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A GEOPHYSICAL REPORT ON

AN INDUCED POLARIZATION SURVEY

OVER

DUNGATE CREEK PROPERTY, OMINECA MINING DIVISION

BRITISH COLUMBIA (54°, 126°, S.W.)

FOR

NORMONT COPPER LIMITED

BY

HUNTEC LIMITED

TORONTO, ONTARIO

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INTRODUCTION

Between October 18th and November 5th, 1966, Huntec Limited carried out an Induced Polarization (I.P.) survey over a property held by Normont Copper Limited and located in the Houston-Smithers area of British Columbia.

The survey was conducted along picket lines turned off at 400 foot intervals from N 68° E baseline and chained at 100 foot intervals.

Reconnaissance chargeability (the I.P. response parameter) measurements were made every 200 feet using the "three-electrode array" method of surveying with an electrode separation of 200 feet. Where necessary additional measurements were made at appropriate station intervals using multiple electrode spacings to further examine possible anomalies.

Simultaneous readings of resistivity were made in addition to these chargeability measurements and in all 3.41 miles of reconnaissance and 0.78 miles of detail surveying were completed.

The reconnaissance data are presented in contoured form on 1":200 feet plan maps of the line grid, while the detail data are presented in profile form. The profile scales are one inch to ten milliseconds and 2 inches per logarithmic cycle for chargeability and resistivity respectively.

PROPERTY AND LOCATION

The Dungate Creek property of Normont Copper Limited is in the Omineca Mining Division of British Columbia and is located approximately 5 miles southeast of Houston (54°23'N, 126°33'W).

The property is on a flat logged area at an elevation of some 3000 feet surrounded by high hills, access to which is by a winding gravel road from the south end of Houston.

The following mineral claims representing the property were surveyed:

Star 17, 19 and 21

Klondike 1, 2, 3, 4, 7 and 8

Purpose of the Survey

The purpose of the survey was to try and locate, by the Induced Polarization method, the presence of any mineral deposits in the area.

Geological Environment

The area in general is covered by Pleistocene and Recent deposits such as glacial outwash, sand and gravel. These are underlain by acid-intermediate volcanics of the Hazelton group.

Trachyte and andesite outcrop as hills ringing the property, while greywacke and quartz porphyry are exposed in trenched areas.

For further geological details the reader is referred to a report on the property written by Mr. Norman Shepherd of Southwest Potash Corporation in December 1965.

SURVEY SPECIFICATIONS

The survey was carried out using a Huntec pulse-type Induced Polarization unit, comprised basically of a transmitter, receiver and motor generator.

In this system a gasoline motor, coupled to a 2.5 kw, 400 cycle three-phase generator allows the transmitter to provide a maximum of 2.5 kilowatts d.c. to the ground at a cycling rate of 1.5 seconds "current on" and 0.5 seconds "current off", the pulses reversing continuously in polarity.

The data recorded in the field consist of careful measurements of the current (I) in amperes flowing through electrodes C_1 and C_2, the primary voltage (V_p) appearing between the potential electrodes, P_1 and P_2, during the "current on" part of the cycle and a secondary or over-voltage (V_s) appearing between P_1 and P_2 during the "current off" part of the cycle. The apparent chargeability (M_a) in milliseconds is calculated by dividing the secondary voltage by the primary voltage and multiplying by 400 which is the sampling time in milliseconds of the receiver unit. The apparent resistivity (ρ_a) is proportional to the ratio of the primary voltage and the measured current, the proportionality factor depending on the geometry of the array used. The resistivity and chargeability obtained are called "apparent" as they are values which that portion of the earth sampled would have if it were homogeneous. As the earth

sampled is usually inhomogeneous, the calculated apparent resistivity and apparent chargeability are functions of the actual resistivities and chargeabilities of the rocks.

The survey was carried out using the "three-electrode array" system. In this system, the current electrodes (C_1) and the two potential electrodes, P_1 and P_2, are moved in unison along the survey lines. The spacing between them is kept constant for each traverse, at a figure roughly equal to the depth to be explored by that traverse. The second current electrode (C_2) is kept fixed at "infinity".

Thus, on a three electrode traverse with a spacing of 200 feet, a body lying at a depth of 100 feet will produce a strong response, whereas one at a depth of 200 feet will produce a weaker one. By running subsequent traverses at different electrode spacings, more precise estimates can be made of depth to the top of causative bodies, as well as more information on the geometry and extent of the bodies.

The "three-electrode array" with a 200 foot electrode separation was used over the entire survey area to try and detect zones of sulphide mineralization. Subsequent detail work was then done with 100 and 400 foot electrode separations respectively along certain lines as deemed necessary to give additional information for the selection of drilling targets.

INTERPRETATION PROCEDURE

Induced Polarization interpretation procedures have been most completely developed in situations of horizontal layering and for bodies of large lateral extent such as porphyry coppers. The complex problem of resolving the combined effect of depth, width, dip and true chargeability of steeply dipping bodies, together with the physical characteristics of overburden and country rocks have not been completely solved theoretically. The interpreter must, therefore, use empirical solutions, plus experience gained from surveys over known bodies in other areas in addition to existing type curves.

The interpretation submitted in this report indicates two large anomalous zones which could correspond to disseminated sulphide mineralization. The actual bodies, if existent, are probably smaller than the indicated zones as shown on the accompanying maps. Estimates of depth to the top of mineralization have been made by virtue of the three-electrode data. Drill holes have been spotted based on these depths and positions of the probable causative body.

Estimates of average percentage sulphide have been made. These are minimum estimates as they are based on the value of the observed chargeabilities and not on the true chargeabilities of the anomalies themselves. They are necessarily approximate as the relationship

between chargeability and percentage sulphide is affected by such things as grain size, resistivity contrast, quantity and nature of absorbed water, degree of interconnection of mineralization, and other factors. The rule-of-thumb used in this interpretation, based on past experience, is that 1% by volume of sulphide mineralization corresponds to between 5 and 15 milliseconds of true chargeability.

DISCUSSION OF RESULTS

The Induced Polarization survey, as performed with a 200 foot electrode separation, is generally characterized by a high chargeability background, above which two anomalous zones, one strong and one weak, are discernible.

The outlines of these zones are simple and of maximum extent as determined by the 200 foot electrode separation, but they could conceivably be narrower and more complex.

The resistivity survey, which was done simultaneously with the I.P. survey, appears to do little except indicate changes in overburden conductivity and/or depth. The lower resistivity values are seemingly associated with the wetter and lower ground to the east and west while the higher values are obtained over the higher and drier ground in the centre of the property.

The results of a magnetometer survey, conducted by the client, negate the possibility of the I.P. response being due entirely to magnetite. They do, however, show the presence of minor magnetic highs which are thought to be caused by magnetite mineralization. It is not possible from the results of either the resistivity or magnetometer survey to determine the alleged contact between the porphyry intrusive and the adjoining greywacke.

Detail Induced Polarization work using electrode separations of 100, 200 and 400 feet respectively was done over the anomalous readings on Line 2W and the baseline to give additional information for the selection of drilling targets.

The overall results, as shown on the accompanying profiles, exhibit the highest response, in all cases, on the 200 foot electrode separation. They lead to the interpretation that the high chargeability background existing over the whole property, with the exception of the two most easterly lines, is caused by 2 to 3% (by volume) sulphide mineralization, disseminated throughout most of the porphyry intrusive and the greywacke.

The low readings on Lines 8E and 12E are thought attributable to a change in the chargeability background caused by a change in rock type.

The anomalous readings are considered to be probably caused by increased sulphide mineralization and two holes are accordingly suggested to test the nature of the stronger anomaly. They are:

Hole No. 1 — This angle hole, of minimum length 400 feet, preferably 50°, should be collared on Line 2W and drilled southwards so as to intercept 5+30N at 150 feet perpendicularly below the surface. This hole has been recommended to test the existence of a shallow causative

body, bearing a minimum of 3% sulphide mineralization, as indicated by the chargeability peaks on the 100 and 200 foot electrode spacings.

Hole No. 2 — This angle hole of minimum length 500 feet, preferably 50°, should be collared on the baseline and drilled westwards so as to intercept 5+25W at 250 feet perpendicularly below the surface. This hole has been recommended to test the existence of a causative body, bearing a minimum of 3% sulphide mineralization, indicated by the peaks on the 100, 200 and 400 foot electrode spacings.

SUMMARY AND RECOMMENDATIONS

Between October 18th and November 5th, 1966, Huntec Limited carried out an Induced Polarization (I.P.) survey over a property held by Normont Copper Limited and located in the Houston-Smithers area of British Columbia.

The survey indicated the presence of two possible zones of mineralization. Multiple electrode spacing work done over the stronger zone suggested the causative source to be reasonably shallow.

Drilling has been recommended to test the nature of the interpreted mineralization on the stronger anomaly. The location of two boreholes have been suggested as described in the previous section.

Should the results obtained by drilling be encouraging, the weaker anomaly should be subjected to detail surveying by the Induced Polarization method.

HUNTEC LIMITED

Peter E. Walcott, P. Eng.
Consulting Geophysicist.

Andrew R. Dodds, B. Sc.
Geophysicist.

APPENDIX

Survey Data

Claims Surveyed:

The following mineral claims were covered in whole or in part by this survey:

Star 17, 19 and 21

Klondike 1 to 4 inclusive, 7 and 8.

Line-miles Surveyed:

The survey comprised two phases: reconnaissance (covering all lines once with one electrode separation), and detail (resurveying selected lines with different electrode separations). The number of line-miles of readings taken in each phase was as follows:

	Line-miles	Readings
Reconnaissance	3.41	121
Detail	0.78	33
Total	4.19	154

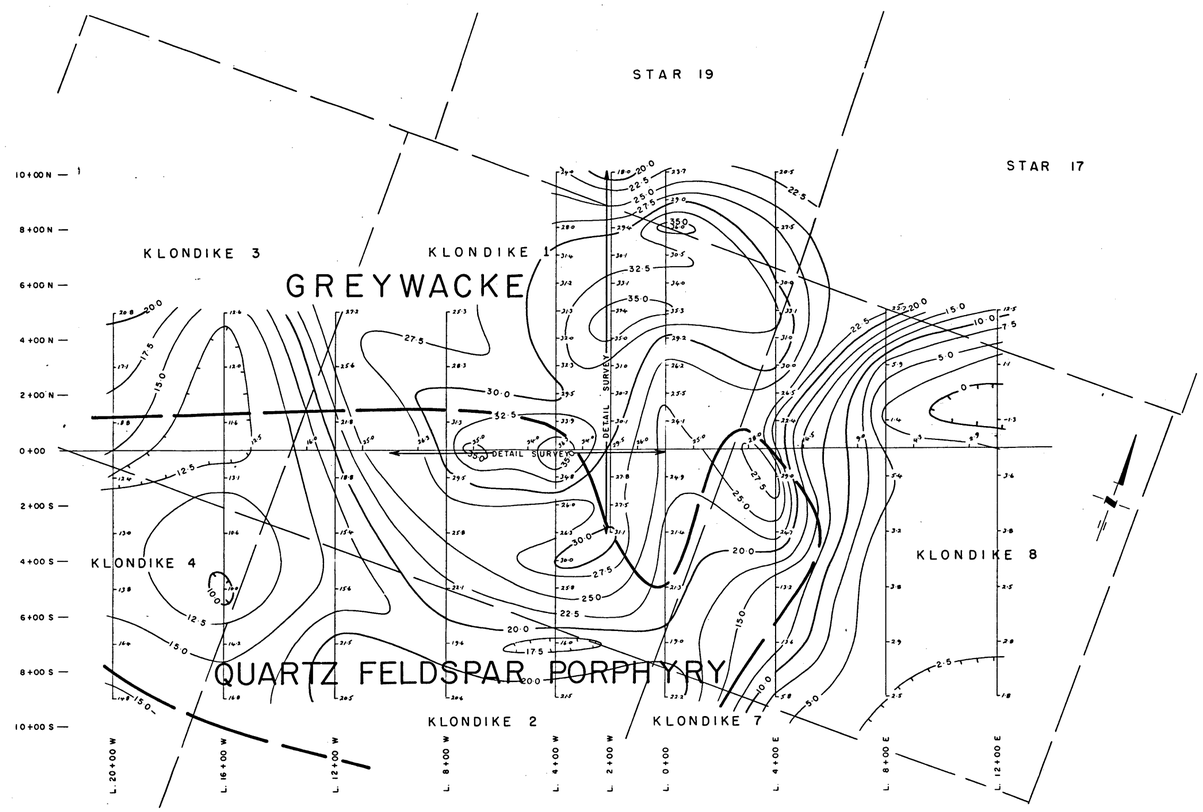
Man-days Required:

The number of man-days required to complete the survey was:

	Man-days
Operating geophysical equipment	32
Interpretation and Report writing	2
Drafting	3
Typing	1/2
	37 1/2

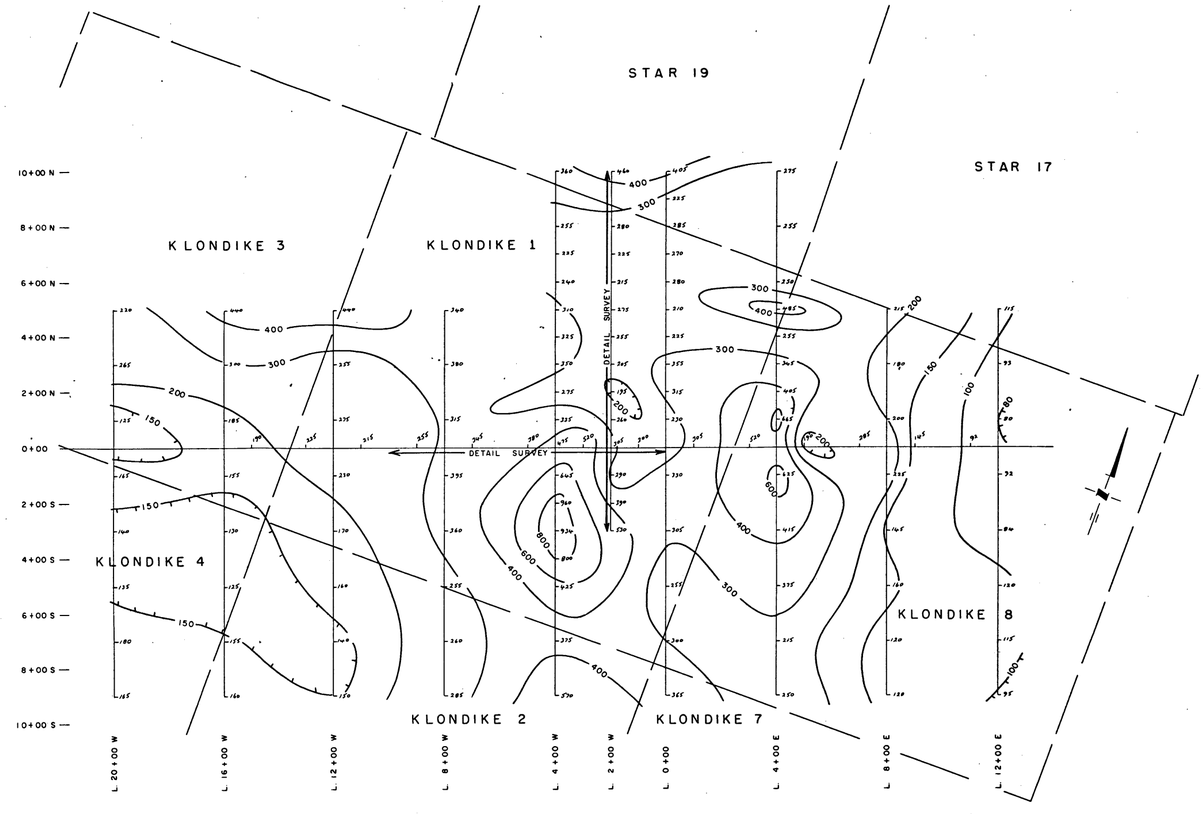
Personnel Employed on Survey:

Name	Occupation	Address	Dates
P. E. Walcott	Consulting Geophysicist	Rexdale, Ontario	Dec. 25, 1966
A. R. Dodds	Geophysicist	1450 O'Connor Dr., Toronto 16, Ontario.	Nov. 14, 21, 1966
A. Schamotta	Geophysical Operator	"	Oct. 20, Nov. 3-5, 1966
G. Boulay	"	"	"
R. Carisse	"	"	"
H. MacDonald	Helper	Houston, B. C.	Oct. 20-22, 1966
R. Beckett	"	"	Oct. 21-24, 1966
R. O'Brien	"	Smithers, B. C.	Nov. 3-5, 1966
K. D. Hafner	"	"	Nov. 4-5, 1966
J. Wilson	Drafting	1450 O'Connor Dr., Toronto 16, Ont.	Jan. 11, 12, 13, 1967
L. Brunton	Typing	"	Jan. 13, 1967



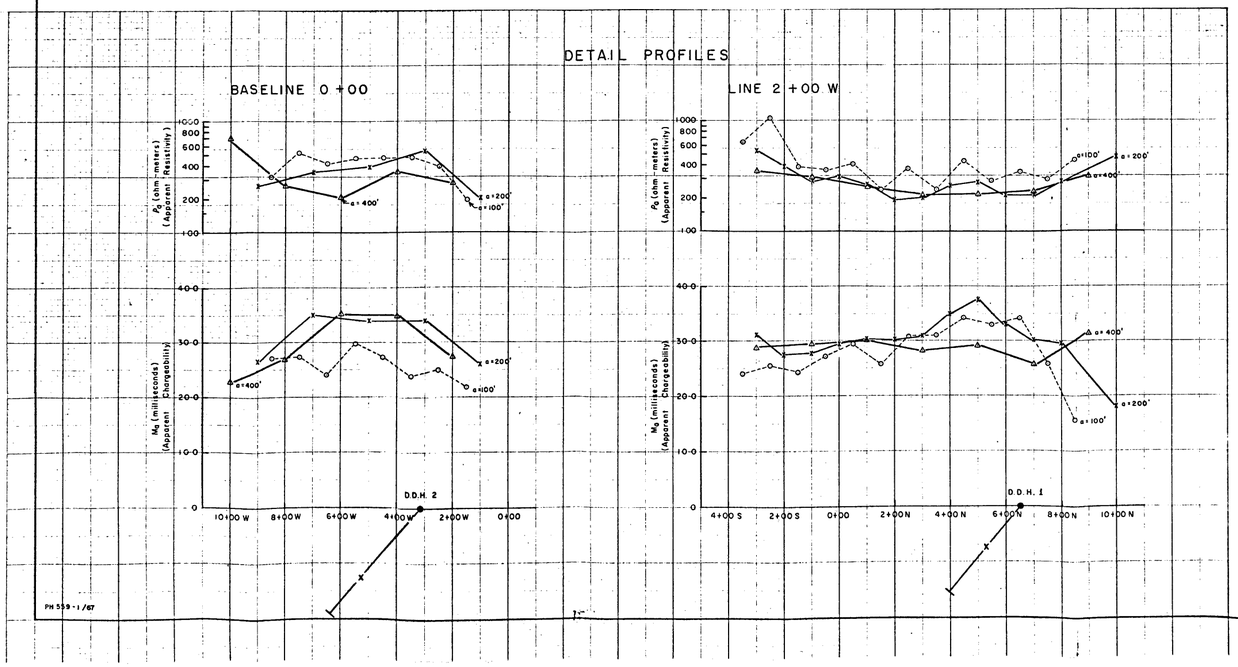
APPARENT CHARGEABILITY CONTOURS
WITH INTERPRETATION

CONTOUR INTERVAL 2·5 milliseconds



APPARENT RESISTIVITY CONTOURS

CONTOURS AT (logarithmic intervals) 80, 100, 150, 300, 400, 600, 800 ohm—meters



INTERPRETATION LEGEND

Geological contact

D.D.H. Recommended Diamond Drill Hole

3 ELECTRODE ARRAY

Sta. Loc. C_1 P_1 P_2 C_2

Contour Maps : a = 200 feet

Detail Profiles : a as marked

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CAUTION
50%
OF ORIGINAL SIZE

NORMONT COPPER LIMITED

INDUCED POLARIZATION SURVEY

DUNGATE CREEK PROPERTY

OMINECA MINING DIVISION, B.C.

SCALE 1 inch = 200 feet

To accompany report by
P. E. Walcott, P.Eng., Geophysicist

HUNTEC LIMITED, Toronto, Canada — January, 1967