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GEOLOGICAL SURVEY OF CANADA

PAPER 49-17

GOLDFIELDS AND MARTIN LAKE MAP-AREAS SASKATCHEWAN

(Preliminary Account and Two Maps)

By

A. M. Christie and S. N. Kesten

OTTAWA

1949

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Goldfields and Martin Lake Map-areas, Saskatchewan

Introduction

This report has been prepared to accompany the two preliminary geological maps of Goldfields and Martin Lake map-areas, lying between latitudes 59°15' to 59°45' and longitudes 108°15' to 108°45', on the north shore of Lake Athabaska. Field work on which the report is based was done during the seasons of 1947 and 1948. The purpose of the investigation was to assist a Crown Company, Eldorado Mining and Refining (1944) Limited, in assessing the uranium possibilities of the region. Much assistance was received from the company: where its geologists did detailed work, this work has been incorporated into the present report and maps. All radioactive occurrences indicated on the maps, with the exception of the Nicholson property, have been located and staked by the Crown Company. Descriptions of properties are adapted from the company files and maps and from a report written by Mr. S.N. Kesten for the company.

The writer is particularly indebted to E.B. Gillanders, Mine Manager and Manager of the Eldorado Exploration Division, to R.F. Murphy, who was Chief Geologist of Eldorado Mine during a part of 1947, and to S.N. Kesten, the company geologist in the area. C.E.B. Conybeare, H.C. Norman, S.J. Kidd, J.H.H. Huckle, R. Edie, E.E.N. Smith, J.R. Walter and Ian Bain, mapped various areas in detail for the Crown Company.

D.A.W. Blake, J.B. Stubbins, J.R. Ross, J.R. Smith, K. Laatsch, E. Hanes, R.C. Heron, Stirling Heron, Roy Heron, Lawrence Heron and J.E.M. Parker were members of the writer's field parties and rendered efficient service.

TOPOGRAPHY

The topography of the map-areas is similar to that of other parts of the Canadian Shield. In detail the country is rough, the highest hills rising more than 700 feet above the nearest lakes.

Amphibolite and basalt stand out in highest relief, forming the more conspicuous hills and ridges. Areas underlain by granite, granite-gneiss, quartzite, and dolomitic quartzite are usually characterized by moderate relief. Dolomite and Athabaska arkose underlie low ground. The two major faults in the area, the St. Louis fault and the Black Bay fault are marked by prominent lineaments on the ground, which are clearly visible on the air photographs and on topographic maps.

The numerous lakes are joined by small streams, none of which, except Crackingstone River below Beaverlodge Lake, are navigable by canoe.

About 15 per cent of the area underlain by the Athabaska series is exposed bedrock, whereas in those areas underlain by older rocks more than 50 per cent of the bedrock is exposed, or is mantled only by lichen or thin moss.

General Geology

The following table indicates the probable geological succession in the map-areas:

Table of Formations

Era		Formations and Lithology	
Proterozoic		Diabase dykes	
	Athabaska series	Basalt and andesite flows (a few believed to be sills)	
		Arkose	
		Conglomerate	
		Unconformity	
		Lamprophyre dykes	
		Granite and granite-gneiss	
		Intrusive contact	
Archaean or Proterozoic	Tazin group	Mafic rocks	(A - amphibolite (B - biotite schist or gneiss (G - garnetiferous gneiss (C - chlorite-bearing rocks (E - epidote-bearing rocks (Q - chlorite-epidote rocks grading to more siliceous types (V - of volcanic origin (S - of sedimentary origin (I - of intrusive origin (V,S, or I in brackets indicates uncertainty of origin
		Quartzite	
		Conglomerate	
		Dolomite and Dolomitic Quartzite	

DESCRIPTION OF MAP-UNITS

Tazin Group

Dolomite and Dolomitic Quartzite

The dolomite and dolomitic quartzite comprise pure crystalline carbonate rocks, quartz-diopside and quartz-tremolite rocks, and quartzite with abundant diopside or tremolite. The pure carbonate seldom occurs in large masses, usually containing bands of pure white quartzite or of silicate minerals that alternate with the carbonate bands and indicate the bedding. On the weathered surface the bands of silicate minerals or quartzite form prominent, resistant, light green or white ridges, standing ½ inch to 2 inches above the softer, rusty weathering carbonates. Near Fish Hook Bay, the dolomite contains much interbedded jasper, hematite, and ferruginous quartzite. The writer has included dolomitic quartzite in the same map-unit as the dolomite so that much of the area mapped as underlain by these rocks is represented by quartzites with no contained carbonate but with abundant diopside crystals.

Conglomerate

Three small occurrences of conglomerate are interbedded with the other rocks of the Tazin group. The pebbles in the conglomerate are of quartz, a quartz-diopside-tremolite rock apparently derived from a metamorphosed dolomitic quartzite, albite granite-gneiss, and a granite porphyry consisting of well-formed crystals of microcline and quartz in a fine-grained groundmass of microcline, quartz, epidote, muscovite, sphene, and chlorite. The groundmass is arkosic in composition, consisting of quartz, microcline, epidote, penninite, muscovite, and sphene. The conglomerate on Pebble Island in Lodge Bay of Lake Athabaska is cut by pegmatite dykes and sills.

Quartzite

Quartzites are most common in the Goldfields map-area. The typical rock is a pure white, well-jointed quartzite in which the bedding planes are recognized only with difficulty. The quartzite

grades into arkosic quartzite and greywacke. In a few localities are exposures of highly foliated white quartzose rock containing abundant sericite. Across wide areas the quartzite contains notable amounts of hematite or magnetite. Most commonly the iron is a hematite stain, which has penetrated the quartzite along joint planes and other fractures. In places the quartzite has been brecciated and recemented by quartz, carbonate, and hematite, forming a ferruginous quartzite-breccia. In the vicinity of Fish Hook Bay, bands of iron minerals and red chert occur in this formation. A few of the areas indicated as quartzite on the Martin Lake Sheet may be mylonitized and silicified zones in the gneisses; this remark applies to the band bordering the Black Bay fault and to the quartzite bands indicated in the triangle formed by Verna, Max, and Elusive Lakes.

Mafic Rocks[1]

Under the term 'mafic rocks' are included all the basic or dark-coloured rocks of the two map-areas, such as the amphibolites, biotite schists, and chlorite-epidote rocks. They may be of extrusive, intrusive, or sedimentary origin. Because of the difficulty experienced in distinguishing the mode of origin of these rocks they have been mapped as a unit and subdivided by overprint lettering according to mineralogical composition and origin or postulated origin, as follows:

Mineralogical Composition

A - Amphibolite

B - Biotite schist or gneiss

G - Garnetiferous gneiss

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[1] A. Holmes in his "The Nomenclature of Petrology" defines mafic as "a mnemonic term for the ferromagnesian and other non-felsic minerals actually present in an igneous rock, and also applied to rocks in which those minerals predominate;---". In this report the term "mafic rocks" includes all dark coloured rocks whether of igneous or sedimentary origin. This extension of the meaning of an established term is not intended as a recommendation that this general usage be adopted by geologists; it is employed here in this sense only because it appears to be the term best fitted to the map-unit.

C - Chlorite bearing rocks

E - Epidote bearing rocks

Q - Chlorite-epidote rocks grading to or interbedded with more siliceous types

Origin or Postulated Origin:

S - of sedimentary origin

I - of igneous origin

V - of volcanic origin

S,I, or V in brackets indicates opinion, but lack of certainty regarding origin.

Thus, for example, AI indicates an amphibolite of igneous origin, BGS a garnetiferous biotite schist or gneiss of sedimentary origin, and AEV an amphibolite with abundant epidote, and of volcanic origin.

In general, A indicates a coarse-grained amphibolite, AEC indicates a fine-grained amphibole - epidote - chlorite rock in which small crystals of amphibole and bands or patches of epidote are distinguishable, and CE indicates a very fine-grained chlorite-epidote rock or greenstone.

Intrusive Rocks

Granite and Granite-gneiss

This map-unit includes granitic rocks of two ages, but whether they represent different phases of the same period of intrusion or separate geological periods is uncertain.

The older granitic rock is commonly gneissic, and varies in composition from granite to granodiorite. The plagioclase feldspar (albite to andesine) is commonly in excess of the potash feldspars, microcline or orthoclase. The gneiss always contains some ferro-magnesian minerals - amphibole, biotite, or chlorite. Variations in composition are believed to be due mainly to the type of rock intruded or replaced. Inclusions of all sizes occur in the gneiss, all three major Tazin rock types - amphibolites, quartzites, and dolomites - being represented.

Amphibolite masses, bands, and lenses are especially well preserved and numerous. Where these are large enough to map separately, their boundaries are shown on the maps. Most of them are, however, too small to map. The amphibolites are invariably intruded by the granite, being commonly altered to biotite gneiss on the contacts, and in many places they contain dykes and sills of granite. In some localities, notably north of Raggs Lake, the gneiss contains bands of amphibole and biotite, the bands varying from very thin to 2 inches wide and being separated by granitic material. The dark minerals comprise from a little up to 35 per cent of the rock. Some of the gneisses contain chlorite formed from the alteration of amphibole and biotite, whereas in others the chlorite appears to have been introduced into fractures or shear planes. In other gneissic areas, numerous quartzite remnants occur. About 1 mile north of Bearcat Lake, bands of diopside and tremolite occur in the gneiss, doubtless indicating the occurrence of dolomitic beds in this area. Minor amounts of diopside and tremolite also occur in the quartzite beds of the northward plunging anticline southeast of Charlot Lake and in the complexly folded series of rocks southwest of LeBlanc Lake. Bands of sillimanite-bearing gneiss and garnetiferous gneiss are also included in this map-unit.

The younger granite is most commonly an even-grained intrusive rock with no ferromagnesian minerals. It is often pegmatitic. It is rich in potash feldspar, being composed of microcline or orthoclase, albite-oligoclase (near An_{10}) quartz, and occasional muscovite. This type of intrusion is widespread in the gneissic areas of the Martin Lake map-area, although it nowhere forms a large percentage of the gneiss. The pegmatite dykes shown east of Murmac Bay of Beaverlodge Lake are of coarse grain, consist solely of microcline and quartz, and are believed to be related to the younger granite. The distribution of these dykes, and the common occurrence of bodies of potash-rich younger granite throughout the area of granite-gneiss suggest a genetic

connection between the older and younger granitic rocks.

Near the shores of Lake Athabaska, three bodies of granite occur which are of the microcline-rich type. The Lodge Bay and the Athona granites are composed mainly of microcline and quartz, with albite and very little muscovite. Ferromagnesian minerals are absent, with the exception of a little chlorite. The Mackintosh Bay granite is an exception, as it is a microcline or orthoclase-rich granite, which contains biotite. It appears from the field relations to have thrust aside the sedimentary formations during its emplacement. Because of the composition of the feldspars, it is classed with the later granites. All seven observed lamprophyre dykes appear to be related spatially to the Mackintosh Bay granite.

Microcline crystals in the Athona and Box mine 'granites' have been largely replaced by albite, indicating a period of albite deposition following the emplacement of the granite.

Lamprophyre Dykes

Several lamprophyre dykes occur in the vicinity of the Mackintosh Bay granite, the farthest being near Geebee Lake. These dykes are not shown on the map. Most of them are less than 20 feet wide, and are chocolate-brown to red on the weathered surface on which shiny black flakes of biotite stand out.

On fresh surfaces the rock has a reddish brown groundmass, with an average grain size of 0.5 mm., and with books of biotite up to 8 mm. across, and visible idiomorphic crystals of apatite. Under the microscope, the groundmass is seen to consist of orthoclase, apatite, magnetite and quartz. Calcite and chlorite are alteration products. The orthoclase occurs in well formed crystals. A.P. Beavan reports that a lamprophyre dyke south of Mackintosh Bay is cut by a diabase dyke.

Athabaska Series

Conglomerate

The Athabaska conglomerate was seen to rest unconformably on

the older rocks in many places. It contains boulders and angular fragments up to 6 feet in diameter, but commonly about 2 inches, composed of all the older rocks in the area. The fragments may be enclosed in a sandy matrix or may be cemented by carbonate, chlorite, or ferruginous material. The conglomerate may be divided into two types, one containing angular to subangular pebbles or fragments, which is found at the base of the series, and a type containing rounded pebbles often interbedded with arkose, which occurs at a higher horizon commonly separated from the basal conglomerate by a band of arkose.

In several localities the basal conglomerate has the appearance of a talus breccia, as all the fragments are derived from adjacent older rocks and show no signs of water transportation or sorting. Thus, adjoining a quartzite area, the basal conglomerate may consist entirely of quartzite fragments cemented by a siliceous, carbonaceous, or chloritic matrix, whereas, adjoining a gneissic area, the angular fragments may be entirely of gneiss. In other localities, however, the basal conglomerate contains some subangular to rounded fragments in a sandy or gritty matrix, the fragments being of different rock types and crudely sorted. The material in these conglomerates has obviously been transported by water at least a short distance.

Stratigraphically above the basal conglomerate and above an arkose band is a conglomerate with rounded fragments. The pebbles in this are of all types and must have been transported a considerable distance. This upper conglomerate is interbedded with bands of gritty to sandy arkose. Of particular interest is the occurrence of rounded pebbles of Athabaska sandstone and conglomerate in this member.

Arkose

Athabaska arkose consists largely of reddish beds of sand and grit grain, but includes some fine-grained, red siltstone beds.

Bedding is commonly well exhibited in the arkose; in many places it is marked by colour banding, in others by bands of different grain size. Crossbedding and ripple-marks are common, and mud-cracks are common in the siltstone beds.

Under the microscope, the arkose is seen to consist of fragments of quartz and clear, unaltered microcline, microperthite, and albite, as well as grains of altered feldspar and minor amounts of biotite, sericite, apatite, sphene, tourmaline, and zircon. The most common cementing material appears to be red hematite, but carbonate and chlorite are common interstitial materials. Small cubes of pyrite were noted in some specimens. The siltstone was seen, under the microscope, to consist of very small fragments of fresh microcline, albite, and quartz, with accessory biotite, tourmaline, and muscovite, all cemented by hematite and carbonate.

Basalt and Andesite Flows

Andesites and basalts interbedded with arkose occur in a structural basin near Martin Lake. The basin is much faulted.

The andesites and basalts are dense, dark green, black or red rocks, and are commonly amygdaloidal. The amygdules, usually $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter are distributed throughout the rock in bands and irregular areas. They may consist of chlorite, calcite, dolomite, or quartz. Flow breccia and flow structures have been noted. Fragments of amygdaloidal basalt have been found in pebble bands in the arkose between lava bands. One coarse-grained and non-amygdaloidal band of rock observed south of Cinch Lake may be a sill.

Under the microscope, these rocks are seen to contain laths of plagioclase feldspar up to 8 mm. long, which vary in composition in the various flows from andesine to labradorite (An_{35} to An_{55}). These phenocrysts may be set in a fine-grained greenish or brownish isotropic groundmass or in a finer grained matrix composed of augite, epidote, or chlorite. Apatite, sphene, and iron ores occur as accessory minerals. Carbonate is common both in the groundmass and filling fractures in the rock. Other fractures are stained with red hematite.

Post-Athabaska Intrusions

Diabase Dykes

Small, black, dark green or brown diabase dykes occur throughout the area, but are most numerous in the northern part. Most of these dykes are from 1 foot to 20 feet wide, are usually straight, dip nearly vertically, and can rarely be traced more than 100 feet. As traverses in the area were spaced at $\frac{1}{2}$ to $\frac{1}{3}$ mile intervals, only a small percentage of these dykes has been mapped. They are shown by a conventional symbol as it is not possible to indicate their true size and shape.

One large, coarse-grained diabase dyke north of Neely Lake averages 150 feet in width and has been traced for $1\frac{1}{2}$ miles. Another coarse-grained mass of more than normal thickness occurs on the large island in Fredette Lake, but due to poor exposures its attitude and relation to the Athabaska sedimentary beds (whether sill or dyke) was not determined. Under the microscope, the Neely Lake dyke is seen to consist of well-twinned laths of labradorite, augite, hornblende, biotite, and minor amounts of granophyric intergrowths of quartz with potassic feldspar. Chlorite and epidote are also present. The coarse-grained diabase mass on the island in Fredette Lake is very similar. The smaller diabase dykes are seen to consist of labradorite laths and augite with chlorite and accessory magnetite, apatite, and sphene. Some contain hornblende, biotite, and epidote. Some of the small dykes are amygdaloidal, the fillings of the vesicles consisting of carbonate and chlorite.

STRUCTURAL GEOLOGY

Tazin Group and Granitic Intrusions

The Tazin group of sedimentary and volcanic rocks is a bedded series in which no unconformities have been found. Alcock[1]

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[1] Alcock, F.J.: Geology of Lake Athabaska Region, Saskatchewan; Geol. Surv., Canada, Mem. 196 (1936).

divided this group, separating the "Beaverlodge series" of quartzite, conglomerate, and iron formation from the remainder of the group. The present work has shown that the quartzite, conglomerate, and iron formation, previously mapped as Beaverlodge, are interbedded with the remainder of the Tazin group. Pebbles of albite granite-gneiss, granite-porphyry, metamorphosed dolomitic rocks, and quartzite, have been found in the Tazin conglomerate, but those conglomerates are intraformational, and, apparently, rest conformally on the underlying beds. The source of the pebbles is not known.

This group of bedded rocks is intruded by basic sills, now amphibolite, which have been included by the writer in the Tazin group.

Near Goldfields, the Tazin beds are folded to form an open syncline, which plunges south to southwest at about 25 degrees. Southeast from Fish Hook Bay, along the lake shore, is an anticlinal structure the axial trace of which passes southeast through Bigfowl Island. West of the Mackintosh Bay granite mass, the beds form a syncline plunging south-southwest. North of Mackintosh Bay the beds strike roughly east, with numerous minor variations, whereas farther north the beds swing northeastward to where they disappear into the gneiss.

North and west of Milliken Lake is a minor anticlinal structure plunging northeast at a low angle. Remnants of older rocks in the gneisses of the northern sheet southeast of LeBlanc Lake, southeast of Charlot Lake, and near Right Lake appear to be folds, with the axes plunging northeast. It is, therefore, believed that the remnants of bedded rocks in the gneissic areas are all parts of the same group and, roughly, of the same horizons as the bedded rocks near Lake Athabaska.

Athabaska Series

The northeast-trending belt of Athabaska sedimentary rocks extends from near Black Bay to Anne Lake. It overlies unconformably the older rocks, the unconformity being well exposed in many places

south and east of Beaverlodge Lake. To the west this belt is bounded by the Black Bay fault.

The series may be considered as occupying two structures, a southern basin and a northern asymmetrical basin. The southern basin is the much faulted structure in the vicinity of Martin Lake. Near the north portage from Beaverlodge to Martin Lake is a greatly shattered zone on or near the extension of the St. Louis fault. Numerous faults were noted in other parts of the basin, the faults tending to have a crude radial relation to the basin. It is possible that subsidence of the interior of the basin may be in part due to extrusion of lava from its centre, but it is necessary also to postulate folding to explain the steep attitudes of the beds. The arkose of the southern basin is separated from that of the northern basin by a band of conglomerate.

The northern asymmetrical basin comprises the belt from Fredette to Anne Lakes. In this area the beds dip for the most part steeply northwest. At the base of the series is the angular conglomerate followed by arkose, on top of which is a conglomerate with rounded pebbles and containing grit and sand bands, which forms the western edge of the area. In this upper member the northwestward dip flattens and in some places is horizontal or reverses its direction before the western boundary is reached. The lower members of the series are not repeated on the northwest side of the structure probably due to faulting, although it is possible that the deposition of the sediments was asymmetrical with respect to the present basin, and the lower beds may not have been deposited as far west as the Black Bay fault. One feature of interest is the occurrence of well rounded pebbles of Athabaska sandstone associated with pebbles of granitoid rocks, quartz, etc., in the upper conglomerate. The excellent rounding of these pebbles suggests to the writer that they were derived from a distant basin formed prior to the present one, as the sandstone must have been well consolidated to yield these pebbles on erosion.

The Athabaska arkose on the islands in Lake Athabaska is flat-lying. It rests unconformably on the folded Tazin quartzites. Here the old land surface on which the arkose was laid down is being exposed by erosion, the harder quartzite forming the hills and the softer, less consolidated arkose occurring only in the valleys or low-lying ground, especially in positions where they were protected from the southwestward moving glacial ice. Little of the quartzite has been eroded as "sandstone dykes", that is, Athabaska arkose preserved in cracks and fissures in the Tazin quartzite, are numerous, as mentioned by Alcock, and occur on the highest hills.

That the Athabaska series is of continental and shallow water origin is attested by red colour of the rocks (red beds), and the common ripple-marks, mud-cracks and crossbedding. That the main band was formed in valleys bordered by faults is suggested by the occurrence of talus breccias and by the location of known faults. That this series was deposited at different times in different basins is suggested by the rounded pebbles of Athabaska sandstone in the upper member. Remnants of other basins of Athabaska sandstone occur near Tazin Lake and Camsell Portage, according to Alcock's map.

It is, therefore, believed that the Athabaska series was laid down as a terrestrial deposit in separate basins formed at different times, although in the same geological period, by earth movements (largely faulting).

Major Faults and Shear Zones

Two major faults are recognized in the area, the St. Louis fault and the Black Bay fault. Both are marked on the ground by prominent lineaments. These lineaments are visible on topographic maps.

The St. Louis fault strikes north of east from the north shore of Beaverlodge Lake to Raggs Lake and probably to Prince Lake. At Ace and Christie Lakes diamond drilling has shown that the fault dips southward at about 50 degrees. The apparent horizontal displacement of an intrusive contact between mafic rocks and gneisses northeast of

Verna Lake indicates that the northwest side was apparently displaced northeastward about 1,100 feet with respect to the southeast side. The preservation of Athabaska sediments along the south side of the fault between Beaverlodge and Ace Lakes indicates that the south side moved downward with respect to the north side. Associated with the St. Louis fault is much parallel shearing, especially in the area southeast of Donaldson Lake. Here and elsewhere near the fault the appearance of the rocks has been altered by development of shear planes, mylonitization, and introduction of silica, chlorite, carbonate, and red hematite stain.

The Black Bay fault bounds Black Bay of Lake Athabaska on the southeast, and strikes northeastward to a point north of Anne Lake. From Cinch Lake to Anne Lake it forms the northwest boundary of a belt of Athabaska sediments. As this fault is parallel with the strike of the gneisses and sedimentary rocks, no horizontal displacement has been observed. The presence of Athabaska sediments on the southeast side indicates that this side is downthrown with respect to the northwest side. On the west side of the fault, a lengthy, mylonitized and silicified zone occurs in the older rocks. Bands of chlorite schist occur in the altered zone. In the southwest corner of the Martin Lake map-area, it is probable that strike-faults occur parallel with the Black Bay fault.

North of the St. Louis fault, in the vicinity of Melville, Eagle, and Mic Lakes, are numerous faults and shear zones that strike between north 40 and north 70 degrees east. These breaks are in the area where the St. Louis and Black Bay faults converge.

Near Hammond and Bain Lakes, bands of amphibolite or quartzite in the gneisses are offset by appreciable amounts along roughly east-striking faults.

Another break is indicated by the rough alinement of the swarms of diabase dykes west of LeBlanc Lake with the large diabase dyke north of Neely Lake.

ECONOMIC GEOLOGY

RADIOACTIVE MINERAL OCCURRENCES

General Statement

The presence of radioactive minerals in the Goldfields area was first recognized in 1935 on the present Nicholson property 2 miles east of Goldfields. One minor occurrence of the uranium mineral thucholite, was reported from the Box mine during its period of operation 1935 to 1942.

During World War II, when intensive exploration for uranium minerals was undertaken, the Nicholson again received attention. In September 1944, the showings were examined by R.F. Murphy and A.W. Jolliffe, the former acting for the Crown Company, Eldorado Mining and Refining (1944) Limited, and the latter for the Geological Survey of Canada. As a result of this examination Eldorado staked the Fish Hook Bay property adjoining the Nicholson on the north and east.

In the period 1945 to 1948, prospectors employed by the Crown Company staked the other uranium deposits shown on the accompanying maps. The properties are situated as follows:

(a) Deposits along the Shore of Lake Athabaska. Nicholson property - at the head of Nicholson Bay, 2 miles east of Goldfields; Fish Hook Bay property - 1 mile east of the Nicholson property; Gil group - near Lodge Bay, 3 miles west of Goldfields; and the Box mine of the Consolidated Mining and Smelting Company of Canada, Limited, near Goldfields.

(b) Beaver Island deposits. Deposits on Beaver Island in Murmac Bay of Beaverlodge Lake.

(c) Deposits associated with the St. Louis Fault. Martin Lake deposits - on the peninsular between Martin and Beaverlodge Lakes; Ura group - near the north shore of Beaverlodge Lake, 1½ miles north of Beaver Island; Ace Lake deposits - on the south side of Ace Lake; Bolger group - east of Verna Lake; Donaldson Lake deposits - south of

the 'foot' of Donaldson Lake; and the Love group - near the northwest end of Christie Lake.

(d) Deposits northwest of the St. Louis Fault. Tam Lake deposit - near the north tip of Beaverlodge Lake, 1½ miles northwest of the Ura group; Eagle group - northeast of Melville Lake; Gully zone - west of Eagle Lake; Mic claims - west of Mic Lake; Hab group - 1 mile northwest of Donaldson Lake; and the Don group - near Don Lake, 2 miles northeast of Jean Lake.

Various other less important showings were staked during the 1945-1948 period. By the end of 1948, the Crown Company had staked one hundred and ninety-three claims in the region, and had carried out detailed exploration on about two-thirds of the ground covered. Considerable underground development has been done at Martin Lake, and prospect shafts are planned for the Ace Lake and Eagle properties.

Nicholson Property

The Nicholson property is 2 miles east of the town of Goldfields. The property was first explored as a copper prospect in 1930. An investigation of its gold possibilities was begun in 1935. The western zone was explored underground by about 350 feet of workings in two adits, in the course of which work uranium stain and pitchblende were noted. The following account of this zone is adapted from Murphy's 1944 report to the Crown Company and from information supplied by Mr. J. Mason of Nicholson Mines Limited.

Structure. The formations in the vicinity of the property are a generally conformable but intricately folded series of bedded rocks - dolomite, dolomitic quartzite, amphibolite, and ferruginous quartzite breccia, which are cut by a basic sill and associated dykes now altered to amphibolite. The principal vein containing pitchblende occurs about 1,600 feet northwest of the north end of Nicholson Bay. It strikes north 30 degrees west, and dips almost vertically. The vein is exposed by pits and trenches and by two adits; the northern

adit lies 30 feet below the outcrop, the southern about 60 feet. The length of the mineralized zone is about 1,000 feet.

The workings follow the western contact of the ferruginous quartzite breccia with the dolomitic quartzite. In the dolomitic quartzite, pure bands of quartzite alternate with bands of altered dolomite. The pitchblende appears to favour that part of the breccia contact adjoining the dolomite. Diamond drilling has shown the contact of the ferruginous quartzite breccia and the dolomitic quartzite to be nearly vertical to a depth of 500 feet.

The mineralized zone in the surface trenches consists of a break filled by an irregular vein containing interbanded red quartz and pink to buff carbonate. The vein pinches and swells, the maximum width being about 3 feet. Soft platy hematite and minor amounts of niccolite, smaltite, cobalt-nickel arsenides, chalcopyrite, pitchblende, and thucholite are present. Assays indicate the presence of gold and platinum. Exposures are abundatly iron-stained, and show various pink, blue, green, and yellow stains from the weathering of ore minerals. The ore minerals appear to follow narrow seams or fractures in the quartz.

In the north adit, the vein appears as a reddish carbonate-quartz-hematite zone with poorly defined vein structure. The same streaks of sulphides, arsenides, pitchblende, and thucholite occur in stringers and lenses. In the south adit, no quartz vein material was noted, but mineralized seams, with cobalt-nickel minerals, pitchblende, and thucholite occur on the contact of altered dolomite and the red breccia. There are numerous, coarse, carbonate veinlets, with a little platy hematite, and carbonate lines the numerous vugs, including a cavern about 8 by 20 feet and 12 feet deep, encountered by the workings.

In general, the western zone is persistent in strike, but variable in mineral content. The gangue may be banded and crustified quartz and carbonate, or one or both of these minerals may be missing at any one place. Ore minerals include pitchblende, thucholite, niccolite,

smaltite, cobalt-nickel arsenides, and gold and platinum. The thorium content of the ore is negligible. Murphy believes that these minerals have been deposited in open brecciated zones, probably at shallow to moderate depths.

The No. 2 zone lies about 200 feet east of the head of Nicholson Bay. It consists of a series of en echelon shears and fractures striking roughly north and dipping almost vertically. It occurs in quartzite close to a contact with ferruginous quartzite breccia. The zone is up to 1½ feet wide, and has been traced for 180 feet. The contact itself is associated with minor values, and has been traced a further 400 feet to the north and dips nearly vertically according to its intersection by diamond drill holes at a depth of 280 feet. The mineralized zone contains soft, mud-like gouge and coarse carbonate, with pitchblende, some specularite, and very minor disseminated chalcopyrite. High assay returns in gold and platinum are recorded from this area.

Fish Hook Bay Property

On the Fish Hook Bay property, nearly four hundred separate radioactive anomalies have been found, and pitchblende is visible in about 15 per cent of these. The pitchblende occurs in veins that are confined mainly to dolomite or dolomitic rocks, and forms lenses and pods in short fractures striking subparallel with the prominent Fish Hook Valley. The more important occurrences are localized in the region of the valley, in what have been designated the 'A', 'B', and 'C' zones, from south to north; respectively.

The area is underlain by quartzite, ferruginous quartzite, dolomitic quartzite, dolomite, and either siliceous or dolomitic iron formation. These rocks strike in general north-northwest, and dip 30 to 50 degrees to the southwest. They grade into one another both across and along the strike, and the boundaries, in consequence, are gradational and irregular, and are difficult to represent adequately

on the map. The quartzite, dolomitic quartzite, and dolomite have been described in the body of the report. The iron formation is a banded cherty rock with darker bands of hematite and/or magnetite present. Some of the iron formation contains abundant dolomitic material. The 'A' zone, on the west shore of the east arm of Fish Hook Bay, is a weak, almost vertical shear cutting the westward dipping beds of siliceous and dolomitic iron-rich rocks. It is considered that appreciable pitchblende is confined to irregular fractures in a bed of dolomitic rocks lying between beds of ferruginous quartzite. The 'B' and 'C' zones lie in a drift-covered valley underlain by ferruginous quartzite and iron formation, which, along two zones, have been crushed to a breccia and later recemented by red hematite and calcite. The crush zones strike roughly north and dip west nearly parallel with the bedding planes of the enclosing formations. In the 'B' zone, mineralization is in evidence mainly in the hanging-wall of the crushed zone; in the 'C' zone, mainly in the foot-wall.

The chief gangue mineral in the pitchblende-bearing veins of the Fish Hook Bay property is calcite. Hematite is almost invariably found in the vein and/or in the wall-rock. Chlorite is common, and quartz occurs sparingly in the veins. In the 'A' zone, a little disseminated chalcopyrite is found in the calcite veins. An unidentified, black, vanadium-uranium mineral was also found in this zone.

Roughly 700 feet west of the south end of the 'B' zone, is a vein in which masses of botryoidal pitchblende are accompanied by massive arsenides of cobalt and nickel. These minerals have not, however, been found in any other showings on this property.

Gil Group

The Gil group was discovered by Seaberg and Fontaine while prospecting for the Crown Company in 1946. It lies near the shore of Lake Athabaska just west of the portage to Beaverlodge Lake. The area is underlain by quartzites of the Tazin group, which are intruded by thin sills of basic igneous rock, now amphibolite. Although generally

conformable, the sills in places cut across the bedding-foliation of the quartzites. The beds strike northeast and dip gently southeast. The quartzites are well jointed and disintegrate readily. They are exposed mainly on northwesterly facing scarps, which are capped by the more resistant amphibolite sills. The south-facing gentle, dip slopes are underlain principally by amphibolite.

Several veins containing pitchblende occur in the amphibolite. All occupy minor fractures or weak shear zones a few inches wide striking approximately north 70 degrees east. Although these fractures are very minor features, some of them can be traced for remarkable distances along strike, one being 1,200 feet long.

The veins show rough banding, and in places contain vugs. Brecciation is common, with carbonate and a minor amount of euhedral quartz filling the spaces between the wall-rock fragments. Carbonate is everywhere present in these veins. Wherever pitchblende occurs, the carbonate is stained deep red-brown, a colour probably due to hematite, which everywhere accompanies the radioactive minerals. The pitchblende may occur as small veinlets cutting the carbonate, in small (up to 5 mm.) rounded or angular masses within the carbonates, or as nodular masses adjoining the carbonate veinlets. It is invariably accompanied by hematite, and generally by minor amounts of disseminated chalcopyrite and bornite.

All the pitchblende found in the area occurs within the amphibolite masses. None has been found in the quartzite. In the case of the long mineralized fracture south of Henry Lake, which crosses from amphibolite to quartzite and to amphibolite again, hematite and pitchblende occur where amphibolite is the wall-rock but not where the wall-rock is quartzite. This is true also in a small vein west of Seaberg Lake, where the quartzite inclusion is relatively small.

As the evidence seems to show that the radioactive minerals occur only in the amphibolite in this area, the thickness of the sills

in which the veins occur is important. Unfortunately, diamond drilling has shown that the sills in the vicinity of the showings are less than 50 feet thick and are separated from other thin sills by great thicknesses of quartzite.

Box Mine

Many minor anomalies were found in testing the outcrop of the orebody of the now inactive Box mine. The anomalies are associated with narrow fractures, a few feet long, in the "mine granite" in which the orebody occurs. This granite is stained a deep red, due to hematite principally in the feldspars. The fractures contain chlorite and, in one place, a small veinlet of pitchblende was noted. Fragments of pitchblende have also been found in the overburden within 2,000 feet of No. 2 shaft. The fractures associated with the radioactive anomalies in the Box orebody cut the gold-bearing quartz veins and are, therefore, of later age. The anomalies on the surface of the Box orebody are more numerous at the northeast end near the No. 2 shaft and fewer toward the southwest end. The orebody is a striking brick red colour where the anomalies are most numerous and pink to reddish to the southwest where the anomalies are fewer. It is suggested that the brick red colour is due to introduction of hematite stain into the feldspars of the mine granite by the solutions that deposited the pitchblende.

Beaver Island Deposits

The Beaver Island property was discovered by Larum and Muldal while prospecting for the Crown Company in 1945. The island is formed of quartzites and amphibolites of the Tazin group, which are overlain unconformably by Athabaska conglomerate and arkose. The Athabaska conglomerate was, apparently, deposited in a depression in the older sediments.

The showings are in narrow breaks or breccia zones in the conglomerate; they strike about north 70 degrees east and dip steeply to vertically. A few minor mineralized fractures strike north 20 degrees west. Mineralization is represented by sparsely scattered carbonate and

quartz veinlets carrying hematite, disseminated sulphides, and pitchblende. It appears to be restricted to the conglomerate on this property and, therefore, may be of limited depth.

Martin Lake Property

The Martin Lake property was discovered by St. Louis and Larum while prospecting for the Crown Company in 1946. It lies 6 miles north-northeast of the town of Goldfields on a narrow neck of land separating Martin and Beaverlodge Lakes. Interbedded arkose and basaltic lavas strike northerly through the property and dip 45 to 80 degrees to the west. Tops of beds are to the west, as indicated by ripple-marks, mud-cracks, and crossbedding in the arkose. Many of the lava flows are amygdaloidal, the vesicles being filled with quartz, chlorite, calcite, and dolomite.

The formations are cut by two main sets of faults or fractures, the more important striking about north 60 degrees east parallel with the St. Louis fault, and the less important north 30 degrees west. Both sets have steep to vertical dips. These faults or fractures in places contain hematite-stained carbonate vein material, with stringers and replacement areas of pitchblende in the carbonate. Native copper is disseminated in the carbonate. Bornite also occurs in the ore. The veins and ore minerals are better developed in the basaltic flows than in the arkose.

Underground exploration of these deposits commenced in 1948. An adit entry lies near the east shore of Martin Lake.

Ura Group

The Ura group was staked for the Crown Company by St. Louis and Larum in 1946, the principal mineral occurrence lying near the north shore of Beaverlodge Lake, 1½ miles north of Beaver Island. The claims are underlain by Athabaska conglomerate and arkose, which rest unconformably on quartzites and granite-gneiss. To the north, the formations are cut off sharply along a scarp, the topographic expression

of the St. Louis fault.

Most of the showings occur in a northeasterly striking zone, parallel with and about 1,000 feet south of, the St. Louis fault. The zone is about 2,000 feet long and from 50 to 200 feet wide. Within it radioactive anomalies are related to fractures up to 200 feet in length, to small quartz veinlets that coalesce in several stringer zones, and to narrow, well-defined breaks filled by carbonate-pitchblende vein material.

It is probable that the radioactive zone will not continue downward into the older gneisses and quartzites below the unconformity.

Ace Lake Prospect

The Ace Lake prospect, on the south shore of this lake, was discovered by St. Louis while prospecting for the Crown Company in 1946.

The mineral occurrences are closely related to the St. Louis fault, which here strikes north 60 degrees east and dips about 48 degrees to the south. The fault, which is marked on the surface by a deep draw, separates mafic rocks (chlorite-epidote type) on the north from granite-gneiss to the south. Preserved against the down-thrown southern side of the fault is a basin of Athabaska sediments.

On the surface, some radioactive anomalies were found in the Athabaska conglomerate, but more promise is shown by anomalies on the foot-wall side of the fault. Here, several short narrow carbonate veins rich in pitchblende occur subparallel with the strike of the fault and within 100 feet of it. One important vein appears to dip at 38 degrees toward the fault, but most of the veins dip more steeply in that direction. In some veins, pitchblende occurs as stringers and threads accompanied by brown to red carbonate vein material, in other veins it is disseminated thinly through a mass of red-altered rock. This fine-grained, red, cherty-looking alteration product is a prominent feature on the property, and is expected to be of value in searching for further concentrations of pitchblende.

Bolger Property

The Bolger property was staked in the spring of 1947 by St. Louis and Ostopovitch, the main mineral occurrence lies south of the St. Louis fault, about 1,000 feet east of Verna Lake. The discovery was peculiar in that it was made by means of the geiger-counter through a snow cover 2 to 4 feet deep.

The property is underlain by banded mafic rocks of the fine-grained, amphibolite-epidote-chlorite type. Over an area of 6,500 square feet, the overburden of glacial origin, which is a few feet deep in most places, is rich in yellow and orange uranium stain. This overburden lies in a slight depression in the slope of a hill, and it is suggested that its uranium content was deposited from rain-water that had leached nearby uranium-bearing veins. Trenching through the overburden has revealed the presence of pitch-blende-bearing carbonate veins in fractures parallel with the strike of the St. Louis fault. The red, cherty-looking alteration product of the mafic rocks is well displayed near the radioactive veins on this property. C.E.B. Conybeare, in a preliminary study of polished sections from this group, found pitchblende, niccolite, native silver, and reddish carbonate in the brecciated chloritic rock. The native silver occurs as tiny blebs and stringers in carbonate veinlets that cut across, and are, therefore, later than, the pitchblende.

Donaldson Lake Showing

The Donaldson Lake showing was discovered by St. Louis and Ostopowitch in 1947. It lies between Donaldson Lake and the St. Louis fault. The typical rock in this vicinity is a red granite-gneiss, with inclusions of amphibolite and chlorite schist. The Donaldson Lake fractured zone, in which most of the radioactive anomalies in this area occur, is about 10,000 feet long and up to 400 feet wide. Both this zone and the fractures within it are subparallel with the St. Louis fault.

The rock of the fractured zone contains brick-red, hematite-stained feldspar, with shreds of green chlorite, the interstices between

the feldspar grains being filled by white carbonate. Quartz is typically missing, or is present in only minor amounts. C.E.B. Conybeare, who mapped this area in detail, considers that "in zones of shearing the wall-rock is in places replaced by feldspar, here commonly oligoclase forming a brick red, fine-grained to cherty or coarse-grained mass of feldspar referred to as red feldspathic alteration. This red alteration is radioactive at the surface". The same source states that albite has been introduced with quartz as vein material.

Pitchblende, accompanied by hematite, occurs most commonly with carbonate gangue as stringers and lenses along shears, minor faults, and tension fractures, which are in general subparallel with the St. Louis fault. Quartz stringers and veins occur in this area, but are not abundant. They strike about north 80 degrees west, dip vertically, and contain euhedral crystals of quartz. Three of these quartz veins are known to be radioactive. Many calcite-filled fractures cut across the pitchblende-mineralized fractures and are not themselves radioactive. It is considered that much calcite was introduced after the formation of the pitchblende-bearing veins.

Love Group

The Love group was discovered by St. Louis and Ostopovitch in 1947. Minor amounts of pitchblende are associated with carbonate in sheared red gneiss close to the St. Louis fault. Some graphitic stringers occur in the sheared zones.

Tam Lake Deposit

The Tam Lake deposit was discovered by Larum and Broatch while prospecting for the Crown Company in 1947. The area is underlain by well banded mafic rocks (chlorite-epidote type), probably sediments or tuffs, which apparently overlie quartzites, the latter being exposed at the core of an anticlinal structure that plunges gently east-northeast. These formations have been intruded by granites now represented by banded gneisses.

A wide sheared zone extends northeasterly from the northwest tip of Tam Lake. Carbonate-pitchblende veins occur near this zone at various places, some striking parallel with the zone but more commonly normal to it. Dips are steep to vertical. The strongest veins so far noted are in the mafic rocks just north of the quartzite contact 800 feet north of Tam Lake. If significant mineralization is here restricted to the mafic rocks, the depth to the quartzite contact beneath may be an important factor in further exploratory or development work.

Eagle Group

The Eagle group, ¾ mile northwest of Melville Lake, was discovered by Larum and Broatch while prospecting for the Crown Company in 1947. The area is underlain by quartzite, mafic rocks (chlorite-epidote type), red albite-granite gneiss, and conglomerate. The conglomerate is of uncertain age but is tentatively assigned to the Athabaska series. The mineralization is related to northeast trending faults, which converge toward the southwest. From north to south these faults are named the Edie fault, Spur zone, Conglomerate fault, and Lost Mine fault-zone. Part of the Spur zone dips northwest at 45 degrees; a part of the Lost Mine fault-zone dips in the same direction at 60 degrees. The faults are inferred from topographic breaks, structural breccia, abrupt truncation of beds, and in some places, by exposed shears and slickensides. Graphite has been noted along several faults. Indirectly, late faulting is inferred from the presence of red cherty alteration and radioactive anomalies.

Pitchblende is commonly found in the mafic rocks, especially close to the granite-gneiss contacts, although in a few places it persists into the gneiss. The pitchblende commonly occurs as threads or stringers associated with carbonate and comb quartz. Minor amounts of specularite and red hematite are present, and many mineralized zones are indicated by the red, cherty-looking material previously mentioned. In some localities pitchblende-carbonate stringers and zones carry considerable bornite.

Gully Zone

The Gully zone was located in 1947 by Larum and Broatch, 1,000 feet west of Eagle Lake. A fault is believed to strike north 35 degrees east beneath the deep depression of the Gully zone. Radioactive anomalies have been found on both sides of the gully. Pitchblende occurs in narrow fractures apparently related to the fault.

Mic Claims

The showing on the Mic claims was discovered by Larum and Broatch in 1947, just west of Mic Lake. A shear or fault zone marked on the ground by a scarp, trends northeasterly through these claims. Pitchblende occurs in a swarm of irregular, narrow fractures mainly within 25 feet of the fault. The strike of the fractures is about normal to that of the fault. The showings lie near a contact between mafic rocks and red gneiss, and most of the mineralized fractures are in the gneiss. Little work has been done on these showings, in which the pitchblende does not appear to be associated with much gangue.

Hab Group

The Hab group was discovered by St. Louis and Larum in 1948 while prospecting for the Crown Company. It lies about a mile northwest of Donaldson Lake. The area is underlain by quartzite, mafic rocks (chlorite-epidote type), and granite-gneiss. The radioactive minerals occur in quartz-filled shears that roughly parallel the strike of the rocks. Gangue minerals associated with the quartz are chlorite and minor carbonate. Near the radioactive minerals the quartz is a dark coloured smoky variety. Both pitchblende and thucholite are said to be present, accompanied by hematite and minor amounts of disseminated pyrite. The highest values occur where the mafic rocks form the vein walls.

Don Group

The Don group was staked by St. Louis and Ostopovitch in 1947. The main occurrences are south of Don Lake, which is 2 miles northeast of Jean Lake. The claims are underlain by amphibolite, quartzite, and granite-gneiss. A strong lineament is seen in the air photographs to strike northeast through the property, and lesser, parallel features occur to the southeast. It is believed that these lineaments indicate faults or fractures. Quartz veins, small diabase dykes, and weak shear zones carrying pitchblende, all steeply dipping, strike normal to the assumed faults. The most important occurrence is just southwest of Don Lake. There a group of fissures is filled with quartz and brecciated wall-rock fragments, carbonate, hematite, pitchblende, and minor amounts of disseminated pyrite. One radioactive occurrence in this group lies along the contact of a diabase dyke with the older rocks. The mineral deposits appear to be younger than the diabase.

SUMMARY AND CONCLUSIONS

1. The pitchblende deposits in Goldfields and Martin Lake map-area are not believed to be related to any exposed intrusive rocks for the following reasons: (a) the mineralization is post-Athabaska, as deposits occur in the Athabaska sediments and flows; (b) the Athabaska sediments overlie unconformably and contain pebbles of all other rocks in the area, with the exception of the diabase dykes and sills; and (c) the diabase dykes are the only intrusive rocks that cut the Athabaska series, and are a possible source because of the age limitation, but their distribution has no apparent connection with the deposits and their volume is small.

2. The pitchblende deposits are related to faulting. The spatial relation of six of the described deposits to the St. Louis fault is clear, and those near Melville Lake are related to smaller faults or shears. The concentration of these structures in the area between the converging St. Louis and Black Bay faults may be of

significance. The properties near Lake Athabaska are related to shears or fractures close to the lake shore.

3. Pitchblende occurs most commonly in veins associated with carbonate, comb quartz, specular hematite, and chlorite. The veins may be banded, and in many places they contain brecciated fragments of wall-rock. Vugs are not uncommon. The veins contain small quantities of disseminated metallic minerals such as pyrite, chalcopyrite, bornite, and native copper or native silver. On the Nicholson property, nickel and cobalt minerals, platinum and gold occur. Megascopically-observed cobalt and nickel minerals are restricted to the Nicholson property, with the exception of one small vein on the adjoining Fish Hook Bay property; however, the reported occurrence of niccolite from the Belger group by Conybeare suggests that further work will show that these minerals have a wider distribution than has previously been recognized.

The character and mineralogical composition of the pitchblende-bearing veins appear to fit best the medium temperature, shallow depth type as described by Lindgren. No determination of the temperature of deposition of the quartz, by the inclusion method, or of the associated pyrite by the geothermometer have been made, but this should be done as soon as possible. It is believed that the veins were deposited at rather shallower depth than indicated by the standard mesothermal theory, because of the frequently noted banded and brecciated structure of the veins and because the deposits occur close to the unconformity between the Athabaska and older rocks. It is believed that no very great thickness of Athabaska sediments, which are of continental origin, covered these deposits, nor is there any evidence that marine formations covered the area since Athabaska time. A relatively high temperature of formation is postulated because of the presence of specular hematite in the veins.

4. Carbon occurs with the pitchblende in several deposits. Thus the uranium hydrocarbon, thucholite, is common at the Nicholson

property and occurs also at the Box mine. Amorphous carbon has been noted associated with pitchblende on the surface in one of the Fish Hook Bay showings. Graphite has been reported in the St. Louis fault zone on the Love group, and from various faults or shears in the Contact Lake area.

5. Hematite, specular hematite, or red hematite stain has been reported from all the pitchblende occurrences, and the carbonate of the mineralized veins is usually at least in part, stained red or brown by hematite. In the gneisses in the vicinity of radioactive anomalies, the feldspar are stained red. A good example of this was seen at the southwest corner of Neely Lake, where a radioactive fissure in white granite-gneiss is flanked for a distance of a few feet by granite-gneiss that is red, due to the staining of the feldspars.

Over most of the map-areas this effect is more difficult to observe because the feldspars of the granites and granite-gneisses are pink or red, probably due to the large amount of iron in the intruded sedimentary formations. This earlier stain may mask the later introduction of hematite or stain associated with the pitchblende deposits; however, in several places, as was mentioned in the case of the Box orebody, a deeper-than-normal brick-red stain is associated spatially with the pitchblende occurrences.

Another important type of alteration is what has been called "red cherty alteration" of wall-rock near pitchblende-bearing veins. This may occur in any type of rock, but is most conspicuous and most important in the fine-grained mafic rocks (chlorite-epidote type), as at the Ace Lake property. It may be due to silicification, the silica being accompanied by iron stain, or it may be due to introduction of fine-grained, red-stained feldspar, or to both.

6. With few exceptions, the pitchblende deposits favour the dark coloured mafic rocks or the altered carbonate rocks rather than the quartzites or granite-gneisses. Thus, on the Martin Lake property,

pitchblende occurs in the basalt rather than the arkose; on the Gil Group, it occurs in the amphibolite but not in the quartzite. The Ace Lake and Bolger veins occur in fine-grained, chlorite-epidote rocks, as do the principal occurrences at Contact Lake, Tam Lake, Gully zone, and Hab group. At the Nicholson and Fish Hook Bay properties the mineralization appears to favour dolomitic bands or breccia zones with carbonate cement. Showings in altered gneiss at the Donaldson Lake and Love groups and in the Athabaska conglomerate on the Ura group and Beaver Island deposits are not really exceptions, as those rocks contain appreciable carbonate and chlorite and the showings are not of high grade.

SUGGESTIONS FOR PROSPECTORS

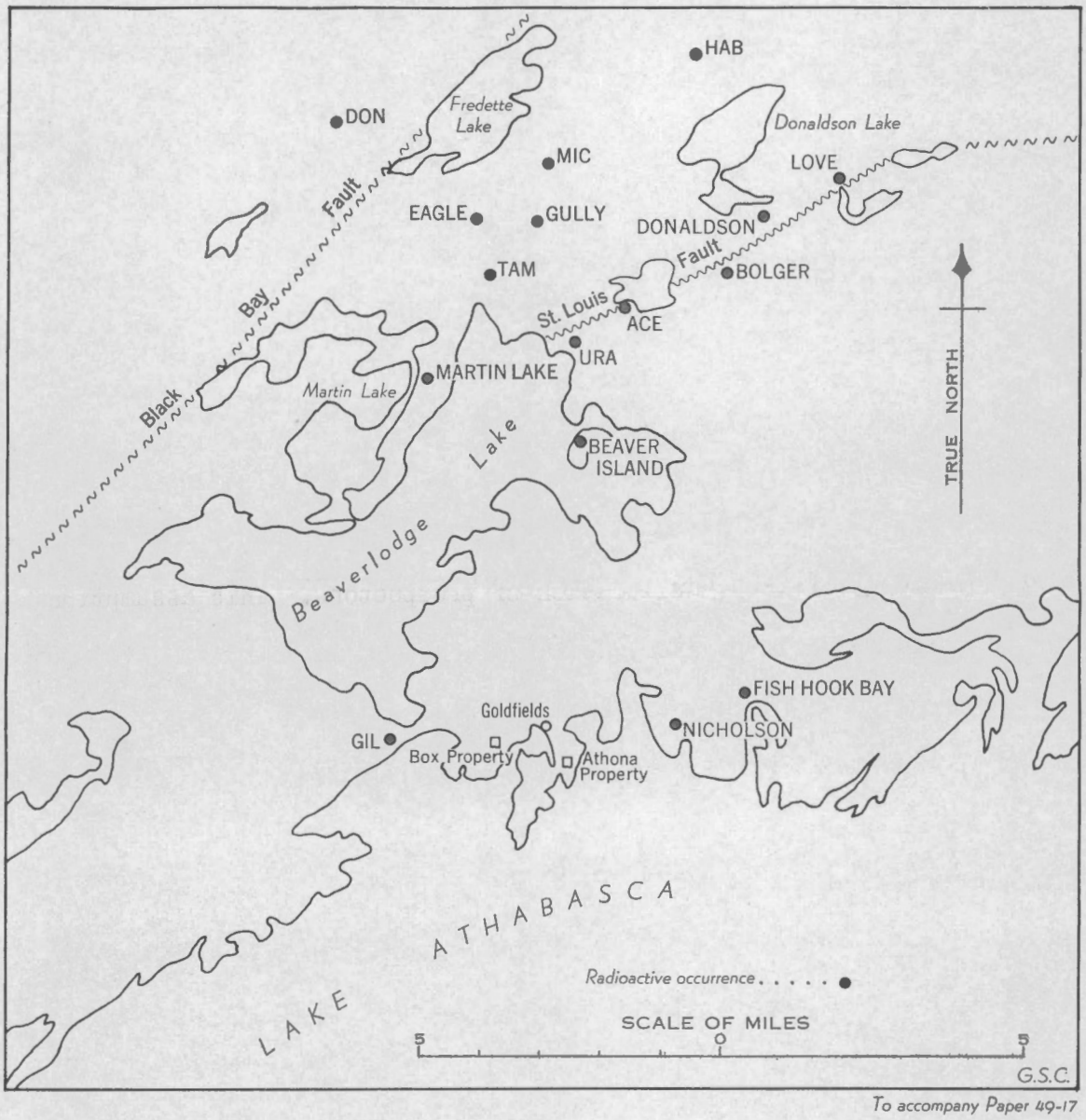
Assuming that new deposits found in this region will be of the same type as those already discovered, the following points can be recommended for the consideration of prospectors. This assumption may be valid for a large area, as the Black Lake deposit 120 miles to the east has similar characteristics.

1. Look for evidence of major and minor breaks on the map, on air photographs, or on the ground, and check the vicinity of these for radioactivity.

2. Red hematite stain in country rocks, including red feldspars in granite and gneiss or a cherty-looking, red alteration product, are favourable signs.

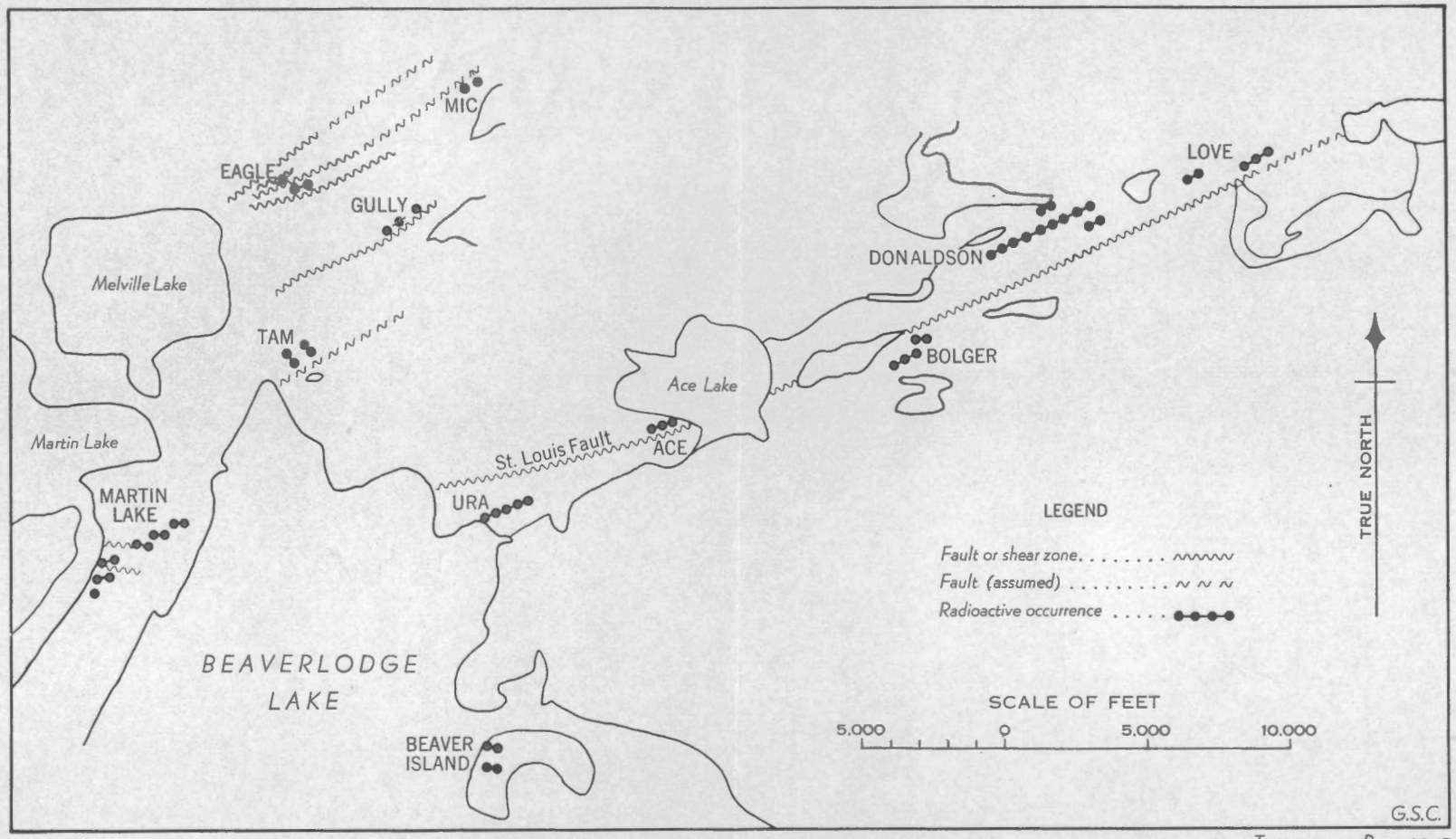
3. Pay especial attention to basalts, amphibolites, greenstones, or any other type of mafic (dark-coloured) rocks, particularly near the contacts with other formations. Carbonate bands or zones in sedimentary rocks are also favourable.

4. Every one of the deposits discovered in this area during or since the war has been discovered through the use of the Geiger counter. One strongly reactive deposit was discovered through a thick snow cover.



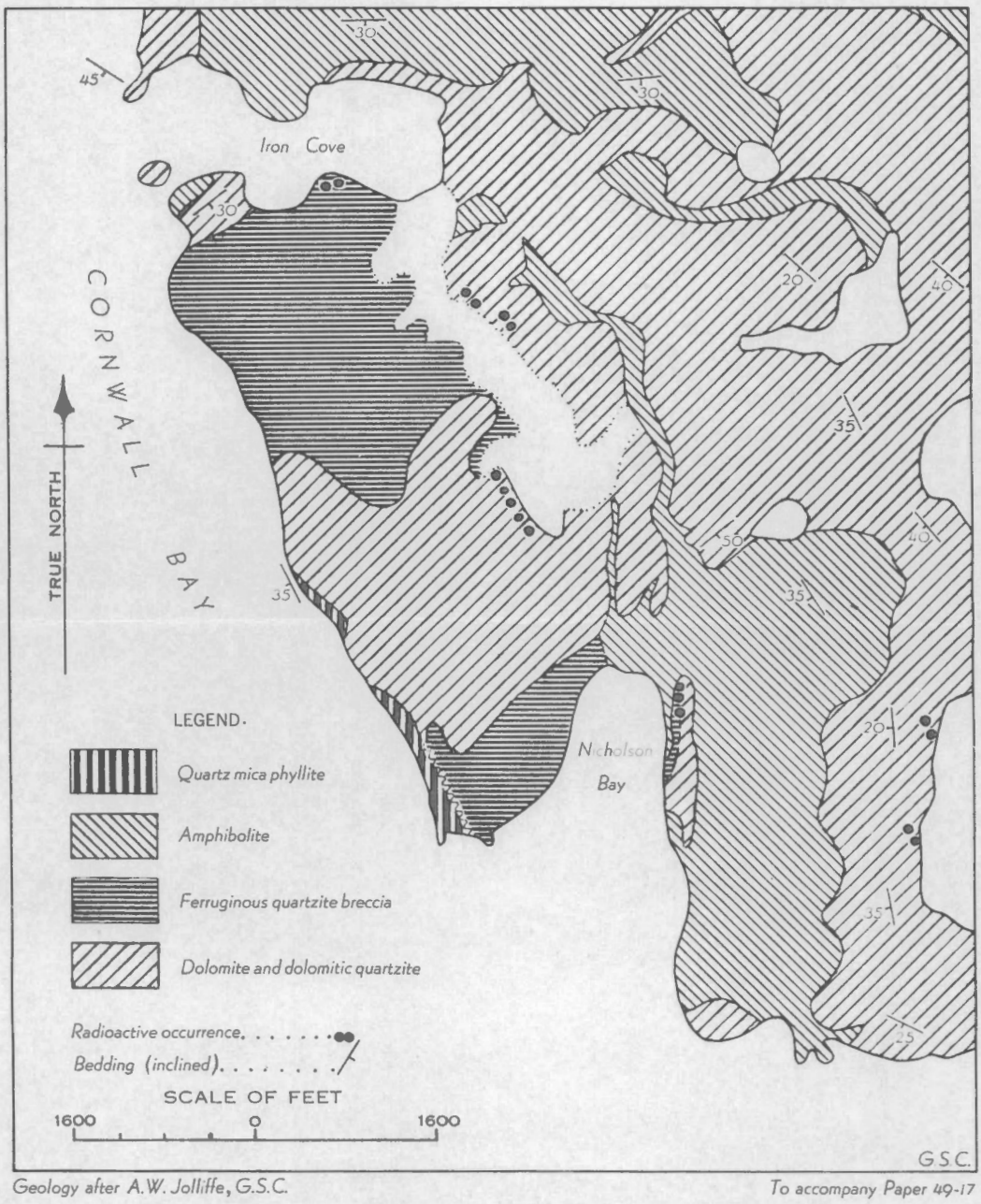
To accompany Paper 49-17

Figure 1. Key Map showing location of radioactive occurrences



To accompany Paper 49-17.

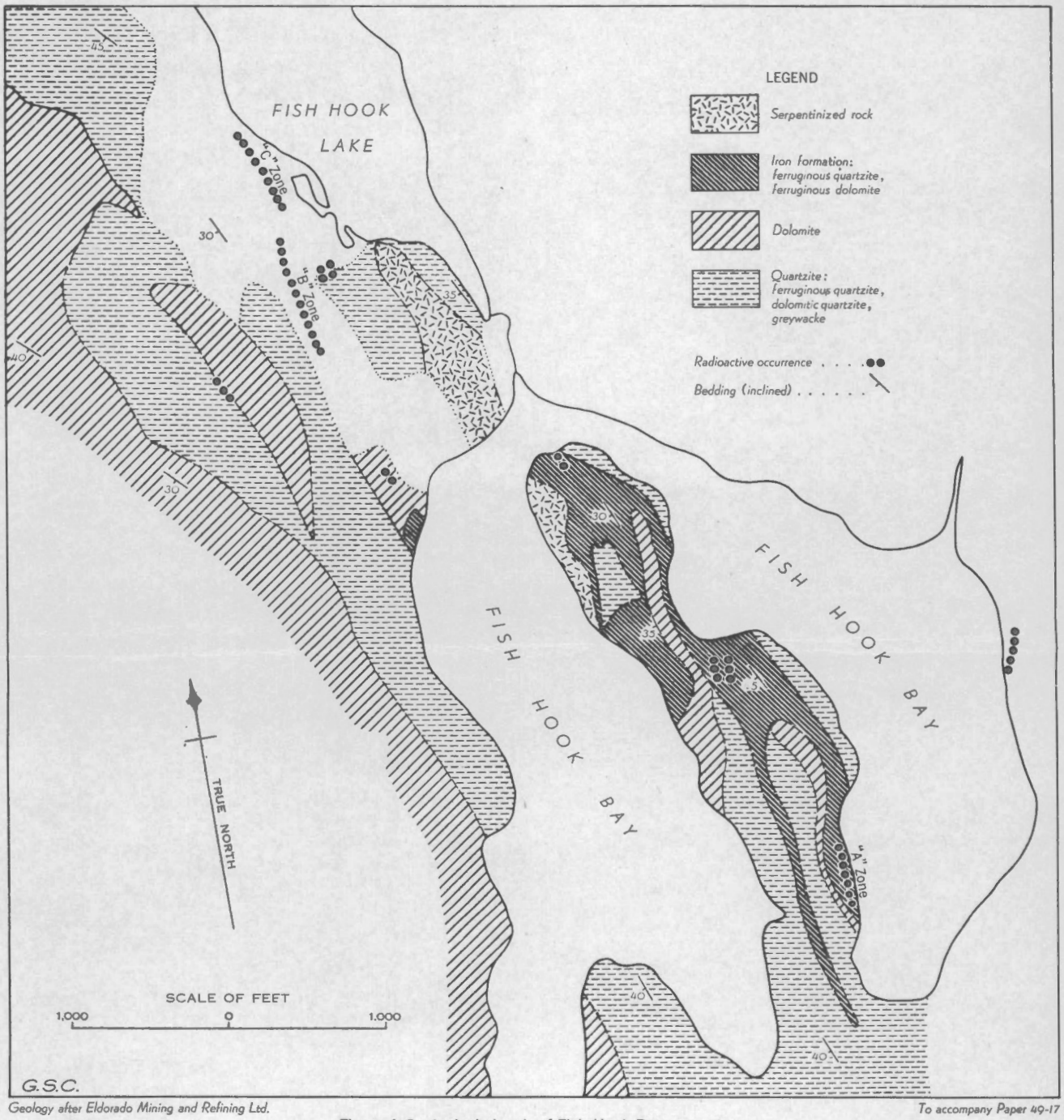
Figure 2. Key Map of northern part of the area, showing faults and radioactive occurrences



Geology after A.W. Jolliffe, G.S.C.

To accompany Paper 49-17

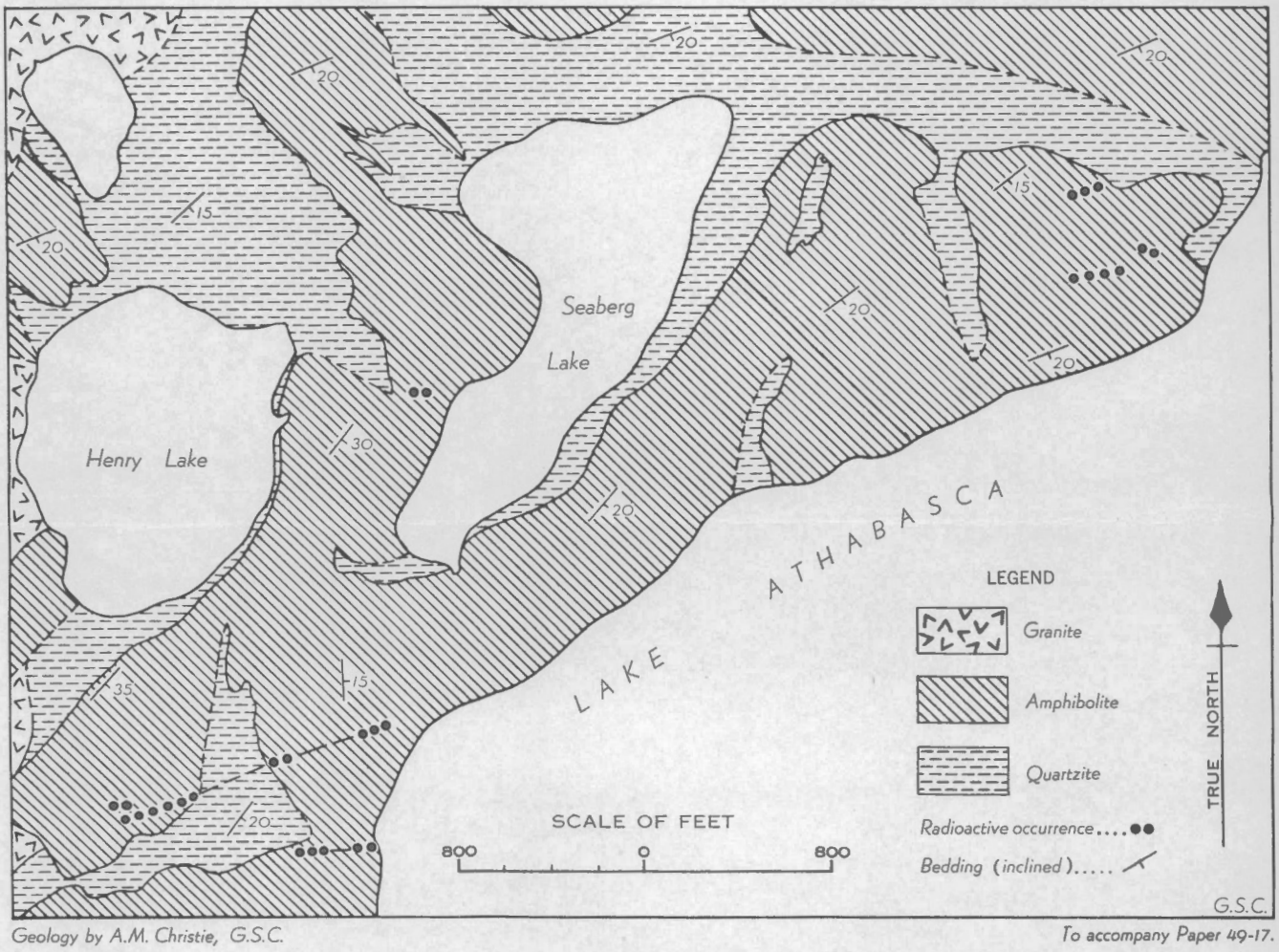
Figure 3. Geological sketch of Nicholson property



Geology after Eldorado Mining and Refining Ltd.

To accompany Paper 49-17

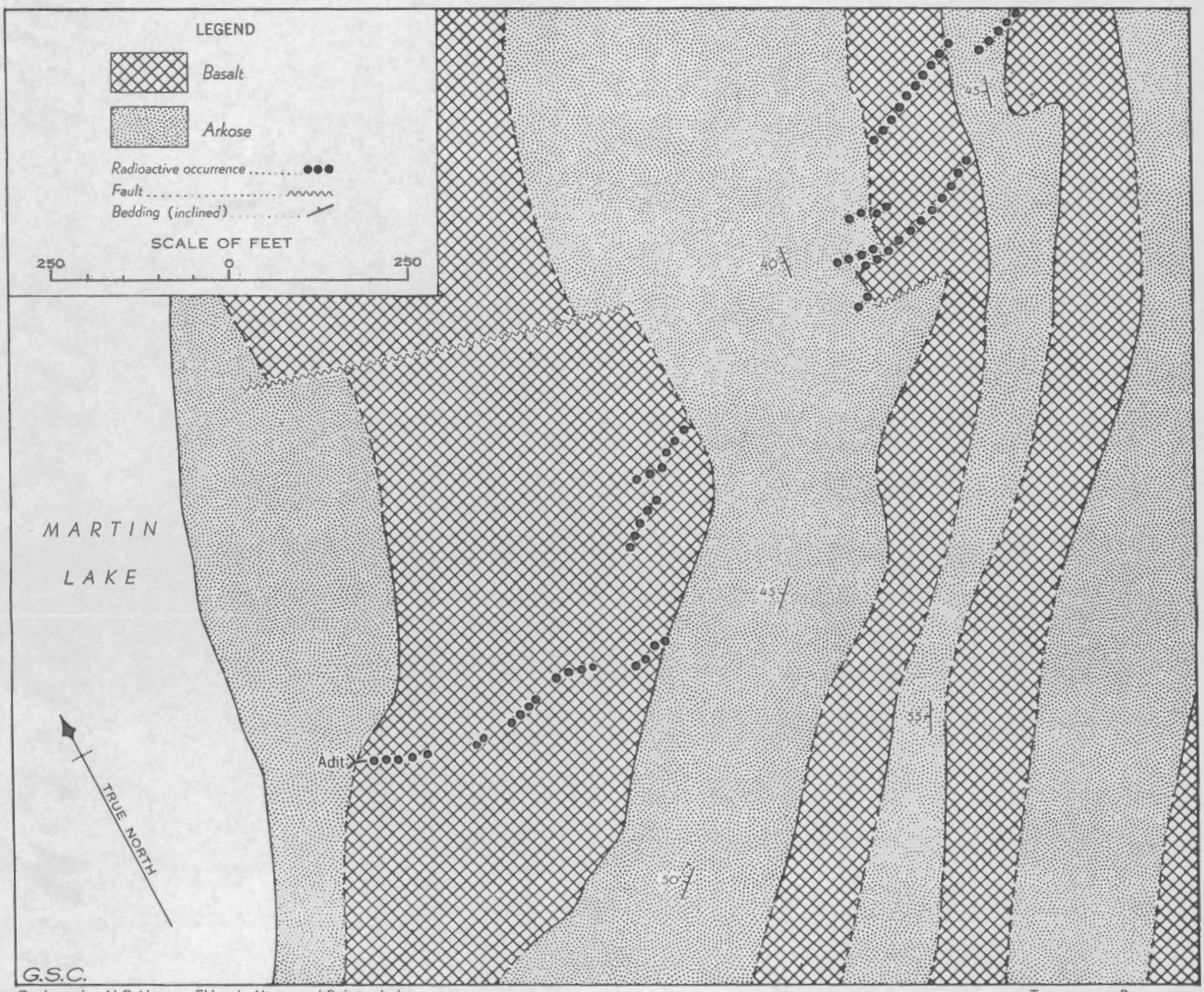
Figure 4. Geological sketch of Fish Hook Bay property



Geology by A.M. Christie, G.S.C.

To accompany Paper 49-17.

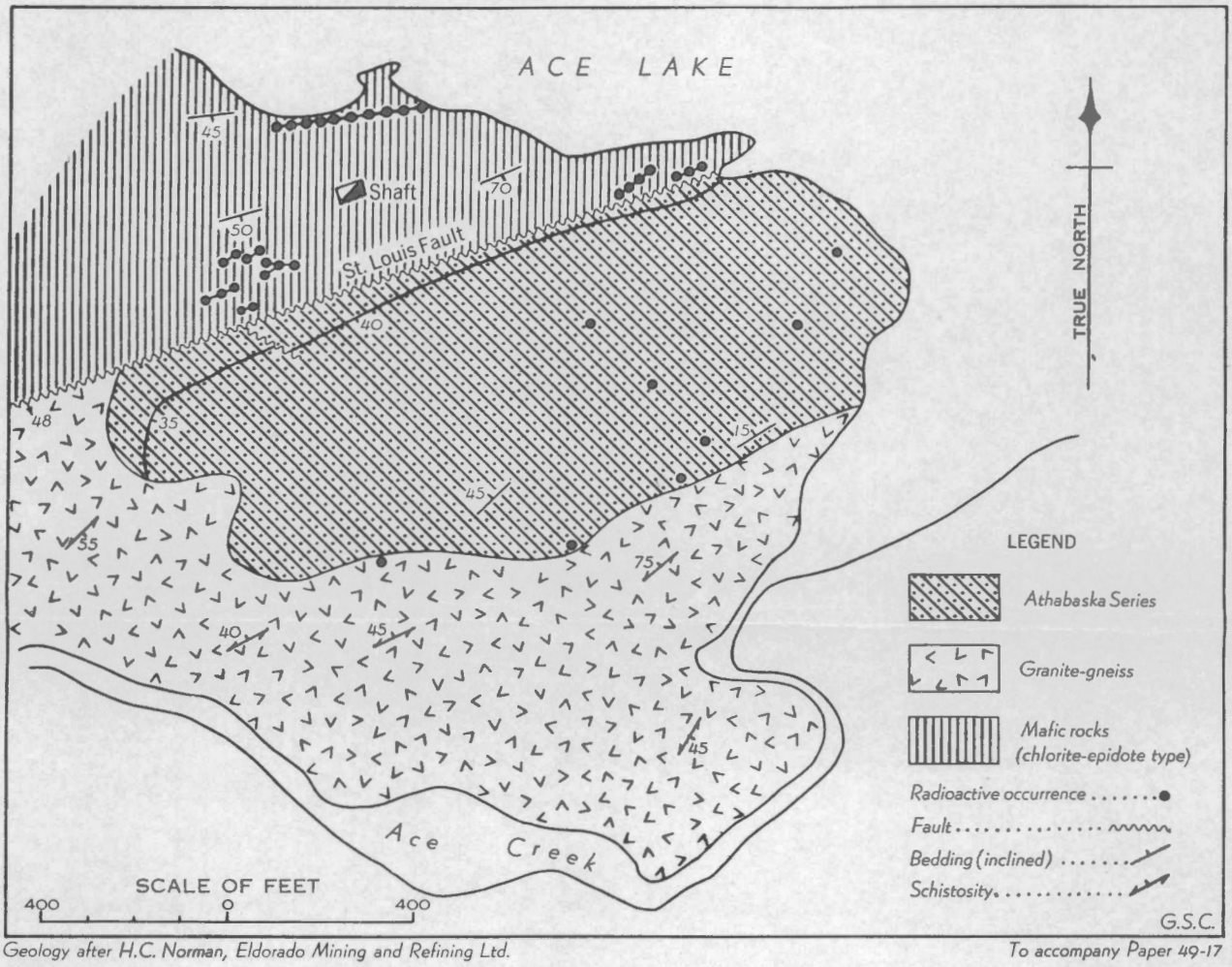
Figure 5. Geological sketch of Gil group



Geology after H.C. Norman, Eldorado Mining and Refining Ltd.

To accompany Paper 49-17

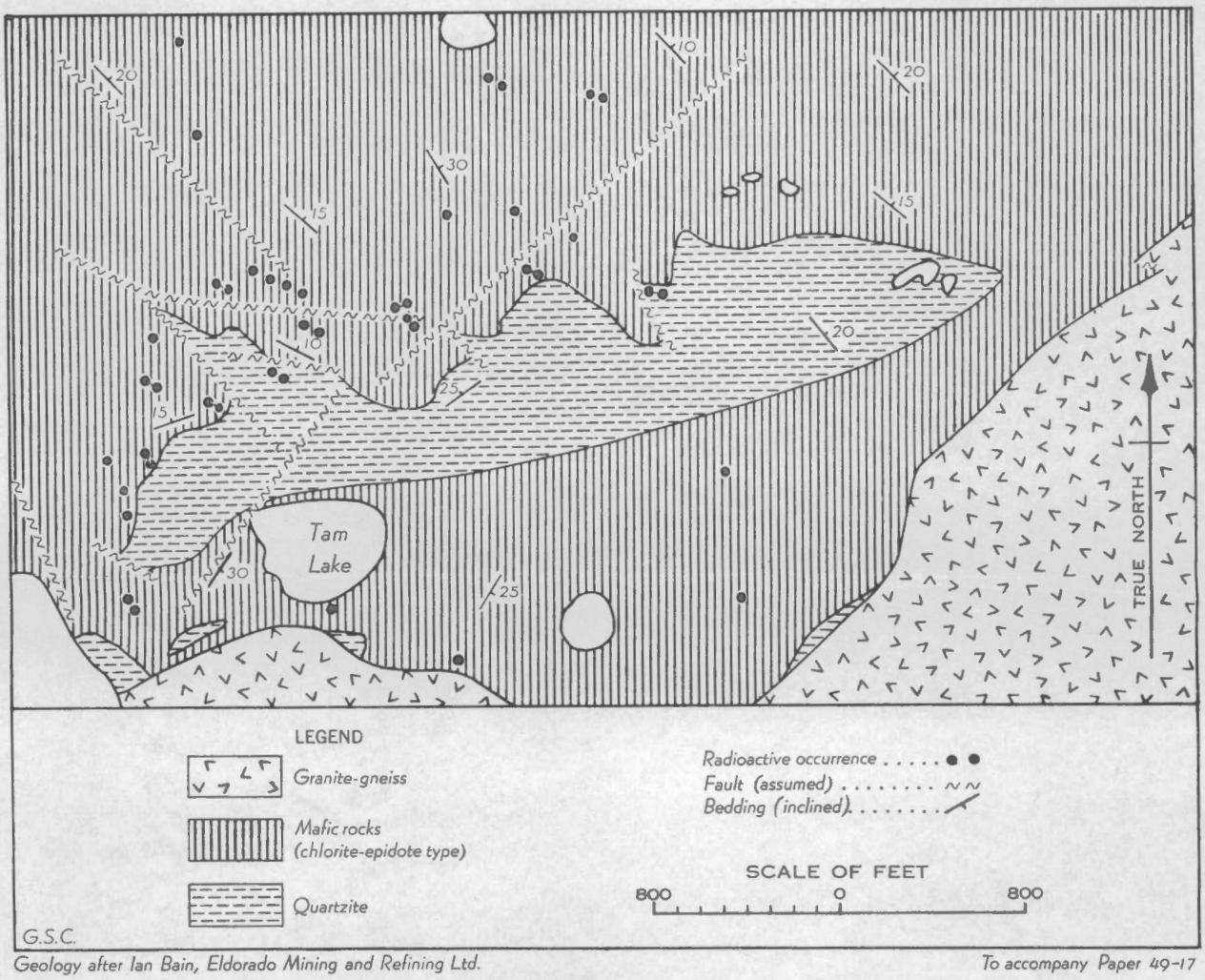
Figure 6. Geological sketch of Martin Lake property.



Geology after H.C. Norman, Eldorado Mining and Refining Ltd.

To accompany Paper 49-17

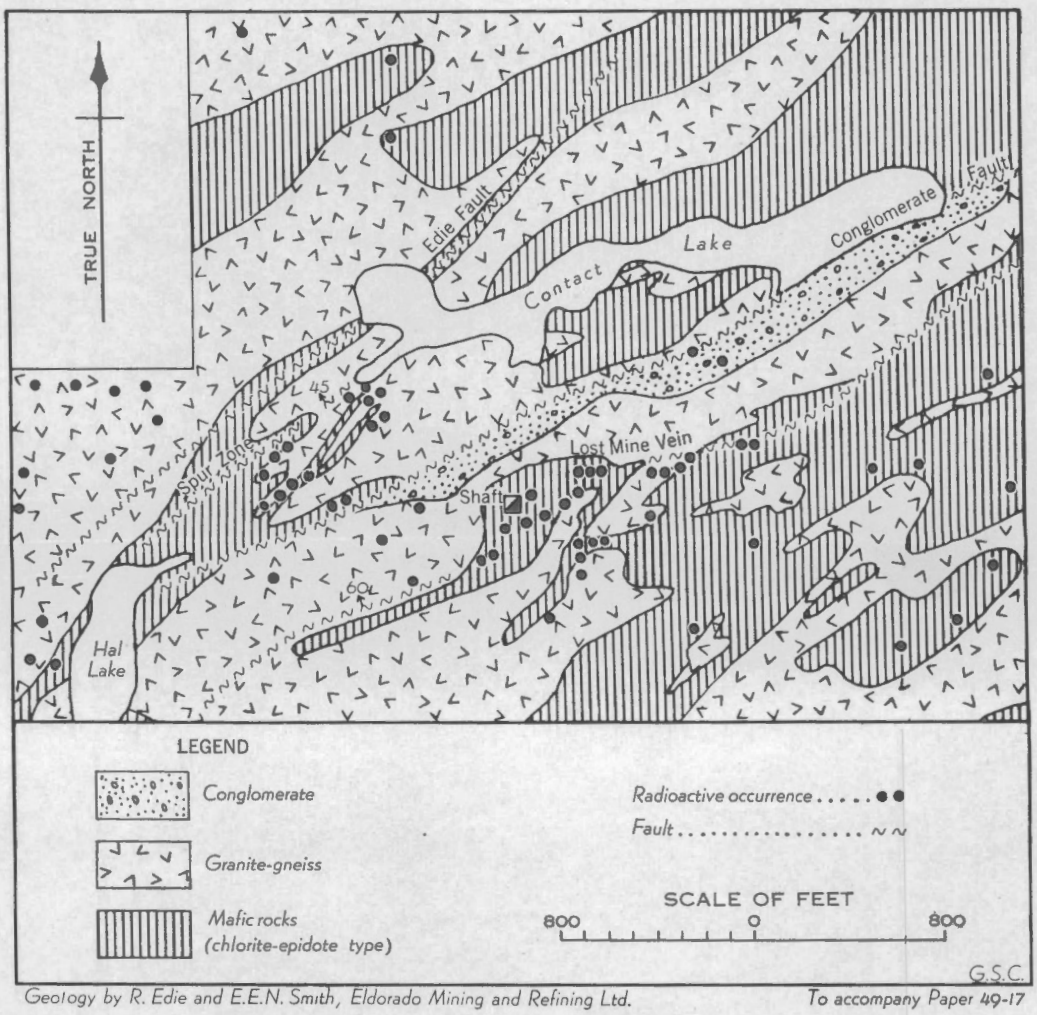
Figure 7. Geological sketch of Ace Lake deposit



Geology after Ian Bain, Eldorado Mining and Refining Ltd.

To accompany Paper 49-17

Figure 8. Geological sketch of Tam Lake deposit



Geology by R. Edie and E.E.N. Smith, Eldorado Mining and Refining Ltd. To accompany Paper 49-17

Figure 9. Geological sketch of Eagle group