87-603-16352

REPORT ON
COMBINED HELICOPTER BORNE
ELECTROMAGNETIC, MAGNETIC, AND VLF-EM
SURVEY
TOP HAT PROPERTY
LILLOOET AREA
BRITISH COLUMBIA

8/88

Kamloops M.D.
92 I/12E
50°37'12" 121°42'

for
KANGELD RESOURCES LIMITED
by
AERODAT LIMITED

PART 1 OF 2

September 3, 1987

FILMED

CLAIMS SURVEYED

CLAIM	UNITS	RECORD NUMBER	ANNIVERSARY
TOP HAT 1	20	4704	AUGUST 24
TOP HAT 2	20	4705	AUGUST 24
TOP HAT 3	15	4706	AUGUST 24
TOP HAT 4	15	4707	AUGUST 24

GEOLOGICAL BRANCH
ASSESSMENT REPORT

16,352

OWNER: KANGELD RESOURCES LTD.
OPERATOR: KANGELD RESOURCES LTD.

J8738

W. R. Lechow
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 Kangeld 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, comprising a block of ground in the Lillooet area of British Columbia, is located approximately 18 kilometres south-east of the town of Lillooet, British Columbia.

Three flights, which were flown on June 27, 1987, were required to complete the survey with flight lines oriented at an Azimuth of 045 degrees and flown at a nominal spacing of 100 metres. Coverage and data quality were considered to be well within the specifications described in the contract.

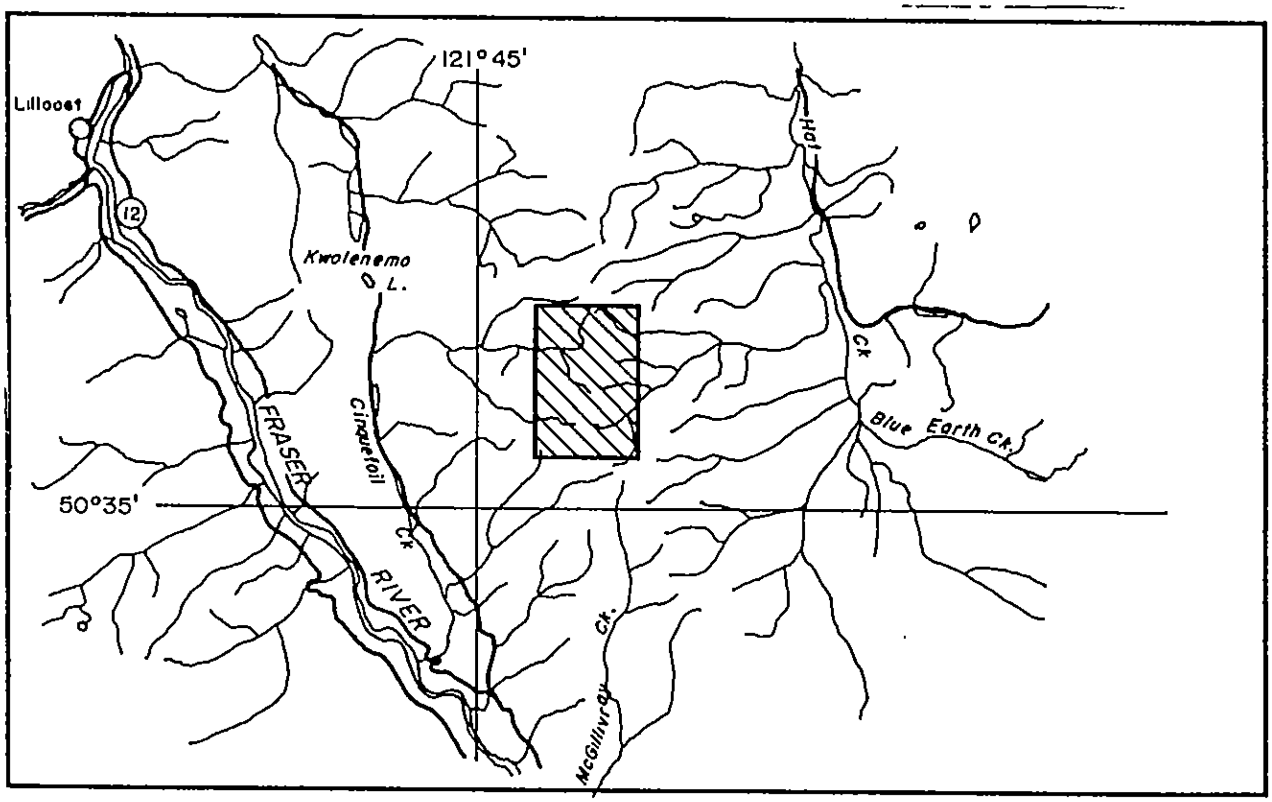
The survey objective is the detection and location of mineralized zones which can be directly or indirectly related to precious metal exploration targets. Of significance, therefore, are weak conductors which may represent structural features which can play an essential role in the eventual location of primary minerals.

A total of 222 kilometres of the recorded data were compiled in map form and are presented as part of this report according to specifications outlined by Kangeld Resources Limited.

2. SURVEY AREA LOCATION

The survey area is depicted on the index map shown. It is centred at Latitude 50 degrees 37'30" north, Longitude 121 degrees 42'30" west, (NTS Reference Map No. 92 I/12).

The terrain is rough with relief in the order of 1500' within the survey area.



3. AIRCRAFT AND EQUIPMENT

3.1 Aircraft

An Aerospatiale A-Star 350D helicopter, (C-GNSM), owned and operated by Maple Leaf Helicopters Limited, 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, as well as Annapolis, Maryland at 21.4 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.

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 20 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

No geological information was conveyed nor available during the interpretation of the survey data.

5.2 Magnetics

Examination of the contoured magnetic data reveals relatively high intensities over the southern two-fifths of the survey block, implying the presence of mafic lithologies. The predominant strike of these rocks appears to be SE-NW, although there is evidence of folding in the southeast. There is a strong suggestion of the presence of rocks of a more mafic composition intruded into the area lying just beyond the southeast corner of the block. Satellite intrusives appear to be situated just east of the south-central position of the site, and approximately 700 metres north and 300 metres east of the southwest corner of the area.

A more felsic lithology is situated across the middle of the survey area with a northward extension from this, in the central portion of the block. The remaining areas to the northwest and northeast are occupied by mafic rocks. A thin band of felsic rock with a north-south trend is apparent near the west margin of the survey block in the northern half of the area. This lithology appears to change to an eastward trend at its northern extremity. There is some evidence of a possible fault with an approximate east-west trend intersecting this feature. The trace of the fault is marked by a linear low magnetic gradient.

5.3 Electromagnetic Data

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 and to a minor extent, on both the low frequency inphase and quadrature response.

The survey has demonstrated considerable broad quadrature-only type responses. These are indicative of the low conductivities frequently associated with surficial deposits and occasionally with some bedrock lithologies such as carbonaceous sediments. These responses are, however not to be considered as primary exploration targets. Their appearance within this survey may relate to variances in colluvial texture or thickness. It is also suspected that some of these responses may be derived directly from the fundamental texture and composition of the mafic bedrock of the area since there is a loose association between the two features as presented on the EM profile map and the magnetic map.

Such features seldom demonstrate any degree of high frequency inphase response and show virtually no response on the low frequency inphase channel.

A second type of response apparent on the EM profile map can be easily identified by anomalously negative inphase deflection accompanied by either a positive quadrature response or none at all. It will be noticed that this category of EM response always corresponds to sites showing relatively high magnetic susceptibility, and can be normally attributed to higher concentrations of magnetite present in bedrock. These are frequently associated with mafic intrusives, the characteristic EM signature indicating the purely magnetic polarizability of disseminated magnetite.

The strongest responses recorded from the survey were of this nature. Although useful for geological mapping, these responses cannot normally be considered as direct indicators of the presence of any economically significant mineralization unless there exists some other independent positive corroborative evidence of this.

Any EM responses that do not fall into one of the two categories previously described may be considered as potentially interesting targets for follow-up. Anomalies of this latter variety were scrutinized and, based on general anomaly character, selected for inclusion on the interpretation map.

Very little spatial continuance has been demonstrated by conductors represented by the latter type of response. They frequently show a response on only one or two flight lines. Most responses of this type have also shown weak amplitudes. These two characteristics have made the recognition of axial trends difficult, and in most cases the magnetic map was relied upon for this as well. Thus the orientation of conductors depicted on the interpretation map can only be considered tentative, and subject to ground verification. A discussion of individually selected conductors follows.

ZONE I (LINES 1210 and 12210)

This site is represented by a weak but definite pair of responses on two adjacent flight lines. The conductor is likely about 200 metres in extent, and demonstrates low to intermediate conductivity thickness. The site is located on the trace of a fault, and is situated in a valley. The structural relationship implies that the site should be explored further.

ZONE II (LINE 1260)

Zone II marks a definite isolated EM response situated in a magnetic low straddled between two more or less circular positive magnetic features. The location is suspected to possibly represent a geologic contact, and should be examined in more detail using appropriate ground methods. The site lies in a valley bottom. The conductor is obviously quite short in spatial extent and the EM response is rather broad, possibly owing to an oblique orientation with respect to the flight direction. The apparent conductivity thickness is indicated to be only moderate.

ZONE III (LINE 1290)

A convergent pair of conductors have shown a relative maximum in response amplitude and definition at this site. This may therefore represent a portion of subcrop for the conductors in question. They converge toward the northwest, at the same time losing some quality to their EM response. Similarly, they diverge in the opposite direction, again losing response quality. The locaton also appears to mark the approximate contact between a mafic lithology to the southwest and felsic rocks to the northeast. The photomosaic indicates Zone III is on a south facing slope. Although the EM responses are not outstanding, offering only moderate conductivity thickness values, the zone may warrant further study based on an interesting geological context.

ZONE IV (LINE 1590)

This zone is situated on the south margin of the survey area and possibly as a result of this, has been resolved on only a single flight line. The response however is quite strong, more typically that of a "formational" conductor, or that which is derived from non-economic conductive mineralization as part of the general make-up of a given rock type. The apparent conductivity thickness is high, and the conductor probably dips southward. The magnetic association indicates a pronounced peak at this site, apparently related to what is likely to be a mafic intrusive lying to the northwest. The EM anomaly lies near the contact between this body and the country rock lying to the south. The site should be considered further since the remainder of the proposed intrusive offers no comparably strong EM responses. The zone appears to lie in a valley bottom. This site should be explored further.

ZONE V (LINES 1480 and 1490)

Zone V is represented by a weak pair of EM anomalies on adjacent flight lines, which at this location, are closely spaced. The site is in a valley, and coincides with a vague east-west magnetic linear, possibly indicative of a fault within mafic rocks. Conductivity-thickness values are moderate, and the zone can be considered for follow-up as a lower priority target.

ZONE VI (LINE 1600)

This location has provided a weak EM response situated on a steep horizontal magnetic gradient, implying the presence of a contact within mafic rocks. The zone lies near a topographic crest, making ground access difficult. The site may be investigated as a low priority, primarily based on a potentially interesting geological context. The indicated conductivity-thickness appears to be only moderate here.

ZONE VII (LINES 1590 and 1600)

A conductive trend oriented approximately north-south has been resolved at this location. The responses are broad, probably due to the oblique relationship between the flight line and the conductor axis. The apparent conductivity-thickness is moderately high as determined on line 1600. The conductor appears to occupy a similar geological context to that of Zone VI. It is recommended that this feature be given additional investigation as a medium priority. It lies within a valley, and appears to be at least 400 metres in extent.

ZONE VII (LINES 1540 and 1550)

The conductor represented here is situated among mafic rocks of probable intrusive origin. The EM responses are weak, but definite and offer indications of moderate conductivity-thickness. The conductor is approximately 300 metres in length, and demonstrates an east-west orientation. Since the site occurs well within a mafic intrusive, it can only be regarded as a lower priority target from an economic perspective. The zone is situated on a northeast facing slope.

5.4 Apparent Resistivity

The notable features on the apparent resistivity map are a weak correpsondence between vague resistivity contrasts in the south and north of the area, with the magnetic representation of mafic rocks in these same areas. The lack of total agreement here is expected, since the electrical permittivity and magnetic susceptibility of the rocks are not necessarily tightly interrelated.

In addition, it can be seen that the fault discussed earlier, situated on the northwest quadrant of the block has been clearly delineated here as a resistivity low.

5.5 VLF-EM Total Field

The contoured VLF data show a number of vague conductive trends oriented SSE-NNW. The most pronounced of these is situated in the south central part of the survey area. This feature appears broadly arcuate with a convex curvature toward the northeast.

A dislocation is evident where the previously mentioned fault is situated. The strike-slip component appears to be left-lateral.

5.6 Summary

EM responses detected in this survey tend to be weak, or poorly-defined. Nonetheless the most promising of these have been individually assessed and discussed based on their relative merits. A number of additional conductors have been delineated on the interpretation map, however it is felt that these remaining conductors lack the necessary attributes which allow for a meaningful comparative evaluation and discussion.

It is felt that the magnetic data derived from this survey are at least as valuable for future exploration of the locality as are the EM data, and, there is little doubt that the knowledge of the local geology can be further improved by referral to the magnetic maps.

It is suggested that all data from the survey be compared to any known geological, geochemical, or ground geophysical data in order to establish an overall follow up strategy, based on mutually supportive evidence derived from the above-mentioned independent sources. Preference should naturally be given to areas in proximity to mafic-felsic contacts.

William R. Lechow

Geophysicist

J8738

September 3, 1987

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.

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
3	1210	A	0	5.0	9.0	0.3	336	-286
3	1221	A	0	7.5	20.1	0.2	271	-237
2	1230	A	0	6.9	24.1	0.1	214	-185
2	1260	A	0	6.4	20.9	0.1	214	-183
2	1260	C	0	5.6	11.6	0.2	334	-290
2	1270	A	0	4.0	13.8	0.1	309	-273
2	1290	A	0	6.2	34.0	0.0	193	-171
2	1290	B	0	6.0	45.0	0.0	193	-175
1	1480	A	0	4.1	9.9	0.1	288	-244
1	1490	A	0	4.0	12.6	0.1	274	-236
1	1540	A	0	6.1	19.8	0.1	241	-209
1	1550	A	0	6.3	16.8	0.2	254	-218
1	1590	A	0	25.9	53.7	0.5	220	-194
1	1590	B	0	5.1	6.5	0.5	360	-300
1	1600	A	0	4.8	16.3	0.1	244	-210
1	1600	C	0	9.9	14.7	0.5	317	-273
1	1600	D	0	7.8	14.3	0.3	287	-245
1	1620	A	0	10.1	10.7	0.9	290	-239
1	1630	B	0	10.0	15.0	0.5	260	-217
1	1640	A	0	11.3	13.1	0.8	301	-254

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 III

CERTIFICATE OF QUALIFICATIONS

I, WILLIAM R. LECHOW, certify that: -

1. I hold a B. Sc. (Hons.) in Geological Sciences from Brock University. After graduation, I attended the University of Western Ontario as a full-time student during which time I obtained additional credits in geophysics.

2. I reside at 17 Willingdon Blvd. in the city of Etobicoke, Ontario.

3. I have been continuously engaged in a professional role in the minerals industry in Canada and abroad for the past twelve years.

4. I have been an associate member of the Society of Exploration Geophysicists since 1974 and hold memberships on other professional societies involved in the minerals extraction and exploration industry.

5. The accompanying report was prepared from information supplied by Kangeld Resources Limited and from a review of the proprietary airborne geophysical survey flown by Aerodat Limited for Kangeld 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 Kangeld Resources Limited.

Mississauga, Ontario
September, 1987

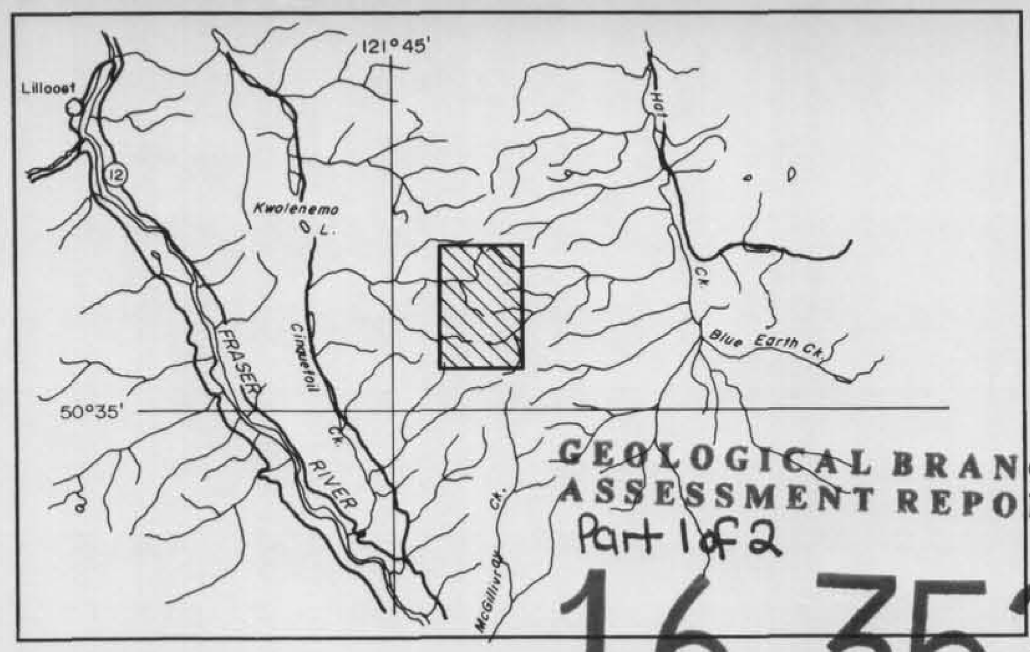
Signed,

William R. Lechow
Geophysicist

COST STATEMENT

AIRBORNE GEOPHYSICAL SURVEY
TOP HAT CLAIMS
27 JUNE 1987

Aerodat Limited - 180 Line Km @ $75.00	$13,500.00
Mark Management - Planning, Supervision, Reporting	2,025.00
TOTAL COST	$15,525.00



GEOLOGICAL BRANCH
ASSESSMENT REPORT
Part 1 of 2

16,352

KANGELD RESOURCES LTD.

BASE MAP

LILLOOET AREA

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 1/2 MILE

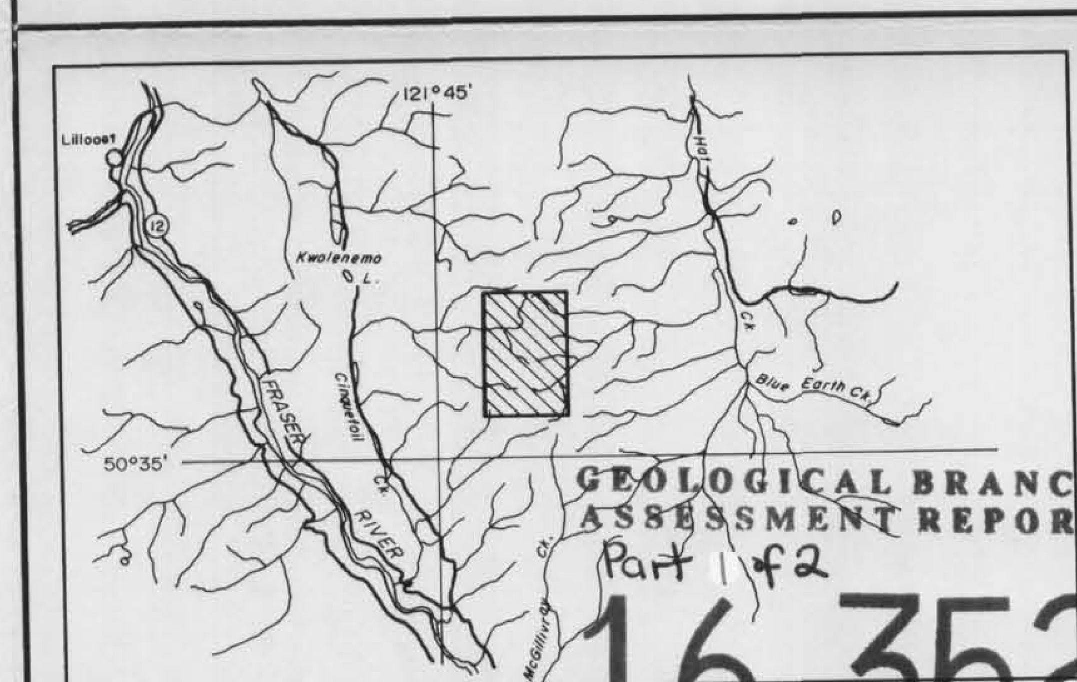
0 100 200 500 1 KILOMETRE

AERODAT LIMITED	DATE: JUNE 1987
	NTS No: 92 I/12
	MAP No: 1 J8738

Flight Path

Flight path derived from VHS video tape.

Average terrain clearance 60m
Line spacing = 100m



GEOLOGICAL BRANCH
ASSESSMENT REPORT
Part 1 of 2

16,352

KANGELD RESOURCES LTD.

FLIGHT PATH

LILLOOET AREA

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 1/2 MILE

0 100 200 500 1 KILOMETRE

AERODAT LIMITED

DATE:	JUNE 1987
NTS No:	92 I/12
MAP No:	2 J8738

EM Anomalies

Conductivity Thickness (mhos)

- 0 - 1
- 1 - 2
- 2 - 4
- 4 - 8
- 8 - 15
- 15 - 30
- > 30

EM Anomaly A. 4600 Hz inphase amplitude 7 ppm. Conductivity thickness 1-2 mhos (see code).

Interpreted bedrock conductor axis

Wide conductor

Fault

Conductive Zone

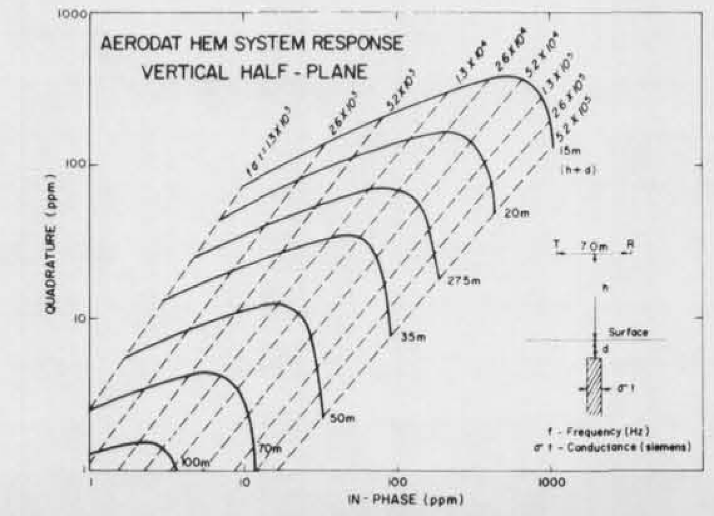
Direction of dip

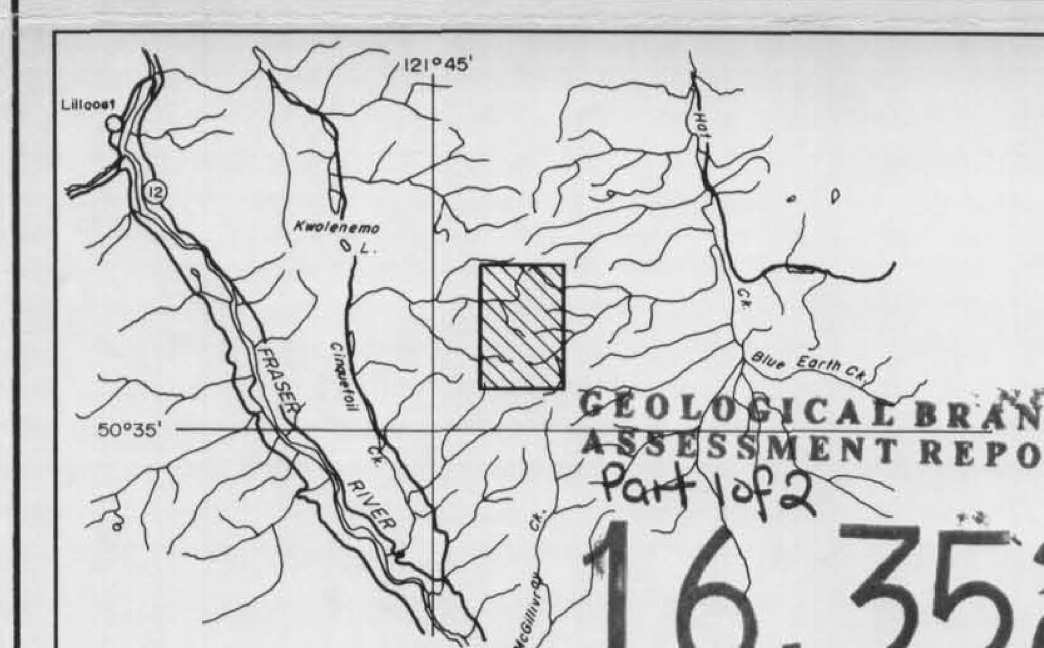
Flight Path

Flight path derived from VHS video tape.

Average terrain clearance 60m
Line spacing = 100m

N





GEOLOGICAL BRANCH
ASSESSMENT REPORT
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KANGELD RESOURCES LTD.

INTERPRETATION

LILLOOET AREA

BRITISH COLUMBIA

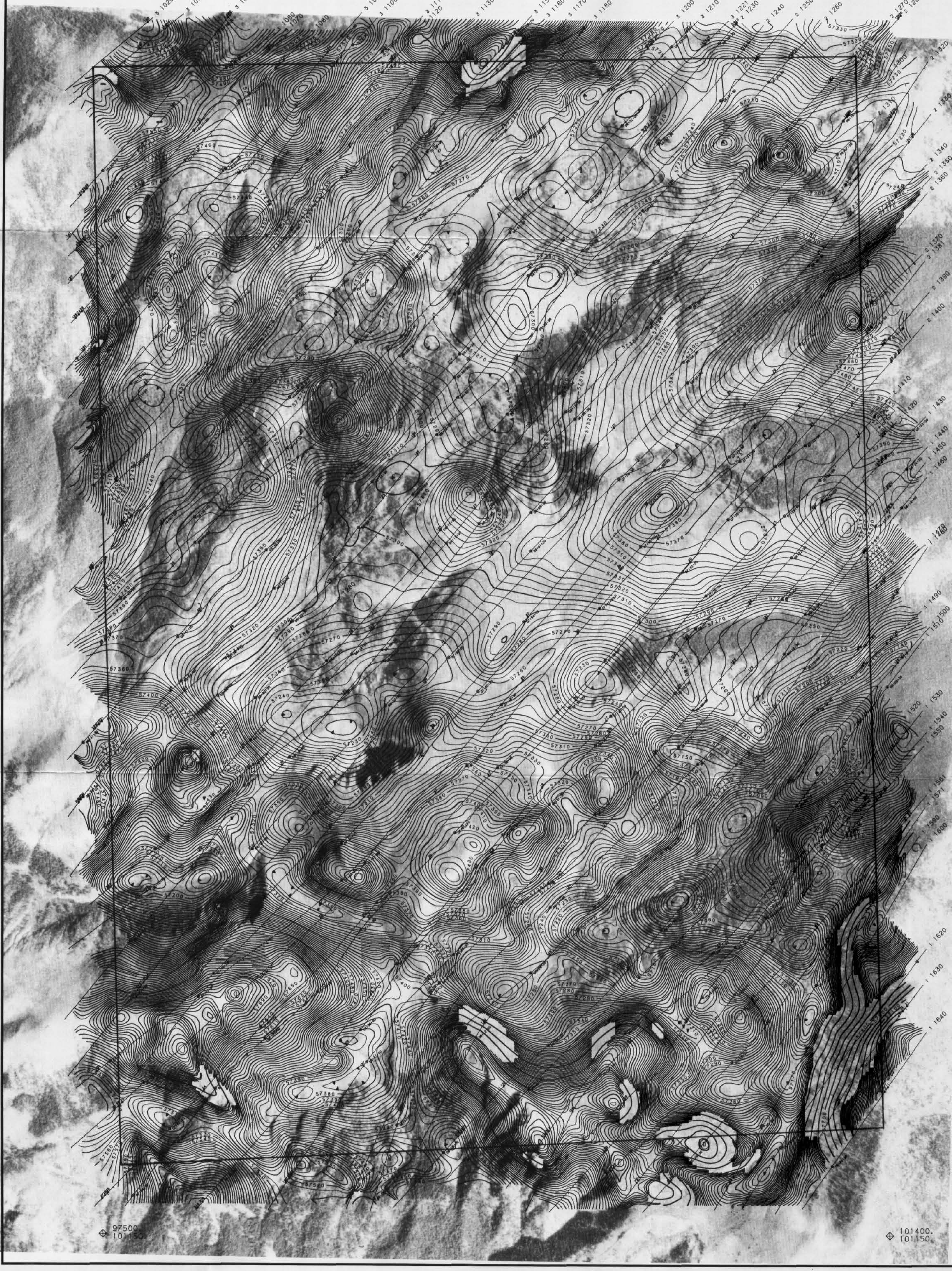
SCALE 1:10,000

0 330 660 1320 1/2 MILE

0 100 200 500 1 KILOMETRE

AERODAT LIMITED

DATE:	JUNE 1987
NTS No:	92 I/12
MAP No:	3 J8738



Magnetics

Cesium high sensitivity magnetometer
Sensor elevation 45m

Total Field Magnetic Intensity
Contours in nT

CONTOUR INTERVAL:

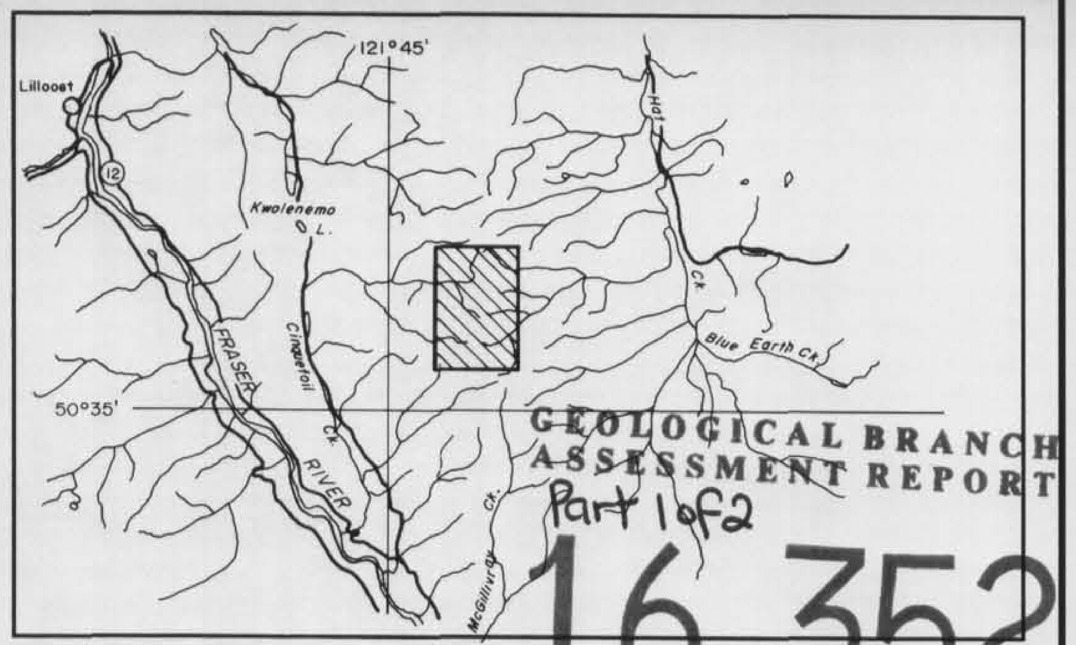
100 nT ....
10 nT ....
5 nT ....

Flight Path

Flight path derived from VHS video tape.

Average terrain clearance 60m
Line spacing = 100m

N



GEOLOGICAL BRANCH
ASSESSMENT REPORT
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KANGELD RESOURCES LTD.

TOTAL FIELD MAGNETIC CONTOURS

LILLOOET AREA

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 1/2 MILE

0 100 200 500 1 KILOMETRE

AERODAT LIMITED	DATE: JUNE 1987
	NTS No: 92 I/12
	MAP No: 4 J8738

Vertical Gradient

Vertical magnetic gradient calculated from the total field magnetic intensity

Contours in nT/m

Cesium high sensitivity magnetometer
Sensor elevation 45m

CONTOUR INTERVAL:

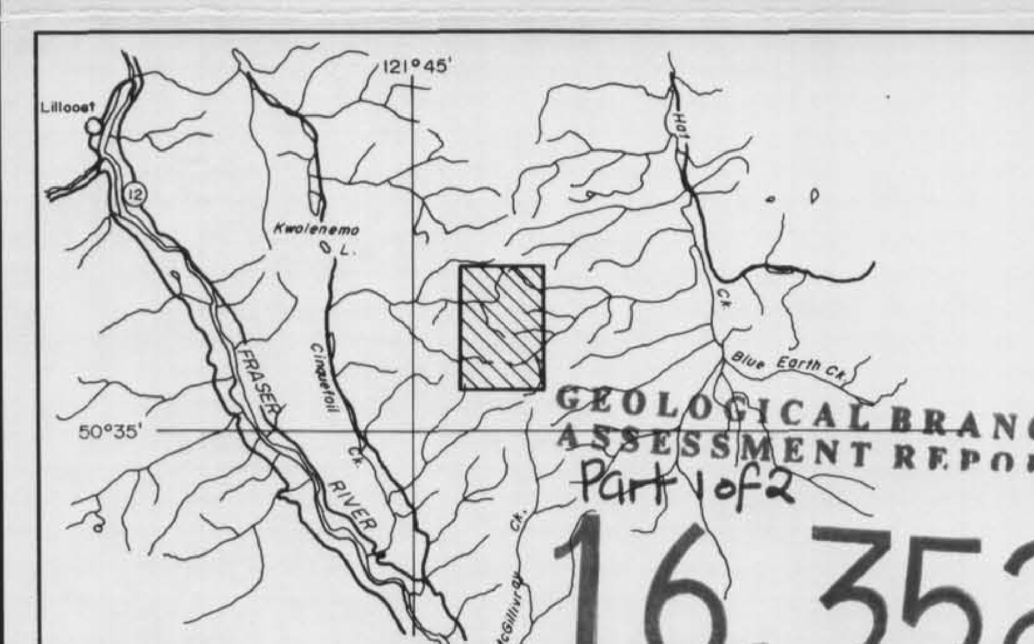
25 nT/m..........
5 nT/m..........
1 nT/m..........

Flight Path

Flight path derived from VHS video tape.

Average terrain clearance 60m
Line spacing = 100m

N



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ASSESSMENT REPORT
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KANGELD RESOURCES LTD.

CALCULATED VERTICAL MAGNETIC GRADIENT

LILLOOET AREA

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 1/2 MILE

0 100 200 500 1 KILOMETRE

AERODAT LIMITED

DATE: JUNE 1987

NTS No: 92 I/12

MAP No: 5 J8738

Apparent Resistivity

Contouring in ohm-m at logarithmic intervals.

Calculated from 4600 Hz coaxial EM response assuming a 200 m conductive layer.
Sensor elevation 30m

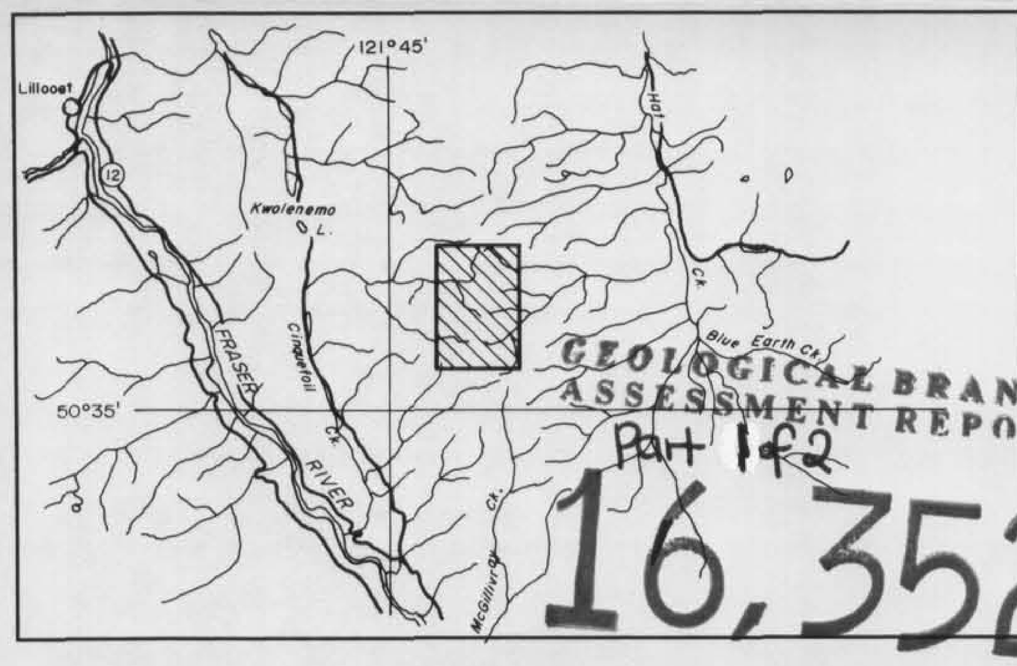
$10^{N.0}$ OHM-M N = 1,2,3, ... 9

$10^{N.M}$ OHM-M M = 1,2,3, ... 9

Flight Path

Flight path derived from VHS video tape.

Average terrain clearance 60m
Line spacing = 100m



GEOLOGICAL BRANCH
ASSESSMENT REPORT
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16,352

KANGELD RESOURCES LTD.

APPARENT RESISTIVITY CONTOURS

LILLOOET AREA

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 1/2 MILE

0 100 200 500 1 KILOMETRE

AERODAT LIMITED

DATE: JUNE 1987

NTS No: 92 I/12

MAP No: 6 J8738

VLF-EM

VLF-EM Total Field Intensity in percent

Station: NLK (Jim Creek, Wash.)
24.8 kHz

Sensor elevation 45m

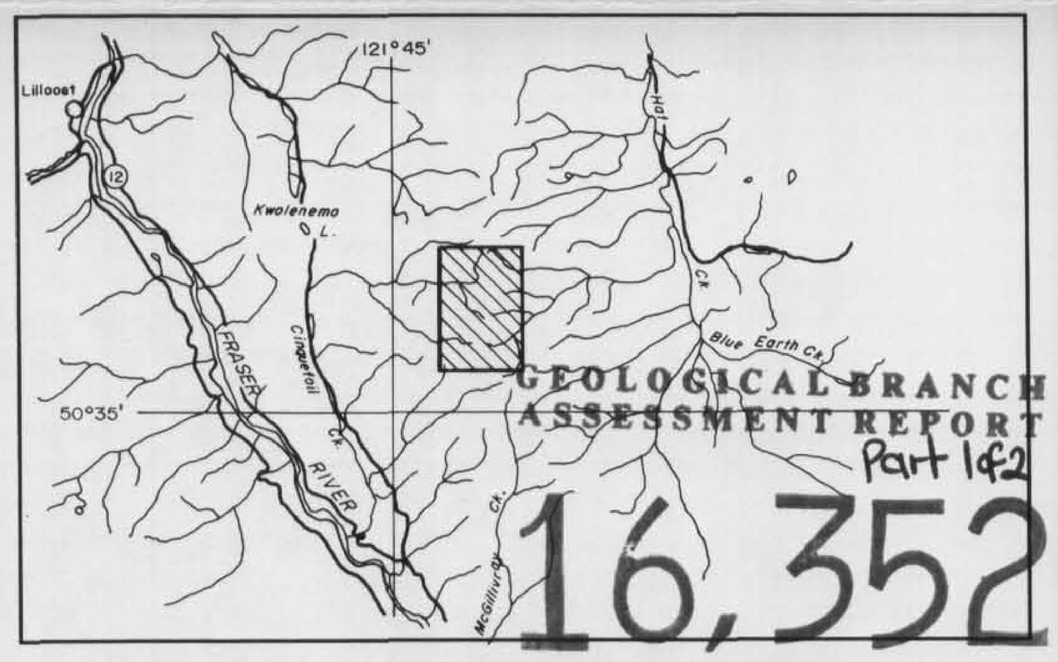
CONTOUR INTERVAL:
50%
10%
2%

Flight Path

Flight path derived from VHS video tape.

Average terrain clearance 60m
Line spacing = 100m

N



GEOLOGICAL BRANCH
ASSESSMENT REPORT
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KANGELD RESOURCES LTD.

VLF-EM TOTAL FIELD CONTOURS

LILLOOET AREA
BRITISH COLUMBIA

SCALE 1:10,000
0 330 660 1320 1/2 MILE
0 100 200 500 1 KILOMETRE

AERODAT LIMITED	
DATE:	JUNE 1987
NTS No:	92 I/12
MAP No:	7 J8738