HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 - Keluit
LINE 50W HALF N SP. 1 DATE 5/4/70

SEND	5-6	4-5	3-4	2-3	1-2				CAL	
RECEIVE	45-55N	→	→	→	→				6-7	
RANGE	10	1.0	1.0	1.0	1.0				10	
DC 1	1.5	1.5	1.6	1.6	2.4				-0.2	
DC 2 I	2	3	4	3	3				2000	
DC 3 K_n	3	12	30	60	105					
DC 4										
DC 5 ρ	347	366	560	278	399				(0.976)	
DC 6 PFE	1.7	1.7	1.8	1.8	2.6				(-0.2)	
DC 7 MCF	5	5	3	6	7					
DC 8										
DC AVG.										
AC 1	233	92.3	75.2	14.0	11.4				205	
AC 2	0.0	0.0	0.0	0.0	0.0				0.0	
AC AVG.										
S.P.	+17.1	→	→	→	→					
AC NOISE										
POT RES.	0.2K	→	→	→	→					

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516
LINE 50W HALF N SP. 1 DATE 4/5/70

SEND	6-7	5-6	4-5	3-4	2-3	1-2				
RECEIVE	55-65m	→								
RANGE	10	1.0	1.0	1.0	0.1	0.1				
DC 1	0.8	1.3	1.4	1.5	1.3	2.1				
DC 2 I	3	2	3	4	3	3				
DC 3 K	3	12	30	60	105	168				
DC 4										
DC 5 ρ	236	305	407	600	295	410				
DC 6 PFE	1.0	1.5	1.6	1.7	1.5	2.3				
DC 7 MCF	4	5	4	3	5	6				
DC 8										
DC AVG.										
AC 1	240	51.4	41.1	40.3	8.52	7.34				
AC 2	0.0	0.0	0.0	0.0	-0.1	0.0				
AC AVG.										
S.P.	-5.0									
AC NOISE										
POT RES.	1K									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 Kelvin
LINE 50W HALF N SP. 1 DATE 5/9/70

SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	
RECEIVE	65-75N					75-85N				
RANGE	1.0	0.1	0.1	0.1	0.1	1.0	0.1	0.1	0.1	
DC 1	0.5	0.8	0.9	1.1	0.8	0.6	0.9	1.1	1.1	
DC 2 I	3	2	3	4	3	3	2	3	4	
DC 3 Ka	12	30	60	105	168	30	60	105	168	
DC 4										
DC 5 C	109	123	174	246	126	148	170	260	360	
DC 6 PFE	0.8	1.0	1.1	1.3	1.0	0.8	1.1	1.3	1.3	
DC 7 MCP	7	8	6	5	8	5	6	5	4	
DC 8										
DC AVG.										
AC 1	27.6	8.33	8.82	9.47	2.29	15.0	5.74	7.54	8.68	
AC 2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
AC AVG.										
S.P.	+5.5					+0.4				
AC NOISE										
POT RES.	1K					1K				

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 50W HALF No SP. 1 DATE 5-4

SEND	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	
RECEIVE	15-25N	→	25N	↔	35N	35N	←	→	45N	
RANGE	10X300	10X300	10X400	10X300	10X300	10X300	10X400	10X300	10X300	
VOLTAGE	310	380	350	310	380	400	350	310	380	
CURRENT	3.0	3.0	4.0	3.0	3.0	3.0	4.0	3.0	3.0	
SEND	5-6	4-5	3-4	2-3	1-2		Cal 67			
RECEIVE	45N	←		→	55N		45N			
RANGE	10X200	10X300	10X400	10X300	10X300		10X200			
VOLTAGE	310	400	350	310	380		260			
CURRENT	2.0	3.0	4.0	3.0	3.0		2.0			

FREQUENCIES 3.0 0.3

SENDER NO. 18701-5

OPERATOR 23 Coons

RECEIVER NO. 2069 -R

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 50W HALF No SP. 1 DATE 5-4

PAGE 2

SEND	6-7	5-6	4-5	3-4	2-3	1-2				
RECEIVE	55N	←			→	65N				
RANGE	10X300	10X200	10X300	10X400	10X300	10X300				
VOLTAGE	310	310	400	350	310	380				
CURRENT	3.0	2.0	3.0	4.0	3.0	3.0				
SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	
RECEIVE	65N	←		→ 75N	75N	75N	←	→	85N	
RANGE	10X300	10X200	10X300	10X400	10X300	10X300	10X200	10X300	10X400	
VOLTAGE	310	310	400	350	310	310	310	400	350	
CURRENT	3.0	2.0	3.0	4.0	3.0	3.0	2.0	3.0	4.0	

FREQUENCIES 3.0 0.3

SENDER NO. 1870/-5

OPERATOR #23 Coon

RECEIVER NO. 2069 R

OPERATOR Freeman

COMMENTS:

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 - Kelvin
LINE 50W HALF S SP. 1 DATE 5/4/90

SEND	5-6	6-7	4-5	5-6	6-7	3-4	4-5	5-6	6-7	[redacted]
RECEIVE	5-15N	→	5N-5S	→	→	5-15S	→	→	→	[redacted]
RANGE	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
DC 1	1.5	1.5	1.0	1.6	1.4	1.2	1.6	2.2	2.1	
DC 2 I	2	3	3	2	3	4	3	2	3	
DC 3 K_n	3	12	3	12	30	3	12	30	60	
DC 4										
DC 5 ρ	216	379	133	118	182	159	233	202	276	
DC 6 PE	1.8	1.8	1.3	1.9	1.7	1.5	1.9	2.5	2.4	
DC 7 MCP	8	5	10	16	9	9	8	12	9	
DC 8										
DC AVG.										
AC 1	146	95.8	135	19.8	18.4	215	59.0	13.5	13.9	
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
AC AVG.										
S.P.	+9.6		+3.6			+5.4	→	→	→	
AC NOISE										
POT RES.	3K		2K	→	→	2K	→	→	→	

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 - Kelvin
LINE 0N HALF S SP. 1 DATE 5-4-20

SEND	2-3	3-4	4-5	5-6	6-7					CAL
RECEIVE	15-255									1-2
RANGE	10	1.0	1.0	0.1	0.1					10
DC 1	2.0	2.0	2.1	2.4	2.0					-0.3
DC 2 I	3	4	3	2	3					2000
DC 3 K_n	3	12	30	60	105					
DC 4										
DC 5 ρ	100	239	302	232	295					(0.971)
DC 6 PFE	2.3	2.3	2.4	2.7	2.3					(-0.3)
DC 7 MCF	23	10	8	12	8					
DC 8										
DC AVG.										
AC 1	101	80.3	30.4	7.74	8.49					206
AC 2	0.0	0.0	0.0	0.0	0.0					0.0
AC AVG.										
S.P.	+4.5									
AC NOISE										
POT RES.	0.3K									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 - Kelvin
LINE 50W HALF S SP. 1 DATE 5/4/20

SEND	1-2	2-3	3-4	4-5	5-6	6-7				
RECEIVE	25-35	→								
RANGE	10	1.0	1.0	1.0	0.1	0.1				
DC 1	2.2	1.9	1.6	1.8	2.3	2.0				
DC 2 I	3	3	4	3	2	3				
DC 3 K_n	3	12	30	60	105	168				
DC 4										
DC 5 ρ	127	128	283	313	229	273				
DC 6 PFE	2.5	2.2	1.9	2.1	2.6	2.3				
DC 7 MCE	20	17	7	7	11	8				
DC 8										
DC AVG.										
AC 1	128	32.3	38.2	15.8	4.37	4.91				
AC 2	0.0	0.0	0.0	0.0	+0.1	0.0				
AC AVG.										
S.P.	+7.6									
AC NOISE										
POT RES.	0.3K									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516- Kelvin
LINE 50W HALF S SP. 1 DATE 5-4-20

SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	
RECEIVE	35-45s	→	→	→	→	45-55s	→	→	→	
RANGE	1.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0	0.1	
DC 1	1.6	1.3	1.1	1.5	1.9	1.7	1.3	1.1	1.5	
DC 2 t	3	3	4	3	2	3	3	4	3	
DC 3 Kn	12	30	60	105	168	30	60	105	168	
DC 4										
DC 5 ρ	162	148	298	301	209	213	178	362	349	
DC 6 PFE	1.9	1.6	1.4	1.8	2.2	2.0	1.6	1.4	1.8	
DC 7 MCF	12	11	5	6	11	9	9	4	5	
DC 8										
DC AVG.										
AC 1	41.0	15.0	20.2	8.70	2.51	21.5	9.01	14.0	6.30	
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
AC AVG.										
S.P.	+8.7					-5.4				
AC NOISE										
POT RES.	3K					0.5K				

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 - Keluin
LINE 50W HALF S SP. 1 DATE 5-4-2

SEND	1-2	2-3	3-4							
RECEIVE	55-65S	→	→							
RANGE	0.1	0.1	0.1							
DC 1	1.9	1.4	1.6							
DC 2 I	3	3	4							
DC 3 Km	60	105	168							
DC 4										
DC 5 ρ	161	135	255							
DC 6 ρa	2.2	1.7	1.9							
DC 7 MF	14	13	7							
DC 8										
DC AVG.										
AC 1	3.10	3.92	6.14							
AC 2	0.0	0.0	0.0							
AC AVG.										
S.P.	+0.8									
AC NOISE										
POT RES.	1K									

PAGE 1

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 50W HALF So. SP. 1 DATE 5-4

SEND	5-6	6-7	4-5	5-6	6-7	3-4	4-5	5-6	6-7	
RECEIVE	15 N	-5 N	5 N		5 S	5 S			15 S	
RANGE	10X200	10X300	10X300	10X200	10X300	10X400	10X300	10X200	10X300	
VOLTAGE	310	310	400	310	310	350	400	310	310	
CURRENT	2.0	3.0	3.0	2.0	3.0	4.0	3.0	2.0	3.0	
SEND	2-3	3-4	4-5	5-6	6-7		Cal. 1-2			
RECEIVE	15 S				15 S		15 S			
RANGE	10X300	10X400	10X300	10X200	10X300		10X200			
VOLTAGE	310	350	400	310	310		350			
CURRENT	3.0	4.0	3.0	2.0	3.0		2.0			

FREQUENCIES 3.0 0.3

SENDER NO. 18701 - S

OPERATOR #23 Coons

RECEIVER NO.

OPERATOR Freeman

COMMENTS:

PAGE 2

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 50w HALF So SP. 1 DATE 5-4

SEND	1-2	2-3	3-4	4-5	5-6	6-7				
RECEIVE	25s	—	—	—	—	35s				
RANGE	10X300	10X300	10X400	10X300	10X200	10X300				
VOLTAGE	380	310	350	400	310	310				
CURRENT	3.0	3.0	4.0	3.0	2.0	3.0				
SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	
RECEIVE	35s	—	—	—	45s	45s	—	—	55s	
RANGE	10X300	10X300	10X400	10X300	10X200	10X300	10X300	10X400	10X300	
VOLTAGE	380	310	350	400	310	380	310	350	400	
CURRENT	3.0	3.0	4.0	3.0	2.0	3.0	3.0	4.0	3.0.	

FREQUENCIES 3.0 0.3

SENDER NO. 18701-S

OPERATOR 23 Cons

RECEIVER NO.

OPERATOR Freeman

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 5DW HALF So SP. 1 DATE 5-4

SEND	1-2	2-3	3-4	~~4-5~~						
RECEIVE	55s		65s							
RANGE	10X300	10X300	10X400							
VOLTAGE	380	310	350							
CURRENT	3.0	3.0	4.0							
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 3.0 0.3

SENDER NO. 18701-S

OPERATOR 23 Coons

RECEIVER NO.

OPERATOR Freeman

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 10E HALF N SP. 1 DATE 3-27

PAGE 1

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
RECEIVE	10-20	N →	→	20-30	N →	→	→			
RANGE	10	1.0	1.0	1.0	1.0	1.0	0.1			
DC 1	3.2	4.1	3.9	4.0	3.9	4.5	4.0			
DC 2 I	4	4	3	4	→	→	3			
DC 3 n	1	2	3	1	2	3	4			
DC 4 K_n	3	12	30	3	12	30	60			
DC 5										
DC 6 ρ	104	106	109	64	81	87	88			
DC 7 PFE	2.9	3.8	3.6	3.7	3.6	4.2	3.7			
DC 8 MCA	28	36	33	58	44	48	42			
DC AVG.										
AC 1	137	34.6	10.7	83.5	26.5	11.3	4.32			
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
AC AVG.										
S.P.										
AC NOISE										
POT RES.	1.4K →	→	→	7.0K →	→	→	→			

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 10E HALF N SP. 1 DATE 3-27

SEND	5-6	4-5	3-4	2-3	1-2		6-7			
RECEIVE	30-40 N →						cal			
RANGE	10	1.0	1.0	0.1	0.1		10			
DC 1	2.1	3.3	3.7	4.0	3.6		0.4			
DC 2 I	4 →				3		2000			
DC 3 "	1	2	3	4	5					
DC 4 K"	3	12	30	60	105					
DC 5										
DC 6 ρ	95	88	107	111	110		(0.985)			
DC 7 PFE	1.8	3.0	3.4	3.7	3.3		(0.3)			
DC 8 MCF	19	34	32	33	30					
DC AVG.										
AC 1	126	28.8	14.0	7.27	3.10		203			
AC 2	0.0	0.0	0.0	0.0	0.0		0.2			
AC AVG.										
S.P.										
AC NOISE										
POT RES.	3K →									

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 10E HALF N SP. 1 DATE 3-27

SEND	6-7	5-6	4-5	3-4	2-3	1-2				
RECEIVE	40-50 N →									
RANGE	1.0	1.0	1.0	0.1	0.1	0.1				
DC 1	1.2	2.2	3.5	3.8	4.2	4.0				
DC 2 I	4	→				3				
DC 3 n	1	2	3	4	5	6				
DC 4 K_m	3	12	30	60	105	165				
DC 5										
DC 6 ρ	121	129	124	143	147	141				
DC 7 PFE	0.9	1.9	3.2	3.5	3.9	3.7				
DC 8 MCF	7	15	26	24	27	26				
DC AVG.										
AC 1	162	42.8	16.2	9.37	5.47	2.47				
AC 2	0.0	0.0	-0.1	0.0	0.0	0.0				
AC AVG.										
S.P.										
AC NOISE										
POT RES.	3.5K →									

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 10E HALF N SP. 1 DATE 3-27

SEND	6-7	5-6	4-5	3-4	2-3					
RECEIVE	50-60	N →								
RANGE	1.0	1.0	0.1	0.1	0.1					
DC 1	1.6	2.5	3.9	4.5	4.8					
DC 2 I	4	→								
DC 3 n	2	3	4	5	6					
DC 4 K_n	12	30	60	105	168					
DC 5										
DC 6 ρ	108	122	115	129	129					
DC 7 MFE	1.3	2.2	3.6	4.2	4.5					
DC 8 MF	12	18	31	33	35					
DC AVG.										
AC 1	36.2	16.2	7.50	4.77	2.99					
AC 2	0.0	0.0	0.0	0.0	0.0					
AC AVG.										
S.P.										
AC NOISE										
POT RES.	3K →									

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 10E HALF N SP. 1 DATE 3-27

SEND	6-7	5-6	4-5	3-4						
RECEIVE	60-70	N →								
RANGE										
DC 1										
DC 2										
DC 3										
DC 4										
DC 5										
DC 6	River									
DC 7										
DC 8										
DC AVG.										
AC 1										
AC 2										
AC AVG.										
S.P.										
AC NOISE										
POT RES.										

PAGE 1

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT Kelvin 516

LINE 10E HALF N SP. 1 DATE 3-27

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
RECEIVE	10-20	N →		20-30	N →					
RANGE	10×400	10×400	10×400	10×400	10×400	10×400				
VOLTAGE	225	325	340	210	225	325	340			
CURRENT	4A	4A	3A	4A	4A	4A	3A			
SEND	5-6	4-5	3-4	2-3	1-2			6-7		
RECEIVE	30-40	N →						CAL		
RANGE	10×400	10·400	10·400	10·400	10·300			10·200		
VOLTAGE	210	210	225	325	340			175		
CURRENT	4A	4A	4A	4A	3A			2A		

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT _____

LINE 10E HALF N SP. 1 DATE 3-27

PAGE 2

SEND	6-7	5-6	4-5	3-4	2-3	1-2				
RECEIVE	40-50 N →									
RANGE	10·400	10·400	10·400	10·400	10·400	10·300				
VOLTAGE	270	210	210	225	325	340				
CURRENT	4A	4A	4A	4A	4A	3A				
SEND	6-7	5-6	4-5	3-4	2-3					
RECEIVE	50-60 N →									
RANGE	10×400	10×400	10×400	10×400	10×400					
VOLTAGE	270	210	210	230	330					
CURRENT	4A	4A	4A	4A	4A					

FREQUENCIES _____ _____

SENDER NO. 1

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT _____

LINE 10E HALF N SP. 1 DATE 3-27

SEND	6-7	5-6	4-5	3-4						
RECEIVE	60-70N									
RANGE										
VOLTAGE										
CURRENT										
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PAGE 1

PROJECT Kelvin 516

LINE 10E HALF S SP. 1 DATE 3-27

SEND	4-5	5-6	6-7	3-4	4-5	5-6	6-7			
RECEIVE	10-20 S →			20-30 S →						
RANGE	10	1.0	1.0	10	1.0	1.0	0.1		Use N½	
DC 1	2.7	4.1	4.5	2.0	2.7	3.8	4.5		Calc	
DC 2 I	4	→								
DC 3 n	1	2	3	1	2	3	4			
DC 4 K_n	3	12	30	3	12	30	60			
DC 5										
DC 6 f	132	106	88	144	136	110	91		(0.985)	
DC 7 PFE	2.4	3.8	4.2	1.7	2.4	3.5	4.2		(0.3)	
DC 8 MCE	18	36	48	12	18	32	46			
DC AVG.										
AC 1	175	34.4	11.4	191	44.9	14.4	5.89			
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
AC AVG.										
S.P.										
AC NOISE										
POT RES.	2K →			12K →						

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT 516 Kelvin

LINE 10E HALF S SP. 1 DATE 3-27

SEND	2-3	3-4	4-5	5-6	6-7					
RECEIVE	30-40	5 →								
RANGE	10	1.0	1.0	0.1	0.1					
DC 1	1.4	2.1	2.7	3.9	4.2					
DC 2 I	4	→								
DC 3 n	1	2	3	4	5					
DC 4 K_n	3	12	30	60	105					
DC 5										
DC 6 e	123	159	182	146	122					
DC 7 PFE	1.1	1.8	2.4	3.6	3.9					
DC 8 MCA	9	11	13	25	32					
DC AVG.										
AC 1	165	53.0	24.0	9.54	4.54					
AC 2	0.0	0.0	0.0	0.0	0.0					
AC AVG.										
S.P.										
AC NOISE										
POT RES.	4K →									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Kelvin 516
LINE 10E HALF S SP. 1 DATE 3-27

PAGE 3

SEND	1-2	2-3	3-4	4-5	5-6	6-7				
RECEIVE	40-50S →									
RANGE	10	1.0	1.0	1.0	0.1	0.1				
DC 1	1.3	1.8	2.4	3.1	4.4	4.5				
DC 2 I	3	4	→							
DC 3 n	1	2	3	4	5	6				
DC 4 K_n	3	12	30	60	105	168				
DC 5										
DC 6 ρ	108	199	260	281	219	185				
DC 7 PFE	1.0	1.5	2.1	2.8	4.1	4.2				
DC 8 MCF	9	8	8	10	19	23				
DC AVG.										
AC 1	109	66.4	34.5	18.5	8.12	4.28				
AC 2	0.0	0.0	0.0	0.0	0.0	0.0				
AC AVG.										
S.P.										
AC NOISE										
POT RES.	5K →									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Kelvin 5.6
LINE 10E HALF S SP. 1 DATE 3-27

PAGE 4

SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	
RECEIVE	50-60 S	→	→	→	→	60-70 S	→	→	→	
RANGE			1.0	0.1	0.1	1.0	1.0	0.1	0.1	
DC 1	1.6	1.9	2.7	3.2	4.8	1.7	2.3	2.9	3.7	
DC 2 I	3	4	→	→	→	3	4	→	→	
DC 3 n	2	3	4	5	6	3	4	5	6	
DC 4 K_n	12	30	60	105	168	30	60	105	168	
DC 5										
DC 6 ρ	100	157	188	196	154	123	182	236	225	
DC 7 PFE	1.3	1.6	2.4	2.9	4.5	1.4	2.0	2.6	3.4	
DC 8 MCE	13	10	13	15	29	11	11	11	15	
DC AVG.										
AC 1	25.0	20.9	12.4	7.36	3.55	12.3	12.1	8.90	5.25	
AC 2			0.0	0.0	0.0					
AC AVG.										
S.P.										
AC NOISE										
POT RES.										

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Ketvin 516

LINE 10E HALF S SP. 1 DATE 3-27

PAGE 5

SEND	1-2	2-3	3-4				1-2	2-3	3-4	
RECEIVE	70-80 S →									
RANGE	0.1	0.1	0.1							
DC 1	1.8	2.6	3.5				X 1.8	2.6	3.5	
DC 2 I	3	4	4							
DC 3 n	4	5	6							
DC 4 K_n	60	105	165							
DC 5										
DC 6 C	86	122	142							
DC 7 PFE	1.5	2.3	3.2							
DC 8 MCH	18	19	23							
DC AVG.										
AC 1	4.28	4.60	3.32				4.28	4.60	3.32	
AC 2										
AC AVG.										
S.P.										
AC NOISE										
POT RES.										

PAGE 1

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT _____

LINE 10E HALF 5 SP. 1 DATE _____

SEND	~~3-4~~	~~2-3~~	~~5-6~~	~~6-7~~	4-5	5-6	6-7			
RECEIVE	~~0-10N →~~		~~0-10S →~~		10S —	20S →				
RANGE					10x400	10x400	10x400			
VOLTAGE					205	210	270			
CURRENT					4A	4A	4A			
SEND	3-4	4-5	5-6	6-7	2-3	3-4	4-5	5-6	6-7	
RECEIVE	20S —	30S —	→		30-40S →					
RANGE	10x400	10x400	10x400	10x400	10x400	10x400	10x400	10x400	10x400	
VOLTAGE	230	205	210	270	330	230	210	210	270	
CURRENT	4A	4A	4A	4A	4A	4A	4A	4A	4A	

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

PAGE 2

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT _____

LINE 10E HALF S SP. 1 DATE _____

SEND	1-2	2-3	3-4	4-5	5-6	6-7				
RECEIVE	40-50 S →									
RANGE	10 x 300	10 x 400	10 x 400	10 x 400	10 x 400	10 x 400				
VOLTAGE	335	330	230	210	210	270				
CURRENT	3A	4A	4A	4A	4A	4A				
SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	
RECEIVE	50-60 S →					60-70 S →				
RANGE	10 x 300	10 x 400	10 x 400	10 x 400	10 x 400					
VOLTAGE	340	330	230	210	210					
CURRENT	3A	4A	4A	4A	4A	3	4	4	4	

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT _____

LINE 10E HALF N SP. 1 DATE _____

SEND	1-2	2-3	3-4							
RECEIVE	70-80 S →									
RANGE										
VOLTAGE										
CURRENT	3	4	4							
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PAGE 1

PROJECT 516 Kelvin

LINE 40E HALF N SP. 1 DATE 4-14

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2		4-5	
RECEIVE	10-20	N →		20-30	N →				cal	
RANGE	10	1.0	1.0	10	1.0	1.0	0.1		10	
DC 1	3.1	3.2	4.2	1.8	2.6	3.1	3.5		1.1	
DC 2 I	4 →								2000	
DC 3 K_n	3	12	30	3	12	30	60			
DC 4		← 1st cals		later cals →						
DC 5 ρ	104	124	143	111	76	94	108		(1.000)	first 3 reads
DC 6 PFE	2.1	2.2	3.1	1.4	2.2	2.7	3.1		(1.1)	" " "
DC 7 MCF	20	18	22	13	29	29	29			
DC 8										
DC AVG.										
AC 1	136	40.5	18.5	14.7	25.2	12.3	7.04		200	
AC 2	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0		0.0	
AC AVG.										
S.P.	10.7 →			24.2 →						
AC NOISE										
POT RES.	2.2K →			9.6K →						

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 Kelvin
LINE 40E HALF N SP. 1 DATE 4-14

SEND	5-6	4-5	3-4	2-3	1-2					
RECEIVE	30-40N →									
RANGE	10	1.0	1.0	0.1	0.1				10	
DC 1	2.0	2.4	3.2	3.3	4.1				0.4	
DC 2 I	4 →								2000	
DC 3 K_e	3	12	30	60	105					
DC 4				Fence, metal grounded						
DC 5 ρ	167	167	98	134	163				(0.990)	
DC 6 PFE	1.6	2.0	2.8	3.0	at 3.7 @ 500N				(0.4)	
DC 7 MCP	10	12	29	22	23					
DC 8										
DC AVG.										
AC 1	222	55.0	12.8	8.76	6.06				202	
AC 2	0.0	0.0	0.0	-0.3	0.0				0.0	
AC AVG.										
S.P.	6.0 →									
AC NOISE										
POT RES.	3.3K →									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 Kelvin
LINE 40E HALF N SP. 1 DATE 4-14

SEND	6-7	5-6	4-5	3-4	2-3	1-2		67		
RECEIVE	40-50N →							cal		
RANGE	10	1.0	1.0	0.1	0.1	0.1		10		
DC 1	2.1	2.2	2.5	3.4	4.0	4.3		0.4		
DC 2 I	3	4	→					2000		
DC 3 K_n	3	12	30	60	105	168				
DC 4										
DC 5 P	111	126	115	69	95	117		(0.990)		
DC 6 PFE	1.7	1.8	2.1	3.0	3.6	3.9		(0.35)		
DC 7 MIP	15	14	18	44	38	33				
DC 8										
DC AVG.										
AC 1	110	41.8	15.2	4.49	3.53	2.71		202		
AC 2	0.0	0.0	0.0	0.0	0.0	0.0		0.1		
AC AVG.										
S.P.	18.5 →									
AC NOISE										
POT RES.	5.9K →									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 Kelvin
LINE 40E HALF N SP. 1 DATE 4-14

SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	
RECEIVE	50-60N				→	60-70 N			→	
RANGE	1.0	1.0	0.1	0.1	0.1	1.0	0.1	0.1	0.1	
DC 1	2.4	2.4	2.8	3.7	4.2	2.2	2.2	2.8	2.8	
DC 2 I	3	4			→	3	4		→	
DC 3 K_n	12	30	60	105	168	30	60	105	168	
DC 4										
DC 5 ρ	147	151	134	88	116	137	146	133	92	
DC 6 PFR	2.0	2.0	2.4	3.3	3.8	1.8	1.8	2.4	2.4	
DC 7 MCF	14	13	18	37	33	13	12	18	26	
DC 8										
DC AVG.										
AC 1	36.3	20.0	8.78	3.28	2.68	13.6	9.68	4.98	2.17	
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
AC AVG.										
S.P.	-5.0	→			→	7.5	→		→	
AC NOISE										
POT RES.	8.3K	→			→	1.8K	→		→	

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 Kelvin
LINE 40E HALF N SP. 1 DATE 4-14

PAGE 5

SEND	6-7	5-6	4-5							
RECEIVE	70-80N →									
RANGE	0.1	0.1	0.1							
DC 1	2.4	2.5	3.5							
DC 2 I	3	4	4							
DC 3 K_n	60	105	168							
DC 4										
DC 5 ρ	104	115	107							
DC 6 PFE	2.0	2.1	3.1							
DC 7 MCA	19	18	29							
DC 8										
DC AVG.										
AC 1	5.15	4.35	2.50							
AC 2	0.0	0.0	0.0							
AC AVG.										
S.P.	20.0 →									
AC NOISE										
POT RES.	1.5K →									

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 KELVIN

LINE 40E HALF N SP. 1 DATE 4-14

PAGE 1

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
RECEIVE	10-20N →			20-30N →						
RANGE	10·400	10·400	10·400	10·400	10·400	10·400	10·400			
VOLTAGE	270	290	340	260	270	290	340			
CURRENT	4A	4A	4A	4A	4A	4A	4A			
SEND	5-6	4-5	3-4	2-3	1-2			4-5	6-7	
RECEIVE	30-40N →							CAL	CAL	
RANGE	10·400	10·400	10·400	10·400	10·400			10·200	10·200	
VOLTAGE	320	260	270	290	340			140	340	
CURRENT	4A	4A	4A	4A	4A			2A	2A	

FREQUENCIES 3.0 0.3

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 KELVIN

LINE 40E HALF N SP. 1 DATE 4-14

SEND	6-7	5-6	4-5	3-4	2-3	1-2		6-7	5-6	4-5
RECEIVE	40-50N							70-80N		
RANGE	10.300	10.400	10.400	10.400	10.400	10.400		10.300	10.400	10.400
VOLTAGE	350	310	260	260	290	330		350	310	260
CURRENT	3A	4A	4A	4A	4A	4A		3A	4A	4A
SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	↑
RECEIVE	50-60N					60-70N				
RANGE	10.300	10.400	10.400	10.400	10.400	10.300	10.400	10.400	10.400	
VOLTAGE	350	320	260	260	290	350	310	260	270	
CURRENT	3A	4A	4A	4A	4A	3A	4A	4A	4A	

FREQUENCIES 3.0 0.3

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PAGE 1

PROJECT 516 Kelvin

LINE 40E HALF S SP. 1 DATE 4-14

SEND	SP only	SP only	4-5	5-6	6-7	3-4	4-5	5-6	6-7	
RECEIVE	10N-ONS	ONS-10S	10-20S	→	→	20-30S	→	→	→	
RANGE			10	1.0	0.1	10	1.0	1.0	0.1	
DC 1			2.9	2.8	3.2	2.5	3.3	3.3	3.7	
DC 2 I			4	4	3	4	4	4	3	
DC 3 K_h	all	G.F. 900S	3	12	30	3	12	30	60	
DC 4										
DC 5 ρ			157	123	99	129	184	141	112	
DC 6 PFE			2.5	2.4	2.8	2.1	2.9	2.9	3.3	
DC 7 MCF			16	19	28	16	16	21	29	
DC 8										
DC AVG.										
AC 1			206	40.5	9.73	170	60.2	18.4	5.49	
AC 2			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
AC AVG.										
S.P.	0.0	6.6	18.2	→	→	14.1	→	→	→	
AC NOISE										
POT RES.	3.2K	4.2K	6.5K	→	→	1.6K	→	→	→	

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT 516 Kelvin

LINE 40E HALF S SP. 1 DATE 4-14

PAGE 2

SEND	2-3	3-4	4-5	5-6	6-7		1-2			
RECEIVE	30-40S →						cal			
RANGE	10	1.0	1.0	0.1	0.1		10			
DC 1	2.4	3.7	4.1	4.0	4.3		0.4			
DC 2 I	4	→			3		2000			
DC 3 K_n	3	12	30.	60	105					
DC 4										
DC 5 ρ	168	133	166	130	108		(0.990)			
DC 6 PFE	2.0	3.3	3.7	3.6	3.9		(0.35)	(use 0.4)		
DC 7 M(F)	12	25	22	28	36					
DC 8										
DC AVG.										
AC 1	222	43.3	21.6	8.44	3.01		202			
AC 2	0.0	0.0	0.0	0.0	0.0		0.1			
AC AVG.										
S.P.	18.1 →									
AC NOISE										
POT RES.	3.2K →									

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT 516 Kelvin

LINE 40E HALF S SP. 1 DATE 4-14

PAGE 3

SEND	1-2	2-3	3-4	4-5	5-6	6-7				
RECEIVE	40-50S	→	→	→	→	→				
RANGE	10	1.0	1.0	0.1	0.1	0.1				
DC 1	2.3	2.4	2.4	3.8	4.1	4.2				
DC 2 I	4	→	→	→	→	3				
DC 3 K_n	3	12	30	60	105	168				
DC 4										
DC 5 ρ	154	167	111	140	112	98				
DC 6 PFE	1.9	2.0	2.0	3.4	3.7	3.9				
DC 7 MEF	12	12	18	24	33	40				
DC 8										
DC AVG.										
AC 1	203	55.1	14.6	9.11	4.15	1.70				
AC 2	0.0	0.0	0.0	0.0	0.0	-0.2				
AC AVG.										
S.P.	9.7	→	→	→	→	→				
AC NOISE										
POT RES.	8.4K	→	→	→	→	→				

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 Kelvin
LINE 40E HALF S SP. 1 DATE 4-14

SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	
RECEIVE	50-60 S →					60-70 S →				
RANGE	1.0	1.0	0.1			1.0	1.0	0.1	0.1	
DC 1	2.2	2.1				2.2	2.3	3.7	4.6	
DC 2 I	4 →									
DC 3 K	12	30	60	105	168	30	60	105	168	
DC 4		Power line at 5400 S								
DC 5 ρ	142	134	2.16			171	159	102	133	
DC 6 PFE	1.8	1.7	→			1.8	1.9	3.3	4.2	
DC 7 MCF	13	13				11	12	32	31	
DC 8										
DC AVG.										
AC 1	47.1	17.8	3.10			22.6	10.5	3.80	3.08	
AC 2	0.0	0.0				0.0	0.0	0.0	0.0	
AC AVG.										
S.P.	16.0 →					9.2 →				
AC NOISE										
POT RES.	12K →					6.0K →				

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT 516 Kelvin

LINE 40E HALF S SP. 1 DATE 4-14

PAGE 5

SEND	1-2	2-3	3-4							
RECEIVE	70-80	5 →	→							
RANGE	0.1	0.1	0.1							
DC 1	2.1	2.5	3.9							
DC 2 I	4	→	→							
DC 3 K_n	60	105	168							
DC 4										
DC 5 ρ	131	121	79							
DC 6 PFE	1.7	2.1	3.5							
DC 7 MCE	13	17	44							
DC 8										
DC AVG.										
AC 1	8.70	4.56	1.84							
AC 2	0.0	0.0	0.0							
AC AVG.										
S.P.	11.1 →	→	→							
AC NOISE										
POT RES.	6.1K →	→	→							

PAGE 1

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 KELVIN

LINE 40E HALF 5 SP. 1 DATE 4-14

SEND	4-5	5-6	6-7	3-4	4-5	5-6	6-7			
RECEIVE	10-20s →			20-30s →						
RANGE	10.400	10.400	10.300	10.400	10.400	10.400	10.400			
VOLTAGE	260	310	350	260	250	310	350			
CURRENT	4A	4A	3A	4A	4A	4A	4A			
SEND	2-3	3-4	4-5	5-6	6-7			1-2		
RECEIVE	30-40s →							CAL		
RANGE	10.400	10.400	10.400	10.400	10.300			10.200		
VOLTAGE	290	260	260	310	350			160		
CURRENT	4A	4A	4A	4A	3A			2A		

FREQUENCIES 0.3 3.0

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 KELVIN

LINE 40E HALF S SP. 1 DATE 4-14

SEND	1-2	2-3	3-4	4-5	5-6	6-7		1-2	2-3	3-4
RECEIVE	40-50s	→				→		70-80s	→	→
RANGE	10.400	10.400	10.400	10.400	10.400	10.300		10.400	10.400	10.400
VOLTAGE	320	290	260	260	310	350		320	290	260
CURRENT	4A	4A	4A	4A	4A	3A		4A	4A	4A
SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	↑
RECEIVE	50-60s	→			→	60-70s	→	→	→	
RANGE	10.400	10.400	10.400	10.400	10.400	10400	10.400	10.400	10.400	
VOLTAGE	320	280	260	260		320	290	260	260	
CURRENT	4A	4A	4A	4A	4A	4A	4A	4A	4A	

FREQUENCIES 0.3 3.0

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Kelvin 516
LINE 30E HALF N SP. 1 DATE 4-9

PAGE 1

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
RECEIVE	10-20 N →			20-30 N →						
RANGE	10	1.0	1.0	10	1.0	1.0	8.32			
DC 1	3.3	3.4	3.7	1.8	3.9	3.7	3.9			
DC 2 I	4 →									
DC 3 K_m	3	12	30	3	12	30	60			
DC 4										
DC 5 ρ	78	126	124	109	94	138	127			
DC 6 PFE	2.9	3.0	3.3	1.4	3.5	3.3	3.6			
DC 7 MCF	37	24	27	13	37	24	28			
DC 8										
DC AVG.										
AC 1	103	41.5	16.2	146	30.6	18.1	8.32			
AC 2	0.0	0.0	0.0	0.0	0.0	0.1	-0.1			
AC AVG.										
S.P.	23.4 →			10.2 →						
AC NOISE										
POT RES.	3.4K →			2.5K →						

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 30E HALF N SP. 1 DATE 4-9

PAGE 2

SEND	5-6	4-5	3-4	2-3	1-2		6-7			
RECEIVE	30-40 N →						cal			
RANGE	1.0	1.0	1.0	1.0	0.1		10			
DC 1	1.6	2.4	4.7	3.8	3.6		0.4			
DC 2 I	4 →						2000			
DC 3 Kn	3	12	30	60	105					
DC 4							(108.3)			
DC 5 ρ	134	151	133	199	163					
DC 6 PFE	1.3	2.0	4.3	3.4	3.2		(8.0)	(0.35)	(vac 04)	
DC 7 MEA	10	13	32	17	20		+2x Multiplier		(0.985)	
DC 8										
DC AVG.	179	52.0	17.2	13.0	6.10		203			
AC 1 FLAM	159	48.0	15.2	11.0	5.90		183			
AC 2	-0.1	0.0	0.0	0.0	0.0		0.1			
AC AVG.										
S.P.	24.1 →									
AC NOISE										
POT RES.	2.8K →									

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Kelvin 516
LINE 30E HALF N SP. 1 DATE 4-9

SEND	6-7	5-6	4-5	3-4	2-3	1-2				
RECEIVE	40-50 N →									
RANGE	1.0	1.0	1.0	0.1	0.1	0.1				
DC 1	1.8	2.0	2.9	4.5	3.8	4.2				
DC 2 I	4 →									
DC 3 K	3	12	30	60	105	168				
DC 4			Fence at 4300 N; Grounded							
DC 5 ρ	157	149	161	129	195	189				
DC 6 PFE	1.4	1.6	2.5	4.1	3.4	3.8				
DC 7 MCF	9	11	15	32	17	20				
DC 8										
DC AVG.	21.0	49.5	21.3	8.36	7.30	4.41				
AC 1	19.0	47.5	19.3	8.16	7.10	4.21				
AC 2	0.0	0.0	0.0	0.0	0.0	0.0				
AC AVG.										
S.P.	12.3 →									
AC NOISE										
POT RES.	8.6K →									

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 5.6

LINE 30E HALF N SP. 1 DATE 4-9

SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	
RECEIVE	50-60	N →	→	→	→	60-70	N →	→	→	
RANGE	1.0	1.0	0.1	0.1	0.1	1.0	0.1	0.1	0.1	
DC 1	1.7	1.9	1.6	5.2	3.6	2.0	2.1	3.5	4.9	
DC 2 I	4 →	→	→	→	→	→	→	→	→	
DC 3 Kq	12	30	60	105	168	30	60	105	168	
DC 4										
DC 5 ρ	114	111	118	101	164	89	89	97	84	
DC 6 PFE	1.3	1.5	1.2	4.8	3.3	1.6	1.7	3.1	4.6	
DC 7 MEF	11	14	10	47	20	18	19	32	55	
DC 8										
DC AVG.	38.0	14.8	7.88	3.73	3.84	11.9	5.90	3.65	1.93	
AC 1	36.0	12.8	7.68	3.53	3.64	09.9	5.70	3.45	1.73	
AC 2	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	-0.2	
AC AVG.										
S.P.	27.5 →	→	→	→	→	2.1 →	→	→	→	
AC NOISE										
POT RES.	1.7K →	→	→	→	→	1.0K →	→	→	→	

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 30E HALF N SP. 1 DATE 4-9

PAGE 5

SEND	6-7	5-6	4-5							
RECEIVE	70-80 N →									
RANGE	0.1	0.1	0.1							
DC 1	2.0	3.7	4.0							
DC 2 I	4 →									
DC 3 K_n	60	105	168							
DC 4	Power line running									
DC 5 ρ	66	68 along	70 r tracks							
DC 6 PFE	1.5	2.5 at	3.7 100 N							
DC 7 MCA	23	38	48							
DC 8										
DC AVG.	4.39	2.50	1.78							
AC 1	4.19	2.30	1.58							
AC 2	0.2	1.8	-0.2							
AC AVG.										
S.P.	30.0 →									
AC NOISE										
POT RES.	1.1K →									

PAGE

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT Kelvin 516

LINE 30E HALF N SP. 1 DATE 4-9

SEND	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
RECEIVE	10-20	N →		20-30	N →					
RANGE	10x400	10x400	10x400	10x400	10x400	10x400	10x400			
VOLTAGE	250	290	360	175	250	290	360			
CURRENT	4A	4A	4A	4A	4A	4A	4A			
SEND	5-6	4-5	3-4	2-3	1-2				6-7	
RECEIVE	30-40	N →							CAL	
RANGE	10x400	10x400	10x400	10x400	10x400				10x200	
VOLTAGE	200	210	300	300	370				160	
CURRENT	4A	4A	4A	4A	4A				2A.	

FREQUENCIES 3.0 0.3

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR DC

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT Kelvin 516
LINE 306 HALF N SP. 1 DATE 4-9

SEND	6-7	5-6	4-5	3-4	2-3	1-2		6-7	5-6	4-5
RECEIVE	40-50	N →	→	→	→	→		70-80	N →	→
RANGE	10x400	10x400	10x400	10x400	10x400	10x400		260	30x400	10x400
VOLTAGE	260	200	210	300	300	370		10x400	200	210
CURRENT	4A	4A	4A	4A	4A	4A		4A	4A	4A
SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	
RECEIVE	50-60	N →	→	→	→	60-70	N →	→	→	
RANGE	10x400	10x400	10x400	10x400	10x400	10x400	10x400	10x400	10x400	
VOLTAGE	260	200	210	300	300	260	210	210	300	
CURRENT	4A	4A	4A	4A	4A	4A	4A	4A	4A	

FREQUENCIES 3.0 0.3

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR DC

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT S16 Kelvin

LINE 20E HALF S SP. 1 DATE 4-11

PAGE 1

SEND	SP	SP	4-5	5-6	6-7	3-4	4-5	5-6	6-7	2-3
RECEIVE	10N-0N	0N S-10S	10S-20S	→		20-30S	→			Cal
RANGE			10	1.0	1.0	10	1.0	1.0	0.1	10
DC 1			2.9	3.4	3.6	3.1	3.3	3.7	3.8	0.4
DC 2 I			4	→						2000
DC 3 Km			3	12	30	3	12	30	60	
DC 4			Fence, grounded,			106.2				
DC 5 C			115	127	137	83 6.0	126	124	126	(0.985)
DC 6 PFE			E-W cut 3.900		5 3.2	3.7	2.9	3.3	3.4	(0.4)
DC 7 MCA			22	24	23	33	23	27	27	
DC 8										+4xM
DC AVG.		+4xM	152	41.7	18.0	109	41.4	16.2	8.25	203
AC 1			112	37.7	14.0	069.	37.4	12.2	7.85	163
AC 2			0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
AC AVG.										
S.P.	-0.9	21.1	31.9	→		80.4	→			
AC NOISE										
POT RES.	4.0	4.4	3.7	→		5.2K	→			

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT 516 Kelvin

LINE 30E HALF S SP. 1 DATE 7-11

PAGE 2

SEND	2-3	3-4	4-5	5-6	6-7					
RECEIVE	30-40 S →									
RANGE	1.0	1.0	1.0	0.1	0.1					
DC 1	2.5	3.3	3.5	3.9	4.1					
DC 2 I	4 →									
DC 3 Kn	3	12	30	60	105					
DC 4										
DC 5 ρ	196	113	157	139	143					
DC 6 PFE	2.1	2.9	3.1	3.5	3.7					
DC 7 MCA	11	26	20	25	26					
DC 8										
DC AVG.	2.60	37.0	20.6	9.10	5.34					
AC 1	22.0	33.0	16.6	8.70	4.94					
AC 2	0.0	0.0	0.0	-0.1	0.0					
AC AVG.										
S.P.	9.4 →									
AC NOISE										
POT RES.	3.7K →									

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Kelvin 516

LINE 30E HALF S SP. 1 DATE 4-11

SEND	1-2	2-3	3-4	4-5	5-6	6-7				
RECEIVE	40-50S	→	→	→	→	→				
RANGE	1.0	1.0	1.0	0.1	0.1	0.1				
DC 1	2.2	2.3	3.4	3.7	4.1	4.6				
DC 2 I	4	→	→	→	→	→				
DC 3 K_a	3	12	30	60	105	168				
DC 4										
DC 5 ρ	174	173	109	141	126	133				
DC 6 PFE	1.8	1.9	3.0	3.3	3.8	4.3				
DC 7 MCF	10	11	28	23	30	32				
DC 8										
DC AVG.	231	57.3	14.3	9.22	4.71	3.08				
AC 1	191	53.3	10.3	8.82	4.31	2.68				
AC 2	0.0	0.0	0.0	0.1	-0.2	-0.2				
AC AVG.										
S.P.	31.8	→	→	→	→	→				
AC NOISE										
POT RES.	5.5K	→	→	→	→	→				

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 516 Kelvin
LINE 30E HALF S SP. 1 DATE 4-11

PAGE 4

SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	
RECEIVE	50-60S →					60-70S →				
RANGE	1.0	1.0	0.1	0.1	0.1	1.0	0.1	0.1	0.1	
DC 1	2.2	2.1	3.4	3.7	4.2	2.2	2.0	3.3	4.1	
DC 2 I	4 →									
DC 3 K_n	12	30	60	105	168	30	60	105	168	
DC 4								89		
DC 5 ρ	146	146	90	111	98	138	Power line at 112			
DC 6 PFE	1.8	1.7	3.0	3.3	3.9	1.8	1.6 6.10	5 3.0	3.7	
DC 7 MIP	12	12	33	30	40	13	11	34	33	
DC 8										
DC AVG.	48.6	19.4	5.92	4.16	2.29	18.4	9.61	3.36	2.62	
AC 1	44.6	15.4	5.52	3.76	1.89	14.4	9.21	2.96	2.22	
AC 2	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-0.2	0.0	
AC AVG.										
S.P.	22.7 →					8.8 →				
AC NOISE										
POT RES.	8.0K →					4.6K →				

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Kelvin 516
LINE 30E HALF S SP. 1 DATE 4-11

PAGE 5

SEND	1-2	2-3	3-4							
RECEIVE	70-80	S →	→							
RANGE	0.1	0.1	0.1							
DC 1	2.2	2.4	4.5							
DC 2 I	4	→	→							
DC 3 K_n	60	105	168							
DC 4										
DC 5 ρ	114	122	76							
DC 6 PFE	1.8	2.1	4.1							
DC 7 MCE	16	17	54							
DC 8										
DC AVG.	7.59	4.62	1.77							
AC 1	7.19	4.22	1.37							
AC 2	0.0	-0.2	0.0							
AC AVG.										
S.P.	30.2 →	→	→							
AC NOISE										
POT RES.	22K →	→	→							

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 5/6 KELVIN

LINE 30E HALF ~~N~~S SP. 1 DATE 4-9

PAGE 1

SEND	4-5	5-6	6-7	3-4	4-5	5-6	6-7			
RECEIVE	10-20s →			20-30s →						
RANGE	10x400	10·400	10·400	10·400	10·400	10·400	10·400			
VOLTAGE	170	200	260	250	170	200	260			
CURRENT	4A	4A	4A	4A	4A	4A	4A			
SEND	2-3	3-4	4-5	5-6	6-7			2-3		
RECEIVE	30-40s →							CAL		
RANGE	10·400	10·400	10·400	10·400	10·400			10·200		
VOLTAGE	290	240	170	200	260			170		
CURRENT	4A	4A	4A	4A	4A			2A		

FREQUENCIES 3.0 0.3

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 KELVIN

LINE 30E HALF S SP. 1 DATE 4-8

PAGE 2

SEND	1-2	2-3	3-4	4-5	5-6	6-7		1-2	2-3	3-4
RECEIVE	40s - 50s							70-80s		
RANGE	10.400	10.400	10.400	10.400	10.400	10.400		10.400	10.400	10.400
VOLTAGE	360	290	240	170	200	260		360	290	250
CURRENT	4A	4A	4A	4A	4A	4A		4A	4A	4A
SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	↑
RECEIVE	50s	- 60s				60-	70s			
RANGE	10.400	10.400	10.400	10.400	10.400	10.400	10.400	10.400	10.400	
VOLTAGE	360	290	240	170	200	360	290	250	170	
CURRENT	4A	4A	4A	4A	4A	4A	4A	4A	4A	

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Tipperary 516

LINE 20 E HALF N SP. 1 DATE 4-7-70

PAGE 1

SEND	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	
RECEIVE	0-10N	→	10-20N	→	→	20-30N	→	→	→	
RANGE	10	1.0	1.0	1.0	1.0	10	1.0	1.0	0.1	
DC 1	2.7	3.0	3.5	3.7	3.8	2.6	3.9	4.5	4.1	
DC 2 I	3	→	→	→	→	→	→	→	→	
DC 3 n	1	2	1	2	Grounded	steel	fence	at	3400'N.	4
DC 4 K	3	12	3	12	30	3	12	30	60	
DC 5										
DC 6 P	131	163	80	128	144	104	96	142	146	
DC 7 PFE	2.4	2.7	3.2	3.4	3.5 Fence	2.3	3.6	4.2	3.8	
DC 8 MCE	18	17	40	26	24	22	38	30	26	
DC AVG.										
AC 1	130	40.3	78.8	31.5	14.1	103	23.4	13.8	7.16	
AC 2	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
AC AVG.										
S.P.	+2.5	→	+9.2	→	→	+23.7	→	→	→	
AC NOISE										
POT RES.	3K	→	0.5K	→	→	0.8K	→	→	→	

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Tipperary 516

LINE 20 E HALF N SP. 1 DATE 4-7-70

SEND	5-6	4-5	3-4	2-3	1-2			CAL		
RECEIVE	30-40N	→	→	→	→			6-7		
RANGE	1.0	1.0	0.1	0.1	0.1			10		
DC 1	2.0	3.1	3.6	4.0	3.9			0.3		
DC 2 I	3	→	→	→	→			2000		
DC 3 n	1	2	3	4	5					
DC 4 K_n	3	12	30	60	105					
DC 5										
DC 6 ρ	85	94	98	136	144			(0.985)		
DC 7 ρ%	1.7	2.8	3.3	3.7	3.5			(0.3)		
DC 8 mcf	20	30	34	27	24					
DC AVG.										
AC 1	84.6	23.1	9.61	6.66	4.04			203		
AC 2	0.0	0.0	0.0	0.0	+0.2			0.0		
AC AVG.					0.1					
S.P.	+12.6	→	→	→	→					
AC NOISE										
POT RES.	0.7K	→	→	→	→					

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT TIPPERARY
LINE 20E HALF N SP. 1 DATE 4-7-20

SEND	6-7	5-6	4-5	3-4	2-3	1-2				
RECEIVE	40-50N	→								
RANGE	10	1.0	1.0	0.1	0.1	0.1				
DC 1	1.8	2.1	3.3	3.9	3.9	4.1				
DC 2 I	3	→								
DC 3 n	1	2	3	4	5	6				
DC 4 Kn	3	12	30	60	105	168				
DC 5										
DC 6 ρ	140	120	131	133	178	189				
DC 7 MR	1.5	1.8	3.0	3.6	3.6	3.7				
DC 8 MCR	11	15	23	27	20	20				
DC AVG.										
AC 1	140	30.0	12.9	6.53	4.99	3.30				
AC 2	0.0	0.0	0.0	0.0	0.0	+0.2				
AC AVG.										
S.P.	+12.0	→								
AC NOISE										
POT RES.	0.9 K	→								

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Tipperary

LINE 20E HALF N SP. 1 DATE 4-7-70

SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	
RECEIVE	50-60N	→	→	→	→	60-70 N	→	→	→	
RANGE	1.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
DC 1	1.9	2.0	3.5	4.2	4.1	2.2	3.8	4.8	4.1	
DC 2 I	3	→	→	→	→	→	→	→	4	
DC 3 η	2	3	4	5	6	3	4	5	6	
DC 4 K_η	12	30	60	105	168	30	60	105	168	
DC 5										
DC 6 ρ	113	92	99	99	133	53	65	70	98	
DC 7 PFE	1.6	1.7	3.2	3.9	3.8	1.9	3.5	4.5	3.8	
DC 8 MOE	14	18	32	40	29	36	53	64	39	
DC AVG.										
AC 1	28.2	9.23	4.86	2.75	2.32	5.30	3.21	1.94	2.28	
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	
AC AVG.										
S.P.	+12.0	→	→	→	→	+15.3	→	→	→	
AC NOISE										
POT RES.	0.8K	→	→	→	→	0.8K	→	→	→	

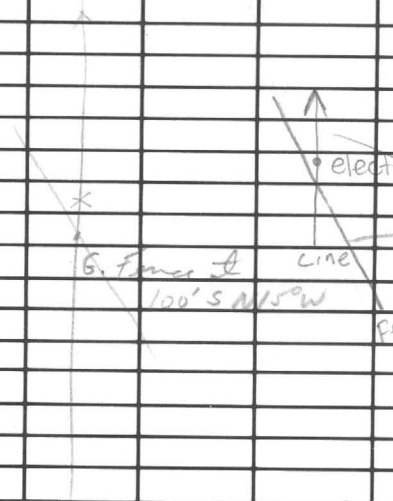
HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Tipperary 516

LINE 20E HALF N SP. 1 DATE 4-7-70

SEND	6-7	5-6	4-5							
RECEIVE	70-80N	→	→							
RANGE	0.1	0.1	0.1							
DC 1	2.9	4.0	5.1							
DC 2 I	4	4	3							
DC 3 n	4	5	6							
DC 4 K	60	105	168							
DC 5										
DC 6 ρ	54	61	60							
DC 7 PFE	2.6	3.7	4.8							
DC 8 MCE	48	61	81							
DC AVG.										
AC 1	3.55	2.27	1.03							
AC 2	0.0	0.0	0.0							
AC AVG.										
S.P.	+24.5	→	→							
AC NOISE										
POT RES.	0.5K	→	→							



PAGE 1

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT Kelum 516

LINE 70E HALF N SP. 1 DATE 4-7

SEND	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	
RECEIVE	0-10N	→	10-20	N	→	20-30	N	→	→	
RANGE	10x300	10x300	10x300	10x300	10x300	10x300	→	→	→	
VOLTAGE	245	255	300	245	255	270	300	245	255	
CURRENT	3A	3A	3A	3A	3A	3A	→	→	→	
SEND	5-6	4-5	3-4	2-3	1-2		6-7			
RECEIVE	30-40N	→	→	→	→		Cal			
RANGE	10x300	→	→	→	→		10x200			
VOLTAGE	220	270	300	245	255		140			
CURRENT	3A	→	→	→	→					

FREQUENCIES 3.0 0.3

SENDER NO. 9662-5

OPERATOR DC

RECEIVER NO.

OPERATOR WJF

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 20E HALF N SP. 1 DATE 4-7

PAGE 2

SEND	6-7	5-6	4-5	3-4	2-3	1-2		6-7	5-6	4-5
RECEIVE	40-50	N →						70-80	N →	
RANGE	10x300	10x300	10x300	10x300	10x300	10x300		10x400	10x400	10x300
VOLTAGE	220	220	270	300	245	255		290	315	300
CURRENT	3A	3A	3A	3A	3A	3A		4A	4A	3A
SEND	6-7	5-6	4-5	3-4	2-3	6-7	5-6	4-5	3-4	
RECEIVE	50-60	N →				60-70	N →			
RANGE	10x300	→				10x300	→		10x400	
VOLTAGE	220	270	270	300	245	220	270	300	375	
CURRENT	3A	→				3A	→		4A	

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Tipperary 516

LINE 20E HALF S SP. 1 DATE 4-7-70

SEND	SP	SP	3-4	4-5	5-6	6-7		CAL		
RECEIVE	3-4	2-3	20-30 S	→	→	→		1-2		
RANGE			1.0	1.0	1.0	0.1		10		
DC 1			2.3	3.1	3.8	4.2		0.3		
DC 2 I			3	→	→	→		2000		
DC 3 4			1	2	3	4				
DC 4 Kn			3	12	30	60				
DC 5										
DC 6 C			98	161	144	144		(0.980)		
DC 7 RFB			2.0	2.8	3.5	3.9		(0.3)		
DC 8 MCR			20	17	24	27				
DC AVG.										
AC 1			97.3	39.6	14.1	7.01		202		
AC 2			0.0	0.0	0.0	0.0		0.0		
AC AVG.										
S.P.	+10.6	+13.7	-6.0	→	→	→				
AC NOISE	0.5K	0.3K	0.3K	→	→	→				
POT RES.										

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Tipperary 5/6

LINE 20E HALF 5 SP. 1 DATE 4-7-70

SEND	2-3	3-4	4-5	5-6	6-7	1-2	2-3	3-4	4-5	5-6
RECEIVE	30-40s	→	→	→	→	40-50s	→	→	→	→
RANGE	10	1.0	1.0	0.1	0.1	10	1.0	1.0	1.0	0.1
DC 1	1.7	2.2	3.2	3.9	4.1	1.4	2.0	2.6	3.5	4.3
DC 2 I	3	→	→	→	→	→	→	→	→	→
DC 3 "	1	2	3	4	5	1	2	3	4	5
DC 4 K"	3	12	30	60	105	3	12	30	60	105
DC 5										
DC 6 ρ	124	161	218	180	176	124	176	192	241	196
DC 7 PFE	1.4	1.9	2.9	3.6	3.8	1.1	1.7	2.3	3.2	4.0
DC 8 MCF	11	12	13	20	22	9	10	12	13	20
DC AVG.										
AC 1	124	39.9	21.4	8.75	4.89	124	43.6	19.0	11.8	5.45
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC AVG.										
S.P.	+15.3	→	→	→	→	+4.2	→	→	→	→
AC NOISE										
POT RES.	0.4K	→	→	→	→	0.3K	→	→	→	→

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Tipperary 516
LINE 20E HALF S SP. 1 DATE 4-7-76

SEND	6-7	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5
RECEIVE	40-50s	50-60s	→	→	→	→	60-70s	→	→	→
RANGE	0.1	1.0	1.0	0.1	0.1	0.1	1.0	0.1	0.1	0.1
DC 1	4.6	1.8	2.2	2.7	3.7	4.5	2.0	2.5	3.1	4.1
DC 2 I	3	→	→	→	→	→	→	→	→	→
DC 3 n	6	2	3	4	5	6	3	4	5	6
DC 4 K_n	168	12	30	60	105	168	30	60	105	168
DC 5										
DC 6 ρ	201	127	151	147	172	142	131	164	156	178
DC 7 PFE	4.3	1.5	1.9	2.4	3.4	4.2	1.7	2.2	2.8	3.8
DC 8 MCF	21	12	13	16	20	30	13	13	19	21
DC AVG.										
AC 1	3.48	31.6	15.0	7.23	4.80	2.45	13.0	8.08	4.38	3.10
AC 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC AVG.										
S.P.										
AC NOISE	—	+5.5	→	→	→	→	-16.8	→	→	→
POT RES.	—	0.3K	→	→	→	→	0.2K	→	→	→

Broken Pot

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Tipperary 516

LINE 20E HALF 5 SP. 1 DATE 4-7-70

SEND	1-2	2-3	3-4							
RECEIVE	70-80	→	→							
RANGE	0.1	0.1	0.1							
DC 1	2.2	2.7	3.1							
DC 2 I	→	→	→							
DC 3 n	4	5	6							
DC 4 K_n	60	105	168							
DC 5										
DC 6 ρ	106	124	113							
DC 7 PFE	1.9	2.4	2.8							
DC 8 MCF	18	19	25							
DC AVG.										
AC 1	5.25	3.50	1.99							
AC 2	0.0	0.0	0.0							
AC AVG.										
S.P.	−16.0	→	→							
AC NOISE										
POT RES.	0.9K	→	→							

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 205 HALF 5 SP. 1 DATE 4-7

PAGE 1

SEND	3-4	4-5	5-6	6-7	2-3	3-4	4-5	5-6	6-7	
RECEIVE	20-30 S	→	→	→	30-40 S	→	→	→	→	
RANGE	10x300	→	→	→	10x300	→	→	→	→	
VOLTAGE	300	270	215	210	240	300	270	215	210	
CURRENT	3A	→	→	→	3A	→	→	→	→	
SEND	1-2	2-3	3-4	4-5	5-6	6-7		1-2		
RECEIVE	40-50 S	→	→	→	→	→		cal		
RANGE	10x300	→	→	→	→	→		10x200		
VOLTAGE	250	240	300	270	215	210				
CURRENT	3A	→	→	→	→	→		2A		

FREQUENCIES 30 0.3

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 516 Kelvin

LINE 206 HALF S SP. 1 DATE 4-7

PAGE 2

SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	
RECEIVE	50-60 S	→	→	→	→	60-70 S	→	→	→	
RANGE	10x300	→	→	→	→	10x300	10x300	→	→	
VOLTAGE	250	240	300	270	215	250	240	300	270	
CURRENT	3A	→	→	→	→	3A	3A	→	→	
SEND	1-2	2-3	3-4							
RECEIVE	70-80 S	→	→							
RANGE	10x300	→	→							
VOLTAGE	250	240	300							
CURRENT	3A	→	→							

FREQUENCIES _____ _____

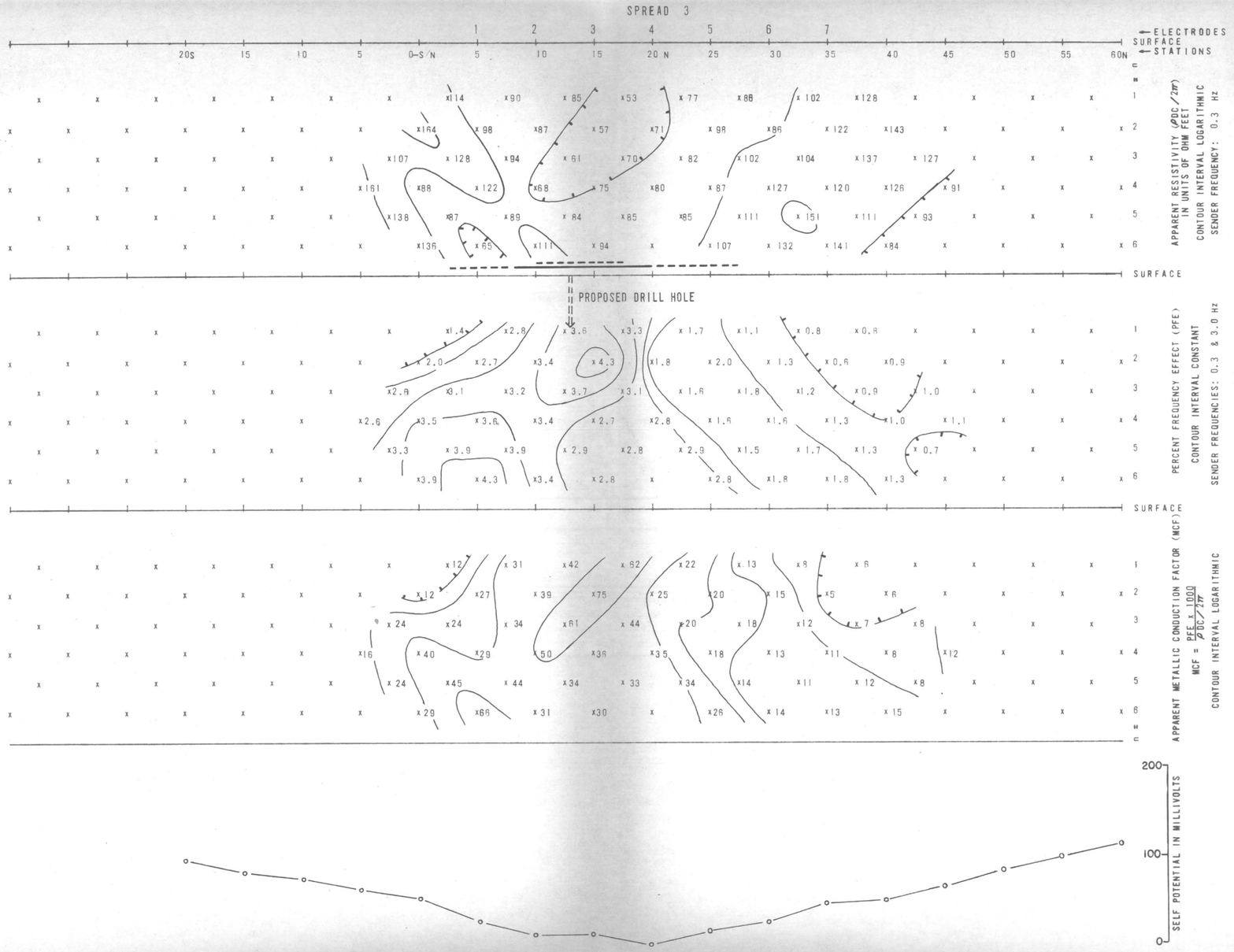
SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:



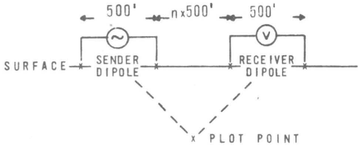
516-70

LINE NO.
10E
SPREAD(S)
3

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

DIPOLE DIPOLE ELECTRODE ARRAY



AREA
KELVIN
LOOKING
WEST
DATE
MARCH 1970

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS
AUSTRALIA
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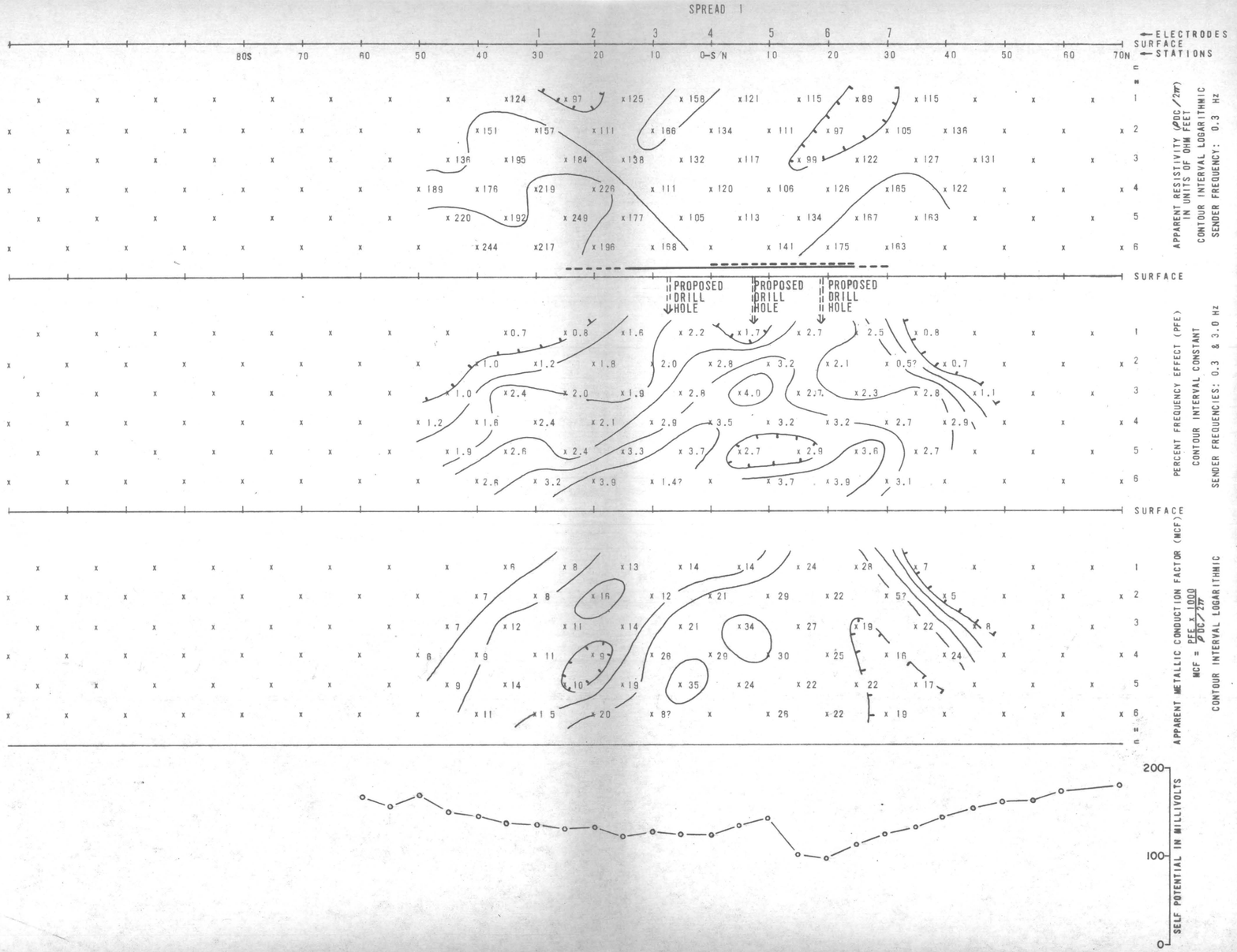
Phone: (602) 623-0578
Cable: GEOEX, Tucson

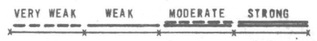


516-70

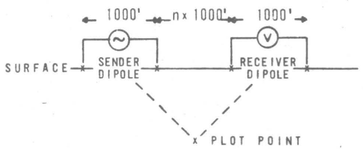
LINE NO.
0 E/W
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA
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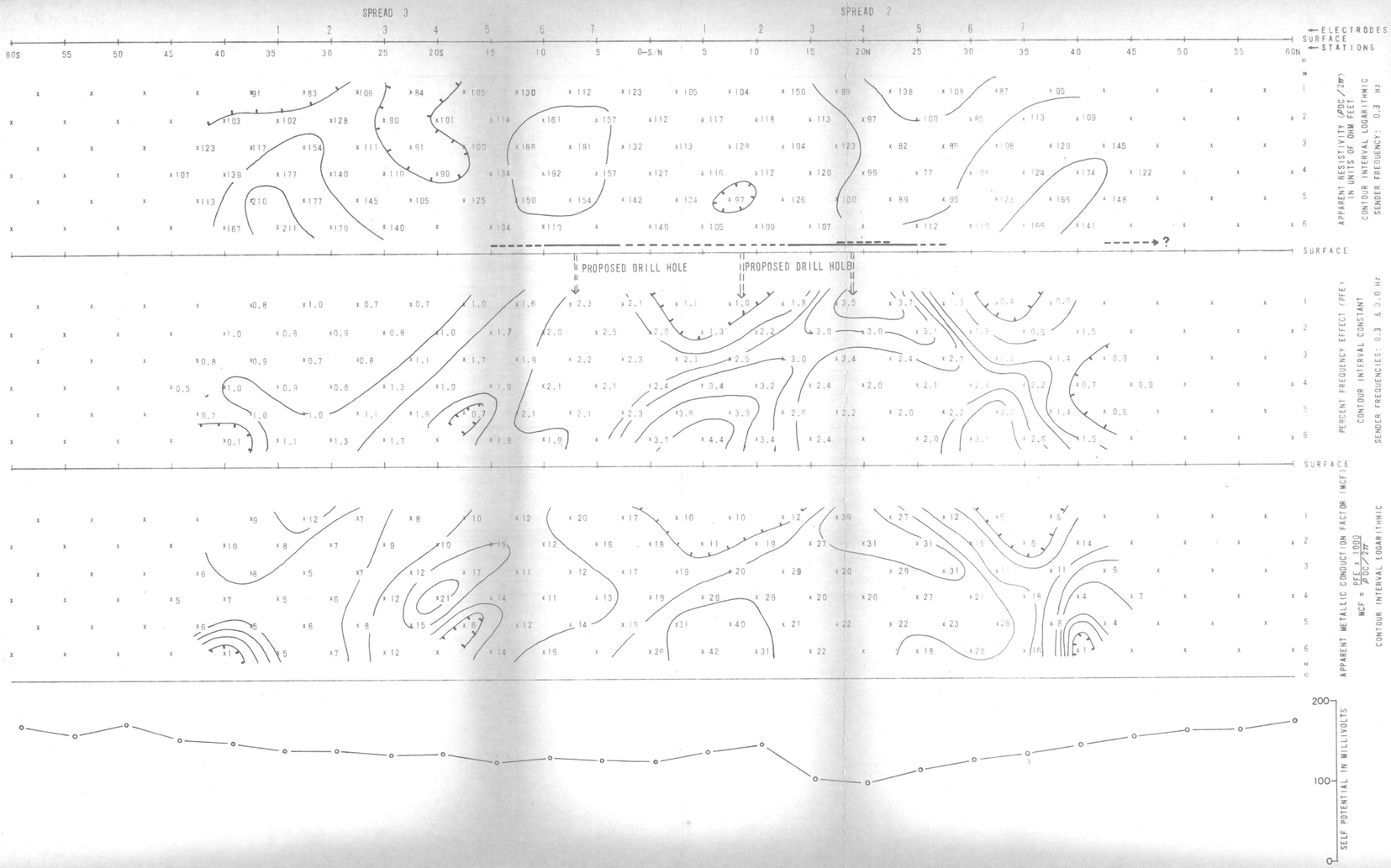


516-70

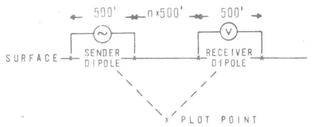
LINE NO.
0 E/W
SPREAD(S)
2 & 3

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

DIPOLE DIPOLE ELECTRODE ARRAY



AREA
KELVIN

LOOKING
WEST

DATE
MARCH 1970

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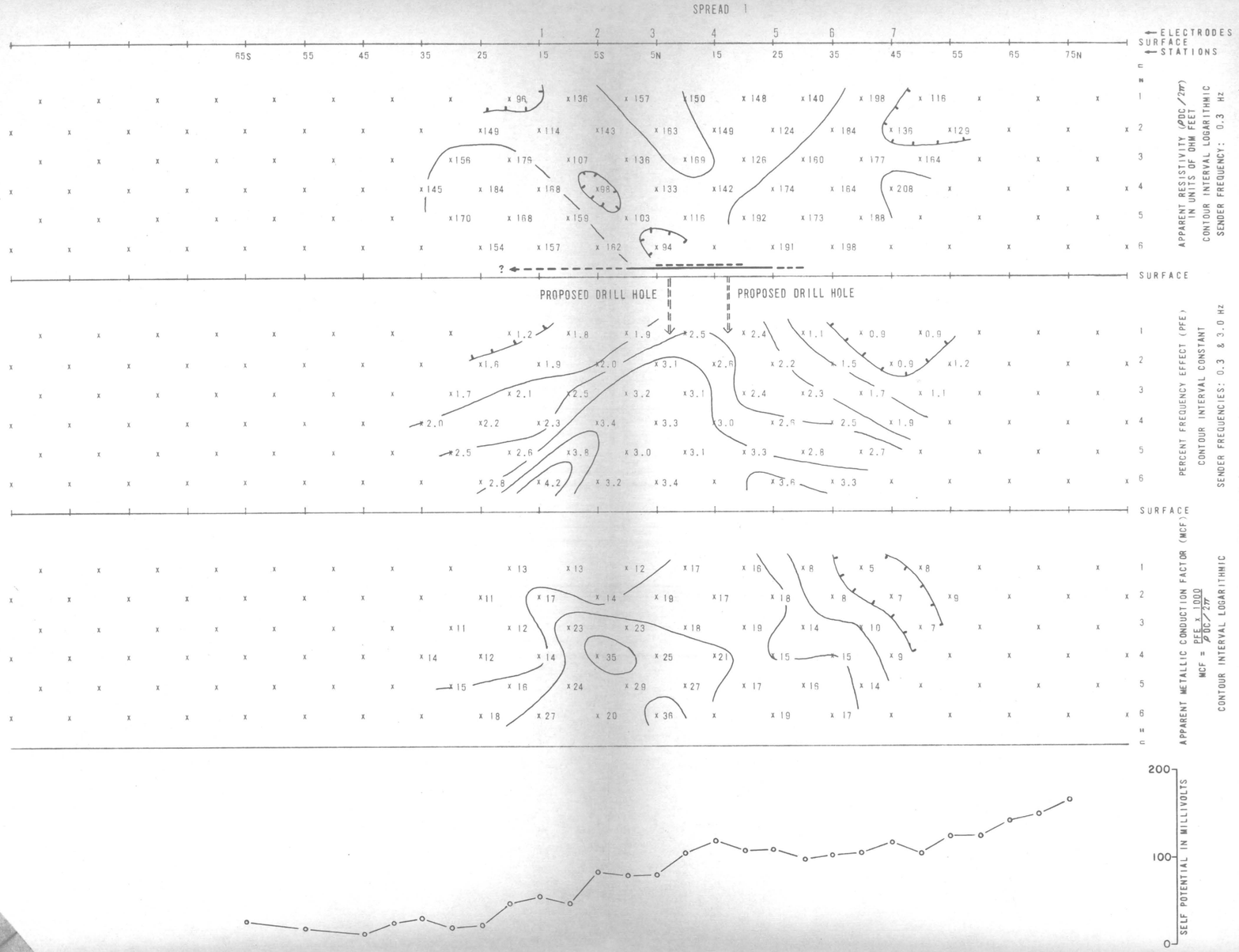


516-70

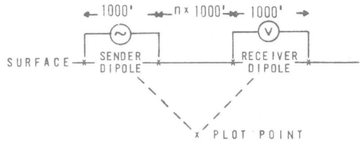
LINE NO.
10W
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for

TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

DIPOLE DIPOLE ELECTRODE ARRAY



AREA

KELVIN

LOOKING WEST

DATE

MARCH 1970

HEINRICHS
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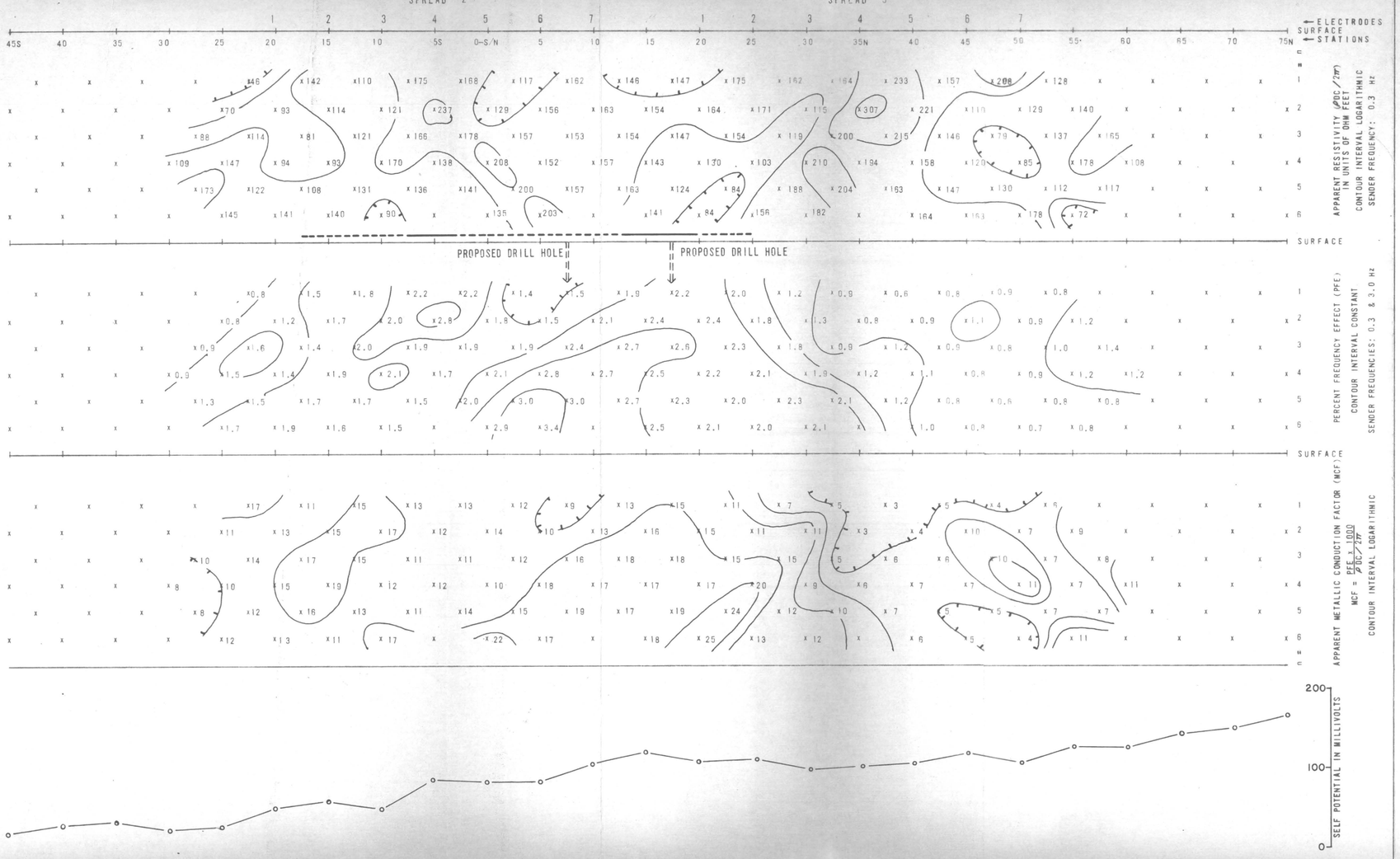


516-70

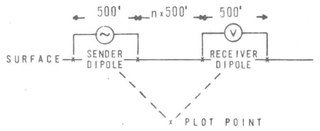
LINE NO.
10W

SPREAD(S)
2 & 3

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

DIPOLE DIPOLE ELECTRODE ARRAY



AREA
KELVIN

LOOKING
WEST

DATE
MARCH 1970

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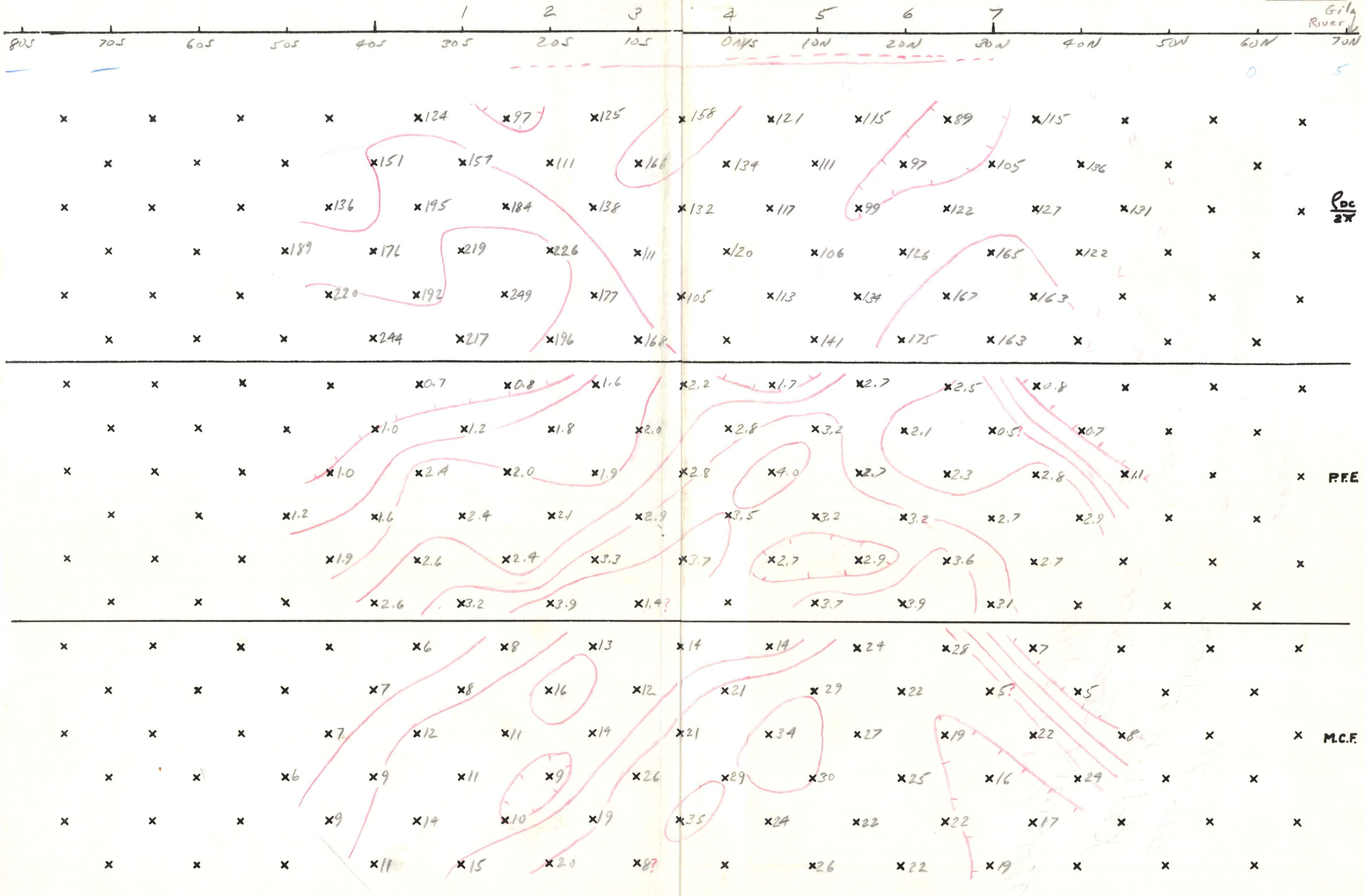
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING

EINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West



AREA Kelvin (516) LINE 0 E/W Spread 1 a = 1000' SCALE: 1" = 1000' DATE: 3/11/70 LINE a = ' SCALE: DATE:

~~482-70~~

Bagdad Area

~~Miami Cu.~~

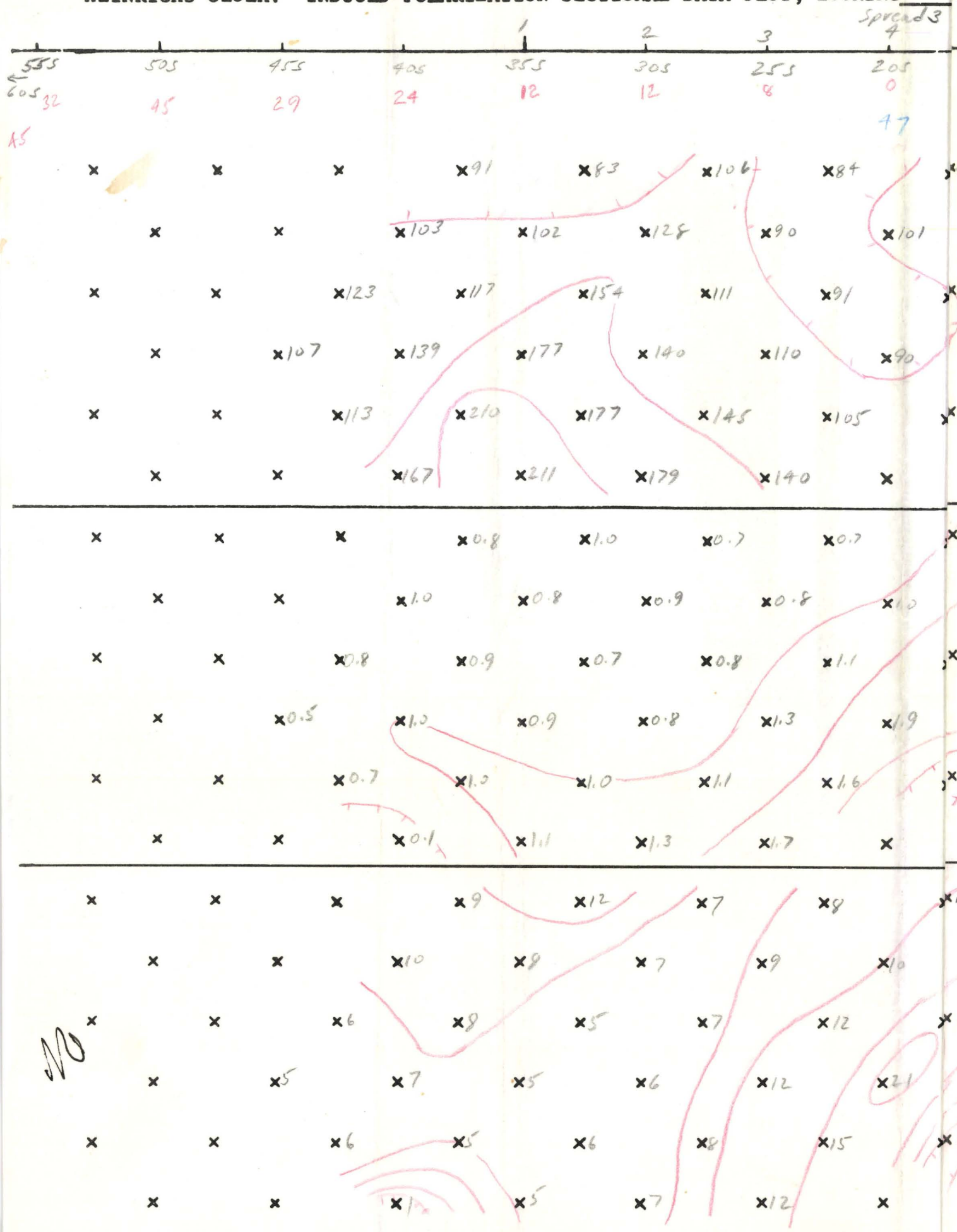
3.0 0.3

516-70

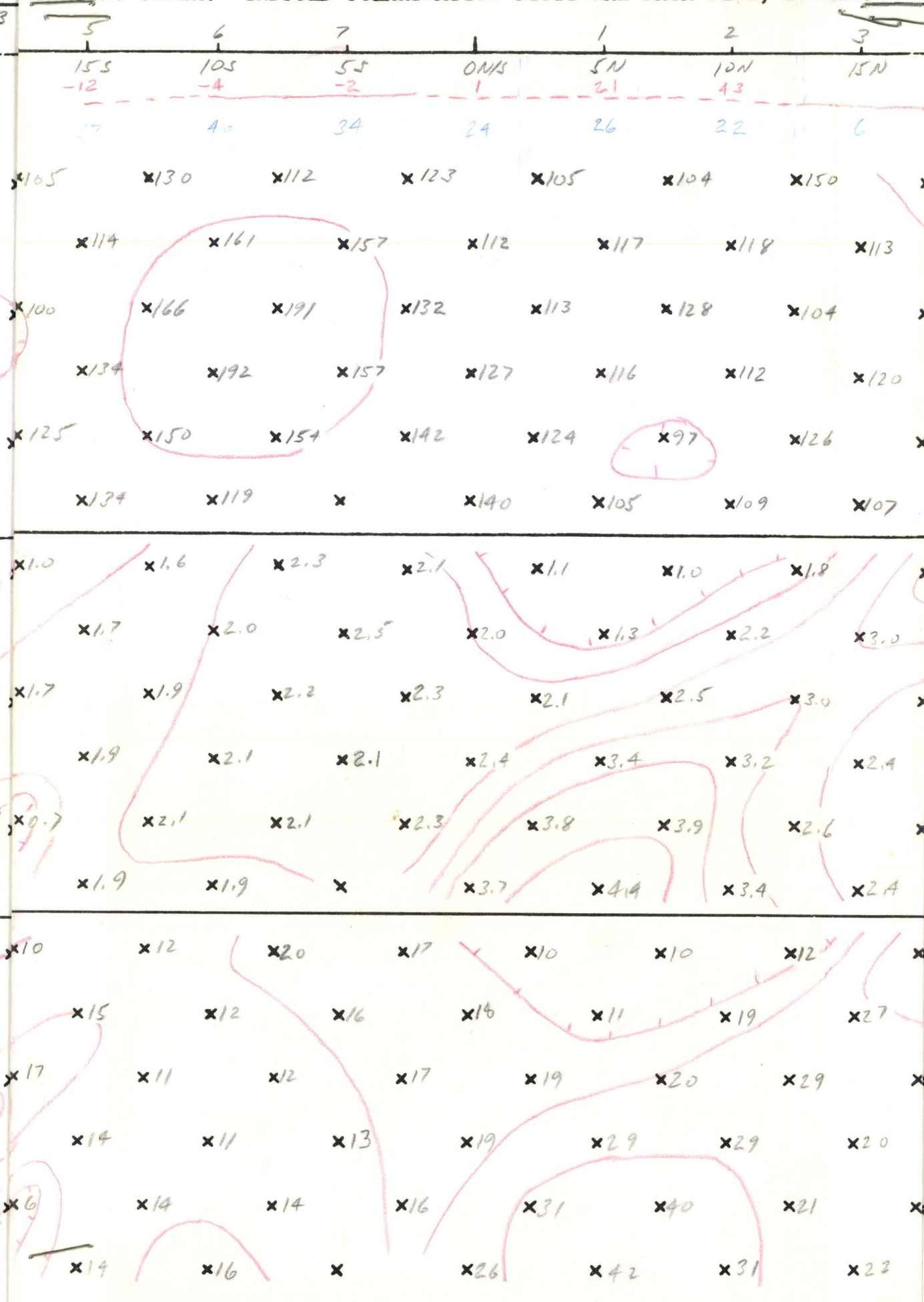
Kelvin Area

Tipperary Resources Corporation

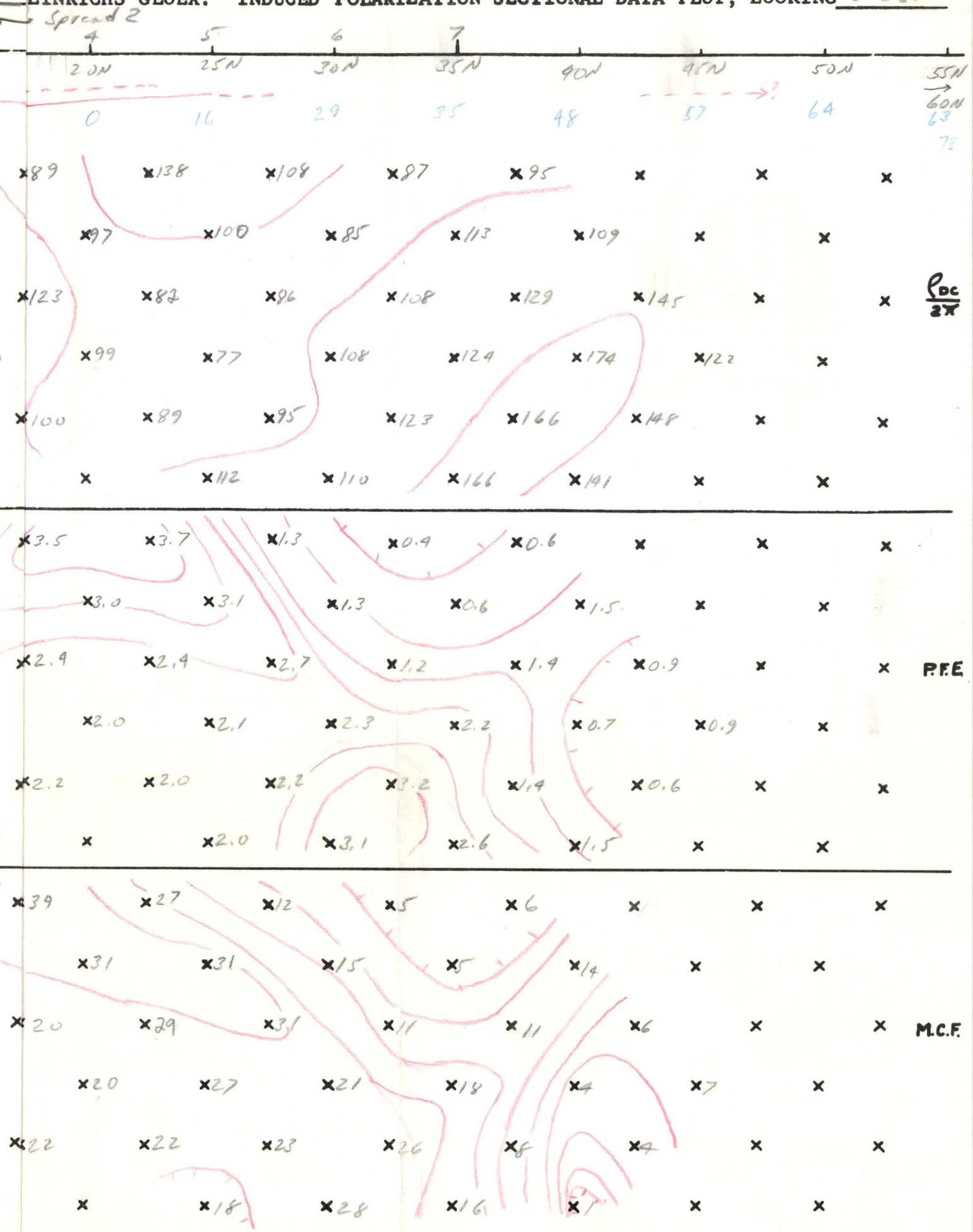
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING



EINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING



EINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West



$\rho_{DC}/2\pi$

P.F.E.

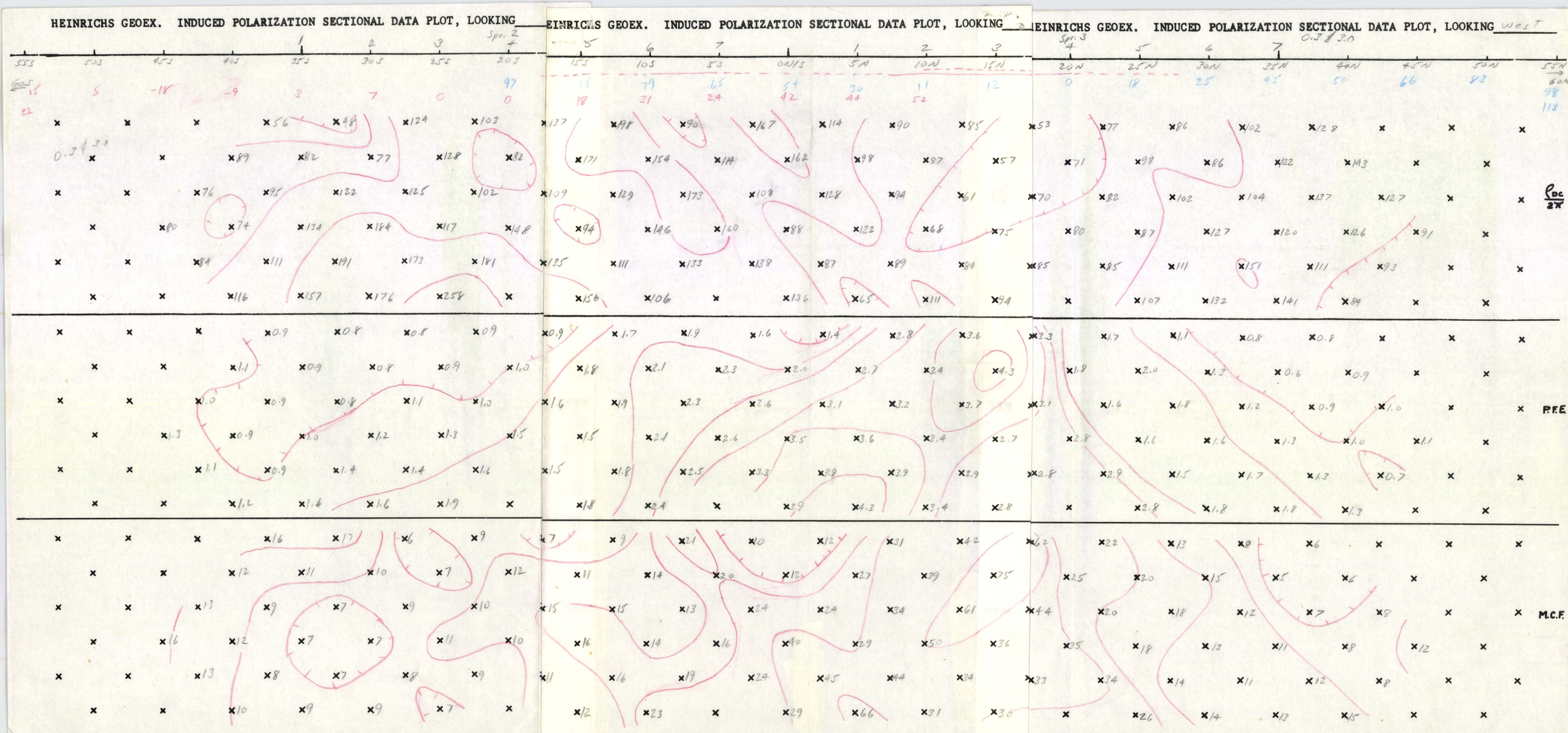
M.C.F.

AREA Kelvin (516) LINE Spreads 2&3 0 E/W a = 500' SCALE: 1" = 500' DATE: 3/14/70 LINE a = ' SCALE: AREE: LINE a = ' SCALE: DATE:

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING ___ HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West

AREA Kelvin - Tipperary 516 Spr. L. 1 LINE 10E a = 1000' SCALE: 1" = 1000' DATE: 3/30/70 LINE ___ a = ' SCALE: ___ DATE: ___

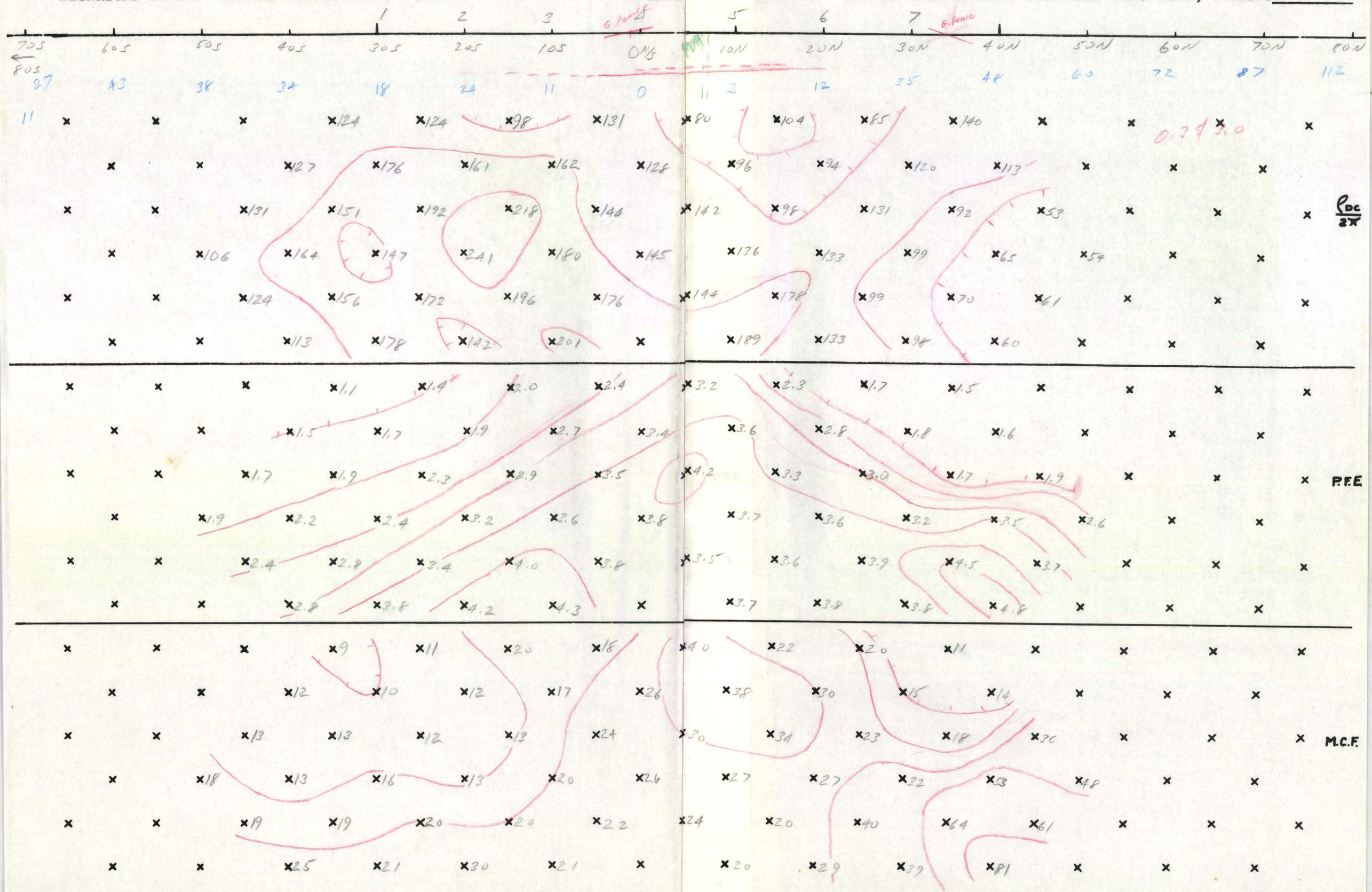
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING



AREA Kelvin: Tipperary 516 Sprds. 2 & 3 LINE 10E a = 500 ' SCALE: 1" = 500' DATE: 3/30/70 LINE a = ' SCALE: DATE: LINE a = ' SCALE: DATE:

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING

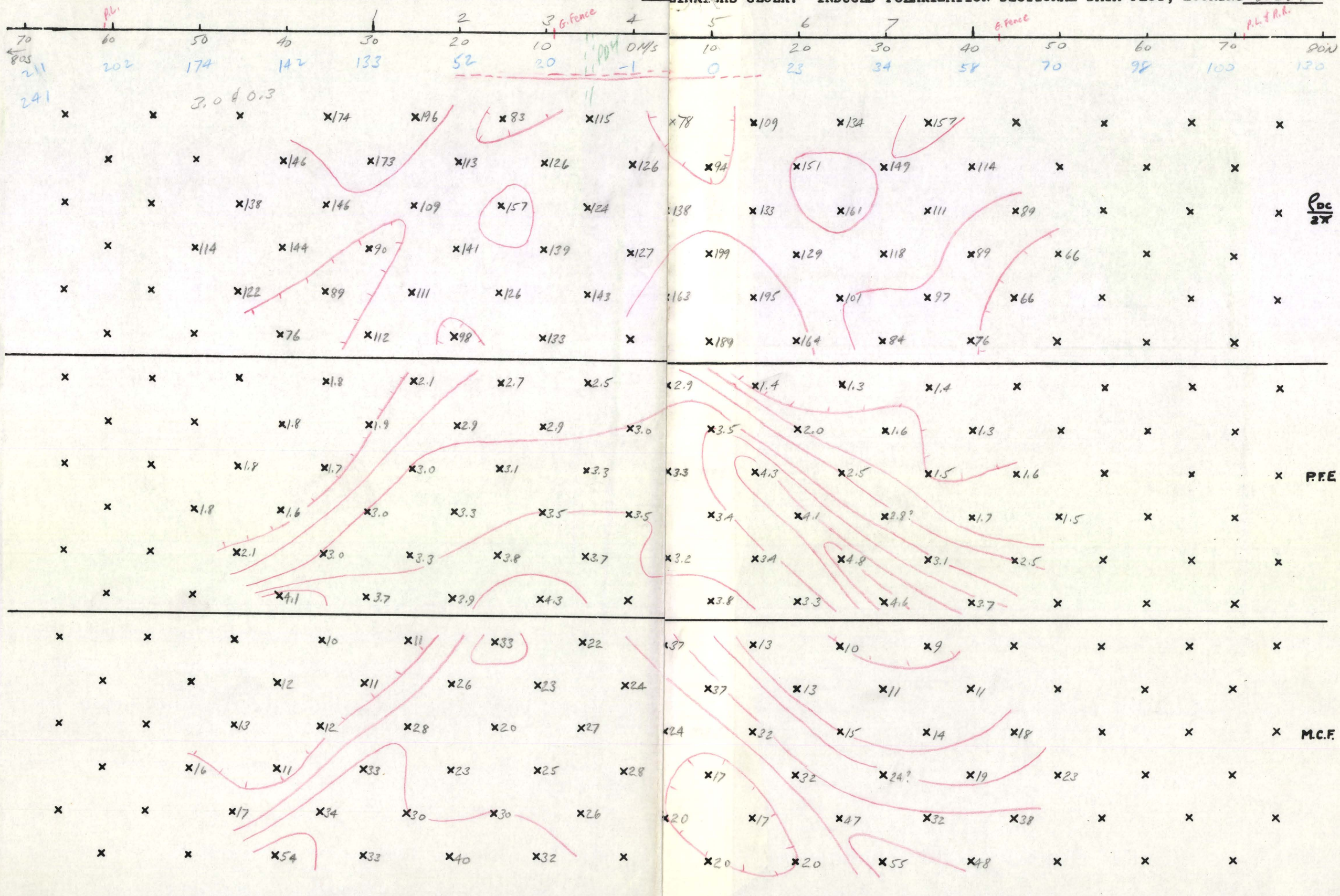
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West



AREA Kelvin - 516-Tipperary LINE 20E a = 1000 ' SCALE: 1" = 1000' DATE: 4/6/70

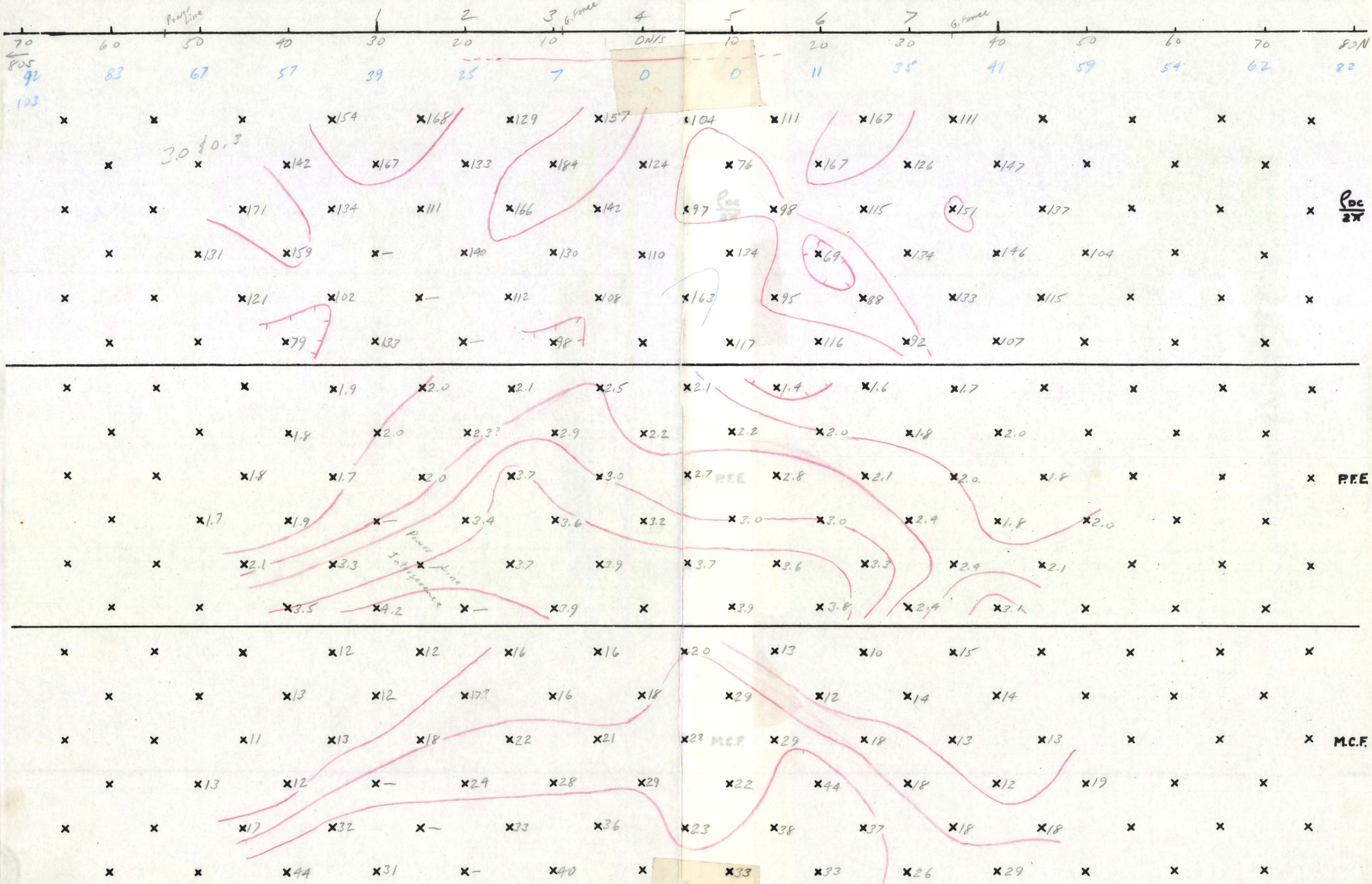
LINE a = ' SCALE: DATE:

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING



AREA Kelvin - Tipperary 516 LINE 30E a = 1000 ' SCALE: 1" = 1000' DATE April 1970 LINE a = ' SCALE: DATE:

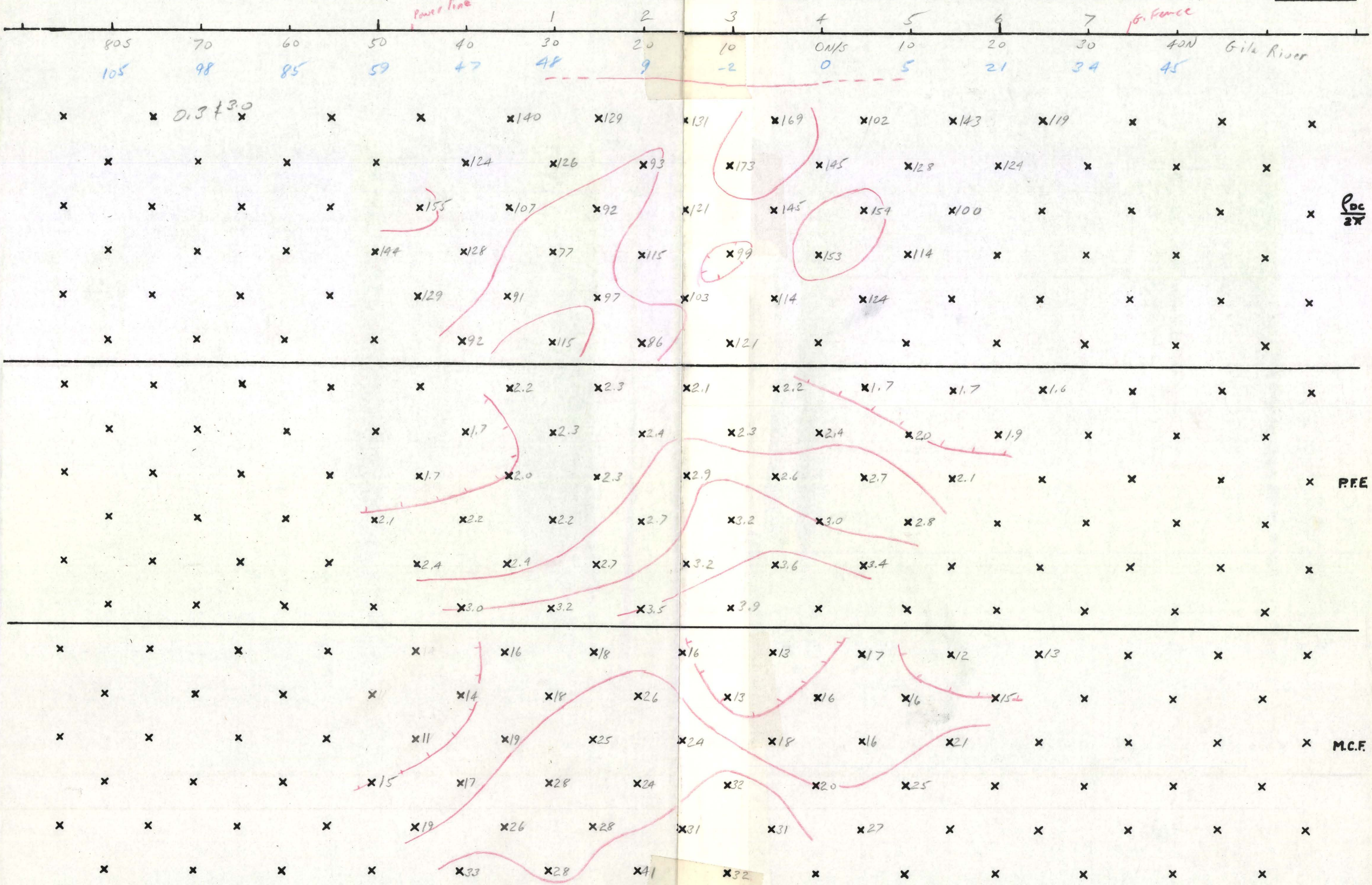
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING ____ EINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West



AREA Kelvin-Tipperary 516 LINE 40E a = 1000 ' SCALE: 1" = 1000' DATE: April 1970 LINE ____ a = ' SCALE: ____ DATE: ____

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING

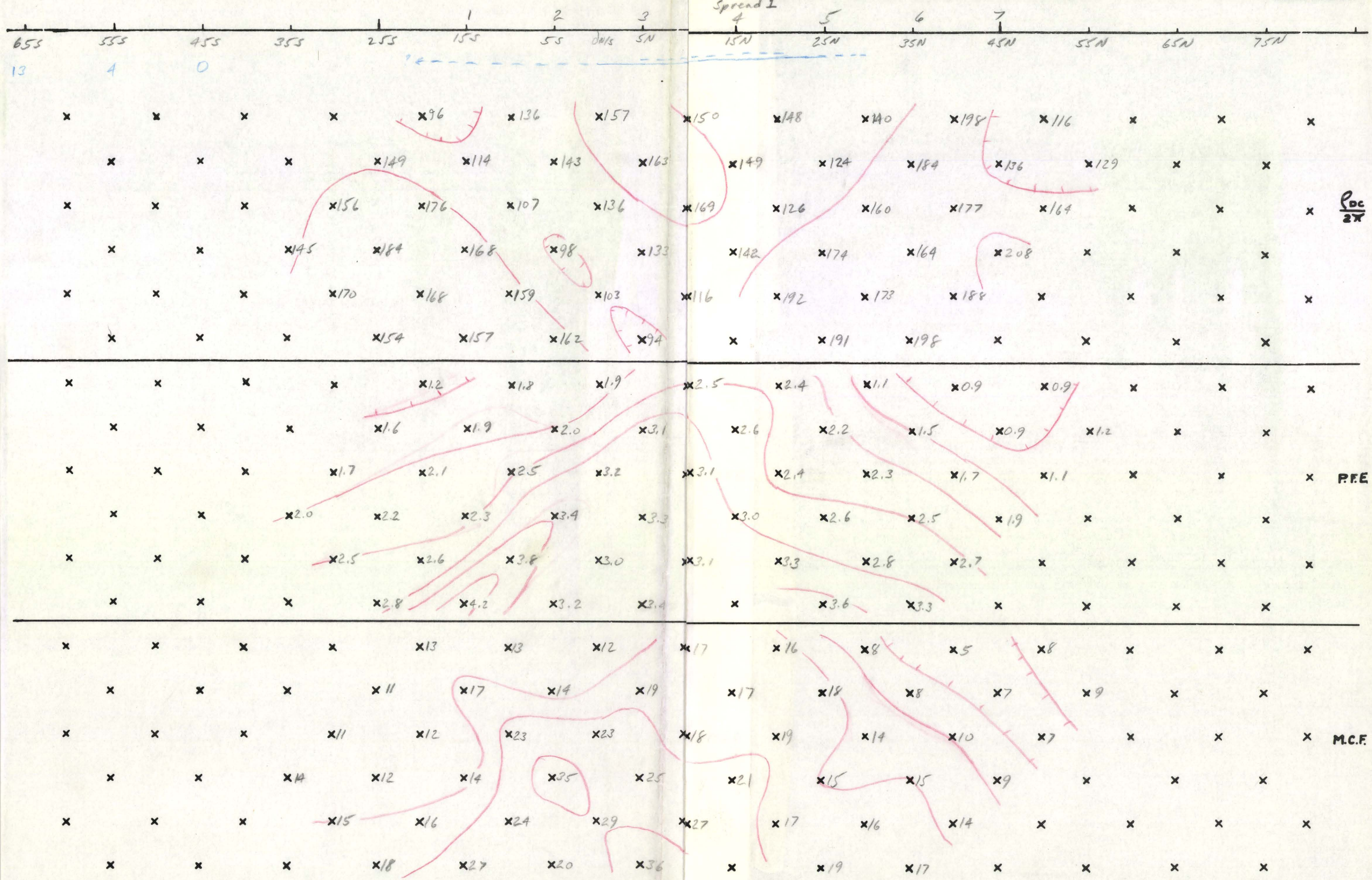
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West



AREA Kelvin-Tipperary 516 LINE 50E a = 1000' SCALE: 1" = 1000' DATE: April 23, 1970 LINE a = ' SCALE: DATE:

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING _____

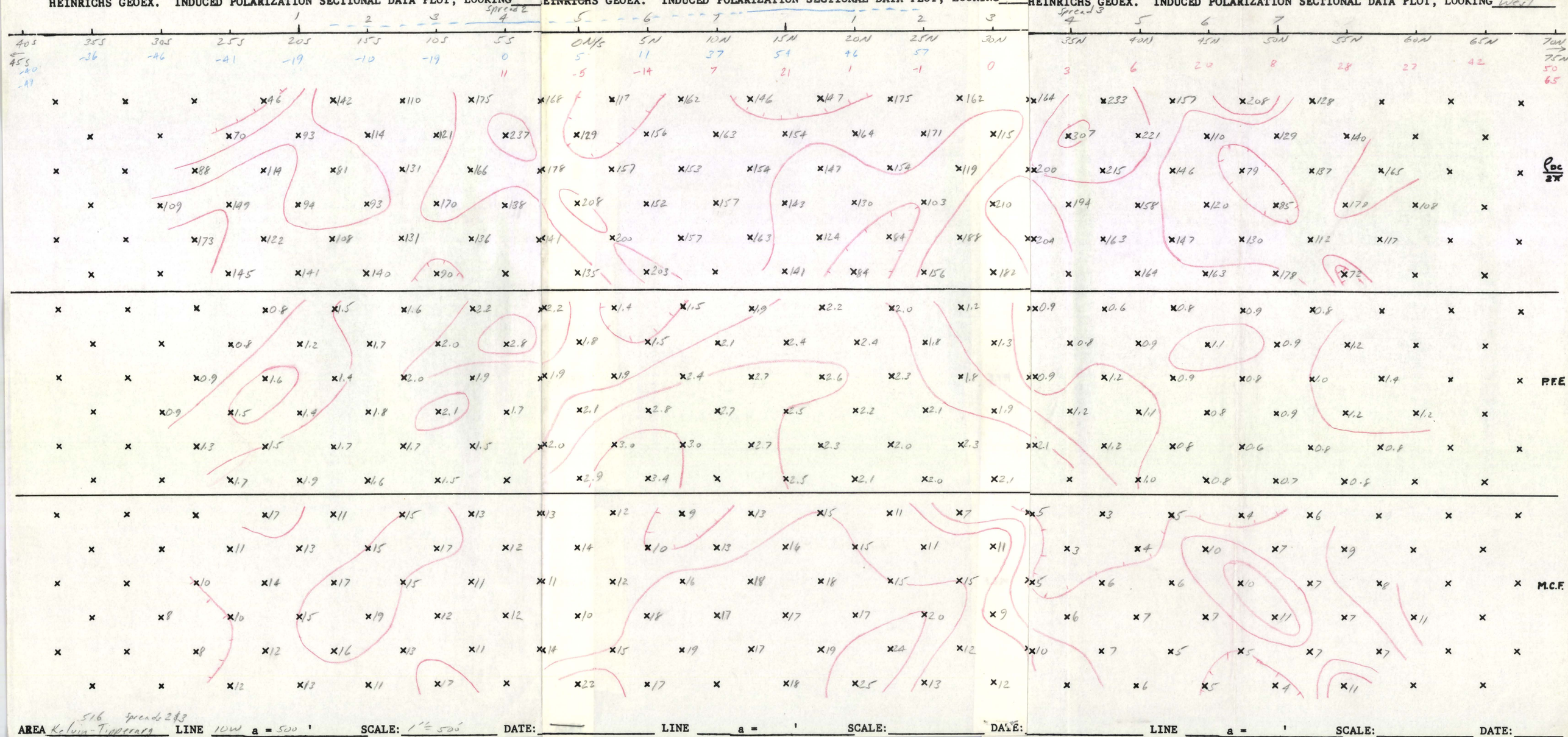
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West



AREA Tipperary-Kelvin (516) LINE 10W a = 1000' SCALE: 1" = 1000' DATE: 3/24/70

LINE _____ a = ' SCALE: _____ DATE: _____

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING _____



AREA Kelvin-Tipperary 5&6 spreads 2&3 LINE 10W a = 500 ' SCALE: 1" = 500' DATE: _____

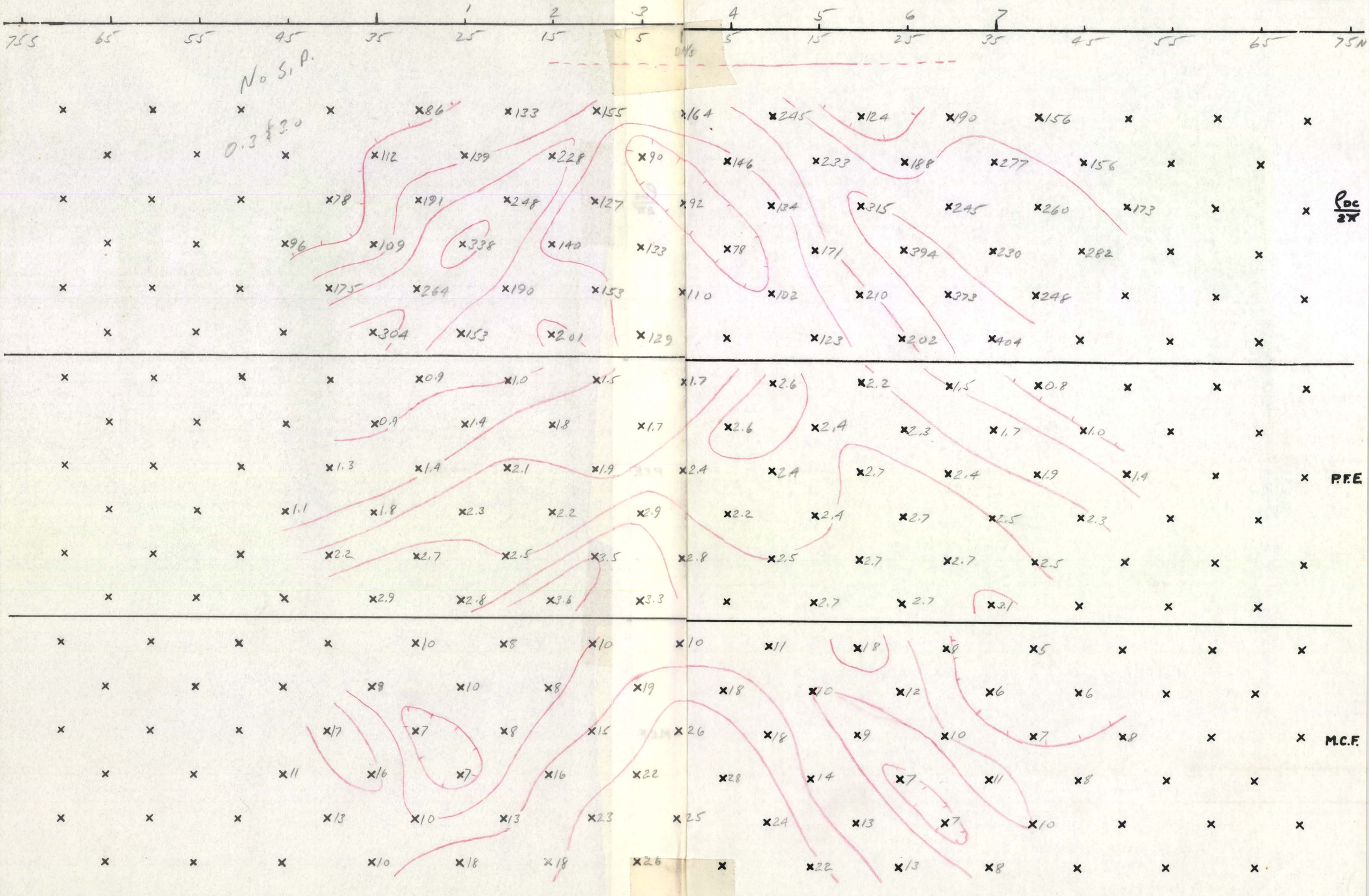
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING _____

LINE _____ a = ' SCALE: _____ DATE: _____

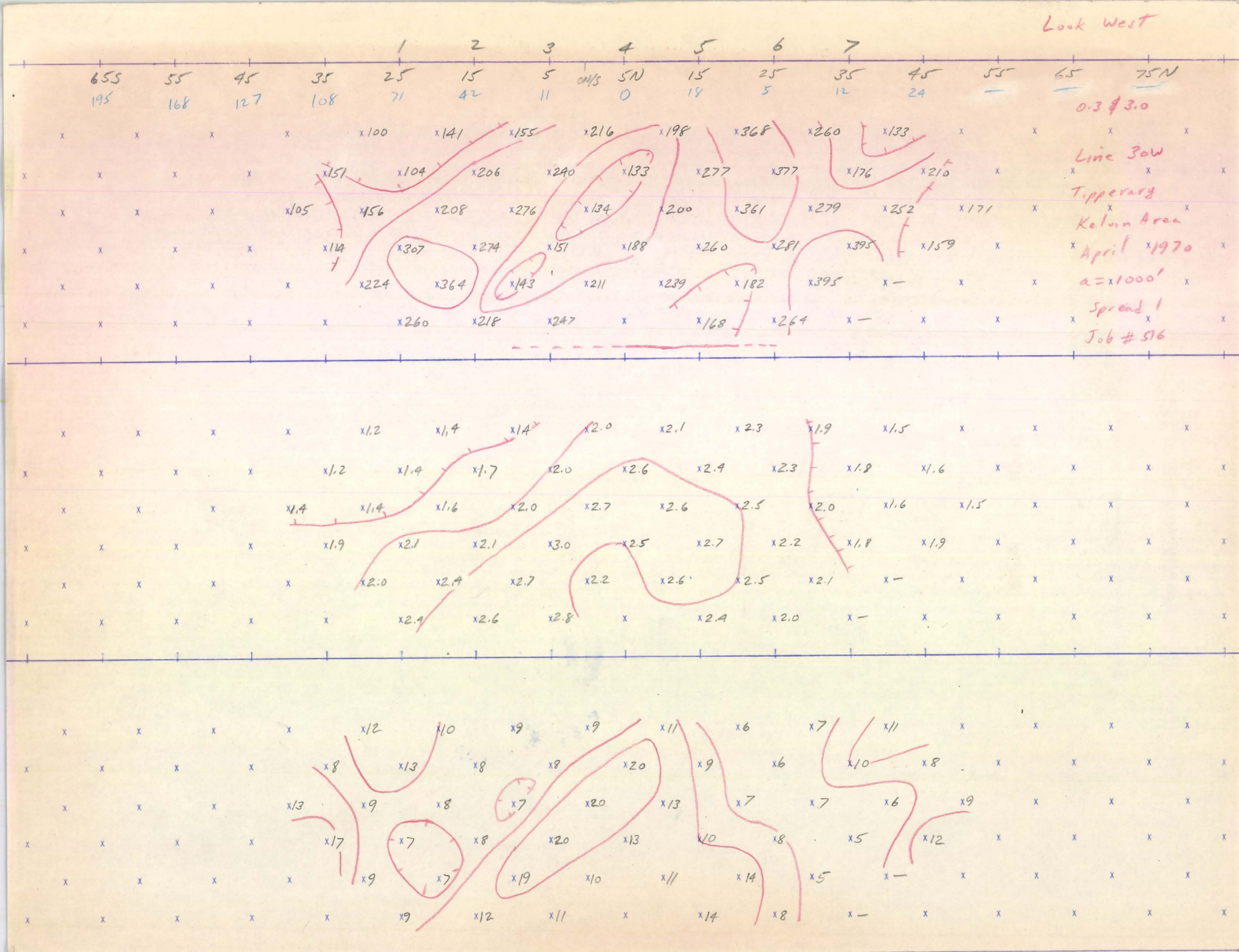
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West

LINE _____ a = ' SCALE: _____ DATE: _____

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING

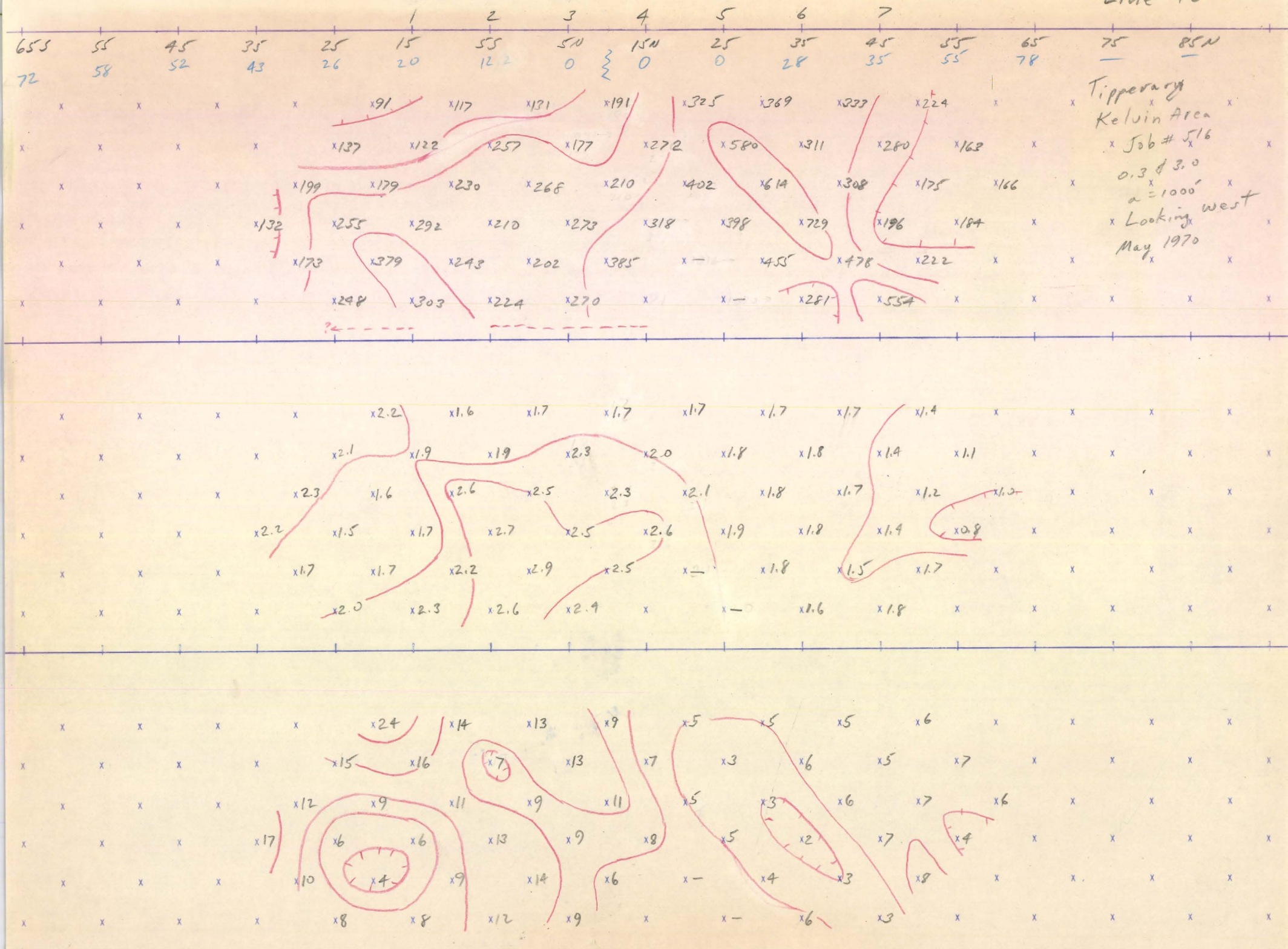


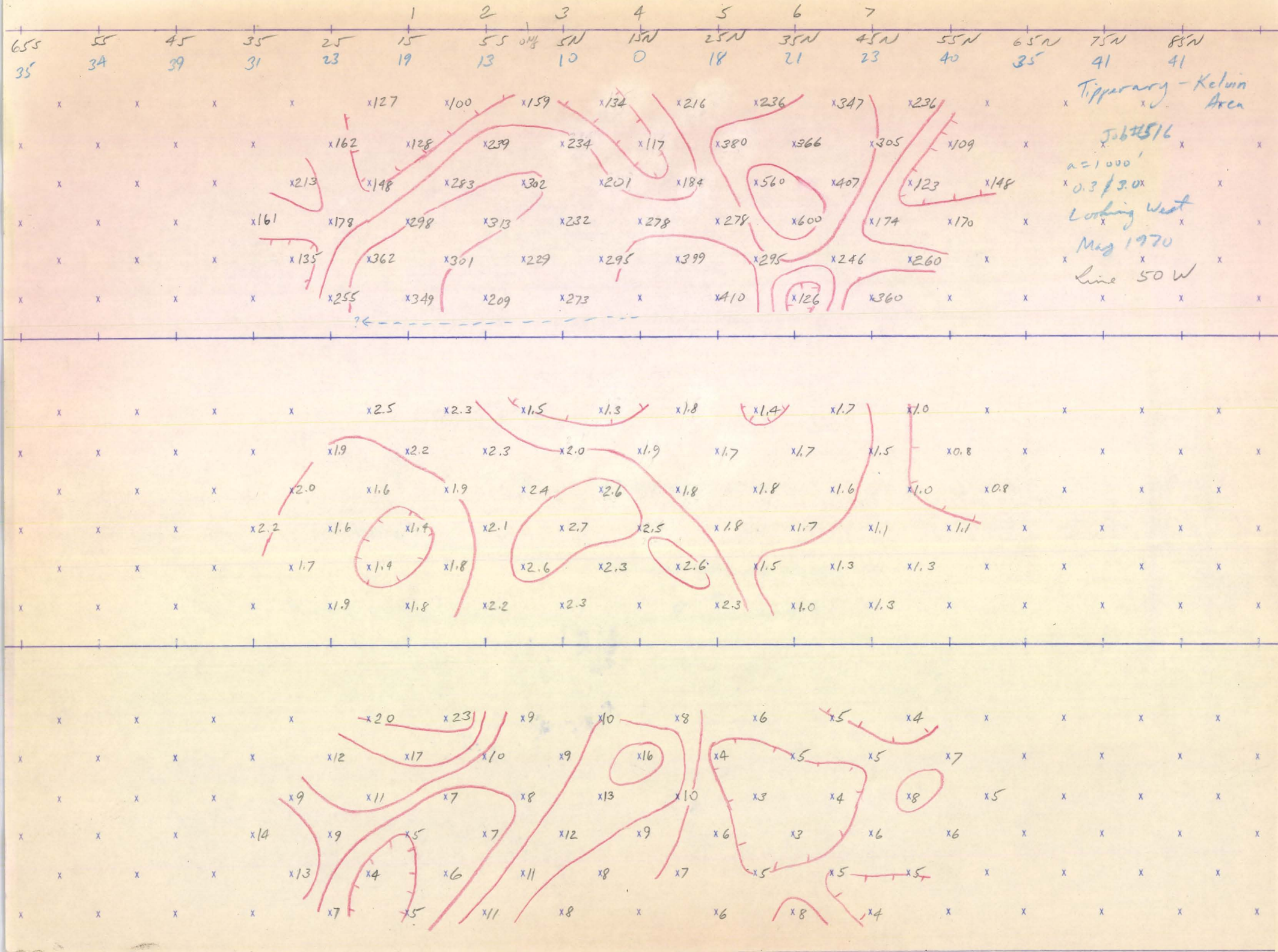
AREA Kelvin-Tipperary LINE 20 W a = 1000.' SCALE: 1" = 1000' DATE: April 28, 1970 LINE a = ' SCALE: DATE:


Look West
1 2 3 4 5 6 7
65S 55 45 35 25 15 5 0N/S 5N 15 25 35 45 55 65 75N
195 168 127 108 71 42 11 0 18 5 12 24
0.3 & 3.0
Line 30W
Tipperary
Kelvin Area
April 1970
a = 1000'
Spread 1
Job # 516

Line 40W

Tipperary
Kelvin Area
Job # 516
0.3 & 3.0
a = 1000'
Looking west
May 1970




1 2 3 4 5 6 7
65S 55 45 35 25 15 5S 0 5N 15N 25N 35N 45N 55N 65N 75N 85N
35 34 39 31 23 19 13 10 0 18 21 23 40 35 41 41
Tipperary - Kelvin Area
Job #516
a = 1000'
0.3 / 3.0
Looking West
May 1970
Line 50 W

Tipperary – Kelvin Job (516)

lowest $\rho_{2\pi}$ ~ 60 ohm-ft

$a = 1000'$, $f = 3.0$ Hz $n = 1 \to 6$

$$\theta = \frac{0.6189 \times 1000}{1000}\sqrt{\frac{3}{60}} = \frac{0.6189}{\sqrt{20}} = \frac{0.6189}{4.47} = 0.138$$

	$\rho_{2\pi} = 60$	120
PFEC$_{n=6}$	≃ 5.6	2.4
PFEC$_{n=4}$	≃ 2.3	1.0
PFEC$_{n=2}$	≃ 0.6	0.2

if $\rho_{2\pi}$ ~ 120

$$\theta = \frac{0.138}{\sqrt{2}} = 0.98$$

$a = 500'$ $f = 3.0$ Hz $n = 1 \to 6$

$$\theta = \frac{0.6189}{8.94} = 0.069$$

	$\rho_{2\pi} = 60$
n	PFEC
6	0.9
4	0.4
2	0.1

O.K. to use 3.0 Hz on 500' = a line 3.0 & 0.3 ?

$$\rho_{2\pi} = \frac{V}{I} K_n \qquad K_6 = 168$$

$$\frac{(\rho_{2\pi})I}{K_n} \sim \frac{60 \times (2 \to 4)}{168} \sim \frac{120}{168} \to \frac{240}{168}$$

$0.7 \to 1.4$ MV

Typical lowest $\frac{130 \times 2}{168}$ 1.5 MV

O.K. to use 3.0 Hz on 1000' = a with coupling corrections & close monitoring

pits: worst 240 Ω (< 100 Ω) → but 70 Ω typical (< 400 Ω) 130 Ω

MK-7 4a @ 400V & 2a @ 800V

$V = IR$ $R = \frac{V}{I}$

∴ currents of at least 2a and some to 4a

∴ Can get by with MK 7 but MK 4 considerably better.

POST OFFICE DEPARTMENT
OFFICIAL BUSINESS

Tipperary

TX

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300

MIDLAND, TX TEXAS CITY
MAY 25 1970
USPO

POSTMARK OF DELIVERING OFFICE

Print your name and address below. If you want to restrict delivery, or to have the address of delivery shown on this receipt, check block(s) on other side. Moisten gummed ends and attach this card to back of article.

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HEINRICHS GEOEXPLORATION CO.

Phone: (Area 602) 6[illegible] [illegible]8

(Cable: [illegible]

P.O. Box 5964 • TUCSON, ARIZONA 85703

POD Form 3811 Apr. 1969 c55—16—71548-1

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DATE DELIVERED
5-25-70

(1) SIGNATURE OR NAME OF ADDRESSEE (*Must always be filled in*)
C. R. Williams

(2) SIGNATURE OF ADDRESSEE'S AGENT, IF ANY
Judy Makowsky

(3) SHOW WHERE DELIVERED (*only if requested*)

c55—16—71548-11 347-198 GPO

In this same vicinity there is some evidence of a fairly steep southerly dip of the overall mineralized zone which may have been intersected downdip by your drill hole near 13N (and perhaps also by your drill hole near 2N if deep enough - say 1500 feet or so). Both of your existing drill holes appear to be within the zone of stronger anomalism as outlined by the 1000 foot dipole coverage but the southernmost hole is quite near the southern fringe and this may explain why it intersected less mineralization than the northernmost hole which is more centrally situated in the anomalous zone. Later on in the project, if still economically encouraging, a deep vertical hole is suggested near 7.5N between the two existing holes. A hole near 7.5N would likely test the best (geophysically speaking) portion of the deeper downdip anomalism and should go to roughly 1500 feet to completely evaluate the width of the section of interest.

However, at this time, a possibly more valuable hole could be collared near 19N on Line OE/W and be drilled vertically for 500 feet or so to evaluate the moderate strength shallow I.P. anomaly. In that this location is also within the moderate strength zone of response noted at depth on the 1000 foot dipole line, and would test it reasonably far (roughly 600 feet north) from the present drilling, it is suggested that the hole be drilled past 500 feet to 1000 to 1500 feet, or so, in depth. It is possible that the near surface anomaly is not really distinct from and stronger than the underlying zone and is only reflecting a shallow weathering phenomenon - another reason to continue drilling below 500 feet.

On Line 10W the near surface anomaly noted near 20N on Line OE/W is absent. The deeper zone does persist to the west and is almost as strong as on Line OE/W but is somewhat narrower and centered near 15N. No drilling is recommended on the line at this time. Targets can be picked when it is desired to further sample the sulfide zone along strike to the west and preferably should be based on the results and correlations from drilling on Line OE/W. Without this data, the best drilling locations on Line 10W appear to be near 17.5N and 7.5N.

Line 10E shows the strongest response to date on the survey - mainly between 5N and 20N. The most shallow response within the zone is centered near 15N and again the source appears to have a relatively steep slope to the south. This anomalous zone can be initially evaluated with a hole collared near 13N on Line 10E and should be drilled to at least 1000 feet in depth. Mineralization is expected from within 150 feet of the surface to at least 1200 to 1500 feet in depth.

HEINRICHS GEOEXPLORATION COMPANY

NEW P. O. BOX 5964
806 WEST GRANT ROAD, TUCSON, ARIZONA, 85703. P.O. BOX 5671. PHONE: (AREA CODE 602) 623-0578

April 1, 1970

Mr. C.R. Williams
Senior Minerals Geologist
Tipperary Resources Corporation
500 W. Illinois
Midland, Texas 79701

Re: I.P. Survey near Kelvin
Arizona

Dear Mr. Williams:

As per your request, this letter is a preliminary interim report on the work accomplished to date on the Kelvin project. We have completed I.P. Lines 10W, OE/W and 10E on both 1000 foot and 500 foot spacings. Sectional data sheets for each line and spacing plus two interpretation plans (one for each spacing) are attached herewith.

The I.P. coverage to date has disclosed a broad, definite but complex, sulfide zone lying mostly between stations 30N and 25S on all three lines within which are several zones of significantly stronger sulfide indications which are discussed in detail below.

On the more detailed (and shallower penetrating) 500 foot dipole spacing coverage, a moderately strong, near surface, depth limited anomaly source is indicated on Line OE/W near 20N and is associated with a self potential low suggestive of actively oxidizing, relatively interconnected sulfides. The top of the source of this anomaly is likely within 150 feet of the surface and continues to 300 or 400 feet below surface where the source may weaken somewhat in strength. This somewhat weaker indicated mineralization persists indefinitely below the near surface body and in fact may persist below 1500 feet based on the corresponding 1000 foot dipole data. In fact, the overall sulfide strength may increase again roughly below 1000 feet in depth.

Both Lines OE/W and 10W show a minor zone of somewhat increased mineralization near 5S having a source coming to within 150 feet of the surface and depth persistence to at least 1200 feet. Drilling should be considered here at some stage of the project and a hole collared near 7S on Line OE/W should give an adequate initial test.

The OE/W - ON/S coordinate is the SE corner of Section 8 and all stations have been designated in hundreds of feet. Drill sites based on the geophysical grid should be measured relative to the nearest existing I.P. stations on the ground to minimize surveying errors thereby helping to maximize intersection of the geophysical targets.

I hope this letter gives you enough information to help position future drilling. The field crew is continuing with the 1000 foot dipole coverage on lines to the east. If you have any questions please let me know.

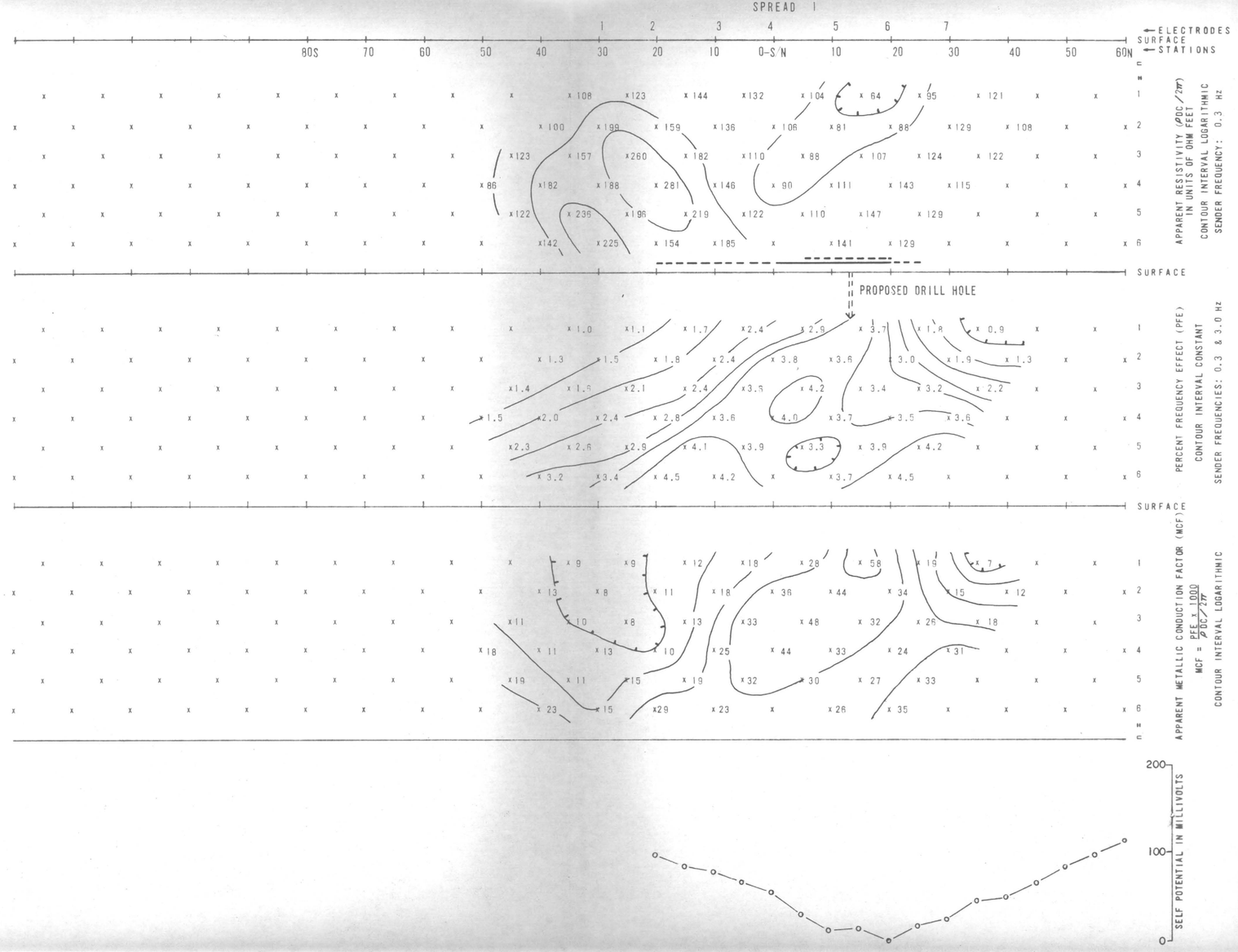
Sincerely,
HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

Enclosures: 2 copies each of 6 Sectional Data Sheets and
2 Interpretation Plans

CSL/re:



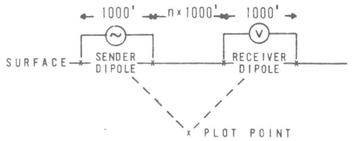
516-70

LINE NO.
10E
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

DIPOLE DIPOLE ELECTRODE ARRAY



AREA
KELVIN

LOOKING
WEST

DATE
MARCH 1970

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GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS
AUSTRALIA
(SYDNEY)
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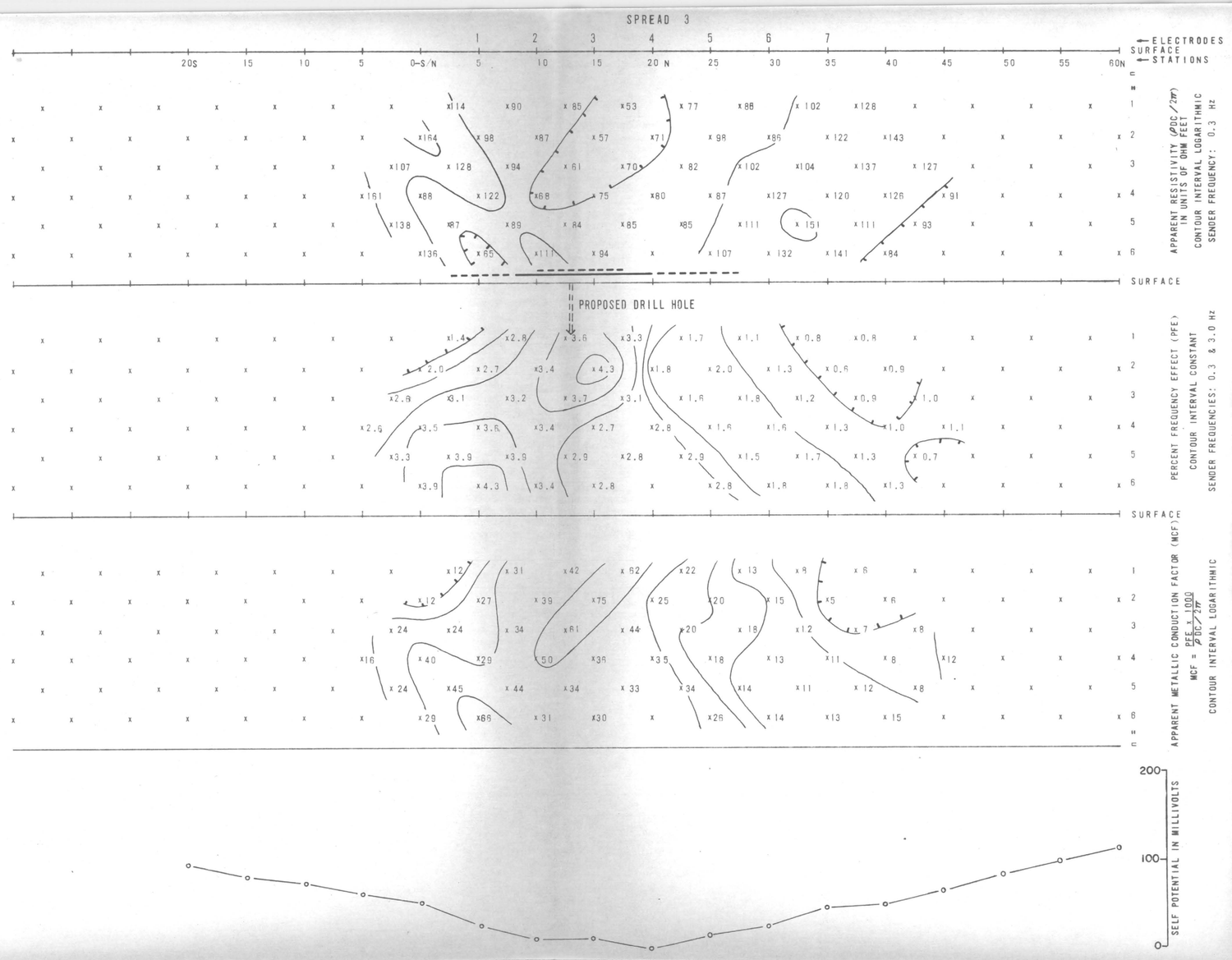
Cable: GEOEX, Tucson



516-70

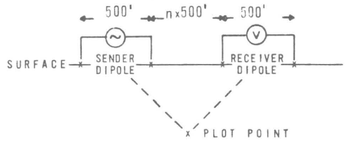
LINE NO.
10E
SPREAD(S)
3

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

DIPOLE DIPOLE ELECTRODE ARRAY



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KELVIN
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DATE
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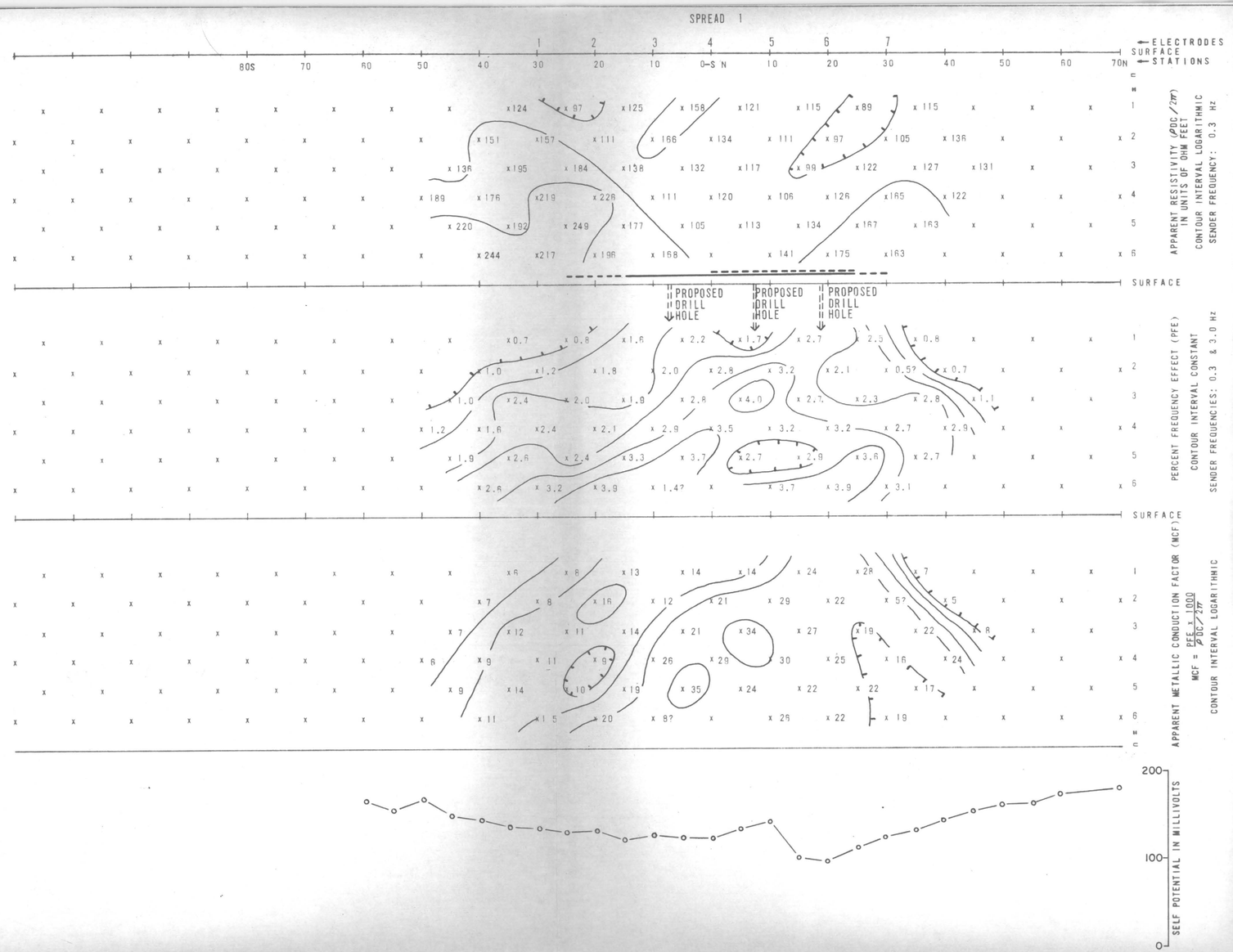


516-70

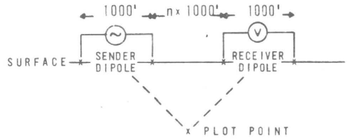
LINE NO.
0 E/W
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

DIPOLE DIPOLE ELECTRODE ARRAY



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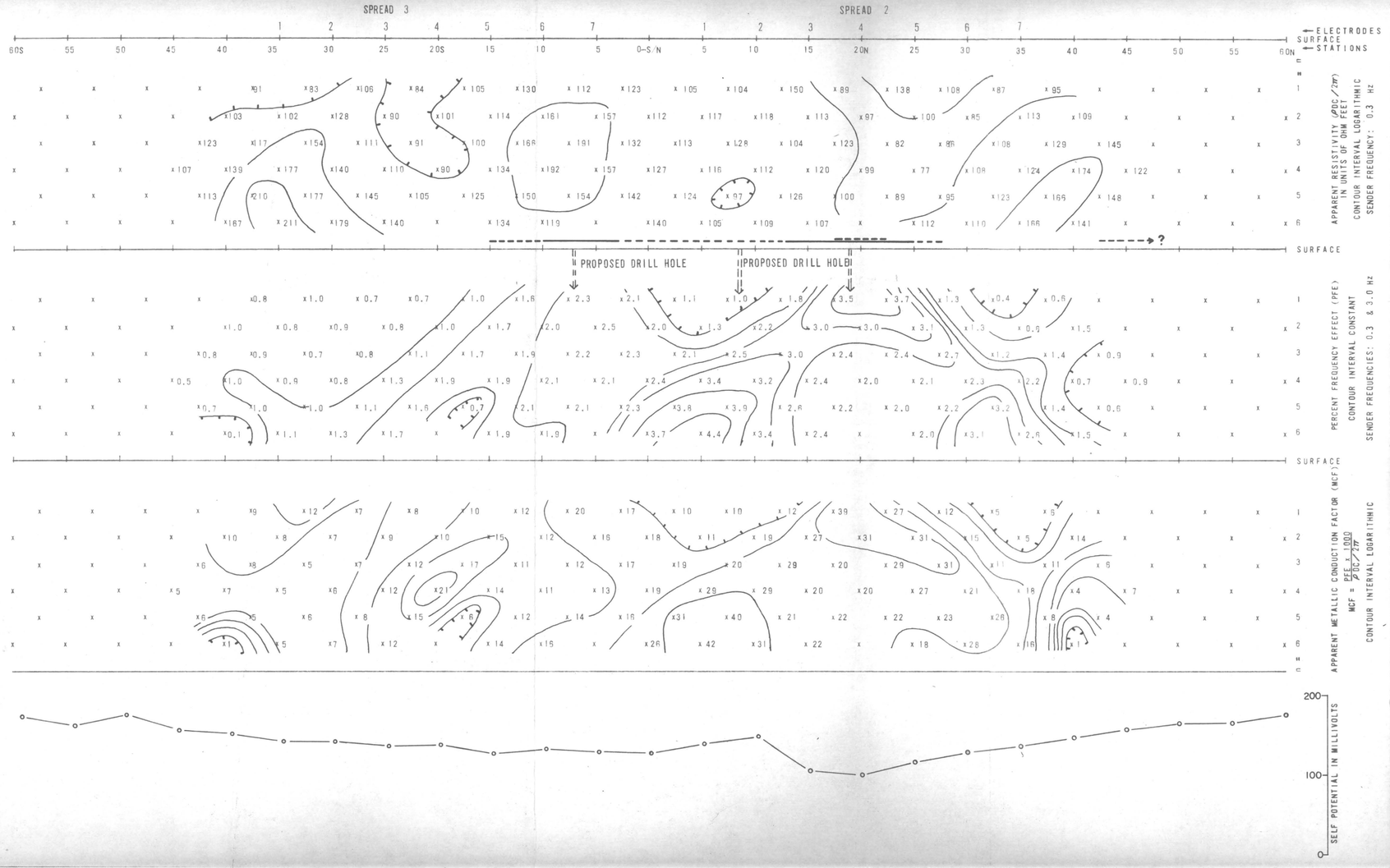


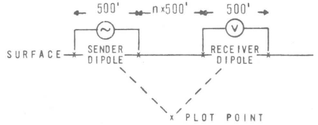
516-70

LINE NO.
0 E/W
SPREAD(S)
2 & 3

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

DIPOLE DIPOLE ELECTRODE ARRAY



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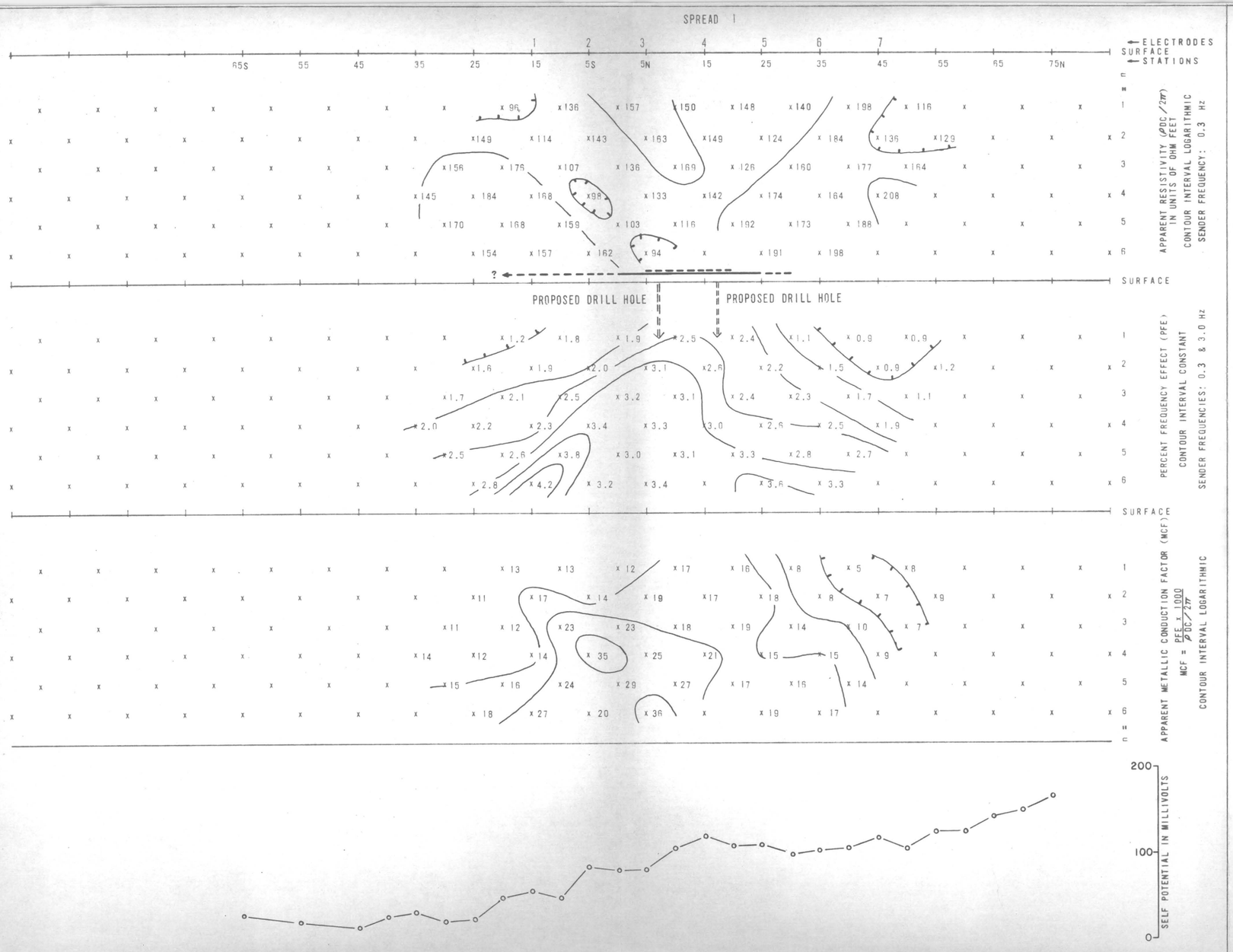


516-70

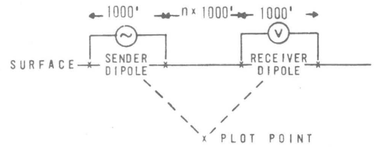
LINE NO.
10W
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for

TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH

DIPOLE DIPOLE ELECTRODE ARRAY



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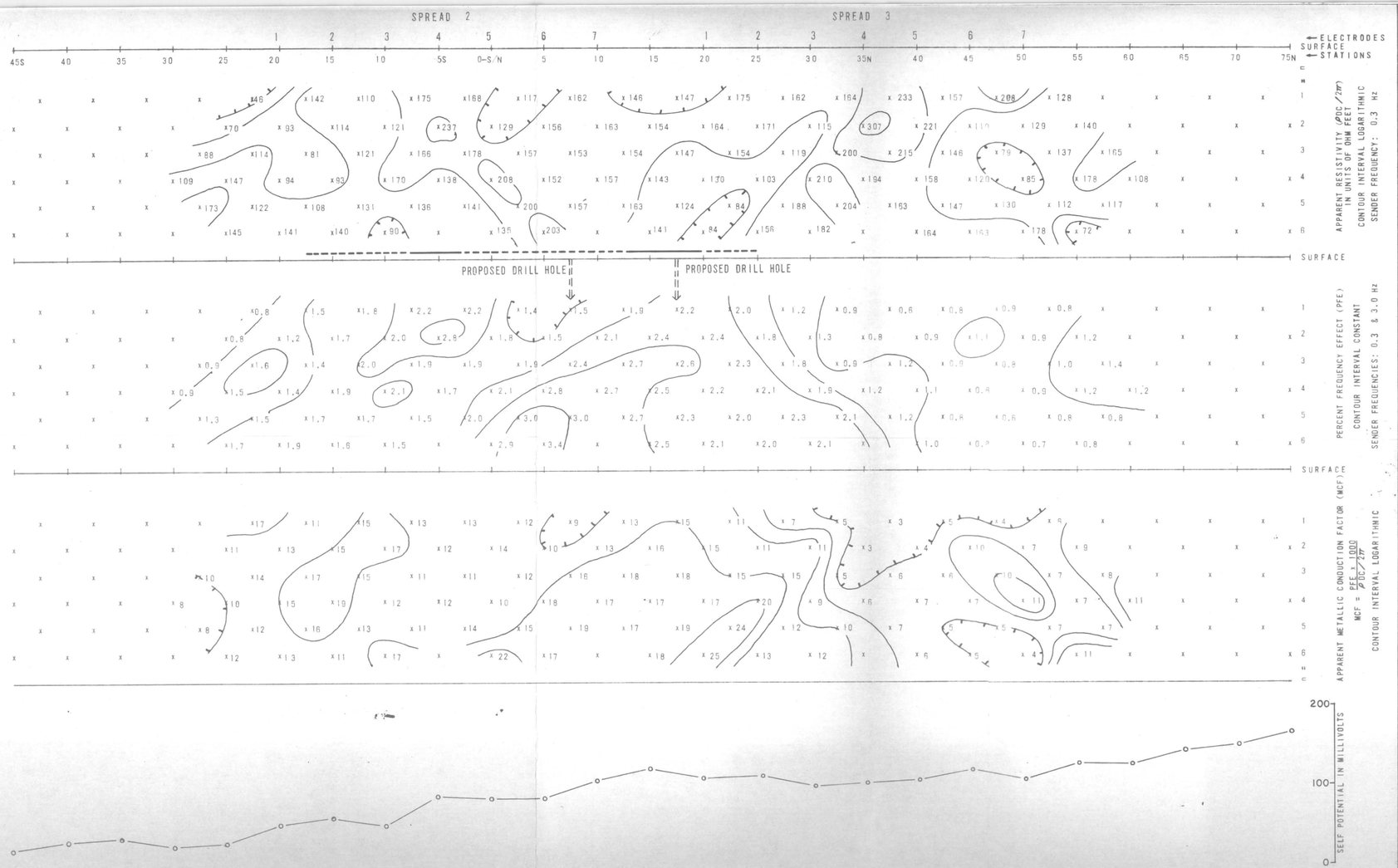


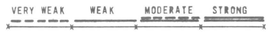
516-70

LINE NO.
10W

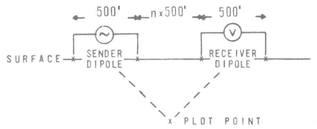
SPREAD(S)
2 & 3

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for TIPPERARY RESOURCES CORPORATION

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



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Kelvin, AZ
Pinal County
GEOL

TIPPERARY LAND AND EXPLORATION CORPORATION

GEOLOGY OF THE KELVIN PROSPECT
T4S R13E PINAL COUNTY
ARIZONA

BY
TIPPERARY RESOURCES CORPORATION

W. P. Zelinski - Geologist
David Brown - Geologist
C. R. Williams - Exploration Manager

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APPENDIX B . . . . . (in pocket)

Note: 2 colored topo maps in pocket showing geology by Zelinski & Brown date: June 18, 1970.

Appendix B ?

No drill hole locations

ILLUSTRATIONS

FIG.

1 LOCATION MAP - RAY-KELVIN AREA, PINAL CO. ARIZONA . . . 2

2 PROSPECT TOPOGRAPHIC MAP SHOWING CLAIM BOUNDARIES . . . 4

PLATES

1 GEOLOGIC MAP OF THE KELVIN PROSPECT

2 DRILL HOLE NO. 1 SAMPLE LOG

3 DRILL HOLE NO. 2 SAMPLE LOG

ABSTRACT

The Kelvin Copper-Molybdenum Prospect located in Pinal County, Arizona, has been the subject of an extensive geological and geophysical program designed to investigate the economic potential of copper-molybdenum mineralization. Review of both local and regional geological relationships points out numerous similarities between structure, petrology, and mineralization at Kelvin and Kennecott Copper's Ray open pit mine five miles to the northeast.

Results of geophysical and geological investigations show the presence of an anomalous zone of sulfide mineralization trending approximately east-west across the prospect. Tipperary drilled two holes on the property, which were located on the basis of surface mineralization and prior geophysical observations (before completion of geophysical surveying). Mineralization in both holes is submarginal to marginal but several short intervals contain ore grade mineral. The leached character of the granite host in the drill holes combined with increasing amounts of sulfide mineralization at increasing depth in Drill Hole 2 may be indicative of an enriched zone at greater depth. Support for this hypothesis are the numerous shows of chalcocite pseudomorphism after pyrite and the highly leached and altered nature of the granite.

The geophysical anomaly tends to be confined between two bordering Laramide intrusives. The northern boundary of the anomaly subparallels a large diorite porphyry dike and the southern boundary parallels an apophysis of a quartz monzonite stock. Because of the restriction of significant mineralization to the main anomalous zone it is possible that the mineralization is the result of hydrothermal migration upward through the basement weakness zone created by intrusion of the monzonite stock and confinement of solutions by the monzonite barrier on the south and the diorite porphyry dike to the north.

Additional exploratory core tests are needed to ascertain the economic potential of the prospect as recommended in the geophysical report.

INTRODUCTION

The Kelvin Copper-Molybdenum Prospect was acquired by Tipperary Resources Corporation in January, 1970 through negotiations with claim owners and prospecting permitees.

An extensive preliminary exploratory program was initiated to ascertain the extent of mineralization in the Kelvin area. A thorough geologic mapping program was initiated to run concurrently with an extensive induced polarization survey and drilling of two holes. This report is a summary of pertinent geological data derived from the current study and a review of the regional geology and ore deposits.

LOCATION AND ACCESSIBILITY

The Kelvin Prospect is located in the Riverside Mining District, also known as the Mineral Creek and Kelvin Mining Districts. (Fig. 1.) The prospect consists of 33 unpatented lode mining claims, one patented mining claim known as the Zelleweger Claim and two state sections. All of the property is in a contiguous block located in Sections 8, 9, 10, 16 and 17, Township 4 South, Range 13 East of the Gila and Salt River Base and Meridian, Pinal County, Arizona as shown on Figure 2. Quit claim deed to additional claims which are not contiguous with the main group have also been obtained.

The property is located five miles south of Kennecott Copper's Ray open cast copper mine which is currently mining 110,000 tons per day. Access to the prospect is via State Highway 177 from Superior,

Arizona, 15 miles south to Kelvin where an improved gravel road extending from Kelvin to Florence, Arizona, intersects Highway 177. This road is followed six miles to the A-Diamond Ranch Road and Southern Pacific Railroad's access turnoff. The railroad access road is followed a distance of two miles to the entrance of Johnson Wash from where a mine road extends south one mile to the prospect.

CLIMATE AND VEGETATION

Temperatures range from a minimum of approximately 20 degrees during the winter months to a maximum of 120 degrees during extreme periods in the summer. Rainfall is scant, averaging between 10 and 15 inches per year. Excessive periods of rainfall create hazardous conditions in the numerous gullies and washes in the prospect area and flash flooding conditions occur in numerous areas between Kelvin and the prospect area.

Vegetation consists predominately of saguaro and cholla cacti. Ocotillo, creosote and paloverde are also common as is mesquite in the lower topographic areas.

CLAIM DESCRIPTIONS AND OWNERSHIP

Tipperary has acquired through a purchase agreement a total of 33 unpatented mining claims in a contiguous block in Sections 8, 9 and 17, Township 4 South, Range 13 East. The relative position of these claims is shown on Figure 2. All of the claims have been

surveyed by Carl Weckerly and Associates, Registered Land Surveyors, Chandler, Arizona. In addition to the unpatented claims mentioned above, one patented claim, known as the Zelleweger Claim was acquired to complete the block so that no internal voids exist. Two State of Arizona sections (Nos. 10 and 16) were acquired for additional coverage. Both sections are held under prospecting permits.

HISTORY

Mining in the Ray area is reported to have begun during the early 1880's at which time many claims in the general area were located and prospected. Although exact records are not available, prospecting in the Kelvin area is thought to have been initiated during the 1910 to 1920 decade. Several old claim papers dating back to 1917 have been found and are thought to represent the earliest stages of exploration in the prospect area. The Zelleweger claim was patented in 1924 and is the most extensively developed property within the prospect boundary. Approximately $40,000 in gold, copper and zinc were reportedly mined from the property in the 1920's and early 1930's. A. H. Johnson located several claims in the area in 1933 (Black Copper Claims) and prospected numerous surface shows for copper and gold. Numerous other shallow pits and tunnels were worked about this time by other prospectors but no large accumulations were found. Johnson continued prospecting the area and located several encouraging shows of molybdenum and copper oxides. The filing of additional mining claims during 1953 through 1957 and the subsequent sinking of two sixty foot shafts on the molybdenum mineralization were the last attempts at small scale production on the prospect.

Inspiration Copper ran two IP lines across the property during 1967 and Minbanco Corporation acquired the property for an exploratory program during 1968-1969.

Minbanco drilled nine exploratory holes on the property from September to December of 1968. Drilling procedures and sample collecting were inadequate for complete evaluation. Results from preliminary induced polarization lines pointed out anomalous sulfide concentrations which were only partially tested by drilling. A more complete description of the work done and results obtained is compiled in Appendix A.

Tipperary acquired the prospect in December of 1969 and initiated a detailed exploratory program utilizing geologic, geochemical and geophysical techniques. Geologic mapping was done on a 1" = 200' horizontal scale using plane table and alidade. Both fracture system and mineralization overlays were prepared to be superimposed upon the basic geologic map. All old mine workings were mapped and systematically sampled and a petrographic examination of the various rock types was initiated by the Colorado School of Mines Research Institute. Results of the School of Mines research is presented in Volume III.

A detailed geophysical survey program was designed for the Kelvin area with the technical assistance of Heinrich's Geoexploration of Tucson, Arizona. A north-south grid system was designed to evaluate the postulated mineralization by utilizing induced polarization techniques. Both 500 foot and 1000 foot dipole arrays were used. A complete report of all geophysical survey work conducted by Heinrich's is presented in Volume II.

GENERAL GEOLOGY

A general review of the basic geology of the Ray quadrangle and Tortilla Mountains is necessary to provide an adequate background for the more detailed study of the Kelvin prospect area. Numerous parallelisms and similarities between surficial geology of the Ray mine area and the Kelvin prospect area can be noted.

Physiographically the Ray - Kelvin area may be classified as lying in the Mountain Region of Southeast central Arizona. The mountain region is characterized by numerous short relatively parallel mountain ranges, few of which exceed fifty miles in length. The Ray-Kelvin area is traversed by two of the typical ranges in a southeast to northwest direction.

The Dripping Spring Range, six miles northeast of the Kelvin Prospect, east of the Ray open pit presents a complicated picture of numerous small fault blocks composed mostly of Paleozoic sediments and irregular intrusives. Southwest of the Dripping Spring Range is the Gila River valley which is characterized by extensive thicknesses of Quaternary Gila conglomerate. The Tortilla Range marks the southwestern edge of the mountain region. The higher portions of the range consist mainly of Pre-Cambrian granite with younger intrusives flanked by sharp narrow ridges of the lower Paleozoic sedimentary formations on the east and a gentle slope to the west. The Kelvin Prospect is situated on the northern portion of the Tortilla Range.

The geologic section in the Ray - Kelvin area consists of Pre-Cambrian Pinal Schist and granitic rocks overlain by the Apache Group, a sequence of Scanlan conglomerate, Pioneer shale, Barnes conglomerate, Dripping Spring quartzite, Mescal limestone and basalt. Succeeding the Apache group is the Troy quartzite, Martin limestone (Devonian), Escabrosa limestone and undifferentiated Cretaceous limestones. Numerous diabase sills, dikes and irregular intrusives were emplaced during late Paleozoic or early Mesozoic time.

To the south of the Ray - Kelvin area is a sequence of andesite tuff, breccias and flows cut by andesitic to monzonitic dikes. Eruption of the andesites was followed by an intrusive cycle of quartz diorite, granite, quartz monzonite porphyry, and quartz diorite porphyry during the Laramide. The granitic and monzonitic rocks are closely related to the copper deposits of the general area. Late Tertiary time is represented by extensive dacite flows which have been broken by faulting and erosion. The Gila conglomerate of Quaternary age occupies a large portion of the present day Ray - Kelvin area and has been deformed by extensive faulting and erosion.

The relationships of the various intrusive rocks in the Ray - Kelvin area have been studied in detail by the U.S.G.S. (Professional Paper 115) and are summarized below:

<u>Precambrian Granite (Biotite Granite)</u> - according to the U.S.G.S. this rock type crops out over most of the Tortilla Range and is the dominant rock type of the Tortilla

batholith. Composition of the granite varies slightly but is principally potash feldspar phenocrysts in a ground mass of anhedral plagioclase and quartz with
unbound by xtal faces
moderate amounts of biotite.

Mesozoic Diabase - The diabase intrusives in the vicinity of Ray and Kelvin intrude all rock types up to and including the Cretaceous limestones. It is conceivable, however, that repeated intrusions of diabasic magmas during separate geologic periods account for the irregular and apparent dissimilar nature of many of the intrusions. Petrographically the diabase is a dark gray to black holocrystalline medium grained to aphanitic rock with
essent. all xtalline
accessory magnetite and large tabular plagioclase crystals. Younger diabase dikes cut across some older diabase and are typically the finer grained variety. Mineralogically the diabase is composed of labradorite, augite, olivine and accessory amounts of biotite, apatite, titanite and magnetite.

Quartz Diorite - Quartz diorite dikes and irregular intrusive bodies crop out in numerous areas within the Ray - Kelvin vicinity. The rock is light to dark gray, of fine grained texture and normally consists of hornblende, augite, and biotite crystals in a mass of euhedral plagio-
bound by x tal faces
clase with anhedral orthoclase, interstitial quartz and accessories of titanite, magnetite and apatite. The quartz diorite is the oldest of the Tertiary intrusives.

Quartz Monzonite Porphyry - Several small irregular intrusions are recognized west and southwest of Ray. Most of the Monzonite porphyry is associated with copper mineralization. Petrographically the rock is light-gray to white and consists of plagioclase phenocrysts and a medium grain groundmass of quartz, orthoclase and occasional biotite. Age of the monzonite is Tertiary.

Quartz Diorite Porphyry - Numerous dikes, sills, and irregular intrusive bodies crop out in the Ray - Kelvin area. Ore deposits at the Christmas mine appear to be genetically dependent upon the quartz diorite porphyry.

Petrographically the rock varies radically in both texture and composition but is typically exemplified by the larger intrusions as a light gray speckled rock with phenocrysts of white plagioclase, black biotite, or quartz in a fine groundmass of the same composition. Most of the dikes exposed show extreme textural differences between the central core and outer fringes.

Several other rock types occur in the Ray vicinity but are not pertinent to the area under study or to the ore deposition in the area.

STRUCTURE

As described previously, this area is characterized by north-northwest-trending mountain ranges. Regionally the fault systems parallel the mountain ranges. Most faulting in the area is normal, but thrust and reverse faults are also represented. Repeated movement of the prominent faults dates back to the Precambrian.

RAY ORE DEPOSITS

A review of the mineralization at Ray is provided for background information and because of its proximity to the Kelvin Prospect.

Disseminated copper mineralization at Ray covers an area roughly two miles square and at least 3000 feet in its vertical dimension. The ore body is a combination of supergene enriched ore which occurs as an irregular blanket of considerable thickness and large zones of copper oxides in the eastern portion of the Ray pit.

Ore minerals consist of hypogene pyrite, chalcopyrite, molybdenite, and bornite with traces of galena and sphalerite. Chalcocite is the dominant secondary sulfide and is the most important ore mineral. Native copper, cuprite and chalcotrichite along with chrysocolla comprise the bulk of the oxidized portions of the ore body.

Past production has come mainly from enriched zones in Pinal Schist. Ore grade is erratic and at present averages less than one percent copper. Protore in the leached schist capping averages between 0.1 and 0.2 percent copper. Because of this leached capping totalling approximately 500 feet the supergene ore body is believed to have originated from protore of the same grade.

Diabase intrusives in the Ray Mine form an important ore reserve as they were apparently the most important primary host rock in the area. The diabase exhibits little or no enrichment and copper values are thus derived from primary chalcopyrite. Diabase containing primary sulfides are often found above rocks which have been leached.

Alteration of the rocks in the Ray mine area is of three types as follows:

1. Biotite-orthoclase
2. quartz-sericite
3. propylitic - chlorite, epidote, clay minerals, etc.

Each of the alteration types is considered to be of hypogene nature.

Ore controls of the Ray mine are essentially structural with the primary controlling agents being the major faults and the zone of basement weakness along which the Granite Mountain Porphyry intruded.

GEOLOGY OF THE KELVIN PROSPECT

Surface geology of the Kelvin Prospect area is similar to the geology at Ray in some respects. The dominant host in the Kelvin Prospect is the Precambrian granite of the Tortilla Mountain batholith. The granite has been fractured, faulted and subsequently intruded by a wide variety of dikes, sills, and irregular bodies of rock ranging in composition from diabase to aplite. Repeated movement along fractures and faults has resulted in the broken nature of the rocks as is apparent on the geologic map. A discussion of the petrology of the various rock types and a review of their field relationships is presented to establish a basic geologic environment suitable for the emplacement of ore deposits.

Precambrian granite - (Grayback granite)

The granite of the Tortilla batholith crops out in over 60 percent of the mapped area. Typical hand specimens exhibit a medium grained texture ranging from light gray to pink in color. Common

minerals are phenocrysts of pink orthoclase feldspar, occasionally of a perthitic texture; quartz, both interstitial and as phenocrysts; and accessory amounts of magnetite, biotite, plagioclase, hornblende and apatite. The granite outcrops form rounded, highly weathered slopes except where silicification and sericitization has occurred. Alteration of the granite is intense over most of the mapped area and contact metamorphism is present to a lesser degree adjacent to intermediate dikes and irregular intrusives. The granite exhibits both propylitic and quartz-sericite stages of alteration and appears to have undergone an intense alteration along fractures where secondary orthoclase has been formed.

The granite host is highly fractured throughout the mapped area as evidenced by the geologic map. Many of these fractures are associated with the transecting dikes, but there are a number not associated with the exposed dikes. The geologic map shows the preponderance of fractures accompanied by disseminated sulfides along the fracture borders and also the presence of iron staining, goethite and limonite, and sulfide boxwork structures.

Mineralization in the granite is of two main types; primary sulfide minerals disseminated throughout the granite and more particularly associated with the feldspars and sulfide minerals along microfractures and quartz stringers. Mineralization is also present in the granite adjacent to many of the intermediate to basic dikes. Examination of available drill hole cuttings shows the persistence of low grade mineralization at depth in the granite, but also shows a marked leaching effect near the surface and a

partially leached zone down to approximately 1500 feet. Propylitic alteration is present at all depths thus far examined in drill hole cuttings.

Dacite porphyry - (Diorite porphyry)

The difference in terminology as applied to the porphyry dike systems is basically due to groundmass size rather than compositional differences. The dikes exhibit great textural changes from the central core to the outer fringes and representative samples are difficult to obtain. The dacite porphyry dikes intrude the Precambrian granite, diabase dikes and diabase porphyry dikes. Compositionally the dacite porphyry contains large 3 to 6mm phenocrysts of anhedral to subhedral quartz and occasional smaller phenocrysts of plagioclase and biotite in an aphanitic groundmass of gray to black augite, olivine and pyroxene with minor accessories of magnetite and apatite. At least two separate cycles of intrusion are represented by the diorite porphyry or dacite porphyry.

The majority of the dikes are more accurately described as quartz diorite porphyry or granodiorite porphyry depending upon varying amounts of potassium feldspar. These coarser grained dikes are younger than the dacite porphyry dikes.

Andesite - (Diabase)

Terminology is dependent upon grain size as in the dacite above with andesite pertaining to the finer grained variety. The diabase dikes are identical to the diabase of the Ray Mine area. Compositions vary considerably from the central portions of the dikes to their

borders. Typical diabase dikes show an aphanitic texture with occasional plagioclase phenocrysts.

Andesite Porphyry (Porphyritic Diabase)

The porphyritic diabase dikes crop out in scattered areas within the prospect and are not as numerous as the diabase above. The main difference is the tabular or rice grain shaped plagioclase phenocrysts. A few dikes contain dark pyroxene phenocrysts in an aphanitic groundmass.

Quartz Latite Porphyry (Quartz Monzonite Porphyry)

A quartz monzonite porphyry stock, intruded along a general east-west trend, is present in the southern part of the prospect. The monzonite is generally fresh with no significant alteration except along narrow east-west trending fractures where molybdenite and pyrite occur in small quantities.

The quartz monzonite or quartz latite depending on groundmass textures generally consists of anhedral quartz, orthoclase, plagioclase and biotite. A number of small metamorphosed biotite schist xenoliths and dacite porphyry xenoliths are present in the monzonite.

Aplite and Pegmatites

Aplite and pegmatite dikes are the youngest of the intrusives present in the prospect area. The aplite is a pink, fine grained rock consisting primarily of orthoclase feldspar, quartz and muscovite. Pegmatite veins consist of large massive quartz zones and large subhedral to euhedral crystals of orthoclase with minor

amounts of black tourmaline and occasional garnets. These dikes are generally fresh except near east-west or northwest-southeast trending fracture zones where pyrite, limonite and hematite fill fractures in the pegmatites.

Alteration

As discussed briefly in the section on rock descriptions two main types of alteration are prominent in the prospect area - propylitic and sericitization. A third type of alteration exemplified by the formation of secondary orthoclase is occasionally present along prominent fractures in the host granite and along margins of crosscutting dikes.

Propylitic alteration is the most extensive alteration type found in the prospect area as it occurs in virtually all rock types. Alteration products are typified by chlorite and epidote with minor amounts of albite, montmorillonite, limonite and sericite. Bleaching effects are also prominent.

Zones of quartz-sericite alteration are scattered throughout the area and are most prominent along east trending dikes and fracture systems. Several silicified zones occur in the granite along the east-west trends with no apparent relationship to the exposed dikes or other intrusive bodies.

Secondary alteration products such as limonite, goethite and jarosite are also present in scattered fracture systems and are pronounced in the vicinity of the Zelleweger claim.

Structure

Structure is the most important localizer of mineralization in the prospect area as well as in the Ray District. Prominent north-south, east-west, northwest-southeast and northeast-southwest faults marked by the dike systems intruded along zones of weakness and offsets of dikes show results of repeated movements through geologic time.

The north-south fracture pattern is the most obscure and oldest of the faulting in the area. Its existence is marked by diabase dikes striking north-south and apparent north-south offsets in the granite. Very little alteration or mineralization is present along this set of fractures. North-south diabase dikes are offset by east-west faults and the north-south movement occurred prior to quartz monzonite and quartz diorite intrusions.

Most of the diabase, quartz diorite and quartz monzonite dikes have been intruded along east-west fractures. Strike-slip movement is evident along a few vertical east-west faults. Many of the east-west striking dikes have been cut by northwest trending faults dipping steeply to the southwest (60° - 80°). The northwest dikes are extensively altered and contain significant mineralization. Heavy iron staining and copper oxide stringers crop out along these faults.

The intrusion of a large quartz latite (monzonite) porphyry stock in the southern part of sections 8 and 9 apparently occurred along a major weakness in the Precambrian structure. Mineralization associated with the later stages of intrusive activity appears to be closely

related to the quartz latite porphyry particularly along the outer margins although the major portion of the stock to the south and west of the prospect area is barren.

Minor east-west trending shear zones are developed in at least three places as indicated on the geologic map. The shear zones show evidence of repeated movements and contain significant amounts of molybdenum and copper mineralization. The shearing has altered a diabase or andesite dike into a chlorite-sericite schist and the host granite has undergone propylitic alteration and, to a minor degree, silicification. Disseminated molybdenite is present in the granite adjacent to the shear zones.

Mineralization

Mineralization in the Kelvin prospect is predominately copper-molybdenum with trace amounts of silver and gold.

As mentioned above the fracture systems and faults apparently control near surface mineralization. Most of the exposed dike systems carry copper oxides and contact zones show disseminated copper and molybdenum mineralization. The shear zones and adjacent wall rocks both carry copper and molybdenum mineralization.

Copper mineralization in the form of chrysocolla, azurite, malachite, chalcocite and melanconite occur in fractures in the granite and along the fringes of the quartz latite porphyry. Oxides also occur in the diorite porphyry dikes, diabase dikes and in silicified zones. Remnant sulfide zones containing chalcopyrite and pyrite have been found in scattered outcrops in the shear zones and along the north-west trending faults.

A drift 500 feet long has been cut along one of these northwest trending faults on the Zelleweger claim. The wall rock, Precambrian granite, has been sericitized and propylitized. Veinlets and stringers of chalcopyrite, bornite, chalcocite (after pyrite), sphalerite and specular hematite occupy fractures in the granite wall rocks. Some disseminated pyrite, chalcopyrite and minor amounts of bornite occur in the wall zones. Chalcanthite, leached from the granite is abundant along the entire length of the underground workings. Surface exposures of the northwest faults exhibit extensive chrysocolla veinlets and heavy iron staining. Numerous other shallow workings expose varying degrees of copper oxides.

Molybdenum mineralization is exposed in several shallow workings on the prospect and is most conspicuous on Rare Metals Claims 1 and 2 west of the southernmost minor shear zone and in Rare Metals 4. Ferrimolybdite and molybdenite are the most common molybdenum bearing minerals. A small quantity of powellite was also noted. The molybdenum minerals are found along fractures in the granite, along the northern fringe of the quartz monzonite porphyry intrusion, in the shear zones and in quartz veinlets. Both fracture fillings and disseminated mineralization are present.

Zinc mineralization has been noted in samples from the Johnson Prospect and in the Zelleweger tunnel. The ore mineral is the zinc sulfide, sphalerite.

Gangue constituents in the fault zones and quartz veinlets consist of minor amounts of calcite, barite and iron oxides. A quantity of specular hematite occurs along the minor shear zones in association with calcite and chlorite.

Previous Exploratory Programs

To fully understand the results of previous data derived from drill holes a review of drilling procedures and sample collecting techniques is necessary.

Minbanco Corporation initiated exploratory drilling on the prospect in late 1968. Drilling was accomplished using an air hammer technique and rock bit methods when encountering excessive water and samples were collected from the sample trench leading to the mud pits.

Due to extensive mixing of samples in both techniques a representative sample was difficult to obtain. Examination of many drill samples indicates considerable contamination occurred. Logs of the drill holes 1 through 4 and 6 through 9 are included in Appendix "A". Rock names were apparently derived from visual examination. As shown on the logs no distinction was made between quartz monzonite and granite and contacts can only be inferred between granite and monzonite in the available logs. Locations and depths of drill holes as shown on Minbanco's map were apparently designed through use of geologic and geophysical data. Inconsistencies between interpretation of the geophysical anomalies and the location of drill holes are apparent and are probably due to a lack of complete geophysical data. Sulfide mineralization encountered in drill holes J-1 and J-2 shows low grade copper and molybdenum. Accuracy of the samples is not known.

Tipperary Resources Corporation drilled two tests as located on the geologic and geophysical maps. Both tests were drilled on the basis

of surface geological features and proximity to shallow mineralization encountered in Minbanco's J-1 and J-2 drill holes. Both tests were designed to drill to a depth of 1500 feet.

A unique approach to hard rock drilling was utilized in the project to insure good sample recovery. A con-cor reverse circulation rig utilizing a double string of drill pipe and a revolutionary new sample catcher were used by the drilling contractor, Elenburg Exploration Inc. The sample collection system involved cycling all of the sample and drilling fluids through a rotating circular splitter which retains one-quarter of the sample and fluids. The portion retained was cycled through sizing screens and into a centrifuge which recovered all of the fine particles. Due to the tendency of molybdenum to escape by suspension in the drilling fluids a Baroid Molybdenum depressant was used to settle out and coagulate molybdenite particles.

No circulation problems were encountered and sample quality was considered excellent.

Results of drilling the initial two holes are inconclusive in establishing the presence of an ore body. This is due to (a) the submarginal grade of mineralization in both holes and (b) the hole location relative to anomalies shown by the 1-P surveys. Copies of both drill logs are in Appendix B with corresponding petrologic names and assays. Copper equivalents for the molybdenum mineralization are also presented and are calculated on a ratio of 5 to 1, or 0.1% Mo = 0.5% Cu.

Drill Hole No. 1

Located 125' FSL and 300' FEL of Section 8, drill hole No. 1 was spudded in alluvium and encountered Precambrian granite at 36 feet. The granite exhibited propylitic alteration and traces to 2% of sulfide mineralization. The quartz latite porphyry stock (quartz monzonite) was encountered at 225 feet and continued to 918 feet. Precambrian granite was encountered from 918 feet to 1400 feet. Two minor zones of metallization were encountered. The upper zone from 135' to 144' contained an average of 0.6% Cu and 0.05% Mo. This zone was encountered immediately above a narrow diabase (andesite) dike. The lower zone from 720' to 785' averaged approximately 0.2% Cu and 0.1% Mo. Several five foot zones show significantly higher grade mineralization as shown on the log in Appendix B.

It is significant to note that alteration of the granite and partial leaching of the pyrite and chalcopyrite disseminated throughout the granite occurs beneath the quartz latite stock.

The position of the drill hole is toward the southern edge of the geophysical anomaly and is not a true test of the anomalous conditions.

Drill Hole No. 2

Located approximately 1260' FSL and 150' FWL of Section 9, Drill Hole No. 2 was spudded in Quaternary alluvium and encountered Precambrian granite at 30 feet. The granite is highly altered and exhibits strong propylitic alteration. Bleaching and heavy iron staining are common. A number of narrow diabase dikes were

encountered in shallow drilling. Larger dikes of granodiorite and diorite porphyry were encountered at a depth of 650' to 765'. (See Appendix B)

Mineralization in Drill Hole No. 2 varies from background content to marginal grade. The granite is highly altered and partially leached to a depth of approximately 900 feet. The most common alteration products are limonite, goethite, hematite, epidote, chlorite, montmorillonite and secondary orthoclase. Ore minerals are chalcopyrite, pyrite, chalcocite, bornite and molybdenite. The mineralization is of the disseminated type although occasional fractures and veinlets are mineralized. It is significant to note that the leaching effect on the granite and associated ore minerals has produced some replacement of pyrite grains by chalcocite. It is also apparent that the copper content, although of a submarginal grade, has generally increased with depth. The possibility exists that effective leaching within the limits of the observed geophysical anomaly could produce an ore grade supergene enriched body at considerable depth. Additional drilling is needed to test this possibility.

Conclusions

It has been established by previous exploratory efforts that mineralization of a submarginal grade is present in the Kelvin Prospect. The program being followed by Tipperary was designed to evaluate the prospect for further development by a thorough geological examination and detailed geophysical investigations. Results of the geological and geophysical surveys are sufficiently encouraging to warrant an additional exploratory program as outlined by the geophysical report.

Available data indicates that the leaching of ore minerals in the granite host may have resulted in the creation of enriched zones at depth. An exploration program designed to comply with geophysical recommendations is needed to test this possibility. The relationship of the mineralization to the monzonite stock combined with the restriction of the geophysical anomaly to the area of the monzonite stock on the south and the diorite porphyry dike to the north provides an adequate ore-trapping structure which should be thoroughly evaluated by core drilling.

APPENDIX "A"

Johnson Claims
Pinal County
Arizona
SCALE 1'' = 20'

DIRECTION Vertical
INCLINATION -
STARTED 9-11-68
COMPLETED 9-16-68
DEPTH 530'
LOGGED BY T. L. Hanks
DRILLER Whatley Drilling Co.

HOLE NO J-1
PROPERTY A. H. Johnson
LOCATION SW¼ Sec. 9, 4S, 13E
COLLAR COORD. N 9324 E 9771
COLLAR ELEV. 2085
SHEET 1 OF 4
HOLE SIZE 5¼'' Hammer Bit

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	Au	Ag	Cu	Mo	Zn
10		Hole collared in Qtz. monz. on contact with alluvial wash. Py, chpy, malachite and specularite in outcrop.	10	10	J-1	0	0	.01	.001	
20		Qtz. Monz.: Large orthoclase xls. Traces of malachite.								
30		Iron oxide with minor malachite.								
		Est. 5% specularite.	5	5	J-2			.03		
40		Est. 5% total sulfides.	5	5	J-3			.13		
		do.	5	5	J-4			.19		
50		do.	5	5	J-5			.61		
		Qtz. Monz.: Minor py & chpy, pronounced orthoclase xls & biotite.	10	10	J-4[illegible]			.1[illegible]		
70		do.								
80		do.	10	10	J-6	0	.0[illegible]	.0[illegible]	[illegible]	
90		do.								
100		do.								
110		do.								
1[illegible]		Diabase dikes starting at about 118', Slightly pyritized, chpy traces. Hard drilling 11[illegible]-12[illegible]	10	10	J-7			.0[illegible]		
130		Qtz. Monz.: Considerable pink orthoclase, some chpy, minor chlorite.								
140		do. Water at 140', slurry thereafter.	10	10	J-8			.0[illegible]		
150		do. Diabase fragments, minor dikes.								
		do. 155-158' native cu fragments. Al[illegible] fr[illegible]	10	10	J-9	0	.04	.13	.001	

Pyrite ([illegible]), chalcopyrite (ch[illegible]), sericite ([illegible]), chlorite (ch), crystals or crystalline (xl, xln) and mi[illegible]

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-1
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu				
170		Qtz. Monz.: Few diabase fragments; minor py, chpy and specularite.								
180		do. Spec. of native cu, considerable ortho some sulfides.	10	10	J-10			.03		
190		Scattered cu oxides from surface to about 250'. Epidote increasing with depth.								
200		do.	10	10	J-11			.07		
210		do.								
220		do. Minor bornite. Increasing chloritization.								
230		do. Sericite	10	10	J-12	0	0	.06	.001	
240		do. Some bornite. Rock particles ½-1'' with strong py and chpy mtzn at 237'.	10	10	J-13			.07		
250		do. Py & chpy increasing below 230'.	10	10	J-14	0	0	.08		
260		Diabase and epidote. do.	10	10	J-15	0	.02	.08		
270		do. Sharp increase in mtzn at 268'; total sulfides est at 5%. Hard drilling.	10	10	J-16	0	0	.20		
280		do. Diabase fragments throughout.	10	10	J-17	0	.02	.32	.003	
290		do.	10	10	J-18	0	0	.53		
300		do.	10	10	J-19	0	0	.63	.011	
310		do.	8	8	J-20	0	.06	.45		
		do.	7	7	J-21	0	.03	.32	.007	
		do.	5	5	J-22	0	.03	.29		

J-1

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO.
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 3 OF 4
HOLE SIZE

SCALE

Depth	Log	Rock Type and Description	Interval (m)	Recovery (m)	Sample (m)	Au	Ag	Cu	Mo	Zn
		J-31 308-345'	37	37	J-31	0	.08	.20	.002	
		J-32 250-308'	58	58	J-32	0	.11	.69	.005	.08
		Spectrochemical composite J-17 to J-23 inc. (270-325', 55' total)								
320		Qtz. Mons.: Diabase fragments, some chlorite and ser.	5	5	J-23	0	.04	.98		
330		do. 231' dec. in mtan.	5	5	J-24	0	.03	.19	.001	
		do. Cu oxide 331-335', py & chpy.	5	5	J-25	0	.03	[illegible]		
340		do.	10	10	J-26		.07			
		do.	10	10	J-27		.15			
360		do.	10	10	J-28		.12			
370		do. Minor epidote & bornite.	10	10	J-29		.14			
380		do. Chpy & py increasing bog. at 383'.	10	10	J-30		.08			
390		Strong chloritization & some ser.	10	10	J-33		.12			
400		do.	10	10	J-34		.07			
410		do. malachite	5	5	J-35		.07			
		do. py, hematite, sert.	5	5	J-36		.11			
420		do. Hem and Magnetite	5	5	J-37		.10			
		do. Cu oxides	10	10	J-38		.08			
		do. Minor mtan, bornite & malachite; ser.	10	10	J-39		.14			
		do.	5	5	J-40		.09			

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-1
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 4 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (m)	Recovered (m)	Sample No.	ASSAYS Au				
455		Qtz. Monz.: Considerable orthoclase & ch sericite, py & chpy, 3% magnetite & traces of oxides.								
465		do. Occasional pronounced veinlet of chpy.	10	10	J-42			.06		
475		do.								
485		do.								
495		do.	10	10	J-43			.06		
505		do.								
515		do.	10	10	J-44			.08		
525		do.								
530	TD	do.	5	5	J-45			.08		

Johnson Claims
Pinal County
Arizona
SCALE 1'' = 20'

DIRECTION Vertical
INCLINATION -
STARTED 11-15-68
COMPLETED 11-20-68
DEPTH 582'
LOGGED BY T. L. Hanks
DRILLER Whatley Drilling Co.

HOLE NO J-2
PROPERTY A. H. [illegible]
LOCATION SW Sec. 9, AS, 13S
COLLAR COORD. N 9454 E. 10, 2[illegible]
COLLAR ELEV. 2133
SHEET 1 OF 4
HOLE SIZE 6 1/2'' Hammer Bit

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Depth (ft)	ASSAYS Cu
10		Hole collared in decomposed qtz. monz. 9 5/8'' hole to 17' & cased with 8 5/8'' surface pipe.				
20		Qtz. Monz.: Strong surface weathering to 23'; magnetite.	10	10	J-46	.07
30		do.				
40		do. Epidote, biotite and minor pyrite.				
50		do.				
60	.53	Base of surface weathering. Qtz. Monz.: Epidote, considerable biotite magnetite. Some py with traces of chpy.				
70		do. Granitic zone.	10	10	J-47	.02
80		do.				
90		Qtz. Monz.: Minor chlorite, epidote & sulfides. Water beginning just below 80'.				
100		do.				
110		do.				
120		do. Much biotite, partial alteration to chlorite, less than .5% sulfides.				
130		do.				
140		do. Traces of chpy & py.	10	10	J-48	.01
150		do.				
		do.				

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-2
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu
170		Qtz. monz.: biotite, magnetite & fragments of secondary orthoclase which usually has sulfides assoc. with it; less than 1% sulfides.				
180		do.				
190		do.				
200		Qtz and considerable biotite, moderate chlorite, only traces of chpy. Few large ortho. (large pink) xls that appear to be secondary orgin.				
210						
220		do.	10	10	J-49	.01
230		do. Py &chpy in veinlets associated with quartz & secondary orthoclase.				
240		do.				
250		do. Less than 1% sulfides, traces of chpy, sericite and chlorite.				
260		do.				
270		do.				
280		do. Decreasing biotite below about 260'.				
290		do.				
300		Increase py, est. 2%. Chpy usually found on darker pink orthoclase xls. Magnetite & chlorite.	10	10	J-50	.02
310		do.				
		do.				

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-2
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 3 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (no)	ASSAYS Ag	Cu
330		Qtz. Monz.: 1-2% py, shows of chpy. About 5% magnetite; chlorite.					
340		do. (Constant drilling rate from surface to 431', about 45' per hour.)					
350		do.					
360		Homogeneous unit from 320-400' with gradual sulfide increase from 350-420. Chpy showings.	10	10	J-51		.01
370		do.					
380		do.					
390		do.	10	10	J-52		.02
400		do. Total sulfides est. at 3%.					
410		do.	10	10	J-53		.01
420		do.	10	10	J-54		.01
430		Strong py mtsn; minor chpy. 429' sharp water increase.	10	10	J-55		.02
440	432	Diabase: Greenish-gray, micro-crystalline, strong py mtsn with minor chpy.	10	10	J-56	0	.06
450		Some qtz. Monz.; strong sulfides that are mostly py.	10	10	J-57		.06
460		Qtz. Monz.: Dark pink orthoclase xls with sulfides mtsn (est. 4% total).	10	10	J-58	0	.02
470	469	Less sulfides; traces of diabase and epidote.					
		Diabase: from about 469-478'; only traces of sulfides. Abundant epidote.	10	10	J-59		.01

J-2

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 4 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Au	Cu
490		Qtz. Monz.: Est. 1-2% sulfides, epidote, chlorite. Dark pink orthoclase xls.					
500		do.					
510		do.					
520		Chpy in veinlets and as coating on orthoclase & qtz. Sulfides est at 1%.	10	10	J-60	0	.03
530		524-45' extremely soft drilling; some diabase.					
		do.					
550		do.					
		do.					
570		do.	10	10	J-61		.01
580		do.	10	10	J-62		.02

Johnson Claims
Pinal county
Arizona
SCALE 1" = 20'

DIRECTION Vertical
INCLINATION -
STARTED 11-21-68
COMPLETED 12-6-68
DEPTH 1165'
LOGGED BY T. L. Hanks
DRILLER Whatley Drilling Co.

HOLE NO J-3
PROPERTY A. H. Johnson
LOCATION SE¼SE¼ Sec. 6, [illegible]
COLLAR COORD. N. 6,273 E. 9,2[illegible]
COLLAR ELEV. 2170
SHEET 1 OF 8
HOLE SIZE 6¼" Ham. Bit to 642'
6¼" Rock Bit 642-1165'

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu
10		Hole collared in Quartz Monzonite with showings of pyrite, chalcopyrite & malachite. 9 5/8" hole to 10' and cased.	10	10	J-65	.05
20	18	Qtz. Monz.: Sericite, considerable biotite and some chlorite. Minor sulfides. Diabase: Bsg. at about 18'. Dark greenish-gray, microcrystalline. Some py and chpy and traces of malachite.	10	10	J-66	.21
30		do.				
40	36	Qtz. Monz.: Minor sericite and py. Pronounced orthoclase crystals which have the sulfides associated with them				
50		do.				
60	58	Diabase: Bsg. around 58'. Traces of py & chpy. First water coming in between 60-70'				
70		Diabase: Same as above.				
80		Diabase: Some Qtz. monz. with chpy & typical orthoclase crystals.				
90		do. No significant sulfides.				
100		do.				
110		Qtz. Monz.: Some diabase; traces of py & chpy.				
120		Diabase: Dark Greenish-gray, fine-grained. Carrying some sulfides. Scattered white quartz veins and crystals.				
130		do.				
140		do.	10	10	J-67	.02
150		do.				

[illegible] (py), Chalcopyrite (chpy), sericite (ser), chlorite (ch), crystals or crystalline (xl, xln), mineralization (mn).

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-3
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 7 OF 8
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (ft)	Sample No.	ASSAYS Au	Ag	Cu	Mo	Z
		Qtz. Monz.; Some diabase. Twisted or at 50°.	3	3	J-11	–	–	.08	.033	
970		Diabase: A little qtz. monz. with py, chpy and moly; sericitized.	10	10	J-11			.20	.102	
980		Qtz. Monz.: Diabase dikes. Est. sulfides .75%; py, chpy, mo. and occasional fragment of copper oxide.								
990		do. Moly may be occurring on or near monz diabase contacts.								
1000		do.								
1010		do. Increasing diabase.	10	10	J-11			.11	.003	
1020		Diabase & Qtz. Monz.; Minor sulfides.								
1030		do.								
1040		do.	10	10	J-12			.06	.0025	
1050		Qtz. Monz.: About 1/3 of the rock is diabase. Fairly large fragments of py. chpy. Partially chloritized, some ser.	10	10	J-12			.12	.012	
1060		do. Sulfides and traces of copper oxides.								
1070		Minor diabase. Equal amounts of biotite and chlorite.								
1080		do. Partial kaolinization of feldspars.	10	10	J-12			.05	.006	
1090		do.								
1100		do.								
		do. Increased drilling rate between 1107 & 1129'; may be due to interbedded diabase and qtz. monz. and altered schist.	10	10	J-12			.09	.007	
1110		do.								

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-3
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 8 OF 8
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No)	ASSAYS Cu	ASSAYS Mo
1130		Qtz. Monz.: Minor diabase. Pronounced pink ortho. xls with traces of py & chpy; about 3% magnetite.	10	10	J-12	.04	.003
1140		do. Flakes of oxide copper, may be coming from higher in hole.					
1150		do. Increasing diabase at 1150' to bottom of hole.	10	10	J-12	.06	.007
1160		do.	10	10	J-12	.05	.001
	1165 TD	do.					
1170							

James Sharpie School Lease
Pinal County
Arizona
SCALE 1'' - 20'

DIRECTION Vertical
INCLINATION -
STARTED 12-6-68
COMPLETED 12-9-68
DEPTH 126'
LOGGED BY T. L. Hanks
DRILLER Whatley Drilling Co.

HOLE NO J-4
PROPERTY Sharp-State Section
LOCATION NW¼ Sec. 16, 4S, 13E
COLLAR COORD. N. 7760 E. 9983
COLLAR ELEV. 2305
SHEET 3 OF 3
HOLE SIZE 6 1/2'' Hammer Bit

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu
10		Hole started in Qtz. Monz., 9 5/8'' hole to 20' and permanently cased.				
20		Qtz. Monz.: Surface weathering. Pronounced pink feldspars. Little or no ch, no sulfides				
30		do. Base of intense surface weathering at about 32'. Some ser, mostly biotite with limited ch; no sulfides detected.	10	10	J-127	.03
40						
50		Qtz. Monz. & Diabase: Diabase dike carrying cu oxides and sulfides	10	10	J-128	.07
60		Qtz. Monz.: Slightly weathered, minor ch, traces of copper oxides.				
70		do.				
80		do. Considerable biotite & magnetite.				
90		do.				
100		do. Minor sulfides, Water starting near 90'.				
110		Qtz. Monz.: Prevailing lime-green coloration of feldspars.	10	10	J-129	.04
120		do. 107-117' Soft drilling (water course).				
130		Diabase & Qtz. Monz.: Minor sulfides mostly of pyrite.				
140		Diabase: Pyritized (Est. 1%), some chpy and a few Qtz. Monz. fragments.	10	10	J-130	.05
150		do.				
		do.				

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO. J-4
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 3
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu
		Qtz. Monz.: Few pyritized diabase fragments.				
170		do.				
180		Diabase & Qtz. Monz.: Less than .5% sulfides with traces of chpy.	10	10	J-13[illegible]	.05
190		do.				
200		Decreasing diabase. do.				
210		do.				
220		do.				
230		Qtz. Monz.: Est. 3-5% magnetite. Minor py & chpy. Increase water 221-240', Sludge samples starting at 230'.				
240		do. Considerable biotite.				
250		Slightly more sulfides, chlorite & ser. Few scattered diabase fragments.				
260		do.	10	10	J-13[illegible]	.0[illegible]
270		do.				
280		do.				
290		do. Possibly some sphalerite.				
300		do.				
310		do. Homogeneous unit below 210'.				

J-4

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER
SCALE

HOLE NO
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 3 OF 3
HOLE SIZE

Depth	Interval	Log	Rock Type and Description	Interval (m)	Recovery (%)	Sample No.	ASSAYS Au	Ag	Cu	Mo
330			Qtz. Monz. Little alteration except for some chlorite and sericite. Considerable biotite and magnetite. Py & chpy.							
340			do.	10	10	J-13			.02	
350			do.							
360			do.							
370			Qtz. Monz.: Pyritized diabase with traces of chpy.							
380			do.							
390			do.							
400			Qtz. Monz.: Pyritized diabase (est. py 1-2%). Traces chpy. Large pink k-feld. xls.	10	10	J-14	0	.04	.07	.001
410			Minor diabase. Sulfides on or near diabase-monz. contacts. Moderately chloritized.							
420			do.	10	10	J-13			.05	
426 TD										

[illegible] Claims
Pinal County
[illegible]
SCALE 1'' = 20'

DIRECTION Vertical
INCLINATION -
STARTED 12-13-68
COMPLETED 12-21-68
DEPTH 12[illegible]'
LOGGED BY T. L. Hanks
DRILLER Whaley Drilling Co.

HOLE NO. J-6
PROPERTY A. H. Johnson
LOCATION [illegible] Sec. 17, [illegible], 13E
COLLAR COORD. N. 7288 E. 8360
COLLAR ELEV. 2246'
SHEET 1 OF 8
HOLE SIZE 6 5/8'' Hammer bit to 11[illegible]'
6 5/8'' Rock [illegible] Lich-12[illegible]'

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (lb)	ASSAYS Cu				
10		Hole collared in qtz. monz. 9 5/8'' hole to 10' and cased with 8 5/8'' pipe.								
20		Qtz. Monz.: Considerable biotite, minor ch, a few specks of sulfides. Epidote, magnetite.	10	10	J-16[illegible]			.01		
30		do.								
40		do. Surfact water starting at about 30'. Epidote.								
50		do.								
		do.								
70		do. Diabase: Dark gray to black, micro-[illegible] & slightly pyritized.								
80		do.	10	10	J-17[illegible]			.02		
90		do.								
100		do.								
110		do.								
120		do.								
130		do.								
140		Qtz. Monz.: Pink orthoclase [illegible] with associated sulfides; traces chry.	10	10	J-17[illegible]			.02		
150		do. some diabase								
		Qtz. Monz.: Highly altered (ser), about 2% sulfides. Sand-sized part., moly.	10	10	J-17[illegible]			.02	.013	

J-6

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 8
HOLE SIZE

Depth	Py & chpy	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No)	ASSAYS Cu	Mo
170			Qtz. Monz.: Slightly pyritized & ch. Ser.; traces of chpy. & diabase.					
180			do.					
190	189		do.					
200			Diabase: Gray, heavily pyritized. Minor qtz. monz.	10	10	J-17[illegible]	.01	
210			do. Decreasing sulfides.					
[illegible]			Qtz. Monz.: Small diabase dikes. Specks of epidote. Conversion to sludge.					
220			Qtz. Monz.: Dark fine-grained biotite. Traces of py & chpy associated with quartz and or orthoclase gls. Appears to be more sericitic than holes No. 1-5.					
230			do.	10	10	J-17[illegible]	.01	.002
[illegible]			do.					
[illegible]			do.					
[illegible]			do.					
240			do.					
250			do.	10	10	J-17[illegible]	.02	
260			do.					
[illegible]			do. Slightly more chpy.	10	10	J-17[illegible]	.02	.001
[illegible]			do.					

J-6

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO.
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 3 OF 8
HOLE SIZE

SCALE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (%)	ASSAYS Cu				
330		Qtz. Monz.: Sulfides, ch & considerable ser. Strongly seritized frag. are heavily pyritized.								
340		do.								
350		do. More epidote.								
360		do.	10	10	J-177			.01		
370		do.								
		do. Decreasing biotite below 370'								
380		do.								
400		Qtz. Monz.: Less ch & ser. Sulfides in ortho. and qtz. xls.								
410		do. Epidote. Some feldspars altered to a light bluish-green.	10	10	J-178			.10		
420		do.								
430		Qtz. Monz.: Moderate ch & ser. Minor chpy and moly. 2nd ortho, darker pink and carries sulfides.	10	10	J-179			.05		
440		do. Epidote								
450		Qtz. Monz.: Same as above.								
460		do.								
470		do.								
		do.	10	10	J-180			.02		

	DIRECTION	HOLE NO	J-6
	INCLINATION	PROPERTY	
	STARTED	LOCATION	
	COMPLETED	COLLAR COORD. N.	E.
SCALE	DEPTH	COLLAR ELEV.	
	LOGGED BY	SHEET 4 OF 6	
	DRILLER	HOLE SIZE	

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (no)	ASSAYS Cu				
490		Qtz. Monz.: Sulfides, epidote and minor ch. Total sulfides est at less than .5%.								
500		do.								
510	?	Diabase: Black, micro-xln, mtmn with py and chpy.	10	10	J-18[illegible]			.01		
520		do.	10	10	J-18[illegible]			.07		
530		do. Few fragments showing strong ser.								
540		do.								
550	?	do. Qtz. Monz.: Light colored, few ortho. xln, some traces of sulfides. Epidote & gypsum flakes.								
560		do.								
570		do.								
580		do. Mors ser and gypsum. Inc. water 570'								
590		do. Inc. ser with larger cuttings showing considerable py in cube form up to 1/8" in diameter.	10	10	J-18[illegible]			.01		
600		do.								
610		do.								
620		do. Strong ser., py plus 1%. Cemented at 614'								
630		do.	10	10	J-18[illegible]			.01		
		do.								

DIRECTION		HOLE NO	J-6
INCLINATION		PROPERTY	
STARTED		LOCATION	
COMPLETED		COLLAR COORD. N.	E.
DEPTH		COLLAR ELEV.	
LOGGED BY		SHEET 5 OF 8	
DRILLER		HOLE SIZE	

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (ft)	ASSAYS Cu	Mo
		Qtz. Monz: Moderate to strong ser. Less than .5% sulfides. Epidote.					
650	652						
		Diabase: Medium-xln, pyritized, some chpy.	10	10	J-187	.03	
660		do. Fragment of qtz. monz. Sulfides seem to decrease to 717'.	10	10	J-188	.05	
670		3-5% magnetite.					
680		do.					
690		do.					
700		do.					
710		do.	10	10	J-189	.05	
	717	do.	10	10	J-190	.04	.003
720		Qtz. Monz.: Good sulfide mtn. Limited ch & ser. About 1% total sulfides. Semi-sized particles.					
730		do.					
740		do.					
750		do. Varying amounts of ser & ch.					
760		do.					
770		do.	10	10	J-191	.06	
780		do.					
790		do.					
	798	Diabase:					

	DIRECTION	HOLE NO	J-6
	INCLINATION	PROPERTY	
	STARTED	LOCATION	
	COMPLETED	COLLAR COORD. N.	E.
SS[illegible]E	DEPTH	COLLAR ELEV.	
	LOGGED BY	SHEET 6 OF 6	
	DRILLER	HOLE SIZE	

Depth	Log	Rock Type and Description	[illegible]	[illegible]	[illegible]	ASSAYS				
								Cu	Mo	Zn
810		Diabase: Pyritized, moderate ser. Soft drilling 800-833'.								
820		do.	10	10	J-192			.01		
830		do								
	833	do.								
840		Qtz. Monz.: Dark pink orthoclase xls. ~~Less than 1% py, some chpy and ser.~~								
850		do.								
860		Diabase: Some monz., micro-xln, dark gray to black. Heavily pyritized with shows of chpy. Moderate ser & ch.	10	10	J-193			.05		
870		Same as above except with more monz.	10	10	J-194			.02		
		Qtz. Monz.: a little diabase. Dark pink ortho. xls and qtz. xls with sulfides.	10	10	J-195			.02		
		do.								
		Qtz. Monz. & Diabase: Slightly [illegible]	10	10	J-196			.02		
910		Qtz. Monz.: Strong ser., sulfides with showing of moly.	10	10	J-197	.02	0	.06	.01	.07
920		do.	10	10	J-198			.05		.02
930		do. Decreasing ser and sulfides.								
		do.								
		do. Minor ser and sulfides. Traces Epidote.								
		do. Sulfides associated with qtz.	10	10	J-199			.02		

	DIRECTION	HOLE NO	J-6
	INCLINATION	PROPERTY	
	STARTED	LOCATION	
	COMPLETED	COLLAR COORD. N.	E.
SCALE	DEPTH	COLLAR ELEV.	
	LOGGED BY	SHEET 7 OF 8	
	DRILLER	HOLE SIZE	

Depth	Log	Rock Type and Description	Interval (FT)	Recovery (FT)	Sample (FT)	ASSAYS Cu	Mo
970		Qtz. Monz.: Ser, Sulfides. Biotite appears to be partially converted to chlorite. Epidote xls.					
980		do.					
990		do. Partial alt of feldspars to clay. Chpy & moly in or on orthoclase or qtz. xls.	10	10	J-200	.01	.001
1000		do.	10	10	J-201	.03	.010
1010		960-1050' zones of strong sericite alteration, sulfides & showings of Epidote.					
1020		do.	10	10	J-202	.01	.003
1030		do.					
1040		do.					
1050		do.					
1060		Qtz. Monz.: Fine particles, moderate ser, minor sulfides and epidote.					
1070		do.					
1080		Strong sericite. do.	10	10	J-203	.01	
1090		do.					
1100		do.	10	10	J-204	.01	.003
1110		do.					
		Sand-sized fragments, less ser & sulfides.					

DIRECTION		HOLE NO	J-6
INCLINATION		PROPERTY	
STARTED		LOCATION	
COMPLETED		COLLAR COORD. N.	E.
DEPTH		COLLAR ELEV.	
LOGGED BY		SHEET 8 OF 8	
DRILLER		HOLE SIZE	

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No)	ASSAYS Au	Ag	Cu	Mo	Zn
1130		Qtz. Monz.: Sand-sized fragments. Biotite, some ser & ch. Minor sulfides; magnetite								
1140		Slightly more ser & sulfides.	10	10	J-20[illegible]			.03		
1150		do. Moly coated & fracture-lined qtz.	10	10	J-20[illegible]	0	0	.02	.005	.0[illegible]
1160		do.								
[illegible]		Qtz. Monz.: Ser & some ch. Sulfides .5% or less. Particles of chpy & moly. Hole caving somewhere above.								
[illegible]		do. Increase in water.								
1190		1183' Converted to drilling with water and rock bit.								
1200		do. Strong ser & est. 1% sulfides, traces of moly.								
1210		do.								
1220		do. Chpy increasing 1212-1217'.	10	10	J-20[illegible]			.0[illegible]		
1230		Qtz. Monz.: Minor diabase, sulfides, moderate ser.								
1240		do.	10	10	J-20[illegible]			.03	.002	
[illegible]		do.								

Johnson C[illegible]

Pinal County

Arizona

SCALE ''' = '''

DIRECTION [illegible]

INCLINATION –

STARTED [illegible]-69

COMPLETED [illegible]-69

DEPTH [illegible]

LOGGED BY T. [illegible] Hanks

DRILLER Whatley Drilling Co.

HOLE NO. J-7

PROPERTY Johnson Claims

LOCATION [illegible] Sec. 5, [illegible]

COLLAR COORD. N [illegible] E. 8033

COLLAR ELEV. 2290

SHEET 1 OF 4

HOLE SIZE [illegible] Hammer bit [illegible]

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No)	ASSAYS Cu	Mo
10		Hole collared in quartz monzonite porph. 95/8'' rock bit to 14', cased with 14' 8 5/8'' surface pipe.					
20	14	Qtz. Monz.: Weathered, light tan to br. 2-4% magnetite; pyrite fragments & py oxidization, moderate biotite.					
30		do.	10	10	J-209	.02	
40		do.					
50		Surface weathering extends to near 50'. do.					
60		do.					
70		do.					
80		do.					
90		do. Pyrite increasing.					
100		Some oxidization; silicification & chloritization. Qtz. carries about 1% pyrite, specs of chpy and moly.	10	10	J-210	.03	.001
110		do.					
120		do. Water beg. at 110' & inc. sharply @ 120'.					
130		do.					
140		do.					
150		do.					
		do.	10	10	J-211	.02	

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-7
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu	ASSAYS Mo
170		Qtz. Monz.: Dk gray, few dk pink ortho. xls, ch. Associated with ortho. is some chlorite & few epidote xls.	10	10	J-212	.03	
180		Seams & disseminations of py & chpy. Considerable magnetite.					
190		do.					
200		do.					
210		do. Bottom portion has plag. partially alt. to white clay.					
220		do.					
230		Qtz. Monz.: Prevaling tan with pink K-feld. & qtz. Traces of sulfides & epidote.					
240		do.					
250		do.					
260		do. Tan & gray, fine-grained chlorite; Traces of sulfides.					
270		do. Considerable water increase.					
280		do. Hammer bit buttons broke off at 273'					
290		do.					
300		do. Trace of mo.	10	10	J-213	.01	.002
310		303' rods pulled-hole cemented, heavy water concentration (This sample contains about 50% cement).					
		Qtz. Monz.: Slightly chloritized, minor pyrite.					

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

SCALE

HOLE NO J-7
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 3 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (m)	Recovery (%)	Sample (No.)	ASSAYS Cu	ASSAYS Mo
330		20% Monz.: Moderately chloritized, traces of py. Some of the ortho. xls have sulfides scattered through them or on cleavage faces. Total sulfides est. @ .5%. Fine-grained biotite which also has some sulfides assoc. with it. Epidote.					
340							
350		do.					
360		do.	10	10	J-211	.01	
370		do.					
380		do.					
390		do.					
400		do.					
410		do.					
420		do. Partial kaolinization of plag. Only few sulfides.	10	10	J-215	.01	
430		do.					
440		do.					
		Slight increase in pyrite.					
450		do.					
460		do.					
470		do.					
		do.					

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-7
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 4 OF 4
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample No.	Assays Au	Assays Mo
490		478-495' Qtz. Monz. & Diabase: Sulfides est. at 1%, large ortho xls.	10	10	J-216	.01	
500	495	Qtz. Monz.: White to light-gray, biotite, sulfides less than .5%. Extremely hard from 495 to 531'. (Aplite dikes)					
510		do.					
520		do.					
530		do. Caving from about 250'					
540		Qtz. Monz.: Small diabase dike. Traces of sulfides.					
550		Qtz. Monz.: Hard, few sulfides, higher qtz. content.					
560		do.					
570		do.					
580		do.	10	10	J-217	.01	.001
	531 TD	Note: Below 495' hole was cemented three times in an attempt to shut off the large water volume (est. 100-200 gpm). Rock composed partially of aplite dike material which is unusually hard; nine rock bits used in this interval.					

Johnson Property
Pinal County
Arizona
SCALE 1" = 20'

DIRECTION Vertical
INCLINATION -
STARTED 1-2[illegible]-69
COMPLETED 2-1-69
DEPTH 972'
LOGGED BY T. L. Hanks
DRILLER Whatley Drilling Co.

HOLE NO. J-8
PROPERTY Johnson Claims
LOCATION SW¼SW¼ Sec. 9, 4S, 13E
COLLAR COORD. N. 8270 E. 10,105
COLLAR ELEV. 2295
SHEET 1 OF 6
HOLE SIZE 6¾" Ham. Bit to 762'
Rock Bits to 972'

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu
10		Hole collared in weathered QTz. Monz. 9 5/8" rock bit to 20' & cased. ~~Small c-w mtzn streaks NE of collar.~~				
20		Weathered Qtz. Monz.: Considerable magnetite and iron oxides.				
30		do. sericite	10	10	J-21[illegible]	.01
40		Qtz. Monz.: Large fragments showing moderate ser & considerable qtz. ~~Very few sulfides.~~				
50		do. Partial alt. of biotite.				
60		do.				
70		Slight oxidization, first sig. pyrite minor sericite.				
80		Minor ser., est .5-1% total sulfides. First water.				
90		Diabase coming in at about 85'. Py, chpy and some bornite.	10	10	J-219	.02
100		Diabase & Qtz. Monz.: Diabase dike 85-93', sulfides within dike and on contact. ~~Minor sericite.~~				
110		Chpy on dk pink ortho xls.				
120		do.				
130		do.				
140		do. Inc. pink feld. Py veins.				
150		do.				
		do. Iron oxide frag. to 160'				

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
BRAZER

HOLE NO J-8
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 6
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (ft)	Dip	Assays Au	Ag	Cu	Mo	Zn
70'		Qtz. Monz.: Increasing pyrite with xls to 1/8" dia. Some chpy and ser.	10	10	[illegible]			<.01	<.001	.01
80		About .178' sulfides of py, chpy and sphalerite (1-2%). Minor 2-nd ortho.	10	10	[illegible]	0	0	<.01	<.001	.46
		do. Heavy oxides 183-85.	5	5	[illegible]		.03	<.01	<.001	.32
90		do. Decreasing sulfides	5	5	[illegible]			<.01	<.001	.06
		Qtz. Monz.: About 20% limonite, some ser and minor sulfides.								
100		do. Iron oxidized water 198-203'								
110		Plag a light bluish-green. Py less than 1%. Diabase dike at 214'. Considerable sericite.								
120		Traces of chpy. Oxidized frag. do.	10	10	[illegible]			<.01		
		do.								
130		do.								
		do.								
140		do.	10	10	[illegible]			<.01		
		do. Chpy								
150		do. Iron oxide, sulfides and sericite.								
		do.								
160		do.								
		do.								

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO. J-8
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 3 OF 6
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (m)	ASSAYS Cu
330		Qtz. Monz.: Minor iron oxides & sulfides (py & chpy), sericite. Magnetite.				
340		do.				
350		do. Biotized granite; much like thin zones near diabase dike contacts as seen at surface. (Water fairly cont. at about 10 gpm)				
360		do.				
370		do.				
380		Plag. are light-bluish-green as drilled through higher up. Traces of py with flakes of chpy; some sericite.				
390		do.				
400		do.				
410		do.	10	10	J-22[illegible]	.03
420		Some dk pink orths with sulfides. Traces of ser & iron oxides persisting to 440'				
430		do.				
440		do.				
450		Slightly pyritized with traces of chpy, ser and ch. Iron oxides; flakey ser. texture.				
460		do.				
470		do. Hematite; slightly more sulfides.				

J-8

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 4 OF 6
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (mm)	Assays				
								Cu	Mo	Zn
		Qtz. Monz.: Partial alteration of biotite to ch. Traces of sulfides & ser, epidote, Chpy & Mo assoc. with some of the quartz fragments.								
		do.								
		do. Chpy on orthoclase.	10	10	J-227			.02	.001	.0[illegible]
		do.								
		Partial chloritization. Chpy veinlets in dk pink ortho. Micaceous iron oxides.								
		do.								
		do.								
		Minor sulfides and traces of micaceous iron oxides.								
		do. Few pink feldspars; generally white & gray with chpy and bornite showings.								
		Slight increase in overal sulfides. Ch and ser showings.	10	10	J-22[illegible]			.0[illegible]		
		do.	(Composite of No. 229 & 230 [illegible]) (" " 231 & 232 less than [illegible])							
		do.								
		do. Chpy traces.								
		do. Pyrite mainly in biotized zones around feldspar crystals.								
		do.								
		do.	10	10	J-2[illegible]			.03		

DIRECTION		HOLE NO	J-8
INCLINATION		PROPERTY	
STARTED		LOCATION	
COMPLETED		COLLAR COORD. N.	
DEPTH		COLLAR ELEV.	
LOGGED BY		SHEET 5 OF 6	
DRILLER		HOLE SIZE	

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (ft)	ASSAYS Au	Ag	Cu	Mo	Zn
		Qtz. Monz.: Minor sulfides, slightly ser. Chpy as veinlets on or within dk pink ortho. Micaceous iron oxides.								
		Sulfides begin increasing about 580' were there are approx. .5% to this interval where there is slightly over 1%. Traces of chpy and mic. iron oxides, some hematite.								
		do.								
		do.	10	10	J-230			.04		
		do. Inc. in water.								
		do.	10	10	J-231			.03		
		do.								
		do.	10	10	J-232			.02		
		Sulfides 1-3%; hole caving at about 660' and 160-220' (Iron oxides)								
			4	4	J-233			.02	.001	
		Extremely fine sulfides, some chpy, ser. mic. iron oxides and sphalerite. Minor diabase.	10	10	J-234	0	0	.06	.001	.1[illegible]
		do.	10	10	J-235			.07	.001	.5[illegible]
		do.	10	10	J-236			.06	.001	
		do. 1-2% sulfides.								
		do. 1% sulfides.								
		do.	10	10	J-237			.03		

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-8
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 6 OF 6
HOLE SIZE

Depth	Pyrite	Log	Rock Type and Description	Interval (m)	Assay (%)	Sample (no.)	ASSAYS Cu				
810			Qtz. Monz.: Extremely fine particles; some ortho (secondary) & mo traces.								
820			Thin diabase dike. Qtz, sulfides, ch and some moly. (Rock hit with drilling mud starting at 812')								
830			do. Part. alt of biotite	10	10	J-238			.04		
840			do. Increase in ser and ortho, less diabase								
850			do.								
860			Minor sulfides and diabase and kaolinization. Total sulfides est at less than 1%.								
870			do.								
880			do.								
890			About 3% of the fragments are made up of diabase, some chlorite.								
900			do.								
910			Minor diabase, ser and ch. Some clay alt.								
920			Sulfides and secondary ortho. Inc. calcite content.								
930			do.								
940			do.	10	10	J-23			.04		
950			do.								
960			do.								
972 T.D.			do.								

Johnson Property
Pinal County
Arizona
SCALE 1" = 20' or as shown

DIRECTION Vertical
INCLINATION -
STARTED 2-3-69
COMPLETED 2-27-69
DEPTH 2320'
LOGGED BY T. L. Hanks
DRILLER Whatley Drilling Co.

HOLE NO J-9
PROPERTY Johnson Claims
LOCATION NE¼NE¼ Sec. 17, 4S, 13E.
COLLAR COORD. N. 7790 E. 9160
COLLAR ELEV. 2210
SHEET 1 OF 10
HOLE SIZE 6" Ham. Bit to 538'
Rock Bits below

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample No.	Assays Cu	Assays Mo
10		Hole collared in wash near contact with Qtz. Monz. Porph. 9 5/8" rock bit to ~~41' and cased with 8 5/8" surface~~ pipe.					
20		Alluvial Wash: Sulfides in outcrop near collar.					
30		do.					
40	38	do. Bedrock at about 38'					
50	41	Qtz. Monz.: Predominantly a light-gray, few pronounced ortho fragments. Minor ~~sulfides. Shows of copper oxides.~~					
60		Little alteration. Traces of sulfides, ~~fine-grained biotite, partial alt. to ch.~~	10	10	J-2[illegible]	.01	
70		do.					
80		Part. alt feld; moderate chlorite. Rust stained joints and fractures. ~~Traces of sulfides & ser, incr. with~~ depth. Epidote traces.					
90		do.					
100		do.					
110		do.					
120		do.					
130	129	Moderate ch & ser, some secondary ortho. Inc. chpy and mo bag. at 129'.	10	10	J-24[illegible]	.01	.001
140		do.	10	10	J-24[illegible]	.03	
150	145	do. Diabase: Dk gray to black; py, chpy and some epidote.	10	10	J-24[illegible]	.01	
	15[illegible]	do.	5	5	J-24[illegible]	.02	
		Minor qtz. mon., Pyritized					

J-9

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO.
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 10
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample Tag	ASSAYS Au	ASSAYS Mo
		Diabase: Pyritized, some qtz. Monz.					
170	168						
		Qtz. Monz. & Diabase: Thin dikes of diabase which are pyritized and carry some chpy. Moderate ch and fine biotite.	5	5	J-245	.01	
180							
		do.					
190							
		do.	5	5	J-246	.01	
200							
		Qtz. Monz.: Moderate ch & ser, fine-grained biotite; traces of chpy.					
210							
		do.					
220							
		do.					
230							
		do.	5	5	J-248	.01	
240							
	244	Diabase: Py and chpy, est total-1%.	5	5	J-249	.01	
250			5	5	J-250	.01	.001
		do.					
	257						
260		Qtz. Monz. and Diabase: Diabase dikes 257 to 273'. Sulfide traces.					
270		do.					
	273	Qtz. Monz.: Minor ser, chpy and py. Sulfides associated with the qtz.					
280							
		do.					
290							
		do.					
300							
		do.					
310							
		Minor diabase. Alluvium washing into hole beneath surface casing.					

DIRECTION _____ HOLE NO J-9
INCLINATION _____ PROPERTY _____
STARTED _____ LOCATION _____
COMPLETED _____ COLLAR COORD. N. _____ E. _____
DEPTH _____ COLLAR ELEV. _____
LOGGED BY _____ SHEET 3 OF 10
DRILLER _____ HOLE SIZE _____

Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu				
	Qtz. Monz.: with small dikes of pyritized diabase. Some ser and minor ch; sulfides assoc with qtz. or secondary ortho.								
	do.								
	do								
		5	5	J-250			.04		
	Diabase dikes from a few inched thick to 5-10'; mts thorough with slightly more sulfides near the contacts.								
	do.								
	do.								
	do.								
	do.								
	do.								
	Some sample pollution from beneath casing. Hole cemented back to the surface from 416'. Total sulfides in diabase 1-3%; less than one percent in Qtz. monz.	5	5	J-251			.01		
	Diabase and Qtz. Monz.: Sulfides in dia. Ch and very few ortho frag.; gypsum & some calcite.	10	10	J-252			.03		
	do.								
	do.	10	10	J-253			.05		
	do.								
465	Diabase & Qtz. Monz.: pyritized, shny in dark pink ortho and qtz. Traces of epidote.								
	do.								

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 4 OF 10
HOLE SIZE

Depth	Log	Rock Type and Description				Assays
490		Qtz. Mons.: Few frag of diabase. Sulfides less than .5%. Traces of chpy on Dark pink ortho crystals.				
500		do.				
510		do.				
520		Moderate ch; traces of chpy & py, some ser. Pronounced dark pink ortho xls.	10	10	J-251	301
530		do.				
540		do. (Hammer bit not properly working due to large volume of water. Hole drilled below 538' with rock bits.)				
550						
560		do.				
570		do.				
580		Begining about 570' rock becomes a darker greenish-gray with more chlorite.				
590		do.				
600		do. Slightly more chpy	10	10	J-254	303
610		Qtz. Mons.: Same as above except with a few frag of py & chpy bearing diabase.				
620		do.				
630		do.				
		do.				

J-9

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO.
PROPERTY
LOCATION
COLLAR COORD. N. ____ E. ____
COLLAR ELEV.
SHEET 5 OF 10
HOLE SIZE

SCALE 1" = 40'

Depth	Log	Rock Type and Description	Lateral (ft)	Sample (%)	Sample (ft)	ASSAYS Cu
650		Qtz. Monz.: Few scattered frag. of py & chpy bearing diabase. Minor chlorite and small about of clay alteration in the plagioclase. Some scattered and very minor particles of epidote. Homogeneous unit from about 610 to 800 feet.				
660						
670						
680						
690						
700						
710						
720						
730						
740						
750			10	10	J-256	.01
760						
[illegible]						
780						
790						
800						
810		Qtz. Monz.: Some diabase; Est. 1% sulfides Minor ch & ser; decrease in secondary orthoclase.				
820			10	10	J-257	.01
[illegible]						
830						
840		Qtz. Monz.: Gradual increase in ch & sulfides. Prevailing greenish-gray. Minute flaces of py & chpy in ortho particles. Continued minor showings of clay alteration. Sulfides est at slightly more than 1%.	10	10	J-258	.01
850						
860						
870						
880						
890						
900						
910		Less chlorite; same as above				
920			10	10	J-259	.04
[illegible]		Diabase and minor Qtz. Monz.: Moderately pyritized with showings of chpy; ch. Total sulfides around 1%. Epidote fragments.				
[illegible]						
950						

SCALE 1" = 40'

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO. J-9
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 6 OF 10
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (m)	ASSAYS				
970		Qtz. Monz.: Light greenish- gray, slightly sericitized with an estimated .5%sulfides. Moderate ch and clay alteration. Epidote fragments.								
980										
990										
1000										
1010										
1020		Pale green coloration of plagioclase and some orthoclase 962-1070'; few pyrite and chalcopyrite bearing diabase fragments.	10	10	J-26[illegible]			.01		
1030										
1040										
1050										
1060		Do.								
1070										
1080		Pronounced dark pink orthoclase with moderate clay alteration.								
1090										
1100										
1110		Homogeneous unit 1070 to 1240'; diabase increases in last 30-40'.	10	10	J-26[illegible]			.01		
1120										
1130										
1140										
1150										
1160										
1170										
1180										
1190										
1200										
1210										
1220										
1230										
1240		Diabase & Qtz. Monz.: Pyritized; slight overall sulfide increase. (Five foot samples 1250-1290').								
1250										
1260			5	5	J-26[illegible]			.01		
1270		Diabase, qtz. monz. same as above.								

SCALE 1" = 40'

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
SAMPLED

HOLE NO J-9
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 1 OF 10
HOLE SIZE

Depth	Log	Rock Type and Description				ASSAYS
1290	✓ ✓	Qtz. Monz.: Moderate chlorite and clay alteration only traces of sulfides. Some cpy and pyrite found either on or within the dark pink orthoclase crystals or the quartz. Scattered fragments of epidote.				
1300	✓ ✓					
1310	✓ ✓					
1320	✓ ✓					
1330	✓ ✓					
1340	✓ ✓					
1350	✓ ✓					
1360	✓ ✓					
1370	✓ ✓					
1380	✓ ✓					
1390	✓ ✓	Gradual increase below this depth in the quantity of clay content.				
1400	✓					
	✓ ✓					
1420	✓ ✓	Homogeneous unit with little variation except for some small diabase dikes and varying clay alteration.				
1430	✓ ✓					
1440	✓ ✓					
	✓ ✓					
	✓ ✓					
	✓ ✓					
	✓					
	✓ ✓					
	✓ ✓					
	✓ ✓					
	✓ ✓					
	✓ ✓					
	✓ ✓	Inc. Diabase, flakes of mo in quartz.	10	10	4-20	.001
	✓ ✓	Same as above.				
	✓ ✓					
	✓ ✓					
	✓ ✓					

SCALE 1" = 40'

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO. J-9
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 8 OF 10
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS
1610		Qtz. Monz.: Moderate chlorite and clay alteration. Minor diabase which has pyrite and traces of chalcopyrite disseminated through it and concentrated along the fractures. Cpy is more common on the orthoclase crystal faces. No moly shows detected below 630 feet. Clay alteration consists of from 5 to 20% of the total samples.				
1620						
1630						
1640						
1650						
1660						
1670						
1680						
1690						
1700						
1710						
1720						
1730						
1740						
1750						
1760		Increase in diabase.				
1770		Qtz. Monz.: About 10% of the particles made up of diabase. Clay alt. to near 1800'.				
1780						
1790						
1800						
1810		Qtz. Monz.: Little clay alt. Sulfides increasing slightly above previous 30'-foot interval				
1820		1820' Return of clay alteration. Cpy seen on dark pink orthoclase particles.				
1830						
1840						
1850						
1860						
1870						
1880		Sharp increase in fine-grained, black biotite.				
1890						
1900		Diabase: Pyritized with some cpy. Many qtz. Monz. fragments.	10	10	4-265	.02
1910		Qtz. Monz.: Same as above.				

SCALE 1" = 40'

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-9
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 9 OF 10
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (no.)	ASSAYS Cu	ASSAYS Mo
1930		Qtz. Monz.: Few pyritized diabase particles. Moderate chlorite & sericite. Total sulfides are approximately .5% with traces of chalcopyrite. 3-5% magnetite. Clay alteration is about 15% of the returns. Nearly 1/3 of the cuttings are made up mostly of mafic minerals; this decreases below 1980'		10	J-266	.03	.001
1940							
1950							
1960							
1970							
1980							
1990							
2000							
2010							
2020							
2030		More mafic material.					
2040							
2050		Qtz. Monz. & Diabase: Diabase is pyritized and includes showings of chpy; biotite					
2060			10	10	J-267	.04	
2070							
2080							
2090			10	10	J-268	.04	
2100		Qtz. Monz.: Minor chlorite and sericite. Clay alteration, minor sulfides.					
2110							
2120							
2130							
2140							
2150							
2160		Chpy on dark pink (secondary) orthoclase crystals.					
2170							
2180							
2190			10	10	J-269	.04	
2200							
2210							
2220							
2230							

SCALE 1" = 50'

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-9
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 10 OF 10
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (m)	Recovery (%)	Dip (°)	ASSAYS Cu
2250		Qtz. Monz.: Moderate chlorite, some ser. Only minor sulfides. Limited clay alteration. Some pyritiezed diabase.	10	10	J-270	.001
2260						
2270						
2280						
2290						
2300		Qtz. Monz.: Considerable diabase which is carrying considerable py and traces of chpy.				
2310						
2320						
T.D.			10	10	J-271	.005

SCALE

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-3
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 2 OF 8
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (ft)	ASSAYS Cu				
170		Diabase: Dark greenish-gray, mirocrystal line, pyritized and chloritized, magnetite & white quartz. Sulfides (est. 1-2%) appears to be fairly well disseminated with concentrations along veinlets.	10	10	J-63			.08		
180		do.								
190		do. Less pyrite and strong chloritization.								
200		do.								
210		do. Py est. at near 1% & 3% magnetite.	10	10	J-64			.18		
220		Less than a percent pyrite.								
230		do.								
240		do.								
250	252	Qtz. Monz.: Minor sulfides.								
260		do. Between about 260-285' the rock is more granite than a monzonite.								
270		do.								
280	285	Diabase: Same as upper units. No important sulfides.								
290		do.								
300	30[illegible]	Qtz. Monz.: Traces of py and chpy. Typical orthoclase xls. Biotite and an estimated 3% magnetite. Moderate chloritization. Minor sericite.	10	10	J-68			.03		
310										

DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

SCALE

HOLE NO J-3
PROPERTY
LOCATION
COLLAR COORD. N S
COLLAR ELEV.
SHEET 3 OF 8
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (ft)	Recovery (%)	Sample (No.)	ASSAYS Cu				
330		Qtz. Monz.: Typical pronounced orthoclase xls. Considerable biotite & 2-3% magnetite. Traces of py & chpy.								
340	339	do. Water at 336'. Drilling rate to 339' about 75'/ hour. Slower penetration below this depth.								
350		Qtz. Monz.: Few scattered fragments of diabase. Sulfides less than 1% with about half composed of chpy. Chpy is associated with quartz or orthoclase crystals.								
360		do.								
370		do.								
380		do.								
390		do.	10	10	J-65			.02		
400		do.								
410		do.								
420		Granite & Qtz. Monz.: Sharp decrease in orthoclase. Much biotite. Fragments of py and chpy.								
430		do.								
440		Qtz. Monz.: Same as above without the diabase.								
450		do. Minor diabase.								
460		Qtz. Monz.: About an equal amount of diabase. Traces of sulfides.								
470		do. Some of diabase fragments have discoloured through them finely py and chpy.								

DIRECTION _____ HOLE NO J-3
INCLINATION _____ PROPERTY _____
STARTED _____ LOCATION _____
COMPLETED _____ COLLAR COORD. N. _____ E. _____
DEPTH _____ COLLAR ELEV. _____
LOGGED BY _____ SHEET 4 OF 6
DRILLER _____ HOLE SIZE _____

Log	Rock Type and Description	Sample Int.	Sample Int.	Sample No.	ASSAYS Au	Ag	Cu	Mo	Pb	Zn
	Qtz. Mons.: Minor quantity of diabase									
	do. Scattered fragments of chpy and mo.									
	do. Vein type coatings of chpy with mo lining outside (earlier mineralization)	10	10	J-70			.09	.003		
	Chpy & mo., trace pyrite. Total sulfides est. @ less than 1% but incr. with depth. Starting @ 400-500'.	10	10	J-71	0	0	.09	.003		
	Heavy sh & mod. Chpy & mo present in strong sulfide stn. Sphalerite bands slightly green cast.	10	10	J-72			.10	.03		.50
	do.	10	10	J-73	0	0	.12	.031		.39
	do. Easy drilling through ore zone, exceptionally soft at about 565'	10	10	J-74			.21	.056		1.12
	Ore washed out in cleaning hole from 520-530'; sample no. J-81 also complete spectrochemical analysis.	10	10	J-80 J-75	0	0	.28 .15	.10 .108	.01	7.51 1.83
	567-569 No. J-77	10	10	J-77 J-76	.005	.3	.28 .15	.12 .095		4.39 2.15
	Boring cavities below about 570'	10	10	J-78			.15	.095		1.1
	Decreasing stain beg. about 575'. Strong chloritization, also fine hem-ilm.	10	10	J-79	.005	.15	.72	.005		1.74
	Est. sulfides 1%, chpy to py about 1:1	10	10	J-80			.15	.015		.62
	Considerable biotite, minor stain. More granitic than qtz. mons.	10	10	J-81	0	0	.06	.015		.14
	do.	10	10	J-102			.17			
	Qtz. Mons.: Some sulfides of chpy, py and mo. Sericitic.	10	10	J-103			.06	.011		.10
	Increasing sericite and hematite.	10	10	J-82			.04	.005		
	Composite sample from drip ditch at bottom of hole									2.83
	Manis Sample " "				.005	.3	.13	.0		2.72
	From drain ditch to sump.				0	.14	.078			2.28

SCALE

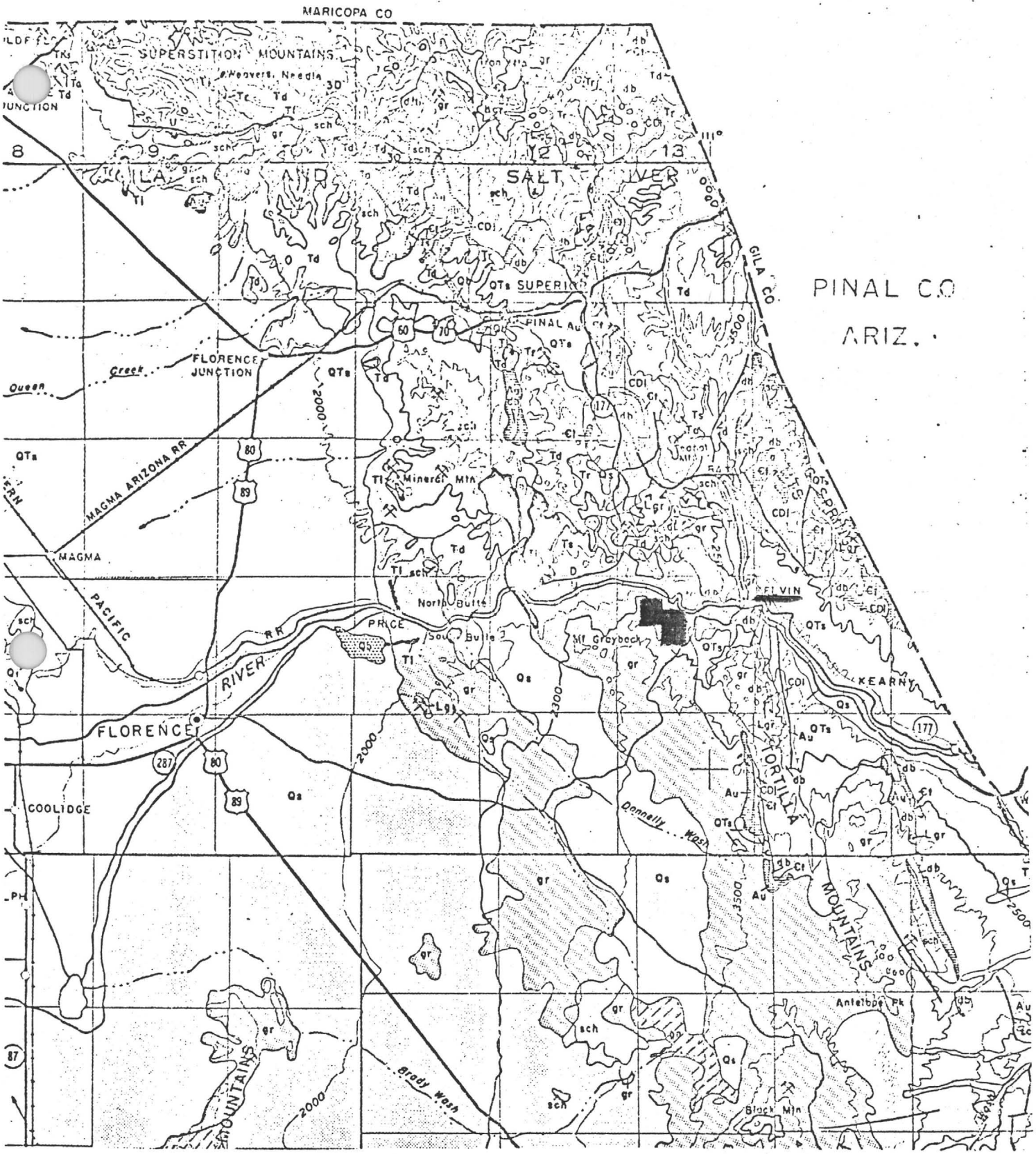
DIRECTION
INCLINATION
STARTED
COMPLETED
DEPTH
LOGGED BY
DRILLER

HOLE NO J-3
PROPERTY
LOCATION
COLLAR COORD. N. E.
COLLAR ELEV.
SHEET 6 OF 8
HOLE SIZE

Depth	Log	Rock Type and Description	Interval (m)	Recovery (%)	Sample (No.)	Assays Au	Ag	Cu	Mo	Zn
		Same as above.	10	10	J-96	0	0	.10	.106	
810		Qtz. Monz.: Diabase dikes. Est. sulfides less than 1% mostly as chcy, minor py & mo. Chlorite and ser. Mtzn appears to be associated with diabase.	10	10	J-95	0	.07	.25	.052	
820		Small specks of copper oxide. Hematite and decreasing chlorite.	10	10	J-97			.20	.028	
830		do. Mtzn does not appear to increase with diabase content.	10	10	J-105			.19	.025	.21
840	842	Decreasing Mtzn. Pred. biotite over chlorite.	10	10	J-106	0	0	.12	.028	.13
850		do.								
860		do. Total sulfides est. @ .8%	10	10	J-107			.10	.011	.17
870		Qtz. Monz.: Some diabase. Biotite & ch, Sulfides less than 1%. Specks of oxide.	10	10	J-108			.12	.015	.16
880		Homogeneous unit from 870-960', except for increasing diabase at about 938'.	10	10	J-109			.10	.015	.11
890		do.	10	10	J-110			.11	.011	
900		do.	10	10	J-111	0	0	.09	.018	
910		do.	10	10	J-112			.10	.015	
920		do.	10	10	J-113			.08	.011	
930		do.	10	10	J-114			.08	.017	
940		do.	10	10	J-115			.09	.027	
950		do. Silightly more sulfides; inc. diabase.	10	10	J-116	0	0	.10	.015	.49

DIRECTION		HOLE NO	J-8
INCLINATION		PROPERTY	
STARTED		LOCATION	
COMPLETED		COLLAR COORD. N.	E.
DEPTH		COLLAR ELEV.	
LOGGED BY		SHEET 5 OF 8	
DRILLER		HOLE SIZE	

Depth	Log	Rock Type and Description	Interval (m)	Recovery (m)	Sample (m)	ASSAYS Au	Ag	Cu	Mo	Zn
		Qtz. Monz.: Some granitic material. Good mtzn beg. at 641'. Sulfides Sericitized.	2 8	2 8	J-84 J-89	0	.13	.19 .71	.07	[illegible]
		J-83 from around collar at beg. of shift Qtz. Monz.: With granitic and diabase material. Moderate chlorite.	10	10	J-83 J-90	0	.04	.61 .40	.097 .06	2.5
		Qtz. Monz.: Mtzn. Est. total sulfides at over 2%. Hematite. Sand-sized particles	10	10	J-91	0	0	.28	.050	1.6
		do.	10	10	J-92	0	.15	.37	.23	1.5
		do. Thin diabase dikes.	10	10	J-93	0	0	.19	.07	.7
		do.	10	10	J-94	0	0	[illegible]	[illegible]	1.0
		do. Total sulfides 1% or less. Dropped some. Feldspars partially kaolinized.	10	10	J-98			.07	.022	
		do. Minor cu oxides & moly.	10	10	J-99			.04	.011	
		Total sulfides less than .5% hematite and mtzn diabase.	10	10	J-100			.05	.01[illegible]	
		do.								
		do.	10	10	J-101			[illegible]	[illegible]	
		do.								
		do.	10	10	J-102	0	0	.06	.01[illegible]	
		do. Increasing diabase and sulfides.								
		do.	10	10	J-103			.08	.01[illegible]	
		Increasing sulfides and cu oxides below 790' & between 800-810'.	10	10	J-104	0	0	.11	[illegible]	.2



LOCATION PLAT

KELVIN PROSPECT

Cu- Mo

Figure 2
TOPOGRAPHY & CLAIM MAP
KELVIN PROSPECT

INDUCED POLARIZATION SURVEY

OF THE

KELVIN AREA, PINAL COUNTY, ARIZONA

FOR

TIPPERARY RESOURCES CORPORATION

MAY 1970

BY

HEINRICHS GEOEXPLORATION COMPANY
P.O. BOX 5964 TUCSON, ARIZONA 85703
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Line OE/W (Spread 1, a = 1000')

Line OE/W (Spreads 2 & 3, a = 500')

Line 10E (Spread 1, a = 1000')

Line 10E (Spreads 2 & 3, a = 500')

Line 20E (Spread 1, a = 1000')

Line 30E "

Line 40E "

Line 50E "

Line 10W (Spread 1, a = 1000')

Line 10W (Spreads 2 & 3, a = 500')

Line 20W (Spread 1, a = 1000')

Line 30W "

Line 40W "

Line 50W "

Basis of the Induced Polarization Method

GENERAL LOCATION
of
THE KELVIN AREA
FOR
TIPPERARY RESOURCES CORPORATION

ARIZONA

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INTRODUCTION

At the request of Mr. C.R. Williams, Senior Minerals Geologist, Tipperary Resources Corporation, Heinrichs GEOEXploration Company conducted and completed a comprehensive induced polarization survey in the Kelvin Area, Pinal County, Arizona. The field work was done during the interim March 10 to May 5,1970.

A total of eleven lines were completed, all oriented N-S. A coordinate grid was used whose origin is the southeast corner of Section 8, T4S, R13E to which all lines and stations have been referred. The lines are separated by 1000 feet and a station spacing (dipole or "a" spacing) of 1000 feet was utilized except on Lines OE/W, 10E and 10W where a more detailed spacing of 500 feet was also employed. The total surface coverage counting both dipole spacings was 37.5 miles of which 24.5 miles was "subsurface" plotted data points.

The dual frequency I.P. technique was used with sending frequencies of 0.3 and 3.0 Hz with a GEOEX MK-7 sender and a GEOEX MK-4C receiver. The collinear dipole-dipole configuration was the electrode arrangement employed which on a 1000 foot spacing should typically give resolvable penetration within the zone from roughly 300 feet to approximately 1200 to 1500 feet below surface.

The purpose of this survey was to aid in delineating a subsurface sulfide zone and thereby help to define drilling targets in a mineralized area evidenced by several surface showings of copper and molybdenum and partially defined by several existing drill holes.

The data are presented on Sectional Data Sheets, one for each line and spacing, showing resistivity, percent frequency effect (PFE) and metallic conduction factor (MCF) contoured in section with self potential (SP) in profile form. An "Induced Polarization Location and Interpretation Plan" is also included showing the surface projected plan interpretation of the 1000 foot dipole data relative to the land net and overlays a portion of the U.S.G.S. 1:24,000 scale Grayback Topographic Quadrangle which is also included herewith and which shows the surface projected 500 foot dipole data interpretation. For additional details concerning theory, interpretation and presentation, see the "Basis of the Induced Polarization Method" appended to the report.

Heinrichs personnel involved in the field work were D. Chaffin, geophysical crew chief; D. Kern, J. Boduch, J. Patten, B. Coons and W. Wright, technical assistants with W. Freeman, Geophysicist supervising in the field. Report and interpretation by C. Ludwig, Senior Geophysicist assisted by the GEOEX staff.

CONCLUSIONS

Anomalous induced polarization effects are seen on all lines and define a WNW-ESE trending zone roughly through the central portion of the area surveyed. The total width of this zone varies from about 3500 feet to 5000 feet considering the very weak (and sometime poorly defined) fringes. The stronger core of the anomaly is about 1500 feet to 2000 feet in width and lies roughly between 15W and 35E.

The cause of the anomalous response is likely metallic lustered sulfide mineralization. Within the stronger anomalous core about 0.5 to 2.0% by volume total bulk average sulfides is indicated based on a comparison with "typical" disseminated sulfide zones in the Southwest. This concentration crudely represents 1.0 to 4.0% total sulfide by weight and therefore could certainly be of economic interest providing the ratio between minerals of copper, molybdenum etc., to the iron minerals is reasonably high.

Depth to the top of this indicated mineralization varies from within 150 feet of the surface on portions of Lines 0E/W and 10E and becomes progressively deeper east and west thereof. The greatest depth to the top of polarizable mineralization noted is on Line 50E where the main causative body may be deeper than 1500 feet below surface. Dip is difficult to determine by the I.P. technique but there is some evidence of a southerly dip (or top slope of a broad body) in several portions of the area.

Based on the geologic data available to us, no obvious correlation is noted between any particular geologic units or structure and the I.P. anomaly. Therefore it is possible that the polarizable zone is caused by or related to some unexposed intrusive or structure at depth roughly below the anomalous area. However, no obvious change is seen in the geophysical data with depth, thereby suggesting in excess of 1500 feet to this postulated intrusive or structure or simply that there is a lack of electrical contrast with the overlying material. The induced polarization response in general shows no obvious evidence of having a depth limited source. Sulfides are expected to persist to at least 1500 feet in depth - the probable limit of resolvable "penetration" of the resultant data.

The resistivity is relatively uniform and rather non-diagnostic. Portions of the more strongly polarized zone have lower associated resistivities probably caused by the concentration of conductive sulfide mineralization and associated alteration.

Lower resistivity is also seen where there is an appreciable thickness of recent alluvium overlying the crystalline bedrock as on the north ends of Lines 20E and 30E in the Gila River gravels. Higher resistivities are associated with the topographic effect of erosional resistant ridge crests and perhaps tighter or more silicified rock. The highest resistivities are noted near 35N on Lines 40W and 50W where the most extreme topography on the survey was traversed.

Many of the lines show a broad self potential low, correlating with the anomalous I.P. response, which is likely reflecting concentrations of relatively interconnected, actively oxidizing sulfides within several hundred feet of the surface.

RECOMMENDATIONS

Because of the geophysical correlation with encouraging copper - molybdenum mineralization at depth in DH-2 it is recommended that a fairly extensive and deep drilling program be executed to more completely evaluate the rest of the significant appearing induced polarization anomaly. Eight drill holes are proposed in order of geophysical priority - some of which will of course depend on the results of higher priority holes, existing drilling and geological and geochemical information available, all of which should be in constant correlation.

1. Line OE/W near 19N to test a rather strong but narrow near surface polarizable zone apparently merging at depth with the broad main anomaly. This drill hole should go to about 600 feet to evaluate the shallow anomaly but could effectively be carried to at least 1000 feet and preferably to 1500 feet to also test the northern portion of the broad anomaly at depth.

2. Line 10E near 13N to test the strongest I.P. response noted on the survey. This hole should be at least 1000 feet in vertical depth to properly evaluate the zone of interest. Mineralization is expected from within about 150 feet of the surface to at least 1200 to 1500 feet in depth.

3. Line OE/W near 7.5N (or essentially equivalently near 5N on Line 10E)to test one of the stronger and deeper portions of the main anomaly. This hole is approximately midway between your DH-1 and DH-2 and will give additional information as to the mineralization across the width of the anomalous zone. To completely evaluate the section of interest, the hole should be programmed for about 1500 feet total depth and should depend to some degree on the results of Recommendation 1. above.

4. Line OE/W near 7S to test a minor zone of increased mineralization, within the fringe zone, which shows up best on the more detailed 500 foot coverage. A relatively shallow hole - about 500 feet - should suffice to evaluate this target unless encouragement is obtained. The expected strength of mineralization in this area is roughly only one half that of the stronger core of the main anomaly and it will therefore necessitate a very high copper to iron ratio to be economically interesting. Because of this low expected sulfide content, drilling at this stage should only be considered if there is supporting geological or geochemical data.

5. If Recommendation 2. proves encouraging then a hole is suggested near 7.5N on Line 20E to test a zone of similar response. A minimum drilling depth of 1000 feet should be considered to properly sample the interesting section.

6. If Recommendation 5. proves encouraging, a drill hole near 5S on Line 30E should be considered and again should be programmed for a minimum of 1000 feet in depth.

7. and 8. Depending on drilling results on Line OE/W, two holes could be considered on Line 10W; near 17.5N and 7.5N. Somewhat deeper and/or weaker mineralization is expected compared to Line OE/W and drilling here should be in excess of 1000 feet in depth to effectively sample the target.

All of the above drilling is considered vertical as recommended. However, if after several holes have been completed and if a definite and persistent dip is established, inclined drilling may prove more efficient.

Additional geophysical drill targets can be located by reference to the interpretation plan surface projected anomalism and its correlation with existing drill information. The weaker fringes of the I.P. anomaly should be given some consideration especially if in areas having evidence of a high copper to iron ratio. In fact in many mining areas, the weaker I.P. zones are of more interest than the stronger portions which may only be reflecting high pyrite concentrations. In this area, because of the rather low overall indicated sulfide concentration, initial attention has been focused on the stronger sulfide zones in the hope that they would have the highest probability of being economically interesting.

Further detailed I.P. coverage should be considered particularly if some of the more shallow mineralization becomes of interest. Reconnaissance I.P. along the general strike of the mineralized zone east and west of the present coverage is also suggested if the prospect continues viable. A semi-reconnaissance ground magnetic survey would conceivably delineate a related intrusive at depth as well as other possibly significant features of mineralization and structure and would be relatively inexpensive.

DRILLING OF I.P. TARGETS

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

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

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

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

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

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

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

INTERPRETATION

Line OE/W (Spread 1, a = 1000', Spreads 2 & 3, a = 500'):

The detailed coverage on Spreads 2 & 3 defines a moderately strong, narrow (about 500' in width) near surface and somewhat depth limited anomaly whose source is indicated near 20N and is associated with a self potential low suggestive of relatively interconnected, actively oxidizing sulfides. Depth to the top of this anomaly source is likely less than 150 feet and the source probably continues to 300 or 400 feet below surface where it becomes weaker in indicated strength of mineralization. This somewhat reduced indicated mineralization may persist indefinitely below the near surface body and in fact may persist below 1500 feet based on the 1000 foot dipole coverage. There is even some indication that the overall sulfide content may increase again below about 1000 feet in depth.

North of this moderate strength anomaly, the response fairly rapidly decreases to background near 27.5N. A minor probably very narrow source anomaly is noted near 45N and is apparently quite limited in size since it is not observed on nearby parallel traverses.

South of the moderate anomaly the response more gradationally diminishes to very weak in strength from 12.5N to 2.5S where slightly increased response is noted continuing to about 10S. This minor increase in anomalism is probably caused by a zone roughly 500 feet in width, coming to within 150 feet of the surface but having very good depth persistence. South of 15S very uniform background is noted.

The deeper penetrating 1000 foot dipole coverage shows a zone between about 0N/S to 25N of moderate strength I.P. response having very good depth persistence and a sharp cutoff to background to the north and a gradational decrease to the south.

In the area of the moderate anomalism, there is some evidence of a fairly steep southerly dip of the overall mineralization. This may explain in part why DH-2 intersected interesting mineralization shallower than DH-1. Both of these drill holes appear to be within the zone of stronger anomalism but DH-1 is quite near the southern fringe and this may also explain why less mineralization was intersected compared to DH-2 which is more centrally situated in the anomalous zone.

This deeper information suggests that the shallow anomalies seen near 20N and 7S on Spreads 2 and 3 are continuous with and just projections of the broad deeper main anomaly.

The resistivity is quite uniform on this Line. A minor low correlates with portions of the stronger I.P. zone. The weak zone near 7S appears to relate to an area slightly higher in resistivity perhaps due to silicification or simply less fractured, tighter rock. The self potential shows a general low over the entire width of the complete I.P. anomaly but with a pronounced fairly narrow low relating to the shallow moderate strength I.P. anomaly at 20N on Spread 2 likely reflecting the near surface oxidizing concentrated sulfides in that area.

Line 10E (Spread 1, a = 1000', Spreads 2 & 3, a = 500'):

The I.P. response on the Line is quite similar to that seen on Line OE/W, but is somewhat stronger, in fact the strongest seen on the survey. There is a rather pronounced resistivity low associated with the stronger I.P. response which lies mainly between 7.5N and 20N. A definite self potential low also correlates with the stronger I.P. effects. Again there seems to be several near surface zones of concentrated sulfide merging at depth with the main broad anomaly. The strongest of these shallow zones appears to originate from near 17.5N and to progressively become deeper to the south. Another, but weaker, near surface zone is noted near 7.5S correlating with a similar anomaly 1000 feet to the west on Line OE/W. Resistivities on this line are more erratic, at least on Spread 2, than on Line OE/W perhaps due in part to topographic ridge effects.

Line 20E (Spread 1, a = 1000'):

Line 20E shows a good correlation to Line 10E, Spread 1 except for being somewhat weaker in I.P. response and indicating about 300 to 500 feet to the top of the main concentration of mineralization instead of less than 150 feet as on Line 10E. Also, the two near surface projections noted on the two lines directly west are no longer evident. There is still a broad self potential low and a minor resistivity low correlating with the stronger I.P. effects which lie mostly between ON/S and 15N.

Line 30E (Spread 1, a = 1000'):

This Spread shows a well defined I.P. anomaly whose source is mainly between 20S and 15N and having a moderate strength core from 10S to 5N obviously correlating with the moderate zone on Line 20E but displaced about 1000 feet to the south. Depth to the source and anomaly strength is similar to Line 20E and again there are

associated resistivity and self potential lows.

The extreme north end of this line and Line 20E show lower resistivities apparently related to relatively conductive gravels in the Gila River channel.

Line 40E (Spread 1, a = 1000'):

As on Line 30E, a well defined anomaly is seen between 20S and 15N. However this anomaly suggests a considerably deeper source than on Line 30E, perhaps in excess of 1000 feet to the zone of most concentrated sulfides. Weak mineralization may come to much closer to the surface, however. Again there is an associated broad self potential low, Minor zones of high and low resistivity are seen to relate to the I.P. anomaly.

Line 50E (Spread 1, a = 1000'):

A very deep source is indicated on this Spread, perhaps in excess of 1500 feet below surface, and likely correlating with the deep response noted on Line 40E. A broad self potential low and erratic resistivities are associated. As on Line 40E, weak sulfides may be present much shallower than the indicated depth to the main concentration of mineralization.

Line 10W (Spread 1, a = 1000', Spreads 2 & 3, a = 500'):

Line 10W shows a fair degree of pattern correlation with Line OE/W but is quite a bit weaker in strength of I.P. response and somewhat deeper appearing. The near surface anomaly near 20N is much subdued and has almost completely merged with the main broad anomaly. At depth, on the 1000 foot dipole coverage, the response is nearly as strong as data from a similar depth on Line OE/W and is therefore of some interest. It is possible however, that the response at depth is actually a lateral effect from mineralization east of the line near Line OE/W.

The resistivities are fairly uniform and show no obvious correlation with the I.P. response. The self potential also shows no well defined relation to the I.P. response.

Line 20W (Spread 1, a = 1000'):

The I.P. response on this line is quite similar to that noted on Line 10W in strength (except at depth where it is weaker), position, shape and indicated depths. However, there is a pronounced resistivity high centered near ON/S which gives some complexity

to the MCF pattern. This resistivity high may be caused by a quartz monzonite or aplite dike as indicated on the Geologic Map by Mr. T.L. Hanks. There is no obvious significant appearing sulfide response from this dike based on the I.P. data. No self potential data was obtained on this line due to improperly balanced non-polarizing electrodes.

Line 30W (Spread 1, a = 1000'):

An I.P. anomaly centered near 10N similar to that on Line 20W is noted but which is somewhat deeper and narrower. The resistivities are quite complex and again show a high area near 0N/S perhaps caused by the same dike as on Line 20W. Another resistivity high is noted near 20N which is likely related to the high ridge topographic effects and/or erosionally resistant, tighter, less conductive material. A broad self potential low is apparently related to the zone of increased I.P. response.

Line 40W (Spread 1, a = 1000'):

This line shows only very weak and very deep appearing I.P. effects. The depth to the causative source may be in excess of 1200 feet in the vicinity of 5N but the source is likely a portion of the same sulfide zone seen on lines to the east. A minor but more shallow appearing anomaly is noted south of 15S. There is no obvious resistivity correlation but a broad self potential low seems to relate to the 5N I.P. zone. There is a very high zone of resistivity near 30N again apparently reflecting the high topographic ridge in that area.

Line 50W (Spread 1, a = 1000'):

Very similar I.P. effects are seen here compared to Line 40W with deep response below about 5N and more shallow but still very weak effects south thereof. The resistivity is erratic but still shows very high values crossing the ridge near 35N. A near surface conductive zone is present roughly between 25S and 5N perhaps reflecting more deeply weathered material. No significant self potential effects are seen along the traverse.

Respectfully submitted:

HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

APPROVED: Walter E. Heinrichs, Jr.
Walter E. Heinrichs, Jr.
President

May 22, 1970
Tucson, Arizona

April 1, 1970

Mr. C.R. Williams
Senior Minerals Geologist
Tipperary Resources Corporation
500 W. Illinois
Midland, Texas 79701

Re: I.P. Survey near Kelvin
Arizona

Dear Mr. Williams:

As per your request, this letter is a preliminary interim report on the work accomplished to date on the Kelvin project. We have completed I.P. Lines 10W, OE/W and 10E on both 1000 foot and 500 foot spacings. Sectional data sheets for each line and spacing plus two interpretation plans (one for each spacing) are attached herewith.

The I.P. coverage to date has disclosed a broad, definite but complex, sulfide zone lying mostly between stations 30N and 25S on all three lines within which are several zones of significantly stronger sulfide indications which are discussed in detail below.

On the more detailed (and shallower penetrating) 500 foot dipole spacing coverage, a moderately strong, near surface, depth limited anomaly source is indicated on Line OE/W near 20N and is associated with a self potential low suggestive of actively oxidizing, relatively interconnected sulfides. The top of the source of this anomaly is likely within 150 feet of the surface and continues to 300 or 400 feet below surface where the source may weaken somewhat in strength. This somewhat weaker indicated mineralization persists indefinitely below the near surface body and in fact may persist below 1500 feet based on the corresponding 1000 foot dipole data. In fact, the overall sulfide strength may increase again roughly below 1000 feet in depth.

In this same vicinity there is some evidence of a fairly steep southerly dip of the overall mineralized zone which may have been intersected downdip by your drill hole near 13N (and perhaps also by your drill hole near 2N if deep enough - say 1500 feet or so). Both of your existing drill holes appear to be within the zone of stronger anomalism as outlined by the 1000 foot dipole coverage but the southernmost hole is quite near the southern fringe and this may explain why it intersected less mineralization than the northernmost hole which is more centrally situated in the anomalous zone. Later on in the project, if still economically encouraging, a deep vertical hole is suggested near 7.5N between the two existing holes. A hole near 7.5N would likely test the best (geophysically speaking) portion of the deeper downdip anomalism and should go to roughly 1500 feet to completely evaluate the width of the section of interest. (3)

However, at this time, a possibly more valuable hole could be collared near 19N on Line OE/W and be drilled vertically for 500 feet or so to evaluate the moderate strength shallow I.P. anomaly. In that this location is also within the moderate strength zone of response noted at depth on the 1000 foot dipole line, and would test it reasonably far (roughly 600 feet north) from the present drilling, it is suggested that the hole be drilled past 500 feet to 1000 to 1500 feet, or so, in depth. It is possible that the near surface anomaly is not really distinct from and stronger than the underlying zone and is only reflecting a shallow weathering phenomenon - another reason to continue drilling below 500 feet. (1)

On Line 10W the near surface anomaly noted near 20N on Line OE/W is absent. The deeper zone does persist to the west and is almost as strong as on Line OE/W but is somewhat narrower and centered near 15N. No drilling is recommended on the line at this time. Targets can be picked when it is desired to further sample the sulfide zone along strike to the west and preferably should be based on the results and correlations from drilling on Line OE/W. Without this data, the best drilling locations on Line 10W appear to be near 17.5N and 7.5N. (7 & 8)

Line 10E shows the strongest response to date on the survey - mainly between 5N and 20N. The most shallow response within the zone is centered near 15N and again the source appears to have a relatively steep slope to the south. This anomalous zone can be initially evaluated with a hole collared near 13N on Line 10E and should be drilled to at least 1000 feet in depth. Mineralization is expected from within 150 feet of the surface to at least 1200 to 1500 feet in depth. (2)

Both Lines OE/W and 10W show a minor zone of somewhat increased mineralization near 5S having a source coming to within 150 feet of the surface and depth persistence to at least 1200 feet. Drilling should be considered here at some stage of the project and a hole collared near 7S on Line OE/W should give an adequate initial test. (4)

The OE/W - ON/S coordinate is the SE corner of Section 8 and all stations have been designated in hundreds of feet. Drill sites based on the geophysical grid should be measured relative to the nearest existing I.P. stations on the ground to minimize surveying errors thereby helping to maximize intersection of the geophysical targets.

I hope this letter gives you enough information to help position future drilling. The field crew is continuing with the 1000 foot dipole coverage on lines to the east. If you have any questions please let me know.

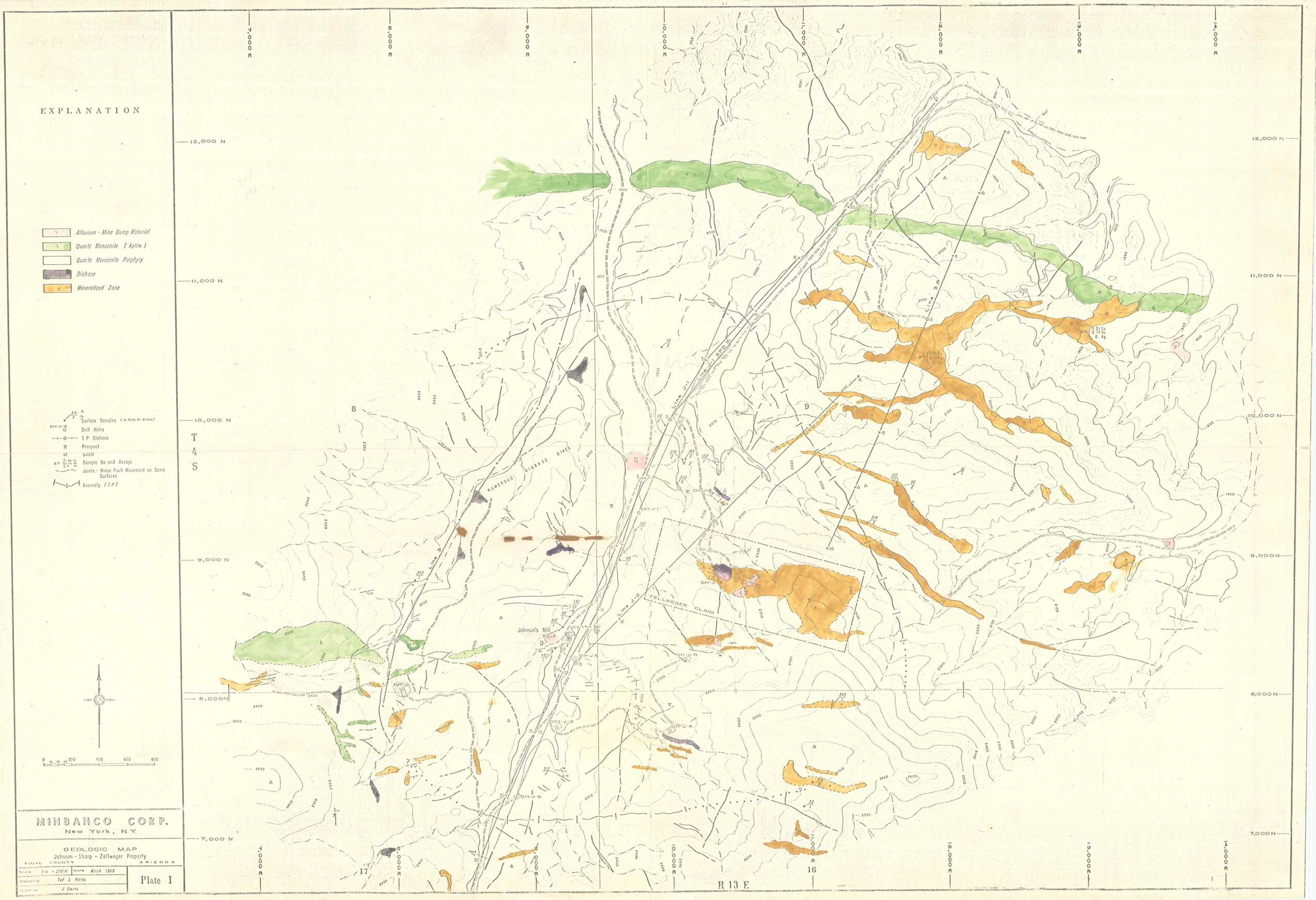
Sincerely,
HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

Enclosures: 2 copies each of 6 Sectional Data Sheets and
2 Interpretation Plans

CSL/re:


EXPLANATION
Alluvium - Mine Dump Material
Quartz Monzonite (Aplite)
Quartz Monzonite Porphyry
Diabase
Mineralized Zone
Surface Samples (In Parts Per Million)
Drill Holes
I.P. Stations
Prospect
Shaft
Sample No. and Assays
Joints - Minor Fault Movement on Some Surfaces
Anomaly (I.P.)
MINBANCO CORP.
New York, N.Y.
GEOLOGIC MAP
Johnson - Sharp - Zellweger Property
PINAL COUNTY ARIZONA
Scale 1 in = 200 ft
Date March 1969
Mapping Ted L. Hanks
Drafting J. Owens
Plate I
Johnson's Mill
ZELLWEGER CLAIM
NUMEROUS DIABASE DIKES
Line 3
Line 3R
Line J-1
Line J-2
T 4 S
R 13 E
12,000 N
11,000 N
10,000 N
9,000 N
8,000 N
7,000 N
7,000 E
8,000 E
9,000 E
10,000 E
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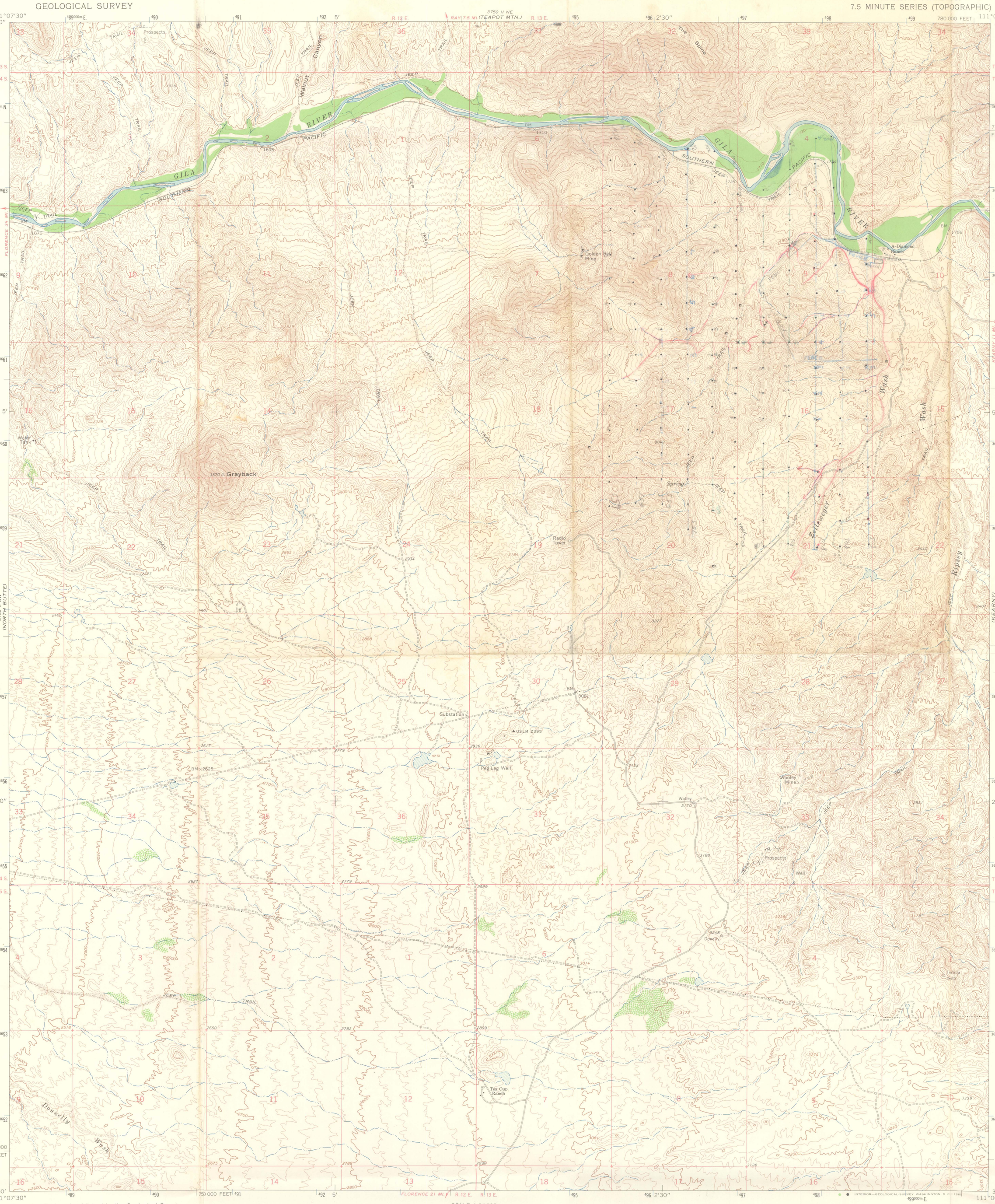
12,000 E
13,000 E
14,000 E

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GRAYBACK QUADRANGLE
ARIZONA—PINAL CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey in cooperation with the Bureau of Reclamation

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1962. Field checked 1964

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Fine red dashed lines indicate selected fence lines

UTM GRID AND 1964 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

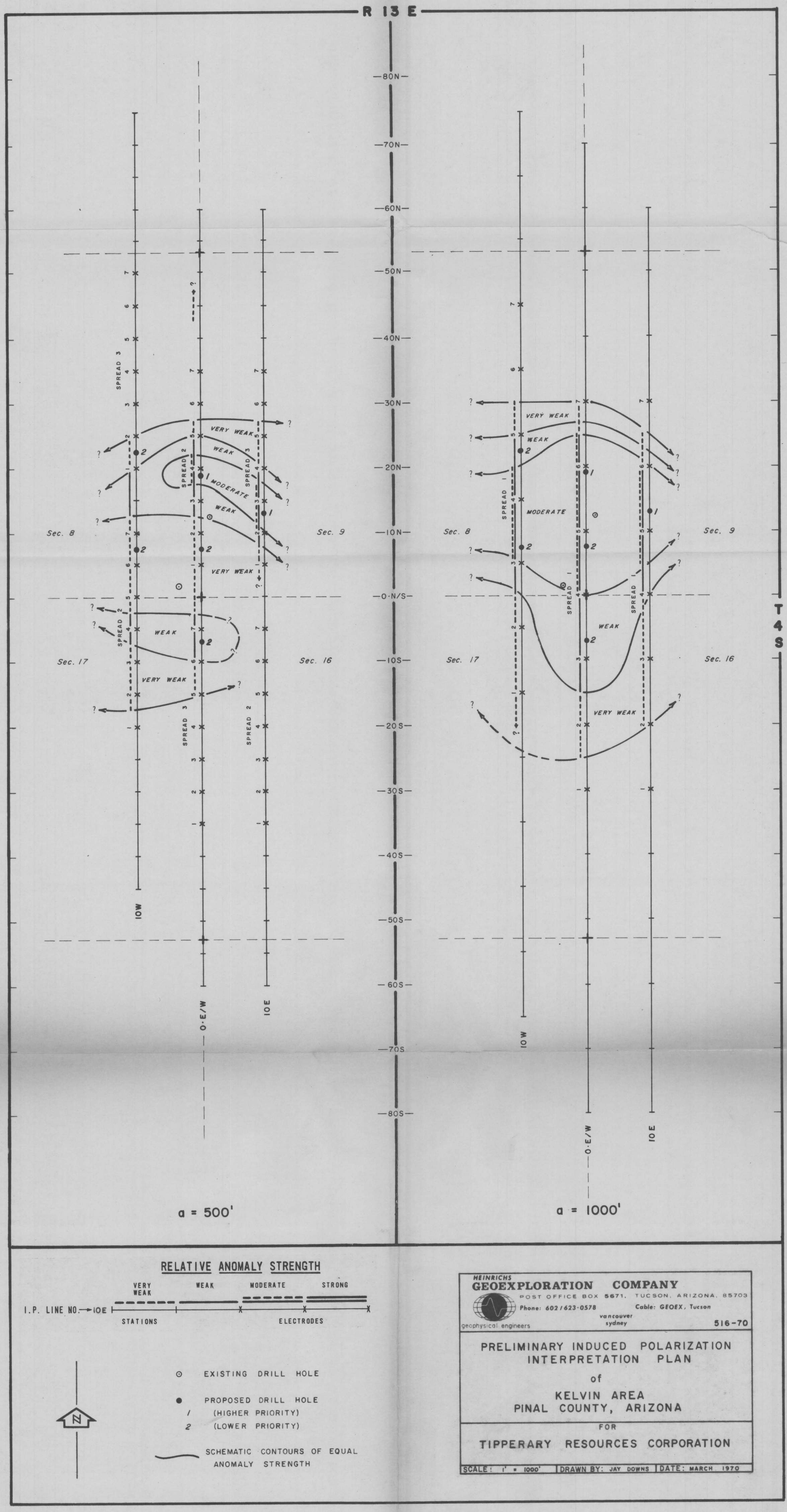
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

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

QUADRANGLE LOCATION

ROAD CLASSIFICATION
Light-duty — Unimproved dirt

GRAYBACK, ARIZ.
N3300—W11100/7.5
1964
AMS 3750 II SE—SERIES V898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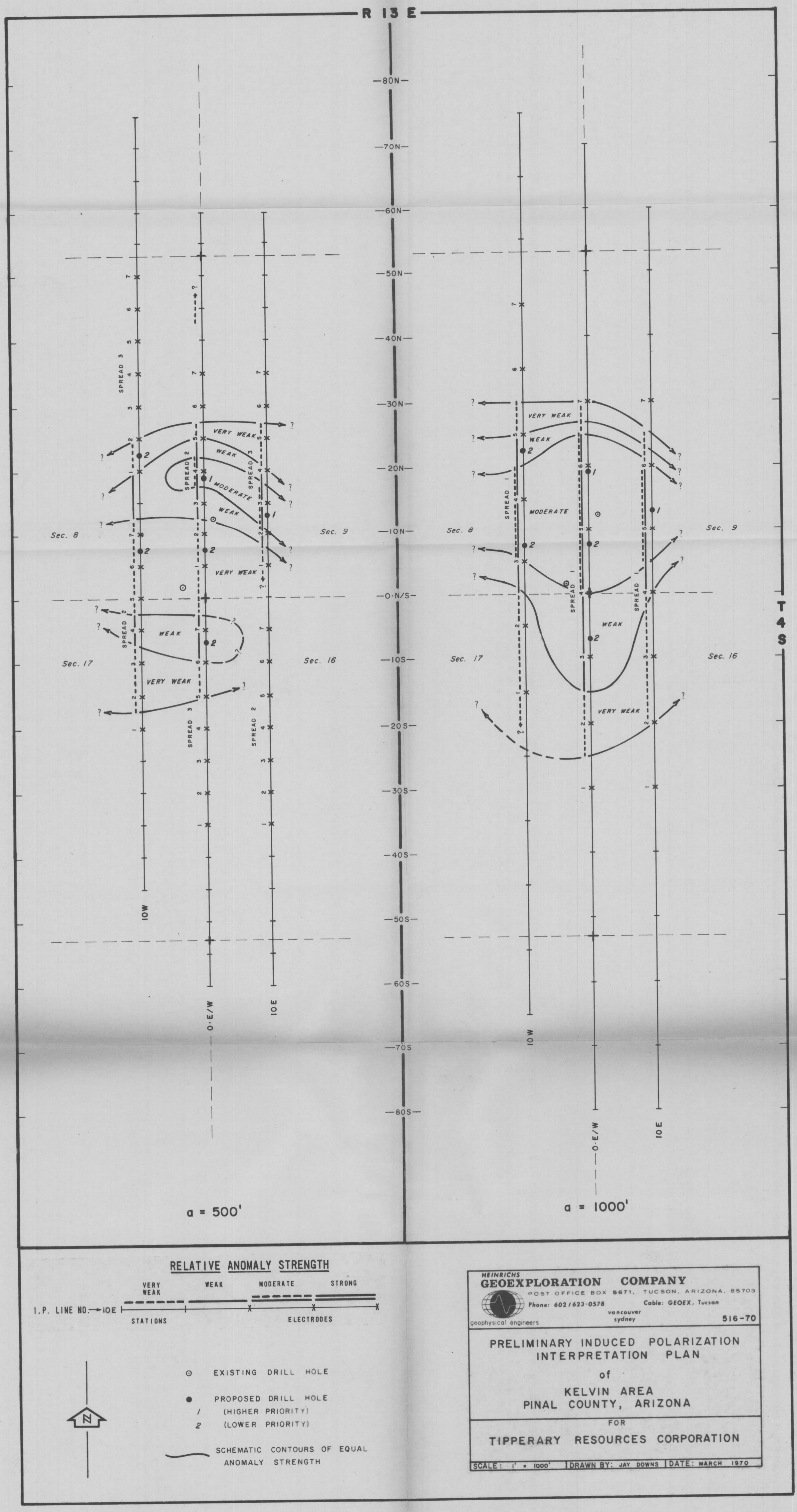
70N
60N
50N
40N
30N
20N
10N
0 N/S
10S
20S
30S
40S
50S
60S
70S
80S
SPREAD 3
SPREAD 2
SPREAD 1
VERY WEAK
WEAK
MODERATE
Sec. 8
Sec. 9
Sec. 17
Sec. 16
10W
0 E/W
10E
a = 500'
a = 1000'
RELATIVE ANOMALY STRENGTH
VERY WEAK
WEAK
MODERATE
STRONG
I.P. LINE NO. → 10E
STATIONS
ELECTRODES
EXISTING DRILL HOLE
PROPOSED DRILL HOLE
1 (HIGHER PRIORITY)
2 (LOWER PRIORITY)
SCHEMATIC CONTOURS OF EQUAL ANOMALY STRENGTH
N
HEINRICHS GEOEXPLORATION COMPANY
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
Phone: 602/623-0578
Cable: GEOEX, Tucson
vancouver
sydney
geophysical engineers
516-70
PRELIMINARY INDUCED POLARIZATION INTERPRETATION PLAN
of
KELVIN AREA
PINAL COUNTY, ARIZONA
FOR
TIPPERARY RESOURCES CORPORATION
SCALE: 1" = 1000'
DRAWN BY: JAY DOWNS
DATE: MARCH 1970


R 13 E
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30S
40S
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