by the thin alluvial cover in this area.

In the area immediately east of #7 shaft, natural potential results corresponded with the strong electromagnetic results. However, this zone also coincides with the Cretaceous arkose and Permian limestone contact. While this is the most favorable ore horizon, the over-all difference in resistivity of the two formations may have caused the anomalous condition. The contact may also represent a fault that is saturated with mine water which flows on the surface along this trend. The separate or combined effect of these factors could account for most of the anomalism indicated. Since this contact dips to the south, any sub-outcrop or oxidized zone along the contact should occur to the north of the sulphide zone. Three old drill holes near this area showed pyrite mineralization.

On the east flank of Helmet Peak, the natural potential anomaly parallels the electromagnetic anomaly but is offset to the east. A zone striking about N 35° W and possibly dipping in a south-westerly direction is indicated, however the sediments and most mineralized fissures on surface dip in an easterly direction. Folding along the east flank of Helmet Peak could have developed a set of fractures which would explain this situation. The main zone of mineralization may exist along these fractures, or some minor mineralization may have come up along the bedding planes of the arkose (see diagram).



North of Helmet Peak, in the water gap area, no natural potential anomaly was found to correspond to the electromagnetic anomaly. Two possible explanations for this are: (1) If a mineralized zone exists it lies beneath the water table level and no portion of it is in an active state of oxidation or (2) the electromagnetic anomaly in this area was caused by conductive water or sources other than mineralization.

A high ratio and low phase angle zone occurred about 400' west of line "20 W" and 250' north of line "0". The significance of this effect is not known but it is interesting because usually the ratio and phase are either high or low at the same place.

METHODS AND RESULTS

Maps:

Maps and profiles included with this report are all at a scale of 1" = 200'. This is the same as the mine geology and surface contour maps.

Gaps will be noticed in some of the map contouring and

profiles. This was necessary in order to denote the zone of overlap between individual electrode setups and separate areas of natural potential coverage which could not be absolutely tied. Readings obviously due to high artificial effects were also left out.

Selected profiles for each of the three main areas show the relation between the results of the three geophysical methods or between the geophysical results and the geology.

Electromagnetic:

Seven electromagnetic setups were made. These were designated "A" through "G" respectively, and the following is a more detailed description of the method and results obtained.

Major anomalous zones were detected in the north part of setup "A" and the north part of setup "B". The zone in the north part of setup "A" is located 2000 feet west of #7 shaft, between lines "12W" and "22W" and stations "4S" to "1N". The zone in the north part of setup "B" is located 1500' east of #7 shaft, between lines "10E" and "24E" and stations "5S" to "1N".

The electrode line was oriented in an east-west direction for setups A, B, C and F for two reasons: (1) The major geologic structure of economic importance appeared to be the east-west trending monoclinal type structure to the north and northeast of the San Xavier Mine and (2) most of the previous ore bodies were found along the east-west trending Cretaceous arkose and Permian limestone contact.

In the area to the east of Helmet Peak, the electrode line was oriented in a N 35° W direction parallel to the apparent axis of the

possible tight anticlinal fold comprising Helmet Peak. Setups "D" and "E" used this electrode orientation. Strong anomalism was detected on the east flank of Helmet Peak. This zone is located 4200 feet east and 1100 feet south of #7 shaft between lines 15N and 18S and stations 10W and 14W.

Setup "C" was an experimental setup used to check results obtained from setups "B", "C" and "D" with a different electrode orientation.

Electromagnetic field equipment consisted of the following items used in one or more units:

1 - bridge

1 - amplifier

2 - coil leads

2 - pickup coils

1 - 400 cycle generator

1 - transformer

1 - 5,000 foot electrode wire and electrode stakes.

The procedure was to lay out the 5000 foot wire in a straight line and ground it at each end with the electrode stakes. The electrode line was oriented as near parallel as possible to the known structural trends or zones of possible mineralization in order to obtain the best electrical coupling and response. This grounded circuit was then energized with a 400 cycle generator at an average of 300 volts and 4 amperes.

The resulting current concentration converges toward the grounded electrodes at each end of the electrode line and to pro-

vent an end effect, observations were not taken within 1,000 feet of the electrodes. Consequently only 3,000 feet of each 5,000 foot electrode spread was effectively used. Also readings could not be taken closer than 500 feet to the electrode wire.

Electromagnetic observations were made every 100 feet along lines orientated perpendicular to the electrode line. Only the gradient of the vertical component of the field was studied. This was done by mutually comparing the relative field intensity and phase effect at two pickup coils stationed 100 feet apart with an electronic bridge. These data were then plotted in either contour or profile form, indicating the related zones of larger conductivity change in the area.

Natural Potential:

The equipment used for the natural potential survey was a millivolt potentiometer, two non-polarizing porous pot electrodes, 1500 feet of wire and a commutator reel. Base stations were established and observations were taken with both electrodes placed at the base station. The movable electrode was then advanced along the line of the traverse. Every 50 feet the movable electrode was placed on the ground and the potential difference between the movable electrode and the base electrode was observed. After the last station along the traverse was occupied, the movable electrode was returned to the base station and the potential difference between the two electrodes was again observed. The potential drift for a set of observations was determined from the difference in the two base readings. A drift correction was then applied to all readings taken along the traverse, and the results plotted in

relative millivolt values corrected to an arbitrary plus 500 millivolt datum.

Some abnormal readings were obtained due to polarization at the electrodes, poor electrode contact and telluric currents. Poor electrode contact was noted mainly in areas of bedrock outcrop. Topography also effected the readings in some areas. Unfortunately none of these effects could be evaluated quantitatively and this factor was the most serious limitation on interpretation of the natural potential results.

Magnetic:

For the magnetic work on Askania vertical magnetic field balance was used. Reconnaissance observations were taken at stations located no more than 100 feet apart along north-south lines, spaced at intervals from 500 feet to 1,000 feet apart and parallel to each other. Detail lines were spaced from 100 feet to 200 feet apart and observations were made at 50 foot intervals or less when necessary. Values were plotted in gammas corrected to an arbitrary plus 1000 gammas datum.

Respectfully submitted,

UNITED GEOPHYSICAL COMPANY, INC.

by: _____
Wayne K. Wallace
Exploration Engineer

by: _____
Walter E. Heinrichs, Jr.
Acting Manager of Mining Exploration

MAP POCKET CONTENTS

1. #6 shaft area composite natural potential and electromagnetic contour map.

2. Nine profiles and sections:

   (a) Line 20 West
   (b) Line 12 West
   (c) Line 12 East
   (d) Line 14 East
   (e) Line 20 East
   (f) Line "0"
   (g) Line 3 South
   (h) Line 6 South
   (i) Line 9 South

3. Electromagnetic gradient, vertical component phase angle difference per 100'.

4. Electromagnetic gradient, vertical component ratio per 100'.

5. Electromagnetic gradient, vertical component phase angle difference per 100'. Experimental setup G.

6. Electromagnetic gradient, vertical component ratio per 100'. Experimental setup G.

7. Natural potential contour map.

8. Vertical magnetic intensity contour map.

UNITED GEOPHYSICAL COMPANY, INC.

UNITED GEOPHYSICAL

PASADENA TULSA HOUSTON NEW YORK CALGARY FAIRBANKS CARACAS RIO DE JANEIRO SANTIAGO

P.O. BOX M
1200 SOUTH MARENGO AVENUE
PASADENA 15, CALIFORNIA
PYRAMID 1-1134

August 21, 1953

Mr. John W. Chandler
General Mining Director
The Eagle-Picher Company
First National Bank Building
Miami, Oklahoma

Dear Mr. Chandler:

Enclosed herewith are two copies of a report prepared by our Tucson staff on the results of the geophysical survey conducted on your San Xavier holdings from February through August, 1953. The report includes seven maps and nine profiles and sections.

Based upon these results, it is concluded that drilling is warranted in several areas; however, that no new very large deposits would be expected above 500 feet.

I wish to thank you for the cooperation you and your San Xavier staff gave us in this investigation.

Faithfully yours,

UNITED GEOPHYSICAL COMPANY, INC.

Herbert Hoover, Jr.

jc

THE EAGLE-PICHER COMPANY
SAN XAVIER MINE
PIMA COUNTY, ARIZONA
MAGNETIC CONTOUR MAP
VERTICAL INTENSITY
CONTOUR INTERVAL 100 GAMMAS
SURFACE MAP SHOWING CLAIMS, ROADS, POWER LINES,
FENCES, ETC. ADJACENT TO THE SAN XAVIER MINE
SCALE 1" = 200'
AUG. 10, 1953
BY
UNITED GEOPHYSICAL CO. INC.
LEGEND
POWER LINES
ROADS
WASH (ARROYO)
FENCE
TRIANGULATION STATIONS
SECTION LINES
SHAFT
DUMP
DRILL HOLE
Pico Blanco
△4027'
Helmet Peak
△4016'
SECTION ~ 11
ARIZONA KING
ARIZONA QUEEN
WESTERN EXTENSION SAN XAVIER
SAN XAVIER
COPPER WEDGE
GREY COPPER
DEMOCRAT
MARJORIE
JUNCTION
CALIFORNIA
HAPPY NEW YEAR
NEW MOON
OLIVETTE NO 2
OLIVETTE NO 6
COLLECTOR
CHRISTMAS
VIENNA
HOOSIER
MINNESOTA
RUBY MINE
IRON MOUNTAIN
PATTERSON
ARGO
TURK
KEY
PASS
COLUMBIA
ENGLISH
BOBBY NO 2
BOBBY NO 3
BOND STREET NO 1
BOND STREET NO 2
BLITZ NO 1
BLITZ NO 2
BLITZ NO 3
BLITZ NO 4
BLITZ NO 5
BLITZ NO 6
BLITZ NO 7
BLITZ NO 8
BLITZ NO 9
VALLE NO 2
VALLE NO 3
VALLE NO 4
VALLE NO 5
VALLE NO 6
CHOLLA NO 1
CHOLLA NO 2
CHOLLA NO 3
CHOLLA NO 4
CHOLLA NO 5
CHOLLA NO 6
MARTHA B KETZ NO 2
FIDA B NO 2
PIEDRA NO 1
PIEDRA NO 2
#6 SHAFT
#7 SHAFT
102,000 N
101,000 N
100,000 N
99,000 N
98,000 N
97,000 N
96,000 N
95,000 N
97,000 E
98,000 E
99,000 E
100,000 E
101,000 E
102,000 E
103,000 E
104,000 E
105,000 E
106,000 E
107,000 E
108,000 E
109,000 E

100,000 E
101,000 E
102,000 E
103,000 E
104,000 E
105,000 E
106,000 E

N

IRON MOUNTAIN

E.M. ELECTRODES SETUP "G"

ARGO

PATTERSON

SAN XAVIER

KEY

TURK

RUBY MINE

PASS

COLUMBIA

CHOLLA NO 1

BOBBY NO 1

BOBBY NO 2

ENGLISH

MINNESOTA

HOOSIER

BLITZ NO 2

BLITZ NO 7

BOBBY NO 3

BOND STREET NO 1

OLIVETTE NO 5

BLITZ NO 3

BOND STREET NO 3

VALLE NO 5

BLITZ NO 8

ARIZONA

BOND STREET NO 2

OLIVETTE NO 4

BLITZ NO 4

BLITZ NO 6

CHRISTMAS

BLITZ NO 1

OLIVETTE NO 6

VALLE NO 4

VALLE NO 3

BLITZ NO 5

E.M. ELECTRODES SETUP "G"

VALLE NO 2

THE EAGLE-PICHER COMPANY

SAN XAVIER MINE

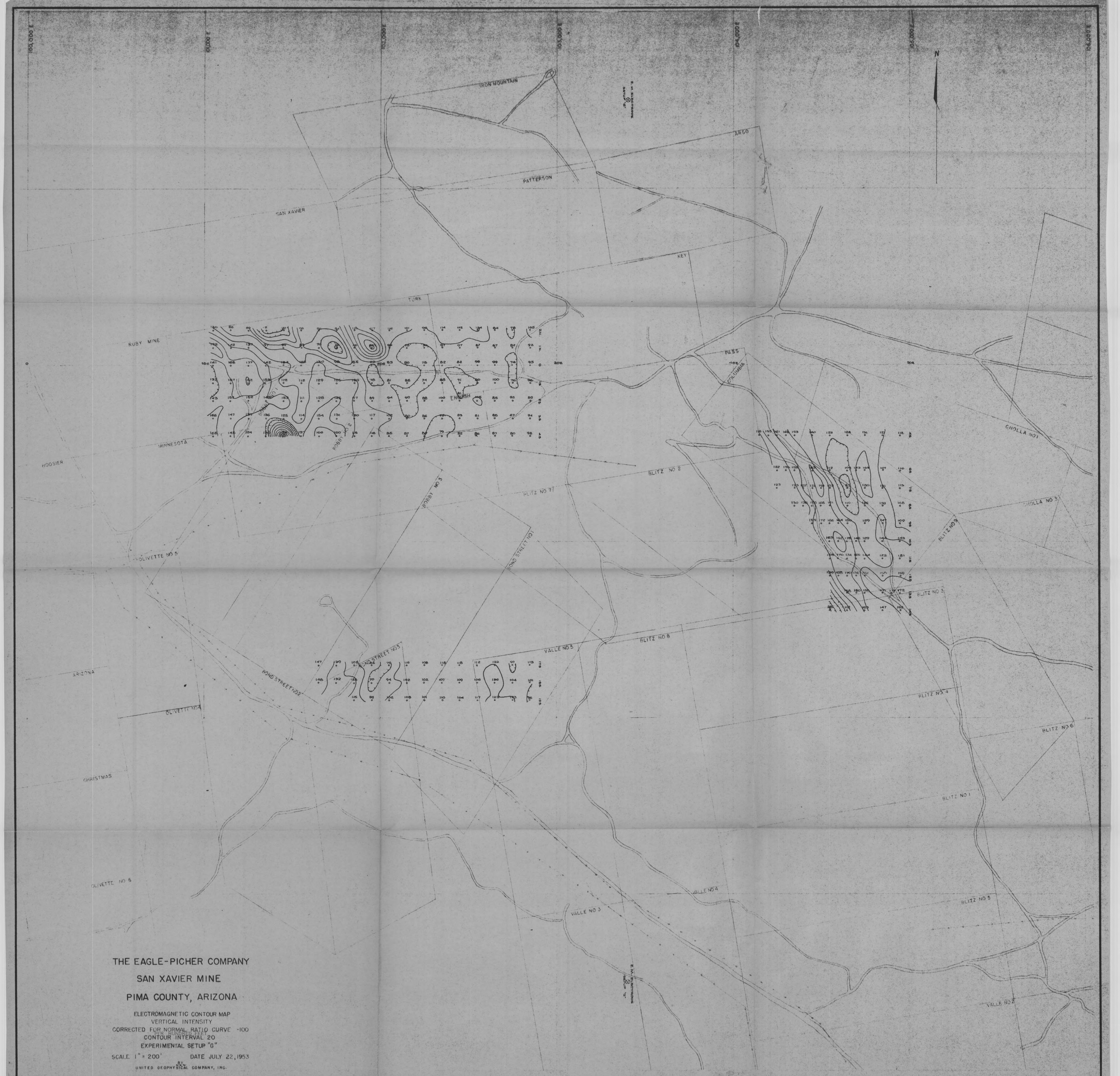
PIMA COUNTY, ARIZONA

ELECTROMAGNETIC CONTOUR MAP
VERTICAL INTENSITY
AVERAGE PHASE ANGLE
PER HUNDRED FEET
CONTOUR INTERVAL - 1°

EXPERIMENTAL SETUP "G"

SCALE 1" = 200' DATE JULY 22, 1953

BY
UNITED GEOPHYSICAL COMPANY, INC.



THE EAGLE-PICHER COMPANY

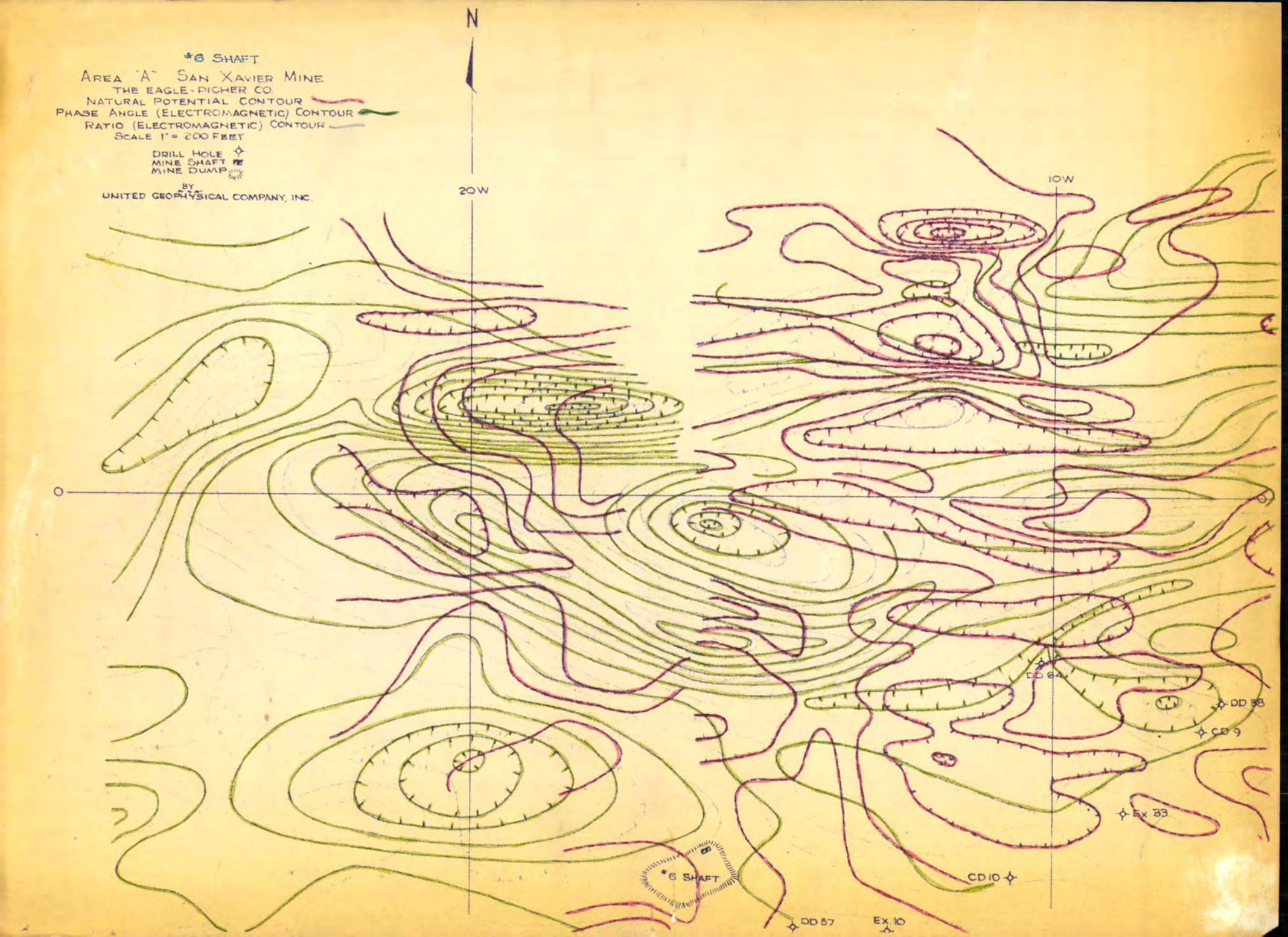
SAN XAVIER MINE

PIMA COUNTY, ARIZONA

ELECTROMAGNETIC CONTOUR MAP
VERTICAL INTENSITY
CORRECTED FOR NORMAL RATIO CURVE -100
PER HUNDRED FEET
CONTOUR INTERVAL 20
EXPERIMENTAL SETUP "G"

SCALE 1" = 200' DATE JULY 22, 1953

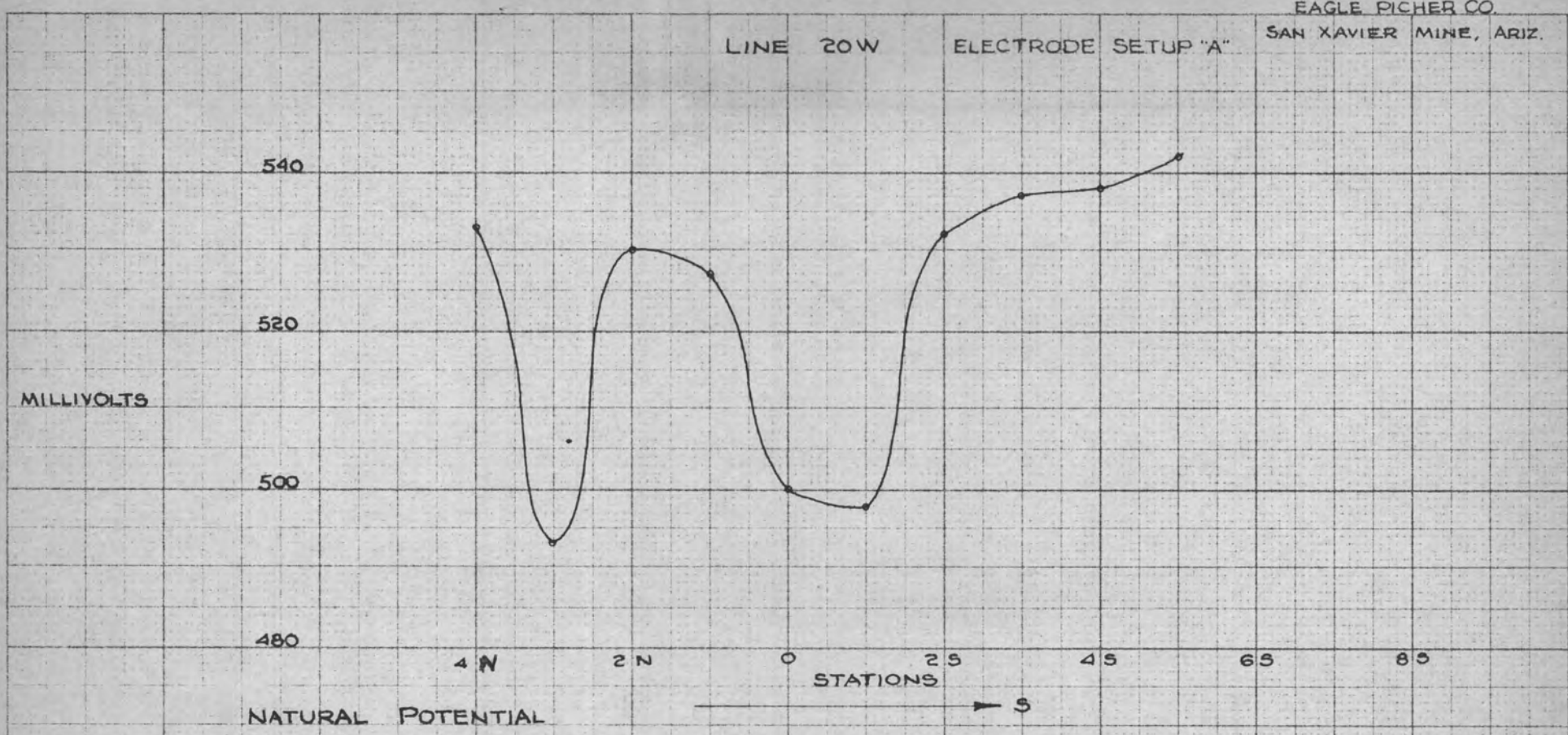
BY
UNITED GEOPHYSICAL COMPANY, INC.


*6 SHAFT
AREA "A" SAN XAVIER MINE
THE EAGLE-PICHER CO.
NATURAL POTENTIAL CONTOUR
PHASE ANGLE (ELECTROMAGNETIC) CONTOUR
RATIO (ELECTROMAGNETIC) CONTOUR
SCALE 1" = 200 FEET
DRILL HOLE
MINE SHAFT
MINE DUMP
BY
UNITED GEOPHYSICAL COMPANY, INC.
N
20W
10W
0
DD 64
DD 38
CD 9
Ex 33
CD 10
*6 SHAFT
DD 57
Ex 10

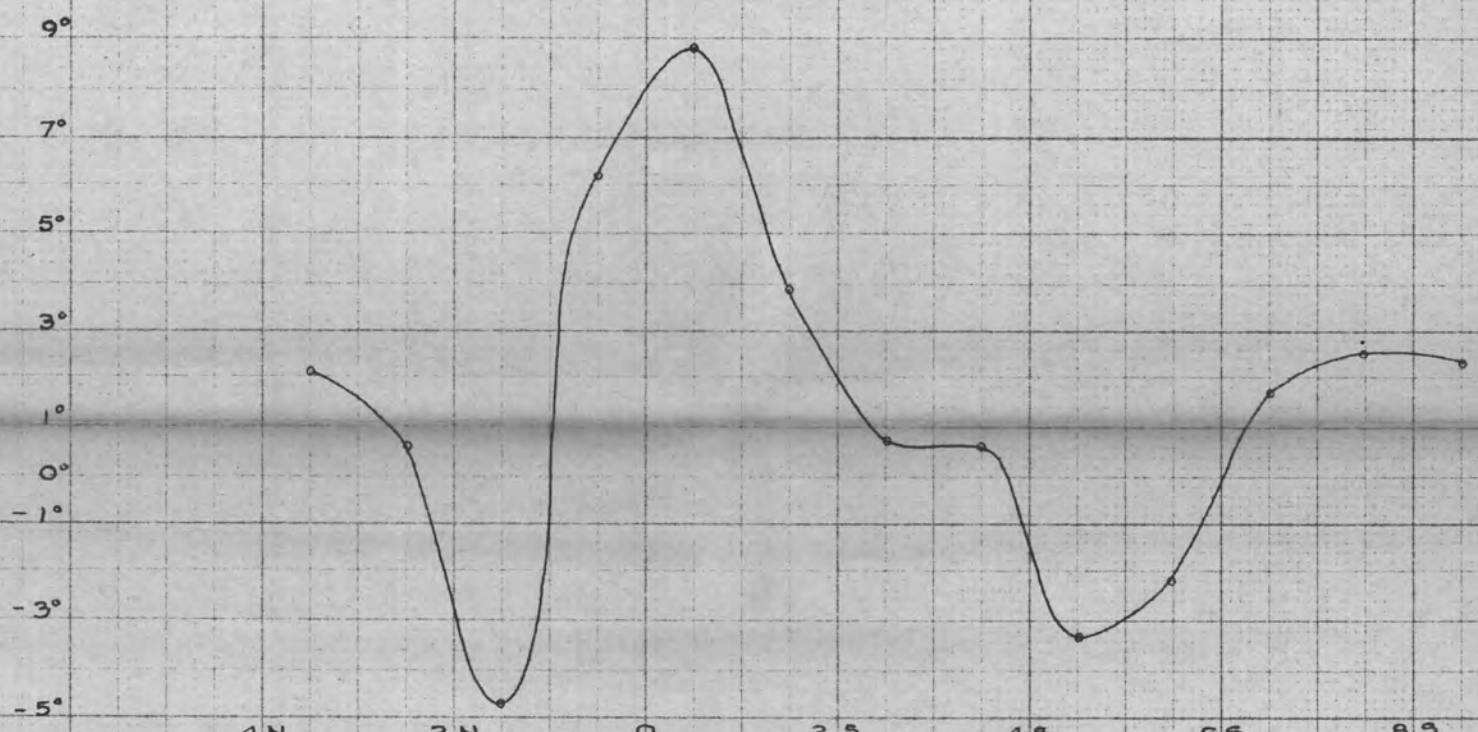
PROFILES

EAGLE PICHER CO.
SAN XAVIER MINE, ARIZ.

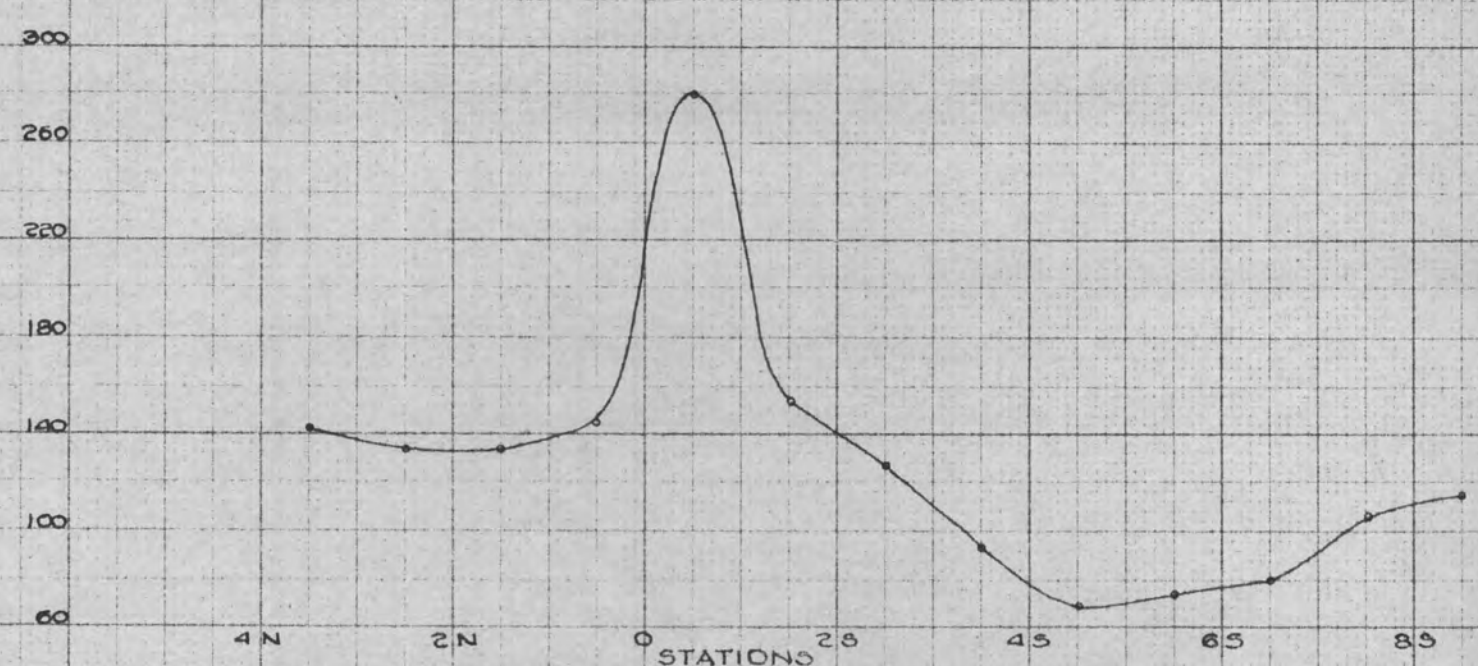
LINE 20W ELECTRODE SETUP "A"



NATURAL POTENTIAL



PHASE ANGLE (ELECTROMAGNETIC)



RATIO (ELECTROMAGNETIC)

HORIZONTAL SCALE 1" = 200'

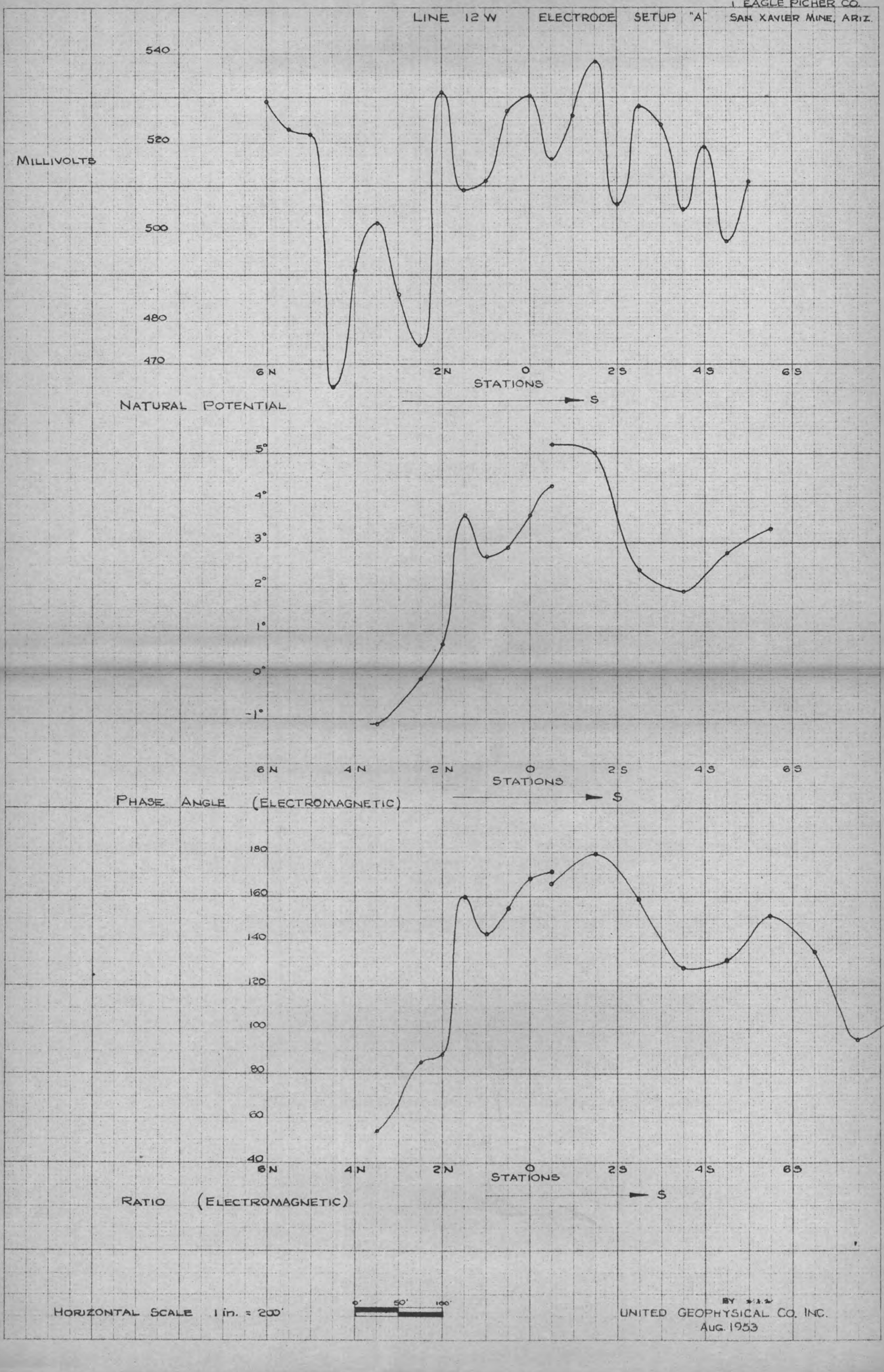
0 100' 200'

BY W.K.L.
UNITED GEOPHYSICAL CO. INC.
AUG. 1953

PROFILES

I. EAGLE PICHER CO.

LINE 12 W ELECTRODE SETUP "A" SAN XAVIER MINE, ARIZ.



HORIZONTAL SCALE 1 in. = 200'

0' 50' 100'

BY J.L.W.

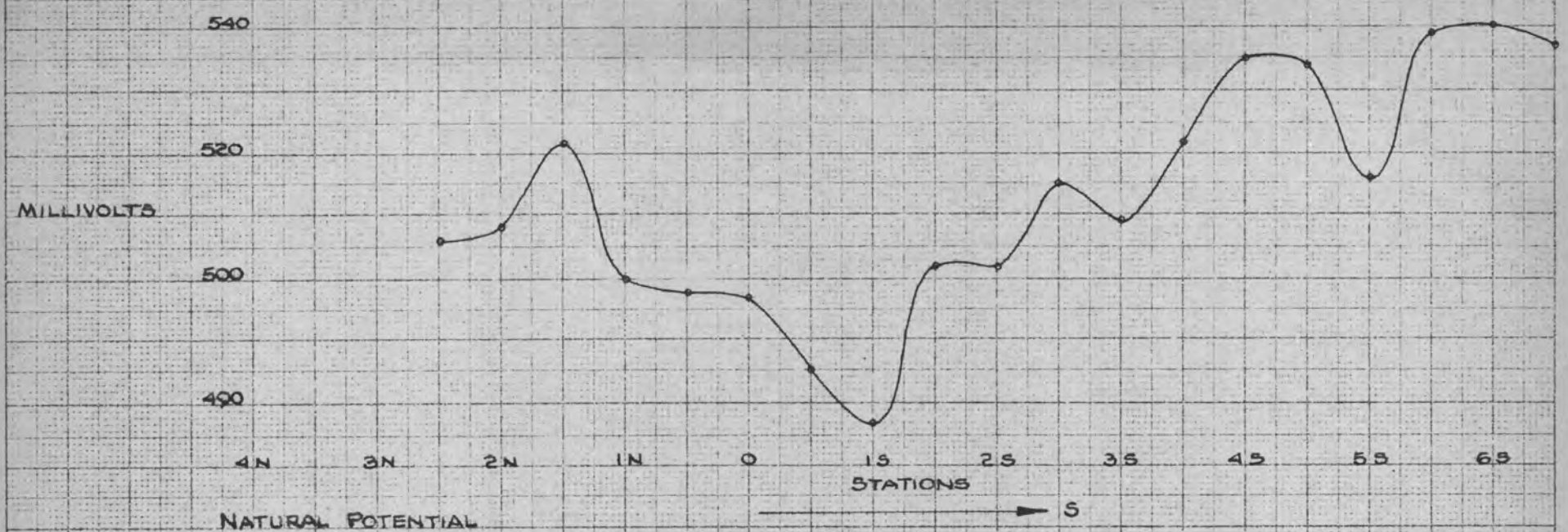
UNITED GEOPHYSICAL CO. INC.

AUG. 1953

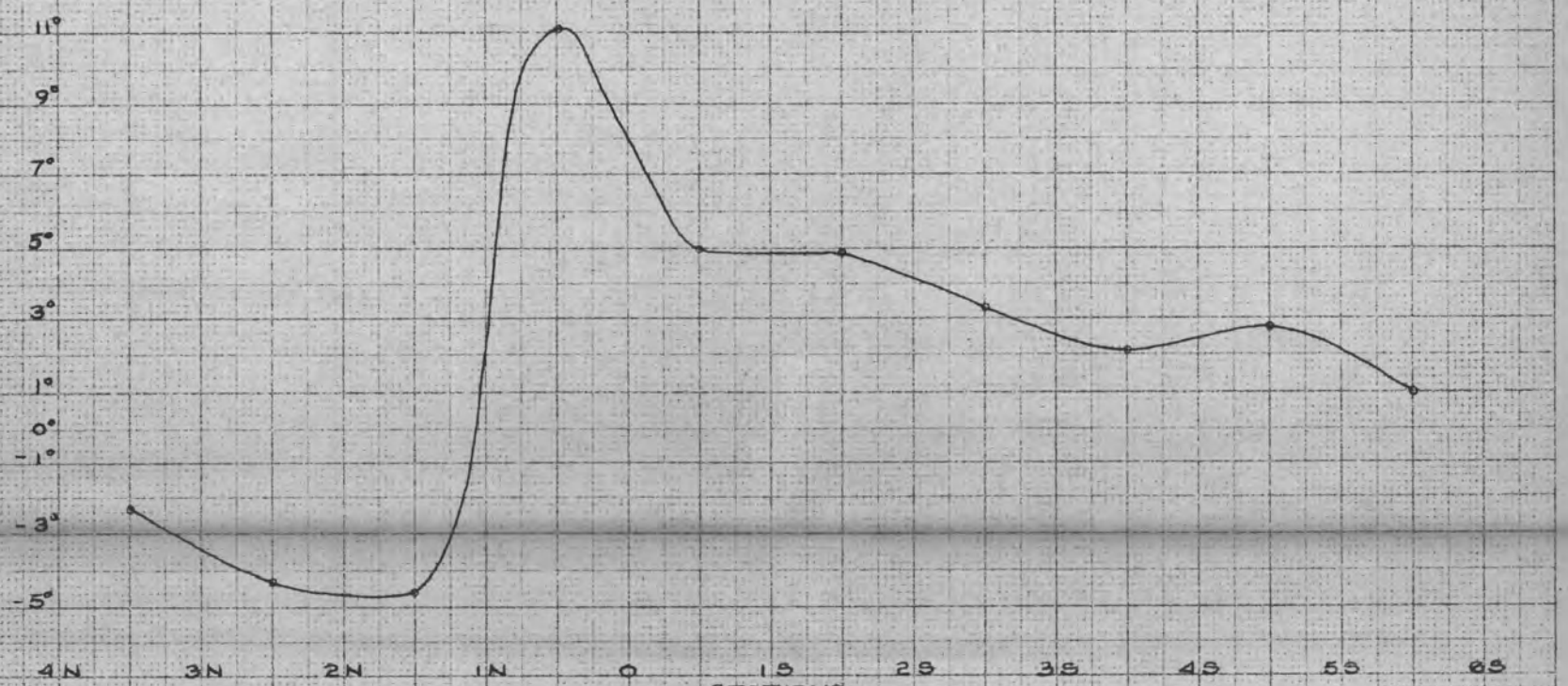
PROFILES AND GEOLOGIC SECTION

EAGLE PICHER CO.
SAN XAVIER MINE, ARIZ.

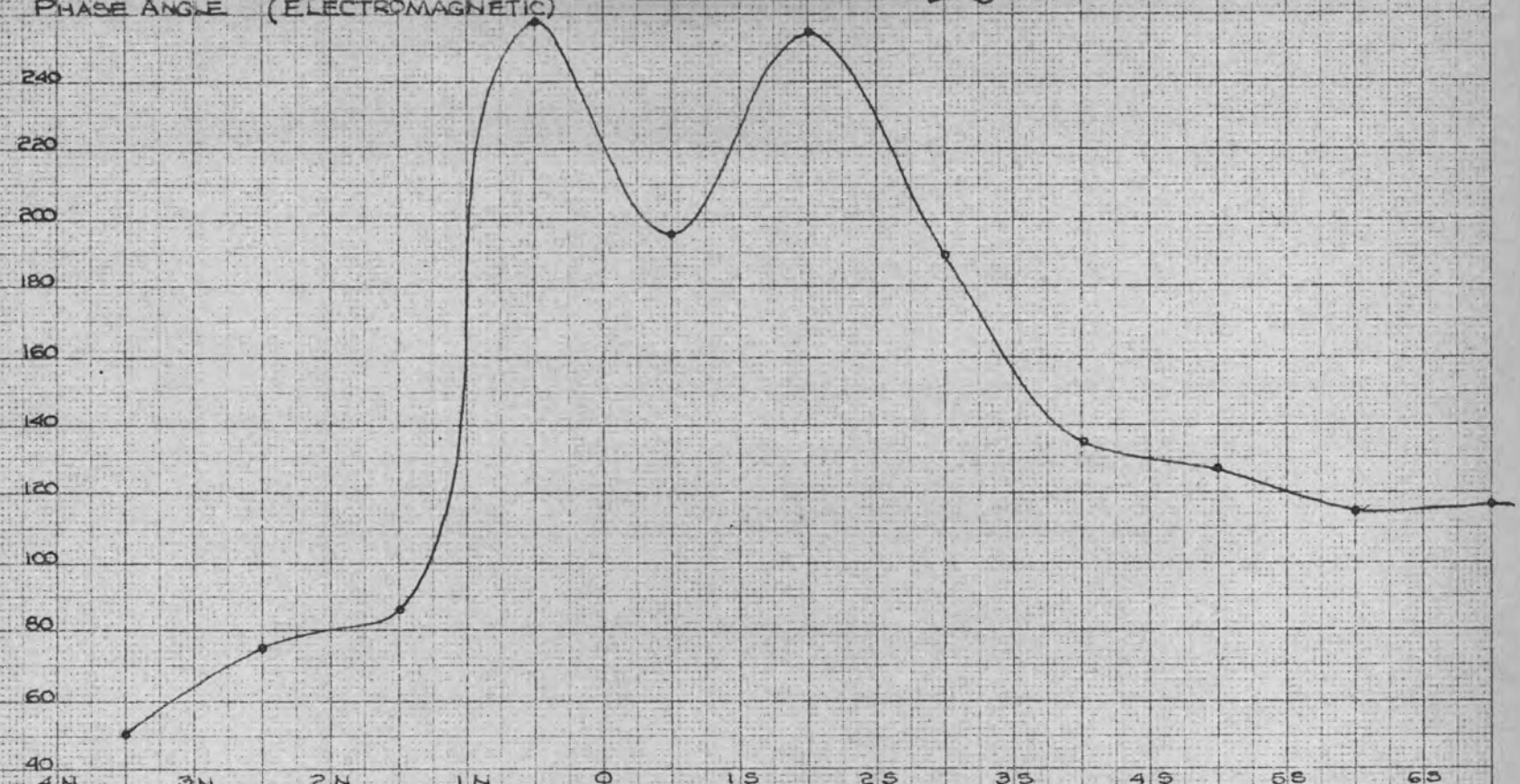
LINE 12E ELECTRODE SETUP "B"



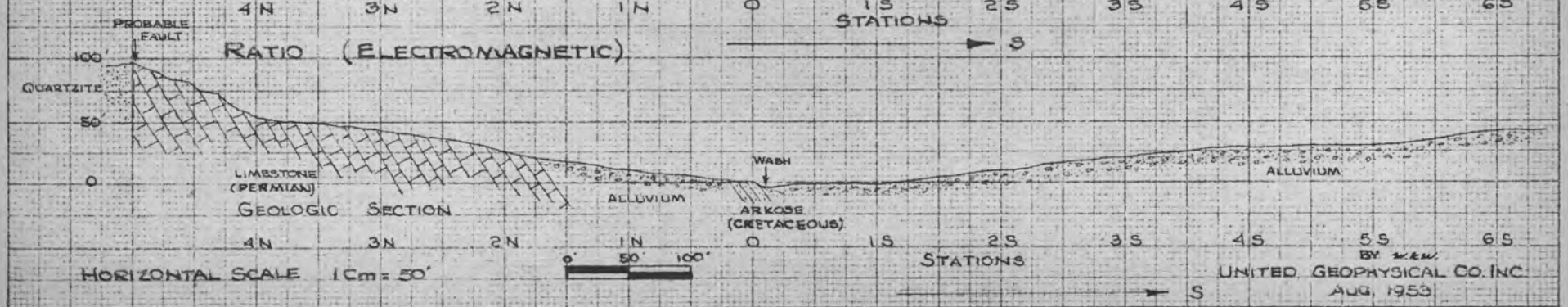
NATURAL POTENTIAL



PHASE ANGLE (ELECTROMAGNETIC)



RATIO (ELECTROMAGNETIC)



HORIZONTAL SCALE 1 Cm = 50'

0' 50' 100'

BY M.E.W.
UNITED GEOPHYSICAL CO. INC.
AUG. 1953

PROFILES AND GEOLOGIC SECTION

EAGLE PICHER CO.
SAN XAVIER MINE, ARIZ.

LINE 20E ELECTRODE SETUP "B"

GAMMAS

1700
1500
1300
1100
900

C.H.D "C" STEEL CASING 25' WEST

5N 4N 3N 2N 1N 0 1S 2S 3S 4S 5S
MAGNETIC (VERTICAL INTENSITY) STATIONS

S

MILLIVOLTS

540
520
500
480

5N 4N 3N 2N 1N 0 1S 2S 3S 4S 5S
STATIONS

S

NATURAL POTENTIAL

9°
7°
5°
3°
1°
0°
1°
3°
5°

5N 4N 3N 2N 1N 0 1S 2S 3S 4S 5S
STATIONS

S

PHASE ANGLE (ELECTROMAGNETIC)

300
200
100
40

5N 4N 3N 2N 1N 0 1S 2S 3S 4S 5S
STATIONS

S

RATIO (ELECTROMAGNETIC)

HORIZONTAL SCALE 1Cm. = 50' 0 50 100

GEOLOGIC SECTION - LINE 20E

5N 4N 3N 2N 1N STATIONS 0 1S 2S 3S 4S 5S

100
0
-100
-200
-300
-400

SHAFT W/ MINERALIZED FISSURES
LIMESTONE (PERMIAN)
LIMESTONE (PERMIAN)
ALLUVIUM
C.H.D #12 PROJECTED
WASH AREA
CONGLOMERATE
ALLUVIUM
ARKOSE (CRETACEOUS)
ARKOSE
FeS_2 - 1%
H_2O LEVEL
ARKOSE
LIMESTONE
FAULT

S

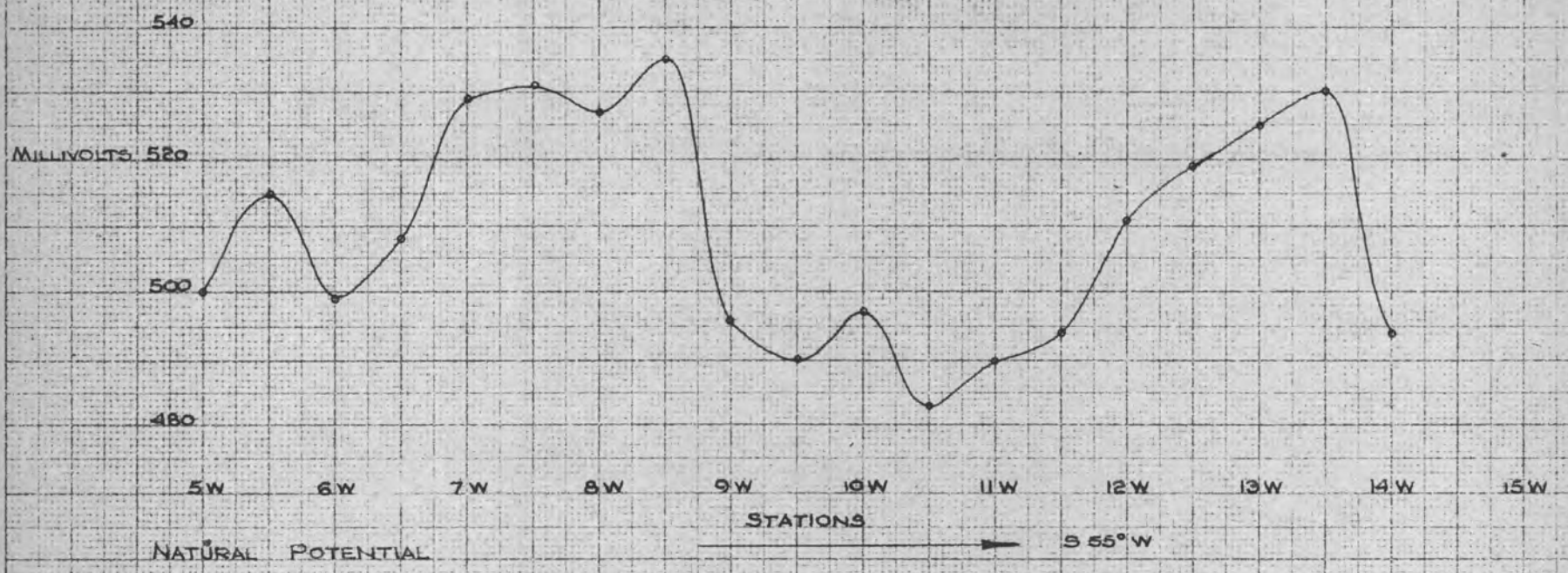
HORIZONTAL SCALE = VERTICAL SCALE
SCALE 1 Cm = 50' 0 50 100

BY W. E. M.
UNITED GEOPHYSICAL CO. INC
AUG. 1953.

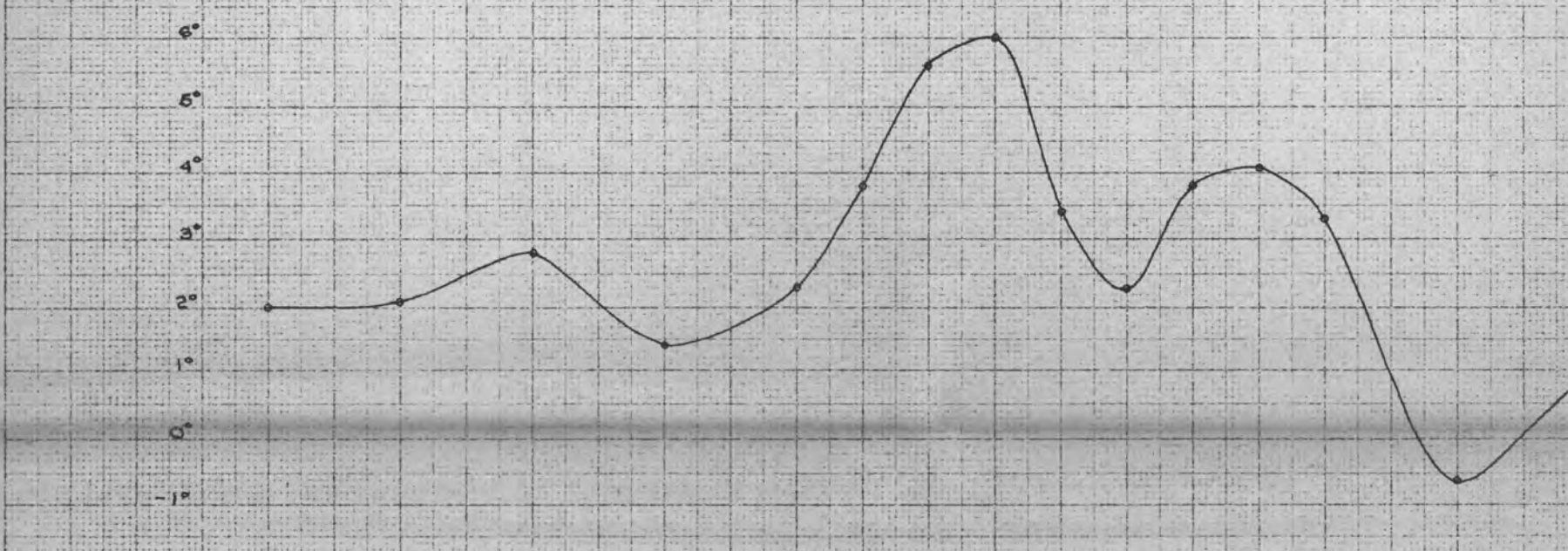
PROFILES AND GEOLOGIC SECTION

EAGLE PICHER CO.
SAN XAVIER MINE, ARIZ.

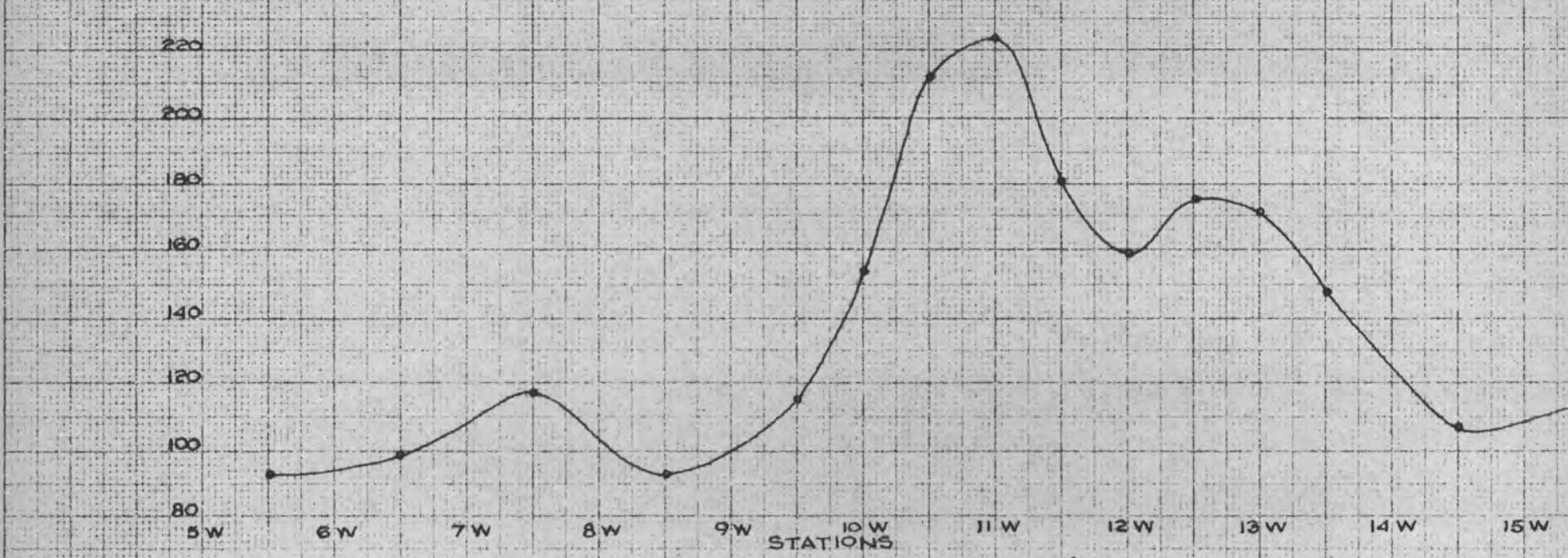
LINE "O" ELECTRODE SETUP "D"



NATURAL POTENTIAL



PHASE ANGLE (ELECTROMAGNETIC)



RATIO (ELECTROMAGNETIC)

HORIZONTAL SCALE 1Cm = 50'

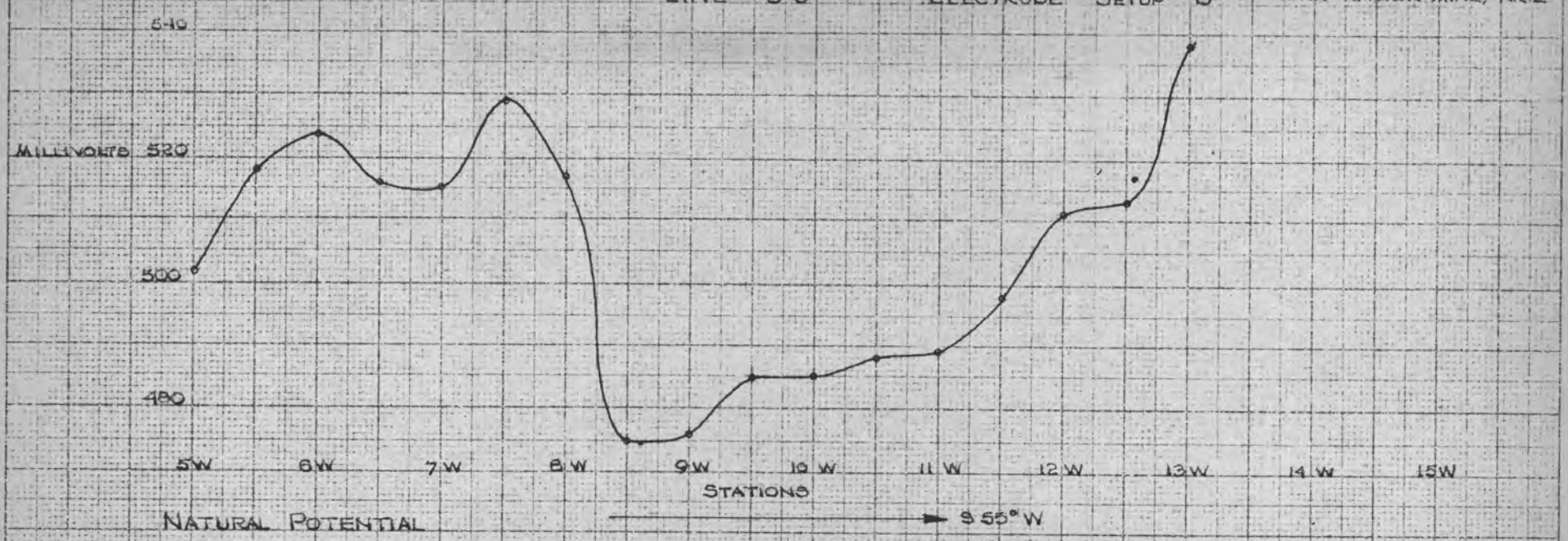
0 50' 100'

BY
UNITED GEOPHYSICAL CO. INC.
AUG. 1953

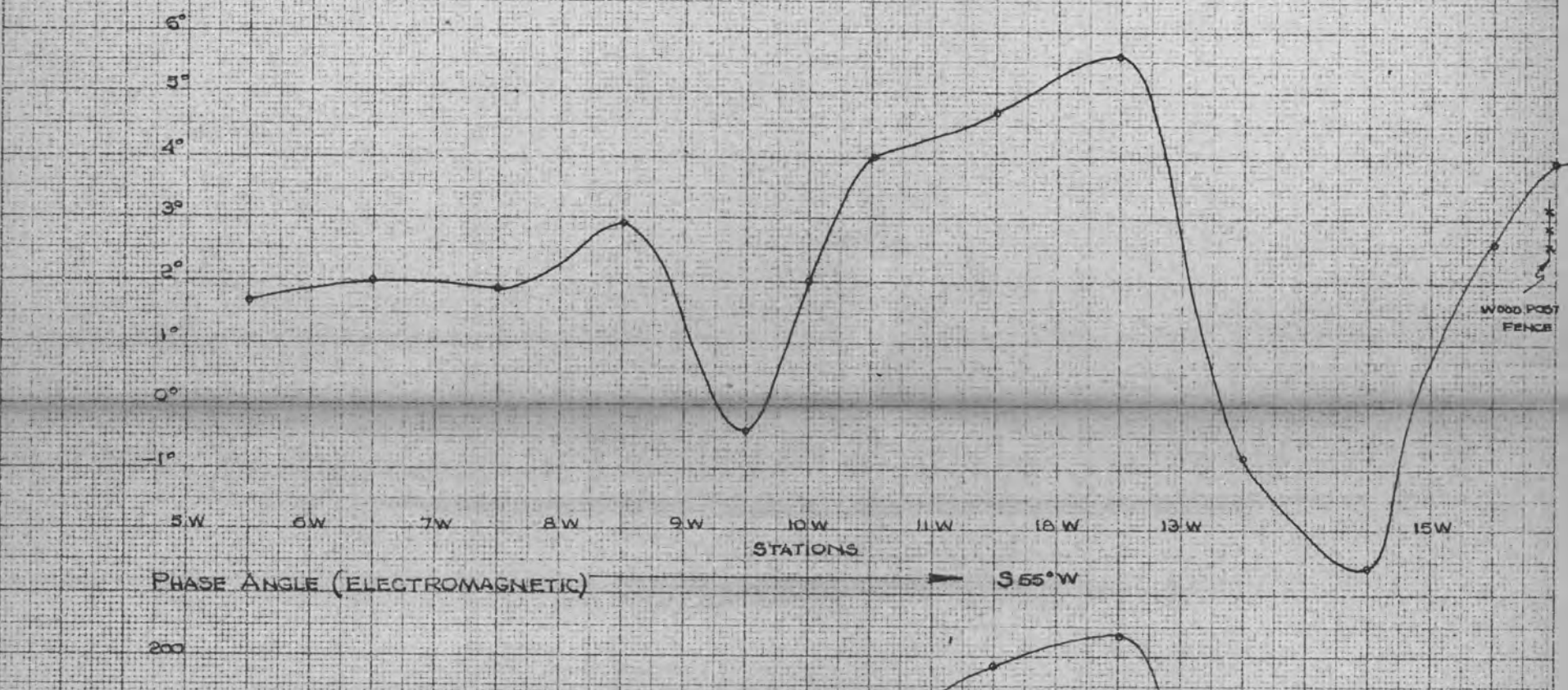
PROFILES AND GEOLOGIC SECTION

EAGLE PICHER CO
SAN XAVIER MINE, ARIZ.

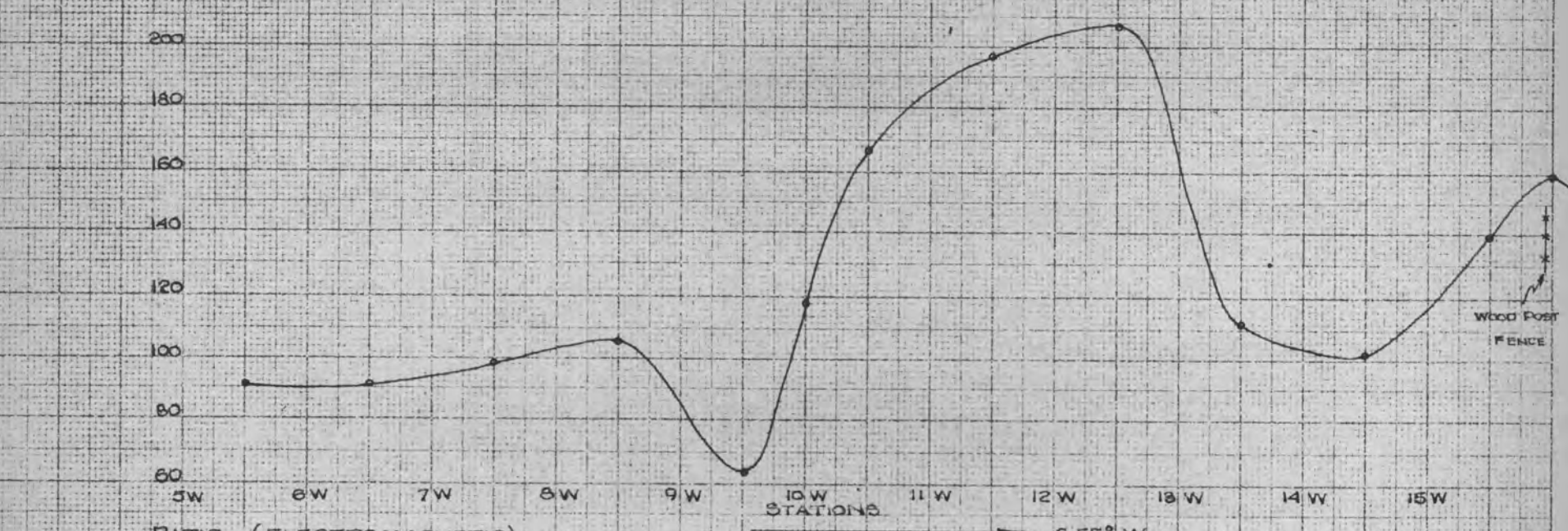
LINE 3 S ELECTRODE SETUP "D"



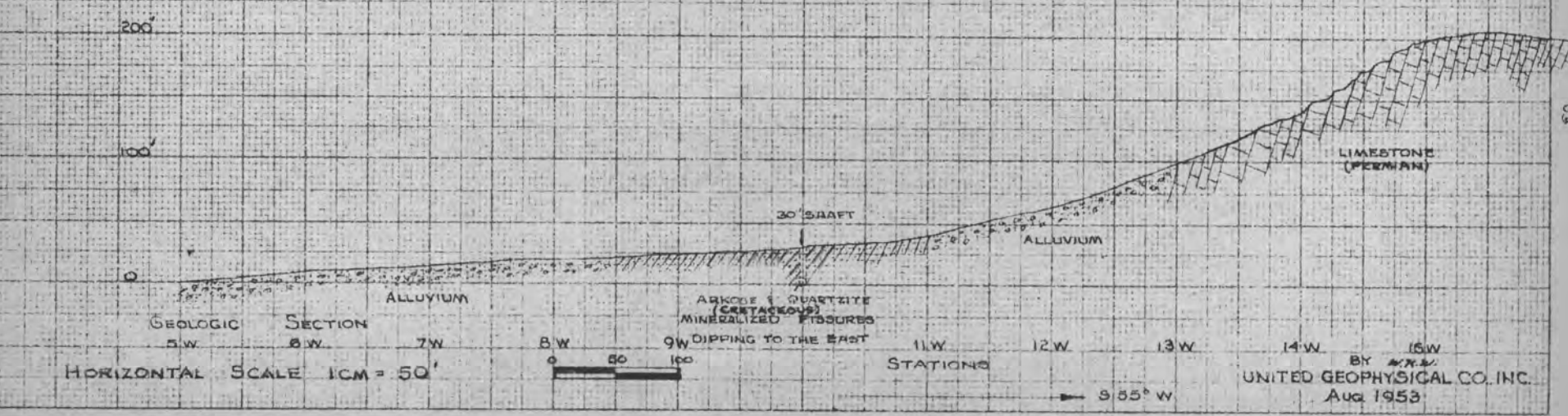
NATURAL POTENTIAL



PHASE ANGLE (ELECTROMAGNETIC)



RATIO (ELECTROMAGNETIC)



GEOLOGIC SECTION

HORIZONTAL SCALE 1CM = 50'

BY UNITED GEOPHYSICAL CO. INC.
Aug 1953

PROFILES

EAGLE PICHER CO.
SAN XAVIER MINE, ARIZ.

LINE 6.5 ELECTRODE SETUP "D"

GAMMAS 1040 1020 1000

5W 6W 7W 8W 9W 10W 11W 12W 13W 14W
STATIONS

MAGNETIC (VERTICAL INTENSITY) → S 55° W

MILLIVOLTS 520 500 480 460 450

5W 6W 7W 8W 9W 10W 11W 12W 13W 14W
STATIONS

NATURAL POTENTIAL → S 55° W

7° 6° 5° 4° 3° 2° 1°

5W 6W 7W 8W 9W 10W 11W 12W 13W 14W
STATIONS

PHASE ANGLE (ELECTROMAGNETIC) → S 55° W

260 240 220 200 180 160 140 120 100 80 60

5W 6W 7W 8W 9W 10W 11W 12W 13W 14W
STATIONS

RATIO (ELECTROMAGNETIC) → S 55° W

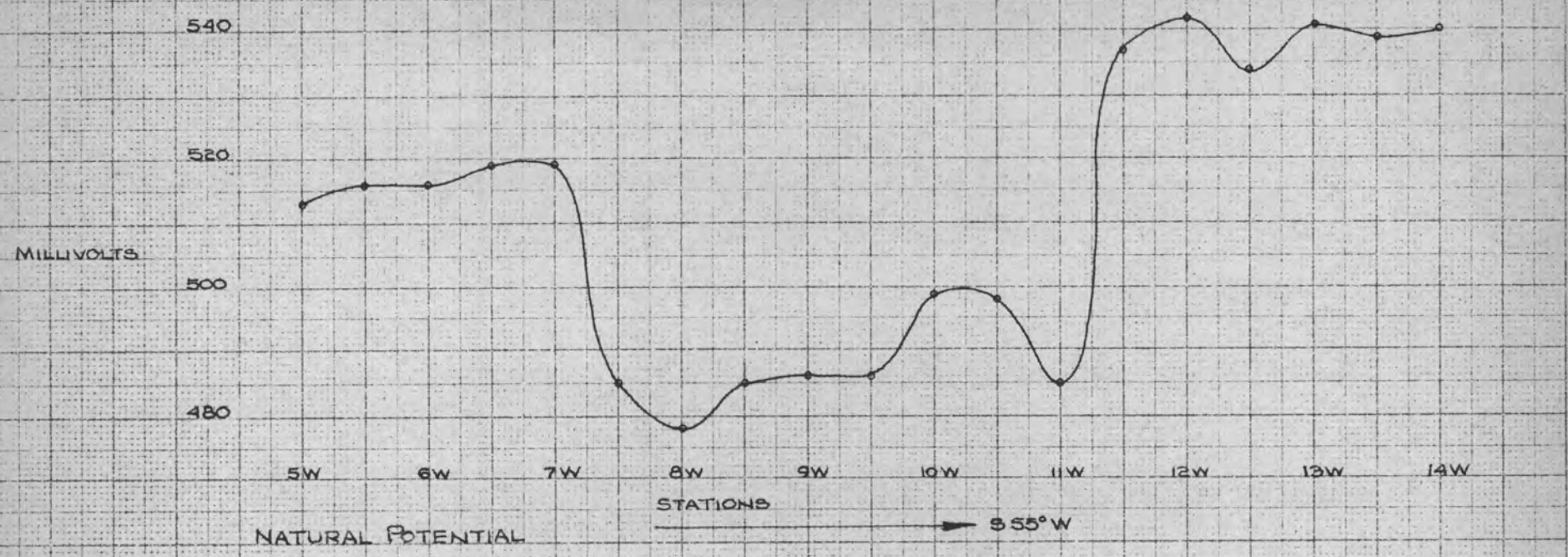
HORIZONTAL SCALE 1 Cm = 50' 0 50' 100'

BY A.T.R.
UNITED GEOPHYSICAL CO. INC.
Aug. 1953

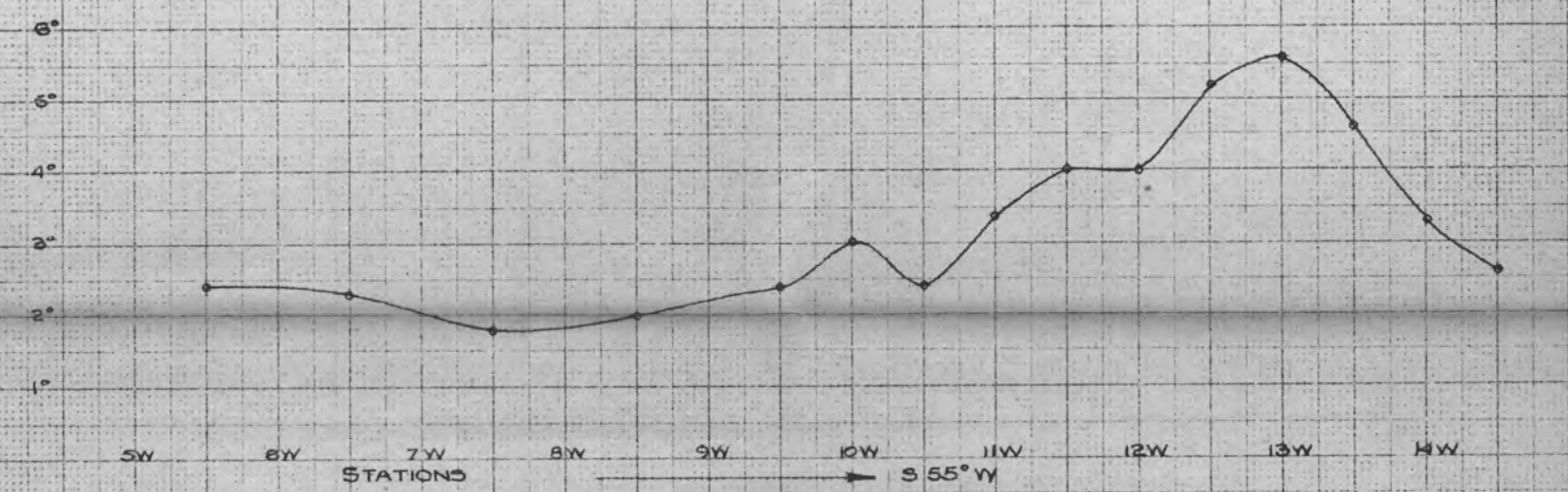
PROFILES AND GEOLOGIC SECTION

EAGLE PICHER CO.
SAN XAVIER MINE, ARIZ.

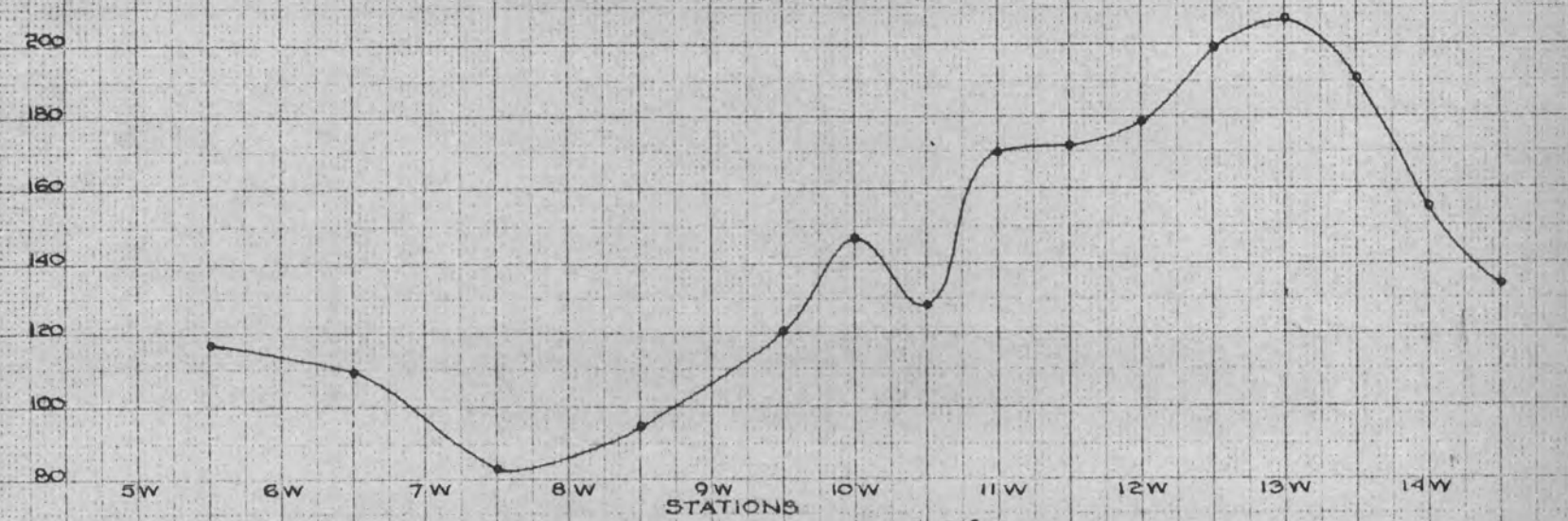
LINE 9S ELECTRODE SETUP "D"



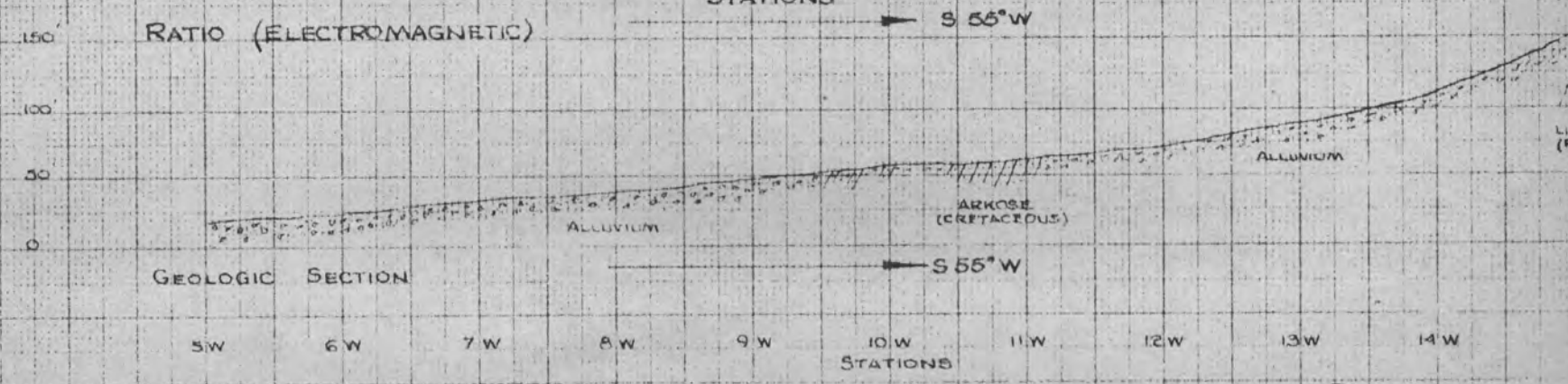
NATURAL POTENTIAL



PHASE ANGLE (ELECTROMAGNETIC)



RATIO (ELECTROMAGNETIC)



GEOLOGIC SECTION

HORIZONTAL SCALE 1 Cm = 50'

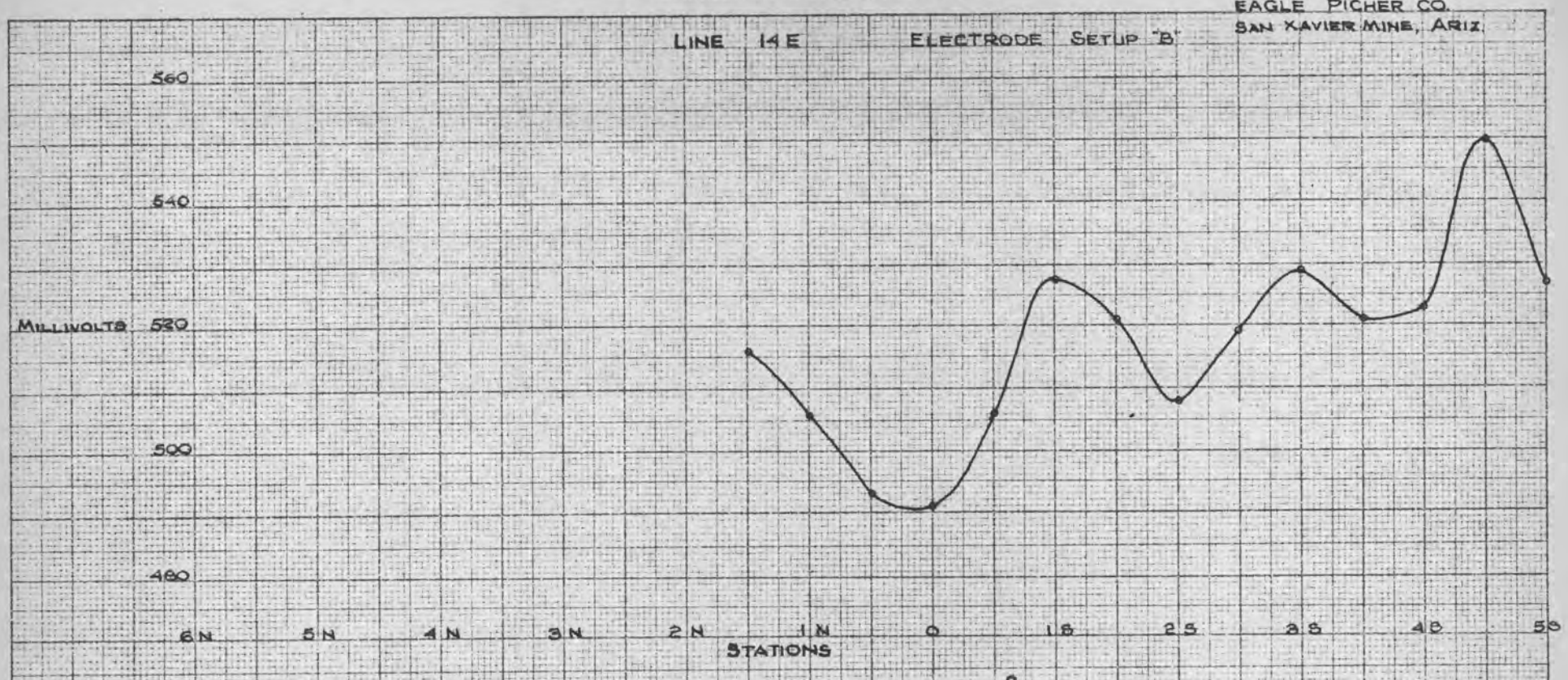
0' 50' 100'

BY L.K.V.
UNITED GEOPHYSICAL CO. INC.
AUG. 1958

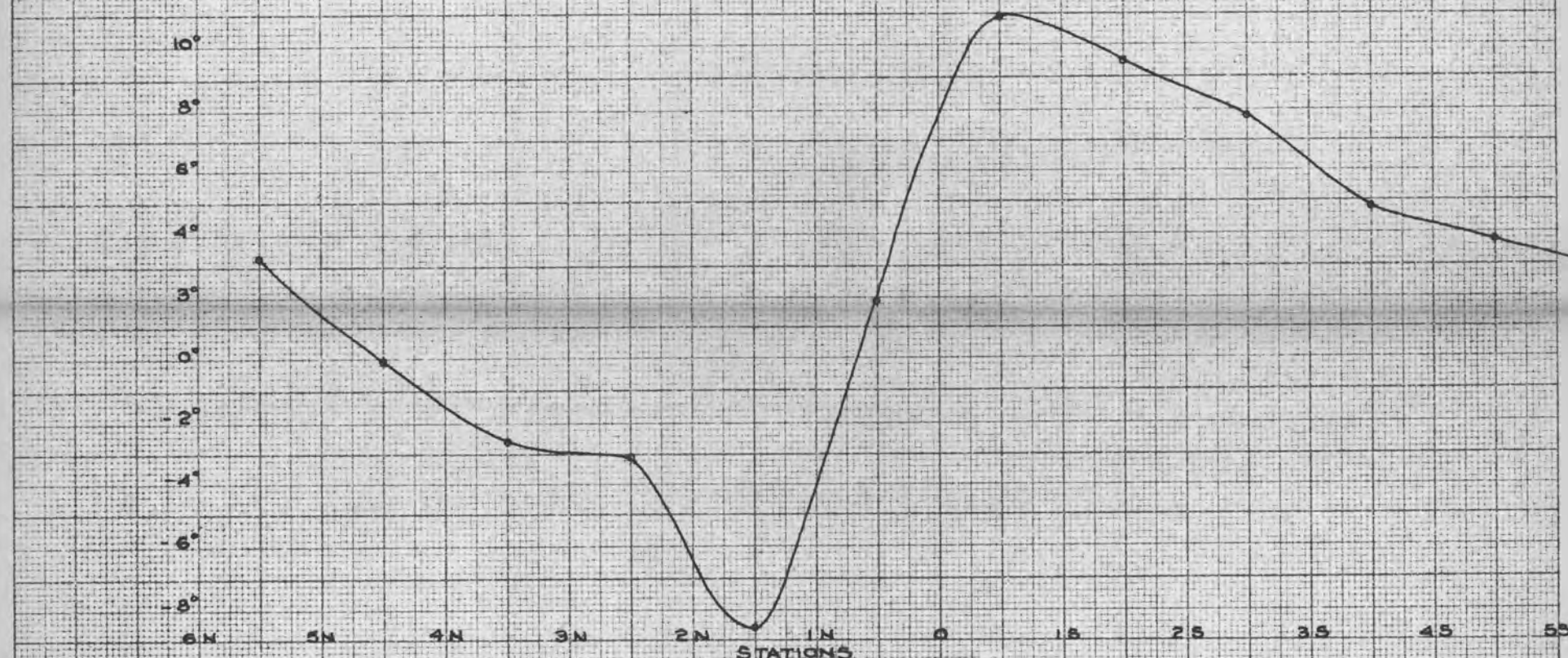
PROFILES AND GEOLOGIC SECTION

EAGLE PICHER CO.
SAN XAVIER MINE, ARIZ.

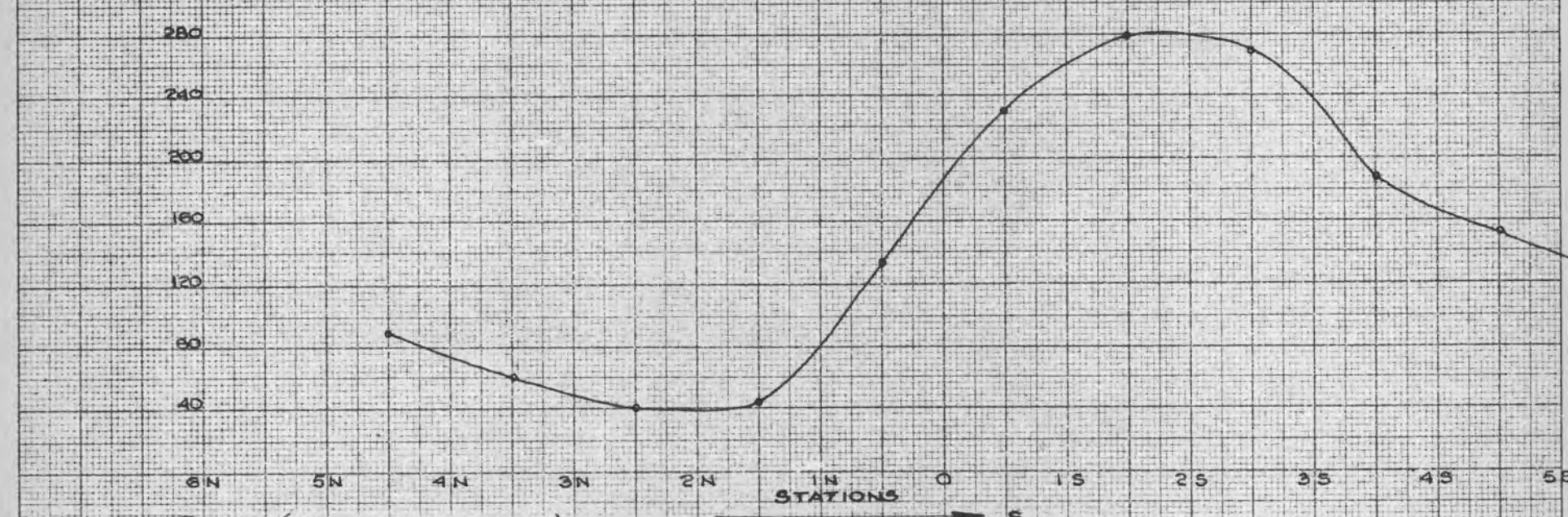
LINE 14 E ELECTRODE SETUP "B"



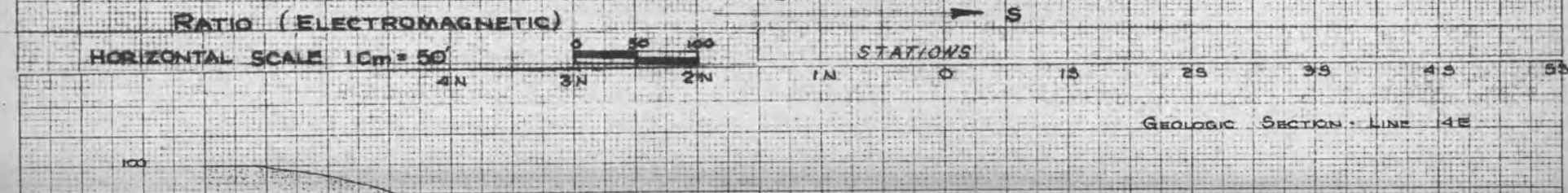
NATURAL POTENTIAL



PHASE ANGLE (ELECTROMAGNETIC)

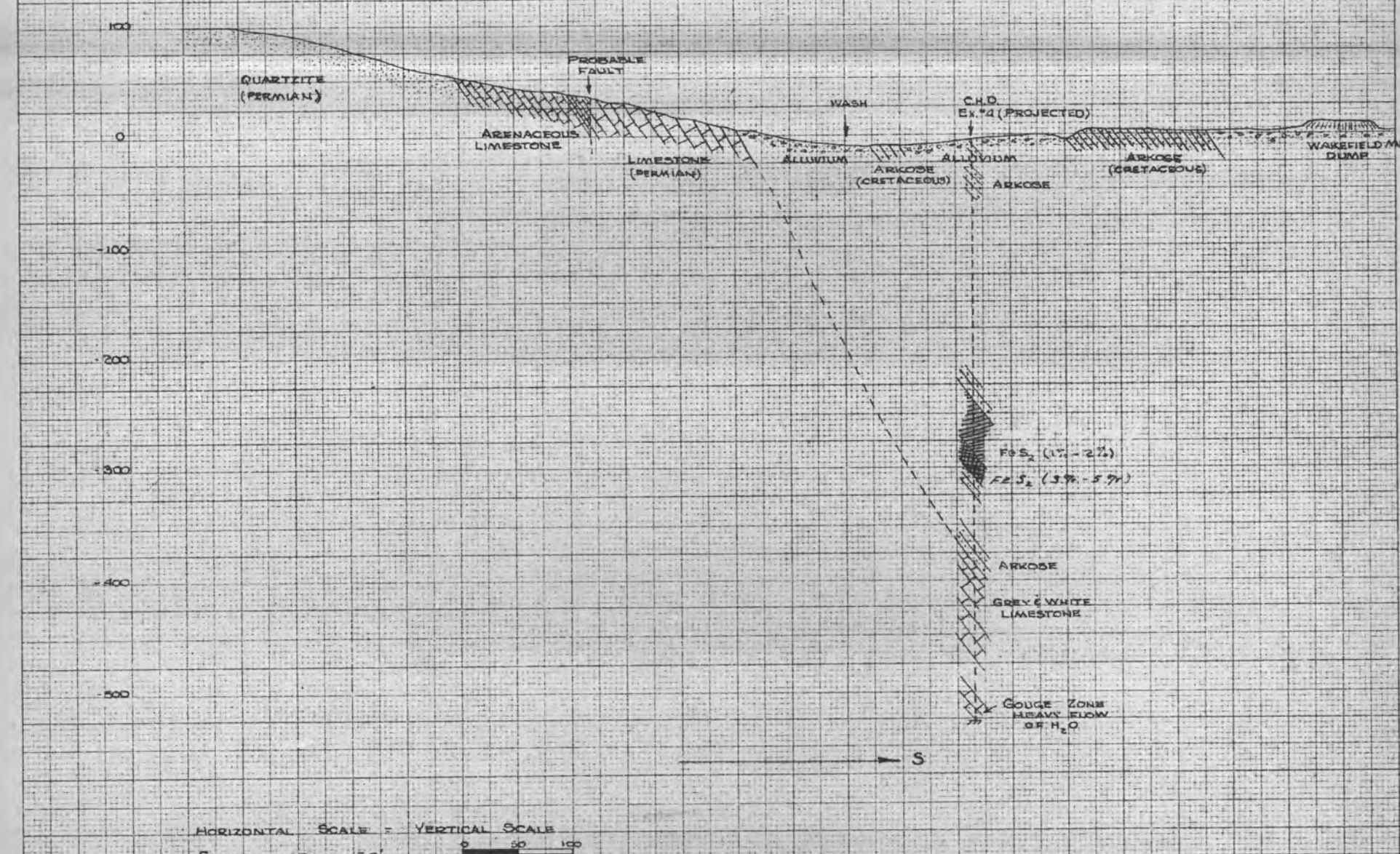


RATIO (ELECTROMAGNETIC)



HORIZONTAL SCALE 1Cm = 50'

GEOLOGIC SECTION - LINE 14E



HORIZONTAL SCALE = VERTICAL SCALE
SCALE 1Cm = 50'

BY W.R.K.
UNITED GEOPHYISCAL CO. INC.
Aug. 1953

No. 359-14. Millimeters, 5 mm lines accented, cm lines heavy.
KEUFFEL & ESSER CO.

LEGEND

- POWER LINES
- ROADS
- WASH (ARROYO)
- FENCE
- TRIANGULATION STATIONS
- SECTION LINES
- MINE DUMP
- SHAFT
- DRILL HOLE

THE EAGLE-PICHER COMPANY

SAN XAVIER MINE

PIMA COUNTY, ARIZONA

ELECTROMAGNETIC CONTOUR MAP

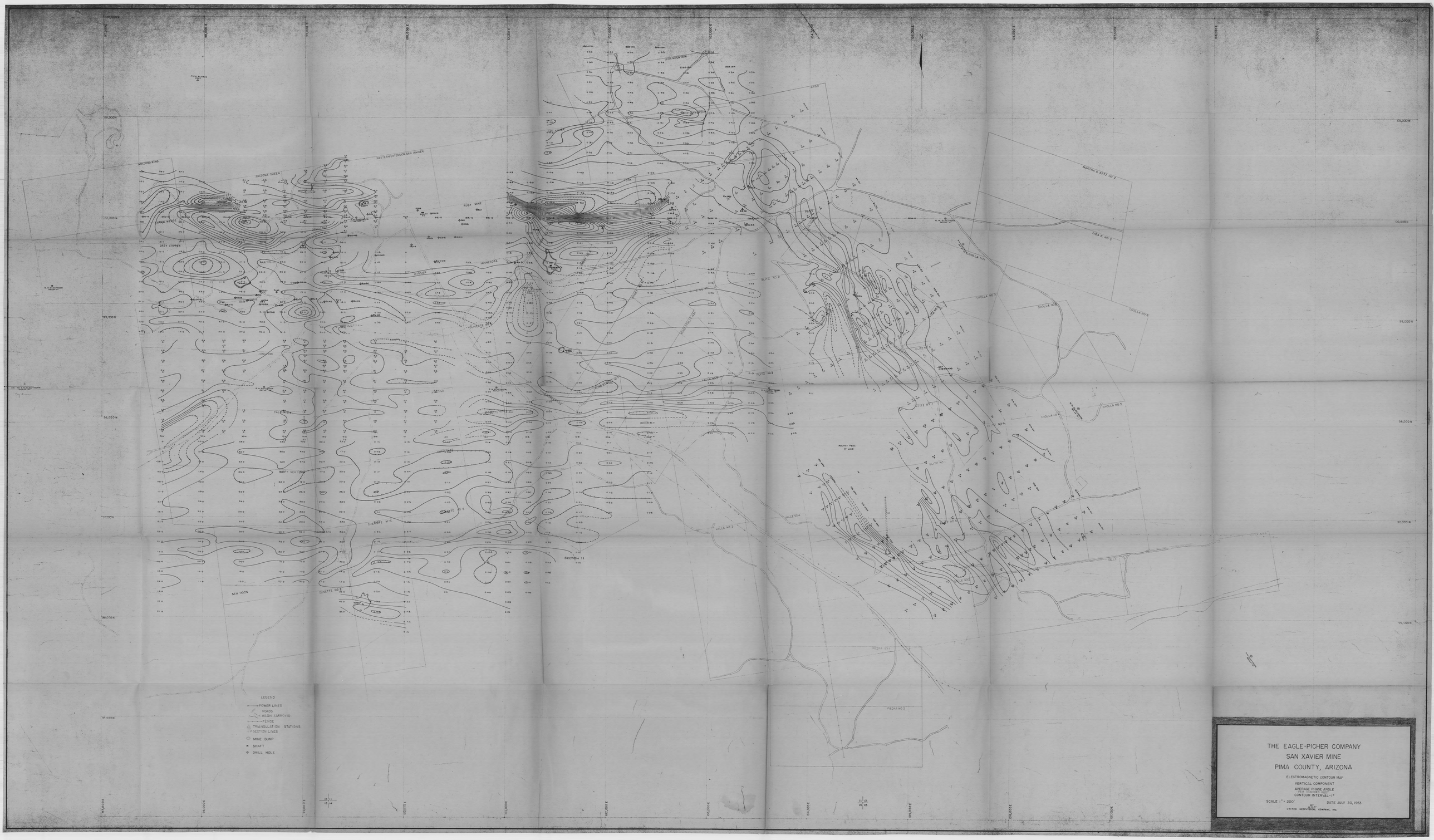
VERTICAL COMPONENT RATIO
FOR WORKING FREQ.
CORRECTED FOR NORMAL RATIO CURVE - 100

CONTOUR INTERVAL 20

SCALE 1" = 200'

DATE JULY 30, 1953

UNITED GEOPHYSICAL COMPANY, INC.



LEGEND
POWER LINES
ROADS
WASH (ARROYO)
FENCE
TRIANGULATION STATIONS
SECTION LINES
MINE DUMP
SHAFT
DRILL HOLE
THE EAGLE-PICHER COMPANY
SAN XAVIER MINE
PIMA COUNTY, ARIZONA
ELECTROMAGNETIC CONTOUR MAP
VERTICAL COMPONENT
AVERAGE PHASE ANGLE
CONTOUR INTERVAL-1°
SCALE 1" = 200'
DATE JULY 30, 1953
UNITED GEOPHYSICAL COMPANY, INC.

LEGEND

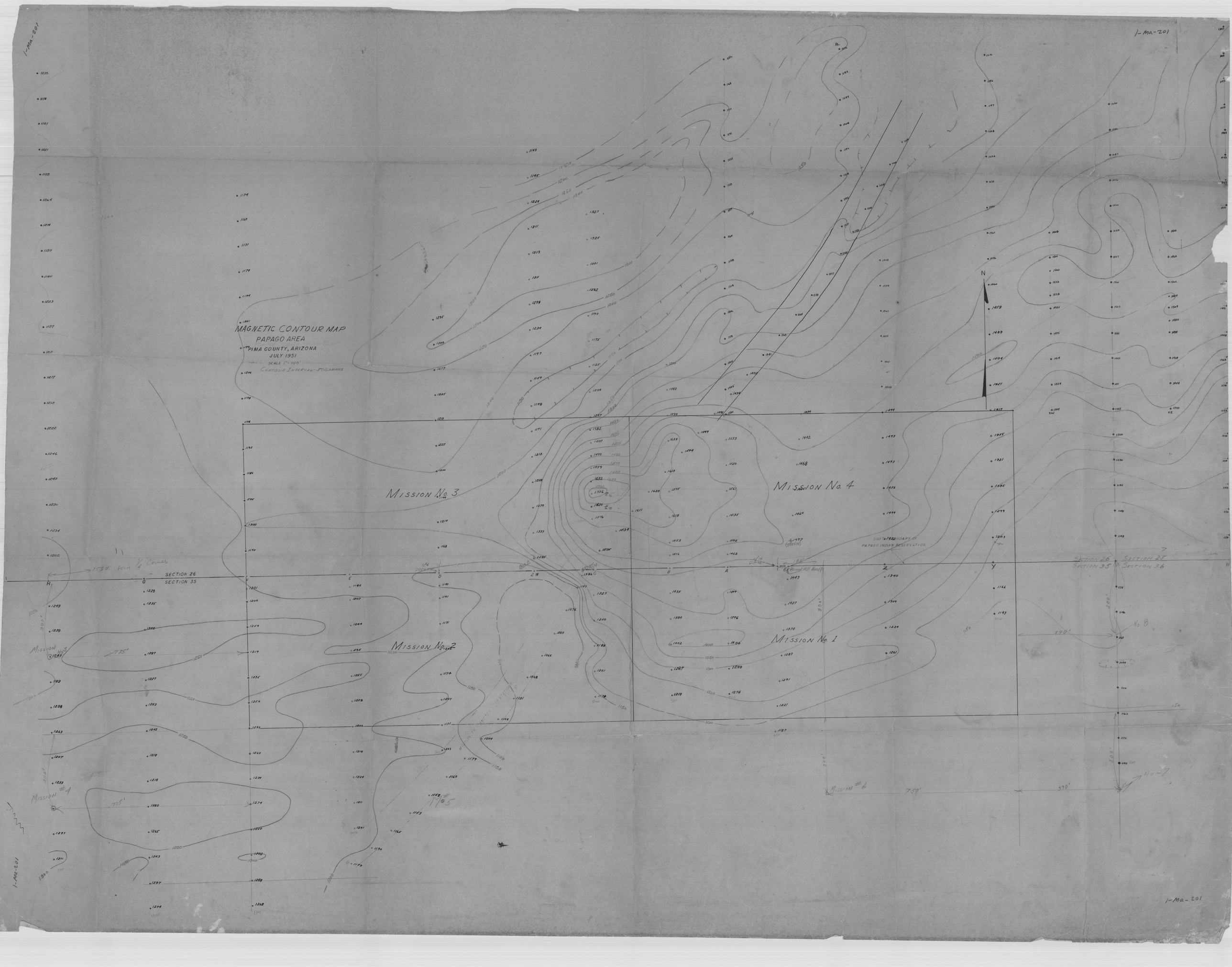
- POWER LINES
- ROADS
- WASH (ARROYO)
- FENCE
- TRIANGULATION STATIONS
- SECTION LINES
- SHAFT
- DUMP
- DRILL HOLE

SECTION-11

THE EAGLE-PICHER COMPANY
SAN XAVIER MINE
PIMA COUNTY, ARIZONA

NATURAL POTENTIAL CONTOUR MAP
CONTOUR INTERVAL 10 MILLIVOLTS
SCALE 1" = 200' DATE: JULY 31, 1953

UNITED GEOPHYSICAL COMPANY, INC.



1-Ma-201
MAGNETIC CONTOUR MAP
PAPAGO AREA
PIMA COUNTY, ARIZONA
JULY 1951
SCALE 1" = 100'
CONTOUR INTERVAL - 50 GAMMAS
MISSION No. 3
MISSION No. 4
MISSION No. 2
MISSION No. 1
SECTION 26
SECTION 35
SECTION 25
SECTION 36
SOUTH BOUNDARY OF PAPAGO INDIAN RESERVATION
N

Papago - Magnetometer

Mission Magnetic

$$\frac{(d^2 + 3048^2)^{3/2}}{d^3} = \frac{427}{115}$$

$$\frac{d^2 + 3048^2}{d^2} = \left(\frac{427}{115}\right)^{2/3}$$

13075
2.395

$$d^2 = \frac{3048^2}{1.395} = \frac{3048^2}{1.18^2}$$

$$d = \frac{3048}{1.18} = 2580 \text{ cm.}$$

$$d = \frac{2580}{30.48} = 84.7$$

$$d = 85 \text{ ft.}$$

$R = 10'$ $\qquad V = 427\,r$

$z = ?$

$$\begin{array}{r} 2.54 \\ 12 \\ \hline 508 \\ 254 \\ \hline 30.48 \end{array}$$

$$427 = 4\pi(10)^3$$

when $r = d$ $\qquad \Delta z = 427$

when $r = \sqrt{d^2 + [150(30.48)]^2}$ $\qquad \Delta z = 0$

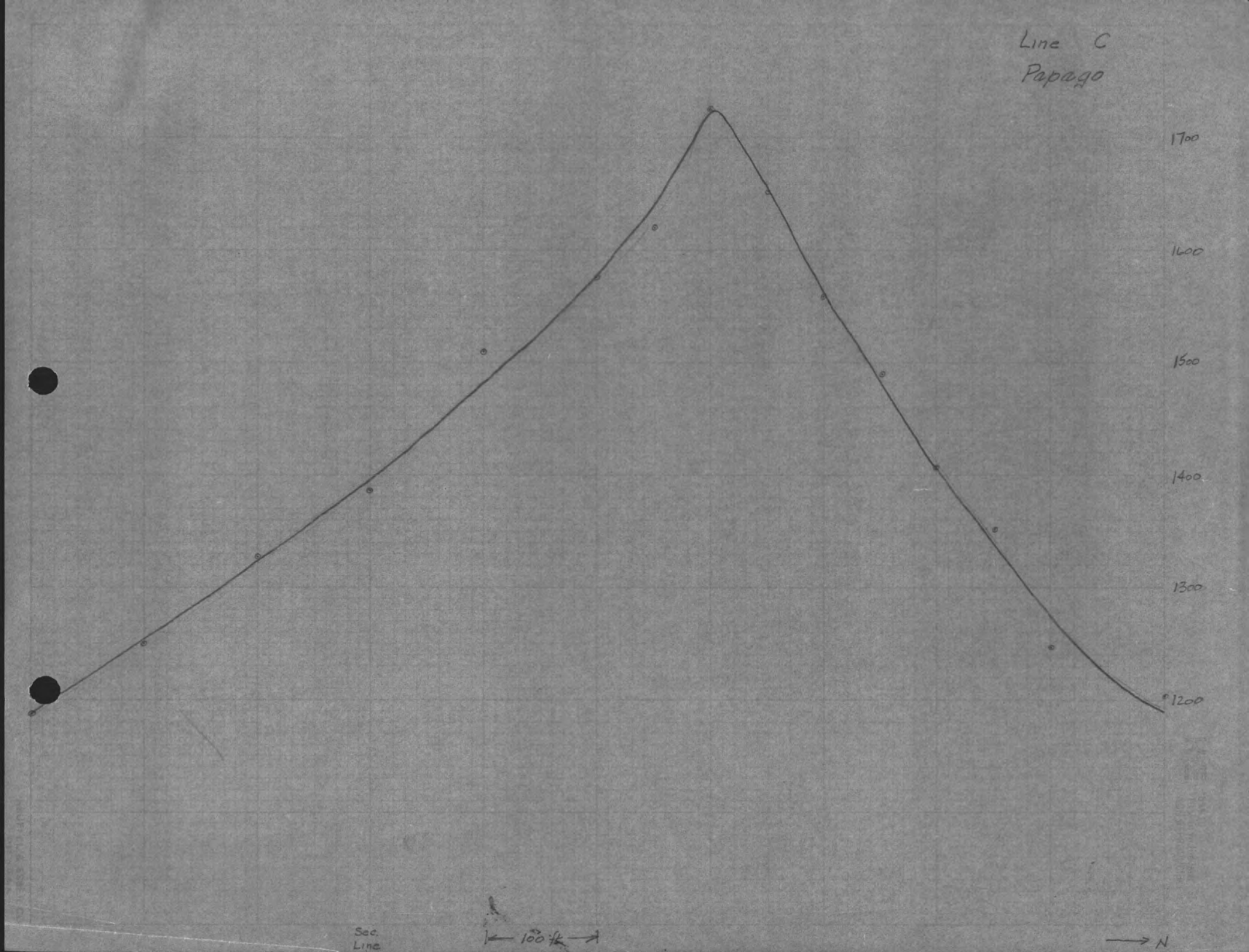
$$427 = -\frac{m}{d^2}$$

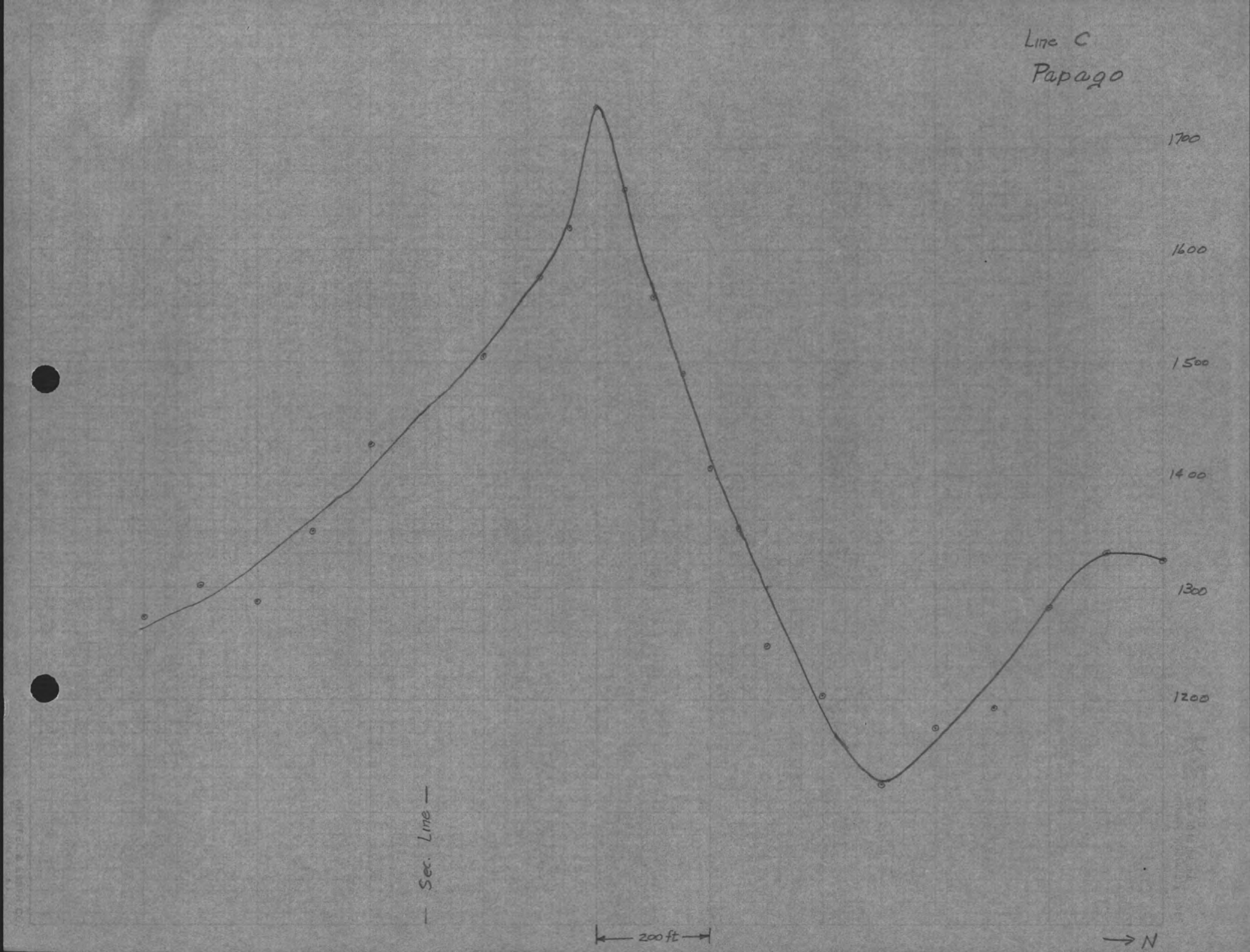
$$0 = -\frac{d\,m}{\sqrt{d^2 + [(150)(30.48)]^2}}$$

$$115 = -\frac{d\,m}{\left(\sqrt{d^2 + [(100)(30.48)]^2}\right)^3}$$

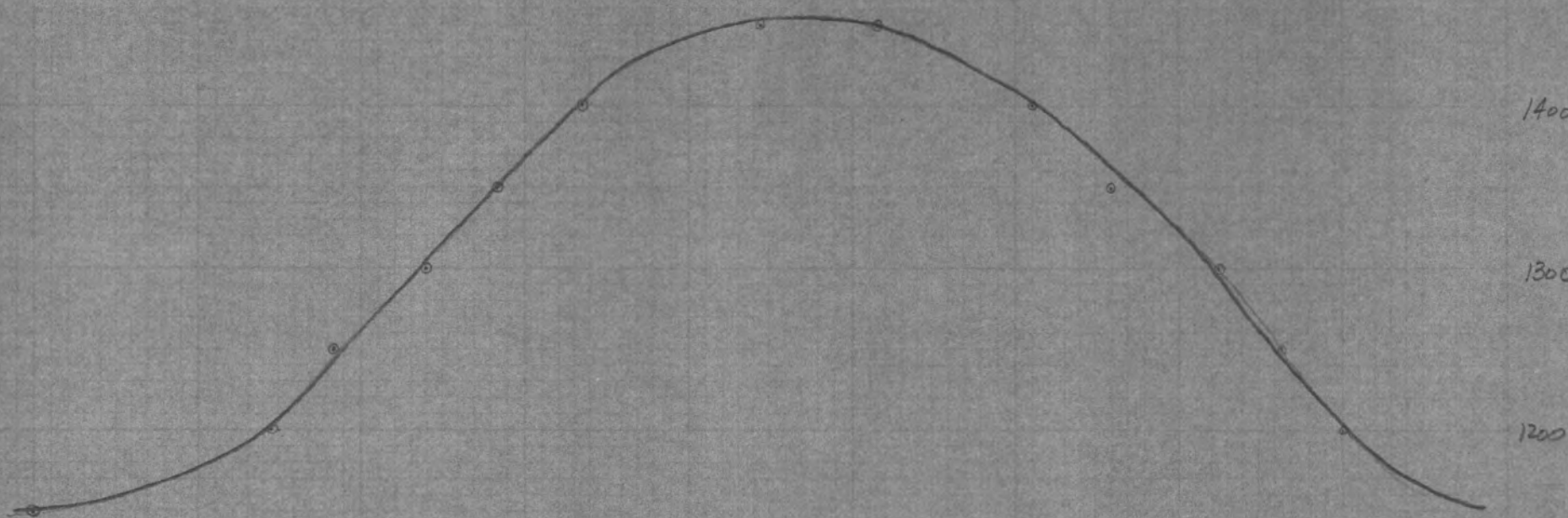
$$\frac{115\,(d^2 + 3048^2)^{3/2}}{d} = 427\,d^2$$

115


Line C
Papago
1700
1600
1500
1400
1300
1200
Sec. Line
100 ft
N

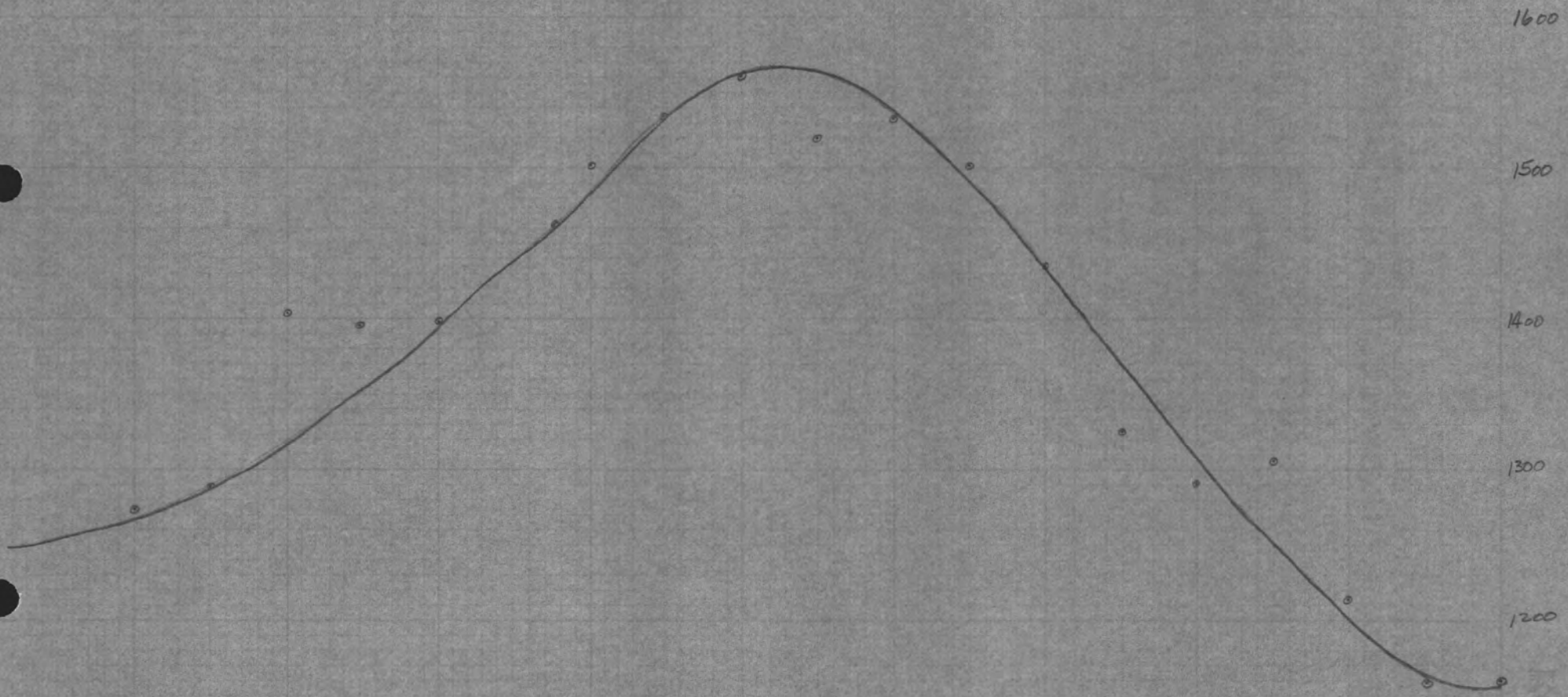

Line C
Papago
1700
1600
1500
1400
1300
1200
— Sec. Line —
200 ft
N

A A'



100 50 ← 200ft → 0 → SE

Line A
Papago

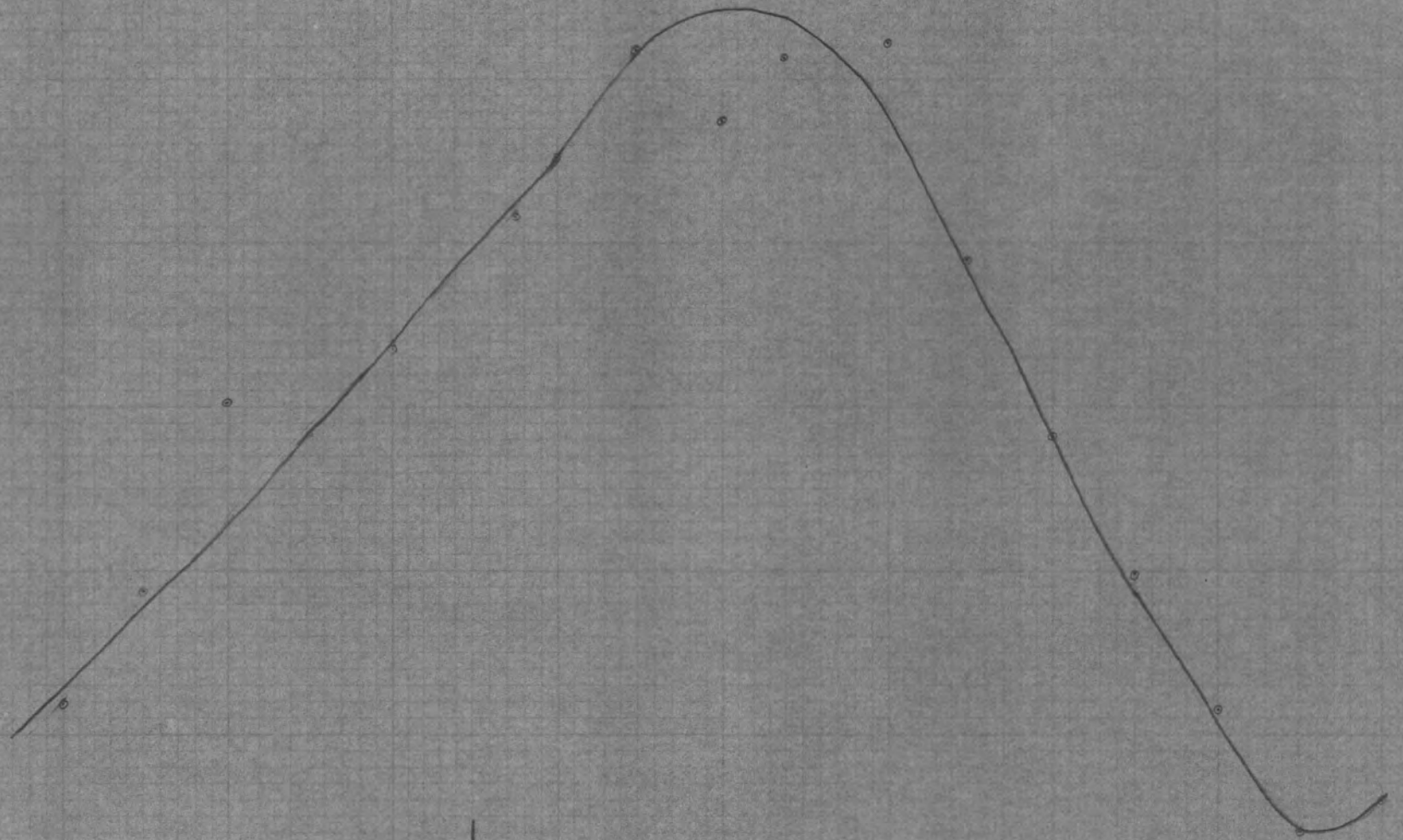


- Sec. Line

← 200 ft →

→ N

Line B
Papago



384. GRAVITY SURVEY NEAR TUCSON, ARIZONA

By DONALD PLOUFF, Denver, Colo.

A total of 767 gravity stations were established near Tucson, Ariz. D. B. Jackson, A. J. Vaughn, and R. N. Babcock assisted in the field operations and reduction of the data. This region of the Basin and Range physiographic province is characterized by irregularly spaced mountains surrounded by desert plains.

Three major groups of rock crop out in the mountains located within the area of the gravity survey (fig. 384.1). The intrusive rocks include granite, granodiorite, and related crystalline rocks of Precambrian, Cretaceous, and Tertiary age. The Paleozoic and Mesozoic rocks mainly include a wide variety of sedimentary and volcanic rocks. The rocks of Tertiary age also include several types of sedimentary and volcanic rocks. A sampling program to determine the densities of the rock types in this area is being conducted.

The observed gravity measurements were referred to the absolute value of 979,227.2 mgal (milligals) at the Tucson Municipal Airport (Woollard, 1958, p. 332). A standard rock density of 2.67 g per cm^3 was assumed for calculation of the elevation and terrain corrections. Terrain corrections were carried to 18 miles, using the U.S. Coast and Geodetic Survey system (Swick, 1942).

The Bouguer gravity anomaly map (fig. 384.2) shows significant correlations between gravity highs and outcrops of Tertiary and older rocks. Many of these correlations can be attributed to the contrast in density between the rocks cropping out in the mountains and the less dense alluvium of the intervening valleys. Highs correlated with the outcrops are at localities *A*, *B*, *C*, *E*, and *F* (figs. 384.1 and 384.2). Relative gravity lows that are associated with thick alluvium deposits are at localities *G*, *H*, *J*, *K*, and *L* (figs. 384.1 and 384.2).

The gravity anomaly pattern enclosing the Tucson Mountains (loc. *A*) is markedly linear; this linearity suggests that the mountain area is bounded by faults. The gravity pattern in the Sierrita Mountains, (loc. *B*), however, does not have such striking linear boundaries, and, moreover, the gravity high is 6 miles northwest of the topographic high. The elongate gravity high is

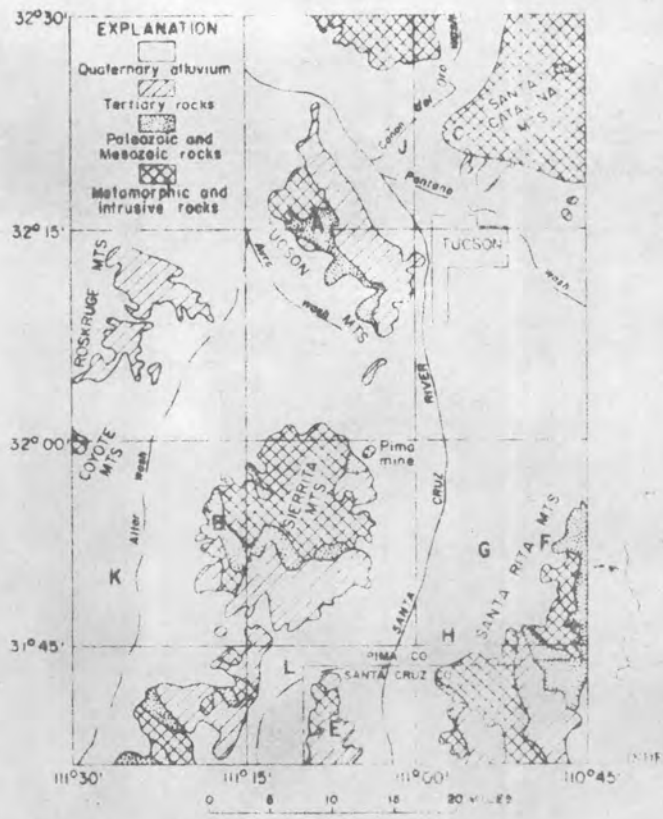


FIGURE 84.1.—Geologic map (generalized from Wilson and others, 1960). Localities mentioned in text indicated by capital letters.

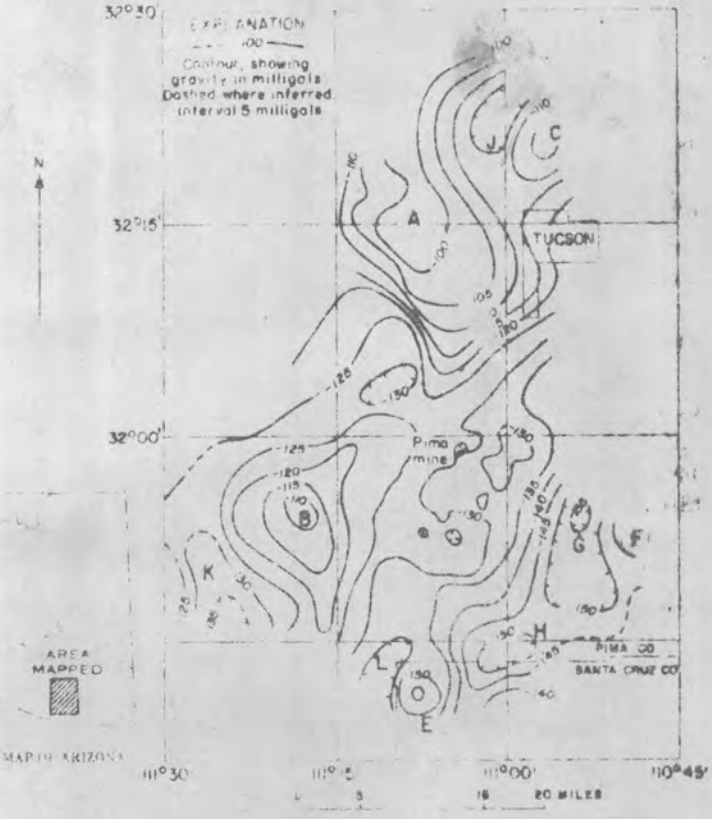


FIGURE 384.2.—Bouguer gravity anomaly map. Localities mentioned in text indicated by capital letters.

along a northwestward-elongated band of Cretaceous and older sedimentary rocks.

The gravity lows at localities *G* and *H*, are about 4 miles east of the topographic low along the Santa Cruz River. Interpretation of the thickness of alluvium in this area is complicated by the uncertain distribution beneath the alluvium: the Helmet fanglomerate, of Tertiary age, is about 10,000 feet thick in this area (Cooper, 1960). The density of the fairly to moderately well indurated conglomerate, which comprises most of the Helmet fanglomerate, is about 2.4 to 2.5 g per cm^3, according to preliminary density measurements. This density probably is intermed[illegible] that of the alluvium and the pre-Tertiary rocks of the area.

REFERENCES

Cooper, J. R., 1960, Some geologic features of the Pima mining district Pima County, Arizona: U.S. Geol. Survey Bull. 1112-C, p. 63-103.

Swick, C. H., 1942, Pendulum gravity measurements and isostatic reductions: U.S. Coast and Geodetic Survey Spec. Pub. 232, 82 p.

Wilson, E. D., Moore, R. T., and O'Haire, R. T., 1960, Geologic map of Pima and Santa Cruz Counties, Arizona: Arizona Bur. Mines, Tucson.

Woollard, G. P., 1958, Results for a gravity control network at airports in the United States: Geophysics, v. 23, no. 3, p. 520-555.

385. ELECTROMAGNETIC STUDIES IN THE TWIN BUTTES QUADRANGLE, ARIZONA

By F. C. Frischknecht and E. B. Ekren, Denver, Colo.

Electromagnetic measurements of the Helmet fanglomerate of Tertiary age (Cooper, 1960, p. 77–89) and surrounding rocks in the Twin Buttes quadrangle near Tucson, Ariz., give some information on the feasibility of prospecting for minerals in the older bedrock beneath the Helmet formation, and the usefulness of electromagnetic methods in resolving structural problems in this area.

The generalized geology of the area in which electromagnetic measurements were made is shown on figure 385.1. The Helmet fanglomerate dips steeply to the southeast in the traverse areas. According to Cooper (1960, p. 91), the fanglomerate is poorly sorted and contains pebbles, cobbles, and boulders of variegated material in a silt matrix. The most prominent structural feature in the area is the San Xavier thrust fault.

Conventional turam measurements (Hedstrom, 1940) were made along traverses normal to a long grounded wire, using a coil spacing of 100 feet and a frequency of 500 cycles per second. The turam ratios were normalized and the amplitude and phase angle of the normalized field were computed from the ratios, assuming values of 1.00 and 0° for the amplitude and phase angle, respectively, at a distance of 100 feet from the cable. The results of the traverse in the [illegible]rd direction are shown on figure 385.2. In general, the ratio curves are displaced considerably from their free-space values of 100 percent and 0 percent. Also, the ratio curves display discrete anomalies, which show that individual beds within the Helmet vary considerably in resistivity. Had a smaller coil spacing been used these anomalies might have been more pronounced. However, despite local lateral variations in resistivity, the turam amplitude and phase angle curves closely follow the theoretical curves for the field about an infinite wire on a conducting homogeneous half-space (Wait, 1953). The measured values of amplitude and phase angle are compared on figure 385.2 with theoretical curves chosen to fit the measured points best. The best fits for the amplitude and the phase angle curves differ, as indicated by the displacement between the points where $(\sigma\mu\omega)^{\frac{1}{2}}r = 2.0$ on each curve. For any distance along the measured curves, there is a corresponding value of $(\sigma\mu\omega)^{\frac{1}{2}}r = 2.0$ on the theoretical curves, making it possible to calculate an "apparent" resistivity. For example, at the point where $(\sigma\mu\omega)^{\frac{1}{2}}r = 2.0$ on the theoretical amplitude curve, the distance r on the measured curve is 512 feet. The apparent resistivity is then calculated to be 24 ohm-meters. Similarly, for the phase angle curve the resistivity is 16 ohm-meters.

Variable-frequency measurements, or depth soundings, were made at eight different locations (fig. 385.1)

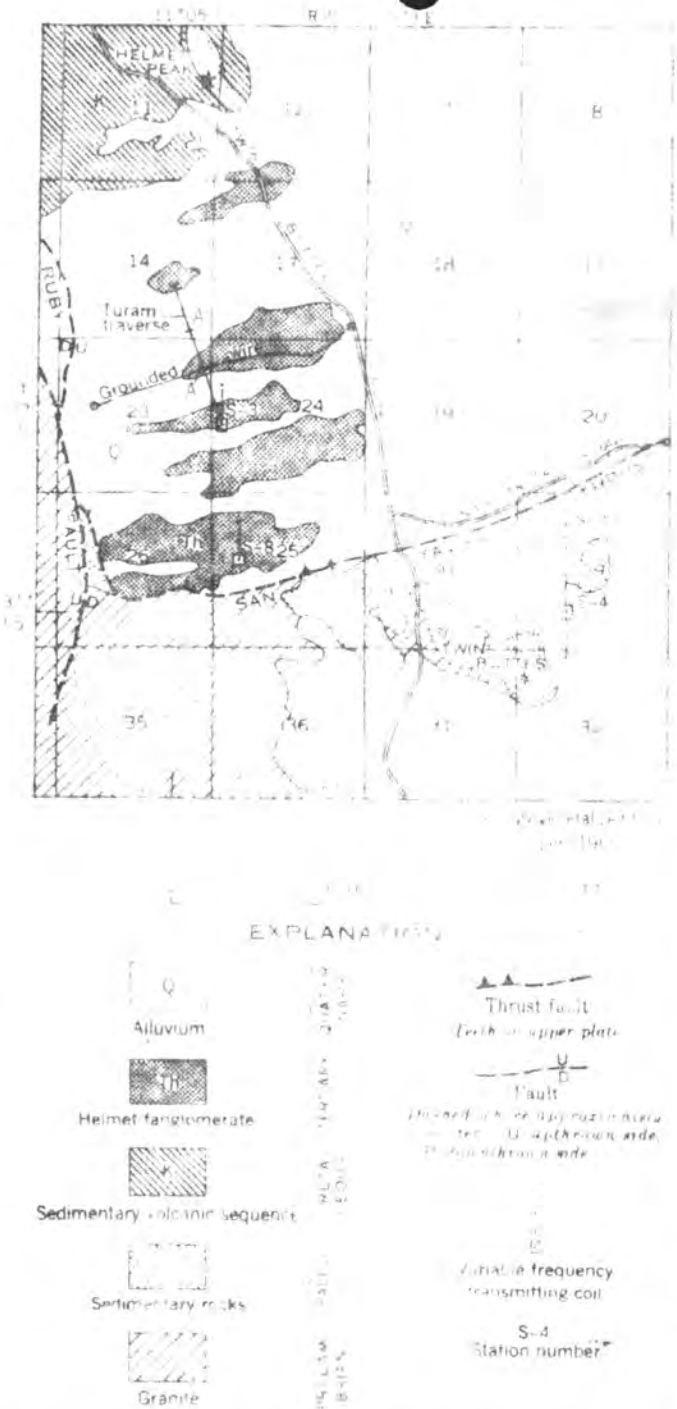


FIGURE 385.1.—Geologic map of part of the Twin Buttes quadrangle, Arizona, showing location of electromagnetic traverses.

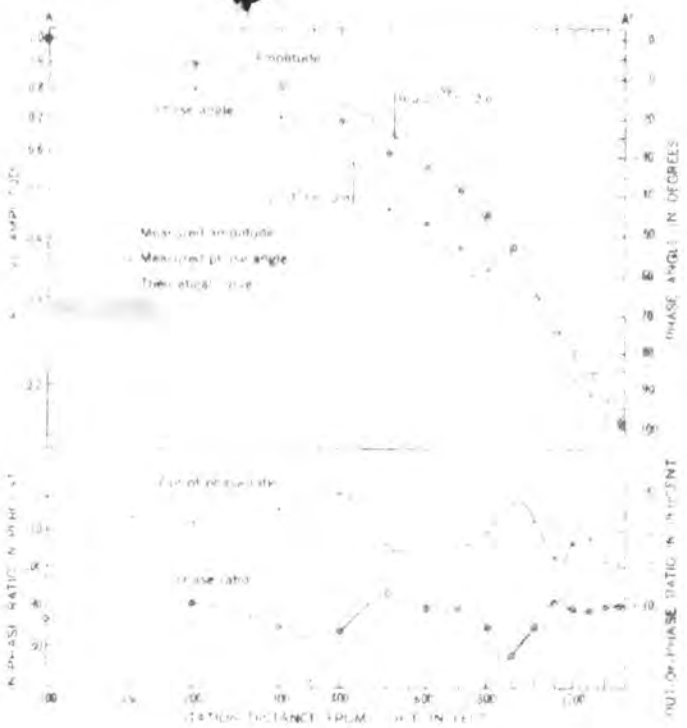


FIGURE 385.2.—Turam ratio and field curves for a traverse northward from long grounded cable. Because of attenuation of the signal beyond station distances of 1,500 feet from the cable, only results from the nearer part of the traverse are shown. The traverse in the southward direction yielded similar results.

Two large loops were placed on the ground; one was energized by a 70-watt power amplifier and the other served as a receiving coil (Keller and Frischknecht, 1960). A ratiometer was used to measure the mutual impedance between the coils over a frequency range of 35–1200 cycles per second.

Sounding S–3 was located near the cable used for the turam measurements, and a coil spacing of $r = 1{,}350$ feet was used. One coil for S–8 was several hundred feet north of the south edge of the San Xavier thrust; the other coil was 1,100 feet north of the first. The amplitude ratios for S–3 and S–8 were fitted on figure 385.3 to the theoretical curves (after Wait, 1953) for the mutual coupling between loops on a homogeneous half-space. The data for S–3 and S–8 closely fit the theoretical curves, indicating that in gross behavior the Helmet is an electrically homogeneous medium to a depth of at

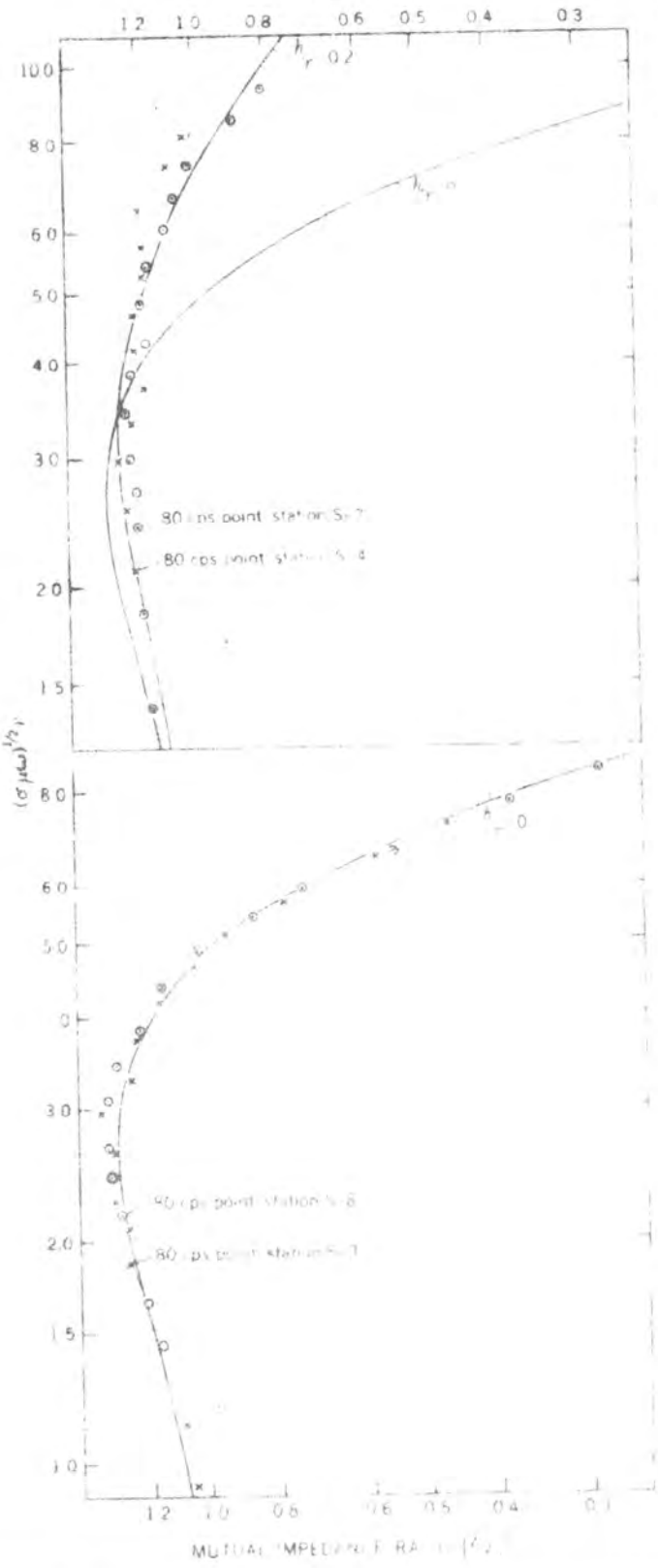


FIGURE 385.3.—Variable frequency measurements and matching theoretical curve for stations S-3, S-8, S-4, and S-7.

least several hundred feet. The scatter in the measured values represents instrumental errors.

Apparent resistivities can be determined from the variable frequency loop measurements, as from the turam measurements, by the positions at which the measured curves fit the theoretical curves (Keller and Frischknecht, 1960). For S-3 the apparent resistivity is 28 ohm-meters and for S-8 it is 24 ohm-meters.

Four soundings were made along a north-south traverse between the eastern [illegible] of the Twin Buttes and the Sahuarita road (fig. 385.1) in order to locate the San Xavier [illegible]. Measurements from two of these soundings, S-4 and S-7, [illegible] spacings of 1,350 and 1,450 feet, respectively, are plotted on figure 385.3. Few theoretical curves for this type of sounding over layered earth are available, and the scatter of the data is too great to permit an accurate interpretation. The values for S-7 approximately fit the theoretical curve for loops raised above a homogeneous half-space a distance h, where $h = 0.2r$, implying a relatively [illegible] surface layer 200 to 300 feet thick, underlain by more conductive rocks. From calculations for loops raised above the surface it may be [illegible] that the theoretical curve for loops on the surface of a conducting layer that has an insulating half-space beneath also is probably flatter than the curve for a homogeneous half-space. The latter is the more [illegible], because in this area a layer of alluvium probably [illegible] underlain by granite or limestone.

Apparent resistivities of the Helmet fanglomerate, as determined by electromagnetic measurement, are somewhat lower (16 to 28 ohm-meters) than those determined from electric logs (35 to 60 ohm-meters, G. V. Keller, oral communication, 1963). Because of its low resistivity and because of local variation in resistivity the Helmet would be a formidable obstacle in trying to locate possible underlying [illegible] by electromagnetic methods.

REFERENCES

Cooper, J. R., 1960, Some geologic features of the Pima mining district, Pima County, Arizona: [illegible] Geol. Survey Mail 1112-C, p. 63–103.

Heilstrom, Helmer, 1940, Phase measurements in electrical prospecting: Am. Inst. Mining Metal. Engineers [illegible] 138, p. 456–472.

Keller, G. V., and Frischknecht, F. C., 1960, Electrical resistivity studies on the Athabasca Glacier, Alberta, Canada: [illegible] Bur. Stand. [illegible] Research, v. [illegible] 5, p. [illegible]–448.

Wait, J. R., 1955, The [illegible] of a [illegible] over a stratified conductor: Appl. Sci. Research, sec. B, v. 3, p. 27–292.

1955, Mutual [illegible] of loops over a homogeneous [illegible] Geophysics [illegible] 20 [illegible] p. 630–637.

(Pima Dist F)

Geophysical Studies in support of geologic mapping in the Twin Buttes quadrangle, Arizona

by

G. V. Keller,[1] D. Plouff,[1] and I. Zietz[2]

U. S. Geological Survey, [1]Denver, Colorado and [2]Washington, D. C.

Abstract

The Twin Buttes quadrangle, south of Tucson, Arizona, includes the central portion and eastern flanks of the Sierrita Mountains. Interest in the geology of the Sierrita Mountains has increased recently since the discovery of several major copper deposits in the area. Geologic mapping over the lower part of the Sierrita pediment is hampered because much of the area is covered with alluvium and the exposures are poor.

A major structural feature in the quadrangle is the San Xavier thrust sheet--a wedge of Helmet fanglomerate and some older rocks, located in the northeast corner of the Twin Buttes quadrangle. A gravity low approximately outlines the limits of the Helmet fanglomerate, but a quantitative interpretation of the thickness and outline of the thrust sheet is limited by the presence of dense, older rocks along the border and in the sole of the thrust. A regional gravity survey supports the hypothesis that the source of the thrust sheet may be about 6 1/2 miles southeast of its present location.

There is a small but consistent contrast in density between the granitic rocks and the Paleozoic rocks, which are largely carbonates. Gravity highs apparently correlate with outcrops of Paleozoic rock at many locations, while relative gravity lows correlate with outcrops of granitic rock.

An airborne magnetic survey was useful in mapping the extent of volcanic flow rocks under the alluvium. Flow rocks are common in the eastern half of the quadrangle, and extend about 6 miles north of the Twin Buttes quadrangle, under cover.

Electrical resistivity soundings were made at 12 locations over the thrust sheet to determine its thickness. The greatest depths to basement rocks were found to be 2,000 to 2,500 feet, in the central part of the thrust sheet. The sheet thins gradually to the west and north, more abruptly to the south.

2/20/61

Bob Lacy —:
Dean Kent
Bert Morrison.

Tuesday Afternoon 2:PM.
Khorassan "A" Room Chase

*

Heyburn: 6000 γ = ore at Tahawus.

Plouff: Helmet Fanglomerate Density 2.4-2.5
Granite " 2.7
LS " 2.75

Gravity highs = LS areas or zones
" lows = Gr. " " "

Fauenstoth says: he saw 12000 '/" Gyp that would not rip.

3/25/61 he did { " he will send collection of 2"x2" kodachrome slides on Seis uses and problems.

MEH.

MEH.

Adam Juan Garcia

1/2 interest of W 1/2 SE 1/4 Sec 26

1/4 " " SE 1/4 SE 1/4 & SW 1/4 SW 1/4 Sec 25

Maria Josepha Garcia (Sister of Adam Juan) identical interest to above of " "

Jose Juan Garcia (Uncle of above)

1/2 of SE 1/4 SE 1/4 & SW 1/4 SW 1/4 of Sec 25

35.00 to Treas of U.S.A. for estate probation.

20.00 each to above (token good faith payment)

UNITED GEOPHYSICAL CO., INC.
P. O. BOX 7005
TUCSON, ARIZONA
RECEIVED
NOV 30 1951

Form No. 5-776

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

OFFICE RECEIPT

NOV 28 '51

Received of United Geophysical Company, Inc.
(Name)

Address P.O.Box 911-M Pasadena 20, California $ 95.00

Ninety-five and No/100---------- Dollars

Description of Remittance: (For money orders, drafts, checks, and other negotiable papers, give description, including date, numbers, etc.)

Valley Natl.Bank; Tucson, Arizona Check No.277 dated Nov.15,1951 - $95.

Field receipt Nos. ..... to .....

DESCRIPTION	QUANTITY	UNIT PRICE	AMOUNT	FUNDS TO BE CREDITED
Proceeds of consideration for a mineral prospecting agreement on the San Xavier Indian Reservation on Allotments 174 and 176, originally allotted to Francisco Garcia and Antonio Garcia, deceased Papago Indians. Credited in unapplied collections pending determination of shares of heirs to Allotments 174 & 176.			95.00	Acc. 66.10 Unapplied Special Deposits Collections-Sundry.
		Total,	95.00	

Remittances, if not in cash, are accepted subject to collection.

Nov. 26, 1951
(Date)

103-Papago Agency; Arizona
(Agency)

№ 890383

L. L. Nelson, Special Disbursing Agent
Sym.892-227

Harry L. Stevens
(Signature)

by: Harry L. Stevens, Supt.& DDA
(Title)

Original

U. S. GOVERNMENT PRINTING OFFICE 16—24989-2

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS
FIELD SERVICE
Papago Indian Agency
Sells, Arizona

RECEIVED
OCT 5 1951
UNITED GEOPHYSICAL CO., INC.
P. O. BOX 7005
TUCSON, ARIZONA

AGREEMENT

1. This agreement made and entered into this 20th day of September, 1951 by and between the United Geophysical Company, Inc., of Box 911-M, Pasadena, California through their Agent, W. E. Heinrich, Jr., hereinafter called the Lessee and the undersigned heirs to San Xavier Allotment No. 174, originally allotted to Francisco Garcia and San Xavier Allotment No. 176, originally allotted to Antonio Garcia, both deceased Papago Indians, hereinafter called the Lessors:

   Witnesseth: That parties hereto for the considerations hereinafter mentioned covenant and agree as follows:

2. The Lessors hereby agree to allow the Lessee to prospect for mining ore and to test drill not to exceed 5 holes which shall be cased and left capped at the expiration of this agreement within the boundaries of the San Xavier allotments hereinbefore mentioned.

3. This agreement shall be for prospecting of minerals only and no ore shall be taken from the premises only for sampling purposes. Further, this agreement is not to be construed in any manner by either party as being an option or right to a mining lease at the expiration of said agreement.

4. This agreement shall take effect immediately upon approval of the Superintendent of the Papago Indian Agency, Sells, Arizona and shall be in effect for a period not to exceed six (6) months.

5. The consideration for this agreement shall be ninety-five ($95.00) dollars payable by the Lessee in advance.

Witnesses:

_____

_____

_____

_____

_____

_____

Heirs to the San Xavier
Allotments 174 and 176

Adam J. Garcia
Adam Juan Garcia

Maria Josepha Garcia
Maria Josepha Garcia

Jose Juan Garcia
Jose Juan Garcia

United Geophysical Co., Inc.

BY: W. E. Heinrich Jr.
W. E. Heinrich, Jr
Engineer - Agent.

APPROVED Harry L Stevens 11/26/51

Harry L. Stevens,
Superintendent

UNITED STATES
DEPARTMENT OF THE INTERIOR
Papago Indian Agency
Sells, Arizona

Silver Bell South

_____

_____ (Date)

Dear Sir:

We have your letter dated _____ requesting information regarding mining claims in the Papago Reservation.

Section 185.37 (Part 185, Title 43, Code of Federal Regulations) is quoted below for your information in part.

"In addition to complying with the existing laws and regulations governing the recording of mining locations with the proper local recording officer, the locator of a mining claim within the Papago Indian Reservation shall furnish to the superintendent or other officer in charge of the reservation, within 90 days of such location, a copy of the location notice, together with a sum amounting to 5 cents for each acre and 5 cents for each fractional part of an acre embraced in the location for deposit with the Treasury of the United States to the credit of the Papago Tribe as yearly rental. Failure to make the required annual rental payment in advance each year until an application for patent has been filed for the claim shall be deemed sufficient grounds for invalidating the claim. The payment of annual rental must be made to the superintendent or other officer in charge of the reservation each year on or prior to the anniversary date of the mining location."

The function of this agency in connection with mineral locations in the Papago Indian Reservation is set forth in the Act of June 18, 1934 (48 Stat.984; 25 U.S.C. 461-479), as amended by the Act of August 28, 1937 (50 Stat.862; 25 U.S.C.,Sup.,463). Briefly, we collect and deposit yearly rentals once a claim is locate d and a copy of the location notice is filed with this office; we also investigate damages for the loss of improvements on the land. The only record we are required to maintain, in addition to the copy of the location notice, is a record of payments. We report delinquent claims to the Bureau of Land Management, Department of the Interior, and they are voided by that office for nonpayment of rentals. It is not the function of this office to advise prospective locators as to available property open for location or to give any infor mation as to mining opportunities in the Papago Reservation. In fact, such information is not available to us. I suggest that you obtain a copy of the Lode and Placer Mining Regulations from your nearest District Land Office, Bureau of Land Management which is located in the Federal Building _____

_____.

Counties wherein claims are located keep accurate assessment work records on claims; their records should be consulted in cases involving trespassing, overlapping, and location delinquencies.

Sincerely yours,

Harry L. Stevens
Superintendent

UNITED GEOPHYSICAL COMPANY, INC.
595 EAST COLORADO STREET, PASADENA 1, CALIFORNIA

TELEPHONES:
PASADENA, SYCAMORE 6-9261
LOS ANGELES, RYAN 1-6774

Box 7005
Tucson, Arizona
September 17, 1951

U. S. Department of Interior
Sells Indian Agency
Papago Indian Reservation
Sells, Arizona

Gentlemen:

We are interested in the possibility of acquiring some land or else a permit or lease on some land within the San Xavier District of the Papago Indian Reservation for mining purposes. The area under consideration is the south half of the southeast quarter Section 26, T 16 S, R 12 E.

What is the prodedure to follow in order to do this type of work on the reservation?

Very truly yours,

UNITED GEOPHYSICAL COMPANY

W. E. Heinrichs, Jr.
Engineer

actually referred to S 1/2 of SE 1/4 of Sec 26
T16S R12E

Title 25, Code of Regs.

REGULATIONS GOVERNING THE LEASING OF TRIBAL LANDS FOR MINING PURPOSES

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The Act of May 11, 1938 (Public No. 506 - 75th Congress), provides:

"That hereafter unallotted lands within any Indian reservation or lands owned by any tribe, group, or band of Indians under Federal jurisdiction, except those hereinafter specifically excepted from the provisions of this act, may, with the approval of the Secretary of the Interior, be leased for mining purposes, by authority of the tribal council or other authorized spokesmen for such Indians, for terms not to exceed ten years and as long thereafter as minerals are produced in paying quantities.

"Sec. 2. That leases for oil and/or gas mining purposes covering such unallotted lands shall be offered for sale to the highest responsible qualified bidder, at public auction or on sealed bids, after notice and advertisement, upon such terms and subject to such conditions as the Secretary of the Interior may prescribe. Such advertisement shall reserve to the Secretary of the Interior the right to reject all bids whenever in his judgment the interest of the Indians will be served by so doing, and if no satisfactory bid is received, or the accepted bidder fails to complete the lease, or the Secretary of the Interior shall determine that it is unwise in the interest of the Indians to accept the highest bid, said Secretary may readvertise such lease for sale, or with the consent of the tribal council or other governing tribal authorities, a lease may be made by private negotiations: Provided, That the foregoing provisions shall in no manner restrict the right of tribes organized and incorporated under sections 16 and 17 of the act of June 18, 1934 (48 Stat. 984), to lease lands for mining purposes as therein provided and in accordance with the provisions of any constitution and charter adopted by any Indian tribe pursuant to the act of June 18, 1934.

"Sec. 3. That hereafter lessees of restricted Indian lands, tribal or allotted, for mining purposes, including oil and gas, shall furnish corporate surety bonds, in amounts satisfactory to the Secretary of the Interior, guaranteeing compliance with the terms of their leases: Provided, That personal surety bonds may be accepted where the sureties deposit as collateral with the said Secretary of the Interior any public debt obligations of the United States guaranteed as to principal and interest by the United States, equal to the full amount of such bonds, or other collateral satisfactory to the Secretary of the Interior, or show ownership of unencumbered real estate of a value equal to twice the amount of the bonds.

"Sec. 4. That all operations under any oil, gas, or other mineral lease issued pursuant to the terms of this or any other act affecting restricted Indian lands shall be subject to the rules and regulations promulgated by the Secretary of the Interior. In the discretion of the said Secretary any lease for oil or gas issued under the provisions of this act shall be made subject to the terms of any reasonable co-operative unit or other plan approved or prescribed by said Secretary prior or subsequent to the issuance of any such lease which involves the development or production of oil or gas from land covered by such lease.

"Sec. 5. That the Secretary of the Interior may, in his discretion, authorize Superintendents or other officials in the Indian Service to approve leases for oil, gas, or other mining purposes, covering any restricted Indian lands, tribal or allotted.

"Sec. 6. Sections one, two, three, and four of this act shall not apply to the Papago Indian Reservation in Arizona, the Crow Reservation in Montana, the ceded lands of the Shochone Reservation in Wyoming, the Osage Reservation in Oklahoma, nor to the coal and asphalt lands of the Choctaw and Chickasaw Tribes in Oklahoma.

"Sec. 7. All acts or parts of acts inconsistent herewith are hereby repealed."

To carry these provisions of law into effect, except as to the reservations named in section 6 of the above quoted act where separate regulations are in effect, the following regulations are prescribed:

DEFINITIONS

Sec. 1. The term "superintendent" herein refers to the superintendent or other officer of the Indian Service or of the Government who may have jurisdiction over the lands involved.

The term "supervisor" herein refers to a representative of the Secretary of the Interior, under direction of the Geological Survey, authorized and empowered to supervise and direct operations under oil and gas or other mining leases, to furnish scientific and technical information and advice, to ascertain and record the amount and value of production, and to determine and record rentals and royalties due and paid.

HOW TO ACQUIRE LEASES

Sec. 2. Tribal Council may Authorize Leases to be made. The Tribal Council of any Indian tribe, speaking for such Indians by resolution properly authenticated, may authorize the Secretary of the Interior to advertise the sale of leases for mining purposes on their tribal lands not needed for farming or agricultural purposes. Except where a tribe is authorized to execute its own leases pursuant to tribal constitution and charter adopted and approved pursuant to provisions contained in the act of June 18, 1934 (48 Stat. 984), the act of May 1, 1936 (49 Stat. 1250) or the act of June 26, 1936 (49 Stat. 1967), the Secretary of the Interior may thereafter authorize and empower any person to be by him designated to execute for and on behalf of any tribe, and subject to his approval, all leases on such lands for oil and gas or other mining purposes.

Sec. 3. Sale of Oil and Gas Leases. At such times as the Secretary of the Interior may direct, after being authorized by the tribal council, the superintendent shall publish and distribute notices, at least 15 days prior to the sale, that oil and gas leases on specific tracts, each of which shall be in a compact body, will be offered at public auction to

the highest responsible bidder. The successful bidder must deposit with the superintendent, on the day of the sale, a certified check or bank draft on a solvent bank in an amount equal to 20 percent of the bonus bid and of the first year's rental as a guaranty of good faith. The balance of the bonus and of the first year's rental shall be paid and the lease in completed form shall be filed with the superintendent within 20 days after the lease is forwarded to the lessee for execution, unless such period shall have been extended by the superintendent for good and sufficient reason. If the successful bidder fails to complete the lease or pay the full consideration within said period or extension thereof, or if the lease is disapproved through no fault of the lessor or of the Department, the amount of bonus and rental deposited will be forfeited, as liquidated damages, for the use and benefit of the Indian lessor.

All notices or advertisements of sales of oil and gas leases shall reserve to the Secretary of the Interior the right to reject all bids when in his judgment the interests of the Indians will be best served by so doing, and that if no satisfactory bid is received, or if the accepted bidder fails to complete the lease, or if the Secretary of the Interior shall determine that it is unwise in the interests of the Indians to accept the highest bid, the Secretary may readvertise such lease for sale, or if deemed advisable, with the consent of the Tribal Council or other governing tribal authorities, a lease may be made by private negotiations.

Sec. 4. Government Employees cannot acquire Leases. No lease, assignment thereof, or interest therein will be approved to any employee or employees of the United States Government whether connected with the Indian Service or otherwise, and no employee of the Interior Department shall be permitted to acquire any interest in any mineral lease covering restricted Indian lands by ownership of stock in corporations having such leases or in any other manner.

Sec. 5. Corporations and Corporate Information. If the applicant for a lease is a corporation, it shall file evidence of authority of its officers to execute papers; and with its first application it shall also file a certified copy of its articles of incorporation, and, if foreign to the State in which the lands are located, evidence showing compliance with the corporation laws thereof. Statements of changes in officers and stockholders shall be furnished by a corporation lessee to the superintendent January 1 of each year, and at such other times as may be requested.

Whenever deemed advisable in any case the superintendent may require a corporation applicant or lessee to file:

(I) Lists of officers, principal stockholders, and directors, with post office addresses and number of shares held by each.

(II) A sworn statement of the proper officer showing:

(a) The total number of shares of the capital stock actually issued and the amount of cash paid into the treasury on each share sold; or, if paid in property, the kind, quantity, and value of the same paid per share.

(b) Of the stock sold, how much remains unpaid and subject to assessment.

(c) The amount of cash the company has in its treasury and elsewhere.

(d) The property, exclusive of cash, owned by the company and its value.

(e) The total indebtedness of the company and the nature of its obligations.

(f) Whether the applicant or any person controlling, controlled by or under common control with the applicant has filed any registration statement, application for registration, prospectus or offering sheet with the Securities and Exchange Commission pursuant to the Securities Act of 1933 or the Securities Exchange Act of 1934 or said Commission's rules and regulations under said Acts; if so, under what provision of said Acts or rules and regulations; and what disposition of any such statement application, prospectus or offering sheet has been made.

(III) Affidavits of individual stockholders, setting forth in what corporations or with what persons, firms, or associations such individual stockholders are interested in mining leases on restricted lands within the State, and whether they hold such interests for themselves or in trust.

Sec. 6. Bond. Lessees shall furnish with each lease, a bond (form 5-157c with an acceptable company authorized to act as sole surety. Such bond shall be in amount as follows: For less than 80 acres, $1,000; for 80 acres and less than 120 acres, $1,500; for 120 acres and not more than 160 acres, $2,000; and for each additional 40 acres, or part thereof, above 160 acres, $500: Provided, That a lessee may file one bond (form 5-157f) in the sum of $15,000, covering all leases of a particular class in any one State up to 10,240 acres, to which he is or may become a party. The right is reserved at any time before or after approval of the lease to increase the amount of a bond above the sum named, in any case where the Secretary of the Interior deems it proper to do so. Personal surety bonds may be accepted where the sureties deposit as collateral with the said Secretary of the Interior any public-debt obligations of the United States guaranteed as to principal and interest by the United States equal to the full amount of such bonds, or other collateral satisfactory to the Secretary of the Interior, or show ownership of unencumbered real estate of a value equal to twice the amounts of the bonds. In lieu of other bonds, lessees may execute their own surety contracts upon deposit, with the Secretary of the Interior, of Government bonds, equal in value to the full amount of the bond, as collateral (form 5-154a).

Sec. 7. Lessees to furnish Additional Information. The superintendent may, either before or after approval of a lease, call for any additional information desired to carry out these regulations. If a lessee shall fail to furnish the papers necessary to put his lease and bond in proper form for consideration, the superintendent shall forward such lease for disapproval.

Sec. 8. Lands to be in Compact Body. The area covered by a lease shall be in a reasonably compact body and shall conform to the system of public-land surveys, except that leases covering lode ground may consist of one or more adjoining parallelograms 1,500 feet in length by 600 feet in width, as provided by the United States mining laws. No lease under these regulations shall convey any extralateral rights, and no coal lease shall have a length exceeding one mile along the outcrop.

ACREAGE LIMITATION

Sec. 9* No individual, corporation, partnership, company, or association shall hold under leases for mining purposes Indian tribal lands and restricted allotted Indian lands in any one State in excess of the following areas, exclusive of holdings in the Five Civilized Tribes and the Osage Nation:

(1) On deposits of the nature of lodes or veins, containing ores of gold, silver, copper, lead, zinc, or other useful metals, not more than 640 acres.
(2) For beds of placer gold, gypsum, asphaltum, phosphate, iron ores, or other useful minerals except coal, oil, and gas, not more than 960 acres.
(3) For coal, not more than 10,240 acres.
(4) For oil or gas, not more than 15,360 acres, except as follows:

(i) State of Oklahoma - no limitation.
(ii) Tribal lands within that part of the Navajo Reservation lying within the State of New Mexico - 10,240 acres irrespective of other holdings in said State.
(iii) Leases operated under a cooperative or unit plan approved or prescribed by the Secretary of the Interior shall not be considered in determining holdings under this subparagraph.

(b) For the purposes of this section:

(1) Acreage leased by an officer or director of a corporation, company, or association, or by a stockholder holding 40 percent or more of the stock of the corporation, company, or association, shall be charged against the corporation, company, or association, and vice versa.

(2) Acreage leased by a member of a partnership shall be charged against the partnership, and vice versa.

(3) The acreage of corporations, companies, or associations having common stockholders owning a majority of the stock of each corporation, company, or association, or having one or more common officers or directors, shall be charged against each other.

* As amended May 1, 1947 (12 F.R.3051.

TERM OF LEASES

Sec. 10. Oil and gas mining leases shall be made for periods of ten years from the date of approval by the Secretary of the Interior and as much longer as the substances specified in the lease are produced in paying quantities.

Leases for minerals other than oil and gas shall be for a period of ten years.

GOVERNMENT RESERVES RIGHT TO
BUY MINERALS PRODUCED

Sec. 11. In time of war or other public emergency all of the executive departments of the United States Government shall have the option to purchase at the posted market price on the date of sale all or any part of the substance or substances produced under any lease.

RENTS AND ROYALTIES

Sec. 12. Manner of Payments. Except where otherwise provided by the terms of leases where the tribes are organized under the act of June 18, 1934 (48 Stat. 984), all rents and other payments due under leases which have been or may be approved by the Secretary of the Interior shall be paid to the superintendent or to such other person as may be designated by the Secretary of the Interior, for the benefit of the lessors. Except advance payments for the first year which shall be sent direct to the superintendent at the time of filing leases, payments of rental and royalty under leases shall be transmitted through the supervisor, shall be accompanied by a statement by the lessee, in triplicate, showing the specific items of rental or royalty that the remittance is intended to cover, and shall be made at such time or times as the lease provides.

In the event of the discovery of minerals in paying quantities all advance payments shall be allowed as credit on stipulated royalties for the year for which such advance payments have been made. No refund will be made under oil, gas, or other mining leases, in the event that royalty from production is not sufficient to equal the advance payment, nor will any part of the moneys so paid be refunded to the lessee because of any subsequent surrender or cancellation of the lease, nor shall the lessee be relieved from the obligation to pay said advance rental annually when it becomes due, by reason of any subsequent surrender or cancellation of the lease.

Sec. 13. Rates of Rentals and Royalties under Oil and Gas Leases. The lessee shall pay, beginning with the date of approval of oil and gas leases by the Secretary of the Interior, a rental of $1.25 per acre per annum in advance during the continuance thereof, together with a royalty of 12½ per cent of the value or amount of all oil, gas, and/or natural gasoline, and/or all other hydrocarbon substances produced and saved from the

land leased, save and except oil, and/or gas used by the lessee for development and operation purposes on the lease, which oil or gas shall be royalty free. During the period of supervision, "value" for the purposes of the lease may, in the discretion of the Secretary of the Interior, be calculated on the basis of the highest price paid or offered (whether calculated on the basis of short or actual volume) at the time of production for the major portion of the oil of the same gravity, and gas, and/or natural gasoline, and/or all other hydrocarbon substances produced and sold from the field where the leased lands are situated, and the actual volume of the marketable product less the content of foreign substances as determined by the supervisor. The actual amount realized by the lessee from the sale of said products may, in the discretion of the Secretary of the Interior, be deemed mere evidence of or conclusive evidence of such value. When paid in value, such royalties shall be due and payable monthly on the last day of the calendar month following the calendar month in which produced; when royalty on oil produced is paid in kind, such royalty oil shall be delivered in tanks provided by the lessee on the premises where produced without cost to the lessor unless otherwise agreed to by the parties thereto, at such time as may be required by the lessor. The lessee shall not be required to hold such royalty oil in storage longer than 30 days after the end of the calendar month in which said oil is produced. The lessee shall be in no manner responsible or held liable for loss or destruction of such oil in storage by causes beyond the lessee's control. In determining the value for royalty purposes of products, such as natural gasoline, that are derived from treatment of gas, a reasonable allowance for the cost of manufacture shall be made, such allowance to be two thirds of the value of the marketable product unless otherwise determined by the Secretary of the Interior on application of the lessee or on his own initiative, and that royalty will be computed on the value of gas or casinghead gas, or on the products thereof (such as residue gas, natural gasoline, propane, butane, etc.), whichever is the greater.

If the leased premises produce gas in excess of the lessee's requirements for the development and operation of said premises, then the lessor may use sufficient gas, free of charge, for any desired school or other buildings belonging to the tribe, by making his own connections to a regulator installed, connected to the well and maintained by the lessee, and the lessee shall not be required to pay royalty on gas so used. The use of such gas shall be at the lessor's risk at all times.

Sec. 14. Annual Rentals and Expenditures for Development on Leases other than Oil and Gas. Lessees other than oil and gas lessees shall pay on all leases annually in advance for the first calendar year or fraction thereof a rent of 25 cents per acre; for the second and third years, 50 cents per acre; and for the fourth and each succeeding calendar year $1 per acre.

On all leases of class (b) referred to in section 9 of these regulations, there shall be expended annually in actual mining operations, development, or improvements upon the land leased, or for the benefit thereof, a sum which, with the annual rental, shall amount to not less than $5 per acre.

On all leases of class (c) referred to in section 9 of these regulations, there shall be expended annually in actual mining operations, development, or improvements upon the land leased, or for the benefit thereof, a sum which, with the annual rental, shall amount to not less than $100 for each 160 acres or fraction thereof included in the lease.

On all leases of class (d) referred to in section 9 of these regulations there shall be expended annually in actual mining operations, development, or improvements upon the land leased, or for the benefit thereof, a sum which, with the annual rental, shall amount to not less than $10 per acre.

Each lessee of a nonproducing lease designated in class (b), (c), or (d) in section 9 of these regulations, shall file with the superintendent an itemized statement in duplicate within 20 days after the close of each calendar year of the amount and character of said expenditure during such year, the statement to be certified under oath by the lessee or his agent having personal knowledge of the facts contained therein.

Sec. 15. Royalty Rates for Minerals other than Oil and Gas. For substances other than gold, silver, copper, lead, zinc, tungsten, coal, asphaltum and allied substances, oil, and gas, the lessee shall pay quarterly or as otherwise provided in the lease, a royalty of not less than ten per cent of the value, at the nearest shipping point, of all ores, metals, or minerals marketed.

For gold, silver, copper, lead, zinc, and tungsten, the lessee shall pay quarterly or as otherwise provided in the lease, a royalty of not less then ten per cent, to be computed on the value of bullion as shown by mint returns after deducting forwarding charges to the point of sale, and to be computed on the value of ores and concentrates as shown by reduction returns after deducting freight charges to the point of sale. Duplicate returns shall be filed by the lessee with the superintendent within ten days after the ending of the quarter or other period specified in the lease within which such returns are made: Provided, however, That the lessee shall pay quarterly or as otherwise provided in the lease, a royalty of not less than ten per cent of the value of ores and concentrates sold at the mine.

For coal the lessee shall pay quarterly or as otherwise provided in the lease, a royalty of not less than ten cents per ton of 2,000 pounds of mine-run, or coal as taken from the mine, including what is commonly called "slack."

For asphaltum and allied substances the lessee shall pay quarterly or as otherwise provided in the lease, a royalty of not less than 10 cents per ton of 2,000 pounds on crude material and of not less than 60 cents per ton on refined substances.

Sec. 16. Time of Making Royalty Payments. Royalty payments under producing oil and gas leases shall be made monthly on or before the last day of the calendar month following the calendar month for which such payment is to be made.

Sec. 17. Division Orders. Lessees may make arrangements with the purchasers of oil for the payment of the royalties to the superintendent by such purchasers, but such arrangement, if made, shall not operate to relieve a lessee from responsibility should the purchaser fail or refuse to pay royalties when due. Where lessees avail themselves of this privilege, division orders permitting the pipe line companies or other purchasers of the oil to withhold the royalty interest shall be executed and forwarded to the supervisor for approval, as pipe line companies are not permitted to accept or run oil from leased Indian lands until after the approval of a division order showing that the lessee has a lease regularly approved and in effect. When the lessee company runs its own oil, it shall execute an intra-company division order and forward it to the supervisor for his consideration. The right is reserved for the supervisor to cancel a division order at any time or require the pipe line company to discontinue to run the oil of any lessee who fails to operate the lease properly or otherwise violates the provisions of the lease, of these regulations, or of the operating regulations.

When oil is taken by authority of a division order, the lessee or his representative shall be actually present when the oil is gauged and records are made of the temperature, gravity, and impurities. The lessee will be held responsible for the correctness and the correct recording and reporting of all of the foregoing measurements; which, except lowest gauge, shall be made at the time the oil is turned into the pipe line. Failure of the lessee to perform properly these duties will subject the division order to revocation.

OPERATIONS

Sec. 18, Inspection of Leased Premises, and Books and Accounts of lessee. Lessees shall agree to allow the lessors and their agents or any authorized representative of the Interior Department to enter, from time to time, upon and into all parts of the leased premises for the purpose of inspection, and shall further agree to keep a full and correct account of all operations and make reports thereof, as required by the regulations of the Department governing operations on public and restricted Indian lands; and their books and records, showing manner of operations and persons interested, shall be open at all times for examination of such officers of the Department as shall be instructed in writing by the Secretary of the Interior or authorized by regulations, to make such examination.

Sec. 19. Diligence, and Prevention of Waste. The lessee shall exercise diligence in drilling and operating wells for oil and gas on the leased lands while such products can be secured in paying quantities; carry on all operations in a good and workmanlike manner in accordance with approved methods and practice, having due regard for the prevention of waste of oil or gas developed on the land, or the entrance of water through wells drilled by the

lessee to the productive sands or oil or gas-bearing strata to the destruction or injury of the oil or gas deposits, the preservation and conservation of the property for future productive operations, and to the health and safety of workmen and employees; plug securely all wells before abandoning the same and to shut off effectually all water from the oil or gas-bearing strata;not drill any well within 200 feet of any house or barn on the premises without the lessor's written consent approved by the superintendent; carry out at his expense all reasonable orders and requirements of the supervisor relative to prevention of waste, and preservation of the property and the health and safety of workmen; bury all pipelines crossing tillable lands below plow depth unless other arrangements therefor are made with the superintendent; pay the lessor all damages to crops, buildings, and other improvements of the lessor occasioned by the lessee's operations: Provided, That the lessee shall not be held responsible for delays or casualties occasioned by causes beyond the lessee's control.

Sec. 20. Permission to Start Operations. No operations will be permitted on any lease before it is approved by the Secretary of the Interior.

Written permission must be secured from the supervisor before any operations are started on the leased premises. After such permission is secured the operations must be in accordance with the operating regulations promulgated by the Secretary of the Interior. Copies of these regulations may be secured from either the supervisor or the superintendent and no operations should be attempted without a study of the operating regulations.

Sec. 21. Restrictions on Operations. Oil and gas leases issued under the provisions of these regulations shall be subject to imposition by the Secretary of the Interior of such restrictions as to time or times for the drilling of wells and as to the production from any well or wells as in his judgment may be necessary or proper for the protection of the natural resources of the leased land and in the interest of the lessor. In the exercise of his judgment the Secretary of the Interior may take into consideration, among other things, the Federal laws, State laws, regulations by competent Federal or State authorities, lawful agreements among operators regulating either drilling or production, or both, and any regulatory action desired by tribal authorities.

All such leases shall be subject to any co-operative or unit development plan affecting the leased lands that may be required by the Secretary of the Interior, but no lease shall be included in any cooperative or unit plan without prior approval of the Secretary of the Interior, and consent of the Indian tribe affected.

Sec. 22. Penalties. Failure of the lessee to comply with any provisions of the lease, of the operating regulations, of these regulations, order of the superintendent or his representative, or of the orders of the supervisor or his representative, shall subject the lease to cancellation by the Secretary of the Interior or the lessee to a penalty of not more than $500 per day for each and every day the terms of the lease, the regulations, or such orders are violated; or to both such penalty and cancellation: Provided, That the

lessee shall be entitled to notice and hearing, within 30 days after such notice, with respect to the terms of the lease, regulations, or orders violated, which hearing shall be held by the supervisor, whose findings shall be conclusive unless an appeal be taken to the Secretary of the Interior within 30 days after notice of the supervisor's decision, and the decision of the Secretary of the Interior upon appeal shall be conclusive.

Sec. 23. Mines to be Timbered Properly. In mining operations the lessee shall keep the mine well and sufficiently timbered at all points where necessary, in accordance with good mining practice, and in such manner as may be necessary to the proper preservation of the leased property and safety of the workmen.

Sec. 24. Surrender of Leased Premises in Good Condition. On expiration of the term of a lease, or when a lease is surrendered, the lessee shall deliver to the Government the leased ground with the mine workings in good order and condition, and bondsmen will be held for such delivery in good order and condition, unless relieved by the Secretary of the Interior for cause. It shall, however, be stipulated that the machinery necessary to operate the mine is the property of the lessee, but that it may be removed by him only after the condition of the property has been ascertained by inspection by the Secretary of the Interior or his authorized agents, to be in satisfactory condition.

FEES

Sec. 25. All leases and assignments shall be executed in sextuplet and when filed with the superintendent shall be accompanied by a filing fee of $5 which is hereby required pursuant to provisions contained in the act of February 14, 1920 (41 Stat. 408-415), as amended by the act of March 1, 1933 (47 Stat. 1417; 25 U. S. C. 413). This fee will be refunded in case the instrument is disapproved.

ASSIGNMENTS

Sec. 26. (a) Approved leases or any interest therein may be assigned or transferred only with the approval of the Secretary of the Interior, and to procure such approval the assignee must be qualified to hold such lease under existing rules and regulations and shall furnish a satisfactory bond conditioned for the faithful performance of the covenants and conditions thereof; Provided, That in order for such assignment to receive favorable consideration the lessee shall assign either his whole interest or an undivided interest in the whole lease.

(b) No lease or interest therein or the use of such lease shall be assigned, sublet, or transferred, directly or indirectly, by working or drilling contract, or otherwise, without the consent of the Secretary of the Interior.

(c) Assignments of leases, and stipulations modifying the terms of existing leases, which stipulations are also subject to the approval of the Secretary of the Interior, shall be filed with the superintendent within 30 days after the date of execution.

CANCELLATIONS

Sec. 27. When, in the opinion of the Secretary of the Interior, the lessee has violated any of the terms and conditions of a lease or of the applicable regulations, the Secretary of the Interior shall have the right at any time after 30 days notice to the lessee specifying the terms and conditions violated, and after a hearing, if the lessee shall so request within 30 days after issuance of the notice, to declare such lease null and void, and the lessor shall then be entitled and authorized to take immediate possession of the land.

On the following conditions, the lessee may, on approval of the Secretary of the Interior, surrender a lease or any part of it:

(a) That he make application for cancellation to the superintendent having jurisdiction over the land.

(b) That he pay a surrender fee of one dollar at the time the application is made.

(c) That he pay all royalties and rentals due to the date of such application.

(d) That he make a satisfactory showing that full provision has been made for conservation and protection of the property and that all wells, drilled on the portion of the lease surrendered, have been properly abandoned.

(e) If the lease has been recorded, that he file, with his application, a recorded release of the acreage covered by the application.

(f) If the application is for the cancellation of the entire lease or the entire undivided portion, that he surrender the lease: Provided, That where the application is made by an assignee to whom no copy of the lease was delivered, he will be required to surrender only his copy of the assignment.

(g) If the lease (or portion being surrendered or canceled) is owned in undivided interests by more than one party, then all parties shall join in the application for cancellation.

(h) That all required fees and papers must be in the mail or received on or before the date upon which rents and royalties become due, in order for the lessee and his surety to be relieved from liability for the payment of such royalties and rentals.

(i) If there has been a contest respecting a lease or leases, the approved, the disapproved, or the canceled parts thereof will be held in the office of the superintendent for five days after the Department's decision has been promulgated, by mail or delivery, and will not be delivered, if within that period a motion for review and reconsideration be filed, until such motion is passed upon by the Department.

(j) In the event oil or gas is being drained from the leased premises by wells not covered by the lease; the lease, or any part of it, may be surrendered only on such terms and conditions as the Secretary of the Interior may determine to be reasonable and equitable.

No part of any advance rental shall be refunded to the lessee nor shall he be relieved, by reason of any subsequent surrender or cancellation of the lease, from the obligation to pay said advance rental when it becomes due.

Sec. 27A: Prospecting Permits. With the consent of the Tribal Authorities the Superintendent may issue permits to prospect for minerals other than oil and gas upon tribal lands. Such permits must describe the area to be prospected and definitely state the period of time within which such work is permitted. No ores shall be removed from the reservation under such permits, except samples for assay and experimental purposes. A prospecting permit will not give the permittee any preference right to a lease, unless specifically so stated in the permit, and all permits granting a preference right to a lease must comply with all the laws and regulations applicable to mineral leases on tribal Indian lands.

EFFECTIVE DATE OF THESE REGULATIONS

Sec. 28. These regulations shall become effective and in full force from and after the date of approval, and shall be subject to change or alteration at any time by the Secretary of the Interior: Provided, That no regulations made after the approval of any lease shall operate to affect the term of the lease, rate of royalty, rental, or acreage unless agreed to by both parties to the lease. All former regulations governing the leasing of tribal lands for mining purposes are superseded by these regulations.

EXEMPTION OF LEASES MADE BY ORGANIZED TRIBES

Sec. 29. These regulations may be superseded by the provisions of any tribal constitution, by-law or charter issued pursuant to the Indian Reorganization Act of June 18, 1934 (48 Stat. 984), the Alaska Act of May 1, 1936 (49 Stat. 1250), or the Oklahoma Indian Welfare Act of June 26, 1936 (49 Stat. 1967), or by ordinance, resolution or other action authorized under such constitution, by-law or charter. These regulations, in so far as they are not so superseded, shall apply to leases made by organized tribes if the validity of the lease depends upon the approval of the Secretary of the Interior.

FORMS

Sec. 30. Applications, leases, and other papers must be upon forms prescribed by the Secretary of the Interior, and the superintendent will furnish prospective lessees with such forms at a cost of ten cents each or $1 per set.

Form 5-154a.	Lessee's personal bond supported by Government securities.
Form 5-157.	Oil and Gas Lease.
Form 5-157b.	Mining lease other than oil and gas.
Form 5-157c.	Bond for separate leases.
Form 5-157d.	Authority of officers to execute papers.
Form 5-157e.	Assignment.
Form 5-157f.	Collective bond.
Form 5-157g.	Stipulation.

Moneys received from the sale of forms should be deposited as Miscellaneous Receipts to the credit of Receipt Account 145060 "Sale of Forms" unless the expense of printing the forms was paid from tribal moneys, in which event, the receipts from the sale of the forms should be deposited to the credit of the tribe.

UNITED STATES
DEPARTMENT OF THE INTERIOR
Office of Indian Affairs

May 25, 1938.

The foregoing regulations are respectfully submitted to the Secretary of the Interior with the recommendation that they be approved.

(Sgd.) John Herrick

Acting Commissioner of Indian Affairs.

Approved: May 31, 1938.

(Sgd.) Oscar L. Chapman

Assistant Secretary of the Interior.

29390

5—154g
(July, 1932)

AFFIDAVIT OF SURETY

(To be used only when individual sureties are offered)

..... } ss:
..... }

I, ..., of .....

State of ....., one of the sureties on the prefixed bond of ....., as ....., depose and say that I am more than twenty-one years of age and in all other respects legally competent to make and enter into a contract; and that I am worth in unincumbered property, over and above my debts, liabilities, and exemptions under the laws of the State of ....., ... dollars and upward, as follows:

Real estate valued at ..... dollars, situate in ....., and consisting of (*a*) .....

.....

.....

Real estate valued at ..... dollars, situate in ....., and consisting of (*b*) .....

.....

.....

.....
(Signature)

.....
(Post office address)

Subscribed and sworn to before me this ..... day of .....

[SEAL]

.....

.....

(*a*) Here state whether city property, improved or unimproved, farm, or unimproved land. Property must be described by street numbers, lot numbers, or section, township, and range numbers.

(*b*) Here describe the nature of the property, whether notes, bonds, stocks, merchandise, etc. State, also, as nearly as practicable, the present market value.

6—3434

STATE OF _____ }
COUNTY OF _____ } ss:

I, _____, do hereby certify that _____, who administered the above oath, was, at the time of doing so, a _____ in and for said _____ duly qualified to act as such and to administer oaths in such cases, and that I believe his signature, as above written, is genuine.

In testimony whereof I have hereunto set my hand and affixed the seal of _____ this _____ day of _____, one thousand nine hundred and _____

_____

_____

U. S. GOVERNMENT PRINTING OFFICE: 1932 6—3434

5-154 g
(August, 1939)

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS

AFFIDAVIT OF SURETY

(To be used only when individual sureties are offered)

State of _____ } ss:
County of _____ }

I, _____, of _____

State of _____, depose and say that I am worth in real property, over and above my debts, liabilities, and exemptions under the laws of the State of _____, _____ dollars and upward, as follows:

Real estate situate in _____ and consisting of (*a*)

_____

_____

_____

_____

That the property herein listed is not community property (*b*) and is unencumbered except for the following (*c*):

_____

_____

_____

That I am the identical person who signed as one of the sureties on the bond covering Indian lands under lease to _____

(Signed) _____

Subscribed and sworn to before me this _____ day of _____, 19____

(Notary Public) _____

My commission expires _____, 19____

(*a*) Here state whether city property, improved or unimproved, farm, or unimproved land. Property must be described by street numbers, lot numbers, or section, township, and range numbers.
(*b*) Applicable to States having community property laws.
(*c*) Here list all encumbrances, stating principal and interest due.

16—11469 U. S. GOVERNMENT PRINTING OFFICE

5—157 c

DEPARTMENT OF THE INTERIOR

OFFICE OF INDIAN AFFAIRS

TO ACCOMPANY MINING LEASES OF TRIBAL LANDS

BOND

Know all men by these presents, That.....

....., of ....., as

principal , and.....

of....., as suret....., are held and firmly bound unto the United

States of America in the sum of.....dollars, lawful money of the

United States, for the payment of which, well and truly to be made, we bind ourselves, and each of us, our heirs, successors, executors, administrators, or assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this .....day of....., 19 .

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the above-bounden.....

....., as principal ,

entered into.....certain indenture of lease, dated.....

with the officer in charge of the.....Tribe of Indians for the lease of a tract of land described as follows:

.....

.....

.....

and located in..... Reservation, ...for .....

.....purposes for the period of.....

.....

Now, if the above-bounden.....

.....

shall faithfully carry out and observe all the obligations assumed in said indenture of lease by.....

.....and shall observe all the laws of the United States, and regulations made, or which shall be made thereunder, for the government of trade and intercourse with Indian tribes, and all the rules and regulations that have been or may be, lawfully prescribed by the Secretary of

the Interior relative to leases executed on the.....Reservation, in the

6—6907

State of _____, then this obligation shall be null and void; otherwise to remain in full force and effect.

Signed and sealed in the presence of—

Witnesses.[1]

_____

P. O. _____ as to _____ [SEAL]

_____

P. O. _____

_____

P. O. _____ as to _____ [SEAL]

_____

P. O. _____

_____

P. O. _____ as to _____ [SEAL]

_____

P. O. _____

_____

P. O. _____ as to _____ [SEAL]

_____

P. O. _____

DEPARTMENT OF THE INTERIOR,

Washington, D. C., _____, 19

Approved:

_____

Assistant Secretary.

DEPARTMENT OF THE INTERIOR,

Washington, D. C., _____, 19

Approved:

_____

Assistant Secretary of the Interior.

[1] Two witnesses to all signatures.

U. S. GOVERNMENT PRINTING OFFICE. 1939

Form 5-157 b
(April 1940)

CONTRACT NO. I..... IND. .....

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS

MINING LEASE—TRIBAL INDIAN LANDS

(FOR MINERALS OTHER THAN OIL AND GAS)

..... Tribe, State of .....

THIS INDENTURE OF LEASE, made and entered into in quintuplicate this ..... day

of ....., 19....., by and between .....

.....

.....

of ....., State of .....

for and on behalf of the ..... Tribe of Indians, designated

herein as lessor, and .....

of ....., State of .....

herein designated as lessee:

WITNESSETH

1. That the lessor , for and in consideration of $1, receipt whereof is hereby acknowledged, and of the royalties, covenants, stipulations, and conditions hereinafter contained and hereby agreed to be paid and observed by the lessee, doth hereby demise, grant, and lease unto the said lessee, the following-described tract of land lying and being within

the ..... Reservation, County of .....

and State of ....., to wit: .....

.....

.....

of section ....., township ....., range ....., ... meridian,

and containing ..... acres, more or less, for the full term of 10 years from the date of approval hereof,

for the sole purpose of prospecting for and mining minerals, as follows: .....

.....

.....

16—15629

the lessee to occupy so much only of the surface of said land as may be reasonably necessary to carry on the work of prospecting for, mining, milling, storing, and removing such minerals.

2. The term "Superintendent" as used herein shall refer to the superintendent or other official in charge of the Indian Agency having jurisdiction over the lands leased.

3. In consideration of the foregoing, the lessee hereby agrees:

(*a*) ROYALTY.—To pay, or cause to be paid, to the Superintendent, for the use and benefit of the lessor, or to the Treasurer of said Tribe where the tribe is organized under the act of June 18, 1934 (48 Stat. 984), as royalties, the sums of money as follows, to-wit:*

.....

.....

.....

All royalties accruing for any month shall be due and payable on or before the 25th day of the month succeeding.

(*b*) ANNUAL RENTAL.—To pay, or cause to be paid, to the Superintendent for the use and benefit of the lessor, or to the Treasurer of said Tribe where the tribe is organized under the act of June 18, 1934 (48 Stat. 984), in advance beginning with the date of approval of the lease, as annual rental, the following: 25 cents per acre for the first calendar year or fraction thereof, 50 cents per acre per annum for the second and third years, and $1 per acre per annum in advance for each and every calendar year thereafter during the continuance of the lease; it being understood and agreed that said sum so paid shall be a credit on the royalties accruing during the year for which the payment of annual rental is made, and that said annual rental when paid shall not be refunded to the lessee because of any subsequent surrender or cancelation hereof.

(*c*) DILIGENCE, PREVENTION OF WASTE.—To exercise diligence in the conduct of prospecting and mining operations; to carry on development and operations in a workmanlike manner and to the fullest possible extent; to commit no waste on the said land and to suffer none to be committed upon the portion in his occupancy or use; to comply with all the requirements of the laws of the State in which the land is located; to take appropriate steps for the preservation of the property and the health and safety of workmen; promptly to surrender and return the premises upon the termination of this lease to whomsoever shall be lawfully entitled thereto, in as good condition as received, excepting for the ordinary wear and tear and unavoidable accidents in their proper use; not to remove therefrom any buildings or permanent improvements erected thereon during the said term by the said lessee, but said buildings and improvements shall remain a part of said land and become the property of lessor, excepting the office fixtures and records, personal property, tools, pumping and drilling outfits, boilers, engines, and mining machinery, which shall remain the property of the lessee and may be removed at any time prior to 60 days after the termination of the lease by forfeiture or otherwise, provided the payments agreed upon by this lease have been made and the lease terms and regulations applicable thereto have been fully complied with, but not otherwise; not to permit any nuisance to be maintained on the premises under lessee's control, nor allow any intoxicating liquors to be sold or given away for any purpose on such premises; and not to use such premises for any other purposes than those authorized in this lease.

(*d*) DEVELOPMENT.—The land described herein shall not be held by the lessee for speculative purposes, but in good faith for mining the minerals specified; and the failure by the lessee in the diligent development and continued operation of the mine or mines, except when operations may be interrupted by strikes, the elements, or casualties not attributable to the lessee, shall be held as a want of compliance with the purposes of this lease and shall render it subject to cancelation: *Provided*, That whenever the Secretary of the Interior shall consider the marketing facilities inadequate or the economic conditions unsatisfactory, he may authorize the suspension of operations for such time as he may deem advisable, but such action will not release the lessee from the payment of the advance annual rental.

(*e*) MONTHLY STATEMENTS.—To keep an accurate account of all mining operations, showing the sales, prices, dates, purchasers, and the whole amount of minerals mined, the amount removed, and the gross receipts derived therefrom, and to furnish the Superintendent or the Treasurer of said Tribe if payments are made to him, sworn

* Here insert the royalties agreed upon in accordance with applicable regulations.

monthly reports thereon not later than the 25th of the succeeding month; and all sums due as royalty and advance rental shall be a lien on all implements, tools, movable machinery, and all other personal chattels used in operation upon said property, and upon all of the unsold minerals obtained from the land herein leased, as security for payment of said sums. An audit of the lessee's accounts and books shall be made annually or at such times as may be directed by the Superintendent by certified public accountants approved by the Secretary of the Interior and at the expense of the lessee. The lessee shall furnish free of cost a copy of such audits to the Secretary of the Interior through the Superintendent within 30 days after the completion of each auditing.

(*f*) REGULATIONS.—To abide by and conform to any and all regulations of the Secretary of the Interior now or hereafter in force relative to such leases: *Provided*, That no regulations hereafter approved shall effect a change in rate of royalty, the annual rental herein specified, or the term of this lease, without the written consent of the parties to this lease.

(*g*) ASSIGNMENT OF LEASE.—Not to assign this lease or any interest therein by an operating agreement or otherwise nor to sublet any portion of the leased premises, except with the approval of the Secretary of the Interior. If this lease is divided by the assignment of an entire interest in any part of it, each part shall be considered a separate lease under all the terms and conditions of the original lease.

(*h*) BOND.—To furnish such bond as may be required by the regulations of the Secretary of the Interior conditioned upon compliance with the terms of this lease.

4. MILLING.—All ores or minerals mined on said land shall be cleaned and prepared for market thereon, and no ore or crushed material shall be removed therefrom to be cleaned or prepared for market without the written consent of the Secretary of the Interior.

5. INSPECTION.—The leased premises and producing operations, improvements, machinery, and fixtures thereon and connected therewith and all books and accounts of the lessee shall be open at all times for inspection by agents of the lessor or any duly authorized representative of the Secretary of the Interior.

6. DISPOSITION OF SURFACE.—The lessor expressly reserves the right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereafter enacted, such disposition to be subject at all times to the right of the lessee herein to the use of so much of said surface as is necessary in the extraction and removal of the minerals from the land herein described in accordance with this lease.

7. SURRENDER AND TERMINATION.—The lessee shall have the right at any time during the term hereof to surrender and terminate this lease or any part thereof upon the payment of all rentals, royalties, and other obligations due and payable to the lessor, and the further sum of $1, upon a showing satisfactory to the Secretary of the Interior that full provision has been made for the conservation and protection of the property, the lease to continue in full force and effect as to the lands not so surrendered. If this lease has been recorded lessee shall file a recorded release with his application to the Superintendent for termination of this lease.

8. CANCELATION AND FORFEITURE.—When, in the opinion of the Secretary of the Interior, there has been a violation of any of the terms and conditions of this lease before restrictions are removed, the Secretary of the Interior shall have the right at any time after 30 days' notice to the lessee, specifying the terms and conditions violated, and after a hearing, if the lessee shall so request within 30 days of receipt of notice, to declare this lease null and void, and the lessor shall then be entitled and authorized to take immediate possession of the land.

9. HEIRS AND SUCCESSORS IN INTEREST.—It is further covenanted and agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors of, or assigns of the respective parties hereto.

10. GOVERNMENT EMPLOYEES CANNOT ACQUIRE LEASE.—No lease, assignment thereof, or interest therein will be approved to any employee or employees of the United States Government whether connected with the Indian Service or otherwise, and no employee of the Interior Department shall be permitted to acquire any interest in such leases by ownership of stock in corporations having leases or in any other manner.

16—15629

IN WITNESS WHEREOF, the said parties have hereunto subscribed their names and affixed their seals on the day and year first above mentioned.

Two witnesses to execution by lessor:

.... [SEAL]

P. O. .....

.... [SEAL]

P. O. .....

Two witnesses to execution by lessee:

.... [SEAL]

P. O. .....

.....

P. O. ..... Attest: .....

ACKNOWLEDGMENT OF LESSOR

STATE OF .....
} *ss:*
COUNTY OF .....

Before me, a notary public, on this ..... day of ....., 19.....

personally appeared .....

....., to me known to be the identical person, who executed the within and foregoing lease, and acknowledged to me that ..... executed the same in ..... official capacit..... as .....

as ..... free and voluntary act and deed for the uses and purposes therein set forth.

.....

Notary Public.

My commission expires .....

UNITED STATES DEPARTMENT OF THE INTERIOR

Washington, D. C., ..., 19.....

The within lease is hereby ..... approved.

.....

Assistant Secretary of the Interior.

Filed for record this ..... day of ....., 19.....

at ..... o'clock ..... m. .....

By .....

Rental received, $.....

16—15629 U. S. GOVERNMENT PRINTING OFFICE

5-154 b
(October 1947)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

BOND

TO ACCOMPANY MINING LEASES

Know All Men by These Presents, That _____

of _____, as principal_____, and _____

_____

of _____, as suret_____, are held and firmly bound unto the United States of America in the sum of _____ dollars, lawful money of the United States of America, for the payment of which well and truly to be made, we bind ourselves, and each of us, our and each of our heirs, executors, administrators, successors, or assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 19_____

The condition of this obligation is such that whereas the above-bounden _____, as principal_____, entered into a certain indenture of lease, dated _____ with _____

_____

_____

for the lease of a tract of land described as follows: _____

_____

_____

and located in the _____ in the State of _____ for _____ mining purposes for the period of _____ years from the date of approval thereof, and as much longer thereafter as the lease shall be continued in force in the manner provided for therein.

Now, if the above-bounden principal herein shall faithfully carry out and observe all the obligations assumed in said indenture of lease, and shall observe all the laws of the United States, and regulations made, or which shall be made thereunder, for the government of trade and intercourse with Indian Tribes, and all the rules and regulations that have been, or may be, lawfully prescribed by the Secretary of the Interior relative to mining leases on the said Reservation, then this obligation shall be null and void; otherwise to remain in full force and effect.

Provided, That in event supervision over all the leased tract to which this bond applies is relinquished by the Secretary of the Interior and lessee shall have made all payments then due under the lease and shall have fully performed all obligations on his part to be performed up to the time of relinquishment of supervision, this bond shall be of no further force and effect.

The rate of premium charged on this bond is $_____; the total premium paid is $_____

[OVER]

Signed and sealed in the presence of—

WITNESSES:

P. O. ---

P. O. ---

as to ---- [SEAL]

P. O. ---

P. O. ---

as to ---- [SEAL]

P. O. ---

P. O. ---

as to ---- [SEAL]

P. O. ---

P. O. ---

as to ---- [SEAL]

(Two witnesses to each signature)

DEPARTMENT OF THE INTERIOR,
Bureau of Indian Affairs,

APPROVED:

Washington, D. C., ----

Acting Commissioner of Indian Affairs.

16—11481-1 U. S. GOVERNMENT PRINTING OFFICE

Form 5-154
(October 1939)

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS

Contract No. _____

MINING LEASE ALLOTTED INDIAN LANDS

(For Minerals other than Oil and Gas)

_____ Mining Lease _____ Reservation
(Write all names and addresses in full)

THIS INDENTURE OF LEASE, made and entered into in quintuplicate, on this _____ day of _____, 19____, by and between _____

_____

allottee No. _____ of the _____ tribe of Indians,

of _____, State of _____

part____ of the first part, hereinafter called the lessor , and _____

_____, of _____

State of _____, part____ of the second part, hereinafter called the lessee , under and in pursuance of the provisions of existing law and the rules and regulations prescribed by the Secretary of the Interior relative to mining leases covering restricted Indian allotments.

WITNESSETH

1. That the lessor , for and in consideration of $1, receipt whereof is hereby acknowledged, and of the royalties, covenants, stipulations, and conditions hereinafter contained and hereby agreed to be paid and observed by the lessee, doth hereby demise, grant, and lease unto the said lessee, the following-described tract of land lying and being within the _____

Reservation, county of _____, and State of _____

to wit: _____

_____

_____

of section _____, township _____, range _____, _____ meridian, and containing _____ acres, more or less, for the full term of 15 years from the date of approval hereof, for the sole purpose of prospecting for and mining minerals, as follows: _____

_____

_____

the lessee to occupy so much only of the surface of said land as may be reasonably necessary to carry on the work of prospecting for, mining, milling, storing, and removing such minerals.

16—12302

2. The term "Superintendent" as used herein shall refer to the superintendent or other official in charge of the Indian Agency having jurisdiction over the lands leased.

3. In consideration of the foregoing, the lessee hereby agrees:

(*a*) ROYALTY.—To pay, or cause to be paid, to the Superintendent, for the use and benefit of the lessor, as royalties, the sums of money as follows, to wit:*

All royalties accruing for any month shall be due and payable on or before the twenty-fifth day of the month succeeding.

(*b*) ANNUAL RENTAL.—To pay, or cause to be paid, to the Superintendent for the use and benefit of the lessor, in advance beginning with the date of approval of the lease, as annual rental, the following: Twenty-five cents per acre for the first calendar year or fraction thereof, 50 cents per acre per annum for the second and third years, and $1 per acre per annum in advance for each and every calendar year thereafter during the continuance of the lease; it being understood and agreed that said sum so paid shall be a credit on the royalties accruing during the year for which the payment of annual rental is made, and that said annual rental when paid shall not be refunded to the lessee because of any subsequent surrender or cancelation hereof.

(*c*) DILIGENCE, PREVENTION OF WASTE.—To exercise diligence in the conduct of prospecting and mining operations; to carry on development and operations in a workmanlike manner and to the fullest possible extent; to commit no waste on the said land and to suffer none to be committed upon the portion in his occupancy or use; to comply with all the requirements of the laws of the State in which the land is located; to take appropriate steps for the preservation of the property and the health and safety of workmen; promptly to surrender and return the premises upon the termination of this lease to whomsoever shall be lawfully entitled thereto, in as good condition as received, excepting for the ordinary wear and tear and unavoidable accidents in their proper use; not to remove therefrom any buildings or permanent improvements erected thereon during the said term by the said lessee, but said buildings and improvements shall remain a part of said land and become the property of the owner of the surface of the land, excepting the office fixtures and records, personal property, tools, pumping and drilling outfits, boilers, engines, and mining machinery, which shall remain the property of the lessee and may be removed at any time prior to 60 days after the termination of the lease by forfeiture or otherwise, provided the payments agreed upon by this lease have been made and the lease terms and regulations applicable thereto have been fully complied with, but not otherwise; not to permit any nuisance to be maintained on the premises under lessee's control, nor allow any intoxicating liquors to be sold or given away for any purpose on such premises; and not to use such premises for any other purposes than those authorized in this lease.

(*d*) DEVELOPMENT.—The land described herein shall not be held by the lessee for speculative purposes, but in good faith for mining the minerals specified; and the failure by the lessee in the diligent development and continued operation of the mine or mines, except when operations may be interrupted by strikes, the elements, or casualties not attributable to the lessee, shall be held as a want of compliance with the purposes of this lease and shall render it subject to cancelation: *Provided,* That whenever the Secretary of the Interior shall consider the marketing facilities inadequate or the economic conditions unsatisfactory, he may authorize the suspension of operations for such time as he may deem advisable, but such action will not release the lessee from the payment of the advance annual rental.

(*e*) MONTHLY STATEMENTS.—To keep an accurate account of all mining operations, showing the sales, prices, dates, purchasers, and the whole amount of minerals mined, the amount removed, and the gross receipts derived therefrom, and to furnish the Superintendent sworn monthly reports thereon not later than the twenty-fifth of the succeeding month; and all sums due as royalty and advance rental shall be a lien on all implements, tools, movable machinery, and all other personal chattels used in operation upon said property, and upon all of the unsold minerals obtained from the land herein leased, as security for payment of said sums. An audit of the lessee's accounts and books shall be made annually or at such times as may be directed by the Superintendent by certified public accountants approved by the Secretary of the Interior and at the expense of the lessee. The lessee shall furnish free of cost a copy of such audits to the Secretary of the Interior through the Superintendent within 30 days after the completion of each auditing.

(*f*) REGULATIONS.—To abide by and conform to any and all regulations of the Secretary of the Interior now or hereafter in force relative to such leases: *Provided,* That no regulations hereafter approved shall effect a change in rate of royalty, the annual rental herein specified, or the term of this lease, without the written consent of the parties to this lease.

* Here insert the royalties agreed upon in accordance with applicable regulations.

(*g*) ASSIGNMENT OF LEASE.—Not to assign this lease or any interest therein by an operating agreement or otherwise nor to sublet any portion of the leased premises before restrictions are removed, except with the approval of the Secretary of the Interior. If this lease is divided by the assignment of an entire interest in any part of it, each part shall be considered a separate lease under all the terms and conditions of the original lease.

(*h*) BOND.—To furnish such bond as may be required by the regulations of the Secretary of the Interior conditioned upon compliance with the terms of this lease.

4. MILLING.—All ores or minerals mined on said land shall be cleaned and prepared for market thereon, and no ore or crushed material shall be removed therefrom to be cleaned or prepared for market without the written consent of the Secretary of the Interior.

5. INSPECTION.—The leased premises and producing operations, improvements, machinery and fixtures thereon and connected therewith, and all books and accounts of the lessee shall be open at all times for inspection by the lessor and his agents or any duly authorized representative of the Secretary of the Interior.

6. DISPOSITION OF SURFACE.—The lessor expressly reserves the right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereafter enacted, such disposition to be subject at all times to the right of the lessee herein to the use of so much of said surface as is necessary in the extraction and removal of the minerals from the land herein described in accordance with this lease.

7. SURRENDER AND TERMINATION.—The lessee shall have the right at any time during the term hereof to surrender and terminate this lease or any part thereof upon the payment of all rentals, royalties, and other obligations due and payable to the lessor, and the further sum of $1, and in the event restrictions have not been removed, upon a showing satisfactory to the Secretary of the Interior that full provision has been made for the conservation and protection of the property, the lease to continue in full force and effect as to the lands not so surrendered. If this lease has been recorded lessee shall file a recorded release with his application to the Superintendent for termination of this lease.

8. CANCELATION AND FORFEITURE.—When, in the opinion of the Secretary of the Interior, there has been a violation of any of the terms and conditions of this lease before restrictions are removed, the Secretary of the Interior shall have the right at any time after 30 days' notice to the lessee, specifying the terms and conditions violated, and after a hearing, if the lessee shall so request within 30 days of receipt of notice, to declare this lease null and void, and the lessor shall then be entitled and authorized to take immediate possession of the land: *Provided,* That after restrictions are removed the lessor shall have and be entitled to any available remedy in law or equity for breach of this contract by the lessee.

9. RELINQUISHMENT OF SUPERVISION BY THE SECRETARY OF THE INTERIOR.—Should the Secretary of the Interior, at any time during the life of this instrument, relinquish supervision as to all or part of the acreage covered hereby, such relinquishment shall not bind lessee until said Secretary shall have given 30 days' written notice. Until said requirements are fulfilled, lessee shall continue to make all payments due hereunder as provided in section 3 (*a*) and (*b*). After notice of relinquishment has been received by lessee, as herein provided, this lease shall be subject to the following further conditions:

(*a*) All rentals and royalties thereafter accruing shall be paid directly to lessor or his successors in title.

(*b*) If, at the time supervision is relinquished by the Secretary of the Interior as to all lands included in this lease, lessee shall have made all payments then due hereunder, and shall have fully performed all obligations on its part to be performed up to the time of such relinquishment, then the bond given to secure the performance hereof, on file in the Indian Office, shall be of no further force or effect.

10. HEIRS AND SUCCESSORS IN INTEREST.—It is further covenanted and agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors of, or assigns of the respective parties hereto.

11. GOVERNMENT EMPLOYEES CANNOT ACQUIRE LEASE.—No lease, assignment thereof, or interest therein will be approved to any employee or employees of the United States Government whether connected with the Indian Service or otherwise, and no employee of the Interior Department shall be permitted to acquire any interest in such leases by ownership of stock in corporations having leases or in any other manner.

IN WITNESS WHEREOF, the said parties have hereunto subscribed their names and affixed their seals on the day and year first above mentioned.

TWO WITNESSES TO EXECUTION BY LESSOR:

_____ _____ [SEAL]

P. O. _____

_____ _____ [SEAL]

P. O. _____

TWO WITNESSES TO EXECUTION BY LESSEE:

_____ _____ [SEAL]

P. O. _____

_____

P. O. _____ Attest: _____

State of _____
County of _____ } *ss:*

ACKNOWLEDGMENT OF LESSOR

Before me, a notary public, on this _____ day of _____, 19____, personally appeared _____, to me known to be the identical person who executed the within and foregoing lease, and acknowledged to me that _____ executed the same as _____ free and voluntary act and deed for the uses and purposes therein set forth.

_____
Notary Public.

My commission expires _____

UNITED STATES
DEPARTMENT OF THE INTERIOR

Washington, D. C., _____, 19____

The within lease is hereby _____approved.

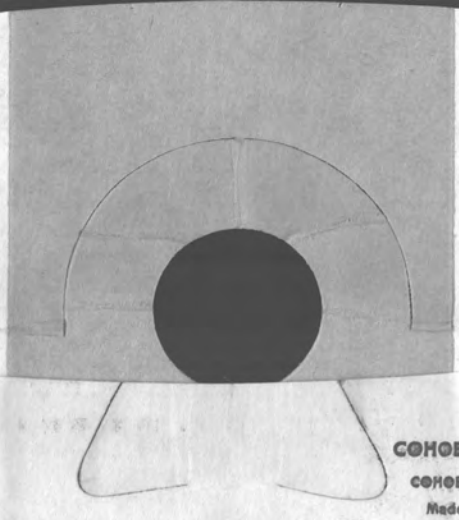
_____
Assistant Secretary of the Interior.

Filed for record this _____ day of _____, 19____, at _____ o'clock _____ m.

_____
By _____

Rental received, $_____

16—12302 U. S. GOVERNMENT PRINTING OFFICE



7-61

COHOES CARRYBAG T. M. REG.
COHOES CARRYBAG COMPANY, Inc.
Made in Cohoes, N. Y., U. S. A.
PATENT No. 2234180

Mission
Pit
5/8/62

Promised

Mon. Tues.

Wed. Thurs.

Fri. Sat.

____AM ____PM

MAY 5 1962

DATE 5/4/62

NO. F 98276

NAME Heindrich, W.E.

ADDRESS Box 5671 PH. NO.

No. Rolls Inclosed		SIZE	Prints of Each
Black-and-white	Color		
1		828	0, 1, (2), 3, 4, 5, 6, 7, 8, 9

CONTACT [ ] HOW TO PRINT JUMBO [X]

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Please Print _____ of Each

Make _____ Enlargements of Each

To Size _____

JUMBO PRINTS ALWAYS MADE UNLESS REQUESTED CONTACT.

FOR PRICING ONLY:

Developing	20
16 Prints	160
____ Enlargements	
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SPECIAL INSTRUCTIONS

P 199

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PRINTING

APR 62

APR 62

APR 62

VICTOR H. VERITY
613 VALLEY NATIONAL BUILDING
TUCSON, ARIZONA

ATTORNEY AT LAW
AND
MINING ENGINEER

January 2, 1952.

UNITED GEOPHYSICAL CO., INC.
P. O. BOX 7005
TUCSON, ARIZONA

Pima Mining Company,
P. O. Box 7005,
Tucson, Arizona.

Gentlemen:

With reference to the leasing of certain restricted alloted Indian Lands for mining, tne rules applicable thereto are set fortn in 25 CFR (Code of Federal Regulations) Part 189. As applied to your situation, the following requirements must be met:

1. Make application for tne lease to the Superintendent of the Reservation having jurisdiction over the land.

2. The lease to me made on the form entitled "Mining Lease Allotted Indian Lands."

3. The applicant, being a corporation, must file evidence of authority of its officers to execute papers, using the form entitled "Evidence of Authority of Officers to Execute Papers."

4. The company must file the following data with tne application for tne lease:

a) A certified copy of its articles of incorporation, and, if foreign to the State in which tne lands are located, evidence showing compliance with tne corporation laws thereof.

b) Lists of officers, principal stockholders, and directors, with postoffice addresses and number of shares held by each.

c) A sworn statement of tne proper officer showing:

1) The total number of shares of the capital stock actually issued and tne amount of cash paid into tne treasury on each share sold; or, if paid in property, the kind, quantity, and value of the same paid per share.

2) Of tne stock sold, how much remains unpaid and subject to assessment.

3) The amount of cash the company has in its treasury and elsewhere.

4) The property, exclusive of cash, owned by the

company and its value.

5) The total indebtedness of the company and the nature of its obligations.

5. Applicant must furnish a bond, using form 5-154b with two or more personal sureties or with an acceptable company authorized to act as sole surety. Bond shall be for varying amounts, depending on acreage.

6. Term of the lease for minerals other than oil and gas is 15 years.

7. Advance rental for first year payable in advance at time of filing the lease at the following rates: Twenty-five cents per acre for the first calendar year or fraction thereof; 50 cents per acre per annum for the second and third years; and $1 per acre per annum for each and every calendar year thereafter during the continuance of the lease.

8. A fee of $5.00 must be paid upon approval of the lease.

9. Royalties for minerals other than oil and gas: For gold, silver, copper, lead, zinc, and tungsten the lessee shall pay quarterly a royalty of not less than 10 percent, to be computed on the gross value of the ores as shown by reduction returns after deducting freight and treatment charges. For substances other than gold, silver, copper, lead, zinc, tungsten, coal, asphaltum and allied substances, oil and gas the lessee shall pay not less than 10 percent of the value at the nearest shipping point.

10. There is an acreage limitation of 640. While the rules do not specifically state there are no extralateral rights, the text of the lease indicates that mining rights are confined to the boundaries of the land described in the lease, and furthermore, that part of the code relating to the leasing of tribal lands does specifically state there are no extralateral rights.

11. The Superintendent may request additional information either before or after approval of the lease, and statements of changes in officers and stockholders shall be furnished to the Superintendent on January 1 of each year.

12. Heirship must be established in accordance with the terms of the act applicable thereto to determine the heirs of the deceased allottee. If the heirs have already been determined, the Superintendent when forwarding the lease to the Bureau of Indian affairs shall so notify the bureau.

Attached are one copy each of the following forms:

Mining Lease Allotted Indian Lands

Bond to Accompany Mining Leases

Evidenee of Authority of Officers to Execute Papers

I am writing to Washington today to secure additional copies of the "Evidence of Authority" form. We have sufficient copies of the others on hand, I believe, although I suggest you check with the Superintendent of the Reservation and find out how many copies of the lease will be required by the government, so that if we do not have enough forms on hand, we have obtain more without delay.

Very truly yours,

Victor H. Verity

Victor H. Verity

JAN 3 1952
UNITED GEOPHYSICAL CO., INC.
P. O. BOX 7005
TUCSON, ARIZONA

January 2, 1952.

Pima Mining Company,
P. O. Box 7005,
Tucson, Arizona.

Gentlemen:

With reference to the leasing of certain restricted alloted Indian Lands for mining, tne rules applicable thereto are set fortn in 25 CFR (Code of Federal Regulations) Part 189. As applied to your situation, the following requirements must be met:

1. Make application for tne lease to the Superintendent of the Reservation having jurisdiction over the land.

2. The lease to me made on the form entitled "Mining Lease Allotted Indian Lands."

3. The applicant, being a corporation, must file evidence of authority of its officers to execute papers, using the form entitled "Evidence of Authority of Officers to Execute Papers."

4. The company must file the following data with the application for the lease:

a) A certified copy of its articles of incorporation, and, if foreign to the State in which tne lands are located, evidence showing compliance with the corporation laws thereof.

b) Lists of officers, principal stockholders, and directors, with postoffice addresses and number of shares held by each.

c) A sworn statement of tne proper officer showing:

1) The total number of shares of the capital stock actually issued and tne amount of cash paid into tne treasury on each share sold; or, if paid in property, the kind, quantity, and value of the same paid per share.

2) Of tne stock sold, how much remains unpaid and subject to assessment.

3) The amount of cash the company has in its treasury and elsewhere.

4) The property, exclusive of cash, owned by the

company and its value.

5) The total indebtedness of the company and the nature of its obligations.

5. Applicant must furnish a bond, using form 5-154b with two or more personal sureties or with an acceptable company authorized to act as sole surety. Bond shall be for varying amounts, depending on acreage.

6. Term of the lease for minerals other than oil and gas is 15 years.

7. Advance rental for first year payable in advance at time of filing the lease at the following rates: Twenty-five cents per acre for the first calendar year or fraction thereof; 50 cents per acre per annum for the second and third years; and $1 per acre per annum for each and every calendar year thereafter during the continuance of the lease.

8. A fee of $5.00 must be paid upon approval of the lease.

9. Royalties for minerals other than oil and gas: For gold, silver, copper, lead, zinc, and tungsten the lessee shall pay quarterly a royalty of not less than 10 percent, to be computed on the gross value of the ores as shown by reduction returns after deducting freight and treatment charges. For substances other than gold, silver, copper, lead, zinc, tungsten, coal, asphaltum and allied substances, oil and gas the lessee shall pay not less than 10 percent of the value at the nearest shipping point.

10. There is an acreage limitation of 640. While the rules do not specifically state there are no extralateral rights, the text of the lease indicates that mining rights are confined to the boundaries of the land described in the lease, and furthermore, that part of the code relating to the leasing of tribal lands does specifically state there are no extralateral rights.

11. The Superintendent may request additional information either before or after approval of the lease, and statements of changes in officers and stockholders shall be furnished to the Superintendent on January 1 of each year.

12. Heirship must be established in accordance with the terms of the act applicable thereto to determine the heirs of the deceased allottee. If the heirs have already been determined, the Superintendent when forwarding the lease to the Bureau of Indian affairs shall so notify the bureau.

Attached are one copy each of the following forms:

Mining Lease Allotted Indian Lands

Bond to Accompany Mining Leases

Evidenee of Authority of Officers to Execute Papers

I am writing to Washington today to secure additional copies of the "Evidence of Authority" form. We have sufficient copies of the others on hand, I believe, although I suggest you check with the Superintendent of the Reservation and find out how many copies of the lease will be rqquired by the government, so that if we do not have enough forms on hand, we have obtain more without delay.

Very truly yours,

Victor H. Verity

Victor H. Verity

Form 5-154
(October 1939)

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS

Contract No. _____

MINING LEASE ALLOTTED INDIAN LANDS

(For Minerals other than Oil and Gas)

_____ Mining Lease _____ Reservation
(Write all names and addresses in full)

THIS INDENTURE OF LEASE, made and entered into in quintuplicate, on this _____ day of _____, 19____, by and between _____

_____

allottee No. _____ of the _____ tribe of Indians,

of _____, State of _____

part____ of the first part, hereinafter called the lessor , and _____

_____, of _____

State of _____, part____ of the second part, hereinafter called the lessee , under and in pursuance of the provisions of existing law and the rules and regulations prescribed by the Secretary of the Interior relative to mining leases covering restricted Indian allotments.

WITNESSETH

1. That the lessor , for and in consideration of $1, receipt whereof is hereby acknowledged, and of the royalties, covenants, stipulations, and conditions hereinafter contained and hereby agreed to be paid and observed by the lessee, doth hereby demise, grant, and lease unto the said lessee, the following-described tract of land lying and being within the _____

Reservation, county of _____, and State of _____

to wit: _____

_____

_____

of section _____, township _____, range _____, _____ meridian, and containing _____ acres, more or less, for the full term of 15 years from the date of approval hereof, for the sole purpose of prospecting for and mining minerals, as follows: _____

_____

_____

the lessee to occupy so much only of the surface of said land as may be reasonably necessary to carry on the work of prospecting for, mining, milling, storing, and removing such minerals.

16—12302

2. The term "Superintendent" as used herein shall refer to the superintendent or other official in charge of the Indian Agency having jurisdiction over the lands leased.

3. In consideration of the foregoing, the lessee hereby agrees:

(*a*) ROYALTY.—To pay, or cause to be paid, to the Superintendent, for the use and benefit of the lessor, as royalties, the sums of money as follows, to wit:*

_____

_____

_____

All royalties accruing for any month shall be due and payable on or before the twenty-fifth day of the month succeeding.

(*b*) ANNUAL RENTAL.—To pay, or cause to be paid, to the Superintendent for the use and benefit of the lessor, in advance beginning with the date of approval of the lease, as annual rental, the following: Twenty-five cents per acre for the first calendar year or fraction thereof, 50 cents per acre per annum for the second and third years, and $1 per acre per annum in advance for each and every calendar year thereafter during the continuance of the lease; it being understood and agreed that said sum so paid shall be a credit on the royalties accruing during the year for which the payment of annual rental is made, and that said annual rental when paid shall not be refunded to the lessee because of any subsequent surrender or cancelation hereof.

(*c*) DILIGENCE, PREVENTION OF WASTE.—To exercise diligence in the conduct of prospecting and mining operations; to carry on development and operations in a workmanlike manner and to the fullest possible extent; to commit no waste on the said land and to suffer none to be committed upon the portion in his occupancy or use; to comply with all the requirements of the laws of the State in which the land is located; to take appropriate steps for the preservation of the property and the health and safety of workmen; promptly to surrender and return the premises upon the termination of this lease to whomsoever shall be lawfully entitled thereto, in as good condition as received, excepting for the ordinary wear and tear and unavoidable accidents in their proper use; not to remove therefrom any buildings or permanent improvements erected thereon during the said term by the said lessee, but said buildings and improvements shall remain a part of said land and become the property of the owner of the surface of the land, excepting the office fixtures and records, personal property, tools, pumping and drilling outfits, boilers, engines, and mining machinery, which shall remain the property of the lessee and may be removed at any time prior to 60 days after the termination of the lease by forfeiture or otherwise, provided the payments agreed upon by this lease have been made and the lease terms and regulations applicable thereto have been fully complied with, but not otherwise; not to permit any nuisance to be maintained on the premises under lessee's control, nor allow any intoxicating liquors to be sold or given away for any purpose on such premises; and not to use such premises for any other purposes than those authorized in this lease.

(*d*) DEVELOPMENT.—The land described herein shall not be held by the lessee for speculative purposes, but in good faith for mining the minerals specified; and the failure by the lessee in the diligent development and continued operation of the mine or mines, except when operations may be interrupted by strikes, the elements, or casualties not attributable to the lessee, shall be held as a want of compliance with the purposes of this lease and shall render it subject to cancelation: *Provided,* That whenever the Secretary of the Interior shall consider the marketing facilities inadequate or the economic conditions unsatisfactory, he may authorize the suspension of operations for such time as he may deem advisable, but such action will not release the lessee from the payment of the advance annual rental.

(*e*) MONTHLY STATEMENTS.—To keep an accurate account of all mining operations, showing the sales, prices, dates, purchasers, and the whole amount of minerals mined, the amount removed, and the gross receipts derived therefrom, and to furnish the Superintendent sworn monthly reports thereon not later than the twenty-fifth of the succeeding month; and all sums due as royalty and advance rental shall be a lien on all implements, tools, movable machinery, and all other personal chattels used in operation upon said property, and upon all of the unsold minerals obtained from the land herein leased, as security for payment of said sums. An audit of the lessee's accounts and books shall be made annually or at such times as may be directed by the Superintendent by certified public accountants approved by the Secretary of the Interior and at the expense of the lessee. The lessee shall furnish free of cost a copy of such audits to the Secretary of the Interior through the Superintendent within 30 days after the completion of each auditing.

(*f*) REGULATIONS.—To abide by and conform to any and all regulations of the Secretary of the Interior now or hereafter in force relative to such leases: *Provided,* That no regulations hereafter approved shall effect a change in rate of royalty, the annual rental herein specified, or the term of this lease, without the written consent of the parties to this lease.

* Here insert the royalties agreed upon in accordance with applicable regulations.

(*g*) ASSIGNMENT OF LEASE.—Not to assign this lease or any interest therein by an operating agreement or otherwise nor to sublet any portion of the leased premises before restrictions are removed, except with the approval of the Secretary of the Interior. If this lease is divided by the assignment of an entire interest in any part of it, each part shall be considered a separate lease under all the terms and conditions of the original lease.

(*h*) BOND.—To furnish such bond as may be required by the regulations of the Secretary of the Interior conditioned upon compliance with the terms of this lease.

4. MILLING.—All ores or minerals mined on said land shall be cleaned and prepared for market thereon, and no ore or crushed material shall be removed therefrom to be cleaned or prepared for market without the written consent of the Secretary of the Interior.

5. INSPECTION.—The leased premises and producing operations, improvements, machinery and fixtures thereon and connected therewith, and all books and accounts of the lessee shall be open at all times for inspection by the lessor and his agents or any duly authorized representative of the Secretary of the Interior.

6. DISPOSITION OF SURFACE.—The lessor expressly reserves the right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereafter enacted, such disposition to be subject at all times to the right of the lessee herein to the use of so much of said surface as is necessary in the extraction and removal of the minerals from the land herein described in accordance with this lease.

7. SURRENDER AND TERMINATION.—The lessee shall have the right at any time during the term hereof to surrender and terminate this lease or any part thereof upon the payment of all rentals, royalties, and other obligations due and payable to the lessor, and the further sum of $1, and in the event restrictions have not been removed, upon a showing satisfactory to the Secretary of the Interior that full provision has been made for the conservation and protection of the property, the lease to continue in full force and effect as to the lands not so surrendered. If this lease has been recorded lessee shall file a recorded release with his application to the Superintendent for termination of this lease.

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9. RELINQUISHMENT OF SUPERVISION BY THE SECRETARY OF THE INTERIOR.—Should the Secretary of the Interior, at any time during the life of this instrument, relinquish supervision as to all or part of the acreage covered hereby, such relinquishment shall not bind lessee until said Secretary shall have given 30 days' written notice. Until said requirements are fulfilled, lessee shall continue to make all payments due hereunder as provided in section 3 (*a*) and (*b*). After notice of relinquishment has been received by lessee, as herein provided, this lease shall be subject to the following further conditions:

(*a*) All rentals and royalties thereafter accruing shall be paid directly to lessor or his successors in title.

(*b*) If, at the time supervision is relinquished by the Secretary of the Interior as to all lands included in this lease, lessee shall have made all payments then due hereunder, and shall have fully performed all obligations on its part to be performed up to the time of such relinquishment, then the bond given to secure the performance hereof, on file in the Indian Office, shall be of no further force or effect.

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11. GOVERNMENT EMPLOYEES CANNOT ACQUIRE LEASE.—No lease, assignment thereof, or interest therein will be approved to any employee or employees of the United States Government whether connected with the Indian Service or otherwise, and no employee of the Interior Department shall be permitted to acquire any interest in such leases by ownership of stock in corporations having leases or in any other manner.

IN WITNESS WHEREOF, the said parties have hereunto subscribed their names and affixed their seals on the day and year first above mentioned.

TWO WITNESSES TO EXECUTION BY LESSOR:

_____ _____ [SEAL]

P. O. _____

_____ _____ [SEAL]

P. O. _____

TWO WITNESSES TO EXECUTION BY LESSEE:

_____ _____ [SEAL]

P. O. _____

_____

P. O. _____ Attest: _____

State of _____
County of _____ } *ss:*

ACKNOWLEDGMENT OF LESSOR

Before me, a notary public, on this _____ day of _____, 19_____, personally appeared _____, to me known to be the identical person who executed the within and foregoing lease, and acknowledged to me that _____ executed the same as _____ free and voluntary act and deed for the uses and purposes therein set forth.

_____
Notary Public.

My commission expires _____

UNITED STATES
DEPARTMENT OF THE INTERIOR

Washington, D. C., _____, 19_____

The within lease is hereby _____approved.

_____
Assistant Secretary of the Interior.

Filed for record this _____ day of _____, 19_____, at _____ o'clock _____ m.

_____

By _____

Rental received, $_____

16—12302 U. S. GOVERNMENT PRINTING OFFICE

5-154 b
(October 1947)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

BOND

TO ACCOMPANY MINING LEASES

Know All Men by These Presents, That _____

of _____, as principal_____, and _____

_____

of _____, as suret_____, are held and firmly bound unto the United States of America in the sum of _____ dollars, lawful money of the United States of America, for the payment of which well and truly to be made, we bind ourselves, and each of us, our and each of our heirs, executors, administrators, successors, or assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 19_____

The condition of this obligation is such that whereas the above-bounden _____, as principal_____, entered into a certain indenture of lease, dated _____ with _____

_____

_____

for the lease of a tract of land described as follows: _____

_____

_____

and located in the _____ in the State of _____ for _____ mining purposes for the period of _____ years from the date of approval thereof, and as much longer thereafter as the lease shall be continued in force in the manner provided for therein.

Now, if the above-bounden principal herein shall faithfully carry out and observe all the obligations assumed in said indenture of lease, and shall observe all the laws of the United States, and regulations made, or which shall be made thereunder, for the government of trade and intercourse with Indian Tribes, and all the rules and regulations that have been, or may be, lawfully prescribed by the Secretary of the Interior relative to mining leases on the said Reservation, then this obligation shall be null and void; otherwise to remain in full force and effect.

Provided, That in event supervision over all the leased tract to which this bond applies is relinquished by the Secretary of the Interior and lessee shall have made all payments then due under the lease and shall have fully performed all obligations on his part to be performed up to the time of relinquishment of supervision, this bond shall be of no further force and effect.

The rate of premium charged on this bond is $_____; the total premium paid is $_____

[OVER]

Signed and sealed in the presence of—

WITNESSES:

P. O. ---

P. O. ---

as to ---- [SEAL]

P. O. ---

P. O. ---

as to ---- [SEAL]

P. O. ---

P. O. ---

as to ---- [SEAL]

P. O. ---

P. O. ---

as to ---- [SEAL]

(Two witnesses to each signature)

DEPARTMENT OF THE INTERIOR,
Bureau of Indian Affairs,

APPROVED:

Washington, D. C., ----

Acting Commissioner of Indian Affairs.

16—11481-1 U. S. GOVERNMENT PRINTING OFFICE

5—154d

UNITED STATES

DEPARTMENT OF THE INTERIOR

OFFICE OF INDIAN AFFAIRS

EVIDENCE OF AUTHORITY OF OFFICERS TO EXECUTE PAPERS

(To be sworn to by Secretary or President of a corporation and sealed with its seal.)

I solemnly swear that _____ and _____ were on the _____ day of _____, 19 __, the duly elected, qualified and acting president and secretary, respectively, of _____, a corporation organized under the laws of _____, on which day they executed _____ mining lease for and in behalf of said corporation as lessee, covering certain lands of _____ Indian of _____ tribe; that they were fully empowered to execute said lease and all papers in connection therewith, and that their action in executing the same binds the said corporation to full performance of all obligations thereunder.

(Signed) _____

_____
(Title.)

This _____ day of _____, 19

[CORPORATE SEAL.]

Subscribed and sworn to before me this _____ day of _____, 19

(Signed) _____

_____
(Title.)

[SEAL.]

U. S. GOVERNMENT PRINTING OFFICE 6—3435

UNITED GEOPHYSICAL COMPANY, INC.

15 November 1951

Papago Indian Agency
Sells, Arizona

Attn: Mr. Harry L. Stevens, Supt.

Gentlemen:

Enclosed are the executed copies of the exploration agreement relating to the San Xavier District lands, and a check in the amount of $95.00 to cover the consideration involved.

It is our understanding that the agreement will take effect upon approval of The Agency Superintendent and will be in force for six months from that date. If this is the case, will you please insert this date on the agreement when consumated, so that it will show on our copy when returned to us after afixing the Superintendent's signature?

If there is anything that can be done to enable us to proceed in applying for a lease we would appreciate your assistance, as I believe we may go right ahead with this. In particular, the procurement of forms etc., will be helpful.

Very truly yours,

UNITED GEOPHYSICAL COMPANY, INC.

by: _____
W. E. Heinrichs, Jr., Engineer.

Encl:
copies agreement
check.

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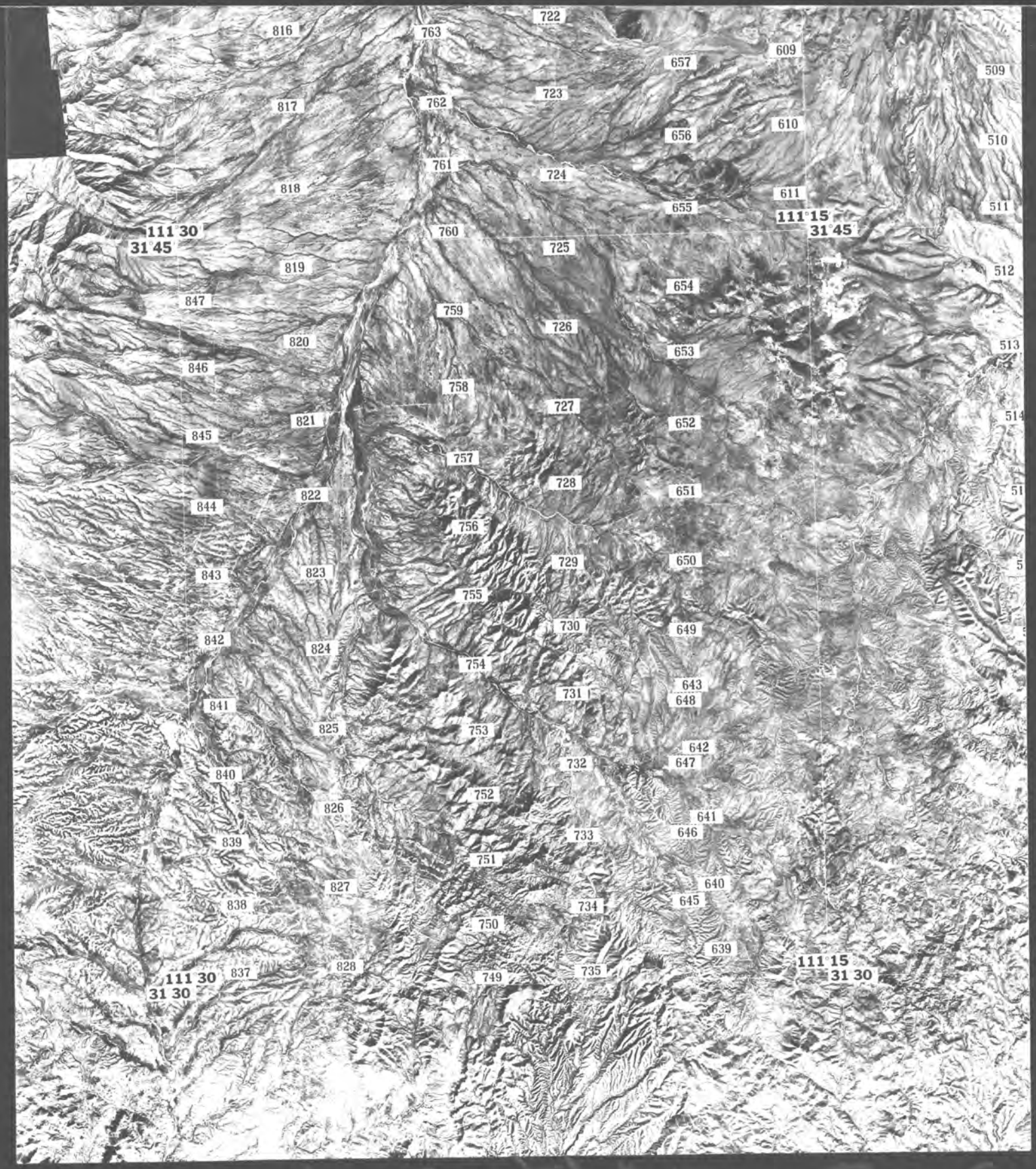
SAN XAVIER
MISSION, ARIZ.



Ariz Quad #459 — Pima County
Arivaca

AK12 Quad #459

Pima County

ARIVACA Dist (ARON)

MAGNETIC SURVEY OF THE VICINITY OF THE SAN XAVIER ZINC AND LEAD MINE, PIMA COUNTY, ARIZONA

made by

C. H. FROST GRAVIMETRIC SURVEYS, INC.

September 1946

COPY

MAGNETIC SURVEY OF THE VICINITY OF THE SAN XAVIER ZINC AND LEAD MINE, PIMA COUNTY, ARIZONA

INTRODUCTION

The following is a report of a magnetic investigation of the San Xavier zinc and lead mining area, located 20 miles south of Tucson and about 11 miles south of San Xavier Mission. The survey was conducted for the Tri-State Zinc and Lead Mining Company during the period August 1 to September 5, 1946, by C. H. Frost Gravimetric Surveys, Inc., of Tulsa, Oklahoma.

The chief mine of the district, the San Xavier, is located in an area of intense geologic disturbance. The outcrops of a steeply dipping Permian limestone reveal a southerly pitching syncline abutting against a curving range of hills north of the mine. Cretaceous arkose interspersed with quartzite, andesite, and Tertiary basalt outcrop to the south of the mine, while north thereof the surface formations consist mostly of limestone, marl and quartzite. The whole area, which is cut by several faults, is bounded on the north and west by a medium coarse grained, light colored granite basement (?) igneous rock, which is presumably the buttress against which thrust from the south occurred.

The ore, consisting of zinc blende and galena, occurs as a replacement within the limestone, at and near the contact between the lime and the overlying arkose. The contact at the mine dips about 60 degrees to the south. The deposits seem to be associated with faulting, jointing, and shattering in the limestone, the richest ore bodies being found in folds or "rolls" along the contact. Information obtained from churn drill logs and underground workings down to a depth of 400 feet,

show these rolls to have a "wave length" of about 200 feet but an "amplitude" of only 10 feet or less. It is reported that magnetite is usually, but not always, associated with the ore along the contact.

With the exception of a few outcrops about 1000 feet northwest of San Xavier, granite has been found in the mining area only at Mineral Hill where a drill hole encountered it at a depth of about 1300 feet. However, granite or other intrusive rocks are evidently closer to the surface in certain localities as indicated by the occurrence of hornfels and quartzite. The ore was therefore probably formed at moderate depth by ascending hot solutions.

The survey was primarily experimental, to determine, by observations over, and in the vicinity, of a known area of zinc and lead accumulation, whether magnetic surveys might be of assistance in the location of such deposits in areas in which surface geological studies are hampered by presence of an alluvial cover.

The specific objectives of the survey were:

1) To determine, by means of a regional survey at a station pattern of 1000 feet, the regional variations in magnetic intensity, particularly as related to the relationship between the sedimentary syncline and its contact with the granite to the northwest;

2) To determine, by means of a semi-detail survey consisting of profiles separated by 500 feet, with station spacing of 200 feet along profiles, whether the arcuate limestone-arkose contact could be mapped;

3) To determine, by means of adetailed survey at a pattern of 100 feet, whether the "rolls" on the limestone-arkose contact can be identified.

FIELD PROCEDURE AND REDUCTION OF DATA

For the semi-detailed work, a series of north-south profiles was run covering an area of 8000 feet east-west by 3000 feet north-south with the mine in the north center of the area. These profiles all crossed the known lime-arkose contact. The station spacing was 200 feet and the profile separation 500 feet.

Next, the areas of greatest magnetic disturbance were detailed with stations spaced 100 feet apart. The detailed work was laid out with transit and stadia rod and plotted to a scale of 200 feet to the inch.

The regional work which extended past Mineral Hill on the north and down to Helmet Peak prospect on the south crossed the known granite contact to the west and northwest in several places. It also covered an area immediately to the south of Helmet Peak proper, about 2 miles southeast of San Xavier Mine. The stations were spaced about 1000 feet apart and located directly on an aerial survey map to a scale of 800 feet to the inch.

The magnetic work was done with Askania Vertical Component Magnetometer #90520 with a sensitivity of 17.0 gammas per scale division used for the detailed work, and a lowered sensitivity of 31.8 gammas per scale division used for the regional work. The magnetometer was read to 0.1 scale division, yielding a reading error of less than plus or minus 3 gammas.

Six base stations were employed for the entire magnetic survey. The magnetometer was returned to a base station at intervals of 1 1/2 to 2 hours in order to determine the instrumental "drift" caused by diurnal variation of the earth's magnetic field and by temperature

changes. Incalculating the results, correction for this drift was distributed proportionately with time among the stations occupied on each particular excursion from base.

The calculations were also corrected for the normal northeastward increase in the intensity of the vertical component of the earth's field. The correction for this area amounts to approximately 3 gammas per 1000 feet north or south, but only one gamma east or west for the same distance.

A check with the U. S. Coast and Geodetic Survey Magnetic Observatory at Tucson revealed that the diurnal variation had been normal during the period of the survey and that there had been no magnetic storms to interfere with the precision of the observation.

A total of 420 stations was occupied. As most of the locations were inaccessible by car, they had to be reached on foot.

A map was prepared using a coordinate system of 1000 foot coordinates, with the coordinate 7N-6E coinciding with Triangulation Station A, which is on the road a few hundred feet southwest of the mine. Station locations were plotted in correct geographic position on this map as small circles, and designated by diagonal station numbers. The corrected values of the magnetic intensity were then posted on the map as horizontal numerals, and contoured at an interval of 25 gammas.

A reduced reporduction of this map, with principal outcrops shown in color, will be found in the pocket of this report.

INTERPRETATION

The contoured map shows rather moderate magnetic relief except in a band about 3000 feet wide and 7000 feet long in the

vicinity of the mine. The contact between the granite and sedimentaries is feebly indicated by the magnetic highs in the vicinity of 6.5N-1.5E and 12N-6.5#, and by the high magnetic nose joining these which follows along the south side of the contact. Apparently the granite is of very moderate magnetic susceptibility, as might be expected from its light color.

Across the southern portion of the map there is a magnetically low trend extending through magnetic lows centering at coordinates 1.3N-5.3E and 3N-4E. The axis of this low trend lies about 1000 feet south of the surface trace of a fault of unspecified type. The appearance of the magnetic anomaly is more consistent with faulting of graben type than of thrust type.

Limestone, unless mineralized and magnetite-bearing, is known to have negligible magnetic susceptibility. Arkose, being derived in part from the weathering of igneous rocks, generally has a moderate susceptibility. Consequently, it was anticipated that careful work with the magnetometer might make it possible to map the arkose-limestone contact. However, examination of the magnetic values crossing the limestone-arkose contact outside the zone of extreme magnetic disturbance shows no consistent relationship, and it must be concluded that the arkose, being derived from igneous rocks poor in ferro-magnesian minerals, has a susceptibility negligibly different from that of the limestone.

Examination of the magnetic changes in the vicinity of the areas of andesite outcrop show no consistent association between them, and it must be concluded that the andesite is magnetically neutral, and probably extrusive.

The features of principal interest on the magnetic map are the two high-relief, steep-sided magnetic anomalies whose centeres are at 5.8N-6.7E and 6.7N-7.2E, respectively. These must be due to stock-like intrusions of material of high magnetite content. The smaller northeastern anomaly is probably a branch off the larger mass to the south. The top of this intrusion cannot be much more than 100 feet in diameter, and its depth beneath the surface no more than 150 feet.

The writer believes that this intrusion followed the structural movement which resulted in the crushing and shattering of the limestone at the contact and the weakening of the floor of the syncline, and that it served as the source of the mineralization, which followed up the limestone from the piercing point of the intrusion through the limestone. It is believed that the andesite is likewise a product of this intrusion, although not necessarily.

The steep decrease in magnetic intensity which occurs southwards from the lime-arkose contact just north of the two positive anomalies is ascribed to two causes: the negative magnetic anomaly which is associated with every positive anomaly, and, probably less importantly, the rapid southwards increase in the depth of the mineralized zone, if this carries associated magnetite.

CONCLUSIONS

The sedimentary-ibndoux contact has been only feebly indicated by this survey. It has not proved possible to map the arkose-limestone contact. The area of mineralization is an area of strong magnetic distrubance, with which is associated a very strong anomaly, ascribed to an intrusion of basic igneous rock. If churn-drilling should prove

this intrusion to be the source of the mineralization, magnetic exploration would be of assistance in the location of zinc and lead deposits of this type.

There is no evidence of another area of interest within the limits of the area mapped by magnetometer.

Respectfully submitted,

C. H. FROST GRAVIMETRIC SURVEYS, INC.

Prepared by: /s/ E. U. Garpner

E. U. Garpner

Checked and Approved by: /s/ Joseph A. Sharpe

Joseph A. Sharpe

COPY

2.45 x 2.2 x 2.85 $\quad \rho = \frac{RA}{L}$

$L = 2.85$
$A = 2.45 \times 2.2$
$R = 850{,}000\ \Omega$

$\rho = \frac{850000 \times 2.45 \times 2.2}{2.85}$

$= 1.608 \times 10^6\ \Omega \text{ cm.}$

$L = 2.2$
$A = 2.45 \times 2.85$
$R = 520{,}000\ \Omega$

$\rho = \frac{520000 \times 2.45 \times 2.85}{2.2}$

$= 1.650 \times 10^6\ \Omega \text{ cm.}$

$L = 2.45$
$A = 2.2 \times 2.85$
$R = 660{,}000\ \Omega$

$\rho = \frac{660000 \times 2.2 \times 2.85}{2.45}$

$= 1.689\ \Omega \text{ cm.}$

Ave. $1.65 \times 10^6\ \Omega$ cm.

Sphalerite sample (high grade)
San Xavier Mine
Sample #1

2.5 × 2.0 × 2.9

$\rho = \frac{RA}{L}$

1/27/53
amk

$L = 2.0$ cm
$A = 2.5 \times 2.9$
$R = 12{,}000\ \Omega$

$$\rho = \frac{12000 \times 2.5 \times 2.9}{2.0}$$

$$= 4.35 \times 10^4\ \Omega\ \text{cm}$$

$L = 2.5$ cm.
$A = 2.0 \times 2.9$
$R = 15{,}000\ \Omega$

$$\rho = \frac{15000 \times 2.0 \times 2.9}{2.5}$$

$$= 5.22 \times 10^4\ \Omega\ \text{cm}$$

$L = 2.9$ cm.
$A = 2.0 \times 2.5$
$R = 12{,}000\ \Omega$

$$\rho = \frac{12000 \times 2.0 \times 2.5}{2.9}$$

$$= 2.07 \times 10^4\ \Omega\ \text{cm}$$

Note; Small cavity runs along L on this sample. May account for decrease in ρ.

Sample #2 San Xavier Mine

Ave. $3.88 \times 10^4\ \Omega$ cm

San Xavier Mine 1/20/53 AMB

3.30 Cm.

2.06 Cm.

2.70 Cm.

$$\rho = \frac{RA}{L}$$

Sample is non-magnetic.
Limestone w SiO_2 stringers

$L = 2.06$ 600,000 Ω

$A = 3.30 \times 2.70 = 8.91$

$$\rho = \frac{8.91 \times 6 \times 10^5}{2.06} = 2.595 \times 10^6 \ \Omega\text{cm}$$

$A = 3.30 \times 2.06 = 6.80$ 800,000 Ω

$L = 2.70$

$$\rho = \frac{8 \times 10^5 \times 6.8}{2.7} = 2.015 \times 10^6 \ \Omega\text{cm}$$

$L = 3.30$ 500,000

$A = 2.70 \times 2.06 = 5.56$

$$\rho = \frac{5 \times 10^5 \times 5.56}{3.3} = .8424 \times 10^6 \ \Omega\text{cm}$$

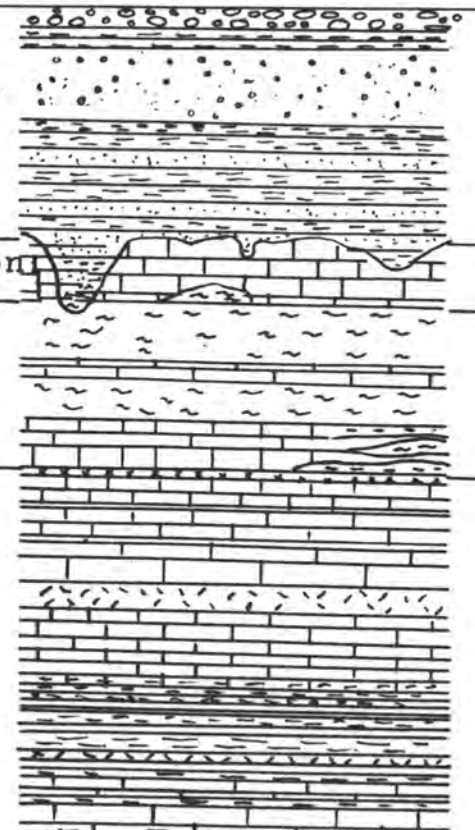
Sample taken [redacted] from wall rock on 340 level, stope at coordinates 99,200N 98,600E

Mine Clo[redacted] To Cost $100,000 A Month Here

By CLIFTON ABBOTT

STRATIGRAPHIC COLUMN

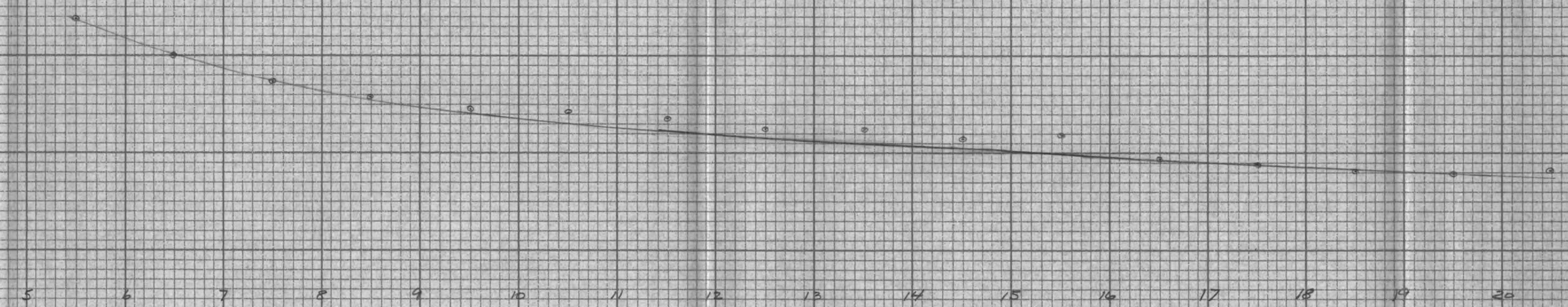
Limestone | Shale | Sandstone | Gypsum
Shaly Limestone | Conglomerate | Quartzite | Sandy Limestone

AGE	FORMATION	COLUMN	THICKNESS	
Cretaceous	Undifferentiated shale, conglomerate, and sandstone.		600 ft.	Conglomerate composed of limestone pebbles. (Upper part. Bright red shales. (Upper part) Middle part--Conglomerate composed mainly of shale. Lower part--Dark red to black shale and varicolored arkoses.
Permian	Snyder Hill Formation		From 200 to 500 ft.	Thin bedded dark gray to blue limestone.
Permian	San Andreas (?) Formation. (Manzano ? Group)		500 ft,	Thin bedded gray limestone interstratified with thick beds of quartzite.
Permian	Yeso (?) Formation (Manzano ? Group)		1700 ft.	Upper part--Beds of limestone, marl, dolomite and gypsum. A few thin beds of shale. Lower part--Thick beds of red and black shale. Thin beds of shaly limestone, conglomerate and sandstone between thicker beds of shale. Some gypsum. Approximately 800 feet of limestone and shale below the first bed of gypsum.
Pennsylvanian.	Naco Limestone.		1200 feet.	Thin bedded limestone interstratified with beds of shaly limestone. Shaly limestone is buff colored on a weathered surface.
Mississippian	Escabrosa Limestone		400 feet.	Thick bedded light gray limestone.
Devonian	Martin Limestone		200 feet.	Limestone, sandy limestone and some very thin shale partings.
Cambrian	Abrigo (?)Formation		500 feet.	Thin beds of limestone interstratified with thinner beds of shale, sandy limestone, chert, and some quartzite. Chert layers are very thin. Quartzite bed at top of formation.
Cambrian	Bolsa (?)Quartzite			Quartzite.

San Xavier - Ave. Ratio Curves

Station	16W	12W	10W	8W	6W	3W	12E	4E	8E	10E	Total	Ave
22.5S	235	244	238	233	244	239	225	263	233	239	2393	1239
23.5S	212	215	212	212	199	185	191	183	186	208	2003	1200
24.5S	171	180	177	184	185	182	174	147	153	179	1732	1173
25.5S	170	159	153	158	158	179	164	146	156	146	1589	1159
26.5S	148	145	143	144	141	145	156	132	148	149	1446	1145
27.5S	131	126	127	153	142	123	163	134	169	145	1413	1141
28.5S	125	136	129	119	130	159	134	118	168	132	1350	1135
29.5S	111	114	131	118	117	127	118	113	121	175	1245	1125
30.5S	117	122	103	122	134	129	117	107	102	187	1240	1124
31.5S	120	122	118	112	123	115	105	108	072	158	1153	1115
32.5S	100	123	149	133	121	109	097	093	150	117	1192	1119
33.5S	060	111	112	099	118	101	084	104	087	065	941	1094
34.5S	090	072	074	085	132	072	074	094	101	097	891	1089
35.5S	073	057	087	104	072	093	059	105	089	073	812	1081
36.5S	060	087	088	073	079	107	069	091	078	062	794	1079
37.5S					104	118	061	095	052	056	486	1081
38.5S					135	110				064	309 (103)	1103
39.5S					099	159				053	311 (104)	1104

Average Ratio Curve
San Xavier Property Based
on 10 Lines



"CLEARPRINT" CROSS SECTION 10 X 10
"CLEARPRINT PAPER CO"
MADE IN U.S.A.

January 20, 1953

Memo Re: EAGLE-PICHER SAN XAVIER CONTRACT

An examination of the San Xavier property both surface and underground indicates the following relative to geophysical exploration:

1. Some preliminary magnetometer detail over known shallow copper-zinc occurrences is warranted to determine the type of anomaly, if any, that might be detected by this method. An apparent lack of known magnetite association makes the odds unfavorable but it is worth a sample check.

2. Magnetometer reconnaissance over much of the undeveloped area is worth while because of the possible existence of Alpha and Mineral Hill type deposits. Such work might also provide some structural information and be of value in tracing the Bobby and Olivette fissuring.

3. Because of volcanic cover part of the area may not be suitable for magnetometer work but it can still be covered electromagnetically.

4. The individual high grade lead zinc deposits are quite small and discontinuous and indicate a very marginal possibility of shallow detection, with only the E.M. method being feasible. In present development these deposits have been found in two major zones and if additional zones exist they may give an overall integrated response that is detectable. A preliminary E.M. check over one of the known occurrences is recommended before attempting any broad scale coverage.

5. Some of the area is extremely rough and will be particularly deterring to E.M. application. Helmet Peak proper cannot be satisfactorily covered by any method except drilling.

6. Methods other than magnetometer and E.M. appear initially to have very limited application, but should be further considered as the work progresses.

7. Time estimation for the work is difficult at this stage, but the size of the area would indicate at least one month of mag work for one crew. Selected E.M. work would take about two months with one crew. This would give fair coverage but would not provide complete detail. If good results were being obtained or further detail seemed warranted, extensions would be necessary.

8. Cost estimation has been tentatively figured at a $4000.00 charge.per month. With additional information on the job now available, it would seem worthwhile to consider a daily charge.

The $4000.00 figure is equivalent to about $200.00 per day. This would allow greater flexibility and eliminate computation for part months, holidays, etc. Also, a differential could be established if desired between mag and E.M. work, which would bear comparison with contemplated charges on the Illinois work.

9. Our plan is to keep Bonnis and Look (who has been rehired), exclusively on this job for our usual five ten-hour days per week, with my or Al Rugg's supervision and Griswold's filling in as appropriate when not busy on other work. Thus, we can guarantee at least two men either in the field or computing data plus almost constant supervision from Tucson.

Because of curtailed operations, Eagle-Picher will only be able to help occasionally with surveying when their chief engineer (Jerry Irwin) is available. Considerable layout will be necessary which we will do, but Irwin can be of considerable help in establishing ties to their grid system, etc..

All maps and data have been made available to us at the mine office plus plenty of working space. Their chief geologist is now out of town a week to ten days at a time and will only be available for consultation for short periods between trips.

We will be ready to start this work as soon as we complete an E.M. survey on the Itzwier mag anomaly which is under consideration as one of the next places to drill.

Jack Chandler would like some formal estimate of costs as soon as possible for submission to his "capital expenditures" committee and we agree that some simple form of contractural letter would be in order with one copy for Grover Duff. In the meantime, he is agreeable for us to go right ahead if this is satisfactory with Pasadena.

Respectfully submitted,

Walter E. Heinrichs, Jr.

WEH:lm

Olivette

Both E-W and N-S striking veins
Pb-Ag. E-W veins seem to be better worked
Possible N-S veins in area. Country rock Arkose
E-W veins dip north. N-S veins may dip slightly
to the East.

Prosperity

High pyrite. Veins E-W steep dip. Silver

Helmet Pk Mine

600 ft. shaft
Copper. No production.

Tit for Tat

On strike of zone ~~from~~ from Prosperity

Breccia Hill

Slight mineralization
Hole drilled by Anaconda on West side

COPY

January 30, 1953

P. O. Box M
Pasadena 15, California

Mr. John W. Chandler
General Mining Director
The Eagle-Picher Company
First National Bank Building
Miami, Oklahoma

Dear Mr. Chandler:

This will serve to confirm our recent discussions regarding geophysical surveys of a group of claims adjoining your San Xavier Mine in Pima County, Arizona.

United Geophysical Company, Inc. will conduct both magnetic and electromagnetic surveys and self potential surveys, where advisable, furnishings all required personnel, geophysical equipment, transportation, supervision and interpretation.

United will pay all expenses in connection with these surveys and assume all liabilities in connection therewith.

The fee for these surveys will be $150.00 per working day for magnetic and self potential surveys and $225.00 per owrking day for electro-magnetic survey.

It is estimated that the magnetic survey will require approximately one month to complete and that a selected electromagnetic survey, sufficient to give good coverage, will require approximately two months to complete.

The survey will commence on or about February 2, 1953, and will continue for three months unless terminated by you prior to that time upon two days' notice.

If the above is in accord with your understanding, will you kindly so denote on the enclosed copy of this letter and return to us.

Very truly your,

UNITED GEOPHYSICAL COMPANY, INC.

Approved:

_____ By_____
M. G. Edwards

Date:_____

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UNITED GEOPHYSICAL COMPANY , INC.

Approved:

_____ By_____
M. G. Edwards

Date:_____ _____

SOME GEOLOGIC NOTES ON THE SAN XAVIER MINE

In spite of the detailed geologic work that has been done here for the past 6 years the significance of the "17" fault is not clearly understood. We have avoided taking a dogmatic stand on some theory, and thereafter collecting facts to prove it. Instead, the facts have been accumulated and they can be used by anyone interested in developing a theory. Listed below are certain facts about the "17" fault.

1. It strikes northeast and dips southward. It is far from being the text-book plane type of fault as it has many irregularities in both its strike and dip. It changes course abruptly, and has been known to flatten and steepen down dip.

2. It has a tendency to split in the direction of strike and dip. These splits probably originate at places of change in strike and dip. Because it intersects the bedding planes of the hanging wall limestone at an acute angle, many splits leave the main fracture and follow out along some bedding plane. The contacts between limestone and dense shaly quartzite, or limestone and quartzite seem to have localized some of the more prominent splits. Splits into the foot wall formations have not been recognized.

3. It is usually characterized by 4-6 inches of greenish gray gouge on its footwall side. In places it is mineralized, usually in the foot or two of brecciated rock above the gouge.

4. The displacement (if any exists) of the arkose-limestone contact, along the "17" fault is very obscure. The apparent displacement of the Permian beds has not been measured. It may be great or small depending upon the identification of the beds in the foot wall and hanging wall, which to date has not been positively made.

5. It has been conveniently used as a geologic marker in development work to date. No ore bodies of any size have been found in the foot wall of the "17" fault east of about coordinate line 100, 200 E. (The east wall of No. 7 shaft is 100, 184' E.) This does not mean that ore bodies may not exist beneath the fault farther east than 100, 200 E., and, as will be explained later, exploration should be directed to prospect this possibility.

THEORY:

In order to understand the significance of the "17" fault one must first appreciate the broad geologic features as exhibited by the local surface geology.

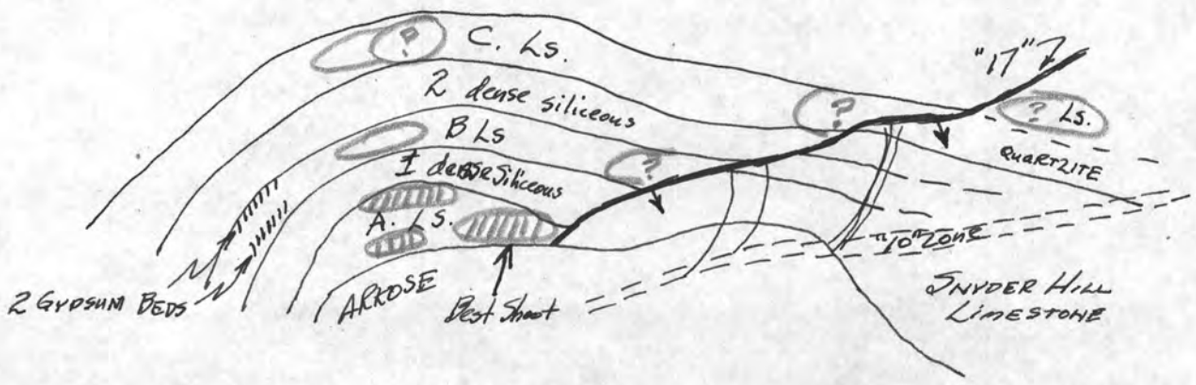
The ridge above the mine is made up of Permian limestones and quartzite which strike about east-west and dip southward at a moderate angle. On the north slope of the ridge and in the gully beyond, there is exposed a series of white and dark gray limestone beds with interbedded shaly quartzites, marls and gypsum beds. These underlying beds strike northwest and dip to the south. Their exposure is roughly triangular in shape; the base being about parallel with the highway (probably a fault contact with the Penn. Naco beds), and the apex being to the east at the head of the gully. The north side of the triangle may well be a vertical fault, along which the block on the north side has been dropped. The south side of the triangle is marked by an angular unconformity with the overlying upper Permian (Snyder Hill) beds. The fault which makes this angular unconformity is the most important as far as the geology of the San Xavier Mine is concerned. The fault dips south and the movement along this fault must have been reverse, i.e., the hanging wall block moved up relative

to the foot wall. The faulting was not confined to a single break, but rather to several faults which intersect each other either along the strike or down the dip. I believe the 17 fault is part of that system of reverse faults.

Evidence of thrust faulting in this part of Arizona (Santa Rita Mts., Empire Mts., Tucson Mts.) is common. Thrust faulting would be expected in this area, and strong evidence is found to support the expectation. The reverse faults described in the preceding paragraph are considered to be related to the broader structural features of the area, specifically to the thrust faulting.

Below the 500 level, in the west half of the mine, evidence has been accumulated which when recently reviewed established the presence of 5 beds below the arkose (and the "17" fault). The continuity of the beds from the deepest level to the surface is best shown in section c-c (200' scale). The five beds comprise 3 limestone beds and "two "dense siliceous beds." (Predominantly very fine grained, shaly, and possibly limy, quartzites.) The limestone beds can be conveniently called the A, B, and C members. The "dense siliceous" beds can be numbered 1 and 2. From arkose down, the stratigraphic section is then; A, 1, B, 2, C, 3? At present the continuation of the alternating beds is not known underground stratigraphically below limestone member C, except at the surface where the third "dense siliceous" bed appears. All five members, and possibly the overlying cretaceous sediments, have been folded into a southeastwardly pitching syncline. The east limb of this syncline is known definitely to have been truncated by the 17 fault and by others belonging to the reverse set mentioned previously. Development work underground has not proceeded far enough west as yet to ascertain if the west flank of the syncline is similarly truncated.

As may be seen in the following sketch, all 5 beds (at least) butt up against the 17 fault.



To date, only the A limestone member has been productive. The largest and most productive shoot of the mine yet found was in the "A" bed where it abutts the "17" fault. There appears to be a chance that shoots may exist in the B and C limestone members where they abutt the 17 fault. Diamond drilling through the 17 fault to the north is necessary to ascertain where along the underside of the 17 fault the B and C members are likely to be found in this apparently favorable structural relationship. Considerable work has already been done which will be useful.

It should also be kept in mind that a similarly favorable situation may exist if the "17" fault truncates the west limb of the syncline.

Still another possibility exists in the hanging wall block of the "17" fault, where the limestone below the quartzite abuts the fault and even elsewhere in it to the east.

Recently in D. D. Hole #238 (660 level) two beds of gypsum have been penetrated in what appears to be the "B" member of the series. There is some chance that a large fault was crossed before hitting the gypsum, which would mean that the gypsum was not in the "B" member. If the gypsum beds are confined to one layer of the Yeso section, the gypsum exposed in the gully north of the mine would be the same bed as hit in D.D.H. 238. The occurence of the gypsum in the Yeso should be well known to F. W. Galbraith, and B. S. Butler who have seen many yeso sections. The extraordinary thickness of the "B" in DD.H. 238 can be explained by the flat dip of the beds. (See log.)

The previously mentioned syncline apparently truncated by the "17" and allied faults, is probably also truncated nearer the trough of the fold by a set of steep northeast fissures which can be observed underground on the 340 and 270 levels in the vicinity of the No. 4 shaft, CDH #1.

There is an area above the 270 level, between the No. 4 and No. 1 shaft, which has not been sufficiently explored. If any ore exists, it may be in part oxidized. The area could be drilled from the surface or the 200 west face could be advanced as suggested several years ago. See longitudinal projection. Some work in this direction was done on the 115 level, but not much lateral work was done from this drift.

W. R. Jones

1945±?

SOME GEOLOGIC NOTES ON THE SAN XAVIER MINE

In spite of the detailed geologic work that has been done here for the past 6 years the significance of the "17" fault is not clearly understood. We have avoided taking a dogmatic stand on some theory, and thereafter collecting facts to prove it. Instead, the facts have been accumulated and they can be used by anyone interested in developing a theory. Listed below are certain facts about the "17" fault.

1. It strikes northeast and dips southward. It is far from being the text-book plane type of fault as it has many irregularities in both its strike and dip. It changes course abruptly, and has been known to flatten and steepen down dip.

2. It has a tendency to split in the direction of strike and dip. These splits probably originate at places of change in strike and dip. Because it intersects the bedding planes of the hanging wall limestone at an acute angle, many splits leave the main fracture and follow out along some bedding plane. The contacts between limestone and dense shaly quartzite, or limestone and quartzite seem to have localized some of the more prominent splits. Splits into the foot wall formations have not been recognized.

3. It is usually characterized by 4-6 inches of greenish gray gouge on its footwall side. In places it is mineralized, usually in the foot or two of brecciated rock above the gouge.

4. The displacement (if any exists) of the arkose-limestone contact, along the "17" fault is very obscure. The apparent displacement of the Permian beds has not been measured. It may be great or small depending upon the identification of the beds in the foot wall and hanging wall, which to date has not been positively made.

5. It has been conveniently used as a geologic marker in development work to date. No ore bodies of any size have been found in the foot wall of the "17" fault east of about coordinate line 100, 200 E. (The east wall of No. 7 shaft is 100, 184' E.) This does not mean that ore bodies may not exist beneath the fault farther east than 100, 200 E., and, as will be explained later, exploration should be directed to prospect this possibility.

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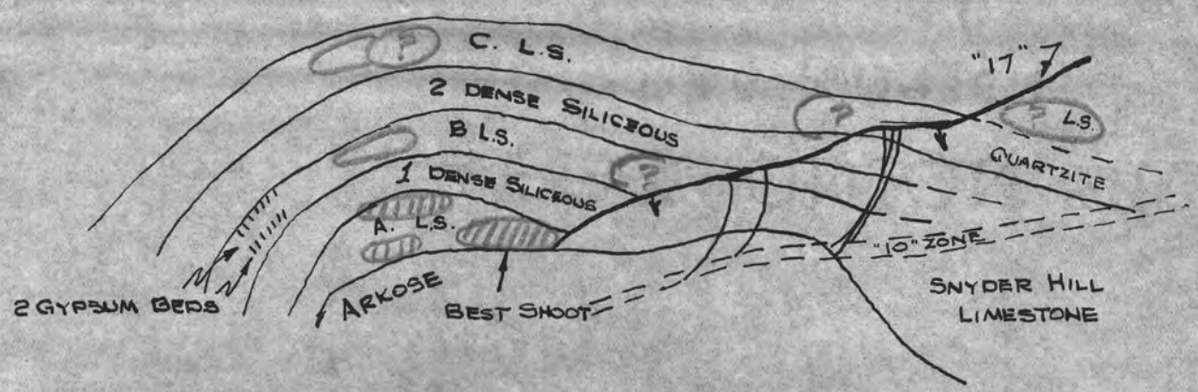

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