CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the Walter E. Heinrichs, Jr. Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

INDUCED POLARIZATION SURVEY

on the

EMPIRE PROJECT

near

PARKER, YUMA COUNTY, ARIZONA

for
WESTATES PETROLEUM COMPANY

May 1971

Job 625

INDUCED POLARIZATION SURVEY

on the

EMPIRE PROJECT

near

PARKER, YUMA COUNTY, ARIZONA

for

WESTATES PETROLEUM COMPANY

May 1971

HEINRICHS GEOEXPLORATION COMPANY
P.O.Box 5964, Tucson, Arizona 85703

GEOEX Job # 625

TABLE OF CONTENTS

	Page
General Location	
Introduction----------	1
Conclusions & Recommendations----------	2
Comments on Drilling I. P. Targets----------	3
Interpretation----------	4
Induced Polarization Location and Interpretation Plan	
Sectional Data Sheets (All 1,000 ft. dipoles)	
Line 1	
Line 2	
Line 3	
Line 4	

Neenah Onionskin
25% COTTON FIBER

GENERAL LOCATION
of
EMPIRE PROJECT
for
WESTATES PETROLEUM

ARIZONA

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Cross Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson

INTRODUCTION

At the request of Mr. H. W. Thompson, President of Westates Petroleum Company, Heinrichs GEOEXploration Company was contracted to extend an induced polarization survey originally initiated December 1970, in the Empire Project area near Parker, Yuma County, Arizona. This extension phase of the field work was done in the interim April 19 to April 24, 1971.

Four lines of I. P. coverage were added to the original three lines and are designated as Lines 1 thru 4. Line 1 was run roughly E-W and Lines 2 thru 4 are oriented roughly NE-SW. All four lines utilized a dipole spacing of 1,000 feet with "n" separations ranging from 1 to 6. The dual frequency I.P. system was employed with sending frequencies of 0.3 and 3.0 Hz to be comparable with the previous data. The electrode configuration used was the collinear dipole-dipole array which on a 1,000 foot dipole spacing typically gives resolvable penetration within the zone from about 300 feet to 1,200 or 1,500 feet below surface depending on target size, resistivity contrasts, etc.

The surface coverage obtained in this second phase work totals 48,000 feet of which 28,000 feet is "subsurface" plotted data. The data were obtained with a GEOEX Mark 4 Sender and a GEOEX Mark 4C Receiver.

The purpose of this new coverage was to obtain more detail to help delineate drilling targets on an anomalous zone detected in the first phase work.

The I. P. data presented are in "sectional" form as on the initial survey. A new " Induced Polarization Location and Interpretation Plan" is included showing all seven lines and is presented on a portion of the Cross Roads 7 1/2 minute U.S.G.S. Topographic Quadrangle to show the relation of the geophysics to topography at a convenient scale.

GEOEX personnel involved in this second stage field work were W. Freeman, Geophysicist-Crew Chief with D. Swanson and W. Hitchcock as technical assistants. Initial field supervision was by J. P. Matthews, Geophysicist with report and interpretation done by C. S. Ludwig, Senior Geophysicist, assisted by the GEOEX staff. We wish to extend our appreciation to Mr. Dan King, Consultant to Westates and Mr. Jerry Bray for their valuable assistance to the field crew.

CONCLUSIONS AND RECOMMENDATIONS

All four new lines show anomalous I. P. response very similar in character to the response seen on the initial work. No very well defined pattern is indicated in plan, however. There appears to be a very broad polarizable body generally below 300 to 500 feet in depth underlying most of the area surveyed.

A slightly stronger portion of this broad anomalous zone appears to trend NNW roughly from the Carnation Mine to at least Line 4. Because this slightly stronger zone crudely correlates with surface showings of oxide copper mineralization, we recommend it as an initial focus for deeper evaluation by drilling.

Based solely on the geophysical data, a vertical drill hole collared near 0-N/S on Line 2 is suggested as the first priority target. The hole should be programmed for a total depth of at least 1,000 to 1,500 feet to obtain a representative sampling of the zone of interest but the top of the polarizable source may actually be encountered as shallow as 300 or 400 feet below surface.

Strength of the expected polarizable mineralization cannot be estimated in this case due to our profound lack of knowledge of rock and mineralization types involved in the underlying rocks at depth. However, the strength of response is enough that if caused mainly by ore sulfides such as chalcopyrite, it could be economic in grade and should therefore be tested for this possibility. Other non-economic polarizable sources or causes are possible which should be kept in mind during any I. P. target drilling. These include various metallic lustered materials such as pyrite, pyrrhotite, magnetite, manganese oxides, graphite and specularite and rarely certain clays. Specularite can probably be essentially ruled out since a large surface zone heavy with specularite mineralization was crossed in the initial work with no obvious response.

If the proposed initial drill hole proved encouraging, another geophysically similar portion of the I. P. anomaly would then also warrant investigation with a vertical hole collared near 10N on Line 3 and programmed for a similar depth to the first hole.

In general, the resistivities are quite high in the area surveyed and together with the not particularly high PFE's, even in the most strongly anomalous areas, produced rather low MCF's. This implies a rather tight (electrically non-conductive) host rock with disseminated or veinlet type - not interconnected, or massive - polarizable mineralization. The resistivity pattern is rather complex and suggests several different surface rock types being crossed on most of the traverses. No well defined resistivity layering suggestive of low angle thrusting or gravity glide faulting is noticed, but any such condition could easily be obscured by the erratic surface variations in conductivity present.

Some of the resistivity variation is caused by the rugged terrain crossed by all four lines. These adverse terrain effects rendered the MCF's somewhat less diagnostic than usual, also.

No significant appearing self potential response was noticed. The apparent considerable depth to oxidizing sulfides, if present, and their expected thoroughly disseminated character, would not likely provide a particularly detectible or interpretable spontaneous or natural potential effect in any event.

Indications of anomalous I. P. values were seen on the northeast or east ends of Lines 1, 2 and 4 which could be reflecting another polarizable zone 3,000 or 4,000 feet east of the primary target area. This response may be related to, or below, a basalt flow crossed on the ends of these lines. Additional I. P. coverage may be justified in this area if any encouragement is obtained in the preliminary drilling. Likewise, more I. P. coverage could be desirable north and south (and to some degree west) of the present grid in that the anomalous zone is still open in these directions.

It is suggested that GEOEX have a representative on hand during the latter phase of the first hole drilling or be furnished representative samples of the first hole to confirm the specific cause of the anomalous effects noted. This should be done before the initial drilling is completed, along with a meeting be held between Westates and GEOEX to review the project to take a maximum advantage of all data available to date and best plan any subsequent processing of the area.

COMMENTS ON DRILLING I. P. TARGETS

To maximize the probability that a recommended drill hole will intersect the source of an induced polarization anomaly, the following points should be considered:

1. The anomaly has been caused by some physical property, hopefully a polarizable body containing economically interesting metallic mineralization, and this property should be determined before abandoning the anomaly.

2. Location of drill holes should be made relative to the actual sending and receiving electrode positions as they exist on the ground.

3. Due to inherent limitations in the I. P. method, depth determinations are only approximate and the interpretation of dip is severely limited, particularly for angles greater than 45°. Also, targets can generally be laterally resolved no finer than the station spacing (dipole length). Because of these limitations, targets less than one dipole spacing in width, particularly when steeply dipping or deeper than the

dipole length, may be difficult to intersect. In these cases, several drill holes in a fence line should be considered. For the steeply dipping cases, angle drilling may also prove advantageous, mainly where the direction of dip can be geologically inferred and the drill hole oriented such that an optimum intersection of the zone of interest is obtained.

4. An observed anomaly can be the effect of a polarizable body laterally offset to the side of a line and therefore if practical, drilling should be confined to those portions of the anomalous zones well defined by several lines. Also, it should be noted that a single line cannot define the strike direction of an elongate anomalous zone - another reason for utilizing several parallel lines.

5. Logging of the drill core must be done with special care to note the quantity of all possible polarizable material such as pyrite, graphite, magnetite, manganese oxides and clay minerals as well as the polarizable ore minerals. The anomalous source could conceivably be overlooked if the core is not carefully logged.

6. Typical sections of core representing the gross physical properties of material encountered in the drilling should be tested in the laboratory for their I. P. parameters, if there is some doubt about confirmation of the anomalous source.

INTERPRETATION

Line 1: This line shows several anomalous zones in the PFE's with the strongest zone lying mainly between about 5N and 15S, having a source buried as shallow as 300 feet to as deep as 1,000 feet and with an indefinite depth extent. There is some MCF correlation with this anomaly and it may also be involved with a resistivity level change near 0-E/W which is possibly reflecting a rock type change. East of about 40E, the PFE's and MCF's both increase, suggesting the west edge of an anomalous zone in (or beneath) the basaltic rocks in that area. More coverage is needed to the east to interpret this zone in detail. The PFE's also increase on the west end of the line at depth but with no corresponding increase in MCF.

The resistivities on the east half of the line suggest that the basalts are several times more conductive than the sediments and metamorphics in the main area of interest. Higher resistivities at depth in the basalt may be reflecting the buried sediments and metamorphics 500 to 1,000 feet below surface under the basalts. The resistivities on the west half of the line show a near surface high resistivity zone conceivably reflecting the surface sediments and metamorphics resting on top of a more conductive rock perhaps due to thrust faulting which is known to be present in the general district. The main I.P. anomaly would appear to be mostly coming from a source within the buried more conductive material. The self potentials show only minor regional - topographic variations.

A narrow near surface MCF high is noted between stations 10N and

20N but has no associated anomalous PFE response and is probably not significant and could be topographically caused.

Line 2: The PFE's show a pronounced increase with depth along the entire line. A slightly stronger zone is interpreted between 10N and 10S with gradational fringes extending indefinitely both to the northeast and southwest. This anomalism likely correlates with similar response seen between 5N and 15S on Line 1. Depth estimates to the top of the polarizable source range from as shallow as 300 or 400 feet to as much as 1,000 feet below surface. No obvious resistivity feature correlates with the I. P. anomalism and very little resistivity correlation can be seen between this line and nearby Line 1, inferring considerable structural complexity although perhaps in part caused by the difference in line orientations.

Lower near surface resistivities southwest of about 15S and northeast of 45N are likely the result of traversing the more conductive basalts. Higher MCF's relate to the basalts but are probably not of particular significance because of the lack of near surface associated higher PFE's. Again, the surface sediments and metamorphics appear as a rather high resistivity material. No significant appearing self potential variations were noted.

Line 3: This line is fairly similar in character to Line 2 and shows I.P. anomalism of similar strength and depth. Again, low resistivities are seen on the southwest end of the line. However, the line apparently does not extend far enough northeast onto the basalts to show the corresponding resistivity low in that direction. The self potentials show a minor low near 0-N/S which could possibly be reflecting near surface oxidizing sulfide mineralization. However, due to a lack of correlation on Line 2 directly southeast, not much significance is attached to this low.

Line 4: The PFE response at depth is similar in strength to that on Line 3 but is apparently coming from a greater depth, say about 750 to 1,000 feet deep. The associated resistivities are quite high producing rather low MCF's. Nearer surface anomalous I.P. effects, both PFE and MCF, are noted on the southwest and northeast ends of the line. On the northeast end of the line, at least, this shallow response could be related to the basalts and is similar to response seen on the east end of Line 1.

Resistivities on this line show a general increase with depth somewhat different than seen on the other lines and could be reflecting the northerly dipping "Syncline" limestone directly southeast of Line 4 as shown on Mr. H. H. Neel's Preliminary Geologic Map of the area. This limestone is the only mapped unit other than the basalt that gave a fairly diagnostic electrical signature on this survey. Again, the very northeast end of the line shows a low resistivity zone where traversing the basalt. No significant self potential variations are noted.

Respectfully submitted,
Heinrichs GEOEXploration Company

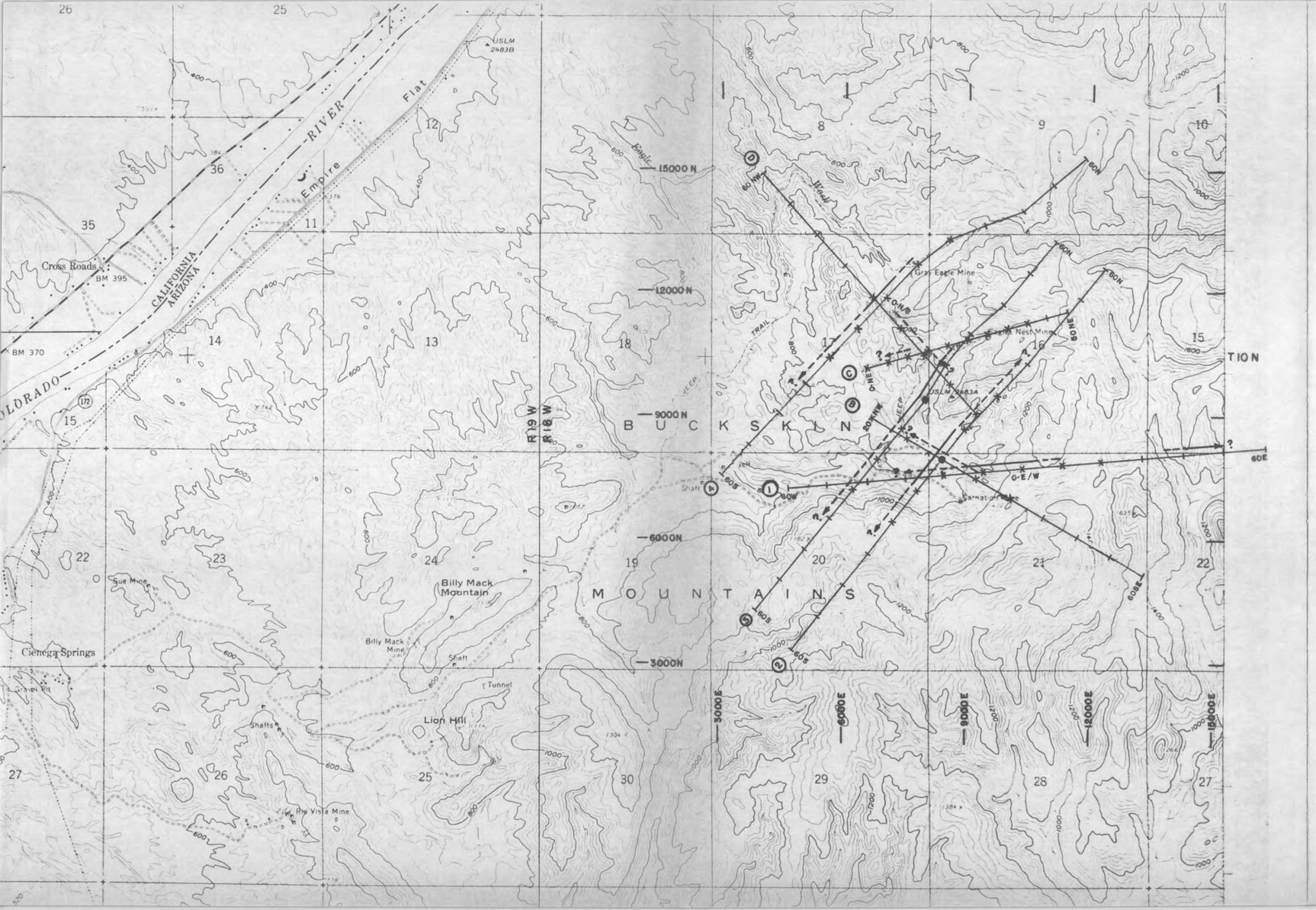
Chris S. Ludwig
Senior Geophysicist

Approved: Walter E. Heinrichs, Jr., President

May 7, 1971
P. O. Box 5964
Tucson, Arizona, 85703

GEOEX Job. 625

INDUCED POLARIZATION LOCATION
AND INTERPRETATION PLAN
of
EMPIRE PROJECT
for
WESTATES PETROLEUM COMPANY
by
HEINRICHS GEOEXPLORATION COMPANY



RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

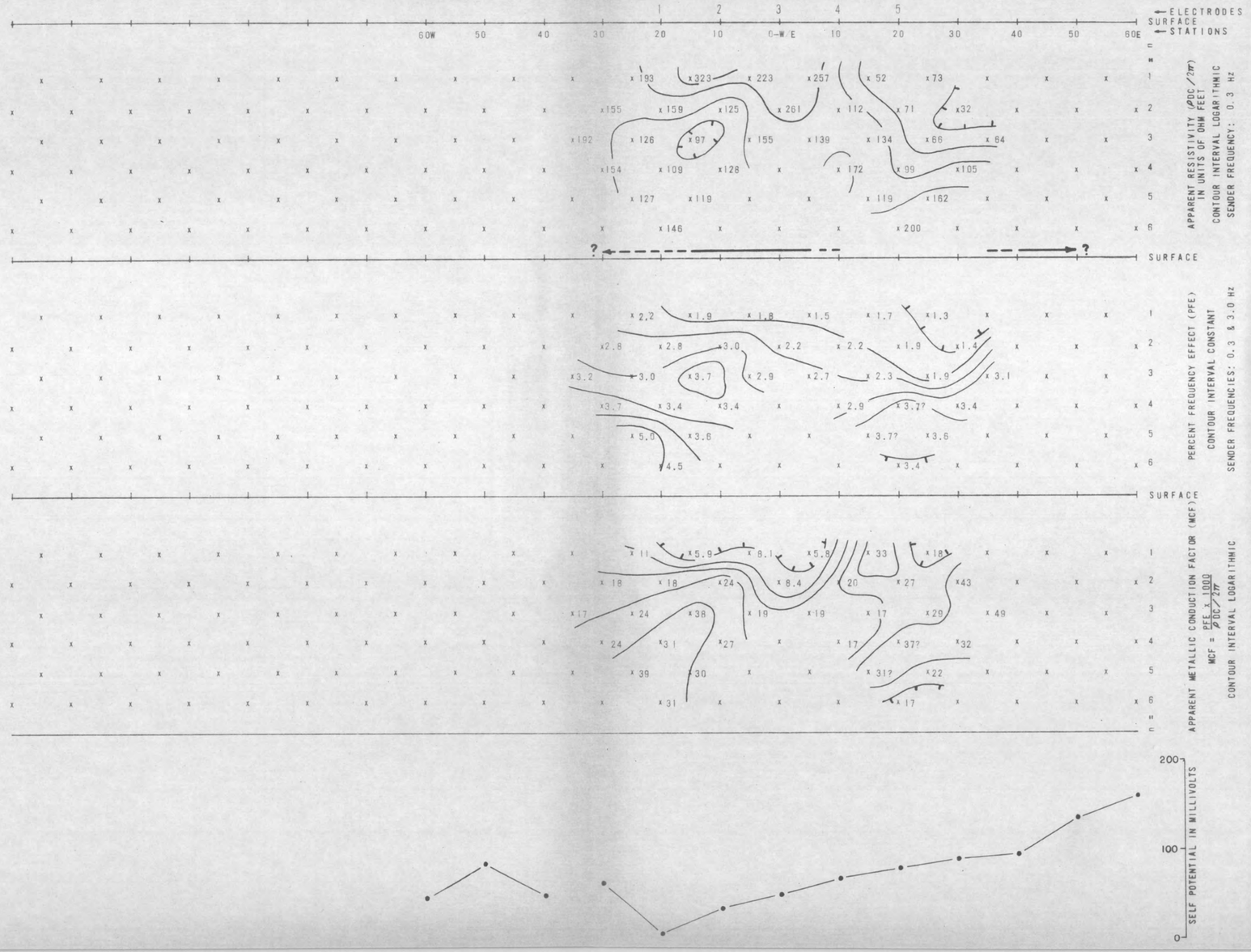
SCALE: 1:24,000

JOB 625-71 MAY 1971

EXPLANATION

- (3) I. P. LINE DESIGNATION
- ELECTRODE
- STATION
- PROPOSED DRILL HOLE

POST OFFICE BOX 5964
TUCSON, ARIZONA 85703

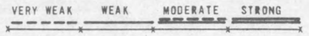


625-71

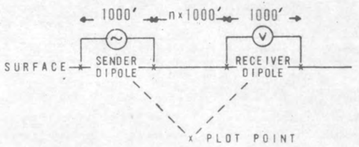
LINE NO.
1
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for WESTATES PETROLEUM COMPANY

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY

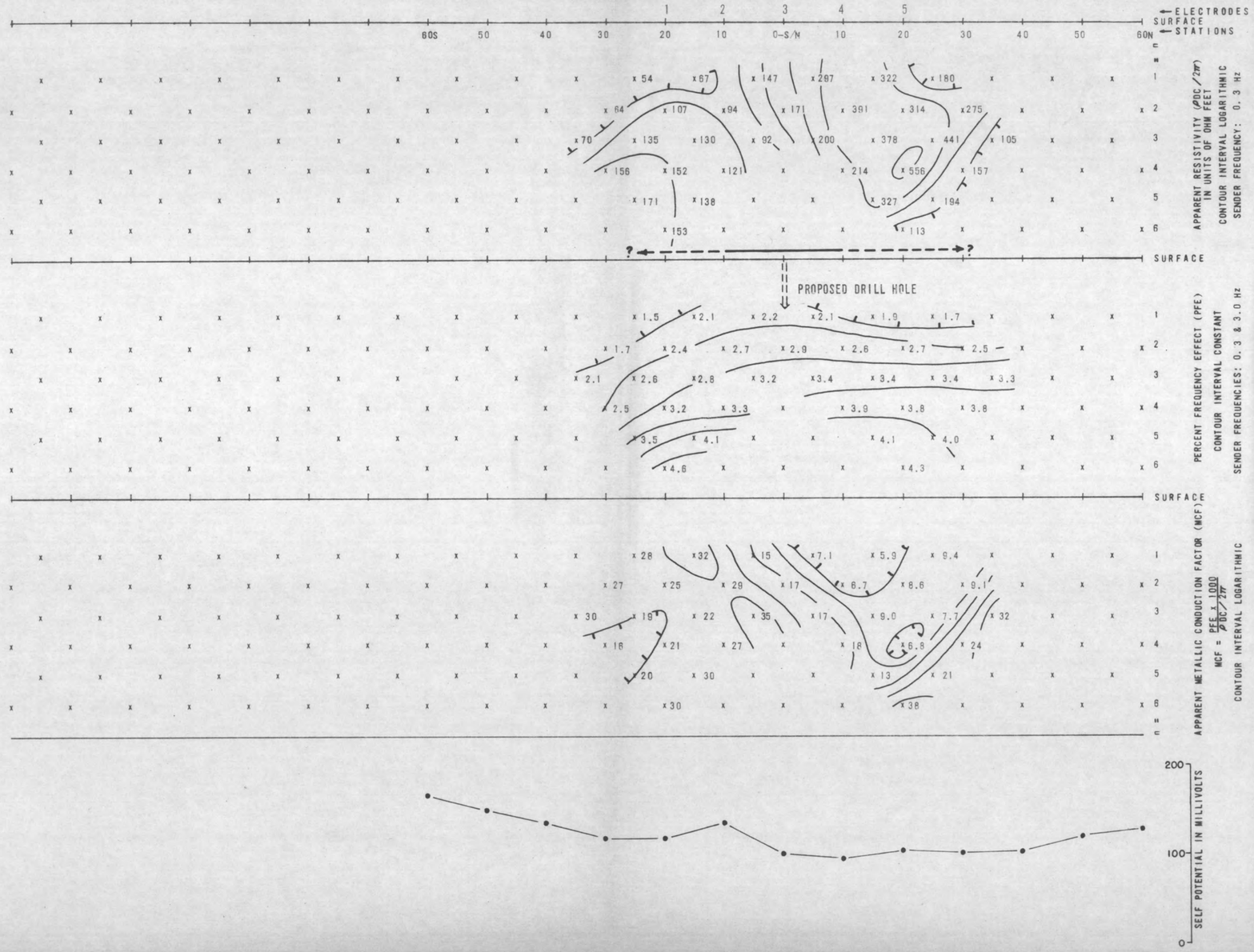


AREA
EMPIRE PROJECT
LOOKING
N 4° W
DATE
APRIL 1971

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson



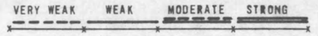
625-71

LINE NO.
2
SPREAD(S)
1

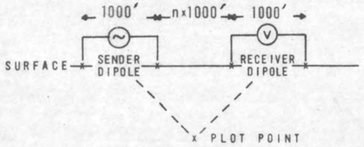
INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for

WESTATES PETROLEUM COMPANY

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY

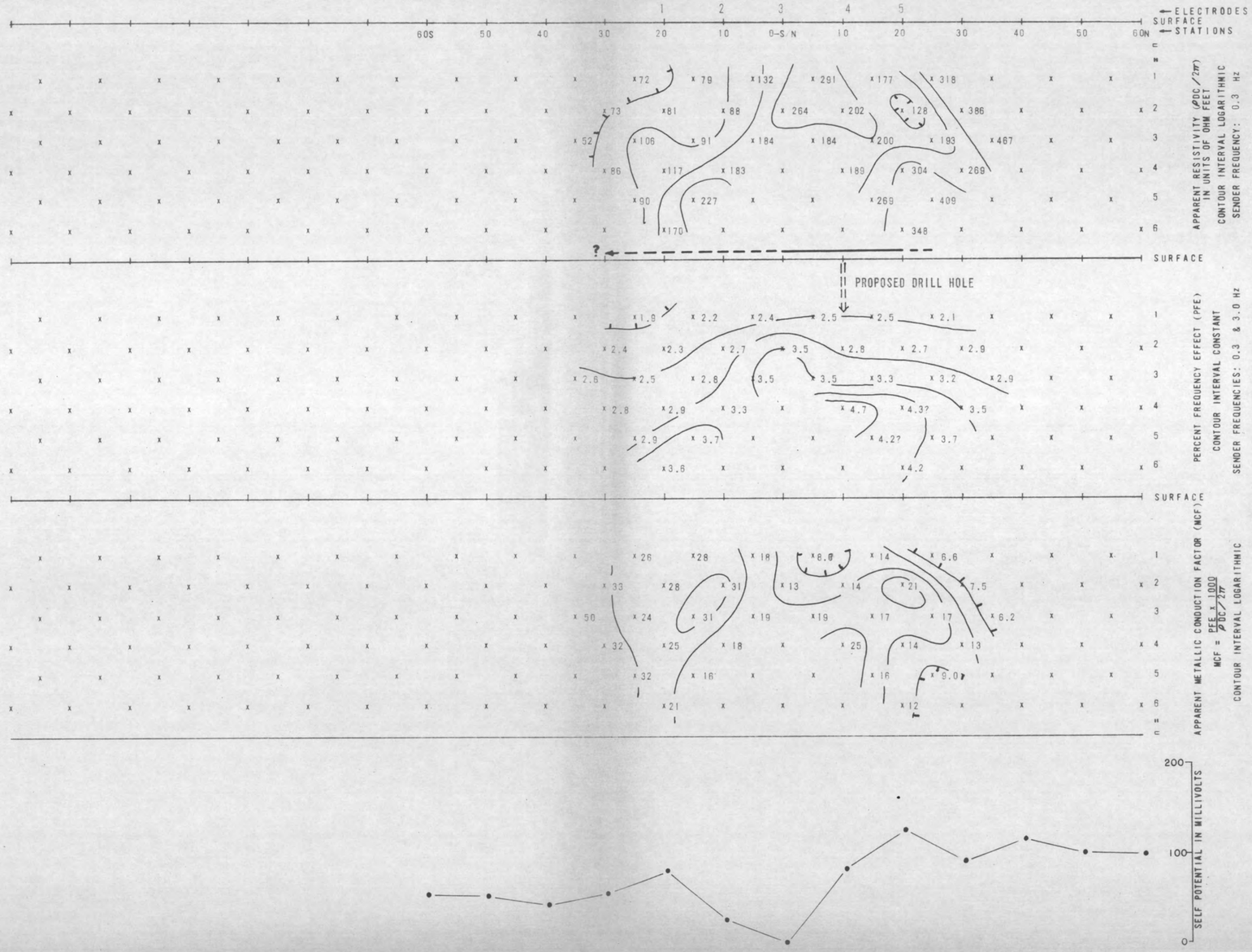


AREA
EMPIRE PROJECT
LOOKING
N 50° W
DATE
APRIL 1971

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson

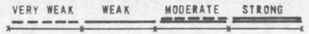


625-71

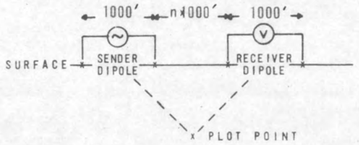
LINE NO.
3
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for WESTATES PETROLEUM COMPANY

RELATIVE ANOMALY STRENGTH

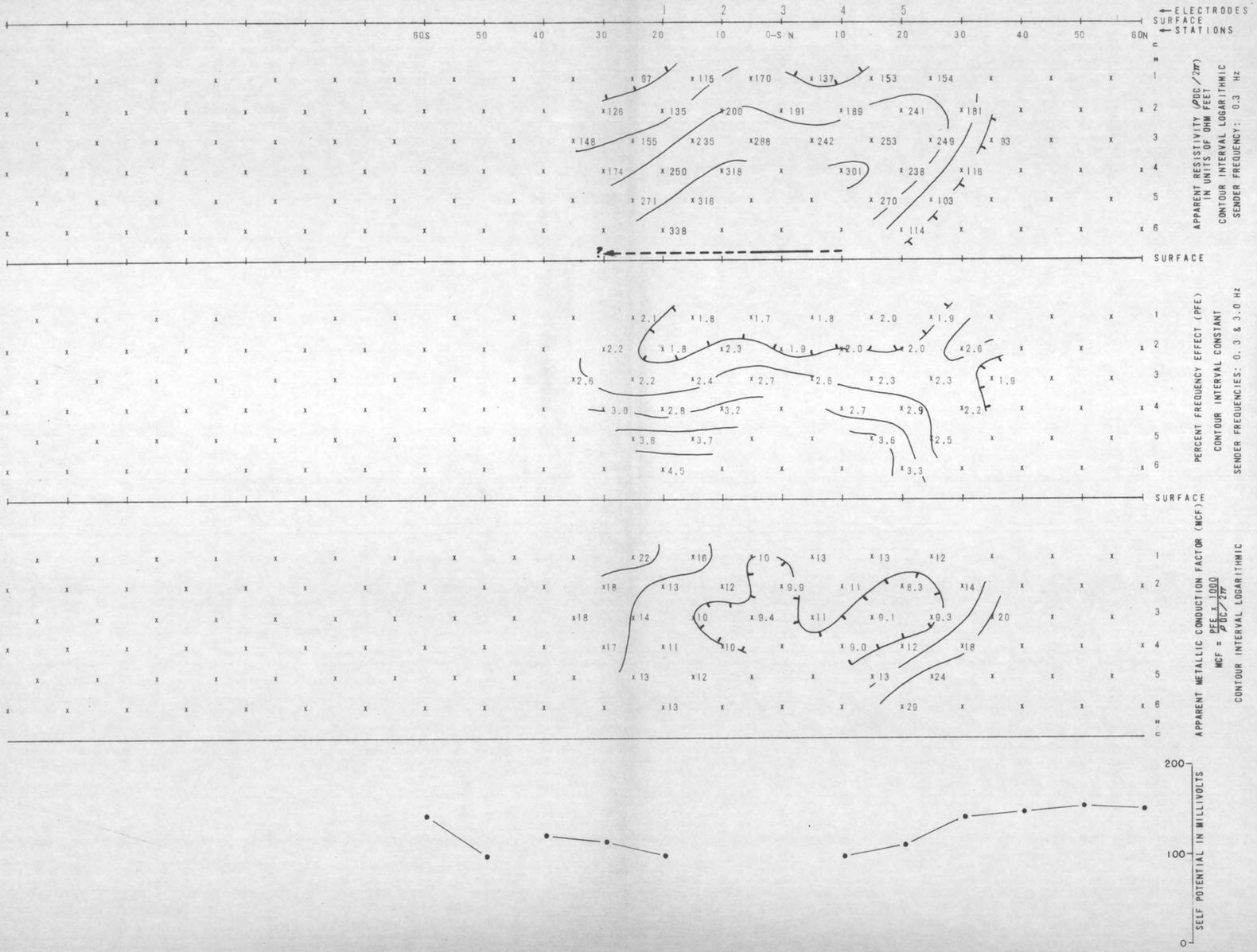


DIPOLE DIPOLE ELECTRODE ARRAY



AREA
EMPIRE PROJECT
LOOKING
N 50° W
DATE
APRIL 1971

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS
AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793
U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson



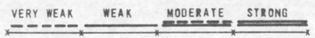
625-71

LINE NO. 4

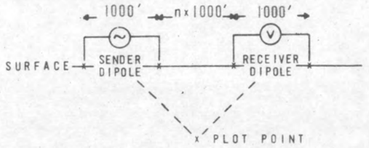
SPREAD(S) 1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for WESTATES PETROLEUM COMPANY

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA
EMPIRE PROJECT
LOOKING
N 37° W
DATE
APRIL 1971

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson

Geo. Job #595

INDUCED POLARIZATION SURVEY

OF

EAGLES NEST MINE AREA

NEAR

PARKER, YUMA COUNTY, ARIZONA

FOR

WESTATES PETROLEUM COMPANY

DECEMBER 1970

By

Heinrichs GEOEXploration Company
P.O. Box 5964 Tucson, Arizona 85703
Tel: 623-0578

GEOEX Job # 595

TABLE OF CONTENTS

	Page
Index Map	
Introduction	1
Conclusions and Recommendations	2
Comments on Drilling I.P. Targets	3
Interpretation	4
Sectional Data Sheets	
Line B	
Line C	
Line D	
Basis of the Induced Polarization Method	
Induced Polarization Location and Interpretation Plan	

GENERAL LOCATION
of
EMPIRE PROJECT
for
WESTATES PETROLEUM

ARIZONA

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson

DEC 17 1970

INTRODUCTION

At the request of Mr. Dan King, consultant to Westates Petroleum Company, Heinrichs GEOEXploration Company conducted and completed several induced polarization lines at the Eagles Nest Mine, near Parker, Yuma County, Arizona. The field work was performed during the interim December 14 through December 16, 1970.

The purpose of this survey was to ascertain if there are subsurface concentrations of sulfide mineralization associated with the surface exposures of copper and iron oxides. Past production in the area has apparently been from steeply dipping mineralized contacts between the limestone and adjacent schists and other intrusive rocks. Abundant specular hematite float occurs throughout the area, often associated with copper mineralization.

Immediately preceding this survey, reportedly another geophysical contracting company also doing frequency domain induced polarization work here, had indicated difficulty in obtaining valid I.P. data owing to noise problems in the area. Reportedly because of this they were unable to complete the assigned survey. Subsequently, GEOEX was retained to comparatively determine what noise problems were present and if possible to complete the I.P. survey. Prior to any routine data acquisition, specific noise readings were taken over the spectrum of available receiver frequencies i.e. d.c., 0.1 Hz, 0.3 Hz, 1.0Hz and 3.0 Hz. As expected, the noise level was quite low at 3.0 Hz: 0.01 millivolts(MV) increasing to 0.09MV at 0.1 Hz. Similarly the d.c. noise was somewhat higher yet. Based upon these data, 3.0 Hz and 0.3 Hz were used as sender frequencies (maximum noise 0.03MV. During the course of the survey, somewhat higher noise readings were observed at certain stations, however, it never reached levels in which data quality was compromised and the type of severe noise problem, reported by the other contractor, was not encountered.

A total of three partial spreads on three lines were completed. Line C was run with 500 foot dipoles on a bearing of N 73°E. Line D was run with 1000 foot dipoles on a bearing of N 40°W and crosses Line C. Line B bears N 30°W

and utilized 1000 foot dipoles. This line was previously run by another contractor using 500 foot dipoles. Total surface coverage was 21,000 feet of which 11,000 feet is "subsurface" plotted data.

The dual frequency I.P. technique was utilized on all lines using the collinear dipole-dipole electrode array, however, readings were taken only in one direction rather than both ways as is usually done. The effective subsurface volume explored with this configuration is typically within a zone from one-fourth to one and one-half the dipole spacing maximum depth, which in the case of 500 foot dipoles, would be from roughly 125 feet to 750 feet deep. These depths are only typical and are dependent on such factors as resistivity and degree of homogeneity of the subsurface material. Lines B and C were run using 1000 foot dipoles after it was determined that the expected depth of any target would be at or in excess of 1000 feet.

The data are presented on sectional data sheets, herewith attached one for each line, showing apparent resistivity, present frequency effect (PFE) and metallic conduction factor (MCF), contoured in vertical section and the self potential profile. Also included is an "Induced Polarization Location and Interpretation Plan" at a scale of 1:12,000.

Additional information concerning theory, interpretation and presentation is given in the "Basis of the Induced Polarization Method" in the appendix of this report.

GEOEX personnel who conducted the field work were: Phil Matthews, geophysicist and Gary Hix, technical assistant. Report and interpretation are by Phil Matthews, geophysicist, assisted by the GEOEX staff in Tucson, Arizona. The help of Messrs. Dan King and Jerry Bray during the field operations is greatly appreciated.

CONCLUSIONS AND RECOMMENDATIONS

Very weak I.P. effects are noted on all three lines.

The anomalism found on Lines C and D are nearly coincident, and that found on Line B seems to lie roughly along the same north-south trending structure (?), which apparently carries most of the known mineralization. Unfortunately there is not enough I.P. coverage to get a good "feel" for background frequency effects, or to outline a definite zone of interest. Inasmuch as the anomalism found on Lines C and D is reportedly in an area where encouraging drill results were encountered, definite economic potential could be associated with the I.P. effects noted.

It is recommended that, if there is any geologic favorability for economic mineralization at depth in the anomalous area additional I.P. coverage be obtained both laterally and with depth on Lines B, C and D. If this work is encouraging further detailed I.P. should be run to define a definite zone of interest, and possible subsequent drill targets.

COMMENTS ON DRILLING I.P. TARGETS

To maximize the probability that a recommended drill hole will intersect the source of an induced polarization anomaly, the following points should be considered:

1. The anomaly has been caused by some physical property, hopefully a polarizable body containing economically interesting metallic mineralization, and this property should be determined before abandoning the anomaly.

2. Location of drill holes should be made relative to the actual sending and receiving electrode positions as they exist on the ground.

3. Due to inherent limitations in the I.P. method, depth interpretations are only approximate and the determination of dip is severely limited, particularly for angles greater than 45°. Also, targets can generally be laterally resolved no finer than the station spacing (dipole length). Because of these limitations, targets less than one dipole spacing in width, particularly when steeply dipping or deeper than the dipole length, may be difficult to intersect. In these cases, several drill holes in a fence line should be considered. For the steeply dipping cases, angle drilling

may also prove advantageous, mainly where the direction of dip can be geologically inferred and the drill hole oriented such that an optimum intersection of the zone of interest is obtained.

4. An observed anomaly can be the effect of a polarizable body laterally offset to the side of a line and therefore if practical, drilling should be confined to those portions of the anomalous zones well defined by several lines. Also, it should be noted that a single line cannot define the strike direction of an elongate anomalous zone - another reason for utilizing several parallel lines.

5. Logging of the drill core must be done with special care to note the quantity of all possible polarizable material such as pyrite, graphite, magnetite, manganese oxides and clay minerals as well as the polarizable ore minerals. The anomalous source could conceivably be overlooked if the core is not carefully logged.

6. Typical sections of core representing the gross physical properties of material encountered in the drilling should be tested in the laboratory for their I.P. parameters, if there is some doubt about confirmation of the anomalous source.

INTERPRETATION

Line B: An apparent very weak I.P. anomaly is centered at station 3 extending approximately 1000 feet southeast and continuing on for an undetermined distance to the northwest. There is the possibility that the relatively high PFE's and MCF's are not "real" but are the result of an electrode array effect caused by a relatively non-polarizable high resistivity zone. Additional I.P. coverage to the northwest will be needed to resolve this anomaly. The resistivity data indicates a possible interface (rock type change) near station 3. No self potential anomalism is noted, suggesting the lack of significant quantities of near surface, relatively interconnected, relatively oxidizing sulfide mineralization within several hundred feet of the surface.

Line C: Very weak frequency effects are located between stations 2 - 3 which are accompanied by a relative resistivity low, and corresponding MCF high. This zone is difficult to pinpoint or to determine its southwestern extent based on the available data. The self potential profile probably reflects only topographic relief and is not necessarily indicative of oxidizing sulfides.

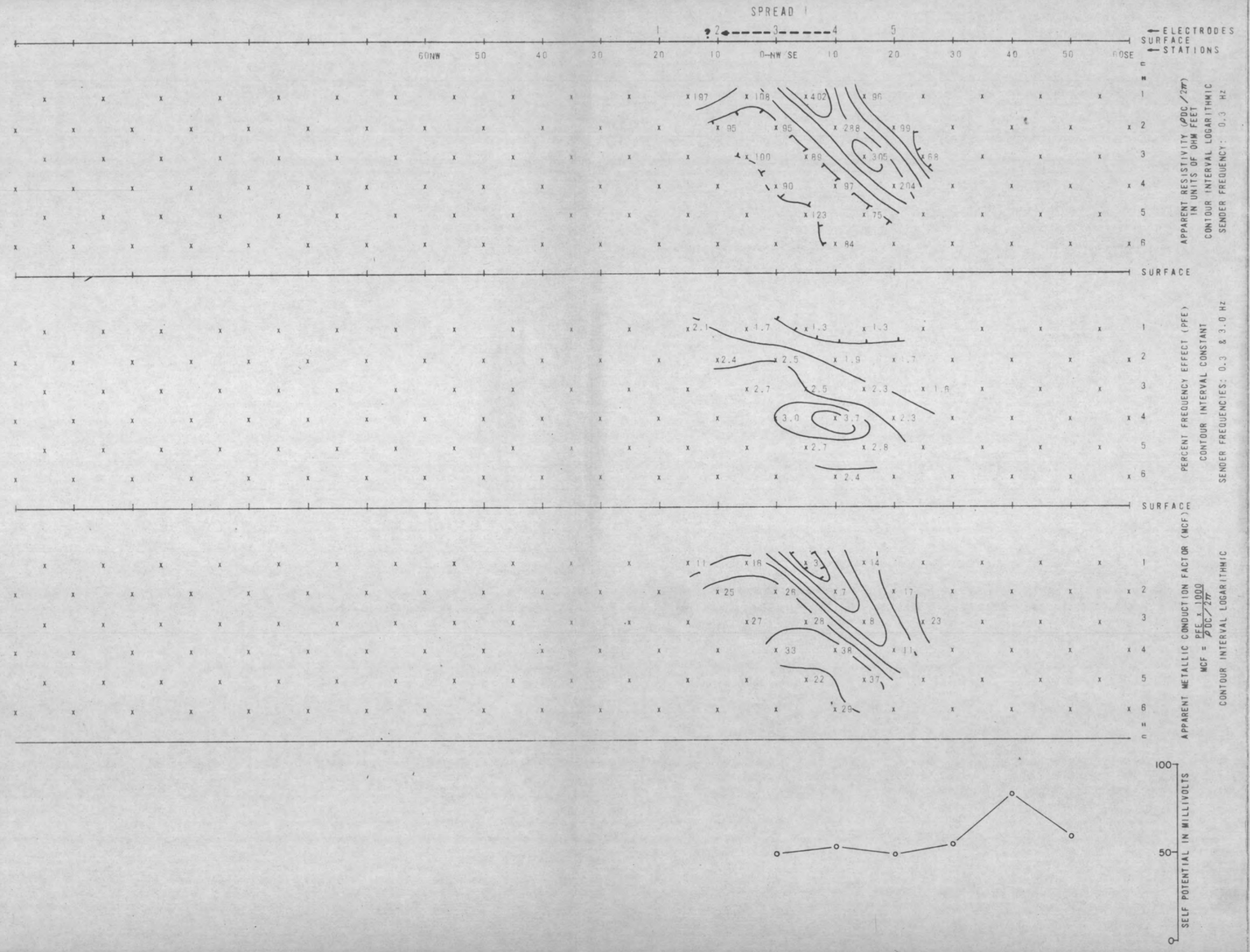
Line D: Very weak frequency effects are located between 2 and 5 and possibly extending to the southeast. Again, the limited amount of data makes a more definite interpretation impossible, particularly in view of the rather complex resistivity picture which results from the rugged topography. A self potential low is located near 20NW which again is probably due to topographic relief although it is coincident with a weak MCF high.

Respectfully submitted:
HEINRICHS GEOEXPLORATION COMPANY (INC.)

By : John P. Matthews, Jr.
Geophysicist

Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
WALTER E. HEINRICHS, JR.
DEC. 31, 1970
ARIZONA, U.S.A.

P.O. Box 5964
Tucson, Arizona 85703
19 December 1970
GEOEX Job # 595

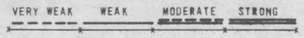


595-70

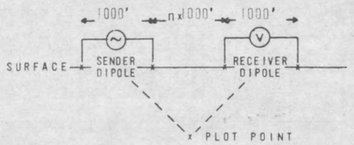
LINE NO.
B
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for WESTATES PETROLEUM

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA
EMPIRE PROJECT

LOOKING
N 30° E

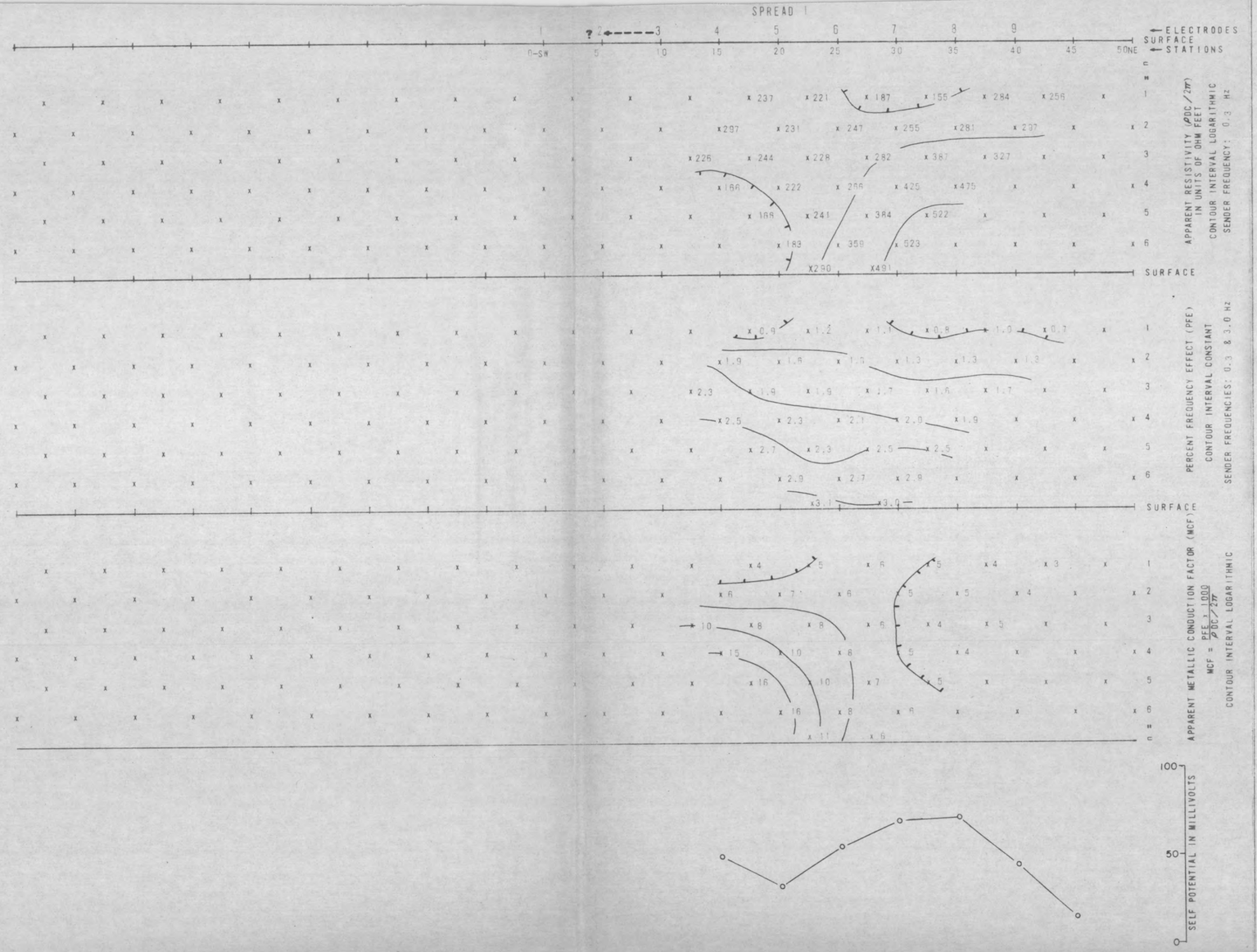
DATE
DEC 1970

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson

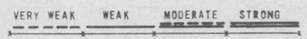
595-70



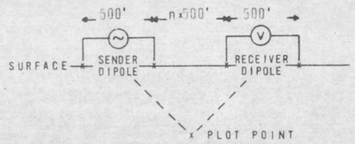
LINE NO.
G
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for WESTATES PETROLEUM

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA
EMPIRE PROJECT

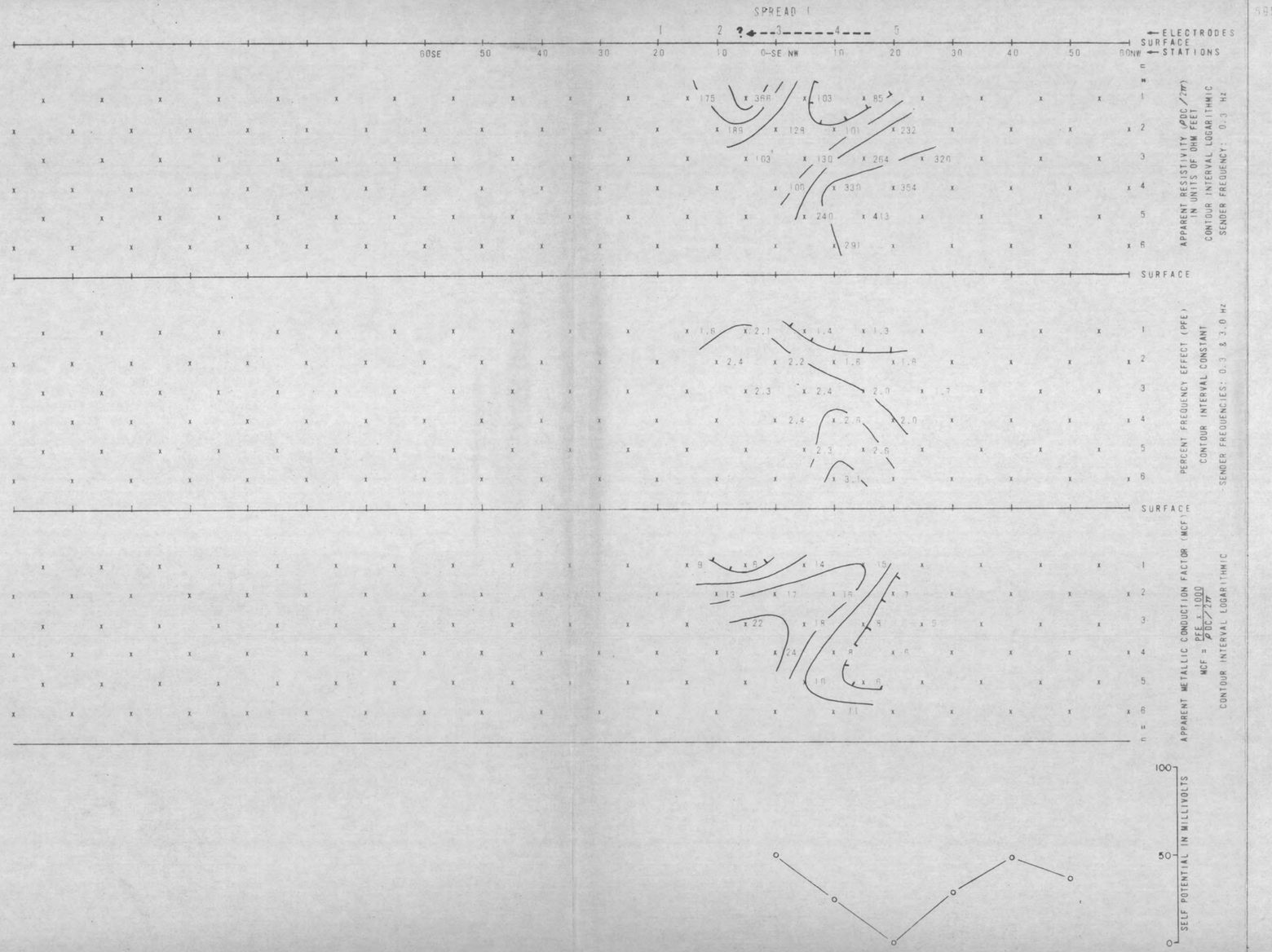
LOOKING
N 17° W

DATE
DEC 1970

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5934
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson

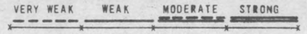


595-70

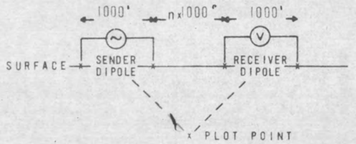
LINE NO.
D
SPREAD(S)
I

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for WESTATES PETROLEUM

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA
EMPIRE PROJECT

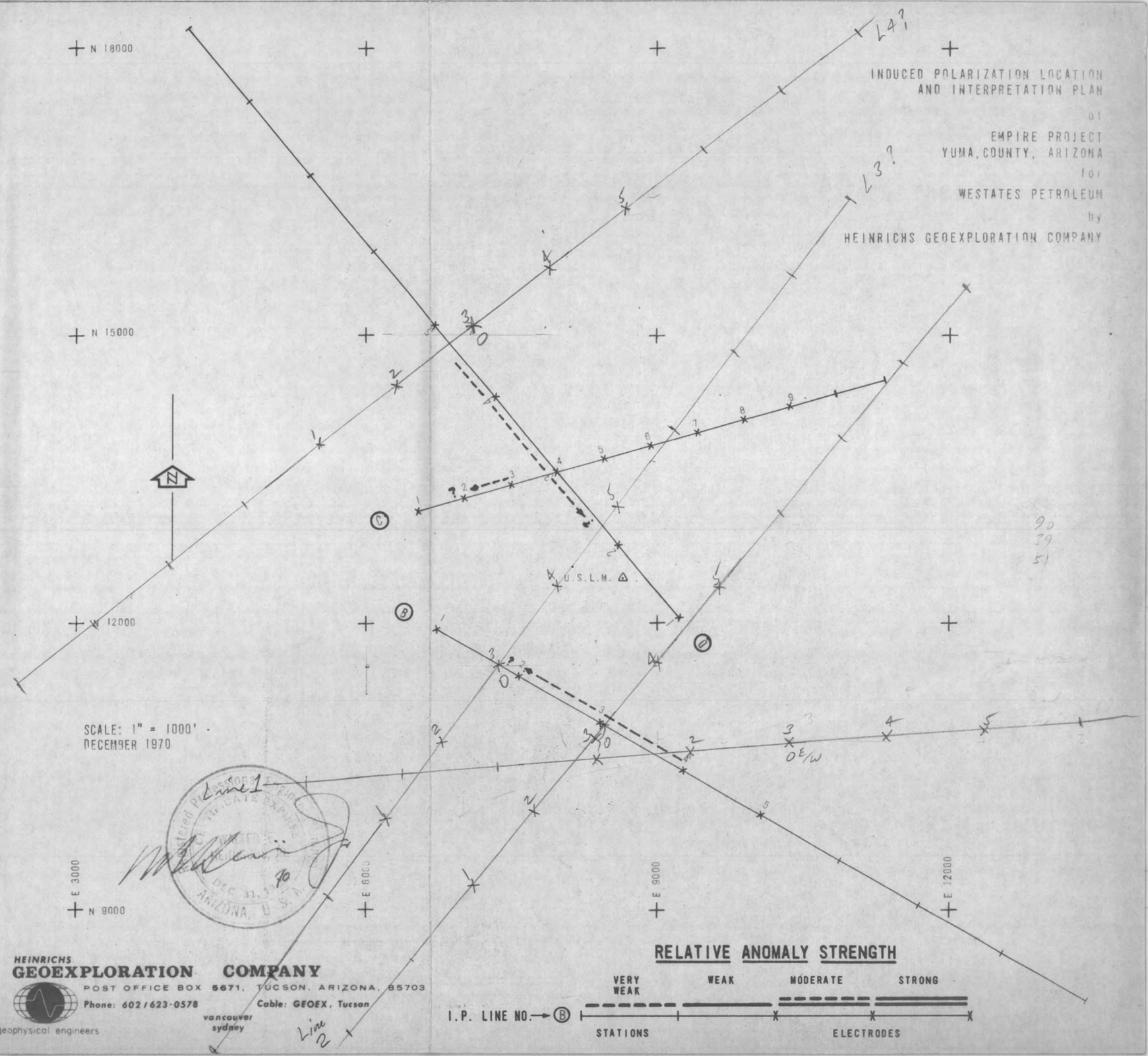
LOOKING
S 50° W

DATE
DEC 1970

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS

AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793

U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson



INDUCED POLARIZATION LOCATION
AND INTERPRETATION PLAN

of

EMPIRE PROJECT
YUMA, COUNTY, ARIZONA

for

WESTATES PETROLEUM

by

HEINRICHS GEOEXPLORATION COMPANY

90
39
51

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

TABLE OF CONTENTS

	Page
Index Map	
Introduction	1
Conclusions and Recommendations	2
Comments on Drilling I.P. Targets	3
Interpretation	4
Sectional Data Sheets	
Line B	
Line C	
Line D	
Basis of the Induced Polarization Method	
Induced Polarization Location and Interpretation Plan	

INDUCED POLARIZATION SURVEY

OF

EAGLES NEST MINE AREA

NEAR

PARKER, YUMA COUNTY, ARIZONA

FOR

WESTATES PETROLEUM COMPANY

DECEMBER 1970

By

Heinrichs GEOEXploration Company
P.O. Box 5964 Tucson, Arizona 85703
Tel: 623-0578

GEOEX Job # 595

INTRODUCTION

At the request of Mr. Dan King, consultant to Westates Petroleum Company, Heinrichs GEOEXploration Company conducted and completed several induced polarization lines at the Eagles Nest Mine, near Parker, Yuma County, Arizona. The field work was performed during the interim December 14 through December 16, 1970.

The purpose of this survey was to ascertain if there are subsurface concentrations of sulfide mineralization associated with the surface exposures of copper and iron oxides. Past production in the area has apparently been from steeply dipping mineralized contacts between the limestone and adjacent schists and other intrusive rocks. Abundant specular hematite float occurs throughout the area, often associated with copper mineralization.

Immediately preceding this survey, reportedly another geophysical contracting company also doing frequency domain induced polarization work here, had indicated difficulty in obtaining valid I.P. data owing to noise problems in the area. Reportedly because of this they were unable to complete the assigned survey. Subsequently, GEOEX was retained to comparatively determine what noise problems were present and if possible to complete the I.P. survey. Prior to any routine data acquisition, specific noise readings were taken over the spectrum of available receiver frequencies i.e. d.c., 0.1 Hz, 0.3 Hz, 1.0Hz and 3.0 Hz. As expected, the noise level was quite low at 3.0 Hz: 0.01 millivolts(MV) increasing to 0.09MV at 0.1 Hz. Similarly the d.c. noise was somewhat higher yet. Based upon these data, 3.0 Hz and 0.3 Hz were used as sender frequencies (maximum noise 0.03MV. During the course of the survey, somewhat higher noise readings were observed at certain stations, however, it never reached levels in which data quality was compromised and the type of severe noise problem, reported by the other contractor, was not encountered.

A total of three partial spreads on three lines were completed. Line C was run with 500 foot dipoles on a bearing of N 73°E. Line D was run with 1000 foot dipoles on a bearing of N 40°W and crosses Line C. Line B bears N 30°W

and utilized 1000 foot dipoles. This line was previously run by another contractor using 500 foot dipoles. Total surface coverage was 21,000 feet of which 11,000 feet is "subsurface" plotted data.

The dual frequency I.P. technique was utilized on all lines using the collinear dipole-dipole electrode array, however, readings were taken only in one direction rather than both ways as is usually done. The effective subsurface volume explored with this configuration is typically within a zone from one-fourth to one and one-half the dipole spacing maximum depth, which in the case of 500 foot dipoles, would be from roughly 125 feet to 750 feet deep. These depths are only typical and are dependent on such factors as resistivity and degree of homogeneity of the subsurface material. Lines B and C were run using 1000 foot dipoles after it was determined that the expected depth of any target would be at or in excess of 1000 feet.

The data are presented on sectional data sheets, herewith attached one for each line, showing apparent resistivity, present frequency effect (PFE) and metallic conduction factor (MCF), contoured in vertical section and the self potential profile. Also included is an "Induced Polarization Location and Interpretation Plan" at a scale of 1:12,000.

Additional information concerning theory, interpretation and presentation is given in the "Basis of the Induced Polarization Method" in the appendix of this report.

GEOEX personnel who conducted the field work were: Phil Matthews, geophysicist and Gary Hix, technical assistant. Report and interpretation are by Phil Matthews, geophysicist, assisted by the GEOEX staff in Tucson, Arizona. The help of Messrs. Dan King and Jerry Bray during the field operations is greatly appreciated.

CONCLUSIONS AND RECOMMENDATIONS

Very weak I.P. effects are noted on all three lines.

The anomalism found on Lines C and D are nearly coincident, and that found on Line B seems to lie roughly along the same north-south trending structure (?), which apparently carries most of the known mineralization. Unfortunately there is not enough I.P. coverage to get a good "feel" for background frequency effects, or to outline a definite zone of interest. Inasmuch as the anomalism found on Lines C and D is reportedly in an area where encouraging drill results were encountered, definite economic potential could be associated with the I.P. effects noted.

It is recommended that, if there is any geologic favorability for economic mineralization at depth in the anomalous area additional I.P. coverage be obtained both laterally and with depth on Lines B, C and D. If this work is encouraging further detailed I.P. should be run to define a definite zone of interest, and possible subsequent drill targets.

COMMENTS ON DRILLING I.P. TARGETS

To maximize the probability that a recommended drill hole will intersect the source of an induced polarization anomaly, the following points should be considered:

1. The anomaly has been caused by some physical property, hopefully a polarizable body containing economically interesting metallic mineralization, and this property should be determined before abandoning the anomaly.

2. Location of drill holes should be made relative to the actual sending and receiving electrode positions as they exist on the ground.

3. Due to inherent limitations in the I.P. method, depth interpretations are only approximate and the determination of dip is severely limited, particularly for angles greater than 45°. Also, targets can generally be laterally resolved no finer than the station spacing (dipole length). Because of these limitations, targets less than one dipole spacing in width, particularly when steeply dipping or deeper than the dipole length, may be difficult to intersect. In these cases, several drill holes in a fence line should be considered. For the steeply dipping cases, angle drilling

may also prove advantageous, mainly where the direction of dip can be geologically inferred and the drill hole oriented such that an optimum intersection of the zone of interest is obtained.

4. An observed anomaly can be the effect of a polarizable body laterally offset to the side of a line and therefore if practical, drilling should be confined to those portions of the anomalous zones well defined by several lines. Also, it should be noted that a single line cannot define the strike direction of an elongate anomalous zone - another reason for utilizing several parallel lines.

5. Logging of the drill core must be done with special care to note the quantity of all possible polarizable material such as pyrite, graphite, magnetite, manganese oxides and clay minerals as well as the polarizable ore minerals. The anomalous source could conceivably be overlooked if the core is not carefully logged.

6. Typical sections of core representing the gross physical properties of material encountered in the drilling should be tested in the laboratory for their I.P. parameters, if there is some doubt about confirmation of the anomalous source.

INTERPRETATION

Line B: An apparent very weak I.P. anomaly is centered at station 3 extending approximately 1000 feet southeast and continuing on for an undetermined distance to the northwest. There is the possibility that the relatively high PFE's and MCF's are not "real" but are the result of an electrode array effect caused by a relatively non-polarizable high resistivity zone. Additional I.P. coverage to the northwest will be needed to resolve this anomaly. The resistivity data indicates a possible interface (rock type change) near station 3. No self potentialism is noted, suggesting the lack of significant quantities of near surface, relatively interconnected, relatively oxidizing sulfide mineralization within several hundred feet of the surface.

Line C: Very weak frequency effects are located between stations 2 - 3 which are accompanied by a relative resistivity low, and corresponding MCF high. This zone is difficult to pinpoint or to determine its southwestern extent based on the available data. The self potential profile probably reflects only topographic relief and is not necessarily indicative of oxidizing sulfides.

Line D: Very weak frequency effects are located between 2 and 5 and possibly extending to the southeast. Again, the limited amount of data makes a more definite interpretation impossible, particularly in view of the rather complex resistivity picture which results from the rugged topography. A self potential low is located near 20NW which again is probably due to topographic relief although it is coincident with a weak MCF high.

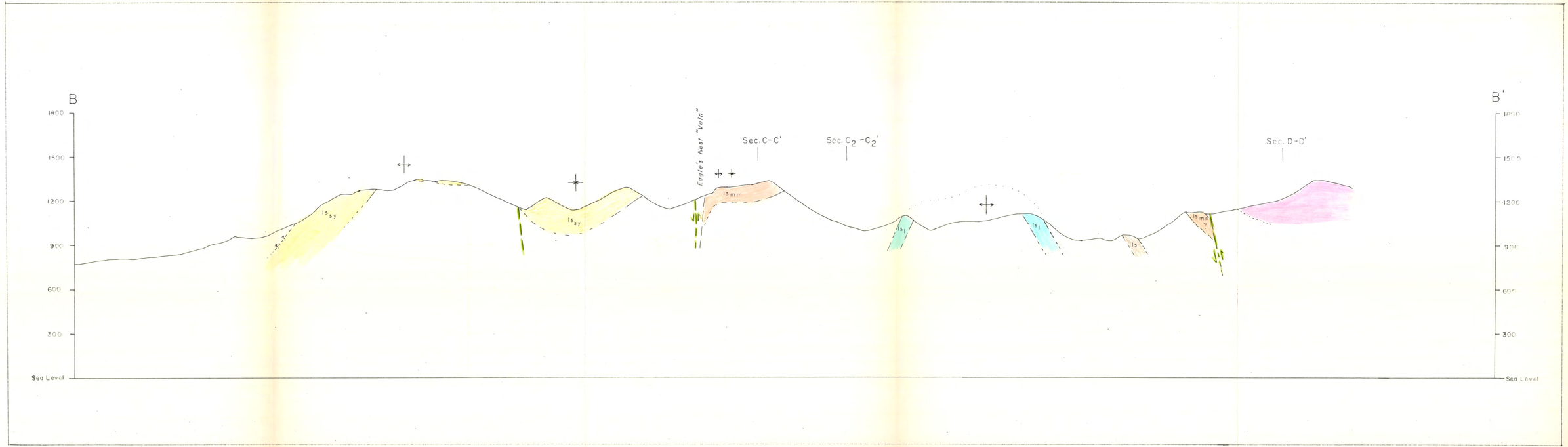
Respectfully submitted:
HEINRICHS GEOEXPLORATION COMPANY (INC.)

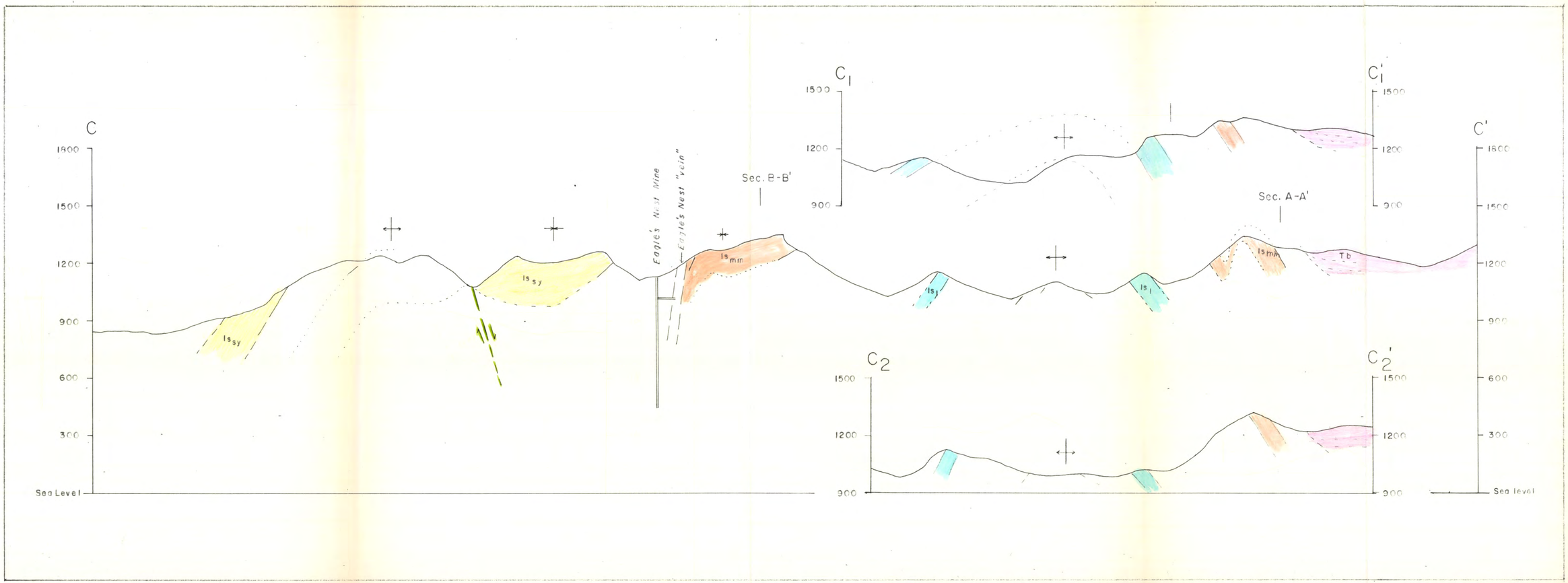
By : John P. Matthews, Jr.
Geophysicist

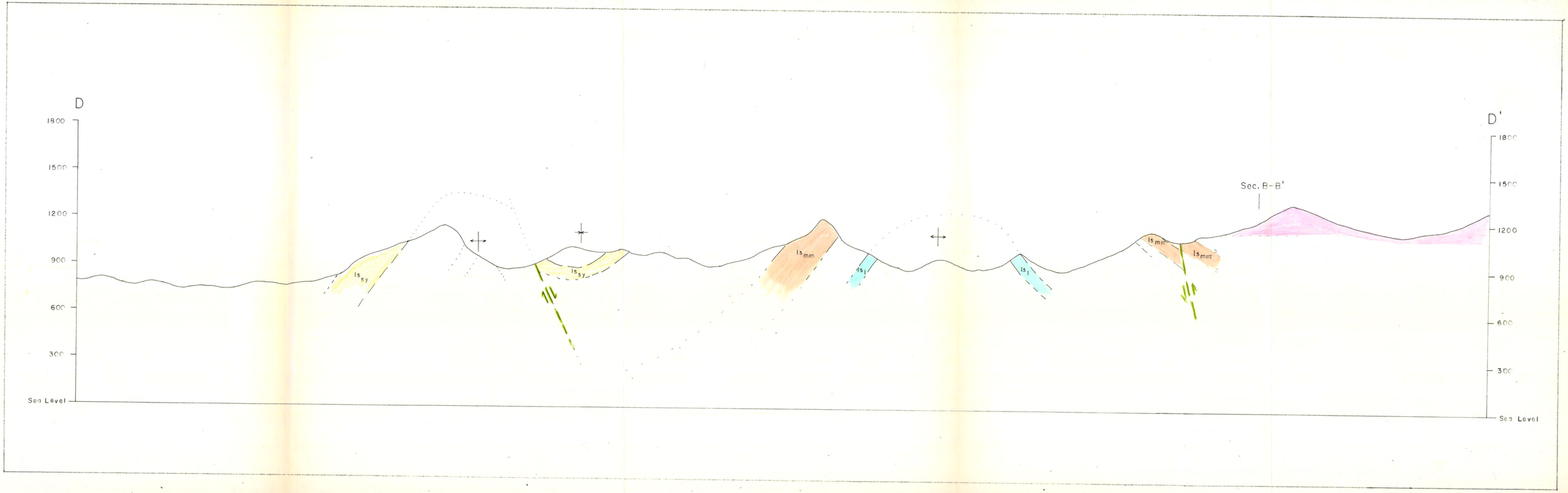
Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES:
WALTER E. HEINRICHS, JR.
DEC. 31, 19 70
ARIZONA, U. S. A.

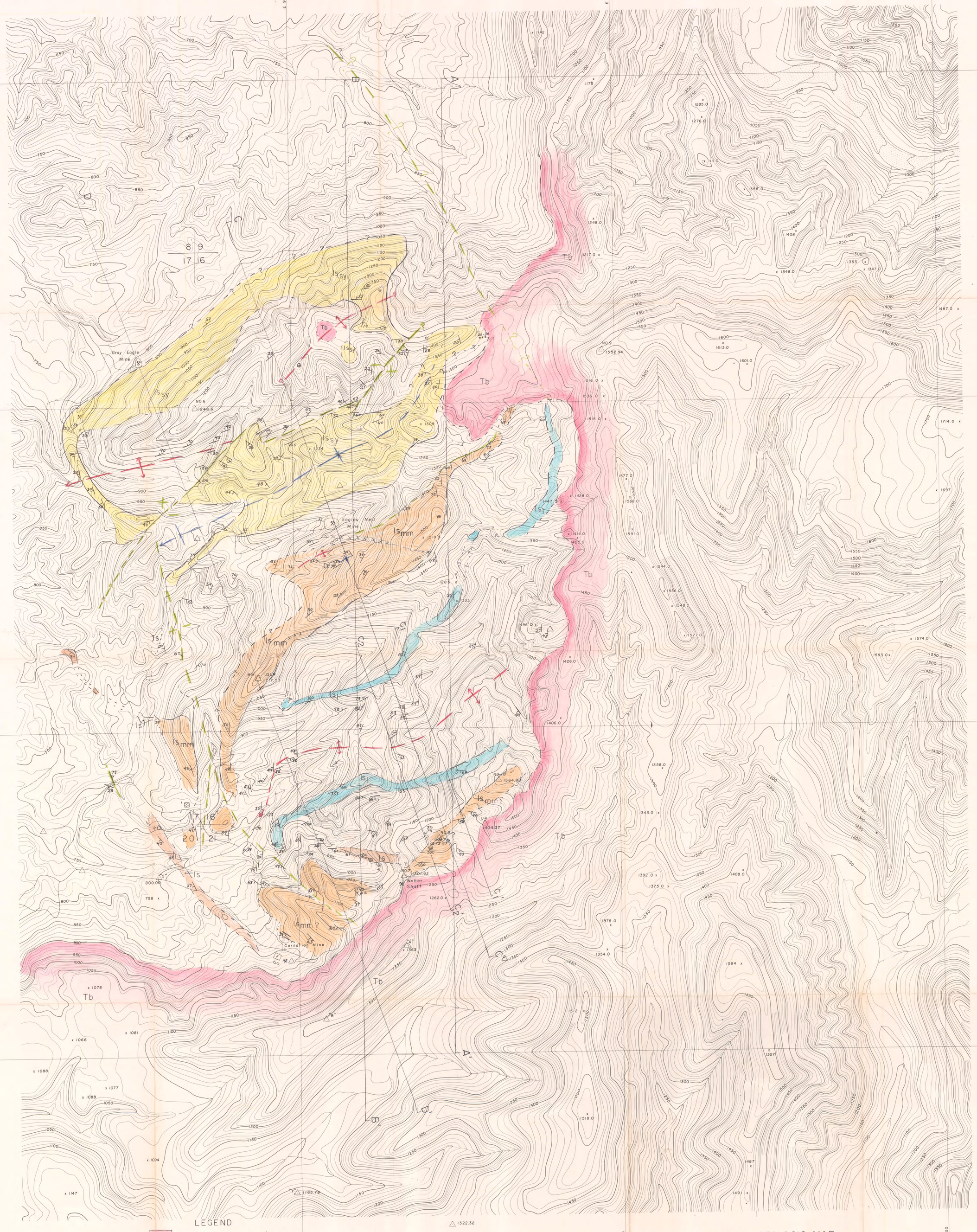
P.O. Box 5964
Tucson, Arizona 85703
19 December 1970
GEOEX Job # 595

A
A'
1800
1500
1200
900
600
300
Sea Level
Sec. C1 - C1'
Sec. C-C'


B
B'
1800
1500
1200
900
600
300
Sea Level
Eagle's Nest "Vein"
Sec. C-C'
Sec. C2 -C2'
Sec. D-D'
ls sy
ls sy
ls mm
ls l
ls l
ls
ls mm ?


C
1800
1500
1200
900
600
300
Sea Level
Eagle's Nest Mine
Eagle's Nest "vein"
Sec. B-B'
Sec. A-A'
C1
C1'
C2
C2'
C'
1500
1200
900
1800
600
300
Sea level
Tb


D
D'
1800
1500
1200
900
600
300
Sea Level
Sec. B-B'
ls sy
ls mm
ls l



LEGEND

Tb	Volcanics (mostly basalt)
Is	Limestone, undifferentiated
Is_{sy}	"Syncline" limestone
Is_{mm}	"Mineral Monument" limestone
Is_{j}	"Lomalino" limestone

△ 1322.32

SCALE : 1" = 300'

300 200 100 0 300 600 900 1200

CONTOUR INTERVAL 10 FT

Buckskin Mountains, Arizona
Mine Area
WESTATES PETROLEUM

PRELIMINARY GEOLOGIC MAP
WESTATES PETROLEUM COMPANY CLAIMS
EMPIRE MINING DISTRICT, YUMA COUNTY, ARIZONA

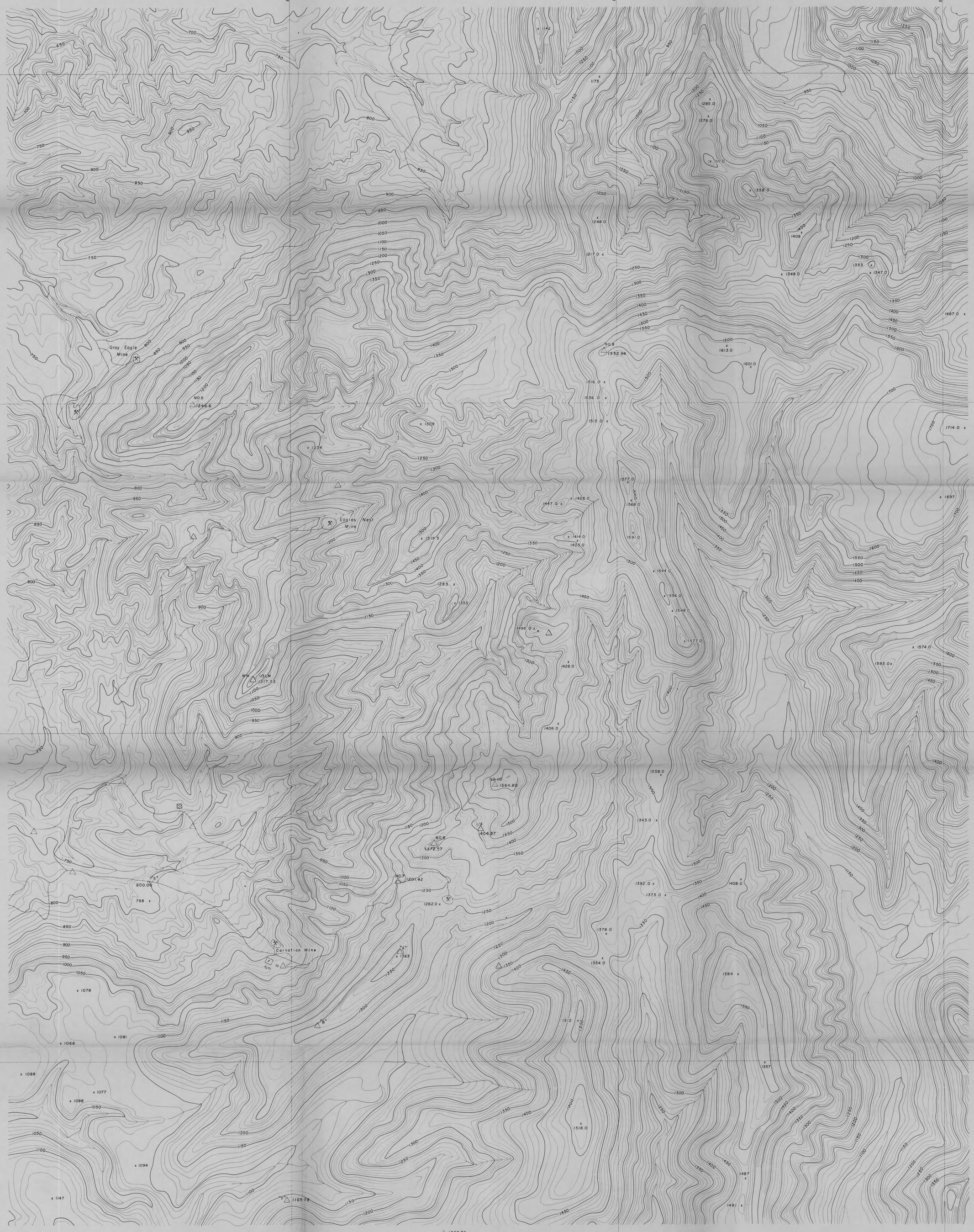
H. H. Neel

April, 1971

Cooper Aerial Survey Co.

Date Flown 6/17/70

Tucson, Arizona



Buckskin Mountains, Arizona
Mine Area
WESTATES PETROLEUM

Cooper Aerial Survey Co.
Date Flown 6/17/70
Tucson, Arizona

Buckskin Mountains, Arizona
Mine Area
WESTATES PETROLEUM

Cooper Aerial Survey Co.
Date Flown 6/17/70
Tucson, Arizona

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CROSS ROADS QUADRANGLE
ARIZONA–CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 BLACK PEAK 15' QUADRANGLE

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1955. Field check 1959

Polyconic projection. 1927 North American datum
10,000-foot grids based on Arizona coordinate system, west zone, and California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

Land lines unsurveyed in parts of T. 9 N., R. 18 W.

Unchecked elevations are shown in brown

TRUE NORTH
MAGNETIC NORTH
15°
APPROXIMATE MEAN DECLINATION, 1959

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ARIZONA
QUADRANGLE LOCATION

ROAD CLASSIFICATION
Medium-duty — Light-duty
Unimproved dirt
State Route

CROSS ROADS, ARIZ.–CALIF.
NW/4 BLACK PEAK 15' QUADRANGLE
N3407.5—W11407.5/7.5

1959

I.P. RECEIVER NOTES

32 stations

PAGE 1

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE

LINE C BEARING N 73° E HALF E½ SP. 1 DATE 12-14-70

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2			CAL
RECEIVE	2.5-3	→	→	3-3.5	→	→	→			
MULT.	10	1.0	1.0	10.0	1.0	1.0	1.0			
PFE	0.8	1.8	2.2	1.1	1.5	1.8	2.4			-0.2
3.0-.01										
I 1.0-.01	2000	→	→	→	→	→	→			
Kn 0.3-.03	1.5	6	15	1.5	6	15	30			
0.1-0.9										
Bearings	237	297	226	221	231	244	166			
PFE	0.9	1.9	2.3	1.2	1.6	1.9	2.5			
MCF	4	6	10	5	7	8	15			
PFE Avg.										
AC	319.0	100.0	30.4	297.0	77.8	31.6	11.2			~~205.5~~
DRIFT	0.0	—	—	—	—	—	—			202.5
S.P.	-15.5	→	→	+22.1	→	→	→			—
AC NOISE				.01	→	→	→			
POT RES.	15K	→	→							

I.P. RECEIVER NOTES

PAGE 2

HEINRICHS GEOEXPLORATION CO. PROJECT _____

LINE _____ BEARING _____ HALF _____ SP. _____ DATE _____

SEND	5-C	4-5	3-4	2-3	1-2	6-7	5-6	4-5	3-4	2-3
RECEIVE	3.8-40	→	→	→	→	8.0-4.5	→	→	→	→
MULT.	10	1.0	1.0	1.0	0.1	10	1.0	1.0	1.0	0.1
PFE	1.0	1.5	1.8	2.2	2.6	0.7	1.2	1.6	2.0	2.2
I	2000	→	→	→	→	→	→	→	→	→
Kn	1.5	6	15	30	52.5	1.5	6	15	30	52.5
Pa	187	247	228	222	166	155	255	282	266	241
PFE	1.1	1.6	1.9	2.3	2.7	0.8	1.3	1.7	2.1	2.3
MCF	6	6	8	10	16	5	5	6	8	10
PFE Avg.										
AC	249	83.2	30.8	14.9	6.37	209	85.8	38.0	17.9	9.28
DRIFT	252	—	—	—	—	—	—	—	—	—
S.P.	+13.8	→	→	→	→	+1.8	→	→	→	→
AC NOISE						.01	→	→	→	→
POT RES.										

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT _____

LINE _____ BEARING _____ HALF _____ SP. _____ DATE _____

SEND	1-2	7-8	6-7	5-6	4-5	3-4	2-3	1-2	8-9	7-8
RECEIVE	40-45	45-50	→	→	→	→	→	→	50-55	→
MULT.	0.1	10	1.0	1.0	1.0	1.0	0.1	0.1	10	1.0
PFE	2.8	0.9	1.2	1.5	1.9	2.4	2.6	3.0	0.6	1.2
I	2000	1000	2000	→	→	→	→	→	900	2000
Kn	84	1.5	6	15	30	52.5	84	126	1.5	6
Pa	183	284	281	387	425	384	359	290	256	297
PFE	2.9	1.0	1.3	1.6	2.0	2.5	2.7	3.1	0.7	1.3
MCF	16	4	5	4	5	7	8	11	3	4
PFE Avg.										
AC	4.41	191.0	94.6	52.1	28.6	14.8	8.65	4.64	155.0	99.8
DRIFT	0.0	—	—	—	—	—	—	—	—	—
S.P.	→	-27.1	→	→	→	→	→	→	+35.9	→
AC NOISE	→	.02							.01	→
POT RES.	→	28k	→	→	→	→	→	→		

I.P. RECEIVER NOTES

PAGE 4

HEINRICHS GEOEXPLORATION CO. PROJECT Empire

LINE C BEARING N 73°E HALF ____ SP. ____ DATE ____

SEND	6-7	5-6	4-5	3-4	2-3					
RECEIVE	~~50-55~~	→								
MULT.	1.0	1.0	1.0	1.0	0.1					
PFE	1.6	1.8	2.4	2.8	2.9					
I	2000	→								
Kn	~~30~~ 15	~~[illegible]~~ 30	52.5	84	126					
ρa	327	475	522	523	491					
PFE	1.7	1.9	2.5	2.9	3.0					
MCF	5	4	5	6	6					
PFE Avg.										
AC	44.1	32.0	20.1	12.6	7.87					
DRIFT	—	—	—	—	—					
S.P.										
AC NOISE										
POT RES.										

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 595 - EMPIRE PARKER

LINE C HALF E SP. 1 DATE 12-14

PAGE 1

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2	5-6	4-5	CHK
RECEIVE	2.5-3.0	→	→	3.0-3.5	→	→	→	3.5-4.0	→	4-5
RANGE	2B	2B	2B	2B	2B	2B	2B	2B	2B	2B
VOLTAGE	380	560	520	320	380	560	520	450	320	160
CURRENT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
SEND	3-4	2-3	1-2	6-7	5-6	4-5	3-4	2-3	1-2	
RECEIVE	3.5-4.0	→	→	4.0-5.0	2.0	3.0	4.0	5.0	6.0	
RANGE	2B	2B	2B	2B	2B	2B	2B	2B	2B	
VOLTAGE	380	550	500	450	450	320	380	550	500	
CURRENT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	

FREQUENCIES 30 3

SENDER NO. 64 9662-5

OPERATOR 64

RECEIVER NO. 18691 R

OPERATOR

COMMENTS:

#4 = 500' SW IS CENTER

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 595 - EMPIRE
LINE C HALF E SP. 1 DATE 12-14

SEND	7-8	6-7	5-6	4-5	3-4	2-3	1-2	8-9	7-8	6-7
RECEIVE	~~5.8~~ 5.5	~~2N~~	~~3N~~	~~4N~~	~~6N~~	~~8N~~	~~7N~~	5.5-6.0	~~2N~~	~~3N~~
RANGE	2B	2B	2B	2B	2B	2B	2B	2B	2B	2B
VOLTAGE	360	440	440	320	380	540	500	550	700	440
CURRENT	1.0	2.0	2.0	2.0	2.0	2.0	2.0	.900MA	2.0	2.0
SEND	5-6	4-5	3-4	2-3						
RECEIVE	5.5-6.0	~~5N~~	~~6N~~	7N						
RANGE	2B	2B	2B	2B						
VOLTAGE	440	320	380	540						
CURRENT	2.0	2.0	2.0	2.0						

FREQUENCIES 3.0 0.3

SENDER NO. 9662-5

OPERATOR 64

RECEIVER NO. 1869-R

OPERATOR

COMMENTS:

PAGE 1

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT EMPIRE
LINE B HALF 60°E SP. 1 DATE 12-16-70

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1	1-2 →	→	2-3	→	→	3-4	→	→	→
RANGE	10	1.0	1.0	10	1.0	0.1	1.0	1.0	0.1	0.1
DC 1 PFE	2.0	1.6	2.3	1.2	2.4	2.6	1.2	1.8	2.4	2.9
DC 2 I	2000	→	→	→	→	→	→	→	→	→
DC 3 kn	3	3	12	3	12	30	3	12	30	60
DC 4										
DC 5 Ra	197	108	95	402	95	100	96	288	89	90
DC 6 PFE	2.1	1.7	2.4	1.3	2.5	2.7	1.3	1.9	2.5	3.0
DC 7 MCF	11	16	25	3	26	27	14	7	28	33
DC 8										
DC AVG.										
AC 1	133	72.8	16.1	271	16.1	6.76	65.0	48.6	6.03	3.04
AC 2	—	—	—	—	—	—	—	—	—	—
AC AVG.										
S.P.	~~+3~~ -21.9	+3.9 →	→	-4.2			+5.8			
AC NOISE										
POT RES.	22K			15K			11K			

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT EMPIRE
LINE B HALF ~~N~~S 60°E SP. 1 DATE 12-16-70

SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
RECEIVE										2-3
RANGE	1.0	1.0	0.1	0.1	0.1	0.1	0.1	0.01		2-10
DC 1	1.6	2.2	3.6	2.6	1.5	2.2	2.7	2.3		-0.1
DC 2 I	2000	→	→	→	→	→	→	→		
DC 3 Kn	12	30	60	105	~~12~~ 30	60	105	168		
DC 4										
DC 5 ρ_a	89	305	REPLATED THE 97	123	68	204	75	84		
DC 6 PFE	1.7	2.3	3.7 PPCT	2.7	1.6	2.3	2.8	2.4		
DC 7 MCF	17	8	38	22	23	11	37	29		
DC 8										
DC AVG.										
AC 1	16.7	20.6	3.26	2.37	4.57	6.89	1.45	1.003		202.5
AC 2	—	—	—	—	—	—	—			—
AC AVG.										
S.P.	+28.2	→	→	→	23.9	→	→	→		
AC NOISE										
POT RES.	14K	→	→	→	18K	→	→	→	→	

S 60° E

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 595-70

LINE B HALF E SP. 1 DATE

PAGE 4

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1.0E	1.0-2.0	→	2.0-3.0	→	→	3.0-4.0	→	→	→
RANGE	2B	2B	2B	2B	2B	2B	2B	2B	2B	2B
VOLTAGE	320	240	320	540	260	340	540	540	260	348
CURRENT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
RECEIVE	4.0-5.0	→	→	→	5.0-6.0	→	→	→		
RANGE	2B	2B	2B	2B	2B	2B	2B	2B		
VOLTAGE	540	540	250	340	540	540	240	340		
CURRENT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		

FREQUENCIES 3.0 0.3

SENDER NO. 9662-5

OPERATOR 64

RECEIVER NO. 18691

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT EMPIRE
LINE "D" HALF N40°W SP. 1 DATE 12-15

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1	1-2 →		2-3 →			3-4 →			
RANGE	1.0	10	1.0	1.0	1.0	0.1	1.0	1.0	0.1	0.1
DC 1 PFE	1.6	2.1	2.4	1.4	2.2	2.3	1.3	1.6	2.4	2.4
DC 2 I	606	1000	800	2000	1000	800	1000	2000	1000	800
DC 3 Kn	3	3	12	3	12	30	3	12	30	60
DC 4										
DC 5 ρa	175	366	189	103	128	103	84.6	101	130	100
DC 6 PFE	1.6	2.1	2.4	1.4	2.2	2.3	1.3	1.6	2.4	2.4
DC 7 MCF	9	6	13	14	17	22	15	16	18	24
DC 8										
DC AVG.										
AC 1	35.34	123	~~14.3~~	69.1	10.8	2.76	28.5	17.0	4.39	1.35
AC 2		—	12.7 —	—	—	—	—	—	—	—
AC AVG.										
S.P.	-24.8			-25.4 →			~~29.2~~			
AC NOISE										
POT RES.	8K	34K		18K			10K			

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Empire
LINE D HALF N40°W SP. 1 DATE 12-15

PAGE 2

SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CHK
RECEIVE	4-5	→	→	→	5-6	→	→	→		
RANGE	1.0	1.0	0.1	0.1	0.1	1.0	0.1	0.1		
DC 1 PFE	1.6	2.0	2.6	2.3	1.7	2.0	2.6	3.1		0.0
DC 2 I	1000	2000	1000	800	1000	2000	1000	800		
DC 3 kn	12	30	60	105	30	60	105	168		
DC 4										
DC 5 ρa	232	264	330	240	320	354	413	291		
DC 6 PFE	1.6	2.0	2.6	2.3	1.7	2.0	2.6	3.1		
DC 7 MCF	7	8	8	10	5	6	6	11		
DC 8										
DC AVG.										
AC 1	19.5	17.8	5.55	1.84	10.77	11.9	3.97	1.40		101
AC 2	—	—	—	—	—	—	—	—		—
AC AVG.										
S.P.	+18.7	→	→	→	-11.2	→	→	→		
AC NOISE					up to	0.12	on Cadamp			
POT RES.										

2.29

N40°W

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 595 EMPIRE

LINE D HALF NW SP. 1 DATE 12-15

PAGE 1

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1.0	1.0-2.0	→	2.0-3.0	→	→	3.0-4.0	→	→	→
RANGE	2B	2B	2B	2B	2B	2B	2B	2B	2B	2B
VOLTAGE	510	700	680	340	700	680	340	340	700	660
CURRENT	.600	1.0	.800	2.0	1.0	.800	1.0	2.0	1.0	.800
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL.
RECEIVE	4.0-5.0	→	→	→	5.0-6.0	→	→	→		3-4
RANGE	340	2B	2B	2B	2B	2B	2B	2B		2-B
VOLTAGE	2B	340	700	660	340	340	680	660		180
CURRENT	1.0	2.0	1.0	.800	1.0	2.0	1.0	.800		1.0

FREQUENCIES 3.0 0.3

SENDER NO. 9662

OPERATOR 64

RECEIVER NO. 18691 R

OPERATOR

COMMENTS: #3 = 0.0

2.666X3 = 8MA

Job 825, Line 4, Spread 1, N+5½, 4/22/71 1000.

I.P. RECEIVER NOTES

PAGE 1

HEINRICHS GEOEXPLORATION CO. PROJECT Empire 625

LINE 4 BEARING N 50° E HALF N SP. 1 DATE 4-22-71

SEND	CAL	3-4	4-5	4-5	S.P.	S.P.	3-4	2-3	1-2	4-5
RECEIVE	2-3	1-2	→	2-3	0-10N	10-20N	20-30N	→	→	30-40
MULT.	10	1.0	0.1	1.0			1.0	1.0	1.0	1.0
PFE	-0.2	1.5	1.7	1.6			1.8	1.8	2.4	1.7
Rem	2	0.4	0.3	0.3			1	3	2	1
#	1	1	2	3			4	5	6	7
M		1	2	1			1	2	3	1
PFE Avg.										
AC	200.	22.3	4.69	13.5			49.9	46.4	15.7	50.4
DRIFT	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0
S.P.					+	+11.5	+29.9			+7.6
AC NOISE	3.0									
POT RES.	0.3				[illegible]	200 K	80 K			170 K

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE

LINE 4 BEARING N50°E HALF N SP. 1 DATE 4-22-11

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
RECEIVE	30-40N	→		40-50N	→			50-60N	→	
MULT.	1.0	1.0	0.1	1.0	1.0	1.0	0.1	0.1	0.1	0.1
PFE	1.8	2.1	2.5	2.4	2.1	2.7	3.4	1.7	2.0	2.3
Cm	2	4	2	1	2	4	2	1	2	4.5
#	8	9	10	11	12	13	14	15	16	17
n	2	3	4	2	3	4	5	3	4	5
PFE Avg.										
AC	39.4	33.0	9.78	14.7	16.2	15.4	4.97	3.05	3.77	4.30
DRIFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S.P.				+4.9				-3.6		
AC NOISE										
POT RES.				140K				190K		

I.P. RECEIVER NOTES

PAGE 3

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 4 BEARING N 50°E HALF N SP. 1 DATE 4-22-7

SEND	1-2									
RECEIVE	50-600									
MULT.	0.1									
PFE	3.1									
1 Hz	2.4									
0.1 Hz	4.2									
Pw	2.5									
#	18									
n	6									
PFE Avg.										
AC	1.64									
DRIFT	0.0									
S.P.										
AC NOISE										
POT RES.										

O.K. FROM DAN = NO S.P. ON 1st 2 stations

PAGE 1

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT EMPIRE 625
LINE 4 HALF S SP. 1 DATE 4-23-71

SEND	CAL	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
RECEIVE	3-4	20-30 S	→	→	30-40	→	→	→	40-50	→
RANGE	10	10	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
DC 1	-0.2	1.7	2.1	2.5	1.9	1.6	2.2	3.0	2.0	2.0
DC 2								1.6		
DC 3				2.3				4.4		
DC 4				ON 1 (0.1)						
DC 5 Cm		4	4	3	3	4	4	3	3	5
DC 6 #		19	20	21	22	23	24	25	26	27
DC 7 M		1	2	3	1	2	3	4	2	3
DC 8										
DC AVG.										
AC 1	200.	150.	65.3	28.0	95.3	44.2	30.6	15.4	30.7	25.3
AC 2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC AVG.										
S.P.		+17.6			+4.4					
AC NOISE										
POT RES.		100 K			120 K					

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT EMPIRE 625
LINE 4 HALF S SP. 1 DATE 4-23-71

PAGE 2

SEND	3-4	4-5	1-2	2-3	3-4	4-5				
RECEIVE	40-50	→	50-60			→				
RANGE	1.0	0.1	1.0	1.0	0.1	0.1				
DC 1	2.6	3.5	2.4	2.8	3.4	4.5				
DC 2 1Hz		1.9				2.7				
DC 3 0.1Hz		5.0				6.4				
DC 4										
DC 5 Ten	4	3	3	5	4	3				
DC 6 #	28	29	30	31	32	33				
DC 7 M	4	5	3	4	5	6				
DC 8										
DC AVG.										
AC 1	16.2	8.70	14.4	14.1	9.98	5.77				
AC 2	0.0	0.0	0.0	0.0	0.0	0.5				
AC AVG.										
S.P.			+43.7							
AC NOISE										
POT RES.			150k							

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT EMPIRE 625

LINE 4 HALF N SP. 1 DATE 1-22-91

PAGE 1

SEND	CAL	3-4	4-5	4-5	3-4	2-3	1-2	4-5	3-4	2-3
RECEIVE	2-3	1-2	→	2-3	20-30N	→		30-40N	→	
RANGE										
VOLTAGE	440	740	640	640	520	620	800	580	840	780
CURRENT	2A	400MA	300MA	300MA	1A	3A	2A	1A	2A	4A
SEND	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	
RECEIVE	30-40N	40-50	→			50-60	→			
RANGE									*	
VOLTAGE	800	560	820	760	780	520	780	820	900	
CURRENT	2A	1A	2A	4A	2A	1A	2A	4½A	2½A	

FREQUENCIES 3 0.3

SENDER NO. 23706 S

OPERATOR SWANSON

RECEIVER NO. 20693 R

OPERATOR FREEMAN

COMMENTS: * .1HZ AND 1 HZ

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PAGE 2

PROJECT EMPIRE 625

LINE 4 HALF S SP. 1 DATE 4-23-71

SEND	CAL	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
RECEIVE	3-4	20-30s	→		30-40	→			40-50	→
RANGE				*				*		
VOLTAGE	560	700	960	900	920	700	960	900	920	820
CURRENT	2A	4A	4A	3A	3A	4A	4A	3A	3A	5A
SEND	3-4	4-5	1-2	2-3	3-4	4-5				
RECEIVE	→		50-60	→						
RANGE		*				*				
VOLTAGE	940	880	920	820	920	880				
CURRENT	4A	3A	3A	5A	4A	3A				

FREQUENCIES 3 0.3

SENDER NO. 23706 S

OPERATOR SWANSON

RECEIVER NO. 20693 R

OPERATOR FREEMAN

COMMENTS: * .1 HZ AND 1 HZ ALSO

JOB 625 LINE 4 SPREAD 1 NORTH + SOUTH 1/2 4/22/71 1000 FEET=DIPOLE LENGTH

CAL GROUP NO. 1

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	-.20	200.000	0.00	3.00	.30	-.2000	1.0000

COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	170.09	1.70	10.0	1.70	10.0	0.00	**	1.50	.40	1	1	22.300	0.00
2	2	191.16	1.90	9.9	1.79	9.4	.11	**	1.70	.30	2	2	4.690	0.00
3	1	137.43	1.80	13.1	1.80	13.1	0.00	**	1.60	.30	3	1	13.500	0.00
4	1	152.69	2.00	13.1	2.00	13.1	0.00	**	1.80	1.00	4	1	49.900	0.00
5	2	189.31	2.00	10.6	1.89	10.0	.11	**	1.80	3.00	5	2	46.400	0.00
6	3	241.62	2.60	10.8	2.41	10.0	.19	**	2.40	2.00	6	3	15.700	0.00
7	1	154.07	1.90	12.3	1.90	12.3	0.00	**	1.70	1.00	7	1	50.400	0.00
8	2	241.13	2.00	8.3	1.92	8.0	.08	**	1.80	2.00	8	2	39.400	0.00
9	3	253.19	2.30	9.1	2.12	8.4	.18	**	2.10	4.00	9	3	33.000	0.00
10	4	301.32	2.70	9.0	2.44	8.1	.26	**	2.50	2.00	10	4	9.780	0.00
11	2	180.99	2.60	14.4	2.48	13.7	.12	**	2.40	1.00	11	2	14.700	0.00
12	3	248.59	2.30	9.3	2.12	8.5	.18	**	2.10	2.00	12	3	16.200	0.00
13	4	237.70	2.90	12.2	2.54	10.7	.36	**	2.70	4.00	13	4	15.400	0.00
14	5	270.32	3.60	13.3	3.09	11.4	.51	**	3.40	2.00	14	5	4.970	0.00
15	3	93.24	1.90	20.4	1.21	12.9	.69	**	1.70	1.00	15	3	3.050	0.00
16	4	115.59	2.20	19.0	1.23	10.7	.97	**	2.00	2.00	16	4	3.770	0.00
17	5	102.84	2.50	24.3	.66	6.4	1.84	**	2.30	4.50	17	5	4.300	0.00
18	6	113.84	3.30	29.0	.88	7.7	2.42	**	3.10	2.50	18	6	1.640	0.00
19	1	114.64	~~1.90~~ 1.8	~~16.6~~	1.84	16.0	.06	**	1.70	4.00	19	1	150.000	0.00
20	2	200.41	2.30	11.5	2.20	11.0	.10	**	2.10	4.00	20	2	65.300	0.00
21	3	287.56	2.70	9.4	2.55	8.9	.15	**	2.50	3.00	21	3	28.000	0.00
22	1	97.30	2.10	21.6	2.02	20.8	.08	**	1.90	3.00	22	1	95.300	0.00
23	2	134.99	1.80	13.3	1.62	12.0	.18	**	1.60	4.00	23	2	44.200	0.00
24	3	235.01	2.40	10.2	2.20	9.4	.20	**	2.20	4.00	24	3	30.600	0.00
25	4	317.86	3.20	10.1	2.96	9.3	.24	**	3.00	3.00	25	4	15.400	0.00
26	2	125.50	2.20	17.5	2.00	15.9	.20	**	2.00	3.00	26	2	30.700	0.00
27	3	155.14	2.20	14.2	1.85	11.9	.35	**	2.00	5.00	27	3	25.300	0.00
28	4	249.80	2.80	11.2	2.46	9.8	.34	**	2.60	4.00	28	4	16.200	0.00
29	5	315.77	3.70	11.7	3.29	10.4	.41	**	3.50	3.00	29	5	8.700	0.00
30	3	147.74	2.60	17.6	2.23	15.1	.37	**	2.40	3.00	30	3	14.400	0.00
31	4	174.28	3.00	17.2	2.44	14.0	.56	**	2.80	5.00	31	4	14.100	0.00
32	5	271.41	3.60	13.3	3.09	11.4	.51	**	3.40	4.00	32	5	9.980	0.00
33	6	338.34	4.45	13.2	3.87	11.5	.58	**	4.50	3.00	33	6	5.770	.50

16
115/1800
115
650
690

BUSINESS FORMS PRINTING COMPANY BLUE SPUCE BAR ENGINEERED FOR HIGH SPEED PRINTERS

Job 625, Line 3, Spread 1, S+N½, 4/24/71 1000.

STM 40W ON LINE 1

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT EMPIRE 625
LINE 3 HALF S SP. 1 DATE 4-24-71

PAGE 1

SEND	CAL	3-4	4-5	4-5	S.P.	S.P.	2-3	3-4	4-5	1-2
RECEIVE	3-4	1-2	→	2-3	0-10S	10-20S	20-30S	→	→	30-40S
RANGE	10	10	1.0	10			1.0	1.0	1.0	1.0
DC 1 1 Hz	-0.2	2.2	3.3	2.3			2.0	2.5	3.3	1.7
DC 2 0.1	0.0									
DC 3 3	-0.2									
DC 4										
DC 5 Cm	2	3	2	2			3	3	2	3
DC 6 #	1	1	2	3			4	5	6	7
DC 7 "		1	2	1			1	2	3	1
DC 8										
DC AVG.										
AC 1	201.	130.	42.8	190.			77.2	21.6	11.9	71.3
AC 2	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0
AC AVG.										
S.P.	3.0				+26.8	+54.0	-24.1			-15.4
AC NOISE	0.3									
POT RES.					10 K	160 K	150 K			180 K

BASALT CLIFF ≈ 23 S

PAGE 2

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT EMPIRE 625
LINE 3 HALF S SP. 1 DATE 4-24-71

SEND	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
RECEIVE	30-40s	→	→	40-50s	→	→	→	50-60s	→	→
RANGE	1.0	0.1	0.1	1.0	1.0	0.1	0.1	0.1	0.1	0.1
DC 1	2.1	2.6	3.1	2.2	2.3	2.7	3.5	2.4	2.6	2.7
DC 2										
DC 3										
DC 4 Ch	3	3	2	3	4	4	2	4	4	4
DC 5 #	8	9	10	11	12	13	14	15	16	17
DC 6 M	2	3	4	2	3	4	5	3	4	5
DC 7										
DC 8										
DC AVG.										
AC 1	19.9	8.92	5.94	18.0	13.9	7.63	4.19	6.80	5.63	3.35
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC AVG.										
S.P.				+11.0				+0.8		
AC NOISE										
POT RES.				190K				170K		

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PAGE 3

PROJECT EMPIRE 625

LINE 3 HALF 5 SP. 1 DATE 4-24-71

SEND	4-5									
RECEIVE	50-60s									
RANGE	0.1	[illegible]								
DC 1	~~3.4~~	[illegible]	3.4							
DC 2 1Hz	2.8									
DC 3 0.1	5.4									
DC 4	3.4									
DC 5	NOISE									
DC 6 Cur	2									
DC 7 #	18									
DC 8 n	6									
DC AVG.										
AC 1	1.96									
AC 2	0.0									
AC AVG.										
S.P.										
AC NOISE										
POT RES.										

STA 30N ACROSS CANYON FROM SHAFT ~ S40°E

PAGE 4

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Empire 625
LINE 3 HALF N SP. 1 DATE

SEND	CAL	S.P.	S.P.	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	2-3	0-10N	10-20N	20-30	N →	→	30-40	→	→	→
RANGE	10			10	1.0	1.0	10	1.0	1.0	1.0
DC 1 3	201.			2.3	2.6	3.3	1.9	2.5	3.1	4.5
DC 2 1	-0.1					1.8				2.2
DC 3 0.1	0.1					5.1				5.6
DC 4 0.3	-0.2									
DC 5										
DC 6 Cu				4	4	4	2	4	4	4
DC 7 #				19	20	21	22	23	24	25
DC 8 n				1	2	3	1	2	3	4
DC AVG.										
AC 1	201.			231.	65.8	23.8	209.	41.8	26.0	12.1
AC 2	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC AVG.										
S.P.		+82.7	+49.5	-36.3				+25.1		
AC NOISE										
POT RES.		150 K	90 K	200 K				100 K		

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Empire 625
LINE 3 HALF N SP. 1 DATE 4-28-71

SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
RECEIVE	40-60	→	→	→	50-60	→	→	→		
RANGE	1.0	1.0	1.0	0.1	1.0	1.0	1.0	0.1		
DC 1	2.7	3.0	4.1	4.0	2.7	3.3	3.5	4.0		
DC 2			3 to 4.5	2.3 to 4.5						
DC 3			Noisy	NOISY						
DC 4										
DC 5 Cur	2	4	4	4	2	4	4	4		
DC 6 #	26	27	28	29	30	31	32	33		
DC 7 n	2	3	4	5	3	4	5	6		
DC 8										
DC AVG.										
AC 1	62.8	25.0	19.5	9.90	30.4	17.4	15.1	7.99		
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
AC AVG.										
S.P.	-15.5				-2.1					
AC NOISE										
POT RES.	30 K				30 K					

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT EMPIRE 625 PAGE 1

LINE 3 HALF S SP. 1 DATE 4-24-7

SEND	CAL	3-4	4-5	4-5	2-3	3-4	4-5	1-2	2-3	3-4
RECEIVE	3-4	1-2	→	2-3	20-30	S	→	30-40	S	→
RANGE										
VOLTAGE	620	840	1000	1000	820	820	1000	740	800	820
CURRENT	2A	3A	2A	2A	3A	3A	2A	3A	3A	3A
SEND	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	
RECEIVE	30-80	40-50	S	→		50-60	S	→	→	
RANGE									*	
VOLTAGE	1000	740	1000	1000	1000	920	1000	1000	1000	
CURRENT	2A	3A	4A	4A	2A	4A	4A	4A	2A	

FREQUENCIES 3 0.3

SENDER NO. 23706 S

OPERATOR SWANSON

RECEIVER NO. 20693 R

OPERATOR FREEMAN

COMMENTS: .1 HZ AND 1 HZ ALSO

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT EMPIRE 625
LINE 3 HALF ~~S~~N SP. 1 DATE 4-29-7

SEND	CAL	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
RECEIVE	2-3	20-30N	→	→	30-40	N →	→	→	40-50	—
RANGE				*				*		
VOLTAGE	560	980	960	920	1000	960	920	900	980	960
CURRENT	2A	4A	4A	4A	2A	4A	4A	4A	2A	4A
SEND	2-3	1-2	4-5	3-4	2-3	1-2				
RECEIVE	40-50	N →	50 60	N →	→	→				
RANGE										
VOLTAGE	920	880	980	960	920	880				
CURRENT	4A	4A	2A	4A	4A	4A				

FREQUENCIES 3 0.3
SENDER NO. 237065
OPERATOR SWANSON
RECEIVER NO. 20693R
OPERATOR FREEMAN

COMMENTS: * .1 HZ 1 HZ ALSO

JOB 625 LINE 3 SPREAD 1 SOUTH + NORTH 1/2 4/24/71 1000 FEET=DIPOLE LENGTH

CAL GROUP NO. 1

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	-.20	201.000	0.00	3.00	.30	-.2000	.9950

COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	132.46	2.40	18.1	2.40	18.1	0.00	**	2.20	3.00	1	1	130.000	0.00
2	2	264.47	3.50	13.2	3.50	13.2	0.00	**	3.30	2.00	2	2	42.800	0.00
3	1	290.67	2.50	8.6	2.50	8.6	0.00	**	2.30	2.00	3	1	190.000	0.00
4	1	78.51	2.20	28.0	2.10	26.7	.10	**	2.00	3.00	4	1	77.200	0.00
5	2	88.29	2.70	30.6	2.38	26.9	.32	**	2.50	3.00	5	2	21.600	0.00
6	3	183.83	3.50	19.0	3.23	17.5	.27	**	3.30	2.00	6	3	11.900	0.00
7	1	72.29	1.90	26.3	1.78	24.7	.12	**	1.70	3.00	7	1	71.300	0.00
8	2	81.03	2.30	28.4	1.93	23.9	.37	**	2.10	3.00	8	2	19.900	0.00
9	3	91.24	2.80	30.7	2.09	22.9	.71	**	2.60	3.00	9	3	8.920	0.00
10	4	183.16	3.30	18.0	2.78	15.2	.52	**	3.10	2.00	10	4	5.940	0.00
11	2	73.36	2.40	32.7	1.98	27.0	.42	**	2.20	3.00	11	2	18.000	0.00
12	3	106.32	2.50	23.5	1.92	18.0	.58	**	2.30	4.00	12	3	13.900	0.00
13	4	117.18	2.90	24.7	1.95	16.6	.95	**	2.70	4.00	13	4	7.630	0.00
14	5	226.98	3.70	16.3	3.05	13.5	.65	**	3.50	2.00	14	5	4.190	0.00
15	3	52.07	2.60	49.9	1.10	21.1	1.50	**	2.40	4.00	15	3	6.800	0.00
16	4	86.38	2.80	32.4	1.38	16.0	1.42	**	2.60	4.00	16	4	5.630	0.00
17	5	90.04	2.90	32.2	.72	7.9	2.18	**	2.70	4.00	17	5	3.350	0.00
18	6	169.72	3.60	21.2	2.16	12.7	1.44	**	3.40	2.00	18	6	1.960	0.00
19	1	176.70	2.50	14.1	2.50	14.1	0.00	**	2.30	4.00	19	1	231.000	0.00
20	2	201.92	2.80	13.9	2.70	13.4	.10	**	2.60	4.00	20	2	65.800	0.00
21	3	183.83	3.50	19.0	3.23	17.5	.27	**	3.30	4.00	21	3	23.800	0.00
22	1	318.49	2.10	6.6	2.10	6.6	0.00	**	1.90	2.00	22	1	209.000	0.00
23	2	128.15	2.70	21.1	2.51	19.6	.19	**	2.50	4.00	23	2	41.800	0.00
24	3	200.43	3.30	16.5	3.06	15.2	.24	**	3.10	4.00	24	3	26.000	0.00
25	4	189.09	4.70	24.9	4.20	22.2	.50	**	4.50	4.00	25	4	12.100	0.00
26	2	385.80	2.90	7.5	2.90	7.5	0.00	**	2.70	2.00	26	2	62.800	0.00
27	3	192.54	3.20	16.6	2.94	15.3	.26	**	3.00	4.00	27	3	25.000	0.00
28	4	303.56	4.30	14.2	4.04	13.3	.26	**	4.10	4.00	28	4	19.500	0.00
29	5	269.44	4.20	15.6	3.69	13.7	.51	**	4.00	4.00	29	5	9.900	0.00
30	3	466.89	2.90	6.2	2.90	6.2	0.00	**	2.70	2.00	30	3	30.400	0.00
31	4	268.79	3.50	13.0	3.19	11.9	.31	**	3.30	4.00	31	4	17.400	0.00
32	5	409.00	3.70	9.0	3.41	8.3	.29	**	3.50	4.00	32	5	15.100	0.00
33	6	347.93	4.20	12.1	3.65	10.5	.55	**	4.00	4.00	33	6	7.990	0.00

BUSINESS FORMS PRINTING COMPANY BLUE SPACE BAR ENGINEERED FOR HIGH SPEED PRINTERS

Job 625, Line 2, Spread 1, Nt 5½, 4/21/71 1000.

HIGH POT -Ω

I.P. RECEIVER NOTES

STA 10S EXACTLY ON MEPhar station

STA 30S ~ 150' W OF MEPhar station

HEINRICHS GEOEXPLORATION CO.

PROJECT EMPIRE 625

LINE 2 BEARING N 40°E

HALF S SP. 1 DATE 4-21-71

PAGE 1

SEND	CAL	3-4	4-5	4-5	S.P.	S.P.	2-3	3-4	4-5	1-2
RECEIVE	3-4	1-2	→	2-3	0-10S	10-20S	20-30S	→	→	30-40S
MULT.	10	10	1.0	10			1.0	1.0	0.1	1.0
PFE	-0.2	2.0	2.7	1.9			1.9	2.5	3.0	1.3
Cur	2	4	2	2			4	4	2	2
#	1	1	2	3			4	5	6	7
n		1	2	1			1	2	3	1
PFE Avg.										
AC	200.	192.	27.7	194.			87.1	30.4	5.97	35.8
DRIFT	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0
S.P.					+33.6	-14.9	+0.0			+17.1
AC NOISE	3.0									
POT RES.	0.3				180K	300K	100K			150K

I.P. RECEIVER NOTES

PAGE 2

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 2 BEARING N40°E HALF S SP. 1 DATE 4-21-71

SEND	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
RECEIVE	30-40s	→	→	40 50 s	→	→	→	50-60s	→	→
MULT.	1.0	1.0	0.1	1.0	1.0	0.1	0.1	0.1	1.0	0.1
PFE	2.2	2.6	3.1	1.5	2.4	3.0	3.9	1.9	2.3	3.3
cm	4	4	2	2	4	4	2	2.5	4.5	4.5
#	8	9	10	11	12	13	14	15	16	17
n	2	3	4	2	3	4	5	3	4	5
PFE Avg.										
AC	34.7	16.8	3.92	10.5	17.5	9.85	2.53	5.72	11.4	7.10
DRIFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S.P.				+13.5				+15.9		
AC NOISE										
POT RES.				56 K				40 K		

ALSO SOME SPECTRAL DATA

I.P. RECEIVER NOTES

PAGE 3

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 2 BEARING N40°E HALF 5 SP. 1 DATE 4-21-X

SEND	4-5			4-5		4-5				
RECEIVE	50-60s			40-50s		50-60				
MULT.	0.1			0.1		0.1				
PFE	4.4		3Hz	2.53		1.74				
			1Hz	2.3		2.4				
			0.3Hz	3.9		4.4				
Cm	2		0.1Hz	5.6		6.0				
#	14									
n	6		Dev.	0.0		0.0				
PFE Avg.										
AC	1.74									
DRIFT	0.0									
S.P.										
AC NOISE										
POT RES.										

SPECULARITE

Fe ON SURFACE

Fe_2O_3 — Fe_3O_4 (?)

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 2 BEARING N 40° E HALF N SP. 1 DATE 4-21-11

SEND	CAL	S.P.	S.P.	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	2-3	0-10 N	10-20 N	20-30 N	→	→	30-40 N	→	→	→
MULT.	10			10	10	1.0	10	10	1.0	1.0
PFE 3 Hz	200.			1.7	2.4	3.2	1.5	2.5	3.2	3.7
1 Hz	0.0									~~1.3~~
0.3	-0.2									
0.1	0.0									
line				4	4	3	2	4	4	3
#				19	20	21	22	23	24	25
n				1	2	3	1	2	3	4
PFE Avg.										
AC				421.	127.	19.3	118.	102.	48.7	10.3
DRIFT	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0
S.P.		-5.1	+6.6	-2.1			+0.6			
AC NOISE			0.8mv							
POT RES.		40 K	100 K	100 K			200 K			

CuO – $CuCO_3$
ON SURFACE + OUTCROPS

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 2 BEARING N 40° E HALF N SP. 1 DATE 4-21-71

PAGE 5

SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
RECEIVE	40-50N	—	—	—	50-60 N	—		—		2-3
MULT.	1.0	1.0	1.0	0.1	0.1	0.1	0.1	0.1		10
PFE	2.3	3.2	3.6	3.9	3.1	3.6	3.8	4.1		-0.2
1 Hz				2.0				2.6		
0.1 Hz				5.6				7.1		
Cur	2	4	4	3	2	4	4	3		
#	26	27	28	29	30	31	32	33		
n	2	3	4	5	3	4	5	6		
PFE Avg.										
AC	44.7	56.9	35.7	8.98	6.77	10.07	7.09	1.94		200.
DRIFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
S.P.	+18.7				+6.6					
AC NOISE										
POT RES.	200K				50K					

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT EMPIRE 625

LINE 2 HALF 5 SP. 1 DATE 4-21-77

PAGE 2

SEND	CAL	3-4	4-5	4-5	2-3	3-4	4-5	1-2	2-3	3-4
RECEIVE	3-4	1-2	→	2-3	20-30	→		30-40	→	
RANGE				*						
VOLTAGE	600	1000	980	980	800	960	940	760	800	960
CURRENT	2 A	4A	2A	2A	4A	4A	2A	2A	4A	4A
SEND	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	
RECEIVE	→	40-50	→		→	50-60	5	→	→	
RANGE					*				*	
VOLTAGE	940	740	800	940	920	860	860	1000	900	
CURRENT	2A	2A	4A	4A	2A	2½ A	4½A	4½A	2 A	

FREQUENCIES 3 0.3

SENDER NO. 23706 S

OPERATOR SWANSON

RECEIVER NO. 20693R

OPERATOR FREEMAN

COMMENTS: * .1 AND 1 HZ ALSO

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT EMPIRE 625
LINE 2 HALF N SP. 1 DATE 4-21-7

SEND	CAL	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
RECEIVE	2-3	20-30N	→	→	30-40	→	→	→	40-50N	→
RANGE	Δ							*		
VOLTAGE	460	900	780	940	820	920	780	900	820	920
CURRENT	2A	4A	4A	3A	2A	4A	4A	3A	2A	4A
SEND	2-3	1-2	4-5	3-4	2-3	1-2				
RECEIVE	40-50	→	50-60	N	→	→				
RANGE		*				*				
VOLTAGE	780	900	820	920	780	880				
CURRENT	4A	3A	2A	4A	4A	3A				

FREQUENCIES 3 0.3
SENDER NO. 237065
OPERATOR SWANSON
RECEIVER NO. 20693R
OPERATOR FREEMAN

COMMENTS: Δ CAL 2-3 440V 2A
* .1 AND 1.0 HZ ALSO

JOB 625 LINE 2 SPREAD 1 NORTH + SOUTH 1/2 4/21/71 1000 FEET=DIPOLE LENGTH
CAL GROUP NO. 1

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	-.20	200.000	0.00	3.00	.30	-.2000	1.0000

COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	147.17	2.20	14.9	2.20	14.9	0.00	**	2.00	4.00	1	1	192.000	0.00
2	2	171.02	2.90	17.0	2.77	16.2	.13	**	2.70	2.00	2	2	27.700	0.00
3	1	297.11	2.10	7.1	2.10	7.1	0.00	**	1.90	2.00	3	1	194.000	0.00
4	1	66.70	2.10	31.5	1.97	29.5	.13	**	1.90	4.00	4	1	87.100	0.00
5	2	93.66	2.70	28.8	2.40	25.6	.30	**	2.50	4.00	5	2	30.400	0.00
6	3	92.42	3.20	34.6	2.50	27.0	.70	**	3.00	2.00	6	3	5.970	0.00
7	1	54.51	1.50	27.5	1.33	24.3	.17	**	1.30	2.00	7	1	35.800	0.00
8	2	106.60	2.40	22.5	2.15	20.2	.25	**	2.20	4.00	8	2	34.700	0.00
9	3	129.53	2.80	21.6	2.36	18.2	.44	**	2.60	4.00	9	3	16.800	0.00
10	4	121.48	3.30	27.2	2.40	19.7	.90	**	3.10	2.00	10	4	3.920	0.00
11	2	64.07	1.70	26.5	1.20	18.7	.50	**	1.50	2.00	11	2	10.500	0.00
12	3	134.66	2.60	19.3	2.18	16.2	.42	**	2.40	4.00	12	3	17.500	0.00
13	4	152.48	3.20	21.0	2.53	16.6	.67	**	3.00	4.00	13	4	9.850	0.00
14	5	138.27	4.10	29.7	2.85	20.6	1.25	**	3.90	2.00	14	5	2.530	0.00
15	3	70.08	2.10	30.0	1.08	15.5	1.02	**	1.90	2.50	15	3	5.720	0.00
16	4	155.80	2.50	16.0	1.85	11.9	.65	**	2.30	4.50	16	4	11.400	0.00
17	5	171.46	3.50	20.4	2.56	14.9	.94	**	3.30	4.50	17	5	7.100	0.00
18	6	152.88	4.60	30.1	2.95	19.3	1.65	**	4.40	2.00	18	6	1.740	0.00
19	1	321.75	1.90	5.9	1.90	5.9	0.00	**	1.70	4.00	19	1	421.000	0.00
20	2	390.91	2.60	6.7	2.60	6.7	0.00	**	2.40	4.00	20	2	127.000	0.00
21	3	199.56	3.40	17.0	3.15	15.8	.25	**	3.20	3.00	21	3	19.300	0.00
22	1	180.01	1.70	9.4	1.70	9.4	0.00	**	1.50	2.00	22	1	118.000	0.00
23	2	314.26	2.70	8.6	2.70	8.6	0.00	**	2.50	4.00	23	2	102.000	0.00
24	3	377.67	3.40	9.0	3.30	8.7	.10	**	3.20	4.00	24	3	48.700	0.00
25	4	214.03	3.90	18.2	3.48	16.3	.42	**	3.70	3.00	25	4	10.300	0.00
26	2	274.90	2.50	9.1	2.50	9.1	0.00	**	2.30	2.00	26	2	44.700	0.00
27	3	441.26	3.40	7.7	3.32	7.5	.08	**	3.20	4.00	27	3	56.900	0.00
28	4	555.85	3.80	6.8	3.69	6.6	.11	**	3.60	4.00	28	4	35.700	0.00
29	5	327.19	4.10	12.5	3.71	11.3	.39	**	3.90	3.00	29	5	8.980	0.00
30	3	104.90	3.30	31.5	2.71	25.8	.59	**	3.10	2.00	30	3	6.770	0.00
31	4	156.79	3.80	24.2	3.16	20.1	.64	**	3.60	4.00	31	4	10.070	0.00
32	5	193.56	4.00	20.7	3.20	16.5	.80	**	3.80	4.00	32	5	7.090	0.00
33	6	113.31	4.30	37.9	1.87	16.5	2.43	**	4.10	3.00	33	6	1.940	0.00

BUSINESS FORMS PRINTING COMPANY BLUE SPACE BAR ENGINEERED FOR HIGH SPEED PRINTERS

JOB 625, LINE 1, Spread 1, W+E ½, 4/20/71 1000.

I.P. RECEIVER NOTES

PAGE 1

HEINRICHS GEOEXPLORATION CO. PROJECT 625

LINE 1 BEARING N 86°E HALF W SP. 1 DATE 4-20-71

SEND	BAL	3-4	4-5	4-5	S.P.	S.P.	2-3	3-4	4-5	1-2
RECEIVE	3-4	1-2	→	2-3	0-10W	10-20W	20-30W	—		30-40
MULT.	10	10	1.0	10			10	1.0	0.1	10
PFE	-0.2	1.7	2.0	1.3			1.7	2.8	2.7	2.1
Cm	2	2	→	→			2	→	→	→
#	1	1	2	3			4	5	6	7
n		1	2	1			1	2	3	1
PFE Avg.							211.	20.2	10.03	126.
AC	200.	146.	42.5	169.			0.0	0.0	0.0	0.2
DRIFT	0.0	0.2	0.0	0.0						
S.P.					-16.2	-26.8	+57.1			
AC NOISE	3.0									
POT RES.	0.3				600K	170 K	200 K			

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 1 BEARING N 86°E HALF W SP. 1 DATE 4-20-7

SEND	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
RECEIVE	30-40	→	→	40-50	→	→	→	50-60	→	→
MULT.	1.0	0.1	0.1	10	0.1	0.1	0.1	1.0	0.1	0.1
PFE	2.6	3.5	3.2	2.6	2.8	3.2	3.4	3.0	3.5	4.8
1.0.			1.9							
0.1			4.8							
Cm	2	→	→	→	→	→	→	→	→	→
#	8	9	10	11	12	13	14	15	16	17
n	2	3	4	2	3	4	5	3	4	5
						NOISY				
PFE Avg.						3.52				
AC	25.8	6.25	4.09	251.	8.16	~~3.47~~	2.18	12.4	4.96	2.31
DRIFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S.P.				+27.4				-28.0		
AC NOISE										
POT RES.				60K				20K		

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT Empire 625

LINE 1 BEARING N 86°E HALF W SP. 1 DATE 1-20-71

SEND	4.5									
RECEIVE	50.60									
MULT.	0.1									
PFE	4.3									
1 Hz	2.5									
0.3 Hz	4.3									
0.1 Hz	5.4									
Cur	2									
#	18									
n	6									
PFE Avg.										
AC	1.66									
DRIFT	0.0									
S.P.										
AC NOISE										
POT RES.										

I.P. RECEIVER NOTES STA 30 IN BASALT

PAGE 4

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 1 BEARING N86°E HALF E SP. 1 DATE 4-20-71

SEND	2-3	S.P.	S.P.	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	CAL	0-10E	10-20E	20-30E	→		30-40E	→		
MULT.				1.0	1.0	0.1	1.0	1.0	0.1	0.1
PFE	-0.2			1.5	2.0	2.5	1.1	1.7	2.1	2.7
Cm				2	→					
#				19	20	21	22	23	24	25
n				1	2	3	1	2	3	4
PFE Avg.										
AC	200			34.2	18.2	9.05	48.3	11.6	8.76	5.56
DRIFT	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0
S.P.		+19.1	+11.0	+9.8			+6.1			
AC NOISE										
POT RES.		200K	18K	15K			100K			

STA 50 ON NOSE
STA 60 IN CANYON

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT EMPIRE 625

LINE 1 BEARING N86°E HALF ∈ SP. 1 DATE 4-20-71

SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		1-2
RECEIVE	40-50E	→			50-60E	→				40-50
MULT.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1Hz	2.22
PFE	1.2	1.7	~3.5(?)	~3.5(?)	2.9	3.2	3.4	3.2	0.1Hz	—
			NOISY	NOISY						-1 to +9
			2-6	2-8						
Pm	2	→	MAX.							
T	26	27	DAMP28	29	30	31	32	33		
n	2	3	TIME4	5	3	4	5	6		
PFE Avg.										
AC	5.32	4.29	3.19	2.18	4.11	3.38	2.97	2.30		
DRIFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
S.P.	+41.3				+22.8					
AC NOISE				0.6 mV						
POT RES.	15K				100K					

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT EMPIRE 625 PAGE 1

LINE 1 HALF W SP. 1 DATE 4-20-71

SEND	CAL	3-4	4-5	4-5	2-3	3-4	4-5	1-2	2-3	3-4
RECEIVE	3-4	1-2	→	2-3	20-30W	→		30-40W	→	
RANGE										
VOLTAGE	860	840	660	660	960	840	660	760	960	840
CURRENT	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A
SEND	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	
RECEIVE	→	40-50W	→		→	50-60W	→		→	
RANGE	*								*	
VOLTAGE	640	760	960	820	640	760	940	800	640	
CURRENT	2A	2A	2A	2A	2A	2A	2A	2A	2A	

FREQUENCIES 3 0.3

SENDER NO. 23706 S

OPERATOR SWANSON

RECEIVER NO. 20693 R

OPERATOR FREEMAN

COMMENTS: * .1 + 1 HZ ALSO

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT EMPIRE 625
LINE 1 HALF E SP. 1 DATE 4-20-71

SEND	CAL	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
RECEIVE	2-3	20-30E	→	→	30-40E	→	→	→	40-50E	→
RANGE										
VOLTAGE	920	780	920	760	640	780	920	740	620	780
CURRENT	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A
SEND	2-3	1-2	4-5	3-4	2-3	1-2				
RECEIVE	40-50E	→	50-60E	→	→	→				
RANGE		*								
VOLTAGE	900	740	620	780	900	720				
CURRENT	2A	2A	2A	2A	2A	2A				

FREQUENCIES 3 0.3
SENDER NO. 23706 S
OPERATOR SWANSON
RECEIVER NO. 20693 R
OPERATOR FREEMAN

COMMENTS: * .1HZ 1HZ ALSO

JOB 625 LINE 1 SPREAD 1 WEST + EAST 1/2 4/20/71 1000 FEET=DIPOLE LENGTH
CAL GROUP NO. 1

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	-.20	200.000	0.00	3.00	.30	-.2000	1.0000

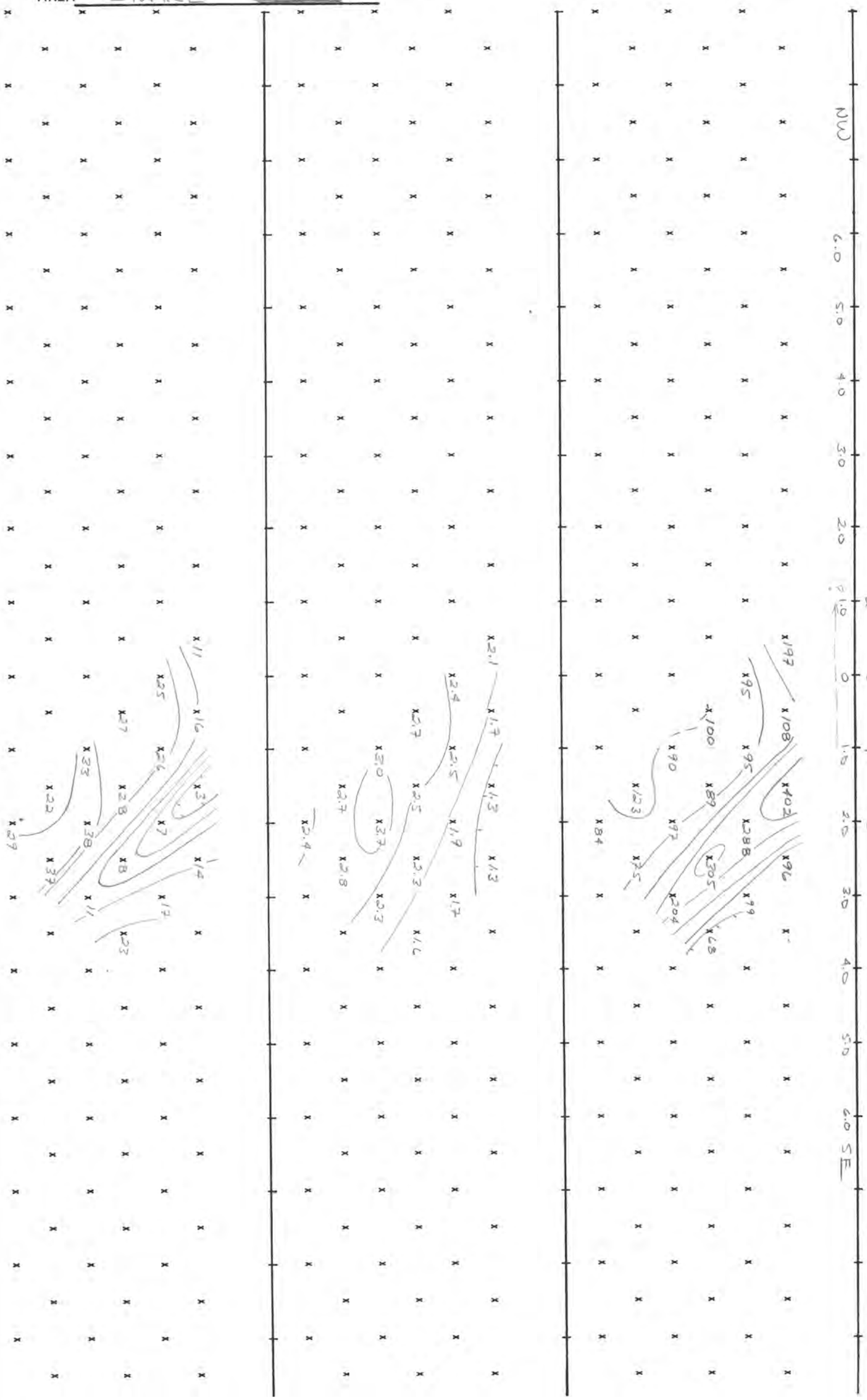
COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	223.16	1.80	8.1	1.80	8.1	0.00	**	1.70	2.00	1	1	146.000	.20
2	2	260.61	2.20	8.4	2.20	8.4	0.00	**	2.00	2.00	2	2	42.500	0.00
3	1	257.30	1.50	5.8	1.50	5.8	0.00	**	1.30	2.00	3	1	169.000	0.00
4	1	322.51	1.90	5.9	1.90	5.9	0.00	**	1.70	2.00	4	1	211.000	0.00
5	2	124.84	3.00	24.0	2.80	22.4	.20	**	2.80	2.00	5	2	20.200	0.00
6	3	154.81	2.90	18.7	2.55	16.5	.35	**	2.70	2.00	6	3	10.030	0.00
7	1	193.35	2.20	11.4	2.20	11.4	0.00	**	2.10	2.00	7	1	126.000	.20
8	2	159.13	2.80	17.6	2.66	16.7	.14	**	2.60	2.00	8	2	25.800	0.00
9	3	97.22	3.70	38.1	3.04	31.3	.66	**	3.50	2.00	9	3	6.250	0.00
10	4	128.83	~~5.00~~ 3.4	~~38.8~~ 27	4.16	32.3	.84	**	~~4.80~~ 3.2	2.00	10	4	4.090	0.00
11	2	1548.17	2.80	1.8	2.80	1.8	0.00	**	2.60	2.00	11	2	251.000	0.00
12	3	126.07	3.00	23.8	2.54	20.1	.46	**	2.80	2.00	12	3	8.160	0.00
13	4	109.19	3.40	31.1	2.36	21.6	1.04	**	3.20	2.00	13	4	3.520	0.00
14	5	118.57	3.60	30.4	2.07	17.5	1.53	**	3.40	2.00	14	5	2.180	0.00
15	3	191.95	3.20	16.7	2.94	15.3	.26	**	3.00	2.00	15	3	12.400	0.00
16	4	154.31	3.70	24.0	3.04	19.7	.66	**	3.50	2.00	16	4	4.960	0.00
17	5	127.34	5.00	39.3	3.61	28.3	1.39	**	4.80	2.00	17	5	2.310	0.00
18	6	145.71	4.50	30.9	2.74	18.8	1.76	**	4.30	2.00	18	6	1.660	0.00
19	1	52.17	1.70	32.6	1.51	29.0	.19	**	1.50	2.00	19	1	34.200	0.00
20	2	111.60	2.20	19.7	1.97	17.6	.23	**	2.00	2.00	20	2	18.200	0.00
21	3	139.42	2.70	19.4	2.30	16.5	.40	**	2.50	2.00	21	3	9.050	0.00
22	1	73.39	1.30	17.7	1.18	16.1	.12	**	1.10	2.00	22	1	48.300	0.00
23	2	70.92	1.90	26.8	1.46	20.6	.44	**	1.70	2.00	23	2	11.600	0.00
24	3	134.42	2.30	17.1	1.88	14.0	.42	**	2.10	2.00	24	3	8.760	0.00
25	4	171.64	2.90	16.9	2.33	13.6	.57	**	2.70	2.00	25	4	5.560	0.00
26	2	32.37	1.40	43.3	.15	4.5	1.25	**	1.20	2.00	26	2	5.320	0.00
27	3	65.57	1.90	29.0	.79	12.1	1.11	**	1.70	2.00	27	3	4.290	0.00
28	4	99.24	3.70	37.3	2.52	25.4	1.18	**	3.50	2.00	28	4	3.190	0.00
29	5	118.68	3.70	31.2	2.17	18.3	1.53	**	3.50	2.00	29	5	2.180	0.00
30	3	63.56	3.10	48.8	1.94	30.6	1.16	**	2.90	2.00	30	3	4.110	0.00
31	4	104.85	3.40	32.4	2.30	21.9	1.10	**	3.20	2.00	31	4	3.380	0.00
32	5	161.54	3.60	22.3	2.58	16.0	1.02	**	3.40	2.00	32	5	2.970	0.00
33	6	199.77	3.40	17.0	2.24	11.2	1.16	**	3.20	2.00	33	6	2.300	0.00

26
128) 3400
256
890
768
72

JOB# 595 LINE# B SP 1 a = 1000' LOOKING N 30° E

CLIENT ~~KMG~~ Weststates Petroleum DATE 12-16-70 FREQUENCIES 3.0 & 0.3 Hz

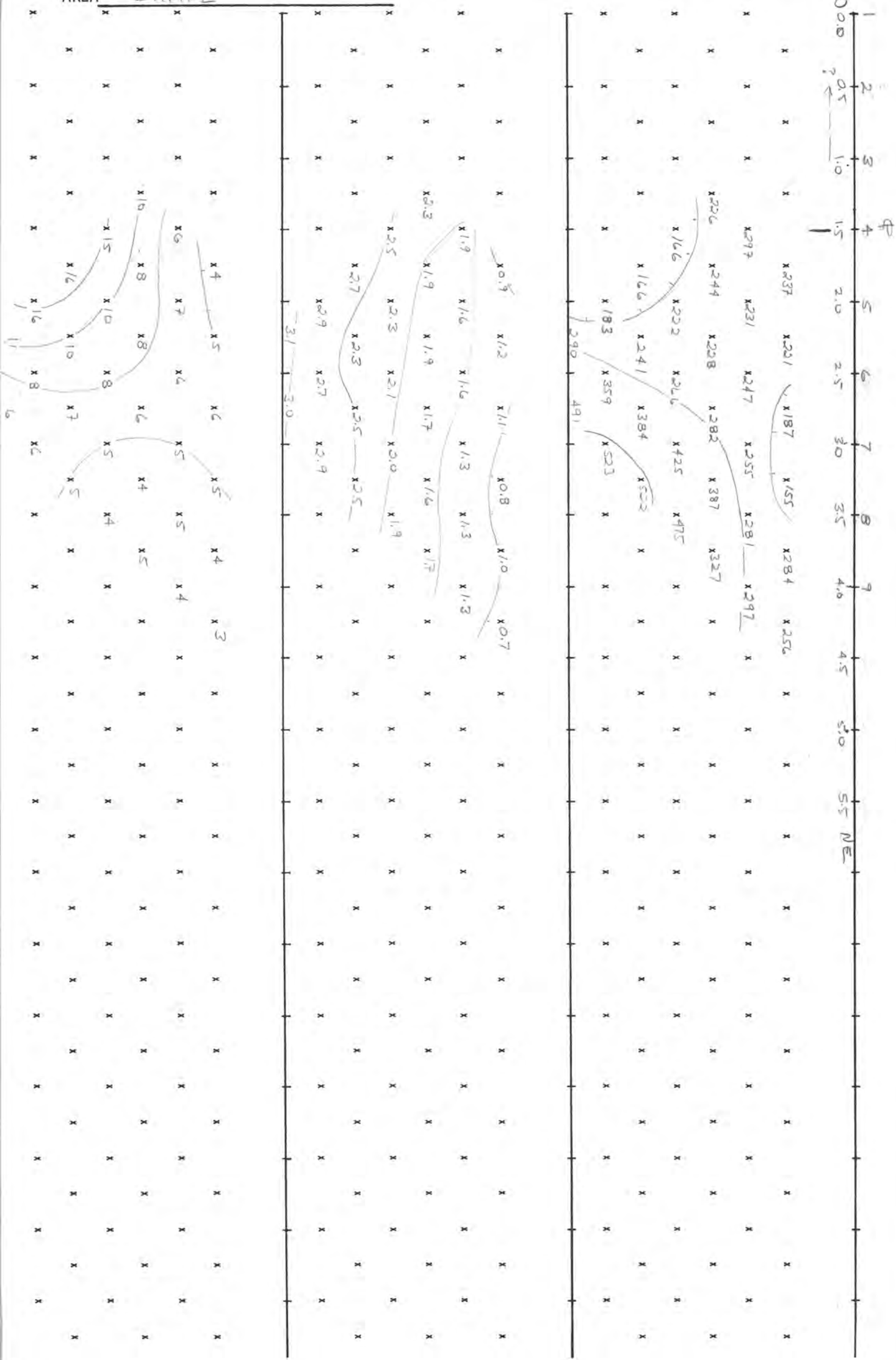
AREA EMPIRE [redacted]



JOB# 595 LINE# C SP 1 a = 500 LOOKING N 17° W

CLIENT WESTATES PETROLEUM DATE 12-14-70 FREQUENCIES 3.0 & 0.3 Hz

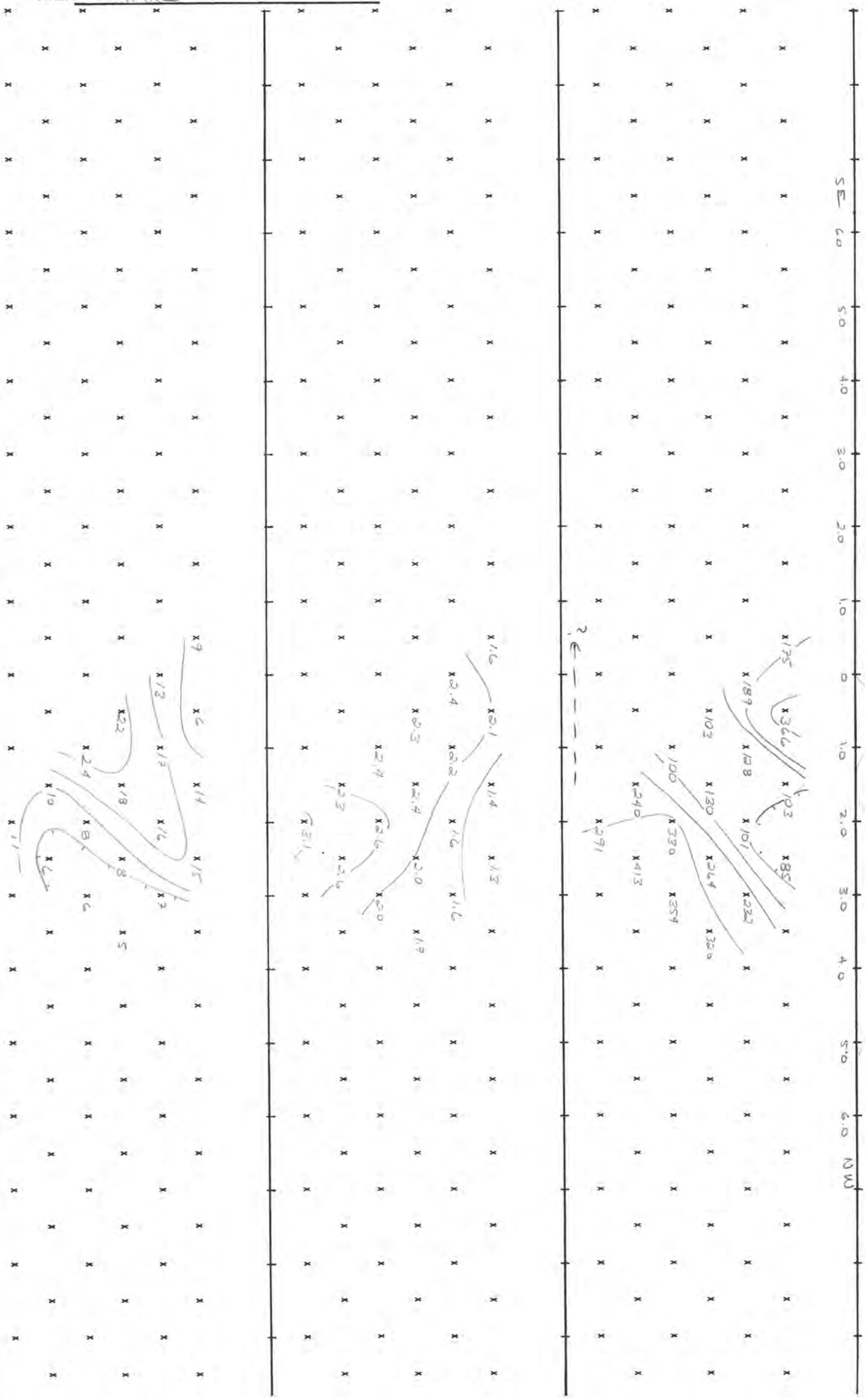
AREA EMPIRE



JOB# ~~EMPIRE~~ 595 LINE# D SP 1 a = 1000' LOOKING S 50°W

CLIENT ~~KING~~ WESTSTATES PETROLEUM DATE 12-15-70 FREQUENCIES 3.0 & 0.3 Hz

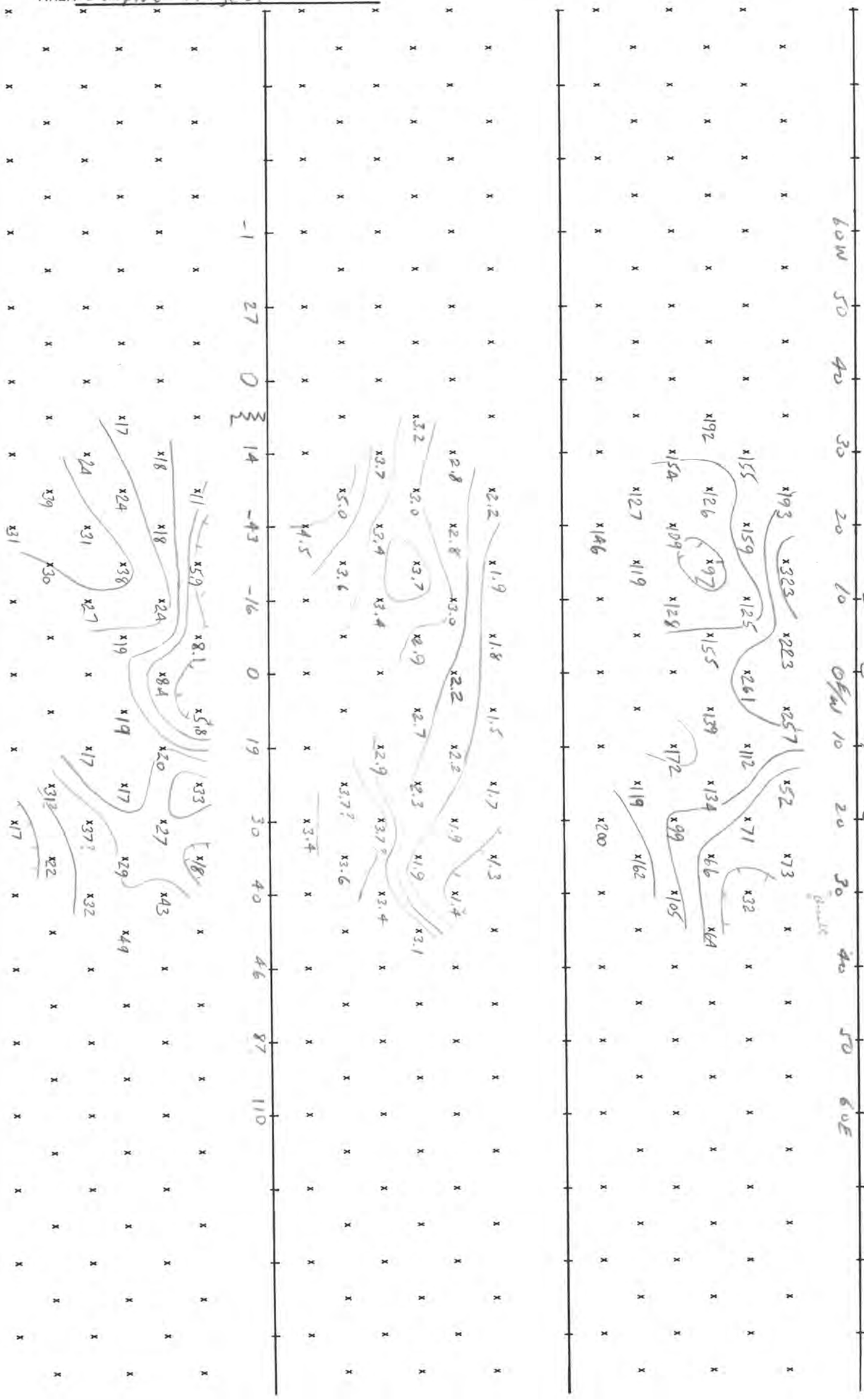
AREA EMPIRE



JOB# 625 LINE# 1 SP 1 a = 1000' LOOKING N4°W

CLIENT Westates Petroleum Company DATE April 1971 FREQUENCIES 3.0 & 0.3 Hz

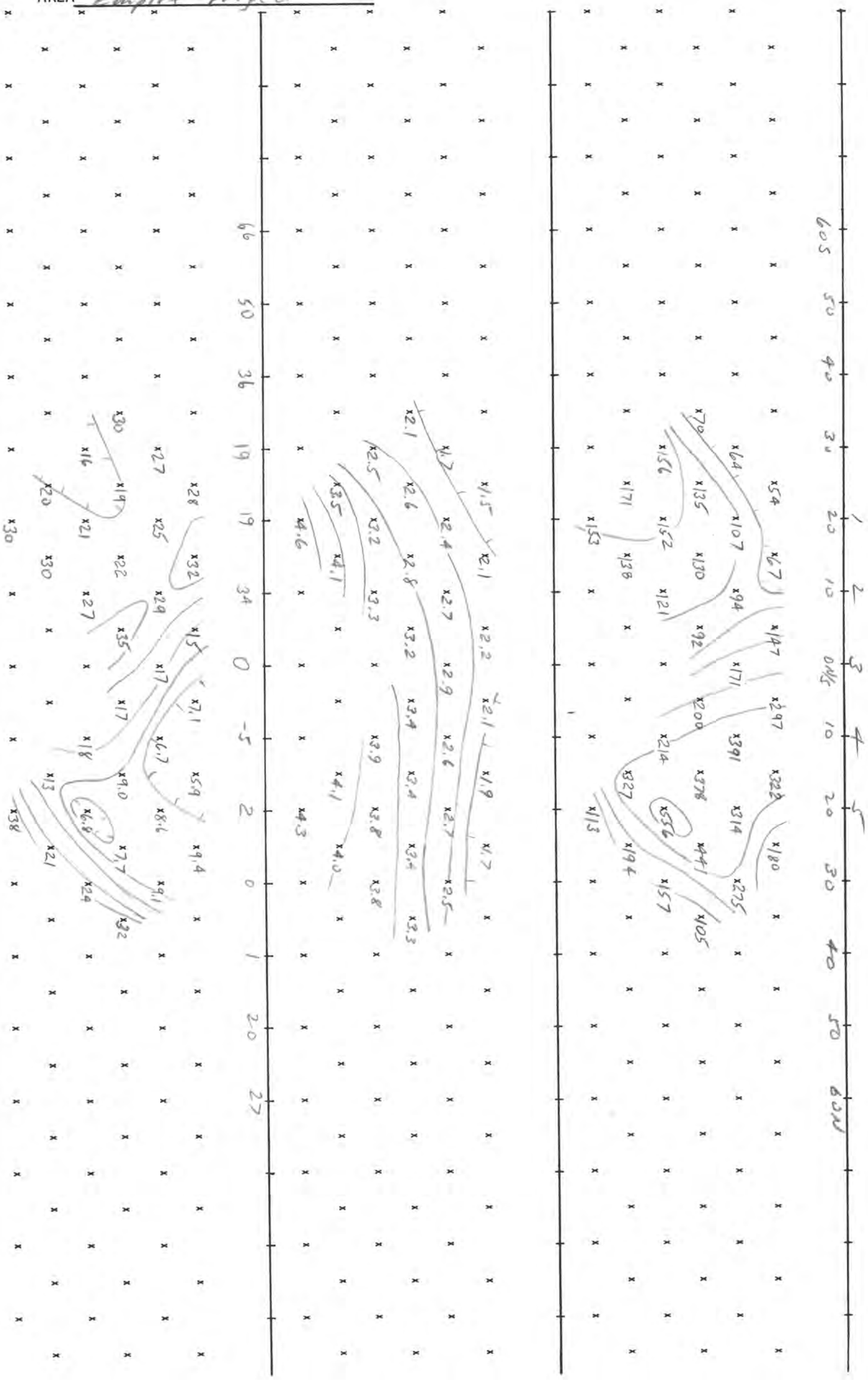
AREA Empire Project



JOB# 625 LINE# 2 SP 1 a = 1000' LOOKING N50W

CLIENT Westates Petroleum Company DATE April 1971 FREQUENCIES 3.0 & 0.3 Hz

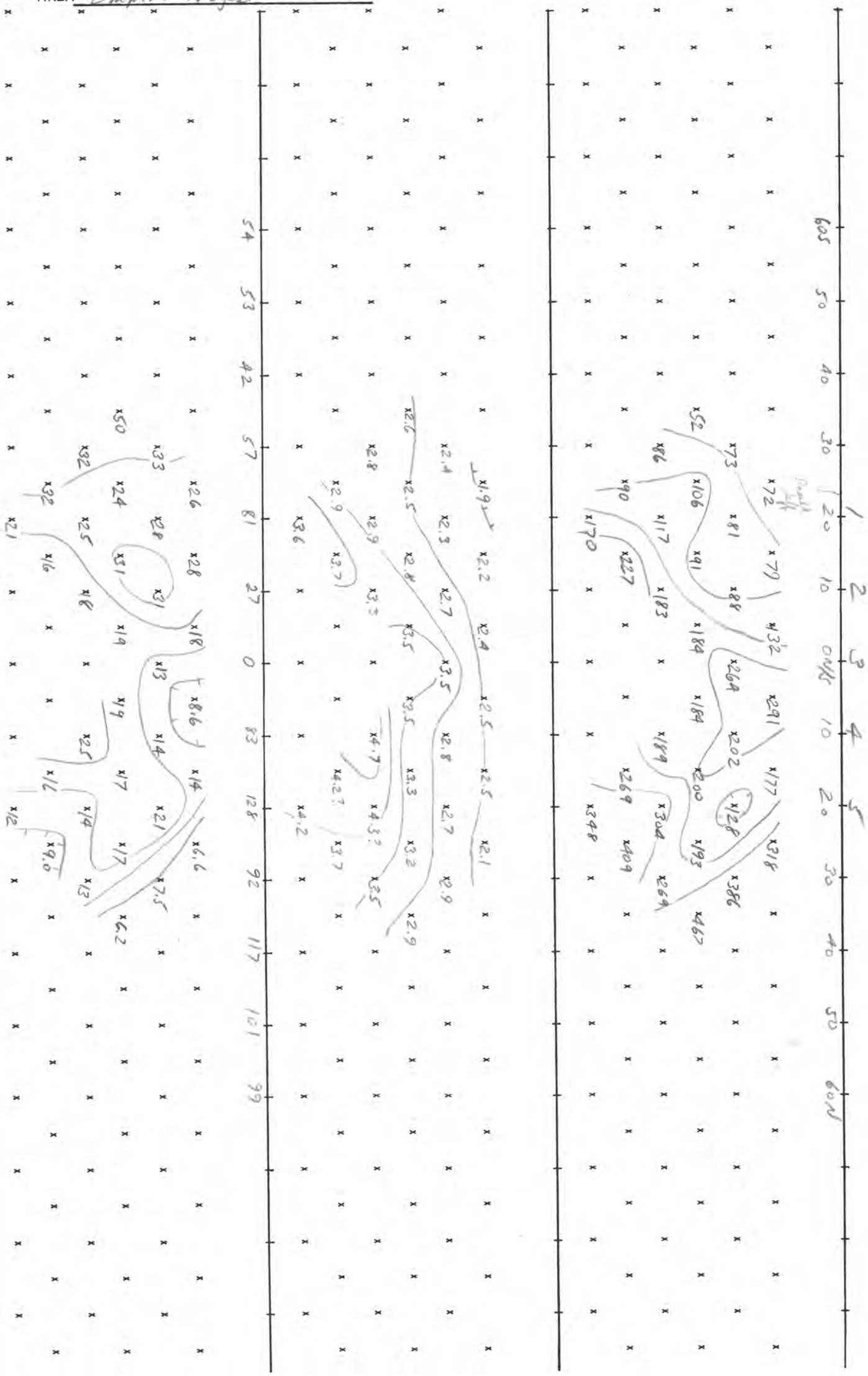
AREA Empire Project



JOB# 625 LINE# 3 SP 1 a = 1000' LOOKING N50°W

CLIENT Westates Petroleum Company DATE Apr. 1 1971 FREQUENCIES 3.0 & 0.3 Hz

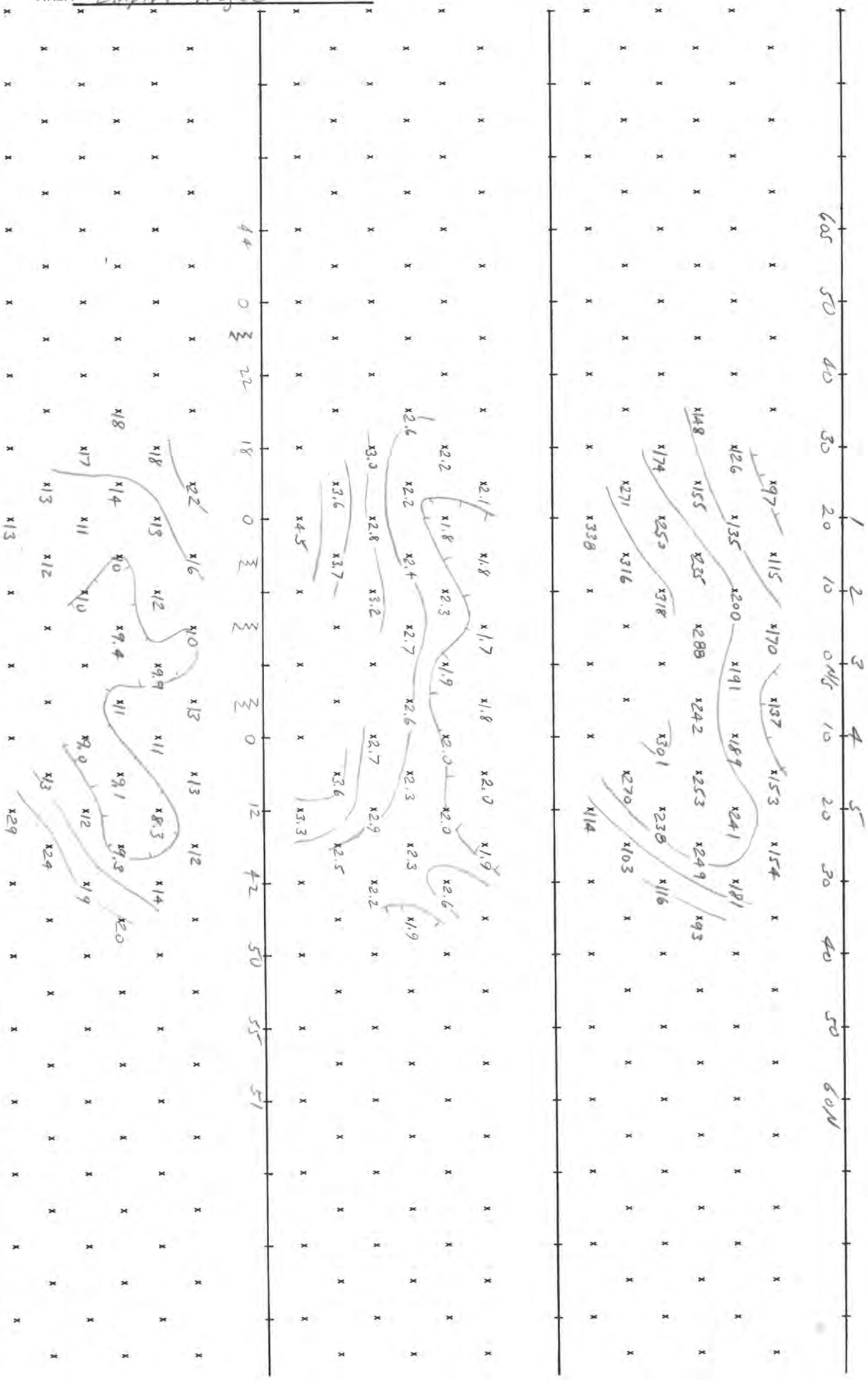
AREA Empire Project



JOB# 625 LINE# 4 SP 1 a = 1000' LOOKING N37°W

CLIENT Westates Petroleum Company DATE April 1971 FREQUENCIES 3.0 & 0.3 Hz

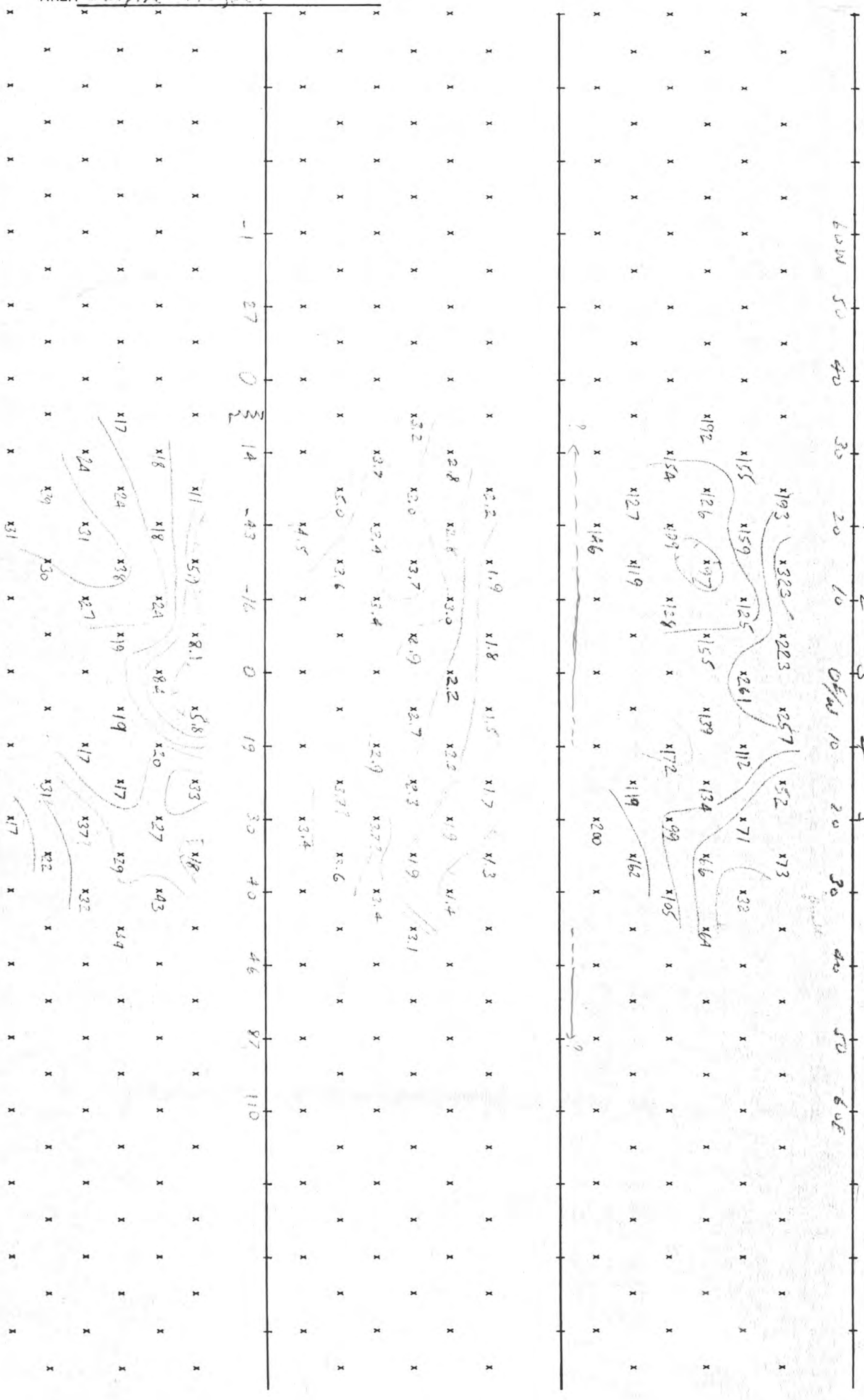
AREA Empire Project



JOB# 635 LINE# 1 SP 1 a = 1000' LOOKING NW

CLIENT Western Petroleum Company DATE April 1991 FREQUENCIES 3.0 & 6.3 Hz

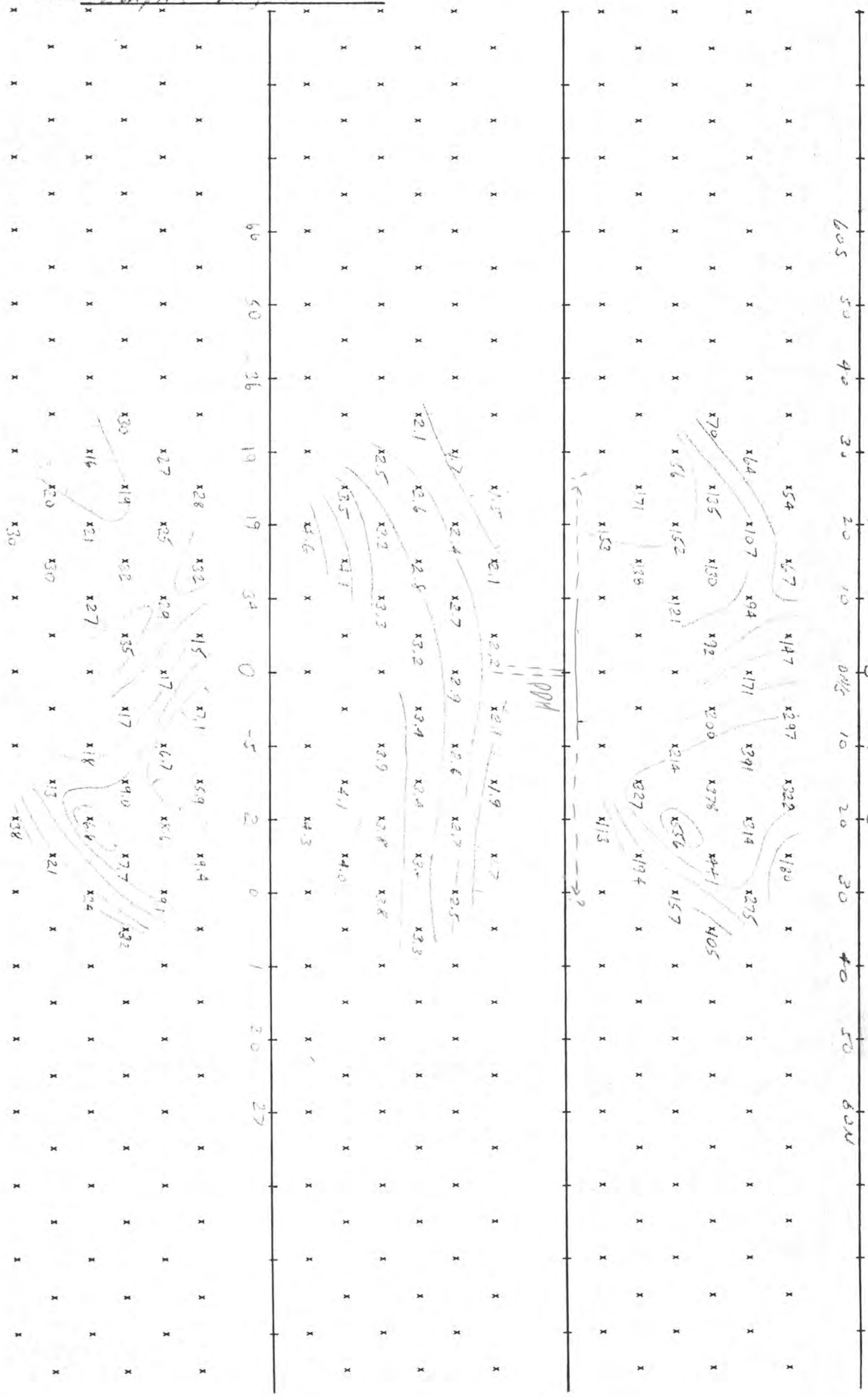
AREA Empire Project



JOB# 625 LINE# 2 SP 1 a = 1000' LOOKING N50W

CLIENT Westates petroleum DATE April 1971 FREQUENCIES 3.0 & 0.3 Hz

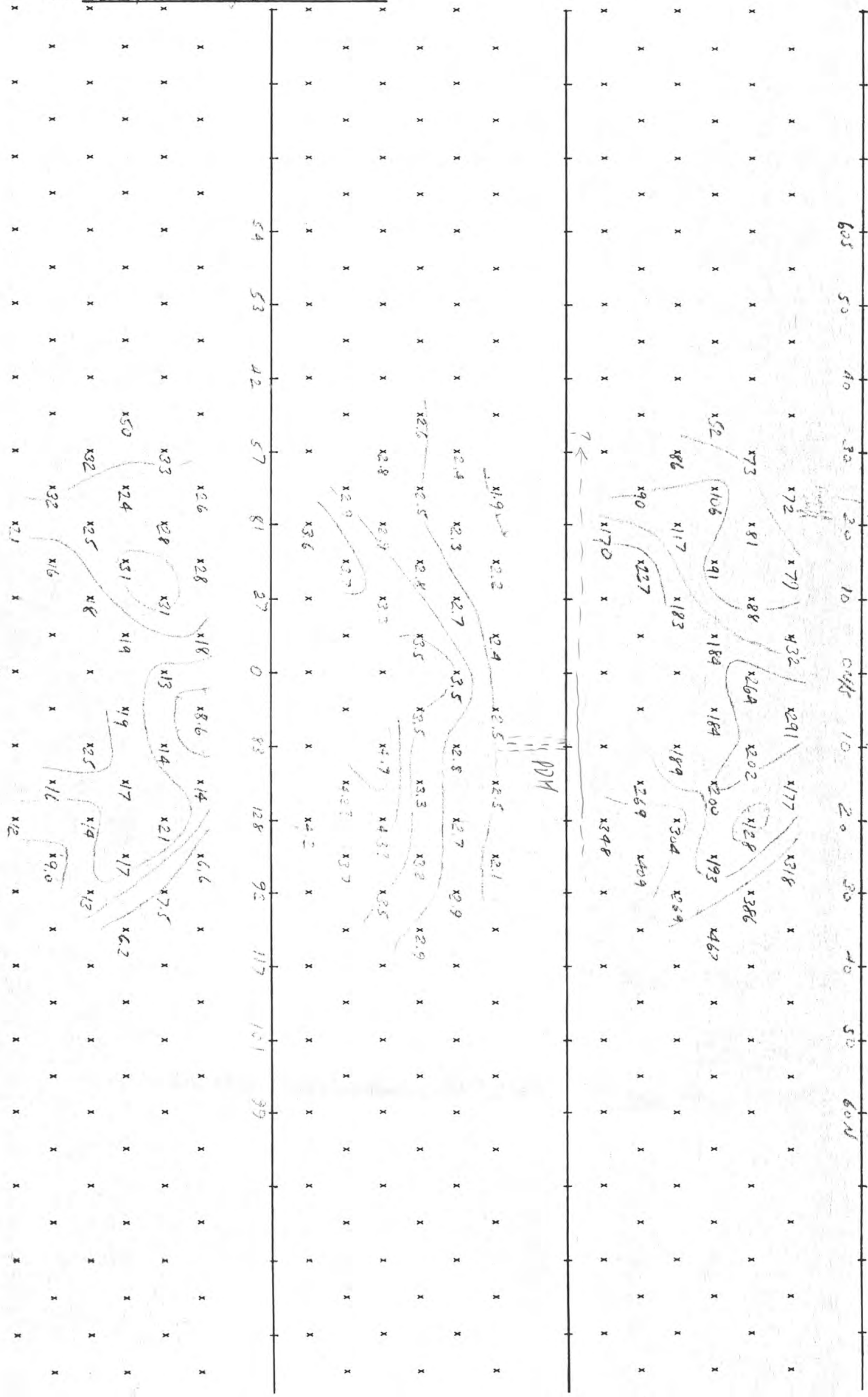
AREA Empire project



JOB# 625 LINE# 3 SP 1 a = 1000' LOOKING N50°W.

CLIENT Westates Petroleum Company DATE Apr 1 1971 FREQUENCIES 3.0 & 0.3 Hz

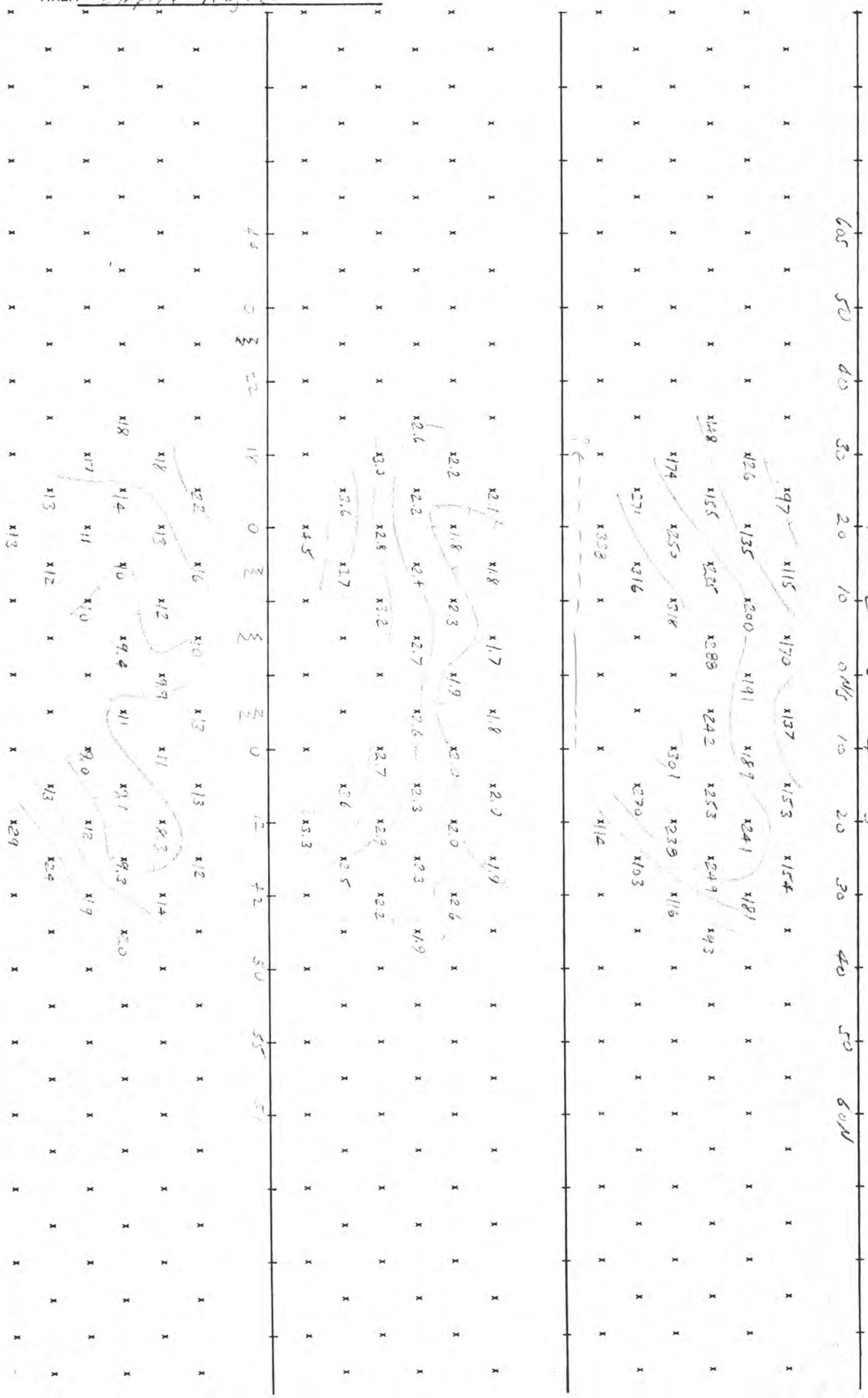
AREA Empire Project



JOB# 625 LINE# 4 SP 1 a = 1000' LOOKING N 37° W

CLIENT Westides Petroleum Company DATE April 1971 FREQUENCIES 3.0 & 0.3 Hz

AREA Empire Project



HENRY H. NEEL
802 ROOSEVELT BUILDING, 727 WEST 7TH ST.
LOS ANGELES, CALIFORNIA 90017
U. S. A.

AREA CODE 213
TELEPHONE 622-6968

CABLE ADDRESS
"HANKNEEL"

May 4, 1971

HEINRICHS
GEOEX
Cable: GEOEX

REC'D MAY 6 1971 REC'D

BOX 5964 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

Mr. Chris S. Ludwig
Heinricks Geoexploration Co.
P. O. Box 5964
Tuscon, Ariz. 85703

Dear Mr. Ludwig:

As per my several promises I am at last sending you, enclosed, a preliminary geologic map and structure sections of the Westates Petroleum Company claims near Parker, Arizona.

As is obvious on the map, I have mapped principally the limestones. This is because of several reasons. The foremost is that most of the copper mineralization on and near the surface seems to occur in the limestones. Also the limestones generally provide the most prominent and continuous outcrops.

Interbedded with the limestones are quartzites ranging from massive to thinly bedded, micaschists and some gneissic textured rocks which may either be altered sediments or intrusives. With the exception of some of the more massive quartzites none of the rocks interbedded with the limestones form readily mappable units. The poor outcrops of the above rocks are complicated by apparent rapid facies changes.

Perhaps this will aid a little in the I. P. interpretations.

Sincerely,

HENRY H. NEEL

Enc.

DESCRIPTION	AMOUNT	DISTRIBUTION
Advance payment under agreement dated April 5, 1971, to be credited against work to be done, for definite crew commitment	$1,000.00	11644

GEO
Cable: GEOEX
REC'D APR 19 1971 REC'D
BOX 5954 TUCSON, ARIZONA 85203
Phone: (AREA 602) 623-0578

PLEASE DETACH THIS STATEMENT BEFORE DEPOSITING CHECK

WESTATES PETROLEUM COMPANY
811 WEST SEVENTH STREET
LOS ANGELES, CALIFORNIA 90017

THIS CHECK IS TENDERED IN PAYMENT OF ITEMS LISTED

WESTATES PETROLEUM COMPANY

811 WEST SEVENTH STREET | LOS ANGELES, CALIFORNIA 90017 | TELEPHONE 820-1770

14 April 1971

HEINRICHS GEOEX
Cable: GEOEX
REC'D APR 19 1971
BOX 5964 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

Heinrichs Geoexploration Company
Post Office Box 5964
Tucson, Arizona 85703

Attention: Mr. Chris S. Ludwig

Gentlemen:

Pursuant to our telephone conversation of April 13, 1971, we have retyped your letter of April 5, 1971 and inserted the penultimate paragraph pertaining to keeping Mr. Henry Neel, our Consulting Geologist, informed of the status and results of all work done on the project and the dissemination by you of information and reports.

We are returning, in duplicate, your April 5th letter which has been executed by us and we shall appreciate your executing the original and returning it to us at the above address.

Also enclosed is our check No. 26736 in the amount of $1,000 in accordance with the last paragraph of the letter of April 5, 1971.

Very truly yours,

H. J. Geerlings
Manager of Lands

HJG/j

enclosures

cc: Mr. Henry Neel
Mr. Dan King

Certified Mail #061138

HEINRICHS GEOEXPLORATION COMPANY

806 WEST GRANT ROAD. TUCSON. ARIZONA 85703. P.O. BOX 5964. PHONE: (602) 623-0578

April 5, 1971

Westates Petroleum Company
811 West Seventh Street
Los Angeles, California 90017

Attention: Mr. H. W. Thompson, President

Gentlemen:

The purpose of this letter is to recommend what further geophysical work is warranted at this time on the Empire Property near Parker, Yuma County, Arizona. These recommendations are based upon a field trip made to the Empire Area by Messers Paul Head and Phil Matthews of GEOEX and Mr. Dan King on Friday, April 1, 1971. In addition, the Induced Polarization Survey done by GEOEX in December 1970 was also reviewed.

183
196

Mr. Paul Head has a degree in Geophysics Engineering from the Colorado School of Mines and has twenty years experience in mining exploration. Besides GEOEX he has worked for Newmont Mining Corporation and Hunting Geophysics.

Mr. Phil Matthews has a degree in geophysics-geochemistry from the University of Arizona and has ten years experience in practical mining exploration. Before joining GEOEX in 1963 Mr. Matthews worked as a geophysical technician in the exploration department at Phelps Dodge Corporation.

The preliminary induced polarization survey done by GEOEX consisted of three partial spreads as outlined by Mr. Dan King. Because of the rather difficult terrain in the area the three lines were placed so as to take best advantage of the topography. The three spreads did indicate weak but possibly economically interesting anomalism. Because of the large distance between lines, a correlation of information from line to line was not possible and thus no drill targets were outlined.

In order to take best advantage of the existing I. P. data and give the necessary correlating information to site geophysical drill targets, four additional induced polarization lines are recommended, as indicated on the accompanying plan map of the area.

These four lines, with the previous information obtained, should give sufficient data to determine if a sulfide zone of reasonable size exists within 1,000 ft. of the surface. Some limited information will be obtained in excess of 1,000 ft. in depth, say to 1,500 or even 2,000 ft. with this coverage.

It is estimated that one line can be completed every two days using a three man crew from GEOEX plus one man supplied by you. Thus it should take approximately eight working days to complete the work presently outlined.

If this work indicates the necessity of further geophysics in the area, additional lines can be added by extending the existing grid.

Our charges for this work would be $250.00 per day plus expenses for a three man I. P. crew and necessary equipment. Expenses include $15.00 per day plus $0.15 per mile per vehicle and one four wheel drive vehicle should suffice. Crew living expenses are charged at $42.00 per day for the three men. Other direct job expenses such as communications and miscellaneous supplies will be billed at invoice cost plus ten percent.

Our normal work schedule is based on a five day week and ten hours per day which includes travel time to and from the area while based in Parker. Deviation from this, only when requested by the client in writing, will be charged at $37.50 per overtime hour for the three man crew.

Standby time due to inclement weather or client request as well as mobilization from and back to Tucson will be charged at half the daily rate plus expenses as above. Malfunction of our equipment in excess of one hour per day will be made up or not charged.

Final data compilation, computation and drafting will be charged at $10.00 per hour. Final interpretation and report will be charged at $150.00 per staff day.

Based on the eight field day estimate above, the total cost of this proposed work including report will be about $3,200.00.

All property permits, brushing and trespass liability and related costs which are incurred on behalf of the client will be chargeable to the client. Charges for extra equipment and personnel employed, if mutually desired, are extra.

GEOEX will save the client harmless from all Workmen's Compensation, public liability and property damage liability incurred by GEOEX employees.

Payments are due on presentation. Billings may be submitted periodically with final payment due on presentation of final report.

We agree to periodically (at least once a week) inform Mr. Henry Neel, your Consulting Geologist, 727 West Seventh Street, Los Angeles, California 90017, telephone 213-622-6968, of the status and results of all work done on this project and to promptly furnish him all information, maps, and reports. Copies of all maps and reports will be sent to Mr. Dan King, A.C.M. Corporation, P. O. Box 98, Aguila, Arizona 85320.

Your understanding and approval of the above may be indicated by signing as provided below on one of the attached copies of this letter and returning it to us together with an advance payment of $1,000.00 to be credited against work to be done, for definite crew commitment.

Sincerely yours,
Heinrichs GEOEXploration Company

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

CSL:jh
Encl: 2 cc
2 plan maps

Date: April 14, 1971

WESTATES PETROLEUM COMPANY

Accepted by: J W Thompson

Title: President

HEINRICHS GEOEXPLORATION COMPANY

806 WEST GRANT ROAD, TUCSON, ARIZONA, 85703. P.O. BOX 5964. PHONE: (AREA CODE 602) 623-0578

December 10, 1970

Mr. Dan King
Westates Petroleum Company
811 West 7th Street
Los Angeles, California 90017

Re: I.P. Survey near Parker,
Yuma County, Arizona

Dear Mr. King:

Furthering our telephone discussion yesterday, we herewith submit the following proposal for several lines of induced polarization in the Eagles Nest Mine area near Parker, Yuma County, Arizona. We understand there are two lines about 4000 feet long on 500 foot dipole stations to be run and if satisfactory results are obtained, two other similar lines previously run by another contractor will be rechecked.

We propose to supply a two man I.P. crew and necessary equipment for $200.00 per day plus expenses. Expenses include $16.00 per day plus $0.16 per mile per vehicle and one four wheel drive vehicle should suffice. Crew living expenses are charged at $30.00 total per day for the two men. Other direct job expenses such as communications and miscellaneous supplies will be billed at invoice cost plus 10%.

Our normal work schedule is based on a 5 day week and 10 hours per day which includes travel time to and from the area while based in Parker. Deviation from this, only when requested by the client in writing, will be charged at $30.00 per overtime hour for the two man crew.

Cont'd.....

Cont'd.....

Standby time due to inclement weather or client request as well as mobilization from and back to Tucson will be charged at half the daily rate plus expenses as above. Malfunction of our equipment in excess of one hour per day will be made up or not charged.

Final data compilation, computation and drafting will be charged at $10.00 per hour. Final interpretation and report will be charged at $150.00 per staff day.

Estimating that about 4 field days would be involved to run the four lines, the total cost of the survey including report will be about $1800.00.

All property permits, brushing and trespass liability and related costs which are incurred on behalf of the client will be chargeable to the client. Charges for extra equipment and personnel employed, if mutually desired, are extra.

GEOEX will save the client harmless from all Workmen's Compensation, public liability and property damage liability incurred by GEOEX employees.

Payments are due on presentation. Billings may be submitted periodically with final payment due on presentation of final report.

Your understanding and approval of the above may be indicated by signing as provided below on the attached copy of this letter and returning it to us together with an advance payment of $500.00, to be credited against work to be done, for definite crew commitment.

Sincerely yours,
HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

Date:_____

Accepted by: Dan M. King

Title: Owner

HEINRICHS GEOEXPLORATION COMPANY

Enclosures: 3 extra copies of letter

CSL/re:

Dan King Parker, Ariz - Current I.P. Job.
A.C.M.

12/8/70

Dan called Walt

Production: 8 days - 8000'

3 N.

500' dipole

2 Critical lines.

Hi-Noise.

low resistivity

Drilled

30,000,000 tons.

0.7 Cu. + Au-Ag.

8 Due West Mineral Hill

nf River

Eieniega Springs.

2 days work one points

S T A T E M E N T

May 10, 1971

Westates Petroleum Company
811 West Seventh Street
Los Angeles, California 90017

Re: I.P. near Parker,
Arizona
GEOEX Job # 625

Attn: Mr. H.J. Geerlings
Manager of Lands

Week Ending April 24, 1971

Mobilization - 1 day @ 1/2 daily rate----------	$ 125.00
I.P. Crew - 5 days @ $250.00/day----------	1,250.00
Vehicle - 6 days @ $15.00/day----------	90.00
Mileage - 740 miles @ $0.15/mile----------	111.00
Living Expenses - 3 men 5 1/2 days @ $42.00/day-----	231.00
C.S. Ludwig - 16 hours supervision, computation & compilation @ $10.00/hour----------	160.00
W.E. Heinrichs - 2 hours supervision----------	W/C
J.C. Downs - Drafting 14 hours @ $10.00/hour--------	140.00
Reproductions----------	15.34
Drafting Material----------	10.00
Total This Billing----------	$ 2,132.34
Received On Account 4/19/71----------	$ 1,000.00
Total Amount Due This Billing----------	$ 1,132.34

cc: Dan King

(301)

740
15
370
1110

740
15
3700
740
11100

125 00
1250 00
90 00
111 00
231 00
25 34
160 00
300 00
140 00

2432.34

200 + 200 + 200

600 miles

@ .15/mile

2 days 2300 × 8/5

18400

90

30

120 vehicle

150

20 expenses

290 7.50

1 man day

3680

15 × 20

165

100

430

65

30

125

20

290

75

rept

21

21

231

315

1575

231

1806

3

5

8

8

24 × 10/hr

Jot 625

Westates Petroleum. w/e april 24, 1971

Mot - 1 day @ 1/2 rate 125.00 — 125.00

5 days @ 250.00 — 1250.00

6 Vehicle days @ $15.00/day — 90.00
740 miles @ 15¢/mi. — 110.00

Living exp. 3 men 5 1/2 days. @42.00/day = $231.00

1806.

Rec'd. On account 4/19/71 ($1,000.00)

Reproductions
13.95 + 10% = $15.34
20# Sep 40# B.L. 10.00

Supervision
16 hrs Computation & Compilation @ $10/hr = 160.00
2 day rept @ 150/staff day = 300.00

WEH 2 hrs N/C

Buzz Jt 14 hrs @ $10/hr — 140

Total → 2432.34
Due → −1000.00
1432.34

SPEED LETTER ®

TO Mr. Henry H. Neel
802 Roosevelt Bldg.
727 West Seventh Street
Los Angeles, California 90017

FROM Heinrichs GEOEXploration Co.
P.O. Box 5964
Tucson, Arizona 85703

SUBJECT Enclosures

No. 9 & 10 FOLD

MESSAGE

DATE May 7 19 71

Dear Mr. Neel:

Enclosed please find reproducible sepias of the following:

Induced Polarization Location and Interpretation Plan
Sectional Data Sheets for lines 1 through 4.

If you have any questions please feel free to contact us.

Sincerely yours,

SIGNED Chris S. Ludwig

REPLY

DATE 19

No. 9 FOLD

No. 10 FOLD

SIGNED

GrayLine "SNAP-A-WAY" FORM 44-902 3-PARTS

WILSON JONES COMPANY • © 1961 • PRINTED IN U.S.A.

SNAP-A-WAY AND RETAIN YELLOW COPY. SEND WHITE AND PINK COPIES WITH CARBON INTACT

No. 444518

RECEIPT FOR CERTIFIED MAIL—30¢ (plus postage)

SENT TO
H. Neel -

STREET AND NO.
802 Roosevelt Bld

P.O., STATE AND ZIP CODE
727 W 7th St L.A CA 90017

POSTMARK OR DATE

TUCSON, AZ KINO STA.
MAY 7 1971
USPO

OPTIONAL SERVICES FOR ADDITIONAL FEES

RETURN RECEIPT SERVICES

1. **Shows to whom and date delivered** ..... 15¢
   With delivery to addressee only ..... 65¢
2. **Shows to whom, date and where delivered** .. 35¢
   With delivery to addressee only ..... 85¢

DELIVER TO ADDRESSEE ONLY ..... 50¢

SPECIAL DELIVERY (2 pounds or less) ..... 45¢

POD Form 3800
July 1969

NO INSURANCE COVERAGE PROVIDED—NOT FOR INTERNATIONAL MAIL

(See other side)

☆ GPO : 1969 O—358-312

May 7, 1971

Mr. Henry H. Neel
802 Roosevelt Building
727 West 7th Street
Los Angeles, California 90017

Dear Mr. Neel:

Enclosed please find an original and one copy of our report "Induced Polarization Survey on the Empire Project near Parker, Yuma County, Arizona" for Westates Petroleum Company dated May 1971. Reproducible sepias will follow directly in a separate mailing tube. A copy of this report is also being sent to Mr. Dan King in Aguila, Arizona.

I received your geologic map and sections and briefly inspected them in relation to the I.P. survey. As you suggested previously, there is an inferred NNW fault and folded sediments with a NNW strike in the vicinity of the main I.P. anomaly which could help explain its NNW trend. The main NE trend of the geology is not obvious in the I.P. data but the line orientation (and terrain) was such to make it difficult to observe subtle trends in that direction.

If you have any questions regarding the report or project, please don't hesitate to contact us.

Sincerely yours,
Heinrichs GEOEXploration Company

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

Enclosures:
cc: Mr. H.W. Thompson
Mr. Dan King
CSL:dm

April 19, 1971

Westates Petroleum Company
811 West Seventh Street
Los Angeles, California 90017

Re: Your 14 April, 1971 letter

Attn: Mr. H.W. Thompson, President

Dear Mr. Thompson:

Enclosed you will please find the executed copy of the Parker, Arizona Project contract letter as per your request.

The crew started on the project today, and we will inform Mr. Neel as to the job status toward the end of the week.

Very truly yours,
Heinrichs GEOEXploration Company

Chris S. Ludwig

Chris S. Ludwig
Geophysicist

Enclosure: Contract letter
CSL:dm

4/13/71

Parker Arizona - Don King Job

Go! ASAP

They will retype our proposal letter to Don King rewording so as client will be Westates Pet. & include $1000 advance.

Talked to Mr. Geerlings with Westates (they tried to reach Mr. King today but he was out)

Send Billings to Westates
Mr. H. J. Geerlings
Westates Petroleum Company
811 West 7th Street
Los Angeles, California 90017

Note:

Send Data & Reports to their consultant
Mr. Henry Reel
727 West 7th Street
Los Angeles, California 90017
and a copy to Mr. King at usual address.

April 5, 1971

Mr. Dan King
A. C. M. Corp.
P. O. Box 98
Aguila, Arizona 85320

Dear Mr. King:

The purpose of this letter is to recommend what further geophysical work is warranted at this time on the Empire Property near Parker, Yuma County, Arizona. These recommendations are based upon a field trip made to the Empire Area by Messers Paul Head and Phil Matthews of GEOEX and yourself on Friday April 1, 1971. In addition, the Induced Polarization Survey done by GEOEX in December 1970 was also reviewed.

Mr. Paul Head has a degree in Geophysics Engineering from the Colorado School of Mines and has twenty years experience in mining exploration. Besides GEOEX he has worked for Newmont Mining Corporation and Hunting Geophysics.

Mr. Phil Matthews has a degree in geophysics-geochemistry from the University of Arizona and has ten years experience in practical mining exploration. Before joining GEOEX in 1963 Mr. Matthews worked as a geophysical technician in the exploration department at Phelps Dodge Corporation.

The preliminary induced polarization survey done by GEOEX consisted of three partial spreads as outlined by Mr. Dan King. Because of the rather difficult terrain in the area the three lines were placed so as to take best advantage of the topography. The three spreads did indicate weak but possibly economically interesting anomalism. Because of the large distance between lines, a correlation of information from line to line was not possible and thus no drill targets were outlined.

In order to take best advantage of the existing I. P. data and give the necessary correlating information to site geophysical drill targets, four additional induced polarization lines are recommended, as indicated on the accompanying plan map of the area. These four lines, with the previous information obtained, should give sufficient data to determine if a sulfide zone of reasonable size exists within 1,000 ft. of the surface. Some limited information will be obtained in excess of

1,000 ft. in depth, say to 1,500 or even 2,000 ft. with this coverage.

It is estimated that one line can be completed every two days using a three man crew from GEOEX plus one man supplied by you. Thus it should take approximately eight working days to complete the work presently outlined.

If this work indicates the necessity of further geophysics in the area, additional lines can be added by extending the existing grid.

Our charges for this work would be $250.00 per day plus expenses for a three man I. P. crew and necessary equipment. Expenses include $15.00 per day plus $0.15 per mile per vehicle and one four wheel drive vehicle should suffice. Crew living expenses are charged at $42.00 per day for the three men. Other direct job expenses such as communications and miscellaneous supplies will be billed at invoice cost plus ten percent.

Our normal work schedule is based on a five day week and ten hours per day which includes travel time to and from the area while based in Parker. Deviation from this, only when requested by the client in writing, will be charged at $37.50 per overtime hour for the three man crew.

Standby time due to inclement weather or client request as well as mobilization from and back to Tucson will be charged at half the daily rate plus expenses as above. Malfunction of our equipment in excess of one hour per day will be made up or not charged.

Final data compilation, computation and drafting will be charged at $10.00 per hour. Final interpretation and report will be charged at $150.00 per staff day.

Based on the eight field day estimate above, the total cost of this proposed work including report will be about $3,200.00.

All property permits, brushing and trespass liability and related costs which are incurred on behalf of the client will be chargeable to the client. Charges for extra equipment and personnel employed, if mutually desired, are extra.

GEOEX will save the client harmless from all Workmen's Compensation, public liability and property damage liability incurred by GEOEX employees.

Payments are due on presentation. Billings may be submitted periodically with final payment due on presentation of final report.

Your understanding and approval of the above may be indicated by signing as provided below on one of the attached copies of this letter and returning it to us together with an advance payment of $1,000.00 to be credited against work to be done, for definite crew commitment.

Sincerely yours,
Heinrichs GEOEXploration Company

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

CSL:jh
Encl: 2 cc
2 plan maps

Date:_____

Accepted by:_____

Title:_____

LONG DISTANCE PHONE CALL REPORT

Request of Mr. CSL : PM, DBC.

Date 3/29/71

Number Called 655-2344
Exchange Number

Time Requested _____ A. M. P. M.

Individual Dan King

KIND OF SERVICE DESIRED

☒ Station to Station ☐ Person to Person

Firm

Time Called 1:39 A. M. P. M.

Street Address West States $4000.00

Time Connected 1:39 A. M. P. M.

City Aguila State Arizona

Time Off 1:49 A. M. P. M.

Remarks: Hank Neel $15-20,000 (drill hole.)

Minutes Elapsed Time 10

Having where to run what lines. 6000' NS

CHARGES: $

Phone Company Verification of Charge Given by

3-4000 6-7 lines 1000' [illegible]

Phil est.: 12 crew days Basalt up to 700' thick or more? very weak

(field) Dan Not Avail - Thru.

Switchboard Operator's Notations

☒ **Company Business**
☐ **Personal Call**

Charge to _____ A/C No. _____

Signed [signature]
Switchboard Operator

Now job Poss.

The **UTILITY** Line Form 39A

Don King called 3/29/71
Aquila talked to Don. —:

Prop. Near Parker

Deep drilling still being considered

Need to look at it -

2:00
685 - 2344

wants Matthews

Not available ~~Thurs~~ ~~Wednesday~~ rest of week OK?
in a hurry

Friday morning ~~done~~ P.M. early
have Don call Phil tomorrow night

Chris: Don King called me on Saturday afternoon at the office. Westates Pet. has not as yet o.k'ed any further work. Don says he will have the work done himself & pay for it.

Since he is going to pay for this ~~worked~~ work this letter should not be addressed to Westates. He wants two copies of the letter plus the map. I ~~will~~ have outlined the lines on the map. He also wants us to make copies of the maps for ourselves. Have Byg transfer lines to Blue & return to Don King along with work map.

old work map

The crap about Paul & myself is at his insistance probably to show Westates its not just his ideas, and that we are qualified.

Please put letter with maps in a tube & send to him via Greyhound - to Aguila. Get out Monday

Feel free to improve my letter. Thanks, Phil

Don King said to send bill for our field trip to him - Suggest possibly send statement and indicate N/C.

Dan King
c/o Westates Petroleum Co.

Geoex Job ~~585~~ 595
Parker Arizona Area

~~Week ending Dec. 19 1980~~
~~Field I.P. Survey (10 hours)~~ Charge ~~of~~ 8 hrs

1 day travel @ 1/2 daily rate $200.00/day =	$100.00
2 3/4 days I.P. Survey @ 200.00/	550.00
Per diem - 2 men @ 30.00/day 3 1/2 days.	105.00
One Vehicle 4 days @ 16.00/day	64.00
699 miles @ 16¢/mi	111.84
W.E.H. conferring, interpretation, & supervision ~~& report & communication~~	V/C.
2 1/2 days Geoex Office Staff, ~~Conference~~ Data Compilation, Report & interpretation ~~preparation~~ @ $150.00/staff day. Charge only	250.00 ~~375.00~~
Reproductions - Sepia + Bluelene	8.00
	$ ~~1313.84~~ 1188.84
rec'd. on account	500.00
Total Fees + Services Bal. due:	$ ~~813.84~~ 688.84

Info note
CSL
P.H.
PM
file

Geox Job#
Dan King 595 / 12/17/70

Called Walt:

Data on top of McPhar. $1000.00 ±

Preliminary letter copy of Dan notes eventually by Monday?

10-15 Mi South of Florence old I.P. for

Tom King older brother + Inspiration

is a Real promotor

ask age of data

how released.

Should be re run

effect from perched water table or?

false anomaly?

get money in advance for sure!

Dupont back of Tom King? Tom May call GEOEX

Dan: Brief letter report on conclusions and data copy (results) in mail Friday 18 Dec. ok.

other (if any) and all field notes (copies) Says Phil

Same time of ready or next week.

Including statement final!

WHH.

Mr. Dan King
Westates Petroleum Company
811 West 7th Street
Los Angeles, California 90017

Chris S. Ludwig
Heinrichs GEOExploration Company
P.O. Box 5964
Tucson, AZ. 85703

MESSAGE DATE 1/7/1971

TO

Dear Mr. King:

Enclosed please find copies of each of the following:

Induced Polarization Location and Interpretation Plan of the Empire Project, Yuma County, Arizona, and Sectional Data Sheets for Line C (Spread 1);Line B (Spread 1); Line D (Spread 1).

If you have any questions please feel free to contact us.

Sincerely,
HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

SIGNED Enclosures:

REPLY DATE / /

SIGNED

Rediform® 4S 473

SEND PARTS 1 AND 3 WITH CARBON INTACT - PART 3 WILL BE RETURNED WITH REPLY.

DETACH AND FILE FOR FOLLOW-UP

S T A T E M E N T

December 23, 1970

Mr. Dan King
Westates Petroleum Co.
c/o A C M Corp.
Aguila, Arizona 85324

Re: GEOEX Job 595
Parker Arizona Area

Week Ending December 19, 1970

Field I.P. Survey - (10 Hours) Charge 8 hours 1 day travel @ 1/2 daily rate - $200.00/day---------	$ 100.00
Field I.P. Survey - 2 3/4 days @ $200.00/day---	550.00
Per Diem - 2 men @ $30.00/day 3 1/2 days-------	105.00
Vehicle - 4 days @ $16.00/day----------	64.00
Mileage - 699 miles @ .16/mile----------	111.84
W.E. Heinrichs conferring, interpretation and supervision----------	N/C
GEOEX Office Staff - 2 1/2 days - Data compilation, report and interpretation @ $150.00/day---------- (Charge only 1 2/3 days)	250.00
Reproductions - Sepis & Blueline----------	8.00
	$ 1,188.84
Received on Account	$ 500.00
Total Fees & Services Balance Due----------	$ 688.84

No. 444507

RECEIPT FOR CERTIFIED MAIL—30¢ (plus postage)

SENT TO
Mr. Dan King

STREET AND NO.
c/o ACM Corp

P.O., STATE AND ZIP CODE
Aguila, Ariz 85320

POSTMARK OR DATE
12/28/78

OPTIONAL SERVICES FOR ADDITIONAL FEES

RETURN RECEIPT SERVICES	1. Shows to whom and date delivered	15¢
	With delivery to addressee only	65¢
	2. Shows to whom, date and where delivered	35¢
	With delivery to addressee only	85¢
DELIVER TO ADDRESSEE ONLY		50¢
SPECIAL DELIVERY (2 pounds or less)		45¢

POD Form 3800
July 1969

NO INSURANCE COVERAGE PROVIDED—NOT FOR INTERNATIONAL MAIL

(See other side)

☆ GPO : 1969 O—358-312

December 22, 1970

Mr. Dan King
Westates Petroleum Company
811 West 7th Street
Los Angeles, Calif. 90017

Dear Mr. King:

Enclosed is an original and two copies of our report "Induced Polarization Survey, Eagles Nest Mine Area, Near Parker, Yuma County, Arizona".

If you have any questions about this report or if we can be of any further assistance please contact us at your earliest convenience.

Very truly yours,

J.P. Matthews, Jr.
Geophysicist

Enclosures:

JPM/re:

1 & 5 cc

December 19, 1970

Mr. Dan King
Westates Petroleum Company
811 West 7th Street
Los Angeles, Calif. 90017

c/o A.C.M. Co.
P.O. Box 98 Aguila Arizona
85320

Dear Mr. King:

Enclosed is an excerpt from our report on the Empire Project I. P. Survey. That part included is only the "Conclusions and Recommenations" along with one copy each of the three related sectional data sheets and the "I. P."Location and Interpretation Plan" along with the field notes.

The final report in its entirety should be out of our office by Monday afternoon and hopefully in your hands by mid-week. If you have any immediate questions, not answered by this preliminary report, please call me.

Very truly yours,
Heinrichs GEOEXploration Company

J. P. Matthews, Jr.
Geophysicist

JPM:jh
Enclosures

CONCLUSIONS AND RECOMMENDATIONS

Very weak I. P. effects are noted on all three lines. The anomalism found on Lines C and D are nearly coincident, and that found on Line B seems to lie roughly along the same north-south trending structure (?), which apparently carries most of the known mineralization. Unfortunately there is not enough I. P. coverage to get a good "feel" for background frequency effects, or to outline a definite zone of interest. Inasmuch as the anomalism found on Lines C and D is reportedly in an area where encouraging drill results were encountered, definite economic potential could be associated with the I. P. effects noted.

It is recommended that, if there is any geologic favorability for economic mineralization at depth in the anomalous areas, additional I. P. coverage be obtained both laterally and with depth on Lines B, C and D. If this work is encouraging further detailed I. P. should be run to define a definite zone of interest, and possible subsequent drill targets.

December 10, 1970

Mr. Dan King
Westates Petroleum Company
811 West 7th Street
Los Angeles, California 90017

Re: I.P. Survey near Parker,
Yuma County, Arizona

Dear Mr. King:

Furthering our telephone discussion yesterday, we herewith submit the following proposal for several lines of induced polarization in the Eagles Nest Mine area near Parker, Yuma County, Arizona. We understand there are two lines about 4000 feet long on 500 foot dipole stations to be run and if satisfactory results are obtained, two other similar lines previously run by another contractor will be rechecked.

We propose to supply a two man I.P. crew and necessary equipment for $200.00 per day plus expenses. Expenses include $16.00 per day plus $0.16 per mile per vehicle and one four wheel drive vehicle should suffice. Crew living expenses are charged at $30.00 total per day for the two men. Other direct job expenses such as communications and miscellaneous supplies will be billed at invoice cost plus 10%.

Our normal work schedule is based on a 5 day week and 10 hours per day which includes travel time to and from the area while based in Parker. Deviation from this, only when requested by the client in writing, will be charged at $30.00 per overtime hour for the two man crew.

Cont'd.....

Cont'd.....

Standby time due to inclement weather or client request as well as mobilization from and back to Tucson will be charged at half the daily rate plus expenses as above. Malfunction of our equipment in excess of one hour per day will be made up or not charged.

Final data compilation, computation and drafting will be charged at $10.00 per hour. Final interpretation and report will be charged at $150.00 per staff day.

Estimating that about 4 field days would be involved to run the four lines, the total cost of the survey including report will be about $1800.00.

All property permits, brushing and trespass liability and related costs which are incurred on behalf of the client will be chargeable to the client. Charges for extra equipment and personnel employed, if mutually desired, are extra.

GEOEX will save the client harmless from all Workmen's Compensation, public liability and property damage liability incurred by GEOEX employees.

Payments are due on presentation. Billings may be submitted periodically with final payment due on presentation of final report.

Your understanding and approval of the above may be indicated by signing as provided below on the attached copy of this letter and returning it to us together with an advance payment of $500.00, to be credited against work to be done, for definite crew commitment.

Sincerely yours,
HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

Date:_____

Accepted by:_____

Title:_____

Enclosures: 3 extra copies of letter

CSL/re:

Dan King 12/9/70

500' foot stations
2 lines and if O.K.
rerun 2 other line

Geox Job # 595

stay in Parker 6 miles up to Cienega Springs
Empire Mine
Carnation Mine
Key Eagle "
Crossroads Quad

(Kelly Oil)

Wickenburg
Ph 684 7795 wife's phone
call tomorrow

2 man crew $2 00

raw

Westates Petroleum Company
811 W. 7th street
L.A.
several copies

$500.00

Write proposal letter

Walt 1.35 P.M

Please call —

Dan King at

685 — 2344 —

about an I.P Grew-

this week —

If you call much

later please call

684-7795

~~A.C.M. Co.~~

P.O. Box 98

Agua Prieta Arizona 85320

MWR

LONG DISTANCE PHONE CALL REPORT

Request of Mr.

Date 12/8/70

Number Called 685 - 2344
Exchange Number

Time Requested ____ A.M. P.M.

KIND OF SERVICE DESIRED

☒ Station to Station ☐ Person to Person

Individual Dan King

Firm

Street Address A.C.M. Corp.

City Agua Dulce State Ariz

Time Called ____ A.M. P.M.

Time Connected 9:52 A.M. P.M.

Time Off 9:55 A.M. P.M.

Minutes Elapsed Time 3

Remarks: Walt talked to Grace Evans, she will give him message to call back.

CHARGES: $ 3

Phone Company Verification of Charge Given by

Switchboard Operator's Notations

☒ **Company Business**
☐ **Personal Call**

Charge to Gen'l A/C No.

Signed MWR
Switchboard Operator

The **UTILITY** Line Form 39A

11:45
12-7-70

Walt,

Mr. Dan King
A.C.M. Corp. -
Aguila, Az called.
He will be in his
office til 4:00

Please call -
685-2344
RM