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March 17, 1967

HEINRICHS GEOEXPLORATION COMPANY

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

Dr. C. W. Lorenz
Duval Corporation
4715 East Ft. Lowell Road
Tucson, Arizona

Dear Dr. Lorenz:

Regarding the induced polarization survey conducted by us February 6 through 8, 1967, in the dos Cabezas Area, here is a brief summary of the work done and results thereof.

One line was run and was oriented N 45° E - S 45° W, centered in the area of interest. Dipole spacing used was 750 ft. and sender frequencies were 0.05 and 3.0 cycles per second. The results are presented on a sectional data sheet and on a location and interpretation plan.

A strong anomaly was found from Station 15NE on to the northeast indefinitely. To the southwest of 15NE, the anomalism decreases to background at about 0-NE/SW and remains background to the end of the line. The top of the source of this anomaly is likely within 200 ft. of the surface and extends down to at least 750 ft.

The strength of anomalism in the strongest portion so far seen (from about 15NE to 22.5NE) indicates about 1.5% to 4.5% total sulfide by volume (about 3% to 9% by weight) integrated across this width and depending on ratio or kind of metals involved is of potential interest. If the sulfides occur in a zone more narrow than 750 ft., the percentage of sulfide could be even greater.

More I. P. work is recommended and should consist of extending Line 1 further NE plus additional parallel lines on the same grid but centered on 7.5NE rather than 0-NE/SW to better center on the projected strike. However, if the cause of this anomaly is definitely evident from surface geology, and not of economic interest, then further I. P. could only be justified on the basis of more completely processing the area of interest for other related and possibly ore bearing sulfide

bodies. Since the I. P. anomaly extends relatively deep, a negative-appearing surface show does not necessarily negate the possibility of other significant mineralization associated with this sulfide mass.

The resistivity shows a minor low correlating with the anomaly. The ridge of Paleozoic sediments to the southwest shows a resistivity high. Self potentials snow some minor variations near the anomaly and are background elsewhere.

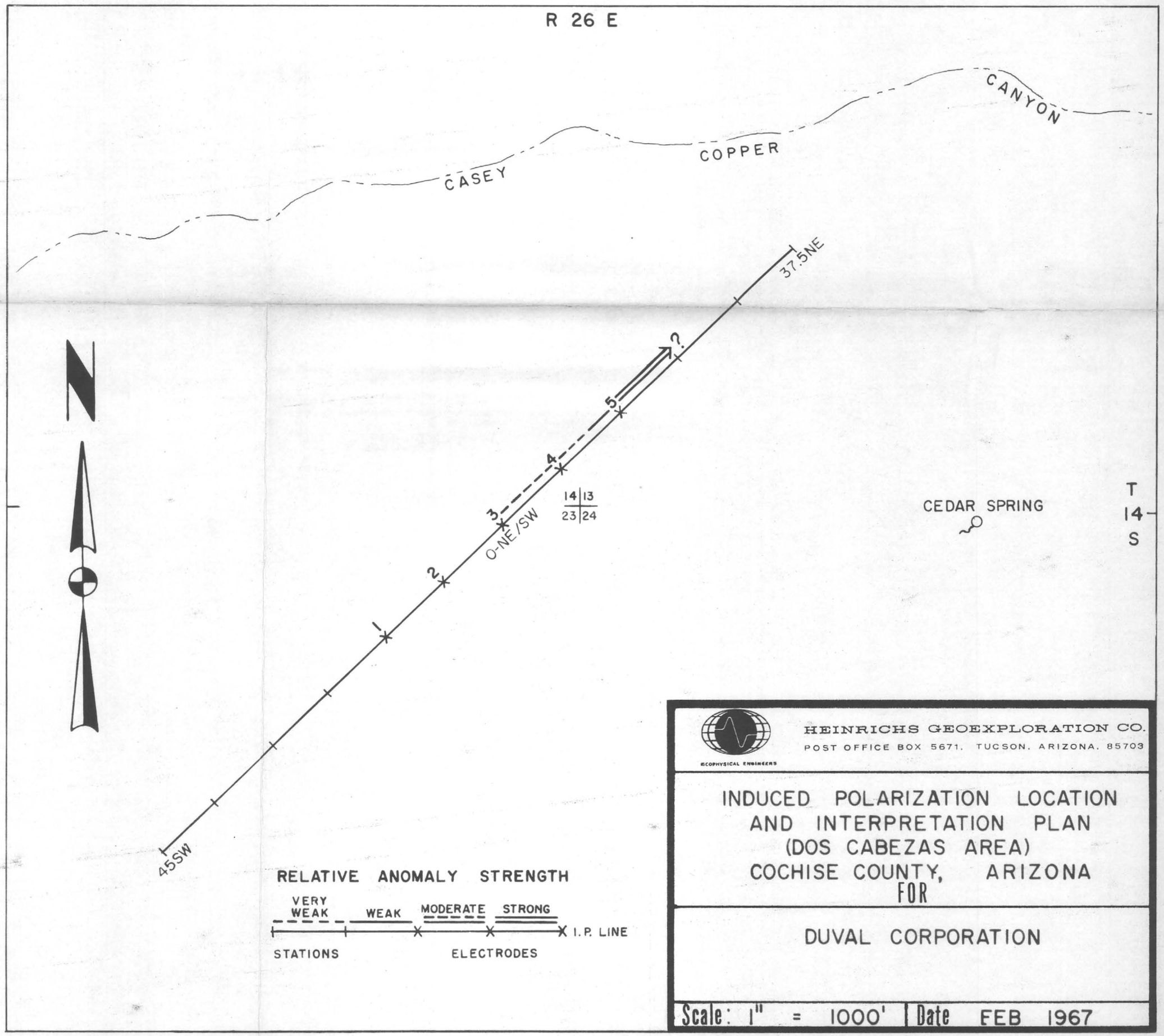
If we may be of further service, please let us know.

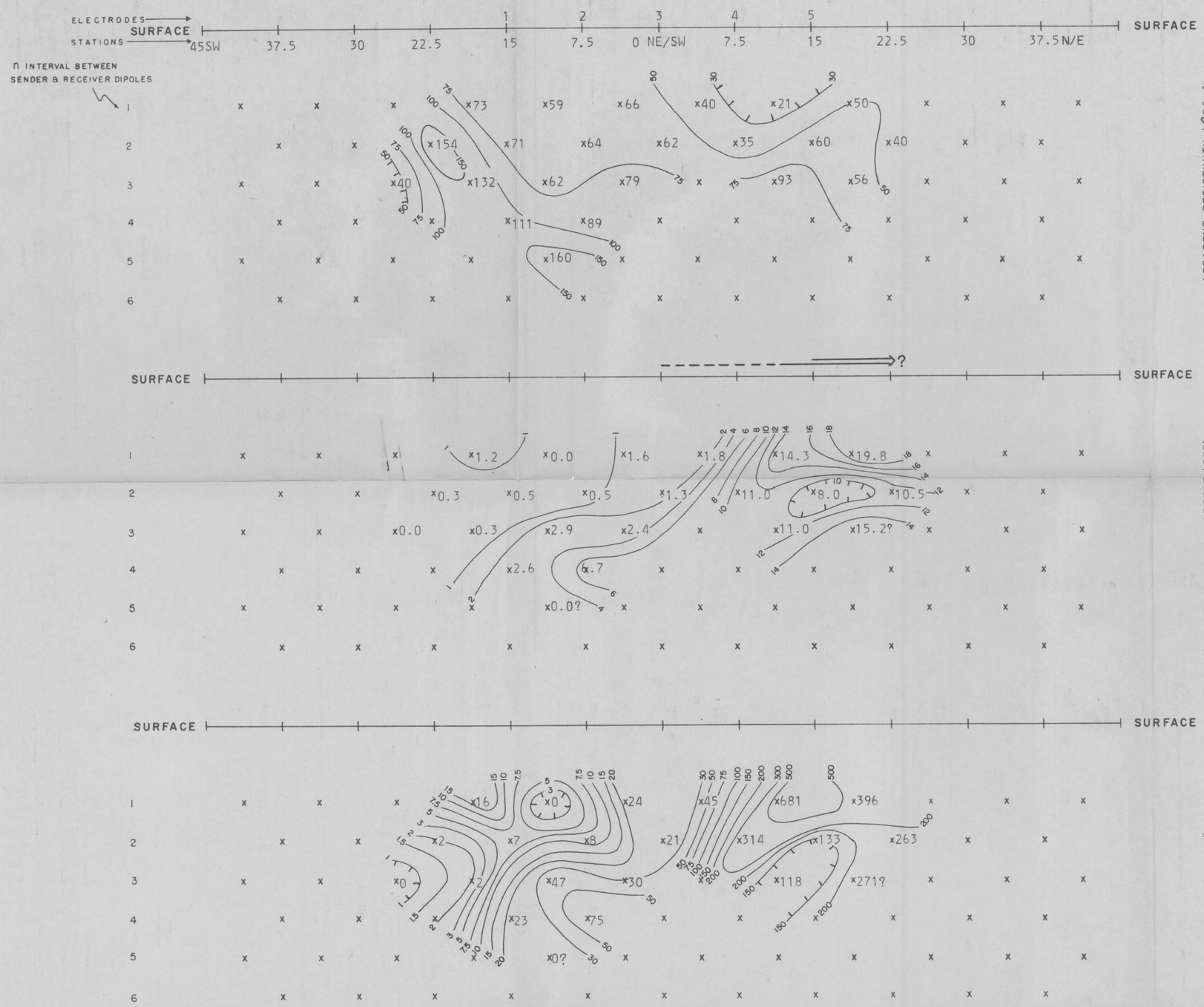
Very truly yours,
HEINRICHS GEOEXPLORATION CO.

Chris S. Ludwig

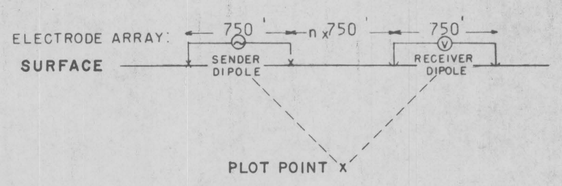
Chris S. Ludwig
Senior Geophysicist

CSL:jh
Encl: Extra cc (2)
Sectional Data Sheet
Location & Plan Map

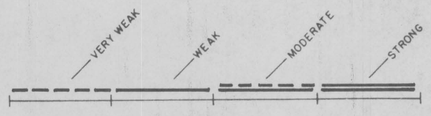

R 26 E
CASEY
COPPER
CANYON
37.5NE
?
5
4
3
2
1
0-NE/SW
45SW
14 13
23 24
CEDAR SPRING
T
14
S
RELATIVE ANOMALY STRENGTH
VERY WEAK
WEAK
MODERATE
STRONG
I.P. LINE
STATIONS
ELECTRODES
HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
GEOPHYSICAL ENGINEERS
INDUCED POLARIZATION LOCATION
AND INTERPRETATION PLAN
(DOS CABEZAS AREA)
COCHISE COUNTY, ARIZONA
FOR
DUVAL CORPORATION
Scale: 1" = 1000'
Date FEB 1967



EXPLANATION



RELATIVE ANOMALY STRENGTH



LOOKING N 45° W

DOS CABEZAS AREA

SECTIONAL DATA SHEET

LINE NO. 1

INDUCED POLARIZATION TRAVERSE

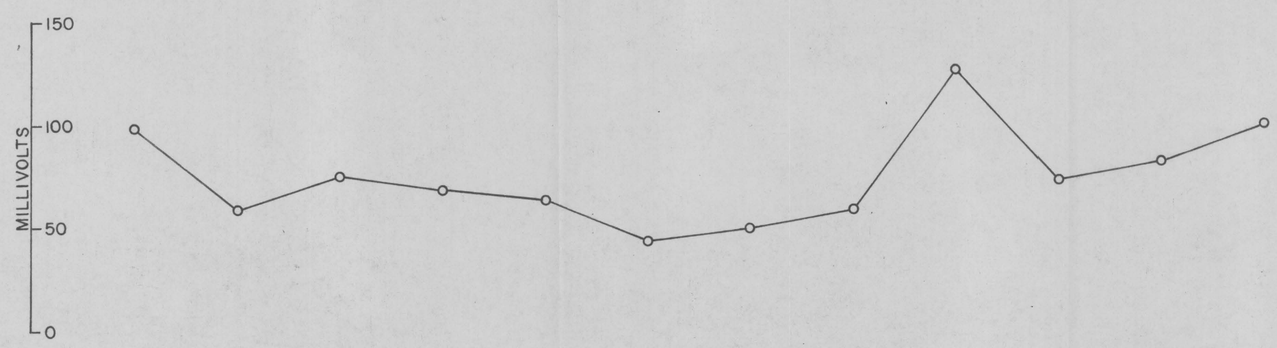
HEINRICHS GEOEXPLORATION COMPANY

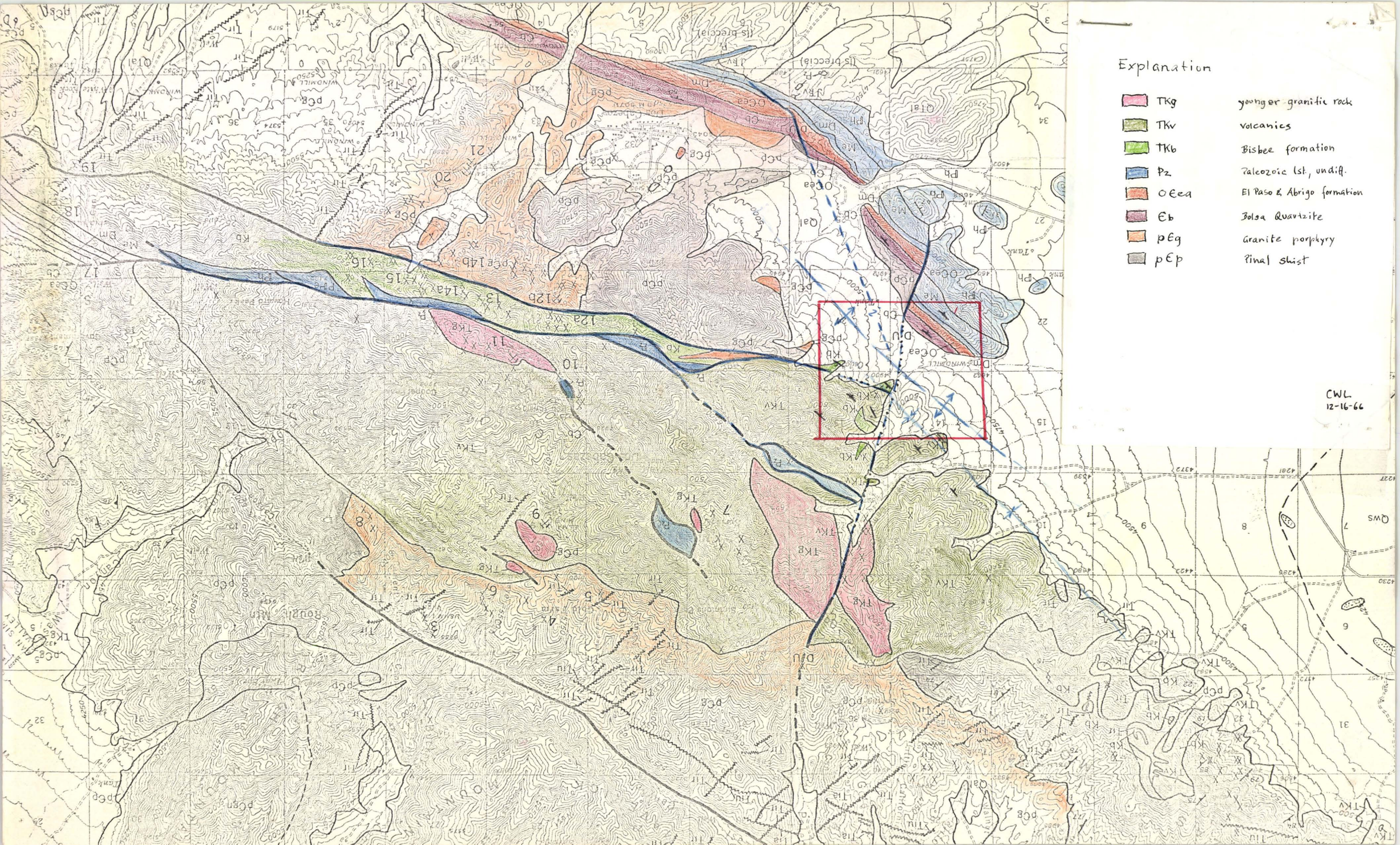
SCALE: 1" = 750' DATE: FEB 1967

FOR

DUVAL CORPORATION

SELF POTENTIAL




Explanation
TKg younger granitic rock
TKv volcanics
TKb Bisbee formation
Pz Paleozoic lst, undif.
O€ea El Paso & Abrigo formation
€b Bolsa Quartzite
p€g Granite porphyry
p€p Pinal Schist
CWL
12-16-66

I.P.

JOB PARTICULARS

Job No. B107-67
Taken By C.S.L.
Date 11/31/67

Client DUVAL

Requested by
Jack Frost & Chris Lorentz

Area of survey
Dos Cabezas (Cabezas) Cochise Co. Sections 14/13 23/24 R26E, T14S

Purpose
Find buried porphyry (porphyry)

Field address of client

Commence date
ASAP - told him we would start in February

Sepia base map from client or alternatives
Topo blow up &
Geology on topo

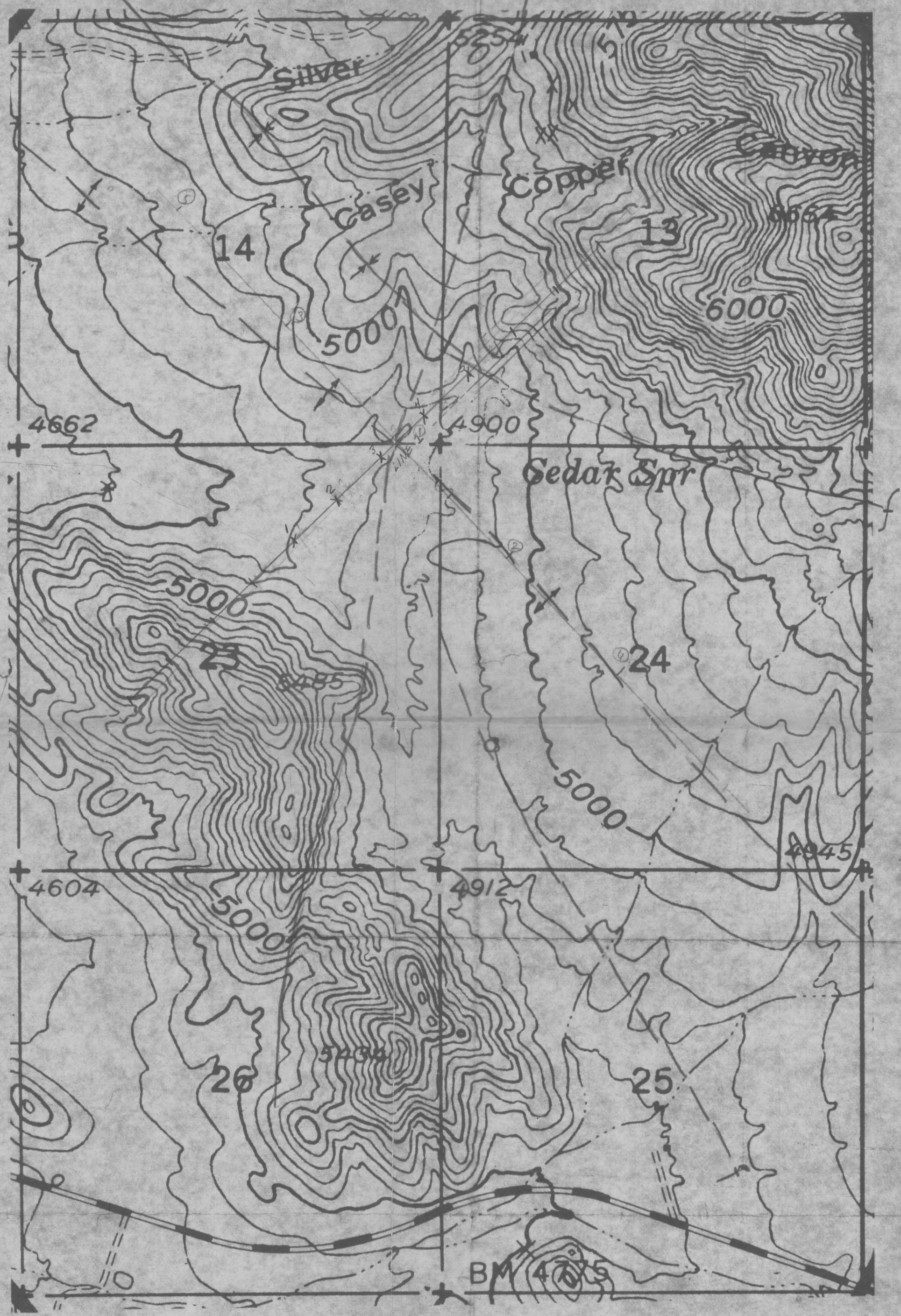
Credit check
Advance
Billing to
usual Duval arrangements

Reports to following persons, addresses and number or copies
usual ?

References in our files

Special instructions or remarks from client
Run Lines 1, 2 & 3 - if smell obtained 4 & 5
750' a - see plan
2000' separation

*Special notes where applicable



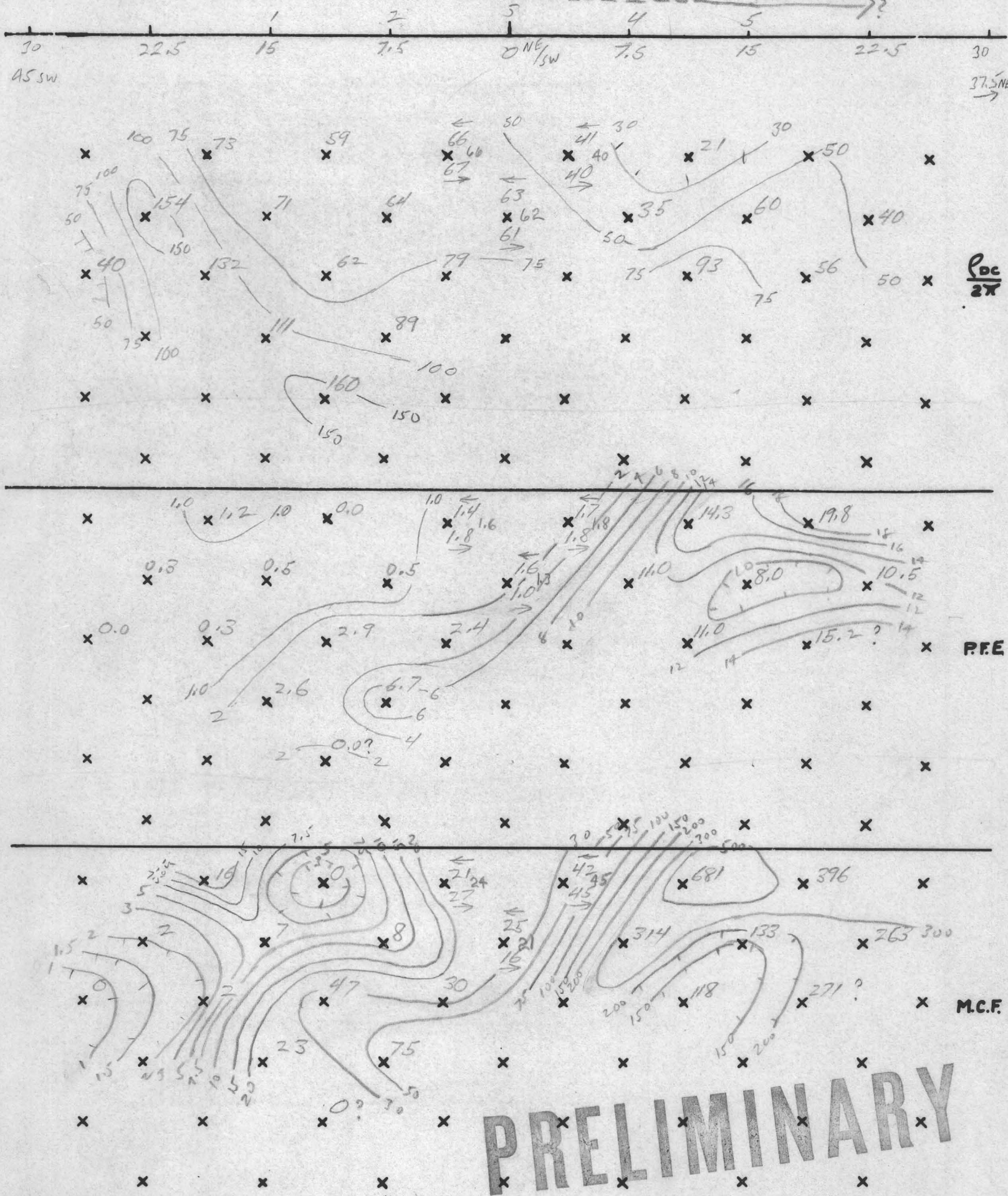
750' ±
2000' Line spacing

1" = 1000'

N

Casey Copper Canyon
Dos Cabezas Dist.
Cochise Co. Arizona

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N 45° W



PRELIMINARY

DUVAL CORPORATION

AREA DOS CABEZAS AREA LINE # 1 a = 750' SCALE: 1" = 750' DATE: 9/2/67

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT DASCABEZAS
LINE #1 HALF WEST SP. 1 DATE 2-7-67

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0-750	750 —	1500	1500 —	2250	→	2250 —	3000	→	
RANGE										
VOLTAGE	345	360	345	360	360	345	320	360	360	345
CURRENT	3.5	2.5	3.5	2.5	2.5	3.5	2.0	2.5	2.5	3.5
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		3-4
RECEIVE	3000 —	3750	→		3750 —	4500	→			1.0
RANGE										CAL
VOLTAGE	320	360	360	345	320	360	360	345		
CURRENT	2.0	2.5	2.5	3.5	2.6	2.5	2.5	3.5		

FREQUENCIES DC 3.0
SENDER NO. 10663S
OPERATOR M. F.
RECEIVER NO. 3641
OPERATOR J. McCLAIN

COMMENTS:

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: DESCABESAS Line: #1 - S[illegible] Int.Cal _____ Date: _____

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Rec.	30-37.5 →				37.5-45 →							
Time	.1	.03	.03	.03	.01	.003	.003					
DC-1	36.2 33.5	15.7 15.0	6.3 5.2 6.5 6.8	5.7 4.8 8.7 9.5	3.62 3.60	1.8 1.2 1.2 2.5						
DC-2	35.0 33.5	14.9 15.5	5.3 6.1 7.8 6.0	6.5 6.9 8.4 7.5	3.9 3.6 3.9 2.7							
Σ				7.0 7.1 7.5 7.2								
DC-3	36.5 32.5	17.8 12.1	3.2 8.2 8.6 4.6	7.0 6.4 7.9 8.2	4.5 3.8 3.4 3.2	drift	drift					
Dc-4	35.0 35.2	17.2 11.4	8.9 6.0 4.9 6.1	6.7 7.0 7.6 7.2	3.1 4.2 3.8 3.5							
Σ				7.5 7.3 7.1 7.1								
DC-AV	34.7	14.95	6.3	7.27	3.63	1.7						
AC-1	34.6	14.9	6.2	7.4	3.65	1.75	0.77					
AC-2	34.6	14.9	6.1	7.4	3.65	1.75						
Σ												
S. P.	-15.9			?	+37.8							
AC-N												
nt.Res.												

2.8	5.1
4.8	2.4
1.8	3.8
5.2	3.3

14.9	33.0
13.9	36.5
16.4	32.5
13.5	57.0
17.2	
14.5	
13.8	
15.5	

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: DOS CABEZAS Line: #1 - 5W½ Int.Cal 88 Date: 5/2/67

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-7.5	7.5-15	→	15-22.5	→	→	22.5-30	→	→	→		3-4
Time Sc	.1	.3	.1	.3	.03	.03	.3	.10	.03			
DC-1	63.2 65.4	73 76	22.5 27.5	66 68	19.5 17.9	11.7 13.7	66 67	20.4 19.8	6.0 8.5	6.0 7.7		98 98
DC-2	62.5 66.2	73 76	25.2 27.0	65 69	19.2 18.6	11.9 13.4	66 67	20.0 20.1	6.5 7.2	5.5 8.3		98 98
Σ	64.3 64.3											
DC-3	66.3 62.3		25.2 26.7		18.5 18.9	11.7 13.0		20.0 20.1	7.0 6.7	8.9 6.4		
Dc-4					18.8 18.5	12.2 13.2			6.9 7.1	5.7 8.1		
Σ												
DC-AV	64.3	75	25.0	67	18.7	12.6	66.5	20.1	7.0	7.1		98
AC-1	63.2	74	24.6	67	18.6	12.3	66.5	20.0	6.8	6.65		98
AC-2	63.2	74	24.6	67	18.6	12.3	65.5	20.0	6.8	6.65		
Σ												
S. P.	-6.9	+30.5		+3.9			+6.7					
AC-N		.03										
t.Res.												

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project DOS CABEZAS Line #1 - SW½ Field date 8/2/67 Data page_____ Comp. date 8/2/67. Comp by_____

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-7.5	7.5-15	→	15-22.5	→	→	22.5-30	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	3.5	2.5	3.5	2.5	2.5	3.5	2.0	2.5	2.5	3.5		
(E) Vdc (avg)	64.3	.75	25.0	67	18.7	12.6	66.5	20.1	7.0	7.1		
(F) DCcal	.980	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	2.25	2.25	9.0	2.25	9.0	22.5	2.25	9.0	22.5	45.0		
(H) ρ dc=ExFxGx10^3/D	41	66	63	59	64	79	73	71	62	89		
(I) Vac Σ	63.2	74	24.6	67	18.6	12.3	65.7	20.0	6.8	6.65		
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	1.00	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.012	1.014	1.016	0	1.005	1.024	1.012	1.005	1.029	1.067		
(N) PFE=(M-1)(10^2)	1.2	1.4	1.6	0	.5	2.4	1.2	.5	2.9	6.7		
(O) MCF=(M-1)(10^5)/H	42	21	25	0	8	30	16	7	47	75		
	+71	+31		+4			+7					

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	30-37.5	→	→	→	37.5-45	→	→	→				
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2.0	2.5	2.5	3.5	2.0	2.5	3.5					
(E) Vdc (avg)	34.7	14.95	6.31	7.27	3.63						98	
(F) DCcal	.980	→	→	→	→	→	→					
(G) Kn x 10^{-3}	9.0	22.5	45.0	78.75	22.5	45.0						
(H) ρ dc=ExFxGx10^3/D	154	132	111	160	40							
(I) Vac Σ	34.6	14.9	6.15	7.4	3.65	1.75					98	
(J) AC noise x 2	—											
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	1.00	→	→	→	→	→	→					
(M) ρdc/ρac =ExL/K	1.003	1.003	1.026	~~1.017~~	0							
(N) PFE=(M-1)(10^2)	.3	.3	2.6	~~1.7~~	0							
(O) MCF=(M-1)(10^5)/H	2	2	23	0	0							
	-16			+38								

10
15
20
30
50
75 10^0

$$\begin{array}{r} -20 \\ +5 \\ \hline -15 \end{array}$$

$$\begin{array}{r} +20\ mV. \\ +5\ mV. \\ \hline 25. \end{array}$$

INDUCED POLARIZATION SENDER NOTES

Project: DOSCADSMS Line: #1 E ½ Date: 2-7-67

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-750	750-1500		1500-2250		→	2250-3000			→		
Time												
Range												
Current	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL 1AMP		
Receive	3000-3750		→		3750-4500		→			3-4		
Time												
Range												
Current	2.0	2.0										

INDUCED POLARIZATION - RECEIVER NOTES N45E PAGE 1

Project: DOS CABEZAS Line: #1 - NE 1/2 Int.Cal 88 Date: 2/7/67

Send	1-2	2-3	1-2	~~3-4~~	~~3-5~~	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-7.5	7.5-15	→	~~15-22.5~~	→	→	22.5-30	→	→	→		~~3~~-4
Time	.1	.03	.03	.03	.01	.01	.03	.03	.01			
DC-1	28.5 31.8	16.2 19.6	6.8 6.7	10.0 10.6	4.20 3.25	2.52.9 2.52.5	23.0 21.5	6.5 6.2	3.8/3.1 4.7/5.0			99 99
DC-2	30.5 30.0	14.8 20.6	6.76.5 6.72.3	9.4 9.4	5.15 3.24	2.13.5 2.13.2	20.2 22.3	7.0 6.2	4.1/4.2 3.4/5.4	-		99 99
Σ	30.2 30.2	17.9 17.7	6.80 6.76	10.3 9.4	3.73 4.20	2.4/3.3 2.1/3.8	22.8 21.2	6.3 6.6	4.39/4.0 1.75/4.8			
DC-3	29.0 31.7	15.3 20.2	6.86.5 7.27.2	9.2 10.2	3.9 3.0 4.52.5	2.5 3.2 3.2-3.0	21.6 23.8	7.2 8.64	2.1/4.3 6.3/4.3			
Dc-4	30.8 29.5	18.0 17.9	7.17.1 6.76.8	10.2 8.0	3.5 3.8 4.2 3.6	?	22.8 22.8	8.5 5.5	4.9/5.0 1.5/5.0			
Σ	36.3 30.2	17.7 18.0	7.02 6.97	9.7 9.1	4.128 3.89	2.5/3.3	22.7 22.8	7.8 8.5	4.2/4.52 3.2/3.5			
DC-AV	30.2	17.83	6.89	9.39	3.89	~~2.8/3.3~~ ~~2.1/3.8~~	22.73	6.83	4.11/4.21	1.45		
AC-1	30.0	17.7	6.9	8.3	3.55	2.33	19.2	6.3	3.80	~~2.38~~		1.00
AC-2	30.0	17.7	6.9	8.3	3.55	2.34	19.2	6.4	3.78			100
Σ	30.0	17.7										
S. P.	+9.3	+67.2		-52.5			+9.4					
AC-N												
Int.Res.												

PROJECT PT - @ 2000

5.9	10.1	9.7	17.8
4.2	9.2		17.4
3.3			17.5
3.8	10.3	9.2	18.6
	8.1		
3.2			
4.7	8.0	9.3	
3.7	10.6		
4.0			

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: DOS CABESAS Line: #1-NE 1/2 Int.Cal _____ Date: _____

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2				
Rec.	30-37.5	→	→	→	37.5-45	→	→	→				
Time	.01	.01										
DC-1	7.0 5.3 2.0 3.8	1.9 2.5 3.3 2.2										
DC-2	6.0 5.3 3.0 3.9	1.2 2.6 4.4 3.8										
Σ	4.5 4.6 4.5 4.6	2.6 2.4 2.8 3.2										
DC-3	5.8 4.1 3.0 6.6	2.3 2.8 2.0 1.4										
Dc-4	5.8 5.3 3.1 3.9	2.4 2.6										
Σ	4.4 ~~5.4~~ 4.4 4.6	2.1 2.1 2.5										
DC-AV	4.5	2.53										
AC-1	4.12	2.22										
AC-2	4.12	2.22										
Σ												
S. P.	+17.5											
AC-N		7)37 (5 3 / 35 / 20)										
t.Res.												

drift drift

V=IR 280V=2 500 140Ω=

V=IR
V=I/2πKn

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

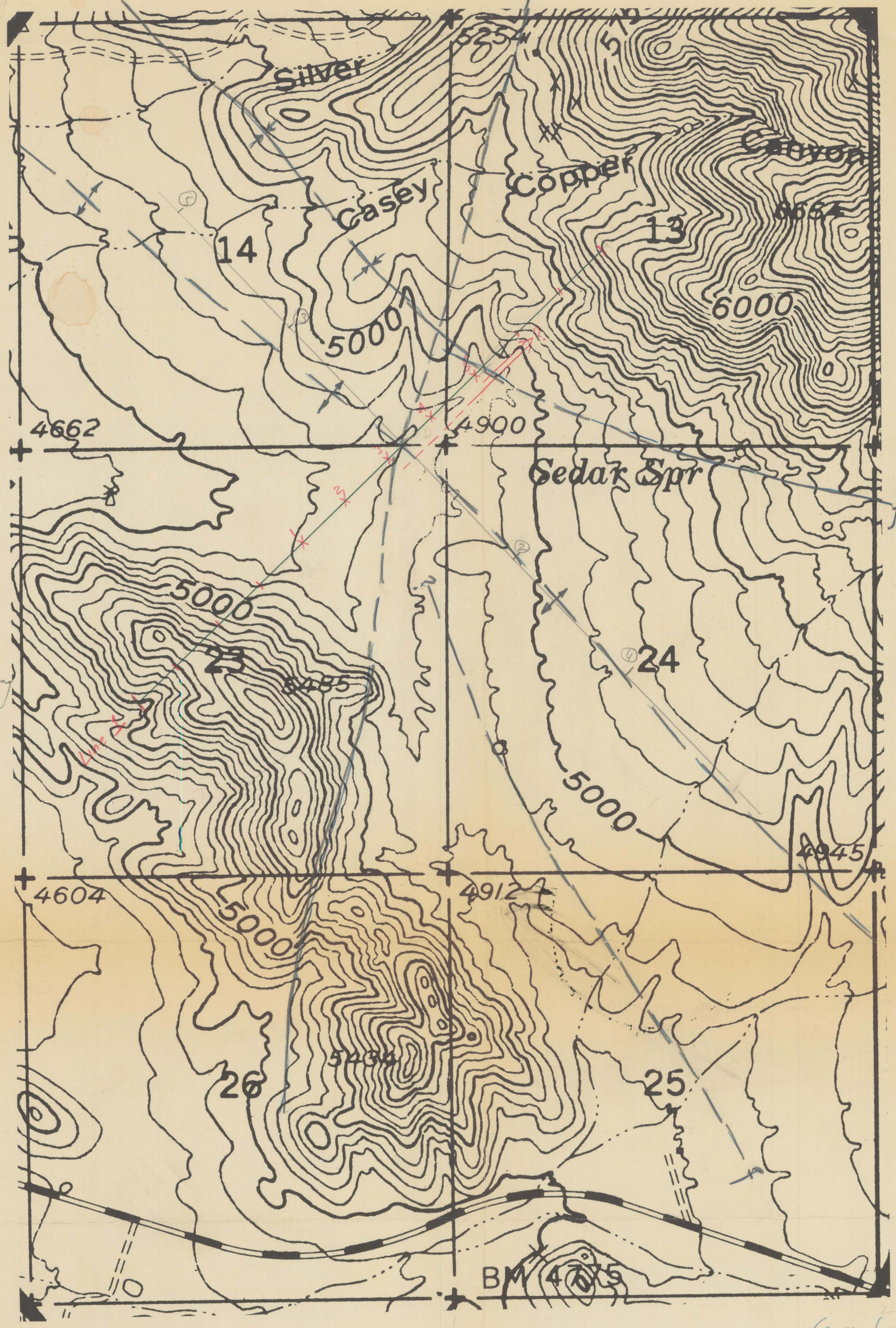
Page_____

Project DOS CABESAS Line #1-NE½ Field date 7/2/67 Data page_____ Comp. date 7/2/67. Comp by JMc

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
(B) Receive	0-7.5	7.5-15	→	15-22.5	→	→	22.5-30	→	→	→		
(C) n separation	1	1	2	1	2	3	4	2	3	4		
(D) I	1	1	1	1	1	1	2	2	2	1		
(E) Vdc (avg)	30.2	17.83	6.89	9.39	3.89	2.78	22.75	6.73	4.16			
(F) DCcal	.99									~~1.45~~		.99
(G) Kn x 10^{-3}	2.25	2.25	9.0	2.25	9.0	22.5	2.25	9.0	22.5			
(H) ρ dc=ExFxGx10^3/D	67	40	61.0	21	35	62	50	60	93			
(I) Vac Σ	30.0	17.7	6.9	8.3	3.55	2.33	19.2	6.3	3.79			
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.011	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.018	1.018	1.010	1.143	1.110	1.205	1.198	1.080	1.11			
(N) PFE=(M-1)(10^2)	1.8	1.8	1.0	14.3	11.0	20.5	19.8	8.0	11.0			
(O) MCF=(M-1)(10^5)/H	27	45	16	681	314	331	396	133	118			
	+9	+67		-53			+9					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	3-4										
(B) Receive	30-37.5	→										
(C) n separation	2	3										
(D) I	2	2										
(E) Vdc (avg)	4.5	2.53										
(F) DCcal	.99	→										
(G) Kn x 10^{-3}	9.0	22.5										
(H) ρ dc=ExFxGx10^3/D	40	56										
(I) Vac Σ	4.12	2.22										
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.011	→										
(M) ρdc/ρac =ExL/K	1.105	1.152										
(N) PFE=(M-1)(10^2)	10.5	15.2										
(O) MCF=(M-1)(10^5)/H	263	271										
	+18											



750' ⅈ
2000' Line spacing

1" = 1000'

N

Casey Copper Canyon
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Cochise Co., Arizona

DUVAL

CORPORATION

Dr.

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