92-L-8

GEOPHYSICAL REPORT

BOYES CREEK - ADAMS RIVER COPPER PROSPECT

FOR

CONOCO SILVER MINES LTD. (N.P.L.)

Oct. 1971 D.R. Cochrane, P.Eng.

GEOPHYSICAL REPORT on an
Induced Polarization Survey of Portions
of the BOYES CREEK - ADAMS RIVER COPPER
Prospect
The Bruce, Denis and Kevin Claim Groups
Situated about Ten Miles Southwest of
Sayward, British Columbia, Vancouver Island,
Nanaimo Mining Division
Latitude 50°17' N; Longitude 126°04' W,
N.T.S. 92 L/8E
and on behalf of

CONOCO SILVER MINES LIMITED (N.P.L.)

Field Work Between

October 4th and October 19th, 1971

by

D. R. Cochrane, P. Eng.

Report by -

D. R. Cochrane, P. Eng.,
Delta, B. C.,
October 29th, 1971.

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FIGURES

PART A

A - 1: PREAMBLE

During the month of October, 1971, a field crew employed by the author completed approximately eight (8) line miles of induced polarization surveys, and one depth probe on the Boyes Creek Copper Prospect on behalf of Conoco Silver Mines Limited.

The purpose of the geophysical work was to further investigate areas of high trace copper content in geochemical soil samples collected in the summer of 1971 as a portion of a comprehensive exploration program being conducted in the area by Conoco Silver.

This report is a documentation and discussion of the induced polarization work and it is divided into four parts. Part A includes a Summary and Conclusion; Part B describes the General Setting; Part C describes Field and Data Processing procedures and Part D discusses the results that were obtained.

A - 2: SUMMARY

The Boyes Creek copper prospect is situated near the Adams River road, 10 miles southwest of Sayward, Nanaimo M.D. Vancouver Island. The midland surface is of relatively gentle relief, but tributary streams have eroded steep and precipitous valleys

A - 2: SUMMARY (cont'd)

into sidehills making traversing difficult in some areas. The region is underlain by Karmutsen volcanic rocks, and Quatsino limestone, and is close to a north-northwest trending belt of Island intrusives. Time domain IP surveying was conducted on several west directed cross lines, and on two tie lines at 90 degrees to the cross lines. A Wenner array was deployed, with "a" spacings of 200 and 300 feet. One depth probe was completed in the "showing" area, and the Lee Partition of the Wenner was used with spacings varying from 500 to 10 feet. The pulse current was of 4 seconds in duration, with an 0.3 second delay and an integration time normally of 0.8 seconds after the delay. Data processing was facilitated with the use of a Diehl Algotronic Desk Top Computer.

Gradient self potential data was recorded, and the largest change between two consecutive readings was approximately 300 millivolts. Several areas contain SP changes in excess of 100 millivolts.

Apparent resistivity response ranged from a low of 2,000 to a high of 39,200 ohm-feet. Two resistivity families are present; the lower response group (less than 17,000) is believed to be response from Karmutsen rocks, and the higher response group from Quatsino limestone. Anomalously "low"

A - 2: SUMMARY (cont'd)

values, (i.e. below 10,000 ohm-feet) occur in three areas.

Apparent chargeability response averaged 10.6 milliseconds (m.s.), with a standard deviation of 4.7 m.s. Values exceeding 20 m.s. are considered anomalous, and two areas are characterized by plus 20 m.s. response. Depth probe chargeability peaked at 19.8 m.s. and the polarizing center is situated some 100 to 150 feet below the center receiving electrode position (P_o). Metal factor values were calculated, and two anomalous patches were outlined. These coincide with the peak chargeability zone, and are situated near the north end of lines 8 and 12 west, and at the south end of line 0. Scattered geochemical high copper results lie close by. Investigation as to the cause of these above described anomalies is recommended.

Respectfully submitted,

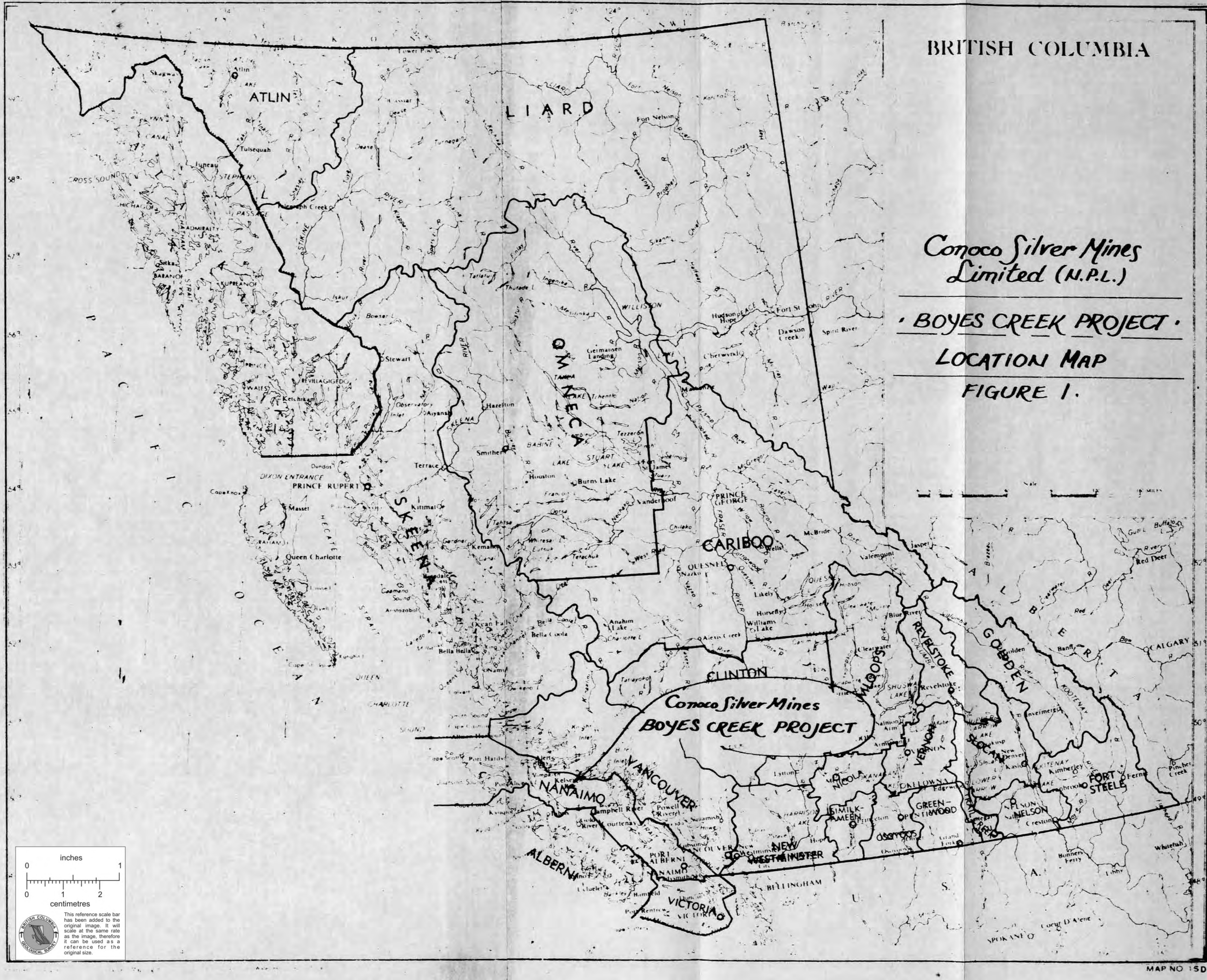
D. R. Cochrane, P.Eng.,
November 5, 1971,
Delta, B.C.

PART B: SETTING

B - 1: LOCATION AND ACCESS -

The Boyes Creek Property is situated approximately ten (10) miles southwest of the settlement of Sayward, in the north-east section of Vancouver Island, British Columbia. The claims are easily accessible by car or truck by proceeding southwesterly from the Island Highway (No. 19) at the White River Bridge and then via a MacMillan-Bloedel logging road which connects with the main Adams River haulage road. The claims are located on an east sloping flank of an unnamed prominence rising to just over 3,500 feet on the west side of the Adams River. The main Adams River logging road passes through the easternmost claims. Access to the remainder of the claims is by trail and picket lines.

The center of the property lies close to latitude 50° 17' North, and latitude 126° 04' West. The National Topographic System reference code number for the area is 92L/8E.


BRITISH COLUMBIA
Conoco Silver Mines Limited (N.P.L.)
• BOYES CREEK PROJECT •
LOCATION MAP
FIGURE 1.
Conoco Silver Mines
BOYES CREEK PROJECT
ATLIN
LIARD
OMINECA
SKEENA
CARIBOO
CLINTON
KAMLOOPS
REVELSTOKE
GOLDEN
VERNON
SLOCAN
NICOLA
SIMILKAMEEN
GREENWOOD
NELSON
FORT STEELE
NANAIMO
VANCOUVER
NEW WESTMINSTER
ALBERNI
VICTORIA
PRINCE RUPERT
PRINCE GEORGE
QUESNEL
CALGARY
SPOKANE
BELLINGHAM
inches
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centimetres
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.
BRITISH COLUMBIA GEOLOGICAL SURVEY
MAP NO 15D

B - 2: PROPERTY -

The Boyes Creek Property consists of some 103 located mineral claims forming a contiguous block and situated in the Nanaimo Mining Division. They are under option by Conoco Silver Mines Limited (N.P.L.), Suite 3, 4647 Kingsway Avenue, Burnaby, B. C. The geophysical work herein described was conducted on a portion of the property, but includes claims listed below:

CLAIM NAME	RECORD NUMBER	ANNIVERSARY DATE
Boyes 3 and 4	18637, 18638	May 27
George 1,2,3,4,6	19256, 19257, 19258,	
	19259 and 19261	March 28
Dennis 21 and 23	27094, 27096 to	
to Dennis 30 incl.	27103 inclusive	Sept. 17
Bruce 3,4,5,9, and	27054, 27055, 27056	
Bruce 10	27060 and 27061	Sept. 17

Figure Two (2) of the Claims and Grid Plan shows the relation of claims to the geophysically surveyed lines.

B - 3: GENERAL SETTING -

The Boyes Creek property is situated on the north-eastern edge of the Vancouver Island Range Physiographic division of British Columbia. This mountain range forms the main body of the island and the higher peaks reach 7,000 feet in elevation. Many of the prominences were sculptured by alpine glaciers, thus rugged topography is characteristic. However most of the low lands and valleys were invaded by a continental ice mass from the main-land which carved fairly gentle "U" shaped valleys and rounded ridges. The Adams River valley area is a relatively gentle mid-land surface, but fast flowing tributaries have eroded steep secondary valleys in many of the side hills. Boyes Creek is one such very steep precipitous valley. The overburden is quite extensive, and normally significant natural bedrock exposures oc-cur only along steep sidehill bluffs or in stream valleys in the area.

The northern part of Vancouver Island is underlain primarily by a thick pile of Triassic basalts called the Karmutsen Group. It is overlain by the Quatsino Formation, an upper Triassic carbonate sequence which normally grades from pure limestone at the base upward through argillaceous limestone to calcareous argillite. The argillaceous section of the Quatsino is not present everywhere and in places the overlying Bonanza pyroclastics rest directly on pure limestone. The Karmutsen and

B - 3: GENERAL SETTING (cont'd) -

Quatsino rocks have for the most part been thrown into broad open folds, which often trend northwesterly. This bedrock volcanic - sedimentary sequence was intruded by Jurassic - Cretaceous intrusive rocks called the Island Intrusives.

The Boyes Creek property is shown by Mr. J. E. Muller of the G. S. C. (1967) as lying immediately west of the Island Intrusive band and within Quatsino limestone and Karmutsen basic volcanics. Mr. B. Mottershead kindly showed the author the Quatsino - Karmutsen contact which, at a point near 60 + 00N on Line 20 W, strikes at azimuth 128° (true). The limestone to the east dips between 35 and 50° NE and varies between 125° and 145° in strike azimuth. A second, thinner band of limestone is present uphill to the west of this point but is capped in the area in and around 40 N, 44 W by volcanics. The author noted a collapse structure at the limestone - volcanic contact near 18 W, 57 N, and thus there is some evidence for the presence of subsurface solution cavities in the limestone.

Mr. J. S. Vincent, P. Eng., in a report dated January 30, 1971, describes the Boyes Creek copper occurrence as a northwest trending vein system localized by fracturing. He states, page eight, "Mineralization consists of chalcopyrite, chalcocite, and bornite with minor values in gold and silver. It is apparent that two basic types are present:- -

B - 3: GENERAL SETTING (cont'd) -

1. Veins and disseminations associated with a strong and well developed set of fractures.
2. Disseminations of bornite and chalcopyrite in the amygdaloidal volcanic rocks."

The geophysical induced polarization survey was conducted in an effort to locate concentrations of the above described two mineralization types, specifically in areas characterized by high concentrations of copper in soil samples.

PART C: PROCEDURES

C - 1: GROUND CONTROL GRID -

The ground control grid was laid out by Conoco personnel, and consisted of brushing out previously flagged and chained geochemical lines. The main base line runs almost due east-west and is designated 0 + 00. It is supplimented by a parallel tie line at 40 + 00 North. The main base line runs from 8 East to 44 West (in units of 100') and the tie line from 8 East to 68 West. Cross lines were turned off at right angles to the tie and base lines and are parallel and spaced 400 feet apart. The lines which were geophysically surveyed are shown in plan in Figure No. 2.

C - 2: INDUCED POLARIZATION FIELD PROCEDURE -

A standard Wenner array was deployed, and in this method current electrodes are placed outside the receiving pots and at a total distance of 3 "a" spacings from each other. The two receiving pots are placed one "a" from the front electrode, and one "a" from the rear electrode and are themselves one "a" apart. The "a" spacing for reconnaissance work was set at 200 and 300 feet. The front electrode position is electrically positive and the rear electrode negative. The transit interval was equal to the "a" spacing in each case.

C - 2: INDUCED POLARIZATION FIELD PROCEDURE (cont'd) -

At the start of each day's survey, the electrode men and rear pot man (front pot man is also instrument operator) moved to their appropriate positions on the lines. The pot men cleared a strip of ground and seated the pots and the electrode men excavated a shallow depression, spread out a sheet of aluminum foil and buried the foil. Salt water was poured on the foil to assure good contact.

Communications with the instrument operator was facilitated by small tranceivers and when all positions were reported read, the operator commenced measurement. First the self potential between the two receiving pots was bucked out and the value (in millivolts) recorded. A four second pulse was then initiated during which the transmitter current (I in milliamperes) and impressed EMF between the receiving pots (dV in millivolts) was recorded. On cessation of the square wave current pulse, an integrated value of the residual decay voltage is automatically registered on the receiver galvanometer. This value was recorded (IP in millivolts) along with the position of the instrument, RC filter, integration function setting, output voltage of the transmitter, notes on the terrain, steadiness of SP, and sharpness of IP response. Normally integration function one was used, and on this setting the decay voltage is integrated for 0.8 seconds commencing 0.3 seconds after current pulse termination.

C - 2: INDUCED POLARIZATION FIELD PROCEDURE (cont'd) - Often an 8 second current pulse was used in various combinations of filters and integration times to assist in the interpretation of the results.

After completion of several pulse cycles the order was then given to move an "a" distance to the next set up position where the procedure was repeated.

A depth probe was carried out on the Boyes Creek showing, and consisted of placing an intermediate receiving pot between the two outside pots and then contracting the array. (The Lee partition of the Wenner array). The "a" spacing commenced at 500 feet and then decreased to 250, 150, 100, 50, 30 and 10 feet. At each "a" spacing spread readings were taken between the center pot and the south pot ($P_1 - P_0$), between the center pot and the north pot ($P_2 - P_0$) and between the two outside pots as with a regular Wenner array ($P_1 - P_2$). The results are plotted in profile form in Figures 8, 9 and 10.

C - 3: DATA PROCESSING -

Chargeability values were normalized and apparent resistivities were calculated, by slide rule, at the end of each day's work while in the field. At the completion of the survey the raw geophysical data, compiled on to standard pre-printed field note forms, were punched on to computer paper tape. A standard program to calculate (a) normalized chargeability, (b) apparent resistivity, (c) metal factors, (d) and grouping of data and standard deviation and arithmetic mean of sets in (a) and (b) above, were carried out on a Diehl Algotronic Programmable Desk Top Computer. In addition, the coefficient of correlation between chargeability and apparent resistivity was calculated.

The computer-calculated values were utilized for final drafting purposes.

Self potential gradient information was corrected for sign such that the arbitrary positive (electric) pole is either north or west on any particular line.

On the basis of the rather encouraging preliminary data processing work conducted by Mr. B. Mottershead, the metal factor values (or the equivalents) were calculated in the hope of aiding interpretation. The metal factor is actually a mixture of physical properties and is proportional to chargeability divided by apparent resistivity in time domain work.

C - 3: DATA PROCESSING (cont'd)

(Or percentage frequency effect divided by resistivity in frequency domain work). Since it is dependent (inversely) on the apparent resistivity, it serves to emphasize induced polarization effects which occur in conductive environments and to minimize the effect in resistive environments. Mr. H. O. Seigle, in a paper entitled "The Induced Polarization Method"(in Mining and Groundwater Geophysics, G.S.C. Economic Geology Report No. 26, 1967), describes metal factor as: "Since it is not a dimensionless factor nor a true single physical property, it is subject to variation related to changes of shape and resistivity of the medium under investigation, rather than simply to variations in polarization characteristics.". In the writer's opinion the metal factor has some merit in emphasizing induced polarization anomalies due to concentrated metallic bodies but should not be used as a primary indicator of abnormal induced polarization conditions.

Metal factors (MF) were calculated by dividing the chargeability, (M in milliseconds) by the apparent resistivity, (R in ohm-feet) and multiplying by 10^3. Thus,

$$MF = \frac{M}{R} \times 10^3 \text{ seconds/ohm-feet.}$$

C - 4: GRAPHICS -

A set of figures, numbered Figures 1 to 10 inclusive, accompany this report and form the "backbone" of the results obtained. Figures 1, 8, 9 and 10 are included in the body of the report and the remaining figures are included in the map pocket at the end of the report body.

The figures were prepared by personnel employed by the senior author and were drafted in the Delta (Main) Office. Figures 3 through 7 are reconnaissance plan views at a scale of 1" to 400 feet and were prepared from base maps kindly supplied by Mr. Kapp of Conoco Silver Mines Limited. Figures 8, 9, and 10 are profiles of the depth probe conducted on the Boyes Creek showing. They are at a scale of 1" to 100 feet, horozontal equals vertical. Figure 2 shows the relationship of the grid lines to the claim boundaries and is at the same scale as the reconnaissance geophysical maps.

PART D: DISCUSSION OF RESULTS

D - 1: SELF POTENTIAL -

A Self-Potential Gradient plan accompanies this report as Figure No. 4 (map pocket). The plotted results show the value of naturally developed potentials, recorded between the two receiving pots spaced "a" distance apart. Each line is independent of adjacent lines, (that is the results are floating), and the values are gradient potentials.

The direct measurement of potential differences applied to the search for sulphide ores is one of the oldest geophysical prospecting methods. When a sulphide body is situated in a suitable hydrological and geomorphological environment, a natural "battery effect" produces potential differences whose magnitudes occasionally exceed one volt. However, in gradient surveying, changes in excess of 100 millivolts recorded within two "a" spacings are normally considered anomalous. These changes may be due to the oxidation of sulphide minerals or possibly magnetite or the presence of graphite. Self Potential (SP) changes occuring in sedimentary rocks and due to saline solutions of differing concentrations, are generally less than 100 millivolts.

A number of SP changes in excess of 100 millivolts (mv) are shown in Figure 4, the largest number occuring in the northeast survey quadrant on Lines 8 and 12 West. The largest changes were recorded on Line 8 where, between Stations 70+ 50N

D - 1: SELF POTENTIAL (cont'd) -

and 73 + 50 N values of 273 and -33 occur. These strong differences in potential apparently trend northwesterly. Their cause is unknown.

Other significant changes occur in and around positions recorded in the following table:

LINE	STATION	SP GRADIENTS (M-V.)
0	13N	-58; + 60
0	21N	-59; + 63
0	25N	+47; - 73
4W	5S	-75; + 26
8W	3N	50; - 51
8W	11N	81; - 60
12W	27N	56; - 42
12W	31N	52; - 60
40N	35W	-108; 60
40N	43W	98; - 37
38N	37W	-39; 86

Where such large SP gradients occur coincident with high chargeability (or metal factor) response, the importance of the target is certainly enhanced.

D - 2: APPARENT RESISTIVITY -

Figure 5, the Reconnaissance Apparent Resistivity Plan presents subsurface resistivities in ohm-feet. Figure 3 (a) shows

D - 2: APPARENT RESISTIVITY (cont'd) -

a frequency histogram of the recorded values.

Apparent resistivities ranged from a low of 2,000 to a high of 39,200 ohm-feet. The arithmetic mean, of a population of 158 processed values, is 16,936, (approximately 17,000) and the standard deviation is 6,539 ohm-feet. The frequency histogram shows that the population is multimodal and positively skewed. The primary mode lies in the 14,000 to 16,000 ohm-feet class and encompasses eighteen percent of the total population. The secondary mode lies in the 20,000 to 22,000 class. At least two resistivity families are represented; a family "A" which lies in the 10,000 to 25,000 ohm-foot range, and a much more "resistive" family above the 25,000 ohm-foot level. These two families are believed to represent two distinct lithologic units. Family "A" (lower resistivities) is presumably response from volcanic rocks , and family "B" from limestone.

The following catagories of apparent resistivity values is herein defined: -

RANGE	CLASSIFICATION
>10,000	anomalously low
10,000 to 17,000	below "average", family "A"
17,000 to 25,000	above "average", family "A"
>25,000	family "B"

Figure No. 5 has been contoured at the above described levels.

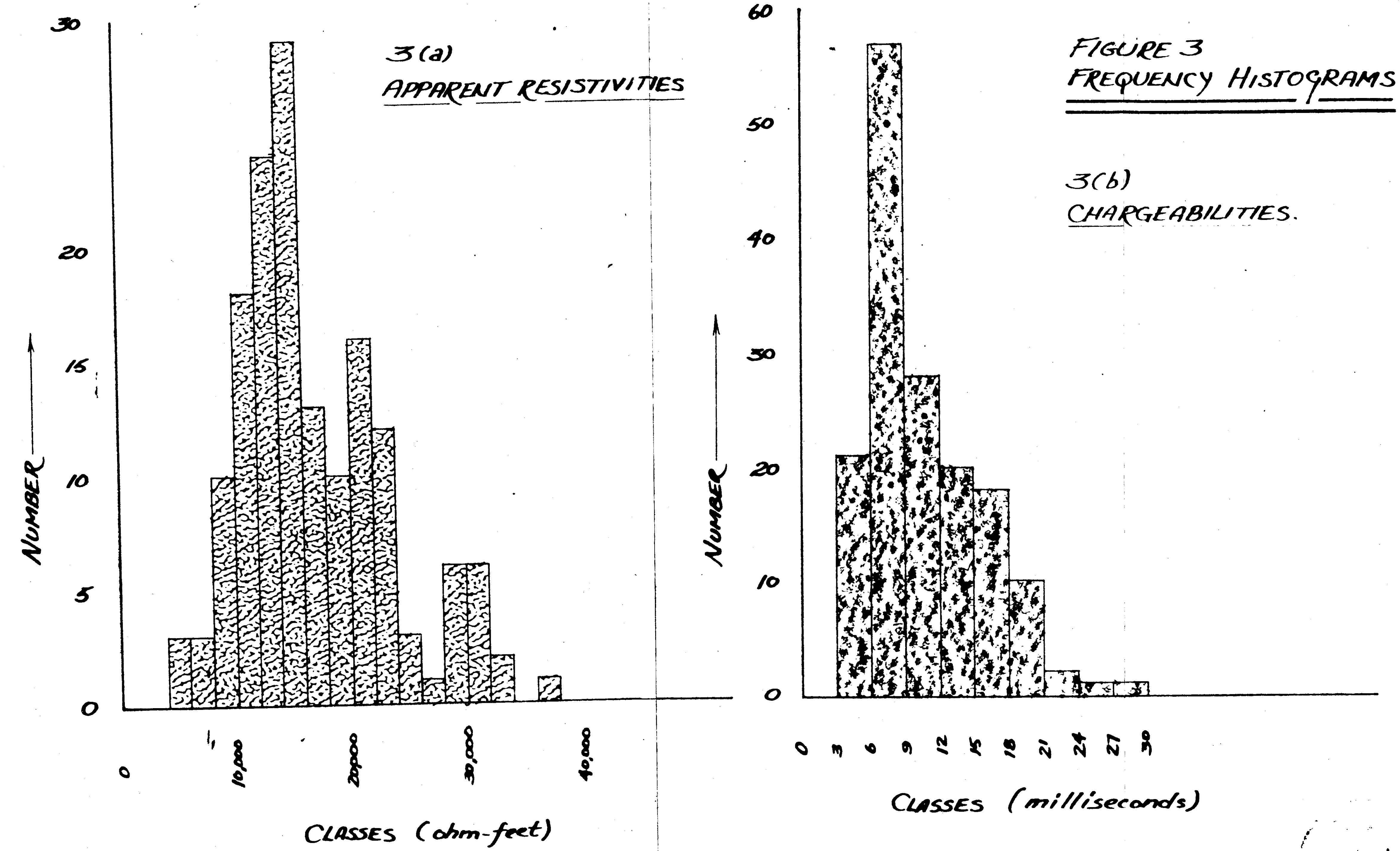


FIGURE 3
FREQUENCY HISTOGRAMS

D - 2: APPARENT RESISTIVITY (cont'd) -

In general, the iso-apparent resistivity trends are northwesterly directed, and are believed to reflect the dominant subsurface lithologic trends. A notable exception occurs in and around 22 to 30 N, on Lines 0, 4 and 8 West. In this area a resistive "wedge" impinges from the northeast and disturbes the general northwest bias. The disturbance is coincident with an easterly flowing stream draining the hillside. Thus there is a physical counterpart to the disturbance, but the actual cause of the feature is not known at this time.

Several "anomalously" low apparent resistivity zones were outlined. The most prominent is centered at 48N; 24 W. This less than 10,000 ohm- foot patch trends northerly and is situated on an easterly sloping hillside. A second anomalous section occurs near the south end of Lines 0, 4, 8 and 12 West, and a third anomaly at the north end of Line 8 West. Resistivity lows of this nature may be attributable to two conditions or to a combination of the two. The anomalies may be due to the presence of sulphides or to the presence of fractured, altered and moist subsurface rocks. Although the presence of sulphides in the bedrock decrease the apparent resistivity values quite noticeably, it has been shown that the presence of significant subsurface moisture often decreases resistivities to a much greater extent. This is verified somewhat in and around the Boyes Creek showing area (see Depth Probe Results) where only a few "anomalous" values are recorded,

D - 2: APPARENT RESISTIVITY (cont'd) -

although sulphides are present, and in fact, the majority of the response lies in the "tens" and lower decade "twenties". Nevertheless, the cause of the "anomalous" apparent resistivity zones should be determined, if they coincide with high chargeability, significant SP changes, or anomalous geochemical results.

D - 3: APPARENT CHARGEABILITY

The chargeability results are presented in contoured plan in Figure No. 6, and a frequency histogram, contained in the report body is designated Figure 3 (b). The chargeability depth probe information is presented in Figure No. 9.

The frequency histogram, compiled from a total population of 158 samples, shows a rather normal to log-normal positively skewed distribution with the primary mode lying in the 6 to 9 millisecond class and encompassing 36 percent of the population. The arithmetic mean is 10.6 and the standard deviation 4.7 m.s. Based on the statistics, the following categories have been devised:

Range (m.s.)	Category
<10	Below average
10 to 14.9	Slightly anomalous
15 to 19.9	Moderately anomalous
>20	"Anomalous"

D - 3: APPARENT CHARGEABILITY (cont'd)

The most important area, with respect to chargeability, is centered near the base line, on cross line 0. Chargeability peaks at just over 20 m.s. in this area, and is enclosed by a slightly to moderately anomalous envelope which trends northerly. Several 8 to 4 second chargeability ratios were computed in this anomalous zone, and values lie in the "hybrid" polarization type class. A standard classification of 8 to 4 second pulse ratios, which is somewhat empirical but has proved useful in previous interpretation is tabulated below:

Ratio of 8/4 sec. IP	Type of Polarization
less than 1.20	Membrane (clays, alteration products, etc.)
1.20 to 1.35	Hybrid (combination of sulphide and membrane types)
Greater than 1.35	Sulphide type (pyrite, chalcopyrite, galena, graphite, etc.)

An 8 to 4 second IP pulse ratio recorded at the extreme south end of line 4W gave a result of 1.20, just on the border between membrane and hybrid type classes of polarization.

A second area of anomalous chargeability response was discovered at the north end of lines 8, 12 and 16 West. Peak

D-3: APPARENT CHARGEABILITY (cont'd)

value in this area is 25 milliseconds and occurs at 73 + 50N on line 8 West. 8 to 4 second pulse ratios in this area are slightly more encouraging, and include values such as 1.29; 1.33; and 1.28. It is worthy to note that apparent resistivity values drop off very sharply in this area.

One moderately anomalous chargeability value was recorded near 60N on line 20W. The author examined this area in the company of Mr. B. Mootershead, and found it to be the sight of the limestone volcanic contact. A few scattered outcrops in the area showed only trace disseminated sulphides, but some fracturing and brecciation. However, a collapse structure, at the limestone contact was observable some 200 feet east of the chargeability high, and a small stream entered the depression and dissappeared under the overburden. The inference is then that the small chargeability high in this area is due to the presence of groundwater and solution cavities in the limestone. An 8 to 4 second pulse determination at 63N on line 20W fell in the upper hybrid class however, (1.34).

Additional chargeability highs were encountered on lines 40W and 56N. (See Figure 6).

D-4: METAL FACTOR

As previously discussed, metal factor calculations are not a primary physical parameter, but a combination of the

D - 4: METAL FACTOR (cont'd)

chargeability and apparent resistivity variables. Metal factors are included in this discussion because of the rather surprising correlation with geochemistry discovered by Mr. B. Mottershead.

The metal factor is herein defined as:

$$MF = \frac{M \text{ Chargeability}}{R \text{ Apparent resistivity}} \times 1,000$$

and has the dimensions of seconds per ohm-feet.

The MF values ranged from a low of 2.0 to a high of 67.8 seconds/ohm-feet. The contour interval used on accompanying Figure 7 is 10.0 seconds/ohm-foot.

There are two areas which are significantly anomalous with respect to metal factors. The largest occurs at the north end of lines 8 and 12 West. In this area a plus 20 seconds/ohm-feet band trends northwesterly and peaks at 67.8. The metal factor high is coincident with low resistivities, chargeabilities in the order of 20 m.s., and steep self potential gradients.

A second area of high metal factors occurs near the south end of line 0. The peak value is 28.8, and is coincident with apparent resistivity values below the 10,000 ohm-foot level, and chargeabilities in the 20 m.s. range. There are no significant self potential gradients which coincide directly.

D - 4: METAL FACTOR (cont'd)

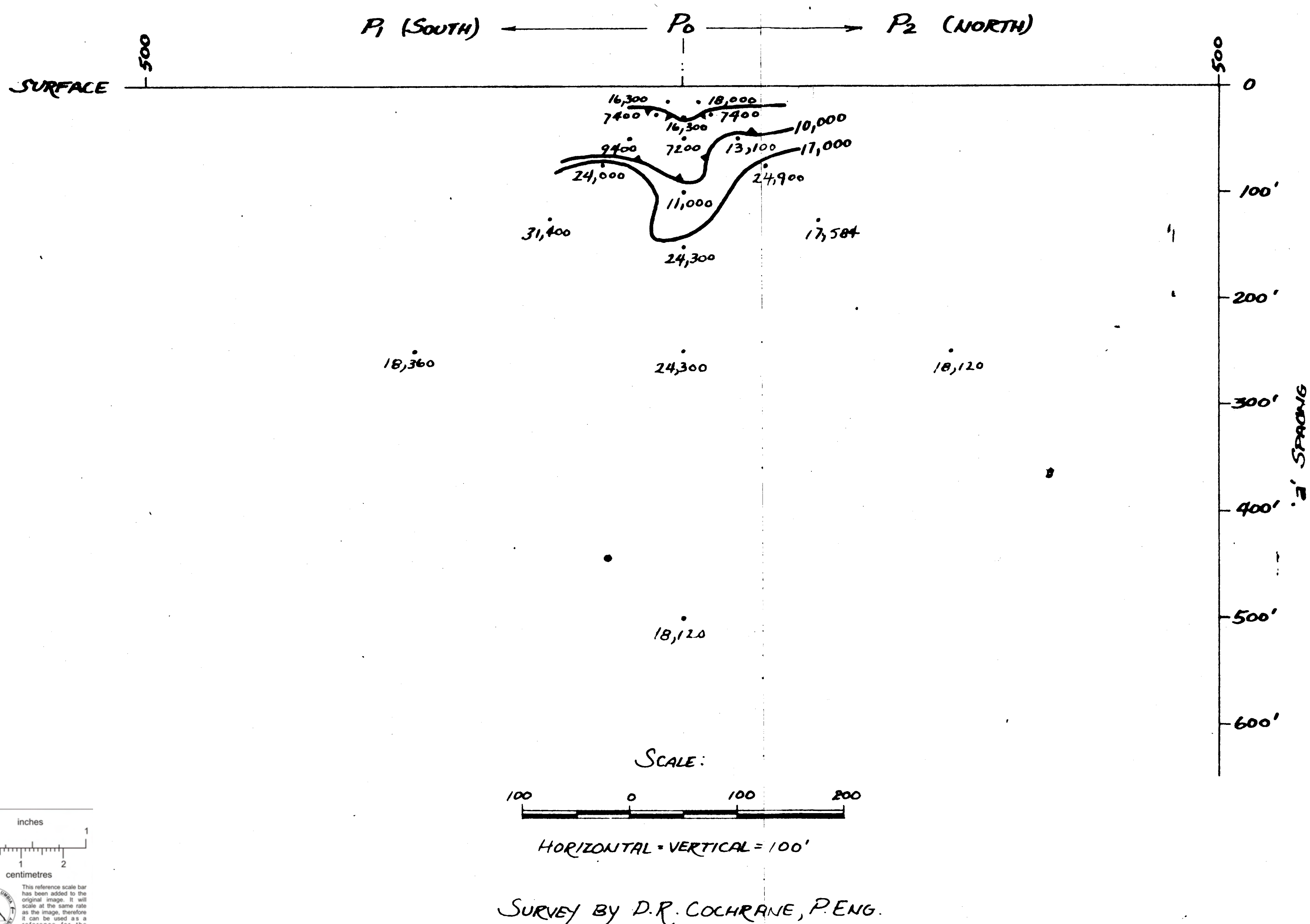
Several areas of above 10 seconds/ohm-feet are shown in Figure 7. One of the largest is centered at 50N on line 24W. This metal factor high is due primarily to low resistivities recorded in the area.

D - 5: DEPTH PROBE

The depth probe results are presented in profile form on Figures numbered 8, 9, and 10, and are located in the report body.

The self potential results are not shown, but gradients were fairly low, the largest changes recorded were at 50 and 30 foot "a" spacings and included values of 50 and 57 millivolts.

Apparent resistivity results in the showing area varied from a low of 7,200 to a high of 31,400 ohm-feet. The anomalous zone (i.e. less than 10,000 ohm-feet) appears to be almost horizontal, and extends from a depth of about 20 to 90 feet from surface. The presence of groundwater is suspected to have exerted a considerable influence in decreasing resistivities in this near surface zone. The iso-apparent resistivity profile contours loop downward at a point immediately below pot P_o, which suggests the bedrock is fractured or broken in the area.



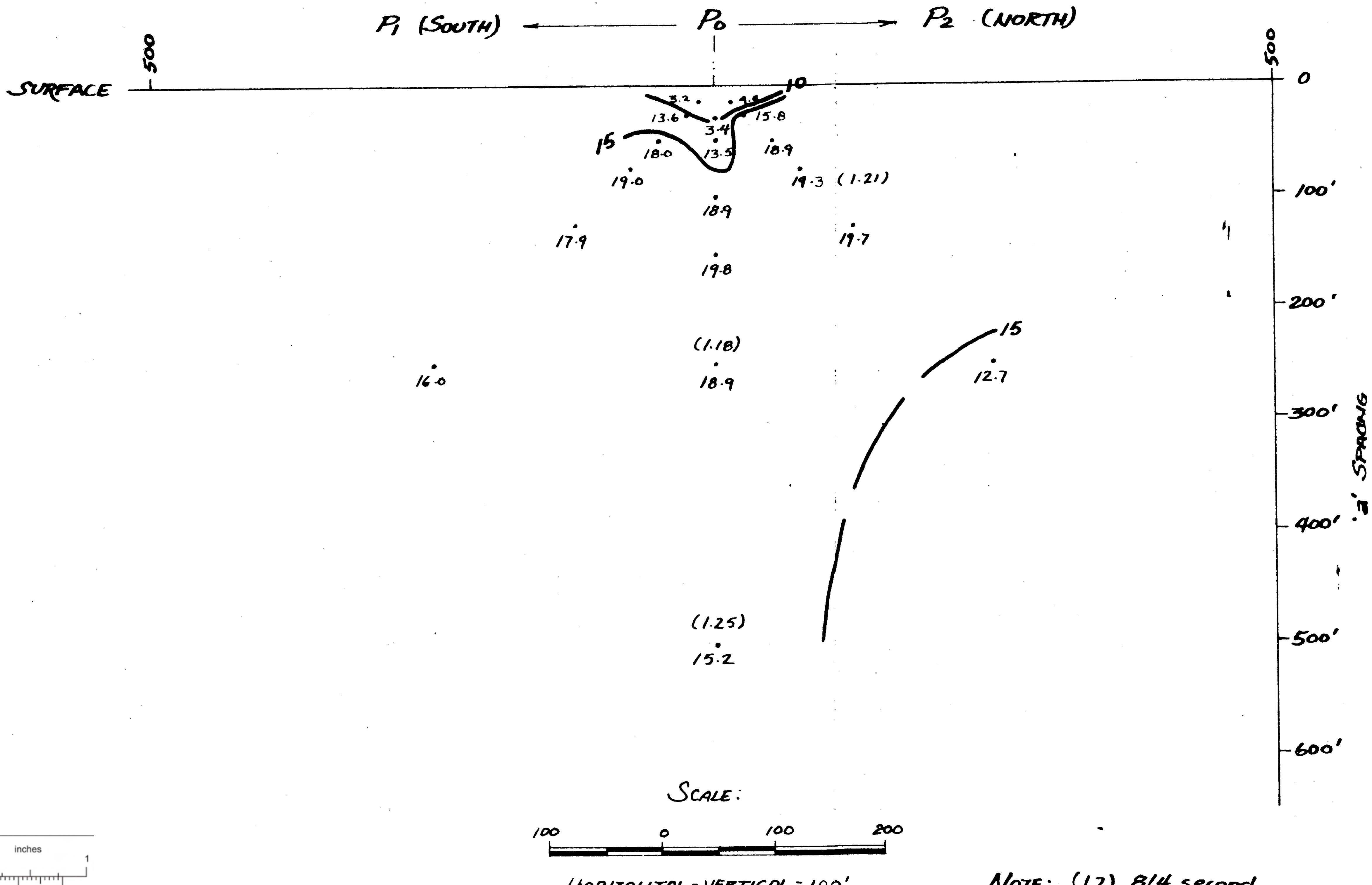
Conoco Silver Mines Limited (N.P.L.)

BOYES CREEK PROJECT
DEPTH PROBE

at 13S; 18W RUN N-S
PROFILE FACING WEST

FIGURE 8
- APPARENT RESISTIVITY -
in ohm-feet

To accompany Geophysical Report by D.R. Cochrane, P.Eng on the Boyes Creek Project of Conoco Silver Mines, Nanaimo M.D., dated Nov. 4, 1971
Delta, B.C.



NOTE: (1.2) 8/4 second chargeability ratios.

SURVEY BY D.R. COCHRANE, P.ENG.

Conoco Silver Mines Limited (N.P.L.)

BOYES CREEK PROJECT
DEPTH PROBE

at 13S; 18W RUN N-S
PROFILE FACING WEST

FIGURE 9
CHARGEABILITY
in milliseconds

To accompany Geophysical Report by D.R. Cochrane, P.Eng on the Boyes Creek Project of Conoco Silver Mines, Nanaimo M.D., dated Nov. 4, 1971
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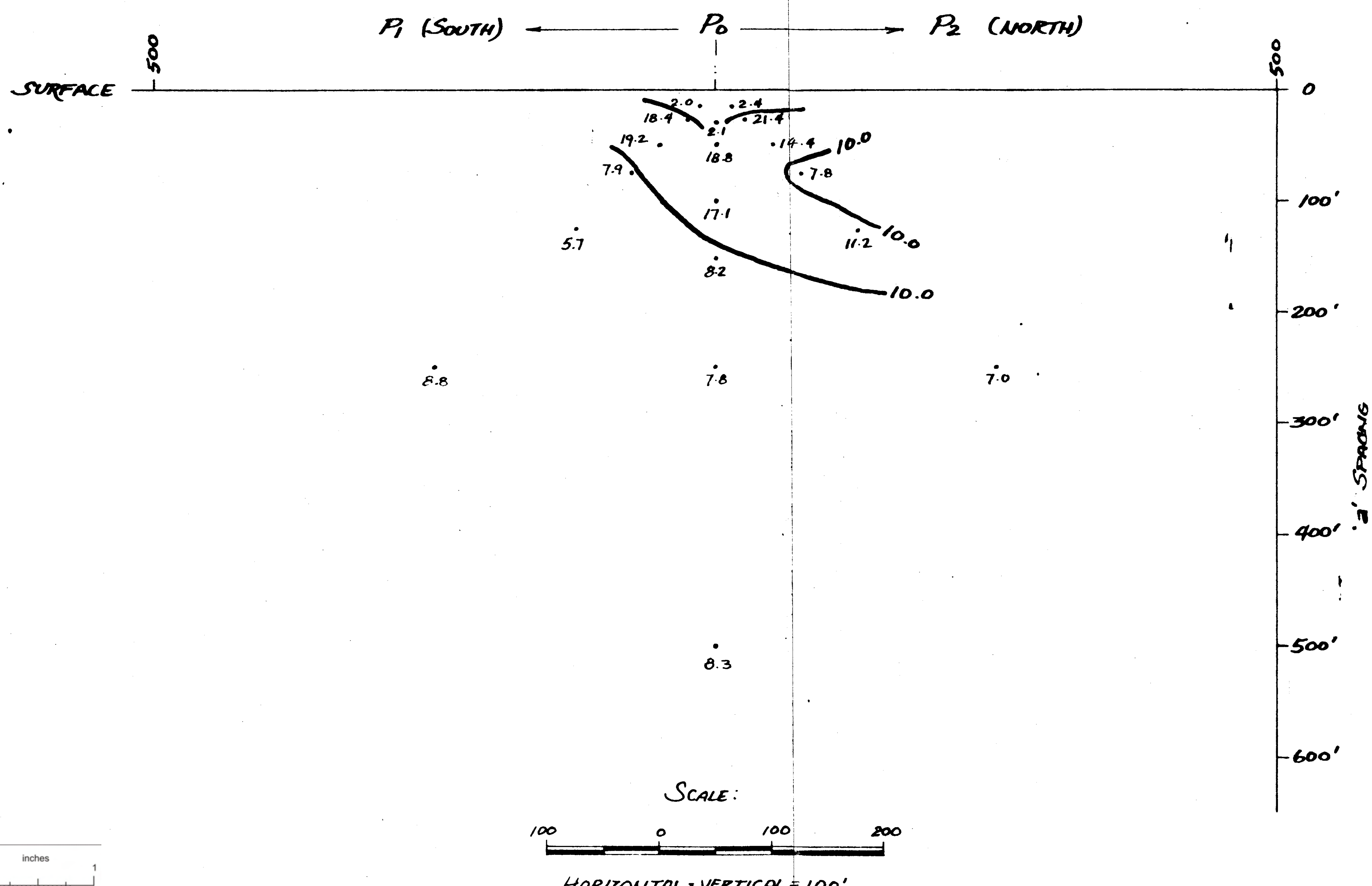

SURVEY BY D.R. COCHRANE, P.ENG.

Conoco Silver Mines Limited (N.P.L.)

BOYES CREEK PROJECT
DEPTH PROBE

at 13S; 18W RUN N-S
PROFILE FACING WEST

FIGURE 10
METAL FACTOR
in seconds/ohm-feet

To accompany Geophysical Report by D.R. Cochrane, P.Eng on the Boyes Creek Project of Conoco Silver Mines; Nanaimo M.D., dated Nov. 4, 1971
Delta, B.C.

D - 5: DEPTH PROBE (cont'd)

Apparent chargeability values in the depth probe area ranged from a low of 3.2 to a high of 19.8 milliseconds. The plus 10 m.s. band is wedge shaped and apparently dips (or plunges) to the south. The most favourable chargeability point is situated immediately below position P_o some 100 to 150 feet below surface.

The metal factor profile shows values ranging from a low of 2.0 to a high of 19.2 seconds/ohm-feet. The plus 10 band is "Y" shaped and the peak metal factor value is located about 50 feet south of P_o and approximately 50 feet below surface.

D - 6: CORRELATION OF DATA

One quantatative measure of the "matching" of data is the coefficient of correlation. This parameter may vary from plus 1.0 (a perfect one to one correlation) through zero (indicating no correlation, i.e. random signals) to minus 1.0. The latter indicates a perfect inverse correlation, that is when one variable increases the other variable decreases in amplitude. The ideal geophysical-geochemical target would be the increase in chargeability, coincident with a decrease in apparent resistivity, coincident with an increase in geochemical values.

D - 6: CORRELATION OF DATA (cont'd)

The coefficient of correlation of the chargeability with matching apparent resistivity values was calculated of the entire set of reconnaissance data, and the calculated coefficient is -0.06. This is a rather weak correlation, and indicates a very weak tendency for apparent resistivity values to increase as chargeability increases. The coefficient of correlation between copper geochemical values and metal factors was calculated from the data on lines 0, 8W, and 24N. The coefficient is -0.15 indicating a very weak tendency for geochemical values to decrease in areas of high metal factors. This latter result may have been influenced by the downslope migration of geochemical values, so that geochemical high's now exist on the flanks of the metal factor peaks.

Respectfully submitted,

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. R. COCHRANE

D. R. Cochrane, P.Eng.,
November 5, 1971.
Delta, B.C.

APPENDIX I

Certificates

Name:	COCHRANE, Donald Robert
Education:	B. A. Sc. - U. of T., M.A.Sc. - Queen's University
Professional Associations:	Professional Engineer of B. C., Ontario, and Saskatchewan. Member of C.I.M.M., G.A.C., M.A.C., Geological Eng.
Experience:	Engaged in the profession since 1962 while employed with Noranda Exploration Co. Ltd., Quebec Cartier Mines Ltd., and Meridian Exploration Syndicate.

Name:	SCOTT, Alan R.
Education:	B. Sc. - Geophysics, U.B.C.
Experience:	Two summers - crew member and operator with Geo-X Surveys Ltd. Presently employed with D. R. Cochrane - Geophysicist
Professional Associations:	Member of S.E.G.

Name:	CHASE, William
Age:	20
Education:	Grade 12 Diploma
Experience:	Employed since September, 1970 and engaged in EM and IP surveying. Previous experience at the Anvil Mine, Y.T., Summer, 1970.

Name:	ESTACAILLE, N.
Age:	24
Education:	Grade 12 Diploma
Experience:	One-half year exploration experience with Huntec.

Name:	WHELEN, Michael A.
Age:	19
Education:	First year university - Douglas College
Experience:	No previous experience

Name:	COCHRANE, Bruce
Education:	O.C.A. Certificate
Experience:	Geo-X Surveys Ltd. - one full season

APPENDIX II

Personnel & Dates Worked

The following personnel, employed by D. R. Cochrane, P.Eng. were employed on the Conoco Boyes Creek Project on the dates set out below.

A. Field Crew:

Name	Position	Dates
A. Scott (B.Sc.)	Instrument Operator	Oct. 4 to 10, 15 to 19
D. R. Cochrane, P.Eng.	Supervision	Sept. 29, 30; Oct. 12, 13
N. Estacaille	IP Crew, Operator	Oct. 4 to 19
W. Chase	IP Crew, Operator	"
M. Whelen	IP Crew, Operator	"

B. Data Processing, Report Preparation:

D. R. Cochrane, P.Eng.		Oct. 25 to 29, 31, Nov. 2, 3
A. Scott	Data Processing	Oct. 20, 21
B. A. Cochrane	Drafting	Oct. 25 to 29, 31, Nov. 1, 2

APPENDIX III

Cost Breakdown

By contract, dated October 1, 1971, between Conoco Silver Mines Ltd. (N.P.L.) and D. R. Cochrane, P.Eng., re:

IP surveying on claims in the Adams River Area, Nanaimo, M.D.

1.	7.8 line miles @ $605.00/line mile	$ 4,719.00
2.	Oct. 18, Depth Probe, 1 day @	355.00
	Sub Total	$ 5,074.00
3.	Preparation, Reproduction of 6 additional reports and maps	
	Maps: $\frac{6}{11}$ x $41.10	22.42
	Report: 6 x 32 x 10¢	19.20
	TOTAL	$ 5,115.62

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — D. R. COCHRANE

D. R. Cochrane, P.Eng.

APPENDIX IV (a)

Instrument Specifications - IP

Transmitter Unit

Current pulse period (D.C. Pulse)	
Manual initiated timer	1 - 10 seconds
Current measuring ranges	0 - 500 0 - 1000 milliamperes 0 - 5000
Internal voltage converter 27 volt D.C. 350 watt output with belt pack batteries	250 500 volts D.C. 1000 Nominal

500 watts using 27 volt aircraft batteries

Transmitter can switch up to 3 amps at 1000 volts from generator or battery supply with resistive load. The switching is done internally in the transmitter unit. Remote control output can switch up to 10 kilowatts of power by using a separate control unit. A remote control cord is supplied with auxiliary equipment.

Receiver Unit

Self Potential Range	0 - 1000 millivolts 1 millivolt resolution
Integration time periods	.8 seconds 1.6 seconds
Tandem Integration time periods	1.6 seconds 3.2 seconds
Input filtering	3 ranges plus 4 integration combinations
Delay time from cessation of current pulse	.3 seconds

(Combined Photo Electric Coupled Receiver and Transmitter)

Operation Temperature .25°F - 120°F

POWER SUPPLY

Receiver Unit	4 Eveready E136 Mercury Batteries 2 Eveready E134 " " 2 Eveready E401 " "
Transmitter Unit (recon. mode)	Sealed Rechargeable 6 amp. hr. belt pack capable of driving the converter at 350 watts for a minimum of one day's operation before recharge.
Transmitter Unit (med. power mode)	Aircraft 11 amp. hr. Battery
Battery Charger	Custom Automatic cutoff for charging sealed batteries.

Conoco Silver Mines Limited (N.P.L.)

BOYES CREEK PROJECT

FIGURE 5

APPARENT RESISTIVITY PLAN

To accompany Geophysical Report by D.R. Cochrane, P.Eng., on the 'Boyes Creek Project' of Conoco Silver Mines, Nanaimo M.D., dated Nov. 4, 1971, Delta, B.C.

Conoco Silver Mines Limited (N.P.L.)
BOYES CREEK PROJECT
FIGURE 6
CHARGEABILITY PLAN
To accompany Geophysical Report by D.R. Cochrane, P. Eng., on the 'Boyes Creek Project' of Conoco Silver Mines, Nanaimo M.D., dated Nov. 4, 1971, Delta, B.C.
400 200 0 200 400 800 1600 ft.
Scale: feet
DEPTH PROBE – BOYES CREEK.
P1 Po P2
10ms
15ms
20ms
(200' 'a')
(300' 'a')
60+00W
56+00W
52+00W
48+00W
44+00W
40+00W
36+00W
32+00W
28+00W
24+00W
20+00W
16+00W
12+00W
8+00W
4+00W
BASELINE
4+00E
8+00E
24+00S
20+00S
16+00S
12+00S
8+00S
4+00S
BASELINE
4+00N
8+00N
12+00N
16+00N
20+00N
24+00N
28+00N
32+00N
36+00N
40+00N
44+00N
48+00N
52+00N
56+00N
60+00N
64+00N
68+00N
72+00N
76+00N
80+00N
FIGURE 6