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AN ASSESSMENT REPORT ON AN INDUCED POLARIZATION SURVEY ON THE MURPHY LAKE PROPERTY LAC LA HACHE PROJECT AREA CARIBOO MINING DIVISION, BRITISH COLUMBIA

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REGIONAL RESOURCES LIMITED / G.W.R. RESOURCES INC.

BY

S. John A. Cornock, B.Sc. and John Lloyd, M.Sc., P.Eng.

LLOYD GEOPHYSICS INC. VANCOUVER, BRITISH COLUMBIA

MARCH, 1995

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Lloyd Geophysics

SUMMARY

During the periods of December 11th to 19th, 1994 and January 16th to February 4th, 1995 Lloyd Geophysics Inc. conducted Induced Polarization (IP) and ground magnetometer surveys on the Murphy Lake property, which is located north of Lac La Hache, British Columbia, and form part of the Lac La Hache Project of Regional Resources Ltd. and G.W.R. Resources Inc.

The resistivity data shows a sharp east-west trending boundary that extends across the property at about 3800N. To the north of this boundary is a well-defined chargeability anomaly which is coincident with an arcuate shaped magnetic high. To the south of the boundary, but in close proximity to, is another, weaker anomaly worthy of further attention.

From a study of the IP and magnetic data described in this report it has been concluded that these anomalies represent good porphyry-style targets worthy of further exploration by drilling.

The contoured data obtained from the 400 metre line spacing could change significantly if additional geophysical surveying on lines 100 metres (or 200 metres) apart was completed. This is recommended prior to planning a practical drill programme.



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1.0 INTRODUCTION

During the periods of December 11th to 19th, 1994 and January 16th to February 4th, 1995 Lloyd Geophysics Inc. conducted Induced Polarization (IP) and ground magnetometer surveys on the Murphy Lake property, which is located north of Lac La Hache, British Columbia, and form part of the Lac La Hache Project of Regional Resources Ltd. and G.W.R. Resources Inc.

The purpose of these surveys was to define sulphide zones associated with a copper porphyry system which could then be tested by drilling.

2.0 PROPERTY LOCATION AND ACCESS

The Murphy Lake property is located at about 51°01'North latitude and 121°15'West longitude in the Cariboo Mining Division, N.T.S. 93A/3 (Figure 1). Access to the property is by truck (and snowmobile or four-track) from Lac La Hache via the Rail Lake road and from Forest Grove via the Bradley Creek road and secondary logging roads.

3.0 PROPERTY STATUS AND CLAIM HOLDINGS

The pertinent claim information is outlined below:

Claim Name	Record Numb		
TT1	302141		
TT2	302142		
TT3	302143		
ACE2	302130		
ACE4	302132		







121 13 * ~ ^ ^ ^ ^ ^ ^ ^ ^ TT I -- <u>66 Ņ</u> 02141 `́ТТ 303085 < 0 x e <u>50 N</u> ACE 2 MURPHY LAKE 302130. **TT 2** GRID 302142 \$S`4 321049 SS 2 320905 30 N ACE 4 11 3 302143 302132 52*00' 18 <u>N</u> JESSE 1 321768 Cariboo Mining Division I Clinton Mining Division JESSE 2-6 321763-67 2 SS 3 S. S. RILEY' 3. 321045 320904 320903 4 5 608655 6 -Roy ₽**₽**₽. RILEY 2 RILĖY 3 LUKE 321046 321047 320901 Regional Resources Ltd./G.W.R. Resources Inc. Lac La Hache Project / Clinton M.D., B.C. MIKE 3209(**Claim Information Murphy Lake Grid** SCALE 1:50 009 LLOYD GEOPHYSICS INC. FIGURE 2



4.0 PREVIOUS WORK

Previous work in the area is summarized in the assessment report by R.J. Aulis on the Lac La Hache Property (Two Mile Lake group), dated September 29, 1993 as follows:

Numerous past exploration programs have been directed towards the discovery of porphyry copper-gold in this region since the discovery of the Cariboo-Bell deposit in the mid-1960's. Exploration activity began in 1966 with reconnaissance geochemical soil sampling program by Coranex Ltd. Since then, major exploration programs have been mounted by the following:

Coranex Ltd. (1966 - Spout Lake property) Falconbridge Nickel Mines Ltd. (1961 - Bory claims) Amax Ltd. (1961-1973 - Spout Lake property) Craigmont Mines Ltd. (1973-74 - SL and WC claims) Tide Resources Ltd. (1988 - Club claims) Asarco Exploration Co. Ltd. (1991 - Ann and Peach Two claim groups) Cominco Ltd. (1992 - Zephyr Property) GWR Resources Ltd. (1987-1993 - various properties)

Various smaller programs have been conducted by junior companies in the immediate areas.

The majority of existing work comprises geological mapping of sparse outcrop, soil geochemistry and ground magnetometer surveys of isolated individual properties. Falconbridge Nickel Mines Ltd. conducted a detailed Induced Polarization survey in the area immediately north of Two Mile Lake and recorded elevated chargeabilities over their entire grid. Cominco Ltd. undertook a reconnaissance IP survey over 65 km of roads in an area bracketed by McIntosh, Spout and Murphy Lakes; background chargeabilities with only rare, weakly-elevated readings were obtained.

Drilling north of Spout Lake is restricted to two or three poorly-documented holes interpreted to have intersected pyrite bearing, weakly to moderately altered volcanics. Scattered drilling of IP targets to the south and south-east of Spout Lake has outlined a large, sulphide-bearing porphyry system with significant portions left untested. Drilling of a prominent magnetic feature on the south shore of Spout Lake has roughly delineated two copper-bearing magnetite skarn zones of economic grades (Gale, R.E. 1989).



In 1993, the Regional Resources/G.W.R. Resources joint venture compiled results of all available pre-existing exploration and completed a program of overburden and rock sampling and of reconnaissance mapping on the Two Mile Lake group of the Lac La Hache project area (R.J. Aulis, 1993).

The surveys delineated two areas with anomalous copper/gold in soils, one to the south of Bluff Lake on the Ace 3 claim, and one near the boundary of the Ace 2 claim with the TT claim. Mineralization in the latter area is related to dioritic dikes intruding the monzonite. Traces of chalcopyrite, bornite and native copper appear to occur in shears and K-feldspar pegmatitic veins.

5.0 REGIONAL GEOLOGY

The Lac La Hache Project is situated within the Upper Triassic to Lower Jurassic Nicola Group, which forms part of the Quesnel Trough (Figure 3), a volcanic and sedimentary arc sequence affected by Upper Triassic to Jurassic intrusions, and by volcanic activity continuing into the Quaternary. The Quesnel Trough extends for over one thousand kilometres from northern Washington State to north-central British Columbia, and hosts alkalic porphyry copper-gold deposits (Afton, Similco) and mine prospects (Mount Milligan, Mount Polley) as well as gold-skarns, and numerous porphyry occurrences.

Northeast of Lac La Hache, Nicola Group sediments, basalts, andesites and breccias are intruded by coeval small stocks of syenitic to dioritic composition. A significant portion of the Nicola Group is covered by Tertiary flood basalts. The Lower Jurassic Takomkane batholith, a monzonitic intrusion measuring about 50 kilometres in diameter, is located with its centre 35 kilometres northeast of Lac La Hache.

A large annular aeromagnetic anomaly, which may have developed as the result of monzonite



intruding Nicola Group to the north of Peach Lake and Spout Lake, was first delineated by a survey flown for the Geological Survey of Canada in 1967. The DMG grid on the Abbey claim group is situated at the northwestern outside edge of the magnetic anomaly, while the Oley group is located inside the anomaly, close to its northern edge. The TT grid on the Ray claim group is also located inside the regional magnetic anomaly, at the contact of a local magnetic high to the east, which may be caused by gabbro.

Hydrothermal alteration has affected Nicola Group intrusives and metavolcanic rocks and consists of K-feldspar flooding, development of magnetite, hematite and propylitic alteration. Porphyry and skarn-type chalcopyrite and pyrite mineralization is locally associated with these alteration zones and includes the Peach, Miracle, Tim occurrences and the WC magnetite-chalcopyrite zone.

6.0 LOCAL GEOLOGY

The portion of the Lac La Hache project area located to the north of Spout Lake and Peach Lake is covered largely by glacio-fluvial deposits, which, together with extensive Tertiary basalt flows make the geological interpretation of that area dependent on indirect exploration methods, e.g. magnetometer and induced polarization surveys.

Rock Types

The oldest rocks in the area are Upper Triassic Nicola Group mafic to intermediate flows, tuffs and breccias, including augite-feldspar porphyritic basalt flows. The latter are relatively fresh and locally difficult to discern from Tertiary volcanics. Minor occurrences of Nicola Group syenitic to dioritic intrusions have also been reported.

A monzonitic intrusion, which is probably the cause of the annular shaped magnetic anomaly in Nicola Group lithologies, extends from Spout Lake - Peach Lake to the north and is possibly



a satellite of the Takomkane batholith. A larger gabbroic intrusion is indicated from outcrop west of Murphy Lake, and is probably a phase of the monzonite.

Basaltic flows of Tertiary or younger age cover a large portion of the project area, and effectively mask underlying lithologies of possible economic interest.

Structure

Faults and fractures with notable alteration or mineralization trend 060°, dipping steeply south and 030°, dipping subvertically. A large topographic linear encompassing Murphy and Lang lakes is interpreted to be a large northwest-trending fault which cuts the northeastern edge of the property.

Alteration and Mineralization

A weak chlorite-epidote alteration is characteristic for the rocks on the property, with a stronger potassium metasomatism being locally developed near stocks and dikes. The monzonite may carry 1-2% disseminated magnetite and traces of sulphides lining fractures.

The most significant mineralization to date is related to dioritic dikes intruding monzonite to the west of Murphy Lake, and consists of traces of chalcopyrite, bornite and native copper. The most anomalous sample from that area returned 508 ppm Cu and 38 ppb Au.

7.0 INSTRUMENT SPECIFICATIONS

7.1 Induced Polarization Survey Equipment



The equipment used to carry out this survey was a time domain measuring system consisting of a Wagner Leland/Onan motor generator set and a Mark II transmitter manufactured by Huntec Limited, Toronto, Canada and a 6 channel IP-6 receiver manufactured by BRGM Instruments, Orleans, France.

The Wagner Leland/Onan motor generator supplies in excess of 7.5 kilowatts of 3 phase power to the ground at 400 hertz via the Mark II transmitter.

The transmitter was operated with a cycle time of 8 seconds and the duty cycle ratio: [(time on)/(time on + time off)] was 0.5. This means the cycling sequence of the transmitter was 2 seconds current "on" and 2 seconds current "off" with consecutive pulses reversed in polarity.

The IP-6 receiver can read up to 6 dipoles simultaneously. It is microprocessor controlled, featuring automatic calibration, gain setting, SP cancellation and fault diagnosis. To accommodate a wide range of geological conditions, the delay time, the window widths and hence the total integration time is programmable via the keypad. Measurements are calculated automatically every 2 to 4 seconds from the averaged waveform which is accumulated in memory.

The window widths of the IP-6 receiver can be programmed arithmetically or logarithmically. For this particular survey the instrument was programmed arithmetically into 10 equal window widths or channels, Ch_0 , Ch_1 , Ch_2 , Ch_3 , Ch_4 , Ch_5 , Ch_6 , Ch_7 , Ch_8 , Ch_9 (see Figure 4). These may be recorded individually and summed up automatically to obtain the total chargeability. Similarly the resistivity (ρ_4) in ohm-metres is also calculated automatically.

The instrument parameters chosen for this survey were as follows:

Cycle Time (T _c)	= 8 seconds
Ratio (Time On)	= 1:1



(Time Off)

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Duty Cycle Ratio

(Time On) (Time On)+(Time Off)

Delay Time (T_D)

Window Width (t_p)

Total Integrating Time (T_p) = 90 milliseconds

= 120 milliseconds

= 900 milliseconds



= 0.5



BRGM IP-6 RECEIVER PARAMETERS

Figure 3



7.2 Ground Magnetometer Survey Equipment

The equipment used to carry out the survey was an OMNI PLUS/OMNI IV magnetometer system manufactured by EDA INSTRUMENTS INC., Toronto, Canada.

The system is completely software and microprocessor controlled. A portable proton precession magnetometer measures and stores in memory the total earth's magnetic field at the touch of a key. It also identifies and stores the location and time of each measurement and computes the statistical error of the reading and stores the decay and strength of the signal being measured. Throughout each survey day a similar base station magnetometer measures and stores in memory the daily fluctuations of the earth's magnetic field. The use of two magnetometers eliminates the need for a network of base stations on the grid. At the end of each survey day the field data is merged with the base station data in the field computer and automatic diurnal corrections are applied to correct the field data, resulting in a very accurate (± 5 nT) measurement of the earth's total magnetic field.

8.0 SURVEY SPECIFICATIONS

The configuration of the pole-dipole array used for the survey is shown below:





x = 50 metres; n = 1, 2, 3, 4, 5 and 6

The dipole length (x) is the distance between P_1 and P_2 and determines mainly the sensitivity of



the array. The electrode separation (nx) is the distance between C_1 and P_1 and determines mainly the depth of penetration of the array.

The Induced Polarization survey was carried out with the current electrode, C_1 EAST of the potential measuring dipole P_1P_2 . Here the lines were 400 metres apart and measurements were taken for x = 50 metres and n = 1, 2, 3, 4, 5 and 6.

9.0 DATA PROCESSING

The data collected was processed in the field at the end of each survey day using a portable 486 computer and a Fujitsu printer.

The IP pseudo-sections were plotted out in the field and contoured using in-house software based on the mathematical solution known as kriging.

In the office the data was transferred to mylar using a PENTIUM P90 computer coupled to a Hewlett Packard Draftsmaster II Plotter for the preparation of the final pseudo-sections and to a HP DesignJet plotter for production of contour plan maps.

10.0 DATA PRESENTATION

The data obtained from the survey described in this report is presented on 13 pseudo-sections, one Chargeability contour plan map, one Resistivity contour plan map, one Magnetic Profile map and one Magnetic contour map as outlined below:

Pseudo-Sections (Scale 1:2500)

<u>Line No.</u> 1800N

<u>Dwg. No.</u> 95364-01 Line No. Dwg. No. 4600N 95364-08



2200N	95364-02	5000N	95364-09
2600N	95364-03	5400N	95364-10
3000N	95364-04	5800N	95364-11
3400N	95364-05	6200N	95364-12
3800N	95364-06	6600N	95364-13
4200N	95364-07		

Plan Maps (Scale 1:5000)

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Chargeability 21 Point Triangular Filter Contours	95364-14
Resistivity 21 Point Triangular Filter Contours	95364-15
Total Field Magnetic Profiles	95364-16
Total Field Magnetic Contours	95364-17

11.0 DISCUSSION OF RESULTS

An IP response depends largely on the following factors:

- 1. The volume content of sulphide minerals
- 2. The number of pore paths that are blocked by sulphide grains
- 3. The number of sulphide faces that are available for polarization
- 4. The absolute size and shape of the sulphide grains and the relationship of their size and shape to the size and shape of the available pore paths
- 5. The electrode array employed
- 6. The width, depth, thickness and strike length of the mineralized body and its location relative to the array
- 7. The resistivity contrast between the mineralized body and the unmineralized host rock

The sulphide content of the underlying rocks is one of the critical factors that we would like to



determine from field measurements. Experience has shown that this is both difficult and unreliable because of the large number of variables, described above, which contribute to an IP response. The problem is further complicated by the fact that rocks containing magnetite, graphite, clay minerals and variably altered rocks produce IP responses of varying amplitudes.

A detailed study has been made of the pseudo-sections which accompany this report. These pseudo-sections are not sections of the electrical properties of the sub-surface strata and cannot be treated as such when determining the depth, width and thickness of a zone which produces an anomalous pattern. The anomalies are classified into 4 groups; definite, probable and possible anomalies and anomalies which have a much deeper source. These latter anomalies are mostly related to deeper overburden cover.

This classification is based partly on the relative amplitudes of the chargeability and to a lesser degree on the resistivity response. In addition the overall anomaly pattern and the degree to which this pattern may be correlated from line to line is of equal importance.

The resistivity data from the Murphy Lake property shows a sharp east-west trending boundary that extends across the property at about 3800N. This feature could be indicative of a fault and/or geological contact. To the north of this boundary the resistivities are in general fairly high with values ranging from 500 to 2000 ohm-metres while to the south the resistivities are quite low and range from 20 to 150 ohm-metres.

On the north side of this boundary is a well-defined chargeability anomaly with values ranging from 6 to 14 milliseconds in a background of about 3.5 milliseconds. Coincident with the chargeability anomaly is an arcuate shaped magnetic high which increases to over 6000 nT above background. This magnetic high straddles the chargeability anomaly to the west, south and east and is considered to be a good porphyry-style target.

To the south of the resistivity boundary lies a second chargeability anomaly. The chargeability



and resistivity values associated with this anomaly are not typical to those associated with a strong sulphide system. However, its proximity to the anomaly to the north and the continuing correlation of the magnetics to the chargeability make it worthy of further attention.

12.0 CONCLUSIONS AND RECOMMENDATIONS

From a study of the IP and magnetic data described in this report it has been concluded that the chargeability anomalies which coincide with high magnetic responses represent good porphyry-style targets worthy of further exploration by drilling.

The contoured data obtained from the 400 metre line spacing could change significantly if additional geophysical surveying on lines 100 metres (or 200 metres) apart was completed. This is recommended prior to planning a practical drill programme.

Finally, additional IP surveying is also recommended to the east between 1800N and 3000N in order to determine the nature of the anomalous responses along the eastern border of the property.

Respectfully submitted,

LLOYD GEOPHYSICS INC.

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S. John A. Cornock, B.Sc.

In honor

John Lloyd, M.Sc., P.Eng.



APPENDICES

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(A) PERSONNEL EMPLOYED ON SURVEY

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Name	Occupation	Address	Dates
J Lloyd	Geophysicist	LLOYD GEOPHYSICS INC.	March 31/95
		1007-1166 Alberni Street	
		Vancouver, B.C. V6E 3Z3	
D Klit	Geophysicist		Dec.11-19/94
			Jan. 16-29/95
J. Cornock	Geophysicist		Jan.31-Feb.4/95
			March 28-30/95
R Hill	Geophysicist		Dec.11-19/94
			Jan.16-Feb.4/95
A Lloyd	Geophysical		Dec.11-19/94
	Technician		
B Westerberg	Helper		Dec.11-19/94
			Jan. 16-29/95
K. Mason	Helper		Dec.11-19/94
			Jan. 16-29/95
E. Radu	Helper	•	Dec.11-19/94
			Jan. 16-29/95



(B) COST OF SURVEY

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Lloyd Geophysics Inc contracted the IP data acquisition on a per diem basis. Mobilization/demobilization, room and board, truck charges, data processing, map reproduction, interpretation and report writing were additional costs:

Room and Board		\$ 9691.17
Truck		2657.79
Data Acquisition		28510.75
Data Processing and Com	2467.71	
Interpretation and Report	1375.00	
	Sub-Total	\$ 44702.42
	G.S.T.	3129.17
	TOTAL	\$ 47831.59



(C) CERTIFICATION OF AUTHORS

I, John Lloyd, of 1007-1166 Alberni Street, in the City of Vancouver, in the Province of British Columbia, do hereby certify that:

- 1. I graduated from the University of Liverpool, England in 1960 with a B.Sc. in Physics and Geology, Geophysics Option.
- 2. I obtained the diploma of the Imperial College of Science and Technology (D.I.C.), in Applied Geophysics from the Royal School of Mines, London University in 1961.
- I obtained the degree of M.Sc. in Geophysics from the Royal School of Mines, London University in 1962.
- 4. I am a member in good standing of the Association of Professional Engineers in the Province of British Columbia, the Society of Exploration Geophysicists of America, the European Association of Exploration Geophysicists and the Canadian Institute of Mining and Metallurgy.
- 5. I have been practising my profession for over twenty-five years.

Vancouver, B.C.

March, 1995



Certification

I, John A. Cornock, of 1007-1166 Alberni Street, in the City of Vancouver, in the Porvince of British Columbia, do hereby certify that:

- 1. I graduated from the University of British Columbia in 1986 with a B.Sc. in Geology and and a minor in geophysics.
- I am a member in good standing of the Society of Exploration Geophysicists of America, British Columbia Geophysical Society, British Columbia and Yukon Chamber of Mines and the Northwest Mining Association.
- 3. I have practiced my profession continuously since 1987.

Vancouver, B.C. March 1995

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REFERENCES

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Aulis, R.J., (1993); Assessment report; Geological and geochemical surveys on the Lac La Hache property (Two Mile Lake Group).

Klit, D.A., Lloyd, J., (1994); An assessment report on an Induced Polarization survey on the Ray, Oley and Abbey claim groups, Lac La Hache Project area, Cariboo Mining Division, British Columbia



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