REPORT ON
COMBINED HELICOPTER BORNE
ELECTROMAGNETIC, MAGNETIC, AND VLF-EM
SURVEY
MARY PROPERTY
CARIBOO MINING DISTRICT
QUESNEL AREA
BRITISH COLUMBIA

10/88

for
SILVER SCEPTRE RESOURCES LIMITED
by
AERODAT LIMITED

September 11, 1987

CLAIMS SURVEYED

CLAIM	UNITS	RECORD NUMBER	ANNIVERSARY
MARY 2-14	224	7346-7358	FEBRUARY 19

OWNER: SILVER SCEPTRE RESOURCES LTD.
OPERATOR: SILVER SCEPTRE RESOURCES LTD.

J8733

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Consulting Geophysicist

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(Scale 1:10,000)

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1. INTRODUCTION

This report describes an airborne geophysical survey carried out on behalf of Silver Sceptre Resources Limited by Aerodat Limited. Equipment operated included a three frequency electromagnetic system, a high sensitivity cesium vapour magnetometer, a two frequency VLF-EM system, a film tracking camera, an altimeter and an electronic positioning system. Electromagnetic, magnetic and altimeter data were recorded both in digital and analog form.

The survey area, known as the Mary Property, comprised of a block of ground in the Cariboo Mining District of British Columbia, is located approximately 33 kilometres northeast of Quesnel, British Columbia. Four flights, which were flown on June 16 and 17, 1987, were required to complete the survey with flight lines oriented at an Azimuth of 030-210 degrees and flown at a nominal spacing of 200 metres. Coverage and data quality were considered to be well within the specifications described in the contract.

The survey objective is the detection and location of mineralized zones which can be directly or indirectly related to precious metal exploration targets. Of importance, therefore, are poorly mineralized conductors which may represent structural features which can play an essential role in the eventual location of primary minerals. As well, conductivity contrasts may reveal information regarding changes of rock types which may have important geological implications.

A total of 523 kilometres of the recorded data were compiled in map form and are presented as part of this report according to specifications outlined by Silver Sceptre Resources Limited.

2. SURVEY AREA LOCATION

The survey area is depicted on the index map. It is centred at Latitude 53 degrees 13 minutes north, Longitude 122 degrees 13 minutes west, approximately 33 kilometres northeast of Quesnel, British Columbia (NTS Reference Map No. 93 G/1). The survey area is also centred approximately 18 kilometres north of Cottonwood.

There are no major highways or secondary roads traversing through the survey block. The closest highway would be the Cariboo Highway or Highway 97 which is located about 11 kilometres to the west. Referring to the photomosaic base map, it will be seen that a certain amount of lumbering has taken place to the east of Genevieve Lake, but apparently has not taken place south of this lake. There is also a lumber road or bush trail traversing in an east-west direction through the southern part of the survey area.

The terrain is one of general rolling hills with the highest ground towards the southeast corner. The elevation in this area is approximately 3400 feet with the remainder of the survey area generally around 3500 feet.

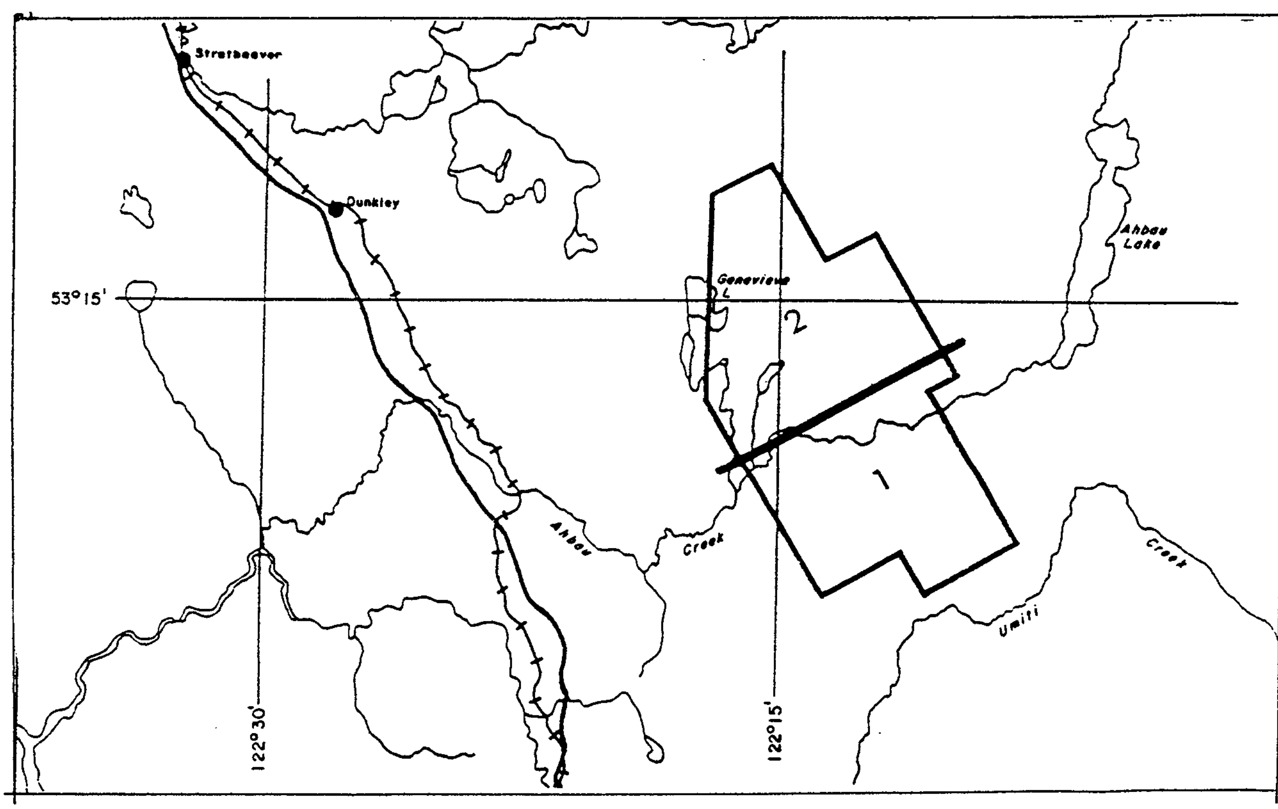
INDEX MAP

MARY PROPERTY

CARIBOO MINING DISTRICT

QUESNEL AREA

BRITISH COLUMBIA



3. AIRCRAFT AND EQUIPMENT

3.1 Aircraft

An Aerospatiale A-Star 350D helicopter, (C-GNSM), owned and operated by Ranger Helicopters, was used for the survey. Installation of the geophysical and ancillary equipment was carried out by Aerodat. The survey aircraft was flown at a mean terrain clearance of 60 metres.

3.2 Equipment

3.2.1 Electromagnetic System

The electromagnetic system was an Aerodat 3-frequency system. Two vertical coaxial coil pairs were operated at 935 Hz and 4600 Hz and a horizontal coplanar coil pair at 4175 Hz. The transmitter-receiver separation was 7 metres. Inphase and quadrature signals were measured simultaneously for the 3 frequencies with a time constant of 0.1 seconds. The electromagnetic bird was towed 30 metres below the helicopter.

3.2.2 VLF-EM System

The transmitters monitored were Jim Creek, Washington at 24.8 kHz for the Line station and Cutler, Maine at 24.0 kHz for the Orthogonal station.

3.2.3 Magnetometer

The magnetometer employed a Scintrex Model VIW-2321 H8 cesium, optically pumped magnetometer sensor. The sensitivity of this instrument was 0.1 nanoTeslas at a 0.2 second sampling rate. The sensor was towed in a bird 12 metres below the helicopter.

3.2.4 Magnetic Base Station

An IFG-2 proton precession magnetometer was operated at the base of operations to record diurnal variations of the earth's magnetic field. The clock of the base station was synchronized with that of the airborne system to facilitate later correlation.

3.2.5 Radar Altimeter

A Hoffman HRA-100 radar altimeter was used to record terrain clearance. The output from the instrument is a linear function of altitude for maximum accuracy.

3.2.6 Tracking Camera

A Panasonic video tracking camera was used to record flight path on VHS video tape. The camera was operated in continuous mode and the fiducial numbers and time marks for cross reference to the analog and digital data were encoded on the video tape.

3.2.7 Analog Recorder

An RMS dot-matrix recorder was used to display the data during the survey. In addition to manual and time fiducials, the following data were recorded:

Channel	Input	Scale
CXI1	Low Frequency Inphase	2 ppm/mm
CXQ1	Low Frequency Quadrature	2 ppm/mm
CXI2	High Frequency Inphase	2 ppm/mm
CXQ2	High Frequency Quadrature	2 ppm/mm
CPI1	Mid Frequency Inphase	8 ppm/mm
CPQ1	Mid Frequency Quadrature	8 ppm/mm
VLT	VLF-EM Total Field, Line	2.5%/mm
VLQ	VLF-EM Quadrature, Line	2.5%/mm
VOT	VLF-EM Total Field, Ortho	2.5%/mm
VOQ	VLF-EM Quadrature, Ortho	2.5%/mm
ALT	Altimeter (150 m at top of chart)	3 m/mm
MAGF	Magnetometer, fine	2.5 nT/mm
MAGC	Magnetometer, coarse	25 nT/mm

3.2.8 Digital Recorder

A DGR 33 data system recorded the survey on magnetic tape. Information recorded was as follows:

Equipment	Recording Interval
EM system	0.1 seconds
VLF-EM	0.2 seconds
Magnetometer	0.2 seconds
Altimeter	0.2 seconds

4. DATA PRESENTATION

4.1 Base Map

A photomosaic base at a scale of 1:10,000 was prepared from a photo lay down map, supplied by Aerodat, on a screened mylar base.

4.2 Flight Path Map

The flight path was manually recovered onto the photomosaic base using the VHS video tape. The recovered points were then digitized, transformed to a local metric grid and merged with the data base. The flight path map showing all flight lines, is presented on a Cronaflex copy of the base map, with camera frame and navigator's manual fiducials for cross reference to both the analog and digital data.

4.3 Airborne Electromagnetic Survey Interpretation Map

The electromagnetic data were recorded digitally at a sample rate of 10 per second with a time constant of 0.1 seconds. A two stage digital filtering process was carried out to reject major sferic events and to reduce system noise.

Local sferic activity can produce sharp, large amplitude events that cannot be removed by conventional filtering procedures. Smoothing or stacking will reduce their amplitude but leave a broader residual response that can be confused with geological phenomena. To avoid this possibility, a computer algorithm searches out and rejects the major sferic events.

The signal to noise ratio was further enhanced by the application of a low pass digital filter. It has zero phase shift which prevents any lag or peak displacement from occurring, and it suppresses only variations with a wavelength less than about 0.25 seconds. This low effective time constant permits maximum profile shape resolution.

Following the filtering process, a base level correction was made. The correction applied is a linear function of time that ensures the corrected amplitude of the various inphase and quadrature components is zero when no conductive or permeable source is present. The filtered and levelled data were used in the interpretation of the electromagnetics.

An interpretation map was prepared showing peak locations of anomalies and conductivity thickness ranges along with the inphase amplitudes (computed from the 4600 Hz coaxial response) and conductor axes. The anomalous responses of the three coil configurations along with the interpreted conductor axes were plotted on a Cronaflex copy of the photomosaic base map.

4.4 Total Field Magnetic Contours

The aeromagnetic data were corrected for diurnal variations by adjustment with the digitally recorded base station magnetic values. No correction for regional variation was applied. The corrected profile data were interpolated onto a regular grid at a 25 metre true scale interval using an Akima spline technique. The grid provided the basis for threading the presented contours at a 2 nanoTesla interval.

The contoured aeromagnetic data have been presented on a Cronaflex copy of the photomosaic base map.

4.5 Vertical Magnetic Gradient Contours

The vertical magnetic gradient was calculated from the gridded total field magnetic data. Contoured at a 0.5 nT/m interval, the gradient data were presented on a Cronaflex copy of the photomosaic base map.

4.6 Apparent Resistivity Contours

The electromagnetic information was processed to yield a map of the apparent resistivity of the ground.

The approach taken in computing apparent resistivity was to assume a model of a 200 metre thick conductive layer (i.e., effectively a half space) over a resistive bedrock. The computer then generated, from nomograms for this model, the resistivity that would be consistent with the bird elevation and recorded amplitude for the 4600 Hz coaxial frequency pair used. The apparent resistivity profile data were interpolated onto a regular grid at a 20 metres true scale interval using an Akima spline technique.

The contoured apparent resistivity data were presented on a Cronaflex copy of the photomosaic base map with the flight path.

4.7 VLF-EM Total Field Contours

The VLF-EM signals from NLK, Jim Creek, Washington, broadcasting at 24.8 kHz were compiled. The NLK data were compiled in contour map form and presented on a Cronaflex copy of the photomosaic base map.

5. INTERPRETATION

5.1 Geology

There were no geology maps available to the writer so that a geological-geophysical interpretation was not possible.

5.2 Magnetics

Referring to Sheet No. 1, it will be seen that the magnetic intensity is moderate with only a few areas displaying large amplitude responses. One area displaying larger amplitudes is the extreme northeastern corner of the map sheet. Another area is the small north-south trending feature located on the southeastern boundary of the area, as well, there appears to be portions of two higher intensity trends located towards the northwestern corner. All of these higher magnetic intensity areas are thought to be related to ultramafic rocks.

The rather featureless area in the centre of the map sheet seems to be related to one particular rock type, possibly a package of sedimentary rocks. The variable magnetic activity surrounding this horizon may be related to volcanic rocks.

It is suggested that the oblong magnetic feature towards the east central area is related to an intrusive. Whatever the source, the three small features to the west of this larger trend, is interpreted to be outliers of this same source.

One will note the four higher intensity magnetic features along the southern edge of map sheet no. 2. These areas too would seem to be related to an ultramafic rock unit. It is suggested that the magnetic feature in the extreme south-eastern corner of the map sheet is associated with the same rock type. However, in this instance, the bedding is on the east side of a magnetic low which constitutes another rock unit.

Note how the strike direction changes, for some areas, to an east-west direction. Because of this, there is a certain amount of folding.

The strike directions, over most of the area varies, as indicated on the interpretation map, with the amount of dip being vertical to steeply dipping.

5.3 Vertical Magnetic Gradient Contours

This data presentation has clearly defined the boundaries of the previously mentioned magnetic trends and at the same time, has perhaps outlined the contacts of the various rock types.

The interpreted amphibolite that was suggested for the north-east corner of map sheet no. 1, as well as the east central area, have been clearly outlined.

Some of the magnetic features isolated within the so-called sedimentary package of rocks, may be related to interbedding of volcanic rocks.

Towards the south end of map sheet no. 2, it is very evident that whatever rock type is located there, there is a great deal of folding along with numerous suspected fault zones. It is quite a distorted geological environment.

The remainder of map sheet no. 2 is rather magnetically featureless. There are a number of weaker trends throughout the map area, most not being aligned in any one particular direction. Folding is obvious which suggests a great deal of tectonic activity in this area. As well, some faulting is suspected, especially strike slip and/or fault contact zones. Cross-faulting is not readily noticeable.

There does not seem to be any signs of either felsic or basic intrusives within map sheet no. 2. With the exception of the southern most part of the map sheet, the remainder of the area is thought to be underlain with pretty much the same rock type.

5.4 Electromagnetics

The electromagnetic data was first checked by a line-by-line examination of the analog records. Record quality was good with minor noise levels on the low frequency coaxial trace. This was readily removed by an appropriate smoothing filter. Instrument noise was well within specifications. Geologic noise, in the form of surficial conductors, is present on the higher frequency responses and to a minor extent, on both the low frequency inphase and quadrature response.

Anomalies were picked off the analog traces of the low and high frequency coaxial responses and then validated on the coplanar profile data. These selections were then checked with a proprietary computerized selection program which can be adjusted for ambient and instrumental noise. The data were then edited and re-plotted on a copy of the of the profile map. This procedure ensured that every anomalous response spotted on the analog data was plotted on the final map and allowed for the rejection - or inclusion if warranted - of obvious surficial conductors. Each conductor or group of conductors was evaluated on the bases of magnetic (and lithologic, where applicable) correlations apparent on the analog data and man made or surficial features not obvious on the analog charts.

RESULTS

As a result of this airborne survey being carried out, very few bedrock conductors, if any, were intercepted within the survey block. There seems to be a rather constant level of conductivity throughout the survey area and any changes in amplitude, especially with the high frequency coplanar data, can be related to a thickening or thinning of the overburden cover.

The writer has indicated on both maps, Conductors A to D, areas of conductivity, some that may warrant further work in the field. Electromagnetic responses that are rather broad, and have both the coaxial and coplanar traces tracking each other, have been outlined on the maps with a letter and are interpreted to be poorly conducting overburden. It is questionable whether or not there is any relationship between the EM responses and any bedrock conductivity.

Areas that have been assigned a number on the maps, are considered to be possible bedrock conductors. They certainly display poor looking EM responses but have the best chance of being related to a bedrock source. ZONES 1 to 5 display very poor EM responses and only encouraging results from other types of follow-up exploration, will any of these conductors be of any interest. ZONE 6 displays a little better EM response and one that seems to be correlating with the flank of a magnetic feature. This would suggest a relationship with a geological contact. The long conductor is very close to the highly conductive ZONE A. Areas to check along ZONE 6 are intercepts 10270B, 10280C and 10390B.

Area D has been outlined on the map because of its very rough characteristics of being due to a bedrock source. In other words, a high frequency coaxial peak correlates with a coplanar low. They are certainly not well defined but could possibly be looked at further by the client. As far as magnetic correlation is concerned, there does not appear to be any. The two northerly responses coincide with the west contact of a trend while the southern EM anomalies coincide with the east flank. A low priority zone.

5.5 Apparent Resistivity

Referring to sheet no. 1, it will be seen that the entire area is quite a featureless presentation with very little contrast in resistivity to support any interpretation related to specific rock types. One area that does stand out as being very resistive compared to the surrounding area is located towards the extreme northeast corner of the map sheet. This is the same area that has the higher intensity magnetic feature which has been interpreted as possibly being due to amphibolite.

It will be noted that ZONE 1 does not show up on the apparent resistivity presentation suggesting that the conductor is probably due to conductive overburden. ZONES 2 to 6 are not that well defined either. Conductors A to C show up rather well on this data presentation, especially the south end of Conductor B. It may be worthwhile to investigate further the south end of this trend which may have been influenced by a north-northeast fault zone.

Creeks seem to be somewhat more conductive than in other areas suggesting conductive alluvial deposits, especially for areas such as Umiti Creek and Ahbau Creek. These are also known to be low lying areas where swamp like conditions exist.

If one compares the apparent resistivity data with the calculated vertical magnetic data for map sheet no. 2, it will be noted that the higher intensity magnetic features located towards the south end of the map sheet are actually quite resistive. There is a general indication that this magnetic environment is not conductive. It is also interesting to note that Conductor D does not show up on the apparent resistivity data presentation as a distinctive zone. This would seem to indicate that the outlined conductor is not bedrock related but actually an edge effect to a wide region of conductive overburden.

In fact, the overburden throughout the area is quite conductive, with resistivities as low as 20 ohm-metres for the northern map and generally in the 40-100 ohm-metre range, while in the southern half of the survey area, resistivities are as low as 6 ohm-metres and generally in the 60-150 ohm-metre range. The range of resistivities within the entire survey area is rather consistent.

5.6 VLF-EM Total Field

There is only vague correlation between the 3 frequency EM data or the magnetic data and the VLF-EM data. The general strike direction of the VLF conductors is north-south and with respect to the magnetic data, there is a shallow oblique angle. The previously mentioned sedimentary rock unit does not stand out as being a separate package of rocks with the VLF-EM data. It is obvious then, that the VLF is not mapping the conductivity contrasts of the basement rocks but more than likely the conductive cover.

Structurally, the VLF-EM data may render some information in regard to fault zones. The writer has indicated on the maps a few fault zones which may represent shears that have contributed to the stratigraphic offsetting of lithological units. There may be several others interpreted within the survey block, after a more comprehensive interpretation of the data is made. Any cross oriented structural effects could only be resolved when using the Orthogonal station data. This Orthogonal station data presentation may be considered as a product in the future.

There seems to be some correlation between VLF-EM lows and various creeks, perhaps indicating structural effects.

5.7 Recommendations

On the basis of the results of this airborne survey, it would seem that further work in the field must be carried out before any priority can be established. It has been indicated during the discussions of this report, that there were no priority targets established as a result of the survey.

It can be said that a moderate cover of overburden, which displays reasonably high conductivity, overlays the entire survey area. However, it is not felt that this conductive overburden inhibited, in any way, the detection of any bedrock conductors. The latter tend to be in the range of 1 to 10 or 15 ohm-metres while the resistivity for the overburden, in the survey area, is generally above 25 ohm-metres. There are a few locations where the resistivites are as low as 6 ohm-metres. It would be quite impossible, however, to utilize the resistivity information to map conductivity contrasts between the various rock types because it is suspected that the resistivity values for the rock types may be within the same range or higher than the overlying overburden.

It is suggested that a till sampling programme be carried out in the vicinity of ZONE 6 and the south end of Conductor B. As well, one wonders if a similar programme should not be carried out in the vicinity of some of the higher intensity magnetic features, especially if there are fault zones in close proximity. If any encouraging results should occur over any of these horizons, in the form of auriferous values, then a follow-up programme in the form of an induced polarization (IP) survey should be considered.

Ground EM surveys are not recommended because of the nature of the poor conductivity for all areas. One should treat the other outlined zones with caution, unless other information, which the client is aware of, is encouraging.

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for
AERODAT LIMITED
September 11, 1987

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APPENDIX I

GENERAL INTERPRETIVE CONSIDERATIONS

Electromagnetic

The Aerodat three frequency system utilizes two different transmitter-receiver coil geometries. The traditional coaxial coil configuration is operated at two widely separated frequencies and the horizontal coplanar coil pair is operated at a frequency approximately aligned with one of the coaxial frequencies.

The electromagnetic response measured by the helicopter system is a function of the "electrical" and "geometrical" properties of the conductor. The "electrical" property of a conductor is determined largely by its electrical conductivity, magnetic susceptibility and its size and shape; the "geometrical" property of the response is largely a function of the conductor's shape and orientation with respect to the measuring transmitter and receiver.

Electrical Considerations

For a given conductive body the measure of its conductivity or conductance is closely related to the measured phase shift between the received and transmitted electromagnetic field. A small phase shift indicates a relatively high conductance, a large phase shift lower conductance. A small phase shift results in a large inphase to quadrature ratio and a large phase shift a low ratio. This relationship is shown quantitatively for a non-magnetic vertical half-plane model on the accompanying phasor diagram. Other physical models will show the same trend but different quantitative relationships.

The phasor diagram for the vertical half-plane model, as presented, is for the coaxial coil configuration with the amplitudes in parts per million (ppm) of the primary field as measured at the response peak over the conductor. To assist the interpretation of the survey results the computer is used to identify the apparent conductance and depth at selected anomalies. The results of this calculation are presented in table form in Appendix II and the conductance and inphase amplitude are presented in symbolized form on the map presentation.

The conductance and depth values as presented are correct only as far as the model approximates the real geological situation. The actual geological source may be of limited length, have significant dip, may be strongly magnetic, its conductivity and thickness may vary with depth and/or strike and adjacent bodies and overburden may have modified the response. In general the conductance estimate is less affected by these limitations than is the depth estimate, but both should be considered as relative rather than absolute guides to the anomaly's properties.

Conductance in mhos is the reciprocal of resistance in ohms and in the case of narrow slab-like bodies is the product of electrical conductivity and thickness.

Most overburden will have an indicated conductance of less than 2 mhos; however, more conductive clays may have an apparent conductance of say 2 to 4 mhos. Also in the low conductance range will be electrolytic conductors in faults and shears.

The higher ranges of conductance, greater than 4 mhos, indicate that a significant fraction of the electrical conduction is electronic rather than electrolytic in nature. Materials that conduct electronically are limited to certain metallic sulphides and to graphite. High conductance anomalies, roughly 10 mhos or greater, are generally limited to sulphide or graphite bearing rocks.

Sulphide minerals, with the exception of such ore minerals as sphalerite, cinnabar and stibnite, are good conductors; sulphides may occur in a disseminated manner that inhibits electrical conduction through the rock mass. In this case the apparent conductance can seriously underrate the quality of the conductor in geological terms. In a similar sense the relatively non-conducting sulphide minerals noted above may be present in significant consideration in association with minor conductive sulphides, and the electromagnetic response only relate to the minor associated mineralization. Indicated conductance is also of little direct significance for the identification of gold mineralization. Although gold is highly conductive, it would not be expected to exist in sufficient quantity to create a recognizable anomaly, but minor accessory sulphide mineralization could provide a useful indirect indication.

In summary, the estimated conductance of a conductor can provide a relatively positive identification of significant sulphide or graphite mineralization; however, a moderate to low conductance value does not rule out the possibility of significant economic mineralization.

Geometrical Considerations

Geometrical information about the geologic conductor can often be interpreted from the profile shape of the anomaly. The change in shape is primarily related to the change in inductive coupling among the transmitter, the target, and the receiver.

In the case of a thin, steeply dipping, sheet-like conductor, the coaxial coil pair will yield a near symmetric peak over the conductor. On the other hand, the coplanar coil pair will pass through a null couple relationship and yield a minimum over the conductor, flanked by positive side lobes. As the dip of the conductor decreased from vertical, the coaxial anomaly shape changes only slightly, but in the case of the coplanar coil pair the side lobe on the down dip side strengthens relative to that on the up dip side.

As the thickness of the conductor increases, induced current flow across the thickness of the conductor becomes relatively significant and complete null coupling with the coplanar coils is no longer possible. As a result, the apparent minimum of the coplanar response over the conductor diminishes with increasing thickness, and in the limiting case of a fully 3 dimensional body or a horizontal layer or half-space, the minimum disappears completely.

A horizontal conducting layer such as overburden will produce a response in the coaxial and coplanar coils that is a function of altitude (and conductivity if not uniform). The profile shape will be similar in both coil configurations with an amplitude ratio (coplanar:coaxial) of about 4:1*.

In the case of a spherical conductor, the induced currents are confined to the volume of the sphere, but not relatively restricted to any arbitrary plane as in the case of a sheet-like form. The response of the coplanar coil pair directly over the sphere may be up to 8* times greater than that of the coaxial pair.

In summary, a steeply dipping, sheet-like conductor will display a decrease in the coplanar response coincident with the peak of the coaxial response. The relative strength of this coplanar null is related inversely to the thickness of the conductor; a pronounced null indicates a relatively thin conductor. The dip of such a conductor can be inferred from the relative amplitudes of the side-lobes.

Massive conductors that could be approximated by a conducting sphere will display a simple single peak profile form on both coaxial and coplanar coils, with a ratio between the coplanar to coaxial response amplitudes as high as 8*.

Overburden anomalies often produce broad poorly defined anomaly profiles. In most cases, the response of the coplanar coils closely follows that of the coaxial coils with a relative amplitude ratio of 4*.

Occasionally, if the edge of an overburden zone is sharply defined with some significant depth extent, an edge effect will occur in the coaxial coils. In the case of a horizontal conductive ring or ribbon, the coaxial response will consist of two peaks, one over each edge; whereas the coplanar coil will yield a single peak.

* It should be noted at this point that Aerodat's definition of the measured ppm unit is related to the primary field sensed in the receiving coil without normalization to the maximum coupled (coaxial configuration). If such normalization were applied to the Aerodat units, the amplitude of the coplanar coil pair would be halved.

Magnetics

The Total Field Magnetic Map shows contours of the total magnetic field, uncorrected for regional variation. Whether an EM anomaly with a magnetic correlation is more likely to be caused by a sulphide deposit than one without depends on the type of mineralization. An apparent coincidence between an EM and a magnetic anomaly may be caused by a conductor which is also magnetic, or by a conductor which lies in close proximity to a magnetic body. The majority of conductors which are also magnetic are sulphides containing pyrrhotite and/or magnetite. Conductive and magnetic bodies in close association can be, and often are, graphite and magnetite. It is often very difficult to distinguish between these cases. If the conductor is also magnetic, it will usually produce an EM anomaly whose general pattern resembles that of the magnetics. Depending on the magnetic permeability of the conducting body, the amplitude of the inphase EM anomaly will be weakened, and if the conductivity is also weak, the inphase EM anomaly may even be reversed in sign.

VLF Electromagnetics

The VLF-EM method employs the radiation from powerful military radio transmitters as the primary signals. The magnetic field associated with the primary field is elliptically polarized in the vicinity of electrical conductors. The Herz Totem uses three coils in the X, Y, Z configuration to measure the total field and vertical quadrature component of the polarization ellipse.

The relatively high frequency of VLF (15-25) kHz provides high response factors for bodies of low conductance. Relatively "disconnected" sulphide ores have been found to produce measureable VLF signals. For the same reason, poor conductors such as sheared contacts, breccia zones, narrow faults, alteration zones and porous flow tops normally produce VLF anomalies. The method can therefore be used effectively for geological mapping. The only relative disadvantage of the method lies in its sensitivity to conductive overburden. In conductive ground the depth of exploration is severely limited.

The effect of strike direction is important in the sense of the relation of the conductor axis relative to the energizing electromagnetic field. A conductor aligned along a radius drawn from a transmitting station will be in a maximum coupled orientation and thereby produce a stronger response than a similar conductor at a different strike angle. Theoretically, it would be possible for a conductor, oriented tangentially to the transmitter to produce no signal. The most obvious effect of the strike angle consideration is that conductors favourably oriented with respect to the transmitter location and also near perpendicular to the flight direction are most clearly rendered and usually dominate the map presentation.

The total field response is an indicator of the existence and position of a conductivity anomaly. The response will be a maximum over the conductor, without any special filtering, and strongly favour the upper edge of the conductor even in the case of a relatively shallow dip.

The vertical quadrature component over steeply dipping sheet-like conductor will be a cross-over type response with the cross-over closely associated with the upper edge of the conductor.

The response is a cross-over type due to the fact that it is the vertical rather than total field quadrature component that is measured. The response shape is due largely to geometrical rather than conductivity considerations and the distance between the maximum and minimum on either side of the cross-over is related to target depth. For a given target geometry, the larger this distance the greater the depth.

The amplitude of the quadrature response, as opposed to shape is function of target conductance and depth as well as the conductivity of the overburden and host rock. As the primary field travels down to the conductor through conductive material it is both attenuated and phase shifted in a negative sense. The secondary field produced by this altered field at the target also has an associated phase shift. This phase shift is positive and is larger for relatively poor conductors. This secondary field is attenuated and phase shifted in a negative sense during return travel to the surface. The net effect of these 3 phase shifts determine the phase of the secondary field sensed at the receiver.

A relatively poor conductor in resistive ground will yield a net positive phase shift. A relatively good conductor in more conductive ground will yield a net negative phase shift. A combination is possible whereby the net phase shift is zero and the response is purely in-phase with no quadrature component.

A net positive phase shift combined with the geometrical cross-over shape will lead to a positive quadrature response on the side of approach and a negative on the side of departure. A net negative phase shift would produce the reverse. A further sign reversal occurs with a 180 degree change in instrument orientation as occurs on reciprocal line headings. During digital processing of the quadrature data for map presentation this is corrected for by normalizing the sign to one of the flight line headings.

APPENDIX II

ANOMALY LIST

J8733 MARY PROPERTY, BRITISH COLUMBIA

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
1	10011	A	0	4.5	9.1	0.2	3	44
1	10030	A	0	5.8	10.8	0.3	8	37
1	10050	A	0	3.2	7.2	0.1	8	41
1	10070	A	0	8.7	16.7	0.3	6	33
1	10180	A	1	20.1	17.1	1.6	18	26
1	10180	B	2	26.3	17.4	2.4	14	29
1	10180	C	2	16.2	10.3	2.2	12	39
1	10180	D	2	16.2	10.2	2.2	20	32
1	10200	A	2	8.8	4.6	2.3	34	34
1	10200	B	2	17.5	11.6	2.1	17	33
1	10200	C	2	17.9	10.9	2.4	15	36
1	10200	D	1	14.5	14.1	1.2	16	30
1	10200	E	2	29.4	15.6	3.4	6	38
1	10200	F	2	26.5	14.3	3.2	0	45
1	10220	A	1	14.9	11.5	1.6	0	55
1	10220	B	1	16.6	13.6	1.6	6	42
1	10220	C	2	17.2	11.8	2.0	10	39
1	10220	D	2	17.9	12.1	2.1	11	38
1	10220	E	1	12.9	13.1	1.0	8	40
1	10220	F	3	36.5	15.3	5.0	4	38
1	10220	G	3	31.8	14.3	4.4	0	47
1	10240	A	2	20.0	13.9	2.1	0	51
1	10240	B	1	15.2	12.7	1.5	3	46
1	10240	C	1	18.0	17.9	1.2	7	35
1	10240	D	1	17.5	12.7	1.9	14	34
1	10240	E	1	13.9	13.0	1.2	9	39
1	10240	F	3	42.4	15.5	6.3	0	42
1	10250	A	3	33.8	13.7	5.1	0	48
1	10250	B	2	18.6	10.5	2.7	0	54
1	10250	C	1	17.3	14.2	1.6	13	34
1	10250	D	1	17.0	17.2	1.2	4	39
1	10250	E	1	16.7	14.6	1.4	6	41
1	10270	A	4	54.2	17.3	8.1	0	51
1	10270	B	2	28.5	16.2	3.1	0	47
1	10270	C	1	21.4	18.6	1.6	5	37

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

J8733 MARY PROPERTY, BRITISH COLUMBIA

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
1	10270	D	1	23.2	19.6	1.7	0	41
1	10270	E	1	19.4	14.9	1.8	0	54
1	10270	F	1	15.8	12.3	1.6	0	62
1	10280	A	1	17.7	13.8	1.7	0	50
1	10280	B	2	24.4	15.5	2.5	0	49
1	10280	C	2	24.4	16.5	2.3	0	45
1	10280	D	3	49.9	17.8	6.8	0	48
1	10280	E	3	35.0	15.5	4.6	0	52
1	10300	A	1	18.2	19.4	1.1	5	36
1	10300	B	1	15.2	15.3	1.1	12	33
1	10300	C	1	15.2	14.1	1.3	7	39
1	10300	D	2	21.1	11.0	3.1	0	49
1	10300	E	3	31.8	9.3	7.7	0	57
1	10320	A	1	20.3	19.6	1.3	7	34
1	10320	B	1	21.8	22.4	1.3	8	31
1	10320	C	2	27.3	18.6	2.4	1	41
1	10320	D	2	31.6	16.0	3.7	3	41
1	10320	E	2	34.1	17.0	3.9	5	37
1	10330	A	3	56.8	27.2	4.8	0	38
1	10330	B	3	34.0	12.7	5.7	0	51
1	10330	C	1	20.5	19.0	1.4	0	41
2	10351	A	3	26.2	11.9	4.0	10	37
2	10351	B	1	14.1	14.7	1.0	11	34
2	10351	C	3	32.3	9.4	7.8	9	37
2	10351	D	3	60.5	25.5	5.8	7	29
2	10360	A	3	22.2	8.6	4.8	8	43
2	10360	B	3	27.8	8.7	6.8	7	41
2	10360	C	2	9.4	4.8	2.4	0	66
2	10360	D	2	9.4	4.1	3.0	2	66
2	10370	A	3	14.8	5.2	4.8	11	49
2	10370	B	2	12.2	6.4	2.6	10	50
2	10370	C	3	17.1	6.4	4.6	16	40
2	10370	D	4	19.4	4.3	9.7	9	48
2	10390	A	3	27.0	11.9	4.3	9	38
2	10390	B	2	14.6	8.0	2.6	24	31
2	10390	C	2	18.6	11.9	2.3	18	31
2	10390	D	3	27.8	8.9	6.6	11	37

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J8733 MARY PROPERTY, BRITISH COLUMBIA

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
2	10400	A	4	20.3	5.0	8.5	7	48
2	10400	B	3	21.0	6.0	7.0	10	43
2	10400	C	1	12.5	8.3	1.9	7	49
2	10400	D	2	13.3	5.4	3.8	10	51
2	10410	A	2	25.3	15.9	2.6	8	37
2	10410	B	2	17.4	9.4	2.8	2	51
2	10410	C	2	15.2	6.4	3.8	2	55
2	10420	A	3	23.0	9.8	4.2	1	49
2	10420	B	2	23.8	13.1	3.0	2	45
2	10420	C	2	18.0	12.0	2.1	4	45
2	10430	A	2	24.5	16.6	2.3	15	29
2	10430	B	2	22.6	12.0	3.1	7	41
2	10450	A	3	26.4	11.5	4.3	6	41
2	10450	B	3	25.8	8.4	6.3	10	40
2	10460	A	3	23.1	10.3	4.0	16	34
2	10480	A	2	22.6	11.9	3.2	11	37
2	10490	A	3	28.4	11.7	4.7	2	44
2	10490	B	3	27.6	11.4	4.7	10	37
2	10520	A	2	17.4	10.1	2.5	14	37
2	10550	A	2	11.9	6.4	2.5	11	49
2	10550	B	4	34.9	9.0	9.4	3	43
2	10560	A	3	25.8	9.0	5.7	5	44
2	10560	B	2	18.2	8.3	3.6	9	45
2	10560	C	3	20.5	7.8	4.7	12	40
2	10570	A	3	26.1	10.0	5.1	4	44
2	10570	B	2	28.4	14.5	3.6	5	40
2	10570	C	3	34.2	14.6	4.8	7	36
2	10570	D	3	34.1	13.1	5.5	5	38
2	10591	A	2	16.3	7.9	3.2	10	45
2	10591	B	2	16.6	8.5	3.0	10	44
2	10600	A	2	19.4	12.3	2.3	7	41

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J8733 MARY PROPERTY, BRITISH COLUMBIA

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
2	10610	A	2	17.3	12.0	2.0	9	41
2	10630	A	2	19.9	14.0	2.0	0	49
2	10630	B	1	21.5	18.4	1.6	6	37
2	10630	C	1	20.7	16.5	1.7	4	40
3	10670	A	4	29.6	6.8	10.5	6	42
3	10850	A	0	8.5	14.3	0.4	3	39
3	10870	A	0	15.5	21.1	0.7	0	39
3	10890	A	1	12.6	11.4	1.2	4	47
3	10930	A	1	16.0	14.4	1.3	6	40

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

APPENDIX II

CERTIFICATE OF QUALIFICATIONS

I, ROBERT J. DE CARLE, certify that: -

1. I hold a B. A. Sc. in Applied Geophysics with a minor in geology from Michigan Technological University, having graduated in 1970.

2. I reside at 28 Westview Crescent in the town of Palgrave, Ontario.

3. I have been continuously engaged in both professional and managerial roles in the minerals industry in Canada and abroad for the past eighteen years.

4. I have been an active member of the Society of Exploration Geophysicists since 1967 and hold memberships on other professional societies involved in the minerals extraction and exploration industry.

5. The accompanying report was prepared from information published by government agencies, materials supplied by Silver Sceptre Resources Limited and from a review of the proprietary airborne geophysical survey flown by Aerodat Limited for Silver Sceptre Resources Limited. I have not personally visited the property.

6. I have no interest, direct or indirect, in the property described nor do I hold securities in Silver Sceptre Resources Limited.

7. I hereby consent to the use of this report in a Statement of Material Facts of the Company and for the preparation of a prospectus for submission to the British Columbia Securities Commission and/or other regulatory authorities.

Signed,

Robert J. de Carle

Palgrave, Ontario — Robert J. de Carle

September 11, 1987 — Consulting Geophysicist

COST STATEMENT

AIRBORNE GEOPHYSICAL SURVEY
24 JUNE 1987

Aerodat Limited -	400 Line Km @ $75.00	$30,000.00
Mark Management -	Planning, Supervision, Reporting	4,500.00
TOTAL COST		$34,500.00