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PROPOSED COPPER EXPLORATION

AISHIHIK MAP-AREA

YUKON

March 15, 1966

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PROPOSED COPPER EXPLORATION

AISHIHIK MAP-AREA,

YUKON.

INTRODUCTION

The area of the south central Yukon lying between Aishihik Lake and the Whitehorse-Carmacks road, between latitudes 61<sup>and 62</sup> degrees N. (see map), is particularly favourable as an exploration target for copper. The main factors supporting this idea are:

- a) It is crossed by the eastern margin of the Coast Range Batholith, the site of numerous significant mineral deposits including New Imperial, (copper), Mt. Nansen, (gold, silver,) Wheaton, Windy Arm, and Atlin areas, (gold, silver, lead, antimony.)
- b) It contains known copper mineralization-Mack's Copper, Giltana and (slightly further north) Williams and Merrice Creeks area.
- c) It is fairly accessible from existing all-weather roads, is crossed by two excellent potential road routes, (Dalton Trail and the original Dawson-Whitehorse wagon route,) *would probably be crossed by any future* and railway extension north of Whitehorse.
- d) The Aishihik Map-sheet is the only unmapped area in the southern Yukon which is accessible and close to civilization.
- e) An aerial magnetometer survey is currently being flown over the area by the Geological Survey of Canada, with

publication presently scheduled for late summer or fall of 1966.

- f) Outcrop <sup>of</sup> the sedimentary and volcanic rocks is sparse, and therefore, the area is particularly attractive for prospecting using modern techniques.

#### LOCATION AND ACCESS

The Alaska Highway crosses the southern margin of the area, while the Mayo-Dawson Highway crosses the northeast corner. On the west, the Aishihik road follows the east shore of Aishihik Lake, while the Mt. Nansen development road provides access to the northern part of the area from Carmacks. In addition, both the Dalton Trail and the original Dawson-Whitehorse wagon route cross the area and are excellent road routes. The latter would be a likely choice for a right-of-way should a railway be built into the north or central Yukon.

Numerous lakes suitable for fixed-wing aircraft occur in the area. The centre of the area is about 75 air miles from Whitehorse, which is the northern terminus of the White Pass and Yukon Railway and a major charter aircraft centre besides being the capital and the business, transportation and communications centre of the Yukon.

#### HISTORY AND PREVIOUS WORK

Although the area has not yet been regionally mapped by the Geological Survey of Canada, it was at one time crossed by the main land transportation routes of the Klondike and Keno Districts and was crossed by innumerable prospectors from the early 1890's to the late 1920's, when falling metal prices and gradual dwindling

of interest in the Klondike temporarily ended lode exploration in the Yukon. The fact that no major discovery was made in this area using conventional prospecting could explain why it has not yet been intensively explored using modern techniques or why the Survey has neglected to fill in this gap in its regional mapping.

The Aishihik area was crossed by the original Dalton Trail, which was established prior to 1896 and was used by Klondike prospectors who had come over the Chilkat and Chilkoot Passes. The Trail was surveyed by J.J. McArthur in 1897, and in the following year, J.B. Tyrrell made a geological reconnaissance of the route on his way to the Klondike.

During 1907 and 1908, D.D. Cairnes worked in the northeast corner of the area, primarily investigating the coal deposits around Carmacks. He also visited the Williams Creek copper prospects in 1907, and the Mack's and Giltana copper prospects in 1908. The reports on the latter were reprinted in 1910 in Memoir 5. In 1909 he revisited the copper prospects on Williams and Merrice Creeks. In 1914, Cairnes traversed from the north end of Aishihik Lake to Nisling River and mapped an area around Victoria and Nansen Creeks. The maps for this traverse were published in 1917.

No further exploration was done until 1926 when Cockfield mapped the area south and east of Aishihik Lake.

Green and Godwin flew a few reconnaissance traverses over the central part of the area in 1963 with fixed-wing aircraft

and the results, although not published, have been seen by the writer.

Presumably, many exploration geologists have done reconnaissance work in the area since the Second World War, but so far as is known the only geologist to carry out a detailed program in the area using geochemistry is J.R. Woodcock of Coranex Ltd. in the summer of 1965 (Green, L.H., personal communication). However, the nature or results of his program are not known.

During 1964 and 1965, Arctic Mining and Exploration, under the direction of Jim Snell, conducted ground magnetometer surveys and diamond drilling on the Mack's Copper deposit and reportedly obtained disappointing results.

#### KNOWN COPPER MINERALIZATION

Following are brief summaries of published information on the known copper occurrences in the area, including the Williams and Merrice Creeks area to the north of Carmacks, and The Whitehorse Copper Belt.

##### a) MACK'S COPPER

This property was discovered sometime prior to 1906 and when visited by Cairnes in that year the workings consisted of a 38-foot adit on one hill and an open-cut on the adjoining hill. A sample taken by Cairnes from the face of the adit (probably 4-5 feet wide) assayed 1.80% Cu. and trace in Au and Ag. The best four feet in the open cut assayed 5.55% Cu.,

3.4 oz/ ton Ag and 0.025 oz/tonAu. The mineralization consisted chiefly of magnetite with some hematite, Chalcopyrite, malachite and azurite and occurred in andesite at or near a limestone contact. According to Cairnes (1910b, p.55) "the main mass of mineral is in the form of a small hill of almost solid iron ore, about 200 feet wide, and from 300 to 400 feet long." It is this deposit which was recently traced magnetically and drilled by Arctic and so far as is known the property lay idle for the entire intervening period.

b) GILLTANA LAKE CLAIMS

As in the case of the Mack's Copper occurrence, Cairnes made the first and only published report on this property in 1908. The original claims were staked in 1907 and 1908 on both sides of the lake. On the northwest side of the lake the copper occurred in narrow quartz lenses, up to four feet wide but generally only one to two feet wide, at a granite limestone contact.

On the northeast side of the lake the mineralization occurred in a sequence comprising mica schist, quartzite and limestone, belonging to the Yukon group. Magnetite with associated chalcopyrite and malachite were found as disseminations, and in places, massive bands up to twenty feet thick and from 50 to 200 feet in length. On the Helen Claim,

on Franklin Creek, "streaks of copper ore.....1 to 3 feet thick" were seen.

When visited by Cockfield in 1926 these showings had been idle for many years.

c) WILLIAMS & MERRICE CREEKS

This area is actually situated in the Carmacks Map-sheet, about 25 miles north of latitude 62 degrees N., and just west of the Yukon River. The first lode claim staked was the Bonanza King, on Williams Creek a mile and a half above its mouth. When visited by Cairnes in 1907 it was the only claim that had been developed and the workings consisted of a shaft twenty feet deep on a quartz vein six feet wide, and an adit forty feet long. The copper minerals were bornite, chalcopyrite and malachite, and the vein occurred in granite near the contact with an altered, schistose diabase. Average samples assayed 3.29 to 4.21% Cu and trace in Ag and Au.

Returning to the area in 1909, Cairnes (1910 a, pp. 57-60) found that prospectors had been quite active. The mineralization occurred in all cases at or near contacts between granite and amphibolite (altered diabase.) Very little outcrop was present and the mineralization that was found was confined to quartz veins. The following claims were described in detail;

- (1) BONANZA KING: On Nancy Lee Creek, a tributary of Williams Creek. The adit mentioned in 1907 had been extended to a length of 150 feet while the shaft had been deepened to 30 feet. Both veins had a strike of N45W and appeared to be different structures.
- (2) DAWSON: a 40 foot drift followed a quartz vein less than two feet wide. The ore was described as resembling that on the Bonanza King.
- (3) MONTE CRISTO: also on Nancy Lee Creek. The vein was exposed by trenching in only one place and was five feet wide, assaying 1.0% Cu, 0.2 oz/ton Ag and 0.01 oz/ton Au.
- (4) HOMESTAKE: on the south side of Merrice Creek, two and a half miles above the Yukon River. Several narrow veins, up to 10 inches wide, were found on surface and in an adit which, including several short cross-cuts, was 155 feet long. The main vein was 76 inches wide on surface and varied from 12 to 55 inches in width in the adit, striking N83E and dipping about 50 degrees northwest. Other veins and quartz lenses occurred elsewhere on the property. An average surface sample from the main vein assayed 0.28% Cu., 0.01 oz/ton Au., and trace Ag. An average

sample from the other surface showings assayed 0.92% Cu, 0.05 oz/ton Au and 1.3 oz/ton Ag. As on the other claims outcrop was scanty and the mineralization similar in appearance.

d) WHITEHORSE COPPER BELT

The copper deposits around Whitehorse were discovered in 1897 and first staked in 1898. Between 1900 and 1915 some 13 million pounds of copper were produced from high-grading operations. Little further interest was shown, until after World War Two, in the possibility of developing a milling operation. Since early 1963 New Imperial Mines have conducted a vigorous exploration program which has succeeded in proving a published reserve of 5.5 million tons grading 1.2% Cu., and construction of a 2,000 ton mill is currently underway.

The geology of the Whitehorse copper belt has been well described by McConnell (1909), Kindle (1964) and others. The deposits are associated with the contact between a Cretaceous granitic stock and upper Triassic sediments of the Lewes River group. The Lewes River group consists of greywacke, arkose, limestone, quartzite, argillite and slate, all of which have undergone contact metamorphism.

The stock appears to be an outlier, 20 miles long and 10 miles wide, of the main Coast Range batholith from which it is separated by a distance of 8 miles. It is a grey, coarse-grained hornblende granite but locally ranges in composition from quartz monzonite to granodiorite to diorite.

Most of the significant deposits are associated with the east side of a northwest trending belt of limestone and associated strata, 11 miles long and a half mile wide, which is caught up as a roof pendant within the stock. This belt is folded and faulted along northwesterly trending axes. The deposits are probably from late lower Cretaceous to early upper Cretaceous in age. The limestone occurs as discontinuous lenses which locally reach widths up to 500 feet or more.

The copper deposits are of relatively small size, with probably no more than two million tons available to open-pit mining methods in the largest. Most of the copper in the belt is in the form of contact metamorphic deposits, both in limestone and in granite. Some quartz-copper veins also occur and McConnell states that the granite also contains substantial disseminated copper. Also, according to McConnell, where limestone is absent the belt is practically barren.

The granite-limestone contact is in many places obliterated by skarn composed of epidote, garnet, clinopyroxene, tremolite, wollastonite, magnetite and specular hematite.

The copper deposits can be divided into two types:-

- a) chalcopyrite and bornite associated with magnetite, and
- b) chalcopyrite and bornite associated with skarn minerals and some magnetite, pyrite, and pyrrhotite. Also present in small amounts are malachite, azurite, chrysocolla, and native copper with practically no gossan remaining since the last glaciation.

Thus, not all the copper deposits are strongly magnetic, nor are all the magnetic anomalies associated with copper deposits.

#### RECOMMENDED EXPLORATION PROGRAM

a) GENERAL:

The Mack's Copper, Giltana Lake, and Williams Creek occurrences have no economic importance themselves, but they are significant in that they indicate widespread copper mineralization. It is likely that any copper deposits found in the area will be of the contact-metasomatic type although the possibility exists of finding a large disseminated occurrence, either in granite or in older volcanics or sediments.

The area to be explored is about 65 miles long and 40 miles wide, or about 260 square miles. The initial program is designed to provide background geochemical

information and narrow the target to areas containing limestone older than the Coast Range Batholith and in close proximity to it. The eastern margin of the batholith is very irregular with numerous outliers and probably much of the initial target area is underlain by granite rocks at shallow to moderate depths. Enough mapping should be done along the margins of the batholith to detect major changes in composition but the majority of the geological work will be regional helicopter reconnaissance with local detailed follow-up mapping. This mapping will be used to guide reconnaissance silt and soil geochemical sampling along favourable belts.

The entire initial field program will aim at:

- (1) Providing the necessary background information with which to evaluate the aeromag results when they are released.
- (2) Locate geochemically any copper - rich areas which are present but which may not be magnetically anomalous.

Phase II of the program would be the staking of all magnetic anomalies within favourable zones delineated by phase I and could vary from a few to many. Phase III would possibly involve further airborne magnetometer and (or) E.M. surveys, ground geophysics and geochemistry, and, finally, diamond drilling of suitable targets. Only Phase I, the initial program is considered at this time.

b) DETAILS OF PHASE I

- CREW:- (a) One senior geologist to direct soil samplers and do reconnaissance geological mapping and write report.
- (b) One junior geologist (student) to help with mapping in selected areas and assist in preparation of map and sample records.
- (c) Four soil samplers (high school or first year university students)
- (d) Cook and bullcook.

LOGISTICS:-

- (a) Work from two camps starting with one around Long Lake and moving later to about 61 degrees 42'N, 137 degrees 03'W.
- (b) Charter Bell G2 helicopter for six weeks. Will require some fixed-wing charter time to ferry supplies and gas.
- (c) Establish radio communications from the camp to Whitehorse via Aishihik or Carmacks.
- (d) Field work will take about 6 to 8 weeks and the senior and junior geologist will require another two weeks to complete maps and reports. Start field work around middle of June.
- (e) Geochemical analysis can be done locally either by the Whitehorse assay office or under contract to the Atlas Lab. at Ross River.

COSTS

- assume 2 month program

Labour -

senior geologist at \$1000 per month	-	\$2000	
junior geologist at \$600 per month	-	1200	
cook at \$500 per month	-	1000	
bullcook at \$400 per month	-	800	
soil samplers at \$400 per month	-	<u>3200</u>	\$ 8,200
plus 20% c.p.p., holiday pay etc.			1,600
air fares Vancouver-return			1,200

Aircraft Charter

1 bell G.2 helicopter (6 weeks)	-	12,000
fixed-wing charter	-	1,400

Camp

(10 men including helicopter crew)	-	
tents, sleeping bags, equipment	-	2,500
food	-	2,500

Geochemistry

supplies	-	500
contract analysis [ ] = 7		5,000

Professional services,

	-	<u>1,500</u>
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TOTAL \$36,400

5  
 air photos - 500<sup>xx</sup>  
 vehicle - 1000<sup>xx</sup>  
 claim staking 5000<sup>xx</sup>  
 reserve 5000<sup>xx</sup>  
 approx. 50,000<sup>xx</sup>  
 total            R.C.P.

Respectfully submitted,

  
 R. J. Cathro

REFERENCES

BOSTOCK, H.S.

- 1936: Carmacks District, Yukon; Geol. Surv.  
Canada, Memoir 189.

BOSTOCK, H.S. & LEES, E.J.

- 1938: Laberge Map-area Yukon; Geol. Surv. Canada,  
Memoir 217.

CAIRNES, D.D.

- 1908: Report on portions of the Yukon Territory,  
chiefly between Whitehorse and Tantalus;  
Geol. Surv. Canada, Sum. Rept. 1907.
- 1909: Preliminary Report on a portion of the Yukon  
Territory, west of Lewes River and between the  
Latitudes of Whitehorse and Tantalus;  
Geol. Surv. Canada, Sum. Rept., 1908
- 1910 a: Williams and Merritt Creeks; Geol. Surv.  
Canada, Sum. Rept., 1909.
- 1910 b: Preliminary Memoir on the Lewes and Norden-  
skiold Rivers Coal District; Geol. Surv.  
Canada, Memoir 5.
- 1915: Explorations in Southwestern Yukon; Geol.  
Surv. Canada, Sum. Rept., 1914, pp 10-13
- 1917: Southwestern Yukon: Geol. Surv. Canada, Map 154A

COCKFIELD, W.F.

- 1927: Aishihik Lake District; Geol. Surv. Canada,  
Sum. Rept. 1926, pp 1-13.

REFERENCES CONT'D.

GREEN, L.H.

- 1965: The Mineral Industry of the Yukon, 1964; Geol. Surv. Canada, Paper 65-19 pp 40-41.

GREEN, L.H. & GODWIN, L.H.

- 1963: Aishihik Map-Area; Geol. Surv. Canada, Unpublished Aerial Reconnaissance.
- 1964: The Mineral Industry of the Yukon; 1963; Geol. Surv. Canada, Paper 64-36, pp.33-39.

KINDLE, E.D.

- 1953: Dezadeash Map-area, Yukon Territory; Geo. Surv. Canada, Memoir 268.
- 1964: Copper and Iron Resources, Whitehorse Copper belt, Yukon Territory, Paper 63-41.

MULLER, J.F.

- 1958: Kluane Lake Map-area, Yukon Territory; Geol. Surv. Canada, Paper 58-9.

McCONNELL, H.C.

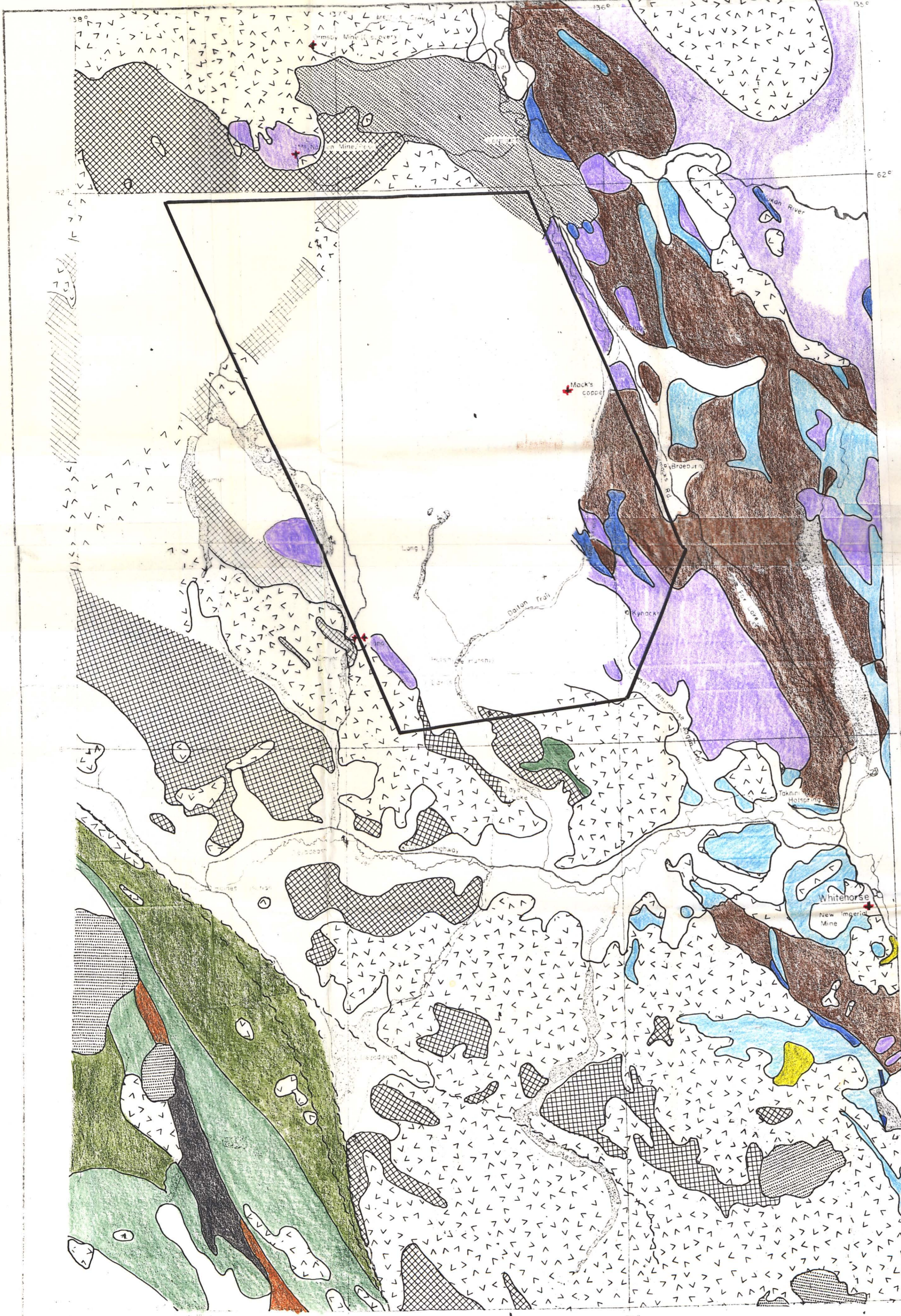
- 1909: The Whitehorse Copper Belt, Yukon Territory; Geol. Surv; Canada, Report 1050.

TYRELL, J.B.

- 1901: Yukon District; Geol. Surv. Canada, Ann. Rept. 1898, vol. XI, pp 36-46.

WHEELER, J.O.

- 1961: Whitehorse Map-area, Yukon Territory; Geol. Surv. Canada, Memoir 312.

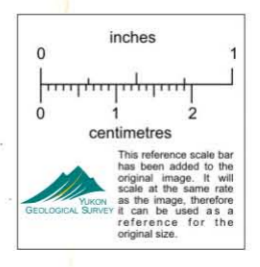


**LEGEND**

- Cenozoic**
  - Quaternary - Miles Canyon Basalts
  - Tertiary Volcanics
  - " Sediments
- Mesozoic**
  - Cretaceous - Coast Range Batholith
  - " - Hutshi group volcanics
  - Lower " - Dezadeash group - sediments
  - " " & upper Jurassic Tantalus formation sediments
  - " Jurassic - Laberge group sediments
  - " " & upper Triassic - Mush Lake group - volcanics and sediments
  - Upper Triassic - Lewes River group - volcanics and sediments
- Precambrian - Palaeozoic**
  - Carboniferous or Permian - Kaskawulsh group sediments
  - Yukon group - Metamorphosed sediments

(Kynocks) - Abandoned Road House  
 + - Known Mineral Occurrence

AREA OF PROPOSED EXPLORATION



**AISHIHIK AREA**  
 CONSULTING GEOLOGICAL ENGINEERS  
 As Shown