A GEOPHYSICAL REPORT ON AN INDUCED POLARIZATION SURVEY MOOREHEAD & LIMECAP CLAIM GROUPS MOOREHEAD LAKE, NR. LIKELY, B.C. (52° 121° NW) FOR MILESTONE MINES LTD. BY W.A. Finney, B.Sc. Geophysicist

R.K. Watson, B.A.Sc., P.Eng. Geophysicist

February 8th - 20th, 1968



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REPORT ON

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AN INDUCED POLARIZATION (I.P.) SURVEY MOOREHEAD AND LIMECAP CLAIM GROUPS CARIBOO MINING DIVISION, B.C.

FOR

MILESTONE MINES LTD.

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HUNTEC LIMITED VANCOUVER B.C. FEBRUARY 1968

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1'' = 200 ft.

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ACCOMPANYING MAPS

Dwg.#1

Dwg.#2

Dwg.#3

Dwg.#4

Dwg.#5

Dwg.#6

Dwg.#7

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Map Pocket Scale Apparent Chargeability Contours with Interpretation $1^{11} = 200 \text{ ft.}$ 1'' = 200 ft.Apparent Resistivity Contours Apparent Chargeability and 3 Resistivity Contours with 1'' = 200 ft.Interpretation Detail Profiles - Line 10E 1'' = 200 ft.Detail Profiles - Line 14E 1'' = 200 ft.Detail Profiles - Line 18E 1" = 200 ft.

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Dwg.#1	(Fig.A)	-	Location Mag	р	1"	Ξ	1	mile

Detail Profiles - Line 22450E

INTRODUCTION

General

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This report contains the results of an induced polarization survey carried out by Huntec Limited for Milestone Mines Ltd. on the Moorehead and Limecap Claim Groups in the Cariboo Mining Division, British Columbia.

The purpose of the survey was to prospect for sulphide mineralization in both massive and disseminated form. The I.P. method has been shown in the past to be capable of detecting both types of mineralization, even in circumstances where the percentage volume of mineralization is quite low.

The field work was carried out between February 8th and February 20th, 1968 using a four-man crew under the direction of Mr. W. Finney.

The Property

The Claim Groups are situated south of Moorehead Lake about twelve miles by road from Likely which is on the west end of Quesnel Lake. Access by highway and secondary gravel roads is possible from either Quesnel or Williams Lake, which are located 44 air miles northwest and 35 air miles south-west respectively.

The claims surveyed include Limecap 2, 3, 5, 6 and 7, Copper Ridge 1, 2 and 3, and Miles 1 and 2. The detailed surface geology of the property is not known fully but outcrops of andesitic volcanics occur extensively. Syenite outcrop is known to exist further to the south and it is possible that this rock type underlies the volcanics on the property itself. A small limestone outcrop occurs about 1,000 feet north of the survey area, but it is not known if this rock type occurs within the survey area; detailed geological mapping may show this to be the case.

Small mineralized showings have been noted within the volcanics. These are mainly native copper, malachite staining and chalcocite, which is associated with narrow crystalline carbonate veinlets.

The survey was carried out along the grid of lines at 200 ft. intervals, oriented approximately 115° azimuth. Readings were taken at 200 foot intervals along the lines in the reconnaissance phase of the survey. Several traverses were run along lines orthogonal to these using several electrode separations and closer station intervals. Full details of this work and the reasons for it are given in the section under Results and Interpretation.

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SURVEY SPECIFICATIONS

The Equipment

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The Induced Polarization equipment used was a 2.5 kw pulse-type instrument manufactured in Toronto by Huntec Limited. The following specifications apply:

Type of current	Direct Current broken at periodic intervals
Frequency	1.5 seconds "current on" and 0.5 seconds "current off". Alternate pulses have reverse polarity
Integrating time	400 milliseconds
Maximum power available	2.5 kw
Maximum current available	3.0 amps

Measurements taken in the field were:

- 1. The current flowing through the current electrodes C_1 and C_2 .
- 2. Primary voltage V_p between measuring electrodes during "current on" time.
- 3. Secondary voltage V_S between measuring electrodes during "current off" time.

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 is calculated by dividing V_p by the current and multiplying by the geometrical factor appropriate to the electrode array being used.

Electrode Configuration

The entire I.P. survey was carried out using the

pole-dipole electrode configuration or array. In this array the current electrode C_1 and the two potential electrodes P_1 and P_2 are moved in unison along the line to be surveyed. The quantity "a" or "electrode separation" is the distance between C_1 and P_1 . The distance between P_1 and P_2 is kept at some convenient distance equal to "a" or a simple fraction of "a".

Since the value of "a" is a rough approximation to the depth penetration, detailing of anomalies discovered in the reconnaissance phase was done by profiling the anomalies at different electrode separations. This additional data provides information from which depth, dip and location may more easily be calculated than from a single profile.

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RESULTS AND INTERPRETATION

General

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A preliminary inspection of the property was made initially to determine exactly the region in which previous work had outlined possible mineralized zones. A rectangular survey grid was then established to cover the area of prime interest. This consisted of a northsouth (magnetic) baseline 2200 ft. long with survey lines spaced at 200 ft. intervals along it, extending 800 ft. to the west and 1200 ft. to the east. The Initial Post of Claims Limecap 5 and Limecap 6 was used at the origin of the grid, i.e. the intersection of the Baseline and Line 0+00N.

All lines were chained and 100 ft. stations marked with either pickets or flags. All flags were marked with the prefix I.P., H.T. as well as line and station numbers. A total of 4.55 line-miles was intended for survey using the pole-dipole array with readings taken at 200 ft. intervals along the lines.

During the actual field work several fixed points in the survey area were located relative to the I.P. survey lines. These include the Government Survey Peg, the existing Diamond Drill Hole, the initial post for Limecap Claims 1, 2, 3 and 4, the initial and final posts for Limecap Claims 5 and 6, the final post for Copper Ridge Claims 1 and 2, the initial post of Limecap Claim 7 and Copper Ridge Claim 3, and the final post of Miles Claim 1 and 2. The position of some outcrops, the trench, and roads within the survey area, have also been accurately located. On Drawings #1 and #2, the claim boundaries are shown as doubtful because in most cases only one of the

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two identification posts were located. Only Limecap 5 and Limecap 6 were completely defined.

The original grid was later enlarged by extending the southernmost three lines 600 feet to the east, and cutting one extra line south of this 1800 feet eastward from the baseline. As the data from the early part of the survey materialized, a change was made to surveying along orthogonal lines spaced at 400 foot intervals as it was thought this would yield more useful information. The electrode separation used on these lines was increased to 400 foot and on one particular line several electrode separations were used in order to obtain depth information.

Presentation

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The reconnaissance data obtained using the narrower electrode separation (a = 200 ft.) are shown as contours of apparent chargeability and apparent resistivity on Drawings #1 and #2. These drawings also show the lines covered in the remainder of the survey using the wider electrode separation (a = 400 ft.), and the portion of Line 10E which was detailed is indicated by the double lines and arrows.

The results of the work using the wider electrode separation are shown in contour form on Drawing #3. In addition these results, and the results of the detail work, are shown as profiles on Drawings #4, #5, #6 and #7. Sections of the interpreted causative body are outlined under the profiles where these have been considered possible to estimate.

The boundary of the interpreted causative body has been outlined, where possible, on Drawings #1, #2 and #3.

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Recommended diamond drill holes, D.D.H.1 and D.D.H.2, are shown on these drawings and under the appropriate profiles.

Interpretation and Conclusions

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The apparent chargeability response in the northwest part of the survey area, as is shown by the contours in Drawing #1, is generally flat and inactive. The response generally speaking varies between 2.5 and 4.0 milliseconds, which is the normal background expected from bedrock containing a very small percentage by volume of sulphides or none at all.

In the south-eastern part of the survey area it is clear that a large zone of higher chargeability response has been detected. This zone is open to the south-east and to the east, and the boundary on the western side appears to coincide approximately with the Likely Road. To the north the boundary is not as well defined, but the response appears to drop off north of Line 8S, although a narrow tongue of higher readings continues as far north as Line 2S, just east of the Likely Road. The chargeability values in this zone, generally speaking, vary between 7.5 and 9.5 milliseconds with a maximum reading of 10.4 milliseconds.

From this data it appeared that the causative body producing the anomaly had a strike which was approximately parallel to the survey lines. Consequently a number of profiles were obtained along Line 10E orthogonal to the original survey direction (Drawing #4). The strongest chargeability response was obtained using a value of a = 400 ft., which suggests that the causative body is centred around this depth. The southern extremity of the body

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appears to be near Station 14S or 15S on this line, although the high readings obtained using the 600 foot electrode separation suggest that the body continues at depth to around 20S. The northern edge of the body along Line 10E is at approximately 7S, although one high reading occurs 300 ft. north of that at Station 4S. Insufficient information on the northern side makes it impossible to say if this is caused by a separate body or an extension of the main body northward.

As the strongest I.P. response was obtained using a value of a = 400 ft., three extra lines along 14E, 18E and 22+50E were run using this electrode spacing. One of these, Line 18E, was extended southward in order to determine the southern limit of this causative body.

The results of this work (Drawing #3) show that the body has not been completely defined to the east or to the north, but that its southern extremity is probably around 28S to 30S. The chargeability values are remarkably consistent throughout these four lines, which suggests the body is relatively homogeneous and reflects a lithologic feature rather than a concentration of sulphide There is no geologic evidence on the mineralization. surface to suggest a lithologic change occuring west of the Likely Road, which marks the western boundary of this body. However, it is noted that this road follows a strong topographic feature which might reflect a fault at depth which is not recognizable easily on the surface. Andesitic volcanics outcrop throughout the southern part of the survey area, and it is known that these volcanics consist of a number of flows of different ages. It is possible that one of these flows has a normal chargeability

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background higher than the others, and that this is the cause of the anomaly.

There is a general increase in the apparent resistivity associated with this apparent chargeability anomaly, although the relative change in resistivity values could easily be accounted for by changes in depth of overburden. Usually a large increase in the percentage of sulphide would probably be indicated by decreased resistivity values especially if the mineralization is in massive form. However, it is possible that if the mineralization is in disseminated form with no continuous conducting paths, that the apparent resistivity would show little or no variation.

The apparent resistivity results in themselves, therefore, do not confirm nor rule out the possibility of a lithologic change in this part of the survey area. However it has been noted in other I.P. surveys that an associated increase in apparent resistivity detracts from the economic potential of apparent chargeability anomalies.

The broad areal extent of the zone and the homogeneity of the apparent chargeability values, together with the increased apparent resistivity values, suggest that the feature is either lithologic or due to disseminated sulphide mineralization. Other sources of chargeability anomalies such as magnetite or graphite do not seem likely. Magnetite was not observed in the diamond drill core nor is there any evidence of a magnetic anomaly over this area on the government aeromagnetic map. Graphite, if present, even in very small quantities, would be reflected in low apparent resistivity values

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which is not the case here. Surface mineralization in the area has shown native copper and chalcocite, both of which, if in sufficient quantities, could produce an I.P. anomaly. Little or no pyrite has been observed on the surface, nor was it recorded in the diamond drill hole. If disseminated sulphides are present, therefore, there is a good possibility that these could be copper sulphides.

It is therefore recommended that two diamond drill holes be put down to test the causative body. The first of these should be located on Line 10+00E at Station 11+00S, and because of the breadth of the target this should be drilled vertically. A minimum of 500 ft. is proposed, and possibly 600 ft. as the anomaly appears to be coming from a deep source, although there is a fairly strong response on the narrower electrode spacing which suggests that the causative body might be encountered below 200 ft.

The second drill hole should be located on Line 22+50E at Station 22+00S. Although this point is at the extremity of the survey area the apparent chargeability readings are still quite strong and it is obvious that the anomaly continues beyond this point. A deep vertical diamond drill hole here would, in conjunction with D.D.H.1 and the existing D.D.H., yield maximum geological information. Furthermore it might intersect the contact between the volcanics and the syenite (which outcrops south of this point?), and this would be important in geological interpretation as well as assessing the significance of the I.P. results.

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SUMMARY

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- 1. The Induced Polarization survey over the Moorehead and Limecap claim groups consisted of 4.36 linemiles of reconnaissance work, and 0.70 miles of detail work.
- 2. A zone of strong chargeability response, (7.5 9.5 milliseconds against a background of 2.5 - 4.0 milliseconds) was detected in the southern part of the survey area.
- 3. The interpreted causative body producing the anomaly appears to be fairly deep, centred at approximately 400 ft. below ground level, and is outlined on Drawings #1, #2 and #3. The eastern and northern extremities of it have not been determined.
- 4. The overall dimensions and character of the I.P. response suggest the anomaly is caused by a change in lithology and/or sulphide mineralization in disseminated form.
- 5. Two vertical diamond drill holes, to a depth of 500 ft., at least, are recommended to test the source rock. D.D.H.1 is sited at 10+00E, 11+00S, and D.D.H.2 is sited at 22+50E, 22+00S.

HUNTEC LIMITED

W.A. Finney

W.A. Finney, B.Sc., Geophysicist

G.K.Watson, B.A.Sc.,**P.E**ng. Geophysicist

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APPENDIX A

ASSESSMENT CREDIT DATA

Miles Surveyed:

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Line-Miles

Reconnaissand	ce	4.36
Detail Phase		0.70
	Total	5.06

Personnel:

Name	Position	Dates
W.A. Finney	Geophysicist/Party Chief	Feb.8th - 20th, 22nd, 23rd, 26th & 27th,1968
W. Mairs	Operator	Feb.11th - 20th, 1968
J. Cox	Operator	Feb.11th - 20th, 1968
R. Spooner	Helper	Feb. 9th - 20th, 1968
A. Chadwick	Helper	Feb.10th - 20th, 1968
R. Dick	Helper	Feb.12th, 1968
E. Helkio	Drafting	Feb.26th - 29th, 1968
R.K. Watson	Geophysicist	Feb.27th, 1968
M. Vatcher	Typing	Feb.29th, 1968

M. Vaton. Declared before me at the losity much , in the of lancouver alakt. Province of British Columbia, this 10 ck day of Actober, 1968 , Λ.D. A Commissioner State MErconite Merconite Printer Columbia or A North State Attached

DOMINION OF CANADA: PROVINCE OF BRITISH COLUMBIA. In the Matter of Moorekead group То WIT:

I. Y. J. WAKITA.

OF MILESTONE MINES LIMITED (N.P.L.)

in the Province of British Columbia, do solemnly declare that

Geophysical Survey Cost. WA. FINNEY - 10000 per day TOTAL 136500 W. MAIRS - 9000 pu day J. Cox - 7500 15000 R. Spooner _ 2500 287.50 162.50 A Chadwick - 25" 15.00 R. Dich 1500 E. HECKIO 6000 240.00 125.00 R. K. WATSON 12500 35.00 M. VATCHER 3500 700.00 I. P. Squipment 70 " \$ 4580.00

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the locity Julation of Vancouver Province of British Columbia, this 10th day of Actober, 1968 A Commissioner for taking Affidavits for British Columbia or A Notary Public in and for the Province of British Columbia.

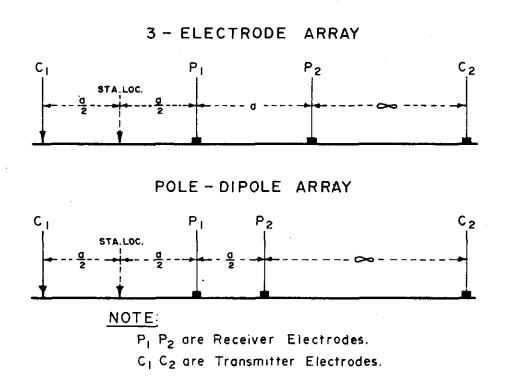
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DETAIL PROFILES of APPARENT CHARGEABILITY & RESISTIVITY

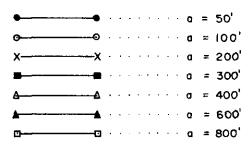
MILESTONE MINES LIMITED.

HYDRAULIC AREA, CARIBOO M.D. - B.C.

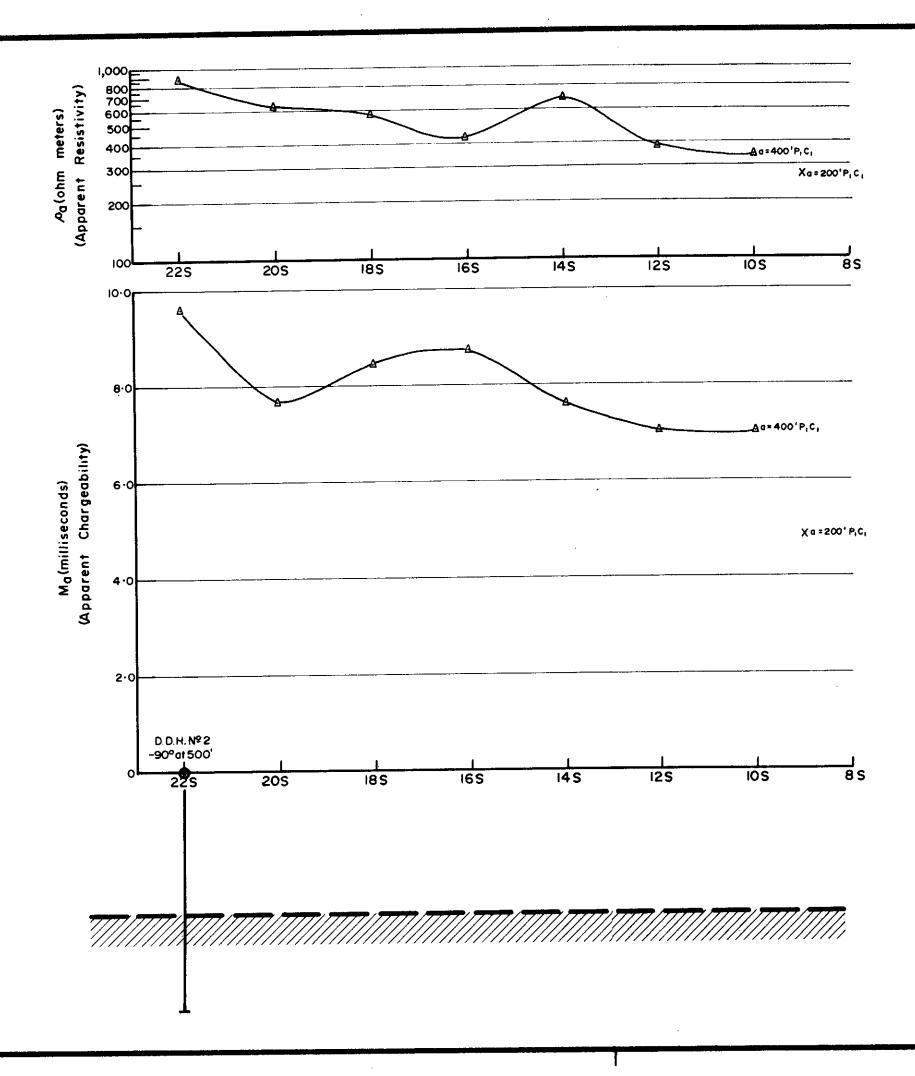
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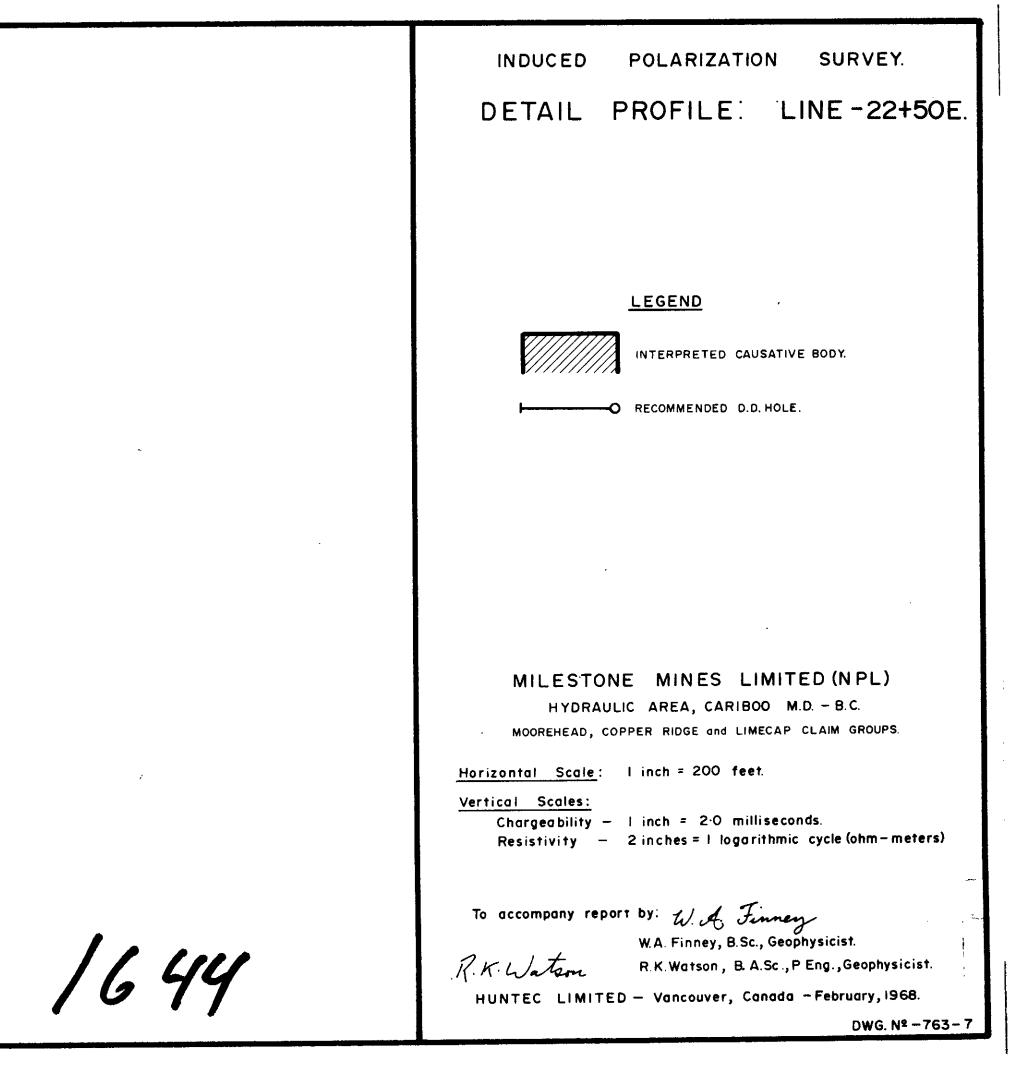


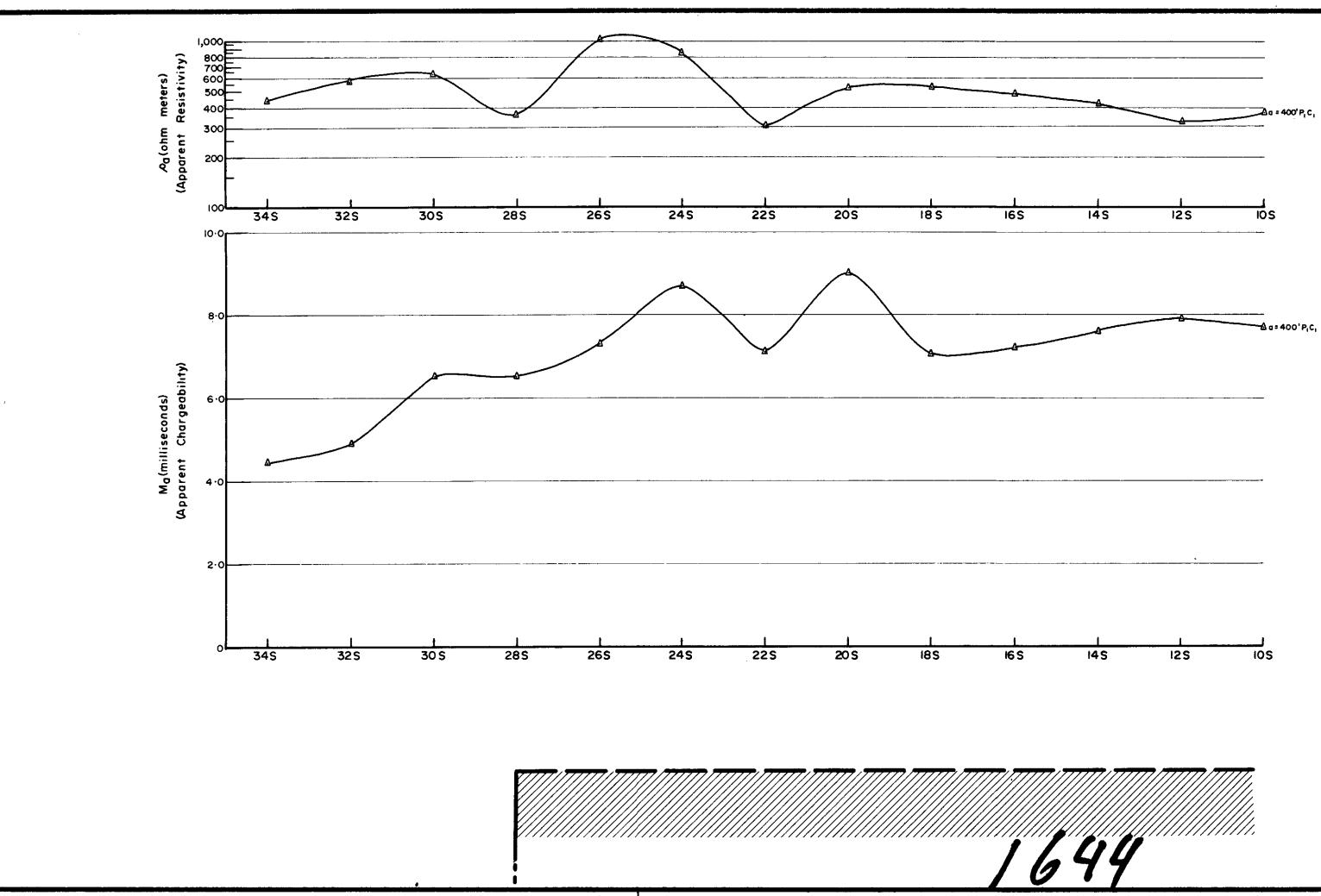




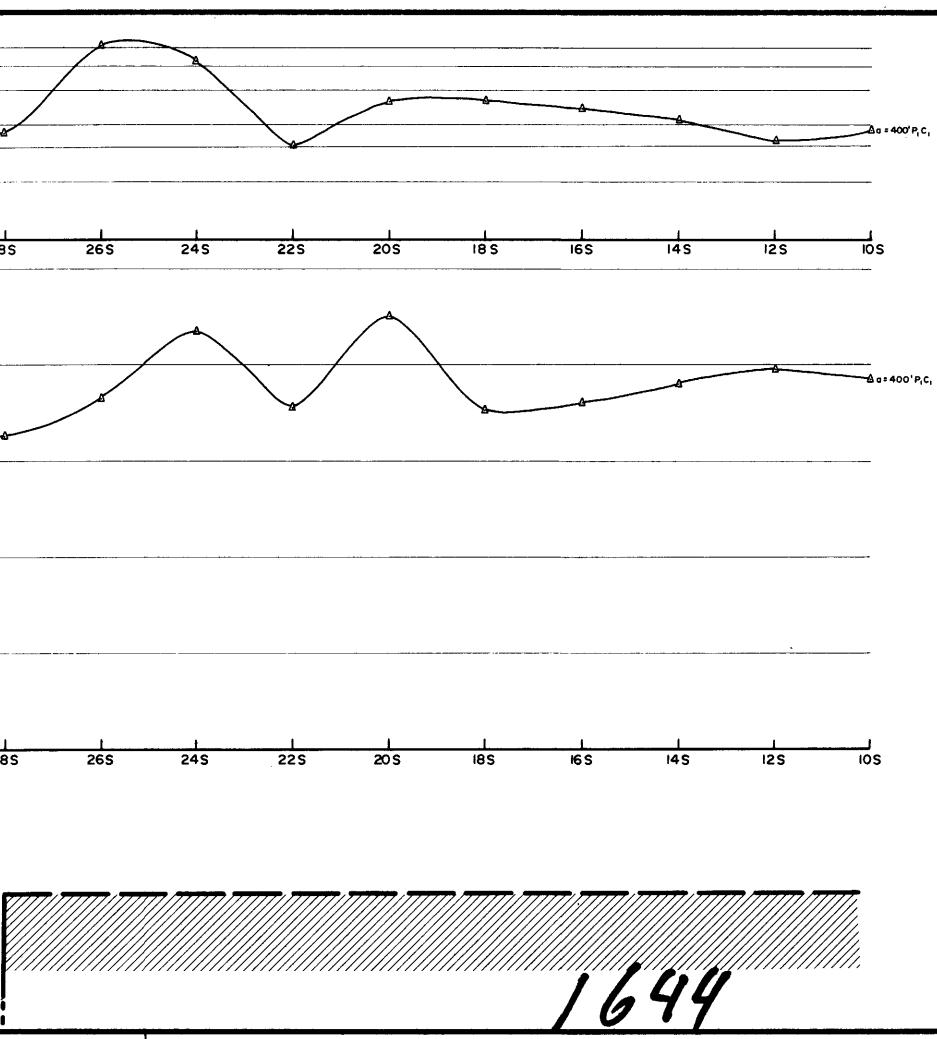
Horizontal Scale: | inch = 200 feet. Vertical Scales: Chargeability | inch = 2.0 milliseconds. Resistivity | 2 inches = | logarithmic cycle (ohm-meters) | JOB Nº: PH. 763.



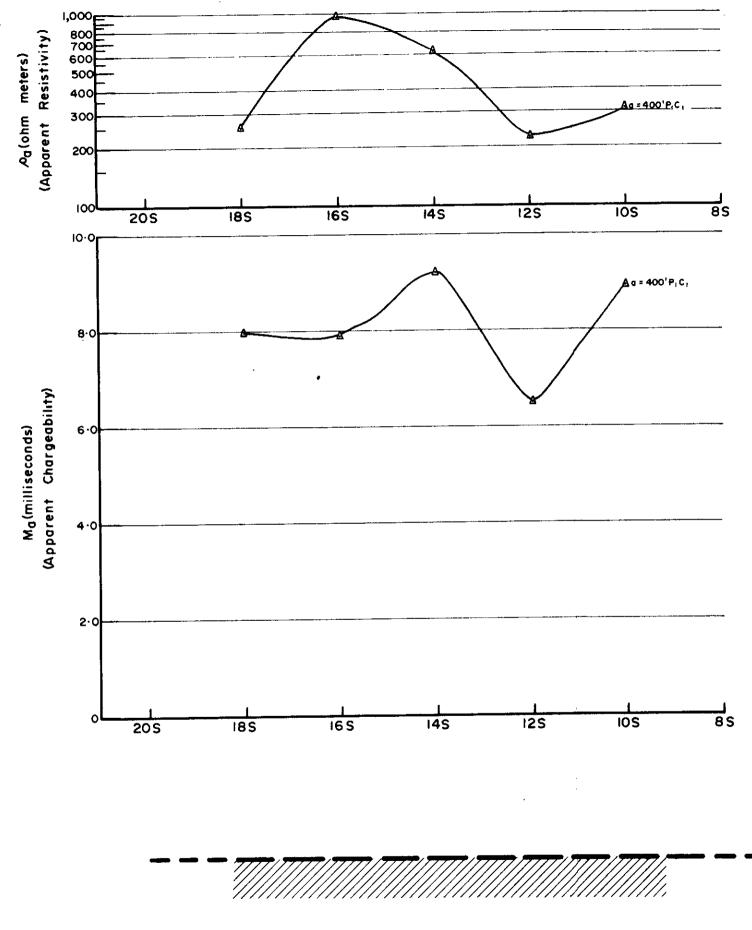




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INDUCED POLARIZATION SURVEY. DETAIL PROFILE: LINE-18E. LEGEND INTERPRETED CAUSATIVE BODY. MILESTONE MINES LIMITED (NPL) HYDRAULIC AREA, CARIBOO M.D. - B.C. MOOREHEAD, COPPER RIDGE and LIMECAP CLAIM GROUPS. Horizontal Scale: | inch = 200 feet. Vertical Scales: Chargeability - 1 inch = 2.0 milliseconds. Resistivity — 2 inches = 1 logarithmic cycle (ohm-meters) To accompany report by: W. A Finney W.A. Finney, B.Sc., Geophysicist. R.K. Water R.K.Watson, B.A.Sc., P. Eng., Geophysicist. HUNTEC LIMITED - Vancouver, Canada - February, 1968. DWG. Nº -763-6



POLARIZATION SURVEY. INDUCED DETAIL PROFILE: LINE - 14 E. LEGEND INTERPRETED CAUSATIVE BODY. MILESTONE MINES LIMITED (NPL) HYDRAULIC AREA, CARIBOO M.D. - B.C. MOOREHEAD, COPPER RIDGE and LIMECAP CLAIM GROUPS. Horizontal Scale: | inch = 200 feet. Vertical Scales: Chargeability - 1 inch = 2.0 milliseconds. Resistivity - 2 inches = 1 logarithmic cycle (ohm-meters) To accompany report by: W. S. Finney W.A. Finney, B.Sc., Geophysicist. R.K. Watson, B.A.Sc., P. Eng., Geophysicist. HUNTEC LIMITED - Vancouver, Canada - February, 1968. DWG. Nº -763-5

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