C A N A D A
DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

GEOLOGICAL SURVEY
Paper 47-16

ROSS LAKE MAP-AREA, NORTHWEST TERRITORIES

(Descriptive Notes)

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OTTAWA
1947

CONTENTS

Illustration

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INTRODUCTION

The map-area, some 30 miles northeast of Yellowknife, can be reached by airplane, by canoe in summer along Yellowknife and Cameron Rivers, or by tractor in winter along a road that leads to Thompson Lake and thence to Victory Lake. Electricity from the power plant at the outlet of Bluefish Lake is transmitted to the Thompson-Lundmark mine, which is linked by telephone with the Con mine in Yellowknife Bay.

Relief is generally less than 200 feet, but the surface is hummocky and rough. Rock exposures are plentiful. Granitic areas are higher but less rugged than those of sedimentary strata; ridges are formed by bands of volcanic rocks and gabbro dykes, and linear depressions mark bands of foliated strata, diabase dykes, faults, and shear zones. Raised beaches occur at some of the highest points in the area. Timber is abundant locally; some lumber was cut on the east shore of Victory Lake for the Thompson-Lundmark mine.

GEOLOGY

East of Ross and Victory Lakes a conglomerate member of the older Yellowknife group rocks (1)[1] has a crystalline

[1] Numbers, in brackets, are those of the map-units on accompanying map.

limestone matrix, is altered to lime-silicate minerals in many places, and grades westward into a conglomerate composed of volcanic material. At Ross Lake the conglomerate is separated from sedimentary strata to the west by a heterogeneous group of rocks including rhyolite, breccia, chert, slate, sericite schists, and bands of metamorphosed limestone. Farther south the conglomerate is in conformable contact with the sedimentary strata to the west. To the east it is intruded by a biotite granodiorite, except to the north where altered basic lavas are exposed between the granodiorite and the conglomerate, which peters out south of the north boundary of the area.

Sedimentary strata of the Yellowknife group (2) underlie most of the area. They are for the most part dark weathering, fine-grained argillites grading into buff to grey weathering, coarser grained greywackes. Bedding is generally well preserved; beds vary in thickness from a fraction of an inch to more than 10 feet. Adjacent to bodies of granitic rocks the sedimentary strata are altered to nodular quartz-mica schists or hornfels (3), in which the nodules may be composed of cordierite or andalusite but are more generally nebulous aggregates carrying much mica. Isograd lines of metamorphism as shown on the map mark the approximate boundaries between these nodular rocks and their less metamorphosed equivalents (2).

An intrusive mass (4) east of Ross and Victory Lakes is composed mainly of granodiorite containing about 10 per cent of biotite, but numerous inclusions have apparently modified its composition; in areas of numerous biotite schist inclusions (presumably altered sediments) the intrusive rock also contains abundant biotite and is locally a quartz-biotite gneiss, whereas in areas of many amphibole schist inclusions (presumably altered basic flows) the intrusion contains variable amounts of hornblende and is locally a quartz diorite. The granodiorite is well foliated and, locally, brecciated. For a distance of about 1,000 feet from the contact with the Yellowknife group it contains abundant inclusions, is cut by veinlets of diopside and dykes of aplite, and is traversed and replaced by pegmatites. Smaller areas of granitic rocks with inclusions, and abundant dykes and sills of quartz-feldspar porphyry (5) throughout the sedimentary strata in the southwest quarter of the map-area may be related to the granodiorite.

Numerous basic dykes (6), some with large phenocrysts of plagioclase, intrude the granodiorite at Ross Lake, and most of them strike about north 30 degrees west roughly parallel with the trend of schist inclusions in the granodiorite. The dykes are cut by a granite (7) and its pegmatitic satellites (8), and by quartz veins that in part carry much feldspar. Other basic dykes and sills, almost all altered to amphibole schists, intrude the rocks of the Yellowknife group, and are especially abundant at Tibbit Lake, where they are cut by pegmatitic quartz veins carrying scheelite.

A pink to light grey weathering granite (7), containing some 40 per cent potassium feldspar, mostly microcline, about 20 per cent plagioclase, 30 per cent quartz, and muscovite and biotite in variable amounts, outcrops in the northeast and southwest corners of the area. Tourmaline grains and intergrowths of tourmaline and quartz replace the granite, particularly near its outer margin, in the southwest corner of the map-area, where a selvage of tourmaline locally marks the contact between the granite and the sedimentary strata.

Pegmatite dykes (8), satellites of the granite and composed mainly of feldspars (including microcline and albite, the latter commonly of the variety cleavelandite), quartz, and muscovite, occur along the western margin of the area, where most of them dip to the west towards the parent granite mass, and east of Ross and Victory Lakes, where most of them dip easterly to southerly towards the granite. Dips vary from 10 degrees to vertical. The following minerals have been identified in some of the dykes: tantalite-columbite, cassiterite, beryl, tourmaline, spodumene, amblygonite, petalite, lithiophillite, lazulite, garnet, and molybdenite. The sedimentary rocks may have a selvage of tourmaline at the dyke contacts. The texture of the dykes varies from aplitic to pegmatitic, and where zoning is indicated it is, with few exceptions, restricted to the margins of the dykes. Patches of coarse-grained quartz are in evidence in some dykes.

Two sets of brown weathering diabase dykes (9) cut all other rocks. They trend north 10 to 40 degrees west and north 10 to 30 degrees east, and are composed for the most part of plagioclase and augite.

STRUCTURE

The strata of the map-area are complexly folded as a result of more than one period of deformation. Folds, generally steeply plunging, vary in character in different parts of the area; many are isoclinal and overturned. Axes of earlier folds have been deformed and bent into a regional fold the axis of which trends northwest. Axes of superimposed flexures and cross-folds also trend northwesterly, as does a late cleavage along which nodules are elongated. Likewise, flakes of mica in the granite are oriented northwest. It may be that the cross-folds, granite intrusions, nodules, and northwesterly cleavage were roughly coincident developments.

The larger faults in the area post-date the diabase dykes. Brecciation rather than shearing has taken place along these faults, and some fault zones contain a mesh of white, vuggy quartz. Many faults, with apparent small displacement, and shear zones at some contacts between volcanic and sedimentary strata were probably formed during folding.

ECONOMIC GEOLOGY

At least three periods of vein-quartz mineralization and a variety of structural controls have resulted in great amounts and diversities of quartz bodies. Bedding planes, bands of finely bedded argillite and greywacke between more massive, thicker greywacke beds, axes and crests of folds, drag-folds, cleavage planes, tension fractures, contacts, faults, shear zones, and breccias have controlled to a varying degree the emplacement of quartz. Much of the adjustment to folding has taken place in the finer grained beds, as shown by their greater foliation and mashed appearance, and has resulted in numerous zones of structural weakness. Within bands of finely laminated strata the immediate controls have been bedding and foliation planes, and the resulting quartz bodies are either single or multiple veins, or groups of lenses of all dimensions. Such controls have resulted in greatest lengths of quartz veins or zones. The widest bodies of quartz are found along axes of folds, especially where there has been much crumpling and flowage.

Three periods of vein quartz mineralization are indicated by "banded" quartz veins traversed by "grey" quartz veins, which in turn are cut by "vuggy" quartz veins. The "banded" quartz has a laminated appearance due to alinement, parallel with the walls of the veins, of numerous thin seams of included rock, sericite and chlorite flakes, and abundant, generally fine, grains of chalky feldspar distributed along lines or thin bands. The quartz is grey-white and fine grained. The veins contain iron sulphides, particularly in the rock inclusions and along the vein walls, which are commonly rusty and poorly defined. The veins have been observed to follow minute drag-folds in argillite beds. They are traversed by altered basic dykes (6), quartz-feldspar porphyry (5), pegmatite (8), and diabase (9) dykes, and are truncated by the granite (7) in the southwest corner of the map-area.

The "grey" quartz is generally light grey and coarsely crystalline, and fractures readily. Locally it is sugary and

vitreous. Sulphides, including pyrite, pyrrhotite, chalcopyrite, arsenopyrite, galena, and sphalerite, may be present in minor amount. Some veins carry relatively coarse feldspar, with which muscovite may be associated, and they appear pegmatitic. Tourmaline is found in many veins or along their walls in nodular sedimentary strata, but was not observed in veins lying in the less altered strata. Also in the zones of nodular strata, some black, argillaceous beds, apparently rich in graphite, have metacrysts of chiastolite where they are traversed by veins of "grey" quartz. Veins either filled fractures and have distinct walls, or they replaced the wall-rock and their contacts are less distinct. This type of quartz has been observed veining the granodiorite (4), the basic dykes (6), the quartz-feldspar porphyry (5), and the granite (7) in the southwest corner of the area, but is cut by the pegmatites (8) within the granite and the sedimentary strata, and by diabase dykes (9). It is probably genetically related to the intrusion of granite.

The "vuggy" quartz is milky white, locally stained reddish, with crystals projecting towards the centres of the veins. It occurs in veinlets or narrow veins, massive or vuggy, locally ribboned, filling fractures and in places forming small stockworks, cementing breccia and fault zones along which the wall-rocks may be well silicified. The veins may be devoid of sulphides or may carry some pyrite and chalcopyrite. Seams of hematite up to 3 inches wide are present in the middle of a few veins.

Gold occurrences have been found in many places in the area. Gold ore was mined at Thompson-Lundmark mine from August 1941 to September 1943, when operations were suspended because of conditions imposed by the War. Some gold has also been recovered at Pensive Yellowknife mine. At both places it is associated with "grey" quartz with minor sulphides. Assays of grab samples from relatively well mineralized veins of "vuggy" quartz yielded only a very low gold content.

Many veins with scheelite have been found at Tibbit Lake, particularly in the altered gabbro dykes. The veins are short and narrow, and occur in small shear zones trending northerly. The scheelite is associated with garnet, clinozoisite, a little carbonate, and some plagioclase feldspar. Disseminated scheelite occurs in basic dykes and granitic rocks east of Ross Lake, in a band of limy rock south of Victory Lake, and has also been reported at the Thompson-Lundmark mine.

Galena and sphalerite are associated with quartz in shear zones at the contact of volcanic and limy rocks with sedimentary strata at Victory Lake and to the southwest.

The pegmatites (8) may be of economic interest for their tantalum, columbium, tin, beryllium, and lithium content. However, beryl is generally a minor constituent, spodumene is commonly altered to a fine micaceous aggregate or is replaced by quartz, and amblygonite does not occur in any large quantity. Some dykes are under development for their columbite-tantalite content, and cassiterite, which is associated with ores of tantalum and columbium in some dykes, may prove an additional attraction. The larger crystals of tantalite-columbite are usually found in the coarsely crystalline parts of the dykes; patches composed mainly of muscovite seem favourable for concentrations of the ore minerals.