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REPORT ON

AN ELECTROMAGNETIC SURVEY

OF THE

BROCKS MINERAL CLAIMS

McLeese Lake Area — Cariboo M. D.

British Columbia

Location: 52° N 122° W.

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Vancouver 3, B. C.

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REPORT ON

AN ELECTROMAGNETIC SURVEY OF

BROOKS MINERAL CLAIMS

CARIBOO MINING DIVISION

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1. INTRODUCTION

During September and October 1959 the author with two helpers did a geophysical and geological survey of the Brooks Mineral Claims Numbered 1-16 in the McLeese Lake Area. This report details the object, method and results of the geophysical work.

2. SUMMARY

In June 1959 the McLeese Lake Joint Venture, a group of five companies, undertook to study the copper occurrences of the Granite Mountain - McLeese Lake areas and the geology of that range of hills between Granite and Dragon mountains. Arrangements were made for airborne geophysical surveys of the larger area with follow-up work as indicated.

An option was taken on the Brooks Mineral Claims with a view to a more detailed study of the copper-bearing zone. During September and October lines were cut, the claims were mapped geologically and an electromagnetic survey was made using Ronkas horizontal loop equipment.

3. DISCUSSION OF THE RESULTS

The sixteen claims of the Brooks group are part of an area of 310 square miles which was surveyed aeromagnetically in September, 1959. Outcrop on the claims is fairly abundant and geology has been mapped. The electromagnetic survey which is the subject of this report confirms the magnetic and geologic observations.

The claims lie on the west flank of Granite mountain and the rocks observed are all granitic to dioritic. Some outcrops show strong foliation or layering which, in the opinion of the writer, is a relict bedding in a granitised sediment. The distinction indicated on the geologic map between granodiorite and diorite has not been mapped in any detail. No evidence of mineralization was noted in the outcrops examined.

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The magnetic maps of the area indicate a remarkably low and constant susceptibility. This would ind.cate a fairly acidic rock of constant composition which confirms the geologic observations.

The electromagnetic survey reads phase differences due to local variations in conductivity of the rocks. The presence of veins or lenses of massive sulfides or graphite produces anomalous readings. Minor variations may sometimes be traced to differences in coil separation or tilt due to steep topography as explained elsewhere.

The readings observed in this survey are remarkably constant and we must assume that no significant variation in conductivity occurs within range of the equipment. The line spacing of 800 feet was chosen with the intention of reducing to 400 feet if results indicated. However such added expense is not justified by results.

4. CONTROL LINE

The survey is controlled by a system of base and cross lines totalling approximately seven miles. The base line has an asimuth of 140° and is offset at 4800 feet south of the north boundary 2700' westerly where it continues on the same asimuth to 8000 feet. Cross lines are cut 800 feet apart at right angles to the base line and extending to the claim boundaries.

Chainages were taken at the time of the survey and surveyors' flagging was used to mark 100 foot stations. Footages were noted at roads, lakes, creeks or base lines for purposes of plotting.

5. SURVEY PROCEDURE

The survey was done with a three-man crew. Two men are required to operate the transmitter and receiver of the Ronka electromagnetic equipment. The third man preceded the equipment marking the 100 foot stations with surveyor's flagging. These flags were picked up by the receiver operator. This three-man method proved an economy of time in that two men would normally be required to chain and mark the line. In this case the

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transmitter operator also handled the chain. By this method production of 150-250 stations per day or 3-5 miles of line are quite feasible. With more closely spaced lines the higher figure should be readily attainable.

6. TECHNIQUE

Operation of the Ronka electromagnetic equipment requires considerable care. The two coils, receiving and transmitting, must be held co-planar. Where two operators 200 feet apart are unable to see each other, alignment of coils is difficult. Coil separation is controlled by the length of the wire joining them but in rough topography some error is introduced by variation in separation due to sag or rise. For these reasons field notes should locate steep hills, deep ravines or water courses and due allowances or check readings made for apparently anomalous readings.

J.S.S.

7. COST OF THE SURVEY

Line-cutting; including finding posts, chaining lines and tying in claim posts.

A. Berglund	
September 28, 29, 30, October 1-13, inclusive	
16 days @ $25.00/day, including board	$ 400.00
L. A. Welch	
September 28, 29, 30, October 1-5, 7 and 8.	
10 days @ $25.00/day, including board	250.00
Surveying: Ronka horizontal loop equipment.	
L. A. Welch - operator helper.	
October 6, 9, 10	
3 days @ $25.00/day	75.00
J. S. Scott - operator	
October 6, 9 10	
3 days @ $50.00/day	150.00
Supervision, maps and reports	
J. S. Scott - 2 days office time @ $50.00	100.00
Supervision and geologic mapping	
3 days @ $50.00/day	150.00
Total Cost	$ 1,125.00

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BROOKS MINERAL CLAIMS - CARIBOO MINING DIVISION

RONKA HORIZONTAL LOOP - ELECTROMAGNETIC SURVEY

Line 24 + 00 S

Note: Stn. 0 at road; west end

Stn.	O.P.	I.P.
0	+9	- 5
1	+5	-9
2	+8	-5
3	+5	-6
4	+7	-6
5	+5	-5
6	+5	-5
7	+5	-5
8	+6	-6
9	+6	-0
10	+6	-5
11 (hill)	+6	+8
12	+5	-4
13	+5	-6
14	+5	-8
15	+5	-5
Note Stn. 15 30' west of base line.		
16	+8	-5
17	+5	-4
18	+5	-6
19	+6	-7
20	+6	-7
21	+6	-8
22	+5	-5
23	+4	-5
24	+5	-5

Line 16 + 00 S

Note: Stn. 0 at east end of line.

Stn.	O.P.	I.P.
0	+5	0
1	+5	-5
2	+5	-4
3	+5	-5
4 (hill)	+5	+4
5	+4	-4
6	+6	-4
7	+6	-5
8	+7	- 3
9	+8	-5
10	+5	-5
11	+6	-5
12	+5	-6
13	+7	-8
Note: Stn. 13 20' west of base line.		
14	+6	-4
15	+7	-4
16	+8	-6
17	+7	+5
18	+8	-0
19	+7	-3
20	+5	-3
21	+6	-2
22	+6	-2
23	+8	-4
24	+7	-8
25	+7	-5
26	+6	-4
Note: Stn. 26 200' east of road.		

BROOKS MINERAL CLAIMS -- CARIBOO MINING DIVISION

RONKA E.M. SURVEY (Cont.)

Line 8 + 00 S

Note: Stn. 0 100' east of base line reading east.

Stn.	O.P.	I.P.
0	+6	-2
1	+5	-5
2	+5	-5
3	+6	-4
4	+6	-4
5	+6	0
6	+7	-3
7	+5	0
8	+5	-4
9	+7	0
10	+7	-3
11	+7	-5
12	+5	0
13	+7	-5
14	+4	-5

Note: Stn. 14 is east end of line 1500' east of base line.
Stn. 15 is at base line.

Stn.	O.P.	I.P.
15	+5	-4
16	+7	0
17	+5	-3
18	+6	-7
19	+7	-4
20	+4	-5
21	+5	-2
22	+8	-2
23	+6	-7
24	+6	0
25	+7	-7

Note: Stn. 25 is 1000' west of base line.

Line 32 + 00 S

Note: Readings start at west end.

Stn.	O.P.	I.P.
0	+5	+5
1	+5	-5
2 (creek)	+5	-10
3	+5	-10
4	+5	-5
5	+5	-10
6	+6	-10
7	+5	-10
8	+4	-8
9 (hill)	+5	0
10 (hill)	+5	0
11	+5	-7
12	+6	-8
13	+5	-5
14	+6	-6
15	+5	-8
16	+6	-8
17	+6	-8

Note: Stn. 17 is 30' east of base line.

Stn.	O.P.	I.P.
18	+6	-7
19	lake	
20	lake	
21	+8	-5
22	+6	-10
23	+6	-5
24	+5	-6
25	+5	-5
24	+6	-6
27	+6	-7
28	+6	-7

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BROOKS MINERAL CLAIMS - CARIBOO MINING DIVISION

RONKA E. M. SURVEY (Cont.)

Line 40 + 00 S

Note: reads from west to east.

Stn.	C.P.	I.P.
0	+4	-6
1	+6	-7
2	+5	-7
3	+4	-5
4	+6	-8
5 (base line)	+4	-8
6	+6	-4
7	+5	-5
8	+5	+4
9	+5	-10
10	+5	-10
11	+4	-8
12	+6	-3
13	+5	-10
14	+5	-6
15	+6	-5
16	+5	-5
17	+5	-10
18 (Noise. No reading)		
19 (level. No reading)		
20 (at creek)	+5 —	-10
21 (No reading)		
22	+5	-9
23	+5	+2
24	+5	-2
25	+5	-4
26	+4	-7
27	+5	-9
28	+7	-9
29	+7	-8
30	+7	-5
31	+6	-6
32	+7	-11
33	+6	-10

Line 80 + 00 S

Note: reads west to east.

Stn.	C.P.	I.P.
0	+7 -	-10
1	+5	-3
2	+7	-10
3	+7	-5
4	+7	-7
5	+7	-2
6 (road)	+7	-2
7	+7	-4
8	+6	0
9	+6	-6
10	+5	0
11	+5	-5
12	+5	0
13	+5	-5
14	+6	-8
15	+7	-4
16	+6	-5

Note Stn. 16 is 20' E of base line.

Stn.	C.P.	I.P.
17	+5	-5
18	+4	0
19	+5	-5
20	+5	-5
21	+5	-10
22	+6	-6
23	+5	-10
24	+6	-5
25	+6	-5

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BROOKS MINERAL CLAIMS - CARIBOO MINING DIVISION

RONKA E. M. SURVEY (Cont.)

Line 72 + 00 S

Note: line reads from east end.

Stn.	C.P.	I.P.
0	+5	0
1	+5	-5
2	+4	-5
3	+4	-2
4 (steep)	+3	+5
5	+5	+4
6	+6	-3
7	+5	-3
8	+5	0
9 (base line)	+5	0
10	+5	-5
11	+5	-5
12	+3	-5
13	+5	+1
14	+5	+6
15	+7	-2
16	+6	-4
17	+6	-3
18	+6	-5
19 (road)	+7	-5
20	+6	-5
21	+6	-3
22	+7	-6
23	+7	-5
24	+8	-5
25	+7	0
26 (W. End)	+8	0

Line 64 + 00 S

Note: line reads from west end at road.

Stn.	C.P.	I.P.
0	+5	-5
1	+6	-5
2	+6	-4
3	+5	-4
4	+6	-5
5	+6	-2
6	+7	-2
7	+7	-8
8	+6	-8
9	+5	-8
10	+7	-3
11 (50' east of base line)	+6	-2
12	+6	-4
13	+6	-5
14	+7	-8
15	+5	0
16	+7	-4
17	+6	-6
18	+7	-7
19	+7	-8
20	+6	-8
21	+5	-8
22	+6	-5
23	+6	-8
24	+7	-5

BROCKS MINERAL CLAIMS - CARIBOO MINING DIVISION

RONKA E. M. SURVEY (Cont.)

Line 56 + 00 S

Note: line reads from east to west.

Stn.	O.P.	I.P.
0	+8	-4
1	+7	-5
2	+7	-5
3	+7	-7
4	+5	-3
5	+6	-4
6	+6	-5
7	+6	-5
8	+5	-5
9	+6	-5
10	+6	-3
11	+7	-4
12	+6	-5
13	+5	-5
14	+5	-8
15	+7	-2
16	+6	-8
17	+6	-8
18	+7	-7
19	+6	-5
20	+6	-7
21	+6	0
22	+6	-8
23	+6	-5
24	+7	-6
25	+7	-4
26	+7	-5
27	+7	-3
28 (road)	+8	-6
29	+8	-8

Line 48 + 00 S

Note: reads east from 100' E. of lake.

Stn.	O.P.	I.P.
0	+7	-10
1	+7	-6
2	+7	-6
3	+7	-8
4	+7	-7
5	+7	-10

Note: Stn. 5 is 50' west of base line.

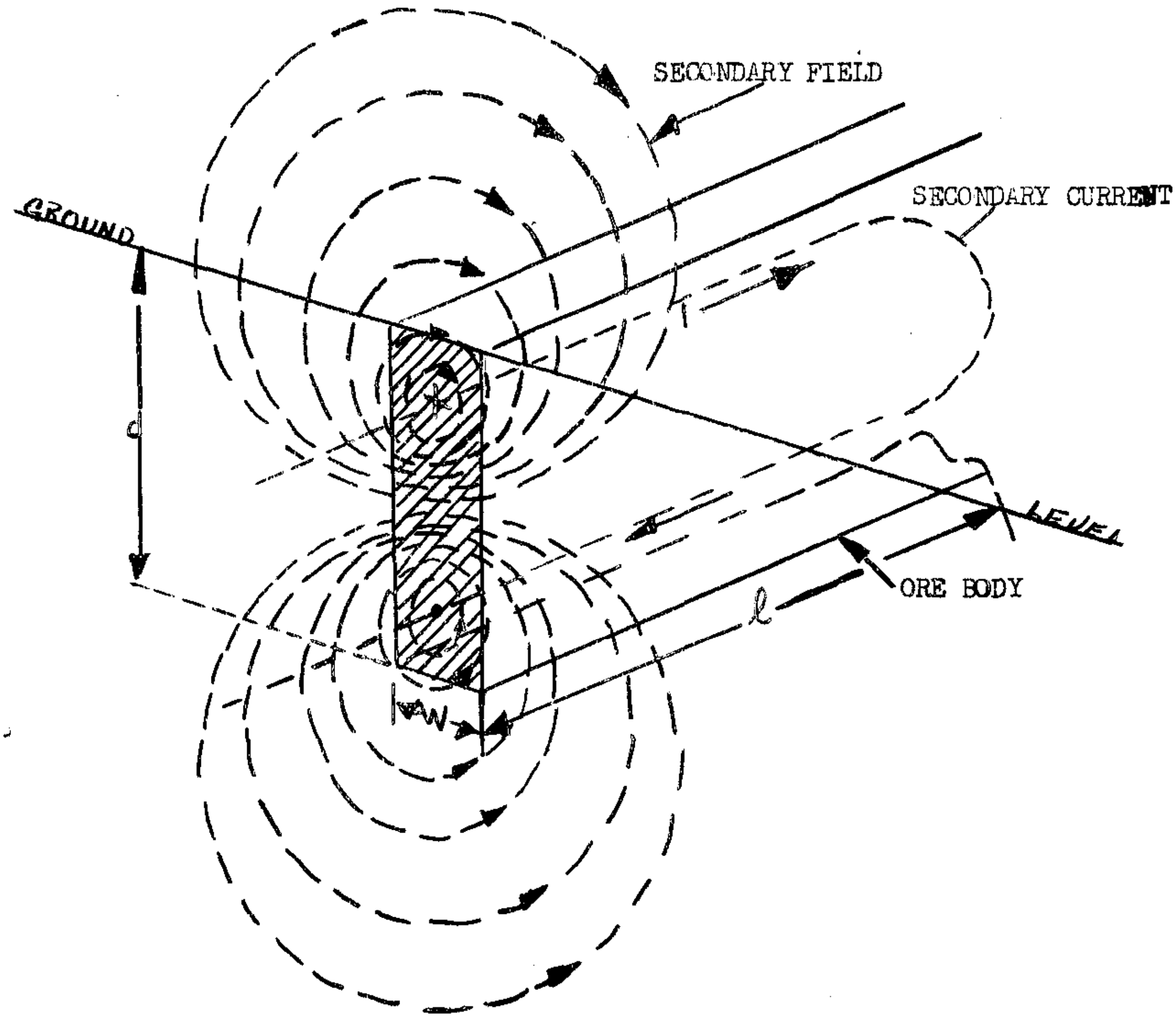
Stn.	O.P.	I.P.
6 (base line)	+7	-6
7	+7	-10
8	+6	-10
7	+6	-7
10	+6	-10
11	+6	-8
12	+6	-12
13	+6	-3
14	+6	-9
15	+6	-8
16	+6	-4
17	+7	-3
18	+7	-4
19	+6	-5
20	+7	-7
21	+5	-5
22	+7	-5
23	+4	-4
24	+5	-5
25	+5	-5
26	+5	-5
27	+5	-5

7. INTERPRETATION

The object of this section is to give the user some idea how to use the results obtained by the equipment and how these results are related to the anomaly.

DISTRIBUTION OF THE PRIMARY AND SECONDARY FIELD

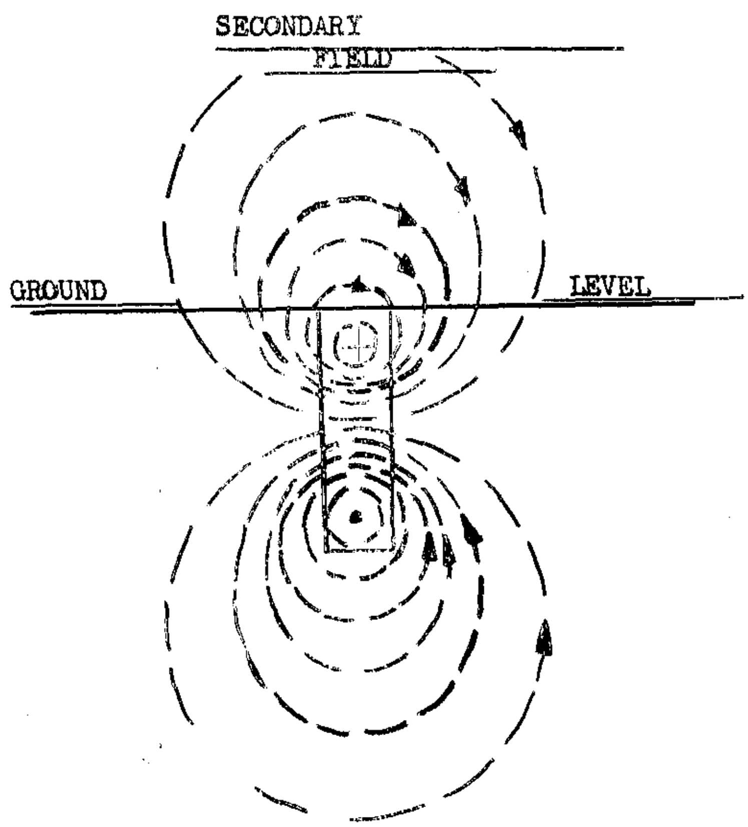
The following discussion assumes that the ore body is a homogeneous sheet whose depth is large compared with the thickness and whose length may be considered large compared with either the thickness or depth.



Showing current and field distribution in an ore body.

FIGURE 1.

By this is meant that "l" is much larger than "d" and "d" is much larger thant "w". Then if a current "i" is induced in the ore body we may suppose it to flow as shown so that it will give rise to a secondary field approximately as shown looking at the end of the ore body in FIGURE 2.



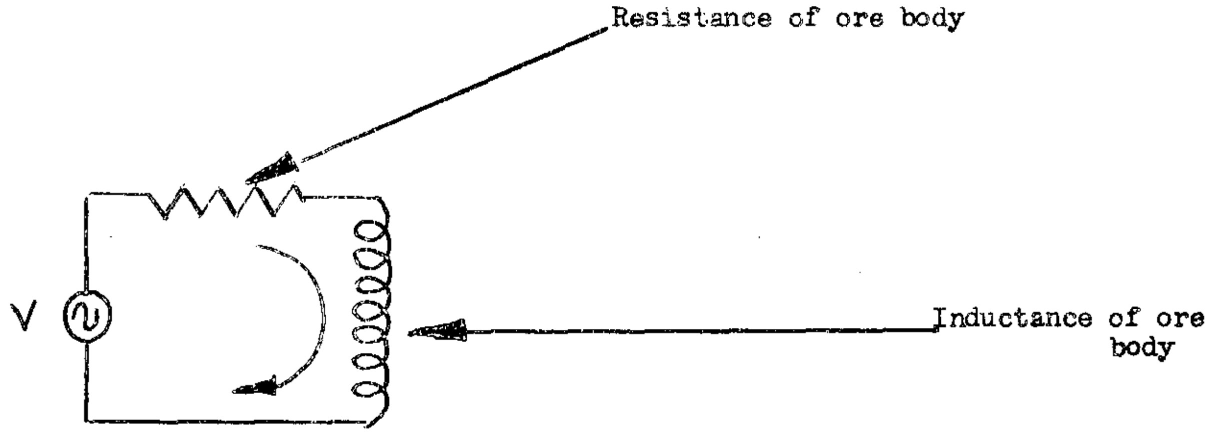
The secondary field of interest is the one due to the current closet to the surface and may be considered to be the only one of signifiance since the lower one is as a rule too far away from the coils to be effective.

Distribution of magnetic lines of force around a conducting ore body

FIGURE 2.

EQUIVALENT CIRCUIT

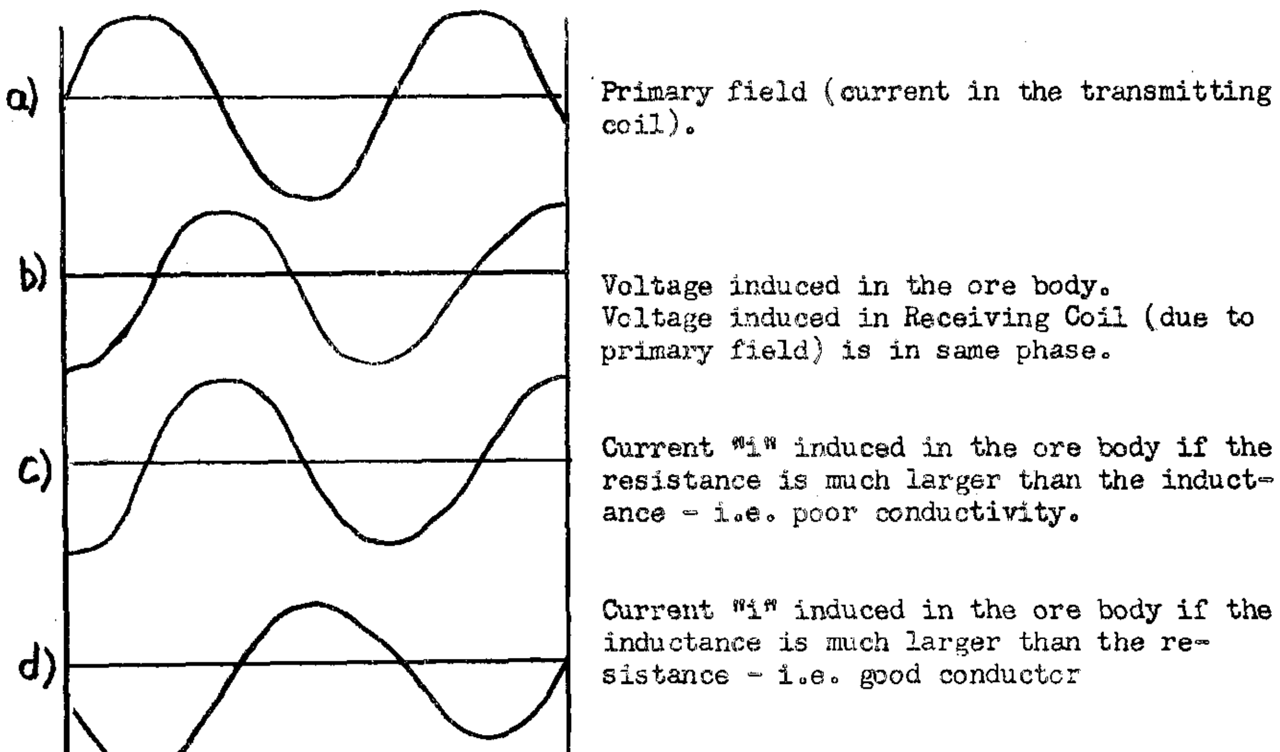
The ore body may be considered as a loop FIGURE 3. containing inductance and resistance and energized by a voltage V which results from the primary field.



Ewuivalent circuit of a conducting ore body

FIGURE 3.

The wave forms in various parts of the circuit and ore body are shown in FIGURE 4.



Wave forms in the transmitting coil and ore body.

FIGURE 4.

Wave form (a) represents the primary field which induces a voltage in the ore body which lags the primary field by 90°. The voltage will induce in the ore body the current "i" noted in FIGURES 1., 2., and 3., so that "i" will lag V by an amount depending on the relative magnitude of inductive reactance to resistance (FIGURE 3.)

If the ore body conductivity is poor, then "i" will be in phase with V. If the conductivity is good, then it will lag V by 90° see FIGURE 4. curves (c) and (d). The secondary field produced by the ore body is always in phase with the current "i". Hence it can be seen that there will be a voltage induced in the receiving coil due to the primary field and another due to the secondary field. The latter may have a phase similar to that of the primary field or may have a combination of components in phase and out of phase with the primary field up to the point where the total contribution due to the secondary field is 90° out of phase with the primary field.

The relative variation of in-phase and out-of-phase components with varying ore conductivity is represented in FIGURE 5.

Also the effect of permeability higher than one is seen in the same figure.

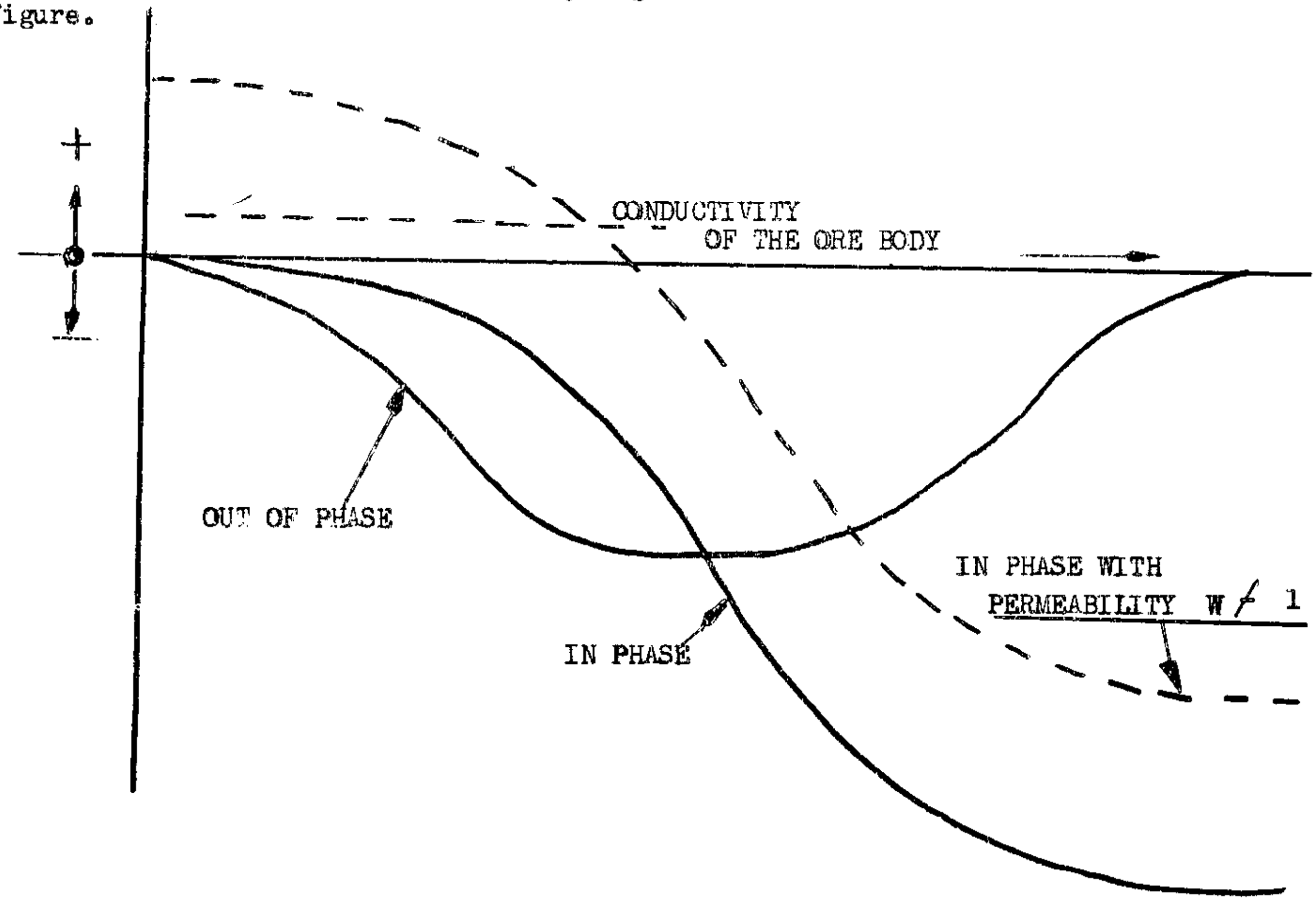
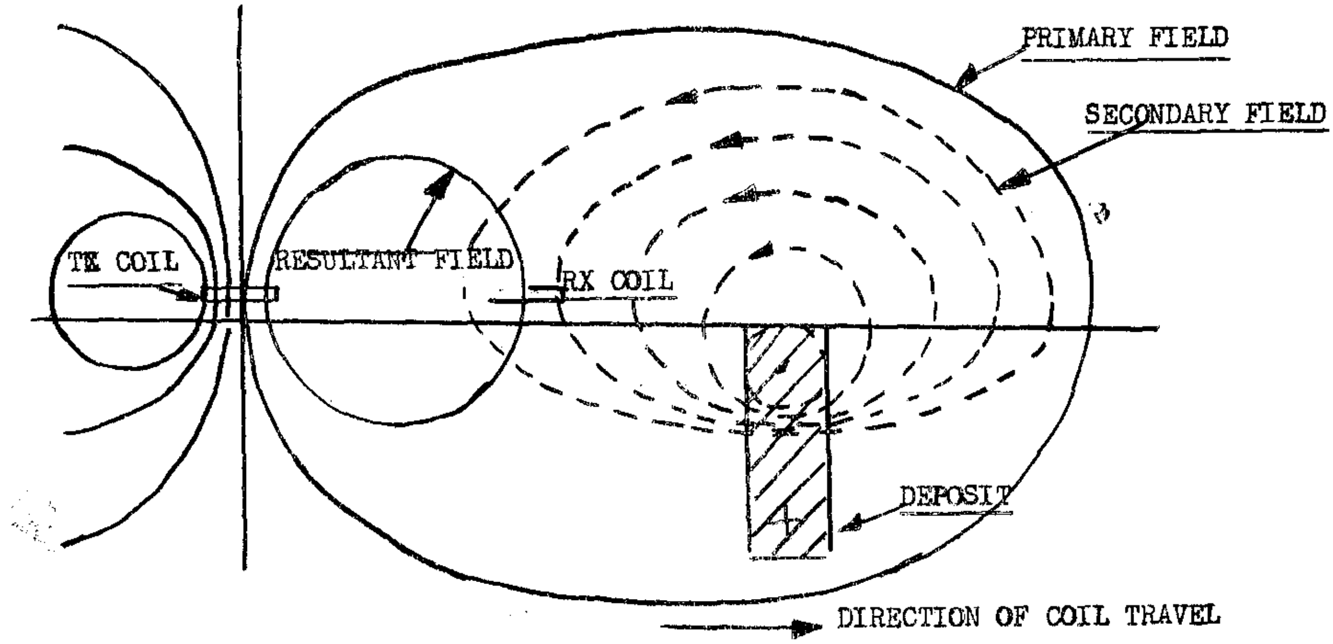


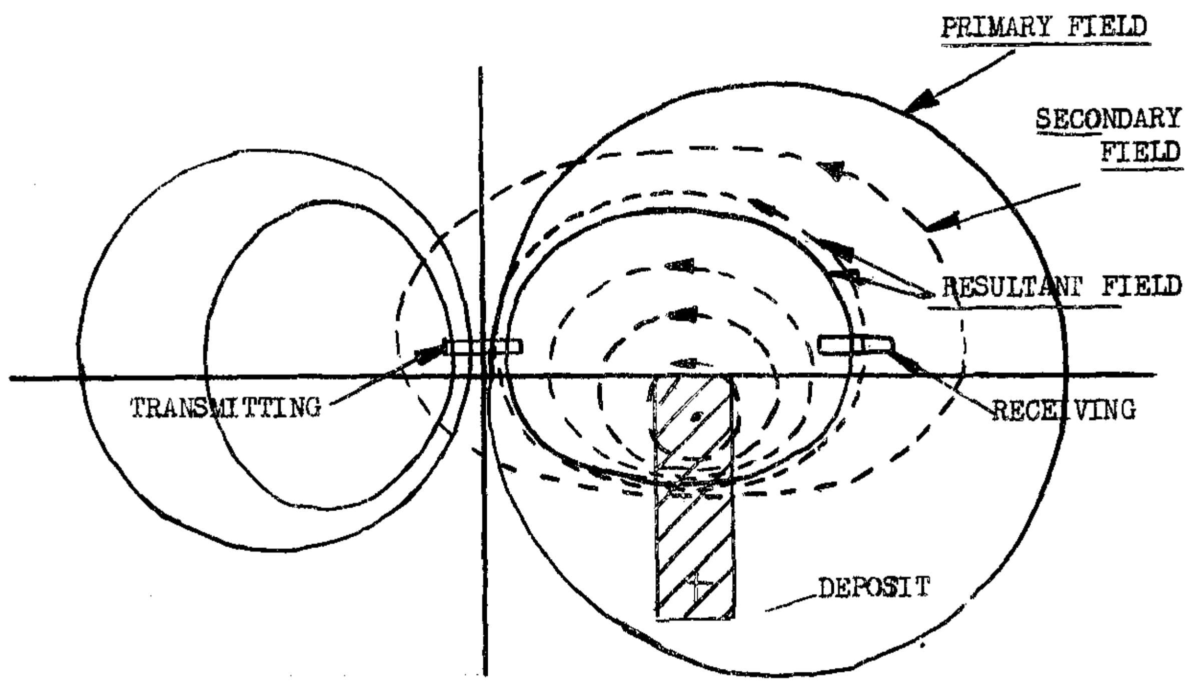
FIGURE 5.

THE ANOMALY CURVES



Both coils to the left of the ore body

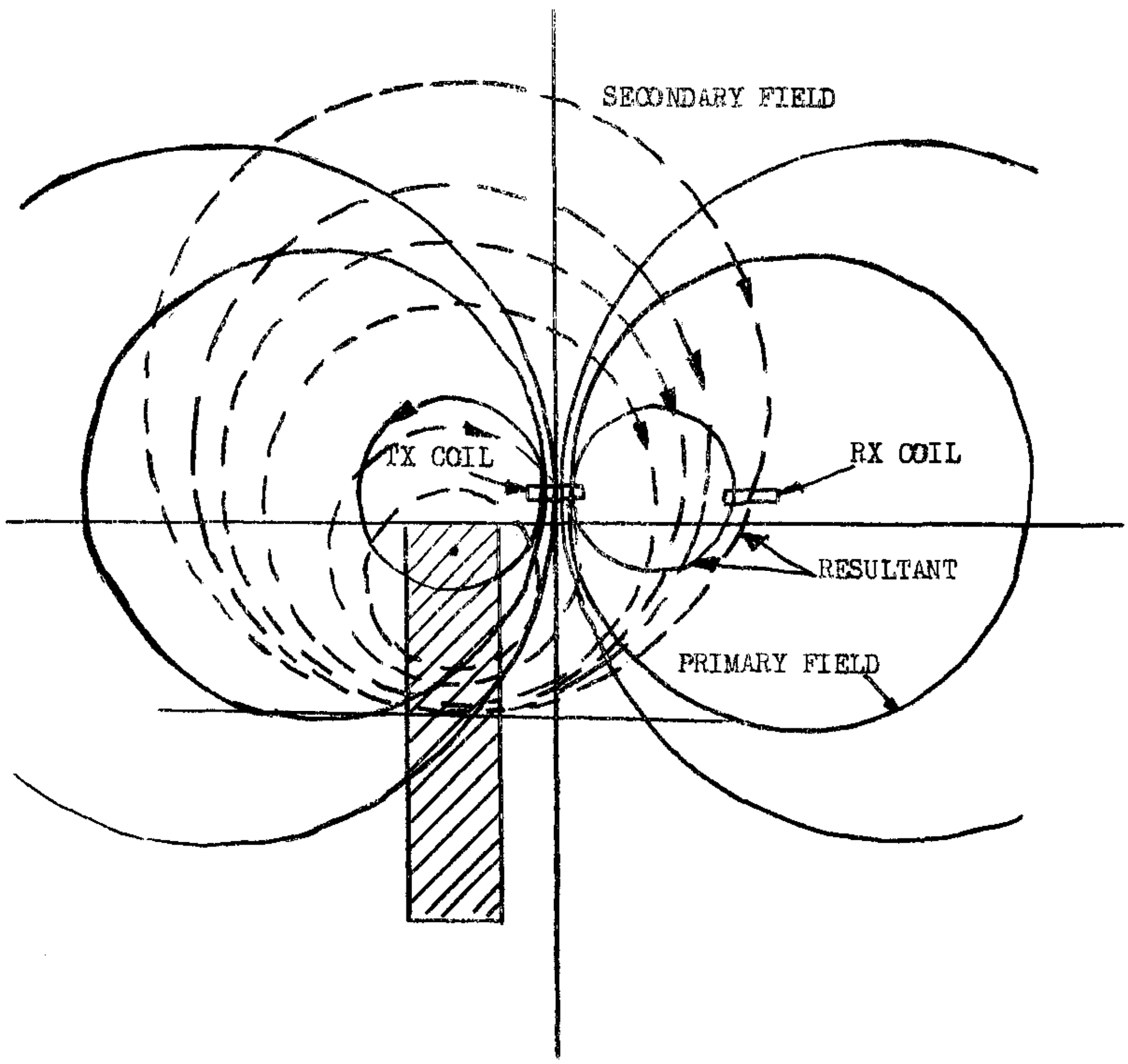
FIGURE 6.



Coils straddling the ore body.

FIGURE 7.

Since the secondary field is alwasy induced in such a way as to oppose the primary field, the direction of the field will be as noted by the arrows, in FIGURES 6. to 8. If the direction of the secondary field at the receiving coil - dotted lines - is the same as that of the primary field - full lines, then the effect is to cause a signal voltage in the receiving coil proportional to the sum of the two fields. If the fields oppose in the receiving coil then a voltage will be produced which is proportional to the difference between them.



Colis to the right of the ore body.

FIGURE 8.

In the absence of a secondary field, the signal received by the receiving coil is due to the primary field alone and is balanced by the compensating voltage. It is clear then that if the presence of a secondary field changes the value of the received signal, then the value of the compensating voltage must also be changed to achieve a null. The amount of the change in the compensating voltage is measured as a % of its original value.

The IN PHASE and the OUT OF PHASE controls are used to produce the necessary change in the compensating voltage to measure the effect of the secondary field.

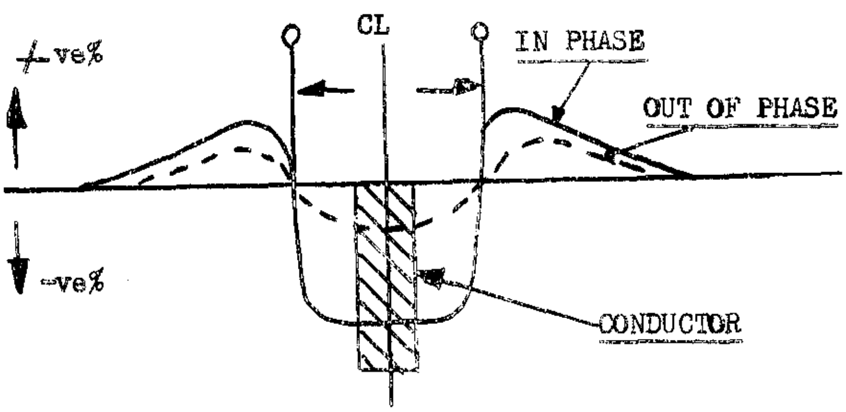
The % values read on the controls then are the % by which the compensation voltage must be changed from its initial value (when it just balances the signal received in the absence of a secondary field) in order to exactly balance some new received signal due to the presence of a secondary field.

From FIGURE 6. then we see that the fields add and hence the compensating signal must be increased - this is called moving the compensating signal in a positive direction. In FIGURE 7. the fields oppose and hence the compensating signal must be reduced - this is call negative. In FIGURE 8. the fields again add (because the anomaly is energized by the transmitter coil in the opposite drection to FIGURE 6.) and the compensator signal must be increased for a balance or null. FIGURE 9. shows a plot of the readings made over an ideal vertical conductor which reaches the surface of the ground.

The later part of the section includes a series of figures a anomalies taken over known deposits which will give some idea how the proportion of IN PHASE to OUT OF PHASE readings depends on conductivity and size and how the characteristic shapes of the curves are altered if the sheet slopes from the vertical.

Conductive bodies which are wider than the coil spacing will give the same basic form but the zeros will be wider apart. See FIGURE 9.

When taking readings, the receiving coil or the transmitting coil may go first. However, the readings are always taken at the receiving coil station. It is best, therfore, to adjust the readings 100' to the centre of the cable and



Ideal Anomaly
FIGURE 9.

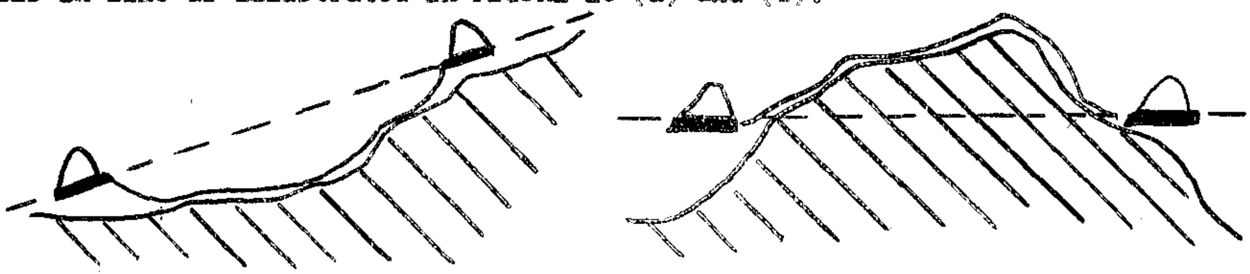
INTERPRETATION AND TEST AREA DATA

RONKA HORIZONTAL LOOP GROUND ELECTROMAGNETIC EQUIPMENT

plot the readings at this point. The location of any anomaly is thus unaffected by the direction in which it is traversed or by which coil is leading. The centre of the conductor at its closest point to the surface is then half way between the zeros of the curves as in FIGURE 9.

CORRECTIONS

When moving over rough ground an attempt should be made to keep the coils in line as illustrated in FIGURE 10 (a) and (b).



(a) Correct attitude of the coils (b)

FIGURE 10.

The reason for this is that the equipment is zeroed with the coils lined up and if the coils are tilted an appreciable amount with respect to each other the component of the primary field received by the receiving coil will be altered.

Effect of short cable or tilted coil

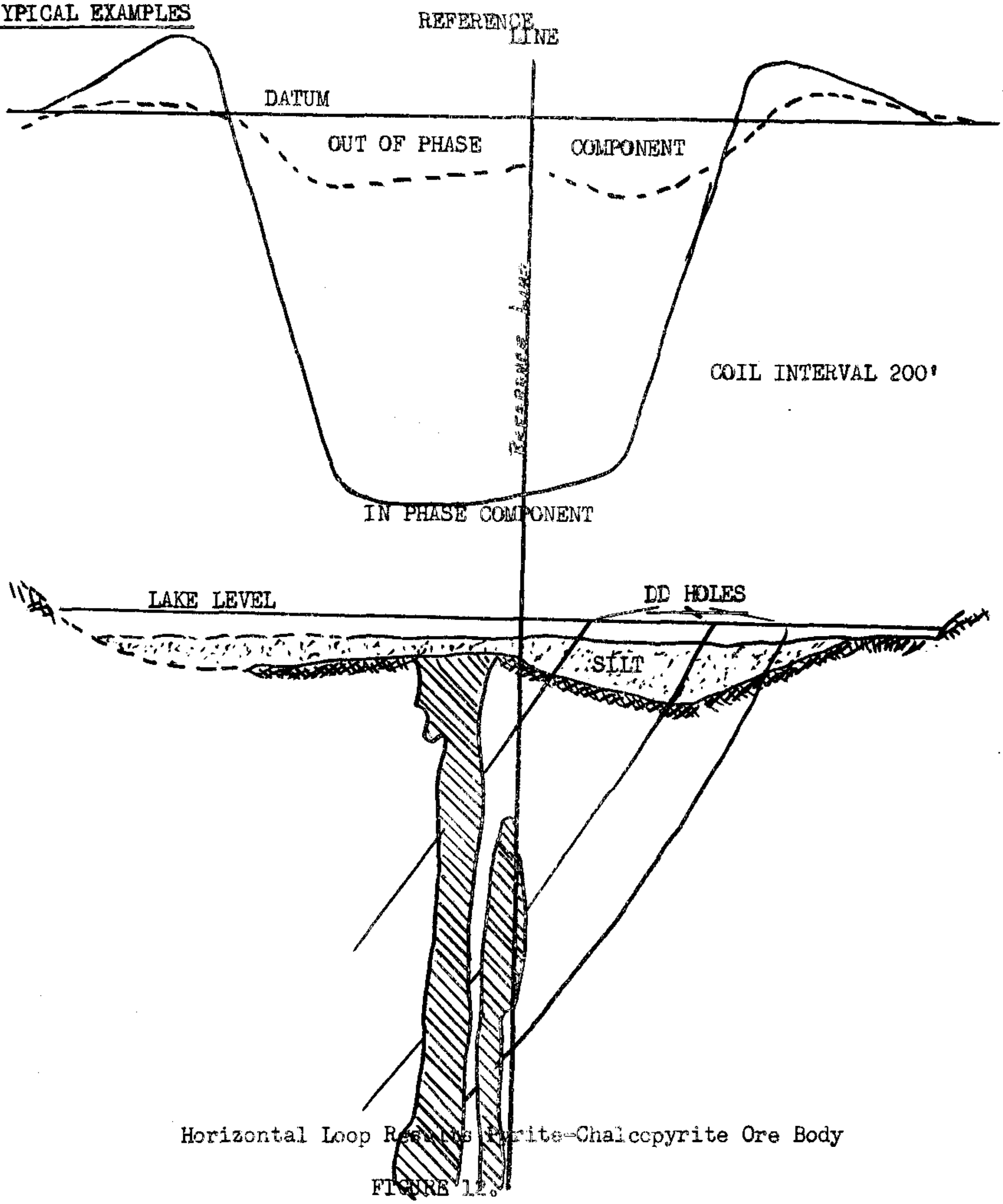
FIGURE 11.

Tilting either coil as shown in FIGURE 11. (a) produces a negative anomaly. Moving toward the transmitting coil (b) produces an apparent positive anomaly - on the IN PHASE control. The OUT PHASE control should not change appreciably.

When the coils require to be set as in FIGURE 10. (b) for instance, it is clear that the cable will be shortened. Since the IN PHASE COMPONENT CHANGES by about 1.5% for every foot that the distance between the coil is reduced (within 10' of normal coil position) topographical notes should be made as to the type of terrain, any obstacles, etc., in fact any notes which will assist in the interpretation.

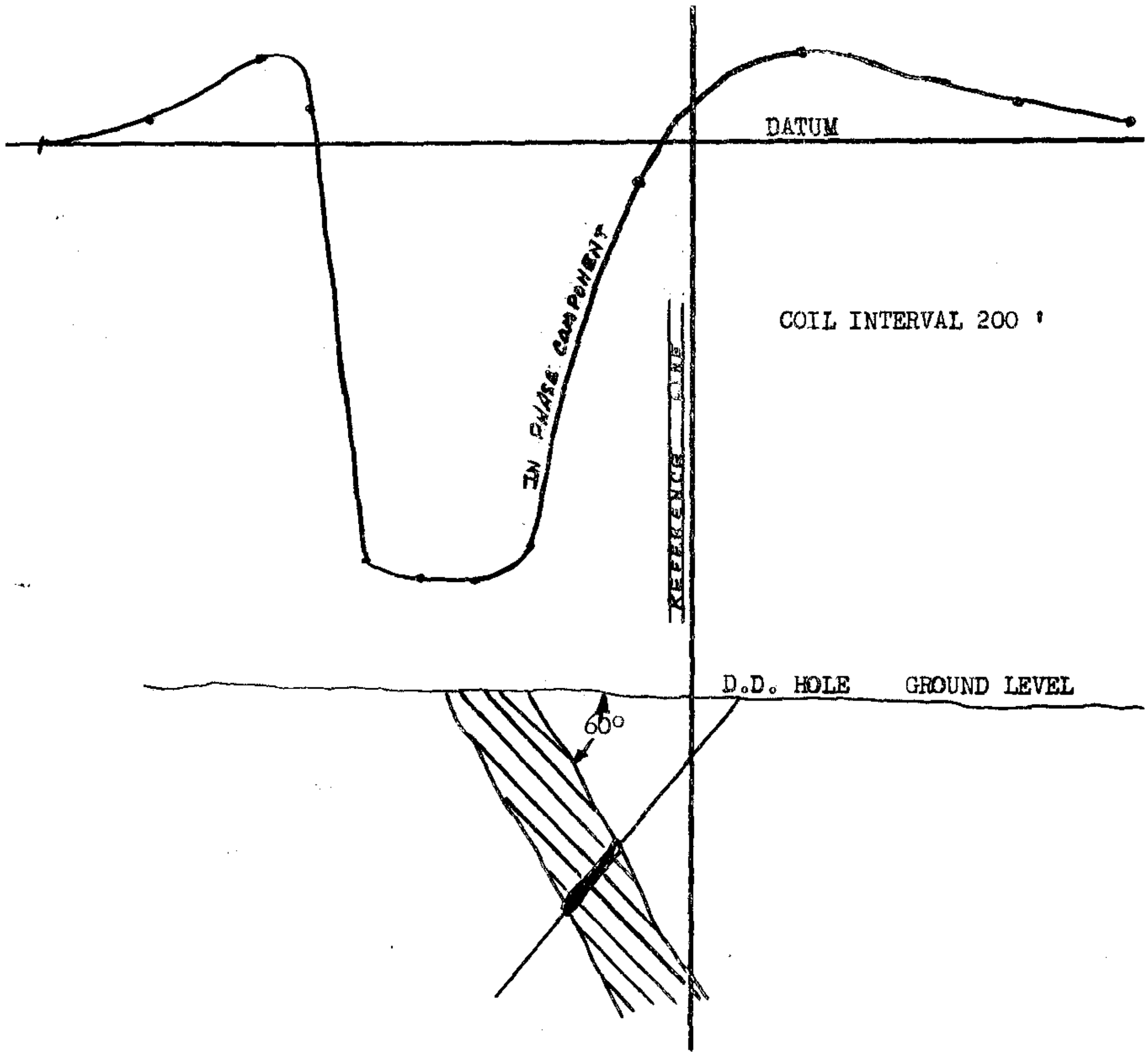
Equipment using a higher frequency will in general produce a higher ratio of our of phase to in phase reading.

SOME TYPICAL EXAMPLES



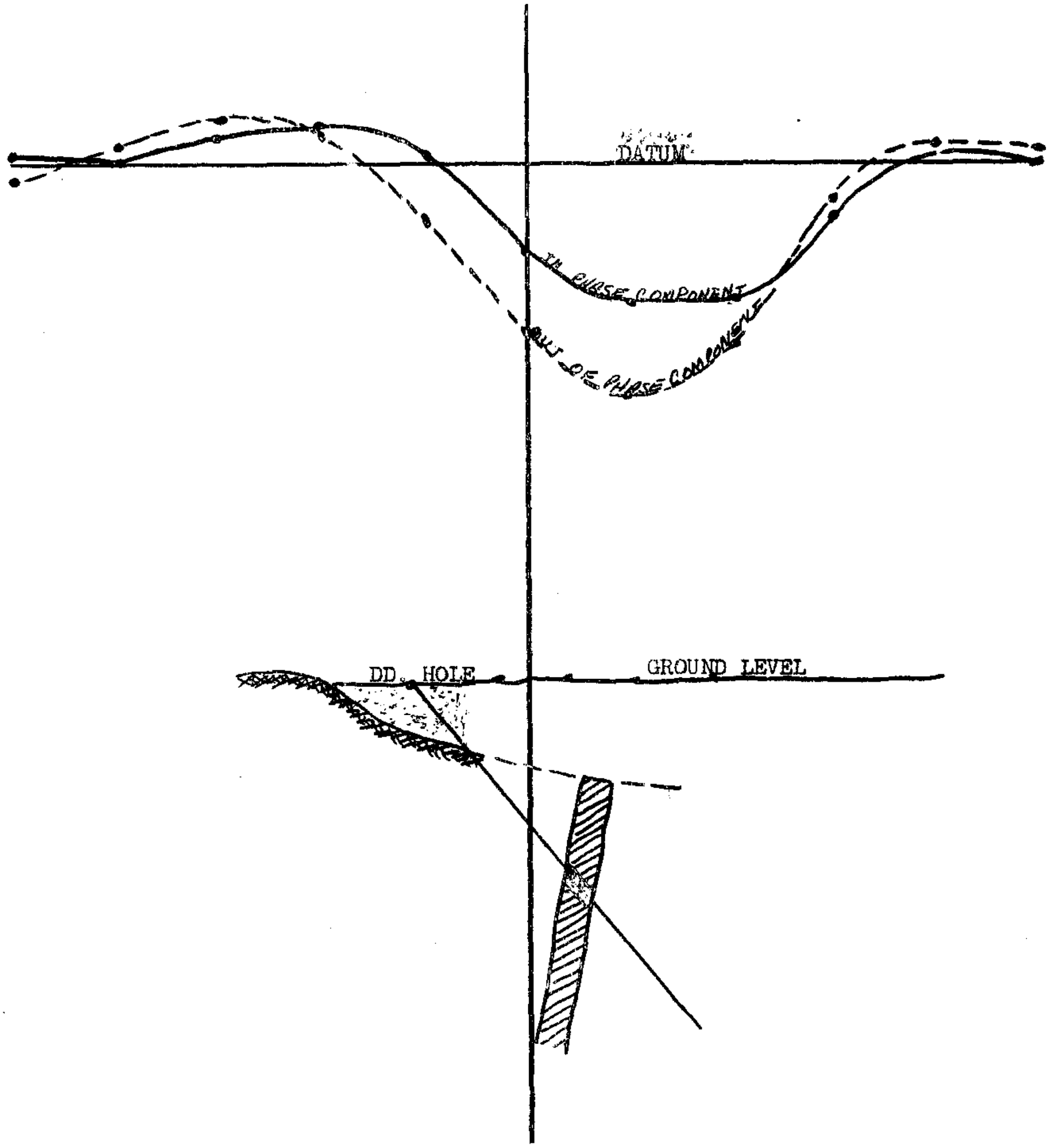
Horizontal Loop Results Pyrite-Chalcopyrite Ore Body

FIGURE 12.



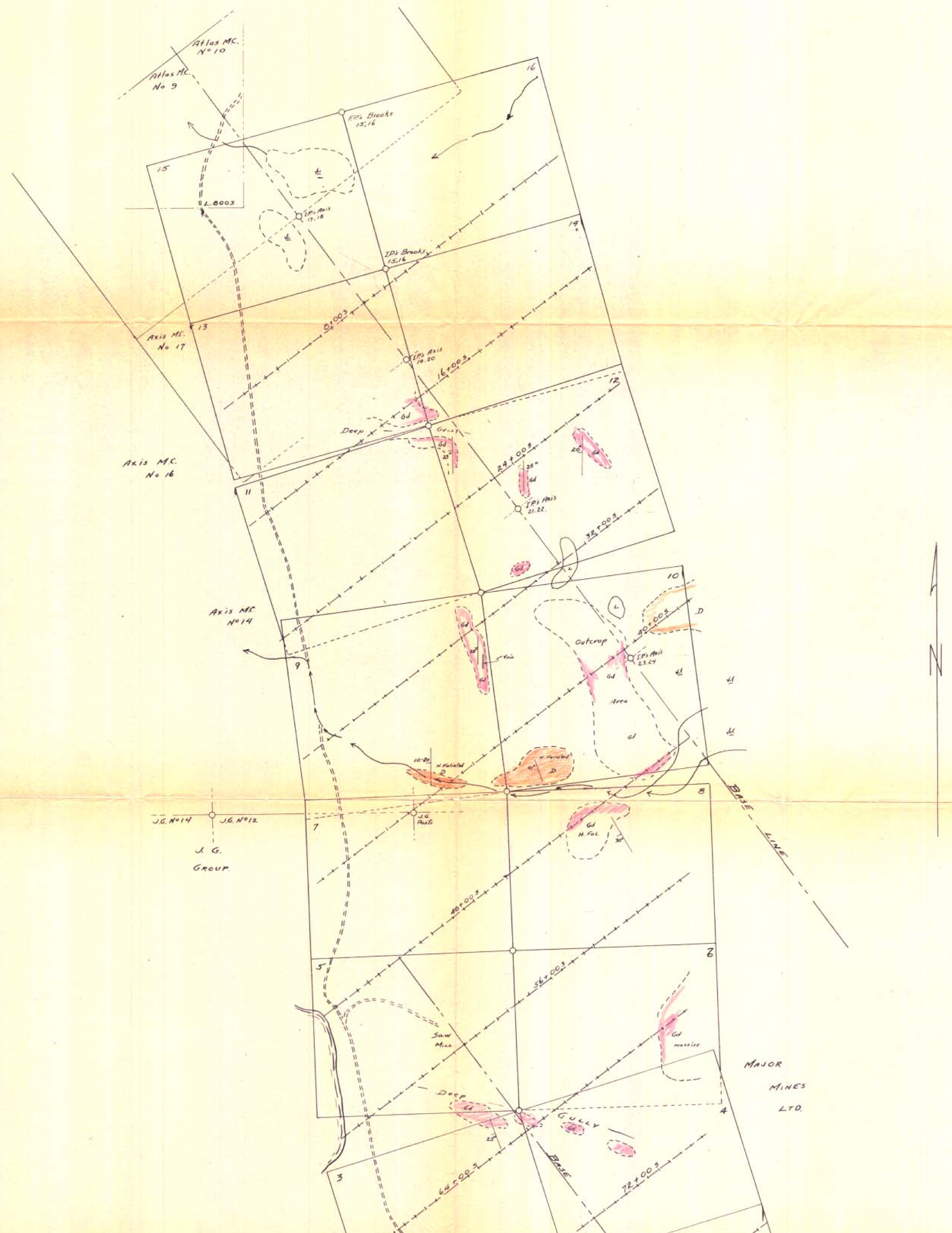
Horizontal Loop Results over a Pyrrhotite Deposit.

FIGURE 13.



Horizontal Loop Results over Disseminated Sulphides

FIGUERS 14.



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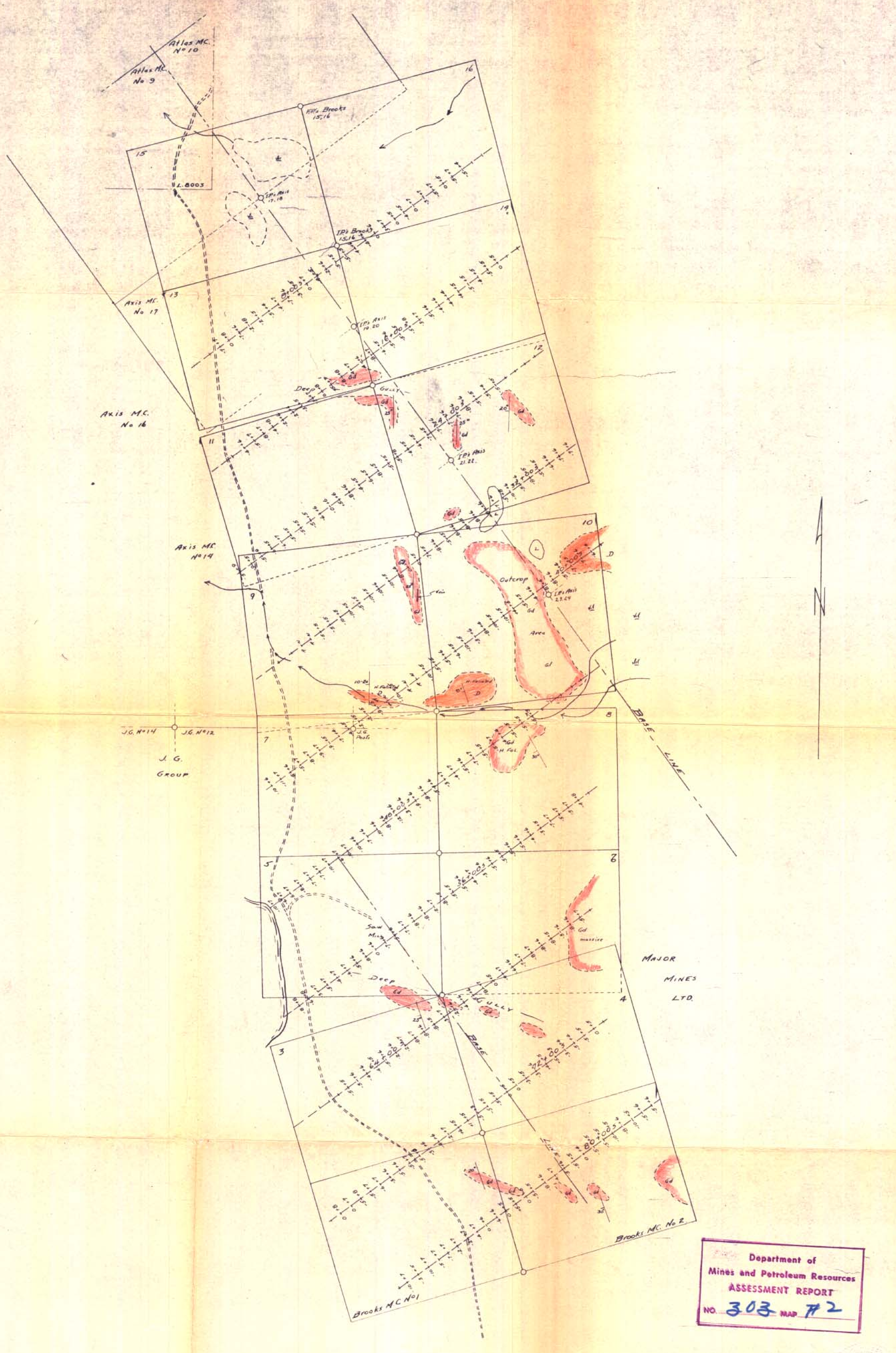
Gd GRANODIORITE DIORITE D

BROOKS CLAIMS of Island Prince Mines Ltd.

Cariboo M.D. British Columbia

Scale. 1" = 400'	Geologic & Electromagnetic Survey October 1959	J.S. Scott P.Eng. 19/10/59.

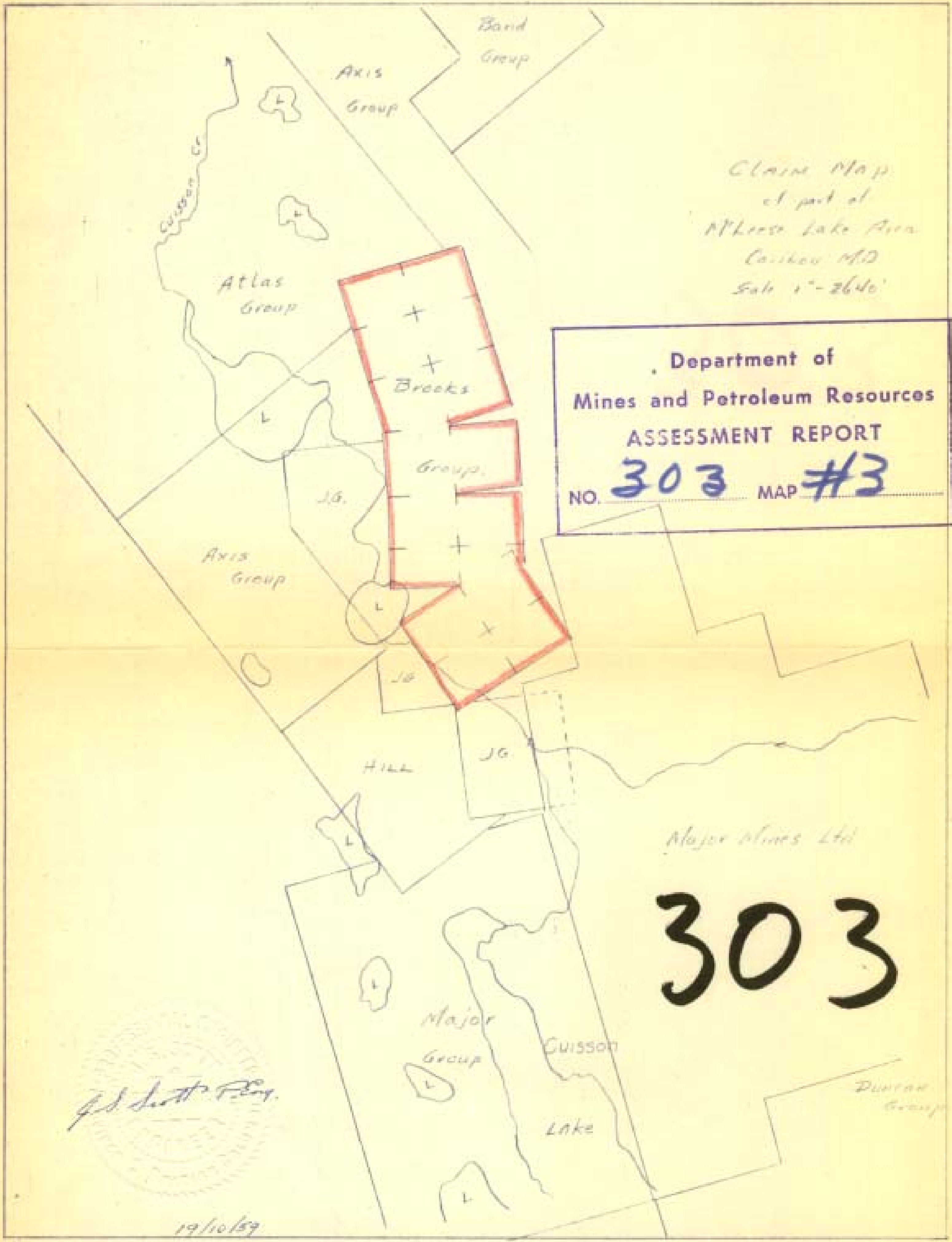


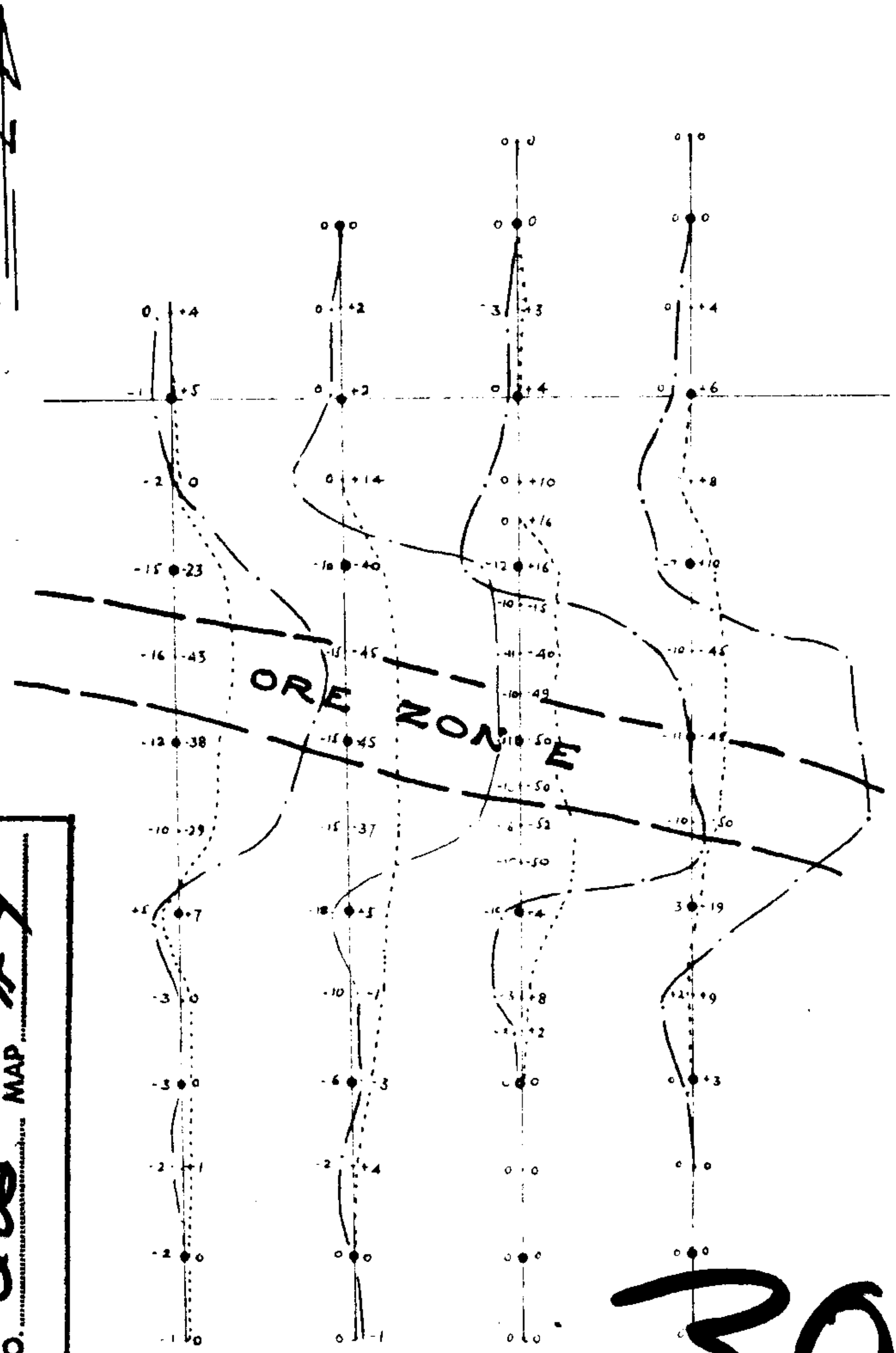
J.S. Scott P.Eng.

GRANODIORITE — DIORITE

BROOKS CLAIMS
of
Island Prince Mines Ltd.
Cariboo M.D. — British Columbia

Scale. 1" = 400'	Geologic & Electromagnetic Survey October 1959	J.S. Scott P.Eng. 19/10/59.


Band Group
Axis Group
Cuisson Cr.
Atlas Group
Brooks Group
J.G.
Axis Group
J.G.
Hill
J.G.
Claim Map of part of McLeese Lake Area Cariboo M.D. Scale 1"-2640'
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 303 MAP #3
Major Mines Ltd
303
Major Group
Cuisson Lake
Duncan Group
19/10/59



303

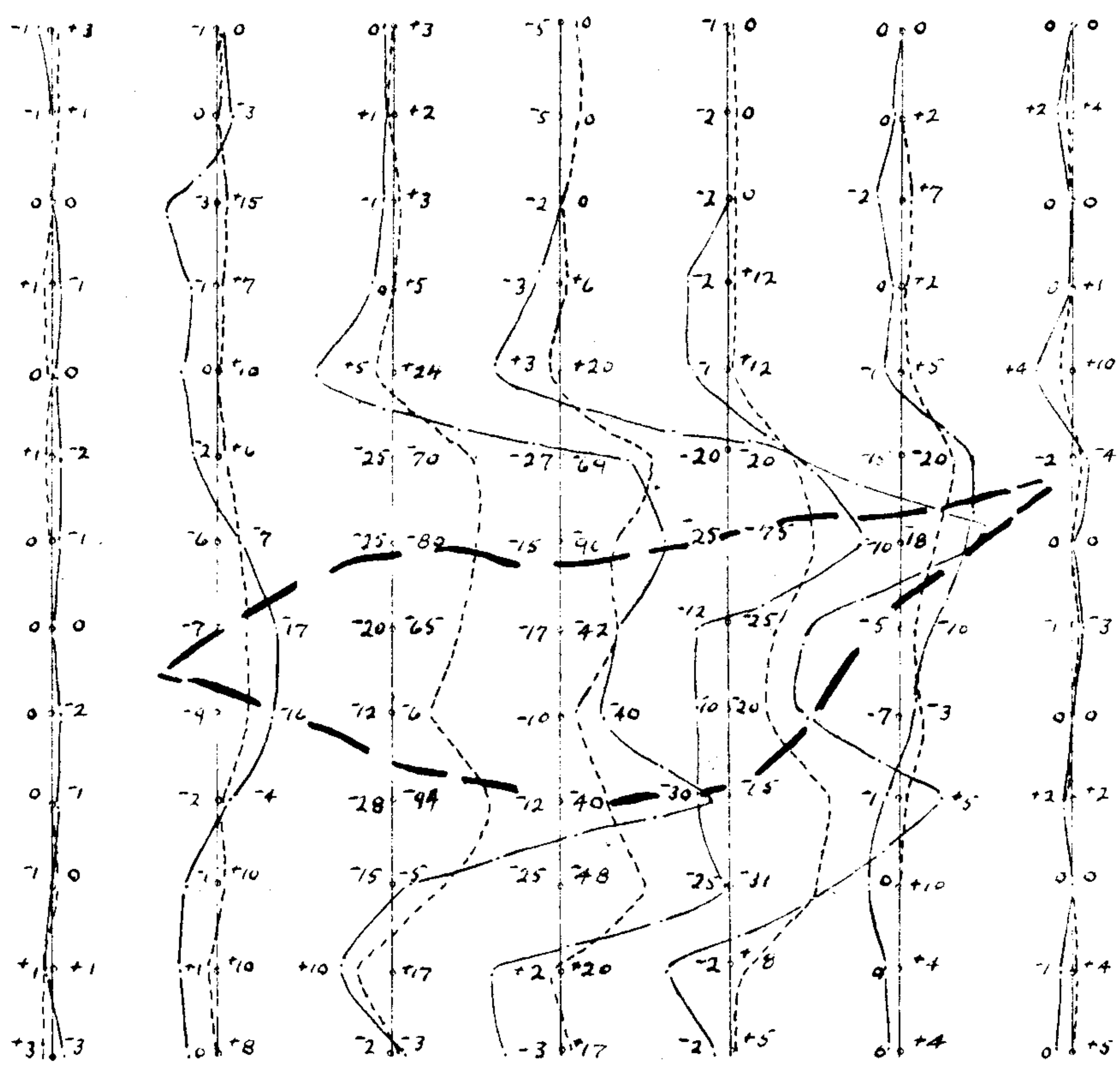
KOKKO CREEK
CAMPBELL CHIBOUGAMAU MINES

FIELD TEST
USING
"HORIZONTAL LOOP" E.M. METHOD
by
PROSPECTING GEOPHYSICS LTD.
SCALE: 1" = 100'

IN PHASE COMPONENT (50% = 1")
OUT OF PHASE COMPONENT (50% = 1")

ure 4

March 1957



303

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 303 MAP #5

STRATMAT
BATHURST-NEWCASTLE AREA
N.B.
SULPHIDE ZONE

FIELD TEST USING HORIZONTAL LOOP-
E-M METHOD
by
PROSPECTING GEOPHYSICS LTD.
SCALE- 1" = 100'

IN PHASE COMPONENT (1" = 50%)

OUT OF PHASE COMPONENT (1" = 50%)

Figure 2