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GEOLOGICAL REPORT 17

SISCOE MINE MAP-AREA

DUBUISSON AND VASSAN TOWNSHIPS

ABITIBI-EAST COUNTY

by

P.-E Auger

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SISCOE MINE MAP-AREA

DUBUISSON AND VASSAN TOWNSHIPS

ABITIBI-EAST COUNTY

by P. E. Auger

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INTRODUCTION

Foreword

This report presents the results of a detailed study of the geology of the area adjacent to the Siscoe mine and an outline of the exploration and development work that has been done on the mining properties of the district.

The general geology of the region was studied and described by J.E. Hawley in 1930 (1). Since then, much new geological information has been brought to light through the exploration and development of gold-mining properties in the district. It was opportune, therefore, to re-examine in detail a part of the area which Hawley studied, in order to obtain and to record the additional information so that it could be applied to the search for other mineral deposits in the vicinity, or elsewhere in the Province. Most of the field-work was done in 1939, and the information was brought up to date in 1946.

The map-area is named after the only producing mine within its boundaries, the Siscoe gold mine, on Siscoe island in De Montigny lake.

Summary

The southeast corner of the map-area is occupied by granodiorite, the western nose of the Bourlamaque batholith which extends eastward for a distance of fifteen miles. An isolated stock (the Siscoe stock) of similar, but highly altered, granodiorite, probably genetically related to the Bourlamaque mass, underlies the northern part of Siscoe island. Apart from these intrusive bodies, the whole of the map-area is underlain by Keewatin-type volcanic rocks. Cutting these and also the granodiorite are numerous dykes. These are of various rock types, and some of them, especially certain porphyries, are genetically related to gold deposits.

Throughout the area, the Keewatin-type volcanic rocks are steeply-dipping, with a general east-west strike. Nearly all determinations of the attitudes of the beds or the flows indicate that their tops face to the south. This leads to the conclusion that they lie on the northern limb of a large synclinal fold, or on the southern limb of an

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(1) Gold and Copper Deposits of Dubuisson and Bourlamaque Townships, Abitibi County, Quebec; Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.3-95.

anticline. It may be noted that a similar structure was inferred by L.V. Bell (1) for the Keewatin-type volcanics of an adjoining area.

In the several deposits so far found in the area, gold is the only metal of economic interest. In addition to a producing mine, the Siscoe, there are two partially developed mines, the Siscoe Extension and the West Siscoe; both have been idle since the end of 1938. Three other mines just outside the boundaries of the map-area were also examined by the writer: the Wisik, Kiena, and Dorval Siscoe. None of these properties has been under active development since 1939.

The gold deposits occur both in the greenstone and in the granodiorite. Three specific types may be distinguished: (1) quartz-tourmaline gold-bearing veins; (2) quartz-pyrite gold-bearing veins; and (3) gold-bearing quartz lenses within shear zones; The deposits at the Siscoe mine are typical of the first and third classes, whereas those at Dorval Siscoe and Kiena are representative of the second. The Siscoe Extension deposits present characteristics of the first and second types.

Location of Area and Transportation Facilities

The map-area is nearly square, measuring slightly more than four and a half miles from east to west and from north to south. Its southeastern corner is one mile and three-quarters north of the town of Val d'Or. The southern boundary is an east-west line in Dubuisson township, 4,400 feet south of the boundary between that township and Vassan. The Senneterre-Rouyn branch of the Canadian National railway is about two miles south of the southern boundary; a highway leading from Val d'Or to Rouyn closely parallels the railway. The highway connecting Val d'Or and Amos crosses the western part of the area in a north-south direction.

The shafts of the Siscoe and Siscoe Extension mines are reached by branch roads from the Val d'Or-Amos highway. The workings of West Siscoe, which are beneath De Montigny lake, can be reached only through the Siscoe shaft. The Dorval Siscoe, Wisik, and Kiena gold Mines are on islands in De Montigny lake and, in the summer time, can be reached by boat.

Field-Work and Acknowledgments

A base-map, at a scale of one inch equals 400 feet, was compiled by the Cartography Branch of the Department from plans obtained from the Department of Lands and Forests and the Roads Department of the Province of Quebec, and from plans of mining properties on file in the Department of Mines. Useful information taken from maps issued by the Geological Survey of Canada and from aerial photographs made several years ago by the Royal Canadian Air Force was added in the office and in the field.

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(1) Northern Dubuisson Area, Abitibi County; Que. Bur. Mines, Ann. Rept., 1935, Part B, p.6.

Pace-and-compass traverses in a north-south direction were made at half-lot intervals and, wherever groups of outcrops warranted such procedure, these were surveyed by plane-table. The observations and surveys made in the field were plotted on the base-map, and the resulting field-map was reduced to a scale of one inch equals 1,000 feet to be issued as Map No.513 to accompany this report.

Grateful acknowledgment is expressed to the managers and geologists of the mining properties visited for the co-operative spirit in which they gave valuable information, and also for their cordial hospitality. The writer is especially indebted to Messrs. C.O. Stee and E.B. Gillanders, respectively Manager and Geologist of Siscoe Gold Mines,Ltd.; to Mr. C.M. Bowyer, Manager of Kiena Gold Mines, Ltd.; and to Mr. Hansen, Mine Captain at Dorval Siscoe Gold Mines, Ltd. Roland Charette, student at l'Ecole Polytechnique, was a very conscientious and helpful field-assistant. The full co-operation of the staff of the Provincial Mine-School greatly facilitated the work.

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PHYSIOGRAPHY

The topography of the region is typical of that of the 'clay Belt' (1). The country is flat, poorly drained, and characterized by numerous swampy tracts. A few hills, especially in the northern half of the map-area, afford the only relief. Outcrops are small and rare; they occupy only 0.26 per cent of the total area of the map-sheet.

Part of De Montigny lake occupies about two-thirds of the southwest quarter of the map-area; Faucher and Calder lakes, as well as three small unnamed lakes, lie within its boundaries, and a small part of Blouin lake is included in the southeast corner. The whole region is within the limits of the basin of Harricana river, which drains into James

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(1) COOKE, H.C., JAMES, W.F., and MAWDSLEY, J.B., Geology and Ore Deposits of Rouyn-Harricanaw Region, Quebec; Geol. Surv. Can., Mem. 166, 1931, pp.20-22, 154-157.

bay. The Harricana, flowing westward in this part of its course, crosses the northern half of the map-area in ranges III and IV of Vassan township.

GENERAL GEOLOGY

The formations observed in the area are listed in the following table.

Table of Formations

Pleistocene and Recent	Superficial deposits	Lake clay, sand, gravel, boulders
	Unconformity	
Precambrian	Keweenawan?	Diabase
	Intrusive contact	
	Late- or Post-Keewatin-type Intrusives	Lamprophyre dykes Andesite and diorite dykes Albitite dykes Rhyolite dykes Granite quartz-feldspar porphyry Quartz monzonite, monzonite porphyry Syenite and feldspar porphyry Quartz diorite, diorite porphyry Hornblende granite Granodiorite
	Intrusive contact	
	Keewatin-type Volcanics	Serpentinized and talcified rock Tuff, fragmental volcanics and breccia Rhyolite, trachyte (pillowed and amygdaloidal) Basalt, andesite (pillowed and amygdaloidal) massive diorite lava; undifferentiated rock including talc-chlorite schist, altered basic lava, and 'Keewatin coarse'

Keewatin-type

Excellent general descriptions of the Keewatin-type formation have been given by geologists who have studied this and adjacent or similar areas. For such a description, the reader is referred to reports by Cooke, James and Mawdsley (1) and by Hawley (2). For the purpose of this report, it will be assumed that the reader is familiar with the general character of the formation, and only new or pertinent local features will be discussed.

Keewatin-type rocks underlie about 95 per cent of the total map-area. They are for the most part of volcanic origin and may be subdivided into four main groups: (1) basic flows (andesite, basalt, and diorite); (2) acidic flows (rhyolite, trachyte); (3) volcanic breccia, fragmental material and tuff; (4) serpentinized and talcified rocks, which in part may be intrusive.

Basic Flows:

Andesitic rocks predominate along and south of the boundary between ranges I and II of Vassan township. Pillowed, brecciated, and amygdaloidal types were recognized. Pillow structure is common in the zone which extends from Siscoe island to Blouin lake. The pillowed lavas are very frequently amygdaloidal, but this texture is found also in un-pillowed basic flows and even in some of the acidic ones.

On Siscoe island and under the bed of De Montigny lake, both to the east and to the west of the island, the rocks have been altered to chlorite- and talc-chlorite schists, so that much of the original structure has been obliterated. In many places, these rocks were of necessity classified as altered basic lava, or as undifferentiated basic volcanics, as there was no way of establishing more precisely their original character and composition. In the southeastern part of Siscoe island, highly altered basic lavas containing patches rich in actinolite outcrop on the shore. The same mineral is found in abundance in the 'K' zone of the Siscoe gold mine; this zone is composed of completely altered rock at the contact between granodiorite and Keewatin-type greenstone. In the Kiena mine, the underground workings cut a wide band of actinolite-rich rock about 400 feet northwest of the shaft.

Volcanic diorite was observed chiefly in outcrops in the southern and central parts of range II of Vassan township, between De Montigny lake and Faucher lake. This diorite is a massive rock with a medium to coarse grain. The principal constituent minerals are chlorite and completely altered feldspar; with these are minor amounts of quartz, epidote, and serpentine. At numerous places, notably on Siscoe island, south of the 'K' zone, and in the greater part of the area held by West Siscoe Gold Mines, Ltd., rock of similar appearance and composition has been observed at

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(1) Geol. Surv. Can., Mem.166, 1931, pp.24-32, 40-51.

(2) Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.13-17.

the surface or intersected in diamond drilling; on company plans, geologists employed by mining and exploration companies have mapped the occurrences in some places as 'Keewatin coarse' and in others as 'altered granodiorite'. The confusion and difference of opinion which these two designations imply are the natural result of the difficulty in classifying the rock and in interpreting its relation to other formations. The writer believes that the rock is a coarse facies of basic Keewatin-type lava flows.

Outcrops of basalt were seen at a few places in the map-area, as for example to the east of Faucher lake, where the rock has a medium to fine grain. In the centre of range III, Vassan township, on the line between lots 58 and 59, there is a large outcrop whose southern end is basaltic lava.

Acidic Flows:

Acidic volcanics, perhaps forming a continuous band of acidic flows, outcrop at widely separated intervals between lot 45, range III, Vassan township, and the eastern boundary of the map-area, at the line between ranges II and III. The length over which the outcrops are spaced is nearly three miles, and the width is about two thousand feet. The fact that no other rocks were found within this zone, and the general parallelism of the zone to the ridges on which the basic flows are exposed, farther south, are evidence favouring the assumption that the horizon is continuous. Some of the acidic flows in this zone are pillowed. The flows in this band have the characteristics of trachyte.

Between Faucher and Calder lakes, acidic volcanics interbedded with volcanic breccia are exposed in a series of outcrops within an area measuring 1,000 feet (east-west) by 400 feet.

A well defined contact, striking N.76°E., between acidic lavas and intrusive diorite may be seen in an outcrop approximately 2,000 feet west of the western end of Calder lake. Northward from the contact there is a wide band of fragmental and brecciated material, followed by successive flows of lava of which the more northerly are amygdaloidal and well pillowed. Most of these volcanic rocks are very fine-grained and acidic, approaching trachyte in composition. The diorite to the south of the contact is coarse grained and is either a large dyke or a small stock-like mass. About 6,000 feet to the east, on the shore of Blouin lake, there are two outcrops of rhyolite. These lie out on the projected strike of the acidic flows of the main outcrop, which suggests the existence of a continuous band of acidic volcanics between these widely separated exposures.

In outcrops on the Siscoe Extension property and in range II of Vassan township, on the east shore of the point extending farthest to the west into De Montigny lake, the volcanic flows exhibit a striking structure to which the name 'wash-tub' has been given (1). The 'tubs' are rounded

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(1) BELL, L.V., Que. Bur. Mines, Ann. Rept., 1935, Part B, p.24.

patches, from two to twelve inches in diameter, of a massive and brittle facies of the rock, generally characterized by a large content of epidote. They form a prominent feature of the rock on account of their pale colour on weathered surfaces, and the very complex fracture patterns, which are attributable to their brittleness. In some places, it may be seen that this structure is restricted to certain individual flows, and, on the Siscoe Extension property, a lava flow about 140 feet wide was readily identified and followed by the presence of this 'wash-tub' structure, which does not appear in the neighbouring flows.

Breccia, Fragmental Material, and Tuff

The volcanic breccias most commonly found in the map-area form the brecciated tops of lava flows. The best exposures of these are on lot 51, range II, Vassan township, about 100 feet north of the boundary between ranges I and II. At this place a succession of narrow rhyolite flows strike N.59°W., and on top, that is, on the south side, of each flow there is a narrow band of volcanic breccia. Similar brecciated flow-tops were observed at a point about 400 feet to the southwest. In the central part of a large group of outcrops on lots 45 and 46, in the southern part of range II, there are many lava flows which exhibit, from north to south, a gradual change from coarse, spotted, basic rock at the base, through pillow lava, to amygdaloidal lava and, finally, a band of brecciated material near the top of each flow; the contacts between successive flows are very sharp, with a general strike of N.84°W. and a steep dip to the north. In the centre of range III, on the boundary between lots 58 and 59, a large outcrop consists of basaltic lava succeeded, to the north, by strongly brecciated lava. Bands of volcanic breccia associated with acidic volcanics are exposed in outcrops between Faucher lake and Calder lake.

The volcanic breccias are at some places accompanied by bands of tuffaceous sediments, which may be strongly foliated, twisted, and drag-folded. None of the occurrences is sufficiently extensive in outcrop to be shown on a map at a scale of one inch equals 1,000 feet. Bands of these tuffaceous sediments may be seen in the outcrops on lots 45 and 46, range II, and on lots 58 and 59, range III, to which reference was made in the preceding paragraph.

Serpentinized and Talcified Rock:

Cooke, James, and Mawdsley (1) drew attention to a discontinuous band of ultrabasic rocks crossing La Motte, Malartic, Vassan, and Bourlamaque townships in a southeasterly direction, and outcrops of rock of this type were recorded by Hawley (2) and by Bell (3) on islands in De Montigny lake. Within the Siscoe Mine map-area, a group of outcrops of serpentinized basic rock extends in a direction

(1) Geol. Surv. Can., Mem.166, 1931, p.139.
(2) Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.15-16.
(3) Que. Bur. Mines, Ann. Rept., 1935, Part B, pp.11-12.

S.85°E. from lot 39 to lot 45, along the boundary between ranges III and IV of Vassan township; the width of outcrop is about 1,500 feet. The rock is massive, light grey on freshly broken surfaces, and weathers to a soft, dark brown, pebbly aggregate. The mammilated character of the weathered surface is largely a consequence of a system of irregular and closely spaced fractures which traverse the rock.

Underground work at the Siscoe mine has established the presence of a wide band of talcified and serpentinized rock which was intersected on the fourth level by a long cross-cut which, passing beneath the lake, extends eastward between Siscoe island and the mainland. Diamond drilling from the ice, in addition to underground work at the Siscoe Extension and Sullivan Consolidated mines, has frequently encountered similar serpentinized and talcose rocks under the lake. Thus it seems that there must be one or more large bodies of this altered ultrabasic rock in the area between the east side of the lake and Siscoe island.

Hawley (1) cites evidence that the ultrabasic rocks in this general area are intrusive into the Keewatin-type volcanics. L.V. Bell (2) suggests that, in part at least, they may be altered lavas. The writer did not find, in the map-area, any exposures affording conclusive evidence one way or the other, but as a rule the serpentinized rock seems to lie conformably with the flows, and at several places the surface of the serpentinized rock shows structures suggestive of flow-lines, pillows, and even volcanic breccia. For these reasons it is believed that, in part at least, the ultrabasic rocks are altered flows.

In the long cross-cut under the lake, to the east of Siscoe island, the serpentinized and talcose rocks are cut by dykes of granodiorite, albitite, andesite, and diorite, named in order of intrusion, and of syenite porphyry whose age relationship to the others is not conclusively established.

'K' Zone Rocks:

The 'K' zone is a wide zone of shearing exposed on Siscoe island and in the workings of the Siscoe mine. Throughout most of its length it follows the contact between Keewatin-type volcanics and granodiorite of the Siscoe stock. On both sides of the 'K' zone, the rocks are highly altered, and both the granodiorite and the greenstone have been converted into a carbonatized schist containing mainly talc and chlorite, accompanied by actinolite and sericite.

Examination of thin sections of the 'K'-zone schist shows that, in addition to carbonate, talc, chlorite, actinolite, and sericite, it contains quartz, leucoxene, and an opaque iron oxide, either ilmenite or magnetite. The relative proportions of these minerals are very variable, and in many places the rock is formed almost entirely of green talc or of black actinolite.

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(1) Que. Bur. Mines, Ann. Rept., 1930, Pt.C, p.15.

(2) Que. Bur. Mines, Ann. Rept., 1935, Pt.B, pp.11-12.

Post-Keewatin-Type Intrusives

Granodiorite, Granodiorite Porphyry:

There are, in the map-area, two occurrences of granodiorite which are especially noteworthy. These are the Siscoe stock, and the western end of the Bourlamaque batholith. Although the granodiorite of these two masses presents certain characteristics common to both, there are also marked differences between specimens typical of each. The Siscoe stock, which is much smaller than the Bourlamaque batholith, is apparently a separate mass, as it is not joined to the batholith at or near the surface. It is reasonable to assume that the two masses are genetically related, and it is even possible that they are connected at a depth greater than that to which exploration to date has been carried.

Bourlamaque Batholith.-There are, in the map-area, few outcrops of granodiorite of the Bourlamaque batholith, but exploration by diamond drilling and by geophysical surveying indicates that a portion of the batholith underlies the southeastern corner of the area, between Blouin lake and De Montigny lake, in range X of Dubuisson township. The position of the contact as shown on Map No.513 has been located by geophysical survey and by diamond drilling, and it is believed to be correct within very narrow limits. For further information on the batholith and its petrological character, the reader is referred to papers by Hawley (1) and by Gussow (2); in Gussow's paper, which is the more recent, many other pertinent references are cited.

Siscoe Stock.-Granodiorite outcrops at many points in the northern part of Siscoe island. By exploratory diamond drilling and underground development, it has been established that these outcrops form part of a single mass whose surface plan is an ellipse measuring about 5,500 feet by 2,000 feet; the major axis of this ellipse has a direction N.75°W. The southern boundary of the stock is a fault-plane, known as the 'K' zone, and consequently it is well-defined; on the other sides of the intrusive, however, intense alteration both in the intrusive and in the invaded rocks makes it difficult to fix the boundaries with equal certainty, and, furthermore, because relatively less development work has been done in the northern section of the mine, fewer reference points have been established along the contact.

The granodiorite of the Siscoe stock is far from uniform in character and is quite different in appearance from that of the Bourlamaque batholith. It is more chloritized and carbonatized, and, in places, it possesses marked schistosity and has a green colour. A feature characteristic of both intrusives is the presence of opalescent quartz 'eyes' in the rock. Detailed studies of the Siscoe stock

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(1) Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.23-25.

(2) Roy. Soc., Can., Trans., Vol.XXXI, 1937, Sec.IV, pp.134-144.

have been made by Hawley (1) and Gussow (2), and more recently by Moss (3). Hawley recognized two distinct facies of the granodiorite, one green and chloritic, the other light-weathering and quartzose, and he stated that the quartzose type intrudes the chloritic type. Moss showed that the stock is composite and formed of an earlier basic, porphyritic, unit intruded by an even grained albitic one; he further subdivided the rocks of each of these units into two varieties, the characteristics of which are believed to be chiefly due to the degree of alteration effected by permeating solutions.

In all essential features, Hawley's two-fold division of the intrusive corresponds to that of Moss. His green chloritic facies may be regarded as the equivalent of the latter's basic porphyritic unit. Exploration and development subsequent to Hawley's investigations enabled Moss to add much information concerning the distribution of the two types. This work has shown that the porphyritic type forms the western end of the stock, and extends as a narrow shell around the south and east margins of the later quartz-albite intrusive. The area occupied by the porphyritic type is greater on the lower levels of the mine, where it is found both east and west of the main shaft, than on the upper levels, where it occurs only to the west of the shaft and in a narrow band along the 'K' zone, south of the shaft.

As is implied by its designation, the porphyritic type is distinguished in the field by phenocrysts of altered feldspar; these measure up to half an inch in length and form about 50 per cent of the rock. The matrix is composed chiefly of chlorite and quartz and is cut by fine veinlets of quartz and carbonate. Occasionally, the rock contains large opalescent 'eyes' of quartz. Examination of thin sections shows that the phenocrysts are composed of an aggregate of zoisite with some epidote. From their outline, there can be little if any doubt that originally they were crystals of feldspar, but in the thin sections he examined Moss found no residual feldspar whose composition could be determined. He drew attention (4) to the presence of needle-like crystals of actinolite distributed irregularly within the mass of the porphyritic type of granodiorite.

Moss also distinguished (5) a variety of the porphyritic type in which the phenocrysts can no longer be discerned by the naked eye, and in which the mass of the rock resembles the matrix of the normal type; this variety he termed the 'intermediate' type.

The quartz-albite type is usually fine grained and even textured, and in hand specimens it is possible to

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(1) Que. Bur. Mines, Ann. Rept., 1930, Pt.C.
(2) Loc. cit.
(3) MOSS, A.E., The Geology of the Siscoe Gold Mine; unpublished thesis, presented in part fulfilment of the requirements for the degree of Ph.D., McGill University, 1939, pp.71-134.
(4) Op.cit., pp.86, 94.
(5) Op. cit., p.84.

recognize quartz, feldspar, chlorite, and carbonates. The rock contains two varieties of quartz, one dark, glassy, and frequently opalescent, the other milky-white. Examination of thin sections shows that the feldspar, in relatively large grains or aggregates partially destroyed and replaced by quartz and chlorite, is albite, with composition ranging from Ab_{90} to Ab_{95}. Some of the quartz is in relatively large, irregular grains, most of which seem to be more recent than the albite. Chlorite and carbonate form most of the groundmass. Moss (1) distinguished a highly chloritized variety of the quartz-albite type, and, in field-mapping, included under this variety all rock containing in excess of 80 per cent chlorite. This variety he termed the 'Main ore zone' type.

In the following table are given analyses of the granodiorite from the Bourlamaque batholith and from the Siscoe stock. Analysis No.8, of average granodiorite, has been added for comparison.

Analyses of Granodiorite, Bourlamaque Batholith and Siscoe Stock

	1	2	3	4	5	6	7	8
SiO_2	57.00	58.98	57.37	46.68	45.34	41.14	60.16	65.82
Al_2O_3 ...	16.44	15.80	14.48	20.75[x]	16.53[x]	14.20[x]	13.89[x]	15.99
Fe_2O_3 ...	0.86	1.60	1.58	0.96	1.66	2.27	4.09	1.66
FeO)	6.33	4.73	8.98	6.36	9.01	15.68	6.82	(2.69
MnO)								(0.05
MgO	1.73	1.25	1.96	10.54	8.65	7.65	1.45	2.19
CaO	5.36	6.75	3.49	8.91	7.49	6.68	3.10	4.71
Na_2O	6.40	6.28	7.13	0.56	2.40	1.30	5.63	3.86
K_2O	0.90	0.71	0.32	0.14	0.32	0.06	0.19	2.32
TiO	tr.	tr.	tr.	0.25	0.38	1.22	0.84	0.85
P_2O_5	0.08	0.35	0.03	-	-	-	-	0.16
FeS_2	0.43	0.35	0.26	-	-	-	-	-
CO_2+H_2O .	4.76	3.92	4.52	-	-	-	-	-
Loss on ignition	-	-	-	4.28	7.96	8.99	3.21	
Total ..	100.29	100.72	100.12	99.43	99.74	99.19	99.38	100.00

[x]Includes traces of other oxides.
1.Granodiorite from Sullivan dump, Bourlamaque mass (2).
2.Granodiorite from drill core at Herbin Lake property, Bourlamaque mass (2).
3.Granodiorite from Siscoe dump, Siscoe stock (2).
4.Porphyritic type from 12th level, Siscoe stock (3).
5.Intermediate type from 10th level, Siscoe stock (3).
6.Main Ore Zone type from 6th level, Siscoe stock (3).
7.Quartz-albite type from 6th level, Siscoe stock (3).
8.Average granodiorite (4).

(1) Op.cit., p.86.
(2) HAWLEY, J.E., Que. Bur. Mines, Ann. Rept., 1930, Pt.C, p.24 (Provincial Government Assay Lab., analyst).
(3) MOSS, A.E., Op.cit., p.107, (J.T. Donald and Company, Ltd., analyst).
(4) DALY, R.A., Igneous Rocks and Their Origin, 1914, p.386.

Hornblende Granite:

A few outcrops of hornblende granite were found along the western shore of Blouin lake, well within the limits of the granodiorite batholith. The hand specimens show a coarse to medium grained rock, pink to grey in colour. It contains a fair percentage of quartz with pink and white feldspar and some hornblende. Study of thin sections of the rock shows that it contains a large percentage of orthoclase, some oligoclase, large grains of quartz, and laths of partially altered hornblende. This rock is probably an acid facies of the granodiorite, but there is no visible evidence as to the age relationship of the two rocks.

Quartz Diorite, Diorite Porphyry:

Numerous dykes of diorite have been intersected in diamond drilling under the lake, east of Siscoe island; they cut Keewatin-type volcanics. Outcrops of similar rock were observed on lots 53 and 54, range I, Vassan township. A dyke of quartz diorite 100 feet wide outcrops on the western shore of Blouin lake, on the boundary between Dubuisson and Vassan townships; the strike of this dyke is N.75°E. It has been traced by a geophysical survey made by the Basin Gold Mine Company, and has been intersected in several diamond-drill holes. The data from the geophysical survey suggest that the dyke is an apophysis of the Bourlamaque granodiorite batholith.

On the northwestern side of island No.3, in De Montigny lake, there is an outcrop of schistose quartz diorite and diorite porphyry characterized by abundant long, radiating needles of tourmaline. These may be genetically related to a quartz vein whose presence is reported nearby. On map No.513 accompanying the present report, the diorite has been placed at the top of the stratigraphic column because numerous small dykes of diorite, petrographically similar to the larger dykes apparently related to the granodiorite, have been found underground at Siscoe, where they definitely cut the albitite dykes.

Syenite Porphyry Dykes:

Although dykes of syenite porphyry are found at several places in the map-area, those on Siscoe island and more especially in the workings of the Siscoe mine afford the best exposures. The syenite porphyry forms wide east-west dykes both to the north and to the south of the 'K' zone, cutting respectively granodiorite and Keewatin-type volcanics. In the 'K' zone itself, a composite dyke of the porphyry consists of as many as five adjacent dykes or lenses, best seen on the 5th level in the workings in the eastern end of the 'K' zone. Similar dykes cut talc-schist in the long cross-cut, No.404, which extends under the lake northeastward from Siscoe island.

Dykes of syenite porphyry, cutting Keewatin-type volcanics, were also noted in the southern part of lots 42-45 and 46, range II, Vassan township, and in the southern part of lot 43, range III. There are similar dykes on the

property of Siscoe Extension Holdings and on the lakeshore at a point 1,800 feet to the east of the Siscoe Extension shaft.

The syenite porphyry is a light-coloured rock, characterized by large phenocrysts of feldspar in a matrix of quartz, feldspar, and chlorite. Determinations made in a thin section cut from a specimen taken in cross-cut No.404 at the Siscoe mine indicate that the feldspar is albite, Ab_{90}. Examination of thin sections of the syenite porphyry from the Siscoe Extension property shows the presence of phenocrysts of orthoclase, in part altered to large muscovite flakes and sericite, and also some of relatively unaltered albite, which may be secondary; the groundmass is composed of quartz, orthoclase, plagioclase, chlorite, epidote, zoisite, and apatite.

Quartz Monzonite, Monzonite Porphyry:

Several dykes of quartz monzonite and of monzonite porphyry cut the Keewatin-type volcanics, especially at a short distance from their contact with the granodiorite intrusive, to which the dykes are assumed to be genetically related. The outcrops of monzonitic rock are in general too small to appear on map No.513. Some of the dykes have a well developed porphyritic texture. A good example of this may be seen in the occurrence in the northern part of lot 57, range I, Vassan township, which, on map No.513, is shown under the general colour for 'syenite and feldspar porphyries'. Study of thin sections of the rocks shows that they contain about equal proportions of orthoclase and oligoclase (Ab_{73}). In the porphyritic facies, the oligoclase, but slightly altered, forms large euhedral crystals with random orientations; the groundmass is very fine and even-grained and consists chiefly of quartz, orthoclase, and plagioclase, together with chlorite; the grains of chlorite are aligned in fluidal arrangement around the phenocrysts. Epidote is abundant in some specimens.

Granitic Quartz-Feldspar Porphyry:

Hawley (1) has drawn attention to the presence, in the granodiorite on Siscoe island, of porphyry with quartz and feldspar phenocrysts. Similar rock is to be found on the first outcrop to the east of the outlet of De Montigny lake. On the eastern shore of the lake, there are outcrops of rock closely similar in composition, although the porphyritic texture is not in evidence at all places; this granitic rock is cut by numerous quartz veins carrying tourmaline. A small dyke of granitic rock cuts the granodiorite in an outcrop in the middle of lot 52, range X, Dubuisson township; this dykelet is cut in turn by a larger dyke of rhyolite.

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(1) Que. Bur. Mines, Ann. Rept., 1930, Pt.C., p.30.

Rhyolite Dykes:

Small dykes of rhyolite, too small to be shown on map No.513, cut the Keewatin-type lavas at several places in the map-area. A good example of this may be seen on the second island on the northwest side of Siscoe island.

Albitite:

The most persistent dyke in the Siscoe mine-workings is an albitite dyke, 20 to 40 feet wide, which has been traced for a distance of 900 feet along the strike and has been found on every level of the mine; the dyke is vertical and its trend varies between N.45°E. and N.65°E. It lies about 200 feet west of the main shaft, and, starting from the 'K' zone, it penetrates the Siscoe granodiorite stock. The intrusion of the albitite has apparently been accompanied by some albitization of the granodiorite wall-rock, so that in some places the contacts appear to be gradational. Westward from the southward projection of the large albitite dyke, there are several lenses of similar rock which cross into the Keewatin-type volcanics to the south of the 'K' zone. Even within the 'K' zone, the albitite is so massive that it is believed to post-date the major movements along the shear-zone; there is evidence, however, that there has been some movement along the dyke itself, with displacement of the east side upward and to the southwest. A similar dyke of albitite is crossed by the long cross-cut, No.404, under the lake; this dyke cuts the granodiorite at a point close to the contact between the granodiorite of the Siscoe stock and the adjacent talc-chlorite schist.

The typical albitite is massive, light-coloured, and even-grained; in places, however, it has a porphyritic texture. The mineralogical composition, as determined by examination of thin sections, is albite, in fine laths, with quartz, chlorite, carbonate, and sericite.

Andesite and Diorite Dykes:

In the Siscoe mine workings, the granodiorite is cut by several dykes of andesite. These dykes are later also than the albitite and than some of the gold-bearing veins. One of the principal andesite dykes, exposed on the 850-foot level, has a north-south strike and a steep dip to the west; this same dyke crosses the main ore-zone between the seventh and eighth levels. The andesite dykes are very dark and are composed almost entirely of chlorite.

Diorite dykes, which are numerous, cut granodiorite, albitite, and some of the vein systems. They are composed largely of chloritic material, with remnants of altered plagioclase feldspar.

Altered Lamprophyre:

Two dykes of altered basic rock, probably originally hornblende lamprophyre, were noted in lot 40, on the

boundary between ranges III and IV, Vassan township; they are respectively 25 and 60 feet wide, with strike slightly north of west and dip 80°N. Their contacts with the serpentine-talc rock they cut are sharp and are marked by chilling effects in the dykes. One of the dykes exhibits definite schistosity.

In thin section under the microscope, it is seen that relatively large crystals of ferromagnesian minerals form from 60 to 75 per cent of the rock; they are completely altered to an aggregate of chlorite and talc, with some serpentine. The chlorite is nearly colourless and shows scarcely any pleochroism, indicating a variety containing very little iron; it also shows marked polysynthetic twinning. The groundmass consists of very fine, clear grains of quartz and feldspar, both of which may be secondary.

Keweenawan (?)

Diabase:

A wide dyke of little altered, massive diabase cuts Keewatin-type volcanics exposed on the northwest side of island No.2 in De Montigny lake. A similar dyke outcrops on the shore of Blouin lake, at the boundary between Dubuisson and Vassan townships. These two dykes have been described by Hawley (1), who tentatively classed them as Keweenawan. The writer has no new information to add regarding these dykes.

Pleistocene and Recent

By far the greater part of the map-area is covered by glacial débris. In places, the thickness of these deposits is greater than 200 feet. They include widespread accumulations of varved clay, good exposures of which may be seen on the shores of De Montigny lake.

Evidence of glaciation is apparent all along the shores of De Montigny lake in the form of polished outcrops bearing glacial striae, which usually strike a little west of north.

STRUCTURAL GEOLOGY

There are so few outcrops in the map-area that it is difficult to make a thorough study of the structural features of the rock formations. This and adjacent areas have been subjected to tectonic forces which produced the regional schistosity to be observed in almost all the Keewatin-type volcanic rocks. Throughout the area, this schistosity is uniform in character, but not in trend. In the western section, the strike is slightly south of east; going westward, it swings progressively northward until, at the eastern boundary of the map-area, close to Blouin lake, its direction is slightly north of east. This progressive change in strike is best seen in the southeastern

(1) Que. Bur. Mines, Ann. Rept., 1930, Pt.C, p.33.

section of the map-area and it may be controlled by the mass of the Bourlamaque granodiorite batholith, which projects into this corner of the area. The dip of the schistosity is vertical or very steep to the north.

At several places, it was possible to determine the top of individual units in the formation by observation of the forms of the pillows or of the variation in grain size across single lava flows. Out of nine determinations, seven seemed to show quite conclusively that the tops of the flows face south; the two others, more doubtful, indicated that the tops face northward. These observations are in accordance with the conclusion reached by L.V. Bell (1) concerning the regional structure of an adjoining map-area to the south. The general conclusion, applicable to both areas, is that the formations throughout form part of the southern limb of a large anticline or the northern limb of a large syncline, and that this fold is slightly overturned. The sedimentary rocks underlying the central part of Dubuisson township (2) probably lie along the axis of this fold, which was formed after the Temiscamian-type sediments had been deposited upon the Keewatin-type volcanics.

It was observed that the pattern of the schistosity, the bedding of the volcanic tuffs, the orientation of the lava flows, and the elongation of the pillows, is uniform throughout the map-area.

There are numerous fracture and fault systems in the map-area. The most conspicuous fault is the 'K' zone, which crosses Siscoe island with a strike of N.65°W. and a dip of 80°-85°N. Its course is marked by a wide zone of strong shearing at the large number of places where it has been encountered in the Siscoe mine workings. At both ends, this fault seems to swing to the north and to divide into more than one fault. Near and on both sides of the 'K' zone there is a complex fracture pattern, which presumably is subsidiary to the main fault. Since this complex fracture has largely controlled gold deposition in the ore deposits of the mine, it is further discussed in the chapter on Economic Geology. Several faults were observed at other places in the area, notably along the eastern shore of De Montigny lake; all of these have a northwesterly strike.

ECONOMIC GEOLOGY

Gold mineralization has been found in a number of localities in the map-area, but up to the present only one producing mine, the Siscoe, has been developed. Up to June, 1946, it had produced 828,751 ounces of gold. Deposits on two other properties, Siscoe Extension and West Siscoe, have been partially developed by underground workings, but work at each of these was suspended at the end of 1938. A considerable amount of underground development has been carried out on three properties - the Kiena, Wisik, and Dorval Siscoe - which are just outside the map-area. These were examined by the writer during the field season and descriptions of them are included in the present report.

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(1) Que. Bur. Mines. Ann. Rept., 1935, Part B, p.20.

(2) Que. Bur. Mines, Map No.342.

At the time they were visited, only the Kiena was under active exploration.

Regional Relation Between Gold and Granodiorite

Although the gold deposits of the district are found both in granodiorite and in the Keewatin-type volcanics, the distribution of the mineralization is most suggestive of a close relationship, genetic or structural, between the deposits and the granodiorite. The Bourlamaque batholith is the principal mass of granodiorite. Adjacent to it are smaller, satellitic bodies, of which the Siscoe stock affords an excellent example. In order to obtain a clear view of the distribution of the deposits in relation to these intrusives, it is necessary to take into consideration the territory beyond the limits of the Siscoe Mine map-area. The sketch map, Figure 1, shows both the outline of the intrusive bodies and the location of the principal deposits of the district. Of the producing mines, the Siscoe and Lamaque are adjacent to, and in, satellitic masses; the Sullivan, Cournor, Beaufort, and Perron are adjacent to, or in, the Bourlamaque batholith; the Sigma and Quebec Manitou are within a relatively short distance from the Bourlamaque batholith. Partially developed deposits include the West Siscoe, Siscoe Extension, Dorval Siscoe, Kiena, Wisik, Jacola, Ricanaw, Basin, Beaucourt, Pascalis, and Senore, all lying relatively close to granodiorite. It is noteworthy, too, th that in every case where deposits lie within the granodiorite, they are close to the margin of the mass. To summarize, then, there are many gold deposits, of which twenty have been named, distributed in a belt three to four miles wide beginning at the Siscoe mine and going southward and eastward around the western nose of the main batholith, and then extending along its southern and eastern margins, for a total length of about twenty-two miles.

Types of Gold Mineralization

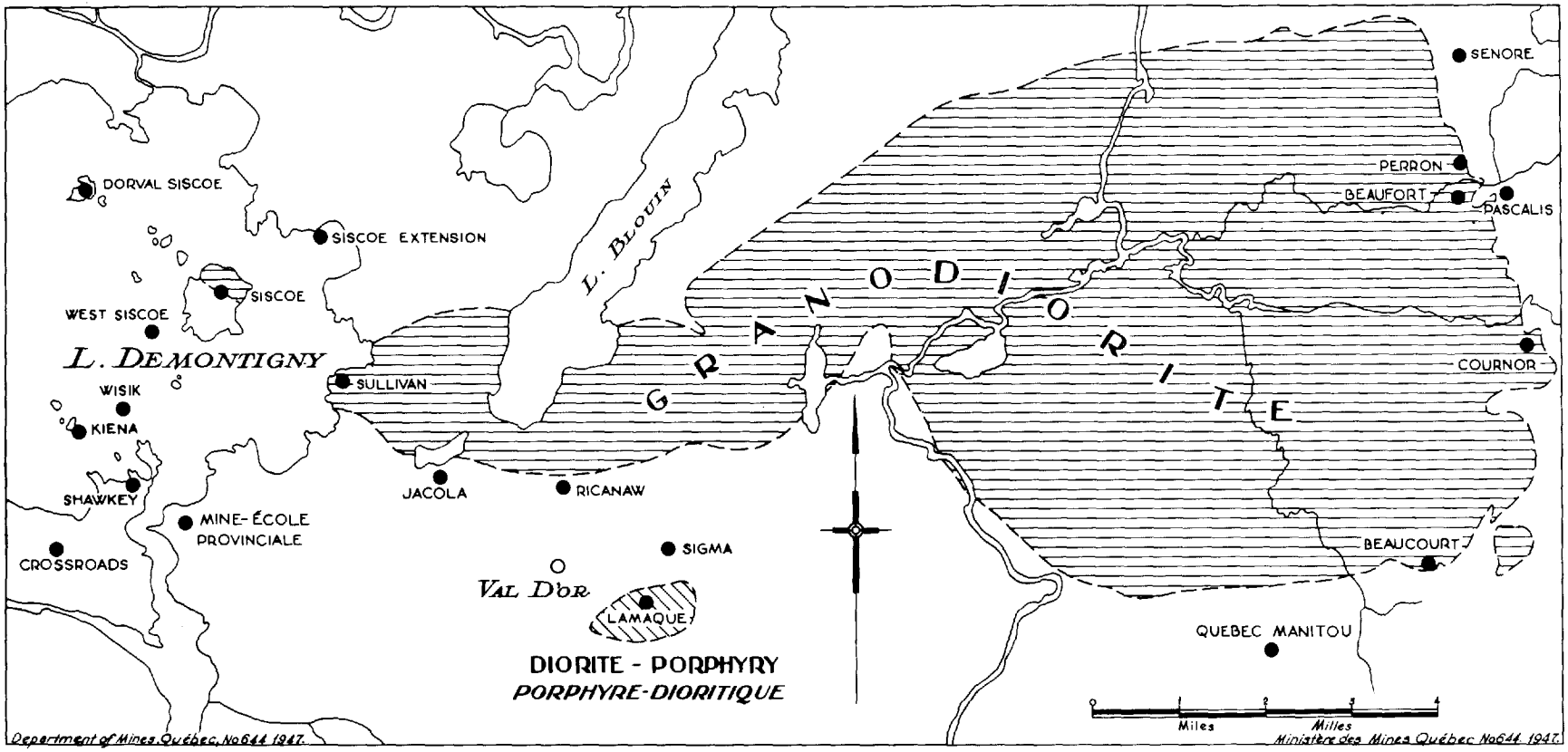
The gold deposits of the Siscoe map-area are, broadly, of three types:

(1) Veins of quartz with tourmaline, in granodiorite or diorite and related rocks, carrying pyrite and generally some chalcopyrite. The 'Main', 'Siscoe', and 'C' veins at Siscoe are typical of the group.

(2) Vein deposits in Keewatin-type volcanics, rather than in the intrusive rocks, that commonly carry little or no tourmaline. The 'N', '21', and 'A' veins at Siscoe, and the Dorval Siscoe vein, are typical of this class.

(3) Gold-bearing quartz lenses along the highly sheared contact between greenstone and granodiorite, as in the 'K' zone at Siscoe.

The gold-bearing veins at Siscoe Extension might be said to constitute a fourth type. They occur in Keewatin-type volcanics but differ from the deposits of type (2) in containing abundant tourmaline.



SKETCH-MAP SHOWING DISTRIBUTION
OF GOLD DEPOSITS AND OF GRANODIORITE
VAL D'OR DISTRICT

CARTE CROQUIS MONTRANT LA DISTRIBUTION
DES GÎTES AURIFÈRES ET DE LA GRANODIORITE
DISTRICT DE VAL D'OR

Figure No.1

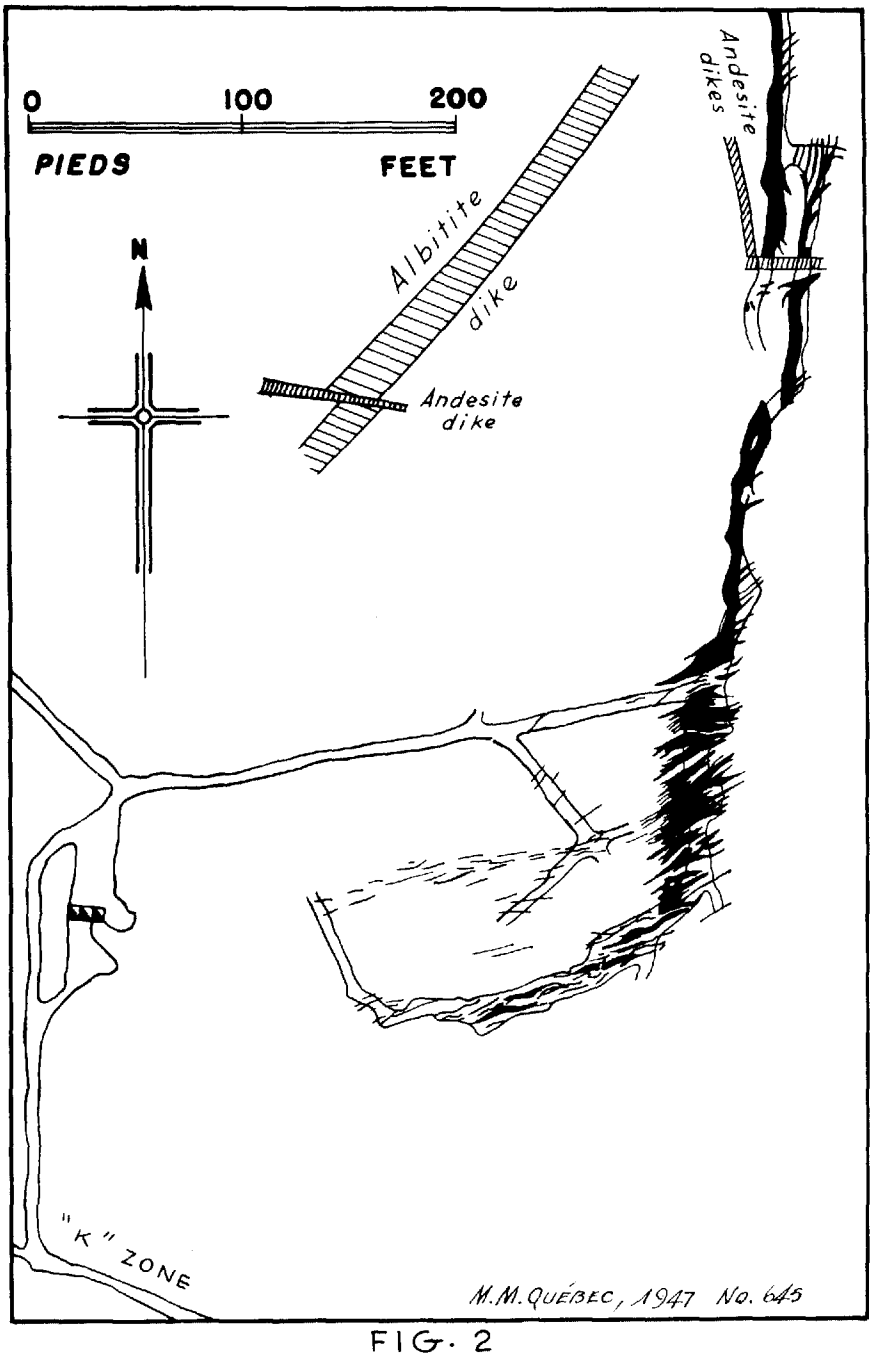


FIG. 2

SISCOE GOLD MINES LTD.

"Horse-tail" portion of the Main ore zone 975 foot level

Partie "Horse-tail" de la zone principale de minerais Niveau de 975 pds.

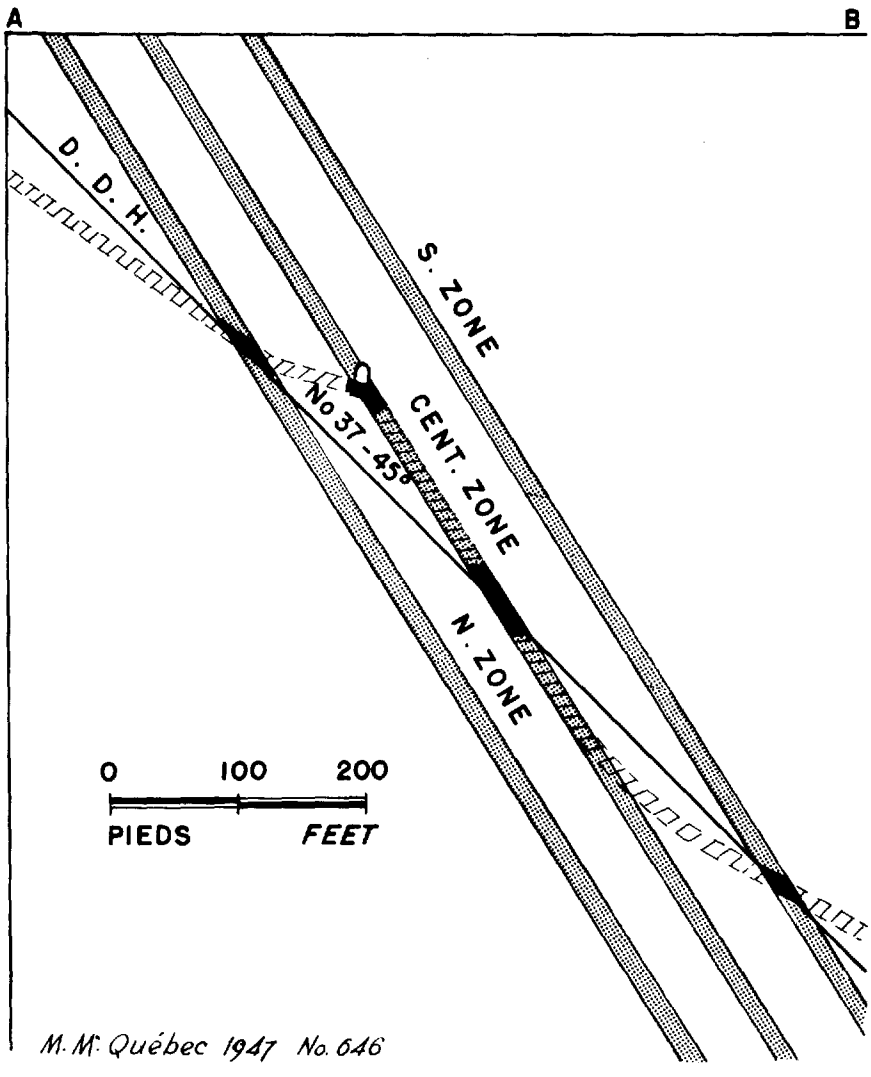


FIG. 3

DORVAL SISCOE MINES LTD.

Vertical section along hole No. 37

Section verticale le long du trou de forage No.37

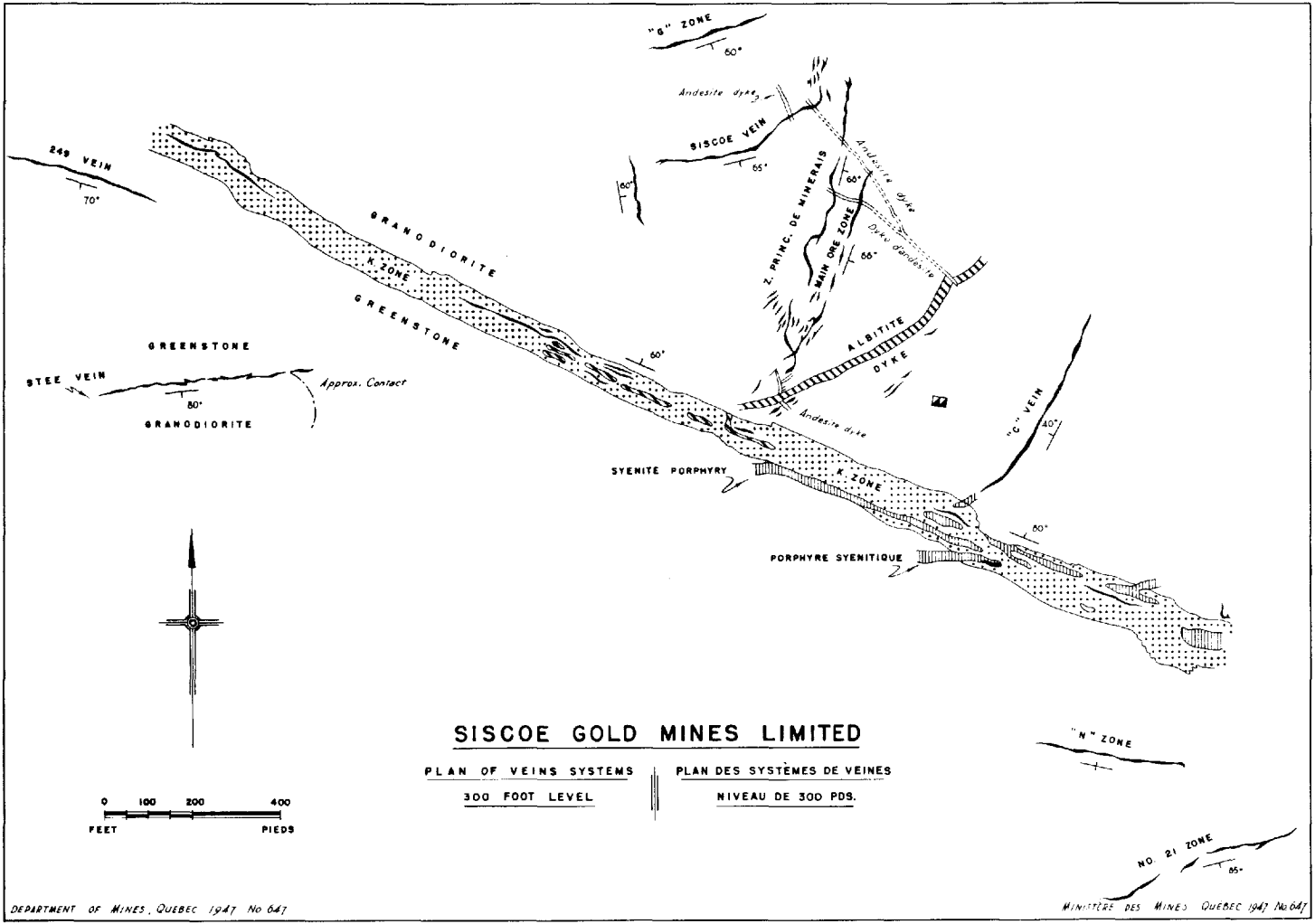
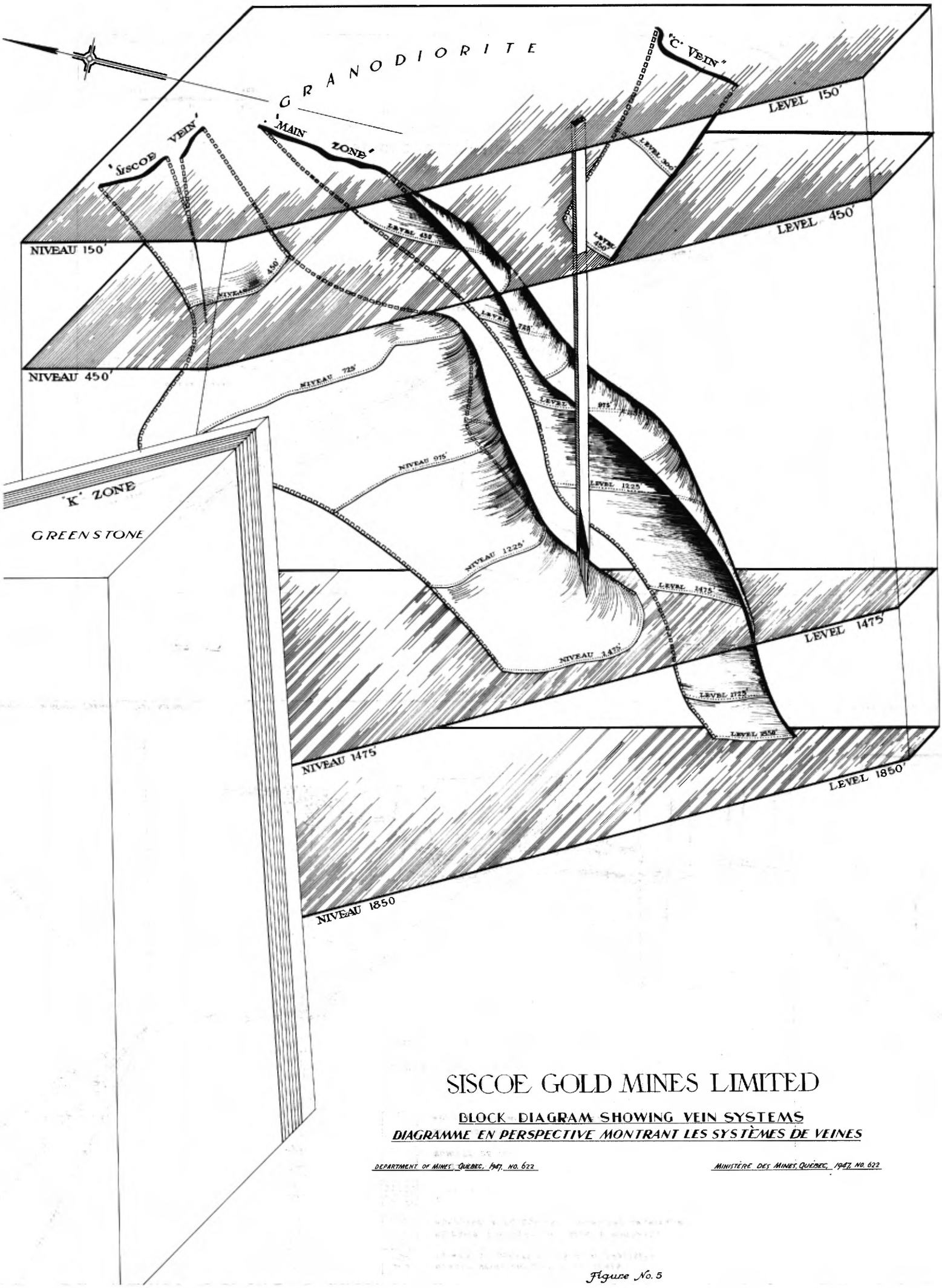

"6" ZONE
60°
Andesite dyke
SISCOE VEIN
65°
249 VEIN
70°
GRANODIORITE
K ZONE
GREENSTONE
Z. PRINC. DE MINERAIS
MAIN ORE ZONE
Andesite dyke
Dyke dacite
60°
ALBITITE DYKE
GREENSTONE
STEE VEIN
80°
Approx. Contact
GRANODIORITE
Andesite dyke
"C" VEIN
40°
SYENITE PORPHYRY
K ZONE
PORPHYRE SYENITIQUE
0 100 200 400
FEET PIEDS
SISCOE GOLD MINES LIMITED
PLAN OF VEINS SYSTEMS
300 FOOT LEVEL
PLAN DES SYSTÈMES DE VEINES
NIVEAU DE 300 PDS.
"N" ZONE
NO. 21 ZONE
65°
DEPARTMENT OF MINES, QUEBEC 1947 No 647
MINISTÈRE DES MINES QUEBEC 1947 No 647

FIG. 4



SISCOE GOLD MINES LIMITED

BLOCK DIAGRAM SHOWING VEIN SYSTEMS

DIAGRAMME EN PERSPECTIVE MONTRANT LES SYSTÈMES DE VEINES

DEPARTMENT OF MINES, QUEBEC, 1947. NO. 622

MINISTÈRE DES MINES, QUÉBEC, 1947. NO. 622

Figure No. 5

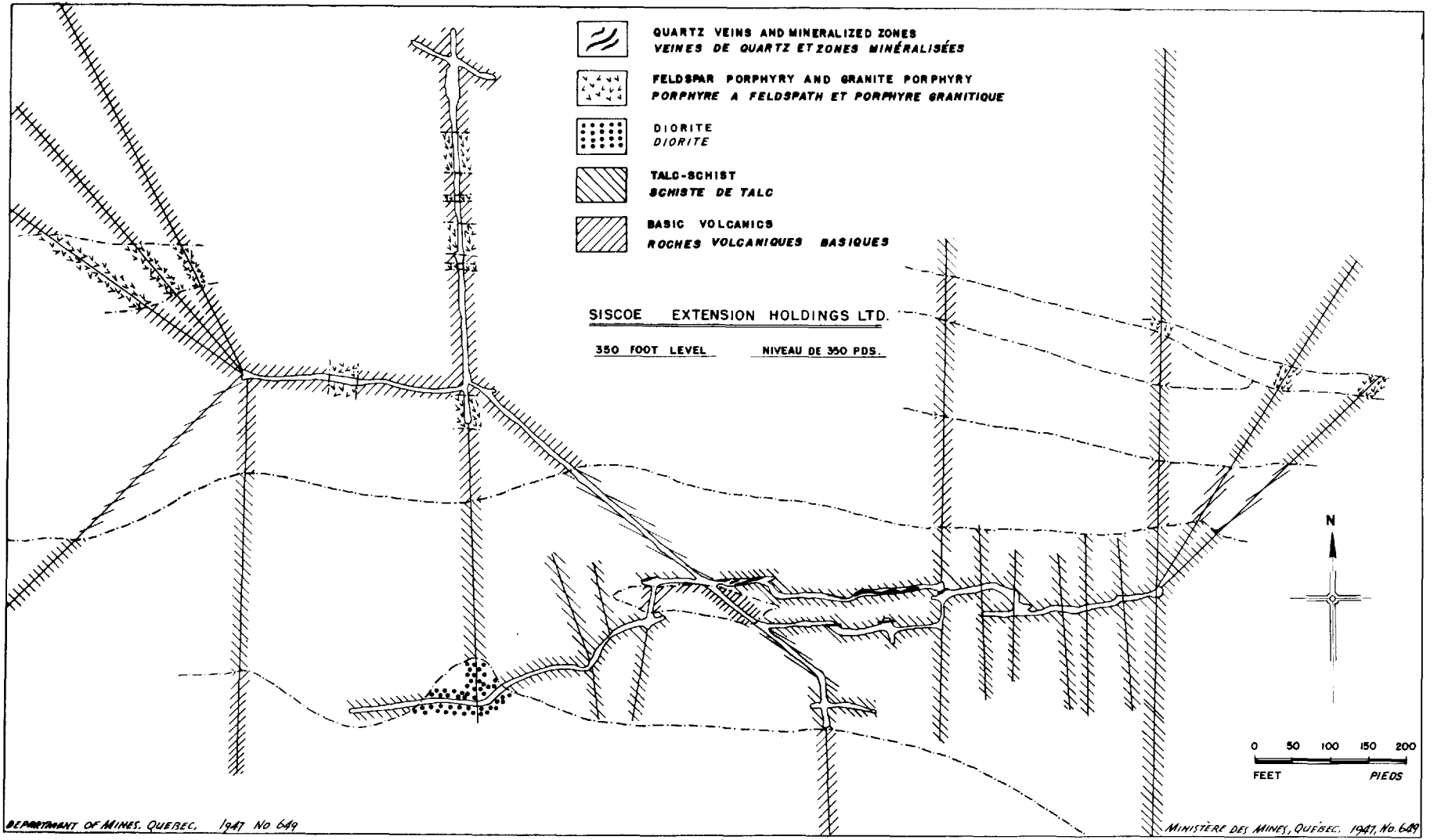

QUARTZ VEINS AND MINERALIZED ZONES
VEINES DE QUARTZ ET ZONES MINÉRALISÉES
FELDSPAR PORPHYRY AND GRANITE PORPHYRY
PORPHYRE A FELDSPATH ET PORPHYRE GRANITIQUE
DIORITE
DIORITE
TALC-SCHIST
SCHISTE DE TALC
BASIC VOLCANICS
ROCHES VOLCANIQUES BASIQUES
SISCOE EXTENSION HOLDINGS LTD.
350 FOOT LEVEL
NIVEAU DE 350 PDS.
N
0 50 100 150 200
FEET
PIEDS
DEPARTMENT OF MINES, QUEBEC, 1947 No 649
MINISTÈRE DES MINES, QUÉBEC, 1947, No. 649

FIG. 6

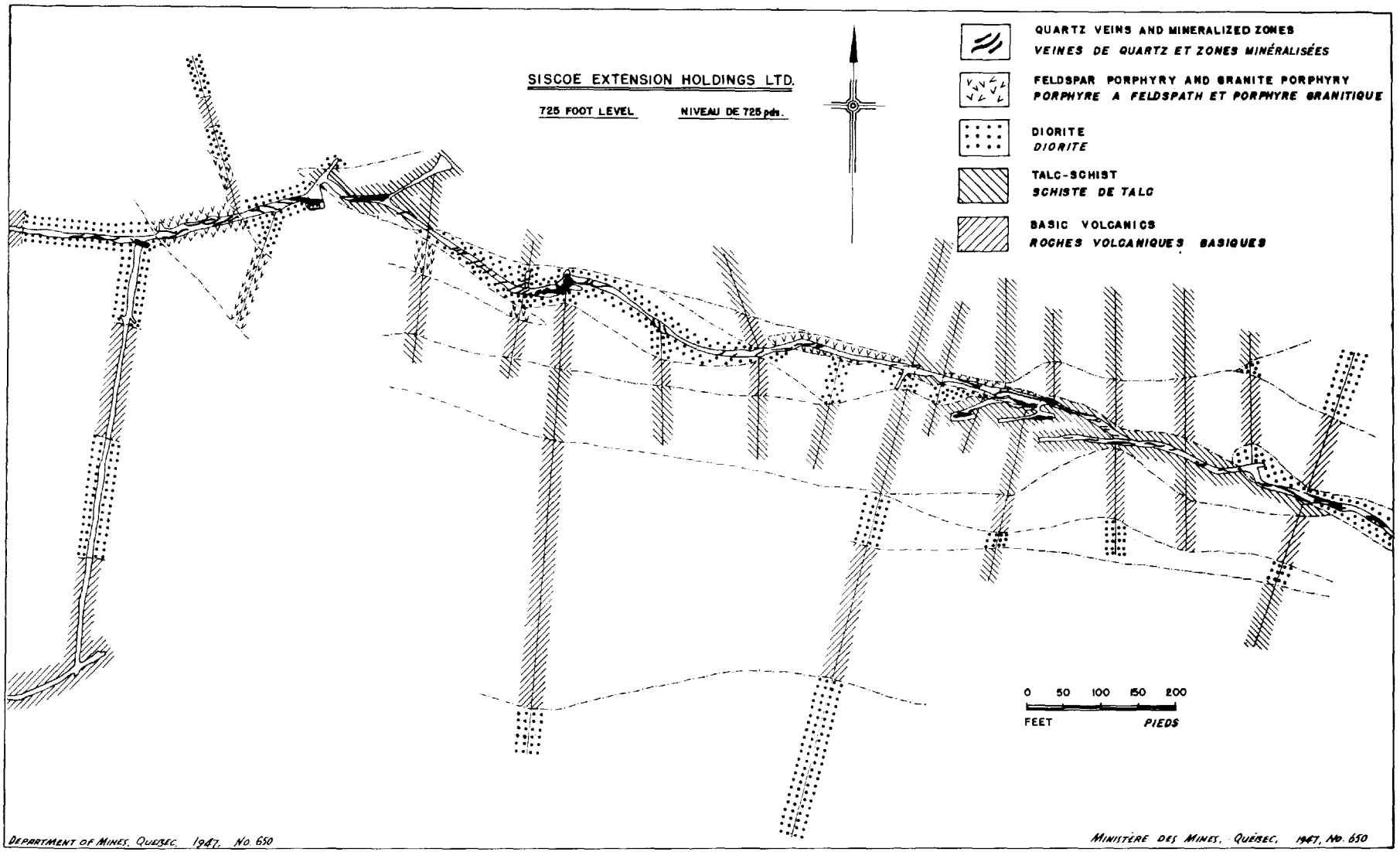

SISCOE EXTENSION HOLDINGS LTD.
725 FOOT LEVEL
NIVEAU DE 725 pds.
QUARTZ VEINS AND MINERALIZED ZONES
VEINES DE QUARTZ ET ZONES MINÉRALISÉES
FELDSPAR PORPHYRY AND GRANITE PORPHYRY
PORPHYRE A FELDSPATH ET PORPHYRE GRANITIQUE
DIORITE
DIORITE
TALC-SCHIST
SCHISTE DE TALC
BASIC VOLCANICS
ROCHES VOLCANIQUES BASIQUES
0 50 100 150 200
FEET
PIEDS
DEPARTMENT OF MINES, QUEBEC, 1947, NO. 650
MINISTÈRE DES MINES, QUÉBEC, 1947, NO. 650

FIG. 7

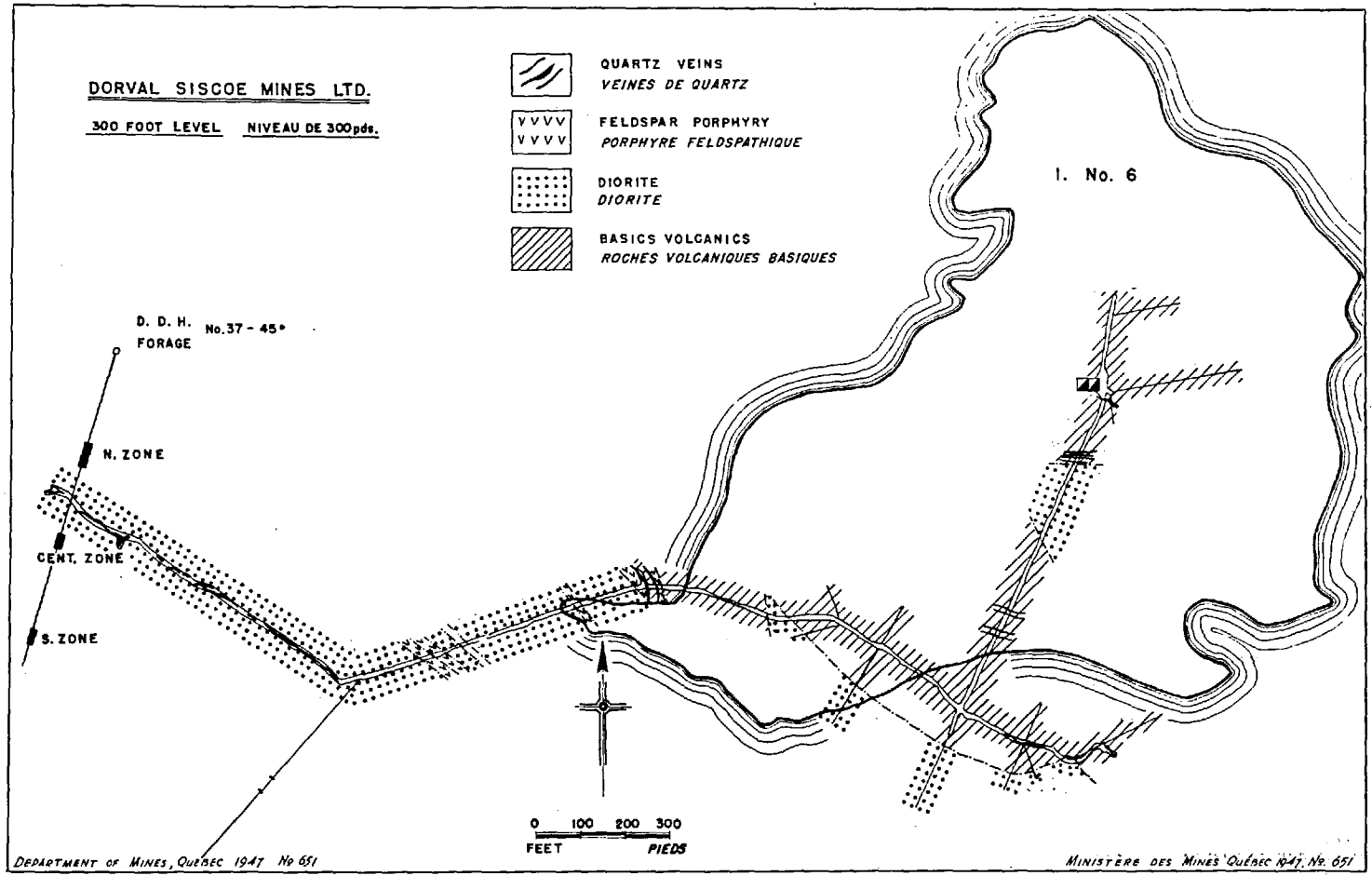

DORVAL SISCOE MINES LTD.
300 FOOT LEVEL NIVEAU DE 300pds.
QUARTZ VEINS
VEINES DE QUARTZ
FELDSPAR PORPHYRY
PORPHYRE FELDSPATHIQUE
DIORITE
DIORITE
BASICS VOLCANICS
ROCHES VOLCANIQUES BASIQUES
I. No. 6
D. D. H. No.37 - 45°
FORAGE
N. ZONE
CENT. ZONE
S. ZONE
0 100 200 300
FEET PIEDS
DEPARTMENT OF MINES, QUEBEC 1947 No 651
MINISTÈRE DES MINES QUÉBEC 1947 No. 651

FIG. 8

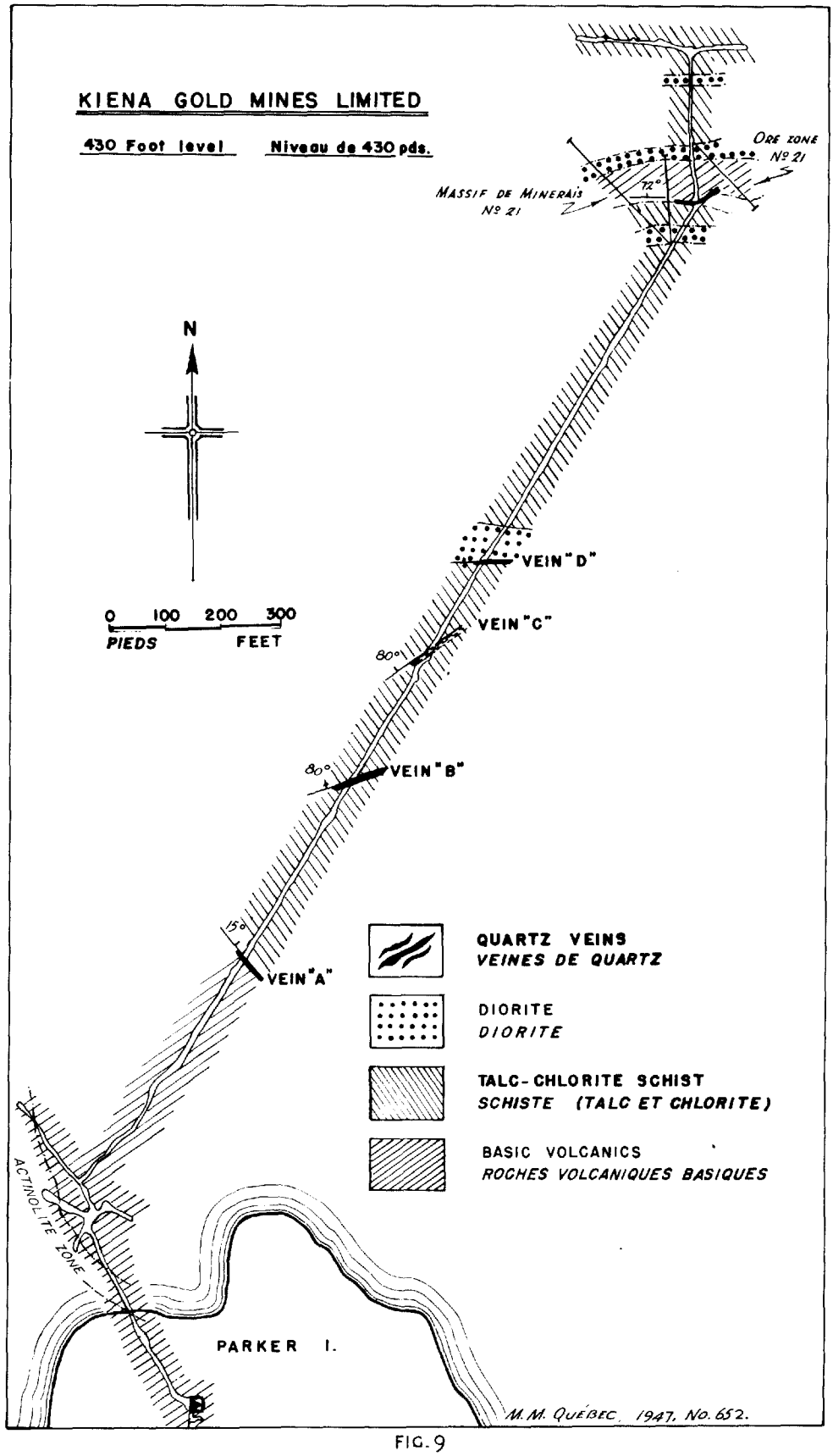

KIENA GOLD MINES LIMITED
430 Foot level
Niveau de 430 pds.
ORE ZONE
No 21
MASSIF DE MINERAIS
No 21
72°
N
0 100 200 300
PIEDS FEET
VEIN "D"
VEIN "C"
80°
80°
VEIN "B"
5°
VEIN "A"
QUARTZ VEINS
VEINES DE QUARTZ
DIORITE
DIORITE
TALC-CHLORITE SCHIST
SCHISTE (TALC ET CHLORITE)
BASIC VOLCANICS
ROCHES VOLCANIQUES BASIQUES
ACTINOLITE ZONE
PARKER I.
M.M. QUÉBEC 1947, No. 652.

FIG. 9

The gold is most frequently present in a very finely divided state in quartz veins of the fracture or fissure type. More rarely it occurs also in the adjacent wall-rock, as for example at Dorval Siscoe, where the wall-rock is albitized and carbonatized, and in the 'K' zone at Siscoe, where the talc-chlorite schist locally carries fine, free gold. Petzite, a telluride of gold, has been reported by Hawley (1) in the 'C' vein at Siscoe but it accounts for only a very small proportion of the total gold in the vein.

As a general rule, the veins contain very little pyrite or other sulphides. Those at Siscoe Extension are quite exceptional in this respect, containing as they do large amounts of pyrite, pyrrhotite, and chalcopyrite in addition to abundant tourmaline. Scheelite, in very minor amount, has been found in the gold-bearing veins at Siscoe and Siscoe-Extension, and, indeed, at all the producing gold mines in this section of Western Quebec.

Factors Affecting Gold Deposition

Attention has already been drawn to the fact that the known gold deposits of the district lie at, just within, or not far beyond, the margin of the Bourlamaque granodiorite mass or of satellitic bodies adjacent to it. Although this distribution suggests a genetic connection between the mineralization and the intrusives, it is also possible that it is due chiefly to the structural influence of the latter. It seems most reasonable to assume that the injection of a large mass of relatively homogeneous granitic-textured rock into an accumulation of volcanic rocks whose layers had different degrees of competency would provide opportunities for the formation of varied fracture patterns if the whole assemblage were subjected to severe tectonic stress; furthermore, in the writer's opinion it is to be expected that the vicinity of contacts between the volcanics and large bodies of intrusives would be particularly favourable to the localization of the shears or faults along which the principal adjustments to the stresses took place.

The intrusive rocks, because of their greater competence and brittleness, were more prone than the volcanics to fracturing, and the openings so formed provided good channels for the circulation of ore-bearing solutions; the tendency would be for such fractures to be most numerous near the margins of the larger intrusive masses. The principal deposits at Siscoe illustrate this, as do the veins at Sullivan and Perron, which lie just within the Bourlamaque batholith at its western and eastern ends, respectively.

The Keewatin-type volcanics are in great part altered and chloritized. In them, therefore, there was much less likelihood than in the intrusive rocks for the development of fractures suitable to ore deposition. In those places where veins are found in the volcanics, the

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(1) Que. Bur. Mines, Ann. Rept., 1930, Pt.C, p.44.

fractures they fill seem frequently to be related structurally to nearby intrusives. At Siscoe, the veins to the south of the 'K' zone are in Keewatin-type volcanics; other examples are found at Siscoe Extension, Dorval Siscoe, and West Siscoe.

The highly altered talcose and chloritic formations are so soft and incompetent that in them, fractures of a type favourable to vein formation are exceptional. Examples may be seen, however, in the 'K' zone at Siscoe, where parallel gold-bearing quartz lenses are localized here and there in a relatively narrow zone of strong shearing. It may also happen that, where dykes or other small bodies of relatively brittle rocks intrude talc-chlorite schists, ore deposits are formed in or adjacent to such dykes or bodies; the deposit at the Kiena property may be cited as an example, and analogous relations prevail at some places in the Siscoe Extension mine workings.

The gold deposits of the district are distributed at intervals in a zone which has a general east-west trend. Within the map-area, and in the adjoining territory, the individual veins most frequently occupy fractures whose strike lies between west and northwest. The 'K' zone at Siscoe is in this group and so are the economically important 'A', No.2, and No.4 vein systems at the Sullivan; other examples are the veins at West Siscoe, Dorval Siscoe, and Siscoe Extension. Although the prevailing mineralized fracture system has a northwesterly trend, locally there are subsidiary fractures having quite different directions; these may be economically important, and at the Siscoe property, for example, the bulk of the production has been extracted from veins localized in subsidiary fractures which have a northeasterly trend; the vein system at Siscoe will be discussed in more detail in the section of this report in which the property is described.

Wall Rock and Vein Alteration

Adjacent to most of the veins there has been more or less albitization of the wall-rock: very slight at Siscoe, very pronounced at Dorval Siscoe. Chloritization, however, is the most common and most strongly developed type of wall-rock alteration. Actinolite has been formed at several places. In the 'K' zone at Siscoe, actinolite is accompanied by talc and carbonate, to form a schist; in the Wisik gold mine, the actinolite, accompanied by biotite, forms a brown-coloured zone bordering the vein, and a similar rock was found in diamond-drill hole No.32 on the Kiena property. The best examples of silicification were observed at the Dorval Siscoe and Kiena properties, where the wall-rocks have been brecciated and both fragments and unbroken wall-rock have been partly replaced by albite, quartz, and vein material; later veinlets of quartz and of carbonates cut the earlier phases of vein material and also the fragments.

Description of Properties

Siscoe Gold Mines, Limited

Refs.: Geol. Surv. Can., Sum. Rept., 1926, Part C, pp.66-72.
Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.39-53.
Can. Min. Jour., Vol.57, 1936.
Que. Bur. Mines, Ann. Repts., 1926-1939, Part A.
Unpublished thesis by A.E. Moss on The Geology of the Siscoe Gold Mine, McGill University, 1939.

The property of Siscoe Gold Mines, Limited, covers about 1,600 acres in Dubuisson and Vassan townships. The shaft and plant are on Siscoe island, in De Montigny lake, and the greater part of the holdings are covered by the waters of the lake. The Siscoe is the only producing mine in the map-area. C.O. Stee was Manager at the mine when the writer did the field-work for this report.

Gold was discovered on the property in 1911 but it was not until three or four years later that the finding of the important veins on Siscoe island was reported. By 1926, an inclined shaft, 600 feet deep, had been sunk on the 'C' vein. Milling operations were started early in 1929 at a rate of less than 100 tons of ore per day.

The mine is now being worked from a main three-compartment vertical shaft which reaches the 19th level, at a depth of 2,475 feet; the mill is treating nearly 1,000 tons of ore per day. The total gold production up to June, 1946, has amounted to 828,751 ounces.

The Siscoe orebodies lie for the most part along the contact between the Siscoe granodiorite stock and Keewatin-type volcanics to the south of it. Throughout the greater part of its length, as exposed in the mine workings, this contact is a shear zone whose strike is N.65°W. and dip 80°-85°N. This zone of strong shearing is known as the 'K' zone and is a major fault in the map-area. It is, moreover, believed to be the 'master fault' to which the principal ore-bearing veins on the property are subsidiary, and it may also have provided a channel-way through which the ore-bearing solutions rose and subsequently spread throughout the vein system. The ore deposits lie in and on both sides of the 'K' zone, but by far the bulk of the production has been extracted from veins in the granodiorite, on the north side of the zone (see Fig.4 and Fig.5).

The ore zones at Siscoe, sixteen in number, may be divided into two groups: (1) shear zones containing quartz lenses, and (2) fracture zones with continuous quartz veins. In the first group are the 'K' zone and the 'N' zone. The second group includes the following veins: in the granodiorite to the north of the 'K' zone - Main, Siscoe, F, C, No.27, G-zone, No.20, Hope, and No.28; and in the greenstones to the south of the 'K' zone; No.249, Stee, No.21, M, and A. The distribution of the ore zones on the 300-foot level is shown in Fig.No.4. Descriptions of the ore zones or veins are given in the following paragraphs, arranged according to the order in which they have been listed above.

K Zone.-The 'K' zone, a zone of strong shearing having a width of 50 to 120 feet, has been traced for a length of more than 5,000 feet, and it persists without change to the deepest workings of the mine, at 2,475 feet below the surface. The strike of the zone is N.65°W., and the dip is 80°N. For part of its length it follows the granodiorite-volcanics contact, but at the west end it leaves the contact and lies wholly within the granodiorite for a length of more than 1,000 feet. The character of the talc-chlorite schists in the 'K' zone has already been described on page 11.

In the 'K' zone, gold is found in quartz lenses, veins, and stringers, and to some extent in the adjacent schists. Most of the ore in the quartz is high grade, and coarse gold is frequently visible along fractures in the quartz and in the talcose schist. The quartz is glassy to sugary with a bluish colour and contains veinlets and small patches of chalcopyrite, pyrite, pyrrhotite, chlorite, and carbonate. The examination of polished surfaces indicates that the chalcopyrite is later than the pyrite.

The richest ore in the 'K' zone has been found in the lower levels of the mine, whereas the reverse is true for most of other vein systems at Siscoe.

N Zone.-The 'N' zone is a strong shear zone in the Keewatin-type volcanics about 300 feet south of the contact. It has about the same strike as the 'K' zone and dips almost vertically. Development work on this zone has been limited to the 300-foot level, where it has been opened over a length of about 350 feet in the southeastern section of the mine workings. The zone is similar in character to the 'K' zone, but, so far, the amount of ore found in it is small.

Main Ore Zone.-The Main ore zone consists of a series of overlapping and branching veins occupying fractures in the granodiorite. It has been traced northeastward from the 'K' zone for a distance of about 1,000 feet and has been mined from the surface to a depth of 1,850 feet. It changes somewhat in character between the 850- and 975-foot levels of the mine. Above the 850-foot level, it has a strike of S.15°W. for most of its length and dips at 58°E., but, as it is followed southward, toward the K zone, the strike swings more southwesterly, and the veins break up into a number of short veins and lenses to which the term 'horse-tail' structure has been given. Below the 975-foot level, the zone is a single north-south vein which dips at 70°E. until, near its southern extremity, it swings westward, and here, the 'horse-tail' structure, striking east-west, is much more strikingly developed than in the upper levels (Figure 2). In the 'horse-tail' section, the zone presents evidence of shearing rather than fracture opening, whereas in the northern section the fractures present many of the characteristics of tensional-type openings. On the 1,725-foot level, the north end of the zone seems to be cut off very abruptly. A series of diamond-drill holes put out in all directions to explore the ground to the north, failed to encounter any definite continuation of the zone.

The vein material of the Main ore zone is white quartz containing very little pyrite, chalcopyrite, and pyrrhotite. Tourmaline is not abundant. Carbonate and later barren quartz form veinlets cutting the early vein matter. Gold is present as fine specks in the quartz and as thin films or plates along fractures in the quartz. At the bend north of the 'horse-tail' section, gold in high-grade pockets occurs as small patches or intricate threads, ribbons, and plates, which form a network within the quartz mass. In the lower levels, the 'horse-tail' section has proven to be an important source of high-grade ore; its sulphide content is higher than the average.

Throughout the length of the Main ore zone, the wall-rock is altered granodiorite which shows very minor silicification adjacent to the veins. Chloritization of the wall is characteristic throughout the zone and is most pronounced at the southern end, where it approaches the 'K' zone.

Since 1939, a large amount of development work has been done in the footwall of the Main ore zone and its southern end in the 'horse-tail' section. In these places, a series of small veins and stringers were mined and they supplied a large proportion of the ore to the mill. This ore came mainly from above the 600-foot level, and most of it from the 450- and 600-foot levels. In the hanging-wall of the zone there are numerous quartz stringers of the 'Main ore zone' type. Where intersected by 'C type' veins, these are of ore grade. However, there has been very little production to date from this part of the mine.

Siscoe Vein.-The Siscoe vein is west of the Main ore zone (see Figure 4). Unlike the latter, it is a more or less continuous, single vein, or series of lenses, with a width ranging from a few inches to eight feet. It strikes east-west for most of its length, but swings sharply northeastward, and finally due north, at its eastern end, which is about sixty feet west of the north end of the Main ore zone. The western end of the vein is 300 to 400 feet north of the 'K' zone. The dip of the Siscoe vein is to the south and southeast, and varies between 35° and 80°. The length of the vein, as it has been developed on the several levels, varies between wide limits. From the surface to the 450-foot level, and from the 1,350-foot level to the bottom of the vein, on the 1,600-foot level, the length is from 350 to 400 feet; on the intermediate levels it is longer than this, and on the 725-foot level it reached its maximum length, of 1,000 feet. The vein has been mined as far down as the 1,600-foot level, but at this depth its length is only 120 feet. It shows characteristics of the tension-fracture type of vein, but there is also evidence of movement in that section of the vein which strikes east-west.

The vein material is white quartz with sparse tourmaline and little sulphide. Visible gold occurs in places as coarse grains and as veinlets in the quartz.

The wall-rock shows alteration by chloritization, and also by silicification and albitization which, however, are confined to a very narrow zone bordering the vein on

both sides. A good example of albitization of the wall-rock may be seen on the 1,475-foot level in the northeastern section of the vein, where it is intersected by andesite dykes.

The F vein strikes north-south and at the surface its north end is about sixty feet due west of the west end of the Siscoe vein (see Fig.No.4). Its average length is 175 feet. The dip being 50° to 60° east, it approaches the usually steeper Siscoe vein at depth and on the 750-foot level its north end meets, and is cut off at, the hanging-wall (south side) of the Siscoe at about the centre of the developed length of the latter. It has not been mined below this level.

The F vein thus parallels and has about the same dip as the Main ore zone. It probably belongs to the same fracture system as the latter. The vein material is white quartz with very minor sulphides and some visible gold.

'C' Vein and No.27 Vein.-At the surface, the 'C' vein lies in granodiorite at 450 feet to the east of the main shaft, occupying a fracture which has been traced for a length of approximately 500 feet with a strike of N.20°E. and dip of 35°-40°W. Its average width is from two to three feet, but locally the mined width increased to ten feet. The vein was mined to a depth of 450 feet, where it narrowed. Although having about the same strike as the Main ore zone, the 'C' vein dips in the opposite direction, i.e., toward the Main ore zone, and, at various depths below the 450-foot level, the two fracture systems meet. At the intersections, the C-type veins have the form of parallel tourmaline-rich stringers, which cut the Main ore-zone vein system. Good examples of these relations may be seen in cross-cut No.342 on the 450-foot level of the mine. It was at one time believed that the C-vein system had bottomed on the 450-foot level, but, subsequently, several other veins and fractures of the same type were found to the east of and below the principal vein; to these belong veins No.608, No.610, and No.27, in which mineable widths of ore of good grade have been outlined in places by exploration. These are at present under development.

Between 1939 and 1946, a series of C-type veins and stringers were developed by raises - and were mined - in the footwall of C vein in the hope of finding a new low-grade orebody, but bulk sampling did not prove the existence of any extensive body of ore grade.

West of C vein, in its hanging-wall, similar C-type veins and stringers were explored and mined out to the surface, but here, again, the work failed to reveal a continuous orebody.

Mineralogically, the C vein is different from the others on the property. It consists of white, glassy quartz containing relatively large amounts of tourmaline. The tourmaline occurs either as radiating needles in the quartz, or as fine grained masses which, usually, are concentrated along the vein walls, especially on the hanging-wall side. Where the vein is narrow, tourmaline sometimes fills almost the entire width. At those places where the tourmaline needles are most abundant, the glassy appearance of the

quartz is accentuated. The vein contains visible gold, scheelite, and magnetite; Hawley (1) reported the presence of the gold telluride, petzite.

The wall-rock of the C-type veins is bleached and highly silicified and contains tourmaline and pyrite.

'G' Zone.-This ore zone is about 300 feet north of - on the footwall side of - the Siscoe vein. It belongs to the same vein system as the Siscoe vein and is about parallel to it, with an east-west strike and a dip of 60° south. The G zone is a fracture zone in the granodiorite, extending over a width of about 100 feet, in which numerous quartz veins are visible, usually accompanied by a certain amount of silicification on both walls. The principal vein in this zone was developed, and was mined in places, by drifts with a maximum width of eight feet. It extends for a distance of 600 feet horizontally and was traced from the surface to a depth of 250 feet.

The veins are composed of white quartz containing some pyrite, chalcopyrite, tourmaline, and free gold. It is intersected by C-type stringers dipping north and cutting the G-zone vein almost at right angles on the dip. Both types of vein contain free gold.

No.20 Vein Zone.-The No.20 ore zone lies in the hanging-wall of the Main ore zone, and the principal fractures belong to the Main ore-zone system, having a north-south strike and an average dip of 50°E. In addition, however, the zone includes west-dipping veinlets filling fractures of the C-vein type. The approximate length of the zone is 170 feet, and its known vertical extension is 600 feet. In places, the width reached 40 feet.

The mineralogical characteristics of the veins and stringers are those of the fracture system to which they belong. Thus some veins are similar to those of the Main ore zone; others are of the 'C' type, with abundant tourmaline. Free gold is found in both types.

The granodiorite host-rock is silicified and pyritized.

Hope Vein and No.28 Vein.-This vein system is about 400 feet north of the 'K' zone, on the east side of the Siscoe stock. The strike varies from east-west in the western half, to N.65°E. in the eastern part; the dip is 65-85°S. The vein has not yet been fully explored but, on the 100-foot level, development work indicates a length of 365 feet of ore; vertically, it is known to extend from the 150-foot level to below the 850-foot level. The vein is single in the upper levels, but just below the 725-foot level it splits and continues as two separate veins.

Vein 249.-Vein 249 is at the western end, and about 160 feet south, of the K zone. It is best developed on the 300- and 450-foot levels. Drilling has shown that it does not extend far below the latter level. In 1946,

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(1) Que. Bur. Mines, Ann. Rept., 1930, Pt.C, p.44.

this quartz vein had been developed for a length of 175 feet on each level and drifting along it was still in progress. It is in greenstone, with strike N.65°W. and dip 70° southward. The vein contains some chalcopyrite and visible gold and is reported to carry 0.2 oz. gold per ton across a width of three feet.

Stee Vein.-The Stee vein is in the western part of the mine, to the south of the 'K' zone. It strikes slightly north of east and dips steeply to the south. The maximum mining length of the vein is 225 feet. The vein follows a contact between granodiorite and Keewatin-type volcanics along the northern margin of a small body of granodiorite; the contact is marked by a fault.

The vein material is sugary quartz, banded with a large amount of chlorite. Sulphides are quite rare but pyrite, pyrrhotite, and sphalerite have been noted, and, in several places, visible gold.

M, A, and No.21 Veins.-These veins are in the greenstone in the southeast corner of the mine workings. They are to the south of the N zone which, in turn, is to the south of the K zone. The veins A and No.21 strike N.60°E. and dip steeply to the southeast. All three veins consist of white, sugary quartz mineralized with relatively abundant sulphides and some visible gold. They are of minor importance as a factor in the total gold production of the mine.

Mainland Showing.-The original discovery on the Siscoe property is on the mainland, on lot 39, range I, Vassan township. It has been described as follows by W.F. James and J.B. Mawdsley (1): "On the mainland north of Siscoe island, a large mineralized zone has been disclosed by stripping on the lake shore ... The country rock is a granite, somewhat porphyritic in habit, and mineralized with pyrite and carbonate. The 'vein' is a zone 100 feet wide with a generally east-west strike ... Within the zone are numerous reticulated masses of glassy white quartz enclosing elongated masses of the granite. The quartz carries some pyrite, and a little free gold. Tourmaline within the quartz occurs in seams up to three inches wide parallel to the general strike of the zone. Small seams of carbonate locally form a selvage to the quartz masses; other veinlets are composed of tourmaline and carbonate, the carbonate being later than the tourmaline. Pyrite occurs also in the carbonate ... Samples of small widths are said to carry good values".

A cross-cut was driven northeastward from the main shaft on the 600-foot level to explore the ground under the lake and the Mainland Showing underground. This cross-cut encountered several relatively wide bodies of granite porphyry traversed by numerous quartz veins. Sampling of these veins did not give encouraging results.

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(1) Geol. Surv. Can., Sum. Rept., 1926, Part C, p.71.

Other Veins.-On the 450- and 600-foot levels, drilling to the north of the K zone intersected some narrow quartz veins carrying gold in commercial amount. They are oriented almost at right angle to the K zone. These veins are more or less in line with the southern end of Siscoe vein and may belong to the same system of fractures. A similar vein, designated 1204, was found on the 1,600-foot level. It is possible that the veins in this section of the mine may prove to be a definite orebody. They were being further explored in the summer of 1946.

Under Powder island, diamond-drill holes from the surface intersected a flat vein, 10 to 50 feet wide, lying at 50 to 100 feet below the surface. Apart from one intersection, which assayed 0.17 oz. gold per ton across a width of two feet, this vein was found to carry little or no gold.

Relative Ages of the Vein Systems at Siscoe.-Definite knowledge of the relative ages of the vein systems and also of the dyke rocks at Siscoe would be of the greatest value in the analysis of the structural factors which controlled the formation of the gold deposits. Unfortunately, many of the vein systems are found at relatively widely spaced intervals through the workings, and, even where different vein systems are found close to one another, the workings seldom provide exposures in which conclusive evidence regarding their relative ages is apparent. It has been established that the C-type veins are younger than those of the Main-ore-zone system, and younger also than the dykes found in the mine. The Main-ore-zone and Siscoe veins are cut at several places by andesite dykes and by diorite dykes.

Spectrographic analyses, made by the writer, of the pyrite in the various veins have yielded indirect evidence that the deposits of the K zone, the C veins, the Main ore zone, and the Siscoe vein, are all of different ages. These analyses showed that:

(1) Chromium is common in the K zone, and is absent in the C, Main ore zone, and Siscoe veins.

(2) Titanium is very high in the Siscoe vein and very low in the Main ore zone.

(3) Lead is abundant in the Main ore zone and the Siscoe vein but absent in the K zone.

(4) Vanadium is abundant in the Siscoe vein, but absent in the others.

(5) Pyrite from the C vein, known to be youngest, contains the least impurities.

Since it seems reasonable to assume that contemporaneous solutions from the same source would contain the same minor constituents, the observations cited above are interpreted as evidence favouring different ages for the deposits concerned. They do not, however, shed any light on the order of deposition.

Should it be decided to pursue this line of investigation further, the suggestion is offered that a

comparison be made between pyrite from the 'horse-tail' section of the Main ore zone and that from the north-south part of the same vein system, and also of pyrite from the western part and the north-south striking section of the Siscoe vein.

Structure.-The vein systems at Siscoe are so numerous, and their attitudes so diverse, that it is impossible to present a simple structural analysis which will suffice to account for all the observed facts. Furthermore, since it now seems certain that the complex fracture pattern has resulted from stresses applied at successive intervals, it will be readily understood that lack of information on the sequence of these events is a serious obstacle to the successful solution of all the problems involved. A further handicap arises from the great difficulty in interpreting the nature of the several types of fracture, some of which are probably due to tension, others to shear; and perhaps, too, tension and shear have acted along the same planes at different times. The block diagram (Figure 5) of the vein systems will aid in visualizing the fracture pattern and the hypotheses that have been advanced to explain its formation.

The hypothesis offered by Hawley (1) assumed the action of strong east-west stresses causing shear fractures along planes of maximum shear, now represented by the Main and C veins, the direction of easiest relief being upward. This plausible explanation does not account for the fact that the two vein systems are not contemporaneous, the C veins being the later; this fact only came to light in the course of development of the mine subsequent to Hawley's examination. Neither does this explanation take into account the Siscoe, F, and many other veins which had not been discovered at that time.

More recently, the structure of the Siscoe ore deposits was analyzed by O.L. Backman (2), who postulated that the K zone was the controlling shear, and that a force acting steeply upward and directed toward the northeast would resolve itself into three components: (1) a major horizontal component parallel to the contact between the granodiorite and the greenstone, which would account for the K-zone fault with displacement of the south side toward the east; as a consequence of this movement, tension fractures originated which formed the 'horse-tail' at the south end of the Main ore zone and the Stee vein; as a consequence of further compressive east-west forces, the C vein and Main ore-zone fractures were formed; (2) a minor component normal to the contact, causing compression which was relieved, upward, by fracturing in which the Siscoe vein was deposited; (3) a minor vertical component parallel to the contact, which would account for an upward movement of the south side of the K zone. In this analysis, the Main ore zone (both fractures and horse-tail section), the Siscoe vein system, probably the C-vein type and also the Stee vein, are considered to be tensional.

Yet another interpretation of the structure of the

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(1) Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.44-45.
(2) Can. Min. Jour., Vol.57, 1936, pp.469-471.

Siscoe deposits has been outlined by A.E. Moss (1), who gives credit for its conception to J.E. Gill. According to this hypothesis, the main stress caused a shear couple to develop, so that the south wall of the K zone was thrust upward and to the east. The Main ore-zone, the eastern part of the Siscoe vein, and the F veins represent fractures developed in a subsidiary direction of shear at right angles to the K-zone. The 'horse-tail' section of the Main ore zone, and the western part of the Siscoe vein, would represent east-west tension fractures developed at the same time. The direction of easiest relief was upward and to the south. At a later period, the C-vein fractures were formed, and the movement whose effects have been observed in the western part of the Siscoe vein may have taken place at the same period.

West Siscoe Gold Mines, Limited

Ref.: Que. Bur. Mines, P.R. No.116, 1936, p.52.

This property is in De Montigny lake, west of the southern part of Siscoe island. It comprises twelve claims, all completely covered by the waters of the lake. Exploration work, carried out under the direction of Siscoe Gold Mines, has included diamond drilling from the lake surface when frozen over in winter, and underground drifting and cross-cutting. A cross-cut, 5,000 feet long, from the west end of the K-zone workings on the 450-foot level of the Siscoe mine gives access to the underground workings on the West Siscoe property.

The predominating rock type on the claims is altered Keewatin-type volcanic flow material (or possibly altered granodiorite) of the type locally known as 'Keewatin coarse' (see p.8). A dyke, 20 to 70 feet wide, designated the 'Thompson granodiorite', has been traced by diamond drilling for a length of 1,300 feet; the strike is N.65°W. and the dip steep to the north. This dyke, whose strike is about parallel to that of the K zone at Siscoe, lies about 3,000 feet to the south of where that zone would appear if continuous so far westward.

Gold-bearing mineralization has been found in a zone, about 1,000 feet long, of quartz-stringers in the Thompson granodiorite dyke and along its northern side. Four hundred and fifty feet of drifting was done along the dyke, and some narrow veins, similar to the C-type veins at Siscoe, were found; these proved to be gold-bearing, but all were narrow and were judged to be without economic value. The results of assays of samples taken in the drift were less encouraging than those of samples taken from the drill-cores.

Another cross-cut, 1,200 feet long, was driven toward the southeast from the main cross-cut, in order to examine the ground in the vicinity of promising intersections encountered by drilling from the surface. Again, narrow gold-bearing C-type veins were encountered, but on the whole the results were disappointing.

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(1) Op.cit., pp.62-63.

Development work had been suspended at the time of the writer's visit.

Siscoe Extension Holdings, Limited

Refs.: Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.53-56.
" " " P.R. No.116, 1936, p.56.
" " " P.R. No.120, 1937, p.12.

Siscoe Extension Holdings, Limited, which has taken over the property of Siscoe Extension Gold Mines, Limited, holds a group of sixteen claims in range I of Vassan township and in range X of Dubuisson. Eight of the claims are covered by the water of De Montigny lake and the others are on the mainland adjacent to the bay to the northeast of Siscoe island. The claim numbers are A-27060-64, 30413, 30811-12, 30827, 31467-69, 31982-83, and 33230-31. A great deal of diamond drilling has been done on the property since 1929, and on lot 43, range I, Vassan township, a shaft has been sunk to a depth of 750 feet and a considerable amount of lateral exploration and development work has been carried out on two levels at 350 feet and 725 feet. Operations have been suspended since the fall of 1938, and at the time of the writer's visit the mine was flooded.

Exposures of bed-rock are rare on the property, and are almost entirely limited to the area in the vicinity of the shaft. Near the shaft, the outcrops are for the most part Keewatin-type chlorite schist, showing pillow structure and abundant amygdules. A distinctive band about 140 feet wide, with strike N.65°W., can be traced across the outcrops. It probably represents a single flow. The rock is of dioritic type, in part massive, in part slightly sheared, and it is characterized by numerous rounded patches rich in epidote, of the type referred to on p.9 in the description of 'wash-tub' structure.

Dykes of feldspar porphyry, a foot or so wide, cut the greenstone. In strike and dip, N.74°E. and 65°N., they about parallel the schistosity.

On an outcrop 260 feet to the northwest of the shaft, a fault was observed which has a strike of N.34°E. and a vertical dip; on the same outcrop there is a series of tension fractures with strike N.50°E. and dip 85°S.

In sheared volcanic schists outcropping near the top of the hill along the west side of the road leading to the provincial highway, pyrite is abundant in the form of cubes, often flattened and striated.

Since it was impossible to examine the mine workings, the following description of the geology and ore zones is based on Company records.

A greater diversity of rock types were encountered underground than appear on the surface. The predominating types are chloritized and highly serpentinized rocks, presumably derived from basic lavas. These are cut by numerous dykes and small masses of granite porphyry, diorite, and diorite porphyry. Cutting relations on the 725-

foot level clearly established the fact that the diorite is older than the granite porphyry (see Figure No.7).

On the 350-foot level (Figure No.6), about 850 feet southeast of the shaft, a sulphide ore-zone was encountered in a drift. According to L.V. Bell (1) the ore shoots in this zone occur in narrow sulphide lenses in strong east-west shear zones in chloritic or talcose schist of volcanic origin; the strike of the shear zones is east-west, the dip steep. The lenses are very narrow, but their grade is such that it is possible they could be mined profitably over narrow stoping widths. Assays of samples taken across widths of 25 to 36 inches are reported to have ranged from 0.21 to 0.35 ounce gold per ton.

Horizontal diamond drilling from the 350-foot level indicated the presence of a large body of granite porphyry, core samples from which contained up to 0.14 ounce gold per ton. This body was outlined by holes Nos. 342, 347, 335, 340, and 338, bored in a northwesterly direction. In core from several other holes, visible gold was noted in vein material cutting altered granodiorite. Four long drill holes, Nos.345, 341, 353, and 346, were bored in a northeasterly direction from the eastern end of No.347 drift, two of them flat and two inclined downward at 45°. Several mineralized zones, mapped on Company plans as "quartz-tourmaline intrusions with granite porphyry in serpentinized greenstone", were intersected in these holes. In No.346, one of the inclined holes, an intersection showing a gold content of 0.46 ounce per ton over a width of 66 inches is reported.

On the 725-foot level (Figure No.7), most of the drifting was done in a general N.65°W. direction in a mass of diorite lying between two lenses of serpentinized greenstone. The downward extension of the sulphide ore-zone encountered on the 350-foot level was not identified, either in the drift or in diamond-drill cores. To the southwest of the shaft, a mass of granite porphyry is cut by numerous stringers of gold-bearing quartz, characterized by a very erratic distribution of the gold; the occurrence has been tentatively correlated with similar material encountered in diamond drilling from the 350-foot level, in the several holes put out to the northwest. The workings to the east of the shaft follow a series of very irregular quartz veins, whose general trend is east-west or slightly south of west. Individually, they are lens-shaped and rarely longer than 100 feet. In the following table, the length, width, and average assay are given for three sections along these easterly workings:

Length	Width	Assay, Gold Per Ton
30 feet	46 inches	$6.42
100 "	26 "	17.15
75 "	25 "	6.25

Since there was no opportunity to gain access to

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(1) Que. Bur. Mines, P.R. No.116, 1936, p.56.

the deposits, specimens from the dump were collected for study. The ore consists of magnetite, pyrite, pyrrhotite, and chalcopyrite, with quartz, iron carbonate, and tourmaline; the tourmaline is associated with quartz either in the form of radiating needles or massive, and, wherever quartz is present, tourmaline usually accompanies it. Arsenopyrite has been reported in the ore. Several blocks of porphyry cut by narrow quartz stringers carrying free gold were also recognized. Examination of polished sections shows that pyrite was followed by chalcopyrite and this by pyrrhotite, and that all the sulphides are cut and replaced by quartz, and probably by some carbonate.

Dorval Siscoe Mines, Limited

Refs.: Que. Bur. Mines, P.R. No.116, 1936, p.54.
" " " P.R. No.120, 1937, p.12.
" " " P.R. No.135, 1938, p.39.

Dorval Siscoe Mines, Limited, holds a large group of claims adjacent to the north and west sides of the property of Siscoe Gold Mines, Limited. Most of the property lies beneath the waters of De Montigny lake, and the shaft giving access to the underground workings is on an island, No.6, in the lake, about a mile and a half to the northwest of Siscoe island (Fig. No.8). Exploration activities have been under way, with interruptions, since 1933. The main shaft has a depth of 340 feet, and, on the 300-foot level, 3,600 feet of lateral workings have been driven. Another shaft, not completed, was started on island No.7. Both islands lie to the west of the Siscoe Mine area (Map No.513).

Basic Keewatin-type volcanics underlie the greater part of the property, but in its south and west part they are intruded by diorite which is believed to be the border phase of a large body of granodiorite lying farther to the south. The diorite is a rather basic type and is highly altered by the development of quartz and abundant carbonate. In places, it contains inclusions of chloritic greenstone.

The underground geology is shown in Figure No.8. From the shaft, which was sunk in Keewatin-type greenstone, a cross-cut on the 300-foot level was driven for a length of 830 feet southward toward the greenstone-diorite contact. At a distance of about 100 feet from the contact there is a strong shear zone in which the volcanics are altered to talc- and talc-chlorite schist, with strike N.75°W. and dip 58°N. This shear zone was explored by drifting to both east and west. The drift to the east is about 350 feet long, and at its eastern end the shear zone was found to include a conformable band of almost pure actinolite. In the drift to the west, which has a length of 2,250 feet, the predominating rock for the first 750 feet is greenstone, and, beyond that, diorite. At the contact between these there are two irregular masses of porphyry, exposed over drift lengths of 25 feet and 15 feet, respectively. Several dykes of feldspar porphyry and of albitite were encountered, cutting both the greenstone and the diorite; some of the dykes cutting diorite contain inclusions of greenstone.

Several lenticular quartz veins, striking slightly north of west, were exposed in the course of exploration of the shear-zone, particularly in the eastern part of the

workings. None of these is considered to have economic value. In the drift to the west, in the zone of contact between the diorite and the greenstone, two very irregular quartz veins, striking slightly west of north, were found in either side of a large inclusion of greenstone in feldspar porphyry; they were traced for a distance of 30 to 40 feet. Because of the large flow of water through the rock at the point where the drift encountered these two veins, they are referred to on the property as the 'wet veins'. At a point about 480 feet to the west of the 'wet veins', three narrow veins, 12 to 18 inches wide, are exposed; their strike is N.63°W. and their dip is steep to the south; they occur along the margins of and within a porphyry dyke. These three veins are believed to be the extension of the most northerly of three mineralized zones encountered in diamond drill hole No.37, put down from the surface. It is assumed, for the purpose of the present discussion, that the three vein-intersections in hole No.37 represent three distinct, parallel, vein-zones, but it is pertinent to point out that an alternative interpretation may be postulated, according to which the three vein-intersections represent three points where the diamond drill encountered a single vein zone, nearly parallel to the boring, but varying slightly in dip from place to place in such a manner as to afford three different points of penetration. These alternative interpretations are illustrated in Figure 3. At a point in the drift two hundred feet to the west of the most westerly of the three veins, another vein zone was encountered. It was traced by drifting along the strike for a length of about 800 feet in a direction N.60°W.; the dip varies from 50°S. where it was first encountered to 60° to 65°S. at the western end of the drift. This vein zone has been tentatively correlated with the 'Middle zone' encountered in diamond drill hole No.37 at a depth of 135 feet below the drift. The width of this vein zone is quite variable: in many places it is wider than the drift, but the average width is about three feet. At a point 195 feet from the western end of the drift, the width of the quartz appears to increase considerably, probably as a result of a roll in the vein; a cross-cut driven southwestward across the vein here revealed that the wall-rock is intensely silicified and contains abundant pyrite; the vein itself is rather narrow, but it forms, on the south side, a drag-fold plunging gently toward the northwest. At the western end of the drift, the vein had split into two branches. Beyond the eastern end of the drift, the continuation of the vein has been cut in two flat diamond-drill holes. The vein material is white or milky quartz containing numerous fragments of the wall-rock. At some places, examination of the vein as exposed along the walls of the drift suggests that some of the quartz was introduced later than the main period of formation of the vein. The wall-rock of the vein is either diorite or, in places, greenstone which forms inclusions in the diorite. Along both walls, and particularly in places where the foot-wall is brecciated, marked albitization and silicification of the walls was observed. Metallic mineralization in the vein is sparse and consists of disseminated pyrite and visible gold. Small amounts of green mica, either mariposite or fuchsite, are found in the quartz, especially along minor shear zones, or as small, elongated patches in the vein material.

Wisik Gold Mines, Limited

Refs.: Que. Bur. Mines, Ann. Rept., 1935, Part B, p.55.
" " " P.R. No.116, 1936, p.50.
" " " P.R. No.120, 1937, p.13.

Wisik Gold Mines, Limited, holds several groups of claims in Dubuisson township. The group upon which underground exploration has been undertaken adjoins the southeast side of the property of Kiena Gold Mines, Limited. The original showing is on Mocassin island, in De Montigny lake, and lies southwest of the boundary of the map-area. A three-compartment shaft has been sunk on Mocassin island to a depth of 325 feet, and levels have been established at 200 feet and 300 feet. All operations on the property have been suspended since early in 1937. The mine workings are flooded and could not be examined. The principal surface showing was reported to consist of two small quartz veins in a shear zone extending southeast from the island, beneath the bed of the lake; these veins are at present concealed by the ore dump. The information that follows was gathered from Company records.

The gold-bearing zone was traced by diamond drilling from the ice during the winter of 1934-35. Subsequently, the shaft was sunk, and the zone was located on the 200-foot level at a point 55 feet northeast of the shaft. The vein was traced for a short distance by drifting and a section 50 feet long was reported to contain an average of 0.29 ounce in gold per ton across drift-width.

On the 300-foot level, the vein and mineralized zone was traced for a length of about 700 feet. The strike varies from place to place, but the general trend of the zone is northwesterly. Many faults interrupt its continuity. At the eastern end, the zone is characterized by a series of irregular quartz lenses which seem to have random attitudes; the section of the zone which displays this character is about 280 feet long. At the eastern extremity of the workings, a cross-cut was driven to the southwest and it is believed that a vein zone which it intersected is the continuation of the principal vein. At the western extremity on this level, several dykes of porphyry and of granodiorite intrude the greenstone, and the greenstone formation includes much breccia. On both sides of the vein, a marked form of alteration, locally designated as 'brown rock', is characteristic; in many places the 'brown rock' is gold bearing.

The Company's assay plan shows that the average of face and channel sampling to the west of the shaft gave 0.10 ounce in gold per ton over a width of 5.75 feet, and in a length of 365 feet; the corresponding figures to the east of the shaft were 0.45 ounce in gold per ton over a width of 8.7 feet for a length of 93 feet.

Kiena Gold Mines, Limited

Refs.: Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.74-76.
" " " " " 1935, Part B, pp.55-56.
" " " P.R. No.116, 1936, p.48.

Que. Bur. Mines, P.R. No.120, 1937, p.12.
Geol. Surv. Can., Mem. 166, 1931, pp.245-6.

Kiena Gold Mines, Limited, holds a large group of claims, most of which are in the bed of De Montigny lake to the west of Siscoe island. The shaft, 455 feet deep, is on Parker island, which lies southwest of the map-area. Underground work has been confined chiefly to the 430-foot level (Figure No.9) where more than 3,000 feet of cross-cutting, in a northeasterly direction was done - and to a sub-level, established at the 390-foot horizon.

The formations outcropping on Parker island are chiefly andesitic flows having a trend slightly north of west. At the eastern end of the island, the lavas are cut by feldspar porphyry dykes. Five quartz veins carrying pyrite, chalcopyrite, galena, sphalerite, and visible gold have been described by Hawley (1). By the end of 1937, exploration work by underground methods and by diamond drilling had revealed a wide band of actinolite-rich rock with a parallel gold-bearing quartz vein which was intersected at about 400 feet northwest of the shaft, but the vein was found to be irregular and the tonnage developed was judged to be insufficient to warrant further work in this section of the mine.

In 1938, further diamond drilling, from the ice, disclosed another ore-zone, designated No.21, about 2,400 feet northeast of Parker island. A long cross-cut was driven toward this on the 430-foot level. It started from a point 450 feet northwest of the shaft and was driven in a northeasterly direction for 2,080 feet, where it intersected the zone. Here, another cross-cut was driven to the north for 300 feet, and at its end short drifts were run to east and west in order to provide stations for further exploration of the zone by diamond drilling.

The long cross-cut, running northeast, was driven through andesite for the first 500 feet, and then it penetrated talc-chlorite schist for 1,600 feet. Several dykes of granodiorite, feldspar porphyry, and diorite were encountered. At two places, at 1,900 feet and 2,050 feet from the start of the cross-cut, there are dykes of basic rock which are younger than any other rocks in the mine. Four irregular, gold-bearing veins, 'A', 'B', 'C', and 'D', are exposed in the cross-cut. Vein 'A' is at the contact between the andesite and talc-chlorite schist; it is a very irregular quartz vein with strike N.40°W. and dip 10°-20°N. It contains small amounts of gold. Vein 'B' is somewhat similar to vein 'A', but follows a fault in the talc schist and forms a stockwork, 14 feet wide, of quartz veins filling fractures in a dyke of light-coloured diorite; the strike is east of north and the dip 70° to 85°W. This vein contains disseminated pyrite and finely divided visible gold. Vein 'D' is at the contact between talc-schist and a wide dyke of granodiorite; its strike is east-west and it is vertical.

The No.21 ore-zone proved to be about 70 feet wide, lenticular in shape, with a plunge to the west and a dip of

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(1) Que. Bur. Mines, Ann. Rept., 1930, Part C, pp.74-76.

72° to the north. It is formed of a mass of andesite cut by dykes of porphyry. Most of the gold-bearing veins are close to the footwall of the andesite mass in a series of fractures along which evidence of albitization is apparent. Pyrite and gold are distributed across a width of approximately 20 feet from the footwall. Plans have been made for further exploration of the zone.

Basin Gold Mines, Limited

Ref.: Que. Bur. of Mines, P.R. No.116, 1936, p.54.

This Company held, until 1939, a large group of claims in the northeastern corner of Dubuisson township and covering part of the bed of Blouin lake, in Senneville township. Most of the area is covered by overburden and outcrops are very sparse. The claim-group is crossed by the contact between Keewatin-type volcanics, to the north, and the Bourlamaque granodiorite batholith, to the south. The contact has been located within very close limits by geophysical surveying and by diamond drilling. In the course of this drilling, intersections of gold-bearing vein material were reported, but no continuous ore shoot was outlined.

ALPHABETICAL INDEX