4028

REPORT ON THE ELECTROMAGNETIC SURVEY ON THE LV - PY CU - FORT CLAIM GROUP DEER LAKE AREA, LITTLE FORT, KAMLOOPS MINING DIVISION, B.C. FOR BARRIER REEF RESOURCES LTD. (N.P.L.)

92I/9W

BY

PHILIP G. HALLOF, Ph.D.

AND

MARION A. GOUDIE, B.Sc.

NAME AND LOCATION OF PROPERTY

DEER LAKE AREA, LITTLE FORT, B.C.

KAMLOOPS MINING DIVISION, B.C. 120°24'W, 51°31.5'N

DATE STARTED: JULY 12, 1972

DATE FINISHED: JULY 17, 1972

MAPS

#4 Plan map DWG. EM- 4856
#5 Plan map DWG. EM- 4857

McPHAR GEOPHYSICS

GENERAL NOTES ON
VERTICAL-LOOP
ELECTROMAGNETIC PROSPECTING

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1. THEORY

The field lines about a magnetic dipole (e.g. bar magnet) follow the form of donut-shaped shells. Fig. 1 shows a cross-section of one such shell. All flux lines pass through the dipole axis at the centre and form approximate ellipses which have a length/width ratio of 1.3.

When a magnetic dipole oscillates, an electric field is generated which is orthogonal to the magnetic flux lines. Thus electric currents, commonly called "eddy currents", are induced in any sheet-like conductor which is penetrated by the alternating magnetic flux lines. The eddy currents form large circles in the conductor and in turn produce a secondary alternating magnetic field which opposes the primary inducing field.

If the conducting sheet is relatively large and thick, with high conductivity and magnetic permeability, the secondary electromagnetic field will be strong enough to appreciably distort the primary field. An instrument capable of measuring the spatial distortions in the field can thus be used to locate conductors. One possible coil configuration is shown in Fig. 2.

2. FIELD PROCEDURES

There are three common field procedures which are used in conventional vertical-loop prospecting.

DIPOLE FIELD

$$\vec{H} = \frac{NAI}{4\pi} e^{-iwt} \frac{(2x^2 - y^2 - z^2)\vec{i} + 3xy\vec{j} + 3xz\vec{k}}{(x^2 + y^2 + z^2)^{5/2}}$$

Equipotentials satisfy $x^2 = c(x^2 + y^2)^3$

Flux lines satisfy $x = \pm(ky^{4/3} - y^2)^{1/2}$ and $\frac{dx}{dy} = 0$ at $y = \pm\sqrt{2}x$

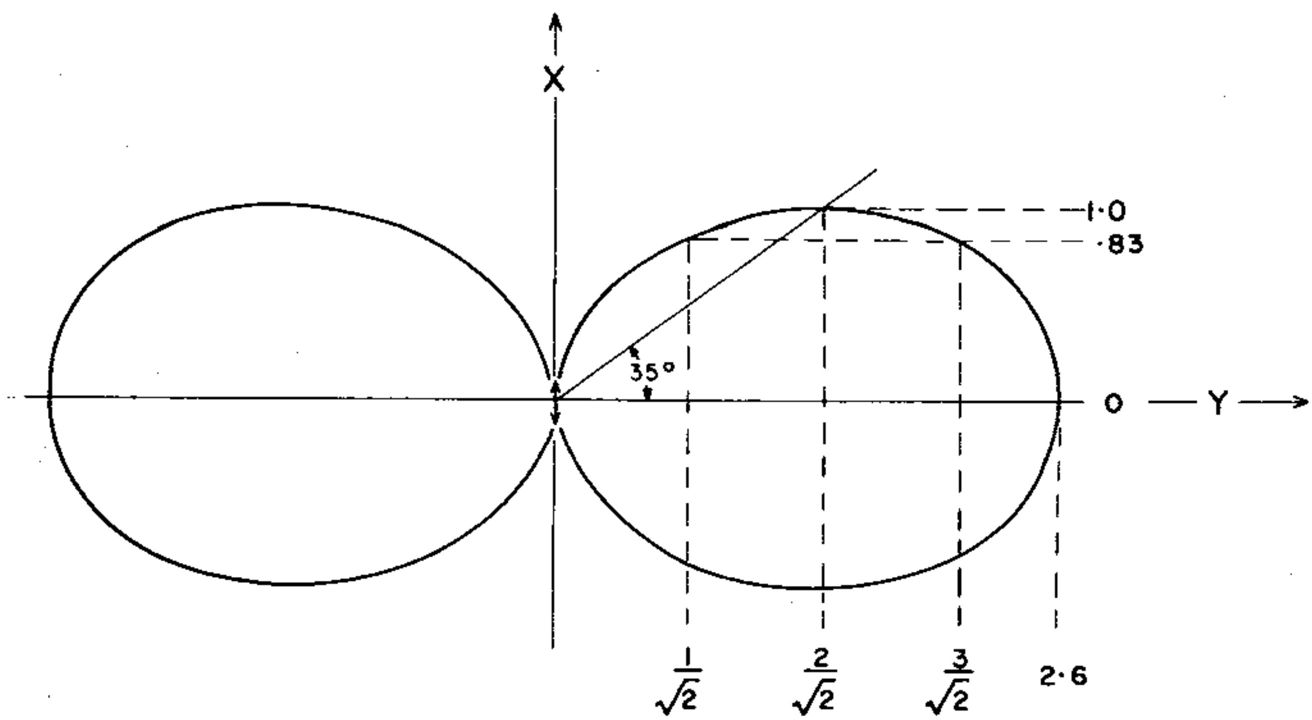


FIG. I

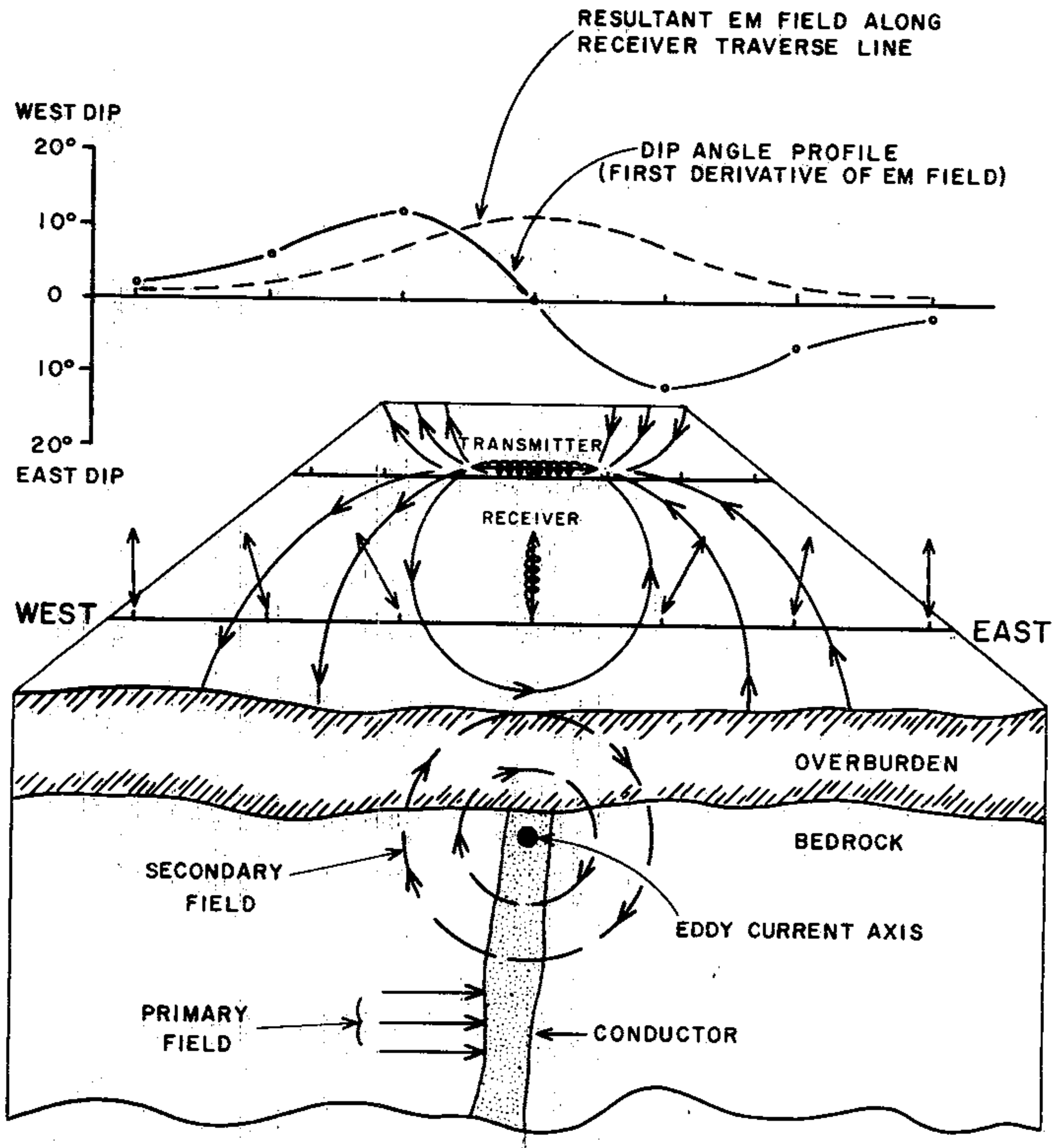
1) In-Line Method

This method is used for reconnaissance only, on lines which are widely-spaced or where there are no lines at all (as in the initial follow-up of airborne EM anomalies). The transmitter and receiver follow "in-line" along traverse lines which should be oriented at 45° to the suspected strike of the conductor. If the lines are exactly perpendicular, there will be little or no dip angle response over the zone.

Depending on relative position of the instruments, the direction of travel and the strike of the conductor, the in-line anomaly can be either positive or negative. As shown in Fig. 3, the peak response occurs when the transmitter is directly over the conductor, and in this case the dip angles are positive. If the conductor were at 135° to the strike instead of 45°, the profile would be negative, since the dip angles would all be to the north.

2) Broadside Method

This method is commonly used for reconnaissance on a well-cut grid. The transmitter and receiver move in co-ordination down adjacent parallel lines. The typical response over a conductor is shown in Fig. 3. Since all data sheets are drawn with west or south on the left, all bona fide anomalies (corresponding to "bumps" in the EM field) are indicated by "cross-overs" which go from positive on the left to negative on the right. A "reverse cross-over" which is negative on the left and positive on the right does not indicate an anomaly. Instead it corresponds to a "valley" in the EM field which possibly lies between two conductors.



SCHEMATIC DIAGRAM OF
VERTICAL LOOP
ELECTROMAGNETIC PROSPECTING METHOD

FIG. 2

3) Set-Up Method

This method is used for "detailing" or obtaining maximum information about a conductor. The transmitter is positioned over the conductor axis and is oriented perpendicular to the receiver as it follows the traverse line across the conductor. As shown in Fig. 3, the dip angle anomaly is considerably broader than that for the broadside configuration. This is because the transmitter stays above the conductor in a position of maximum electromagnetic coupling as the receiver makes the traverse. In the broadside method the transmitter is maximum-coupled with the conductor in only one position, usually where the dip angle is near the point of cross-over. When the transmitter and receiver are two stations away, the transmitter coupling with the conductor is very small and the dip angle response negligible; thus there is often only one strong anomalous reading on each side of the zone. Conversely, with the set-up method, the coupling between the transmitter and conductor stays relatively constant throughout the receiver traverse. Thus the anomalous dip angle profile is broader and more characteristic of the dip and depth of the source.

The same comments apply for the set-up method as well as the broadside method on the interpretation of "true" and "reverse" cross-overs. "Reverse" cross-overs may arise between two conductors but do not themselves indicate anomalies.

As a further aid to interpretation, two frequencies are usually used during a vertical-loop survey. The response parameter of a conductor depends upon the frequency of the electromagnetic field as well as its conductivity, magnetic permeability, thickness and size (in relation to the coil separation).

FIELD PROCEDURES

showing dip angle profiles—receiver and transmitter coils in plan

SCALE 1" = 500'

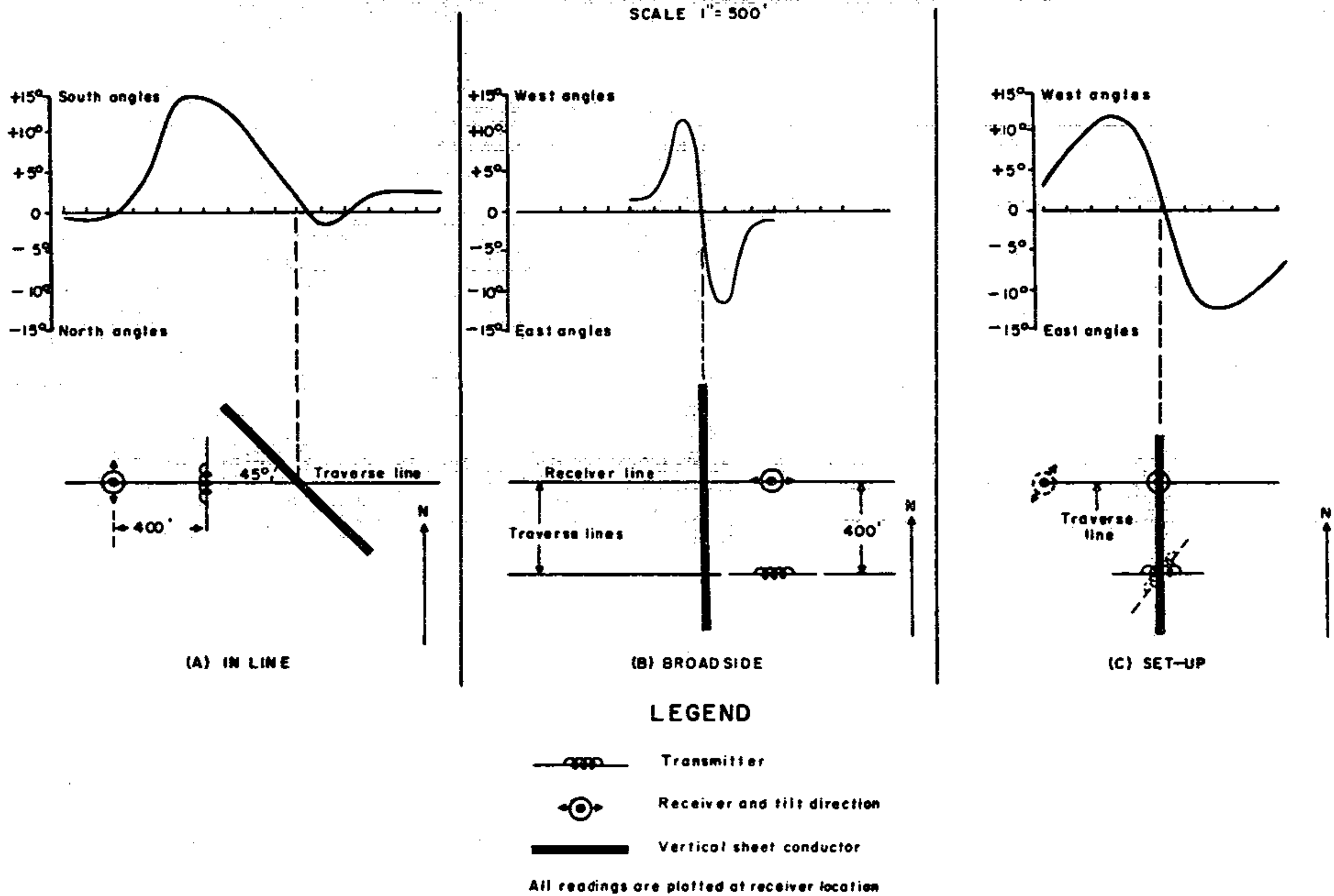


FIG. 3

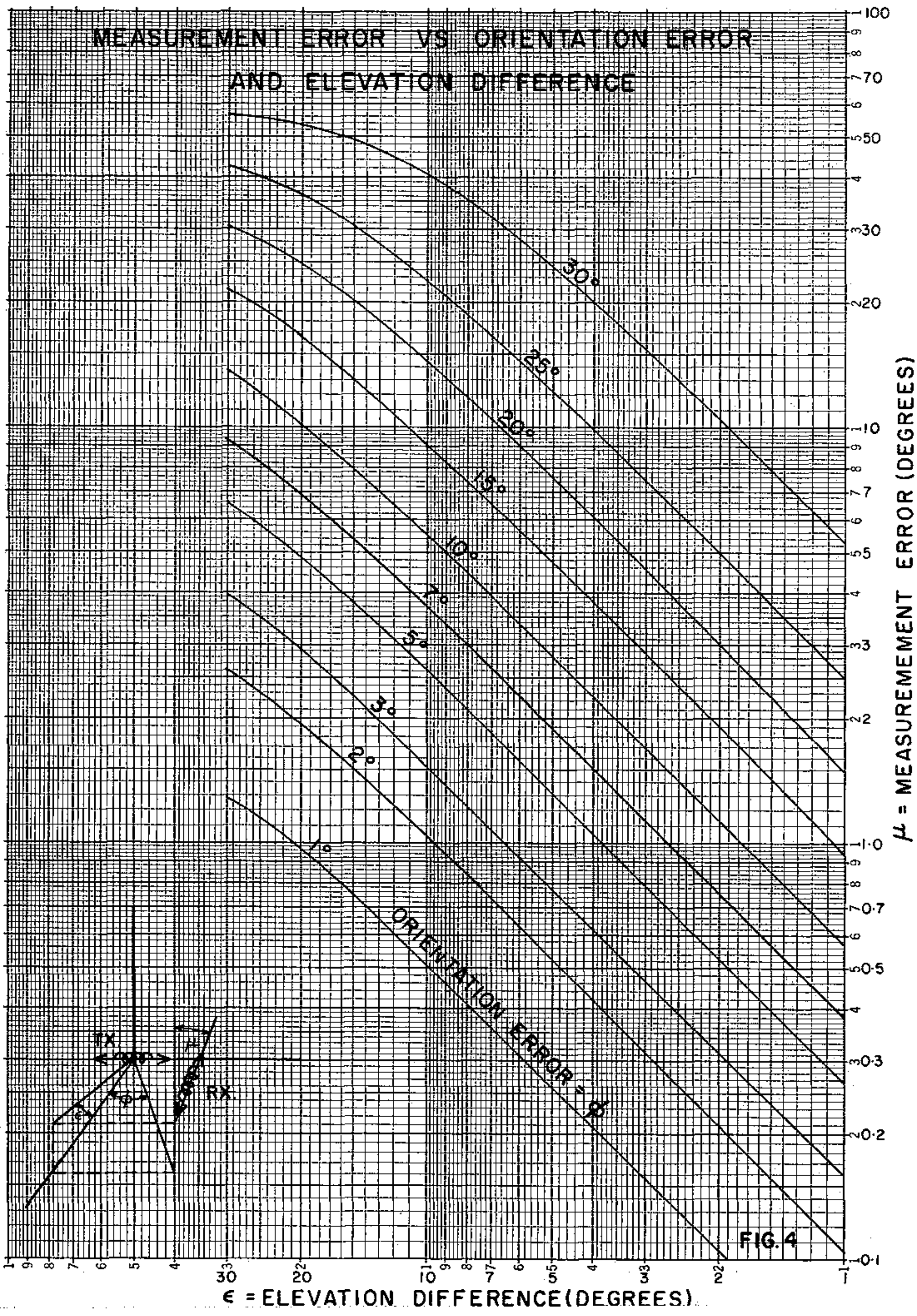
Consequently, by varying the frequency, an estimate can be obtained of the other parameters. The following is a "rule of thumb" guide for estimating conductivity:

1000 cps response / 5000 cps response	Conductivity	Typical Sources
0.9 to 1.0	excellent	massive sulphides, graphite
0.7 to 0.9	good	fracture-filling sulphides, graphitic schists
0.4 to 0.7	moderate	fault zones, shear zones, clay overburden, disseminated sulphides
less than 0.4	poor	lake bottom sediments, swamp

Another estimate of conductivity can be obtained from the "width of null" of the operator's measurements. Poor conductors have eddy currents which lag behind the inducing field. These eddy currents produce an "out-of-phase" secondary field in a different direction from the primary field at a time when the primary field is zero. Thus there is no orientation of the receiving coil that will result in a complete null of the incoming signal. The number of degrees the receiver must be rotated through to obtain a noticeable increase in signal is called the "null" and is an additional measure of the response parameter or conductivity.

3. ORIENTATION ERROR

There is only one main source of error in vertical-loop dip angle measurements (aside from reading errors when the signal is very weak, or when there is large out-of-phase response). On perfectly flat ground the



MEASUREMENT ERROR VS ORIENTATION ERROR
AND ELEVATION DIFFERENCE
30°
25°
20°
15°
10°
7°
5°
3°
2°
1°
ORIENTATION ERROR = θ
TX
RX
φ
μ
ε
μ = MEASUREMEMENT ERROR (DEGREES)
ε = ELEVATION DIFFERENCE (DEGREES)

FIG. 4

transmitter axis does not have to be kept absolutely perpendicular to the direction to the receiver. The dipole field is horizontal when both coils are in the same plane. However, when the survey is in rough topography and the receiving coil is above or below the transmitter, any departure of the transmitting coil from the perpendicular direction to the receiver will result in a fictitious anomalous dip angle. Fig. 4 shows the dip angles to be expected from various orientation errors and elevation differences. It can be seen that a misorientation of 15 degrees and an elevation difference of 10 degrees will result in a dip angle reading of 9 degrees.

Since few conductors have excellent conductivity, orientation errors may be suspected when the anomalous measurements are the same for both frequencies.

McPHAR GEOPHYSICS LIMITED

REPORT ON THE ELECTROMAGNETIC SURVEY ON THE LV - PYCU - FORT CLAIM GROUP DEER LAKE AREA, LITTLE FORT, KAMLOOPS MINING DIVISION, B.C. FOR BARRIER REEF RESOURCES LTD. (N.P.L.)

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1. INTRODUCTION

At the request of the client, an Electromagnetic survey has been completed on the Lv-Pycu-Fort Claim Group in the Deer Lake area, Little Fort, in Kamloops Mining Division, British Columbia for Barrier Reef Resources Ltd. (N.P.L.). The claim group is situated at 120°24' west longitude and 51°31.5' north latitude. Access is by car from Little Fort on the Cariboo Highway.

The claim group lies to the southwest of Deer Lake, underlain by thin-bedded andesitic tuff, massive porphyritic andesite flows and medium-grained pyroxenite diorite. The latter vol canics contain from 1% to 10% sulphides in the form of pyrite and pyrrhotite, generally disseminated.

The Lakeview Mine is situated 300' south of Deer Lake. Here skarn zones containing magnetite, pyrrhotite, pyrite and chalcopyrite, with values in silver, gold and copper, occur in volcanic rocks and limestone.

Another company who previously held the area conducted limited IP, magnetometer, geochemical and geological surveys. The results of this work are not available at the time this report is written.

The electromagnetic survey was carried out to locate any economic deposits of metallic mineralization which might be present in the area west of the Lakeview Mine. The work was completed in mid-July, using a McPhar dual frequency reconnaissance electromagnetic unit operating at frequencies of 1000 and 5000 cps. The In-line reconnaissance method was used for the survey; detail was done on three anomalies using the set-up method. Following this, the grid was again surveyed using the broadside method. The claims covered were:

Pycu 3, 4, 6, 8, 9, 10, 11, 20, 22, 36, 38, 40.

These claims are held under option from Mr. John McAndrew by Barrier Reef Resources.

2. PRESENTATION OF RESULTS

The results of the reconnaissance In-line survey are shown on Dwg. EM 4856 at a scale of 1" = 200'. The results of the detail using the set-up method are shown on Dwg. EM 5978 at a scale of 1" = 200'. The results of the broadside method survey are shown on Dwg. EM 4857 at a scale of 1" = 200'.

3. DISCUSSION OF RESULTS

The In-line method is used primarily for reconnaissance electromagnetic surveying as data can be obtained quickly. The maximum response is obtained when a linear conductor is corssed at a 45° angle.

Traverses perpendicular to a long linear conductor will produce zero dip angles, while traverses parallel to this type of conductor will yield a constant dip angle.

In comparison, the maximum response when surveying with the broadside method is obtained when the conductor is crossed at right angles. This method has better conductor resolution than that of the In-line method; however, an accurate grid is essential and surveying is usually slower.

The two methods complement each other although the results are not necessarily identical.

Four conductive zones have been outlined by the survey.

Zone A

Zone A was initially located by the In-line survey on Line 130W, Line 126W and Line 122W striking at 90° to the survey line. The conductor was detailed using the set-up method (see Dwg. EM 4856) and a very strong, shallow, poorly conductive source was outlined. The broadside survey further confirmed the presence of the conductor which was shown to extend from east of Line 138W to Line 118W - the anomaly on Line 138W is off the end of the conductor.

Zone B

The zone consists of a single continuous conductor from Line 130W, where it is uncertain, to Line 118W. The apparent conductivity is poor.

Zone C

Zone C extends from Line 118W to Line 110W; the apparent conductivity is moderate on Line 118W and Line 110W.

Zone D

Zone D extends from Line 110W, where it is uncertain, to Line 102W, where it is again uncertain. The apparent conductivity is good.

An isolated strong anomaly on Line 102W at 38+50 South reflects a conductor with excellent conductivity which has no strike length to the west but which might possibly extend eastward; it is difficult to interpret the In-line survey at this point on Line 98W.

4. CONCLUSIONS AND RECOMMENDATIONS

A very strong, shallow conductor of poor conductivity was located by a McPhar In-line electromagnetic survey, then subsequently confirmed using the "set-up" method. The survey grid was then detailed using the broadside EM method and the Zone A conductor was extended. Three additional zones were interpreted from the results of the "broadside" survey.

Zone A and Zone B should both be tested on Line 118W. The following drill hole locations are suggested:

Zone A a 45° hole drilled south from 38 South to test the conductor under 39+50 South.

Zone B a 45° hole drilled south from 42+75 South to reach the conductor under 43+25 South.

If the results of the drilling are encouraging, the most interesting EM anomalies should be checked by an Induced Polarization and Resistivity survey to better locate and define the source or sources of the anomalies. It should be noted that disseminated mineralization can be located by IP but not by EM.

If the magnetometer survey results from the previous work are available they should be used with the EM results to aid in interpretation.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: January 15, 1973

Marion A. Goudie,
Geologist

Dated: August 24, 1972

ASSESSMENT DETAILS

PROPERTY: LV-PYCU-FORT Claim Group MINING DIVISION: Kamloops

SPONSOR: Barrier Reef Resources Ltd. (N.P.L.) PROVINCE: B.C.

LOCATION: Deer Lake Area, Little Fort

TYPE OF SURVEY: Electromagnetic

OPERATING MAN DAYS:	10	DATE STARTED:	July 12, 1972
EQUIVALENT 8 HR. MAN DAYS:	15	DATE FINISHED:	July 17, 1972
CONSULTING MAN DAYS:	2	NUMBER OF STATIONS:	728
DRAUGHTING MAN DAYS:	5	NUMBER OF READINGS:	1434
TOTAL MAN DAYS:	22	MILES OF LINE SURVEYED:	14.08

CONSULTANTS:

Philip G. Hallof, 15 Barnwood Court, Don Mills, Ontario.
Marion A. Goudie, 739 Military Trail, West Hill, Ontario.

FIELD TECHNICIANS:

G. Trefenanko, Box 923, Lac La Biche, Alberta.
M. Barron, 152 Greenstone Drive, Kamloops, B.C.

DRAUGHTSMEN:

R. Koenig, 50 Thorncliffe Park Drive, Apt. 510, Toronto 17, Ontario.

	Miles	Stations	Reading
In Line Method	7.7	388	772
Broadside Method	5.7	308	598
Set-up Method (detail)	0.68	32	64
	14.08	728	1434

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist.

Dated: August 24, 1972

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA P. G. HALLOF

Expiry Date: February 25, 1973

STATEMENT OF COST

Barrier Reef Resources Ltd. (N. P. L.) - LV-PYCU-FORT Claim Group
Deer Lake Area, Little Fort, Kamloops Mining Division, B. C.

EM Survey

Crew: G. Trofenanko & M. Barron

5 days	Operating	@ $140.00 per day	$ 700.00
½ day	Travel	@ $ 80.00 per day	40.00
			740.00

Crew Expenses

Vehicle Expenses	$133.81	
Meals and Accom.	178.03	
Supplies	4.40	
	$316.24	
Plus 10%	31.62	
	$347.86	347.86
		$1,087.86

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist

Expiry Date: February 25, 1973

Dated: August 24, 1972

(over)

Declared before me at the

of , in the

Province of British Columbia, this

day of , A.D.

A Commissioner for taking Affidavits within British Columbia
A Notary Public in and for the Province of British Columbia.

CERTIFICATE

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

1. I am a geophysicist residing at 15 Barnwood Court, Don Mills, 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 Barrier Reef Resources Ltd. (N.P.L.) 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 24th day of August 1972.

Philip G. Hallof, Ph.D.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 28, 1973

CERTIFICATE

I, Marion A. Goudie, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geologist residing at 739 Military Trail, West Hill, Ontario.

2. I am a graduate of the University of Western Ontario with a B.Sc. Degree (1950) in Honours Geology.

3. I am a member of the Geological Society of America.

4. I have been practising my profession for 23 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 Barrier Reef Resources Ltd. (N.P.L.) or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

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Dated at Toronto

This 24th day of August 1972.

Marion A. Goudie

Marion A. Goudie, B.Sc.

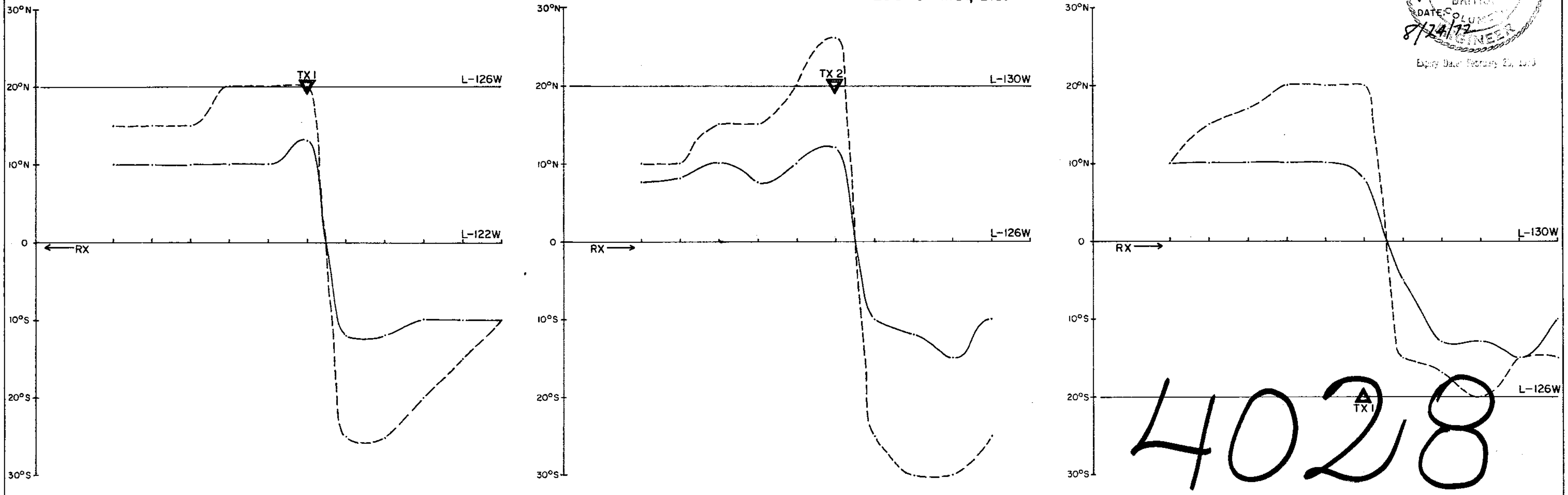
BARRIER REEF RESOURCES LTD. (N.P.L.)

LV - PYCU - FORT CLAIM GROUP
DEER LAKE AREA, LITTLE FORT
KAMLOOPS M.D., B.C.

DRAWN: R.K.
DATE:
APPROVED:
DATE: 8/24/77

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 28, 1978

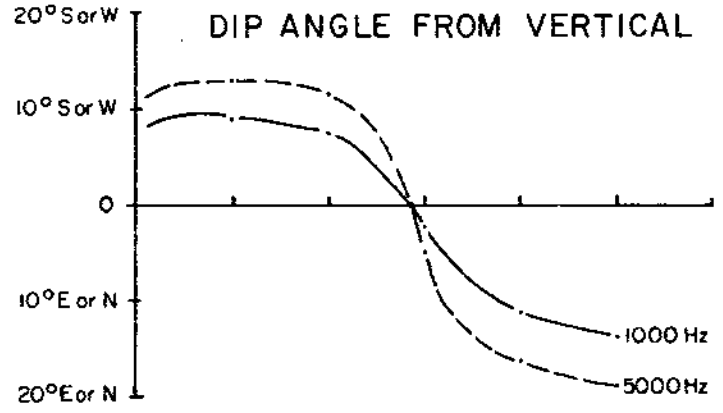


LEGEND

IN LINE METHOD

TX → RX DIRECTION OF TRAVERSE

200'



SCALE: 1" = 200'

SYMBOLS

CONDUCTOR AXIS 1000 c.p.s.		CONDUCTOR AXIS TREND 5000 c.p.s.
	DEFINITE	
	PROBABLE	
	POSSIBLE	

DWG. EM-5978

McPHAR GEOPHYSICS

VERTICAL LOOP ELECTROMAGNETIC SURVEY

PLAN MAP

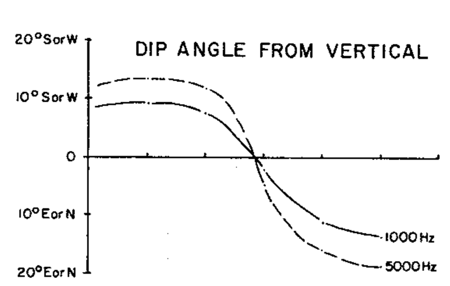
LEGEND

BROADSIDE METHOD

RX → DIRECTION OF TRAVERSE

TX

N.R. – READING OMITTED



BARRIER REEF RESOURCES LTD. (N.P.L.)

LV – PYCU – FORT CLAIM GROUP

DEER LAKE AREA, LITTLE FORT

KAMLOOPS M.D., B.C.

SCALE 1" = 200'

4028

SYMBOLS

CONDUCTOR AXIS 1000 c.p.s.		CONDUCTOR AXIS TREND 5000 c.p.s.
(solid)	DEFINITE	(solid line)
(open)	PROBABLE	(dotted line)
(dashed)	POSSIBLE	(dashed line)

M-2

Department of Mines and Petroleum Resources ASSESSMENT REPORT NO. 4028 MAP #2

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, PHILIP G. HALLOF

DATE AUG. 22/1972

8/24/72

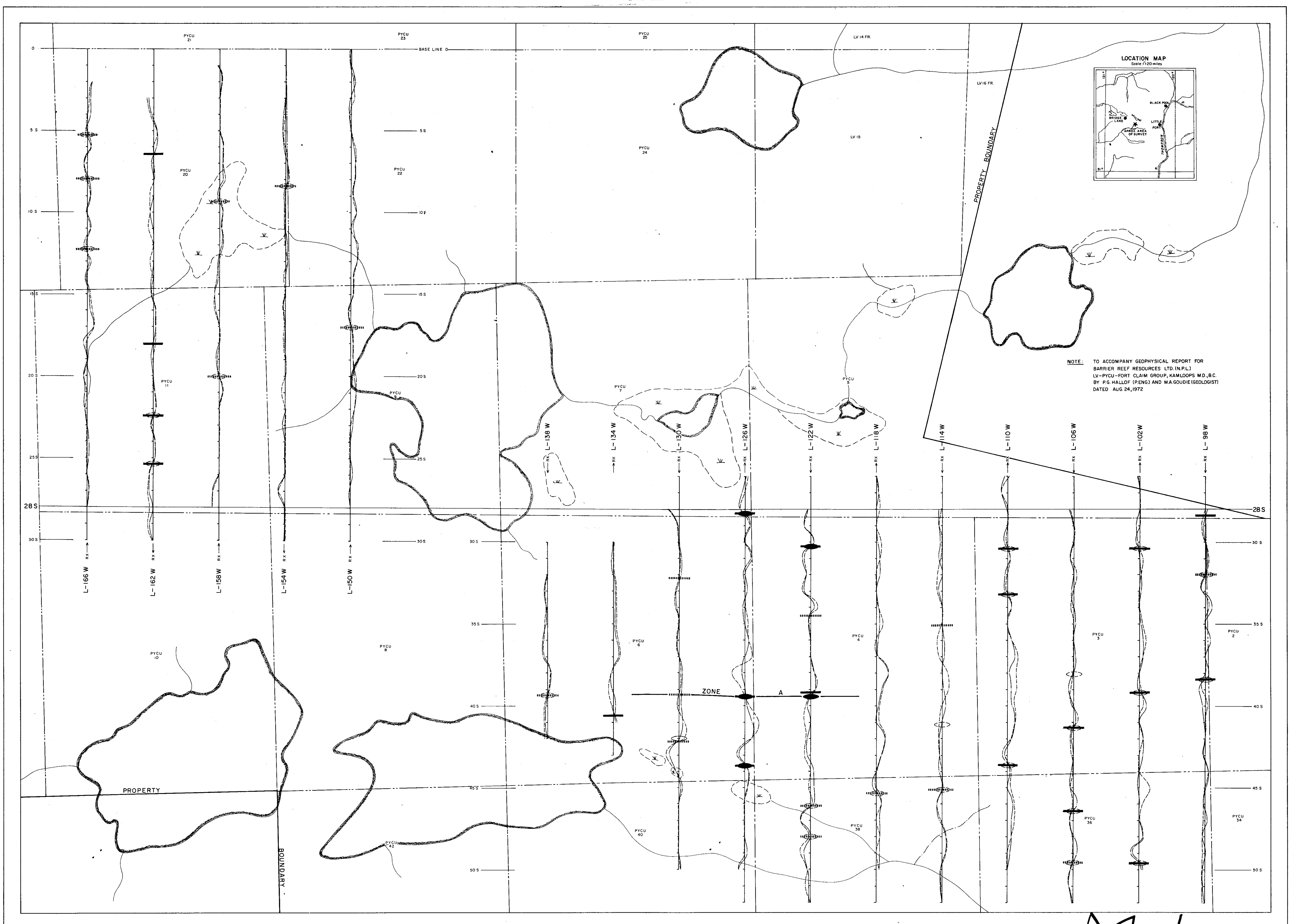
DWG. EM – 4857

DWG. EM-4856

McPHAR GEOPHYSICS

VERTICAL LOOP ELECTROMAGNETIC SURVEY

PLAN MAP



LEGEND

IN LINE METHOD

TX — RX DIRECTION OF TRAVERSE

200'

DIP ANGLE FROM VERTICAL

20° S or W, 10° S or W, 0, 10° E or N, 20° E or N

1000 Hz, 5000 Hz

BARRIER REEF RESOURCES LTD. (N.P.L.)

LV-PYCU-FORT CLAIM GROUP

DEER LAKE AREA, LITTLE FORT

KAMLOOPS M.D., B.C.

SCALE 1" = 200'

4028

M-1

SYMBOLS

	CONDUCTOR AXIS 1000 c.p.s.	CONDUCTOR AXIS TREND 5000 c.p.s.
DEFINITE	⬬	▬
PROBABLE	⬭	┅┅┅
POSSIBLE	⬭ (dashed)	//////

Department of Mines and Petroleum Resources

ASSESSMENT REPORT

NO. 4028 MAP #1

8/24/72

DWG. EM-4856