

GEOPHYSICAL REPORTPERMIT 1473NORTHWEST TERRITORIES

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GEOPHYSICAL REPORTPERMIT 1473NORTHWEST TERRITORIES1. Introduction

An aerial scintillometer survey was conducted over Permit 1473 by Pentland and Allen Petroleum Consultants Ltd., in August, 1958. The Mackenzie River flows across the permit area from the southeast corner to the northwest corner, and the Mountain River flows into the Mackenzie near the south boundary. A part of East Mountain is included in the southeast corner and the remainder of the permit is covered with muskeg, small lakes and streams.

Lundberg Explorations Limited surveyed areas in Alberta, British Columbia, Saskatchewan, Quebec, Texas, New Mexico, Oklahoma and various other parts of the United States. Lundberg (1) found that radioactive lows generally are obtained over oil fields and that these lows are commonly surrounded by radioactivity slightly higher than normal. He states that variations in intensity may look rather erratic over broken topography, lakes, swamps, and river valleys, but that the lows above the oil fields may, as a rule, still be observed. He claims that his operations were extended into unknown territory and drill holes were put down on anomalies which looked promising with the result that new oil fields were found.

Other workers, for example Williams and Lorenz (2) do not believe that the measurement of radioactivity is a direct method of finding oil but state that it is a tool that may be used to aid in the interpretation of subsurface geology.

In order to test the method under conditions as nearly like those

on the permit as possible, a check was made over the oil field at Norman Wells. It was found that low readings were obtained over the oil pool and that relatively high readings were recorded over parts of the islands and mainland away from the oil pool. As a general rule, readings were low over the Mackenzie River itself.

2. Location and Ownership

Permit 1473 is located at the confluence of the Mackenzie and Mountain Rivers about seventy miles north of Norman Wells, Northwest Territories. The area of the permit is 52,664 acres.

Location of northeast corner is:

65° - 50' north and 128° - 45' west

The permit is held by Laburnum Enterprises of 404 - 510 West Hastings Street, Vancouver 2, B. C.

3. Accessibility

Access to the Norman Wells area is by aircraft throughout the year. During the summer season freight is transported on the Mackenzie River by barge.

Canadian Pacific Airlines operate scheduled flights from Edmonton to Norman Wells and Aklavik E 3. The distribution of passengers and air freight to the smaller centres such as Fort McPherson and Fort Good Hope is by Otter Aircraft. Aircraft are available for charter at Aklavik. Freight may be shipped by train during the summer from Edmonton to Waterways, thence by barge down the Athabasca River, through Lake Athabasca, down the Slave River and through Great Slave Lake, down the Mackenzie River, and thence up smaller rivers such as the Arctic Red, Peel and other main waterways. Heavy equipment may be transported by "cat train" over most of the north country during the winter months. Plans are being

made for several main access roads as far as the Arctic Ocean in order to assist in the development of the natural resources of the Yukon and the western part of the Northwest Territories.

Being on the Mackenzie River near Norman Wells, permit 1473 is favorably located on the main northern transportation route.

4. Climate and Vegetation

Spring break-up is usually in late May or early June. Freeze-up occurs between mid-September and late October. May, June and July are the summer months when there is almost continuous daylight and the weather is pleasantly warm. The sun is not seen during the months of November, December and January and during these winter months the temperature may drop to 60 degrees below zero for short periods of time. With lakes, river, swamps and muskeg frozen, transportation is active by "cat train" over the many winter roads. It is during this winter season that most of the drilling rigs will be moved and ground geophysical survey work done in the search for oil and gas.

Small scattered stands of stunted spruce, poplar, birch and tamarack grow on this muskeg-covered country. In some sheltered areas, usually along the banks of streams, the trees may reach diameters of 12 to 18 inches and heights of 30 to 40 feet.

5. Physiography

Permit 1473 is located near a large bend in the Mackenzie River where it changes direction from westerly to northerly. The land on the west side of the river is low and dotted with numerous small lakes, whereas on the east side a series of hills rise 1000 to 1800 feet above the river level from East Mountain - the southeast corner to Beavertail Mountain off the northeast corner. At this location the Mackenzie River

is $1\frac{1}{2}$ to 5 miles wide, and there are six islands within the permit area. The Mountain River flows across the southwest corner of the permit and enters the Mackenzie a short distance above Sans Sault rapids two miles from the south boundary. The Donnelly River flows westerly into the Mackenzie near the northeast corner of permit 1473.

6. Geology

Cretaceous and Devonian strata outcrop on East Mountain and along both banks of the Mackenzie River on permit 1473. Lower Cretaceous rocks are also exposed along the Donnelly River near the northeast corner of the permit.

The brecciated dolomites of the Devonian Bear Rock formation outcrops just off the southeast corner of the permit on East Mountain. It is there at least 138 feet thick. On the west bank of the Mackenzie River, in the central part of the permit, the Sans Sault Number 1 well penetrated 366 feet of this formation where it was stopped because of mechanical difficulties.

The Ramparts formation outcrops at three locations on the east bank of the Mackenzie River. This is chiefly massive dark grey, light grey weathering, limestone with shale interbeds underlain by thin bedded grey to buff limestones and shale. The latter is in turn underlain by massive limestones. On East Mountain the massive limestone is in places heavily laden with Amphyliora, Cladopora and Stromatoporoids, and has a strong petroliferous odor. The Sans Sault Number 1 well penetrated 437 feet of the massive limestone and 1080 feet of the limestone and shale.

The Cretaceous Sans Sault formation outcrops on the permit. It is composed of sandstone and shale overlain by shale. Near the top of the formation sandstone beds are again prominent, and it is these rocks that form the Sans Sault rapids in the southeastern part of the permit.

A few outcrops on the Donnelly River are flat lying, thin-bedded black friable shale containing numerous ironstone concretions. This may be lower Slater River formation which conformably overlies the San Sault.

The East Mountain, Bat Hills and Beavertail Mountain anticlines extend from the east to, and probably across, permit 1473. What appears to be a minor fold and not on the projected strike of either of the above outcrops on the west bank of the Mackenzie River in the central part of the permit. The San Sault Number 1 well was drilled in this structure.

7. Equipment and Methods

Equipment consisted of a Cessna 170-B aircraft fitted with a very sensitive gamma ray detector utilizing the scintillation principle, an amplifier and a recorder synchronized to give a continuous record of all readings along each flight line.

Navigation was greatly simplified by the Mackenzie River, islands thereon, Mountain and Donnelly River, and many small lakes. Also, the area had been flown several times previously and much of it covered on foot by the writers. When each recognizable feature was crossed a mark was made on the recording tape to identify that particular landmark.

8. Interpretation of Results

Scintillometer readings, in counts per second, averaged for each half mile of flight line, are recorded on the map accompanying this report. The average readings range from 35 to 70 counts per second. Comparison of this map with the serial mosaic shows that the recording of gamma ray intensity over the permit is controlled by surface physical features. Readings over rivers and lakes are lowest; those over the islands and land surfaces are higher, and those over sand bars and exposed bedrock

are highest. It is concluded therefore, that because of pronounced masking of gamma ray radiation by water and other surface cover, no useful sub-surface geological data was supplied by the airborne scintillometer survey over permit 1473.

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