84-#859 - 12853

GEOPHYSICAL REPORT

ON

AIRBORNE MAGNETIC AND VLF-EM SURVEYS

OVER THE

G.G. CLAIMS

PENROSE CREEK, GUN LAKE AREA

LILLOOET MINING DIVISION

BRITISH COLUMBIA

PROPERTY	: 5 km due west of the Town of Gold Bridge on immediate west side of Gun Lake
	: 50° 122° NW
	: N.T.S. 92J/15W
WRITTEN FOR	: CHALICE MINING INC. P.O. Box 2240 Sechelt, B.C., V0N 3A0
SURVEYED BY	: COLUMBIA AIRBORNE GEOPHYSICAL SERVICES LTD. #1807-1450 West Georgia Street Vancouver, B.C., V6G 1T8
WRITTEN BY	: David G. Mark, Geophysicis GEOTRONICS SURVEYS LTD. #403-750 West Pender Stree Vancouver, B.C., V6C 2T7
DATED	: September 24, 1984

GEOTRONICS SURVEYS LTD.
Engineering & Mining Geophysicists
VANCOUVER, CANADA

12853

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

SUMMARY

Airborne magnetic and VLF-EM surveys were carried out over the Gold Bridge property owned by Chalice Mining Inc. of Vancouver, B.C. in the month of August, 1984. The claims are located to the immediate west of Gun Lake and immediate north of Downton Lake. Access is easily gained by a two-wheel drive vehicle. The terrain consists of moderate to steep slopes forested with moderately dense coniferous trees. The purpose of the surveys was to aid in the mapping of geology as part of the exploration program in locating probable areas of gold mineralization.

"The G.G. claims are located 13 km from the former gold producing Bralorne and Pioneer Mines. Other smaller former gold producers are located along the northwesterly belt of metamorphosed sedimentary and volcanic rocks. A central structure, along the Cadwallader Creek valley with which the gold bearing quartz fissure veins of the Bralorne Intrusives appear to be associated, is projected northwestward to the Chalice property"

The Veritas vein included in the Chalice property appears to be related to a porphyrite flow (greenstone) with the mineralized veins of up to 1.2 meters wide (four feet) mineralized with erratic sulphide contact. The vein is revealed for 304 meters (1,000 feet) horizontally with a vertical height of 122 meters (400 feet) as indicated from the old workings."

The airborne surveys were flown at about a 50-meter terrain clearance on contour lines with a separation varying from 100 to 200 meters. The instruments used were a Sabre Electronics proton precession magnetometer and a Sabre Electronics VLF-EM receiver. The magnetic data were picked from the strip charts and hand con-

toured. The contours were drawn on a survey plan on which the VLF-EM anomalies were plotted as well.

CONCLUSIONS

1. The airborne magnetic survey has mapped bodies of serpentine as well as intrusive of diorite and greenstone.

2. The survey also appears to have mapped sediments of both the Fergusson Group and the Hurley Group.

3. Both the VLF-EM and magnetic surveys revealed lineations within the survey area that are likely caused by fault, shear and/or contact zones. These can be important indicators of sulphide and native gold mineralization especially where the lineations cross.

4. There are also some strong VLF-EM single-line conductors that are possibly caused by gold and/or sulphide mineralization. One interesting anomaly correlates with the upper reaches of Penrose Creek.

RECOMMENDATIONS

These are as follows:

1. Thorough prospecting and/or geological mapping in addition to

what so far has been carried out. This will also greatly aid in the interpretation of any geophysics and geochemistry that have been or may be carried out, especiallythe airborne magnetic survey.

2. Soil geochemistry sampling. The total sample picked up should be pulverized and not screened in order to preclude the screening out of coarser gold. (The writer considers porphyrite gold occurring on the Doyle Claims to be a good possibility). It may be cost-efficient to contour sample rather than on a grid.

3. Ground VLF-EM and magnetic surveys as well as possibly low-frequency EM in selected areas (such as MaxMin II EM system). The VLF-EM method has proven to be very useful in this area for discovering gold mineralization, especially together with soil sampling. An induced polarization-resistivity survey should be considered since it may well prove to be one of the best tools available for this area.

4. Trenching and diamond drilling of promising targets resulting from the above work.

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INTRODUCTION AND GENERAL REMARKS

This report discusses the survey procedure, compilation of data and the interpretation of low-level airborne magnetic and VLF-EM surveys carried out over the G.G. claims near Gun Lake on August 19th, 1984. The surveys were carried out by Lloyd Brewer, instrument operator and project manager, and Caun O'Neill, navigator, both of whom are of Columbia Airborne Geophysical Services Ltd. A total of 145.6 line km of airborne surveys were done over the property and surrounding area.

The object of the two surveys was to aid in the geological mapping of lithology and structure for the purpose of exploration of the type of gold mineralization as is found in the Gold Bridge and Bralorne area. Magnetic surveys have especially been proven to be a good geological mapping tool.

PROPERTY AND OWNERSHIP

The property consists of six contiguous claims totalling 62 units as shown on Map 2 and as described below:

Claim Name	# Units	Record #	Expiry Date
G.G. #1	12	2605(8)	August 23, 1984
G.G. West	12	2245(10)	October 25, 1984
G.G. West #1	18	2184(10)	October 25, 1984
G.G. North	18	2185(10)	October 25, 1984
G.G. Fraction	1	2186(10)	October 25, 1984
Reverted Crown Grant			
Veritas #1	1	2358(1)	January 24, 1985

The expiry dates shown does not take into account the surveys under discussion as being accepted for assessment credits.

The six claims are owned by Chalice Mining Inc. of Vancouver, British Columbia.

LOCATION AND ACCESS

The property is located on the southeastern slope of Mount Penrose and abuts the western edges of Gun Lake and Lajoie Lake as well as the northern edge of Downton Lake.

The geographical coordinates are 50°52'N latitude and 122°56'W longitude.

Access can be gained by a series of 2-wheel drive roads from Gold Bridge which runs westerly towards and around Gun Lake. The distance from Gold Bridge to the property is about 6 km.

PHYSIOGRAPHY

The property lies at the southeastern part of the Pacific Ranges which is a physiographic division of the Coast Mountains. The terrain is, in general, steep and mountainous with the general slope facing towards the south and southeast. The claims are dissected by the southeasterly-draining Penrose Creek.

Elevations vary from 762 m a.s.l. at the southwestern corner of the property close to the edge of Downton Lake, to 2,627 m a.sl. at the northwestern edge of the property on Mount Penrose.

The main water sources would be Penrose Creek as well as Downton Lake, Gun Lake and Lajoie Lake.

The forest cover consists primarily of fir and spruce, moderate in density and with an undergrowth light to moderate.

HISTORY OF PREVIOUS WORK

The following is quoted from Sookochoff's September, 1983 report on the property:

"The history of the area is centered around the Bralorne and the Pioneer Mines where lode gold production was carried on from the early 1900's.

"The Bralorne and Pioneer situated on Cadwallader Creek within 13 km southwest of the Chalice property, in addition to other significant former properties such as the Ben d'Or and the Wayside are located within a mineralized belt on the western flank of the Ben d'Or Mountains.

"During the early 1900's, production initially utilizing arrastras was carried out at these properties with the Bralorne producing to 1972 when shut down for economic reasons.

"The history of the Chalice property stems from the Veritas crown grant where former exploration included a 'tunnel 225 feet long and several open cuts' on a vein cutting an augite-diorite and serpentine. A total of a 'thousand feet' of underground work in three tunnels is reported.

"Preliminary geophysical and geochemical surveys were carried out by Chalice personnel in 1979 with a diamond drill hole put down on an anomalous zone.

"In 1982 trenching by Chalice personnel was completed at the southwest corner of the Gwendolyn's Glory claim."

GEOLOGY

The following is also quoted from Sookochoff's same report:

"In the area of the Chalice property, Triassic sedimentary and volcanic rocks including variable metamorphosed units are intruded by three or more intrusive episodes including an ultrabasic or intrusive. Generally, the Triassic formations include the middle Triassic Fergusson group of cherts to limestone in addition to biotite schists, the younger Noel Formation, Pioneer Formation and the Youngest Hurly Formation which in addition to fine grained and sedimentary rocks, include conglomerate, agglomerates and andesites.

"The individual formations are exposed to a greater irregularity towards the central Cadwallader Creek extending northwesterly to Mt. Penrose west of Gun Lake. The band is generally enveloped by diorite to syenodiorite intrusives with localized ultrabasic and augite diorite. Bralorne intrusive plugs and northwesterly stretched stocks are associated with the central formations.

"The major aerial structural feature is a broad northwesterly trending and plunging anticlinal arch centered east of Cadwallader Creek in the Ben d'Or range of mountains. The western limb in which the principal ore deposits of the area occur, extends into the Cadwallader Creek valley, which reflects a major structure. The major structure results in secondary and minor folds which resulted in complex distortion of the formations in addition to providing a locus for the ultrabasic and gold associated Bralorne intrusives. The lenticular intrusives extend to the Chalice property area where topographical structural features are not as obvious as along the Cadwallader Creek valley.

"The gold bearing quartz fissure veins of the Bralorne intrusives and more specifically, the veins in the Bralorne and Pioneer Mines are conspicuous for the exhibited ribboning effect where quartz ribbons are 'separated by thin, dark-grey films of ground-up sulphides, serecite, white mica and gouge and occasional slickensided free gold'.

"The vein fissures extending from the augite diorite are persistent into the Pioneer greenstone with weaker indications in thinly bedded sediments and 'feathering out' in serpentine.

"Associated indicator minerals that are found in the Bralorne-Pioneer veins and can reflect gold mineralization are mariposite, scheelite, arsenopyrite, sphalerite and galena. Other metallic

minerals include pyrite, chalcopyrite, stibnite, tetrahedrite, marcasite and sylvanite(?) or calaverite(?).

"On the Gun Lake road west of the southwest corner of the property, a reported sequence of mixed sandstone, siltstone and carbonate rich conglomerate with minor thin rhyolite/dacite volcanic members trending NW and dipping SW occur."

"On the Chalice property the Veritas vein is described as a vein trending at 120° with a dip varying from 64° NE to vertical. The vein formed along a fracture system in altered volcanics (greenstone) which is locally intruded by a Bralorne-like-micro-diorite pluton. The micro-diorite is serpentized near the contact. Quartz veins are irregular lenses in NW trending shears. The outcrop and workings reveal 1,000 feet of vein zone with a vertical height of 400 feet (old workings). Veins are of milky white quartz 'three inches to four feet' wide with erratic suphide content. The vein appears to be cut off by a micro-diorite pluton.

"On Penrose Creek along the western boundary of the property the geology is reported as altered volcanics and serpentines occurring as large inclusions (pendants) within micro-diorite. Calcite, ankerite and quartz stockworks occur in the serpentine with pyrite, chalcopyrite and arsenopyrite. Carbonate quartz veins also occur within becciated green volcanics of a serpentine lens."

INSTRUMENTATION AND THEORY

a) Magnetic Survey

The magnetic data are detected using a nuclear free precession proton magnetometer, manufactured by Sabre Electronic Instruments

Ltd. of Burnaby, B.C. The magnetometer measures the total count of the earth's magnetic field intensity with a sensitivity of one gamma. The data are recorded on magnetic tape and 12 cm analog strip chart.

The magnetic patterns obtained from a regional airborne survey are directly related to the distribution of magnetite in the survey area. However, the geology cannot be deduced from isomagnetic maps by simply assuming that all magnetic highs are underlain by gabbro or ultramafic rocks, and that all magnetic lows are caused by limestone or chert. The problem with such a simplistic approach is that magnetite is not uniformly distributed in any type of rock. Other problems arise from the fact that most geologic terrains have rocks of high susceptibility superimposed on less 'magnetic' rocks, and vice versa. Cultural features such as powerlines, pipelines and railways also complicate matters. So many variables can be involved that it may be impossible to make a strictly accurate analysis of the geology of an area from magnetic data alone. It is preferable to use other information such as geological, photogeological and electromagnetic in combination with magnetic data to obtain a more accurate geological analysis.

b) <u>VLF-EM Survey</u>

A two-frequency omni-directional receiver unit, manufactured by Sabre Electronic Instruments Ltd., of Burnaby, B.C., was used for the VLF-EM survey. The transmitters used are NLK Arlington (Seattle), Washington, operating on 24.8 KHz, and Annapolis, Maryland, transmitting at 19.0 KHz. These signals are used due to their ideal orientation with respect to northwest and east-west geological structures, and their good signal strengths. The measurement taken during the survey is the variation in the horizontal component of the signal strength.

The VLF (Very Low Frequency) method uses powerful radio transmitteres set up in various parts of the world for military communications. These powerful transmitters can induce electric currents in conductive bodies thousands of kilometers away from the radio source. The induced currents set up secondary magnetic fields which can be detected at surface through deviations in the normal VLF field. The VLF method is inexpensive and can be a useful initial tool for mapping structure and prospecting. Successful use of the VLF requires that the strike of the conductor be in the direction of the transmitting station so that the lines of magnetic field from the transmitter cut the conductor. Thus, conductors with northeast to southeast strikes will respond to Annapolis transmissions, while conductors striking north to west will respond to Seattle transmissions.Conductors striking east to northeast may respond to both stations, giving coincident field strength peaks.

The theory of VLF-EM interpretation is quite simple. Conductors are located at field strength maxima. In the Woodfibre area, one may assume that a Seattle field strength peak represents a conductor with a generally northwest trend, and an Annapolis peak will be a conductor with an east-west trend. This, of course, only applies to conductors with clearly linear trends and cannot be assumed for single line anomalies.

It is impossible to determine the quality of conductors with any reliability, using field strength data alone. The question of linearity is in doubt if the conductor does not appear to cross the adjacent flight lines. The relatively high frequency results in a multitude of anomalies from unwanted sources such as swamps, creeks and cultural debris. However, the same characteristic also results in the detection of poor conductors such as faults, shear zones, and rock contacts, making the VLF-EM a powerful mapping tool.

The interpretive technique requires information from magnetic surveys, air photo analyses, and ground traverses to aid in discrimination between important and unwanted anomalies. Even armed with this information the interpreter can easily be misled.

SURVEY PROCEDURE

A two-meter bird was fitted with a magnetometer coil and 2 omni-directional EM receivers and towed beneath the helicopter on a 10-meter cable. The terrain clearance for the bird was 50 m.

The surveys were contour-flown at a line spacing varying from 100 to 200 m. Navigation was visual, using 1:50,000 scale maps blown up to 1:10,000.

The aircraft used to conduct this survey was a Bell Jet Ranger helicopter. Airspeed was a constant 60 kph so that creek valleys and canyons were penetrated thoroughly. The slow airspeed provided safety, detailed coverage of boxed-in areas, and consistency of data retrieval, which is critical in rugged terrain.

The number of line km flown covering the area as shown on Map 3 is 145.6.

The project supervisor, Mr. Brewer, has over 4 years of experience in conducting aerial magnetic and electromagnetic surveys from fixed-and rotary-wing aircraft, under all types of terrain conditions.

DATA REDUCTION AND COMPILATION

The observant magnetic total field was recorded on analogue strip

charts. These were played-back together with audio recordings containing fiducial markers, and the fiducial markers were transferred to the strip charts. The fiducial markers were identified with topographic features along the flight lines.

The magnetic data were taken from the strip charts and plotted. It was then contoured at a 100-gamma interval onto Map 3 at a scale of 1:10,000 (1cm = 100 m).

The VLF-EM anomalies were taken from the strip charts and plotted on Map 3 with the magnetic contours. For each anomaly, a heavy line along the flight line was drawn showing its half-width. An 'S' or an 'A' designated the anomaly as being from the Seattle transmitter or the Annapolis transmitter.

A question mark on the anomaly indicates that it could be caused by terrain. The survey area was somewhat rugged causing numerous VLF-EM anomalous responses most of which was easily sorted out as being caused by terrain. However, some were difficult to sort out and they were therefore plotted with a question mark.

Strong anomalies were plotted with exclamation marks, and anomalies without any marks indicate average responses. Other symbols are explained on the sheets.

DISCUSSION OF RESULTS

The obvious feature of the magnetic survey is the very strong magnetic high within the center of the survey area. With the magnetic background for the survey area being about 700 to 800 gammas, the magnetic high reaches an amplitude of close to 3,000 gammas. As can be seen on Map 4, the high has a very obvious her-

ring-bone effect to its contours. This is produced by the severe wind problems mentioned earlier in the report. For this high, the shape of the causative source has been sketched in averaging the herring-bone effect.

The high correlates directly with mapped bodies of serpentine. However, the shape of the serpentine is different from that mapped by the magnetic survey.

This may mean that the serpentine is much larger and wider below the surface.

Throughout the rest of the survey area occurs numerous highs, some of them thumbprint in shape and size. Some of these correlate directly with known bodies of serpentine as well as diorite or greenstone intrusives. It therefore can be concluded that any highs within the survey area are very likely reflecting these rock types with the higher-amplitude anomalies likely reflecting serpentine.

Northeast of the main magnetic high, the magnetic field is relatively quiet. This is a reflection of the underlying Fergusson Group which is composed of undifferentiated sedimentary and volcanic rocks. The moderately large magnetic low occurring east of the magnetic high and on the central eastern edge of the survey area could be reflecting sedimentary rocks of this group.

Southwest of the same high the magnetic field is a little noisier. This area is underlain by volcanics of the Pioneer Formation. Also sedimentary rocks of the Hurly Group occurs to the west of the Pioneer rocks. A contact between sedimentary and volcanic rocks should be able to be mapped by a magnetic survey, but the contact area on this property is made more complex by intru-

sions of serpentine. However, the southwest part of the survey area is magnetically quiet and low in amplitude. This is likely a reflection of the Hurley sediments.

On the northeastern edge of the survey area, the magnetic survey has mapped the westerly striking contact between the Fergusson Group and the acid intrusives (quartz diorite, granodiorite) with the 1,000-gammas contour,

The major cause of VLF-EM anomalies, as a rule, are geologic structure such as fault, shear and breccia zones. It is therefore logical to interpret VLF-EM anomalies to likely be caused by these structural zones. Of course, sulphides may also be a causative source. But in the writer's experience, when VLF-EM anomalies correlate with sulphide mineralization, the anomalies are usually reflecting the structure associated with the mineralization rather than the mineralization itself.

There is some variation in intensity from one VLF-EM anomaly to the next. This is not only due to the conductivity of a causative source, but also the direction it strikes relative to the direction to the transmitter. In other words, those conductors lying close to the same direction as the direction to the transmitter can be picked up easier than those that are lying at a greater angle. Depending upon its conductivity, a conductor may not be picked up at all if it is at too great an angle.

Lineal trends considered to be indicative of geological structure have been drawn on Map 3 taking into account:

a) Magnetic lows which are often caused by the magnetite within the rocks being altered by geological structure processes.

b) VLF-EM anomalies which more often than not are reflecting structure.

c) Topographic depressions such as creek valleys which are usually caused by structure.

Several lineations that are indicative of faults have been mapped across the property striking in virtually all directions. The lineations cross each other on the property in different areas. Structure is often important for the emplacement of mineralizing fluids especially where lineations intersect. Thus these areas may have greater exploration interest.

There are also some strong EM conductors occurring on the Chalice property that could well be related to mineralization. These stronger conductors are marked on Map 3.

Respectfully submitted,
GEOTRONICS SURVEYS LTD.

David G. Mark,
Geophysicist

September 24, 1984

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GEOPHYSICIST'S CERTIFICATE

I, DAVID G. MARK, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

That I am a Consulting Geophysicist of Geotronics Surveys Ltd., with offices located at #403-750 West Pender Street, Vancouver, British Columbia.

I further certify:

1. That I am a graduate of the University of British Columbia (1968) and hold a B.Sc. degree in Geophysics.

2. I have been practising my profession for the past 16 years and have been active in the mining industry for the past 19 years.

3. That I am an active member of the Society of Exploration Geophysicists and a member of the European Association for Exploration Geophysicists.

4. This report is compiled from data obtained from airborne magnetic and VLF-EM surveys carried out by Columbia Airborne Geophysical Services Ltd., under the supervision of Lloyd Brewer on August 19, 1984.

5. I have no direct or indirect interest in any of the Claims mentioned within this report, nor in Chalice Mining Inc., nor do I expect to receive any interest as a result of writing this report.

David G. Mark
Geophysicist

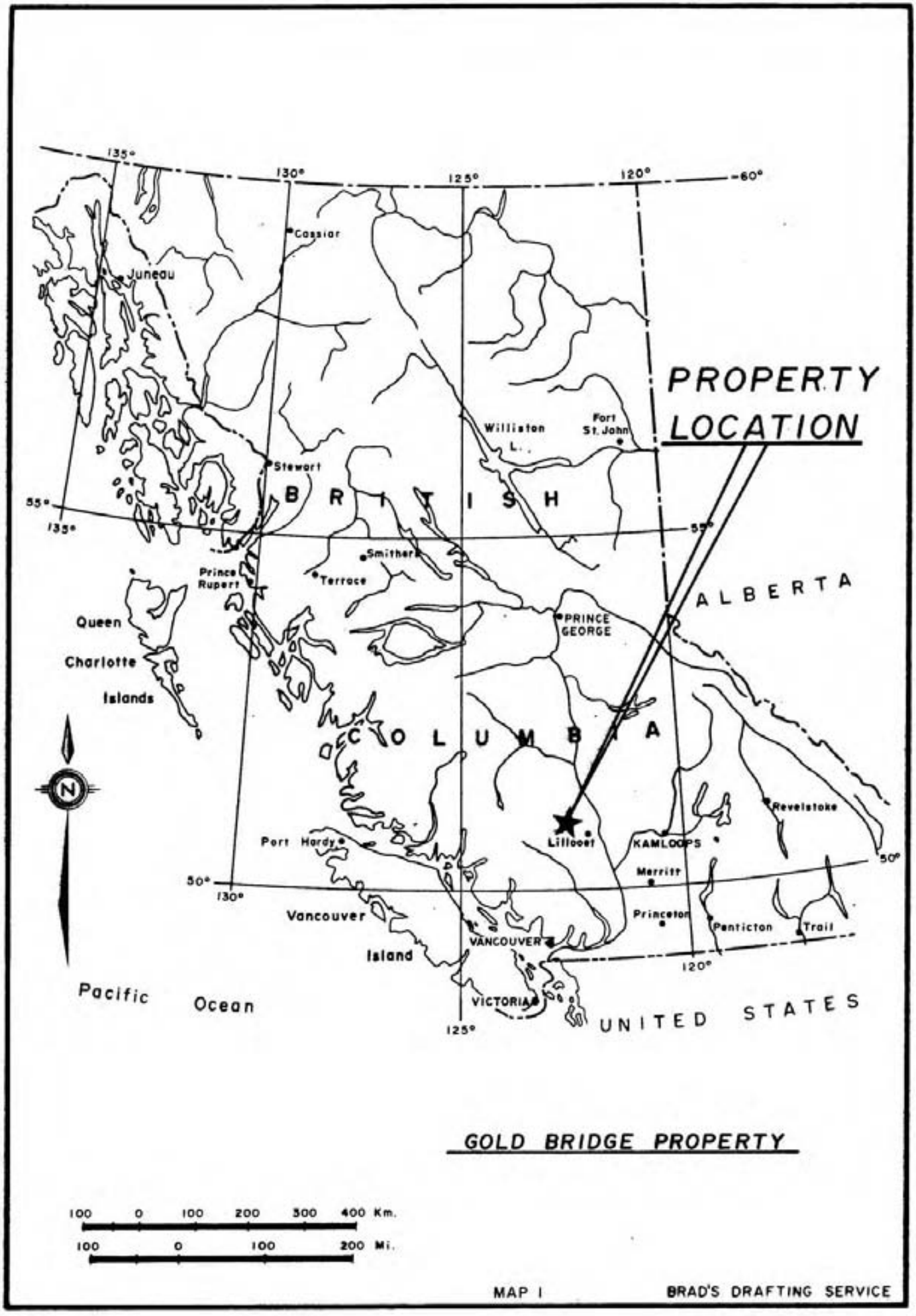
September 24, 1984

AFFIDAVIT OF COSTS

I, Lloyd Brewer, president of Columbia Airborne Geophysical Services Ltd., certify that the airborne magnetic and VLF-EM surveys were flown on August 19, 1984, and that they were flown at an all inclusive cost of $100.00 per kilometers for 145.6 km for a total of $14,560.00

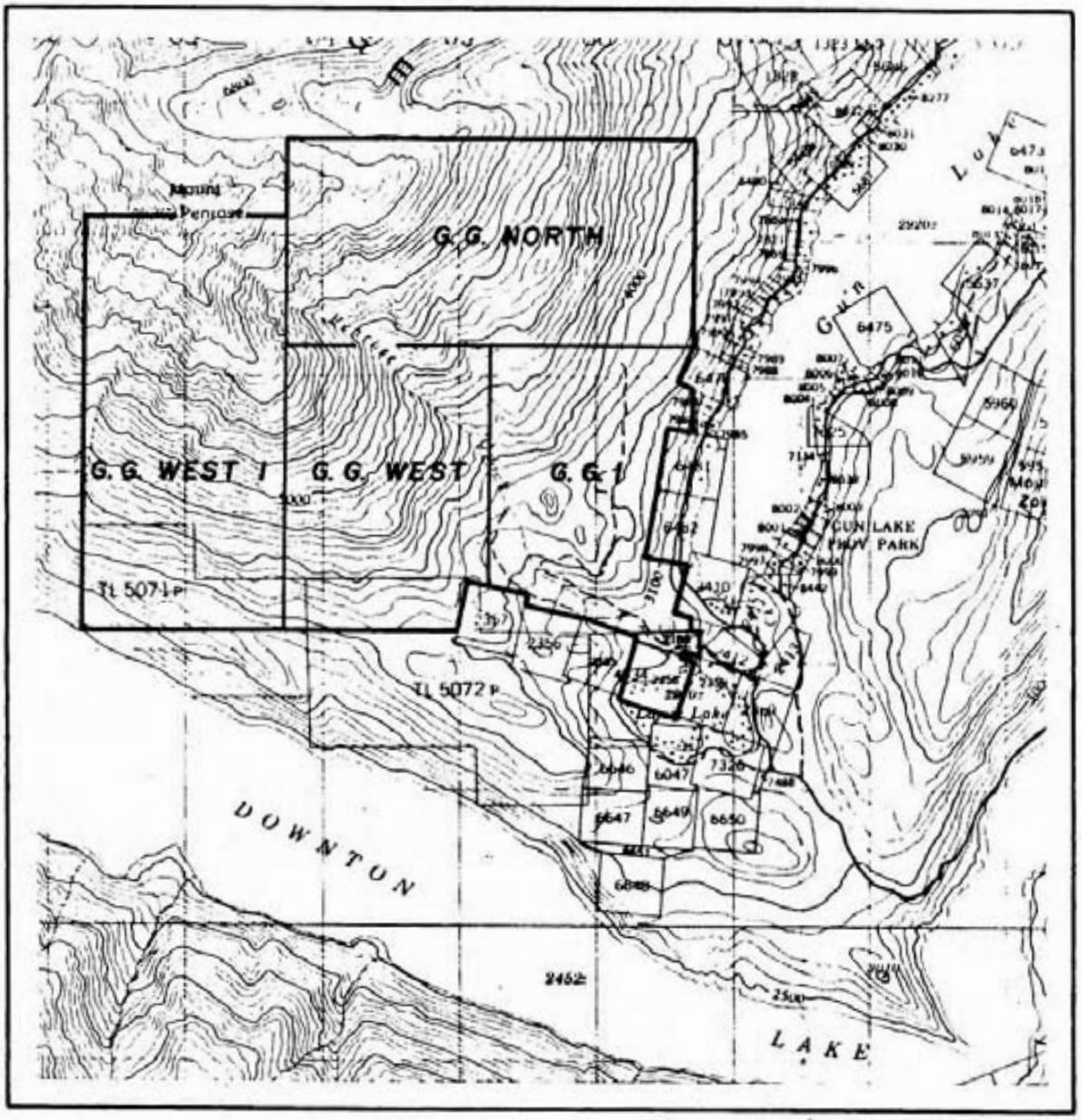
Lloyd Brewer

September 24, 1984


PROPERTY LOCATION
135°
130°
125°
120°
60°
Cassiar
Juneau
Williston L.
Fort St. John
Stewart
55°
BRITISH
COLUMBIA
ALBERTA
Smithers
Prince Rupert
Terrace
PRINCE GEORGE
Queen Charlotte Islands
N
Revelstoke
Port Hardy
Lillooet
KAMLOOPS
50°
Merritt
Vancouver Island
Princeton
Penticton
Trail
VANCOUVER
VICTORIA
Pacific Ocean
UNITED STATES
GOLD BRIDGE PROPERTY
100 0 100 200 300 400 Km.
100 0 100 200 Mi.
MAP 1
BRAD'S DRAFTING SERVICE

122°56'

50° 52'



CHALICE MINING INC.

GOLD BRIDGE PROPERTY

PENROSE CREEK, GUN LAKE AREA, B. C.

LILLOOET M.D.

CLAIM LOCATION MAP

SCALE:	DATE:	MAP:	N.T.S.
1:50,000	Sept. 84	2	92 J/15 W

122°56'

50° 52'

G.G. NORTH

G. G. WEST

G. G. WEST

G.G. 1

TL 5071 P

TL 5072 P

Lajoie Lake

Downton Lake

Gun Lake

GUN LAKE PROV PARK

LEGEND

- Lineation produced from magnetic and E.M. results suggesting geological structure
- VLF-EM anomaly
- T+ Terrain anomaly with a conductor anomaly superimposed
- ! Strong anomaly
- ? Questionable anomaly
- S "S" denotes Seattle anomaly
- A "A" denotes Annapolis anomaly
- Magnetic depression
- Shore line
- Property boundary
- Claim boundary
- Flightline
- Outline of conductive source of large magnetic high

Annapolis Transmitter 21.4 KHz.

Seattle Transmitter 24.8 KHz.

CONTOUR INTERVAL

100 gamma

500 gamma

Mean terrain clearance: 30 metres

500m 250m 0 1 Km

N.T.S. 92 J/15 W

Survey Carried Out By: COLUMBIA AIRBORNE GEOPHYSICAL SERVICES (1984) LTD.

To Accompany Report By: DAVID G. MARK, Geophysicist.

CHALICE MINING INC.

GOLD BRIDGE PROPERTY

PENROSE CREEK, GUN LAKE AREA, B.C.

LILLOOET M.D.

AIRBORNE SURVEY

MAGNETIC CONTOURS & VLF-EM ANOMALIES

SCALE:	DATE:	MAP:	DRAWN BY:
1:10,000	Sept. 84.	3	B.D.S.