180-#418-# 8457 GEOPHYSICAL-GEOCHEMICAL REPORT

ON

VLF-EM AND SOIL SAMPLE SURVEYS

GOLD BRIDGE PROPERTY

TYAUGHTON LAKE, LILLOOET M.D., B.C.

Property :

:

:

Written for

by:

Dated :

MINERAL RESOURCES BRANCH
SESSMENT REPORT
NO.

9 Km N25E of the town of Gold Bridge at south end of Tyaughton Lake

50° 122° NW

N.T.S. 92J/15

Warstar Resources Inc. 2150 Palliser Avenue, Coquitlam, B.C.

David G. Mark
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June 29th, 1980



GEOTRONICS SURVEYS LTD. Engineering & Mining Geophysicists

VANCOUVER, CANADA



# TABLE OF CONTENTS

SUMMARY	i
CONCLUSIONS	ii
RECOMMENDATIONS	iv
INTRODUCTION AND GENERAL REMARKS	1
PROPERTY AND OWNERSHIP	2
LOCATION AND ACCESS	2
PHYSIOGRAPHY	3
HISTORY OF PREVIOUS WORK	4
GEOLOGY	4
VLF-EM SURVEY	
1. Instrumentation and Theory	5
2. Survey Procedure	6
3. Compilation of Data	7
SOIL GEOCHEMISTRY SURVEY	7
1. Survey Procedure	7
2. Testing Procedure	7
3. Treatment of Data	8
DISCUSSION OF RESULTS	9
1. VLF-EM Survey	9
2. Soil Geochemistry	10
SELECTED BIBLIOGRAPHY	13
GEOPHYSICIST'S CERTIFICATE	14

MAPS - Bound in Report	Figure
LOCATION MAP, 1:50,000	1
CUMULATIVE FREQUENCY GRAPH	2
MAPS - InPocket	Sheet
VLF - EM SURVEY FRASER FILTERED DATA AND CONTOURS 1:5,000	1
SOIL GEOCHEMISTRY SURVEY COPPER DATA AND CONTOURS 1:5,000	2
SOIL GEOCHEMISTRY SURVEY LEAD DATA AND CONTOURS 1:5,000	3
SOIL GEOCHEMISTRY SURVEY ZINC DATA AND CONTOURS 1:5,000	4
SOIL GEOCHEMISTRY SURVEY SILVER DATA AND CONTOURS 1:5,000	5

## SUMMARY

During the month of May, 1980, soil sampling and VLF-EM surveys were carried out on the Golden Sidewalk Claim within the Lillooet Mining Division, British Columbia. The Claim is located 9 km N25E of Gold Bridge at the south end of Tyaughton Lake. Access to much of the property is easily gained by a two-wheel drive vehicle. The terrain consists of mainly moderate slopes forested with moderately spaced coniferous trees and undergrowth. The purpose of the surveys was to extend the known zones of sulphide mineralization as well as locate new zones.

Previous work on the property consists of several trenches and adits as well as diamond drilling, much of which was done prior to its staking.

The property is mainly underlain by Ferguson Group andesitic and basaltic volcanics, cherts, argillites and limestones of Triassic or older age. Mineralization on the Gold Belt claims consists of arsenopyrite, pyrite and stibnite with gold and silver values within quartz-calcite within a north-

easterly striking shear. On the Golden Sildewalk Claim, a northeast-striking fissure vein consists of quartz, calcite, and ankerite mineralized with erratic depositions of sphalerite, pyrite and galena with gold-silver values.

The VLF-EM readings and the soil samples were taken every 33 meters on 100-meter separated east-west lines. The VLF-EM readings were Fraser-filtered, plotted and contoured. The soil samples were tested for lead, zinc, silver and copper and the results statistically analyzed, plotted and contoured.

## CONCLUSIONS

The VLF-EM anomalies probably have reflected mainly faults and possibly lithologic contacts. Many of these are related to soil anomalies.

Some of the most interesting parts of the VLF-EM anomalies are those that appear to indicate cross-structure since these would be prime areas to look for sulphide mineralization.

The anomalous soil results occur west of the baseline and north of Line 24S.

- The mode of the causitive sources appears to be parallel and sub-parallel fissure veins and/or shear zones as indicated by the shape of the anomalies as well as the correlation with the VLF-EM results.

  The mineralization is likely lead and zinc sulphides with silver values, and some copper sulphides.
- 4. The most promising anomalous zone, by far, is that labelled A which occurs in the northwest corner of the property. The zone is quite extensive being 800 m long, 800 m wide and open to the northwest. It probably is caused by several sources as explained, above. The anomalous values of each of the metals have intensities of several standard deviations.
- Anomalous zones B and E are also of considerable exploration interest though these zones are somewhat smaller. Zones A, B and E could well be related.

### RECOMMENDATIONS

The results of the VLF-EM and soil geochemistry surveys are very encouraging and certainly warrant the continuation of the exploration program as recommended by Mr. Elwell, P.Eng.

The next stage recommended is a Max-Min EM survey which will help to delineate the causitive sources somewhat better and should result in more precise diamond drill targets.

If the Max-Min EM survey does not work that well, then IP survey testing should be carried out for the same purpose.

GEOPHYSICAL-GEOCHEMICAL REPORT

on

VLF-EM AND SOIL SAMPLE SURVEYS

GOLD BRIDGE PROPERTY

TYAUGHTON LAKE, LILLOOET M.D., B.C.

## INTRODUCTION AND GENERAL REMARKS

This report discusses the survey procedure, compilation of data, and the interpretation of a soil sampling survey and a very low frequency electromagnetic (VLF-EM) survey carried out on the Bridge River Property of Warstar Resources Inc. over the month of May, 1980.

The surveys were done under the supervision of Wally McClelland, a director of Warstar, and the resulting data brought to the writer for interpretation and a report.

A total of 1,042 soil samples were picked up and 47.4 line km of VLF-EM were done. The samples were tested for copper, lead, zinc and silver.

The primary purpose of the VLF-EM and soil geochemistry surveys was to extend the known zones of sulphide mineralization found on the property as well as to locate new ones. A secondary

object of the VLF-EM survey was to delineate faults and/or shear zones that may be related to the deposition of sulphides on the property.

# PROPERTY AND OWNERSHIP

The property consists of 5 claims and 1 mineral lease all contiguous one with the other, as described below and as shown on Figure 1.

Claim Name	No. Units	Record No.	Anniversary Date
Golden Sidewalk	20	660	August 28th
Gold Belt 1-4	4	649 - 652	August 8th
Mineral Lease 16	4 (equiv)	653 - 656	August 8th
(formerly Alpha Extension 1-4 mine	ral claims)		

The claims are wholly owned by Warstar Resources Inc.

# LOCATION AND ACCESS

The Golden Sidewalk Claim is located to the immediate south and east of the south end of Tyaughton Lake, and about 9 km N25E of the town of Bridge River, within the Lillooet Mining Division, British Columbia. The Gold Belt claims and Mineral Lease 16 are found over Mowson Pond and adjoin the southeast corner of the Golden Sidewalk Claim as well as the north shore of Carpenter Lake.

The geographical coordinates are  $50^{\circ}$  55'N latitude and  $122^{\circ}$  45'W longitude.

Access is quite good and can be gained by a two-wheel drive vehicle. One travels west from Lillooet on the Bridge River

road for 96 km. From this point several logging roads cross the property as shown on Figure 1 and on Sheets 1 to 5.

## PHYSIOGRAPHY

The property is found along the southwestern edge of the Chilcotin Range, a non-granitic subdivision of the Pacific Ranges, which is a physiographic unit of the Coast Mountains. Typical of these ranges, the topography of the general region in the property area is mountainous with steep and precipitous slopes, and elevations reaching 2,400 to 2,800 m a.s.l.

However, the property itself occurs for the most part in the Carpenter Lake valley. The terrain is therefore fairly flat to moderate with the elevation ranging only 520 m from a low of 650 m at Carpenter Lake to a high of 1170 m at the north central edge of the Golden Sidewalk Claim. The surveys were done only on the Golden Sidewalk Claim and its elevation ranges less than 400 m.

The main water sources on the property are: Carpenter Lake at the southeast edge of the Gold Belt claims; Mowson Pond within the Alpha Extension claims; Pearson Pond at the south central edge of the Golden Sidewalk claim; Tyaughton Lake at the northwestern corner of the Golden Sidewalk claim; and a southerly flowing creek within the center of the Golden Sidewalk claim.

Vegetation is primarily fir and spruce, moderate in density, with light to moderate undergrowth.

## HISTORY OF PREVIOUS WORK

The following is quoted from J. P. Elwell's engineering report on the property.

"The history of the Gold Belt claims which cover the old Dauntless prospect, dates from around 1935 when the present adit was started by the Reward Mining Co. Ltd. Since this time the ground has been held by a number of companies, including San Doh Mines Ltd, which carried out some bulldozer trenching and diamond drilling in 1965. Later it was staked by Rainbow Lake Explorations Ltd., and in 1974 by Ashcroft Resources Ltd. which company carried out further sampling and diamond drilling in 1975, this work being examined by the writer and covered by a report dated November 19th, 1975. (The results of this work are discussed in a later section).

"The Golden Sidewalk Claim covers the property of the Peerless Gold Mines Ltd., and a description of the workings, consisting of two adits, an inclined shaft, and some trenches is contained in the B.C. Minister of Mines Report for 1937.

"In 1974 the property was re-staked as the Zinc claims by Thunder Creek Mines Ltd., and a report was prepared by Charles A.R. Lammle, P. Eng., dated December 1974. No work was reported and the claims lapsed, the area being re-staked by P. Polishuk for Dawson Logging and Construction in 1978 which company has carried out a program of line cutting and some bulldozer trenching."

## GEOLOGY

The following is also quoted from Elwell's report:

"Both the Golden Sidewalk and Gold Belt claims are underlain by the Ferguson Group of andesitic and basaltic volcanics, cherts, argillites and limestones, which are believed to be of Triassic or older age. Locally, these rocks have been intruded by serpentenized ultrabasic rocks and Cretaceous or Tertiary feldspar porphyries. The Ferguson rocks are highly contorted and altered, and are cut by strong faults, some of which are filled with quartz-calcite veins carrying both sulphide mineralization as well as variable gold and silver values.

On the Gold Belt claims (Dauntless property) the structure of economic interest is a strong shear zone striking at about 55° with a dip of about 80° to the northwest. The shear is mineralized with quartz-calcite carrying arsenopyrite, pyrite and stibnite with variable gold and silver values. A 246 foot adit driven over the shear to the southwest indicates a vein width of 6 to 10 feet tending to pinch to the southwest.

"The Golden Sidewalk claim which covers the old Peerless property on which an old adit and some trenching has partially developed a north-east trending mineralized fissure vein containing erratic depositions of sphalerite, pyrite and galena with gold-silver values associated with a vein material of quartz, calcite and ankerite. Other mineral showings are reported, but have not been confirmed."

### VLF-EM SURVEY

# Instrumentation and Theory:

A VLF-EM Receiver, Model EM-16, manufactured by Geonics Ltd. of Toronto, Ontario, was used for the survey. This instrument is designed to measure the magnetic component of a very low frequency (VLF) electromagnetic field. The U.S. Navy submarine transmitter located at Seattle, Washington and transmitting at 18.6 KHz, was used.

In all electromagnetic prospecting, a transmitter produces an alternating magnetic field (primary) by a strong alternating current usually through a coil of wire. If a conductive mass such as a sulphide body is within this magnetic field, a secondary alternating current is induced within it which in turn induces a secondary magnetic field that distorts the primary magnetic field. It is this distortion that the EM receiver measures. The VLF-EM uses a frequency range from 16 to 24 KHz. whereas most EM instruments use frequencies ranging from a few hundred to a few thousand Hz. Because of its relatively high frequency, the VLF-EM can pick up bodies of a much lower conductivity and therefore is more susceptible to clay beds, electrolyte-filling fault or shear zones and porous horizons, graphite, carbonaceous sediments, lithological contacts as well as sulphide bodies of too low a conductivity for other EM methods to pick up.

Consequently, the VLF-EM has additional uses in mapping structure and in picking up sulphide bodies of too low a conductivity for conventional EM methods and too small for induced polarization (in places it can be used instead of IP). However, its susceptibility to lower conductive bodies results in a number of anomalies, many of them difficult to explain and, thus, VLF-EM preferably should not be interpreted without a good geological knowledge of the property and/or other geophysical and geochemical surveys.

# 2. Survey Procedure:

The VLF-EM survey was run on a grid in which the lines run east-west at 100-meter intervals from a baseline running due north. Dip angle readings were taken every 33 meters with the instrument facing towards the transmitter at Seattle.

## 3. Compilation of Data:

The readings were reduced by applying the Fraser Filter. Filtered data, as shown on Sheet 1, are plotted between the reading stations. The positive filtered values were contoured at intervals of  $5^{\circ}$  starting at  $5^{\circ}$ .

The Fraser Filter is essentially a 4-point difference operator which transforms zero crossings into peaks, and a low pass smoothing operator which reduces the inherent high frequency noise in the data. Therefore, the noisy, non-contourable data are transformed into less noisy, contourable data. Another advantage of this filter is that a conductor that does not show up as a cross-over on the unfiltered data quite often will show up on the filtered data.

## SOIL GEOCHEMISTRY SURVEY

## 1. Survey Procedure:

The soil samples were picked up at the 33-meter stations. The samples were picked up with a D-handled shovel at about a 15-centimeter depth. The horizon sampled was B except where it could not be obtained, then horizon C was sampled. Samples were placed in brown wet-strength paper bags with grid co-ordinates marked thereon.

# 2. Testing Procedure:

All samples were tested by Acme Analytical Laboratories Ltd. of Burnaby, B.C. The sample is first thoroughly dried and then sifted through a -80 mesh screen. A measured amount of the sifted material is then put into a test tube with subsequent measured additions of aqua regia. This mixture is next heated for a certain length of time. The parts per million (ppm) copper, lead, zinc or silver is then measured by atomic absorption.

## 3. Treatment of Data:

The values in ppm of each metal were grouped into logarithmic intervals of 0.10 (0.15 for silver). The cumulative frequency for each interval was then calculated and then plotted against the correlating interval to obtain the logarithmic cumulative frequency graphs as shown on Figure 3.

Each graph shows a break at the 12 to 16% level which, therefore indicates that there is an excess of high values for each metal on the Warstar property. This is usually the case where sulphide mineralization occurs.

The mean background value for each metal is taken at the 50% level. The sub-anomalous threshold value, (a term used by the writer to denote the minimum value that is not considered anomalous but still important as an indicator of mineralization) is taken at one standard deviation from the mean background, value which is at the 16% level. The anomalous threshold value is two standard deviations away at the 2½% level.

The statistical parameters for each metal in parts per million (ppm) are as follows:

	Copper	Lead	Zinc	Silver
Mean background value	34	16	78	0.25
Sub-anomalous threshold value	54	27	120	0.45
Anomalous threshold value	84	42	190	0.79

The copper, lead, zinc and silver values were plotted on Sheets 2, 3, 4 and 5 respectively, and contoured at an interval of one standard deviation starting at the sub-anomalous contour. This contour was dashed in and the anomalous contours were drawn in solid.

#### DISCUSSION OF RESULTS

## 1. VLF-EM SURVEY

The major cause of VLF-EM anomalies, as a rule are geologic structures 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 causitive source. Most often in British Columbia, however, when VLF-EM anomalies correlate with sulphide mineralization, the anomalies are usually reflecting the structure associated with the mineralization rather than the mineralization itself.

The major trend of the VLF-EM anomalies, as seen on Sheet 1, is north with secondary trends being northeast and northwest. Considering the VLF-EM anomalies are likely reflecting structure, the strike of structure on this property is concluded to be in these directions.

There is considerable variation in intensity from one VLF-EM anomaly to the next. This may not only be due to the conductivity of a causitive source, but also the direction it strikes relative to the direction to the transmitter. In other words, those conductors lying closer to the same direction as the direction to the transmitter (S13E in this case), 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's at too great an angle.

What is immediately obvious from examining the VLF-EM anomalies on Sheet 1 is their complexity. Each anomaly appears to reflect structure striking in several directions. This is favourable for the occurrence of sulphides since mineralization often occurs at or near the intersection of faults, shears, fracture zones, or contacts.

It should be noted, however, that the direction of contouring of some, or parts of some, of the anomalies may be different than is shown. That is, the direction that the writer chose for some of the contouring was rather arbitrary.

For ease of discussion, the anomalies have been labelled by the lower case letters, a to i. This is mainly for the purpose of correlating with the soil geochemistry results.

Three of the anomalies correlate with the trenching as well as the two adits. These are anomalies a, b and d. The middle part of anomaly b correlates with both adits appearing to show a geological connection between them.

### 2. SOIL GEOCHEMISTRY

The soil geochemistry results are very encouraging. Anomalous results of all four metals almost entirely occur west of the baseline and north of line 24S. The southeastern section of the claim is almost devoid of lead, zinc, silver or copper anomalies of any significance.

Anomalous Zone A occurs in the north-western corner of the claim to the southeast of Tyaughton Lake. There is very good to excellent correlation between the lead, zinc and silver anomalous values. The intensity (or strength) of each of these metals anomalies is several standard deviations. The correlation of the copper results is fairly good as well though the copper

anomalies are somewhat more spotty with the intensity being one or two standard deviations. The causitive source of anomalous Zone A, therefore, appears to be primarily lead, zinc, and silver mineralization with some values in copper.

The strike of this zone appears to be about N20W. There is some doubt, however, since lines 15 and 18S as well as the area to the northwest of the anomaly was not soil sampled due to swamp-like conditions. For the same reason, the size of the zone is difficult to ascertain as well. However, it appears that the zone crosses the non-sampled lines of 15 and 18S to as far south as line 24S. If this is the case, the anomalous zone, therefore, is about 800 meters wide and at least 800 meters long being open to the north.

The extensive size of the zone does not necessarily mean that the causitive source is as extensive. Rather the appearance of the zone indicates the anomaly to be caused by several parallel and sub-parallel mineralized shears or veins. This is the mode of occurrence of the mineralization as Elwell describes in other areas of the property.

The correlation of VLF-EM anomalies b and f with anomalous Zone A supports this as well. However, the correlation is not always direct. That is the VLF-EM anomalies sometimes correlate directly with high soil geochemistry values and sometimes adjacent to high values. Soil geochemistry values, however, are sometimes displaced from the causitive source by groundwater drainage.

Anomalous Zone B is somewhat small since it occurs on only one line. However, it is open to the north as well as correlating with an adit and a trench. The causitive source appears to be two or three parallel zones striking in a northerly direction. B consists of an excellent correlation of lead, zinc, silver and copper values with the intensity being several standard deviations. Four small VLF-EM anomalies occur around the zone, but none correlate directly.

Anomaly C is only a two-standard deviation zinc anomaly occurring on the west side of the survey area.

Anomaly D consists of a fairly good correlation of lead, zinc, silver and copper values with VLF-EM anomaly a. The strike of the zone from the VLF-EM anomaly is indicated to be southwest with the anomaly being open in this direction. There has been some trenching done on this anomaly

Anomalous Zone E consists of two parallel anomalies with values in all four metals. The strike is primarily northerly with parts of it also being northeast and northwest. The western anomaly has a similar length and may join anomalous Zone A.

There is fairly good correlation of anomaly E with VLF-EM anomaly b.

Respectfully submitted, GEOTRONICS SURVEYS LTD.,

oavid G. Mark Geophysicist

June 30, 1980

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  Zinc Mineral Claims (Peerless Prospect), December 1974.
- Sullivan, J. P.Eng., <u>Geological Report on the Pond Group of Mineral Claims</u>, March 1965.

## 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 at 403-750 West Pender Street, Vancouver, British Columbia.

# I further certify:

- I am a graduate of the University of British Columbia (1968) and hold a B.Sc., degree in Geophysics.
  - I have been practising my profession for the past twelve years and have been active in the mining industry for the past fifteen years.
  - I am an active member of the Society of Exploration Geophysicists and a member of the European Association of Exploration Geophysicists.
  - This report is compiled from data obtained from VLF-EM and soil sampling surveys carried out under the supervision of W.A. McClelland during the month of May, 1980.
  - I hold no interest in Warstar Resources Inc. nor any of its properties, nor do I expect to receive any interest as a result of writing this report.

David G. Mark Geophysicist

June 30, 1980

	COST STATEMENT	
. *	EM Survey (contract) 47.4 cm	
	Line cutting	12 225 00
	Soil sampling 1042 samples	
	Instrument rental	352.60
	Drafting, copying, reporting	2669.08
	Analyses	3:09.99
	TOTAL	18 656.67













