

NB

Note: In the following descriptive notes, the area east of the Fourth Meridian is referred to as Clearwater River area; the area west of this meridian is referred to as Bitumount area.

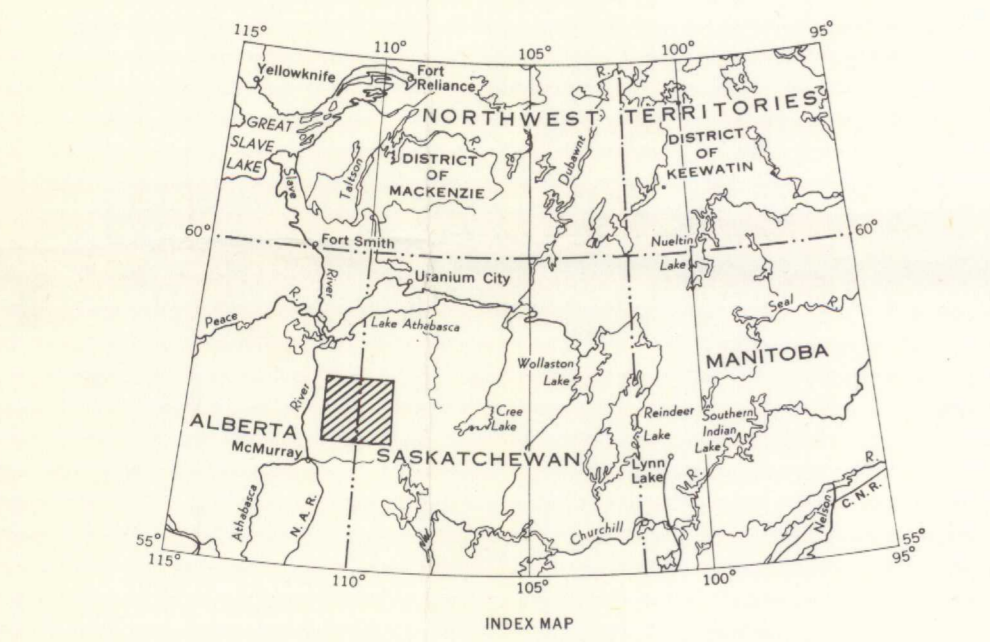
- LEGEND**
- DEVONIAN (mainly)
MIDDLE DEVONIAN (mainly)
- 5 METHY FORMATION: dolomite
- PROTEROZOIC PALAEOZOIC
- 4 Athabasca sandstone
- 3 Basalt dykes and sills (may be younger than 4)
- 2 Garnetiferous red and white granite and pegmatite; 2a, in part fine- to medium-grained garnetiferous quartz-feldspar-biotite gneiss; 2b, graphic; 2c, gneissic and impure; some pegmatite and remnants of gneiss; 2d, porphyroblastic; 2e, in part fine-grained bedded quartzitic rock
- ARCHAEN
- 1 Regularly to irregularly interbedded, highly granitoid, garnetiferous quartz-feldspar-biotite gneiss and biotite-rich porphyroblastic (microcline-perthite) gneiss; 1a, includes small areas of granite and pegmatite

- Outcrop visited x
- Low-level observation flights ⊗
- Outcrop seen from the air but not visited ⊗
- Loose slabs, probably from near-by unexposed bedrock ⊗
- Geological boundary (assumed) - - - - -
- Bedding (dip known, top of bed unknown) / / / / /
- Foliation, banding (inclined, vertical, dip unknown) / / / / /
- Crossbed (strike and dip indicated) / / / / /
- Syncline / / / / /
- Glacial striae / / / / /
- Moraines (recessional and annual) ⊗
- Drumlin (direction of ice-movement known) ⊗
- Fossil locality ⊗

- Geology by L. P. Tremblay, 1960
- Provincial boundary - - - - -
- Township boundary (surveyed) - - - - -
- Township or range boundary (unsurveyed) - - - - -
- Boundary monument - - - - -
- Intermittent lake and stream / / / / /
- Marsh or swamp / / / / /
- Rapids / / / / /
- Height in feet above mean sea-level 1798 +

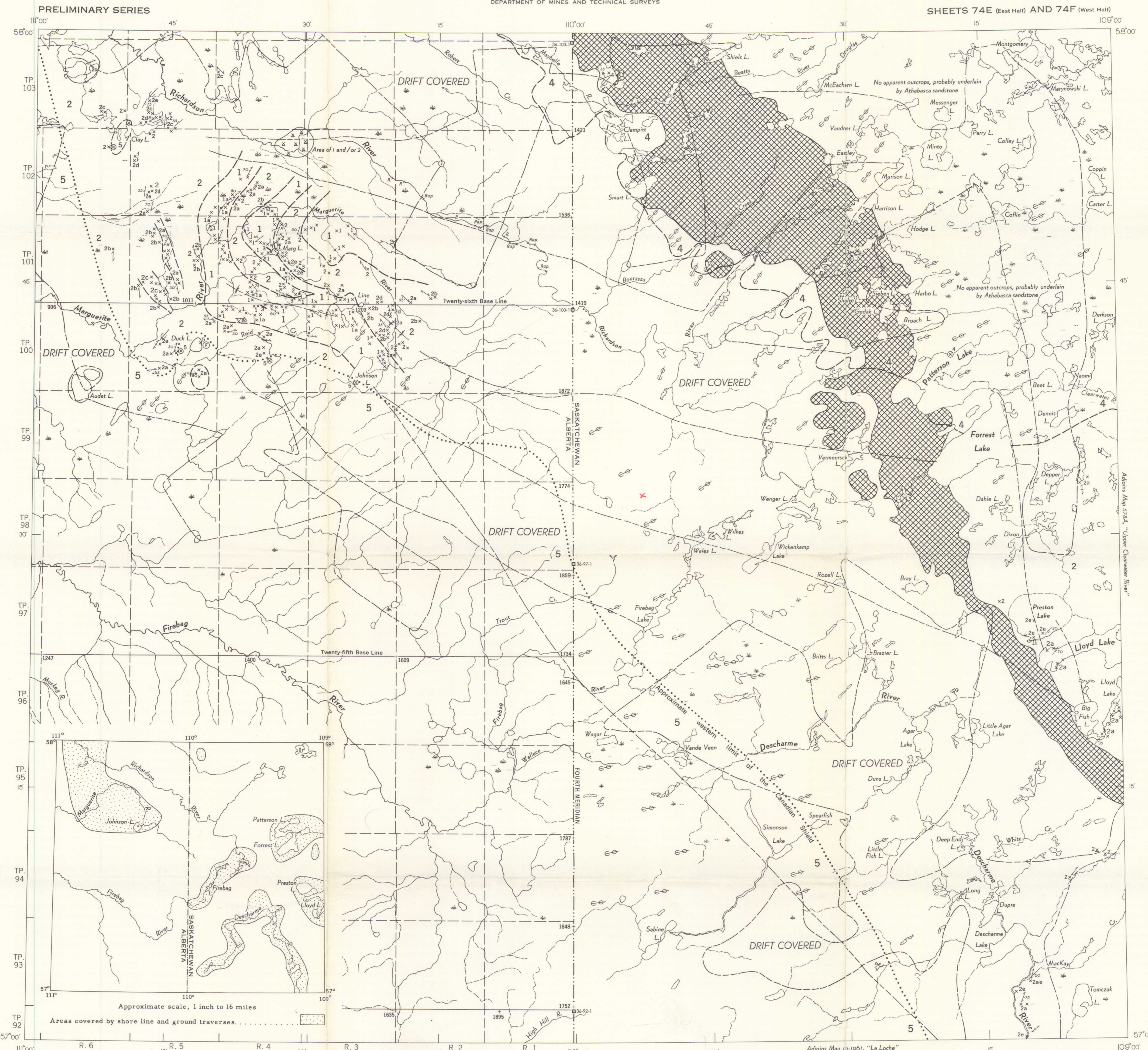
- Cartography by the Geological Survey of Canada, 1961
- Approximate magnetic declination, 26° 10' East
- Geographical names subject to revision
- Air photographs covering this area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa

In response to public demand for earlier publication, Preliminary Series maps are issued in this simplified form and will be clearer to read if all or some of the map-units are hand-coloured



Approximate scale, 1 inch to 16 miles

Areas covered by shore line and ground traverses / / / / /



The area is reached by aircraft from either McMurray, Alberta, or Buffalo Narrows, Saskatchewan. Uranium City is about 120 miles north of the northern boundary of the map-area. Using an almost-empty canoe, the Deschambe, Marguerite, Richardson, and Firebag Rivers could possibly be travelled downstream in the spring or the early part of summer. But in general these rivers are not recommended; they are too shallow, their beds are mostly covered with boulders, and they are obstructed by several log jams. There are indeed no good travelling routes.

The area is almost entirely covered with apparently thick drift. Drift thickness is indicated by the deep gullies cut by the Deschambe, Firebag, and many other rivers. Aerial photographs suggest that at least the top layer is in the form of drumlins and eskers. Most of the Clearwater River area is covered by a wide plateau-like belt of drumlins dissected by narrow esker zones. The esker zones occur as valley-like depressions, traceable for many miles, apparently formed by river action. Individual eskers are distributed in a honeycomb pattern and suggest, in part, deposition along cracks in the ice. Both drumlins and esker zones indicate a southwesterly movement of the ice in the northern half of the map-area and an almost westerly movement in the south.

A similar pattern seems to be indicated by the huge recessional moraine in the eastern half of the map-area. This moraine, as indicated by minor features within it, trends about north in the south and northwesterly in the north. It is a very complex deposit; where present, it covers and obscures the drumlins and esker zones. South of Preston Lake the moraine is about 2 miles wide; it has a local relief of possibly 400 feet and is very hummocky. From Preston Lake to the northern boundary of the map-area, it is made up of a close succession of small, narrow, low annual moraines. Four hundred of these were counted on aerial photographs over a 10-mile zone along the direction of ice-retreat. This appears to be the maximum relief for the moraine and the local relief is not great there as in the south. Northeast of this moraine, esker zones are abundant and drumlins are elongate; whereas in the southwest, eskers are rare and the drumlins appear blocky. These are believed to be partly fluvial and partly lacustrine in origin. Many have been reworked by the wind, giving rise to the deposits described below.

Sand deposits that exhibit the forms and characteristics of aeolian deposits are common. These are the last deposits to have formed and in places they cover all the other types of deposits. The fact that some deposits differ in shape from the others suggests that they may have formed under slightly different conditions. In general the aeolian deposits occur as thin sheets of sand covering large irregular drift areas but not necessarily hiding the form of the drift. They also occur as clusters of complex longitudinal sand dunes all over the area, but concentrated immediately north of the recessional moraine. The dunes are complex features up to several miles long and many feet high. They trend northwesterly and on aerial photographs they are visible as long white lines or ridges with irregular ends. In general they indicate winds from the north and west. Locally, however, some dunes seem to be earlier and may have been formed by winds blowing from the south-southeast. Most of these may have been destroyed or covered by later dunes.

Two sets of well-developed striations were measured in the area—one trending south to southwesterly, the other northwesterly. Locally they look identical and may both be present on the same outcrop, with the northwesterly striations overlying the southwesterly ones. The southwesterly striations are believed to have been formed by advancing ice; they are typical of glacial striae in all respects and their trend is parallel with the trend of the drumlins and esker zones. The northwesterly striations show, at least locally, the channel-like and funnel-shaped features characteristic of wind action. Furthermore, most are on the south and southeasterly face of outcrops and some are on the undersurface of ledges facing southeasterly. These striations were probably the result of sand-blasting by winds from the south and southeast.

Some of the lakes in this map-area were much larger during the period of deglaciation and shortly after. At least five different levels of raised beaches were noted in the Lloyd Lake area; the difference in elevation from one to the next varies from about 1 foot to almost 15 feet; the lower or later formed deposits being the more closely spaced.

Clearwater River area is almost devoid of outcrops. A few were found along the southern stretch of Deschambe River and along the eastern boundary of the map-area as far north as Patterson Lake. In Bitumount map-area, outcrops are plentiful in the north-central and northwestern parts; elsewhere there are none.

The succession of the formations shown in the legend is based partly on increasing metamorphism but mainly on crosscutting relationships and superposition of formations.

The contact between Precambrian rocks to the northeast and much younger rocks to the southwest is not exposed, so that its indicated position is only approximate, based partly on aerial photographs and partly on physiographic features. Around Johnson Lake and Clay Lake, contact may be farther north and northeast than is shown.

The gneisses (1) occur in wide layers interbedded with the coarse-grained granite (2) and are cut by dykes and masses of granite and pegmatite. Both types of rock appear to be an interbedded mixture of mainly greywacke and quartzite now metamorphosed to granitoid banded gneisses and granite.

The gneisses (1) are made up of two rock types. It is medium to coarse grained with, generally, a granitoid appearance. Locally it exhibits a porphyroblastic texture. Its mafic content, generally less than 5%, is mainly biotite locally altered to chlorite. Fine, garnet, generally visibly altered to chlorite, is almost ubiquitous but amounts to less than 1%. The other rock type weathers dark brown and black, contains much biotite, and exhibits either a coarse-grained impure granitic texture or a porphyroblastic texture. The porphyroblasts are abundantly and evenly distributed in a coarse-grained groundmass of grey and blue quartz, greenish biotite, and white feldspars (microcline perthite and oligoclase).

Both rock types occur in fairly regular bands or in masses of various shapes and sizes. Those in fairly uniform bands generally alternate regularly. Where the white-weathering bands are wide they may enclose irregular masses of the darker rock. These masses may be distributed in such a way as to suggest that they were once parts of a complete band. Where both rock types are in irregular masses the arrangement is generally haphazard.

The gneisses of Clearwater River area are, in general, more thinly banded, finer grained, and more siliceous looking than those of Bitumount map-area. Indeed locally they resemble quartzite. In places, hypersthene is the main mafic mineral.

The granites (2) are coarse grained, fairly homogeneous rocks, composed of quartz, red and white feldspars, and some biotite. The red granite has white quartz, is not always uniform in grain size and composition, and is widely distributed. In thin sections it exhibits abundant cataclastic effects. In many places it encloses an occasional large remnant of the gneisses (1). The white granite looks much like the white-weathering gneiss (1). In some instances it has a porphyroblastic texture; large (up to 3-inch) euhedral feldspar grains, forming about 50% of the rock and locally faintly aligned, are in a matrix of grey quartz and biotite. In granite areas, pegmatites are fairly common, in many places forming the bulk of the outcrops. Almost all show graphic textures and are devoid of mafic minerals. Both granites and pegmatites carry some garnet.

Burwash studied thin sections of six specimens of drill-core from possibly similar rocks south and west of the area of gneisses and granites in Bitumount map-area, where the Precambrian rocks lie under a thick cover of younger rocks. All of these he called 'calc-alkali granites'; they contain abundant magnetite and show cataclastic effects, locally producing banding.

Basalt dykes and sills (3) were noted only in Bitumount map-area, where they cut the gneisses (1) and granites (2). They are less than 9 feet wide and none was traced for more than 1,000 feet. All trend northwesterly and pinch out over short distances. They are fine grained to dense, and weather black to dark brown. The Athabasca sandstone (4) was not seen in contact with any other rocks in the area. There is very little information on its extent in the map-area, and the position of its boundary is uncertain. Possibly, where the sandstone is present the drift-cover is mostly gravel in the form of drumlins and eskers; where it is absent the ground is covered by a sandy layer. The sandstone is a fine-grained white rock that is faintly bedded and crossbedded and has a clastic texture. Some colour-banding is also present. At the only area of outcrops studied, the beds appear to be almost flat-lying. The drift south of this area contains many fragments of sandstone.

Unit 5 is believed to be of Middle Devonian age and to be part of the Methy formation (A. W. Norrish, personal communication) as indicated by the fossil assemblage. Only one small outcrop, at the edge of a small shallow lake, was seen. It is composed of a greyish brown, massive dolomite. A few slabs—believed to be from nearby unexposed bedrock—appear to be from the same formation, and their locations are shown on the map.

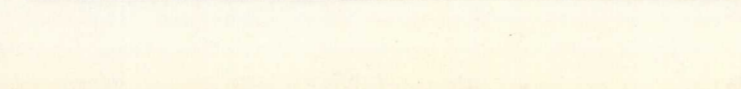
Outcrops are too far apart over much of the map-area and areas of outcrops too widely separated for much to be learned about the structure, other than what appears on the map. Fossiliferous dolomite are abundant in the Bitumount area; they trend in four main directions—N20°E, N60°E, N80°W and N40°W—forming two conjugate sets.

Very little prospecting has been or is being done in the area and only a few tiny grains of pyrite and magnetite were seen here and there.

Burwash, R. A.: Reconnaissance of Subsurface Precambrian of Alberta; Bull. Am. Assoc. Petrol. Geol., vol. 41, No. 1, pp. 70-103 (1957).
Blake, D. A. W.: Geological Notes on the Region South of Lake Athabasca and Black Lake, Saskatchewan and Alberta; Geol. Surv., Canada, Paper 55-33 (1956).
Carrigy, M. A.: Geology of the McMurray Formation, Part III, General Geology of the McMurray Area; Alta. Res. Council, Geol. Div., Mem. 1 (1959).

MAP 16-1961
GEOLOGY
FIREBAG RIVER AREA
ALBERTA AND SASKATCHEWAN

Scale: One Inch to Four Miles = $\frac{1}{253,440}$ Miles



MAP LIBRARY / CARTOTHEQUE
G
3401
C5
1956
G4
omvfc
16-1961
C. 2

MAP 16-1961
FIREBAG RIVER AREA
ALBERTA AND SASKATCHEWAN
SHEETS 74E (E 1/2) AND 74F (W 1/2)