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**PRELIMINARY REPORT
on
THE GEOLOGY
of
PERMITS 2855 and 2856
NORTHWEST TERRITORIES**



**PREPARED FOR
PAYSON-COWELL SYNDICATE**

by

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INTRODUCTION

Location and Accessibility of Permit Area. Type and Scope of Survey.

Permit 2855 ($61^{\circ} 25' - 30' N$; $117^{\circ} 00' - 15' W$)

is located approximately fourteen miles northeast of Fort Providence. Permit 2856 ($61^{\circ} 10' - 20' N$; $117^{\circ} 30' - 45' W$) lies on the Mackenzie River immediately south of Fort Providence. Fort Providence is served by the Mackenzie River Highway, and has landing facilities for barges and an air-strip served by Pacific Western Airlines.

Permit 2855 lies immediately west of an all weather road leading from Fort Providence to Yellowknife. The section of the road between Fort Providence and the permits has been completed, other parts are still under construction. Permit 2856 is accessible from the Mackenzie River highway. Permit 2855 and most of permit 2856 are completely flat; only in the southwestern part of permit 2856 there is a gentle rise. The area is covered by muskeg, patchy stands of stunted black spruce forest and burnt over forest with secondary growth. Heavy equipment could be moved into the area quite easily during winter months.

The purpose of the work was to evaluate the hydro-carbon potential of the acreage. Operations were based at Fort Providence and were carried out by means of a Model G Bell helicopter supplied by Bullock Wings & Rotors Ltd. As the permits themselves are completely covered by overburden, outcrops on Great Slave Lake, Kakisa River, Kakisa Lake and in the Horn Mountains were studied. The geology was done by Dr. H. P. Trettin. The helicopter was operated by C. H. Bullock, pilot and R. L. McNevin, engineer. The camp was served by a Norseman float plane supplied by Bullock Wings & Rotors Ltd. and operated by D. M. Christensen. Work was carried out during the period of September 25 through September 29, 1960.

STRATIGRAPHY

The stratigraphy of the area is summarized in G.S.C. paper 59-6. Middle and Upper Devonian and Cretaceous outcrops were studied in the Horn Mountains, on the shores of Great Slave Lake, on Kakisa River, Kakisa Lake and in the Horn Mountains. A few drill cores were examined near Sulphur Bay.

The oldest rocks underlying the permit area belong to a Pre-Cambrian crystalline basement complex. The Pre-Cambrian is overlain unconformably by Ordovician shale, dolomite, gypsum, and salt. Recorded thicknesses of these strata vary considerably in the Great Slave Lake area but fall between 705 and 189 feet. Apparently the Ordovician system thins and pinches out near a Pre-Cambrian High located between Fort Providence and Rabbit Lake. Ordovician rocks are overlain with unconformity by Middle Devonian strata. The Middle Devonian stratigraphy is complex and characterized by numerous facies changes. The rocks consist of limestone, dolomite, shale, gypsum and salt. Thicknesses of the various

members and facies vary considerably. The total thickness of the Middle Devonian at the northwest shore of Great Slave Lake is roughly of the order of 1,100 feet.

Of particular interest in the Middle Devonian are the Presqu'ile Formation, the stratigraphic equivalents of this formation and the overlying limestone beds. The formation is made up of dolomites that show vuggy and inter-crystalline porosity and locally carry bitumen and oil in pore spaces.

The Presqu'ile Formation crops out near Windy Point on the northwest shore of Great Slave Lake and near Pine Point on the south shore of the lake. It was also recognized in Northwest Territories Escarpment Lake No. 1 well but is not reported from Northwest Territories Deep Bay No. 1 well and from Briggs Rabbit Lake No. 1 well, Foetus Lake No. 1 well and Tahltina Lake No. 1 well. Based on this data, it is probable that Presqu'ile dolomite is not present in the subsurface of permits 2855 and 2856.

However, certain limestones approximately equivalent to this formation, that were penetrated in Deep Bay No. 1 well, are very promising. The log of this well reports 350 feet of "limestone, light brown, finely crystalline with scattered vugs and stromatoporoids or algae in buff, fine- to coarse-grained, oil stained matrix." Above this limestone there are twenty-one feet of shale which are overlain by 215 feet of "limestone, light grey, finely crystalline with scattered stromatoporoids and corals and brown, micro-crystalline to medium-grained, partly fossiliferous dense and finely porous; stylolites and thin shale partings".

In the vicinity of Northwest Territories Deep Bay No. 2 well the writer observed 250 feet of drill core the position of which was not marked. These cores consist partly of coralline and stromatoporoidal reef limestone with some vuggy porosity and contain bituminous matter. The core represents either the equivalent of the Presqu'ile or the overlying limestone unit. This facies may well extend into the subsurface of permit 2855.

The final report will include all information available about the wells in the vicinity of Great Slave Lake, Kakisa Lake, Mills Lake etc. In that report an attempt will be made to establish the facies of the Middle Devonian present in the subsurface of permits 2855 and 2856.

The Upper Devonian strata, that probably underlie the permits, consist of shale, limestone, and sandstone.

STRUCTURE

The structure of the permits is unknown as there is no outcrop. Structural deformation in the area is very gentle, there seems to be a regional dip of about twenty-five feet per mile to the southwest.

CONCLUSIONS

Facies studies based on the wells in the vicinity of the permits will have to be made. Judging from the present data it is possible that there are porous Middle Devonian reef limestones in the subsurface of the permits which may contain hydro-carbons.

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REFERENCE

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