INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: SANTA CRUZ Line: 1 Spd 2 W 2 Int.Cal Date: 7/31/63

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	.1-.2	W→	.2-	.3W	→	.3-	.4W	→	→	.4-	.5W	→
Time												
DC-1	-55	-77	-289	-350	-91	-425	-120	-31	-10	-40	-16	-3
DC-2	-234	+112	+490	+723	+73	+555	+129	+55	+20	+56	+23	+13
Σ	RR		RR									
DC-3	-69		-270						250			
Dc-4	-250		+510			234		250 69	85			
Σ	RR					55		91	165			
DC-AV	-85					179		90				
AC-1	-250					89						
AC-2	90 90 60	95	390	527	82	490	125	43	15	48	20	8
Σ												
S. P.	—	Note	? Sign of N- Rev readings				no N. Potential between Pots					
AC-N												

INDUCED POLARIZATION SENDER NOTES

Project: Upper Santa Cruz Line: 1 Spd 2 W½ June Date: 7-31-63

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive	.1-.2	→	.2-.3	→	→	.3-.4	→	→	→	.4-.5	→	→
~~Time~~ TRANS TAP	D	→	→	→	→	→	→	→	→	→	→	→
~~Range~~ SCALE	2.0	→	→	→	→	→	→	→	→	→	→	→
Current	N 56 53 R 42 43	52 45 43 33	57 50 35 35	55 44	45 33	39 37	57 38	54 43	45 34	41 37	57 39	54 43
Send	49/48	47.5/39	46/45	49.5	39	38	47.5	48.5	39.5	39	48	48.5
Receive	3300 3250 3200	2625	3100/3130	3350	2625	2550	3220	3275	2675	2625	3250	3275
Time												
Range												
Current												

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: SANTA CRUZ Line: 1 Spd. 2 W 2 Int.Cal Date: 7/31/63

Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Rec.	→											
Time												
DC-1	0	-16	-7	-1	0	-13	-10	-6	-5			
DC-2	+8	+24	+13	+8	+6	+5	+1	0	-3			
Σ												
DC-3	4	20	10	5	3	9	6	3	1			
Dc-4												
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												

INDUCED POLARIZATION SENDER NOTES

Project: Upper Santa Cruz Line: 1 ~~3~~ and 2 W½ Date: 7-31-63

Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Receive	.4-.5	.5-.6	→	→	→	.6-.7	→	→	→			
Time	D											
Range	2.0											
Current	N 45 R 33	40 36	54 37	52 42	43 32	42 38	59 39	56 45	46 33			
Send	39	38	45.5	47	37.5	40	49	50.5	39.5			
Receive	2625	2550	3075	3175	2525	2700	3310	3425	2675			
Time												
Range												
Current												

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper SANTA CRUZ Line 1 Spd 2W² Field date_____ Data page_____ Comp. date_____. Comp by EGH

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive	1	2	1	2	3	1	2	3	4	2	3	1
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	3300/3250/3200	2625	3100/3130	3350	2625	2550	3220	3275	2675	2625	3250	3275
(E) Vdc (avg)	90/80/88	95	390	527	82	490	125	43	15	48	20	8
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρdc=ExFxGx10^3/D	8.2/8.3	43.4	37.7	188.0	93.7	57.6	46.6	39.4	33.6	21.9	18.5	14.7
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
(B) Receive	5	3	4	5	6	4	5	6	7			
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	2625	2550	3075	3175	2525	2700	3310	3425	2675			
(E) Vdc (avg)	4	20	10	5	3	9	6	3	1			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρdc=ExFxGx10^3/D	16.	23.5	19.5	16.5	20.0	20.0	19.0	14.7	9.4			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper Santa Cruz Line 1 Sp 2 E² Field date_____ Data page_____ Comp. date_____. Comp by EGH

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive												
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	3450	2825	3800	3450	2800	2760	3525	3450	2825	2725	3425	3380
(E) Vdc (avg)	869	53	786	205	17	843	139	51	6	176	37	17
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D	75.6	22.5	62.0	71.3	18.2	91.6	47.3	44.3	12.7	77.5	32.4	30.2
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
(B) Receive												
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	2800	2700	3425	3425	2825	2700	3425	3425	2760			
(E) Vdc (avg)	11	53	14	8	3	15	5	3	1			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D	41.3	58.9	24.5	24.5	17.8	33.3	15.3	14.7	9.1			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

POLARIZATION - RECEIVER NOTES

PAGE 1

Project: Upper Santa Cruz Line: 1 100a Spk1 E2 Int.Cal _____ Date: 7/29/63 7 30 63

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	.1-.2E →		.2-.3E →					.3-.4E →		.4-.5E →		
Time												
DC-1	+120	+29	+177	+64	+14	+101	+46	+21	+5	+50	+32	+17
DC-2	-69	-13	-195	-43	-19	-97	-57	-17	-9	-49	-44	-13
Σ												
DC-3 AVG.	94	21	186	54	17	99	52	19	7	50	38	15
Dc-4												
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												

Upper

INDUCED POLARIZATION 100a SENDER NOTES 1A

Project: Santa Cruz Line: 1 spr. 1 Dipole - Dipole East ½ Date: 7/30/63

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive	·1-·2 →		·2-·3 →		→	·3-·4		→		·4-·5 →		→
~~Time~~ TRANS TAP	D											→
~~Range~~ Scale	2.0											→
Current	W 66 R 33	34 39	61 49	69 31	33 40	55 35	50 44	58 28	30 35	60 37	58 55	73 28
Send AVG	50	37	55	50	37	45	47	43	33	49	57	51
Receive FACTOR	.320	?.320	.316	.320	?.320	.320	.320	.320	.320	.320	.314	.319
Time CURRENT MILL.	1600	?1184	1738	1600	?1184	1440	1504	1376	1056	1568	1790	1627
Range	~~3375~~ 3075	~~2480~~ 1975	~~3500~~	~~4050~~	~~1975~~	~~3225~~	~~2930~~	~~3400~~	~~1750~~	~~3525~~	~~3400~~	~~4280~~
Current	2613	3050 5025	3730	3315	2480	3030	3170	2900	2220	3320	3825	3450

2513 (2480)

7/30/63

4-5	1400	ohms	8:30 AM.
3-4	600		
2-3	850		
1-2	650		
4-5	150		9:00 AM
3-4	101		
2-3	100		
1-2	150		

INDUCED POLARIZATION - RECEIVER NOTES PAGE (2)

Project: Upper Santa Cruz Line: 1 Sp 1 E² Int.Cal _____ Date: 7/30/63

Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Rec.	.4-.5	.5-.6	→	→	→	.6-.7	EAST	→	→			
Time												
DC-1	+3	+49	+37	+25	+8	+15	+11	+8	+3			
DC-2	-7	-40	-42	-11	-6	-12	-13	-4	-2			
Σ												
DC-3 AVG	5'	45'	39'	18'	7	13	12	6	3			
Dc-4		67 paces	from	.6	to	N-S	Fence					
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												

100'A

INDUCED POLARIZATION SENDER NOTES 2A

Project: Upper Santa Cruz Line: 1 Spread 1 East ½ Dipole Dipole Date: 7/30/63

Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Receive	.4-.5	.5-.6	→	→	→	.6-.7	→	→	→			
Time (Trans Tap)	D	→	→	→	→	→	→	→	→			
Range (Scale)	2.0	→	→	→	→	→	→	→	→			
Current (Meter)	27 / 32	63 / 38	60 / 59	84 / 28	32 / 42	63 / 38	58 / 58	80 / 31	33 / 39	Time	10:45	
Send AVG	30	51	59	56	37	51	58	56	36			
Receive (Current Corr. Factor)	.320	.319	.312	.315	.320	.319	.313	.315	.320			
Time (Current Milliamp)	960	1627	1841	1764	1184	1627	1815	1764	1152			
Range	1575 / 1375	3750 / 1840	3525 / 3470	4925 / 1050								
Current	2000 / 1580	3450 / 3700	4000 / 3525	3800 / 5925	2480 / 1870	3450 / 3700	3930 / 3400	3800 / 4700	2420 / 1925			

3450 (3800)

$5130 \overline{)5073}$ 5130

57

$57 \overline{)5073}$

J POLARIZATION - RECEIV[illegible]S

Project: Upper S. Cruz Line: 1 Sp. 1 W2 Int.Cal Date: 7/30/83

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4.5	1-2	2-3	3-4
Rec.	.1 - .2 W →		.2 - .3 W	→		.3 W	- .4	W	→	.4 - .5 W		→
Time												
DC-1	-91	-29	-106	-38	-17	-56	-44	-17	-8	-23	-24	-13
DC-2	+120	+38	+50	+52	+14	+89	+24	+23	+9	+28	+8	+9
Σ												
DC-3 AVG	105	33	78	45	16	72	34	20	9	26	16	11
Dc-4												
Σ	from 0.4		in	Rd.								
DC-AV		35'	W.	to	fence	parallel		ranch	rd			
AC-1		24'	E	to	pipe	line	"	"	"			
AC-2												
Σ												
S. P.												
AC-N												

86
30
2[116
58

89
32
2[121
60.5

120

109
54

107
53.5

27.5
37.5
2[116
59

INDUCED POLARIZATION SENDER NOTES

3A

Project: Upper Santa Cruz Line: 1 spread 1 w/2 Date: June 7/30/63

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive	.1-.2	→	.2-.3	→	→	.3-.4	→	→	→	.4-.5	→	→
~~Time~~ TRANS. TAP	D	→	→	→	→	→	→	→	→	→	→	→
~~Range~~ Scale	2.0	→	→	→	→	→	→	→	→	→	→	→
Current MILAMPS	N 62 R 63	68 40	8689 3032	63 64	67 42	33 43	89 31	63 62	66 41	33 42	85 33	62 61
Send AVG	63	54		63.5	54.5	38	60	62.5	53.5	37.5	59	61.5
Receive Factor	.309	.317										
Time CURRENT	4275 1947	1712										
Range		3670										
Current	4250	4000 3150 7150 3575	4200 3925	4300	3700	2550	4070	4225	3625	2525	4000	4175

INDUCED POLARIZATION - RECEIVER NOTES PAGE 4

Project: Santa Cruz Line: 1 Spr. 1 W² Int.Cal Date: 7/30/63

Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Rec.	→	.5→.6W		→		.6→.7W		→				
Time												
DC-1	-9	-9	-10	-5	-3	-7	-8	-5	-4			
DC-2	+1	-11?	+5	+5	+2	+4	+1	+2	±0			
Σ												
DC-3 AVG	5	1	7	5	3	6	5	3	2			
Dc-4		120'	W.	to	main	hiway	fence	from	.7W			
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												

June 4A

INDUCED POLARIZATION SENDER NOTES

Project: Upper SANTA CRUZ Line: 1 spd 1 west 1/2 Date: 7-30-63

Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Receive	.4-.5	.5-.6	→	→	→	.6-.7	→	→	→			
Time (Trans Tap)	D	→	→	→	→	→	→	→	→			
Range (Scale)	2.0	→	→	→	→	→	→	→	→			
Current (Milliamps)	63 40	35 39	82 33	59 52	59 39	34 39	80 33	59 57	63 39			
Send	51.5	37	57.5	55.5	49	36.5	56.5	58	51			
Receive	3475	2480	3875	3750	3310	2450	3825	3925				
Time												
Range												
Current												

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET 100a

Page_____

Project Upper Santa Cruz Line 1 Spd 1E² Field date 7/29/63 Data page 1 & 2 Comp. date_____. Comp by_____

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive												
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	3375	2480	3730	3375	2480	3030	3170	2900	2220	3320	3825	3450
(E) Vdc (avg)	94	21	186	54	17	99	52	19	7	50	38	15
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	.3	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D	8.4	10.2	15.0	19.2	20.6	9.8	19.6	19.7	18.9	18.1	29.8	26.1
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
(B) Receive												
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	2000	3450	4000	3800	2480	3450	3930	3800	2420			
(E) Vdc (avg)	5	45	39	18	7	13	12	6	3			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D	26.3	37.7	68.3	49.7	47.4	22.6	32.1	26.5	31.2			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET 100a

Page_____

Project Upper Santa Cruz Line 1 Spd 1 W² Field date_____ Data page_____ Comp. date_____. Comp by EGH

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive												
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	4250	3670	4200/3925	4300	3700	2550	4070	4225	3625	2525	4000	4175
(E) Vdc (avg)	105	33	78	45	16	72	34	20	9	26	16	11
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	.3	6.0	1.2	3.0	6.0
(H) ρdc=ExFxGx10^3/D	7.4	10.8	5.6/6.0	12.6	13.0	8.5	10.0	14.2	14.9	12.4	12.0	15.8
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	5-6			
(B) Receive												
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	3475	2480	3875	3750	3310	2450	3825	3925	3450			
(E) Vdc (avg)	5	1?	7	5	3	6	5	3	2			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρdc=ExFxGx10^3/D	15.1	12.1?	10.8	14.0	15.2	14.7	13.7	12.8	14.6			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: SANTA CRUZ Line: 3 S of 2 E² Int.Cal Date: 8/2/63

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	·1-·2	E →	·2-·3	E →		·3-·4	E →			·4-·5	E →	
Time												
DC-1	-576	-54	-157	-45	-19	-154	-28	-12	-4	-29	-9	-6
DC-2	+290	+25	+154	+50	+19	+155	+36	+22	+14	+28	+9	+6
Σ S.P.	-45		-8			-6				-2		
DC-3 RR	-554											
Dc-4 RR	+272											
Σ												
DC-AV	453/413	39	156	48	19	155	32	17	9	28	9	6
AC-1												
AC-2												
Σ												
S. P.												
AC-N												

INDUCED POLARIZATION SENDER NOTES

Project: Up. Santa Cruz Line: 3 Spr. 2 E 1/2 Date: 8-2-63

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive	.1-.2	→	.2-.3	→	→	.3-.4	→	→	→	.4-.5	→	→
Time	A											
Range												
Current	N 46 47 R 37 37	40 29	36 28	46 37	40 28	39 28	36 28	46 37	40 29	39 28	36 28	46 37
Send	41.5 42	34.5	32	41.5	34	33.5	32	41.5	34.5	33.5	32	41.5
Receive	2780	2325	2125	2800	2275	2250	2125	2800	2325	2250	2125	2800
Time	2825											
Range												
Current												

INDUCED POLARIZATION - RECEIVER-NOTES PAGE

Project: Line: 3 Spd 2 E2 Int.Cal Date:

Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Rec.	→	.5-.6 E	→	→	→	.6-.7 E	→	→	→			
Time												
DC-1	-4	-23	-15	-14	-13	-6	-2	-1	0			
DC-2	+4	+1	-?7	-?7	-?8	+7	+3	+3	+3			
Σ S.P.		-1R				0						
DC-3												
Dc-4	4	12	4	3.5	2	6	3	2	2			
Σ												
DC-AV		.7	72'	E.	to	Center	of Rd					
AC-1			& 100 E		to	0+00	Spd.	1				
AC-2												
Σ												
S. P.												
AC-N												

INDUCED POLARIZATION SENDER NOTES

Project: 4' Santa Cruz Line: 3 Spd 2 E 1/2 Date: 8-2-63

Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Receive	14-15	15-16	→	→	→	16-17	→	→	→			
Time	A											
Range												
Current	M 40 R 29	39 28	37 28	46 37	40 29	39 28	37 28	46 37	40 29			
Send	34.5	33.5	32.5	41.5	34.5	33.5	32.5	41.5	34.5			
Receive	2325	2250	2175	2800	2325	2250	2175	2800	2325			
Time												
Range												
Current												

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Upper Santa Cruz Line: 3 Spd. 2 W² 100a Int.Cal _____ Date: 8/2/63

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	·1-·2W	→	·2-·3	W	→	·3-·4	W	→	→	·4-·5	W	→
Time												
DC-1	+101	+51	+214	+38	+27	+184	+42	+14	+12	+35	+16	+8
DC-2	−99	−51	−224	−38	−27	−177	−37	−8	−6	−29	−11	−2
Σ												
DC-3												
Dc-4	100	51	219	38	27	181	40	11	9	33	13	5
Σ												
DC-AV												
AC-1												
AC-2		LINE bearing S 30° W										
Σ						N 30° E						
S. P.		South of old mission adobe.										
AC-N												

INDUCED POLARIZATION SENDER NOTES

Project: Up Santa Cruz Line: 3 Spread 2 W 1/2 Date: 8-2-63

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive	.1-.2	→	.2-.3	→	→	.3-.4	→	→	→	.4-.5	→	→
Time	A											
Range												
Current	N 35 R 28	39 27	45 36	36 28	39 27	38 27	45 35	35 27	38 27	38 27	45 35	35 28
Send	31.5	33	40.5	32	33	32.5	40	31	32.5	32.5	40	31.5
Receive	2100	2200	2725	2125	2200	2175	2700	2075	2175	2175	2700	2100
Time												
Range												
Current												

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Upper Santa Cruz Line: 3 Sol 2 W² 100a Int.Cal Date: 8/2/63

Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Rec.	→	·5-·6	W →		→	·6-·7	W →		→			
Time												
DC-1 N	+ 7	+ 11	+ 4	0	0	+ 34	+ 30	+ 26	+ 25			
DC-2 R	- 2	- 18	- 11	- 6	- 6	+? 13	+? 16	+? 20	+ 19			
S		↑										
DC-3									S.P. +23			
Dc-4 →	4	14	7	3	3	10	7	3	3			
S												
DC-AV												
AC-1			·2 EAST		20'	to fence						
AC-2												
S			·7 ON silt		39' W	to WATER IN River						
			·6	ON	Conglomerate							
		↓	·5+	30' is	bare	out crop	CONGLOMERATE					

INDUCED POLARIZATION SENDER NOTES

Project: Mp - Santa Cruz Line: 3 spread 2, W1/2 Date: 8-2-63

Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Receive	.4-.5	.5-.6	→	→	→	.6-.7	→	→	→			
Time	A	→	→	→	→	→	→	→	→			
Range												
Current	N 38 R 27	38 27	45 36	36 28	38 27	38 27	45 36	36 28	39 27			
Send	32.5	32.5	40.5	32	32.5	32.5	40.5	32	33			
Receive	2175	2175	2725	2125	2175	2175	2725	2125	2200			
Time												
Range												
Current												

2.700 ohm
2.12 s
1.27

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper Santa Cruz Line 3 Spd 2 E² Field date_____ Data page_____ Comp. date_____. Comp by EGH

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive	.1-.2E →		.2-.3E →			.3-.4E →				.4-.5E →		
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	2780 2825	2325	2125	2800	2275	2250	2125	2800	2325	2250	2125	2800
(E) Vdc (avg) ✓	433/413	39	156	48	19	155	32	17	9	28	9	6
(F) DCcal												
(G) Kn x 10^{-3} ✓	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D	46.7											
(I) Vac Σ	43.9	20.1	22.0	20.5	25.0	20.6	18.0	18.2	23.2	14.9	12.7	12.8
(J) AC noise x 2												
(K) Vac(corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
(B) Receive	→	.5-.6E		→		.6-.7E		→				
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	2325	2250	2175	2800	2325	2250	2175	2800	2325			
(E) Vdc (avg)	4	12	4	3	2	6	3	2	2			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	18.0	16.0	11.0	11.2	14.4	16.0	14.4	12.0	21.6			
(J) AC noise x 2												
(K) Vac (corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper Santa Cruz Line 3 SPD. 2 W½ Field date_____ Data page_____ Comp. date_____. Comp by_____

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive	.1-.2 W →		.2-.3 W →			.3-.4W →				.4-.5 W →		
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	2100	2200	2725	2125	2200	2175	2700	2075	2175	2175	2700	2100
(E) Vdc (avg)	100	51	219	38	27	181	40	11	9	33	13	5
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	14.2	27.8	24.1	21.4	36.8	24.9	17.7	15.9	24.8	18.2	14.4	14.2
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
(B) Receive	→	.5-.6 W			→	.6-.7 W			→			
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	2175	2175	2725	2125	2175	2175	2725	2125	2200			
(E) Vdc (avg)	4	14	7	3	3	10	7	3	3			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	19.3	19.3	15.4	14.8	23.1	27.5	26.9	23.7	34.3			
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

INDUCED POLARIZATION SENDER NOTES

Project: Up Santa Cruz Line: 2 Spread 1 E½ Date: 8-2-63

Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Receive	.4-.5	.5-.6	→		→	.6-.7	→		→			
Time	A											
Range												
Current	N 61 R 46	56 42	42 32	51 38	61 46	56 42	42 32	51 38	60 45			
Send	53.5	49	37	44.5	53.5	49	37	44.5	52.5			
Receive	3625	3310	2480	3000	3625	3310	2480	3000	3550			
Time												
Range												
Current												

INDUCED POLARIZATION SENDER NOTES

Project: Up. Santa Cruz Line: 2 Sprd 1 E 1/2 Date: 8-2-63

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive	.1-.2	→	.2-.3	→		.3-.4	→		→	.4-.5	→	
Time	A											
Range												
Current	N 50 R 38	60 45	42 31	49 38	60 45	55 41	41 31	49 38	59 44	57 42	42 32	51 38
Send	44	52.5	36.5	43.5	52.5	48	36	43.5	51.5	49.5	37	44.5
Receive	2975	3550	2450	2925	3550	3250	2425	2925	3500	3350	2480	3000
Time												
Range												
Current												

~ 4-5 200 3-4 200 2-3 190 1-2 210

INDUCED POLARIZATION SENDER NOTES

project: Up Santa Cruz Line: 2 Spd. 1 W 2 Date: 8/2/63

Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Receive	.4-.5 →		.5 -	.6	→	.6 -	.7	→	→			
Time												
Range	A											
Current N R	57 43	58 43	49 37	41 31	54 41	59 45	50 38	42 32	56 43			
Send	50	50.5	43	36	47.5	52	44	37	49.5			
Receive	3380	3425	2900	2410	3225	3525	2975	2480	3350			
Time												
Range												
Current												

INDUCED POLARIZATION SENDER NOTES

Project: Up. Santa Cruz Line: 2 Spd 1 W½ Date: 8-2-63

Send RG A	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive	.1-.2	→	.2-.3	→	→	.3-.4	→	→	→	.4-.5	→	→
Time	2480	3380	2975	2480	3380	3550	3000	2480	3380	3500	2975	2480
Range AVG	37	50	44	37	50	52.5	44.5	37	50	51.5	44	37
Current	N 42 R 32	57 43	50 38	42 32	57 43	60 45	51 38	42 32	57 43	59 44	50 38	42 32
Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Receive	.4-.5	.5-.6	→	→	→	.6-.7	→	→	→			
Time												
Range	A											
Current	N 57 R 43	58 43	49 37	41 31	54 41	59 45	50 38	42 32	56 43			

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Upper Santa Cruz Line: 2 Spd. 1 W² Int.Cal Date: 8-2-63

	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Send	~~+2~~	~~4-5~~	~~3-4~~	~~2-3~~	~~+2~~	~~4-5~~	~~3-4~~	~~2-3~~	~~+2~~			
Rec.	→	.5-.6 W	→	→	→	.6-.7	W →	→	→			
Time												
DC-1	+10	+9	+1	-?2	-?3	+29	+26	+24	+24			
DC-2	+?4	-17	-10	-7	-7	+?18	+?20	+?21	+?21			
Σ SP		-4				+24						
DC-3						↑						
Dc-4	3	13	5	2	2	5	3	1	1			
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												
						↓	.7 is 80' from .6 (on river's edge)					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Upper Santa Cruz Line: 2 Sod. 1 E² Int.Cal Date: 8/26/63

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	.1-.2 E	→	.2-.3 E	→	→	.3-.4 E	→	→	→	.4-.5 E	→	→
Time												
DC-1	-45	-17	-38	-12	-8	-39	-7	-3	-2	-12	-6	-5
DC-2	+35	+6	+33	+6	+1	+39	+7	+3	+2	+6	0	-1
Σ SP	-5		-2			0				-1		
DC-3												
Dc-4	40	11	35	9	4	39	7	3	2	9	3	2
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Upper Santa Cruz Line: 2 Spd.1 W2 Int.Cal Date: 8-2-63

	3-4 / 2-3	4-5 / 1-2	2-3 / 3-4	3-4 / 2-3	4-5 / 1-2	1-2 / 4-5	2-3 / 3-4	3-4 / 2-3	4-5 / 1-2	1-2 / 4-5	2-3 / 3-4	3-4 / 2-3
Send												
Rec.	.1-.2 W →		.2-.3 W →			.3-4 W →				.4-.5 W →		
Time												
DC-1	+36	+21	+24	+21	+3	+75	+7	-?1	-?3	+33	+16	+11
DC-2	+?2	-2	-50	-50	-8	-88	-20	-10	-8	-21	-3	+?3
Σ SP	+10		-3	RR	-2	-7				+6		
DC-3												
Dc-4	17	11	37	35	5	81	13	4	2	27	9	4
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												
							3 is 20' from road					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Upper Santa Cruz Line: 2 Spd 1 E2 Int.Cal Date: 8/2/63

Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Rec.	→	.5-.6	E →	→	→	.6-.7	E →	→	→			
Time												
DC-1	-4	-9	-7	-6	-6	-4	-3	-2.6	-2.8			
DC-2	-?2	-?1	-?4	-?4	-?4	0	-?1	-?1.4	-?1.3			
Σ SP		-5				-2						
DC-3						↑						
Dc-4	1	4	2	1	1	2	1	.6	.75			
Σ												
DC-AV												
AC-1												
AC-2												
Σ												
S. P.												
AC-N												
						↓	.7 is 30' E of wash					

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INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper Santa Cruz Line 2 Sod. 1 W½ Field date_____ Data page_____ Comp. date_____. Comp by_____

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive	.1-.2W	→	.2-.3W	→	→	.3-.4W	→	→	→	.4-.5W	→	→
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	2480	3380	2975	2480	3380	3550	3000	2480	3380	3500	2975	2480
(E) Vdc (avg)	17	11	37	35	5	81	13	4	2	27	9	4
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D				1.69								
(I) Vac Σ	2.0	3.9	3.7	(12.0)	4.4	6.8	5.2	4.8	3.5	9.2	9.0	9.6
(J) AC noise x 2												
(K) Vac(corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
(B) Receive	→	.5-.6W	→	→	→	.6-.7W	→	→	→			
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	3380	3425	2900	2410	3225	3525	2975	2480	3350			
(E) Vdc (avg)	3	13	5	2	2	5	3	1	1			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	9.3	11.3	10.3	8.7	10.4	8.5	10.5	6.7	7.5			
(J) AC noise x 2												
(K) Vac (corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

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INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

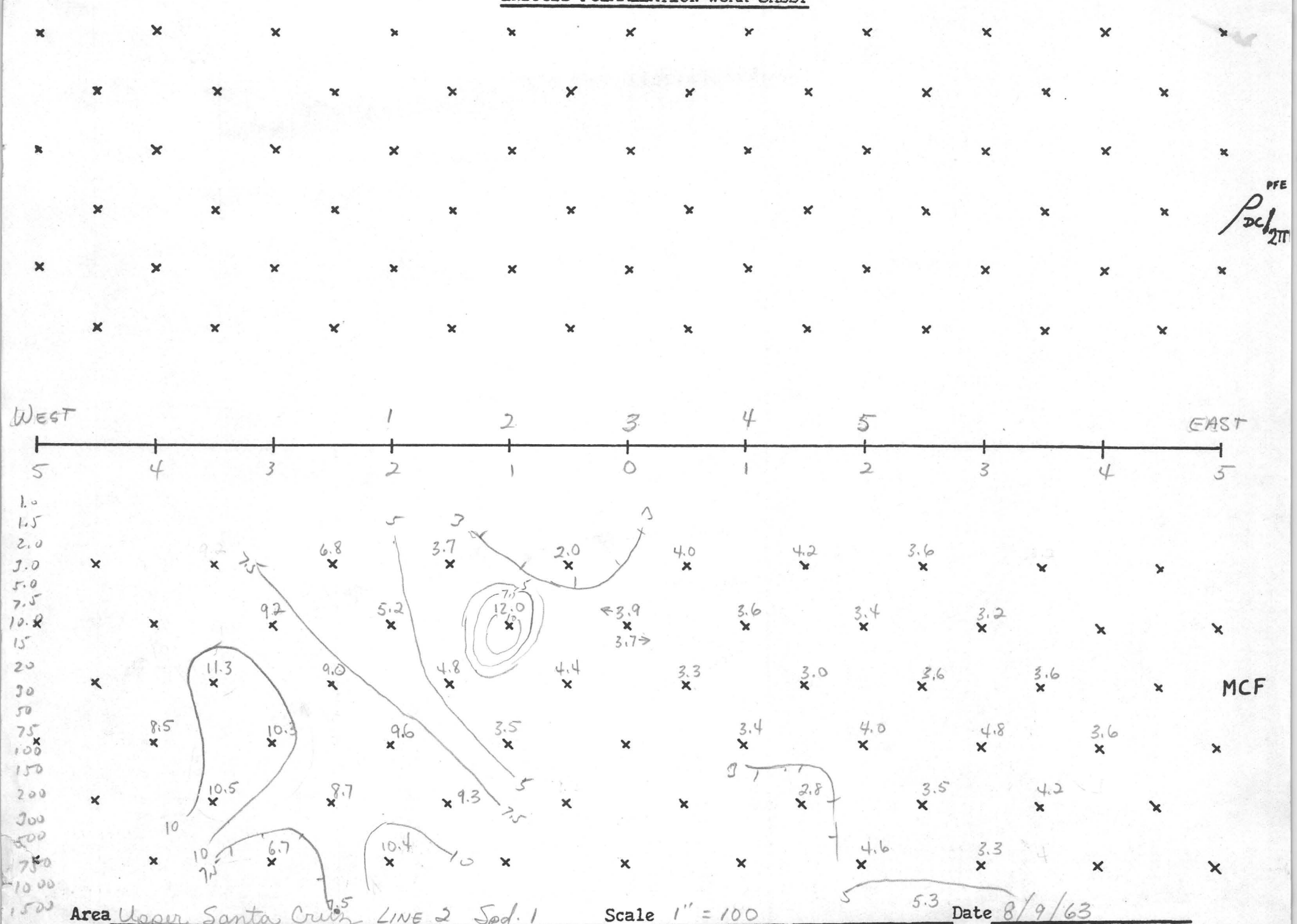
Project Upper Santa Cruz Line 25pd. 1 E ½ Field date_____ Data page_____ Comp. date_____. Comp by_____

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive	.1-.2E	→	.2-.3E	→	→	.3-.4.E	→	→	→	.4-.5E	→	→
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	2975	3550	2450	2925	3550	3250	2425	2925	3500	3350	2480	3000
(E) Vdc (avg)	40	11	35	9	4	39	7	3	2	9	3	2
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	4.0	3.7	4.2	3.6	3.3	3.6	3.4	3.0	3.4	3.2	3.6	4.0
(J) AC noise x 2												
(K) Vac(corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

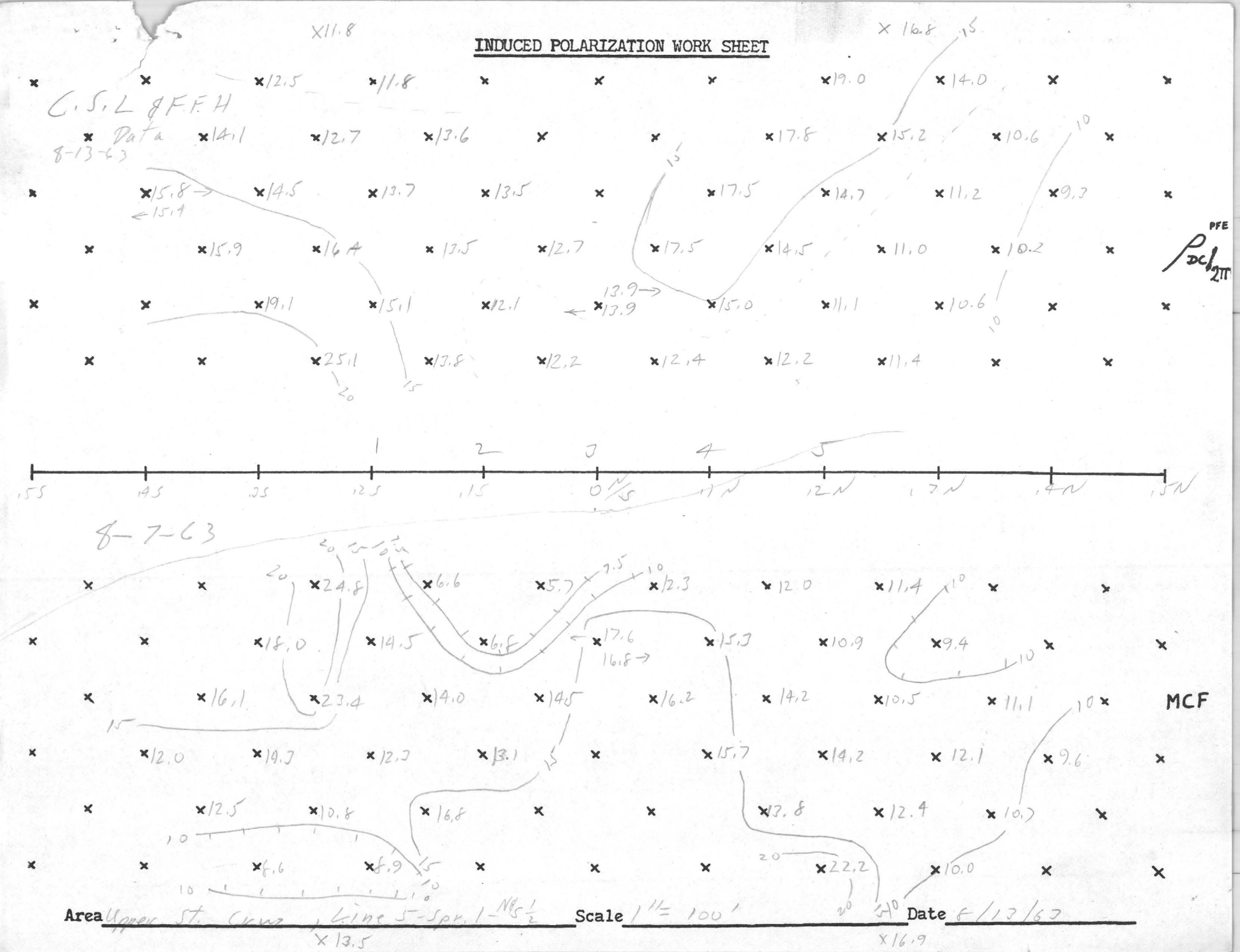
(A) Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
(B) Receive	→	.5-.6E	→	→	→	.6-.7E	→	→	→			
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	3625	3310	2480	3000	3625	3310	2480	3000	3550			
(E) Vdc (avg)	1	4	2	1	1	2	1	.6	.75			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ	2.8	3.6	4.8	3.5	4.6	3.6	4.2	3.3	5.3			
(J) AC noise x 2												
(K) Vac (corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

INDUCED POLARIZATION WORK SHEET



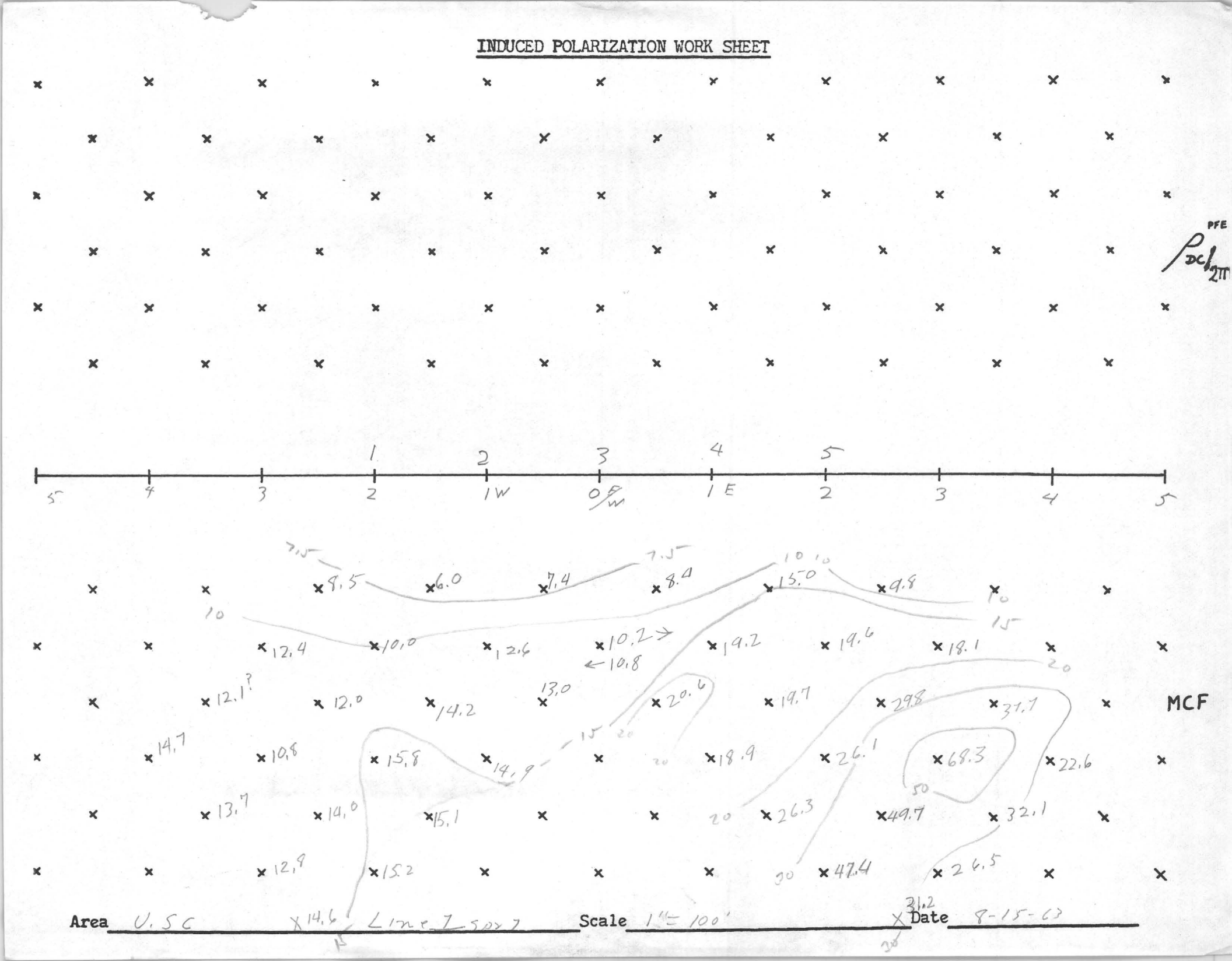
Area Upper Santa Cruz LINE 2 Spd. 1 Scale 1" = 100 Date 8/9/63

INDUCED POLARIZATION WORK SHEET

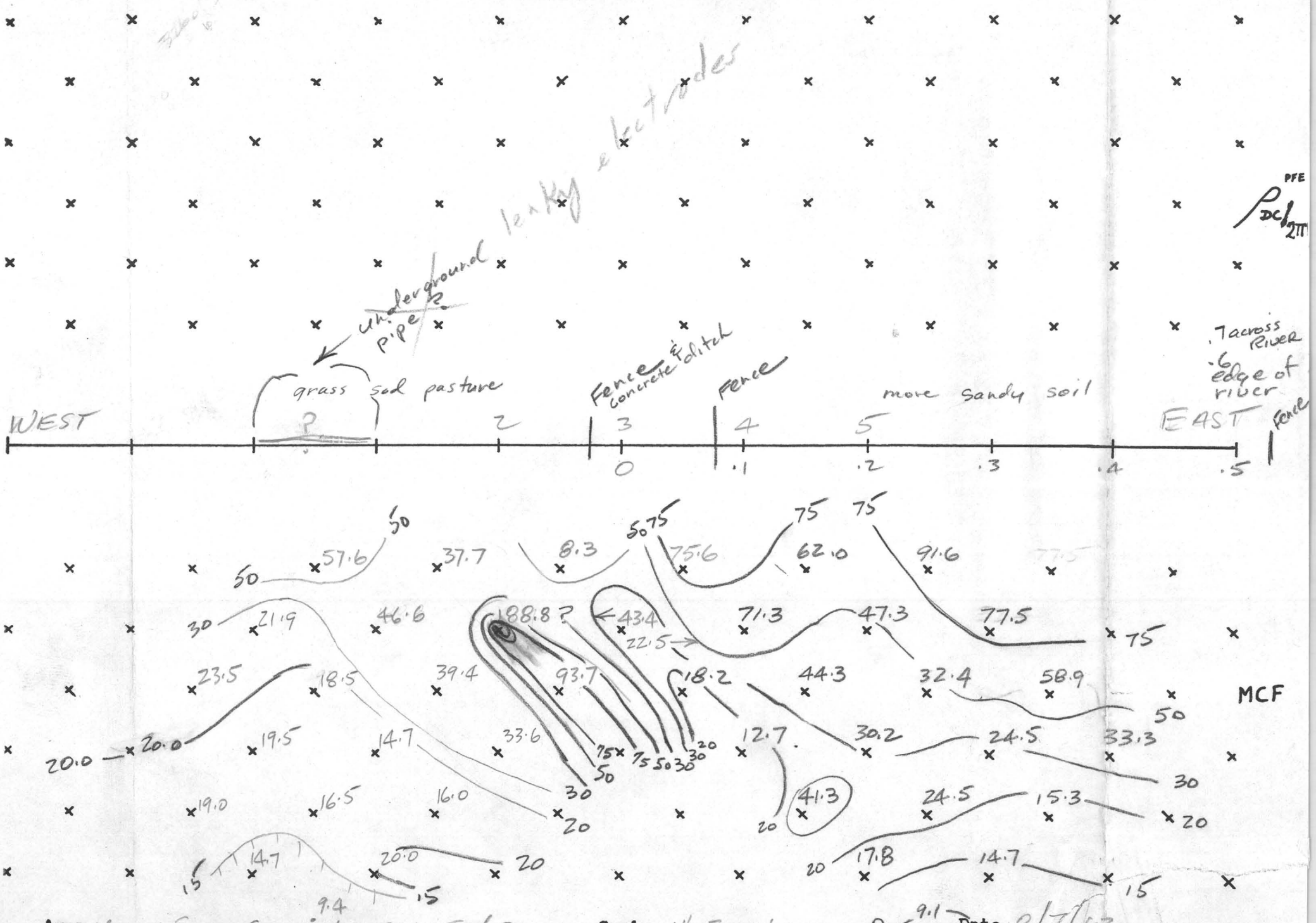


Area Upper St. Cruz, Line 5-Sph. 1-N85½ Scale 1"= 100' Date 8/13/63

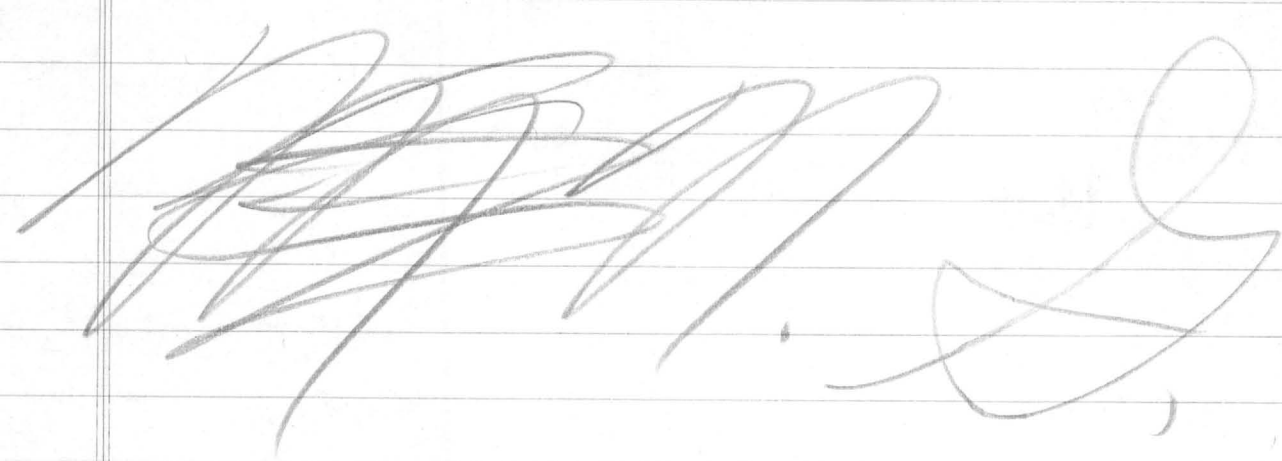
INDUCED POLARIZATION WORK SHEET



INDUCED POLARIZATION WORK SHEET



Area Upper Santa Cruz LINE 1 Spd 2 Scale 1" = 100' Date 8/7/63



UCED POLARIZATION - RECEIVER NOTES PAGE

Project: Upper Santa Cruz Line: 3 SD & 3 N 1/2 Int.Cal Date: 8-12-63

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	→	→	→	→	→	→	→	→	→	→	→	→
Time	300	100	300	100	30	300	100	30	10	100	30	10
DC-1	121	38.5	120	23.3	10.3	89.0	27.0	10.5	5.43	22.5	13.0	5.9
DC-2	121	38.4	120	23.3	10.3	89.0	27.0	10.5	5.43	22.4	13.0	5.9
Σ SP	242	76.9	240	46.6	20.6	178.0	54.0	21.0	10.86	44.9	26.0	11.8
DC-3												
Dc-4												
Σ	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
DC-AV	→	→	→	→	→	→	→	→	→			
AC-1	10	30	30	10	10	10	10	10	3			
AC-2	3.40	11.2	8.6	4.6	2.82	4.75	4.44	2.44	1.62			
Σ	3.40	11.2	8.6	4.6	2.82	4.75	4.44	2.44	1.62			
S. P.	6.80	22.4	17.2	9.20	5.64	9.50	8.88	4.88	3.24			
AC-N												

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Upper Santa Cruz Line: 3sp2 3 5½ Int.Cal Date: 8-13-63

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	→	→	→	→	→	→	→	→	→	→	→	→
Time	300	100	300	300	100	300	300	100	30	300	100	100
DC-1	190	38.4	189	82	25.0	172	72	45.9	16.8	84	49	33.7
DC-2	189	38.4	189	82	25.0	172	72	45.9	16.8	84	49	33.7
Σ	379	76.8	378	164	50.0	344	144	91.8	33.6	168	98	67.4
DC-3												
Dc-4												
Σ												
DC-AV	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
AC-1	→	→	→	→	→	←	←	←	←			
AC-2	30	100	100	30	30	30	30	10	10			
Σ	14.2	33.1	22.3	17	7.4	8.4	6.3	4.9	2.4			
S. P.	14.2	33.1	22.3	17	7.4	8.4	6.3	4.9	2.39			
AC-N	28.4	66.2	44.6	34	14.8	16.8	12.6	9.8	4.79			

INDUCED POLARIZATION SENDER NOTES

Project: UPPER SANTA CRUZ Line: 3 spread 2 N.K2 Date: 8/13

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Receive												
Time												
Range												
Current	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
Receive							(1)					
Time												
Range												
Current	2000	2000	2000	2000	2000	2000	2000	2000	2000			

INDUCED POLARIZATION SENDER NOTES

Project: UPPI-R SANTA CRUZ Line: 3 SPREAD 3 3½ Date: 8/13

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Receive												
Time												
Range												
Current	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
Receive												
Time												
Range												
Current	2000	2000	2000	2000	2000	2000	2000	2000	2000			

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper S. Cruz Line 3-Spr. 3N½ Field date 8/13/63 Data page_____ Comp. date 8/13/63. Comp by C.S.L.

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive	.1-.2N	→	.2-.3N	→	→	.3-.4N	→	→	→	.4-.5N	→	→
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	2000	→	→	→	→	→	→	→	→	→	→	→
(E) Vdc (avg)	242	76.9	240	46.6	20.6	178.0	54.0	21.0	10.86	44.9	26.0	11.8
(F) DCcal	.938	→	→	→	→	→	→	→	→	→	→	→
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3	.3	1.2	3	6	1.2	3	6
(H) ρ dc=ExFxGx10^3/D	34.0	43.3	33.8	26.2	29.0	25.1	30.4	29.6	39.6	25.3	36.6	33.1
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	CAL	→	
(B) Receive	→	.5-.6N	→	→	→	.6-.7N	→	→	→	1-2	→	
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	→	→	→	→	→	→	→	→	→	1000	1200	
(E) Vdc (avg)	6.80	22.4	17.2	9.20	5.64	9.50	8.68	4.84	3.24	107.5	127.0	
(F) DCcal	938	→	→	→	→	→	→	→	→	.930	.945	
(G) Kn x 10^{-3}	10.5	3	6	10.5	16.8	6	10.5	16.8	25.2	938	938	
(H) ρ dc=ExFxGx10^3/D	34.5	31.5	48.2	45.3	44.5	26.7	43.8	38.5	38.3			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

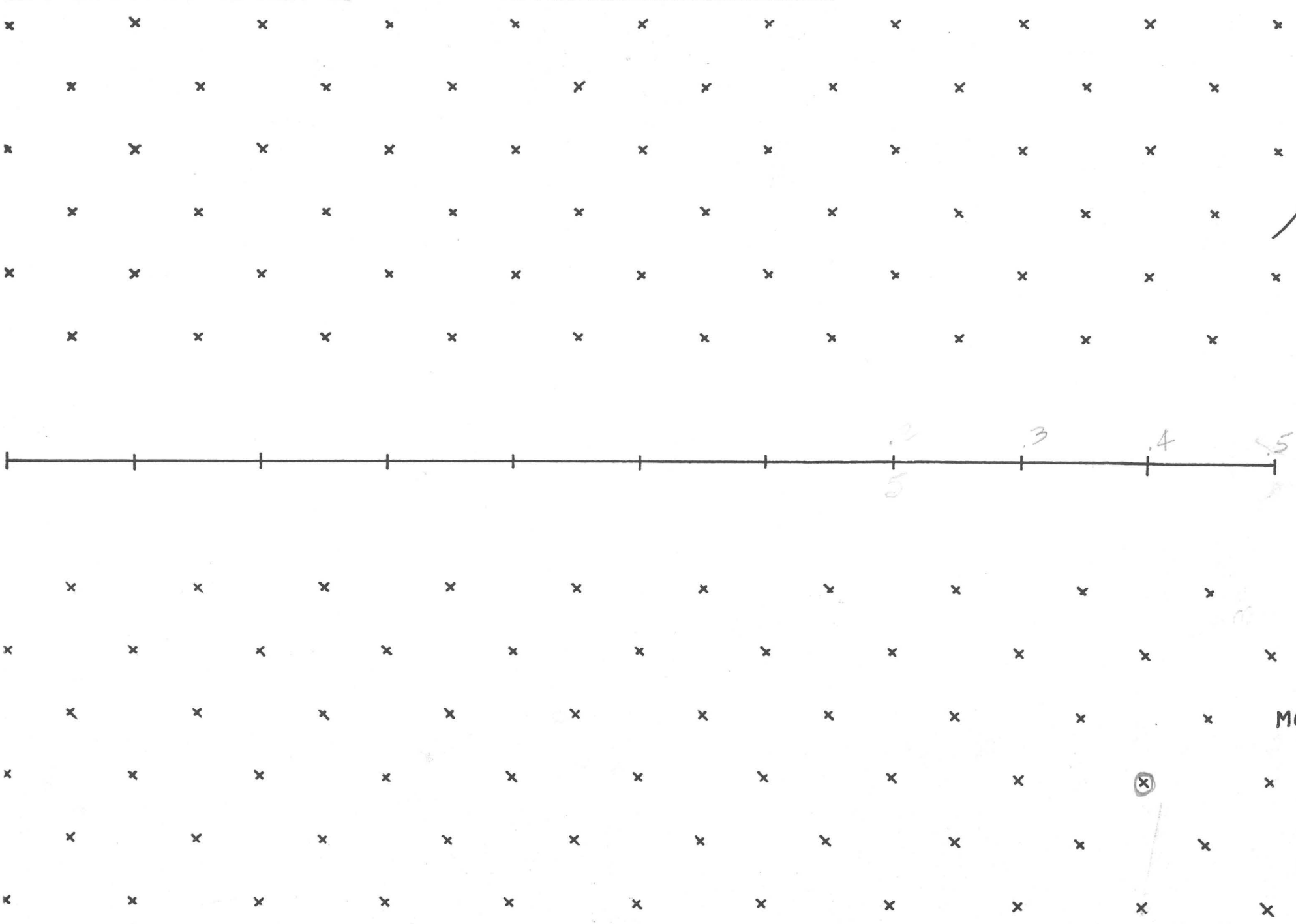
Project Upper S. Creek Line 3-Sp. 3-S Field date 8/13/67 Data page_____ Comp. date 8/12/67. Comp by C. S. L.

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive	.1-.25	→	.2-.35	→	→	.3-.41	→	→	→	.4-.55	→	→
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	2.000	→	→	→	→	→	→	→	→	→	→	→
(E) Vdc (avg)	379	76.8	378	164	50.0	344	144	91.8	33.6	168	98	674
(F) DCcal	.938	→	→	→	→	→	→	→	→	→	→	→
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3	.3	1.2	3	6	1.2	3	6
(H) ρ dc=ExFxGx10^3/D	53.3	43.2	53.2	92.4	70.3	38.4	81.0	129	94.5	94.6	138	189
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
(B) Receive	→	.5-.65	→	→	→	.6-.75	→	→	→			
(C) n separation	5	3	4	1	6	4	5	6	2			
(D) I	→	→	→	→	→	→	→	→	→			
(E) Vdc (avg)	28.4	66.2	44.6	34	14.8	16.8	12.6	9.98	4.79			
(F) DCcal	→	→	→	→	→	→	→	→	→			
(G) Kn x 10^{-3}	10.5	3	6	10.5	16.8	6	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D	140	93.1	125	167	117	97.2	62.1	78.7	56.7			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

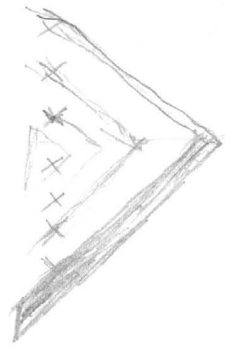
INDUCED POLARIZATION WORK SHEET



Area _____ Scale _____ Date _____

100 a

1 st	.3
2 nd	1.2
3 rd	3.0
4 th	6.0
5 th	10.5
6 th	16.8
7 th	



$(A\ N\ N+1 \times N+2) \div 2$

$\frac{7 \times 8 \times 9 \times 100 \div 2}{1000}$

$\frac{6 \times 7 \times 8 \times 100 \div 2}{100}$

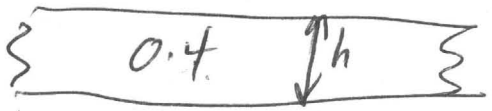
+22
+11
16

2 | 33600 | 16.8

2 | 50400 | 252
50

$\frac{28200}{1600}$

$\frac{28.2}{1600}$



$h = 20(BA)_{gw}$

2.3

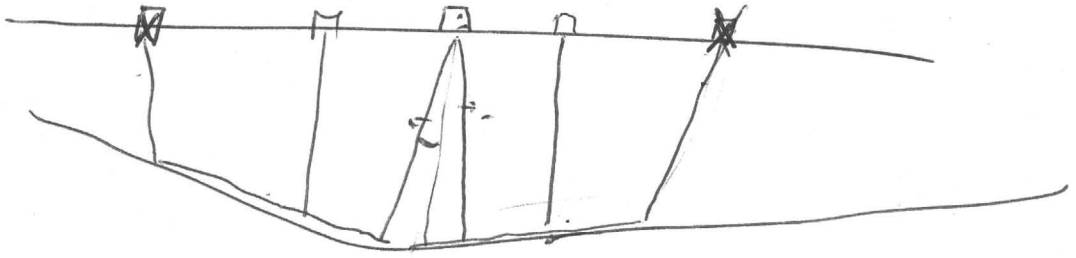
1.7

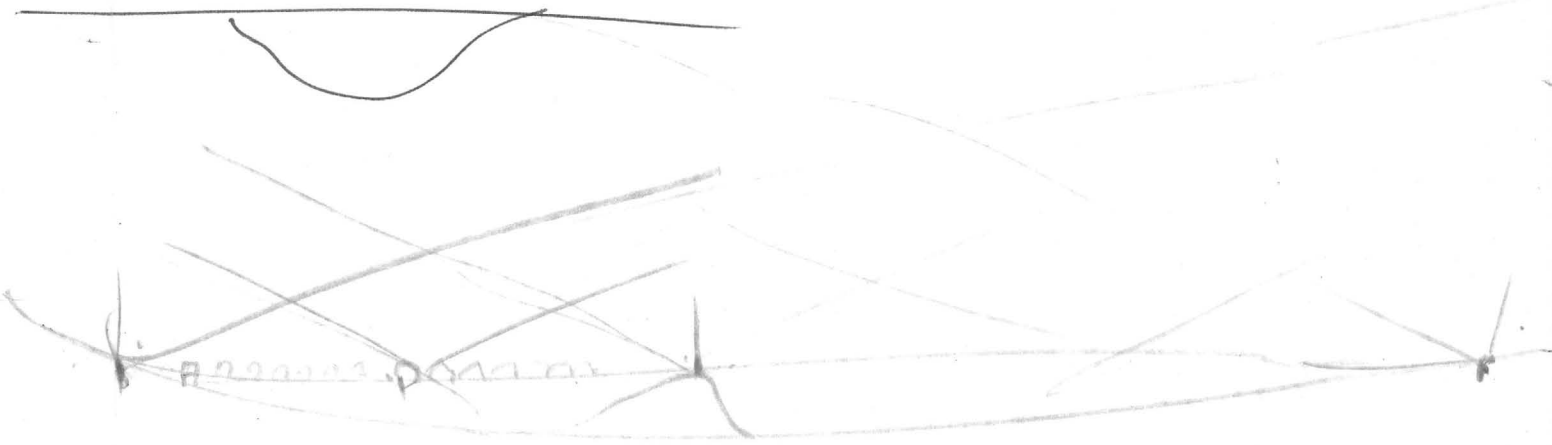
(.6)

200'

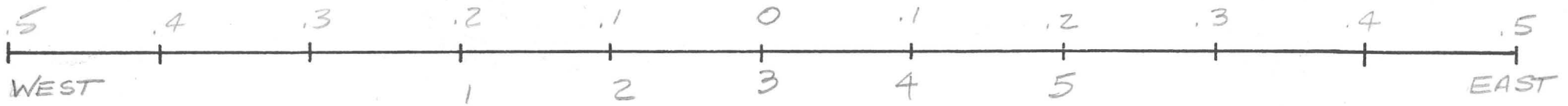
(100')

$h = 15(BA)_{gw}$





INDUCED POLARIZATION WORK SHEET



PFE

$\rho_{DC} l_{2\pi}$

MCF

Area _____ Scale _____ Date _____

252

2 | 119
59

2 | 111
56

84
28
2 | 112
5

2 | 74 9 2 | 65
37 101 33

2 | 99
49

2 | 94
47

8

126000

2 | 73
37

2 | 97
48

1815
7
12605

73
28
2 | 101

1764 | 189000 | 10
1764
1260

1841 | 232000 | 12.7
7
12889
1841
4790
3682
11080

1504 | 624000 | 41.4
4
6016
6016
2240
1504
7360

396000
1712

252000
1184
2
2368

1184 | 2520 | 21.3
8
2368
1520
1184
3360
2368
9920

297
1440

38
3
114

624

558000
1738
3
5214

1056 | 42000 | 39
3
168
3168
10320

1738 | 558000 | 32.
3
3566
5214
3660
3566

1790
3
5370

1790 | 1140000 | 63.7
6
10740
10740
6600
5370
12300

1600 | 64800 | 40.5
4
6400
6400
8000

1600
5
8000

1712 | 396000 | 23.1
2
3424
3424
5360
5136
2240

1712
3
5136

1627
9
14643

51000
1184

960
5
4800

52500 | 5
4800
4500

1627

1184 | 51000 | 43.3
4
4730
4730
3700
3360
3400

45
3
135

1627 | 135000 | 82.9
8
13016
13016
4840
3260
15800

RECORD OF SEISMIC SURVEY

Job No. _____

Location _____

Date 7/26/63

Purpose _____

Engineer E. G. H.

Local Geology _____

Survey Line No. 1 Direction N 51° E Page 4 of _____

Survey Line Location Spread 2a

GEOPHONE LOC. N. #1	#2 Dist.	IMPACT #1 DISTANCE	#2	TRAVEL-TIMES Geophone #1						Geophone #2						
E		5	145							11	4	10	4	10	4	
		10	140							12	9	9	11	8	9	
		20	130							18	19	18				18
		30	120							33	34	34				34
		40	110	134	135	135			135	43	43					43
		50	100	88	89	89			89	50	50	50				50
		60	90	83	81	83	83		83	57	58	58				58
		70	80	74	74				74	65	66	66				66
		80	70	68	68				68	74	74					74
		90	60	59	59				59	83	83					83
		100	50	51	52	52			52	141	140	139				140
		110	40	31	31				31	130	130	130				130
		120	30	23	23				23	170	170					170
		130	20	16	17	16			16	183	181	180	182			182
		140	10	11	10	10			10	124	124	?				?
		145	5	4	5	9	9	9	9	129	?					?

REMARKS:

$ft/sec = \frac{Feet}{Sec.}$

9/5/63

Nogales AT 7-2591 Office

Bill Troutwine

S. Griffin
287 3031

ARRowhead Inn (Troutwine)
287-3653

RECORD OF SEISMIC SURVEY

Job No. _____

Location _____

Date 7/26/63

Purpose _____

Engineer _____

Local Geology _____

Survey Line No. _____ Direction _____

Page 3 of _____

Survey Line Location Spread 2

EAST OF Highway

84' GAP between phones – highway

GEOPHONE LOC. N. #1	#2 @ inst.	IMPACT DISTANCE		TRAVEL-TIMES Geophone #1					Geophone #2							
W	E	5	145	45	5				5	?						
		10	140	17	17				17	?						
		20	130	28	29	28			28	?						
		30	120	40	40				40	? 100						
Fence on	Highway	40	110	46	46				46	?						
		50	100	55	56	55			55	100						
		60	90	78	78				78	?						
		70	80	92 91	93 93	92 91	142	91	92	?						
		80	70	158	158	158			158	?						
		90	60	?	?					104	104					104
		100	50	?	?					86	85	85				85
		110	40	?	?					46	45	46				46
		120	30	?	?					35	36	36				36
		130	20	?	?					14	14					14
		140	10	?	?					9	9					9
		145	5	?	?					6	7	7	7			7

REMARKS:

$\frac{.028}{50'}$ 21780

$\frac{50'}{.028}$ $\frac{50}{2.8\times10^{-2}}$

2000 1/11

3400 1/11

$\frac{40}{155}$

$\frac{32}{21}$

RECORD OF SEISMIC SURVEY

Job No. _____

Location _____

Date 7/26/63

Purpose _____

Engineer E. G. H.

Local Geology _____

Survey Line No. _____ Direction _____

Page 2 of _____

Survey Line Location Set Up 1a West of Hiway

GEOPHONE LOC. N. #1	#2 a inst.	IMPACT DISTANCE		TRAVEL-TIMES Geophone #1					Geophone #2							
Hiway E 110'	W	5	105	7	10	10	11		10	105	105	105				105
		10	100	26	26				26	95	95					95
		20	90	31	30	31			31	80	79	80				80
		30	80	39	39				39	77	76	76				76
		40	70	61	60	62			61	50	50					50
fence		50	60	65	65				65	42	42					42
		60	50	92	92				92	36	36					36
		70	40	101	101	101			101	31	31					31
		80	30	108	108	109			108	25	25					25
		90	20	94	94	94			94	19	20	20				20
		100	10	124	124	124	123		124	14	14					14
		105	5	177	177	177			177	8	7	7				7

REMARKS:

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper Santa Cruz Line 3 Spd. 1W Field date_____ Data page_____ Comp. date_____. Comp by EGH

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive												
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	1375	2480	825	1325	2430	800	800	1300	2410	1040	1110	1660
(E) Vdc (avg)	90	42	59	19	16	54	13	7	7	21	10	6
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D	19.6	20.3	21.4	17.2	19.8	20.3	19.5	16.2	17.4	24.2	27.0	21.7
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			
(B) Receive												
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	3000	1040	1075	1660	2975	1040	1075	1660	2975			
(E) Vdc (avg)	7	9	5	4	5	3	2	1	2			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D	24.5	26.0	27.9	25.3	28.2	17.3	19.5	10.1	16.9			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Upper Santa Cruz Line 3 Spd 1E 2E Field date_____ Data page_____ Comp. date_____. Comp by_____

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive												
(C) n separation	1	2	1	2	3	1	2	3	4	2	3	4
(D) I	1080	1020	1660	1080	1040	2960	1660	1080	1040	2960	1660	1080
(E) Vdc (avg)	81	19	101	22	4	220	23	7	4	58	11	3
(F) DCcal												
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3.0	6.0	1.2	3.0	6.0
(H) ρ dc=ExFxGx10^3/D	22.5	22.3	18.3	24.4	11.5	22.2	16.6	19.4	23.1	23.5	19.9	16.7
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
(B) Receive												
(C) n separation	5	3	4	5	6	4	5	6	7			
(D) I	1020	2960	1660	1080	1020	2960	1660	1080	1020			
(E) Vdc (avg)	2	19	4	2	1	11	3	1	1			
(F) DCcal												
(G) Kn x 10^{-3}	10.5	3.0	6.0	10.5	16.8	6.0	10.5	16.8	25.2			
(H) ρ dc=ExFxGx10^3/D	20.6	19.3	14.5	19.4	16.4	22.2	19.0	15.6	24.7			
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

RECORD OF SEISMIC SURVEY

Job No. _____

Location _____

Date 7/26/63

Purpose _____

Engineer EGH.

Local Geology _____

Survey Line No. 1 Direction N51°E Page 1 of _____

Survey Line Location Set up 1 West of Hiway

GEOPHONE LOC. N. #1	#2 @ INST.	IMPACT DISTANCE		TRAVEL-TIMES Geophone #1					AV.	Geophone #2							AV.
W Edge of bluff	E	5	145	3	4	4			4	70	73	75	77	76	90		
		10	140	14	07	7	7	7	7	74	73	75					74
		20	130	20	12	13	20	13	16	71	70	71					71
		30	120	19	19	19			19	69	69	69					69
		40	110	26	35	34	34		34	65	65	65					65
		50	100	34	33	34			34	19	65	64	65				65
		60	90	46	37	36 46	47 36	36	41	57	57	57					57
		70	80	51	51	51			51	49	49	50					49
		80	70	56	55	55			55	44	44	44					44
		90	60	64	77	62	64	64	64	41	41	41					41
		100	50	69	68	67			68	34	34	35					34
		110	40	73	97	73	115	115		30	30	30					30
				73	72	73			73								
		120	30	122	119	119			120	22	23	23					23
		130	20	123	123	124	124		124	17	17	17					17
		140	10	No Signal						10	9	9					9
		145	5							5	6	5					5

REMARKS:

$$\boxed{D_8 = \underset{v}{20}\,(\underset{\substack{v_1\\5718}}{.75}) = \underset{\substack{v_2\\8000}}{15.0'}}$$

v_1 1600 v_2 5718

$$\boxed{D_9 = \underset{\substack{v_1\\8000}}{75}\,(\underset{\substack{v_2\\18{,}000}}{.40}) = 30.0 + 15 = 45'}$$

$$\boxed{D_{10} = \underset{\substack{v_1\\1333}}{155}\,(\underset{\substack{v_2\\6{,}666}}{.65}) = 100.1 + 45 = 145'}$$

$$\boxed{D_{11} = 20\,(\underset{\substack{v_1\\6{,}666}}{.815}) = \underset{\substack{v_2\\1800}}{16.30'}}$$

$$\boxed{D_{12} = 145\,(\underset{\substack{v_1\\1540}}{.675}) = \underset{\substack{v_2\\5340}}{98.} + 16 = 114'}$$

$$\boxed{D_{13} = 25\,(\underset{\substack{v_1\\1540}}{.775}) = \underset{\substack{v_2\\8000}}{19.4'}}$$

$$\boxed{D_{14} = 30\,(\underset{\substack{v_1\\5340}}{.835}) = \underset{\substack{v_2\\8000}}{25.05'}}$$

$$\boxed{D_{15} = 50\,(.455) = 22.75 + 20 = 44.7'}$$

6
.04 $\frac{.04'}{12}$
3 .666

LINE - 2 SPREAD - 1

$$D_2 = D_1 + \frac{\psi}{2}\sqrt{\frac{V_1 - V_0}{V_1 + V_0}} + D_1 R$$

8,885
2,350
6535

$\psi = 90'$ $V_0 = 2,350$; $V_1 = 8,885$

$$D_1 = 45\sqrt{\frac{6535}{11235}} = 45\sqrt{.582}$$

$$\boxed{D_1 = 45(.763) = 34.3'}$$

6,666
2,860
3,806

$$D_2 = \frac{75}{2}\sqrt{\frac{3,806}{9,526}}$$

$$= 37.5\sqrt{.40} = 37.5(.633)$$

$$\boxed{D_2 = 23.8'}$$

V_2 220,000 V_1 6.666

D_3 $n = .675(180)$

$$\boxed{D_3 = 122 + 23.8 = 145.8}$$

V_1 1330 V_2 7280

$$\boxed{D_4 = 25(.825) = 20.6'}$$

V_1 1330 V_2 8885

$$\boxed{D_5 = 25(.85) = 21.3'}$$

$$\boxed{D_6 = .35(80) = 28 + 20 = 48'}$$

$$D_7 = 170(.425) = 72.4 + 48 = 120.4'$$

LINE-3

V_1 2,350 V_2 6,666

$D_1 = 30(.675) = 20.25'$

V_1 6,666 V_2 10,000

$D_2 = 50(.50) = 25. + 20 = 45'$

V_1 10,000 V_2 13,000

$D_3 = 60(.125) = 7.50' +$ NO

V_1 3,333 V_2 13,330

$D_4 = 35(.782) = 27.4'$

V_1 8,000 V_2 13,330

$D_5 = 150(.53) = 80'$

V_1 3640 V_2 9,000

$D_6 = 50(.66) = 33.0'$

V_1 1540 V_2 9,000

$D_7 = 35(.85) = 30'$

V_1 1540 V_2 35,000

$D_8 = 25(\sqrt{.918}) = 25(.958) = 24'$

V_1 1540 V_2 7150

$D_9 = 30(.81) = 24.3'$

V_1 1540 V_2 10,000

$D_{10} = 35(.86) = 30'$

V_1 7150 V_2 14,500

$D_{11} = 75(.585) = 44 + 24.3 = 68.3'$

V_1 7150 V_2 10,000

$D_{12} = 60(.425) = 21.50' + 24.3 = 45.8'$

V_1 10,000 V_2 14,500

$D_{13} = 100(\sqrt{.183}) = 100(.428) = 42.8 + 45.8 = 88.6'$

LINE - #1

V_1 1144 V_2 8000

$D_1 = 50(.86) = 43.0'$

	Milliamperes			Millamps.	
Sender x2	N	R	Sender x2	N	R
86 ✓	5073		25	1452	
R 64·5		5130	R 19		1453
85	4972		24	1397	
R 63		5000	R 18		1397
82	4757		18	1058	
R 60·5		4815	R 17		0983
77	4530		16	0923	
R 57		4525			
70	4153				
R 52		4148			
65	38471				
R 49		3861			
62	3668				
R 47		3692			
57	3358				
R 42		3321			
55	3				
R 41		3263			
50	2952				
R 38		2993			
48	2818				
R 36		2820			
45	2653				
R 34		2670			
38	2223				
R 29		2235			
36	2087				
R 27		2104			
33	1926				
R 25		1936			
30	1735				
R 22		1736			
28	1642				
R 21		1637			

1729
51 69

2 59,75
2907

LINE 1 Spread 2

9/9/63

Rec. 4

N .75

V_1 1175'/"

V_2 4450

V_3 10,000

$\frac{100}{2} \cdot .75 = \frac{75}{2}$ 37.5

$D_1 = 37.5$

.60

$\frac{240}{2} \cdot \frac{3}{100} = 72.0$

$+ 37.5$

109.5

$-$ 5.0 "R" correction

104.5

$D_2 = 104.5$

Rec. 3 V_1 1175

V_2 5718

V_3 13000 Aug.

N .625

$\frac{150}{300} \cdot .625 = 93.75$

$+ 40$

133.75

$-$ 5 R correction

128.75

$D_1 = 40'$

$D_2 = 128.75$

$D_2 = $ Alt. 113.75

N .525

$\frac{150}{300} \cdot .525 = 78.75$

$+ 40$

118.75

$- 5$

113.75

EGH.

R.T.

WHH.

LINE 3
Spread 1
Rec. 4

D_1 28'
D_2

V_1 1540
V_2 7150
V_3 14500 .575

$\frac{75}{150} \cdot .575 = 43.12$
$\frac{2}{}$
28
$71.$

V_1 1480
V_2 6666 .45
V_3 10000
L_x 150'

D_1 42
D_2 71

$\frac{75}{150} \cdot .45 = 33.75$
$\frac{2}{}$
42
75.7
-5
71

75
45
375
300
3375

V_1 1330
V_2 10000 .40
V_3 13000
L_x 225

D_1 45
D_2 85

$\frac{225}{2} \cdot .40$ 450
45
90
-5
$85'$

LINE - 3 A

3 layer

$x_{c_1} = 200'$ $\quad v_1 = 3330$

$v_2 = 6660$

$$Z_2 = N + \frac{x_c}{2}\sqrt{\frac{v_2 - v_1}{v_2 + v_1}} - D_1 R$$

α

$$= \quad + 100\sqrt{\frac{3330}{9990}}$$

$$= \quad + 100\sqrt{.333}$$

$$= \quad + 100(.5.8) \qquad 93$$

$$Z_2 = \quad - 5.80 + 35 \quad \alpha$$

$$= 93'$$

$x_{c_1} = 470'$; $v_1 = 8{,}000$; $v_2 = 15{,}000$

15000
8000
7,000

$$Z_2 = 17 + 235\sqrt{\frac{7000}{23000}}$$

β

$$+ 235\sqrt{.304}$$

$$17 + 235(.552)$$

$$17 + 129 = 146'$$

129
17
146

12

13
17
30

γ

9,000
7150
1,850

Z

$$8\left(\frac{1{,}850}{16{,}150}\right)^{\frac{1}{2}} = (.145)^{\frac{1}{2}}$$

1615 γ

$$.75(.340)$$

$$= 25.50 + 45$$

$$= 70.4$$

1,110 50 - 100 - 200

3,330

6,660

10,000 2,220

$\boxed{39.7}$

10

$\frac{3,340}{16,660} = (.498)^{\frac{1}{2}}$

20

.705 (100) .448

$\frac{3}{2}$

70.5 + 39.7

110.2

.448

.39.7

.84.5

11,100
5,500
5,600
16600

325

125

$\left(\frac{5600}{16,600}\right)^{\frac{1}{2}} = (.3375)^{\frac{1}{2}}$

$(.3375)^{\frac{1}{2}} = .580$

$137(.580)$

$= 79.6' + 48$

$= 127.6$

8,000
4,160
3,840
12,160

$\left(\frac{3840}{12,160}\right)^{\frac{1}{2}} = (.316)^{\frac{1}{2}}$

$(.316)^{\frac{1}{2}} = .562$

$62.5(.562)$

$= 35.1 + 40$

$= 75.1'$

270

10,000
5500
4,500
15500

$\left(\frac{4,500}{15,500}\right)^{\frac{1}{2}} = (.290)^{\frac{1}{2}}$

$= 135(.538)$

$= 72.6' + 40$

$= 112.6$

50 - 100 - 200

$V_1 = 1{,}1100$
$V_2 = 3{,}330$
$V_3 = 6{,}660$
$V_4 = 10{,}000$

$$V_1 = \frac{50}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} = \sqrt{\frac{2220}{4440}} = \frac{1110}{2220}$$

$$(.202)^{\frac{1}{2}} = .45$$

25 4

$$25(.45) = \boxed{11.25}$$

$$V_2 = \sqrt{\frac{3330}{9990}} = (.333)^{\frac{1}{2}}$$

36

$$= .5\cancel{0}5 \times \overset{10}{50}$$

$$28.5 + 11.25$$

$$= \boxed{39.7}$$

10,000
6,660
3340

$$V_3 = \left(\frac{3340}{16{,}660}\right)^{\frac{1}{2}} = (.497)^{\frac{1}{2}}$$

11.3
39.7
70.5
120.5

$$= .705(100$$

$$= 70.5 + 39.7 + \cancel{[illegible]}$$

$$= \boxed{[illegible]}$$

108

70.5
39.7
110.2

σ

$$\left(\frac{2,130}{20,730}\right)^{\frac{1}{2}} = (.1029)^{\frac{1}{2}}$$

11430
9300
2130

20730

$(140)(.3205)$

$= (44.8 + 28)$

72.8

.500

σ ω

$$\left(\frac{9,340}{46,660}\right)^{\frac{1}{2}} = (.200)^{\frac{1}{2}}$$

3,300

(3340)

.717

ω

16,000
6660
9340

10,000

$= 75\,(.442)$

63.5

$= 59.' + 93'$

$= 152'$

63.5
156.5

.60

93
59
152

$\frac{.2}{3}$ (.066)

6.

75 .02.4
.025
375
150
1.875

σ_1 1,140

σ_1 1110

σ_2 3330

σ_3 = 6660

σ_4 = 10,000

1190
3800
5500
10,000

50
150
275

3800
1190
2610

$$\frac{2610}{4990} = (.523)^{\frac{1}{2}}$$

5500
3800
1700

$= (.716)\ 50$

$= \boxed{35.82}$

9'3

$$\frac{1700}{9300} = (.1829)^{\frac{1}{2}}$$

10,000
5500
4500

~~.1829~~

$(.329)(75)$

50
25

36
25
61

24.72
$= \boxed{61}$

$$\frac{4500}{15500} = (.29)$$

$(.29)^{\frac{1}{2}}$ .538

$\frac{75}{2}$ 37.5

.538 (137.5)

74 +

74.0

1/5

$\frac{.40}{.012}$ $\frac{.40}{.0035} = 1143$ 9/4/63

1.000
.319
.681

$\boxed{\text{LINE -3A}}$

2 LAYER METHOD $\psi_c = 225$

$\frac{V_0}{V_1} = \frac{3,640}{11,430} = .3188$ $\frac{.40}{.0035}$

$Z = 112.5 \sqrt{\frac{.681}{1.3188}} = 112.5 \sqrt{5.17}$

$= 112.5 \times .719 = \boxed{80.8' \text{ at } \psi_{c1}}$

ψ_{c1} is located 225' from 0'

.0058

1.000
.232
.768

$\frac{V_0}{V_1} = \frac{1,600}{6,900} = .232$

.623

$Z = 27.5 \sqrt{\frac{.768}{1.232}}$

$= 27.5 \times .79$

$= \boxed{21.7 \text{ at } \psi_{c2}}$ ψ_{c2} is located 500' from 0'

$V_0 = \frac{1,600}{V_1 = 5,000} = .3200$ $\psi_{c3} = 70$

.0065
4
.008

1.00
32
.68

$Z = 35 \sqrt{\frac{.68}{1.32}}$ ψ_{c3} is located 485' from 0'

$= 35 \sqrt{.515}$

$= 35 \times .718$

$= \boxed{25.1 \text{ at } \psi_{c3}}$

2/5

.0055

2 LINE - 3A

2 LAYER METHOD

1.000 ± 25%
.224
.776
2 min

$V_0 = 1,630$
$V_1 = 7,280$; $\frac{V_0}{V_1} = .224$; $4c_4 = 100$

$$Z = 50\sqrt{\frac{.776}{1.224}}$$

$$= 50\sqrt{.634}$$

$$= 50 \times .796$$

$$= [39.8 \text{ at } 4c_4]$$

$4c_4$ is located 650' from 0' mark

1.0000
.0664
.9336

$V_0 = 1,330$
$V_1 = 8,000$

$4c_5 = 95'$ 47.5

$\frac{V_0}{V_1} = .1664$

$$Z = 47.5\sqrt{\frac{.8336}{1.1664}}$$

$$= 47.5\sqrt{.715}$$

$$= 47.5 \times .846$$

$$= [40.4' \text{ at } 4c_5]$$

$4c_5$ is located 1010' from 0' mark

3/5

LINE - 3A

2-LAYER METHOD

$V_0 = 1,815$ $\quad$ $Y_{CC} = 115'$

$V_1 = 8,000$

1.000
.227
.773

$\frac{V_0}{V_1} = .227$ $\quad$ Y_{CC} is located 1208 ft from 0' mark

$$Z = 57.5\sqrt{\frac{.773}{1.227}}$$

$$= 57.5\sqrt{.63}$$

$$= 57.5 \times .794$$

$$= \boxed{45.7' \text{ at } Y_{CC}}$$

1.000
.143
.857

$V_0 = 1,430$ $\quad$ $Y_{C7} = 100$

$V_1 = 10,000$ $\quad$ $\frac{V_0}{V_1} = .143$

$$Z = 50\sqrt{\frac{.857}{1.143}}$$

Y_{C7} is located 1552 ft from 0' mark

143
1,000

$$= 50\sqrt{.75}$$

$$= 50 \times .866$$

1.43 x 602
1 x 103

$$= \boxed{43.3' \text{ at } Y_{C7}}$$

4/5 .0263 .0928 14,810 16,00 3 14,820

LINE 30A2

2 LAYER

$V_0 = 3{,}640$ $\quad z_{c_0} = 102'$

$V_1 = 6{,}666$

$\frac{V_0}{V_1} = .5463$

1.0000
.5463
.4537

z_{c_0} is located at 102 ft from 0' mark

$$Z = 51\sqrt{\frac{.4537}{1.5463}}$$

$$= 51\sqrt{.293}$$

$$= 51 \times .541$$

$$= \boxed{27.6 \text{ at } z_{c_0}}$$

$V_0 = 1{,}540$ $\quad z_{c_8} = 105$

$V_1 = 16{,}000$

1.0000
.0962
.9038

$\frac{V_0}{V_1} = .0962$ ✓

$$Z = 52.5\sqrt{\frac{.9038}{1.0962}}$$

$$= 52.5\sqrt{.4604}$$

$$= 52.5 \times .6784$$

z_{c_8} is located 1754' from 0' mark

$$\boxed{Z = 35.6 \; z_{c_8}}$$

1.000
.104
.896

$V_0 = 1{,}540$

$V_1 = 14{,}820$

$\frac{V_0}{V_1} = .104$

$$Z = 52.5 \times \sqrt{\frac{.896}{1.104}}$$

$$= 52.5 \times \sqrt{.812}$$

5/5

#0

10645

$\boxed{\text{LINE - 3A}}$

2 LAYER

$V_0 = 4{,}450$ $\qquad$ $\psi_{c9} = 60$

$V_1 = 8{,}900$ $\qquad$ $\frac{V_0}{V_1} = .5000$

$$Z = 30\sqrt{\frac{.500}{1.500}}$$

ψ_{c9} is located 2150' from 0' mark

$$= 30\sqrt{.333}$$

$$= 30 \times .58$$

$$= \boxed{17.4' \text{ at } \psi_{c9}}$$

$$Z = \frac{\dfrac{V_0 t_{i1}}{\sqrt{1 - \frac{V_0^2}{V_1^2}}} + h}{2}$$

$t_{i1} = .015$

$h = 3'$

$V_0 = 3{,}640$; $V_0^2 = 13.23 \times 10^6$

$V_1 = 6{,}666$; $V_1^2 = 44.50 \times 10^6$

$$Z = \frac{\dfrac{54.6}{\sqrt{1 - \frac{13.23}{44.50}}} + 3}{2} = \frac{\dfrac{54.6}{\sqrt{1 - .297}} + 3}{2} = \frac{\dfrac{54.6}{\sqrt{.703}} + 3}{2}$$

$$\begin{array}{r} 1.000 \\ .297 \\ \hline .703 \end{array}$$

$$= \frac{\dfrac{54.6}{.838} + 3}{2} = \frac{54.6}{.419} + 3 = 130.3$$

LINE – 3A 9/5/63
2 LAYER

$V_0 = 3{,}640 = .392$

$Z_{c_1} = 215 \qquad V_1 = 9{,}300$

1.000
.392
.608

$$Z = 107.5 \sqrt{\frac{.608}{1.392}}$$

$$= 107.5 \sqrt{.437}$$

$$= 107.5 \ (.661)$$

$$= 71.06$$

$V_1 = 10{,}000$
$V_0 = 1{,}600 \qquad \frac{V_0}{V_1} = .1600$

1.000
.16
.84

$$Z = 110 \sqrt{\frac{.84}{1.16}}$$

$$= 55 \sqrt{.724}$$

$$= 55 \ (.851)$$

$$= 46.8$$

Y

LINE - 3 9/5/63

2 LAYER METHOD

$V_0 = 1,540$

$V_1 = 10,000$

$$Z = \frac{65}{2}\sqrt{\frac{1 - \frac{V_0}{V_1}}{1 + \frac{V_0}{V_1}}} \qquad \frac{V_0}{V_1} = .1540$$

1.0000
.1540
.8460

$$= 32.5\sqrt{\frac{.8460}{1.1540}} \qquad Y_c = 65' \text{ at a dist beg. at } 0'$$

$$= 32.5\sqrt{.734}$$

$$= 32.5\ (.856)$$

$$\boxed{Z_1 = 27.8' \text{ at } 65'}$$

$Y_c = 67'$, beginning at 550' mark

$$\frac{V_0}{V_1} = \frac{3,333}{13,330} = .250$$

1.000
.250
.750

$$Z = 33.5\sqrt{\frac{.750}{1.250}}$$

$$= 33.5\sqrt{.60}$$

$$= 33.5\ (.774)$$

$$\boxed{Z_2 = 25.9}$$

3/

LINE -3
2 LAYER METHOD

$Z_c = 50$ at a dist beg at 1100' mark going to left

$V_0 = 2,350$; $\frac{V_0}{V_1} = .353$
$V_1 = 6,666$ /

1.000
.353
.647

$$Z = 25\sqrt{\frac{.647}{1.353}}$$

$$= 25\sqrt{.478}$$

$$= 25(.692)$$

$$\boxed{Z_3 = 17.3'}$$

Y

LINE - 1
SPREAD - 1

9/6/63

$$Z = \frac{y_0}{2}\sqrt{\frac{1-\frac{V_0}{V_1}}{1+\frac{V_0}{V_1}}}$$

$y_{c_1} = 83'$ from O jet.

$V_0 = 1{,}330$
$V_1 = 6{,}666$
$\frac{V_0}{V_1} = .1995$

1.0000
.1995
.8005

$$Z = 41.5\sqrt{\frac{.8005}{1.1995}}$$

$$= 41.5\sqrt{.668}$$

$$= 41.5 \times .818$$

$$\boxed{Z_1 = 39.5' \text{ at } y_{c_1}}$$

$y_{c_2} = 88'$ $V_0 = 1{,}144$, $V_1 = 8{,}000$

$$\frac{V_0}{V_1} = \frac{1144}{8000} = .1430$$

.035
1.000
.143
.857

$$Z_2 = 44\sqrt{\frac{.857}{1.143}}$$

$$= 44\sqrt{.98}$$

$$44(.99)$$

y_{c_2} is located 462' from O' mark

$$\boxed{Z_2 = 43.5' \text{ at } y_{c_2}}$$

2/

LINE-1
SPREAD-2

$x_{c_3} = 100'$; $V_0 = 1{,}175$; $V_1 = 4{,}450$

1,000
.264
.736

$\frac{V_0}{V_1} = .264$

$Z_3 = 50\sqrt{\frac{.736}{1.264}}$

x_{c_3} is located 100' from 0' mark

$= 50\sqrt{.582}$

$= 50(.763)$

$Z_3 = 38.3'$ ft at x_{c_3}

$x_{c_4} = 124'$; $V_0 = 1{,}175$; $V_1 = 20{,}000$

1.0000
.0588
.9412

$\frac{V_0}{V_1} = .05875$

$Z_4 = 62\sqrt{\frac{.9412}{1.05875}}$

x_{c_4} is located 124' from 0' pt.

$= 62\sqrt{.889}$

$= 62(.943)$

$= 58.5'$ ft at x_{c_4}

3/

LINE -1
SPREAD -2

$x_{c5} = 100'$ $\quad V_0 = 1{,}175$; $V_1 = 5{,}718$

$\frac{V_0}{V_1} = .2055$

x_{c5} is located 450' from 0' ⊥

$$\begin{array}{r} 1.0000 \\ .2055 \\ \hline .7945 \end{array}$$

$$Z_5 = 50\sqrt{\frac{.7945}{1.2055}}$$

$$= 50\sqrt{.658}$$

$$= 50(.811)$$

$$\boxed{Z_5 = 40.6' \text{ at } x_{c5}}$$

Y1

LINE - 4
SPREAD - 1

$4c_1 = 102'$; $V_0 = 1,330$; $V_1 = 11,440$

1.0000
.1166
.8834

$\frac{V_0}{V_1} = \frac{1,330}{11,440} = .1166$

$Z_1 = 51\sqrt{\frac{.8834}{1.1166}}$

$4c_1$ is located 102' from 0' mark

$= 51\sqrt{.792}$

$= 51\,(.89)$

$Z_1 = 45.4'$ at $4c_1$

$4c_2 = 98'$ $\quad V_0 = 1,480$, $V_1 = 10,000$

1.000
.148
.852

$\frac{V_0}{V_1} = .148$

$Z_2 = 49\sqrt{\frac{.852}{1.1480}}$

$4c_2$ is located 98' from 0' mark

$Z_2 = 49\sqrt{.743}$

$= 49\,(.862)$

$Z_2 = 42.3'$ from $4c_2$

1/3
.95

LINE - 2
SPREAD - 1

$Z_{c1} = 90'$; $V_0 = 5,340$; $V_1 = 8,895$

$\frac{V_0}{V_1} = .601$

1.000
.601
.399

$Z_1 = 45\sqrt{\frac{.399}{1.601}}$

Z_{c1} is located 90' from 0' mark

$= 45\sqrt{.249}$

$= 45(.499)$

$Z_1 = 22.45'$ ft from Z_{c1}

$Z_{c2} = 78'$; $V_0 = 4,210$; $V_1 = 6,666$

$\frac{V_0}{V_1} = .632$

1.000
.632
.368

$Z_2 = 39\sqrt{\frac{.368}{1.632}}$

Z_{c2} is located 4.72' from 0' mark

$= 39\sqrt{.2255}$

$= 39(.475)$

$Z_2 = 18.5'$ at Z_{c2}

2/3

LINE -2
SPREAD -2

$x_{c_3} = 48'$; $V_0 = 1,320$; $V_1 = 8,885$

$\frac{V_0}{V_1} = .1497 \approx .15$

1.0000
.15
.85

$Z_3 = 24\sqrt{\frac{.85}{1.1497}}$

x_{c_3} is located 598' from 0' mark

$= 24\sqrt{.738}$

$= 24(.859)$

$Z_3 = 20.6'$ at x_{c_3}

$x_{c_4} = 44'$, $V_0 = 1,600$; $V_1 = 5,710$

$\frac{V_0}{V_1} = .280$

1.00
.28
.72

$Z_4 = 22\sqrt{\frac{.72}{1.28}}$

x_{c_4} is located 1056' from 0' mark

$= 22\sqrt{.562}$

$= 22(.75)$

$Z_4 = 16.5'$ at x_{c_4}

3/3

LINE - 2
SPREAD - 3

$4c_5 = 45'$; $V_0 = 1,333$; $V_1 = 6,666$

$\frac{V_0}{V_1} = .2000$

1.0000
.2
.8

$Z_5 = 22.5\sqrt{\frac{.8}{1.2}}$

$4c_5$ is located 1045' from 0' mark

$= 22.5\sqrt{.666}$

$= 22.5(.816)$

$Z_5 = 18.35'$ at $4c_5$

$4c_6 = 50'$; $V_0 = 1,540$; $V_1 = 8,000$

$\frac{V_0}{V_1} = .1925$

1.0000
.1925
.8075

$Z_6 = 25\sqrt{\frac{.8075}{1.1925}}$

$4c_6$ is located 1450' from 0' mark

$= 25\sqrt{.676}$

$= 25(.822)$

$Z_6 = 20.6'$ at $4c_6$

L-2
S-3

Sat
4/6/

$\boxed{\text{3 layer}}$

$x'_{c4} = 260'$ $\quad V_1 = 5718;\ V_2 = 20{,}000$

$\frac{V_2}{V_3} = .2859$

$$Z_2 = Z_1 + 130\sqrt{\frac{.714}{1.2859}}$$

1.000
.286
.714

$$= Z_1 + 130\sqrt{.555}$$

$$= 20.6 + 130(.744)$$

$$= 20.6 + 92.0'$$

$$\boxed{Z_2 = 112.6 \text{ at } x_{c4}'}$$

$x_{c5}' = 100'$ $\quad \boxed{\text{3 layer}}$ $\quad \boxed{\begin{matrix}\text{L-2}\\ \text{S-3}\end{matrix}}$

$V_1 = 5{,}340;\ V_2 = 9{,}500$

using a new simplified form of old eq

9500
5340
4160
14840

$$Z_2 = \overset{20.6'}{Z_1} + (50)\left(\frac{4160}{14{,}840}\right)^{\frac{1}{2}} \qquad (.281)^{\frac{1}{2}} = .53$$

$$= 20.6 + (50)(.53)$$

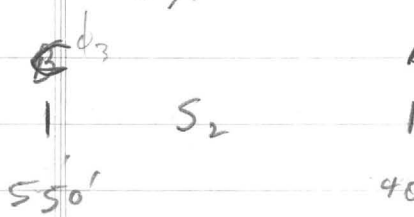
$$= 20.6 + 26.5$$

$$\boxed{= 47.1' \text{ at } x_{c5}'}$$

LINE - 3A (A-B-C)

9/5/63

~~$t_{BA} = .078$, $t_{BC} = .068$, $t_{CA} = .102$~~



V' is curve on left

$V_0 = 3,640$; $V_1 = 9,300$

$V_0' = 1,600$; $V_1' = 10,000$

$\frac{5,240}{2} = 2620$

$\overline{V_0} = 2,620$; $\overline{V_1} = 9,650$

.083
.071
.154

$t_{BA} = .083$, $t_{BC} = .071$, $t_{CA} = .099$ (V')

.154
.099
.055

$\frac{t_{BA} + t_{BC} - t_{CA}}{2} V_0 = d_2$

.0275

$2.75 \times 10^{-2} \times 2.62 \times 10^{3} = d_2$

$[d_2 = 72.1' \text{ at } 400'] \checkmark$

$t_{BA} = \frac{d_1}{V_0} + \frac{S_1}{V_1} + \frac{d_2}{V_0}$

.0830
.0689
.0141

$.083 = \frac{d_1}{2,620} + \frac{400}{9,650} + \frac{72.1}{2620}$

10^{-2} 10^{3} 10^{2}

.0414
.0275
.0689

$\frac{d_1}{2,620} = .083 - .0414 - .0275$

.0830
.0689
.0141

$d_1 = .0141 (2,620)$

$[d_1 = 36.9' \text{ at } 0'] \checkmark$

2/

LINE - 3A
ABC METHOD

$$t_{CA} = \frac{d_1}{V_0} + \frac{S_1 + S_2}{V_1} + \frac{d_3}{V_0}$$

$$.099 = \frac{63.2}{2620} + \frac{550}{9650} + \frac{d_3}{2620}$$

$$.099 = .0242 + .057 + \frac{d_3}{2620}$$

$$d_3 = 2620(.0178)$$

$$\boxed{d_3 = \cancel{46.7} \text{ at } 550'}$$

$$.071 = \frac{d_3}{2620} + \frac{150}{9650} + \frac{72.1}{2620}$$

$$\frac{d_3}{2620} = .071 - .01555 + .0275$$

$$\boxed{d_3 = 2620 \times .0279 = 73.2 \text{ at } 550'}$$

12
.0242
.057
.0812

.0990
.0812
.0178

.0275
.0155
.0431

.0710
.0431
.0279

.01555
.0275
.04305

.0710
.0431
.0279

3/

LINE-3A
ABC METHOD

$\frac{5,240}{2} = 2620$ 1356 6,733

$V_0 = 3,640$; $V_1 = 6,666$

$V_0' = 1,600$; $V_1' = 6,900$

$\bar{V}_0 = 2,620$; $\bar{V}_1 = 6,733$

.078
.047
.125
.099
.026
.013

$t_{BA} = .078$; $t_{BC} = .047$; $t_{CA} = .099$

$d_2 = .013\,(2,620) = 34.2$ at 400'

→ using ↓ V curve

$.078 = \frac{d_1}{2620} +$

$.078 = \frac{d_1}{2,620} + \frac{400}{6,733} + \frac{34.2}{2620}$

.0594
.0134
.0725

$\frac{d_1}{2620} = .078 - .0594 - .01305$

.0780
.0725
.0055

$d_1 = 2620\,(.0055)$

$d_1 = 14.4$' at 0'

→ using ↓ V ~~flx~~ curve

d_3 → not calculated using ↓ V curve

4/ .0057

LINE - 3A

ABC METHOD

$\boxed{v' \text{ is on left}}$

.400
150

$v_0 = 1{,}666$ $\quad v_1 = 7{,}0200$

$v_0' = 1{,}330$ $\quad v_1' = 8{,}000$

2996 $\quad$ 15,020

$\overline{v_0} = 1{,}495$ $\quad \overline{v_1} = 7{,}510$

$t_{BA} = .103$; $t_{BC} = .083$; $t_{CA} = .123$

.103
.083
.186
.123
.063 = .0315
2

$d_2 = .0315\,(1{,}495)$

$\boxed{d_2 = 47.1' \text{ at } 950' \text{ from } 0' \text{ mark}}$

$$t_{BA} = \frac{d_1}{v_0} + \frac{S_1}{v_1} + \frac{d_2}{v_0}$$

$$.103 = \frac{d_1}{1{,}495} + \frac{400}{7{,}510} + \frac{47.1}{1{,}495}$$

10^2 $\quad 10^3$

.0533
.0315
.0848

$$\frac{d_1}{1495} = .103 - .0533 - .0315$$

.1030
.0848
.0142

$$d_1 = 1.495 \times 10^3 \times 1.82 \times 10^{-2}$$

$\boxed{d_1 = 27.2' \text{ at } 550' \text{ from } 0' \text{ mark}}$

5/

LINE - 3A
ABC METHOD

$$.083 = \frac{d_3}{1,495} + \frac{150}{7,510} + \frac{47.1}{1,495}$$

$$\frac{d_3}{1,495} = .083 + .01998 - .0315$$

.01998
.0315
.05148

.0830
.0515
.0315

$$d_3 = 1,495\,(.0315)$$

$$d_3 = 47.1 \text{ at } 1100 \text{ ft from o'}$$

solving again for d_1 using t_{CH} =

$$.123 = \frac{d_1}{1,495} + \frac{550}{7,510} + \frac{47.1}{1,495}$$

.0732
.0315
.1047

.1230
.1047
.0183

$$\frac{d_1}{1,495} = .123 - .0732 - .0315$$

$$d_1 = 1495\,(.0183)$$

$$d_1 = 27.2$$ see p. 4

L-2
S-2

$4c_6' = 270'$; $V_1 = 7{,}280$; $V_2 = 10{,}000$

$Z_1 \approx 21'$

10,000
7,280
2,720
17280

$$Z_2 = 21 + 135\left(\frac{2{,}720}{17{,}280}\right)^{\frac{1}{2}}$$

$$= 21 + 135\ (.1574)^{\frac{1}{2}}$$

$$= 21 + 135(.397)$$

$$21 + 53.6$$

$$Z_2 = \boxed{74.6' \text{ at } 4c_6'}$$

Recalculation of $4c_4$ using 12,000

12,000
5,718
6,282

$$Z_2 = 20.6 + 130\left(\frac{6280}{17{,}718}\right)^{\frac{1}{2}}$$

$$= 20.6 + 130\ (.354)^{\frac{1}{2}}$$

$$= 20.6 + 130(.598)$$

$$= 20.6 + 77.8$$

$$= 97.8'$$

Recalculation of $4c_3''$ using 12,000

12000
8000
4,000

69.4
47.2
16.5
133.1

$$Z_3 = 16.5 + 47.2' + 155\left(\frac{8000}{20000}\right)^{\frac{1}{2}}$$

$$+ 155\ (.2)^{\frac{1}{2}}$$

$$= + 155\ (.447)$$

$$= 16.5 + 47.2 + 69.4$$

L-2
S-2

Sat
9/6

$\boxed{\text{3 layer}}$

$u'_{c_2} = 150$; $v_1 = 5{,}718$; $v_2 = 8{,}000$

$z_1 = 16.5'$

$z_2 = 75\sqrt{\frac{.286}{1.714}} + z_1$ $\quad \frac{v_0}{v_1} = .714$

1.000
.714
.286

$\frac{v_1 = 5{,}718}{v_0 = 1600} = 3.5$

$\frac{v_2}{v_1} = \frac{8{,}000}{5{,}718} = 1.4$

$75\sqrt{.167}$ $\quad$ 75

$75(.409)$

30.7
16.5
47.2

.3720

$z_2 = 30.7 + 16.5 = \boxed{47.2'}$

7.0

$u_c = 250$ $\quad z_c = 102.2'$

$\boxed{\text{4 layer}}$

$u''_{c_3} = 310$, $v_0 = 8{,}000$; $v_1 = 20{,}000$

$z_3 = z_2 + z_1 + 155\sqrt{\frac{.6}{1.40}}$

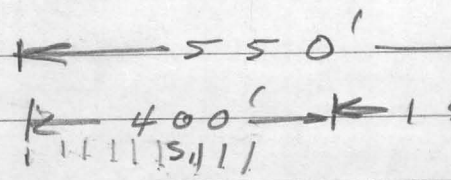
$= \sqrt{.428}$

$= 155(.654)$

$= 101.4 + 47.2 + 16.5$

$\boxed{z_3 = 165.1'}$ max

16.5
47.2
101.4
165.1



$$t_{BA} = \frac{d_1}{V_1} + \frac{S_1}{V_2} + \frac{d_2}{V_1}$$

$$t_{BC} = \frac{d_3}{V_1} + \frac{S_2}{V_2} + \frac{d_2}{V_1}$$

$$t_{CA} = \frac{d_1}{V_1} + \frac{S_1 + S_2}{V_2} + \frac{d_3}{V_1}$$

$$\frac{t_{BA} + t_{BC} - t_{CA}}{2} \times V_1 = d_2$$

$$t_{BA} = \frac{d_1}{3{,}640} + \frac{400}{6{,}666} + \frac{d_2}{3{,}640}$$

$$t_{BC} = \frac{d_3}{3{,}640} + \frac{150}{6{,}666} + \frac{d_2}{3{,}640}$$

$$t_{CA} = \frac{d_1}{3{,}640} + \frac{550}{6{,}666} + \frac{d_3}{3{,}640}$$

$$\frac{d_1}{3640} + \frac{d_3}{3640} + 1 + \frac{2d_2}{3640} = t_{BA} + t_{BC}$$

$$t_{BA} + t_{BC} - t_{CA} = \frac{6{,}116}{6{,}666} + \frac{2d_2}{3640}$$

$$\left(\frac{6{,}116}{6{,}666} + \frac{2d_2}{3640}\right) 1820 = d_2$$

$$(1820)\left(\frac{6{,}116}{6666}\right) + d_2 = d_2$$

$$t_{BA} + t_{BC} = \frac{d_1}{V_1} + \frac{d_3}{V_1} + \frac{S_1}{V_2} + \frac{S_2}{V_2} + \frac{d_2}{V_1} + \frac{d_2}{V_1}$$

$$t_{BA} + t_{BC} - t_{CA} = \frac{d_1}{V_1} - \frac{d_1}{V_1} + \frac{S_1 + S_2}{V_2} - \frac{S_1 + S_2}{V_2} + \frac{2d_2}{V_1} - \frac{d_3}{V_1}$$

$$= \frac{2d_2}{V_1} - \frac{d_3}{V_1} = \frac{2d_2 - d_3}{V_1}$$

$$\frac{t_{BA} + t_{BC} - t_{CA}}{2} \times V_1 = d_2$$

$$\frac{\frac{2d_2 - d_3}{V_1}}{2} \times V_1 = d_2 \; ; \quad d_2 - \frac{d_3}{2} = d_2$$

$$\frac{d_3}{2} = 0$$

$$Z := \frac{\frac{T_0 V_0}{2}}{\left(1 - \frac{V_0^2}{V_1^2}\right)^{\frac{1}{2}}}$$

where T_0 is intercept on t axis of V_1 curve.

$t_0 = .032$; $V_0 = 1,330$; $V_1 = 8,885$

$V_0^2 = 115.4 \times 10^4$

$V_1^2 = 790. \times 10^5$

$\frac{V_0^2}{V_1^2} = .0146$

$\left(1 - \frac{V_0^2}{V_1^2}\right)^{\frac{1}{2}} = .97$

$$Z = \frac{.032 \times 665}{\left(1 - \frac{115.4 \times 10^4}{79 \times 10^6}\right)^{\frac{1}{2}}}$$

$$Z = \frac{.032 \times 665}{.97} \approx 21.3$$

A S1 B S2 C v' to the left

|← 400 →|← 150' →

$v_1' = 8{,}885$; $v_1 = 10{,}000$; $\overline{v_1} = 9{,}443$

$v_0' = 1{,}330$; $v_0 = 1{,}600$; $\overline{v_0} = 1{,}465$

$t_{BA} = .073$; $t_{BC} = .046$; $t_{CA} = .090$

$$.0145\,(1{,}465) = d_2$$

$$\boxed{d_2 = \cancel{28.6}}\ 21.2'$$

$$.046 = \frac{d_3}{1{,}465} + \frac{150}{9{,}443} + \frac{21.2}{1{,}465} \quad = .0145$$

$$.046 = \frac{d_3}{1465} + .0159 + .0145$$

$$\overline{d_3} = 1465\,(.0156)$$

$$\boxed{d_3 = 22.9'}$$

$$.073 = \frac{d_1}{1{,}465} + \frac{400}{9{,}443} + \frac{21.2'}{1{,}465}$$

$$.073 = .0145 + .0424 + \frac{d_1}{1{,}465}$$

$$d_1 = .0161\,(1{,}465)$$

$$\boxed{d_1 = 23.6''}$$

$$.090 = \frac{23.6}{1{,}465} + \frac{550}{9{,}443} + \frac{d_3}{1465}$$

$$.090 = .0161 + .0583 + \text{"}$$

$$d_3 = .0156\,(1465)$$

$$\boxed{d_3 = 22.9'}$$

10,000
8885
18,885

1,330
1,600
2930

.073
.046
.119
.090
.029 = 1
2

.0
.0159
.0145
.0304
.0460
.0304
.0156

.0424
.0145
.0569

.0730
.0569
.0161

.0583
.0900
.0694
.0206

.0583
.0161
.0744

.0900
.0744
.0156

LINE – 3a

V_1 2,000 V_2 8,900

D_1 30 (.80) = 24′

V_1 8,900 V_2 20,000

D_2 = 235 ($\sqrt{.58}$) = 235 (.616) = 145+24 = 169′

V_1 1,110 V_2 3,330

D_3 = 25 (.725) = 18.1′

V_1 3,330 V_2 6,666

D_4 = 55 (.58) = 32 + 18 = 50′

V_1 1500 V_2 7,150

D_5 = 60 (.81) = 54.6′ = 55′

V_1 7150 V_2 9,000

D_6 = 70 (.66) = 46.2 + 55′ = 101.2′

V_1 1175 V_2 2860

D_7 = 25 (.65) = 16.25′

V_1 2860 V_2 5,500

D_8 = 155 (.575) = 31.6 + 16.3 = 47.9′

V_1 5,500 V_2 11,100

D_9 = 160 (.555) = 88.8 + 47.9 = 136.7′

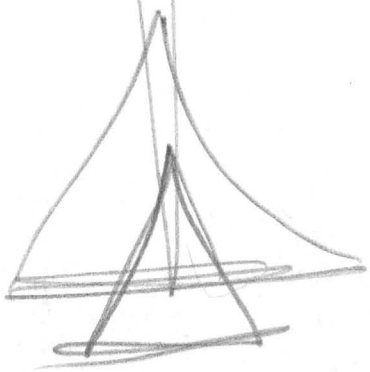
9/9/63

Halfpenny.

Line 3A —

Line 2 —

81.7 — 210'



Line 2
Spread 2

V_1	1600	Lx 40	.75	D_1 15'
V_2	5700	Lx 150	.40	D_2 43'
V_3	8000			

$\frac{\cancel{40}^{20}}{2} \times .75$

20
15.00

$\frac{\cancel{150}^{75}}{2} \times .40$

75
40
30.00
15
45

43

V_1	1403	Lx 50	.775	D_1 19.3
V_2	5700	Lx 260	.725	D_2 110.
V_3	20,000			

$\frac{\cancel{50}^{25}}{2} \times .775$

$\frac{\cancel{260}^{130}}{2} .725$

94.25
19.3
113.55