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."

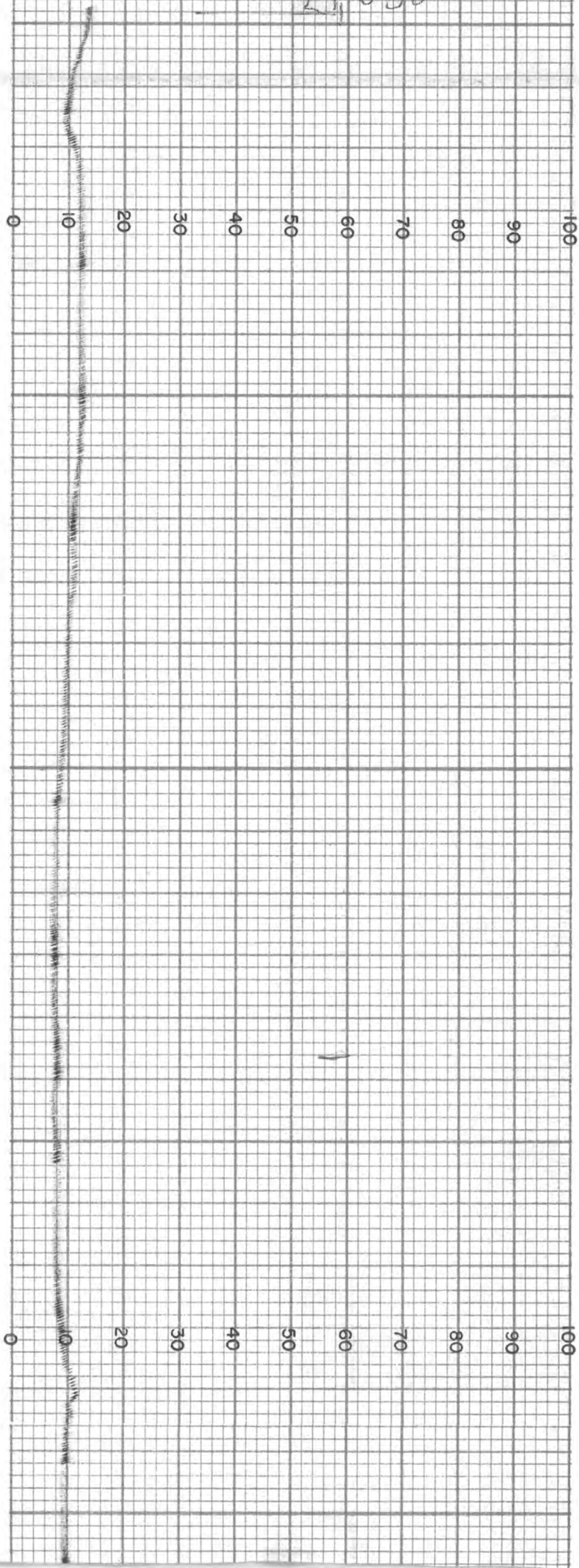
The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official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

29,050'
End D-39 at Hyw #68

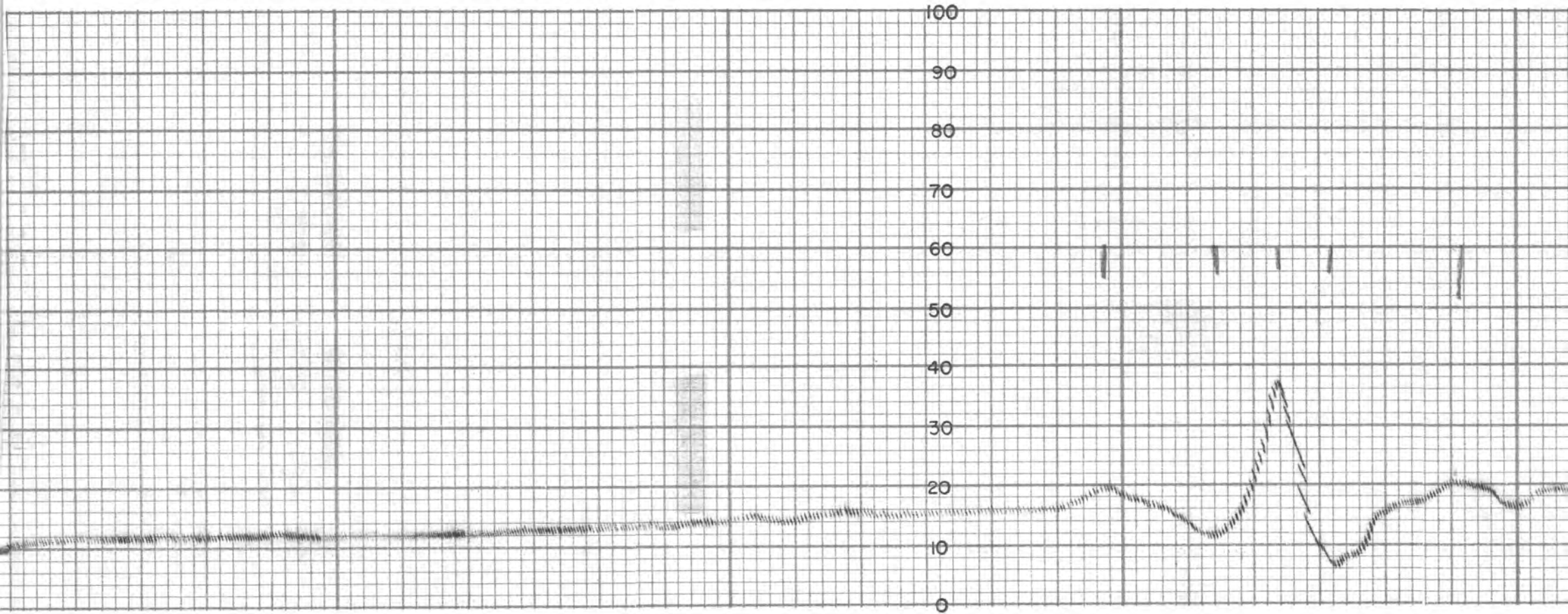
END D-39 AT 68
29,050



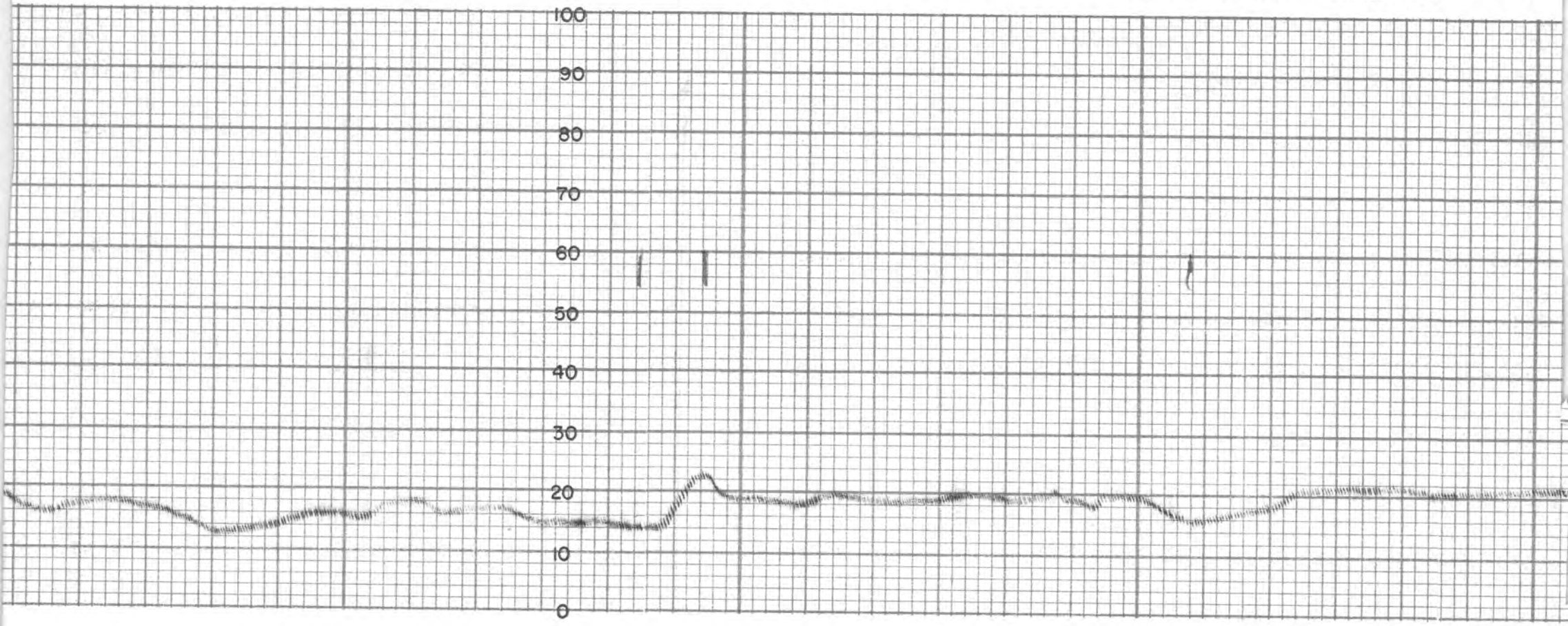
S.A. CHART No. 17491X

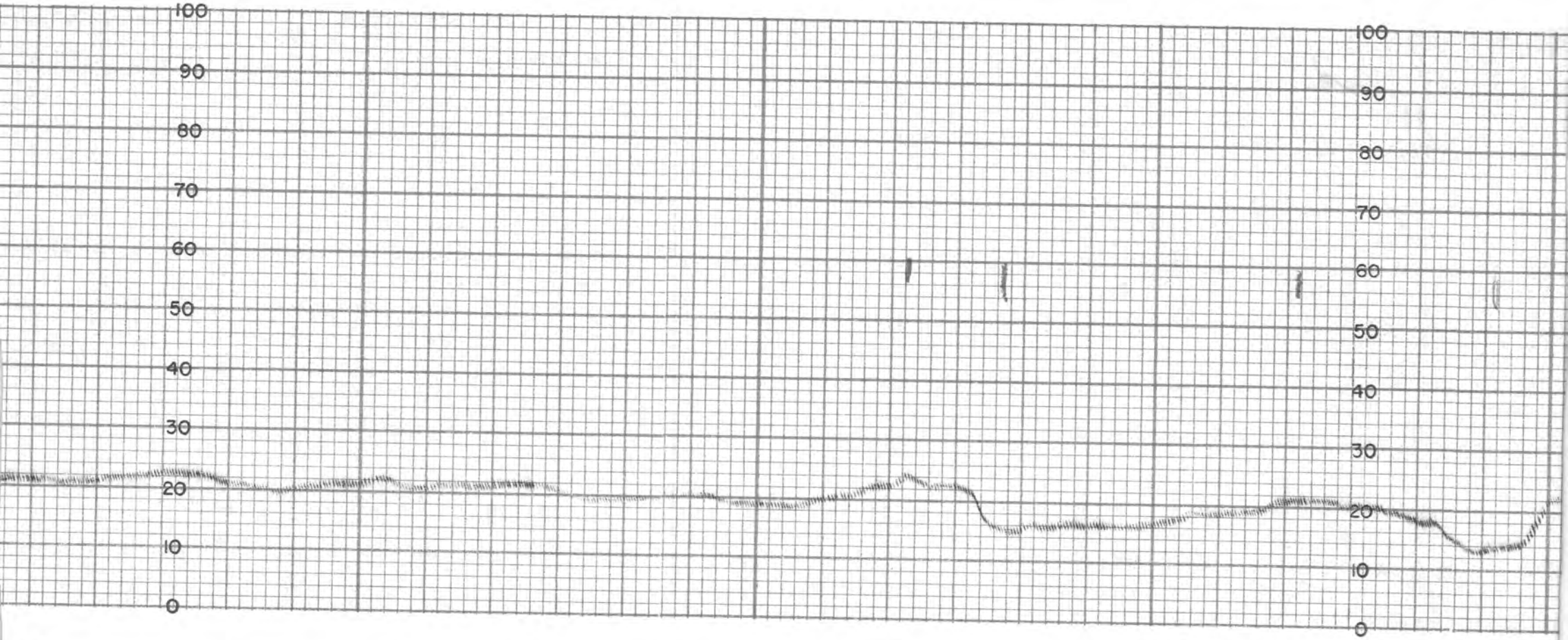
MADE

IN U.S.A. ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. E.S.

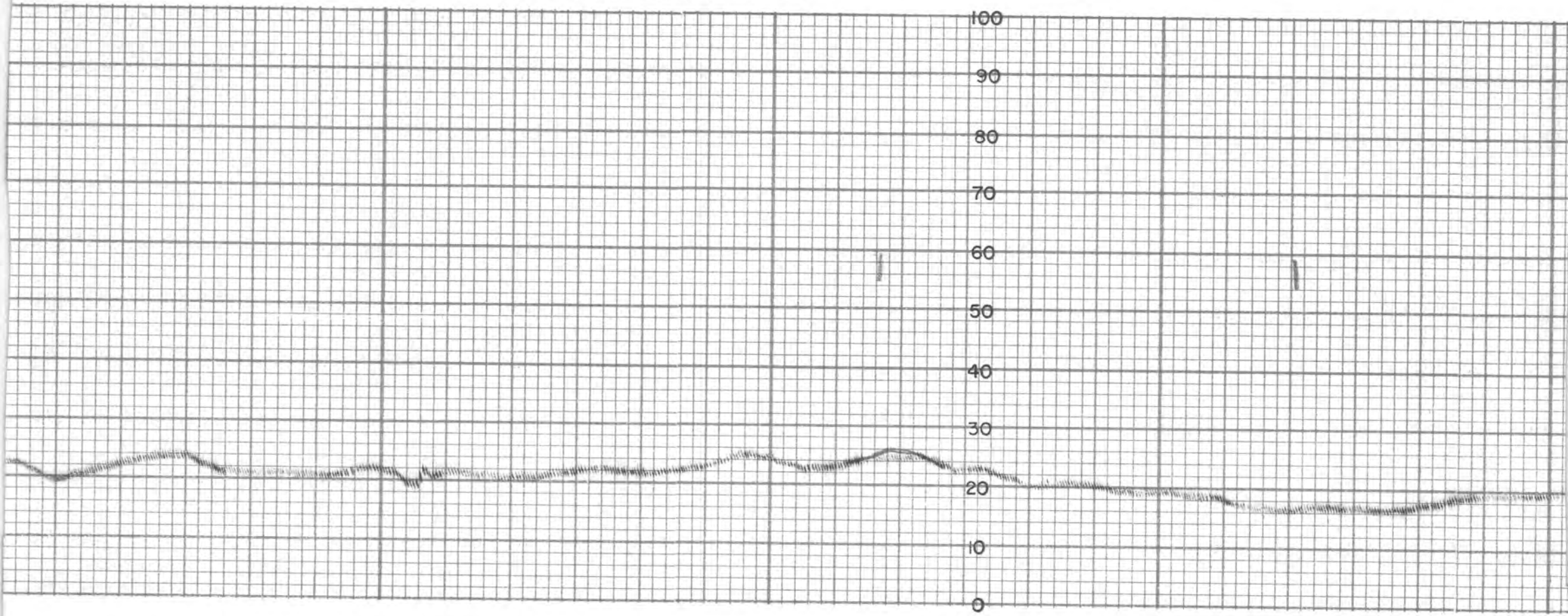


ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. CHART No. 17491X

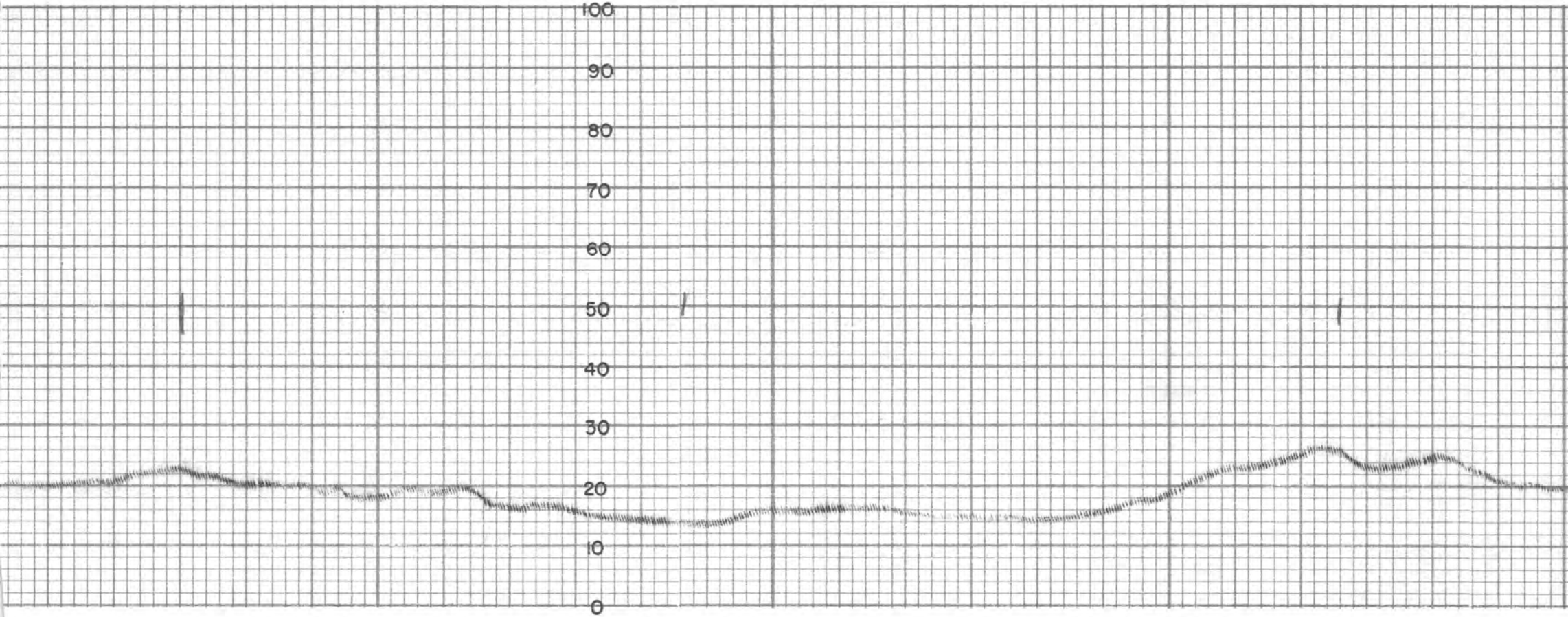


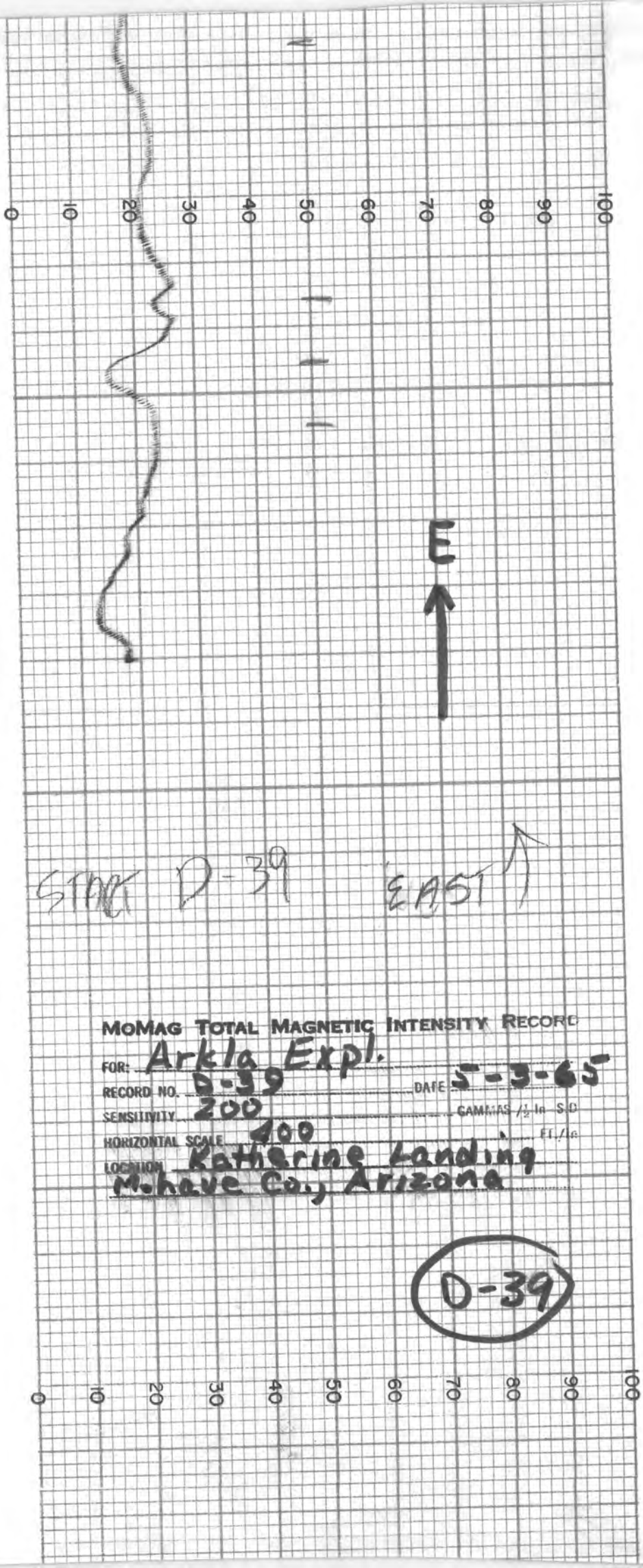

100
90
80
70
60
50
40
30
20
10
0
100
90
80
70
60
50
40
30
20
10
0

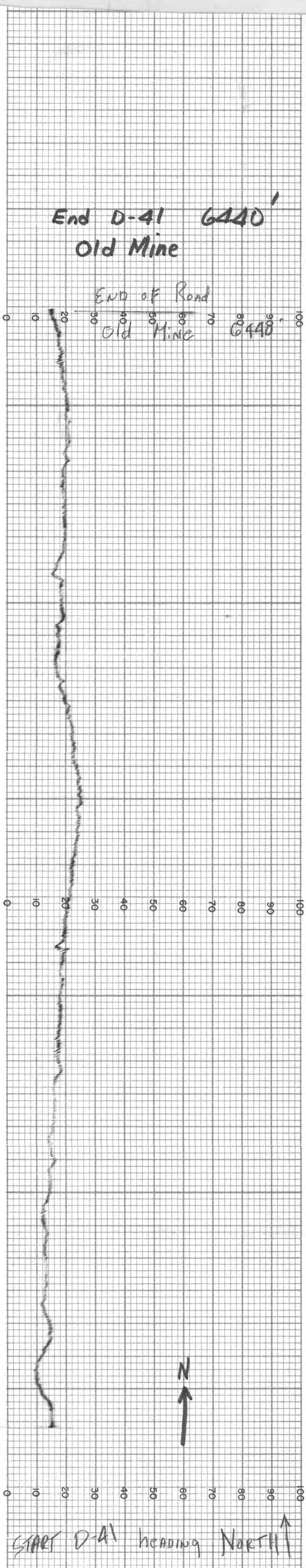
MADE IN U.S.A. ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. E.S.



ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. CHART No. 17491X




0 10 20 30 40 50 60 70 80 90 100
E
STAT D-39
EAST
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: Arkla Expl.
RECORD NO. D-39
DATE 5-3-65
SENSITIVITY 200
GAMMAS /½ In. S.D.
HORIZONTAL SCALE 400
FT./In.
LOCATION Katherine Landing
Mohave Co., Arizona
D-39
0 10 20 30 40 50 60 70 80 90 100



MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: Arkla Expl.

RECORD NO. D-41 DATE 5-3-65

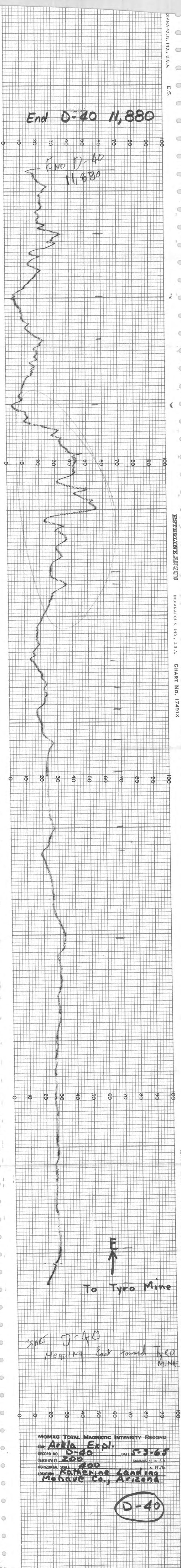
SENSITIVITY 200 GAMMAS /½ in

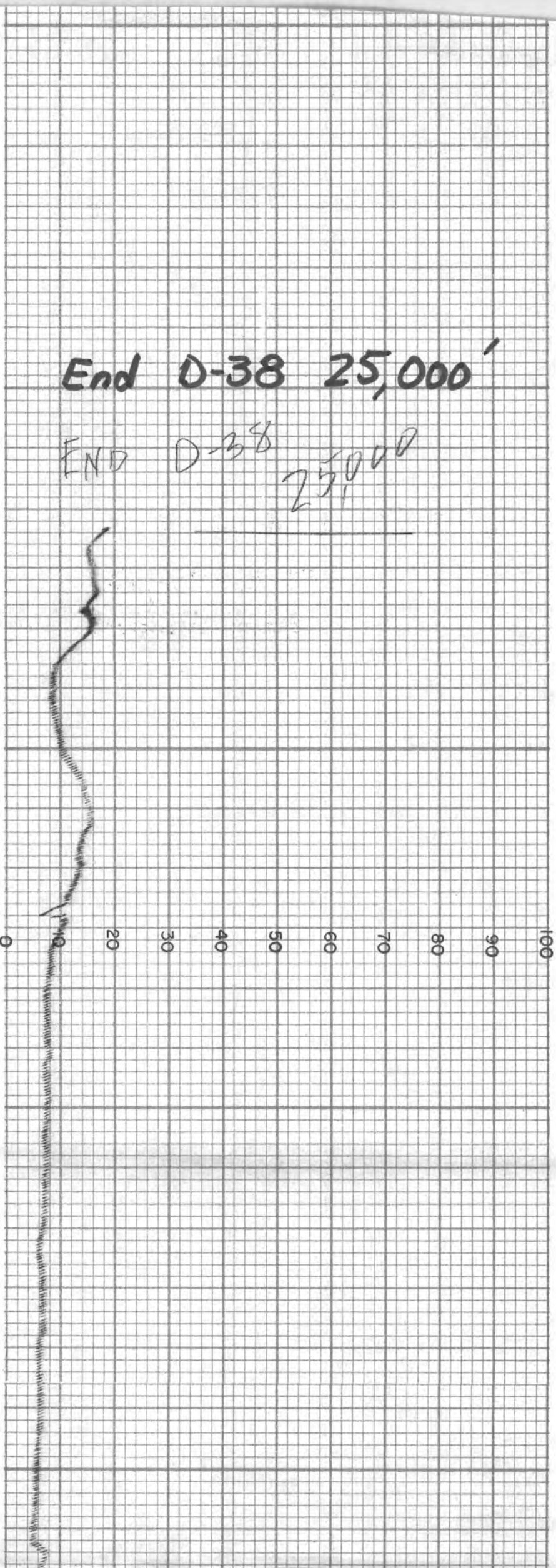
HORIZONTAL SCALE 400 Ft./in

LOCATION Katherine Landing Mohave Co., Arizona

D-41

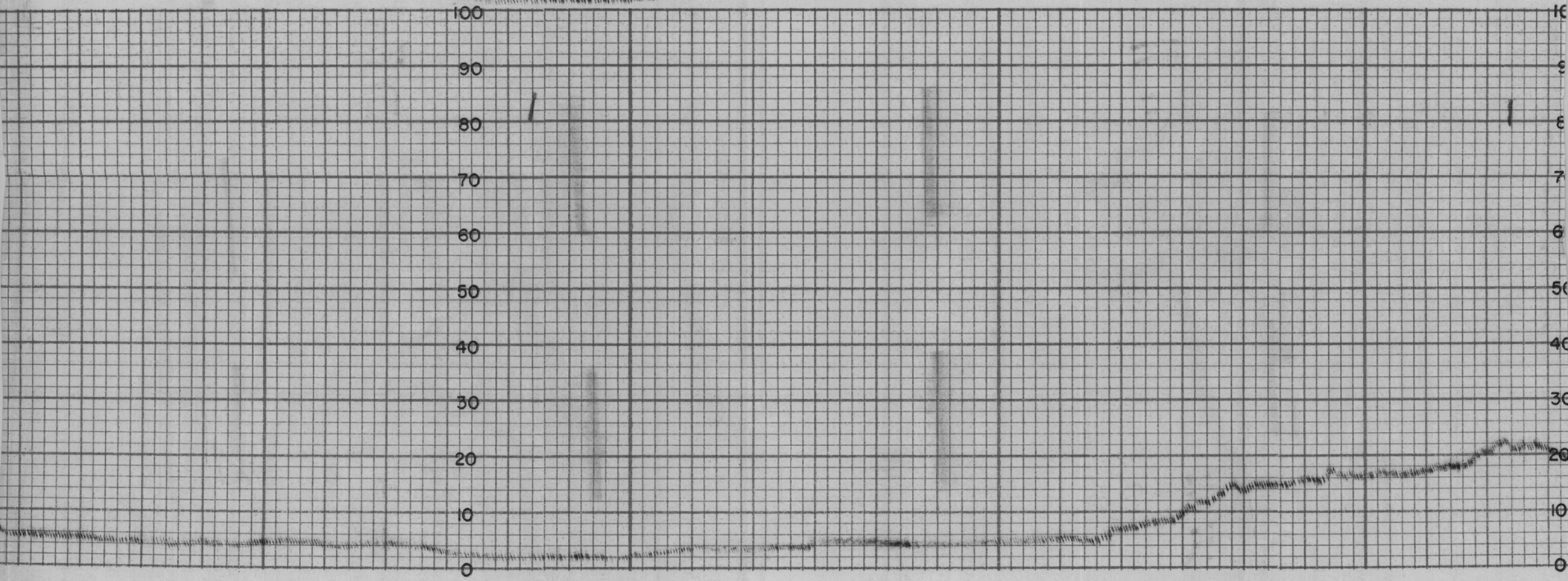
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X MADE IN U.S.A. ESTERLINE ANGUS

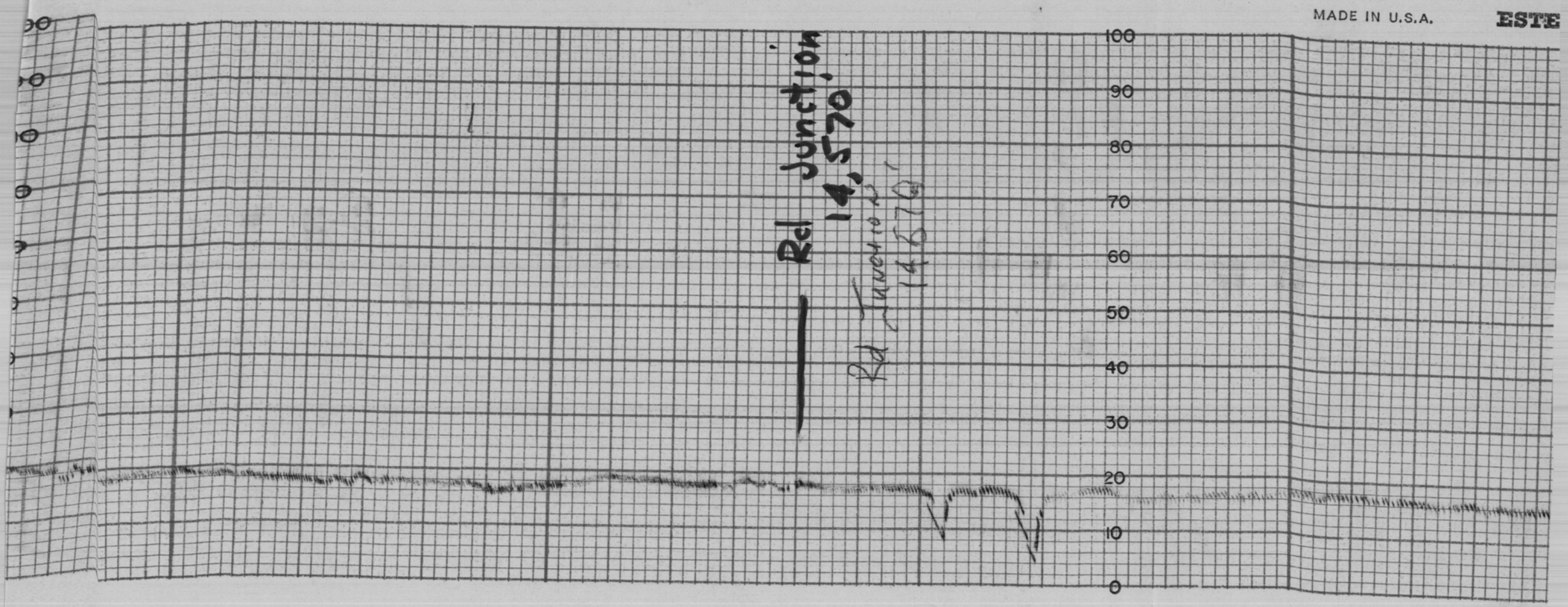

End D-40 11,880
End D-40
11,680
E
To Tyro Mine
Start D-40
Heading East toward Tyro
MINE
0 10 20 30 40 50 60 70 80 90 100
MoMag Total Magnetic Intensity Record
FOR: Arkla Expl.
RECORD NO. D-40
DATE 5-3-65
SENSITIVITY 200 GAMMAS /½ In. S.D.
HORIZONTAL SCALE 400 FT./In.
LOCATION Katherine Landing
Mohave Co., Arizona
D-40
ESTERLINE ANGUS
INDIANAPOLIS, IND., U.S.A.
CHART No. 17491X
MADE IN U.S.A.
E.S.

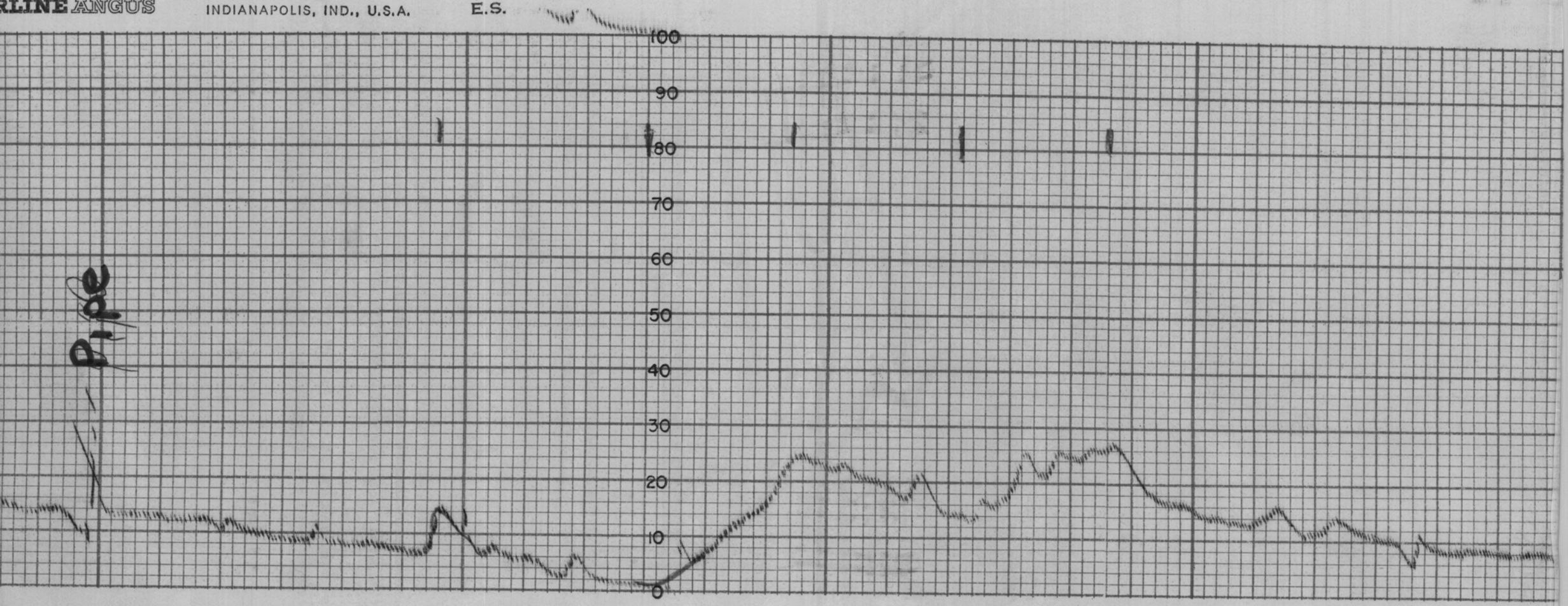


MADE IN U.S.A. ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. E.S.

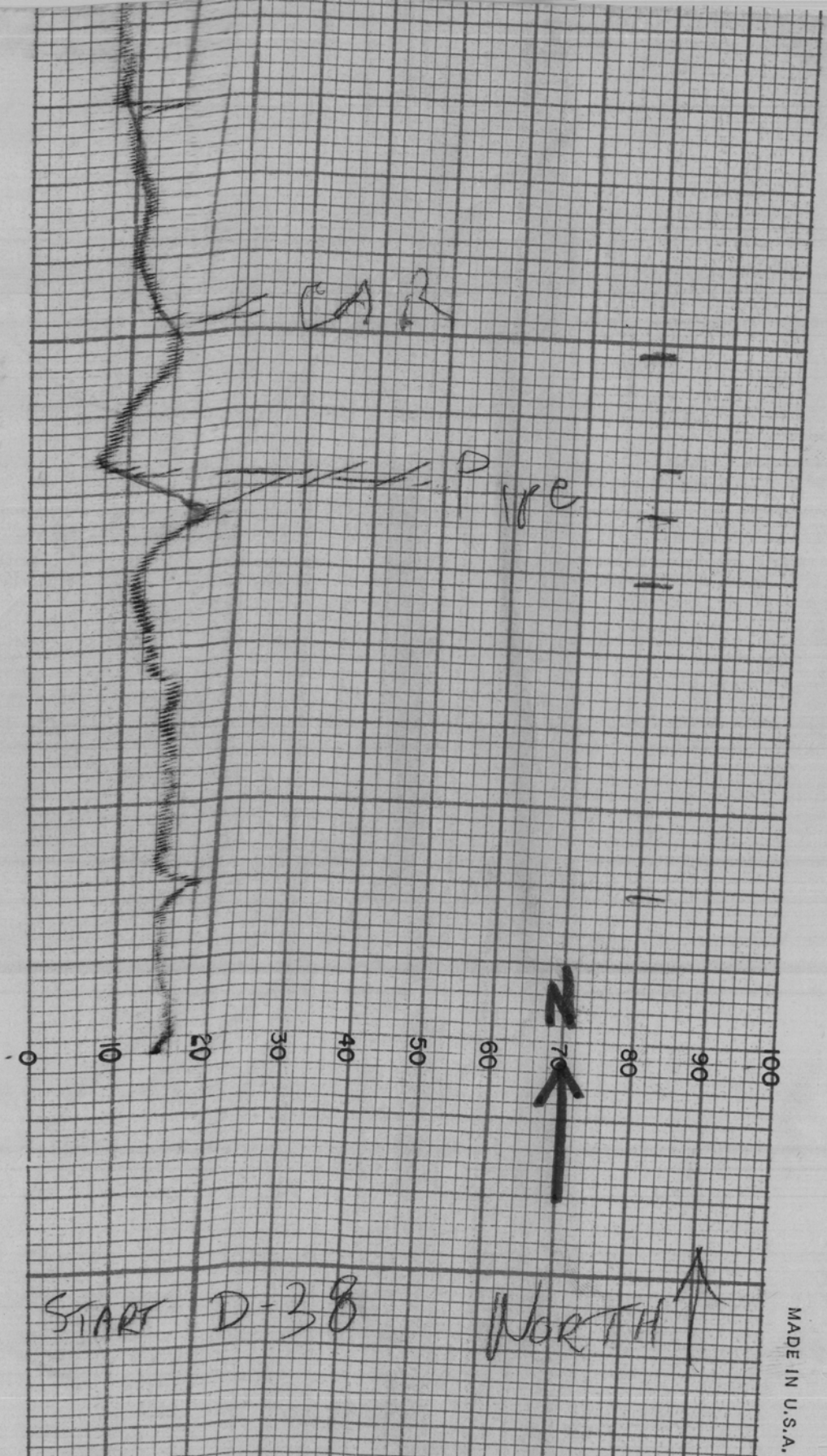
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. CHART No. 17491X




MADE IN U.S.A.
ESTE
Rd Junction
14,570
Rd Junction
14,670
100
90
80
70
60
50
40
30
20
10
0


RLINE ANGUS
INDIANAPOLIS, IND., U.S.A.
E.S.
100
90
80
70
60
50
40
30
20
10
0
Pipe

ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. CHART No. 17491X



MADE IN U.S.A.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: Arkla Expl.

RECORD NO. D-38 DATE 5-3-65

SENSITIVITY 200 GAMMAS 1/2 in. S/C

HORIZONTAL SCALE 400 ft./in.

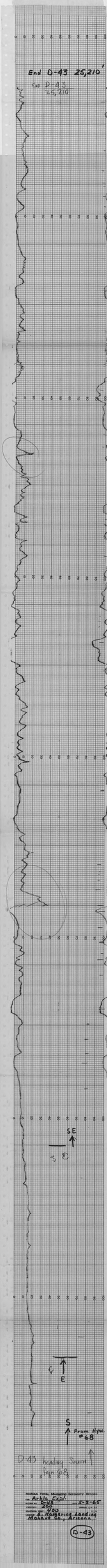
LOCATION Katherine Landing Mohave Co., Arizona

ESTERLINE ANGUS

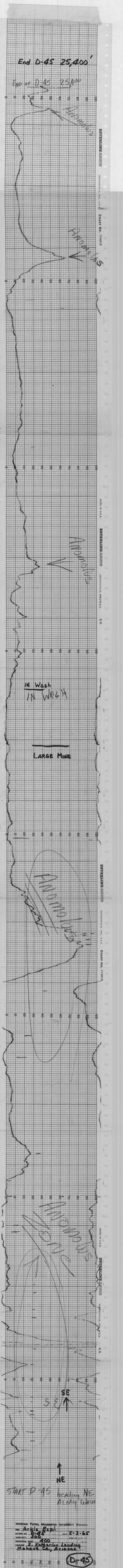
INDIANAPOLIS

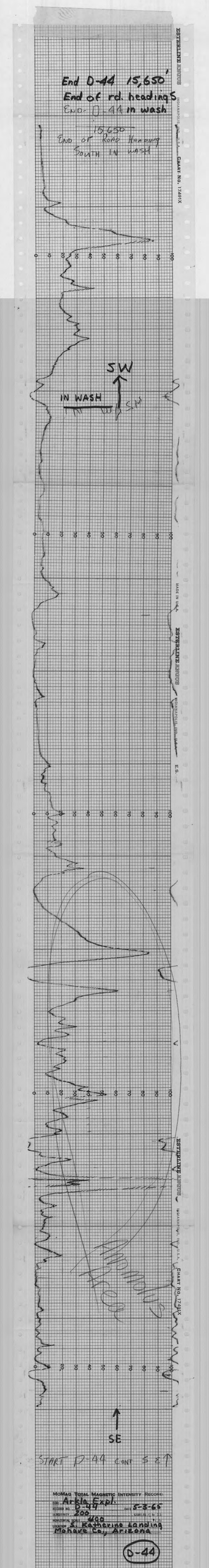
D-38

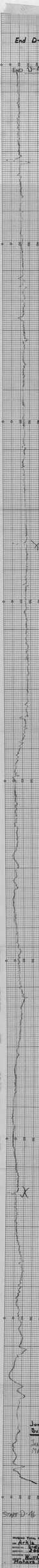
GUS INDIANAPOLIS, IND., U.S.A. E.S.
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X
MADE IN U.S.A. ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. E.S.



MORAN TOTAL MAGNETIC INTENSITY RECORD
CO. Arkla Expl.
DATE 5-3-66
RUN NO. 2
CHART NO. 2
FIELD NO. 400
OPER. R. Hampton
MORAN NO. 2
LOCATION Mohave Co., Arizona


End D-45 25,400'
End of D-45 25,500'
Anomaly
Anomaly
Anomaly
IN Wash
IN WASH
LARGE MINE
Anomaly
Anomaly
SE
NE
START D-45 heading NE
along wash
Arkla Expl.
Date 5-2-65
Operator
Total 400
Location S. Katherine Landing
Mohave Cty, Arizona
D-45


End D-44 15,650'
End of rd. heading S
End D-44 in wash
15,650
End of Road Heading South in wash
SW
IN WASH
SW
SE
START D-44 CONT S & ↑
MOMAG TOTAL MAGNETIC INTENSITY RECORD
TOWN Arsia Expl.
RECORD NO. D-44
DATE 5-3-65
SENSITIVITY 200
SCALE 1/2 & 1/1
MONITORING SCALE 400
LOCATION S. Katherine Landing
Mohave Co., Arizona
D-44

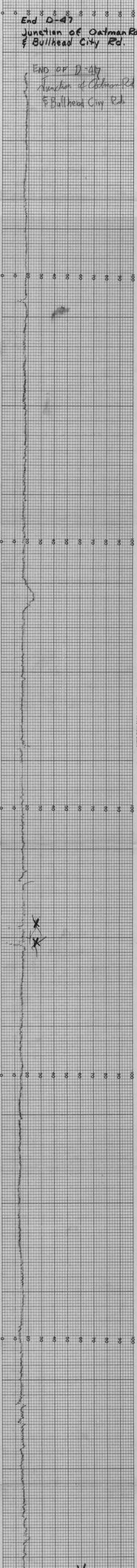


MOBAR TOTAL MAGNETIC INTENSITY RECORD
Arkla Expl.
Date 5-3-62
Area
Line 400
Station Bullhead City
Mohave Co., Arizona

D-46

End D-47
Junction of Oatman Rd
& Bullhead City Rd.

END OF D-47
Junction of Oatman Rd
& Bullhead City Rd.



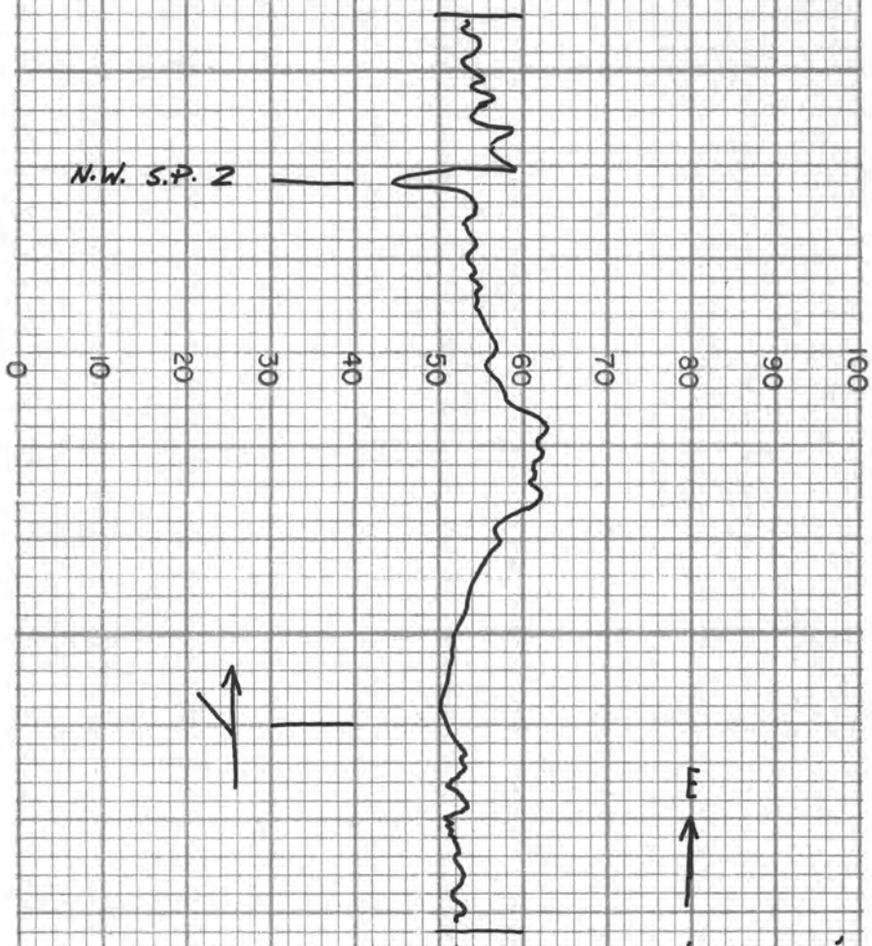
START D A7 Heading West
ON Dirt Road to Bullhead

MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR Arkla Expl.
RUNS NO. D-47 DATE 5-3-65
CASING 200
SERIAL NO. 780
WHERE Bullhead City
Mohave Co. Arizona

D-47

SENSITRITE RECORDS INDIANAPOLIS NO. U.S.A. CHART NO. 17681X
MADE IN U.S.A.

END REC. 14 AT SE COR. C-1



START AT Rd. Junction at 22520' OF REC. 10 AROUND So. Side of Butte.

HEINRICHS GEOEXPLORATION CO.

BOX 5671 TUCSON, ARIZONA 85703

Phone: (AREA 602) 623-0578

GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: ARKLA EXPLORATION CO.

RECORD NO. 14 DATE Dec. 1964

SENSITIVITY 200 GAMMAS /½ In.

HORIZONTAL SCALE 400 FT./In.

LOCATION Mohave Co., Arizona

14

MADE IN U.S.A. ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. E.S.

End Rec. 9 at Rd. Junction
Middle Butte near Pits

ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X

HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578
GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: ARKLA EXPLORATION Co.

RECORD NO. 9 DATE Dec 1964

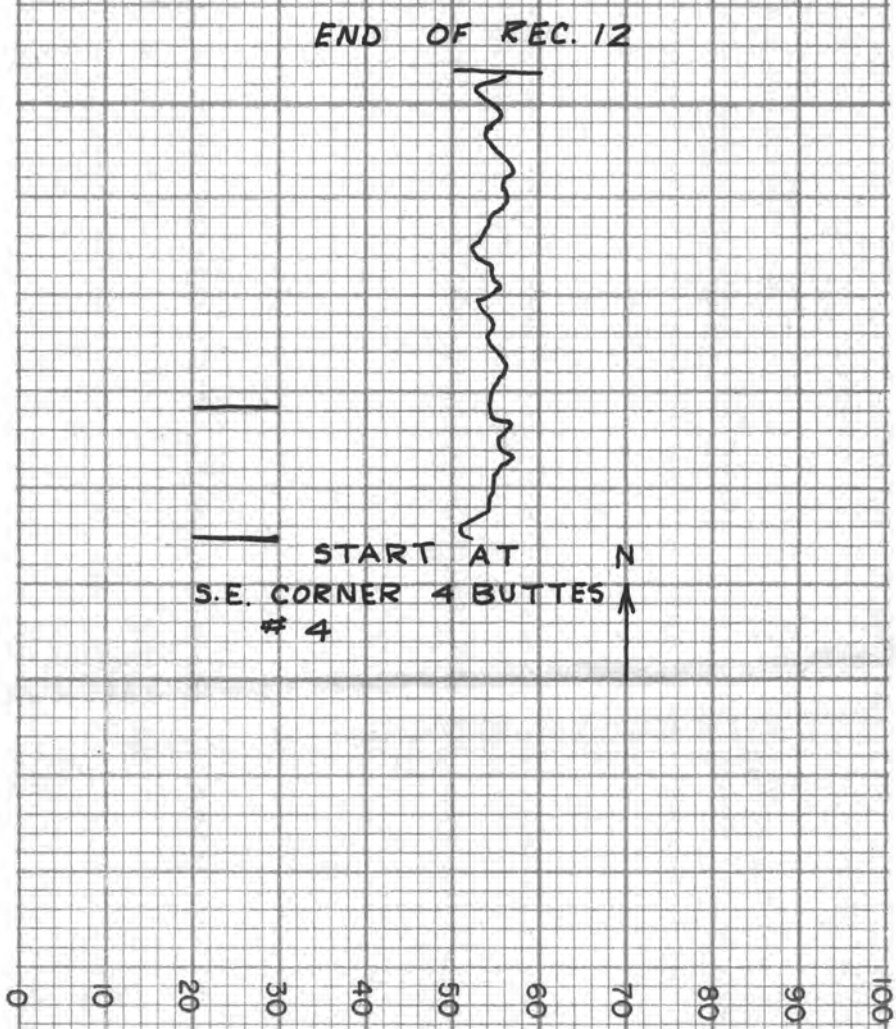
SENSITIVITY 200 GAMMAS /½ In.

HORIZONTAL SCALE 400 FT./In.

LOCATION Mohave Co., Arizona

0 10 20 30 40 50 60 70 80 90 100

9



HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578
GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: ARKLA EXPLORATION Co.

RECORD NO. 12 DATE Dec. 1964

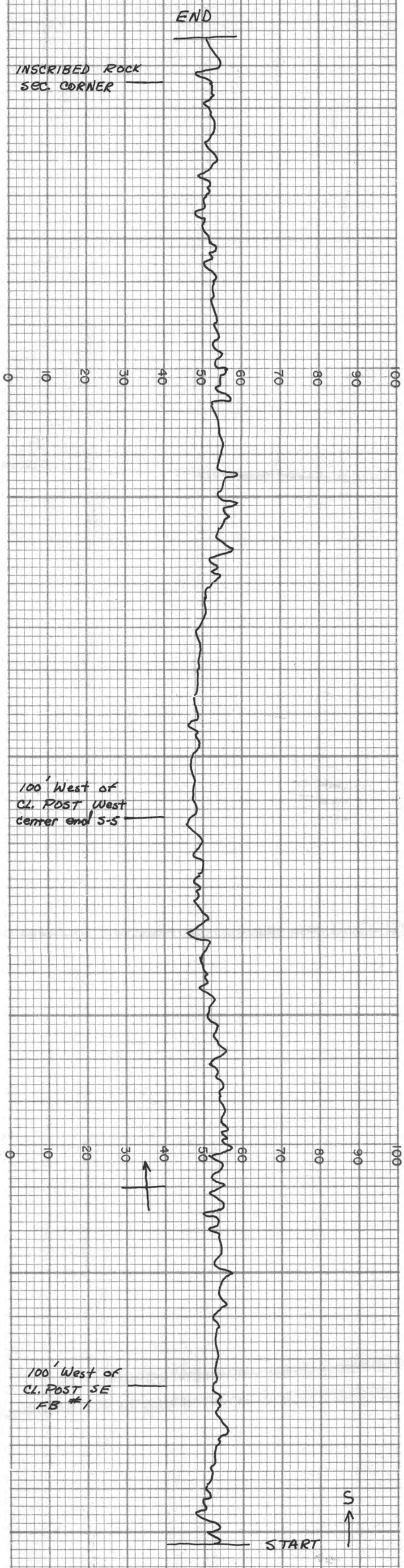
SENSITIVITY 200 GAMMAS /½ in.

HORIZONTAL SCALE 400 FT./in.

LOCATION 4 Buttes Area
Mohave Co., Arizona

12

ESTERLINE ANGUS
INDIAN



HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 628-0578
GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: ARKLA EXPLORATION Co.

RECORD NO. 10 DATE Dec 1964

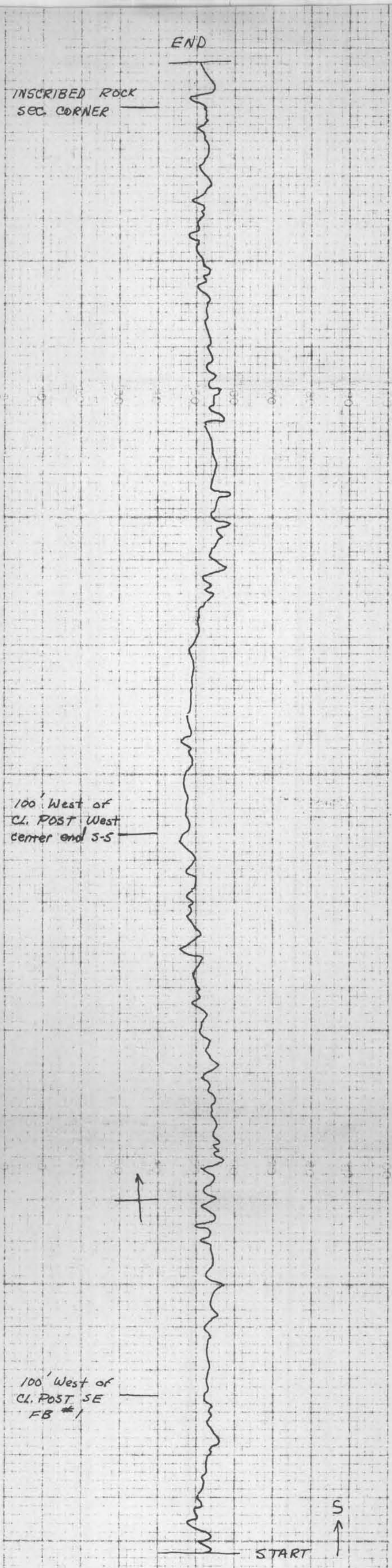
SENSITIVITY 200 GAMMAS 1½ In.

HORIZONTAL SCALE 400 FT./In.

LOCATION Mohave Co., Arizona

10

MADE IN U.S.A. ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. E.S.



HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone (AREA 602) 623-0578
GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: ARKLA EXPLORATION Co.

RECORD NO. 10 DATE Dec 1964

SENSITIVITY 200 GAMMAS/½ In.

HORIZONTAL SCALE 400 FT/In.

LOCATION Four Buttes AREA
Mohave Co., Arizona

10

End Rec. 9 at Rd. Junction
Middle Butte near Pits

HEINRICHS GEOEXPLORATION CO.
BOX 6671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578
GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: ARKLA EXPLORATION CO.

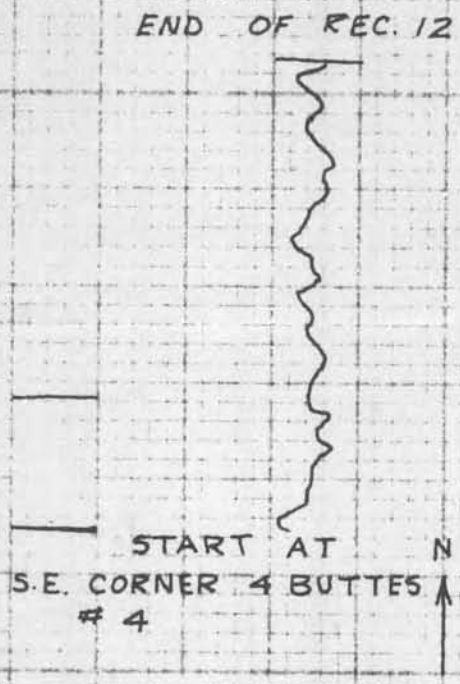
RECORD NO. 9 DATE Dec 1964

SENSITIVITY 200 GAMMAS/½ in.

HORIZONTAL SCALE 400 FT./in.

LOCATION FOUR BUTTES AREA
Mohave Co., Arizona

9



HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578
GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: ARKLA EXPLORATION Co.

RECORD NO. 12 DATE Dec. 1964

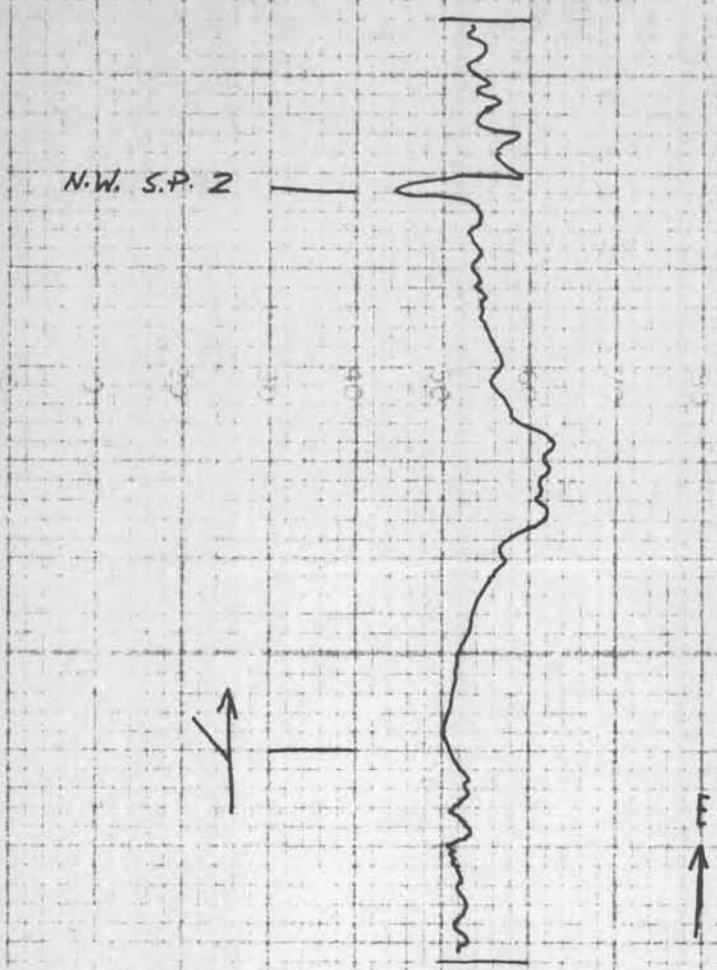
SENSITIVITY 200 GAMMAS / ½ in.

HORIZONTAL SCALE 400 FT./in.

LOCATION 4 Buttes Area
Mohave Co., Arizona

12

END REC. 14 AT SE COR. C-1



START AT Rd. Junction at 22520'
of REC. 10 AROUND So. Side of Butte.

HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
PHONE: (AREA 602) 623-0578
GEOPHYSICAL ENGINEERS

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: Arela Exploration Co.

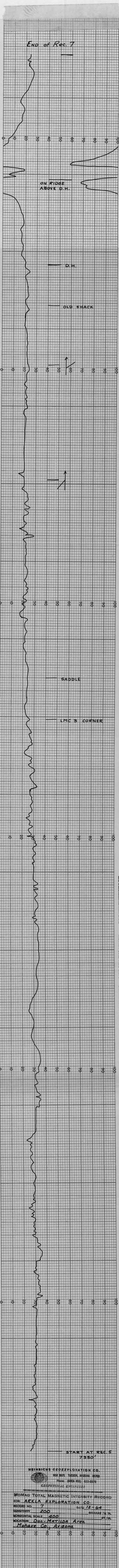
RECORD NO. 14 DATE Dec. 1964

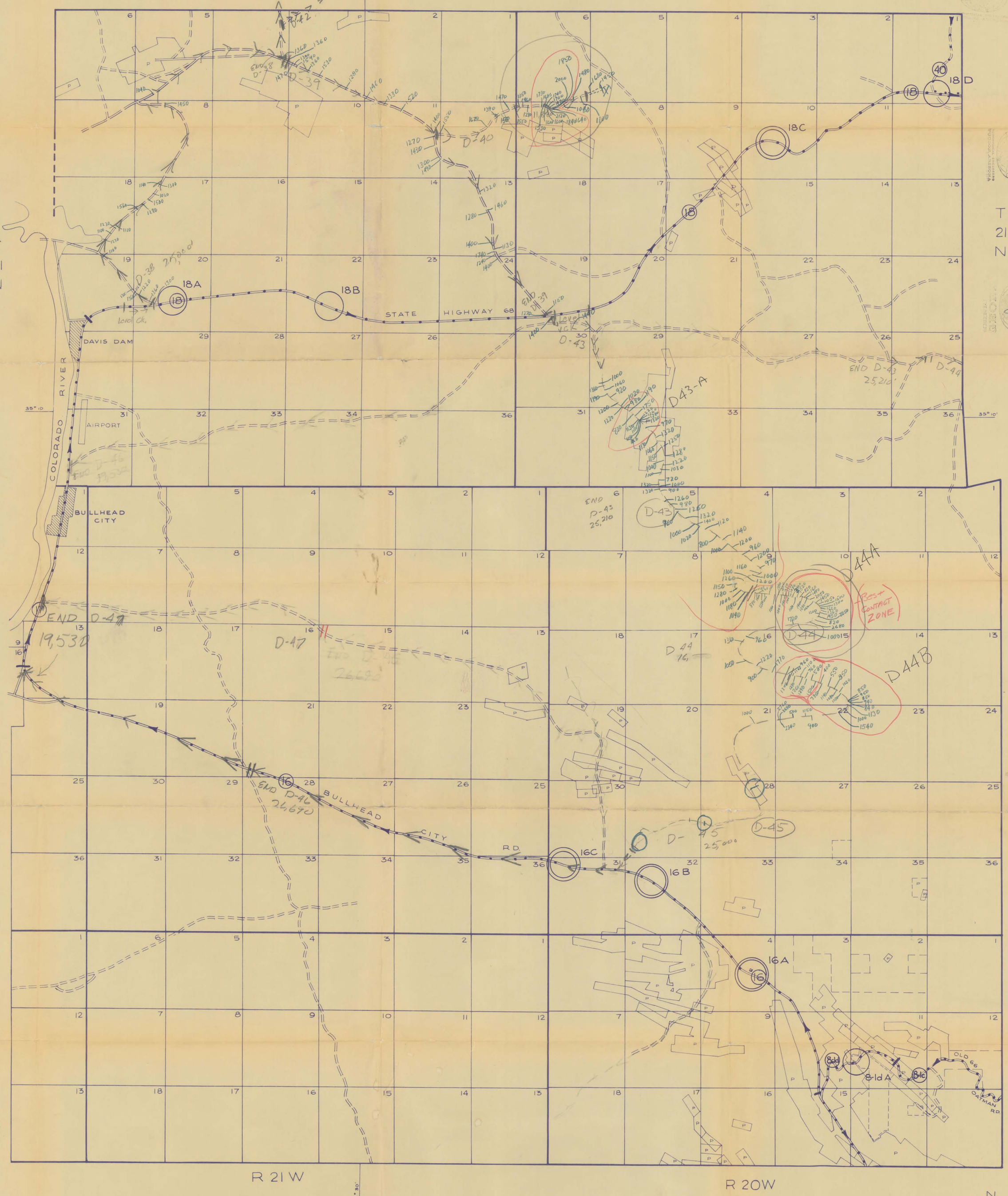
SENSITIVITY 200 GAMMAS/½ In.

HORIZONTAL SCALE 400 Ft./In.

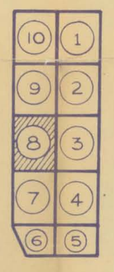
LOCATION Four Buttes Area
Mohave Co., Arizona

14


END of Rec. 7
ON RIDGE ABOVE D.H.
D.H.
OLD SHACK
SADDLE
LMC 3 CORNER
START AT REC. 5 7350'
CHART NO. 17401X
MADE IN U.S.A.
INTERNATIONAL SERVICES
INDIANAPOLIS, IND. U.S.A.
E.S.
HUMMCO GEOEXPLORATION CO.
900 WEST, TUCSON, ARIZ. 85705
Phone: (602) 882-5125
GEOPHYSICAL SERVICES
MONMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: ARKLA EXPLORATION CO.
RECORD NO. 7
DATE 12-64
SENSITIVITY 200
VERTICAL SCALE 10 IN. PER DIV.
HORIZONTAL SCALE 400
LOCATION Dos Matias Area
Mohave Co., Arizona
7



MAP INDEX



3B INDICATES ANOMALY

POSSIBLE SIGNIFICANT ANOMALISM

P — PATENTED MINING CLAIMS

• DH2 — DIAMOND DRILL HOLE

MOMAG TRAVERSE, No & DIRECTION (TOTAL MAGNETIC INTENSITY)

COMPILED FROM INFORMATION SUPPLIED BY
ARIZONA & CALIFORNIA STATE GEOLOGY
U.S. BUREAU OF LAND MANAGEMENT
DOERINGSFELD, AMUEDO & IVEY
U.S. GEOLOGICAL SURVEY
ARKLA GEOLOGISTS
GEOEX

Field Map.

MOMAG TRAVERSES

N

0 1 2 MILES

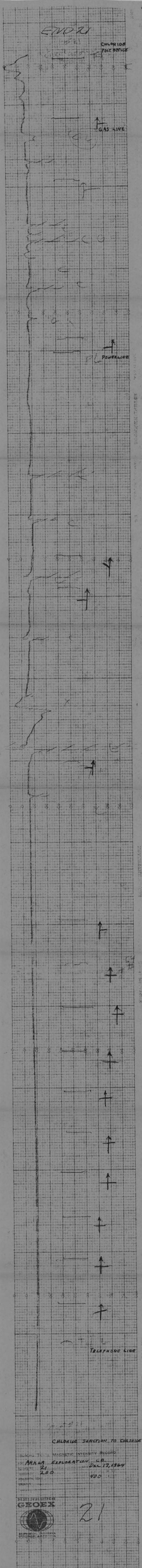
ADJOINING TOWNSHIPS NOT INTENDED TO MATCH EXACTLY, DUE TO VARIABLE SCALES & BASE DATA.

HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5671 Tucson, Arizona

MINING EVALUATION PROJECT
FOR
ARKLA EXPLORATION CO.

MOHAVE COUNTY, ARIZONA

SCALE: 2" = 1 mile ±	CONTOUR INTERVAL:	REVISIONS
	DATA BY:	
DATE: Feb. 1965	SHEET 8 OF 10	
DRAWN BY:	DRAWING NO.:	FILE:



SCHLUMBERGER

GEOEX

ARKLA EXPLORATION CO.

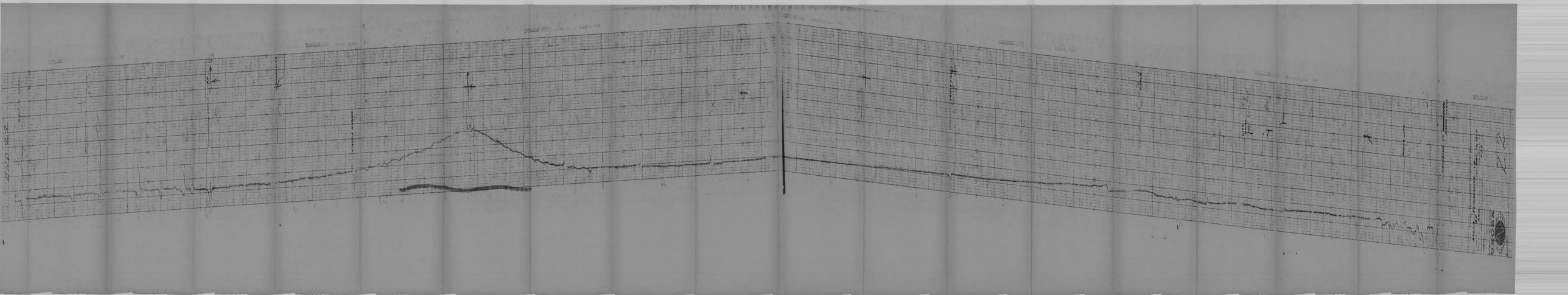
21

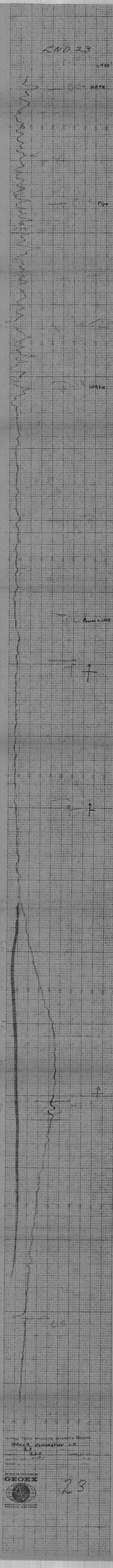
220

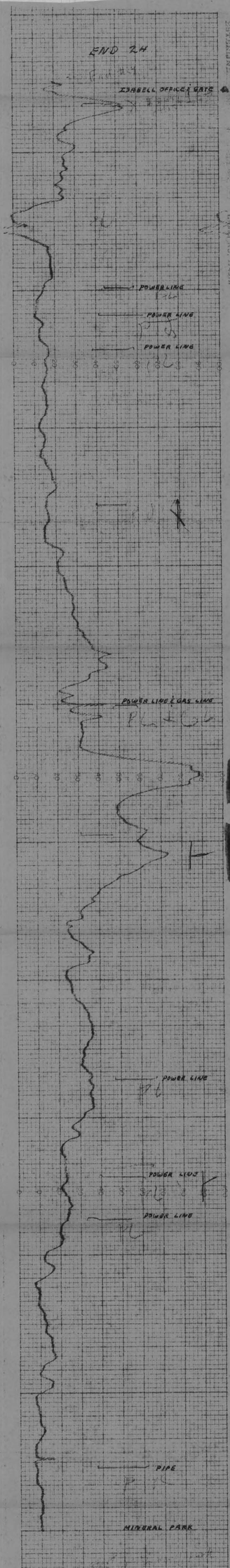
JAN. 12, 1969

120

21



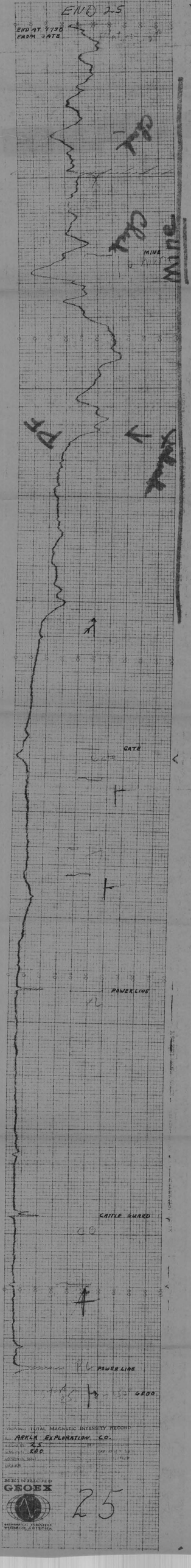

END 23
4400'
GATE
PIT
WASH
PIPELINE
23
TYPICAL TOTAL MAGNETIC INTENSITY RECORD
ALASKA EXPLORATION CO.
K3
260
GEOEX
23

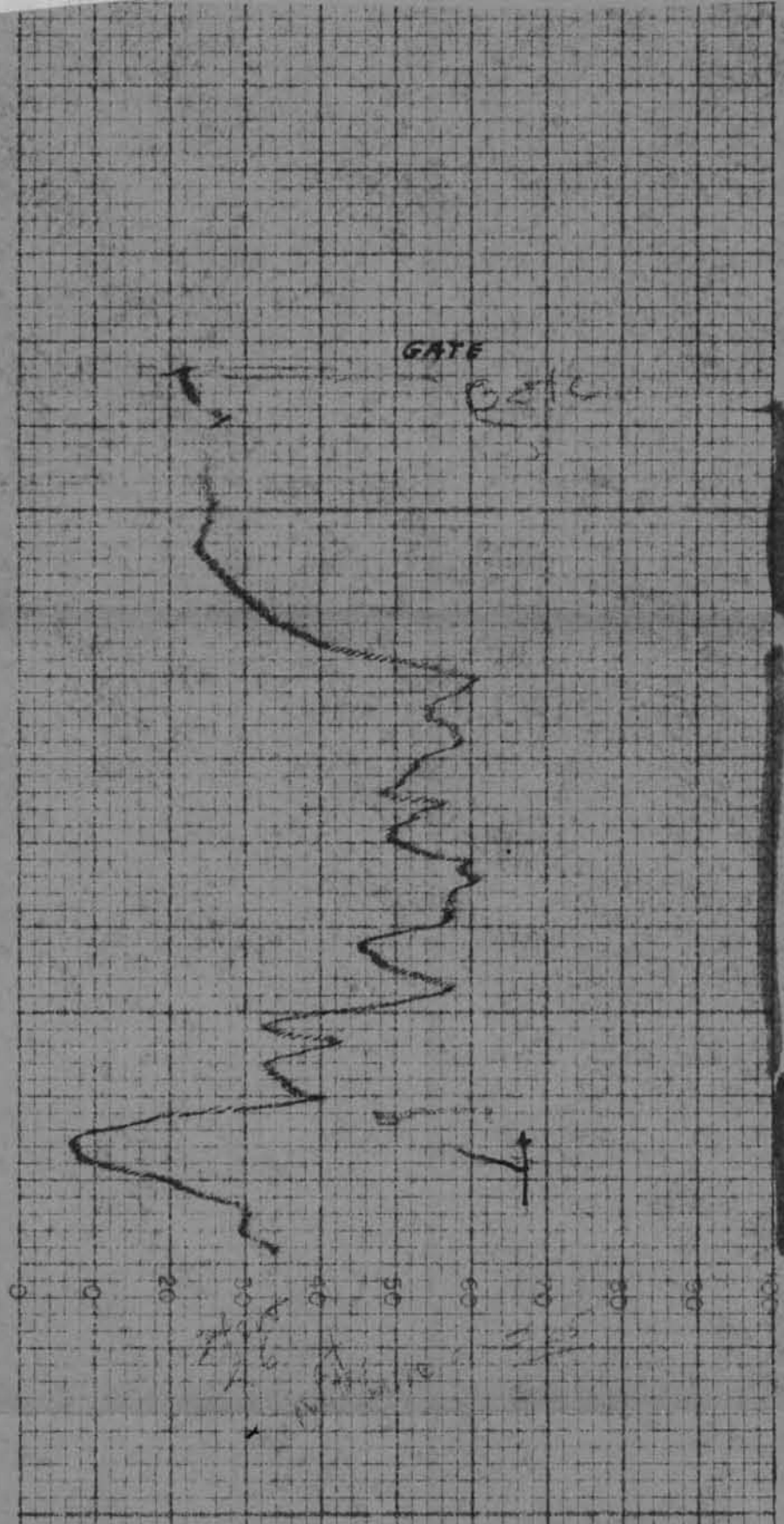


NORTH TOTAL MAGNETIC INTENSITY RECORD
ARKLA EXPLORATION CO.
PROJECT NO. 24 DATE DEC. 16, 1967
HORIZONTAL SCALE 200 GAMMA ASSIGNED
VERTICAL SCALE 400
LOCATION

HEINRICHS
GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA

24


END 25
END AT 1750
FROM GATE
MINE
Mine
GATE
POWER LINE
CATTLE GUARD
POWER LINE
6500
TOTAL MAGNETIC INTENSITY RECORD
ARKLA EXPLORATION CO.
25
200
MEINRICHS
GEOEX
25



MoMag TOTAL MAGNETIC INTENSITY RECORD

FOR ARKLA EXPLORATION CO.

RECORD NO. 26 DATE DEC. 16, 1964

SENSITIVITY 200 GAMMAS ½ in. S.D.

HORIZONTAL SCALE 400 Ft./in.

LOCATION

HEINRICHS
GEOEX

GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA

26

END 27

PIPE

END OF CAGERIDE JUNCTION

CATTLE GUARD

N

CATTLE GUARD

ROAD JUNCTION & 28

MAGNETIC TOTAL MAGNETIC INTENSITY RECORD

PARKER EXPLORATION CO.

LINE NO. 27 DATE DEC. 18, 1964

ASSIGNED 200 GAMMA

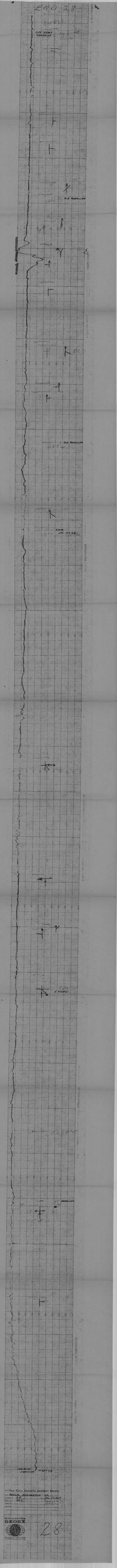
ACCIDENTAL 100

LEADER

HEINRICHS GEOEX

GEOPHYSICAL SERVICES STOCKTON, ARIZ.

27


KMD 28
CUT DOWN GARAGE
OLD MANSION
OLD MANSION
CAPE COD STYLE
CUT FRONT
MANSION
GARAGE JUNCTION STATION
GEOTEX
28

END 29

POWER LINE

POWER LINE

POWER LINE

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR ARKLA EXPLORATION CO.

RECORD NO. 29 DATE DEC. 16, 1964

SENSITIVITY 200 GAMMAS/in. S.D.

HORIZONTAL SCALE 400 FT./in.

LOCATION

HEINRICHS GEOEX

GEOPHYSICAL ENGRS. TUCSON, A

29

ESTERLINE ANGUS RICHMOND, IND., U.S.A.
CHART NO. 17491X

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: MKLA. EXPLORATION CO.

RECORD NO. 30 DATE DEC 16, 1964

SENSITIVITY: 200 GAMMAS/1 in. S.D.

HORIZONTAL SCALE 400 FT./in.

LOCATION

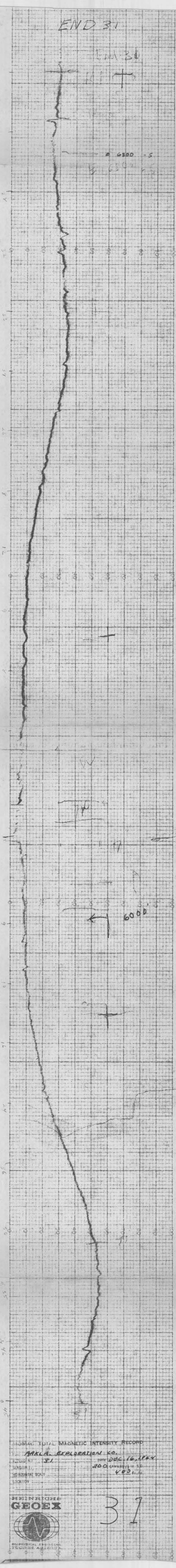
HEINRICHS GEOEX

GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA

30

ESTERLINE ANGUS

CHART NO. 17401X



MOMAC TOTAL MAGNETIC INTENSITY RECORD

TITLE AKLA EXPLORATION CO.

RECORD NO. 31 DATE DEC 16, 1964

SENSITIVITY 200 GAMMAS/cm SD

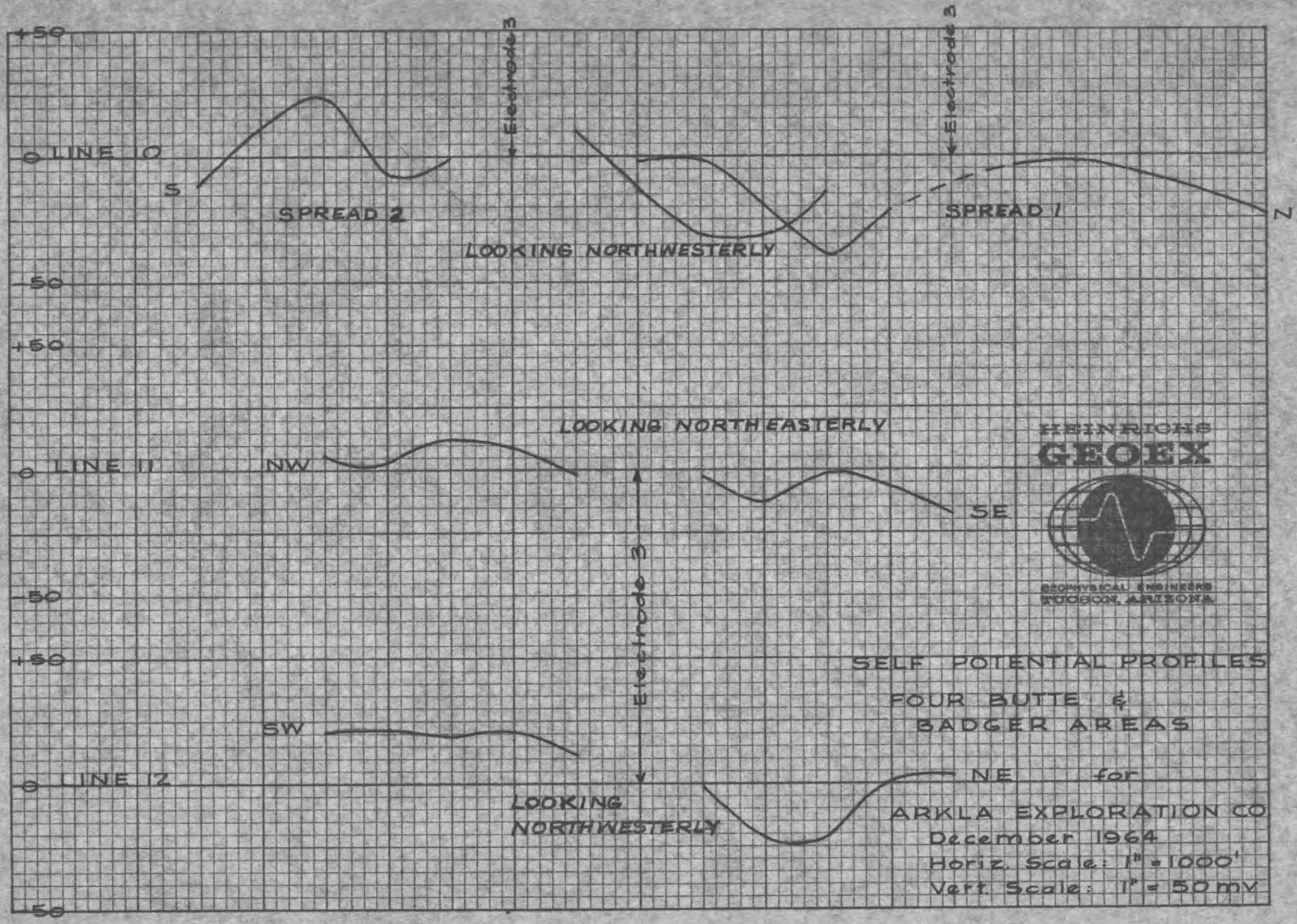
HORIZONTAL SCALE 400 ft./in.

LOCATION

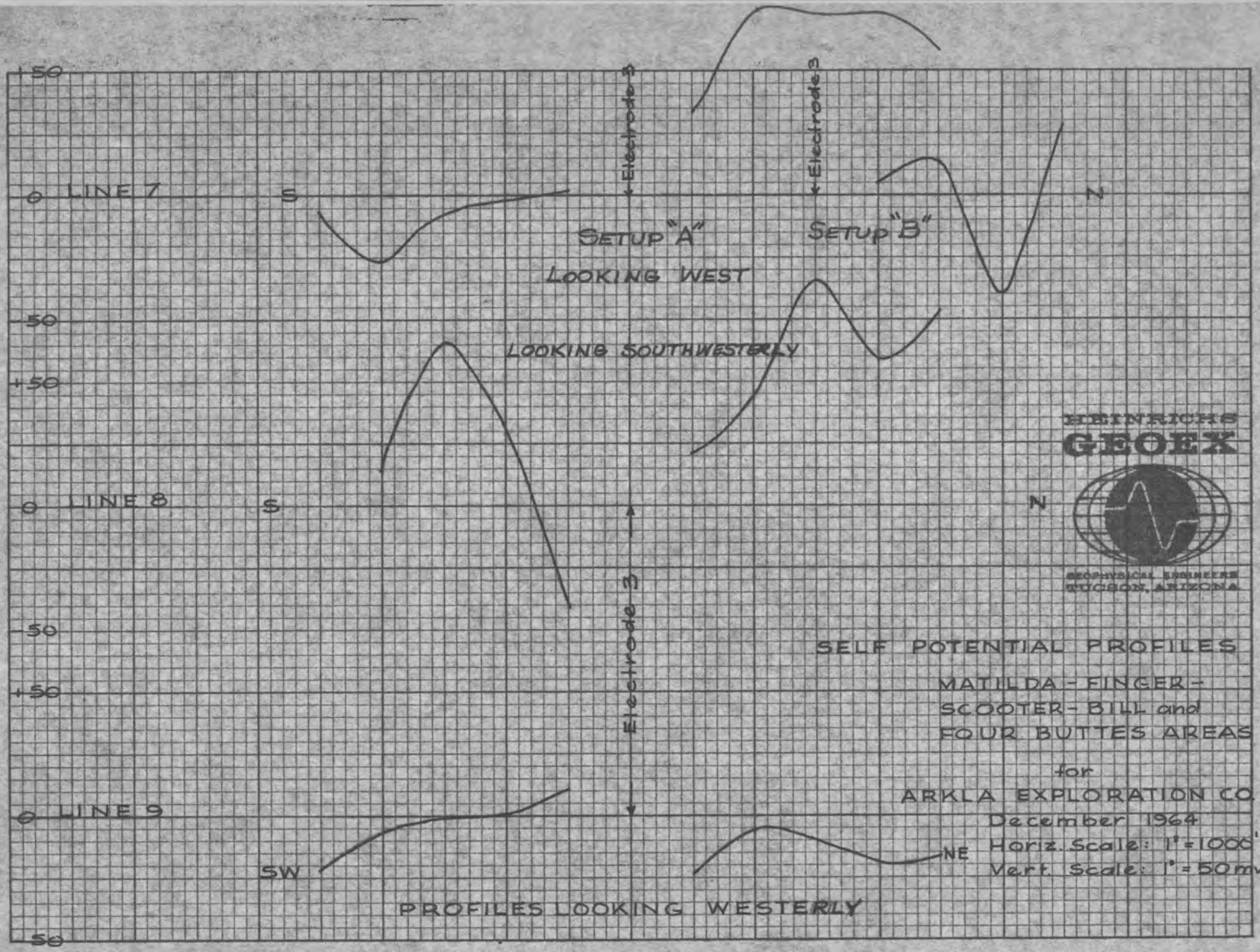
HEINRICHS GEOEX

GEOPHYSICAL ENGINEERS TELEDYNE AMERICA

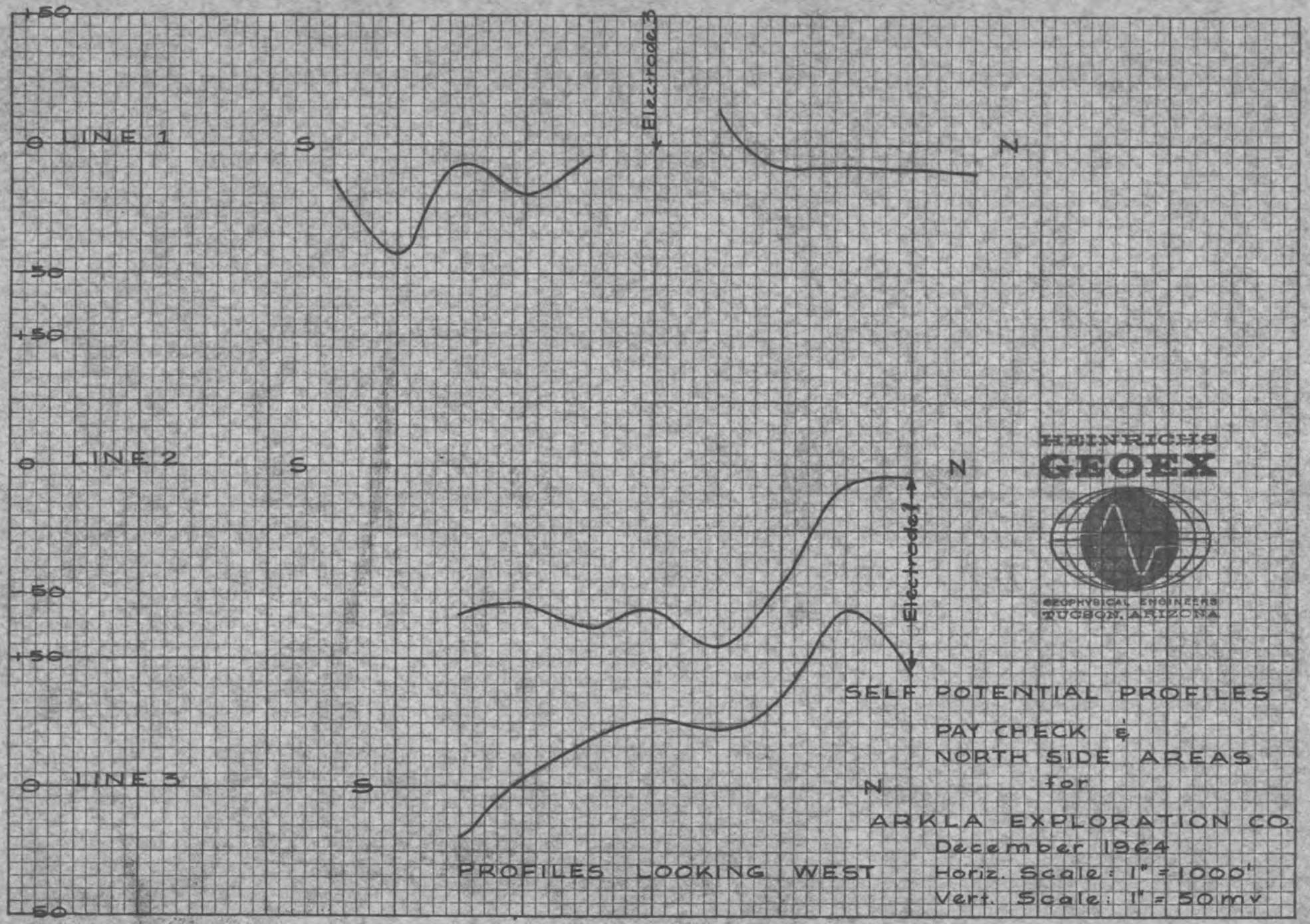
31



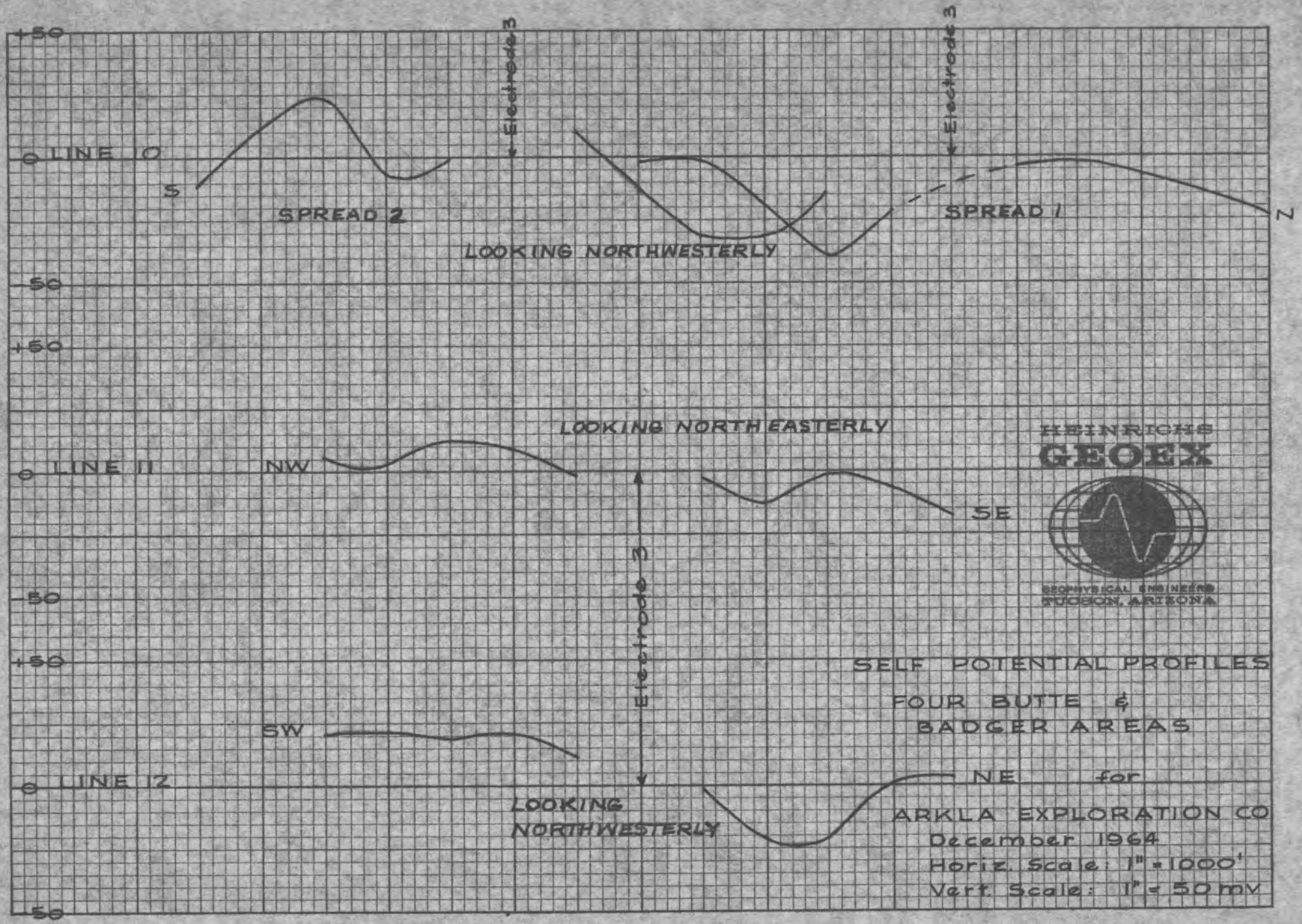
K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.



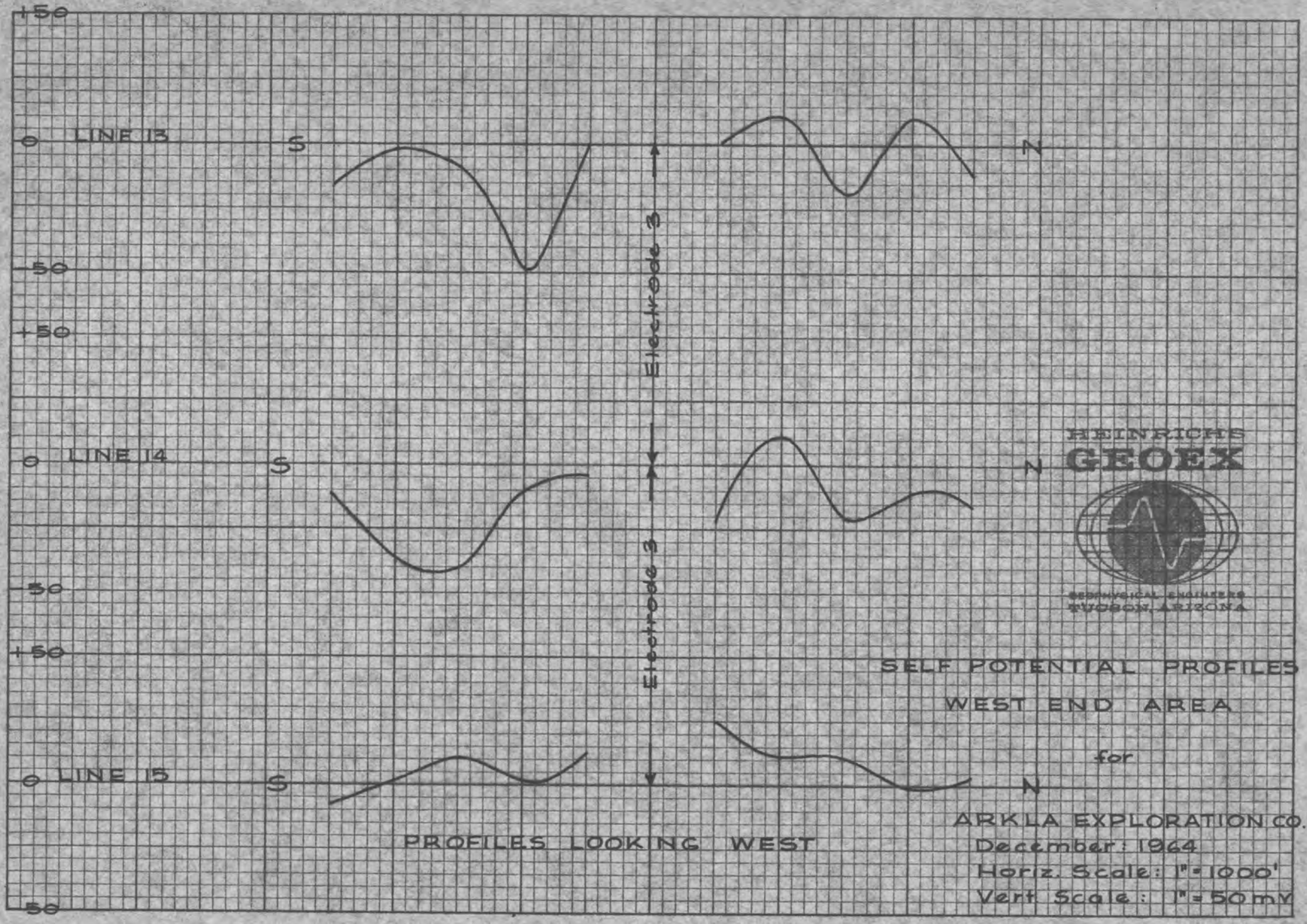
K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.



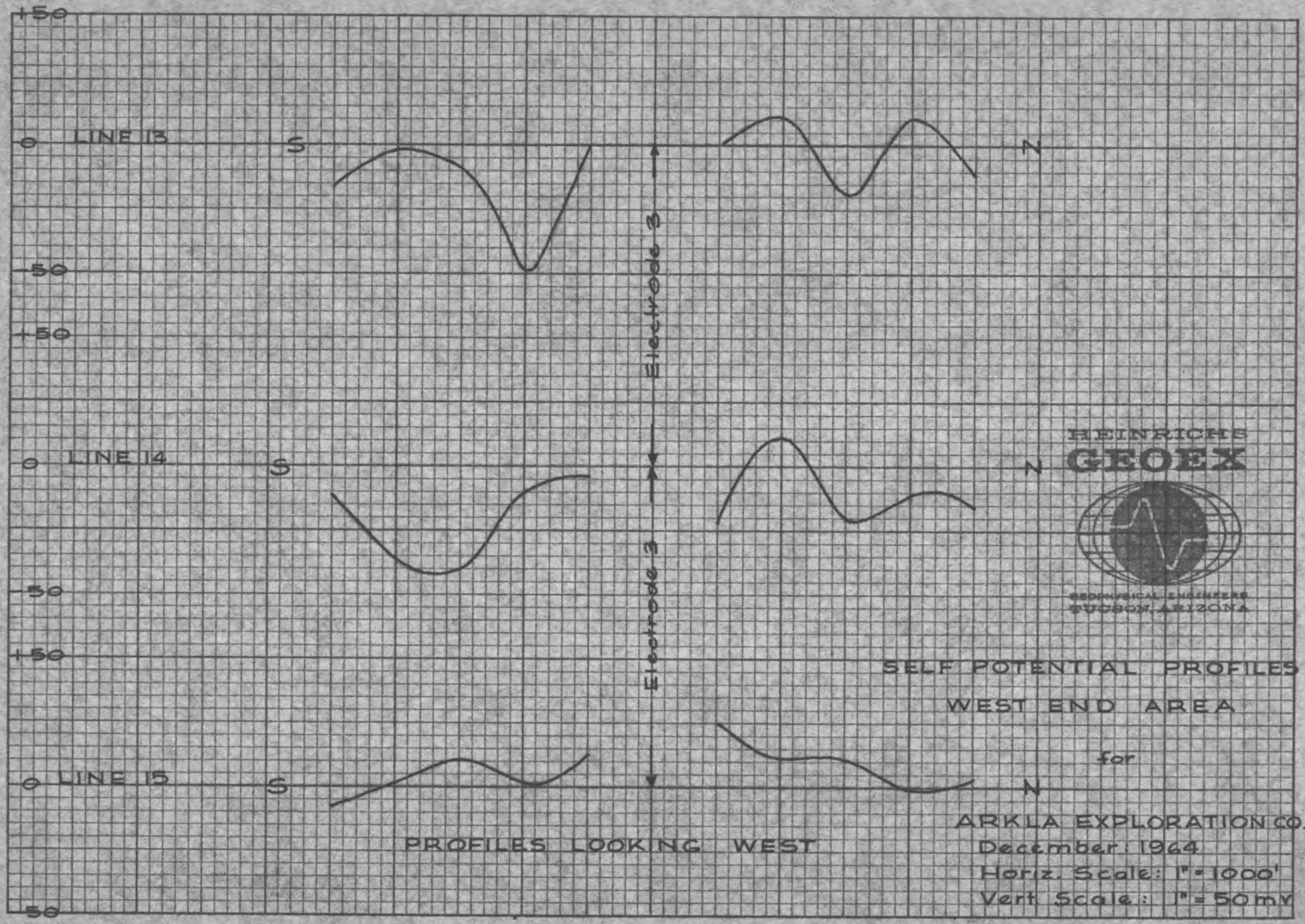
K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.



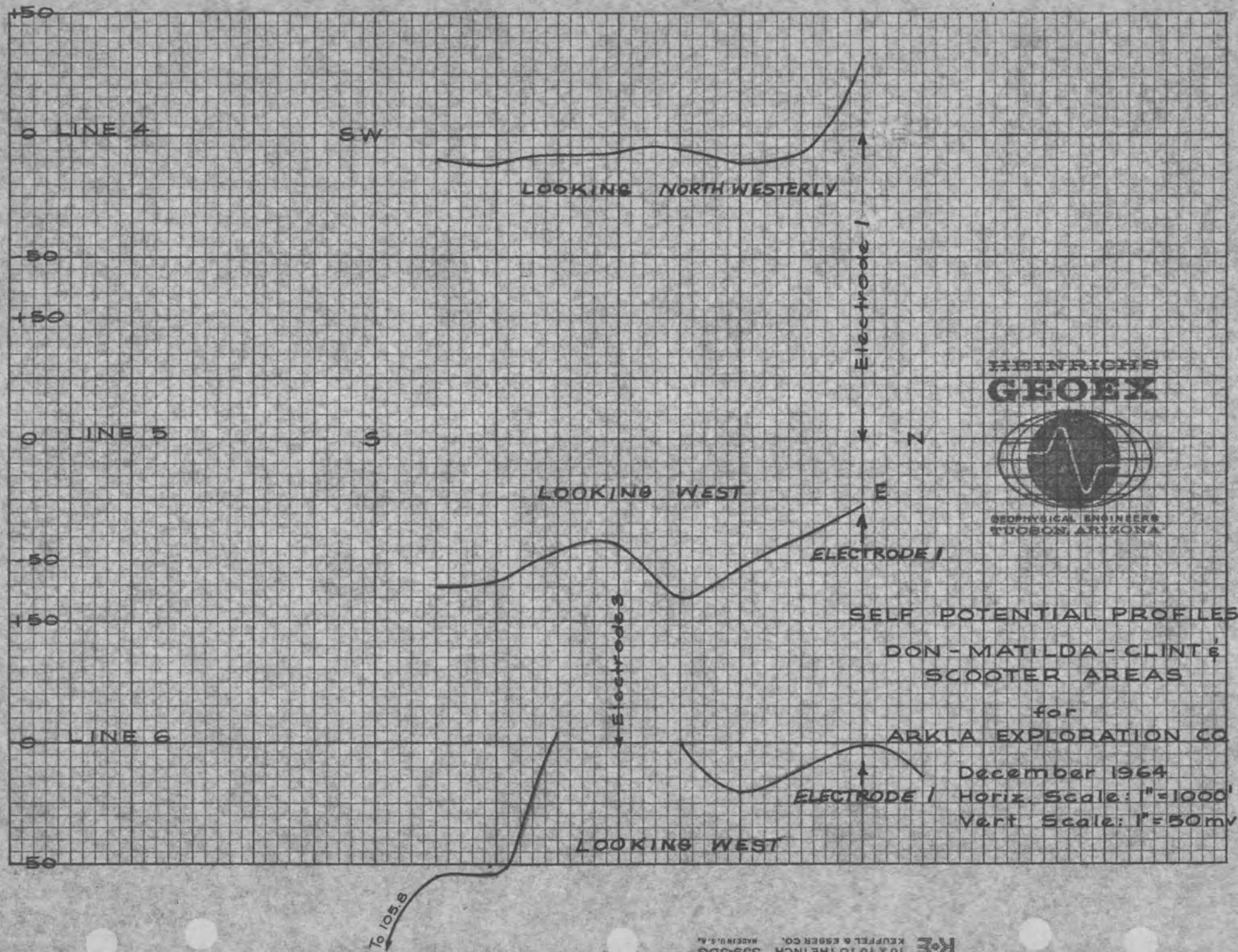
K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.



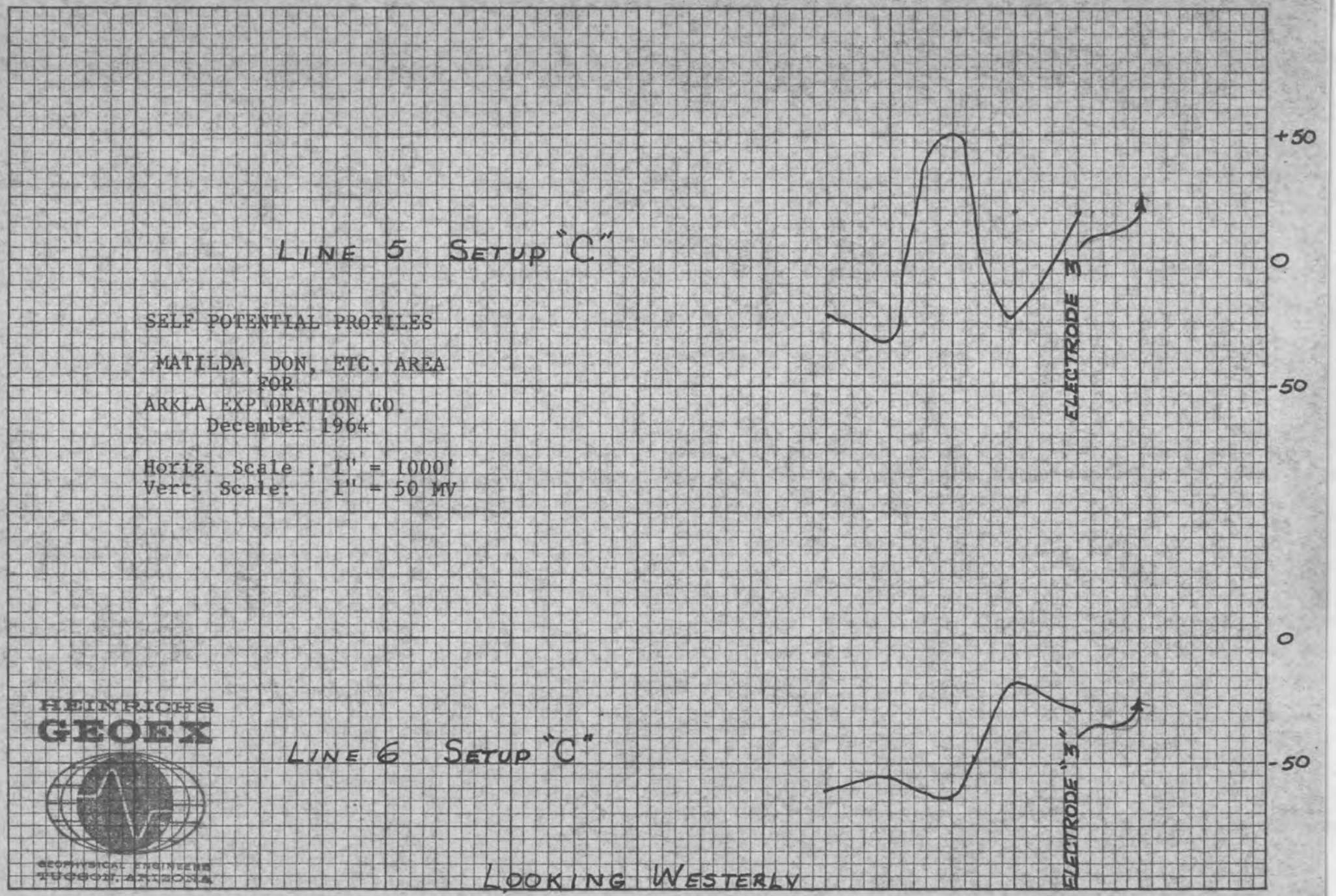
K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.



K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.



K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.



K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.

45-514 ARKLA LINE # 6 EAST

1	2	4	6	3	5	7	8	9
STATION # SOUTH	READING	COMBINED DAILY & DIURNAL DRIFT	MILES N-S OF BASE N- S+	ELEVATION IN FEET +	1+2+5C Mgs	A+LA+Cor	6xCBFA	3+5+7
0+00	1 386.3	-57.68	4.00	3620	2920	494	4012	7426
2+50	88.5	57.71	4.04	15	2940	500	3980	7420
5+00	90.7	57.74	4.09	10	2959	505	3947	7411
7+50	90.7	7.77	4.14	07	2959	511	3928	7398
10+00	89.5	7.80	4.19	04	2948	517	3908	7373
12+50	85.5	7.83	4.24	02	2912	523	3896	7331
15+00	83.7	7.86	4.28	01	2896	528	3889	7313
17+50	81.3	7.89	4.32	599	2874	534	3876	7284
20+00	83.1	7.92	4.38	596	2890	540	3857	7287
22+50	78.5	7.95	4.43	95	2849	546	3850	7245
25+00	75.4	7.98	4.47	93	2821	552	3837	7210
27+50	75.1	8.02	4.52	92	2818	558	3831	7207
30+00	68.8	8.05	4.57	91	2762	564	3824	7150
32+50	66.5	8.08	4.62	90	2741	570	3818	7129
35+00	64.4	8.13	4.66	88	2722	575	3805	7102
37+50	62.8	8.16	4.71	86	2707	581	3792	7080
40+00	64.9	8.19	4.76	84	2726	587	3779	7092
42+50	63.8	8.22	4.81	82	2716	593	3766	7075
45+00	66.9	8.25	4.85	80	2743	598	3753	7094
47+50	69.5	8.28	4.90	77	2766	604	3734	7104
50+00	71.4	8.31	4.95	75	2782	610	3721	7113
52+50	71.7	8.34	5.00	73	2785	616	3708	7029
55+00	76.5	8.37	5.04	71	2827	622	3695	7144
57+50	77.8	8.40	5.09	69	2839	628	3682	7149
60+00	74.9	8.43	5.14	67	2812	634	3669	7115
62+50	82.8	8.45	5.19	65	2882	640	3656	7178
65+00	88.8	↓	5.23	62	2936	646	3637	7219
67+50	91.0	↓	5.28	60	2955	652	3624	7231
70+00	85.6	58.44	5.33	58	2907	658	3611	7176
72+50	91.4	↓	5.38	49	2959	664	3553	7176
75+00	94.6	↓	5.42	41	2987	669	3501	7157
77+50	99.7	58.43	5.47	37	3033	675	3475	7183
80+00	97.4	↓	5.52	32	3012	681	3443	7136
82+50	401.9	↓	5.57	25	3052	687	3397	7136
85+00	10.3	58.42	5.61	18	3127	692	3352	7171
87+50	07.9	↓	5.66	14	3106	698	3326	7130
90+00	08.2	↓	5.70	11	3108	704	3307	7119
92+50	10.6	58.41	5.75	13	3130	710	3320	7160
95+00	12.8	↓	5.80	16	3149	716	3339	7204
97+50	19.5	↓	5.84	12	3209	722	3313	7244
100+00	21.7	58.40	5.89	07	3229	727	3281	7237

45-514 ARKLA 6 EAST Cont.

						3	5	7	8	9
STA # South	Reading	Combined Daily & Diurnal Drift	Miles South of Base 5+	Elevations		1+2+5C Mgs	4+lat Cor	6XCBFA	3+5+7	
102+50	1423.7	58.40	—	3499		3246	733	3229	7208	
105+00	31.1	↓	5.99	3490		3312	739	3171	7222	
107+50	45.0	↓	6.03	78		3436	745	3093	7274	
110+00	46.5	58.39	6.08	66		3449	751	3015	7215	
112+50	35.8	↓	6.13	68		3354	757	3028	7139	
115+00	36.4	↓	6.18	71		3359	763	3048	7170	
117+50	40.7	58.38	6.22	67		3398	769	3022	7189	
120+00	41.9	↓	6.27	62		3408	774	2990	7172	
122+50	50.4	↓	6.32	48		3484	780	2899	7163	
125+00	48.1	58.37	6.37	35		3464	786	2815	7065	
127+50	58.0	↓	6.41	32		3552	792	2795	7139	
130+00	58.9	↓	6.46	30		3560	798	2783	7141	
132+50	60.9	58.36	6.51	31		3577	804	2789	7170	
135+00	65.0	↓	6.56	33		3614	810	2802	7226	
137+50	68.9	↓	6.60	29		3648	816	2776	7240	
140+00	65.0	58.35	6.65	25		3614	821	2750	7185	
142+50	68.3	↓	6.70	20		3643	827	2718	7188	
145+00	71.3	↓	6.75	16		3670	833	2692	7195	
147+50	73.8	58.34	6.80	06		3692	839	2627	7158	
150+00	79.3	↓	6.84	3396		3741	844	2563	7148	
152+50	82.3	↓	6.89	86		3768	850	2498	7116	
150+00	83.5	58.33	6.94	76		3778	856	2433	7067	

(CK BY P.R. 4-1-65)

ARKLA LINE 1

6000X

3/31/65

DENSITY = 2.3 g/cc

CBFA = 0.06471 MGALS / FT.

SCALE CONS. = 0.08887 MGALS/S.D.

LAT. COR. = 1.234 MGALS/MI.

1	2	4	6	3	5	7	8	9
STATION # SOUTH	READING (NOT USED)	COMBINED DAILY & DIURNAL DRIFT	MILES NORS OF BASE N− S+	ELEV. IN FEET ABOVE DATUM	1+2×S.C. CORR. MG.	4×LAT COR MGALS	6×CBFA MGALS	3+5+7 MGALS	8±C
0+00	1 333.4	+15.6		3 564.00	28.92	6.60	36.50	71.52	
0+00	283.5		4.00	731.81	23.99	4.94	47.36	76.29	
5+00	280.3		4.09	731.93	23.70	5.05	47.36	76.11	
10+00	283.7		4.19	725.67	24.00	5.17	46.96	76.13	
15+00	287.7		4.28	715.59	24.36	5.28	46.31	76.15	
20+00	286.2		4.38	714.54	24.23	5.40	46.24	75.87	
25+00	287.5		4.47	709.57	24.34	5.52	45.92	75.78	
30+00	291.1		4.57	699.75	24.66	5.64	45.28	75.58	
35+00	297.1		4.66	685.49	25.19	5.75	44.35	75.29	
40+00	301.9		4.76	675.11	25.62	5.87	43.69	75.18	
45+00	309.8		4.85	659.22	26.32	5.98	42.66	74.96	
50+00	314.0	−13.7	4.95	651.87	26.69	6.10	42.18	74.97	
55+00	325.1		5.04	636.53	27.67	6.22	41.19	75.08	
60+00	328.6		5.14	625.61	28.07	6.34	40.48	74.89	
65+00	336.5		5.23	615.50	28.69	6.46	39.83	74.98	
70+00	342.0		5.33	602.93	29.18	6.58	39.02	74.78	
75+00	352.8		5.42	590.95	30.14	6.69	37.59	74.42	
80+00	353.4		5.52	576.46	30.01	6.81	37.24	74.06	
85+00	359.4		5.61	560.92	30.72	6.92	36.30	73.94	
90+00	366.2		5.70	547.76	31.33	7.04	35.45	73.82	
95+00	380.5		5.80	527.90	32.60	7.16	34.16	73.92	
100+00	385.5		5.89	522.54	32.86	7.27	33.81	73.94	
105+00	388.5	−13.8	5.99	514.35	33.30	7.39	33.28	73.97	
110+00	397.3		6.08	503.43	34.08	7.51	32.58	74.17	
115+00	403.0		6.18	490.76	34.59	7.63	31.76	73.98	
120+00	405.8		6.27	486.58	34.84	7.74	31.49	74.07	
125+00	407.9		6.37	482.77	35.02	7.86	31.24	74.12	
130+00	412.3		6.46	475.40	35.41	7.98	30.76	74.15	
135+00	421.6		6.56	461.60	36.24	8.10	29.87	74.21	
140+00	429.7		6.65	450.80	36.96	8.21	29.17	74.34	
145+00	436.4		6.75	443.77	37.56	8.33	28.72	74.61	
150+00	449.6		6.84	426.38	38.73	8.44	27.59	74.76	
155+00	457.0		6.94	415.93	39.39	8.56	26.91	74.86	

132549 × .06471 = 124334

116723 − 457 = 116266 × .08887 = 99882

79911 22254 124335 246470

ARKLA LINE 2
3-31-65

CK BY P.R. 4-1-65

STATION # SOUTH	1 READING NOT USED	2 COMBINED DAILY DIURNAL DRIFT	4 MILES NOR. S OF BASE N- S+	6 ELEV. IN FEET ABOVE DATUM	3 1+2 X S.C. COR. MG.	5 4 X LAT. COR MGALS	7 6 X CBFA MGALS	8 3+5+7 MGALS	9 8 ± C
BASE	0 334.1	-14.1		564.00	28.44	6.60	36.50	71.54	
0+00	252.9		4.00	774.74	21.22	4.94	50.13	76.29	
5+00	249.9		4.09	782.70	20.96	5.05	50.65	76.66	
10+00	252.9		4.19	776.86	21.22	5.17	50.27	76.66	
15+00	259.4		4.28	766.91	21.80	5.28	49.63	76.71	
20+00	264.5		4.38	756.30	22.25	5.40	48.94	76.59	
25+00	265.8		4.47	752.05	22.37	5.52	48.67	76.56	
30+00	276.1		4.57	733.22	23.20	5.64	47.45	76.29	
35+00	280.6		4.66	720.62	23.68	5.75	46.63	76.06	
40+00	287.7		4.76	704.33	24.31	5.87	45.58	75.76	
45+00	292.7		4.85	692.63	24.76	5.98	44.82	75.56	
50+00	303.2		4.95	677.95	25.67	6.10	43.87	75.66	
55+00	313.3		5.04	662.62	26.59	6.22	42.88	75.69	
60+00	322.3	-14.0	5.14	648.41	27.40	6.34	41.96	75.70	
65+00	331.5		5.23	633.16	28.22	6.46	40.97	75.65	
70+00	343.5		5.33	615.76	29.28	6.58	39.85	75.71	
75+00	352.1		5.42	595.34	30.05	6.69	38.52	75.26	
80+00	356.3		5.52	585.48	30.42	6.81	37.89	75.12	
85+00	373.9		5.61	566.50	31.98	6.92	36.66	75.56	
90+00	376.9		5.70	560.07	32.16	7.04	36.24	75.44	
95+00	381.5		5.80	551.42	32.66	7.16	35.68	75.50	
100+00	389.1		5.89	541.64	33.34	7.27	35.05	75.66	
105+00	385.8	-13.7	5.99	548.74	33.07	7.39	35.51	75.97	
110+00	391.4		6.08	541.33	33.57	7.51	35.03	76.11	
115+00	395.5		6.18	534.76	33.95	7.63	34.60	76.16	
120+00	403.1		6.27	523.73	34.61	7.74	33.89	76.24	
125+00	408.3		6.37	517.30	35.07	7.86	33.47	76.40	
130+00	415.2		6.46	509.05	35.68	7.98	32.62	76.28	
135+00	423.9		6.56	499.25	36.05	8.10	31.98	76.13	
140+00	434.2		6.65	486.06	37.37	8.21	31.19	76.77	
145+00	441.8		6.75	469.21	38.04	8.33	30.36	76.73	
150+00	453.0	-13.9	6.84	451.86	39.02	8.44	29.24	76.70	
155+00	458.9		6.94	441.75	39.55	8.56	28.59	76.70	
				201,775 X 0.00421 =	17196	22.54	1306.32	1506.83	

GEODET

ARKLA LINE 3
4-1-65

OK BY
PR
4-1-65

	1	2		4	6			3	5	7	8	9
STATION # SOUTH	READING	COMBINED DAILY & DIURNAL DRIFT		MILES NOR S OF BASE N- S+	ELEV. IN FEET			1+2+S.C. COR. MGALS	4 X LAT. COR. MGALS	6 X CBFA MGALS	3+5+7 MGALS	8 + C
BASE	(1) 336.4								6.60			
0+00	213.5	-15.6		4.00	(B) 839.87			17.59	4.94	54.35	76.88	
5+00	223.7			4.09	825.75			18.49	5.05	53.43	76.97	
10+00	222.7	-15.6		4.19	819.66			18.40	5.17	53.04	76.61	
15+00	228.6			4.28	809.77			18.93	5.28	52.40	76.61	
20+00	240.0			4.38	799.36			19.94	5.40	51.73	77.07	
25+00	252.7	-15.6		4.47	779.29			21.07	5.52	50.43	77.02	
30+00	260.0			4.57	762.74			21.72	5.64	49.36	76.72	
35+00	274.3			4.66	743.64			22.97	5.75	48.12	76.86	
40+00	286.6	-15.5		4.76	723.69			24.09	5.87	46.85	76.79	
45+00	293.4			4.85	709.94			24.70	5.98	45.94	76.62	
50+00	296.6			4.95	700.29			24.98	6.10	45.32	76.40	
55+00	309.2	-15.4		5.04	680.64			26.11	6.22	44.04	76.37	
60+00	327.4			5.14	654.59			27.73	6.34	42.36	76.43	
65+00	332.8			5.23	646.41			28.21	6.46	41.83	76.50	
70+00	344.3	-15.3		5.33	623.42			29.24	6.58	40.34	76.16	
75+00	355.3			5.42	602.50			30.22	6.69	38.79	75.90	
80+00	360.5			5.52	595.18			30.68	6.81	38.51	76.00	
85+00	352.9	-15.2		5.61	605.65			30.01	6.92	39.19	76.12	
90+00	359.3			5.70	597.47			30.58	7.04	38.68	76.28	
95+00	366.5			5.80	590.95			31.22	7.16	38.34	76.72	
100+00	366.7	-15.1		5.89	590.16			31.25	7.27	38.19	76.71	
105+00	373.7			5.99	582.03			31.87	7.39	37.66	76.92	
110+00	382.3			6.08	572.40			32.63	7.51	37.04	77.18	
115+00	389.7	-15.0		6.18	562.21			33.30	7.63	36.38	77.31	
120+00	405.4			6.27	538.28			34.69	7.74	34.83	77.26	
125+00	420.4			6.37	526.29			36.03	7.86	34.06	77.95	
130+00	420.2	-14.9		6.46	515.26			36.82	7.98	33.34	78.14	
135+00	437.0			6.56	499.22			37.51	8.10	32.30	77.91	
140+00	450.4			6.65	482.41			38.70	8.21	31.22	78.13	
145+00	464.4	-14.8		6.75	465.19			39.96	8.33	30.10	78.39	
150+00	464.3			6.84	467.79			39.95	8.44	30.27	78.66	
155+00	469.2			6.94	(3) 461.19			40.38	8.56	29.89	78.78	
BASE	(1) 334.5	-14.7										

Geo ✓ ARKLA LINE 4
3-31-65

CK BY P.R. 4-1-65

Station # South	1 Reading	2 Combined Daily & Diurnal Drift	4 Miles N or S of Base N- S+	6 Elev. in Feet Above Datum	3 1+2+SC Cor. Mg	5 4 x Lat Cor Mg	7 6 x CBFA Mg	8 3+5+7 Mg	8 ± C
BASE						6.60			
0+00	0319.4	-11.6	4.00	0680.75	27.35	4.94	44.05	76.34	
5+00	310.1		4.09	686.93	26.53	5.05	44.45	76.03	
10+00	313.8		4.19	679.85	26.86	5.17	43.99	76.02	
15+00	306.6		4.28	680.46	26.22 ✓	5.28	44.03	75.53	—
20+00	309.5		4.38	672.11	26.47	5.40	43.49	75.36	
25+00	303.2	-11.5	4.47	673.81	25.92	5.52	43.60	75.04	
30+00	308.1		4.57	667.66	26.36	5.64	42.88	74.88	
35+00	305.4		4.66	658.07	26.12	5.75	42.58	74.45	
40+00	314.8		4.76	638.87	26.95	5.87	41.34	74.16	
45+00	315.7		4.85	631.40	27.03	5.98	40.86	73.87	
50+00	322.3	-11.4	4.95	616.65	27.63	6.10	39.90	73.63	
55+00	327.2		5.04	604.96	28.07	6.22	39.15	73.44	
60+00	327.5		5.14	598.36	28.09	6.34	38.72	73.15	
65+00	336.0		5.23	580.61	28.85	6.46	37.57	72.88	
70+00	337.1		5.33	574.76	28.94 ✓	6.58	37.19	72.71	—
75+00	342.1	-11.3	5.42	566.91	29.40	6.69	36.68	72.77	
80+00	349.3		5.52	552.89	29.95	6.81	35.78	72.54	
85+00	354.8		5.61	537.89	30.53	6.92	34.81	72.26	
90+00	362.3		5.70	523.16	31.19	7.04	33.85	72.08	
95+00	361.8		5.80	519.58	31.15	7.16	33.62	71.93	
100+00	370.2		5.89	506.16	31.90	7.27	32.75	71.92	
105+00	375.1	-11.2	5.99	497.34	32.34	7.39	32.18	71.91	
110+00	391.0		6.08	475.55	33.75	7.51	30.77	72.03	
115+00	388.3		6.18	477.81	33.51	7.63	30.92	72.06	
120+00	395.7		6.27	466.75	34.17	7.74	30.20	72.11	
125+00	402.1	-11.1	6.37	457.89	34.75	7.86	29.63	72.24	
130+00	406.0		6.46	449.65	35.27	7.98	29.10	72.35	
135+00	414.4		6.56	440.52	35.89	8.10	28.51	72.45	
140+00	420.7		6.65	430.48	36.40	8.21	27.86	72.47	
145+00	429.8		6.75	418.50	37.21	8.33	27.08	72.62	
150+00	449.1		6.84	392.69	38.93	8.44	25.41	72.78	
155+00	457.0	-11.0	6.94	382.26	39.64	8.56	24.74	72.94	

144674 − 3629 = 140689 x .05559
= 9822
983.22

1793.30 x .06371
114772

98417 215794 114769 234850

983.22

GEDET

ARKLA LINE 5

3-31-65

Station # South	1 Reading	2 Combined Daily Diurnal Drift	4 Miles N or S of Base N- S+	6 Elev. in Feet	3 1+2+5C Cor. Mgals	5 4 x Lat Cor Mgals	7 C x CBFA Mgals	8 3+5+7 Mgals	9 8±C
Base	329.4	-9.6			28.42	6.60			
0+00	343.1	-9.8	4.00	641.19	29.62	4.94	41.49	76.05	
5+00	342.1	-10.0	4.09	641.13	29.51	5.05	41.49	76.05	
10+00	335.2		4.19	643.18	28.90	5.17	41.62	75.69	
15+00	328.8	-10.1	4.28	639.03	28.33	5.28	41.35	74.96	
20+00	325.3		4.38	633.63	28.01	5.40	41.00	74.41	
25+00	323.2	-10.2	4.47	623.45	27.82	5.52	40.67	74.01	
30+00	314.2		4.57	633.70	27.02	5.64	41.01	73.67	
35+00	313.6	-10.3	4.66	629.76	26.95	5.75	40.43	73.13	
40+00	314.4		4.76	613.58	27.03	5.87	39.70	72.60	
45+00	314.3	-10.4	4.85	604.57	27.01	5.98	39.12	72.11	
50+00	317.7		4.95	592.74	27.31	6.10	38.37	71.78	
55+00	321.5	-10.5	5.04	582.98	27.64	6.22	37.72	71.58	
60+00	321.3		5.14	566.23	27.62	6.34	36.64	70.60	
65+00	329.9	-10.6	5.23	557.48	28.38	6.46	36.20	71.04	
70+00	335.7	-10.7	5.33	550.20	28.88	6.58	35.60	71.06	
75+00	349.9		5.42	509.54	30.14	6.69	34.27	71.10	
80+00	345.0		5.52	531.23	29.71	6.81	34.38	70.90	
85+00	355.4		5.61	516.79	30.63	6.92	33.44	70.99	
90+00	360.7		5.70	505.00	31.10	7.04	32.68	70.82	
95+00	377.9		5.80	478.49	32.63	7.16	30.96	70.75	
100+00	375.9		5.89	479.13	32.46	7.27	31.00	70.73	
105+00	376.5		5.99	475.87	32.51	7.39	30.79	70.69	
110+00	386.8	-10.8	6.08	467.76	32.88	7.51	30.27	70.66	
115+00	396.6		6.18	446.69	34.29	7.63	28.91	70.83	
120+00	401.7		6.27	437.78	34.79	7.74	28.33	70.81	
125+00	404.7		6.37	433.54	35.01	7.86	28.05	70.92	
130+00	409.6	-10.9	6.46	428.13	35.43	7.98	27.70	71.11	
135+00	411.8		6.56	423.08	35.63	8.10	27.38	71.11	
140+00	418.7		6.65	413.64	36.24	8.21	26.77	71.22	
145+00	423.7		6.75	406.61	36.69	8.33	26.31	71.33	
150+00	432.0		6.84	395.98	37.42	8.44	25.62	71.48	
155+00	438.2		6.94	387.81	37.97	8.56	25.10	71.63	

118688 - 3842 = 115846 x .08667 = 10039.2

109014 x .06911 = 10093.37

100893 - 2842 = 97551

21594 109437 23052

6 EO Et

ARKLA LINE 6
3-31-65

Station # South	1 Reading	2 Combined Daily & Diurnal Drift	4 Miles N or S of Base N- S+	6 Elev in Feet	3 1+2+S.C. Cor. Mg	5 4 x Lat Cor Mgals	7 6 x CBFA Mgals	8 3+5+7 Mgals	9 8 ± C
BASE	(0)336.4	-16.6		3564.00	28.42	6.60	36.50	71.52	
0+00	343.4		4.00	(3)605.57	29.04	4.94	39.06	73.04	
5+00	342.0		4.09	602.92	28.92	5.05	39.01	72.98	
10+00	343.7		4.19	596.51	29.07	5.17	38.60	72.84	
15+00	339.8		4.28	597.31	28.72	5.28	38.65	72.65	
20+00	335.3		4.38	591.00	28.59	5.40	38.24	72.23	
25+00	334.1	-16.5	4.47	587.19	28.23	5.52	38.00	71.75	
30+00	331.9		4.57	583.71	27.99	5.64	37.77	71.40	
35+00	329.8		4.66	581.21	27.49	5.75	37.61	70.76	
40+00	325.5		4.76	577.18	27.46	5.87	37.35	70.68	
45+00	328.2		4.85	566.84	27.70	5.98	36.68	70.36	
50+00	330.2		4.95	557.52	27.88	6.10	36.08	70.06	
55+00	328.5		5.04	544.18	27.73	6.22	35.21	69.16	
60+00	344.2		5.14	531.84	29.12	6.34	34.41	69.87	
65+00	351.1		5.23	519.44	29.74	6.46	33.61	69.81	
70+00	353.8		5.33	511.83	29.98	6.58	33.12	69.68	
75+00	349.6		5.42	515.10	29.60	6.69	33.33	69.62	
80+00	362.0		5.52	506.36	30.70	6.81	32.77	70.28	
85+00	367.2		5.61	486.84	31.17	6.92	31.50	69.59	
90+00	381.4		5.70	464.27	32.43	7.04	30.04	69.51	
95+00	373.5		5.80	470.71	31.73	7.16	30.46	69.35	
100+00	378.5		5.89	463.42	32.17	7.27	29.99	69.43	
105+00	399.7	-16.4	5.99	434.85	33.98	7.39	28.14	69.51	
110+00	404.1		6.08	429.45	34.19	7.51	27.79	69.49	
115+00	397.3		6.18	432.98	33.85	7.63	28.02	69.50	
120+00	402.5		6.27	424.96	34.31	7.74	27.50	69.55	
125+00	409.0		6.37	415.95	34.89	7.86	26.91	69.66	
130+00	414.4		6.46	407.96	35.37	7.98	26.40	69.75	
135+00	422.4		6.56	395.07	36.08	8.10	25.56	69.74	
140+00	425.4	-16.3	6.65	392.64	36.36	8.21	25.41	69.98	
145+00	431.0		6.75	384.69	36.85	8.33	24.89	70.07	
150+00	441.3		6.84	370.66	37.77	8.44	23.99	70.20	
155+00	445.3		6.94	364.06	38.13	8.56	23.56	70.25	
	1[illegible]960	-5[illegible]32 = 116534 x .0889			1035.57	22.54	1066.16	2324.27	
BASE	336.0	-16.2		1647.00 x .06471 = 106.617	28.42	6.60		71.52	
		+103.55							

GEOEX

ARKLA LINE 7
4-1-65

Station # South	1 Reading	2 Combined Daily & Diurnal Drift	4 Miles N or S of Base N- S+	6 Elev in Feet	3 1+2 + S.C. Cor. Mgals	5 4 x Lat Cor. Mgals	7 6 x CBFA Mgals	8 3+5+7 Mgals	9 8 ± C
BASE	0339.3	-19.5			29.42	6.60			
0+00	339.2		4.00	3577.99	28.41	4.94	37.40	70.75	
5+00	336.5		4.09	577.64	28.17	5.05	37.38	70.60	
10+00	340.2		4.19	569.16	28.50	5.17	36.83	70.50	
15+00	340.4		4.28	566.13	28.52	5.28	36.63	70.43	
20+00	344.1		4.38	557.61	28.85	5.40	36.08	70.33	04.2993
25+00	345.8	-19.4	4.47	550.40	29.01	5.52	35.62	70.15	
30+00	343.3		4.57	548.68	28.78	5.64	35.51	69.93	
35+00	341.9		4.66	545.20	28.66	5.75	35.28	69.69	
40+00	343.3		4.76	539.17	28.78	5.87	34.89	69.54	
45+00	344.9		4.85	531.21	28.93	5.98	34.37	69.28	
50+00	347.7	-19.3	4.95	523.95	29.18	6.10	33.90	69.18	
55+00	353.3		5.04	512.46	29.68	6.22	33.16	69.06	
60+00	355.8		5.14	505.03	29.90	6.34	32.68	68.92	
65+00	362.1		5.23	493.92	30.46	6.46	31.96	68.88	
70+00	363.0		5.33	490.26	30.59	6.58	31.72	68.89	
75+00	372.2	-19.2	5.42	477.24	31.37	6.69	30.88	68.94	
80+00	375.2		5.52	470.36	31.64	6.81	30.44	68.89	
85+00	382.3		5.61	455.54	32.27	6.92	29.48	68.67	
90+00	383.3		5.70	459.98	32.36	7.04	29.49	68.89	
95+00	392.9		5.80	439.44	33.21	7.16	28.99	68.81	
100+00	391.9		5.89	436.59	33.08	7.27	28.32	68.67	
105+00	395.9	-19.1	5.99	432.16	33.42	7.39	27.97	68.85	
110+00	400.0		6.08	421.49	33.85	7.51	27.27	68.63	
115+00	409.1		6.18	409.02	34.66	7.63	26.47	68.76	
120+00	415.8		6.27	400.58	35.25	7.74	25.92	68.91	
125+00	430.1	-19.1	6.37	378.85	36.53	7.86	24.52	68.91	
130+00	425.7		6.46	389.27	36.13	7.98	24.87	68.98	
135+00	428.0		6.56	380.87	36.34	8.10	24.65	69.09	
140+00	435.1		6.65	372.09	36.97	8.21	24.08	69.26	
145+00	438.8		6.75	366.45	37.30	8.33	23.71	69.34	
150+00	447.0		6.84	355.42	38.05	8.44	23.00	69.47	
155+00	447.8		6.94	357.91	38.10	8.56	22.84	69.50	
	15577	-1358 = 11,896		150770 - 7447 = 9958	1,09337				
		= 10538			- 2348				
						21594	97571	221860	
					107,695				

GEDEX

ARKLA LINE 8
3-31-65

1	2		4	6			3	5	7	8	9
STATION # SOUTH	READING	COMBINED DAILY & DIURNAL DRIFT	MILES N OR S OF BASE N- S+	ELEV. IN FEET ABOVE DATUM			1+2+SC COR. Mg	4 X LAT COR MGALS	6 X CBFA MGALS	3+5+7 MGALS	8 ± C
BASE	(1) 337.7	-17.9		(3) 569.00			28.42	6.60	36.50	71.52	
0+00	342.6		4.00	550.30			28.86	4.94	35.61	69.41	
5+00	343.5	-18.0	4.09	545.64			28.93	5.05	35.31	69.29	
10+00	341.7		4.19	545.04			28.77	5.17	35.27	69.21	
15+00	341.5	-18.1	4.28	542.02			28.74	5.28	35.07	69.09	
20+00	346.9		4.38	532.70			29.22	5.40	34.47	69.09	
25+00	345.9	-18.2	4.47	530.98			29.12	5.52	34.36	69.00	
30+00	352.2		4.57	518.07			29.68	5.64	33.52	68.84	
35+00	350.3	-18.3	4.66	516.73			29.50	5.75	33.44	68.69	
40+00	352.6		4.76	511.93			29.71	5.87	33.13	68.71	
45+00	354.5	-18.4	4.85	505.42			29.87	5.98	32.71	68.56	
50+00	356.4		4.95	499.29			30.04	6.10	32.31	68.45	
55+00	359.4	-18.5	5.04	491.59			30.30	6.22	31.81	68.33	
60+00	368.7		5.14	476.87			31.12	6.34	30.86	68.32	
65+00	372.2	-18.6	5.23	469.98			31.42	6.46	30.41	68.29	
70+00	378.9		5.33	460.81			32.82	6.58	29.79	67.19	
75+00	376.3	-18.7	5.42	460.42			31.78	6.69	29.79	68.26	
80+00	384.5		5.52	447.24			32.51	6.81	28.94	68.26	
85+00	389.0	-18.8	5.61	438.17			32.90	6.92	28.35	68.17	
90+00	395.9		5.70	426.85			33.51	7.04	27.62	68.17 ✓	
95+00	399.0	-18.9	5.80	419.83			33.78	7.16	27.10	68.04	
100+00	403.9		5.89	411.59			34.21	7.27	26.63	68.11	
105+00	407.1	-19.0	5.99	406.34			34.49	7.39	26.29	68.17	
110+00	424.7		6.08	390.68			36.05	7.51	24.63	68.19	
115+00	415.7	-19.1	6.18	391.54			35.25	7.63	25.34	68.22	
120+00	418.2		6.27	386.46			35.47	7.74	25.01	68.22	
125+00	427.4	-19.2	6.37	373.05			36.28	7.86	24.14	68.28	
130+00	433.9		6.46	363.86			36.85	7.98	23.55	68.38	
135+00	443.8	-19.3	6.56	351.38			37.73	8.10	22.74	68.57	
140+00	442.7		6.65	350.68			37.63	8.21	22.69	68.53	
145+00	447.4	-19.4	6.75	344.59			38.04	8.33	22.30	68.67	
150+00	453.4		6.84	336.91			38.57	8.44	21.67	68.68	
155+00	457.6	-19.5	6.94	330.90			38.93	8.56	21.41	68.90	
	12,999.5	- 61.63 = 12,938 x .0687					1380.50	332.54	963.77	2676.81	
	339.4	-19.6	1060.5	148,189 x .0641 = 9,277			28.42	6.60	36.50	71.52	

ROUGH DRAFT Jan. 7, 1966

FOUR BUTTES AREA, T19N, R19W Sec 36
T18N, R19W Sec 1 & 2
T18N, R18W Sec 6 Mohave County, Arizona

Magnetic and Induced Polarization (I.P.) surveys were run over this claim group. Three I.P. lines were run consisting of four spreads giving a total surface coverage of 21,500' of which 14000 is subsurface plotted data. Dipole separations of 500' ~~was~~ WAS used on a dipole-dipole electrode configuration with frequencies of .05 and 3 cycles per second. I.P. line #9 had one sulfide indication located between electrodes three and four. Electrode 3, Line 9, is at the NW corner of Four Buttes 4 and electrode 4 is 500' south 41° west of electrode 3. This anomalism probably indicates a narrow structure containing sulfide but because of low resistivities, data were sporadic and the feature looks somewhat artificial. If no pipe, grounded fence, or similar conductor is noted in ~~this~~ the area, some limited consideration should be given to rerunning Line 9 with higher powered equipment using a double density spread (250'-500') to validify the anomaly and help resolve drill location. However, the lack of associated ~~numeralization~~ mineralization and smallness of the I.P. target make ~~leave very~~ this feature a rather remote economic possibility, therefore no further work is recommended.

Heinrichs personnel involved were Marcel LeDuc, party chief, John Beeler and Gene Juarez, technical assistants.

The magnetic survey was complicated by surface and near surface basalt boulders ~~of~~ which contained magnetite. Moving only a few feet frequently resulted in several hundred gammas fluxuation. Data were sporadic and miss-ties frequent, ~~But~~ but some values ~~can~~ may be derived from comparing magnetic profiles with geology ~~profile evaluation by a geologist on location~~. However, because (no correlation is noted with the) more definitive I.P. data ~~are available and no correlation~~ was ~~note~~, further magnetics in this area are not recommended. Evaluation of the magnetic data was made in profile form only. If contouring & presenting in plan is (over)

desired it is recommended that gross adjustments be made on all tie lines. We have presented IN SKETCH FORM A Rough contour plan on 500ft contour interval only.

GEOPHYSICAL INVESTIGATIONS

DON-MATILDA, NORTH SIDE, SCOOTER, PAYCHECK, AGUA DE ORO, FINGER, LIL, CALIENTE, WEST SIDE, UNPATENTED MINING CLAIM GROUPS, MOHAVE COUNTY, ARIZONA

For

Arkla Exploration Company

February 1966

By

Heinrichs Geoexploration Company
P. O. Box 5671 Tucson, Arizona

TABLE OF CONTENTS

	PAGE NO.
INTRODUCTION	1
INTERPRETATION, RECOMMENDATION & CONCLUSIONS	1
Don-Matilda Area	1
West End Area	2
PayCheck-North Side Area	3
Procedures	3
Induced Polarization	3
Basis of I. P.	4a
Magnetic Procedures	5
Gravity Procedures	5

MAPS IN POCKET:

Don-Matilda Area
I.P. Sectional data sheets, Lines 5-8 and 17-18
West End Area
I.P. Sectional data sheets, Lines 13, 14, 15, and 16
North Side Area
I.P. Sectional data sheets, Lines 1-4

Map No. 1	Composite G.P. location	1"=1000'
2	Elevations by Altimeter Don-Matilda	1"= 500'
3	Bouguer Gravity Profiles Don-Matilda	1"= 500'
4	Bouguer Contour Gravity, Don-Matilda	1"= 500'
5	Magnetic Data Don Matilda	1"= 500'
6	Composite Contour Sketch Map	1"= 500'
7	Don Matilda Mag Profiles	V 1"= 500
	E-W Secondary Lines	H 1"= 500'
8	Don Matilda Mag Profiles	V 1"= 500
	North-South Primary Lines	H 1"= 500'

Following not included here, previously submitted to Arkla:

9	PayCheck Area Mag Profiles	V 1"= 500
		H 1"= 500'
10	West End East Gravity Contour	1"= 500'
11	West End West Gravity Contour	1"= 500'
12	West End East Elevation Map	1"= 500'
13	West End West Elevation Map	1"= 500'
14	West End Gravity Profiles Lines 1, 4, 5, and 6	
15	West End Gravity Profiles Lines 11, 12, 13, 14, & 9	

INTRODUCTION

At the request of Mr. M. L. Pugh, chief geophysicist of Arkla Exploration Company, Heinrichs Geoexploration Company conducted 18.4 miles of manual portable vertical intensity magnetic surveys totaling 974 stations, 9.9 miles of gravity totaling 266 stations, and 21.2 miles of induced polarization (I.P.) resistivity surveys totaling spreads in the area of Don-Matilda claim group which included the following other claim names all part of a contiguous group: Scooter, Lil, Ted, Finger, Caliente, and Bill.

Two areas, one the Paycheck-Northside claim group and the West End claim group area commented on separately.

Geoex personnel assigned to this project were Marcel LeDuc, party chief later replaced by Dan Anderson, Ron Palmer--gravity and magnetic operator, George Miguel, Gene Juarez, and John Beeler, assistants.

Data were analyzed and interpreted by E. Grover Heinrichs, Chris S. Ludwig, senior geophysicist, and John Langs, geophysicist.

Copies of resultant data were submitted on a weekly basis as work was being done. This report compiles all the data the results of which, are listed here in the Table of Contents.

INTERPRETATION, RECOMMENDATIONS, AND CONCLUSIONS

Don-Matilda Area Sections 8, 9, 10, 15, 16, 17, T.17N. R.19W. Mohave County, Arizona

On the Don-Matilda-Scooter-Caliente Area, some moderate induced polarization effects were observed between 5500' west and 1500 east on Line 17 and from 500' west to 2000' east on Line 18, the eastern portion of the anomalism is still open ended.

This anomalism may be due to sulfide mineralization of about one percent total sulfide by volume with a slight increase with depth or may be due to a combination of coupling, resistivity, or geometric effects and therefore not necessarily related to sulfides. It does, however, correlate with a projected gravity high indicating denser and/or shallower material.

The proximity of some past minor gold mineralization in the general area enhances any significant though weak

mineralization and two drill holes to be drilled to a depth of 1000' and located in the NW 1/4 of Section 17 T.17N., R19W., Mohave County, Arizona have been recommended to explain the feature.

Additional very weak I.P. effects have been observed on Line 7 between electrodes 1 and 2 North, where a dike like structure does correlate with the magnetics.

Additional geologic work or I.P. using shorter dipole spacing of perhaps 100' to 200' could better localize this feature for picking drill sites.

If the I.P. effects on I.P. Line 7 should prove to be near an area of geologic interest, then other similar though weaker indications also warrant further investigation using both I.P. and geology, and later, based on results of the geology and geophysics, some shallow drilling may be indicated. These weaker zones are located on I.P. Line 6 at electrode 2 North and on I.P. Line 5 at electrode 4 North.

Additional correlation between the existing magnetics and the known geology will be necessary to derive full benefit from the magnetic data. This could be accomplished by comparing existing data at the same scale. For example, map #6 - Scale 1"=500', would be ideal to compare with known geology at the same scale.

West End Area T.17N., R.19W., Section 35 and 36 Mohave County, Arizona

Gravity and induced polarization surveys were run in this area. Four I.P. lines consisting of 24,000' surface coverage giving 14,000' of subsurface plotted data were run on 500' spacings utilizing dipole-dipole electrode configuration with frequencies of 0.5 and 3 cycles per second. Lines 13, 14, and 15 strike North-South and lie on the west boundaries of claim WE-5, WE-3, and WE-1 respectively. Line 16 strikes East-West and is centered 1000' North of the South 1/4 corner with respect to section 36.

Heinrichs personnel involved were Marcel LeDuc--party chief, Gene Juarez and John Beeler, technical assistants.

Eighty-four gravity stations were surveyed and vertical elevations established with an altimeter by Ron Palmer assisted by George Miguel.

The more diagnostic results were obtained from I.P. data which indicated no significant sulfide mineralization was present.

If new evidence is found to justify continued work in this area, the gravity data should be terrain corrected. The gravity does indicate a major fault or contact striking East-West roughly 250' north of the southern boundary of the West End claim block but has no known associated mineralization. Based on the geophysical work done to date, no further exploration in this area is recommended.

PayCheck-North Side Area Sections 14, 22, T.17N., R.19W. Mohave County, Arizona

Induced polarization and magnetic surveys were run in this area. Four lines of I.P. with 30,000' of surface coverage giving 20,000' of subsurface plotted data. Dipole separations of 500' were used on a dipole-dipole electrode configuration with frequencies of 0.5 and 3 cycles per second. I.P. Line 1 was a single 5 electrode spread while Lines 2, 3, and 4 were double spreads using nine continuous electrodes. Lines 1, 2, and 3 strike NW-SE and Line 4 intersects 1, 2, and 3 with a NE-SW strike.

Magnetics were run along I.P. lines on 100' stations by Dan Anderson and Ron Palmer. Maximum benefit from this data can be derived from a profile study of gamma variation in conjunction with the geology.

I.P. data indicated a structure containing sulfide in the vicinity of electrode 5 on Line 3. The feature is narrow and may average one percent sulfide by volume. Low resistivities have made interpretation difficult, but no extention of this feature was noted on Lines 2 or 4, and no follow up work is recommended.

I.P. Line 1 has sulfide indications, but due to low resistivity and high noise levels, the indications are considered indicative of only minor concentrations at best. This is further suggested because the NE end of Line 4 intersects Line 1 but does not show similar anomalism, and the anomalism does not show on Line 2 which is parallel and 2000' to the southeast. Based on geophysical results to date no further work is recommended in this area.

PROCEDURES

Induced Polarization

Selections of 500' and 1000' dipole separations were made to maximize ground coverage per unit time, data resolution and probability of locating economically sized sulfide bodies within about 1200' of the surface.

The induced polarization measurements were made with the dual frequency technique on a dipole-dipole electrode configuration. On lines 1, 2, 3, 4, 5, 6, 7, 8, 13, 14, and 15 the two frequencies used were 0.05 and 3.0 cycles per second at a power level of 2 amps at 400 volts. On Lines 17 and 18, 0.05 and 1.0 cycles per second were the frequencies used, the latter to reduce electromagnetic inductive coupling interference. An increased power level of 8 amps at 500 volts was also used on Lines 17 and 18. Resultant data are compiled on sectional data sheets, one for each line, showing apparent resistivity in ohm feet, percent frequency effect (PFE) and metallic conduction factor (MCF) contoured in section with a logrithmic contour interval. An induced polarization location and interpretation plan composite also showing magnetics in contour form aided the interpretation and presentation.

HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

BASIS OF THE INDUCED POLARIZATION METHOD

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

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

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

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

Almost all metallic lustered sulfides such as for example; pyrite, chalcopyrite, chalcocite, bornite and molybdenite are electronic conductors and the rocks and ground water, with which they permeate or are permeated, are ionic conductors, therefore if an electric current is made to flow through a sulfide deposit, it will polarize and can be detected by the three methods described above.

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

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

FIELD TECHNIQUES AND INTERPRETATION

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

The two frequencies we most commonly use are 0.05 and 3.0 cycles per second, respectively or so called "D.C." and "A.C." modes. Other frequencies are available with our equipment and are occasionally used when desired. The usual frequency range used is from about 0.01 cps. to 10 cps. The lower frequency limit is due to naturally existing time varying Telluric (earth) currents and

electrode polarization. The upper limit is determined by electro-magnetic coupling effects which increase rapidly with increasing frequency.

In our standard reconnaissance field practice, five equally spaced co-linear current electrodes are placed in the ground by burying aluminum foil in pits wetted with brine. Observations are made in accordance with a symmetrical dipole-dipole configuration where the distance between the receiver or potential electrodes is kept equal to the distance between adjacent electrode pairs. Generally the receiving dipole is separated by one to six dipole units ("n" separation) from the sending dipole. Figures 1 and 2 indicate this configuration and resulting data plotting positions. A precisely controlled square wave current is sent through a sending dipole at 0.05 and 3.0 cycles per second from which, at the receiving dipole, a "D.C." and an "A.C." voltage are measured, respectively. By knowing the geometry involved (the dipole length or spacing and the separation distance between the two receiving-sending dipole pairs), along with the two voltages, an apparent "D.C." and an "A.C." resistivity can be calculated. From these apparent resistivities, their percentage difference is determined, thus giving the Percent Frequency Effect (PFE). A third quantity proportional to PFE and inversely proportional to "D.C." resistivity, called Metallic Conduction Factor (MCF) is computed in order to somewhat normalize PFE for variations in ground conductivity purely as a technical interpretational aid. Formulas for these various quantities are given on Figure 3.

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

In general, the greater the dipole spacing and "n" separation, the greater the depth penetration and the less

the resolution. A rule of thumb used in practice is that, with a good contrast of electrical properties, using the symmetrical - co-linear dipole-dipole system, and having data from 1 through 6 in "n" separations, two times the dipole length is the maximum depth of detectable penetration, and 0.2 times the dipole length is about the minimum depth of detectable penetration for a body having two or three of its dimensions large in relation to the dipole spacing. However, a body having two or three of its dimensions less than the dipole spacing, and buried more than one spacing probably will not be detectable. A zone, regardless of orientation, having a dimension less than 0.1 the dipole spacing will not likely be detectable. Also, zones differing by less than about 30% in electrical conductivity will not be very easily resolved by resistivity measurements, but may still be detected if a polarization contrast exists.

To illustrate the above in more concrete terms, consider a dipole spacing of 1,000 feet for the following: An overburden of more than 2,000 feet would likely not allow enough current penetration into bedrock to detect even a large and highly mineralized zone in the bedrock. Also, a sulfide zone lying completely within 200 feet of the surface generally would not be detected. A spherical or elongated cylindrical body whose top is more than about 1,000 feet below surface and whose diameter is much less than 1,000 feet would be just out of the range of detectability. A Dike-like or sill-like zone whose width is less than 100 feet probably would not be detected regardless of how it lies relative to the spread.

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

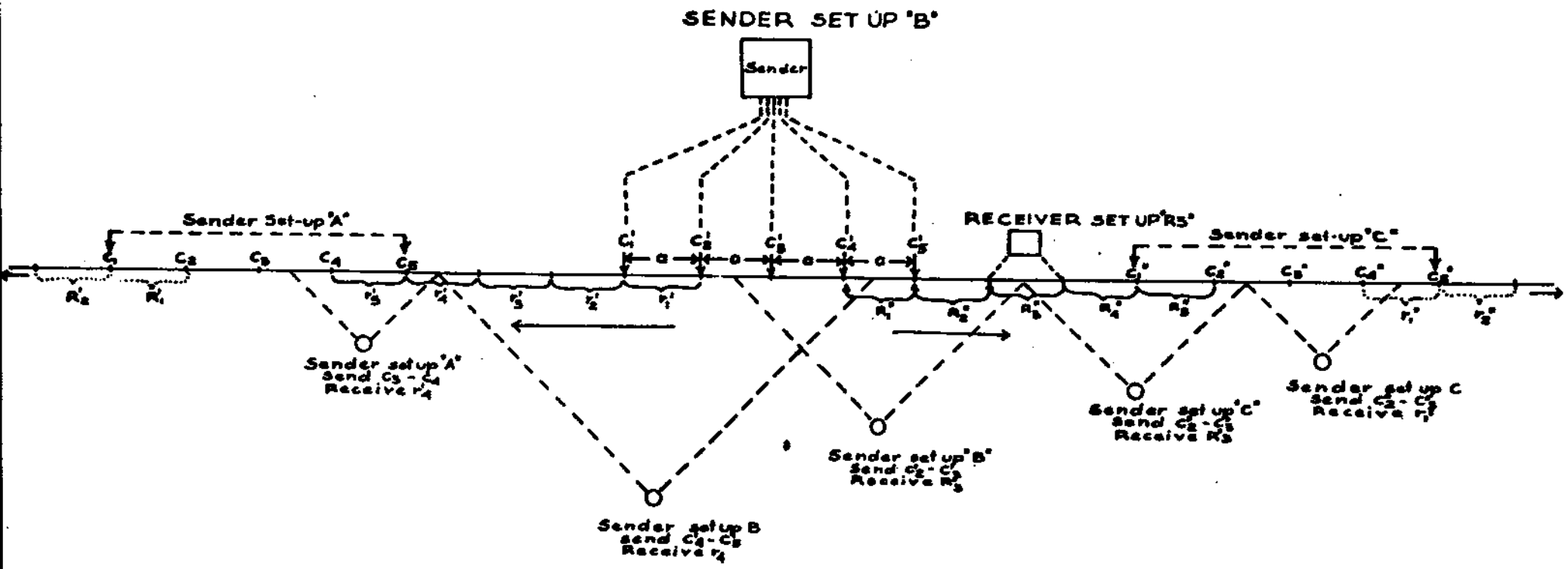
The field data are interpreted after plotting the PFE, MCF and resistivity as in Figures 1 and 2. These values are then contoured, the resistivity and metallic conduction factor logarithmically (because of the usual large variations in magnitude) and the percent frequency effect on a constant interval.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

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

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

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

Figure 1



Schematic diagram illustrating the method of obtaining and plotting Dipole-Dipole I. P. data. Diagram shows three separate current electrode spreads along a traverse line. In normal procedure, there are three dipole separations between current electrode spreads. The receiver setups are moved outwards from the ends of each current electrode spread usually until three dipole spacings separate the potential electrode setup from the near end of the spread. Current is "sent" to each possible pair of electrodes for each receiver setup. For instance, in Sender setup "B" when the receiver is receiving at R_1 only $C_3' - C_2'$ and $C_2' - C_1'$ can be "sent" so that data at 1 and 2 dipole separations is obtained respectively. When the receiver is at R_5'; $C_5' - C_4'$, $C_4' - C_3'$, $C_3' - C_2'$, and $C_1' - C_2'$ are sent and data is obtained for 3, 4, 5 and 6 dipole separations respectively. Each sender setup provides 33 data points.

Figure 2

(Data obtained from the three setups of Figure 1)

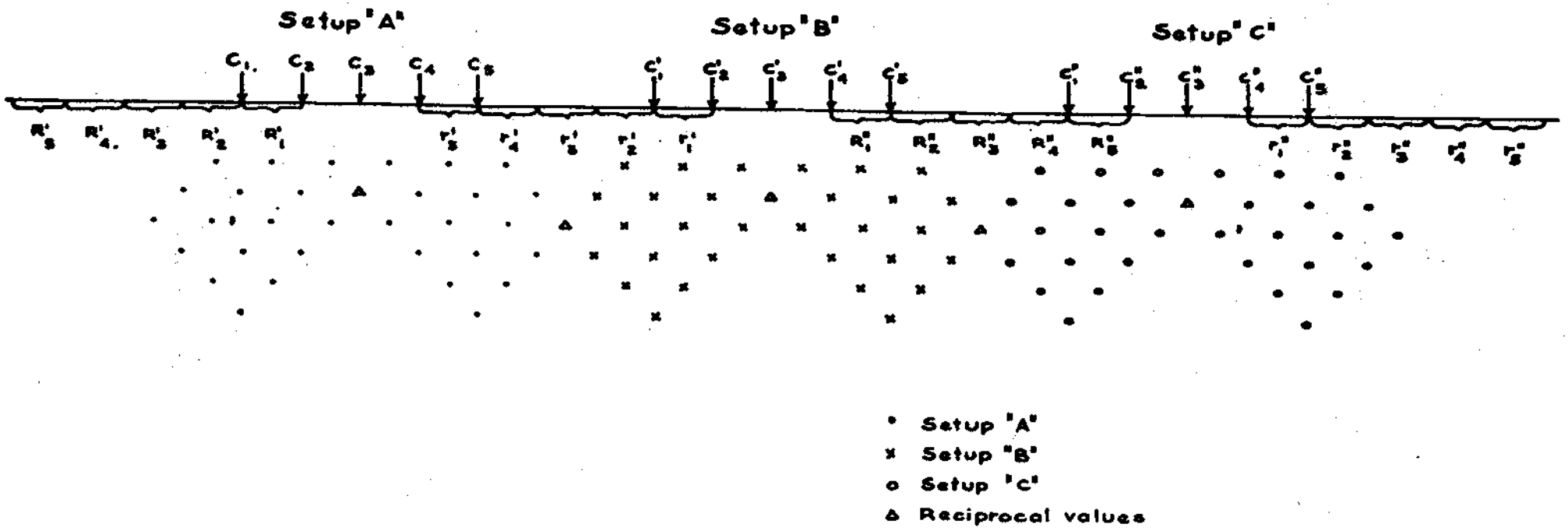


FIGURE 3

$$PFE = \left(\frac{\rho dc}{\rho ac} - 1\right) 100$$

Where PFE is Percent Frequency Effect, ρdc is the apparent resistivity at the lower frequency and ρac is the higher frequency apparent resistivity.

$$\rho = \frac{2\pi V}{I} Kn$$

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

$$Kn = \frac{an(n+1)(n+2)}{2}$$

(Only for dipole-dipole arrays)

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

$$\rho = \frac{2\pi V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

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

$$\frac{\rho}{2\pi} = \frac{V}{I} Kn = \frac{V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

$$MCF = \frac{PFE}{\rho dc/2\pi} \times 1000$$

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

INDUCTIVE COUPLING INTERFERENCE

If $a(n+1)\sqrt{\frac{f}{\rho/2\pi}}$ is less than 1000 then the inductive coupling false frequency effect will be less than 2.5%. Likewise if less than 1500 the false effect will be less than 5%, and if less than 2000, the false effect will be less than 10%. Frequency f is in cycles per second.

Magnetic Procedures

Magnetic data were obtained using a fluxgate vertical intensity Jalander magnetometer with a sensitivity of +/-20 . Primary lines were observed running North-South and labeled I through XIV, with East-West lines labeled A through F joining and tieing the ends of each primary line.

Primary lines were spaced 1500' apart with stations each 100' along the line except where more detail was desired, then the line spacing was reduced to 300 and 400' as shown on the magnetic plan map No. 5. Magnetic data has also been presented in profile form to aid interpretation. Diurnal drift was noted by checking back to a base station three times per day. No magnetics was observed in the West End Area. In the North Side-Paycheck Area, limited magnetic coverage over the I.P. lines 1, 2, 3 on 100' spacing was observed.

Gravity Procedures

A worden gravity meter with a scale constant of 0.09760 milligals per scale division was used for the survey. All computations were based on a density factor of 2.65 grams per c.c. Vertical control was obtained by dual altimeters taking simultaneous readings at stations along the line. Combined Bouguer and free air and latitude and drift corrections were figured in the computations, but no terrain or tidal corrections were made. If gravity results prove helpful in the Don-Matilda Area, more elaborate gravity computation and vertical control techniques might eventually be justified. No gravity readings were taken in the North Side-PayCheck Area.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

E. Grover Heinrichs
Vice President

APPROVED: _____
Walter E. Heinrichs, Jr.

February 17, 1966

GEOPHYSICAL INVESTIGATIONS
DON-MATILDA, NORTH SIDE, SCOOTER, PAYCHECK, AGUA DE ORO, FINGER, LIL, CALIENTE, WEST SIDE, UNPATENTED MINING CLAIM GROUPS, MOHAVE COUNTY, ARIZONA

For

Arkla Exploration Company

February 1966

By

Heinrichs Geoexploration Company
P. O. Box 5671 Tucson, Arizona

Don Matilda line 5 6 7 8 17 18

TABLE OF CONTENTS

	PAGE NO.
INTRODUCTION	1
INTERPRETATION, RECOMMENDATION & CONCLUSIONS	1
Don-Matilda Area	1
West End Area	2
PayCheck-North Side Area	3
Procedures	3
Induced Polarization	3
Basis of I. P.	4a
Magnetic Procedures	5
Gravity Procedures	5

MAPS IN POCKET:

Don-Matilda Area
I.P. Sectional data sheets, Lines ~~1-8~~ 5-8 and ~~13-18~~ 17 & 18
West End Area
I.P. Sectional data sheets, Lines 13, 14, 15, and 16
North Side Area
I.P. Sectional data sheets, Lines 1-4

Map No. 1	~~Composite~~ Geophysical G.P. location	1"=1000'
2	Elevations by Altimeter Don-Matilda	1"= 500'
3	Bouguer Gravity Profiles Don-Matilda	1"= 500'
4	Bouguer Contour Gravity, Don-Matilda	1"= 500'
5	Magnetic Data Don Matilda	1"= 500'
6	Composite Contour Sketch Map	1"= 500'
7	Don Matilda Mag Profiles	V 1"= 500
	E-W Secondary Lines	H 1"= 500'
8	Don Matilda Mag Profiles	V 1"= 500
	North-South Primary Lines	H 1"= 500'

Following not included here, previously submitted to Arkla:

9	PayCheck Area Mag Profiles	V 1"= 500
		H 1"= 500'
10	West End East Gravity Contour	1"= 500'
11	West End West Gravity Contour	1"= 500'
12	West End East Elevation Map	1"= 500'
13	West End West Elevation Map	1"= 500'
14	West End Gravity Profiles Lines 1, 4, 5, and 6	
15	West End Gravity Profiles Lines 11, 12, 13, 14, & 9	

INTRODUCTION

At the request of Mr. M. L. Pugh, chief geophysicist of Arkla Exploration Company, Heinrichs Geoexploration Company conducted 18.4 miles of manual portable vertical intensity magnetic surveys totaling 974 stations, 9.9 miles of gravity totaling 266 stations, and 21.2 miles of induced polarization (I.P.) resistivity surveys totaling spreads in the area of Don-Matilda claim group which included the following other claim names all part of a contiguous group: Scooter, Lil, Ted, Finger, Caliente, and Bill.

Two areas, one the Paycheck-Northside claim group and the West End claim group area commented on separately.

Geoex personnel assigned to this project were Marcel LeDuc, party chief later replaced by Dan Anderson, Ron Palmer--gravity and magnetic operator, George Miguel, Gene Juarez, and John Beeler, assistants.

Data were analyzed and interpreted by E. Grover Heinrichs, Chris S. Ludwig, senior geophysicist, and John Langs, geophysicist.

Copies of resultant data were submitted on a weekly basis as work was being done. This report compiles all the data the results of which, are listed here in the Table of Contents.

INTERPRETATION, RECOMMENDATIONS, AND CONCLUSIONS

Don-Matilda Area Sections 8, 9, 10, 15, 16, 17, T.17N. R.19W. Mohave County, Arizona

On the Don-Matilda-Scooter-Caliente Area, some moderate induced polarization effects were observed between 5500' west and 1500 east on Line 17 and from 500' west to 2000' east on Line 18, the eastern portion of the anomalism is still open ended.

This anomalism may be due to sulfide mineralization of about one percent total sulfide by volume with a slight increase with depth or may be due to a combination of coupling, resistivity, or geometric effects and therefore not necessarily related to sulfides. It does, however, correlate with a projected gravity high indicating denser and/or shallower material.

The proximity of some past minor gold mineralization in the general area enhances any significant though weak

mineralization and two drill holes to be drilled to a depth of 1000' and located in the NW 1/4 of Section 17 T.17N., R19W., Mohave County, Arizona have been recommended to explain the feature.

Additional very weak I.P. effects have been observed on Line 7 between electrodes 1 and 2 North, where a dike like structure does correlate with the magnetics.

Additional geologic work or I.P. using shorter dipole spacing of perhaps 100' to 200' could better localize this feature for picking drill sites.

If the I.P. effects on I.P. Line 7 should prove to be near an area of geologic interest, then other similar though weaker indications also warrant further investigation using both I.P. and geology, and later, based on results of the geology and geophysics, some shallow drilling may be indicated. These weaker zones are located on I.P. Line 6 at electrode 2 North and on I.P. Line 5 at electrode 4 North.

Additional correlation between the existing magnetics and the known geology will be necessary to derive full benefit from the magnetic data. This could be accomplished by comparing existing data at the same scale. For example, map #6 - Scale 1"=500', would be ideal to compare with known geology at the same scale.

West End Area T.17N., R.19W., Section 35 and 36 Mohave County, Arizona

Gravity and induced polarization surveys were run in this area. Four I.P. lines consisting of 24,000' surface coverage giving 14,000' of subsurface plotted data were run on 500' spacings utilizing dipole-dipole electrode configuration with frequencies of 0.5 and 3 cycles per second. Lines 13, 14, and 15 strike North-South and lie on the west boundaries of claim WE-5, WE-3, and WE-1 respectively. Line 16 strikes East-West and is centered 1000' North of the South 1/4 corner with respect to section 36.

Heinrichs personnel involved were Marcel LeDuc--party chief, Gene Juarez and John Beeler, technical assistants.

Eighty-four gravity stations were surveyed and vertical elevations established with an altimeter by Ron Palmer assisted by George Miguel.

The more diagnostic results were obtained from I.P. data which indicated no significant sulfide mineralization was present.

If new evidence is found to justify continued work in this area, the gravity data should be terrain corrected. The gravity does indicate a major fault or contact striking East-West roughly 250' north of the southern boundary of the West End claim block but has no known associated mineralization. Based on the geophysical work done to date, no further exploration in this area is recommended.

PayCheck-North Side Area Sections 14, 22, T.17N., R.19W.
Mohave County, Arizona

Induced polarization and magnetic surveys were run in this area. Four lines of I.P. with 30,000' of surface coverage giving 20,000' of subsurface plotted data. Dipole separations of 500' were used on a dipole-dipole electrode configuration with frequencies of 0.5 and 3 cycles per second. I.P. Line 1 was a single 5 electrode spread while Lines 2, 3, and 4 were double spreads using nine continuous electrodes. Lines 1, 2, and 3 strike NW-SE and Line 4 intersects 1, 2, and 3 with a NE-SW strike.

Magnetics were run along I.P. lines on 100' stations by Dan Anderson and Ron Palmer. Maximum benefit from this data can be derived from a profile study of gamma variation in conjunction with the geology.

I.P. data indicated a structure containing sulfide in the vicinity of electrode 5 on Line 3. The feature is narrow and may average one percent sulfide by volume. Low resistivities have made interpretation difficult, but no extention of this feature was noted on Lines 2 or 4, and no follow up work is recommended.

I.P. Line 1 has sulfide indications, but due to low resistivity and high noise levels, the indications are considered indicative of only minor concentrations at best. Thi is further suggested because the NE end of Line 4 intersects Line 1 but does not show similar anomalism, and the anomalism does not show on Line 2 which is parallel and 2000' to the southeast. Based on geophysical results to date no further work is recommended in this area.

PROCEDURES

Induced Polarization

Selections of 500' and 1000' dipole separations were made to maximize ground coverage per unit time, data resolution and probability of locating economically sized sulfide bodies within about 1200' of the surface.

The induced polarization measurements were made with the dual frequency technique on a dipole-dipole electrode configuration. On lines 1, 2, 3, 4, 5, 6, 7, 8, 13, 14, and 15 the two frequencies used were 0.05 and 3.0 cycles per second at a power level of 2 amps at 400 volts. On Lines 17 and 18, 0.05 and 1.0 cycles per second were the frequencies used, the latter to reduce electromagnetic inductive coupling interference. An increased power level of 8 amps at 500 volts was also used on Lines 17 and 18. Resultant data are compiled on sectional data sheets, one for each line, showing apparent resistivity in ohm feet, percent frequency effect (PFE) and metallic conduction factor (MCF) contoured in section with a logrithmic contour interval. An induced polarization location and interpretation plan composite also showing magnetics in contour form aided the interpretation and presentation.

Magnetic Procedures

Magnetic data were obtained using a fluxgate vertical intensity Jalander magnetometer with a sensitivity of +/-20 . Primary lines were observed running North-South and labeled I through XIV, with East-West lines labeled A through F joining and tieing the ends of each primary line.

Primary lines were spaced 1500' apart with stations each 100' along the line except where more detail was desired, then the line spacing was reduced to 300 and 400' as shown on the magnetic plan map No. 5. Magnetic data has also been presented in profile form to aid interpretation. Diurnal drift was noted by checking back to a base station three times per day. No magnetics was observed in the West End Area. In the North Side-Paycheck Area, limited magnetic coverage over the I.P. lines 1, 2, 3 on 100' spacing was observed.

Gravity Procedures

A worden gravity meter with a scale constant of 0.09760 milligals per scale division was used for the survey. All computations were based on a density factor of 2.65 grams per c.c. Vertical control was obtained by dual altimeters taking simultaneous readings at stations along the line. Combined Bouguer and free air and latitude and drift corrections were figured in the computations, but no terrain or tidal corrections were made. If gravity results prove helpful in the Don-Matilda Area, more elaborate gravity computation and vertical control techniques might eventually be justified. No gravity readings were taken in the North Side-PayCheck Area.

Respectfully submitted,

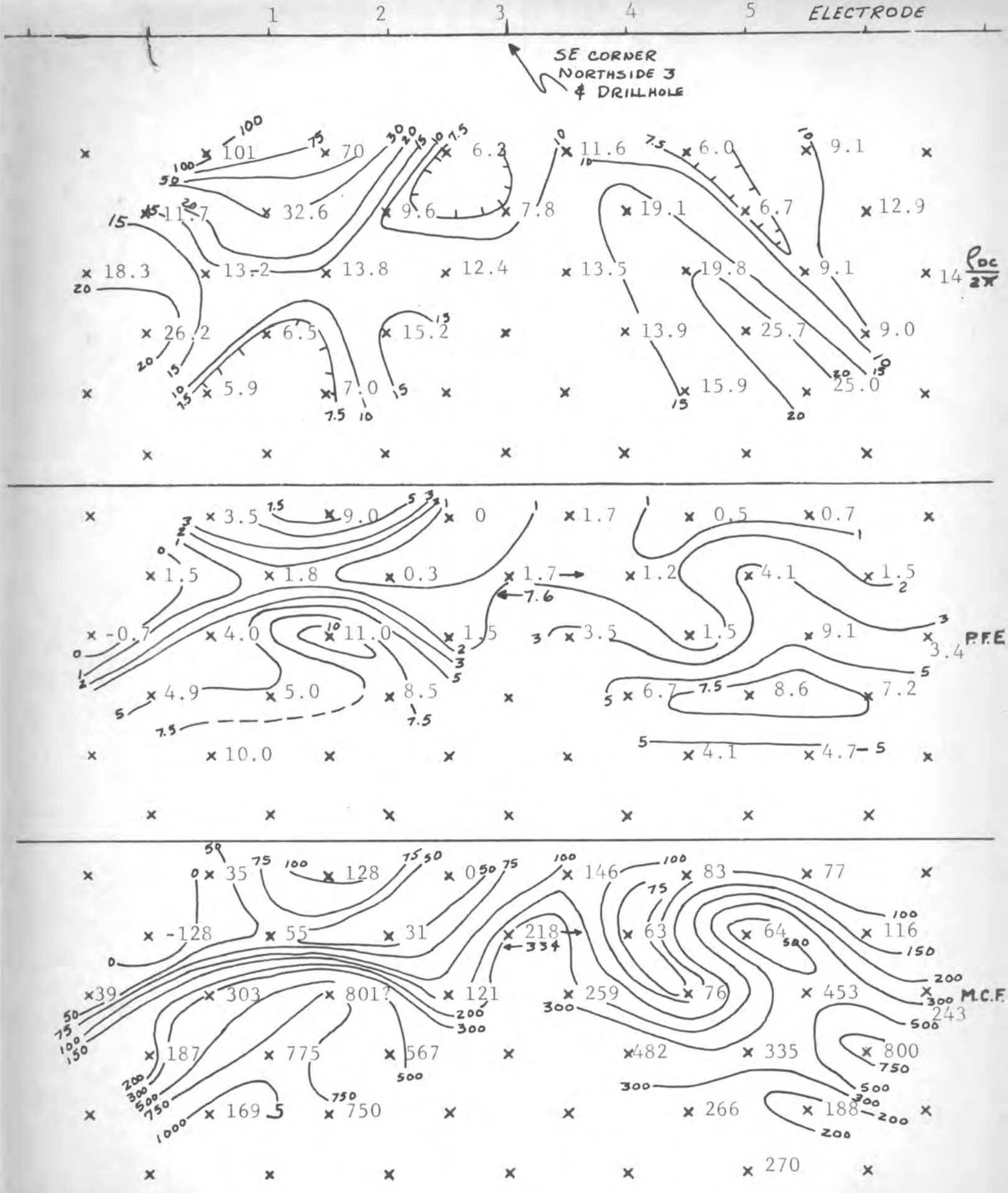
HEINRICHS GEOEXPLORATION COMPANY

E. Grover Heinrichs
Vice President

APPROVED: Walter E. Heinrichs, Jr.

February 17, 1966

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NE

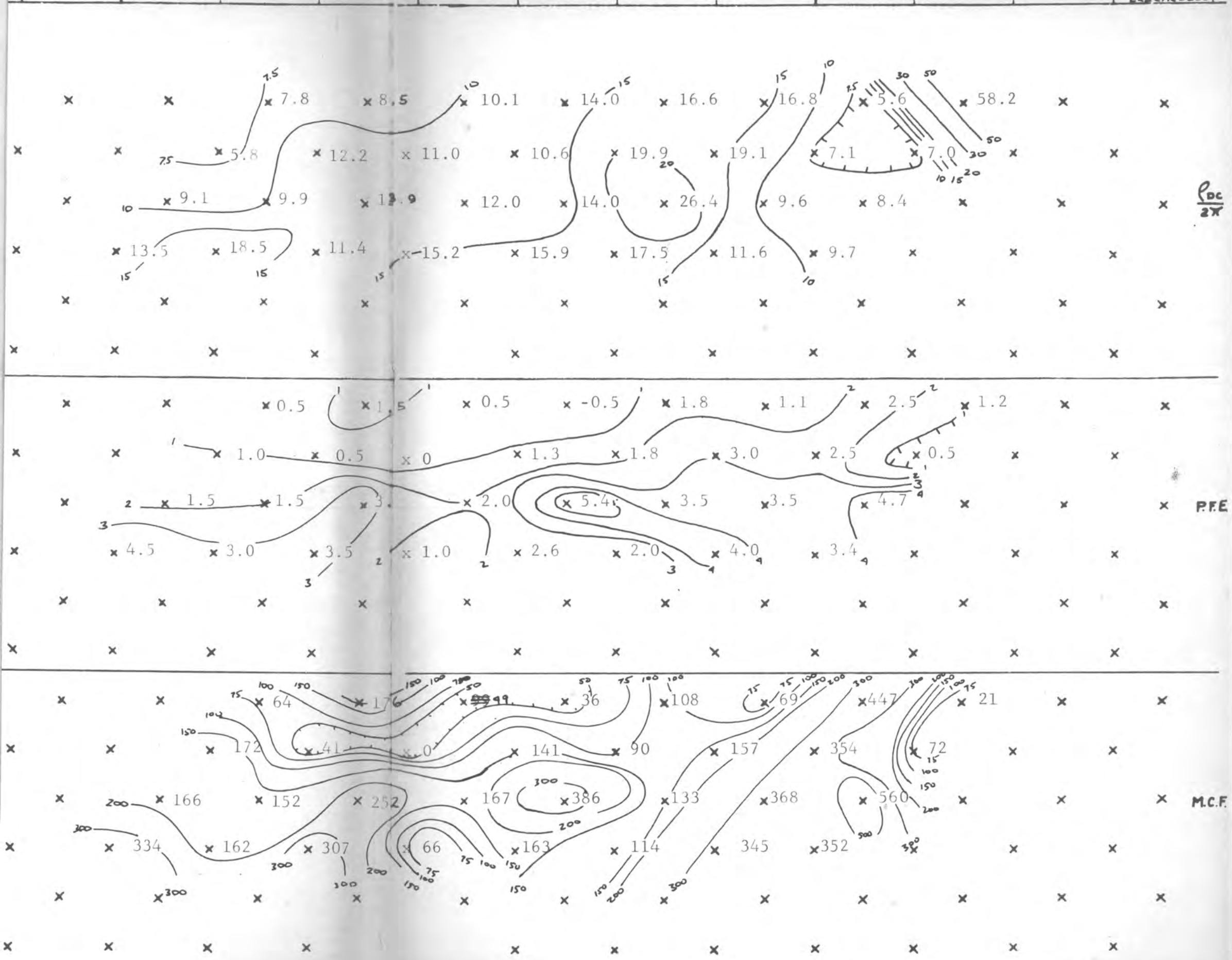


ARKLA

AREA NORTHSIDE CLAIMS LINE 1 a = 500' SCALE: 500' = 1" DATE: 10-23-64

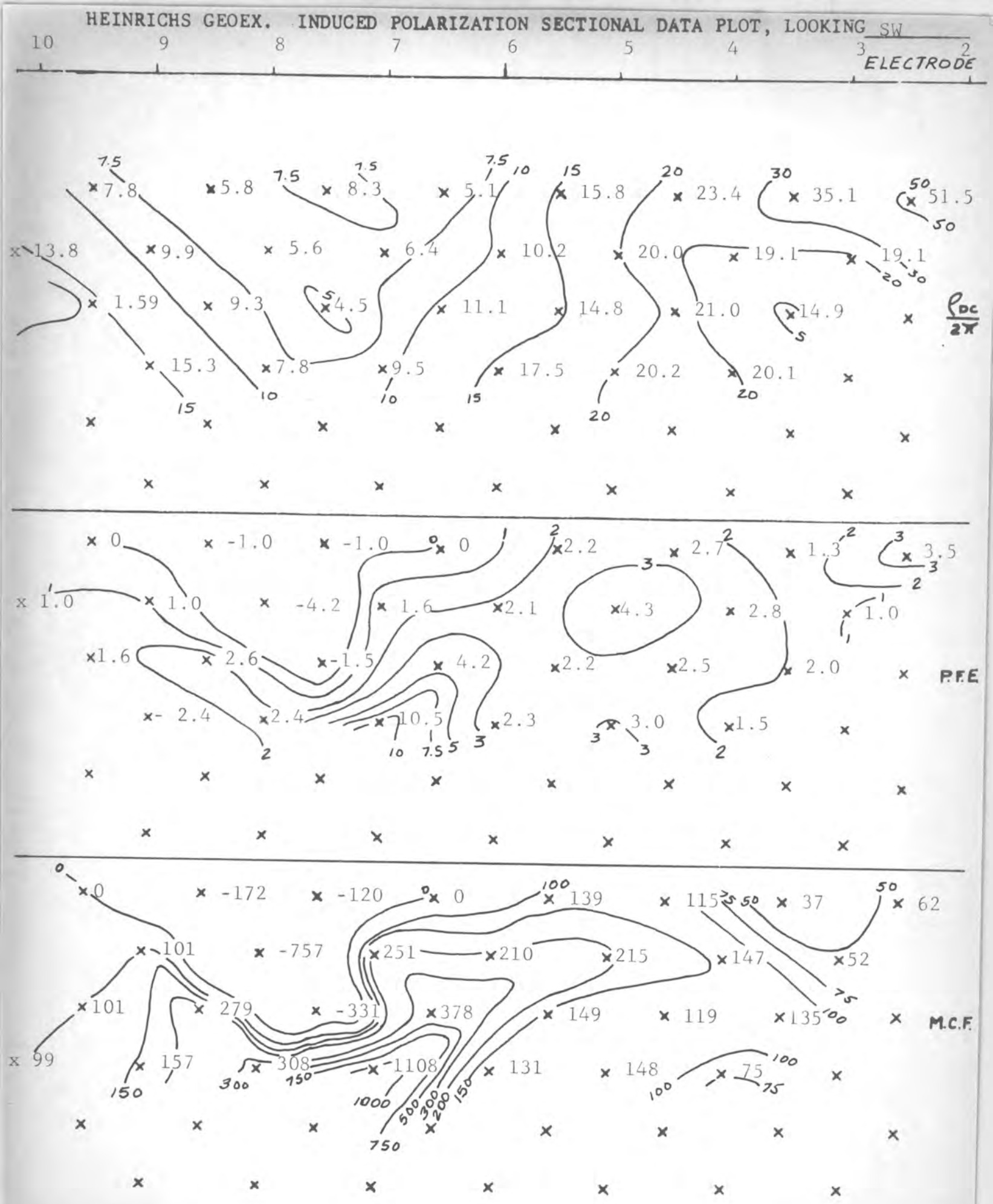
POLARIZATION SECTIONAL DATA PLOT, LOOK

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING SW



a = ' SCALE: AREA ARKLA PAYCHECK LINE 2 a = 500 ' SCALE: 1"=500' DATE: 1-27-64

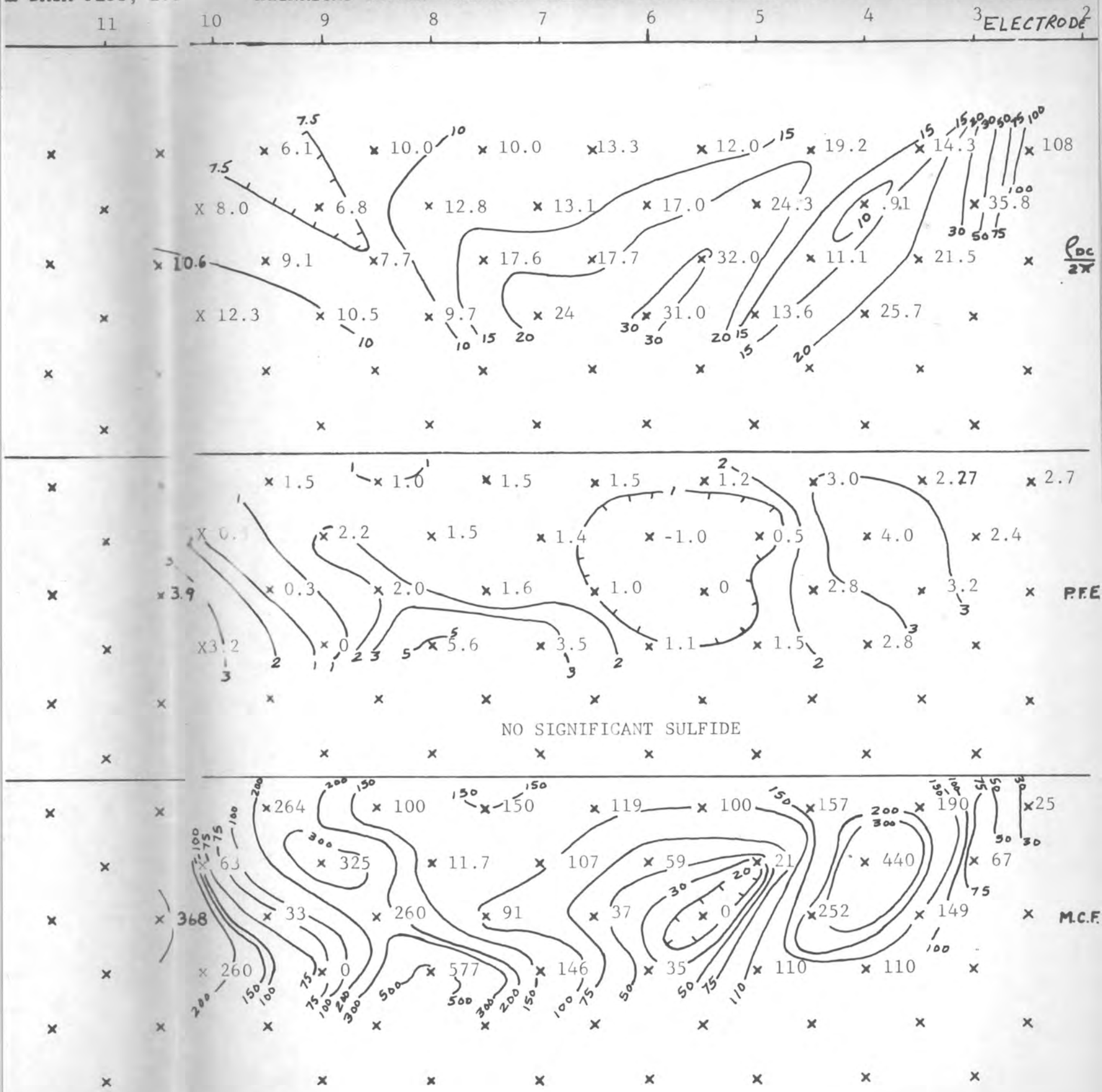
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING SW



AREA ARKLA PAYCHECK LINE 3 a = 500' SCALE: 1"=500' DATE: 10-29-64

⊥ DATA PLOT, LOC

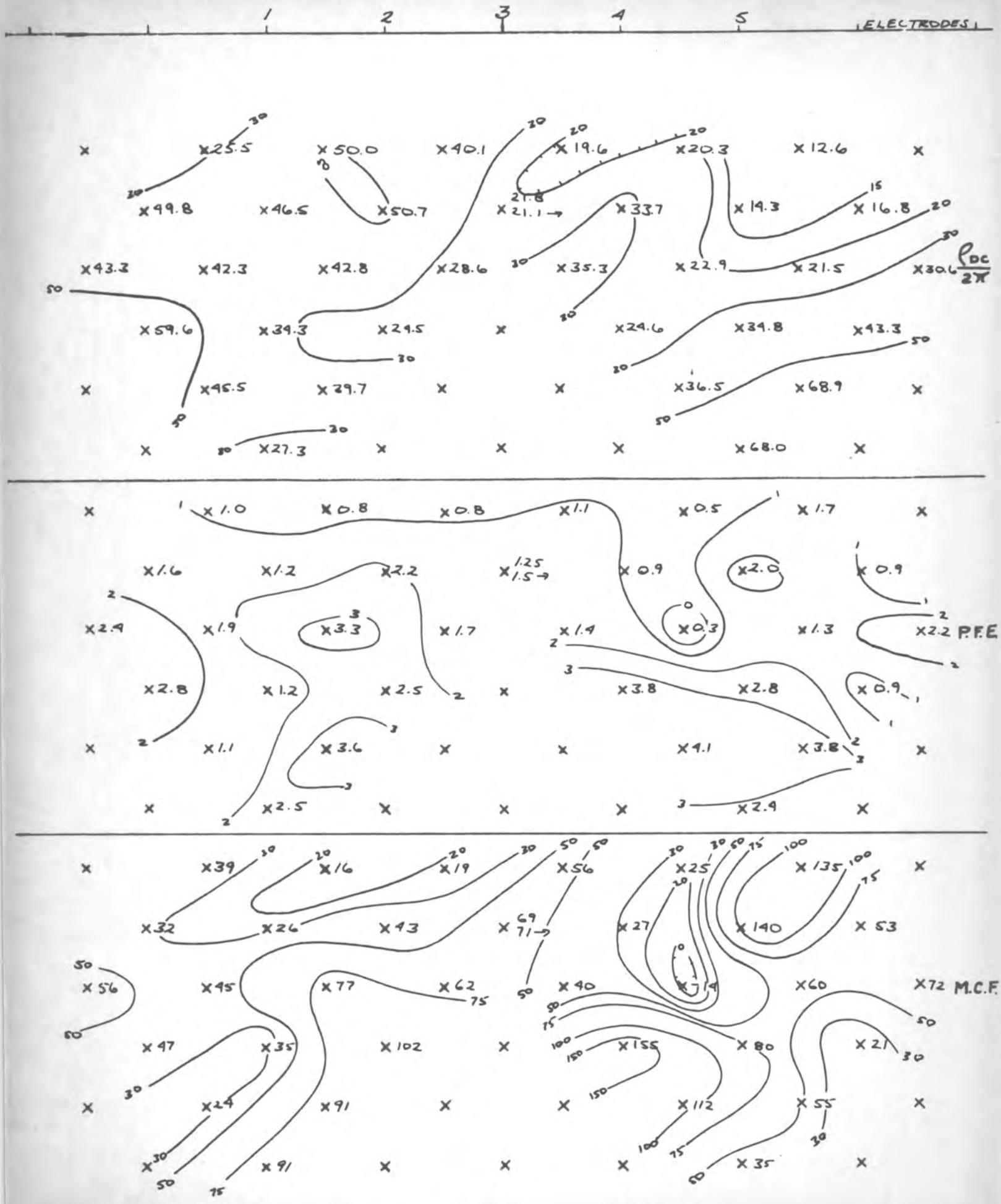
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW



ARKLA

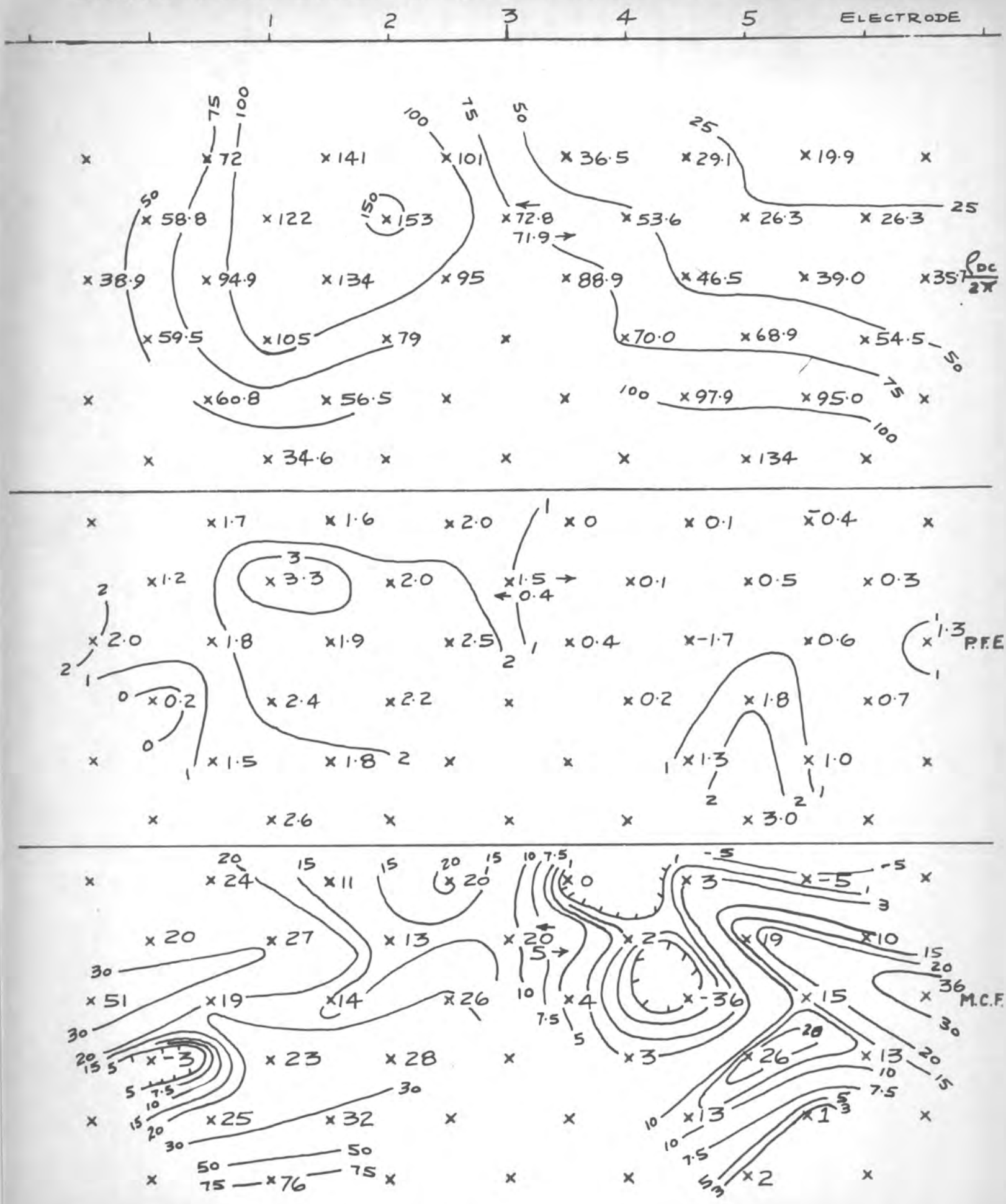
ALE: _____ AREA PAYCHECK-N.SIDE LINE 4 a = 500 ' SCALE: 1"=500' DATE: 11-3-64

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West



AREA ARKLA WEST END LINE 13 a = 500' SCALE: 1"=500' DATE: 12-3-64

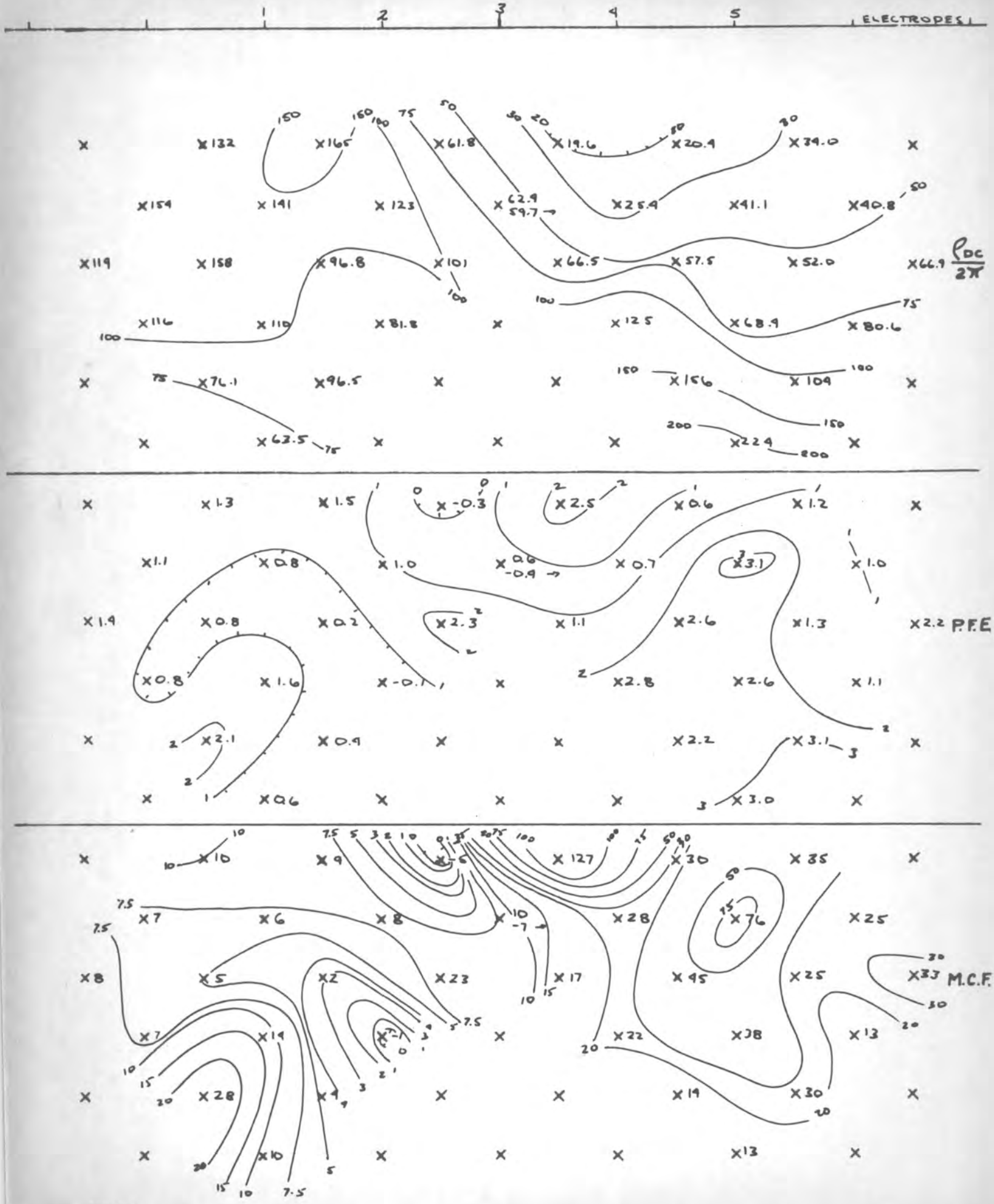
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING WEST



ARKLA

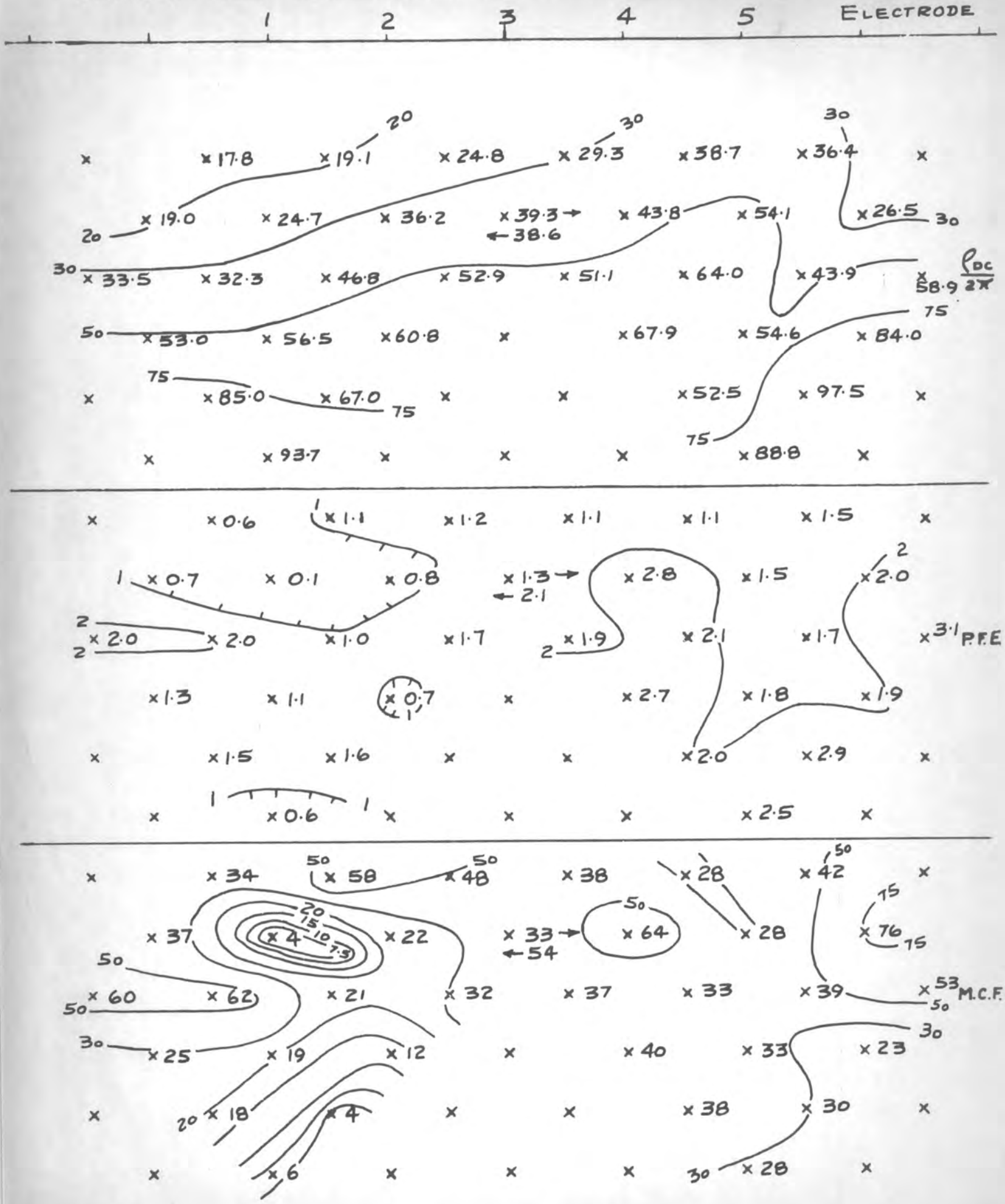
AREA WEST END LINE 14 a = 500' SCALE: 1" = 500' DATE: 12-5-64

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING W



AREA ARKLA WEST END LINE 15 a = 500' SCALE: 1" = 500' DATE: 12-8-69

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NORTH



AREA ARKLA WEST END LINE 16 a = 500' SCALE: 1" = 500' DATE: 12-11-64

(1)

GEOPHYSICAL INVESTIGATIONS

DON-MATILDA, NORTH SIDE, SCOOTER,

PAYCHECK, AGUA DE ORO, FINGER, LIL,

Caliente, WEST SIDE, UNPATENTED MINING CLAIM

GROUPS, MOHAVE COUNTY, ARIZONA

For

ARKLA EXPLORATION COMPANY

January 1966

By

HEINRICHS GEOEXPLORATION COMPANY

P. O. Box 5671 Tucson, Arizona

TABLE OF Contents

	Page No.
Introduction	1
Interpretation Conclusions & Recommendations	1
DON-MATILDA AREA	2
West END AREA	3
NORTH SIDE - Paycheck	4
Procedures	
~~Magnetic~~ I.P.	5
~~Gravity~~ Magnetic	6
~~[illegible]~~ Gravity	6
DON - MATILDA AREA	
~~Interpretation~~ I.P. Sectional data sheets	
Lines 1 thru 8 & 13 thru 18	
~~[illegible]~~ WEST END AREA	
I.P. Sectional DATA SHEETS	
LINES 13, 14, 15, 16	
~~[illegible]~~ NORTH SIDE AREA	
I.P. Sectional data sheets Lines 1 thru 4	
MAPS IN Pocket	

		Scale
MAP #	1 — Composite G.P. Location	1"=1000'
"	2 — Elevations by Altimeter DON MATILDA	1"=500'
"	3 — Bouguer Gravity Profiles DON MATILDA	1"=500'
	4 — Bouguer Gravity contour Don Matilda	1"=500'
	5 — Magnetic DATA Don Matilda	1"=500'
	6 — Composite Don Matilda contour SKETCH MAP	1"=500'
	7 — DON MATILDA MAG PROFILES E-W Secondary LINES	V 1"=500γ H 1"=500'
	8 — DON MATILDA MAG profiles NORTH - South Primary LINES	V 1"=500γ H 1"=500'
	9 — Paycheck AREA Mag~~netic~~ profiles ~~(Not included previously sent)~~	V 1"=500γ H 1"=500'
	10 — West End EAST Gravity contour	1"=500'
	11 — " " WEST " "	
	12 — " " EAST Elevation map	"
	13 — " " WEST " "	"
	14 — " " Gravity Profiles Lines 1, 4, 5, 6	
	15 — " " Gravity Profiles " 11, 12, 13, 14, 9	

not included here ~~this report because~~ (previously submitted to ARKLA)

INTRODUCTION

At the request of Mr. M. L. Pugh, chief geophysicist of Arkla Exploration Company, Heinrichs Geoexploration Company conducted 18.4 miles of manual portable ~~hand~~ vertical intensity magnetic surveys, ~~totalling~~ totaling 974 stations, ~~and~~ 9.9 miles of gravity totaling 266 stations, and 21.2 miles of induced polarization resistivity surveys totaling (12) spreads in the area ~~known as~~ of Don-Matilda Claim group which included the following other claim names ~~and were~~ all part of a contiguous group: Scooter, Lil, Ted, Finger, Caliente, and Bill.

Two areas, one ~~known as~~ the Paycheck--Northside claim group and ~~the other as~~ the West End claim group are ~~a part of this report and are~~ commented on separately. ~~in the Interpretation Conclusions and Recommendations~~.

Geoex personnel assigned to this project were Marcel Leduc, party chief later replaced by Dan Anderson, Ron Palmer, gravity and magnetic operator, George Miguel, Gene Juarez, and John Beeler, assistants.

Data were analyzed and interpreted by E. Grover Heinrichs, and Chris S. Ludwig, senior geophysicist and John Langs, geophysicist.

Copies of resultant data were submitted on a weekly basis as work was being done. This report compiles all the data the results of which, are listed here in the Table of Contents.

INTERPRETATION, CONCLUSIONS AND RECOMMENDATIONS

<u>Don-Matilda Area</u> Sections 8,9,10,15,16,17, T.17N,R19W. Mohave County, Ariz.

On the Don-Matilda-Scooter-(Caliente Clint) Area, some moderate induced polarization effects were observed between 5500' west and 1500' east on Line 17 and from 500' west to 2000' east on Line 18, the eastern portion of the anomalism is still open ended.

This anomalism may be due to sulphide mineralization of about

1% total sulphide by volume with a slight increase with depth or may be due to a combination of coupling, resistivity, or geometric effects and therefore not necessarily related to sulphides. It does, however, correlate with a projected gravity high indicating denser & or shallower material.

The proximity of some past minor gold mineralization in the general area enhances any significant though weak mineralization and two drill holes to be drilled to a depth of 1000' and located in the NW 1/4 of Section 17 T17N, R.19W, Mohave County, Arizona have been recommended to explain the feature.

Additional very weak I.P. effects have been observed on Line7 between electrodes 1 and 2 north, where a dike like structure does correlate with the magnetics.

Additional geologic work or I.P. using shorter dipole spacing ~~or perhaps using shorter dipole spacing~~ of perhaps 100' to 200' could better localize this feature ~~prior to~~ for picking drill~~ing.~~ sites.

If the ~~strong~~ I.P. effects on I.P. Line 7 should prove to be near an area of geologic interest, ~~significant~~ then other similar though weaker indications also warrant further investigation~~s~~ using both I.P. and geology, and later, based on results of the geology and geophysics, some shallow drilling may be indicated. These weaker zones are located on I.P. Line 6 at electrode 2 North and on I.P. Line 5 at electrode 4 North.

Additional correlation between the existing magnetics and the known geology will be necessary to derive full benefit from the magnetic data. This could be accomplished by comparing existing data at the same scale. For example, ~~such as map~~ # 6-Scale 1"=500', would be ideal to compare with known geology at the same scale.

West End Area T17N, R19W, Section 35 and 36 Mohave County, Arizona

Gravity and induced polarization surveys were run in this area. Four I.P. lines consisting of 24,000' surface coverage ~~[illegible]~~

giving 14,000' of subsurface plotted data were run on 500' spacings utilizing dipole-dipole electrode configuration with frequencies of 0.5 and 3 cycles per second. Lines 13, 14, and 15 strike North-South and lie on the west boundaries of claim WE-5, WE-3 and WE1 respectively. Line 16 strikes East-West and is centered 1000' North of the South 1/4 corner with respect to section 36.

Heinrichs personnel involved were Marcel LeDuc, party chief, Gene Juarez and John Beeler, technical assistants.

Eighty-four 84 gravity stations were surveyed and vertical elevations established with an altimeter by Ron Palmer assisted by George Miguel.

The more diagnostic results were obtained from I.P. data which indicated no significant sulfide mineralization was present.

If new evidence is found to justify continued work in this area, the gravity data should be terrain corrected. The gravity does indicate a major fault or contact striking East-West roughly 250' north of the southern boundary of the West End claim block but has no known ~~significant~~ associated mineralization. Based on the geophysical work done to date, no further exploration in this area is recommended.

<u>PayCheck North Side Area</u> Sections 14, 22, T17N, R19W, Mohave County, ARiz.

Induced polarization and magnetic surveys were run in this area. Four lines of I.P. with 30,000' of surface coverage giving 20,000' of subsurface plotted data. Dipole separations of 500' were used on a dipole-dipole electrode configuration with frequencies of 0.5 and 3 cycles per second. I.P. Line 1 was a single 5 electrode spread while Lines 2, 3 and 4 were double spreads using nine continuous electrodes. Lines 1, 2, and 3 strike NW-SE and Line 4 intersects 1, 2 and 3 with a NE-SW strike.

Magnetics were run along I.P. lines on ~~xxxx~~ 100' stations by Dan Anderson and Ron Palmer. maximum benefit from this data can be de~~livered~~ derived from a profile study of gamma variation in conjunction with the geology.

I.P. data indicated a structure ~~continuing~~ containing sulfide in the vicinity of electrode 5 on Line 3. The feature is narrow and may average ~~contain~~ ~~a~~ one percent sulfide by volume. Low resistivities have made interpretation difficult, but no extention of this feature was noted on Lines 2 or 4, and no follow up work is recommended.

I.P. Line #1 has sulfide indications, but due to low resistivity and high noise levels ~~thixxi~~ the indications are ~~not~~ considered ~~and important~~ indicative of only minor concentrations at best. ~~Interpretable~~ ~~significant as explained below.~~ This is further suggested because

?????

The NE end of Line 4 intersects Line 1 but does not show similar anomalism, & the anomalism does not show on Line 2 which is parallel and 2000' to the southeast, & ~~The anomalism on Line 1, therefore, indicates only minor sulfides at best.~~ Based on geophysical ~~xxxx~~ results to date no further work is recommended in this area.

PROCEDURES

I.P. (INDUCED POLARIZATION)

Selections of 500' and 1000' dipole separations were made to maximize ground coverage per unit time, data resolution and probability of locating economically sized sulfide bodies within about 1200' of the surface.

The induced polarization measurements were made with the dual frequency technique on a dipole-dipole electrode configuration. On Lines 1,2,3,4,5,6,7,8,13,14,15 the two frequencies used were 0.05 and 3.0 cycles per second at a power level of 2 amps at 400 volts, ~~and~~ On lines 17 and 18, 0.05 and 1.0 cycles per second were the

frequencies used, the latter to reduce electromagnetic inductive coupling interference. An increased power level of 8 amps at 500 volts was also used on lines 17 & 18.

Resultant data are ~~presented~~ compiled on sectional data sheets, one for each line, showing apparent resistivity (ρ DK/2π in ohm feet), percent frequency effect (PFE) and metallic conduction factor (MCF) contoured in section with a logrithmic contour interval. ~~and self potential (SP) in profile form.~~ An induced polarization location and interpretation plan composite also showing magnetics in contour form aided the interpretation and presentation.

Insert → (BASIS OF I.P.COMES HERE)

Start new page

MAGNETIC PROCEDURES

Magnetic data were obtained using a fluxgate vertical intensity Jalander magnetometer with a sensitivity of +/-20γ. Primary lines were observed running North-South and labeled I thru XIV, with East-West lines labeled A thru F joining and tieing the ends of each primary line.

Primary lines were spaced 1500' apart with stations each 100' along the line except where more detail was desired, then the line spacing was reduced to 300 & 400' as shown on the magnetic plan map No. 5. Magnetic data has also been presented in profile form to aid interpretation. Diurnal drift ~~for use to aid interpretation~~ was noted ~~determined~~ by checking back to a base station 3 times per day. No magnetics was observed in the West End Area. In the North Side—Paycheck Area, limited magnetic coverage over the I.P. lines 1,2,3, on 100' spacing was observed.

Gravity Procedures

A WORDEN gravity meter with a scale constant of 0.09760 milligals per scale division. All computations were based on a density factor of 2.65 grams per cc. ~~was used for the survey.~~ Vertical control was obtained by dual altimeters taking simultaneous readings at stations along the line. Combined Bouguer and free air and latitude and drift corrections were figured in the computations, but no terrain

or tidal corrections were made. If gravity results prove ~~to be a useful tool~~ helpful in the Don-Matilda Area, more elaborate gravity computation & vertical control techniques might eventually be justified. ~~such as precise vertical control and terrain and tidal corrections~~. No gravity readings were taken in the NorthSide-Paycheck Area.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

E. Grover Heinrichs
Vice President

APPROVED: _____
Walter E. Heinrichs, Jr.

~~Map inventory of 4 Buttes Area~~

~~1.) Geophysical Location and Interpretation Map. Including:~~

~~Sketched magnetic contour Plan~~

~~2.) I.P. Line traced and~~

3.) Inventory 4 Buttes area

1.) Mag contour 200 γ - obsolete

2.) Raw magnetic redings in Plan
Dec 5 - 1964

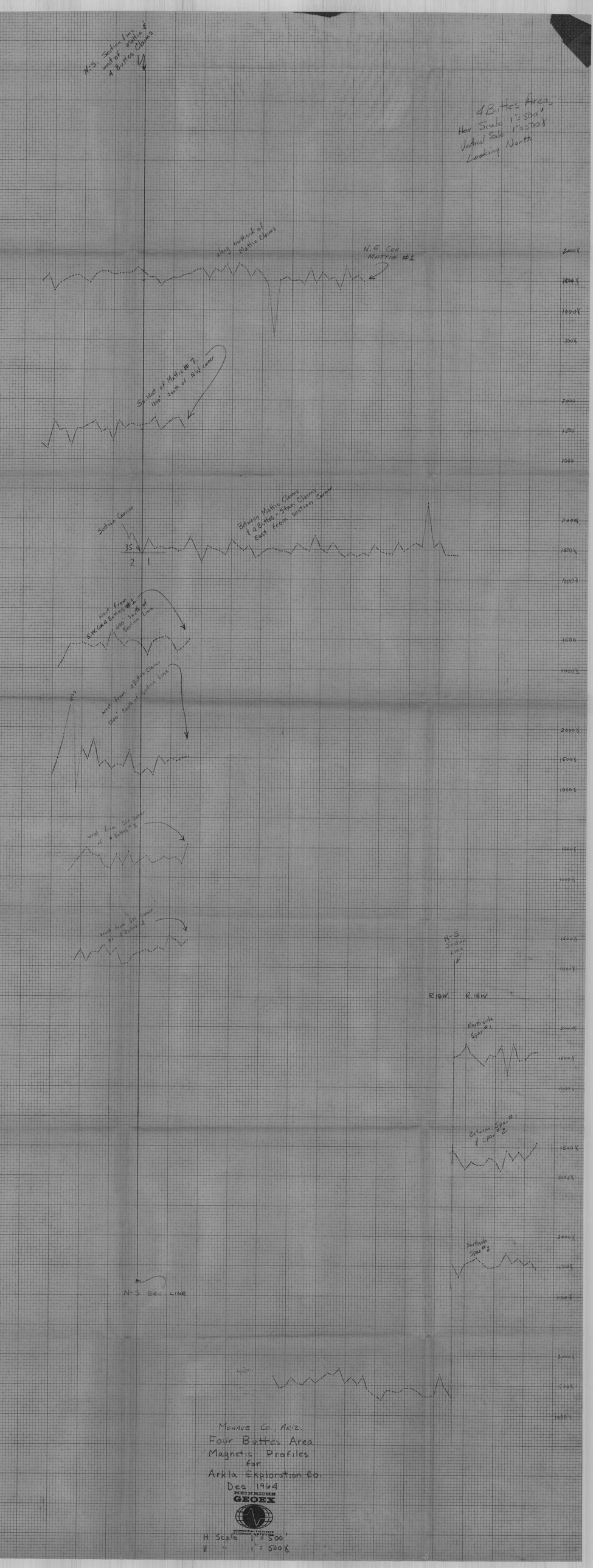
3.) Profile Magnetic 1964 - 2 maps.

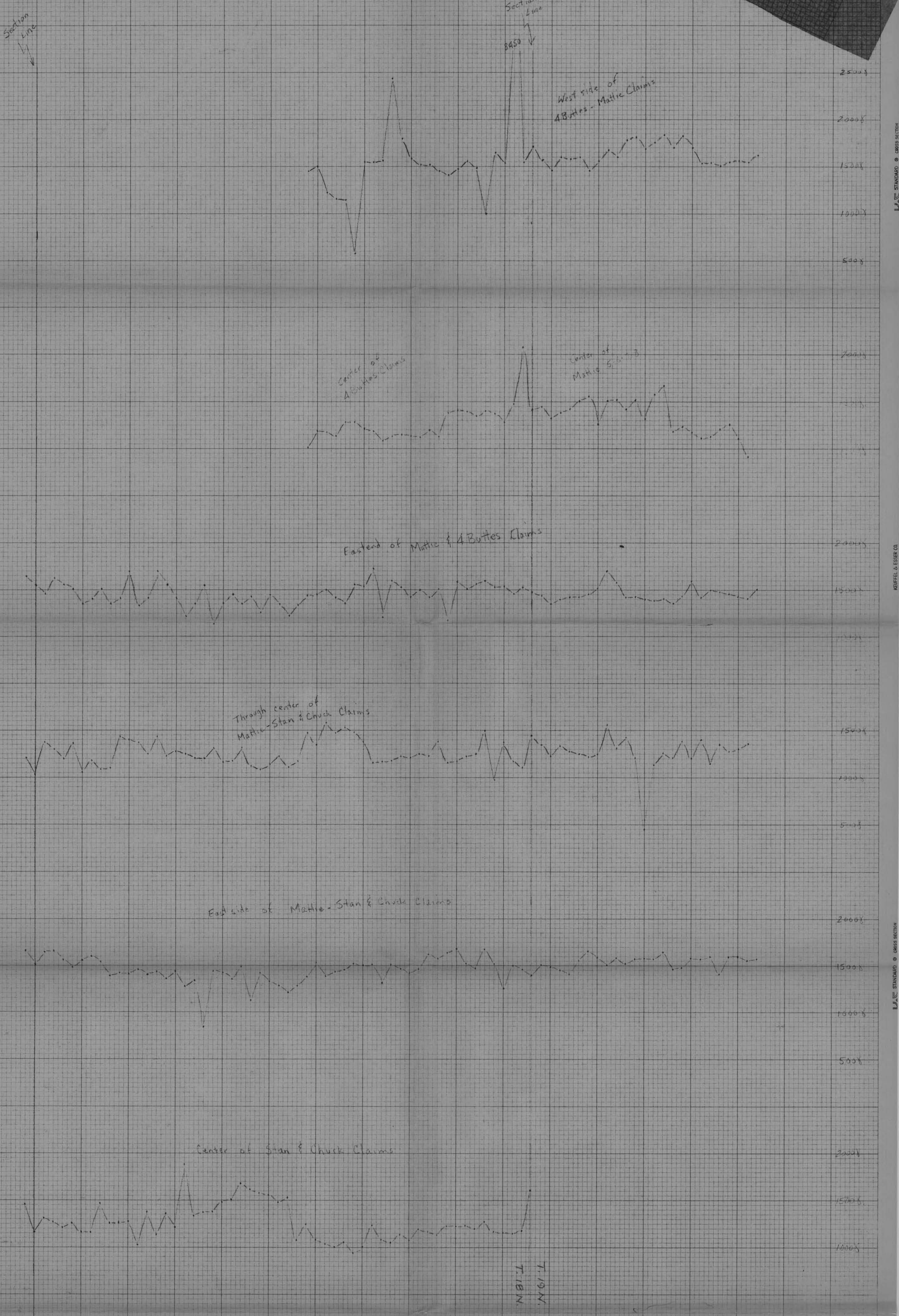
4.) Mag contour + I.P. location Obsolete

5.) Raw readings for Affidavid of Labor.

6.) 2 Mylars magnetic 400 γ contours level

7.) I.P. Mag - Claim - Location and I.P. interpretation 1" = 1000" scale


4 Buttes Area
Hor Scale 1"=500'
Vertical Scale 1"=500γ
Looking North
N-S. Section Line west of Mattie & 4 Buttes Claims
along northend of Mattie Claims
N.E. Cor. Mattie #1
Soil West of Mattie #7. 1200' South of N-W corner
Section Corner
35
2
1
Between Mattie Claims & 4 Buttes - Stan Claims East from Section Corner
West from S.W. Cor. 4 Buttes #1 1000' South of Section Line
West from 4 Buttes Claims 1200' South of Section Line
West from SW Corner of 4 Buttes #3
West from SW Corner of 4 Buttes 4
N-S Section Line
R.18W.
R.18W
North side Spar #1
Between Spar #1 & Spar #2
Southside Spar #2
N-S Sec. Line
2000γ
1500γ
1000γ
500γ
2000
1500
1000
Mohave Co., Ariz.
Four Buttes Area
Magnetic Profiles
for
Arkla Exploration Co.
Dec. 1964
HEINRICHS
GEOEX
H Scale 1" = 500'
V " 1" = 500γ



VERTICAL INTENSITY MAGNETIC PROFILES FOUR BUTTES AREA

LOOKING WEST

FOR

ARKLA EXPLORATION CO.

HORIZONTAL SCALE 1" = 500'

VERTICAL SCALE 1" = 500γ

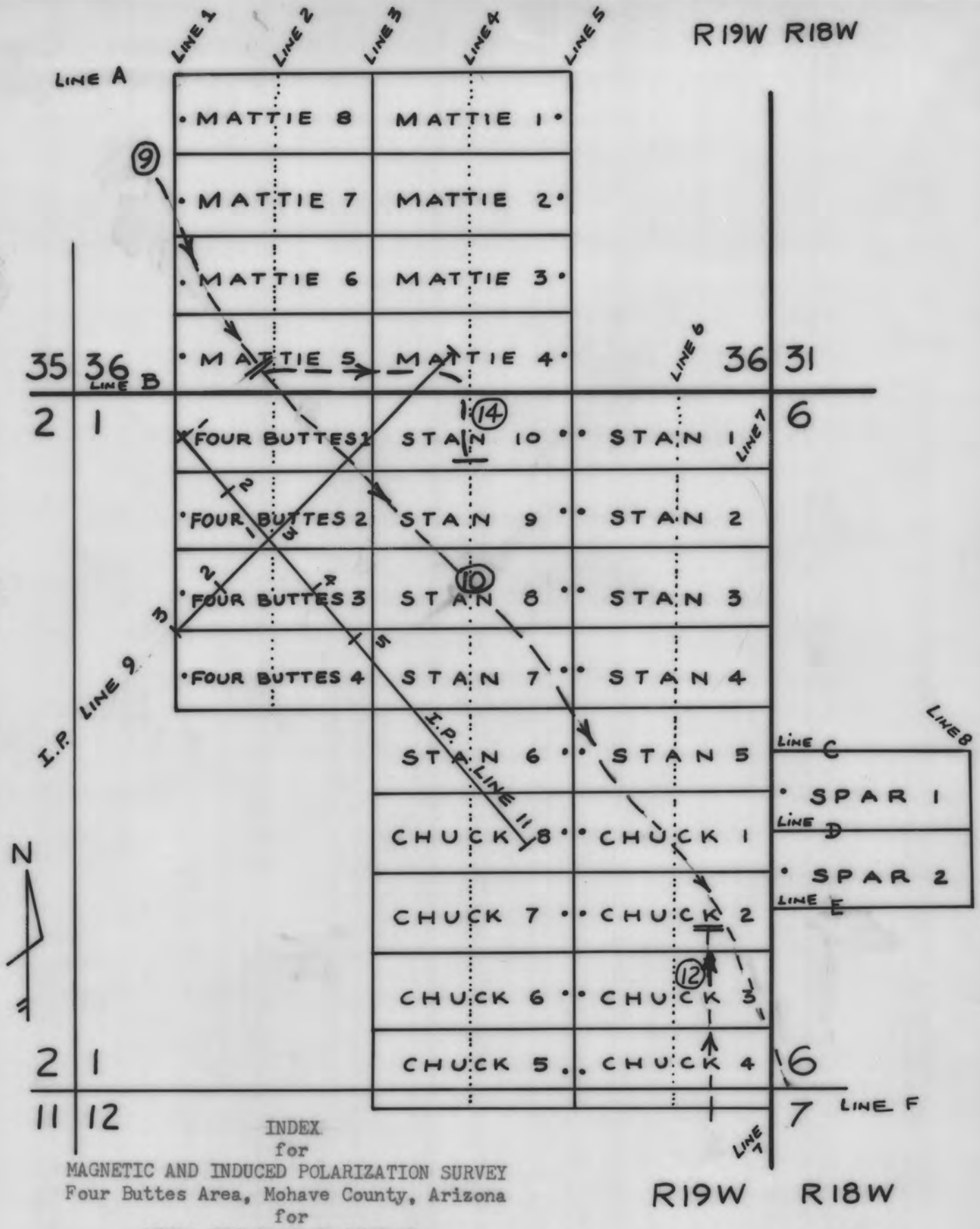
OCT. - DEC. 1964

MOHAVE CO., ARIZONA

HEINRICHS GEOEX

GEOPHYSICAL ENGINEERS TUCSON, ARIZONA

KEUFFEL & ESSER CO. STANDARD CROSS SECTION



INDEX
for
MAGNETIC AND INDUCED POLARIZATION SURVEY
Four Buttes Area, Mohave County, Arizona
for
ARKLA EXPLORATION COMPANY
by
HEINRICHS GEOEXPLORATION COMPANY
P. O. Box 5671 Tucson, Arizona
November 1964

Scale: 1" = 1,000'

for
Affidavit of LABOR

I.P. Indicates Induced Polarization

..... Indicates Magnetic Survey (Vertical Intensity)

• Indicates Location Monument

Indicates Mobile magnetic traverse & direction.

REPORT OF GEOPHYSICAL SURVEY

PREPARED FOR AFFIDAVIT OF LABOR

This is a report of a geophysical survey of the claims hereinafter described, done as a part of the requirements for annual labor for the period from September 1, 1964 to September 1, 1965.

These claims consist of a contiguous group situated in Sections 36, T 19 N, R 19 W and Section 1, T 18 N, R 19 W and Section 6, T 18 N, R 18 W. G & S R B & M in Mohave County, Arizona. The claims are owned by Arkla Exploration Company and the work was performed by the undersigned at the request of and at the expense of said owners.

The claims are more particularly described on the claim notices which are recorded in the records of Mohave County, Arizona as Follows:

NAME OF CLAIM	DOCKET	PAGE
Mattie 1 thru 8	5 V	193 thru 200
Stan 1 thru 10	5 V	183 thru 192
Four Buttes 1 thru 4	5 V	201 thru 204
Chuck 1 thru 8	5 V	205 thru 212
Spar 1 and 2	5 V	227 thru 228

The work was done on these claims and was done for the benefit of the group as a whole. The geophysical work done consists of 18 magnetic profiles and 2 Induced Polarization profiles. The location of the work performed in relation to points of discovery and boundaries of the claims and the nature and extent thereof is shown on plats identified as: Index Map for Magnetic and Induced Polarization Survey, Magnetic Survey and Induced Polarization Sectional Data Sheets for Line 9 and Line 11, Mobile magnetic tapes portions of Lines 9, 10, 12, 14 and the eight plats are further identified as Four Buttes area, Mohave County, Arizona, Heinrichs Geoexploration Company, November and December 1964 for Arkla Exploration Company and are attached hereto by this reference and are made a part hereof.

The cost of the geophysical work done on the group of claims during this assessment period was in excess of thirty two hundred dollars ($3,200.00). The basic findings from the geophysical work are as indicated on the attached plats.

All of this geophysical work was done under the direction of Mr. Walter E. Heinrichs, Jr., President & General Manager of Heinrichs Geoexploration Company, Tucson, Arizona at the request of said owners. The persons who worked on said survey in addition to Mr. Walter E. Heinrichs, Jr. are as follows: E. Grover Heinrichs, Ronald E. Palmer Dan Anderson, George Miguel and Chris S. Ludwig, all employees of Heinrichs Geoexploration Company.

Mr. Walter E. Heinrichs, Jr., is a registered professional mining engineer, No. 2447, State of Arizona, with many years of experience in making geophysical surveys, and all of the other persons performing said work are either graduate geophysical engineers, geologists, technicians or helpers.

Walter E. Heinrichs, Jr.

Registered Professional Engineer (Mining) CERTIFICATE EXPIRES WALTER E. HEINRICHS, JR. DEC. 31, 1965 ARIZONA, U.S.A.

STATE OF ARIZONA)
) ss.
COUNTY OF MOHAVE)

WALTER E. HEINRICHS, JR., being first duly sworn deposes and says:

That he is the President & General Manager of Heinrichs Geoexploration Company of Tucson, Arizona; that he has read the foregoing report of Geophysical Survey, knows the contents thereof, and that the same is true.

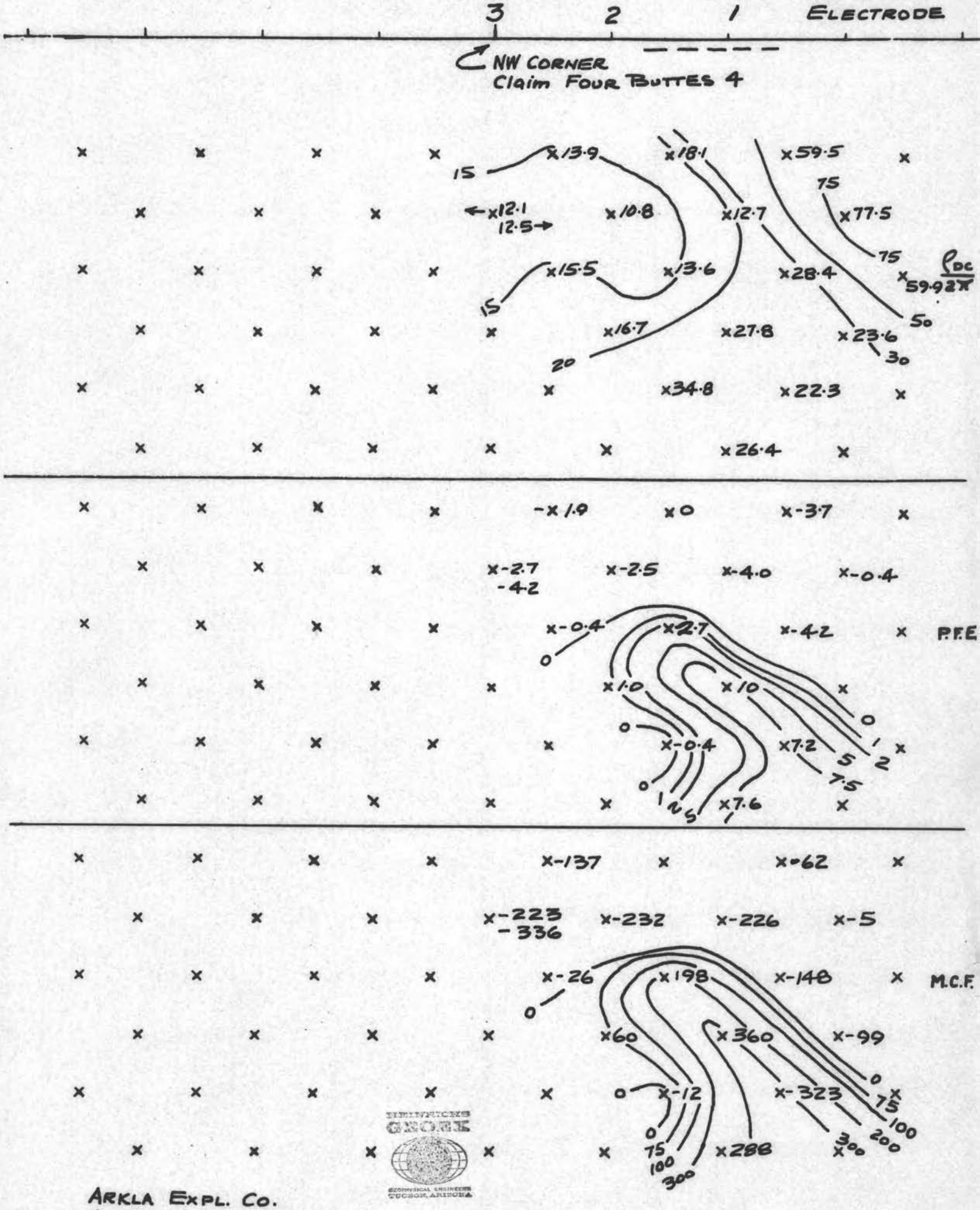
Walter E. Heinrichs, Jr.

Subscribed and sworn to before me this 24th day of November 1965.

Notary Public

My commission expires: July 20, 1969

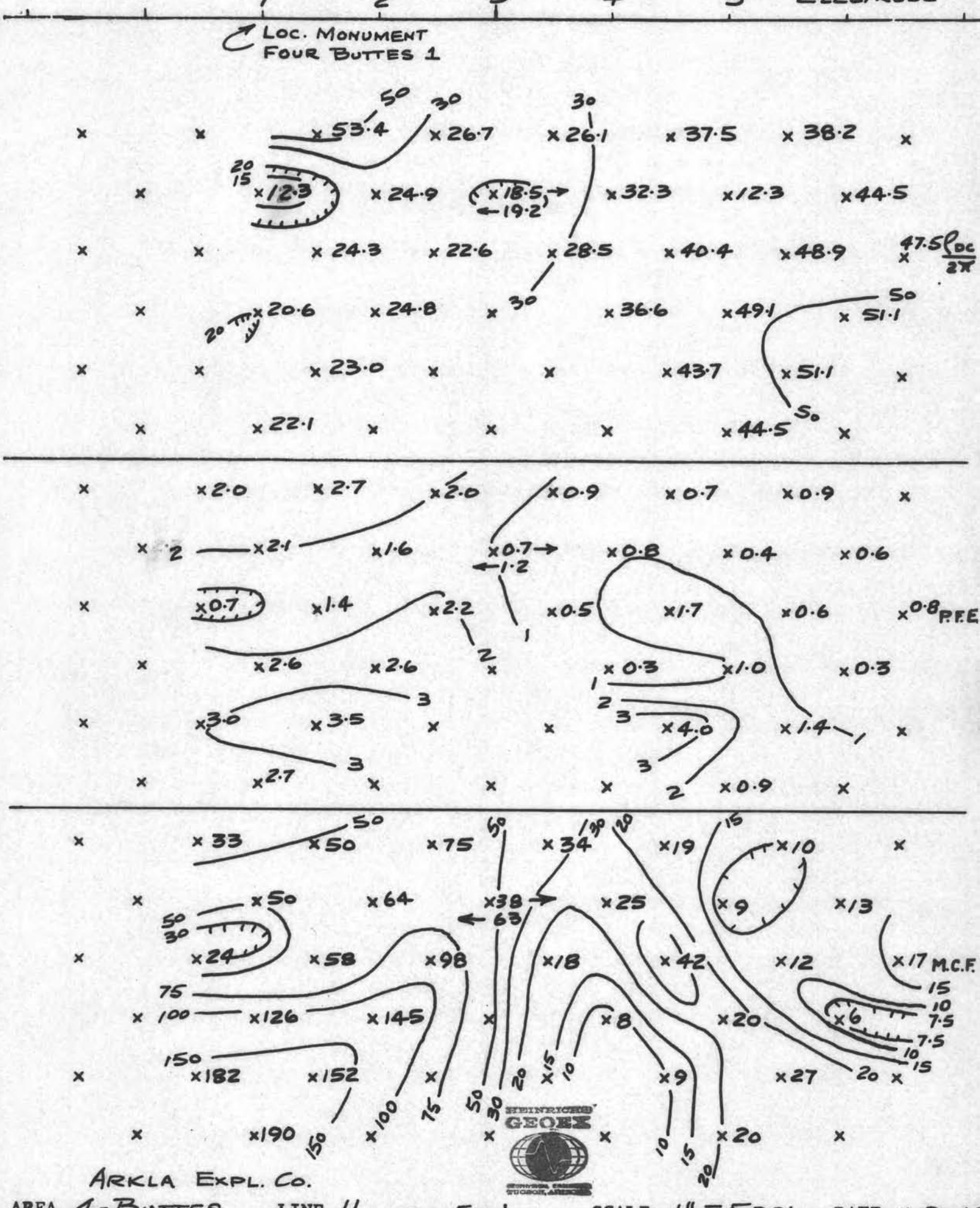
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW



ARKLA EXPL. CO.

AREA 4-BUTTES LINE 9 a = 500' SCALE: 1" = 500' DATE: 11-21-64

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NE



ARKLA EXPL. CO.

AREA 4-BUTTES LINE 11 a = 500' SCALE: 1" = 500' DATE: 11-30-64

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW

3 2 1 Electrode

HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

NW Corner
Claim Four Buttes 4

×	×	×	×	×13.9	×18.1	×59.5	×	
×	×	×	←12.1 ×12.5→	×10.8	×12.7	×77.5		
×	×	×	×	×15.5	×13.6	×28.4	8 59.9.	ρ_{DC} / 2π
×	×	×	×	×16.7	×27.8	×23.6		
×	×	×	×	×	×34.8	×22.3	×	
×	×	×	×	×	×26.4	×		

×	×	×	×	×-1.9	× 0	×-3.7	×	
×	×	×	←× -2.7 -4.2→	×-2.5	×-4.0	×-0.4		
×	×	×	×	×-0.4	×2.7	×-4.2	×	P.F.E
×	×	×	×	×1.0	× 10	×		
×	×	×	×	×	×-0.4	×7.2	×	
×	×	×	×	×	×7.6	×7.5		

×	×	×	×	×-137	×	×-62	×	
×	×	×	← -223 ×-336→	×-232	×-226	×-5		
×	×	×	×	×-26	×198	×-148	×	M.C.F.
×	×	×	×	×60	×360	×-99		
×	×	×	×	×	×-12	×-323	×	
×	×	×	×	×	×288	×		

Registered Professional Engineer (Mining) CERTIFICATE EXPIRES DEC. 31, 1965 WALTER E. HEINRICHS, JR. ARIZONA, U. S. A.

Arkla Exploration Company

AREA 4-Buttes **LINE** 9 **a =** 500 ' **SCALE:** 1"=500' **DATE:** 11-21-64

original affidavits sent to D. McCarthy

November 24, 1965

Mr. J. R. Mallot
345 S. 1st Street
Globe, Arizona

Re: Recording for Assessment
Work, Arkla Exploration Co.

Dear Mr. Mallot:

Enclosed you will find all the data intended for recording as the Geophysical Report, for annual labor and assessment work on claims known as part of the Arkla Exploration Co.'s Four Buttes Project, Mohave County, Arizona.

Mr. Pugh, Arkla's Chief Geophysicist, by phone, on Nov. 23, 1965 instructed me to seek your legal opinion on the term "basic findings' as outlined in the statute 30 USCA 28 - 1 & 2. On your recommendations I have included the geophysical data without any interpretation. This is somewhat contrary to Mr. Pugh's desire for he wanted to show meter readings only; this would be risky as you point out. Therefore, to be completely safe in the matter I have presented the data as enclosed.

If you have any questions please give me a call as time is getting short. I will hold the data here until Saturday, Nov. 27, 1965 in case you recommend any changes.

Very truly yours,
HEINRICHS GEOEXPLORATION COMPANY

E. Grover Heinrichs
Vice President

EGH:jh
cc: M. L. Pugh
D. McCarthy
R. B. Jones

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NE

1 2 3 4 5 Electrode

Location Monument
Four Buttes 1

HEINRICHS GEOEXPLORATION CO.
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

Registered Professional Engineer (Mining) CERTIFICATE EXPIRES DEC. 31, 1965 WALTER E. HEINRICHS, JR. ARIZONA, U.S.A.

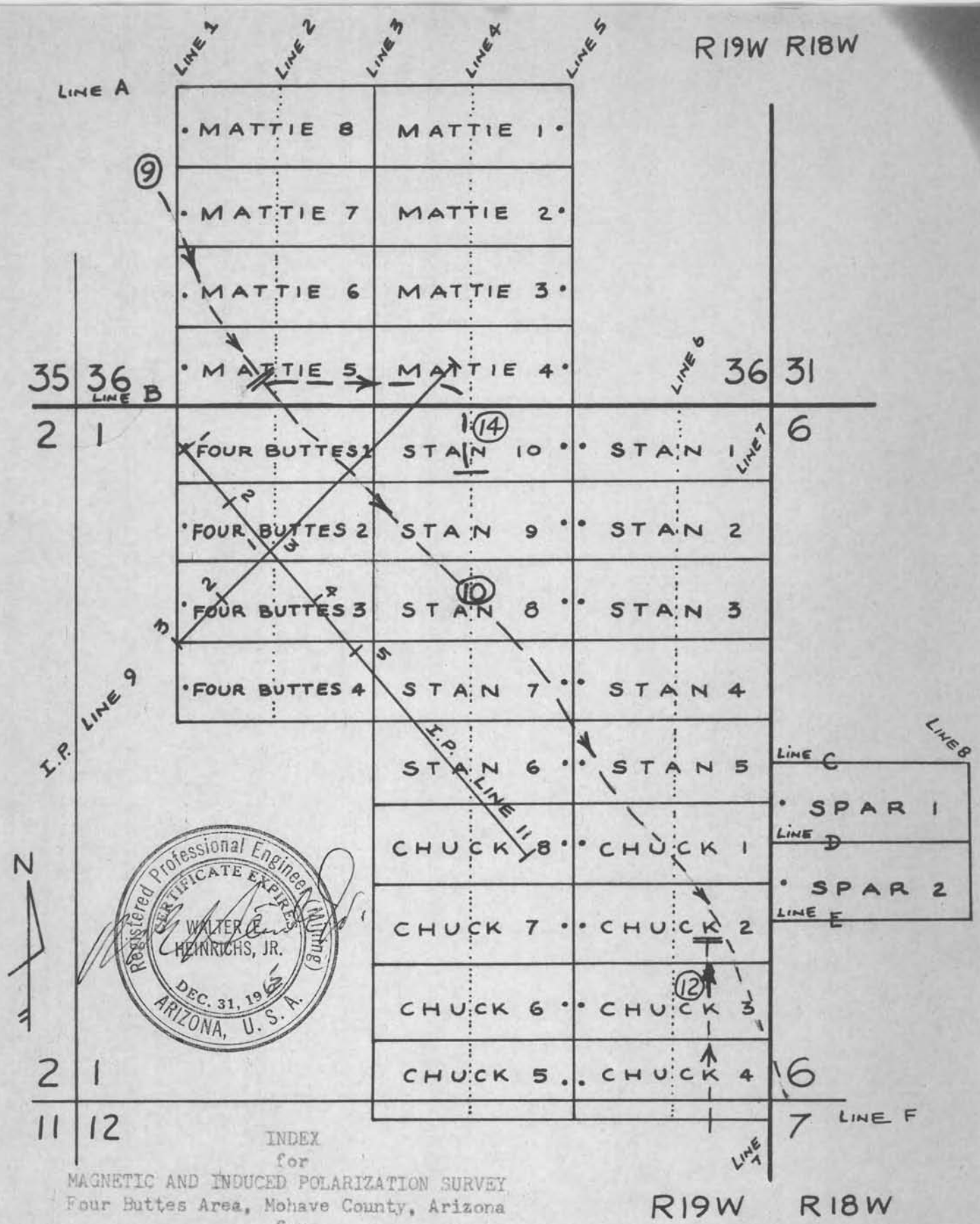
		53.4	26.7	26.1	37.5	38.2		
	12.3	24.9	18.5→ ←19.2	32.3	12.3	44.5		
	24.3	22.6	28.5	40.4	48.9	47.5	ρ_{DC} / 2X	
	20.6	24.8		36.6	49.1	51.1		
		23.0			43.7	51.1		
	22.1				44.5			

	2.0	2.7	2.0	0.9	0.7	0.9		
	2.1	1.6	0.7→ ←1.2	0.8	0.4	0.6		
	0.7	1.4	2.2	0.5	1.7	0.6	0.8	P.F.E.
	2.6	2.6		0.3	1.0	0.3		
	3.0	3.5			4.0	1.4		
	2.7				0.9			

	33	50	75	34	19	10		
	50	64	38→ ←63	25	9	13		
	24	58	98	18	42	12	17	M.C.F.
	100	126	145		8	20	6	
	182	152			9	27		
	190				20			

Arkla Exploration Company

AREA 4-Buttes **LINE** 11 **a** = 500 ' **SCALE:** 1"=500' **DATE:** 11-30-64



INDEX
for
MAGNETIC AND INDUCED POLARIZATION SURVEY
Four Buttes Area, Mohave County, Arizona
for
ARKLA EXPLORATION COMPANY
by
HEINRICHS GEOEXPLORATION COMPANY
P. O. Box 5671 Tucson, Arizona
November 1964

Scale: 1" = 1,000'

I.P. Indicates Induced Polarization

..... Indicates Magnetic Survey (Vertical Intensity)

• Indicates Location Monument

Indicates Mobile magnetic traverse & direction.

HEINRICHS GEOEXPLORATION COMPANY

806 WEST GRANT ROAD, TUCSON, ARIZONA, 85703. P.O. BOX 5671. PHONE: (AREA CODE 602) 623-0578

September 21, 1965

Arkla Exploration Co.
P. O. Box 1734
Shreveport, Louisiana

Re: Kingman Project

Gentlemen:

Please find listed below inventory of maps received by Mr. Push on September 20, 1965:

ROLL NO.	DESCRIPTION	SCALE	QUANTITY
1	Geology	2"=1 mile	9
2	Momag Traverse	2"=1 mile	9
3	West End	Various	
	Claim, Topo, Geology		2
	Elevation		2
	Gravity Contour		3
	Gravity Profile		2
4	Don-Matilda, Etc.		
	Mylar-Mag. & I.P. Plan	1"=500'	1
	Sepia-G.P. Plan	1"=1000'	1
	Sepia-G.P. Plan	1"=1000'	1
	Sepia-G.P. Location	1"=1000'	1
	Gravity Profiles	1"=500'	1
	Gravity Contour	1"=500'	1
	Mag Profiles	1"=500'	1
	Mag Profiles	1"=500'	1
	Mag Plan Plotted Values	1"=500'	1
	Mylar Base	1"-1000'	1
	Sepia Base	1"-1000'	2
	Planetable Geology		1
5	Pay Check - North Side		
	Geology	1"-100'	1
	Mag Profile	1"-500'	1
	Mag Profile	1"-500'	1
	Mag Plan Plot	1"-500'	1

ROLL NO.	DESCRIPTION	SCALE	QUANTITY
6	Badger-Four Buttes Area		
	Elevation	1"=500'	1
	Mag & I.P. Contour	1"-500'	1
	Mylar-Mag Plan	1"-500'	1
	Mylar-Mag Work Sheet	1"-500'	2
	Mag Profile	1"-500'	1
	Gravity Profile	1"-500'	2
	Gravity Contour	1"-500'	1
	Mag Value Plan Plot	1"-500'	1
	Sepia-Location, Final	1"-1000'	1
	Mylar Base	1"-1000'	1
	Sepia Base	1"=1000'	1
	Sepia Composite	1"-500'	1
	Mylar-Mag Contour	1"-500'	1
	Mylar-Mag Contour	1"-500'	1
	Mylar-Mag Profiles	1"=500'	1
	Magnetic Profiles	1"-500'	1
	Magnetic Profiles	1"=500'	1
	Magnetic Value Plan Plot	1"=500'	1
7	Photo Geology		2
8	Mohave Tract 2 - 10		
	(#1 never started)		9
9	Santa Claus Area		
	MoMag Survey	1"=1000'	1
	MoMag Traverse	1"=1000'	1
	Gravity, I.P. Location	1"=1000'	1
	Mag Vertical Intensity	1"=1000'	1
	Gravity (Bouguer)	1"=1000'	1
	Gravity (Regional Gradient Corrected)	1"=1000'	1
	Geology, Drill Hole Claim Location	1"=1000'	1
	Mylar Base	1"=1000'	1
	Mag Preliminary	1"=200'	1
	Mag Preliminary Value Plot	1"=200'	1
	Gravity Profile	1"=1000'	1
	Sepia-Momag, Geol., Claim, Etc. Location	1"=1000'	1
	Mag, Gravity Composite Profile	1"=1000'	1

ROLL NO.	DESCRIPTION	SCALE	QUANTITY
10	Misc. Auto Positive & Mylar Enlargement for Base Map Drafting		
11	MoMag Records - Original Tapes		
12	MoMag Field Traverse Maps		8
13	Chloride Quad Maps showing MoMag Route		5
14	Field Notes - Hand Mag - Santa Claus		
15	Obsolete: Don-Matilda, Paycheck, No Sam, Badger-Four Buttes Area, Momag Traverse Maps		
16	Aerial Photos - Sent to Don McCarthy 9-21-65		

Very truly yours,

HEINRICHS GEOEXPLORATION COMPANY

E. Grover Heinrichs, Vice President

pr

Geol. & Mineral Resources Kingman Area of Mohave County, Ariz.

FEB 1965 GEOEX

SELECTED REFERENCES

1. Anthony, J. W., Wilson, E. D., and Moore, R. T., 1953, Bibliography of the geology and mineral resources of Arizona, 1939-1952: Arizona Bur. of Mines, Geol. Ser. 20, Bull. 161.

2. Arizona Geological Society, 1959, Guidebook 2, southern Arizona, April 2-6, 1959, Ariz. Geol. Soc. Digest, 2nd Ann. XX, 290 p.

3. Bastin, E. S., 1925, Origin of certain rich silver ores near Chloride and Kingman, Arizona: U.G.S.G. Bull. 750-b, p. 17-39.

4. Bove, Albert N., 1957, Geological Map index of Arizona: U.G.S.S.

5. Butler, B. S., and Wilson, E. D., 1938, General features of some Arizona ore deposits: Univ. of Ariz., Ariz. Bur. Mines Bull. 145, p. 9-25.

6. Darton, N. H., 1915, Santa Fee guidebook: U.G.S.G. Bull. 613.

7. Dings, M. G., 1950-51, Arizona zinc and lead deposits; Wallapai mining district, Mohave County, Arizona: Univ. Ariz., Ariz. Bur. Mines Bull. 156, p. 138-42.

8. _____, 1951, Wallapai mining district, Cerbat Mountains, Mohave County: U.S.G.S. Bull. 978-E.

9. Farnham, L. L., and Stewart, L. A., 1958, Manganese deposits of western Arizona: U.S. Bur. Mines Inf. Circ. 7843, iv, 87 p.

10. Gardner, E. D., 1936, Gold mining and milling in the Black Mountains, western Mohave County, Arizona: U.S. Bur. Mines, Inf. Circ. 6901, 45 p.

11. Hart, O. M., and Hetland, D. L., 1953, Preliminary report on uranium-bearing deposits in Mohave County: U.S. AEC, RME-4026.

12. Haury, P. S., 1947, Examination of zinc-lead mines in the Wallapai mining district, Mohave County: U.S. Bureau Mines Rept. 4101, Invest. 4101.

13. Hernon, R. M., 1938, Cerbat Mountains: Univ. Ariz., Ariz. Bur. Mines Bull. 145, p. 110-117.

14. Holt, E. B., 1944, Antler Mine in Mohave County, Arizona: Min. Journ. v. 27, no. 19, p. 3-4.

15. Lausen, Carl, 1931, Geology and ore deposits of the Oatman and Katherine districts: Ariz. Bur. Mines Geol. Ser. 6, Bull. 131.

16. _____, 1942, The Oatman and Katherine districts, Arizona: Ore deposits as related to structural features, W. H. Newhouse, Ed. p. 226-29, Princeton Univ. Press.

17. Lee, W. T., 1908, Geologic reconnaissance of a part of Western Arizona: U.S.G.S. Bull. 352.

18. Moore, R. T., 1958, Geology of northwestern Mohave County, Arizona (abs.): Ariz. Geol. Soc. Digest (1st Ann.), p. 52-53.

19. Ramsome, F. L., 1923, Geology of the Oatman gold district: U.S.G.S. Bull. 743.

20. Reeside, John B., Jr., and Bassler, Harvey, 1922, Stratigraphic sections in southwestern Utah and northwestern Arizona: U.S.G.S. Prof. Paper 129-D, p. 53-77.

21. Romslo, T. M., 1948, Antler copper-zinc deposit, Mohave County, Arizona: U.S. Bur. Mines R.I. 4124, 14 p.

22. Schrader, F. C., 1909, Mineral deposits of the Cerbat Range, Black Mountains and Grand Wash. Cliffs, Mohave County, Arizona: U.S.G.S. Bull. 397.

23. _____, 1916, Geology and ore deposits of Mohave County, Arizona: Am. Inst. Min. Eng. Bull. 119.

24. _____, 1917, Geology and ore deposits of Mohave County, Arizona: Am. Inst. Min. Eng. Trans., v. 56, p. 195-236.

25. Tainter, S. L., 1947, Johnny Bull-Silver Knight lead-zinc property, Cerbat Mountains, Mohave County, Arizona: U.S. Bur. Mines, R. I. 3998, 14. p.

26. Thomas, B. E., 1949, Ore deposits of the Wallapai mining district: Econ. Geology, v. 44, no. 8.

27. _____, 1953, Geology of the Chloride quadrangle: Geol. Soc. American Bull, v. 64, no. 4, p. 391-420.

28. Wilson, E. D., 1939, Bibliography of the geology and mineral resources of Arizona: Ariz. Bur. of Mines, Geological Series no. 13, Bull. 146.

29. Wilson, E. D., 1948, Geology of Antler copper-zinc deposit, Mohave County, Arizona: U.S. Bur. Mines R. I. 4214, p. 4-5.

30. _____, 1962, A resume of the geology of Arizona: Ariz. Bur. of Mines, Bull. 171, 140 p.

31. _____, and others, 1959, Geologic map of Mohave County, Arizona: Ariz. Bur. Mines, scale 1:375,000.

FEB 1965
GEOEX

SELECTED REFERENCES

1. Anthony, J. W., Wilson, E. D., and Moore, R. T., 1953, Bibliography of the geology and mineral resources of Arizona, 1939-1952: Arizona Bur. of Mines, Geol. Ser. 20, Bull. 161.

2. Arizona Geological Society, 1959, Guidebook 2, southern Arizona, April 2-6, 1959, Ariz. Geol. Soc. Digest, 2nd Ann. XX, 290 p.

3. Bastin, E. S., 1925, Origin of certain rich silver ores near Chloride and Kingman, Arizona: U.G.S.G. Bull. 750-b, p. 17-39.

4. Bove, Albert N., 1957, Geological Map index of Arizona: U.G.S.S.

5. Butler, B. S., and Wilson, E. D., 1938, General features of some Arizona ore deposits: Univ. of Ariz., Ariz. Bur. Mines Bull. 145, p. 9-25.

6. Darton, N. H., 1915, Santa Fee guidebook: U.G.S.G. Bull. 613.

7. Dings, M. G., 1950-51, Arizona zinc and lead deposits; Wallapai mining district, Mohave County, Arizona: Univ. Ariz., Ariz. Bur. Mines Bull. 156, p. 138-42.

8. _____, 1951, Wallapai mining district, Cerbat Mountains, Mohave County: U.S.G.S. Bull. 978-E.

9. Farnham, L. L., and Stewart, L. A., 1958, Manganese deposits of western Arizona: U.S. Bur. Mines Inf. Circ. 7843, iv, 87 p.

10. Gardner, E. D., 1936, Gold mining and milling in the Black Mountains, western Mohave County, Arizona: U.S. Bur. Mines, Inf. Circ. 6901, 45 p.

11. Hart, O. M., and Hetland, D. L., 1953, Preliminary report on uranium-bearing deposits in Mohave County: U.S. AEC, RME-4026.

12. Haury, P. S., 1947, Examination of zinc-lead mines in the Wallapai mining district, Mohave County: U.S. Bureau Mines Rept. 4101, Invest. 4101.

13. Hernon, R. M., 1938, Cerbat Mountains: Univ. Ariz., Ariz. Bur. Mines Bull. 145, p. 110-117.

14. Holt, E. B., 1944, Antler Mine in Mohave County, Arizona: Min. Journ. v. 27, no. 19, p. 3-4.

15. Lausen, Carl, 1931, Geology and ore deposits of the Oatman and Katherine districts: Ariz. Bur. Mines Geol. Ser. 6, Bull. 131.

16. _____, 1942, The Oatman and Katherine districts, Arizona: Ore deposits as related to structural features, W. H. Newhouse, Ed. p. 226-29, Princeton Univ. Press.

17. Lee, W. T., 1908, Geologic reconnaissance of a part of Western Arizona: U.S.G.S. Bull. 352.

18. Moore, R. T., 1958, Geology of northwestern Mohave County, Arizona (abs.): Ariz. Geol. Soc. Digest (1st Ann.), p. 52-53.

19. Ramsome, F. L., 1923, Geology of the Oatman gold district: U.S.G.S. Bull. 743.

20. Reeside, John B., Jr., and Bassler, Harvey, 1922, Stratigraphic sections in southwestern Utah and northwestern Arizona: U.S.G.S. Prof. Paper 129-D, p. 53-77.

21. Romslo, T. M., 1948, Antler copper-zinc deposit, Mohave County, Arizona: U.S. Bur. Mines R.I. 4124, 14 p.

22. Schrader, F. C., 1909, Mineral deposits of the Cerbat Range, Black Mountains and Grand Wash. Cliffs, Mohave County, Arizona: U.S.G.S. Bull. 397.

23. _____, 1916, Geology and ore deposits of Mohave County, Arizona: Am. Inst. Min. Eng. Bull. 119.

24. _____, 1917, Geology and ore deposits of Mohave County, Arizona: Am. Inst. Min. Eng. Trans., v. 56, p. 195-236.

25. Tainter, S. L., 1947, Johnny Bull-Silver Knight lead-zinc property, Cerbat Mountains, Mohave County, Arizona: U.S. Bur. Mines, R. I. 3998, 14. p.

26. Thomas, B. E., 1949, Ore deposits of the Wallapai mining district: Econ. Geology, v. 44, no. 8.

27. _____, 1953, Geology of the Chloride quadrangle: Geol. Soc. American Bull, v. 64, no. 4, p. 391-420.

28. Wilson, E. D., 1939, Bibliography of the geology and mineral resources of Arizona: Ariz. Bur. of Mines, Geological Series no. 13, Bull. 146.

29. Wilson, E. D., 1948, Geology of Antler copper-zinc deposit, Mohave County, Arizona: U.S. Bur. Mines R. I. 4214, p. 4-5.

30. _____, 1962, A resume of the geology of Arizona: Ariz. Bur. of Mines, Bull. 171, 140 p.

31. _____, and others, 1959, Geologic map of Mohave County, Arizona: Ariz. Bur. Mines, scale 1:375,000.

DOERINGSFELD, AMUEDO AND IVEY
CONSULTING GEOLOGISTS
2[illegible] WASHINGTON ST. • DENVER 3, COLO.

U.S. POSTAGE
DENVER
FEB 26 '69
COLO.
16
CENTER
268003

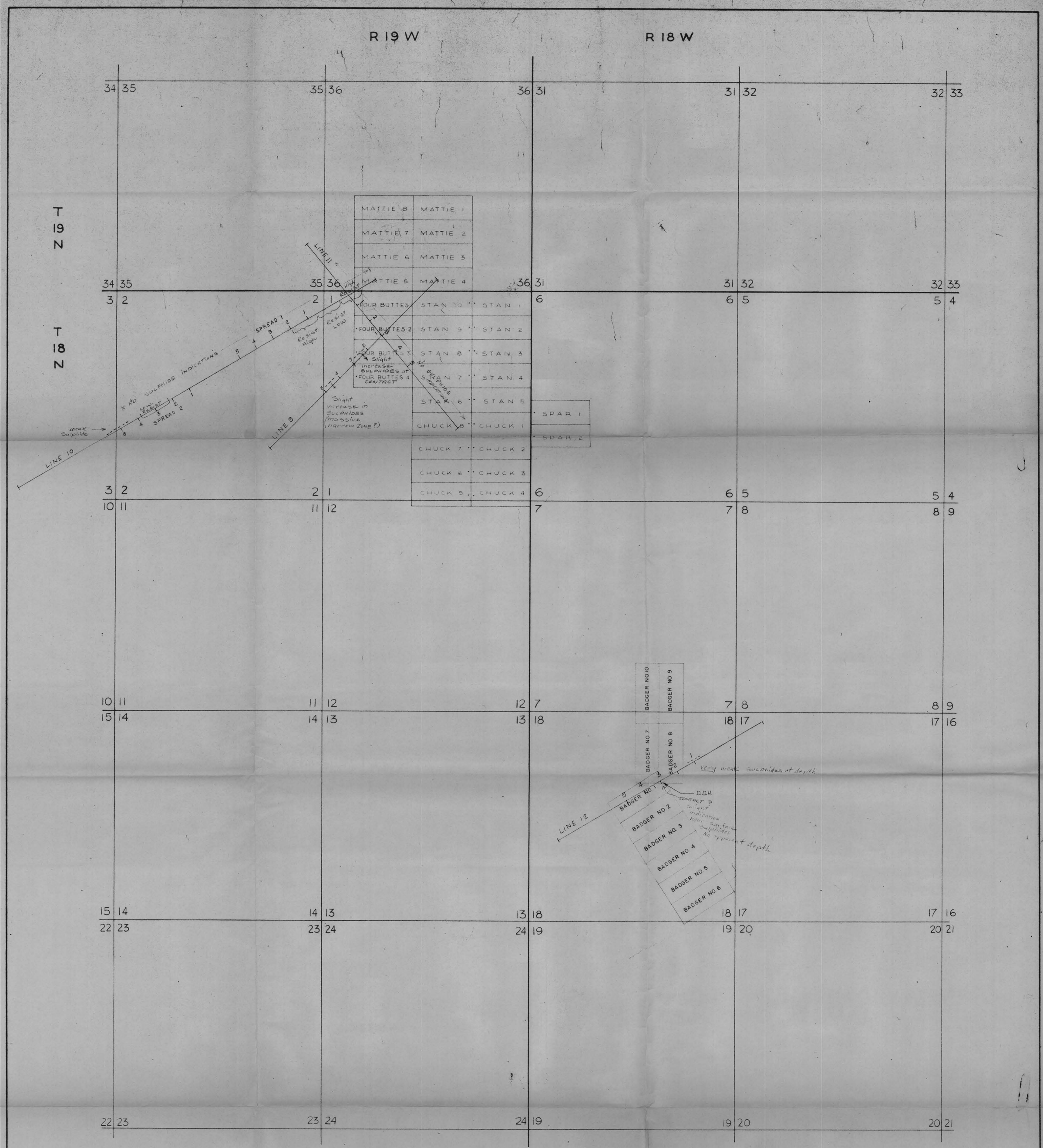
AIR MAIL

Heinrichs Geoexploration Company

P. O. Box 5671

Tucson, Arizona

AIR MAIL



INDICATES DIRECTION & RECORD NUMBER OF MAGNETIC TRAVERSE (TOTAL INTENSITY)

INDICATES MAGNETIC STATIONS (VERTICAL INTENSITY)

INDICATES INDUCED POLARIZATION SURVEY LOCATION ELECTRODES & STATIONS

INDICATES GRAVITY STATIONS

FINAL

N

HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5671 Tucson, Arizona

Location I.P. Survey & Interpretation

FOR

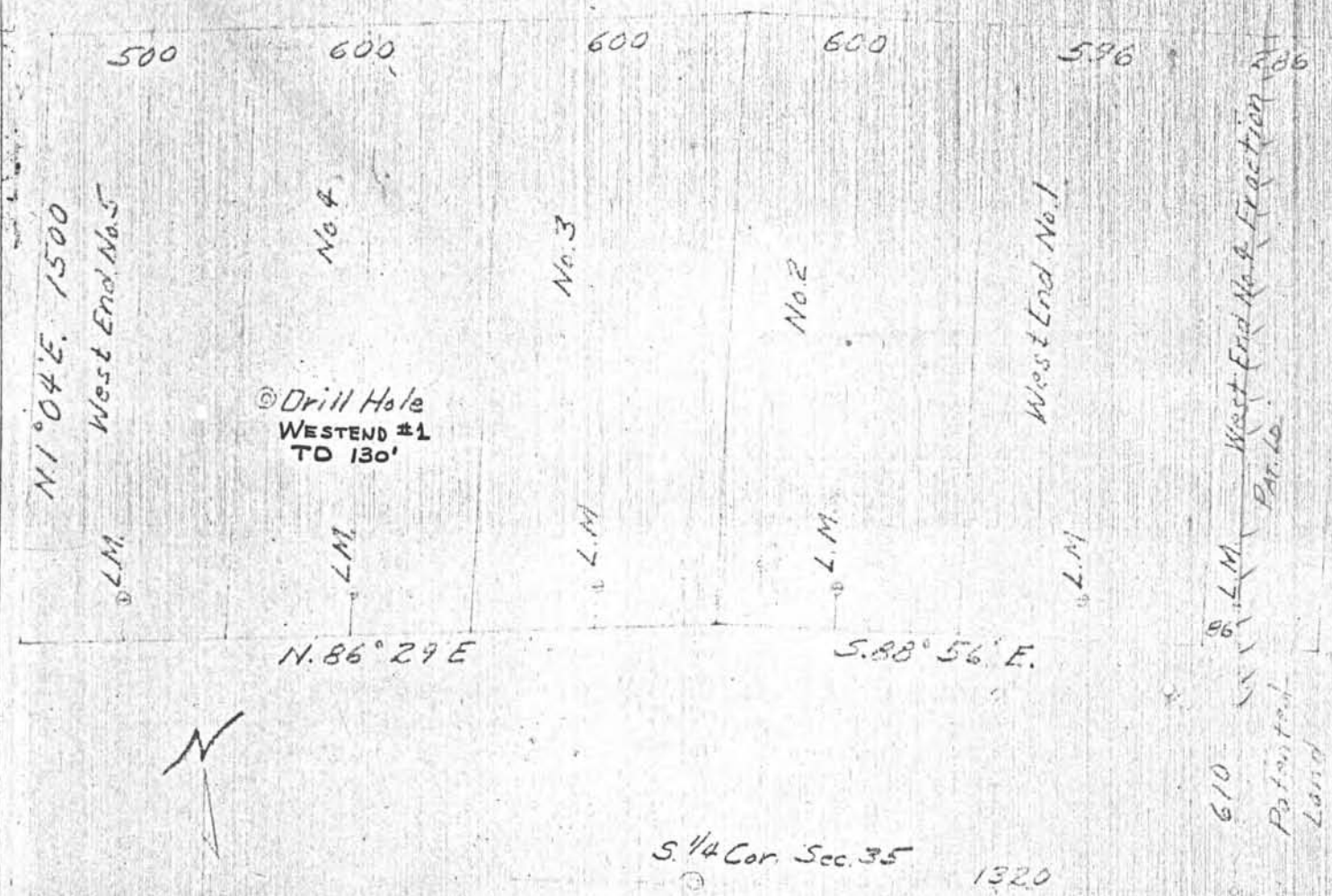
ARKANSAS LOUISIANA GAS COMPANY

FOUR BUTTES - BADGER AREAS
MOHAVE COUNTY, ARIZONA

SCALE: 1" = 1000'	CONTOUR INTERVAL:	REVISIONS
	DATA BY:	1/65
DATE: OCT 1964	SHEET OF	
DRAWN BY: I B	DRAWING NO.:	FILE:

232

⊗ L.M. = Location Monument



Arkansas Louisiana Gas Company
West End No.1-5 & West End No.4 Fraction
Validation Drilling
Mohave County, Ariz., T.17N., R.19W., G&SRB&M
Scale 1" = 400' Sept. 26, 1964
Surveyed By: Harvey W Smith, E.M.
Registered Mining Engineer
U.S. Mineral Surveyor

FEB 1965
GEOEX

ARKLA LAB REPORT
March 15, 1965

SANTA CLAUS PROJECT

Sample	Resistance (Dry)	Resistance (Wet)	Magnetic Susceptibility	Density	Rock Type
R-1 646	1.6 meg.ohms	0.1 meg.ohms	Moderate	2.7	Schist
R-1 651	10 " "	0.0075 meg.ohms	Moderate to slight	2.69	Granitic schist
R-1 728-5	0.9 " "	.004 " "	Slight	---	Granitic schist
R-1 886	.04 " "	.013 " "	None	2.9	Granite plus pyrite
Ithica Peak Gr.	15 meg.ohms	.008 " "	None	2.7	" " "
P-4 51-5	2 " "	.006 " "	None	2.62	Granite gneiss?

March 24, 1965

R-1 1053	0.7	0.19	V.Strong	2.85	Magnetic biotite schist
R-1 1200	0.9	0.46	V.Strong	2.85	"
R-3 1272	infinite	2.0	None	2.56	Altered granitic gneiss?

HEINRICHS GEOEXPLORATION COMPANY

FEB 1965
GEOEX

HEINRICHS GEOEXPLORATION COMPANY

806 WEST GRANT ROAD, TUCSON, ARIZONA, 85703. P.O. BOX 5671. PHONE: (AREA CODE 602) 623-0578

February 17, 1965

Mr. M. L. Pugh
Arkla Exploration Co.
P. O. Box 1734, Slattery Building
Shreveport, Louisiana

Re: Special Mapping Project

Dear Mr. Pugh:

It is our understanding that we are to prepare 10 Mineral Evalution of Mohave County base maps, all on a scale of 2" = 1 mile.

This will be invoiced on the basis of cost plus twenty percent (20%).

We would appreciate your signing the carbon copy of this letter and returning it to us as your approval of the above.

Very truly yours,

HEINRICHS GEOEXPLORATION CO.

E. Grover Heinrichs
Vice President

APPROVED:
ARKLA EXPLORATION CO.

BY M. L. Pugh DATE: 2-19-65

FEB 1965
GEOEX

HEINRICHS GEOEXPLORATION COMPANY

806 WEST GRANT ROAD, TUCSON, ARIZONA, 85703. P.O. BOX 5671. PHONE: (AREA CODE 602) 623-0578

February 17, 1965

Mr. M. L. Pugh
Arkla Exploration Co.
P.O. Box 1734, Slattery Building
Shreveport, Louisiana

Re: Geophysical Survey
Sacramento Valley, Phase 2

Dear Mr. Pugh:

The above survey will be performed on the following basis:

Per Contract dated 13 November 1964, except the following:

ARTICLE III-A: MoMag Survey @ $280.00 per day including report

ARTICLE XIV: THREE Man Crew - I. P. Survey @ $4,866.67 Per month
TWO Man Crew - Hand Mag. & Gravity Survey @ $2,433.33 per month
This will constitute a five day week, ten hour day, including travel to and from project., plus 1 man as needed @ cost plus 20%.

If the foregoing meets with your approval, please so indicate by signing and returning the enclosed carbon copy of this letter.

Very truly yours,
HEINRICHS GEOEXPLORATION COMPANY

Walter E. Heinrichs Jr. by P.K.

Walter E. Heinrichs, Jr., President

APPROVED:
ARKLA EXPLORATION CO.
BY M. L. Pugh Date: 2-19-65

NAME CHANGED TO ARKLA Expl. Co.

CONTRACT FOR GEOPHYSICAL SURVEYING

HEINRICHS GEOEXPLORATION COMPANY, an Arizona corporation with principal offices in Tucson, Pima County, Arizona, hereinafter called "Contractor" and SOUTHWEST NATURAL PRODUCTION COMPANY, with offices in the Slattery Building, Shreveport, Louisiana, hereinafter called "CLIENT", in consideration of the mutual promises and agreements herein, agree and contract as follows:

I.

CLIENT hereby employs CONTRACTOR as an independent contractor and CONTRACTOR agrees to perform the work herein undertaken as an independent contractor, subject to all of the terms and provisions of this instrument, to conduct and carry on gravity meter, induced polarization and magnetometer exploration for CLIENT in such areas of the Continental United States as CLIENT may from time to time designate.

II.

The term of this contract shall be for a minimum period of two (2) months, commencing on the date the CONTRACTOR'S crew arrives at the work site party headquarters. The crew arrival date is estimated to be on or about October 22, 1964. The contract shall extend thereafter until terminated by either party by written notice specifying the date of termination served upon the other party seven (7) days in advance. Such notice, if given by CLIENT, shall be sufficient if sent by registered mail and addressed to Heinrichs Geoexploration Company, P. O. Box 5671, Tucson, Arizona 85716, and such notice, if given by CONTRACTOR, shall be sufficient if sent by registered mail and addressed to Southwest Natural Production Company, P. O. Box 1734, Slattery Building, Shreveport, Louisiana. Subject to the foregoing, the contract shall terminate on completion of assigned program at the then current party headquarters location.

III.

CONTRACTOR agrees to furnish personnel and equipment as described below on the following basis:

1. Induced Polarization Surveys: One (1) crew consisting of one (1) I.P. receiver operator-computer, one (1) sender operator and one (1) field assistant equipped with an I.P. receiver and I.P. sender and related equipment and supplies including two field vehicles and other equipment necessary to conduct normal I.P. field operations as applied to mining exploration.

2. Magnetic and Gravity Surveys: One (1) magnetic and gravity crew consisting of one (1) gravity-magnetic observer-computer and one (1) field assistant equipped with a gravity meter and magnetometer and necessary surveying instruments and supplies including one field vehicle and necessary related equipment to conduct normal gravity and magnetic field operations as applied to mining exploration.

III-A.

Under mutually agreed conditions by CONTRACTOR and CLIENT the magnetic equipment may be a total intensity mobile magnetometer (Heinrichs Geoexploration under exclusive license with Gulf Oil Co.). When this equipment is used the charge for the use of it will be the same as described in Article XIV as it pertains to a magnetic crew: 1/3 of $6,850.00 or $2,283.33 per month prorated for a fractional month based on the ratio of the number of days of operation to the number of scheduled work days in the month. The use of this mobile magnetometer under the above agreement is limited to ten (10) days only, during the life of this agreement, and CLIENT agrees to pay CONTRACTOR 1/2 the cost of the Royalty Fee due to Gulf Oil Co. in the amount of $15.00 per operating day, or a maximum of $150.00 for a ten (10) recording day period.

It is understood that the CLIENT will reimburse the CONTRACTOR over and above the basic contract fee on the following instruments when and if used during a working month:

$280.00 / operating day includes maps & interpretation & all license fees & royalties

4566.67 I.P.

Gravity Meter	$250.00 per month
Magnetometer	50.00 per month

The personnel and equipment, listed in Article III of this agreement, shall constitute the crew provided by the CONTRACTOR under the terms of this contract and CONTRACTOR shall not be required to use additional men or equipment except on such terms as are provided herein.

Extra labor, when needed, will be charged CLIENT at CONTRACTOR'S cost plus 20%, and it is expressly understood that extra labor will be used only when mutually agreed to by CLIENT and CONTRACTOR.

IV.

CONTRACTOR hereby indemnified and agrees to hold CLIENT harmless on account of any claim or demand, if any, and any and all expenses and costs incurred by CLIENT in defending any claim or suit brought for any and all alleged infringements of patents resulting from the use of geophysical instruments and/or their appurtenances.

V.

CONTRACTOR agrees to carry out all operations hereunder and perform same with reasonable care and dilligence, to keep all information and results of such work in strict confidence, and divulge the same only to such person or persons as may be designated by CLIENT.

VI.

CLIENT shall not be liable for any damages caused in whole or in part by the negligence of CONTRACTOR, its agents or employees, or caused by inadequate or improper equipment used by CONTRACTOR.

VII.

CONTRACTOR shall protect, indemnify and save CLIENT harmless against any and all claims, demands and causes of action of every kind and character arising by reason of the negligence or willfull misconduct of CONTRACTOR, its agents, employees or subcontractors (and not resulting from the negligence or willful misconduct of CLIENT or CLIENT'S employees, agents or subcontractors), in favor of any person including both CONTRACTOR'S and CLIENT'S employees, on account of personal injuries or death, or damage to property, occurring, growing out of, incident to or resulting directly or indirectly from the work to be performed by CONTRACTOR hereunder, provided, however, CONTRACTOR will not be liable for any claims based on the theory that the operations of CONTRACTOR have depreciated the mineral values of any lands, and provided further that the provisions of this Article VII are intended solely for the protection and benefit of CLIENT and shall not create any liability on the part of the CONTRACTOR to persons other than CLIENT which would not otherwise exist in the absence of these provisions.

VIII.

CONTRACTOR shall provide Public Liability Insurance with limits of not less than $100,000.00 as respects any one person and $300,000.00 as respects any one accident, and Public Property Damage with limits of not less than $100,000.00 as respects any one accident and $300,000.00 aggregate for protection against loss or claims for damages to property, bodily injury, or death resulting from such operations. CONTRACTOR shall also provide Workmen's Compensation Insurance in accordance with the laws of the several states in which it may be required to operate in performing the terms of this agreement. CONTRACTOR shall furnish CLIENT with certificates evidencing such insurance coverage.

CONTRACTOR shall pay all Federal and State payroll taxes and make the required contributions for Unemployment Insurance, Old Age Pensions, Annuities and Retirement Benefits imposed or assessed under any provisions of any law, State or Federal, and measured by wages, salaries or other remuneration paid by or which may be due from CONTRACTOR to employees of CONTRACTOR engaged in said work or service, and agrees to indemnify and hold CLIENT harmless against all claims, penalties, interests and costs growing out of such taxes or contributions with respect to CONTRACTOR'S employees; and further agrees to pay and indemnify CLIENT against the payment of all other taxes, including penalty and interests, if any, arising out of the performance of work hereunder, except as modified by provisions in Article XIV.

IX.

CONTRACTOR will enter upon and conduct surveys in such areas as are designated by CLIENT, and the order in which such work will proceed shall be decided upon in advance as to each area in consultation with representatives of CLIENT and CONTRACTOR. Excepting only CLIENT'S right to decide, in consultation with CONTRACTOR, upon the extent and order of work in each area as aforesaid, CONTRACTOR shall have full power and authority to select the means, methods and manner of performance of the work herein contracted for, and CLIENT shall not have the power or authority to direct, supervise or control CONTRACTOR in the means, manner or method of performance of the work. CONTRACTOR shall be responsible to CLIENT for the faithful and satisfactory completion of the work herein contracted for.

CLIENT shall furnish sufficient base maps of suitable scale for each area that is to be explored so that the work can be conducted more effectively. These maps shall be returned to CLIENT upon completion of the work herein contracted for. When such base maps are not available to CONTRACTOR, CONTRACTOR shall be compensated for preparation of such maps as provided under extra labor clause of Article III, or if purchased by CONTRACTOR, CLIENT shall compensate CONTRACTOR for cost of maps.

X.

CLIENT shall designate each area to be surveyed and shall secure any geophysical permits necessary from governmental agencies and private parties for CONTRACTOR to enter upon such areas and conduct the survey; and CLIENT agrees to protect and hold CONTRACTOR harmless from all losses, expenses, or liabilities growing out of the work performed under this contract when such losses, expenses, or liabilities result from the absence of a permit, or from an invalid or insufficient permit, so long as CONTRACTOR conducts its operations in the area designated by CLIENT and in accordance with the instructions of CLIENT relating to such permits. CLIENT will advise CONTRACTOR of any restrictions or requirements in said permits and CONTRACTOR will comply with such restrictions or requirements and be responsible for any failure to so comply.

XI.

CONTRACTOR agrees to keep records and to furnish CLIENT, or such persons as may be designated in accordance with hereinabove set forth provisions of this instrument, written reports, including data sheets, records, results, maps, and written discussion of work which will be furnished daily if requested, and shall furnish once each week a report showing the progress of the work done during the preceding week, and shall furnish at least twice each month a map of the work performed during the preceding period with such comments as may be proper in CONTRACTOR'S opinion. It is not intended, however, that CONTRACTOR shall furnish CLIENT any mathematical equations, formulae, charts, tables or diagrams of equipment or method. All reports or other data delivered by CONTRACTOR to CLIENT shall become the property of CLIENT but shall be accessible to CONTRACTOR during the term of this contract but not afterwards, and at the conclusion of all work hereunder CONTRACTOR shall turn over to CLIENT all data of every kind and character which it has accumulated in its performance of this agreement. CONTRACTOR also agrees to study and evaluate prospective areas. Such areas are to be selected by CONTRACTOR and CLIENT.

XII.

CONTRACTOR shall comply with all Federal, State and Municipal laws, ordinances, rules and regulations applicable to any part of said work, and hereby warrants that the work and service performed under this agreement shall be in full and complete compliance with all applicable laws and regulations, including, among others, the Fair Labor Standards Act of 1938, as amended.

XIII.

CONTRACTOR agrees that the crew will be scheduled to operate five (5) days per week for an average of approximately fifty (50) hours per week including travel time. Time consumed in moving from one headquarters to another will be considered operating time. When inclement weather or other causes prevent performance of a full fifty hours of work during the scheduled work week, CONTRACTOR shall make every effort to make up the shortage of work time on the unscheduled days of the week.

Notwithstanding the schedule of work for personnel and equipment outlined herein, CLIENT agrees that work shall not be done on the following holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day; and, in the event any of these holidays fall on Saturday or Sunday, then work will not be done on the following Monday. It is agreed that suspension of work on holidays will not affect the schedule of payments to CONTRACTOR by CLIENT as is hereinabove provided.

XIV.

CLIENT hereby obligates itself to pay CONTRACTOR SIXTY EIGHT HUNDRED AND FIFTY DOLLARS ($6,850.00) per month for the personnel and equipment described above in Article III. Compensation for a fractional month shall be based on the ratio of the number of days of operation to the number of scheduled work days in the month. If it is mutually agreed by CONTRACTOR and CLIENT the crew may be split into two separate units and used only when desired. The CLIENT to be charged a prorated amount as follows:

I.P. crew at 2/3 of $6,850.00 or $4,566.66. + 300.00/mo.
Magnetic-Gravity crew at 1/3 of $6,850.00 or $2,283.34. + 150.00 /mo

If CLIENT shall require CONTRACTOR to make surveys in a State which imposes a Sales, Use or any tax based on the gross revenue received by CONTRACTOR for the services rendered, CLIENT shall reimburse CONTRACTOR for the amount of such tax paid by CONTRACTOR (whether currently or upon any assessment thereafter asserted), in as much as the remuneration provided for in the paragraph does not contemplate the absorption by CONTRACTOR of taxes of this nature.

CLIENT agrees to pay CONTRACTOR the sum of FIVE HUNDRED DOLLARS ($500.00) for initial crew move into Kingman, Arizona. This amount is intended to cover CONTRACTOR'S expense for the cost of transportation of the crew and for the additional expenses incurred by CONTRACTOR'S employees and their families in moving between work locations.

When crew personnel are required to work on temporary assignments away from party headquarters CLIENT shall reimburse CONTRACTOR on the basis of $7.50 per night per married employee and $4.00 per night per single employee, for all crew personnel while on such temporary assignments.

XV.

This agreement shall be binding upon and inure to the benefit of the successors and assigns of the respective parties hereto; provided, however, that CONTRACTOR shall obtain CLIENT'S consent in writing before assigning to a third party any of CONTRACTOR'S rights or obligations hereunder.

XVI.

CONTRACTOR shall maintain a true and correct set of records pertaining to work performed. CONTRACTOR further agrees to retain all pertinent records relating to work performed for a period of not less than two years after completion thereof. CONTRACTOR shall not pay any commissions or fees, or grant any rebates, to any employee or officer of CLIENT and CLIENT may, upon request, have an independent audit made by a nationally known firm of certified public accountants, of any and all records of the CONTRACTOR relative to the work performed hereunder for the sole purpose of determining whether there have been any such concessions, fees, or rebates; provided that the accountants shall agree not to disclose to the CLIENT any information secured in the course of such audit which does not bear on its above mentioned purpose.

CONTRACTOR agrees to invoice client the first week of each month for services rendered the previous month, and CLIENT agrees to pay CONTRACTOR within thirty (30) days from receipt of the statement from CONTRACTOR.

EXECUTED on this 13th day of November 1964.

ATTEST:

BY: M. Jean Heinrichs

HEINRICHS GEOEXPLORATION COMPANY

BY: [illegible]

ATTEST:

BY: H. E. Walker
Asst. Secretary

SOUTHWEST NATURAL PRODUCTION COMPANY

BY: [illegible]
Vice President