Report on
Airborne Geophysical Survey
Survey flown Jan. 24, 1968

by
under the supervision of
P. H. Sevensma Ph.D., P. Eng.

February 14, 1968

P. H. Sevensma Consultants Ltd.
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Fig. 1  Location Map  1"=½ mile
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Fig. 6  Electromagnetic Survey  1"=1000'
1. INTRODUCTION

The property which is the subject of this report covers an area in which massive sulphide float boulders, containing values in silver, zinc, lead, and copper, have been located. Surface work including hand trenching and a reconnaissance magnetometer survey of a limited area together with some geological mapping is reported by a group previously active in the area. An examination of the property was made in August, 1967 by R. Gifford in company with D. Duncan, prospector and co-owner. This airborne survey had as primary objective the location of an area of anomalous magnetic or electromagnetic response suggestive of a source of the high-grade float found in the area.

2. PROPERTY

The property consists of the following claims held by location:

<table>
<thead>
<tr>
<th>Name</th>
<th>Grant No's.</th>
<th>Date of Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>KF 1 to 8 incl.</td>
<td>Y 17700 to 17707</td>
<td>April 17, 1967</td>
</tr>
<tr>
<td>DF 1 to 8 incl.</td>
<td>Y 17708 to 17715</td>
<td>April 18, 1967</td>
</tr>
</tbody>
</table>

H. Kepper of Vancouver, B. C. is the owner of record.

3. LOCATION AND ACCESS

The property is located 72 miles due north of Watson Lake, Y.T. at a point some 12 miles north of the Canada Tungsten Road. The claims cover the east flank of a broad north-south trending valley on a timbered slope between elevations of 3,500 and 4,500 feet.
No difficulty is envisioned in constructing a tote road into the property from a point on the Canada Tungsten Road 22 miles from the Ross River Highway junction. The elevation at this point is 3,000 feet and the intervening terrain as shown on air photo A 17113-14 appears well suited to road construction.

4. HISTORY

The 1964 report on the Mineral Industry of the Yukon Territory by L. H. Green makes reference to the activities of the Norquest Joint Venture in the Tyers River area. It is known that Norquest performed some work on the property during 1965. All claims were allowed to lapse in 1966.

The D.F. and K.F. claims were staked by D. Duncan in the spring of 1967. Duncan returned to the property in June to do some further prospecting in the course of which he located more float in the same general area. Samples obtained at this time lead to an examination of the property by R. G. Gifford, P. Eng., who has contributed to and supervised the preparation of this report.

5. GEOLOGY (from private report by R. G. Gifford, P. Eng.)

The region is underlain by complexly folded Devonian-Mississippian rocks comprising carbonate and pelitic sediments that occupy a north-trending, pencil-like embayment within a large mass of granitic rock (Fig. 1).

Argillite is the most common rock exposed on the claims. Some siltstone and graphite schist is present in subordinate amount. One exposure of limestone ribbed with chert occurs in the creek bed.
near the showing.

The bedding is shallow in dip and variable in strike in the area of main interest.

Replacement zinc-lead-copper sulfide in significant amount occurs associated with altered limestone-chert and calc-silicates in float material. Galena, sphalerite, and chalcopyrite form the chief ore minerals present.

Several mineralized boulders have been found in a distance of 2000 feet. Most are \( \frac{1}{2} \) to 1 ton in size, one is as large as 5 tons. (Fig. 2)

Distribution of the mineralized material is wholly obscured by a thick vegetal cover. Depth of overburden should be in the order of 15 feet or less in the area requiring trenching, judging from exposures in the creek.

Results from sampling of assorted mineralized boulders are listed below. They indicate the order of magnitude only since none were from material in place.

<table>
<thead>
<tr>
<th>No.</th>
<th>Sample Description</th>
<th>Au</th>
<th>Ag</th>
<th>Pb</th>
<th>Zn</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>219</td>
<td>Grab sample by owner, asst'd boulders</td>
<td>Tr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.16</td>
<td>7.3</td>
<td>13.7</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>2401</td>
<td>Chip sample by writer, 5' across banding in 5 ton boulder</td>
<td>*N.A.</td>
<td>5.56</td>
<td>5.2</td>
<td>5.8</td>
<td>0.16</td>
</tr>
<tr>
<td>2402</td>
<td>Grab sample by writer, several widely separated ( \frac{1}{2} ) to 1 ton boulders</td>
<td>N.A.</td>
<td>5.70</td>
<td>8.8</td>
<td>11.8</td>
<td>1.65</td>
</tr>
<tr>
<td>2403</td>
<td>Select sample by writer, pyrrhotite-quartz in argillite host</td>
<td>Tr</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

*N.A. = No Assay

All samples assayed by G. Spalding, Whitehorse.
Figure 3, a composite map of the area is derived from G. S.C. map 19-1966 south of lat. 61° N. The embayment in the surrounding crystalline rocks is clearly shown. The reader is referred to these publications for a more detailed account of the regional setting.

An airborne magnetic survey of the area flown in 1961 by Aero Surveys Ltd. provides some further data. These data have been compiled and published as geophysics paper 1357 by the Dept. of Mines and Technical Surveys.

6. Airborne Geophysical Survey
(a) General
The occurrence of massive pyrrhotitic sulphides as float over part of this property suggested the near presence of a sulphide deposit which might be expected to provide anomalous magnetic and electromagnetic response. An airborne reconnaissance survey was considered the most effective method of delineating any areas which might warrant more detailed study. The nature of the terrain and the attitude of the bedded rocks appeared well suited to a fixed wing survey. The Waterton survey method described below was accordingly selected and flown as shown on Figure 1.

(b) Method
This method incorporates the combined readings from a fluxgate magnetometer, a nuclimeter and an electromagnetic unit recorded on 8 mm. film and timed electrically to enable the readings to be entered on a grid of a chosen scale.

To give the most accurate forms to the anomalies, level lines are flown over the area, and a fixed-wing aircraft is chosen as the most suitable vehicle for this purpose.
Airborne Geophysical Survey Method Cont'd

Any inaccuracy in the timed readings due to airspeed error is calculated out before the readings are entered on the grid.

All the instruments are set on "0" over a pre-determined spot near the survey area and this adjustment is made after each 1 1/2 hours of survey.

Station-keeping is accomplished by flying between two lines drawn on a map with a scale of 1:50,000 and referring to land features. A directional gyro is also used, set to true heading by astro compass. Altitude of the level line is usually 500 ft. over the highest point of ground along the line.

Ground checks from over twenty areas have found the accuracy of the method to be between 250 and 500 ft. on a 500 ft. grid. Fluxgate Magnetometer: PMF-3 Sharpe, adjusted to return to "0" fast enough for the movement of the aircraft. Readings are in units of 100 gammas.

Kilometer: Detectron - DR229, 24 tubes, which is more suitable for airborne work. Readings are in units of .005 MT/HR.

Electromagnetic: 55 ft. cable attached to the bottom of the aircraft. A small 10 oz. bird is drawn behind the aircraft as a receiver, powered by its own mercury cell. A magnetic field is transmitted through the cable at a thousand cps. and the receiver is tuned to "0". The receiver coil is set at 90° to the transmitted field, and, being very sensitive, only 30% of its receiving power is used. This indicates electromagnetic activity in the area, such as disseminated sulphides, which usually read 3 to 6; heavy sulphides 10 to 15. It also picks up other electrical fields besides those produced by the transmitted field.
6. (c) Results and Interpretation

All data provided by this survey are shown on Fig. 4 in numerical form.

(i) Magnetic

That portion of the survey area which is shown on Figure 5 is believed to be underlain by a succession of gently dipping beds of Silurian-Devonian dolomite, argillite and quartzite. The sequence is known to be truncated by a major granitic intrusive mass just east of the claim group and approximately as shown.

Very low susceptibility contrast could be expected from the sediments if no magnetic minerals were present. The existence of areas of sharp magnetic relief is therefore more likely due to magnetic sulphides, than to the presence of basic rock with associated magnetite. The number of pronounced strike changes observed tend to confirm the picture of folding inferred by the sinuous anomaly pattern.

Contouring of magnetic data north of station 20, not shown, shows a magnetic low continuing along the sedimentary-intrusive contact. Aside from this general pattern and two small isolated highs, this area reveals little of immediate interest.

The shaded magnetic anomalies on Fig. 5 therefore are regarded as the most favourable targets for further work.

(ii) Electromagnetic Survey

Much of the area flown returned a very low background response. This is particularly true of the west half of the area covered by Fig. 6 where, except for the point source conductors shown, few readings above the 1 level were recorded. Flight lines
6 and 7 detected a more variable response with readings in the range of 1 to 4 but revealing no coherent pattern. Flight lines 8 to 14 as shown on Fig. 6 crossed several anomalous areas which are of interest. Of these, the more northerly zone which appears sub-parallel to the strike of a limestone strata, could be the source of the sulphide float located along the west flank near the claim posts. Ground confirmation of this interpretation is suggested before attempting to rate the other anomalies.

It may be noted that the system employed measures only a single quantity - the reference coil response, at any frequency, both to the signal transmitted by a horizontal coil at a frequency of 1000 c.p.s. and to any naturally occurring EM field. The anomalies shown are therefore selected on the basis of this response, the profile developed along the flight path, and the consistency of reading on adjacent flight lines.

The two largest anomalies both exhibit to a marked extent the characteristics which would be expected from heavily disseminated, near surface sulphides.

(iii) Radiation

Background radiation on this survey was somewhat higher than recorded by this method on other surveys conducted recently. The results do not appear to bear a relationship to known geologic or lithologic data. No importance has been attached to this phase of the work.

7. SUMMARY

This survey is considered as having successfully defined at least one target which could explain the source of float material of one grade located on the property. Further assessment of these data should be considered if initial ground work in the target area proves
successful. Acquisition of some adjacent ground is indicated and careful prospecting of the area to the north should be carried out.

8. RECOMMENDATIONS

The following program is recommended as the next stage in assessing this property.

<table>
<thead>
<tr>
<th>Type of Work</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulldozer trenching &amp; line cutting</td>
<td>$7000.00</td>
</tr>
<tr>
<td>including access to property</td>
<td></td>
</tr>
<tr>
<td>200 hrs. @ $35.00 per hour</td>
<td></td>
</tr>
<tr>
<td>Ground Geophysical surveys</td>
<td>$1000.00</td>
</tr>
<tr>
<td>10 line miles @ $100 per mile</td>
<td></td>
</tr>
<tr>
<td>Geological mapping &amp; prospecting</td>
<td>$750.00</td>
</tr>
<tr>
<td>Geochemical Survey</td>
<td>$1250.00</td>
</tr>
<tr>
<td>250 samples @ $5.00 per sample</td>
<td></td>
</tr>
<tr>
<td>Sub-Total</td>
<td>$12500.00</td>
</tr>
<tr>
<td>Supervision and Overhead</td>
<td>2500.00</td>
</tr>
</tbody>
</table>

Contingencies 20%

* Recommended Budget

* It is expected that other interests active in this area may participate in the construction of a tote road across this property which would reduce the cost of the bulldozer work appreciably.

Eligibility for a Northern Mineral Exploration Assistance grant should also be established prior to commencement of any further work.

Respectfully submitted,

H. S. Aikins

Endorsed:

P. H. Sevensma, Ph.D., P.Eng.
IN THE MATTER OF A GEOPHYSICAL SURVEY ON
THE D.F. AND K.F. MINERAL CLAIMS

AFFIDAVIT

I, Harvey Kepper, of 120 Kingston Street, in the
City of Victoria, Province of British Columbia, HEREBY
MAKE OATH AND SAY AS FOLLOWS:-

That attached hereto, this my Affidavit, marked
Appendix "A" is a list of Personnel engaged in work for
the above, and marked Appendix "B", is a statement of the
cost of said work which I certify to be accurate to the
best of my knowledge and belief.

SWORN before me at the
City of Vancouver, Province )
of British Columbia, this )
30th day of March, )
A.D. 1968 )

H. Kepper

A Commissioner for Oaths
for Yukon Territory
APPENDIX "A"

List of Personnel Employed

Field Examination
August, 1967

R. G. Gifford P.Eng.
715-850 West Hastings St.
Vancouver 1, B.C.

Airborne Survey
January 24, 1968

Waterton Aeronautics & Explorations Ltd.
4210 Almondel Rd.,
West Vancouver, B.C.

Preparation of Geophysical Report
Jan. 10/68 to Feb. 14/68

P. H. Sevensma Consultants Ltd.
715-850 West Hastings St.
Vancouver 1, B.C.
- P. H. Sevensma, Ph.D., P. Eng.
- H. S. Aikins
APPENDIX "B"

Statement of Costs


A. Preliminary Studies and Map Preparation
   Services, Senior Technician
   - 1½ days, @ $75.00 per day $ 112.50

   Drafting
   - 1 day @ $40.00 per day 40.00

B. Contract Services

   Waterton Aeronautics & Exploration Ltd. 764.00

C. Preparation of Maps & Report
   Professional Services, P. H. Sevensma
   - 1 day @ $150.00 150.00

   Services, Senior Technician
   - 3 days @ $75.00 per day 225.00

   Drafting Services
   - 2½ days @ $40.00 per day 100.00

D. Disbursements
   92 Xerox prints @ $0.12 11.04
   Feb. 7/68 - Riley's Invoice # V52529 1.69
   Feb.19 - Riley's Invoice # V53417 (part) .80
   Feb.19 - Riley's Invoice # V53416 (part) 1.32
   Feb.16 - VanCal Invoice # R56095 (part) 3.16

   Total Charges re Survey $ 1,409.51
CERTIFICATE

I, PETER H. SEVENSMA, of Vancouver, B.C. do hereby certify that:

1. I am a graduate of the University of Geneva, Switzerland (Physics and Chemistry, 1937; Geology and Mineralogy, 1937) where I obtained my Ph.D. in Geological and Mineralogical Sciences in 1941.

2. I am a Consulting Geological Engineer and a registered member in good standing of the Association of Professional Engineers of British Columbia and of the Association of Professional Engineers of Yukon Territory.

3. From February 1948 until December 1965, I have been engaged continuously in mining and exploration geology in the employ of Cominco Limited. As a Senior Exploration Geologist, I have worked extensively both in Eastern and Western Canada.

4. I have not personally examined the claims which are the subject of this report, but Mr. Gifford of my staff has, as mentioned in this report.

5. I have not received, nor do I expect to receive or acquire directly or indirectly, any interest in any of the properties or securities of Htokepper& Associates.

Respectfully submitted,

[Signature]

P.H. Sevensma, Ph.D., P. Eng.

PHS/cm

Vancouver, B.C.

February 14, 1968.
Plutonic Rocks

Dolomite, limestone

Devono-Mississippian pelitic and carbonate rocks.

Bedding variable strike shallow dip.

Area covered by Geophysical Survey
Flight line bearing 336°
14 lines of 17,500 ft.

FIG. 1

H. KEPPER & ASSOCIATES
LOCATION MAP

Watson Lake M.D.
P. H. Sevensma Consultants Ltd-Vancouver B.C
Feb. 1968, 105-H-2
Severe depth veins and parallel bedding minor pyrrhotite.

- Chert Boulders
- Sulfide Boulders: Well mineralized with galena, sphalerite, chalcopyrite altered chert-limestone host. Mainly 1/2 ton size (2'x2'x2')

Possible source area of mineralized float. Short, sharp rise in topography.

Sample 2401
Ag 5.56, Pb 5.2, Zn 5.8, Cu Q/6

Sample 2402
Ag 5.70, Pb 8.8, Zn 11.0, Cu 1.65

Fractures uniform close spaced.

Strong cleavage parallel bedding.

Crumpled.

Several 6" quartz veins parallel bedding minor pyrrhotite.

Elev. 4175'

- Occasional quartz vein parallel bedding

H. Kepper & Associates
GEOLOGY

Watson Lake M.D.
P. H. Sevensma Consultants Ltd. — Vancouver B.C.

Fig. 2
Feb. 1968, 105 — H — 2
LEGEND

* Relative Magnetic intensity
in gammas x 100.
Contour interval 500 gammas.
Approx. loc. of claim expts
Location of sulphide belt
Inferred granite contact

H. KEPPER & ASSOCIATES
AEROMAGNETIC SURVEY
watson Lake, M.O. Y.T
(P. H. Sevensma Consultants Ltd. Vancouver B.C)
Feb. 1968, 105 - H -2

FIG. 5
LEGEND
- E.M. Response Strong
- Moderate
- Relative distortion of p.m.f. (> 5)
- Transmitted frequency 1000 c.p.s.
- Approx. loc. of claim posts
- Location of sulphide float
- Inferred granite contact.

Flightline position & direction

H. KEPPER & ASSOCIATES
ELECTROMAGNETIC SURVEY
Watson Lake M.D. Y.T. (Waterton Aeronautics)
P. H. Sevensma Consultants Ltd. Vancouver B.C.
Feb. 1968, 105-H-2,