

MEMO TO: Spartan Explorations Ltd.
Dr. C. Smith

FROM : Barringer Research Ltd.
John L. Walker

DATE : July 2, 1968

SUBJECT: GEOCHEMICAL PROSPECTING TILLEI LAKE AREA, Y.T.

During the undersigned's visit to the Tillei Lake Area from 18 to 21 June, the following aspects of geochemical prospecting have been discussed and examined in the field.

1. Reconnaissance Drainage Sediment Survey.

This type of survey is undertaken in order to assess the mineral potential of a relatively large area and to focus attention on those areas of relatively high metal content. During oxidation of sulphide minerals, portions of the metals which are dissolved by shallow ground waters are transported to the nearest stream or lake where the ground water discharges into the surface drainage. Upon transition to the surface environment, many of the critical properties affecting the solubility of metals are radically altered and metal is precipitated at the point of discharge of the ground waters. This precipitate is added to the bottom sediments as a readily soluble salt which may be analyzed using some partial or "weak" analytical method.

This salt generally occurs in a fine grain size (<20 microns) and the sample collected should represent the active sediment, devoid of organic material and recently collapsed bank material. Organic and bank material do not represent the active sediments and the metal concentrations may be very variable introducing large errors into the metal distribution patterns.

Economic metal deposits commonly produce drainage trains of saline transported

metals of 1/2 to 2 miles. Samples, therefore, may be collected at 1/4 or 1/2 mile intervals.

In the area to be investigated active sediments from the main valleys, and "true" side valleys should be collected in order to locate hydromorphic molybdenum and zinc anomalous concentrations. Some of the side valleys are simple talus gulleys or have formed from surface run off of melting ice. Such side creeks are channels of mechanically dispersed minerals as the ground water may not discharge into these channels. It is recommended that the rock flower material from these chemicals should be collected as the main valley creek is traversed. Such sampling will complete the coverage of the area and the analytical technique will be adapted to extract the mechanically dispersed sulphide and oxide metal as well as the precipitated hydroxide etc.

The sampling outlined above will also be effective for detecting tungsten mineralization. Scheelite is resistant to normal chemical weathering and is mechanically eroded and dispersed. Mechanical dispersion is of relatively local extent and scheelite mineralization may not be reflected in the main valley areas. Samples, however, have been collected to test the dispersion of scheelite from a known deposit in the area. Experience has proved that scheelite tends to concentrate in +20 mesh and -80 mesh fractions of the sediment. The -80 mesh fraction, therefore, will be used throughout the present programme as this fraction is also optimum for molybdenum and zinc.

Analyses will be undertaken initially for cold extractable zinc, bisulphate extractable molybdenum and total tungsten.

2. Soil Sample Survey.

Steep topography does not generally lend itself to detailed soil surveys. Immature soil profile development and local variation in overburden type together with downhill displacement present difficulties in a detailed interpretation.

Nevertheless, in a general sense, soil sampling may supplement geological mapping and prospecting and provide a general indication of a metal source or an extension to a known source area.

In the course of the field examination the following four overburden profiles were noted:

- a) Ao - raw humus; moss, leaves, needles etc.
- A₂ - light grey to white leached zone (like ash)
- A₃/B - brown iron oxide rich zone
- C - grey to grey-brown clay/gravel/rock chips etc.

In this environment the A₃/B layer should be sampled. This layer is readily recognized by its reddish iron oxide staining and it occurs below the leached zone.

b) and c) An immature soil profile is more difficult to sample as the brown A₃/B layer may not be well developed. In the following two examples the top organic-free material lying below the white ash layer is recommended.

b)

- Ao - raw humus
- ash (volcanic)
- A₁ - decomposed humus
- grey-brown gravel
(sample layer)

c)

- Ao - raw humus
- grey-brown gravel
- ash (volcanic)
- A₁ - decomposed humus
- grey-brown gravel
(sample layer)

d) In some areas there was no soil development and organic - raw humus-material directly overlay bedrock. In such cases no sample should be collected. As this may be a local feature the sampler is recommended to test other sites.

It is recommended that a few pits be dug across the general area to be examined. In this way the variation in overburden may be recognized prior to a soil survey. Instructions may then be given as to which layer should be sampled when the optimum

layer has been selected, samples should not be collected from any other layer. Avoid organic, ash and leached material.

3. Assessment of a Mountain Ridge with Favourable Geology.

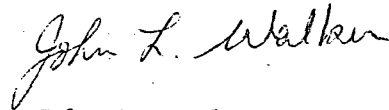
As stated previously geochemical prospecting methods may not be completely applicable in determining underlying mineralization in steep topography. (Rock chip sampling, however, may be applied). In order to make an initial assessment of a mountain ridge, however, the following two approaches may be added to the sampling procedures recommended in the drainage sediment survey.

- a) Collect samples of "seepage" soil at the base of slope along the ridge. At this point ground water generally discharges at some period of the year. The uppermost organic-free material should be sampled and analysis carried out for the precipitated metal.
- b) Collect samples of rock flower or talus gully material in order to examine the mechanically transported material.
- c) It may be useful to collect soil samples along one or two traverse lines up the ridge and across the strike of the rocks (if such geology is known). Such a traverse would, at least, locate a down slope anomaly from sub outcropping mineralization.

4. Geochemical Testing of Transported Gossan.

Sampling of gossan or limonitic material has been used to distinguish barren gossans from gossans associated with base metals. In the gossan zone examined in the field, limonitic material is precipitating on discharge of the ground water. Springs and seepage soils areas are reddish stained as well as containing large amounts of precipitated iron oxides. This type of accumulation is the same as that discussed in the stream sediment survey programme. Any base metals associated with the oxidizing iron sulphides producing the limonite will also precipitate in the surface environment.

Sampling of seepage soil or drainage sediment material across the gossan area will demonstrate the presence or absence of base metals. It may be necessary to build up some background data on base metal content of "so called" barren sulphide gossans and comparison then made between different gossans.



John L. Walker
Consulting Geochemist