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YELLOWKNIFE BAY - PROSPEROUS LAKE AREA, NORTHWEST TERRITORIES

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Illustrations

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By A. W. Jolliffe

INTRODUCTION

This report and accompanying maps relate to an area of 460 square miles adjacent to Yellowknife Bay, on the north arm of Great Slave Lake. Exploratory geological mapping was done in this area and the surrounding region by C.H. Stockwell in 1931 and 1932[1], and by the writer in 1935[2]. Beaulieu River area, lying immediately east was re-examined in 1937 by J.F. Henderson[3]. Detailed geological mapping in Yellowknife

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[1]Stockwell, C.H., and Kidd, D.F.: Metalliferous Mineral Possibilities of the Mainland Part of the Northwest Territories; Geol. Surv., Canada, Sum. Rept. 1931, pt. C, pp. 70-85.

Stockwell, C.H.: Great Slave Lake-Coppermine River Area, Northwest Territories; Geol. Surv., Canada, Sum. Rept. 1932, pt. C, pp. 37-63.

[2]Jolliffe, F. : Yellowknife River Area, Northwest Territories; Geol. Surv., Canada, Paper 36-5, 1936.

[3]Henderson, J.F.: Beaulieu River Area, Northwest Territories; Geol. Surv., Canada, Paper 38-1, 1938.

Bay - Prosperous Lake area and study of some of the gold deposits there was begun by the writer in 1936. This work was continued for a month that year and for the whole field season of 1937.

Yellowknife Bay lies 650 miles due north of Edmonton, Alberta, the nearest primary source of supplies. It may be reached by plane from Edmonton, or by river boats with accommodation for passengers from Waterways, Alberta. Access to the area by both boat and plane is controlled by spring break-up and autumn freeze-up on Great Slave Lake. In normal seasons boats and aircraft on floats can operate between Yellowknife and Waterways or Edmonton from about June 1 until October 15, and aircraft on skis from December 1 until April 15.

Bedrock is well exposed throughout most of the area. The More conspicuous exceptions to this occur near the mouth of Yellowknife River and north and east of Duck Lake where much of the bedrock is covered by sandy clays and drift. Sand-covered areas around Long and Sand Lakes may represent abandoned beaches of Great Slave Lake. Local relief is generally less than 100 feet, but a few hills rise more than 350 feet above adjacent lakes. Such hills occur south of Landing Lake, near the west shore of Upper Walsh Lake, and at several places east of Prosperous Lake.

Yellowknife River flows southward through the centre of the area. Its chief expansion is Prosperous Lake, which also receives the waters of Cameron River draining Gordon Lake 50 miles to the northeast. Many lakes, some of them 5 miles long, lie east and west of Yellowknife River and afford easy means of access to all parts of the area by both canoe and aircraft. Streams connecting these lakes are short and interrupted by many rapids and falls.

Forest growth is general, but nowhere dense. Timber sufficient for fuel, preliminary mining operations, and for cabin construction is present in most parts of the area. Lumber may be obtained from a sawmill on Slave River delta 90 miles to the southeast.

Fish of many kinds abound in Yellowknife Bay. These include whitefish, lake trout, inconnu, and pike. Pike are plentiful in almost all the inland waters, together with trout in some of the larger lakes. The mainland part of the area lies within the Yellowknife Preserve throughout which trapping and hunting privileges are restricted to Indians. Caribou are said to be plentiful in the surrounding region during the winter and spring months. At other times game, with the exception of wildfowl, is scarce.

GENERAL GEOLOGY

Table of formations

		Late basic intrusives	Diabase, gabbro, peridotite
	Batholithic	Granite, granodiorite, pegmatite, and allied rocks (may include some granite older than lower sediments)	
	intrusives	Quartz diorite, diorite.	
			Quartz-mica schist, slate, knotted schist, phyllite (metamorphosed middle and upper sediments chiefly)
		Upper volcanics	Andesite, dacite, tuff, agglomerate
Precambrian	Yellowknife	Middle and upper sediments	Greywacke, argillite, slate, impure quartzite, and arkose (in part younger than upper volcanics)
		Lower sediments	Arkosic grit, conglomerate, argillite, limestone; porphyry intrusions
		Lower volcanics	Andesite, basalt; chert, tuff, agglomerate; carbonate rocks; porphyry and basic intrusives; (in part of the same age or younger than some of the lower sediments)

Lower Volcanics

The oldest member of the Yellowknife group is composed largely of rather basic flow rocks most of which show pillow and vesicular or amygdular structures, weather green to dark green and are not markedly schistose.

Cherty sediments occur between flows in bands commonly discontinuous, and less than 10 feet thick. These are very thinly bedded, are hard, very fine-grained, and light grey, buff, or pink. The cherty sediments are associated in many places with coarser grained, thicker, tuffaceous beds that locally are agglomeratic.

Along and near the contact with the lower sediments, particularly in the northern part of the area, certain rocks included in the lower volcanics contain large proportions of ferruginous carbonate. These weather brown to green and on fresh fractures are very fine-grained, moderately soft, mottled greenish grey to brown with a dark red-brown selvage up to one-half inch wide next the weathered surface. At places along the west shore of Upper Walsh Lake, remnants of pillows are apparent in rocks that are now almost wholly ferruginous carbonate, but in most places original structures cannot be identified.

Quartz-feldspar porphyry intrusions, mainly sills, are widespread within the lower volcaics, particularly in the northern part of the area. Two porphyry sills, each about 500 feet thick, separated by younger hornblende gabbro of about the same thickness, trend east-northeast through Sand Lake, extending east to the shore of Yellowknife Bay and west to a valley marking the granite contact. West of Upper and West Walsh Lakes are many porphyry intrusives, mainly sills. Most of these are light weathering, less than 25 feet wide, and have been considerably sheared and carbonated. Larger porphyry intrusions have apparently escaped shearing and carbonation except near their borders. On the west side of the central peninsula of the lake immediately southwest of Walsh Lake, a feldspar porphyry intrusion up to 150 feet wide parallels the lake shore for a short distance. Some of the porphyries cutting the lower volcanics may be of the same age as those cutting the overlying lower sediments. Others are older, as pebbles and boulders of quartz-feldspar porphyry occur in the conglomerate of the lower sediments, particularly on the islands southwest of the entrance to Yellowknife Bay.

The flows, associated sediments, and some of the porphyries are cut by innumerable, altered basic intrusives most of which occur as dykes. In most places these can be distinguished from the surrounding massive flows only with great difficulty, but they can readily be recognized where lichen growth has been burnt off. These intrusives were studied most closely in an area of about one-quarter square mile at the southwest corner of Yellowknife Bay. Basic intrusives exposed in this small area include two hornblende gabbro sills respectively about 50 and 400 feet thick, and at least twenty-five altered diabase dykes from 10 to 150 feet wide. The diabase dykes cut the sills and almost all of them strike about north. They are thought to be pre-granite in age. Some may be younger than some of the lower sediments, but none was found in the middle and upper sediments. They possibly represent near-surface intrusions contemporaneous with some of the later, lower volcanic flows.

Lower Sediments

The rocks of this group are arkosic grit, conglomerate, limestone, and argillite. They are characterized by considerable variation in composition both along and across the bedding as contrasted with the more uniform, middle and upper sediments. Sheared quartz-feldspar porphyry sills are common in the lower sediments and can be distinguished from the arkosic grit only under most favourable conditions.

The characteristic member of the lower sediments in the northern part of the area is arkosic grit, and in the south, conglomerate. Excellent exposures of the arkosic grit occur on the west side of the peninsula on Upper Walsh Lake and on the southwest shore of Walsh Lake. At the first locality a thickness of 600 feet is exposed, weathering mainly light grey, locally buff to brown to greenish. Fresh surfaces are pale greenish grey, with numerous quartz grains lying in a fine-grained matrix probably high in carbonate. Many of the beds show crossbedding and numerous small, round pits less than an inch across on the weathered surface. The beds vary from 6 inches to several feet in thickness and across the whole 600-foot width possibly ten beds are conglomeratic. The pebbles in these are up to 8 inches long, rounded to subangular, light buff, and very fine-grained. At the southwest corner of Walsh Lake the lowermost 800 feet of the lower sediments are continuously exposed. The top of the lower volcanics here consists of carbonated pillow lavas, and the contact appears conformable. The sediments for 100 feet above the contact are conglomeratic, with both pebbles and matrix high in ferruginous carbonate. Tho overlying 700-feet thickness of the lower sediments is fairly uniform and consists of arkosic grit in beds varying from less than an inch to several feet thick. In places, crossbedding indicates that the tops of the beds face east. A few beds hold well-rounded pebbles up to 3 inches long composed largely of iron carbonate and chert.

Overlying the arkosic grits in the northern part of the area, are interbanded grit, argillite, and limestone, with a few discontinuous lenses of conglomerate. The limestone is best exposed along the west side of the peninsula near the northeast corner of Upper Walsh Lake, The weathorod surface of this rock shows many closely spaced, deep, irrogular, angular pits up to several inches across. Fresh surfaces are very fino-grained, and grey to buff. In this northern section the lower sediments contain more and more argillite beds towards the east where they resemble the greywacke-argillite assomblage of the middle and upper sediments. The eastern boundary of the lower sediments against the area of highly altered sodiments is fairly sharp and it may be that a strike fault forms the boundary.

In the southern half of the area, on the point southwest of Latham Island arkosic grit overlies pillow lavas of the lower volcanics. On Racine Island the most westerly (oldest) beds consist of 700 feet of grey weathering, conglomeratic arkose, grit, and argillite. Pebbles and boulders in the conglomerate are well rounded and up to 10 inches long. Twenty-five per cent of them are chort; 25 per cent milky to glassy, dark grey, quartz containing some buff-coloured carbonate and a few specks of pyrite, pyrrhotite, and chalcophyrite; 20 per cent grey to pink, medium-grained granite; 15 per cent arkosic grit; 5 per cent argillite and slate 5 per cent greenstone; and 5 per cent quartz-foldspar porphyry, These sediments become less conglomeratic, and contain more cherty argillito towars the east where they are overlain by a 600-foot thickness of altered basic sills and (or) massive flows, with some tuff and chert. This latter complex has been represented on the map as belonging to the lower volcanics.

On the three large islands southwest of the entrance to Yellowknife Bay, conglomerate with minor amounts of grit are exposed. On the most northerly island the conglomerate holds rounded boulders up to 20 inches long, of granite, chert, and porphyry, and small lenticular pebbles of iron carbonate, arkosic grit, and medium- to fine-grained green rocks. Most of the matrix is brown weathering and crossbedding in some gritty interbeds indicates that the beds face east. Most of the pebbles of the conglomerate on the middle island are of ferruginous carbonate; on the southern island over half the pebbles and boulders are greenish and resemble the flows and altered basic intrusives of the lower volcanics.

On West Mirage Islands dark grey grits, agglemerate, and rhyolite (?) are cut by quartz porphyry and basic intrusives. These rocks are tentatively included in the lower sediments.

Sheared quartz-feldspar porphyry occurs on the large peninsula on the south side of Walsh Lake, and probably is widespread in the band of lower sediments extending southerly from this point for nearly 3 miles. This rock weathers streaky, light pink to grey, with a few quartz "eyes" and feldspar crystals elongated parallel to the strike of the nearest definite sediments. It greatly resembles some of the arkosic grit.

Middle and Upper Sediments

Although definite proof is lacking, those sediments probably lie conformably above the lower sediments. They consist almost entirely of interbedded greywacke and argillite or slate with greywacke prodominating in most places. They are in part older (middle sediments) and in part younger (upper sediments) than the upper volcanics. The middle and upper sediments cannot be differentiated except where their age relations with the upper volcanics are established. Thus the sediments immediately west of the upper volcanics northwest of Duck Lake are probably older and those on the islands in Duck Lake west of the fault are probably younger than the upper volcanics.

The greywacke weathers grey to buff, is fine-grained, and the beds vary from a few inches to several feet in thickness, Thin sections show over half quartz, the rest being mainly micas and chlorite, with smaller amounts of feldspar and carbonate. In composition, some beds approach an impure quartzite, others an arkose. A few beds show quartz grains up to one-quarter inch across, and others contain scattered angular to lenticular black fragments up to several inches long, similar in appearance to the associated argillite.

The argillite weathers dark grey to black, is very fine-grained, and the beds vary from a fraction of an inch to several inches in thickness. In many places, single beds grade from greywacke at the bottom to argillite at the top.

Upper Volcanics

Rocks placed in this division occur in three major areas: around Horseshoe Island and on the mainland to the east; north and south of the west half of Duck Lake; and south and southwest of Creek Lake.

The rocks around Horseshoe Island are similar to those of the Duck Lake area. The two areas were once continuous but have been offset along the Akaitcho Bay fault. The rocks in both areas are mainly light green to buff-weathering, rather acid flows, probably largely dacitos and andcsites. Quartz amygdules up to 2 inches long are common and pillows loss so. Fresh surfaces are light greenish grey to green, and fine- to medium-grained. Interbanded with those are agglomerate and breccia. Some medium- to coarse-grained, green rocks possibly represent intrusives contemproaneous with some of the flows.

The volcanics in the Creek Lake area weather green to green-black, and are probably andesites and more basic rocks. Pillows and quartz amygdules occur in places. At the southwest corner of Creek Lake the volcanic rocks are succeeded, to the north, confomably by highly altered sediments that dip 70 degrees south. According to grain gradations the sedimentary beds face north and therefore the volcanics here are older than the sediments.

North of the eastern part of Duck Lake a few bands of pillow lavas up to 300 feet wide trend oast-west in an area of altered sediments. Possibly these bands extend continuously from the Duck Lake fault to the Creek Lake volcanic area and, therefore, the Creek Lake volcanics, although they resemble the lower volcanics, have been tentatively correlated with the upper volcanics.

Quartz-mica Schist Knotted Schist, Slate, Phyllite

Complete gradation exists between the relatively unaltered lower, middle, and upper sediments and quartz-mica shhist, knotted schist, slate, and phyllite, hence boundaries between the areas of unaltered and those of altered sediments are arbitrary. The greywacke-aggillite assemblage of the middle and upper sediments is commonly separated from the knotted schist by a zone of quartz-mica schist up to several miles wide but in some places this zone is lacking.

The least metamorphosed type of the altered sediments is generally found farthest from granite contacts and is a quartz-mica schist. Fresh surfaces show a mica sheen and the coarser-grained types are somewhat friable. Weathered surfaces are mainly buff to rusty brown. Interbedded with the quartz-mica schist are bands of slate generally like those in the areas of unmetamorphosed sediments.

All gradations exist between the quartz-mica schist and the more highly altered, knotted schist. Many types of knotted schist are present. The "knots" or nodules vary from indefinite, shadowy aggregations of micas or quartz, visible only on well-exposed, weathered surfaces, to euhedral crystals of chiastolite, cordierite, etc. The smallest nodules are about one-eighth inch across, the largest 2 inches by 4 inches. At places, as around Bighill Lake, nodules form over half the volume of certain beds. The matrix surrounding the nodules is as a rule, fine- to medium-grained, friable, quartz-biotite schist. Throughout the knotted schist areas, non-nodular or leanly nodular strata are interbedded with those showing many nodules. Interbedded slate is rare, but phyllite is common.

Newar granite contacts the altered sediments commonly are cut by dykes, sills, and irregular bodies of pegmatite and granite. The narrow bands of altered sediments around Mason and Moise Lakes contain up to 20 per cent granitic material and the adjacent granite contains many inclusions of garnetiferous mica schist and gneiss of varying size, and showing varying degrees of replacement by granite.

Quartz Diorite, Diorite

Within the rather heterogeneous granite intrusives southest of Yellowknife Bay are irregular areas, up to 4 square miles in extent, underlain by rocks varying in composition from diorite to quartz diorite. All contain abundant hornblende but vary in mineral composition and texture within short distances. In places, as one-half mile northwest of Moise Lake and on the southernmmost point of the mainland three-quarters of a mile south of the southwest corner of Wool Lake, they hold dark green to almost black inclusions composed largely of fine-grained hornblende and resembling recrystallized basic volcanic material. These inclusions vary in size up to 10 feet across. In places they are angular and sharply defined, but elsewhere their boundaries are indefinite and they grade imperceptibly by increase in grain size into basic phases of the enclosing diorite. Thus, most or all of the rocks mapped as diorite and quartz diorite may represent granite contaminated by reaction with inclusions of volcanic rocks.

The most abundant dioritic type is a porphyritic quartz diorite. It weathers mottled light brown, buff, green, and grey, and shows varying amounts of pink to grey feldspar phenocrysts up to three-quarters of an inch across. Hornblende, with lesser amounts of biotite, forms half the rock; the remainder is made up of grey to green to pink feldspar and 5 to 15 per cent quartz. Hornblende with small amounts of biotite make up about two-thirds and feldspar one-third of the quartz-free varieties. Local, more acid, phases approach a hornblende-biotite granodiorite. The quartz diorite and diorite masses are cut by numerous granite dykes.

Granite, Granodiorite, Pegmatite, and Allied Rocks

At all contacts between rocks of the Yellowknife group and granite the latter shows intrusive relations, thus most of the granite in the area is of post-Yellowknife age. A pre-Yellowknife granite is represented by granite boulders in the lower sediments.

For descriptive purposes the granites and related rocks may be divided into: (a) Western granite, lying west of the lower volcanics throughout the length of the map-area; and (b) Southeastern granite, lying south and east of Duck Lake; and (c) River Lake granite, extending northerly from Madeline Lake to the north boundary of the map-area.

The western granite is fairly uniform and in most places free from inclusions but between Sand and Long Lakes and around Landing Lake fine-grained, angular, hornblendic inclusions form up to 25 per cent of the rock over small areas. Most of the western granite weathers grey to pink, is medium- to coarse-grained, and consists of grey and pink feldspar, quartz, and biotite in part altered to chlorite. A specimen taken near the shore of Great Slave Lake southwest of Yellowknife Bay shows in thin section 40 per cent oligoclase, 20 per cent microcline, 30 per cent quartz, and 10 per cent green biotite altering to chlorite. The two granitic stocks in the lower volcanics, respectively north and south of Sand Lake, are classed with the western granite. The granite northwest and west of Likely Lake for at least 2 miles is rather different from the rest of the western granite. It weathers flesh-pink to red, is coarse-grained, and has a fresh, homogeneous, massive appearance. Fresh surfaces show mainly pink to brownish red feldspar and about half as much glassy quartz. Dark minerals are scarce or absent, Near the swing in the contact northwest of Likely Lake this granite is sheared and sericitized.

Most of the southeastern granite, particularly in the vicinity of the sedimentary schist areas, contains dark-weathering, fine-grained, foliated bands high in biotite and commonly garnetiferous. In most places these bands are recognizable as being highly altered sedimentary inclusions. All gradations exist from areas half granite and half of such inclusions through gneissic granite rich in biotite to apparently normal granite. In the vicinity of quartz diorite and diorite bodies the southeastern granite is hornblendic and contains relatively large proportions of basic inclusions varying from fine-grained, hornblendic rocks through diorites to quartz diorites. Relatively pure granite is found north of Mason Lake and south from the east end of this lake to the southeast corner of the map-area. This granite is predominantly grey weathering and average fresh surfaces are medium- to coarse-grained and show about 55 per cent feldspar, 30 per cent quartz, and 15 per cent biotite and (or) chlorite. One stock probably connected with the southeastern granite lies 3 miles south of Island Lake, and consists of a pink to grey weathering, medium-grained, chlorite granite.

At least half of the River Lake granite consists of tourmaline-bearing pegmatite with smaller amounts of aplite occurring in some places as fairly sharply boundeded dykes cutting the granite, but in most places the contacts with the granite are gradational. All are predominantly pink weathering. The granite is medium- to coarse-grained and contains variable amounts of both muscovite and biotite, and in places tourmaline needles. The pegmatite carries abundant tourmaline crystals up to 6 inches long, plates of muscovite of about the same size, quartz, perthitic feldspar, and a graphic intergrowth of feldspar and quartz. The highly altered sediments adjacent to the River Lake granite are cut by many pegmatite bodies. Around Bighill Lake pegmatite dykes up to 60 feet wide trend northeast through knotted schist and carry abundant tourmaline, some spodumeme, and in places arsenopyrite and molybdenite. Northeast of River Lake many pegmatites of irregular outline cut knotted schist. These ar e up to 3,000 feet long and 400 feet wide. One such intrusive, one-half mile northeast of River Lake, contains abundant muscovite and toumaline. Other minerals include garnet and a blue-green mineral in grains up to one-eighth inch across. The grains have a vitreous lustre with a hardness of about 5. Microchemical tests[1] show the mineral to be a

[1]By H.V. Ellsworth, mineralogist, Geological Survey.

phosphate of calcium with some manganese. This is possibly a new mineral. Elsewhere, in the pegmatites of this area lepidolite, lazulite, beryl, and spodumene occur.

Late Basic Intrusives

Both quartz diabase and olivine diabase dykes are widespread in the area. These basic dykes together with a composite peridotite-gabbro intrusive sheet are probably the youngest consolidated rocks. The dykes range in width from less than a foot to over 300 feet. They are vertical or nearly so, but have no prevailing direction of strike. They weather rusty brown with dense, black margins. Near faults hornblende and chlorite.

A composite, ultrabasic-basic, intrusive sheet dipping gently east outcrops as a band up to 2,000 feet wide from Yellowknife River 4 miles below Prosperous Lake southward to the north shore of Duck Lake. Occurrence of this body on an island in Duck Lake shows that there its trend changes to about southwest. The lack of further exposures of this intrusive around the west end of the lake suggests that its southwesterly extension lies under water and is cut off by the Akaitcho Bay fault. The probable southerly continuation of this intrusive is found on the western side of the fault some 4 miles to the southeast. From this point it can be traced a further 4 miles in a south-southwesterly direction. This intrusive is medium- to coarse-grained and dark brown to black. Spheroidal weathering has resulted in the formation of detached or nearly detached, round blocks from a few inches to several feet across, lying in a coarse brown sand formed by disintegration of surrounding material. In the wider, northern part of this intrusive, the east and west sides differ from each other in both structure and mineral composition, and at one place the two types are separated by a body of highly altered sediments up to 400 feet across and possibly ten times that length. In most places the western edge of this intrusive exhibits rude columnar jointing dipping steeply to the west, and a more poorly defined parting (locally marked with jet-black serpentine or white carbonate veinlets) at right angles, that is, dipping about 15 degrees to the east. North of Duck Lake and on Hay Lake the western contact of the intrusive with the steeply inclined middle and upper sediments can be seen to dip east at angles of 5 to 20 degrees. The eastern side of the intrusive in the north is more massive and homogeneous with no pronounced jointing. The eastern contacts with the highly altered sediments, in the north, and the granite and diorite, in the south, are obscured by drift.

A specimen from the eastern side (top) of this intrusive on Yellowknife River shows, in thin section, about 50 per cent basic andesine and 40 per cent pyroxone (pigeonite). The remainder is mainly opaque material with small amounts of yellow serpentine (possibly after olivine), quartz, and brown biotite. This rock may be termed a pigeonite gabbro. Two thousand feet southwest, at the western edge (base) of the intrusive, three samples show in thin section: 40 to 50 per cent iron-rich augito, 20 to 30 per cent olivine, and 10 to 20 per cent very basic plagioclase. The remainder of the sections is composed mainly of opaque material (probably ilmenite) and a bright yellow serpentine. This rock may be termed an augite peridotite. A number of chips taken from near the base of the intrusive showed on assay:[1]

	Per Cent
Ni	0.13
Cr	0.11
V	trace
Pt	none

[1]Except where noted all assays were made at the Ore Dressing and Metallurgical Laboratories, Department of Mines and Resources, Ottawa.

Near the southeast corner of Hay Lake a specimen taken near the base of the intrusive shows in thin section: 40 per cent basic plagioclase, 30 per cent pigeonite, and 25 per cent olivine. At this place a number of rusty weathering 2-inch segregations of a hard grey mineral containing small smounts of a light metallic mineral occur in the intrusive. The minerals were identified[2]

[2]By H.V. Ellsworth, mineralogist, Geological Survey.

as andalusite and as pyrrhotite with traces of chalcopyrite, respectively. The andalusite probably represents recrystallized argillaceous material picked up by the basic intrusive from the enclosing sediments.

On Duck Lake a specimen from near the base of the sheet shows in thin section about 40 per cent basic plagioclase, 30 per cent pigeonite, 25 per cent olivine, and 5 per cent black metallic mineral. At this place areas up to 6 inches across are high in pyrrhotite, pyrite, and chalcopyrite. Selected samples from these areas showed on assay:

The lower volcanics in the southern and central parts of the area strike northeasterly and dip steeply to the southeast. South from Kam Lake tops of beds and flows face southeast, as determined by grain gradations in tuff beds and shapes of pillows. In the northern part of the lower volcanics area intercalated cherty sediments strike north-northeast to north. Dips are near vertical.

Lower sediments on West mirage Islands strike about west. Dips vary from vertical at the west end of the group to 60 degrees south at the east. At one place near the eastern end of the islands grain gradations indicate that the beds face north, thus some of the beds there are overturned. Lower sediments in the central and northern parts of the area strike between north-northeast and north. Kips vary only slightly from the vertical. Newar the contact with the lower volcanics crossbedding in the lower sediments shows that the beds face east.

The middle and upper sediments show predominantly northeasterly trends near the shore of Yellowknife Bay and predominantly northwesterly trends inland. The rocks are closely folded and dips are everywhere steep to vertical. Slaty cleavage throughout this area strikes between northwest and north-northwest.

The upper volcanics vary greatly in strike. They generally parallel and nearest geological contact with other members of the Yellowknife group.

Strikes and dips in the areas of highly altered sediments show great divergences within short distances, particularly towards the central parts of the larger areas. An examination of air photographs covering the area between Hay and Bighill Lakes reveals most intricate folding. Near the southwest side of Bihill Lake, rock ridges form a closed oval about 1 mile long in a west-northwesterly direction and half that width. Beds dip 50 to 60 degrees south on the north side and 80 degrees north on the south side. Surrounding beds bulge around this basin structure and pass to the west into drag-folds and intricate convolutions showing little or no uniformity in the orientation of axial planes. In places air photographs of this area show that this folding is traversed by lines of discontinuity (inferred faults). These are commonly straight or gently curved and are traceable for distances up to $1\frac{1}{2}$ miles. In the central part of the area of highly altered sediments northeast of River Lake similar structures are evident, but are not quite as complex. Beds showing intricate folding dip at lower angles (averaging less than 70 degrees) than in the less metamorphosed members of the Yellowknife group. Near the contacts with other rocks the sediments strike parallel to these contacts. Throughout the islands in the southeastern corner of the map-area, the highly altered sediments strike north of west and dip steeply both north and south, but the tops of beds uniformily face north.

The structure of Yellowknife Bay - Prosperous Lake area is dominated by late, major faults. Almost all of these strike between northwest and north, and are traceable for distances up to 20 miles. Their dips are probably nearly vertical. Many of the faults are evident from the air, appearing as sharp-walled valleys, scarps, shorelines, lake-chaines, or river courses that form straight or gently curved lines. Other such rectilineal topographic features, where definite stratigraphic evidence of faulting is lacking, are shown on the accompanying maps as inferred faults. Only some of the known faults are shown. Thus, in a distance of 4 miles along the western shoreline of Yellowknife Bay east of Kam Lake more than twenty faults occur. These all strike roughly northwest and have steep southwesterly dips.

Where displacement could be determined along the faults the eastern side has moved relatively towards the north. The maximum horizontal offset observed (nearly 5 miles) occurs along the West Bay fault extending northwesterly near the west shore of Yellowknife Bay to beyond Vital Lake. In only one fault, that paralleling the northeast side of Akaitcho Bay, is the direction and extent of relative veritcal movement indicated. Assuming that the late basic intrusive sheet on Duck Lake is the continuation of the similar body extending south from Willow Lake, and assuming that the average easterly dip of this sheet is 15 degrees, the east side of the Akaitcho Bay fault has moved relatively about 2 miles northward and $\frac{1}{2}$ mile downward.

The fault planes and any vein fillings that may occur along them are hidden under drift or water throughout most of their courses. At the few places where they can be examined there is apparently very little relation between the amount of displacement along a fault and the width of the shearing. Thus, the North Bay fault (extending northwest from the north end of Yellowknife Bay) can be seen in places and is there marked by only 3 or 4 geet of shearing with little or no introduced material, although the offset is about a mile. Similarly the Akaitcho Bay fault near the cutlet of Duck Lake shows shearing only a few feet wide, and the fault extending northwest north of locality 16, Yellowknife Bay map-area, which has a relative displacement of about 1,000 feet, varies in width from an inch to about a foot. On the other hand, some faults north of this last locality with displacement of only 100 feet or less show shearing up to 5 feet wide. The age of the faulting, or at least of the last major movements, cannot be fixed any more definitely at present than post-diabase and pre-pleistocene.

ECONOMIC GEOLOGY

Although gold from veins in Yellowknife Bay - Prosperous Lake area was reported in 1898, [1] the important

[1]Geol. Surv., Canada, Ann. Rept., Vol. XI, pt. R, pp. 32-33, (1901)

discoveries have all been made within the past 4 years, and nearly all intensive prospecting has been limited to the last 2 years. In this short time a large number of minerals and many types of deposits have been found. Metals present in the ore minerals of the area include: antimony, arsenic, bismuth[2], cadmium[2], chromium, copper, gold, indium[2], iron, lead, manganese[2], molybdenum, nickel, silver, tin, titanium, vanadium.

[2]Identified spectroscopically by H.V. Ellsworth, mineralogist, Geological Survey.

and zinc. Non-metallic minerals of possible value so far discovered include: andalusite, beryl, lazulite, lepidolite, and spodumene. So far attention has been focused almost entirely on the gold occurrences of the area.

Gold

Only some of the many gold discoveries in the area could be examined by the writer and most of these are described below under the name or names of the claim groups on which they occur. In some cases only one of several gold deposits on a claim group has been described and in such cases the undescribed occurrences may possess greater economic possibilities.

A.E.S. Group

This group comprises fifty claims, of which twenty-six lie east and twenty-four west of the north end of Yellowknife Bay. They were staked in February 1936 for the Aerial Exploration Syndicate, Limited.

Only some of the gold-bearing veins on the western claims were examined, and of these only one will be described. This vein (locality 7, Prosperous Lake map-area) lies about 1,000 feet east of the West Bay fault. The country rock is pillowed lavas and bands of thinly bedded, cherty sediments up to 10 feet wide striking north 30 degrees east and dipping steeply to the east. South of the southermost pit on the vein is a drift-covered area. In this pit a rusty schistose zone averaging 6 feet in width is exposed. The schist is highly contorted and encloses quartz lenses. These are up to 8 inches wide and several feet long, and are composed of milky quartz containing tiny curving seams of chlorite that roughly parallel the sides of the lenses. Metallic minerals in the quartz include chalcopyrite, pyrite, and possibly, tetrahedrite, arsenopyrite, and sphalerite. From the north wall of the pit a milky quartz vein extends in a direction north 30 degrees east for 40 feet, bounded on either side by a foot or two of green schist. Throughout this length the vein varies in width from 8 to 18 inches and contains few metallic minerals. Forty feet north of the pit it is intersected by a fault which meets the vein at a very acute angle. This fault trends north 25 degrees east and along it the northeasterly extension of the vein is displaced 30 feet to the south, nearly back to the southermmost pit. From this point the vein can be traced continuously for 135 feet in a direction north 40 degrees east. In this distance the schistose zone enclosing the vein narrows from 5 to 3 feet and is composed of very fine-grained green schist, except for bands about 6 inches in width on either side of the vein which are rusty and contain considerable disseminated fine pyrite and arsenopyrite. Both schist and vein dip steeply east to vertical. Throughout the length of 135 feet the quartz is commonly less than 1 foot wide, but in places is 20 inches It is milky to grey in colour and contains chalcopyrite, pyrite, tetrahedrite (?), gold, and electrum. These metallic minerals are for the most part in or near thin chloritic seams lying within th quartz and paralleling the vein walls. Electrum (pale red to white silver--gold) and red gold occur together in most specimens examined. It is reported[1] that a

[1] Personal communication from C. Riley

picked specimen from this section containing electrum showed on assay 65.55 ounces gold and 58 ounces silver a ton. Along the assumed northeasterly extension of the vein, bedrock is covered by drift for a distance of several hundred feet. Within the first 50 feet of this drift area, three test pits show quartz in widths up to 9, 7 and 2 inches, respectively.

Arsenc Group

This group of ten claims was staked in May 1936 by A. Swanson and others. West of the north end of Likely Lake on this group (locality 2, Prosperous Lake map-area) the granite is sheared and mashed throughout an area about 400 feet in diameter near its contact with the lower volcanics. Here and there within this sheared area are rusty patches a few feet across. Fresh surfaces of the sheared rock show much sericite, the most altered specimons consisting of quartz crystals up to one-quarter inch across in a sericitic groundmass. In places the altered rocks are cut by indefinitely bounded quartz veinlets up to one-quarter inch across carrying purple fluorite. In these as well as along joint planes and disseminated through the rock are small amounts of arsenopyrite, pyrite, pyrrhotite, chalcopyrite, galona, and sphalerite. Samples taken over about 30 square feet of the weathered surface of one of the better mineralized parts of the sheared granite showed an assay: gold, 0.0075 ounco to the ton; silver, 0.125 ounce to the ton.

Aye Group

This group of thirty-seven claims was staked in September 1935 by V. Stevens, D. McLaren, and E.B. McLellan, on behalf of A.X. Syndicate, Limited, following their discovery of the first visible gold west of Yellowknife Bay (locality 13, Yellowknife Bay map-area). The claims are now being developed by Kamlac Gold Mines, Limited. Gold has been found within several veins on this property, but description here will be limited to a rather unusual occurrence in aplite.

About a mile northwest of the outlet of Baker Creek a sheared aplite dyke on the Aye group carries gold (locality 12, Yellowknife Bay map-area). The country rock is pillowed lava cut by several narrow, pink, aplite dykes and a diabase dyke 25 feet wide. One hundred feet west of the gold-bearing aplite the lava is in contact with granite. The gold-bearing aplite dyke strikes north 13 degrees east and has a steep dip. It varies in width from less than an inch to 30 inches and is exposed for a total length of 250 feet. The northern part of the exposed length of the dyke is relatively unsheared and consists of fine- to coarse-grained, salmon-pink feldspar and dark glassy quartz. Towards the south this is strongly sheared, the shearing being confined largely to the dyke itself. The resulting rock is very fine-grained and is banded pink and grey. The centres of some of the wider pink bands consist of relatively unsheared aplite. Within and between the bands are lonsos of grey, sugary quartz up to one-quarter inch wide. Small amounts of fine-grained arsenopyrite, pyrite, chalcopyrite, molybdenite, and gold occur in the quartz lonticles and to a lesser extent in the altered aplite.

Con. P. and G. and Nogus Groups

The Con group of fourteen claims was staked in September and October 1935 on behalf of the Consolidated Mining and Smelting Company. After sinking test pits and about 4,500 feet of diamond drilling, an inclined prospect shaft was started on a vein (locality 15, Yellowknife Bay map-area) in Septmmber 1936, and was completed to a depth of 50 feet that year. In the summer of 1937 a 3-compartment vertical shaft was started a short distance to the northeast of the prospect shaft, and sinking had proceeded to a depth of 300 feet by January 1938. During this period a 100-ton mill was erected near the shaft.

The P and G group comprises four claims, staked by T. Payne and G. Latham in August 1936. This ground was originally staked late in 1934, but had been allowed to lapse. Following the discovery of gold-bearing veins on the claims, initial development work was carried on by Ryan Gold Mines until August 1937 when Consolidated Mining and Smelting Company obtained a controlling interest in the property. A shaft was started on the P and G 3 claim in October of that year and had reached a depth of 100 feet by January 1938.

The Negus group of six claims was staked by O. Hagen and others in January 1936 and later. Surface exploration was carried on during the summer of 1937 and some of the veins found were diamond drilled following freeze-up that year. The property is owned by Negus Gold Mines.

The rocks on these groups are basic flows cut by early diabase dykes, a granite stock, a few aplitic dykes, and a late diabase dyke. The pillows in the flows are elongated in a northeasterly direction. All these rocks are relatively unsheared except along certain zones in the basic flows (see Figure 1). These sheared zones contain the gold-bearing veins and are younger than all the consolidated rocks of the area, including the late diabase. They vary in width from less than a foot to 18 feet. They can be traced for distances up to 700 feet on the surface, and diamond drilling indicates that some of them continue under drift-covered areas to join other exposed shears. Most of them trend and few degrees west of north nearly parallel to the West Bay fault, and all dip to the west. They branch and join as indicated on Figure 1. The rock within the shear zones is chloritic schist more or less replaced by ferruginous carbonate. Depending on the extent of replacement the resulting rocks vary from a green, slightly carbonated, chlorite schist to a banded, fissile, buff-coloured, rusty-weathering, carbonate rock containing a few chloritic seams parallel to the strike and dip of the zone. Particularly within the high-carbonate parts of the shear zones, quartz stringers and augen occur, and in most of these places the carbonated schist is mineralized with fine-grained, disseminated pyrite and arsenopyrite. The borders of the shear zones are commonly well-defined, but in places the schist passes into the massive country rock through a breccia cemented by quartz-carbonate veinlets up to one-half inch across, some of which contain pyrite, chalcopyrite, and pyrrhotite.

Veins of quartz or of quartz and carbonate here and there follow the shear zones, commonly occupying a more or less medial position. Most of the veins are continuous for hundreds of feet, but pinch and swell within short distances. Some of them are lenticular and discontinuous. In some cases the vein walls are sharply defined by a thin layer of powdery rusty gouge, but in many places--particularly where the vein consists largely of carbonate and the enclosing schist is high in carbonate--they lack this definition and the distinction between vein and schist is arbitrary.

The veins are composed of a very fine-grained, rusty weathering mixture of quartz and ferruginous carbonate more or less replaced by medium- to coarse-grained quartz. All the joints within the quartz signify some fissure filling. Along the strike of a vein complete gradation from the relatively pure, fine-grained, quartz--carbonate mixture to relatively pure quartz may occur within as short a distance as 15 feet. Disseminated through the quartz-carbonate mixture are tiny grains of light-coloured metallic minerals, chiefly pyrite, but in places including arsenopyrite and stibnite or tetrahedrite. Most of the mixture is banded in various shades of grey and buff parallel to the vein walls. Some of the bands contain more disseminated metallic minerals than others. Residual chloritic seams and tiny quartz stringers are common between the bands.

All stages in the replacement of the fine-grained quartz-carbonate mixture by quartz are evident. In an early stage numerous subangular quartz aggregates up to a fraction of an inch across are present. A later stage is characterized by the further addition of poorly defined lenticular areas of milky to light grey vitreous quartz. These lenses are up to 2 inches across and several times that length, and are elongated parallel to the vein walls. Commonly the quartz is darker in colour and finer in grain towards the borders of the lenses and shows no sharp contact with the matrix. At some places, however, definite boundaries between quartz and matrix do occur, and in many such cases the pattern formed by adjacent quartz areas suggests that they represent brecciated fragments of an originally continuous lens. The final stage in the replacement process is marked by increase in number of the lenticular quartz areas, whereby eventually the vein consists almost wholly of pure quartz.

Most of the relatively pure quartz veins are mottled. Commonly milky to light grey quartz occurs in indefinitely bounded, lenticular patches, from a fraction of an inch up to several inches across, within dark grey to almost jet-black quartz. In a few places the above relationship is reversed. Drusy cavities and joints are particularly common in milky quartz. These may be lenticular vugs up to an inch long and half that width, or a joint in massive quartz may be lined with freely terminating or partly interlocking comb-quartz crystals. Such joints commonly parallel vein walls. In a few places comb-quartz occurs in sharply bounded veins up to 2 inches wide, but commonly th base of the quartz combs passes without noticeable break into the characteristic mottled light and dark grey massive quartz.

Metallic minerals present in the veins are pyrite, arsenopyrite, chalcopyrite, sphalerite, galena, bornite, tetrahedrite, stibnite, jamesonite, gold, electrum, and probably, other minerals. Pyrite is the most common metallic mineral in the veins. All the fine-grained quartz-carbonate mixture carries tiny crystals of pyrite, and in places arsenopyrite. Pyrite also occurs in aggregates up to one-half inch across in quartz. Chalcopyrite is scarce but was noted in one vein, where it occurs with pyrite in quartz. Sphalerite and bornite were recognized in several veins where they fill vugs in quartz. Next in abundance to pyrite are soft, grey, metallic minerals commonly in aggregates too fine-grained for positive identification in the field. Chemical[1] and microscopic

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[1] By H.V. Ellsworth, mineralogist, Geological Sryvey.

tests have shown the presence of tetrahedrite, stibnite, and jamesonite among these grey minerals. They commonly occur filling cracks, vugs, and drusy joints in quartz. In a few places tiny, acicular or platy, soft grey crystals are disseminated through the fine-grained quartz-carbonate mixture. In one vein massive stibnite forms a band up to 3 inches wide. A picked sample of this assayed: gold, 0.01 ounce to the ton; silver, 1.11 ounces to the ton; and tin, 0.13 per cent. Other samples from these veins containing soft grey metallic minerals showed the presence of small amounts of tin.[1] Gold occurs in all types of gangue, but is

[1] Spectroscopic examination by H.V. Ellsworth, mineralogist, Geological Survey.

most common in and near drusy quartz, and is rare in the fine-grained quartz-carbonate mixture. In many cases it replaces the soft grey metallic minerals occupying vugs and cracks in quartz. Very finely divided gold occurs in massive, mottled quartz. Electrum is similar in occurrence to gold, but much less common.

In general, gold values are restricted to the veins and the adjoining schist carries only a negligible amount. The gold content of a vein varies greatly within short distances. Thus, one channel sample may contain more than an ounce of gold to the ton and another from the same vein a few feet away only a trace of gold. Available information suggests that as a general rule a high gold content is accompanied by a high content of relatively pure quartz, but exceptions to this occur. As the gold is later than the quartz it is possible that the seeming relation between quartz and gold content is due to the brittle character of the quartz, which, in consequence, fractured more readily than either the quartz-carbonate mixture or the schist.

Description of Individual veins

Vein 17 (Con Group)

Pits on the southern half of the schistose zone holding this vein show schist only a few inches wide, dipping 55 to 60 degrees west and containing little or no quartz. In the northern half, the zone is about a foot wide and consists of rusty schist with a dark glassy quartz vein up to 9 inches in width containing pyrite, arsenopyrite, grey, metallic mineral, and gold.

Vein 10 (con group) (locality 15, Yellowknife Bay Map-area)

This vein has been traced continuously on the surface for about 250 feet, and may extend several hundred feet farther northwest, to join one or other of two veins occurring there. In pits sunk on the vein, the dip of the shearing planes in the enclosing schist is between 55 and 65 degrees west, but a diamond drill intersection at a depth of 150 feet indicates an average dip of 52 degrees west. The width of the schistose zone at the north end is about 30 inches, and at the south end slightly less. At about half-way between, it is more than 6 feet wide and at this point is joined by a narrow shear zone containing a banded vein, a few inches wide, of quartz and a fine-grained mixture of quartz and carbonate. This vein can be traced for about 100 feet south of east from the junction. The main vein throughout most of its exposed length occupies nearly the whole width of the enclosing shear zone and consists of interbanded milky and dark quartz, a very fine-grained mixture of quartz and carbonate, and white to light buff to pink, medium-grained carbonate. Most of the bands are less than 2 inches thick, but in places bands of pure quartz are as much as 18 inches wide. Many of the narrow bands are separated from one another by thin, residual, chloritic seams. Crystals of arsenopyrite and pyrite up to one-eighth inch across are disseminated through the quartz-carbonate mixture and part of the dark quartz. Sphalerite, galena, and a fibrous, sectile, grey, metallic mineral occur in the medium-grained, light-coloured carbonate. Some of the dark, glassy quartz contains finely divided, visible gold.

Vein 4 (Con Group)

The shear zone holding this vein is exposed for a length of 420 feet and dips steeply to the west. In the northern and central parts it exceeds 15 feet in width, but gradually narrows to about a foot at the south end. The zone consists of rusty-weathering, banded, carbonated schist. Lenticular areas, up to 4½ feet wide, containing considerable quartz are irregularly distributed within this zone. In part the quartz forms a fine-grained mixture with carbonate and, in part, occurs as dark glassy stringers and lenses. The latter range from a fraction of an inch across to indefinitely bounded, lenticular areas 2 inches across and 6 inches long. Fine-grained arsenopyrite and pyrite are disseminated in the quartz-carbonate mixture and in some of the dark glassy quartz stringers and lenses.

Vein AB (P and G Group)

The shear zone holding this vein is exposed for 100 feet. At the north end it dips 60 degrees to the west, is 20 inches wide, and consists almost entirely of a banded, fine-grained mixture of quartz and forruginous carbonate containing abundant dissominated pyrite and a few glassy quartz lenses and stringers. To the south the shear zone gradually widens to about 4 feet and holds a relatively pure quartz vein increasing in width from a few inches at the north end to 18 inches at the south end. The quartz is milky with bands of grey and drusy quartz parallel to the vein walls. It contains a few residual patches and bands of the quartz-carbonate mixture. Tetrahedrite is abundant in cracks in the milky, massive quartz and around freely terminating quartz crystals in the drusy bands. Gold occurs in both quartz and tetrahedrite.

Vein CD (P and G Group)

The schistose zone enclosing this vein can be traced for 230 feet. It dips from 65 to 75 degrees west. The zone at the north end is about 3 feet wide, up to 2 feet of which is fairly pure quartz containing pyrite, tetrahedrite, and gold, Towards the south the shear zone gradually narrows and the vein contains more fine-grained, intermixed quartz and carbonate, and less coarse-grained quartz. In the southern half there sre two veins separated by a few inches of carbonated schist which, in places, is stained dark red-brown by hematite.

Vein EFI (P and G Group)

This vein and the enclosing schistose zone dip about 65 degrees west and are exposed for a length of about 600 feet. The width of the zone narrows from about 10 feet at the north end to 4 feet near its junction with a minor shear zone. The south face of a trench 50 feet south of the most northerly exposure shows the following section from east to west.

Inches	
0 - 12	Very fine-grained, rusty schist cut by a few ferruginous carbonate veinlets.
12 - 18	Rusty, powdery gouge.
18 - 42	Mottled, light to dark grey quartz containing tetrahedrite (?) and a few small residual areas of fine-grained intermixed quartz and carbonate carrying disseminated pyrite and arsenopyrite.
42 - 90	Schist, in part carbonated, containing a few quartz lenses up to an inch wide and 6 inches long.
90 - 110	Quartz lens (pinches out within 6 feet to the north, grey in colour along eastern side becoming milky and in places drusy in central and western parts.
110 - 118	Rusty schist.
118	Hanging-wall.

South of this trench for the next 180 feet the relatively pure quartz vein ranges in width from 18 inches to nearly 5 feet. The quartz varies from milky to nearly jet-black, in places is drusy, and contains small amounts of pyrite, a soft grey metallic mineral, gold, and at one place, sphalerite. In a second trench 230 feet south of the north end, the north face shows a 40-inch width of fairly pure quartz. This narrows within the length of the trench (13 feet) to a width of 18 inches in the south face. The quartz is almost jet-black on the western side of the vein, whereas the central and eastern parts are mottled light to dark grey. A third trench 50 feet farther south, shows only one or two pure quartz veins up to a few inches wide, carrying pyrite and grey mineral in a 4-foot width of fine-grained intermixed carbonate and quartz most of which contains numerous small quartz lenses averaging one-quarter inch across and disseminated, fine-grained pyrite and stibnite. In a fourth trench, 30 feet south of the last mentioned trench, the vein is 2 feet wide in the north face and consists of about equal proportions of relatively pure, milky to grey quartz and fine-grained intermixed carbonate, quartz, pyrite, and possibly, arsenopyrite. The relatively pure quartz occurs as stringers and lenses, commonly with indefinite boundaries and less than an inch across. Towards the south end of this trench the vein narrows to 14 inches and by a gradual increase in the size and number of the quartz lenses changes into a relatively pure, milky to grey quartz vein streaked parallel to the vein walls. This contains pyrite and fine-grained aggrogates of a soft grey metallic mineral or minerals. South of this trench similar variations in width and character of vein material occur for a distance of 230 feet to where a miner zone of shearing joins. Throughout this length relatively pure quartz nowhere exceeds 2 feet and averages about 18 inches in width. Abundant finely divided gold occurs in quartz in several trenches. At the junction of the two zones of shearing, the main zone changes strike and for a distance of 70 feet averages 30 inches across, with up to 2 feet of fairly pure quartz, and dips 70 to 75 degrees to the west. At the end of this stretch it is joined by vein IH and the point of junction is marked by shearing and brecciation across 6 feet.

Vein IH (P and G Group)

This vein is traceable for 60 feet and consists of about 6 inches of quartz lying in a shear zone about 18 inches wide dipping 70 degrees west. Visible gold is reported to occur in the vein.[1]

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[1] Personal communication from O. Hagen.

Vein FG (P and G Group)

Near the junction with vein EFI this vein dips very steeply west and, farther south, about 70 degrees west. It is exposed for a length of 60 feet and consists of intimately mixed milky and dark quartz varying from a fraction of an inch to 15 inches in width. The vein is bordered on both sides by less than an inch of schist. Pyrite, grey mineral, and gold are present in the quartz.

Vein QR (P and G Group)

This vein is exposed at intervals over a total length of 190 feet. Where exposed it is about 7 inches wide with only a few inches of schist on either side. It dips 50 to 60 degrees west. Commonly, dark quartz forms the central part of the vein and milky quartz the borders. In the two trenches on the northern half abundant finely divided gold and electrum occur with grey minerals in dark quartz. In the trench at the south end pyrite and chalcopyrite (?) are the only metallic minerals evident.

Vein JKL (P and G and Negus Groups)

This vein can be traced for 280 feet. At about 150 feet south of the most northerly exposure, it crosses the south boundary of the P and G group into the negus group. It lies in a shear zone varying from 2 inches to 2 feet wide, most of which is occupied by mottled and streaked, light to dark grey quartz. The dip is steep to the west at the north end and about 60 degrees west in the central and southern parts. Pyrite, a grey mineral, and gold occur within quartz, and tetrahedrite, sphalerite, stibnite, bornite, and gold fill drusy cavities that are up to an inch long and ½ inch wide and are lined with freely terminating quartz crystals. Two veins branch from vein JKL, One starts 40 feet south of the north outcrop of the main vein and trends south 20 degrees east for 180 feet. Throughout this length it varies from less than an inch to a foot in width with very little schist on either side, and is composed of vitreous grey to jet-black quartz at one place (150 feet south of the junction with the main vein) containing visible gold. The second branch starts 70 feet south of the first. It is a quartz vein up to 6 inches wide containing pyrite, grey mineral, and gold, and it trends north 40 degrees west for at least 40 feet.

Vein ST (P and G and Negus Groups)

This vein, at a point about 130 feet south of its northermost outcrop, crosses the south boundary of the P and G group into the Negus group. It lies in a zone of shearing exposed for a total length of 300 feet that dips 70 degrees west and is 3 to 4 feet wide, except at the southernmost exposure where it widens to 6 feet. The vein is composed of mottled, milky to grey quartz containing pyrite and soft grey minerals. In places the quartz is drusy. The width of the vein varies greatly within short distances. At the north end it is from 6 to 12 inches wide and 15 feet south of this point it is 30 inches wide. South from here in places no quartz is visible in the shear zone, but near the south end a quartz vein up to 20 inches wide is present.

Vein UV (P and G and Negus Groups)

One hundred and forty feet south of the north outcrop of this vein and a few feet east of it are claim posts: No. 1 post Negus fraction 4, No. 2 post P and G 4, No. 3 post Star 1, and No. 4 post Negus 3. The total exposed length of the vein is 290 feet. At the north end the shear zone holding the vein is 30 inches wide, dips 60 degrees west and contains two quartz veins, one 3 inches wide lies near the foot-wall; the other, 6 inches wide, is near the hanging-wall. South from here is a single quartz vein about 7 inches wide, bordered by a few inches of schist on either side. The quartz is predominantly milky and contains pyrite, tetrahedrite, jamesonite, and gold.

Veins MN (Negus Group)

This vein is composed of quartz and lies in a shear zone about 30 inches wide, dipping 70 degrees west at the north end and 55 degrees west at the south. It is exposed for 220 feet. At the north end the quartz is a foot wide and mainly grey. About half-way along the vein, the quartz is predominantly milky and up to 20 inches wide. At the south end the quartz is mottled milky and grey and is about 8 inches wide. Gold and grey metallic minerals are present in the four trenches on the vein.

Vein OP (Negus Group)

This vein ranges from 6 to 15 inches in width, is composed of milky to grey quartz, and lies in a shear zone 2 to 3½ feet wide, which dips 70 degrees west, and can be traced for 230 feet. Pyrite and grey metallic minerals occur in the quartz, which also contains gold in the two southern trenches.

Vein WX (Negus Group)

This vein was seen only in the southern trench of the two trenches sunk on it. Visible gold is reported to occur[1] in the northern trench, which was filled with water at the time of the geological examination. In the southern trench a zone of shearing 4 feet wide, dips 75 degrees west and consists of carbonated schist containing a few quartz lenses less than 2 inches across.

[1] Personal communication from O. Hagen.

Vein YZ (Negus Group)

The shear zone holding this vein can be traced for 240 feet. In the northermost trench, carbonated schist 15 feet wide dips 55 degrees west, and contains scattered quartz lenses a few inches across. In the central and southern trenches a quartz vein ranging in width from 1 to 3 feet lies in a carbonated shear zone 6 feet wide. The quartz contains pyrite, grey mineral, gold, and a soft, dark blue, metallic mineral, possibly chalcocite or bornite.

Fox Claim

This claim was staked by Michiel Saingrie in January 1936. Surface trenching and some diamond drilling were done on the deposit described below during the winter of 1936-1937 by Ventures, Limited, who held the claim under option at that time.

A zone up to 100 feet wide, rich in ferruginous carbonate, extends northeasterly from the shore of a small lake for nearly 1,000 feet (locality 6, Prosperous Lake map-area). This weathers brown, is moderately sheared and contains no identifiable original structures, but a few hundred feet distant on either side pillowed lavas and cherty and tuffaceous beds occur in the generally massive, green to brown-weathering country rock. Irregularly within the carbonate zone up to half the rock over 10-feet widths is composed of quartz veinlets, commonly less than an inch wide, and an intimate, fine-grained mixture of quartz and ferruginous carbonate. These contain fine-grained, disseminated pyrite and arsenopyrite. Chips taken every few inches across a total width of 60 feet near the lake showed on assay: gold, 0.11 ounce to the ton; silver, 0.05 ounce to the ton.

Giant Group

The Giant group of twenty-one claims was staked by C.J. Baker and H.M. Muir for Burwash Yellowknife Mines, Limited, in July 1935. In 1936, 3,800 feet of diamond drilling was done on the group. In the summer of 1937 an inclined prospect shaft was started on vein O. The property is new being developed by Giant Yellowknife Gold Mines, Limited. A number of gold-bearing veins have been found on these claims, but description here will be limited to vein B and vein O (localities 9 and 8, Prosperous Lake map-area).

The rocks adjacent to these two deposits are all highly altered and include pillow lavas, massive flows and tuffaceous sediments, cut by quartz-feldspar porphyry and basic intrusives. Folds in the interbedded flows and sediments strike north 30 degrees east. Minor shear zones parallel this direction, but the larger shear zones trend north, parallel to the West Bay fault which lies a few hundred feet to the west of the deposits.

The B "vein" consists of several quartz lenses and veins along and near the crest of an anticlinal fold plunging at a low angle to the south-southwest. Most of the quartz occurs in a sheared zone a few feet wide at the top of a basic flow immediately overlain by a quartz-feldspar porphyry sill. The quartz introduced along this horizon outcrops in two bodies converging towards the southwest and dipping at low angles away from each other. The point of junction of these is obscured by drift. The quartz along the western limb of the anticline extends continuously about 100 feet in a northerly direction, dips 10 to 40 degrees west, and is up to 18 inches thick. It is milky and contains chloritic seams commonly less than one-quarter inch wide parallel to vein walls and enclosing schist. Probably the quartz has formed by replacement of schist and the chlorite seams may be residual. Fine-grained gold, pyrite, and chalcopyrite occur in the vein, chiefly within or near the chlorite. A few feet east of this vein, small, parallel, gold-bearing quartz lenses occur in chlorite schist. In the eastern limb of the fold, starting at a point 20 feet east of the south end of the vein matter exposed in the west limb, a number of quartz lenses are exposed along a line trending north 20 degrees east and 130 feet long. The lenses are up to 30 inches thick and 15 feet long, and all dip about 30 degrees to the east. They probably are faulted fragments of a once continuous vein. The greatest horizontal distance between any two adjacent lenses is less than 10 feet. The vein matter is similar to that along the western limb. The northward extensions of the quartz bodies in the eastern and western limbs of the anticline are hidden under drift. A hundred feet northeast of the northernmost quartz exposure on the eastern limb is an isolated quartz lens carrying abundant visible gold. This lens is about 30 feet long and up to 3 feet wide, but these dimensions are arbitrary as silicification, disseminated sulphides, and possibly gold values extend out several feet into the enclosing quartz-feldspar porphyry country rock. The lens is elongated due north and its western edge dips 50 degrees west. The central part of the lens is composed of fairly pure milky quartz containing a little pyrite and gold. Towards the borders of the lens milky quartz occurs in subangular areas up to several inches across, surrounded by a mixture of medium- to fine-grained, milky quartz, pyrite, and green, chloritic material. In most places the boundaries of the milky quartz areas are indefinite, suggesting a replacement origin, elsewhere they are sharply bounded and simulate a vein breccia. Gold and a little chalcopyrite occur in aggregates up to one-sixteenth inch across in milky quartz, and very fine-grained gold occurs in both milky quartz and the quartz-pyrite-chlorite mixture. The borders of the lens consit of very fine-grained, hard, greenish grey material (probably silicified prophyry) containing abundant, disseminated, fine-grained pyrite and a few, indefinitely bounded, cherty quartz stringers, commonly less than an inch wide.

The south end of "vein" Q lies 600 feet northeast of "vein" B and 750 feet east of and parallel with the West Bay fault. A strongly sheared zone, largely drift covered, extends north for at least 800 feet along the eastern base of a ridge composed largely of quartz-feldspar porphyry. Drift and muskeg extend north, south, and east from the ridge, and most of the fifteen trenches along the 800-foot length exposed only the western edge of the zone. The porphyry hanging-wall dips 60 to 70 degrees west, and is commonly underlain by a foot or two of rusty, powdery gouge. In some places minor shears extend several hundred feet into the porphyry in a direction south 30 degrees west. The total width of the zone is revealed at only one place, 450 feet south of the northernmost trench. Here intense shearing is about 40 feet wide and is bounded on the east by a few feet of moderately sheared greenstone. East of this for several hundred feet is muskeg. Throughout the exposed parts of the zone most of the schist strikes north and dips 60 to 70 degrees west, parallel with the hanging-wall, but in places it trends up to 30 degrees east of north. It is very fine-grained, soft, gree-grey to brown-grey, and in part weathers rusty. Milky quartz lenses and veins in the zone are up to 3 feet wide and commonly parallel and trend of the schist. Inpplaces these contain arsenopyrite, pyrite, electrum, and acicular crystals of a blue-grey metallic mineral (probably jamesonite or stibnite). Quartz also occurs in replacement bodies consisting of interbanded thin layers of milky and cherty quartz, carbonate, and chlorite. These contain disseminated, fine-grained pyrite and arsenopyrite. The banding parallels adjacent schist, into which the replacement bodies grade by decrease in quartz.

The eight trenches in the northernmost 400 feet of the zone are all located close to its western edge, and expose up to 20-foot widths of schist immediately east of the hanging-wall. In all these trenches quartz stringers and lenses up to a few inches wide, containing some brown-weathering carbonate, occur in the schist, but are not abundant, and metallic minerals are absent or scarce.

In the section extending 175 feet south from a point 400 feet south of the northernmost trench, four trenches expose shearing up to 40 feet wide. The most northerly of these trenches extends 36 feet east from the hanging-wall. The first 30 feet is rusty schist cut by a few milky quartz veins up to 3 inches wide, containing considerable chlorite, buff to brown carbonate, and a little pyrite. East of this is a milky quartz vein up to a foot wide containing chlorite seams parallel with the vein walls and subangular, grey-green areas several inches across carrying disseminated pyrite and arsenopyrite. Between this vein, and the east end of the trench a banded quartz-carbonate-chlorite replacement of schist carries fine-grained disseminated pyrite and possibly other ligh-coloured metallic minerals. The next trench lies 60 feet south and extends 40 feet east from the hanging-wall. The first 25 feet is rusty schist containing little or no quartz. The next 15 feet consists mainly of a banded siliceous replacement of schist containing milky quartz lenses up to 30 inches wide, carrying fine-grained arsenopyrite, pyrite, electrum, and a blue-grey metallic mineral. Selected samples from two of the lenses assayed:

	No. 1	No. 2
Au	13.87 ounces to the ton	7.35 ounces to the ton
Ag	3.06 " " " "	2.06 " " " "
Sn	Not determined	0.05 per cent

The two trenches in the southern half of the 175-foot section expose only the westernmost 20 feet of the zone. In both trenches banded, siliceous replacement and milky quartz veins and lenses up to 3 feet wide occur across most of the exposed width. Mush of the banding in the replacement quartz and many of the lenses and veins trend 30 to 40 degrees east of north. The metallic minerals are similar to those in the two trenches immediately north.

The three trenches in the southernmost 225 feet of the sheared zone expose only a few feet of schist east of the hanging-wall. Quartz and metallic minerals are scarce in these trenches.

Homer Group

This group comprises twelve claims, staked in September 1933 by H.T. Dixon on behalf of Yellowknife Gold Mines, Limited.

At locality 3, Prosperous Lake map-area, a quartz-porphyry dyke about 100 feet wide trends northeast for at least 800 feet through massive, green-wathering rocks, in places showing pillows. Throughout much of this distance the dyke is covered by drift. Where exposed the weathered surface is light coloured except for numerous rusty stains. Fresh surfaces show quartz crystals up to one-quarter inch across in a felsitic groundmass, which also contains some disseminated light coloured metallic minerals including pyrite and possibly arsenopyrite and galena. Chips taken at intervals across this body and over a total length of 400 feet were assayed with the following results: gold, 0.02 ounce to the ton; silver, 0.12 ounce to the ton.

Five small lead-zinc replacement depostis, named in this report deposits 1 to 5, occur on either side of the quartz-porphyry dyke.

Deposit 1 lies in and near a north-south fault at the northeast end of the prophyry dyke close to its southeast margin. Drag along the fault indicates that the rocks on the east side have moved relatively northwards. Masses of banded sulphides, up to 2 feet wide, and consisting of galena, sphalerite, pyrite, chalcopyrite, and arsenopyrite, occur along the fault for about 10 feet, and these minerals also are disseminated through the adjacent porphyry. A chip sample taken across a 2-foot width assayed: gold, 0.01 ounce to the ton; silver, 2.14 ounces to the ton.

Deposit 2 lies 150 feet west of deposit 1, in the southwest end of an exposure of rusty-weathering chlorite schist forming an inclusion or fault block up to 15 feet wide and extending 70 feet northeasterly within the porphyry dyke and close to its northwest margin. A trench across the deposit shows the following section, starting at the northwest end:

Feet	
0 - 6½	Porphyry containing pyrite crystals up to 1/8 inch across, in places scattered along bands trending northeasterly and dipping vertically, and in places forming irregular aggregates up to 4 inches across. Possibly one-quarter of this width is pyrite.
6½-8	Massive, fine-grained galena, some of which contains small amounts of pyrite and sphalerite in vertical bands trending northeasterly.
8 - 12	Chlorite schist, trending northeast and dipping vertically and containing a few scattered stringers of pyrite less than an inch across, paralleling the schist.
12-15	Fine- to medium-grained sphalerite and galena, with lesser amounts of pyrite all banded parallel to the adjacent schist; one band of fairly pure sphalerite is about a foot wide. A spectroscopic examination of a chip sample taken across this section showed the presence of tin, zinc, iron, manganese, lead, calcium, indium, silver, cadmium, aluminium, selicon, and magnesium.[1]
15-20	Chlorite schist containing a few stringers of pyrite less than an inch across, paralleling the schist.
20	Drift.

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[1] Spectroscopic examination by H.V. Ellsworth, mineralogist, Geological Survey.

Gossans a few feet across occur at intervals throughout the schist area in the porphyry northeast of the trench. Southwest of the trench is drift.

Deposit 3 lies 100 feet southeast of deposit 2, and a similar distance southwest of deposit 1. The country rock is dark green and fine-grained, and is probably an altered, early basic intrusive. The southeast border of the porphyry dyke lies under drift a few feet northwest of deposit 3. A trench shows banded galena, sphalerite, pyrite, and arsenopyrite replaceing chlorite schist, which strikes north 30 degrees east and dips steeply southeast. These sulphides occur in a lens up to a foot wide and 10 feet long. From a point 10 feet west of the south end of this lens a rusty gossan up to 2 feet wide extends 20 feet southwest. This is not trenched, but appears to indicate vein matter similar to that exposed in the lens.

Deposit 4 lies 200 feet southwest of deposit 2 and a few feet southeast of the quartz-porphyry dyke. A trench shows banded galena, sphalerite, pyrite, and arsenopyrite with a very little, fine-grained, shite to buff carbonate in a lens up to 6 feet wide, elongated north 30 degrees east within and parallel to a schistose zone in a massive, fine-grained, green rock. A gossan of rusty, white, and yellow secondary iron, lead, and zinc minerals extends less than 10 feet both northeast and southwest of the trench, and probably marks the limits of the sulphides. A channel sample across 6½ feet in this trench is reported by the owners to have assayed 0.03 ounce gold and 10.8 ounces silver to the ton.

Deposit 5 lies 450 feet southeast of deposit 4. Three trenches in a distance of 120 feet along the sheared western contact of an early basic dyke with pillow lavas show erratically distributed lenses of massive banded arsenopyrite and pyrite, with a little chalcopyrite, galena, and pyrrhotite. These are up to a foot wide and 4 feet long. The elongation of the lenses and the banding of the metallic minerals trend north 20 degrees west and dip vertically, parallel to the trend of the enclosing schist. The schist contains a little disseminated pyrite and arsenopyrite. A few milky quartz lenses up to a foot across in the southern trench contain chlorite and ferruginous carbonate, but no metallic minerals.

Elsewhere on the group lead-zinc replacement deposits accompanied by some quartz are reported to carry higher values in precious metals than the five zones described above.[1]

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[1] Personal communication from O.J. Baker

Jack and Lily Groups

The Jack group of six claims was staked in April 1936 by J.A. Morie. The Lily group of eighteen claims was staked by J. Stevens and W.G. Matthews in July 1936. The deposit described below extends 650 feet across Lily 2 and continues on an equal distance into Jack 6 and 5 (locality 10, Prosperous Lake map-area).

The country rock is quartz-mica schist whose shear planes strike between north 10 degrees west and northwest and dip about 70 degrees northeast. Along a line trending north 65 degrees west are a number of vein quartz outcrops separated by drift areas. The exposures suggest that the quartz occurs in lenticular bodies arranged on echelon along the 1,300-foot length, rather than in a single continuous vein. However, in places quartz can be traced continuously for more than 300 feet and is up to 25 feet wide. In most places the contacts of the quartz masses with schist are irregular and show no shearing. Commonly, a stockwork up to 10 feet wide of quartz veins a few inches wide occurs in the schist on either side of the quartz bodies. The latter in places contain inclusions of schist up to several feet wide. Most of the quartz is watery and colourless to light grey to pale blue, and in places shows subangular clear quartz grains up to one-half inch across in a sugary quartz groundmass. Some of the quartz is milky to grey and contains lenticular cavities, commonly less than an inch long, lined with freely terminating quartz crystals and partly filled with dark brown sphalerite. Tiny needles of brown tourmaline and a little green feldspar, in crystals up to one-quarter inch across, occur in some of the watery quartz. Metallic minerals present include pyrrhotite, arsenopyrite, pyrite, chalcopyrite, sphalerite, and galena. These are relatively rare, except in and near vuggy cavities. Visible gold is reported to occur at several palces in the deposit. Assays from the western half of the deposit show rather erratic values in gold up to nearly an ounce of gold a ton across a width of 7 feet.[1] The highest values occur where there is abundant sphalerite filling vugs in quartz.

[1] Personal communication from J. Stevens

In the exposed parts of the westernmost 175 feet watery quartz averages 5 feet wide and contains very small amounts of pyrite and sphalerite. In the next 275 feet to the east the quartz averages 10 feet wide and in part is vuggy.

with arsenopyrite, pyrite, chalcopyrite, sphalerite, and galena within and near the vugs. Throughout the next 300 feet quartz averages 20 feet wide and in places is vuggy and mineralized. Exposures and trenches in the easternmost 550 feet of the deposits show an average width of 7 feet of quartz, in part watery and in part vuggy.

Other veins similar to that described above occur on adjacent claims. Some of those contain wires of native copper up to one-sixteenth inch long in watery quartz, and several are reported to contain visible gold.

Nib Group

This group comprises eighteen claims, staked in April 1936 by R.A. Ingrey, N. Barlow, and A.G. Nielson.

The deposit described below lies a few hundred feet inland from the southeast corner of Upper Walsh Lake (locality 4, Prosperous Lake map-area). A trench 25 feet long and 6 feet deep crosses quartz-mica schist and slate, trending north-south, with a vertical dip. In the trench walls is visible a glassy, light to dark grey quartz vein 3½ feet wide, parallel to the schistosity. The quartz and the contry rock to the west contain few or no metallic minerals. Immediately to the east of the vein arsenopyrite occurs in dark glassy quartz stringers and lenses up to a few inches across, and in intervening bands of slate across a total width of 4 feet. The arsenopyrite is fine- to coarse-grained, with some crystals up to one-half inch across. A chip sample taken across this 4-foot width assayed: gold, 0.10 ounce to the ton; silver, 0.13 ounce to the ton; tin, 0.06 per cent. The rocks immediately north and south of the trench are largely drift covered, but two smaller trenches are located 40 feet northeast and 250 feet south respectively. That to the northeast shows closely spaced, dark, glassy quartz stringers carrying abundant arsenopyrite across a total width of about 2 feet. In the southern trench a glassy quartz vein up to a foot wide carries very little arsenopyrite and a few, dull green crystals of andesine up to one-half inch across near the vein borders.

Rich Group

This group comprises twenty-four claims, staked in September 1934 for Yellowknife Gold Mines, Limited, by C.J. Baker and H. Muir, following their discovery of the first visible gold in the area. A subsidiary company, Burwash Yellowknife Mines, Limited, was formed to take over the claims. During the summer of 1935 an open-cut 25 feet long and 30 feet deep was put down on the widest part of the discovery vein near the northeast corner of the Rich 4 claim (locality 14, Yellowknife Bay map-area). All the quartz from the open-cut with a little wall-rock, aggregating in all 16 tons, was shipped to Trail, B.C., for treatment and yielded 13.6 ounces gold to the ton.[1] A 2-compartment

[1] Personal communication from L.T. Burwash.

vertical shaft was started in September 1935, and this had been carried to a depth of 125 feet by the end of that year. Early in 1936 a cross-cut was driven 70 feet west from the shaft at the 125-foot level and several quartz lenses were intersected and drifted on, but no values comparable to those in the open-cut were found. During the summer of 1936 more than 2,000 feet of diamond drilling and 300 feet of trenching were done on the discovery and adjacent veins. Development work on these was discontinued in September and has not since been renewed, but prospecting of the rest of the group is being carried on.

The discovery vein has been briefly described previously.[2] The country rock is greywacke and slate of the

[2] Yellowknife River Area; Geol. Surv., Canada, Paper 36-5, pp. 4,5 (1936).

middle and upper sediments of the Yellowknife group. The bedding varies in strike from north 60 degrees east to south 60 degrees east; the dip is vertical to steeply south, but tops of beds face north. A shear zone containing quartz lenses strikes about 15 degrees east of north, dips 75 degrees west, and marks a fault along which the rocks on the west side have moved relatively upward and slightly south. This shear zone is exposed for 230 feet to where it disappears under muskeg and drif t to the north and south, respectively . It is only slightly wider than the quartz lenses that it contains. Where no quartz is present the shear zone is marked by a few inches of chlorite schist. Rather dark quartz, in widths up to 10 inches, occurs at intervals along the exposed length of the zone. The open-cut and shaft are located at the greatest width of quartz, about 45 feet from the south end of the outcrop. Here for 25 feet along the zone widths up to 27 inches of quartz occur and are offset in several places by cross faults. The maximum horizontal displacement observed along any of these is 3 feet. The vein is largely grey quartz with considerable brown-warthering pink dolomite, some calcite, and minor amounts of pink to buff feldspar. The metallic minerals in order of their apparent relative abundance are arsenopyrite, pyrite, gold, marcasite, chalcopyrite, galena, and pyrrhotite. The gold occurs chiefly in quartz, but some is in carbonate, and a very little in the chloritic schist marking the foot-wall of the vein.

On the 125-foot level the shear zone contains up to 2 inches of dark, glassy quartz on the north wall of the cross-cut, and less than an inch of chlorite schist on the south wall. The zone was drifted on for 53 feet south of the cross-cut. In this distance quartz nowhere exceeded 30 inches in width, and in places was absent. One face sample across 5½ feet, including a 10-inch width of quartz, is reported to have assayed 0.35 ounce gold a ton.[1]

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[1] Personal communication from L.T. Burwash.

Other Minerals

The wide distribution of andalusite in knotted quartz-mica schist has been mentioned, as has also the occurrence of beryl, lazulite, lepidolite, spodumene, and other rare minerals in pegmatites cutting the schist. The presence of small amounts of tin on the Nib, Giant, P and G, and Negus groups, and of tin and indium on the Homer group, is noted under the descriptions of the gold deposits on these groups.

A quartz-feldspar porphyry on the Arseno group northwest of the north end of Likely Lake carries molybdenite (locality 1, Prosperous Lake map-area). This body is at least 105 feet wide (the northwest edge is drift covered) and trends northeast for several hundred feet through recrystallized basic lavas. Most of the porphyry is massive, homogeneous, well-joints. A fresh surface shows many quartz and feldspar crystals up to one-quarter inch across in a fine-grained pale pink groundmass. Along and near its eastern border it is greatly sheared showing a few glassy quartz crystals up to one-eighth inch across in a foliated, light green, fine-grained, soft groundmass, probably composed largely of sericite and carbonate. At places in this sheared part along joint planes, and in tiny quartz veinlets in the massive prophyry, pyrite, pyrrhotite, molybdenite, and fluorite occur. A chip sample (6 pounds) taken across 105 feet showed on assay: gold, None; silver, None; molybdenite, 0.24 per cent.

A large quartz vein outcrops at intervals along the West Bay fault from a point 2 miles southeast of Landing Lake to ½ mile northwest of Vital Lake, This vein is about 50 feet wide and consists of coarse- to fine-grained to cherty quartz mottled milky to dark grey in colour. Except for abundant hematite no metallic minerals were seen at the places this vein was examined. Numerous quartz veinlets carrying hematite occur in adjacent rocks and parallel the fault and large vein. This vein is generally similar to the giant quartz veins east and southeast of Great Bear Lake. A number of chips of hematite from the vein in the West Bay fault showed no appreciable radioactivity.[1]

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[1]Tested by H.V. Ellsworth, mineralogist, Geological Survey

Deposits of pyrite and pyrrhotite occur in highly altered sediments at the southeast end of Walsh Lake (locality 5, Prosperous Lake map-area), and are common in upper volcanics near the contacts with sediments and altered sediments of the Yellowknife group (include locality 17, Yellowknife Bay map-area). These deposits are reported to carry very low values in precious metals.[2]

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[2]Stockwell, C.H., and Kidd, D.F.: Op. cit., pp. 73, 74

Age and Origin of the Gold Deposits

Gold occurs in a variety of deposits in Yellowknife Bay-Prosperous Lake area. Evidence regarding the age and origin of the gold is furnished chiefly by the deposits along faults and shear zones in the lower volcanics, to which type belong most of the gold deposits so far found in the area. Consequently, discussion here will be limited to such deposits. The conclusions reached regarding the age and origin of these can be applied to all the other gold occurrences in the area, unless more than one age of gold mineralization is postulated.

Most of the gold deposits along shear zones in the lower volcanics lie not far distant from and approximately parallel to a major fault trending between north and northwest. In all cases where a late diabase dyke is in contact with a major fault, the faulting is younger. In the one case where a late diabase dyke is in contact with a gold-bearing shear zone (vein 17, Con group), the shearing is likewise younger than the dyke. Gold occurs in quartz fillings and replacements along many such shears and at one place in a major fault (locality 11, Yellowknife Bay map-area). In these deposits the vein matter is later than most or all of the major shearing movements, and in all veins where the paragenesis has been studied the gold is the latest mineral to be deposited. Thus the gold mineralization is younger than all the consolidated rocks of the area. That it may be much younger is suggested by the fact that the major faults have displaced late diabase dykes for distances up to 5 miles. Probably such a tremendous offset represents the accumulation of minor displacements over a long period of time. In any case, however, the age of the gold mineralization, like that of the major faulting, cannot be fixed any more definitely at the present time than post-diabase and pre-Pleistocene.

The problem of the origin of the gold resolves itself into this: the deposits possess hydrothermal characters yet they are apparently much younger than and, consequently, unrelated to any igneous body exposed at the present surface. As the gold is later than all the other minerals of the veins speculation regarding the conditions existing at the time of its deposition may not be warranted.[1] However, in many of

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[1]Mawdsley, J.B.: Late gold and Some of Its Implications; Ec. Geol., vol. 33, pp. 194-210 (1938).

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these deposits the gold has a high silver content and is most closely associated with soft grey metallic minerals, including tetrahedrite, stibnite, jamesonite, and freibergite. Such an association suggests deposition from hydrothermal solutions at moderate to low temperatures. Furthermore, its occurrence filling vugs and drusy joints in quartz suggests moderate to low pressures. These characters, indicative of deposition from hydrothermal solutions at some considerable distance from their source, and the probability that the veins are unrelated to any known igneous body exposed at the present surface unite in suggesting that the gold-bearing solutions were derived from an igneous source so deep-seated that ist only expression at the present surface is in the gold-bearing veins.

From the above assemblage of facts and assumptions a general theory of origin for the gold deposits of Yellowknife Bay-Prosperous Lake area may be presented. The gold-bearing solutions originated in a deep-seated igneous body of unknown character. Channelways for the ascent of these solutions were provided by the major faults in Proterozoic or later times. Circulation of the late gold-rich fraction of these solutions and consequent deposition of gold were localized by structures in the rocks adjacent to the faults.

Prospecting Notes

According to the theory of origin outlined above, the gold deposits of the area are much younger than and not genetically related to any rocks exposed at the present surface. One implication of this is that gold deposits may occur in the area wherever there is a favourable structure regardless of whether the country rock be granite, diabase, volcanics, sediments, or mica-schist. However, for structural reasons the nature of the country rock probably is a controlling factor in the localization of gold deposits. The majority of the deposits so far found occur along and near faults trending north to northwest. Such faults and subsidiary parallel shears are more common in the less metamorphosed members of the Yellowknife group than in either the metamorphosed non-granite rocks or granites of the area. Thus, the less metamorphosed volcanics and sediments are structurally the most favourable rocks in which to prospect, although faults in any of the other rocks warrant examination.