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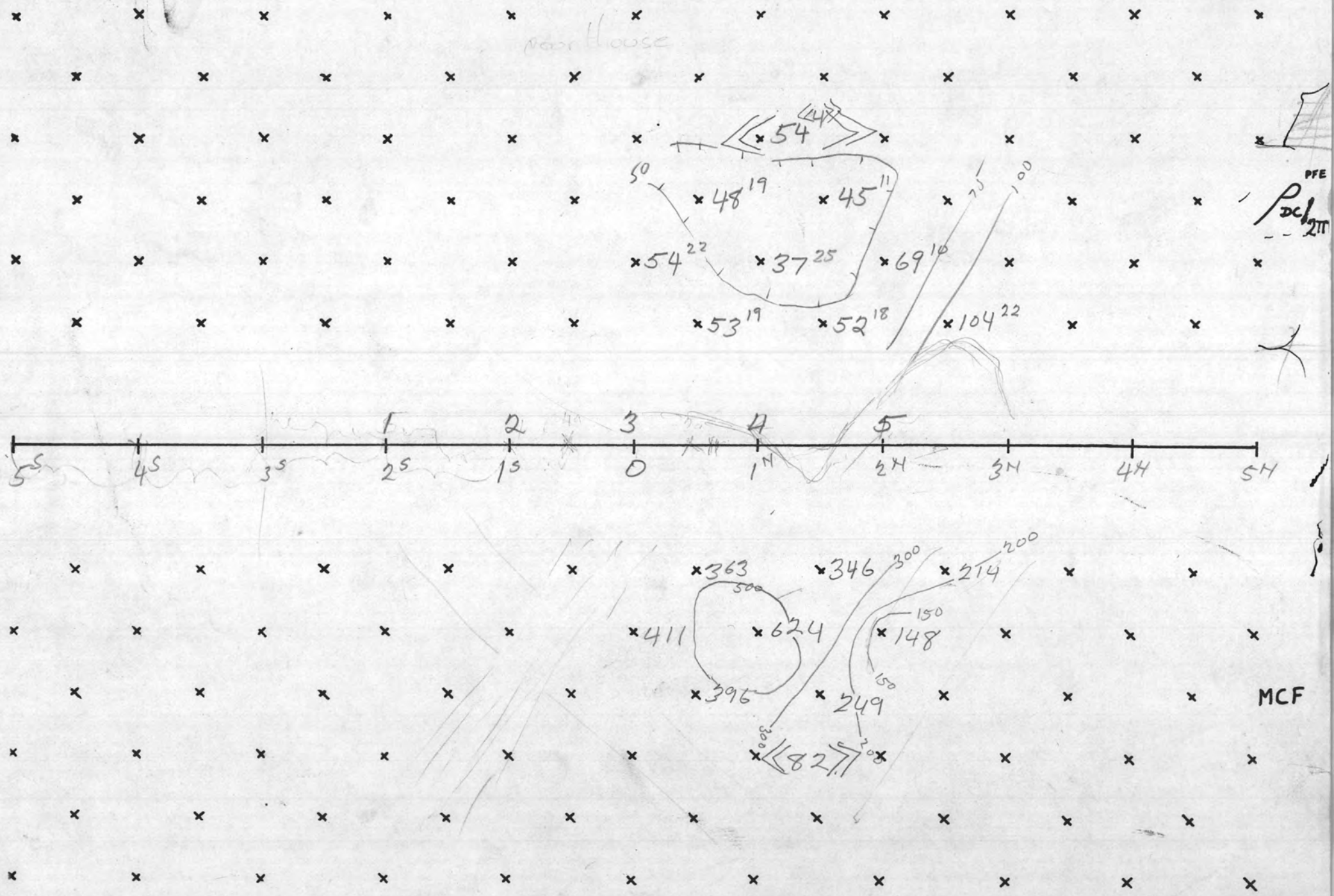
INDUCED POLARIZATION WORK SHEET



Area Line # 2 - Christmas Scale 1" = 1000' Date 3/Aug/63

INDUCED POLARIZATION - RECEIVER NOTES PAGE 3

Project: Y-mas Line: 2-Spr.1-N½ Int.Cal 51.2 Date: 8/1/62

Send	1-5	— CAL										
Rec.Cal	.870	.902	.905	.926	.961	.968	.888	.957	.923	.946	.960	.968
Time I	310	300	500	500	1800	1800	300	300	500	500	1500	1500
DC-1	17.2	16.8	27.5	27.0	93.7	93.0	16.9	16.2	27.1	26.5	78.2	77
DC-2	17.3	16.5	27.7	27.0	93.7	93.0	16.9	16.2	27.2	26.3	78.2	78
Σ	34.5	33.3	55.2	54.0	187.4	186.0	33.8	32.4	54.3	52.8	156.4	155
DC-3	17.2	16.8	27.5	27.0	93.7	93.0	16.9	16.2	27.1	26.5	78.2	77
Dc-4	17.3	16.5	27.7	27.0	93.7	93.0	16.9	16.2	27.2	26.3	78.2	78
Σ	34.5	33.3	55.2	54.0	187.4	186.0	33.8	32.4	54.3	52.8	156.4	155
DC-AV	34.5	33.3	55.2	54.0	187.4	186.0	33.8	32.4	54.3	52.8	156.4	155
AC-1	16.2	16.1	25.2	26.0	85.2	89.0	15.8	15.8	24.7	25.5	72.1	73.0
AC-2	16.3	16.2	25.0	26.0	85.2	88.0	15.9	15.8	24.6	25.5	72.0	73.0
Σ	32.5	32.3	50.2	52.0	170.4	177.0	31.7	31.6	49.3	51.0	144.1	146.0
S.P. Rec.Cal	.943	.971	.910	.963	.910	.952	.939	.976	.907	.966	.923	.943
AC-N %	54%	167	84%	26%	85%	29%	53%	16%	82%	26%	73%	24%
Scale	30	100	30	100	100	300	30	100	30	100	100	

INDUCED POLARIZATION SENDER NOTES

Project: + MAS Line: Date: 1 AUG 62

Send	4-5	→									
Receive	CAL,	→									
Time											
Range ~~1/2~~	~~80~~	150	250	900							
Current	~~140~~	300	500	1800							
Send											
Receive											
Time											
Range											
Current											

INDUCED POLARIZATION SENDER NOTES

Project: CHRISTMAS Line: #2 Date: 31 JUL 62

Send	4-5	→	→									
Receive	Cal	→	→									
Time	1357	1400	1406	1410								
Range	2x80	2x150	2x250	2x900								
Current	160	300	500	1400								
Send												
Receive												
Time												
Range												
Current												

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: X-mas Line: 2 - Spr. 1 - N½ Int.Cal Date: 7/3/82

Send	4-5											
Rec.	CAL											
Time	1357	—	1400	—	1406							
DC-1	8.40 8.40	8.20 8.20	15.7 15.7	14.8 14.8	26.2 26.2	25.3 "	93.8 93.8	91.0 91.0				
DC-2	8.42 8.42	8.20 8.20	15.7 15.7	14.8 14.8	26.2 26.2	25.3 "	92.5 92.5	90.0 90.0				
Σ	16.82	16.4	31.4	29.6	52.4	50.6	186.3	181.0				
DC-3 Normal	160	160	300	310	500	500	1500	1800				
DC Cal	.951	.976	.956	.987	.954	.988	.966	.995		DC/Cal.		
Σ												
DC-AV												
AC-1	7.60	8.00	14.7	14.3	23.7	24.0	84.0	87.0				
AC-2	7.60	8.00	14.7	14.3	23.7	24.2	84.0	87.0				
Σ	15.20	16.0	29.40	28.6	47.4	48.2	168.0	174.0				
~~AC Cal~~	.905	.976	.936	.967	.905	.964	905.	961		AC/DC Cal		
~~AC-N %~~	76%	27%	49%	14%	79%	24%	84%	29%				
Scale	10	30	30	100	30	100	100	300				

INDUCED POLARIZATION SENDER NOTES

Project: Xmas Line: #2 Sprd #1 M/2 Date: 2/Aug/62

Send	4-5	3-4	2-3	1-2								
Receive	5-4	→										
Time		0829										
Range	2x900	2x900	2x900									
Current	1800	1800	1800									
Send												
Receive												
Time												
Range												
Current												

NDUCED POLARIZATION - RECEIVER NOTES PAGE 1

roject: X-mas Line: 2 - Spr. 1 - N½ Int.Cal 51.8 Date: 8/1/62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Rec.	1-2N	→	2-3N	→	→	3-4N	→	→	→			
Time	Polarization		highly	noticible	OK?	110K	O.K.?	??	?,?,?,?			
DC-1	16.6 16.6	3.55 3.40	16.3 16.5	2.80 2.80	1.25 1.40 1.40 1.43	32.1 32.1	5.6 5.4 5.65 5.4	1.3 1.4 1.4 1.5	.6 .6			
DC-2	16.6 16.6	.45 3.70	16.0 15.9	2.95 3.05	1.20 1.09 1.10 1.05	32.5 32.5	5.1 5.25 5.25 5.2	1.5 1.4 1.4 1.3	.8 .8			
Σ	33.2 33.2	7.00 7.10	32.3 32.4	5.75 5.85	2.45 2.49 2.50 2.48	64.6 64.6	10.7 10.65 10.9 10.65	2.8 2.8 2.8 2.8	1.4 1.4			
DC-3	16.3 17.3	3.00 3.20	16.5 16.6	2.80 3.05	1.40 1.30 1.55 1.20	32.5 32.0	5.40 5.4 5.50 5.4	1.2 1.5 1.2 1.4	.6 .6			
Dc-4	16.9 15.9	3.60 3.90	15.8 15.8	3.00 2.80	1.05 1.30 .89 1.20	32.3 32.3	5.25 5.2 5.20 5.2	1.6 1.3 1.6 1.4	.8 .8			
Σ	33.2 33.2	7.00 7.10	32.3 32.4	5.80 5.85	2.45 2.65 2.44 2.40	64.8 64.3	10.65 10.6 10.70 10.6	2.8 2.8 2.8 2.8	1.4 1.4			
DC-AV	33.2	7.05	32.35	5.82	2.48	64.5	10.68	2.80	1.4??			
AC-1	13.2	2.78	13.0	2.25	1.00	25.5	4.58	1.20?	0.65			
AC-2	13.2	2.78	13.0	2.27	1.00	25.5	4.58	1.20?	0.05			
Σ	26.4	5.56	26.0	4.52	2.00	51.0	9.16	2.40	1.30??			
S. P.		-11.0			-11.5		very	noisy	+5.4			
AC-N		0.12	with	AC & DC	0.12			A.C.	>0.3			
Scale	30	10	30 Rmble	10	3	100	10	3	3			

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: X-mas Line: 2 - Sp. 1 - N½ Int.Cal _____ Date: 8/2/62

Send	4-5	3-4	2-3	1-2								
Rec.	7-8N											
Time												
DC-1	32.3 32.0	5.3 5.00 4.95 5.00	1.46									
DC-2	31.5 30.8	5.25 5.10 5.75 5.20	1.47									
Σ	63.8 63.8	10.55 10.15 10.65 10.35	2.93									
DC-3	32.9 32.5	5.39 5.40 5.40 5.60	1.73 1.70									
Dc-4	31.0 31.5	5.20 5.35 5.25 5.25	1.25 1.65									
Σ	63.9 64.0	10.59 10.70 10.65 10.60	2.95 2.95									
DC-AV	63.9	10.64										
AC-1	25.5	4.58	1.21									
AC-2	25.3	4.58										
Σ	50.8	9.16										
S. P.												
AC-N												
Scale	100	10	3									

INDUCED POLARIZATION SENDER NOTES

Project: ¢MAS Line: 2 S Date: 1 AUG

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Receive	1-2S	→	2-3S	→	→	3-4S	→	→	→			
Time								(DC .15Ω)				
Range X2	900	750	900	900	750	900	900	900	750			
Current	1800	1500	1800	1800	1500	1800	1800	1800	1500			
Send						4-5						
Receive						CAL2						
Time												
Range X2						150	150	150				
Current						300	500	1500				

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

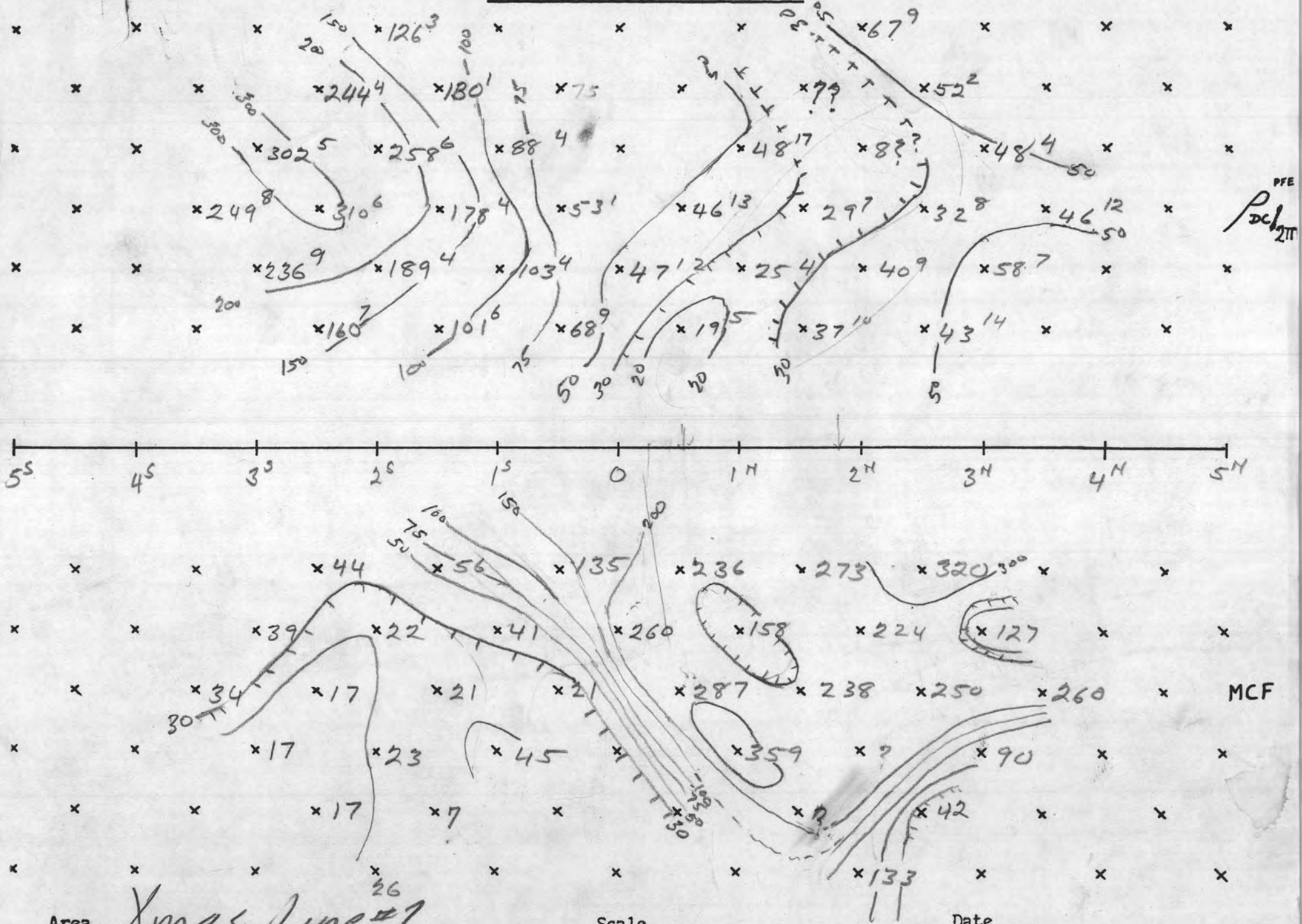
Project Xmas Line #2-1-N Field date 1/Aug/62 Data page_____ Comp. date_____. Comp by_____

	44%	28%	43%	23%	33%	26%	46%	40%	24%			
(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
(B) Receive	1N-2N →		2N-3N	→		3N-4N	→					
(C) n separation	1	2	1	2	3	1	2	3	4			
(D) I	1800	1500	1800	1800	1500	1800	1800	1800	1500			
(E) Vdc (avg)	33.2	7.05	32.35	5.82	2.48	64.5	10.68	2.80	1.4			
(F) DCcal Avg 30% use 965	965	→										
(G) Kn x 10^{-3}	3	12	3	12	30	3	12	30	60			
(H) ρ dc=ExFxGx10^3/D	53	54	52	37	48	104	69	45	54			
(I) Vac Σ	26.4	5.56	26.0	4.52	2.00	51.0	9.16	2.40	1.30			
(J) AC noise x 2	.24	→	.24	→		.6++	→					
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.948	.963	.949	.969	.959	.966	.947	.952	.970			
(M) ρ dc/ρac=ExL/K	1.192	1.222	1.180	1.249	1.190	1.223	1.102	1.112	1.044			
(N) PFE=(M-1)(10^2)	19	22	18	25	19	22	10	11	4			
(O) MCF=(M-1)(10^5)/H	363	411	346	624	396	214	148	249	82			

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

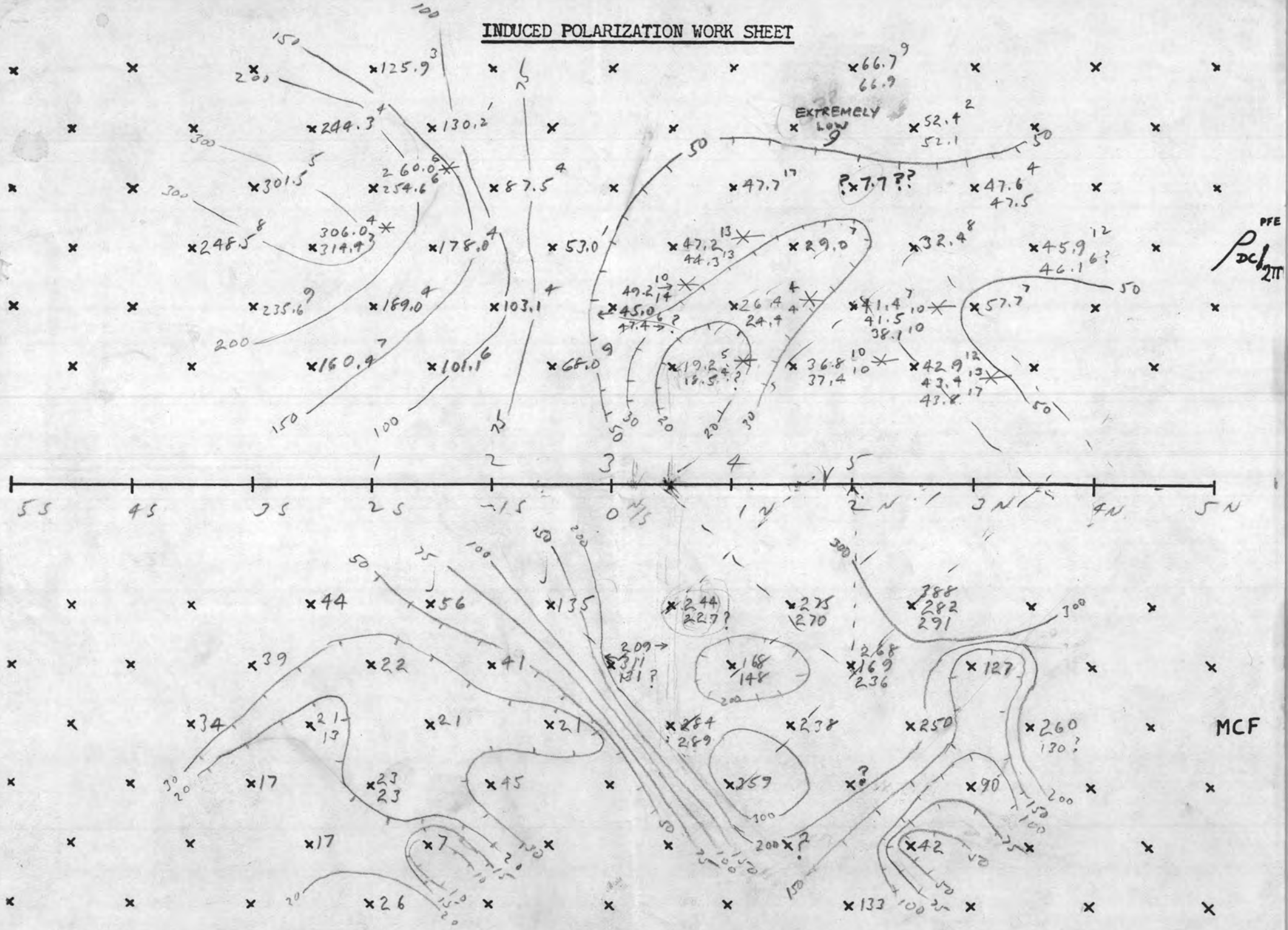
(A) Send												
(B) Receive												
(C) n separation												
(D) I												
(E) Vdc (avg)												
(F) DCcal												
(G) Kn x 10^{-3}												
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

INDUCED POLARIZATION WORK SHEET



Area Xmas Line #1 Scale _____ Date _____

INDUCED POLARIZATION WORK SHEET



Area X - mas - Line 1 - Spr. 1 - N45½ Scale 1" = 1000' Date 7/28/62

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: X-mos Line: 1, Spr. 1, N½ Int.Cal Date: 7/25/62

Send	4-5		5-9		2-5		1-2						
Rec.	5-6N	→		→	→		→						
Time		9:26		9:35		10:00		10:05					
DC-1	14.7 13.1	12.5 17.5	.73 .75	.73 .73	.49 .49	.40 .50	.25 .23	.25 .28					
DC-2	9.3 11.3	11.9 12.0	.78 .80	.81 .79	.50 .50	.54 .48	.26 .23	.27 .20					
Σ	2.50 2.44	2.44 2.45	1.51 1.55	1.54 1.52	.99 .99	.94 .98	.51 .50	.52 .48					
DC-3	17.0 15.0	12.4 12.5	.80 .73	.75 .73	.37 .29	.47 .41	.40 .23	.40 .32					
Dc-4	11.3 10.0	11.8 11.7	.76 .80	.79 .77	.58 .54	.49 .53	.11 .29	.10 .18					
Σ	2.43 2.50	2.42 2.42	1.56 1.55	1.54 1.54	.95 .93	.96 .94	.51 .52	.58					
DC-AV		2.45		1.53		0.96		0.51					
AC-1		1.04		0.70		0.45		0.23					
AC-2		1.04		0.70		0.45		0.23					
Σ		2.08		1.40		0.90		0.46					
S. P.		+4.7	→				→	+2.3					
AC-N		0.08		0.08		0.07		0.06					
Scale	3	→	→	→									

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: X-Mas Line: 1 Cpr 1½N Int.Cal 51.6 Date: 7-25-62

Send	4-5	→	→									
Rec.	CAL	→	→									
Time		8:37										
DC-1		11.2	16.8	16.0	26.8	26.0	47.2	46.	9.6	9.6		
DC-2		11.2	16.6	16.0	27.0	26.0	46.8	46.	9.75	9.6		
Σ		22.4	33.4	32.0	53.8	52.0	94.0	92.	19.35	19.2		
DC-3		11.2	16.8	16.0	26.8	26.0	47.2	46.	9.6	9.6		
Dc-4		11.2	16.6	16.0	27.0	26.0	46.8	46.	9.75	9.6		
Σ		22.4	33.4	32.0	53.8	52.0	94.0	92.	19.35	19.2		
DC-AV		22.4	33.4	32.0	53.8	52.0	94.0	92.	19.35	19.2		
AC-1		10.7	15.5	15.4	24.2	24.7	43.8	43.5	8.65	9.0		
AC-2		10.7	15.5	15.5	24.2	24.7	43.7	43.	8.67	9.0		
Σ		21.4	31.0	30.9	48.4	49.4	87.5	86.5	17.32	18.0		
S. P.												
AC-N												
SCALE	10	30	30	100	30	100	100	300	10	30		

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: X-mas Line: 1, spr 1, N½ Int.Cal 51.6 Date: 7/29/62

Send	4-5	→	→									
Rec.	CAL	→	→									
Time						8:47						
DC-1	9.6	9.4	16.1	15.8	46.8	46.0						
DC-2	9.45	9.5	16.2	15.8	47.2	46.0						
Σ	19.05	18.9	32.3	31.6	94.0	92.0						
DC-3	9.6	9.4	16.1	15.8	46.8	46.0						
Dc-4	9.45	9.5	16.2	15.8	47.2	46.0						
Σ	19.05	18.9	32.3	31.6	94.0	92.0						
DC-AV	19.05	18.9	32.3	31.6	94.0	92.0						
AC-1	8.52	9.0	15.1	15.0	43.9	43.5						
AC-2	8.52	9.0	15.1	15.0	44.0	43.5						
Σ	17.04	18.0	30.2	30.0	87.9	87.0						
S. P.												
AC-N												
SCALE	10	30	30	100	100	300						

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: X-MAS Line: 1 Sp½N ½ Int.Cal 5.2 Date: 7-24-62

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2
Rec.	5-6N			→	4-5N			→	5-6N			→
Time	11:11	11:16	11:02	11:06	12:22	12:29			O.K.	12:18 Val.?	POOR ?	POOR PRESS
DC-1	12.2 12.8	2.12 2.02	.87 .90 .93 .70	.30 .41 .45 .42	4.00 4.00	1.12 .94 .95 1.00	0.12 0.12		1.30 .35 1.20 1.30	.78 .70 .73 .90	.43 .40 .35 .40	.20 .20
DC-2	2.3 11.7	1.25 2.10	.92 .93 .88 1.13	.70 .59 .55 .60	4.05 4.05	1.09 1.08 1.02 1.05			1.95 1.25 1.30 1.20	.68 .78 .77 .60	.52 .53 .57 .53	.30 .20
Σ	24.5 24.5	5.77 6.02	1.79 1.83 1.81 1.83	1.00 1.00 1.00 1.02	8.05 8.05	2.12 2.02 1.97 2.05			2.65 1.60 2.60 2.05	1.46 1.45 1.50 1.50	.95 .93 .95 .93	.50 .50
DC-3	12.5 12.3	2.05 2.25	1.10 .91 1.10 1.18	.68 .99 .72 .95	4.00 4.00	.95 1.00 1.10 1.02	TOO SMALL		1.30 1.40 1.40 1.15	.70 .63 .72 .70	.44 .41 .53 .46	.25 .35
Dc-4	12.0 12.2	2.90 2.75	.69 .91 .70 .60	.30 .57 .72 .52	4.05 4.05	1.00 1.05 .93 1.02	TO READ		1.30 1.15 1.20 1.40	.80 .85 .70 .80	.45 .52 .43 .45	.25 .25
Σ	24.5 24.5	5.95 6.00	1.79 1.82 1.80 1.84	.98 1.00 1.02 1.00	8.05 8.05	1.95 2.05 2.08 2.04			2.60 2.55 2.60 2.55	1.50 1.51 1.52 1.50	.92 .95 .96 .93	.50 .50
DC-AV	24.5	5.99	1.82	1.00	8.05	2.04	0.24?	<0.1?	2.58	1.49	.937	.50
AC-1	10.0	2.58	0.81	0.41	3.55	0.90	0.19		1.15!			
AC-2	9.9	2.59	0.81	0.40	3.57	0.89			1.15			
Σ	19.9	5.17	1.62	0.81	7.12	1.79	.38		2.30			
S. P.	←			-27.9				-14.7				+9.1
AC-N	←			0.08				0.08				5-3.6
SCALE	30	10	3	3	10	3	→					

INDUCED POLARIZATION - RECEIVER NOTES PAGE 3

Project: X-mas Line: Repeat 1-Sor 1-N½ Int.Cal _____ Date: 7/23/62

Send	4-5	3-4	2-3	1-2								
Rec.	3-4N											
Time												
DC-1	11.9 11.9	2.75 2.70										
DC-2	12.0 12.0	2.75 3.00										
Σ	23.9 23.9	5.70 5.70										
DC-3	11.0 11.9	2.75 2.65										
Dc-4	12.0 12.0	3.00 3.05										
Σ	23.9 23.9	5.75 5.70										
DC-AV	23.9	5.71										
AC-1	10.3	2.58	.84									
AC-2	10.5	2.58	x2									
Σ	20.8	5.16	1.68									
S. P.												
AC-N	30	10	3									

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: X-mas Line: Part. rep 1 - Sp 1 - W½ Int.Cal _____ Date: 7/23/62

Send	3-4	2-3	1-2	CAL	→	→	→	→				
Rec.	→	→	→	4-5	→	→	→	→				
Time					11:44		11:47		11:50			
DC-1				8.00	7.85	15.0	14.0	44.0	42.0			
DC-2				8.02	7.85	14.9	14.1	44.0	42.0			
Σ				16.02	15.70	29.9	28.1	88.0	84.0			
DC-3				8.00	7.85	15.0	14.0	44.0	42.0			
Dc-4				8.02	7.85	14.9	14.1	44.0	42.0			
Σ				16.02	15.70	29.9	28.1	88.0	84.0			
DC-AV				16.02	15.70	29.9	28.1	88.0	84.0			
AC-1				7.65	7.9	14.65	14.2	43.6	42.0			
AC-2				7.65	7.8	14.65	14.2	43.3	42.0			
Σ				15.30	15.70	29.3	28.4	86.9	84.0			
S. P.												
AC-N												
Scale				10	30	30	100	100	300			

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 1

partial repeat

Project: X-mac Line: 1 - Spr 1 - N½ Int.Cal 50.5 Date: 7/20/62

Send	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5
Rec.	2-N	→	→	3-4N	→	→	→	4-5N	→	→	→	5-6N
Time	11:03	11:13	12:20	12:35	12:45 POOR	14:15 POOR	POOR					
DC-1	1.26 0.8 10.3 7.2	1.70 1.65 20.1 20.2	1.04 1.10 1.01 1.14	12.0 10.4 11.0 9.9	28.0 27.8	.6 1.0 .91 3.5	.4 .7					
DC-2	10.2 10.5 10.0 10.0	1.70 1.67 1.6	.83 .77 .85 .71	11.8 13.1 11.9 12.3	28.0 27.7	1.2 .9 .80 1.25	.6 .3					
Σ	10.5 20.3 20.3 20.2	3.25 3.35 3.33 3.30	1.87 1.87 1.86 1.85	23.8 23.5 22.9 23.6	56.0 5.71	1.80 2.1 1.71 2.00	1.0 1.0					
DC-3	10.0 9.4 10.0 9.4	1.65 1.70 1.65 1.65	1.02 1.06 1.10 1.08	17.1 10.8 19.1 10.5	3.02 2.88	.98 .9 .81	.6 .65					
Dc-4	10.3 11.3 10.3 11.2	1.70 1.65 1.70 1.70	.84 .78 .74 .79	10.1 12.9 10.3 12.9	2.70 2.80	.75 .85 .81	.4 .35					
Σ	20.6 20.7 20.6 20.1	3.35 3.35 3.35 3.35	1.86 1.86 1.89 1.87	23.2 23.7 23.4 23.7	5.72 5.68	1.73 1.75 1.68	1.0 1.0					
DC-AV	20.6	3.35	1.86	23.6	5.70	1.73	1.00					
AC-1	9.3	1.59	.84	10.4	2.58	.88	.50					
AC-2	9.4	1.58	.89	10.3	2.58	.88	.57					
Σ	18.7	3.17	1.68	20.7	5.16	1.76	1.02					
S. P.	very [illegible]		-5.6									
AC-N	0.15 D.C. very [illegible]		0.15 D.C.				.50					
Scale	30	3	3	30	3	3						

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: Christmas Line: 1-Sp, 1-N½ Int.Cal 50.5 Date: 7/20/62

P.R. 50002 10,000Ω

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	1-2N	→	2-3N	→	→	3-4N	→	→	→	4-5N	→	→
Time			15:46		15:59							
DC-1	5.0 4.8	2.0 2.35 2.4 2.1	9.30 9.6 9.95 9.7	1.79 1.66 1.65 1.67	10.89 10.99							
DC-2	5.0 4.8	1.9 2.25 2.5 1.95	9.4 9.1 9.39 9.0	1.61 1.69 1.72 1.6	10.72 10.77							
Σ	9.8 9.8	4.4 4.45 4.4 4.20	18.7 18.7 18.7 18.3	3.40 3.25 3.37 3.26	1.66 1.61 1.70 1.64							
DC-3	5.0 4.8	2.5 2.30 1.9 1.90	9.25 9.4 9.25 9.4	1.72 1.70 1.70 1.6	10.75 10.89							
Dc-4	5.0 4.8	2.2 2.20 2.0 2.15	9.25 9.4 9.25 9.4	1.63 1.66 1.62 1.72	10.89 10.73							
Σ	9.8 9.8	4.4 4.20 4.2 4.35	18.5 18.8 18.5 18.8	3.35 3.25 3.32 3.32	1.62 1.66 1.65 1.69							
DC-AV	9.80	4.32	18.75	3.36	1.655							
AC-1	4.60	1.93	8.25	1.57	.74							
AC-2	4.55	1.93	8.30	1.57	.74							
Σ	9.15	3.86	16.55	3.14	1.48							
S. P.	+21.6 →				-3.3							
AC-N	0.3 →				0.10							
SCALE	10	3	10	3	3							

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: Christmas Line: 1-Spv.1-N½ Int.Cal _____ Date: 7/20/62

Send	1-2	4-5	3-4	2-3	1-2	CAL	→	→				
Rec.	→	5-6N	→	→	→	4-5	→	→				
Time							13:18		13:22			
DC-1						8.00	7.8	14.9	13.9	43.8	41.	
DC-2						8.06	7.8	14.9	13.9	43.8	41.	
Σ												
DC-3						8.00	7.8	14.9	13.9	43.8	41.	
Dc-4						8.00	7.8	14.9	13.9	43.8	41.	
Σ												
DC-AV						16.00	15.6	29.8	27.8	87.6	82.0	
AC-1						7.65	7.8	14.3	13.9	42.9	41.	
AC-2						7.65	7.8	14.3	13.9	42.9	41.	
Σ						15.3	15.6	28.6	27.8	85.8	82.0	
S. P.												
AC-N												
SCALE						10	30	30	100	100	300	

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Repeat Line: _____ Int.Cal _____ Date: 7/20/62

PR 4000 Ω

Send	2-7				1-2								
Rec.	1-2 N	→											
Time													
DC-1	4.52 5.95 5.7 4.50 4.30 3.85 3.6 4.45				2.07 2.07	1.92							
DC-2	5.4 5.60 6.0 4.65 4.0 3.95 3.6 4.75				2.2 1.90								
Σ	9.82 9.60 9.3 9.35 8.0 9.55 9.6 9.40				4.1 4.10								
DC-3	5.6 5.50 5.65 3.9 3.60 3.65				200 2.22								
Dc-4	5.9 5.90 4.60 3.7 3.7 4.95				2.20 1.85								
Σ	9.5 9.18 9.30 9.40 9.60 9.55				4.22 4.15								
DC-AV	9.465				4.15								
AC-1	4.43				1.92								
AC-2	4.45				1.92								
Σ	8.88				3.84								
S. P.	+24.7	→		→									
AC-N	6.25	→		→									
SCALE	10				3								

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: XMAS Line: 2 Spr 2 N ½ Int.Cal 51.5 Date: 7-27-62

Send	4-5	→										
Rec.												
Time		8:50		8:57		9:04						
DC-1	16.0	15.6	26.3	25.9	46.9	46.00						
DC-2	16.0	15.7	26.1	25.6	46.6	46.00						
Σ	32.0	31.3	52.4	51.4	93.5	92.00						
DC-3	16.0	15.6	26.3	25.8	46.9	46.00						
Dc-4	16.0	15.7	26.1	25.6	46.6	46.00						
Σ	32.0	31.3	52.4	51.4	93.5	92.00						
DC-AV	32.0	31.3	52.4	51.4	93.5	92.00						
AC-1	15.0	15.0	23.8	24.2	43.8	43.5						
AC-2	15.0	14.9	23.7	24.2	43.7	43.5						
Σ	30.0	29.9	47.5	48.4	87.5	87.0						
S. P.												
AC-N												
SCALE	30	100	30	100	100	300						

INDUCED POLARIZATION SENDER NOTES

Project: X mus Line: #1 Sprd #1 N 1/2 Date: 24/July/62

Send	2-3	1-2	4-5	3-4	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2
Receive	3H-4H	→	→		4H-5H	→	→	→	5H-6H	→	→	→
Time	1100	1106	1111	1116	1222	1229	No data	No data		1618		
Range	2x900	2x600	2x800	2x900	2x800	2x900	2x900	2x600	2x800	2x900	2x900	2x600
Current	1800	1200	1600	1800	1600	1800	1800	1200	1600	1800	1800	1200
Send							4-5	→	→			
Receive							Cal					
Time							0836	0840				
Range							2x80	2x150	2x450			
Current							160	300	900			

71
-0
47

71 50N
166 50E

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project X-mas Line 1-Spr 1 (N½) Field date 7/20/62 Data page_____ Comp. date 7/21/62 Comp by C.S.L.

	% S.D. 45	64	83	52	25		44	64				
(A) Send	2-3	1-2	3-4	2-3	1-2		2-3	1-2				
(B) Receive	1-2 N	→	2-3 N	→	→		1-2 N	→				
(C) n separation	1	2	1	2	3		1	2				
(D) I	1600	1100	1600	1600	1100		1600	1100				
(E) Vdc (avg)	9.80	4.32	18.75	3.36	1.655	Repeat	9.465	4.15				
(F) DCcal USED	1.045	→	→	→	→		→	→				
(G) Kn x 10^{-3}	3	12	3	12	30		3	12				
(H) ρ dc=ExFxGx10^3/D	19.2	49.2	36.8	26.4	47.2		18.5	47.4				
(I) Vac Σ	9.15	3.86	16.55	3.14	1.48		8.88	3.84				
(J) AC noise x 2	.60	.60	.20	.20	.20		.50	.50				
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	9.15	3.82	16.55	3.14	1.47		8.88	3.81				
(L) AC-DC cal. →												
(M) ρ dc/ρac=ExL/K	1.071	1.131	1.133	1.070	1.128		1.066	1.090				
(N) PFE=(M-1)(10^2)	7	13	13	7	13		7	9				
(O) MCF=(M-1)(10^5)/H	244	209	275	168	284		227	131				
Corr. ρ_{DC}	1.047	1.103	1.101	1.044	1.134		1.042	1.062				
ρ_{AC} Corr. % S.E.	5	10	10	4	13		4	6				

Project_____ Line 5 10 Field date_____ Data page 4 Comp. date_____ Comp by_____

(A) Send	CAL	IBR	ATIONS	4	-5							
(B) ~~Receive~~ SCALE	10	30	30	100	100	300	10	30	30	100	100	300
(C) ~~n separation~~ % S.D	77%	26%	44%	14%	43%	14%	77%	26%	44%	14%	43%	14%
(D) I	160	160	300	300	900	900	160	160	300	300	900	900
(E) Vdc (avg)	16.00	15.6	29.8	27.8	87.6	82.0	15.68	15.2	29.5	27.8	86.6	82.0
(F) DCcal	1.000	1.026	1.006	1.079	1.028	1.098	1.020	1.051	1.017	1.079	1.039	1.098
(G) Kn x 10^{-3}			DC	CAL	1.045							
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	15.3	15.6	28.6	27.8	85.8	82.0	15.34	15.4	28.8	27.8	85.4	82.0
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.956	1.000	.960	1.000	.980	1.000	0.980	1.012	0.976	1.000	0.988	1.000
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

.144
.026
118

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INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Xmas Line #1 Sprd #1 Field date 24/July/62 Data page_____ Comp. date_____. Comp by_____

	30 38%	10 26%	3 27%	3 18%	10 36%	3 30%	<10%		38%			
(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2
(B) Receive	3N-4N	→	→	→	4N-5N	→	→	→	5N-6N			
(C) n separation	1	2	3	4	2	3	4	5	3	4	5	6
(D) I	1600	1800	1800	1200	1600	1800	1800	1200	1600	1800	1800	1200
(E) Vdc (avg)	24.5	5.99	1.82	1.00	8.05	2.04	0.24?	—	2.58	1.49	9.37	0.50
(F) DCcal	.955	→	→	→	→	→	→	→	→	→	→	→
(G) Kn x 10^{-3}	3	12	30	60	12	30	60	105	30	60	105	168
(H) ρ dc=ExFxGx10^3/D	43.8	38.1	29.0	47.7	57.7	32.4	7.7?	—	46.1	47.5	52.1	66.9
(I) Vac Σ	19.9	5.17	1.62	0.81	7.12	1.79	.38?	—	2.30	?	?	?
(J) AC noise x 2	.16	→	→	→	.16	→	→	→	1.0-6.0?	→	→	→
(K) Vac(corr) = $\sqrt{I^2 - J^2}$							?					
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K	1.231	1.158	1.122	1.235	1.130	1.139			1.121			
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H	388	268	238	359	127	250			130			
	.950 1.170 17	.950 1.102 10	.950 1.069 7	.950 1.171 17	.950 1.073 7	.950 1.081 8	?		.945 1.060 6			

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	→	→	→	→	→						
(B) Receive	Cal	→	→	→	→	→						
(C) n separation	10	30	30	100	100	300						
(D) I	160	160	300	300	900	900						
(E) Vdc (avg)	19.05	18.9	32.3	31.6	94.0	92.0						
(F) DCcal	.840	.846	.930	.950	.958	.978	→	Used .955				
(G) Kn x 10^{-3}												
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	17.04	18.0	30.2	30.0	87.9	87.0						
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.895	.952	.936	.950	.934	.946						
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												
	90%	30%	50%	15%	44%	15%						

.178 √.105 / 50 12 FOB 1.96 .03 .81 2

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INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project X-mas Line 1-5, 1N Field date 7/25/62 Data page_____ Comp. date 7/25/62 Comp by C.S.L.

	35	23	15	8	5½	59	26	28	70	45	36	52
(A) Send	4-5	3-4	2-3	1-2		2-4	4-5	2-3	3-4	4-5	CAL	→
(B) Receive	5-6N	→	→	→		1-2.5	→	2-3.5	→	→	4-5	→
(C) n separation	3	4	5	6		1	2	1	2	3	30	30
(D) I	1500	1800	1800	1200		1800	1600	1800	1800	1600	200	300
(E) Vdc (avg) 1st	2.45	1.53	0.96	0.51		41.8	6.16	62.4	15.85	2.90	22.4	33.4
(F) DCcal USED	0.935					975					0.893	0.899
(G) Kn x 10^{-3}	70	60	105	168		3	12	3	12	30		
(H) ρ dc=ExFxGx10^3/D	45.9	47.6	52.4	66.7		68.0	45.0	101.1	103.1	53.0		
(I) Vac Σ	2.08	1.40	0.90	0.46		35.4	5.12	56.0	13.90	2.70	21.4	31.0
(J) AC noise x 2	.16	.16	.14	.12				.50	.50	.50		
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	2.08	1.39	0.89	.445		35.4	5.12	56.0	13.90	2.66		
(L) AC-DC cal.											0.955	0.929
(M) ρ dc/ρac=ExL/K →	1.178	1.100	1.079	1.146		1.180	1.202	1.113	1.140	1.090		
(N) PFE=(M-1)(10^2)	18	10	9	15		18	20	11	14	9		
(O) MCF=(M-1)(10^5)/H	260	90	42	133		135	311	56	41	21		
	1.119 12	1.043 4	1.022 2	1.079 9		1.092 9	1.140 14	1.056 6	1.042 4	1.011 1		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	15	81	25	44	15	87	30	76	26, 49	14, 43	14 78	24
(B) Receive	100	90	100	100	300	10	30					
(C) n separation												
(D) I	300	500	500	900	900	180	180	160	160 300	300 900	900 500	500
(E) Vdc (avg)	32.0	53.8	52.0	94.0	92.0	19.35	19.2	16.85	16.6 31.5	29.8 93.0	90.0 52	51.0
(F) DCcal	0.938	0.930	0.961	0.957	0.979	0.930	0.938	.951	.965 .958	1.005 .969	1.000 .960	.980
(G) Kn x 10^{-3}				0.936					0.973			
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	30.9	48.4	49.4	57.5	56.5	17.32	18.0					
(J) AC noise x 2	0.965	0.900	0.951	0.930	0.940	0.896	0.939	15.12	15.8 29.2	28.5 86.6	85.5 46.8	47.8
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.								.899	.952 .929	.955 .930	.950 .900	.937
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

160 300 900

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INDUCED POLARIZATION SURVEY COMPUTATION SHEET

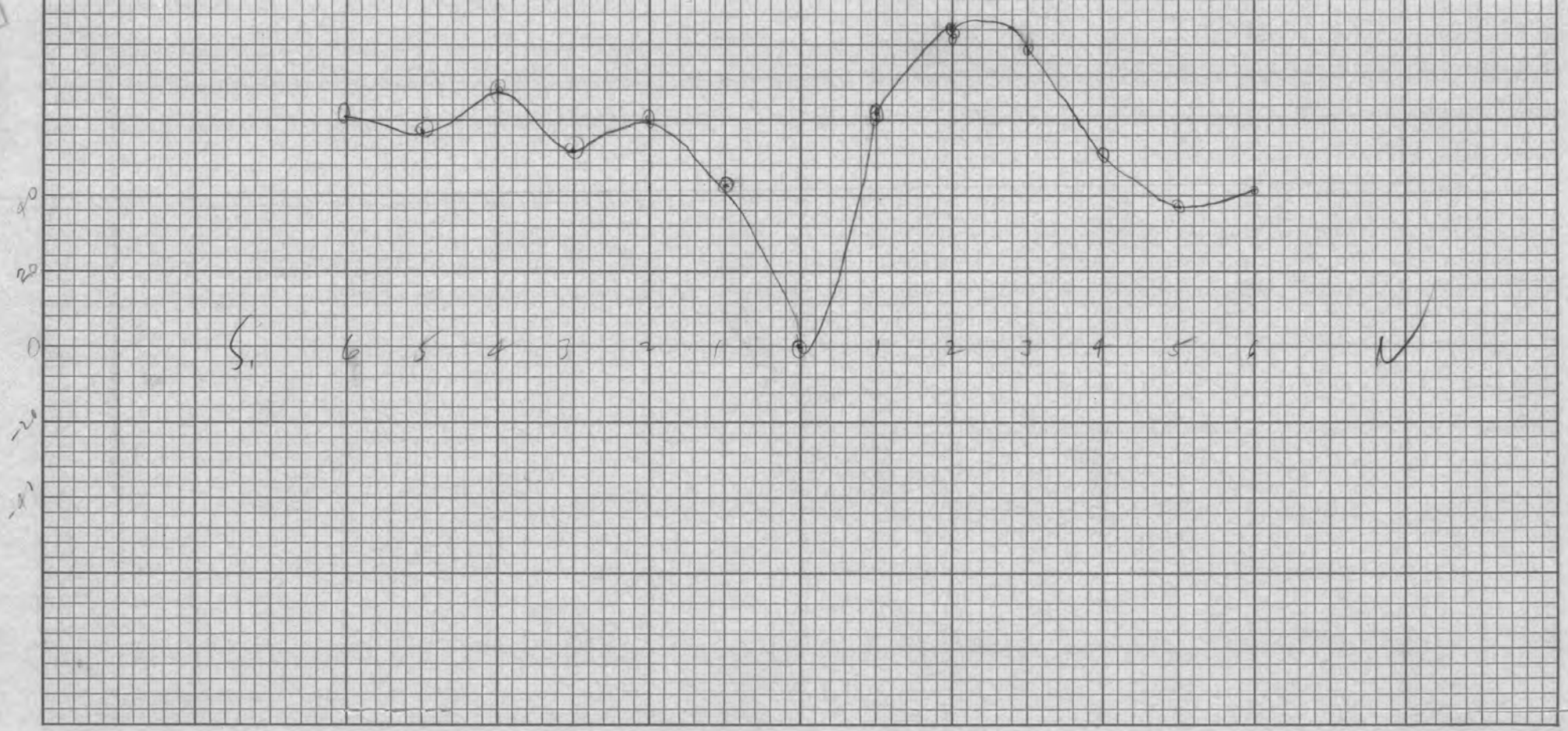
Page_____

Project X-mas Line 1-Spr. 1 N½ Field date 7/23/62 Data page_____ Comp. date 7/23/62. Comp by C.S.L.

Scale	30	3	3	30	3	3	3		30	10	3	
(A) Send	3-4	2-3	1-2	4-5	3-4	2-3	1-2	Repeat	4-5	3-4	2-3	
(B) Receive	2-3N	→	→	3-4N	→	→	→		3-4N	→	→	
(C) n separation	1	2	3	1	2	3	4		1	2	3	
(D) I	1700	1700	1700	1700	1700	1700	1300		1700	1700	1700	
(E) Vdc (avg)	20.6	3.35	1.86	23.6	5.70	1.73	1.00		23.9	5.71	1.73	
(F) DCcal USED	1.030											
(G) Kn x 10^{-3}	3	12	30	3	12	30	60		3	12	30	
(H) ρ dc=ExFxGx10^3/D	37.4	24.4	44.3	42.9	41.4	31.5	47.6		43.4	41.5	31.5	
(I) Vac Σ	18.7	3.17	1.68	20.7	5.16	1.76	1.02		20.8	5.16	1.68	
(J) AC noise x 2	.30	.30	.30	1.0	1.0	1.0	1.0					
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	18.7	3.17	1.65	20.7	5.06							
(L) AC-DC cal.	1.000	.980										
(M) ρ dc/ρac=ExL/K	1.101	1.058	1.128	1.140	1.126				1.149	1.108		
(N) PFE=(M-1)(10^2)	10	6	13	14	13				15	11		
(O) MCF=(M-1)(10^5)/H	270	148	289	282	169				291	236		
	30% 10	56% 1.036 4	31% 13	40% 1.12	95% 1.070 7				34% 1.126 13	26% 1.098 10		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	CAL											
(B) Receive	4-5											
(C) n separation	10	30	30	100	100	300						
(D) I	160	160	300	300	900	900						
(E) Vdc (avg)	16.02	15.70	29.9	28.1	88.0	89.0						
(F) DCcal	.999	1.019	1.002	1.068	1.021	1.070						
(G) Kn x 10^{-3}			1.030									
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	15.30	15.70	29.3	28.4	86.9	89.0						
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.954	1.000	.980	1.010	.986	1.000						
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												
	10 80%	30 26%	30 50%	14%	44%	74%						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20
0
-20
-40
6
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1
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6

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: X-mds Line: 1-Spr. 1-S½ Int.Cal 51.7 Date: 7/27/67

Send	1-2		2-3		3-4		4-5					
Rec.	4-5S											
Time			10:15		10:24		10:30					
DC-1			9.0 10.0		3.95 4.25	4.08 4.40	.97 1.13	1.07 .95				
DC-2			10.0 9.0		4.15 3.80	4.00 3.70	1.13 .99	1.00 1.22				
Σ			19.0 19.0		8.10 8.05	8.08 8.10	2.10 2.12	2.07 2.17				
DC-3			9.9 10.0		4.02 4.00	3.85 3.92	1.02 1.17	.92 .99				
Dc-4			9.1 9.0		4.04 4.05	4.20 4.25	1.00 .93	1.00 1.00				
Σ			19.0 19.0		8.06 8.05	8.05 8.17	2.02 2.10	1.92 1.99				
DC-AV			19.00		8.08		2.06					
AC-1			8.65		3.61		0.97					
AC-2			8.60		3.61		0.97					
Σ			17.25		7.22		1.94					
S. P.								-11.1				
AC-N								0.10				
Scale			30		10		3					

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: X-mas Line: 1 - Spr 1, 5½ Int.Cal _____ Date: 7/27/62

Send	1-7		2-3		3-4		4-5					
Rec.	5-65	→	→	→	→	→	→					
Time	11:35											
DC-1	5.85 6.10		4.6 4.8	4.8 4.3 4.6 4.9	2.22 2.03	1.92 2.43	.63 .64	.73 .84 .54 .80	.84 .78 .62 .80			
DC-2	5.95 6.05		4.8 4.6	5.0 4.8 4.4 4.5	2.29 2.02	1.90 2.38	.72 .50	.51 .80 .73 .57	.58 .60 .65 .62			
Σ	11.95 12.00		9.4 9.4	9.4 9.2 9.4 9.3	4.25 4.37	4.35 4.25	1.27 1.26	1.27 1.00 1.24 1.31	1.46 1.38 1.23 1.11			
DC-3	5.70 6.40		4.6 4.8	4.9 4.0 4.4 4.4	1.95 2.33	2.19 2.20	.80 .78	.72 .79 .50 .79	.51 .53 .44 .69			
Dc-4	5.60 6.40		5.0 4.6	4.8 4.7 4.8 4.7	2.35 2.07	2.20 2.23	.65 .60	.50 .60 .75 .69	.57 .54 .69 .70			
Σ	12.10 12.00		9.4 9.6	9.3 9.4 9.6 9.1	4.27 4.42	4.39 4.43	1.26 1.25	1.22 1.25 1.28	.99 1.22 1.26 1.29			
DC-AV	12.01		9.37		4.34		1.24					
AC-1	5.19		4.22		1.92		0.58					
AC-2	5.18		4.22		1.92		0.58					
Σ	10.37		8.44		3.84		1.16					
S. P.							+4.3					
AC-N							0.12					
SCALE	10		10		3		3					

INDUCED POLARIZATION SENDER NOTES

Project: Christmas Line: Line #1 Sprd #1 Date: 23/July/62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive	1N-2N →		← REPEAT 2N-3N	from 20/July →		3N-4N	3N →			Repeat 3N-4N	→	
Time	See		1207	1213	1222	1310 1320	1320 1345	1415	1423			
Range	20/July		2x850	2x850	2x650	2x850	2x850	2x850	2x650			
Current			1700	1700	1300	1700	1700	1700	1300			
Send	1-2						4-5	→				
Receive	Repeat 3N-4N						Calls	→				
Time							1144	1147	[illegible]			
Range							2x80	2x150	2x450			
Current							160	300	900			

INDUCED POLARIZATION SENDER NOTES

Project: Xmas Line: #1 Sprd #1 Date: 25/July

Send	4-5	3-4	1-3	1-2		2-3	3-4	4-5	3-4	4-5		
Receive	5-6					2-3	→		1-2	→		
Time	0946	0953		1002		1343		1357	1503			
Range	2x750	2x900	2x900	2x600		2x900	2x900	2x800	2x900	2x800		
Current	1500	1900	1800	1200		1800	1800	1600	1800	1600		
Send	1-2					X	4-5	→				
Receive	Cal					Y	Cal	→				
Time	1520	1523	1526	1530			0837	0841	0848	0900	0906	
Range	2x80	2x150	2x450	2x250			1x100	1x150	2x250	2x450	2x90	
Current	160	300	900	500			200	300	500	900	180	

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: X MAS Line: 15pr1-6½ Int.Cal 51.8 Date: 7-26-62

Send	1-2	→										
Rec.	CAL	→										
Time			8:38			8:42		8:45				
DC-1		10.9	17.0	16.5	27.3	26.0	47.9	47.0				
DC-2		11.00	17.2	16.4	27.0	26.3	47.3	47.0				
Σ		21.90	34.2	32.9	54.3	52.3	95.2	94.0				
DC-3		10.9	17.0	16.5	27.3	26.0	47.9	47.0				
Dc-4		11.00	17.2	16.4	27.0	26.3	47.3	47.0				
Σ		21.90	34.2	32.9	54.3	52.3	95.2	94.0				
DC-AV		21.90	34.2	32.9	54.3	52.3	95.2	94.0				
AC-1	9.90	10.4	16.0	15.9	24.0	24.8	44.3	44.00				
AC-2		10.4	16.0	15.9	24.3	24.8	44.2	43.5				
Σ		20.8	32.0	31.8	48.3	49.6	88.5	87.5				
S. P.												
AC-N												
SCALE	10	30	30	100	30	100	100	300				

INDUCED POLARIZATION - RECEIVER NOTES PAGE 8/17

Project: X-mas Line: 1, Spr. 1 - 5 1/2 Int.Cal 51.6 Date: 7/25/62

Send			2-3	3-4	4-5	3-4	4-5					
Rec.			2-35	→	→	1-25	→					
Time			13:43	13:46	13:55	15:03		15:39				
DC-1			31.5 31.5	7.90 7.90	1.50 1.50	21.7 21.3	3.2 2.7	3.0 2.85				
DC-2			30.9 30.9	7.95 7.95	1.40 1.40	20.0 20.3	2.9 3.5	3.2 3.25				
Σ			62.4 62.4	15.85 15.85	2.90 2.90	41.7 41.6	6.1 6.2	6.2 6.1				
DC-3			31.5 31.5	7.95 7.95	1.50 1.50	21.5 21.5	2.85 3.0	3.0 3.0				
Dc-4			30.9 30.9	7.90 7.90	1.40 1.40	20.4 20.4	3.25 3.2	3.2 3.2				
Σ			62.4 62.4	15.85 15.85	2.90 2.90	41.9 41.9	6.1 6.2	6.2 6.2				
DC-AV			62.4	15.85	2.90	41.8	6.16					
AC-1			28.0	6.95	1.36	17.7	2.57					
AC-2			28.0	6.95	1.34	17.7	2.55					
Σ			56.0	13.90	2.70	35.4	5.12					
S. P.					-8.0		+170					
AC-N			←	—	0.25							
SC ALE			100	10	3	30	10					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: X-mas Line: 1 - Spr. 1 5½ Int.Cal 51.6 Date: 7/25/62

Send	1-2	→	→	→	→	→	→	→				
Rec.												
Time		15:20		15:23		15:26		15:30				
DC-1	8.45	8.3	15.7	14.9	46.5	45.0	26.0	25.4				
DC-2	8.40	8.3	15.8	14.9	46.5	45.0	26.1	25.6				
Σ	16.85		31.5	29.8	93.0	90.0	52.1	51.0				
DC-3	8.45	8.3	15.7	14.9	46.5	45.0	26.0	25.4				
Dc-4	8.40	8.3	15.8	14.9	46.5	45.0	26.1	25.6				
Σ	16.85	16.6	31.5	29.8	93.0	90.0	52.1	51.0				
DC-AV	16.85	16.6	31.5	29.8	93.0	90.0	52.1	51.0				
AC-1	7.55	7.9	14.6	14.2	43.4	43.0	23.4	23.9				
AC-2	7.57	7.9	14.6	14.3	43.2	42.5	23.4	23.9				
Σ	15.12	15.8	29.2	28.5	86.6	85.5	46.8	47.8				
S. P.												
AC-N												
Sc	10	30	30	100	100	300	30	100				

INDUCED POLARIZATION - RECEIVER NOTES

PAGE _____

Project: X-mas Line: 1-5 pr. 1-5 1/2 Int.Cal _____ Date: 7/26/62

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		3-4	→	
Rec.	3-4 5	→	→	→	4-55	→	→	→				
Time	10:16	10:23	10:46	11:00	11:54	12:06	12:21					
DC-1	38.7 38.1	14.9 14.9	5.80 5.6 5.60 5.4	1.00 1.40 1.48 1.42	14.0 14.0	10.0 10.0	3.9 3.95 4.3 4.35			3.9 4.3 4.4 4.8	4.0 3.6 4.0 4.0	
DC-2	37.7 38.4	15.0 15.0	5.70 5.6 5.65 5.8	1.52 1.08 0.99 .98	14.0 14.0	10.1 10.0	4.25 4.10 3.9 3.95			4.2 4.0 3.9 3.2	4.2 4.2 3.9 4.2	
Σ	76.4 76.5	29.9 29.9	11.50 11.2 11.25 11.25	2.52 2.48 2.47 2.40	28.0 28.0	20.1 20.0	8.15 8.05 8.20 8.30			8.1 8.3 8.1 8.1	8.2 7.8 7.9 8.2	
DC-3	38.5 38.2	15.3 14.9	5.45 5.4 5.60 5.5	1.20 1.48 1.50 1.28	13.8 13.8	10.0 10.0	4.0 3.95 4.3 3.80			3.8 3.9 3.6 4.2	4.3 4.2 4.1 4.0	
Dc-4	38.0 38.0	14.9 15.1	5.80 5. 5.90 5.	1.20 1.07 1.98 1.15	14.2 14.2	10.1 9.9	4.0 4.75 3.75 4.60			4.2 4.4 4.6 4.1	3.6 3.8 3.8 3.8	
Σ	76.5 76.2	30.2 30.0	11.25 11.25 11.40 11.25	2.40 2.55 2.48 2.39	28.0 28.0	20.1 19.9	8.00 8.20 8.05 8.40			8.0 8.3 8.2 8.3	7.9 8.0 7.9 7.8	
DC-AV	76.4	30.0	11.30	2.46	28.0	20.0	8.10	25				
AC-1	33.5	13.5	5.10	1.11	12.0	8.8	3.60					
AC-2	33.3	13.5	5.10	1.11	12.0	8.8	3.58					
Σ	66.8	27.0	10.20	2.22	24.0	17.6	7.18					
S. P.	←			+16.4								
AC-N	←			0.10			.15					
Scale	100	30	10	3	30	30	10					

INDUCED POLARIZATION SENDER NOTES

Project: Xmas Line: #1 Sprd #1 Date: 27 July

Send	4-5	→	→	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	
Receive	Cal	→	→	1-5-5	→	→	→	5-5-6	→	→	→	
Time	0850	0857	0900	1015	1015	1024	1030	1135	1143	1149	1200	
Range	2x150	2x250	2x450	[illegible]	2x900	2x900	2x800	2x700	2x900	2x900	2x800	
Current	300	500	900	1800	1800	1800	1600	1400	1800	1800	1600	
Send												
Receive												
Time												
Range												
Current												

INDUCED POLARIZATION SENDER NOTES

Project: Xinas Line: #1 - Sprd #1 Date: 26 July 62

Send	1-2		→	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	
Receive	Cal		→	3S-4S	←		→					
Time	838	842		1016	1023	1046		1154	1206	1221		
Range	2x150	2x250	2x450	2x675	2x900	2x900	2x800	2x675	2x900	2x900		
Current	300	500	900	1350	1800	1800	1600	1350	1800	1800		
Send												
Receive												
Time												
Range												
Current												

INDUCED POLARIZATION SENDER NOTES

Project: Xmas Line: #1 – Cals Date: 20/30 ly

Send	4-5	→										
Receive	Cals											
Time	1318	1322	1328	1607	1611	1614						
Range	2x80	2x150	2x450	2x80	2x150	2x450						
Current	160	300	900	160	300	900						
Send	2-3	1-2										
Receive	Repeat 1M-9M →											
Time	1450	1										
Range	2x800	2x550										
Current	1600	1100.										

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: CAL Line: _____ Int.Cal 50.1 Date: 7/20/0

Send	4-5	→	→	→								
Rec.	5-4											
Time		16:07		16:10		16:14						
DC-1	7.84	7.6	14.7	13.9	43.3	41						
DC-2	7.84	7.6	14.8	13.9	43.3	41						
Σ	15.68	15.2	29.5	27.8	86.6	82						
DC-3	7.84	7.6	14.7	13.9	43.3	41						
Dc-4	7.84	7.6	14.8	13.9	43.3	41						
Σ	15.68	15.2	29.5	27.8	86.6	82						
DC-AV	15.68	15.2	29.5	27.8	86.6	82.0						
AC-1	7.68	7.70	14.4	13.9	42.8	41						
AC-2	7.68	7.70	14.4	13.9	42.6	41						
Σ	15.34	15.40	28.8	27.8	85.4	82.0						
S. P.												
AC-N												
SCALE	10	20	20	100	100	200						

INDUCED POLARIZATION SENDER NOTES

Project: XMAS Line: #1 Sprd #1 Date: 20/July/62

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive	1N-2N	→	2N-3N	→								
Time	1349	1404	1546	1551	1559							
Range	2x800	2x550	2x800	2x800	2x550							
Current	1600	1100	1600	1600	1100							
Send	1-2	4-5	3-4	2-3	1-2							
Receive												
Time												
Range												
Current												

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project X-mas Line 1 - Sp. 1 5½ Field date 2/26/62 Data page_____ Comp. date 2/28/62 Comp by C.J.L.

		9. S.D.	33	45	51	37	40	29	36				
(A) Send	CAL	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
(B) Receive	1-2	3-45	→	→	→	4-5	→	→	→				
(C) n separation		1	2	3	4	2	3	4	5				
(D) I		1350	1800	1800	1600	1350	1800	1800					
(E) Vdc (avg)		76.4	30.0	11.30	2.46	28.0	20.0	8.10					
(F) DCcal USED	0.945												
(G) Kn x 10^{-3}		3	12	30	60	12	30	60					
(H) ρ dc=ExFxGx10^3/D		160.4	189.0	178.0	87.5	235.6	314.4	254.6					
(I) Vac Σ		66.8	27.0	10.20	2.22	24.0	17.6	7.18					
(J) AC noise x 2		.2	.2	.2	.2	.3	.3	.3					
(K) Vac(corr) = $\sqrt{I^2 - J^2}$													
(L) AC-DC cal.	→	.937											
(M) ρ dc/ρac=ExL/K		1.143	1.111	1.108	1.109	1.167	1.138	1.129					
(N) PFE=(M-1)(10^2)		1.071 7	1.041 4	1.038 4	1.039 4	1.092 9	1.065 7	1.054 6					
(O) MCF=(M-1)(10^5)/H		44	22	21	45	39	21	23					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	CALS												
(B) Receive 9. S.D.	34	53	16	80	25	44	15						
(C) n separation													
(D) I	200	300	300	500	500	900	900						
(E) Vdc (avg)	21.9	34.2	32.9	54.3	52.3	95.2	94.0						
(F) DCcal		.877	.913	.920	.957	.945	.959						
(G) Kn x 10^{-3}					.945								
(H) ρ dc=ExFxGx10^3/D													
(I) Vac Σ	20.8	32.0	31.8	48.3	49.6	88.5	87.5						
(J) AC noise x 2													
(K) Vac (corr) = $\sqrt{I^2 - J^2}$													
(L) AC-DC cal.	.950	.936	.866	.890 .977	.949	.930	.932						
(M) ρdc/ρac =ExL/K													
(N) PFE=(M-1)(10^2)													
(O) MCF=(M-1)(10^5)/H													

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project X-mas Line 1-Spr 1.5½ Field date 7-27-62 Data page_____ Comp. date 7/28/62 Comp by C.S.L

% S.D.			29	36	32	52	42	64	19			
(A) Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
(B) Receive	CAL	4-5S	→	→	→	5-6S	→	→	→			
(C) n separation		2	3	4	5	3	4	5	6			
(D) I			1800	1800	1600	1400	1800	1800	1600			
(E) Vdc (avg)			19.00	8.08	2.06	12.01	9.37	4.34	1.24			
(F) DCcal USED	0.965											
(G) Kn x 10^{-3}			30	60	105	30	60	105	166			
(H) ρ dc=ExFxGx10^3/D			306.0	260.0	130.2	248.5	301.5	244.3	125.9			
(I) Vac Σ			17.25	7.22	1.94	10.37	8.44	3.84	1.16			
(J) AC noise x 2			0.20	0.20	0.20	0.24	0.24	0.24	0.24			
(K) Vac(corr) = $\sqrt{I^2 - J^2}$			17.25	7.22	1.929	10.37	8.44	3.84	1.133			
(L) AC-DC cal.			.945	.945	.945	.935	.945	.922	.945			
(M) ρ dc/ρac=ExL/K uncorrected			1.100	1.119	1.069	1.160	1.111	1.130	1.093			
(N) PFE=(M-1)(10^2) corr			1.040 4	1.059 6	1.009 1	1.084 8	1.050 5	1.041 4	1.033 3			
(O) MCF=(M-1)(10^5)/H corr			13	23	7	34	17	17	26			

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	CAL	→	→	4-5								
(B) ~~Receive~~ Scale	30	100	30	100	100	300						
(C) ~~n separation~~ % S.D.	50	15	79	24	44	15						
(D) I	300	300	500	500	900	900						
(E) Vdc (avg)	32.0	31.3	52.4	51.4	93.5	92.0						
(F) DCcal	.938	.990	.955	.974	.963	.977						
(G) Kn x 10^{-3}	~.966											
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	30.0	29.9	47.5	48.4	87.5	87.0						
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. ~940	.938	.956	.907	.943	.936	.946						
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

94
79
96
~~44~~
5)219
20

INSPIRATION CONSOLIDATED COPPER COMPANY

INSPIRATION, ARIZONA

May 22, 1962

MAY 1962
GEOEX

Mr. Walter E. Heinrichs, Jr.
Heinrichs Geoexploration Company
P. O. Box 5671
Tucson, Arizona

Dear Walt:

In discussing your letter of May 11, 1962, regarding Geophysical Application to the Christmas Mine Area with the Management, the idea was brought out that it would be of more value to us, and to you, if at least preliminary geophysical investigation of the immediate Christmas area was made without an investigation of the underground conditions.

What we want to know is whether or not the orebodies existing at Christmas could have been found by geophysical methods. We are willing to pay for a geophysical investigation of the area which can later be correlated with known mineralization zones. A later underground investigation could show the reasons for success or failure of the geophysical work. If the underground work was done first, we believe it would influence the interpretation of the geophysical results.

We have an aerial photomosaic which has some distortion in some areas and have made a geologic overlay for at least part of the area. Topographic and aerial mag-contour overlays could be prepared.

There are three more rolls of geophysical data in the office here which I will send down to you. The photomosaic is either the one we sent to you or one which was sent down to Christmas. I am attempting to find copy #1 of Rugg's report to obtain McAlister's profile. It may have been kept by the Anaconda geologists who were doing the work at that time.

I think we should discuss this matter further with Mr. Weed before we start the actual investigation. Let me know when it will be convenient for you and Hugh and I will see if we can arrange a meeting.

Sincerely,

E. F. Reed

E. F. Reed
Chief Geologist

EFR:CW
cc: Mr. H. C. Weed
Mr. H. W. Olmstead

May 11, 1962

Inspiration Consolidated Copper Co.
Inspiration, Arizona

Attn: Mr. E. F. Reed, Chief Geologist

Re: Geophysical Application
Christmas Mine Area

Gentlemen:

Near the end of last month, Mr. Hugh Olmstead left with us a quantity of aerial magnetic data and report by Mr. Allen M. Rugg, Jr. and requested our opinion regarding problems and possibilities for further geophysics in the area. I have quickly scanned these data, and other available published literature handy here, with the following off hand observations:

1. Rather large area.

2. Considerable geologic variation in both structure and stratigraphy, (Rock type) but generally fairly straight forward.

3. Considerable detail available in immediate mine area and at least some broad general information elsewhere.

4. Targets may be quite deep, but may also be fairly large.

5. Topography, relief and accessibility factors would be somewhat difficult but not necessarily unsurmountable.

In view of the amount of data available and our relative unfamiliarity with it and the area, there are likely other potentially important details which should be more clearly understood and in mind. In order to properly assimilate these, I recommend underground and surface inspection, mutual consultation and review with your personnel and a short study by us of all available data be made. This would require about an

estimated five days in the area and five days in the office all together. I believe such an approach would be most worthwhile, and in any event essential for over all maximum efficiency and reliability. A possible more direct supplement or variation of this would be to add some quick mobile magnetometer traversing of the readily accessible roads and trails.

In spite of the somewhat negative view taken by Mr. Allen Rugg, because I know him to be quite concervative, for the momeht, I retain a reasonable hope that some worthwhile work can be done toward aiding the general objective of most reliably and economically processing the Christmas "back yard" so to speak.

With more information on hand, and with a little more data, further unraveling of the present magnetic picture and additional exploration leverage may be gained from magnetics. As a matter of fact, I would like to see more and better confirmation and exploration obtained on the major aerial mag. high immediately south of Christmas. And maybe some more ground detail over the presently known deposition for direct correlation purposes in addition to the theoretical calculations already made. In this connection, I have asked Hugh if a copy of the E. O. Macallister profile and items #1, 2 & 3 mentioned on page 3 of Rugg's report might be obtained?

Eventually, a test I. P. profile across the better known zone may be useful. Some of the other electrical methods such as S. P., E. M., AFMAG and even gravity, seismic and geochem, should and would be at least considered.

Incidently, another potentially very important procedure would be to get an aerial photo mosaic, topocontour, best available geology (whether detail or only recon), and the aerial mag contour compiled in some compositing or overlay manner all at the same scale.

Let us know if this isn't the information desired, or if it generates any new or different problems, ideas and questions.

Best regards,

WEH:jh

Walter E. Heinrichs, Jr.

cc: extra enclosed

END RECORD #2 NEAR
#3 SHAFT 10260'
Coordinates 6980 N
16460 E
ROAD JUNCTION
JOINS START RECORD #3
POWER LINE
SMALL
Head Frame
AT BEND
8710'
POWER LINE
ROAD JUNCTION To
McDONALD SHAFT
ALSO MAG. BASE
JOINS rec. 6
BUNK HOUSE
ROAD JUNCTION
GROCERY STORE
Culvert
BRIDGE OR CULVERT
ROAD JUNCTION
Road JUNCTION to
NEW HOMES
JOINS
Record #17
Road GRADER IGNORE
CULVERT
S.E.
Record starts @ Coordinates 22980E
6480 N
LOCAL GRID SYSTEM
Sheet No. 2
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: Inspiration Con. Copper Co.
RECORD NO. 2
DATE 7/23/62
SENSITIVITY 200
GAMMAS
HORIZONTAL SCALE 200
FT./In.
LOCATION: CHRISTMAS Mine & Vic.
Gila COUNTY, ARIZONA
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A.
CHART No. 17491X
MADE IN U.S.A.
2

HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: Inspiration Con. Copper Co.
RECORD NO. No. 3 DATE 7/23/62
SENSITIVITY 200 GAMMAS /½ IN.
HORIZONTAL SCALE 200 FT./IN.
LOCATION Christmas Mine & Vic.
Gila County Arizona

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 4 DATE 7/23/62

SENSITIVITY 200 γ GAMMAS

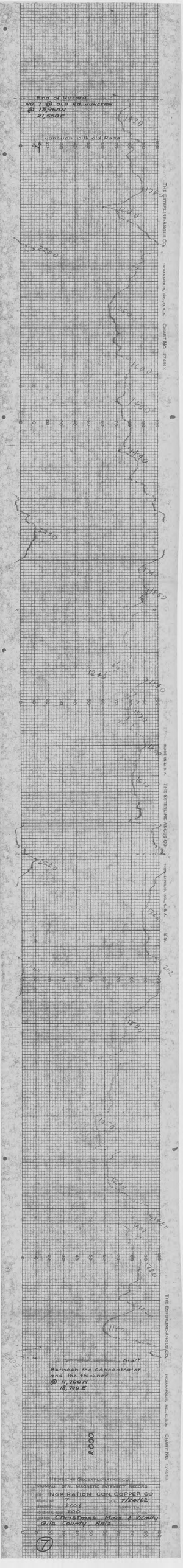
HORIZONTAL SCALE 200 FT./IN.

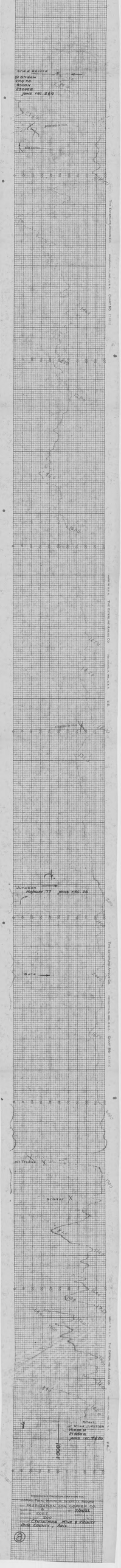
LOCATION CHRISTMAS MINE & VICINITY

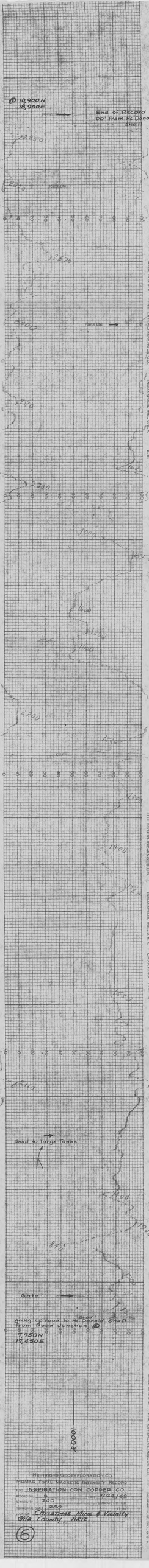
GILA COUNTY, ARIZONA

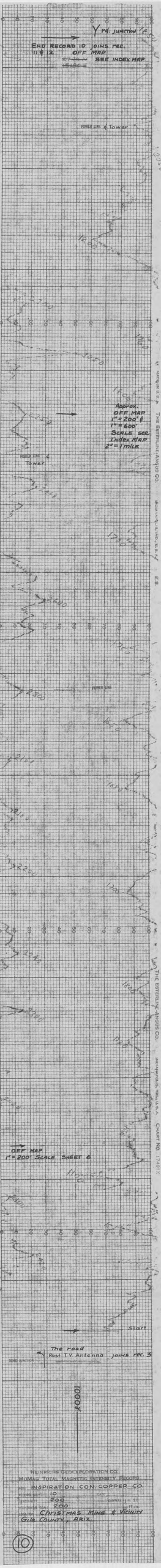
4

MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.
NO. 17491X

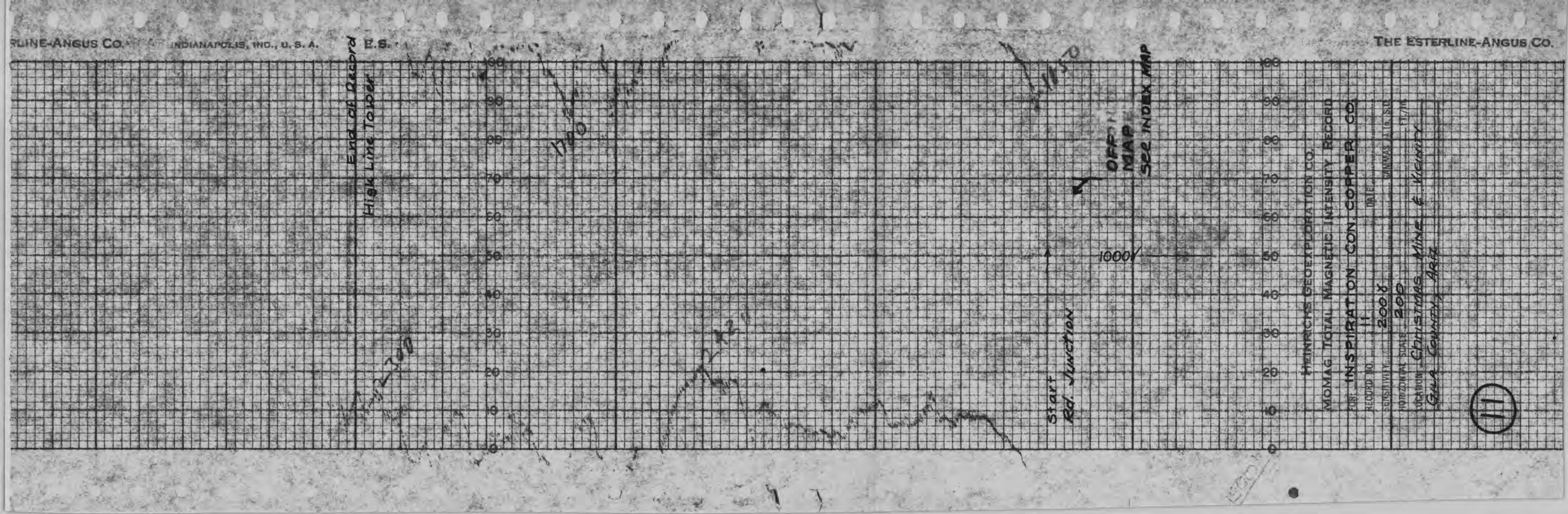

End of Hazard
No. 7 @ Old Rd. Junction
@ 12,950N
21,550E
Junction with Old Road
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A.
CHART NO. 37481X
MADE IN U.S.A.
E.S.
Start
Between the concentrator
and the thickner
@ 11,700 N
18,700 E
1000 R
HEINRICH GEOLOGICAL CORPORATION
VERTICAL TOTAL MAGNETIC INTENSITY RECORD
INSPIRATION CON COPPER CO
Christmas Mine & Vicinity
Gila County, Ariz.


STRIKE DIRECTION
DIP STRIKE
N90°W
S30°W
S30°E
JONES REC. 269
JUNCTION
FEBRUARY '77
JONES REC. 28
STRIKE
DISTURBANCE
STRIKE
STRIKE
DIP
N 30°W
S 30°W
JONES REC. 7820
PHOENIX CONSOLIDATED COPPER CO.
WASHINGTON IRON COPPER CO.
SCALE 1" = 20'
CHICHIMAN MINE & VICINITY
PIMA COUNTY, ARIZ.
8


@ 10,900 N
18,900 E
End of Record
100' from McDonald Shaft
Road to Large Tanks
Gate
Start
going up road to McDonald Shaft
from Good Junction @
7,750 N
17,450 E
1000 N
MERINGER GEOPHYSICAL CORPORATION CO.
VERTICAL TOTAL MAGNETIC INTENSITY RECORD
INSPIRATION CONSOLIDATED COPPER CO.
DATE 7/24/62
SENSITIVITY 200
CHART NO. 1-2-X
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.
6
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A.
MADE IN U.S.A.

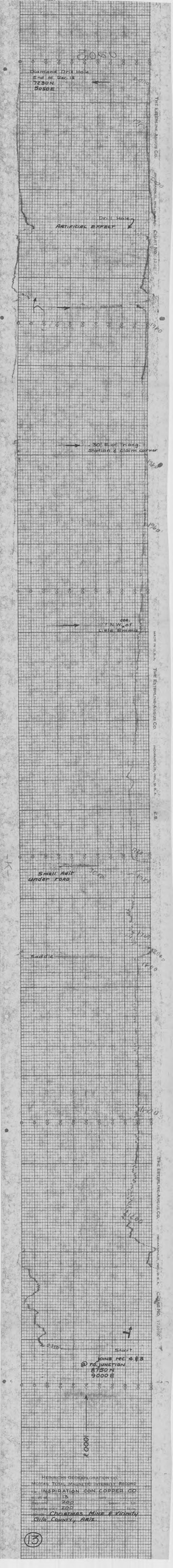

Y Pt. junction
End record 10 joins rec. 11 & 12. OFF MAP
See index map
Power line & Tower
Approx. OFF MAP 1" = 200' & 1" = 600' Scale see Index map 2" = 1 mile
Power line & Tower
Power line
OFF MAP 1" = 200' Scale sheet 6
Start
The road
Past T.V. Antenna joins rec. 3
1000'
The Esterline-Angus Co.
Chart No. 17431
Weinrich Geo. Incorporated
Normal Total Magnetic Intensity Records
Inspiration Con. Copper Co.
Record No. 10
Date
Scale Horizontal 200
Vertical 200
Drawn
Location Christmas Mine & Vicinity
Gila County, Ariz.

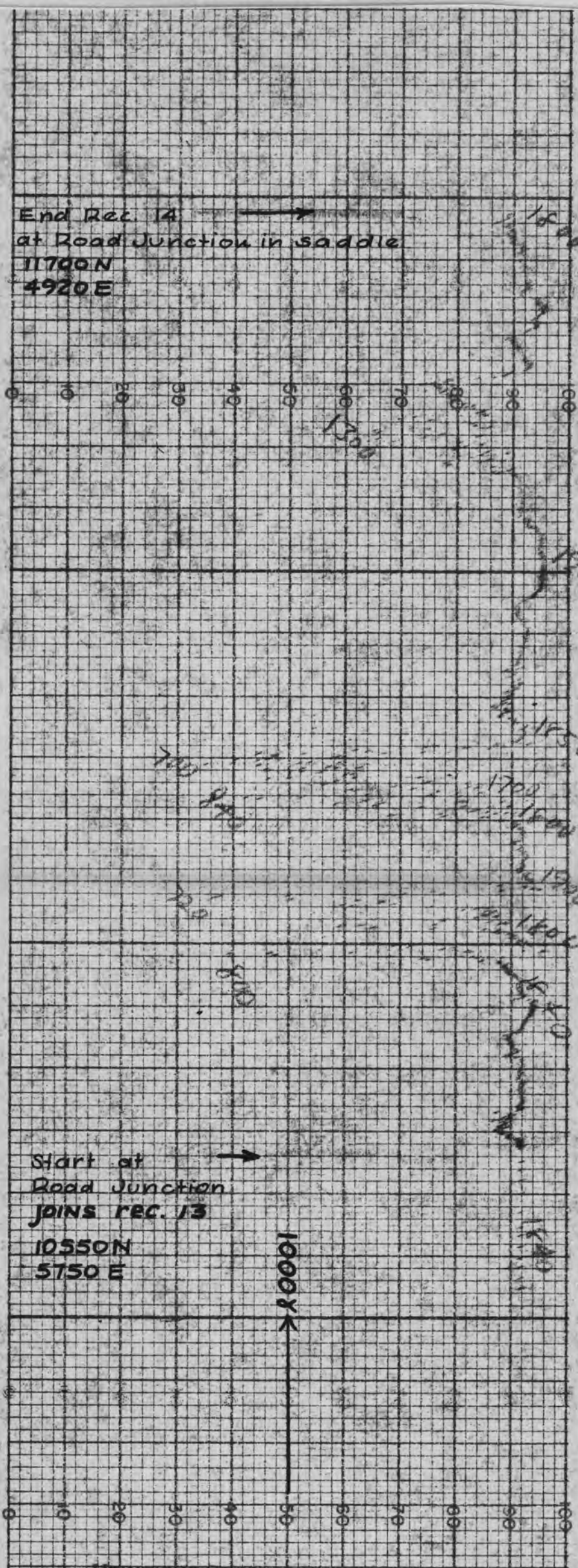
10



RLINE-ANGUS CO. INDIANAPOLIS, IND., U. S. A. E.S.
THE ESTERLINE-ANGUS CO.
End of Record
High Line Tower
1700
1150
OFF MAP
See INDEX MAP
1000
Start
Rd. Junction
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 11
DATE
SENSITIVITY 200 γ
GAMMAS 1 in. S.D.
HORIZONTAL SCALE 200 FT./IN.
LOCATION Christmas Mine & Vicinity
Gila County, Ariz.
11

THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. E.S.
MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. CHART NO. 1748-X


7000
Diamond Drill Hole
End of Rec. 18
7280N
8050E
THE ENGINEERING NEWS CO.
Drill Hole
ARTIFICIAL EFFECT
CHART NO. 12-18
30' E of Triang.
Station 2 Claim corner
THE ENGINEERING NEWS CO.
Small Adit
under road
Saddle
THE ENGINEERING NEWS CO.
Start
JOINS REC 4 & 5
@ rd. junction
8750 N
9000 E
K 6000
HEINRICHS GEOEXPLORATION CO.
NOMAS TOTAL FORCE INTENSITY REPORT
INSPIRATION CON. COPPER CO.
15
200
200
CHILCOTAS MINE & VICINITY
GILA COUNTY, ARIZ.
13



HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 14 DATE 7/24/62

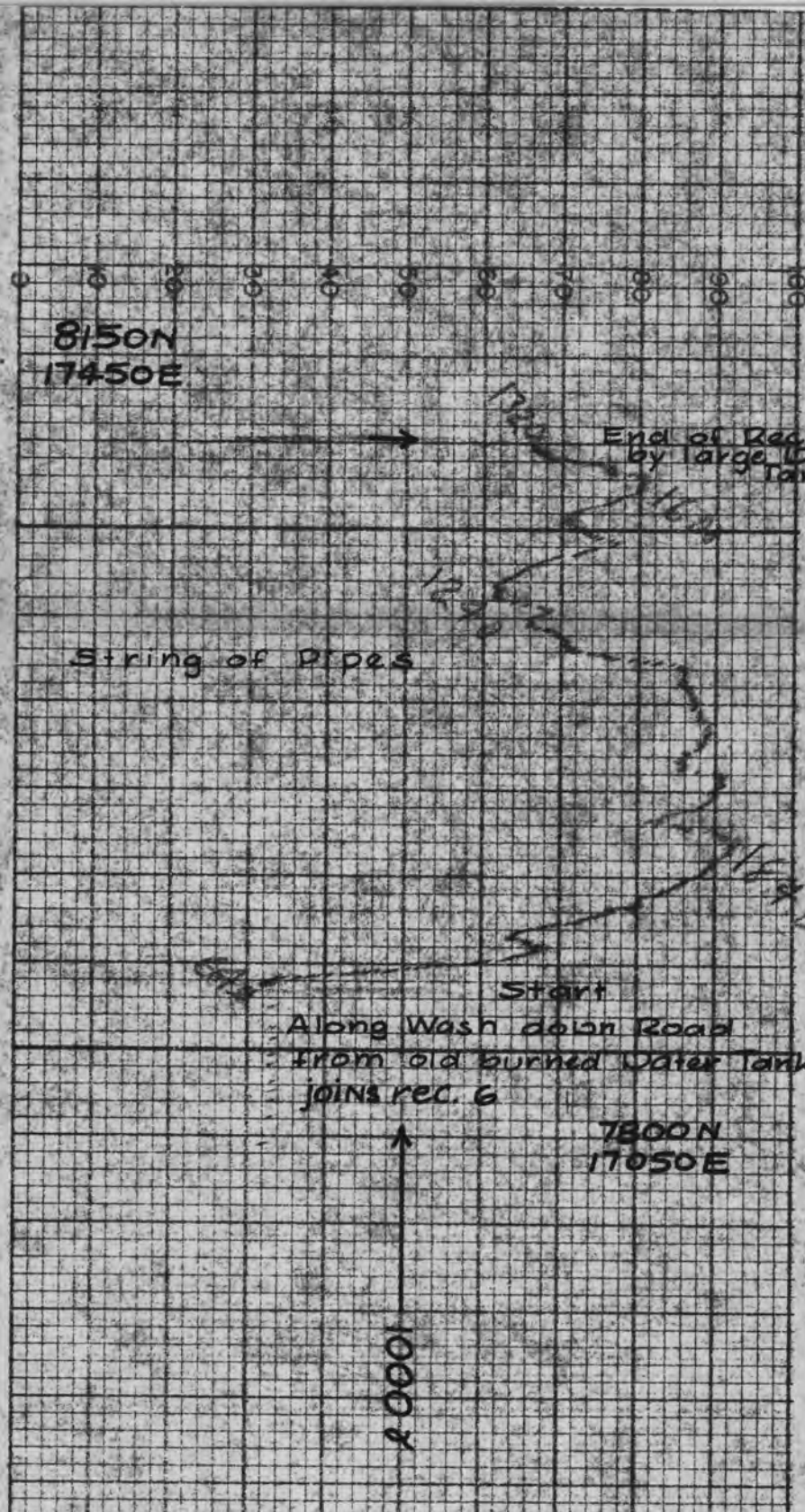
SENSITIVITY 200γ GAMMAS / in. S.D.

HORIZONTAL SCALE 200 FT./in.

LOCATION Christmas Mine & Vicinity
Gila County, Ariz.

14

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



HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 15 DATE 7/25/62

SENSITIVITY 200 GAMMAS / 2 in. S.D.

HORIZONTAL SCALE 200 ft./in.

LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.

15

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 16 DATE 7/25/62

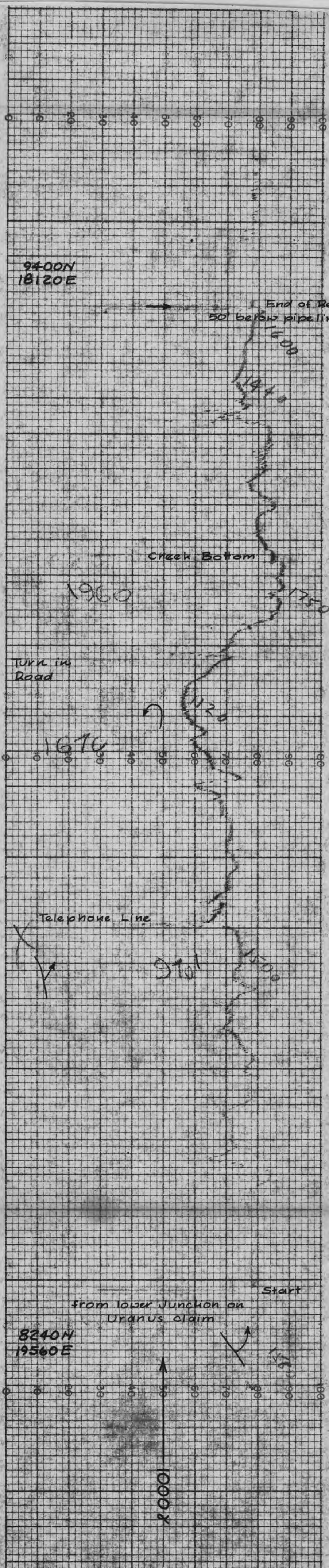
SENSITIVITY 200 GAMMAS / 5 in. S.D.

HORIZONTAL SCALE 200 FT./in.

LOCATION Christmas Mine & Vicinity
Gila County, Ariz.

16

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



HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 17 DATE 7/25/62

SENSITIVITY 200 GAMMAS / 1 in. S.D.

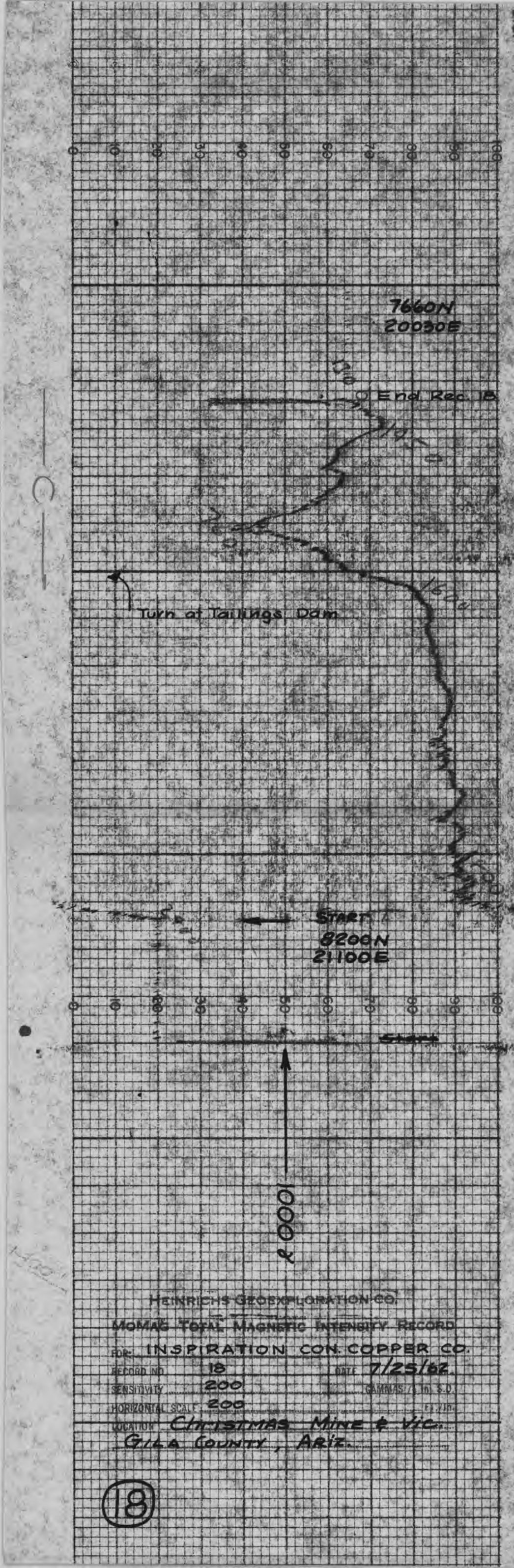
HORIZONTAL SCALE 200 FT./in.

LOCATION CHRISTMAS MINE & VICINITY

GILA COUNTY, ARIZ.

17

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



HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 18 DATE 7/25/62.

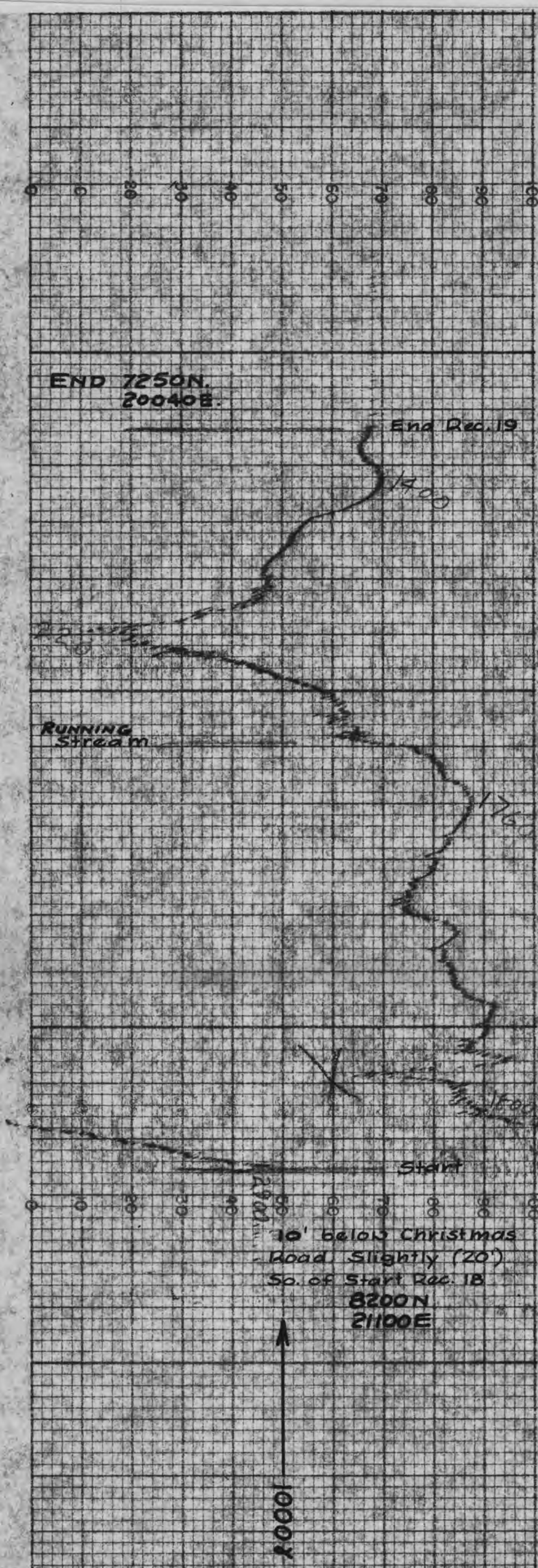
SENSITIVITY 200 GAMMAS/(1 in) S.D.

HORIZONTAL SCALE 200 Ft./in.

LOCATION Christmas Mine & Vic.
Gila County, Ariz.

18

THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.



HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR INSPIRATION CON. COPPER CO.

RECORD NO. 19 DATE 7/25/62

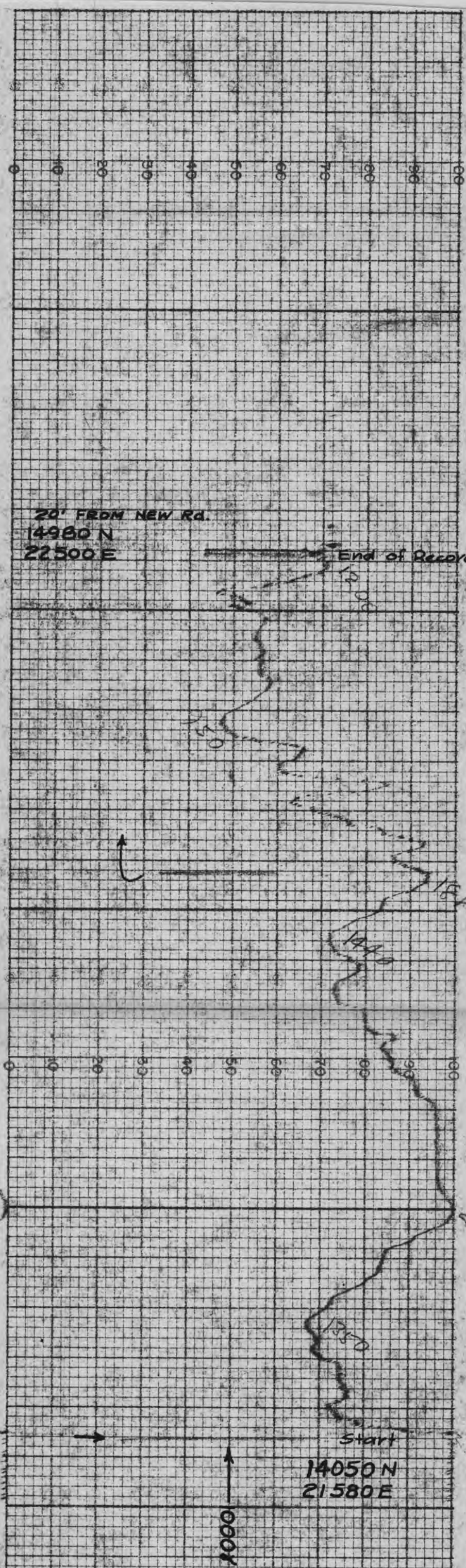
SENSITIVITY 200 γ GAMMAS /½ in. S.D.

HORIZONTAL SCALE 200 Ft./in.

LOCATION CHRISTMAS MINE & Vicinity
Gila COUNTY, ARIZONA

19

MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPO

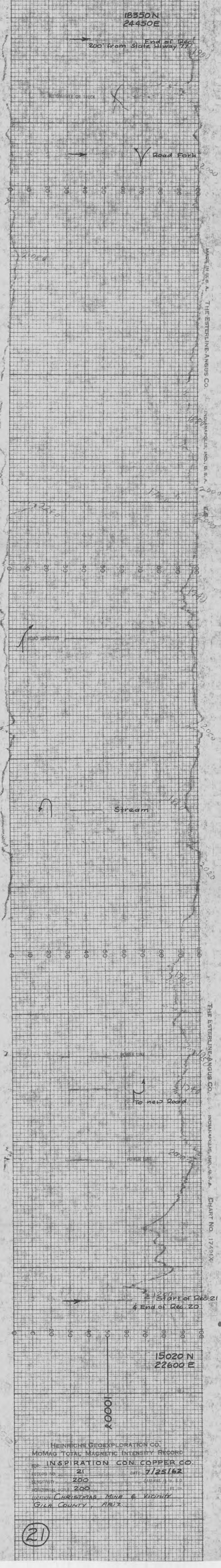


HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 20 DATE 7/25/62
SENSITIVITY 200 GAMMAS /1 in. S.D.
HORIZONTAL SCALE 200 FT./in.
LOCATION CHRISTMAS MINE & VICINITY
Gila COUNTY, ARIZ.

20

MADE IN U.S.A. THE ESTERLINE ANGUS CO. INDIANAPOLIS, IND., U.S.A.



HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 21 DATE 7/25/62
SENSITIVITY 200 GAMMAS / In. S.D.
HORIZONTAL SCALE 200 FT./In.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.

21

14450 N.
17200 E.
END
End of Rec.
at South West Cor. Lost Bar #6
Gate
S.E. Corner of
Lost Bar #6
40' North of
Inspiration 42, West
End Center
Start
16740N
22700E
1000X
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 22
DATE 7/26/62
SENSITIVITY 200
GAMMAS/in. to S.D.
HORIZONTAL SCALE 200
FT./in.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZONA
22
THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X
MADE IN U.S.A.

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 23 DATE 7/25/62

SENSITIVITY 200 GAMMAS 75 lb. S.P.

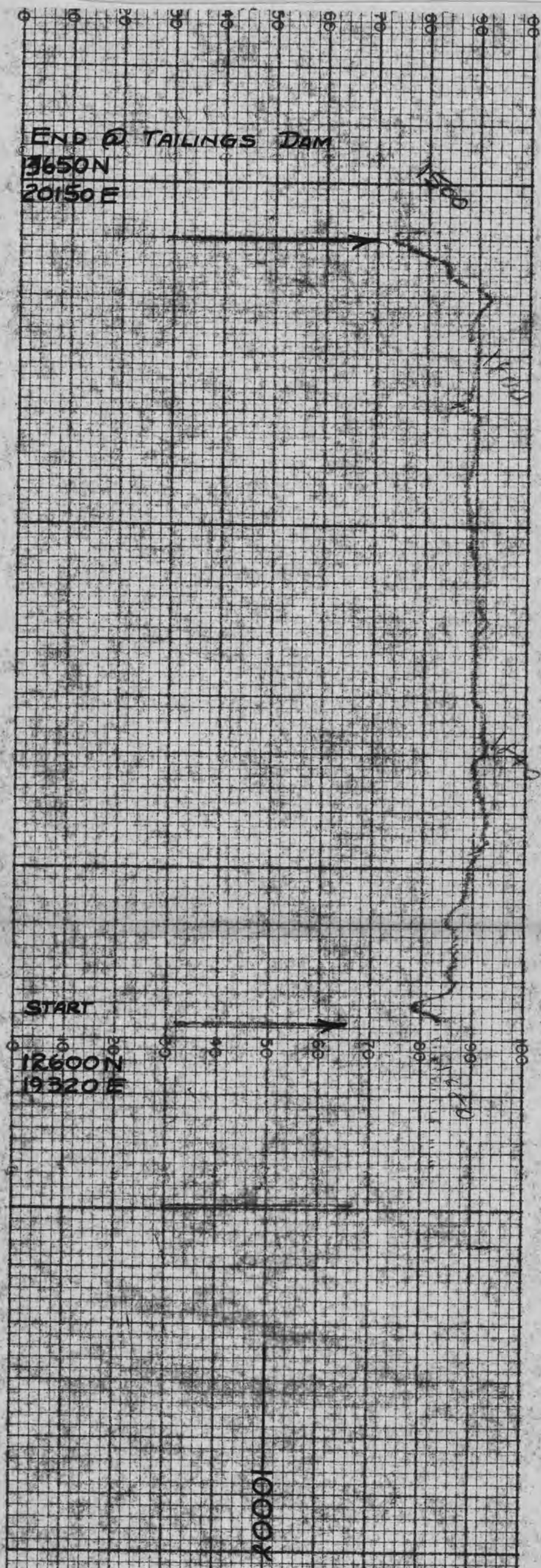
HORIZONTAL SCALE 200 FT./IN.

LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZONA

23

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

END RECORD
12850N
20500E
CULVERT
PARALLEL POWER LINE
ARTIFICIAL EFFECT
SCRAP IRON
BEGIN
by THICKNER @ MILL
11750 N
18600 E
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 24
DATE 7/25/62
SENSITIVITY 200
GAMMAS / in. S.D.
HORIZONTAL SCALE 200
FT./in.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.
24
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A.
CHART NO. 1749 X
MADE IN U.S.A. BY THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A.



HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 25 DATE 7/25/62
SENSITIVITY 200 GAMMAS/1 in. S.D.
HORIZONTAL SCALE 200 FT./in.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.

25

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

End of Record at Christmas Junction, new pavement to Mc Donald Shaft
JOINS REC. 8
THE ESTERLINE-ANGUS CO.
ARTIFICIAL INTERFERENCE
IGNORE
Start at Cooley's Beer Joint to Christmas Junction on Highway 77
1000γ
INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 26
DATE 7/27/62
SENSITIVITY 200
HORIZONTAL SCALE 200
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZONA
26

End of Record 27 Winkelman city Limits
MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.
SLAG DUMP
THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X
WASH
START @ O'CARROLL CANYON RD. JUNCTION & HIGHWAY 77 THENCE TO WINKLEMAN
JOINS REC. 5&9
1000'
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR Inspiration Con. Copper Co.
RECORD NO. 27
DATE 3/2/62
SENSITIVITY 200
GAMMAS/½ IN. 50
HORIZONTAL SCALE 200
LOCATION Christmas Mine & Vicinity Gila County, Ariz.
27

NOT

COMPLETE

#3 SHEET 10260'
Coordinates 6980 N 16400 E
2950
ROAD JUNCTION
JOINS START RECORD #3
POWER LINE
SMALL Head Frame AT BEND 8710'
POWER LINE
ROAD JUNCTION To McDONALD SHAFT ALSO MAG. BASE
JOINS rec. 6
BUNK HOUSE
ROAD JUNCTION
GROCERY STORE
Culvert
BRIDGE OR CULVERT
Road Junction NEW HOMES JOINS Record #17
CULVERT
Road GRADER IGNORE
CULVERT
ARBITRARY BASE LEVEL
1600
S.E.
Record starts @ Coordinates 22980 E 6460 N
LOCAL GRID SYSTEM Sheet No. 2
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
Inspiration Con. Copper Co
SENSITIVITY 200
HORIZONTAL SCALE 200
LOCATION CHRISTMAS Mine Area
Gila County ARIZONA
THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.
CHART No. 17491X
MADE IN U.S.A.

End Record No. 3 at rd. junction
Coordinates 8800' N & 9000E
Joins rec. 4 & 13
Rd. Junction
13010
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A. CHART NO.
Rd. Junction
Location Electrode No. 3
Spread 1 →
START @ rd. junction
6550N
17150E
1000'
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: Inspiration Con. Copper Co.
RECORD NO. No. 3
DATE 7/23/62
SENSITIVITY 200 GAMMAS ½ IN.
HORIZONTAL SCALE 200 FT./IN.
LOCATION Christmas Mine & Vic.
Gila County, Arizona
3

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR INSPIRATION CON. COPPER CO.

RECORD NO. 4 DATE 7/23/62

SENSITIVITY 2008 GAMMAS 1/10 STD

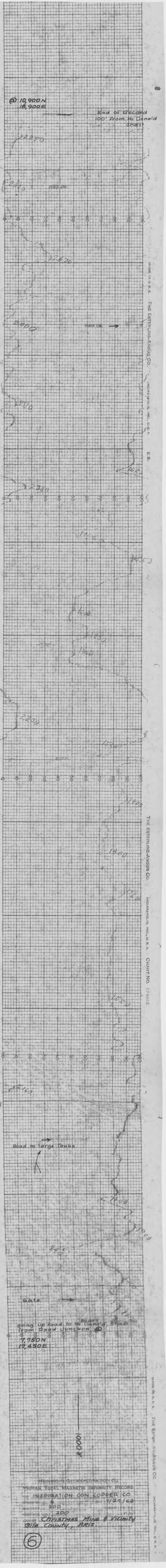
HORIZONTAL SCALE 200 FT./IN.

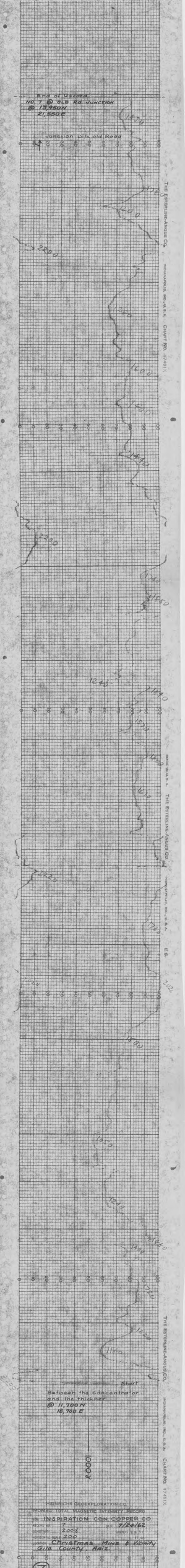
LOCATION CHRISTMAS MINE & VICINITY

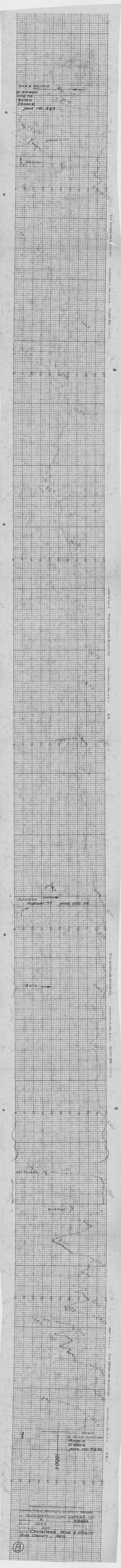
GILA COUNTY, ARIZONA

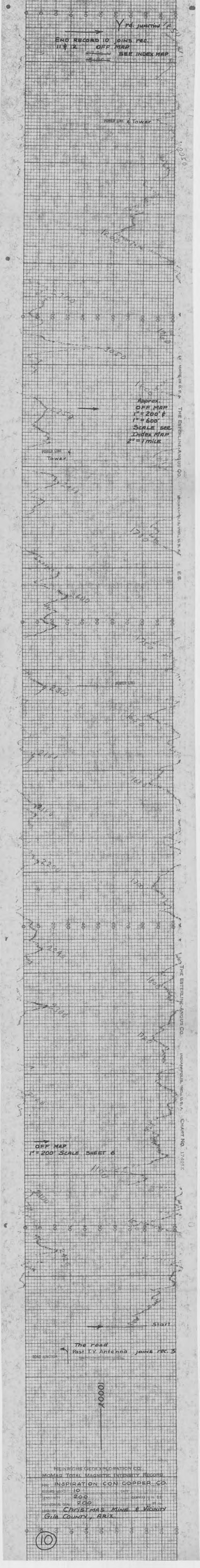
4

MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. E.S.
No. 17491X


@ 10,900 N
18,900 E
End of Record
100' from McDonald
Shaft
POWER LINE
POWER LINE
Road to Large Tanks
Gate
going up road to the Stope of Shaft
from Road Junction @
7,750 N
17,450 E
100'
MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND. U.S.A.
E.S.
THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND. U.S.A. CHART NO. 17411X
MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND. U.S.A.
MONTANA-DECORPORATION CO.
MONTANA TUNNEL MINERS INSURANCE PROGRAM
INSPIRATION CON COPPER CO.
7/24/62
200
200
Christmas Mine & Vicinity
Gila County, Ariz.
6


END OF LINE TOTAL
NO. 7 @ OLD RD. JUNCTION
@ 13,950N
21,550E
Junction Dirt old Road
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND. U.S.A.
CHART NO. 17-601X
MADE IN U.S.A.
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND. U.S.A.
E.G.
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND. U.S.A.
CHART NO. 17-601X
Start
Between the concentrator
and the thickner
@ 11,700N
18,700 E
R.000
HEINRICHS GEOEXPLORATION CO.
PROMPT TOTAL MAGNETIC INTENSITY RECORD
FOR INSPIRATION CON. COPPER CO
WORK BY T. DATE 7/24/62
SURVEY 200X
SUBSTATION 200
WORKING AT Christmas Mine & Vicinity
Gila County, Ariz.
7


SHAFT
SE SEAM LOCATION
1800'W
2180'N
BOOK 10 PAGE 7820
1000'
INDEPENDENCE COPPER CO.
OREGONIAN MINE & TUNNEL
GILA COUNTY, ARIZ.
8


Y Pt. Junction
End Record 10 Joins Rec. 11 & 12 Off Map
See Index Map
Power Line & Tower
Approx. Off Map 1"=200' & 1"=600' Scale See Index Map 2"=1 Mile
Power Line & Tower
Power Line
Off Map 1"=200' Scale Sheet 6
Start
The Road Past T.V. Antenna Joins Rec. 3
Long Section
10000'
The Eberline Analyze Co.
Chart No. 174012
Heinrich's Geological Corporation
Mohave Total Magnetic Intensity Records
Inspiration Con Copper Co.
Horizontal Scale 200
Christmas Mine & Vicinity
Gila County, Ariz.
10

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 11 DATE

SENSITIVITY 200γ GAMMAS / IN. S.D.

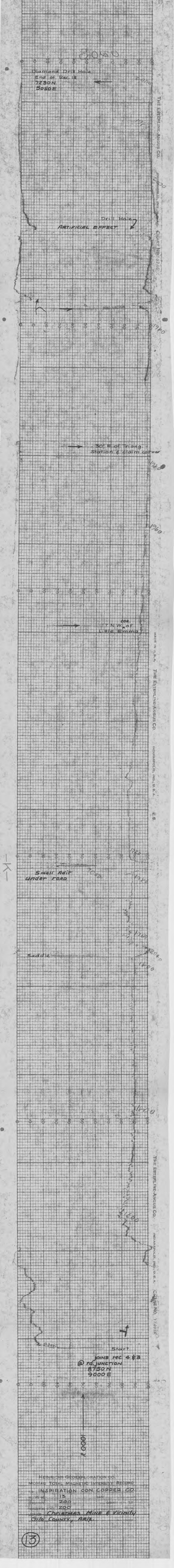
HORIZONTAL SCALE 200 FT./IN.

LOCATION Christmas Mine & Vicinity
Gila County, Ariz.

11

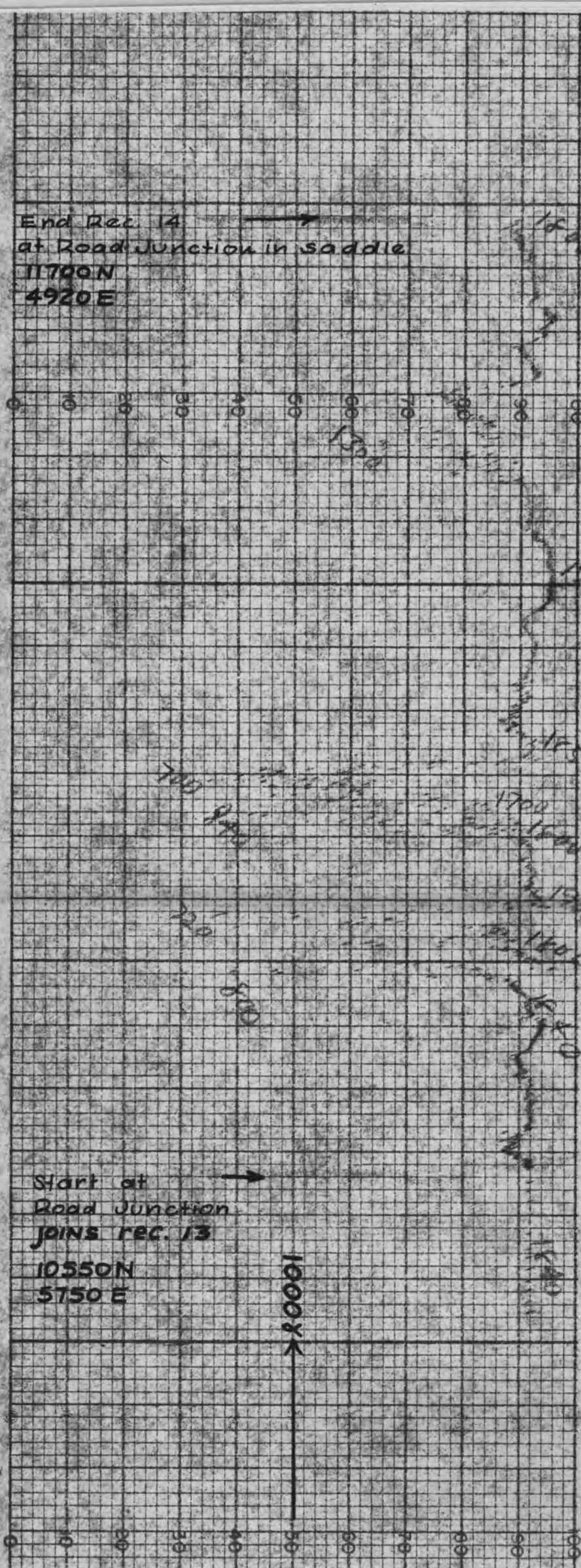
THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.

THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. E.S. MADE IN U.S.A.
THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. CHART NO. 1749 1X


Diamond Drill Hole
End of Rec. 13
12300N
8050E
Drill Hole
ARTIFICIAL EFFECT
30' E. of trang.
Station & claim corner
Cor.
Y.N.W. of
Little Emma
Small Adit
under road
Saddle
ONE REC. 4 & 3
@ RD. JUNCTION
8750 N
9000 E
Short
7000
THE ERICSON-ARGUS CO.
INDIANAPOLIS, IND. U.S.A.
CHART NO. 1-2-4C
MADE IN U.S.A.
HENRICHS GEOEXPLORATION CO.
NOMAS TOTAL MAGNETIC INTENSITY RECORD
INSPIRATION CON. COPPER CO.
Chestnut Mine & Vicinity
Gila County, Ariz.

-K-

13



HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 14 DATE 7/24/62

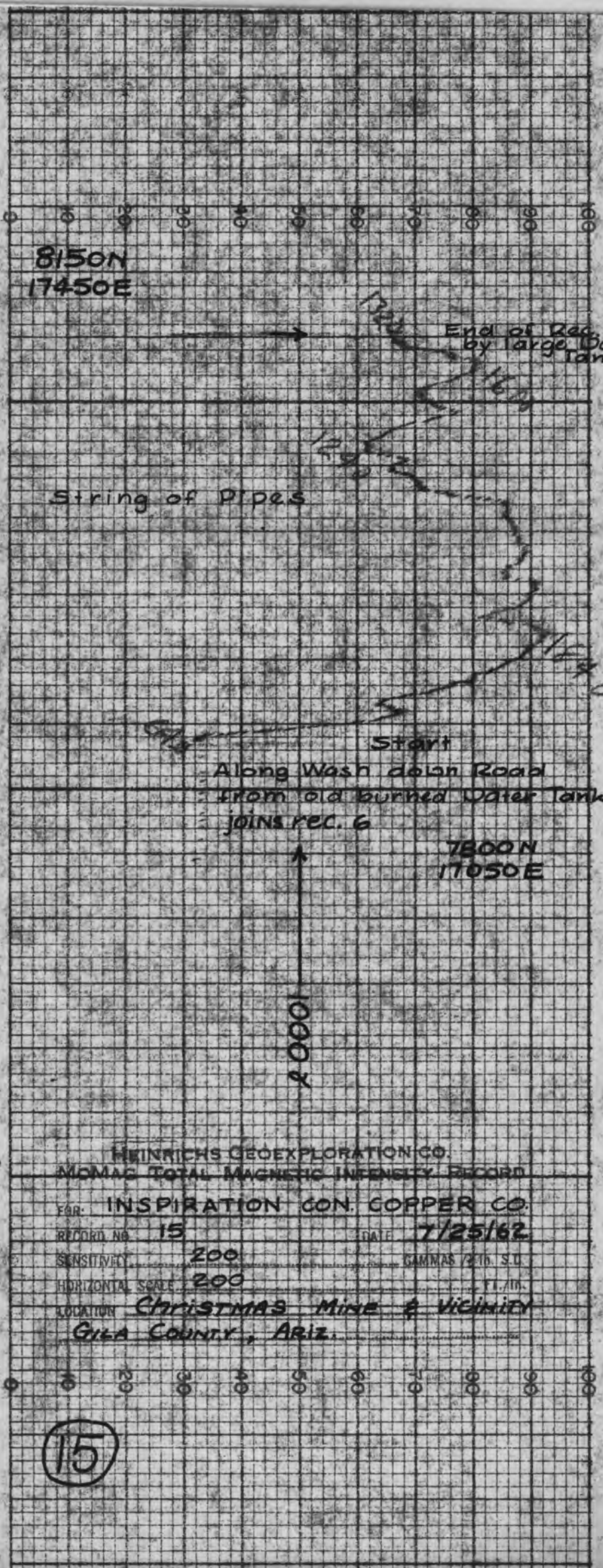
SENSITIVITY 200 γ GAMMAS / in. S.C.

HORIZONTAL SCALE 200 Ft./in.

LOCATION Christmas Mine & Vicinity
Gila County, Ariz.

14

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


8150N
17450E
End of Rec by Large Water Tanks
String of Pipes
Start
Along Wash down Road from old burned Water Tank joins rec. 6
7800N
17050E
2000'
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 15
DATE 7/25/62
SENSITIVITY 200 GAMMAS /2.16. S.U.
HORIZONTAL SCALE 200 FT./IN.
LOCATION Christmas Mine & Vicinity
Gila County, Ariz.
15

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 16 DATE 7/25/62

SENSITIVITY 200 GAMMAS / ½ in. S.D.

HORIZONTAL SCALE 200 FT./in.

LOCATION Christmas Mine & Vicinity
Gila County, Ariz.

16

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

HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 17 DATE 7/25/62
SENSITIVITY 200 DAMVAS/A IN. S.D.
HORIZONTAL SCALE 200 FT./IN.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.

17

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

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 18 DATE 7/25/62

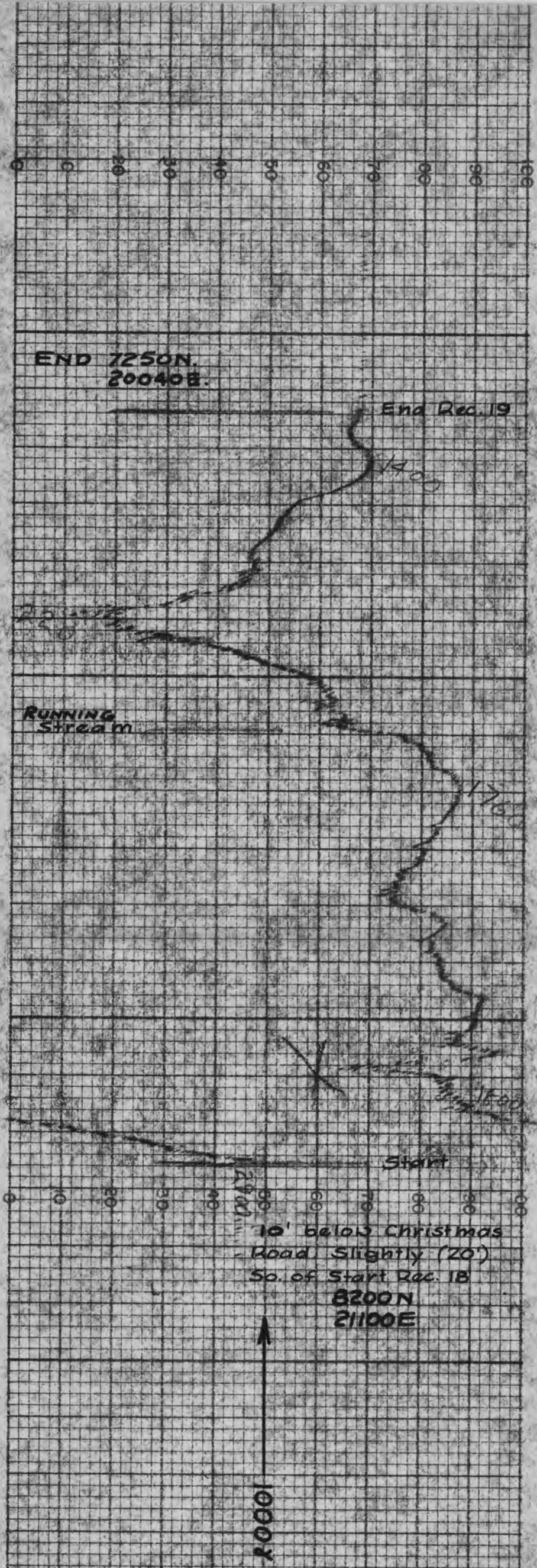
SENSITIVITY 200 GAMMAS / in. S.D.

HORIZONTAL SCALE 200 ft./in.

LOCATION CHRISTMAS MINE & VIC.
GILA COUNTY, ARIZ.

18

THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.



HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 19 DATE 7/25/62

SENSITIVITY 200 γ GAMMAS 1/2 in. S.D.

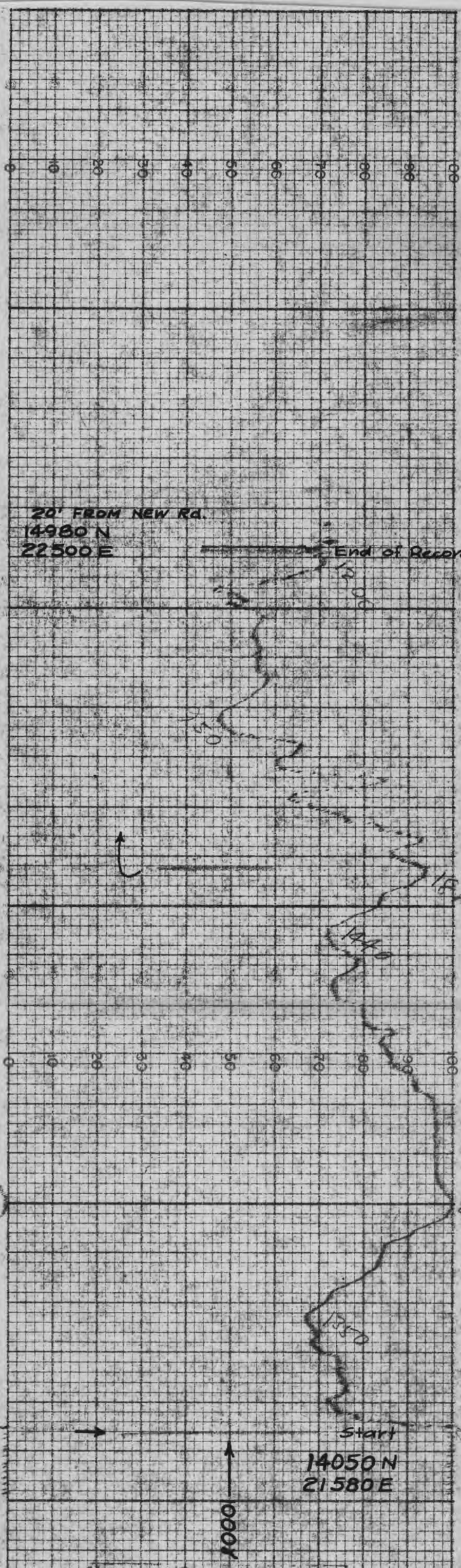
HORIZONTAL SCALE 200 ft. in.

LOCATION CHRISTMAS MINE & VICINITY

GILA COUNTY, ARIZONA

19

MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPO



MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.

HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

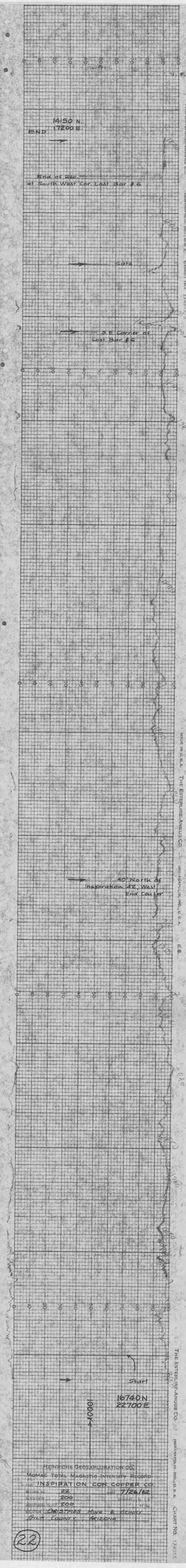
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 20 DATE 7/25/62
SENSITIVITY 200 GAMMAS /½ IN. S.D.
HORIZONTAL SCALE 200 FT./in.
LOCATION: CHRISTMAS MINE & VICINITY
Gila COUNTY, ARIZ.

(20)

HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 21 DATE 7/25/62
SENSITIVITY 200 GAMMAS / In. S.D.
HORIZONTAL SCALE 200 FT. / In.
LOCATION: CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.

21


14150 N.
17200 E.
END
End of Rec.
at South West Cor. Lost Bar #6
Gate
S.E. Corner of
Lost Bar #6
40' North of
Inspiration 42, West
End Center
Start
16740N
22700E
1000'
HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 22
DATE 7/26/62
SENSITIVITY 200
GAMMAS/in. S.D.
HORIZONTAL SCALE 200
FT./in.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZONA
22
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A.
CHART NO. 17491X
MADE IN U.S.A.

13280N
20330E
End of Record
Beneath Power Line
Upper Tailings
Power Line
Tower
Start
13860N
21400E
1000'
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 70 80 90 100
MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.
HEINRICHS GEOEXPLORATION CO.
MoMag TOTAL MAGNETIC INTENSITY RECORD
FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 23
DATE 7/25/62
SENSITIVITY 200
GAMMAS 7/8 in. S.D.
HORIZONTAL SCALE 200
FT./IN.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZONA
23

END RECORD
12850N
20500E

CULVERT

PARALLEL POWER LINE
ARTIFICIAL EFFECT

SCRAP IRON

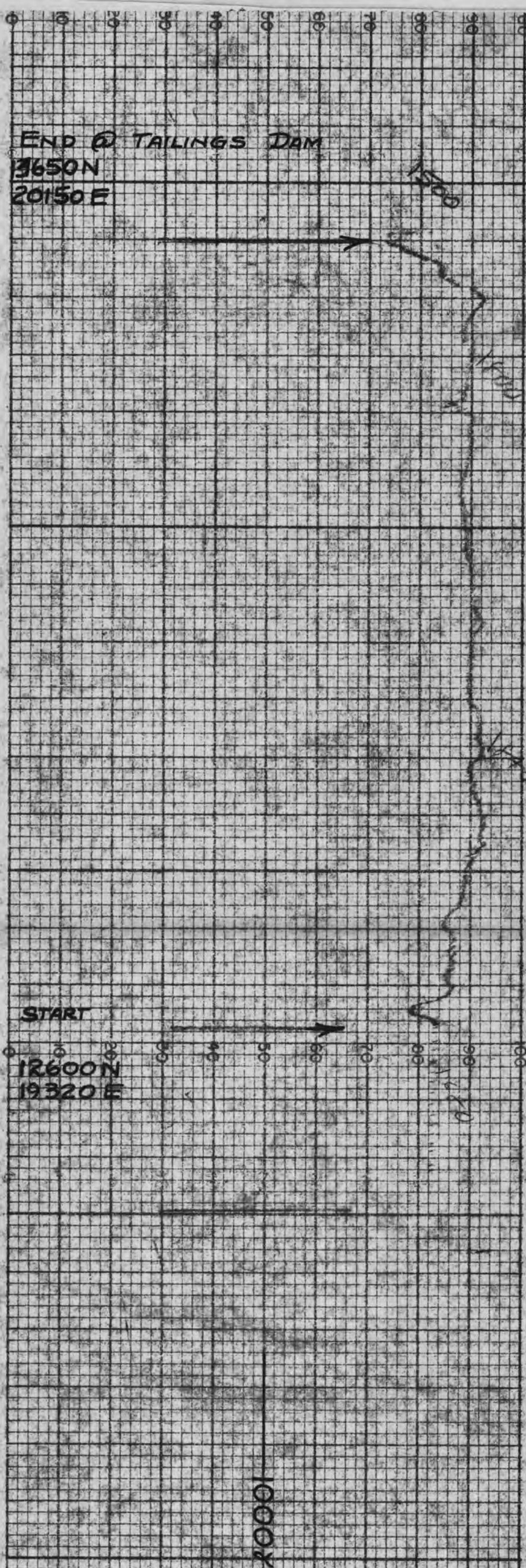
BEGIN
by THICKNER @ MILL
11750 N
18600 E

HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 24 DATE 7/25/62
SENSITIVITY 200 GAMMAS/2 in. S.D.
HORIZONTAL SCALE 200 Ft./in.
LOCATION: CHRISTMAS MINE & Vicinity
GILA COUNTY, ARIZ.

24

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



HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.
RECORD NO. 25 DATE 7/25/62
SENSITIVITY 200 GAMMAS/½ in. S.D.
HORIZONTAL SCALE 200 FT./IN.
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.

25

HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD
FOR INSPIRATION CON. COPPER CO.
RECORD NO. 26 DATE 7/27/62
SENSITIVITY 200
HORIZONTAL SCALE 200
LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZONA

(26)

End of Record 27 Winkelman city Limits
SLAG DUMP
WASH
START @ O'CARROLL CANYON RD. JUNCTION & HIGHWAY 77 THENCE TO WINKLEMAN
JOINS rec. 5&9
1000'
MoMAC TOTAL MAGNETIC INTENSITY RECORD
FOR Inspiration Con. Copper Co.
RECORD NO. 27 DATE 8/2/62
SENSITIVITY 200 GAMMAS
HORIZONTAL SCALE 200 FT.
LOCATION Christmas Mine & Vicinity Gila County, Ariz.
27
MADE IN U.S.A.
THE ESTERLINE-ANGUS CO.
INDIANAPOLIS, IND., U.S.A.
CHART NO. 17491X

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 14 DATE 7/24/62

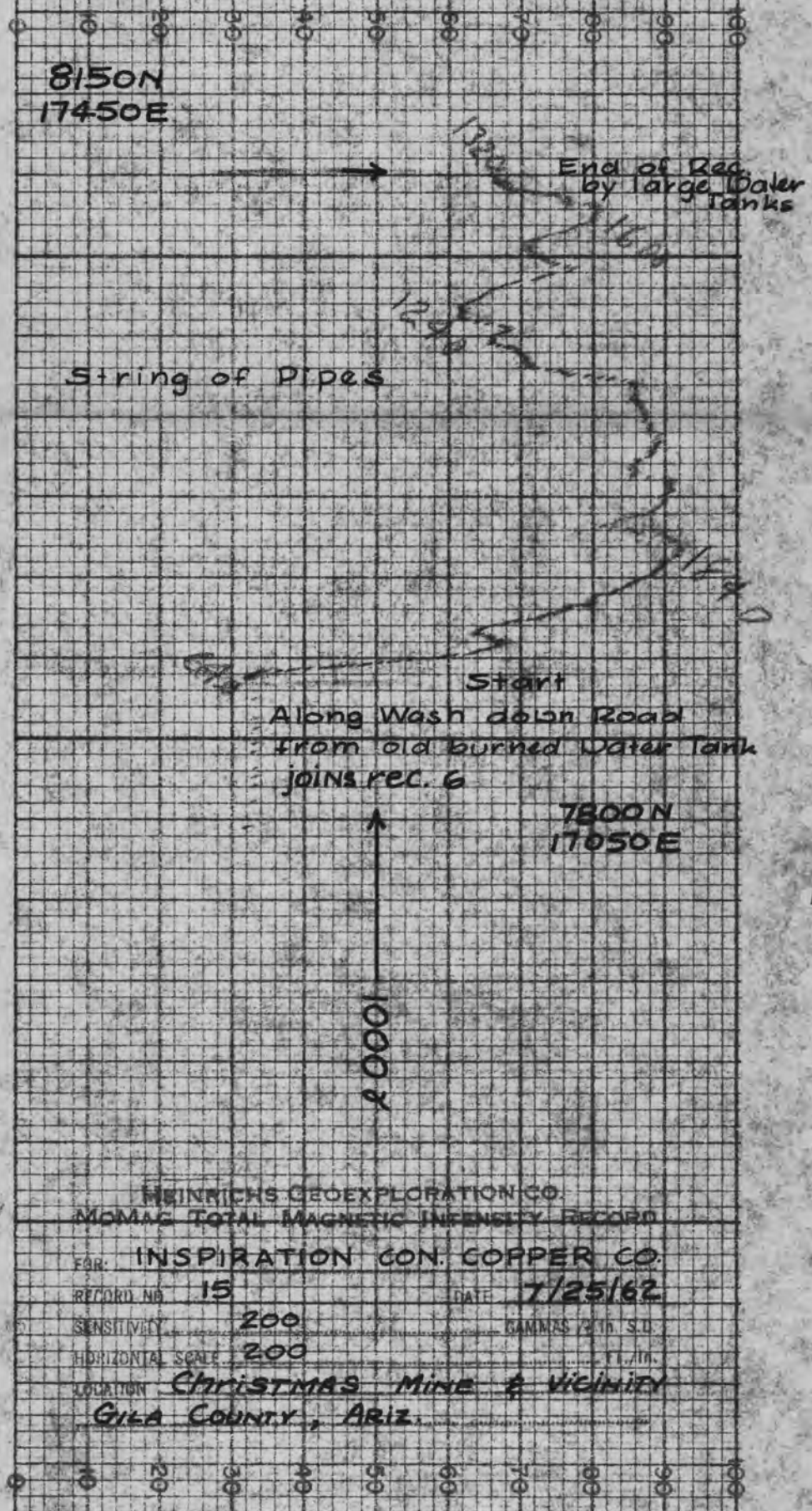
SENSITIVITY 200γ MOMAG

HORIZONTAL SCALE 200 FT./IN.

LOCATION Christmas Mine & Vicinity
Gila County, Ariz.

14

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



HEINRICHS GEOEXPLORATION CO.
MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 15 DATE 7/25/62

SENSITIVITY 200 GAMMAS /2 in. S.D.

HORIZONTAL SCALE 200 ft./in.

LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZ.

15

THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U. S. A.

HEINRICHS GEOEXPLORATION CO.

MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: INSPIRATION CON. COPPER CO.

RECORD NO. 23 DATE 7/23/62

SENSITIVITY 200 GAMMAS 1/3 in. S.D.

HORIZONTAL SCALE 200 FT./in.

LOCATION CHRISTMAS MINE & VICINITY
GILA COUNTY, ARIZONA

23

August 16, 1962

Mr. E. F. Reed, Chief Geologist
Inspiration Consolidated Copper Co.
Inspiration, Arizona

Dear Bert,

Attached are an original and three copies of our report on the recent geophysical work done at the Christmas Mine area. The one extra copy is for Mr. Jack Eastlick as requested by him.

We believe the work demonstrates that sulfide concentrations (not necessarily ore) can be detected at depth and that concentrations of magnetite may have been located which were not detected aerially.

To the extent of your satisfaction that these aspects may relate to known ore and serve as a guide toward future work, we believe the effort was successful and worthwhile. Furthermore, it is indicated that some structural and broad rock type information could be gained from added coverage.

We will look forward to your comment.

Sincerely yours,

HEINRICHS GEOEXPLORATION CO.

Walter E. Heinrichs, Jr.
President & General Manager

WEH:jh

cc: Mr. Weed)
Mr. Olmstead) Enclosed
Mr. Eastlick)

COPY

GEOPHYSICAL

INDUCED POLARIZATION TEST
and
MOBILE MAGNETIC RECONNAISSANCE

of
CHRISTMAS MINE AREA
Gila County, Arizona

for
INSPIRATION CONSOLIDATED COPPER COMPANY
Inspiration, Arizona

COPY

July - August 1962

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

TABLE OF CONTENTS

	Page
Introduction----------	1
Conclusions & Recommendations----------	1
Mobile Magnetic Work----------	3
Procedure----------	6
Electrical Work----------	7
Interpretation----------	8
Technical comment----------	9

COPY

MAPS

Index Map (U.S.G.S.)

In Pocket:

Index Map 1" = 600'
Topo Maps---Magnetic Traverse---Location & Level
Sheets 1 thru 6 & 8
I. P. Sectional data sheets (2)
I. P. Comparison Profiles (1)
Magnetic Records----1 thru 27

NOTE: Record #1 has been omitted on all but original report because it is a repeat of Record #2.

INTRODUCTION

From July 18th through August 2, 1962 Heinrichs Geoexploration Co. conducted reconnaissance mobile magnetics (mag.) and induced polarization (I.P.) tests at the Christmas Mine area of the Inspiration Consolidated Copper Company.

Principal objective was to determine the detectability of magnetic and induced polarization effects related to the known mineral deposition and to determine and provide further interpretational control for other areas. The work was greatly complicated by both A.C. and D.C. noise interference from various artificial sources such as surface and underground pipelines, power lines, track, etc., as well as intensive telluric noise from electrical storm activity in the afternoons. Nevertheless, positive and representative electrical results from the known mineralization in the area was obtained, as well as some possibly related magnetic effects of potential use and importance.

COPY

CONCLUSIONS AND RECOMMENDATIONS

1. I. P. values obtained were strongly anomalous and are considered to definitely reflect response from the general mineralized zone on Line 1.

2. I. P. boundary definition of the main zone is more pronounced on the south side and somewhat more gradational on the north.

3. Within the main zone there appears to exist an area of somewhat less intense sulfide mineralization separating two stronger concentrations of sulfides, the southernmost of which gives the strongest polarization effects on Line #1.

4. Assuming there were no other information available and without further detailed I. P. coverage, lateral interpretation would be limited to plus or minus 500' and probably about three drill holes of minimum 1,000' depth would be required to properly test the anomalous results obtained.

5. I. P. effects on Line #2 were even stronger in absolute over all amplitude than those observed on Line #1. This, together with a magnetic high obtained not too far away, may indicate relatively larger and or richer concentration of sulfides and mineralization in this area.

6. Future work, especially electrical, near the producing area, could be more efficiently executed by resorting to special techniques and schedules designed to work around the rather severe artificial interferences caused mainly by the existing underground D.C. circuits.

7. It is suggested that ground magnetics in this area will provide useful detail not available from aerial results. However, final economic analysis and comparison must await further information.

COPY

8. Although coverage was spot-reconnaissance in nature and not too comprehensive or detailed, this sample of results obtained seems sufficiently representative to indicate that additional detailed mag. and I.P. coverage would definitely and economically aid as a guide to further drilling and delineation of mineralization especially adjacent to the area already known and explored. Therefore, this should be strongly considered whenever such work is contemplated.

9. Maximum benefit will be gained from this report (and any future work) by the earliest possible thorough assimilation, understanding and detailed correlation with all the known geology, both surface and underground.

MOBILE MAGNETIC WORK

Interpretation

Generally, considerable magnetic deviation was noted, most of which can be related directly to andesite.

Anomalies A, B, C & D may have some direct and immediate economic significance and additional work is recommended to further delineate these and relate them to the geology.

Anomaly A, on magnetic Record #2. Located between 8, 200 N, 2,100 E and 8, 150 N, 2,1970 E on the main dirt road to Christmas Mine from Highway 77.

Maximum deviation from 1,040 gammas to 4,240 gammas from

trough to trough, the length of the zone being 1,200 ft. If the geologic structure related to the anomaly conforms to other structure in the area, then the magnetic traverse was along the strike or generally east-west. The trend appears to conform somewhat to the drainage which may infer fault control. Cause of the anomaly appears more likely massive magnetite, but could be andesite or diabase. Further hand work is recommended to determine strike, dip and magnitude.

Anomaly B, on magnetic record #3. Located on the access road to the T.V. antena facility above No. 3 shaft between 6,300 N, 1,5350 E and 6,150 N, 1,5950 E. Maximum deviation from 1,160 gammas to 4,820 gammas from trough to trough. The length of the zone appears to be about 1,200' and may be actually two separate features with the easterly one having the greater magnitude and a limestone outcrop down slope to the north about 100 ft. Additional hand magnetic work is recommended to further evaluate and detail the importance of this feature.

Anomaly C, on magnetic records #18 & 19. Located between 7,450 N, 20,260 E and 7,650 N, 20,350 E. This anomaly is a sharp low with maximum deviation of 1,540 gammas and is most probably related to the magnetic high labeled Anomaly A. Any future hand mag work done in the vicinity of Anomaly A should also check this feature.

Anomaly D, on magnetic record #9. Located about 1,600' SW on Highway 77 from the Goat Ranch. This was the largest magnetic deviation recorded on this project. It is definitely a fault or formational contact related phenomenon and may include effects from a concentration of massive magnetite rather than diabase. The record level and character northeast of the anomaly appears to represent the average andesite picture and the level SW becomes more ragged with sharper features and may be more affected by diabase. Ground investigation should be conducted to determine if there is any apparent or potential associated mineralization.

Anomalies E, F, G, H, I & J are in areas of less known geology and tentatively in the light of present information are not considered of immediate importance. Nevertheless, eventually they should be examined on the ground when convenient.

Anomaly K, on record #13. Located at 10,020 N, 6,550 E may be artificial because of its size and symmetry. The width from trough to trough is about 100' wide and the magnitude is about 1,400 gammas high. The cause of the anomaly, if not artificial (drill stem, drill steel, ore car, etc.,) may indicate a small vertical dipping magnetite dike. The mineralization as seen from the vehicle covered a rather large area but was not investigated on the ground.

COPY

PROCEDURE

The instrument used is a Gulf Oil Co. licensed flux-gate type total intensity magnetometer mounted on a Dodge Powerwagon. Variations in the total earth's field are continuously recorded on chart paper on a recorder geared to the vehicle drive. Record is made at whatever speed the vehicle can be driven, according to terrain conditions. Most of the existing roads were traversed in the area assigned, except on the advice of Mr. Eastlick, the roads on Sheet #7 were omitted due to land ownership.

A total of 38.6 miles of record were made. Except for Record #1, the recorder was set to record on a vertical scale of approximately 200 gammas per ½ inch (2,000 gammas full chart width) and 200' per inch horizontally. The charts are always recorded from right to left and are identified by respective number and arrow as to direction run as shown on the various maps. To aid in following the level, values in gammas have been plotted at intervals on the records. To further aid in locating one's position on the ground, certain natural and cultural features were noted and marked on the records. An arbitrary base and level of 1,600 gammas was picked at coordinate 7,750 N and 17,450 E (start of record #6).

Record #1 is included with all of the original records and original copy of the report. Record #2 is a re-run of #1 except at a different vertical scale.

Certain anomalies have been assigned a letter and noted on the record and on the maps. A color code on the 1" = 200' scale maps was used to help differentiate on the variations in magnetic level in units of 1,000 gammas each. This allows for a broad interpretational correlation--in plan. However, it must be emphasized, that the maximum detail interpretation must be made by direct reference to each individual profile record, and re-evaluated in the light of any related new geological or subsurface information.

ELECTRICAL WORK

Procedure: It was decided that to fulfill the ultimate objective of determining how successful induced polarization would have been in discovering the Christmas orebody, it would be necessary to approach the problem initially as a purely reconnaissance project. Therefore, 1,000 ft. electrode (dipole) spacing, which is the broadest type of I. P. reconnaissance we normaly employ, was used. The first line was located on the basis of known surface geology and was centered about 300 ft. southeast of the No. 3 shaft at about coordinates 6,650 N, 16,500 E and run N 10° E - S 10° W from this point. A second line centered at about coordinates 7,600 N, 18,550 E and run N 10° E - S 10° W, was only partially completed.

A secondary consideration for selection of the 1,000 ft. dipole length was that maximum depth to sulfides was theoretically

unknown and therefore deepest penetration was considered desirable in order to determine how much definition might be expected between shallower and deeper horizons.

Interpretation: Line #1 shows a zone of strong total sulfide mineralization that is sharply terminated in what appears to be an essentially steep dipping contact somewhere between station "0" and 2,000 ft. south of center. The north boundary of the main zone is not as pronounced as at the south end, possibly partly due to the fact that the line did not extend sufficiently far to the north to completely see the total termination in that direction. Actually assuming a background level of 4 PFE for nil-sulfides, there is some indication of weak sulfides throughout the entire length of the line surveyed, but certainly not approaching the intensity observed between approximately station 0.5S and station 3.5N. Within the main zone of mineralization is a zone of less intense effects that could range from weak sulfide mineralization up to some degree of sulfides that is somewhat less than that on either side. This zone is probably relatively steep sided and is located in the vicinity of station 1N. The largest absolute magnitude effects are towards the south end of the general anomaly and probably represent a shallower and/or over all higher percentage of sulfide concentration at or near the south boundary of the "weaker" zone. The zone of highest anomalism lies between "0" and 1N and between 1.5N

and 3.5N. From station 0.5S the stronger sulfides may extend somewhat northerly with depth to the 3rd separation then appear to merge and possibly reverse direction toward the south with strong sulfides comming in from station 3.5N in the 3rd separation and extending at least to station 1N in the 4th separation and probably to station 2N in the 6th separation.

Only three setups were observed on the north end of Line #2 but some of the most intense polarization effects were observed on this line. No positive analysis can be made of this limited amount of data other than that the effects are definitely those of sulfide mineralization either shallower and/or of greater intensity and/or more continuous (no intervening weaker zone) than those on Line #1. The lack of coverage precludes detailed analysis, however, the anomalism appears attenuated somewhat toward the north with the strongest effect centered at station 1N in the 2nd separation.

Technical Comment

Selection of a given electrode spacing is determined by the objectives to be reached in a given survey. This spacing will range from very small (50 ft. or less) for very detailed surveys, up to 1,000 ft., or occasionally more, for broad reconnaissance work. Other factors involved in the selection are concerned with the anticipated physical geometry of any possibly existing mineral occurrence which must include consideration

of such factors as expected depth of burial to the top of the source, the dimensions of the source itself as well as of its electrical and other physical properties. In general the greater the spacing the greater the maximum penetration and the less the lateral definition. With this dipole-dipole (Eltran) electrode configuration, the maximum theoretical possible penetration is from 1.0 times the electrode spacing in the first separation to 3.5 times the spacing on the 6th separation. In other words, with theoretically IDEAL conditions of completely isotropic-homogeneous resistivity in every direction both lateral and vertical, (a situation we never have), using 1,000 ft. dipoles, the information obtained in the first dipole separation represents the average electrical composition of the materials from 0 to 1,000 ft; in the third separation from 0 to 2,000 ft; in the 6th separation from 0 to 3,500 ft. Actually, penetration is a function of the absolute resistivity distribution and magnitude which are most often rather complex. In practice, empirical results have shown that under average conditions the depth of penetration ~~will~~ may vary from 0.2 to 2.0 times the electrode spacing from first to sixth dipole separation. The I.P. data obtained is plotted at a point that represents the geometric "bottom" of a hemisphere which has a radius equal to ½ the dipole separation, however, it must be emphasized that this value does not necessarily represent ~~not~~ the electrical properties at that point, but

COPY

Note "A"

Furthermore in the vicinity of sharply contrasting resistivity contacts the hemisphere will be greatly distorted often providing for lateral translation of maximums and minimums

actually the average of the properties of all the materials within the hemisphere. Therefore it is unrealistic to attempt interpretation to a degree of accuracy greater than a minimum of about half the distance between any two adjacent depth points. Fortunately geological (and therefore physical property) contacts are often sharp enough to create a pattern within the data that lends itself to more or less definite analysis within the limitations above described.

Since we usually only effectively collect our data from the surface with essentially two dimensional coverage, the exact vertical aspects are often the most difficult to analyze. For example, it is very hard to detect the presence of a relatively poor conductor, or non-polarizing horizon, lying below a good conductor or polarizing layer, and if the upper horizon were an especially good conductor there would be no indication what so ever of the lower zone.

In the case of an alternating series of conducting and insulating horizons the affect is to average the electrical properties of the entire section with a somewhat more attenuated resultant than if the whole section were a uniform equivalent of the same averaged conditions from surface to the point of maximum penetration. In the more usual case of non-sulfides, less conducting material, overlying a conducting (sulfides) zone that extends beyond the depth of maximum penetration, the data

will show no more than background polarization effects in separations that are smaller than the thickness of the overburden, with polarization uniformly increasing with depth until certain lateral and vertical limits related to the size, shape and position of the conducting horizon were exceeded.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Franklin A. Seward, Jr.
Geophysicist

L. Grover Heinrichs
Vice President

Walter E. Heinrichs, Jr.
President

COPY

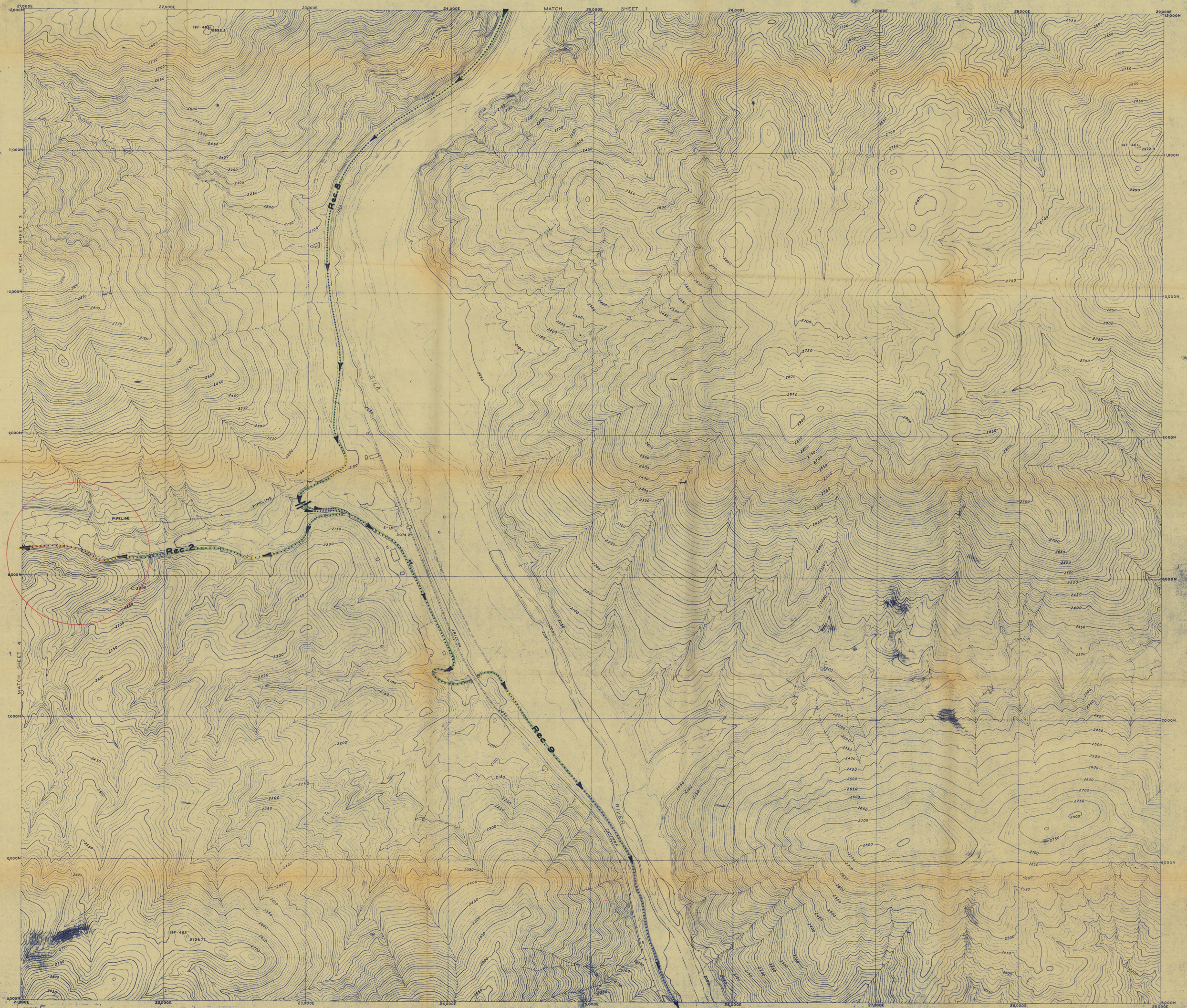
August 16, 1962
P. O. Box 5671
Tucson, Arizona

Christmas Mine Area & Vicinity

INDEX MAP

Showing magnetic coverage off
1" = 200' Scale Maps and
1" = 600' Scale Map
for
INSPIRATION CONSOLIDATED COPPER CO.
by
HEINRICHS GEOEXPLORATION CO.
July 1962

Scale: 2" = 1 mile



Compiled by FAIRCHILD AERIAL SURVEYS, INC. Los Angeles — New York

BY STEREOPHOTOGRAMMETRIC METHODS
PHOTOGRAPHY BY F. A. S. PROJECT NO. 22020 MAY 1955
CONTROL BY U.S.C. & G.S. & F.A.S. 1927 N.A.D.

8		1
5	3	
7	6	4

SCALE 1:2400

200 0 200 400 600 800 1000 FEET

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

1000 FOOT GRID IS BASED ON LOCAL SYSTEM

Gammas Total Magnetic Intensity
- Below 0
- 0 - 1000
- 1000-2000
- 2000-3000
- 3000-4000
- 4000-5000
- 5000 & above

TOTAL INTENSITY MOBILE MAGNETIC TRAVERSE

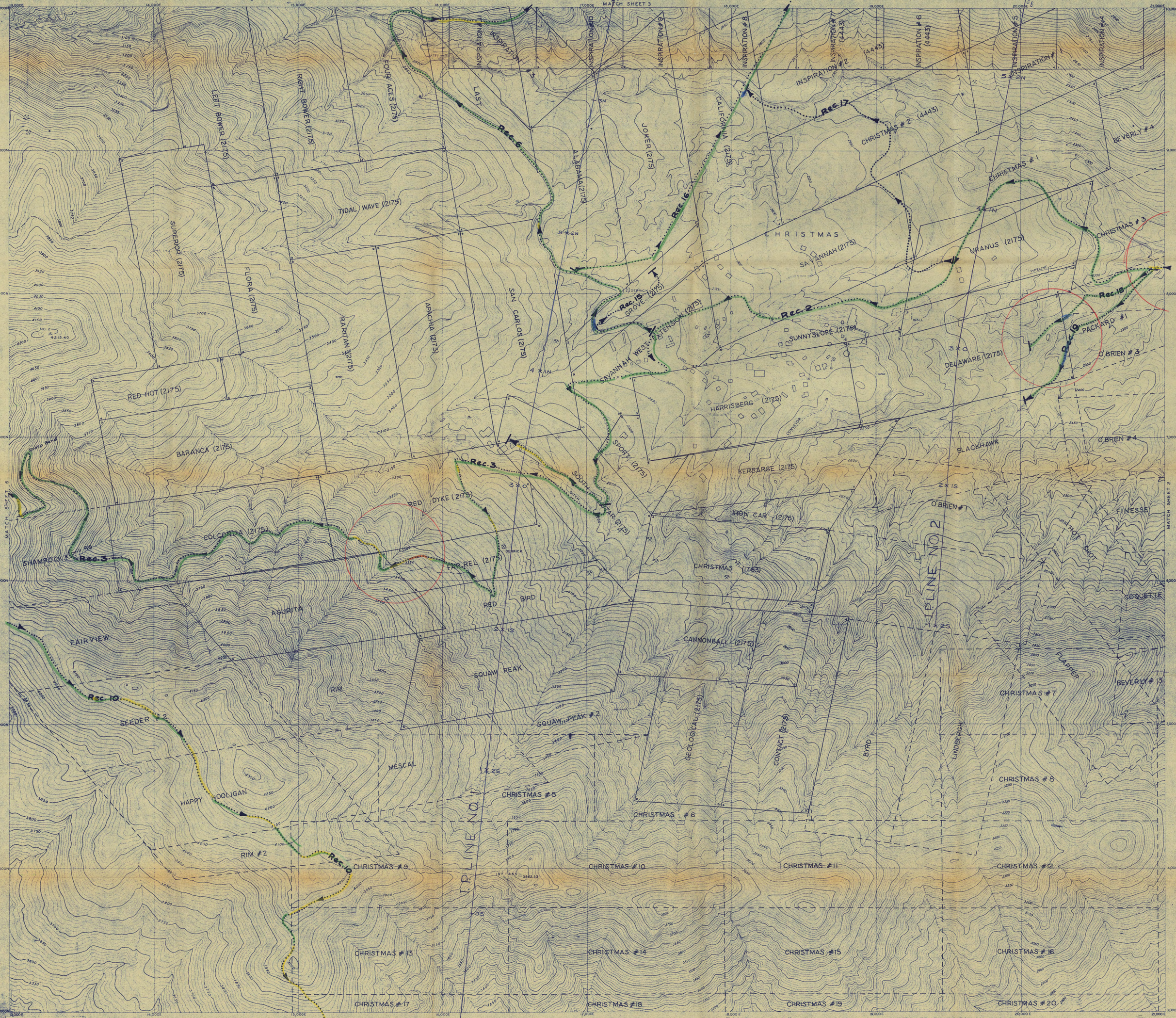
by

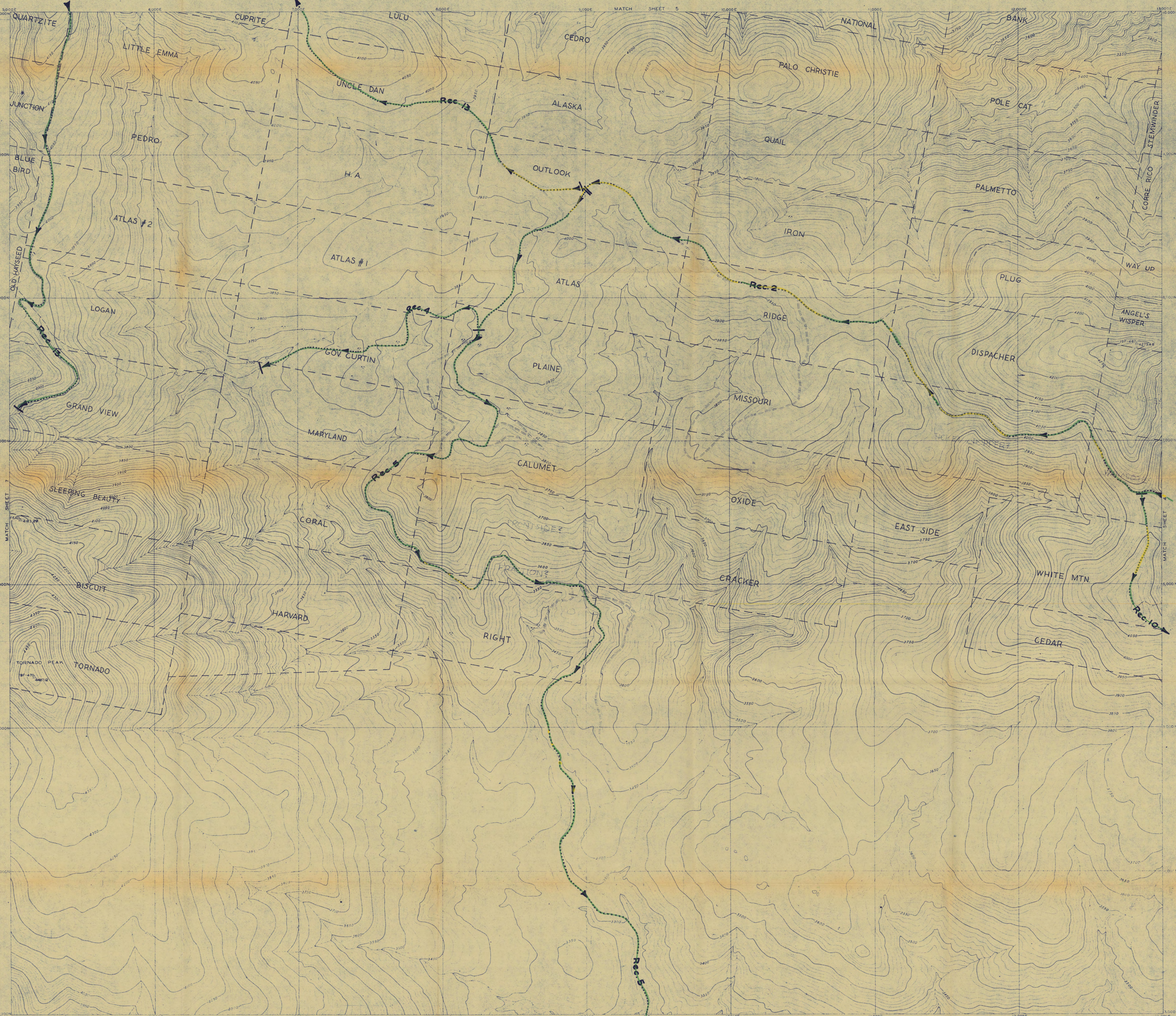
HEINRICHS GEOEXPLORATION CO.

JULY 1962

TOPOGRAPHIC SURVEY
CHRISTMAS AREA
INSPIRATION CONSOLIDATED
COPPER COMPANY
INSPIRATION, ARIZONA

SHEET 2 OF 7


MATCH SHEET 3
MATCH SHEET 6
MATCH SHEET 2
INSPIRATION #11
INSPIRATION #10
INSPIRATION #9
INSPIRATION #8
INSPIRATION #7 (4443)
INSPIRATION #6 (4443)
INSPIRATION #5
INSPIRATION #4
INSPIRATION #2 (4443)
LAST
FOUR ACES (2175)
LEFT BOWER (2175)
RIGHT BOWER (2175)
ALABAMA (2175)
JOKER (2175)
CALIFORNIA (2175)
CHRISTMAS #2 (4443)
CHRISTMAS #1
BEVERLY #4
TIDAL WAVE (2175)
SUPERIOR (2175)
FLORA (2175)
RARITAN (2175)
APACHA (2175)
SAN CARLOS (2175)
CHRISTMAS
SAVANNAH (2175)
URANUS (2175)
CHRISTMAS #3
GROVE (2175)
SAVANNAH WEST EXTENSION (2175)
SUNNYSLOPE (2175)
PACKARD #1
O'BRIEN #3
DELAWARE (2175)
RED HOT (2175)
HARRISBERG (2175)
BARANCA (2175)
SPORTY (2175)
KERSARGE (2175)
BLACKHAWK
O'BRIEN #4
RED DYKE (2175)
SOUTH STAR (2175)
IRON CAR (2175)
O'BRIEN #1
FINESSE
COLCONDA (2175)
SHAMROCK
FAIR REL (2175)
CHRISTMAS (1763)
T.P. LINE NO 2
SOQUETTE
AGURITA
RED BIRD
FAIRVIEW
CANNONBALL (2175)
FLAPPER
BEVERLY #13
RIM
SQUAW PEAK
SEEDER #2
SQUAW PEAK #2
GEOLOGICAL (2175)
CONTACT (2175)
BYRD
LINDBERGH
CHRISTMAS #7
MESCAL
CHRISTMAS #5
CHRISTMAS #6
CHRISTMAS #8
HAPPY HOOLIGAN
T.P. LINE NO 1
RIM #2
CHRISTMAS #9
CHRISTMAS #10
CHRISTMAS #11
CHRISTMAS #12
CHRISTMAS #13
CHRISTMAS #14
CHRISTMAS #15
CHRISTMAS #16
CHRISTMAS #17
CHRISTMAS #18
CHRISTMAS #19
CHRISTMAS #20
Rec. 1
Rec. 2
Rec. 3
Rec. 6
Rec. 10
Rec. 15
Rec. 16
Rec. 17
Rec. 18
Rec. 19
Rec. 10 continues on 2"=1mi. Scale Map
End of Rec. 10 & Start of Rec. 11 & 12 at Rd. Junction 2050' from edge of this map
Induced Polarization Survey Line
4S continues to 6S
SCALE 1:2400
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
1000 FOOT GRID IS BASED ON LOCAL SYSTEM
Gammas Total Magnetic Intensity
Below 0
0 - 1000
1000-2000
2000-3000
3000-4000
4000-5000
5000 & above
Compiled by FAIRCHILD AERIAL SURVEYS, INC. Los Angeles - New York
BY STEREOPHOTOGRAMMETRIC METHODS
PHOTOGRAPHY BY F.A.S. PROJECT NO 22020 MAY 1955
CONTROL BY U.S.C.&G.S. & F.A.S. 1927 N.A.D.
INDUCED POLARIZATION SURVEY and
TOTAL INTENSITY MOBILE MAGNETIC TRAVERSE
by
HEINRICHS GEOEXPLORATION CO.
JULY 1962
TOPOGRAPHIC SURVEY
CHRISTMAS AREA
INSPIRATION CONSOLIDATED COPPER COMPANY
INSPIRATION, ARIZONA
SHEET 4 OF 7



Rec. 5 continues on 2"=1mi. Scale map

SCALE 1:2400

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

1000 FOOT GRID IS BASED ON LOCAL SYSTEM

Gammas Total Magnetic Intensity
- Below 0
- 0 - 1000
- 1000-2000
- 2000-3000
- 3000-4000
- 4000-5000
- 5000 & above

TOTAL INTENSITY MOBILE MAGNETIC TRAVERSE
by
HEINRICHS GEOEXPLORATION CO.
JULY 1962

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BY STEREOPHOTOGRAMMETRIC METHODS
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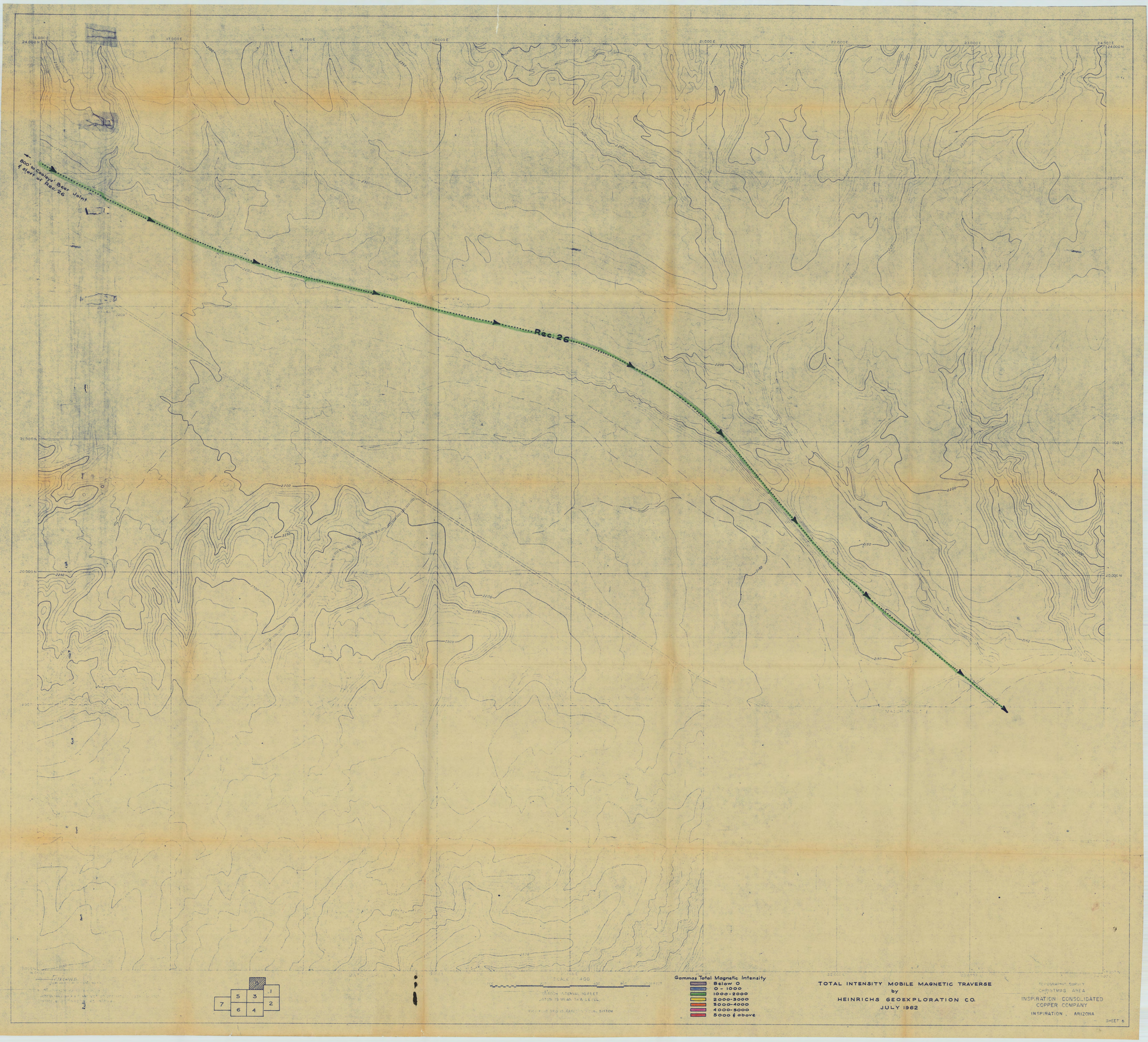
CONTROL BY U.S.C. & G.S. & F.A.S. 1927 N.A.D.

TOPOGRAPHIC SURVEY
CHRISTMAS AREA
INSPIRATION CONSOLIDATED
COPPER COMPANY
INSPIRATION, ARIZONA

SHEET 6 OF 7



SCALE 1:2400

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

1000 FOOT GRID IS BASED ON LOCAL SYSTEM

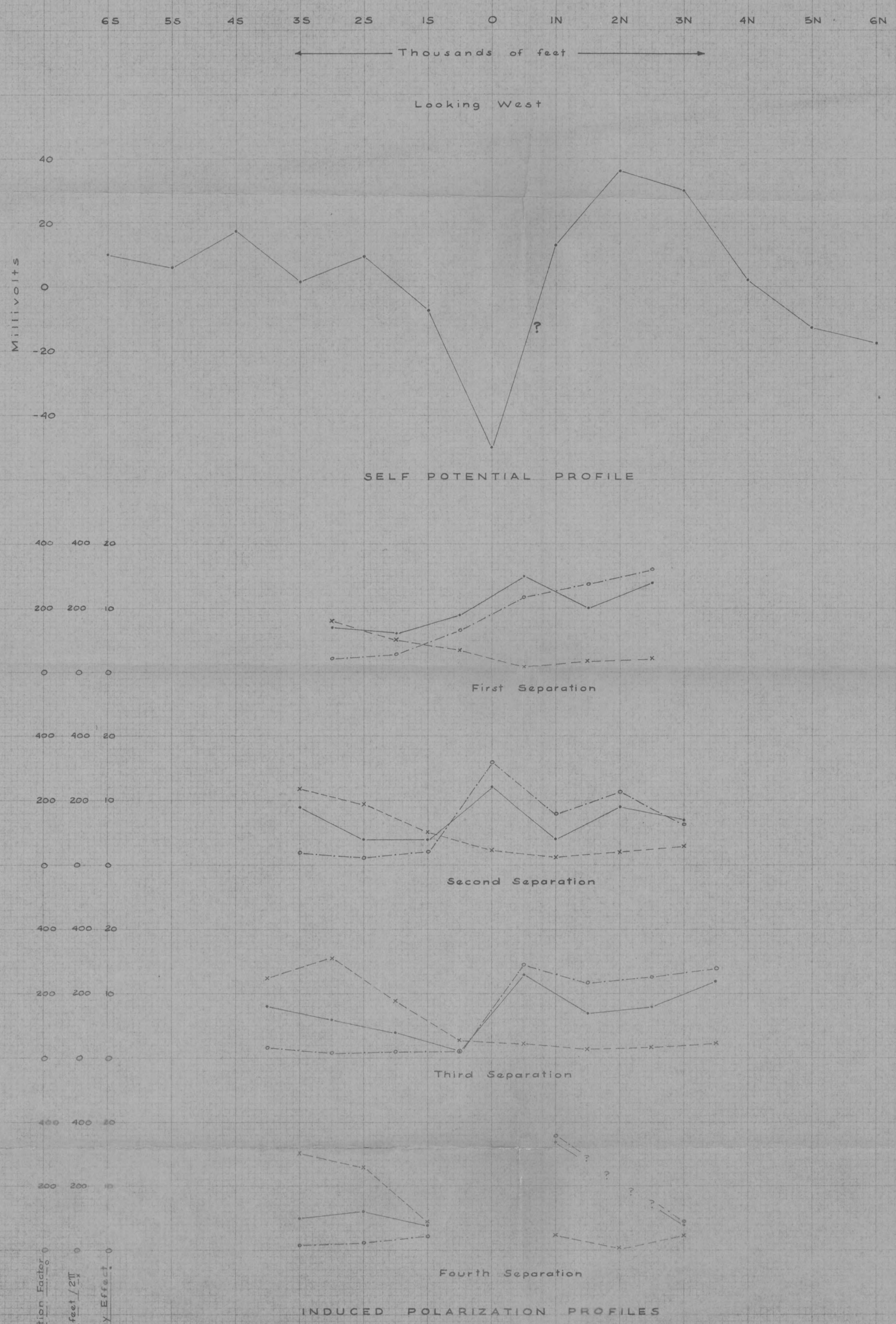
Gammas Total Magnetic Intensity

- Below 0
- 0 - 1000
- 1000-2000
- 2000-3000
- 3000-4000
- 4000-5000
- 5000 & above

TOTAL INTENSITY MOBILE MAGNETIC TRAVERSE
by
HEINRICHS GEOEXPLORATION CO.
JULY 1962

TOPOGRAPHIC SURVEY
CHRISTMAS AREA
INSPIRATION CONSOLIDATED
COPPER COMPANY
INSPIRATION, ARIZONA

SHEET 8



COMPOSITE PROFILES

LINE I - Spr. I

CHRISTMAS MINE AREA
Sec. 19-20-29-30
T4S - R16E
GILA COUNTY, ARIZONA

for

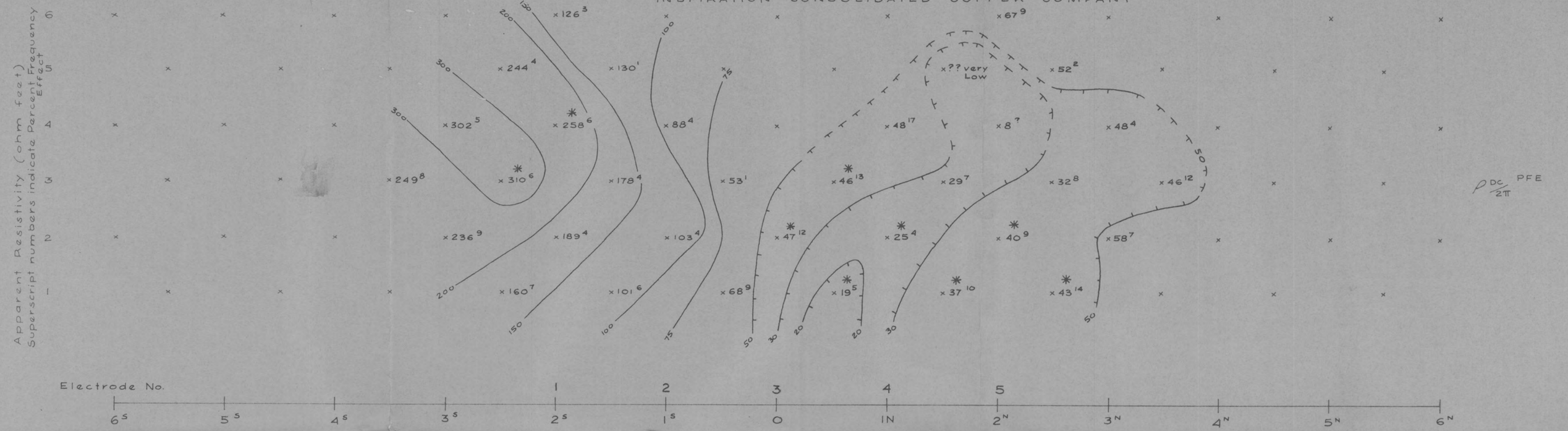
INSPIRATION CONSOLIDATED COPPER CO.

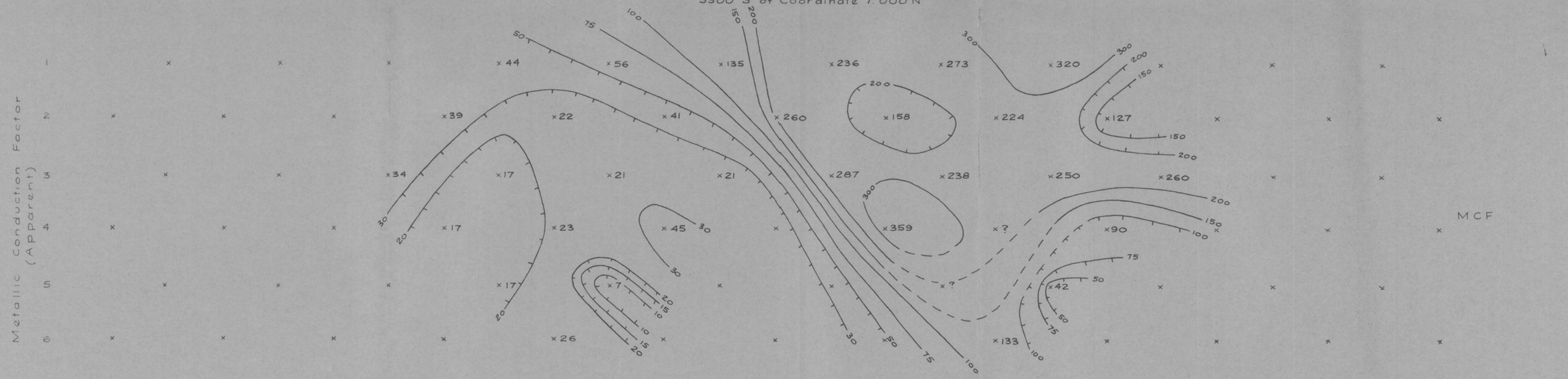
by

Heinrichs Geoexploration Co.
July 1962 Scale: 1" = 1000'

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SECTIONAL DATA SHEET
for
INSPIRATION CONSOLIDATED COPPER COMPANY





AREA: CHRISTMAS MINE LINE No: 1 Looking westerly, N½ bearing N 10° E, S½ bearing S 6° W SPREAD No: 1 - N½ & S½ SCALE: 1" = 600' (1000' dipole setup) DATE: 7/20/68

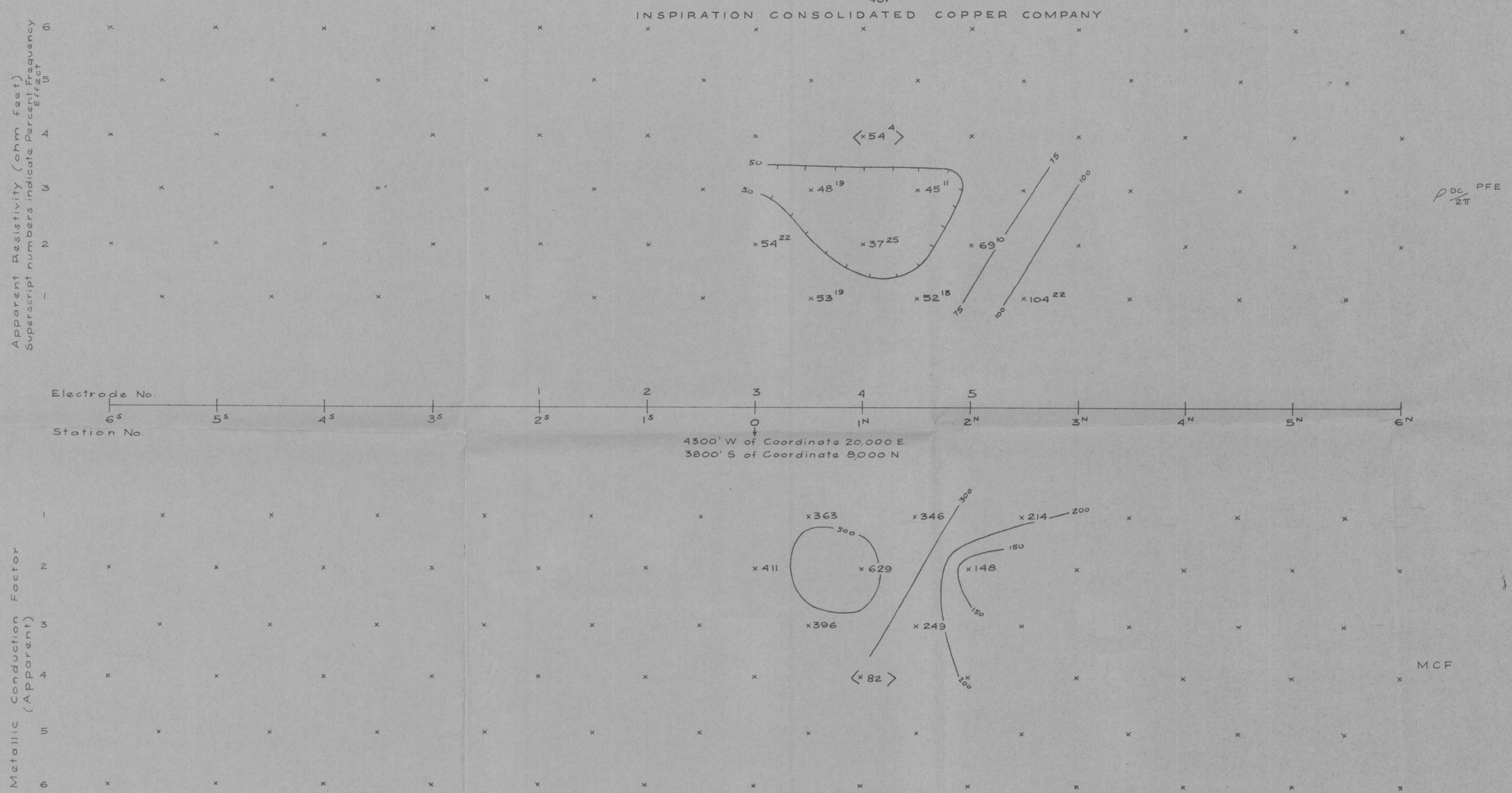
* = Repeat PFE data within 3% and averaged

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SECTIONAL DATA SHEET

for

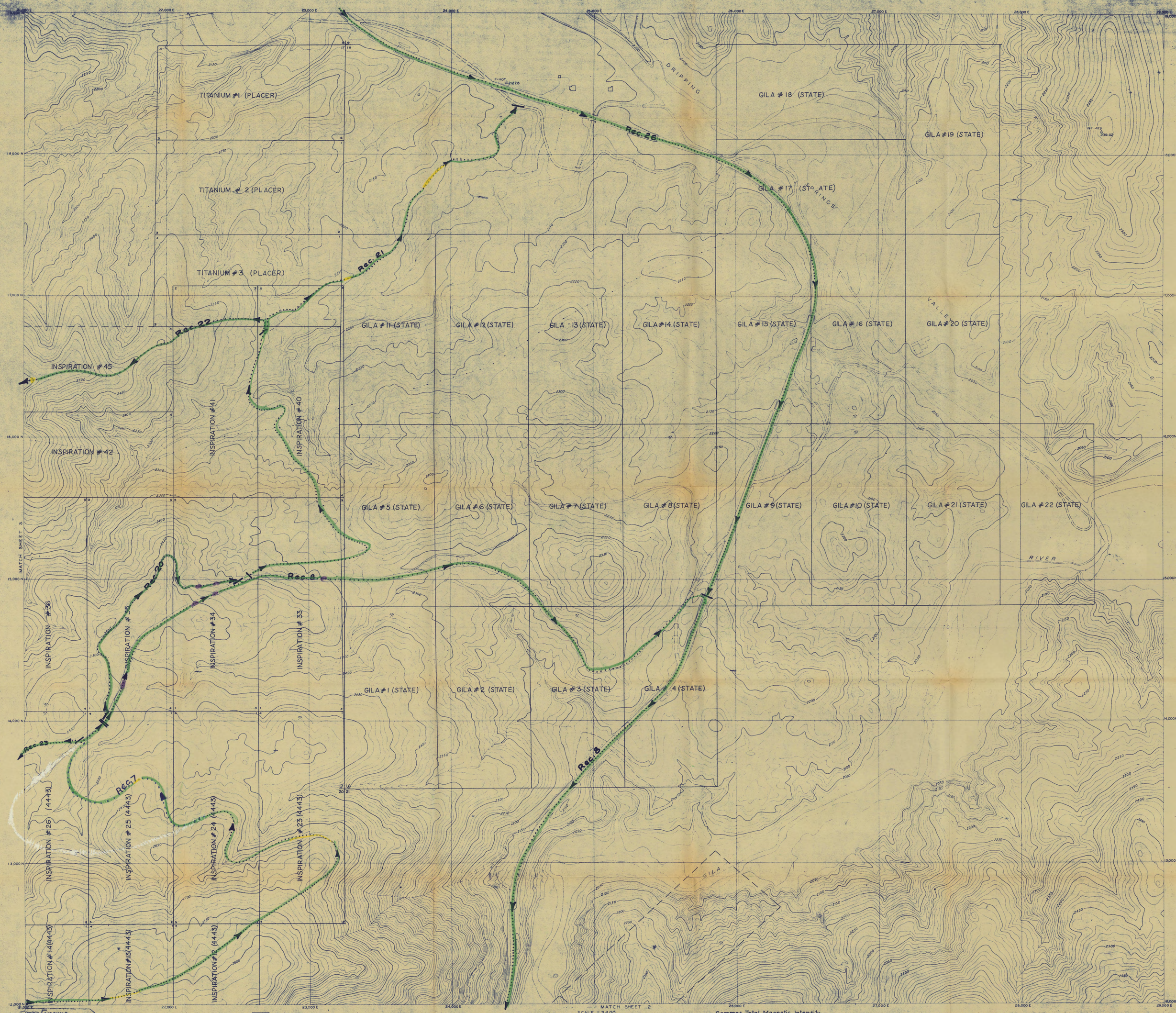
INSPIRATION CONSOLIDATED COPPER COMPANY



AREA: CHRISTMAS MINE LINE No: 2 Looking westerly SPREAD No: 1 – Partial Spread 1 SCALE: 1" = 600' (1000' dipole setup) DATE: JULY 1962

N½ bearing N 0° E

S½ bearing S 6° W


TITANIUM #1 (PLACER)
TITANIUM # 2 (PLACER)
TITANIUM # 3 (PLACER)
GILA # 18 (STATE)
GILA # 19 (STATE)
GILA # 17 (STATE)
GILA # 11 (STATE)
GILA # 12 (STATE)
GILA # 13 (STATE)
GILA # 14 (STATE)
GILA # 15 (STATE)
GILA # 16 (STATE)
GILA # 20 (STATE)
INSPIRATION # 45
INSPIRATION # 41
INSPIRATION # 40
INSPIRATION # 42
GILA # 5 (STATE)
GILA # 6 (STATE)
GILA # 7 (STATE)
GILA # 8 (STATE)
GILA # 9 (STATE)
GILA # 10 (STATE)
GILA # 21 (STATE)
GILA # 22 (STATE)
INSPIRATION # 36
INSPIRATION # 35
INSPIRATION # 34
INSPIRATION # 33
GILA # 1 (STATE)
GILA # 2 (STATE)
GILA # 3 (STATE)
GILA # 4 (STATE)
INSPIRATION # 26 (4443)
INSPIRATION # 25 (4443)
INSPIRATION # 24 (4443)
INSPIRATION # 23 (4443)
INSPIRATION # 14 (4443)
INSPIRATION # 13 (4443)
INSPIRATION # 12 (4443)
Rec. 26
Rec. 21
Rec. 22
Rec. 8
Rec. 20
Rec. 23
Rec. 7
Rec. 3
DRIPPING
SPRINGS
VALLEY
RIVER
GILA
MATCH SHEET 3
MATCH SHEET 2
SCALE 1:2400
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
1000 FOOT GRID IS BASED ON LOCAL SYSTEM
Gammas Total Magnetic Intensity
Below 0
0 - 1000
1000-2000
2000-3000
3000-4000
4000-5000
5000 & above
TOTAL INTENSITY MOBILE MAGNETIC TRAVERSE
by
HEINRICHS GEOEXPLORATION CO.
JULY 1962
TOPOGRAPHIC SURVEY
CHRISTMAS AREA
INSPIRATION CONSOLIDATED
COPPER COMPANY
INSPIRATION, ARIZONA
SHEET 1 OF 7
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BY STEREOPHOTOGRAMMETRIC METHODS
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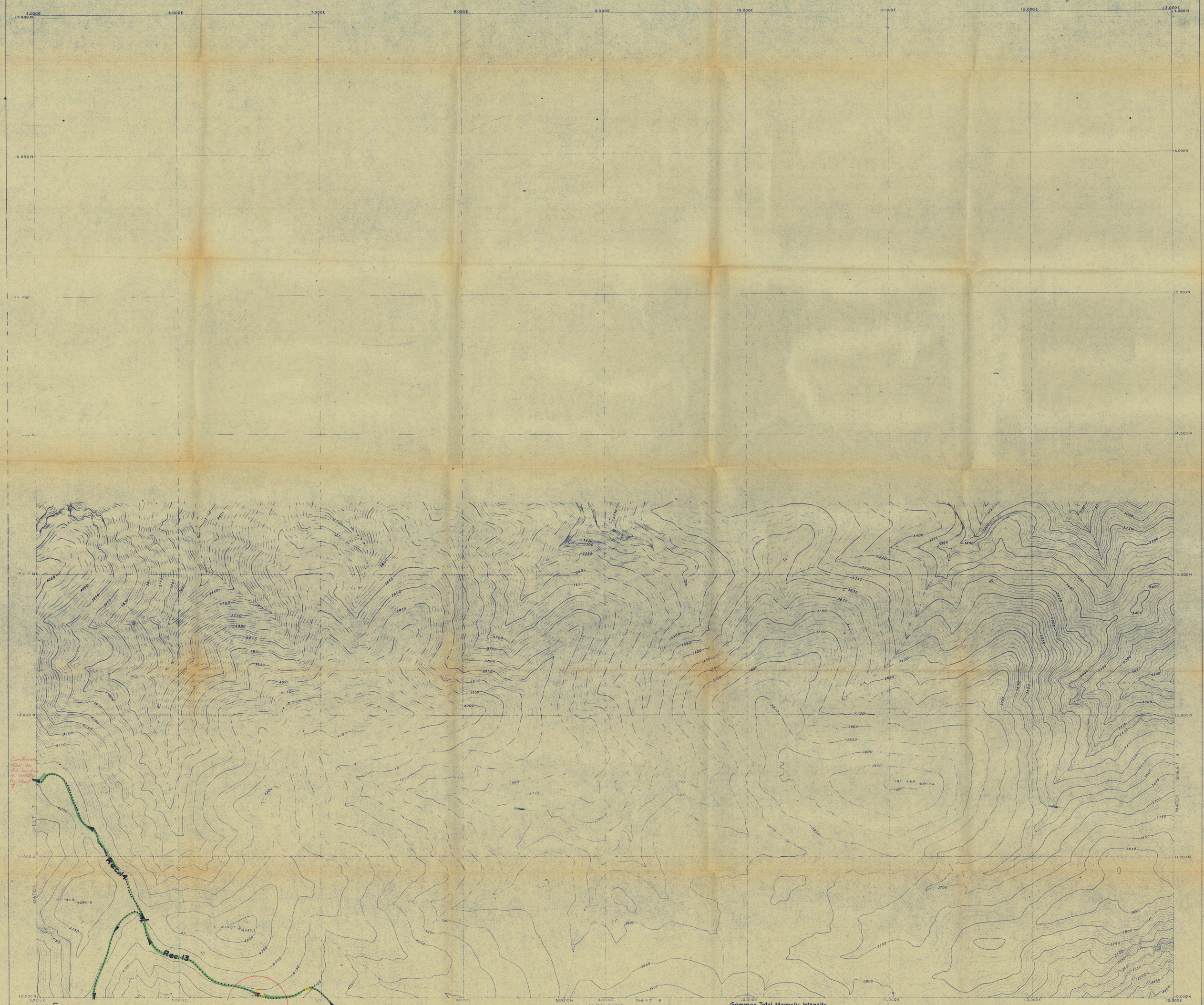

Compiled by FAIRCHILD
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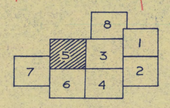
BY STEREOPHOTOGRAMMETRIC METHODS
PHOTOGRAPHY BY F.A.S. PROJECT NO. 22020 MAY 1955
CONTROL BY U.S.C. & G.S. & F.A.S. 1927 N.A.D.



MATCH SHEET 6

SCALE 1:2400

200 0 200 400 600 800 1000 FEET

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

1000 FOOT GRID IS BASED ON LOCAL SYSTEM

Gammas Total Magnetic Intensity

- Below 0
- 0 - 1000
- 1000-2000
- 2000-3000
- 3000-4000
- 4000-5000
- 5000 & above

TOTAL INTENSITY MOBILE MAGNETIC TRAVERSE

by

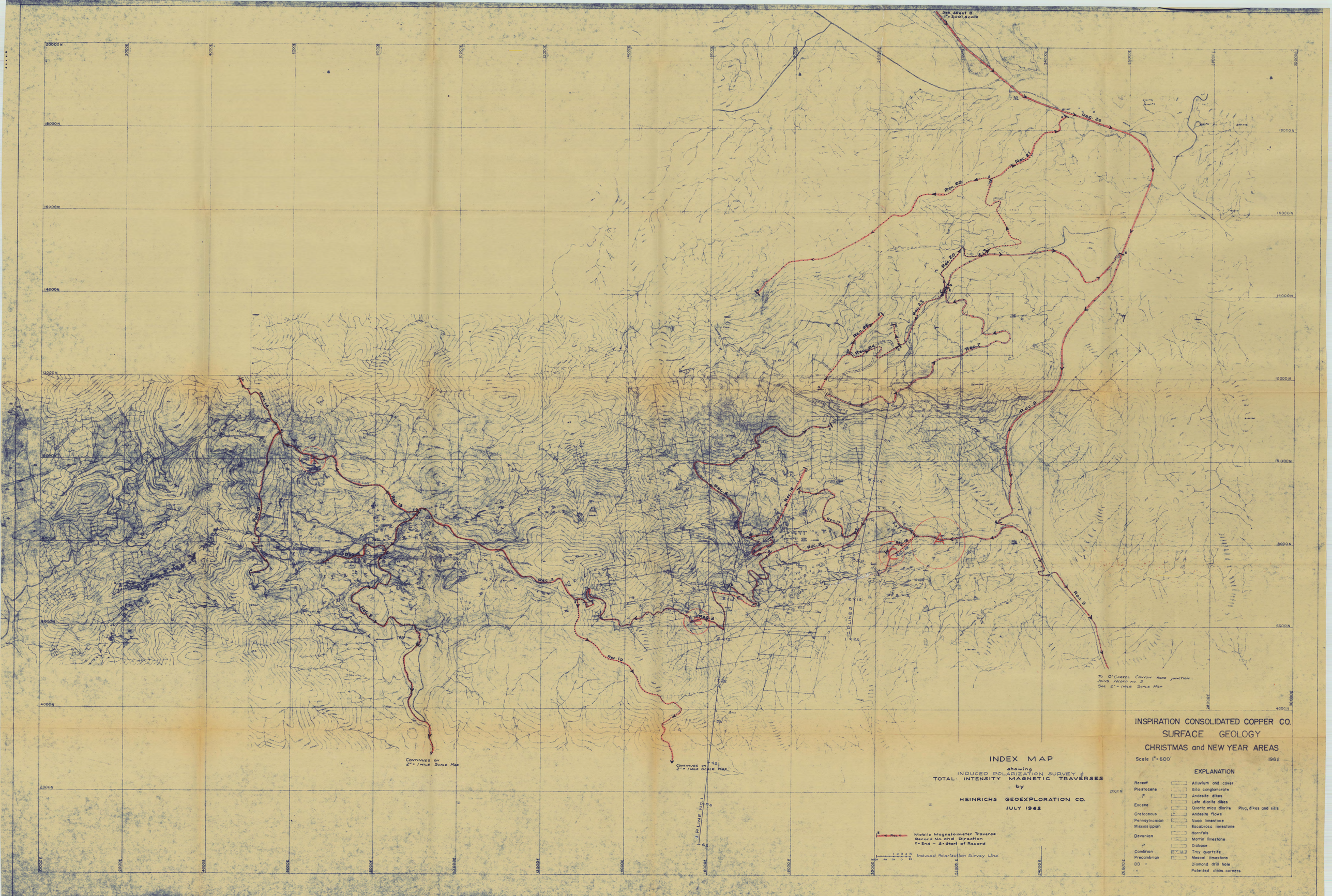
HEINRICHS GEOEXPLORATION CO.

JULY 1962

Geoex Copy

TOPOGRAPHIC SURVEY
CHRISTMAS AREA
INSPIRATION CONSOLIDATED
COPPER COMPANY
INSPIRATION, ARIZONA

SHEET 5 OF 7


See Sheet 8
1" = 200' Scale
Rec. 26
Rec. 21
Rec. 22
Rec. 20
Rec. 23
Rec. 25
Rec. 24
Rec. 7
Rec. 8
Rec. 1
Rec. 13
Rec. 12
Rec. 5
Rec. 3
Rec. 10
Rec. 11
Rec. 2
Rec. 9
Rec. 6
I.P. LINE 2
I.P. LINE No. 1
Continues on 2" = 1 Mile Scale Map
Continues on 2" = 1 Mile Scale Map
To O'Carrol Canyon road junction
Joins record no. 5
See 2" = 1 Mile Scale Map
20000N
18000N
16000N
14000N
12000N
10000N
8000N
6000N
4000N
2000N
20000E
22000E
24000E
26000E
28000E
30000E
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980000E
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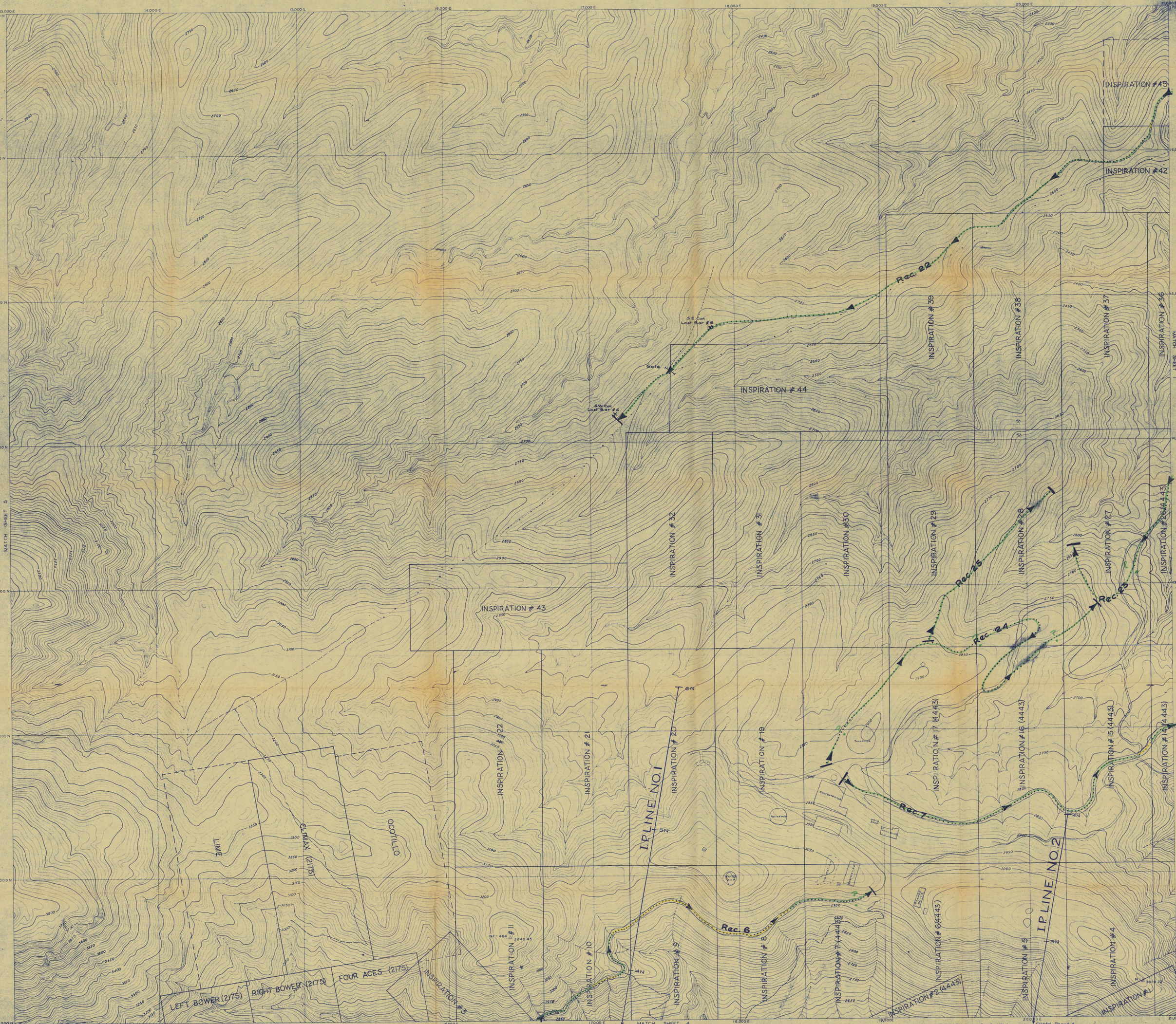
984000E
986000E
988000E
990000E
992000E
994000E
996000E
998000E
1000000E
INDEX MAP
showing
INDUCED POLARIZATION SURVEY &
TOTAL INTENSITY MAGNETIC TRAVERSES
by
HEINRICHS GEOEXPLORATION CO.
JULY 1962
Mobile Magnetometer Traverse
Record No. and Direction
E = End — S = Start of Record
Induced Polarization Survey Line
INSPIRATION CONSOLIDATED COPPER CO.
SURFACE GEOLOGY
CHRISTMAS and NEW YEAR AREAS
Scale 1" = 600'
1962
EXPLANATION
Recent — Alluvium and cover
Pleistocene — Gila conglomerate
P — Andesite dikes
Eocene — Late diorite dikes
Quartz mica diorite — Plug, dikes and sills
Cretaceous — Andesite flows
Pennsylvanian — Naco limestone
Mississippian — Escabrosa limestone
Hornfels
Devonian — Martin limestone
P — Diabase
Cambrian — Troy quartzite
Precambrian — Mescal limestone
DD — Diamond drill hole
+ — Patented claim corners



Compiled by FAIRCHILD AERIAL SURVEYS, INC. Los Angeles-New York

BY STEREOPHOTOGRAMMETRIC METHODS
PHOTOGRAPHY BY F.A.S. PROJECT NO 22020 MAY 1955
CONTROL BY USC & G S & F.A.S. 1927 NAD.

Induced Polarization Survey Line

SCALE 1:2400

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

1000 FOOT GRID IS BASED ON LOCAL SYSTEM

Gammas Total Magnetic Intensity

- Below 0
- 0 - 1000
- 1000-2000
- 2000-3000
- 3000-4000
- 4000-5000
- 5000 & above

INDUCED POLARIZATION SURVEY and TOTAL INTENSITY MOBILE MAGNETIC TRAVERSE

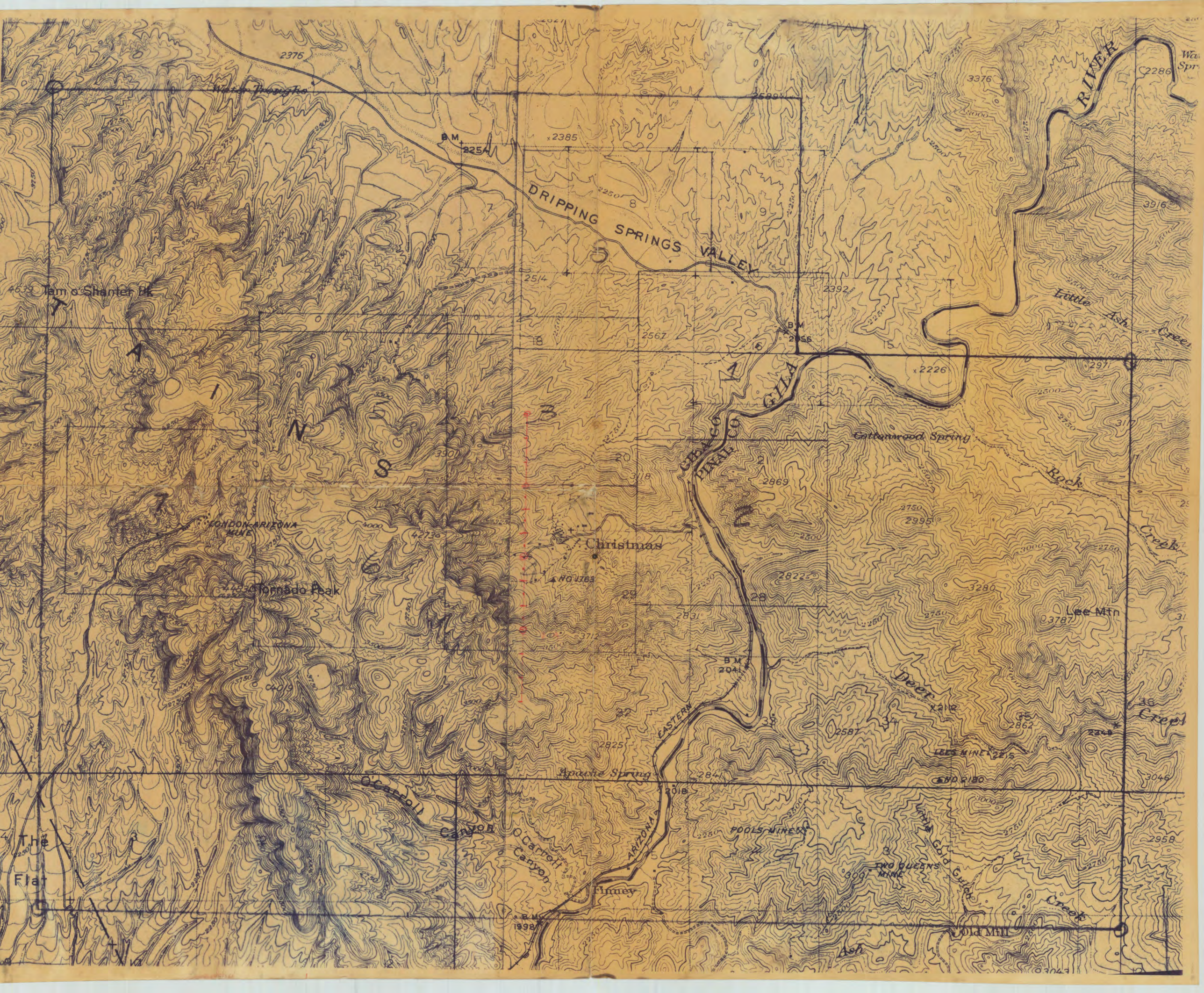
by

HEINRICHS GEOEXPLORATION CO.

JULY 1962

TOPOGRAPHIC SURVEY
CHRISTMAS AREA
INSPIRATION CONSOLIDATED COPPER COMPANY
INSPIRATION, ARIZONA

SHEET 3 OF 7



Water Troughs
DRIPPING SPRINGS VALLEY
Tam o'Shanter Pk
LONDON-ARIZONA MINE
Tornado Peak
Christmas
GILA
PINAL CO
Cottonwood Spring
Little Ash Creek
Rock Creek
Lee Mtn
Deer Creek
LEES MINE
Apache Spring
O'Carroll Canyon
ARIZONA EASTERN
POOLS MINE
TWO QUEENS MINE
Little Gold Gulch
Finney
Old Mill
Ash Creek
The Flat

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ARIZONA
CHRISTMAS QUADRANGLE

Marshall, Chief Geographer.
.R.Davis, Geographer in charge.
ography by T.P.Pendleton and C.A.Stonesifer.
trol by T.M.Bannon, S.H.Birdseye,
s.Windsor, and L.F.Biggs.
rveyed in 1915.

14½°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1915

SCALE 1:62500

1 ½ 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1957

Polyconic projection. To place on 1927 North American datum move projection lines 100 feet west.

Note. *In joining Ray and Winkelman use the dotted projection corners.*

ARIZ.
CHRISTMAS
N 3300—W 11030/15

1915

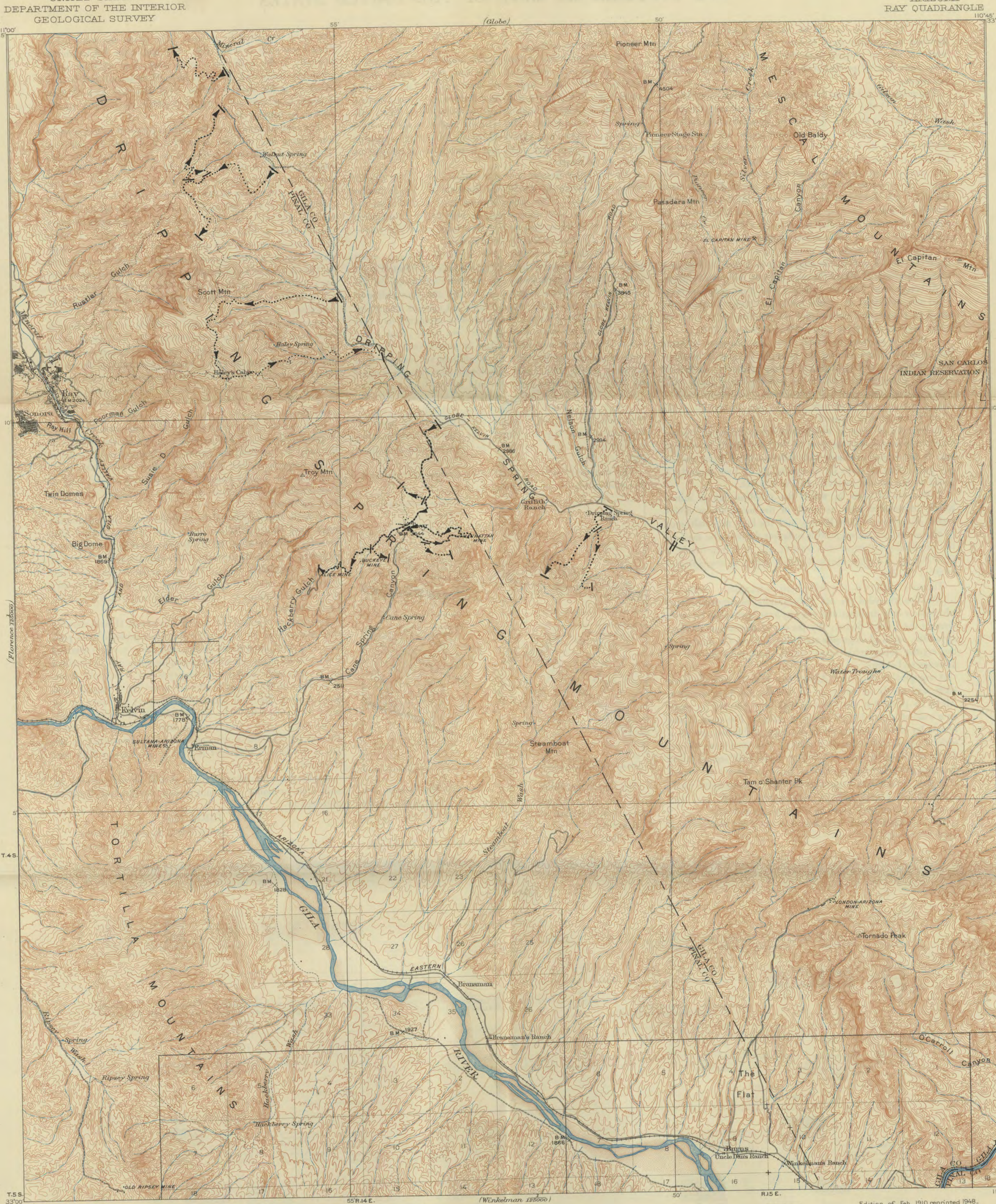
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 2, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

Inspiration File
Christmas Proj.

8

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ARIZONA
RAY QUADRANGLE



R.B.Marshall, Chief Geographer.
T.G.Gerdine, Geographer in charge.
Topography by Pearson Chapman, C.F.Eberly, and reduced from map of Ray and Vicinity.
Control by T.M.Bannon and Thos.Winsor.
Surveyed in 1907-1908.

TRUE NORTH
MAGNETIC NORTH
14½°
APPROXIMATE MEAN DECLINATION 1908.

Scale $\frac{1}{62500}$

1 ½ 0 1 2 3 4 Miles
1000 500 0 1000 2000 3000 4000 5000 6000 7000 Yards
1000 0 3000 6000 9000 12000 15000 18000 Feet
1 .5 0 1 2 3 4 5 Kilometers

Contour interval 50 feet
Datum is mean sea level

Chapman
Eberly

Edition of Feb. 1910, reprinted 1948.
Polyconic projection. To place on North American datum move projection lines 450 feet south and 400 feet west

Map of Ray and Vicinity, scale 1:12 000, contour interval 25 feet, from a later and more detailed survey of the area between latitudes 33°09′28″ and 33°11′32″ and between longitudes 110°58′32″ and 111°01′26″, is available.

RAY, ARIZ.
N3300-W11045/15

THE TOPOGRAPHIC MAPS OF THE UNITED STATES

The United States Geological Survey is making a series of standard topographic maps to cover the United States. This work has been in progress since 1882, and the published maps cover more than 47 percent of the country, exclusive of outlying possessions.

The maps are published on sheets that measure about 16½ by 20 inches. Under the general plan adopted the country is divided into quadrangles bounded by parallels of latitude and meridians of longitude. These quadrangles are mapped on different scales, the scale selected for each map being that which is best adapted to general use in the development of the country, and consequently, though the standard maps are of nearly uniform size, the areas that they represent are of different sizes. On the lower margin of each map are printed graphic scales showing distances in feet, meters, miles, and kilometers. In addition, the scale of the map is shown by a fraction expressing a fixed ratio between linear measurements on the map and corresponding distances on the ground. For example, the scale $\frac{1}{62,500}$ means that 1 unit on the map (such as 1 inch, 1 foot, or 1 meter) represents 62,500 of the same units on the earth's surface.

Although some areas are surveyed and some maps are compiled and published on special scales for special purposes, the standard topographic surveys and the resulting maps have for many years been of three types, differentiated as follows:

1. Surveys of areas in which there are problems of great public importance—relating, for example, to mineral development, irrigation, or reclamation of swamp areas—are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{31,680}$ (1 inch = one-half mile) or $\frac{1}{24,000}$ (1 inch = 2,000 feet), with a contour interval of 1 to 100 feet, according to the relief of the particular area mapped.

2. Surveys of areas in which there are problems of average public importance, such as most of the basin of the Mississippi and its tributaries, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile), with a contour interval of 10 to 100 feet.

3. Surveys of areas in which the problems are of minor public importance, such as much of the mountain or desert region of Arizona or New Mexico, and the high mountain area of the northwest, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{125,000}$ (1 inch = nearly 2 miles) or $\frac{1}{250,000}$ (1 inch = nearly 4 miles), with a contour interval of 20 to 250 feet.

The aerial camera is now being used in mapping. From the information recorded on the photographs, planimetric maps, which show only drainage and culture, have been made for some areas in the United States. By the use of stereoscopic plotting apparatus, aerial photographs are utilized also in the making of the regular topographic maps, which show relief as well as drainage and culture.

A topographic survey of Alaska has been in progress since 1898, and nearly 44 percent of its area has now been mapped. About 15 percent of the Territory has been covered by maps on a scale of $\frac{1}{500,000}$ (1 inch = nearly 8 miles). For most of the remainder of the area surveyed the maps published are on a scale of $\frac{1}{250,000}$ (1 inch = nearly 4 miles). For some areas of particular economic importance, covering about 4,300 square miles, the maps published are on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile) or larger. In addition to the area covered by topographic maps, about 11,300 square miles of southeastern Alaska has been covered by planimetric maps on scales of $\frac{1}{125,000}$ and $\frac{1}{250,000}$.

The Hawaiian Islands have been surveyed, and the resulting maps are published on a scale of $\frac{1}{62,500}$.

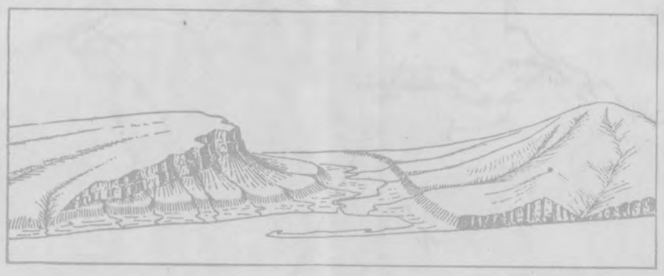
A survey of Puerto Rico is now in progress. The scale of the published maps is $\frac{1}{30,000}$.

The features shown on topographic maps may be arranged in three groups—(1) water, including seas, lakes, rivers, canals, swamps, and other bodies of water; (2) relief, including mountains, hills, valleys, and other features of the land surface; (3) culture (works of man), such as towns, cities, roads, railroads, and boundaries. The symbols used to represent these features are shown and explained below. Variations appear on some earlier maps, and additional features are represented on some special maps.

All the water features are represented in blue, the smaller streams and canals by single blue lines and the larger streams by double lines. The larger streams, lakes, and the sea are accentuated by blue water lining or blue tint. Intermittent streams—those whose beds are dry for a large part of the year—are shown by lines of blue dots and dashes.

Relief is shown by contour lines in brown, which on a few maps are supplemented by shading showing the effect of light thrown from the northwest across the area represented, for the purpose of giving the appearance of relief and thus aiding in the interpretation of the contour lines. A contour line represents an imaginary line on the ground (a contour) every part of which is at the same altitude above sea level. Such a line could be drawn at any altitude, but in practice only the contours at certain regular intervals of altitude are shown. The datum or zero of altitude of the Geological Survey maps is mean sea level. The 20-foot contour would be the shore line if the sea should rise 20 feet above mean sea level. Contour lines show the shape of the hills, mountains, and valleys, as well as their altitude. Successive contour lines that are far apart on the map indicate a gentle slope, lines that are close together indicate a steep slope, and lines that run together indicate a cliff.

The manner in which contour lines express altitude, form, and grade is shown in the figure below.



The sketch represents a river valley that lies between two hills. In the foreground is the sea, with a bay that is partly enclosed by a hooked sand bar. On each side of the valley is a terrace into which small streams have cut narrow gullies. The hill on the right has a rounded summit and gently sloping spurs separated by ravines. The spurs are truncated at their lower ends by a sea cliff. The hill at the left terminates abruptly at the valley in a steep scarp, from which it slopes gradually away and forms an inclined tableland that is traversed by a few shallow gullies. On the map each of these features is represented, directly beneath its position in the sketch, by contour lines.

The contour interval, or the vertical distance in feet between one contour and the next, is stated at the bottom of each map. This interval differs according to the topography of the area mapped: in a flat country it may be as small as 1 foot; in a mountainous region it may be as great as 250 feet. In order that the contours may be read more easily certain contour lines, every fourth or fifth, are made heavier than the others and are accompanied by figures showing altitude. The heights of many points—such as road intersections, summits, surfaces of lakes, and benchmarks—are also given on the map in figures, which show altitudes to the nearest foot only. More precise figures for the altitudes of benchmarks are given in the Geological Survey's bulletins on spirit leveling. The geodetic coordinates of triangulation and transit-traverse stations are also published in bulletins.

Lettering and the works of man are shown in black. Boundaries, such as those of a State, county, city, land grant, township, or reservation, are shown by continuous or broken lines of different kinds and weights. Public roads suitable for motor travel the greater part of the year are shown by solid double lines; poor public roads and private roads by dashed double lines; trails by dashed single lines. Additional public road classification if available is shown by red overprint.

Each quadrangle is designated by the name of a city, town, or prominent natural feature within it, and on the margins of the map are printed the names of adjoining quadrangles of which maps have been published. More than 4,100 quadrangles in the United States have been surveyed, and maps of them similar to the one on the other side of this sheet have been published.

Geologic maps of some of the areas shown on the topographic maps have been published in the form of folios. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped, and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. Two hundred twenty-five folios have been published.

Index maps of each State and of Alaska and Hawaii showing the areas covered by topographic maps and geologic folios published by the United States Geological Survey may be obtained free. Copies of the standard topographic maps may be obtained for 10 cents each; some special maps are sold at different prices. A discount of 40 percent is allowed on an order amounting to $5 or more at the retail price. The discount is allowed on an order for maps alone, either of one kind or in any assortment, or for maps together with geologic folios. The geologic folios are sold for 25 cents or more each, the price depending on the size of the folio. A circular describing the folios will be sent on request.

Applications for maps or folios should be accompanied by cash, draft, or money order (not postage stamps) and should be addressed to

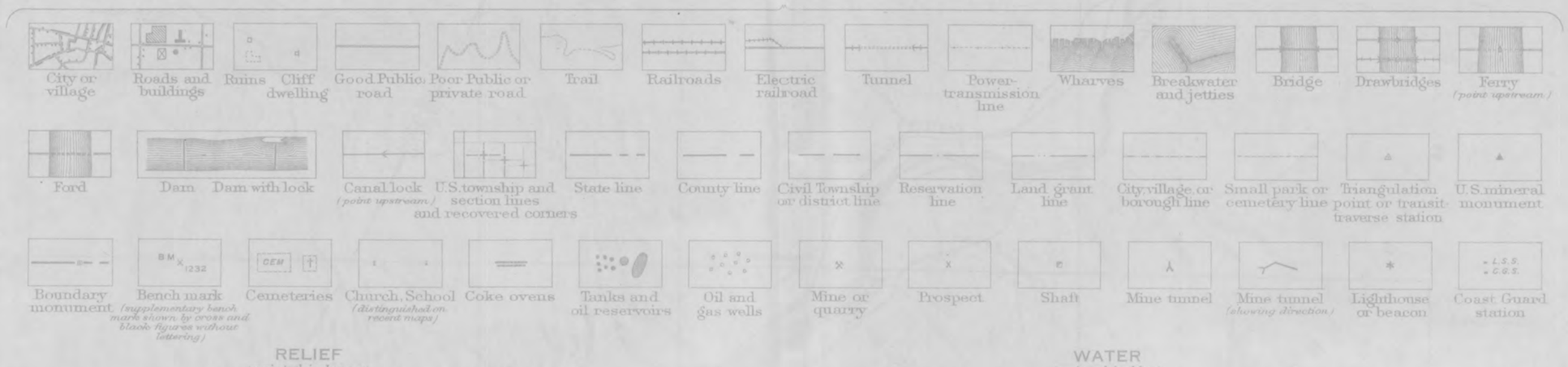
THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

November 1937.

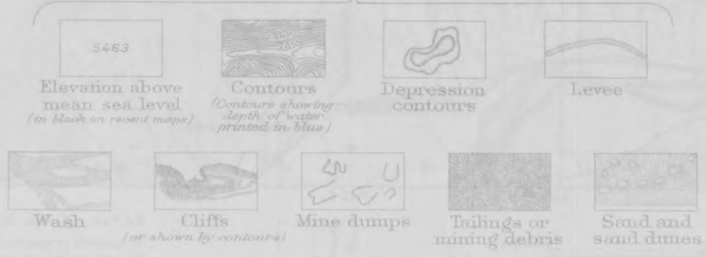
STANDARD SYMBOLS

NOTE:—Effective on and after October 1, 1946, the price of standard topographic quadrangle maps will be 20 cents each, with a discount of 20 percent on orders amounting to $10 or more at the retail rate.

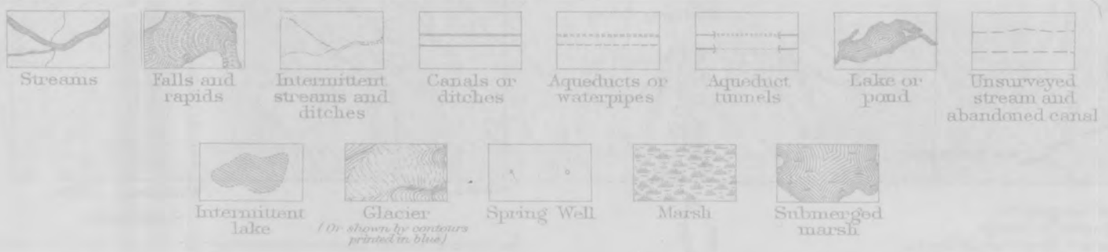
CULTURE
(printed in black)



RELIEF
(printed in brown)



WATER
(printed in blue)



WOODS
(when shown, printed in green)