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

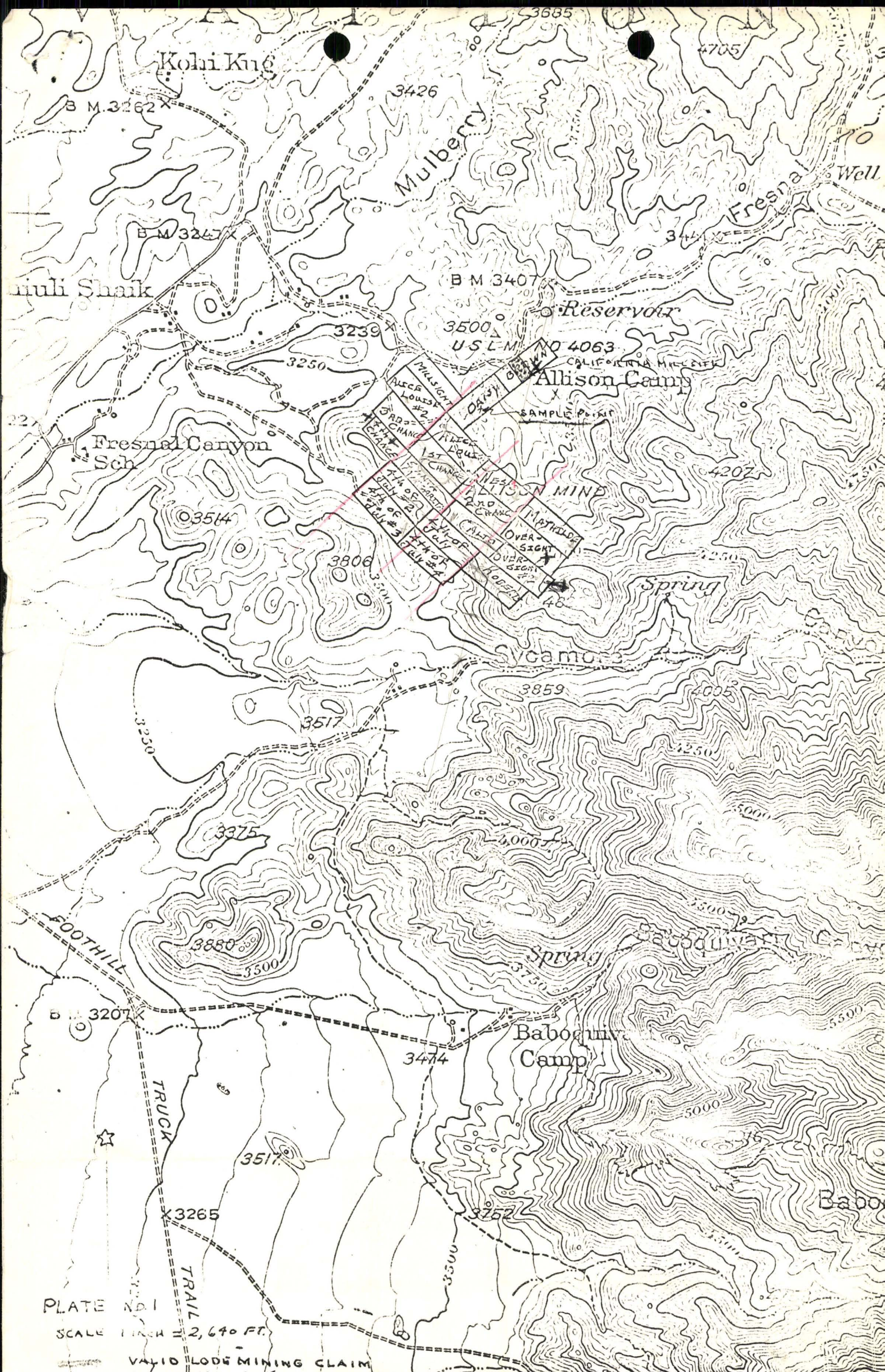


PLATE No. 1

SCALE 1 INCH = 2,640 FT.

VALID LODE MINING CLAIM

VALID MILLSITE

— Proposed I.P. coverage

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Allison Line: 2 SP2 5½ Int.Cal Date:

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal		
Rec.	20-25	→			25-30	→				0-5		
Time	30	10	1	1	30	10	1	1				
DC-1	20.7 19.1	466 350	410 398 462 368	205 262 240 174	10.1 9.2	2.65 2.78	406 395 295 308	218 180 182 182		100 100		
DC-2	20.7 19.1	466 350	402 380 452 482	215 290 230 140	10.1 9.2	2.65 2.78	402 348 300 340	232 200 140 192		100 100		
Σ												
DC-3	20.6 19.2	466 354	410 376 454 490	222 322 226 125	10.1 9.2	2.65 2.78	400 352 298 330	262 198 102 150				
Dc-4	20.6 19.2	466 354	404 360 464 490	228 350 214 098	10.1 9.2	2.65 2.78	386 352 320 380	190 232 208 138				
Σ												
DC-AV	39.8	8.17	.847	.452	19.3	5.43	.696	.377		200		
AC-1	20.05	4.10	.432	.226	9.7	2.70	.346	.186		101		
AC-2	20.05	4.10	.434	.228	9.7	2.70	.346	.186		101		
Σ	40.1	8.2	.866	.454	19.4	5.40	.692	.372		202		
S. P.	-10.0				-11.3							
AC-N	.07				.07							

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ____________

Project: Allison Line: 2' Sp 2 5½ Int.Cal ________ Date: ____

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time	300	100	10	1000	30	10	300	30	3	1		
DC-1	175 174	436 41.4	462 448	370 375	18.1 15.7	208 222 262 250	139 142	21.5 19.0	178 168 135 145	470 505 684 625		
DC-2	175 174	43.8 41.0	450 456	370 375	18.2 15.6	218 238 268 222	139 142	21.6 18.9	178 171 136 142	500 530 702 650		
Σ												
DC-3	175 174	44.0 40.8	446 478	370 375	18.3 15.5	210 236 276 260	140 141	21.6 18.9	176 170 148 142	500 495 682 645		
Dc-4	175 174	444 40.6	425 482		18.3 15.5	210 216 270 268	140 141	21.6 18.9	164 173 150 140	518 480 662 670		
Σ												
DC-AV	349	84.9	9.07	645	33.8	4.79	281	40.5	3.14	1.166		
AC-1	173	42.8	4.58	365	16.9	2.43	139	21.0	1.56	.578		
AC-2	173	42.8	4.58	365	16.9	243	139	20.1	1.56	.576		
Σ	346	85.6	9.16	730	33.8	4.86	278	40.2	3.12	1.154		
S. P.	-5.6	+37.8		+38.9			-8.9					
AC-N	.06	.03		.08			.04					
ot.Res.												

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: ~~5~~- N½ 2-Sp2 Date: 29 Jul 66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time												
Range	210V	290V	210V	350V	290V	210V	360V	350V	290V	220V		
Current	2A	2A	2A	1½A	2A	2A	1½A	1½A	2A	2A		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal 2-3		
Receive	20-25	→	→	→	25-30	→	→	→				
Time												
Range	280V	350V	290V	210V	270V	350V	290V	210V		150V		
Current	1½A	1½A	2A	2A	1½A	1½A	2A	2A		1A		

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: ~~5~~-5½ 2 Sp2 Date: 29 Jul 66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time												
Range	360v	340v	270v	290v	340v	270v	210v	300v	340v	270v		
Current	2A	1½A	1½A	2A	1½A	1½A	2A	2A	1½A	1½A		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal 2-3		
Receive	20-25	→	→	→	25-30	→	→	→				
Time												
Range	210v	290v	340v	270v	210v	290v	340v	270v		150v		
Current	2A	2A	1½A	1½A	2A	2A	1½A	1½A		1A		

INDUCED POLARIZATION - RECEIVER NOTES PAGE ___

Project: Allison Line: 2 Sp2 N½ Int.Cal ______ Date: ______

Send	1-2											
Rec.	0-5											
Time	.1	.3	[illegible]	.3	.1	30	.1	30	.1			
DC-1	61.6 61.4 62.2 61.6	[illegible]	[illegible]	180	[illegible]	31.3	101	35.2				
DC-2	61.6 61.2 62.4 61.4			[illegible]	135				[illegible]	[illegible]		
Σ									[illegible]	[illegible]		
DC-3	59.0 61.6 63.8 61.0								[illegible]	[illegible]		
Dc-4	59.4 62.2											
Σ												
DC-AV		349	13.1	180	135	31.3	101	35.2	55.6	21.1		
AC-1	61.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	49.5	17.5	[illegible]	[illegible]		
AC-2	61.0											
Σ	122.2	352	13.2	178	132.8	31.2	99.0	35.0	55.6	21.0		
S. P.	+1.1	[illegible]		[illegible]			[illegible]					
AC-N	.08											

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: Allison   Line: 2 Sp2 N½   Int.Cal ______   Date: ______

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
Rec.	20-25	———	———	——→	25-30	———	———	——→				
Time	[illegible]	[illegible]	[illegible]	[illegible]								
DC-1										100 100		
DC-2				[illegible]						100 100		
Σ	[illegible]	[illegible]	[illegible]					[illegible]				
DC-3	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]				
Dc-4	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]				
Σ												
DC-AV	27.5	13.9	27.5	12.12	11.50	7.00	15.0	7.45				
AC-1	13.6	6.83	13.5	5.98	5.65	3.4	7.2	3.65		100		
AC-2										100		
Σ	27.2	13.7	27.0	11.96	11.3	6.8	14.6	7.30.				
S. P.	[illegible]				[illegible]							
AC-N												
ot.Res.												

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Allison-LYNCH Line 2 Sp 2 N½ Field date 7-29-66 Data page________ Comp. date 7-30-66. Comp by R.P.

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-5	5-10	→	10-15		→	15-20			→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2	2	2	1.5	2	2	1.5	1.5	2	2		
(E) Vdc (avg)	122.91	349	13.1	180	135	31.3	101	35.2	55.6	21.1		
(F) DCcal	.500											
(G) Kn x 10-3	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10³/D	46	131	20	90	202	117	51	70	209	158		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	122.2	352	13.2	178	132.8	31.2	99	35.0	55.6	21.0		
(L) AC-DC cal.	1.000											
(M) ρ dc/ρ ac=ExL/K	1.006	.991	.992	1.011	1.017	1.003	1.020	1.006	1.000	1.005		
(N) PFE=(M-1)(10²)	0.6	-0.9	-0.8	1.1	1.7	0.3	2.0	0.6	0	0.5		
(O) MCF=(M-1)(10⁵)/H	13	-6.9	-40	12	8.4	2.6	39	8.6	0	3.2		
S.P.	+1.1	-7.6		+4.7			-12.4					

Project____________ Line__________ Field date________ Data page________ Comp. date_______ Comp by________

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
(B) Receive	20-25			→	25-30			→		0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1.5	1.5	2	2	1.5	1.5	2	2		1		
(E) Vdc (avg)	27.5	13.9	27.5	12.12	11.50	7.00	15.0	7.45		200		
(F) DCcal												
(G) Kn x 10-3	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10³/D	55	70	206	159	58	70	197	156				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	27.2	13.7	27.0	11.96	11.3	6.8	14.6	7.3		200		
(L) AC-DC cal.												
(M) ρ dc/ρ ac =ExL/K	1.011	1.015	1.019	1.013	1.018	1.029	1.027	1.021				
(N) PFE=(M-1)(10²)	1.1	1.5	1.9	1.3	1.8	2.9	2.7	2.1				
(O) MCF=(M-1)(10⁵)/H	20	21	9.2	8.2	31	41	13.7	13.4				
S.P.	+6.9				-15.5							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Allison-LYNCH Line 2 Sp2 5½ Field date 7-29-66 Data page______ Comp. date 7-30-66. Comp by R.P.

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-5	5-10 →		10-15 →			15-20 →					
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2	1.5	1.5	2	1.5	1.5	2	2	1.5	1.5		
(E) Vdc (avg)	349	84.9	9.07	745	33.8	4.79	281	40.5	3.14	1.166		
(F) DCcal	.500											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	131	42	18	279	68	24	105	61	16	12		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	346	85.6	9.16	730	33.8	4.86	278	40.2	3.12	1.154		
(L) AC-DC cal.	1.010											
(M) ρ dc/ρac=ExL/K	1.019	1.002	1.000	1.031	1.010	.995	1.021	1.018	1.016	1.021		
(N) PFE=(M-1)(10^2)	1.9	0.2	0	3.1	1.0	-0.5	2.1	1.8	1.6	2.1		
(O) MCF=(M-1)(10^5)/H	15	4.8	0	11	15	-21	20	30	100	175		
S.P.	-5.6	+37.8		+38.9			-8.9					

Project______ Line______ Field date______ Data page______ Comp. date______ Comp by______

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal		
(B) Receive	20-25 →				25-30 →					0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2	2	1.5	1.5	2	2	1.5	1.5		1		
(E) Vdc (avg)	39.8	8.17	.847	.452	19.3	5.43	.696	.377		200		
(F) DCcal												
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	60	31	8.5	7.9	72	41	12	11				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	40.1	8.2	.866	.454	19.4	5.40	.692	.372		202		
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.002	1.006	.988	1.006	1.005	1.016	1.016	1.024				
(N) PFE=(M-1)(10^2)	0.2	0.6	-1.2	0.6	0.5	1.6	1.6	2.4				
(O) MCF=(M-1)(10^5)/H	3.3	19	-141	76	6.9	39	133	218				
S.P.	-10.0				-11.3							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Allison (Lynch) Line 2 5½ Field date 7-15-66 Data page 1 Comp. date 7-15-66 . Comp by R.P.

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-5	5-10 →		10-15 →			15-20 →					
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1	1	1	.75	1	1	.75	1	1	1		
(E) Vdc (avg)	146	234.5	66.2	217.5	85.0	36.0	267.8	77.2	38.3	20.2		
(F) DCcal	.500											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	110	176	199	219	255	270	278	232	280	303		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	138	226	62.0	209.0	81.0	33.5	258	74.4	36.2	18.8		
(L) AC-DC cal.	.990											
(M) ρ dc/ρ ac=ExL/K	1.047	1.027	1.057	1.029	1.036	1.062	1.066	1.027	1.048	1.064		
(N) PFE=(M-1)(10^2)	4.7	2.7	5.7	2.9	3.6	6.2	6.6	2.7	4.8	6.4		
(O) MCF=(M-1)(10^5)/H	43	15	28	13	14	23	24	12	17	21		

−22 −6 −19 −11

Project________ Line________ Field date________ Data page________ Comp. date________ Comp by________

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal		
(B) Receive	20-25 →				25-30 →					0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	.75	1	1	1	.75	1	1	1		.5		
(E) Vdc (avg)	45.0	21.8	14.28	8.49	4.77	3.00	2.13	1.34		100		
(F) DCcal												
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	181	164	214	231	~~261~~ 35.7	45	71	56				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	43.8	21.1	13.6	8.2	4.62	2.76	2.02	1.30		99		
(L) AC-DC cal.												
(M) ρ dc/ρ ac =ExL/K	1.017	1.021	1.039	1.061	1.022	1.074	1.043	1.021				
(N) PFE=(M-1)(10^2)	1.7	2.1	3.9	6.1	2.2	7.4	4.3	2.1				
(O) MCF=(M-1)(10^5)/H	9	13	18	26	~~8~~ 62	164	61	38				

−33 +26

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Allison (Lynch) Line 2 N½ Field date 7-15-66 Data page 1 Comp. date 7-15-66. Comp by R.P.

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1	1	1	1	1	1	1	1	1	1		
(E) Vdc (avg)	228	149	66.0	238	62.2	35.85	199	56.8	20.9	14.1		
(F) DCcal	.508											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	172	113	204	180	190	270	150	173	158	215		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	208	144	63.6	218	56.8	32.9	184	55.0	20.2	13.7		
(L) AC-DC cal.	1.009											
(M) ρ dc/ρ ac=ExL/K	1.103	1.043	1.047	1.101	1.103	1.099	1.092	1.022	1.044	1.037		
(N) PFE=(M-1)(10^2)	10.3	4.3	4.7	10.1	10.3	9.9	9.2	2.2	4.4	3.7		
(O) MCF=(M-1)(10^5)/H		38	23	56	54	37	61	13	29	17		

-39 -21 -45 -16

Project__________ Line__________ Field date__________ Data page__________ Comp. date__________ Comp by__________

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
(B) Receive	20-25	→	→	→	25-30	→	→	→		0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1	1	1	.75	1	1	1	.75		.5		
(E) Vdc (avg)	36.4	14.6	6.18	3.80	18.4	9.28	4.44	3.03		98.4		
(F) DCcal												
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	111	110	94	137	139	141	118	172				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	34.9	14.4	6.12	3.82	17.45	8.96	4.30	2.90		99.2		
(L) AC-DC cal.												
(M) ρ dc/ρ ac =ExL/K	1.052	1.022	1.017	1.018	1.063	1.043	1.040	1.053				
(N) PFE=(M-1)(10^2)	5.2	2.2	1.7	1.8	6.3	4.3	4.0	5.3				
(O) MCF=(M-1)(10^5)/H	47	20	18	13	45	31	34	31				

+7 -36

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ________

Project: Allison   Line: 2 N 1/2   Int.Cal ________   Date: 7-15

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
Rec.	20-25	→		→	25-30	→		→		3-4		
Time	30	30	10	3	30	10	10	3		100		
DC-1	18.3 18.1	6.2 8.4	3.14 3.00	1.93 1.92	9.2 9.2	440 488	240 204	1.44 1.58		49.2 49.2		
DC-2	18.1 18.3	6.1 8.5	3.26 2.90	2.03 1.82	9.2 9.2	436 492	2.40 2.04	143 159		49.2 49.2		
Σ												
DC-3	17.8 18.6	5.9 8.7	3.45 2.72	2.13 1.72	9.1 9.3	434 4.94	2.40 2.06	148 155				
Dc-4	17.6 18.8	5.8 8.8	3.55 2.64	2.26 1.62	9.1 9.3	4.32 496	2.38 2.06	151 152				
Σ												
DC-AV	36.4	14.6	6.18	3.86	18.4	9.28	4.44	3.03		98.4		
AC-1	17.4	7.2	3.06	1.91	8.7	4.48	2.15	1.45		49.6		
AC-2	17.5	7.2	3.06	1.91	8.75	4.48	2.15	1.45		49.6		
Σ	34.9	14.4	6.12	3.82	17.45	8.96	4.30	2.90		99.2		
S. P.	+7.0				-36.1							
AC-N	.08				.05							
ot.Res.												

INDUCED POLARIZATION - RECEIVER NOTES   PAGE ______

Project: Allison   Line: 2 N1/2   Int.Cal ______   Date: 7-15-66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time	300	300	100	300	100	30	300	100	30	30		
DC-1	115 113	74 75	33.5 32.5	120 118	29.0 33.2	17.7 18.2	99.5 99.5	29.2 27.5	10.2 10.6	7.0 7.1		
DC-2	115 113	74.5 75	33.5 32.5	120 118	28.6 33.6	17.6 18.3	99.5 99.5	29.4 27.4	10.2 10.7	7.1 7.0		
Σ												
DC-3	115 113	74.5 74.5	33.8 32.2	120 118	28.4 33.6	17.5 18.3	99.5 99.5	29.6 27.2	10.1 10.8	7.1 7.1		
Dc-4	115 113	74.5 74.5	34.0 32.0	120 118	28.4 33.8	17.5 18.3	99.5 99.5	29.6 27.2	10.1 10.8	7.0 7.1		
Σ												
DC-AV	228	149	66.0	238	62.2	35.85	199	56.8	20.9	14.1		
AC-1	103	72	31.8	109	28.4	16.45	92	27.5	10.1	6.85		
AC-2	105	72	31.8	109	28.4	16.45	92	27.5	10.1	6.85		
Σ	208	144	63.6	218	56.8	32.90	184	55.0	20.2	13.70		
S. P.	-38.5	-21.4		-45.4			-16.4					
AC-N	.04	.05		.05			.06					
ot.Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE ______

Project: Allison Line: 2 5½ Int.Cal ______ Date: ______

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal.		
Rec.	20-25	→		→	25-30	→		→		3-4		
Time	100	30	30	10	10	3	3					
DC-1	22.5 22.5	11.1 10.8	7.2 7.1	4.64 456 4.24 418	236 194 258 286	129 171	109 107 096 096	58 82 75 49		50.0 50.0		
DC-2	22.6 22.4	11.1 10.9	7.2 7.0	4.58 458 4.70 420	206 272	107 192	126 123 076 077	71 74 60 56		50.0 50.0		
Σ												
DC-3	22.6 22.4	11.05 10.95	7.3 7.0	4.56 462 4.24 420	202 276	155 146	141 139 065 64	85 90 50 44				
Dc-4	22.6 22.4	11.0 11.0	7.3 7.0	4.60 456 4.18 416	198 280	135 164	156 155 052 049	70 79 63 55				
Σ												
DC-AV	45.0	21.9	14.28	8.79	4.77	3.00	2.13	1.34		100		
AC-1	21.9	10.55	6.8	4.10	2.30	1.38	1.01	0.65		49.5		
AC-2	21.9	10.55	6.8	4.10	2.32	1.38	1.01	0.65		49.5		
Σ	43.8	21.1	13.6	8.2	4.62	2.76	2.02	1.30		99		
S. P.	-32.8				+25.7							
AC-N	.09				.08							
Pot.Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Allison Line: 2 5½ Int.Cal Date:

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time	300	300	100	300	100	30	300	100	30	30		
DC-1	75 71	118 116.5	31.4 34.8	108.5 109	43.0 42.0	17.4 18.6	133 135	40.6 36.6	19 19.4	9.5 10.7		
DC-2	75 71	118 116.5	31.2 35.0	108.5 109	43.0 42.0	17.4 18.6	133 135.5	40.6 36.6	19 19.3	9.4 10.8		
Σ												
DC-3	75 71	118.5 116	31.0 35.2	108.5 109	43.0 420	17.4 18.6	132.5 135.5	40.6 36.6	18.8 19.4	9.4 10.8		
Dc-4	75 71	119 115.5	30.8 35.4	108.5 109	43.0 420	17.4 18.6	132 136	40.6 36.6	18.8 19.5	9.3 10.9		
Σ												
DC-AV	146	234.5	66.2	217.5	85.0	36.0	267.8	77.2	38.3	20.2		
AC-1	.69	113	31.0	104.5	40.5	16.75	129	37.2	18.1	9.4		
AC-2	.69	113	31.0	104.5	40.5	16.75	129	37.2	18.1	9.4		
Σ	138	226	62.0	209.0	81.0	33.5	258	74.4	36.2	18.8		
S. P.	-21.6	-5.5		-19.0			-10.6					
AC-N	.10	.10		.15			.10					
ot.Res.												

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: 2 - N½ Date: 15 Jul 66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time												
Range	350v	290v	350v	320v	290v	350v	350v	320	290v	350v		
Current	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A		

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal 3-4		
Receive	20-25	→	→	→	25-30							
Time												
Range	350v	320	290v	270v	350v	320v	290v	260v		150v		
Current	1A	1A	1A	3/4A	1A	1A	1A	3/4A		1/2A		

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: 2 - 5½ Date: 15 Jul 66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time												
Range	290	310v	340v	210v	310v	290v	250v	290v	310v	290v		
Current	1A	1A	1A	3/4A	1A	1A	3/4A	1A	1A	1A		

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal 3-4		
Receive	20-25	→	→	→	25-30	→	→	→				
Time												
Range	260v	290v	310v	290v	260v	280v	310v	340v		160v		
Current	3/4A	1A	1A	1A	3/4A	1A	1A	1A		1/2A		

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine **Line:** 1-NE½ **Date:** 12 Jul 66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-5	5-10	→	10-15	→	→	15-20					
Time												
Range	270V	310V	270V	290V	320V	270V	290V	290V	320V	270V		
Current	2A	2A	2A	1½A	2A	2A	2A	1½A	2A	2A		

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal 2-3		
Receive	20-25	→	→	→	25-30	→	→	→				
Time												
Range	290V	300V	320V	270V	290V	290V	310V	260V		300V		
Current	2A	1½A	2A	2A	2A	1½A	2A	2A		1A		

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: 1-SW½ Date: 12 Jul 66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-5	5-10	→	10-15	→	→	15-20					
Time												
Range	280v	290v	280v	230v	290v	220v	200v	230v	290v	220v		
Current	2A	1½A	2A	1½A	1½A	1½A	1½A	1½A	1½A	1½A		

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal 2-3		
Receive	20-25	→	→	→	25-30							
Time												
Range	200v	240v	290v	220	200v	240v	290v	220		290v		
Current	1½A	1½A	1½A	1½A	1½A	1½A	1½A	1½A		1A		

INDUCED POLARIZATION - RECEIVER NOTES PAGE ____

Project: Allison Line: 1 5[illegible] ½ Int. Cal ____ Date: ____

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-5	5-10	⟶	10-15	⟶	⟶	15-20	⟶	⟶	⟶		
Time	300	300	100	300	100	30	100	30	30	10		
DC-1	223 221	206 210	44.8 50.1	117 116	36.2 358	9.1 10.8	48.6 50.4 43.6 42.6	18.4 20.1 18.1 15.1	8.9 7.3 5.8 7.2	2.18 242 3.62 420		
DC-2	223 221	206 210	44.8 50.2	117 116	362 35.8	9.1 10.8	49.4 50.6 43.6 432	18.5 19.8 17.3 15.7	7.0 9.5 6.6 5.5	2.58 040 3.62 480		
Σ												
DC-3	223 221	206 210	44.6 50.4	117 116	36.2 35.8	9.0 10.9	50.8 50.4 42.4 42.2	19.6 20.5 16.7 15.6	7.6 9.2 9.6 7.8	260 260 190 300		
Dc-4			44.4 50.6			8.9 11.0	50.8 51.2 41.6 41.2	20.7 21.2 17.4 16.6	6.3 7.0 6.6 6.6	270 220 228 218		
Σ												
DC-AV	444	416	94.91	233	72.0	19.9	93.03	36.53	14.5	5.55		
AC-1	212	200	46.2	114	34.6	9.65	45.8	18.0	7.15	2.40		
AC-2	213	200	46.2	114	34.6	9.65	45.8	18.0	7.15	2.40		
Σ	425	400	92.4	228	69.2	19.3	91.6	36.0	14.3	4.8		
S. P.	-14.8	+25.5		-28.3.			-13.4					
AC-N	.05	.04		.03			.09					
Pot. Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Allison Line: 1 NE½ Int.Cal Date: 7-11-66

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal.		
Rec.	20-25	⟶			25-30	⟶				2-3		
Time	100	30	30	30	100	30	30	10		300		
DC-1	54.0 53.6	19.6 20.8	15.0 16.8	6.5 8.4	35.0 30.8	13.5 15.2	13.7 11.8	5.66 548 5.96 628		100 100		
DC-2	54.0 53.6	19.5 20.9	15.0 16.9	6.4 8.5	35.2 30.6	13.5 15.2	13.7 12.0	5.58 518 6.06 676		100 100		
Σ												
DC-3	54.0 53.6	19.5 21.0	14.9 16.9	6.4 8.5	35.4 30.6	13.5 15.2	13.6 11.9	582 548 618 622				
Dc-4		19.4 21.0	14.9 17.0	6.4 8.5	354 30.6		13.6 12.0	540 550 628 642				
Σ												
DC-AV	107.6	40.4	31.85	14.9	65.9	28.7	25.56	11.76		200		
AC-1	51.8	18.9	14.8	7.0	30.6	13.0	11.65	5.40		99.5		
AC-2	51.8	18.9	14.8	7.0	30.6	13.0	11.65	5.40		99.5		
Σ	103.6	37.8	29.6	14.0	61.2	26.0	23.3	10.8		199		
S. P.	-26.0				+5.6							
AC-N	.15				.09							
Pot.Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE ______

N.A. Mines

Project: Allison Mine Line: 1 NE 1/2 Int. Cal ______ Date: 7-12-66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time	1000	1000	100	300	300	100	300	100	100	30		
DC-1	278 264	225 225	47.8 47.6	207.5 207.	85 83	25.4 27.8	149 152.5 147 150	32.8 33.4 35.6 35.6	21.6 23.0	10.1 8.9		
DC-2	278 264	225 225	47.8 47.6	208 207	85 83	25.2 28.0	150 152.5 148 151	33.2 35.6	21.8 22.8	10.0 9.0		
Σ												
DC-3	278 264	225 225	47.8 47.6	208.5 207.	85 83	25.2 28.0	151 153 149 151	33.4 35.6	21.8 22.8	10.0 9.0		
Dc-4							151 153.5 150 151	33.4 35.6				
Σ												
DC-AV	542	450	95.4	415.1	168	53.2	301.2	68.89	44.6	19.0		
AC-1	260	215	46.4	201	81	25.8	146.5	33.4	21.4	9.1		
AC-2	260	215	46.4	203	81	25.8	151.0	33.6	21.6	9.1		
Σ	520	430	92.8	404	162	51.6	297.5	67.0	43.0	18.2		
S. P.	0	-8.8		+8.2			+9.0					
AC-N	.03	.07		.06			.11					
Pot.Res.												

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ________

Project: Allison Line: 1 SW½ Int.Cal ________ Date: ________

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal		
Rec.	20-25	→			25-30	→				2-3		
Time	100	30	30	10	10	10	10	3		300		
DC-1	24.8 25.2	16.9 16.0 16.6 17.1	9.4 6.7	3.90 378 208 242	5.05 460 580 570	458 330 440 520	320 190 230 290	130 130		99.5 99.5		
DC-2	25.0 25.0	16.2 15.8 16.9 17.2	9.9 6.2	440 360 180 238	508 550 660 425	390 370 530 570	250 190 270 305			99.5 99.5		
Σ												
DC-3	25.4 24.8	16.1 15.8 16.9 17.3	10.5 5.7	460 435 312 175	418 790 608 440	330 340 560 630	180 370					
Dc-4	25.4 24.6	15.9 15.5 16.7 17.7	10.6 5.7	350 495 242 140	444 550 578 635	385 150 590 790	150 310					
Σ												
DC-AV	50.14	32.97	16.33	6.37	10.87	9.01	4.99	—		199		
AC-1	24.6	16.1	7.8	3.12	5.28	4.30	2.36	1.03		99.0		
AC-2	24.6	16.1	7.8	3.12	5.28	4.30	2.36	1.03		99.0		
Σ	49.2	32.2	15.6	6.24	10.56	8.6	4.72	2.06		198		
S. P.	+3.8				-14.0							
AC-N	.05				.10							
Pot.Res.												

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Allison (LYNCH) Line 1 N½ Field date 7-13-66 Data page 1 Comp. date 7-16-66. Comp by R.P.

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2	2	2	1.5	2	2	2	1.5	2	2		
(E) Vdc (avg)	542	450	95.4	415.1	168	53.2	301.2	68.89	44.6	19.0		
(F) DCcal	.500											
(G) Kn x 10-3	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10³/D	203	169	143	208	252	200	~~226~~ 113	138	167	143		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	520	430	92.8	404	162	51.6	297.5	67.0	43.0	18.2		
(L) AC-DC cal.	.995						1.007					
(M) ρ dc/ρ ac=ExL/K	1.037	1.041	1.023	1.022	1.032	1.026	~~1.050~~	1.023	1.032	1.039		
(N) PFE=(M-1)(10²)	3.7	4.1	2.3	2.2	3.2	2.6	~~5.1~~ 0.7	2.3	3.2	3.9		
(O) MCF=(M-1)(10⁵)/H	18	24	16	11	13	13	~~22~~ 6	17	19	27		

Project__________ Line__________ Field date__________ Data page__________ Comp. date__________ Comp by__________

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal.		
(B) Receive	20-25	→	→	→	25-30	→	→	→		0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2	1.5	2	2	2	1.5	2	2		1		
(E) Vdc (avg)	107.6	40.4	31.85	14.9	65.9	28.7	25.56	11.76		200		
(F) DCcal												
(G) Kn x 10-3	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10³/D	161	202	239	196	247	287	335	247				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	103.6	37.8	29.6	14.0	61.2	26.0	23.3	10.8		199		
(L) AC-DC cal.												
(M) ρ dc/ρ ac =ExL/K	1.033	1.063	1.071	1.059	1.071	1.098	1.092	1.083				
(N) PFE=(M-1)(10²)	3.3	6.3	7.1	5.9	7.1	9.8	9.2	8.3				
(O) MCF=(M-1)(10⁵)/H	20	31	30	30	29	34	27	34				

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

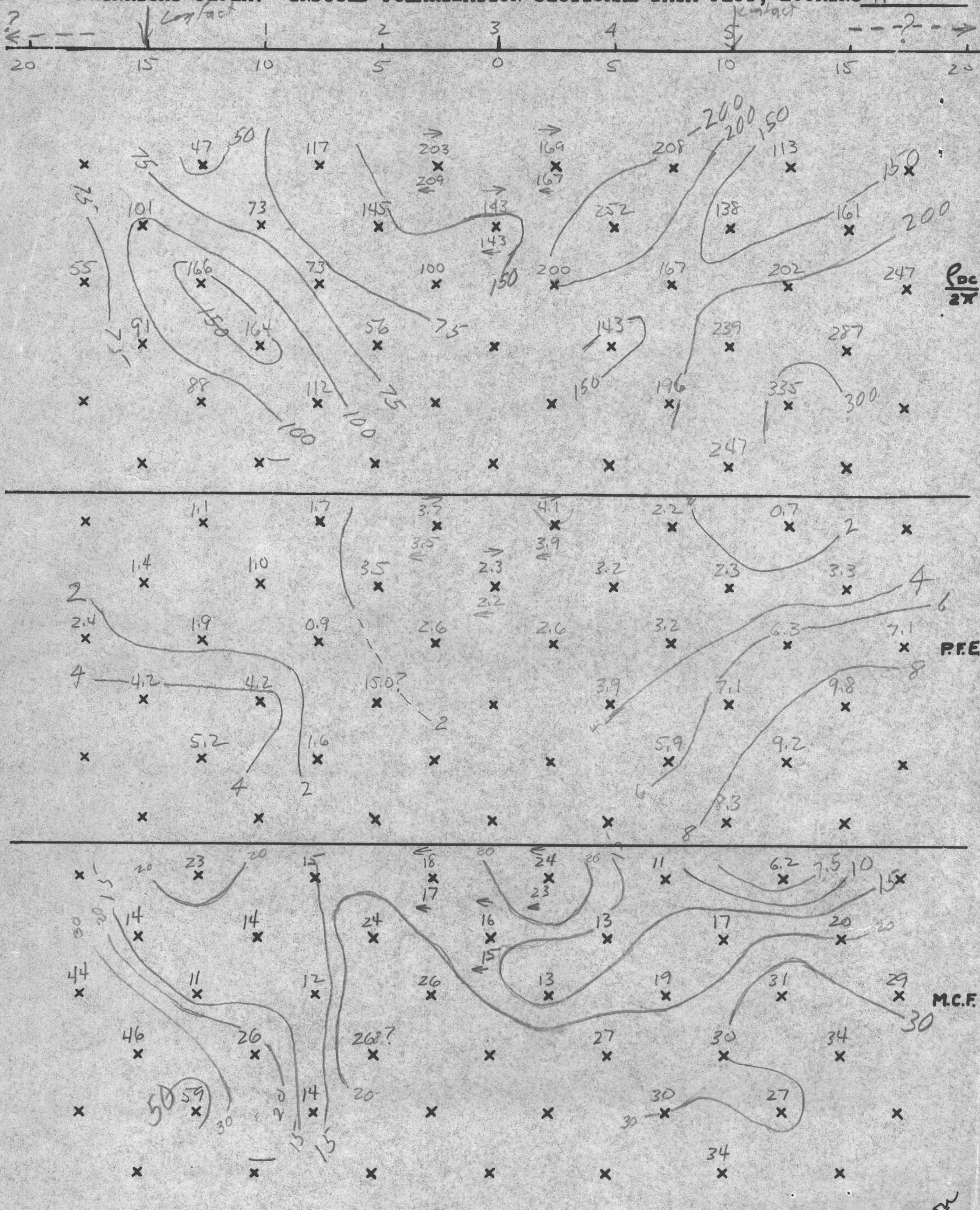
Project Allison (LYNCH) Line 1 SW 1/2 Field date 7-12-66 Data page 2 Comp. date 7-16-66. Comp by R.P.

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2	1.5	2	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
(E) Vdc (avg)	444	416	94.91	233	72.0	19.9	93.03	36.53	14.5	5.55		
(F) DCcal	.503											
(G) Kn x 10-3	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	167	209	143	117	145	100	47	73	73	56		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	425	400	92.4	228	69.2	19.3	91.6	36.0	14.3	4.8		
(L) AC-DC cal.	.995											
(M) ρ dc/ρ ac=ExL/K	1.039	1.035	1.022	1.017	1.035	1.026	1.011	1.010	1.009	1.150		
(N) PFE=(M-1)(10^2)	3.9	3.5	2.2	1.7	3.5	2.6	1.1	1.0	0.9	15.0		
(O) MCF=(M-1)(10^5)/H	23	17	15	15	24	26	23	14	12	268		

Project__________ Line__________ Field date________ Data page________ Comp. date________ Comp by________

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal.		
(B) Receive	20-25	→	→	→	25-30	→	→	→		0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		1		
(E) Vdc (avg)	50.14	32.97	16.33	6.37	10.87	9.01	4.99	—		199		
(F) DCcal												
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	101	166	164	112	55	91	88					
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	49.2	32.2	15.6	6.24	10.56	8.6	4.72	—		198		
(L) AC-DC cal.												
(M) ρ dc/ρ ac =ExL/K	1.014	1.019	1.042	1.016	1.024	1.042	1.052					
(N) PFE=(M-1)(10^2)	1.4	1.9	4.2	1.6	2.4	4.2	5.2					
(O) MCF=(M-1)(10^5)/H	14	11	26	14	44	46	59					

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW



AREA Lynch-Allison LINE 1 a = 500' SCALE: 1" = 500 DATE: 7/18/

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Allison Line: 3 5 1/2 Int.Cal Date: 7-1966

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time	300	300	100	300	100	30	300	100	100	30		
DC-1	126.5 129.5	152 152	27.2 29.5	167 162	52.4 53.8	15.0 12.7	166 166	58.4 58.0 57.8 59.0	24.6 26.8	6.85 7.7 9.40 8.8		
DC-2	126.5 129.5	153 151	26.8 29.8	166 163	51.8 54.0	15.1 12.6	167 165	59.8 57.8 57.0 59.4	24.6 26.8	6.7 7.1 9.5 9.2		
Σ												
DC-3	126 130	153 151	26.6 29.8	167 163	51.8 53.8	15.1 12.6	167 165	59.8 57.8	24.6 26.8	6.7 7.1 9.3 8.2		
Dc-4	126 130	153 151	26.6 30.0	165 165	51.8 53.8	15.1 12.5	167 165	58.6 58.4	24.6 26.8	7.3 8.8 8.9 8.4		
Σ												
DC-AV	256	304	56.5	329.5	105.8	27.68	332	116.9	51.4	16.31		
AC-1	122	145	27.2	156	50.5	13.45	160	55.5	24.6	7.8		
AC-2	122	145	27.2	156	50.5	13.45	160	55.5	24.6	7.8		
Σ	244	290	54.4	312	101	26.9	320	111.0	49.2	15.6		
S. P.	-18.6	-23.7		-29.1			-15.3					
AC-N	.11	,04		.05			,04					
Pot.Res.												

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 4

Project: Allison Line: 3 5 1/2 Int.Cal ______ Date: ______

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal.		
Rec.	20-25	→	→	→	25-30	→	→	→		0-5		
Time	100	30	30	10	100	30	30	10		300		
DC-1	41.0 38.5	22.0 21.0	11.8 11.0	4.05 4.20	25.5 24.5	17.9 16.5	9.6 11.2	3.90 4.40		99 99		
DC-2	41.5 38.2	22.1 20.9	11.6 11.2	3.95 4.30	25.5 24.5	17.9 16.5	9.6 11.2	3.94 4.36		99 99		
Σ												
DC-3	41.5 38.0	22.1 21.0	11.6 11.2	3.82 4.38	25.5 24.5	17.8 16.6	9.6 11.1	3.95 4.34				
Dc-4	41.8 38.0	22.0 21.1	11.4 11.4	3.82 4.45		17.8 16.6	9.7 11.1	3.95 4.34				
Σ												
DC-AV	79.5	43.05	22.8	8.24	50.0	34.4	20.8	8.295		198		
AC-1	38.4	20.6	10.95	3.95	24.0	16.2	9.85	3.95		99.5		
AC-2	38.4	20.6	10.95	3.95	24.0	16.2	9.85	3.95		99.5		
Σ	76.8	41.2	21.9	7.9	48.0	32.4	19.7	7.90		199		
S. P.	-36.5				-23.1							
AC-N	.05				.06							
pt.Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE 4

Project: Allison Line: 3 N½ Int.Cal ______ Date: ______

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time	300	300	100	300	100	30	300	100	30	30		
DC-1	155 155	120 127	26.4 28.0	226 211	57.0 59.6	16.5 19.5	86.0 86.0	42.6 45.4	21.6 21.2	9.8 10.1		
DC-2	155 155	121 127	26.4 28.0	228 210	56.4 60.0	16.4 19.6	86.0 86.0	42.6 45.4	21.6 21.1	9.9 10.0		
Σ												
DC-3	155 155	121 128	26.4 28.0	227 210	56.0 60.2	16.5 19.5	87.0 85.0	42.6 45.4	21.6 21.2	9.9 10.0		
Dc-4		121 128		226 210	56.0 60.2	16.6 19.4	87.0 85.0	42.6 45.4	21.6 21.3	9.9 10.0		
Σ												
DC-AV	310	248.25	54.4	437	116.35	36.0	172	88.0	42.8	19.9		
AC-1	144	117	26.0	206	55.0	17.0	80.0	41.4	20.0	9.45		
AC-2	144	118	26.0	206	55.0	17.0	80.0	41.4	20.0	9.45		
Σ	288	235	52.0	412	110	34.0	160	82.8	40.0	18.9		
S. P.	+3.3	-22.4		+32.2			-37.7					
AC-N	.12	.14		.07			.11					
ot.Res.												

INDUCED POLARIZATION - RECEIVER NOTES   PAGE ____

Project: Allison   Line: 3 N½   Int.Cal ____   Date: ____

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
Rec.	20-25	→		→	25-30	→		→		0-5		
Time	100	100	30	30	30	30	30	10				
DC-1	30.8 30.8	23.6 24.2	13.5 14.6	7.7 6.2	12.6 12.4	12.5 11.7	8.4 7.6	392 4.82		100 100		
DC-2	30.8 30.8	23.6 24.4	13.5 14.6	7.8 6.1	12.6 12.4	12.5 11.7	8.3 7.6	392 480		100 100		
Σ												
DC-3	30.8 30.8	23.6 24.4	13.4 14.7	7.9 6.1	12.7 12.3	12.5 11.7	8.3 7.5	3.92 4.80				
Dc-4		23.6 24.4	13.4 14.7	7.9 6.1	12.7 12.3	12.5 11.7	8.3 7.5	3.94 4.78				
Σ												
DC-AV	61.6	47.95	28.1	13.95	25.0	24.2	15.88	8.72		200		
AC-1	29.0	22.4	12.9	6.5	12.0	11.45	7.4	4.08		98.5		
AC-2	29.0	22.4	12.9	6.5	12.0	11.45	7.4	4.08		98.5		
Σ	58.0	44.8	25.8	13.0	24.0	22.9	14.8	8.16		197		
S. P.	-18.2				+12.9							
AC-N	.11				.11							
ot.Res.												

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: 3 - 5½ Date: 19 Jul 66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time												
Range	180v	320	180v	310v	320v	180v	250v	310v	320v	180v		
Current	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal 3-4		
Receive	20-25	→	→	→	25-30	→	→	→				
Time												
Range	250v	310v	320v	180v	250v	310v	320v	180v		260v		
Current	2A	2A	2A	2A	2A	2A	2A	2A		1A		

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: 3 - N 1/2 Date: 19 Jul 66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-5	5-10	→	10-15		→	15-20			→		
Time												
Range	250v	310v	250v	320v	310v	250	150	320	310	250		
Current	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal 2-3		
Receive	20-25			→	25-30			→				
Time												
Range	150v	310v	300v	250v	150v	300v	300v	250		250v		
Current	2A	2A	2A	2A	2A	2A	2A	2A		1A		

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Allison (LYNCH) Line 3 N½ Field date 7-19-66 Data page 1 Comp. date 7-19-66. Comp by R.P.

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-5	5-10		10-15			15-20					
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2											
(E) Vdc (avg)	310	248.25	54.4	437	116.35	36.0	172	88.0	42.8	19.9		
(F) DCcal	.500											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	116	94	82	164	175	135	65	131	160	149		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	288	235	52.0	412	110	34.0	160	82.8	40.0	18.9		
(L) AC-DC cal.	.986											
(M) ρ dc/ρ ac=ExL/K	1.062	1.041	1.032	1.047	1.042	1.043	1.059	1.048	1.058	1.038		
(N) PFE=(M-1)(10^2)	6.2	4.1	3.2	4.7	4.2	4.3	5.9	4.8	5.8	3.8		
(O) MCF=(M-1)(10^5)/H	53	44	39	29	24	32	91	37	36	25		
S.P.	+3.3	-22.4		+32.2			-37.7					

Project______ Line______ Field date______ Data page______ Comp. date______ Comp by______

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
(B) Receive	20-25				25-30							
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2									1		
(E) Vdc (avg)	61.6	47.95	28.1	13.95	25.0	24.2	15.88	8.72		200		
(F) DCcal	.500											
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	93	180	210	183	94	182	208	183				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	58.0	44.8	25.8	13.0	24.0	22.9	14.8	8.16		197		
(L) AC-DC cal.	.986											
(M) ρ dc/ρ ac =ExL/K	1.032	1.054	1.074	1.059	1.031	1.073	1.057	1.054				
(N) PFE=(M-1)(10^2)	3.2	5.4	7.4	5.9	3.1	7.3	5.7	5.4				
(O) MCF=(M-1)(10^5)/H	34	30	35	32	33	40	27	29				
S.P.	-18.2				+12.9							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Allison (LYNCH) Line 3 5½ Field date 7-19-66 Data page______ Comp. date 7-19-66. Comp by R.P.

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-5	5-10 →		10-15 →			15-20 →					
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2 →											
(E) Vdc (avg)	256	304	56.5	329.5	105.8	27.68	332	116.9	51.4	16.31		
(F) DCcal	.505											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	97	115	86	125	161	105	126	177	195	124		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	244	290	54.4	312	101	26.9	320	111.0	49.2	15.6		
(L) AC-DC cal.	1.004											
(M) ρ dc/ρac=ExL/K	1.053	1.053	1.024	1.060	1.052	1.032	1.043	1.055	1.048	1.049		
(N) PFE=(M-1)(10^2)	5.3	5.3	2.4	6.0	5.2	3.2	4.3	5.5	4.8	4.9		
(O) MCF=(M-1)(10^5)/H	55	46	29	48	32	30	34	31	25	40		
S.P.	-18.6	-23.7		-29.7			-15.3					

Project__________ Line__________ Field date________ Data page________ Comp. date________ Comp by________

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal		
(B) Receive	20-25 →				25-30 →					0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2 →									1		
(E) Vdc (avg)	79.5	43.05	22.8	8.24	50.0	34.4	20.8	8.295		198		
(F) DCcal												
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	121	163	173	109	189	261	272	176				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	76.8	41.2	21.9	7.90	48.0	32.4	19.7	7.90		199		
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.041	1.051	1.047	1.047	1.046	1.064	1.061	1.056				
(N) PFE=(M-1)(10^2)	4.1	5.1	4.7	4.7	4.6	6.4	6.1	5.6				
(O) MCF=(M-1)(10^5)/H	34	31	27	43	24	24	22	32				
S.P.	-36.5				-23.1							

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine Line: 4-N½ Date: 22 Jul 66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time												
Range	150v	160v	150v	230v	160v	150v	230v	230v	160v	150v		
Current	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A		

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal 2-3		
Receive	20-25	→	→	→	25-30	→	→	→				
Time												
Range	230v	230v	160v	150v	230v	230v	160v	160v		110v		
Current	2A	2A	2A	2A	2A	2A	2A	2A		1A		

INDUCED POLARIZATION SENDER NOTES

Project: Allison Mine   Line: 4 - 5 ½   Date: 22 Jul 66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time												
Range	230v	230v	230v	160v	230v	230v	150v	160v	230v	230v		
Current	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal 3-4		
Receive	20-25	→	→	→	25-30	→	→	→				
Time												
Range	150v	160v	230v	230v						140v		
Current	2A	2A	2A	2A						1A		

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: Allison Line: 4 5½ Int.Cal ______ Date: ______

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal		
Rec.	20-25	→	→	→	25-30	→	→	→		0-5		
Time	100	30	30	10						300		
DC-1	41.4 42.2	12.0 13.9	7.0 7.1	4.28 3.68						101 101		
DC-2	41.0 42.4	11.9 14.0	7.0 7.1	4.34 3.64						101 100		
Σ												
DC-3	41.0 42.4	11.9 14.0	7.0 7.1	4.32 3.66								
Dc-4	40.8 42.6	11.8 14.1	6.9 7.2	4.32 3.66								
Σ												
DC-AV	83.45	25.9	14.1	7.975						202		
AC-1	40.0	12.2	6.8	3.80						99.5		
AC-2	40.0	12.2	6.8	3.82						99.5		
Σ	80.0	24.4	13.6	7.62						199		
S. P.	-12.2				-2.4							
AC-N	.12				.15							
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES PAGE ______

Project: Allison Line: 4 5½ Int.Cal ______ Date: ______

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-5	5-10 →		10-15 →			15-20 →					
Time	1000	300	300	300	100	30	300	100	30	30		
DC-1	266 266	230 230	65 63	98. 100.5	33.5 37.0	15.5 14.6	148 149	31.6 30.8	14.3 15.85	7.8 7.5		
DC-2	266 266	230 230	65 63	98 100.5	33.5 37.2	15.5 14.6	148 149	31.8 30.6	14.3 15.9	7.8 7.5		
Σ												
DC-3	266 266	230 230	65 63	98 100.5	33.3 37.2	15.6 14.5	148 149	31.8 30.6	14.2 16.0	7.9 7.4		
Dc-4			65 63	98 100.5	33.2 37.4	15.6 14.5	148 149	31.8 30.6	14.1 16.1	8.0 7.3		
Σ												
DC-AV	532	460	128	198.5	70.58	30.1	297	62.4	30.2	15.3		
AC-1	257	219.5	61.5	94.5	33.9	14.4	142	29.6	14.4	7.3		
AC-2	257	220.0	61.5	94.5	33.9	14.4	142	29.6	14.4	7.3		
Σ	514	439.5	123.0	189.0	67.8	28.8	284	59.2	28.8	14.6		
S. P.	-14.3	-8.9		-1.2			-12.4					
AC-N	.14	.14		.13			.15					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: Allison Line: 4 NE½ Int.Cal ______ Date: ______

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
Time	300	300	100	300	100	100	1000	100	100	30		
DC-1	226 228	224.5 225.0	57.4 55.4	202 202	57.0 55.4	22.2 23.6	252 254	63.0 64.8	25.8 23.8	13.6 12.2		
DC-2	226 228	224.5 225.0	57.4 55.4	203 201	57.0 55.4	22.2 23.6	252 254	63.2 64.6	25.8 23.8	13.8 12.0		
Σ												
DC-3	226 228	224.5 225.0	57.6 55.2	203 201	57.0 55.4	22.2 23.6	252 254	63.0 64.8	25.8 23.8	13.8 12.1		
Dc-4	226 228	224.5 225.0	57.6 55.2	203 201	57.0 55.4	22.2 23.6	252 254	63.0 64.8	25.8 23.8	13.7 12.1		
Σ												
DC-AV	454	449.5	112.8	404	112.4	45.8	506	127.8	49.6	25.81		
AC-1	221.5	220	55.0	198	55.0	22.2	246	62.8	24.2	12.45		
AC-2	221.5	219	55.0	198	55.0	22.2	246	62.8	24.2	12.45		
Σ	443	43.9	110.0	396	110	44.4	492	125.6	48.4	24.9		
S. P.	+17.6	+0.4	-3.1	-3.1			+4.1					
AC-N	.05	.04		0.4			.03					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES PAGE ______

Project: Allison Line: 4 N 1/2 Int.Cal ______ Date: ______

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
Rec.	20-25	→			25-30	→				0-5		
Time	100	30	30	10	100	30	30	10		300		
DC-1	48.8 49.4	17.4 18.5	8.0 9.5	5.62 5.74	31.4 30.2	12.8 13.8	6.3 7.9	5.00 4.95		100 100		
DC-2	48.6 49.4	17.4 18.6	8.0 9.5	5.64 5.72	31.6 30.2	12.6 13.8	6.3 7.9	5.00 4.95		100 100		
Σ												
DC-3	48.6 49.4	17.3 18.6	7.9 9.6	5.61 5.75	31.8 30.0	12.55 13.95	6.2 8.0	5.02 4.92				
Dc-4	48.6 49.4	17.3 18.6	7.9 9.6	5.61 5.75	32.0 30.0	12.5 14.0	6.2 8.0	5.05 4.88				
Σ												
DC-AV	98.0	35.95	17.5	11.36	61.8	26.5	14.2	9.94		200		
AC-1	48.3	17.7	8.5	5.41	30.4	13.0	6.8	4.68		101		
AC-2	48.3	17.7	8.5	5.41	30.4	13.0	6.8	4.70		101		
Σ	96.6	35.4	17.0	10.82	60.8	26.0	13.6	9.38		202		
S. P.	-19.6				+14.8							
AC-N	.01				.03							
Pot. Res												

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Allison - LYNCH Line 4 SW 1/2 Field date 7-21-66 Data page_____ Comp. date_____. Comp by R.P.

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-5	5-10 →		10-15	→		15-20	→				
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2	→										
(E) Vdc (avg)	532	460	128	198.5	70.58	30.1	297	62.4	30.2	15.3		
(F) DCcal	.495											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	197	170	190	74	105	112	110	93	112	114		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	514	439.5	123.0	189.0	67.8	28.8	284	59.2	28.8	14.6		
(L) AC-DC cal.	.985											
(M) ρ dc/ρ ac=ExL/K	1.019	1.031	1.025	1.035	1.025	1.029	1.030	1.038	1.033	1.032		
(N) PFE=(M-1)(10^2)	1.9	3.1	2.5	3.5	2.5	2.9	3.0	3.8	3.3	3.2		
(O) MCF=(M-1)(10^5)/H	9.6	18	13	47	24	29	27	41	29	28		
S.P.	-14.3	-8.7		-1.2			-12.4					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4	4-5						cal.		
(B) Receive	20-25	→								0-5		
(C) n separation	2	3	4	5								
(D) I	2 →									1		
(E) Vdc (avg)	83.45	25.9	14.1	7.975						202		
(F) DCcal												
(G) Kn x 10^{-3}	6	15	30	52.5								
(H) ρ dc=ExFxGx10^3/D	124	96	105	104								
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	80.0	24.4	13.6	7.62						199		
(L) AC-DC cal.	1											
(M) ρ dc/ρ ac =ExL/K	1.027	1.046	1.021	1.031								
(N) PFE=(M-1)(10^2)	2.7	4.6	2.1	3.1								
(O) MCF=(M-1)(10^5)/H	22	48	20	30								
S.P.	-12.2											

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page____

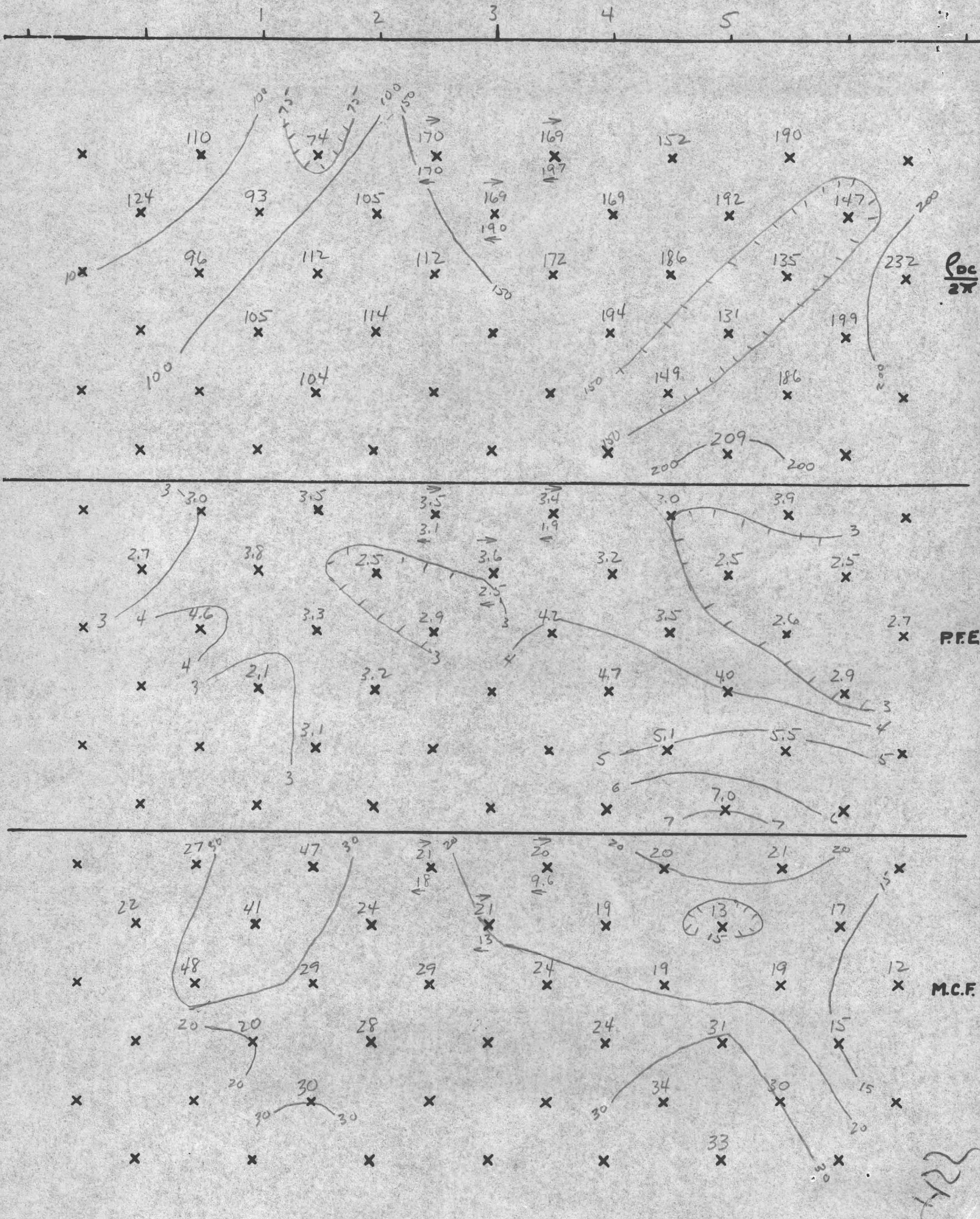
Project Allison – LYNCH Line 4 NE ½ Field date 7-21-66 Data page____ Comp. date____. Comp by R.P.

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-5	5-10	→	10-15	→	→	15-20	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	2	→	→	→	→	→	→	→	→	→		
(E) Vdc (avg)	454	449.5	112.8	404	112.4	45.8	506	127.8	49.6	25.81		
(F) DCcal	.500											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	170	169	169	152	169	172	190	192	186	194		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	443	439	110	396	110	44.4	492	125.6	48.4	24.9		
(L) AC-DC cal.	1.010											
(M) ρ dc/ρ ac=ExL/K	1.035	1.034	1.036	1.030	1.032	1.042	1.039	1.025	1.035	1.047		
(N) PFE=(M-1)(10^2)	3.5	3.4	3.6	3.0	3.2	4.2	3.9	2.5	3.5	4.7		
(O) MCF=(M-1)(10^5)/H	21	20	21	20	19	24	21	13	19	24		
S.P.	+17.6	+0.4		-3.1			+4.1					

Project____ Line____ Field date____ Data page____ Comp. date____ Comp by____

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal.		
(B) Receive	20-25	→	→	→	25-30	→	→	→		0-5		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2	→	→	→	→	→	→	→		1		
(E) Vdc (avg)	98	35.95	17.5	11.36	61.8	26.5	14.2	9.94		200		
(F) DCcal												
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	147	135	131	149	232	199	186	209				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	96.6	35.4	17.0	10.82	60.8	26.0	13.6	9.38		202		
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.025	1.026	1.040	1.051	1.027	1.029	1.055	1.070				
(N) PFE=(M-1)(10^2)	2.5	2.6	4.0	5.1	2.7	2.9	5.5	7.0				
(O) MCF=(M-1)(10^5)/H	17	19	31	34	12	15	30	33				
S.P.	+19.6				+14.8							

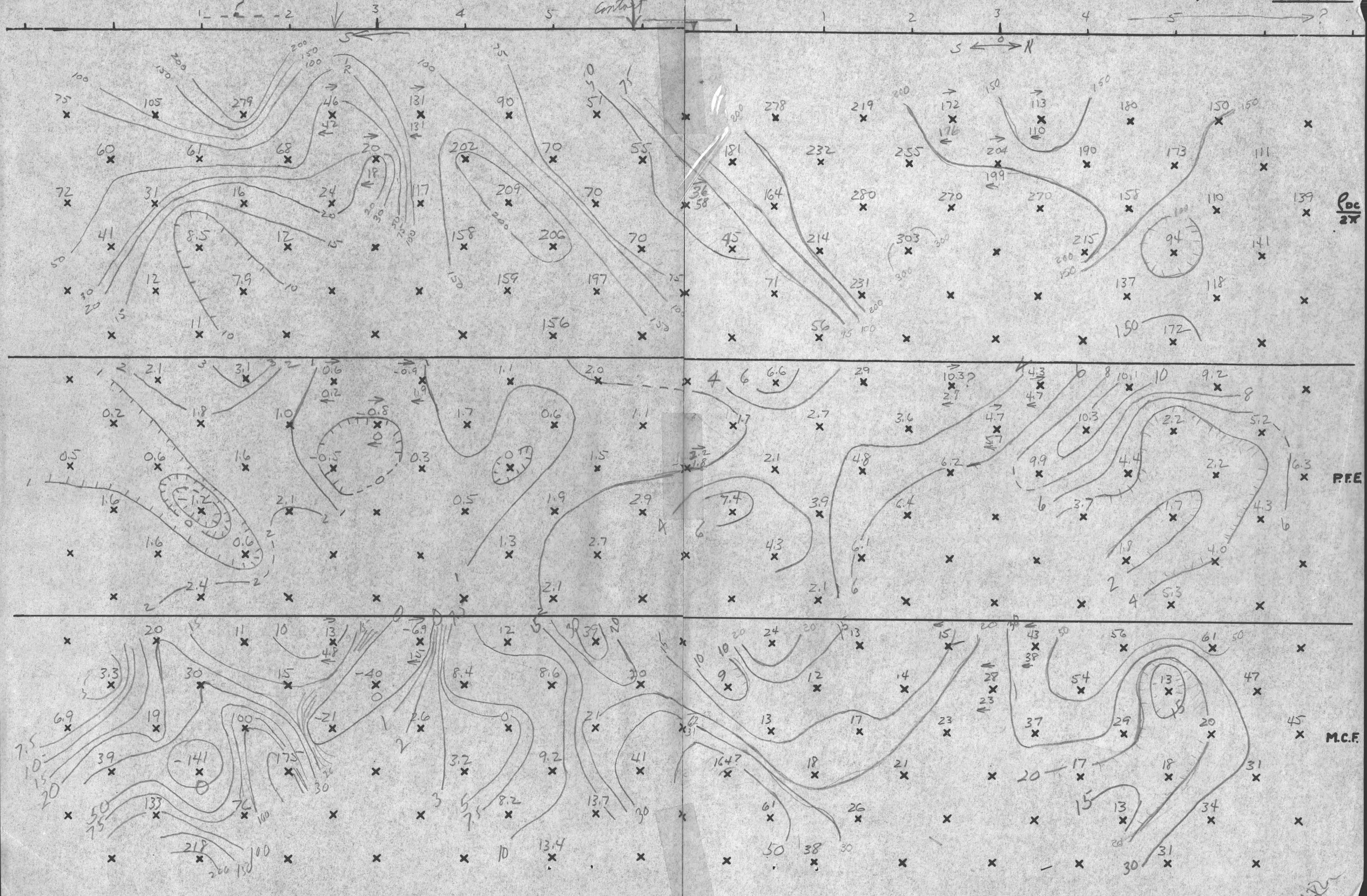
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW



AREA Allison -LYNCH LINE 4 a = 500 ' SCALE: 1" = 500 DATE: 7-21-66

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING West

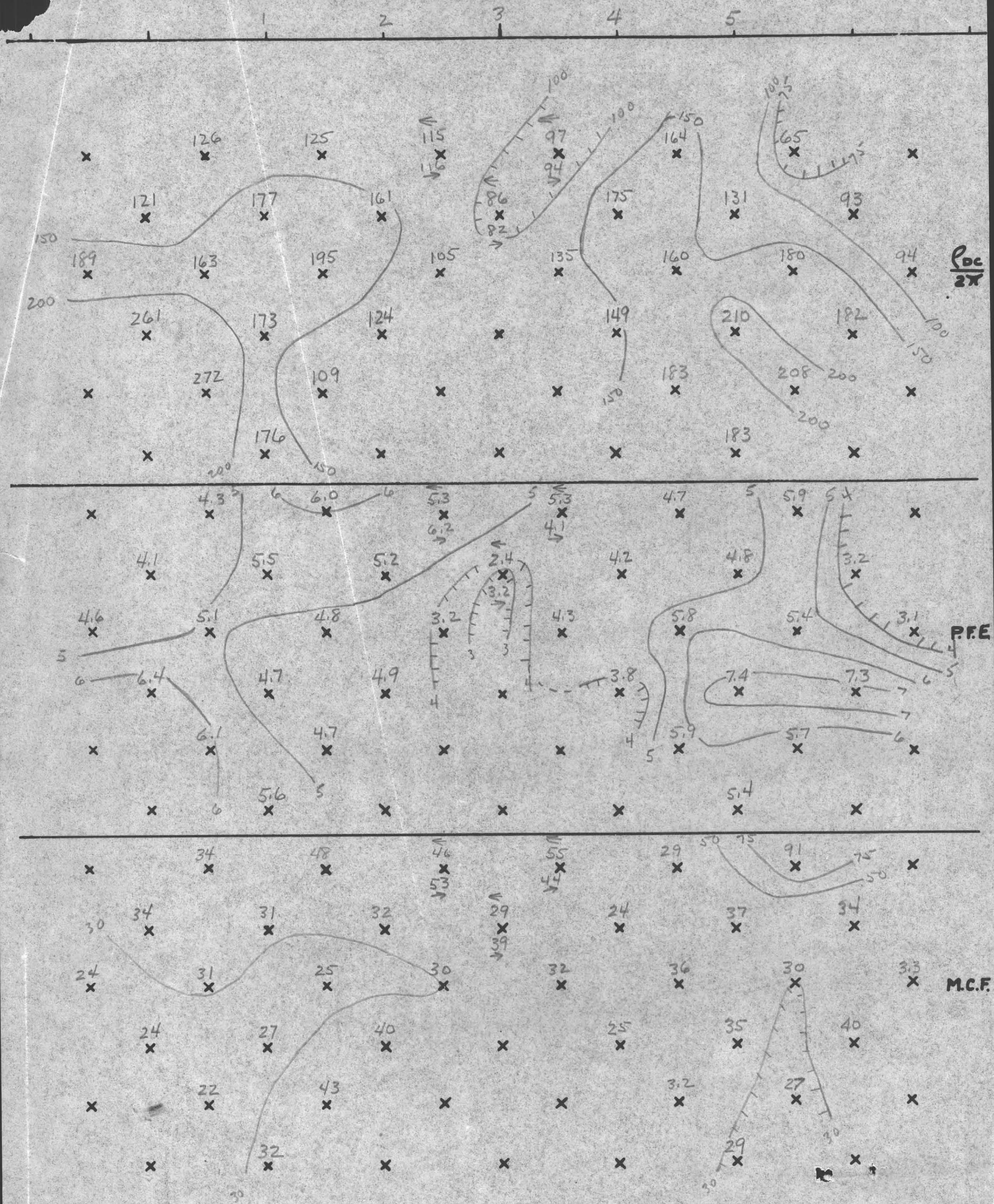
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING WNW



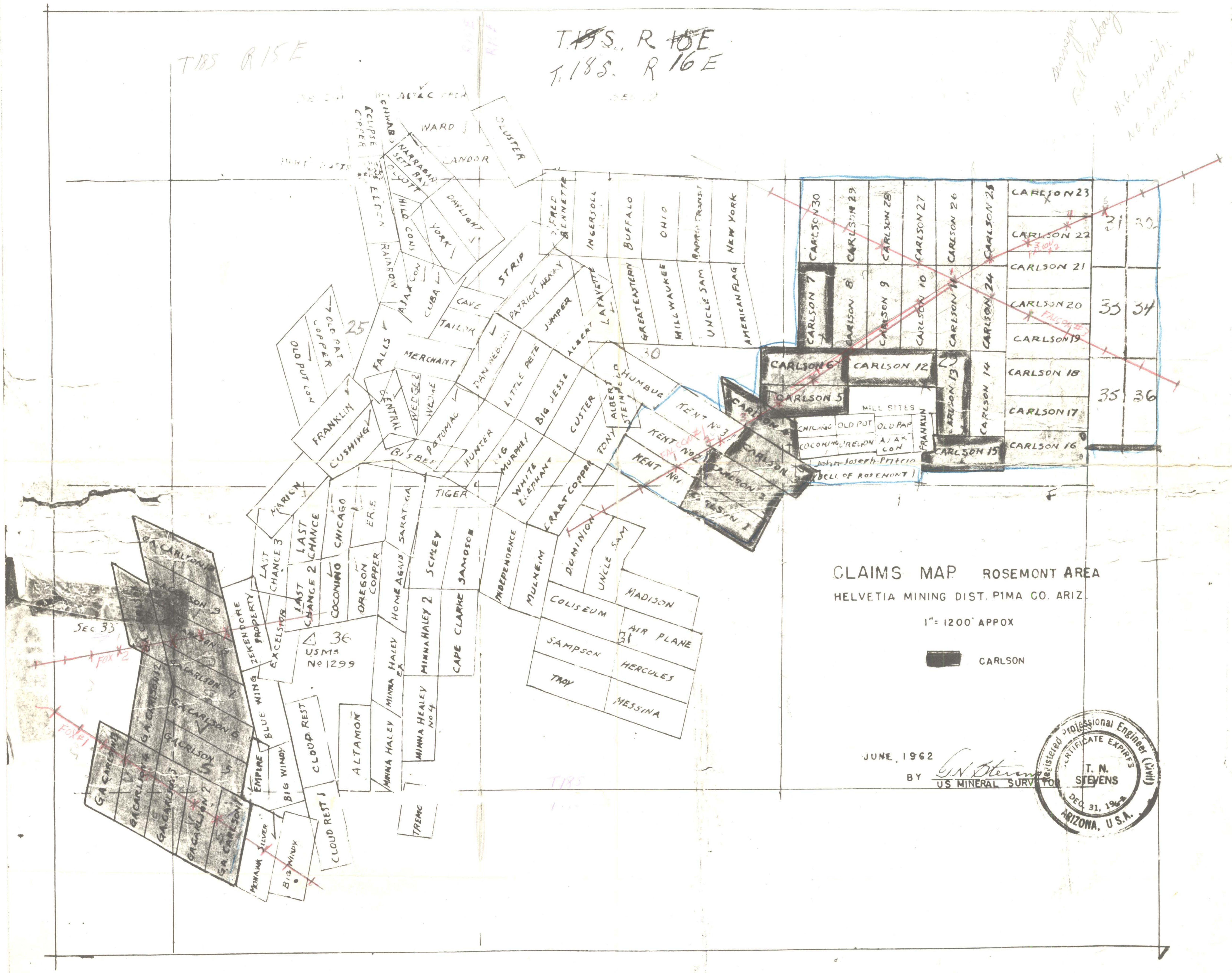
AREA Allison – LYNCH LINE 2 SD2 a = 500 ' SCALE: 1" = 500 ' DATE:

AREA Allison – LYNCH LINE 2 SD1 a = 500 ' SCALE: 1" = 500 DATE: 7-15-

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING Westerly



AREA Allison Mine (LYNCH) LINE 3 a = 500' SCALE: 1" = 500' DATE: 7-19-66



T.18S. R 16E
T18S R15E
CLAIMS MAP ROSEMONT AREA
HELVETIA MINING DIST. PIMA CO. ARIZ.
1" = 1200' APPOX
CARLSON
JUNE, 1962
BY G.N. Stevens
US MINERAL SURVEYOR
Registered Professional Engineer (Civil)
CERTIFICATE EXPIRES
T. N. STEVENS
DEC 31, 1962
ARIZONA, U.S.A.
H.G. Lynch
No. American
MILL SITES
USMS No 1299
SEC 33
CARLSON 1
CARLSON 2
CARLSON 5
CARLSON 6
CARLSON 7
CARLSON 8
CARLSON 9
CARLSON 10
CARLSON 12
CARLSON 13
CARLSON 14
CARLSON 15
CARLSON 16
CARLSON 17
CARLSON 18
CARLSON 19
CARLSON 20
CARLSON 21
CARLSON 22
CARLSON 23
CARLSON 24
CARLSON 25
CARLSON 26
CARLSON 27
CARLSON 28
CARLSON 29
CARLSON 30
KENT No 1
KENT No 2
KENT No 3
WARD
CANDOR
CLUSTER
DAYLIGHT
YORK
STRIP
CAVE
TAILOR
MERCHANT
FALLS
FRANKLIN
CUSHING
BISBEE
POTOMAC
HUNTER
MURPHEY
LITTLE PETE
BIG JESSE
CUSTER
TONY
HUMBUG
INGERSOLL
BUFFALO
OHIO
NEW YORK
GREATEASTERN
MILLWAUKEE
UNCLE SAM
AMERICAN FLAG
LAFAYETTE
JUMPER
PATRICK HENRY
ALBERT
WHITE ELEPHANT
CRAAT COPPER
TIGER
SCHLEY
SAMOSON
SARATOGA
ERIE
CHICAGO
LAST CHANCE
LAST CHANCE 2
LAST CHANCE 3
COCONINO
OREGON COPPER
HOME AGAIN
MINNA HALEY
MINNA HALEY 2
MINNA HALEY No 4
CAPE CLARKE
INDEPENDENCE
MULHEIM
DOMINION
MADISON
COLISEUM
AIR PLANE
SAMPSON
HERCULES
TROY
MESSINA
ALTAMONT
CLOUD REST
CLOUD REST 1
BIG WINDY
BLUE WING
EMPIRE
EXCELSIOR
ZEKENDORF PROPERTY
MOHAWK
SILVER
OLD POT
OLD PAT
OLD PAP
CHICAGO
COCONINO
OREGON
AJAX CON
FRANKLIN
John Joseph Pritcio
HELL OF ROSEMONT
FOX #1
FOX #2

Allison Mine
Area for
North American Mines

INDUCED POLARIZATION SURVEY

ALLISON MINE AREA

Pima County, Arizona

for

NORTH AMERICAN MINES, INC.

July 1966

By

HEINRICHS GEOEXPLORATION COMPANY

P. O. Box 5671 Tucson, Ariz.

TABLE OF CONTENTS

Attachments

INTRODUCTION

At the request of Mr. Graton Lynch, Heinrichs Geoexploration Company conducted and completed an induced polarization survey over a portion of the Allison Mine area, for North American Mines, Incorporated. The field work for this survey was carried out during the interim July 13 to July 29, 1966.

A total of five 500 ft. spreads, making up four lines, using the dipole-dipole electrode configuration and the dual frequency technique were used. The data obtained is presented on sectional data sheets, one for each line. Each sheet has apparent resistivity, percent frequency, effect, metallic conductors factor, and self-potential plotted as described in "The Basis of Induced Polarization" bound with this report. In the following discussion these four types of data will be abbreviated a, PFE, MCF, and S.P. A plan map is also included showing the relative position of the lines in relation to USMM #4063 and the Allison Mind. Electrode numbers are written above the lines and line stationing is below the line.

The GEOEX personnel working in this area were: Mr. Ron Palmer, party chief; Mr. Michael Critchley, sender operator; and Mr. William Hood, technical assistant. Mr. Paul Head, geophysist in charge, is responsible for interpretation of the data.

CONCLUSION AND RECOMMENDATION

Initially lines #1 and #2 developed moderate interest at their north ends due to some rather weak anomalism which seems continuous between lines. Lines #3 and #4 were then done, off-setting their centers north to correspond with the assumed strike of anomalism. Line #3 did not detect anomalism, and that on line #4 was exceedingly weak. We conclude that mineralization is best between lines #1 and #2 and probably does not extend much farther north than has been indicated on the plan map.

This area merits additional work and it was recommended to Mr. Lynch that prior to additional geophysics some detailed geology be undertaken to localize the anomalous material at surface and to determine the possible relation of copper showings to the observed I.P. effects.

Line #2 was extended to the south in an unsuccessful attempt to expand the weak anomaly detected on line #2, spread #1. However, additional work is recommended farther south of the Allison Mine because certain aspects of the data are strange and unusually anamalous.

INTERPRETATION

Line #1.

Two moderately sharp resistivity contacts are shown, at 1.5 SW and at 1.0 NE. The southerly one apparently is associated with a very weak PFE anomaly just beginning at the end of the line. Another very weak anomaly at the north end of the line has a very good pattern beginning to develop and may become much stronger if the line is extended. No self potential correlation is noted.

Line #2.

This line was surveyed with two 500 ft. dipole arrays. At the north end of this line and continuing beyond the survey a weak, well-patterned anomaly has been detected. The disturbing body seems to be narrow and very near surface. There is also possible S.P. correlation, at least a broad low is present on the north end. Spread #1 revealed a weak anomaly at its south end which is closely related to an interpreted contact at about station 2.0 south. Spread #2 was run in hope that the PFE-MCF anomaly might be traced to a more intensly mineralized zone. Instead a completely unrelated anomaly associated with a very low a was detected at 4.8 south. Although the polarization effects are almost negligible in this area, the moderately high resistivity values overlying the exceptionally low resistivity values must indicate something of interest, perhaps only academically but conceivably economic and possibly sulfide related. This represents a highly unusual area. The contact indicated at about 3.8 south could be 500 feet farther south and does fall in this zone of interest. It is possible that exceedingly bad topographic conditions on this line have made resistivity calculations erroneous and account for the results, but further work is required to be more certain either way. One or two more short lines probably would do the job.

Line #3.

This has shown nothing of interest except that the S.P. shows a very rapid decrease and a vague increase of PFE to the south. A "pod" of slightly high PFE values was found to the north. This line was run to extend or cut off the anomalism on the north end of line #2. It was cut off. The low S.P. zone may be accounted for by topography.

Line #4.

This line was also run to extend or cut-off anomalism of a parallel line. Only a very weak anomaly was detected that we do not associate with the anomaly seen on line #1.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Paul A. Head
Research Geophysicist

August 11, 1966

Approved:

Walter E. Heinrichs, Jr.
President

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

BASIS OF THE INDUCED POLARIZATION METHOD

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

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

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

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

HEINRICHS GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA

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

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

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

FIELD TECHNIQUES AND INTERPRETATION

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

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

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

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

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

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

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

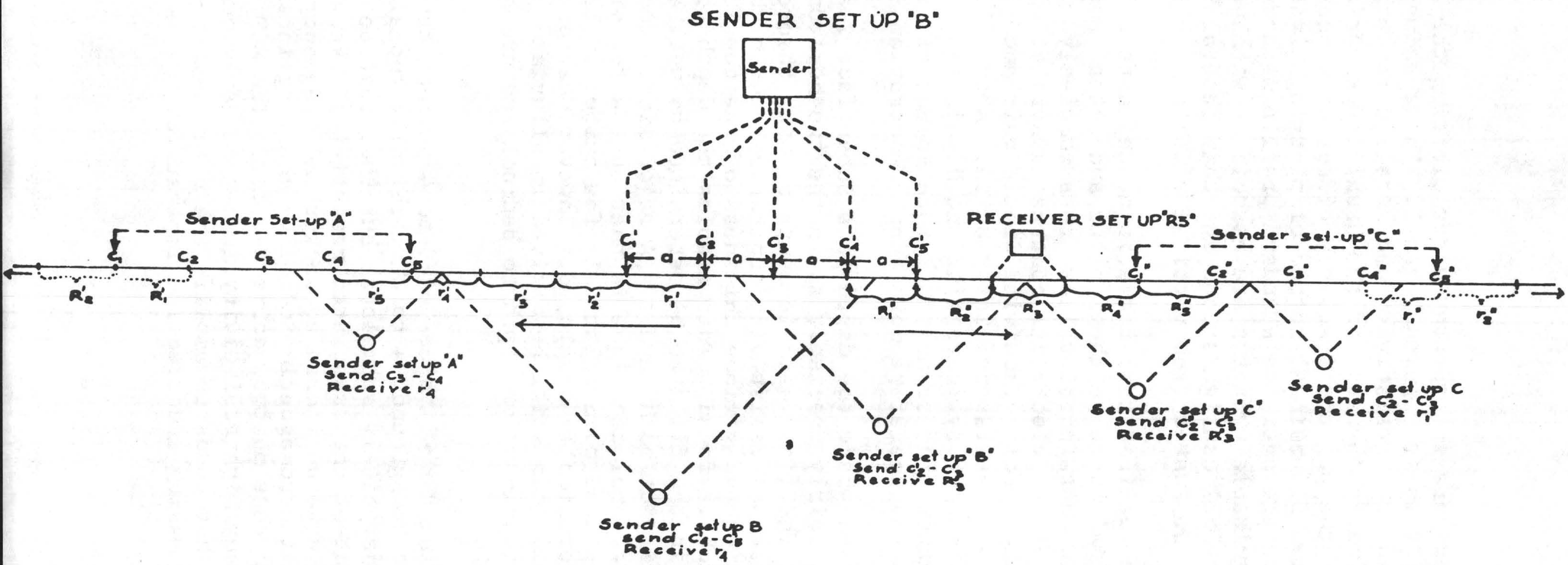
The field data are interpreted after plotting the PFE, MCF and resistivity as in Figures 1 and 2. These values are then contoured, the resistivity and metallic conduction factor logarithmically (because of the usual large variations in magnitude) and the percent frequency effect on a constant interval.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

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

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

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

Figure 1



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

Figure 2

(Data obtained from the three setups of Figure 1)

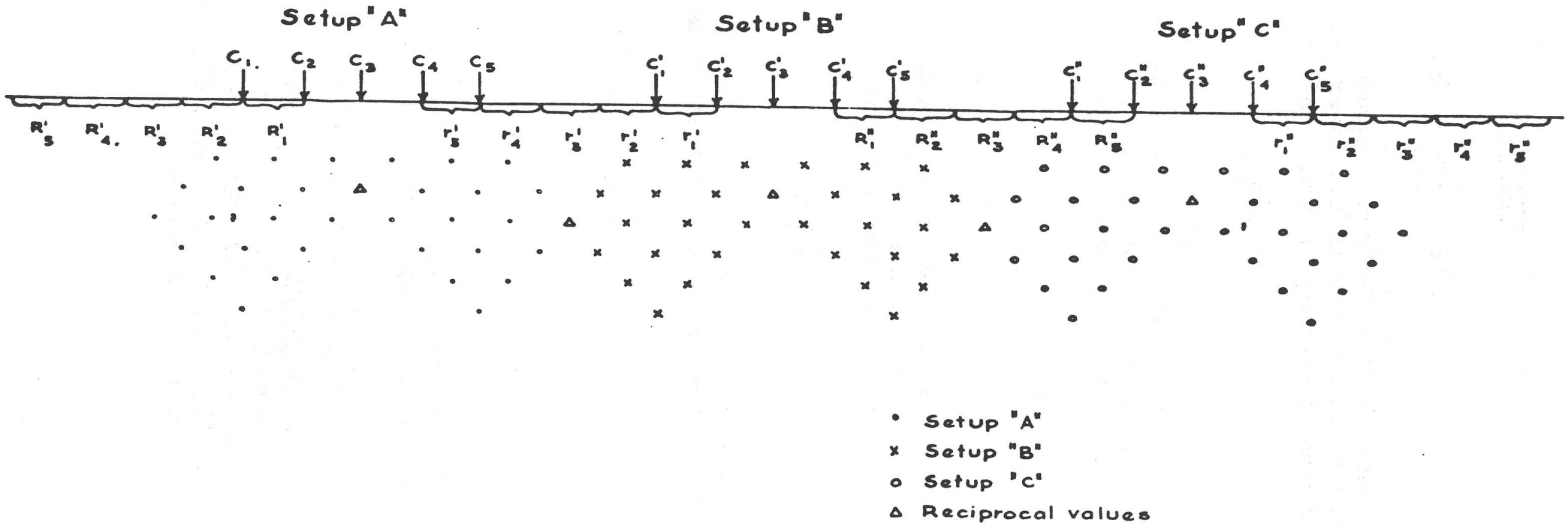


FIGURE 3

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

Where PFE is Percent Frequency Effect, ρ dc is the apparent resistivity at the lower frequency and ρ ac is the higher frequency apparent resistivity.

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

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

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

(Only for dipole-dipole arrays)

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

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

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

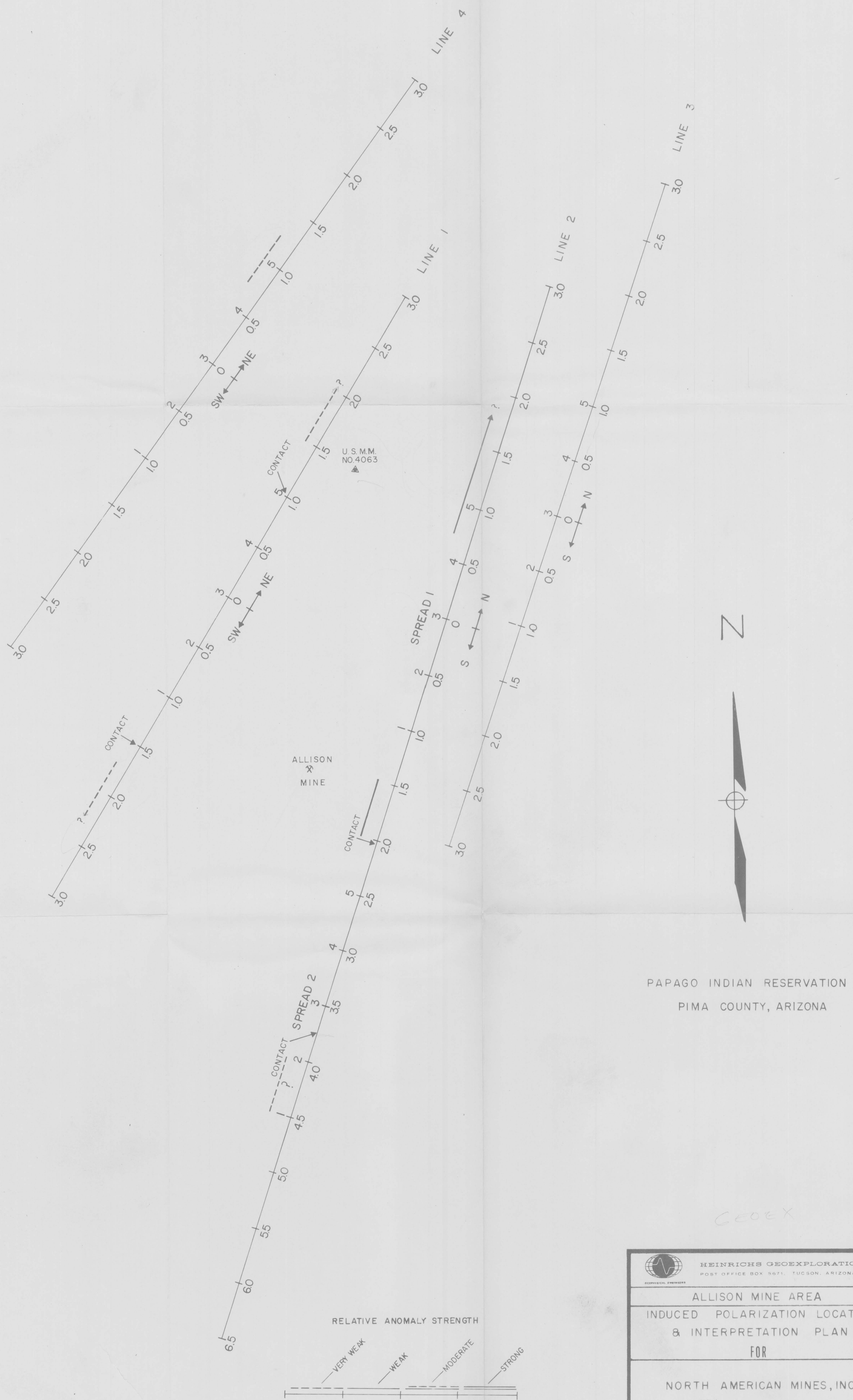
$$\frac{\rho}{2\pi} = \frac{V}{I} Kn = \frac{V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

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

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

INDUCTIVE COUPLING INTERFERENCE

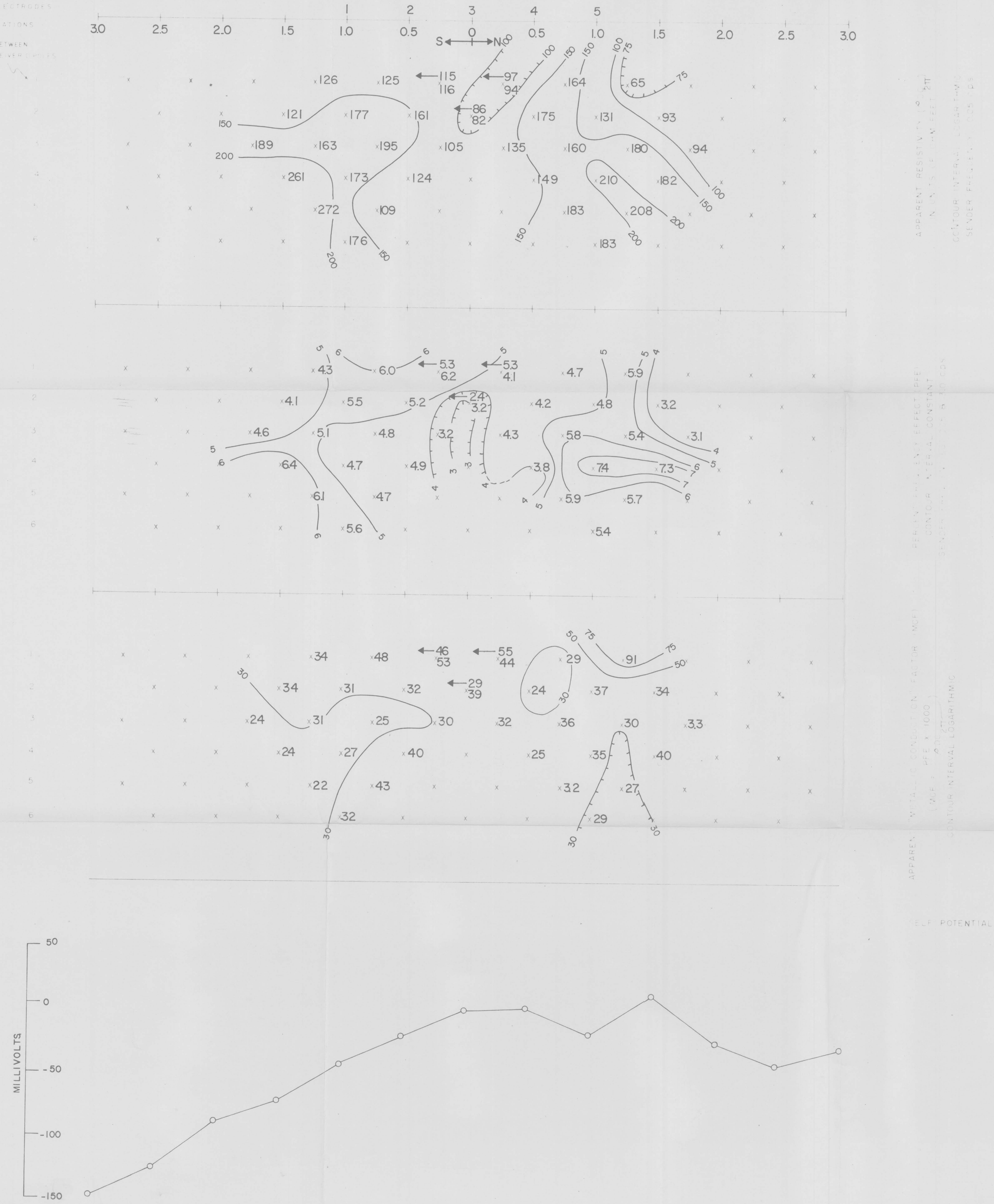
If $a(n+1)\sqrt{\frac{f}{\rho/2\pi}}$ is less than 1000 then the inductive coupling false frequency effect will be less than 2.5%. Likewise if less than 1500 the false effect will be less than 5%, and if less than 2000, the false effect will be less than 10%. Frequency f is in cycles per second.



HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703

ALLISON MINE AREA
INDUCED POLARIZATION LOCATION & INTERPRETATION PLAN
FOR
NORTH AMERICAN MINES, INC.

Scale 1" = ~~1000~~ 500 | Date JULY 1966



EXPLANATION

ELECTRODE ARRAY - 500 - 500 - 500 -

LOOKING W

ALLISON MINE AREA

SECTIONAL DATA SHEET

LINE NO. 3

INDUCED POLARIZATION TRAVERSE

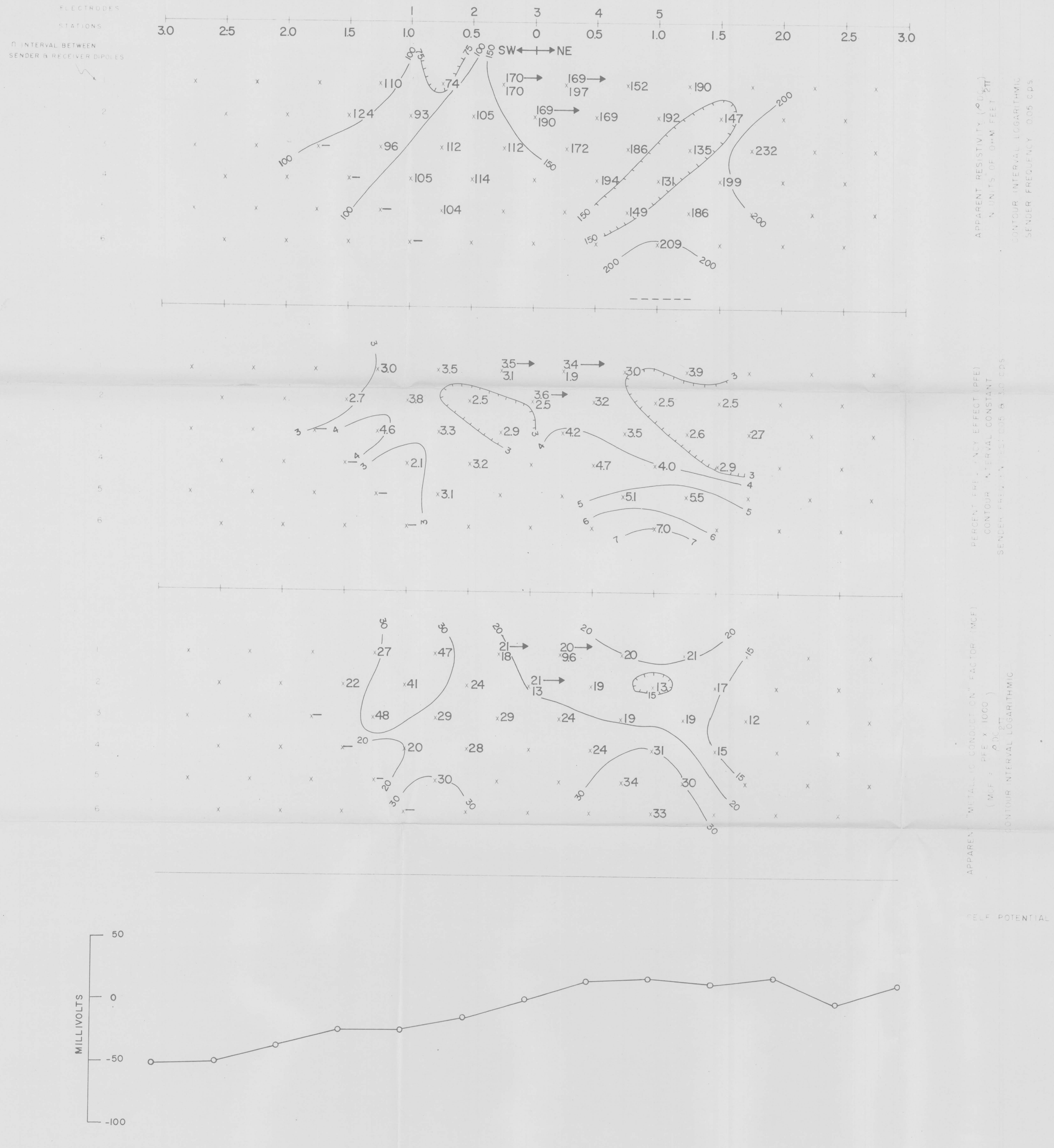
HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 500'   DATE: JULY 1966

FOR

NORTH AMERICAN MINES, INC.

HEINRICHS GEOEX



EXPLANATION

ELECTRODE ARRAY 500 – n · 500 – 500

SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING NW

GEOEX

ALLISON MINE AREA

SECTIONAL DATA SHEET

LINE NO. 4

INDUCED POLARIZATION TRAVERSE

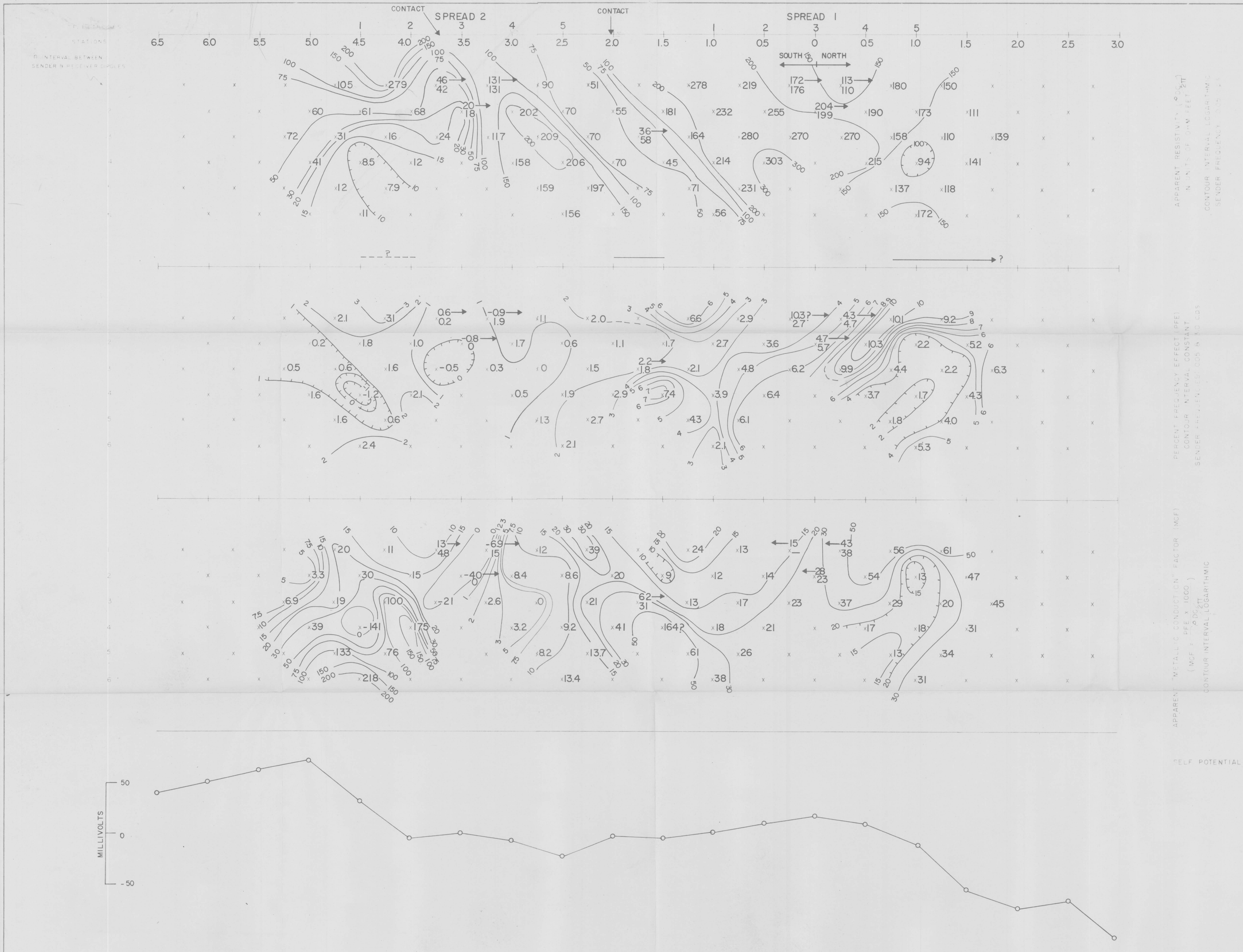
HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 500' DATE: JULY 1966

FOR

NORTH AMERICAN MINES, INC.

HEINRICHS GEOEX



EXPLANATION

LOOKING NW

ALLISON MINE AREA

SECTIONAL DATA SHEET

LINE NO. 2

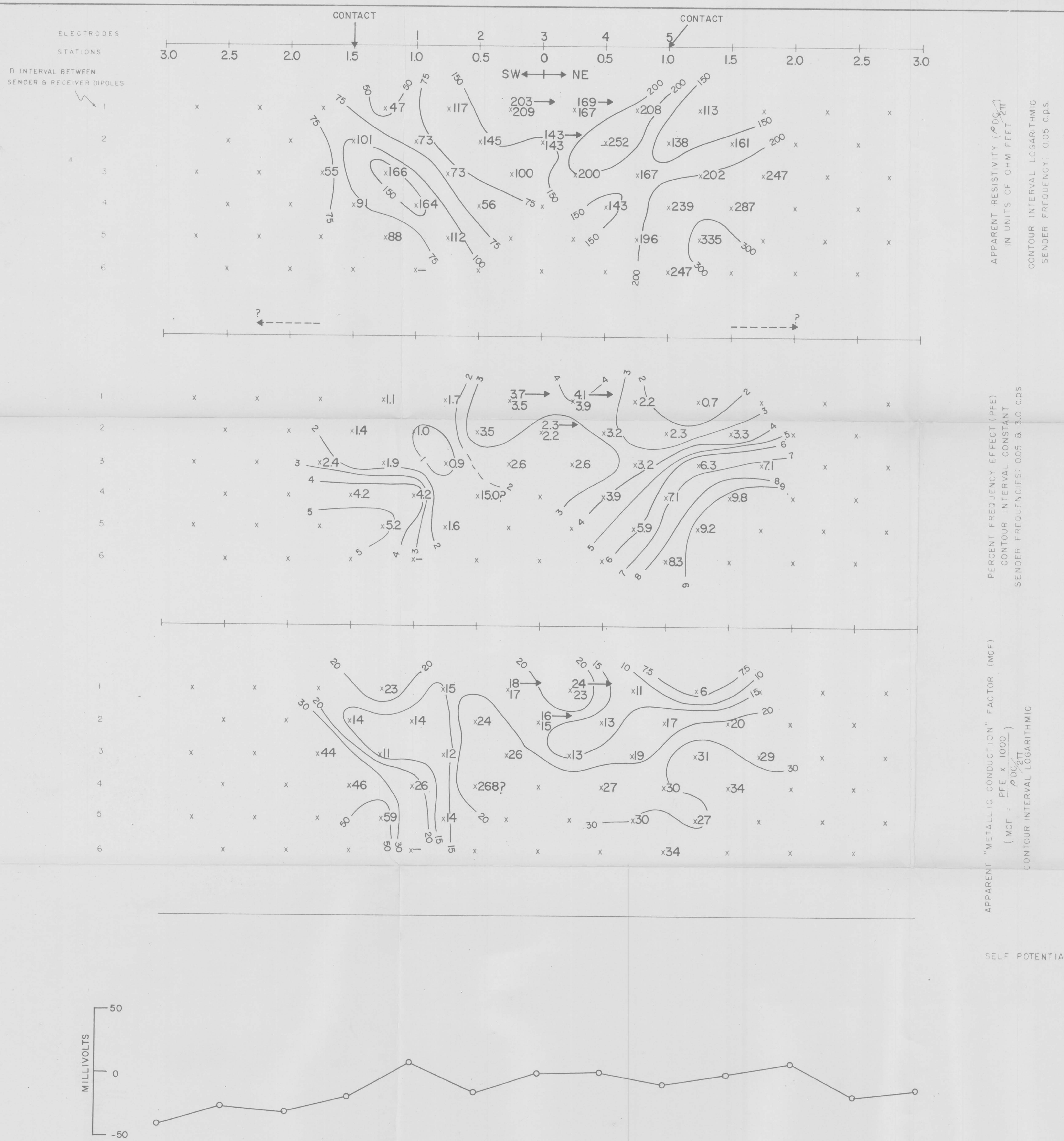
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 500' DATE: JULY 1966

FOR

NORTH AMERICAN MINES, INC.



EXPLANATION

ELECTRODE ARRAY: 500 — n × 500 — 500

SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING NW

ALLISON MINE AREA

SECTIONAL DATA SHEET

LINE NO. 1

INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 500' DATE: JULY 1966

FOR

NORTH AMERICAN MINES, INC.