

G U L F

Petroleum and its Products

CANADIAN GULF OIL COMPANY

P.O. Box 130
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E.D. Loughney
Vice-President

July 13, 1954.

Mr. C.K. LeCapelain,
Chief Land Division,
Dept. of Northern Affairs and Natural Resources.

Dear Sir:

Canadian Gulf Oil Company conducted geologic and stratigraphic studies in the Mackenzie Mountains Area of the Northwest Territories during the field season of 1953 under Exploratory Licence number 115. A summary of the work accomplished is given below in compliance with section 5 of the Provisions of the Territorial Oil and Gas Regulations.

The sections studied in 1953 lie roughly within the triangle formed by the Nahanni Range of the Franklin Mountains and the North and the South Nahanni Rivers between latitudes 61°N and $62^{\circ}30'\text{N}$ and longitudes 123°W and 126°W .

The purpose of the study was to measure, describe, and sample outcrops in order to establish the Palaeozoic stratigraphic sequence of the area. Eleven sections were described and sampled and a total of 35,000 linear feet of strata was measured. The localities of the sections measured are shown on the accompanying map (Fig. 1).

The geological party consisted of four geologists, three student assistants, seven Indian back packers, one boatman and a cook. Transportation within the area was by means of a float-equipped De Havilland Beaver aircraft, a Bell helicopter and various small boats.

The field season commenced June 10th terminated September 10th. No potentially useful waters, coal, gravel or sand deposits were found.

GEOLOGY

Strata ranging in age from Ordovician to Mississippian were exposed throughout or in parts of the area. The lithologic character and stratigraphic relation of each system is described below.

Ordovician

Ordovician strata were measured at one locality, Virginia Falls ($61^{\circ}30'\text{N}$ $125^{\circ}40'\text{W}$) where over four thousand feet are exposed. The lowermost 345 feet consists of dark grey banded fine crystalline limestone. Fossils, including numerous gastropods, occur in the lower part of the zone.

Overlying the basal zone is a 1,000 foot interval covered by vegetation and gravel. The upper 3,000 feet consists of dark grey, thin bedded, fine crystalline limestone. Brachiopods, bryozoans, nautiloids, trilobites and gastropods are common throughout.

Silurian

Silurian strata underlie much of the area investigated and were examined in detail at Little Doctor Lake (61°52'N 123°16'W), "Rim Mountain" (61°30'N 123°30'W), Bluefish Lake (61°11'N 123°20'W), First (lower) Canyon of the South Nahannie River (61°10'N 124°33'W) and at Virginia Falls. The thickest exposure is at Bluefish Lake where approximately 2,500 feet of strata was measured.

In general Silurian strata consist of fine to medium crystalline thick-bedded dolomite. A characteristic feature of the rock is its banded appearance caused by alternating light and dark grey colors. No lithologic change is apparent between the banks.

Near the base of the section dolomitic sandstones, siltstones and silty dolomites are interbedded with thin dolomitic bands. The sandstones have a dolomitic cement and have poor to fair intergranular porosity. Brecciated strata as much as 100 feet thick occur in places throughout the section.

The silurian strata have little or no porosity although intergranular and vuggy porosity was noted in places.

Fossil imprints and crinoid columals are common. The complete dolomitization of the strata is believed responsible for the lack of any recognizable fossil forms.

Devonian

Strata of Middle and Upper Devonian age underlie much of the area forming a characteristic topography. The Middle Devonian limestones form the mountain ridges and high plateaus and outcrop extensively whereas the Upper Devonian shales weather out forming large extensive valleys and recessive slopes.

Middle Devonian

Middle Devonian strata were measured at Bluefish Lake; First Canyon South Nahanni River; Second Canyon of South Nahanni River, (61°18'N 124°33'W); "Rim Mountain" and Little Doctor Lake. The thickest section was in the Second Canyon of the South Nahanni where 1,200 feet of strata was measured. The Middle Devonian consists of light to brownish to dark grey fine to coarse crystalline limestones which weathers to light yellowish grey. The lower third is slightly argillaceous and silty and in places has thin dolomite stringers. Bedding is poorly defined and generally massive with a thin-bedded and platy zone 300 feet above the base. Fossils are common throughout the section.

Upper Devonian

The strata of Upper Devonian age weather to recessive slopes and readily support vegetation and therefore outcrops are rare. One section at Ward Lake, (62°27'N 123°56'W) was measured in 1953 where a partial section 1,930 feet thick was obtained. The Upper Devonian at Ward Lake can be divided into four zones. The lowest zone 1,150 feet thick consists of brownish grey, brown and grey green shale, sandy and silty in part with interbedded fine grained siltstone and sandstone which calcareous in part. The lowest zone is overlain by 240 feet of brownish grey, fine to very fine grained sandstone calcareous and shaly in part. The third zone consists of 315 feet light to brownish grey, thinly bedded, flaky shales. The fourth zone consists of 240 feet of medium light grey to greenish grey micro micaceous sandstones and siltstones with numerous shale breaks.

Mississippian

Four Mississippian sections were measured in 1953, namely at Ram Creek, (61°10'N 124°25'W), Jackfish Gap, (61°N 124°W); Twisted Mountain (61°13'W 123°37'W) and Bluefish Mountain (61°07'N 123°30'W).

The contact between the Mississippian and Devonian is transitional and has tentatively been placed where the shales, sandstone and siltstones become calcareous. The Mississippian in the Nahanni Area is a heterogeneous complex of black to dark green fissile shales, fine grained micro-micaceous calcareous and argillaceous siltstones and sandstones; and dark grey to light grey limestones, silty and argillaceous in part. Chert bands and lenses are present in some limestones. Fossils are common throughout.

Permian-Pennsylvanian?

Overlying the Mississippian strata at Jackfish Gap, Ram Creek and Twisted Mountain is a thick series of beds and age of which is unknown but is designated herein as Permian-Pennsylvanian.

A complete section was not available but 3,700 feet of strata were measured at Jackfish Gap. Here the beds consist of a basal zone approximately 200 feet of light grey to medium dark grey fine-grained quartzose sandstones and dark grey to greyish black shales. The beds have an extremely lens-like character. Overlying the basal zone is a series of sandstones which range in colour from light grey through yellow to dark red. The beds have a cyclic aspect and each unit begins with shale grading upward into massive sandstone and changing abruptly into the shale of the overlying cycle. The shales are medium grey to black in colour.

A near shore environment is indicated by the presence of numerous carbonaceous layers, a four-foot seam of low grade coal at Jackfish Gap, plant remains, ripple marks and numerous minor unconformities.

Mesozoic

The presence of strata of Mesozoic Age, probably Cretaceous, was noted in the southern part of the area but an examination of these rocks was not carried out.

Yours very truly,

CANADIAN GULF OIL COMPANY,

"E.D. Loughney"
Vice President

ADB:dp

