REPORT ON THE RECONNAISSANCE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE

ALICE - OFTEN CLAIM GROUP
AFTON AREA, KAMLOOPS MINING DIVISION,
BRITISH COLUMBIA
FOR
CAIRN MINES LTD. (N. P. L.)

### McPHAR GEOPHYSICS

### NOTES ON THE THEORY, METHOD OF FIELD OPERATION, AND PRESENTATION OF DATA FOR THE INDUCED POLARIZATION METHOD

Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present

in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d. c. current is allowed to flow through the rock; i. e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces, to appreciably reduce the amount of current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d.c. voltage used to create this d.c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.

The values of the per cent frequency effect or F. E. are a measurement of the polarization in the rock mass. However, since the measurement of the degree of polarization is related to the apparent resistivity of the rock mass it is found that the metal factor values or M. F. are the most useful values in determining the amount of polarization present in the rock mass. The MF values are obtained by normalizing the F. E. values for varying resistivities.

The induced polarization measurement is perhaps the most powerful geophysical method for the direct detection of metallic sulphide mineralization, even when this mineralization is of very low concentration. The lower limit of volume per cent sulphide necessary to produce a recognizable IP anomaly will vary with the geometry and geologic environment of the source, and the method of executing the survey. However, sulphide mineralization of less than one per cent by volume has been detected by the IP method under proper geological conditions.

The greatest application of the IP method has been in the search for disseminated metallic sulphides of less than 20% by volume. However, it has also been used successfully in the search for massive sulphides in situations where, due to source geometry, depth of source, or low resistivity of surface layer, the EM method can not be successfully applied. The ability to differentiate ionic conductors, such as water filled shear zones, makes the IP method a useful tool in checking EM

anomalies which are suspected of being due to these causes.

In normal field applications the IP method does not differentiate between the economically important metallic minerals such as chalcopyrite, chalcocite, molybdenite, galena, etc., and the other metallic minerals such as pyrite. The induced polarization effect is due to the total of all electronic conducting minerals in the rock mass. Other electronic conducting materials which can produce an IP response are magnetite, pyrolusite, graphite, and some forms of hematite.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points in distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes is an integer number (n) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (nX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (n); i.e. (n) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (n) used.

In plotting the results, the values of the apparent resistivity, apparent per cent frequency effect, and the apparent metal factor

measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. (See Figure A.) The resistivity values are plotted above the line as a mirror image of the metal factor values below. On a second line, below the metal factor values, are plotted the values of the per cent frequency effect. In some cases the values of per cent frequency effect are plotted as superscripts of the metal factor value. In this second case the frequency effect values are not contoured. The lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (nX) between the current and potential electrodes when the measurement was made.

The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. The plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field results, model study results and theoretical investigations. The position of the electrodes when anomalous values are measured is important in the interpretation.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made. One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance (X) over which the electrodes are moved each time. In the past, intervals have been used ranging from 25 feet to 2000 feet for (X). In each case, the decision as to the distance (X) and the values of (n) to be used is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

The diagram in Figure A demonstrates the method used in plotting the results. Each value of the apparent resistivity, apparent metal factor, and apparent per cent frequency effect is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of (n) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of (n); i. e. the depth of the measurement is increased. When the F. E. values are plotted as superscripts to the MF values the third section of data values is not presented and the F. E. values are not contoured.

The actual data plots included with the report are prepared utilizing an IBM 360/75 Computer and a Calcomp 770/763 Incremental Plotting System. The data values are calculated, plotted, and contoured according to a programme developed by McPhar Geophysics. Certain symbols have been incorporated into the programme to explain various situations in recording the data in the field.

The IP measurement is basically obtained by measuring the difference in potential or voltage ( $\Delta V$ ) obtained at two operating frequencies. The voltage is the product of the current through the ground and the apparent resistivity of the ground. Therefore in field situations where the current is very low due to poor electrode contact, or the apparent resistivity is very low, or a combination of the two effects; the value of ( $\Delta V$ ) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.

In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisey to record a reading.

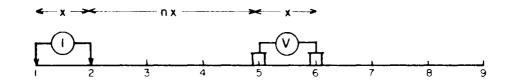
If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, the reading is bracketed in the data plot ().

In certain situations negative values of Apparent Frequency Effect are recorded. This may be due to the geologic environment or spurious electrical effects. The actual negative frequency effect value recorded is indicated on the data plot, however the symbol "NEG" is

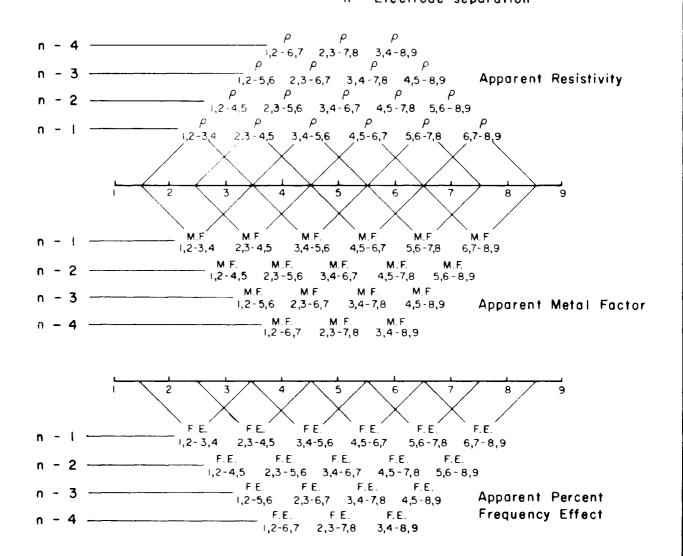
indicated for the corresponding value of Apparent Metal Factor. In contouring negative values the contour lines are indicated to the nearest positive value in the immediate vicinity of the negative value.

The symbol "NR" indicates that for some reason the operator did not attempt to record a reading although normal survey procedures would suggest that one was required. This may be due to inaccessible topography or other similar reasons. Any symbol other than those discussed above is unique to a particular situation and is described within the body of the report.

### METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS



Stations on line x = Electrode spread length n = Electrode separation



### McPHAR GEOPHYSICS LIMITED

### REPORT ON THE

### RECONNAISSANCE INDUCED POLARIZATION AND RESISTIVITY SURVEY

ON THE

ALICE - OFTEN CLAIM GROUP

AFTON AREA, KAMLOOPS MINING DIVISION, B.C.

FOR

CAIRN MINES LTD. (N.P.L.)

### 1. INTRODUCTION

At the request of Mr. A. R. Hanna, Vice-President of Cairn Mines Ltd. (N. P. L.), we have completed a Reconnaissance Induced Polarization and Resistivity Survey on the Alice-Often Claim Group. The area of interest lies within the Kamloops Mining Division, about thirteen miles, by road, from the town of Kamloops.

In the Kamloops Area, several copper deposits of economic interest are known. The disseminated copper mineralization (of the "porphyry copper" type) is associated with Jurassic age intrusives (Iron-Mask Batholith, Guichon Batholith, etc.) that have intruded the Nicola Volcanics and Sedimento of Triassic age.

Little is known about the geology of the Alice-Often Claim

Group. The regional geologic picture shows that the area is underlain

by Nicola Volcanics. No mineralization is known on the claims. The reconnaissance Induced Polarization and Resistivity survey was planned in an attempt to locate any zones of metallic mineralization that might be present, but hidden by the overburden. As shown in the Appendix to this report, the Induced Polarization method has been found to be very useful in this form of exploration.

The company's geological consultant has recommended that a magnetic survey and a geochemical soil sampling survey also be completed.

### 2. PRESENTATION OF RESULTS

The induced Polarization and Resistivity results are shown on the following enclosed data plots. The results are plotted in the manner described in the notes preceding this report.

Line	Electrode Intervals	Dwg. No.
56N	300 feet	1.P. 5959-1
52 N	300 feet	1.P. 5959-2
48N	300 feet	I.P. 5959-3
44N	300 feet	I.P. 5959-4
40N	300 feet	1. P. 5959-5
36N	300 feet	I.P. 5959-6
32 N	300 feet	I.P. 5959-7
28N	300 feet	I.P. 5959-8

Also enclosed with this report is Dwg. 1. P. P. 3533, a plan map of the Alice-Often Claim Group Grid at a scale of 1" = 400".

The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manner shown on the legend, on this plan map as well as on the data plots. These bars represent the surface projection of the anemalous sones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the Induced Polarisation measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the electrode interval length; i.e. when using 300' electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 300' apart. In order to definitely locate, and fully evaluate, a narrow, shallow source it is necessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals must be used, with a corresponding increase in the uncertainties of location. Therefore, while the centre of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

The claim boundary information shown on Dwg. I.P.P. 3533 has been taken from maps made available by the staff of Cairn Mines Ltd. (N.P.L.)

### 3. DISCUSSION OF RESULTS

The recent survey shows that the Alice-Often Claim Group is underlain by rocks with a moderately high resistivity. The resistivity level suggests non-porous rocks that are unusual for the Nicola Group rocks in the Kamloops Area. The magnetic survey and a complete geological examination may help to clarify the geologic picture.

The Induced Polarization results are of definite interest.

There are two types of Induced Polarization anomalies shown. In a few places, there are narrow, shallow anomalies that suggest narrow sources. However, because 300' electrode intervals were used for the survey the sources cannot be fully evaluated; they could be due to massive mineralization. The anomalous zones have a limited strike length and are of little immediate interest. However, if significant amounts of copper mineralization are located elsewhere on the claim group, it will be desirable to better lecate and evaluate the narrow sources by repeating the measurements using shorter electrode intervals.

The most important I.P. anomalies on the Alice-Often Claim

Group lie at the southeastern corner. Moderate ranguitude, definite I.P.

anomalies were measured on several lines; as shown on the plan map,

the anomalies can be correlated to form an anomalous zone.

The sone suggests the presence of a substantial volume of disseminated metallic mineralisation. The concentrations could be two to four per cent. As explained in the Appendix to this report, this amount of mineralisation can be of economic importance, if the proper minerals are present. It would be necessary to extend the measurements to the south and east in order to fully determine the lateral extent of the mineralization. On Line 32N and Line 28N the measurements for  $K = 300^\circ$  and n = 1 are definitely anomalous. This suggests a relatively shallow depth to the top (i.e. less than 300°). The depth to the top could be better evaluated by repeating the measurements using shorter electrode intervals.

### 4. CONCLUSIONS AND RECOMMENDATIONS

The Reconnaissance Induced Polarisation and Resistivity survey on the Alice-Often Claim Group has outlined an anomalous zone of definite interest at the southeastern corner of the claim group. The I.P. results suggest the presence of a substantial volume of disseminated metallic mineralisation. This type of mineralisation can be of great economic interest in the Kamloops Area, particularly if the mineralisation is contained within intrusive rocks.

The anomalous sone should be compared with the available geological and geochemical data. If the source of the I.P. anomaly is not known, drilling would be warranted. Several vertical percussion drill holes in the interval from 24+00E to 33+00E on Line 32N should determine the type of metallic mineralization causing the I.P. anomalies. The holes would have to be drilled to a depth of 250' to 350'.

If the mineralization intersected is of economic interest, the

L.P. measurements should be extended in order to determine the lateral

extent of the anomalous zone.

MEPHAR GEOPHYSICS LIMITED

Philip G. Hallof, Geophysicist.

Ashton W. Mullan, Geologist.

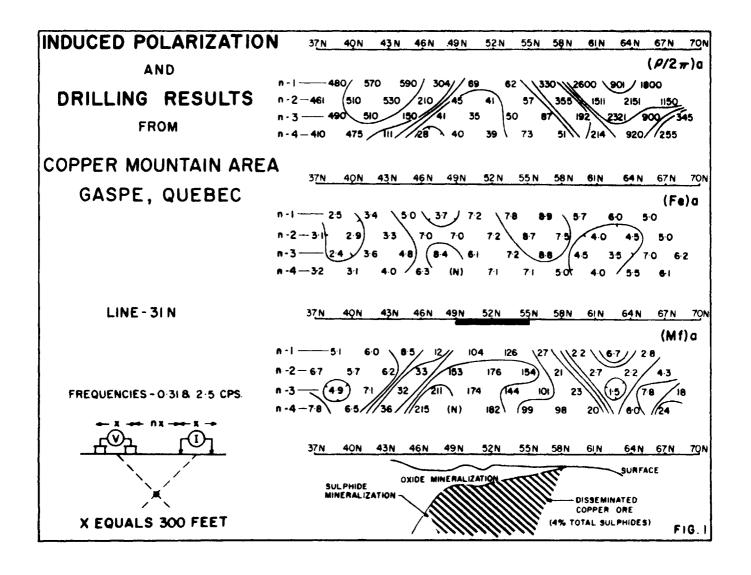
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### McPHAR GEOPHYSICS

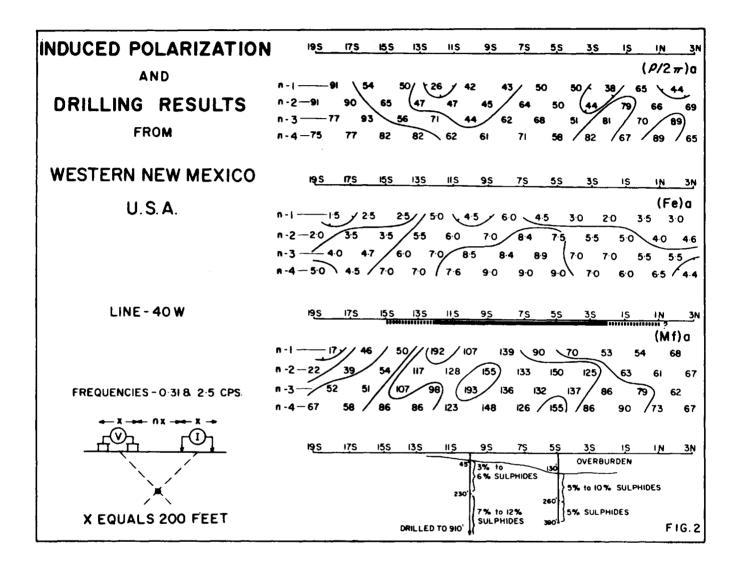
### **APPENDIX**

### EXPECTED IP ANOMALIES FROM "PORPHYRY COPPER" TYPE ZONES OF DISSEMINATED SULPHIDE MINERALIZATION

Our experience in other areas has shown that the induced polarization method can be successfully used to locate, and outline, zones of disseminated sulphide mineralization of the "porphyry copper" type. In most cases the interpretation of the IP results is simple and straightforward. The results shown in Figure 1 and Figure 2 are typical.

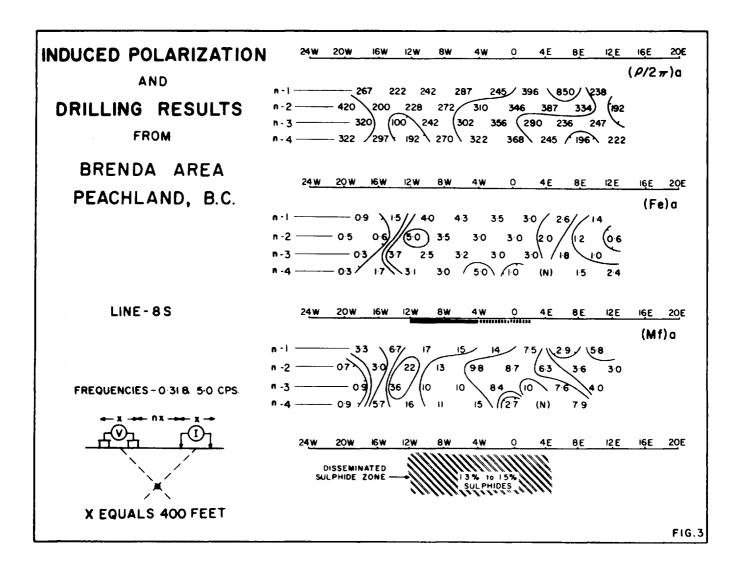


The source of the moderate magnitude IP anomaly shown in Figure 1 contains approximately 4% metallic mineralization. The zone is of limited lateral extent and enough copper is present to make the mineralization "ore grade". The presence of the surface oxidation can be seen in the fact that the apparent IP effects increase for n = 2.



The IP anomaly shown in Figure 2 has about the same magnitude as that described above. It should be noted that appreciably greater concentrations of metallic mineralization are present; further, there is little or no copper present. These results illustrate the fact that IP results can not be used to determine the exact amount of metallic mineralization present or to determine the economic importance of a mineralized zone. In some geologic situations zoning is present; the zones of mineralization of greatest economic value may contain less total metallic mineralization than other zones in the same general area.

In the proper geologic environment, the method will detect even very low concentrations of metallic mineralization. The IP results shown in Figure 3 located the ore zone at the Brenda Property near Peachland, B.C. The zone contains 1.0 to 1.5 per cent metallic mineralization; however, the mineralization is "ore grade" because only molybdenite and chalcopyrite are present.



OF ANOMALOUS ZONES

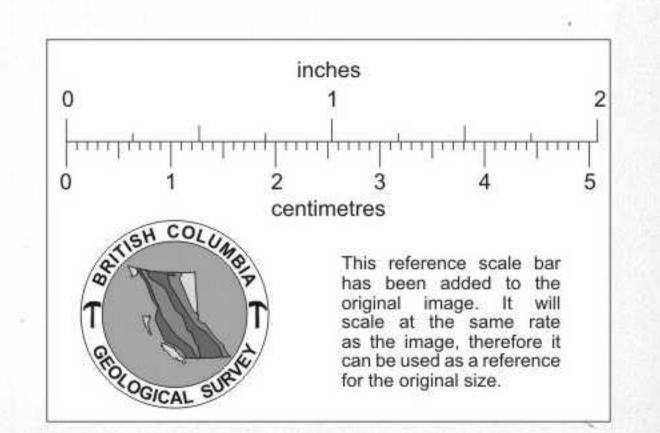
PROBABLE INTERNATIONAL POSSIBLE IIIIIII Number at the end of anomaly indicates electrode interval

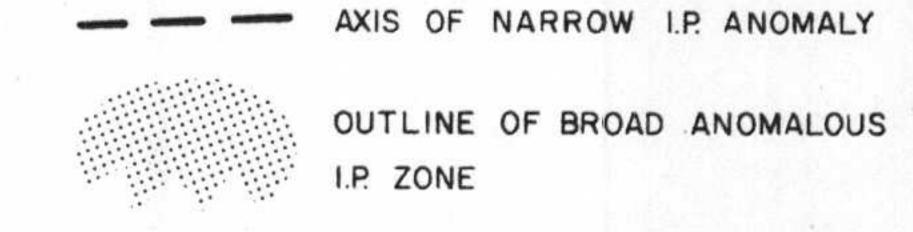
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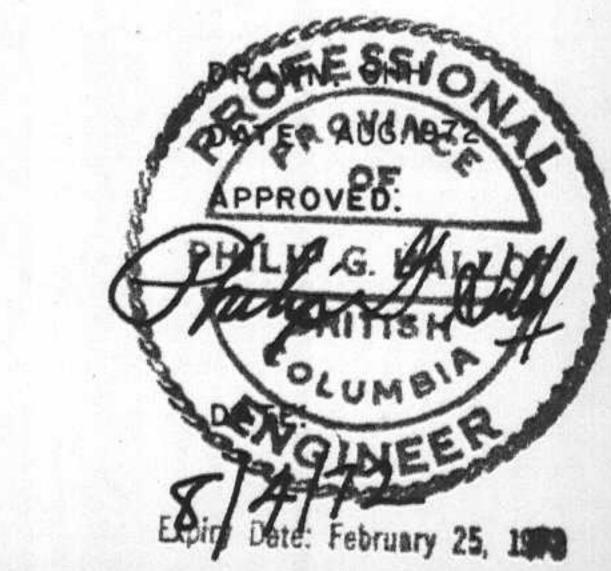
ALICE OFTEN GROUP, AFTON AREA KAMLOOPS M.D., BRITISH COLUMBIA

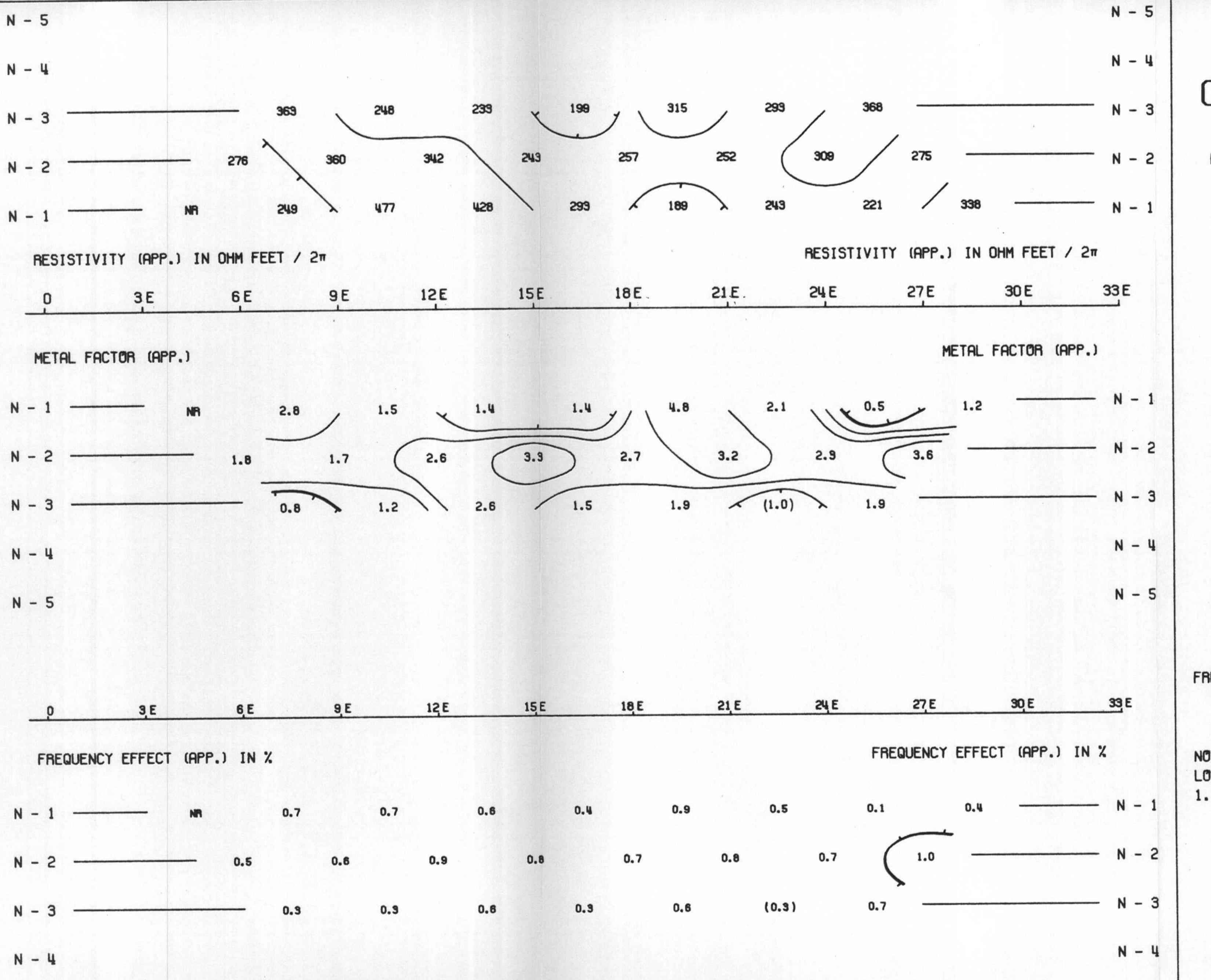
SCALE

ONE INCH EQUALS FOUR HUNDRED FEET







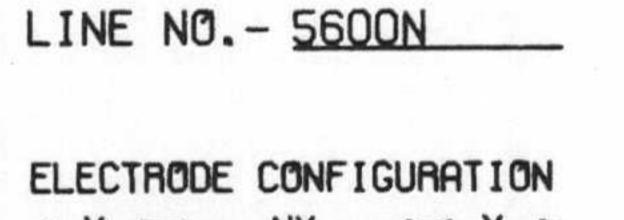


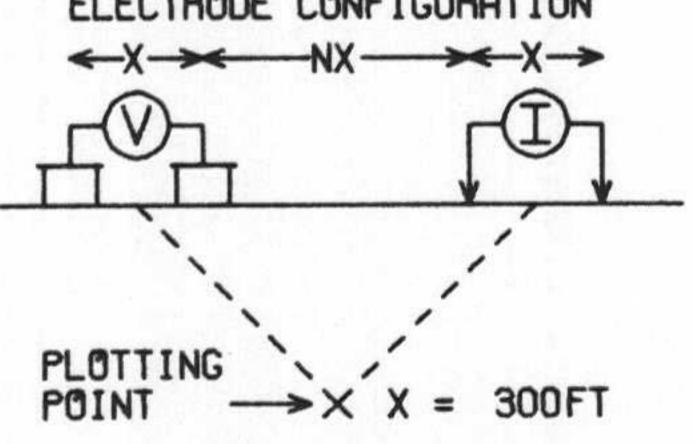
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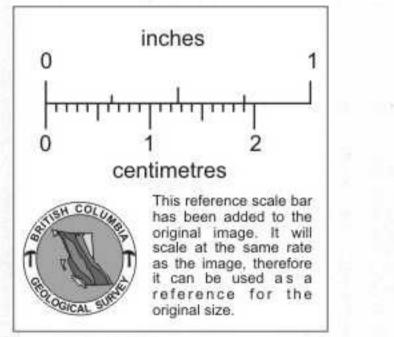
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### CAIRN MINES LTD. (N.P.L.)

ALICE OFTEN GROUP, AFTON AREA, KAMLOOPS M.D. B.C.







SURFACE PROJECTION OF ANOMALOUS ZONES

PROBABLE POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

N-5

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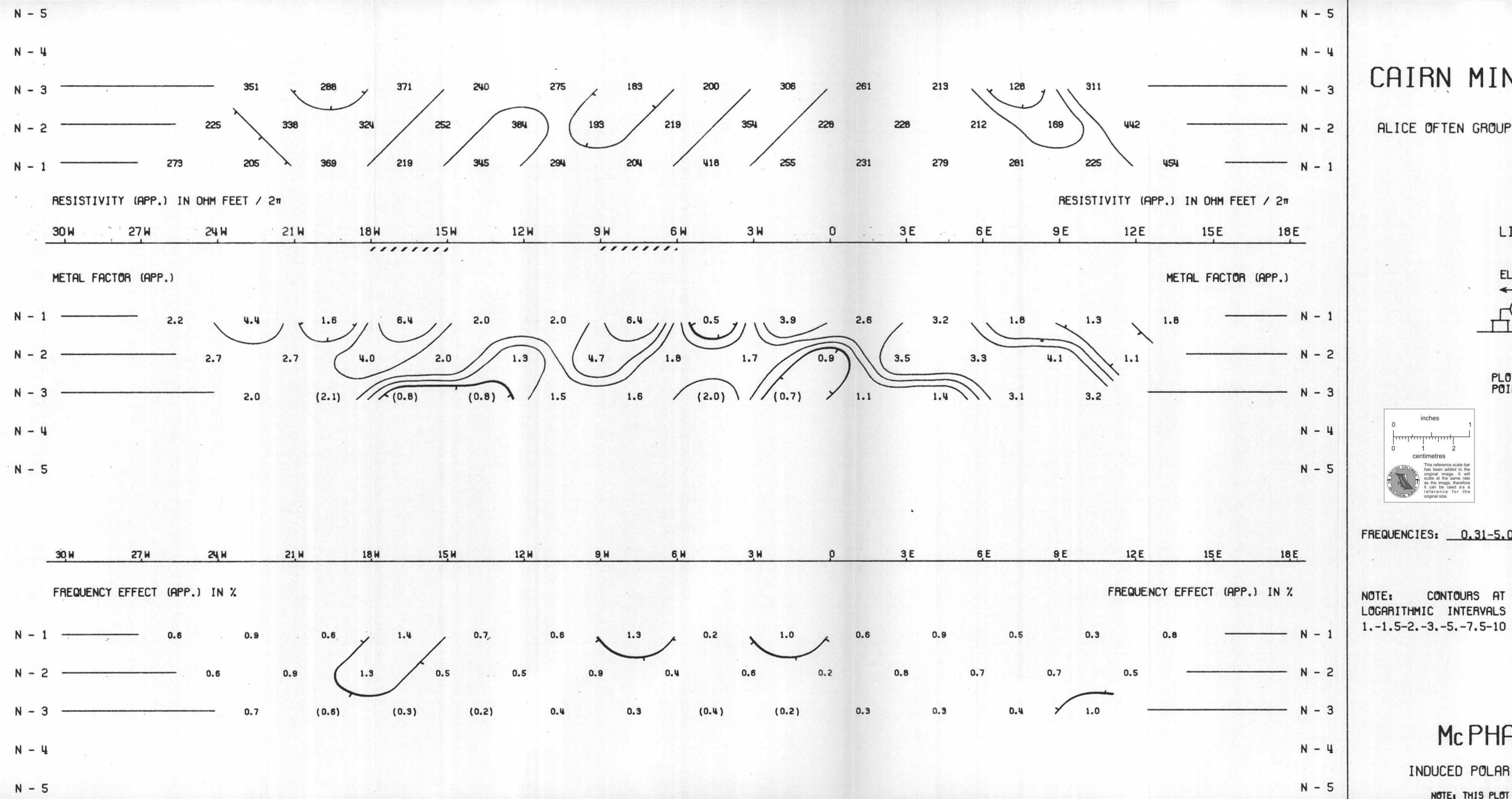
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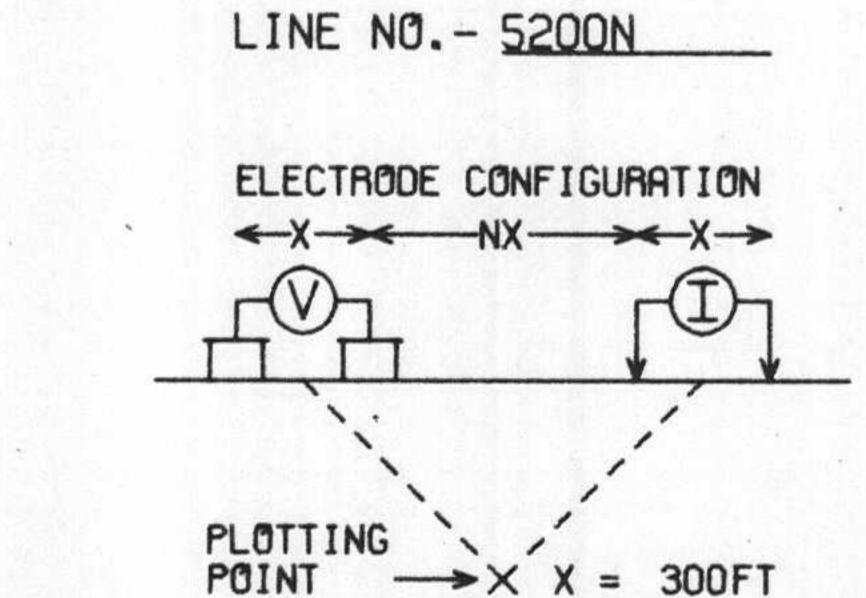
### McPHAR GEOPHYSICS

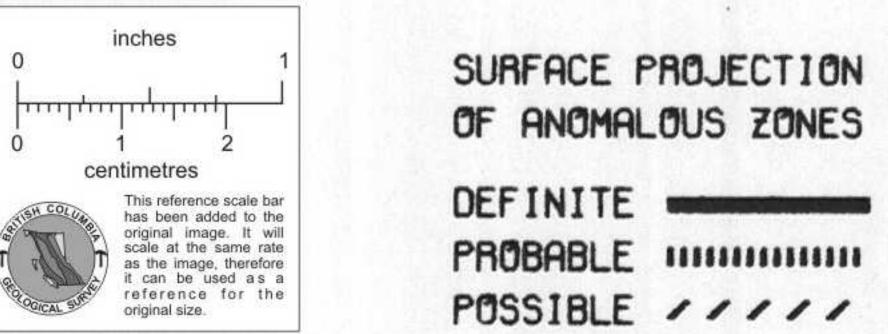


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## CAIRN MINES LTD. (N.P.L.)

ALICE OFTEN GROUP, AFTON AREA, KAMLOOPS M.D. B.C.





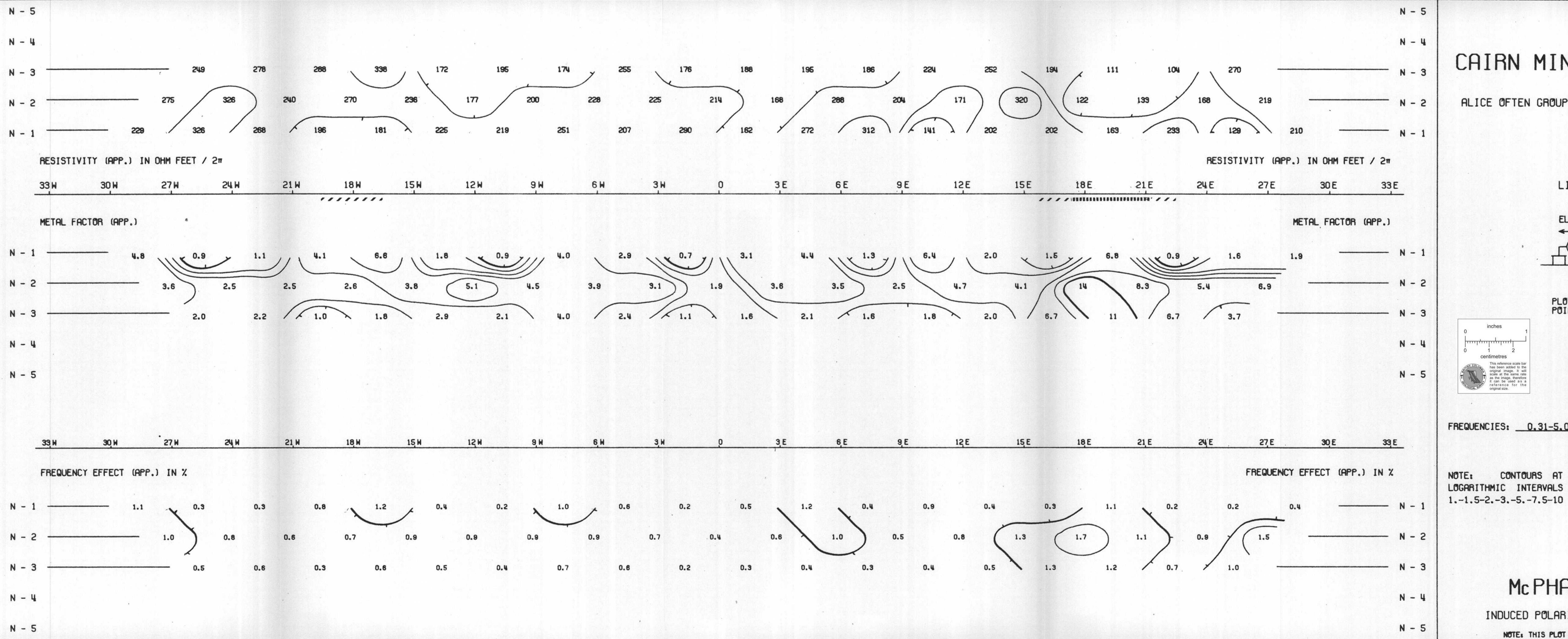
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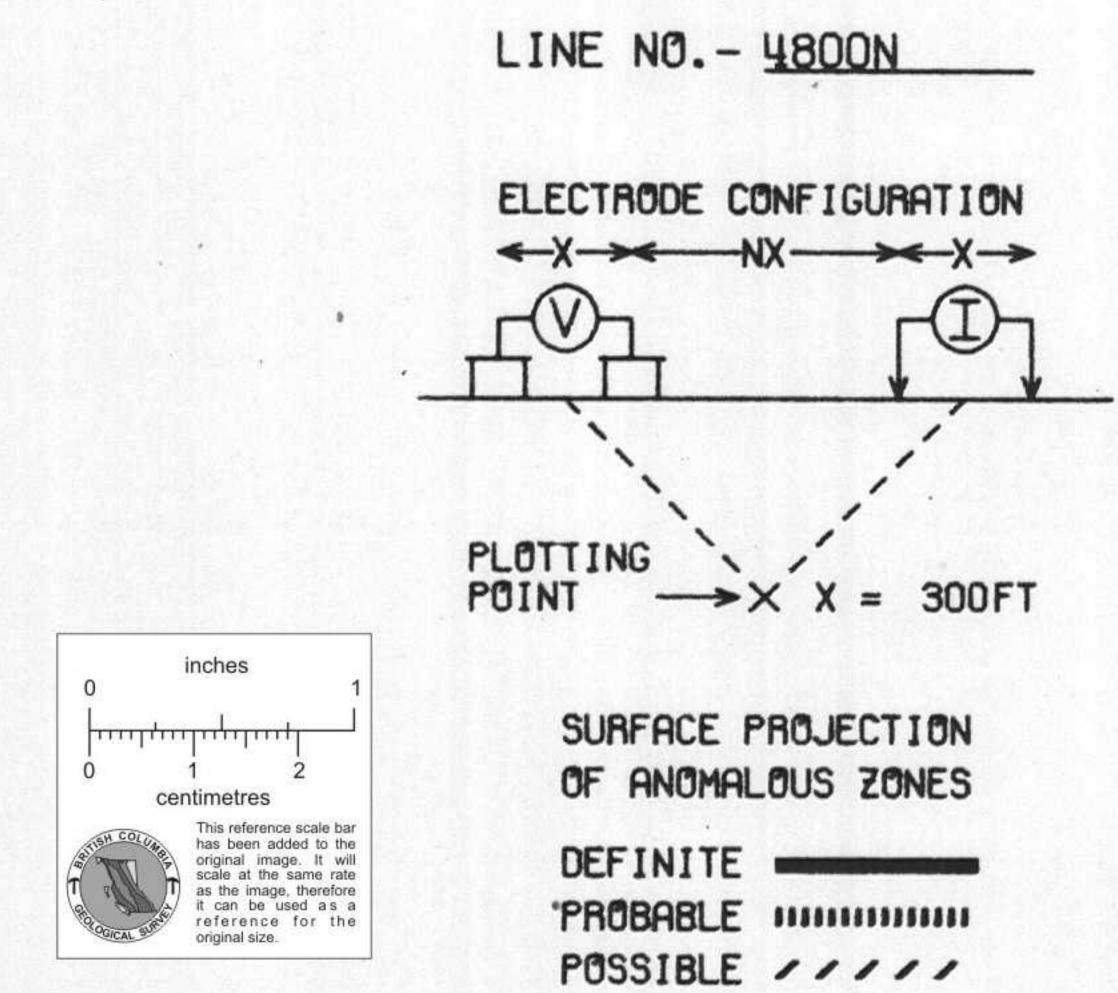
INDUCED POLARIZATION AND RESISTIVITY SURVEY

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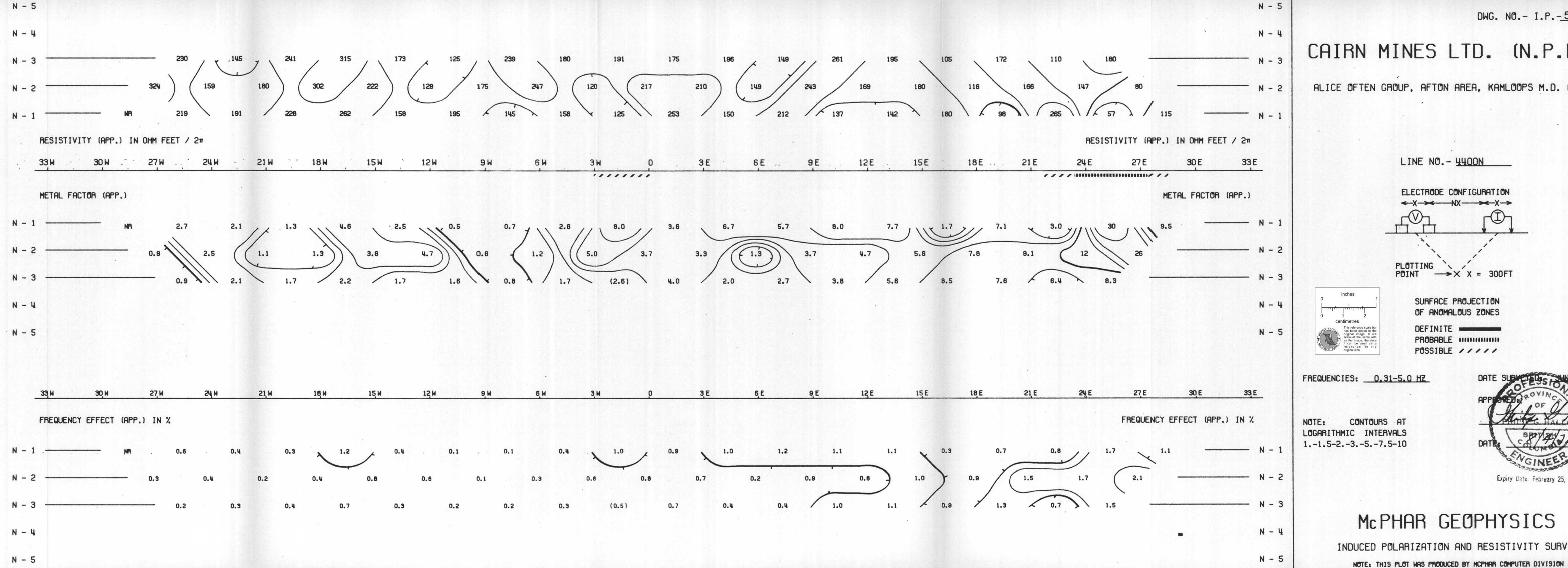


FREQUENCIES: 0.31-5.0 HZ

LOGARITHMIC INTERVALS

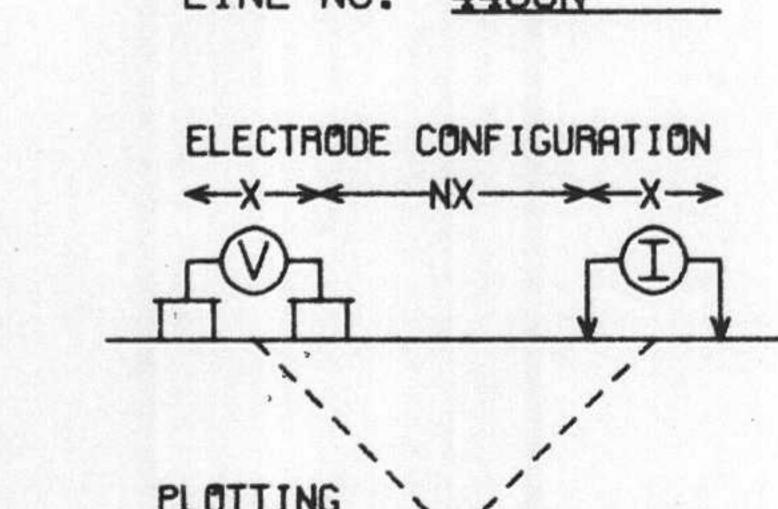
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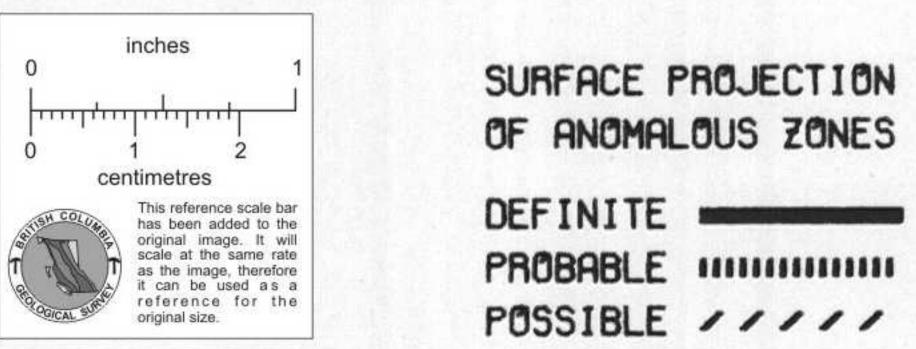
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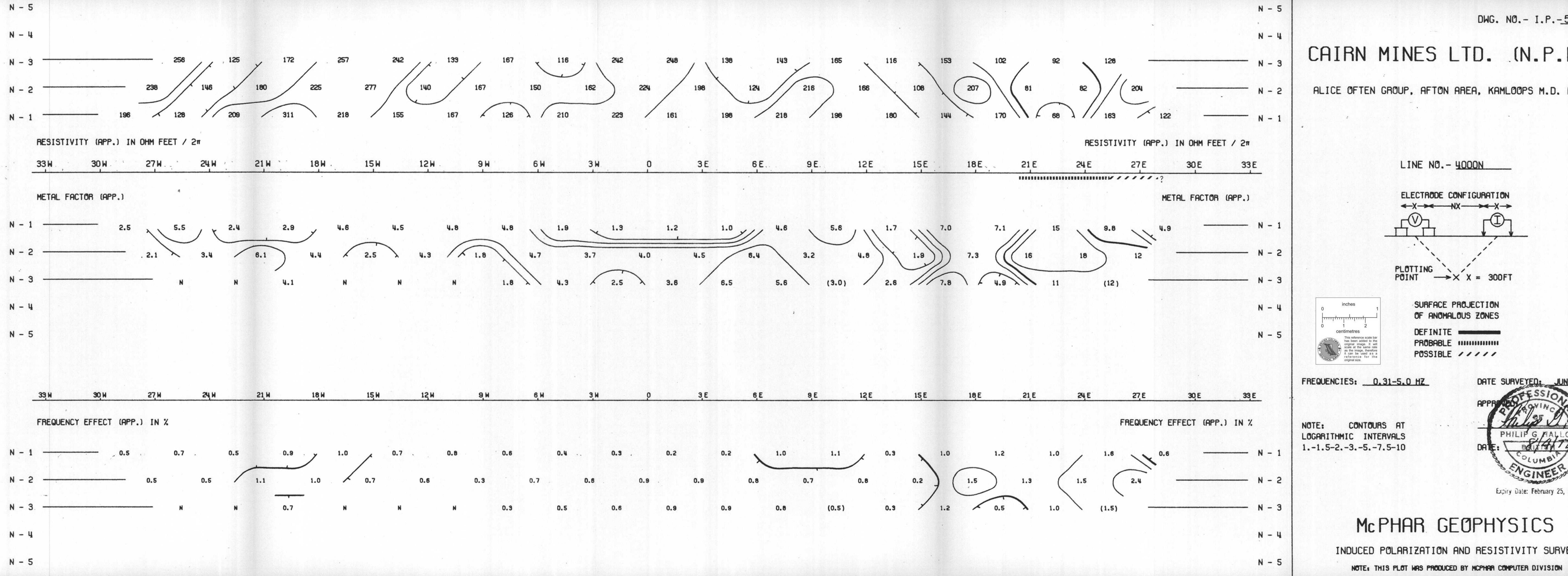
ALICE OFTEN GROUP, AFTON AREA, KAMLOOPS M.D. B.C.

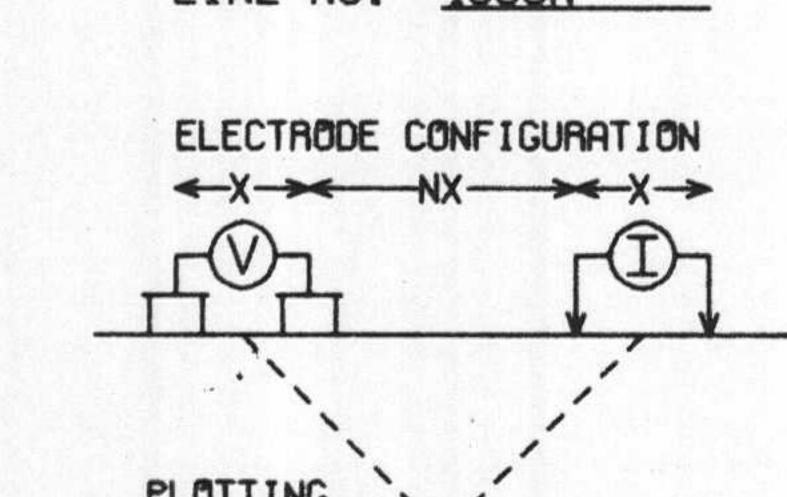




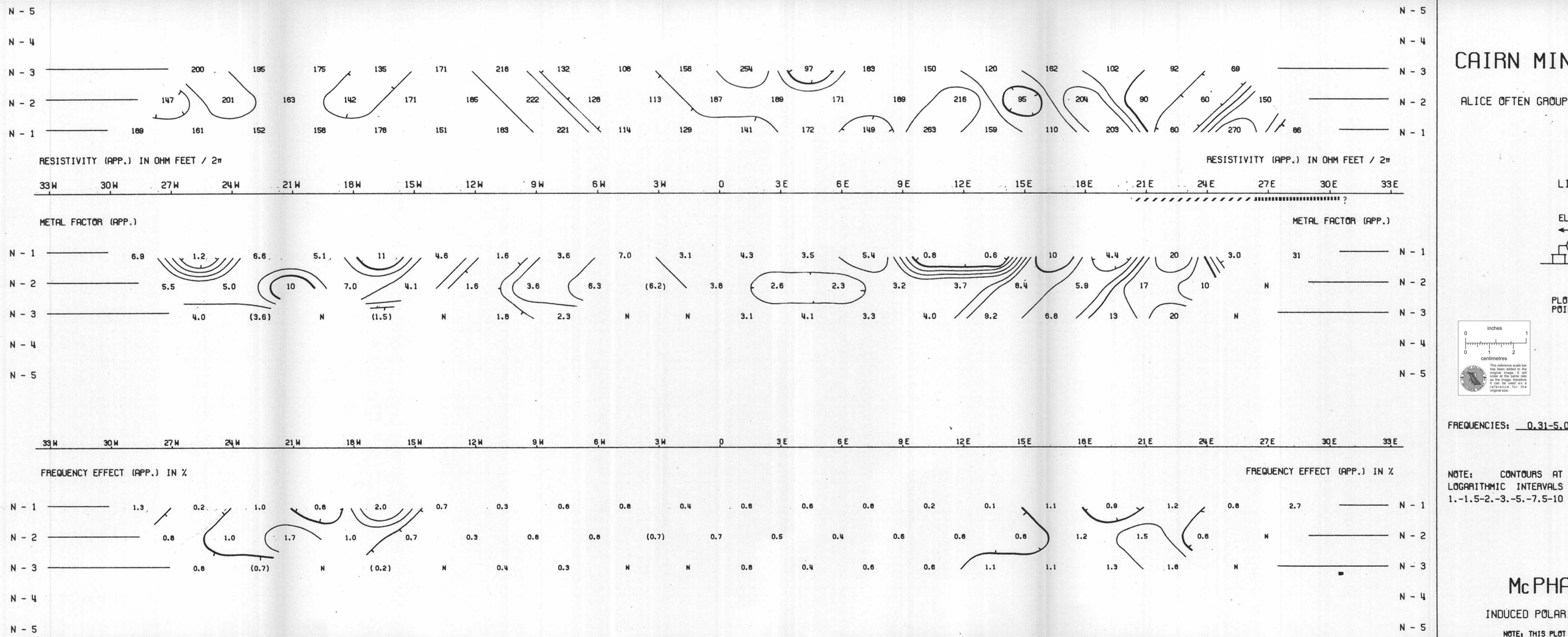
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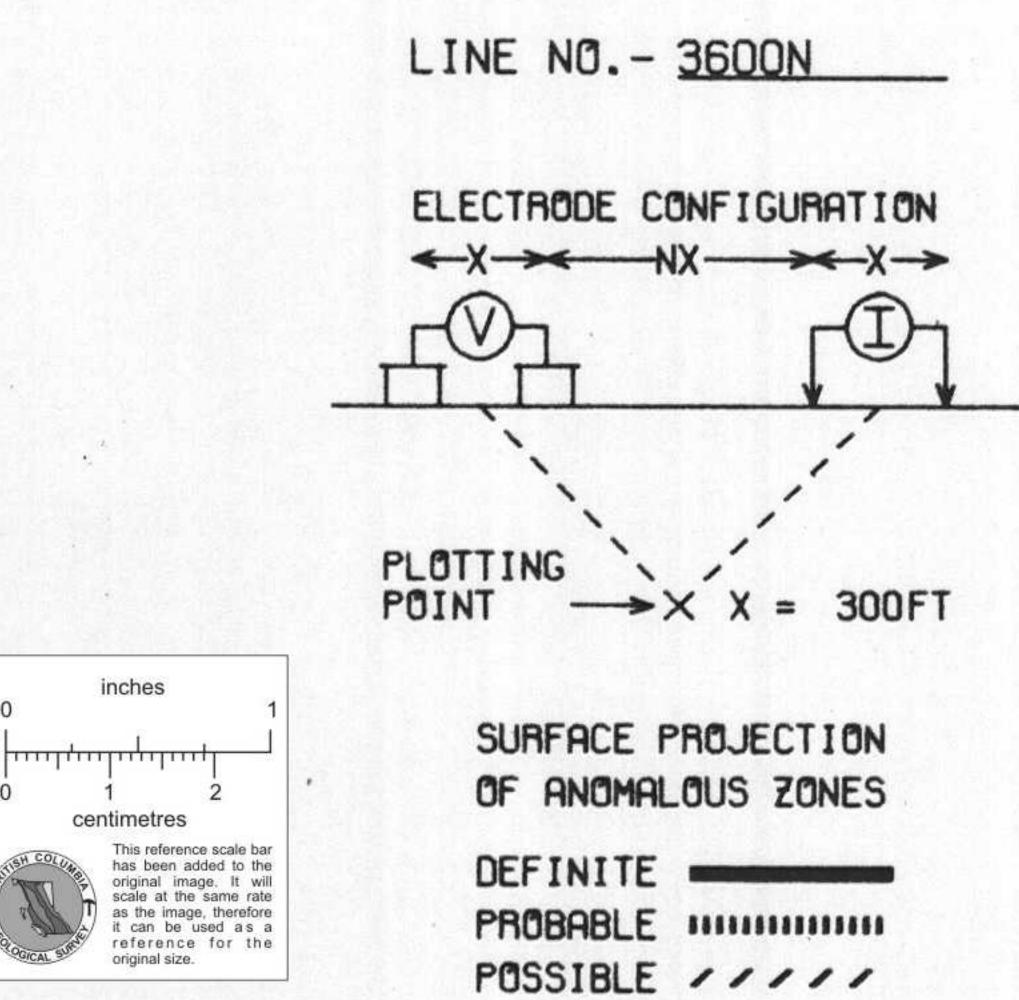






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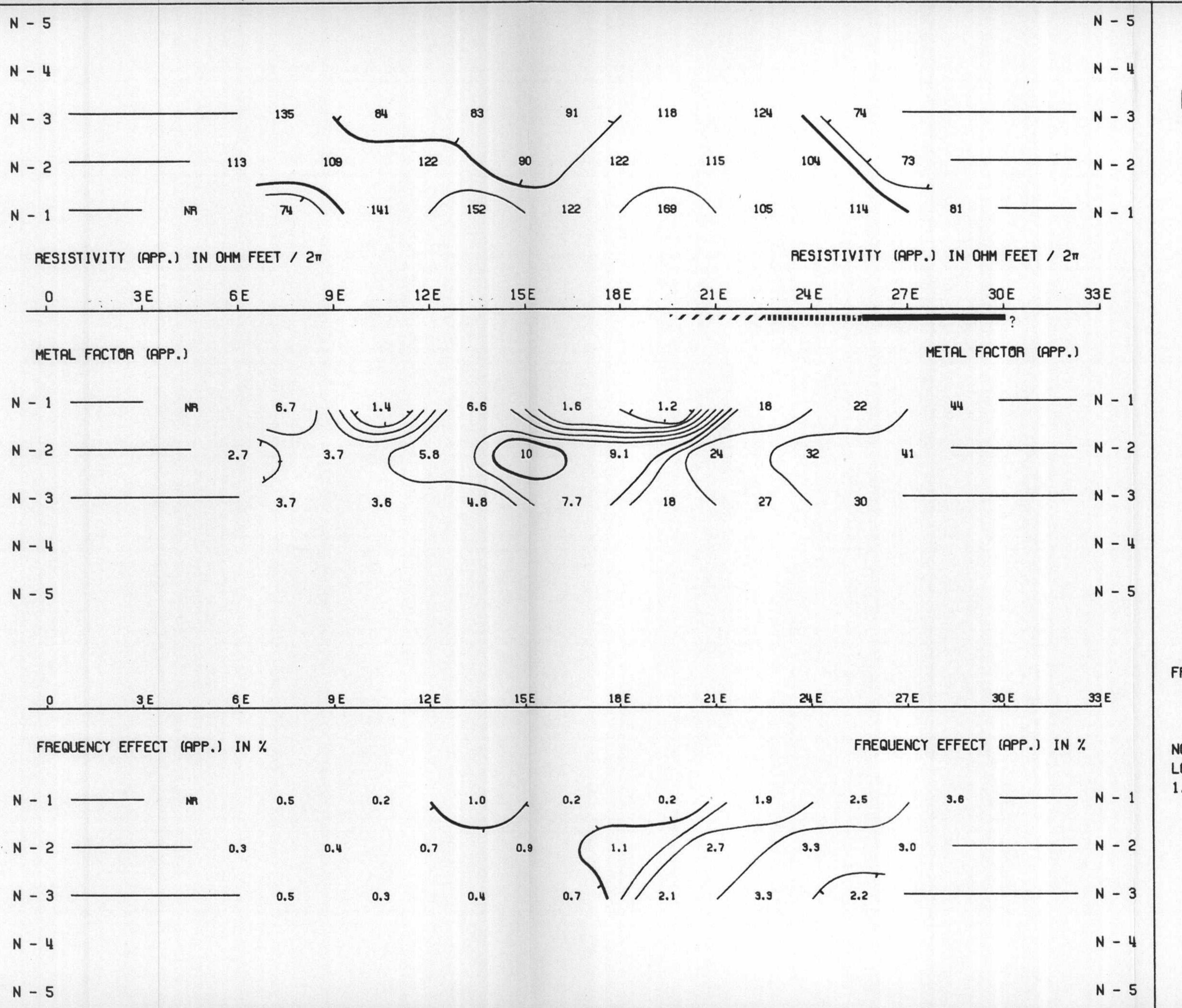


FREQUENCIES: 0.31-5.0 HZ

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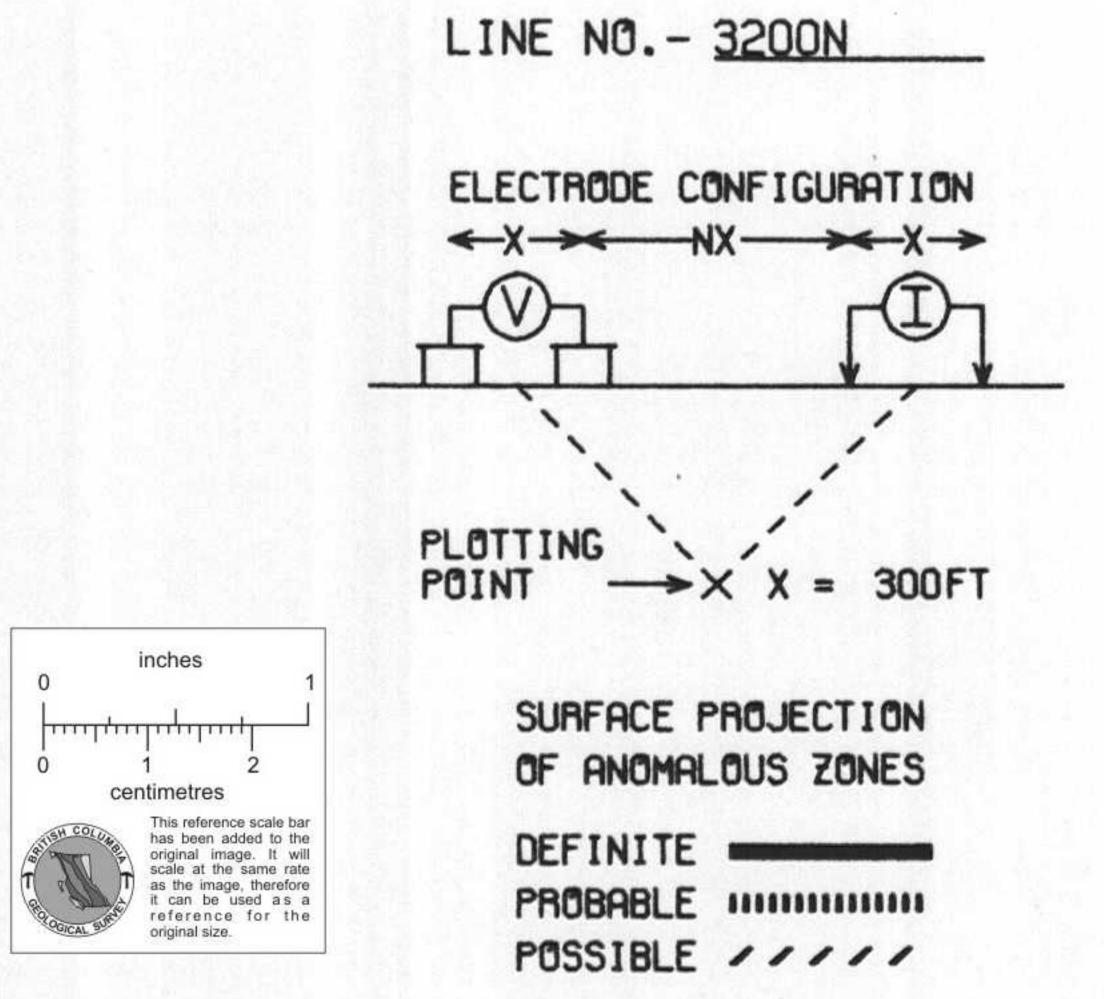
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ALICE OFTEN GROUP, AFTON AREA, KAMLOOPS M.D. B.C.



FREQUENCIES: 0.31-5.0 HZ

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

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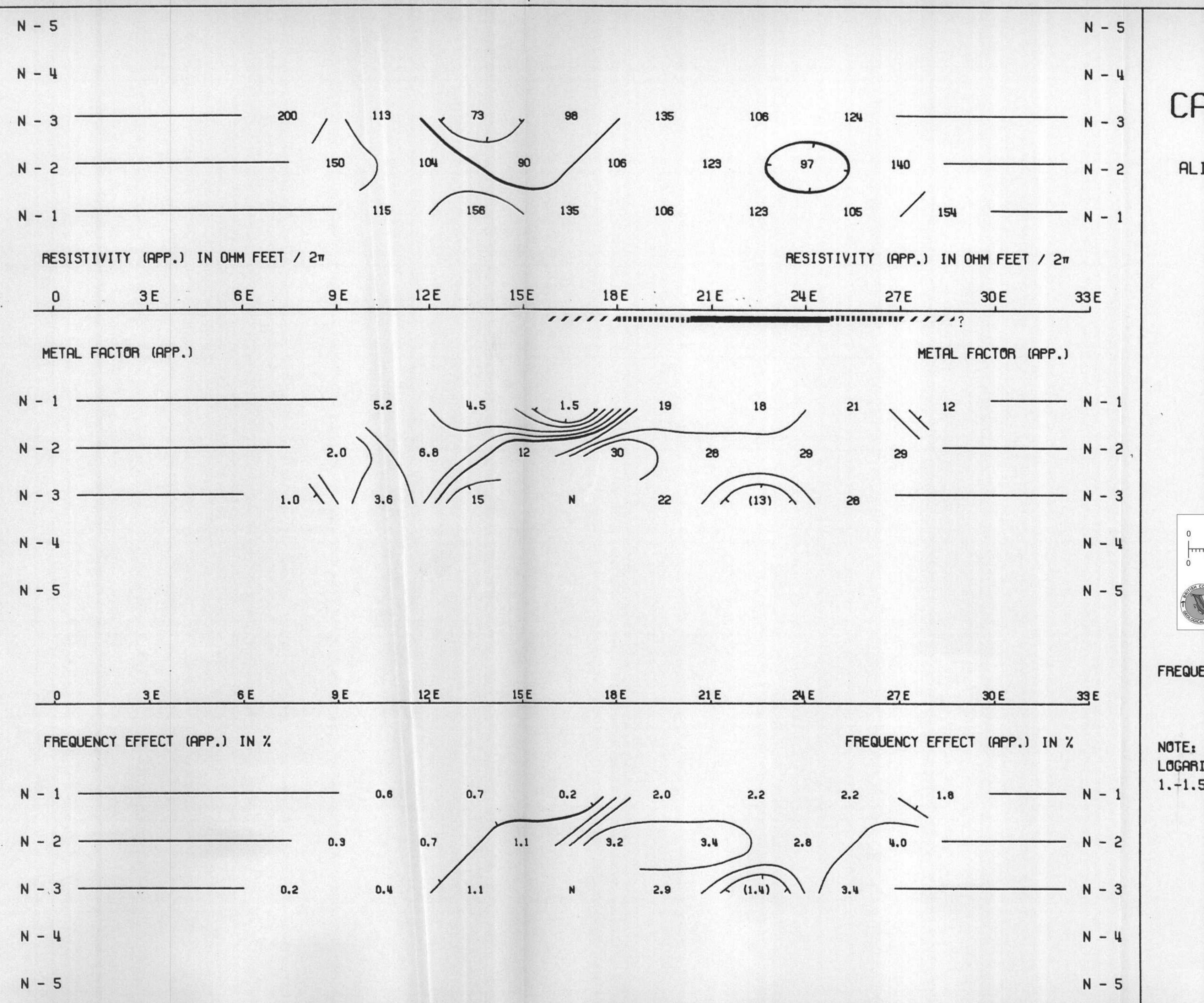
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### McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

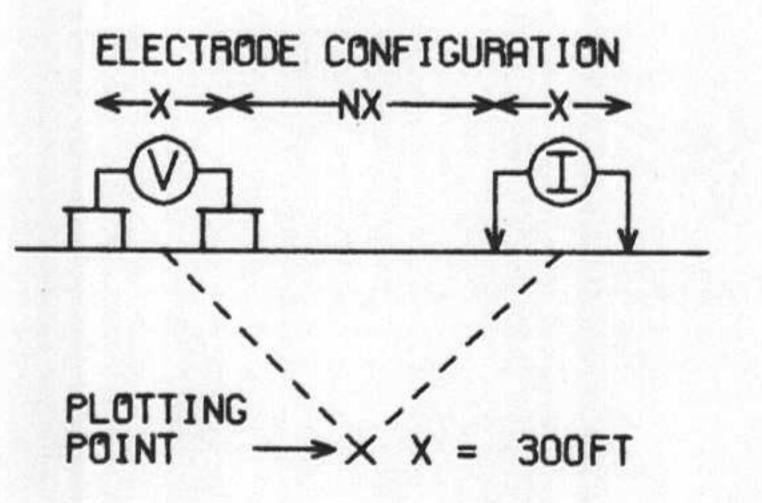
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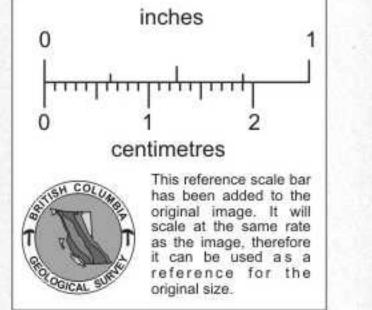


### CAIRN MINES LTD. (N.P.L.)

ALICE OFTEN GROUP, AFTON AREA, KAMLOOPS M.D. B.C.

LINE NO. - 2800N



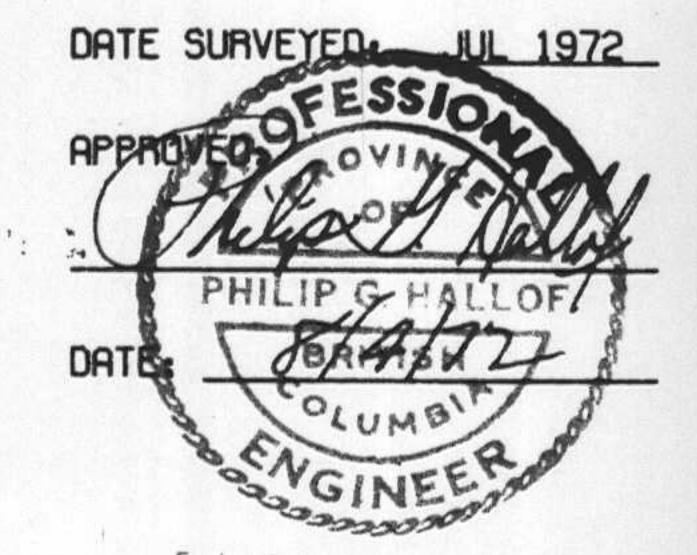


SURFACE PROJECTION OF ANOMALOUS ZONES

PROBABLE POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

NOTE: CONTOURS AT
LOGARITHMIC INTERVALS
1.-1.5-2.-3.-5.-7.5-10



Expiry Date: February 25, 1973

### McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY
NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

### PROGRESS REPORT

### CAIRN MINES LTD. (N.P.L.)

Alice-Often Group Kamloops, British Columbia

Vancouver, B.C.

July 8, 1972

W.G. Hainsworth P.Eng.

### W. G. HAINSWORTH

CONSULTING GEOLOGIST

### INTRODUCTION

This progress report on the Kamloops area property of CAIRN MINES LTD. (N.P.L.) follows the completion of Phase I and Phase II as recommended in the author's report of April 20th 1972.

A progress report was issued by the writer on May 24th 1972 covering the results of the early operations on the property. The recommendations of that date included a restricted in area Induced Polarization survey which operation has since been carried out by the company.

The property was visited by the writer near the completion of the Induced Polarization survey on June 30th 1972.

### SUMMARY & CONCLUSIONS

The completed surveys have shown the CAIRN MINES LTD (N.P.L.) claim block to have anomalous conditions existing in all surveys.

The eastern half, particularily the central and southern portions, carries more anomalous developments than its western counterpart.

There is a modest, although not strong, coincidence between the Induced Polarization, geochemical and electromagnetic surveys. In particular the property's strongest soil anomaly lies in the general area of the induced polarization high results. The electromagnetic survey coincides in part with the soils and the I.P. The magnetometer anomaly (a 'low') seemingly has no connection with the other survey anomalies.

The agreement between portions of the various surveys plus their moderate to strong intensities warrant further checking through a limited drill program.

### RECOMMENDATIONS

The area of strongest anomaly overlap should be checked out by surface drilling. The writer recommends a diamond drill program of, initially, a 1000 feet. This program should check out the I.P., soil and E.M. anomalies coincidentally existing on line 28 between 20+00 East and 26+00 East. The drill holes should be vertical, to depths of 350 feet each and located at 20+00 East 23+00 East 26+00 East

Cost estimates for this program:

1000 feet BQ drilling @ \$9.50/ft.		= \$	9,500
Core grabbing, sample preparation etc.			700
Core assaying		=	350
Consultation		=	500
Misc.		=	500
Contingencies 10%		_	11,550
	Total	22	\$12,700

Should the results from this limited program be encouraging, then consideration should be given to an expanded drill program working on a grid network.

### LOCATION & ACCESS

Location of the claim group is some eleven miles southwest of the city of Kamloops, British Columbia. The claims lie within the Kamloops Mining Division.

At a point 12 miles south of the TransCanada Highway, on the Kamloops-Lac LeJeune road, CN Communications have an access road to their repeater station. At the  $3\frac{1}{2}$  mile marker on this road, CAIRN MINES has pushed a road north to a point slightly below their northern boundary. This road should only be travelled

by a four wheel drive vehicle.

### PROPERTY

Since the last progress report, CAIRN MINES has purchased from Brian Hanna, a claim group immediately adjoining the CAIRN block to the west. There are eighteen (18) claims in the group called the LODI 1-15 inclusive plus the LODI 17-19 inclusive. These claims were recorded in Vancouver on June 20th 1972. No work has been done on these claims. The newly-purchased group lies between the Bronco group to the north and the Cash group on the south.

### SURVEYS

The following surveys have been completed as per recommendations:

- (1) Claim Survey
- (2) Magnetometer Survey
- (3) Soil Sampling Survey
- (4) Electromagnetic Survey
- (5) Induced Polarization Survey

Accompanying this report is a composite map showing the results of all five surveys.

### Claim Survey

Refer to report of May 24th 1972.

### Magnetometer Survey

The original survey on the small grid showed an irregular magnetic 'low' running east-west across the central portion of the claim group. With the expanded grid this magnetic anomaly has been traced farther to the east where it passes out of the CAIRN ground. To the west the anomalous situation shows a weak attentuation to finally die out within the claims.

### Soil Sampling Survey

Three new soil anomalies were uncovered in the expanded survey. In addition

several previously discovered anomalies were expanded or cut-off.

In addition to the original 695 samples collected an additional 421 samples were taken this time making a total of 1116 samples collected over the full claim block.

The 3 new soil anomalies have been designated K,L and M.

Anomaly 'A' - remains as before. Average 123 ppm Cu.

Anomaly 'B' - has been expanded rather weakly to the southwest. Its average count is 109 ppm Cu.

Anomaly 'C' - as before. Average 93 ppm Cu.

Anomaly 'D' - as before. Average 234 ppm Cu.

Anomaly 'E' - no change. Average 127 ppm Cu.

Anomaly 'F' - This situation has been greatly expanded. Soil assays have shown a hook-up with anomaly'J' previously lying to the south. In addition several narrow bands have been identified extending to the north and east from the original outlines. Its average count is 164 ppm Cu.

Anomaly 'G' - No change. Average 91 ppm Cu.

Anomaly 'H' - No change. Average 95 ppm Cu.

Anomaly 'J' - As stated this anomaly has been expanded into the anomaly 'F' picture.

Anomaly 'K' - This new situation has developed at the eastern boundary of the property on lines 20 and 24. Average 91 ppm Cu.

Anomaly 'L' - A narrow lens of minor importance extending from line 48 through to line 56 near the eastern boundary. Average 111 ppm Cu.

Anomaly 'M' - This new anamoly lies near the baseline in the southern part of the property. It is rather weak having a count of 105 ppm Cu. It remains open to the south.

The recent survey has justified the significance given in earlier reports to anomaly 'F'. This is probably the strongest development on the property. It extends over 750 feet in a north-south direction with a width varying from 25 to 100 feet.

### Electromagnetic Survey

The expansion of this survey to the complete grid has confirmed the relatively

quiet conductivity of the claim block. However several areas of good conductivity were uncovered.

A relatively strong area extends from line 12 through to line 28 over a width of 30 feet near the eastern boundary. This conductive zone is flanked on the west by a pronounced E.M. linear.

Another zone of weaker prominence lines up in the southeast corner of the claim block.

### Induced Polarization Survey

This survey was undertaken by McPhar Geophysics of Vancouver who covered an area roughly of 7.9 line miles. The area included in the survey extended from line 28 north to line 56. Only the eastern portions of lines 28,32 and 56 were covered wheras the eastern and western portions of the lines were run on the remaining lines.

The I.P. survey disclosed an anomalous condition existing from line 48 south to line 28. At the northern end the anomaly appears to deepen while losing some of its intensity. On line 28 and 32 it is relatively strong (4 times background) and at a moderate depth (150 to 200 feet). The anomaly remains open below line 28. It is not too wide varying from 300 to 800 feet through the line. The structure trends north-south but at the north end takes a sharp swing to the northwest before dying out on line 52.

There is a relative coincidence with portions of soil anomaly 'F' particularily in the wider and higher grade areas of the latter situation (line 28 and portions of line 32). It also agrees in part with an E.M. conductive zone. The I.P. survey, unfortunately, does not carry far enough south to establish identity with the southern portion of this same E.M. zone.

The induced polarization survey cuts across the magnetic low in its northern sections and has no apparent relationship to this magnetic situation.

In all, the induced polarization survey is of modest dimensions and intensity.

It has no strong ties with any previous surveys but has several coinciding areas with the E.M. and geochem surveys.

Of interest is the fact that rock samples taken from the numerous outcrops of the claims show little, if any, pyrite. Copper sulphides are in the same classification.

A report is awaited from McPhar Geophysics on the CAIRN induced polarization survey.

Respectfully submitted,

W.G. Hainsworth P.Eng.

Vancouver, B.C.

July 8, 1972.

CAIRN MINES LTD. (N.P.L.)

Alice-Often Group

Kamloops Mining Division

B.C.

April 20, 1972 W.G. Hainsworth P.Eng.

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CONSULTING GEOLOGIST

## INTRODUCTION

At the request of Mr. A.R. Hanna, associated with CAIRN MINES LTD., this report has been prepared for the company concerning their recent claim block acquisition in the Kamloops area of British Columbia. The information contained herein is based on intensive study and evaluation of geological data pertaining to the area in general and information obtained during a visit to the property on March 29, 1972.

The property is a copper prospect located in the Kamloops Mining Division of British Columbia.

## SUMMARY AND CONCLUSIONS

The twenty-four claim group (Alice-Often) of CAIRN MINES is located eleven miles southwest of the city of Kamloops, British Columbia. It is in the Kamloops Mining Division.

The claims have been acquired following the recent success of Afton Mines with their drilling for copper mineralization. No work is known to have been done in the past on the CAIRN block of claims.

Nicola volcanics are known to underlie certain areas of the claims but government geological maps show the contact with the Nicola Lake Batholith to lie a short distance to the east.

② A magnetic low, its cause yet unknown, is located within the core of the claims block.

The CAIRN block of ground is within an area that is active at the present time and has seen strong activity in the past. Known copper occurrences, some with good outlined tonnages, are scattered through the general area. The Alice-Often claims are situated within a good geologic

framework, and contain an initial target. They are well worthy of a full scale exploration program.

## RECOMMENDATIONS

The CAIRN group of claims should be investigated in three phases:

The first phase should be a preliminary survey limited in scope with a target of defining the aeromagnetic low in terms of ground location.

The second phase should encompass the full twenty-four claims in a reconnaissance type program.

The third phase should be a detailed program confined to targets delineated in the earlier phases.

Phase one should be a line cutting plus magnetometer survey restricted to the central group of claims (Alice 53 to 56 and Alice 62 and 64)(and partial Alice 51,52,57,58, 60 and 66). A north-south baseline should be cut with picket lines turned off at 400 foot intervals. Dependent upon magnetometer survey results the lines can be lengthened or intermediate lines added.

Phase two should consist of entending the baseline and the picket lines to cover the full block of claims. Several sets of surveys could then be carried out. A geological survey, a soil sampling campaign and a magnet-ometer survey are recommended. In addition, an electromagnetic survey using a Ronka EM 16 instrument would outline certain structures and assist in the full interpretation of the claims.

Phase three would be confined to targets outlined by the earlier programs. An induced polarization survey would be included at this time. Preliminary diamond drilling of restricted footage would follow the I.P. program. Dependent upon results a full scale grid-type drilling program would be laid on. Expenditure estimates for the recommended programs are:

# PHASE 1

Line Cutting	10 miles @	\$100/mile =	1,000.00
Magnetometer Survey	10 miles @ 3	\$ 75/mile =	750.00
Interpretation & Cons	ultation	=	500.00
Claim Survey		." =	500.00
Contingencies		=	750.00
			\$3,500.00

# PHASE 11

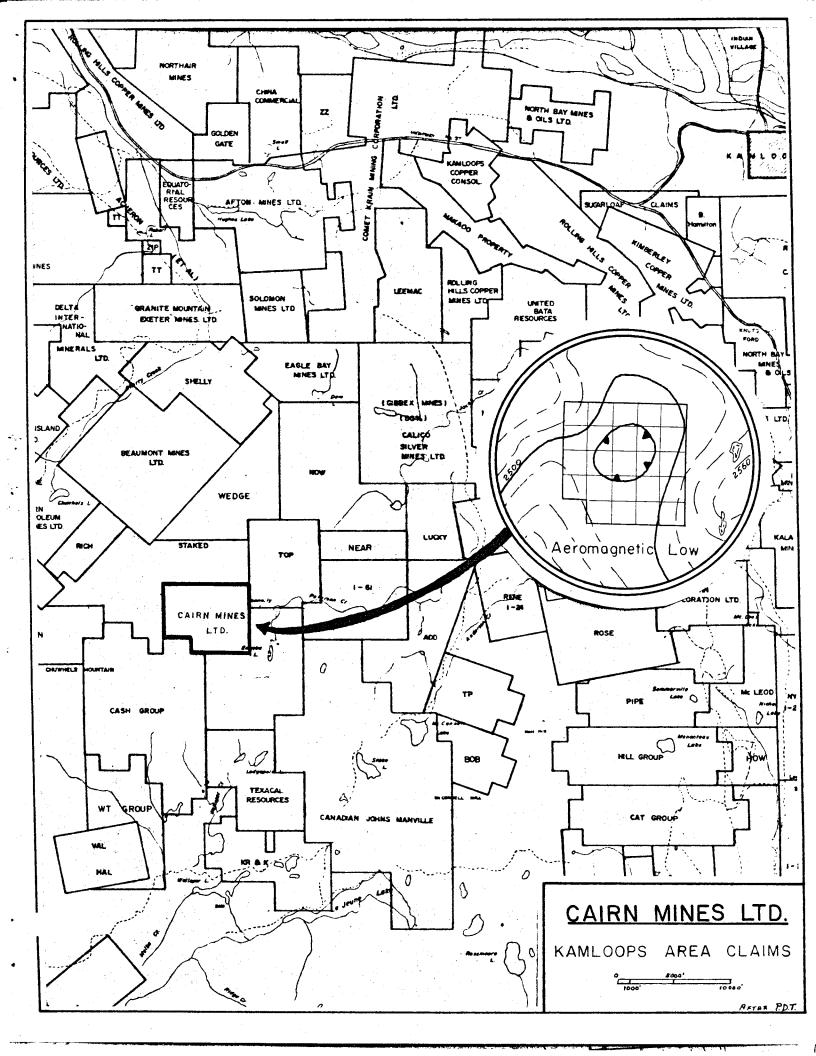
Line Cutting	20 miles @ \$100/mile	=	2,000.00
Magnetometer Survey	20 miles @ \$ 75/mile	=	1,500.00
Geological Survey	27 miles @ \$ 50/mile	=	1,350.00
Soil Sampling Survey	1400 samples @\$4 per	=	5,600.00
Electromagnetic Surve	y 27miles @ \$ 75/mile	=	2,025.00
Interpretation & Cons	sultation	=	1,500.00
Contingencies			2,025.00

\$16,000.00

# PHASE 111

At this stage the number of targets which will be delineated are unknown, consequently estimates of expenditures are of little value.

From the above figures it can be seen that the property can be thoroughly examined in two stages for expenditures slightly under the \$20,000 figure.



## LOCATION & ACCESS

The claim block lies eleven miles southwest of the city of Kamloops. In terms of the most active property in the area, the group lies seven miles due south of the Afton Mines drilling area. Its co-ordinates are approximately 50° 33' North Latitude and 120° 32' West Longitude.

Access to the claims is made at a point 12 miles south of the TransCanada highway on the Kamloops-Lac Le Juene road. B.C. Tel has an access road into their repeater station which enters the southern portion of the claims. Numerous logging roads exist in the north portion and it is quite possible that some may lead out to the roadway.

# PROPERTY

CAIRN MINES claim block located in the Kamloops Mining Division of British Columbia is composed of twenty-four (24) contiguous claims held by right of location. The claims were staked for a Mr. A.Ablett of Kamloops who in turn sold them to CAIRN MINES LTD.

The claims were recorded in the Kamloops Mining Recorders office on February 23,1972.

The names of the claims within the block are OFTEN 1,3 and 5 and the ALICE 11 and 13 plus the ALICE 49-67 inclusive.

To the time of this report, no record numbers have been made available.

#### TOPOGRAPHY

The topography of the claims can best be described as a gentle rise from the southeast corner, approximately 5000 feet above sealevel, to a height of 5500 feet along the western boundary. Local relief is not extreme seldom exceeding 30 to 50 feet.

The ground is moderately timbered with spruce, fir and pine. Several areas in the northern reaches have been logged in the past.

The overburden does not appear to be too thick. The

amount of rock exposures is unknown due to the snow mantle at the time of examination. However several side hill exposures were observed and examined.

# HISTORY OF THE AREA

The area belongs to the well-established Kamloops copper belt. The mineral deposits of this area are represented by a number of diverse types. The principle copper deposits occur as vein structures, shear zone fillings and disseminated material.

The Kamloops copper belt is tightly wrapped around the Iron Mask Batholith. Most producers of the past have been located on the rim of this intrusive body. A few have been located within the Triassic volcanics but none are known to have produced within the core of the intrusive.

The copper producers were most active during the 1904-1930 era. Such notable names as the Iron Mask Mine, Copper King, and the Evening Star were the principle operations of that time, producing in excess of  $5\frac{1}{2}$  million pounds of copper.

Several attempts have been made in the past decade to revive the production efforts in this area. The rise to prominence of the Highland Valley to the southwest has spurred these endeavours. In late 1971 a little known mining company called Afton Mines had its property returned by a senior mining company. After a refinancing period the company embarked on a drilling program of its own. Starting in November, by April 1972 it had outlined an orebody of modest dimensions but exceptional copper grade. It had also precipitated a heavy staking rush followed by company claim acquisitions and strong underwritings. At the time of writing the Kamloops area is one of the 'hottest' camps in the mining industry of British Columbia.

#### GEOLOGY

Geologically the large area under consideration lies within the Interior Plateau belt. Portions of this plateau within the Kamloops area is underlain by Triassic age volcanics assigned to the Nicola Series. Intrusive into these volcanics are Jurassic bodies, the more notable being the Iron Mask Batholith near Kamloops and the Guichon Batholith in the Highland Valley. Overlying the Nicola Series and the intrusives are much younger volcanics belonging to the Kamloops Series.

Extending south from the Iron Mask Batholith is the lengthy but relatively narrow, north-south oriented, Nicola Lake Batholith. There are some copper-gold deposits associated with this structure.

The CAIRN group of Alice-Often claims lies several miles west of the northwest corner of this latter intrusive body.

The claims are represented on government geological maps as being completely underlain by Nicola volcanics. The writer verified the presence of these volcanics during the examination.

The general trend of the volcanics is northwest-southeast on the CAIRN ground with apparent dips to the west.

In structure the Alice-Often group lies close to an embayment of the Nicola Lake Batholith. These embayments have at times proved good traps for mineralization.

#### AEROMAGNETIC RESULTS

The area has been covered by an aeromagnetic survey sponsored by the Federal government and undertaken by Lockwood Survey Corporation Ltd. from 1966 to 1968. The results are available in Geophysics Paper 5217 entitled "Cherry Creek".

The results of this survey show a magnetic depression

occupying the greater bulk of the central group of claims. The magnetic intensities in the area are not strong and are within the keeping of a volcanic formation. The possibility exists that this magnetic low may represent an offshoot finger of an intrusive. Equally possible is the location of a less intense magnetic phase of the volcanics.

One of the intriguing features of this 'low' is that Afton Mines similarily has a magnetic low in close proximity to their drilling.

It should be stated that the aeromagnetic map shows a fair number of these magnetic lows throughout the area. The significance of each low will only be realized following geological work within its area.

## ADJOINING PROPERTIES

A close neighbour of CAIRN MINES is Canadian Johns-Mansville. Their large claim holdings lie directly to the east and straddle the volcanic-granodiorite contact. Johns-Mansville acquired the ground some three years ago and it is rumoured that they have a substantial soil anomaly within their boundaries. They have done a large amount of trenching.

Adjoining directly to the south is a large block of ground recently acquired by Scandia Mines Ltd. of Montreal. This company is preparing for a full program on their property. They are said to be discussing the property location with two major companies.

Respectfully submitted,

Vancouver, B.C. April 20, 1972

W.G. Hainsworth P. Eng.

CONSULTING GEOLOGIST

## CERTIFICATE

# I, WILLIAM G. HAINSWORTH, HEREBY CERTIFY:

- 1. That I am a geologist residing at 4664 Clovelly Walk, West Vancouver, British Columbia.
- 2. That I am a graduate of the University of Western Ontario, London, Ontario with a B.Sc. degree and am a registered member of the Association of Professional Engineers of the Province of British Columbia.
- 3. That I have practiced my profession for twenty-two years.
- 4. That I have no financial interest, either direct or indirect in the subject properties, in the securities of Cairn Mines Ltd., nor in that of any of its affiliates and that I do not expect to obtain any such interest.
- 5. That the information contained in this report is based on my personal knowledge of the general area and specific examination of the property pertained to in the report on March 29, 1972.

Vancouver, B.C. April 20, 1972

W.G. Hainsworth P.Eng.

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527 - 470 Granville St., Vancouver, B.C. March 24, 1972

The President and Directors, Cairn Mines Ltd., 411 - 1200 West Pender St., Vancouver, B.C.

#### Gentlemen:

This letter report is preliminary to a full report on the recent Cairn Mines acquisition of claims in the Afton area of the Kamloops district.

The claims have not as yet been visited for an examination by the writer so that this report is basically of a broad information nature.

The twenty-four claims acquired by Cairn Mines are the OFTEN 1,3, and 5 and the ALICE 11 and 49-67 inclusive. They are located in the Kamloops Mining Division of British Columbia approximately seven miles due south of the Afton Mines drilling area and a half mile west of Connolly Lake. The Kamloops-Lornex road, via Lac Le Jeune, is two and a half miles to the south east.

Afton Mines has been proving up by percussion and diamond drilling a copper zone some eight miles west of the city of Kamloops and closely adjoining TransCanada Highway 1. To date the discovery zone measures 1600 feet by 800 feet. Percussion holes have been put down to three hundred foot depths whereas the diamond drills have penetrated deeper than eight hundred feet. A recent consultants report for Afton Mines puts their inferred ore at 36 million tons. No copper grade has been attached to this tonnage figure. An inventory grade from fifty percusion holes published to date gives a copper grade of 0.604% over an average width of 160 feet. The prime mineral in native copper but narrow

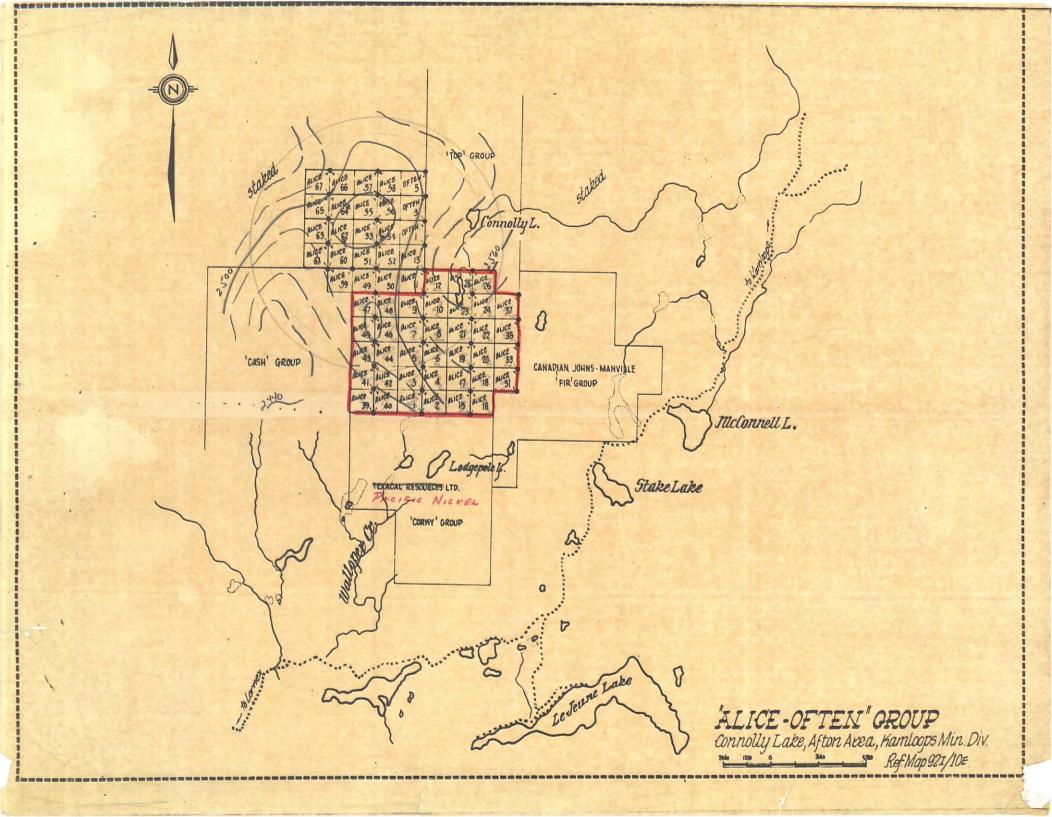
sections of chalcopyrite with minor bornite have been logged in some of the later holes. Magnetite and hematite are accessory minerals. Government aeromagnetic maps show a magnetic low a short distance to the southwest of the Afton drilling area. This low is associated with the northwestern fringe of the Iron Mask Batholith, presumably the host rock of the Afton mineralization.

The Cairn Mines claim block is shown on the government geological maps to be underlain by Nicola volcanics. The claims are located close to the contact with the Nicola Lake Batholith. This intrusive stock is related in age and composition to the Iron Mask Batholith. An eromagnetic depression is contained within the eastern portion of the claim block. There is a possibility that this 'low' might represent an offshoot finger of the intrusive.

A close neighbour of Cairn Mines is Canadian Johns Manville. Their large group of claims lies directly to the east and straddles the volcanic-granodiorite contact. Johns Manville acquired this ground some three years ago and it is rumoured that they have a substantial soil anomaly within their boundaries.

The Cairn block of ground lies in an area that is active at the present time and has seen strong activity in the past. Known copper occurrences, some with good outlined tonnages, are scattered through the area. The ALICE-OFTEN claims are situated within a good geologic structure. A full scale exploration program should be undertaken as soon as weather permits.

Respectfully submitted,



CONSULTING GEOLOGIST

## RECOMMENDATIONS

The Cairn group of claims should be investigated in three phases:

The first phase should be a preliminary survey limited in scope with a target of defining the aeromagnetic low in terms of ground location.

The second phase would encompass the full twenty-four claims in a reconnaissance type program.

The third phase would be a detailed program confined to targets delineated in the earlier phases.

Phase one would be a line cutting magnetometer survey restricted to the central group of claims (Alice 53 to 56 and Alice 62 and 64) (and partial Alice 66-60-57-58-51-52). A north-south baseline should be cut with picket lines turned off at 400 foot intervals. A magnetometer survey results the lines can be lengthened or intermediate lines added.

Phase two would consist of extending the baseline on picket lines to cover the full block of claims. Several sets of surveys would then be carried out. A geological survey, a soil sampling campaign and a magnetometer survey are recommended. In addition, an electromagnetic survey using the Ranka EM 16 would outline certain structures and assist in the full interpretation of the claims.

Phase three would be confined to targets outlined by the earlier programs. An induced polarization survey would be included at this time. Preliminary diamond drilling of restricted

CONSULTING GEOLOGIST

footage would follow the I. P. program. Dependent upon results a full scale grid-type drilling program would be laid on. Expenditure estimates for the recommended programs are:

#### PHASE 1

Line Cutting	10 Miles @ \$100/mil	e =	1,000.00
Magnetometer Survey	10 Miles @ \$ 75/mil	e =	750.00
Interpretation and Consult	ation	=	500.00
Contingencies		=	750.00
Claim Survey		=	500.00
			\$3.500.00

#### PHASE 11

Line Cutting	20 Miles	@	\$1	00/mile	=	2,000.00
Magnetometer Survey	20 Miles	@	\$	55/mile	=	1,500.00
Geological Survey	27 Miles	@	\$	50/mile	=	1,350.00
Soil Sampling Survey 1,400	Samples @	\$4	1.0	00/sample	=	5,600.00
Electromagnetic Survey	27 Miles	@	\$	75/mile	=	2,025.00
Interpretation and Consult	ation				=	1,500.00
Contingencies					=	2,025.00
		1				\$16,000.00

#### PHASE 111

At this stage the number of targets which will be delineated are unknown, consequently estimates of expenditures are of little value.

Respectfully submitted,

W. G. Hainsworth, P. Eng.