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INVESTIGATION OF THE TIN POTENTIAL OF AN AREA AROUND ASH MOUNTAIN, NORTH-CENTRAL BRITISH COLUMBIA

by

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INTRODUCTION

During a previous investigation of tin-bearing skarns in the vicinity of Ash Mountain, the writer collected a piece of float of an unusual texture. The rock was later stabbed, studied petrographically, and chemically analyzed. The analysis returned values of 6.88% F and 0.082% Sn. The texture of the rock, that of fine, convolute bands which alternate mineralogically between magnetite, silicate minerals, (pyroxene, vesuvianite, garnet) and fluorite, is identical to a rock named, for its texture, "wrigglite" in Australia. These, similar rocks host low grade deposits of tin, fluorine, and beryllium. The largest of the Australian deposits is the Moina prospect which hosts 30 $\bar{M}$ tons of 16 - 18% F, 0.15% Sn, and 0.1% WO_3. A rock of identical texture occurs at the Lost River deposit, Alaska, and contains 0.27% Sn, 0.004% WO_3 and 15.6% F. This is the first occurrence recognized in Canada.

During the period of August 7 - 9, the area was again visited to determine: (a) if the rock-type cropped-out and could be measured; (b) if the "wrigglite" could be used as an exploration guide towards larger, granite-hosted 'lode' tin deposition.

The results of the project have shown that metasomatic rocks within the thermal aureole of the granitic intrusion contain up to 5,565 ppm Sn. Granitic rocks in contact with the metasomatic rocks, however, contain a maximum of 39 ppm Sn (one sample) and average less than 5 ppm Sn where exposed, and where sampled.

GEOLOGIC SETTING

General Statement

In the Ash Mountain area, Cretaceous-age batholiths (the Parallel Creek and Tuya batholiths), of quartz monzonite to granite composition, intrude a sequence of Carboniferous-age sediments and metasediments (the Oblique Creek Formation). In the vicinity of the contacts, carbonate rocks have been locally altered to skarn rocks which can contain minor amounts of tungsten and tin.

Intrusive Rocks

The Parallel Creek Batholith is comprised of biotite granite and quartz monzonite, even and medium grained and locally coarsely megacrystalline. These rocks weather a distinctive yellowish-brown colour, similar to the tin-hosting Seagull batholith to the north. According to Gabrielse (1968), plagioclase composition varies from An_{20} to An_{30}. Apalite, magnetite, and zircon are present as accessory minerals.

Contacts with the Oblique Creek Formation are vertical where observed.

Granitic rocks are not heavily fractured nor jointed. In the vicinity of cross-cutting, high-angle faults in the vicinity of Ash Mountain, however, minor sericitic alteration was observed. No true greissen alteration was observed.

At Ash Mountain, the granitic rocks have generated small skarn zones at their contact with carbonate units within the Oblique Creek Formation. At the contact of the granite with the skarn, the intrusion exhibits a weak, but pervasive, alteration. This zone, approximately 20 m wide, is represented by the destruction of biotite, weakly disseminated muscovite and chlorite, and stronger fracturing. Minor tourmaline and fluorite were noted. Rare miarolitic cavities are infilled with quartz.

No mineralization was noted within the batholith.

OBLIQUE CREEK FORMATION

The Oblique Creek Formation (Watson and Mathews, 1944) is comprised of meta-chert, quartzite, hornfels, greenstone, schist, gneiss, and minor limestone.

In the vicinity of Ash Mountain, the Formation comprises quartz-biotite schist, biotite-hornfels, quartzite, and minor limestone and marble. These units, which are vertically-dipping, are weakly to moderately fractured and thermally metamorphosed in the vicinity of the vertically-dipping contact with granitic rocks.

LOCAL GEOLOGY

In the vicinity of the tin-bearing metasomatic rocks, the granite is in steeply-dipping contact with a vertically-dipping sequence of marble, quartz-mica schist, and quartzite of the Oblique Creek Formation. The marble beds, each approximately 2 m wide, and separated by 5 m of quartz-mica schist are irregularly altered to skarn adjacent to the contact, and exposed as the crest of a cirque. Approximately 100 m 'up-section', on the far side of the same cirque, another marble band is similarly-altered. This exposure, which is less than 1 m wide, occurs between beds of quartz-biotite schist and quartzite. Plate 1 is a photograph taken from the top of the cirque at the granite contact towards the skarn zone described above.

Skarn is irregularly developed along the marble beds and sharp contacts occur everywhere between skarn and unaltered marble.

MINERALOGY AND CHEMISTRY OF ALTERED ROCKS

Table 1 lists the values of Sn for whole-rock samples collected at the occurrence. Only metasomatic rocks contain anomalous values of Sn, and these vary between 375 and 5565 ppm (0.037% to 0.56%). The average Sn content of the 9 skarn samples analyzed is 1,700 ppm Sn.

The petrology and texture of the skarns are highly variable. Green, andradite garnet is by far the most abundant silicate mineral and is considered to contain most of the tin in solid-solution in at least some of the samples. (An earlier study by the writer has shown green garnets in the general region are all Sn-bearing and that SnO_2 can be present in amounts exceeding 4% by weight). Accessory minerals in the skarns are pyroxene, vesuvianite, fluorite, magnetite and red, andradite garnet. The latter occurs as cross-cutting fracture-fillings.

The texture of the tin-bearing skarns varies from coarse-grained and massive to much finer-grained and thinly laminated or rhythmically-banded. This banding is the consequence of the deposition, in discrete, convolutely-shaped laminae, of alternating bands of magnetite, fluorite, and the silicates pyroxene, garnet, and vesuvianite (or idocrase). No cassiterite has been observed. The banded skarns grade irregularly along strike, into and out of, the more massive and unlaminated textural variety. This latter skarn type contained, in one isolated locality on the back side of the cirque, a coarse-grained, black, metallic mineral that could not be identified. The mineral, which comprises 30% of the rock, has an excellent basal cleavage and is intergrown with green (and hence, probably tin-bearing) andraditic garnet and coarse-grained calcite. This particular sample contains 5565 ppm Sn.

Granitic rocks in contact with skarn contain between <5 and 39 ppm Sn. The most anomalous sample was of an altered, chlorite-, clay-bearing zone. An unaltered sample of buff-white, yellow-weathering, alaskitic granite contains 18 ppm Sn.

Biotite schists and quartzites, which are by far the most voluminous rocks in the cirque, contain between <5 and 29 ppm Sn. No samples of quartzite were anomalous, although 3 samples of quartz-biotite schist contain 36, 21, and 29 ppm Sn respectively. These are, in all cases, thinly-laminated, moderately well-fractured, rusty-weathering rocks with minor amounts of finely-disseminated pyrite.

<u>Summary</u>

The sedimentary rocks in the thermal aureole of a tourmaline-bearing granitic stock, adjacent to Ash Mountain in north-central British

Columbia, have been thermally and metasomatically altered. Two thin (2 m wide) marble beds, which are interbedded with schists and quartzites, have been metasomatically altered to garnet-magnetite-rich skarn irregularly along a strike length (exposed) of approximately 100 meters.

Petrographic evidence indicates that the Sn is mainly contained within the garnets although the possibility exists that minor cassiterite might be present in the more highly-anomalous specimens.

RECOMMENDATIONS

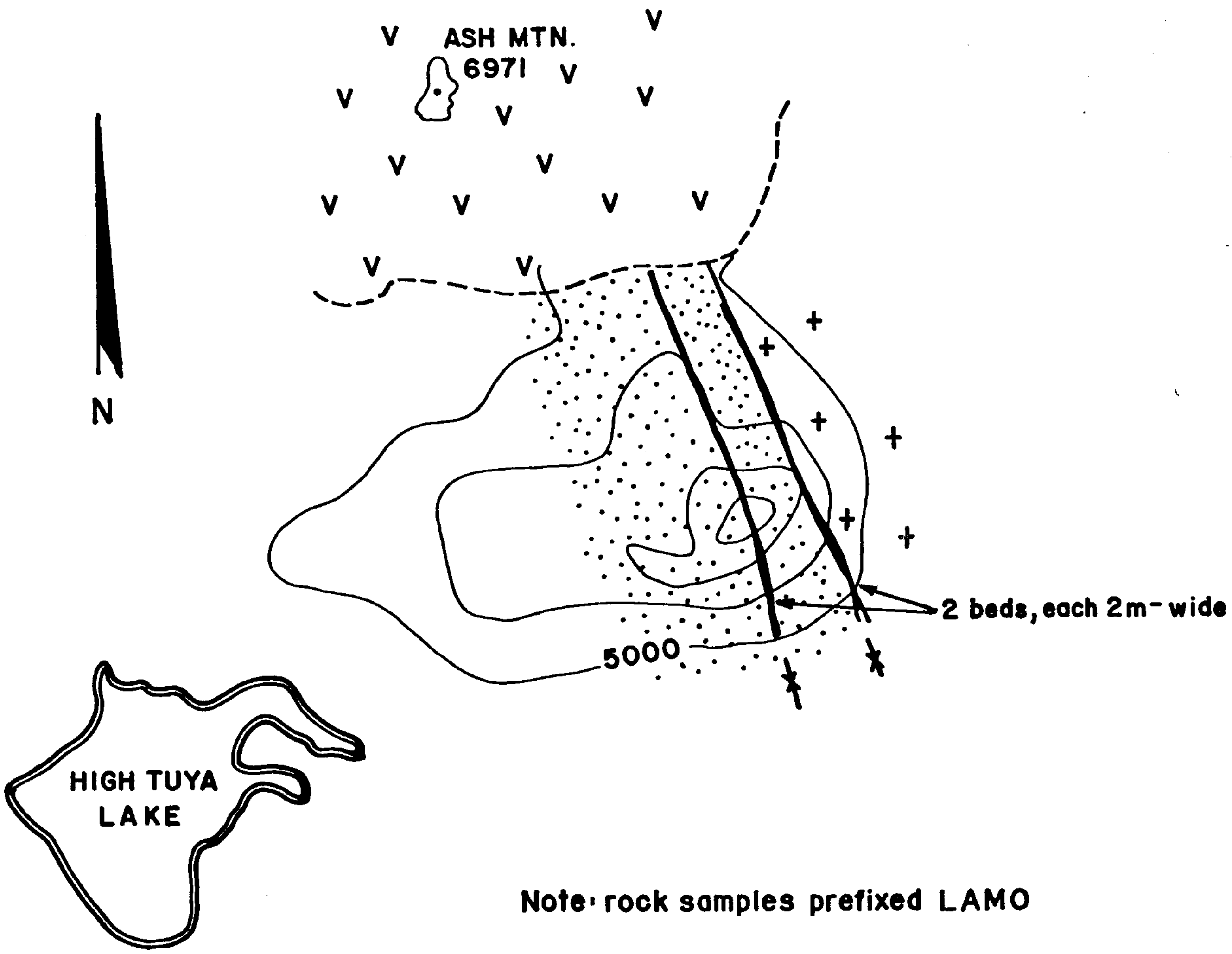
No further work is suggested at this point in view of:

(1) the relatively thin nature of the limestones

(2) their vertically-dipping attitude

(3) the absence of (exposed) granitic rocks of a highly-altered and fractured nature which would represent a potential lode tin host.

However, should tin become a commodity of interest to Chevron in the future, the area of the Parallel Creek batholith should be given priority. Extensive exploration to the north, in similar rocks of the Seagull batholith, has located tin deposits in granite (STQ occurrence), in highly-fractured hornfels, and in skarn. The largest and most promising Sn deposit so far located in that area (the J.C. deposit) consists of stanniferous garnet, malayaite ($CaSnSiO_5$) and cassiterite in calc-silicate skarns. To date, however, there is no locality in the world where Sn-bearing skarns are being commercially exploited.



M507 Northen Tin
Ash Mountain Area.
Local Geology

Scale: 1" = 1km (approx)

LEGEND

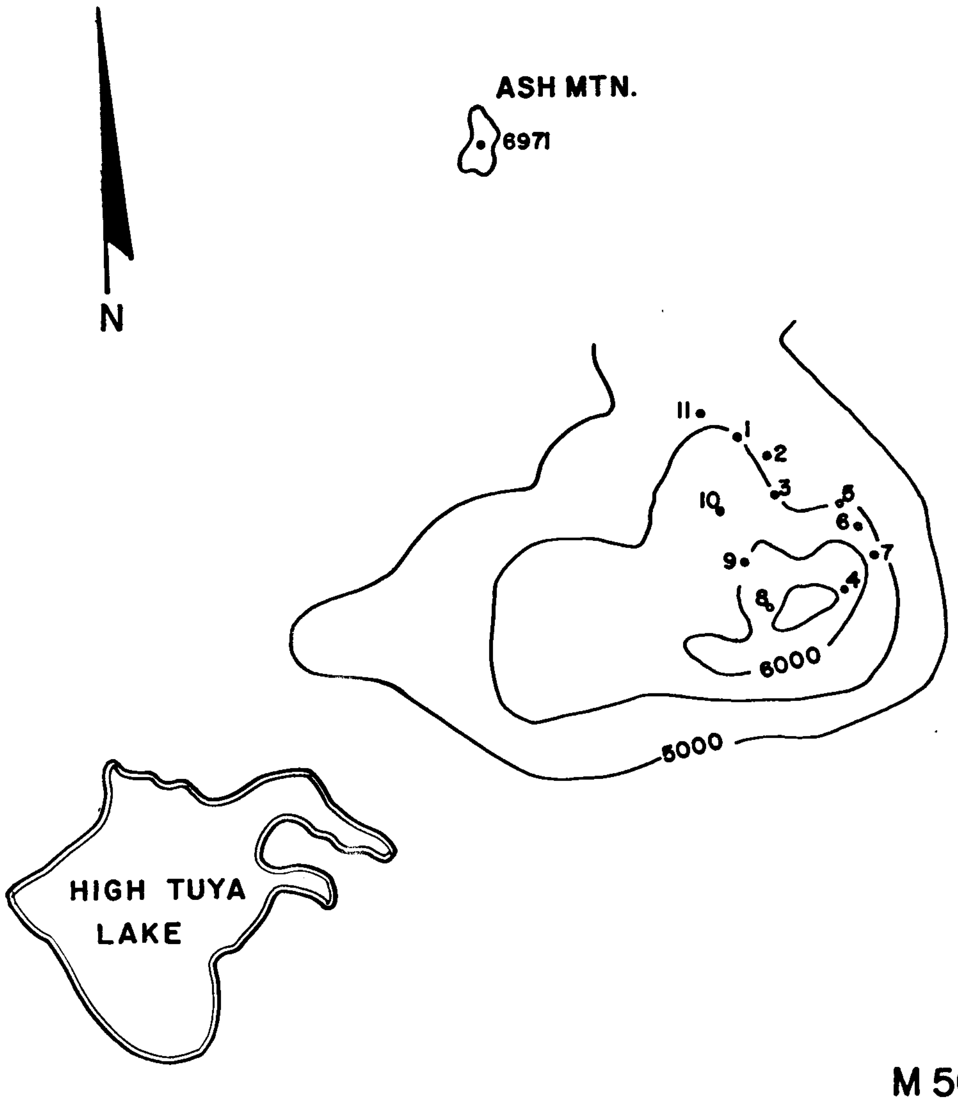
V V RECENT BASALTIC FLOWS

+ + CRETACOUS GRANITE

QUARTZITE; QUARTZ-MICA SCHIST

MARBLE BAND; IRREGULARLY ALTERED TO SKARN.

ATTITUDE OF BEDDING (VERTICAL)



M 507
NORTHERN TIN
SOIL SAMPLE LOCATIONS
Ash Mountain Area

NOTE Numbers refer to TAMO series.

SCALE 1" = 1 km (approx.)
SAMPLER : T. Zanger

TABLE 1.

Description and tin content of rocks in the vicinity of Ash Mountain

SAMPLE	DESCRIPTION	Sn (ppm)
LAMO-1	Skarn; green garnet + calcite; 1 cm - wide rusty weathering patch; no sulphides. Sn must be contained within silicate minerals.	3040
LAMO-2	Very rusty-weathering, highly-foliated, qtz-biot. schist coming from cirque wall; 2% clots of py or po gives rust. Moderately well fractured with fractures parallel to bedding planes.	36
LAMO-3	Skarn; garnetite. Very rusty-weathering, extremely dense, py-mgt-bearing red-brown-rich andradite skarn. Float. Characteristic of the thin (1 m-wide) skarn beds found in-situ on the west wall of the cirque. Mineral proportions: garnet 70% cc 5% pxn 10% py + cpy 5% unknown 2%	930
LAMO-4	Quartzite; rusty-weathering	<5
LAMO-5	Skarn; mgt-rich; rusty-weathering; contains green gar., cc, qtz, pxn, mgt. Extremely dense, Mgt. a major component and appears to be later than the calc-silicate minerals. Sulphides pitted and eroded.	375
LAMO-6	Hand spec. only. Mica (lepidolite?)-bearing tourmalinized pegmatite.	
LAMO-7	Quartzite. Rusty-weathering, moderately well-fractured with minor dissem. po + cpy. as fracture-fillings.	<5
LAMO-8	Skarn. Dense, green, garnet-rich. Weakly developed 'wrigglite' texture outlined by green, andraditic garnet. Trace mgt. present. Late red andradite-filled veins. Mineralogy: green andradite, pxn, qtz, mgt, cc.	1105

SAMPLE	DESCRIPTION	Sn (ppm)
LAMO-9	Skarn. Non-foliated, coarse-grained assemblage of green andradite (80%), red andradite (10%) and calcite (10%). A few rusty-weathering "pitted" patches but no sulphides present.	1020
LAMO-10	Wrigglite. Random chip samples. Mgt-rich rocks with alternating bands of vesuvianite, garnet, etc. Late, cross-cutting red garnet veins.	525
LAMO-11	Skarn zone. Back side of Ash Mtn. near summit, unusual rock. Contains a very coarse-grained, black, metallic unknown. Resembles sphalerite in colour and in having excellent basal cleavage. Unknown mineral comprises 30% of rock. Intergrown with green, andraditic garnet and coarse-grained calcite.	5565
LAMO-12	Same unit as LAMO-11. Same mineralogy comprising banded calc-silicate skarn. Bands comprised of one or more of garnet, pxn, vesuvianite, and coarse-grained calcite.	2060
LAMO-13	Granite, Miarolitic and alaskitic. Local pegmatitic domains. Miarolitic cavities infilled with euhedral quartz and tourmaline. Rock is buff-white in colour, weathers orangy-yellow weakly rusty. Mafic content is 5% overall.	18
LAMO-14	Granite. Yellow-brown-weathering, slightly more altered variety of LAMO-13. Mafics are largely destroyed and altered to micaceous clays and chlorite.	39
LAMO-15	As per LAMO-14	<5
LAMO-16	Granite. Mafic-free, fine-grained, porous, white, highly-altered alaskite/rhyolite. Weakly vesicular. Minor purple fluorite. Rhyolitic dyke rock?	<5
LAMO-17	Yellow-brown weathering, moderately-to-weakly fractured, mafic-poor, qtz-fsp-biot. granite with rare miarolitic cavities.	<5

SAMPLE	DESCRIPTION	Sn (ppm)
LAMO-18	Rock chips, taken across 10 m of O/C. Rusty-weathering, thinly-bedded biotite hornfels and qutz-biot. schists.	21
LAMO-19	As per LAMO-18. Across 10 m; composite rock-chip sample. Biot. hnfls. are py-, mgt-bearing.	<5
LAMO-20	As above. Across 15 m. Dominantly quartzite with minor hornfels and schist.	<5
LAMO-21	Skarn. Extremely mgt-rich (80%) with 20% green andradite and pyroxene. Extremely dense.	675
LAMO-22	Rusty-weathering, coarse-grained, biot-msc-qtz. schist.	29
LAMO-23	Rusty-weathering, fine-grained, biot. hornfels. Moderately to well fractured.	<5
LAMO-24	As per LAMO-23	<5
LAMO-25	Rusty-weathering, highly-fractured, biotite hornfels with minor disseminated py, upgraded adjacent to fractures. Grades in and out of mafic-free quartzite.	<5

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Geochemical Lab Report

Extraction ____ Report No. 20 - 1863 PROJECT:

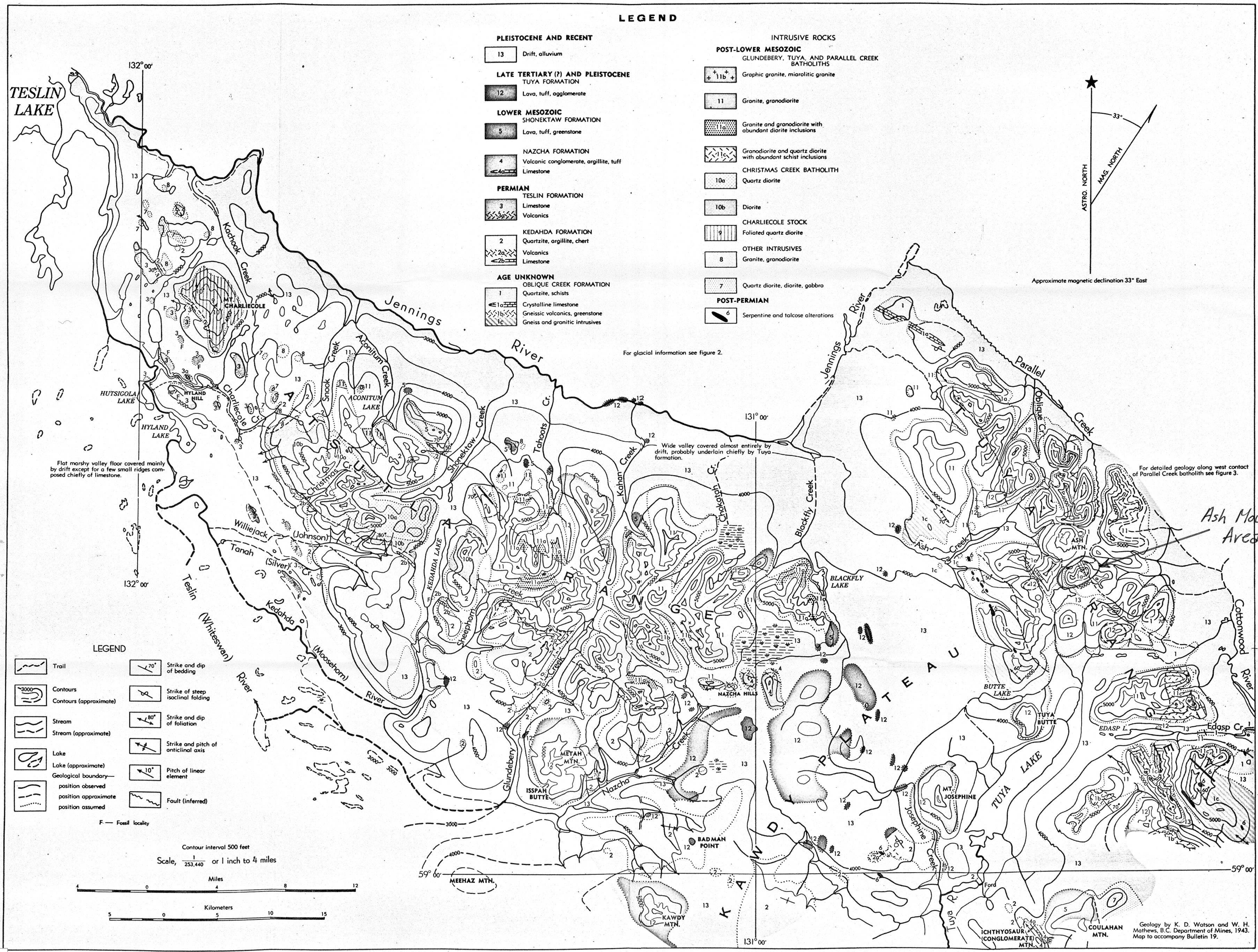
Method ____ From Chevron Standard Lt

Fraction Used ____ Date Augu

SAMPLE NO	Cu ppm	Zn ppm	Ag ppm	W ppm	Au ppb	As ppm	Sn ppm	
TAMO 1	-	-	-	-		-	< 5	
2	-	-	-	-		-	< 5	
3	-	-	-	-		-	15	
4	-	-	-	-		-	70	
5	-	-	-	-			33	
6	-	-	-	-		-	26	
7	-	-	-	-		-	5	
8	-	-	-	-		-	68	
9	-	-	-	-		-	< 5	
10	-	-	-	-			36	
11	-	-	-	-		-	< 5	

SAMPLE NO.	Cu ppm	Zn ppm	Ag ppm	W ppm	Au ppb	As ppm	Sn ppm	
LAMO 1 ROCKS	-	-	-	-	-	-	3040	
2	-	-	-	-	-	-	36	
3	-	-	-	-	-	-	930	
4	-	-	-	-	-	-	< 5	
5	-	-	-	-	-	-	375	
7	-	-	-	-	-	-	< 5	
8	-	-	-	-	-	-	1105	
9	-	-	-	-	-	-	1020	
10	-	-	-	-	-	-	525	
11	-	-	-	-	-	-	5565	
12	-	-	-	-	-	-	2060	
13	-	-	-	-	-	-	18	
LAMO 14	-	-	-	-	-	-	39	
15	-	-	-	-	-	-	< 5	
16	-	-	-	-	-	-	< 5	
17	-	-	-	-	-	-	< 5	
18	-	-	-	-	-	-	21	
19	-	-	-	-	-	-	< 5	
20	-	-	-	-	-	-	< 5	
21	-	-	-	-	-	-	675	
22	-	-	-	-	-	-	29	
23	-	-	-	-	-	-	< 5	
24	-	-	-	-	-	-	< 5	
25	-	-	-	-	-	-	< 5	

1944
BRITISH COLUMBIA DEPARTMENT OF MINES
Victoria, B.C.



TUYA-TESLIN AREA

NORTHERN BRITISH COLUMBIA