Forty-Fifth Annual Report

of the

Ontario Department of Mines

1936

Part IV

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. PAUL LEDUC, *Minister of Mines* T. F. SUTHERLAND, *Deputy Minister*

FORTY-FIFTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. XLV, PART IV, 1936

Geology of the Birch-Springpole Lakes Area

By

W. D. HARDING

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed and Published by T. E. Bowman, Printer to the King's Most Excellent Majesty
1936

PRESS OF THE HUNTER-ROSE COMPANY LIMITED
TORONTO

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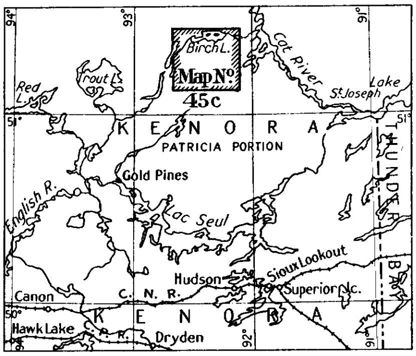
Aerial photograph looking west towards Washagomis and Woman lakes from the west end of Okanse lake, shown in the foreground.

Geology of the Birch-Springpole Lakes Area

By W. D. Harding

INTRODUCTION

The Birch-Springpole Lakes area is situated in Patricia portion of Kenora district directly north of Lac Seul. Geologically it constitutes a small part of the extensive belt of pre-Cambrian greenstones and sediments that has been traced intermittently for over 150 miles from Red lake eastward through Woman lake, Birch lake, the Cat river, Fry lake, and Kawinogans lake to Pickle lake. The area examined covers about 325 square miles. It extends from Perrigo lake on the south, northward to Birch lake, and from Swain lake on the west, eastward to Seagrave lake, and includes the townships of Honeywell and McNaughton and parts of the townships of Agnew and Costello.



Key map showing the location of the Birch-Springpole Lakes area. Scale, 70 miles to the inch.

Birch lake, the waters of which flow through Springpole lake to the Cat river, constitutes part of the Lake St. Joseph–Albany River drainage system. Its irregular shores circumscribe an area of approximately 50 square miles. The clearness of its waters, the picturesqueness of its wooded and rocky islands, and the intricacies of its shore line, are only a few of the many delightful and fascinating features that characterize its natural beauty.

Besides being on the canoe route to James bay by way of Lake St. Joseph and the Albany river, Birch lake also gives access to the route to Hudson bay by way of the English and Berens rivers, Lake Winnipeg, and the Nelson river. Its location suggests that it may have been travelled by the early Canadian explorers, but no mention of it was found in the records examined. Nevertheless, Birch lake has long been recognized as a travel route between Cat lake and the English river, and its use in this respect goes back into the traditional history of the oldest Indian inhabitants. Flint arrow heads, rude stone ornaments, and fragments of broken pottery of Indian origin found in the vicinity of Birch lake point to a culture which existed when the first white explorers penetrated the district. It is interesting to note that, although the local Indian inhabitants are aware of the origin of the arrow heads, neither memory nor tradition has preserved for them any record regarding the origin of the pottery, the making of which is a forgotten art.

Acknowledgments

During the period of field work, which lasted from late May to early October of 1935, the writer was ably assisted by H. W. Fairbairn and A. G. Darling, of Queen's University and P. A. Chubb, of the University of Toronto. Dr. Fairbairn accompanied the party as senior assistant and did a considerable amount of the geological mapping. The writer is indebted to him for many useful observations and for discussion of various geological problems.

It is impracticable to attempt to acknowledge individually the numerous courtesies and favours received by the writer and the members of his party during the period of field work and during the preparation of this report. The useful information and hospitality extended by prospectors and by the staffs of the various mining companies made the association with them a pleasure. The co-operation received from the Ontario Forestry Branch and from the Provincial Air Service eliminated much of the arduous work associated with the transportation of provisions and equipment. The hospitality extended by Deputy Chief Ranger N. Bamford at Swain Lake and by Chief Ranger M. Roadhouse at Goose Island (Lac Seul) was indeed appreciated.

The writer wishes to thank Dr. J. Satterly, of the University of Toronto, for information on the country that lies between Christina lake and Slate falls (on the Cat river) and on parts of the Birch-Springpole Lakes area.

The assays for gold, various qualitative tests, and the rock analyses were carried out under the direction of W. K. McNeill, Provincial Assayer.

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Previous Geological Work

There is no mention of Birch lake in the records of the early Canadian explorers. The fact that a Hudson's Bay Company's post was established at

Cat lake long before geologists visited the region proves, however, that its location was known to the early employees of that company.

In 1885, Thos. Fawcett of the Department of the Interior of Canada made a survey from Lake St. Joseph to Cat lake.[1] Fawcett did not visit Birch lake,but his written observations on the area north of Lake St. Joseph constitutes one of the earliest authentic records of that large region of which the Birch-Springpole Lakes area forms a small part.

It was not until 1904 that Chas. Camsell, who was commissioned by the Geological Survey of Canada to explore a large area in the vicinity of the head-waters of the Severn river, examined the section between Kapikik and Shabumeni lakes and described the rocks in the vicinity of Birch lake.[2] This is the first mention of Birch lake in the literature, and no doubt the name originated with Camsell.

Subsequent work, including reconnaissance surveys by E. M. Burwash[3] in 1919 and by J. W. Greig[4] in 1926, had to some extent defined the distribution of the greenstones, sediments, and granites of the Birch-Springpole Lakes area. The work described in the present report was more detailed in character than these early surveys. Those parts of the area that had been previously mapped were remapped with more precision, and the country that extends from Perrigo lake to Birch lake in the centre of this area and which was not previously examined by geologists was mapped for the first time.

The area that lies immediately west of the field examined and includes Narrow, Woman, and Confederation lakes, was mapped by E. L. Bruce[5] in 1927. The Shabumeni-Birch Lakes area, which lies to the north and northwest of the area described in this report, was mapped by G. D. Furse[6] in 1933. During the summer of 1935 the Geological Survey of Canada had parties engaged in geological reconnaissance work in the Papaonga Lake area and the Trout Lake area, which lie, respectively, to the south and to the southwest of the Birch-Springpole Lakes area.

History of Development

Prior to the rush of prospectors to Red lake in 1925, little was known of the area surrounding Birch lake. Commercial activities had until that time been confined largely to trapping, and despite the fact that prospectors had from time to time penetrated various sections, the area had little significance as a mineral field. Sudden developments coming in quick succession soon changed this peaceful picture. By 1926 the prospecting activity that was focused on Red lake was deflected in the direction of Woman lake, Narrow lake, and Birch lake. Hundreds of claims were staked on locations widely scattered throughout the region, which within a few months was transformed from a relatively uninhabited wilderness into an active prospecting field. The details of this rather spectacular staking rush would provide material for a colourful chapter in a history of the search for gold in Ontario. The country in the vicinity of Woman and Narrow

[1]Thos. Fawcett, Dept. of the Interior, Canada, Ann. Rept., 1885, pt. II.

[2]Chas. Camsell, "Country around the Headwaters of the Severn River," Geol. Surv. Can., Vol. XVI, pt. A, 1904, pp. 147-151.

[3]E. M. Burwash, "A Geological Reconnaissance into Patricia," Ont. Dept. Mines, Vol. XXIX, pt. 1, 1920, pp. 157-192.

[4]J. W. Greig, "Woman and Narrow Lakes Area," Ont. Dept. Mines, Vol. XXXVI, pt. 3, 1927, pp. 85-110.

[5]E. L. Bruce, "Gold Deposits of Woman, Narrow, and Confederation Lakes," Ont. Dept. Mines, Vol. XXXVII, pt. 4, 1928, pp. 1-51.

[6]G. D. Furse, "Geology of the Shabumeni-Birch Lakes Area," Ont. Dept. Mines, Vol. XLII, pt. 6, 1933, pp. 21-51.

lakes was staked solid. For some time Birch lake was situated on the margin of this activity, but subsequently scores of claims were also staked in that neighbourhood. Activities there were chiefly confined to the region extending north from the lake. Several mining companies were organized and funds were raised to develop gold properties scattered throughout the area. In spite of rather favourable geological conditions and interesting surface showings, operations were not highly successful. Subsequently the flow of funds for development work was curtailed by the financial slump of 1929. Interest in the new field lagged for a period, and many of the claims were abandoned. The recent high price of gold, coupled with a general upward trend in business conditions, has been responsible for a revival of interest in this field. and some ground has been restaked. The number of prospectors now living in the area, however, is not large, and the task of developing gold mines, which was begun by hundreds of prospectors in 1926, is now being pursued by a relatively small band.

Future of the Area

Up to the present time (1935), there have been no important gold-producing mines in the area surrounding Birch, Woman, and Narrow lakes. Despite mining activities spread over almost a decade and the erection during that period of small mills on several of the properties, the entire gold production of the area including Birch lake, Woman lake, and Narrow lake, amounts probably to less than $70,000. Of this total, about $50,000 has been produced by the J-M Consolidated Gold Mines, Limited. On many of the claims little work has been done. For this reason and also because of the presence of rather favourable geological conditions, the Birch-Springpole Lakes area, together with the neighbouring areas, constitutes a field that still offers inducements to prospectors.

Topography and Physiography

The Birch-Springpole Lakes area lies well within the borders of the Canadian pre-Cambrian peneplain. Topographically the area lacks prominent features, and when viewed from the air the country appears almost flat. Actually it consists of a rather monotonous succession of low hills composed of rock or glacial debris separated by shallow depressions containing swamps and lakes. The highest ground is situated in the southern part of the area in the vicinity of Okanse and Perrigo lakes. On account of the general absence of topographic forms, some of the few present assume a position of great relative importance. For example, a rocky hill that rises from the west shore of Sundown lake to the modest height of about 200 feet above the lake provides an excellent view of the surrounding country and is one of the highest points in the area. The altitude of Birch lake is 1,276 feet and Springpole lake, with an altitude of 1,270 feet, is the lowest lake in the area. None of the high ground anywhere in the area rises as much as 300 feet above the level of Springpole lake. Most of the drainage of the area is through Birch lake to Springpole lake, thence to the Cat river and Lake St. Joseph. The waters of Perrigo and Cook lakes, however, which flow southwestward, belong to the Lac Seul–English River system.

Owing to the numerous lakes, the physiography of the area has many interesting features and provides a pleasant contrast to the monotonous topography. It has been estimated that approximately one-third of the surface of the area is covered with water, represented by the various lakes and streams, and that more than one-half of the remainder consists of swamp and muskeg. Of the high ground still remaining, much is covered with morainal overburden. It is obvious, therefore, that the total area of exposed rock is relatively small and that only a limited part of the surface is accessible to the prospector who is equipped merely with hand tools. The best rock exposures are found in the northeastern part of the area in the neighbourhood of Birch, Springpole, and Seagrave lakes. Good exposures, however, occur in many other localities. That part of the area that lies between Perrigo, Okanse, Grace, Bertha, and Cook lakes consists largely of swamp and muskeg.

Power Development

No water power has been developed in the vicinity of Woman lake and Birch lake, and very little is available from streams within these areas. At the present time, power for mine development is being supplied by wood-fired boilers and from Diesel-type motors. The plant of the Hydro-Electric Power Commission at Ear Falls on the English river is the nearest place at which power is now being produced and is probably the most suitable source of power for the area. Present equipment at Ear Falls is capable of producing 5,000 horsepower, all of which is consumed by the mines of Red Lake and vicinity. According to information supplied by the Ontario Hydro-Electric Power Commission, plans are under way for the development of further power from Ear falls for use in Red Lake and other fields, such as the Birch-Springpole Lakes area.

GENERAL GEOLOGY

All the consolidated rocks of the area are of pre-Cambrian age. On the basis of age relationships they may be divided into three groups. The oldest rocks belong to the Keewatin group and consist largely of lavas, with which are intercalated minor beds of sediments. Above and younger than the Keewatin are rocks of the Timiskaming type, which consist predominantly of rather coarse sediments, but which may include minor phases of lavas. Algoman rocks, which are the third group, consist altogether of plutonic types, most of which are of granitic character. They intrude both the Keewatin and Timiskaming types. The Algoman rocks, therefore, are the youngest rocks of the area. Unconsolidated sediments of Pleistocene time have been distributed in patches here and there over the pre-Cambrian surface. The gap between the youngest Algoman rocks and the Pleistocene sediments represents a very long geological time interval, records of which have been preserved in many places on the earth's surface, but which are entirely lacking in the Birch-Springpole Lakes area.

The following classification shows the position of the various rocks in the geological time table:—

QUATERNARY	
RECENT:	Unconsolidated stream sediments.
PLEISTOCENE:	Unconsolidated glacial gravels, sands, clays. Lake deposits.
	Great unconformity
PRE-CAMBRIAN	
ALGOMAN:	Quartz veins. Pegmatite. Syenite, quartz porphyry. Granite, granite gneiss, granodiorite. Diorite, hornblendite.
TIMISKAMING(?)	Greywacké, quartzite, arkose, slate. Conglomerate. Iron formation.
KEEWATIN:	Acid volcanics. Basic volcanics and intercalated sediments.

Keewatin

From an areal standpoint the Keewatin rocks constitute about one-half of the surface of the field examined. They are the oldest and therefore the most highly metamorphosed rocks of the area. In general this group is composed of types that have been formed at or near the surface of the earth. From the standpoint of origin, appearance, and composition, the Keewatin rocks of the Birch-Springpole Lakes area largely resemble the original Keewatin series identified by Lawson[1] in the Lake of the Woods area in 1885. This group consists predominantly of basic and acid lavas, with which are associated basic and acid pyroclastics, including both tuffs and agglomerates. Intercalated with these volcanics are numerous sedimentary beds including iron formation, which with some minor intrusives complete the Keewatin rocks. These types cover large sections near Okanse and Perrigo lakes and in the vicinity of Sundown and Honeywell lakes, the Shabumeni river, Birch, Springpole, Seagrave, and Bertha lakes.

To some extent the difficulty with which the various types are recognized is a measure of their alteration. Heat, pressure due to burial, and emanations from neighbouring bodies of magma are thought to have been the most potent factors in their metamorphism. The margins of the Keewatin rocks near their contacts with granite are locally marked by the development of hornblendite and hornblende schist. All the Keewatin rocks have been subjected in varying degree to rock flowage, evidence of which is seen in folded structures and in the development of widespread foliation. Lava pillows, conglomerate boulders, and amygdaloidal cavities have been elongated in such a manner that the maximum axes of elongation lie parallel to the planes of schistosity.

Basic Volcanics

The basic lavas, with which are associated basic pyroclastics, compose the largest part of the Keewatin rock areas. The lavas consist of ellipsoidal, amygdaloidal, ropy, and brecciated types of andesites and basalts. Associated with these rocks are thin beds of banded tuffs, which in some places are difficult to distinguish from the beds of normal sediments, which also occur between the flows. Amygdaloidal and pillow lavas of basic character form most of the basin of the north arm of Springpole lake. They extend west from Springpole lake to Birch lake, where they form the east shore of Wagner bay. Here they include sedimentary beds, some of which are rather black and slaty and contain much magnetite. Pillow lavas and amygdaloidal lavas of andesitic character with associated minor sediments occupy most of the section that extends north from the east arm of Springpole lake to Birch lake. The lavas in this vicinity locally contain spheroidal amygdules up to one inch in diameter filled with granular quartz. In the southern part of this section near Springpole lake the rocks have been very highly metamorphosed, owing to their proximity to the Seagrave granite batholith, and are largely hornblende schists. They have been mapped as Keewatin by the writer and they probably represent highly altered lavas and sediments. In the vicinity of the Dole claims some metamorphosed flows contain large crystals of white feldspar and are difficult to distinguish from metamorphosed conglomerates. A large area of Keewatin rocks in the vicinity of Seagrave lake has, for mapping purposes, been classed as basic volcanics.

[1]A. C. Lawson, "Report on the Geology of the Lake of the Woods Region, with special reference to the Keewatin (Huronian?) belt of the Archæan rocks," Geol. Surv. Can., Vol. I, pt. CC, 1885, pp. 10-15.

Much of this part of the area, however, is covered with lavas of intermediate composition. Dark ellipsoidal andesites, locally of very fresh appearance due to the presence of much hornblende, occur east of Okanse lake and between that lake and Perrigo lake.

In the vicinity of Philchub lake these hornblendic lavas are associated with diorites, which are similar in appearance to the lavas, and it is difficult to distinguish between intrusives and extrusives. Some thin beds of sediments intercalated with the lavas were identified in this section. Dark-weathering andesitic lavas are well exposed in a belt, which strikes almost east-west, north of Bertha lake. The western part of this belt contains well-formed pillow structures. As the belt is followed eastward the pillows are less abundant and the rocks more massive and more hornblendic, until finally in the vicinity of the east end of Bertha lake they become hornblendites in which no flow structures are visible. Some masses of hornblendite porphyry in this section which occur near granite intrusions and which have been designated as Algoman by the writer may have resulted from the contact metamorphism or refusion of Keewatin basic lavas.

Keewatin basic flows also occupy most of the area between Sundown and Grace lakes as well as a considerable area in the vicinity of the western part of Birch lake and along the Shabumeni river.

Basic pillow lavas of spherulitic character were identified near the northern end of Honeywell lake and on the east and south shores. Bruce[1] found a similar type of spherulitic lava near the outlet of Lost bay of Confederation lake, which he has described as follows:—

> The rocks at Confederation lake seem to be the result of the segregation of the feldspathic and quartzose material without the formation of phenocrysts. Under the microscope a specimen appears as a fine-textured aggregate of feldspar-chlorite and brownish-green biotite. The boundaries of the white areas are fairly sharp, and the outer rim consists of material of still finer grain, which is muddy in appearance and lacks both biotite and chlorite. The rim probably was originally composed of feldspar. Within this is a coarser-grained feldspathic material and some quartz, and the centre of most of the nodules consists of clear quartz in a mosaic pattern. Thus the whole arrangement is similar to the structure of those agates that have a central core of coarsely crystalline quartz. It seems likely that the nodules are explainable as rhythmic crystallizations in the cooling lava.
>
> In a specimen from a lake east of Washagomis on the route to Sundown lake, not all of the nodules are complete, but in some there is simply a spherical shell of white material enclosing within it material similar to the matrix in which the spherule is embedded. Under the microscope this interior part seems to be much finer grained than those described above and is brownish in colour. It probably represents a rock cooled too quickly to allow the completion of the migration of the material necessary to form a solid spherule, chilling having arrested the segregation in an intermediate stage between the homogeneous greenstones and the perfectly formed spherulites.

The location of these last-described spherulites found by Bruce at "a lake east of Washagomis" appears to be the first lake north of Sundown lake, where the writer found spherulites on the shore. These appear to be similar in character to those at Honeywell lake, to which Bruce's theory of origin is also applicable.

Coarse basic pyroclastic material of agglomerate type, though perhaps widely distributed, does not cover a very large part of the Birch-Springpole Lakes area. Some material of this type is, however, associated with the basic lavas that occur north of McNaughton lake and also in the section between Okanse and Grace lakes. None of the agglomerate masses identified in the area were traced for more than a few hundred feet.

Fine tuff appears to be widely distributed throughout the area, although much of it is difficult to distinguish from other types of volcanics and from normal

[1]E. L. Bruce, op. cit., p. 7.

sediments. East of Okanse lake fine-grained, well-bedded tuffs are difficult to distinguish from the Timiskaming type of sediments that occur in that vicinity. A thin-bedded tuff from Wagner lake examined under the microscope shows as many as twenty laminations to the inch. The minerals include fragments of quartz, orthoclase, plagioclase, and alteration products such as carbonate and kaolin. Some iron oxide is also present, but femic minerals are practically absent. These minerals do not correspond to any of the common rock types. Fine-grained tuffs also occupy horizons in the vicinity of the Keewatin-Timiskaming contact on the north shore of the southwest arm of Birch lake and on the south shore of the eastern part of Birch lake.

Acid Volcanics

The Keewatin acid volcanics consist mostly of light-coloured rocks. They cover only a small part of the map area. Some rather light-coloured volcanics of intermediate composition have been included with the basic rocks.

The largest area of acid volcanics is a mass about 11 miles long and up to 1½ miles in width, which strikes northeast through the western part of Birch lake. Most of this mass is rather light-weathering, and in places where the composition is highly acid the rock has the striking whitish-green colour that distinguishes weathered acid lavas in many parts of Ontario. The belt is moderately sheared, and in a few places along the shore of Birch lake the weathered outcrops display much loose flaky material characteristic of the disintegrated products of highly foliated rocks. In most of this belt the rock texture is so fine that individual minerals cannot be easily identified. Phenocrysts of quartz, however, were recognized in various places in the mass. Under the microscope the mineral composition appears to be limited largely to quartz and remnants of orthoclase surrounded by carbonate. Kaolin, sericite, and magnetite are also present, but there are practically no basic rock-forming minerals. A considerable amount of acid fragmental material of agglomeratic type appears to be associated with this belt.

A small mass of light-weathering acid lavas similar to those of the belt just described is exposed on the big island in the southwest bay of Birch lake. This mass, which also contains basic lavas, is surrounded by Timiskaming sediments. Although the true relationships are obscured by folding, the writer tentatively regards this mass as belonging to the same horizon as the acid belt described above.

Rather dark-coloured acid lavas occur in the vicinity of the north arm of Seagrave lake, where they are exposed on some of the islands and on the south shore east of the narrows. The acid lavas here vary considerably in composition and are intimately associated both with other flows and with sediments.

Several masses of an unusual light-coloured, reddish-weathering rock, composed mainly of light-coloured feldspar, are exposed among the basic volcanics on the north side of the big island in the north arm of Springpole lake and on the mainland to the northeast. Some of this rock is exposed in the vicinity of the eastern part of the Dunkin claims. The feldspar crystals are somewhat brecciated and exhibit a parallel arrangement suggestive of a flow structure. A thin section examined under the microscope shows that this rock is composed mostly of altered orthoclase with much carbonate, and small amounts of acid plagioclase and pyroxene. Pyrite and very small grains of magnetite were also identified. A chemical analysis showed the following constituents:—

	Per cent.
SiO_2	57.92
Al_2O_3	18.76
Fe_2O_3	1.24
FeO	.48
CaO	4.36
MgO	.47
Na_2O	4.68
K_2O	7.89
H_2O	.91
CO_2	3.25
TiO_2	.16
P_2O_5	.16
MnO	.11
FeS_2	.30
Total	100.69

Both the mineral and chemical composition suggest that the rock belongs to the syenite family, and as it is probably a flow it might be called a trachyte.

Sediments

The Keewatin sediments are represented largely by thin beds which lie between the flows. On account of their close association with the flows and also because of their widespread distribution, no attempt was made to separate them for mapping purposes. They consist largely of conglomerates, greywackés, fine slaty sediments, iron formation, and tuffaceous material, some of which was probably deposited in water. These sediments do not cover extensive areas, but they occur in most localities where Keewatin lavas are found. In general, the Keewatin sediments may be distinguished from those of the Timiskaming type by their dark colour, in which respect they resemble the Keewatin lavas, their position between lava flows, and the fact that they consist largely of partly sorted volcanic detritus. In general they represent minor phases of sedimentation, such as might occur between periods of volcanic activity. Nevertheless, on account of the complex folding that characterizes the area it is, in places, difficult to distinguish these sediments from remnants of folded Timiskaming rocks. No pronounced angular discordance was observed anywhere in the area between Keewatin and Timiskaming rocks. There is reason to believe that in this area late Keewatin time was characterized by sedimentation to a greater extent than earlier Keewatin time. The apparent lack of evidence of an impressive erosion interval and the conformable relationship between Keewatin and Timiskaming type rocks suggest that earth movements at that time were not revolutionary in character. Possibly the change was a gradual one from a period dominantly volcanic to one featured largely by the processes of sedimentation.

Keewatin sediments associated with Keewatin lava flows are well exposed at several places along the east shore of Wagner bay of Birch lake. The beds in this vicinity include conglomerate, greywacké, fine-grained siliceous material, dark-green sediments, and slaty iron formation.

In the vicinity of Seagrave lake the Keewatin sedimentary horizons are composed largely of conglomerates, and long tongues of Timiskaming sediments from the large Timiskaming area to the west extend into and are infolded with the Keewatin lavas and sediments.

In the section that extends north from the east arm of Springpole lake to the south shore of Birch lake there are a few highly metamorphosed sedimentary horizons composed of greywacké and conglomerate. In the large Keewatin areas north of Perrigo lake and north of Okanse lake the sedimentary horizons are confined to a few thin beds and to lenses of both fine- and coarse-grained material.

Intrusives

The Keewatin intrusives are plutonic rocks of pre-Timiskaming age. Rocks of this type are rare in the Birch-Springpole Lakes area. They include a few scattered dikes and possibly some irregular-shaped intrusive masses. Some of the apparent Keewatin intrusives probably represent extruded magmas, which welled up into fissures and cavities formed in cooling lavas. Keewatin intrusives of positively deep-seated origin are not conspicuous. One or two dikes of dioritic character which cut the Keewatin volcanics on the property of the Sol D'Or Gold Mines, Limited, probably belong to this category. Dikes of dioritic character similar in composition to the lavas which they intrude were identified in that part of Birch lake that lies east of Wagner bay and north of Springpole lake. East of Okanse lake andesitic pillow lavas are associated with massive, well-textured diorites, some of which may possibly be intrusive.

Laurentian Granite.—The term "Laurentian granite" is reserved for those granites that intrude only pre-Timiskaming rocks. No such granite was identified in the Birch-Springpole Lakes area. The presence of granite boulders, however, in the Timiskaming conglomerates of the area suggest that a mass of Laurentian granite was exposed to erosion somewhere in the region during Timiskaming time. As far as the writer knows, no masses of pre-Timiskaming granite have been identified by the geologists who have examined neighbouring areas.

Timiskaming(?)

The rocks of the Timiskaming type, which are represented almost entirely by sediments, cover large parts and form one of the interesting features of the Birch-Springpole Lakes area. In age and character this group appears to be analagous to the Shabu series described by Furse.[1] On account of the complex folding the maximum thickness of the Timiskaming series of the Birch-Springpole Lakes area could not be satisfactorily estimated. That part of the series that is exposed on the south shore of Birch lake east of Wagner bay has a thickness of over 7,000 feet. The largest area of these sediments and the locality in which the series probably attains its maximum thickness lies in the section that extends from Birch lake south toward Bertha lake. Although the thickness of the series in this vicinity is unknown, it probably exceeds by a substantial amount the above estimate of 7,000 feet. The lower horizons of the series are composed of highly metamorphosed volcanics, iron formation, and conglomerate. The upper part consists of metamorphosed conglomerate, greywacké, impure quartzite, arkose, and some slate. Volcanics were not positively identified in the upper horizons of the Timiskaming-type series.

Iron Formation

Most of the iron formation occurs in thin, dark, slaty magnetite beds, which are scattered throughout the Keewatin sections of the area, but are probably most common in the vicinity of the east shore of Wagner bay of Birch lake.

Iron formation of highly banded character is best exposed on the south shore

[1]G. D. Furse, "Geology of the Shabumeni–Birch Lakes Area," Ont. Dept. Mines, Vol. XLII, pt. 6, 1933, pp. 24-26.

near the east end of Birch lake, where a belt over 400 feet wide strikes northwest along the water's edge for a distance of about 1,500 feet. This belt lies in a transition zone between the Keewatin and the Timiskaming-type rocks. As this iron formation somewhat resembles the Timiskaming iron formation identified by Furse on an island that lies along the strike of the rocks several miles to the northwest, it has been classed with the Timiskaming rocks. The iron formation is locally much folded. It appears to dip steeply to the northeast and disappears under the waters of Birch lake, so that its entire width was not determined. South of the belt lie Keewatin rocks composed mostly of lavas with beds of sediments and possibly tuffs, the strike and dip of which conform approximately to the bands of the iron formation. There is no visible angular discordance or erosional unconformity between the iron formation and the Keewatin rocks. The rocks to the north of the belt are covered by the waters of Birch

Banded iron formation on the south shore near the east end of Birch lake.

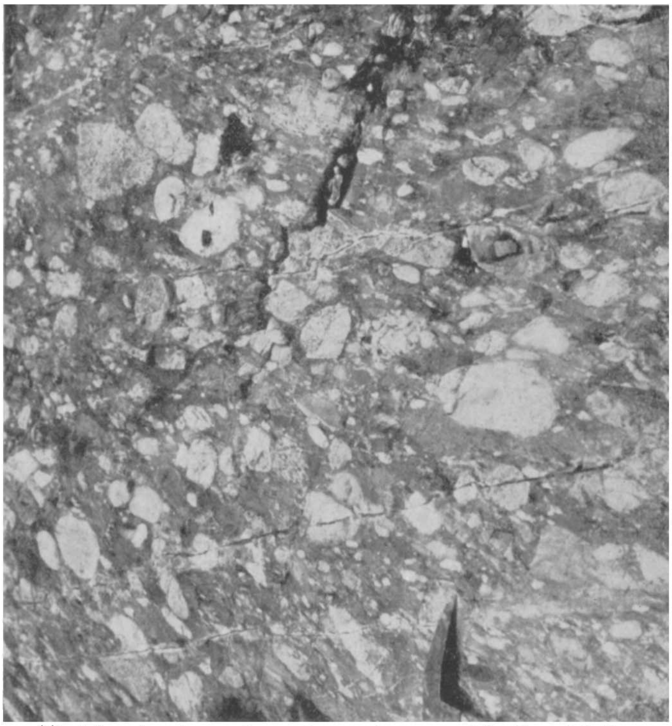
lake, but the presence of Timiskaming sediments to the northwest suggests that the iron formation may be situated in the lower horizons of the Timiskaming series. The individual beds range in thickness from very thin laminations that measure only a fraction of an inch to bands of 3 or 4 feet. There are no white pure silica bands. All beds are dark in colour and are composed of slaty greywacké and impure quartzite with varying amounts of magnetite. Some very thin laminations examined under the microscope were composed almost entirely of quartz and magnetite. The banding is primarily due to a difference in composition, but it has been strikingly accentuated by weathering. The iron formation belt is traversed by a few small stringers and veins of quartz, some of which contains a little pyrite.

Iron formation consisting of thin slaty magnetic beds was identified at several places on the south shore of Birch lake between Wagner bay and the east end of the lake. All the occurrences in this section are confined to the transition zone between the Keewatin and Timiskaming rocks.

Well-banded, distinctly folded iron formation associated with sediments of Timiskaming type occur northeast of Bertha lake. On account of the overburden in the vicinity no estimate could be made of the magnitude of this belt. Other small bands of iron formation belonging to both Keewatin and Timiskaming rocks occur near Lindsay lake, near the east shore of the Shabumeni river, and in the vicinity of the northwestern part of Birch lake.

Conglomerate

The Timiskaming conglomerates are best exposed on islands of Wagner bay, and along the south shore and in South bay of Birch lake. Coarse conglomerates also occur in the vicinity of Cromarty and Grace lakes. In most of these places the conglomerates are interbedded with greywacké and impure quartzite, but



Timiskaming type of conglomerate exposed in the vicinity of the northwest shore of Perrigo lake.

in places also with arkose and slate. The material that composes the conglomerates ranges from coarse sand to boulders over a foot in diameter. Most of the Keewatin types were recognized among the conglomerate boulders. They include ellipsoidal and amygdaloidal andesites and basalts, diorites, hornblendites, acid lavas, quartz porphyries, feldspar porphyries, slate and banded sedimentary material, banded iron formation, and vein quartz. Granite boulders from an unknown source were also identified. A few of the boulders have a nodular appearance similar to spherulitic lavas. In most of the conglomerate, boulders are well rounded. The matrix consists of greywacké, impure quartzite, and other fine-grained clastic material.

Greywacké, Quartzite, Arkose, Slate

The finer-grained sediments, although associated with the conglomerates, also cover substantial areas elsewhere in the area. Greywacké and impure quartzites cover large areas between Birch lake and Bertha lake. The sediments in the vicinity of Bumpy and Cook lakes are largely mica schists, which, under the microscope, were found to be composed mostly of quartz and biotite. They probably represent the metamorphosed equivalents of impure quartzites.

Slates have not been developed on a prominent scale anywhere in the area, although thin beds of slaty material are widely distributed. In the vicinity of Grace lake contorted slates are interbedded with the coarser sediments. The sedimentary belt that extends north from Perrigo lake to McNaughton lake contains beds of conglomerate, slate, and other fine-grained sediments, as well as thin beds of fine-grained tuffaceous material.

Arkose, which might be mistaken for altered quartz porphyry, is well exposed on the west shore of South bay of Birch lake.

All the Timiskaming sediments are highly folded and extensively metamorphosed. Nevertheless, the bedding is still apparent in most localities. Structures such as ripple marks were not identified and if once present have been obliterated. Cross-bedding is not common, and the few occurrences recognized were of no use in determining the positions of the beds.

Algoman

The Algoman rocks of the Birch-Springpole Lakes area consist of plutonic types which intrude the Keewatin and Timiskaming groups. The oldest Algoman rocks are diorite and hornblendite. Next in sequence follow the granites and granite gneisses, which occupy extensive areas. The youngest Algoman rocks, which represent the closing stages of Algoman activity, are pegmatite dikes and quartz veins.

Diorite and Hornblendite

Diorite and hornblendite have been indicated on the map accompanying this report as of early Algoman origin. Some of these rocks undoubtedly belong to early Algoman time, but others, which may belong to the same period, could not be certainly determined as Algoman. Some of the diorite and hornblendite masses definitely intrude pre-Algoman rocks, as for example those situated in the vicinity of the western part of Birch lake near the Shabumeni river and others situated near the south end of South bay of Birch lake. The latter cut Timiskaming sediments. In the vicinity of the east end of Bertha lake, however, masses of hornblendite porphyry occur in highly metamorphosed Keewatin lavas. Granite is exposed in the neighbourhood, and it is possible that granite also occurs at shallow horizons below the hornblendite porphyry. These masses, too, have been tentatively designated as Algoman by the writer, although they may have resulted from contact metamorphism or refusion of Keewatin basic lavas.

The diorite and hornblendite identified in localities west of Cook lake are undoubtedly marginal phases of the granite. These masses not only lack precise boundaries but they appear to grade imperceptibly, by gradual change in composition, into pink granite. Genetically they may be explained as the result of assimilation of greenstone by granite or as the result of the migration of basic material toward the margins of cooling granite magma.

Granite and Granite Gneiss

All the light-coloured granite rocks in the margins of the area as well as those masses within the area that are surrounded by greenstones and sediments are of Algoman age, as are the vast granite fields that extend eastward from the borders of the area for an unknown distance into unexamined country. They include the Seagrave lake batholith, the Bumpy lake and Deaddog lake granites, the Perrigo lake and Okanse lake batholiths, and the isolated smaller masses of granite that intrude the greenstones and sediments in various parts of the area, the exact relationship of which to the large granite masses is unknown. Some small marginal phases of granodiorite and syenite and a few quartz porphyry dikes are also of Algoman age.

The granites vary in colour, mostly from pink to grey, but near the contacts with basic lavas they have been darkened, owing to assimilation. They are composed largely of quartz, orthoclase, a little oligoclase, and either biotite or hornblende. Two thin sections of granite were examined under the microscope. One was obtained from the Perrigo lake batholith and the other from the small batholith on the west shore of South bay of Birch lake. Each contained small amounts of both biotite and hornblende. In the larger Algoman areas granites and granite gneisses are intimately associated, with confused relationships. Most granite masses exhibit foliation to a minor degree, but nowhere in the area were the granites intensely foliated. The absence of foliation suggests that there has been no major deformation in the area since Algoman time. The small batholith on the west shore of South bay of Birch lake and the one about three miles to the north on the north shore of the main part of Birch lake are rather more massive and of finer texture than the granites of the Perrigo, Seagrave, or Okanse batholiths.

Syenite

Syenites are rare and appear to be confined to very highly coloured, locally porphyritic phases associated with the granites in the vicinity of the north shore of Perrigo lake and a few red dikes and small masses, containing much orthoclase feldspar, which occur in the vicinity of the north arm of Springpole lake. Under the microscope samples from both these localities showed considerable quartz. It is doubtful, therefore, if there are any true Algoman syenites in the area.

Quartz Porphyry

The quartz porphyries also occur infrequently. They appear to be limited to a few dikes in the vicinity of the Dole claims north of the east arm of Springpole lake and localities near the eastern part of Exit bay of Birch lake. One mass is exposed on the north shore of Satterly lake. These dikes are composed almost entirely of bluish quartz and white orthoclase with varying amounts of sulphide. Some small masses of quartz feldspar porphyry were also identified in the vicinity of the western part of Birch lake. None of the quartz porphyry masses examined were associated with pegmatite dikes, and the age relationships of these two Algoman types could not be ascertained.

Pegmatites and Quartz Veins

The granite pegmatites cut the Keewatin and Timiskaming, as well as the earlier Algoman rocks. They appear to be associated mostly with the granites, and with the Keewatin and Timiskaming rocks near the margins of granite masses. They are the result of the slow crystallization of granitic material rich in silica and other hydrothermal solutions that filled the fractures caused by the cooling of previously crystallized granitic magma. Pegmatite dikes in the vicinity of Cook and Bumpy lakes are composed mostly of quartz, orthoclase, muscovite, and biotite. One dike in the vicinity of the granite-sediments contact on the survey line that runs south from the north end of Cook lake contains suggestions of graphic texture. The pegmatites of the other granite sections of the area do not differ materially in composition from those of Cook lake. The flat-lying dikes that cut the granite at Deaddog lake are perhaps a little unusual. The fresh undisturbed appearance of the granite suggests that the dike material was deposited in a set of horizontal fractures which have not been greatly disturbed.

Quartz veins, most of which are small, represent the last phases of Algoman activity. The veins cut all the consolidated rocks of the area including the pegmatite dikes.

Pleistocene

The topography of the Birch-Springpole Lakes area is the result of the action of the continental glacier which once covered most of the northern part of North America. The pre-glacial mantle of residual soil was swept away by the ice-sheets, and the debris redistributed over a smoothed and locally polished surface. Mounds of boulder clay and of gravel, sand deposits, remnants of eroded eskers, and rounded hillocks of rock are characteristic features of this typical glacial topography. Probably the most pronounced effects of glaciation are the numerous lakes, which owe their origin chiefly to the uneven redistribution of the glacial debris. It is doubtful if any lakes existed in the Birch-Springpole Lakes area immediately prior to glacial time, as a base-levelled topography, such as then existed, did not provide basins for water to accumulate. The pre-glacial rivers were largely confined to the major troughs, which, although modified in detail, have nevertheless prevailed throughout the glacial period to form the main water channels of the present time.

Structural Geology

Most of the folded structures of the Birch-Springpole Lakes area are the result of Algoman earth movements. The complexity of these folded rock structures is one of the outstanding features of the area. Throughout most of the area the sedimentary beds and flows have been tilted and now stand in nearly vertical positions. Furthermore, the planes of schistosity throughout most of the area are also almost vertical and appear to bear a parallel relationship to the steeply dipping beds and flows. This parallelism between the beds and planes of schistosity suggests deformation that resulted in close folding. It has been observed, moreover, that this parallel relationship exists in many places where sudden changes in strike show that the schistose rocks have been subjected to crumpling. Crumpling of this character occurs frequently in the Timiskaming sediments in the vicinity of Birch lake. It is apparent, therefore, that there have been two distinct periods of deformation: first, a period of close folding, during which schistosity was developed, in the main parallel to the limbs of the folds; second, a period of deformation which locally crumpled the schistose beds and complicated the previously formed structures. The stresses that produced the second deformation were not severe enough to obliterate the primary cleavage. Partial development of secondary cleavage was identified in the vicinity of the northwest corner of Perrigo lake, and visibly folded fracture cleavage is exposed on the east shore of Wagner bay of Birch lake south of the point where the shore line turns eastward. There is no evidence that any great time interval elapsed between the two periods of deformation. In fact the entire sequence might be regarded as having progressed without interruption during Algoman time.

The rocks north of Perrigo lake and near Okanse lake strike approximately north-south. Farther to the north, in the vicinity of the western part of Birch lake, the strikes change gradually to northeast; and farther eastward the rocks of Seagrave, Springpole, and Birch lakes strike almost east-west. Observations of the plunge of the schistosity (plunge of the elongation of mineral grains) made at various places along this changing strike show that the plunge changes from steeply south in the vicinity of Perrigo and Okanse lakes, to steeply southwest in the northwestward-striking rocks of the west part of Birch lake, and finally to steeply west in the east-west striking rocks of the eastern part of the area. The consistency of the plunge of schistosity observed on this huge structure, which was followed from the southwestern to the northeastern part of the area, substantiates the view already stated concerning two periods of deformation.

Some problems involving rock deformations in the Birch-Springpole Lakes area have been discussed by H. W. Fairbairn in a paper entitled "Elongation in Deformed Rocks," which was presented at the annual meeting of the Geological Society of America held in New York in December, 1935.

Drag-folded dike exposed on the north shore of the large island situated near the south shore of Birch lake not far east of Wagner bay.

One of the most obvious structures of the area is a folded anticline which is exposed in the vicinity of Springpole lake. This structure has been described by Burwash[1] as follows:—

> The axis of the anticline . . . is occupied by the northern arm of Springpole lake, and by a bay which extends south from Birch lake and lies to the west of the north arm of Springpole lake. . . . Passing over the portage from the north arm of Springpole lake to Birch lake we descend the northern limb of the anticline.

Keewatin volcanic rocks, which strike northwest from the north arm of Springpole lake to Birch lake, are exposed along the centre of this structure, and the younger Timiskaming sediments are exposed on the limbs to the northeast and to the southwest. The Timiskaming sediments in the southwest limb of this fold extend into a large area of folded Timiskaming rocks, the structural details of which the writer was unable to solve in the time at his disposal. It appears, however, that there are some warped folds in this section which strike nearly east-west.

The basic and acid volcanics exposed in the vicinity of the large island in Birch lake west of Wagner bay probably represent a window of Keewatin rocks surrounded by Timiskaming sediments.

[1]E. M. Burwash, "A Geological Reconnaissance into Patricia," Ont. Dept. Mines, Vol. XXIX, pt. 1, 1920, pp. 174, 175.

ECONOMIC GEOLOGY

Mineralization

The mineralization of the Birch-Springpole Lakes area is similar in some respects to that of the Red Lake and Pickle Lake–Crow River sections of the same belt.

Mineralized quartz veins, sulphide-bearing porphyry dikes, and shear zones containing both quartz and sulphides have been located in various parts of the area. In some cases the flows, sediments, and granites contain small amounts of disseminated sulphides. Although the entire area is of potential importance most of the interesting mineralization discovered so far is confined to the northern sections of the area, in the vicinities of Grace, Springpole, and Birch lakes. North of the east arm of Springpole lake highly folded Keewatin rocks, which strike almost east-west and dip to the north, are cut by dikes of pink granite and quartz porphyry and by quartz veins. Some of the veins cut across, others conform to the strike of the surrounding rocks. Many of them are small and irregular, and the majority appear to carry only a little sulphide. Pyrite, chalcopyrite, pyrrhotite, and some small cubes of galena were identified in the veins. The mineralization in a quartz porphyry dike in this section appeared to be limited to a little pyrite. Some staking was done in this neighbourhood by Dole Brothers in 1934.

The numerous Algoman red porphyry dikes that cut the Keewatin lavas and sediments in the vicinity of the north arm of Springpole lake appear to be almost barren of sulphides. On account of their striking red colour these dikes are very conspicuous and may be readily recognized among the dark Keewatin rocks. Disseminated pyrite was the only sulphide recognized in the dike material. An assay of a sample from a dike that outcrops on the east shore of the north arm of Springpole lake gave no gold.

Prospectors reported that a gold concentrate could be obtained by panning the light-coloured, reddish-weathering trachyte that is associated with the dark Keewatin lavas on the mainland to the north and northeast of the big island in the north arm of Springpole lake. A grab sample of some of this material, which contained a little disseminated pyrite, was assayed by the Provincial Assayer and yielded a trace of gold.

Mineralization of rather interesting character occurs in a shear zone in metamorphosed Keewatin lavas just east of the portage at the north end of Springpole lake. The shear zone contains quartz veins and lenses and bands of schist and parallels the foliated lavas, which strike about N.65°W. and dip 50°N.E. Some sediments and light-weathering masses of trachyte occur in the vicinity. Intrusions of Algoman granite are found about a mile to the east, and Timiskaming sediments lie in contact with the Keewatin rocks some hundreds of feet north of the shear zone. The mineralized zone contains tourmaline, ankerite, and various sulphides. At the time of the writer's visit the mineralized exposures were confined to the Dunkin claims; to the east the rocks are largely obscured by muskeg and overburden, and to the west they consist of metamorphosed Keewatin volcanics. Numerous claims were staked in this neighbourhood in 1935.

Interesting gold mineralization associated with quartz veins has been found at Grace lake and in the section north of Bergstrand lake and west of South bay of Birch lake. Visible gold has been found at three scattered locations in this neighbourhood, as follows: at the property of Sol D'Or Gold Mines, Limited, situated on Grace lake; on the Bergstrand claims, north of Bergstrand lake;

and on the Harris-Swain-Cavano claims near South bay of Birch lake. At the Sol D'Or property the veins occur in Keewatin volcanics, but at the other two properties they cut Timiskaming sediments. The veins so far exposed are small, and as the gold appears to be confined within the vein walls the amount of ore indicated is small. Probably deep-seated granite masses have been the source of the mineralization. A granite batholith is exposed at the east end of Swain lake. Geologically this neighbourhood is worth intensive prospecting.

A few small quartz veins and some quartz porphyry dikes were identified in the vicinity of the east end of Exit bay. In this section the mineralization appears to be confined to pyrite. Near the south shore of Exit bay old stakings are evidence of previous prospecting activity. The rocks here include sediments, greenstones, and diorites. Sulphide mineralization associated with fracturing was the reason for the previous interest of prospectors in this locality.

In the neighbourhood of the western part of Birch lake and along the Shabumeni river quartz veins up to 4 feet in width cut the Keewatin rocks. Most of these consist of barren quartz. One vein, however, exposed on the south shore of Birch lake near the mouth of the Shabumeni river, contains a variety of minerals, including quartz, tourmaline, calcite, ankerite, albite, pyrite, chalcopyrite, and probably other sulphides. An assay of a grab sample which contained sulphide material from this vein gave no gold values.

Description of Properties

BIRCH-SPRINGPOLE LAKES AREA

Sol D'Or Gold Mines, Limited

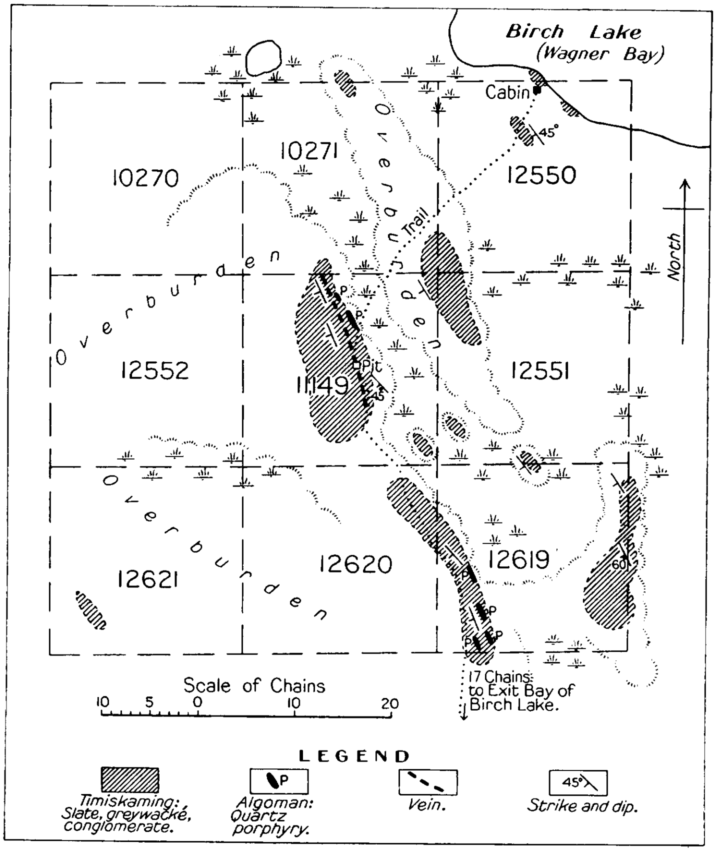
The property of Sol D'Or Gold Mines, Limited, consists of 24 unsurveyed claims situated on Grace lake in the northeast corner of Honeywell township, the northwest corner of McNaughton township, and in the block immediately north of these two townships. Adjacent ground held under option brings the total present (July, 1935) holdings to 38 claims. The original staking dates back to 1927, when 18 claims were staked by Messrs. T. W. Bathurst, R. Ellis, and Walter Johnson for the T. W. Bathurst Syndicate. Shortly afterwards the Rainbow Lake Gold Mining Company, Limited, was organized to take over the property, and funds were made available for the erection of camps and for mining work, including a small shaft to 34 feet. In 1930, the name of the company was changed to Rainbow Lake Gold Mines, Limited. Subsequently the ground became open for staking, and in 1932, it was restaked by Earl McDougall. In the fall of 1932, the property was leased to T. W. Bathurst, and a 3-ton Jack Nutt mill was installed. The mill was first operated in November, 1932, and in December of the same year the first gold was shipped to the mint at Ottawa. In 1934, the property was acquired by the Sol D'Or Gold Mines, Limited. During the summer of 1935 this company installed a 5-ton Straub mill with amalgamation plates and concentrating table. The mill was first operated in September, 1935, and was driven by a new 8 h.p. Diesel-type Lister motor.

The rocks on the property are Keewatin lavas and volcanic fragmentals, which near the north end are in contact with Timiskaming sediments. The mineralization occurs in a fracture zone, about 350 feet in width, and consists of six small parallel quartz veins, each of which is less than 10 inches wide. The veins dip from 40° to 70°N.E. and strike N.70° to 80°E. They contain pyrite, chalcopyrite, galena, sphalerite, and fine visible gold. Tellurides are also present. Operations to date have been confined mainly to open-cut mining on No. 3 vein. Officials state that up to July, 1935, about 400 tons of ore had been milled, which yielded approximately $7,500 in gold. During the winter of 1934-35, the vein zone was explored by diamond-drilling. Ten holes ranging in depth from 150 to 650 feet and aggregating 3,000 feet were completed. Some ore was indicated over narrow widths. Sampling done so far indicates that the gold is confined almost entirely to the narrow quartz stringers.

Open cut showing No. 3 vein on the property of Sol D'Or Gold Mines, Limited, Grace lake.

Swain, Harris, and Cavano

The Harris-Swain-Cavano holdings consist of 9 claims situated near the west shore of South bay of Birch lake. The country rock of Timiskaming sediments consists of beds of conglomerate, greywacké, arkose, and slate, which strike almost east-west and dip about 60°S. These rocks are highly altered, and the character of some of them suggests the presence of intrusives or other igneous types. The claims were staked in September, 1934, by Bob Harris, who had panned visible gold from rusty gossan associated with the bedded rocks. A 5-foot pit sunk into the gossan on claim K.R.L. 12,258 lies wholly in rusty oxidized material. The work done at the time of the writer's visit was not sufficient to allow any reliable estimate of the size of the gold-bearing zone. Conditions suggest that the showing is the location of small gold-bearing quartz veins containing tourmaline, pyrite, chalcopyrite, abundant mispickel, and gold. The gossan has resulted from the decomposition of the vein material and of the hydrothermally carbonated wall rock. About 75 feet north of the pit some small sulphide-bearing quartz veins have the same strike as the sediments. In August and September, 1935, a few ounces of gold were recovered from the gossan by means of pans and rockers. In view of the gold mineralization and owing to the fact that gold has also been discovered elsewhere in the neighbouring sections, the property merits further prospecting.



Geological sketch map of the Wagner-Melanson claims, Wagner bay of Birch lake. Scale, 10 chains to the inch.

Wagner and Melanson

The Wagner-Melanson group of 9 claims is situated at the south end of Wagner bay of Birch lake. The rocks here are Timiskaming sediments, which include conglomerates, greywackés, and slates. The beds strike north-northwest and dip steeply to the southwest. Structurally this section is thought to be on the southwest limb of an anticline, the axis of which strikes northwest through Springpole lake towards Birch lake. The ground was first staked in 1930 by Louis Wagner, Jack Kerr, and Henry Mayo, but at present it is held by Wagner and Melanson. The main showing consists of a quartz vein, which has a maximum width of 8 feet and strikes north-northwest through the centre of claim K.R.L. 11,149 for a distance of over 700 feet. The vein conforms in dip and strike to the surrounding sediments, which are largely greywackés. At one place near the centre of claim K.R.L. 11,149 the vein zone consists of several parallel folded quartz veins spaced over a total width of about 25 feet. The sulphide mineralization is confined to pyrite, which carries the gold values and is found in the vein and in the walls close to the vein. In 1930, the group was optioned to the Consolidated Mining and Smelting Company, Limited, which did some stripping, trenching, and sampling. Gold values as high as $13.65 (gold at $20.67 per ounce) are reported to have been obtained. The option was not exercised. Since 1930, the property has been examined by various interests. Very little additional work has been done.

Dunkin

The Dunkin holdings consist of 8 claims most of which are situated on the north shore of the north bay of Springpole lake. The Northern Aerial Minerals Exploration Company, Limited, did some prospecting in the vicinity in 1928. It was not until 1934, however, that the ground was staked by Tom Dunkin, who did a little stripping and trenching on a northwestward-striking mineralized shear zone in chloritized Keewatin greenstones. Most of the rocks in this vicinity are Keewatin lavas, with which are associated some thin beds of sediment. The beds and flows strike N.60°W. to N.75°W and dip 50° to 80°N.E. North of the Keewatin rocks lies a rather extensive mass of Timiskaming sediments. The main showing consists of a mineralized belt containing two parallel shear zones, both of which contain mineralized quartz stringers and mineralized schist. One of these shear zones has been traced intermittently along the strike for about 500 feet and has a maximum width of about 25 feet. Some of the schist in the vicinity is highly foliated. The sheared belt conforms in strike and dip to the greenstones. Sulphides, including pyrite, chalcopyrite, pyrrhotite, galena, zinc blende, and probably mispickel, are associated with the schist and the quartz stringers. Tourmaline and ankerite are also present. As high as one ounce of gold per ton is said to have been obtained. No visible gold, however, was identified in the mineralized material. A grab sample taken by the writer from a well-mineralized part of the zone gave no gold. A number of claims adjoining this group were staked in September, 1935.

Bergstrand

The Bergstrand holdings consist of claims K.R.L. 10,586, 10,587, and 10,588 at the northeast end of Louwag lake and K.R.L. 11,344, 11,345, and 11,346 just north of Bergstrand lake. Only the last-mentioned group was visited by the writer. The rocks in the vicinity consist of eastward and northwestward striking, vertically dipping Timiskaming sediments, including greywacké, impure quartzite, and thin beds of slate. Conglomerates also occur on the property. The mineralized zone consists of small quartz stringers, which lie both parallel and transverse to the sedimentary beds. The veins contain various sulphides, including pyrite, galena, and chalcopyrite. They also contain fine visible gold. The stringers are narrow and are not spaced closely enough to make one ore body. A considerable amount of stripping and trenching has been done, the deepest pit being down about 9 feet. Apparently the gold-bearing zone has never been systematically sampled. A few ounces of gold were recovered by Ephraim Bergstrand by means of hand-crushing and panning.

Dole Brothers

Dole Brothers hold 9 unsurveyed claims, which were staked in May, 1935, on the north shore of the east arm of Springpole lake. The group extends northward to the east bay of the north arm of Springpole lake. The rocks in the vicinity consist mostly of highly altered Keewatin lavas, chiefly hornblende schist. They strike almost east-west and dip to the north at angles ranging from 15 to 55 degrees. They are cut by masses of diorite, dikes of granite, syenite porphyry, and quartz porphyry, and quartz veins. The main showing consists of a combined shear zone and quartz vein, which strikes about east-west in the northwestern part of claim K.R.L. 12,591. The shear zone, which is about 4 feet wide and at this place dips about 45°S., contains quartz stringers and gouge. The minerals include quartz, tourmaline, ankerite, pyrite, and chalcopyrite. At the bottom of a 10-foot pit sunk in the shear zone mineralized schist is exposed, with a mineralized quartz vein about one foot wide. Gold values as high as $16.00 per ton are said to have been obtained from this mineralized material. A considerable amount of stripping and trenching has been done at various other places on the property, and several small mineralized veins have been located.

ADJACENT TO THE BIRCH-SPRINGPOLE LAKES AREA

Johnson-Dynes

The Johnson-Dynes property, which was formerly known as the Dynes claims, is situated on Casummit creek, about 1½ miles east of Casummit lake and about 1 mile north of Birch lake. The property has been described by Furse[1] in his report on the Shabumeni-Birch lakes area. The mort important mineralization disclosed so far is associated with a moderately sheared zone containing quartz stringers and lenses, which strikes almost east-west and dips steeply to the north. The strike and dip of the quartz veins and stringers conform to those of the surrounding greywacké. During the summer of 1935, the vein zone was explored by drilling. Altogether 10 holes were completed, which aggregated 1,500 feet. The vein was located along the strike for a distance of about 800 feet. The sulphide mineralization, which is confined mostly to the schist but which also occurs in the quartz at some places, consists mostly of pyrite and mispickel. The writer did not take samples, and as the drill-core was not logged or assayed at the time of his visit, nothing is known of the gold values. No visible gold was identified on the property by the writer.

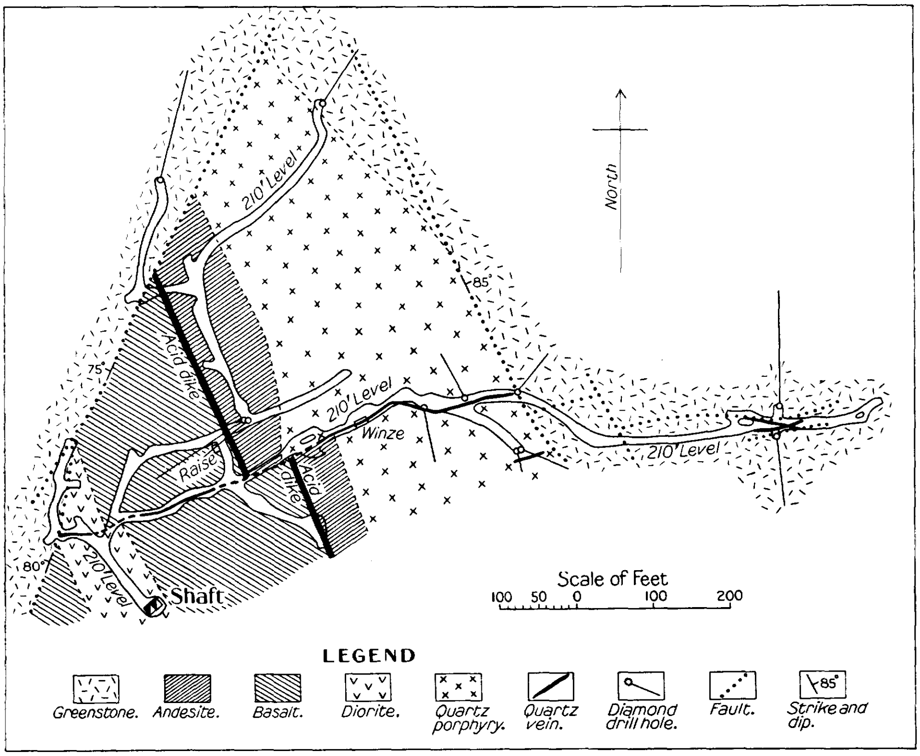
Cooper and Barry (McIntyre)

The claims of the W. D. Cooper and P. A. Barry lease are situated on the north shore of Birch lake. The geology of this property has been previously described by Furse.[2] The rocks in the vicinity are Keewatin volcanics and sediments. A mineralized shear zone with a steep northerly dip parallels the lava flows and strikes almost east-west through the property. The zone ranges in width from 2 feet to 15 feet and has been traced intermittently along the strike for about 2,000 feet. It contains veins and lenses of mineralized quartz as well as mineralized schist. The mineralization includes quartz, tourmaline, pyrite, mispickel, and gold.

The claims were originally staked by Jack Miller for McIntyre-Porcupine Mines, Limited, and early work consisted of stripping, trenching, and diamond-drilling. In 1933 the property was leased to W. D. Cooper and P. A. Barry, who commenced shaft-sinking at a mineralized section of the shear zone. A 25-ton Tremaine mill with amalgamation plates was installed and was first operated

[1]G. D. Furse, "Geology of the Shabumeni-Birch Lakes Area," Ont. Dept. Mines, Vol. XLII, pt. 6, 1933, pp. 39, 40.
[2]Ibid, pp. 40, 41.

in August, 1934, mill feed being obtained from shaft-sinking. At a depth of 70 feet the mineralized zone was lost owing to a fault, and at 90 feet shaft-sinking was suspended and operations were confined to drifting both east and west on the 40-foot level above the faulted zone. Only a small amount of lateral work was done. In the summer of 1935 additional exploration work was carried out along the shear zone by diamond-drilling. Altogether 9 holes, totalling 2,000 feet, were drilled. Apparently the gold values in the mineralized zone are erratic, and the ore pockets located have been small. In October, 1935, mining operations were suspended. The amount of gold produced was not large, amounting to 23 ounces, worth $825.



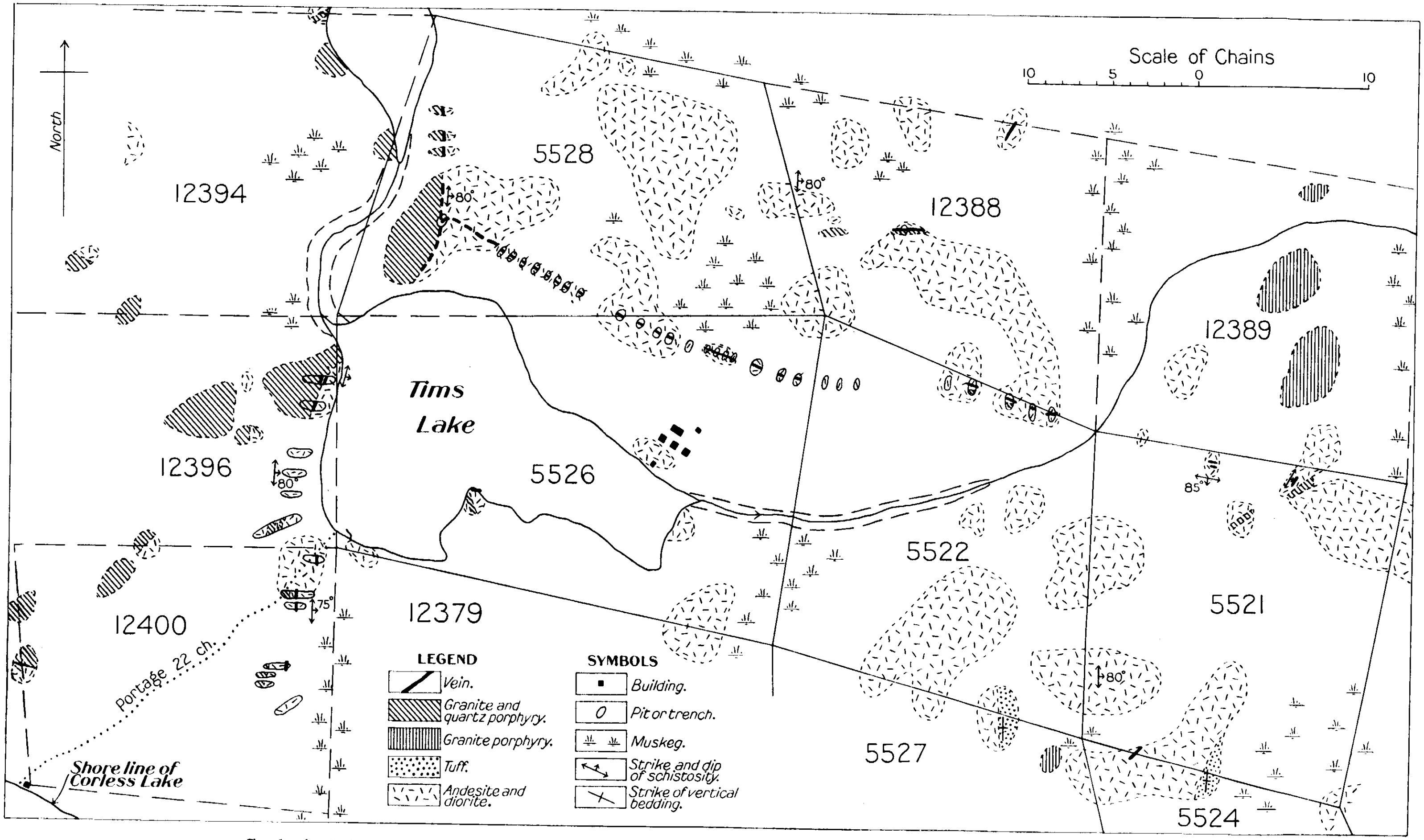
Plan showing the geology and workings on the 200-foot level, Hudson-Patricia Mines.

Hudson-Patricia Gold Mines, Limited

The geology of this property has been previously described by Bruce[1] and Furse.[2] In 1934, Hudson-Patricia Gold Mines was organized to acquire the property of Metals Development, Limited, situated between Woman and Confederation lakes. There are several quartz veins on the property. The most important operations have been carried out on claim K.R.L. 5,603, on a gold-bearing quartz vein ranging in width from a few inches to over 3 feet. This vein, which strikes about N.65°E. and dips 65°N.W., cuts Keewatin basic volcanics, which strike about N.10°W. and dip 80°N.E. A vertical shaft was sunk

[1]E. L. Bruce, "Gold Deposits of Woman, Narrow, and Confederation Lakes," Ont. Dept. Mines, Vol. XXXVII, pt. 4, 1928, p. 45.

[2]G. D. Furse, op. cit., pp. 45, 46.



Geological sketch map of the western section of the property of the Corless Patricia Gold Mines, Limited.

on the vein by Metals Development, Limited, in 1931-32, and spasmodic underground operations have followed. Up to July, 1935, the workings consisted of a vertical shaft to 237 feet, with levels at 80 and 210 feet; a winze to the 325-foot level; and a raise from the 210-foot level to the 80-foot level. Over 3,000 feet of lateral work has been completed, most of which has been confined to the 210-foot level. Work done so far indicates two almost vertically plunging bodies of material reported to be of ore grade. The writer was informed that 1,500 tons of ore were on the dump and that a considerable amount of ore was indicated underground. The vein minerals include pyrite, galena, chalcopyrite, sphalerite, and gold. A qualitative test for tellurium was made on a grab sample of vein material that contained a variety of minerals and gave a negative reaction. Since 1934, an aggregate of about 2,400 feet of diamond-drilling in 20 holes has been done from underground. Mine officials state that the drill-holes that intersected the vein zone at the 450-foot horizon indicated two quartz veins, each of which carry gold values. Intricate faults have complicated mining operations at this property. In July, 1935, at the time of the writer's visit, both ends of the 210-foot level had reached points where the vein was faulted off. Mining operations were temporarily suspended in September, 1935. In March, 1936, the writer was advised by mine officials that a 50-ton mill was being installed on the property and that it was the intention of the management to dewater the workings and resume operations in the near future.

Corless Patricia Gold Mines, Limited

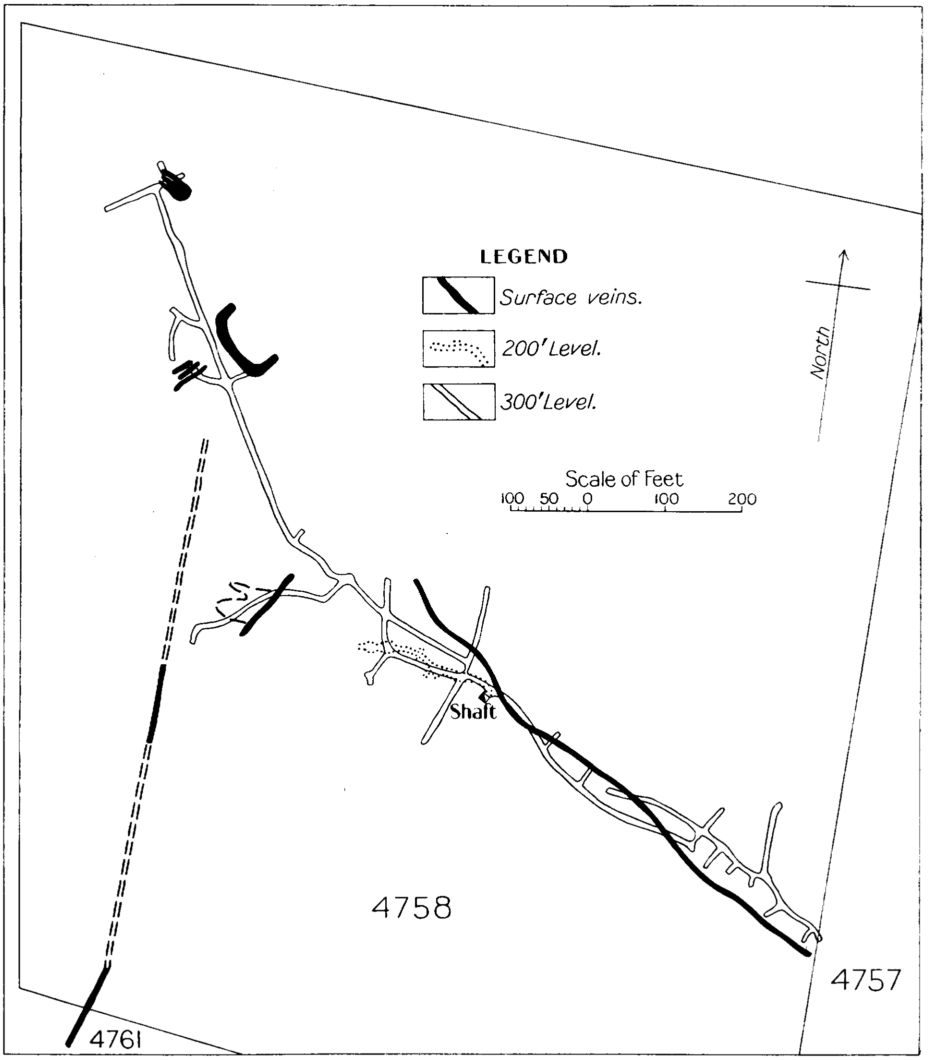
Corless Patricia Gold Mines, Limited, was organized in 1934 to take over the property of Henry Brothers situated in Corless township near the south end of Woman lake. The claims were staked by Henry Brothers in 1926. Since the claims were acquired by the new company an active programme of work, consisting of stripping, trenching, and diamond-drilling, has been in progress on the western part of the property in the vicinity of Tims (Smith) lake. This property has been described by Bruce.[1] In this section andesitic lavas and pillow lavas of Keewatin age have been intruded by diorite, and subsequently both were intruded by Algoman granite. Quartz veins genetically related to the granite also cut the Keewatin rocks. No. 5 vein, which lies just north of Tims lake, consists of a mineralized shear zone in Keewatin rocks, which has been traced for approximately 2,000 feet and has a maximum width of 20 feet. This zone strikes nearly east-west, dips almost vertically or steeply south, and contains stringers and lenses of quartz separated by bands of schist and silicified material. A very dark quartz porphyry occurs in the eastern part of this zone. The sulphides present include pyrite, chalcopyrite, and pyrrhotite, which are associated with both the quartz and the schist.

On October 1, 1935, mine officials stated that sampling done up to that time had indicated a 500-foot section of ore grade over mineable widths. No visible gold was identified by the writer. An assay of a grab sample of well-mineralized material in the zone gave no gold. Assay results from 3,000 feet of diamond-drilling were not available at the property at the time of the writer's visit. A considerable amount of surface work has also been done on No. 6 vein, which strikes a few degrees east of north on the west side of Tims lake. Flakes of molybdenite and much disseminated pyrite were identified in a pit at the junction of No. 5 and No. 6 veins. A good deal of surface work has been done on other sections of the property in past years but without important results.

[1]E. L. Bruce, op. cit., pp. 34, 35.

Bathurst Gold Mines, Limited

The property of Bathurst Gold Mines, Limited, is situated between Bathurst and Car lakes in Skinner township in the Narrow Lake area. The surface geology has been described in some detail by Bruce.[1] Operations on this property were begun with the object of mining a gold-bearing quartz vein, surface

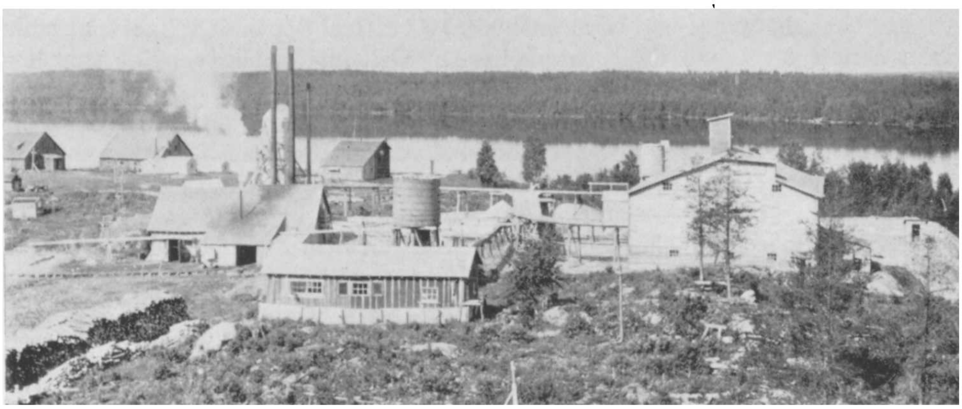


Composite plan of a section of the Bathurst mine, showing the 200- and 300-foot levels and the surface veins.

sections of which had indicated high gold values. Present workings include a vertical shaft to 420 feet and levels at 200 and 300 feet. Altogether about 2,700 feet of lateral work has been done on the two levels. Shaft-sinking on the property was first commenced in April, 1928, and during the period from that date to December, 1929, when operations were temporarily suspended, most of

[1]E. L. Bruce, op. cit., pp. 40-43.

the present underground work was accomplished. This work included the sinking of the shaft to over 300 feet practically all the present work on the 200- and 300-foot levels. The property then remained inactive until 1934, and in August of that year the mine was dewatered and shaft-sinking was resumed. No additional lateral work was undertaken. By December, 1934, the shaft was sunk to a depth of 420 feet, when operations were again suspended. No underground work has been done since. In September, 1935, the workings were filled with water and inaccessible to the writer. The property is equipped with boilers, compressor, and hoists capable of operating to a depth of 1,000 feet. In 1929, a 10-ton Tremaine stamp mill with amalgamation plates was installed, and according to mine records about 160 ounces of gold was recovered during spasmodic mill operations spread over two months. The failure to locate ore bodies of sufficient size to feed the small mill was responsible for the suspension of mining operations. In the spring of 1935, the property was optioned to Erie Canadian Mines, Limited (subsidiary of Sylvanite Gold Mines, Limited), which did considerable surface work on other veins. These operations were discontinued in September, 1935.



Plant of the J-M Consolidated Gold Mines, Limited, near Woman lake.

J-M Consolidated Gold Mines, Limited

The J-M Consolidated Gold Mines, Limited, was organized in 1932 and acquired the properties formerly held by the Jackson-Manion Mines, Limited, and Mint-Ore Mines, Limited, to the south of the Jackson-Manion, in the Woman Lake area. The early history and the surface geology has been described by Bruce.[1] Underground operations were undertaken on this property for the purpose of mining a gold-bearing quartz vein which had been exposed at intervals on the surface for a distance of over 2,300 feet, with a maximum width of 20 feet. The vein lies in basic Keewatin lavas and strikes about north-south, with a dip of 80° to 85°E.

Shaft-sinking was begun by hand in 1927. In 1928 a mining plant was installed, and underground development was continued until February, 1929, when work was suspended. Operations were resumed in November, 1933, and were still in progress when the writer visited the property in June, 1935. At that time the workings consisted of a vertical shaft to 404 feet and levels at 125, 240 (sublevel), 250, and 375 feet. Over 4,200 feet of lateral work had been done

[1]E. L. Bruce, op. cit., pp. 24-33.

on these levels. Underground workings indicate a vein of strong character, which in some places consists of a zone of quartz stringers and schist. At intervals along the strike there are pronounced drag folds, which plunge steeply to the south, indicating that the relative movement of the west wall has been to the south. In general the folds and faults so far encountered have not seriously complicated mining operations. The vein minerals consist largely of quartz, tourmaline, pyrite, and visible gold. Bruce also found petzite in the vein material.[1] Work done so far indicates that the ore exists in southward-plunging shoots. At July 1, 1935, the total ore reserves were estimated at over 33,000 tons, which included 4,000 tons of broken ore in a stope and about 1,500 tons on the dump. This ore represents the tonnage of one ore body, which extends from the surface to below the 250-foot level. The bottom limit of this ore body apparently lies above the 375-foot level.

In 1934, a 25-ton mill was installed and operated for 152 days, producing in that time about $50,000 in gold from 4,200 tons of ore.

When the writer visited the property in September, 1935, a vertical winze had been commenced from the 375-foot level north of the shaft with the object of exploring new low horizons.

On March 16, 1936, T. J. Day, secretary-treasurer of the company, advised the writer that the winze had been pushed to a vertical depth of 482 feet, at which horizon a new level had been commenced. Drifting in the vein at this level has indicated the presence of a second vertically dipping ore body situated to the north of the previously located ore section. Although the limits of this newly indicated body have not been defined, the writer was informed that 150 feet of drifting on the 482-foot level was in ore and that the face north of the winze was still in material of ore grade.

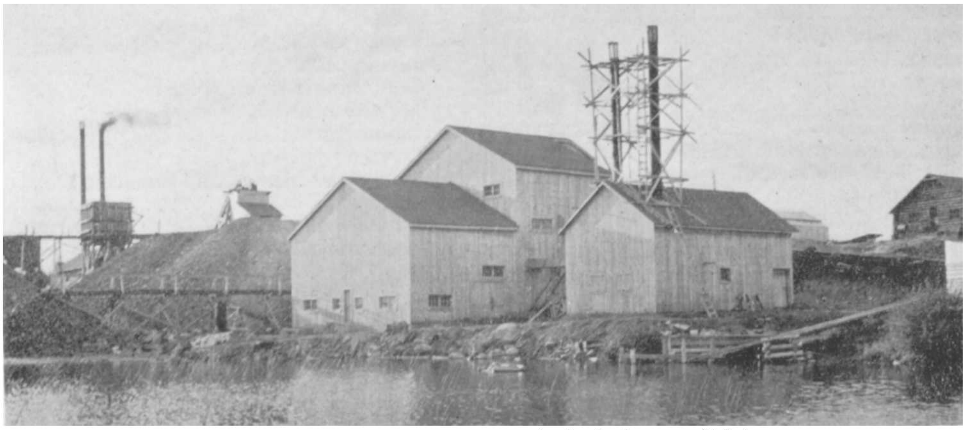
Mr. Day also stated that a raise had been put up from the 250-foot level to the surface and that equipment for a new 125-ton mill had reached the property. It is expected that the mill will be in operation by midsummer, 1936.

Argosy Gold Mines, Limited

The property of Casey Summit Gold Mines, Limited, situated on Casummit lake was acquired by Argosy Gold Mines, Limited, in the spring of 1935. The geology of the property has been described by Furse.[2] The rocks on the property are Keewatin lavas, tuffs, and sediments. There are several quartz veins, most of which strike approximately north-south. The original mine workings are located on No. 2 vein, which strikes almost north-south from the north shore of Casummit lake and dips about 45°W. This vein, which is characterized by very gently undulating folds, varies in width from 1 to 4 feet. In May, 1935, the workings, which then consisted of a vertical shaft to 300 feet with levels at 75, 200, and 300 feet, were dewatered, and an active programme of underground exploration was commenced by the new company with the object of locating additional ore bodies. Previous work had indicated about 400 feet of ore above the 300-foot level. At the time of the writer's visit to the mine in August, 1935, a new Diesel-driven compressor had been installed, and the company's development programme was well under way. Drifting was in progress on No. 2 vein on the 300-foot level south of the shaft, and a crosscut was being run west from the 300-foot level on No. 2 vein to intersect No. 3 vein. The object of this crosscut

[1]E. L. Bruce, op. cit., p. 31.
[2]G. D. Furse, op. cit., pp. 30-34.

was the underground exploration of No. 3 vein situated in an unexplored section to the west. A winze was also being sunk from the 300-foot level to explore lower horizons on No. 2 vein. In March, 1936, a company official informed the writer that drifting on the 300-foot level on No. 2 vein had reached a point about 700 feet south of the shaft and that the inclined winze on No. 2 vein had been sunk to a vertical depth of 500 feet, with a new level at 400 feet and a station at 500 feet. About 800 feet of lateral work had been completed on the 400-foot level, which included drifting on No. 2 vein both north and south of



Plant of the Argosy Gold Mines, Limited, Casummit lake.

the winze. Work on No. 2 vein has indicated the presence of a 450-foot ore body between the surface and the 400-foot level. The crosscut west from the 300-foot level on No. 2 vein intersected No. 3 vein at a distance of about 600 feet. About 500 feet of lateral work had been done on No. 3 vein on this horizon, including drifting both north and south of the crosscut. Work done so far indicates that the strike and dip of No. 3 vein conforms roughly to the strike and dip of No. 2. A well-mineralized section associated with iron formation and carrying high gold values was encountered on this vein to the north of the crosscut.

Underground exploration by the new company has produced very encouraging results. As no raises have been completed, no ore has been actually blocked out, but it appears that ore bodies exist in both No. 2 and No. 3 veins. A 125-ton cyanide mill is being installed on the property and is expected to be in operation during the summer of 1936.

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