MAR 19680015: NORTHEASTERN ALBERTA

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GEOLOGICAL EVALUATION

of

QUARTZ MINERAL PERMITS #43 and #45

December, 1968

[redacted]
J. W. Worobec
Consulting Geologist

INTRODUCTION

This report was prepared at the request of Mr. R. Standen of Boswell Minerals Ltd., 1140 Guinness House, Calgary 2, Alberta.

The object of this study was to ascertain the possible economic mineral potential of the above captioned permits from the regional geologic setting, in so far as the local geologic conditions and features may be related to adjacent known mineralized areas. The conclusions and recommendations arrived at in this report are based on published data and other information gained from personal knowledge and prior field work.

Very little published data is available in the immediate area of the permits, or within the Precambrian shield area of Alberta, other than those reports published by J. D. Godfrey, through the Research Council of Alberta. (See bibliography). Trade Journals and personal investigation in the area, have been helpful in appraising current activities and rumoured discoveries, as they might relate to these properties, in particular.

Peaceful uses of uranium, particularly in the nuclear power field, are growing rapidly and will continue to exceed all forecasts for demand. W. M. Gilchrist, President of the Crown-owned Eldorado Mining and Refining Ltd., in his annual report of this year, said there is an

urgent need to find and develop new uranium ore bodies. He further states, "It is clear that the annual production possible from the western world's present reserves of uranium, proven and developed, will not meet the demand beyond 1973, and possibly not even in that year".

The report predicted that in 1975, at least 42,000,000 tons of uranium ore will have to be mined and processed and by 1980, at least 80,000,000 tons. In Canada, the output of U308 amounted to 8,357,000 lbs. during 1967; approximately 1,000,000 lbs. over the previous peak year in 1959.

J. Lorne Gray, President of Atomic Energy of Canada, recently stated before the Canadian Nuclear Association and the American Nuclear Society, "the U.S. program for development of uranium reserves is growing very rapidly and it's going to get a lot bigger. They are chewing up a lot of uranium for their system. They are going to run into trouble on availability and price".

The above statements, by eminently qualified authorities, predicts a rapidly increasing price rise for U308, caused by a serious production shortage in the very near future. It therefore seems assured, that mining properties that are indicative of possible occurences of economic uranium deposits, could become very valuable holdings within the next two years. When U308

shortages become more apparent, followed by an inevitable price increase, a major rush into uranium exploration will occur, far surpassing that of the mid-fifties.

DESCRIPTION OF PROPERTIES

PERMIT NO. 43

IN TOWNSHIP ONE HUNDRED AND TWENTY-TWO (122), RANGE THREE (3), WEST OF THE FOURTH (4) MERIDIAN:

Sections Sixteen (16) to Twenty-one (21) inclusive and Sections Twenty-eight (28) to Thirty-three (33) inclusive;

AND

IN TOWNSHIP ONE HUNDRED AND TWENTY-THREE (123), RANGE THREE (3), WEST OF THE FOURTH (4) MERIDIAN:

Sections Four (4) to Nine (9) inclusive;

AND

IN TOWNSHIP ONE HUNDRED AND TWENTY-TWO (122), RANGE FOUR (4), WEST OF THE FOURTH (4) MERIDIAN:

Sections Thirteen (13), Twenty-four (24), Twenty-five (25) and Thirty-six (36);

AND

IN TOWNSHIP ONE HUNDRED AND TWENTY-THREE (123), RANGE FOUR (4), WEST OF THE FOURTH (4) MERIDIAN:

Sections One (1) and Two (2), Sections Eleven (11) to Fourteen (14) inclusive and Sections Twenty-four (24) and Twenty-five (25);

containing an area of Nineteen Thousand, Two Hundred (19,200) acres, more or less.

PERMIT NO. 45

IN TOWNSHIP ONE HUNDRED AND SEVENTEEN (117) RANGE FOUR (4), WEST OF THE FOURTH (4) MERIDIAN:

Sections Five (5) to Eight (8) inclusive, Sections Seventeen (17) to Twenty (20) inclusive and Sections Twenty-nine (29) to Thirty-three (33) inclusive;

AND

IN TOWNSHIP ONE HUNDRED AND SEVENTEEN (117), RANGE FIVE (5), WEST OF THE FOURTH (4) MERIDIAN:

Sections One (1) and Twelve (12);

containing an area of Nine Thousand, Six Hundred (9,600) acres, more or less.

ACCESSIBILITY

Direct access to this region is easily available by the charter of float equipped, fixed wing aircraft, operating out of Uranium City, Saskatchewan. During freeze-up, the planes are equipped with skis. Uranium City is serviced by scheduled Pan-Western Airlines flights operating out of Edmonton, Alberta.

The topography of the Alberta Portion of the Precambrian Shield, east of the Slave River, consists of a rather gentle, undulating surface of low rounded hills with localized deep valleys and scarps with maximum relief up to 300 feet. The outcrops of rock in this area are mainly Precambrian with many glacially scoured lakes and muskeg patches. The valleys are wooded with spruce,

poplar and fir trees, while the low areas consist of scrub brush or open-water muskeg. There is a general elevation increase from 700 feet on Lake Athabasca to 1370 feet in the northeast corner of the province of Alberta.

Surface travel within the area itself is slow and difficult and can only be accomplished by foot traverses and canoes equipped with outboard motors. Also, the lack of drainage requires many long and difficult portages. Maximum field party efficiency is obtained with aircraft support.

GENERAL GEOLOGYZ

Metalliferous vein deposits are generally recognized to be genetically and spatially related to fault systems. A large number of vein or related type uranium deposits occur in an east-west belt along the north shore of Lake Athabasca. This belt extends eastwards from Fort Chipewyan in Alberta for over two hundred miles to Black Lake, Saskatchewan.

This belt lies within the Athabasca geologic province of the Precambrian Shield, and for ease of reference is termed the Lake Athabasca uranium metalogenic belt. Map 1045-MI, Metalogenic Map, Uranium in Canada, indicates this belt could possibly extend eastwards for an additional 500 miles, to the west shore of Hudson's Bay.

In the Canadian Shield, uranium ores are classified into three general types: (1) conglomeratic (2) vein and related occurences and (3) pegmatitic. Almost all of the uranium deposits which have made producing mines, and other known occurences within the Lake Athabasca Belt, consist of veins, stringers and disseminations, which fall within the classification of the vein and related types. Since this type of deposit is related to fault systems, structural control, determined from aerial photographs, can be used to delineate the favourable and unfavourable areas.

The rocks within the subject permit areas are of Precambrian age, but the succession and distribution are unknown since they have not been mapped. Intense folding and faulting of the strata, generally along northerly or northeasterly trending axes, has created a complex geological picture that must be studied in great detail.

The oldest exposed rocks are of sedimentary and volcanic origin, exhibiting various degrees of metamorphism. They belong to the Tarzin Group. However, much of the terrain is composed of granites and related rocks and other complexes of gneisses, migmatites and granitized rocks. The intense deformation resulted in

faulting and shearing, accompanied by brecciation, fracturing and mylonitization of the strata. These zones of weakness often occur in the metasedimentary rocks and areas wherein mineralization of the vein or related type of deposit can take place.

The principal structural features of the Precambrian, north of Lake Athabasca on the Alberta side, are three major fault systems, termed the Allan, Rutherford and Warren fault zones; by J. D. Godfrey (Figure #2). These main deep-seated fault systems provided the escape for emanating magmatic solutions. The shallow secondary or ancillary structures, are tension faults, fractures and folds, which have created the void spaces that the magmatic solutions could seek out as mineral repositories.

Aerial photographs available from the Department of Lands and Forests, Edmonton, Alberta, are invaluable for use in planning field work, by pre-selecting structurally favourable areas for detailed prospecting and field mapping.

PERMIT # 43

This irregularly shaped permit has maximum north-south length of nine miles and a maximum east-west width of five miles. The location of the permit is such that it straddles the north central portion of the Allan Fault. The Allan Fault is the major structural element in the western part of the Lake Athabasca region. This

fault system, more than 100 miles in length, with a northerly strike, is expressed as a shear zone, varying from one to five miles in width, with a great number of minor faults and shears. North of Woodman Lake, into the permit area, this structural element appears as several parallel fault planes within structurally weak metasedimentary rocks, alternating with granites and granite gneisses.

The deep seated origin of the Allan Fault provides the source of mineralizing solutions and gases. It is therefore concluded that secondary structural features such as tension faults and folds, would be important prospecting areas.

Along the Allan Fault, several occurences of Pitchblende and other uranium bearing minerals have been reported in a lightly prospected area. The enclosed map, Metalogenic Map of Canada, makes reference to four Pitchblende or Urananite occurences along this structural feature. In addition, approximately four miles north of the permit area, radioactive occurences, molybdenite and chalcopyrite mineralizations have been reported from geological reconnaissance surveys conducted by the Research Council of Alberta.

Permit # 43 is considered to be highly prospective for the discovery of uranium, copper and molybdenum, due

to its location over the Allan Fault belt, with its known occurences of these minerals.

PERMIT # 45

Permit # 45 is six miles long (N-S) and has an average width of slightly less than 2 1/2 miles. Geologically, this permit is located four miles west of the Allan Fault at its southern extremity, where it intersects Lake Athabasca at Fidler Point. From Wylie Lake southwards, a "horsetail" or drag effect, along the Allan Fault, appears to be responsible for a wide zone of strong northeasterly faulting, in an area composed primarily of granite and granite gneisses.

Nothing is known at present, about mineral occurences on this permit. However, since it is located in a strongly sheared area, these shears being associated with a major mineralized fault trend - it definitely warrants geologic evaluation in the field.

RECOMMENDATIONS

The following exploratory program is recommended:

1. Conduct an airborne scintillometer survey over the permit areas. The flight paths and coverage should be tied to a preliminary aerial photo geologic interpretation.

2. Any encouraging radioactive anomalies should then be field checked before the end of field season.

3. Depending on the results of Phase 2, a detailed geological field study, including sampling and trenching should be undertaken, to be followed by:

4. Diamond drilling of significant surface showings.

BIBLIOGRAPHY

"Aerial Photographic Interpretation of Precambrian Structures North of Lake Athabasca", by J. D. Godfrey; Research Council of Alberta, Bulletin 1, 1958.

" Mineralization in the Andrew, Waugh, and Johnson Lakes Area, Northeastern Alberta", by J. D. Godfrey; Research Council of Alberta, Preliminary Report 58-4. (1958).

"Geology of the Andrew Lake, North District", by John D. Godfrey; Research Council of Alberta, Preliminary Report 58-3. (1961).

"Geology of the St. Agnes Lake District, Alberta", by John D. Godfrey and E. W. Peikert; Research Council of Alberta, Preliminary Report 62-1. (1963).

"Geology of the Andrew Lake, South District, Alberta", by John D. Godfrey; Research Council of Alberta, preliminary Report 61-2. (1963).

"Geology of the Colin Lake District, Alberta", by John D. Godfrey and E. W. Peikert; Research Council of Alberta, Preliminary Report 62-2. (1964).

"Geology of the Bayonet, Ashton, Potts and Charles Lakes District, Alberta", by John D. Godfrey; Research Council of Alberta, Preliminary Report 65-6. (1966).

McIntyre To Test Uranium Property Of New Senator

McIntyre Porcupine Mines has completed plans for what will amount to a sizable exploration program this year on an extensive uranium acreage taken under a working option last year from New Senator-Rouyn Ltd. The property is an 80-sq. mile concession located in the northeastern part of Alberta and some 60 miles due west of the Beaverlodge uranium camp in Saskatchewan. Also holding a minority interest in the ground is Astrabrun Mines.

The program is to involve diamond drilling as well as other surface investigations, with a drill being moved to the property and slated to commence work on or about Feb. 20. This is to take advantage of winter conditions so that first drilling may be done from the ice on Cherry Lake.

The program during last year's field season consisted primarily of surface trenching and general prospecting, and this outlined five separate radioactive areas of sufficient importance to warrant further work, The Northern Miner understands. In each case, the showings are associated with fault zones.

Most interesting showing is regarded as the one at the north end of Cherry Lake. Here, ore grade uranium values have been obtained in two areas, while three others are regarded as potential targets for further exploration.

In one case, a radioactive zone related to a major north-south trending fault has been traced intermittently by scintillation counter and surface trenching for a length of about 2,500 ft. At the south end, near the shore of Cherry Lake, chip sampling of a rock trench across the zone has returned grade of 0.79% uranium oxide across 4.0 ft.

High scintillation counter readings have also been obtained in a swampy area about the middle of the known length. This is regarded as an interesting area and will be tested later by diamond drilling. Only low grade values were found in trenching towards the north end of the zone.

As mentioned, first drilling will be near the south end of this zone.

In addition to this winter program, which is expected to amount to at least 3,000 ft. of work, an extensive program has been lined up for this coming summer season. This latter will include further surface investigation of other known areas, as well as diamond drilling which already has been carmarked for some.

As indicated, the property is held under working option from New Senator which, in turn, obtained the ground from Astrabrun Mines. If carried to completion by McIntyre, a new company would be formed to operate the property in which McIntyre interest would amount to approximately 52%, with New Senator having a 39% stake. In addition, McIntyre has also agreed to furnish most of the senior financing which would be required should production be warranted.

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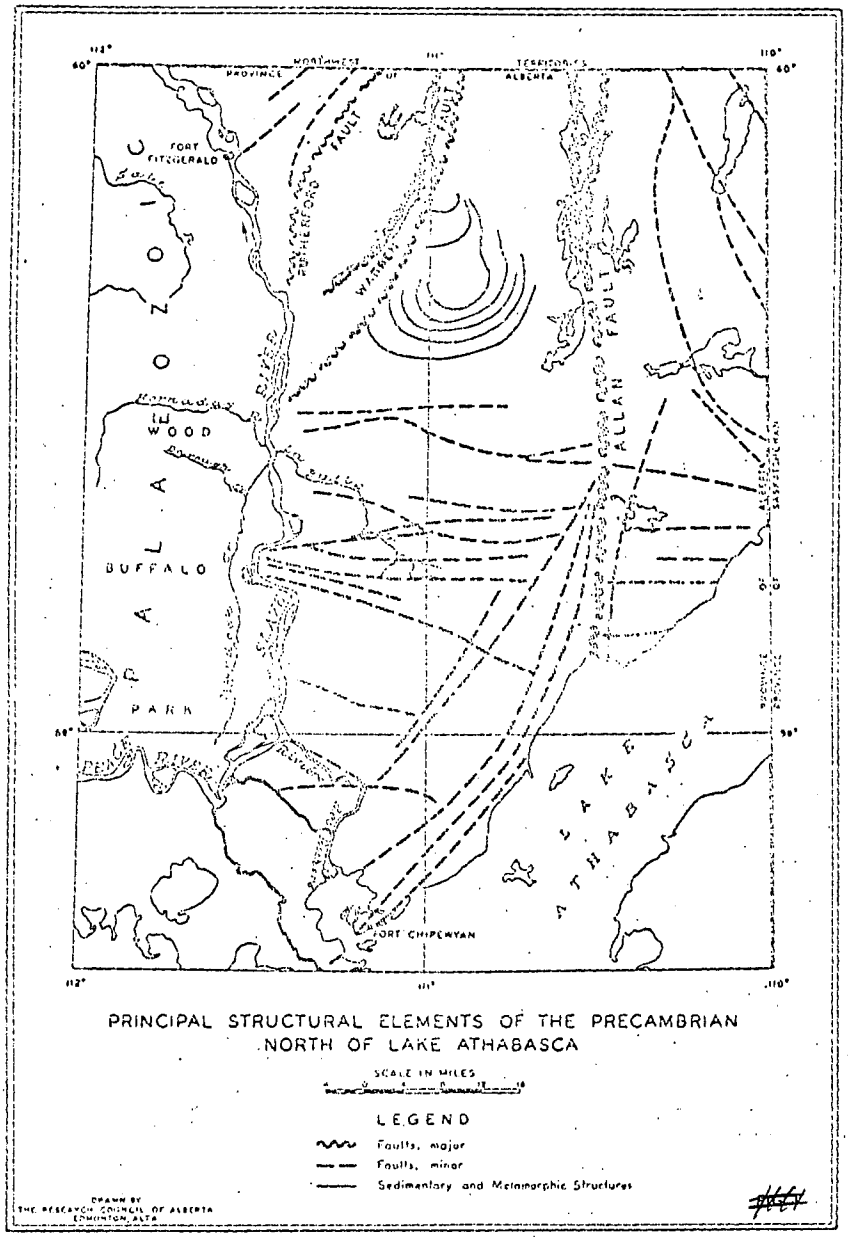
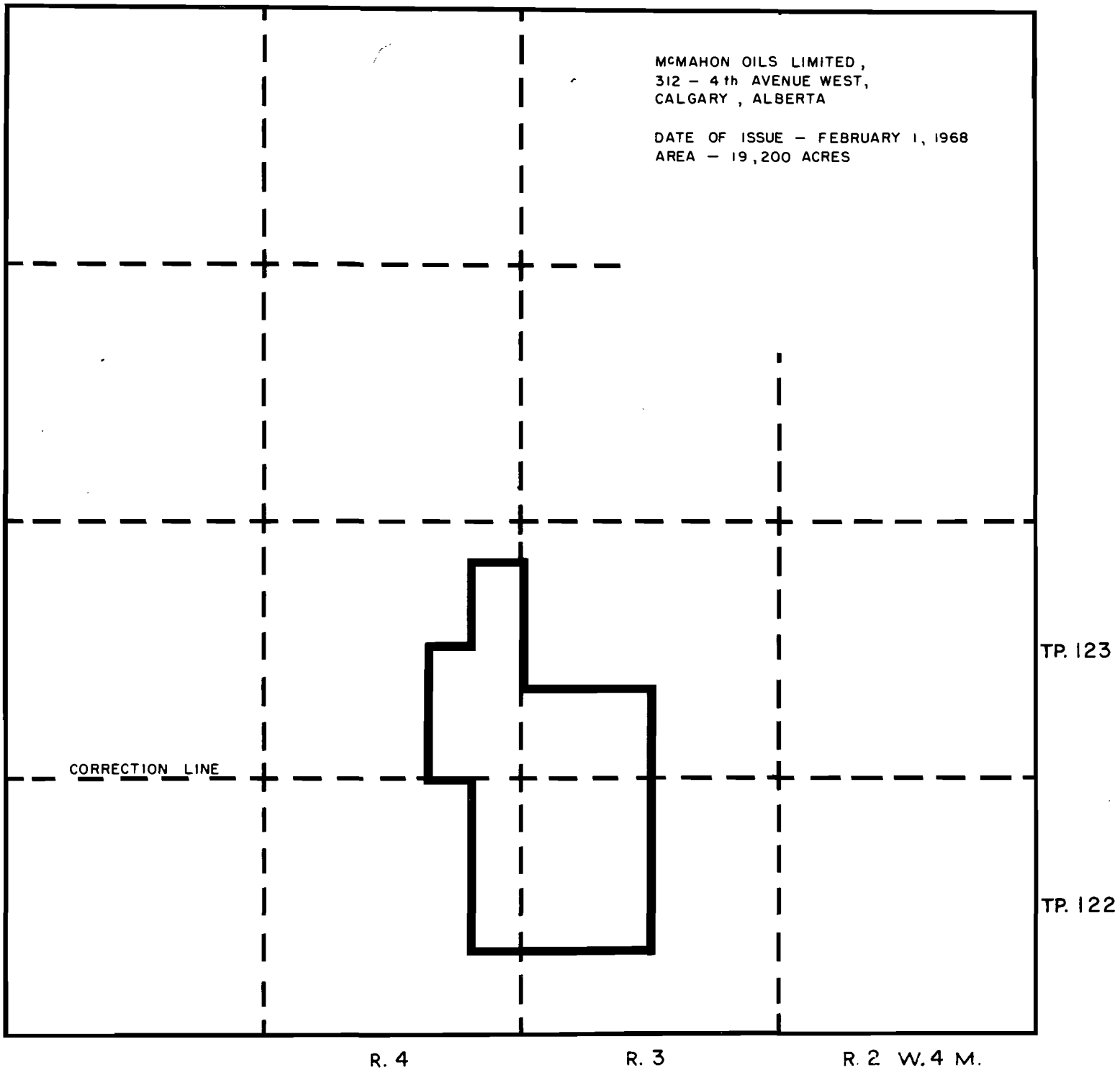
Figure 2

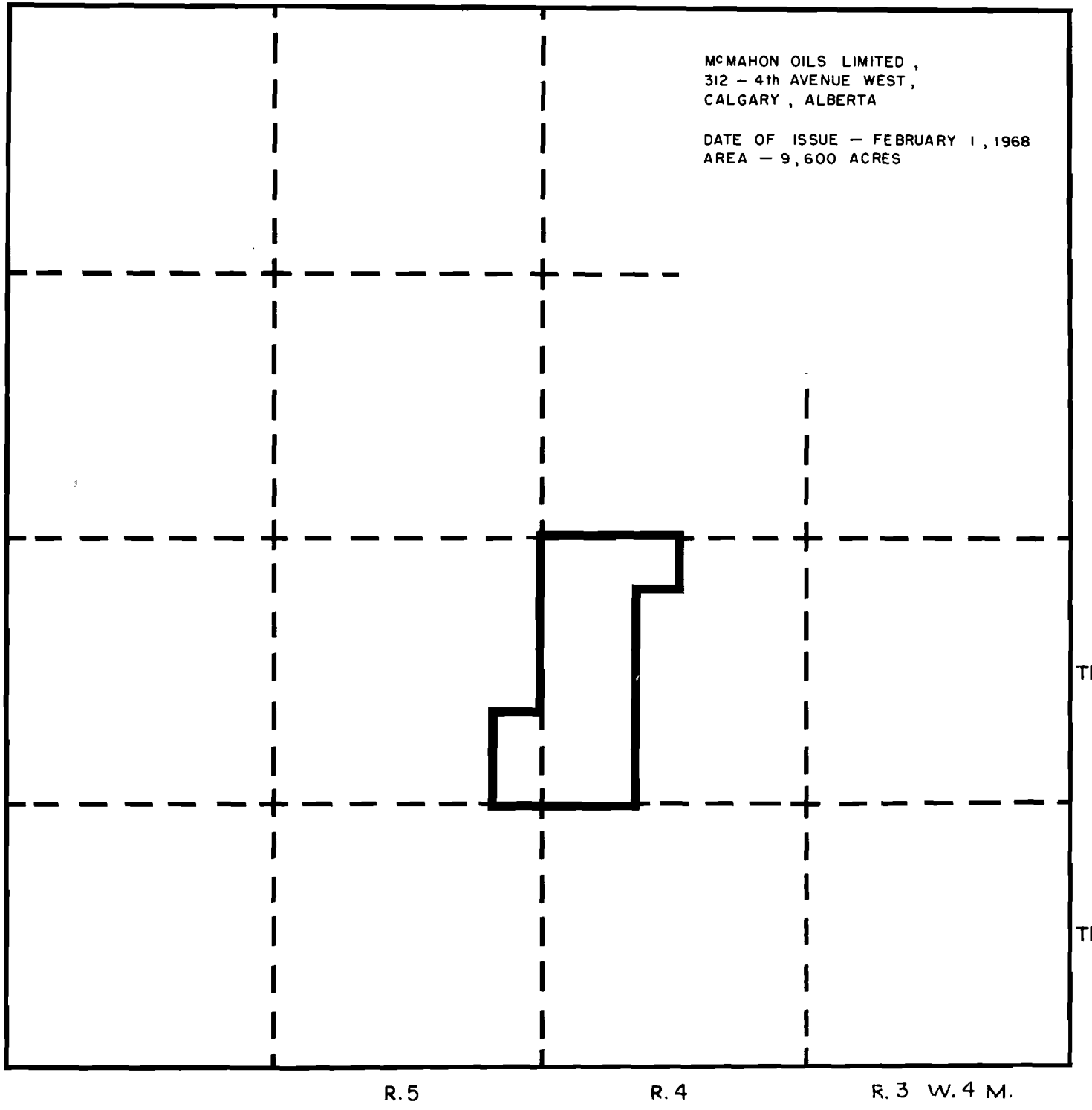


Considering these major fault and fold features together, it seems possible that the faults are shears which have replaced the limbs of the folds under excessive shearing stress. Relative movement has brought south the two folds mentioned, whilst the intervening complementary fold has been moved north and out of the map area.

QUARTZ MINERAL EXPLORATION PERMIT No. 43



QUARTZ MINERAL EXPLORATION PERMIT No. 45



19680015
PERMIT No. 43(a)

RESEARCH COUNCIL OF ALBERTA
GEOLOGICAL DIVISION.

GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

FIRST EDITION

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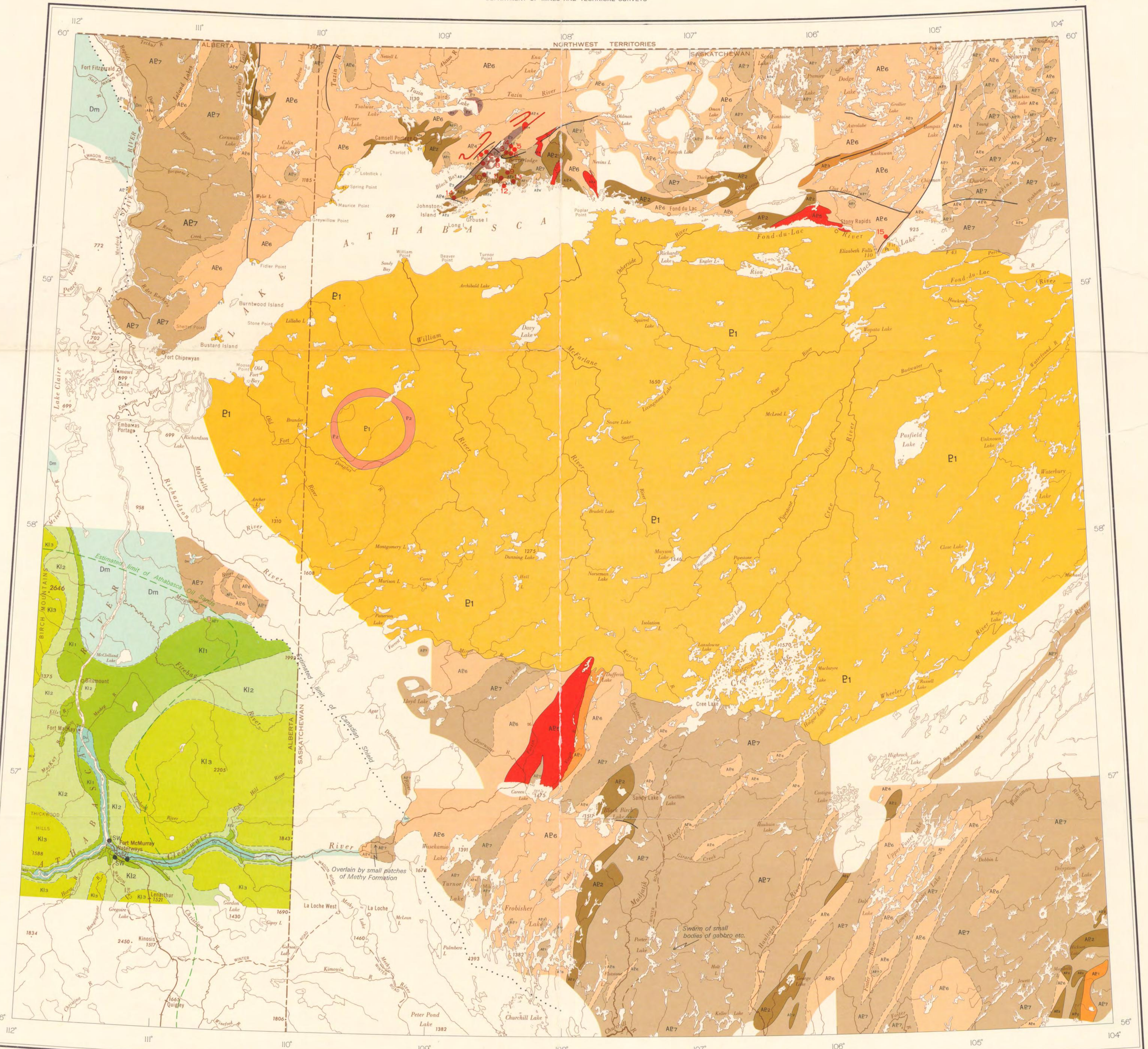

PUBLISHED, 1965
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PRINTED BY THE SURVEYS AND MAPPING BRANCH

85 SLAVE RIVER	75 LOCKHART RIVER	65 DUBAWNT RIVER
84 1161A HAY RIVER	74 1162A CLEARWATER RIVER	64 COCHRANE RIVER
83 ATHABASCA RIVER	73 1163A NORTH SASKATCHEWAN RIVER	63 1164A CARROT RIVER

INDEX TO ADJACENT SHEETS

MAP 1162A

GEOLOGY

CLEARWATER RIVER

SASKATCHEWAN-ALBERTA

Scale 1:1,000,000
1 inch to 15.78 miles

Miles 20 0 20 40 60 Miles

Kilometres 25 0 25 50 75 100 Kilometres

LEGEND

MESOZOIC

CRETACEOUS
LOWER CRETACEOUS

Kl3 — *GRAND RAPIDS FORMATION: white and yellow sand and sandstone*

Kl2 — *CLEARWATER FORMATION: grey and black shale; grey and green sandstone*

Kl1 — *McMURRAY FORMATION: sandstone, shale, conglomerate. Parts impregnated with oil*

PALAEOZOIC

DEVONIAN
UPPER AND/OR MIDDLE DEVONIAN

Du — *BEAVERHILL LAKE (Waterways) FORMATION: limestone, argillaceous limestone, shale*

MIDDLE DEVONIAN AND (?) OLDER

Dm — *METHY FORMATION: dolomite, calcareous dolomite*
LA BUTTE FORMATION: limestone
McLEAN RIVER FORMATION: shale, sandy and silty shale, dolomite, sandy and calcareous dolomite
FITZGERALD FORMATION: dolomite, dolomitic limestone, calcareous shale
LA LOCHE FORMATION: arkosic sandstone

PROTEROZOIC

Ꝑ3 — *MARTIN LAKE FORMATION: arkose, sandstone, feldspathic siltstone, conglomerate, basalt*

Ꝑ2 — *CARSWELL FORMATION: dolomite*

Ꝑ1 — *ATHABASCA FORMATION: sandstone, grit, conglomerate, siltstone, shale*

ARCHAEAN AND/OR LOWER PROTEROZOIC

AꝐ7 — *Granite, granodiorite, and related rocks, and gneissic equivalents. Includes unseparated bodies of units AꝐ1, AꝐ2, and AꝐ4*

AꝐ6 — *Gneisses, schists, migmatites, granitized rocks, and unseparated bodies of units AꝐ1, AꝐ2, AꝐ4, and AꝐ7*

AꝐ4,5 / AꝐ4 — AꝐ4. *Amphibolite and other metamorphosed mafic and ultramafic rocks of sedimentary, volcanic, and igneous origins. Includes unseparated bodies of AꝐ5*
AꝐ5. *Gabbro, norite, and other mafic or ultramafic intrusions*

AꝐ3 — *Unseparated sedimentary, volcanic, and metamorphic rocks equivalent to units AꝐ1 and AꝐ2*

AꝐ2 — *Quartzite, ferruginous quartzite, dolomite, dolomitic quartzite, conglomerate, limestone, argillite and gneissic and schistose equivalents. Includes part of TAZIN GROUP*

AꝐ1 — *Andesite, basalt, rhyolite, tuff, and metamorphic equivalents. Includes part of TAZIN GROUP*

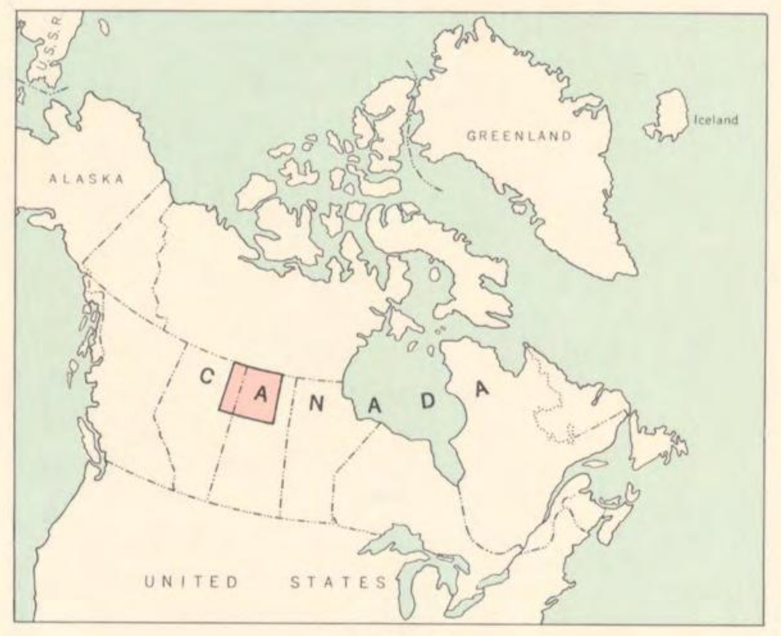
Geological boundary (defined or approximate)
Geological boundary (inferred or gradational)
Principal fault
Estimated limit of Athabasca Oil Sands
Mine (gold, uranium) . . . Au,U
Salt well . . . SW

Geology compiled by A. H. Lang, 1962, from maps and reports published by the Geological Survey of Canada, the Saskatchewan Department of Mineral Resources, and the Research Council of Alberta

Base-map from Map 2141, "Clearwater River" by the Surveys and Mapping Branch, 1949, with minor revisions, 1964

INDEX TO MINES
*Former producer

1. *Rix (Rix-Athabaska Uranium Mines Ltd.) U
2. *Cayzor (Cayzor Athabaska Mines Ltd.) U
3. *Jam-Maj (Nesbitt—La Bine Uranium Mines Ltd.) U
4. *National Explorations (National Exploration Ltd.) U
5. Verna (Eldorado Mining and Refining Ltd.) U
6. Ace-Fay (Eldorado Mining and Refining Ltd.) U
7. *Lake Cinch (Lake Cinch Mines Ltd.) U
8. *Martin Lake (Eldorado Mining and Refining Ltd.) U
9. *Gretta (Black Bay Uranium Ltd.) U
10. *Lorado (Lorado Uranium Mines Ltd.) U
11. *Box (The Consolidated Mining and Smelting Co. of Canada Ltd.) Au
12. *Athona (Athona Mines Ltd.) Au
13. *Nicholson (Consolidated Nicholson Mines Ltd.) U
14. Gunnar (Gunnar Mines Ltd.) U
15. *Nisto (Haymac Mines Ltd.) U



INDEX MAP

NOTES

GENERAL

Most of the map-area is in the Churchill 'province' of the Canadian Shield, but the eastern part is in the Interior Plains and Lowlands. Physiographically, the part in the Shield is divisible into two main areas. One is a flat area extending eastward from the mouth of Athabasca River to Wollaston Lake, and northward from Cree Lake to Lake Athabasca. It slopes gently northward from an elevation of about 1,600 feet along its southern limit to about 700 feet, the level of Lake Athabasca. It is underlain mainly by the Athabasca Formation, which is poorly exposed and covered mainly by sand and other glacial deposits. This area is flanked to the north and south by hilly areas containing elevations up to about 1,400 feet above sea-level, and underlain by older Precambrian rocks, which are fairly well exposed. The surface of the area within the Interior Plains and Lowlands varies from flat to hilly, with elevations up to about 2,800 feet above sea-level. It is underlain by flat-lying Palaeozoic and Mesozoic strata, exposures of which are virtually restricted to the banks of the larger streams.

Almost all the 'Precambrian' part of the map-area has been mapped geologically on the scale of 1 inch to 4 miles, much of it has also been mapped at 1 inch to 1 mile, and a large area extending from the vicinity of Johnston Island to a line about 5 miles north of Beaverlodge Lake has been mapped at 1 inch to 400 feet. As much of the detail cannot be shown at the scale of this map, it has been possible to illustrate only the larger geological features and a few smaller ones that illustrate structures or other phenomena particularly well.

PRECAMBRIAN

The older strata exposed are sedimentary and volcanic rocks exhibiting various degrees of metamorphism. It is not clear whether volcanic or sedimentary strata are the oldest, and it is possible that rocks of several ages are represented. North of Lake Athabasca these strata have been named the Tazin Group, to which at least some of the analogous strata in other parts of the area are probably related. The strata are intensely folded, generally along northeasterly trending axes. Evidence available at present from age determinations on samples from the Churchill province indicates that the orogenies within it took place in Proterozoic rather than Archaean times, but this does not preclude the possibility that some of the rocks involved may be Archaean. Much of the Precambrian terrane is composed of granites and related rocks, and of complexes made up of gneisses, migmatites, grantizied rocks, and small bodies of granite and other rocks. In areas that have been mapped at 1 inch to 1 mile or in greater detail the various components of the complexes have been separated and in some areas several varieties of gneisses have been mapped separately. It proved impossible to indicate these details on the present map, not only because of limitations of scale, but also because various workers used different classifications.

Also present are numerous bands of amphibolite of different sizes. Some of the narrower ones have been indicated symbolically because they illustrate the folding; many others had to be omitted.

In the large flat area south of Lake Athabasca the older rocks are overlain by the gently tilted Athabasca Formation, which was originally thought to be of Cambrian age but is now generally regarded as Proterozoic. At and near Carswell Lake several outcrops of dolomite in a circular pattern have been grouped as the Carswell Formation. The contact between these beds and the Athabasca Formation has not been found exposed, but nearby dips suggest that the Carswell overlies the the Athabasca and has been infolded in a domal structure. In the vicinity of Beaverlodge Lake beds of arkose and other sedimentary rocks interbedded with flows of basalt, which were formerly considered part of the Athabasca 'series' have recently been redefined as the Martin Lake Formation.

The older Precambrian rocks are traversed by numerous faults, many of which strike northeasterly. Only a few of the more prominent ones could be shown on this map. North of Lake Athabasca two main periods of faulting have been recognized. The older followed the granitization of rocks of the Taxin Group, and the younger took place after the deposition of the Martin Lake Formation. Wide zones of fracturing, brecciation, and mylonitization are believed to have resulted from still earlier deformation or faulting, rather than from faults that can now be mapped.

PALAEOZOIC AND MESOZOIC

The Palaeozoic strata exposed in the area mainly contain fossils indicative of Middle and Upper Devonian ages. The Fitzgerald Formation found along Slave River was formerly considered to be Upper Silurian, and because the evidence available at present is uncertain its age is now stated as "Upper Silurian and/or Middle Devonian". In the southwestern part of the map-area Lower Cretaceous strata rest on an erosion surface in the Devonian beds. The distribution of the Palaeozoic and Mesozoic formations is reasonably well known from exposures along streams and from drilling records, but the precise locations of the boundaries between them is in most places indefinite because of the extensive overburden of glacial and post-glacial deposits. Some additional formations have been recognized in drill sections but are not mappable from surface information.

ECONOMIC FEATURES

The map-area contains occurrences of a large variety of metals, discoveries to date being almost entirely confined to the earlier Precambrian rocks. The region first attracted prospectors in and following 1910 when interest was mainly in copper-nickel occurrences associated with norite, and in iron-bearing sedimentary rocks, neither of which were developed successfully. Gold discoveries in 1934 caused establishment of the town of Goldfields, near which two mines produced for a few years. An occurrence of pitchblende found at the Nicholson copper prospect near Goldfields in 1935 was not then of particular interest, but in and following 1942 it caused much prospecting for uranium in the area. This resulted in discovery of more than 3,000 occurrences of pitchblende in the general vicinity of Beaverlodge Lake, and establishment of 12 producing mines, the town of Uranium City, and several roads and airstrips. The larger pitchblende deposits consist of stringer-systems and disseminations in a variety of earlier Precambrian rocks and in the Martin Lake Formation; most are associated with prominent faults. Many additional uranium occurrences were found between Slave River and Beaverlodge area, and between that area and Porcupine River; some are of the pitchblende type described above, and most others contain crystalline uraninite in pegmatites, migmatites, and related rocks. Many occurrences of the latter type were also found in the general vicinity of Foster Lakes.

The map-area contains the northeastern part of the Athabasca Oil Sands, which in their entirety are considered to be the world's largest reserve of petroleum. They are mainly in the McMurray Formation, which is impregnated with viscous petroleum, and are regarded as an oil reservoir that was exposed sufficiently by erosion to permit escape of the more volatile constituents. Whether the oil originated in these beds, in the underlying Devonian strata, or in overlying Cretaceous formations has not yet been proved. Many investigations have been undertaken regarding the extent of the sands, and methods of exploiting them, but to date commerical production has not been achieved.

Devonian strata contain thick beds of salt, anhydrite, and gypsum. Salt was produced for several years from wells drilled near McMurray.

REFERENCES

The maps and reports used in this compilation are too numerous to be listed here. Most will be found in the Index to Publications of the Geological Survey of Canada (1845-1958) and its supplements, and in the lists of the Research Council of Alberta and the Saskatchewan Department of Mineral Resources.

EXPLANATORY NOTES

PURPOSE AND SCOPE OF MAP

The main purpose of this map is to show the location of known uarnium occurrences in Canada and to permit relating this information to principal geological features; in other words, to illustrate the present state of knowledge of "metallogenic provinces" for uranium in this country. This information will be useful in selecting areas for any prospecting that may be undertaken for uranium, and to companies seeking prospects. It is also a guide to much of the literature on Canadian uranium deposits and their geology.

Because it is impracticable to include data for areal geology on this map, it is printed on fairly transparent paper and on the same scale as the Geological Map of Canada (No. 1045A, price 50 cents), so that geological comparisons can be made by placing the map over Map 1045A. The present map may also be compared with the Tectonic Map of Canada, although this is not on the same scale; the Tectonic Map, published jointly by the Geological Society of America and the Geological Association of Canada is available at $1.50 (U.S.) from the Geological Society of America, 419 West 117th Street, New York 20, N.Y.

The information shown on this map is based on about 1,500 discoveries or mining properties at which one or more uranium minerals have been found or from which samples have yielded assays indicating 0.05 per cent U_3O_8 or more. Most of these occurrences or properties are grouped so closely that it is impracticable to show them individually, therefore the areas containing them are indicated. The larger of these areas are generalized to some extent and include some fairly large sections in which occurrences have not yet been found. Virtually all uranium occurrences known up to the end of 1957 are included. A few isolated occurrences have been omitted because the discoverers do not wish them to be revealed, but in almost all cases where permission to publish information is not available the locations fall within the ruled areas outlined by other occurrences that may be revealed. Many of the occurrences appear to be small and only of scientific interest, but their positions are useful in providing more complete information on the distribution of uranium in small quantities. Thorium occurrences have been omitted unless they are known or believed also to contain uranium in amounts of 0.05 per cent U_3O_8 or more. Occurrences of the mineral allanite have been omitted unless assays from the occurrences showed 0.05 per cent U_3O_8 or more.

CLASSIFICATION

In the Canadian Shield the uranium ores, and most of the prospects and minor occurrences, are divisible into three general types. The deposits of the Blind River area consist mainly of conglomerate whose matrix contains finely dispersed uranium minerals; these are called the 'conglomeratic' type, although a few deposits are actually in quartzite and related rocks. The producing uranium mines of Saskatchewan and the Northwest Territories, and also many prospects and occurrences, consist of veins, lenses, stringers, and disseminations of pitchblende and are called the 'vein' type for convenience, although many are not actually veins. The ores of the Bancroft area, and many occurrences there and elsewhere, belong to the general 'pegmatitic' class. Many of these are not true pegmatites but are related to them; they include migmatites, unusual calcite-bearing pegmatites, contact metasomatic deposits, granites, and syenites. The three classes of deposits usually occur in distinct parts of the Shield, which correspond with recognized geological provinces and sub-provinces, or parts thereof. Minor overlapping of types occurs however in some regions, for some of which only the dominant type can be indicated because some generalizations must be made on a map of this scale. For example, one pegmatitic occurrence has been reported from the area between Great Bear and Great Slave Lakes, where all other known occurrences are of the 'vein' type. Also, pegmatitic and vein types are intermixed to some extent at the East Arm of Great Slave Lake and in the Taltson area between that lake and Lake Athabasca. Several pegmatitic occurrences have been found in the Beaverlodge region, but it contains thousands of individual veins and related occurrences, and most of the known pegmatitic ones are near the border of the area. In the Blind River area almost all discoveries are of the conglomerate type, but one stringer of pitchblende has been reported, and a few other occurrences are also of the vein type, but these could not conveniently be separated on a map of this scale.

A few occurrences in the Canadian Shield have not been differentiated as to type because of lack of sufficient information. The occurrences in the Cordilleran and Appalachian regions have not been differentiated because the types occur heterogeneously and because several belong to types other than the three that are separated in the Shield.

In the list of localities the names of the principal uranium mineral or minerals reported are included in parentheses if the information is available.

FAVOURABLE AREAS

Besides the areas in which uranium has already been discovered — where additional occurrences are likely to be found — certain other areas that the compiler believes are favourable in a more general way are indicated roughly. These are mainly extensions of geological provinces or sub-provinces, in other parts of which uranium has been found. This information is based on theoretical and, commonly, very scanty evidence; it should be used cautiously.

Within the Canadian Shield, most such areas are designated as favourable for either the vein or the pegmatitic type of occurrences, although occurrences of other kinds might also be found. A belt extending from the vicinity of Sault Ste. Marie to that of Lake Mistassini is unclassified as to type because occurrences of various kinds have been found along it. Areas favourable in a general way for further discoveries of the conglomeratic type are not designated because certain problems regarding the origin of these deposits are not yet solved. Many additional parts of the Shield are also favourable in a general way but are not indicated because less is known about them.

The entire Appalachian region is shown as favourable because that area is relatively small on a map of this scale. The part of the Cordilleran region lying between the Rocky Mountain Trench and the Coast Range Batholith, exclusive of large areas of young volcanic rocks, is indicated as favourable in a general way, but many parts of the territory farther west are not unfavourable. At present, because of lack of producing uranium mines, neither the Appalachian nor the Cordilleran region can be regarded as favourably as many parts of the Canadian Shield.

The areas indicated are much generalized because of the scale of the map. All parts of them are not equally favourable. Local geological maps and reports available for most areas provide much more detailed data.

It must be emphasized that the present map is only a step in the elucidation of the distribution of uranium in Canada; further discoveries and research will undoubtedly cause changes in the pattern as work progresses.

SOURCES OF INFORMATION

The information on this map is based largely on reports made to the Geological Survey of Canada by prospectors and companies as required by the Atomic Energy Control Regulations, and later released for publication. Additional information has been obtained from studies made and published by the Geological Survey, by Provincial mining departments, and by geologists and mineralogists working for companies or independently. All these sources of information are acknowledged gratefully. Most of the information shown has been verified but it is possible that a few of the occurrences that have not yet been studied may prove to be misplaced or wrongly classified.

REFERENCES

If information has been published on an occurrence or on the uranium deposits of an area, references are listed in the margin of the map. For some areas the literature is extensive, and a selection has been made. Many additional publications are listed in a recent publication: "A Bibliography on the Occurrence of Uranium in Canada, and Related Subjects" (Geological Survey of Canada, Paper 56-5).

For those occurrences not yet described in publications the list of localities includes the name and address of the prospector who reported the discovery or the name of the company concerned.

The Geological Survey of Canada cannot supply publications other than its own, nor unpublished information.

LEGEND

OCCURRENCES OF THE CONGLOMERATIC TYPE
- Area containing more than one producing mine
- Area containing occurrences

OCCURRENCES OF THE VEIN TYPE
- Area containing more than one producing mine
- Single producing mine
- Area containing occurrences
- Single occurrence
- Favourable area from which occurrences have not been reported

OCCURRENCES OF THE PEGMATITE TYPE
- Area containing more than one producing mine
- Area containing occurrences
- Single occurrence
- Favourable area from which occurrences have not been reported

TYPE UNDIFFERENTIATED
- Area containing occurrences
- Single occurrence
- Favourable area from which occurrences have not been reported

Metallogenic data compiled by A.H.Lang, 1957

Cartography by the Geological Cartography Unit, 1958

CANADA
DEPARTMENT
OF
MINES AND TECHNICAL SURVEYS
GEOLOGICAL SURVEY OF CANADA

MAP 1045A-M1

METALLOGENIC MAP

URANIUM IN CANADA

SCALE: 1 INCH TO 120 MILES = 1/7603,200

100 0 100 200 300 400 MILES
KILOMETRES 100 0 100 200 300 400 500 KILOMETRES

PUBLISHED, 1958

19680015

PRINTED BY THE SURVEYS AND MAPPING BRANCH

LOCALITIES

(With key to selected references where available. Otherwise names of companies or individuals concerned are included)

1. Atlin area. Ref. 2, 1953, p. 79; 2, 1955, p. 7 (uraninite)
2. Lincoln Creek, Y.T. (B. A. Sage, 10824A-82 Ave., Edmonton, Alta.)
3. Hazelton area. Ref. 1, p. 40; 2, 1948 p. 80; 2, 1949 p. 82 (uraninite)
4. Granite Creek. Ref. 2, 1955 p. 29 (pyrochlore)
5. Grandview Claim, near Houston. (C. S. Powney, Fort St. James, B.C.)
6. Nation River. Ref. 3 (uraninite)
7. Fraser Lake (south of). Ref. 2, 1955 p. 28; 2, 1956 p. 28 (autunite, etc.)
8. Tudyah Lake. (N. Micholls, 4444 S.E. Marine Drive, S. Burnaby, B.C.)
9. Zeballos area. (S. N. Ray, 4717 Fender St., Vancouver, B.C.)
10. Bridge River area. Ref. 1, p. 43; 2, 1948 p. 112
11. Clinton area. Ref. 1, p. 44
12. Horsefly River. (R. B. Earle, 2254 Bowker Ave., Victoria, B.C.)
13. Birch Island area (including Resspar deposit). Ref. 2, 1953 p. 101; 2, 1954 p. 108; 2, 1955 p. 38; 2, 1956 p. 70; 4 (uraninite, uranothorite)
14. Lempriere area. Ref. 2, 1952 p. 115; 2, 1954 p. 111 (pyrochlore)
15. Texas Creek. Ref. 1, p. 45 (uraninite)
16. Lytton area. Ref. 1, p. 45; 2, 1955 p. 33, 34 (metazeunerite)
17. Harrison Lake (south of). (L. G. Woodman, 1671 Harrow St., Vancouver, B.C.)
18. Hope area. Ref. 1, p. 45
19. A.M. claims. Ref. 2, 1954 p. 152 (uraninite)
20. Hedley Lake (north of). (G. Ramsay, Keremeos, B.C.)
21. Armstrong area. Ref. 1, p. 44 (uraninite)
22. Kelowna area. Ref. 1, p. 45 (fergusonite)
23. Part of Kootenay region. Ref. 1, p. 44, 45; 2, 1954 p. 142. 150; 2, 1955 p. 86; 2, 1956 p. 142 (uraninite, pyrochlore)
24. Great Bear Lake area (Eldorado mine). Ref. 1, p. 46-57 (pitchblende)
25. Beilleau Lake. Ref. 1, p. 56
26. Hepburn Lake. (A. M. Berry, 14 Mercantile Bldg., Edmonton, Alta.)
27. Hottah Lake area. Ref. 1, p. 57-60 (pitchblende)
28. Contwoyto Lake (approx.) Ref. 5 (pitchblende)
29. Marian River area (Rayrock mine). Ref. 1, p. 61; 6; 7 (pitchblende)
30. De Staffany property. Ref. 1, p. 64
31. Barnston River area. Ref. 1, p. 63, 64 (uraninite)
32. Copmor property. Ref. 1, p. 64
33. Stark Lake and Murky Channel areas (Rag property, etc.). Ref. 1, p. 64, 65 (pitchblende)
34. Rex property. Ref. 1, p. 65 (uraninite)
35. Tee Lake. Ref. 1, p. 66
36. Nonacho (Taltson) area. Ref. 1, p. 66 (pitchblende)
37. Nicholson Lake. Ref. 1, p. 67
38. Leggo Lake area (pegmatitic). Dog River Mining Co. Ltd.
39. Leggo Lake, Dog River Mining Co. Ltd. (pitchblende)
40. Abitau River. New Santiago Mines Ltd.
41. Fort Chipewyan, New Delhi Mines Ltd., etc. (uraninite)
42. Fidler Point, Goldfields Uranium Mines Ltd. (pitchblende)
43. Beaverlodge or Goldfields area. Ref. 1, p. 68-106; 8, 9, 10, 11 (pitchblende)
44. Sucker Bay and Grease River. Ref. 1, p. 107, also Fond-du-Lac Exploration Co. Ltd. (pitchblende)
45. Black Lake area (pegmatitic). Ref. 1, p. 108-109; 13
46. Black Lake area. Ref. 1, p. 108-112; 13 (pitchblende)
47. Middle Lake occurrence. Ref. 12 (autunite)
48. Charlebois Lake area. Ref. 1, p. 108-114; 13, 14 (uraninite)
49. Foster Lakes. Ref. 15; 16 (uraninite)
50. Cup Lake area. Ref. 15 (uraninite)
51. Lac la Ronge area. Ref. 1, pp. 114-116; 15; 17; 18; 19 (uraninite)
52. Bleasdel Lake area. Ref. 20 (uraninite)
53. Herb Lake area. Ref. 21 (uraninite)
54. Manigotagan River - Bird River area. Ref. 1, pp. 116-117; 21 (uraninite)
55. Whiteshell area. Ref. 1, pp. 116-117 (uraninite, uranothorite)
56. Kenora area. Ref. 1, pp. 117-121; 22; 23; 24 (uraninite)
57. Wolf Island, Lake of the Woods. Ref. 1, p. 120; 22
58. Bamaji Lake. Ref. 24
59. Fort Frances area. Pioneer Consultants Ltd.
60. Port Arthur. Ref. 1, p. 120 (uraninite)
61. Port Arthur. Ref. 1, p. 120
62. Greenwich Lake. Ref. 1, p. 118 (pitchblende)
63. Mountain Bay. Ref. 1, p. 118
64. Marathon area. Ref. 1, pp. 118-121
65. Montreal River area (Sault Ste. Marie Region). Ref. 1, pp. 121-136; 25 (pitchblende)
66. Nemegos area. Ref. 1, p. 131 (pyrochlore)
67. Township 10D. Ref. 1, p. 128 (assay in this reference should read 0.081, not 0.81)
68. Aubakagama Lake. Ref. 1, p. 123 (uraninite)
69. Aubrey Falls. Ref. 1, p. 132; 26
70. Tarbutt Township. Tarbutt Mines Ltd.
71. Blind River area. Ref. 1, p. 122, 124; 27; 28; 29; 30 (brannerite, uraninite)
72. Carter Township. Ref. 1, p. 150 (euxenite)
73. Elk Lake - New Liskeard area. Ref. 1, p. 150
74. Vermilion River - Timagami Lake area. Aubay Uranium Mines Ltd., D'Eldona Gold Mines Ltd., Harrison Minerals Ltd., etc.
75. Lake Nipissing area. Ref. 34 (pyrochlore)
76. Parry Sound area. Ref. 1, pp. 136-149 (uraninite, etc.)
77. Haliburton area. Ref. 1; 31, pp. 146-149 (uraninite, etc.)
78. Bancroft area. Ref. 1, pp. 136-150; 31; 32; 33 (uraninite, uranothorite, etc.)
79. Kipawa area. (Dr. J. T. MacLean, 202 Medical Arts Bldg., Ottawa, Ont.; Mr. Gerald Jones, Kipawa, Que.) (fergusonite, etc.)
80. Abitibi area. Ref. 1, p. 155; 35; 36 (betafite)
81. Pontiac-Gatineau area. Ref. 1, pp. 151-154, 37; 38; 39 (uraninite, etc.)
82. Oka area. Ref. 40 (pyrochlore)
83. Laviolette-Portneuf area. Ref. 1, p. 152-153 (uranothorite, etc.)
84. Bresanni Township. Barnat Mines Ltd. (uraninite)
85. Levy Township. Opemiska Copper Mines Ltd.
86. Harvey Township. (J. R. Dallaire, 466 rue de Sales, Chicoutimi, Que.)
87. Charlevoix area. Ref. 1, p. 151 (uraninite, fergusonite)
88. Letellier Township. Ref. 41 (uraninite)
89. Cross Point. Ref. 1, p. 154; 42 (pitchblende)
90. Coxs Brook. Ref. 42 (pitchblende?)
91. Shippigan Island. Ref. 42 (pitchblende?)
92. Harvey area. Ref. 42 (uranospinite)
93. Hampton. Ref. 42 (uranium-bearing hydrocarbon)
94. Shediac River, Maritime Exploration Co. Ltd.
95. Black Brook. Ref. 42
96. Georgeville. Ref. 42 (cyrtolite, uranothorite)
97. New Ross. Ref. 42 (torbernite)
98. Barnes Ice Sheet, Baffin Island (radioactive columbite-tantalite)
99. Ryan Bay
100. Ten Mile Lake. Frobisher Ltd. (pyrochlore)
101. Seal Lake area. British Newfoundland Exploration Ltd. (pitchblende)
102. Makkovik area. British Newfoundland Exploration Ltd. (uraninite)
103. Makkovik area. British Newfoundland Exploration Ltd. (pitchblende)
104. Indian Head area. Ref. 43 (uraninite)
105. Flat Bay area (J. J. Dodd, Flat Bay River, Newfoundland)
106. Searston area (J. J. Dodd, Flat Bay River, Newfoundland)
107. Torbay area. (J. J. Dodd, Flat Bay River, Newfoundland)

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PARK

PEACE RIVER

ATHABASCA LAKE

Tp.118
Tp.117
Tp.116
59°00'
Tp.115
Tp.114
Tp.113
Tp.112
58°40'

R.12 R.11 R.10 R.9 R.8 R.7 111°00' R.6 R.5 R.4 R.3 R.2 R.1 110°00'

Crane L.
Murdock Creek
Barrow Lake
Ryan Creek
Ryan Lake
Powder Creek
Scow Channel
Revillon Coupé
Rothery's
Flett Lake
Claire River
Baril River
Chenal des Quatre Fourches
Baril Lake
Lake Claire
Loutit Lake
Florence Lake
Greywillow Pt.
Fallingsand Pt.
Winnifred
Cypress Pt.
Flying Cr.
45
Whitesand Pt.
Lapworth Pt.
Fidler Pt.
Sand Pt.
Burntwood Island
Pt. Brule
Shelter Pt.
Lucas Islands
Pt. Basse
Bustard Island
Grouse Cape
Pine Island
Dog Head
English Island
FORT CHIPEWYAN
Lobstick Island
Mouse Island
Potato Island
Stone Pt.
Clausen Creek
Old Fort Bay

FOURTH MERIDIAN

Map to accompany bulletin. 1

Published in 1958.

THE DECLINATION OF THE COMPASS NEEDLE 1954.

LEGEND

STRUCTURAL FEATURES

- Fault, major - regional
- Fault, minor
- Fault or strong fracture
- Fracture, minor - mainly tension
- Fracture, minor - irregular orientation
- Fracture, minor - closely spaced
- Shear zone
- Folded sedimentary or metamorphic structures

SURFICIAL FEATURES

- Sand dunes
- Glacial flutings

Aerial photographic interpretation by J. D. Godfrey.

MAP 25

AERIAL PHOTOGRAPHIC INTERPRETATION OF PRECAMBRIAN STRUCTURES NORTH OF LAKE ATHABASCA

ALBERTA

WEST OF FOURTH MERIDIAN

Scale 1 Inch to 2 Miles.

2 1 0 2 4 6 8 10

REFERENCE

- Secondary road
- Boundary, provincial
- Boundary, park, game preservation
- Boundary, township, surveyed
- Boundary, township, unsurveyed
- Boundary, settlement
- Lake and stream, permanent
- Lake and stream, intermittent
- Rapids

Cartography taken from Department of Lands and Forests, Alberta, Aerial Survey Sheets No. 74M. and north half of 74L—1951.

Magnetic declination taken from Canada Sheets No. 74M. and north half of 74L, National Topographic Series, Department of Mines and Technical Surveys, Canada—1955.

INDEX MAP

74 M   1:250,000

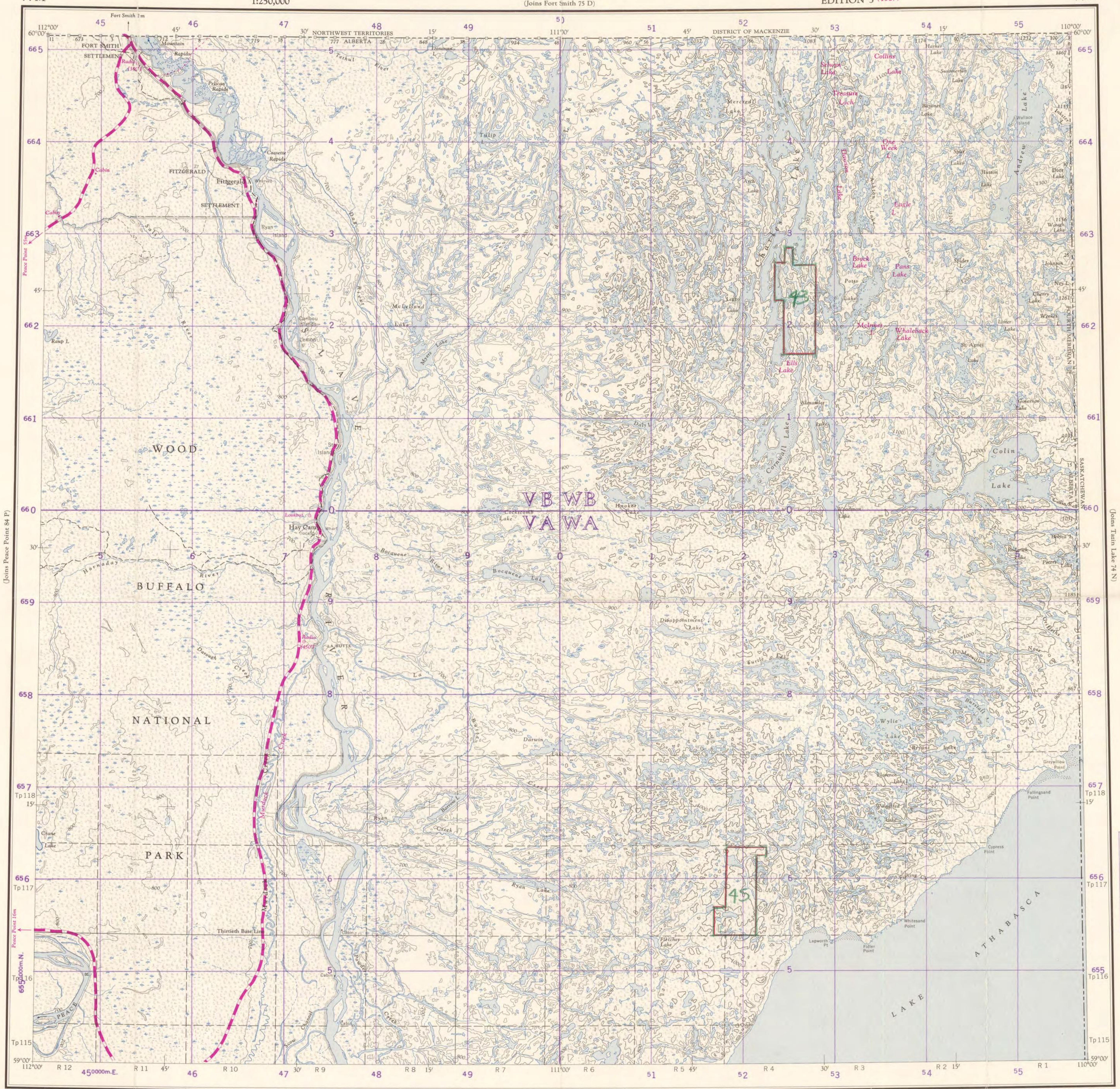
CANADA

(Joins Fort Smith 75 D)

EDITION 3 (1967)   74 M

~~Refer to this map as:~~	~~74 M EDITION 3 ASE SERIES A502~~	
Refer to this map as:	74 M EDITION 3 MCE SERIES A 502	(1967)

(Joins Peace Point 84 P)



(Joins Tazin Lake 74 N)

GRID ZONE DESIGNATION 12V	TO GIVE A STANDARD REFERENCE ON THIS SHEET TO NEAREST 1000 METRES	
100,000 M. SQUARE IDENTIFICATION	SAMPLE POINT	CABIN
VB WB / VA WA 660 / 50	1. Read letters identifying 100,000 metre square in which the point lies.	VA
	2. Locate first VERTICAL grid line to LEFT of point and read LARGE figures labeling the line either in the top or bottom margin, or on the line itself. Estimate tenths from grid line to point.	7 6
IGNORE the SMALLER figures of any grid number; these are for finding the full coordinates. Use ONLY the LARGER figures of the grid number, example: 450000	3. Locate first HORIZONTAL grid line BELOW point and read LARGE figures labeling the line either in the left or right margin, or on the line itself. Estimate tenths from grid line to point.	5 4
	SAMPLE REFERENCE	VA7654
	If reporting beyond 18° in any direction, prefix Grid Zone Designation as:	12VVA7654

TEN THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 12

Produced and printed by the SURVEYS AND MAPPING BRANCH, DEPARTMENT OF MINES AND TECHNICAL SURVEYS, 1963, from air photographs taken in 1955. Field surveys and culture check 1957.

Copies may be obtained from the Map Distribution Office, Department of Mines and Technical Surveys, Ottawa.

Road, loose or stabilized surface, all weather . . Route, gravier aggloméré, toute saison. 2 lanes or more / 2 voies ou plus

Power transmission line . . . . Ligne de transport d'énergie . . . .

Transverse Mercator Projection
North American Datum 1927
Contour Interval 100 feet
Elevations in feet above Mean Sea Level
Magnetic declination 27°34′ East at centre of map 1963
Annual change (decreasing) 5.2′
Interim corrections 1967.

(Joins Chipewyan 74 L)

FITZGERALD

ALBERTA

WEST OF FOURTH MERIDIAN - OUEST DU QUATRIÈME MÉRIDIEN

Projection Transverse de Mercator
Réseau géodésique nord-américain unifié (1927)
Équidistance des courbes: 100 pieds
Élévations en pieds au-dessus du niveau moyen de la mer
Déclinaison magnétique au centre de la feuille en 1963: 27°34′ Est
Variation annuelle (décroissante) 5.2′
Corrections provisoires 1967.

Établie et imprimée par la DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE, MINISTÈRE DES MINES ET DES RELEVÉS TECHNIQUES en 1963, d'après les photographies aériennes prises en 1955. Travaux exécutés sur le terrain et vérification des ouvrages en 1957.

Ces cartes sont en vente au Bureau de distribution des cartes, ministère des Mines et des Relevés techniques, Ottawa.

Scale 1:250,000 Échelle

Miles 5 0 5 10 15 20 Milles

Kilometres 5 0 5 10 15 20 25 30 Kilomètres

Road, all weather . . . . Chemin, toute saison
Wagon or winter road . . . . Chemin de terre ou d'hiver
Trail or portage . . . . Sentier ou portage
Town . . . . Ville
Village or settlement . . . . Village ou hameau
Post office . . . . Bureau de poste
Building . . . . Bâtiment

Horizontal control point . . . . Point géodésique
Boundary monument . . . . Borne frontière
Spot elevation, in feet . . . . Repère de nivellement en pieds 2550
Rapids; falls . . . . Rapides; chutes
Marsh or swamp . . . . Marais ou marécage
Depression contours . . . . Courbes de cuvette
Surveyed line . . . . Ligne arpentée

PROVISIONAL MAP

Some names on this map are not yet official. Corrections or additions are invited by the Surveys and Mapping Branch.

CARTE PROVISOIRE

Certains noms inscrits sur cette carte ne sont pas encore officiels. La Direction des levés et de la cartographie saurait gré au public de lui signaler corrections et additions.

1968015
74 M

FITZGERALD
74 M
EDITION 3 (1967)