CANADA

DEPARTMENT OF MINES AND RESOURCES

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# MIKANAGAN LAKE
# MANITOBA

(Map and Descriptive Notes)

BY

J. D. Bateman and J. M. Harrison

OTTAWA

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Illustration

# MIKANAGAN LAKE MAP-AREA, MANITOBA

## Introduction

Mikanagan Lake map-area lies east of Flin Flon and most of it may be reached conveniently by canoe from Channing on Schist Lake, or from the end of the motor road on Manistikwan (Big Island) Lake. An alternative route to the area extends south and west from the village of Cold Lake, near Sherridon.

The rock formations are grouped into three structural units: one of these occupies the western part of the map-area south of Wabishkok Lake; a second unit, the Lac Aimée fault-block, lies to the south of Lac Aimée, and has been thrust northwards over the first unit; the third unit is the complex of Kisseynew gneisses extending across the northern part of the map-area and lying with apparent erosional unconformity on the first unit.

## Western Structural Unit

The oldest formation of the western structural unit is a thinly stratiform, quartz-oligoclase gneiss (1)[1].

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1 Figures in brackets refer to map-unit numbers on map legend.

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It is overlain by hornblende gneiss and schist (2a) and by metamorphosed equivalents of these rocks (2b). These formations surround the elliptical mass of granodiorite-gneiss (10a) that lies north of Wabishkok Lake. The hornblende gneiss and schist is a fine-grained, dark green, thinly layered rock that dips away from both sides of the granodiorite at an angle of about 50 degrees. Farther north, near Lobstick Bay in Kisseynew Lake, it is exposed along the crest of a subsidiary anticline in the Kisseynew gneisses. North of Bluenose and Wabishkok Lakes it is partly altered to a dark grey, medium-grained, coarsely layered, biotite-bearing gneiss that resembles an altered diorite (2b). Its alteration has probably resulted from the intrusion of granodiorite (10a).

A thick assemblage of greenstones (3) extends across the map-area between Wabishkok and Tartan Lakes, and south to Lac Aimée and Mikanagan Lakes. These rocks are folded into a syncline whose axis extends through Tartan Lake to Mikanagan Lake. Similar rocks occur east and north from Manistikwan Lake. All top determinations in these southwestern greenstones indicate that the flows face east and northeast. The boundary between the greenstones and the hornblende gneisses and schists (2a) near Wabishkok Lake is indefinite.

Most of the greenstones are amygdaloidal pillow lavas that form flows from 60 to 90 feet thick. In many places narrow beds of tuff and breccia lie between the flows. Irregular masses of associated amphibolite are regarded as intrusions contemporaneous with the volcanic rocks and were not mapped separately.

The greenstones have been variously altered and deformed and, as a result, may appear as quite different rocks from place to place. Near Wabishkok and Flux Lakes they are dark green, medium-grained rocks mineralogically similar to the hornblende gneisses and schists (2a) and composed chiefly of secondary plagioclase and hornblende. Farther south they lose their crystalline appearance and become light coloured. Locally, as on the northwest shore of Lac Aimée and east of Mikanagan Lake, the pillow lavas are pale green to white, and clinozoisite is the principal constituent mineral. In places weathered surfaces are strikingly like those of rhyolites, although the rock has the composition of a basalt. The greenstones south of the Tartan-Mikanagan synclinal axis are generally less deformed and altered. They consist chiefly of fibrous amphibole, albite, chlorite, clinozoisite, and a little carbonate and quartz.

Beds of andesitic tuff and breccia (4) overlie the greenstones on both limbs of the syncline at the west border of the map-area near Tartan Lake, and are apparently interbedded with the greenstones to the south, between Manistikwan and Bear Lakes. The tuff and breccia weather pea-green to jade-green and buff. The breccia consists of small, subangular to round fragments of porphyritic andesite in a fine-grained matrix. These rocks are commonly coarsely textured, but between Manistikwan and Whitefish Lakes there are some thinly bedded, fine-grained types. The minerals composing the tuff and breccia are the same as those of the greenstones (3), though in somewhat different proportions.

Argillite (5a) outcrops as a narrow formation, extending from Tartan Lake to Swordfish Lake, in the centre of the Tartan Lake syncline. It, therefore, overlies the andesitic tuff and breccia (4). The rock is indistinctly bedded, dark grey to black, and is composed mainly of minute grains of sericite and biotite. Two narrow formations of thinly bedded, white to buff weathering, fine-grained, cherty rock (5b) occur north and east of Bear Lake. These are interbedded with thin layers of argillite. The cherty rock may be a variety of tuff, and it becomes more prominent to the north.

Along the southward plunge of the Tartan-Mikanagan syncline, in the vicinity of the axis, a formation of dacitic tuff and breccia (6) appears northwest of Bartley Lake and extends southward on the west side of Mikanagan Lake nearly to Whitefish Lake.

A narrow wedge of schistose conglomerate (7) outcrops along the east side of the north bay of Mikanagan Lake. It is bounded by faults. The rock consists of rounded boulders and disk-shaped pebbles in a greenish, schistose matrix. The pebbles and boulders are of granitic and dioritic types, as well as of all the volcanic rocks previously described. In addition, there are pebbles of quartz, quartz-magnetite rock, jasper, and hematite, but none similar to those of the Kisseynew complex to the north.

Extensive masses of altered basic intrusions (9) outcrop in the vicinity of Tartan, Mikanagan, and Whitefish Lakes. One of the largest of these (9e) lies between the arms of Tartan Lake and consists of several related basic rock types, one successively intrusive into the other. The final product is an aplitic, pink, albite granite (9f). The different types cut one another in such profusion that extensive areas of intrusive breccia have been formed. The rocks of this complex (9e) vary considerably in grain size, but due to the presence of hornblende and epidote, they have a characteristic green colour on the weathered surface. In addition, several sills of altered gabbro (9d) south of Tartan Lake consist of two or more, related, basic and ultra-basic rock types. Most of them are composed chiefly of secondary hornblende and clinozoisite, and one phase consists mainly of quartz and epidote. They have a bleached green appearance on weathered and fresh surfaces.

Three bodies of granodiorite-gneiss (10) have been intruded along, and adjacent to, the Bluenose-Wabishkok anticline, and cut the oldest rocks in the district. As the gneisses and basic intrusions do not occur together their relative age is unknown. The granodiorite masses are medium- to coarse-grained, vary from pale grey to pink, and are partly porphyritic and strongly gneissic. Phenocrysts are crushed and granulated. Gneissosity has been developed in a constant direction and is continuous with that in the surrounding rocks. The gneissosity must be due to deformation and appears to be related to the development of foliation in the enclosing hornblende schist and gneiss (2a).

Most of the late dykes and associated rocks (12) are relatively fresh and unsheared. They include porphyries and related rocks. The largest is a sill-like body of salmon-pink diorite (12c), containing phenocrysts of hornblende, that extends across the map-area north of Bluenose and Wabishkok Lakes.

## Lac Aimée Fault-block

Formations within this area, which includes all rocks east and south of the arc formed by Whitefish, Mikanagan, and Aimée Lakes, are intricately folded and deformed. The fault-block probably represents the southward extension of the south-plunging Tartan-Mikanagan syncline, now thrust some miles to the north. Zones of shearing are numerous and there are probably many faults that have not been shown on the map.

The greenstone flows and pyroclastic rocks (3, 4) probably represent the younger, or upper, part of those already described. They are very similar to them, except for a larger proportion of tuff and breccia (4).

In the southeast corner of the map-area is a band of dark to light grey, fine- to medium-grained, well-bedded, garnetiferous gneisses (5c). These consist mainly of impure quartzites and greywackes, and possibly some greenstone tuff, and may be younger than the rhyolites and dacites (6).

Rhyolite, dacite, and associated tuffs and breccia (6) are common, and in the south part of the map-area are the most widespread of the rocks. The rhyolites in the northern part of the fault-block are pink and contain small phenocrysts of quartz and albite. The dacites here are light grey and carry small phenocrysts of quartz and oligoclase. Some of these may be intrusive. The large mass of rhyolite and dacite in the south part of the area weathers light greyish green, due to the presence of chlorite. In many places rather large phenocrysts of quartz are prominent on weathered surfaces. In places the rocks are intensely sheared and crumpled, a very pronounced feature from Thompson Lake east to Lake Athapapuskow, and also north of Thompson Lake. Locally, along their northwest contact, the rhyolites and dacites are difficult to distinguish from the fine-grained border of 'quartz-eye' granite (10b) as both are strongly sheared, somewhat chloritized, and contain 'eyes' of quartz.

Some strongly sheared, schistose conglomerate (7) outcrops on the north shore of Whitefish Lake. Most of the pebbles and boulders are of red jasperoid rocks set in a greenish to reddish brown, rather coarse, arkosic groundmass. Other types of pebbles and cobbles noted were: two of granitic types, a few of sheared greenstone, and some of relatively massive greenstone, rhyolite, and quartz. The conglomerate is bounded by faults and its relations to the intrusive rocks are unknown. At one place an elongate exposure of rhyolite tuff is bounded by conglomerate. On its west side the conglomerate beds dip and face steeply west; on the east side no tops were recognized, but the beds dip steeply east. The actual contact is drift covered, but at the west side only 1½ feet of drift separate tuff from conglomerate, and on the east side, only 3 feet. Some pebbles in the conglomerate are similar to the rhyolite. This may represent an unconformity.

A large mass of basic intrusive rock (9c) occurs south of Alberts Lake. It is mainly fresh-looking, but altered, diabasic gabbro. Locally, phases contain quartz. Other, smaller bodies of similar rock are scattered through the fault-block.

Along and near the south and west margins of the Alberts Lake gabbro is a mass of sheared 'quartz-eye' granite (10b). It is quite green and the 'eyes' of quartz stand out prominently on the weathered surface. Its close association with the gabbro suggests that the two may be related.

East of Alberts Lake the volcanic rocks grade almost imperceptibly into a greenish grey to pink, strongly gneissic rock (10c). South and a little east from Alberts Lake is a similar rock type. Field relations suggest that these are granitized volcanic rocks, but both in hand specimen and under the microscope they appear as a granodiorite-gneiss, and hence are mapped as such.

At the east edge of the map-area, the western margins of two bodies of massive granodiorite (11b) were observed. Both occurrences consist of rather coarse-grained, massive, pink to red rocks that show no sharp contact with the granodiorite-gneiss (10c). They may represent the western parts of extensive intrusive masses responsible for the alteration of volcanic rocks to granodiorite-gneiss (10c).

Coarse-grained, brownish pink quartz diorite (11c) is present in the extreme southeast corner of the map-area. It is locally sheared, but otherwise massive. Farther to the east and south, outside the map-area, the rock becomes more typical granite or granodiorite. It is cut by diabase dykes.

The youngest intrusive rocks are represented by quartz-feldspar porphyry (12a) west of Alberts Lake, diorite porphyry (12d) east of Mikanagan Lake, a large mass of quartz-feldspar porphyry and feldspar porphyry (12a, 12b) north of Whitefish Lake, some feldspar porphyry (12b) on the east shore of Whitefish Lake, which cuts the conglomerate farther south, and numerous small dykes of feldspar porphyry throughout the fault-block.

## Kisseynew Complex

The Kisseynew complex (8a, 8b) rests with apparent conformity upon hornblende gneiss and schist (2a). However, several younger formations (3-6) are missing and, as the contact is not along a fault, it must represent a considerable erosional interval. The entire Kisseynew section within the map-area appears to represent a broad syncline with at least two subsidiary folds. The largest of these is the anticlinal dome south of Kisseynew Lake. The formations of the Kisseynew dip northward at angles generally less than 45 degrees except in the subordinate synclines where dips are somewhat steeper.

The Kisseynew gneiss (8a) is a light grey to buff, coarsely stratiform or bedded rock consisting essentially of plagioclase feldspar and quartz, with biotite, hornblende, and garnet as accessory minerals. Some zones consist of conformable layers of pink granitoid gneiss (8b) that resembles a granite except that it has a stratiform structure. The chief difference between the two types is that in the one (8b) the plagioclase feldspars are more sodic and there is a little potassium feldspar. Both are cut by great numbers of dykes and thin sills of pink pegmatite - a characteristic feature of the Kisseynew complex.

The Kisseynew gneiss and granitoid gneiss are intruded by fine-grained, pink, aplitic, albite granite that contains little or no dark minerals (11a). The granite may be younger than the granodiorite-gneiss (10) as it lacks the deformation and the shearing of the latter. It was evidently intruded after the folding of the Kisseynew gneiss for it is undeformed. It resembles the granitoid gneiss (8b), but has been found to cut it. These features suggest that the granitoid gneiss represents granitized beds of the more abundant Kisseynew gneiss (8a).

Small bodies of basic intrusive rocks (9) are present in the Kisseynew complex. These include two laccoliths of norite and associated diorite (9a) as well as some chocolate-brown, altered pyroxenite and hornblendite (9b).

## Economic Geology

There are no important base metal occurrences known in the area, though three prospects have had a considerable amount of work done on them. These are the Baker-Patton deposit, just east of Sourdough Bay on Lake Athapapuskow, the Don Jon deposit on an island in the east side of Thompson Lake and on the east shore of the lake, and the Amulet prospect on the west shore of a small lake just north of the north end of Lake Athapapuskow. In 1943 all the workings at these deposits were caved and filled with water.

The Baker-Patton deposit has been idle since 1930 when the buildings were destroyed by fire. The mineralized zone is in strongly schistose, mainly acidic, volcanic rocks. Narrow bodies of sulphide carrying 3 per cent copper have been reported. A shaft has been sunk to a depth of 415 feet and some crosscutting and drifting done on the 150-, 275-, and 400-foot levels. No bodies of commercial size were found.

The Don Jon deposit consists of strongly pyritized schists carrying some chalcopyrite. Considerable trenching and drilling has been done. The schists have been derived from dacitic and rhyolitic flows and breccias, with some intercalated andesitic layers.

The Amulet property occurs in strongly pyritized sericite schists derived from acidic volcanic rocks. Some stringers of chalcopyrite were noted in specimens on the dump beside the portal of a partly caved adit.

Several, small, low-grade gold occurrences are known in the area, but none has so far indicated deposits of commercial size. A number are located within and around the basic intrusive complex (9c) between Tartan and Mikanagan Lakes. The gold is associated with quartz veins and stringers carrying small amounts of pyrite, chalcopyrite, or arsenopyrite. The veins fill small shear zones and associated tension fractures. Gold may occur in the wall-rocks, particularly where they are impregnated with arsenopyrite. The wall-rocks are partly replaced by rusty weathering carbonate.

In the Lac Aimée fault-block several irregular gold-bearing zones and quartz veins are localized within or adjacent to brittle rocks such as small bodies of quartz-feldspar porphyry. The gold is associated with pyrite and the wall-rocks are silicified. None of the prospects appears promising, but most of them have not been investigated adequately.