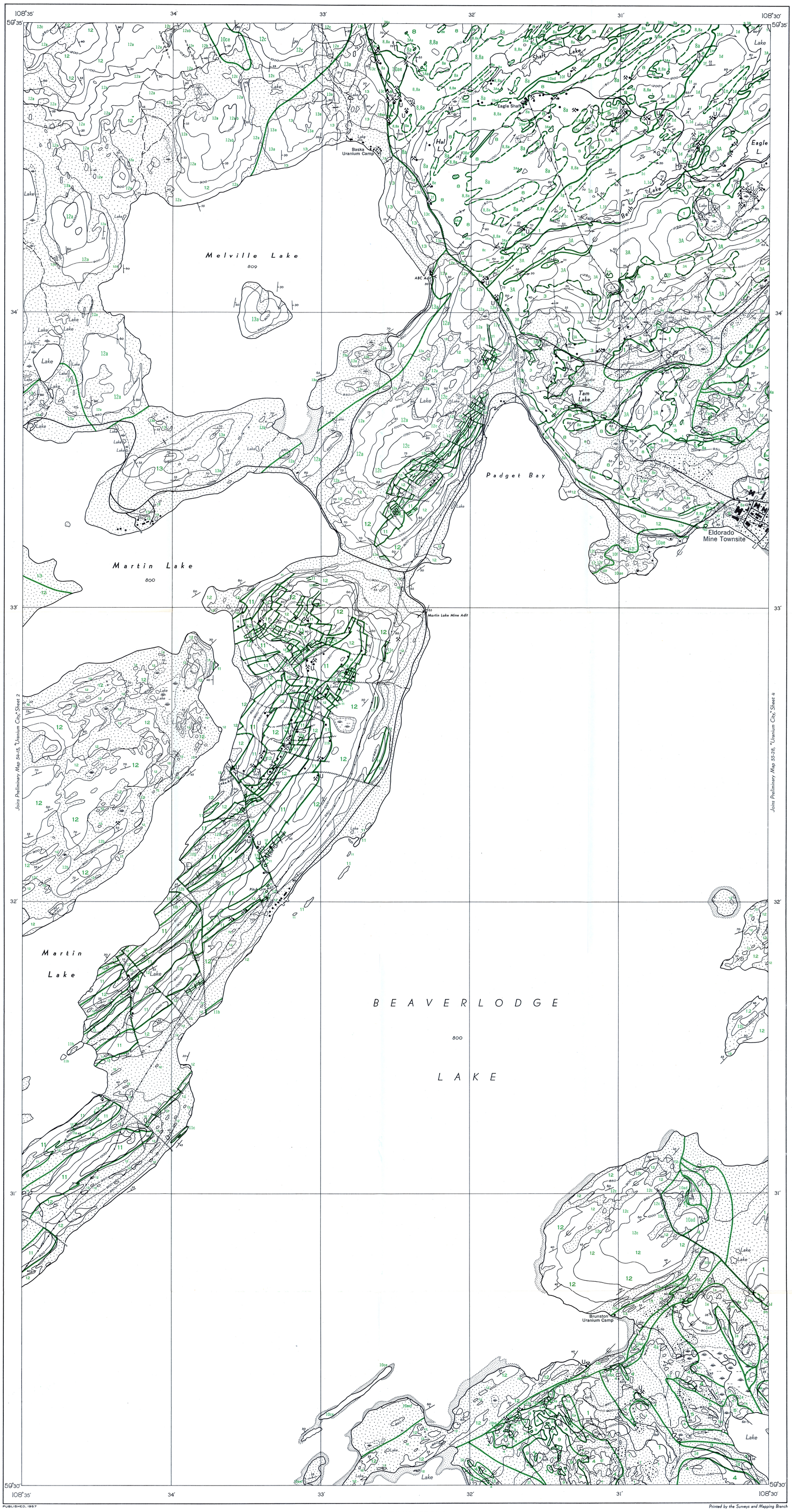
CANADA
DEPARTMENT
OF
MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA



LEGEND

Note: *Map units 1k, 1o, 2a, 3c, 3d, 3Ad, 4b, 4c, 4d, 4e, 4g, 4h, 4o, 5b, 5c, 5d, 5e, 5f, 6b, 6c, 6d, 6e, 6f, 6g, 6h, 7b, 7f, 8b, 8d, 12d, 13b, 14 on Sheet 4 only*

PROTEROZOIC

14 — *Gabbro, basalt; in part diabasic*

ATHABASCA SERIES (10-13)

13 — *Siltstone; minor arkose, conglomerate;* **13a**, *arkose, abundant;* **13b**, *conglomerate, abundant;* **13c**, *brecciated*

12 — *Arkose; minor siltstone, conglomerate;* **12a**, *siltstone, abundant;* **12b**, *conglomerate, abundant;* **12c**, *massive;* **12d**, *calcareous;* **12e**, *brecciated;* **12f**, *abundant veinlets of siliceous material*

11 — *Amygdaloidal, porphyritic andesite and basalt;* **11a**, *includes small masses of arkose;* **11b**, *pillow lava;* **11c**, *intrusive gabbro, in part diabasic*

10 — *Conglomerate; minor arkose, siltstone;* **10a**, *abundant fragments of quartz-feldspar gneiss (7) and granite (8);* **10b**, *abundant fragments of quartzitic rocks and gneiss (6);* **10c**, *abundant fragments of arkose;* **10d**, *mainly composed of angular fragments;* **10e**, *mainly composed of rounded fragments;* **10f**, *includes arkose beds*

9 — *Granite, pegmatite*

TAZIN GROUP (1-8)

8 — *Metasomatic granite, in part faintly gneissic; few mafic minerals;* **8a**, *cataclastic, brecciated;* **8b**, *colour banded;* **8c**, *includes some remnants of quartzite;* **8d**, *includes some amphibolite masses;* **8e**, *locally grading into gneisses (7);* **8f**, *mylonite*

7 — *Quartz-feldspar gneiss, 15 to 50 per cent biotite, chlorite, and/or hornblende, probably granitized, impure sandstone;* **7a**, *in part brecciated;* **7b**, *includes narrow bands of amphibolite and biotite schist;* **7c**, *includes small areas of gneiss (probably 6);* **7d**, *locally grading into granite (8);* **7e**, *contorted;* **7f**, *includes separate pegmatite masses*

6 — *Quartz gneiss to quartz-feldspar gneiss, up to 15 per cent biotite, chlorite, and/or hornblende, probably granitized quartzitic rocks; minor granite and amphibolite;* **6a**, *interbedded with granitized chlorite and/or biotite schist;* **6b**, *schistose, in part chlorite-sericite schist;* **6c**, *glassy, ungranitized quartzite;* **6d**, *massive, quartzitic rocks, locally feldspathized; locally includes much granitic material;* **6e**, *brecciated;* **6f**, *coarse, white, granite-like; minor red granite;* **6g**, *includes some amphibolite and hornblende schist;* **6h**, *includes some brecciated granite*

5 — *Quartz-biotite schist, impure quartzite, greywacke;* **5a**, *in part containing hornblende; minor hornblende schist;* **5b**, *quartzite interbeds;* **5c**, *in part containing chlorite; minor chlorite and/or hornblende schist;* **5d**, *includes remnants of carbonate rocks;* **5e**, *graphitic;* **5f**, *contorted*

4 — *Amphibolite, hornblende schist, hornblende-feldspar gneiss; minor quartz-biotite schist;* **4a**, *chlorite schist and/or chlorite-biotite schist; in part with hornblende still present;* **4b**, *chlorite schist, in part hematitized and with quartzite interbeds;* **4c**, *granitized chlorite schist with small granite masses;* **4d**, *granitized chlorite schist with quartzite interbeds;* **4e**, *includes separate masses of granitic material,* **4f**, *includes separate masses of granitic material and quartzite (7) beds;* **4g**, *granitized, includes separate masses of granitic material;* **4h**, *serpentinized;* **4k**, *rusty;* **4m**, *graphitic chlorite schist;* **4n**, *includes remnants of carbonate rocks;* **4o**, *hematitized*

ARCHÆAN (?)

3 — *Black to grey, thin-bedded, slaty to massive argillite, siliceous argillite; minor chlorite-epidote rock;* **3a**, *slaty to massive chlorite-epidote rock;* **3b**, *brecciated;* **3c**, *includes some quartzite;* **3d**, *contorted.*
3A, *Mainly massive chlorite-epidote rock;* **3Aa**, *chlorite schist;* **3Ab**, *amphibolite, in part chlorite schist;* **3Ac**, *locally unconformable on beds of 3;* **3Ad**, *brecciated*

2 — *Limestone, in part silicate-bearing;* **2a**, *includes some quartzite*

1 — *Massive, well jointed, white to reddish quartzite;* **1a**, *containing green diopside;* **1b**, *schistose, in part or wholly altered to chlorite-sericite schist;* **1c**, *hematitized;* **1d**, *brecciated;* **1e**, *mottled black and white;* **1f**, *in part granitized;* **1g**, *includes some biotite schist and/or chlorite schist;* **1h**, *in part thin-bedded;* **1k**, *includes remnants of limestone;* **1m**, *blue quartzite;* **1n**, *impure quartzite, greywacke; minor chlorite-sericite schist;* **1o**, *ferruginous*

Drift-covered area
Area of gravel and sand
Area of rock outcrop, small outcrop
Geological boundary (defined, approximate, assumed)
Bedding (horizontal, inclined, vertical, dip unknown)
Bedding (direction of dip known, upper side of bed unknown)
Schistosity (inclined, dip unknown)
Foliation (inclined, vertical, dip unknown)
Lineation (plunge known)
Fault (defined, assumed)
Anticline (position approximate)
Syncline (position approximate)
Glacial striæ
Rock trench and stripped area
Mineral occurrence (clausthalite, C; garnet, G; hematite, He; pitchblende, U; umangite, M). Mx
Radioactive occurrence
Shaft, raise
Adit
Rock dump

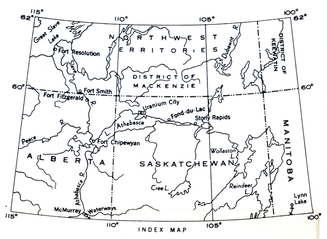
Geology by L. P. Tremblay, 1953, 1954

Road
Trail
Building, tent
Power line
Wharf
Stream (position approximate)
Fall and rapid
Marsh
Foreshore flats
Contours (interval 50 feet)
Height in feet above mean sea-level 800

Approximate magnetic declination, 25° 21′ East

Cartography by the Geological Cartography Unit, 1956

Air photographs covering this map-area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa, Ontario



DESCRIPTIVE NOTES

The area is served regularly by aircraft from Edmonton and Prince Albert. From early June to early October it can also be reached by barge from Waterways to Bushell, and by this route most of the heavy freight is transported.

Physically, the map-area is rugged. Near and around Beaverlodge Lake heights rise to about 250 feet above the lake level. Locally, southwest of the Martin Lake mine adit on the west shore of Beaverlodge Lake, for example, they are up to 450 feet. At some distance away from the shore of Beaverlodge Lake heights are normally between 100 and 200 feet above adjacent valleys and lakes. The land rises gradually in a northerly direction from the level of Beaverlodge Lake, so that a point slightly west and south of Nesbitt-Labine shaft is about 500 feet higher than the level of Padget Bay. The highest hills in the area are formed of conglomerate and volcanic rocks of the Athabasca series or of amphibolite and altered argillite of the Tazin group. Areas of rock outcrops account in general for about 50 per cent of the land area. All drainage is to Beaverlodge and Martin Lakes and thence eventually to Lake Athabasca.

The rocks of the Tazin group (1 to 8) are the oldest of the map-area and underlie most of the area north and east of Beaverlodge Lake. East and south of Murmac Bay on Beaverlodge Lake they are, in part, recognizable sedimentary rocks, which suggests that at one time they were all a normal bedded sequence. Their general low southerly dip there suggests that they are in almost their original position. Elsewhere they are altered and granitized to various degrees and much deformed.

The rocks of the Tazin group vary in composition from quartzite, argillite, amphibolite, minor limestone, and gneisses and schists to more or less granitized rocks. The granitization is generally characterized by, at first injection of granitic material in the form of sills, dykes, and irregular masses, and later by quartz and feldspar grains distributed in such a way as to suggest that a wave of granitizing material had permeated the rock.

The quartzite (1) is a fine- to coarse-grained, massive, well-jointed rock. Bedding is rarely visible. The rock is generally white or reddish white, but a variety north of Nesbitt Bay is blue to green (1m), another east of Brunston Uranium camp is mottled black and white (1e). Some quartzite (1a) east and south of Murmac Bay has lenses, streaks, patches, and individual grains of green diopside scattered throughout. All varieties contain some fine-grained hematite and locally become ferruginous quartzites (1o). In places, particularly north of Murmac Bay, the quartzite (1b) is highly contorted and schistose, becoming in part a chlorite-sericite schist.

The limestone (2) is a white crystalline rock on fresh fractures and grey-black and rough on weathered surfaces where it is criss-crossed by numerous bands and seams of silicate minerals, such as talc and fibrous amphibole, that stand out in relief. It generally occurs as small irregular masses and lenses in amphibolitic rocks and in or near diopside-rich quartzite.

The argillite (3) occurs in massive and thin beds; where massive it is generally black and where bedded black beds alternate with light-coloured siliceous beds. It is locally altered to a slaty green rock composed mainly of chlorite and epidote (3a). Much of the argillite near the St. Louis fault is altered to this green rock, with part of it even altered to a fine-grained amphibolite (3Ab). In the area west of Nesbitt-Labine shaft, a massive, fine- to medium-grained, green rock (3A) overlies the black argillite and is in part unconformable with it. Similar rock occurs at various horizons interbedded with black argillite (3) and altered, slaty argillite (3a). This material may be of tuffaceous origin. North of Padget Bay, the argillite is deformed into gentle anticlines and synclines with low dipping limbs, whereas near and along the St. Louis fault it occurs as steeply dipping lenses and masses that finger out easterly and are parts of the eastern limb of a broad anticline.

The amphibolite (4) and related rocks occur as layers, lenses, and masses of various size interbedded with quartzite (1) and quartz-biotite schist (5). It is also found as irregular bodies following the foliation in granitized rocks. It is generally gneissic and banded but may be massive. The rock is fine to coarse grained and has a dark green to dark brown weathered surface. Some amphibolite is composed mainly of hornblende and feldspar, some is altered to chlorite and/or biotite schist, and some is more or less granitized. The granitization takes the form of dykes and sills of granitic material and grains of quartz and/or feldspar scattered throughout the rocks. The (variety altered to) chlorite schist may be found thinly interbedded with quartzite. A few remnants of carbonate rocks present in coarse amphibolite suggest that the amphibolite may have formed by the metamorphism of impure carbonate rocks.

The quartz-biotite schist (5) occurs interbedded with quartzite (1) and amphibolite (4). It is commonly faintly schistose or massive but may locally be thinly bedded. It is fine- to medium-grained rock, weathering light to rusty brown but grey on fresh surfaces. Some beds contain much biotite whereas others contain little but are high in quartz. Garnet, large hornblende grains, and possibly andalusite and cordierite, occur locally.

The gneisses (6) include all the granitized rocks that appear to be related to quartzite and that contain less than 15 per cent mafic minerals although they include remnants of more basic beds. Where they are obviously a quartzite (6c and 6d), they resemble the quartzite (1) described above and are composed almost entirely of quartz. Where the nature of the original rock is uncertain they contain various amounts of white feldspar grains in a quartzose base, the mafic minerals being concentrated in bands or irregular patches that upon weathering form characteristic rusty patches. These rocks are finely gneissic to coarsely banded and locally present a nebulitic structure. Their quartzose appearance, their white weathering, and the rusty patches on the weathered surface are characteristics that distinguish them from the next group of gneisses (7). They may locally (6f) be so coarse grained as to resemble a coarse granite.

The quartz-feldspar gneisses (7) include all the granitized rocks that resemble a granite, show a pronounced colour banding, and/or are finely gneissic. Mafic minerals constitute between 15 and 50 per cent of the rock and occur in fine layers, streaks, and irregular lenses or bands. Quartz and feldspar may be also concentrated in bands and fine layers. The rock is generally massive, fine to medium grained, and weathers various shades of red and brown to orange-red and reddish white. Much granitic material has been introduced or has formed as dykes and sills, and irregular masses of granite are found in various amounts throughout. Small areas of metasomatic granite (8) may be included.

The metasomatic granite (8) varies from flesh colour to various shades of red and is fine grained to locally coarse grained. It grades imperceptibly within a few hundred feet into the gneisses (6) and the quartz-feldspar gneisses (7) and may, consequently, include small areas of these rocks. It is composed of white, milky quartz, red feldspar, and some mafic minerals. The concentration of these minerals may locally impart to the rock a faintly coloured banding and a roughly gneissic structure. Relicts of the original rocks are locally present.

The intrusive granite (9) occurs mainly as dykes and sills. It is a red to white, coarse-grained rock composed of white, milky quartz, red feldspar, and micas. Where the mica is biotite the granite is granular. Black tourmaline was noted in some related pegmatites.

The rocks of the Athabasca series (10-13) are found mainly west and northwest of Beaverlodge Lake. The conglomerate (10) occurs mainly along the east shore of Beaverlodge Lake where both a basal conglomerate and one interbedded with other formations farther up in the sequence have been recognized. The basal conglomerate contains angular to subangular fragments of various sizes and generally of local origin. Locally the fragments are closely packed. The interbedded conglomerate has rounded to subrounded, well-sorted fragments, some of them arkosic.

The lavas (11) occur interbedded with arkose west of Beaverlodge Lake. Most are massive and display amygdaloidal and porphyritic textures. Pillows were locally observed. Both fresh and weathered surfaces are various shades of green and brown. The lavas are andesites and basalts, composed of plagioclase laths in a fine-grained mass of feldspar and mafic minerals. Intrusive rocks are probably included because some are coarse grained, massive, and rarely amygdaloidal and resemble closely the late gabbros (14).

The arkose (12) is medium grained and sandy looking with an orange-red to reddish brown and white weathered surface. Great thicknesses are formed of fine to coarse beds and much is finely to coarsely interbedded with siltstone, conglomerate, and the lava flows. Individual beds rarely extend for great distances. Crossbedding, ripple-mark, and grain variation were recognized in the field. Occasional large rounded fragments of the Tazin rocks were noted at various places in the arkose as if they had been dropped there by floating ice. In the area where andesite and arkose are interbedded, the arkose was seen locally to contain fragments of the underlying lava. Sedimentary dykes of arkose were also noted in the underlying lava.

The siltstone (13) occurs in thin beds intimately interbedded with arkose, and in some places with conglomerate. It is a dense fine-grained rock, deep red on both weathered and fresh surfaces. It is found mainly around Melville Lake.

The gabbro (14) is the youngest rock present. It was mapped only north of Ace Lake where it occurs as narrow dykes and sills. It is a fine- to coarse-grained rock with a light reddish to greenish brown weathered surface, and contains inclusions of the country rocks. Some of these dykes are highly altered.

Folds and faults are very complex in rocks of the Tazin group, whereas in those of the Athabasca series they are relatively simple. Southeast of the St. Louis fault, the general trend of the Tazin formations is easterly, but in detail is complicated by several drag-folds. These are near the apex of a large northerly trending syncline that plunges gently southerly. Northwest of the fault the trend is northeasterly. Northwesterly from the fault there is first a huge anticline with steeply dipping limbs and a southwesterly plunge, followed by a group of gentle undulations in the form of northeasterly plunging anticlines and synclines, followed, in turn, by a series of large folds apparently with steeply dipping limbs. The rocks of the Athabasca series, on the other hand, west of Beaverlodge Lake are on the eastern limb of a broad syncline that is known as the Martin Lake syncline and whose axis passes slightly west of sheet 3.

Many faults were recognized in rocks of the Athabasca series west of Beaverlodge Lake, but only a few were recognized elsewhere in the area, probably because of the lack of good horizon markers. Only one major fault, the St. Louis fault, was observed, and has been traced, with reasonable accuracy, from the north end of Beaverlodge Lake to at least 1 mile northeast of the northeast end of Verna Lake. What is possibly its extension still farther in this direction was recognized by Blake as far as Hamilton Lake in the Nevins Lake area. Its southwesterly extension is still somewhat in doubt. It is here suggested that it swings abruptly to the northwest passing the ABC adit. The early stages of the movement appears to be a thrust from the southwest, a conclusion that is supported by the field mapping northeast of Verna Lake where a left-hand displacement of about 1,100 feet is indicated by the offset of the margin of the granite.

Uranium is the only metal of economic interest in the map-area. Ore of this metal is at present being mined at the Ace, Fay, and Martin Lake mines of the Eldorado company, at a combined rate of about 500 tons a day. It is also being mined at Nesbitt-Labine mine at a rate of less than 100 tons a day. Verna mine, Meta Uranium, and Black Bay Uranium deposits are being explored underground, and other prospects, such as Eagle, ABC, Pitchore, and Beaverlodge Uranium, have been explored underground but are now inactive. Many other occurrences are known in the area, but so far none has shown much promise.

Pitchblende is the main ore mineral. It occurs as massive or disseminated replacements and as pitchblende-calcite veins filling cleancut fractures. The replacement bodies seem to be related to early structures such as folds and faults. Replacement generally takes place at the expense of brecciated material found within the cataclastic zones of the early faults and particularly at the crests and troughs of minor folds and drag-folds. The surface mapping near Ace and Fay mines suggests a spatial relationship between the ore zones and folds. The pitchblende-calcite veins are related to late faults that formed clean-cut fractures, to joint planes, and to the unconformity between Tazin rocks and rocks of the Athabasca series. It appears also that rocks with a high mafic mineral content were most readily replaced. Similarly, along the clean-cut fractures the ore seems to form mainly in places where the fractures traverse rocks high in mafic minerals. Ore zones in the veins are lenticular, short, and rather erratically distributed along the fractures whereas ore zones in the replacement bodies, it is believed, are generally larger and more continuous.

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PRELIMINARY MAP 55-28

URANIUM CITY

SHEET 3

SASKATCHEWAN

Scale: One Inch to 800 Feet = $\frac{1}{9,600}$

800 0 800 1600 2400 Feet

PRELIMINARY MAP 55-28
URANIUM CITY
SHEET 3
SASKATCHEWAN