

Province of Manitoba

Department of Mines and Natural Resources

MINES BRANCH

PUBLICATION 52-1

Geology and Gold Deposits
of
Southern Rice Lake Area

Rice Lake Mining Division
Manitoba

by
J. F. DAVIES

WINNIPEG

1953

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Province of Manitoba

Department of Mines and Natural Resources

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Geology and Gold Deposits of Southern Rice Lake Area

CHAPTER I

INTRODUCTION

Prior to 1932, when the San Antonio Mine came into production, the Rice Lake and adjacent areas had been studied and geologically mapped by Moore (1), Delury (2), Cooke (3), Wright (4), and other investigators. In 1937 Stockwell (5) mapped an area of about 15 square miles surrounding the San Antonio Mine. The resulting map was published on a scale of 500 feet to the inch. Following this, the Geological Survey issued three maps by Stockwell, on a scale of one mile to the inch; these covered the area north and south of Rice Lake, east as far as the Manitoba-Ontario boundary, and south along the boundary to Flintstone Lake. The results of this work were published in 1943.

In 1947 the Manitoba Mines Branch began mapping the entire belt of Archean volcanic and sedimentary rocks extending eastward from the southern end of Lake Winnipeg to the Manitoba-Ontario boundary. This work was carried out by G. A. Russell and the writer (7, 8, 9, 10, 11); the resulting maps were published on a scale of one-half mile to the inch.

It was deemed advisable to study certain restricted areas in more detail. Accordingly, in 1949, Russell (12) made a structural study in the vicinity of Long Lake and Halfway Lake; the area included the former property of Central Manitoba Mines Limited, and the properties of Gunnar Gold Mines Limited and Ogama-Rockland Mines Limited. In 1950 Russell (13) studied several small areas southeast of this region. Maps accompanying the reports (12 and 13), were on a scale of four inches to the mile, with some property maps on scales of 200, 100, and 50 feet to the inch.

In 1952, it was decided that the region south of Rice Lake warranted detailed mapping and study. The area chosen includes the properties of the Gold Pan Mine, Gold Lake Mine, Packsack Mine, Moose Mine, and others known since the early days of prospecting in the Rice Lake area. The area studied adjoins that mapped by Stockwell on a scale of 500 feet to the inch, and includes all volcanic rocks south of Stockwell's area. The published map is on a scale of 800 feet to the inch.

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LOCATION AND ACCESS

Rice Lake is situated about 100 air miles northeast of Winnipeg and 30 miles east of the southern part of Lake Winnipeg. It may be reached by motor road from Manigotagan, on Lake Winnipeg, which during summer is serviced by boat. Aircraft service is operated from Lac du Bonnet to Bissett, on the north shore of Rice Lake.

ACKNOWLEDGEMENTS

The writer wishes to express his gratitude to the officials of Gold Pan Mines (1945) Ltd., Gold Lake Mines Ltd., and Packsack Mines Ltd., for making available data pertaining to their respective properties.

In 1950 Photographic Survey Corporation made vertical aerial photographs, north and south of Rice Lake for San Antonio Gold Mines Ltd.

These photographs, reproduced on a scale of 400 feet to the inch, were of the greatest assistance in facilitating field work and grateful acknowledgement is made by the writer to both these companies for arranging for their use. Acknowledgement is also made to San Antonio Gold Mines Limited for useful information regarding the property of Portage Avenue Gold Mines Ltd., a subsidiary of San Antonio.

Field assistants were P. Dorozynski and L. Owen, both students at the University of Manitoba.

REGIONAL GEOLOGY

A belt of Archean volcanic and sedimentary rocks, the Rice Lake group, varying from $1\frac{1}{2}$ to 6 or 7 miles wide, and extending eastward from Lake Winnipeg to the interprovincial boundary, is intruded by batholithic bodies of granitic rocks. Dykes, sills, and stocks of basic rock intrude the Rice Lake group. Some of these intrusives are older and some younger than the granitic rocks. In the vicinity of Rice Lake a younger sedimentary formation, the San Antonio formation, unconformably overlies both the Rice Lake group and the granitic intrusives.

A study of published maps of the Geological Survey of Canada and the Manitoba Mines Branch shows that the rocks of the Rice Lake group have their greatest widths in two places along the belt, at Rice Lake and in the Halfway Lake-Long Lake area. In these places the belt is 6 to 7 miles wide. Elsewhere it is two miles or less in width.

Two separate anticlinal structures occur in the Rice Lake rocks in the two places where they attain their greatest widths. There appears to be a distinct concentration of gold-bearing quartz veins and strong shear zones in these two localities. The above considerations led to the present study in one of the localities, that south of Rice Lake.

METHOD OF MAPPING

The aerial photographs were of such detail that claim lines, old trails, and very small outcrops were readily visible. Of even more use in mapping, small clusters of trees or even individual trees on outcrops, changes in type and density of vegetation, small areas of drift, pits and trenches on veins, and numerous other physiographic features were distinctly defined. The photos, after a few days experience with them, were easy to read and follow. They were on a scale of 1 inch to 400 feet, and consequently for a map on a scale of 1 inch to 800 feet points could be located more accurately on the photos than the limit of drafting precision on the map.

No attempt was made to use conventional traverses. Instead, dykes, shear zones, veins, and lithologic contacts were followed on the ground and readily plotted directly onto the aerial photographs. Complete coverage of outcrops was achieved.

Using claim surveys and the survey of the range line between township 13 and 14 in conjunction with these lines, which are visible on the photographs, a base map was prepared and reduced to a scale of 1 inch to 800 feet. Points on the map are probably accurate to within 30 or 40 feet.

CHAPTER II

GENERAL GEOLOGY

The accompanying table of formations presents the classification of rocks found within the area.

Table of Formations

Proterozoic	San Antonio Formation	Feldspathic quartzite, minor conglomerate
Unconformity		
Archean	Intrusive Rocks	Quartz-feldspar porphyry Quartz diorite, albite granite; granite contact zone Diabase Gabbro
	Intrusive Contact	
	Rice Lake Group	Quartz-biotite-feldspar gneiss, injection gneiss Andesite porphyry Porphyritic dacite breccia, trachyte breccia Conglomerate Rhyolite, trachyte Porphyritic andesite breccia

RICE LAKE GROUP

The lithology of the rocks around Rice Lake has been described extensively in previous reports. The writer has followed as closely as possible the division of the volcanic and sedimentary rocks of the Rice Lake group into the same map units as used by Stockwell (5) and himself (10). Some minor changes have been made, especially in the grouping of fragmental volcanic rocks.

Within the map area the Rice Lake group lies upon the south limb of a probable anticline, the axis of which apparently lies mostly to the north but may cross the northwest corner of the area. Although the axis cannot be precisely located, evidence for the anticlinal structure is presented in the chapter on structural geology.

The rocks of the Rice Lake group are largely volcanic, most of which are fragmental. The fragmental rocks have been divided into two units,

one consisting of coarsely porphyritic andesite breccia, the other comprised of porphyritic dacite breccia, trachyte breccia, and probably some rhyolite breccia. The rocks of this latter unit grade into one another and could not be mapped separately. Stockwell (5) included some volcanic breccia within a unit composed mainly of rhyolite but in the present mapping the writer found that this breccia could be more conveniently grouped with the porphyritic dacite and trachyte breccias.

Stockwell also mapped a large area of porphyritic basalt north of Gold Lake and placed the south contact of this rock just south of the lake. The present work shows that dark coloured dacite and trachyte breccias extend right to the south shore of Gold Lake and for at least a short distance north along the east shore.

Brief descriptions of the various rocks of the Rice Lake group follow.

Porphyritic Andesite Breccia (1)

Porphyritic andesite breccia is considered the oldest of the Rice Lake group of rocks. This fragmental rock, irregularly interbanded with trachyte breccia and rhyolite, outcrops along the north border of the map area. The rock is brownish green to medium green weathering and coarsely porphyritic, with plagioclase phenocrysts about 1/12 inch across. Subangular fragments vary in size from an inch to several inches across and are usually a little more coarsely and distinctly porphyritic than the groundmass. The fragments do not have sharp, clear-cut boundaries with the groundmass.

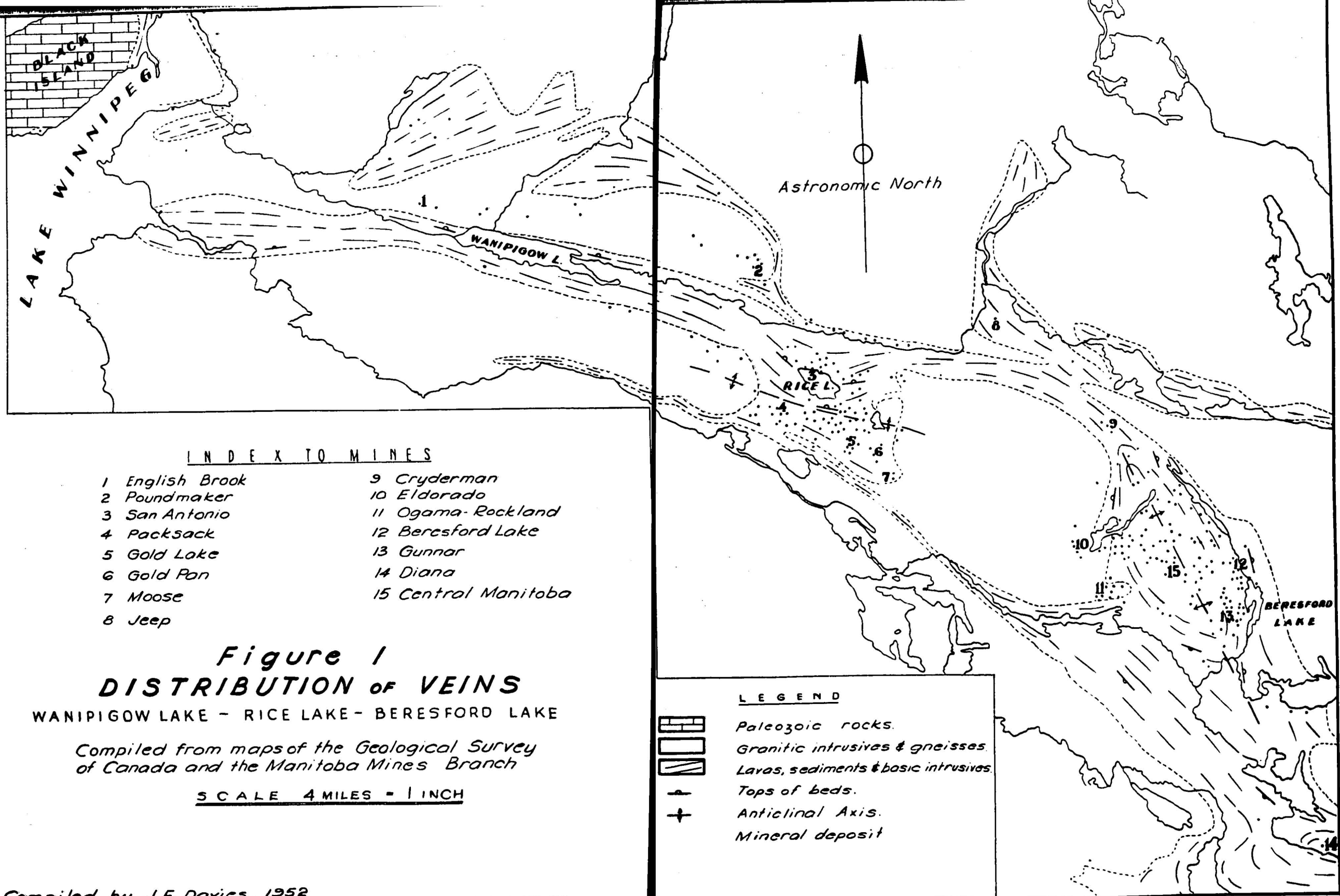
Both fragments and groundmass are very similar in composition. Under the microscope they are seen to consist of euhedral andesine phenocrysts in a matrix of fine-grained plagioclase, granular epidote and saussurite, with considerable fibrous, streaky, and interstitial chlorite which imparts a faint schistosity to the rock. Other minerals present include fine biotite and sericite, carbonate, and magnetite. Apart from minor alteration to sericite and saussurite, and replacement by carbonate, the feldspar phenocrysts are generally fairly fresh.

Rhyolite (2)

Rhyolite outcrops in the northern part of the area east of Little Rice Lake, and west of Elbow Lake. Typically the rock is very fine grained, "cherty," hard, dense and massive, and weathers light green to cream with a chalky appearance. Fresh surfaces are waxy and translucent and a somewhat darker green than the weathered surface. In some cases the rhyolite is brown, dark grey, or almost black.

The rhyolite consists essentially of a very fine-grained mixture of quartz, alkalic feldspar, and fine granular epidote. Granules of carbonate and flakes of sericite are common.

1 Numbers in parenthesis refer to rock units on the accompanying map.



Conglomerate (3)

Conglomerate occurs as a single small lens between bands of rhyolite and porphyritic andesite breccia. It consists of well-rounded fragments of rhyolite up to 4 inches, and as little as 1/5 inch across. The rock consists almost entirely of pebbles and cobbles. The rhyolite of the pebbles is indistinguishable from that of the band with which it is in contact; pebbles of porphyritic andesite breccia, which bounds the conglomerate on the south, are entirely lacking. These facts suggest that the material of the conglomerate may have been derived from the rhyolite to the north of it, and that the rhyolite underlies the conglomerate.

Porphyritic Dacite Breccia, Trachyte Breccia (4)

These rocks, though exhibiting some variation in composition and texture, compose a well-defined map unit. Various phases of the breccia usually grade into one another. These fragmental rocks are characterized by very distinct angular to subangular fragments, an inch to several inches across, in a groundmass of a decidedly different nature than the fragments. The fragments may be darker, lighter, coarser grained, finer grained, more coarsely porphyritic, or more finely porphyritic than the groundmass. In these respects the rocks of this unit differ markedly from the porphyritic andesite breccia.

Trachyte fragments are typically fine grained and various shades of grey. They consist of fine granular plagioclase, commonly with small laths and tablets of this mineral. Saussurite, epidote, and minor streaky chlorite are usually present. These fragments are usually found in a groundmass of trachyte that is either lighter or darker in colour and/or finer- or coarser-grained than the fragments. They may also be found embedded in a dacite groundmass that may or may not be porphyritic, and may or may not contain dacite fragments.

Fragments of porphyritic dacite range from cream to almost black in colour. They are composed of andesine phenocrysts in a matrix of feldspar, quartz, epidote, chlorite, carbonate and magnetite. Small phenocrysts of quartz are also present. Variations in the proportions of light and dark minerals are responsible for the differences in colour of the fragments. Some fragments of porphyritic dacite contain only a few phenocrysts; others contain very abundant phenocrysts.

Generally the porphyritic dacite groundmass consists of a hard, massive dark grey to black matrix containing few or many white andesine phenocrysts. In places phenocrysts are almost entirely lacking and the groundmass resembles the trachyte described above. In the volcanic breccia east of Little Rice Lake the porphyritic dacite groundmass contains more chlorite than usual, and, except that it also contains quartz, closely resembles the porphyritic andesite breccia.

The entire map unit is composed of various volcanic breccias resulting from various combinations of the types of fragments and groundmasses described in the foregoing paragraphs. Some of the fragmental rocks near the north boundary of the area are rhyolite breccias that, except for the presence of quartz, closely resembles the trachyte breccia.

Most of the rocks of this unit are massive or only weakly schistose. In places, where the chlorite content of the groundmass is greater than usual, schistosity is more pronounced.

Andesite Porphyry (5)

Andesite porphyry outcrops in rounded well-exposed ridges and hills. The rock is practically identical with the porphyritic andesite breccia (1) except that it is either non- or very obscurely fragmental. Sometimes very obscure fragments may be seen in the andesite porphyry but these are not common. The rock is usually massive but in places a weak schistose structure is developed.

Quartz-biotite-feldspar Gneiss (6)

Fine- to medium-grained, grey or brown, well-bedded sedimentary gneisses, composed of quartz, biotite, and feldspar, outcrop west of Big Clearwater Lake. They lie in apparent conformity with the band of rhyolite to the north and dip steeply towards the south. Much of the rock is an injection gneiss with stringers of pegmatite intruded between the bedding planes. Large lenses and sills of pegmatite also intrude the gneiss.

INTRUSIVE ROCKS

Rocks intrusive into the Rice Lake group include gabbro, diabase, quartz diorite and granite, and quartz-feldspar porphyry. In addition to mapping these as separate units, a further map unit was introduced to include hybrid rocks; these consist either of quartz diorite and granite with abundant inclusions of volcanic rocks, or else lavas intruded by abundant dykes of porphyry and injected by tongues and stringers of granite. The unit is typically a contact zone.

Gabbro (7)

Two small dyke-like bodies of gabbro occur in the southeast part of the area. The gabbro is medium- to coarse-grained, "spotty" in appearance, and weathers to a brownish green to dark green colour. It is composed essentially of hornblende, chlorite, and plagioclase, partly altered to saussurite, with minor epidote, carbonate, and magnetite.

Diabase (8)

Narrow diabase dykes are very numerous throughout the western half of the area. A few also occur in the eastern half.

Many of these occur as a system of dykes striking NNW parallel to a set of shears. Others strike approximately east, about parallel to another shear direction. Still others strike in various directions. Many of the diabase dykes are less than 100 feet wide but some are as much as 200 feet in width. Considering their narrow widths some of these dykes are remarkably long. One, which starts on the Fisher claim northeast of Little Rice

Lake, averages about 30 feet wide and extends continuously southeast for a distance of two miles, where it apparently joins another long dyke on the Pilot claim. This second dyke, averaging between 50 and 100 feet wide, is, except for one break, continuous for more than two miles and is sheared along its entire length.

The margins of many of the diabase dykes are distinctly chilled. In other dykes, the contacts are sheared so that the original texture is now destroyed.

The diabase typically consists of a fine- to medium-grained aggregate of green hornblende and plagioclase, either andesine or labradorite. In some specimens the feldspar occurs in well-formed laths and tablets and the hornblende is fairly well crystallized. In others, the feldspar is in irregular grains and the hornblende is ragged and patchy. Some specimens contain considerable granular epidote and fine saussurite. In most of the coarser-grained specimens moderate-sized grains of quartz are common. Skeletal crystals of ilmenite, often with considerable leucoxene alteration, occur in all the dykes.

Many of the diabase dykes are cut by dykes of quartz-feldspar porphyry. Others, especially those in the stock-like mass of porphyry west of Little Rice Lake, are younger than the porphyry, as they intrude it and exhibit distinctly chilled borders. The relationship of still other diabase dykes with the porphyry is unknown. The diabase which cuts the porphyry is petrographically identical with that which is cut by porphyry — even to containing notable quantities of both ilmenite and leucoxene. Near the south border of the Ballyhoo claim one of the long diabase dykes referred to previously splits into two thin bands separated by volcanic rocks. A dyke of quartz-feldspar porphyry cuts one of these bands and either is cut off by, or abuts against, the second band of diabase.

Evidence will be presented in the chapter on Structural Geology, to show that the quartz-feldspar porphyry dykes were introduced over a considerable period of time. It is suggested that all the diabases originated from the same source, that they, too, were intruded over a similar period of time, and that the intrusions of diabase and quartz-feldspar porphyry overlap one another.

"Granite" Contact Zone (9)

Along the border between the rocks of the Rice Lake group and intrusive quartz diorite there are zones 500 to 600 feet, exceptionally 1,000 feet, wide which consist of mixed lavas and granitic material. As one passes from the volcanic rocks towards the quartz diorite and granite intrusives, numerous dykes of granite, porphyry, some aplite, and pegmatite are encountered. The boundary between the quartz diorite and contact zone was placed where all signs of volcanic rocks had disappeared. Close to the uncontaminated quartz diorite, the contact zone consists of this rock with inclusions of volcanic rocks in various stages of alteration.

Quartz Diorite, Albite Granite (10)

Only a narrow fringe of these intrusive rocks was mapped. The work of previous years has shown that these intrusive masses are characteristically quartz diorite but gradations all the way to albite granite are found. The rocks are massive, coarse grained, sometimes porphyritic, buff to orange weathering, and sometimes contain blue quartz eyes.

Typical quartz diorite is composed of zoned plagioclase crystals, partly altered to saussurite, hornblende, chlorite, epidote, and quartz. Magnetite, apatite, sphene, microcline, and zircon are also present.

Quartz-feldspar Porphyry (11)

Dykes of quartz-feldspar porphyry are very abundant throughout the rocks of the Rice Lake group. Only the larger of these dykes have been shown on the accompanying map. Many of them strike northeast, in a direction normal to the regional schistosity. Others tend to parallel the schistosity.

In addition to the dykes, two large stock-like intrusions invade the Rice Lake rocks. One of these masses of porphyry is west of Little Rice Lake and the other on the south shore of Gold Lake.

The porphyry typically is fine- to medium-grained, weathers to a buff or cream colour and contains both quartz and plagioclase phenocrysts. It is often difficult to distinguish this rock from porphyritic dacite. The constituent minerals are albite or oligoclase, quartz, chlorite, sericite, epidote, carbonate, apatite, zircon, and sphene.

The rock is usually massive, even where the volcanic rocks exhibit good regional schistosity. The porphyry closely resembles some phases of the albite granite with which it is believed to be associated in origin. The age of these quartz-feldspar porphyry dykes with respect to the period of regional deformation and emplacement of diabase dykes is discussed in the chapter on Structural Geology.

San Antonio Formation (12)

During the work discussed in the present report, not a great deal of attention was paid to the San Antonio formation, except where it is in contact with the older rocks. This formation, of feldspathic quartzite and minor conglomerate, is known to be younger than the Rice Lake group of rocks and the intrusive quartz diorite. At the southeast corner of Little Rice Lake the San Antonio rocks, at this location, conglomerate, can be seen to rest unconformably on quartz diorite.

Stockwell (5) expressed some doubt whether the quartz-feldspar porphyry dykes were older or younger than the San Antonio formation. Furthermore, the age relationship of the San Antonio rocks with respect to some dykes of diabase that are younger than the quartz diorite and quartz feldspar porphyry had never been determined.

Neither quartz-feldspar porphyry nor diabase has ever been found to intrude the San Antonio rocks. It now seems fairly certain that the quartz-feldspar porphyry and "younger" diabase are older than the San Antonio formation. West of Little Rice Lake the stock-like intrusion of quartz-feldspar porphyry apparently lies partly beneath the San Antonio quartzite. Furthermore, the diabase dyke which intrudes the porphyry does not extend into the quartzite.

CHAPTER III

STRUCTURAL GEOLOGY

FOLDING

On previous pages it was stated that, within the map area, the Rice Lake group forms the south limb of an anticline whose axis, for the most part, lies to the north of the map area but may run beneath the San Antonio sedimentary rocks northeast of Little Rice Lake. Failure to locate the axis accurately may be attributed to the fact that marker beds and primary structures suitable for making top determinations are lacking. However, evidence for the anticlinal structure is as follows:

1. North of the map area, in the vicinity of the San Antonio mine, sedimentary beds face north and dip north.
2. The sedimentary gneisses in the south part of the map area dip south.
3. The lens of conglomerate on the Fisher claim, as stated earlier, probably overlies the rhyolite north of it. The conglomerate then, faces south.
4. The lithologic succession in the present map area is, from north to south, essentially the same as that north of here, from south to north, when the beds face north.

The axis, thus, probably lies somewhere within the unit of porphyritic andesite breccia which extends along the north edge of the present map area and the south edge of the area mapped in detail by Stockwell (5).

The absence of suitable marker beds and well-bedded sedimentary rocks made it impossible to recognize any minor folding, if present.

REGIONAL SCHISTOSITY

Regional schistosity or flow cleavage is not as well developed as in the area north of Rice Lake. Faint schistosity can often be recognized in many of the rocks of the Rice Lake group, but only where chlorite becomes a prominent constituent of the rock is schistosity distinct. Most of the fragmental volcanic rocks are very poorly banded and many are massive and apparently structureless.

Wherever schistosity can be observed it strikes ESE and dips almost vertically, sometimes north and sometimes south.

SHEARING AND FAULTING

Two prominent shearing directions are apparent; one, striking NNW, makes a large angle with flow contacts and regional schistosity, the other, striking more westerly, makes a moderate to small angle with contacts and schistosity. In the area as a whole these shearing directions are at angles of 60 to 80 degrees to one another.

Many diabase dykes lie parallel to the NNW shear zones and shears may occur along the contacts of, or within, the dykes. Other diabase dykes trend parallel to, or make small angles with, the westerly-striking shear directions.

Practically all the NNW shears dip steeply NE at angles of 70 degrees or more and the west-striking shears dip north at similar angles. Occasionally the direction of dip will be reversed, as along the shear passing through the Moose, Blue Bell, Saxton, Golden Vein, and Roland claims. On the north (north of Roland claim) it dips 80 degrees NE and on the south it dips 75 degrees SW (on the Moose claim).

Numerous dykes of quartz-feldspar porphyry, only the larger of which were mapped, trend in a direction roughly bisecting the shear directions. Many of the shears and dykes are remarkably straight for considerable distances but both show a distinct tendency to curve in broad arches.

Taking into account the heterogeneity of rocks in the area the structural pattern roughly fits the strain theory of deformation. If the intermediate axis of the strain ellipsoid be considered almost vertical, the shears correspond to the directions of maximum shearing stress and the porphyry may be considered to occupy tension fractures. Regional schistosity (flow cleavage), then, is parallel to the plane including the greatest and intermediate strain axes and normal to the least strain axis.

In many cases it is impossible to determine whether or not the shears have caused any displacement of the rocks they cut. However, several of the shears are quite clearly faults along which some movement has occurred. Displacement is most readily observed along NNW-trending faults; along these the movement is right-handed. Some of the east-trending shears on the Tine, Tine No. 1, Tine Fraction, and south of the Goldbar claims are faults; these show considerable left-handed movement.

Right-handed movement of NNW shears and left-handed movement of the E-W shears is what would be expected from the proposed orientation of the strain ellipsoid. The amount of horizontal displacement along the faults never exceeds 600 feet and in most cases is 200 to 300 feet or less.

The fact that all the structural elements can be suitably fitted in with the postulated strain ellipsoid would seem to indicate that they were all the result of a single process of deformation and hence all more or less contemporaneous. A compressive force operating from the NE or SW would satisfy the requirements of this theory.

It is not to be understood that all the shears and fractures formed at precisely the same time. On the contrary, there is evidence to indicate that deformation occurred over a period of time, before and during which quartz-feldspar porphyry and diabase dykes were intruded.

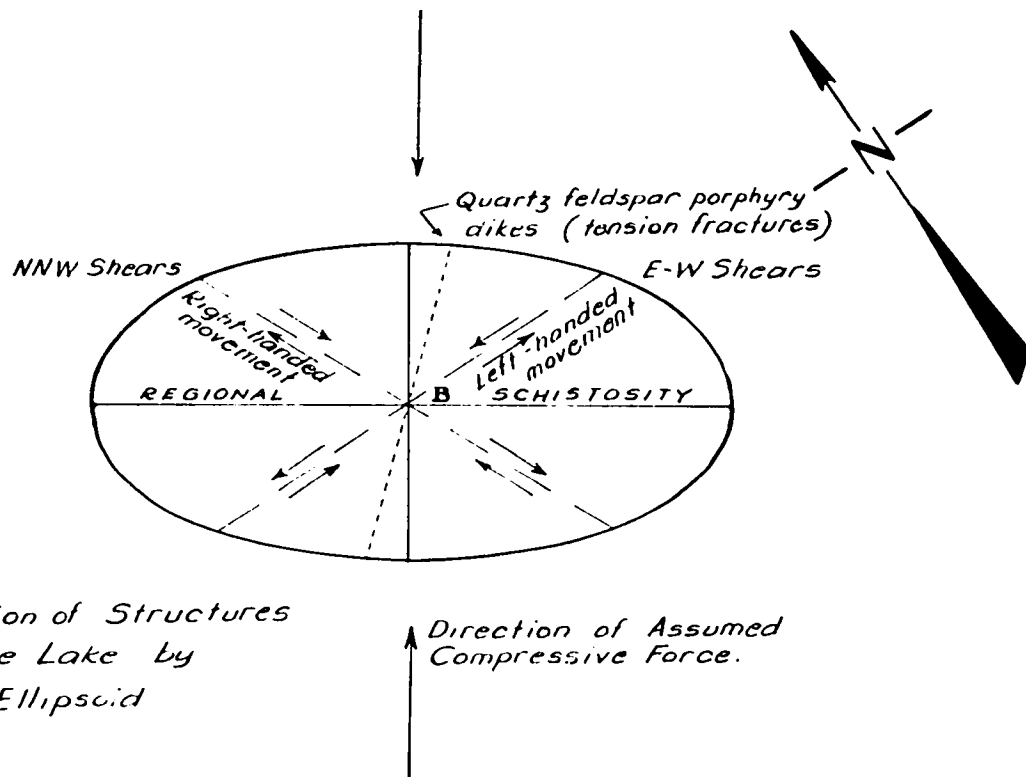


Fig. 2 Representation of Structures South of Rice Lake by the Strain Ellipsoid

The diabase dykes northeast of Little Rice Lake and the long one through the Pilot and Smuggler claims are essentially parallel to one another and undoubtedly were intruded into pre-existing fractures. That these fractures were probably early shears of the NNW set is evidenced jointly by the facts that they are parallel to the other NNW-trending shears and that some of these diabase dykes are themselves sheared parallel to their strikes. It would seem that some of NNW shear zones were formed prior to the intrusion of diabase and that deformation continued along the original zones and perhaps formed other later shears parallel to the early ones.

It has been pointed out that the quartz-feldspar dykes probably occupy tension fractures. These dykes generally do not exhibit schistosity. Southeast of Little Rice Lake some sills of porphyry parallel the schistosity in porphyritic dacite breccia; the sills themselves are not schistose. It is concluded that the quartz feldspar porphyry intruded after schistosity, where present, was developed, and consequently after most of the folding.

However, shearing continued past the time of intrusion of the quartz-feldspar porphyry, as many of the dykes are faulted and in places vein quartz is deformed, notably along the Pilot-Smuggler shear. It is pertinent that several shear zones appear to have acted as dams to the intrusion of quartz-feldspar porphyry. In some places small dykes meet a shear zone and, apart from a few small tongues intruding along the shear, stop abruptly, with no known counterpart on the other side of the shear or fault. Even along the same shear zone some quartz-feldspar porphyry dykes are dammed and others visibly faulted. Hence it is deduced that there was considerable overlap between shearing and intrusion of quartz-feldspar porphyry dykes. This is only to be expected, if the dykes fill tension fractures caused by the same deformation as formed the shears.

It therefore appears that throughout an extended period of deformation both diabase and quartz-feldspar porphyry dykes were being intruded, that the diabase dykes are mostly a little older than the quartz-feldspar porphyry, as shown by cross-cutting relationship, but some are a little younger (e.g., those in the porphyry plug west of Little Rice Lake), and that deformation continued for a time after both diabase and porphyry were introduced into the shears and fractures.

Pronounced variation in both intensity and width of shearing along the strike is exhibited by many shears, especially those striking NNW. In some instances shears 25 or 30 feet, rarely up to 50 or 60 feet wide, pass rapidly into obscure and barely noticeable zones of shattering a few inches wide. This change may occur within a length of 50 to 100 feet along the strike, but usually the distance between very strong and very weak shearing is several hundred feet. Further along its length the zone of shearing may reappear with great intensity.

The above instances of pinching and swelling of shears represents about the extreme as found in the area investigated. Usually the widest parts of shear zones are 10 to 20 feet and, if they pinch, narrow down to a half or a quarter of these widths.

Pinching and swelling of shearing in the Rice Lake area was observed by Cooke, who stated that the shears widened considerably where they changed in strike. Within the limited area studied, the writer was unable to establish that changes in strike were responsible for appreciably in-

creased intensity and width of shearing. For the most part abrupt changes in strike are absent. Gentle curving of the shears is more common. No doubt this pinching and swelling can be attributed to the complexity of local stresses set up within the deforming rocks but this cannot be clearly related to differences in rock types. Pinching and swelling is as apparent within any one lithologic unit as it is between different ones. Many shears were observed to pass from one rock type to another without becoming significantly more or less intense.

With one exception, it cannot be stated that any particular rock type of the Rice Lake group, within the area studied, is more favorable than any other for the formation of shears and fractures. The exception noted is that the quartz-biotite-feldspar gneiss does not appear to have been amenable to the formation of these structures. The readiness with which shears form in the fragmental volcanic rocks in this area is in contrast with the behavior of similar rocks north of Rice Lake. There, the fragmental volcanic rocks are far more laminated and schistose and have not sheared or fractured to any great extent.

STRUCTURE OF THE SAN ANTONIO FORMATION

Previous investigations have shown that the San Antonio quartzite near the northwest corner of the area forms the south limb of a syncline. During the present work little time was spent in studying this formation.

However, it should be noted that the rocks at the contact of the San Antonio formation and Rice Lake group are sheared and faulted in two places, one east of Little Rice Lake on the Lisgar claim, and one at the northwest corner of the lake.

CHAPTER IV

ECONOMIC GEOLOGY

GOLD-BEARING QUARTZ VEINS GENERAL CHARACTER

Quartz veins are widely distributed throughout the area. They are found in all the rock types of the Rice Lake group except the quartz-biotite-feldspar gneiss. Several veins occur in the granite contact zone and others in the quartz-feldspar porphyry mass west of Little Rice Lake. A few unmineralized stringers of quartz are found in short fractures in the San Antonio formation; these are of no economic interest.

Within the rocks of the Rice Lake group and younger intrusives, quartz veins occupy both west- and NNW-trending shear zones. Their distribution is shown on the accompanying map (52-1) where quartz is represented by heavy black lines. Occasionally, as on the Tine claims, Bear claims, and in a few other places, NE-trending veins occur. These branch off the east-trending shear zones and occupy cross fractures.

Like the shear zones, most of the NNW veins dip steeply NE, and the E-W veins dip north.

Many of the shears contain numerous closely-spaced, disconnected lenses and pods of quartz. In others, quartz occurs as more or less continuous veins up to 1,000 feet or more in length. In some cases the vein material consists of closely-spaced parallel and branching stringers of quartz alongside a main band of quartz. Locally, vein quartz outcrops as large dome-shaped masses.

Most of the veins, whether composed of lenses, stringers, or a single band of quartz, are from 400 to 600 feet long. Many shears contain several short veins, 200 feet long, more or less, separated by similar lengths of barren sheared rock.

Many of the veins have a banded structure, due to the presence of thin ribbons and streaks of wall-rock schist and partings of tourmaline. The bands are often considerably contorted.

Both white and dark quartz are found in the veins. Much of the quartz is fractured and splintery; in some instances it has been intensely crushed and granulated. Buff-coloured ankerite is commonly associated with the quartz. This may occur either as irregular patches in, or as narrow veinlets cutting, the quartz. The presence of tourmaline and chlorite ribbons has already been mentioned. Reddish albite is present in some veins, and locally is fairly abundant.

Mineralization

Pyrite is the most abundant sulphide in the quartz veins. Chalcopyrite is frequently present, and small amounts of sphalerite and galena have been found in a few veins.

Pyrite is widely, but usually not very evenly, distributed throughout the veins. In most veins there are considerable lengths that are unmineralized; in many, only short sections carry pyrite. Usually the pyrite is finely disseminated throughout the quartz. In some instances it occurs as small cubic crystals or blebs up to one-eighth of an inch across. Small fractures in the quartz are often filled with fine granular pyrite. Ribbons of schist in unmineralized quartz usually contain small grains of this sulphide.

The occurrence of chalcopyrite is similar to that of pyrite.

The quartz veins are of economic interest only for their gold content. Gold is widely distributed throughout the area but, like the sulphide mineralization which it accompanies, is scattered in discontinuous patches in the veins. High grade material may pass rapidly into low grade or barren quartz. Many veins in the area are well known for their content of spectacular visible gold. The Gold Pan vein is a notable example.

Wall-Rock Alteration

Shearing has produced the familiar chlorite-sericite-saussurite alteration. Often, deposition of vein quartz in the shears has not resulted in any further alteration. In many cases, however, the wall-rocks have been albitized, carbonatized, pyritized and, to a lesser degree, silicified. The effects of hydrothermal alteration rarely extend more than a foot or so beyond the walls of the vein. Wall-rock alteration appears to have preceded the deposition of the bulk of the vein quartz.

Albite wall-rock alteration is best developed along veins in the vicinity of quartz-feldspar porphyry dykes. However, it also occurs where these dykes are not nearby. The albitized rock consists of schist impregnated with fresh, clear albite, sometimes accompanied by sericite and quartz. In exceptional cases these minerals comprise 60 per cent or more of the wall-rocks, but more commonly it is considerably less than this amount.

The most extensive development of albitization in the area is found along the vein crossing the Josephine, Ina Fracture and Mildred claims. This vein occupies a NNW shear crossed by two dykes of quartz-feldspar porphyry. Along the zone between the two cross-cutting dykes, small stringers of porphyry have been injected into the shear, and the schist has been impregnated with a fine granular aggregate composed mostly of red albite and some quartz. Some small irregular blebs and lenses of vein quartz occur within the quartz-feldspar porphyry and fine albite-quartz aggregates. Medium-sized grains of reddish albite are distributed throughout the main quartz vein. Usually these are widely scattered, but in places the albite content of the vein increases to the point where the vein material somewhat resembles quartz-feldspar porphyry. In such instances, no sharp distinction can be made between quartz-feldspar porphyry with a high quartz content and vein quartz with a large amount of albite.

Pyrite and ankerite usually occur together in the wall-rocks. They are most abundantly developed as alteration products along veins in diabase. In these cases, numerous small cubes of pyrite and irregular patches and stringers of ankerite are found in a mixture of dark green chlorite and finely divided ankerite.

In volcanic rocks, this type of alteration although not so extensively developed as in diabase, consists of pyrite and ankerite in an aggregate of chlorite sericite, albite and saussurite.

Available information indicates that, unless traversed by small quartz stringers, the altered wallrock does not as a rule carry appreciable values in gold. However, prospectors have reported occasional assays as high as 0.10 ounces gold per ton from altered wall-rock.

Silicified, Pyritized Zones

West of Walton Lake, just east of the small swamp at the contact between rhyolite and quartz-biotite-feldspar gneiss, the rhyolite has been extensively silicified and pyritized. The altered rhyolite is traversed by numerous small patches and stringers of quartz, 1 to 4 inches wide. A great many stringers trend northeast, the remainder strike in many directions. The zone is a typical stockwork with vein quartz forming 10 to 20 per cent of the outcrop area. The entire zone has been silicified and carries abundant pyrite, either finely disseminated, or in blotches and cubes up to 1/10 inch across. Pyrite is also abundant, and chalcopyrite is commonly found, in the clear quartz.

Samples of sulphide-bearing clear vein quartz and several of silicified and pyritized wall-rock were assayed for gold and found to contain little or none.

A similar silicified zone occurs at the east end of Walton Lake, also in rhyolite near its contact with quartz-biotite-feldspar gneiss. No large quartz veins are known to occur in the vicinity of either of these zones.

North of Walton Lake, towards the Bear claims, the rhyolite contains very numerous small stringers of quartz that fill NE-trending fractures.

LOCALIZATION AND ORIGIN OF VEINS

The distribution of gold deposits in the region between Lake Winnipeg and the Interprovincial Boundary is shown in figure 1. Stockwell (6), recognizing a concentration of veins south of Rice Lake and another west of Beresford Lake, concluded that this distribution indicated a genetic association of the veins with the large egg-shaped mass of quartz diorite between these two localities. This quartz diorite may be significant, but the writer believes that structural conditions in these two areas were in great measure responsible for the occurrences of the large number of veins present. Quite apart from the presence of veins, the rocks in these two areas contain very numerous, strong, well-defined shear zones. Shears, filled with quartz or otherwise, are of far less frequent occurrence elsewhere along the entire belt of Archean volcanic and sedimentary rocks.

In the introductory chapter it was pointed out that in the localities around Rice Lake, and around Beresford Lake, the Rice Lake group of rocks is decidedly wider than elsewhere; and further that in both places the volcanic and sedimentary rocks are folded into anticlines. It is probably also significant that a greater variety of interbanded rock types are present in these two areas than in the narrower bands of the Rice Lake group.

It is deduced that during deformation the physical conditions within the wide blocks of lavas and sedimentary rocks were different from those in the narrower bands flanked by intrusive rocks. Under deformation (implying heat, confining pressure, and directed pressure), the narrow bands behaved in a plastic manner and the wider blocks, as a whole, behaved in a brittle manner, with the result that shears developed readily in the latter rocks. Within these wide blocks, composed of heterogeneous assemblages of massive lava flows, banded and massive fragmental volcanic rocks, and bedded sedimentary rocks, the more massive, brittle, and competent of these rock types sheared and fractured more readily than the banded members, in which stresses were relieved by adjustment between bands. The area investigated in the present study consists of the southern half of the wide block of Rice Lake group rocks around Rice Lake. In this half of the block the rocks are more generally massive than those in the northern part, where massive rocks alternate with banded ones.

The fact that quartz veins occur in both NNW and east-west sets of shear zones, has already been discussed. However, it is difficult to determine why vein quartz is confined to certain portions of the shears. For example, the Pilot-Smuggler shear has a total length of more than 12,000 feet and is wide and strong throughout. Yet vein quartz is confined to three localities close to one another. Together these veins total 2,200 feet in length. Numerous similar examples could be pointed out. No structural reason can be given for the localization of vein quartz along certain portions of a shear and its absence along other portions of the same zone.

It is a recognized fact that in the San Antonio mine structures favourable for the localization of quartz veins are confined to massive, brittle diabase. In the area south of Rice Lake many veins occur within or along the contacts of diabase dykes intruding the volcanic rocks. Recognition of the frequent presence of veins in diabase, and specifically, of the localization of producing veins of the San Antonio mine in this rock, has resulted in a widespread feeling that diabase dykes throughout the area as a whole, are particularly favourable host rocks for veins. While not disputing the frequent occurrence of veins in diabase, the writer feels that generalizations of this sort are misleading, and should not be accepted without certain reservations.

It has already been shown that many of the diabase dykes in the area under study, were intruded along pre-existing shear zones, some of which were subjected to further shearing after the emplacement of the dykes. As a result of the same prolonged period of deformation as that which caused the original shears along which the dykes were intruded, numerous other shears were formed in the Rice Lake group of rocks. In fact, there are many more shear zones in the Rice Lake group of rocks than there are in or along diabase dykes intruding these rocks.

The possibility that later stages of shearing could have been confined to diabase is not overlooked, but this does not appear to have happened.

Further to this discussion, it should be pointed out that the reason diabase is structurally favourable at the San Antonio mine is because it is more competent and brittle than the well-laminated sedimentary rock which it intrudes. It should also be noted that the veins there are confined to the evident parts of the diabase and that where it narrows down to 200

feet or less it loses its superior competency. With these facts in mind, two important differences between the San Antonio mine area and the present one are apparent.

Firstly, only rarely do the diabase dykes in the area under study exceed 200 feet in width. Secondly, a great many rocks of the Rice Lake group are quite as massive as the diabase; this is in direct contrast to the well-laminated nature of the sedimentary and fragmental volcanic rocks round the San Antonio mine. Thus the volcanic rocks in the southern Rice Lake area are equally as favourable for quartz-bearing structures as are the diabase dykes. However, these dykes, since they often occupy pre-existing shear structures, may still often be expected to be the loci of quartz veins. Narrow diabase dykes, then, can be considered a guide to the presence of veins; but they should not be considered any more favourable than massive volcanic rocks. It is unrealistic to compare the structural behaviour of these dykes to the wide sill of diabase at the San Antonio mine.

Lest the active role of diabase in influencing the formation of the veins be unduly minimized certain other factors should be pointed out. In certain cases, notably at the Gold Pan mine, the diabase appears to have had a damming effect on the quartz- and gold-bearing solutions. A dyke of diabase about 30 feet wide cuts across the north part of the Gold Pan claim. It is intersected by a NNW shear and at the junction of the shear and dyke a narrow quartz vein abuts against the south side of the dyke. Spectacular concentrations of visible gold are reported to have been found in the quartz against the dyke. The gold content rapidly diminishes southward away from the diabase.

It has been stated that concentrations of pyrite and ankerite, greater than usual, are found in the walls of veins in diabase. Considering that diabase contains more Fe and Mg than the rocks of the Rice Lake group, it is reasonable to suppose that these elements were derived from the diabase to form pyrite and ankerite. Consequently, the diabase must have exerted some chemical influence on the mineralizing solutions. If this is so, the diabase may have acted as a chemical agent assisting or indirectly responsible for the deposition of gold.

The association of gold-bearing quartz veins with dykes of quartz-feldspar porphyry has been observed in this as in many other areas. Although the veins are younger than the porphyry, they both formed during a single prolonged period of intrusion and structural deformation. This close association in time is, by itself, insufficient reason for believing that the mineralizing solutions were derived from the porphyry or even that they came from the same source. However, other evidence points to one or other of these probabilities.

The most obvious point in favour of one or other of these ideas is the association of pink albite with many veins. Intense albitization of wall rock has been mentioned previously; in addition, many veins contain pink albite in the quartz. The extreme case is that of the Josephine-Mildred vein referred to previously. It will be recalled that fine quartz-albite aggregates and quartz-feldspar porphyry stringers have been injected along the shear, where it is crossed by two dykes of porphyry. The quartz-albite aggregate and porphyry both contain blebs and lenses of quartz; the main quartz vein carries notable quantities of pinkish albite. There is often no sharp distinction between vein quartz with considerable albite and some quartz-feldspar porphyry with extraordinary amounts of quartz.

FUTURE POSSIBILITIES OF THE AREA

The entire region around Rice Lake, including that portion covered by the present investigation, received considerable attention during the years following 1911, when gold was first discovered there. The Gold Pan Mine, commencing production in 1916, was the first gold producer in the area.

Early exploration and development work appears to have been confined largely to digging pits and trenches and sinking shafts indiscriminately on veins, and even on shear zones devoid of vein quartz. This can be understood when it is considered that early workers were influenced by experiences in the Cobalt field.

Except for one or two properties, activity subsided. During the 1930's, following the rise in the price of gold, interest in the area was revived. Considerable exploratory work was carried out, much of it of a high calibre. Some diamond drilling was done on several properties and shafts sunk on the Gold Lake and Packsack properties. Underground work was unsuccessful in developing orebodies.

In recent years activity in the area has been sporadic.

While recognizing the lack of success in developing any of the numerous gold-bearing veins in the area, the writer is convinced the area warrants further detailed exploration when economic conditions become favourable for the development of gold properties.

The erratic manner in which gold occurs in the veins of this area necessitates very close and careful sampling. It is probable that the earlier work was concentrated on the high grade sections and that detailed sampling was neglected.

If and when, economic conditions become favourable to the development of gold properties this region south of Rice Lake should become the scene of considerable renewed activity.

CHAPTER V

DESCRIPTION OF PROPERTIES

PACKSACK MINES LIMITED

Packsack Mines Limited was incorporated in 1934 and acquired a group of claims southwest of Little Rice Lake. The following claims comprise the group: Montcalm, Montcalm Fraction, Helen Fraction, Clappelou, Acme, Tine, Tine 1, Tine Fraction, Tine 1 Fraction, D.A.M. Fraction, Ivie, Noble, Noble 1, Noble Fraction, and Osceola. Some of these claims were staked as early as 1917. Company offices are at 900 Hamilton Building, Winnipeg, Manitoba.

Preliminary investigation was followed by considerable trenching, diamond drilling, and the sinking of a shaft on the Montcalm claim. The shaft served to allow underground exploration of several veins on this claim. Operations were suspended in 1937 but resumed for a few months in 1940. Since that time the property has been inactive.

A total of nearly 15,000 feet of diamond drilling, both surface and underground, was done. The shaft was sunk to a depth of 500 feet and a total of 2867 feet of drift driven.

Geology

Bedrock on the property consists of two bands of porphyritic dacite breccia separated by a band of andesite porphyry; rhyolite outcrops across the southwest quarter of the claim group. Narrow dykes of diabase are very abundant. These strike in two directions, approximately north 25 degrees west and north 85 degrees east. An irregular-shaped diabase intrusive occurs on the Ivie claim. Most of the dykes are less than 50 feet wide.

Several outcrops of San Antonio quartzite are present at the northwest corner of the Montcalm claim and on the Helen Fraction. At the northern limit of exposure of the Rice Lake group the volcanic rocks outcrop along a steep cliff 75 feet or more high. The bulk of the San Antonio formation north of this locality outcrops in high rolling hills. The unconformable contact between the San Antonio rocks and those of the Rice Lake group lies under a wide, deep, drift-filled valley.

Veins

Montcalm Claim

Five separate veins outcrop on the Montcalm claim in the vicinity of the Packsack shaft.

The *Big Dome vein* strikes northwesterly towards the Packsack shaft. It dips steeply northeast, is about 15 feet wide at the northwest end of exposure and thins southward. It is well exposed for a distance of 250 feet but has been traced an additional 70 feet towards the shaft. Pyrite mineralization is sporadic.

The *South Montcalm vein*, located about 200 feet south of the shaft, consists in part of a single vein and in part of a series of closely-spaced lenses. It can be traced for a total distance of 500 feet with a 50 foot discontinuity where a shear crosses the contact between dacite breccia and andesite porphyry.

The south end of the north portion of the vein abuts against a thin diabase dyke, and at this point is about 50 feet wide. Within a distance of a few feet towards the south it narrows rapidly and disappears entirely, then reappears south of the sheared north boundary of andesite porphyry. North of the wide part the vein splits into two veins making a small angle with one another. Small amounts of pyrite are scattered through parts of this vein.

The *Golden Stairway vein*, located about 300 feet southwest of the shaft, strikes north 10 degrees west for a length of 200 feet, the northern 100 feet being in a sheared chloritic diabase dyke. The vein consists of irregular lenses of quartz. A small amount of pyrite is present in the quartz and cubes of this mineral, along with ankerite, are common in the wall-rock diabase. The south end of the vein curves toward the east and dies out. A short east-trending quartz lens outcrop between the Golden Stairway vein and the Central Montcalm vein a few feet to the east.

The *Central Montcalm vein* is located 200 feet south of the shaft, strikes east, and is fairly well exposed by a series of trenches. The vein is up to 40 feet wide and contains some inclusions of country rock. It can be traced for a length of 150 feet. Partings of tourmaline and ribbons of schist, patches of ankerite and some disseminated pyrite are present in the quartz.

All the above veins were extensively explored by surface work, diamond drilling, and underground development. Gold values were reported to be erratic, with many mineralized, high grade sections passing rapidly into barren quartz. The bodies of quartz were not continuous or uniform from surface to the underground workings.

The *West Montcalm vein* which outcrops 500 feet west of the shaft can be traced 300 feet in an ENE direction. A shorter vein occurs a few feet north. Neither one is mineralized and no gold assays were obtained from samples taken.

Tine Claims

A large number of shear zones and veins outcrop on the Tine and Tine 2 claims. Three of these veins, named the *North Tine*, *Middle Tine* and *South Tine* show evidence of considerable work having been performed. The writer found no evidence of diamond drilling.

The *North Tine vein* occurs in the west part of an east-trending shear zone which at its west end is intersected by a gently curving NNW shear. The vein is confined to that portion of the shear which passes longitudinally through a narrow diabase dyke. The dyke is 20 to 30 feet wide and shearing is apparent for a width of about 15 feet. The quartz vein is 3 to 5 feet wide and can be traced for a length of 800 feet. The vein is fairly well mineralized with pyrite and some chalcopyrite. Visible gold has been found in the vein but values are reported to be spotty.

The Middle Tine vein crosses the centre of the north-south boundary between the Tine and Tine 1 claim. The vein lies along the north side of a long shear zone that can be traced across the Ivie, Tine and Tine 1 claims on to the Acme claim where it passes under overburden. The continuation of this shear is found near the west boundary of the Acme claim and can be traced another 500 feet west to a small lake. The total distance along the shear from the lake to the eastern end is 5,600 feet. Along this length a total of 2,000 feet of vein quartz is found in various veins, one of which is the Middle Tine vein.

Just west of the Middle Tine vein, along the south side of the same zone, lies the South Tine vein. It consists partly of lenses and small veins and, in part, of a single continuous vein.

Both the Middle and South Tine veins average 3 to 4 feet in width, but are as narrow as $1\frac{1}{2}$ feet in places. They include a length of 1,000 feet of almost continuous quartz. Disseminated pyrite is scattered throughout these veins, and good gold assays are reported from some of the mineralized sections. Further vein quartz is found farther along the zone where it intersects the east boundary of the Acme claim.

Near the north border of the Tine claim, a quartz vein 700 feet long cuts through a diabase dyke at a small angle. The western part of the vein lies along the south contact of the dyke and the eastern 250 feet lie just north of the diabase. The shear zone in which the vein occurs continues east, where it intersects another shear, and west, where it occurs above the south contact of the diabase.

The vein consists of closely-spaced small lenses of quartz. The maximum width of the quartz zone is 25 feet but the average is 5 feet or less. Practically the entire vein is well mineralized with disseminated pyrite. The writer has no information regarding gold assays obtained from this vein.

On the Tine 1 claim, 400 feet south of, and parallel to, the long shear that contains the Middle and South Tine veins, another strong shear occurs. Three separate small quartz veins, each about 200 feet long, are found along this south shear. These veins are banded, having tourmaline partings, and are scantily mineralized with pyrite. A northeast-trending cross fracture extends between the two east-trending shears and vein quartz is found in two places along this zone.

Ivie, Osceola, and Clappellou Claims

In the northern half of the Ivie claim numerous short disconnected lenses of quartz, separated by lengths of barren schist, lie within the same long shear zone that extends across the Tine and Acme claims. These quartz lenses, averaging 3 feet or less in width, can be found across almost the whole width of the Ivie claim.

In the southwest corner of the same claim a series of lenses, each less than a foot wide and 5 or 6 feet long, extends for a distance of about 400 feet in an easterly direction. At the east boundary of the claim, another vein, up to 3 feet wide and more than 100 feet long, crosses over onto the Ivie Fraction (not owned by Packsack Mines Limited).

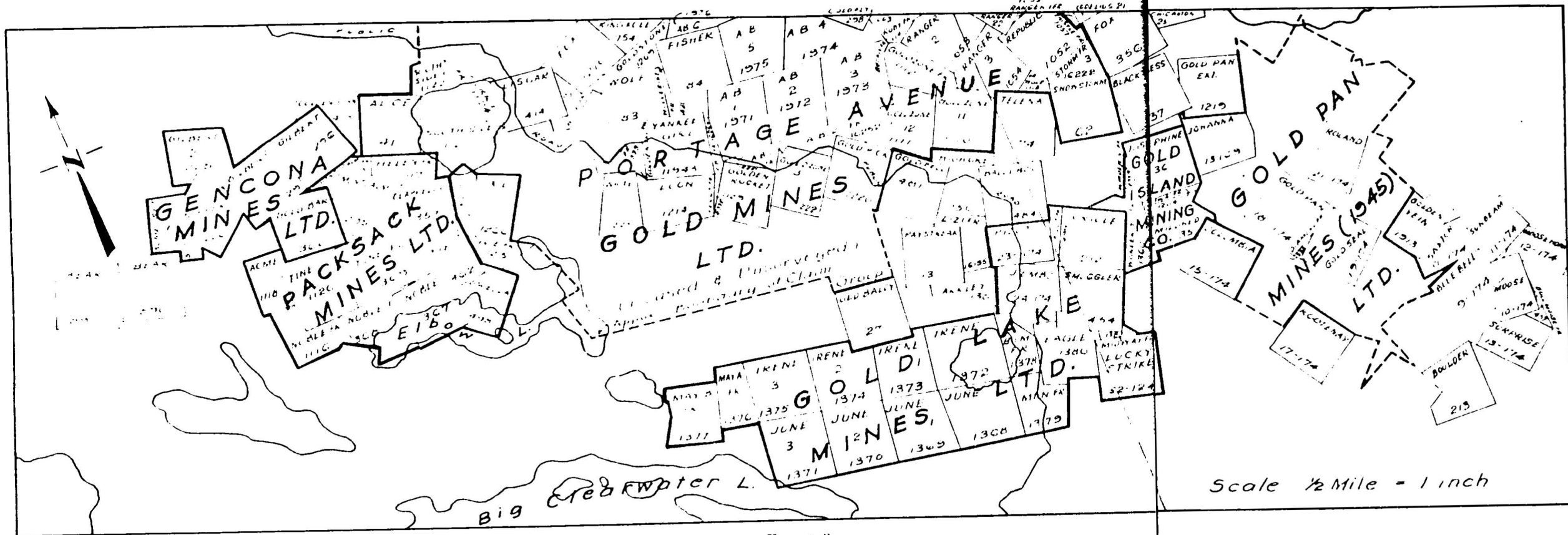


FIGURE 3
Showing Boundaries of Properties.

Also on the Ivie claim, two large veins, about seven feet wide, occur in an irregular mass of diabase and pass under muskeg on the west.

A long shear zone trends NNW through the Clappelou claim and contains several quartz veins. The shear varies in width from 100 feet to 3 feet but averages 10 feet or less. Quartz is found within the main shear and in small parallel shears and gash fractures along the main shear. The veins, which range in width from 8 feet to 1 foot, are composed of a series of lenses and stringers of quartz. The quartz is only sporadically mineralized. Fair gold assays are reported from some of the quartz.

On the Osceola claim, in the vicinity of numerous east-west shears, a quartz vein 300 feet long, and many small quartz lenses about 6 inches wide, occupy a narrow sheared zone. These veins run into a bay on the north shore of Elbow Lake.

GENCONA MINES LIMITED

Gencona Mines Limited was formed in 1944, to consolidate the holdings of Geneva Gold Mines Limited, Conley Mines Limited and Albany Consolidated Mines Limited. The company holds a group of claims west of the Packsack property, composed of the Gilbert, Gilbert 1, Gilbert 2, Goldbar, and Nipper claims. In addition, the Arkley fraction, Ballyhoo, and High Ore claims, all in the central part of the area, are held by this company.

The Gilbert and adjoining claims were originally staked following 1912, during the early days of prospecting. Exploration consisted of surface stripping and trenching. During the early thirties a shaft was sunk to a depth of 35 to 40 feet on a vein on the Gilbert claim. Specimens of quartz carrying visible gold are reported to have been taken out of the shaft. No diamond drilling has been done on any of the company's claims.

Geology

The bedrock on the group of claims west of the Packsack property consists of porphyritic dacite and trachyte breccia, andesite porphyry, and rhyolite, all intruded by small dykes of diabase and a large stock-like body of quartz-feldspar porphyry. Most of the diabase dykes are older than the quartz-feldspar porphyry but two definitely intrude it. The margins of these diabase dykes are chilled against the porphyry.

The San Antonio formation covers the northward extension of all these older rocks.

Veins

Several veins are found on the property; most of these lie within or adjacent to the large mass of intrusive porphyry. Some of the veins strike in a northerly direction; the remaining strike approximately west.

On the Gilbert claim the shaft was sunk on a narrow vein where it cuts the hook-shaped end of a diabase dyke. The vein consists of numerous stringers and "splashes" of white quartz in a zone trending north 20 degrees east. The quartz is heavily mineralized with pyrite and is reported to have carried much visible gold in the shaft. The vein cannot be traced very far north or south of the shaft, but another short vein occurs along the same shear about 300 feet to the south.

Eleven hundred feet east of the shaft a second vein, almost parallel to the first, cuts the quartz-feldspar porphyry. This vein is up to 25 feet wide and contains numerous tourmaline partings. It is sparsely mineralized with pyrite.

In the south part of the quartz-feldspar porphyry mass, several veins trend in an easterly direction. These veins are fairly narrow, probably averaging 2 to 3 feet and consist of lenses and stringers of quartz in sheared porphyry. Scattered pyrite is common throughout the quartz and is finely disseminated in the schisted wall-rock. Encouraging gold values have been reported from certain sections of these veins.

South of the porphyry intrusion, on the Goldbar claim, a narrow vein occurs within a diabase dyke. Both vein and dyke strike NNW and portions of the vein are well mineralized with pyrite.

No veins are known to occur on the Arkley Fraction, Ballyhoo, or High Ore claims, although several strong shear zones traverse these claims.

MISCELLANEOUS VEINS IN WESTERN PORTION OF AREA

Several strong shear zones trend west across the Bear and Bear 1 claims. One such zone, which runs through the centre of both claims, contains several quartz veins. Generally this shear is rather narrow, 3 to 5 feet, but well defined. On the Bear 1 claim the quartz is from 1 foot to 5 feet wide and extends for 200 feet. Further along the shear, on the Bear claim, near its western boundary, a similar vein contains sparse pyrite and chalcopyrite. A few feet further east, quartz is again found in the shear and a cross vein branches southwest from the main zone. In this vicinity the quartz reaches widths of 6 feet and is mineralized with scattered pyrite.

Four hundred feet south of the north boundary of the Bear claim a shear zone, parallel to the one discussed above, contains a small quartz vein 2 feet wide and 50 feet long. The shear runs into a swamp to the east, but reappears on the east side of the swamp, and continues along a quartz-feldspar porphyry dyke. It runs onto the Acme claim near its northwest corner. A little quartz is found for a length of 100 feet in this shear just west of the Acme claim.

Small amounts of quartz are found on the east shore of the small lake north of Walton Lake. The quartz occurs in east-west shears which are extensions of the two long zones that traverse the Tine and Acme claims.

There are numerous other shears west of Walton Lake but most of these carry only very small scattered lenses and stringers of quartz. Near the west boundary of the map area, due west of the north end of Walton Lake, one of these shears contains a quartz vein about 400 feet long. This vein consists of numerous stringers and lenses of quartz for a width of perhaps 4 or 5 feet. The quartz is smoky, almost black, fractured and carries disseminated pyrite. Both ends of the veins are covered by overburden.

Many sheared zones, a few having quartz veins, also occur in the area bounded by the northeast shore of Walton Lake, the south shore of Elbow Lake, Little Clearwater Lake and the north shore of Big Clearwater Lake. These shears all trend a few degrees south of east and dip steeply north. A few veins found in these shear zones consist of stringers and short lenses of quartz, making up total widths which seldom exceed 1½ feet.

East of the Osceola claim and west of the north-south arm of Elbow Lake, a wide zone consisting of numerous parallel and branching shears contains three closely-spaced quartz veins. The largest of these is 900 feet long and up to 35 feet wide. The quartz is white and contains many thin tourmaline partings. Sulphide minerals are rare.

Between Little Rice Lake and Elbow Lake the I.X.L. Fraction and Ivie Fraction contain quartz veins which are extensions of those found on the Clappelou and Ivie claims respectively (the latter two claims owned by Packsack Mines Limited). Other shears, one with a small quartz vein, are found on the I.X.L. claim adjacent to the I.X.L. Fraction.

PORTAGE AVENUE GOLD MINES LIMITED

Portage Avenue Gold Mines Limited, in which a controlling interest is held by San Antonio Gold Mines Limited, was incorporated in 1949. The company acquired a large group of claims east of Little Rice Lake. Some of these are owned and others are held under option by the company. Within the map area the group includes Southside 1, Southside, Currie Fraction, Alice, Lisgar, Fox, Wolf Fraction (84), Wolf, White, Golden Truth Fraction, Loon, Yankee Girl, Golden Rocket, Wolverine Fraction, Fisher, Goldstone, A.B. 1 to 6, Ruby Fraction, Buckle Fraction, Goldzone, Ranger 2, Ranger 3, Ranger 22, Republic, Storm Fraction, Wolf Fraction (1113), Rush Fraction, Goldzone 11, Goldzone 12, Goldzone Fraction, Goldzone 3, Gold Pick, A. B. 2 Fraction, A. B. Fraction, and Golden Rocket. In addition to these claims the company has under option some unleased ground adjoining the above ground on the south.

Many claims of the group were staked prior to 1920. Delury (2) and Wright (4) both refer briefly to veins on the Wolf and Yankee Girl claims. A small shaft was sunk on a vein on the Wolf claim. Other early work was confined to surface stripping and trenching. No diamond drilling is known to have been done on any of the veins prior to the acquisition of these claims by Portage Avenue Gold Mines Limited.

Geology

Rocks of the Rice Lake group outcropping on this property include porphyritic andesite breccia, rhyolite, a small lens of conglomerate, porphyritic dacite and trachyte breccia, and andesite porphyry. These are all intruded by dykes of diabase and quartz-feldspar porphyry. A few small outcrops of San Antonio quartzite are found in the drift-covered area east of Little Rice Lake. Northeast of the lake the San Antonio formation is faulted against porphyritic andesite breccia. At the southeast corner of the lake it rests on a small quartz diorite intrusion. Little Rice Lake is probably largely underlain by San Antonio quartzite.

Veins

East of Little Rice Lake are seven separate shear zones all trending NNW, parallel, or almost so, to one another and to several diabase dykes. Other shears in this vicinity and elsewhere on the property trend approximately east, though a few strike somewhat north or south of east. Vein quartz is found in considerable amounts along both sets of shears.

North-Northwest Set of Veins

These seven veins occupy shear zones striking north 25 degrees west to north 30 degrees west and dipping steeply northeast at angles of 75 degrees or more. Some of the shears can be traced for as much as 4,000 feet. In addition to the NNW shear, the so-called Pilot-Smuggler shear zone, which runs along a diabase dyke, crosses the Goldzone 11 claim. The strike of this shear on the Goldzone 11 claim is about north 5 degrees west.

Some of the NNW shears appear to follow narrow light green felsite on rhyolite dykes.

The most westerly, or *No. 1 shear*, of the NNW set touches the southwest corner of the Wolf (83) claim and has been traced for a distance of 400 feet northwest and 1,100 feet southeast of this point. On the southeast it passes into muskeg but reappears on the southeast end of the muskeg and can be traced 800 feet farther southeast where it then passes into a narrow, fairly straight, drift-filled depression. The shearing cannot be traced along the depression but a shear reappears at the southeast end. It is probable that shearing continues along the floor of the depression.

The shear follows a narrow light green felsite dyke. North of the road several discontinuous veins occur in a zone about 400 feet long along the west side of the shear. Individual veins or lenses trend almost parallel to the strike of the shear. The lenses vary in width from 4 to 10 feet. North of these veins similar short parallel and echelon veins continue on the east side of the shear. These average about 2 feet in width.

South of the road similar occurrences of vein quartz extend for 300 or 400 feet.

Most of the quartz in the No. 1 zone is sparsely mineralized, although some patches contain considerable disseminated pyrite.

The No. 2 zone, a few hundred feet east of No. 1, crosses the northwest corner of the Yankee Girl claim, extends south across this claim, and north across the Wolf (83) claim. The shear zone and vein have long been referred to as "The Yankee Girl." The zone is composed of a main shear and several parallel shears and veins following a NNW diabase dyke. The dyke is slightly dragged and offset near the northwest corner of the Yankee Girl claim. Shearing and vein quartz occur in widths up to 50 or more feet. Lenticular veins of quartz parallel to one another and in echelon arrangement occur along the west part of the zone. Some of these veins are up to 20 feet wide. Close to the road, quartz outcrops in a large dome-shaped mass up to 60 feet across. South of the road the zone swings in a southerly direction. Vein quartz continues to be present to the point where the southern extension of the shear zone becomes overlain by muskeg.

Portage Avenue Gold Mines drilled the No. 2 zone in the vicinity of the road. Four short holes with a total core length of 522 feet were put down there.

Much of the quartz along this zone contains numerous thin tourmaline ribbons, and minor brown ankerite in places. The tourmaline is sometimes crumpled into small folds and the quartz fractured. Sulphides are not abundant.

The No. 3 zone intersects the southeast corner of the Wolf (83) claim and crosses the northeast portion of the Yankee Girl claim. The shear averages about 5 feet wide and dips 30 degrees to the northeast. Near the southeast corner of the Wolf claim a quartz vein about 3 feet wide and 150 feet or more long has sharp frozen walls with the sheared country rock. The quartz contains numerous thin black tourmaline ribbons and is very sparsely mineralized with fine pyrite.

The northwest end of the No. 3 zone, near the centre of the Wolf claim, contains several small veins similar to the one just described. Two holes, with a total length of 268 feet were drilled into two of these veins at the northwest end of the zone.

The south part of the shear passes under muskeg but reappears south of the road as a weak fracture containing a small lens of quartz about 3 feet wide and 20 feet long. At the point where the east boundary of the Yankee Girl claim crosses the road a narrow shear containing some unmineralized quartz appears to branch off the No. 3 zone.

The No. 4 zone begins on the Wolf (83) claim, crosses the Wolverine Fraction, and extends SSE into the Goldzone 3 claim, a distance of more than 4,000 feet. The main shear is 6 to 8 feet wide but in places, especially where vein quartz occurs the zone may be up to 50 feet or more wide, as on the Wolverine Fraction. The shear dips about 70 degrees NE. Vein quartz is especially abundant in the Wolverine section of this zone. The most southeasterly exposures of quartz consist of abundant closely-spaced sub-parallel veinlets and lenses of white quartz with tourmaline partings. Quartz comprises about 50 per cent of the outcrop for a width of 50 feet or more. Northward, quartz becomes somewhat more abundant and occurs in lenses 8 to 15 feet across. The quartz is almost continuous for 150 feet or more and then becomes intermittent before finally dying out about 700 feet northwest of the southerly occurrence.

South of the road along the same zone two small quartz veins, one 1½ to 2 feet wide and 150 feet long, the other about the same width and an exposed length of 50 feet, are separated by 150 feet of sheared rock. The south end of the shorter of these two veins passes under muskeg.

As in the quartz along other zones of this set, pyrite is sporadic in occurrence.

Included in the No. 5 zone in the north half of the A. B. 1 claim, are two sub-parallel shears, both containing vein quartz. The westerly of these two shears was traced 800 feet in a NNW direction. It dips 80 degrees E. The southern 400 feet consists of a quartz vein composed of narrow irregular ¼ inch to 1 foot stringers and lenses for a width of a few feet. The larger quartz lenses contain angular pieces of rhyolite and some blebs and cubes of pyrite.

The easterly zone likewise consists of quartz stringers and lenses. In places the zone widens to 75 feet or more, over which width quartz comprises 60 to 75 per cent of the exposed rock. In one place a single vein is 20 feet across. The quartz in this zone is sparsely mineralized with pyrite and chalcopyrite.

The No. 6 zone cuts diagonally across the A. B. 2 claim. The shear, traced for more than 4,000 feet, curves towards the south near the southwest corner of the A. B. 3 claim. Part of this shear zone cuts lengthwise through a diabase dyke. Vein quartz is found in the southwest quarter of the A. B. 5 claim and south of there at the northwest corner of the A. B. 2 claim. The northerly occurrence consists of more or less regular veins up to 30 feet wide and 125 feet long on either side of the shear. The southerly veins, up to 70 feet wide, consist of numerous closely-spaced, sub-parallel stringers and lenses along the shear. The quartz is white, somewhat fractured, and lightly mineralized with pyrite.

The shear is readily traced southward for hundreds of feet but no further vein quartz is present.

Another shear cuts diagonally northwest across the Gold Pick claim and strikes parallel to the southern part of the shear described above. The two are about 300 feet apart. Vein quartz is found in two places along this zone. Just north of the road a short lens averages 20 feet wide. The second vein lies in the southeast corner of the Gold Pick claim. It averages 2 feet wide and is only a few feet long. Both of these short veins contain sparse pyrite.

A branching northwest shear cuts across the northeast corner of the A. B. 2 claim but no vein quartz is present.

The No. 7 zone trends across the southwest quarter of the Goldzone Fraction and can be traced for a distance of 1,500 feet. Two quartz veins are found along this zone. The northern vein, touching the west boundary of the Goldzone Fraction is about one foot wide and can be traced 150 feet SSE into muskeg. The south vein is 250 feet long, 2 to 6 feet wide, and contains scattered pyrite. The shearing can be traced only a short distance south of this vein.

A wide strip of closely spaced shears trends NNW through the Republic claim near the north boundary of the map area. Within the region inves-

tigated, these shears carry only insignificant quantities of vein quartz. However, on the Storm 3 Fraction a north-trending shear branches off the main zone and extends north on to the Republic claim. This shear contains a small quartz vein about 100 feet long and 1 foot to 3 feet wide. The quartz is poorly mineralized with pyrite.

East-Trending and Other Veins

South and east of Little Rice Lake there are a number of shear zones and veins that strike approximately east though some depart from this direction by several degrees.

A dyke of highly sheared quartz-feldspar porphyry crossing the south claim line of the Wolf Fraction contains two quartz veins. One of these occurs at the south contact of the porphyry intrusion. The quartz is in the form of irregular lenses and stringers. The other vein to the north, has quartz scattered over a width of 40 feet or more. The shear, thinly laminated and crenulated sericite schist derived from the porphyry, and vein quartz both carry widely disseminated fine pyrite. Some of the quartz is reported to carry high gold values.

On the Wolf (83) claim an east-trending vein occurs along the north edge of a high hill of rhyolite intruded by dykes of quartz-feldspar porphyry. A 1 $\frac{1}{4}$ ton sample of mineralized quartz taken from this vein before 1920 gave assays of more than one ounce gold per ton and 1.5 ounces silver per ton (Delury, 1920). Minerals in the vein consist of pyrite, chalcopryrite, and buff coloured ankerite. The westerly extension of this vein and shear passes under overburden but apparently runs along the base of the outcrop. It was intersected in drill holes. Four holes totalling 1068 feet were drilled along the west part of the shear. Encouraging gold assays were obtained.

Another vein consisting of stringers of quartz occurs in a dyke or sill of quartz-feldspar porphyry on the Wolf (83) claim.

Southeast of Little Rice Lake and south of the road, a number of east-trending shears and fractures contain small quartz veins. Several of these are located just north of White Lake. Some of the shears branch. At the northeast corner of the White claim veins 2 to 5 feet wide consist of stringers and lenses of quartz which is fairly well mineralized with pyrite and chalcopryrite. This occurrence was probed by four short drill holes totalling 715 feet, core length. Similar short veins occur 100 feet north of White Lake.

A strong narrow shear runs west across the north part of the White claim from the group of veins north of White Lake. The west end of this shear passes under muskeg. Two irregular quartz veins outcrop north of the muskeg.

The eastern vein trends NE out of the muskeg and about halfway along its length makes a sharp right-angled turn towards the NW. Along most of its length the vein, consisting of white quartz with numerous tourmaline partings and containing small horses of country rock, is 4 or 5 feet wide. Where it bends the quartz is 20 feet or more wide. Pyrite is rare in this vein.

The western vein makes an S-shaped fold. Tourmaline partings in the quartz are contorted. The wall rock is heavily sheared in the south part of the vein where it occurs in dacite breccia, and fractured in the north part where it occurs in a quartz-feldspar porphyry dyke. The vein probably occupies a drag fold associated with the east-trending shear that underlies the muskeg. In the breccia the quartz occurs as one main vein 1 foot to 1½ feet wide. Within the porphyry dyke the quartz occupies numerous small fractures. The quartz is highly fractured and mineralized with chalcopyrite, pyrite and visible gold.

Two or three hundred feet north a number of short east-west veins in dacite breccia are mineralized to various degrees with pyrite and chalcopyrite. These veins and the S-shaped one described above were investigated by 12 drill holes totalling 3718 feet.

Other short veins, mostly containing some pyrite, occur on unleased claims east of the I. X. L. claim. One of these, 600 feet northeast of the north-south arm of Elbow Lake, consists of abundant stringers and lenses of quartz for a width of 35 to 40 feet and a length of 300 feet or more. The wall rock is well mineralized with patches and cubes of pyrite; some of this mineral occurs in the quartz. One hole, 644 feet long, was drilled into this vein.

Southeast of White Lake, at the south border of the Loon claim a curving E-W shear contains a vein 200 feet long and 1½ feet wide. The vein consists of banded quartz and tourmaline and is flecked with small pyrite cubes.

East of Elbow Lake a few quartz veins occur on unleased ground currently held by Portage Avenue Gold Mines. Near the north end of the north-south arm of Elbow Lake a quartz vein, averaging 6 feet wide, trends eastward and intersects a diabase dyke. The vein is probably an extension of, or in the same shear as one on the west side of the lake. Like the vein on the west side of the lake, this one is not mineralized where it lies in volcanic rocks, but that portion of it within the diabase contains considerable widely scattered pyrite. Just east of the diabase a curving quartz vein occurs at the contact of andesite porphyry and dacite breccia.

A couple of very short veins, 50 feet long, occur in two separate shears trending NW along the edge of the swamp which extends east from Elbow Lake.

About 700 feet south of these veins, a vein 2 feet wide is located where an east-west shear bends slightly north. A similar vein is found near the contact between andesite porphyry and breccia a further 700 feet south of the last-mentioned vein. The quartz in both these occurrences is not mineralized.

The vein located 1,500 feet south of the southeast corner of the Loon claim lies in andesite porphyry near the west end of an east-west shear. The quartz is only 1 foot wide and is barren.

GOLD LAKE MINES LIMITED

Gold Lake Mines Limited, successor to Gold Lake Area of Manitoba Mines, Limited, holds 20 leased claims and fractions around Salveigh Lake. The property consists of the Pilot, Pilot Fraction, Oriole, Smuggler, Jumbo, Eagle, Midway Fraction, Lucky Strike, Bim Fraction, Min Fraction, Irene, Irene 1 to 3, June, June 1 to 3, May A Fraction, and May B Fraction.

A gold-bearing quartz vein was discovered on the Pilot and Smuggler claims sometime prior to 1916. Considerable surface stripping and trenching was done and two prospect shafts, 18 feet and 50 feet deep, were sunk on the vein. In 1928 Gold Lake Area of Manitoba Mines, Limited, acquired the property and, in 1934, was succeeded by the present company. In 1935, Mr. Percy E. Hopkins, holding an option on the property, conducted further surface work and tested the vein at depth by diamond drilling. Surface sampling had indicated two ore shoots, one about 300 feet by 5½ feet and the other 175 feet by 2½ feet with gold values averaging between 0.5 and 0.3 ounces per ton. Diamond drilling of the first shoot to depths of 70 to 400 feet gave sufficiently encouraging results to warrant sinking a shaft. The shaft was sunk 321 feet with levels at 150 feet and 300 feet. A total of about 2,000 feet of lateral underground work was done. The vein was explored for a length of 702 feet on the 150 foot level and 443 feet on the 300 foot level. Underground exploration revealed that the ore shoots indicated at surface did not persist to any depth, and that the good values obtained in several drill holes represented isolated patches of high grade material. The underground work was done while the property was optioned jointly by W. C. Pitfield and Co. Ltd. and Anglo-Huronian Ltd. The option reverted to P. E. Hopkins who undertook further underground work for a few weeks in the autumn of 1936. Since that time the property has been inactive.

A small quartz vein a few inches to a foot or more wide and 250 feet long, on the May A Fraction (formerly Pendennis) claim was trenched and a shaft sunk on it prior to 1920. The vein is quite rich, though small.

Geology

The property is underlain largely by trachyte breccia and porphyritic dacite breccia. Several outcrops of andesite porphyry are exposed in the muskeg on the claims northwest of Salveigh Lake. Several diabase dykes intrude the volcanic rocks; the most notable of these is the long one that extends completely across the property and northward to the edge of the map area. South and west of Salveigh Lake the volcanic rocks are intruded by quartz diorite.

Numerous NE-trending quartz-feldspar porphyry dykes intrude the long north-south diabase dyke. Some of these, upon meeting the shear zone in the diabase, follow along it. Others, though they pass into the diabase, stop abruptly against the shear but are not known to be faulted. The shear probably acted as a dam against the quartz-feldspar porphyry. One porphyry dyke on the Ballyhoo claim (not part of the property of Gold Lake Mines Limited) runs into the shear, stops abruptly, and reappears on strike on the other side of the shear, leaving an interval of 30 to 40 feet of sheared diabase not intruded by porphyry. Elsewhere small stringers of porphyry have been injected along the sheared diabase and volcanic breccia.

Veins

The most prominent shear zone on the property is that, in the diabase, known as the Pilot-Smuggler shear, which strikes about north 17 degrees west and for the most part extends along the east contact of the diabase dyke. The diabase is not entirely continuous across the property; in places, rather than a single "break," a wide zone of closely spaced shears is present. This sometimes extends across the full width of diabase and into the volcanic rock west of the dyke. In many places there are remnants and bands of unsheared diabase within the zone. The main shear dips steeply eastward.

On the Smuggler claim a curving SE-trending shear zone branches off the main shear and extends towards Salveigh Lake. Near the juncture of the two shears the rock is highly schistose for a considerable width, and south of here the rocks are in various stages of deformation for a width of 200 feet west of the main shearing.

Quartz veins occur in three places along the Pilot-Smuggler shear. The most northerly of these, located on the Pilot claim, and extending into the northwest corner of the Smuggler claim is that which was drilled and on which the shaft was sunk. The quartz is almost continuous for a distance of 900 feet north and 400 to 500 feet south of the shaft. Quartz is distributed over widths of from 3 to 40 feet, and occurs as single veins 1 foot to 8 feet wide and as abundant parallel veinlets in schist, especially where the quartz zone widens. The diabase extends almost continuously along this portion of the shear but in places is too narrow to show on the map. Most of the quartz is well mineralized with pyrite and chalcopyrite.

Thin leaves and streaks of chlorite and tourmaline, and patches and veinlets of ankerite are also present in the quartz. Much of the sheared diabase, now chlorite schist, contains abundant fine granular ankerite, as well as patches and veinlets of this mineral between the foliation planes. Small cubes of pyrite are especially abundant in the schist.

As already mentioned, surface sampling had indicated two promising ore shoots in this vein, but underground development revealed the spotty nature of the gold occurrences.

The second vein begins about 900 feet south of the end of the first one. This vein is about 400 feet long and passes under muskeg on the south. It consists of lenses and stringers of slightly mineralized quartz over a width of 10 to 20 feet.

On the south side of the small muskeg, the third vein outcrops on the west side of the sheared diabase. This vein consists of stringers and lenses of quartz for a width of 10 feet or more and a length of 300 feet. The quartz is only slightly mineralized.

Four hundred feet south of the shaft the SW shear branches off the main zone and follows a narrow, curving, reddish felsite dyke. About 600 feet along the shear, a 300-foot length of quartz is found in the form of disconnected lenses and stringers. The quartz contains a little disseminated pyrite, streaks and ribbons of tourmaline, and patches of ankerite. Much of the sheared felsite contains disseminated pyrite, even where quartz is lacking. Southwest of the vein, the shear splits into two parts that can be traced to the muskeg east of Salveigh Lake. It is not known if gold assays were obtained from this vein.

The Pendennis vein on the May B fractional claim is now largely covered with waste rock from trenches and pits. The vein extends about 300 feet in an easterly direction near the contact of quartz diorite intruding volcanic rocks. Chalcopyrite and pyrite are abundant and Delury (2) reports common visible gold. The shear zone, in which the vein occurs, dies out to the west and is not well-defined east of the vein.

On the May A and Irene claims a shear within the "granite contact zone," and which may be the extension of the Pendennis shear, contains two short, slightly mineralized quartz veins.

On the north part of the Irene 2 claims, a vein 3 feet wide can be traced for a distance of 600 feet before it passes into muskeg in the east. The probable extension of this vein outcrops on a point of rock jutting into the muskeg on the Irene 3 claim, where the quartz is about 100 feet long. The shearing continues eastward and again passes into muskeg. The quartz in both parts of this vein is poorly mineralized.

A small lens of quartz occurs in a narrow north-dipping, east-trending shear southwest of Salveigh Lake, on the June claim.

Many other east-west shears are present on the property of Gold Lake Mines, Limited, but none carry significant quantities of quartz.

GOLD ISLAND MINING COMPANY LIMITED

The Gold Island Mining Company Limited was incorporated in March 1936 and holds the following claims: Josephine, Mildred, Ina Fraction, Wonder Y fraction, and Wonder Y 1 Fraction.

The company did some diamond drilling on a vein which crosses the Josephine, Ina Fraction, and Mildred claims. This vein is commonly known as the Josephine-Mildred vein.

The vein was discovered sometime prior to 1920 and early work was confined to stripping and trenching.

Geology

The property is entirely underlain by trachyte breccia and porphyritic dacite breccia which are intruded by several dykes of quartz-feldspar porphyry. The largest of these dykes begins on the Josephine claim but, farther southwest, splits into 2 bands which spread apart. Where these bands cross the shear zone on the Josephine and adjacent claims they are 500 feet apart. Stringers and lenses of porphyry, and related felsite aggregates of quartz and albite, occur along the shear between the main dykes. The two bands again merge into a single dyke about 1,000 feet southwest of the vein.

Vein

Vein quartz is distributed along the shear between the places where the porphyry bands intersect it. Quartz continues for a hundred feet north of the north band of porphyry, where it is covered by muskeg. North of the muskeg only a little quartz, and some small porphyry stringers, occur in the shear. The southeast end of the vein is concealed by muskeg but the shear can be traced with difficulty for some distance south of the muskeg, on the Mildred and adjacent Columbia claims. The northern extension of the shear is likewise difficult to follow but can be traced into a well-defined shear on the Snowstorm claim. Thus the greater length of the Josephine-Mildred shear is a zone of weak fracturing except in the vicinity of the porphyry and vein.

The south half of the vein, where it lies between the two cross-cutting dykes of porphyry, consist of a band of quartz 6 to 8 feet, and up to 10 feet, wide, bordered by a foot or so of albitized wall-rock. The quartz contains considerable red albite, and the quartz porphyry lenses and stringers that were intruded along the shear contain small lenticular masses of quartz. The zone of shearing along this section is 15 to 20 feet wide. The remaining northern part of the vein varies from 1½ to 2 feet in width and consists of lenses and stringers of quartz. Some porphyry has intruded along this section as well.

Much of the vein quartz is barren but patches of pyrite are scattered along its entire length. Some chalcopyrite and ankerite are also present. Free gold has been reported from parts of the vein.

The occurrence of this vein was discussed in the preceding chapter where the association of quartz veins and quartz-feldspar porphyry was considered.

GOLD PAN MINE (1945) LIMITED

This company, incorporated in 1945, holds the Gold Pan, Gold Seal, Roland, and Johanna claims as well as a number of unleased claims extending northeast to Gold Lake, west towards the Columbia and Kootenay claims, and southeast to the Bluebell and Saxton claims.

The Gold Pan claim was staked in 1914. A shaft was sunk on the vein in the northern half of the claims and levels cut at 138 feet and 198 feet depth. This work was done by Gold Pan Mines Limited. Drifts were driven 55 feet south and 40 feet north of the shaft on the 138 foot level, and 300 feet south and 65 feet north on the 198 foot level. The property came into production in 1916, making it the first producer of gold in the Rice Lake region. Operations ceased on the Gold Pan in 1930 and work was continued on the adjoining Gold Seal claim where a shaft had been sunk to a depth of 53 feet.

Around 1920 a shaft was also sunk on the vein 50 feet north of the Gold Pan claim.

There are accounts of the high grade gold ore which came from parts of this vein but records of production are unavailable.

The present company dewatered the Gold Pan shaft in 1947, sampled the underground workings and the surface showing and did a total of 10,000 feet of diamond drilling on the zone.

Two old shafts are located on veins 8,000 feet and 2,000 feet south of Gold Lake. These are on the old Brooklyn claims and were sunk prior to 1920 by Brooklyn Mining Company Limited. These veins were sampled by the present company.

Geology

Practically all outcrops on the property are of porphyritic dacite and trachyte breccia. A dyke of diabase about 30 feet wide extends northeast across the south side of the Gold Pan claim. The dyke follows approximately the direction of the quartz-feldspar porphyry dykes in the area. It can be traced across the full width of the Gold Pan claim.

The intersection of the diabase with the NNW-trending shear is covered by the rock dump around the Gold Pan shaft, but it is reported to be slightly offset by the shear.

Some small dykes of quartz-feldspar porphyry occur on the property, but these are too small to be shown on the present map.

Veins

The veins on the Gold Pan and Gold Seal claims follow a well-defined, though narrow, shear zone in hard, massive porphyritic volcanic breccia. The shear can be traced on surface for a length of 3,000 feet. On the south it dies out into an ill-defined zone of fracturing and on the north passes under the muskeg. The maximum width of the shear zone is 9 feet, but in places it is as narrow as one foot; the average width is approximately 5 feet. The quartz veins are 1 foot to 3 feet in width.

From the shaft in the north part of the Gold Pan claim a quartz vein about 2 feet wide extends for a distance of 200 feet southeast. North of the shaft only scattered bits of quartz are found in the shear.

The shaft was sunk at the intersection of the shear and diabase and it is reported that very spectacular quantities of gold were found in the vein against the south wall of the diabase. On surface, just south of the shaft, the vein is well mineralized with large patches and cubes of this mineral. Specimens of diabase on the dump are impregnated with pyrite. Some chalcopyrite occurs in the quartz. Minor sphalerite and galena are reported.

From the examination of the underground workings in 1947, it has been reported that where the diabase dyke is intersected by the shear it shows a tendency to follow along the shear. This would appear to indicate that the diabase intruded during a late stage of deformation that produced

the shearing. This is in keeping with what has already been stated of the relationship between shearing and intrusion of diabase.

The notable concentration of gold and sulphides where the vein meets diabase has been interpreted by many as indicative of the damming influence of the diabase. Nevertheless the possible precipitating influence of diabase on the mineralizing solutions should not be disregarded.

A further 350 foot length of quartz, averaging 2 feet wide, is located along the same shear zone in the southeast part of the Gold Pan claim. This quartz is spottily mineralized with pyrite and lesser chalcopyrite. Gold values are erratic.

The dump around the shaft at the north edge of the Gold Seal claim entirely conceals the quartz vein there and muskeg occurs on both sides of the dump. Quartz on the dump is mineralized with pyrite.

Only insignificant quantities of quartz occur along the remainder of the Gold Pan shear.

A narrow shear crosses the Roland claim and is parallel to that on the Gold Pan claim. It extends NNW and disappears under muskeg to the north. Southeasterly it joins the shears on the Moose and Golden Vein claims. Within the limit of the property of Gold Pan Mines (1945) Limited very minor quartz is found along this shear zone.

Two ill-defined shear zones occur south of Gold Lake. Shafts have been sunk on both zones. These were sunk prior to 1920 by the former owner, Brooklyn Mining Company Limited. The north shaft is 35 feet deep and the south one 90 feet deep.

The north shear is very poorly defined except right at the shaft where the dip is 75 degrees NE. A quartz vein 1 foot to 2 feet wide, and mineralized with some pyrite, is now largely covered.

The shear zone at the south shaft is 1 foot to 3 feet wide and contains very little quartz except perhaps immediately around the shaft where the outcrop is now covered by rock from the underground workings.

MOOSE AND ADJACENT GROUP OF CLAIMS

A group of claims leased by Mr. J. Murray Anderson includes the Saxton, Bluebell, Moose, Sunbeam, Moosehorn, Surprise, Moose Fraction, Red Deer, and Bull Moose Fraction. This property was formerly owned by the Manigotagan Mining & Development Company, Limited, which did work on the claims from 1915 to 1930.

Following 1915 considerable surface development work was done by the Manigotagan Mining & Development Company, Limited and in 1916 a shaft near the centre of the Moose claim, was sunk to a depth of 100 feet and drifts driven 108 feet southeast and 70 feet northwest of the shaft. A few hundred feet north another, shallower, shaft was sunk on a vein along the same zone.

It is not known what other work was done on the property prior to 1947 when a few hundred feet of diamond drilling was done by the present owner.

Geology

Bed rock on these claims consists of poryhyritic dacite and trachyte breccia intruded by a large batholithic mass of quartz diorite to the east and south. In places the contact is fairly definite, but elsewhere a wide zone of mixed quartz diorite and volcanic breccia is present. A long, narrow NW-trending dyke of quartz diorite intrudes the volcanic rocks on the Moose, Blubell, Saxton, and Golden Vein claims.

Veins

A wide shear zone can be traced a total of 7,000 feet NNW from the Moose claim. To the north it is largely concealed by muskeg but signs of shearing and several poorly exposed sheared outcrops occur in the swamp. The Moose shear probably joins with the wide zone of shearing on the Snowstorm, Storm Fraction, and Republic claims. If this is so, a total length of over 3½ miles of shear is present.

On the group of claims under consideration the shear varies from 10 to 35 feet in width. On the Moose claim the shear and vein dip 75 degrees SW, but farther north it dips steeply NE.

At the north edge of the Moose claim a quartz vein, 6 to 8 feet wide, occurs within the shear zone at the contact of the dyke of quartz diorite. Southward the vein cuts the quartz diorite and continues 350 feet southeast to a small shaft. For 150 feet south of the shaft the vein is only 1 foot wide. A short interval of barren shear separates this vein from the one at the south shaft, near the middle of the claim. This vein is 2 to 6 feet wide and can be traced about 100 feet. At the shaft it is covered by the rock dump.

Sulfide minerals in these veins consists of pyrite and chalcopyrite distributed throughout the quartz and wall-rock. Ankerite is commonly present, though not abundant. Free gold is reported to have been found in parts of the vein underground.