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McPHAR GEOPHYSICS LIMITED

REPORT ON ADDITIONAL
INDUCED POLARIZATION SURVEYING
ON THE
BIG ONION PROPERTY
OMINECA MINING DIVISION, B. C.
FOR
BLUE ROCK MINING CORPORATION LIMITED

93L-15

BY

ROBERT A. BELL, Ph. D.

AND

PHILIP G. HALLOF, Ph. D.

NAME AND LOCATION OF PROPERTY:

BIG ONION PROPERTY
OMINECA MINING DIVISION, B. C. 54° N, 126° W - NW
DATE STARTED: OCTOBER 18, 1970
DATE FINISHED: NOVEMBER 5, 1970

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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.

This electro-chemical phenomenon occurs wherever 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 (ΔV) 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 (ΔV) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.

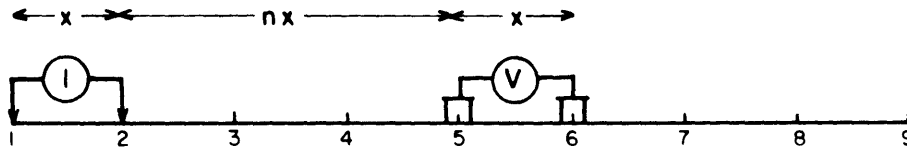
In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisy to record a reading. If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, 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

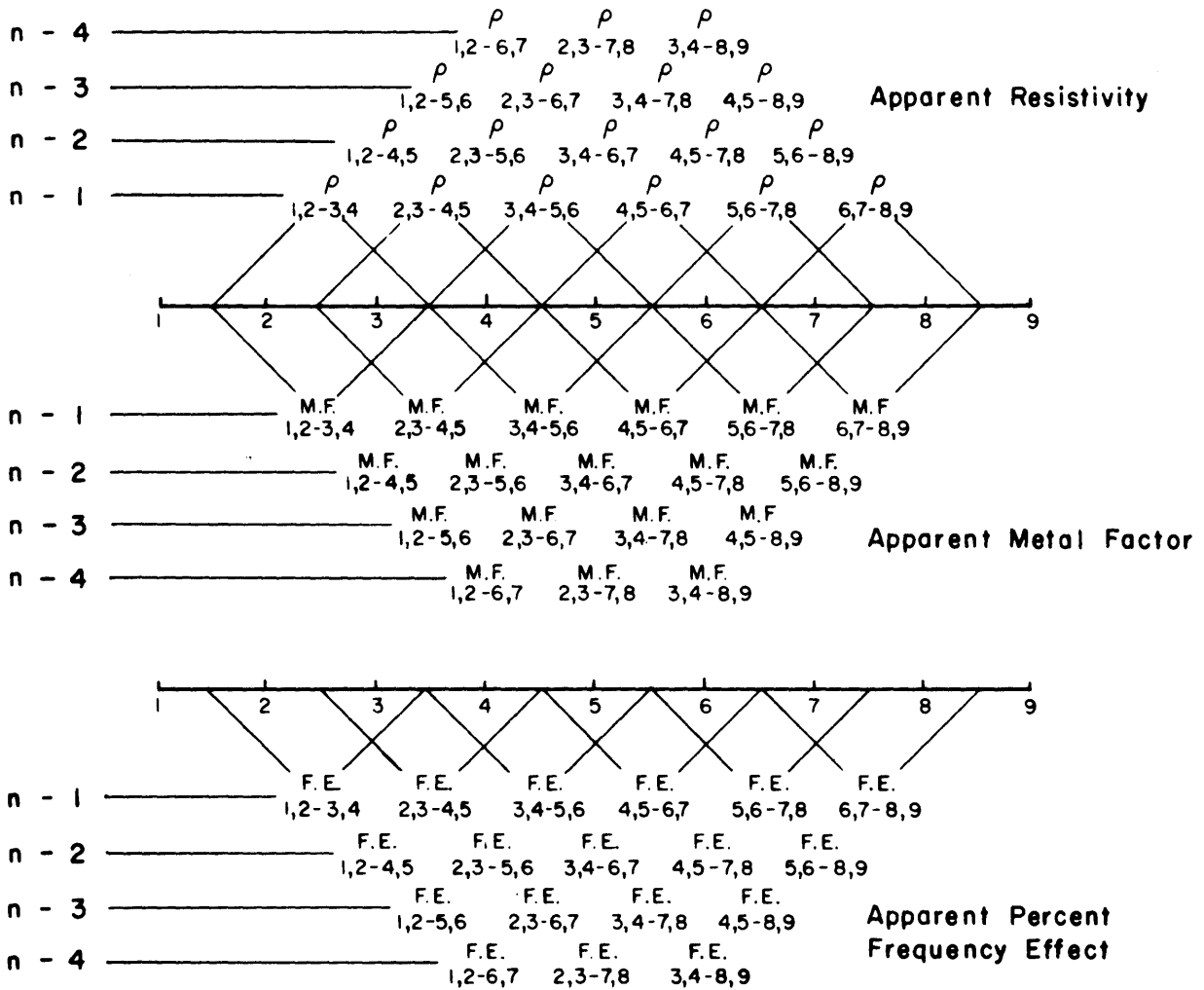


Fig. A

McPHAR GEOPHYSICS LIMITED

REPORT ON ADDITIONAL
INDUCED POLARIZATION SURVEYING

ON THE

BIG ONION PROPERTY

OMINECA MINING DIVISION, B. C.

FOR

BLUE ROCK MINING CORPORATION LIMITED

1. INTRODUCTION

As requested by the Company, additional induced polarization and resistivity surveys have been carried out on the Big Onion Property for Blue Rock Mining Corporation Limited. The property is situated in the Omineca Mining Division near Smithers, British Columbia and is within the northwest quadrant of the one degree quadrilateral whose southeast corner is at 54° N latitude and 126° W longitude.

A previous IP survey was carried out in the summer of 1970 and the results were presented in our report of October 14, 1970. Four definite anomalous zones were outlined, only one of which had been partially tested by drilling. The present survey consists of three traverses to the south of the original grid and was performed during October and November of 1970.

The survey crew employed a McPhar frequency domain IP system,

operating at 0.3 and 5.0 Herz, and a 500-foot dipole-dipole electrode array. Work was carried out on the following claims, all in the Omineca Mining Division, and all believed to be owned or held under option by Blue Rock Mining Corporation Limited.

List of Claims

| | |
|------|--------|
| BA 2 | Jill 8 |
| 3 | 20 |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 10 | |
| 12 | |
| 14 | |
| 16 | |
| 18 | |
| 20 | |

2. PRESENTATION OF RESULTS

The induced polarization and resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

| | | |
|----------|------------------|----------------|
| Line 40S | 500 foot spreads | Dwg. IP 5672-1 |
| Line 48S | 500 foot spreads | Dwg. IP 5672-2 |
| Line 56S | 500 foot spreads | Dwg. IP 5672-3 |

Enclosed with this report is Dwg. I. P. P. 4675R, a plan map of the grid at a scale of 1" = 600'. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization 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 spread length; i. e. when using 500' spreads the position of a narrow sulphide body can only be determined to lie between two stations 500' apart. In order to locate sources at some depth, larger spreads 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.

3. DISCUSSION OF RESULTS

Line 40S

This entire line is moderately to strongly anomalous except for the interval between stations 40E and 45E. There is a shallow source centred at 15E that is much stronger than any anomaly located on the original grid, and a somewhat deeper source at 45E to 50E; both features merit further investigation.

Line 48S

Most of this line is also anomalous but the magnitude is lower and more variable than on Line 40S.

Line 56S

Here there are two strong definite anomalies, centred near 15E and 55E. In both cases the source is shallow relative to the electrode interval

and hence they could be better evaluated by checking with shorter intervals (i. e. 300-foot spreads).

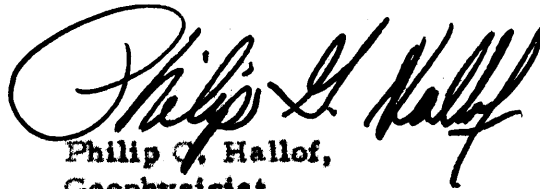
4. SUMMARY AND RECOMMENDATIONS

The additional IP surveying on the south part of the Big Onion grid has located several anomalies that are much stronger than any found by the original survey. In view of the limited data and wide line spacing, it is difficult to correlate these features. If the area is of geological (or geochemical) interest, a more complete grid should be surveyed with more closely-spaced and longer lines. Shallow sources should then be checked with shorter electrode intervals to define drill targets.

McPHAR GEOPHYSICS LIMITED



Robert A. Bell,
Geologist.



Philip C. Hallof,
Geophysicist.

Dated: January 29, 1971

ASSESSMENT DETAILS

PROPERTY: Big Onion

MINING DIVISION: Omineca

SPONSOR: Blue Rock Mining Corporation
Limited

PROVINCE: British Columbia

LOCATION: Smithers Area

TYPE OF SURVEY: Induced Polarization

OPERATING MAN DAYS: 16

DATE STARTED: October 18, 1970

EQUIVALENT 8 HR. MAN DAYS: 24

DATE FINISHED: November 5, 1970

CONSULTING MAN DAYS: 1

NUMBER OF STATIONS: 53

DRAUGHTING MAN DAYS: 3

NUMBER OF READINGS: 585

TOTAL MAN DAYS: 28

MILES OF LINE SURVEYED: 4.7

CONSULTANTS:

Robert A. Bell, 50 Hemford Crescent, Don Mills, Ontario.

Philip G. Hallof, 5 Minorca Place, Don Mills, Ontario.

FIELD TECHNICIANS:

R. Mertens, 304 Holmes Avenue, Willowdale, Ontario.

L. Harrison, 960 #5RD, Richmond, British Columbia.

Plus Extra Labour:-

J.A. Price, Fisherman Motel, Smithers, B.C.

R.J. Blakely, Fisherman Motel, Room 21, Smithers, B.C.

Mel Melissen, Box 2297, Smithers, B.C.

DRAUGHTSMEN:

B. Marr, 19 Kenewen Court, Toronto 16, Ontario.

J. Duffy, 7 Waddington Crescent, Willowdale, Ontario.

F. Hurst, 230 Woburn Avenue, Toronto 12, Ontario.

McPHAR GEOPHYSICS LIMITED



Robert A. Bell,

Geologist.

Dated: January 29, 1971

SUMMARY OF COST

Blue Rock Mining Corporation Limited - Big Onion Property

Crew - 2 men R. Mertens & L. Harrison

| | | | | | |
|---------|-------------|----------|--------------|--------------|--------|
| 4 days | Operating | (| \$240.00/day | \$ | 960.00 |
| ½ day | Travel |) | | | |
| 1½ days | Preparation |) | | | |
| 1 day | Bad Weather |) 4 days | (| \$100.00/day | 400.00 |
| 1 day | Standby |) | | | |

| | | | | | |
|-----------|--|--|--|--|--------------|
| 1 day off | | | | | <u>N. C.</u> |
| | | | | | 1,360.00 |

Expenses

| | |
|-------------------------|-----------------|
| Transportation - Train | 59.00 |
| Rented Vehicle | 803.83 |
| Vehicle Expense | 91.17 |
| Taxis | 21.75 |
| Freight and Brokerage | 39.71 |
| Meals and Accommodation | 959.05 |
| Supplies | 145.11 |
| Excess Baggage | 33.60 |
| Chain Saw Rental | 12.00 |
| Telephone and Telegraph | 185.95 |
| | <u>2,351.17</u> |
| Plus 10% | 235.11 |
| | <u>2,586.28</u> |

Expenses for all properties \$2,586.28

Prorated portion for Big Onion Property

| | |
|--------------------|--------|
| 4/33½ x \$2,586.28 | 308.80 |
|--------------------|--------|

Extra Labour 4,038.00

Plus 20% 807.60

4,845.60

Extra Labour for all properties \$4,845.60

Prorated portion for Big Onion Property

| | |
|--------------------|-------------------|
| 4/33½ x \$4,845.60 | <u>578.56</u> |
| | <u>\$2,247.36</u> |

McPHAR GEOPHYSICS LIMITED

Robert A. Bell
 Robert A. Bell,
 Geologist.

Dated: January 29, 1971


CERTIFICATE

I, Robert Alan Bell, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geologist residing at 50 Hemford Crescent, Don Mills, (Toronto) Ontario.
2. I am a graduate of the University of Toronto in Physics and Geology with the degree of Bachelor of Arts (1949); and a graduate of the University of Wisconsin in Economic Geology with the degree of Ph. D. (1953).
3. I am a member of the Society of Economic Geologists and a fellow of the Geological Association of Canada.
4. I have been practising my profession for over fifteen years.
5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Blue Rock Mining Corporation Limited or any affiliate.
6. The statements made in this report are based on a study of published geological literature and unpublished private reports.
7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 29th day of January 1971.


Robert A. Bell, Ph. D.

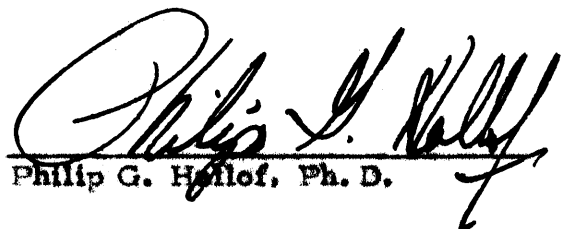
CERTIFICATE

I, Philip George Hallof, of the City of Toronto, Province of Ontario, do hereby certify that:

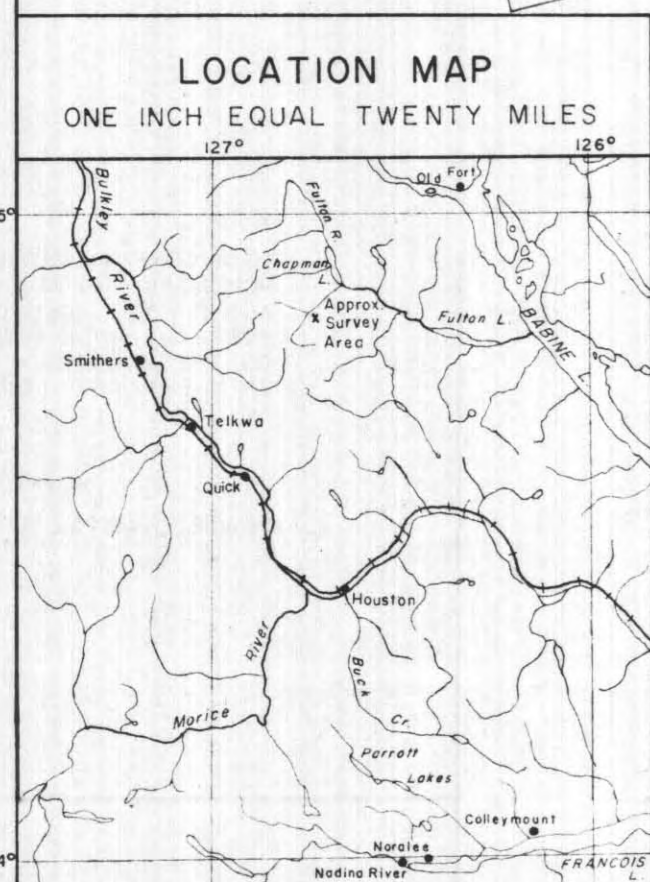
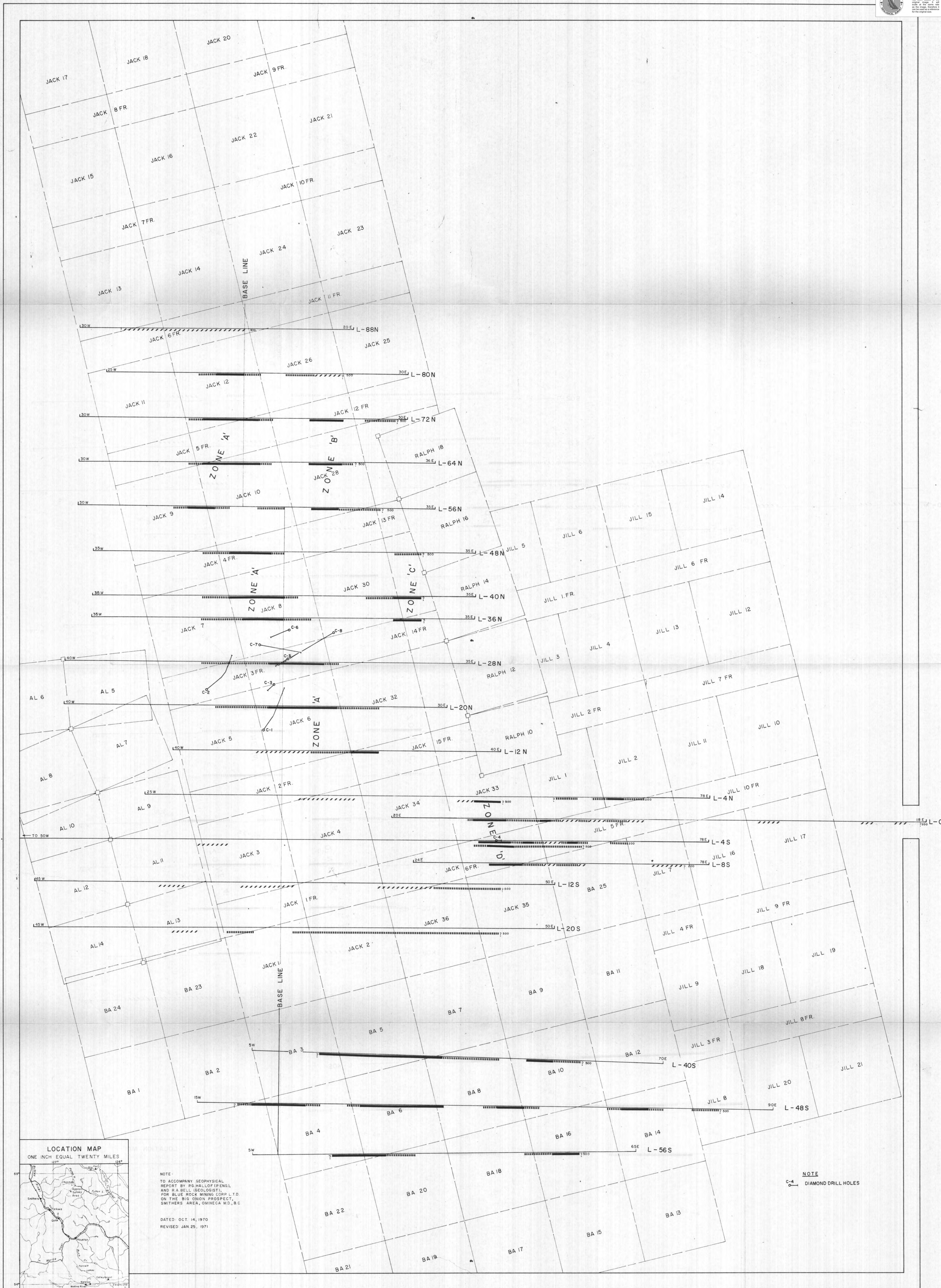
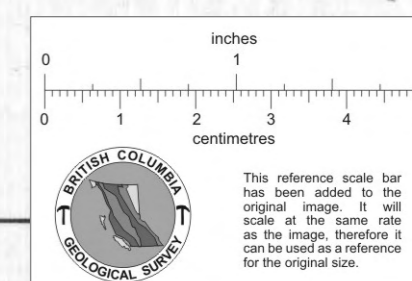
1. I am a geophysicist residing at 5 Minorca Place, Don Mills, (Toronto) Ontario.
2. I am a graduate of the Massachusetts Institute of Technology with a B.Sc. Degree (1952) in Geology and Geophysics, and a Ph. D. Degree (1957) in Geophysics.
3. I am a member of the Society of Exploration Geophysicists and the European Association of the Exploration Geophysicists.
4. I am a Professional Geophysicist, registered in the Province of Ontario, the Province of British Columbia and the State of Arizona.
5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Blue Rock Mining Corporation Limited or any affiliate.
6. The statements made in this report are based on a study of published geological literature and unpublished private reports.
7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 29th day of January 1971.


Philip G. Hallof, Ph. D.

McPHAR GEOPHYSICS
 INDUCED POLARIZATION AND RESISTIVITY SURVEY
 PLAN MAP



NOTE:
 TO ACCOMPANY GEOPHYSICAL
 REPORT BY PG. HALLOP (PENG),
 AND B.A. BELL, GEOLOGIST,
 FOR BLUE ROCK MINING CORP. LTD.
 ON THE BIG ONION PROSPECT,
 SMITHERS AREA, OMEGA, B.C.

DATED OCT 14, 1970
 REVISED JAN 25, 1971

NOTE
 C-4 DIAMOND DRILL HOLES

SURFACE PROJECTION
 OF ANOMALOUS ZONES

DEFINITE
 PROBABLE
 POSSIBLE

Number at the end of anomaly
 indicates spread used

BLUE ROCK MINING CORPORATION LTD.

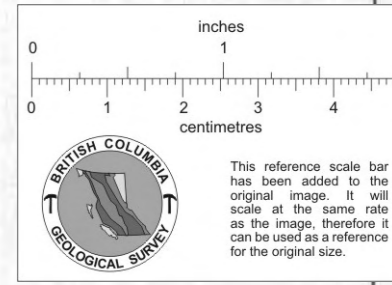
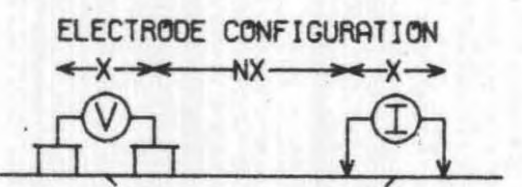
BIG ONION PROSPECT, SMITHERS AREA
 OMEGA, B.C.
 SCALE
 One Inch = Six Hundred Feet



BLUE ROCK MINING CORPORATION LTD.

BIG ONION PROSPECT, SMITHERS AREA
OMINECA M.D., B.C.

LINE NO. - 40S



SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: NOV 1970

APPROVED: *Philip J. Halley*

DATE: 1/23/71

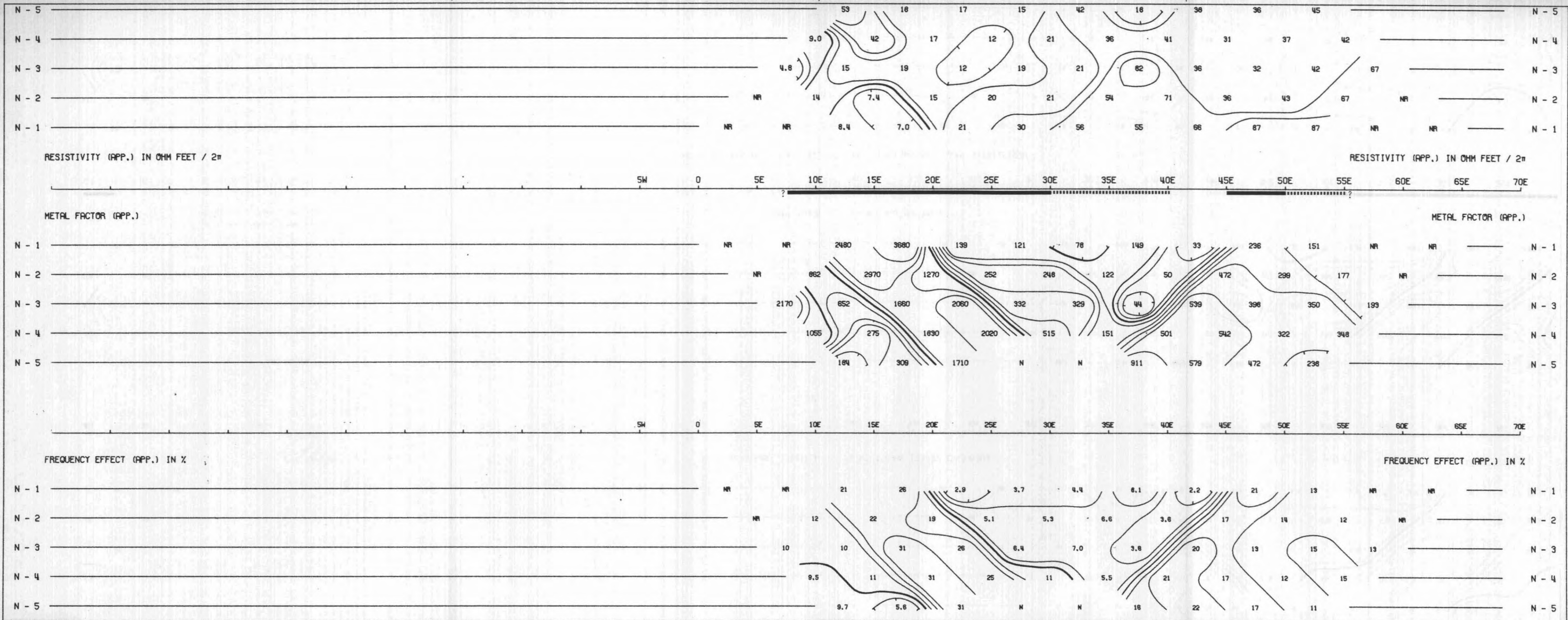
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NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

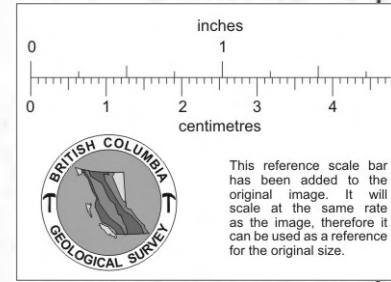
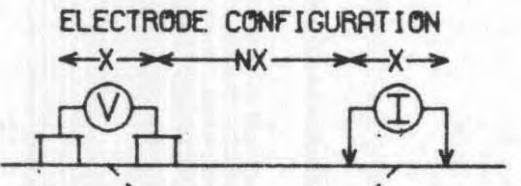
NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/65 COMPUTER AND A CALCOMP PLOTTER



BLUE ROCK MINING CORPORATION LTD.

BIG ONION PROSPECT, SMITHERS AREA
OMINECA M.D., B.C.

LINE NO. - 48S



PLOTTING POINT → X X = 500'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE **————**
PROBABLE **|||||**
POSSIBLE **////**

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: OCT 1970

APPROVED: *Philip G. Hall*
DATE: 4/2/71
BRITISH COLUMBIA ENGINEER

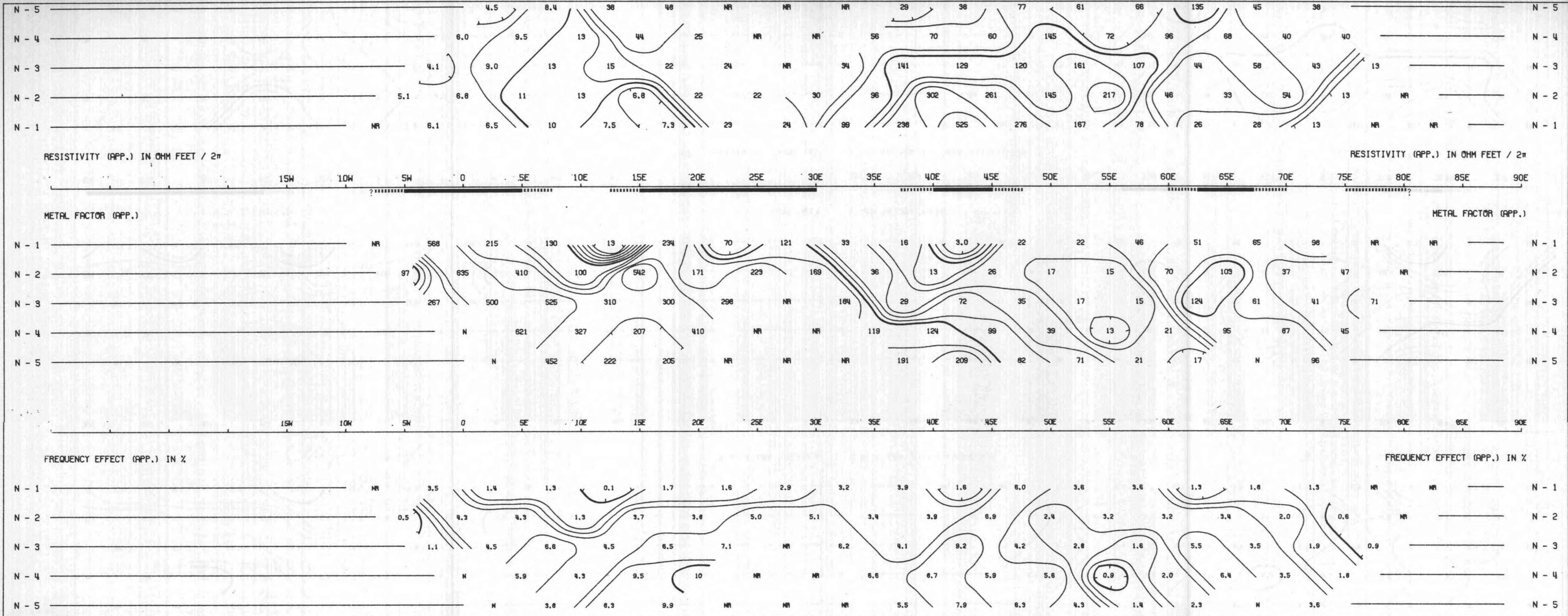
Expiry Date: February 25, 1971

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

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

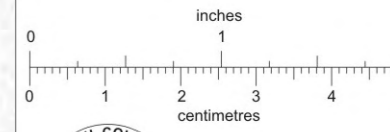
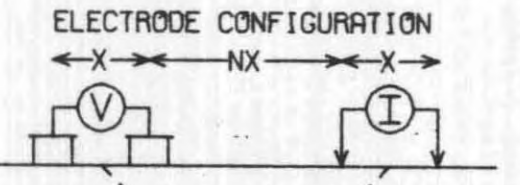
NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/65 COMPUTER AND A CALCOMP PLOTTER



BLUE ROCK MINING CORPORATION LTD.

BIG ONION PROSPECT, SMITHERS AREA
OMINECA M.D., B.C.

LINE NO. - 56S



This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE **————**
PROBABLE **|||||**
POSSIBLE **////**

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: NOV 1970

APPROVED: *Philip S. Hobb*

DATE: 1/29/71

ENGINEER

Entry Date: February 25, 1971

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/65 COMPUTER AND A CALCOMP PLOTTER

