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PIERRE GREYS LAKES MAP-AREA, ALBERTA

(REPORT AND MAP)

BY

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PETROLOGICAL SCIENCES DIVISION

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PIERRE GREYS LAKES MAP-AREA, ALBERTA

(Summary Account)

By

A. H. Lang

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Illustration

Preliminary map - Pierre Greys Lakes, Alberta.....In envelope

PIERRE GREYS LAKES MAP-AREA, ALBERTA

INTRODUCTION

GENERAL STATEMENT

Pierre Greys Lakes map-area (latitudes 53° 45' to 54° 00', longitudes 118° 30' to 118° 45') lies 70 miles north of Jasper and 20 miles north of the north boundary of Jasper Park. Its southeast corner is 40 miles northwest of Entrance, an outfitting point on the main line of the Canadian National Railways 46 miles east of Jasper and 190 miles west of Edmonton.

Interest in the area has been accentuated recently by the drilling of the Muskeg No. 1 well to test the oil and gas possibilities of a structure that crosses the map-area, the well site being 600 feet west of the west boundary, in the adjoining A la Pêche map-area. This test is being financed jointly by the Gulf, Imperial, McColl-Frontenac, Shell, and Socony-Vacuum companies under a compact known as the Northern Foothills Agreement. The production department of Imperial Oil Limited is in charge of the project.

ACCESSIBILITY

Although Jasper is the nearest town to the map-area, there is no direct communication because of high intervening mountain ranges. The readiest access is via Entrance, and until recently the usual route was by a Forestry pack-trail, known as the Lower Trail, which joined a Forestry road extending 23 miles from Entrance to Moberly Creek ranger station. In 1946 and 1947, under the Northern Foothills Agreement, the road to Moberly Creek was improved, and a road following more or less the route of the Lower Trail was built to the Muskeg No. 1 well site. This road was used first as a winter and tractor road, but it became suitable for automobiles in the autumn of 1947.

The map-area contains several branch Forestry trails, those north of the road being very boggy in places because of the prevalence of muskegs. Most of the area is fairly accessible on foot, but there are not many places where horses can be taken without trails.

FIELD WORK AND ACKNOWLEDGMENTS

Field work was begun by the writer in the spring of 1947, using a base map prepared previously by the Topographical Survey, and the northern three-quarters of the area was geologically mapped by him that year. Toward the end of the field season the mapping of the southern quarter was completed by E.J.W. Irish of the Geological Survey.

The writer is greatly indebted to personnel of Imperial Oil Limited, New West Construction Company, and the Alberta Forestry Branch for many courtesies, as well as to numerous residents of Entrance. During the field work he was ably assisted by T.G.Perry, R.E.Laurence, and J. E. Reid, and Mr. Irish by E. Hall, H. G. Gammell, and G.C.Wells.

PHYSICAL FEATURES

The map-area consists of high hills and ridges separated by valleys. The highest summit is about 6,500 feet above sea-level and the lowest point about 3,900 feet, giving a maximum relief of some 2,600 feet.

The highest hills are near the southern boundary of the area, and are the only ones that project above timber-line.

A valley 2 to 3 miles wide extends from west to east across the map-area, slightly north of its centre. It is floored by gravel and flanked by gravel terraces. In the west it is occupied by Muskeg River, and in the east by Pierre Greys Lakes and the lower reaches of Teepee Creek. The upper part of Muskeg River flows northeasterly and enters this valley about a mile southeast of the Muskeg ranger station. The sharp change in the course of the river at this point seems to be the result of stream capture. During some part of Tertiary time Smoky River appears to have flowed easterly through the map-area and to have carved the wide valley described above, which connects with the valley of the Little Smoky farther to the east. At that time the ancestral Muskeg River joined the Smoky near the site of the Muskeg ranger station. Later, probably at the end of Pleistocene time, the Smoky either carved its present valley or reverted to an earlier Tertiary course, and the Muskeg flowed east past the site of Pierre Greys Lakes and down the present valley of the Little Smoky. At this period a minor tributary of the Smoky flowed westerly along what had previously been the course of the Smoky, and this tributary gradually cut back until it tapped the Muskeg, thus causing the sharp bend and the relatively undrained valley now occupied by Teepee Creek and Pierre Greys Lakes. The increased amount of water then flowing westerly resulted in the cutting of the Muskeg canyon, which is such a conspicuous part of the adjoining A la Pêche map-area to the west.

GENERAL GEOLOGY

GENERAL STATEMENT

Pierre Greys Lakes map-area is underlain by a succession of marine and non-marine sedimentary strata ranging in age from Carboniferous to probably Paleocene. The older formations are exposed in the southern part of the area, where they are complexly folded and faulted and are exposed in relatively narrow bands. The younger formations are exposed in the northern part of the area, where folds are less steep and faults appear to be less common.

The formations have been traced from other areas to the southeast, and such variations as they exhibit from the localities where they were first named have not seemed sufficient to require the use of new formational names. The area is, however, fairly close to the Peace River district, where the stratigraphic succession is somewhat different and where a different formational nomenclature has been adopted. The succession in the present map-area shows some analogies to that of Peace River, particularly with respect to strata considered to be equivalent to the Fort St. John group and Dunvegan formation. The ultimate reconciliation of the southern nomenclature with that of Peace River must, however, await the geological mapping and stratigraphic study of the intervening areas. The reasons for the correlations adopted for the present area and the histories of the formational names have been explained in recent reports on nearby areas (3,4)[1] and are not repeated in this summary account.

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[1] Numbers, in parentheses, are those of references given at end of this report.

The formations underlying the map-area are, on the whole, poorly exposed, outcropping chiefly on ridges and along streams. Outcrops

are sufficient, however, to permit fairly accurate estimation of the positions of geological boundaries, except in the southwestern part of the area. For this part it is hoped that the mapping of the adjoining A la Pêche area will throw sufficient light to permit geological interpretation on the final edition of the map.

TABLE OF FORMATIONS

Period or epoch	Formation or group, and approximate thickness (feet)	Subdivision and approximate thickness (feet)	Lithology
Paleocene(?)	4,000 +		Sandstone, shale, conglomerate, coal? (non-marine)
Upper Cretaceous	Brazeau 6,000 ±		Sandstone, shale, conglomerate (non-marine)
		Solomon member 80-100	Sandstone (marine)
	Wapiabi 1,350		Shale, silty shale, sandy shale (marine)
	Bighorn 650 ±		Quartzitic sandstone, shale, sandy shale (marine and non-marine)
	Blackstone 1,000 ±		Shale and silty shale, minor ironstone and limestone (marine)
	Dunvegan 242		Sandstone, siltstone and silty shale (marine and non-marine)
Lower Cretaceous	Fort St. John(?) 400 ±		Shale (marine?)
	Luscar and (?) Mountain Park 2,000 ±		Sandstone, shale, conglomerate(?) coal (non-marine)
	Cadomin 40 - 100		Conglomerate
	Nikanassin 917		Quartzitic sandstone and shale (marine and non-marine)

Jurassic	Fernie 900 ±		Shale and quartzitic sandstone (marine)
Triassic	Spray River	Whitehorse member 100-150	Limestone and dolomite (marine)
		1,300 ±	Quartzitic siltstone (marine)
Carboniferous	Rundle 100 ±		Limestone (marine)

CARBONIFEROUS

Rundle Formation

The Rundle formation is brought to the surface at only one locality in Pierre Greys Lakes area, on a ridge at the south boundary, and there only the uppermost 100 feet of the formation is exposed. These strata consist of thick-bedded, very hard, grey limestone containing chert nodules and corals, the lithology being similar to that of the upper Rundle in areas to the southeast. In the Moon Creek area (2), where the entire formation is exposed, it consists of 500 to 600 feet of interbedded limestone and dolomite.

TRIASSIC

Spray River Formation

The Spray River formation overlies the Rundle. In areas to the southeast the relationship between the two formations is one of erosional unconformity; this relationship was not observed, but probably exists, in Pierre Greys Lakes area. The formation is exposed in several structural units in the southern part of the area, where it is brought to the surface by folding and faulting.

The main part of the formation consists of about 1,000 feet of very fine-grained, grey, slabby, quartzitic siltstone that weathers reddish brown. In places, hard beds up to 2 feet thick alternate with very thin-bedded siltstone. Some of the upper beds in the main part of the formation consist of calcareous siltstone.

Whitehorse Member. The Spray River siltstone is overlain conformably by 100 to 150 feet of cream to white weathering, grey to cream-coloured, porous, soft limestone and dolomite, mapped separately as the Whitehorse member. With this member are included some sandy limestone and a few beds of hard, grey, light grey weathering limestone resembling that of the Rundle formation. The member also contains much white calcite as stringers and cavity fillings. Some of the more porous beds contain fillings of black, lustrous material resembling pyrobitumen.

JURASSIC

Fernie Group

The Fernie group overlies the Whitehorse member of the Spray River formation. It is fairly extensive in the southwestern part of the map-area, but it is poorly exposed because it consists largely of soft beds that do not outcrop well.

The lower 300 or 400 feet of the Fernie consists mainly of black, fissile shale and silty shale, with several interbeds of extremely hard, brittle, black, cherty beds near the base. Some of these cherty beds are calcareous. The shale zones contain streaks of yellow weathering ironstone concretions.

The middle part of the group is composed of about 400 feet of interbedded dark grey shale, silty shale, and quartzitic sandstone beds up to 3 feet thick, the sandstone beds becoming predominant toward the upper part of this zone.

The upper part of the Fernie contains still more sandstone. At one locality the following section of the upper zone was measured:

	Feet
Overlying beds classed as Nikanassin formation	
Silty shale, grey, with some sandstone beds up to 4 feet thick.....	60
Sandstone, grey, quartzitic.....	4
Shale, grey, with 2-inch sandstone ribbons.....	12
Interbedded silty shale and siltstone, grey.....	38
Sandstone, fine-grained, grey, buff weathering, quartzitic.....	27
	141

In the Moon Creek area (2), where the Fernie is better exposed, the total thickness was estimated to be 900 feet.

LOWER CRETACEOUS

Nikanassin Formation

The Nikanassin formation overlies the Fernie conformably and gradationally, the position of the boundary being a matter of individual judgment. The formation is exposed fairly well in two narrow bands in the southern part of the map-area, and because of the plunge of the folds in this region, it is assumed that the more southerly band widens in the western part of the area, but outcrops there are very scarce.

The lower 400 feet of strata classed as Nikanassin consist mainly of thickly bedded grey sandstone with a few thin interbeds of black shale and very hard quartzitic sandstone. This part of the formation is overlain by 517 feet of hard grey and softer brown sandstone, with some grey and greenish silty shale and minor beds of black carbonaceous shale. Two yellow weathering ironstone beds 3 feet thick occur in the uppermost 50 feet of the formation. The upper 100 feet is very similar lithologically to the lower part of the Luscar formation.

No fossils were found in the Nikanassin formation in Pierre Greys Lakes area, the Lower Cretaceous age being assigned because of evidence in areas farther to the southeast. It is possible, however, that the lower part of the formation is Jurassic. The formation is classed as marine and non-marine because part of the formation in Moberly Creek area (3) contains marine fossils.

Cadomin Formation

The Cadomin formation, which consists of 40 to 100 feet of conglomerate overlying the Nikanassin formation, is exposed in two main bands, one on either flank of the Cabin Creek anticline. That on the southwestern flank can be traced fairly continuously from the south boundary of the

map-area to Mahon Creek. The band on the northeastern flank outcrops more intermittently between the same limits. Outcrops of these bands could not be found west of Mahon Creek. The only other exposures found are short faulted segments, one outcropping on the Cabin Creek trail 1,000 feet east of one of the main bands, and the other west of Mahon Creek and southwest of one of the main bands. Neither of these exposures could be traced for any distance.

The conglomerate consists of well-rounded pebbles from $\frac{1}{4}$ inch to 4 inches in diameter, consisting of white, grey, reddish, greenish, and black chert and quartzite in a matrix of quartzitic sandstone. In places, beds and lenses of quartzitic sandstone are interbedded with the conglomerate, but usually no sandstone is present.

Luscar and (?) Mountain Park Formations

The Luscar formation overlies the Cadomin conformably and underlies a considerable part of the southwestern part of the map-area, but it is poorly exposed. It is possible that part of the drift-covered region mapped as underlain by the Luscar may include other formations brought to the surface by structures more complex than those indicated on the map.

The Luscar consists chiefly of grey, greenish, and brown, fine-to medium-grained sandstone, with much interbedded, greenish grey to black shale containing thin coal seams. It is probable that thicker coal seams also occur but are unexposed, as explained in the section on coal in this report. In addition to the sandstone mentioned above, a few thin bands of very hard quartzitic sandstone were found. No conglomerate was seen in the Luscar within the map-area, but as several beds and lenses somewhat similar lithologically to the Cadomin occur in the lower part of the formation in the Moon Creek and Moberly Creek map-areas, it is probable that they are also present in this area.

No complete section of the formation is exposed within the map-area. The total thickness was estimated graphically on structure sections to be about 2,000 feet, but this apparent thickness may be exaggerated by minor folding and faulting.

Judging from reports from other areas, the formation may contain some brackish water or marine strata (6, p.7).

Fort St. John Group (?)

About 400 feet of poorly exposed black shale lying conformably between the Luscar and Dunvegan formations are classed tentatively as "Fort St. John group" because of their similarity in lithology and position below the Dunvegan to the upper part of the Fort St. John group in Peace River district. No fossils were found in these beds in the present map-area. The relationship of these strata to the lower part of the Blackstone formation in more southerly Foothills areas where the Dunvegan is absent is causing considerable speculation at the present time. Nothing germane to this problem was found in Pierre Greys Lakes area.

UPPER CRETACEOUS

Dunvegan Formation

The black, Fort St. John (?) is overlain conformably by beds of sandstone, siltstone, and shale believed to represent the Dunvegan formation of Peace River district (7). The best exposures are on Mahon Creek near the mouth of Isaac Creek, where the following section was measured:

	Feet
Overlying beds - Blackstone formation	
Sandstone, light grey, medium-grained, thick-bedded, buff weathering, crossbedded.....	43.0
Interbedded sandstone and silty shale, grey, soft, with mica flakes on bedding planes.....	35.5
Sandstone, dark grey, buff weathering, fine-grained, poorly bedded to massive, nodular weathering, mica flakes scattered throughout.....	12.5
Silty shale, dark grey, with interbeds of very hard grey, thinly bedded, platy, quartzitic sandstone.....	28.5
Quartzitic sandstone, extremely hard, grey, crossbedded, moderately platy, containing plant remains.....	4.75
Shale and silty shale, dark grey, with a few interbeds of hard, grey, quartzitic sandstone up to 1 foot thick	34.0
Quartzitic sandstone, hard, grey, containing large coalized wood fragments.....	3.6
Covered, but thought to be mainly dark grey shale and silty shale with, possibly, some thin sandstone beds.....	49.0
Interbedded sandstone, siltstone, and silty shale, dark grey, soft; one bed 15 feet from the base of this zone consists of 2 feet of hard grey sandstone with thin ironstone bands.....	31.0
	241.85
Underlying beds - Fort St. John group (?)	

A collection of fossil shells from the above-described section was reported by F. H. McLearn of the Geological Survey to contain Lingula sp. and Corbula sp., which he considers to represent a Dunvegan fauna.

Poorly exposed sandstone resembling that described above and underlain by shale similar to that classed as Fort St. John occurs near the southwest corner of the map-area and appears to represent the Dunvegan formation lying in a narrow synclinal belt.

Blackstone Formation

The Dunvegan formation is overlain, apparently conformably, by the Blackstone. Because of the soft nature of its strata, this formation is poorly exposed. The best exposures are along Mahon Creek below the mouth

of Isaac Creek, where the beds lie on the northeast flank of the Mahon Creek anticline.

The Blackstone formation in this area consists almost entirely of interbedded, friable, black shale and silty shale, with ribbons of somewhat concretionary, yellow weathering ironstone. Two beds of black, grey weathering limestone, up to 6 inches thick, were seen near the base of the formation.

A section could not be measured because of intermittent exposures and minor folds. Estimates of the thickness in nearby areas range from 1,000 to 1,500 feet, but these thicknesses may be exaggerated by folding and faulting.

Bighorn Formation

The Bighorn formation overlies the Blackstone conformably and, because it includes thick, hard sandstone beds, parts of the formation outcrop well and are exposed in several parts of the area. The strata consist of hard, slabby, light grey, quartzitic sandstone and softer, grey sandstone and silty shale, separated by unexposed zones that probably consist of black shale and silty shale. At several places the upper parts of the more massive sandstone zones grade into several feet of conglomerate composed of white and black chert pebbles the size of peas. Judging from experience in other areas where the formation is better exposed, it probably consists of a variable number of sandstone beds and lenses, with two main sandstone zones 25 feet or more in thickness, separated by about 400 feet of shaly beds. About 100 feet below the lower of these two sandstone zones is a third zone containing sandstone beds up to 3 feet thick. The writer has included this lower zone with the Bighorn, following the common practice of including passage beds with the overlying formation, thus raising the total thickness of the Bighorn to about 650 feet.

The following section of the upper part of the formation was measured at the mouth of Veronique Creek:

	Feet
Overlying beds concealed, probably Wapiabi formation	
Sandstone, grey, buff weathering, thick-bedded.....	36
Sandstone, grey, dark buff weathering, in 2-inch beds.....	20
Shale, black.....	10
Sandstone and sandy shale, brown weathering, thin-bedded..	12
Shale, black, with interbeds of buff weathering sandstone 4 to 6 inches thick.....	100
Underlying beds unexposed	
	178

Fossils collected from sandstone beds in the Bighorn formation in Pierre Greys Lakes area were submitted to F. H. McLearn for identification, but proved to be indeterminate pelecypods. Some of the shaly beds contain plant remains.

Wapiabi Formation

Conformably above the Bighorn formation are about 1,000 feet of shaly strata constituting the Wapiabi formation. It consists chiefly of friable, grey to black shale and silty shale with thin, concretionary, calcareous , buff weathering interbeds. The lower 100 feet is more sandy. The upper 200 to 300 feet is very sandy, forming a transition to the overlying Solomon sandstone. In the Veronique Creek section the 100 feet of strata immediately below the Solomon consist of very sandy, chocolate weathering shale, and this is underlain by 100 feet of greenish, glauconitic, sandy shale with interbeds of nodular weathering sandstone 2 to 6 inches thick.

The best exposures of the Wapiabi formation are along the lower part of Veronique Creek and along Muskeg River about half a mile above the mouth of Veronique Creek. At both localities the strata lie on the northeast flank of the Muskeg anticline. Neither place affords a complete section, but on Veronique Creek the stratigraphic interval between the top of the Bighorn and the base of the Solomon sandstone was estimated fairly accurately to be 1,100 feet.

Fossils collected from the Wapiabi formation in Pierre Greys Lakes area were identified by F. H. McLearn as Ostrea sp. and Inoceramus pontoni, the latter being a guide fossil to the ventricosus or lower Wapiabi zone.

Brazeau Formation

Solomon Member. The Wapiabi formation is overlain conformably by 80 to 100 feet of hard, slabby, grey, buff weathering sandstone that generally weathers in slabs ½ inch to 2 inches thick. The rock is much like that of the typical Bighorn and can be described as quartzitic sandstone in places, but it weathers in thicker slabs and a darker buff colour. Following the practice adopted in nearby areas, this sandstone is mapped separately as the Solomon member because it is a useful horizon member. Marine fossils have been found in it in nearby areas but not in Pierre Greys Lakes area; there is no reason to doubt, however, that it is marine here as elsewhere.

The Solomon member outcrops intermittently in several belts in different parts of the map-area, because of folding. It is exposed at two localities on the northeast flank of the Muskeg anticline, one on Veronique Creek and the other on Muskeg River. Elsewhere on this structure the position shown is inferred. It also forms two bands on either flank of the Mason Creek syncline. The band on the southwest flank of this fold outcrops intermittently across the map-area, but the one on the northeast limb is known only from work in the adjoining A la Pêche area and from one doubtful outcrop in the present map-area. The member also outcrops at several places on the Mahon Creek anticline where this structure plunges southeast and where the band is interpreted as having been folded into two minor anticlines. Still another band outcrops in a fault block at the south boundary of the map-area. The best exposures of the strata immediately above the Solomon member are on Veronique Creek. These beds are unlike the typical strata of the main lower part of the Brazeau formation and are fairly similar to transition beds overlying the Solomon in nearby areas. The following section of these strata was measured on Veronique Creek:

	Feet
Immediately overlying beds concealed; nearest overlying beds typical Brazeau conglomerate	
Sandstone, greenish, medium-grained, massive.....	30
Sandstone, soft, dark green, medium-grained.....	44
Shale, black, and sandstone, green, friable, in thin interbeds.....	3
Sandstone, hard, massive, greenish.....	5
Shale, black, friable, with sandstone interbeds up to 2 feet thick.....	95
Conglomerate, composed of small black pebbles $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter.....	5
	182

Main Part of Brazeau Formation. The main part of the Brazeau formation consists of roughly 6,000 feet of generally thickly bedded sandstone, conglomerate, and shale. These strata underlie about half of the map-area, forming a wide belt extending diagonally across the centre. The sandstone is medium to coarse grained, grey and greenish grey, green and brown weathering, and softer than the quartzitic sandstone of older formations. The conglomerate consists mainly of pebbles from $\frac{1}{2}$ to 1 inch in diameter composed of white, grey, and black quartzite and chert. In places it is closely packed, and elsewhere it shows all gradations to sandstone with scattered pebbles. Conglomerate is more common toward the base of the formation. Both sandstone and conglomerate are commonly crossbedded. The shales are black, dark grey, and greenish, and are silty or sandy in places. The upper part of the formation contains some beds of calcareous sandstone and some white beds that appear to be water-lain ash beds.

Plant remains occur at many localities in sandstone and shale, but identifiable fossil plants were collected at only two localities. These were described by W.A.Bell of the Geological Survey as follows:

Lot L 6. (Geol.Surv. Cat. No.3724) Muskeg River at 15th Base Line.

Coniferæ

Sequoia ? sp.

Ginkgophytes

Ginkgoites laramiensis (Ward)

Remarks. The few bits of sterile foliage are too poorly preserved for positive identification. I think probably it is a *Sequoia* of the same species, yet undescribed, that occurs in the Edmonton formation, and I would tentatively consider an age equivalent to part of the Edmonton more probable than a Paleocene one. The *Ginkgoites* is too long-ranging to be diagnostic.

Lot L 15. (Geol. Surv. Cat. No. 3725). Muskeg River, ½ mile north of 15th Base Line.

Conifers

Sequoia sp.

Angiosperms

Grewiopsis nebrascensis (Newberry) forma grandidentata Lesquereux

Remarks. This is the only identifiable leaf among the many fragments of angiosperms. It ranges from high in the Upper Cretaceous to the Paleocene, but is most abundant in the Upper Cretaceous and, tentatively, I consider the age of the florule to be equivalent to that of some part of the Edmonton formation and of the upper part of the Brazeau formation.

PALEOCENE (?)

The Brazeau formation is overlain conformably by roughly 4,000 feet of strata of probable Paleocene age, outcropping poorly in the northeast corner of the map-area, and still higher beds of the same unit continue northeast of the area. These strata consist of sandstone, shale, and conglomerate resembling those of the Brazeau formation to a considerable degree, but are on the whole more thickly bedded, softer, and fresher in appearance. No identifiable fossils were found in them and they are classed as Paleocene only because of evidence obtained in areas to the southeast (3,4). There is not sufficient lithological difference between these strata and those of the Brazeau formation to permit the drawing of anything approaching an accurate geological boundary, the one selected being very arbitrary. To judge from other areas, these strata probably contain coal seams.

GEOLOGICAL STRUCTURES

The strata that underlie Pierre Greys Lakes map-area are divided into a series of structural units by northwesterly trending thrust faults, and the strata within each of these structural units are folded along northwesterly trending axes. The faults themselves are seldom visible, and their exact positions are in most places inferred. From the distribution of the strata and from general conditions known to prevail in other areas, at least most of these faults are considered to dip southwest. Some of the fault planes may have been folded, but no definite evidence of this was obtained within the map-area. The number of faults and the steepness of the folds increase toward the southwest as the more intensely deformed region of the Rocky Mountains is approached. The faults and folds shown on the map accompanying this report are the minimum number required to explain the distribution of the exposed rocks; there are probably many more minor faults and folds. For convenient reference, some of the more important faults and folds have been named.

The largest structural unit underlies the northern half of the map-area. It is bounded to the southwest by a fault that the writer terms the "Muskeg fault", and to the northeast of the map-area this unit presumably grades into the undisturbed strata of the Great Plains. The existence of the

Muskeg fault is, to a large extent, assumed because such a fault is necessary to explain the manner in which the Wapiabi formation overlies the Brazeau on the south part of Bingo Ridge in the adjoining A la Pêche area. Evidence of what is believed to be the same fault is supplied, however, by outcrops along Muskeg River about a mile south of the 15th Base line. Here there is pronounced evidence of shearing, the average dip of the shear planes being vertical. Small, slickensided surfaces filled with calcite stringers occur at many places near the assumed position of the Muskeg fault, but as these dip in various directions they do not afford evidence of the dip of the main fault.

A fault block several miles wide lies southwest of the Muskeg fault and is bounded to the southwest by a fault that extends northwest from near the southeast corner of the map-area. This fault block is occupied by a broad syncline,which is called the Mason Creek syncline because it is well exposed on the creek of that name in A la Pêche area.

The next fault block to the southwest contains several folds, the most prominent of which is called the Mahon Creek anticline because it is best exposed on that creek.

Still farther to the southwest the strata are complexly folded and faulted, and on the whole poorly exposed. The most prominent fold in this part of the area is called the Cabin Creek anticline.

OIL AND GAS POSSIBILITIES

The Muskeg anticline appears to be the most promising structure for the accumulation of oil and gas in the map-area, and if the test well now being drilled nearby proves successful attention will doubtless be given to this structure within the map-area. Owing to the plunge of the structure, however, only a small part near the west boundary of the area is apt to afford as shallow depths to the Palaeozoic formations as does the part near the well site.

In the event of successful development of the Muskeg anticline consideration will probably also be given to other structures in the southern part of the map-area, but there the more complex folding and faulting may prove to be greater obstables to development.

COAL POSSIBILITIES

No coal seams of commercial thickness were observed to outcrop within the map-area, but there is good reason to expect that commercial seams occur in the area, in the Luscar formation and perhaps also in the Paleocene strata.

Good coal has been mined in the Luscar formation as far north as the Brûlé map-area, and prospecting has shown that analogous seams occur still farther north, to within about 10 miles of the south boundary of the present map-area. Important seams have also been found in the Luscar formation along Smoky River about 17 miles west of the map-area (5). It is reasonable, therefore, to expect that related seams may occur in the

Luscar formation in Pierre Greys Lakes area, and it is not surprising that they have not yet been found because the formation does not outcrop well. In more southerly areas the seams occur in the central part of the formation, but on the Smoky they are reported to extend to the basal part (5, p. 30).

In Moberly Creek map-area to the southeast of the present area a 7-foot coal seam was found in the Paleocene strata roughly 2,000 feet above the assumed position of the top of the Brazeau formation, and other important seams occur in these strata still farther to the southeast. Analogous seams may occur in the Paleocene strata in the northeast corner of Pierre Greys Lakes area.

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