

Report on Hop-Acme Claims

Aishihik 115-H-7

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24 November 1978

092058

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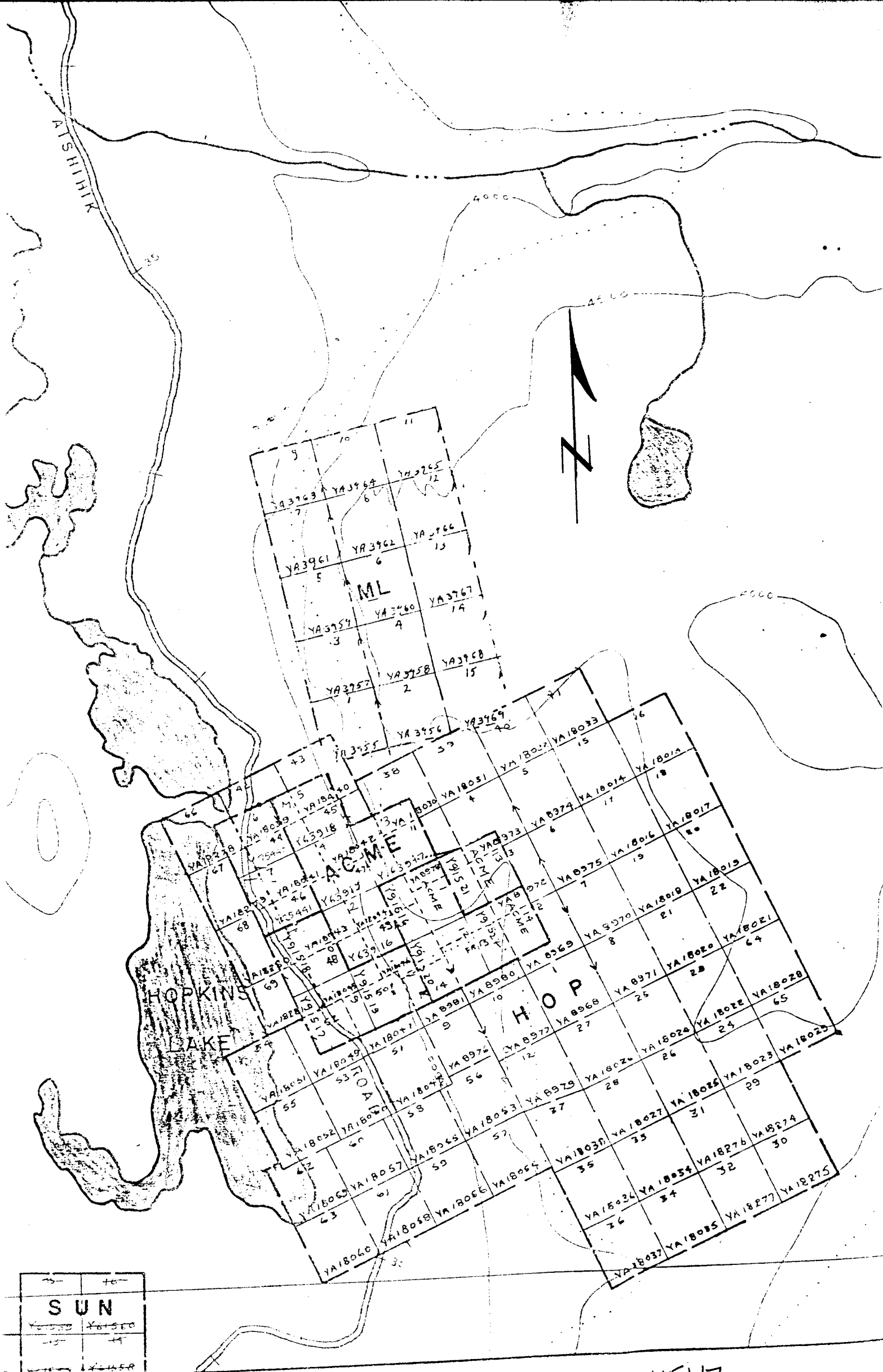
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35	40
SUN	
Y61550	Y61550
Y61550	Y61550
Y61550	Y61550

HOP CLAIMS GROUP - 115H7
 1" = 1/2 Mile (FIG. IV) (JULY, 1977)

Introduction

During the summer of 1978 exploration was conducted by Whitehorse Copper Mines Ltd. on the Hop and Acme claims, Mile 32 of the Aishihik road 115-H-7. The purpose of the program was to locate possible extensions of mineralization intersected during the 1977 drill program.

Approximately twenty-five line miles of ground magnetics (G-816 Proton Mag), a test I.P. survey, a small amount of geological mapping, and four B.Q. diamond drill holes aggregating 2289' were completed.

This report generally describes results of the 1978 program and should be used in conjunction with the W.H.C.M. report on the area by D. Tenney 1977.

General Geology

The property lies within the Yukon Crystalline Complex tectonic sub-division of the Intermontone Belt. Schists of the Yukon Metamorphic Complex which are believed to be of early Paleozoic or Precambrian age are intruded by granitic plutons and associated dykes of Triassic to Cretaceous age. Petrographic studies of various rock and ore types are included as appendix V.

a) Biotite Muscovite Schist

The Schist Unit has the greatest areal extent. Schists are brown weathering strike northwesterly and dip gently (10 - 20) to the northeast. Locally the schists are garnetiferous and may be highly silicified. Rarely they are locally contorted.

Conformable marble lenses occur within the schist unit. Both are considered to be early Paleozoic or Precambrian. No fossils have been reported in the marble unit. The lenses range in thickness from a few feet to hundreds of feet, and have lateral dimensions from tens of feet to thousands of feet. Carbonate minerals have largely been replaced by tremolite and quartz.

b) Skarn

Skarn development occurs mainly near the contact of schist and marble. In these zones the marble has been replaced by epidote, garnet, diopside, actinolite and serpentine. Locally chalcopyrite, bornite, pyrrhotite and magnetite are present.

Sulphide mineralization was not found to occur where tremolite and quartz were the main metasomatic constituents but did occur where these were replaced by the above mentioned green silicate skarn minerals. Skarn development with accompanying mineralization may have resulted from regional metamorphism rather than the emplacement of the nearby intrusive.

c) Intrusives

On the north side of the property the schist has been intruded by a pluton ranging in composition from granite to quartz diorite. The intrusive has a high magnetic intensity relative to the surrounding schists. Government airborne magnetic maps indicate that the intrusive suboutcrops over an area four miles by one and one-half miles. Samples of quartz diorite from a peak within this magnetic high two miles east of the property contained

disseminated magnetite.

The area of intrusive north of the Hop claims is held by Mitsubishi Mining Corp. Occasional flakes of molybdenum and disseminated chalcopyrite are associated with small scattered quartz veins in the intrusive.

d) Dykes

All other units on the property are cut by dykes ranging in composition from granitic to basic with grey feldspar (Plageoclase) being preponderant. The dykes appear to be generally steeply dipping although others (see TH-12) may be nearly conformable. The dykes have a high magnetic intensity relative to the schist with the basic dykes yielding the highest magnetic readings.

The numerous occurrences of dykes in outcrop and drilling suggest that the dyke content of a particular block of "ore" may account for nearly half the volume of the block.

Magnetometer Results

Areas underlain by the main intrusive or dykes have a higher magnetic background than those underlain by schist. The large magnetic high centered at approximately 16 NE, 15 NW, is believed to be caused by magnetic diorite, as is that on line 40 NE 36 NW. These areas are within the area of the large magnetic high on the government airborne magnetic sheet.

The strong magnetic highs on line 12 SW and near TH 1 and TH 2 are caused by magnetite skarns.

Detailed magnetic surveys in the areas of proposed drill sites were of some help in ensuring that the hole was in schist at bedrock. Generally areas below 58,000 gammas were underlain by schist although in areas of deep overburden TH 10 (100') and TH 14 (60') the dykes were not detected.

I.P. Test Survey

An I.P. test survey was run on line 20NE, from 20 NW to the baseline, to determine whether the magnetic high was in fact caused by the intrusive. Chargeability readings were low (4-5 MS) over the magnetic high and rose sharply to four or five times these values from approximately 5 NW to the baseline (schist).

A plot of these results has not been received from the contractor (P. Walcott) and is not included in the report.

It is felt that the high chargeability background over the schists would prevent the detection of sulphide mineralization at depth.

Drilling Results

The drilling program in 1978 was designed to determine whether a large tonnage copper mineralized zone could extend from known mineralization detected in 1977. All holes were drilled at -90°. (Favourable contact dips at -10° NE). Direct costs of the program were approximately \$23.50/ft.

TH 12 was drilled to test the down dip extension of low grade copper magnetite skarn near the cliffs at 11 SW - 2 NW, and the possible northern extension of mineralization in holes TH 4 and TH 6. While the favourable schist marble contact was intersected

at the projected depth little sulphide mineralization was present. The best assays were 0.7' at 2.42% copper and 1.5' at 1.38% copper.

TH 13, one thousand feet southeast of TH 12, also intersected the favourable contact. Ten feet of barren magnetite occurred near the contact. The best assays in other skarn sections were 1.2' at 0.25% copper and 4.2' at 0.36% copper.

TH 14, drilled 1300' NE of TH 7 was in dyke at bedrock and was abandoned.

TH 15 layed out to test the down dip extension of the horizon intersected in TH 7 and TH 13 was drilled 300' past the projected schist marble contact without intersecting it. Several amphibolite bands of up to ten feet in thickness were intersected. One band containing pyrrhotite, pyrite and chalcopyrite assayed 9.8' at 0.20% copper with only traces of nickel.

Summary and Recommendations

Fifteen holes aggregating 5862' were drilled by W.H.C.M. in 1977-1978 to test a gently dipping copper bearing skarn zone near mile 32 of the Aishihik road 115-H-7. Approximately \$130,000 has been spent on the property to date.

Eleven holes were drilled through the favourable contact, only three of which (TH 2, TH 4, and TH 6) intersected "ore" grade - width mineralization. Three holes were abandoned in dykes, one abandoned in a fault (TH 5) and two holes (TH 11 and TH 15) drilled past the projection of the horizon failed to intersect it. Results of TH 11 and TH 15 suggest that the marble horizon pinches out at depth or is faulted. The former interpretation is favored since no evidence of major faulting was observed in outcrop or in the core nor is it suggested by the magnetometer results.

No further work is recommended for the following reasons:

1. The grades and thicknesses of mineralization intersected in drill holes or observed in surface showings are erratic and generally sub economic.
2. The large number of post ore dykes present indicate that they could account for nearly half the volume of any "ore" block outlined.
3. Dykes also add to drilling costs. In areas of deep overburden they cannot be detected by ground magnetics. Since the dykes are generally steeply dipping holes which are in dyke at bedrock should be abandoned.
4. The area north of TH 4 and TH 6 and south of TH 12 and TH 13 where mineralization may occur is considered too small - based on intersected widths and grades - to contain a zone which could be mined economically in the Aishihik area.
5. Testing the area northeast or south of TH 15 for the presence of the mineralized contact would require drilling holes in excess of 1000' deep. Evidence from TH 11 and TH 15 suggests that the marble unit may not exist under the schists in these areas. If the horizon is present mineralization associated with it would probably be uneconomic.
6. The core was checked for scheelite only trace amounts of tungsten were detected in assays.

References: D.J. Templeman - Kluit
G.S.C. Paper 73 - 41
D. Tenney
Report on Hop Claims
Aishihik 115-H-7 1977

APPENDIX V

STUDY BY JACK H. L. MILLER
U.B.C.

B. Aishihik Property

Table II shows some of the results of the petrographic analysis. More detailed information is contained in Appendix B.

All percentages and grain size values in the following descriptions were determined by visual estimate.

MAGNETITE

Magnetite forms anhedral to subhedral grains which have rounded, very irregular grain boundaries with all sulphides except bornite. Crude magnetite-rich bands were observed in specimens TH-4, TH-11 and TH-15. Generally the magnetite is fractured more than any of the other opaques. In specimens TH-11 and TH-15, the fracturing is sub-parallel to the banding. Also, in these two specimens, magnetite becomes so predominant as to make all the sulphides and gangue interstitial to it.

PYRRHOTITE

Pyrrhotite forms anhedral grains which have rounded irregular contacts with all the other sulphides except bornite. Specimen TH-4 has a pyrrhotite-rich band with the other opaques and gangue as interstitial minerals. Pyrrhotite- and chalcopyrite-rich bands occur in specimens TH-9 and TH-15 with interstitial gangue and other opaques, excluding pyrite.

Pyrrhotite fills fractures in the gangue, pyrite and the more fractured magnetite. Sphalerite, chalcopyrite and bornite are all slightly less fractured than the pyrrhotite.

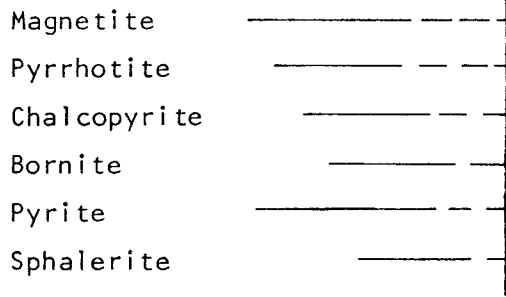
CHALCOPYRITE

Chalcopyrite occurs as anhedral blebs having mutual grain boundaries with all the other sulphides. About 95 percent of the grains in contact with gangue have irregular rounded grain boundaries. The remaining

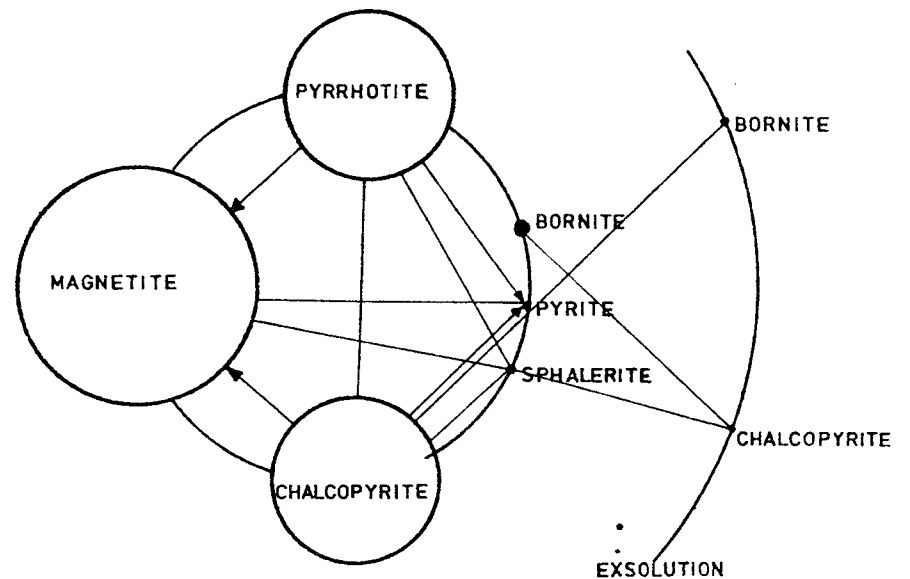
TABLE II

Mineral	TH-4			TH-9			TH-11			TH-15						
	Volume %	Grain size (mm)			Volume %	Grain size (mm)			Volume %	Grain size (mm)						
Magnetite	21	2.0	0.01	0.30	2	0.78	0.01	0.04	73	3.0	0.02	0.50	25	1.80	0.05	0.60
Pyrrhotite	23	3.0	0.01	0.20	5	0.40	0.03	0.08	7	2.0	0.01	0.10	9	0.50	0.01	0.07
Chalcopyrite	16	4.0	0.01	1.0	12	0.60	0.01	0.20	8	2.0	0.01	0.20	5	0.70	0.01	0.04
Bornite	trace	--	--	0.01	--	--	--	--	2	0.09	0.01	0.03	--	--	--	--
Pyrite	--	--	--	--	1	0.50	0.01	0.08	--	--	--	--	1	0.80	0.01	0.03
Sphalerite	trace	--	--	0.05	trace	0.08	0.01	0.03	--	--	--	--	--	--	--	--
Total	60				20				90				40			

Summarized Paragenetic Sequence



VandeVeer Diagram



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grains have very jagged, irregular grain boundaries due to minute lathes, averaging less than 0.01 mm. in diameter and 0.02 mm. in length.

Chalcopyrite also occurs as minute exsolution lathes, averaging less than 0.01 mm. in diameter and 0.02 mm. in length, in bornite. Rounded exsolution blebs averaging less than 0.01 mm. in diameter were found within sphalerite.

Chalcopyrite was seen filling fractures within gangue.

Twinning occurs within the chalcopyrite as irregular shaped lathes in both length and width. These lathes occur at various orientations to one another. The twinning is probably the end result of deformation.

BORNITE

Bornite occurs as anhedral blebs with irregular exsolution lathes of chalcopyrite. Minute irregular exsolution lathes of bornite occur within the chalcopyrite. Bornite was not seen in contact with any of the other oxides or sulphides.

Approximately five percent of the grain boundaries in contact with gangue have minute lathes, averaging less than 0.01 mm. in diameter and 0.01 mm. in length, protruding into the bornite. The remaining bornite-gangue boundaries are irregular and rounded.

PYRITE

Pyrite occurs as anhedral grains with very irregular grain boundaries with pyrrhotite and chalcopyrite and irregular boundaries with magnetite. Some grains are cut by fractures filled with both chalcopyrite and pyrrhotite.

Pyrite grains are sometimes interstitial to magnetite but primarily occur as grains with the other sulphides filling the interstitial spaces.

Chalcopyrite, sphalerite, pyrrhotite and bornite are all less fractured than the pyrite while the pyrite is less fractured than the magnetite.

SPHALERITE

Sphalerite occurs predominantly as anhedral blebs with rounded irregular boundaries with chalcopyrite, pyrrhotite, magnetite and rounded exsolution blebs of chalcopyrite. Occasionally, rounded anhedral exsolution blebs of sphalerite occur within the chalcopyrite.

Sphalerite was seen filling fractures within the gangue.

GANGUE

In general the gangue-magnetite and gangue-pyrite grain boundaries are rounded and irregular. Approximately 95 percent of the gangue-chalcopyrite, bornite and pyrrhotite grain boundaries are irregular and rounded. The other five percent of the boundaries have very irregular jagged lathes, averaging less than 0.01 mm. in diameter and 0.01 mm. in length, protruding into the sulphides.

PETROLOGY

Eleven thin-sections were made from core samples of the Aishihik property. Each was examined under the petrographic microscope and visual estimates made of the volume percent and grain size of the minerals present.

The following pages give volume estimates of minerals and megascopic features of the hand specimen. Visual volume estimates of the minerals, grain size and microscopic features are also included in each petrographic description.

THIN SECTION

HOLE THZ - 72.5'
(#22 MICA SCHIST)

Specimen Number TH-1

Name Quartz-Phlogopite Schist

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Biotite	10
	Muscovite	5
	Quartz	95
	Opagues	trace

COMMENTS:

The specimen has off-white to medium grey bands. Micaeous minerals are aligned which produces a schistosity which gives the rock this banded appearance. Mica flakes average 0.3 mm in diameter while quartz averages 0.1 mm in diameter. Opagues occur as disseminated blebs averaging less than 0.05 mm in diameter.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Quartz	55	
	Phlogopite	15	
	Muscovite	7	
	Plagioclase (An ₃)	5	
	Chlorite	3	
	Altered Feldspar	10	
	Opagues	5	
	Sphene	trace	
COMMENTS:	Apatite	trace	

The specimen exhibits a schistosity marked by the sub-parallel orientation of mica flakes. Large anhedral quartz grains are elongated parallel to the schistosity. Compositional layering, marked by varying concentrations of opagues and phlogopite as opposed to quartz and muscovite, also occurs parallel to the schistosity.

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TH-1 (continued)

Granulose quartz cuts the schistosity and layering at an acute angle. Quartz occurs as large undulatory anhedral blebs, averaging 1.5 mm in diameter, and as granulose quartz, averaging less than 0.01 mm in diameter.

The micas average 0.02 mm in thickness and 0.1 mm in diameter. Chlorite does not occur in contact with muscovite. Some of the mica books are slightly bent, indicating that some grains are pre-kinematic and others post-kinematic.

Altered feldspar grains average 0.8 mm in diameter and are badly clouded by minute alteration minerals.

Apatite occurs as 0.01 mm rounded anhedral blebs within the quartz.

THIN SECTION

HOLE TH2 79.5'
LOG - "2 a +"

Specimen Number TH-2

Name Potassium Feldspar-Quartz-
Diopside HornfelsHANDSPECIMEN

MODE:	Mineral	Volume Percent
	Quartz	40
	Feldspar (?)	35
	Mafics	20
	Opaques	5

COMMENTS:

The specimen is white to off-white with irregular patches and crude banding of opaques and medium to dark grey-green mafics. The rock is fine to medium grained, averaging 0.8 mm in diameter. All minerals are anhedral giving the rock an overall granitic appearance.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Quartz	18	
	K-feldspar	50	
	Diopside	12	
	Chlorite	10	
	Opaques	5	
	Alteration Minerals	3	
	Carbonate	2	

COMMENTS:

Crude banding marked by compositional differences is seen.

Quartz occurs as granulose anhedral grains averaging 0.01 mm. in diameter. This sometimes is clouded by alteration minerals. Crude bands of granulose quartz were seen.

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TH-2 (continued)

Potassium feldspar occurs as anhedral grains averaging 0.2 mm in diameter, clouded by alteration minerals. Crude bands of potassium feldspar were observed.

Diopside occurs as anhedral lathes averaging 0.03 mm in diameter and 0.08 mm in length. The lathes are randomly oriented and grouped into clusters.

Opaques occur as ragged anhedral grains, averaging 0.03 mm in diameter, irregularly scattered throughout the specimen.

Chlorite and carbonate are irregularly scattered in interstices throughout the specimen and have an average grain size of less than 0.01 mm.

THIN SECTION

HOLE TH 2 85'
Log - 2 a d

Specimen Number TH-3

Name Diopside-Anorthoclase Hornfels

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Pyroxene	80
	Feldspar	11
	Chlorite	5
	Opagues	3
	Carbonate	1

COMMENTS:

The specimen is light to medium grey-green with white and dark green to black patches. Grain size is fine grained, averaging about 0.5 mm. Radiating pyroxene lathes occur locally scattered throughout the specimen. Disseminated pyrite and traces of chalcopyrite also occur in the specimen.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Diopside	62	
	Anorthoclase	20	
	Epidote	6	
	Opagues	5	
	Chlorite	3	
	Zeolite	2	
	Sphene	1	
	Phlogopite	1	
COMMENTS:	Carbonate	trace	

The specimen exhibits a crude banding marked by a cordierite-rich band. Diopside occurs as anhedral to subhedral, randomly oriented stubby lathes, averaging 0.07 mm in diameter and 0.4 mm in length. Some diopside occurs as smaller anhedral crystals interstitial to the larger lathes.

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TH-3 (continued)

Anorthoclase forms anhedral grains averaging 0.7 mm in diameter which contain many minute inclusions giving the grains a dirty, clouded appearance.

Zeolite predominantly occurs as an interstitial mineral in contact with the opaque minerals in the form of anhedral blebs averaging 0.1 mm in diameter. It occurred in very few locations in the slide, making the exact mineral name impossible to obtain.

Opaque minerals occur on the average as 0.1 mm anhedral blebs, interstitial to the larger diopside and cordierite grains.

Actinolite occurs as interstitial patches, containing rosettes of minute lathes. These lathes are less than 0.01 mm in diameter and 0.01 mm in length.

All the other minerals occur as anhedral blebs, averaging 0.01 mm in diameter, interstitial to the other minerals.

THIN SECTION

HOLE THZ
114', Log 2a

Specimen Number TH-5

Name Tremolite-Magnetite Skarn

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Magnetite	10
	Mafics	90

COMMENTS:

The specimen is aphanitic with mottled medium blue-grey to dark grey colouring. Anhedral patches, averaging 0.8 mm in diameter, of pale grey-green occur, with euhedral to subhedral crystals of magnetite.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Tremolite	100	

COMMENTS:

No magnetite was seen in the thin section.

The thin section consists of a very fine mass of tremolite, averaging 0.01 mm in diameter and 0.03 mm in length, irregularly oriented with local patches of tremolite averaging 0.5 mm in length and 0.15 mm in diameter.

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THIN SECTION

HOLE TH 2 105'
LOG 3E

Specimen Number TH-6

Name Diopside-Actinolite Skarn

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Felsic	90
	Mafic	10

COMMENTS:

The specimen is white to pale green with irregular patches of dark green mafic minerals. A fracture set appears to be developed at about 4 degrees relative to the drill hole.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Diopside	92	
	Actinolite	8	

COMMENTS:

The specimen consists of large anhedral crystals of diopside, averaging 3 mm in diameter, with smaller crystals, averaging 0.3 mm in diameter, filling in between the larger crystals. Actinolite occurs as elongate lathes, averaging less than 0.01 mm wide and 0.06 mm in length, filling irregular fractures and occasional interstices in the diopside.

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THIN SECTION

HOLE TH 2 - 120'
L 09 3/15

Specimen Number TH-7

Name Altered Ultramafic

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Mafics	85
	Magnetite	10
	Pyrrhotite	2
	Chalcopyrite	3

COMMENTS:

The rock is aphanitic and black in colour. Opaques occur as anhedral grains, averaging 1 mm in diameter, scattered irregularly throughout the specimen.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Olivine	35	
	Opaques	30	
	Serpentine	25	later deuteric
	Tremolite	10	
	Talc	trace	

COMMENTS:

This specimen has no banding and resembles a honeycombed mass cut by very small fractures filled with alteration minerals and occasionally interrupted by patches of minerals.

TH-7 (continued)

Olivine occurs as anhedral patches criss-crossed by serpentine and opaques. Sometimes, adjacent patches are in optical continuity.

Opaques occur as anhedral jagged masses ranging in size from less than 0.01 mm to 2 mm. Olivine does not contain any of these opaque minerals. Opaques predominantly occur in the serpentine as finer grains while the larger masses occur in the interstices of the tremolite.

Tremolite occurs as patches of anhedral lathes irregularly oriented and averaging 0.03 mm in diameter and 0.06 mm in length. Occasionally serpentine cuts across the tremolite lathes along irregular fractures.

Serpentine occurs as minute lathes, less than 0.01 mm in length, perpendicular to the fracture surface or as an irregular mass.

Talc occurs as an irregular mass of minute grains, less than 0.01 mm in length, in the interstices of tremolite or in contact with serpentine.

THIN SECTION

HOLE THZ 134.5'
 Log Sch/3

Specimen Number TH-8

Name Quartz-(Hedenbergite-Diopside)
 Schist

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Quartz	40
	Feldspar	28
	Mafics	30
	Opaques	2

COMMENTS:

The specimen has mafic-rich and quartzo-feldspathic-rich bands averaging 2.0 mm in thickness. The overall grain size is approximately 0.3 mm with the mafic-rich bands being slightly finer grained than the felsic-rich bands. A calcite vein averaging 0.5 mm in diameter cuts through the banding at approximately 90 degrees. Pyrite and traces of chalcopyrite occur as disseminations and are locally concentrated along fractures sub-parallel to the above vein.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Quartz	60	
	Hedenbergite-diopside	20	
	Actinolite	9	
	Carbonate	5	
	Epidote	3	
	Opaques	2	
	Feldspar	1	
	Chlorite	trace	
Vein	Carbonate	90	
	Quartz	7	
	Opaques	3	

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TH-8 (continued)

COMMENTS:

The vein, averaging 1 mm in diameter, cuts across the compositional layering at an acute angle. Finer veinlets splay out from the larger vein and cut across the compositional layering at 90 degrees. The opaques occur scattered throughout the vein and are anhedral grains averaging 0.05 mm in diameter. Quartz occurs as granulose grains averaging 0.01 mm in diameter.

In the main rock, quartz occurs as 0.1 mm anhedral grains with a cloudy dusty appearance due to minute inclusions. All other minerals are interstitial to the quartz grains.

Hedenbergitediopside was used as the name for the clinopyroxene in the slide because it displayed characteristics of both of these end members. This mineral occurs as anhedral blebs, averaging 0.05 mm in diameter. Actinolite occurs as an encasing fringe around most of the grains.

Feldspar grains, averaging 0.02 mm in diameter occur irregularly scattered throughout the specimen and exhibit a checker-board extinction pattern.

Anhedral to subhedral opaque grains average 0.02 mm in diameter near the vein while anhedral opaques average less than 0.01 mm in diameter away from the veins.

Actinolite occurs as minute lathes, averaging less than 0.001 mm in diameter and less than 0.01 mm in length, around the pyroxene or in interstices. Occasionally, the crystals form small rosettes, but more usually it occurs as an irregular mass.

All the other minerals occur as anhedral grains averaging less than 0.01 mm in diameter in small interstices between the larger grains.

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THIN SECTION

HOLE TH6
190' Log 3/2 t

Specimen Number TH-10

Name Metacrystic Tremolite-Magnetite
Skarn

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Tremolite-Actinolite	85
	Magnetite	15

COMMENTS:

The specimen varies from a greenish off-white to medium grey-green with patches of anhedral magnetite, averaging 0.5 mm in diameter, irregularly scattered throughout. Tremolite-actinolite forms anhedral lathes, averaging 1 mm in diameter and 5 mm in length, erratically oriented and locally forming partial rosettes.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Tremolite	85	
	Opagues	15	

COMMENTS:

The thin section contains subhedral crystals of tremolite, averaging 1.5 mm in diameter and 4 mm in length, within a very fine grained mass of tremolite which averages 0.005 mm in diameter and 0.05 mm in length. The opaques occur as anhedral blebs within the large crystals and average 0.3 mm in diameter. This may indicate that the opaques have acted as crystallization centres for the large crystals of tremolite

Note: The tremolite must contain some iron to produce the greenish colour in handspecimen.

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Specimen Number TH-12

Name Andesine-Hornblende Porphyry

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Plagioclase	50
	Amphibole	8
	Biotite	2
	Quartz	2
	Felsic Matrix	33

COMMENTS: The specimen is light grey with white and dark grey patches.

Sixty percent of the time the plagioclase occurs as white 1 by 2 mm subhedral lathes. Elsewhere, it occurs as clear anhedral to subhedral crystals averaging 0.8 mm in diameter. Amphibole occurs as subhedral to euhedral crystals averaging 0.5 mm in diameter and 1 mm in length. There is only a trace of biotite books, which average 0.8 mm in diameter. The rest appears to be in the shape of a pseudomorph after an amphibole.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence	Alter.
			An ₄₀ - An ₂₀	Ang
	Plagioclase	30		
	Hornblende	15	_____	
	Chlorite	5		
	Quartz	3	_____	
	Sericite	2		
	Opagues	1		
	Carbonate	1		
	Quartzo-feldspathic Matrix	43		
	Biotite	trace	_____	
	Sphene	trace	_____	

TH-12 (continued)

COMMENTS:

The thin section shows only slight alteration of the feldspars, hornblende and matrix.

2 by 2 mm normally zoned, subhedral to anhedral plagioclase crystals form the largest phenocrysts. Plagioclase, hornblende, biotite, chlorite and quartz form anhedral to subhedral phenocrysts which average 0.7 mm in diameter. The matrix consists of an anhedral mass of quartz, feldspars opaques and some hornblende and chlorite averaging less than 0.01 mm in diameter.

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THIN SECTION

HOLE TH 6
288' Log 396

Specimen Number TH-13

Name Banded Calc-silicate Hornfels

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Quartz	15
	Mafic	65
	Felsic	20
	Magnetite	trace

COMMENTS:

The specimen has milky white felsic-rich, medium grey green mafic-rich and clear white quartz-rich bands, ranging in width from 1 mm to 20 cm. The felsic-rich bands average 1mm in width and are fine grained. The quartz-rich bands average 1 mm in width and are very fine grained. The mafic rich bands average 4 mm in width and are very fine grained. Magnetite occurs as 0.5 mm subhedral blebs disseminated throughout the specimen.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Quartz	24	
	Diopside	30	
	Anorthoclase	15	
	Idocrase	15	
	Carbonate	6	
	Phlogopite	5	
	Epidote	3	
	Sphene	2	

COMMENTS:

There are quartz-rich, diopside-rich, idocrase-rich and anorthoclase-rich bands. Diopside-rich bands do not have any free quartz within the bands but the quartz-rich bands have diopside crystals.

Quartz occurs as fine grained (approximately 0.5 mm in diameter) undulatory grains and as very fine granulose grains (less than 0.01 mm in diameter). The granulose quartz forms crude bands, within the other quartz,

TH-13 (continued)

parallel to the mineralogical banding. This may indicate that some sort of stress regime existed perpendicular to the banding.

Diopside occurs as very fine anhedral blebs averaging less than 0.01 mm in diameter but varying up to 0.08 mm.

Anorthoclase occurs as anhedral blebs, averaging 0.3 mm in diameter, with very minute inclusions erratically scattered throughout.

Idocrase and carbonate occur as anhedral blebs and have the same average grain size as anorthoclase.

Phlogopite occurs as minute grains, averaging less than 0.01 mm in diameter, scattered throughout the specimen.

Sphene occurs as a 0.03 mm subhedral crystal within the quartz-rich band.

Specimen Number TH-14

Name Quartzite with Tremolite veins

HANDSPECIMEN

MODE:	Mineral	Volume Percent
	Quartz	85
	Tremolite-Actinolite	11
	Magnetite	3
	Pyrrhotite	1

COMMENTS:

The specimen is fine grained, with an average grain size of 0.8 mm. It is white to greyish white in colour with very finegrained bands of medium to dark green tremolite-actinolite and magnetite (average grain size is approximately 0.02 mm with a vein diameter of about 3 mm).

Irregular pods of these mafic minerals also occur locally throughout the specimen. Pyrrhotite is disseminated throughout the felsic part of the specimen.

THIN SECTION

MODE:	Mineral	Volume Percent	Paragenetic Sequence
	Quartz	70	
	Tremolite	15	
	Quartzo-feldspathic minerals	7	
	Diopside	2	
	Sericite	3	
	Opakes	2	
	Carbonate	1	

COMMENTS:

A crude banding is marked by the granulose quartz, the quartzo-feldspathic minerals and the elongate nature of the larger quartz grains. Granulose quartz cuts across the banding at approximately 90 degrees, possibly representing a fracture. A tremolite vein cuts across the banding at an acute angle.

TH-14 (continued)

The vein contains tremolite and about two percent opaques. The tremolite must contain some iron because of its greenish colour in handspecimen. Subhedral lathes of tremolite, averaging less than 0.01 mm in diameter and 0.3 mm in length, occur as irregular radiating masses. Anhedral opaque minerals are concentrated on the selvages of the vein.

The host rock consists mainly of anhedral undulatory elongate grains of quartz which average 1 mm in diameter. Granulose quartz, occasionally mixed with feldspars which have been almost entirely altered, has an overall grain size of less than 0.01 mm. These fine grained minerals are interstitial to the larger quartz grains. Diopside and carbonate occur as anhedral blebs, averaging 0.01 mm in diameter, located in the interstices of the large quartz grains.

092038

HOLE TH2 96.5'
 Log 2 adm

POLISHED SECTION

Specimen Number TH-4

MODE:	MINERAL	VOLUME PERCENT	GRAIN SIZE (max/min/avg)	PARAGENETIC SEQUENCE
	Pyrrhotite	23	3/0.01/0.2 mm	-----*
	Magnetite	21	2/0.01/0.3	-----
	Chalcopyrite	16	4/0.01/1	-----
	Sphalerite	trace	0.05	-----
	Bornite	trace	0.01	-----
	Total Sulphides	60		

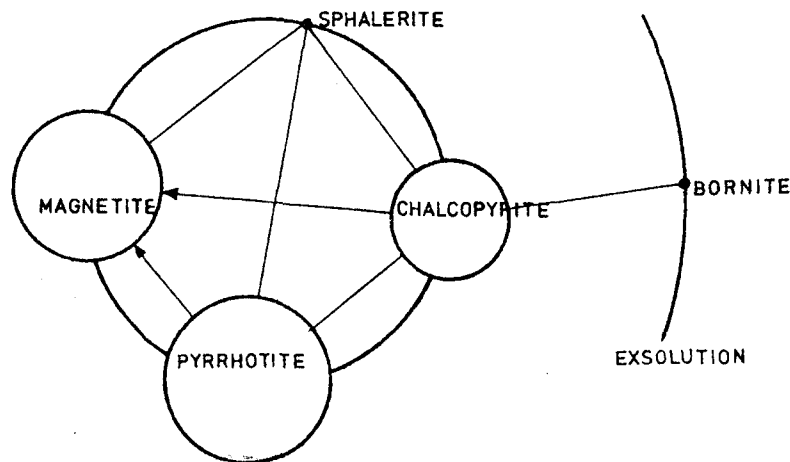
TEXTURE:

Rounded irregular grain boundaries occur between pyrrhotite and chalcopyrite, pyrrhotite and gangue and very irregular rounded boundaries occur between pyrrhotite and magnetite. Approximately 5% of the gangue has a 0.02mm fringe of jagged crystals which project into both pyrrhotite and chalcopyrite. Rounded, anhedral grains of pyrrhotite, chalcopyrite and sphalerite fill fractured areas within the gangue. Magnetite occurs as anhedral to subhedral grains within the gangue, pyrrhotite and chalcopyrite. Rounded irregular grain boundaries occur between the gangue and chalcopyrite. Chalcopyrite also occurs as anhedral blebs within sphalerite. Fine lathes of bornite, less than 0.01 mm wide and 0.03 mm long, occur within chalcopyrite.

Twinning occurs at various angles within chalcopyrite. The twins are irregular in length and width.

In general pyrrhotite and chalcopyrite appear to be less fractured than magnetite. Sphalerite and bornite are not fractured at all.

VANDEVEER DIAGRAM:



083

POLISHED SECTION

Specimen Number TH-9

MODE:	MINERAL	VOLUME PERCENT	GRAIN SIZE (max/min/avg)	PARAGENETIC SEQUENCE
	Chalcopyrite	12	0.6/0.01/0.2 mm	-----
	Pyrrhotite	5	0.4/0.03/0.08	-----
	Magnetite	2	0.08/0.01/0.04	-----
	Pyrite	1	0.5/0.01/0.08	-----
	Sphalerite	trace	0.08/0.01/0.03	-----
	Total Sulphides	20		

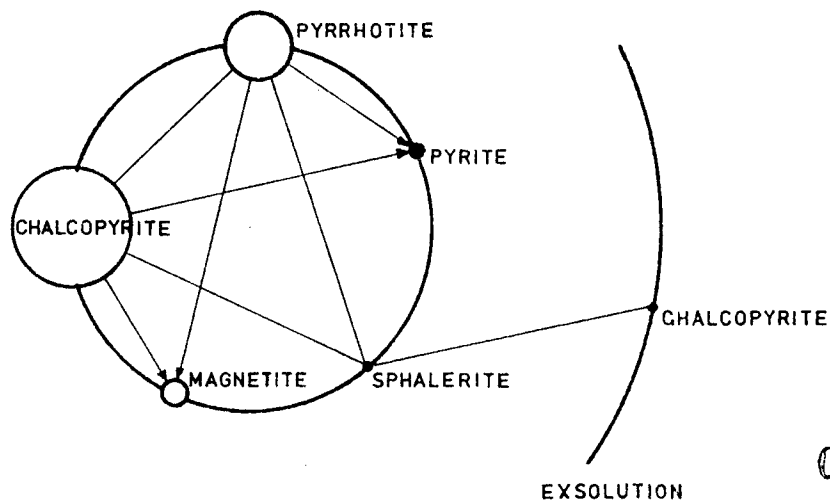
TEXTURE:

Rounded irregular grain boundaries occur between chalcopyrite and pyrrhotite, chalcopyrite and sphalerite, chalcopyrite and gangue, and very irregular rounded grain boundaries occur between chalcopyrite and pyrite and chalcopyrite and magnetite. Less than five percent of the gangue-sulphide grain boundaries have very jagged edges which project approximately 0.02 mm into chalcopyrite and pyrrhotite grains. Pyrrhotite forms rounded irregular grain boundaries with magnetite and very irregular, rounded boundaries with pyrite. Magnetite forms anhedral grains within the pyrrhotite, chalcopyrite and gangue. Sphalerite contains rounded anhedral blebs of chalcopyrite while the chalcopyrite contains anhedral blebs of sphalerite

Twinning at various angles occurs within chalcopyrite.

Pyrrhotite is generally more fractured than chalcopyrite, which is more fractured than sphalerite.

VANDEVEER DIAGRAM:



082

POLISHED SECTION

Specimen Number TH-11

MODE:	MINERAL	VOLUME PERCENT	GRAIN SIZE (max/min/avg)	PARAGENETIC SEQUENCE
	Magnetite	73	3/0.02/0.5 mm	_____
	Chalcopyrite	8	2/0.01/0.2	_____
	Pyrrhotite	7	2/0.01/0.1	_____
	Bornite	2	0.09/0.01/0.03	_____
	Total Sulphides	90		

TEXTURE:

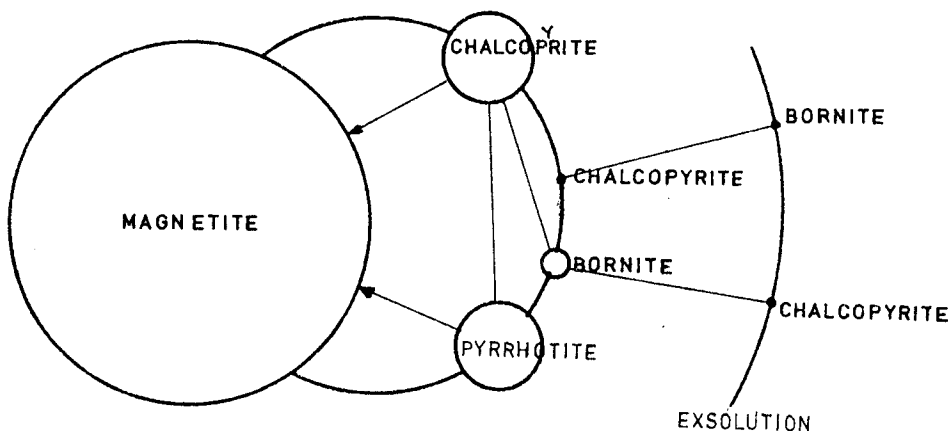
All the opaques, when in contact with one another, have rounded, irregular grain boundaries, except for the minute chalcopyrite exsolution lathes (less than 0.001 mm wide and 0.01 mm long) within the bornite.

Bornite only occurs as blebs within the chalcopyrite.

Chalcopyrite, pyrrhotite and some of the gangue material are interstitial to the magnetite.

The gangue fills fractures in the sulphides and also forms crude bands which have interstitial sulphides. The majority (approximately 90%) of the opaque-gangue grain boundaries are irregular in outline but not jagged. The remainder of the boundaries are jagged with lathes protruding an average of 0.01 mm into the chalcopyrite, bornite and pyrrhotite grains.

VANDEVEER DIAGRAM :



HOLE TH 8 214'
 Log 1da

POLISHED SECTION

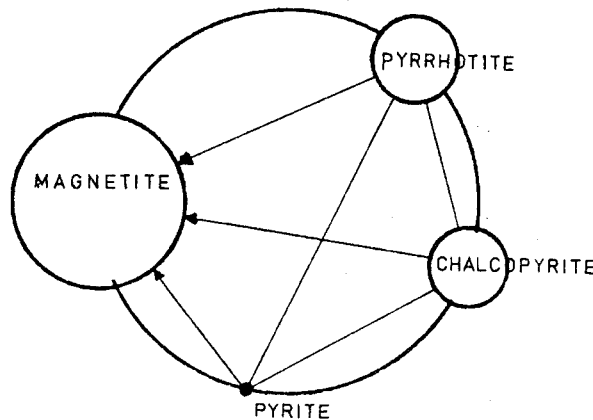
Specimen Number TH-15

MODE:	MINERAL	VOLUME PERCENT	GRAIN SIZE (max/min/avg)	PARAGENETIC SEQUENCE
	Magnetite	25	1.8/0.05/0.6 mm	_____*
	Pyrrhotite	9	0.5/0.01/0.07	_____
	Chalcopyrite	5	0.7/0.01/0.04	_____
	Pyrite	1	0.8/0.01/0.03	_____
	Total Sulphides	40		

TEXTURE:

The specimen has magnetite-rich bands with interstitial pyrite and chalcopyrite, gangue bands and gangue-rich bands with disseminated pyrite and chalcopyrite. These bands are sub-parallel to fractures seen within the magnetite crystals. The grain boundaries between all the sulphides are rounded and irregular. Veinlets of pyrite, pyrrhotite and chalcopyrite, varying in diameter from 0.03 to 0.4 mm and averaging 0.06 mm, cut through magnetite grains at various angles. Ninety percent of the time, the orientation is sub-parallel to the banding and fracturing. About forty percent of the total length of these veinlets have a core of gangue with the opaque minerals concentrated on the selvages. Lathes of gangue, averaging less than 0.01 mm in diameter and approximately 0.02 mm in length, occur with the chalcopyrite but are concentrated around the perimeter of the grain.

VANDEVEER DIAGRAM:



092038

FOOTAGE			ROCK CLASSIFICATION Epid, Diop, Garn, Serp, Qtz/Sil, Actino, Tremo, Chlo, Crystalline, Shearing, Veins, Fracturing, Foliation, Grain Size, Texture	MINERALIZATION		ASSAY DATA						
From	To			TYPE	%	Sample No.	Width	Recov.	%Cu	%Fe	Moly	Au/Ag
374.7	386	S	grey silicified schist gen 70°									0.2/100 ppb
386	392	S	schist being replaced by pale green (diopside? - epidote?) hornfels									
392	393.5	3d	& qtz, highly fractd qtz rich zone dark green diopside developed along fract									
393.5	436	S	1/4q silicified biotite, phlogopite, schist, 70° - 80° good coring lower c+ 70°									
436	442	9	abn grey feldspar porphy dyke lower c+ 80°									
442	457.5	S	silicified mica schist 70° - 80° becoming epidote rich toward end									
457.5	462.5	3	t,e,s/5 white green skarnified limestone occ patch mag & rare spec cp	mag	Tr	9046	5	5	0.02			30 0.09 Tr
462.5	471.3	S	highly silicified biotite schist 70° - 80°									
471.3	472	lsd	diopside, magnetite, serpentine skarn, patches dissem cp, minor po	po	<1	9045	0.7	0.7	2.42			0.089 0.97 Tr
				cp	2(cu)							
				mag	25							
472	556.5	3t, q	white, grey, pink ^b anded tremolite qtz marble, bnds 70° - 80° remnants schist 503 - 503.8, 517.5 - 521, patch epidote @ 543 & on fract @ 547									

092038

Whitehorse Copper Mines Ltd.

MINING DIVISION - WHITEHORSE
YUKON TERRITORY

PROPERTY <u>THOM (HOPKINS LAKE 115H7)</u>	Claim No. _____	Strike _____	Lot. <u>11845N</u>	Hole No. <u>TH 13</u>
Date <u>10 OCTOBER</u> 19 <u>78</u>	Section No. _____	Dip <u>-90</u>	Dep. <u>11734E</u>	Total Depth <u>677'</u>
Logged By <u>A. Hureau</u>	Plan No. _____	Level <u>surface</u>	Elev. <u>4168'</u>	Page No. <u>1</u>

FOOTAGE			ROCK CLASSIFICATION Epid Diop Garn Serp Qtz Sil Actino Tremo Chlo Crystalline Shearing Veins Fracturing Foliation Grain Size Texture	MINERALIZATION		ASSAY DATA							
From	To			TYPE	%	Sample No	Width	Recov	%Cu	%Fe	Moly	Au/Ag	Notes
0	24.5	Oh											
24.5	32.0	S	qtz biotite schist schistosity gen 70° - 80°, gen good coring 188.5' - 190.5' + 310' - 311' biotite amphibolite schist patches & dissemin py	py	Tr								
320	322.5	9	abT grey brown feldspar porphyry dyke white feldspar xnocrysts in fine grained grey groundmass										
322.5	333.5	≈	mud rubble frags gaby, black and white carbonate										
333.5	341	4q/3	grey quartzite remnants of schist toward end carb and tremolite? to 336', dyke as above 335 - 335.2, 336 - 336.2										
341	435.0	S	qtz, biotite muscovite schist sections highly silicified, others bio rich, core Δs consistently 80° rarely to 65°										
435.0	436.7	3	d qtz remnants schist, 80										
436.7	437.7	3	t,s,d, black green skarn, 40% po to 437.3 occ spec cp minor shearing at lower c+	cp	5.5	9047	1.2	1.2	0.25			70/0.11	Tr

FOOTAGE			ROCK CLASSIFICATION Epid, Diop, Garn, Serp, Qtz/Sil, Actino, Tremo, Chlo, Crystalline, Shearing, Veins, Fracturing, Foliation, Grain Size, Texture	MINERALIZATION		ASSAY DATA						
From	To			TYPE	%	Sample No.	Width	Recov.	% Cu	% Fe	Moly	Au/Ag
437.7	461.3	5/3	s White - green weakly skarnified limestone locally vague bnding - 80°								0.1/0.1 (PPB)	W
461.3	473.2	3	s/M, /dt & ca, dark-green black mag - serp skarn, with infilling of caarse xtalline calcite 470.1 - 471.2, 472 - 472.7 pale green hard diopside tremolite skarn with minor 3s, good coring sample 461.3 - 467.3 467.3 - 473.2			9048	6.0	6.0	0.01		0.008 0.10 (60) 0.08	Tr
						9049	5.9	5.9	0.02			Tr
473.2	477	3	td pale green white skarn minor serpentine									
477	501.5	S	/4q grey silicified schist 80° minor py	py								
501.5	506.6	5	/3st White marble, vague bnding 80° @ 506' spec cp @ 502'	cp	Tr							
506.6	520	S	Silicified schist, core 480° 506.6 - 508.5 garnet, droptside developed 511 - 513 knots of cordierite? enclosed by micas 517.5 py on fract									
520	537.7	5	/3st White marble with serpentine developed along fract, loc vague bnding 80°									
		S	535.5 - 536.5 silicified schist									
537.7	558	3	t & qtz, minor e,d,g, white pink grey, well bnded (80°) marble qtz has pinkish cast, occ bnds remnant schist, excellent coring									

0920.9

FOOTAGE			ROCK CLASSIFICATION Epid, Diop, Garn, Serp, Qtz/Sil, Actino, Tremo, Chlo, Crystalline, Shearing, Veins, Fracturing, Foliation, Grain Size, Texture	MINERALIZATION		ASSAY DATA							
From	To			TYPE	%	Sample No.	Width	Recov.	%Cu	%Fe	Ag Au/Ag	Insol	Ni
558	562.2	3	d,e,t,g, & qtz., grey, green, pink, white skarn, spec cp @ 559.5 4" with 10% cp in garnet diopside rich section from 661.2	cp	1(cu)	9050	4.2	4.2	0.36		(80)	0.2/0.0 (ppb)	Tr
562.2	583.5	3t	qtz, mica, white qtz micaceous marble, 80°, lower c+ grades to schist										
583.5	591.5	S	qtz biotite schist 80°-90°										
591.5	596.2	3	t & qtz minor d, white grey well bnded marble, lower c+ 10° 1/4" epidote developed at lower contact.										
596.2	609	9	b ^w dark green basic porphyritic dyke, feldspar xnocrysts mainly altd to chlorite lower c+ 20° irreg.										
609	611.7	3	t,e, grey green marble bnding 80°-90° lower c+ irreg 10°										
611.7	625.5	9b	basic dyke as above										
625.5	633.1	3	t,d,g,e grey green red skarn gen 80° traces disseminated py, cp lower c+ chilled 20° sample 627 - 633.1	py	Tr								
				py	Tr	9051	6.1	6.1	0.05		(35) 0.08	Tr	
633.1	677	9b _γ	basic dyke, as above chloritized xnocrysts to 3mm, occ white anhedral felds grains to 4mm finer grained (chilled?) sects 641 - 642, 646 - 648, 669 - 672 Rem 3de @ 636'										
	677		Hole ends										

092038

Whitehorse Copper Mines Ltd.

MINING DIVISION - WHITEHORSE
YUKON TERRITORY

PROPERTY <u>THOM (HOPKINS LAKE 115H7)</u>	Claim No. _____	Strike _____	Lat. <u>10596N</u>	Hole No. <u>Th 15</u>
Date <u>11 OCTOBER</u> 19 <u>78</u>	Section No. _____	Dip <u>-90</u>	Dep. <u>12847E</u>	Total Depth <u>902'</u>
Logged By <u>A. Hureau</u>	Plan No. _____	Level <u>Surface</u>	Elev. <u>4029'</u>	Page No. <u>1</u>

FOOTAGE			ROCK CLASSIFICATION Epid Diop Garn Serp Qtz Sil Actino Tremo Chlo Crystalline Shearing Veins Fracturing Foliation Grain Size Texture	MINERALIZATION		ASSAY DATA							
From	To			TYPE	%	Sample No	Width	Recov	%Cu	%Fe	Moly	Au/Ag	Insol
0	43	Ob	boulders								0.2/100 (PPB)		
43	437	S	quartz, biotite, muscovite schist, schistosity gen 70° - 80° to core, rarely contorted to 40° gen..highly silicified.										
		Amph	274 - 275.2 green amphibolite chlorite bnd chloritized on contacts, contacts at 80°										
		S	skarnified schist 283 - 296' bnds skarn developed 3 deg, patches and dissem py										
		S	308 - 320 white grey skarnified schist highly silicified, minor d,e, po in fract @ 313' occ py filled fract..										
		Amph	357.5 - 356 biotite amphibolite bnd py dissem & on fract c+s apparently conformable	py - po		9052	4	4	0.02		20 0.06	0.04	
		qtz	362 - 363.2 qtz rich zone with patches green serpentine										
		Amph	366.8 - 376.6 blk green bio, chl, amphibolite, dissem & patches py, po, occ spec cp. bnding contorted along core.	py, po, cp		9053	9.8	9.8	0.20		140 0.10	0.05	
		S	385.5 - 390.5, sch/3 sects pale green qtz rich py on fract.										
437	447	9	bnr grey green feldspar porphry dyke, xnocrysts to 5mm lower c+ 10°, upper c+ 60°										
447	617.7	S	grey white qtz mica schist gen 80° - 90°										
		Amph	586.9 - 587.4, 599 - 601.9 blk, bio amph schist streaks py 90°										

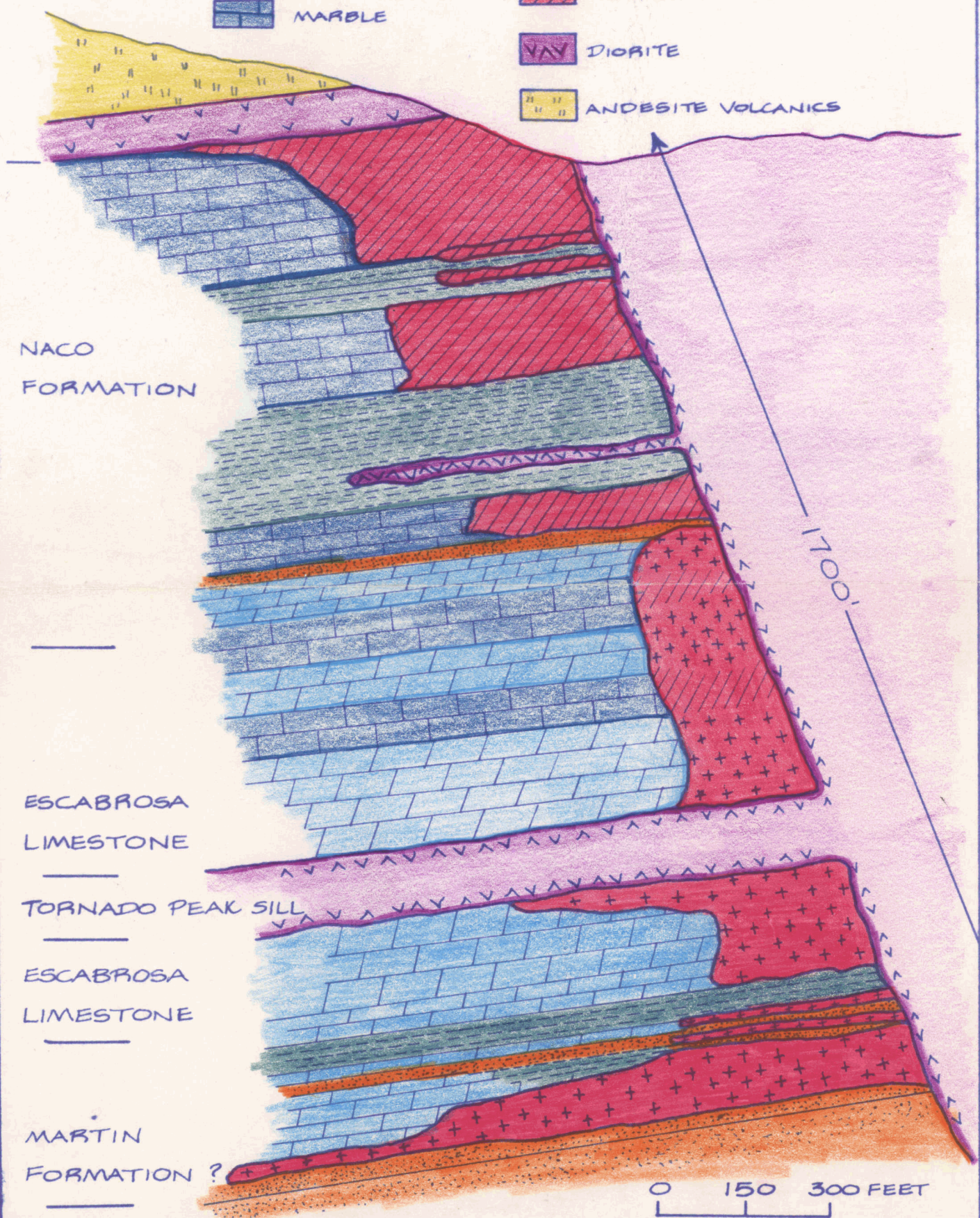
092038

Appendix V11

Hole #	N	E	Elev	Dip	Az	Length
1	10428.3	10033.5	3800	-65	60°	707
2	10408.7	10149.3	3790.4	-60	60°	253
3	10480.8	10584.4	3789.9	-70	240°	206
4	10748.4	10281.9	3890.0	-70	60°	253
5	10020.0	10076.1	3811.1	-80	240°	152
6	10746.4	10802.8	3860.2	-80	240°	320
7	10750.8	11205.4	3879.6	-80	240°	351
8	10349.7	10822.8	3834.1	-80	240°	318
9	9932.8	10589.2	3849.1	-80	240°	290
10	9699.7	11342.1	3971.0	-80	240°	106
11	9721.1	11587.7	3999.0	-80	240°	617
12	12766.	11291.	4184	-90	-	638
13	11845	11734	4168	-90	-	677
14	10652	12506	3980	-90	-	72
15	10596	12847	4029	-90	-	902

5862'

Holes 1 to 11 stadia survey assumed elevation TH 1 at 3800'
Holes 12 to 15 topofil, brunton and abney level from 1977
stadia stations.



NACO
FORMATION

ESCABROSA
LIMESTONE

TORNADO PEAK SILL

ESCABROSA
LIMESTONE

MARTIN
FORMATION ?

CAMBRIAN QUARTZITE

092038

0 150 300 FEET

SECTION, CHRISTMAS MINE, GILA COUNTY, ARIZ. (FIG. 11)

