83-#64-11064



INTRODUCTION

A limited program of geophysical work was undertaken during early September of this year over the old Thistle Mine. This work determined that magnetic and induced polarization surveys could be used to test for copper-gold mineralization similar to that at the old workings. Further testing with the deep penetrating pulse electromagnetometer system was recommended.

This report describes a program of linecutting, total field magnetometer, vector pulse and induced polarization surveying during the period October 12 -November 7, 1982.

PROPERTY

The property consists of the following claims:

Claim	Units	Record No.	Claim	Units	Record No.
Sue	20	488	McQuillan	20	1258
Crow	20	489	Quill	8	1391-1398
Levi	16	490	Museum	15	1223
Rand	16	731	April	20	1226
Rose	1	378	Lore #1	1	575
Jumbo	1	379	Lore #2	1	576
Tan	16	313	Lore #3	1	577

LOCATION AND ACCESS

The mineral claims are located in the area of Father & Son Lake some 18 km SE of Port Alberni, B. C., Alberni Mining Division. Latitude 49°47'N, Longitude 124°40'W, N.T.S. 92 F/2E.

Access to the property is by two-wheel vehicle along good logging roads up the Franklin River.

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GENERAL GEOLOGY

The general geology of the property area is well described by T. G. Hawkins, F.G.A.C., in his report to McQuillan Gold Ltd. dated January 22, 1982. In essence the Crow, Levi, Sue and Rand claims follow from north to south a northwesterly trending faultbound block of Sicker volcanics, limestones, cherty tuff and argillites of Permian age. The Buttle Lake limestone equivalents of the Sicker Group are in evidence through the middle of the Rand claim and reappear to the north on the Levi claim.

Intruding the Sicker Group are Jurassic biotitehornblende granodiorite, quartz diorite Island intrusives and Tertiary hornblende quartz diorite.

The Thistle deposit is described by J. S. Stevenson 1945 in "Geology and Ore Deposits of the China Creek Area" as follows:

The Thistle deposit consists of two chalcopyrite replacement ore-bodies found along two shear-zones about 130 feet apart. These shear-zones are in a band of altered limestone, 200 feet wide, which strikes north 20 degrees west and dips 60 to 75 degrees south-westward. The limestone is enclosed on three sides, north-east, south-east, and south-west, and in part underlain, by fine-grained diorite. The limestone has been largely replaced by fine-grained diopside, resulting in a dense, light-green rock that may be referred to as diopside-rock. Although some small remnants of crystalline limestone, from a few inches to a few feet in maximum diameter, escaped replacement by the diopside, many of them were later replaced by the ore-minerals.

Strong faults are found along the ore-bodies and extend downward beyond the limits of the known ore.

The ore consists mainly of chalcopyrite and some pyrite in a gangue of dirty grey calcite and a little quartz. Very fine magnetite is dispersed through much of the calcite; some of the magnetite has been oxidized to hematite, giving a dull reddish colour to the calcite which encloses it.

The workings, extending north-easterly up the steep hillside from the ore-bunkers at the end of the road, include four adits: the 500 adit, elevation 2,525 feet; the 300 and 300A adits, elevation 2,650 feet; an upper short adit, elevation 2,750 feet; and two large glory-holes, one between the 500 and 300 adits, and another one between the 300 and the uppermost adits. In addition, several open-cuts have been dug above the 300 levels.

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The 500 adit, 65 feet above the road, has been driven north 69 degrees east for 45 feet as a crosscut from the face of which a drift has been driven north 16 degrees west for 57 feet and another south 10 degrees east for 52 feet. These drifts follow a well-defined fault that is 2 feet wide at the northern face but narrows to 1 inch at the southern face. This fault is unmineralized and contains only crushed wall-rock and gouge. Seventeen feet back from the south face, a short branch drift has been driven south 45 degrees east for 30 feet along a faulted block of sulphide-calcite ore that is bounded on the south by a fault, strike south 55 degrees east, dip 80 degrees north-eastward, and on the north by a fault, strike south 40 degrees east, dip 80 degrees south-westward. This block of ore, cut off to the north-west by the fault along the main drift and to the south-east by the junction of the two branch-drift faults, is only about 25 feet long and has a maximum thickness of 4 feet. It has not been stoped, and its vertical extent is unknown. The country-rock in this adit is fine-grained diorite that underlies, in part, the diopside-rock found in the workings above.

The lower glory-hole has been excavated between points 35 feet, elevation 2,570 feet, and 85 feet, elevation 2,580 feet, north-easterly up the hillside from the 500-adit portal, elevation 2,525 feet. The glory-hole measures 55 feet wide in a north-easterly direction and 70 feet long in a north-westerly direction, and its deepest point is 20 feet below the down-hill rim of the excavation. A short open-cut has been driven 6 feet into the north-east face of the glory-hole half-way up the face. The ore mined in the glory-hole apparently came from a north-westerly striking and south-westward dipping lens that, itself, did not extend to the main drift in the 500 adit, although the fault following the strike of the ore extended to this drift. A remnant of the ore, 16 feet long. 3 feet thick and 10 feet down the dip, may still be seen in the north-west face of the glory-hole. Diopside-rock forms both the hanging-wall and foot-wall of the ore. A small portion of a 2-inch bed of crystalline limestone was seen in the remnant of ore, and several small kidneys seen in the diopside-rock. The sulphides, pyrite and chalcoyprite, replace the limestone in preference to the diopside-rock.

The 300 adit, portal elevation 2,650 feet, and 150 feet north 55 degrees east from the 500 adit, has been driven north 63 degrees east for 30 feet, thence north 84 degrees east for 60 feet to the face. Thirty feet back from the face a short drift has been driven 30 feet southerly. No ore appears to have been found in this adit. It crosscuts alightly-banded diopside-rock and some limy bands, which strike north 20 degrees west and dip 60 degrees westward.

The 300A adit, portal elevation 2,650 feet, and 25 feet south 40 degrees east from the 300 adit, has been driven south 76 degrees east for 30 feet, as a diagonal crosscut, and then as a drift south 52 degrees east for 115 feet to the face. For a distance of 40 feet the drift follows the downward extension of ore which was mined in the gloryhole above, and then follows the north-eastern side of a fault, 2 to 20 inches wide, that cuts the ore-body at an angle of 10 degrees on a strike of south 60 degrees east and dip of 75 degrees south-westward. Eighteen inches of heavy sulphide ore found at the face (September 27th, 1941), in the foot-wall of the fault, narrows to 1 inch, 12 feet back from the face. Farther back, three lenses of unmineralized quartz, 1 to 3 inches thick, are found in the fault. From the beginning of the drift-section, but 6 feet above the floor of the drift, a branch working has been driven south-westerly for 15 feet, thence south-easterly for 13 feet along the same fault that is found farther to the south-east in the main drift. Two 1-inch stringers of quartz are found along the fault in this working. The 300A adit is in diopside-rock except for the branch-working in the hanging-wall of the fault, where fine diorite is found. This suggests displacement of the fine diorite against the otherwise south-westerly extension of the diopsiderock.

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PROTON PRECESSION MAGNETOMETER SURVEY

The magnetometer survey was carried out utilizing two GSM-8 proton precession magnetometers. One of these was operated in conjunction with a CMG MR-10 base magnetometer recorder to allow diurnal and micropulsation variation removal. Operator precautions of demagnetization and consistancy were observed and field clock to base magnetometer timing skew was maintained within one second per day. Corrected, unfiltered data are plotted on each of the base maps.

INDUCED POLARIZATION

The equipment used on this survey was the Huntec pulse-type unit and Mark III receiver. Power was obtained from a Briggs and Stratton moter coupled to a 2.5 KW 400 cycle, three phase generator, providing a maximum of 2.5 KW D.C. to the ground. The cycling rate is 1.5 seconds "current on" and 0.5 seconds "current off", the pulse reversing continuously in polarity. Power was transmitted to the ground through two potential electrodes, P_1 and P_2 , which were deployed in the three electrode array with an "a" spacing of 50 m and separations of n = 1 and 2.

The data recorded in the field consists of careful measurements of the current (I) in amperes flowing through electrodes C_1 and C_2 , the primary voltage (V_p) appearing between electrodes P_1 and P_2 during the "current on" part of the cycle. A cycle time of 4 seconds was used with a duty ratio of 2.2 - 1, T_p .20 ms and T_d 60 ms.

The apparent chargeability (M') in milliseconds, is calculated by $T_p (M_1 + 2M_2 + 4M_3 + 8M_4) = M'$, where T_p is the basic integrating time in tenths of seconds. M_1, M_2, M_3 and M_4 are the chargeability effects at various times on the voltage decay curve following switch off of the transmitter, measured as a percentage of the primary voltage, V_p recorded during the "current on" time. By the use of these factors, one can gain an estimate of the decay curve in terms of chargeability for the given time T_p . This gives a quantitative value to the data measured.

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The apparent resistivity, in ohm-metres, is proportional to the ratio of the primary voltage to the measured current, the proportionality factor depending on the geometry of the electrode array used. The chargeability and resistivity obtained are called "apparent" as they are values which that portion of the earth sampled by the array would have if it were homogeneous. As the earth sample is usually inhomogeneous, the calculated apparent chargeability and apparent resistivity are functions of the actual chargeabilities and resistivities of the rocks sampled and of the geometry of the rocks.

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VECTOR PULSE ELECTROMAGNETOMETER SURVEY

The Crone pulse electromagnetometer system is a time domain E.M. system which can be used in the standard horizontal loop mode, fixed source mode or in a downhole mode.

The primary field for the standard horizontal loop method is produced by a portable transmitter loop of 6, 10, or 50 metres diameter. A depth of search of approximately 75% of separation is obtainable due to the high sensitivity of the receiver system. As measurements of the time derivative of the secondary field occur during primary field off time the method is relatively free from geometrical restrictions. Interpretation is accomplished with the aid of Slingram horizontal loop curves.

The primary field for the 2000 watt fixed source system is provided by a 500 by 1000 metre transmitter loop. A 150 by 150 metre loop is utilized with the 500 watt system. The time derivative of the secondary field resulting from the presence of a conductor is sampled at eight windows on the decay curve, during primary field off time. These eight channels of secondary field information are equivalent to a wide spectrum of frequencies from approximately 2 KHz to 16 Hz thus allowing conductor character and strength determination. The vertical and horizontal components are obtained at each station on the traverse, using the convention of vertical component positive upwards and horizontal component positive away from the transmitter loop. In areas of high surficial conductivity the primary field on time of 10.8 ms, and the receiver delay times may be doubled in order to obtain late time information. Time synchronization between transmitter and receiver is by radio or cable link.

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The apparent primary field information is recorded at each occupied station. Normalization of the data with respect to instrument gain produces a constant gain plot. In this format a vertical plate-like conductor anomaly would be symmetric. Normalization with respect to the apparent primary field at each station provides a constant primary field plot that is useful in recognizing conductors present in the far primary field and in correlating anomaly amplitudes from line to line. The anomalies lose symmetry in this format but the condition of anomaly amplitude dependence on distance from the loop is relaxed. In the case of stacked profiles on plan maps it is practical to use the advantages of both of these methods and plot a constant gain profile normalized to the apparent primary field at a station near the conductor axis. This facilitates the correlation of conductors from line to line at varying distance in coverage from several transmitter loops.

The vector focus method of data display is useful in some line source conductor conditions. A resultant vector can be obtained by the vector addition of the vertical and horizontal components of the primary field. A perpendicular to this resultant indicates the apparent eddy current position.

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DISCUSSION OF RESULTS

The area of the Thistle Mine is a mountain slope of some 50° covered by slide alder and second growth timber. Thus, a labor intensive amount of linecutting was necessary before the specific surveys could be undertaken.

The composite profiles, Plates 1 - 6, are necessary to visualize the geophysical data on the steep hillside. Figure 6 shows a synopsis of the geophysical data superimposed on the copper geochemical map.

The composite profiles show a steep southerly dip to the chargeability zone which gives an increase in response with depth as on 300N, Plate 3. The chargeability maps, Figures 2 and 3, show two chargeability anomalies. The western one commences at the lower workings and appears to increase in intensity northwestward. The Minister of Mines Report, outlined under General Geology, describes magnetite associated with the copper mineralization. Figure 5 shows moderate magnetic high intensity values which trend northwest coincident with the chargeability values. A strong magnetic dipole response occurs over the old glory hole.

The eastern anomaly is upslope of the copper geochemical anomaly and the upper workings. A welldefined lenticular magnetic anomaly occurs updip of the chargeability zone as shown on Plates 4 and 5. The apparent resistivity data, Figure 4, shows high values where the overburden has been disturbed and thus appears to be due to variations in the overburden.

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The vector pulse data illustrated on Plates 7 - 14, shows weak responses to channel 3 with the vertical component. The responses are complex in that the transmitter loop is lower than the anomaly and the slope sub-parallels the anomaly. Thus the positive response and the change in slope of the data at 150E, line 400N, Plate 7, are anomalous. This change in slope represents an updip projection of the conductor and as seen on Figure 6, there is excellent correlation with the geochemical data. The VPEM response indicates that this conductor shows poor interconnection but that it extends down-dip coincident with the induced polarization chargeability anomaly.

Correlation of the geophysical data suggests two fault zones as illustrated on Figure 6. The copper geochemical data also trends northwestward coincident with the chargeability-magnetic intensity anomalies.

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CONCLUSION AND RECOMMENDATIONS

The geophysical surveys conducted over the Thistle Mine workings show two induced polarization chargeability and high magnetic intensity anomalies which trend into the old workings. The lower and westernmost anomaly shows an increase in geophysical response to the northwest and with depth. The eastern chargeability anomaly is associated with a well-defined magnetic high lenticular response and occurs just above the upper workings. These trends are reinforced by anomalous copper geochemical values which also trend northwestward.

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It is therefore recommended that these anomalies be tested by diamond drilling. Special attention should be paid to the steep slope and the sub-slope dipping anomalies.

A diamond drill hole should be positioned at: (a) 300N - 150E, drilled E at -60° for 150 m (b) 400N - 225E, drilled E at -60° for 150 m (c) 400N - 075E, drilled E at -60° for 150 m

These holes should then be logged by the pulse electromagnetometer system to assist in detecting off hole conductors and to determine the attitude of any mineralization found.

> Respectfully submitted, GLEN E. WHITE GEOPHYSICAL CONSULTING WICES LTD.

Glen E. WP Consulting Geophysicist

GSM-8 PROTON PRECESSION MAGNETOMETER

SPECIFICATIONS

RESOLUTION: 1 gamma ACCURACY : ±1 gamma over operating range RANGE : 20,000-100,000 gamma in 23 overlapping steps GRADIENT TOLERANCE: Up to 5000 gamma/metre **OPERATING MODES:** MANUAL PUSHBUTTON, new reading every 1.85 sec., display active between readings CYCLING, pushbutton initiated, 1.85 sec. period SELFTEST, pushbutton controlled, 7 sec. period OUTPUT: VISUAL: 5 digit 1 cm (0.4") high Liquid Crystal Display, visible in any ambient light DIGITAL: Multiplied precession frequency and gating pulse ANALOG: Optional 0-99 or 0-999 gamma EXTERNAL TRIGGER: Permits externally triggered operation with periods longer than 1.85 sec. (optional minimum period 0.9 sec.) POWER REQUIREMENTS: 12V 0.7A peak, 5mA standby POWER SOURCE: INTERNAL: 12V 0.75Ah NiCd rechargeable battery 3,000 readings per full charge EXTERNAL: 12-32V BATTERY CHARGER: Input: 110/220V 50/60Hz; output: 14V 75mA DC OPERATING TEMPATURE: -35 to +55C DIMENSIONS: CONSOLE: 15x8x15cm (6x31x6") SENSOR: 14x7cm dia (5½x3" dia) STAFF: 175cm (70") extended, 53cm (21") collapsed WEIGHT: 2.7kg (6 lb) per standard complete with batteries

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INSTRUMENT SPECIFICATIONS

INDUCED POLARIZATION SYSTEM

A. Instruments

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- (a) Type pulse
- (b) Make Huntec
- (c) Serial No. transmitter #107 receiver #3016

B. Specifications

- (a) Size and Power 2.5 KW
- (b) Sensitivity 300 x 10.5 volts
- (c) Power Sources 2.5 KW 400 cycle three-phase generator
- (d) Power 8 H.P. Briggs and Stratton © 3000 R.P.M.
- (e) Timing electronic, remote and direct.
- (f) Readings (i) ampls (ii) volts primary and secondary
- (g) Calculate (i) Resistivity ohm-meters (ohm-feet)

(ii) Chargeability - milliseconds

C. Survey Procedures

- (a) Method power supplied to mobile probe along TW 18 stranded wire from stationary set-up
- (b) Configuration Pole-dipole (three electrode array) Plot point midway between 31 and P1

D. Presentation

Contour Maps (1) Chargeability - milliseconds

(ii) Resistivity - ohm-meters (ohm-feet)

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STATEMENT OF QUALIFICATIONS

NAME: WHITE, Glen E., P.Eng.

PROFESSION: Geophysicist

EDUCATION: B.Sc. Geophysicist - Geology University of British Columbia.

PROFESSIONAL ASSOCIATIONS:

Registered Professional Engineer, Province of British Columbia.

Associate member of Society of Exploration Geophysicists.

Past President of B.C. Society of Mining Geophysicists.

EXPERIENCE:

Pre-Graduate experience in Geology -Geochemistry - Geophysics with Anaconda American Brass.

Two years Mining Geophysicist with Sulmac Exploration Ltd. and Airborne Geophysics with Spartan Air Services Ltd.

One year Mining Geophysicist and Technical Sales Manager in the Pacific north-west for W.P. McGill and Associates.

Two years Mining Geophysicist and supervisor Airborne and Ground Geophysical Divisions with Geo-X Surveys Ltd.

Two years Chief Geophysicist Tri-Con Exploration Surveys Ltd.

Twelve years Consulting Geophysicist.

Active experience in all Geologic provinces of Canada.

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COST BREAKDOWN

Pe	rsonnel	Date	2	Wages	Total
G.	McKenzi	e0ct	12-30/82:.	\$220/day.	\$3080.00
в.	Flaniga	nOct	12-Nov 7/8	2\$180/day.	
т.	Allman.	Nov	1-7/82	\$250/day.	1250.00
в.	Roberts	onNov	1-7/82	\$220/day.	1100.00
0.	Aarrkes	joldNov	1-7/82	\$160/day.	800.00
Me	als and	accomodatio	ons - 66 ma	n days @ \$60.	
Ve	hicle 4x	4 all inclu	usive		1740.00
In	strument	s; proton n	nagnetomete	r	
		Pulse e	lectromagne	tometer system	n900.00
		Induced	polarizatio	on system	1125.00
Ma	terials	and travel			125.00
Dr	afting,	interpreta	tion and rep	ports	2030.00

TOTAL......\$19,970.00

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KEY: Geochemical Contours — Copper ——— — Magnetic Intensity Anomaly ------ Chargeability - N = I Trend ----- Chargeobility - N=2 Trend Proposed Drill Hole

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