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Some Radioactive Mineral Occurrences in the Bancroft Area

By
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TABLE OF CONTENTS

Geological Circular No. 2

ILLUSTRATIONS

GEOLOGICAL MAPS AND SKETCHES

(In pocket at back of report)

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By J. Satterly and D. F. Hewitt

INTRODUCTION

During 1954 exploration for uranium was carried out on at least fifty properties in the area between Bancroft, Haliburton, and Bobcaygeon. This work generally involved scintillometer or geiger ratemeter surveys, geological mapping, stripping, trenching, in some cases diamond-drilling, and at four properties, underground development.

At the present time (February 1, 1955) Faraday Uranium Mines, Limited, is driving two adits on its property near Bancroft to explore two zones of radioactive pegmatite dikes. In 1954, Centre Lake Uranium Mines, Limited, completed a program of underground exploration on its main zone consisting of adit, shaft, and second level. Croft Uranium Mines, Limited, which adjoins Centre Lake on the north, also completed an adit on the *J* zone of pegmatite dikes.

In 1954 Cardiff Uranium Mines, Limited, reopened its property near Wilberforce, installed a mining plant, dewatered the shaft and underground workings, and are now doing underground work on the 125- and 250-foot levels to further explore their calcite-fluorite-uraninite veins.

The total amount of diamond-drilling on all properties in the Bancroft area now exceeds 200,000 feet. Although substantial tonnages, grading less than 0.1 percent U_3O_8, have been outlined on some properties, exploration and underground development to date have not outlined sufficient tonnages of uranium-bearing rock of a grade acceptable to the Atomic Energy Control Board.

During the 1954 field season the Ontario Department of Mines continued its program of geological mapping in the Haliburton-Bancroft area. The mapping of Dungannon and Mayo townships, Hastings county, was completed, and the mapping of Cardiff township, Haliburton county, was begun under the direction of D. F. Hewitt.

At the same time J. Satterly began examination of the radioactive mineral occurrences in the Bancroft-Haliburton-Bobcaygeon area to obtain information on the geology and mineralogy of these deposits.

During 1954, S. C. Robinson of the Geological Survey of Canada began a study of the mineralogy of radioactive mineral deposits in the Bancroft area.

This interim account of the radioactive occurrences is being published to satisfy a demand for information on the Bancroft area. A number of properties at present under active exploration will not be found in the section, Description of Properties, because they either had not commenced operation during the 1954 field season, or it was found impossible to examine all the properties on which work was being done.

HISTORY OF DEVELOPMENT

There have been three cycles of exploitation of the radioactive mineral deposits in the Haliburton-Bancroft area, mostly of a promotional nature. The first period, from 1929 to about 1936, saw underground operations by the Ontario Radium Corporation, Limited, at the Richardson property, Wilberforce, and Canada Radium Mines, Limited, at Cheddar. From 1929 to 1931, the Ontario Radium Corporation, Limited, and its successor International Radium and Resources, Limited, did over 800 feet of underground exploration on the adit of the Richardson property at Wilberforce. A mill of 150-ton capacity was built but never operated successfully. Canada Radium Mines, Limited, began operations in 1932 and sank a two-compartment, 400-foot, vertical shaft with levels at 125, 250, and 375 feet. Lateral work in the active period from 1932 to 1936 amounted to 1,810 feet. A 100-ton mill completed on this property in 1940 was closed in early 1942 after an unsuccessful trial run.

The second period of activity from 1947 to 1951 saw the reopening of the Richardson property at Wilberforce by Fission Mines, Limited, underground development of Cardiff Fluorite Mines, Limited (now Cardiff Uranium Mines, Limited), and the initial development of Lead Ura Mines, Limited (now the Rare Earth Mining Corporation of Canada), in Monmouth township.

Although prospecting activity was continuous in the area, it was not until underground development was begun by Centre Lake Uranium Mines, Limited, in Cardiff township in 1953 that the third and greatest period of exploration was initiated. A widespread staking rush followed in 1953 and 1954, and large parts of Cardiff, Faraday, Monmouth, Herschel, Monteagle, Anstruther, Burleigh, Harvey, and Cavendish townships were staked. In 1953, Newkirk Mining Corporation, Limited, carried out an airborne, scintillometer survey covering 1,600 square miles in the southwestern part of the area. A number of radioactive anomalies were indicated, and a large number of claims staked in Anstruther and Burleigh townships. Seven of the claim groups have been acquired by associated companies, which, in 1954, carried out ground scintillometer and magnetometer surveys, geological mapping, and in some cases, diamond-drilling.

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During the field season the authors received much detailed information from mining companies and individuals, and they gratefully acknowledge this helpful co-operation and assistance. They especially thank R. E. Miller, manager of Cardiff Uranium Mines, Limited; C. S. Brown, manager, and L. Kelly, geologist, of Centre Lake Uranium Mines, Limited; P. S. Cross, manager, and G. Goettler of Croft Uranium Mines, Limited; A. W. Jeckell, manager, R. Benedict Allen, chief geologist, and Nigel Campbell, geologist, of Faraday Uranium Mines, Limited; A. Skrecky of Dyno Mines, Limited; A. E. Tyson, consulting mining engineer for the Rare Earth Mining Corporation of Canada, Limited; D. E. Cameron, geologist, and J. Stewart of Stratmat, Limited; R. Massey Williams, of Newkirk Mining Corporation, Limited.

J. Satterly was ably assisted in the field by M. H. Hill whose enthusiasm and keen observation were of the utmost help in the examination of the properties and in the discovery of radioactive minerals.

The authors are greatly indebted to S. C. Robinson and his staff of the Radioactive Resources Division of the Geological Survey of Canada for the identification by X-ray powder-pattern photographs of over 100 radioactive minerals.

The sections, "General Geology," "Types of Radioactive Mineral Deposits,"

and "Mineralogy of the Radioactive Mineral Deposits," were prepared by D. F. Hewitt. He also read the entire manuscript and made a number of valuable contributions to other parts of the report.

GENERAL GEOLOGY

The host rocks of the radioactive deposits of the Haliburton-Bancroft area are all of Precambrian age. There are two main groups of rocks present in the area: the Grenville-type metasediments, mainly crystalline limestone, paragneiss, and amphibolite; and the plutonic rocks, mainly granite, syenite, and gabbro, together with their gneissic and hybrid equivalents.

The oldest rocks in the area are the crystalline limestone, dolomite, paragneiss, quartzite, and amphibolite of the Grenville series. These rocks were laid down as limestones, sandy and shaly limestones, and sandstones in early Precambrian seas. The sediments were highly metamorphosed: the limestones and dolomites became marble; the shaly and sandy limestones became impure silicated marble; the limy shales became amphibolites and pyroxenic amphibolite; the sandy shales became paragneiss; and the sandstones became quartzite.

The Grenville sediments were intruded by a series of plutonic rocks, the oldest of which are gabbro, diorite, and ultrabasic rocks. These older basic intrusives were later metamorphosed, and in places have been altered to metagabbro, metadiorite, amphibolite, or hornblende schist. After this period of basic intrusion, three other groups of plutonic rocks were emplaced, the nepheline syenites, the syenites, and the granites. The nepheline syenites are the earliest of these. Cutting relations among the later granites and syenites of the Haliburton-Bancroft area indicate that more than one age of granite and syenite is present, and several distinct lithologic facies of granite and syenite are recognized. During the emplacement of these rocks, there was *lit par lit* injection, granitization, and syenitization, resulting in the formation of large areas of granitic and syenitic gneisses of hybrid origin. Dikes of granite and syenite pegmatite, and diabase, are the youngest Precambrian rocks in the area.

Grenville Metasediments

The Grenville metasediments of the area are nearly all well banded, bedded, or foliated. They are classified lithologically into two major groups, the crystalline limestone group and the paragneiss-amphibolite group. The crystalline limestone and dolomite range in colour from pure white to grey or buff and may weather white, grey, blue-grey, or brown. Tremolite, diopside, scapolite, phlogopite, graphite, pyrite, spinel, vesuvianite, apatite, quartz, microcline, and plagioclase often occur as impurities in the crystalline limestone. When lime silicate minerals occur as abundant accessories, the rock is termed silicated limestone.

In the vicinity of intrusives, especially where limestones occur as relics or pendants in granite or granitized gneiss, metasomatic alteration has converted the limestones to lime silicate rocks. Lime silicate rock is here used as a general term for a metamorphic rock composed largely of pyroxene or amphibole, derived by metasomatism of sedimentary limestone. Lime metapyroxenite or metamorphic pyroxenite is a special variety of lime silicate rock composed of dark green diopside or augite, often with some phlogopite mica. Bands of limestone or portions of limestone bands adjacent to intrusives are frequently altered in place to lime metapyroxenite. In the Haliburton-Bancroft area several uraninite deposits of the metasomatic type occur in metapyroxenite. Skarn is a special term here used for an assemblage of lime silicate minerals usually pyroxene, scapolite, and phlogopite, often accompanied by calcite, apatite, garnet, pyrite, vesuvianite, and magnetite,

which has been formed by the contact metamorphism or assimilation, digestion, and reconstitution of limy rocks. The term skarn is used, for example, to describe patches and pods of lime silicate minerals that frequently occur in pegmatites of the Centre Lake type.

The rocks of the paragneiss-amphibolite group can be divided into four main divisions: (1) amphibolite; (2) paragneiss; (3) quartzo-feldspathic and feldspathic gneiss; and (4) quartzite. With the amphibolites are grouped all the metamorphic gneisses that are essentially limy enough to contain hornblende, pyroxene, or scapolite plus plagioclase, but with insufficient free carbonates to be termed limestone. They are probably derived from limy shales. The most common variety of amphibolite is hornblende-plagioclase gneiss. Other common assemblages in the amphibolite group are hornblende-pyroxene-plagioclase gneiss; biotite-hornblende-plagioclase gneiss; biotite-hornblende-pyroxene-plagioclase gneiss; hornblende-scapolite (plagioclase) gneiss; biotite-scapolite gneiss; and garnet-hornblende-plagioclase gneiss. The most common pyroxene is light-green diopside.

The paragneisses include those rocks developed from shales and sandy shales, and are characteristically biotite-quartz-feldspar gneisses. In this group are all the pelitic gneisses; garnet-biotite-quartz-feldspar gneiss; garnet-sillimanite-biotite-quartz-feldspar gneiss; biotite-hornblende-quartz-feldspar gneiss, etc.

Feldspathic and quartzo-feldspathic gneisses are those in which the mafic minerals are present in amounts of less than 30 percent. In some areas quartzite is present.

To the south and east of the Haliburton-Bancroft area, some metavolcanic rocks occur interbedded with the metasediments, but none are found in the area herein described.

Plutonic Rocks

Small bodies of gabbro, diorite, and metagabbro occur in Glamorgan, Monmouth, Cardiff, Chandos, Faraday, and Dungannon townships, intruding Grenville metasediments.

Nepheline and associated alkaline syenite gneisses occur in a narrow band extending eastward from Glamorgan through Monmouth, Cardiff, Faraday, and Dungannon townships. These rocks are intruded by later granite and syenite gneisses and pegmatites.

Hybrid granite gneisses underlie a large part of the Haliburton-Bancroft area; the main bodies of granitic gneiss may be enumerated as follows: to the north, granite gneisses extend across the whole area through Harburn, Dudley, Harcourt, Bruton, Herschel, McClure, and Monteagle townships. The Dysart granite gneiss occupies the northern part of Dysart township and is separated from the Glamorgan granite gneisses, which occupy Snowdon and Glamorgan townships, by a narrow band of Grenville limestone. The Glamorgan granite gneisses are separated from a series of four granitic bodies to the east by a wide band of crystalline limestones, paragneiss, amphibolite, nepheline syenite, and gabbro that narrows to the north towards Wilberforce. The most southerly of these four granite gneiss masses occupies Harvey and Burleigh townships and is called the Burleigh granite gneiss. The Burleigh body is a complex one, consisting of a series of three north-trending synclines and anticlines in granite gneiss, pitching south. The second body is the Anstruther granite gneiss that occupies Anstruther and the eastern part of Cavendish township. The Anstruther body has a double domal structure, with one dome centred in east-central Anstruther township and the other northeast of Catchacoma Lake. The Anstruther body is separated from the Burleigh body by the change in structure

of the gneisses and by narrow discontinuous bands of Grenville limestone and paragneiss.

The Cheddar granite gneiss lies to the north of the Anstruther body, on the boundary between Monmouth and Cardiff townships. It is roughly circular in shape and is completely enveloped by conformable sheets of Grenville limestone and paragneiss that wrap around it. The granite gneiss within the Cheddar body is less foliated than the other two bodies to the south, and may be an intrusive batholith. Structurally it consists of a major oval dome to the north and a small satellite dome to the south just north of Eels Lake. On the north side of the Cheddar body, dips are steeply to the south.

The Deer Lake gneissic body that occupies the northeastern part of Cardiff township consists of granite gneiss, syenite, and metasediments, with metasediments being much more prominent than in the bodies to the south. There is a general domal structure centred at Deer Lake. The main features of the Deer Lake body are several sheets of leuco-granite gneiss on the south and east flanks of the dome, the most prominent of which are the Centre Lake and Monck Lake leuco-granite gneisses, and a large body of alkaline syenite, the Deer Lake syenite, lying in a south-dipping sheet just south of Deer Lake.

To the east of this series of four granitic gneiss bodies there is a wide belt of Grenville metasediments, chiefly limestone, extending to the edges of the area here described.

As will be seen on the location map (Figure 1, back pocket), most of the radioactive deposits appear to be concentrated within the sedimentary belts near the contacts of the granitic gneisses or within the granite gneiss bodies near their margins. There is a concentration of deposits in Cardiff and Monmouth townships around the Cheddar and Deer Lake bodies, and in Faraday township along the gneiss-metasediment contact zone.

A geological map (Figure 2, back pocket), shows the general geology in the vicinity of the Centre Lake and Croft uranium mines in Cardiff township. The radioactive-bearing pegmatitic dikes lie within a zone of syenitized paragneiss and amphibolite, striking N.10°E. and dipping to the east at about 50 degrees. To the east this zone is overlain by crystalline limestone. To the west it is underlain by the Centre Lake leuco-granite sheet which also dips to the east. Hybrid granite gneisses flank the Centre Lake leuco-granite sheet both on the footwall and hanging-wall.

Within the favourable zone the metasediments consist mainly of biotite paragneiss, amphibolite, scapolite-biotite gneiss, and garnet-sillimanite gneiss. This series was intruded and replaced by grey albite syenite and granite, yellow-brown sodic syenite and granite, often characterized by alkaline hornblende or pyroxene and abundant titanite, and by pink potassic syenite and granite. Pegmatitic facies of all three types of granite and syenite occur, and radioactive minerals appear to be most common in the yellow-brown or red sodic granite and syenite pegmatites. The early grey albite-quartz dikes and the late pale pink microcline-quartz dikes appear to be barren.

The Aumacho River radioactive dikes on Paudash Lake are on the southward extension of the Centre Lake zone of syenitized metasediments. The south showings on the Croft property are on the northward extension of the Centre Lake zone and are lithologically quite similar to the Centre Lake type of occurrence. The main or *J* zone at Croft, although occurring in the same zone of metasediments, appears to be stratigraphically lower in the section and much closer to the Centre Lake leuco-granite sheet. This difference in position may be the reason for the marked difference in lithology between the Croft *J*-zone dikes and the Centre Lake dikes. The Croft

dikes are characterized by the presence of biotite as the chief mafic mineral and by their porphyroblastic texture. In places the Croft dikes appear to have been formed by the "pegmatitization" or growth of large feldspar porphyroblasts, wrapped around by biotite, in the biotite-garnet-sillimanite-quartz country rock gneiss.

The Centre Lake–Croft favourable zone is apparently cut off to the northeast by a major fault running N.30°W. just east of the Faraday township boundary. The Centre Lake leuco-granite sheet also pinches out to the north, in concession XV of Cardiff township.

TYPES OF RADIOACTIVE MINERAL DEPOSITS

Lithologically, the radioactive mineral deposits of the Bancroft area can be divided into the following types:

I—Pegmatite Deposits
- A—Segregated (zoned) granite pegmatites
- B—Non-segregated granite and syenite pegmatite dikes or non-segregated pegmatitic granite and syenite dikes
  1) Leucocratic type (e.g. Dyno, Faraday)
  2) Mafic type (e.g. Centre Lake, Croft)

II—Metasomatic deposits
- A—Limestone (e.g. Homer Yellowknife, Normingo)
- B—Metapyroxenite (e.g. McLean-Hogan)
- C—Syenite and granite (e.g. Fission east showing)

III—Vein deposits
- A—Calcite - fluorite - apatite veins (e.g. Cardiff Uranium)

These types of deposits may overlap; for example, the calcite-fluorite-apatite vein deposits often have zones of metasomatic alteration adjacent to the vein fissures. Metasomatic alteration also plays an important part in some of the non-segregated pegmatitic granite and syenite dikes, as for example at Centre Lake Uranium Mines, Limited.

Characteristics and diagnostic features of the various types of deposits follow:

I—Pegmatite Deposits

A—SEGREGATED ZONED TYPE

a) Giant crystallization: large size of individual minerals.

b) Segregation of chemical constituents into pure minerals, in contrast with non-segregated dikes in which mineral intergrowths and replacement textures are common.

c) Zoning of the dike into lithologic units from wall to core.

d) Absence of replacement: no clots or segregations of partially digested or reconstituted mafic minerals within the dike; no migmatites within the dike.

e) The dike is fissure-filling, usually with sharp walls; inclusions and horses of country rock have definite boundaries.

f) Shape is generally lenticular, pod-shaped, or branching.

g) Uranium occurs as complex oxides of rare earths, titanium, columbium and tantalum, and rarely as uraninite.

h) Uranium minerals are usually confined to certain definite lithologic units within the dike.

B—NON-SEGREGATED GRANITE and SYENITE PEGMATITE DIKES

a) Grain size is variable; frequently the dike is pegmatitic granite rather than pegmatite.

b) Lack of segregation of minerals.

c) Lack of regular zoning of the dike into lithologic units usually found from wall to core in a normal zoned granite pegmatite.

d) Where different lithologic units are present in the dike, the units may be quite irregular in size, shape, and position; marked changes in lithology or texture frequently occur along the dike.

e) Shape is usually irregular, sometimes lenticular.

f) Peristerite (plagioclase with an iridescent sheen) is common.

g) Zircon, titanite, and allanite are common accessories.

h) Uranium occurs as uranothorite and uraninite, and rarely as the complex oxides of columbium, tantalum, and titanium.

i) Yellow secondary uranium minerals are often present coating fractures.

j) Uranium minerals occur in shoots within the dike but not in any particular lithologic unit. There may be hanging-wall and footwall enrichment. These suggest structural rather than genetic controls.

k) A brick-red colouration of the minerals is characteristic of uranium-bearing zones.

1) Leucocratic Type (e.g. Dyno, Faraday)

a) Lack of mafic minerals, except magnetite.

b) Characteristically pegmatitic granite.

c) Magnetite is often abundant as a characterizing accessory.

2) Mafic Type (e.g. Centre Lake)

a) Evidence of abundant replacement of minerals within the dike indicates a complex history of recurrent replacement and metasomatism.

b) Assimilation, digestion, and reconstitution of wall rock and wall rock inclusions is often a feature.

c) Metasomatic alteration of wall rocks, with the development of porphyroblasts, is often present.

d) There may be development of migmatites and *lit par lit* gneisses.

e) Dikes may grade from syenitic to granitic to extremely quartz-rich.

f) Biotite, hornblende, or pyroxene may be present as mafic minerals. Where there has been assimilation and digestion of limy wall rocks, the mafic mineral is often pyroxene.

g) Purple fluorite is common.

II—Metasomatic Deposits

A—LIMESTONE

B—METAPYROXENITE

a) Uranium-bearing zones occur in limestone or lime metapyroxenite near the contacts of granitic, syenitic or pegmatitic intrusives.

b) There is frequent development of skarn minerals (diopside, tremolite, scapolite, phlogopite, apatite, epidote and others) in the limestones.

c) Salmon-pink to red colouration of the carbonate is characteristic.

d) Uranium-bearing zones are irregular in size and shape, and erratic in distribution within the limestone host rock.
e) Uranium occurs as uranothorite and uraninite.

C—SYENITE and GRANITE

a) Uraninite crystals occur in fine- to medium-grained syenite or granite, usually accompanied by red colouration of the host rock.
b) Uraninite mineralization is generally associated with fractures as an introduced mineral.
c) Uranothorite is rarely present. No known occurrences of complex oxides of columbium, tantalum, and titanium have yet been found in the Bancroft area.

III—Vein Deposits

A—CALCITE-FLUORITE-APATITE VEINS

a) Occur as lenticular, discontinuous, fissure-filling veins.
b) Veins are frequently well-banded.
c) Grain size is medium to coarse, ¼–3 inches.
d) Apatite, hornblende, black mica, and scapolite form large crystals.
e) Later movement along the fissure is often indicated by shearing and flowage of the vein material, and incorporation of brecciated wall rock fragments in the vein.
f) Uranium commonly occurs as uraninite crystals, rarely as pyrochlore.
g) Walls of the fissure are usually lined with crystals of hornblende, feldspar, apatite, titanite, black mica, and scapolite.
h) The vein stage in many cases has been preceded by a pegmatitic stage and concomitant metasomatic alteration of the walls. Re-opening of the fissure allowed emplacement of the vein.
i) Uraninite crystals may occur frozen to the walls.
j) Fluorite is deep purple to almost black in colour. Apatite is frequently dark red.

The following features are commonly noted in uranium occurrences of all types in the Bancroft area, but the presence of one or more of these features is not necessarily indicative of uranium mineralization:

Minerals

1) Quartz is usually smoky, sometimes black or red in colour.
2) Peristerite feldspar is particularly common in the pegmatite deposits.
3) Calcite in limestone replacement, pegmatite, and skarn deposits is often salmon-pink to red in colour.
4) Deep purple fluorite and green or red apatite are characteristically found in the pegmatites, particularly the mafic granite and syenite type, in the vein deposits and in the metapyroxenite replacement deposits.
5) Zircon and titanite are frequently abundant accessory minerals in all types of pegmatite, and often present in skarns, metapyroxenites, and syenite and granite replacement deposits.
6) Sulphides are locally abundant, and molybdenite in particular is often present in the richer sections of the deposit.
7) Magnetite is an abundant accessory in certain zones of many leucocratic pegmatites and occasionally occurs as segregated pods.

In some cases there appears to be a definite association between magnetite and uranium.

Rock Alteration

1) Uranium mineralization is often accompanied by a brick-red alteration of the host rock and minerals. Uranium-bearing dikes are usually of a deeper-red or pink colour than barren dikes in the same vicinity.

2) Patches and pods of skarn minerals may be present in all types of deposits. Small patches of calcite, cream to salmon-pink in colour, often with scapolite, diopside, apatite, titanite, black mica, and sulphides are particularly common in the mafic replacement type of non-segregated pegmatitic granite and syenite dikes.

Petrology

1) The pegmatitic dikes that carry uranium mineralization are generally more sodic than the barren pegmatites. Leuco-granite pegmatites, consisting primarily of quartz and microcline, are usually barren.

MINERALOGY OF THE RADIOACTIVE MINERAL DEPOSITS

The radioactive minerals most commonly found in the Bancroft area are the following:

Mineral	Main Constituents	Maximum percent U_3O_8	Maximum percent ThO_2
Oxides and Silicates			
Uraninite	$UO_2.UO_3$	95	15
Thorite	$ThO_2.SiO_2$	—	82
Uranothorite	$(U, Th)O_2.SiO_2$	30	50
Columbates — Tantalates — Titanates			
Euxenite	Titanian $(Y, Ce)(Ti, Cb, Ta)_2O_6$	15	17
Polycrase	Columbian $(Y, Ce)(Ti, Cb, Ta)_2O_6$		
Pyrochlore	$NaCaCb_2O_6F$	20	5
Microlite	$(Na, Ca)_2Ta_2O_6(O, OH, F)$		
Yellow Secondary Alteration Products			
Uranophane	$CaO.2UO_3.2SiO_2.6H_2O$	60	3
Radioactive Accessory Minerals			
Allanite	$4(Ca, Fe)0.3(Fe, Al, Ce)_2O_3.6SiO_2.H_2O$	2	6
Cyrtolite	$ZrO_2.SiO_2$	4	5

The following remarks apply to the occurrence of these minerals in the Bancroft area:

Uraninite

Uraninite is isometric and occurs in steel-grey to black cubes and octahedrons with a submetallic lustre. Hardness is 5–6; specific gravity, 8–10.5. In the Bancroft area it occurs chiefly in non-segregated pegmatites, limestone, metapyroxenite and granite or syenite replacement deposits, and in calcite-fluorite-apatite veins. It may be distinguished from magnetite by its lack of magnetic properties and its radioactivity. Uraninite can be fairly readily panned using a gold pan which will separate it from magnetite.

All uraninite from the Bancroft area contains thorium in amounts of 8 to 40 percent ThO_2.[1] Those with the higher thorium content are more properly called uranian thorianite. The latter appears to be characteristic of the occurrences in the limestone.

[1]S. C. Robinson, Geological Survey of Canada, personal communication.

Thorite

Thorite is tetragonal and occurs in square prismatic crystals similar to zircon in habit. It is variable in colour, black, brown, or yellow, with vitreous to glassy lustre. Hardness is 4.5–5; specific gravity, 4.1–6.4. Thorite occurs in some of the non-segregated pegmatitic dikes in the Bancroft area but is difficult to identify in hand sample without an X-ray. It may be confused with zircon or uranothorite.

Uranothorite

Uranothorite, a variety of thorite, is one of the most common radioactive minerals in the Bancroft area. Occasionally it occurs in small elongated rectangular blades, but most often as irregular grains or patches of no definite crystal shape. It usually has a bright vitreous to glassy lustre and ranges in colour from yellow, orange, red or brown, to black.

Uranothorite is commonly found in the non-segregated pegmatitic dikes, and in limestone and metapyroxenite replacement deposits, but is rare in segregated pegmatites, veins, or granite and syenite replacement deposits.

Euxenite-polycrase

Euxenite and polycrase commonly occur in jet black to brown or yellow irregular patches in segregated pegmatite dikes. These minerals are orthorhombic and rarely occur in stout prismatic crystals. The lustre is glassy or vitreous; hardness, 5.5–6.5; specific gravity, 4–5.8. In the Bancroft area minerals of the euxenite-polycrase series have so far only been found to occur in the segregated granite pegmatites. Lyndochite, which occurs in the Quadeville pegmatites, is a high-lime euxenite.

Pyrochlore-microlite

Pyrochlore and microlite are isometric and are sometimes found in good octahedral crystals, as well as in irregular grains and patches intergrown with other minerals. These minerals are usually brown, yellow-brown, or black in colour, with a bright vitreous to glassy lustre. Hardness is 5–6; specific gravity, 4.2–6.4. Good pyrochlore crystals are rare but occur in two calcite-fluorite-apatite vein type of deposits in the Bancroft area. Ellsworthite, the uraniferous, titanian pyrochlore, is common in the segregated granite pegmatites of the Hybla area where it occurs in salmon-pink calcite or feldspar. The MacDonald mine is a well-known example.

Hatchettolite

Hatchettolite, the uraniferous pyrochlore, has been reported from the Woodcox mine.

It is often very difficult to distinguish uranothorite, euxenite, polycrase, pyrochlore, and microlite from one another in hand specimen, and chemical or X-ray analysis may be necessary for identification of these minerals.

Uranophane

This is the most common, yellow secondary alteration product of the primary uranium minerals in this area.

Allanite

This monoclinic mineral is usually found in shiny, vitreous jet-black masses, or bladed, elongate crystals. Occasionally it is yellowish-brown or reddish in colour. Hardness is 5.5–6; specific gravity, 2.7–4.2. This black vitreous mineral is a com-

mon accessory of many granites, syenites, and pegmatites in the area. Although it carries less than 2 percent uranium oxide, and less than 6 percent thorium oxide, it is often present in sufficient amounts in these rocks to give a geiger counter reading several times background. Similarly the radioactive zircon, cyrtolite, may also be present in sufficient amounts to contribute substantially to the radioactivity, but neither allanite nor cyrtolite can be classed as uranium ore minerals, and are of no present commercial value as sources of uranium. Allanite and zircon as well as other radioactive minerals are frequently surrounded by haloes of radial shattering.

Cyrtolite (Radioactive Zircon)

Zircon is tetragonal and occurs in square prismatic crystals with good pyramidal terminations. It is white, grey, brown, or red in colour with a glassy to dull resinous lustre; hardness, 5–7.5; specific gravity 4.6–4.7. Small, well-formed crystals of zircon are a characteristic accessory of most of the pegmatites of the area. Zircon crystals also occur in metapyroxenite, skarn, and granite or syenite replacement deposits. Zircons are rarely found in calcite-fluorite-apatite veins but are common in the metasomatized wall zones of these deposits.

GEIGER COUNTER READINGS AND TECHNIQUE

Throughout the section of this report covering property descriptions frequent reference to geiger readings will be made. The instrument used was a ratemeter, type EA-135, made by Electronic Associates, Limited, Willowdale, Ontario. Three large geiger tubes, having a projected area of 18 square inches, are used in the counter. This instrument has a dial divided into 50 divisions that can be used, by the switch of a knob, on four scales marked, 1M, 5M, 10M, and 50M, meaning 1,000, 5,000, 10,000, and 50,000 counts per minute. In the field it was found that the scales are not comparable, and it was better in any one trench or exposure to use as few scales as possible. To take readings the instrument was held by the shoulder strap so that the counter nearly touched the ground, or where careful sampling was attempted, on the ground for every foot of distance. The case for the instrument is about 1 foot in length. The normal background count in the Bancroft area is 20 to 25 (1M), that is 400 to 500 counts per minute.

It is not possible to interpret the results quantitatively unless numerous assays are available for a check. Where an instrument is in use at one property a quantitative interpretation may be attempted, but only if the uranium-thorium ratio in the rock is fairly constant. Owing to the frequent occurrence of both uranothorite (18 percent U_3O_8) and uraninite (70 percent U_3O_8) in the pegmatites and limestones or skarn deposits, the authors doubt whether the ratio of these minerals is at all constant even in one deposit, let alone in a multitude of dikes on one property.

On the Centre Lake property the abundant uranium mineral is uranothorite, and geiger readings taken in surface trenches there indicate that about 48 $\times$ background count is necessary to indicate an occurrence assaying 0.10 percent U_3O_8 (chemical). The authors do not have comparable data from other properties.

It would appear that on deposits of the leuco-granite pegmatite type that readings on the high 10M scale with spot-highs on the 50M scale would be required to indicate a radioactive deposit of interest. On the Cavendish property, readings filed by the company in their drill logs for assessment-work credit indicate that from 5 to 20 $\times$ background count was necessary to indicate a grade of 0.10 percent U_3O_8. This range may be explained by the different amounts of uraninite, uranothorite, thorite, and other radioactive minerals in the granite pegmatite. The instru-

ment used here was a type EA-135P (probe), made by Electronic Associates, Limited. It has only one geiger tube in the probe.

The Geological Survey of Canada publishes a list entitled, "Data on Portable Geiger Counters Available in Canada," that gives the addresses of firms selling the instruments and types of counters available.

PROSPECTING FOR RADIOACTIVE DEPOSITS IN THE BANCROFT AREA

Within the area examined by the authors in the 1954 field season radioactive occurrences have not been explored sufficiently to indicate whether any particular type of deposit is more likely to be of commercial importance than others.

It is apparent from the deposits examined that occurrences in granite pegmatites are the most abundant and widespread, but in most cases the average U_3O_8 content is below 0.1 percent. The occurrence at Faraday Uranium Mines, Limited, of high-grade pods of magnetite containing 0.75–3 percent U_3O_8 is of interest and may help to maintain a satisfactory mill grade if sufficient tonnage is proven to justify erection of a mill. As noted in the description of the properties, there is a definite correlation between the amount of accessory magnetite and uranium content in the leucocratic type of granite pegmatite. The presence of fracturing, hematitization, and the consequent deeper-red colour of the pegmatite is also indicative of radioactive shoots within the dikes. In the mafic granite pegmatite dikes an abundance of purple fluorite usually indicates the presence of radioactive minerals, but not always.

All calcite-fluorite-apatite veins are not uranium-bearing. This is particularly well shown at the Richardson property where the south zone contains negligible uraninite.[1] Several other occurrences of this type examined with the geiger ratemeter gave readings barely above background count.

Occurrences in limestone appear to be of doubtful economic significance not only because of the erratic distribution of the uranium-bearing mineral, but because of the limited extent of mineralized zones in the limestone mass. The metapyroxenite occurrences at present under exploration will require further work to prove whether continuity of grade can be established over lengths and widths to make ore bodies.

Description of Properties

HALIBURTON COUNTY, CARDIFF TOWNSHIP

Allanite Property, Stratmat, Limited

The Allanite property of Stratmat, Limited, consists of lots 1–3 and the north half of lot 4, concession XIV, and the south halves of lots 2 and 3, concession XV, Cardiff township, Haliburton county.

A showing of allanite on the north half of lot 2, concession XVI, was explored by a scintillometer and magnetometer survey, trenching, and diamond-drilling in 1953. Three holes were drilled in 1953 totalling 985 feet. In 1954 the work on the property consisted of a scintillometer reconnaissance to check the continuity of several anomalies indicated on the 1953 survey, followed by exploration of the main allanite zone, with six additional drill holes totalling 1,728 feet.

[1] S. E. Wolfe and Nelson Hogg, *Report on Some Radioactive Mineral Occurrences in Cardiff and Monmouth Townships, Haliburton County, Ontario,* Ont. Dept. Mines, P. R. 1948-8, p. 10.

The showings are located on the northwest face of a hill that consists predominantly of hybrid syenite gneiss. The gneisses strike N.50°E. and dip 45°SE. The oldest rocks present are amphibolite and paragneiss. The amphibolite group includes hornblende-plagioclase gneiss, biotite-hornblende-plagioclase gneiss, and pyroxene-hornblende-plagioclase gneiss. These dark gneisses occur interbanded with yellow-brown, grey, and pink syenite gneisses, and in places, the sedimentary gneisses are feldspathized. The introduction of potash feldspar gives the amphibolites and paragneisses a pink colour, and these metasediments are gradually converted to hybrid syenite gneiss by this process of potash metasomatism.

Pink leuco-syenite, often with abundant magnetite or hornblende or both, and biotite, is a late intrusive. Brick-red to red pyroxene syenite pegmatite and syenite carrying allanite also intruded the gneisses. The pink leuco-syenite gneiss in places grades to leuco-granite gneiss. The pink and red syenite gneisses are often pyroxenic. Epidotization and shearing is prevalent in parts of the syenite sections in diamond-drill core.

Massive veins of allanite occur in pink pyroxenic syenite and syenite pegmatite. Allanite occurs in massive veins with pyroxene, and as a constituent of syenite, syenite pegmatite, and granite pegmatite.

On the northwest face of the hill three long trenches, from 80 to 140 feet in length and located 50 feet apart, expose the allanite-bearing zone. The main allanite showing is in a pit 35 feet long and 20 feet wide. In this pit an allanite-rich pyroxene syenite pegmatite, running 60 percent allanite, is exposed over a width of 6 feet. Above this there is a 5-foot band of pink hornblende syenite and magnetite-bearing leuco-syenite. Above this, in a 5-foot band of hybrid syenite gneiss, there are two veins composed of calcite-fluorite-apatite-allanite-pyroxene-feldspar and sulphides that appear to be later than the allanite syenite pegmatite since they cut the pegmatite. In the upper 15 feet of this trench, pink hornblende syenite gneiss, pink leuco-syenite, amphibolite, and allanite syenite pegmatite are exposed. One band of allanite-bearing syenite pegmatite has a width of 3 feet.

Much of the allanite zone consists of coarsely crystalline allanite up to 6 inches in size in a red aplitic syenite matrix. Much of the red feldspar is plagioclase. Pyroxene occurs intergrown with the allanite.

Black mica and zircon were noted in the allanite pegmatite, but mica is rare.

Diamond-drill holes Nos. 1, 3, 7, and 6, and the surface exposure in the main trench indicate an allanite zone dipping 55°SE., with an average width of 8 feet. This width includes barren bands of syenite gneiss, the amount of allanite present ranging from 10 to 40 percent. The strike of the zone in holes No. 1 and 2 is N.30°E., and the zone has been traced for 200 feet.

About 500 feet northeast of the main showing there is a stripping 20 by 30 feet in size that exposes pink fluorite-allanite granite pegmatite. Here the allanite occurs as crystals up to 3 or 4 inches long as an accessory mineral of the pegmatite.

The syenitic gneisses that form the hill are underlain by crystalline limestone. This limestone band was picked up in diamond-drilling.

Aumacho River Mines, Limited

Aumacho River Mines, Limited, holds a block of 15 claims, E.O.7705–7710, E.O.7331–7332, E.O.8038–8044 on Paudash Lake, Cardiff township, Haliburton county. A radioactive showing on a point on the east shore of the north arm of Paudash Lake in claim E.O.7332, the south half of lot 22, concession IX, has been explored by 5 trenches and 9 diamond-drill holes. In addition 12 other diamond-

drill holes have been put down to explore extensions of the biotite-garnet gneiss (augen-gneiss) zone from the Centre Lake property. The 21 drill holes total 6,097 feet.

The 5 trenches expose a lenticular dike of granite pegmatite and leuco-granite for 150 feet in a direction N.50°E. from the shore of Paudash Lake. At the shore, stripping and trenching on the sloping bank expose rock for a length of 25 feet and a width of 15 feet. A complex granite pegmatite, 2–3 feet wide, composed of pink feldspar, quartz, hornblende, pyroxene, biotite, scapolite, and calcite occurs as a dike or sill at the contact between leuco-granite gneiss and interbedded biotite paragneiss and hornblende gneiss. The gneisses strike N.65°E., and dip 40°SE. Spot-high geiger readings off the 50M scale were found at three places in the dike. Uraninite was found in large grains ½–¾ inch across, together with allanite, and possibly uranothorite.

The second trench, 50 feet northeast of the first, exposes pink gneissic, graphic, or pegmatitic leuco-granite cut by a 3-inch pyroxene pegmatite stringer, and a 6-foot pod of hornblende-rich granite pegmatite that recorded a high of 30 (50M) on the geiger ratemeter. Also present in the dike complex are patchy areas rich in biotite, quartz, and calcite. No radioactive minerals were recognized.

The third trench, 40 feet northeast of the second, exposes a 15-foot dike of leuco-granite and granite pegmatite cutting amphibolite. The highest geiger reading recorded in this trench was 7 (5M).

The fourth trench, 50 feet northeast of the third, exposes hornblende gneiss cut by a 2-foot dikelet of pyroxene pegmatite with readings on the 5M scale except one area of coarse biotite aggregate that gave a reading of 29 (50M) on the ratemeter. Two 2-inch hornblende stringers, parallel to the gneissic structure gave readings of 7 and 10 (5M).

The fifth trench, 40 feet northeast of the fourth, is in sandy overburden; a little amphibolite is exposed at the north wall of the opening.

An examination of the company's logs of the diamond-drill holes indicates that from 10 to 30 dikelets of granite pegmatite were intersected in each hole. These dikelets were mostly 0.1–5.0 feet in core length, only a few exceeding 10 feet. J. Satterly examined some of the dikelets in holes Nos. 3, 4, 7, and 15. They are granite pegmatite with minor pyroxene, accessory titanite, and orange to black grains of uranothorite. A few grains of purple fluorite were noted in a pegmatite in hole No. 7.

Canada Radium Corporation, Limited

Canada Radium Corporation, Limited, incorporated in 1954, acquired the property formerly held by Canada Radium Mines, Limited, incorporated in 1926. The property consists of lots 7–10, concession XII, and lot 9, concession XIII, Cardiff township, Haliburton county.

Operations by Canada Radium Mines, Limited, were carried on from 1932 to 1936, and 1940 to 1942. Development work prior to 1937 consisted of a two-compartment, vertical shaft, 400 feet deep, with levels at 125, 250, and 375 feet, situated on lot 9, concession XII. Lateral work on the three levels amounts to 1,810 feet, as follows:[1]

[1] The Staff of the Mines Inspection Branch, *Mines of Ontario in 1940,* Ont. Dept. Mines, Vol. L, 1941, pt. 1, pp. 158–59.

Level	Drifts	Crosscuts
	feet	feet
125-foot	218	171
250-foot	373	303
375-foot	—	745

In the late fall of 1939 and early months of 1940, a 100-ton mill was built. Although no mining was carried out in 1941, the mill was enlarged, and an Exolon magnetic separator and Johnson electrostatic separator, having a total capacity of 50 tons, were installed.[1] In 1942 additional equipment was added to the mill, and the mine and plant worked part-time in June and July, when test runs were made on about 200 tons of pegmatite. Operations ceased, and the property closed down on July 16, 1942.[2]

In 1942 the company was mining a pink, graphic granite pegmatite that occurs as a number of dikes cutting hornblende gneiss. The pegmatite contains varying amounts of hornblende and minor amounts of magnetite and was reported to carry rare-element minerals. In the mill these minerals were removed, after being crushed through stages of 20-, 30-, and 60-mesh by the magnetic separator. The resulting quartz-feldspar mixture was then fed through the Johnson electrostatic separator in order to effect a separation of the quartz and feldspar.[3]

In June 1954, J. Satterly examined the old dumps on the property with a geiger counter. Practically no radioactive material could be found, except one sample of pink leuco-granite pegmatite, showing a little yellow uranium stain, and minute grains of orange uranothorite. The concentrates remaining in boxes at the ends of the Wilfley tables in the mill were found to be radioactive, giving readings of 25 (10M), 40 (10M), and 40 (10M) in three different boxes.

In the fall of 1954, Canada Radium Corporation, Limited, dewatered the underground workings for an examination, following which the workings were allowed to fill with water.

Cardiff Uranium Mines, Limited

(See map, Figure 3, in back pocket)

Cardiff Uranium Mines, Limited, prior to 1953 was known as Cardiff Fluorite Mines, Limited, which was incorporated in 1943 to develop a fluorspar property three miles south of the village of Wilberforce. The latter company acquired, on incorporation, the assets of Cardiff Fluorite Mining Syndicate, Limited, Zeta Mining Corporation, and Burnt River Mining Syndicate, Limited.

In 1954 the property consisted of lot A and the north half of lot 2, concession XVII; lot 2, concession XVIII; and the south halves of lots 1 and 2, and lot 3, concession XIX.

The property is an uraninite-fluorspar prospect, with the uraninite crystals occurring in banded veins of calcite, fluorite, and apatite. Exploration over the past ten years has consisted of trenching, diamond-drilling, and underground development, that includes three adits and a shaft to a depth of 275 feet with levels at 125 and 250 feet.

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[1]The Staff of the Mines Inspection Branch, *Mines of Ontario in 1941*, Ont. Dept. Mines, Vol. LI, 1942, pt. 1, p. 64.

[2]J. Satterly, *Mineral Occurrences in the Haliburton Area*, Ont. Dept. Mines, Vol. LII, 1943, pt. 2, p. 70.

[3]J. Satterly, *op. cit.*, pp. 28-29.

History of Development

The showings on the property were formerly designated from south to north as *B*, *C*, *A*, *E*, and *F*, which are now grouped as follows: *A*, *E* and *F*, designated as the North Zone, and *B* and *C* as the South Zone. The initial discoveries were on the *A* and *B* showing.[1] Exploration on the property to 1948 is described by Wolfe and Hogg.[2]

Exploration of the *C* zone, on the north half of lot A, concession XVII, commenced in 1947, when 2,000 feet of diamond-drilling was done; and in October an adit was driven east 133 feet into the hillside, and 72 feet of drifting was done from this crosscut. In December, 1947, a second adit was begun on the *E* zone on the south half of lot 1,. concession XIX.

In 1948 a total of 72 feet of crosscutting and 75 feet of drifting was completed on *C*-zone adit. *E* adit was extended in 1948, and by the end of the year, 555 feet of crosscutting and 85 feet of drifting were completed. Diamond-drilling in 1948 consisted of 600 feet on surface and 1,276 feet underground. Trenching amounted to 1,060 feet.

In 1949, 62 feet of additional crosscutting was done in *E* adit making the total length of crosscuts in this adit 617 feet. Diamond-drilling on surface consisted of nineteen holes, totalling 4,373 feet.

In 1950 a two-compartment shaft, inclined at 50 degrees, was sunk on the *C* zone to a depth of 275 feet with levels at 125 and 250 feet. A service adit at the 60-foot level was driven. By the end of the year, 39 feet of crosscutting and 324 feet of drifting were completed.

In 1951, 196 feet of drifting was done on the 125-foot level, and 51 feet of crosscutting and 177 feet of drifting on the 250-foot level. Total development work at the year's end was 934 feet of drifting, 1,096 feet of crosscutting, and 52 feet of raising. Five diamond-drill holes, totalling 324 feet, were drilled underground. Work was suspended on the property in 1951.

The property was reopened in 1954 by Cardiff Uranium Mines, Limited, and a new mining plant installed consisting of new headframe, power-house building, water tank, machine shop and boiler room, office building, powder magazine, cap house, and pump-house. Underground exploration on the *C* zone consisted of 66 feet of drifting on the 125-foot level. The slope length of the 50-degree inclined shaft is 311 feet. Total development on the *C* zone at the end of 1954 consisted of:

Level	Drifting	Crosscutting
	feet	feet
125-foot	594	40
250-foot	175	50
Adit (840E1)	—	95

Surface trenching in 1954 amounted to 270 feet.

General Geology

The Cardiff Uranium calcite-fluorite-uraninite veins lie within a band of limy paragneiss and amphibolite near its contact with crystalline limestone. The crystalline limestone underlies the western part of the Cardiff Uranium property. It dips 40–60 degrees to the east and strikes generally about N.10°E. The limestone is overlain by scapolitic amphibolite, limy paragneiss, and biotite amphibolite in a

[1] J. Satterly, *op. cit.*, pp. 94–95.

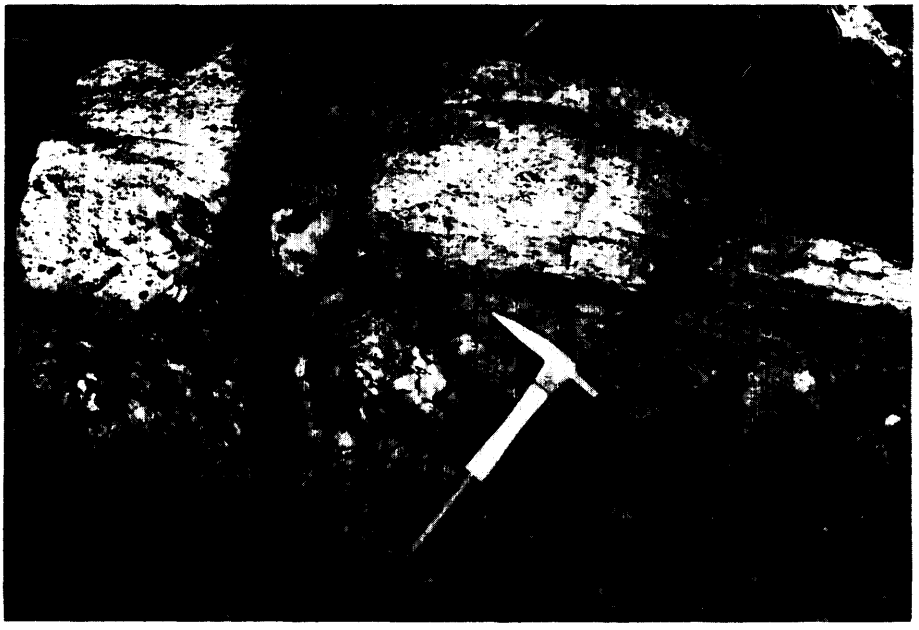
[2] S. E. Wolfe and Nelson Hogg, *Report on Some Radioactive Mineral Occurrences in Cardiff and Monmouth Townships, Haliburton County, Ontario,* Ont. Dept. Mines, P. R. 1948-8, pp. 5–8.

band 300–500 feet wide. These gneisses are syenitized and grade into hybrid, syenite gneiss. The amphibolite and syenite-gneiss zone is intruded by syenite and granite pegmatites.

The calcite-fluorite-uraninite veins occur chiefly within the amphibolite-para-gneiss band and in the syenite gneisses near the limestone contact. The veins are lenticular, pod-shaped, and often irregular in shape, but in general strike and dip in conformity with the structure of the country rocks.

Description of Occurrences

South Zone. — The main ore development has been carried out on the south zone where the 275-foot inclined shaft has been sunk. In September, 1954, the shaft was full of water, and the 125-foot and 250-foot levels were not accessible to the authors. The surface showings and adits were examined.



Calcite-fluorite-apatite vein at Cardiff Uranium Mines, Limited. Note banding in the vein; white is calcite, dark spots and streaks are purple fluorite.

On the hillside above the northern adit on the south zone there are two calcite-fluorite veins, 30 feet apart, striking N.10°E. and dipping 50°E. The west or main vein is exposed over a length of 100 feet and has a width of 4 to 5 feet. A sample of this vein material taken by Wolfe and Hogg assayed 25.96 percent CaF_2. The vein material is quite radioactive, and several uraninite crystals were observed by D. F. Hewitt. This vein was picked up in the adit where it is exposed in the south drift over a length of 80 feet. In the adit the vein has a width of 4 feet; several uraninite crystals were observed. A. G. MacKenzie, engineer on the property from 1948 to 1952, reports that this ore averages about 0.052 percent U_3O_8. However, since the sampling was done by channelling across the face and back it was quite inadequate for this type of occurrence. The only representative type of sampling on this type of coarse uraninite mineralization is a bulk sample of the vein material from the drift.

In the north drift the vein splits into several narrow veinlets and cannot be considered ore. At the south end of the drift the vein is exposed 4 feet wide and is open to the south.

The second or east vein exposed on surface in a trench has an exposed length of 35 feet and a width of 3 to 4 feet. The content of fluorite is low, and the vein is only slightly radioactive. This vein was not intersected in the adit.

A calcite-fluorite vein that appears to be the one developed on the 125- and 250-foot levels outcrops to the south of the shaft for a length of 200 feet. Where seen by the writer in exposures in the footings for the mine plant, the vein ranged from 2 to 4 feet in width and consisted of calcite, fluorite, uraninite, biotite, apatite, scapolite, and pyroxene. High radioactivity was recorded throughout its length.

The following description of the south zone is taken from A. G. MacKenzie's report on the property:[1]

"The main development is now concentrated on the south zone where the main discovery had been explored in 1947–48 by diamond-drilling and the driving of an adit that intersected the vein about 65 below the surface outcrop. Further drilling in 1949 extended the ore zone for a total length of 1,400 feet, a vertical depth of 400 feet, and an indicated width of from 3 to 30 feet.[2] It has a strike of N.10°E. and an easterly dip of about 45 degrees. On surface the vein is exposed continuously for a length of 110 feet and an average width of 5 feet. To the south it passes under overburden, and at the north end it splits into two narrow veins. A character sample of the calcite-fluorite material, weighing about 20 pounds, taken by the Ontario government geologists, Wolfe and Hogg, was analyzed by the Provincial Assayer and returned 25.96 percent CaF_2. The Geiger Mueller counter indicated radioactivity along the full length of the vein.

"In the adit the main vein has been exposed for a length of 80 feet, a width of 3.7 feet, and a dip of 40 degrees. The south face is still open, whereas in the north drift, the vein splits into several narrow, irregular branches and shows evidence of dying out in this direction. Samples taken from this drift averaged 22.35 percent CaF_2 over an average width of 6 feet, and the last sample taken from the south face ran 25.42 percent CaF_2. Eight bulk samples taken at 10-foot intervals along the back of the drift were sent to the Provincial Assayer and returned an average of 0.052 percent U_3O_8 (radiometric) across an average width of 5 feet.

"In 1950 another adit was driven for a total of 181 feet as the haulageway for a 50-degree, inclined, two-compartment shaft, which was then raised to collar on the surface, a distance of 52 feet, and sunk to a depth of 275 feet below the adit horizon. A first level, 125 feet, and a second level 250 feet below the adit were opened up.

"On the first or 125-foot level, 39 feet of crosscutting and 520 feet of drifting have been completed, of which 395 feet are in ore. To the north of the crosscut, an ore shoot having a length of 175 feet, an average width of 44 inches, and an average 0.052 percent U_3O_8 (radiometric) and 13.88 percent CaF_2 has been exposed. To the south of the crosscut, three ore shoots have been developed as follows: the first having a length of 60 feet and an average width of 33 inches is averaged at 0.113 percent U_3O_8 (radiometric) and 19.57 percent CaF_2; the second having a length of 75 feet and an average width of 38 inches is averaged at 0.03 percent U_3O_8 (radiometric) and 24.07 percent CaF_2; the third shoot, which is still open at the face, having a length of 85 feet and an average width of 40 inches is averaged at

[1] A report for Cardiff Fluorite Mines, Limited, by A. G. MacKenzie, resident engineer, 1953.

[2] D. F. Hewitt notes that although calcite-fluorite vein material carrying uraninite has been found in drilling over a length of 1,400 feet, there is no indication of any continuous vein structure; the occurrences are interpreted by him rather as a series of narrow lenticular veins lying within a zone at least 200 feet wide and are thought to consist of several pods and lenses throughout the 1,400-foot length.

0.20 percent U_3O_8 (radiometric) and 15.70 percent CaF_2. A diamond-drill hole, located 70 feet ahead of the present south face, indicates that mineralization continues and is thought to be a continuation of the 85-foot ore shoot.

"On the second or 250-foot level, 51 feet of crosscutting and 177 feet of drifting have been done. The ore shoot developed at this horizon has a length of 113 feet, an average width of 48 inches, and an average value of 0.14 percent U_3O_8 (radiometric) and 16.17 percent CaF_2. Both faces are open.

"A tabulation of the above-mentioned ore shoots follows:

Level	Length	Width	U_3O_8 (radiometric)	CaF_2
	feet	inches	percent	percent
Adit	80	60	0.052	20.00
125	175	44	0.052	13.88
125	60	33	0.113	19.57
125	75	38	0.030	24.07
125	85	40	0.200	15.70
250	113	48	0.140	16.17
	Averages	44	0.095	18.10

"The above averages are based on face-channel samples. The widths shown in the table are those disclosed by drifting and are not necessarily total widths, since no slashing was done during the development period to ascertain the full widths. The average width, indicated by diamond-drilling, is 11 feet 6 inches. The aggregate length of the four shoots on the first level is 395 feet. This average [U_3O_8] is partially checked by a bulk sample sent to Ottawa, which from chemical assay, returned 0.087 percent and 0.12 percent U_3O_8 from the south and north sections of the first level."

At the south end of the south zone, diamond-drilling and trenching on *B* zone have indicated several irregular pods of calcite-fluorite material in syenite gneiss and pegmatite. Very low radioactivity was noted in these veins.

North Zone. — Exploration on the north zone consists of trenching, stripping, diamond-drilling, and one adit. In seventeen trenches in the southern part of the north zone described by Wolfe and Hogg, they concluded that "the greatest true width (of vein) observed is about 5 feet, and the average fluorite content would not be greater than 15 percent. The readings obtained on the Geiger Mueller counter indicate that scattered crystals of uraninite occur throughout the calcite-fluorite lenses."

In the *E* zone or northern section of the north zone, surface trenching has indicated the presence of a flat-dipping, calcite-fluorite vein over 200 feet long and up to 6 feet wide; low radioactivity was noted. In the adit driven eastward below this vein structure no calcite-fluorite vein material was cut. However, uraninite crystals occur within a yellow-brown syenite dike, and a considerable amount of drifting was done on this uraninite-bearing zone. The uraninite occurs in crystals up to ½ inch in size along the contact and within the dike. A bulk sample sent to the Mines Branch at Ottawa is reported by MacKenzie to have averaged 0.135 percent U_3O_8 (chemical). Uraninite also occurs in a calcite-hornblende-mica vein 2 feet wide.

Centre Lake Uranium Mines, Limited

(See maps, Figures 2, 4, and 5, in back pocket)

Centre Lake Uranium Mines, Limited, holds a block of 54 claims, E.O.5936–5939, E.O.6101–6105, E.O.6036–6042, E.O.6059, E.O.6064–6100, and three patented lots in lots 23–30, concessions IX to XIII, Cardiff township, Haliburton county. The block of claims lies northeast of Paudash Lake. Centre Lake is located in the northern part of the property.

The property may be reached by a good motor road from highway No. 28. It is 14 miles southeast from Bancroft.

The property was managed in 1953 and 1954 by Consolidated Ranwick Uranium Mines, Limited, an associate company of Ventures, Limited. This company relinquished its duties on November 30, 1954. S. C. Brown was mine manager and L. Kelly, geologist, during the active exploration of the property.

The company carried out exploration on a north-south zone of radioactive pegmatite dikes and sills occurring in a band of syenitized paragneiss and amphibolite that lies between crystalline limestone on the east, and leuco-granite gneiss on the west. This zone has a strike length on the property of about 16,000 feet.

Development

The zone of pegmatite dikes has been explored by surface stripping and trenching at about 50-foot intervals largely in the central and northern part of the property, over a length of 4,000 feet. A section of the zone was cross-sectioned by 30 diamond-drill holes, totalling 14,242 feet, in 1953. Underground development to further explore and allow bulk sampling of two of the dikes was carried out from an adit in 1953 and by a shaft and a second level in 1954.

A summary of the diamond-drilling and underground development follows:

	feet
Diamond-drilling:	
Surface 1953 (31 holes)	14,242
1954 (6 holes)	2,700
Underground (13 holes)	1,143
Underground development:	
Shaft (vertical, three-compartment, second level at 205 feet)	233.8
Adit level:	
Drifting	995
Crosscutting	510
Second level:	
Drifting	1,320
Crosscutting	418
Raising	188

The shaft is situated on claim E.O.5936, the north half of lot 27, concession XI.

Surface Geology

Surface mapping of the pegmatite in the area of the underground workings south to, and including, the south zone shows that the pegmatite forms lenticular bodies, either narrow dikes or sills, or broad lenses intrusive into metasediments. These bodies may parallel, but also transgress, the gneissic structure of the metasediments at small or large angles. They vary from a few feet to 80 feet in width, and from a few feet to 400 feet in length.

The metasediments include hornblende gneiss or amphibolite, biotite-hornblende gneiss, biotite-scapolite gneiss, biotite paragneiss, biotite-garnet-sillimanite gneiss. Minor interbeds of crystalline limestone and mica pyroxenite are present. The metasediments have been syenitized, the development of hybrid syenite gneiss increasing in amount northwards.

As may be seen in the underground workings the dikes are made up of a number of different lithological units such as granite pegmatite, syenite pegmatite, and leuco-granite gneiss. These units may exhibit gradational or sharp contacts between each other. It may be noted the boundaries are usually transitional along, but sharply defined across the strike. Evidence of the assimilation of the country rock by the pegmatite is shown by the presence of residual bands of hornblende gneiss, streaks of mafic minerals near contacts in the dikes, and syenitized gneiss zones transitional to pegmatite at the footwall of dikes. In the pegmatite, the feldspar

Headframe at Centre Lake Uranium Mines, Limited.

may be yellow-brown, pink, or deep, brick-red in colour, the quartz is grey to black; pyroxene forms rounded crystals or crystal aggregates either arranged in stringers parallel to the dike contacts or in areas from a few inches to 10 feet in diameter. Deep-purple fluorite is a characteristic accessory in many of the dikes. Other minerals include green apatite, titanite, zircon in minute crystals, pyrite, pyrrhotite, molybdenite, and radioactive minerals. The radioactive minerals tend to occur in clusters. Uranothorite is the common radioactive mineral visible to the eye and occurs singly or as clusters of black grains in association with red-stained smoky quartz, clusters of pyroxene, and fluorite. The deep brick-red feldspar around an uranothorite grain is frequently bleached to a yellow-brown colour. From samples collected by J. Satterly, S. C. Robinson of the Geological Survey of Canada has confirmed the identification of uranothorite, and also identifies pyrochlore from trenches Nos. B-5 and B-10, and uraninite from trench No. B-18. Umangite, a copper selenide, was also identified from trench B-18.

Geiger Readings on Pegmatite Dikes

Geiger readings were taken at 1-foot intervals by placing the geiger ratemeter end to end along trenches across the full width of a number of radioactive pegmatite dikes. Through the courtesy of S. C. Brown, mine manager, J. Satterly was supplied with chemical assays for U_3O_8 for the trenches tested. The background count is approximately 500 counts per minute. The results are tabulated below:

Trench No.	Length of pegmatite in trench (full width of dike)	U_3O_8 assay (chemical)	Geiger readings (average)	Times background count equal to 0.1 percent U_3O_8 (chemical)
	feet		counts per minute	
B-1	29.0	0.052	15,000	58
B-2	23.5	0.062	14,000	45
B-3	18.0	0.049	10,700	44
B-4	18.0	0.048	12,300	51
B-8	12.0	0.024	6,000	50
B-8	28.0	0.042	9,500	45
B-25	5.0	0.053	12,000	45
B-25	4.0	0.117	27,000	46
				Average 48

The average background count equivalent to 0.10 percent U_3O_8 (chemical) is $\times 48$ or 24,000, that is, 24 on the 50M scale of the ratemeter. This shows that a much higher reading is necessary to indicate an interesting radioactive occurrence when uranothorite is the chief radioactive mineral present. It may be noted that uranothorite in the Bancroft area contains about 45 percent ThO_2 and only 18 percent U_3O_8.

Geology of Adit Level

On the adit level a crosscut was driven west 320 feet to intersect two pegmatite dikes, Nos. 1 and 2. Drifting and small crosscuts have outlined these dikes for several hundred feet. A crosscut and drift from the south drift on No. 2 dike explored a third dike.

In the crosscut, amphibolite and interbedded paragneiss are exposed for the first 135 feet from the portal, followed by 50 feet of biotite paragneiss containing a 2-foot interbed of crystalline limestone. No. 1 dike is then intersected for a width of 25 feet. On the hanging-wall or east contact of the dike there is 2 feet of paragneiss injected by *lit par lit* pegmatite, and 1–2 feet biotite-garnet gneiss. On the west or footwall contact of the dike there is 3–4 feet of biotite paragneiss with *lit par lit* pegmatite.

Between Nos. 1 and 2 dikes the crosscut traverses 60 feet of biotite-garnet-sillimanite gneiss. No. 2 dike has an exposed width of 25 feet in the crosscut, and again there is a contact zone of 3–4 feet of *lit par lit* pegmatite stringers in biotite paragneiss at the hanging-wall contact. The dike is underlain by biotite-peristerite gneiss and biotite paragneiss. The metasediments strike about N.20°–30°E. The average dip is about 46°E. The pegmatite dikes slightly transgress both the strike and dip of the gneisses at small angles.

Lithology of Pegmatite Dikes

No. 1 dike has been exposed by drifting for a length of 400 feet, and is 25–90 feet in width. The dike is composed of a number of lithological units, the most

common being granite pegmatite and leuco-granite gneiss. The sequence of units may be illustrated by a description of the dike as seen on the south wall of the main crosscut. Here the dike is intrusive into biotite-garnet-sillimanite gneiss, which is altered at the contact for 2–3 feet to a biotite gneiss injected by *lit par lit* white granite pegmatite stringers, which form 25–50 percent of the rock. No garnets remain in the contact-zone gneiss. The dike has an exposed width of 25 feet and, from the hanging-wall to the east to the footwall to the west, consists of the following units:

1) Pink leuco-granite pegmatite, 2–3 feet wide, which becomes very quartz-rich and highly fractured adjacent to unit 2. This unit has high radioactivity.[1]
2) Biotite paragneiss, 1 food wide, injected with pink, *lit par lit* feldspar at the floor, passing upwards into a mafic-rich pegmatitized zone with disseminated pyrrhotite and fine-grained, dark-purple fluorite in streaks. This unit also has high radioactivity.
3) Pale-pink, fine-grained leuco-granite, 1 foot wide, with quartz lenticles, some peristerite, chlorite on fractures, but the over-all mafic mineral content is low. Radioactivity is low.
4) Pegmatitized band, ½–1 foot wide, fingers downwards from back to floor into biotite gneiss stringers with a wedge of leuco-granite at the floor. Deep-purple, almost black, streaks of fluorite are present, parallel to the walls, also yellow-brown peristerite and smoky quartz. Radioactivity is low-medium.
5) Pale-pink, fine-grained leuco-granite or granite gneiss, 2 feet wide, as above (No. 3) with quartz lenticles. It passes gradationally across 6 inches into No. 6.
6) Granite pegmatite or pegmatitic granite with pink and buff feldspar, smoky quartz, chloritized biotite in streaks, and scattered pyroxene crystals. Marked low-medium radioactivity.
7) Medium-grained, pink, leuco-granite or granite pegmatite with scattered mafic minerals. Marked low radioactivity. Units 6 and 7 form the bulk of the dike's width.
8) A quartz-rich, pyroxene-rich zone, 1–2 feet wide, at the footwall of the dike marked high radioactivity. This zone is composed in part of highly shattered smoky quartz, or quartz-pyroxene aggregate with abundant disseminated pyrite. Uranothorite, in grains 1/16–1/8 inch, was noted in the quartz.

This characteristic separation into a leuco-granite gneiss centre with granite pegmatite towards the walls and highly shattered quartz-rich zones at the footwall persists in the dike for 150 feet to the north. The quartz-rich zone is 2 feet wide and bounded on both sides by bands, ½ foot wide, of pink granite pegmatite. North of this the dike changes in character to a very coarse, yellow-brown to red peristerite-pyroxene granite pegmatite with abundant disseminated pyrite, and occasional patches of uranothorite grains. The uranothorite occurrences are adjacent to the footwall or to gneiss inclusions. Where the dike widens out to 90 feet and is exposed in the north crosscut, it is mainly a peristerite-pyroxene granite pegmatite with a 4-foot band of leuco-granite gneiss below the hanging-wall. That part of the dike forming a right angle at the footwall is a buff and red peristerite granite pegmatite rich in sulphides and a red-stained, crushed, quartz-rich tail. This part of the dike contains disseminated uranothorite in grains, ⅛ inch or less, which are most abun-

[1]The pegmatite dikes on the adit level are marked by four colours of chalk indicating four grades of radioactivity based on the following readings on an Electronic Associates geiger ratemeter fitted with probe: >30 (5M) marked in blue; 25 to 30 (5M) in white; 20 to 25 (5M) in red; and <20 (5M) in yellow. These are referred to in the descriptions as high, high-medium, low-medium, and low radioactivity, respectively.

dant near the contact with the biotite paragneiss. North of this crosscut the dike is mainly a coarse, brick-red, pyroxene granite pegmatite. Accessory green apatite was noted in a few places, and several patches of uranothorite grains were observed near the extreme north end of the drift. These occurrences of uranothorite are in feldspar showing a bleached halo, of 1–½-inch radius in one case, and in fluorite-pyroxene aggregates.

No. 2 dike has been drifted for 140 feet to the south and 210 feet to the north of the main crosscut. It pinches out at both ends on the adit level and has a length of about 350 feet. The average width of the dike is not known, it may be less than 10 feet. This dike shows great variations in lithology along its strike. South of the main crosscut it is a coarse, yellow-brown to dark-green pyroxene granite pegmatite characterized by smoky quartz, peristerite, and much pyroxene. Accessories include fluorite, abundant disseminated pyrite and pyrrhotite, and rarely, molybdenite. The sulphides diminish in amount away from the footwall. It is uniform in character from hanging-wall to footwall at the crosscut. The tail of the dike is an intensely shattered grey to red-stained, quartz-rich mass. To the north the dike changes gradually in character from a yellow-brown pyroxene granite pegmatite to a red pyroxene granite pegmatite. This change takes places first of all by the reduction in the amount of pyroxene, the clots of that mineral becoming smaller, with the result that the rock appears lighter in colour. Then, by the introduction of reddish-brown to brick-red feldspar towards the north end of the drift, the dike becomes a red pyroxene granite pegmatite.

In a search of No. 2 dike for radioactive minerals 77 patches of brown to black uranothorite grains were found. These grains are mostly 1/16–1/4 inch across, very occasionally 1 inch, and rarely, in coarse aggregates, 1–3 feet across. The uranothorite occurs most frequently in a red-stained quartz, to a lesser extent in pyroxene, but rarely in feldspar. Although it may be found at any position in the dike, it is especially abundant at or within 1 foot of the footwall or adjacent to inclusions within the dike. Purple fluorite was noted in some cases in close association with occurrences but is not always present. That part of the dike south of the main crosscut is richer in uranothorite occurrences than that to the north. As noted above, the dike to the south is richer in pyroxene, peristerite feldspar, and has abundant accessory, disseminated, fine to coarse pyrrhotite and, to a lesser extent, pyrite.

No. 3 dike is exposed for a length of 90 feet, and is from 1–18 feet wide. The greatest width includes large inclusions of biotite paragneiss and *lit par lit* pegmatite. This dike is a pink granite pegmatite with smoky quartz, accessory fluorite, and locally abundant coarse pyrite. Molybdenite was found, and also a few grains of a steel-grey mineral identified by S. C. Robinson[1] and D. A. Moddle[2] as anatase.

Lithology of Pegmatite Dikes on the Second Level

On the 2nd level, 125 feet below the adit level, exploration consists of a main crosscut that intersected seven pegmatite dikes and lateral work on three dikes. The total amount of crosscutting and drifting is 1,738 feet. The lithology of the seven dikes is described below.

No. 7 dike, which is the one nearest to the shaft, is only exposed in the main crosscut. It is a coarse yellow-brown pyroxene syenite pegmatite with abundant accessory fluorite in streaks, with clots of pyroxene crystals. The dike is about 20 feet wide. This width includes much syenitized gneiss. The country rock is a biotite paragneiss with minor bands of amphibolite.

No. 6 dike is only exposed in the main crosscut. The dike is about 3 feet wide

[1] S. C. Robinson, Geological Survey of Canada.
[2] D. A. Moddle, Provincial Assayer, Ontario Department of Mines.

and dips 40°E. It is a buff and pink granite pegmatite with smoky quartz and accessory fluorite. On the south wall of the crosscut there is exposed an irregular offshoot of coarse granite pegmatite with biotite, pyroxene, calcite, and magnetite. The country rock is biotite paragneiss and a grey siliceous quartzitic feldspar gneiss.

No. 5 dike is exposed in the main crosscut, and in two drifts in which it can be seen to lens out. It has an apparent length of about 130 feet, and in the crosscut, a width of 10–12 feet. It dips 55°E. The dike as mapped includes bands of syenitized gneiss. It is a very coarse pyroxene granite pegmatite with brick-red feldspar, smoky quartz, and purple fluorite, the latter often abundant in places. At the footwall on the south side of the crosscut grains of uranothorite are abundant in bands rich in red-stained quartz.

No. 4 dike is exposed in the main crosscut as a wedge-shaped mass of coarse, brick-red syenite pegmatite tapering from 6 feet on the north to 1 foot on the south wall of the crosscut. It is bounded by syenitized gneiss that widens to 7 feet on the south wall. The gneissic structure dips 50°E. An offshoot of the dike angles across the face of the south wall. Uraninite occurs in the brick-red syenite stringers of the syenitized gneiss (hybrid syenite gneiss). The country rock is biotite paragneiss and syenitized gneiss.

No. 3 dike is exposed only in the main crosscut. It is a pink granite pegmatite, 3–6 feet wide. Mafic clots have a minor amount of associated fluorite. The country rock is biotite paragneiss.

No. 2 dike has been exposed in the main crosscut and by drifting and slashing for a length of 280 feet. The dike is 5–35 feet wide, but a number of inclusions of *lit par lit* injected paragneiss are present. Possibly the extension of this dike, 110 feet to the south, was cut in a curving crosscut. The country rock at the footwall is biotite paragneiss and hybrid syenite gneiss and at the hanging-wall is biotite-garnet-sillimanite gneiss with a zone of gneiss injected with *lit par lit* pegmatite at the contact. To the south the dike lies wholly within the biotite-garnet-sillimanite gneiss. In the vicinity of the main crosscut the dike is mainly a pyroxene syenite pegmatite with patches of granite pegmatite.

A radioactive-rich face of the dike (August 25) in the south drift was a granite pegmatite rich in mafics and sulphides containing black uranothorite grains in red- and green-stained pyroxene.

From 50 feet south of the main crosscut and beyond the dike is a pink granite pegmatite. The 4-foot dike seen in the curving crosscut is a granite pegmatite with lenses of smoky quartz containing much pyrite and 1–2-inch stringers of purple fluorite.

In the raise on No. 2 the dike is a pyroxene-rich granite pegmatite with patches of smoky quartz, peristerite, white calcite, and apatite.

The footwall zone is a 3-inch band of granite gneiss, and the hanging-wall is a band of quartz, 2–3 inches wide.

No. 1 dike is exposed by north and south drifts from the main crosscut for a length of 460 feet, and drilling from the face of the north drift extends this distance an additional 70 feet. In the south drift the width is 4–15 feet, the average being 9 feet. In the north drift, drill holes to the east and west of the drift indicate that the pegmatite mass has a maximum width of 170 feet. As on the adit level, the dike in the crosscut, 50 feet to the south and 50 feet to the north, is mainly a pale-pink. leuco-granite gneiss with minor amounts of granite pegmatite. In the crosscut both the hanging-wall and footwall zones of the dike are shattered and contain abundant quartz. From 115 to 200 feet south of the crosscut the dike becomes a pyroxene granite pegmatite with calcite as a common accessory and sulphides locally abun-

dant either disseminated or in stringers from inches to 5 feet in length. Most of the sulphide is pyrite, but molybdenite was also noted. The occurrence of calcite in the dike may indicate that the dike is here cutting the extension of the limestone band intersected in the main crosscut. To the north of the main crosscut the dike or mass is largely leuco-granite gneiss with patches of granite pegmatite.

In the drift, at about the maximum width of the mass, the leuco-granite is spotted with pyroxene crystals ¼–½ inch across. These are here and there aggregated into clots as much as 1 foot across, with accessory fluorite.

In the dike near the north end of the workings the clots of pyroxene increase in amount, and the red colour is intensified. Adjacent to the wedge of paragneiss at the north-end, footwall enrichment can be seen, the dike being a granite pegmatite characterized by red and smoky quartz, coarse pyrite stringers with calcite, and patches of uranothorite grains.

Footwall enrichment was also noted at a point about 80 feet north of the main crosscut. This is a zone ½–1 foot thick rich in mafic minerals, fluorite and pyrite containing abundant black uranothorite grains in red-stained quartz.

Kemp Showing

The Kemp showing is on claim E.O.6036, the north half of lot 26, concession XI, and has been explored by two trenches, 144 and 173 feet long, on a hill to the south of Auger Lake.

In trench No. K.1, highly granitized biotite amphibolite is cut by a number of pegmatite dikes intersected for widths in the trench 1–30 feet. These dikes are hornblende granite pegmatite with accessory zircon, titanite, and radioactive minerals. Geiger readings give spot highs of 18 to 40 (10M), and occasionally on the 50M scale, where radioactive minerals may be seen by eye. Minerals identified by S. C. Robinson of the Geological Survey of Canada on a sample from this trench are uranothorite, magnetite, and zircon.

Trench No. K.2 runs east from the old Monck road just south of Auger Lake, and is 400 feet north of trench No. K.1. It also exposes a number of narrow granite pegmatite dikes and a 70-foot sill of pink leuco-granite gneiss cutting biotite paragneiss and amphibolite granitized or injected with *lit par lit* pegmatite. The gneissic structure trends N.10°E. and dips 40°–50°E. Two spot-high geiger readings, 20 (10M) and 45 (10M), were obtained at a dike contact, and at a spot in a dike where coarse magnetite was abundant.

Mica Pyroxenite Showing

An occurrence of uraninite in mica pyroxenite on claim E.O.6078, the north half of lot 29, concession XII, Cardiff township, was opened by two pits for mica many years ago.

The mica pyroxenite is exposed in a trench and pit, and in two cross trenches 50 and 100 feet to the north. Distribution of rock types in the pits and trenches would indicate a body of mica pyroxenite 50–90 feet wide, with exposed length of 100 feet. It lies within an assemblage of biotite amphibolite and hybrid syenite gneiss cut by sills or dikes of leuco-granite and syenite pegmatite.

The west pit is 11 by 7 by 6 feet deep. On the east side, leuco-granite gneiss is exposed, underlain by a few feet of biotite-hornblende gneiss, and followed by deeply-weathered mica pyroxenite containing occasional pods of coarsely crystalline white to pink calcite. The gneiss strikes N.22°E. and dips 50°E. In the southwest corner of the pit a spot-high geiger reading of 40 (50M) was obtained. A grab

sample taken at this spot was panned, and uraninite in broken rough crystals or grains to ¼ inch across was recovered. Crystals of uraninite, ½–1 inch across, have been found by others in this pit. A trench to the west exposes an additional 35 feet of pyroxenite. Geiger readings range from 20 (10M) to 5 (10M) at the west end. On the old dump from the pit, green apatite crystals occur in the calcite, and the mica books, 2–4 inches across, may be seen.

The two trenches, Nos. B-67 and B-68, 50 and 100 feet north respectively of the pits, expose lengths of 95 and 45 feet of mica pyroxenite. These distances include interbeds of crystalline limestone, biotite-hornblende gneiss, and dikes of leuco-granite and syenite pegmatite. The pyroxenite contains pods of calcite with green apatite crystals, and occasional books of mica. Spot-high geiger readings on the 50M scale were recorded at the contacts of the mica pyroxenite and calcite pods, but away from these contacts the readings were on the 10M scale or lower. A grab sample was taken of the decomposed rock from trench B-67 at a spot reading 26 (50M) on the ratemeter, and uraninite was recovered by panning.

North Showing

The north showing is exposed by trenches and stripping on claim E.O.6105, the south half of lot 29, concession XIII.

A stripping, 70 feet long and about 10 feet wide, exposes irregular stringers and lenses, ½–5 feet wide, of pyroxene syenite pegmatite cutting hybrid hornblende syenite gneiss. The stringers are parallel or transgress the dip and strike of the gneiss at small angles. Purple fluorite forms veins or fills fractures in the pyroxene or surrounds pyroxene aggregates or euhedral feldspar. Accessory minerals include apatite in clusters of crystals, magnetite in coarse aggregates up to 4 inches across, and uranothorite as rounded crystals or "cigars." Some of the larger crystals measured 1½ by ¾ and 2½ by 3/10 inches. The uranothorite crystals or clusters of grains gave spot-high geiger readings of 25 to 35 (50M). Some of the radioactive mineral is altered to a yellow powder.

In two trenches to the south of the stripping near the No. 2 post of claim E.O.6105, dikes of pyroxene granite pegmatite and leuco-granite gneiss are exposed. The pyroxene is concentrated locally into stringers or clots. Spot-high geiger readings were obtained at clusters of uranothorite grains.

Croft Uranium Mines, Limited

(See maps, Figures 2 and 6, in back pocket)

Croft Uranium Mines, Limited, holds a block of 51 claims on the east boundary of Cardiff township, Haliburton county, and in adjoining Faraday and Herschel townships, Hastings county. The property consists of the following: lot 30 and the north half of lot 31, concession XIII, lots 26–32, concessions XIV and XV, and lots 30–32, concession XVI, Cardiff township; lots 33 and 34, concession I, Herschel township; lots 32 and 33, concession XV, and lot 33, concession XVI, Faraday township. The property is 10 miles west of Bancroft, the adit being 1.1 miles south of the Bancroft-Wilberforce road.

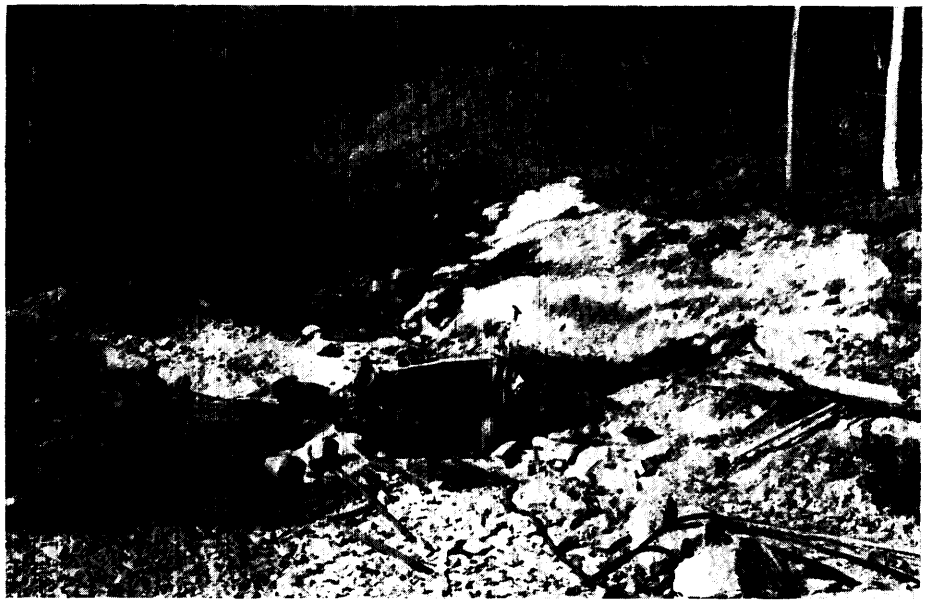
Exploration has been carried out on radioactive pegmatite dikes occurring in the same zone as those at Centre Lake Uranium Mines, Limited. The main or *J* zone has been explored by surface trenches and by 23,000 feet of diamond-drilling for a length of 4,000 feet, and by underground development from an adit 70 feet below the surface. Total drifting amounted to 1,211 feet, and crosscutting to 485 feet. The adit reached the *J* zone after traversing the metasediments for 360 feet. Drifts to the north and south followed the dikes, which are lenticular bodies arranged

en échelon along the contacts of lenticular masses or pods of biotite-garnet-sillimanite gneiss (augen-gneiss) that form a part of the series of metasedimentary gneisses.

The *H* zone, which lies on strike about 1,000 feet to the south of the *J* zone, has been explored by surface trenching and 7,500 feet of diamond-drilling over a length of 500 feet.

In surface trenches on the *J* and *H* zones high geiger counter readings can be obtained in many places, and coatings of secondary yellow uranium minerals are seen in many of the trenches. As exposed in surface trenches on the *J* zone the uranium-bearing pegmatite of the Croft property is a biotite granite pegmatite in which the pink feldspar shows porphyroblastic texture.

A south zone has also been explored from surface by 5,000 feet of diamond-drilling for a length of 1,000 feet adjacent to the north boundary of the Centre Lake property.



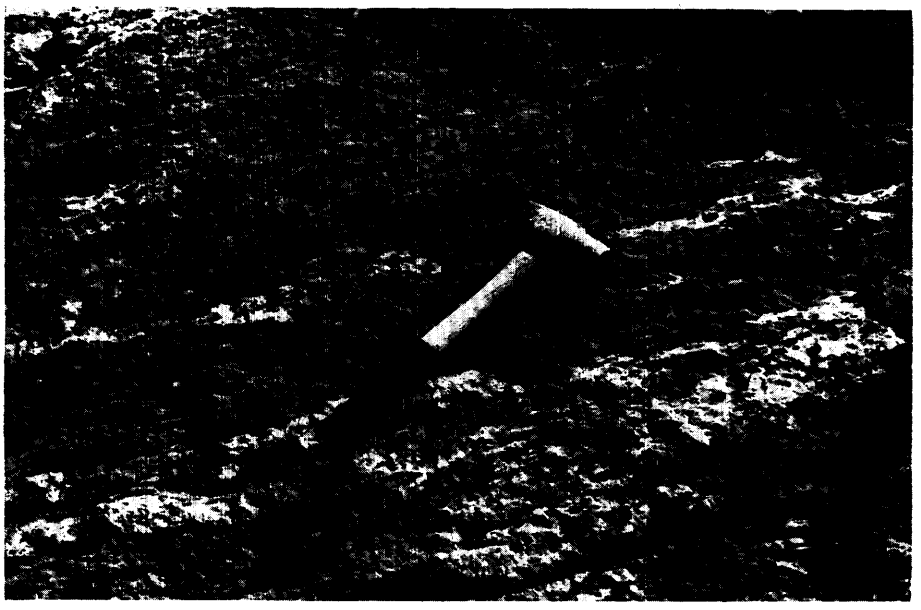
Adit at Croft Uranium Mines, Limited.

The zone, referred to above, is a band of metasediments and hybrid gneisses with pegmatite dikes or sills lying between limestone to the east and granite gneiss to the west. The metasediments consist of hornblende gneiss, amphibolite, biotite paragneiss, and biotite-garnet-sillimanite gneiss known locally as "augen-gneiss". The sediments adjacent to the dikes have been injected by *lit par lit* pegmatite or granitized so that some of the wall rock is a true migmatite.

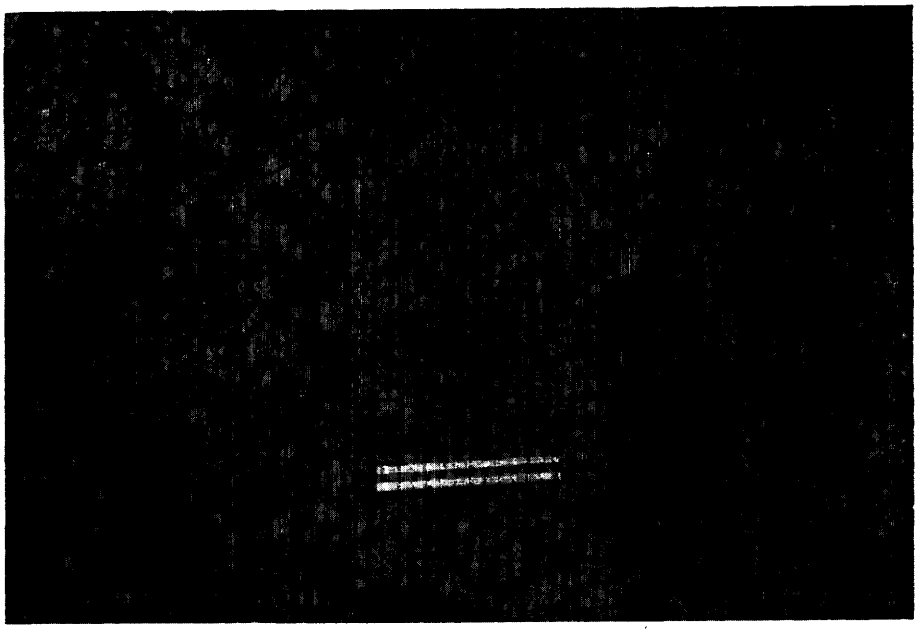
Pegmatites of the Adit Level

The underground development by drifting, crosscutting, and diamond-drilling has outlined four lenticular bodies of pegmatite, which for convenience are numbered 1 to 4, starting at the south end of the workings.

Dike No. 1 is a lenticular body about 150 feet long, which fingers out to the north and south. At the face of the south drift it is 3½ feet wide but widens northwards to a maximum width of 55 feet at the crosscut. This width includes a few horses of paragneiss. The country rock is a biotite paragneiss containing 10–25 per-



Biotite-garnet-sillimanite gneiss (locally known as augen-gneiss) on the property of Croft Uranium Mines, Limited. The dark rounded grains are garnet, and the thin, white streaks are sillimanite.



Biotite granite pegmatite at Croft Uranium Mines, Limited. Feldspar crystals (porphyroblasts) have developed by "pegmatitization" of a biotite gneiss.

cent *lit par lit*, grey pegmatite. The dike is mainly a biotite granite pegmatite consisting of pink feldspar, 1–2 inches across, and quartz and biotite in streaky aggregates. Towards the crosscut, where the dike widens, it becomes a leuco-granite pegmatite, the biotite content being low.

A good section through the biotite-garnet-sillimanite gneiss is exposed in the crosscut between dikes Nos. 1 and 2. The gneiss has been injected by pink and white granite pegmatite stringers and lenses, which may form 10–25 percent of the rock. The garnets in the gneiss are usually ¼–½ inch across, but where they occur in the pegmatite stringers they may be as much as 1½ inches across. Black tourmaline in grains or aggregates ½–3 inches across is not uncommon in the pegmatite stringers.

Dike No. 2 is a sinuous lenticular body with a drift length of about 580 feet. To the south of the adit crosscut it lies along the contact of the augen-gneiss to the east and biotite paragneiss to the west. Much of the augen-gneiss adjacent to the dike is injected with *lit par lit* pegmatite. The wall rock, in part, is a hybrid granite gneiss or migmatite. To the north the dike lies within the paragneisses and lenses out against a lenticular mass of the augen-gneiss. To the south of the adit crosscut the dike has the appearance of a porphyroblastic aggregate of white and pink feldspars, ¼–3 inches across, with the interstices filled with smoky quartz, and a minor amount of biotite. To the north it is a coarse, pink to brick-red granite pegmatite with smoky quartz that is frequently highly shattered. The quartz-rich sections are indicative of the more radioactive sections of the dike.

Dike No. 3 is a narrow lenticular mass about 90 feet long and 7 feet wide, except at the south end where it swells in a bulge to 25 feet. It lies on the east contact of a lenticular pod of augen-gneiss in biotite paragneiss, and dips about 55°E. The footwall augen-gneiss contains 10–25 percent *lit par lit* granite pegmatite with scattered black tourmaline crystals up to 1 inch across. The hanging-wall gneiss is a biotite paragneiss containing sodic feldspar-quartz pegmatite as blobs, lenses, and *lit par lit*. The dike is a porphyroblastic type of granite pegmatite, the feldspar crystals being wrapped around with biotite flakes. Biotite is also present in streaky aggregates. The more radioactive parts of the dike contain abundant shattered grey quartz. In the bulge near the south end the hanging-wall section of the dike is a leuco-granite gneiss.

Dike No. 4 is a club-shaped mass narrowing to the south. It is 140 feet long, the narrow part 7 feet wide, and the expansion or "blow out" at the north end an irregular oval mass about 50 by 70 feet. The mass lies partly within augen-gneiss, but the "blow out" lies between two masses of augen-gneiss and is mainly in contact with biotite paragneiss. At its south end the dike contains much shattered grey quartz and is highly radioactive, but northwards it becomes the typical porphyroblast type. In the "blow out" the pegmatite ranges from the porphyroblast type with radioactive-rich quartz patches to a normal, pale pink leuco-granite pegmatite.

Diamond-drilling and underground development have indicated substantial tonnages of pegmatite grading between 0.09 and 0.05 percent U_3O_8. The chief uranium minerals visible on examination of surface trenches are the yellow secondary uranium minerals. In the adit small grains of orange to amber uranothorite were seen in coarse biotite granite pegmatite with accessory zircon, pyrite, and molybdenite.

Dyno Mines, Limited

(See map, Figure 7, in back pocket)

Dyno Mines, Limited, holds three groups of claims in Cardiff township, Haliburton county, which are known as the South, North, and West groups. Only the South group will be described below. It comprises a block of fourteen claims, E.O.3738–3744, E.O.5584–5587, E.O. 8372–8373, and two patented lots, 13 and 14, concession VII. Six of the claims, E.O. 3738–3744, are also patented.

Radioactive showings in pegmatite dikes have been explored to a limited extent by surface work, but mainly by diamond-drilling. For convenience the showings have been grouped and called the *A*, *B*, *C*, and *D* zones. The *B* zone has been given the most attention to date.

The *A* zone, originally the Denfield showing, is on the boundary between claims E.O.3739 and E.O.5585, that is, between concessions VIII and IX in lot 12. The surface showing is a cliff face adjacent to a small creek. The cliff is 10–20 feet high and about 150 feet long in a direction S.38°E. from a drill road at a point 26 chains east of the Cheddar road. Stripping and blasting along the top and face of the cliff expose brick-red leuco-granite and leuco-granite pegmatite with occasional inclusions of fine-grained biotite-hornblende gneiss. Hornblende and, in places, strings of pyroxene crystals altered marginally to hornblende, are present in the pegmatite in patchy aggregates. There is a well-developed jointing running N.43°W., dipping 55°NE. Radioactive minerals are scarce. Allanite is present in platy crystals, ⅛–½ inch across, and uranothorite, very rarely, in minute black grains up to 1/16-inch. Yellow, secondary uranium mineral coatings were noted on fractures. Other minerals noted are coarse splashes of pyrite and titanite. Geiger readings on the showing range from 10 to 25 (10M) with spot-high readings, where yellow coatings occur, to 35 (10M). The average may be 20 (10M). The background count on crystalline limestone on the access road is 11 to 14 (1M). This showing was seen by J. Satterly on August 13, 1954. The *A* zone has been explored by 24 drill holes totalling 11,488 feet.

The *B* zone is on claims E.O.3739 and E.O.3744, that is, lot 12, concession VIII. Leuco-granite or leuco-granite pegmatite sills, intrusive into biotite-hornblende gneiss and amphibolite, have been explored by surface trenches and 58 drill holes, in 4 tiers, totalling 20,998 feet. J. Satterly examined the surface showings on June 14, 21, and July 7, 1954, and pegmatite in drill holes Nos. 8, 9, 20, 21, 26, 27, 28, 29, 30, 31, 33, 34, 46, 51, and 61 on June 14 and July 6, 1954.

The surface trenches are in three groups: trenches Nos. 1, 2, and 3; trench No. 4; and trenches Nos. 6 to 11. There is no trench No. 5. These trenches expose pegmatite dikes cutting amphibolite or hornblende gneiss. The dikes transgress the strike and the dip of the gneisses at low angles. The dike rock is very similar in all the trenches and is a pink to red leuco-granite or leuco-granite pegmatite characterized by the presence of peristerite feldspar, smoky grey to black quartz, and frequently, disseminated magnetite in coarse grains. Accessory minerals are titanite, zircon, allanite, uranothorite, uraninite, and the secondary uranium mineral uranophane as coatings on fractures. When uranium mineralization is present the pegmatite is marked by a deeper-red colour owing to hematitization, and an abundance of accessory magnetite. It is apparent from the geiger readings that, when a lower count is recorded, the yellow secondary uranium mineral is absent, magnetite is rare or absent, and the rock is of a lighter colour.

Trenches Nos. 2 and 3 expose a pegmatite dike about 17 feet wide. Geiger readings range from 17 to 43 (10M) with spot-highs of 15 and 23 (50M) in trench

No. 3. In trench No. 1, to the west of Nos. 2 and 3, a pegmatite dike is exposed for 12 feet. Two spot-high readings of 30 and 37 (50M) were recorded.

Trench No. 4 is 150 feet south of No. 3. It exposes a dike of pegmatite 36 feet wide. This width includes a few horses of hornblende gneiss. Geiger readings range from 12 to 49 (10M) with spot-high readings of 17, 20, and 21 (50M).

Trenches Nos. 6 to 11 expose widths of pegmatite of 23 to 37 feet over a length of 110 feet. The geiger readings obtained in these trenches may be summarized as follows: In all the trenches except No. 8 the readings range from 10 to 47 (5M) with occasional spot-high readings from 25 to 31 (10M). In trench No. 8 the readings range from 15 to 38 (10M) with spot-high readings from 17 to 27 (50M).

The pegmatite dikes as seen in 14 holes are similar in character to those seen in the surface trenches. From these 14 holes 25 specimens of core were collected containing radioactive minerals, and were submitted for identification to S. C. Robinson of the Geological Survey of Canada. Uranothorite was identified 24 times, thorite 1, and uraninite 3 times. It is not suggested that these figures indicate the relative proportions of these minerals in the pegmatite. Uranothorite appears to the eye to be the commoner radioactive mineral. In these samples it ranged in colour from yellow through amber and red-brown to black. Other minerals identified are uranophane, allanite, zircon, and titanite.

The *C* zone is in the northwest corner of claim E.O.5742, the south half of lot 12, concession VII, near the south end of Farrel Lake. J. Satterly examined this showing on August 9, 1954, and again on September 22, when the areas of strippings had been trenched. Geiger readings referred to below were made on August 9, prior to the blasting of the trenches. The strippings and five trenches expose a lenticular sill or dike of leuco-granite pegmatite ranging from 5 to possibly 25 feet in true width, and 130 feet in length. The trenches are numbered 20, 21, 21a, 22, and 23 from north to south, and are on the top and slope of a low ridge adjacent to a swamp to the south of Farrel Lake.

Four samples collected by J. Satterly from trenches Nos. 21, 21a, 22, and 23 were submitted to S. C. Robinson, Geological Survey of Canada, for the identification of radioactive minerals. His identifications are listed under the appropriate trenches.

In trench No. 20 stripping through ½–3 feet of overburden exposes a sill of leuco-granite pegmatite in biotite-hornblende gneiss dipping 30°–55°E. Geiger readings on the dike range from 23 to 45 (5M), the highest reading being at the hanging-wall contact.

In trench No. 21, 30 feet south of No. 20, the dike is exposed by stripping and shallow trenching on the slope (50°E.) for 14 feet representing the hanging-wall of the sill. Geiger readings range from 15 to 26 (5M) with spot-high readings of 35 (10M) and 37 (10M). The lower 4 feet in the trench on the slope exposing a coarse granite pegmatite is darker in colour because the quartz is more smoky, pyrite is present, and there are also scattered flakes of molybdenite ⅛ inch or less across. The feldspar is a deep brick-red colour. Peristerite was also noted. Accessory minerals include zircon and uranothorite. Robinson identified uraninite from a sample collected from this trench. On the upper slope of this trench the rock is a salmon-pink leuco-granite pegmatite with grey smoky quartz and no sulphides.

Trench No. 21a, 20 feet south of No. 21, is within a stripping on pegmatite exposed on the slope of the ridge. Geiger readings range from 20 to 30 (5M) with a spot-high reading of 46 (10M) on a 6-inch hornblende aggregate at the foot of the slope, which is believed to be near the hanging-wall contact of the sill. On the upper part of the slope the sill is a leuco-granite pegmatite, and on the lower slope

clots of mafic minerals are present. Four fractures with pyroxene or hornblende fillings cross the trench and contain a few ¼–½-inch flakes of molybdenite. Yellow uranium stain was noted at intervals, as was disseminated pyrite and molybdenite. Robinson identified uranothorite, thorite, uraninite, and uranophane from a sample taken by J. Satterly in this trench.

Trench No. 22, 40 feet south of No. 21a, is a stripping on the top and slope of the ridge, and a trench, 29 feet long, on the slope which J. Satterly believes is close to the hanging-wall of the sill. Geiger readings on the sill range from 15 (5M) to 45 (10M) with a spot-high reading of 40 (50M) at the hanging-wall contact. The upper half of the trench exposes a light-coloured leuco-granite pegmatite with pyroxene in a shatter zone 0.7 feet wide. The lower half of the trench exposes a dark-grey, mafic-rich (pyroxene?), granite pegmatite with pyrite and molybdenite as seen in trench No. 21. Other accessory minerals are zircon, titanite, and uranothorite. S. C. Robinson confirmed the identification of uranothorite in a sample collected by J. Satterly from this trench.

Trench No. 23, 30 feet south of No. 22, is a stripping on the top and slope of the ridge, and a trench (or open cut) on the face of the slope. Geiger readings on the sill range from 23 to 30 (5M) with three spot-high readings of 30 (10M) (twice) and 40 (10M) near the east end of the stripping (now a trench). The latter is 14 feet long and 6 feet deep at the sediments-pegmatite contact. The sill is mainly a pink leuco-granite pegmatite, which near the footwall contact is greenish-grey in colour. Near the hanging-wall the pegmatite has grey to black quartz and accessory pyrite, molybdenite, and rarely, uranothorite. Robinson identified uranothorite and uraninite from a sample taken from the trench.

Halo Uranium Mines, Limited, Hogan Property

(See map, Figure 8, in back pocket)

On the Hogan property of Halo Uranium Mines, Limited, in Cardiff township, Haliburton county, a number of uranium mineral occurrences have been explored by trenches. These showings have been named: (1) Uranothorite, (2) Uraninite, (3) Pyrochlore No. 1, and (4) Pyrochlore No. 2, and were examined by J. Satterly on August 20 and 21, 1954.

1) The Uranothorite showing on claim E.O.12800, the south half of lot 7, Concession XV, is exposed in a trench 33 feet long. The rock is a pink to red granite pegmatite with a pyroxene-biotite-rich band, 1 foot wide, exposed along the long axis of the trench. This band gave geiger readings on the 50M scale with a high of 35 (50M). A radioactive mineral is present and has been altered to a secondary yellow mineral. It may be uranothorite.

2) The Uraninite showing on claim E.O.12798, the south half of lot 6, concession XV, is exposed on the face of a cliff. Surface work consists of stripping and blasting. It is reported by company officials that one diamond-drill hole put down to cut the showing 50 feet below the surface failed to intersect the uraninite-bearing dikelet. The cliff face and talus from blasting is about 50 feet high. In the upper part of the cliff a 15-foot face exposes a 1–2-foot deep-red, fine-grained, irregular hornblende syenite dikelet, which parallels and cuts across the gneissic structure of syenitized hornblende gneiss. The gneissosity strikes N.20°W. and dips vertically. Uraninite in poorly-formed crystals ⅛–¼ inch across is quite common in the syenite. Seams of calcite with red apatite are present at the contact or within the syenite dikelet. At about 25 feet east of the dikelet another calcite pod with large crystals, 2–3 inches across and 4–8 inches long, of hornblende and

feldspar is exposed in the cliff face. On the slope above the cliff face a stripping exposes irregular granite pegmatite dikes cutting syenitized hornblende gneiss.

3) The Pyrochlore No. 1 showing is on claim E.O.7802, the north half of lot 6, concession XV.

The calcite vein is a fissure-filling in granite pegmatite and hornblende gneiss. The gneissic structure strikes N.70°W. and dips vertically. The vein strikes N.30°E., has been exposed for a length of 70 feet, and ranges from ½–10 feet in width. The average dip is 60°W. but ranges from 45° to 70°W. The vein consists of coarsely crystalline cream to pale-pink calcite, purple fluorite, green apatite, and black mica. The mica is concentrated at the footwall and hanging-wall of the calcite vein and forms books 1–10 inches across, which may average 3 inches. The narrower sections of the vein appear to be composed entirely of mica books. A cluster of red apatite crystals was noted on the footwall of the calcite vein near the southwest end of the workings. Pyrochlore,[1] in crystals up to 1 inch across, is found in the mica pockets in the vein. The granite pegmatite at the hanging-wall of the calcite vein shows a 1–3-inch-wide contact zone consisting of hornblende. Geiger readings taken at frequent intervals over the granite pegmatite, the calcite vein, and mica pockets, gave a similar range of from 10 to 30 (5M) over pegmatite and calcite, and spot-high readings of 35 (5M), 35 (10M), and 50 (5M) over three pockets of mica.

The small exposure of a calcite vein, 3 feet wide and dipping 60°W., on the east side of the showing is interesting in that it contains no fluorite or pyrochlore but does contain numerous, large crude octahedra of magnetite, either singly or in aggregates, 1–3 inches across. Titanite and apatite are present as accessory minerals. On the hanging-wall of the vein is a 3-inch zone of black mica books.

4) The Pyrochlore No. 2 showing is also on claim E.O.7802, about 800 feet west of No. 1. It has been exposed by a bulldozer and by blasting. Some parts of the exposures are covered by debris that prevents a satisfactory mapping of the geology of the occurrence. A calcite vein, composed of coarsely crystalline white calcite, purple fluorite, apatite, and biotite, is poorly exposed. In the drill hole, 7 feet of it is reported to have been cut. The footwall is a pyroxene syenite pegmatite dike on which pyrochlore[1] crystals, ⅛–½ inch across, occur rarely, and also a yellow-weathering radioactive mineral, possibly uranothorite. Between the footwall and the calcite there is a narrow zone composed of red apatite crystals and biotite books. Another zone of apatite and biotite to the west of the above may indicate the presence of another calcite vein. The country rock is slightly syenitized biotite or hornblende gneiss which strikes N.30°E. and dips 60°SE.

Kemp Property

(See map, Figure 9, in back pocket)

The Kemp property consists of nine claims, E.O.5910–5918, being lots 2 to 5 in concession XIV, and the south half of lot 1, concession XIV, Cardiff township, Haliburton county. The present owners are G. L. Reasor, 135 South Lasalle Street, Chicago 3, Ill., U.S.A., and J. E. Ayrhart, 3 Elizabeth Street North, Brampton, Ontario, each with a half interest. The property was examined on August 27, 1954.

The main showings are on claim E.O.5917, the north half of lot 5, concession XIV, about 1 mile east of the Cheddar road. Rock has been exposed here at intervals by bulldozing over an area 100 feet wide and 900 feet long in a direction approximately east and west. In this area crystalline limestone cut by a narrow sill

[1] Provisionally identified as pyrochlore. Chemical analysis may show it to be betafite.

or dike of fine-grained pink leuco-granite is exposed. The dike is about 40 feet wide. Adjacent to the leuco-granite dike, pyroxene-rich limestone or pyroxene skarns are developed containing disseminated black uranothorite in minute grains. As indicated on the sketch map, a uranothorite-bearing zone, 15 feet wide and possibly 60 feet long, was indicated by geiger readings. It averaged 30 on the 50M scale. A number of spot-high readings were obtained and are indicated on the sketch map. At one spot in the west section of the bulldozed area the pyroxene skarn also contains a mauve agate-like material with uranothorite, such as found at the Thompson property in Monteagle township, Hastings county.

The largest radioactive mineral found is a highly altered, tabular brown crystal of uranothorite measuring 1½ inches across. The crystal is largely covered with small pyroxene crystals and may be a pseudomorph.

McLean-Hogan Property

The McLean-Hogan property consists of four claims, E.O.6199–6201, and E.O.7482 in lots 8 to 10, concession XIX, Cardiff township, Haliburton county. In 1954 the property was under option to Anuwon Uranium Mines, Limited.

A radioactive showing in a band of mica pyroxenite on a ridge near Cope Creek has been explored by eleven bulldozed cross trenches over a length of 750 feet north and south. The showing is on claim E.O.6200, the south half of lot 8, concession XIX, and was examined by J. Satterly on September 8 and 12, 1954.

The eleven trenches, referred to as Nos. 1–11 from the north, are spaced as follows: 0, 50, 100, 150, 210, 260, 340, 390, 440, 600, and 750 feet (by pacing). Between 170 and 260 feet south, a bulldozed area extends east and west 150 feet. Because of the debris spread by the bulldozer, the rocks are not well exposed except in the trenches. The trenches and bulldozed area expose a complex of mica pyroxenite, hornblende gneiss, pegmatite, leuco-granite, and toward the south end, patches of crystalline limestone. The dip of the gneisses varies but is about 45°E. A granite pegmatite is exposed in the bed of Cope Creek just to the east of trench No. 11, and east of the creek, hornblende gneiss outcrops.

In the mica pyroxenite, vugs are lined with crystals of pyroxene, green apatite, titanite, scapolite, and, rarely, octahedral crystals of uraninite. Small pods of salmon-pink calcite are present, and a little purple fluorite was noted on fractures. Uraninite is also present in rough grains in the mica pyroxenite and accounts for spot-high geiger readings of 22 (50M), and 40 (10M) (twice) in trench No. 5; high (10M) readings with a spot-high reading of 30 (50M) in trench No. 10; and a spot-high reading of 40 (10M) in trench No. 11.

The widths of mica pyroxenite are difficult to determine. The width in trench No. 5 is about 80 feet, and in trench No. 11, 100 feet.

Milhol Exploration and Development, Limited

The property of Milhol Exploration and Development, Limited, consists of fourteen claims, E.O.6233–6241 and E.O.7981–7985 in lots 8 to 12, concessions IV to VI, Cardiff township, Haliburton county. In 1945–55 the property was under option to Fab Metal Mines, Limited. Radioactive pegmatite dikes were explored by trenching and diamond-drilling. In 1954, twelve drill holes were completed, totalling 3,631 feet, on three claims, E.O.6239–6241, in lots 10 and 11, concession V.

J. Satterly examined, on August 10 and 12, 1954, core from drill holes Nos. 1, 4, 8, 9, 11, and 12, particularly the pegmatite dikelets in holes Nos. 8, 9, 11, and 12. Only those pegmatite dikes not removed for sampling could be examined

since the core was not split. The country rock intersected in these holes is a limy amphibolite, that is, a phlogopite-diopside-feldspar gneiss, biotite-hornblende gneiss, and granite gneiss. Bands of crystalline limestone and garnet-biotite gneiss are present. The gneisses have been intruded by numerous narrow dikelets of granite pegmatite.

The pegmatite is usually a leuco-granite pegmatite composed of feldspar with quartz in graphic intergrowth, grey to black smoky quartz, and a negligible amount of mafic minerals. Accessory minerals are titanite, pyrite, pyrrhotite, allanite, and uranothorite. Uranothorite occurs in minute orange, amber, or black grains.

Molybdenum Corporation of America

The Molybdenum Corporation of America owns 4½ claims in Cardiff township, Haliburton county, as follows: E.O.6049, the north half of lot 10, concession XI; E.O.6050, the south half of lot 10, concession XI; E.O.6010, the north half of lot 11, concession XI; E.O.6011, the north half of lot 10, concession X; and 25 patented acres, the north half of the south half of lot 11, concession XI.

The main showings are about 400 feet west of the Cheddar road on lot 11, concession XI. The property was examined on August 13, 1954.

Rock outcrops, trenches, and strippings expose a fine-grained, pink graphic leuco-granite or leuco-granite pegmatite. Geiger readings indicate that most of the outcrop reads 5 to 10 (10M) with occasional spot-high readings to 50 (10M), and one spot-high of 14 (50M). A trench across the picket line has been put down on the best area, the readings ranging from 12 to 50 (10M).

Allanite, in crystals up to several inches in length, was seen in several outcrops, also a radioactive mineral weathered to a yellow powder, probably uranothorite. Owing to the age of the trenches, fresh uranothorite was found only after some search.

At the north end of the main area two trenches expose leuco-granite pegmatite in contact with biotite paragneiss injected with pegmatite. In this gneiss a little molybdenite and pyrite was seen.

The geiger readings indicate that the fine-grained, graphic leuco-granite has only low radioactivity, possibly an average of 2,000 counts per minute or five times the background count. Areas of medium-grained leuco-granite have slightly higher radioactivity, possibly 3,000 counts per minute or about eight times the background count.

Montgomery Property

In 1942, F. K. Montgomery of Havelock, Ontario, opened up calcite-fluorite-apatite veins on lot 9, concession XXI, Cardiff township, Haliburton county, and made test shipments of ffuorspar to owners of a foundry supply firm in Toronto.[1] The property has also been described by Wolfe and Hogg.[2]

The writer examined the old workings on July 1, 1954. Although most of the vein material has been removed, it is apparent that most of the work was carried out on two veins that cut hybrid syenite gneiss.

No. 1 vein was removed by a shallow open cut, and one wall of the vein may be seen. The vein had a strike of N.70°–80°W., and dipped from 45 degrees to steeply south. It was probably less than 1 or 2 feet wide. The wall of the vein

[1] J. Satterly, *Mineral Occurrences in the Haliburton Area,* Ont. Dept. Mines, Vol. LII, 1943, pt. 2, p. 33.

[2] S. E. Wolfe and N. Hogg, *Report on Some Radioactive Mineral Occurrences in Cardiff and Monmouth Townships, Haliburton County, Ontario.* Ont. Dept. Mines, P.R. 1948-8, p. 12.

is coated with crystals of black hornblende and red potash feldspar. Only one spot along the vein gave any abnormal reading on the geiger ratemeter. At this place a patch of a dozen uraninite crystals or grains, ⅛–½ inch across, occur in a fracture just outside the contact of the vein material. The gneissosity of the pink to grey hybrid syenite gneiss strikes N.40°–60°W. The syenite gneiss surrounding the uraninite is brick-red in colour.

No. 2 vein was removed by a trench or open cut trending N.25°E. The trench is 60 feet long, 4–20 feet wide, and 7 feet deep. The width of the calcite-fluorite-apatite vein material cannot be determined. It is not exposed at the ends of the workings, so appears to have been a lens. The footwall of the vein is coated with black amphibole crystals from a few inches to 1 foot across in a white calcite matrix. The gneissic structure in the hybrid syenite gneiss strikes N.50°W. and dips 35°–70°SW.

The two veins are separated at their south ends by a fill 10 feet across.

An examination of the dumps of the calcite-fluorite-apatite vein material with the geiger ratemeter uncovered two uraninite crystals ¼ and ½ inch across. These were found in sheared vein material.

Richardson Property, Fission Mines, Limited

(See map, Figure 10, in back pocket)

The Richardson property, at present owned by Fission Mines, Limited, comprises lots 4–7, concession XXI, and lots 4–6, concession XXII, Cardiff township, Haliburton county. The surface workings are on lots 4, 5, and 6, concession XXI, and the underground workings on lot 5, concession XXI. The property has been inactive since 1949.

W. M. Richardson discovered uraninite on his property, lot 4, concession XXI, in 1922. In 1929, Ontario Radium Corporation, Limited, acquired the property, and was succeeded in turn by International Radium and Resources, Limited, in 1931, by Wilberforce Minerals, Limited, in 1937, and by Fission Mines, Limited, in 1946.

Surface and underground exploration were carried out between 1929 and 1931, a mill was built in 1931-32, and small test runs made from March to May, 1933. At a later date the mill was dismantled. Additional exploration by Fission Mines, Limited, included 12,000 feet of diamond-drilling, and further underground exploration before the end of 1948.

There is now extensive literature[1] on the deposit, and the reader is referred to these references for detailed information. Since the report of Wolf and Hogg is now out-of-print a reproduction of Figure 6 from their report is reproduced (Figure 10) to show the extent of the surface and underground workings at the main Richardson deposit.

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[1]H. V. Ellsworth, *Rare-element Minerals of Canada,* Geol. Surv. Can., Econ. Geol. Series, No. 11, 1932, pp. 213–27.

Hugh S. Spence and R. K. Carnochan, *The Wilberforce Radium Occurrence,* Trans. Can. Inst. Min. and Met., Vol. XXXIII, 1930, pp. 34–73.

Hugh S. Spence and R. K. Carnochan, *The Wilberforce Radium Occurrence,* Mines Branch, Can. Dept. Mines, 1930, No. 719, pp. 1–23.

J. Satterly, *op cit.,* pp. 83–85.

S. E. Wolfe and N. Hogg, *op cit.,* pp. 8–10.

Robert B. Rowe, *Petrology of the Richardson Radioactive Deposit, Wilberforce, Ontario,* Geol. Surv. Can., Bull. 23, 1952, pp. 1–22.

A. H. Lang, *Canadian Deposits of Uranium and Thorium (Interim Account),* Geol. Surv. Can., Economic Geol. Series No. 16, 1952, pp. 142-45.

Thor Uranium Mines, Limited

Thor Uranium Mines, Limited, holds a group of 11 claims, E.O.8180–8188, E.O.12993, and E.O.12994 at Eels Lake, in the southwest part of Cardiff township, Haliburton county. Eight radioactive showings are reported by the company on these claims. J. Satterly examined three showings on claim E.O.8186, the south half of lot 6, concession VI, on August 30, 1954, which have been explored by bulldozing, trenching, and two diamond-drill holes totalling 570 feet.

The most easterly showing is in a bulldozed area, 50 by 250 feet, that exposes leuco-granite, coarse biotite or pyroxene granite, or granite pegmatite, and, adjacent to an inclusion of crystalline limestone, a pod of calcite, 50 feet long and 10–20 feet wide. At the north side of the bulldozed area the pegmatite dips under a 5-foot thickness of well-banded paragneisses that strike N.85°W. and dip 30°N. Above the gneisses more leuco-granite and pyroxene granite pegmatite are exposed. Geiger readings on the granite and pegmatite average about 30 (1M) with occasional spot-high readings to 20 (5M), and at a spot-high on the 50M scale, a few grains of black uranothorite were found.

About 200 feet west of the above, a bulldozed area, 60 by 80 feet on the east slope of a hill, exposes paragneisses dipping 30°N. cut by graphic granite and granite pegmatite in dikes 1–40 feet wide. Geiger readings were mainly on the 5M scale, but local spot-highs to as much as 20 (50M) were recorded where magnetite is an abundant accessory in coarse grains. Associated with the magnetite are crystals of allanite, 1–2 inches long, and a yellow-weathering radioactive mineral, probably uranothorite.

A third showing on the south side of the hill, about 400 feet southwest of No. 2, has been exposed by a bulldozed area 110 by 80 feet. Coarse, red granite or granite pegmatite is exposed and contains magnetite as an erratic accessory in coarse grains. Geiger readings are low, being mainly low 1M or 5M scale readings, except at two test-holes where readings of 25 (5M) and 15 (5M) were recorded. At the first of these, small grains of orange uranothorite were found in close association with magnetite.

The two diamond-drill holes that were put down to explore this showing intersected paragneisses containing narrow bands of granite and granite pegmatite, ranging from a few feet to as much as 60 feet in core length, but mostly less than 10 feet.

A. J. Tomlinson

A. J. Tomlinson, 487 Danforth Avenue, Toronto, owns the south 25 acres of the south half of lot 11, concession XI, and the west 75 acres of lot 12, concession X, Cardiff township, Haliburton county.

The uranium occurrences are in a leuco-granite pegmatite on lot 11, concession XI, just each of the Cheddar road. The showings were mapped on August 10 and 12, 1954.

The brick-red leuco-granite pegmatite is well exposed over a length of about 200 feet and in smaller outcrops 150 feet to the northwest along the Cheddar road. The pegmatite is an offshoot from the Cheddar granite batholith. The country rock is a diopside-plagioclase gneiss.

The only working is a trench 50 feet long, 3 feet wide, and 1–3 feet deep. The leuco-granite pegmatite here is mostly medium-grained, but occasionally contains coarse streaks, and rarely, small vugs. Accessory minerals are erratically distributed magnetite and, rarely, uranothorite, allanite, and zircon. Geiger readings in the trench average 24 (10M) with spot-high readings in two places to 42 (10M).

The background count over the diopside paragneiss is 20 to 25 (1M). Geiger readings were taken at 5-foot intervals south along the exposed leuco-granite pegmatite. The uncut average of the readings over a length of 195 feet is 9.8 (10M), and reducing two spot-high readings to the average, the cut average is 9 (10M). These readings indicate the mass has a count about 4.5 times background.

Topspar Fluorite Mines, Limited

In 1940, W. E. Clark opened up a fluorspar deposit on lot 13, concession XXII, Cardiff township, Haliburton county, and made shipments of 12 tons in 1940 and 18 tons in 1942 of acid-grade spar.[1] In 1943, the property was acquired by Tops Mining Syndicate, Limited, the assets of which were taken over by Topspar Fluorite Mines, Limited, in 1950. Additional work on the deposit was carried out by Tops Mining Syndicate, Limited, by driving an open cut and adit to intersect the pegmatite dikes exposed by surface trenches.

J. Satterly examined the property on July 1, 1954. The open cut at the top of a hill is in a direction S.20°E. and 80 feet long, followed by an adit 75 feet in length. A raise to surface has been put through at a point 130 feet from the beginning of the open cut.

The open cut and adit expose a hornblende gneiss dipping at 30°S. at the north end to 15°S. at the beginning of the adit. Very irregular bodies of coarse syenite pegmatite are exposed in the walls and backs of the workings. The pegmatites consist of potash feldspar, pyroxene, calcite, and fluorite. The pink to buff feldspar is in crystals from a few inches to 2 feet across, and the pyroxene is also in large crystals from a few inches to as much as 3 feet in diameter. The calcite is salmon-pink in colour and is present as a filling around euhedral pyroxene and feldspar or as veins with pyroxene ½–3 feet in width. The largest vein of purple fluorite now exposed in the workings may be seen on the south face of the open cut. It is a lens ½–1 foot thick. W. E. Clark advised the authors in 1942 that the largest fluorite lens removed was 5 feet thick and 16 feet in length.

An examination of the workings and dumps with a geiger ratemeter failed to indicate any significant amounts of radioactive minerals. The only occurrence found was on the east wall of the adit, about 100 feet in from the beginning of the open cut. This gave an off-scale reading on the 50M scale. The radioactive mineral occurred with pyroxene and was identified by S. C. Robinson of the Geological Survey of Canada as uranothorite. No radioactive minerals were found in any of the salmon-pink calcite examined in the workings.

Charles Tripp

(See map, Figure 11, in back pocket)

Charles Tripp owns lot 8, concession XXI, Cardiff township, Haliburton county. The property was optioned to Nu-Age Uranium Mines, Limited, in the fall of 1954, and work was carried out on three radioactive zones. The original showing is known as No. 1 zone. No. 2 zone is 600 feet north of No. 1, and No. 3 zone is 200 feet north of No. 2. The early work on the property has been described by Satterly.[2]

The showing described below and illustrated by the sketch map is the original showing, or No. 1 zone. It was examined on July 9, 1954.

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[1] J. Satterly, *op. cit.*, p. 34.
[2] *Ibid.* pp. 32, 33.

The present workings include stripping and trenching in a direction N.45°E. for a length of 160 feet and a width of 10 feet; a 5- by 7-foot shaft about midway along the workings, which was sunk in 1924 by Industrial Minerals Corporation of Canada to a depth of 22 feet; and 18 feet of drifting. At that time the property was being worked for fluorspar, two tons of which was hand-picked and sold for $32.[1]

The workings expose a vein and dike cutting biotite or biotite-hornblende syenite and, more rarely, amphibolite. The vein and dike are fissure fillings and consist of three units: (1) syenite pegmatite with or without hornblende, (2) hornblendite (coarse crystals of hornblende, 6 inches to 1 foot long), and (3) calcite-fluorite-apatite. The main mass of calcite-fluorite-apatite is a vein 110 feet long that pinches and swells from a fracture with a little fluorite to as much as 7 feet wide. The calcite-fluorite shows a coarse banding parallel to the walls, which is accentuated near the vein walls by shearing. The walls of the vein are usually coated with crystals of red apatite and, less commonly, hornblende. These crystals may be absent, since southwest of the shaft the calcite-fluorite-apatite vein is in direct contact with red syenite. The footwall is fairly straight and well defined. It strikes N.45°E. and dips 85°NW. to vertical. The hanging-wall contact is more irregular (see map).

Uraninite, in cubes ⅛–1 inch across, but mostly less than ½ inch, is erratically distributed. The crystals were found on the northwest wall of the vein to the southwest of the shaft. Spot-high geiger readings along the footwall of the vein probably indicate a number of other occurrences of uraninite. Spatial relations of the uraninite would indicate that most of it crystallized out on the walls of the fissure before the consolidation of the calcite-fluorite-apatite vein material. It may be noted that a brick-red colour is found in the syenite adjacent to occurrences of uraninite. The normal colour of the syenite is a yellow-brown.

HALIBURTON COUNTY, MONMOUTH TOWNSHIP

Blue Rock Cerium Mines, Limited

The property of Blue Rock Cerium Mines, Limited, consists of a block of eighteen claims, E.O.4961–4973, E.O.5448, and E.O.9430–9433 in lots 17–21, concessions V and VI, Monmouth township, Haliburton county.

In 1954 the property was under option to Stratmat, Limited. This company made a scintillometer survey of the property, which indicated a number of radioactive anomalies that have been designated as zones *A*, *B*, *C*, etc.

The initial radioactive showing on the property is on claims E.O.4968 and E.O.4970, the south halves of lots 18 and 19, concession VI. This is now known as zone *A*. In 1952 this showing was explored by trenching and seven diamond-drill holes and, in 1954, by additional trenching in overburden and bedrock and by seven additional drill holes (six vertical) totalling 201 feet in the immediate vicinity of the main showing. J. Satterly examined the main surface working on September 10, 1954.

A geological map of zone *A* by D. E. Cameron[2] indicates a mass of granite pegmatite striking N.50°E. This body is about 900 feet long and ranges from 140 to 350 feet wide. It intrudes a limy amphibolite. At the southwest end of the granite pegmatite body, and at one other point, small irregular bodies of a syenite pegmatite are exposed by outcrops or by trenching and pitting. These range from

[1] Statistician, Ontario Department of Mines.
[2] Geologist, Stratmat, Limited.

60 to 240 feet in length. The main radioactive showing is at the northeast end of one of these syenite pegmatite bodies. This body is about 180 feet long and has a maximum width of 90 feet. Stripping and pits in an area 50 by 90 feet expose the northeast nose of this syenite pegmatite. It is in contact, to the northeast, with a coarse, pink leuco-granite pegmatite and to the southeast, with a medium-grained pyroxene-plagioclase rock with accessory titanite believed to be a skarn. The syenite pegmatite is a very coarse-grained rock composed of yellow-brown plagioclase, dark-green pyroxene, abundant deep purple fluorite, and accessory molybdenite in flakes to ½ inch across.

The radioactive showings are in fractures in the syenite pegmatite. The main fracture curves sinuously across the stripping and pits for a length of 30 feet in a direction N.35°W., and dips 55°N. in the main pit. Additional irregular fractures or slips were noted in the workings with nearly flat dips, and, according to D. E. Cameron, branch off from the main fracture. The filling in these fractures is a sheared rock or breccia composed of fragments or schlieren of a fine-grained, brick-red leuco-granite containing abundant uranothorite in orange-brown grains in a sheared matrix of altered pyroxene, chlorite, and fine-grained purple fluorite. The material seen by the writer was 3 inches or less in thickness, but is reported to have been up to 1 foot in thickness in the drill holes. Geiger readings on the uranothorite-bearing material gave spot-highs of 13, 20, and 38 on the 50M scale, in the main pit.

Zone *C* was indicated by the scintillometer survey on claims E.O.4961, E.O.4970, E.O.4973, and E.O.4971. On these claims, rock exposures are scattered and few, and initial exploration by stripping and trenching was followed by bulldozed strippings and trenching in overburden or bedrock. By November, 1954, 3,500 feet of trenching at 50- to 200-foot intervals over a strike length of 1,400 feet had been carried out on claims E.O.4970 and E.O.4973, the south half of lot 19, concession VI, and the north half of lot 19, concession V, respectively. This work exposed a number of bodies of granite pegmatite, intrusive into a coarse metagabbro; radioactive shoots within these pegmatites were found. A black, fine-grained amphibolite is the only other rock type present and may occur as inclusions in either the metagabbro or pegmatite. From the geological map of the zone *C* area prepared by the company geologists, it is apparent that the individual pegmatite bodies vary greatly in width and length. One of these pegmatite bodies containing a radioactive shoot is 30–120 feet wide and over 1,000 feet in length. It trends N.40°E. The radioactive shoot is about 15 feet wide.

On September 10, 1954, J. Satterly examined eight of the trenches between picket lines C-14 and C-12, which covered a strike length of 400 feet, and on October 10, 1954, when additional trenching had been completed, a trench on picket line C-10, 1,400 feet southwest of the first trench. The pegmatite bodies in the trenches examined are all very similar in character and may be described collectively. They are medium- to coarse-grained, pink to brick-red leuco-granite pegmatite or graphic leuco-granite pegmatite. Smoky quartz in ⅛- to ½-inch grains often forms chains in the coarser phases of the pegmatite, which appears to replace graphic leuco-granite pegmatite. Fracturing is a conspicuous feature of the more radioactive sections of the pegmatite, the fractures being often heavily coated with a yellow secondary uranium mineral. Accessory minerals seen are allanite, zircon in minute crystals, and orange-brown or black uranothorite in minute, rounded prisms. From two samples collected by J. Satterly, S. C. Robinson of the Geological Survey of Canada identified uranothorite, uranophane, allanite (meta), and cyrtolite.

Geiger readings in the eight strippings and trenches taken by the writer may average 30 (5M) over the pegmatite, with sections carrying radioactive minerals, either primary or secondary, giving readings on the 10M scale, and spot-high readings to 25 (50M). The background on amphibolite is 25 (1M).

Homer Yellowknife Mines, Limited

Homer Yellowknife Mines, Limited, holds the following claims and lots in Monmouth township, Haliburton county, just west of the town of Wilberforce: lots 29, 30, and 32, concession XVII; lot 31, concession XVI; 7 claims E.O.10502–10508, being parts of lots 25–28, concession XVII; and 3 claims E.O.12392–12394, being lot 31, concession XVII.

The main showing is on a high ridge on lot 31, concession XVII, and was visited by J. Satterly on September 11, and October 13, 1954. Along this ridge, bulldozed areas and trenches expose a sugary pale-green diopside rock or diopside-calcite gneiss as an interbed in crystalline limestone at intervals for 3,000 feet. This assemblage is cut in places by dikes of granite pegmatite. Geiger readings on the diopside band are mainly in the range 20–30 (5M).

The discovery trench (No. 10-1) at the top of the hill is 25 by 4 by 1–3 feet deep. Three diamond-drill holes at and under this trench were reported by the company to indicate a true thickness of 20 feet for the diopside rock. Geiger readings in the trench are 10 to 20 (5M) at the east and west ends, with a spot-high of 40 (10M) in the middle of the trench, where black needles or laths of uranothorite[1] are abundantly distributed. The diopside-calcite rock in this trench ranges from fine- to medium-grained to almost coarse-grained and contains irregular stringers of leuco-granite pegmatite consisting of grey to black quartz and grey feldspar. Uranothorite is also occasionally present in the pegmatite.

A large trench (No. 11-1) about 175 feet north of the above is 70 feet long, 10 feet wide, and 4–5 feet deep. It exposes pale-green, fine- to medium-grained diopside rock with frequent irregular lenses, streaks, and stringers of a salmon-pink calcite. A faint banding in the diopside rock dips 60°E., but varies considerably. The occasional flake of molybdenite was noted. Lenses of coarse, grey calcite with splashes of pyrrhotite are present. Irregular stringers of grey granite pegmatite cut the diopside rock, which is in part silicified. Geiger readings in this trench are 10 (5M) at the ends, but mainly 20 (5M) elsewhere, except a spot-high of 40 (5M) on a pod of diopside rock ½ by 4 feet containing scattered laths of black uranothorite. This occurrence is on strike from a lens of salmon-pink calcite 4–6 inches wide and 4 feet long. A second occurrence containing uranothorite is a lens of diopside rock 1 by 2 feet, which is adjacent to two calcite lenses ½ by 1 foot. This also reads 40 (5M) on the geiger. Uranothorite was also rarely noted in the salmon-pink or orange calcite.

Farther north, in trench No. 23-1, the diopside rock reads 25 to 30 (5M) and, on stringers of salmon-pink calcite, from 25 to 45 (5M). Lenses of black or smoky quartz occur. Uranothorite is present in the diopside rock. This trench has been undercut by three diamond-drill holes. A bulk sample from this trench was sent to the Mines Branch, Ottawa.

Continuing north, trench No. 25-1 exposes deeply weathered rock for 10 feet, and fresh rock for 3 feet above water (October 13, 1954). Pyroxene gneisses

[1] Identification confirmed by D. A. Moddle, Provincial Assayer, Ontario Department of Mines, by X-ray powder pattern photograph and spectrographic analysis. Two other specimens of the mineral were identified as uranothorite by S. C. Robinson of the Geological Survey of Canada.

dip about 45°E. The east end of the trench exposes crystalline limestone. In the diopside rock on the dump from this trench J. Satterly found uranothorite, coarse pyrite up to 4 inches across, and flakes of molybdenite. Some salmon-pink calcite was noted.

Trench No. 25-2 exposes mainly crystalline limestone and minor calcite and pyroxene in stringers. In the west section of the trench, the "sandy" pyroxene gneiss strikes N.50°W. and dips 60°NE.

The west showing, on the east slope of a ridge in lot 30, concession XVII, was examined by J. Satterly on October 15, 1954, and had been explored by four trenches, with two others in progress at that date. These trenches expose deeply weathered, micaceous limestone, rusty paragneiss, and a vertical lime-silicate band about 4 feet wide trending N.20°W. over a length of 200 feet. Geiger readings on the micaceous limestone range from 13 to 40 (1M), the background count over drift being about 15 (1M). On the silicate horizon, spot-high readings were recorded from 50 (1M) in trench No. 1 (north end), 10 (5M) and 12 (5M) in trench No. 2, 12 (5M) in trench No. 3, and 10 (5M) in trench No. 4 (south end). A little uraninite in irregular grains, ¼–½ inch across, was found in the silicate rock in trench No. 2.

Farther south of this showing near a small lake, two bulldozed strippings and two test holes expose a disintegrated, micaceous crystalline limestone. Geiger readings on the bulldozed strippings were barely above normal background count, but in the test holes, 1 and 3 feet across and 2 feet deep, readings of 30 (10M) were recorded. Samples from these pits were taken and treated by Wilfley table and superpanner, recovering a concentrate consisting of pyrite and uraninite. The minute cubes of uraninite show a peculiar etch pattern on their surfaces.

Jesko Uranium Mines, Limited

Jesko Uranium Mines, Limited, holds a block of 27 claims, E.O.7892-7918 in concessions III and IV in the southwest part of Monmouth township, Haliburton county. The company has also acquired 2 patented lots, 13 and 14, concession IV.

Three radioactive showings on or near Hadlington Lake have been explored by surface trenches and 13 diamond-drill holes, totalling 2,000 feet. J. Satterly examined the showings on September 9, 1954.

The most southerly showing on the north side of Hadlington Lake is here called No. 1 Showing. A leuco-granite pegmatite forms a lenticular body at the south point of a swamp "island" at the mouth of the northeast bay of the lake. The pegmatite has an exposed length of 150 feet and a maximum width of 50 feet, at 100 feet north of the end of the point. The strike of the pegmatite body is approximately N.20°E. The character of the pegmatite is quite variable, ranging from medium- to coarse-grained, and in parts is graphic with feldspar crystals up to 1 foot across. The body has been explored by three trenches. At the south end at the point, the pegmatite has an exposed width of 13 feet. Geiger readings in a shallow trench here average 40 (5M). At 25 feet north of the point a shallow pit on the west side gave an average reading of 10 (5M). At 90 feet north, a cross trench, 5 by 20 feet, gave an average reading of 15 (5M). At 150 feet north the pegmatite body pinches out, its width being about 40 feet. The country rock is a calcareous paragneiss striking N.20°E. and dipping 60°E. Geiger readings on the pegmatite between the trenches gave values of from 5 to 10 (5M). The only uranium mineral noted at this showing is uranothorite. It was noted, along with zircon, magnetite, and allanite, in the pegmatite in the shallow trench at the south end and closely associated with purple fluorite stringers in the north trench. The

company reports that four grab samples taken from the south part of this showing averaged 0.108 percent U_3O_8.

No. 2 Showing is about 700 feet north of No. 1. It is a shore-line exposure on the west side of the northeast bay of Hadlington Lake. A fine- to coarse-grained, leuco-granite pegmatite is exposed for a length of 200 feet and has an exposed width of 50 feet. Accessory minerals present are magnetite, purple fluorite, allanite, and uranothorite. Five shallow test holes have been blasted into the pegmatite. Geiger readings in three of these were 15 (5M), and in two others 25 (5M). The company reports four grab samples taken from this showing averaged 0.09 percent U_3O_8.

No. 3 Showing is 31 chains, by picket line running N.20°E. and a trail, from No. 2 Showing at Hadlington Lake. It is a dike or sill of leuco-granite pegmatite striking about N.30°E., which has been explored by three trenches and a number of shallow pits over a length of about 450 feet. The pegmatite has exposed widths of 50–90 feet and has intruded biotite or hornblende gneisses striking N.30°E. and dipping 60°–70°E. Horses of paragneiss are present in the pegmatite. Magnetite is, in places, an abundant accessory as coarse grains. Local magnetic attraction is as much as 10 or 15 degrees over the pegmatite. Other minerals noted are zircon and uranothorite. The company reports in addition a minor amount of uraninite. Geiger readings on the granite pegmatite range from 20 to 50 (5M) with rarely a few spot-high readings to 35 (10M) where magnetite is abundant. The company reports that eleven grab samples of freshly-blasted pegmatite taken at 25- to 50-foot intervals over a length of 200 feet in the northern part of the showing averaged 0.198 percent U_3O_8. Three grab samples taken by the company from the southern 250 feet of this showing are reported to have averaged 0.05 percent U_3O_8.

Rare Earth Mining Corporation of Canada, Limited

(See map, Figure 12, in back pocket)

The property of Rare Earth Mining Corporation of Canada, Limited, in Monmouth township, Haliburton county, consists of sixteen claims, E.O.8258–E.O.8261, E.O.4256–4259, E.O.4265, E.O.4267, E.O.4269, and E.O.4956–4960, in concessions VII, VIII, and IX; patented lots 19 and 20, concession VIII; and, under option, lots 25 and 26, concession VIII.

Six radioactive showings, designated as zones by the company, have been variously explored by stripping, trenching, and diamond-drilling. The surface showings of these zones were examined by J. Satterly on September 7 and 8, 1954.

The main zone comprises showings in the Spence cut, Zircon trench and pit, and the Poker showing.

The Spence showing is in about the centre of lot 20, concession VIII. An open cut 250 feet long, 5–10 feet deep, and 10–20 feet wide, exposes a slightly sinuous dike of dark reddish-brown pyroxene syenite pegmatite. The dike is ½–2 feet wide, averaging about 1 foot. It conforms in part but also cuts across the gneissic structure of the biotite-hornblende gneiss and interbedded calcareous gneisses. The gneisses strike N.10°–30°E. and dip 40°SE. Two small pods, possibly 10 feet across, of white to pink porcelainic calcite are exposed in the open cut. They contain black hornblende crystals, 1–6 inches across, and apatite. Uranothorite was found as three patches of grains in the syenite pegmatite. It was also found at the contacts of white to purple-pink porcelainic calcite in rounded prismatic black grains ⅛–¼ inch across. This material was found on one of the

dumps and was not seen in place. Geiger readings on the pegmatite dike ranged from 10 to 20 (50M) for the full length of the open cut. Spot-high readings of 30 (50M) (twice) and 23 (50M) were obtained at patches of uranothorite.

The Zircon trench and pit is 150 feet east of the north end of the Spence open cut. The pit is 100 feet south of the trench. These workings and surface exposures have explored a lenticular mass of granite pegmatite 150 feet long. The maximum width on the surface is 32 feet. In the trench, the dike is only 5 feet thick and conforms to the dip of the gneiss (40°E.). In the pit it is possibly 20 feet in exposed width. Brick-red areas of the dike contain abundant allanite. The pegmatite at 50 feet south of the pit narrows to 5 feet, and south of that point is covered by overburden. Geiger readings on the pegmatite were recorded as follows: in the trench the average is about 40 (10M) with a high of 50 (10M) at the hanging-wall contact. A second dike, about 2 feet thick, east of the above in the same trench, reads 20 to 40 (10M). The wide section of the dike, which is a leuco-granite pegmatite or graphic leuco-granite pegmatite gave readings from 45 (1M) to 15 (5M), except for a strip, ½ foot wide and 2 feet long, containing plates of allanite and a yellow-weathered radioactive mineral (uranothorite?), which read 18 (50M). A shear zone, 6 inches wide, along the east contact of the dike near the pit, read 35 (10M). The north wall of the pit containing patches rich in allanite recorded 45 (10M). Where the dike narrowed to 5 feet, 50 feet south of the pit, scattered crystals of allanite were seen, and a reading of 42 (10M) was obtained. The east contact just north of this point read 25 (50M).

The southern part of the Main zone in the south part of lot 19, concession VIII, is exposed by bulldozing and six strippings. The country rock gneisses are diopside gneiss and quartzo-feldspathic gneiss striking N.30°E. and dipping 45°SE. They are intruded by a granite pegmatite sill that ranges from a few inches to possibly 4 feet wide, parallel to the enclosing gneisses but sometimes transgressing them for short distances before again parallelling them. Most of the sill is a leuco-granite pegmatite with a very low content of mafic minerals. At the northeast end of the bulldozed area, a sheared or shattered zone in the sill contains 10 percent mafic minerals (pyroxene?) and abundant grains of a yellow-weathering radioactive mineral, possibly uranothorite. This zone is 6 inches wide and was traced for 30 feet. Geiger readings range from 25 to 40 (10M), and may average 35 (10M). The background count over the gneisses is 20 to 25 (1M). The remainder of the sill, that is, outside the shear zone, averages 20 (5M). Slightly higher readings (30 (5M)) were obtained at both contacts, and occasional spot-high readings of 45 (10M) and 20 (50M) where patches of uranothorite with zircon are present. Reddish areas in the sill read 40 (10M). Coarse graphic leuco-granite pegmatite or granite pegmatite gave low readings (45 (1M)).

The Poker showing, an extension of the Main zone, is exposed by bulldozed strippings at the north end of lot 19, concession VII. Biotite paragneiss strikes N.30°E. and dips 50°SE. Within the paragneiss, a discontinuous lenticular biotite granite pegmatite sill has been exposed for 200 feet ranging from 3 inches to 2 feet in width, and averaging possibly 1 foot. The sill contains small tabular crystals of allanite, ¼–½ inch in length and, rarely, altered uranothorite in minute grains. Geiger readings on the sill range from 15 to 40 (5M), the north half reading 20 to 40 (5M) and the south half, 15 to 25 (5M).

The Monck zone is in the southeast corner of lot 20, concession VIII, and has been explored by bulldozing and stripping. Adjacent to the road, drag-folded rusty-weathering diopside gneiss with interbeds of crystalline limestone, 1–3 feet thick, is exposed. In the gneisses are sills of pyroxene syenite pegmatite rich in

small zircon crystals. The sills are 3 inches to 3 feet thick, but of very limited lateral extent. Geiger readings are of the order of 10 (50M), the best areas being rich in disseminated pyrite. Spot-high readings to 22 (50M) were recorded. A. E. Tyson, the company's consulting engineer, advises that drill holes here failed to intersect any pegmatite below the outcrop. Bulldozed strippings or trenches on the hill above the showing described also expose rusty-weathering sugary, fine-grained diopside gneiss with numerous lenticular discontinuous sills of coarse hornblende pegmatite from a few inches to 5 feet across.

The Northeast zone is in the southwestern part of lot 21, concession VIII, and has been exposed in three cross trenches and a bulldozer-stripped area. It is a lenticular granite pegmatite sill or dike striking N.20°E., dipping 45°E., and conforming more or less to the gneissosity of the biotite or hornblende gneisses. The dike ranges from 6 inches to 20 feet wide, and may average 5 feet. It pinches and swells at frequent intervals. Much of it is a leuco-granite pegmatite, but parts of it are rich in mafic minerals — pyroxene with accessory allanite, and titanite. In the most southerly cross trench (No. 1), the dike is 10 feet wide, contains hornblende crystals 1–4 inches in length, and reads 10 (5M) on the geiger ratemeter. In trench No. 2, 70 feet north of No. 1, the dike is 18 feet wide, and reads 10 (5M). Although scattered small mafic minerals, 1 inch or less, are present, most of the dike is a leuco-granite pegmatite. Trench No. 3 is 70 feet north of No. 2. At the west end of the trench a 3-foot dike reads 10 (5M). On the strike of the dike noted in the previous two trenches only a series of fingers rich in mafic minerals are found. These average 10 (5M) with a spot-high reading of 35 (5M) on the geiger. Near the east end of the trench, which is on the slope of a hill, a skin of granite pegmatite possibly 4 inches thick is exposed. It averages 35 (5M) with a high of 50 (5M) on the geiger. The bulldozer-stripped area is 250 feet north of trench No. 3. It is 220 feet long by 40–70 feet wide. The dike can be traced an additional 50 feet northeast of this area. In the bulldozed-stripped area the dike is mainly a leuco-granite pegmatite. Pyroxene-rich parts of the dike, with accessory purple fluorite, titanite, and apatite, are very similar to some of the dikes at Centre Lake. These pyroxene-rich areas record 10 (5M) on the geiger. The best readings were recorded on a shear zone in leuco-granite pegmatite, ½–4 feet wide, averaging less than 2 feet, 80 feet in length, near the north end of the area. It read 30 (10M) with spot-high readings to 40 (10M). The coarse leuco-granite pegmatite at the north end reads 10 (5M) increasing to 20 (5M) at the contacts of the dike over a length of 30 feet.

The Cliff zone is exposed as a high ridge above Otter Creek in the south part of lot 20, concession VII. A. E. Tyson reports that this zone can be traced north through lot 21 into lot 22, concession VIII. It was only examined by the writer in lot 20. It is a pink granite pegmatite sill in hornblende-plagioclase gneisses that strike N.20°E. and dip 50°E. Where examined there is a cliff face, 20 feet high, of pegmatite. Geiger readings at the footwall contact average 35 (10M) over a length of 50 feet, with spot-high readings to 18 (50M) and 22 (50M). North of this, the contact zone only recorded 25 (5M) on the ratemeter. Search of the blasted rock from this zone showed the presence of small zircon crystals, plates of altered allanite, and very rarely, minute grains of orange-brown uranothorite. On the top of the ridge, the rock is mainly a leuco-granite pegmatite with numerous inclusions of paragneiss and, rarely, contains a few patches of pyroxene-rich rock. No uranium minerals were found. Geiger readings range from 30 (1M) to 30 (5M), and may average 10 (5M).

The Otter Creek zone was found by drilling and lies beneath Otter Creek in lots 19 and 20, concession VII. A. E. Tyson reports that this zone is in a grey

pegmatite and has been shown, by ten diamond-drill holes, to be 1,200 feet long, 8.6 feet wide, and to dip 50°E. It is reported to average 0.11 percent U_3O_8.

The Pyroxenite zone is in the south part of lot 24, concession VIII, and has been exposed by trenching and stripping on the slope of a ridge in a clearing adjacent to the Irondale River. The north workings is a bulldozer-stripped area, 50 feet wide and 80 feet long, which exposes pyroxene skarns in rusty-weathering gneisses striking N.20°E. and dipping 65°E. An irregular bed, 1–3 feet wide, of grey crystalline limestone is interbedded with hornblende gneiss. Salmon-pink patches are present in the limestone. Uranothorite was found in a pyroxene-calcite rock from the north end of this area. A cross-trench, 75 feet south of the above, is 80 feet long. It exposes a variety of gneisses with two interbeds of mica pyroxenite, 3 and 5 feet wide, and a 6-inch limestone band. The pyroxenite bands are slightly radioactive. A second cross-trench, 100 feet south of the above, is 200 feet long. It is partly filled in with sand but exposes gneisses with a crystalline limestone band with an exposed width of 3 feet. The limestone is slightly pink and has a very low pyroxene content. There is possibly a second limestone band, ½–3 feet wide, 15 feet east of the above. Loose mica debris may indicate that mica pyroxenite bands are present.

Red Bark Mines, Limited, Monmouth Property

The Monmouth property of Red Bark Mines, Limited, was under option in 1954, and a program of exploration by diamond-drilling was carried out on a radioactive showing in lots 5 and 6, concession XI, Monmouth township, Haliburton county. Eleven short holes were drilled totalling 1,847 feet. The writer examined the surface showing on September 11, 1954.

The surface showing is on the road allowance between lots 5 and 6, adjacent to a dry creek. North and south of this creek an area has been partially cleared by a bulldozer for 100 feet north of the creek and 50 feet east, and 150 feet south and 80 feet east. Through the overburden of sand and boulders, the bulldozing has exposed scattered outcrops of crystalline limestone containing pyroxene, mica and salmon-pink calcite. Geiger readings range from 20 to 40 (5M). Minor occurrences of mica pyroxenite give spot-high readings on the 10M scale. Towards the south end of the bulldozed area, debris or exposures indicate the presence of mica pyroxenite, pink granite pegmatite, and a rusty-weathering pegmatite with inclusions of rusty biotite paragneiss. The latter pegmatite gave readings of 40 (5M) and spot-highs of 40 (10M) on the geiger ratemeter. On the pink granite pegmatite the reading was 35 (1M). Uraninite in grains about 1/16 inch across is a rare accessory in the mica-pyroxene limestone.

Vertical sections through the eleven holes drilled by the company indicate that a north-south mass of crystalline limestone is underlain by granite pegmatite, cut by dikes or sills of granite pegmatite, and intruded from the east by a wedge or tongue of syenite. Drill holes at the north and south ends of the drilled area show that the mass is not more than 200 feet long. The maximum thickness is about 80 feet. The east-west dimension of the limestone was not determined by the drilling. The dikes or sills of granite pegmatite may dip 30°–50°E. Uranium mineralization is confined to the crystalline limestone. Assay results on nineteen samples from the drill holes are all low, mostly below 0.05 percent U_3O_8 (radiometric).

Wadasa Gold Mines, Limited

Wadasa Gold Mines, Limited, holds a block of 22 claims in the southwestern part of Monmouth township, Haliburton county, as follows: E.O.12181–12184,

the north half of lots 6–9, concession IV; E.O.9360–9377, lots 6–9, concession V, and lots 5–9, concession VI.

A uranium showing on claim E.O.9360 of lot 5, concession VI, on a ridge near the Irondale river, has been explored by trenching and by seven diamond-drill holes totalling 1,555 feet. J. Satterly examined the property on September 10 and October 12, 1954.

Limited surface exposures in trenches and diamond-drill holes indicate that crystalline limestone is cut by dikes of pink leuco-granite pegmatite. The main surface showing is in a trench from top to bottom of the east slope of a hill. This trench is 1–3 feet wide and for the first 80 feet up the hill exposes a pink, coarse, graphic leuco-granite pegmatite on which geiger readings range from 10 to 25 (5M) and may average 15 (5M). The next 40 feet is in sand overburden, which is exposed for a depth of 10 feet. The upper section, 75 feet long, exposes a micaceous silicated limestone that gives readings of 15 to 50 (10M) and may average 35 (10M). The minerals present in the limestone include phlogopite, tremolite, diopside, and pink calcite. Uraninite is present as blebs or cubes, mainly in the silicated limestone proper, but occasionally in salmon-pink calcite. The uraninite crystals range from ⅛ to, rarely, ¼ inch across.

HASTINGS COUNTY, DUNGANNON TOWNSHIP

Normingo Mines, Limited

In 1954, Normingo Mines, Limited, held under option and carried out exploration on a radioactive showing on lot 14, concession XVI, Dungannon township, Hastings county. The writer examined the property on June 24 and July 2, 1954. Work on the property had ceased on the latter date.

Exploration was carried out by bulldozing an area 50 by 300 feet and by stripping in four trenches to bedrock over a length of 80 feet in a direction N.10°W. This work exposed a belt, 10–28 feet wide, of micaceous crystalline limestone and mica pyroxenite lying between two sills of pink leuco-granite intrusive into hornblende gneiss. The gneisses dip about 50°E. The radioactive mineral is uranian thorianite,[1] which occurs in minute grains or cubes up to ⅛ inch diameter in the crystalline limestone. The radioactive parts of the limestone are salmon-pink in colour and give geiger readings of from 20 to 35 (10M), with a few spot-high readings on the 50M scale. White areas of the limestone have negligible radioactivity. The radioactive area of the limestone is about 20 by 30 feet.

HASTINGS COUNTY, FARADAY TOWNSHIP

Baumhour Property

In 1954, Silver Crater Mines, Limited, carried out some surface work on the Baumhour property in the northwest part of Faraday township, Hastings county. The property consisted of: the east half of patented lot 29, concession XV, under option; patented lot 28, concession XV, under option; and the southern part of lot 27, concession XV, held under staking (claims E.O.12801 and E.O.12802).

Access to the property is by an old logging road 1½ miles north of the Monck road. A radioactive occurrence was found on these lots by C. H. Burbidge for Silver Crater Mines, Limited. A number of strippings expose a pink, medium-grained leuco-granite with patchy pegmatitic phases. Hornblende gneiss is present

[1] Identified by S. C. Robinson of the Geological Survey of Canada.

as inclusions. Geiger readings indicate the presence of radioactive minerals, although none could be seen by the eye. Coarse disseminated magnetite and a little purple fluorite is present in places.

Bonville Gold Mines, Limited

Bonville Gold Mines, Limited, Room 205, 100 Adelaide Street West, Toronto, owns lots 21–24, concession A, Faraday township, Hastings county.

Radioactive mineral occurrences in pegmatites cutting crystalline limestone have been explored by 25 diamond-drill holes totalling 9,642 feet, and by some surface work.

The surface workings were examined by J. Satterly on September 20, 1954.

A stripping on the west edge of a clearing in lot 22, concession A, is 10 by 30 feet. It exposes a pink graphic granite pegmatite with patchy distribution of pyroxene (or hornblende). Fractures at N.60°E., filled with altered hornblende, gave spot-high geiger readings up to 40 (10M). No radioactive minerals were found. Geiger readings range from 10 (5M) on the graphic leuco-granite pegmatite to 40 (5M) on hornblende granite pegmatite. The background count on the crystalline limestone is 25 (1M). Two small pits have been put down at 5 and 10 feet north of the stripping. The north pit has a spot-high geiger reading of 35 (10M). Coarse calcite with hornblende and apatite was noted on the dump from this pit.

The second working is on lot 23, concession A, 140 feet, at N.70°W., from the above. It is a stripping 25 feet wide and 50 feet long, with a shallow trench, 4 feet wide and 30 feet long, adjacent to the east side of the stripping and a pit at the south end of the stripping. The workings expose a pink, medium- to coarse-grained graphic leuco-granite pegmatite. Scattered small pods of salmon-pink calcite with walls of dark-green hornblende are not uncommon. Irregular fractures contain an altered fibrous hornblende and epidote. The leuco-granite pegmatite reads 15 to 20 (10M) on the geiger. On the west side of the stripping, one of the fibrous hornblende bands is 1–2 feet wide, and has an exposed length of 20 feet. Geiger readings on it are 10 to 15 (50M). This band strikes N.40°E., but others strike N.50°E. and N.25°E. Samples of radioactive and other minerals from material on the dump, apparently from this or similar bands, were submitted to S. C. Robinson of the Geological Survey of Canada for identification by X-ray powder pattern photographs. A yellow coating is identified as beta-uranophane; a black vitreous radioactive mineral as uranothorite accompanied by pale blue apatite; and a yellow-brown radioactive mineral as pyrochlore (*var.* ellsworthite) occurring in small flattened grains with tremolite, quartz, and feldspar.

Also noted in the deposit are pods and lenses, from a few inches to several feet across, of calcite-apatite-hornblende. The calcite is salmon-pink in colour. In such a calcite stringer in the pit at the south end of the workings, J. Satterly noted black laths of uranothorite in epidote.

Faraday Uranium Mines, Limited

The property of Faraday Uranium Mines, Limited, consists of twenty-three lots and parts of six other lots in north-central Faraday township, Hastings county. These lots are on or adjacent to highway No. 28, five miles southwest of Bancroft.

The property was originally staked by Arthur Shore of Bancroft. Prior to 1953 exploration comprised trenching and 25 diamond-drill holes totalling 3,087 feet. In 1953 the property was covered by geological mapping, an airborne

scintillometer survey, ground ratemeter survey, and a geophysical (resistivity) ground survey. Diamond-drilling amounted to 41 holes totalling 10,787 feet. The work in 1954 entailed stripping and trenching the hillside above *A* zone, diamond-drilling on surface in 54 holes totalling 20,621 feet, and underground diamond-drilling in 60 holes totalling 3,024 feet. Underground work was commenced in 1954 by driving two adits, the East and West, 1,240 feet apart, to explore the *A* and *E* zones of pegmatite dikes. The East adit is on lot 16, concession XI, with drifting on lot 16 and into lot 17. The West adit is on lot 17, concession XI, with drifting on the *E* zone on lot 18. In 1954 the underground development from the East adit amounted to 821 feet of crosscutting and 796 feet of drifting, and from the West adit 398 feet of crosscutting, and 595 feet of drifting. The total lateral work is therefore 2,610 feet.

Geology

Three main bands of rock that strike NE. and dip 45°–60°SE. cross the property. The northern band, north of the Monck road, consists of granite and granite gneiss. The southern band, south of highway No. 28, is crystalline limestone. Between these two bands is a zone, about ¾ mile wide, which is made up of amphibolite, hornblende gneiss, and paragneiss. This zone is intruded by gabbro and diorite; granite and syenite gneisses; hornblende syenite; and pegmatites. Radioactive occurrences are found in dikes of pyroxene granite pegmatite and leuco-granite pegmatite cutting the amphibolite series. The work to date has been carried out on zones of dikes referred to as *A*, *B*, and *C*, on the north half of lot 16, concession XI, just north of the northeast bay of Bow Lake.

Pegmatite Dikes at Surface

The *A* zone is exposed on a cliff and may be examined in three cuts, called Top, Middle, and Lower, along the face of the cliff. The face of the cliff trends about N.5°W. Pegmatite is exposed along the Top cut for a distance of 192 feet. It intrudes a fine-grained hornblende gneiss, the gneissic structure of which at the south contact strikes N.65°E. and dips vertically. The pegmatite mass consists of both leucocratic and mafic types. The leucrocratic type is a leuco-granite or leuco-granite pegmatite ranging from medium- to coarse-grained, pink, yellow-brown, or blotchy red and yellow-brown in colour. One variety of the leucocratic type is a pale-pink to purplish-red graphic granite pegmatite with a very variable grain size. Allanite and zircon are present as accessory minerals. The mafic type is a dark-red pyroxene granite pegmatite with pyroxene crystals ¼–4 inches across. Accessory minerals are titanite, zircon, allanite, molybdenite, and very rarely, fluorite. Allanite occurs as thin tabular crystals up to 1¼ inches across.

Pegmatite Dikes in Diamond-Drill Holes

In order to study the characteristics of the radioactive sections of the pegmatite dikes, core from drill holes numbered 28, 29, 35, 43, 44, and 77 was examined. Two types of pegmatite may be recognized as previously noted on surface, that is, leucocratic and mafic varieties. A conspicuous feldspar in the dikes is a variety of plagioclase known as peristerite which exhibits a blue sheen. In the mafic variety, the mafic mineral is a dark-green pyroxene, often highly altered. The mafic phase may occur as distinct units or may be rather erratically distributed through the leucocratic type. The accessory minerals found in both types are magnetite, hematite, zircon, allanite, titanite, uranothorite, uraninite, and yellow secondary uranium minerals, uranophane and beta-uranophane. Sulphides are not abundant although both pyrite and marcasite were found. S. C. Robinson of the

Geological Survey of Canada examined twenty-six pieces of drill core collected by the writer and identified the following radioactive minerals: uranothorite, uraninite, allanite, and uranophane. In these cores uranothorite was identified nineteen times and uraninite only three times. The uranothorite occurs in minute grains, and may be yellow, amber, red-brown, or black in colour.

A striking characteristic of the radioactive-bearing pegmatite is an abundance of hematite along fractures in the quartz and feldspar, giving the rock a dark red, brick-red, or purplish-red colour. The dikes also contain numerous small vugs lined with minute hematite crystals or rarely, needles of sulphur-yellow beta-uranophane.[1] Fractures are coated with films of pale yellow uranophane.

The occurrence of radioactive minerals in the pegmatite dikes may be directly correlated in terms of minerals with the relative abundance of magnetite, hematite, and zircon. The most common uranium-bearing mineral is uranothorite. It is certainly the most obvious one to be observed with a hand lens in core, and would appear to be at least ten times as abundant as uraninite.

Pegmatite Dikes in Adits

The pegmatite was observed underground on October 26, 1954, in occurrences in both adits. In the West adit two dikes were examined. In No. E-1 East Drift, a deep red leuco-granite or leuco-granite pegmatite is exposed, characterized by abundant coarse magnetite in grains ⅛–1 inch across. Peristerite feldspar is present. Accessories are zircon and orange grains of uranothorite attached or embedded in the magnetite. A dike examined in No. E-1 West Drift is a pale buff or pink to purplish-red, friable, quartz-rich leuco-granite pegmatite with abundant small crystals of brown zircon, much yellow secondary uranium mineral coating fractures, especially around the clusters of zircon, and yellow or orange grains of uranothorite in quartz. The darker red phases contain much hematite on fractures or as minute crystals in vugs. Orange-brown uranothorite grains occur in quartz or in magnetite.

In the East adit one dike was examined from the No. A-4 West Drift; it is a yellow-brown to brick-red pyroxene granite pegmatite with accessory black uranothorite occurring in minute grains in feldspar or pyroxene.

High-grade Radioactive Occurrences

In November, 1954, some high-grade material was encountered in No. E-1 West Drift. Through the company, the writer received a large grab sample of this material for study. An examination under binoculars showed that the sample consisted largely of coarse magnetite with a little red-stained quartz, clusters of brown to white (bleached) zircon crystals, and a few grains of black uranothorite. This sample assayed 2.2 percent U_3O_8 (chemical). It was crushed and screened, and two screen sizes, 60- to 100-mesh and 100- to 200-mesh, selected for additional work. These fractions were treated on a Dings magnetic separator, followed by superpanner and heavy-liquid separation. The experimental work on the two fractions would indicate a rather close association of some of the uranium minerals with the magnetite, since 27.7 percent of the uranium values were retained in the magnetic concentrates in the 60- to 100-mesh fraction, as against 17.0 percent in the 100- to 200-mesh fraction. The superpanner concentrate consisted largely of uraninite with minor uranothorite, and the heavy fraction from the heavy liquid

[1]Identified by E. W. Nuffield, Department of Geological Sciences, University of Toronto.

separation of uranothorite and zircon. The relative amounts of uraninite and uranothorite recovered are set forth in the table below:

	Percent of U_3O_8 (radiometric)	Percent of original sample	Percent of U_3O_8 values
Superpanner concentrate, mainly uraninite	70.8	1.0	22
Heavy fraction, heavy liquid, mainly uranothorite and zircon	15.7	8.6	47

The results show that although uranothorite is about nine times as abundant as uraninite, because of its low uranium content, the fraction containing it only carried twice the uranium values.

Goldhawk Porcupine Mines, Limited

The properties of Goldhawk Porcupine Mines, Limited, are adjacent to the Monck road in the northwest part of Faraday township, Hastings county. They are known as the East and West groups.

The East group consists of the north halves of lots 8 and 9, concession A; the south halves of lots 10–13, concession A; lots 8–10, concession B; and lots 11–14 and the east half of lot 15, concession B.

The West group consists of lots 19–21 and the south half of lot 22, concession B; the north half of lot 22, concession XIV; and 28 mining claims: E.O.7193, E.O.7194 in concession B, E.O.7195–7200 in concession XIV, and E.O.7201–7216, E.O.12129–12131, and E.O.12138 in concession XV in lots 16–22.

The writer examined the initial surface showings on the East group on August 25, 1954. These showings are on the south slope of a limestone ridge on lot 13, concession A, 16 chains south of the Monck road. A number of shallow trenches expose massive syenite, syenite pegmatite, granite pegmatite, and impure crystalline limestone. A trench near the bottom of the ridge exposes a few feet of pyroxene syenite pegmatite containing clusters of small grains of uranothorite. Spot-high geiger readings to 10 (50M) were recorded on this pegmatite.

To the west on the upper slope of the ridge, trenches expose a buff leucogranite pegmatite containing erratically distributed grains of black uranothorite. Geiger readings are 10 to 40 (10M) on the pegmatite. The country rocks are crystalline limestone and paragneiss, and the south slope of the ridge appears to closely approximate the dip.

One the East group the company has completed geological mapping, a scintillometer survey,[1] and 32 drill holes totalling 6,000 feet.

On the West group the company carried out geological mapping and a scintillometer survey[1] in the fall of 1954. There has been no diamond-drilling on this group.

Howard Kerr

In 1954, Silver Crater Mines, Limited, had an option on the farm of Howard Kerr and carried out surface exploration and diamond-drilling on uranium occurrences in lot 28, concession B, Faraday township, Hastings county.

In a field to the north of the Monck road in the above-mentioned lot the country rock is a white, fine- to coarse-grained crystalline limestone showing a faint

[1]Ont. Dept. Mines, File No. 63.A.233.

banding at N.60°E. and dipping 45°SE. A small pit, 6 by 8 by 4 feet deep, has been put down on a complex of crystalline limestone, tremolite rock, and pegmatitized rock containing disseminated pyrite. Geiger readings average 20 (5M), and in the silicated limestone and pegmatitized rock a few grains of allanite and uranothorite were found.

Occurrences of pegmatite in the same field to the north of the pit have been explored by two drill holes totalling 580 feet. On the surface pink leuco-granite pegmatite is exposed as irregular lenses in fine- to coarse-grained crystalline limestone, which strikes N.25°E., and dips steeply SE. Geiger readings range from 15 (1M) to 5 (5M) over the limestone to 30 (5M) on the pegmatite exposures. A spot-high reading of 40 (10M) was recorded at one place on a limestone-pegmatite contact. Along the contact an occasional pod or lens of very coarse, white calcite with crystals of red apatite and a dark-green pyroxene was noted. No radioactivity was recorded from this mineral assemblage.

J. Lockwood

In 1954, Silver Crater Mines, Limited, had under option the J. Lockwood property, lot 29, concession A, Faraday township, Hastings county.

Uranium occurrences in silicated limestone, exposed in a field adjacent to the Monck road, were explored by test-holes, pits, and trenches, and two diamond-drill holes totalling 444 feet. The property was examined by J. Satterly on July 20 and 25, 1954.

The workings and drill holes explored a knoll of fine- to medium-grained, white crystalline limestone containing small pods of silicate minerals. Geiger readings on the limestone were mainly on the 5M scale, but near the road, readings taken in trenches ranged from 20 (10M) to a high of 30 (50M). No uranium minerals were found in the decomposed or fresh limestone in these trenches, but coarse, pink calcite containing apatite was noted in one trench. On the knoll and in a pit near drill hole No. 2 a tremolite rock containing coarse, pink calcite in lenses or irregular stringers is exposed. Uraninite with accompanying purple-red staining is found in minute grains or cubes, ¼ inch across, in the tremolite rock. Grains of uranothorite occur alone or with uraninite. Spot-high geiger readings of 30 (10M), 8 (50M), and 18 (50M) were recorded on these isolated occurrences of uraninite.

Only the core from 0–297 feet in drill hole No. 2 was examined by J. Satterly. The rock is a grey to white, fine- to coarse-grained, crystalline limestone, containing varying amounts of diopside, phlogopite, tremolite, pyrrhotite, pyrite, and graphite. Stringers of coarse, pink calcite, 0.1–0.5 feet wide, were noted at four places. Uraninite was noted only once, as a minute grain, at 228.4 feet. The flesh-pink crystalline limestone around the uraninite grain showed a red discolouration.

Silver Crater Mines, Limited, Basin Property

(See map, Figure 13, in back pocket)

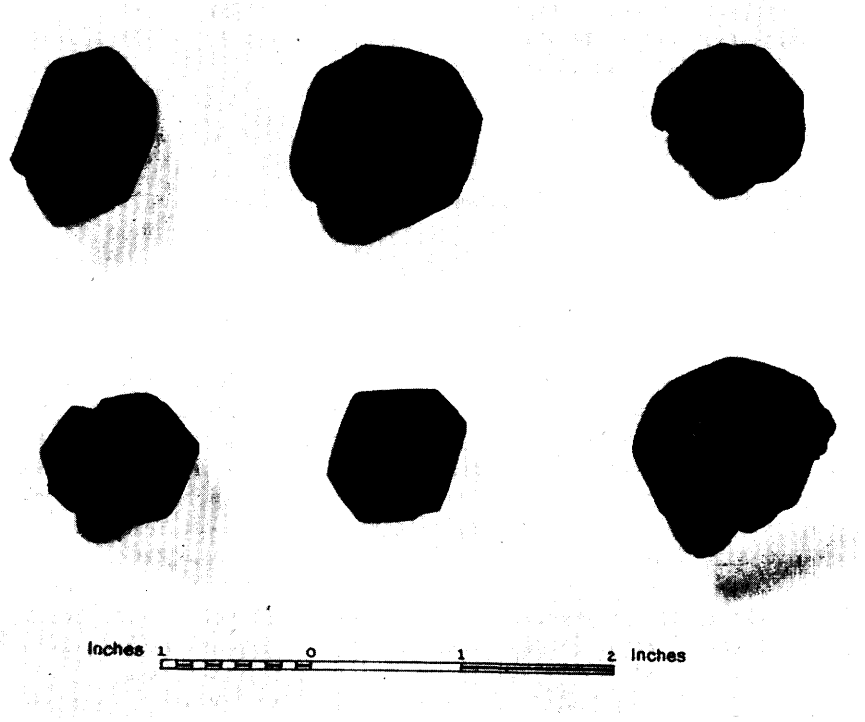
The Basin property of Silver Crater Mines, Limited, is lot 31, concession XV, Faraday township, Hastings county. It is accessible from the Monck road by a jeep-tractor road two miles long.

The company has carried out exploration on a calcite body containing crystals of betafite, a multiple oxide of columbium, titanium, and uranium. This body forms a sill-like mass in biotite-hornblende gneiss adjacent to a body of alkali syenite.

In 1925 the north end of the calcite body was worked for black mica by

S. Orser and D. J. Wilson, and from 1947 to 1949 the property was operated by the Bancroft Mica and Stone Products Mining Syndicate, Limited, producing scrap and trimmed mica. Production was valued as follows: in 1947, $738; 1948, $7,474; 1949, $7,846; 1950, $10,353. This production all came from an open pit which, in 1949, was 30 feet in diameter with a 65-foot wall against the slope of the hill, and a 10-foot wall on the outer side.[1]

Silver Crater Mines, Limited, commenced operations in 1953 and explored the radioactive part of the calcite body to the south of the old mica pit by a number of trenches and by six shallow, X-ray drill holes. The work was continued in 1954 by bulldozing overburden and weathered rock from the top of the calcite body



Betafite crystals from the calcite body at the Basin property, Silver Crater Mines, Limited.

and by diamond-drilling. By the end of 1954, 14 inclined holes and 9 vertical holes, totalling 4,274 feet, had been drilled.

The work to date has indicated that the calcite is a sill-like body which strikes north and dips 25°–55°E. The drilling to the end of 1954 had not delimited the boundaries of the body.

J. Satterly examined the property in July, August, September, and October 1954.

The calcite body is exposed at surface for a length of about 300 feet and a width of 150 feet. It is a coarsely crystalline, cream-coloured calcite containing scattered, large crystals of black mica, hornblende, and apatite. Betafite and zircon are present as accessory minerals. The black mica crystals seen by J. Satterly range from ½ to 2 feet across, the hornblende from 1 to 3 feet, and the largest apatite crystal measured 1 by 2 feet. The betafite is in well-developed crystals (see

[1] I. Williams, *Mines of Ontario in 1949*, Ont. Dept. Mines, Vol. LIX, 1950, pt. 2, p. 86.

photograph), showing cubic and octahedral faces and ranges in size from less than 1 inch to a maximum of 3 inches. In the fall of 1954 the company recovered a number of crystals by sluicing the weathered material that had been bulldozed from the top of the calcite body. The betafite is seen to be intimately associated with clusters of mica books, with apatite, or attached to the biotite-scapolite gneiss of the wall zone. It also occurs, rarely, alone in calcite or as streaks of crystals in red-stained fractured zones in the calcite body, dipping gently 20°–25°E.

A partial analysis by the Provincial Assay Office of the betafite follows: Cb_2O_5, 41.5 percent; Ta_2O_5, 1.4; TiO_2, 20.1; U_3O_8, 21.4; and CaO, 9.9 percent. The mineral was provisionally identified in the field as pyrochlore. The analysis indicates it is betafite. Betafite can only be distinguished from pyrochlore by a chemical analysis since morphologically they are similar.

Geiger readings were made in July when only a small amount of bulldozing had been carried out. Later, extensive bulldozing filled in some of the trenches examined. At the old mica pit the readings were 20 to 30 (1M) on the calcite, that is, background count or barely above. No betafite has been found there. In the trenched and slightly bulldozed area, 100 feet wide and extending 250 feet south of the old mica pit, geiger readings were on the 5M or 10M scales with spot-high or off-scale readings on the 50M scale where betafite crystals were found.

HASTINGS COUNTY, MONTEAGLE TOWNSHIP

S. J. Carr

S. J. Carr has stripped the slope of an outcrop ridge on the line between lots 7 and 8, concession III, Monteagle township, Hastings county. The 100-foot long stripping exposes a medium- to coarse-grained leuco-granite or granite pegmatite cutting a gneissic metagabbro. The pegmatite is exposed for a length of 250 feet on this ridge, and wedges out at the south end of the stripping. Near the north end of the stripping its exposed width is about 50 feet. The contact with the metagabbro strikes N.25°W.

Allanite occurs as scattered rounded crystals from a 1 inch across to masses 2 by 5 inches in size in the pegmatite. Fractures up to a foot in length radiate outwards from the allanite. Orange-brown uranothorite is abundantly disseminated as lenses or grains throughout the allanite. The allanite occurs along fractures in the pegmatite, but many fractures in the pegmatite do not contain that mineral. Geiger readings on the pegmatite are 30 (1M), which is barely above normal background count. On the allanite crystals the readings vary, depending on the uranothorite content. On the large crystal mentioned above the reading is 35 (10M).

The showing was examined on August 19, 1954.

MacDonald Feldspar Mine

For many years the MacDonald mine was the largest feldspar operation in the Hybla area and is well known for its interesting assemblage of radioactive minerals. In 1954 the property was re-examined as a potential source of radioactive minerals.

The main workings of the MacDonald mine are located on lot 18, concession VII, Monteagle township, two miles by road east of Hybla railway station. Three smaller open cuts are located on lot 19, concession VII, just west of the main workings.

The MacDonald mine was opened in 1919 by the Pennsylvania Feldspar Company, which leased the feldspar rights from Peter MacDonald. This company

and its successors, the Verona Mining Company and the Genesee Feldspar Company, operated the mine until 1928. From 1928 to 1935 some production was reported by Peter MacDonald from the dumps and from pits on lot 19. The total production reported to the Ontario Department of Mines amounted to 35,048 tons of feldspar.

The main pegmatite dike strikes east-west and dips 60–70 degrees to the north. The main workings have a length of 550 feet, a maximum width of 70 feet, and a depth of 120 feet. The dike outcrops on the side of an east-facing hill and was originally developed by an open cut driven westward into the hillside. At the west end of this open cut the dike narrows to 15 feet in width and finally pinches out. Subsequently a second open cut was driven westward on the dike at an elevation 40 feet below the original cut for a distance of 110 feet and extended a further 175 feet as an adit. The lower part of the dike was then removed by stoping upward from the adit to break out into the upper open cut.

The country rocks consist of highly syenitized and granitized Grenville metasediments, syenite gneiss, granite gneiss, and pegmatite. The late granite pegmatite dikes occupy east-west fractures that cut these country rocks.

The main dike is a strongly segregated granite pegmatite showing a zonal arrangement of internal units that include, (1) a fine-grained graphic granite border zone, (2) a wall zone of medium-grained albite-microcline-quartz pegmatite, (3) an intermediate zone of coarsely crystalline quartz and microcline perthite, and (4) a central core of massive quartz. In addition to these units, coarsely crystalline pods of salmon-pink calcite occurred in one or two places within the dike. The main minerals of the dike are quartz, microcline, perthite, and plagioclase. Some of the largest feldspar crystals measure 15 feet across. Quartz masses up to 30 feet occur. The quartz is milky, glassy, or smoky. The plagioclase ranges from 10 to 20 percent anorthite content. Hornblende, pyroxene, biotite, and chlorite occur in the outer zones of the pegmatite. Scapolite is found near the contacts, and abundant dark red-brown garnet occurs near the walls. Magnetite is the most common metallic oxide; some ilmenite also occurs. Masses of pyrite and pyrrhotite are present on the dump, and minor amounts of chalcopyrite and molybdenite were reported by Ellsworth.[1]

Titanite and zircon are common. The MacDonald mine is well know for its cyrtolite, a radioactive variety of zircon. The cyrtolite occurs in single crystals or masses of crystals up to 1 inch in size, which are frequently covered with hematite. These crystals show elongated double prisms and shorter pyramidal faces. The cyrtolite often occurs in feldspar or in pink or salmon-coloured calcite, which occurs as pods within the quartz of the dike. Associated with the cyrtolite is the radioactive mineral, ellsworthite, which is a variety of hydrous uranium, calcium, and iron titano-tantalo-columbate of the pyrochlore-microlite series. This material is waxy yellow-brown to shiny black in colour, and commonly occurs in calcite or feldspar. Allanite, in masses up to 1 foot in diameter, also occurs in the dike, and allanite, cyrtolite, and ellsworthite are all frequently surrounded by radial shatter-patterns in the adjacent quartz, feldspar, or calcite.

Ellsworth[2] also reports purple fluorite, uranothorite, and galena. Uraninite is reported by P. A. Peach.[3]

In the northwest cut on lot 19, concession VIII, the granite pegmatite consists

[1] H. V. Ellsworth, *Rare-element Minerals in Canada,* Geol. Surv. Can., Economic Geol. Series, No. 11, 1932, p. 203.

[2] H. V. Ellsworth, *op. cit.,* pp. 203-9.

[3] P. A. Peach, *Some Pegmatites from Eastern Ontario and their Geologic Environment,* unpublished thesis for degree of Doctor of Philosophy, University of Toronto, 1950.

of microcline perthite, quartz, and soda spar, with allanite, biotite, hornblende, zircon, titanite, magnetite, ilmenite, and pyrite. The allanite crystals along the hanging-wall side of the dike in the wall zone are particularly common. They are up to 2 feet in length and are surrounded by pronounced radial shatter-zones.

The MacDonald pegmatite is a good example of the segregated type of granite pegmatite in which radioactive minerals occur irregularly distributed in certain units within the pegmatite.

H. Quirk

Harry and J. E. Quirk have explored a number of small radioactive showings on parts of lots 11 and 12, concession IV, Monteagle township, Hastings county. J. Satterly examined the showings on July 29, 1954.

Exposures in the various workings and a few scattered outcrops in the open fields of the farmland indicate that the area is underlain by a complex of crystalline limestone, silicated limestone, limestone skarn, and interbedded paragneiss intruded by thin sills or dikes of granite pegmatite and leuco-granite. Uranothorite has been identified from these workings.[1]

The most easterly workings are on lot 11, concession IV. These workings expose for 40 feet a 5-foot sill of hornblende granite pegmatite in biotite-hornblende gneiss striking N.25°E., and dipping 60°E. The gneiss may be an interbed in a band of crystalline limestone. Geiger readings on the pegmatite range from 30 to 40 (1M) with a spot-high reading of 15 (5M). No radioactive minerals were found. Titanite occurs as an accessory mineral. The background count over limestone averages 20 (1M).

On lot 12, concession IV, strippings, pits, and trenches have been put down on a hill slope and in adjoining fields to explore miscellaneous occurrences of radioactive minerals. The writer examined nine workings spread over 500 feet in a southwesterly direction. The northeast showing, here called trench No. 4, is really a group of four trenches forming a square. The trench on the north side exposes pink granite gneiss underlying rusty-weathering biotite paragneiss striking N.40°E. and dipping 30°SE. The east trench exposes pink hornblende granite pegmatite, apparently a sill in the series of gneisses. The pegmatite reads 15 to 35 (5M) on the geiger ratemeter. Accessory minerals include titanite, zircon, and both orange and black uranothorite. A small pod of calcite with hornblende and apatite is present at the intersection of the south and west trenches of the square. The pod has been largely removed and may have been 15 feet long. The geiger recorded a reading of 15 (5M) here. The west end of the south trench exposes a 2-foot sill of hornblende granite pegmatite in hybrid granite gneiss.

Working No. 5 consists of stripping and trenching and lies immediately to the south and west of No. 4. It is 100 feet long, north and south. In the east arm a sill of hornblende granite pegmatite lies in biotite and hornblende paragneisses, which strike N.35°E. and dip 70°E., and a pit has been sunk on a small mass, 5 by 10 feet, consisting of calcite, apatite, hornblende, and scapolite, which reads 15 (5M) on the ratemeter. The south section of the working is on a dip slope exposing hornblende and biotite paragneisses with undulating dip. Patches of pink granite gneiss appear in "windows", and at the extreme south end there is a small exposure of overlying pegmatite. In places patches of a pyroxene skarn or of a calcite-apatite-hornblende-scapolite aggregate are present from a few inches to 5 feet across, and possibly less than 1 foot thick. In these patches, uranothorite

[1] A. H. Lang, *Canadian Deposits of Uranium and Thorium (Interim Account)* Geol. Surv. Can., Economic Geol. Series, No. 16, 1952, pp. 142–45.

occurs erratically in disseminated orange-brown grains 1/16–1/2 inch across. The calcite is salmon-pink in colour, often a very deep pink, but fades to cream on long exposure. A trench, 80 feet in length to the northwest, across the strike of gneisses, exposes pink granite gneiss, granitized biotite gneiss, very minor amounts of red hornblende granite pegmatite, and a 7-foot pod of coarsely crystalline calcite. In this trench geiger readings range from 20 to 35 (1M) with a high of 10 (5M) on pink granite gneiss.

Workings Nos. 6 and 7, 50 and 70 feet south of No. 5, expose hornblende-scapolite skarns. Geiger readings of 10 to 20 (5M) were obtained over small lenses of salmon-pink calcite.

Working No. 8, about 80 feet southwest of No. 5, is a group of trenches extending 110 feet in a southwest direction. Silicated limestone, hornblende-scapolite gneiss, hybrid gneisses, and pegmatite are exposed. The southwest and main part of the trench is apparently on the dip slope of a hornblende granite sill, part of which is a leuco-granite gneiss. Accessory minerals include titanite, zircon, and uranothorite. Geiger readings range from 20 to 35 (5M) on the pegmatite. The thickness of the sill could not be determined. The exposed length is 80 feet.

Workings Nos. 9, 10, and 11 are 100, 160, and 200 feet west of No. 8. These are strippings and trenches exposing hornblende granite pegmatite, leuco-granite pegmatite, and hornblende-scapolite skarn. The contact with crystalline limestone is exposed in trenches 10 and 11. Geiger readings on the limestone are 20 to 30 (1M), and over the pegmatites from 20 (1M) to 18 (5M).

Working No. 12, 150 feet southwest of No. 8, is a shallow trench and open cut on a dip slope exposing a thin sill of leuco-granite gneiss overlying a paragneiss containing lenses of crystalline limestone. The exposed thickness of the sill is 2 feet. Zircon and titanite occur as accessory minerals in the granite gneiss. Geiger readings range from 10 to 15 (5M).

Mrs. W. M. Thompson

R. H. Thompson and Larry Black held an option in 1954 on the mineral rights on lots 4 and 5, concession VII, and lot 5, concession VI, Monteagle township, Hastings county, the property of Mrs. W. M. Thompson.

A radioactive showing was found in a pegmatite exposed in a creek bed on lot 4, concession VII, and additional exploration by test-pitting and stripping has been carried out, on the slope of the ridge above the creek, over a length of 7 chains. This work has exposed crystalline limestone and pegmatite. Insufficient work has been done to indicate continuity of rock types. The showing was examined on August 14, 1954.

In the creek bed, granite pegmatite is exposed for a length of 70 feet, and a possible width of 15 feet. Crystalline limestone is exposed on one wall of the creek and may represent the hanging-wall contact or be an inclusion in the pegmatite. Forest and debris on either side of the creek bed conceal the bedrock. At the time of the examination insufficient work had been done to determine the strike of the dike or sill of pegmatite.

The dike rock is a medium-grained hornblende granite pegmatite with accessory titanite, magnetite, zircon, and rarely, uranothorite. A fracture in the pegmatite gave a spot-high geiger reading of 25 (50M) and contains a stringer or lens of pale-mauve agate with grains of orange-brown uranothorite. North of this fracture the pegmatite gives geiger readings from 15 to 30 (5M), and south of it from 5 to 10 (5M).

PETERBOROUGH COUNTY, ANSTRUTHER AND BURLEIGH TOWNSHIPS

Pole Star Mines, Limited

Pole Star Mines, Limited, owns a group of 16 claims, E.O.9041–9043, E.O.9202–9204, E.O.9175–9177, E.O.9184–9186, and E.O.9252–9255, comprising lots 23–25, concessions XI and XII, Burleigh township, and two patented lots, 26 and 27, concession I, Anstruther township, Peterborough county.

In 1953, Newkirk Mining Corporation, Limited, carried out an airborne scintillometer survey covering 1,600 square miles in the Bancroft area. A number of radioactive anomalies were found, and a large number of claims were staked in Anstruther and Burleigh townships. Groups of claims covering different anomalies were allocated to various subsidiary companies, one of which, Pole Star Mines, Limited, acquired the group of claims listed above. In 1954, Pole Star carried out a surface geiger ratemeter survey, followed by geological mapping and diamond-drilling, to explore the radioactive anomalies. On claims E.O.9252 and E.O.9253 in Burleigh township 21 holes, totalling 8,403 feet, were drilled.

The area drilled is underlain by a north-south zone, 200 feet wide, of granite pegmatite or pegmatitic granite lying between biotite-hornblende gneiss to the west and biotite-hornblende gneiss and crystalline limestone to the east. In the zone of dikes the biotite-hornblende gneiss exhibits a variable granitization. The granite pegmatite or pegmatitic granite as seen in surface exposures is a pink, medium-grained leuco-granite with pegmatitic patches. J. Satterly examined core from drill-holes Nos. 2, 4, 5, 6, 7, and 8 on July 5 and 19, 1954. The dikes of granite pegmatite intersected in these holes are all very similar in mineral composition. The minerals present include both potash and soda feldspars and smoky quartz, but practically no mafic minerals. Accessory minerals are magnetite, occasionally abundantly disseminated, zircon, allanite, uranothorite as black or orange grains, pyrite, and titanite. Sections of the core containing radioactive minerals were frequently noted to show a deeper red colour, and hematite-staining on fractures.

A number of samples of drill core were submitted to S. C. Robinson of the Geological Survey of Canada for identification of the minerals by X-ray powder pattern photographs. In three cores he identified the following minerals: uranothorite, uraninite, meta-allanite, and melanocerite (a silicate of the rare earths).

PETERBOROUGH COUNTY, CAVENDISH TOWNSHIP

Cavendish Uranium and Mining Company, Limited

The south group of Cavendish Uranium and Mining Company, Limited, consists of 15 claims, E.O.7316, E.O.7317, E.O.7432, E.O.7433, E.O.7466, E.O.7489–7497, and E.O.7608, in lots 14–17, concessions VI–IX, Cavendish township, Peterborough county.

A number of radioactive mineral showings in granite pegmatite have been explored by shallow pits, trenches, and 28 diamond-drill holes (to November 6, 1954), totalling 8,717 feet. J. Satterly examined the surface showings on August 23, 1954, and short sections of diamond-drill core on September 23 and October 28, 1945.

The showings may be described for convenience as the North and South.

The North showings are on claims E.O.7316 and E.O.7466, lot 15, concessions VIII and IX. A trench and pit on the east boundary of claim E.O.7316 exposes a coarse, pink granite pegmatite for 130 feet. The pegmatite contains abundant magnetite in blebs to ½ inch across, blades of allanite ½ inch long, and

small grains of orange or black uranothorite. Geiger readings in the trench were mainly 10 to 25 (10M) rising to 35 to 45 (10M) for a 10-foot section that was richer in magnetite and redder in colour. Readings in the pit were 10 to 35 (10M). These showings were explored by 12 drill holes, totalling 4,256 feet, but results were disappointing.

The South showings are on claims E.O.7432 and E.O.7433, lot 15, concession VII, on a ridge of pink leuco-granite or leuco-granite pegmatite that had been explored by four shallow pits. Feldspar crystals with graphic intergrowths of quartz may be as much as 1 foot across. The quartz is grey to black in colour. Magnetite is a local and erratic accessory mineral. Other minerals noted in accessory amounts are zircon, allanite, and uranothorite, the latter in minute grains. Yellow uranium stain was noted coating fractures in a number of shallow pits. Geiger readings recorded on the outcrop and pits are very erratic. Away from the pits the granite or granite pegmatite gave readings from 10 to 35 (5M), and may average 25 (5M). In the pits readings were recorded mainly on the 10M scale with spot-high readings in different pits of 25 (50M), 40 (10M), and 45 (10M). These showings have been explored by 16 drill holes, totalling 4,461 feet.

The initial drilling in this area yielded disappointing results, but the later drilling, holes Nos. 15, 19, 21, 26, 28, 30, and 31, indicates uranium mineralization of the order of 0.08–0.10 percent U_3O_8 over mining widths, and a length of 600 feet.

Nine drill core samples of granite pegmatite from holes Nos. 3, 4, and 5, containing uranium minerals associated with magnetite, were submitted to S. C. Robinson of the Geological Survey of Canada for identification by X-ray powder pattern photographs. The minerals were identified as uranothorite, thorite, allanite, cyrtolite, and yellow, secondary uranium minerals as uranophane and kasolite. Uranothorite was also noted by the writer in pieces of core from drill holes Nos. 15, 21, 26, and 27. A brown mineral occurring in magnetite from the trench on claim E.O.7316 was identified by Dr. Robinson as anatase.

PETERBOROUGH COUNTY, CHANDOS TOWNSHIP

Consolidated Uranium Corporation, Limited

Consolidated Uranium Corporation, Limited, holds nine claims, E.O.8319–8327, in lots 9–11, concessions XVI and XVII, Chandos township, Peterborough country.

Radioactive showings in pegmatite dikes on claim E.O.8320 have been explored by trenches and seven shallow diamond-drill holes. The surface exposures were examined by J. Satterly on September 22, 1954.

No. 1 showing has been explored by two trenches and four diamond-drill holes. According to the company, these holes cut core lengths of pegmatite of 12.3, 6.5, and 2.0 feet. The trenches and stripping expose red leuco-granite and granite pegmatite with accessory magnetite, purple fluorite, allanite, and uranothorite. The latter is in orange grains in magnetite, or in biotite flakes. A brown mineral occuring as grains in magnetite may be anatase.

No. 2 showing, 150 feet west of No. 1, has been explored by a stripping 70 feet long, three cross trenches, and three drill holes under the three trenches. A brick-red granite pegmatite dike is exposed cutting a biotite-hornblende gneiss. The dike, which strikes approximately N.60°W., has been traced for 200 feet, and ranges from 5–12 feet in width. The granite pegmatite consists of red microcline, a yellow-green sodic plagioclase, grey quartz, and accessory purple fluorite, magnetite, and uranothorite. Yellow uranium stain is present as coatings on fractures.

No. 4 showing, 200 feet north of No. 2, has been exposed by a stripping. It is a pink, fine-grained leuco-granite dike containing irregular patches of granite pegmatite and inclusions of fine-grained hornblende amphibolite. A little magnetite was noted as an accessory at one contact. The dike is 25–50 feet wide, and is exposed for a length of 160 feet. The country rock is amphibolite. Low geiger readings were recorded on the granite, mainly 35 (1M), with a high of 45 (1M).

Four specimens with radioactive minerals were submitted to S. C. Robinson of the Geological Survey of Canada for identification. He confirmed the presence of uranothorite and allanite, and also identified bastnaesite (a cerium lanthanum fluo-carbonate) and uranophane.

PETERBOROUGH COUNTY, GALWAY TOWNSHIP

Silver Crater Mines, Limited, Crystal Lake Property

Silver Crater Mines, Limited, hold, by staking, eight claims, E.O.8598–8605, and by option, patented lot 24, concession X, all at Crystal Lake, Galway township, Peterborough county. Surface work and diamond-drill exploration was carried out in 1954. Four holes, totalling 735 feet, were drilled on lot 23, concession X, and two holes, totalling 526 feet, were drilled on lot 24. The property was examined by J. Satterly on July 23 and August 26, 1954.

In lots 23 and 24, concession X, an elongate mass of leuco-granite pegmatite lies within white to grey crystalline limestone that strikes N.55°E. and dips 50°SE. The pegmatite forms a prominent ridge that rises 50 feet above the level of Crystal Lake. On lot 23, two pits and four holes have been put down to explore occurrences of uranium mineralization in the pegmatite.

Pit No. 1, 250 feet south of the Crystal Lake road, exposes a leuco-granite pegmatite showing a secondary yellow uranium mineral as coatings, and rarely, a few grains of uranothorite, allanite, titanite, and zircon. Geiger readings at this pit and around it range from a spot-high reading of 40 (10M) in the pit, to 20 to 30 (5M) around it; 80 feet to the east, near a trail, the readings drop to 10 (5M).

Pit No. 2, 450 feet south of the Crystal Lake road, is 8 by 5 by 3 feet deep. It exposes a medium-grained pink pegmatitic granite with occasional hornblende crystals 2–3 inches long. However, most of the rock is a leuco-granite pegmatite. Yellow staining due to uranium is present. Accessory minerals noted are titanite, zircon, allanite, and uranothorite. Geiger readings recorded two spot-highs in the pit of 35 (10M), but mostly the reading was 20 (10M), and the same on the dump rock around the pit.

The work on lot 24, concession X, consists of two drill holes, but no surface work. Much of the rock on the ridge to the west of the two drill holes is a pink graphic granite pegmatite with feldspar crystals 1–3 feet across. The average geiger reading is about 10 (5M) with, rarely, spot-high readings of 20 and 35 (10M). One allanite crystal was noted, ¼ by 3 inches. The background count on the crystalline limestone is 25 (1M).

PETERBOROUGH COUNTY, HARVEY TOWNSHIP

L. Cadesky

L. Cadesky owns part of lot 26, concession XVI, Harvey township. Stripping and trenching has explored a dike of leuco-granite pegmatite on the north side of Nogies Creek at Cedar Rapids. Cedar Rapids are 1.8 miles north by road from highway No. 36. The showing was examined on September 23, 1954.

From the bank of the creek a stripping exposes 30 feet of leuco-granite pegmatite forming a 6-foot dike striking N.25°E. The dike cuts grey biotite granite

gneiss. The pink to brick-red leuco-granite pegmatite contains much coarse hematitized magnetite in masses or clots from ¼–3 inches across. Geiger readings are very variable, being mainly 10 to 30 (5M), but at 30 feet from the creek bank readings of 10 to 40 (10M) and a spot-high of 15 (50M) were obtained where the magnetite is abundant.

At 30 feet north of the creek the dike bends west as a flat sheet with an exposed thickness of 2 feet for a distance of 8 feet before continuing north as a 4-foot dike. Much magnetite is present in the footwall zone, and the geiger gave a reading of 30 (10M). A small trench 8 feet north of this point is 20 feet long. The dike is exposed at the west end and has narrowed to 1½ feet.

On the south side of the creek, pegmatite is exposed and gave a reading of 30 (10M), and again at 80 feet south where it is 7 feet wide. This section reads 30 (1M) with a spot high, rich in magnetite, reading 20 (5M). Across the road the dike trends west and is exposed for 35 feet. Here there is some mineral segregation, the centre of the dike, rich in white to rose quartz, reads 20 to 30 (1M) with a spot-high of 20 (5M) on the south contact.

Roy Kennedy

Roy Kennedy, Shell Service Station, Bobcaygeon, owns lots 22–26, concession XVI, and the west half of lot 27, concession XV. Work has been carried out on pegmatite dikes on lot 26, concession XVI, east of Nogies Creek, near a cedar bridge 1.8 miles north of highway No. 36. The writer examined the property on October 28 and 29, 1954.

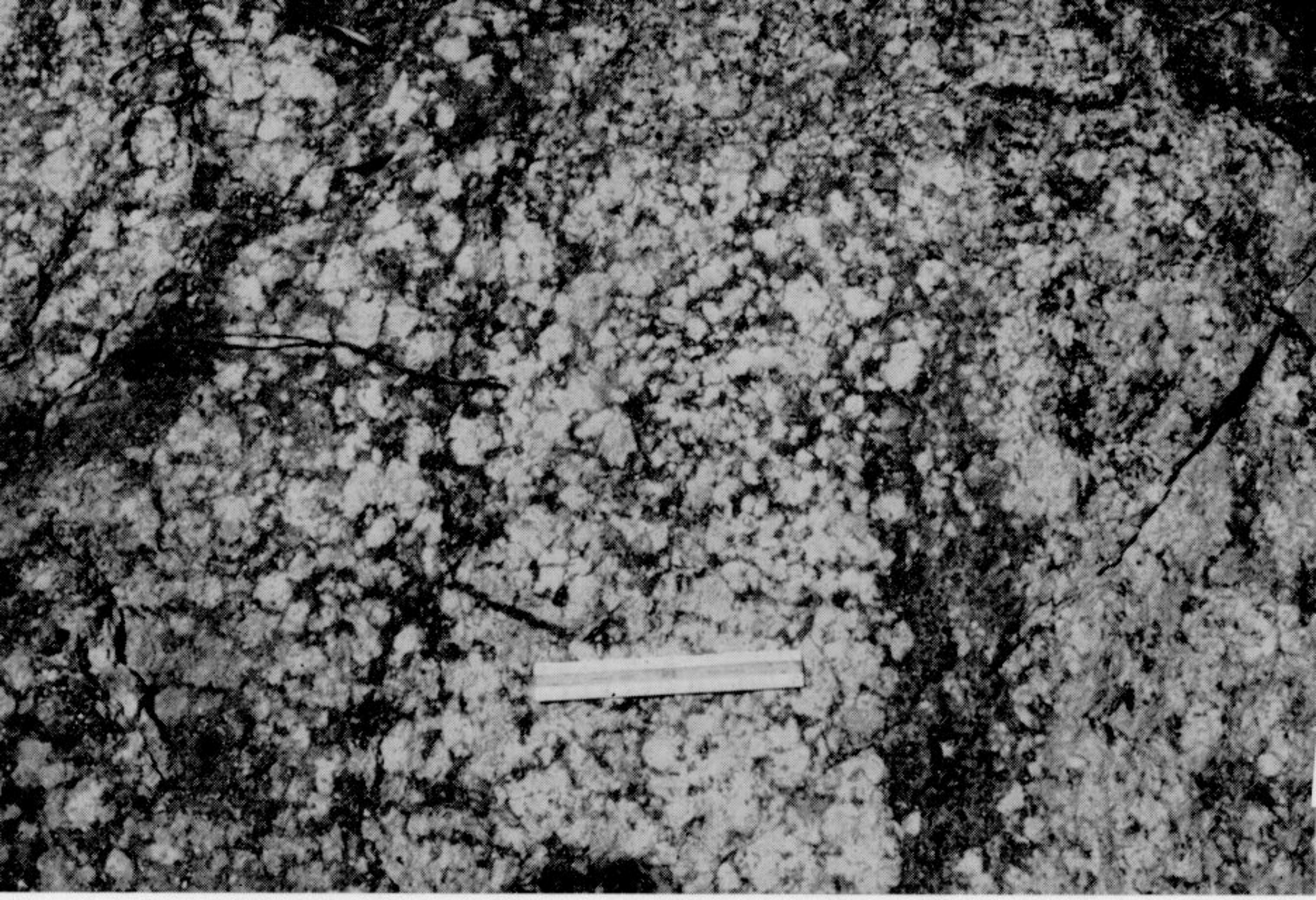
Bush-covered outcrops, strippings, and trenches expose two dikes of pink leuco-granite pegmatite cutting a medium-grained leuco-granite or biotite granite. The pegmatite contains abundant coarse magnetite in grains ⅛–1 inch across. Minerals associated with the magnetite are pale brown anatase (?), bleached zircon, and orange or black uranothorite. The quartz of the pegmatite is glassy clear to faintly smoky.

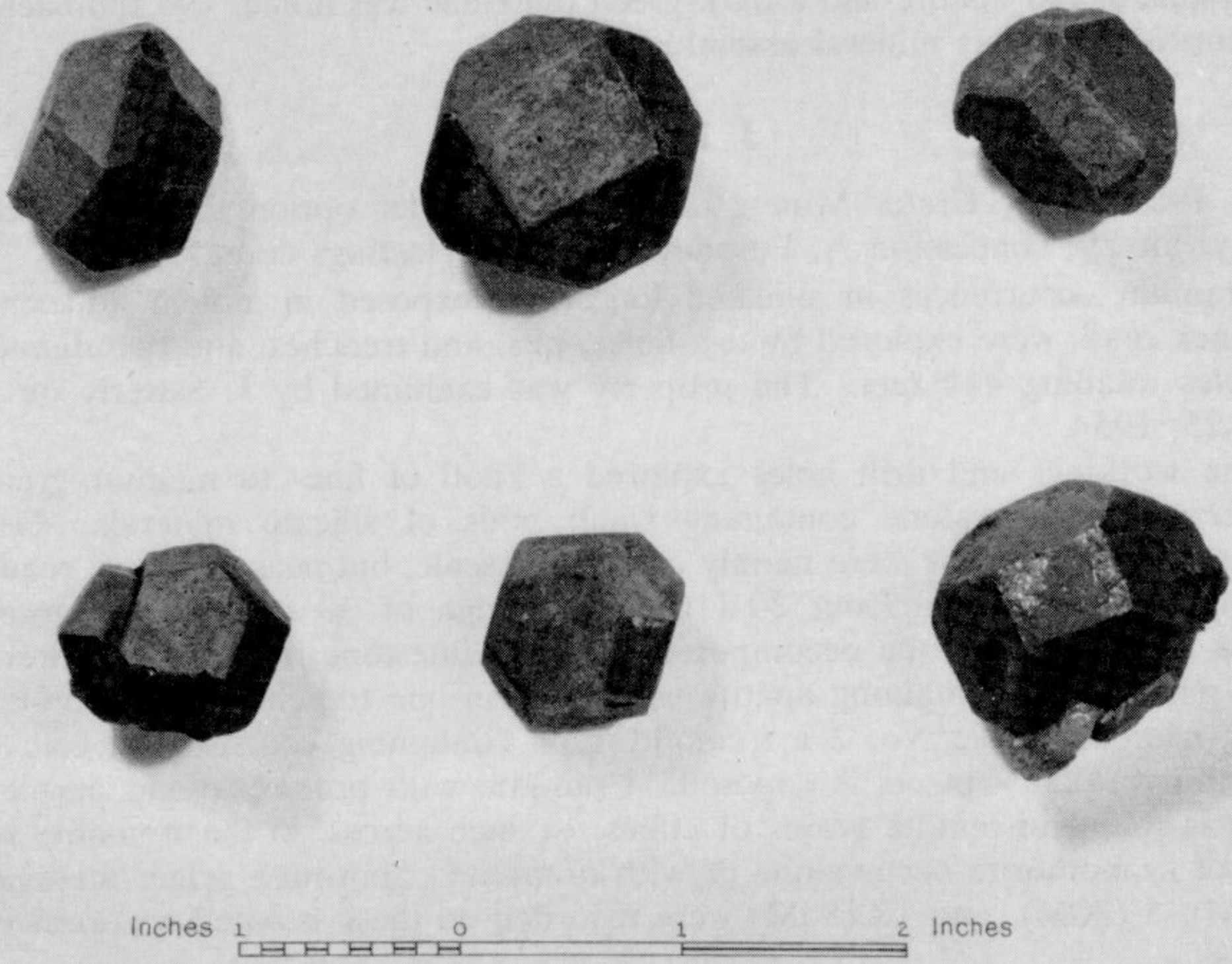
No. 1 dike has been explored by two trenches and five strippings. J. Satterly made some additional strippings while mapping the dike. The dike is from 2 to possibly 15 feet wide, and has an exposed length of 190 feet. It strikes NE. and dips 45° SE. It is characterized throughout its length by abundant coarse hematitized magnetite. Geiger readings obtained over the dike were mainly between 15 and 50 (5M), and may average 35 (5M). A spot-high reading of 30 (10M) was found on the first stripping, and a trench about 150 feet northeast gave readings of 30 to 35 (10M).

No. 2 dike is exposed in an outcrop, and by five strippings. It is 2 to possibly 20 feet wide, and has an exposed length of 200 feet. The dike strikes NE. and dips 50°SE., swinging east at its north end where the dip flattens to 30°S. The distribution of the accessory coarse magnetite is not uniform and the geiger readings range from 13 (5M) to a spot-high of 25 to 35 (50M) over a yard-square area at the extreme northeast exposure of the dike. The lowest readings were obtained on those parts of the dike containing little or no magnetite. The average reading for the whole dike may be 25 (5M).

Grab samples taken by Mr. Kennedy are reported by him to have given the following assay results: 0.04, 0.08, 0.07, 0.11, and 0.97 percent U_3O_8 (chemical). The latter was obtained on the spot-high area (25 to 35 (50M)) at the northeast end of No. 2 dike. Another analysis on a grab sample from this spot was 0.87 percent U_3O_8 equivalent. Two grab samples, 54-S-414 and 54-S-415, were taken from trenches on No. 1 dike by J. Satterly. Radiometric assays made by the Provincial Assay Office gave 0.03 percent U_3O_8 equivalent.

D-2-E(93)

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