BRITISH COLUMBIA DEPARTMENT OF MINES AND PETROLEUM RESOURCES
PRELIMINARY MAP No. 10

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PRELIMINARY GEOLOGICAL MAP OF THE ASPEN GROVE AREA, BRITISH COLUMBIA

GEOLOGY BY P. A. CHRISTOPHER, 1972

LEGEND

PLEISTOCENE AND RECENT

11 — VALLEY BASALT: VESICULAR OLIVINE BASALT

LOWER JURASSIC (?)

10 — DIORITE

- 10a HORNBLENDE DIORITE: PORPHYRITIC AND FOLIATED
- 10b 'BIG KID' BRECCIA
- 10c DIORITE: CONTAINS PYROXENE AND AMPHIBOLE, FINE-GRAINED, PORPHYRITIC AND BRECCIATED ALONG WESTERN MARGIN
- 10d FINE-GRAINED DIORITE: IN PART RECRYSTALLIZED VOLCANIC ROCKS
- 10e HYPABYSSAL ROCKS OF DIORITIC COMPOSITION

9 — MONZONITE

UPPER TRIASSIC

NICOLA GROUP

8 — VOLCANIC SILTSTONE AND SANDSTONE:

- 8a RED SEQUENCE
- 8b GREY TO GREY-GREEN SEQUENCE
- 8c CONGLOMERATE
- 8d FOSSILIFEROUS LIMY ARGILLITE AND LIMESTONE

7 — MASSIVE AND AMYGDALOIDAL AUGITE PORPHYRY

- 7a RED SEQUENCE
- 7b GREEN SEQUENCE

6 — AUTOBRECCIATED AUGITE PORPHYRY: GENERALLY RED TO MAROON WITH SOME PILLOW-LIKE STRUCTURES

5 — VOLCANIC BRECCIA, VOLCANIC CONGLOMERATE, AND LAHAR DEPOSITS

- 5a MASSIVE RED SEQUENCE
- 5b LAYERED RED SEQUENCE
- 5c RED VOLCANIC BRECCIA WITH LAPILLI SIZE FRAGMENTS
- 5d MASSIVE GREEN SEQUENCE
- 5e LAYERED GREEN SEQUENCE
- 5f UNDIVIDED GREEN AND RED VOLCANIC BRECCIA

4 — ANDESITE: GREY TO GREEN AND MASSIVE

3 — LIMESTONE: GREY TO DARK GREY, COMMONLY BRECCIATED AND FOSSILIFEROUS

2 — LIMY SILTSTONE

1 — UNDIVIDED SEDIMENTS: SILTSTONE, SANDSTONE, AND ARGILLITE

GEOLOGICAL BOUNDARY (DEFINED, APPROXIMATE, OR ASSUMED)

AREA OF ABUNDANT OUTCROP

BEDDING (VERTICAL, INCLINED, RIGHT-SIDE-UP)

FAULT OR MAJOR LINEAMENT

PROSPECT (PIT, TRENCH, ADIT, SHAFT)

FOSSIL LOCALITY

MINERAL OCCURRENCE (CHALCOPYRITE, CHALCOCITE, BORNITE, MALACHITE, NATIVE COPPER, PYRITE, MAGNETITE, HEMATITE) cp, cc, bn, mal, Cu, py, mt, hm

POWER LINE

SWAMP

SECONDARY ROAD

SCARP

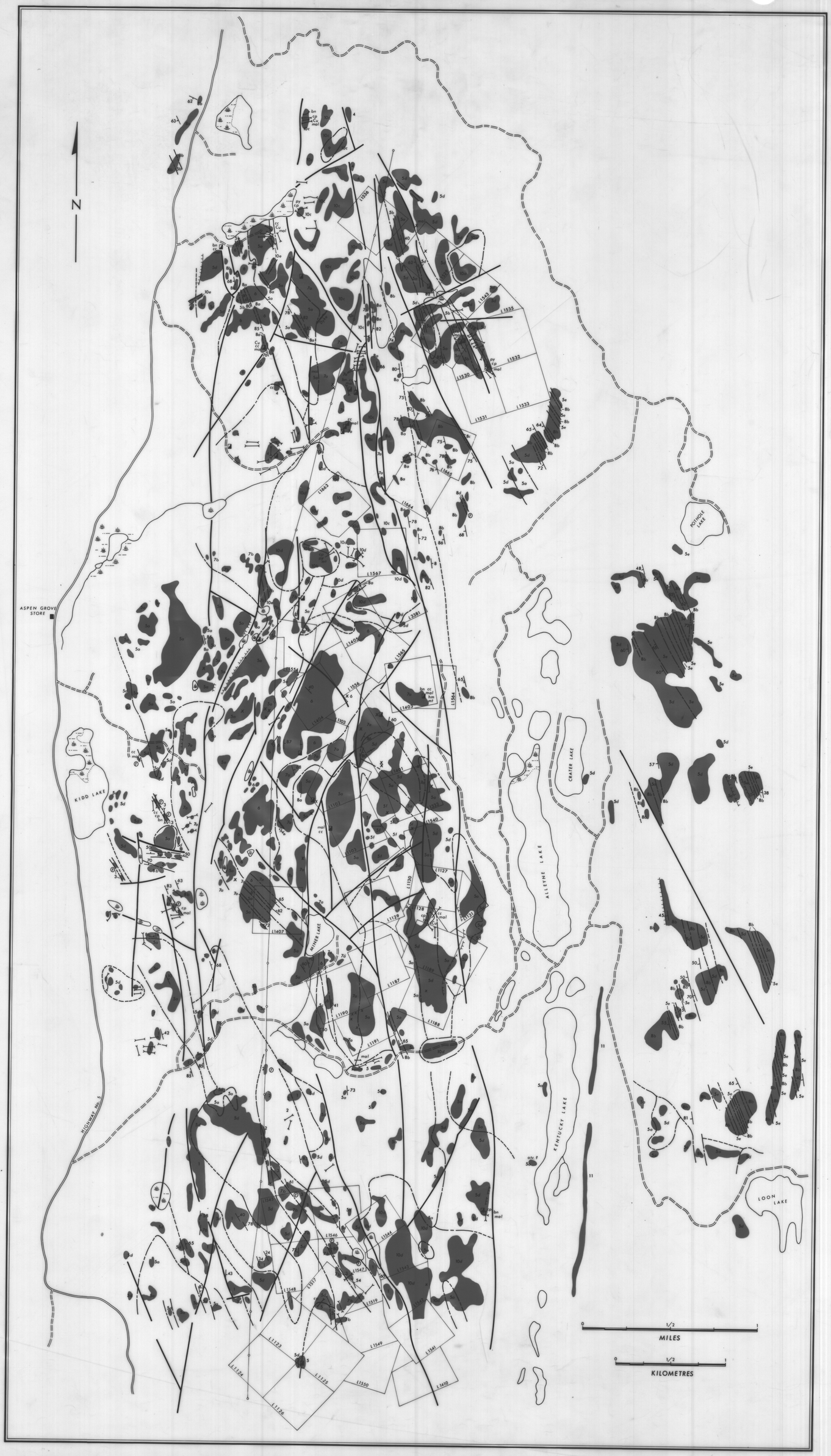
CROWN-GRANTED MINERAL CLAIMS

Claims located from map 92H/15, Edition 1ASE, Series A721.

L1123	COVINGTON
L1124	PORTLAND
L1125	VICKSBURG
L1126	QUEBEC
L1181	LOTTIE FRACTION
L1401	MAY BELL
L1517	TOM CAT
L1535	FRISCO FRACTION
L1547	LIVERPOOL
L1548	LONDON

Lots 1564 and 3381 were also located from map 92H/15; approximate location of old Crown-granted mineral claims from 1906 plan showing mineral claims of the Aspen Grove area.

L1101	GEORGIA
L1102	BRIGMAN
L1103	REDWOOD FRACTION
L1127	CINCINNATI
L1128	COPPER BUTTE FRACTION
L1129	NEW PORT
L1130	BANK OF ENGLAND
L1131	NOBLE FIVE
L1132	QUEEN OF THE WEST
L1187	HAPPY JACK
L1188	HATTIE
L1189	COPPER JACK
L1190	LITTLE LOTTIE
L1332	GOLDEN GATE
L1403	COPPER STANDARD
L1404	AMELIA
L1405	BIG KID
L1407	NICOLA
L1410	TRIANGLE FRACTION
L1519	NIGHT HAWK
L1528	GOLDEN SOVEREIGN
L1529	GREAT REPUBLIC
L1530	YANKEE
L1531	BIG DUTCHMAN
L1532	CANADA
L1533	AMERICA
L1534	FRISCO
L1539	GREAT WEST
L1540	METAL FRACTION
L1541	BOOMERANG
L1542	OCEAPHEMIA
L1543	GLADIATOR
L1544	GOLDEN EAGLE
L1545	PEKIN
L1546	BOSTON
L1549	CORNELL
L1550	WOODPECKER
L1556	VERNON FRACTION
L1565	BLACK PRINCE
L1567	COPPER AGE
L1663	COPPER KING
L1664	HIT OR MISS
L1665	COPPER QUEEN



LOCATION, ACCESS, TOPOGRAPHY, AND DISTRIBUTION OF OUTCROP

The map-area consists of approximately 25 square miles that is in the north central part of the Tulameen area, 92H/NE. Highway 5 passes along the western boundary of the map-area and numerous secondary roads provide access to the entire area. The settlement of Aspen Grove is situated on Highway 5 and the towns of Princeton and Merritt are respectively 40 miles south and 18 miles north of this community.

The topography of the area is characterized by rolling hills that are segmented into blocks by complex faulting, and by broad north-south valleys that follow major fracture zones. Otter Creek and Kidd Lake occupy the main western valley and Kentucky, Alleyne, Crater, and Pothole Lakes occupy the main eastern valley. Scarps related to faulting are most common along margins of the Alleyne-Kentucky Valley but also occur in other parts of the map-area.

The Aspen Grove area is an area of moderate outcrop particularly along ridges which are sculptured and rounded by glaciation. The main valley bottoms, however, are filled by glacial deposits.

PHYSIOGRAPHY AND GLACIATION

The map-area lies within the Thompson Plateau, a subdivision of the Interior Plateau (Holland, 1964). Maximum relief is approximately 1,350 feet. The lowest elevations, approximately 3,250 feet, are in north-south trending fault controlled valleys occupied by Kentucky, Alleyne, Crater, and Pothole Lakes and by Otter Creek and Kidd Lake. The highest point, 4,606 feet, is on the ridge east of Alleyne Lake.

Terraces north and east of Alleyne Lake indicate the former existence of ice-dammed lakes in the Alleyne-Kentucky Valley, and main cross-valleys represent meltwater channels. Kame terraces are well developed and preserved near Pothole and Crater Lakes and large erratic boulders occur on a terrace to the south of Pothole Lake.

GENERAL GEOLOGY

The Aspen Grove area is within a terrain commonly referred to as the Nicola Belt, a eugeoclinal Upper Triassic island-arc rock assemblage. Massive andesitic flows and coarse pyroclastic rocks predominate in the central part of the area and a sequence of layered and massive volcanogenic rocks along the eastern margin. The southwestern section of the area is underlain by intercalated volcaniclastic rocks, flows, and calcareous sedimentary rocks that are partly covered (?) by coarse volcanic breccia.

The area is dissected by two major north-south trending fault zones: the Allison fault to the west and the Alleyne-Kentucky fault zone to the east. The Alleyne-Kentucky fault zone is part of the larger Summers Creek-Quilchena Creek fault system. Brittle deformation is characteristic of the area and changes in dip and strike of the units are mainly attributed to faulting.

A sequence of massive red to purple and green augite porphyry flows, coarse volcanic breccia and dioritized volcanics is present in the central part of the map-area. This sequence may indicate the existence of a central zone of partly subaerial volcanic centres.

To the north near Nicola Lake, Schau (1968) has mapped an extensive sequence of augite porphyry flows and associated volcanic breccias and pyroclastic rocks as part of division A1 of the Nicola Group. These rocks resemble to a degree those of the Aspen Grove area but no correlations can be made as yet. Rice (1947) mapped all the volcanic rocks of Aspen Grove as belonging to the Nicola Group except for part of unit 8 and the Quaternary valley basalt, unit 11.

NICOLA GROUP: The Nicola Group at Aspen Grove has been mapped by the writer as consisting of eight main units with a number of subdivisions based chiefly on colour. These are not stratigraphic units in the conventional sense for the relative ages are obscured by the massive nature of the central volcanic sequence and by complex faulting.

Units 1, 2, and 3 consist of sedimentary rocks and are restricted to the southwest part of the area. Limy siltstone, argillite, and limestone horizons are fossiliferous but fossils are generally poorly preserved and have not been identified.

Massive grey to green andesite of unit 4 is mapped north of Thule Lake and northwest of the 'Big Kid' breccia. These rocks have been called 'andesine' andesites by Olien (1957), and a trachytic texture is often evident within them. Dykes and sills appear to be abundant within unit 4 but are difficult to map because of their similar composition, and alteration of the flow rocks.

The central part of the area is dominated by massive volcanic rocks comprising units 5, 6, and 7. Volcanic breccia, volcanic conglomerate, and lahar deposits of unit 5 form approximately half of the volcanic rocks of the area. This unit is divided into a green to grey-green sequence and a red to purple sequence. The presence of layering that is most pronounced east of Alleyne and Thule Lakes is also used to subdivide unit 5. Fragment size ranges from lapilli to angular or rounded blocks as much as 3 feet in diameter. Coarse blocks are abundant south of Miner and Pothole Lakes and west of Kentucky Lake. The ridge north of Miner Lake contains blocks greater than 2 feet in diameter. Volcanic clasts include red and green varieties of porphyritic andesite, augite porphyry, trachytic andesite, and vesicular bombs. Granitic textured clasts of dioritic composition also occur. Matrix colour is used to subdivide unit 5, however red or grey to green fragments may be present in rocks of either matrix colour.

Red autobrecciated augite porphyry (unit 6) is found mainly in the central part of the area north of Miner Lake. Unit 6 includes some ropy lava and agglomerate with fragments similar to the augite porphyry matrix. Amygdales are filled with epidote, chlorite, calcite, quartz, and potassium feldspar. Hematite replacing olivine (?) resembles amygdale filling. This unit is gradational to the massive and amygdaloidal augite porphyry of unit 7 and hence they are difficult to separate.

Volcanic siltstone and sandstone of unit 8 are most abundant east of Alleyne and Kentucky Lakes and within a sheared zone which trends north 20 degrees west and extends from the north end of Alleyne Lake to beyond Thule Lake. Lenses of conglomerate, limy argillite, and limestone occur within this unit east of Thule Lake. Interbedded tuff within the massive volcanic sequence (units 5, 6, and 7) is shown as part of unit 8 because of similar appearance.

INTRUSIVE ROCKS: Intrusive rocks within the area (unit 10) are mainly dioritic and appear to be in part comagmatic with the Nicola volcanic rocks because of similar composition and gradational relationships. Several subdivisions of unit 10 of distinctive nature are mapped and one small area of monzonite (unit 9) occurs within a diorite body (unit 10c) north of Thule Lake. A small body of foliated hornblende diorite (unit 10A) is found east of Thule Lake. This body has a light green tint because of epidote and chlorite alteration.

Olien (1957) reviewed the possible origins for the Big Kid breccia and concluded that the breccia represents a pipe-like structure of intrusive origin, and that the present exposure is a diorite plug containing andesitic and dioritic fragments plucked from the pipe walls. Chlorite, epidote, and magnetite are abundant and the presence of pyrite and chalcopyrite is of economic interest.

Fine-grained diorite (unit 10d) is characteristically rich in magnetite, epidote, and chlorite. This unit grades into volcanic breccias and flows, and contains recrystallized fragments. Unit 10d is considered to be in part recrystallized volcanics.

STRUCTURAL GEOLOGY

The structure of the Aspen Grove area is dominated by two regional northerly faults about 2½ miles apart. They are linked by many splays and a terrain shattered by brittle fracture. In contrast folding is obscure and may be slight except for drag near faults.

Fold structures could not be defined because of the presence of the core area of massive volcanic rocks and because of rotation and tilting of blocks by faulting. Minor folds observed appear to be restricted to drag along faults. However flow folds and soft rock deformation also occur which resemble minor folds. Soft-sediment deformation occurs south of Pothole Lake and flow folds in volcanic rocks occur west of Alleyne Lake. Flow tops and flow layering have complex patterns not in agreement with bedding attitudes of intercalated well-stratified rocks. The latter generally strike north to north 20 degrees west with steep dips. Blocks of stratified rocks southeast of Kidd Lake appear to have been rotated by faulting to strike north 70 to 80 degrees west.

The major faults of the area, the Allison and Alleyne-Kentucky faults, are part of a regional northerly striking system. A set of prominent lineaments striking north 20 degrees west splay from the Alleyne-Kentucky fault. A zone of north 20 degrees west faults and shearing extends from the north end of Alleyne Lake and a second branching set with the same attitude appears to merge with the Alleyne-Kentucky fault south of the map-area near Bluey Lake. Fracture systems of lesser magnitude strike in the following directions: north 50 to 60 degrees east, north 20 to 30 degrees east, north 40 degrees east, and north 60 degrees west. A zone of fracture cleavage trending north 50 to 60 degrees west extends from east of Miner Lake to Alleyne Lake and right lateral offset of the north 20 degrees west fractures occurs along this zone.

Southeast of Miner Lake a pyritized zone of possible tectonic breccia occurs along the road to Alleyne Lake. Diamond-drill holes have passed through a green pyritized cataclastic breccia into massive red volcanic breccia.

MINERALIZATION

Metallic mineralization is widespread near Aspen Grove and is dominated by copper minerals including chalcopyrite, bornite, chalcocite, native copper, cuprite, malachite, and azurite accompanied by pyrite, hematite, and (or) magnetite. Galena is reported from the Little Lottie group (Ann. Rept., 1901). Silver and gold values have been reported with the copper mineralization.

Showings and prospects are largely confined to the area between the Alleyne-Kentucky fault and the Allison Lake fault. Only one prospect was noted to the east of the Alleyne-Kentucky fault.

Four main types of copper occurrences are found in the area:

(1) Chalcopyrite, bornite and native copper, and chalcopyrite and pyrite mineralization in fine-grained and brecciated zones along the western margin of unit 10c.

(2) Chalcopyrite, bornite, pyrite, and magnetite in breccia zones in andesite, dioritized volcanics, and diorite. The Big Kid breccia and andesite northwest of the road to the Big Kid provide the best examples of this type of mineralization.

(3) Chalcocite, native copper, and hematite in fracture zones in the massive volcanic sequence (units 5, 6, and 7). Contact zones between red and green breccia sequences (unit 5) are favourable for this type of mineralization. The Big Dutchman and Golden Sovereign groups located near Thule Lake are good examples of this type.

(4) Chalcocite, bornite, chalcopyrite, malachite and pyrite in limestone, and argillite. Copper was probably leached from volcanic rocks by acid solutions that were neutralized and deposited copper when limy sediments were encountered. Chemical precipitation of copper in restricted reducing environments may account for some of the mineralization in argillite. Examples of this type of mineralization occur on the ridge east of Kidd Lake and on the Tom Cat claim.

Minor concentrations of copper minerals also occurs at flow tops (500 feet west of Miner Lake), along dyke boundaries (Blue Jay property south of a marsh in the centre of the property) and as widespread disseminated occurrences in volcanic breccia.

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