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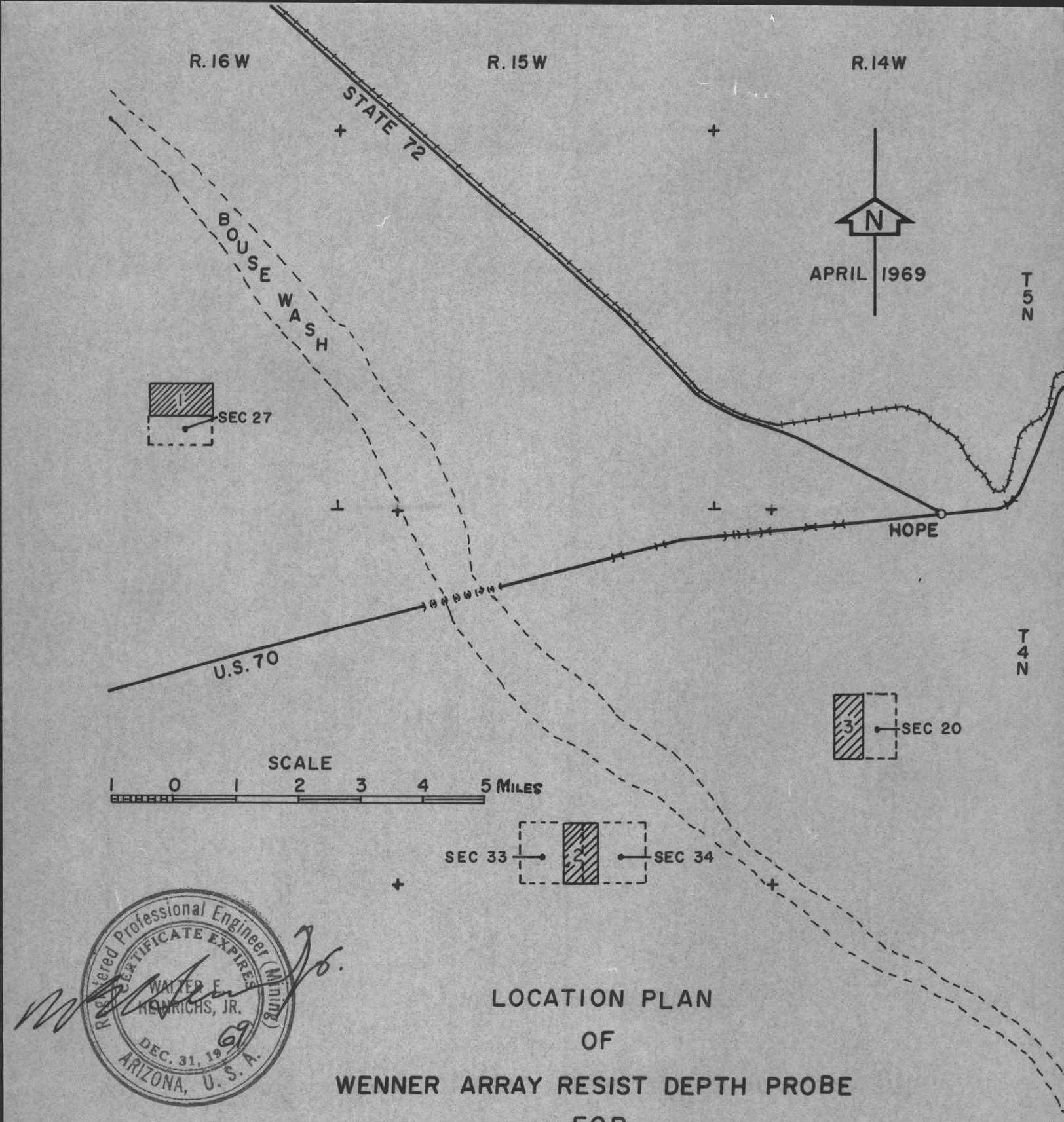



Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
WALTER E. HEINRICHS, JR.
DEC. 31, 1969
ARIZONA, U.S.A.

# LOCATION PLAN
# OF
# WENNER ARRAY RESIST DEPTH PROBE
# FOR
# MR. LEWIS E. SCOTT

APR 17 1969

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

PROBE 3

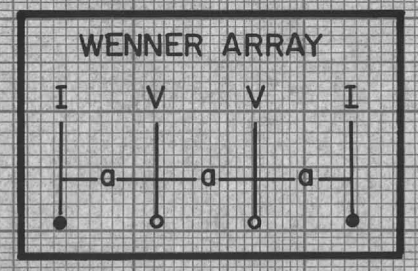
# WENNER ARRAY RESISTIVITY DEPTH PROBE
for
MR. LEWIS E. SCOTT
APRIL 1969

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

$\rho_a/2\pi$ (IN OHM FEET)

a (IN FEET)

WENNER ARRAY




• NORTH-SOUTH

x EAST-WEST

INTERPRETATION

| | |
|---|---|
| $\rho_{1/2\pi}$ = 24 OHM FEET | 10' |
| $\rho_{2/2\pi}$ = 11 OHM FEET | 300' |
| $\rho_{3/2\pi}$ = 33 OHM FEET | 200' to 500' |
| $\rho_{4/2\pi}$ = 50? OHM FEET | |

Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
DEC. 31, 19 69
ARIZONA, U.S.A.

K+E LOGARITHMIC 359-112L
KEUFFEL & ESSER CO. MADE IN U.S.A.
2 X 3 CYCLES

PROBE I

# WENNER ARRAY RESISTIVITY DEPTH PROBE

for

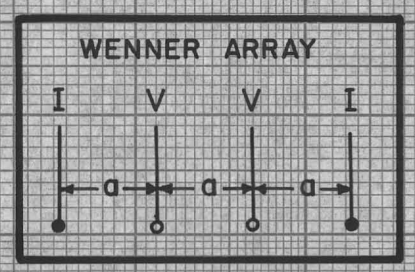
MR. LEWIS E. SCOTT

APRIL 1969

HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 6571, TUCSON, ARIZONA, 85703
Phone: 602 / 623-0578 Cable: GEOEX, Tucson
vancouver
sydney
geophysical engineers

$\rho_a/2\pi$ (IN OHM FEET)

a (IN FEET)




• NORTH-SOUTH

x EAST-WEST

## INTERPRETATION

| | |
|---|---|
| $\rho_1/2\pi$ = 40 OHM FEET | 16' |
| $\rho_2/2\pi$ = 13 OHM FEET | 35' |
| $\rho_3/2\pi$ = 4 OHM FEET | 450' |
| $\rho_4/2\pi$ = 130 OHM FEET | 350' |
| $\rho_5/2\pi$ = 1300 OHM FEET | |

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

K+E LOGARITHMIC 359-112L
KEUFFEL & ESSER CO. MADE IN U.S.A.
2 X 3 CYCLES

PROBE 2

# WENNER ARRAY RESISTIVITY DEPTH PROBE
for
MR. LEWIS E. SCOTT
APRIL 1969

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

ALTERNATE SOLUTION

$\rho_a/2\pi$ (IN OHM FEET) ⟶

⟵ a (IN FEET) ⟶

## INTERPRETATION

$\rho_1/2\pi$ = 195 OHM FEET — 30'

$\rho_2/2\pi$ = 2 OHM FEET — 400' to 500'

$\rho_3/2\pi$ = 400 OHM FEET

WENNER ARRAY

I V V I

a a a

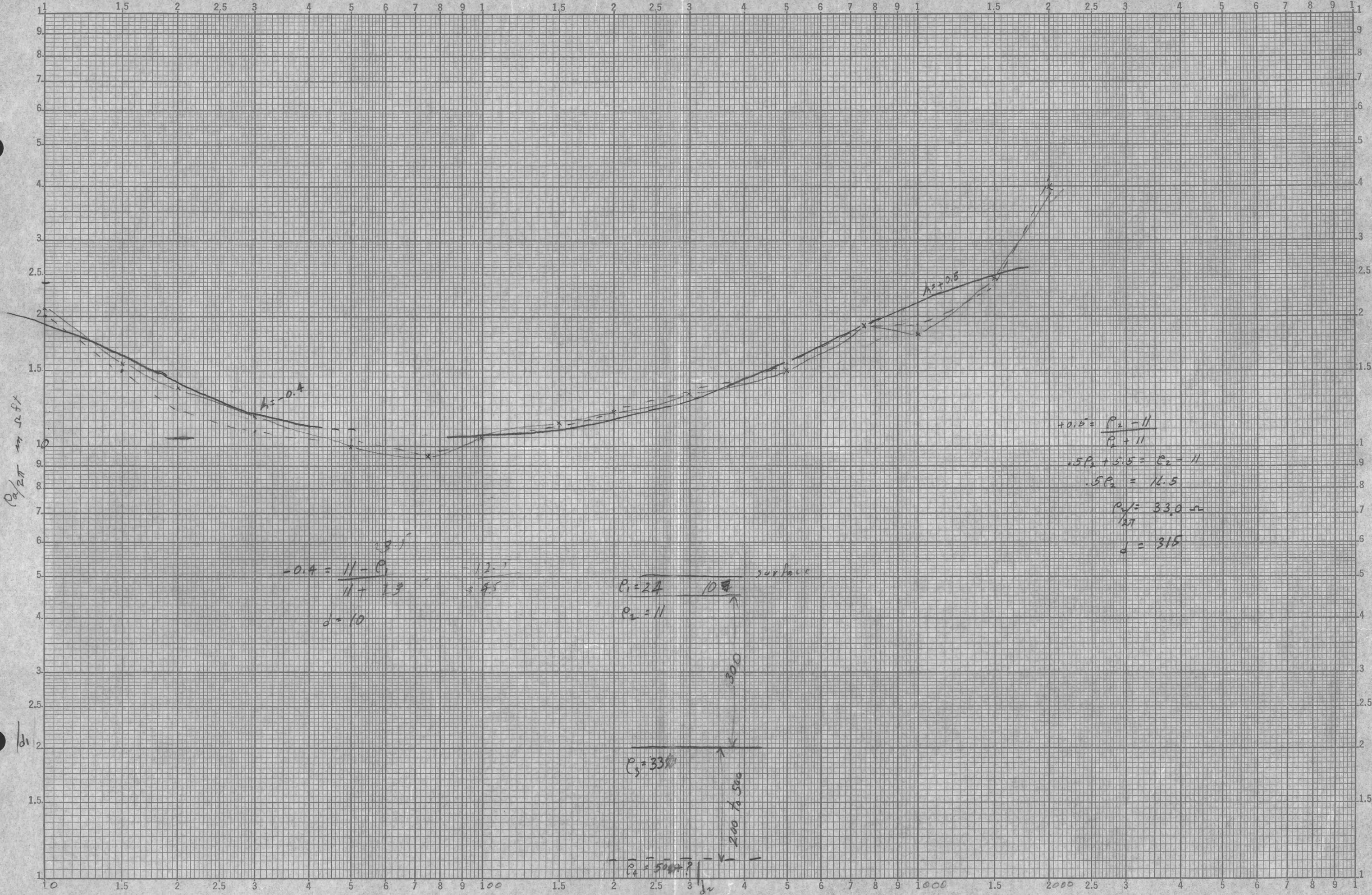
▪ NORTH-SOUTH

X EAST-WEST

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

K+E LOGARITHMIC 359-112L
KEUFFEL & ESSER CO. MADE IN U.S.A.
2 X 3 CYCLES

Job # 374




K+E LOGARITHMIC 359-112L KEUFFEL & ESSER CO. MADE IN U.S.A. 2 X 3 CYCLES

$\rho_a/2\pi = a\frac{V}{I}$

PAGE 1

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT CLC

LINE Ro 3 HALF ____ SP. N-S DATE 4-8-69

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| RECEIVE | 10 | 15 | 20 | 30 | 50 | 75 | 100 | 150 | 200 | 300 |
| RANGE | 3000 | 3000 | 1000 | 1000 | 100 | 300 | 100 | 300 | 300 | 300 |
| VOLTAGE | 1200 | 1000 | 361 | 217 | 62.0 | 128 | 61.8 | 74.0 | 121 | 90.0 |
| CURRENT | 20.0 | 15 | 12.03 | 10.8 | 10.3 | 9.6 | 10.3 | 11.1 | 12.1 | 13.5 |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 640V | 880V | 840V | 780 | 540 | 860 | 760 | 500V | 580 | 840 |
| CURRENT | 0.6A | 1.0A | 0.6A | 0.6 | 0.3 | 1Amp | 0.6 | 1A. | 2A | 2A. |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

700 250 1250 375 1500 500 2250 750 3000 1000

PAGE 2

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT CLC

LINE Pr 3 HALF ____ SP. N-S DATE 1-8-69

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 11 | 12 | 13 | 14 | 15 | | CAL | | | |
| RECEIVE | 500 | 750 | 1000 | 1500 | 2000 | | 15 | | | |
| RANGE | 100 | 100 | 300 | 100 | 100 | | 300 | | | |
| VOLTAGE | 62.0 | 50.5 | 19.1 | 31.4 | 42.3 | | 100 | | | |
| CURRENT | 15.5 | 18.93 | 19.1 | 23.5 | 42.3 | | | | | |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 630V | 620V | 300V | 680V | 680 | | 880V | | | |
| CURRENT | 2Amp | 2Amp | 1Amp | 2Amp | 2Amp | | 1Amp | | | |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT CLC

LINE LR3 HALF ____ SP. E-W DATE 1-8-69

PAGE 3

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| RECEIVE | 10 | 15 | 20 | 30 | 50 | 75 | 100 | 150 | 200 | 300 |
| RANGE | 3000 | 1000 | 300 | 100 | 100 | 30 | 30 | 300 | 100 | 100 |
| VOLTAGE | 1250 | 207 | 68.0 | 39.0 | 39.8 | 12.7 | 20.7 | 75.0 | 60.2 | 44.0 |
| CURRENT | 20.8 | 15.5 | 13.6 | 11.7 | 9.95 | 9.52 | 10.35 | 11.25 | 12.04 | 13.2 |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 560 | 520V | 380V | 200V | 510V | 580 | 280 | 380 | 100V | 500V |
| CURRENT | 0.6A | 0.2A | 0.1A | 0.1A | 0.2A | 0.1 | 0.2 | 1Amp | 1Amp | 1Amp |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT CLC

LINE 2+3 HALF ____ SP. E-W DATE 9-9-69

PAGE 4

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 11 | 12 | 13 | 14 | 15 | | CAL | | | |
| RECEIVE | 500 | 750 | 1000 | 1500 | 2000 | | 15 | | | |
| RANGE | 100 | 300 | 100 | 100 | 100 | | 30 | | | |
| VOLTAGE | 30.0 | 76.0 | 54.1 | 49.0 | 60.0 | | 10 | | | |
| CURRENT | 15.0 | 19.0 | 18.03 | 24.5 | 40.0 | | | | | |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 750 | 640 | 600V | 630V | 680V | | 260 | | | |
| CURRENT | 1Amp | 3Amp | 3Amp | 3Amp | 3Amp | | 0.1A | | | |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PAGE 1

PROJECT Ceres Landco.

LINE Probe 1 HALF ____ SP. N-S DATE 4-2-69

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| RECEIVE | 10 | 15 | 20 | 30 | 50 | 75 | 100 | 150 | 200 | 300 |
| RANGE | 100 | 100 | 100 | 10 | 10 | 10 | 1.0 | 10 | 1.0 | 1.0 |
| VOLTAGE | 1330 | 900 | 1000 | 55.1 | 253 | 293 | 29.8 | 1000 | 79.4 | 46.0 |
| CURRENT | 13.3 | 45.0 | 20. | 16.5 | 12.65 | 10.98 | 9.93 | 9.55 | 7.94 | 6.90 |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 1 Amp | 0.3 | 1.0 Amp | 1.0 | 1.0 | 2.0 | 0.3 | 2.0 | 2.0 | 2.0 |
| CURRENT | 1.00V | 800 | 500 | 600 | 600 | 870 | 300 | 700 | 988 | 600 |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT C L C

LINE Probe 1 HALF ____ SP. N-5 DATE 4-2-69

PAGE 2

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 11 | 12 | 13 | 14 | 15 | | CAL | | | |
| RECEIVE | 500 | 750 | 1000 | 1500 | 2000 | | 10 | | | |
| RANGE | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | 10 | | | |
| VOLTAGE | 35.9 | 33.3 | 44.0 | 37.6 | 50.6 | | 100 | | | |
| CURRENT | 8.975 | 8.325 | 14.66 | 18.8 | 33.7 | | | | | |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 600 | 340 | 560 | 600 | 600 | | 600V | | | |
| CURRENT | 2Amp | 3.0 | 3.0 | 3.0 | 3.0 | | 1Amp | | | |

FREQUENCIES 30 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT C L C

LINE Line 1 HALF ____ SP. E-W DATE 4-3-69

PAGE 3

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| RECEIVE | 10 | 15 | 20 | 30 | 50 | 75 | 100 | 150 | 200 | 300 |
| RANGE | ~~1~~10.0 | 100 | 10 | 10 | 1.0 | 10 | 1.0 | 1.0 | 1.0 | 1.0 |
| VOLTAGE | 510 | 1360 | 333 | 649 | 24.4 | 130 | 52.5 | 70.2 | 48.4 | 25.1 |
| CURRENT | 17.0 | 20.4 | 22.2 | 19.47 | 12.2 | 9.75 | 5.25 | 10.53 | 9.68 | 7.53 |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 180 | 400 | 400 | 400 | 180 | 600 | 700 | 400 | 660 | 760 |
| CURRENT | 0.3A. | 1.0 | 0.3 | 1.0 | 0.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT C L C

LINE Probe 1 HALF ____ SP. E-W DATE 4-3-69

PAGE 4

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 11 | 12 | 13 | 14 | 15 | | CAL | | | |
| RECEIVE | 500 | 750 | 1000 | 1500 | 2000 | | 15 | | | |
| RANGE | 0.1 | 1.0 | 1.0 | 1.0 | 1.0 | | 100 | | | |
| VOLTAGE | 4.5 | 34.8 | 46.0 | 36.5 | 49.9 | | 100 | | | |
| CURRENT | 7.5 | 8.7 | 15.33 | 18.25 | 33.26 | | | | | |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 370V | 370V | 350V | 420V | 800V | | 400V | | | |
| CURRENT | 0.3A | 3.0 | 3.0 | 3.0 | 3.0 | | 1 Amp | | | |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT CLC

LINE Probe 2 HALF ____ SP. N-5 DATE 4-4-69

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| RECEIVE | 10 | 15 | 20 | 30 | 50 | 75 | 100 | 150 | 200 | 300 |
| RANGE | 100 | 100 | 10 | 10 | 10 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| VOLTAGE | 3850 | 1840 | 564 | 280 | 96 | 62.1 | 11.5 | 59.6 | 40.5 | 24.0 |
| CURRENT | 128.3 | 92.0 | 56.4 | 28.0 | 16.0 | 15.52 | 11.5 | 8.94 | 8.1 | 7.2 |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 460V | 500 | 480 | 580 | 540 | 500 | 300 | 700 | 740 | 880 |
| CURRENT | 0.3A | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.0 | 1.0 | 1.0 | 1.0 |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

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# I. P. SENDER NOTES

PROJECT CLC

LINE Probe 2 HALF ____ SP. IX-5 DATE 7-4-69

PAGE 2

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 11 | 12 | 13 | 14 | 15 | | CAL | | | |
| RECEIVE | 500 | 750 | 1000 | 1500 | 2000 | | 10 | | | |
| RANGE | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | 1.0 | | | |
| VOLTAGE | 16.8 | 27.8 | 14.8 | 48.3 | 70.5 | | 10.0 | | | |
| CURRENT | 8.4 | 10.42 | 14.8 | 24.15 | 47.0 | | | | | |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 340 | 920 | 700 | 860 | 780 | | 180 | | | |
| CURRENT | 1.0A. | 2.0 | 1.0 | 3.0 | 3.0 | | 0.1Amp | | | |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT CLC

LINE Probe 2 HALF ____ SP. E-W DATE 1-4-69

PAGE 3

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| RECEIVE | 10 | 15 | 20 | 30 | 50 | 75 | 100 | 150 | 200 | 300 |
| RANGE | 100 | 100 | 100 | 10 | 10 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| VOLTAGE | 4360 | 1680 | 1090 | 321 | 208 | 83.0 | 25.1 | 61.8 | 41.6 | 23.6 |
| CURRENT | 145.3 | 84.0 | 54.5 | 24.0 | 17.33 | 15.56 | 12.5 | 9.27 | 8.32 | 7.08 |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | 460v | 590 | 550 | 640 | 500 | 520 | 460 | 420 | 720 | 540 |
| CURRENT | 0.3A | 0.3 | 0.4A | 0.4A | 0.6A | 0.4 | 0.2 | 1.0 | 1.0 | 1.0 |

FREQUENCIES 3.0 ____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

# I. P. SENDER NOTES

PROJECT CLC

LINE 2 HALF ____ SP. E-W DATE 4-4-65

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SEND | 11 | 12 | 13 | 14 | 15 | | CAL | | | |
| RECEIVE | 500 | 750 | 1000 | 1500 | 2000 | | 10 | | | |
| RANGE | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | 1.0 | | | |
| VOLTAGE | 31.0 | 13.3 | 42.4 | 49.1 | 68.7 | | 10 | | | |
| CURRENT | 15.5 | 9.9 | 14.13 | 24.5 | 45.8 | | | | | |
| SEND | | | | | | | | | | |
| RECEIVE | | | | | | | | | | |
| RANGE | | | | | | | | | | |
| VOLTAGE | | | | | | | 180 | | | |
| CURRENT | 1.0A. | 1.0 | 3.0 | 3.0 | 3.0 | | 0.1Amp | | | |

FREQUENCIES 3.0 ____

SENDER NO.

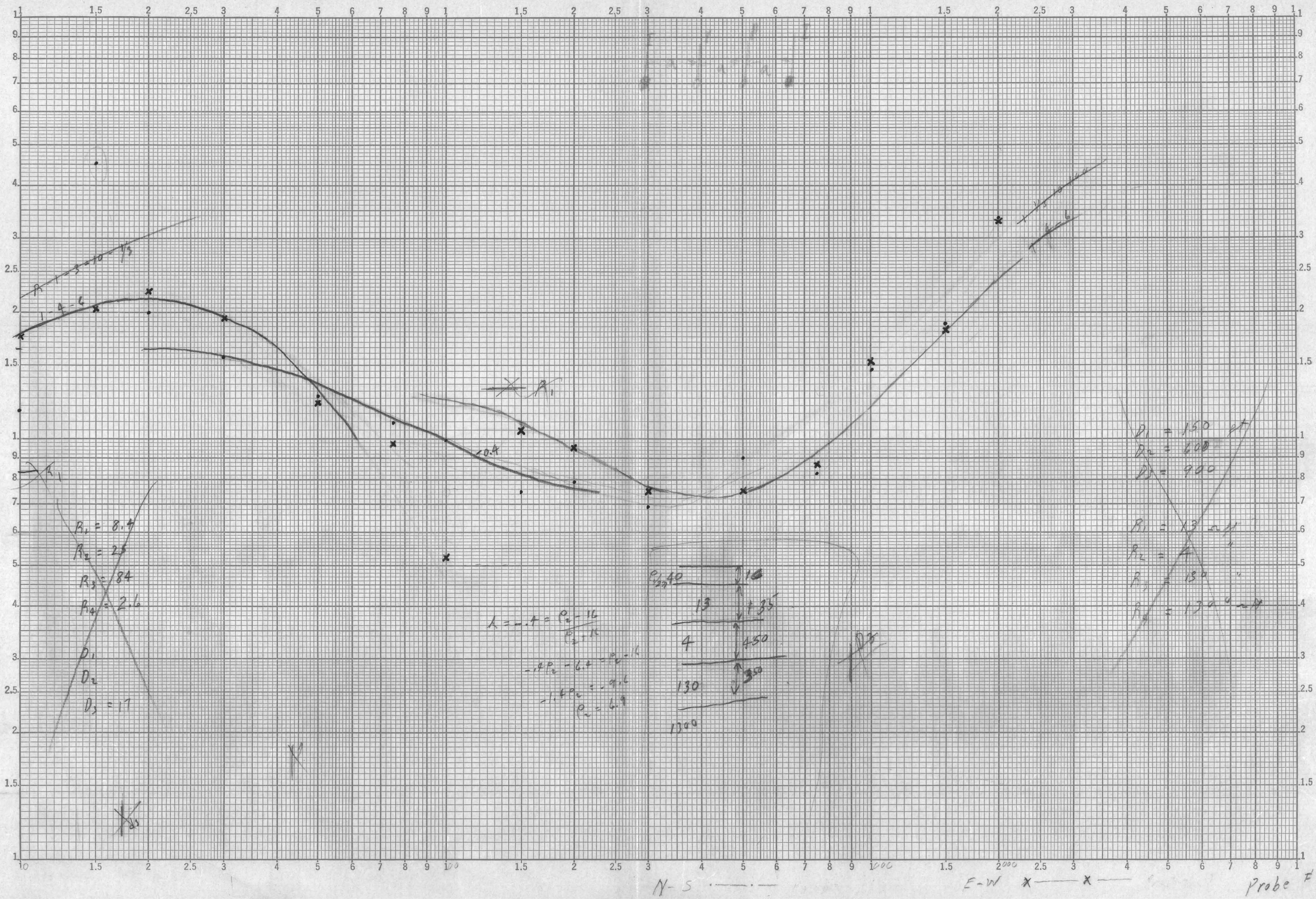
OPERATOR

RECEIVER NO.

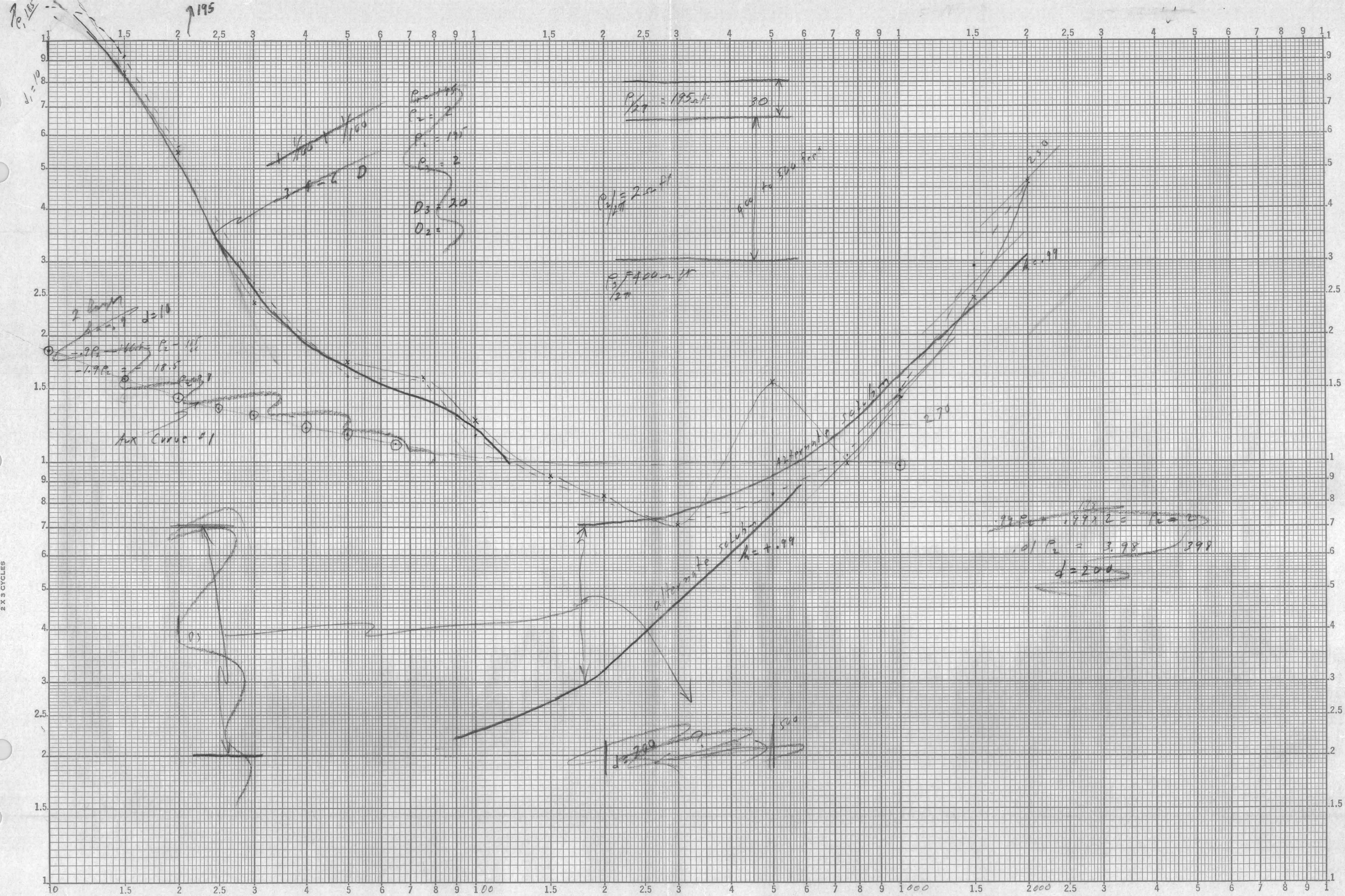
OPERATOR

COMMENTS:

Job #374




LEWIS SCOTT
K+E LOGARITHMIC 359-112L
KEUFFEL & ESSER CO. MADE IN U.S.A.
2 X 3 CYCLES


Probe 2
N-S
E-W
Aux Curve #1
d = 10
d = 200
D
D3 = 20
D2 =
195
LOGARITHMIC
KEUFFEL & ESSER CO.
2 X 3 CYCLES
359-112L
MADE IN U.S.A.

# WENNER RESISTIVITY DEPTH PROBES

In the

BOUSE WASH VALLEY

Yuma County, Arizona

Mr. Lewis E. Scott

APR 1 7 1969

# WENNER RESISTIVITY DEPTH PROBES

In The

BOUSE WASH VALLEY

Yuma County, Arizona

For

Mr. Lewis E. Scott

April 1969

By

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

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| IN MAP POCKET: | |
| Depth Probe #1 - a = 10 to 2,000 feet | |
| Depth Probe #2 - a = 10 to 2,000 feet | |
| Depth Probe #3 - a = 10 to 2,000 feet | |
| Location Map | |

# GENERAL LOCATION
of
# WENNER ARRAY RESISTIVITY DEPTH PROBES
for
# MR. LEWIS E. SCOTT

## ARIZONA

HEINRICHS
**GEOEXPLORATION COMPANY**

GEOPHYSICAL ENGINEERS

BOX 5671 TUCSON, ARIZONA 85703
PH: 602/623-0578 CABLE: GEOEX, TUCSON

SYDNEY VANCOUVER

## INTRODUCTION

At the request of Mr. Lewis E. Scott three resistivity depth probes were surveyed in the Bouse Wash Valley, Yuma County, Arizona for the Ceres Land Company.

The purpose of these depth probes was to make a reasonable estimate of depth to bedrock and, if possible, delineate any water bearing strata above it. It was reported that poor quality water of insufficient quantity is available at depths of less than 400 feet and that large quantities of water are present at about 1,200 feet depth at various places in the valley. The location of the three depth probes are proposed well sites and as such the total section of alluvium is critical for adequate water production.

The Wenner electrode configuration was employed using 3.0 Hz energizing power. At all times the signal level received was greater than 10 times the noise level so that the data quality is very good. To help interpret anisotropic conditions each depth probe used two separate Wenner expanders at right angles to each other with a common center. Fifteen apparent resistivity values from each expander were obtained by expanding the electrode spacings around the center point of each array.

Mr. Mike Critchley was crew chief, assisted by Mr. Tony Ivan-Smith and Mr. Steve Cruz. Mr. Paul Head, geophysicist, was in charge of the project and is responsible for this report and data interpretation.

## CONCLUSIONS

Both Probe #1 and Probe #2 are located on the westerly side of Bouse Wash and indicate exceptionaly low resistivity media over resistant material. We equate the resistant layer to the "Malpais" and "Volcanic Formations" noted in some of the available drill logs. The very low resistivity is likely to be near surface, saline water saturated alluvium.

Probe #3 on the easterly side of Bouse Wash indicates no trace of the "Malpais" but does show a low contrast interface that may be the alluvium-bedrock contact. This is partly surmised by surface geology.

To summarize: Probe #1 indicates at least 600 feet and possibly 900 feet of alluvium; Probe #2 indicates up to 500 feet of alluvium; Probe #3 indicates about 300 to 500 feet of possible alluvium.

## RECOMMENDATIONS

This brief survey indicates that the well proposed near Probe #3 might be better placed about two miles west near Bouse Wash.

A better determination of depth to consolidated rock might be obtained by seismic methods although the "Malpais" would probably mark the end of useable data. The cost of a reasonable seismic survey would be considerably greater than this resistivity survey and probably be about equal to the cost of one drill hole.

Additional resistivity work can be obtained twice as fast because this survey indicates that anisotropy is no problem. Any future resistivity probes can be made using single expanders approximately parallel to the valley.

## INTERPRETATION

All three probes indicate the same general electrical properties of high surface resistivity, low resistivity in the mid-portions of the probe and relatively high resistivity media at depth. Composite solutions of the three probes were made using 2, 3, and 4 layer type curves because no single curve would give a solution unasisted.

Probe #1 is located in the SE¼ of the NW¼ of section 27, T. 5 N., R. 16 W. 1,800 feet east of N-S line. The nearest well log available is (B-5-16) 25 about two miles east. The well log indicates a major change in sediments from caliche and gravel to fine sand at about 120 feet deep. The next change, at about 580 feet, marks the first appearance of clay in the log.

The resistivity data from Probe #1 indicates slightly anisotropic conditions which do not hinder interpretation appreciably. The north-south expander solution indicates much the same values for resistivity and layer depths as does the east-west expander. A composite colution has been developed which probably indicates the major changes of porosity and electrolyte in the alluvium.. The upper 15 feet has a

resistivity ($\rho_1/2\pi$) of about 40 ohm feet, probably caused by relatively dry sods, gravels, and caliche. The second layer is approximately 135 feet thick with a resistivity ($\rho_2/2\pi$) of 13 ohm feet and is probably the same material as above but containing fairly conductive ground water. The resistivity of the third ($\rho_3/2\pi$) is about 4 ohm feet and most probably represents the effect of ground water that is quite saline. This zone is about 450 feet thick. The fourth layer is 350 feet thick having a resistivity ($\rho_4/2\pi$) of 130 ohm feet. The lowest interpretable change of resistivity is about 900 feet deep where the resistivity ($\rho_5/2\pi$) is 1,300 ohm meters.

The bottom of this section may be the "Malpais" recorded on the drill logs. There is no other material noted in the available drill logs which would account for resistivities over 500 ohm feet. Many tight sedimentary rocks such as limestones, marble or quartzite would also have resistivities of this magnitude. Granitic materials typically show resistivities of 50 to 200 ohm feet.

<u>Probe #2</u> is located on the line between Sections 33 and 34, T. 4 N., R. 15 W. and consists of two expanding Wenner arrays oriented north-south and east-west. The nearest producing water well for which we have a log is about five miles northwest in section 18. No bedrock was recorded to 1,242 feet in the drill log.

The curve obtained from Probe #2 is not amenable to good interpretation at depth due to the thick, very low resistivity layer near surface. The observed data results from a relatively high resistivity, 195 ohm feet, surface layer less than 30 feet thick, underlain by material having a resistivity on the order of 2 ohm feet and of indeterminate thickness. An attempt to define the location of this high resistivity boundary at depth using a two layer solution with a 2 ohm feet upper media results in a maximum depth of 500 feet to the high resistivity material. By using larger values for the upper layer, this depth can be reduced to about 200 feet. We feel that 400 to 500 feet is most reasonable, based on past experience. This probe is most probably indicating a several layers or perhaps a somewhat gradational variation of resistivity with depth rather than a simple three layer situation.

The 2 ohm foot media must represent saline water saturated material of considerable thickness. The higher resistivity, $\rho_3/2\pi$ = 400 ohm feet, material at depth is probably not caused by bedrock, but more likely it is due to a definite bottom of saline water near the "Malpais" interface.

<u>Probe #3</u> is located at the center of the E½ of Section 32, T. 4 N., R. 14 W. There are no producing wells nearby from which drill log data can be obtained to aid interpretation.

The minimum value for resistivity at this site is on the order of 11 ohm feet beginning 10 feet deep and about 300 feet thick. The upper 10 feet of the section has a resistivity of 24 ohm feet. The section below 310 feet has a resistivity of about 33 ohm feet for at least 200 feet and possibly as much as 500 feet of depth. The resistivity below this is at least 50 ohm feet and perhaps greater than 100.

It is apparent that Probe #3 is in an entirely different environment than either #1 or #2, probably having to do with being on the east side of Bouse Wash and its proximity to outcropping rock.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Paul A Head

Paul A. Head
Geophysicist

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

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

April 17, 1969
Tucson, Arizona

PROBE 3

WENNER ARRAY RESISTIVITY DEPTH PROBE
for
MR. LEWIS E. SCOTT
APRIL 1969

HEINRICHS
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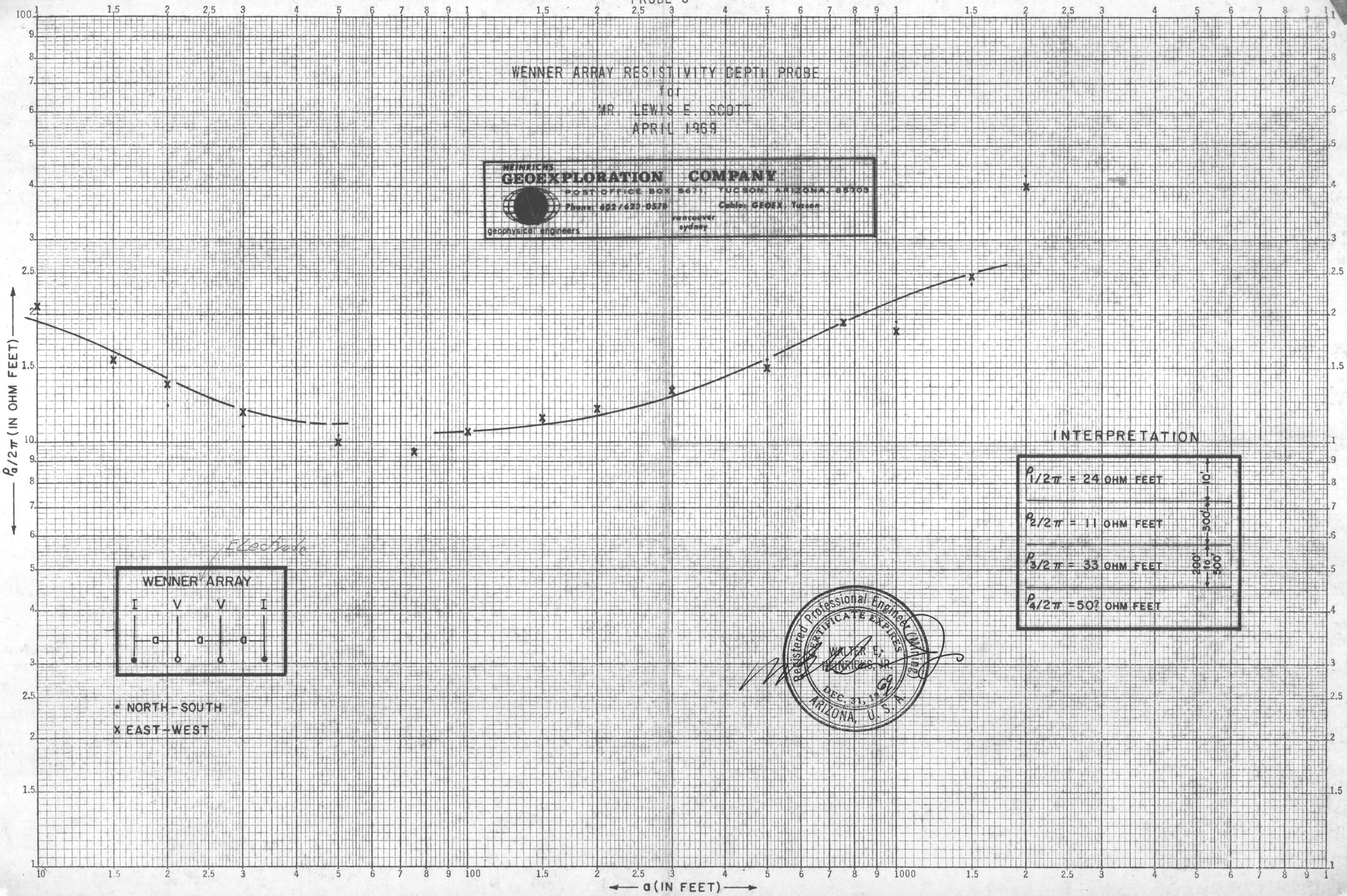
vancouver
sydney
geophysical engineers

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KEUFFEL & ESSER CO. MADE IN U.S.A.
2 X 3 CYCLES

PROBE 2

WENNER ARRAY RESISTIVITY DEPTH PROBE
for
MR. LEWIS E. SCOTT
APRIL 1959

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sydney

$\rho_a/2\pi$ (IN OHM FEET)

a (IN FEET)

ALTERNATE SOLUTION

INTERPRETATION

$\rho_1/2\pi$ = 195 OHM FEET

$\rho_2/2\pi$ = 2 OHM FEET

$\rho_3/2\pi$ = 400 OHM FEET

30' 400' to 500'

WENNER ARRAY

I V V I

a a a

▪ NORTH-SOUTH

X EAST-WEST

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

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PROBE I

# WENNER ARRAY RESISTIVITY DEPTH PROBE

for

MR. LEWIS E. SCOTT

APRIL 1969

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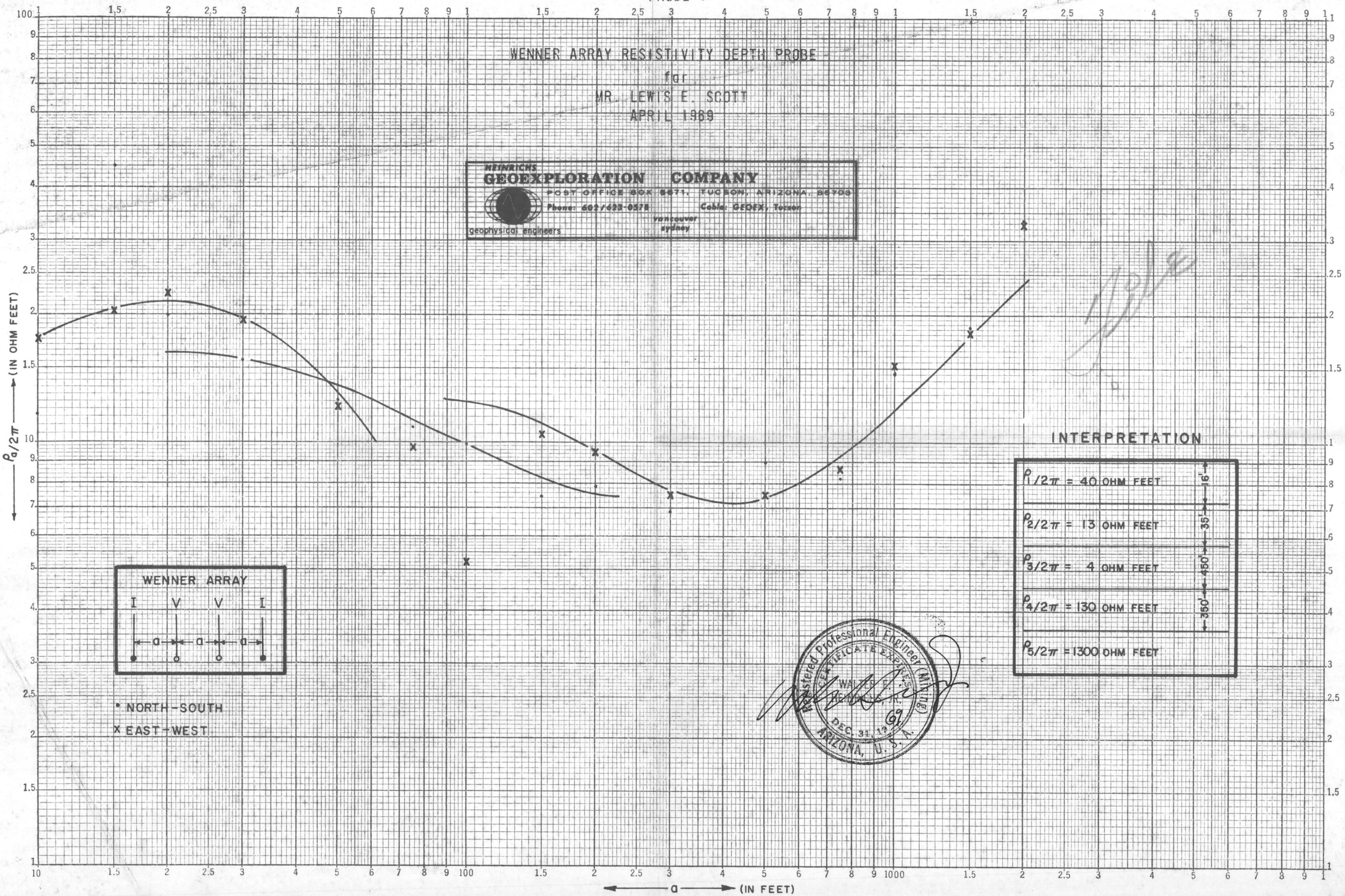


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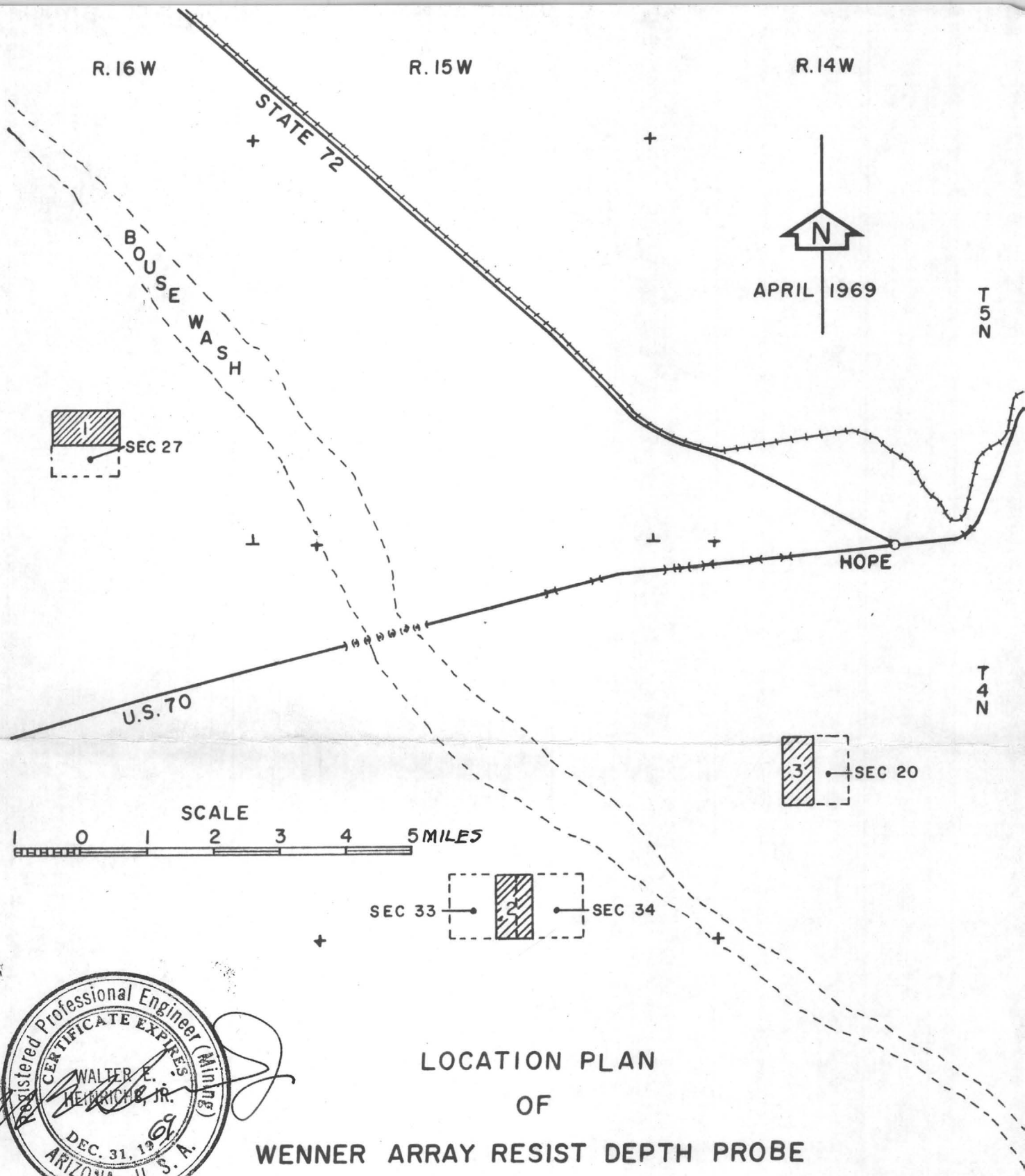


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# LOCATION PLAN
# OF
# WENNER ARRAY RESIST DEPTH PROBE
# FOR
# MR. LEWIS E. SCOTT

APR 1 7 1969

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