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SURVEY
OF
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DEPARTMENT OF ENERGY,
MINES AND RESOURCES

BULLETIN 214

CLASSIFICATION AND DESCRIPTION OF COPPER DEPOSITS, COPPERMINE RIVER AREA, DISTRICT OF MACKENZIE

E. D. Kindle

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CLASSIFICATION AND DESCRIPTION OF COPPER DEPOSITS, COPPERMINE RIVER AREA, DISTRICT OF MACKENZIE

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PLATE I. Coppermine Mountains (at top of photo) and September Mountains separated by Coppermine River; note fault and dyke lineaments and the terraces formed by north-dipping basalt flows.

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By

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PREFACE

An objective of the studies carried out by the Geological Survey is to estimate the potential abundance and probable distribution of the mineral and fuel resources available to Canada. In order to accomplish this it is necessary to establish the geoscientific settings favourable to the occurrence of various types of deposits. From an understanding of the modes of formation of mineral deposits it is possible to establish the settings and geological characteristics that define a given type and thus to give criteria that will assist in the search for mineral deposits.

This report presents the results of a study of the copper deposits of the Coppermine River area, deposits that for the most part are associated with a sequence of continental basaltic lavas of Proterozoic age. The area has long attracted interest and was the scene of intense activity from 1966 to 1968.

The author points out that most of the occurrences are along fault fissures, fault-breccia zones or sheeted, braided, and sheared zones in the basalts. He describes 160 deposits and shows the close relationship of these to the structural controls.

Y. O. FORTIER,
Director, Geological Survey of Canada

OTTAWA, August 12, 1971

BULLETIN 214 — Klassifizierung und Beschreibung von Kupfervorkommen im Gebiet des Coppermine River im Mackenzie-Distrikt.
Von E. D. Kindle

БЮЛЛЕТЕНЬ 214 — Классификация и описание месторождений меди в районе Коппермайн Ривер, округ Маккензи.
Е. Д. Киндле

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Abstract

Fourteen different types of copper deposits of the Coppermine River area are classified and described. These deposits are associated for the most part with a sequence of continental basaltic lavas of Proterozoic age; the most important types occur along fault fissures, fault-breccia, and sheeted, braided, and sheared zones in the basalts. The author briefly describes 160 deposits, and depicts the close relationship of the deposits with fault zones on an index map of more than 1,000 faults and/or fault lineaments. He believes that, when transportation is less costly, the Coppermine River area will become an important copper mining centre.

Résumé

L'auteur classe en 14 types différents les gisements de cuivre de la région de Coppermine River et décrit tous les types. La plupart d'entre eux sont associés à une succession de laves basaltiques continentales datant du Protérozoïque et les types les plus importants sont ceux qui se trouvent le long des fissures faille, des brèches de failles et dans de zones plissées, découpées et cisaillées, dans les basaltes. L'auteur donne une brève description de 120 dépôts et décrit les relations étroites entre les gisements et les zones de faille sur une carte-index qui indique l'emplacement de plus de 1,000 failles ou lignes de faille. Il pense que le région de Coppermine River deviendra ultérieurement un important centre d'extraction du cuivre, lorsque le coût du transport aura baissé.

Chapter I

INTRODUCTION

The Coppermine River area refers in general to the region south of Coronation Gulf and adjacent to Coppermine River, an area underlain by a series of Proterozoic basalt flows, sedimentary rocks and diabase and gabbro dykes, and sills. Hope Lake, 20 miles west of Coppermine River and 10 miles northeast of Dismal Lakes, is the site of permanent camp buildings erected in 1967 by Coppermine River Limited and Hearne Coppermine Explorations Limited. An airfield 2 miles south of Hope Lake makes the camp accessible by aeroplanes, and the lake is suited for landing of float planes. The Coppermine River No. 47 orebody (largest known copper lode in the area) is 3 miles southeast of Hope Lake. National Topographic System (NTS) map-sheets 86 N and 86 O cover the greater part of the copper belt, but the favourable copper-bearing

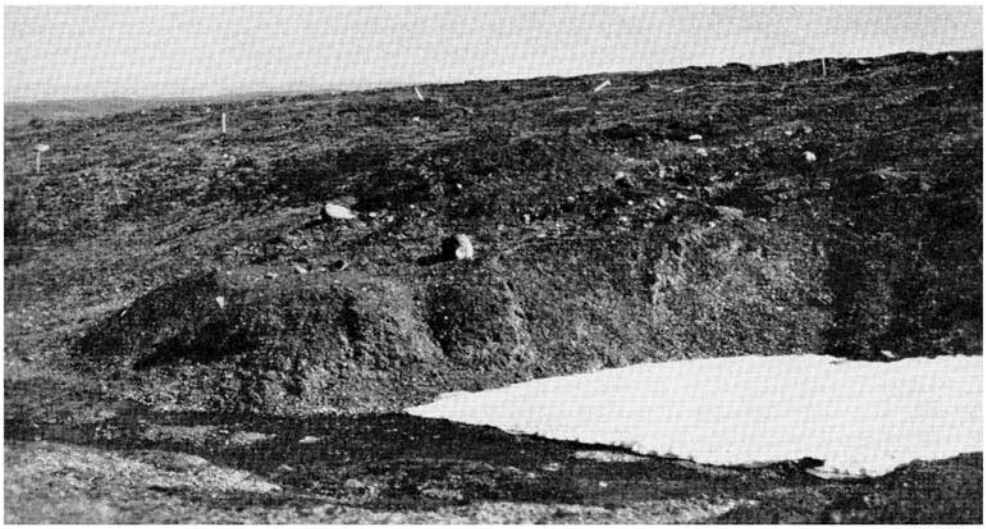

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PLATE II. Hope Lake, northeastward towards the Coppermine River Limited mining camp, and the Hearne Coppermine Explorations camp beyond.

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basalts also extend westerly into NTS map-sheet 86 M. The copper-bearing basaltic sequence forms a westerly trending belt about 150 miles long and up to 30 miles wide near Coppermine River. Copper minerals are also present in places in the overlying and underlying sedimentary rocks (*see* Fig. 1, *in pocket*). Indians and Eskimos have used copper nuggets for making knives and other implements for at least 270 years.

Transportation

Building, heating, and food supplies, etc., are available at Yellowknife and air services are maintained by several aviation firms to any points of interest in the Districts of Mackenzie and Franklin where there are suitable landing sites. One firm makes (1969) scheduled weekly flights to Great Bear Lake, Hope Lake, Coppermine village, Holman Island, and Cambridge Bay with a wheel-equipped DC-3 aircraft.

A winter road has been in use for many years between Yellowknife and Echo Bay on Great Bear Lake, and a number of vehicles were driven from Great Bear Lake to Hope Lake during the winter of 1968–69. Construction of a permanent all-weather gravel highway between Hope Lake and Yellowknife would greatly facilitate exploration and possible future mining operations.

For about two to three months of the year barge transportation is available to Coppermine village from Hay River, Northwest Territories, by way of Mackenzie River, Tuktoyaktuk, Beaufort Sea, and Amundsen Gulf. Large vessels have access to Coppermine via Bering Strait and Beaufort Sea, but sea ice conditions are not always favourable. According to Chipman and Fox (1924, p. 34B), in an average season a ship could probably be taken from the Pacific Ocean into Coronation Gulf, but it is doubtful if the return trip could be made in the same season.

Climate, Flora, and Fauna

Winter temperatures are about the same as at Churchill, Manitoba; the average January temperature is about −25°F, the average July temperature is about +50°F. There are occasional extremes of cold in the winter; thermometer readings of −70°F have been registered at Great Bear Lake. With almost continuous daylight from May 1st to August 15th, the sun's heat has, in an average year, melted most of the snow by May 15th. The lakes are generally free of ice by July 10th. Rainfall is said to be less than 4 inches annually and the snowfall is about 30 inches. Freeze-up comes anytime after September 1st; Norrie (1931, p. 355) reported a 6-inch fall of snow in the Coppermine River area on September 3, 1930. During the summer, when the wind is from the south warm sunny days are predominant; winds from the north and northwest are likely to be accompanied by rain, colder weather, and sometimes heavy fog. Robinson (1946, p. 128) states that winters in northwestern Canada are variable; they can be as cold as the coldest parts of northeastern Siberia or as mild as the Upper Ottawa River Valley.

As the Coppermine country lies within the barren grounds north of the Arctic Circle, it is a treeless tundra region where only grasses, lichens, low shrubs, mosses, and various arctic flowering plants are found in abundance, where soil cover is suitable. In some sheltered spots, 3- to 4-foot stunted willows, alder, and ground birch may be found. Continuous permafrost inhibits growth of deep-rooted flora. However, a few small stunted trees are found in places along the banks of Coppermine River to within 20 miles

of its mouth. Stunted trees are fairly abundant in the valley of Kendall River and some are found at the east and west ends of Dismal Lakes. Timber suitable for commercial use is not present north of Kendall River. Gasoline or other liquid or gas fuels are used for all heating and cooking requirements.

A few Barren Ground caribou and Barren Ground grizzly bears were seen within 10 miles of Hope Lake, and several large grey arctic hare, red fox, and wolves were also seen in this vicinity. Grayling, trout, and whitefish are found in most of the large lakes. Ptarmigan and a variety of small birds nest in the area. One falcon hawk and one owl were seen. Bears entered and damaged several mining camp buildings west of Coppermine River in 1969. Only small numbers of ducks were seen on the lakes. Two white swans (?) were noted on a lake north of Burnt Creek. The presence of musk-oxen at the foot of the Copper Mountains was recorded by Sir John Franklin in 1823. Most of the caribou migrate south in the late fall, though some have wintered in the basin of Coppermine River. Jenness (1922, p. 101) reports their presence near Bloody Fall in February 1915.

Physical Features

The Coppermine River is a swift-flowing river with many rapids that can be descended in canoes only under the guidance of expert canoemen. Where the river is constricted by canyon walls, in places 150 feet high, it is little more than 200 feet wide and from 10 to 20 feet deep. The annual break-up of the river ice occurs about June 1st. At Bloody Fall the river is sometimes open all winter.

South of Coronation Gulf the area is characterized by gently rising peneplaned grassy-sloped tundra where lakes are numerous and bedrock outcrops are confined mainly to stream channels and to diabase sill localities where differential hardness between sills and sandstones have fashioned east-trending ridges.

About 35 miles south-southwest of the river's mouth steep northerly slopes mark the north border of Coppermine Mountains. There the river's elevation is about 600 feet above sea level (at Muskox Rapids). Nine miles farther south the river channel follows a westerly course for 17 miles, and separates Coppermine Mountains from September Mountains, which form a range 4 to 5 miles wide on the south side of the river (*see* Frontispiece). At the west end of September Mountains, the north-flowing river is at an elevation of 700 feet whereas the mountains north and south of the 17-mile-long east-flowing sector rise in places to a little over 1,700 feet above sea level. In the western part of the area, north of Dismal Lakes and west of Bornite Lake, the Bornite Mountains are slightly higher, and surpass 1,800 feet in places, but the neighbouring valleys are also more elevated, for example, Dismal Lakes are 836 feet above sea level and Hope Lake is above the 1,100-foot contour.

Mountains and elevated valleys are formed mostly of resistant lava flows rather than sedimentary rocks. The flows dip northerly and their weathering has produced a terraced topography. Thus along the southern slopes of the mountains the ground rises in a series of cliffs that alternate with relatively flat or gently inclined terrain. The steep basalt cliffs in general indicate the thickness of individual flows, except that the thickness of the amygdaloidal flow top zones must be added. The flat or gently ascending benches or terraces are normally underlain by the amygdaloidal flow top zones or their eroded remnants which would be very thin or even completely missing along the brinks of the cliff-like parts because of their relative softness and the erosive action of glacial ice during the Pleistocene epoch and by more recent weathering.

The north slopes of the mountains and isolated ridges portray the approximate northerly dip of the basalt flows or of diabase sills that intrude the sandstones and shales. Considerable soil cover has accumulated on northern slopes and on the low tundra plain farther north. Much of the soil cover in comparatively flat areas forms northwesterly trending drumlins.

The terraced appearance of the basalt belt is broken in many places by well-developed fault valleys that trend in three principal directions, northeast, north, and northwest. During the glacial epoch the dominant ice movement was northwesterly in the region north of Dismal Lakes and as a result northwest-trending fault valleys were readily deepened. On the PAT 1-23 claim group 8 miles northwest of Hope Lake, the northwesterly trending glacial striae are cut by younger glacial striae that point due west, indicating that final ice movement in that locality was westerly. This observation is of some importance in tracing the origin of some boulder heaps of high-grade copper ore. The parent vein-lode evidently lies east of the float zone.

Small eskers and kettle lakes are found throughout the area. One well-developed esker, about 4 miles long, that lies in low ground on the east side of Coppermine River (and runs southeast from Penny Island), is evidence that the main Coppermine River Valley was formed in preglacial time. The canyon features along the river, however, point to a considerable deepening of the channel since the retreat of the continental ice sheet. Some hills of greyish white stratified clay lie on both sides of Coppermine River south of Bloody Fall.

History of Exploration and Previous Work

The occurrence of native copper in the Coppermine River area was known to trading-post officers at York Factory on the west side of Hudson Bay as early as 1708, and was based on reports of the Indians who came to trade. M. Jeremie who had been in charge of York Factory or Fort Bourbon, then the most northerly trading post on the west side of Hudson Bay, between 1708 and 1714, while it was in the hands of the French wrote of the Dogrib Indians (*see* Tyrrell, 1912, p. 510):

> They have in their country a mine of red copper so abundant and so pure that without putting it through the forge, just as they obtain it at the mine, they pound it between two stones and make anything that they wish with it. I have often seen it, since our Indians constantly bring it from there when they go in war parties.

An expedition to search for the Coppermine River copper lodes was organized in 1719 by Captain Knight who had been in charge of Hudson's Bay posts on Hudson Bay. Captain Knight and his associates sailed from England in two ships, *Albany* and *Discovery*, but the expedition was wrecked on Marble Island and all hands were lost, though their fate was not known until 1767 when their remains were found (Tyrrell, 1912, p. 513).

Samuel Hearne, of the Hudson's Bay Company, was the first white man to visit the Coppermine River country. He set out on foot from Hudson Bay in December of 1770 and reached Coppermine River during the summer of 1771. On his return he reported the finding of one copper nugget of about 4 pounds weight and several small nuggets about 30 miles south-southeast of the mouth of Coppermine River.

Sir John Franklin and Sir John Richardson visited this area in 1821 and made a survey of Coppermine River from the ocean to Point Lake. They were the first to record occurrence of native copper associated with calcite and prehnite, and of scales of native copper in amygdaloid lavas and trap rocks.

Thomas Simpson visited the Coppermine area in 1837, confirmed the presence of the copper-bearing rocks there and also mentioned finding some copper ore on an island in Bathurst Inlet.

David Hanbury ascended Coppermine River in 1902 and says in his book that one of his men while tracking up river found a chunk of native copper weighing 12 pounds. He also records the occurrence of native copper east of the Coppermine area, on Barry Island, Kunnuyak Island, and Lewis Island in Bathurst Inlet.

George M. Douglas, Lionel Douglas, and Dr. August Sandberg a Swedish geologist and chemist, visited Coppermine River via the Great Bear Lake route in the autumn of 1911 and spring of 1912 and their map showing the geology along the river was published in 1913 in the *Transactions of the Canadian Mining Institute*. It was this same year that V. Stefansson first reported that Eskimos of Coronation Gulf collect native copper nuggets on Victoria Island.

In 1915, J. J. O'Neill, R. M. Anderson, and K. G. Chipman mapped the coast and geology of the west side of Bathurst Inlet and some of the larger islands for the Geological Survey of Canada, paying particular attention to areas containing copper. Mapping in the Coppermine River area was done in 1916 by F. Johansen, K. G. Chipman, and R. M. Anderson of the Geological Survey and their work was incorporated into a geological map entitled Arctic Expedition 1913–1918, Southern Party 1913–1916.

In July 1929, Dominion Explorers Limited (Norrie, 1931) staked mineral claims in the vicinity of Burnt Creek, Coppermine area, and widespread prospecting and staking operations were conducted by Northern Aerial Minerals Exploration Limited in 1929 and 1930. The latter company drilled a few holes on the Copper Lamb vein in 1931. In 1943, Herb Dixon staked the Dick group of claims for The American Metal Company, Limited. The Dick vein was drilled in 1944 and the Metal and Lars groups were staked by this company. Between 1945 and 1951 all claims lapsed.

In 1951 The American Metal Company, Limited restaked the Metal group and in 1952 George Byles and William Lendt staked the Larry, Drift, Husky, and Vera claims. Four holes were drilled on the Metal group at this time. A. T. Broderick and L. E. Andrews examined many of the above claims on behalf of The M. A. Hanna Company in 1952. Pickle Crow Gold Mines, Limited carried out surface work on some of the old showings in 1957, and Westfield Minerals Limited (formerly Panamerican Ventures Limited) staked some claims at that time.

D. F. Kidd, who mapped geologically the east side of Great Bear Lake for the Geological Survey of Canada in 1931, included in his report (Kidd, 1932, p. 59) descriptions of three Coppermine properties, the B Group (Copper Lamb), A Group (Harry), and D Group (Dick) but stated that only the last two were examined. A large area lying between Great Bear Lake and Coronation and Amundsen Gulfs and including the Coppermine River basalt belt was mapped on a scale of 8 miles to 1 inch by the Geological Survey of Canada in 1959 (Fraser, 1964). An account of the surficial geology of the district is given by B. G. Craig in GSC Paper 60-18. R. Thorsteinsson and E. T. Tozer (1962) reported occurrences of native copper in basaltic rocks on central Victoria Island. Inco held an option on the Eskimo claims in the Coppermine River area in 1965. W. A. Robertson (1969) investigated the magnetic properties of the Muskox Intrusion and of certain dykes and of the Coppermine River basalt flows in 1966. During the summer of 1967 W. R. A. Baragar carried out systematic sampling of the basalts (Baragar, 1969). Geological mapping of NTS map-sheets 86 N and 86 O was undertaken by J. A. Donaldson and W. R. A. Baragar in 1969 for the Geological Survey of Canada. Some preliminary geochemical

investigations begun in Coppermine area in 1969 are reported on by E. H. W. Hornbrook and R. J. Allan (1970). The geochemical work was continued by Allan in 1970 (*see* Allan, 1971).

As a result of some new copper discoveries in 1966 there was an intense revival of interest in Coppermine River area. A staking rush followed and by late 1967 all ground along the copper belt covered by NTS maps 86 N and 86 O was staked with about 70 different mining companies participating in what has been described as the largest staking rush in the history of mining in Canada. Over 40,000 claims were recorded, and staking extended into the Bathurst Inlet area and onto Victoria Island.

PCE Explorations Limited and its exploration and development company, Coppermine River Limited, started the rush with the staking of 2,134 claims in two groups. East Coppermine, managed by Conwest Exploration Company Limited, became owners of 1,600 claims, and Teshierpi Mines Limited took up 1,884 claims in 12 separate groups. Other mining companies became owners of considerably smaller blocks of mining claims. Permanent camps were constructed at Hope Lake by Coppermine River Limited and Hearne Coppermine Exploration Limited in 1966 and 1967 and a gravel landing strip was built for aircraft. About 30,000 feet of diamond drilling was done by Coppermine River Limited on the DOT 47 lode and when drilling ceased in September 1968 copper ore reserves of 3,571,000 tons grading 3.44% copper were announced. Another estimate is a figure of 5,100,000 tons averaging 2.5% copper, based on drilling to a depth of 600 feet over a length of 1,500 feet.

Exploration activity slowed greatly in 1969 and was practically at a standstill during the summer of 1970. Bernack Coppermine Exploration Limited carried out a diamond drilling program in 1969 on the JUNE group and late in the year reported 1,000,000 tons of ore grading 2.5% copper. Hearne Coppermine Explorations Limited announced in October 1968 that drilling on the CARL 7 claim indicated a possible tonnage of about 125,000 tons grading approximately 2% copper, to a depth of 500 feet. Figures published by Jenney (1954, p. 64) show 90,000 tons of copper ore at a grade of 8.78% copper in the Dick vein owned by Pickle Crow Gold Mines, Limited. Another figure of interest, issued by Quadrate Explorations Limited in 1969, as a result of drilling on the Franklin 3 vein, is 3.74% copper across a true width of 8.1 feet over a length of 525 feet (data from 6 holes drilled to a depth of 100 feet or less). In addition, Consolidated Proprietary Mines Holdings Limited are said to have 5,000 tons of high grade bornite ore in the Copper Lamb vein.

Numerous other surface showings in the Coppermine camp have still to be drilled.

Field Work and Acknowledgments

The author carried out field work in Coppermine River area from the Hope Lake base for three weeks in 1968 and from a Geological Survey camp located at the Hope Lake airport during most of July and August 1969. The writer wishes to acknowledge assistance rendered in the field by officers of Coppermine River Limited, Hearne Coppermine Explorations Limited, Quadrate Explorations Limited, and Bernack Coppermine Exploration Limited. Particular thanks are extended to M. Watts, R. E. Hindson, S. Tough, George Byles, D. Milburn, W. Shuttleworth, K. O'Connor, and Drs. S. H. Ward and R. A. Blais. The resident geologists at Yellowknife, Dr. R. I. Thorpe in 1968 of the Geological Survey of Canada, and Dr. J. A. Kelly in 1969 on behalf of the Indian Affairs and Northern

Development Department, were very helpful in supplying needed information and helping with logistics of the field work. Mr. A. D. Oliver of the Department of Indian Affairs and Northern Development made available a number of technical reports prepared by company geologists and engineers. Drs. W. R. A. Baragar and J. A. Donaldson kindly supplied several new geological formation names for use in this report.

Chapter II

GENERAL GEOLOGY

Summary Outline

A late Precambrian easterly trending belt of basalt flows and associated sandstones and shales that outcrops along Coppermine River contains the copper occurrences after which the river was named. This belt extends 50 miles southerly from the village of Coppermine on Coronation Gulf and 108 miles west and 40 miles east of Coppermine River. In 1959 Fraser (1964) mapped these rocks as Coppermine River Series. Baragar (1967) refers to the Coppermine River Group as being 12,000 feet thick, composed of a lower 8,000-foot volcanic zone made up largely of basalt flows and an upper 4,000-foot volcanic and sedimentary zone of basaltic flows and interbedded red hematitic sandstones and shales. He noted that grey to greenish sandstones, siltstones, and dark shales overlie the red shales unconformably, and separated these and overlying sedimentary beds into a post-Coppermine River Group that has been named Rae Group (pers. com.). Baragar and Donaldson (1970, p. 122) separate the Rae Group into four map-units, the lowest part composed of thinly bedded sandstones and shales, followed by carbonate rocks, massive quartzites, and a shale formation.

The band of grey to greenish, thin-bedded sandstones and dark shales with minor reddish shales that forms the base of the Rae Group is of special economic interest, as the basal beds close to the unconformity contain in some places disseminated copper sulphides and specks and grains of native copper. The formation is about 600 feet thick and is generally referred to as the Escape Rapids Formation by mining geologists. So far only grades averaging about 0.4% copper over mineable thicknesses have been found in these sedimentary beds.

Geological mapping during the summer of 1969 by Baragar and Donaldson (1970, p. 120) confirmed the absence of a time break between the base of the Coppermine River basalts and the underlying dolomites, which earlier had been mapped as part of the Hornby Bay Group. Accordingly the dolomites, dolostones, and immediately underlying red mudstones, shales and sandstones were mapped as a proposed Dismal Lakes Group (*see* unit C1, Fig. 1, *in pocket*). An unconformity within what formerly constituted Hornby Bay Group sedimentary rocks now marks the top of the Hornby Bay Group, which is formed of sandstones, shales, and conglomerate beds. T. N. Irvine (1970, p. 152) states that the Hornby Bay sandstone formation is about 4,000 feet thick. He found the dolomite that

underlies Coppermine River basalts to be 500 feet thick near the Muskox Intrusion (*see* Fig. 1) and to thicken westward to about 4,000 feet.

The basalt flows and sedimentary rocks described all have northerly dips. The basalt flows commonly dip about 5 degrees north but dips of 12 degrees north are found in some places and a few flows are flat lying or even gently domed. The Rae Group sedimentary rocks along Coppermine River have average dips of 2 or 3 degrees north. All rocks in the area are affected by a regional set of faults that strike northeast, north, and northwest.

South of Dismal Lakes and Kendall River, Hornby Bay Group sedimentary rocks rest unconformably on massive and gneissic granitic rocks and on rhyolitic rocks, but east of the big bend, from easterly to northwest in Coppermine River, the rocks rest unconformably on Yellowknife Group strata, consisting mostly of greywackes, slates, phyllites, conglomerates, derived schists, and also basalts. A little farther northeast they rest unconformably on Epworth Formation sedimentary rocks that include greywackes, slates, argillites, phyllites, quartzites, sandstones, siltstones, dolomites, conglomerates, and dacite. For the sake of simplicity, Hornby Bay Group and older rocks have been grouped together on the accompanying index-geological map (Fig. 1).

The northerly tip of the Muskox Complex, a north-striking mass of dunite, peridotite, pyroxenite, and gabbro as much as 4 miles wide and exposed for 74 miles along a southerly course, lies only a mile east of the most southerly outcrop of the Coppermine River basalt belt, 10 miles southeast of the big bend of Coppermine River. According to Irvine (1970, p. 150), the Muskox Intrusion cuts the newly defined Hornby Bay Group sandstones but is older than the Dismal Lakes dolomites and associated sedimentary rocks that lie immediately below the Coppermine River Group rocks.

The Coppermine River Group rocks are cut by dykes and sills of diabase and gabbro. North-striking dykes are common particularly in the basalt flows and underlying dolomites of the September Mountains area. Westerly trending sills that intrude the Rae Group sedimentary succession are known as the Coronation Sills (Donaldson and Baragar, 1971, pers. com.). A gabbroic dyke that strikes southerly across Willow Creek a mile or so east of Willow Lake is said to have been traced for 10 miles south to September Mountains. Some of the diabase dykes contain appreciable amounts of chalcocite; analyses of selected samples show from 0.3 to 0.5% copper.

A potassium–argon age determination made on a sample of basalt collected by J. A. Fraser 16 miles northwest of Dismal Lakes gave 735 m.y. (Wanless, *et al.*, 1965, p. 60). A basalt sample collected by W. R. A. Baragar at the head of Husky Creek gave an age of 769±78 m.y. D. C. Findlay collected a sample of basalt about 100 feet above the base of the Coppermine River basalt succession that gave an age of 1,200 m.y. An age determination made on a sample of a gabbro sill that cuts Rae Group sandstones gave an age of 605 m.y. (Wanless, *et al.*, 1966, p. 41). Sills and dykes of about this age are widely distributed in the northern Canadian Shield and are referred to as the Franklin Diabases by Fahrig, Irving, and Jackson (1971, p. 455).

The term gabbroic dykes as used in this report refers to diabase intrusions. Hand specimens from these dykes are formed of feldspars more sodic than labradorite, in which lath-shaped feldspars are absent. Some dykes and sills display differentiation into pegmatitic zones and granophyric phases. The basalt flows and the diabasic and gabbroic intrusions are considered to have originated from the same magma chamber. The area underlain by the Coppermine River basalt flows commonly exhibits a ridge-and-trough topography resulting from differential erosion between the massive parts of the flows and the softer amygdaloidal flow top zones. Through examination of air photographs of the area north-

east of lower Dismal Lakes at least 70 separate flows were counted. But the actual number of flows is greater as in some places a pair of thin flows appear as a single thick flow on the photographs. Baragar (1969, p. 5) states that 130 flows may be counted in the Bornite Mountains.

A typical basalt flow consists of a dull red, scoriaceous, amygdaloidal, in places fragmental, flow top 10 to 20 feet thick underlain by about 100 feet of massive, grey to purple, brown or dark green basalt, which contains only scattered amygdules commonly from 2 to 6 inches apart. In the flow top zones the amygdules are more generally about one quarter inch apart. The amygdules are for the most part composed of calcite, quartz, epidote, chlorite, and pink potassic feldspar or sanidine, or various mixtures of these minerals. Native copper and/or chalcocite is commonly found within the amygdules as small grains or as thin wall-linings and scattered along narrow fractures. The native copper seen by the writer was always in amygdules scattered through the massive main mass of the basalt flows and not in the flow top zones. Native copper flakes, specks, and grains occur alone and also in some flows associated with small amounts of disseminated chalcocite within the massive parts of the flows. The native copper is present in small amounts in most of the flows but in varying amounts for each flow. The copper content of many of the basalt flows ranges from about 0.01 to 0.5%.

The basalts contain an average of from 1 to 5% of magnetite and ilmenite and, according to W. A. Robertson (1969) who has studied this feature, the magnetic properties of these minerals may cause errors in Brunton compass readings of about 8.5 degrees on the average. Some of the anomalously high magnetic intensities he found are considered as possibly due to local lightning strikes.

Extensive geophysical prospecting has been done in the area in expectation of finding great tonnages of high-grade ore, but these hopes have not been realized. A number of magnetic high anomalies have been drilled with negative results. Magnetic readings taken over flow top zones should theoretically always be lower than those taken over the thick massive parts of the basalt flows, as the magnetite in the flow tops was oxidized to non-magnetic hematite when the flow was originally formed. Magnetic low anomalies in outcrop areas of massive basalt are likely to be significant in pointing to zones of low magnetite content and hence a possible veined structure or fault zone.

Geochemical surveys have been carried out by about a dozen mining companies in the Coppermine River area, numerous geochemical anomalies were found, and several have been drilled with negative results. Geochemical surveys were ruled out by some mining companies as being unrealistic where copper is so widespread in the basalts and drift-cover. In one instance a soil anomaly was absent in an area where copper-bearing float was plentiful and where the drift is underlain by sedimentary rocks.

In a recently published paper Baragar (1969) gives an excellent description of the geochemistry of the Coppermine River basalts. He shows that the average Coppermine basalt contains 49.6% SiO_2, 13.3% Al_2O_3, 5.4% Fe_2O_3, 7.8% FeO, 6.7% MgO, 7.7% CaO, 2.9% Na_2O, 1.5% K_2O, 2.22% TiO_2, 0.22% P_2O_5, 0.21% MnO, 2.8% H_2O, 0.3% CO_2. Baragar states that the Coppermine River Group is about 1,200 million years old (Neohelikian age). The reader is referred to his publication for detailed geochemical data, and for a petrographic description of the basalts by R. N. Annells. Petrographic data are also available in Graton (1913, p. 102–114).

Coppermine Fault Pattern

The Coppermine River Group rocks, as well as the underlying and overlying rocks, are cut by large numbers of north-striking, northeast-striking, and northwest-striking faults. The writer has attempted to map these faults by tracing their lineaments from air photographs of the district (*see* Fig. 1). Numerous observed faults are also shown on Figure 1. Fault lineaments were generally easily recognizable by U-shaped rock-walled ravines some of whose walls are 100 feet or more high. The floors of most of these ravines are drift-covered so that actual outcrops of the fault zones, breccia zones, veins, etc., are not commonly seen. Some of the faults are marked by prominent escarpments over 100 feet high, others are marked by only a few feet in difference of elevation along their strikes. For every fault zone mapped there are of course numerous lesser fault zones that can be found only by ground traversing. Many of the smaller breaks as well as the major fault zones are mineral-bearing, but in general there is more chance of finding large copper deposits by prospecting along the larger structures, so these should be of first interest to the prospector.

In September Mountains area the numerous basic dykes also show on the air photographs as distinctive linears with some breadth, and their positions have been plotted on the index map. It may be that an occasional narrow dyke in this vicinity has been improperly identified and plotted as a fault zone. Many of the known mineral deposits occur along one of the large faults or fault breccia zones plotted on Figure 1 or along smaller subsidiary fault structures.

Difference in strike of the faults and fault breccia zones has apparently not been a factor in mineralization and has had no effect on it: for example, the No. 47 deposit occurs along the northeast-striking Teshierpi fault zone, the Dick lode along a north-striking fault breccia zone, while the Lars copper lode is found along a northwest-striking fault zone.

The Teshierpi northeast-striking fault zone lineament is traceable for 35 miles from Teshierpi River valley to a point about 7 miles northeast of Hope Lake. The known copper deposits along this zone include the DOT 47 (No. 47) lode, the DOT 210 lode, and the Malachite Lake and Wreck Lake deposits. It is reasonable to believe that other deposits will be found elsewhere along its course. At Carleton Creek the zone is represented by three exposed northeast-striking fissured zones, a quarter mile or more apart, one of which contains considerable chalcocite.

The principal component of the Dixon fault system follows a northerly course from the west end of the central Dismal Lakes north through part of Elbow Lake and forms a fault scarp that marks the east limit of the Bornite Mountains. More than a dozen northerly striking faults that lie between the main Dixon fault and the Teshierpi fault are considered as comprising part of the Dixon fault system; chalcocite occurs along many of these faults. The well-known Copper Lamb bornite-chalcocite lens occurs on a branch of the Dixon fault about 1.7 miles north of Bornite Lake.

The Long Lake fault lineament strikes northwesterly and is traceable for about 40 miles from Lars Lake. The Lars copper deposit occurs along this fault zone near the lake. At Ravine Lake 5 miles farther northwest, branch copper-bearing quartz veins run off at right angles to the main fault zone both to the northeast and southwest and the main break beneath the lake may also be mineralized. In the ravine bottom a mile farther northwest the main fault zone (20 feet wide) is exposed; vein quartz is plentiful over a width of 6 feet but mineralization is sparse (*see* COP 6, 9, 10). Long Lake marks the trace of the fault zone for 6 miles at a central point along its course (*see* Fig. 1). About

4½ miles west-northwest of Bob Lake, the Long Lake fault intersects the Bob Lake fault (*see* Fig. 2, *in pocket*); the former strikes N55°W, the latter N68°W. Copper occurs along the Bob Lake fault zone in a strong quartz vein at Bob Lake and also in two strong quartz veins (*see* FAR EXT. 1) 14 miles farther northwest at Crescent Lake. Thus it would seem reasonable to expect to find mineralization at the site marked on Figure 2 as the 3 Ponds site, which is the intersection point of the two major faults, the Bob Lake and Long Lake faults. The site is in a narrow drift-filled valley marked by three ponds.

The Strike Lake fault lineament marks another strong break that has a northwest strike. It passes through Lake 902 (9 miles northeast of Hope Lake) and is well defined for 16 miles. The fault is named after a pencil-shaped lake that lies along its strike 2 miles northwest of Lake 902. (The figure 902 gives both elevation and identification of the larger lake.) Basalts that are traversed by the break are reported to have undergone hydrothermal alteration.

The Melville Creek northeast-striking fault (*see* Fig. 1) is marked by the narrow valley of lower Melville Creek starting 5 miles southeast of the bend in Coppermine River. Farther northeast its presence is suggested by a fault scarp lineament that lies roughly 2 miles southeast of basal Coppermine River basalt flows. The aligned escarpments suggest an overall length of more than 40 miles. For much of this probable length the fault appears to form the southeast contact of the Dismal Lakes Group. Ten or more shorter parallel faults are conspicuous in the rocks to the southeast (*see* Fig. 1).

All faults that cut the Coppermine River basalts are considered to have formed at the same time as many other faults that cut the older sedimentary and igneous rocks beneath the basalts. The fault patterns are similar in the older rocks more than 50 miles to the south and east of Dismal Lakes, thus there is reason to believe that they formed as part of a regional structural deformation; the longest faults probably have great vertical penetration. The igneous dykes that cut the Coppermine River Group and underlying rocks are magma fillings of former deep-seated faults.

Approximately 1,000 fault zones are plotted on Figure 1. About 500 of these cut the Coppermine River basalts, and are considered to form the most favourable structures along which to prospect for copper. But faults that cut the immediately overlying sandstones and associated sills are also important, and fault zones in the older rocks south of the Coppermine River Group should not be overlooked in the search for mineral deposits.

Chapter III

ECONOMIC GEOLOGY

Classification of the Copper Deposits

Most of the copper deposits in the Coppermine River area may be classified as either syngenetic or epigenetic. These are primary mineral deposits formed during the original ore-forming and rock-forming period. By definition the syngenetic ore minerals formed contemporaneously with the enclosing rock; the epigenetic ore minerals formed later than the enclosing country rock. The secondary deposits formed as a result of erosion and disintegration of the original rocks and minerals.

PRIMARY

Syngenetic Deposits

Sedimentary and igneous copper lodes

1. Disseminations of copper sulphides and native copper in sedimentary rocks
2. Disseminations of native copper in basalt flows
3. Disseminations of chalcocite in diabase dykes
4. Disseminations of copper sulphides in gabbroic dykes

Epigenetic Deposits

Copper-bearing cavity fillings

5. Fault-fissure veins and vein-lodes in basalt flows
6. Fault-breccia lodes and shear vein-lodes in basalt flows

Impregnation and replacement copper lodes

7. Amygdaloidal impregnations in basalt flow tops
8. Sandstone beds impregnated and/or replaced by chalcocite adjoining a fault
9. Sandstone beds impregnated and/or replaced by chalcocite adjoining a diabase dyke
10. Carbonatized shear zone vein-lode
11. Sandstone-dyke vein-lode
12. Chert beds replaced by chalcocite

SECONDARY

13. Supergene native copper plates and nuggets
14. Alluvial detrital deposits containing native copper.

A brief description of each of the different types of deposits is given to acquaint the reader with a rough assessment of the economic possibilities and to provide a guide for further prospecting.

Syngenetic Deposits

1. *Disseminations of copper sulphides and native copper in sedimentary rocks.* Chalcopyrite, bornite, and chalcocite occur as fine disseminations in easterly trending bluffs of sandstone, quartzite, siltstone, silty pebble-conglomerate, and dark mudstone on the BUD 942-947 claims (G. Leliever, owner) about 6 miles west of Coppermine River 3 miles north of Husky Creek. According to Kirkham (1970), the copper minerals are confined to a zone that lies between 10 and 40 feet stratigraphically below a gently northerly dipping diabase sill over 100 feet thick. This mineralized zone lies a short distance above an unconformity between the grey to brown copper-bearing sedimentary rocks (Rae Group) and underlying red to rusty sandstones and shales (Coppermine River Group). Copper concentrations in these sedimentary beds generally average less than 0.4% copper but one bed, about 6 inches thick, contains about 1.0% copper (visual estimate by the author).

Copper was found 6 miles farther east at the same stratigraphic horizon described above in two holes drilled on the south side of the east flowing part of Coppermine River 3 miles southwest of Escape Rapids. These holes, drilled by Coppermine River Limited during the summer of 1969, are about 650 feet apart and roughly 1,500 feet south of the river on claim ESC 38. In general it was found that pyrite, chalcocite, and chalcopyrite are disseminated in grey to greenish glauconitic sandstones and in intercalated black, sandy shales which lie a short distance above reddish sandstones; these are locally separated by a basalt flow 25 feet thick. The mineralized section of sandstones and shales is 30 to 35 feet thick and the copper content would probably average close to 0.4%.

An interesting feature in the drilled holes is the presence of fine particles of native copper which is restricted in the easterly hole to a 5½-foot-thick band of interbedded coarse sandstone and black sandy shale at a depth of about 130 feet and 6 feet above a basalt flow. At this locality this band apparently is the uppermost unit of the Coppermine River Group that rests on red sandstones (*see* data in logs by N. J. Byrne, pp. 58 and 59). Some coarse native copper blebs were also found in the other hole 650 feet farther west at about the same horizon but confined to a band of coarse sandstone only 4½ inches thick and 5 feet above the basalt.

Thus it appears that the disseminated copper mineralization occurs within *sediments* of the Rae Group a very short distance above the unconformity with rocks of the Coppermine River Group.

2. *Disseminations of native copper in basalt flows.* Native copper occurs as thin flakes and as grains, and rarely as paper-thin leaves the size of a one cent piece within some grey to green massive basalt flows. A high proportion of the scattered amygdules found within the massive parts of these same flows also contain native copper enveloped within quartz-potash feldspar-calcite and chloritic amygdules. Most geologists who have visited the area contend that this copper originated with the flows, that these were flows

particularly rich in copper, and that the copper has migrated little since consolidation of the flow. The native copper within the amygdules necessarily migrated to its present position through the enveloping massive basalt along with the components for the potash feldspar, calcite, and quartz that form the amygdules, but lateral and vertical movement of the copper may well have been only a few centimetres; for this reason this type of deposit is classified as syngenetic rather than epigenetic.

The writer tested two samples of this type of basalt. One collected a quarter mile south of the west end of Hope Lake contained 0.3% copper; another collected on a basalt ridge 9 miles farther northwest contained 0.5% copper. A sample from the ALF group (north of main vein) was not assayed but a visual estimate placed its native copper content as greater than 0.5%.

Disseminated native copper occurs in basalt bluffs 30 feet high on the KAT claims (Bracemac Mines Limited) and according to a company technical report (1968) a sample of this material assayed 1.32% copper. Drilling failed to confirm this grade over any significant thickness.

3. *Disseminations of chalcocite in diabase dykes.* A north-striking diabase dyke 30 to 60 feet wide that intrudes the basalt flows on the VIC group (Canadore Mining & Development Corp.) contains disseminated chalcocite. Drilling and sampling of a 1,200-foot-long section of the dyke by the owners indicated an average grade of 0.46% copper across a true width of 35.7 feet. Narrow zones of copper-enriched diabase were also found adjoining small fault fissures. Frost-shattered blocks of another diabase dyke that intrudes basalt flows on the AC group (Conwest Exploration Company Limited) also contain disseminated chalcocite. A typical sample of this mineralized diabase, collected by the writer, contained 0.50% copper (spectrochemical analysis). The copper in these dykes is tentatively considered to have been emplaced with the parent dyke magma.

Support for a theory of widespread mineralization in sills or dykes of diabase is given by O'Neill (1924). In the Bathurst Inlet area he found ". . . a considerable amount of chalcopyrite and some chalcocite disseminated through some of the large sills or dykes of diabase which traverse the region." A grab sample of one such occurrence on a small island just northeast of Algak was found by analysis to contain 1.18% copper. Similar sulphide occurrences are found all along the ridge of diabase passing through Hanerotit Island about 16 miles eastward of Cape Barrow, and in other places (O'Neill, 1924, p. 62A).

4. *Disseminations of copper sulphides in gabbroic dykes.* A gabbroic dyke that crosses Willow Creek about a mile east of Willow Lake is well exposed at intervals for 5 miles along a north-northwest course from the creek and it probably extends south of the creek. This dyke was examined by the writer in three places and was found to range from 80 feet to 125 feet wide. At each place the rock was of medium grain and contained sparse disseminations of pyrite, chalcopyrite, and chalcocite. A spectrochemical analysis made on a sample of the gabbroic dyke collected about a mile north of the east end of Big Lake showed a copper content of 0.1%.

Epigenetic Deposits

5. *Fault-fissure veins and vein-lodes in basalt flows.* Most of the fault-fissure veins are formed of quartz, calcite, or dolomite or combinations of these three minerals. Barite

gangue was noted in two places: (1) associated with quartz and chalcocite a mile northwest of the Bornite Lamb property; (2) in veins near the north end of Tundra Lake. Barite gangue has also been reported on the TRI 4 claim and on the HA claims which are south of Pistol Lake. Small amounts of datolite and prehnite are found in a few quartz veins. Most of the above kinds of veins contain variable amounts of chalcocite, bornite, and chalcopyrite and their copper content generally ranges from about 1 to 3%. Some very rich shoots of massive chalcocite and bornite are also associated with quartz and carbonate. The massive sulphide veins are generally short, narrow, and lenticular but in some places are numerous enough to be of economic importance. A lenticular bornite lens known as the Copper Lamb bornite vein is the largest of this type found to date and its existence has been known for many years. This vein, located a mile northwest of Bornite Lake, averages 47% copper across a width of 12 feet at its widest point but is less than 200 feet long and is reported to pinch out 20 feet below surface. It occurs along a strong quartz vein, along which other sulphide lenses might be found when more exploration is undertaken. Many of the copper-bearing quartz and carbonate veins are more than a mile long but none of them has been tested for depth persistence of its copper mineralization (the COPPER LAMB and JACK 13 veins were cut by a few shallow drillholes). Silver content of the sulphide veins is low judging from six fire assays for silver completed by the Mines Branch (Jan. 1970). The silver content of the six samples tested ranged from 1.10 to 2.67 ounces a ton.

Some small narrow chalcopyrite-bearing quartz and carbonate veins have been found in the dolomites that underlie the Coppermine River basalts but none of those found to date appears to be of economic importance.

The Lloyd quartz vein located 7 miles northwest of Hope Lake is one that may eventually be of economic interest; this vein is well exposed on the LLOYD 5 claim in five open-cuts and in natural exposures for a length of 500 feet starting at a point 250 feet northeast of the most northerly bay of Lloyd Lake. The vein strikes N40°E and has a vertical attitude. In the open-cuts the vein ranges from 2 to 8 feet in width and the quartz gangue contains 2 to 3% or more of chalcocite. In one trench a lens of solid chalcocite is 6 inches wide. Vugs lined with idiomorphic quartz crystals occur in several places but this type of quartz is mostly barren. The Lloyd vein is open to the northeast and it probably continues much farther to the northeast in an area largely drift-covered. A mineralized quartz vein that outcrops on the east side of a small bay of Lloyd Lake and again in marshy ground on a peninsula 200 feet farther west, on the north shore, at a distance of 2,700 feet southwest of the showings described above, may be an extension of the same vein as it is directly on strike. If so the total traced length of the Lloyd vein would be about 3,600 feet. At the lakeside showings the vein ranges from 2 to 3 feet in width and the quartz holds chalcocite, bornite, and some chalcopyrite, with a total copper content of at least 2%. Some prehnite and minor carbonate are present in the quartz gangue. About 1,100 feet northeast of this lakeside showing loose blocks of quartz in the drift contain 3 or 4% copper sulphides. A 4-foot-wide malachite-stained shear zone that also strikes N40°E outcrops 100 feet north of the area of copper-bearing float, suggesting that there may be an *en échelon* pattern here and two overlapping parallel veins may be present rather than one.

6. *Fault-breccia lodes and shear vein-lodes in basalt flows.* Fault-breccia zones, sheeted zones, shattered and sheared zones within the basalt flows form the structural framework of the more important copper deposits in this area. These controlling structures are all closely related and they change from one to the other along major fault zones. In a

typical deposit the copper sulphides and quartz and carbonate gangue minerals fill the open spaces and act as a cement that binds the angular fragments of the fault-breccia zones together. The mineralizing process was invariably accompanied by some replacement of the wall-rocks and breccia fragments.

Chalcocite is the dominant copper sulphide found in this class of deposit but some bornite is generally present and chalcopyrite is sometimes seen in very small amounts. The gangue minerals present in varying amount include quartz, white calcite, buff coloured carbonate (dolomite), pink potash feldspar, and rarely some barite. Small grains of anthraxolite are also found in the mineralized lodes, mostly as replacements of basalt, also in quartz veins, and more rarely as amygdule fillings. The anthraxolite grains are mostly in the form of small, soft, jet black grains ¼ to ⅜ inch in diameter. The anthraxolite has well-developed conchoidal fracture and is not radioactive.

The DOT 47 (Coppermine River Limited) copper deposit is the largest found in the area and is a good example of a mineral deposit that occurs along a brecciated, shattered, and sheared zone, in this case along the major northeasterly striking Teshierpi fault zone. It is reported to be a vertically dipping tabular orebody about 1,500 feet long and 35 feet wide, but widening in places along successive gently dipping flow tops. One hole shows a depth of 600 feet. In 1969 the ore reserves were reported to be 5,100,000 tons grading 2.5% copper.

The JUNE deposit (Bernack Coppermine Exploration Limited) is another that occurs along a brecciated fault zone. It ranges from 3 to 15 feet in width on surface exposures, and is well mineralized with chalcocite for a length of about 700 feet in the surface outcrops. Drilling (1969) has indicated that mineralization extends to a depth of more than 300 feet. Ore tonnage outlined by the 1969 drilling is reported (Craig and Kelly, 1970) as 1,000,000 tons of 2.5% copper.

A fractured brecciated zone known as the Dick No. 1 lode (Pickle Crow Gold Mines, Limited) is another that shows good length and mineralization. It is 3 miles south of Willow Lake, strikes north towards the west end of the lake, and has been traced by diamond drilling and as scattered outcrops and float for about 3,200 feet. A breccia zone of basalt fragments is cemented by stringers, veinlets and masses of quartz, calcite, and chalcocite. According to C. P. Jenney (1954) the structure was drilled along a strike length of 1,100 feet and to a depth of 100 feet. The average width of the lode was estimated to be 10 feet and indicated ore was 90,000 tons of 8.78% copper.

The Vera vein-lode (Consolidated Proprietary Mines Holdings Limited) is another chalcocite-bearing sheared and fractured zone that commands interest as it can be followed for 4,000 feet along its northeasterly strike (though much of it is concealed by drift-cover) and in many places it appears to contain from 2 to 5% of chalcocite over widths of 6 or more feet. In a cliff face toward the north end of this lode a branch vein-lode 4 feet wide that lies 100 feet east of the main lode contains 2 to 3% chalcocite.

The Pickle Crow vein-lode that lies north of Burnt Creek and about 2 miles north of the Vera is another deposit of the brecciated fault and shear zone type. The occurrence ranges from 6 to 30 feet in width and is readily traceable by open-cuts and frost-heaved float for more than 1,000 feet in a northeasterly direction. In a rock-cut toward its southwest end the lode is 6 feet wide; 2 feet of this width is well mineralized; a visual estimate suggested a possible chalcocite content of over 20%. A zone 4 feet wide in a rock-cut about 1,000 feet farther northeast contains about 5% chalcocite. The full width of the lode is not exposed in this vicinity.

The CU vein-lodes (Quadrate Explorations Limited), which are on the ridge a mile

east of the Vera lode, are likewise sheared and brecciated fault zones containing appreciable chalcocite. Three separate lodes are present, each more than 1,500 feet long and 8 feet in average width. No. 3 lode, which was partly drilled in 1969, returned a weighted average grade of 3.74% copper across a true width of 8.1 feet for a length of 525 feet (drill intersections about 100 feet below surface).

The DOT 210 shear vein-lode (*see* Fig. 3, *in pocket*) lies a mile northeast of the No. 47 deposit, on Coppermine River Limited ground, and occurs along a branch of the Teshierpi fault system. It strikes northeasterly and can be followed through scattered outcrops for an overall length of 4,000 feet. It is a mineralized sheared zone that changes in places to a mineralized sheeted, braided fractured zone that ranges up to 30 feet wide. One or more chalcocite-bearing lenticular quartz veins that occur along this structure have average widths of about 12 inches but in some places these shear quartz veins are up to 3 feet wide. Along its more northerly exposures the sheared and sheeted basalt and shear quartz veins contain an estimated 1% of chalcocite across widths of up to 18 feet, but this could be an underestimate. For 400 feet along its strike on either side of Dot Creek the sheared zone displays a braided, branching outline and in many places contains up to 4% of chalcocite. Along one sector 30 feet northeast of Dot Creek the lode is 25 feet wide and a chip sample collected across the width by the writer assayed 3% copper. Another sample collected 140 feet farther southwest across a width of 7 feet assayed 5% copper. Other sections with comparable grade may occur in drift-covered areas northeast of Dot Creek.

7. *Amygdaloidal impregnations in basalt flow tops.* Chalcocite fillings of vesicles in the upper parts of basalt flows form what have been called amygdaloidal copper deposits. In general the vesicles of the flow top zones have been filled with one or more of the following minerals: calcite, quartz, pink feldspar, chlorite, and epidote. Where chalcocite amygdules are present, the basalt wall-rocks are commonly found to have been replaced in part by chalcocite.

Amygdaloidal copper deposits in this area are of economic interest only in the vicinity of and immediately adjoining vertical or steeply dipping mineralized, brecciated, fractured, sheared, or fissured zones. Wherever steeply dipping or vertical fractures or brecciated zones are mineralized, the immediately adjoining flow top zones seem to have been favoured sites for chalcocite deposition and enrichment. An example of good copper grades in this type of ore at the No. 47 deposit (Coppermine River Limited) was given recently in a report of drill results for vertical hole S-122 located 50 feet off the southeast boundary of the main lode. The results were: 13 feet starting at 93 feet down assayed 10.46% copper; 12 feet beginning 143 feet down assayed 2.16% copper; 42 feet beginning 160 feet down assayed 1.59%; and 11 feet commencing 210 feet down assayed 5.96% copper.

Malachite Lake gets its name from malachite-stained blocks of amygdaloidal basalt heavily impregnated with chalcocite, which litter the northwest shore of the lake. These blocks of ore are believed to have come from the bottom of the lake and to have been moved to their present position by a northwesterly moving glacier.

8. *Sandstone beds impregnated and/or replaced by chalcocite adjoining a fault.* Flat-lying to gently northerly dipping grey and greenish grey glauconitic sandstones, siltstones, and shales of the Rae Group that outcrop on the east side of Coppermine River 19 miles southwest of the mouth of the river are impregnated and replaced by chalcocite for 50 feet laterally on either side of a strong fault that strikes N60°E. Some chalcocite

nodules occur in the sandstones near the fault fissure and malachite and azurite stains are prominent along the cliff walls in the 100-foot-wide zone centred along the fault. This mineralized belt probably continues northeasterly from the river for as far as the strength of the fault is maintained in that direction. The copper-stained sandstones probably contain between 0.3% and 1.0% copper in the cliff exposures.

Chalcocite-rich nodules occur over a length of 500 feet or more in a 4-foot-thick band of greenish grey glauconitic sandstones of the Rae Group that outcrops at the waters edge on Coppermine River, where the latter flows easterly about 20 miles southwest of Coppermine village (on claim ESC 63). The nodules contain pyrite and hematite as well as chalcocite. They range from 0.1 to 3 inches thick and some are up to 4 inches long. Most of them are lenticular and some are almost spherical. The nodules are most plentiful in a zone 40 feet long and 4 feet thick where some crumpled or slump structures are present in the sandstone. This zone lies only a few feet west of a northeasterly striking fault fissure that is calcite filled and ranges from 1 to 6 inches wide.

Some thin chalcocite-rich layers occur in the greenish grey sandstone beds that overlie the copper nodule zone at the base of vertical bluffs about 75 feet high. A sample of the mineralized sandstone collected by the writer (1968) 15 feet west of the fault contained 0.5% copper. All exposed copper-bearing beds at this site occur within 50 feet of the northeast-striking fault, and it appears probable that the copper-bearing solutions were introduced along the fault, pyrite nodules near the fault were replaced by chalcocite, and certain favourable laminae in the sandstones near the fault were replaced by chalcocite.

According to R.E. Hindson (geologist, Hearne Coppermine 1969) pyritic nodule beds occur at several locations a few miles farther north along the river and he has observed that the pyritic nodules are replaced by chalcocite within a 25-foot-wide zone adjacent to fault fissures.

A variation of the above type of mineralization consists of vertical copper-bearing hematite veins up to 4 feet wide reported by Hearne Coppermine as occurring on the east side of Coppermine River about opposite from the mouth of Husky Creek in red sandstone–siltstone–shale beds of the Coppermine River Group.

9. *Sandstone beds impregnated and/or replaced by chalcocite adjoining a diabase dyke.* Chalcocite occurs as impregnations and replacements in the red sandstones, red siltstones, and shales of the upper part of the Coppermine River Group on Coppermine River adjacent to a large diabase dyke that strikes northwesterly and which is exposed on the banks of the river 3 miles northeast of the mouth of Husky Creek. A Hearne Coppermine geologist's report (1969) states that the chalcocite occurs as disseminations in sandstone for up to 150 feet from the dyke and through a vertical extent of about 15 feet. He observed that mineralization is controlled by the more permeable zones in the sediments; the bedding planes and the coarser sandstone layers were particularly susceptible to mineral deposition. Mineralizing solutions evidently moved along the vertical dyke wall and spread laterally where permeable zones were encountered.

Copper also occurs in a 4-foot-thick bed of greenish black shale that is exposed for a length of 84 feet at a point 25 feet below a large northerly dipping diabase dyke on the RON, TER, HED group (Teshierpi Mines Limited). Disseminated granules of pyrite and chalcopyrite locally comprise up to 10% of the shale horizon. This locality is 5 miles east of Coppermine River from a point on the east bank opposite the mouth of Husky Creek, and the dyke is the same one that strikes across Coppermine River at the place previously described.

A fissured zone that lies along the west wall of a north-striking vertical gabbroic dyke south of Cap Lake (on the BUD 398–415 group) has permitted the replacement of red sandstone beds by about 1% of chalcocite over widths of 1 or 2 feet; a quartz vein 6 to 12 inches wide that fills the break also contains about 1% of chalcocite. The mineralized zone is continuously exposed for 800 feet but it is probably much longer. The red beds are bleached to a pale grey near the deposit.

10. *Carbonatized shear zone vein-lode.* The DOT 20 or Circle Lake No. 3 carbonatized shear zone is 600 feet north of the north bay of Circle Lake about 2 miles northwest of the No. 47 lode on ground owned by Coppermine River Limited. Judging from small scattered surface exposures the deposit is at least 60 feet wide and 250 feet long and is open at both ends. The outcrops are formed of highly carbonatized amygdaloidal flow top basalt, pale grey to white, with considerable green malachite stain. The carbonate mass carries between 1 and 4% of chalcocite and from 0.5 to 1% of pyrite. The ore zone is cut by veinlets of red feldspar and by small quartz stringers. In its surface expression this deposit is part of a flow top and represents a flared or locally expanded part of what is a narrower underlying mineralized zone, one with a steep or vertical attitude, but one which might be expected to flare out at other successive underlying flow top intersections. The lateral widening of the copper deposits, as indicated in Figure 5, along successive buried flow tops, at their intersections with vertical copper lode structures, has been proven to be a feature of mineralization in this area through diamond drilling evidence at the DOT 47 lode. A central deeply penetrating fissured, brecciated, and/or sheared zone seems to be indicated at the DOT 20 lode as openings were formed sufficiently deep to tap and conduct the hydrothermal calcium-rich solutions that were circulated to form the carbonatized zone. This deposit contains higher copper values in its surface outcrops than are found in surface ore outcrops at the DOT 47 lode.

11. *Sandstone dyke vein-lode.* The CAL 44 deposit is a very unusual sandstone dyke copper-lode that is situated on the northeast side of a small lake about 1½ miles west of Cliff Lake in ground owned by Hearne Coppermine Limited. The sandstone dyke is a clastic filling of a tension fissure and the sand filling may have been partly consolidated when it entered the fissure judging from its partly fragmented nature, or it may have been lightly shattered after emplacement and consolidation. The sandstone is replaced by pods, grains, small masses, and veinlets of chalcocite. In one pit several pockets of chalcocite up to 2 inches in diameter were noted. The dyke probably contains an average content of between 1 and 3% chalcocite. Surface exposures close to the lode consist of amygdaloidal basalt.

The chalcocite in the dyke suggests possible mineralization along bounding northwesterly striking major faults which are largely drift-covered. Some mineralized rock was noted along a fault scarp 1,000 feet northwest of the small lake.

12. *Chert beds replaced by chalcocite.* At the south boundary of the CU group (Quadrate Explorations Limited) 2½ miles southwest of the mouth of Burnt Creek some angular blocks of rich copper-mineralized float ore up to 2 feet in diameter are clustered together in an oval area about 12 feet long. This material consists of brecciated reddish brown chert of which the fragmented material shows very little dislocation and the fragments of which are both cemented together by chalcocite and are in part replaced by chalcocite so that the resulting chert breccia contains about 10% of chalcocite and its spectacular appearance is enhanced by the presence of thin films of malachite. The chert

zone in which these copper minerals occur is intercalated with the basalt flows and so may be expected to dip gently north. Judging from the size of the mineralized boulders, the chert zone is probably at least 3 feet thick and it may be much thicker, possibly even 10 or 15 feet. As malachite-stained red chert fragments occur in frost boils 200 feet south of the 12-foot-long area of mineralized float, it is probable that the chert bed is locally only lightly drift-covered. The brittle nature of the chert zone and its ready susceptibility to fracturing and replacement by chalcocite make it a possible carrier of widespread copper mineralization. This theory could be tested by drilling a number of short holes. It may be mineralized only in the vicinity of faults. Brecciation of the chert bed may have developed in part through fracturing by internal expansive chemical cracking. Chemical brecciation may occur according to Sawkins (1969) when cherts are invaded by alkali-rich hydrothermal solutions. Some geologists believe that the cherty zone may be a silicified highly weathered flow top or a silicified argillite.

Another mineralized reddish brown chert zone occurs on the KIL claims (Donalda Mines Limited) about 2 miles east of the mouth of Burnt Creek and just west of a small lake. This chert zone can be seen in only a few places where it is overlain on the west side of a drift area by a massive grey basalt flow. The chert is slightly fractured and is replaced by irregular veinlets, grains, and pods of chalcocite, all of which appear to adjoin minute fractures in the chert. Specimens collected at this locality contained pods of chalcocite partly altered to native copper.

Secondary Deposits

13. *Supergene native copper plates and nuggets.* Native copper occurs as slabs, sheets, thin leaves, and kidney-shaped masses in some places along chalcocite-rich calcite and quartz veins and veinlets, where chalcocite has been changed, possibly by reaction with ferrous oxide or sulphuric acid, to the native copper form. The presence of native copper in the oxidized zones of ores containing copper sulphides and pyrite is a common feature of many mineral deposits of western Canada and the United States, and this feature is normally looked for directly above the zone of secondary enrichment where pyrite has dissolved in groundwater to form iron sulphate and sulphuric acid. Native copper may also form as a result of the reaction of chalcocite with ferric sulphate; the latter could have formed in this area through oxidation of copper sulphide with production of hydrogen ion and sulphate. Possible reactions are as follows:

$$Cu_2S + 3Fe_2(SO_4)_3 + 4H_2O = 2Cu + 6FeSO_4 + 4H_2SO_4$$

or with ferrous oxide and sulphuric acid:

$$Cu_2S + Fe_2O_3 + 5H_2SO_4 = 2Cu + 6FeSO_4 + 5H_2O$$

The reaction of cuprite with ferrous sulphate and acid is:

$$Cu_2O + 2FeSO_4 + H_2SO_4 = 2Cu + Fe(SO_4)_3 + H_2O$$

Glaciation has largely removed most of the favourable oxidized zones where native copper plates and nuggets were formed. As Indians and Eskimos have searched the region for several centuries to find native copper with which to create their tools and hunting implements, the present-day finding of native copper in large masses constitutes an unusual event.

R.I. Thorpe of the Geological Survey believes that some thin plates of native copper that are apparently welded onto the walls of thin fractures they occupy, with no evidence of any in situ parent sulphide, may be primary deposits of native copper (pers. com.).

14. *Alluvial detrital deposits containing native copper.* It is probable that native copper slabs and nuggets have accumulated along the bedrock floors of some of the streams in the Coppermine River area and are now concealed beneath a mantle of alluvial sand, gravel, and boulders. It is unlikely that a placer mining venture to search for such accumulations would ever be financially rewarding.

Origin of the Copper

Most of the Coppermine River basalt flows contain small amounts of copper, as pointed out above, and this natural copper content is considered to have been the prime supplier of the copper in those lode deposits that are found along most of the fissured, sheeted, brecciated, and sheared zones. That copper was deposited along the major vertical and steeply inclined openings could be attributed in large part to the volume concentration of solutions moving along these channels. In part it is also a result of the mingling of vertically moving waters with lateral moving groundwater solutions that moved along the amygdaloidal flow top zones. The writer believes that hydrothermal solutions were also involved and that a deep-seated magma chamber supplied both energy and vein-forming solutions and probably also some of the copper. Surface evidence of the presence of one or more deeply buried copper-bearing igneous bodies is seen in the copper-bearing diabase dykes and copper-bearing gabbroic dykes that cut the Coppermine River Group. A copper-bearing quartz vein that occurs along one wall of the largest gabbroic dyke suggests a period of mineralization that followed the latest period of igneous activity.

The great size and diversity of some of the vein deposits in the basalts are contributing evidence of deposition by hydrothermal solutions. Veins up to 75 feet wide are found that are composed of up to 95% quartz, others are composed of up to 95% calcite, and a few are formed largely of dolomite. The vein-forming solutions from which these were deposited could have come up along conduits that were fed from deep-seated and different parent sources. Some of these veins are barren while others contain appreciable copper that may have originated in part at the same source as the vein gangue.

Wall-rock alteration is well developed along many of the lode deposits and is additional evidence of the former presence of hydrothermal solutions. The feldspars have been altered to chlorite, epidote, and carbonate and these minerals are widely distributed as amygdule fillings. There is an abundance of pink potash feldspar replacing the basalts along most of the sheared and brecciated zones and it also occurs as amygdule fillings.

Conclusions

An understanding of the different types of copper deposits (as outlined above) that are found in the Coppermine area is necessary for an intelligent approach to further exploration in this region. A great deal of drilling and/or pick and shovel or bulldozer trenching will be required to prospect for possible well-mineralized readily accessible copper deposits. Geophysical work may locate the structural breaks beneath the soil

cover, but evidence suggests that geophysical instruments are of little use in determining the presence or absence of chalcocite ores of the 2 to 10% copper category in the presence of magnetite-rich basalt. Geochemical exploration along the strike of known fault zones in the basalts might be useful in determining mineralized areas. Geophysical exploration should normally be effective in prospecting over the pre-Coppermine River rocks.

The writer believes that additional very rich copper ores (the 10% copper variety) may be found but only in limited amounts. Any high tonnage copper lodes discovered in future exploration will probably be of around the 2 to 4% copper tenor.

The recognition that hydrothermal solutions were at least in part responsible for the formation of the copper lodes in the basalts lends hope to the possibility that ore shoots may be found in future years to occur at greater depth than now known, particularly along zones of profound faulting. It also means that copper deposits may be looked for in the older rocks south and east of the Coppermine River basalts.

Aside from the proved and probable ore reserves of Coppermine River area, the available data suggest the presence of large latent copper resources for future development when more favourable conditions arise.

Summary of Prospecting Data

1. The tracing and testing of fault fissured zones in the Coppermine River basalts are of first interest in the search for economic copper lodes. Fault zones include shattered zones, brecciated zones, fractured zones, shear zones, braided zones, and vein fillings of quartz, calcite, dolomite, and barite. Carbonatized shear zones, and chloritized, epidotized, and potash feldspathized shear and fissured zones are also favourable locations for occurrence of the copper sulphides. Numerous gash veins that branch off at right angles or acute angles from the major fault structures are also commonly mineral bearing.

2. Intersection zones of major faults should be worthy of drill tests for copper minerals in the basalts where overburden is too deep for visual inspection by means of pick and shovel or bulldozing techniques. The 3 Ponds site (*see* Fig. 2) is an example of such an intersection; the ponds mark the intersection zone of the Bob Lake and Long Lake faults and several additional lesser faults. As Impact Lake (*see* Fig. 1) lies on the point of convergence of four well-defined fault lineaments it too should be considered for a drill test. A study of Figure 1 will pinpoint the intersection of other fault zones where special search should be made.

As the Coppermine River basalts are cut by at least 500 large faults (*see* Fig. 1) plus many small ones, and as the average length of each of these 500 faults is 10 miles, there are at least 5,000 linear miles of fault fissured ground along which search might be channelled. Assuming that only some 200 miles along the major fissured zones have been explored then it appears in round figures that prospecting accomplished to date has covered only $\frac{200}{5000}$ or 1/25 of the most favourable ground.

3. Diabase and gabbro dykes should be examined for copper contents, as two are known to contain up to 0.5% copper which is mostly in the form of lead-grey chalcocite that is not very conspicuous in the dark groundmass of the diabase or gabbro. A little chalcopyrite is also present in some of the dykes. The intersection zones of dykes and faults should theoretically comprise favourable ground for mineral deposition, in both the basalts and sedimentary rocks.

4. Further exploration for disseminated sedimentary bedded copper deposits in the thin-bedded, grey sandstones and dark shales at the base of the Rae Group is warranted. In some places where these sedimentary rocks are impregnated with copper sulphides adjacent to steeply dipping faults the sulphides are found to have been deposited along the laminated sandstones for at least 50 feet laterally from fault fissures. It is possible that impregnations of the sandstones adjacent to well-defined fault structures may be an indicator of richer concentrations of copper in the underlying buried Coppermine River basalts and red sandstones and shales along the same fault zone, and more particularly in the basalts as they comprise the most favoured host rocks in the district.

5. Do disseminations of native copper in some basalt flows as small specks, flakes, grains and splashes and native copper fillings of amygdules mark such flows as possible large tonnage low grade orebodies? So far insufficient laboratory and field work have been done to prove that copper of the same grade occurs for any appreciable distance along the strike of the flows, but it is known that some basalt flows are much richer in copper than others. Samples from the lower 10 feet of one flow examined by the writer graded 0.5% copper; however, samples containing less copper or samples containing over 1% copper could have been collected.

6. The occurrence of chalcocite in brecciated chert beds that are intercalated with basalt flows indicates that chert beds should be searched for mineralization.

7. As both Coppermine River and pre-Coppermine River Group rocks are cut by the same fault sets, it seems reasonable to expect that the older rocks may be found to be mineralized in some places. Fault zones, unconformities, and intrusive contacts are probably all of about equal interest in these older rocks.

Chapter IV

DESCRIPTIONS OF THE COPPER DEPOSITS

The mineral properties described are listed alphabetically and by the number of the claim on which the mineral deposit is found. The identifying mineral claim maps were supplied by the Department of Indian Affairs and Northern Development. Field locations of the claims do not always correspond exactly with those plotted on the maps. Claim groups visited by the writer and other properties on which information was supplied by the owners are included in these descriptions.

Properties Described

Name	Owner
1. AC group	Conwest Exploration
2. AL 1–108 group	Rolling Hills Copper; Provident Resources
3. ALF group	James Bay Mining
4. ARCH 28 claim	Nordic Explorations
5. ARCH 186 claim	G. Leliever
6. ARCH 196–198+group	Torwest Resources (1962)
7. BET group	Bernack Coppermine
8. BO 57, 120 claims	Pyramid Mining
9. BOB 101–103+claims	Coppermine River
10. BOB 109–126 claims	Artex Mines
11. BUD 37–72, DON 1–36 groups	Coronation Gulf Mines
12. BUD 157–204, etc. group	Canadian Lencourt
13. BUD 398–415, etc. group	Ramid Resources
14. BUD 589–590 claims	G. Leliever
15. BUD 837–924, etc. group	Casino Silver
16. BUD 942–947 claims	G. Leliever
17. C group	Pan American
18. CAL 42 claim	Hearne Coppermine
19. CAL 43 claim	Hearne Coppermine
20. CAL 44 claim (No. 3)	Hearne Coppermine
21. CAL 45–46 claims (No. 2)	Hearne Coppermine
22. CAL group, general	Hearne Coppermine
23. CAM 1–103 group	Cambridge Mines
24. CAN, FOX, etc. groups	G. T. Turner
25. CARL 7 claim	Hearne Coppermine

Name	Owner
26. CARL group, general	Hearne Coppermine
27. CARL 94 claim	Hearne Coppermine
28. COM 1–100 group	Hearne Coppermine
29. CON 1–55 group	Teshierpi Mines
30. COP 6, 9, 10 claims	Pinex Mines
31. COP 14, 18, 30 claims	Pinex Mines
32. COP 361–538 group	Murco Copper
33. COPPER LAMB group	Consolidated Proprietary
34. CORONATION group	Rose Pass Mines
35. CU-TAR groups	Quadrate Explorations
36. CU 36 group	Janus Explorations
37. CU-HOC groups	Quadrate Explorations
38. DICK group	Pickle Crow
39. DIZ, JIM, HERB groups	Teshierpi Mines
40. DOLL 1 claim	Northair Mines
41. DOLL 8 claim	Northair Mines
42. DON 14 claim	Coppermine River
43. DOT 47 (No. 47 mine)	Coppermine River
44. DOT 106–107 (Circle Lake 1)	Coppermine River
45. DOT 13 and 20 (Circle Lake 2+3)	Coppermine River
46. DOT 145–156 claims	Coppermine River
47. DOT 210–216–217 claims	Coppermine River
48. DOT 725 claim	Coppermine River
49. DOT 881–882 (Lake 450)	Northville Explorations
50. DOT 900 claim	Coppermine River
51. DOT 1353 claim	Coppermine River
52. DOT 1425 claim	Coppermine River
53. EB, SB, SIL, BO groups	Spectroair Explorations
54. EM 30 claim	East Coppermine and Conwest Explorations
55. ESC 37, 38 claims	Teshierpi Mines
56. ESC 63, 69 claims	Teshierpi Mines
57. ESC 68 claim	Teshierpi Mines
58. ESCAPE group	Glen Rapson
59. FAR group	Hearne Coppermine
60. FAR EXTENSION claims	Hearne Coppermine
61. FRED 104–200 group	Hearne Coppermine
62. FYM group	Polaris Mines
63. GAL 37–41, 53–58, etc. claims	Crowpat Minerals
64. GDF group	Conwest Exploration
65. GM 1–36, DM 37–72, FD, etc.	Coronation Gulf Mines
66. GO 1–216 group	Coronation Gulf Mines
67. GOOD and BREN groups	Trans Columbia Explorations
68. GORD 1–300 group	Magnum Consolidated
69. GORD 301–414 group	Pinex Mines
70. GORD 368 claim	Torwest Resources
71. GREG 1–275 group	Teshierpi Mines
72. GRR 90 group	Ross Kid
73. GY 1–30 group	Giant Yellowknife
74. HA 1–108 group	Tower Mines
75. HA 28 and 95 claims	Spectroair Explorations
76. HARRY 2–40 group	Consolidated Proprietary
77. HAY 1–36, VOIR 1–36 groups	Anglo-Celtic Explorations
78. HM 1–8 claims	Pinex Mines
79. HR 1–125, 150–209 groups	T.C. Explorations
80. HUSKY group	PCE Explorations, Coppermine River
81. IKE 37 and 72	Torwest Resources

Name	Owner
82. IS group	Coronation Gulf Mines
83. JACK group	Coppermine River Limited
84. JIM N92301–413+517–552 group	Sherto Explorations Limited
85. JIM N92502 claim	D'Aragon Mines Ltd., Willow Lake Mines
86. JOK group	Eskimo Copper Mines
87. JOS, CIS, PAL, TON, MIC, ACK groups	Bernack Coppermine
88. JS 1–36, FM 37–72, RP 73–100	Coronation Gulf Mines
89. JUNE 1–36 group	Bernack Coppermine
90. KARLA 1–13 group	Teshierpi Mines
91. KAT 1–45 and 1A–5A claims	Bracemac Mines
92. KIL group	Donalda Mines
93. LARRY 1–6 claims	Coppermine River
94. LARS group (No. 22)	Coppermine River
95. LASH 201–300 group	Hearne Coppermine
96. LASH 321–332+329–330 claims	Hearne Coppermine
97. LASH 523–524+claims	Hearne Coppermine
98. LASH group (general)	Hearne Coppermine
99. LEAH 1–72 group	Continental McKinney Mines
100. LEL 87–160, 169–172+group	Canadian Lencourt Mines
101. LIZ 1–36 group	Bernack Coppermine Exploration
102. LLOYD 1, 2, 5; DOT 799 claim	Coppermine River
103. MAG 1–64, MAT 1–72 groups	Nordic Explorations
104. MAR 1–100 group	Canadian Goldale Corporation
105. MAR 101–162, 166–197+claims	Northville Explorations
106. MAR 117 claim (Rabbit Lake)	Northville Explorations
107. MAR 322–325, 336–343 etc.	Columbia Placers
108. MAR 326–335, 344–353 etc.	Northville Explorations
109. MAR 500–562 group	Lake Beaverhouse Mines
110. MAS 7–8–9 claims	Teshierpi Mines
111. METAL 5, 7+12 claims	Coppermine River
112. METAL 13–30 claims	Coppermine River
113. MGB 101–180 group	Komo Explorations
114. MGB 181–185, 190–192 group	Nordic Explorations
115. MGB 277 claim	Canadian Goldale+Towagmac Expl.
116. MGB 325–396 group	Canadian Goldale
117. MID 1–100 group	Earlcrest Resources
118. MID 101–200 group	Hearne Coppermine
119. MM 1–72 group	Hardy Minerals
120. MONNIER 1–18 group	Agassiz Mines
121. MONNIER 19–36, +ILROCK 1–36	Shawinigan Mining, Africana Mining
122. NAN 1–36 group	Bernack Coppermine Explorations
123. NAN–GRA–PRO groups	United Buffadison Mines
124. NOR 27–72, WIL 73–79, HOLE 1–8 groups	Colonial Oil and Gas
125. NOR 48 and 94 claims	East Coppermine and Conwest Exploration
126. NWT 78–82 claims	Hearne Coppermine
127. OOK 1–14, 20–21, 27–34+claims	Gyro Explorations, Adera Mining
128. OP 37–64 group	Homestake Silver
129. PAN, DIB, MAS group	Teshierpi Mines
130. PAT 1–23 group (25–26)	Coppermine River
131. PICKLE CROW 140, 141, 200, 201	Pickle Crow Gold Mines
132. PICKLE CROW 350, 360, 361, 370	Pickle Crow Gold Mines
133. PRO-HOC-KIL group	Bernack Coppermine Exploration
134. PUMA 1–15 group	Coppermine River
135. RAY 1–108 group	Rayore Mines
136. RIT 1–147 group	Canadian Lencourt Mines
137. ROB and SOP group	Pinex Mines

Name	Owner
138. ROBB claims	Highland-Bell
139. RON, TER, HED, MAS group	Teshierpi Mines
140. RT 1–99, EH 1–5, 16–25+groups	Univex Mining Corporation
141. SAL 1–100 group	Armore Mines
142. SAM 1–48 group	Teshierpi Mines
143. SD, NWA, MCK groups	Amalta Oils and Minerals
144. SIL group	Spectroair Explorations
145. STAN 25–28, 37–47+group	Lynch Holdings
146. TEA 1–44 group	Teshierpi Mines
147. TIP 1–100+group	MacKenzie Mining
148. TOIVO 1–8, MGB 186–193–232	N.W.T. Copper Mine
149. TOM group	Agassiz Mines, Funday Explorations
150. TRI group	Hearne Coppermine
151. VERA 1–20 group	Consolidated Proprietary
152. VIC 1–32 group	Canadore Mining and Development
153. WATER and SWAK groups	Central Point Resources; Adera Mining
154. WIL 1–70, NOR 1–26 groups	Silver Arrow Explorations
155. WIN 1–108 group	Provident Resources, Rolling Hills Copper
156. XYZ 1–100, SON 1–36, SHE 1–39 groups	Continental McKinney Mines

AC Group (153)[1]
Conwest Exploration Company Limited
(lat. 67°21′, long. 115°23′; NTS 86 O/6)

The AC prospect is 3 miles northwest of Turbo Lake and 9 miles east of the mouth of Burnt Creek. Frost-heaved blocks of a diabase dyke that intrudes basalt flows contain scattered grains of chalcocite. A spectrochemical analysis of grab sample of the diabase gave: Si, over 10%; Al, over 5%; Fe, 10%; Ca, 3.0%; Mg, 2.0%; Ti, 1.5%; Mn, 0.30%; Sr, 0.02%; Ba, 0.005%; Zr, 0.02%; V, 0.05%; Cu, 0.5%.

AL 1-108 Group (126)
Rolling Hills Copper Mines Limited; Provident Resources Management Ltd.
(lat. 67°36′, long. 114°44′; NTS 86 O/10)

The AL 1–108 group covers a little over 8½ square miles and lies about 16 miles southeast of the mouth of Coppermine River.

On the AL 41 claim a shear zone, a few inches wide, along the edge of a basalt outcrop contains chalcocite and some native copper. On claim AL 43, over an area about 100 feet in diameter basalt rock fragments brought up in frost boils contain finely disseminated native copper. Up to 15% of the frost boil fragments are mineralized.

On AL 44 claim the owners outlined five geochemical copper anomalies that ranged from 500 to 2,600 feet long. An east-trending boulder train 150 feet long, of angular basalt blocks, some of which contain considerable chalcocite, was found on claim AL 45. About 200 feet west-northwest of the boulder train, in lightly sheared basalt, native copper occurs in thin plates in a series of old parallel Eskimo excavated trenches in an area 50 feet in diameter. Some native copper is also reported in the basalts on claim AL 79 in an area about 70 feet long.

[1]The number in parentheses appears on the index map (*see* Fig. 1, *in pocket*) at the approximate location of the property, and also in the property list on that map.

On the AL 96 claim a narrow calcite vein 20 feet long was found to be well mineralized with native copper. Geochemical copper anomalies were also outlined on claims 40, 64, 73, and 74.

ALF Group (89)
James Bay Mining Corp.
(lat. 67°16′, long. 115°58′; NTS 86 O/5)

The property lies north of the easterly flowing part of Coppermine River and extends roughly 3½ miles easterly from Big Creek. The principal showing occurs on claim ALF 83-T6383 about 3,500 feet west-southwest of the lake at the head of Hornby Creek.

The "A" zone is a brecciated shear along which the basalt country rocks are replaced by variable amounts of chalcocite. It is exposed in a grassy meadow on the north side of a 50-foot knoll of grey basalt, and outcrops consist mostly of fractured and red hematized flow top basalt and reddish amygdaloidal flow top basalt replaced for the most part by 1 to 5% chalcocite. The red or pink colour of the mineralization is enhanced by pink feldspar as replacements and as tiny veinlets. The zone strikes N80°E and is roughly 35 feet wide and 125 feet long in the surface exposure (open both ends). A grab sample of the material tested by the Mines Branch at Ottawa gave: Au (microscopic) trace; Ag, 2.07 ozs. a ton. This sample contained 30% Cu and 0.01% Ni (spectroscopic analysis, Geological Survey laboratory).

On the north side of the grassy meadow 350 feet from the "A" zone, massive grey basalts contain scales, spots, and grains of native copper, but its average copper content is probably less than 0.3%. This copper occurs both in amygdules and as disseminations in the basalt and as grains and flakes, or as splashes, along hairline fractures. The largest flake seen was an inch long and about 1/40th inch thick.

Additional copper mineralization is reported to be associated with northeasterly striking fault zones on the east side of Hornby Creek 1½ miles south of the "A" zone (not visited).

In the fall of 1968 James Bay Mining Corp. drilled three short holes to test the "A" zone. Hole No. 1 showed three narrow rich sections (*Northern Miner,* Nov. and Dec. 1968), one at 28.6 to 30.0 feet, a second at 43.2 to 44.2, and a third at 47.5 to 49.0 feet. Hole No. 2, a 70 degree bore, under the initial hole gave an intersection of 17 feet averaging 1.80% copper starting at a depth of 72 feet.

For a proper evaluation of drilling results, such as those listed above, a record of the nature of the mineralized rock is required; is it brecciated massive basalt, brecciated amygdaloid or undeformed amygdaloid? (*see* Fig. 5 for the implications in a hypothetical case).

ARCH 28 Claim (3)
Nordic Explorations Limited
(lat. 67°46′, long. 117°55′; NTS 86 N/12, N/13)

The ARCH claim group, 18 miles northwest of the northwest bay of Dismal Lakes, lies astride latitude 67°45′ with the GORD group adjoining on the south. According to the owners, a narrow shear occurs in the northerly dipping basalts near post 1 of the ARCH 28 claim. Lenticular veins of quartz and carbonate along the shear contain some

chalcopyrite and minor amounts of chalcocite. The mineralized vein is exposed for 90 feet and is up to 2 feet wide. It strikes N40°W and dips 85° northeast.

ARCH 186 Claim (1)
G. Leliever
(lat. 67°43′, long. 117°57′; NTS 86 N/12)

ARCH 186 claim is one of a large group of claims 17 miles northwest of the northwest end of Dismal Lakes. A vein on claim ARCH 186 is reported to be richer than the quartz and carbonate vein ARCH 28. The vein is mineralized with chalcopyrite and chalcocite and is up to 2 feet wide along its 90-foot-long exposure.

ARCH 196–198, 203–208, 213–219, etc., GORD 368 group (2);
Torwest Resources (1962) Ltd.
GORD 341–400 (north block)
Pinex Mines
(lat. 67°41′, long. 117°55′; NTS 86 N/12)

This property lies 15 miles northwest of the northwest bay of Dismal Lakes. Scattered fragments and boulders of high-grade chalcocite mineralization found on GORD 368 were probably ice-transported, as two packsack holes 25 feet and 87 feet long penetrated only barren basalt.

On GORD 355 some chalcocite was found in amygdaloidal basalt over widths of 12 to 18 inches for a length of 15 feet. A 35-foot drillhole failed to penetrate any mineralization (from report by W. G. Hainsworth).

BET Group (131)
Bernack Coppermine Exploration Limited
(lat. 67°32′, long. 115°02′; NTS 86 O/11)

The BET prospect is about 11,000 feet south of the JUNE. It is a mile west of Nipartoktuak River and 18 miles south of the mouth of Coppermine River. The principal surface showing consists of frost-heaved boulders of chalcocite-rich basalt in a gravel and cobble strewn field. One well-mineralized boulder train has a northerly trend, is roughly 200 feet long and 10 feet wide. A drillhole angled westerly below this zone penetrated basalt cut by small chalcocite and bornite veinlets.

BO 57 and 120 Claims (95)
Pyramid Mining Co. Ltd.
(lat. 67°17′, long. 115°45′; NTS 86 O/5)

The basalt flows on these claims strike east and dip north. A well-defined north-striking fault lineament lies close to the west side of claim 120. Chalcocite and malachite along fractures in the basalts along the top of a prominent ridge have been exposed in test pits for 600 feet.

BOB 101–103 and 122–124 Claims (12)
Coppermine River Limited
(lat. 67°42′, long. 117°21′; NTS 86 N/11)

The claims blanket northwesterly trending Bob Lake, which is less than half a mile long. Quartz Creek enters the southwest corner of the lake and Bob Creek, the outlet stream, flows northwesterly from the northwest corner of the lake.

The BOB quartz vein is exposed along the south bank of easterly flowing Quartz Creek for 1,700 feet westerly from Bob Lake and the floor of the creek is heavily littered with angular blocks of white vein quartz. Heaps of additional quartz float mark the vein, 2,300 feet west of the lake. The BOB vein is also exposed at intervals along the south shore of the lake, so that its total length probably exceeds 3,000 feet. The vein strikes E15°S and has a vertical attitude. Remnant heaps of drifted snow concealed much of the vein along Quartz Creek at the time of our visit (Aug. 6, 1969), but where exposed, it varied from 2 to 4 feet in width; in several places branch veins were noted. The great abundance of angular quartz boulders along the bed of Quartz Creek suggests the presence of other concealed veins.

Most of the BOB quartz vein and also the quartz boulders along the creek are barren or only sparsely mineralized; some of the quartz boulders, possibly 1 in 20, contain up to 4% of copper sulphides, chiefly chalcocite and bornite with minor chalcopyrite. The average grade of the vein exposures seen in place would be less than 1% copper.

The basalt wall-rocks of the BOB vein are altered over widths of 2 or 3 feet, and the feldspars have been epidotized and sericitized.

The Bob Lake fault zone (*see* Fig. 2, *in pocket*) can be traced as a fault lineament for 15 miles to the northwest to Crescent Lake where two strong quartz veins occur along it on the FAR EXTENSION claim.

BOB 109–126 Claims (55)
Artex Mines Limited
(lat. 67°16′, long. 116°25′; NTS 86 N/8)

The BOB 109–126 group of 18 claims is 6 miles northeast of the outlet of Dismal Lakes. A northeasterly striking quartz and calcite vein from 4 to 16 inches wide has been traced for 800 feet across claim BOB 125 and is known to continue for an additional 400 feet or more to the northeast across claim BOB 128. The vein is mineralized with chalcocite. Two pits 680 feet apart were blasted on the vein on the BOB 125 claim in 1969. Samples collected by G. L. Kirwan indicated that the vein in the northerly (No. 1) pit graded 1.97% copper and in the southerly (No. 2) pit, 1.72% copper. The wall-rocks were also found to be mineralized with chalcocite. The wall-rock of No. 1 pit assayed 0.29% copper giving an average content of 0.77% copper across 7 feet with the vein included. The wall-rock of No. 2 pit assayed 0.37% copper giving an average content of 0.66% copper across an 8-foot-width with vein included. These figures are roughly equivalent to an average copper content, both pits, of 1% across a width of 4 feet 6 inches.

Some copper float is also reported at the base of a low cliff on the BOB 123 claim.

BUD 37–72, DON 1–36, ORE 73–103 Groups (82)
Coronation Gulf Mines Ltd.
(lat. 67°17′, long. 116°12′; NTS 86 N/8)

This group of claims covers about 7 square miles near the head of Stony Creek. A northwesterly striking sheared and brecciated zone has been followed for about 2,000 feet. The zone is erratically mineralized with massive chalcocite over widths of 2 to 3 inches. The mineralized zone rarely exceeds a foot wide.

BUD 157–204, 249–288, 300–301, 312–314, 319–324, 497, 516, 517, 996–1044 Group (108)
Canadian Lencourt Mines Limited
(lat. 67°23′, long. 115°43′; NTS 86 O/5)

The claims lie on the west side of Coppermine River and reach 4 miles north from the Janus and United Buffadison holdings, with a 4-claim-wide belt along the north border that reaches 5 miles west from Coppermine River.

Reddish sandstones and shales of the Coppermine River Group underlie a large part of the claim group area, and outcrops are scarce except along creeks and the river. A quartz vein on BUD 1028 claim is reported to be 2 feet wide and exposed for 100 feet. The vein strikes N40°E, dips steeply southeast, and contains some chalcocite.

BUD 398–415, 418–468, 541–571 Group (109)
Ramid Resources Ltd.
(lat. 67°24′, long. 115°57′; NTS 86 O/5)

This block of 100 claims is centred 3 miles northeast of Willow Lake. The claims are largely underlain by red and grey sandstones and some intercalated basalt flows of the Coppermine River Group. A northerly striking gabbroic dyke, 80 to 125 feet wide, that cuts across the property contains specks of chalcopyrite and pyrite.

About 1,600 feet south of the cap-shaped lake on BUD 463 claim a quartz vein is sparsely mineralized with chalcocite and bornite. The vein is from 6 to 12 inches wide and is well exposed for 600 feet. It occurs along a fault that strikes north along the west contact of the big gabbroic dyke with the sandstone country rock. The sandstones adjacent to the quartz vein are bleached and are commonly malachite stained and impregnated with a little chalcocite. A vein-lode consisting of two or more parallel quartz veins separated by as much as 20 inches of the mineralized sandstone is present in some places. A spectrochemical analysis of a local sample of the dyke showed a copper content of 0.02%. A sample collected from this dyke 2 miles farther north contained 0.1% copper.

The owners report finding a specimen of native copper 12 inches long and half an inch thick from near the east edge of the first basalt ridge north of Willow Creek in the southeast part of the claim block.

BUD 589–590 Claims (110)
G. Leliever
(lat. 67°27′, long. 115°58′; NTS 86 O/5)

A prominent gabbroic dyke that intrudes the Coppermine River Group outcrops about a third of a mile north of the east end of Copper Leaf Lake (this lake 2 miles long and half a mile wide lies astride longitude 116°00′). The dyke contains fine specks of chalcopyrite and pyrite and some chalcocite. It strikes a little west of north and is locally about 100 feet wide. A spectrographic analysis of a typical sample of this rock collected by the writer shows 0.1% copper.

BUD 837–924 and 966–995 Group (114)
Casino Silver Mines Ltd.
(lat. 67°32′, long. 115°49′; NTS 86 O/12)

This claim group lies approximately 5 miles west of Coppermine River and 4 miles north of Husky Creek. The G. Leliever property adjoins on the south.

The claims are underlain by siltstones and sandstones of the Rae Group which are intruded by a flat to northerly dipping diabase sill 50 feet thick; some sediments and basalts of the upper part of the Coppermine River Group are found in the southeast part of the property. The owners report the occurrence of small grains of native copper in the massive basalts and in some of the quartz amygdules in these basalt flows. Chalcocite was seen in quartz veinlets 1 to 2 inches wide and in some narrow, thin fractures. Small specks of chalcocite were found in sandstones overlying the diabase sill in the south-central part of the claim group.

The owners note heavy disseminations of chalcocite over thicknesses of one half inch to 5 inches for a length of 500 feet just south of Casino Silver Mines claims, on the adjoining BUD claims owned by G. Leliever. Similar mineralization is known 1 or 2 miles farther west (*see* BUD 942–947).

BUD 942–947 Claims (113)
G. Leliever
(lat. 67°32′, long. 115°54′; NTS 86 O/12)

Widespread sparse copper mineralization occurs in sedimentary rocks of the Rae Group on these claims. The copper minerals occur in easterly trending bluffs of sandstones, quartzites, siltstones, silty pebble conglomerates, and in dark mudstones. These are dominantly greyish sedimentary rocks and here they have been indurated and metamorphosed to varying degrees by a gently northerly dipping diabase sill, more than 100 feet thick locally, that lies between 10 to 40 feet stratigraphically above the main copper-bearing zone. Chalcopyrite, bornite, and chalcocite occur as disseminations in the sedimentary rocks and also in small quartz veinlets and along fractures in quartz sandstones. These minerals seem to be most abundant in a zone about 10 to 50 feet above the unconformity that separates the Rae Group from underlying Coppermine River Group rocks, especially in beds that are rich in hematite and magnetite. Red sandstones and shales outcrop below the unconformity.

Eight samples collected for assay by R. V. Kirkham (1970, p. 52) across widths ranging from 6 inches to 8 feet contain from 0.02 to 0.44% copper. The sample that contains 0.44% copper was a chip sample taken across a 3-foot-thick bed that contains about 10 to 15% specular hematite.

The copper mineralization in the sedimentary rocks was traced by R. V. Kirkham for at least a mile easterly along the rocky bluffs and it is probable that mineralization extends farther to the east, north, and northwest. The mineralization here is not of immediate economic interest but a higher copper content may be found elsewhere near this general stratigraphic horizon.

Disseminated chalcocite in sedimentary rocks of the Rae Group was noted by C. K. O'Connor (*see* BUD 837–924) in June and July 1968 and was mentioned by him in a report dealing with ground owned by Casino Silver Mines, the property that adjoins the Leliever property on the north. He states that chalcocite occurs as heavy disseminations in alternate laminae in the siltstones over thicknesses of from one half inch to five inches for a maximum length of 500 feet, off the property to the south of Casino.

C Group (53)
Westfield Minerals Limited
(lat. 67°14′22″, long. 117°13′48″; NTS 86 N/3)

The C group prospect is 11 miles southwest of the narrows between upper and middle Dismal Lakes and about 2 miles southwest of Mountain Lake. Pyrite and chalcopyrite occur here in fractures in the granite.

CAL 42 Claim (26)
Hearne Coppermine Explorations Limited
(lat. 67°38′, long. 116°59′; NTS 86 N/10)

A quartz vein occurs along a strong shear zone along the northeast side of "Loop Creek" a mile northwest of Cliff Lake. The vein occurs in basalt, strikes N25°W, and is vertical. It ranges from 2 to 4 feet in width and can be readily followed in 50-foot cliffs along the creek for a distance of about 1,500 feet. Small veinlets of buff carbonate occur with the quartz, which is generally only sparsely mineralized with chalcopyrite.

CAL 43 Claim (25)
Hearne Coppermine Explorations Limited
(lat. 67°38′, long. 116°59′; NTS 86 N/10)

The quartz vein on claim 43 lies about a quarter mile west of the Loop Creek vein on CAL 42 claim. It is on high ground but is mostly in a drift-filled depression that strikes from N10° to N20°W. Loose blocks of leached quartz indicate a vein 6 or 8 feet wide and traceable for 600 feet.

CAL 44 Claim "CAL 3" (24)
Hearne Coppermine Explorations Limited
(lat. 67°38′, long. 116°59′30″; NTS 86 N/10)

The "CAL 3" occurrence is a sandstone-dyke copper vein 1½ miles west of Cliff Lake on the northeast side of a small lake that is locally known as Cal 3 lake. The sandstone dyke is from 5 to 7 feet wide and is well exposed for a length of 250 feet. The vein strikes N70°E and has a vertical dip. The total length of the dyke is about 600 feet; on the east it abuts against a fault that strikes N27°W and on the west against a fault that strikes N30°W. The westerly part of the dyke is concealed beneath a small lake and the last-mentioned fault follows the northwest side of Cal 3 lake, which is about 200 feet wide. The dyke has been slightly shattered and the partly brecciated sandstone has been replaced by veinlets, pods, and grains of chalcocite so that the mass contains between 1 and 3% chalcocite. In some places pockets of chalcocite have a diameter of up to 2 inches. The wall-rocks are amygdaloidal basalts with calcite-filled amygdules.

A quartz vein outcrops at intervals for 200 feet in the basalts at the northwest end of Cal 3 lake. This vein strikes N25°W, has a vertical attitude, and is 8 to 20 inches wide. A little carbonate accompanies the quartz. The gangue holds a small amount of chalcopyrite and probably contains less than 0.1% copper in the exposed parts of the vein. One small grain of black anthraxolite was noted in the quartz where the vein enters a drift area at the north end of the lake. Glacial striae strike N35°W.

A sheeted vein 2 to 3 feet wide and exposed for 100 feet occurs in the basalts about 500 feet west-northwest of the north end of Cal 3 lake. The vein strikes N25°W and has a vertical dip. Chalcocite is present as small veinlets and lenses and also as replacements of the basalt between essentially parallel fractures. Some short sections of the vein are rich in copper but the overall grade would probably be between 1 and 3%.

A mineralized shattered zone occurs a few hundred feet farther west on a low basalt ridge. This zone strikes N55°E and has a vertical dip. It is 3 to 4 feet wide and can be followed at intervals for about 400 feet or more. The fractured basalt is veined and replaced by considerable chalcocite; some malachite is present. Mineralization is erratic with rich sections of the lode alternating with zones that contain very little chalcocite.

CAL 45–46 Claims "CAL 2" (23)
Hearne Coppermine Explorations Limited
(lat. 67°38′, long. 116°59′40″; NTS 86 N/10)

The "CAL 2" deposit is a shear zone lode about 1,000 feet north-northwest of Cal 3 lake. The zone strikes N45°E and at its northerly end probably terminates against the fault that trends west-northwest from the west side of Cal 3 lake. The zone has an average width of 3 feet and has been traced by rock-cuts and natural exposures for about 600 feet. Some rich lenses of finely crystalline mixed chalcocite and bornite occur along the sheared zone and the basalt wall-rocks are replaced in places by small amounts of chalcocite. Several narrow veins of quartz, white calcite, and buff carbonate occur along the shear and are associated with mineralization. Although some solid sulphide lenses along the shear are up to 8 inches thick they are mostly less than 10 feet long.

CAL Group (General)
Hearne Coppermine Explorations Limited
(NTS 86 N/10)

Other copper occurrences were found on the CAL group of claims by Hearne Coppermine geologists during the 1968 season and these were recorded in a report prepared by Chapman, Wood and Griswold Limited very nearly as listed in the following table. *See* Figure 1 for approximate positions of numbered CAL occurrences.

No.	Type of occurrence	Approx. attitude and dimensions	Mineralization and alteration	General data
CAL 1	Quartz-calcite vein	Vertical shear zone 6 inches to 6 feet by 1,000 feet plus, strike N50°E	chalcocite malachite	2 chip samples (1967) total of 11.2 feet averaged 6.86% Cu.
2+3	(described above)			
4	Fracture filling, flow top breccia	(1) Quartz-calcite veins and (2) breccia in areas 1,000 feet apart	chalcocite malachite	
5	Quartz-calcite vein; flow top	Vein 1 foot by 500 feet strike N15°W	chalcocite malachite	Ends of vein are drift-covered
6	Fracture filling and quartz-calcite veins	3 feet wide by 325 feet	malachite chalcocite	Frost-heaved vein material present in broken basalt
7	Breccia and flow top	on strike with CAL 3	massive chalcocite malachite	Mineralization extends into flow tops
8	Flow top	Traced 15 feet into overburden	chalcocite malachite	
9	Fracture filling	1 foot to 2 feet wide by 500 feet	chalcocite chalcopyrite malachite	A quartz-calcite gangue fills a shear zone in massive and flow top breccia
10	Quartz-calcite vein	30 feet by 90 feet strike N20°E	chalcocite malachite	Zone of shattered quartz-calcite veins
11	Quartz vein	6 miles by 100 feet	chalcocite	Vein appears to pinch at both ends
12	Flow top	300 feet	minor chalcopyrite malachite	
13	Quartz-calcite vein	30 feet by 1,000 feet	chalcopyrite chalcocite malachite	Veins vary in width, are 6 inches to 5 feet apart
14	Quartz-calcite vein	Similar to CAL 13 but smaller	chalcopyrite chalcocite malachite	CAL 13 is about 1,500 feet distant
15	Quartz-calcite	Vein strikes N10°E exposed for 5 feet	chalcocite	
16	Breccia zone		chalcocite	Brecciated basalt along northeast side of a diabase dyke 40 feet by 2,400 feet

No.	Type of occurrence	Approx. attitude and dimensions	Mineralization and alteration	General data
CAL				
17	Quartz-calcite vein	3 feet by 300 feet long	chalcocite	Vein gangue includes some barite; most of chalcocite is at eastern end
18	Quartz-calcite vein	6 inches to 1 foot wide by 150 feet long	chalcocite chalcopyrite bornite	
19	Quartz-calcite vein	Veins 1 inch wide and 50 feet long	chalcocite chalcopyrite bornite	
20	Quartz-calcite vein	1 foot wide by 350 feet long	chalcocite	In highly hematized basalt
21	Quartz-calcite vein	30 feet along a cliff	chalcocite malachite	
22	Quartz-calcite vein	One is 6 inches by 150 feet; other is 6 inches by 10 feet	chalcocite bornite	The second vein carries about 60% sulphides
23	Quartz vein	1 foot wide, 100 feet long	minor chalcopyrite malachite	
24	Quartz vein	Two veins, each 6 inches wide	chalcopyrite malachite	
25	Quartz vein	3 feet wide, 50 feet long	chalcopyrite	
26	Quartz-calcite vein	8 inches wide, 100 feet long	chalcopyrite bornite malachite	Weak mineralization occurs mainly at a vein intersection
27	Quartz vein	2 feet wide, 500 feet long	chalcopyrite malachite	
28	Quartz vein	6 inches wide, 150 feet long	minor chalcopyrite malachite	
29	Quartz-calcite	300 feet long	minor chalcocite	

CAM 1-103 Group (68)
Cambridge Mines, Limited
(lat. 67°34′, long. 116°17′; NTS 86 N/9)

The property lies 9 miles northeast of Hope Lake and is underlain by the Coppermine River basalts, some interbedded sedimentary rocks, and some diabase. Basalt float mineralized with chalcocite occurs in the northeast part of the claim group at the northwest end of Strike Lake and also a quarter mile east of the lake. Strike Lake is the very narrow lake, less than half a mile long that lies a mile northwest of Lake 902 (*see* Dismal Lakes sheet 86 N/9); it is not shown on the 86 N compilation.

A strong fault zone that strikes N30°W through Strike Lake is exposed in places along the northeast shore of Lake 902 where it strikes S45°E. According to a technical report by G. R. Hilchey, the fault zone shows hydrothermal alteration, and there is a breccia zone 500 feet wide on its northeast side at Strike Lake. The fault lineament is traceable on air photographs for about 16 miles. Subsidiary branch faults of the Strike Lake fault, lineaments of which are visible in the air photographs, may be as favourable as the main zone for prospecting.

CAN, FOX, CLUB, CO, RED and WG Groups (158)
G. T. Turner
(lat. 67°54', long. 115°50'; NTS 86 N/16 and 86 O/13)

These groups of claims were staked along Rae River by G. Turner in 1968. Some veins are reported to occur in Rae Group dolomites close to a diabase sill or dyke about 20 miles west-northwest from Coppermine village and 3 miles up the river from salt water. The veins contain chalcopyrite, carrollite, pyrite, and marcasite. Here and there some of the veins include coarse tabular siderite crystals.

CARL 7 Claim (10)
Hearne Coppermine Explorations Limited
(lat. 66°44', long. 117°36'; NTS 86 N/12)

The CARL 7 prospect is about 2 miles east of the FAR 3 and less than a mile southeast of a crescent-shaped lake. The property was not visited, but according to published reports preliminary drilling done in 1968 indicated a chalcocite deposit approximately 300 feet long and 150 feet deep with a maximum width of 4.0 feet. The lode strikes about N20°W and the dip is near vertical. The grade was said to be between 3 and 4% copper over a mining width of 8 feet. A tonnage estimate to a depth of 500 feet was given as 125,000 tons grading about 2% copper.

CARL Group (General)
Hearne Coppermine Explorations Limited
(NTS 86 N/12 and 86 N/11)

The following descriptions of 18 copper occurrences on the CARL group are from the company's report for 1968; the original descriptions were prepared by Chapman, Wood and Griswold Limited; none of the showings listed in this table was visited by the writer. See Figure 1 for relative position of the deposits.

No.	Type of occurrence	Approx. attitude and dimensions	Mineralization and alteration	General data
CARL				
1	Fracture filling	12 inches by 200 feet, strike 353°, dip near vertical	bornite	Minerals in quartz vein; diabase contact?
2	Fracture filling	4 by 100 feet, strike 75°, dip near vertical	minor chalcopyrite, malachite	Erratic small lenses, massive galena in calcite vein; minor chalcopyrite, malachite at east end
3	Fracture filling	3 feet by 1 foot, 200 feet, strike E, dip near vertical	minor chalcocite, malachite	
4	Fracture filling	9–18 inches wide, strike E, dip near vertical	minor chalcopyrite, bornite, malachite	
5	Fracture filling	variable	minor chalcopyrite, malachite	Series of quartz veins up to 6 feet wide
6	Fracture filling	2 by 1,000 feet, strike west-northwest, dip near vertical	minor chalcopyrite, malachite	
7	Shear zone	3 by 270 feet, strike E, dip 90° near vertical	chalcocite, malachite	Replacement in brecciated shear zone, numerous narrow, parallel mineralized splinter fractures
8	Fault breccia or shear zone	Northwest fractures in basalt, 150 feet long	chalcocite, limited hematization	
9	Quartz-calcite vein	8 inches by 100 feet	chalcocite, chalcopyrite, malachite	
10	Quartz-calcite vein		chalcopyrite, malachite	Estimated 1.5% copper
11	Flow top and quartz-calcite	Flow top material 75 by 300 feet	chalcocite, malachite	Occurs in fractures, amygdules, and vein in flow top
12	Quartz-calcite vein	6 inches by 100 feet	minor chalcocite, chalcopyrite, malachite	
13	Flow top	small	native copper	Flow top breccia
14	Quartz-calcite vein	narrow	native copper, malachite	Mineralization extends a short distance into massive basalt
15	Quartz-calcite vein	narrow	minor chalcocite, malachite	
16	Quartz-calcite vein	narrow, 100 feet long	malachite	
17	Quartz-calcite	3 inches by 150 feet	minor chalcocite	
18	Quartz-calcite vein	exposed 10 feet	chalcocite	

CARL 94 Claim (11)
Hearne Coppermine Explorations Limited
(lat. 67°43'30", long. 117°29'; NTS 86 N/11)

The CARL 94 claim is 34 miles northwest of Hope Lake on the east side of the CARL group, near a northwest-flowing stream. Small erratic lenses of massive galena with associated minor chalcopyrite and malachite occur along a vein of calcite with some quartz in the basalts. The vein is reported to be 100 feet long and up to 4 feet wide, the strike is N75°E, and the dip is about vertical. A company assay of a sample of the massive galena gave 8.62 ounces of silver a ton.

COM 1–100 Group (65)
Hearne Coppermine Explorations Limited
(lat. 67°32', long. 116°25'; NTS 86 N/9)

The COM 1–100 group is 6 miles north-northeast of Hope Lake. Minor amounts of disseminated native copper were reported from aphanitic basalts on or near claims 22 and 69. Pods of chalcocite were seen in calcite veins on or near claim 47.

CON 1–55 Group[1]
Teshierpi Mines Limited
(lat. 67°46', long. 118°15'; NTS 86 M/9)

Teshierpi geologists reported finding at several places on the claim group amygdaloidal basalts in which the amydules contained some chalcocite; a little chalcocite was also found in a quartz vein 150 feet long and 1 foot wide.

COP 6, 9, 10 Claims (36)
Pinex Mines Limited
(lat. 67°31', long. 116°47'; NTS 86 N/8)

A strong quartz vein 5 to 6 feet wide is exposed at intervals for 600 feet along the floor of a U-shaped canyon half a mile southeast of the south end of Dixon Lake (the mile-long lake north of Elbow Lake). The floor of the canyon is 30 to 40 feet wide and its basalt walls are about 100 feet high. The canyon is about 3,500 feet long and follows a course of N40°W. It extends from Ravine Lake on the southeast to within a quarter of a mile of Dixon Lake. In one place the canyon floor is washed free of gravel, and as many as 12 parallel tight fault fractures are visible across a width of 20 feet; all are parallel with the vein which locally occurs on the southwest side of the structure. Small veinlets of red feldspar traverse the basalt near the fractures. The big quartz vein has a minor carbonate content and contains an irregular distribution of chalcopyrite in small amounts, the total copper content being less than 0.2%. A number of additional quartz veins that are mostly less than a foot wide and 200 feet long occur in the steep bluffs on the northeast side of the canyon and abut against the canyon fault zone. These veins strike N10°W and hold some

[1]This group is west of the area covered by Figure 1.

chalcopyrite, pyrite, and chalcocite; they contain more sulphides than the large vein in the bottom of the ravine.

The canyon fault described above is part of the 40-mile-long Long Lake fault zone (*see* Fig. 1).

COP 14, 18, 30 Claims (38)
Pinex Mines Limited
(lat. 67°31′, long. 116°47′; NTS 86 N/10)

A massive quartz vein with an average width of 10 feet occurs along the faulted contact of basalts with grey weathering (Rae Group?) quartzite half a mile southeast of Dixon Lake. The vein strikes N30°W, basalt lies on its northeast side, and grey quartzite on the southwest side. Vein exposures occur at intervals for more than 2,000 feet. Small specks of chalcopyrite occur in the quartz and in the silicified basalts adjoining the vein but mineralization is generally sparse and the average copper content is probably 0.1%.

Another massive white quartz vein occurs near the south end of the vein described above. This one is 15 feet wide, occurs in the basalts, and is exposed for 250 feet on the south side of a small creek and for 300 feet on the north side of the creek. The vein is vertical and strikes N15°E; the copper content is less than 0.1%.

COP 361–538 Group (119)
Murco Copper Mines Limited
(lat. 67°41′, long. 115°28′; NTS 86 O/11)

The COP 361–538 claims are part of a very large group of claims that include the ANDY and LSD groups. The COP claims extend along the east side of Coppermine River for about 8 miles from Escape Rapids north to within a mile of Bloody Fall. Bornite and chalcopyrite are reported by the company geologists to occur in quartz and carbonate gangue in a chert breccia along a shear that cuts the Rae Group sedimentary rocks. The occurrence is believed to be on, or close to, claim COP 444.

COPPER LAMB Group (30)
Consolidated Proprietary Mines Holdings Limited
(lat. 67°38′, long. 116°52′; NTS 86 N/10)

References: Can. Mining Met. Bull. 1931, p. 377; Geol. Surv. Can., Paper 66-52, 1966, p. 36 and Geol. Surv. Can., Mem. 261, 1951, p. 78.

The COPPER LAMB vein is about 1½ miles northwest of Bornite Lake on a basalt bench about 200 feet above extensive drift-covered flats that reach north from the lake.

The vein, consisting largely of quartz, buff coloured carbonate, bornite, and some chalcopyrite, is exposed intermittently for a length of 1,200 feet, strikes from N12°W to N20°W, and is vertical. At the most northerly exposure the vein is 12 feet wide, consists dominantly of quartz with up to 3% carbonate, and is only sparsely mineralized with bornite. A draw 20 feet wide, drift-filled and water charged, that borders the west wall of the vein may conceal additional vein material.

About 450 feet farther south, trenching revealed a width of 12 feet of bornite with minor chalcopyrite and with 2 feet of vein quartz on the east side. This discovery was made about 40 years ago and sampling across the bornite-rich zone was reported on by G. G. Duncan (1931) as follows:

> The 12 feet of ore was channel-sampled in four three-foot sections, and the results of the assays were as follows:
>
> 1st three feet ..... 48.81 per cent Cu
> 2nd three feet ..... 44.44 per cent Cu
> 3rd three feet ..... 44.77 per cent Cu
> 4th three feet ..... 49.94 per cent Cu

Another trench across the soil-filled draw 70 feet farther south encountered 6 feet of the same type of rich bornite ore. Assay results of channel samples from this trench are given by Duncan (1931) as follows:

> 1st three feet ..... 33.93 per cent Cu
> 2nd three feet ..... 43.67 per cent Cu

There is one other vein exposure in the draw, 700 feet farther south: it is 22 feet wide and consists mostly of quartz with up to 20% of brown to yellow weathering carbonate, the whole mass containing probably less than 0.4% of bornite and chalcopyrite. A picked sample of the bornite ore collected by the author and tested by the Mines Branch at Ottawa, contained a microscopic trace of gold and 1.10 ounces of silver a ton. This sample contained 70% copper (spectrochemical analysis in Geological Survey laboratory). The westerly 15 feet of the draw in which the vein occurs is everywhere drift-filled so that true width and extent of mineralization cannot be ascertained without a close drilling program. A few holes drilled some years ago near the main pit are reported to have shown that the bornite-rich sector is lenticular and shallow. The length of the quartz vein can only be guessed due to the extensive drift-cover but its strength indicates a probable length of several thousand feet.

Four subsidiary parallel narrow quartz veins about 100 feet apart are well exposed in the basalts east of the main vein (*see* Fig. 4). These veins strike about N10°E and are vertical. They range from a few inches to 24 inches in width and contain small amounts of bornite, chalcocite, and malachite. The veins are less than 800 feet long and the line of strike of each forms an angle of 30 degrees with the strike direction of the main vein (actual junctions are drift-covered). The most northerly of these subsidiary veins connects with the main vein 100 feet south of the main open-cut on the 12-foot-wide bornite lens, 30 feet south of where the lens is known to be at least 6 feet wide; as high-grade mineralization occurs near this vein junction, it may also be found farther to the south or north near similar vein junctions.

A dolomite vein 15 feet wide is exposed for about 200 feet along its strike on a bench about 400 feet above and 1,000 feet west of the COPPER LAMB bornite open-cut. The dolomite is a pale yellow-orange and is cut by a few small quartz stringers. Another dolomite vein, 3 to 4 feet wide, lies 50 feet farther east and is exposed for 100 feet along its strike. This vein holds only small amounts of bornite and minor specular hematite; the large vein is only sparsely mineralized with bornite. Both veins strike N10°E and are vertical. They are several hundred feet east of a northerly striking drift-filled draw that is believed to be occupied by a strong northerly striking fault, along which other veins may be present.

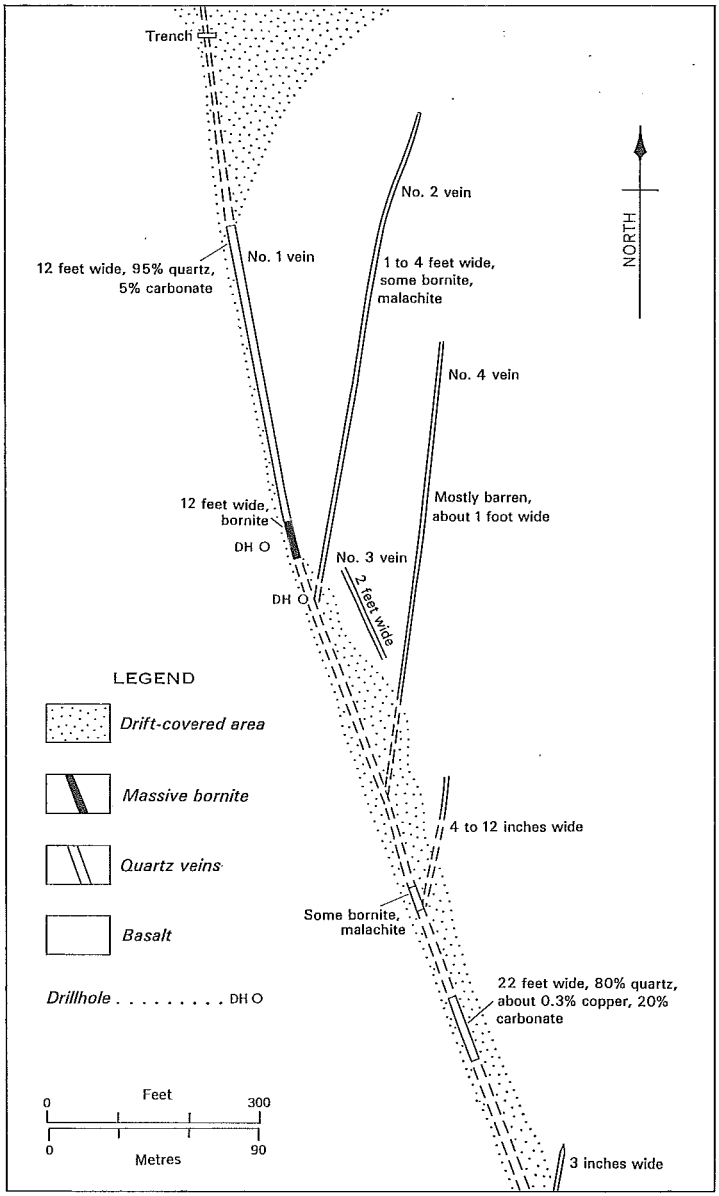

FIGURE 4. Plan showing part of COPPER LAMB property

A quartz-barite copper vein occurs in the basalts about 1,500 feet northwest of the dolomite vein and a short distance west of the last-mentioned fault lineament. This vein strikes from N20° to N35°E and is nearly vertical. It ranges from 1 to 4 feet in width and has been traced for about 450 feet. At a 30-foot-long cut near the north end of the vein a short bornite lens occurs in a gangue of quartz, barite, and buff coloured carbonate. Some blocks of coarsely crystalline barite on the dump measure 18 inches long and 8 inches thick and a block of massive bornite and chalcocite, 4 feet long and 2 feet thick, lies on the floor of the rock-cut.

At the No. 2 pit, 300 feet farther south across a drift area, a sheared zone 4 feet wide holds a vein 1 foot thick: the vein consists of quartz and barite, and some buff coloured carbonate and chalcocite with minor bornite. Some of the quartz and barite blocks on the dump contain up to 20% chalcocite, which here, as in much of the ore, replaces bladed barite crystals.

CORONATION Group (former MGB 1–100 Group) (56)
Rose Pass Mines Ltd.
(lat. 67°18′, long. 116°25′; NTS 86 N/8)

The CORONATION group covers an area of about 7½ square miles 8 miles south of Hope Lake that is underlain by Coppermine River basalts. A tractor trail leads to the camp at the south end of Three Islands Lake. Two showings approximately 2 miles apart have been prospected with a drill, the westerly one in 1968 and the easterly in 1969.

About a mile south of Three Islands Lake, a quartz fissure vein is exposed in a low outcrop of basalt for about 300 feet. The vein strikes N25°E and dips steeply to the northwest. It maintains an average width of about a foot for the length of the outcrop but is split at the south end with a diverging 6-inch-wide quartz vein lying 8 feet east of the main vein. Some carbonate occurs with the quartz gangue, particularly at the north end of the outcrop, and both quartz and carbonate contain scattered grains, blebs, and tiny veinlets of chalcocite; mineralization in the surface exposures suggests that the vein at this horizon probably contains less than 1% copper.

Several frost-heaved angular quartz vein blocks up to 16 inches in diameter in a narrow depression in a low ridge between 1,000 and 1,500 feet farther north could lie along a northerly extension of the vein described above as they lie approximately along the same strike.

The "West" showing is 2 miles west of Three Islands Lake. It is a north-striking sheared and brecciated zone formed along a fault indicated by lineaments that can be traced on air photographs for 3 miles south to Ravine Creek. At the drill site the fractured basalt is cut by several small quartz veins and the zone contains small amounts of copper sulphides. The owners report that the mineralized zone was drilled in 1968 and that the core from 8 drillholes in a block 500 feet long and 132 feet deep gave an average assay of 1.53% copper; this figure is the average grade for 1,300,000 tons. None of this core was available for examination in 1969.

CU-TAR Groups (99)
Quadrate Explorations Limited
(lat. 67°18′, long. 115°47′; NTS 86 O/5)

No. 1 Lode

A faulted and fractured zone 12 feet wide is exposed along the base of the east side of a northerly trending basalt cliff 2,000 feet west of Quadrate Lake (the small lake at lat. 67°19′, long. 115°46′) and 2,800 feet south of Burnt Creek. Blocks of basalt that have fallen from the cliff face cover much of the zone. At the north end where the zone is exposed for a length of 15 feet, it is vertical and strikes N30°E. Only the central 3-foot-wide section of fractured basalt is well mineralized with chalcocite in this outcrop. About 100 feet south of the outcrop described above a draw extends westerly up the side of the cliff. A poorly exposed vein in the draw has been traced by several cuts and by natural exposures for about 1,500 feet along an ascending westerly course across the northerly sloping mountain top. It is a fissured, brecciated zone that strikes S50°W and is vertical. A quartz vein 4 feet wide containing about 3% chalcocite occurs about 60 feet south of the main fissured zone roughly 450 feet west of the draw. The intervening basalt is locally shattered between the two fissured zones, and for 100 feet or more along the strike it contains up to 1% or more chalcocite. Three holes were drilled here by the previous owners about 35 years ago.

In a rock-cut excavated in 1968 on a west-facing cliff at the most westerly exposure of the No. 1 vein, the fractured and fissured basalt is cut by quartz stringers and is well mineralized with chalcocite across a width of 10 feet. There is also erratic mineralization in a 5-foot-wide border zone. A hole drilled in 1969 by the owners was collared 100 feet north of the rock-cut. Results of this drilling are not known.

No. 2 Lode

The No. 2 lode is best exposed in an old rock-cut 300 feet southeast from the most westerly rock-cut on No. 1 lode. In this cut reddish hematized fractured basalt has been cut and replaced by stringers and veinlets of chalcocite, quartz, and calcite; the vein contains about 10% chalcocite across the central 5 feet of a 10-foot-wide zone. The outer 2½ feet on either side of the copper-rich central band is only sparsely mineralized. This vein strikes N20°E and probably forms part of the same fissured zone as that of No. 1 along which there is a quartz vein 4 feet wide that is mineralized with chalcocite.

A shattered zone (No. 2B) 8 feet wide is exposed in the cliff face 80 feet southeast of the No. 2 lode. It is sparsely mineralized with chalcocite and malachite and probably contains less than 0.5% copper (visual estimate). This zone strikes northeast and lies about parallel with the No. 2 zone. A hole was drilled at the foot of the south-facing cliff to sample both the No. 2 and No. 2B veins in 1969; results are not available.

No. 3 Lode

The No. 3 lode lies about 600 feet south of the No. 2 and is partly exposed on a steep slope at the west end of a drift-filled pass between rock bluffs. The pass and concealed vein strike N75°E for about 750 feet. In steep easterly facing bluffs at the northeast end of the pass the strike changes to N85°E. A branch shear 2 feet wide that outcrops on the south side of the pass at its east end contains chalcocite lenses as much as 3 inches wide and 20 feet long. This offshoot from the main No. 3 lode strikes N70°W and its dip is vertical.

Some diamond drilling was done along the western half of the No. 3 lode in the pass area in 1969. The annual report of Quadrate Explorations for 1969 states: "Six shallow

holes over a 525-foot-length returned a weighted average grade of 3.74% copper across a true width of 8.1 feet."

About 300 feet east of the east end of the pass the No. 3 lode appears as a sheared and fractured zone 15 feet wide exposed on the face of a steep 75-foot-high bluff from the base of which a large drift area extends eastward. Lenticular quartz and calcite veins up to 12 inches thick occur along the sheared zone and chalcocite stringers up to half an inch thick are present.

A branch vein is exposed in the same 75-foot bluff 40 feet farther to the north. It probably joins the main No. 3 lode about 75 feet east of the cliff beneath the drift area as it strikes E25°S (the No. 3 strikes E5°N so they are on a converging course). Part way up the bluff, above the talus, this vein consists of a chalcocite lens 6 inches wide and 10 feet long and a white, coarsely crystalline, calcite vein that is a foot wide and contains minor specular hematite.

No. 4 Lode

About 1,500 feet farther south close to the south boundary of the CU group, some angular blocks of rich copper mineralization are clustered together in an oval area about 12 feet long, near the south end of an extensive drift area. The locality is just north of a low area of outcrop that is largely concealed by 1 to 2 feet of soil. The angular blocks, which are up to 3 feet long and 1 foot thick, consist of brecciated red chert, in which the fragments show very little dislocation and are cemented together and partly replaced by chalcocite; malachite stain is abundant. It appears that the mineralization follows a slightly shattered zone in a red chert horizon adjacent to a fissured zone. The chert zone is probably thin but might range from 2 to 10 feet or more in thickness. The chert is interlayered with the basalt flows and so may be expected to dip gently north. Judging by the presence of aligned malachite-stained red chert fragments in frost boils in a zone between 75 to 175 feet south of the "mineralized blocks" locality, the fractured zone along which there is mineralization strikes N20°E. Glacial striae on outcrops west of Quadrate Lake strike N50°W.

CU 36 Group (106)
Janus Explorations Limited
(lat. 67°21′, long. 115°47′; NTS 86 O/5)

The CU group of 36 claims lies a mile west of Coppermine River and 2 miles north of Burnt Creek. The property is underlain by east-striking basalt flows that dip about 8 degrees north.

No. 1 vein is on claim 4901 on the northeast perimeter of the property. It is a vertical northeast-striking fissured zone that is exposed for about 175 feet and is 2 to 6 feet wide. The fissured basalt contains veins and lenses of calcite and chalcocite. These are mostly less than 2 inches wide and pinch and swell along the vein. The calcite lenses are cut by veinlets of pink feldspar up to a quarter of an inch wide.

No. 2 vein is a composite vein that outcrops high on the ridge about half a mile southwest of the No. 1 vein. On the south side of a saddle near a drift area, there is a brown weathering carbonate vein 50 feet wide; some enclosed blocks of basalt are largely replaced by the brown carbonate and the vein is cut by veinlets up to an inch wide of cherty quartz and pink feldspar. A parallel vein 12 feet wide that lies 40 feet to the southeast consists of

brown weathering carbonate and milky white quartz veins. There is a sparse distribution of chalcocite. About 350 feet to the northeast a single quartz-calcite vein is exposed, which is sparsely mineralized with chalcocite. Another 400 feet northeasterly a brown weathering carbonate vein 10 feet wide and a quartz vein 10 feet wide are separated by 45 feet of basalt. The quartz vein, on the southeast side, contains about 2% of chalcocite and in some places very small grains or nuggets of native copper. This composite vein probably continues (concealed by overburden) for a considerable distance farther northeast down the north slope.

No. 3 vein lies parallel to the No. 2 composite vein but is 500 feet farther to the northwest. It is formed of grey weathering, coarsely crystalline calcite that is pure white on fresh surfaces. In a series of open-cuts along its course the calcite appears to be quite barren. Along an exposed length of 1,700 feet the vein ranges from 6 to 20 feet in width.

No. 4 vein, also northeast-striking and carbonate-bearing, is reported to outcrop on claims T5079 and T5082. No. 5 vein, 1,500 feet northwest of the No. 4, strikes N42°E across claims T5081 and T5080 and passes into the SAM group in a southwesterly direction. No. 6 vein is 800 or 900 feet northwest of the No. 5 vein and strikes northeasterly across claims T5094 and T5096. Both veins 5 and 6 are reported to be carbonate-rich fissure veins that contain some chalcocite (veins 4, 5, and 6 were not visited).

CU–HOC Groups (101)
Quadrate Explorations Limited
(lat. 67°20′, long. 115°47′; NTS 86 O/5)

The following descriptions apply to veins that occur on the 40 CU claims that cover the mountain for a little less than 2 miles north of Burnt Creek and which are a mile or more west of Coppermine River (*see* CU–TAR groups for descriptions of veins south of Burnt Creek, same ownership). The claims are underlain largely by north-dipping Coppermine River basalt flows.

The Sandberg vein outcrops on claims T5012, T5013, and T5032. It strikes northeast, and if a vein exposure in the southeast corner of claim T5042 lies along the same fissured zone, then a total length of 3,200 feet might be assigned with widths ranging from 2 to 8 feet. It is a fractured and brecciated zone in the basalts with chalcocite-bearing vein and breccia fillings of quartz and calcite.

No. 5 vein lies parallel with the Sandberg vein but is 850 feet farther to the northwest on claims T5033, T5032, and T5041. It is reported to be a northeast-striking, chalcocite-bearing breccia and fissured zone, 2 to 8 feet wide, that is well exposed for about 1,000 feet but which can be traced at intervals for nearly 10,000 feet.

A northeasterly extension of the Hearne vein from Pickle Crow ground is considered to lie concealed in a drift-covered area on the CU T5010 or CU T5035 claims. On Pickle Crow ground this vein-lode ranges up to 10 feet or more in width, contains abundant quartz, calcite, and pink feldspar, and is well mineralized with chalcocite.

The No. 6 vein, the most northwesterly vein on the property, is on claim T5069. It is reported to consist of chalcocite veinlets along a fault zone that strikes northeasterly and is located near the east side of a small lake that lies a short distance north of two other small lakes.

A linear depression that extends north 3 miles and south 6 miles from Quadrate Lake (at lat. 67°19′, long. 115°46′) may mark the presence of a strong fault zone. On the ST claims photo interpretation suggests that this possible fault is concealed by overburden.

J. J. O'Neill (1924, p. 59A) refers to the north side of Burnt Creek as a favourable locality for the occurrence of native copper as small specks, chips, and shots in the amygdaloidal horizons. In the second flow top zone north of the creek he noted an exposure about 25 feet thick with frequent copper stain in the amygdules. In the fourth flow top zone north of the creek the amygdaloidal is 26 feet thick, it is much altered to epidote and a crumbling mass of light coloured rock in which nearly all the amygdules contain copper carbonate. Chips and flakes of native copper are fairly abundant in this altered rock and some small fractures contain chalcocite. O'Neill also found some native copper higher in the section in amygdaloidal pebbles in beds of conglomerate that outcrop more than half way up the mountain as well as on the mountain top north of Burnt Creek.

DICK Group (87)
Pickle Crow Gold Mines, Limited
(lat. 67°19', long. 116°03'; NTS 86 N/8)

The DICK lode is about 2 miles south of Willow Lake near the top of and on the south slope of a prominent basalt ridge. The lava flows locally are 90 to 150 feet thick, and they dip about 10 degrees north. The copper lode has been traced for at least 3,200 feet according to Jenney (1954) and has an average width of 10 feet. The mineralized zone strikes about north and has a vertical dip. The claims were originally held by Northern Aerial Minerals Exploration Limited in 1930 and eleven short diamond-drill holes are reported to have been drilled at that time (Jenney, 1954). On the basis of a drilled length of 1,100 feet,

201479E

PLATE III. Dick vein-lode in cliff face showing brecciated basalt and fillings of calcite and quartz; a chalcocite content of 4 to 8 per cent is not visible in the photograph.

a depth of 100 feet, and an average width of 10 feet, 90,000 tons of 8.78% copper ore was indicated. The tonnage of 3 or 4% copper ore that might be outlined along the full length of the lode would probably be very much greater.

The vein is in a fault breccia zone in which the basalt fragments are cemented and in part replaced by chalcocite, quartz and calcite stringers, veinlets, pods, and irregular-shaped masses. This vein is very well exposed in two rock bluffs, each 40 feet high, that are about 850 feet apart. In the intervening soil-covered area the course of the vein is indicated by the presence of malachite-stained fragments of chalcocite brought to the surface by frost-boil action.

At the more southerly cliff face some concentric-shaped fractures along the walls of the vein exhibit a red hematite alteration that penetrates up to an inch into the grey basalt. In some places the red altered basalt is replaced by chalcocite. In an old cross-trench near the top of this cliff face the mineralized zone is 15 feet wide; at the second rock face about 850 feet farther north it is about 12 feet wide. The latter basalt horizon lies 150 feet stratigraphically above the more southerly basalt cliff face and comprises the basal part of a second flow involved in the mineralization; thus mineralization at greater depth might be expected north of this point if mineralization persists along the fault breccia structure in both flows.

A selected sample of the chalcocite ore, assayed by the Mines Branch at Ottawa, contained a microscopic trace of gold and 2.29 ounces silver a ton. A spectrochemical analysis showed 70% copper content (tested in Geological Survey laboratory) and about 0.01% nickel.

DIZ, JIM, HERB Groups (54)
Teshierpi Mines Limited
(lat. 67°18′, long. 116°46′; NTS 86 N/7)

The DIZ group covers Teshierpi Mountain and adjacent areas on the south side of the lower Dismal Lakes. The mountain is formed largely of northeasterly dipping basalt flows; these overlie sedimentary rocks of the Dismal Lakes Group that occupy the southwest slopes. The northeasterly striking Teshierpi fault lies on the east side of this mountain. According to a technical report by F. D. Gill, thin seams of chalcopyrite occur over a narrow zone in tight fractures in the sediments. The locality is at the south end of the mountain, north of Teshierpi River, and it is probably a short distance west of the Teshierpi fault.

Quartz and carbonate veinlets containing chalcocite are widely distributed in the basalts. Most range from a quarter inch to three inches in width (data from company report).

DOLL 1 Claim (124)
Northair Mines Ltd.
(lat. 67°37′, long. 114°32′; NTS 86 O/10)

At a waterfall on Asiak River, on what is shown on the claim map as DOLL 1 claim, some occurrences of native copper associated with a number of thin calcite veins that cut a grey basalt flow are reported. Numerous calcite veins 1 or 2 inches wide were seen by the

writer near a 10-foot waterfall, but no copper mineralization was seen; however only the west bank of the river was examined. The veinlets have an average strike of N70°W.

DOLL 8 Claim (125)
Northair Mines Ltd.
(lat. 67°37′, long. 114°27′; NTS 86 O/9)

The "B" showing is a northeasterly striking (N37°E) fault and sheared zone that is 6 feet wide in two small separate outcrops about 150 feet apart. The sheared and fractured basalt has been partly replaced by specular hematite and chalcocite; the latter is in part altered to malachite. The deposit occurs in a draw that is generally drift filled.

A U-shaped ravine 75 feet wide that lies parallel with the "B" showing and about 400 feet farther west probably marks a concealed fissured zone. The walls of the ravine are formed of epidotized amygdaloidal basalt.

DON 14 Claim (41)
Coppermine River Limited
(lat. 67°29′47″, long. 116°42′45″; NTS 86 N/7)

The DON group of 20 claims lies immediately northwest of Brod Lake (the lake at lat. 67°29′30″, long. 116°41′), and the DON veins outcrop half a mile west of the north end of the lake on the DON 14 claim (N91062).

Two parallel veins of quartz and chalcocite 25 feet apart are poorly exposed for a length of 500 feet. These veins strike N60°W and have a vertical dip. No. 1 vein is 3.5 feet wide in a rock-cut and is heavily mineralized with chalcocite across a width of 2.6 feet. A trench-sample assayed 25.84% copper across 2.6 feet or about 21% copper across 3.5 feet. No. 2 vein ranges from 0.5 to 0.8 foot in width in small outcrops. A sample taken across a width of 0.8 foot is reported to have assayed 39% copper. The No. 3 quartz vein lies at the east end of the above veins and strikes S16°W. It is 5 feet wide and contains some chalcocite and bornite.

The above data are from a technical report by G. Byles and M. Watts Jr.

DOT 47 (No. 47 Orebody) (59)
Coppermine River Limited
(lat. 67°24′, long. 116°25′; NTS 86 N/8)

The DOT 47 deposit is on the DOT 47 mining claim 3 miles south-southeast of Hope Lake (there are more than 1,500 claims in the DOT group). A copper deposit outlined here is purported to contain 4,106,000 tons of 3.07% copper ore after dilution by wall-rocks containing 0.6% copper. The No. 47 and neighbouring DOT claims are underlain by basalt flows that strike north-northwest and dip northeasterly between 5 and 10 degrees. The lavas are cut by a northeast-striking fault zone known as the Teshierpi fault (*see* Fig. 1). This fault zone is probably about 40 miles long and for the greater part lies south of Dismal Lakes. The north part runs northeast through Wreck and Malachite Lakes and beyond Carleton Creek.

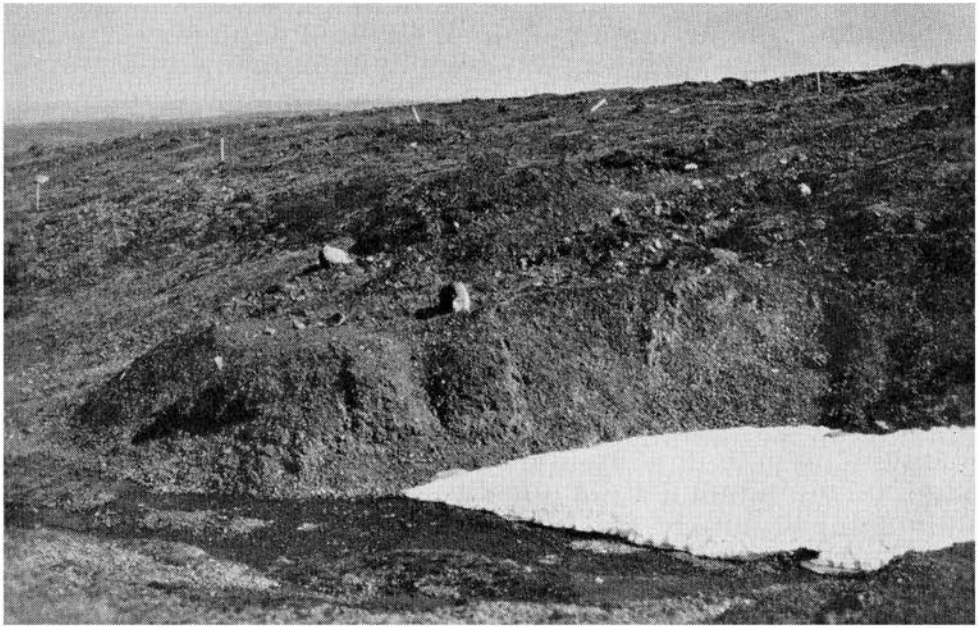

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PLATE IV. Outcrop of No. 47 orebody lies along far side of the snow patch and extends 15 feet west (left) of the tip of the snow area (July 1969).

The No. 47 lode occurs along one of the faults of the Teshierpi fault zone which can be described as a fissured and shattered zone containing replacements of chalcocite and some bornite. The vein comprises a vertical tabular orebody about 1,500 feet long, 35 feet wide, and between 500 and 600 feet deep, but which widens in some places along gently dipping flow top zones where amygdaloidal zones adjacent to the fissured zone were subjected to replacement and amygdule filling by copper sulphides. The copper minerals are commonly associated with some quartz, carbonate, red feldspar, chlorite, and epidote and in some places anthraxolite.

The main mineralized outcrop (No. 47) is 50 feet in diameter (*see* Pl. IV). A steep fault plane forms its east wall and the whole outcrop is crisscrossed by intersecting fault planes. The easterly part consists of reddish hematized malachite-stained basalt containing about 1% or more copper sulphides. The west half of the outcrop (drift on the west and to the north) is mostly a brown amygdaloid with abundant carbonate amygdules half an inch in diameter, but most are less than a quarter inch in diameter; some are chlorite-filled. Chalcocite and bornite occur as fine specks through the rock and are more numerous where calcite fillings are most prevalent. Malachite stain is not plentiful. This half of the outcrop also holds about 1% or more of copper sulphides. Extensions of the mineralized zone to the west and north are obscured by a cover of glacial drift.

About 1,000 feet southeast of the No. 47 lode outcrop, a sheared zone 6 feet wide occurs in fine-grained, brown weathering basalt. It contains between 1 and 2% of chalcocite as fine veinlets and stringer replacements. This zone trends N30°E toward the DOT 210 shear zone.

Altogether 30,000 feet of diamond drilling was done during 1967 and 1968 along the No. 47 lode; this work outlined copper ore reserves of 3,571,000 tons containing 3.44% copper (or 4,106,000 tons of 3.07% copper). A third estimate is of 5,100,000 tons averaging 2.5% copper. Some additional ore can probably be developed nearby on the DOT 210 lode, a mile to the northeast, and on the DOT 20 lode, a mile to the north-northwest.

DOT 106–107 Claims (Circle Lake 1) (60)
Coppermine River Limited
(lat. 67°26′, long. 116°29′; NTS 86 N/8)

Frost-heaved blocks of red amygdaloidal flow top breccia occur along the east side of the low northerly trending ridge of basalt, about 1,500 feet northwest of Circle Lake. The altered rock is traversed by small veinlets and irregular-shaped replacements of calcite, red feldspar, and chalcocite; there is up to 3% chalcocite in some of the loose mineralized blocks. The float material is aligned at N50°W for 300 feet near a bulldozed open-cut. Glacial striae locally strike N5°E.

DOT 13 and 20 Claims (Circle Lake No. 3) (61)
Coppermine River Limited
(lat. 67°26′, long. 116°27′; NTS 86 N/8)

A heavily carbonatized sheared and brecciated amygdaloidal basalt occurs about 600 feet north of a small bay on the north side of Circle Lake. Frost-heaved blocks and small outcrops occur in an oval-shaped area about 60 feet wide and 250 feet long. They are composed of greyish white, malachite-stained, altered amygdaloidal basalt consisting of up to 90% calcite, from 1 to 4% chalcocite, and about 1% pyrite, some pink feldspar, and a network of minute quartz veinlets. Lines of shearing and outlines of former basalt breccia fragments are visible in some places even though all former openings are now completely filled with calcite and the brecciated basalt has been largely converted to calcite.

The mineralized zone trends N20°E, and strikes toward the centre of a small lake 350 feet farther north; drift covers the intervening area. The southerly extension of the zone toward Circle Lake is also drift-covered.

A number of narrow, mostly barren, calcite-quartz and calcite fissure veins, 3 to 4 inches wide and 5 or 6 feet apart, occur in amygdaloidal basalts about 800 feet north of the carbonatized zone and, as they strike southerly toward the deposit, it is presumed that the fissures along which they formed are extensions from the shattered and brecciated zone along which the carbonatized mineral deposit was formed.

A poorly defined lineament suggests a north-striking fault that branches from the Teshierpi fault zone 1½ miles south of Circle Lake, passes just east of the island in the lake, crosses the carbonatized shear zone, and continues northerly passing close to the west edge of the small lake north of Circle Lake.

The downward extension of the deposit has not yet been tested by drilling. Two factors suggest that it may have a good vertical dimension: (a) the intensity of carbonatization and its pyrite content (greater here than anywhere else observed in the Coppermine area) suggest alteration by rising hydrothermal solutions and therefore the presence of

vertical conduits; (b) flow top rocks of the surface exposures appear to contain at least 2% chalcocite and flow top rocks elsewhere in the area that contain this amount of chalcocite do so only close to vertical or steeply dipping, fissured, brecciated sheeted or sheared mineralized structures. The mineralized zone may be similar to that shown in Figure 5.

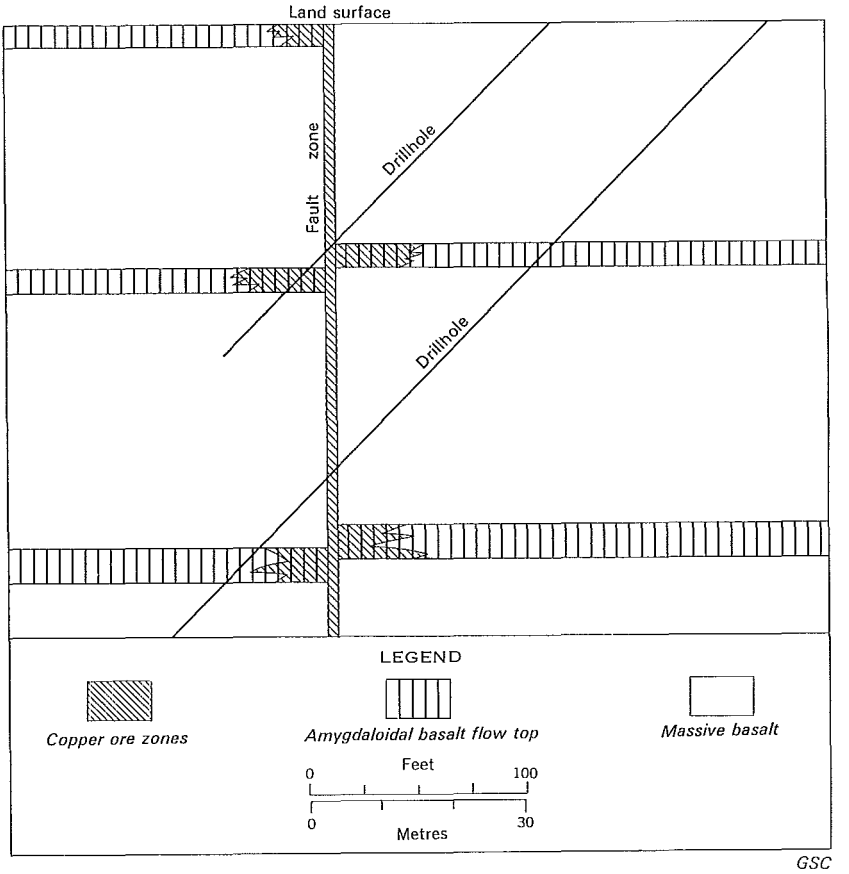

FIGURE 5. Idealized cross-section of a copper-bearing brecciated fault zone in Coppermine River basalt flows, showing favoured locations of some amygdaloid ore pods. Inclined drillholes may fail to detect some of these (if present) as portrayed in the sketch.

Circle Lake No. 2

The Circle Lake No. 2 vein is 200 feet north of Circle Lake at a point due north of the west side of small island and is roughly 200 feet west of a possible southerly extension of the No. 3 vein described above. Two oval-shaped outcrops of carbonatized amygdaloidal basalt occur on sloping ground. These outcrops are 30 feet apart, the larger one is 50 feet long and 20 feet wide, the other is 10 feet in diameter. The grey carbonatized basalt is identical in appearance to that described above (Circle Lake No. 3) and contains replacements of chalcocite as grains, blebs, and small irregular-shaped masses as well as some small grains of pyrite. The chalcocite content may average 3%.

The writer believes that Circle Lake No. 3 vein extends southerly to and beneath Circle Lake and that the No. 2 vein may be a branch deposit that merges with No. 3 beneath the lake.

DOT 145–156 Claims (71)
Coppermine River Limited
(lat. 67°27′, long. 116°29′; NTS 86 N/8)

A quartz vein 65 feet wide outcrops on both sides of the creek that flows out of Hope Lake. The vein is 400 feet north of a 60-foot waterfall, a quarter of a mile west of Hope Lake. The vein strikes N20°E at the creek. It is well exposed in a draw 300 feet north of the creek but is apparently cut off by faults about 300 feet farther north. The vein is also exposed 1,700 feet southwest of the creek on the west side of a small lake that is 300 feet in diameter. About 200 feet north of the lake, at the top of a 100-foot bluff, there is a small outcrop of the quartz vein and 50 feet to the east, chunks of frost-heaved basalt that are heavily mineralized with chalcocite are found in the drift area.

The big quartz vein is mostly barren but in some places contains minor amounts of chalcopyrite and chalcocite. The quartz contains a few grains of anthraxolite in the draw 300 feet north of the creek where the basaltic wall-rocks are silicified and altered to a pale brown. Finely laminated white quartz is dominant but the vein also locally contains coarsely crystalline masses of quartz; crystals an inch wide and 2 to 3 inches long are commonly found. Some of these coarse crystals on the north side of the creek and along the east side of the vein are of pale violet amethystine quartz.

DOT 210–216–217 Claims (63)
Coppermine River Limited
(lat. 67°24′, long. 116°25′; NTS 86 N/8)

The DOT 210 shear zone lies a mile northeast of the DOT 47 occurrence and outcrops along a branch of the Teshierpi fault system. It strikes northeast (*see* Fig. 3, *in pocket*) and can be followed in scattered basalt outcrops for about 4,000 feet. It is a mineralized sheared zone that changes in places to a mineralized sheeted, braided, fractured zone up to 30 feet wide. The average width of one or more chalcocite-bearing lenticular quartz veins along this zone is about a foot but in some places these shear quartz veins are up to 3 feet wide. Along its more northerly exposures the sheared and sheeted basalt, as well as the contained shear quartz veins, contains about 1% of chalcocite across widths of up to 18 feet, but in some places the grade is higher. For several hundred feet along its course, on either side of Dot Creek, the sheared zone exhibits a braided branching outline and in places contains up to 6% chalcocite. Along one section 30 feet east of Dot Creek the lode is 25 feet wide and chip samples collected across this width by the writer returned 5% copper. A chip sample taken across a width of 7 feet 8 inches at a point 140 feet farther southwest contained 3% copper. Other high-grade sections may occur northeast of Dot Creek; the southern end is narrow and surface exposures are not as well mineralized.

DOT 725 Claim (50)
Coppermine River Limited
(lat. 57°23′, long. 116°43′; NTS 86 N/7)

The DOT 725 vein outcrops a short distance from the south end of the fourth small lake east of Pointing Lake, on claim DOT 725 (claim location as on claim sheet 86 N/7), and the vein may extend northeasterly into the adjoining claim DOT 720. The vein strikes N40°E and dips vertically. The quartz gangue contains about 3% copper sulphides, namely in order of abundance, chalcocite, bornite, and chalcopyrite. On its southeast side the vein is protected for 200 feet by a wall of basalt 6 feet high, whereas an area of drift borders and partly covers the northwest side of the vein. As numerous fragmented quartz blocks abound that exceed a foot in diameter, there is reason to believe that this vein may be 3 or 4 feet wide. The vein is concealed immediately northeast and southwest of the outcrop area by drift but it is open at both ends. A second small area of vein outcrop was noted from the air about 1,500 feet northeast of the 200-foot-long vein section and on the air photograph a depression lineament in this direction can be traced for half a mile.

DOT 881–882 (Lake 450) (47)
Northville Explorations Limited
(lat. 67°25′, long. 116°47′; 86 N/7)

Lake 450 is the third lake east of Head Lake and lies 3 miles southeast of Elbow Lake. Narrow, mineralized, quartz-carbonate veins are exposed at intervals for 500 feet in a northerly direction from the north end of Lake 450. The veins contain minor chalcopyrite, chalcocite, and malachite. A chip sample taken across a width of 6 feet assayed 0.27% copper (owners report).

The 450 vein lies along or close to one of the components of the Dixon fault system which can be traced on air photographs south to Dismal Lakes and north to the upper valley of Elbow Lake from Lake 450. It is recommended that the Lake 450 fault be prospected both north and south of the lake for possible ore shoots.

DOT 900 Claim (37)
Coppermine River Limited
(lat. 67°31′, long. 116°47′; NTS 86 N/10)

Two parallel quartz veins 45 feet apart outcrop on the north bank of Ravine Lake (the lake at the head of the ravine that strikes northwesterly toward the south end of Dixon Lake). These veins strike N10°E and dip 70°E. The west vein is 15 inches wide and is sparsely mineralized with chalcopyrite; the east vein is 3 feet wide and carries a possible combined sulphide content of 1 to 2% bornite, chalcopyrite, and chalcocite. The basalt wall-rocks are traversed by a network of tiny red feldspar veinlets. An extensive area of drift conceals these veins beyond 70 feet north of the lake and a 50-foot-wide drift-filled draw that borders the first vein on its west side may conceal another vein.

A third quartz vein is exposed on the south shore of Ravine Lake about 500 feet south of the veins described above. This vein is 4 feet wide and can be traced south for 100 feet

where it passes beneath drift. It is a vertical vein and strikes N50°E. The basalt wall-rocks are invaded by red feldspar stringers. The vein contains about 2% chalcopyrite and bornite.

The intersection zones of the above veins with the major Long Lake fault zone are beneath the northwest part of the lake. The zone of intersection may also contain appreciable amounts of copper sulphides.

DOT 1353 Claim (62)
Coppermine River Limited
(lat. 67°25', long. 116°24'; NTS 86 N/8)

The claim is half a mile south of the Hope Lake airstrip. Pebbles of chalcocite, partly altered to malachite, are exposed in frost boils for a length of 100 feet along a northeast-trending swamp area between two small lakes that are 600 feet apart. Chalcocite veinlets occur in a large basalt boulder 100 feet southwest of the frost boil zone, 50 feet from the edge of the larger lake which is about 250 feet across. This occurrence is of particular interest as it lies along the projected strike, and is only a little over a mile northeast of the DOT 47 occurrence; it could mark a drift-covered mineralized zone.

DOT 1425 Claim (64)
Coppermine River Limited
(lat. 67°25', long. 116°21'; NTS 86 N/8)

The DOT 1425 claim covers a part of north-flowing Carleton Creek, 3 miles southeast of Hope Lake (*see* claim sheet 86 N/8).

A northeast-striking fractured zone in amygdaloidal basalt is exposed on the west bank of Carleton Creek about 1,500 feet south of the mouth of an east-flowing tributary stream. The fractured basalt contains about 4% chalcocite and 1% of the black hydrocarbon compound, anthraxolite. Chalcocite and anthraxolite occur as replacements of slightly shattered basalt and as amygdule fillings associated with calcite. The mineralized zone strikes N35°E and is about 15 feet wide. It is concealed by overburden beyond a 100-foot-wide outcrop area along the southwest bank of the creek.

Another shear zone occurs about 1,000 feet farther south in amygdaloidal basalts on the west bank of Carleton Creek. This zone also strikes N35°E and is about 15 feet wide. The sheared basalt contains scattered stringers of carbonate and some carbonate veins up to 2 inches wide. The chalcocite content of this zone is estimated as less than 1% (visual estimate).

Fifty feet south of the last-described shear zone the stream channel changes direction from south to southwest and for 500 feet the creek is confined by 30-foot walls of basalt. Some tight fractures along the canyon walls strike N30°E and the basalt country rocks are in places replaced by sparse amounts of chalcocite. The creek is locally 4 feet deep, 30 feet wide and fast-flowing, and is probably incised for the length of the canyon (500 feet) along a fractured or brecciated zone.

All the above fissured and brecciated zones are probably members of the Teshierpi fault zone as all strike northeasterly, lie about parallel, and are less than three quarters of a mile distant from the projected location of the Teshierpi main break.

EB, SB, SIL, BO Group (96)
Spectroair Explorations Limited
(lat. 67°17′, long. 115°46′; NTS 86 O/5)

These claims lie south of Burnt Creek and cover ground to the south of the VERA, CU, and TUFF groups. Some holes drilled in 1968 to test high chargeability source material indicated by an induced polarization survey intersected only chlorite-rich basalts.

EM 30 Claim (152)
East Coppermine Exploration Company Limited; Conwest Exploration Company Limited
(lat. 67°17′, long. 115°16′; NTS 86 O/6)

A vein 2 to 3 feet wide that contains some massive chalcocite and bornite was traced for 500 feet on claim EM 30. The enclosing basaltic flows strike northeast and dip gently to the northwest (not visited).

The EM 30 claim is one of a block of 1,685 claims formed of over 40 adjoining claim groups that are being prospected by the owners. About 30 copper occurrences found to date on this block of claims are listed in a report recently completed (Thorpe, 1970).

ESC 37 and 38 Claims (117)
Teshierpi Mines Limited
(lat. 67°35′, long. 115°33′; NTS 86 O/12)

An occurrence of chalcocite nodules in the Rae Group sandstones on the south side of the large U-bend in Coppermine River has been described by R. E. Hindson (1969, unpubl. rept.) as an example of chalcocite and covellite replacing what were originally sedimentary pyrite nodules. He observed that the chalcocite nodules occur adjacent to faults and that chalcocite is absent at distances of more than 25 feet from the faults. Farther from the faults the nodules consist of barren pyrite.

During the 1969 season two holes were drilled about 1,400 feet south of Coppermine River for Teshierpi Mines Limited by Coppermine River Limited, to test the grey glauconitic sandstones and black shales of the "Escape Rapids Formation" (Rae Group) for copper minerals. The results are shown in the following drillhole logs recorded by N. Byrne in a company report. In general these sandstones and shales where tested south of the river contain less than 0.40% copper but some layers hold as much as 0.66%. The copper is present chiefly as disseminated chalcocite and more rarely as specks and grains of native copper in thin beds of coarse sandstone. Small amounts of pyrite, bornite, and chalcopyrite are also disseminated in the copper-bearing beds. The best mineralized section in hole 69-05 is 34.5 feet thick (135.0 to 169.5 feet) and contains a weighted average grade of about 0.37% copper. The equivalent section in hole 69-04 is 35.8 feet thick and it has a weighted average grade of about 0.39% copper. The latter section rests on a basalt flow, 24.7 feet thick at a depth of 140.8 feet, and the basalt lies on red sandstone. The top of the flow marks the unconformity between the upper sedimentary-volcanic formation of the Coppermine River Group and the overlying sediments of the Rae Group.

Fine particles of native copper occur in drillhole 69-04 in a band 5½ feet thick of interbedded coarse sandstone and black sandy shale at a depth of 130 feet. The base of the native copper-bearing band lies 6.5 feet above the basalt flow. Some coarse blebs of native copper were found in the second drillhole, 650 feet farther west at about the same horizon but confined to a band of coarse sandstone only 4.5 inches thick and 5 feet above the basalt. A native copper veinlet an eighth of an inch thick cuts the sandstone between 4 and 5 feet above the flow (*see* log of drillhole 69-05).

Log of Drillhole 69–04, Claim ESC 37

Location — about 1,400 feet south of Coppermine River

(Adapted from 1969 report by Coppermine River Limited)
Logged by N. J. Byrne, B.Sc.

From	To	Description	Feet	% Cu
0	82.0 feet	Overburden (vertical hole)		
82.0	102.1	Greenish grey, medium-grained sandstone; black shale layers 82.5 to 83.5 feet and 90.8 to 94.5 feet. Graphitic shale bands. Glauconitic seams occur in the sandstone below 85.5 feet. Biotite is evenly distributed. Some chalcopyrite, bornite, chalcocite, and pyrite are disseminated in the sandstone from 94.5 to 96.0 feet. Dip shown by banding is 13°.	3.0 4.5 5.0 2.5 5.1 2.9 3.3	0.06 0.06 0.05 0.15 0.10 0.08 0.33
102.1	108.3	Light grey, fine-grained, silty sandstone with crenulated black shale bands, lower half of section.	2.9 3.3	0.08 0.33
108.3	126.6	Dark grey to black sandy shale with some narrow lighter sections. Section 112.5 to 115.3 has sandy layers averaging about ¼ inch thick which contain up to 20% chalcocite in the form of microscopic granules. Only the odd speck of visible chalcocite seen in rest of zone. Dip is almost flat.	4.2 2.8 3.0 5.0 2.5 0.8	0.43 0.52 0.39 0.27 0.43 0.66
126.6	128.9	Light grey, fine-grained sandstone with very few shale layers, minor amount of chalcocite.	2.3	0.19
128.9	133.8	Black sandy shale with sandstone layers, very coarse at 132.5 feet. Native copper and chalcocite is plentiful in the sandy sections in very fine particles. Some blebs of chalcopyrite are present.	4.9	0.61
133.8	140.2	Light grey, medium- to coarse-grained sandstone. In last 6 inches very coarse and up to 50% glauconite. In first 6 inches, coarse native copper is plentiful, only scattered blebs of chalcocite and chalcopyrite in rest of section.	2.0 3.2 1.2	0.29 0.10 0.09
140.2	140.8	Coarse, grey, altered sandstone; chalcopyrite on fracture planes.	0.6	0.49
140.8	165.5	Chloritic basalt with included sand, some chalcopyrite and specular hematite from 140.8 to 154.6 feet. Fractured basalt, chloritic slip surfaces from 157.5 to 165.5 feet.		
165.5	187.0	Red, coarse, argillaceous sandstone to end of hole.		

Log of Drillhole 69–05, Claim ESC 38

Location — about 1,500 feet south of Coppermine River and about 650 feet west of hole 69–04

(Adapted from 1969 report by Coppermine River Limited)
Logged by N. J. Byrne, B.Sc.

From	To	Description	Feet	% Cu
0	82.0 feet	Overburden (vertical hole)		
96	108.5	Light greenish to grey, medium to coarse biotite-bearing sandstone with about 40% black clay bands; glauconite and pyrite sparse in upper half, then more prominent; a few specks of chalcopyrite.	5.0 4.0 3.5	0.05 0.06 0.06
108.5	135.0	Light grey, silty sandstone with thin crenulated clay bands from 129 to 135 feet; glauconite gives a striped appearance. Chalcopyrite and chalcocite are plentiful for 3 inches at 129 feet in the clay bands. Pyrite is finely distributed throughout the rest of the section and is concentrated on some fractures.	5.0 5.0 5.0 5.5 3.0 3.0	0.08 0.05 0.09 0.09 0.25 0.11
135.0	160.2	Black sandy shale with 5% thin sandy layers. From 138.8 to 142.0 feet chalcocite is present in sand layers and as tiny blebs in the shale. From 146 to 150.7 feet chalcocite is sparse. Section 150.7 to 155.2 feet, chalcocite only on a few sand-shale contacts. Section 155.2 to 160.2 feet chalcocite in sandy layers. Native copper grains occur in last half inch of coarse sandstone.	3.8 3.2 4.0 4.7 4.5 5.0	0.33 0.57 0.40 0.32 0.42 0.46
160.2	166.5	Grey to green, medium to coarse argillaceous sandstone. First 4 inches is very coarse with some native copper blebs. From 160.6 to 161.5 feet and ⅛-inch native copper veinlet cuts length of core at a 3° angle and the sandstone is well mineralized with chalcocite and some chalcopyrite.	3.0 3.3	0.22 0.24
166.5	169.5	Basalt mixed with clay and large glauconite grains. Chlorite and some specular hematite are present.	3.5	0.38
169.5	185.0	Basalt, one foot brecciated, then normal amygdaloidal, chloritic, flow top.		

ESC 63 and 69 Claims (116)
Teshierpi Mines Limited
(lat. 67°35′, long. 115°35′; NTS 86 O/12)

The ESC 63 claim covers the west bank of Coppermine River at a prominent easterly bend in the river about 20 miles southwest of Coppermine village. The country rocks consist of gently northerly dipping, greenish grey glauconitic sandstones and shales (Rae Group) that are faulted against reddish sandstones in rock bluffs about 75 feet high, toward the south end of the exposed part of the mineralized zone.

Chalcocite nodules occur over a distance of 400 feet or more in a 4-foot-thick band of greenish grey glauconitic sandstones that outcrop a few feet above Coppermine River. The nodules contain pyrite and hematite as well as chalcocite. They are 0.1 to 3 inches thick, most are lenticular although some are spherical.

The nodules are most plentiful in a zone 40 feet long where some crumpled or slump structures are present in the sandstone. This richer zone of copper nodules lies only a few feet west of a northeasterly striking narrow fault fissure that holds from 1 to 5 inches of calcite. The sandstones in one place on the east side of this fault contain scattered cobbles several inches in diameter.

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PLATE V. Sandstones and shales on west bank of Coppermine River at chalcocite-pyrite-hematite concretions site (ESC 63) looking north, August 1968.

Very thin chalcocite-rich layers occur in the greenish grey sandstone beds that overlie the copper nodule zone. As these mineralized beds form the base of vertical bluffs at least 75 feet high, there was no way to trace the upward extent of the chalcocite seams, but it was noted that mineralization is sparse in the 10 feet of accessible strata. A grab sample of this mineralized sandstone collected by the writer in 1968 showed a copper content of 0.5%.

It seems probable that the copper mineralization in these sedimentary rocks resulted from the introduction of copper-bearing solutions along the northeasterly striking fault mentioned above. All the observed mineralized beds occur within 30 feet of this fault and the richest exposures of chalcocite nodules occur only a few feet west of the fault. In an analogous situation on claim ESC 68 (description follows) a cross-section exposed in a cliff shows that copper mineralization in similar sedimentary rocks is confined mainly to a 50-foot-wide band on either side of a fault.

R. E. Hindson has observed (pers. com.) that pyrite nodule beds farther north along Coppermine River are replaced by chalcocite in zones lying within 25 feet of fault fissures.

During August 1969 a vertical hole (69-02) was drilled about 500 feet north of Coppermine River by Coppermine River Limited. In general grey to green glauconitic sandstones and shales were intersected to the bottom of the hole which was at a depth of 257 feet below 124 feet of overburden. The drillhole log by N. J. Byrne (a Coppermine River Limited report) mentions pyrite as a minor constituent in most of the rock, concentrated in places, but averaging less than 1%. Four mineralized bands were penetrated and assays for copper content as reported in the drill log follow. The copper minerals found in these bands were not identified in the log.

Sample	From (feet)	To (feet)	Width (feet)	% Cu
7063	134.5	137.5	3.0	0.31
7064	166.0	170.0	4.0	1.87
7065	198.0	201.0	3.0	0.36
7066	214.0	217.0	3.0	0.42

Another hole (69-03) drilled about 1,200 feet farther north on claim ESC 79 penetrated 184 feet of overburden and 73 feet of glauconitic, grey argillaceous siltstones and greenish grey sandstones and some alternating red and grey silty shale beds in the upper part of the section. The rock holds less than 1% of disseminated pyrite. A 3-foot-section of core taken at a depth of 223 feet assayed 0.26% copper and another taken from 252.0 feet to 255.0 feet assayed 0.52% copper (from Coppermine River Limited report, 1969).

ESC 68 Claim (118)
Teshierpi Mines Limited
(lat. 67°36′, long. 115°30′; NTS 86 O/12)

The ESC 68 claim is on the east bank of Coppermine River about 19 miles southwest of Coppermine village. Here the river is confined by canyon walls about 100 feet high formed of flat-lying to gently northerly dipping grey and greenish grey glauconitic sandstones, siltstones, and shales (Rae Group). These rocks are cut by a strong fault that strikes N60°E. In places chalcocite impregnates and replaces the sediments, particularly along bedding and joint planes for about 50 feet laterally on either side of the fault. Some calcite gangue occurs along both the fault and some of the joints. Several chalcocite nodules half an inch thick and 3 inches long occur in the sandstones within a few feet of the fault. Green and blue copper carbonate stains are prominent along the cliff walls in a zone 100 feet wide centred along the fault.

The continuation of the mineralized zone northeasterly from the river is concealed by drift that supports a luxuriant growth of grasses and shrubs, but the mineral zone and the fault probably continue northeasterly from the river. The grade of the zone in the cliff exposures is not known, but it probably ranges between 0.3 and 1.0% copper.

ESCAPE Group (15)
Glen Rapson
(lat. 67°34′, long. 117°28′; NTS 86 N/11)

This group of 72 claims covers about 6 square miles of ground underlain principally by dolomites, dolostones, and some quartzites and slates of the Dismal Lakes Group. A fractured zone that lies a mile east of the northeast part of a 2-mile-long lake is mineralized with chalcopyrite (not visited).

FAR Group (7)
Hearne Coppermine Explorations Limited
(lat. 67°44′, long. 117°40′; NTS 86 N/12)

The FAR group consists of 200 claims near the north side of the basalt belt 35 miles northwest of Hope Lake. The best mineral showing on the group is on the FAR 3 claim.

The FAR 3 occurrence is a vertical, fissured, fractured, and brecciated zone that contains chalcocite and some malachite. The chalcocite occurs as thin lenticular veinlets most of which are less than a quarter of an inch wide; it also occurs as spots and blebs that are replacements of the basaltic wall-rocks adjoining the fractures. Some chalcocite is associated with minor quartz and carbonate gangue that cements narrow zones of brecciated basalt. The fractured zone is about 100 feet wide and is exposed for 150 feet with drift-cover at both ends. It strikes a little north of west, and about 300 feet west of the outcrop area, along its projected strike there is a well-developed fault lineament that can be followed for 2 miles along a course striking N65°W. North of a median line drawn along its central axis the 100-foot-wide mineralized zone contains less than 1% chalcocite but toward the south side there is an increase in the chalcocite content and a zone 15 feet wide along its southern side holds 2 to 3% chalcocite. Preliminary drilling in 1968 indicated that the mineralized zone is 150 feet long. The junction of the FAR 3 zone with the fault zone indicated by the N65°W striking linear would probably be a worthwhile area for another drill test.

At least eight quartz veins that contain some chalcocite and chalcopyrite were also found on the FAR claims. Most of these are less than a foot wide and under 500 feet long, and they contain insufficient copper sulphides to be of economic interest. The FAR 14 showing consists of some chalcocite-rich amygdaloid float.

FAR EXTENSION Claims (8) (6) (5)
Hearne Coppermine Explorations Limited
(lat. 67°44′30″, long. 117°37′; NTS 86 N/12)

The FAR EXTENSION claims lie north of the FAR and CARL groups (same ownership) and are about 37 miles northwest of Hope Lake.

The No. 1 lode (loc. 8, Fig. 1) is a vein of quartz and buff coloured carbonate from 2 to 6 feet wide that is exposed almost continuously for about 2,000 feet in the basalts from 300 to 400 feet south of Crescent Lake. The vein strikes S65°E and is vertical. It is generally sparsely mineralized with small specks of chalcopyrite and is malachite-stained in some places. A second parallel vein that lies 40 feet farther north is also sparsely mineralized with chalcopyrite. It is 1 to 2 feet wide and is exposed at intervals for only 1,000 feet. Both veins are concealed by overburden on their east and west ends. They

occur along part of the Bob Lake fault zone (*see* Fig. 2). A visual estimate of the copper content of the larger vein is 0.3%.

No. 2 lode (loc. 6, Fig. 1) consists of a strong quartz-carbonate vein that occurs in the basalts 2 miles farther west (at lat. 67°45′, long. 117°42′) on what is possibly claim 60. This vein lies 300 feet east of a north-flowing creek incised in a north-sloping outcrop area. The vein has an average width of about 3 to 5 feet, and can be readily followed for 1,500 feet. It follows an irregular northerly course with an average strike of N10°W and has a vertical dip. The vein is erratically mineralized with chalcopyrite, bornite, and chalcocite, and probably contains less than 0.4% copper. Buff coloured carbonate that forms half of the vein material is cut by quartz stringers and veins; copper sulphides are present in both gangue minerals. About 500 feet east of the north end of No. 2 lode, there are several smaller sparsely mineralized quartz veins. One ranges from 1 to 3 feet in width and is exposed for 350 feet. It is vertical and strikes S40°E. Only a small chalcocite content was noted. Amygdaloidal basalts are locally capped by 6 feet of red slate.

Twin Lakes quartz vein is half a mile west of No. 2 vein (loc. 5, Fig. 1) and is 500 feet north of the more northerly of the Twin Lakes at latitude 67°45′, longitude 117°43′. The vein is 1 to 2 feet wide and is exposed for 200 feet along a due north course down a north-sloping ridge of basalt. It contains some chalcocite and malachite but probably grades at less than 1% copper (visual estimate).

The No. 3 vein is a little less than half a mile west of the Twin Lakes vein and lies on the east side of a small north-flowing creek about 25 feet from the water's edge. It ranges from 2 to 4 feet in width and is well exposed for about 1,200 feet. The vein occurs along a vertical north-striking fissured and sheared zone and locally the quartz and buff carbonate gangue contains small concentrations of bornite, chalcocite, and chalcopyrite; in general these sulphides are only sparsely disseminated. Quartz is the younger gangue mineral but the copper sulphides are present in both the carbonate and the quartz. About 500 feet south of the north end of the vein (the vein strikes across the creek into a drift area at its north end), the basalt is sheared along its west side over a width of 1 foot and chalcocite veinlets are present in this zone of sheared basalt for a length of 30 feet.

FAR EXTENSION No. 4 vein lies three quarters of a mile north of the No. 3 vein. It is reported to be a chalcocite-bearing quartz-calcite vein about 1,000 feet long and 1½ feet wide. The No. 5 vein is described as a native copper-bearing quartz and calcite veinlet only half an inch wide and 60 feet long (Nos. 4 and 5 not visited). No. 5 is half a mile or more northwest of No. 4.

FRED 104–200 Group (34)
Hearne Coppermine Explorations Limited
(lat. 67°34′, long. 116°57′; NTS 86 N/10)

A quartz-calcite vein, 1 foot wide, mineralized with chalcopyrite, occurs in the northwest part of the claim block, in the basalts, on what is believed to be claim 105.

FYM Group (west of index map)
Polaris Mines Limited
(lat. 67°42′, long. 118°28′; NTS 86 N/9)

This group of 108 claims lies 13 miles north of Bebensee Lake and 26 miles northwest of upper Dismal Lakes. Minor native copper and chalcocite in small quartz-filled

amygdules were reported by the owners. A very strong north-striking lineament occurs near the east side of these claims and may be covered by the staking.

GAL 37–41, 53–58, 66–75, etc. Claims (90)
Crowpat Minerals Limited
(lat. 67°14′, long. 116°00′; NTS 86 O/4 and 86 N/1)

The GAL group of over 60 claims lies south of the ALF group and straddles part of the east-flowing part of Coppermine River. Basalt flows outcrop along the north boundary and in a few places along the south boundary. Some northerly striking fault lineaments are visible on air photographs both north and south of the GAL group. Two malachite-stained shear zones containing some chalcocite and bornite have been reported in the northerly outcrop area, north of the river.

GDF Group (144)
Conwest Exploration Company Limited
(lat. 67°24′, long. 115°26′; NTS 86 O/6)

The Chance showing is a sheared and shattered zone 20 feet wide that outcrops for 50 feet in brown weathering basalts, a short distance north of Fokker Creek. The basalt fragments are invaded and cemented by thin stringers and veinlets of calcite, and the whole material contains some disseminated bornite and chalcocite. The mineralized zone strikes N35°E and the dip appears to be steep. It was drilled by the owners in 1968.

Some drilling was also done to test a northwest-striking chalcocite-bearing sheared zone that outcrops 2 miles farther northwest on claim GDF 19 or 20. This zone is reported to be 10 feet wide in a surface exposure 30 feet long.

GM 1–36, DM 37–72, FD 73–104, SA 105–143 Groups (145)
Coronation Gulf Mines Ltd.
(lat. 67°24′, long. 115°34′; NTS 86 O/5)

The GM–DM, etc., groups cover about 10 square miles, 2 miles east of Coppermine River, just south of Tundra Lake. The company reports that 5 north-northeast-striking brecciated fault zones were found, and that all of these were veined with varying amounts of quartz, calcite, and chalcocite. A number of geophysical anomalies were outlined.

GO 1–216 Group (135)
Coronation Gulf Mines Ltd.
(lat. 67°32′, long. 115°21′; NTS 86 O/11)

The GO group lies about 5 miles east of Coppermine River and 21 miles south-southwest from Coppermine village. Several narrow quartz-carbonate fault breccia zones with average widths of 1½ feet were found in the basalts. These contain chalcocite as fillings and as haloes around breccia fragments that range from one eighth of an inch to

6 inches in diameter. The basalts of this group are interlayered with minor sandstone in the more northerly claims and are intruded by an easterly striking diabase sill up to 300 feet thick along the south side of the property.

GOOD and BREN Groups (21)
Trans Columbia Explorations Ltd.
(lat. 67°43′, long. 116°54′; NTS 86 N/10)

This 70-claim block is 6 miles north of Bornite Lake and lies along or near the contact zone between the Coppermine River basalts and the overlying sandstones of the Rae Group. One of the principal outcrop areas consists of a diabase sill and a thickness of up to 80 feet of underlying sandstones and shales. A geochemical survey by the owners showed a generally higher copper content in the surface soils with a geochemical peak of 30 ppm. An anomaly on GOOD 13 claim is said to be 550 feet long and 100 to 200 feet wide.

GORD 1–300 Group (9)
Magnum Consolidated Mining Co. Ltd.
(lat. 67°41′, long. 117°43′; NTS 86 N/12)

The GORD 1–300 claim block lies 10 miles north-northwest of the most northerly bay of west Dismal Lakes, and covers an area about 8 miles long, from east to west, by 3 miles wide. Basalt flows underlie the claims and generally dip only 2 or 3 degrees north. Drift-cover is extensive. One or more diabase dykes intrude the basalts.

On the GORD 153 and 158 claims, 1.2 miles east of Coot Lake (a lake 2 miles long in the northwest part of property), a native copper specimen 2 feet long, 8 inches wide, and half an inch thick, weighing 20 pounds, was found. It occurred in a small network of calcite veins which hold chalcocite, bornite, and chalcopyrite as well as some native copper. The veinlets strike north.

GORD 301–414 Group (91)
Pinex Mines Limited
(lat. 67°11′, long. 116°00′; NTS 86 O/4 and 86 N/1)

These claims cover about 8 square miles in the September Mountains about 2 miles northeast of the mouth of September Creek. The mountains are formed of northerly dipping basalt flows that are underlain by dolomite at the foot of the southern slopes. A number of north, northeast, and northwest-striking lineaments are seen on airphotos covering these claims. Many of these lineaments are probably faults but some may be diabase dykes.

The owner's report mentions isolated outcrops of coarse basalt breccia mineralized with some chalcocite on both the GORD 343 and GORD 344 claims. Minor native copper was noted elsewhere in flow top basalts.

GORD 368 Claim (2)
Torwest Resources (1962) Ltd.
(lat. 67°41′, long. 117°55′; NTS 86 N/12)

This property lies 15 miles northwest of the northwest bay of Dismal Lakes. Scattered fragments and boulders of high-grade chalcocite were found on GORD 368. These were probably ice-transported, as 2 packsack drillholes, 25 feet and 87 feet deep, penetrated only barren basalt.

On GORD 355 some chalcocite was found in amygdaloidal basalt over widths of 12 to 18 inches for a length of 15 feet. A drillhole 35 feet deep failed to intersect any mineralization.

GREG 1–275 Group (22)
Teshierpi Mines Limited
(lat. 67°42′, long. 116°55′; NTS 86 N/10)

The GREG group extends north for 5 miles from Bornite Lake and is 5 miles wide, east to west, near its northern border. The principal showing known as No. 4 is on the south side of a wide drift area containing several large lakes.

A brecciated fissured zone 6 to 8 feet wide has been exposed in a 100-foot trench. The brecciated basalt fragments are cemented with chalcocite and veined by tiny chalcocite veinlets. The vein strikes N45°E. Malachite alteration is prominent.

Another brecciated zone is exposed about 1,000 feet farther north. This zone is 6 feet wide and is mineralized with chalcocite in a northeast-trending trench that is 50 feet long.

About 200 feet southeast of the first described vein a sheared zone 4 feet wide is exposed for 20 feet in a dry stream bed. Sheared and fractured basalt is veined with quartz, calcite, and chalcocite stringers that are mostly one half to one inch wide. This shattered zone strikes northeast and all three occurrences are formed along an *en échelon* fracture pattern. Greyish purple basalt is predominant.

One of the above zones was tested with short drillholes for a length of 600 feet in 1969 and widely separated, narrow, erratically mineralized lenses were intersected.

GRR 90 Claim (16)
Ross Kid
(lat. 67°33′, long. 117°29′; NTS 86 N/11)

The GRR 90 prospect is 2 miles northeast of the most northerly bay of Dismal Lakes. The claims are underlain by dolomites and dolostones of the Dismal Lakes Group that locally strike east and dip 5 degrees north. Chalcopyrite occurs here in a fractured zone in the dolomites; the zone is 30 feet wide and 250 feet long. Parallel fractures, 1 to 4 feet apart, strike N15°E within this zone and chalcopyrite occurs along the fractures in a gangue of reddish brown carbonate and quartz. Midway along the zone some of the veins range up to 8 inches in width but at the north and south extremities they gradually narrow and pinch out. Some of the veins hold 2 or 3% chalcopyrite but the average copper content across the 30-foot-wide zone would probably be less than 0.2%.

GY 1-30 Group (112)
Giant Yellowknife Mines Limited
(lat. 67°33', long. 115°57'; NTS 86 O/12)

Three holes were drilled to test the northeast extension of the Teshierpi fault for its copper content. Hole 1 stopped at 403 feet, hole 2 at 247 feet, and hole 3 at 384 feet. Drift-cover was 64 feet thick at hole 1, 40 feet thick at hole 2, and 50 feet thick at hole 3. Massive and pillowed basalt flows were found interlayered with tuff beds and the fault zone was marked by many narrow clay gouge seams without any mineralization (from a technical report by R. W. Spence).

HA 1-108 Group (127)
Tower Mines Ltd.
(lat. 67°36', long. 114°50'; NTS 86 O/10)

The claims are 16 miles southeast of the mouth of Coppermine River. The local basalt flows are mostly 40 to 60 feet thick and they dip from 5 to 8 degrees northwest.

The A showing is a shear zone that strikes N70°E and dips 82°S. Chalcocite veinlets associated with some chlorite, epidote, and quartz occur along the shear planes. One chalcocite lens 12 feet long is 0.8 foot wide at a midway point. Narrow chalcocite stringers and some malachite are exposed in four trenches.

B showing consists of a chalcocite-bearing amygdaloid found as fragmented material along the edge of an outcrop.

D showing consists of vertical quartz-calcite veins that contain leaves and blebs of native copper. The veins strike N20°E and occur along a creek bottom.

HA 28 and 95 Claims (154)
Spectroair Explorations Limited
(lat. 67°23', long. 115°06'; NTS 86 O/6)

On claim HA 28 (a mile south of the east end of Pistol Lake) brecciated basalt in a frost-heaved area 50 feet wide and 150 feet long contains chalcocite and minor bornite. Some fragments of massive chalcocite up to 6 inches in diameter were found. Vuggy quartz is present as a cementing gangue mineral.

On claim HA 95 (3 miles south of east end of Pistol Lake) angular blocks of barite up to 10 inches in diameter were noted in overburden adjacent to a prominent diabase dyke.

HARRY 2-40 Group (29)
Consolidated Proprietary Mines Holdings Limited
(lat. 67°38', long. 116°53'; NTS 86 N/10)

The HARRY group adjoins the COPPER LAMB claims northwest of Bornite Lake. In a flat area on the mountain top two old pits exposed blocks of vein quartz mineralized with chalcocite and some bornite. One of the blocks, which consists largely of massive

chalcocite with abundant malachite, measures 16 inches long, 14 inches wide, and 10 inches thick. The open-cuts are in drift material, and as bedrock was not reached, it is impossible to be sure whether the blocks of ore were dropped here by a westerly moving flow of glacial ice or whether they are local frost-heaved material. A smooth glaciated bedrock surface of dark, fine-grained basalt lies 100 feet east of the old pits.

HAY 1–36, VOIR 1–36 Groups (129)
Anglo-Celtic Exploration Ltd.
(lat. 67°33′, long. 114°54′; NTS 86 O/10)

These claims are 20 miles south of Coppermine village and cover about 5 square miles, largely underlain by the basalt flows. According to the company report, the principal showing is a breccia zone 10 feet wide that has a strike of N30°E and is mineralized with some bornite and malachite for a distance of 600 feet. Several samples of native copper are said to have been found in the area.

HM 1–8 Claims (142)
Pinex Mines Limited
(lat. 67°26′, long. 115°32′; NTS 86 O/5)

The claims cover the greater part of the west side of Tundra Lake. A magnetic high anomaly is reported to underlie part of the west side of the lake. Narrow quartz veins that contain some chalcocite occur in places along or near the west shore.

HR 1–125, 150–209 Group (120)
T.C. Explorations Ltd.
(lat. 67°36′, long. 115°07′; NTS 86 O/11)

The HR block of claims covers about 12 square miles along the northern contact of the Coppermine basalts. The property lies 15 miles south of Coppermine village and 10 miles east of Coppermine River. The principal showing is a calcite vein 40 feet wide that outcrops in the north bank of Nipartoktuak River on claim HR 178. The vein strikes about N10°W and dips approximately vertical. North of the river on claim HR 169 the vein is concealed by from 10 to 40 feet of drift and its southward continuation is concealed in the river bed. The river at this point is about 8 feet deep and 100 feet wide. In the exposed section along the waters edge the vein consists mostly of white calcite, some pale pink calcite, minor quartz, and some included fragments of brecciated basalt. The vein contains small amounts of bornite, chalcocite, chalcopyrite, and pyrite and some of the weathered surfaces are azurite-stained. In the river bank exposures the mineralized vein probably contains less than 1% copper (visual estimate). Diamond-drill hole HR 2-02, which was drilled 300 feet north of the river in 1969, intersected the vein at a depth of 105 feet and the succeeding 48 feet of drill core returned a weighted average assay of 1.18% copper. Included in this 48 feet is one 10-foot section that returned an average grade of 2.55% copper. Hole HR 2-04, which was drilled 200 feet farther north, intersected 6.5 feet of vein width that assayed 1.18% copper with an additional 57 feet of core

returning an average of a little less than 0.5% copper. The HR 2-05 hole, which was started 700 feet north of the river, was apparently abandoned at a depth of 54 feet. A bed of white quartzite 7 feet thick intersected in this hole at a depth of 21 feet, contained some marcasite and a little chalcopyrite (from logged data by Messrs. Boies Hall and K. W. Grubaugh).

The company reports another calcite vein in the southwest part of the property which at one point carries some massive bornite and elsewhere minor chalcocite. In the south-central part of the property thin fracture fillings of chalcocite occur along a fissured zone in the basalts. Other fracture fillings of chalcocite and chalcopyrite in the basalts are said to occur in the southeasterly claims.

HUSKY Group (80)
PCE Explorations Limited; Coppermine River Limited; Consolidated Proprietary Mines Holdings Limited
(lat. 67°20′, long. 116°07′; NTS 86 N/8)

The HUSKY group of 24 claims is 3 miles southwest of Willow Lake. Chalcocite occurs along fractures that form a fan-shaped zone in the basalts.The zone trends northerly and is exposed for about 200 feet. It pinches out to the south at a cliff. According to Messrs. G. Byles and M. Watts Jr., at one point a copper content of 4.85% was indicated across a width of 30 feet although 30 feet farther north the indicated grade is about 1% copper across 22.3 feet.

IKE 37 and 72 Claims (83)
Torwest Resources (1962) Ltd.
(lat. 67°15′, long. 116°10′; NTS N/1)

The IKE claim group covers about 24 square miles in the area where the northerly flowing Coppermine River changes direction, turning easterly around the north side of September Mountains. The writer does not have any information on the copper discoveries in this block. However, the report by J. J. O'Neill (1924, p. 60) refers to the occurrence of native copper in small chips and flake form in the hard basalt at the mouth of Stony Creek. This locality on the claim map is covered by claims IKE 37 and 72.

IS Group (85) (86)
Coronation Gulf Mines Ltd.
(lat. 67°18′, long. 116°02′; NTS 86 N/8)

The IS claim group is about 5 miles due south of Willow Lake. On claim IS 148, half a mile northwest of a southerly trending lake that is half a mile long, a fractured and fissured zone (loc. 86, Fig. 1) in the basalt flows has been explored by several rock-cuts and by two drillholes. The fissured zone is from 1 to 6 feet wide and is exposed for 300 feet. It strikes N15°W and has a vertical dip. In one open-cut a chalcocite vein an inch wide and a quartz vein of the same width occur along the centre of the fissured zone. In the largest rock-trench the zone is 6 feet wide and the fractured basalt is invaded by small

chalcocite veinlets and replaced by small aggregates of chalcocite. A barren calcite vein 6 inches wide cuts the mineralized zone. A visual estimate of the copper content of this fissured zone is less than 1%. Assay results of samples taken from depth are not available (two holes were drilled northeasterly by the owners to intersect the zone at a depth of 100 feet).

On claim IS 179 (loc. 85, Fig. 1) half a mile west-northwest of the showing described above, a fractured zone occurs on the west side of a low outcrop of basalt. This zone is roughly 6 feet wide and strikes N10°W. The fractures along both the zone and nearby joint planes are filled with narrow seams and veinlets of chalcocite which is altered in part to malachite. Two drillhole sites were noted, one at 100 feet east, the other at 200 feet east of the mineralized zone, and both inclined toward it at about −45 degrees.

On claim IS 180, about 1,000 feet south of the IS 179 showing, a fractured and slightly shattered zone is exposed on the north side of another basalt outcrop area. This zone is 20 feet wide and it strikes north toward the showing described in the above paragraph (a drift-area 1,000 feet wide intervenes). The fractured basalt is replaced by small pods and tiny veinlets of chalcocite and is cut by small quartz stringers. Malachite-stain attests to the presence of chalcocite fillings along well-developed joints within the fractured zone. One barren 4-inch calcite vein occupies a central fissure. The owners have drilled two holes to a depth of 100 feet. In the surface exposures the mineralized zone probably contains less than 1% copper across a width of 20 feet.

JACK Group (48)
Coppermine River Limited
(lat. 67°25′, long. 116°45′; NTS 86 N/7)

The JACK vein, sometimes referred to as the No. 13 showing by the owners, outcrops on the JACK numbers 9 and 16 claims (*see* 86 N/7 claim map) about 4.5 miles north of middle Dismal Lakes. It is well exposed for 550 feet on JACK 9 claim a short distance north of the west end of Jack Lake. The vein strikes about N15°E and has a vertical dip. It ranges from 3 to 6 feet in width, with an average of about 4 feet. Brown weathering basalt forms the wall-rocks. The gangue is dominantly quartz which holds small to liberal amounts of chalcocite and bornite with minor chalcopyrite. Some lenticular masses of bornite and chalcocite that occur along the walls of the quartz vein or within the vein are up to 6 inches wide. Of those that occur along the east wall of the quartz vein in the number 2 open-cut, one is 12 inches wide. The bulk of the vein quartz is a finely crystalline white variety but some acicular radiating clusters of quartz crystals are also present that range up to a half an inch in diameter and in places exceed 2 inches long. In the summer of 1967, about 15 shallow holes were drilled to test this vein.

A northerly continuation of the same vein is reported to have been displaced for 500 feet to the northwest on claim No. 16 and has been traced for about 2,300 feet in a north-northeast direction or nearly to the southeast bay of Natik Lake.

Assay returns (owners report) suggest that copper determinations were not made on drill-core vein material that appeared from visual examination to contain less than 2.5% copper. Copper determinations were however made on four high-grade sections of the vein and results of these are condensed into the following table:

Hole	Elevation	Dip	Bearing	Depth	Intersection	% Cu
S 33	1278	40°	S 34°E	65	42.0–44.4	2.4′–63.9
S 38	1282	40°	N 56°E	71	49.5–62.9	13.4′–2.83
S 42	1273	40°	N 56°E	56	40.0–51.5	11.5′–5.29
S 45	1292	45°	S 79°E	64	50.4–58.0	7.6′–7.89

It is possible that the two faulted vein sections described above, were formed in an *en échelon* structural pattern and that both were later cut off by the same northwesterly striking fault along which there could have been much less than 500 feet of differential movement.

A sample of the massive sulphides collected by the writer and assayed by the Mines Branch at Ottawa, assayed: gold, a microscopic trace; silver, 2.62 ounces a ton. A spectrochemical analysis, made in the Geological Survey laboratory, gave 70% copper and about 0.01% nickel.

JIM N92301–413; N92517–552 Group (74)
(also N92489–90; N92507–08)
Sherto Explorations Limited
(lat. 67°23′, long. 116°00′; NTS 86 N/8 and 86 O/5)

About a mile southwest of the west end of Willow Lake in a zone 1,000 feet long and 400 feet wide blocks and fragments of quartz-carbonate float with associated brecciated basalt are mineralized with narrow seams and blebs of chalcocite. A northeasterly striking fault zone that outcrops on Willow Creek near the outlet of Willow Lake contains small amounts of chalcocite. A gabbroic dyke that strikes northerly across Willow Creek a little over a mile east of Willow Lake is very sparsely mineralized with chalcopyrite and pyrite and carries some magnetite.

JIM N92502 Claim (104)
D'Aragon Mines Ltd.; Willow Lake Mines Ltd.
(lat. 67°21′, long. 115°55′; NTS 86 O/5)

The JIM N92502 claim is one of a 20-claim block (N92477–84, N92495–502, N92513–16) that lies a mile north of Burnt Creek and 1.3 miles east of Amco Lake.

The No. 1 vein is in a northeast-striking brecciated zone in basalt, in which the fragmented basalt is cemented by quartz, calcite, and chalcocite. Small amounts of native silver as blebs and as wire silver are reported to occur in a short oxidized part of the vein. The outcrop zone is followed to the northeast (vein strikes N52°E) by 100 feet of frost-heaved breccia, then by 300 feet of drift, and farther northeast some vein rubble appears along a northeast-trending linear depression. A sample collected at the outcrop across 3.6 feet gave 7.25% copper and 0.56 ounce silver a ton.

Some chalcocite and native copper occur near the east boundary of claim N92501 in a vein that strikes N35°E in the basalts; a vein with a similar strike was found 900 feet farther northeast.

JOK Group (147)
Eskimo Copper Mines Limited
(lat. 67°21′, long. 115°33′; NTS 86 O/5)

The JOK group of 40 claims is 3.5 miles east of the mouth of Burnt Creek. On the JOK 12 claim near the north end of a lake that is half a mile long, chalcocite occurs in a brecciated zone in a basalt outcrop on a cliff face. The breccia zone is 10 feet wide and strikes about N50°E.

JOS, CIS, PAL, TON, MIC, ACK Groups (157)
Bernack Coppermine Exploration Limited
(lat. 67°26′, long. 115°03′; NTS 86 O/6)

The property consists of six groups of claims as named above with 36 claims per group. The claims extend 4 miles north and about 3 miles south from the east end of Pistol Lake. A one-mile-wide belt east of Pistol Lake is drift-covered but elsewhere scattered outcrops of northeast-striking basalt flows are found. Underlying Dismal Lakes Group dolomites outcrop a short distance south of the property. The basalts are cut by several north-striking diabase dykes. Minor showings of chalcocite, associated with stringers of quartz, are reported to occur in the basalts adjacent to a diabase dyke in the north part of the property.

JS 1–36; FM 37–72; RIP 73–100 (151)
Coronation Gulf Mines Ltd.
(lat. 67°18′, long. 115°27′; NTS 86 O/5 and 86 O/6)

These claims extend easterly from the east bank of Coppermine River for 5 miles and reach to within 2 miles of Turbo Lake. The local basalts are cut by four or five major diabase dykes that strike from northeast to north-northwest. Several quartz-carbonate breccia zones were found; most of these were only 4 to 8 inches wide but some of them contain chalcocite as massive fillings and as haloes around basalt breccia fragments. In places joints and random fractures are coated with malachite. Some narrow quartz veinlets on the southern claims contain only minor chalcocite.

JUNE 1–36 Group (130)
Bernack Coppermine Exploration Limited
(lat. 67°34′, long. 115°02′; NTS 86 O/11)

The JUNE group is astride the Nipartoktuak River about 18 miles south of the mouth of Coppermine River and the copper mineralized zone is on the northeast side of Nipartoktuak River on claims T34472 and T34481.

The JUNE copper mineralized zone occurs along a fractured brecciated fault zone in the Coppermine River basalt flows. The brecciated rocks are partly replaced by chalcocite and spaces between the rock fragments are filled with chalcocite and with minor amounts of bornite, chalcopyrite, and pyrite in a few places. The mineralized zone strikes north and dips at a steep angle to the east. In surface exposures it ranges from several feet to 15 feet in width and can be traced for about 700 feet.

Diamond drilling was carried out by the owners in 1968 and 1969. According to their reports drillholes J1-03 and J1-04 drilled in 1968 disclosed a mineralized zone from 20 to 35 feet wide. Hole J1-03, an inclined hole, intersected the deposit between 40 and 55 feet vertically below surface and recorded a 20-foot width having an average copper content of 4.4%. Hole J1-04 intersected the lode between 65 and 100 feet vertically below surface and showed a vein 35 feet wide with an average grade of 5.1% copper. All the other holes drilled in 1968 found narrower vein intersections and some disclosed parallel veins lying between 10 and 100 feet east of the main vein. Some of these veins probably occur along branch fissures that diverge from the main break. After completion of the drilling program carried out during the summer of 1969, Bernack announced that they had proved 1,000,000 tons of ore grading 2.5% copper.

KARLA 1–13 Group (19)
Teshierpi Mines Limited
(lat. 67°42′, long. 117°05′; NTS 86 N/11)

This group of claims lies 8 miles northwest of Bornite Lake and covers a northwesterly trending area 2 miles long, mostly underlain by basaltic rocks, adjacent to a tributary of Richardson River. A quartz vein up to 6 feet wide and exposed for about 750 feet was found near the southwest corner of KARLA 9 claim; it is mineralized in places with chalcocite and malachite. Another quartz vein occurs near the south boundary of KARLA 10 claim; it is 3 feet wide and can be traced for 170 feet. The quartz holds some chalcocite, pyrite, and malachite. A lenticular quartz vein on the KARLA 1 claim is 20 feet wide and can be followed for 100 feet. The vein and some sheared basalt on either side of it contain some bornite, chalcocite, pyrite, and malachite; the vein is barren in places. All three of the veins mentioned strike northwest. On the KARLA 11 claim a shear zone holds quartz stringers and veins, and in some places the sheared rock and quartz contain a little bornite, hematite, pyrite, and malachite.

KAT 1–45 and 1A–5A Group (93)
Bracemac Mines Limited
(lat. 67°15′, long. 115°52′; NTS 86 O/4 and 86 O/5)

These claims lie half a mile north of the easterly flowing part of Coppermine River and are immediately east of the ALF group. Two north-striking diabase dykes intrude brown, purple, grey, and green basalt flows on the west side of Copper Creek.

Two holes were drilled on an occurrence of disseminated native copper in a basalt flow and one hole is stated to have returned 40 feet of core that assayed 0.1% copper.

Additional holes were drilled to investigate occurrences of chalcocite along fractured zones in the basalts but no mineralization of economic interest was found.

On the KAT 20 claim, green massive basalt contains disseminated flakes of native copper of pin-head size; an analysis of a grab sample showed 0.44% copper. On KAT 31 claim disseminated native copper occurs as spots and flakes in 30-foot bluffs of grey to green basalt that dip 5 degrees north. A selected sample is reported to have contained 1.32% copper. Several chalcocite-bearing sheared and brecciated zones that occur on the KAT 7 and KAT 37 claims are said to be up to 10 feet wide, but they are exposed along their strikes for less than 100 feet.

KIL Group (150)
Donalda Mines Limited
(lat. 67°20', long. 115°36'; NTS 86 O/5)

There are 26 claims in this group which is east of Coppermine River and 2½ miles east of the mouth of Burnt Creek. A mineralized red chert zone that is interbedded with basalt flows is poorly exposed a short distance west of a small lake. This chert zone can be seen in only a few places on the west side of a small drift area where it is overlain by a massive greyish weathering basalt flow. The red chert is slightly fractured and it is replaced by irregular-shaped veinlets, grains, and corn-sized kernels of chalcocite all of which appear to adjoin or occur along minute fractures in the chert. Some native copper in the specimens apparently formed by reduction of chalcocite.

Three short holes were drilled on the KIL 2 claim in 1968. One hole is said to have intersected 11 feet of red sandstone at a depth of 39½ to 50½ feet which assayed 0.35% copper from chalcocite and native copper. The other hole intersected red sandstone from 39½ to 48 feet which assayed 0.15% copper. It is possible that the red sandstone referred to is cherty. As drillholes could narrowly miss irregularly distributed pockets of chalcocite and native copper it is believed that a number of intersections would be required for a proper interpretation of grade in the chert.

The author does not have a record of the exact location of the holes that were drilled, and it may be that they were drilled at a stratigraphic horizon below the chert horizon referred to in the first paragraph.

LARRY 1–6 Claims (44)
(No. 14 Lode)
Coppermine River Limited
(lat. 67°26', long. 116°46'; NTS 86 N/7)

The LARRY group of six claims is 2 miles southeast of the big bend in Elbow Lake three quarters of a mile northwest of Natik or Larry Lake. This property was originally staked in 1952 by George Byles, William Lendt, and Arthur Stollery.

The prospect is a northerly striking, poorly developed stockwork formed of fractured basalt and reticulating chalcocite veins and veinlets. The fractured zone is partly exposed over a length of 250 feet and ranges from 14 to 35 feet in width. It is bounded on the west by a drift-filled depression that strikes N20°W and which probably conceals a structurally related fault zone.

In a trench near the south end of the outcrop the deposit consists of the following units:

(east side)	24.0 inches heavily veined with chalcocite
	36.0 inches of basalt
	1.5 inches of solid chalcocite
	2.0 inches of basalt
	1.5 inches of solid chalcocite
	48.0 inches of basalt
	6.0 inches of solid chalcocite
	72.0 inches of basalt
	1.0 inch of solid chalcocite

(west side) 12.0 inches basalt
drift area

A series of four channel samples was collected across the deposit in 1952 by A. T. Broderick and L. E. Andrews for The M. A. Hanna Company, with the following results:

Sample No.	Width (feet)	Copper %
1 (east side)	13.6	8.03
2	7.7	.86
3	3.9	4.06
4 (west side)	10.6	3.97
Total width	35.8	4.85% average

Assay results of some chip samples collected by Coppermine River Limited in 1966, across parts of the mineralized zone in five different places over a length of 173 feet, are as follows (from company report):

Sample No.	Width (feet)	Copper %
1	5	2.28
2	10	8.36
3	20	2.35
4	15	2.47
5	10	6.19

LARS Group (No. 23 Showing) (43)
Coppermine River Limited
(lat. 67°28', long. 116°38'; NTS 86 N/7)

The LARS group of nine claims is 4.5 miles northwest of Hope Lake, and the LARS copper prospect is on mineral claim N86069 near the southwest end of Oonak Lake.

The LARS showing is a sheared and brecciated zone, in the Coppermine River basalts, erratically mineralized with small veinlets and pea- to grape-sized replacements of chalcocite. It has been traced for length of 1,075 feet and has an average width of 20 feet. It strikes about N40°W and has a vertical dip. The best surface exposures are toward the northwest end where a width of 30 feet of fissured and fractured basalt outcrops; the entire zone is cut by numerous stringers and veinlets of red feldspar and has a low chalcocite content. Several hundred feet to the southeast some amygdaloidal flow top basalt within the fissured zone is heavily mineralized with chalcocite. A sample of the amygdaloid, assayed by the Mines Branch, Ottawa, gave: gold, a trace; silver, 0.5 ounce a ton. This sample graded 5% copper, 0.02% vanadium (spectroscopic analysis, Geological Survey laboratory).

Seven holes were drilled by the owners over a strike length of 800 feet (total footage 604 feet). S-13, reported to be the best hole, intersected 15 feet of chalcocite mineralization in a narrow basalt breccia zone that graded 2.14% copper.

The LARS sheared and fractured zone can be traced by occasional excellent exposures and as a topographic linear for over 35 miles in a northwesterly direction, the major structure is known as the Long Lake fault (*see* Figs. 1 and 2).

LASH 201–300 Group (136)
Hearne Coppermine Explorations Limited
(lat. 67°32′, long. 115°24′; NTS 86 O/11)

The "Lash 1" prospect is 4 miles east of Coppermine River in the southeast part of the LASH 201-300 claims block. Four parallel easterly striking calcite veins occur in a ridge formed of Coppermine River Group basalt flows. The veins are up to 9 feet wide but their average widths are between 2 and 4 feet. They are 50 to 100 feet apart at the east end of the hill, disappear at a low drift-filled area, and in general are exposed for less than 300 feet along strike. They are sparsely mineralized with chalcocite and malachite. Small stringers and veins of quartz that invade the calcite deposits constitute less than 5% of the gangue.

Three holes drilled by the owners in 1968 at –45 degrees, to depths of 300 feet, intersected vein widths of 2 to 3 feet containing less than 1% copper.

LASH 321, 322 and 329–330 Claims (115)
Hearne Coppermine Explorations Limited
(lat. 67°31′, long. 115°35′; NTS 86 O/12)

The LASH block of 600 claims extends northerly for 7 miles along Coppermine River and has an average east to west coverage of 5 miles. Red bed sandstones and shales of the upper part of the Coppermine River Group outcrop along the river on these claims and at the easterly extremity of a 2-mile easterly swing of the river are intruded on claims 321, 322, 329, and 330 by a large northwest-striking diabase dyke. Chalcocite occurs in the red sandstones near this dyke as impregnations of intergrain pore spaces. According to a report by R. E. Hindson for the company, ". . . the chalcocite occurs as disseminations in sandstone over a distance of up to 150 feet from the dyke and through a vertical extent of about 15 feet. Mineralization is controlled by the more permeable zones in the sediment especially the bedding planes."

The big dyke is known to extend southeasterly from the river for 8 miles, then easterly for about 12 miles, and then northerly.

LASH 523–524 (Husky Creek) (111)
Hearne Coppermine Explorations Limited
(lat. 67°29′, long. 115°40′; NTS 86 O/5)

In 1969, paper-thin plates of native copper measuring about 2 by 3 inches in surface area were collected by R. V. Kirkham along Husky Creek about 1,500 feet west of Coppermine River. The thin sheets of copper occur along fractures in a basalt flow that is intercalated with red sandstones and red shale beds of the Coppermine River Group. Some native copper nuggets are reported to have been found at the mouth of Husky Creek by prospectors in 1967, but none was found there in 1969 by a search party of three persons.

LASH GROUP, Miscellaneous occurrences
Hearne Coppermine Explorations Limited

Showing	Type of occurrence	Attitude dimensions	Mineralization	General data
Lash 1	Veins	Vertical	Chalcocite	*See* LASH 201–300 group
Lash 2	Fracture fillings Disseminations		Chalcocite, native copper	Calcite fills fractures in basalts and sandstones. Native copper is disseminated in basalt and fills some fractures (Coppermine River Group)
Lash 3	Veins	Vertical hematite veins 4 feet wide	Minor chalcocite, malachite	Red sandstones of Coppermine River Group
Lash 4	Fracture fillings	Steep to vertical veins	Minor chalcocite, malachite	Fractures in a diabase sill
Lash 5	Fracture fillings	Vertical fractures	Chalcocite, malachite	In red sandstones (Coppermine River Group)
Lash 6	Impregnations	Along bedding planes	Chalcocite	*See* LASH 321–22 group
Lash 7	Fracture fillings	Mostly vertical	Minor malachite, chalcocite	In red sandstones (Coppermine River Group)
Lash 8	Disseminations	Along bedding planes	Disseminated chalcocite	Occurs in limy shales underlying a diabase sill (Coppermine River Group shales)
Lash 9	Fracture fillings		Minor amounts of chalcocite, malachite	Veinlets occur in fractures in a diabase sill
Lash 10	Fracture fillings		Minor chalcocite and malachite	Associated with a diabase dyke

LEAH 1–72 Group (32)
Continental McKinney Mines Limited
(lat. 67°3′, long. 116°35′; NTS 86 N/10)

This 72-claim group is 5 miles east of Bornite Lake. The claims extend 4 miles westerly from longitude 116°30′ and are roughly 1½ miles wide in a northerly direction. The company report states that grains of native copper occur in unaltered basalt on the peninsula at the north end of Leah Lake. On the west side of a creek and 2,000 feet from the south boundary of the property, calcite veins up to half an inch wide contain grains and

pods of native copper; some of the larger angular blocks may contain 1 to 2% copper. The last occurrences are in angular blocks that are probably close to their source.

LEL 87–160, 169–172, 181–183, 339–385+ Group (133)
Canadian Lencourt Mines Limited
(lat. 67°30′, long. 114°50′; NTS 86 O/7 to O/10)

This claim group is 6 miles long from north to south and is 4½ miles wide along its base. Drift-cover is rather widespread. Two diabase dykes that cut the basalts strike N15°W. One fault breccia zone was observed on the LEL 484 and 485 claims. The brecciated basalt is cemented with quartz and carbonate and is sparsely mineralized with chalcocite. The zone strikes northeast and dips steeply east. In one place thin leaves of native copper were found in small carbonate veins along minor fractures and joints.

LIZ 1–36 Group (132)
Bernack Coppermine Exploration Limited
(lat. 67°31′, long. 115°02′; NTS 86 O/11)

The LIZ group is 3 miles south of the June copper deposit and its north border adjoins the BET group. The claims are underlain by northeast-striking basalt flows (Coppermine River Group) that dip 6 or 7 degrees northwesterly. A large diabase dyke crosses the northwest corner of the claim block and extends westerly toward Coppermine River.

The LIZ No. 1 showing, in the northwest corner of the property, consists of brecciated basalt with chalcocite fillings and replacements. The mineralized zone is reported to be 18 inches wide and can be traced for 700 feet in a northeasterly direction.

The LIZ No. 2 showing is close to the south boundary and 4,000 feet south of No. 1 showing. Chalcocite occurs as thin stringers and blebs in the basalt along a northwest-striking fissured zone that can be traced for 800 feet.

LLOYD 1, 2, 5; DOT 799 Claims (42)
Coppermine River Limited
(lat. 67°28′, long. 116°44′; NTS 86 N/7)

The LLOYD quartz vein is well exposed on the LLOYD 5 claim in five open-cuts and in natural exposures for 500 feet starting at a point 250 feet northeast of the most northerly bay of Lloyd Lake. The vein strikes N40°E and is vertical. In the open-cuts the vein ranges from 8 to 20 feet in width, and it is consistently mineralized with 2 to 3% chalcocite. In one trench a lens of solid chalcocite is 6 inches wide. Vugs lined with idiomorphic quartz crystals occur in several places but this type of quartz is commonly barren.

The LLOYD vein is open to the northeast and it probably extends a considerable distance to the southwest. A mineralized quartz vein that outcrops on the east side of a small bay (DOT 799 claim) and in flooded ground on the peninsula 200 feet farther west at a distance of 2,700 feet southwest of the showings described above may be the same vein, and if so the overall length would be about 3,600 feet. At the lakeside showings the vein is from 2 to 3 feet wide and the quartz contains chalcocite, bornite, and some chalcopyrite.

The copper content would be about 2%. Some prehnite and minor carbonate is also present in the vein. About 1,100 feet northeast of this lakeside showing there are many loose quartz blocks in the drift area containing 3 or 4% copper sulphides. A malachite-stained shatter zone 4 feet wide that outcrops 100 feet north of the loose quartz float suggests the presence of two overlapping *en échelon* veins.

MAG 1–64, MAT 1–72 Groups (139)
Nordic Explorations Limited
(lat. 67°28′, long. 115°21′; NTS 86 O/6)

The MAG and MAT claim groups cover about 9 square miles, about 7 miles east-northeast of the mouth of Sleigh Creek. Bedrock consists mostly of northeasterly striking basalt flows that dip gently to the northwest. A large diabase dyke strikes easterly across the north part of the claim block.

On the MAT claims three basalt breccia zones containing chalcocite as stringers and blebs and as irregular-shaped matrix fillings were found near the large easterly striking diabase dyke. One that lies 150 feet northeast of the dyke is a foot wide and has been traced along N40°E course for 120 feet. Another that strikes N70°W is 4 feet wide. It is exposed for only 30 or 40 feet, and the outcrop part lies 100 feet from the diabase. The third mineralized breccia zone is 1 to 5 feet thick but is exposed for only 300 feet.

MAR 1–100 Group (49)
Canadian Goldale Corporation Limited
(lat. 67°23′, long. 116°48′; NTS 86 N/7)

A strong quartz vein outcrops in the basalt ridge on claim MAR 69 about 1,000 feet west of the north part of Pointing Lake (this is the lake, 1½ miles north of middle Dismal Lakes, that has a long north-pointing finger-shaped bay). The vein is exposed at intervals for about 2,000 feet in a southerly direction and appears on claim MAR 54 in low ground 400 feet west of the south end of Pointing Lake. The vein has an average strike of N10°W and a vertical dip. It is 1 to 10 feet wide and erratically mineralized with chalcocite, chalcopyrite, and bornite. At a central point along the vein, where the greatest widths of quartz were seen, the vein is only sparsely mineralized with chalcopyrite. Some sections of the vein, where widths of 2 or 3 feet are prevalent, contain from 1 to 3% copper sulphides.

Five parallel major north-striking fault components of the Dixon fault system trend north through Pointing Lake and are exposed along the north shore of the lake. A number of quartz veins with about 1% carbonate occur along these faults; one barren vein 10 feet wide was seen but time did not permit a search for mineralized zones. Copper sulphides may be found on some of these faults as they are known to occur on a related fault just west of Pointing Lake (the MAR 69 vein described above). North-striking Dixon fault components also pass through the next lake to the east.

MAR 101–162, 166–197, 192–221 Claims (South Group) (45)
Northville Explorations Limited
(lat. 67°27′, long. 116°49′; NTS 86 N/7)

A strong quartz vein occurs on this group in an upland area of grey, green, and pale purple basalt flows that underlie claims 132-33 and 138-39 about 1½ miles southeast of

the bend in Elbow Lake. The vein ranges from 4 feet to 20 feet in width and is exposed at irregular intervals over a distance of 900 feet. Some calcite, as well as brecciated silicified basalt inclusions, accompany the quartz. Generally the quartz is sparsely mineralized with chalcocite and minor bornite but in some places it is cut by lenticular veinlets of chalcocite some of which are as much as 2 inches thick. The vein has been cleaned off for only 200 feet at a central point. It strikes northerly and has a vertical dip. In some places the vein may contain an average of 2% or more copper.

North-striking units of the Dixon fault as well as numerous northeast- and northwest-striking fault lineaments were noted on air photographs covering this claim group. Veins are known to occur along some of these breaks.

MAR 117 Claim (Rabbit Lake) (46)
Northville Explorations Limited
(lat. 67°24′, long. 116°49′; NTS 86 N/7)

Rabbit Lake is the first small lake east of Head Lake; the latter is 2½ miles southeast of Elbow Lake. A 3-foot-wide northerly striking quartz vein is exposed for 25 feet on the south side of Rabbit Lake and additional quartz gangue may be seen at intervals for about 300 feet southerly from the lake. Frost-heaved blocks of vein quartz that contain seams of massive chalcocite cover an area measuring 20 feet by 20 feet adjacent to the vein outcrop. In two trenches near the side of the lake the vein appears to grade about 1% copper.

The Rabbit Lake vein occurs along a branch of the Dixon fault system. Another of these northerly striking faults lies half a mile farther east and passes through a lake slightly larger than Rabbit Lake. The latter fault is known to be mineralized 2 miles farther south at Pointing Lake.

MAR 322–325, 336–343, 354–361, 435–445, 450–462, 469–474 Claims (33)
Columbia Placers Limited
(lat. 67°34′, long. 116°48′; NTS 86 N/8)

This group of 50 claims is in the lowlands east of Bornite Mountains, 6 miles north of the north end of Elbow Lake.

In the southeast corner of the group native copper occurs as fine disseminations in massive basalts, as linings of quartz and feldspar amygdules, and as flecks and small plates in joint fractures. More native copper was noted in dark green basalts than in purplish basalts. The best of four samples sent for assay by the owners contained 0.25% copper.

Minor chalcocite and chalcopyrite were found in veins up to 2 inches wide along a cliff at the east side of the property. Some of the more easterly claims are underlain in part by Coppermine River Group sandstone. A magnetic anomaly 4,000 feet long and several hundred feet wide that strikes due north across the property possibly represents a fault zone. It is concealed by overburden.

MAR 326–335, 344–353, 362–429, 475–482, 484–537 Claims (North Group) (31)
Northville Explorations Limited
(lat. 67°36′, long. 116°53′; NTS 86 N/10)

About 20% of the area covered by these claims is in Bornite Mountains and the rest of the claims cover lower ground to the east. The principal showing occurs at the north

end of a small lake that lies roughly 2 miles southwest of Bornite Lake on what is probably claims 383 and 384.

A flat-lying amygdaloidal basalt flow top 4 feet thick, that is exposed for 200 feet along the base of a north-sloping ridge, is cut by a vertical quartz vein that strikes S70°E. The vein is exposed for several hundred feet and west of the flow top zone passes into an overlying massive basalt flow. At a central point where the vein enters a narrow drift-filled draw, the 4-foot-thick amygdaloidal flow top zone is heavily mineralized with chalcocite and malachite for a length of 25 feet and a width of 3 feet on the north side of the vein. The amygdaloid that lies immediately south of this 25-foot-section on the south side of the vein, is concealed by overlying basalt and drift so that the possible presence of chalcocite could not be detected.

About 200 feet east of the chalcocite-rich amygdaloid zone, on the north side of the drift-filled draw and 100 feet above a small lake, a quartz and calcite vein 3 to 4 feet wide is sparsely mineralized with chalcocite. The wall-rocks are locally composed of fine-grained purple basalt. This vein strikes S80°E and is vertical. It may be an easterly extension of the vein described above.

MAR 500–562 Group (84)
Lake Beaverhouse Mines Limited
(lat. 67°16′, long. 116°05′; NTS 86 N/8)

The MAR 500–562 group of claims covers about 6 square miles near Big Creek and Glance Creek, north of the easterly flowing part of Coppermine River. Copper mineralization on Glance Creek was first noted by Dr. Sandberg (1912) who stated that a mile from its mouth in a brecciated zone the basic rock is cemented by quartz, calcite, and chalcocite.

The owner's technical report states that a westerly striking shear zone 6 feet wide was uncovered on claim MAR 502, in which several thin massive chalcocite veins are present; the total width of chalcocite would amount to 3 inches along the 20-foot exposure.

On claim MAR 519 narrow calcite veins that contain some chalcocite are exposed for 50 feet over a width of 15 feet.

Mineralized float was found on MAR 533–534 over a length of 1,000 feet; and on MAR 512 some veins were found that hold 2% chalcocite and malachite.

A quartz and calcite vein 15 feet wide that is exposed for about 900 feet along Glance Creek was drilled in 1968. According to K. O'Connor the vein is mineralized with chalcocite and malachite. Six holes were drilled and some high-grade assays were returned from hole No. 6 at the north end of No. 5 vein on MAR 541.

J. J. O'Neill (1924, p. 60A) records a breccia zone in the basalts along Glance Creek. He states that the brecciated rock in the bottom of the creek and along the east bank is cemented with quartz, calcite, and chalcocite. Tiny shots of native copper were noted in the hard basalt a few hundred yards to the east.

MAS 7–8–9 Claims (141)
Teshierpi Mines Limited
(lat. 67°27′, long. 115°30′; NTS 86 O/5)

The MAS 7, 8, and 9 claims are units of a large block of claims known as the HED, MAS, RON, and TER groups. These cover North Tundra Lake, the east side of lower Tundra Lake, and extend 6 miles northeasterly.

A strong fault zone 50 feet wide is exposed along Tundra Creek on what is believed to be the MAS 7 or 8 claim. The fault zone strikes N50°E and Tundra Creek follows its course for 300 feet before turning westerly again toward Coppermine River. The basalts along the banks of the creek are cut by many parallel fissures that contain quartz and calcite. The stringers and veins range from less than an inch to as much as 2 feet in width. Some red slates interbedded with the basalts on the east side of the stream are also cut and traversed by numerous veinlets of calcite and quartz. At the north end of the exposures, at a right angle turn in the stream's course, there is a barite vein 2 inches thick. The quartz and calcite veins are generally only sparsely mineralized with chalcocite.

About half a mile farther east on what is probably claim MAS 9 a wide vein of white calcite and quartz is exposed in the 75-foot-high canyon walls of Tundra Creek. On the south side of the stream the vein ranges from 10 to 15 feet in width and some parts of it are stained green with malachite. About 200 feet farther northeast in the vertical cliffs on the north side of the stream, the vein appears to be about 2 feet wide and it is malachite-stained in some places. The vein strikes N25°E and is vertical. There is a waterfall 50 feet high on this stream about 200 feet east of the large vein. At the top of the falls, a barite vein 6 inches wide and several narrower calcite veins are exposed. Red sandstone beds 30 to 40 feet thick are interlayered with the basalt flows on the north side of the creek 500 feet east of the waterfall.

METAL 5, 7, and 12 Claims (Malachite Lake) (58)
Coppermine River Limited
(lat. 67°23′, long. 116°28′; NTS 86 N/8)

Malachite Lake is a small northeast-trending lake in a drift-filled valley nearly 2 miles southwest of the No. 47 copper showing. Chalcocite-rich blocks and fragments of amygdaloidal flow top basalt occur along the northwest shore of the lake at a small bay. They were seen at the water's edge and in the water on the south side of the bay and they are abundantly distributed in a 100-foot-wide train for a distance of 500 feet north from the bay to where one pit has been dug. For another 500 feet northerly there are diminishing numbers of the chalcocite-impregnated amygdaloid fragments and an increasing number of rounded boulders of basalt, quartzite, dolomite, and granite, that were brought a considerable distance to their present position by a northerly moving flow of ice during the glacial period. Glacial striae on the west side of Wreck Lake, a quarter mile farther south, trend at N70°E. Thus it is deduced that most of the mineralized blocks were brought northerly from the bottom of Malachite Lake near the end of a period of local glacial activity. The northeast-trending Teshierpi fault underlies Malachite Lake and the ore grade amygdaloid on the north shore suggests that some of the flow top zones adjacent to the fault beneath the lake are probably mineralized.

American Metals Company drilled a few holes north of the small bay in 1952. Thorpe (1970, p. 53) states that Coppermine River Limited drilled an anomaly near Malachite Lake in 1968 and found hematite; in 1969 the writer saw no evidence of recent drilling on the west side of the lake. Possibly some vertical drillholes through the lake ice would be most informative regarding mineralized flow top zones (*see* Fig. 5).

METAL 13–30 Claims (Wreck Lake) (57)
Coppermine River Limited
(lat. 67°23′, long. 116°30′; NTS 86 N/8)

The METAL 13 to 30 claims blanket the Wreck Lake area about 5 miles south of Hope Lake and 2 miles southwest of the DOT 47 showing. The northeasterly striking Teshierpi fault zone underlies the lake.

Chalcocite occurs as amygdule fillings and partly as replacements of amygdaloidal flow top zones in frost-shattered exposures 200 feet west of the south end of Wreck Lake. The mineralized basalt appears to contain between 1 and 2% of chalcocite in an exposure 100 feet in diameter. Drillhole S109 (367 feet deep) was drilled northwesterly from near the lake toward this zone. An analysis of 10 feet of core from a depth of 50 feet gave 1.45% copper, and an analysis of 6 feet of core from a depth of 150 feet gave 1.13% copper (data from Coppermine River Limited report).

Drillhole S116 (403 feet deep) was drilled at a point about 500 feet farther northeast and in an east-southeast direction beneath Wreck Lake. Five feet of core starting at a depth of 58 feet contained 2.60% copper. Six feet of core starting at a depth of 68 feet held 2.24% copper and 10 feet starting at a depth of 109 feet held 2.59% copper. Several other holes, some of them richer, were drilled east-southeast beneath Wreck Lake (data from Coppermine River Limited report).

The small lake that lies 700 feet southwest of Wreck Lake is known as South Wreck Lake. About 200 feet northwest of the south end of this lake is a fissured zone 40 feet wide; the fractured basalt holds about 1% or more of chalcocite and malachite along vertical fractures that strike N50°E.

MGB 101–180, 232–252 Group (77)
Komo Explorations Ltd.
(lat. 67°20′, long. 116°19′; NTS 86 N/8)

The claims cover about 9 square miles, 7 miles southeast of Hope Lake. The company report states that numerous small samples of native copper were found in frost boils in the overburden in a zone 2,000 feet long and 1,000 feet wide on claims MGB 139 and 142. About a mile farther east angular boulders of quartz and calcite that contain chalcocite and malachite outcrop in a shallow basin on claim MGB 234. Chalcocite was also observed in frost-heaved quartz and calcite boulders and rubble that abound 2,500 feet farther northeast in an area 1,000 feet long and 400 feet wide on claim MGB 252. This zone extends south from the north boundary of a basin a little over 1,000 feet in diameter.

MGB 181–185, 190–192 Group (75)
Nordic Explorations Limited
(lat. 67°22′, long. 116°21′; NTS 86 N/8)

There are eight claims in this small group 8 miles south-southeast of Hope Lake. Much of the ground is covered by gravel deposits and in part by the east half of Three Islands Lake. Small amounts of native copper occur in a basalt flow on MGB 181, particularly along minute fractures.

MGB 277 Claim (78)
Canadian Goldale Corporation Limited; Towagmac Exploration Company, Limited
(lat. 67°20′, long. 116°14′; NTS 86 N/8)

The claim is one of a large group that covers about 5 square miles, 9 miles southeast of Hope Lake. The MGB 277 claim lies about 3.5 miles east of Three Islands Lake. An occurrence of native copper in small plates was found on this claim by R. V. Kirkham and D. Mundy while on a geological traverse in July 1969. The native copper occurs in plates from one quarter to one sixteenth inch thick and up to 10 inches long, in a quartz and carbonate vein that ranges from a quarter inch up to 2 inches wide. The vein strikes northeast and is vertical. Some chalcocite is present along the vein and in places the native copper gives way to chalcocite. The basalt host rock is massive, green to grey, fine-grained to aphanitic, and contains 1% amygdules.

MGB 325–396 Group (79)
Canadian Goldale Corporation Limited
(lat. 67°19′, long. 116°12′; NTS 86 N/8)

The MGB 325–396 group covers a block of land 4 miles long (north-south) and a mile wide that is underlain by basalts. It is roughly 5 miles north-northwest of the mouth of Stony Creek or 11 miles southeast of Hope Lake. Four northerly striking lineaments readily visible on air photographs covering these claims are probably indicative of northerly striking faults. Chalcocite veinlets up to half an inch wide occur in a fissured zone 8 to 10 feet wide that has been traced for 300 feet on claim TO 638.

MID 1–100 Group (18)
Earlcrest Resources Ltd.
(lat. 67°42′, long. 117°10′; NTS 86 N/11)

The MID block of 100 claims is roughly 4 miles long from north to south and about 2 miles wide. It is about 25 miles northwest of Hope Lake. The property is underlain mainly by gentle northerly dipping basalt flows.

The principal showing, a mineralized shear zone, has been traced for more than 500 feet by surface cuts. The zone strikes S70°W and dips 80 degrees south. It is 2 to 10 feet wide in surface cuts along a strike length of 500 feet. At the No. 1 open-cut there is a vein of bornite and chalcocite 14 inches thick, and the hanging-wall of sheared basalt contains chalcocite disseminations over a width of 2 feet. In a rock-cut 100 feet farther east the sulphide vein is 4 inches thick and the wall-rocks are only sparsely mineralized. At a rock-cut 100 feet west of the No. 1 open-cut, the schistose basalt contains grains, spots and blebs of chalcocite across a width of 10 feet. The next trench is 300 feet farther west and is only sparsely mineralized with chalcocite.

Six holes were drilled in 1968 by the owners to test the showing over a length of 500 feet and to depths of 80 to 100 feet. The results were disappointing.

MID 101–200 Group (17)
Hearne Coppermine Explorations Limited
(lat. 67°39′, long. 117°09′; NTS 86 N/11)

The 100 claims of the MID group surround 4-mile-long, northwest-pointing Long Lake, and cover an area of basalt flows extending a mile northeast of the lake. Observations made by company geologists on 5 mineral occurrences found on these claims are summarized below. The claims were not visited by the writer.

Claim No.	Type of occurrence	Dimensions	Mineralization	General data
120	Fracture filling	?	Chalcocite	No. 1 showing: sulphide occurs in fine fractures and as disseminations in fractured chloritized basalt
115	Quartz-calcite vein		Chalcopyrite, chalcocite, malachite, azurite	No. 2 showing; the vein is associated with a narrow diabase dyke
108	Quartz-calcite vein	2,000 feet long	Chalcocite, chalcopyrite, malachite	(No. 3 showing)
104	Quartz-calcite vein	6 inches to 2 feet wide, 2,000 feet long	Chalcopyrite, malachite	No. 4 showing
(No. 5)	Quartz-calcite vein	6 inches to 2 feet wide, 2,000 feet long	Chalcopyrite, malachite	Position not indicated on map supplied; known as MID 5 showing

MM 1–72 Group (100)
Hardy Minerals Ltd.
(lat. 67°18′, long. 115°40′; NTS 86 O/5)

The claims are south of the mouth of Burnt Creek. Minor occurrences of native copper in thin leaves are reported to occur along quartz and calcite veinlets in the basalts on claim MM 43.

MONNIER 1–18 Group (51)
Agassiz Mines Limited
(lat. 67°21′, long. 116°40′; NTS 86 N/7)

This claim group lies between Metal Lake and middle Dismal Lakes, half a mile north of the northeast-striking Teshierpi fault. Basalt exposures are plentiful. Seven north-striking fault linears cross the property. The fault zones are favourable structures to prospect for copper sulphides.

MONNIER 19–36 and ILROCK 1–36 Groups (52)
Shawinigan Mining and Smelting Company, Limited; Africana Mining Company Limited
(lat. 67°20′30″, long. 116°38′; NTS 86 N/7)

The MONNIER group is on the northeast side of middle Dismal Lakes and the ILROCK claims adjoin to the northeast. The claims cover part of the Teshierpi fault zone.

In the north-central part of the Ilrock property a north-striking vein 6 to 8 feet wide is exposed for about 50 feet and chalcocite-rich vein float can be followed for an additional 1,500 feet northerly along its strike. Veins, stringers, and blebs of chalcocite occur in a gangue of quartz and calcite. Analyses of grab samples collected by the owners gave values of between 1.10 and 3.50 ounces of silver a ton. Small flakes of native copper were noted in two of the basalt flows.

NAN 1–36 Group (137)
Bernack Coppermine Exploration Limited
(lat. 67°29′, long. 115°26′; NTS 86 O/6)

The NAN 1–36 claim group is 6 miles east of the mouth of Husky Creek. The claims are underlain by northeasterly striking basalt flows and intercalated sandstone and shale beds of the Coppermine River Group. A large diabase dyke strikes westerly across some of the southerly claims.

Several quartz and quartz-carbonate veins that occur in the western part of the group contain minor copper sulphides. In the northwest sector a fissured zone 15 feet wide is exposed for several hundred feet along the edge of a cliff. The fractured zone contains numerous narrow veins and veinlets of quartz and carbonate and these hold some chalcocite and bornite. Silicified and hematized basalt found near the east boundary of the claim group contains occasional blebs of chalcocite; analyses of samples of the mineralized basalt showed a copper content of less than 1%.

NAN–GRA–PRO Groups (107)
United Buffadison Mines Limited
(lat. 67°22′, long. 115°43′; NTS 86 O/5)

The NAN–GRA–PRO groups straddle Coppermine River for 3 miles starting at half a mile north of the mouth of Burnt Creek and cover low ground that extends for about a mile on both sides of the river. The area is underlain largely by the Coppermine River Group basalt flows with some intercalated red shales and chert beds; possibly 80% or more of bedrock is drift-covered. A strong north-striking fault lineament lies along the west side of the property.

The "A" zone on the GRA 17 claim is a brecciated fault zone about 20 feet wide which strikes N40°E in the basalts and has a vertical dip. The fractured basalt contains veins, veinlets, and matrix fillings of bornite, chalcocite, quartz, calcite, and pink feldspar. There has also been some replacement of wall-rocks by these minerals. Diamond drilling along a strike length of 750 feet was undertaken in 1968. The best assay, 19.02% copper, was obtained from hole A-5 which intersected 3 feet, starting at 86 feet. An assay from hole A-6 showed a copper content of 2.7% across 2 feet at a depth of 105 feet.

The "B" zone is on the GRA 18 claim near the west boundary of the property. It is a sheared zone that, where seen by the writer, has a northerly strike and is 30 feet wide. The sheared basalt exposed in a cross-trench 40 feet long is highly veined with pink feldspar and is impregnated with small amounts of chalcocite and malachite. A drill core at a depth of 169 feet was reported to contain an average of 2.56% copper across 2 feet.

The "C" zone on the NAN 23 claim is on the west bank of Coppermine River. A sheared zone 20 feet wide is exposed there for a strike length of 200 feet. Some quartz and calcite veinlets contain chalcocite and small specks of native copper. A sample collected by a company geologist is reported to have contained 2.40% copper across the 20-foot-width of the zone.

"D" zone of NAN 18 claim refers to the possible northeasterly extension of a calcite-chalcocite vein on the CU 4901 claim, on the property of James Explorations, which strikes N45°E toward low ground covered by the NAN 18 claim. This vein is 2 feet wide along an exposed length of about 200 feet and some short 2-inch-wide lenses of chalcocite are present in some of the surface exposure.

On the south part of the PRO 15 claim on the east side of Coppermine River, about 0.7 mile south of Penny Island, native copper occurs in a quartz vein that is 10 feet long and a quarter of an inch wide.

NOR 27–72, WIL 73–79, HOLE 1–8 Groups (70)
Colonial Oil & Gas Limited
(lat. 67°32′, long. 116°06′; NTS 86 N/9)

The NOR, WIL, and HOLE claims form a northeasterly trending block roughly a mile wide and 4 miles long, 10 miles northeast of Hope Lake. The claims are underlain by basalt flows with sandstone and shale of the Coppermine River Group predominant in the more northerly claims.

On claim HOLE 2 disseminated chalcocite and native copper were found in basalt in a 20-foot exposure adjacent to a gabbro dyke. Geochemical prospecting outlined seven northerly trending anomalous zones.

NOR 48 and 94 Claims (155) (156)
East Coppermine Exploration Company Limited; Conwest Exploration Company Limited
(NOR 48, lat. 67°26′, long. 115°14′; NOR 94, lat. 67°27′, long. 115°13′; NTS 86 O/6)

On the NOR 48 (loc. 155, Fig. 1) claim massive chalcocite and some native copper are reported to occur along a vein that is 1 to 6 inches wide for an exposed length of 300 feet. The basalt flows on both the NOR 48 and 94 claims strike northeasterly and dip gently to the northwest.

On the NOR 94 (loc. 156, Fig. 1) claim chalcocite occurs in fractured basalt along the east side of a north-striking fault that has been traced for 1,200 feet. A chip sample collected in a rock-cut by the owners across a width of 10 feet was reported to contain 2.71% copper.

The NOR group along with more than 40 other adjoining groups that comprise about 1685 claims are still under active exploration by the owners (1969). About 30 copper occurrences found to date on these claims are listed in Thorpe (1970).

NWT 78–82 Claims (4)
Hearne Coppermine Explorations Limited
(lat. 67°44'40", long. 117°47'; NTS 86 N/12, 86 N/13)

The NWT claims lie along the north border of the Coppermine River Group basalt belt and are mostly north of latitude 67°45'; the showings are apparently in the southern tier of claims. The locality is 2 miles northeast of Wallace Lake and 41 miles northwest of Hope Lake.

On NWT claims (81 and 82?) grey to green massive basalt flows with amygdaloidal flow tops strike east and dip 10 degrees north. A brecciated flow top zone 500 feet long, 200 feet wide, and from 1 to 3 feet thick contains chalcocite and malachite, and some native copper occurs in the amygdules associated with calcite, quartz, and potash feldspar. Similar mineralized float is found along the strike at greater distances to the east and west. A selected grab sample of the amygdaloid contained a little more than 10% copper.

On NWT claim 78 or 79, about a mile west of the occurrence described above, a narrow north-striking vertical breccia zone exposed for 100 feet contains chalcocite, malachite, azurite, quartz, and calcite as cement.

OOK 1–14, 20–21, 27–34, 40–41, 47–72 Group (66)
Gyro Explorations Ltd.; Adera Mining Limited
(lat. 67°32', long. 116°21'; NTS 86 N/9)

This group of 52 claims lies 7 miles north-northeast of Hope Lake in an area where outcrops of Coppermine River Group rocks make up only 2 or 3% of the land surface.

On the OOK 9 claim small amounts of native copper were found in carbonate veins less than an inch wide that are separated by a few inches to several feet of basalt. These veinlets strike north-northeast and are mineralized for a length of 750 feet. Small flakes and pin-head-sized particles of native copper are disseminated in basalt on the OOK 32, 57, and 58 claims.

OP 37–64 Group (92)
Homestake Silver Ltd.
(lat. 67°14', long. 115°48'; NTS 86 O/4)

The OP group covers much of the Copper Creek drainage basin north of Coppermine River. According to J. J. O'Neill (1924, 59A) a band of amygdaloid about 30 feet thick outcrops on the east side of Copper Creek, well up on the hillside. The amygdaloid is altered and has a reddish appearance. Epidote is widely distributed and occurs as amygdule fillings and in small irregular masses. The altered rock is malachite-stained on weathered surfaces and although not abundant, small chips of native copper occur in this amygdaloid. The broken rock commonly exhibits copper-stained amygdules. The dense underlying non-amygdaloidal basalt contains tiny specks or shots of native copper. This flow is underlain by a thin bed of apparently barren conglomerate.

PAN, DIB, MAS Group (148)
Teshierpi Mines Limited
(lat. 67°21′, long. 115°36′; NTS 86 O/5)

A central point on this 72-claim group is in an area of numerous basalt outcrops 3 miles northeast of the mouth of Burnt Creek. The flows strike northeasterly and dip at low angles to the northwest.

The company report lists numerous copper occurrences on these claims and seven of these may be summarized as follows:

1. A quartz-calcite basalt breccia vein 5 inches wide and 25 feet long contains some massive chalcocite.
2. A shear zone 10 feet wide contains small amounts of bornite and chalcopyrite along some of the slip surfaces.
3. Chalcocite vein fragments up to half an inch thick were found in frost boils.
4. One shear zone, 200 feet wide, contains occasional quartz and calcite stringers and quartz-calcite basalt breccia zones. Minor amounts of native copper and chalcocite are associated with the gangue minerals. The zone strikes N35°E.
5. Chalcocite occurs in amygdules and as sulphide stringers a quarter of an inch wide in a zone 30 feet wide and 100 feet long.
6. Two parallel quartz-calcite basalt breccia veins about 30 feet long and 7 feet wide hold small amounts of chalcocite.
7. Quartz-calcite basalt breccia vein matter holding some chalcocite, malachite, and azurite were seen in frost boils in an area about 100 by 200 feet.

PAT 1–23 Group (25-26 Showing) (39) (40)
Coppermine River Limited
(lat. 67°32′, long. 116°39′; NTS 86 N/10)

The PAT group of 23 claims is 8 miles northwest of Hope Lake and is contained within the much larger DOT block of claims. The PAT claims lie astride a strong northwest-striking fault that is marked by a ravine 3 miles long along the floor of which narrow ponds and overburden conceal the bedrock. Cliffs of Coppermine River Group basalts up to 100 feet high form both walls of the ravine except that the west side, north of and beginning on PAT 5 claim is occupied by a downfaulted block of coarse, grey weathering sandstone (Rae Group ?). A second parallel northwest-striking linear crosses the PAT claims 0.75 mile east of the PAT 5 fault ravine. Its course follows the northeast side of the lake shown on the claim map as occupying parts of both PAT 17 and PAT 18 claims.

On PAT 5 (loc. 39, Fig. 1) claim a steeply dipping quartz fissure vein 3 feet wide outcrops at the top of and on the west wall of the PAT 5 fault ravine. In flat ground adjoining the upper ravine wall, the vein strikes N80°E; on the ravine wall, above the talus, the strike is northeast. The vein is formed of both finely banded and coarsely crystalline white quartz and 10 to 20% of the gangue consists of yellowish brown weathering carbonate. Chalcocite and minor amounts of bornite are erratically distributed through the gangue and probably constitute about 4% of the showing.

Drilling or deep trenching could quickly determine whether the PAT 5 fault zone along the ravine bottom is mineral bearing. The PAT 16–18 northwest-striking linear that lies 0.75 mile farther east would also be a worthwhile target to be tested for mineralization.

The "25-26" mineral showing (loc. 40, Fig. 1) on the PAT 9 claim is a gently sloping northwest-trending basalt ridge, midway between the two northwest-striking linears described in the above paragraph. This mineral occurrence consists of widely scattered angular blocks, boulders, cobbles, and fragments of chalcocite- and bornite-rich vein quartz with some carbonate. This float material is erratically distributed along a west-trending course across the basalt ridge; it is several hundred feet wide on the east edge of the basalt outcrop area and it narrows and thins in a westerly direction. Some of the rich cobbles were found 325 feet east of the dry land ridge area, in a low, flat, wet area. Several of the rich boulders in the ridge area are more than 2 feet in diameter and appear to contain at least 50% chalcocite and bornite. The owners did some drilling in 1968 and proved that these rich blocks are not local frost-heaved vein material.

A selected sample of the copper sulphides, tested by the Mines Branch at Ottawa, assayed: gold, a microscopic trace, silver, 1.24 ounces a ton. The sample contained 50% copper (spectrochemical analysis, Geological Survey laboratory).

Two sets of glacial striae occur on the low northwest-trending ridge. The older set strikes N20°W to N25°W and the younger set strikes about due west. As the copper-rich float boulders were moved to and deposited at their present position by the final glacial ice movements from east to west, it is to be expected that the parent veins lie concealed in the low ground to the east of the most easterly edge of the known boulder train. The copper-rich quartz veins might be expected to have the same northwesterly trends as the PAT 16–18 and PAT 5 fault linears, indeed the PAT 16–18 structure would be a good starting point for further prospecting, but the presence of gash veins that trend to the southwest at right angles to the linear should also be sought. The high copper content of the float quartz makes this a prime area for further prospecting.

PICKLE CROW 140, 141, 200, 201 Group (102)
Pickle Crow Gold Mines, Limited
(lat. 67°20′, long. 115°49′; NTS 86 O/5)

The PICKLE CROW 140, 141, 200, and 201 claims are half a mile north of Burnt Creek and 3.5 miles west of Coppermine River. Bedrock consists of a series of east-striking Coppermine River Group basalt flows that dip northerly between 6 and 10 degrees. The PICKLE CROW vein is exposed in two trenches approximately 1,000 feet apart. Its presence between these trenches in a drift-covered bench was confirmed about 15 years ago by several shallow drillholes. The vein is in a sheared and brecciated basalt which is replaced and veined by buff coloured carbonate, quartz and calcite, red feldspar, and chalcocite. It is a vertical vein which strikes N50°E and its total length probably exceeds 1,500 feet.

At the southwest trench the exposed vein is 6 feet wide but it may be wider as the east half of the rock-cut has slumped in (1969) and the true width could not be ascertained. The exposure shows 2 feet of chalcocite ore followed by 8 inches of red altered basalt, and then 24 inches of basalt breccia vein that appears to contain up to 25% chalcocite.

At the northeast open-cut the vein is 7 feet wide but again the east half of the trench is now drift-filled so that the vein could be somewhat wider. In the exposed width of 7 feet, 4 feet of brecciated basalt contains 6 to 8?% of chalcocite and the remaining 3 feet holds much less chalcocite. About 75 feet southwest of this trench there is a natural exposure 7 feet wide bounded on the southeast by overburden. A lenticular mass of white coarsely

crystalline calcite 3 to 4 feet wide forms the northwest side of the vein while 4 feet on the southeast side is typical brecciated basalt vein with irregular replacements and matrix fillings of chalcocite that appear to constitute up to about 10% of the material. Quartz, calcite, and pink feldspar are apparent in all of the brecciated basalt parts of the vein. Some angular fragments of the chalcocite-bearing vein occur in shallow frost boils for up to 10 feet or more southeast of the natural exposure so that the true vein width may locally exceed 17 feet.

A possible northeasterly extension of the PICKLE CROW vein on the neighbouring drift-covered ground to the northeast would be on the CU T5010 or CU T5035 claims of Quadrate Explorations.

PICKLE CROW 350, 360, 361, 370 Group (97)
Pickle Crow Gold Mines, Limited
(lat. 67°18′, long. 115°48′; NTS 86 O/5)

The 350, 360, 361, and 370 group of 4 claims are 1.25 miles south of Burnt Creek and 4 miles west of Coppermine River. They are on a (Coppermine River Group) basalt ridge on the south side of the VERA claims. The vein was not seen by the author, and the description that follows is from a report by J. A. Rutherford in 1957 on behalf of Panamerican Ventures Limited.[1]

> The South Burnt Creek vein consists of quartz and carbonate (mostly calcite) that cement a fault breccia in basalt flows. The vein strikes N56°E and has a vertical or nearly vertical attitude. The vein can be traced for at least 1,000 feet on strike by means of frost-heaved fragments. Much basalt is scattered throughout any zones of the vein which are exposed.
>
> Chalcocite and minor native copper are associated with quartz and carbonates in the vein. The vein contains from 5 to 10% by volume of chalcocite. The South Burnt Creek vein appears to fill structures parallel to a major fracture. Tension faults parallel to the vein are quite numerous.

PRO–HOC–KIL Group (149)
Bernack Coppermine Exploration Limited
(lat. 67°21′, long. 115°39′; NTS 86 O/5)

The PRO, HOC, and KIL group of 44 claims lies opposite the mouth of Burnt Creek. Much of the west half of the group bordering the river is covered with overburden but northerly dipping Coppermine River Group basalt flows are exposed in the higher ground to the east. A quartz-calcite vein containing abundant chalcocite occurs along a fissured brecciated zone along a creek in the northwest corner of the property on what is probably PRO 1 claim. Several hundred feet northeast of the creek the showing consists of several narrow irregular lenticular quartz veins with sparse chalcocite.

PUMA 1–15 Group (76)
Coppermine River Limited
(lat. 67°21′, long. 116°14′21″; NTS 86 N/8)

This claim group is about 3 miles east of Three Islands Lake and 6 miles southeast of the No. 47 showing. On what is probably claim 4, are frost-heaved blocks of flow top

[1]Now Westfield Minerals Limited

breccia cemented and replaced by chalcocite, quartz, and calcite. The mineralized blocks range up to 2.5 feet in diameter and are exposed for a distance of 120 feet. Some of this material contains more than 10% copper. There the basalt flows strike northwest and dip gently northeast. A fault lineament striking north-northwest and lying a little farther east is recognizable on an air photograph of this area.

RAY 1–108 Group (67)
Rayore Mines Ltd.
(lat. 67°36′, long. 116°17′; NTS 86 N/9)

The RAY group covers about 6 square miles and lies roughly 10 miles north-northeast of Hope Lake. A major fault zone that strikes N30°W across the property from its southeast corner is the same one that is known to extend southeasterly through Strike Lake (0.1 mile southeast of RAY 73 claim) and Lake 902. The company geologist states that this fault was observed for 4 miles across the RAY claims and that there is widespread alteration and chalcocite mineralization in the basalts bordering it.

RIT 1–147 Group (14)
Canadian Lencourt Mines Limited
(lat. 67°35′, long. 117°26′; NTS 86 N/11)

The owners report that chalcopyrite occurs in a stockwork of reddish carbonate in the Dismal Lakes Group dolomites underlying the Coppermine River basalts on claim RIT 118 near post 3. The fracture system strikes about N20°W.

ROB and SOP Group (159)
Pinex Mines Limited
(lat. 67°21′, long. 116°25′; NTS 86 N/8)

This group of about 50 claims lies between Rose Pass and Coppermine River properties and its northwest corner is a mile southeast of Wreck Lake. Pinex Mines reports that disseminated chalcocite occurs in red sheared basalt, both in place and as float scattered over an area 700 feet long and 200 feet wide. A drift-covered vein at a second locality is indicated by angular chalcocite-bearing boulders of quartz and calcite that are plentiful within a zone 1,000 feet long and 200 feet wide.

ROBB Claims (88)
Highland-Bell, Limited
(lat. 67°21′, long. 116°01′; NTS 86 N/8)

Four veins outcrop on the east side of the prominent ridge of Coppermine River Group basalts half a mile west of the north end of Amco Lake and 2 miles south of Willow Lake, on ground that is covered, according to the claim map, by claims ROBB N99666 and N99668.

The ROBB 2 vein (*see* Fig. 6) is formed largely of yellow-brown carbonate, and some quartz veinlets an inch wide that cut the carbonate. The gangue is only sparsely mineralized with chalcocite, and this sulphide appears to be associated mostly with the vein quartz and some pink feldspar that is present in the quartz. The lode strikes N45°E, is 15 feet wide at a central point, and is well exposed for 350 feet. It enters a drift area on the north and pinches out abruptly in the basalt at its south end.

The ROBB 2, a parallel composite vein 25 feet farther northwest, carries some chalcocite and chalcopyrite but probably contains less than 1% copper. It consists of a quartz vein 4 feet wide with 6 feet of yellow-brown carbonate (probably dolomite) on the southeast side. About 100 feet farther southwest the quartz vein widens to 12 feet whereas the carbonate vein is only 3 feet wide. This composite vein narrows farther southwest and merges with the ROBB 1 vein about 225 feet southwest of the drift area.

The ROBB 3 vein lies 25 feet west of the outcrop of the ROBB 2 vein but is partly concealed by drift in a northeasterly trending draw. It is exposed for 250 feet along the wall of the draw commencing about 300 feet north of the ROBB 2 vein. Numerous parallel quartz veins each about 1 or 2 inches wide occur along a sheared fault zone that is 2 feet wide. Some pale yellow carbonate lenses up to 2 feet wide occur along the most northerly

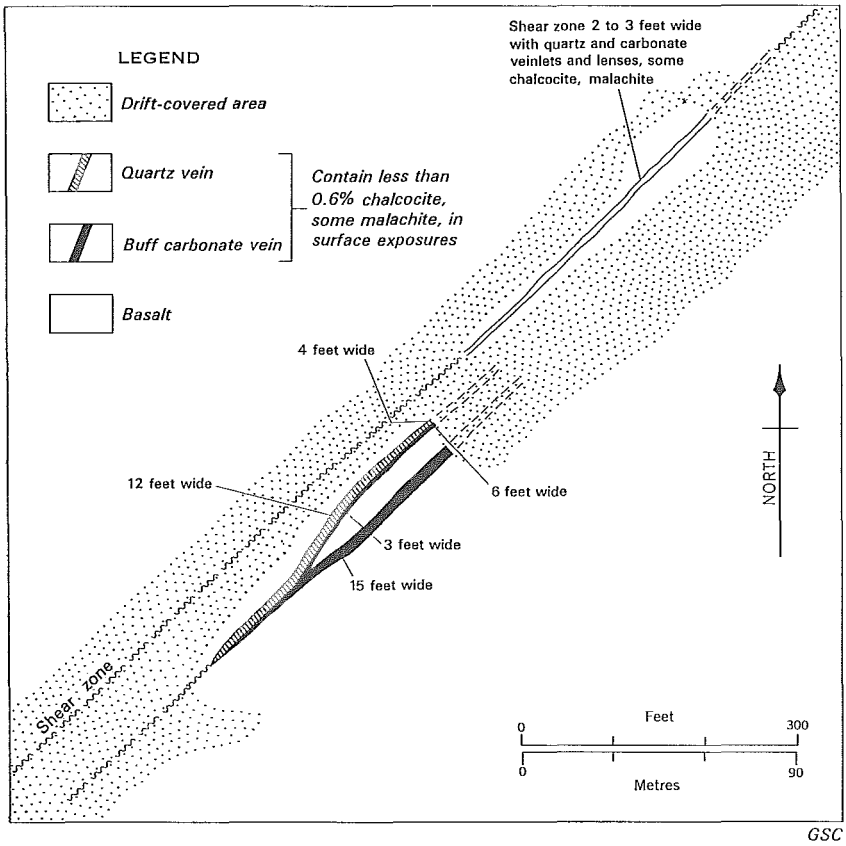

FIGURE 6. Plan showing vein system on part of the ROBB group.

exposed parts of the vein. It probably contains about 1% chalcocite and malachite in exposed surfaces.

An easterly striking chalcocite-rich vein 1 to 2 inches wide and traceable for over 100 feet occurs in basalts on the east side of the southerly extension of the ROBB 3 vein, several hundreds of feet south of the ROBB 1 vein.

RON, TER, HED, MAS Groups (138)
Teshierpi Mines Limited
(lat. 67°28′, long. 115°28′; NTS 86 O/5, 86 O/6)

The RON, TER, HED, MAS block of claims covers North Tundra Lake, much of the east side of Tundra Lake, and extends northeasterly for about 6 miles. The ground is underlain by northeasterly striking Coppermine River Group basalt flows and intercalated sandstones and shales, and by a large diabase dyke that strikes westerly across the property near latitude 67°29′.

The owners report finding a bed of greenish black shale 4 feet thick at a point 25 feet below a diabase sill, in which the shale contains about 10% combined pyrite and chalcopyrite. The zone is exposed for 84 feet. The shales are probably Coppermine River Group strata.

Brecciated basalt float containing abundant chalcocite was found at two localities and a number of chalcocite-bearing sheared zones were investigated. The report mentions the existence of a quartz-calcite vein that contains some chalcocite, bornite, and malachite, with a grade of less than 0.5% copper and which is stated to be 300 feet wide (probably should read 30 feet).

Some showings seen by the writer along Tundra Creek are described under MAS 7-8-9 claims.

RT 1–99 and EH 1–5, 16–25, 36–45, 56–65, 76–80 Groups (146)
Univex Mining Corp. Ltd.
(lat. 67°21′, long. 115°27′; NTS 86 O/6)

The RT group is 5 miles east of Coppermine River and the smaller EH group adjoins the northeast corner of the RT group. The owners report states that frost-heaved brecciated basalt fragments with chalcocite fillings were traced for 1,500 feet along a course of N35°E. Elsewhere a quartz-calcite vein 5 feet wide is exposed for 50 feet; its strike is N55°E. In one place some massive chalcocite veins up to 4 inches wide, as well as coarse disseminations of chalcocite, were found in large talus blocks of calcite gangue.

SAL 1–100 Group (94)
Armore Mines Limited
(lat. 67°16′, long. 115°36′; NTS 86 O/5)

Coppermine River flows northwesterly across the northeast corner of the SAL group. The claims are underlain by gently northerly dipping basalt flows of the Coppermine River Group, and a gabbro body 1,000 feet in diameter is reported in the southeast corner of the property. Chalcopyrite and malachite were found in loose blocks of basalt on SAL 53 claim.

SAM Group (105)
Teshierpi Mines Limited
(lat. 67°22′, long. 115°51′; NTS 86 O/5)

The SAM group of 48 claims lies between Burnt and Willow Creeks and is 3 miles west of Coppermine River in an area underlain by Coppermine River Group basalt flows.

The No. 1 vein is in a brecciated fractured zone containing quartz and calcite veins with red feldspar and associated chalcocite. It strikes N30°E and is reported to have been traced as frost-heaved blocks for about 1,100 feet. In a 12-foot-high cliff-face 200 feet north of a small lake the lode is 10 feet wide and chalcocite is present only as a peppering of small spots.

The No. 2 vein is reported to be about 1.5 miles northwest of the No. 1 vein. Frost-heaved blocks of brecciated basalt with a calcite matrix that contains chalcocite and pyrite and some native copper, suggest the presence of a concealed vein that may be about 1,000 feet long. The vein rubble follows a course of N15°W.

SD, NWA, MCK Groups (128)
Amalta Oils & Minerals Limited
(lat. 67°36′, long. 114°54′; NTS 86 O/10)

This group of over 100 claims is 16 miles southeast of Coppermine village and 15 miles east of Escape Rapids. The claims are underlain by Coppermine River Group rocks. A northeasterly striking quartz-calcite vein occurs on claim NWA 97. This vein has been traced for only 180 feet (open both ends), and over this distance it ranges from 2 feet wide at its northern end to 4 feet wide at its southern end. It is reported to carry more than 5% chalcocite at the south end and possibly up to 30% chalcocite at the north end.

On claim SD 10 there is a 20-foot-long, 4-foot-wide, quartz-calcite vein exposure along a lakeshore that is said to contain up to 10% chalcocite in some places. A geochemical anomaly 1,400 feet long is present here and another geochemical anomaly, also 1,400 feet long, is associated with the vein that occurs on NWA 97 claim.

SIL Group (96)
Spectroair Explorations Limited
(lat. 67°17′, long. 115°46′; NTS 86 O/5)

The SIL group of claims lies south of the CU group, 3.5 miles southwest of the mouth of Burnt Creek. The claims are underlain by east-striking basalt flows of the Coppermine River Group that dip 5 to 10 degrees north. A narrow north-striking valley probably marks a north-striking fault zone. Northeast-striking breccia zones, fissured zones, and shear zones were found on claims SIL 19, 21, 23, 24, and 25 to the west of the north-striking valley. Chalcocite occurs along all of these structures and is in most places associated with calcite, quartz, and pink feldspar. Most of these zones are narrow in their surface exposures.

STAN 25–28, 37–47, 54–66, 73–86, 93–99 Group (35)
Lynch Holdings Limited
(lat. 67°30′, long. 116°55′; NTS 86 N/7 and N/10)

The STAN 25–28 group lies about 3 miles north of the west end of Elbow Lake. The claims are underlain largely by Coppermine River Group basalt flows that strike northwesterly and dip gently to the northeast. The flows are underlain by Dismal Lakes Group dolomite beds close to the south boundary of the property. One very strong northwest-striking fault zone crosses the property and extends southeast to the elbow of Elbow Lake.

The owners report chalcocite fillings of amygdules in basalts adjoining a north-northeast-striking fault in the southeast corner of the property. A quartz vein 2 feet wide was traced 200 feet along the northeast wall of the northwest-striking Elbow Lake fault. This vein is sparsely mineralized with chalcopyrite, bornite, and chalcocite. Chalcocite-bearing quartz stringers in basalt were found in frost-heaved blocks on the eastern part of the property.

TEA 1–44 Group (13)
Teshierpi Mines Limited
(lat. 67°36′, long. 117°32′; NTS 86 N/12)

The TEA 1–44 group is 4 miles north of the most northerly bay of west Dismal Lakes. The claim area is 3 miles long from north to south and a mile wide. Along its southern perimeter it covers the conformable contact zone of the basal Coppermine River Group basalt flows, resting on gently northerly dipping dolomite beds of the Dismal Lakes Group.

At the No. 1 showing samples of jointed, malachite-stained, chloritized, altered basalt returned grades of 1.15% copper across 4 feet and 1.12% copper across 5 feet (owner's report).

Bornite, chalcopyrite, and malachite occur in quartz and calcite which form the cementing matrix of brecciated dolomite close to the overlying basalts at the No. 2 showing.

TIP 1–100, 104, and 105 Group (123)
MacKenzie Mining Ltd.
(lat. 67°38′, long. 115°45′; NTS 86 O/10)

The TIP group block of claims covers about 7 square miles and lies roughly 14 miles southeast of the mouth of Coppermine River. The owners report 80 to 100 feet of black argillites that pass upward into 150 feet of quartzites with minor argillite beds and are capped by a diabase sill 120 feet thick.The sill dips 3 to 5°N. The sedimentary rocks belong to the Rae Group. Basalt flows outcrop on the TIP 104 claim and chalcocite occurs here in a flow top as fracture and amygdule fillings and as disseminated blebs for a length of 200 feet. One particularly well mineralized part, 20 feet long and 5 feet wide, contains about 25% chalcocite.

The B showing is a quartz fissure vein that occurs along an east-trending fault zone at the base of a cliff of Rae Group sediments. It is apparently traceable for 2,000 feet but the quartz vein is exposed only in the most easterly outcrop and for only 20 feet. Chalcopyrite, chalcocite, and pyrite are present in both vein quartz and in the wall-rocks; the total copper sulphide content is estimated as less than 1%.

TOIVO 1-8, MGB 186-199, 193-232 (160)
N.W.T. Copper Mines Limited
(lat. 67°21′, long. 116°17′; NTS 86 N/8)

The claims are 8 miles southeast of Hope Lake, and are underlain by basalt flows that strike northwest and dip gently to the northeast.

A train of northwest-trending frost-heaved chalcocite-rich quartz boulders and cobbles extend from TOIVO 7 onto TOIVO 8 claim. Disseminated native copper was noted in some basalt flows on many of the claims of the TOIVO group.

TOM Group (103)
Agassiz Mines Limited; Fundy Exploration Limited
(lat. 67°19′, long. 115°51′; NTS 86 O/5)

The TOM group of 14 claims (N90986 to N91000) straddles Burnt Creek about 4 miles west of Coppermine River. On claim N90996 about a quarter mile north of Burnt Creek some native silver, native copper, and chalcocite were found in a northeast-striking brecciated fault zone in basalts of the Coppermine River Group. These minerals are associated with stringers and veins and breccia matrix cement of quartz and calcite. The zone is exposed for only a short distance and is 4 to 6 feet wide. In several holes drilled in 1968 the silver content was found to be very low. A second fractured zone that is 500 feet farther to the west contains some chalcocite over narrow widths. One report states that an average grade of less than 0.8% copper was found.

TRI Group (27) (28)
Hearne Coppermine Explorations Limited
(lat. 67°37′, long. 117°04′; NTS 86 N/11)

The TRI group extends southeasterly for 24 miles from a point 7 miles north of the most northwesterly bay of Dismal Lakes and the east boundary is 4 miles west of Dixon Lake. The eastern part of the group has an average width of about 6 miles, the western part 2 miles. The claims are underlain by north- to northeast-dipping basalt flows of the Coppermine River Group.

The TRI 1 showing (loc. 27, Fig. 1) is on the south side of the southeast end of Long Lake. It is in a northeast-striking fractured zone containing some chalcocite and malachite. Some calcite veins are also present. The TRI 2 showing is about 2,000 feet northeast of the TRI 1 showing. It is another fracture filling occurrence, with chalcocite altered to malachite. The TRI 3 showing is in a quartz vein that contains some chalcocite. The TRI 4 showing (loc. 28, Fig. 1) is in a large fractured hematized basalt zone that contains some chalcocite and malachite. Some quartz-calcite veins and also barite veins occur in the mineralized zone. The locality is about a mile east of the southeast end of Long Lake.

VERA 1-20 Group (98)
Consolidated Proprietary Mines Holdings Limited
(lat. 67°18′30″, long. 115°48′; NTS 86 O/5)

The VERA group of 20 claims is 2½ miles southwest of the mouth of Burnt Creek and is mostly on high ground on the west side of the north-flowing Vera Creek (flows north

to Burnt Creek along longitude 115°48'). The claims are underlain by basalt flows that dip northerly at between 5 and 10 degrees.

The Vera 1 vein is in a fissured brecciated zone in the Coppermine River Group basalts, wherein the shattered basalt is veined and replaced, and former open spaces are filled by quartz, calcite, pink feldspar, and chalcocite. The vein is from 4 to 12 feet wide where exposed, vertical and can be traced by cuts and several exposures for an approximate strike length of 4,000 feet. It strikes northeasterly along bearings that range from N30°E in its southerly exposure to N70°E along its northerly course, where it is well exposed for several hundred feet along a 100-foot basalt bluff. Here the vein is 12 feet wide and consists largely of bands of sheared reddish basalt cut by numerous subsidiary veins and veinlets of quartz and calcite that are up to 16 inches thick. The occurrence holds two lenticular veins of dark chalcocite; one of which is 6 inches wide and 3 feet long, the other is 16 inches wide and 6 feet long. There is a scattering of chalcocite across the 12-foot-wide zone but the overall grade is low.

The VERA 1 vein is exposed in 8 or 10 trenches along its southwestern part. In these trenches it is from 6 to 15 feet wide and generally appears to contain more than 5% chalcocite, which occurs associated with quartz, carbonate and pink feldspar and as replacements of fractured basalt. The southwestern part of the vein probably extends into the adjoining property.

A south-striking linear that is a mile long and lies near the west side of the VERA group appears to merge with the southwest part of the VERA 1 vein and their point of intersection should be investigated when further work is done on the property.

A second parallel, brecciated fissured zone, called VERA No. 2 lode, is exposed on the cliff wall 500 feet to the south; its relative position is actually about 100 feet southeast of the VERA 1 lode. This zone, on the cliff face, is 4 feet wide and apparently contains between 2 and 3% chalcocite. The chalcocite is associated in some places with fine granular quartz and is also present as replacements of hematized fractured reddish basalt.

A third parallel vein 2 feet wide, is exposed on the cliff face 40 feet to the west of the VERA 1. It consists dominantly of quartz and calcite and contains chalcocite but as the cliff is nearly vertical at this point no attempt was made to estimate grade.

VIC 1–32 Group (81)
Canadore Mining & Development Corp.; Clero Mines Ltd.
(lat. 67°19', long. 116°05'; NTS N/8)

The VIC group of 32 claims is 12 miles southeast of Hope Lake and about 4 miles north of Coppermine River at the head of Big Creek. A diabase dyke containing disseminated chalcocite outcrops a quarter of a mile south of the southeast end of VIC Lake (lake is identifiable by peninsulas on both east and west sides, and it is half a mile in diameter). The diabase dyke is from 30 to 60 feet wide where well exposed and it strikes from N20°W to due north. The owners did a total of 1,200 feet of drilling on this showing during the summer of 1968 and found that the dyke contains an average of 0.46% copper across a true width of 35.7 feet.

About 1.7 miles farther west on claim T4589? an east-striking fractured zone 4 to 6 feet wide has been traced at intervals for about 500 feet. The fractured basalt has been replaced by some chalcocite and several chalcocite veinlets up to a quarter of an inch wide were seen along some of the narrow fissures. Some malachite stain is present. Two

holes were drilled here in 1968. The outcrop areas of this zone appear to contain less than 1% copper across an average width of 4 feet.

The basalts in the north and west parts of the property are traversed by 5 well-developed north-northwest-trending linears.

WATER and SWAK Groups (72)
Central Point Resources Ltd.; Adera Mining Limited
(WATER 22; lat. 67°27'30", long. 116°03';
SWAK 11; lat. 67°26'30", long. 116°04'; NTS 86 N/8)

On the WATER 22 claim (T27994) thin leaves of native copper mostly less than a tenth of an inch thick occur near the top of a 60-foot-high bluff of basalt that lies about 1,500 feet north of Copper Leaf Lake (the east-trending lake 2 miles long and half a mile wide). The native copper leaves occur as fracture fillings with some associated thin veinlets of calcite in green, fine-grained, slightly fractured basalt. Several holes 1 to 2 feet deep have been chiseled out in the slightly shattered rock about 20 feet below the top of the basalt bluff, where the copper specimens are most easily recovered. The mineralized zone is 30 or 40 feet wide and appears to strike northeasterly.

Some chalcocite impregnates flat-lying amygdaloidal flow tops 2 to 5 feet thick that are exposed on the south face of a ridge of sandstone and basalt, 20 feet high, also located on claim WATER 22. Weathering has formed minor malachite.

On the WATER 22 claim (T27994) south of the west end of Copper Leaf Lake, basalt fragments in a frost boil 200 feet in diameter contain small amounts of chalcocite.

Native copper in thin plates on SWAK 11 claim (T28019) occurs along fractures that cross a sandstone-basalt contact of the upper part of the Coppermine River Group. The fractured zone strikes northeast, is 10 to 12 feet wide, and is exposed for 42 feet.

WIL 1-70 and NOR 1-26 Groups (69)
Silver Arrow Explorations Ltd.; Adera Mining Limited
(lat. 67°31', long. 116°13'; NTS 86 N/9)

This claim block covers about 9 square miles and lies 9 miles northeast of Hope Lake. Diamond drilling of some geochemical anomalies was carried out during the summer of 1969.

An outcrop of amygdaloidal flow top basalt lies in low ground 300 feet north of the thumb-shaped northwesterly trending bay of Roberts Lake. The amygdules are formed largely of calcite with minor malachite and chalcocite. Chalcocite also occurs as small blebs within the main matrix of the hematized basalt but the overall copper content is probably less than 1%.

Claim WIL 70 apparently covers a part of the northeast side of Lake 902 along which there is a strong northwesterly trending fault zone.

WIN 1–108 Group (121)
Provident Resources Management Ltd.; Rolling Hills Copper Mines Limited
(lat. 67°38′, long. 114°50′; NTS 86 O/10)

The WIN 1–108 claim block measures about 3 miles across and a large lake that lies at its centre is referred to in this account as Win Lake. The north side of the block is 12 miles south of the mouth of Coppermine River.

On WIN 54 claim on the west side of Win Lake some talus blocks of light coloured sandstone of the Rae Group contain finely disseminated grains of chalcopyrite and chalcocite. The sandstone dips gently northwesterly and is capped by a gabbro sill.

On WIN 76 claim thin plates of native copper occur along fractures in the basalt country rock but the outcrop is only 20 feet in diameter. This claim is on the long west arm of Win Lake, a mile from the main lake.

On WIN 90 claim, 2,500 feet south of Win Lake, chalcocite occurs in two quartz veins each a foot wide and from 5 to 10 feet apart. The veins strike northeasterly in slightly sheared basalt that also contains a little chalcocite. A chip sample collected by the owners across a vein width of 7 feet in the main pit, returned 0.46% copper. A minor occurrence of native copper and small chalcocite veinlets is reported to be 800 feet west-southwest of the pit mentioned above, on claim WIN 102. The outcrop is 25 feet long and 10 feet wide.

XYZ 1–100, SON 1–36, SHE 1–39 Groups (20)
Continental McKinney Mines Limited
(lat. 67°43′, long. 117°03′; NTS 86 N/10)

The claims cover the south end of Son Lake (2 miles long, elevation 495 feet) and extend 3 miles farther south. Basalts that outcrop in the southwest part of the claim block are overlain on the north and east by sedimentary rocks of the Rae Group and the latter are cut by one or more diabase sills.

The B showing is reported to be a quartz vein 0.5 to 2.5 feet wide that is exposed at intervals for about 1,200 feet along a fissured zone that strikes N30°W and dips 75°SW. Sparse disseminations and thin veinlets of chalcopyrite and malachite occur in the quartz and basalt wall-rock for a strike length of 200 feet at the northwest end of the vein.

The C showing is a quartz fissure vein that is 0.5 to 3 feet wide in surface exposures and is sparsely mineralized with chalcopyrite, malachite, and pyrite. This vein strikes N7°W and dips 70°E. A quartz vein that outcrops along the shore of a lake is considered to be an extension of the C vein.

An east-trending trail of frost-heaved basalt fragments that contain quartz veinlets, some chalcopyrite, malachite, and pyrite is known as the E showing.

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APPENDIX

The author has proposed many new names for features within the area covered by this report. These names have been submitted to the Canadian Permanent Committee on Geographical Names but at the time this report was being prepared for printing the Committee had not rendered its decision. The following names appear in the text in an informal sense as an aid to the author's description, but as all claim localities are clearly marked on Figure 1 they have not been added to that illustration.

Chief Scientific Editor

Names Proposed for NTS 86 N

Proposed name	Latitude	Longitude	Proposed name	Latitude	Longitude
Buck Lake	67° 41′ 30″	117° 57′	Brod Lake	67° 29′ 30″	116° 41′
Matt Lake	67° 42′	117° 55′	Lars Lake	67° 28′	116° 40′
Bebs Lake	67° 40′ 30″	117° 54′	Hope Lake	67° 27′	116° 29′
Wallace Lake	67° 43′	117° 51′	Circle Lake	67° 25′	116° 28′
Coot Lake	67° 41′	117° 48′	Lloyd Lake	67° 27′	116° 45′
Cone Lake	67° 38′ 30″	117° 27′	Oonak Lake	67° 28′	116° 38′
Bob Lake	67° 42′	117° 20′ 30″	Radem Lake	67° 28′	116° 25′
Son Lake	67° 45′	117° 02′	Carleton Lake	67° 27′	116° 22′
Square Lake	67° 36′ 30″	117° 19′	Tuktuvak Lake	67° 27′	116° 20′
Boomer Lake	67° 36′	117° 11′	Carleton Creek	—	116° 21′
Impact Lake	67° 34′	117° 04′	Three Islands Lake	67° 21′	116° 23′
Long Lake	67° 38′	117° 07′	Komo Lake	67° 19′	116° 19′
Austin Lake	67° 36′ 30″	117° 02′	Willow Lake	67° 22′	116° 02′
Leah Lake	67° 37′	116° 36′	Vic Lake	67° 19′	116° 06′
Dixon Lake	67° 33′	116° 50′	Copper Leaf	67° 27′	116° 01′
Elbow Lake	67° 27′	116° 51′	Shelter Lake	67° 18′	116° 36′
Head Lake	67° 25′	116° 50′	Herc Lake	67° 29′	116° 37′
Pointing Lake	67° 23′	116° 47′	Malachite Lake	67° 23′	116° 29′ 30″

Names Proposed for 86 O

Proposed name	Latitude	Longitude	Proposed name	Latitude	Longitude
Elgock Lake	67° 36′	115° 46′	Wreck Lake	67° 22′ 30″	116° 31′
Lash Lake	67° 33′	115° 39′	Kinmik Lake	67° 22′	116° 40′
Hindson Lake	67° 33′	115° 29′	Natik Lake	67° 26′	116° 45′
Jenness Lake	67° 40′	114° 40′	Turtu Lake	67° 25′	116° 42′
Win Lake	67° 38′	114° 50′	Tougac Lake	67° 22′	116° 36′ 30″
Thomson Lake	67° 32′ 30″	115° 10′	Metal Lake	67° 21′ 40″	116° 38′
Judy Lake	67° 29′	115° 11′	Glance Creek	67° 15′	116° 06′
Pistol Lake	67° 24′	115° 08′	Seasor Lake	67° 18′	116° 53′
Turbo Lake	67° 18′	115° 19′	Roberts Lake	67° 31′	116° 14′
Tundra Lake	67° 26′	115° 32′	Lake 902	67° 33′	116° 13′
Penny Island	67° 23′	115° 43′	Milburn Lake	67° 34′	117° 01′
Janus Lake	67° 22′	115° 46′	Club Lake	67° 21′	117° 06′
Amco Lake	67° 21′	115° 59′	Oliver Lake	67° 34′	117° 31′
Delaney Lake	67° 18′	114° 30′			

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Bulletins present the results of detailed scientific studies on geological or related subjects. Some recent titles are listed below (Information Canada No. in brackets):

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