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August 18, 1965

Territorial Hydrocarbons Ltd.,
635 - 6th Avenue S. W.,
Calgary, Alberta

Attention: Mr. A. G. Donaldson,
President

Dear Sirs : Re: Yukon and Northwest Territories -
Permits No. 3883-3884, 3886-3893 Inclusive

Pursuant to your request, the following is a short preliminary evaluation of the hydrocarbon prospects underlying the Permits and recommendations for their further evaluation.

All Permits lie in areas of active interest undergoing exploration by surface geology, photogeology, seismic programs and wildcat drilling.

Permit No. 3883 : (Grid 63 deg. 30 min. 124 deg. 45 min. E 1/2)
28,664 acres

This Permit lies 45 miles due West of Wrigley and is accessible by aircraft from that point. Slim Lake, within the Permit, is capable of handling float equipped aircraft.

Geology : Permit No. 3883 lies immediately in front of the Dahadinni Range, the leading thrust of the Mackenzie Mountains in this area. The Dahadinni Range is formed by a West dipping thrust fault involving Middle Devonian strata at the surface. It is presumed lower rocks are also involved. Permit No. 3883 is located on the East dipping limit of the English Chief Syncline. Douglas and Norris (1963) indicate an anticline approximately six miles long, within the Permit and paralleling the Dahadinni thrust fault.

Rocks underlying the Permit include Cambrian, Ordovician, Silurian and Devonian strata. Cambrian rocks outcrop to the East in the McConnell Range of the Franklin Mountains where they consist of a basal sandstone (Mount Clark formation 450 feet thick) overlain by shales (Mount Cap formation 200 feet thick) which are in turn overlain by an evaporitic sequence (Saline River formation 1,200 feet thick).

It is possible facies changes in this strata have had an influence on the structural grain of the area. A reddish dolomite and sandstone sequence found 35 miles West in the core of the Rouge Range is probably the equivalent of the Cambrian evaporite facies to the East.

Ordovician and Silurian rocks will be present under the Permit. The Whittaker formation - Mount Kindle formation, porous dolomites may be in trap position within the Permit where found in the correct structural position.

The Lower Devonian ? Camsell formation, a massive brecciated carbonate should be in subcrop position on the acreage and may be in trap position on any structural feature.

The Middle Devonian Arnica formation will overlie the Camsell formation. The Arnica is a massive dark grey granular to finely porous and vuggy dolomite. A facies change to the Bear Rock formation, a massive limestone and dolomite breccia occurs in the Dahadinni range immediately to the West of the Permit. This facies change will cross the Permit.

The Arnica-Bear Rock formations are overlain by the argillaceous limestone of the Funeral formation, the shales of the Headless formation and the tight fossiliferous Nahanni-Hume formations.

Recommendations :

1. Photogeologic and photogrammetric work should be undertaken followed by, or in conjunction with field work on the Dahadinni Range. This will enable the structural features indicated by the Geological Survey of Canada to be checked and indicate the type of reservoir to be expected in the Middle Devonian.

2. Short seismic lines normal to the structural grain should be shot to confirm that any surface structure is present at depth.

Permit No. 3884 : (Grid 65 deg. 10 min. 125 deg. 45 min).
53,992 acres

This Permit lies on the flank of the Norman Range immediately Northwest of Fort Norman and a few miles North of the Mackenzie River.

Geology : The lowest formation present is the Cambrian Saline River formation. In the Vermilion Ridge No. 1 well two miles West of the Permit, approximately 3,200 feet of the formation was penetrated. In excess of 2,000 feet of salt was present. This thick incompetent unit probably has a major effect on the structure in this general area.

The Ordovician-Silurian Ronning formation is exposed on the Permit. It consists of a basal shale and an overlying limestone in its equivalent type section to the Southeast. The upper fossiliferous and porous part of the Ronning may subcrop under the overlying Bear Rock formation across the Southwest portion of the Permit.

The Middle Devonian formations also outcrop in the Norman Range within the Permit. The lower-most formation, the Bear Rock, consists of brecciated limestone and dolomite with anhydrite beds and bedded carbonates. The type section of the formation is at Bear Rock, two miles Southeast of the Permit. The Bear Rock formation contained water in the Bluefish No. 1A well drilled four miles South of the Permit.

The Hume formation may have some porosity in this area since the Bluefish No. 1A well lost circulation in this zone. Any up-dip pinchout may cross the Southwest side of the Permit. Only the basal bedded equivalents of the Kee Scarp reef are present in the Vermilion Ridge No. 1 and Bluefish No. 1A wells and there is no outcrop evidence of its presence on the Permit. There may be isolated reef build-ups under the acreage.

The Bluefish No. 1A well was drilled on the basis of a live oil seep from the Devonian-Cretaceous unconformity. It appears that the source of the oil is further downdip than the position of the well.

The structure under the Southwest portion of the Permit appears to be a westerly dipping homocline, however, there are anticlinal structures on Vermilion Creek, a couple of miles to the Northwest. These structures, the Vermilion Gorge anticline and the anticline on which the Vermilion No. 1 well was drilled may extend Southeastward into the Permit area.

Recommendations :

1. Photogeologic and photogrammetric work should be undertaken in conjunction with field examinations in the Norman Range.

2. Seismic lines over the Southwest portion should be shot to determine if there is any isolated build-up in the Kee Scarp reef or any structural traps which would form reservoirs in the Hume, Bear Rock and Ronning formations.

Permit No. 3891 :	(Grid 66 deg. 10 min., 136 deg. 15 min.)
and	51,966 acres
Permit No. 3892 :	(Grid 66 deg. 00 min., 136 deg. 00 min.)
	52,306 acres

These Permits are located in the Southeast corner of the Eagle Plain area and Permit No. 3891 abutts the large Western Minerals Eagle Plain block. This block is presently undergoing active exploratory drilling by Mobil Oil and one gas discovery, Birch YT-B-34, was drilled 10 miles West of Permit No. 3891. A second gas discovery, Blackie YT-M-59 is located approximately 20 miles West of Permit No. 3891.

Geology : The Permits lie immediately West of the Richardson Mountains. Surface rocks belong to the Upper Devonian, Mississippian and Permo-Pennsylvania. The extreme Northeast corner of Permit No. 3892 has Siluro-Ordovician on the surface.

Available published information and that on open file at the Department of Northern Affairs and National Resources indicates that a large anticline running North-South through Permit No. 3891 and then turning Southeast to run through No. 3892. Faulting also occurs in the South end of Permit No. 3892. These structures parallel the Richardson Mountains anticlinorium which brings Cambrian rocks to the surface.

The Cambrian rocks in the Richardson Mountains are made up of slates and shales with some argillites and chert. These rocks are overlain by Ordovician and Silurian rocks. In the Richardson Mountains, these rocks consist of a thick graptolitic shale section. To the Southwest, in the direction of the Permits, the Ronning carbonates outcrop in the Ogilvie Mountains Southwest of the Permits. The carbonate-shale facies traps may underlie parts of the Permits and represent the primary objective.

The Middle Devonian is probably present as a sub-cropping unit below the overlying Upper Devonian shales. The rocks are probably carbonates equivalent to the lower part of the Bear Rock-Arnica formations. These rocks may be in trap position underlying the Permits.

The Upper Devonian is mainly shale in this area, although some sandstones and conglomerate beds may be in trap position if they have not been breeched by erosion.

The Mississippian and Permo-Penn limestones and clastics are at the surface and will not be prospective. A gas seep has been reported within Permit No. 3892 from Permo-Penn rocks near the Peel River.

Recommendations :

1. Photogeologic mapping with some photogrammetric work to indicate the magnitude of the structural closures combined with limited field work to assess the reservoir potential in the Ordovician-Silurian and Middle Devonian rocks.

2. Limited seismic line should be shot over the major structures to confirm structural attitudes at depth.

Permit No. 3886 :	(Grid 68 deg. 40 min., 137 deg. 15 min. S1/2;	23,453 acres)
Permit No. 3887 :	(Grid 68 deg. 30 min., 136 deg. 30 min.;	47,166 acres)
Permit No. 3888 :	(Grid 68 deg. 45 min., 136 deg. 30 min.;	46,820 acres)
Permit No. 3889 :	(Grid 68 deg. 30 min., 135 deg. 30 min.;	47,166 acres)
Permit No. 3890 :	(Grid 68 deg. 20 min., 135 deg. 30 min.;	47,512 acres)
Permit No. 3893 :	(Grid 68 deg. 10 min., 135 deg. 30 min. N1/2;	23,886 acres)

The above Permits lie at the North end of the Richardson Mountains anticlinorium where it plunges below the Arctic Coastal Plain or melds into the Arctic Plateau to the North and Northwest. The Permits lie West of Aklavik some 15 to 60 miles.

Geology : The Permits all have Cretaceous or Jurassic rocks at the surface. These rocks are shales, siltstones and sandstones. According to Jeletzky, rapid facies changes and depositional thickening occur. There may be opportunities for stratigraphic pinchouts in the lower beds where they have not been "breeched" by erosion.

Geology : (cont'd) The underlying thick Permo-Pennsylvanian siltstones and sandstones outcropping extensively in the core of the Northern Richardson Mountains is considered the primary objective underlying the Permits. These rocks appear to underlie all Permits and may have facies changes to carbonates under the Western Permits. Little information has been published on these rocks.

The Permo-Pennsylvanian rocks overlie earlier Paleozoics ranging from Cambrian in the Aklavik Range immediately Southeast of Permit No. 3893 to Mississippian carbonates South of Permit No. 3886. It appears from the sketchy information available that Ordovician-Silurian carbonates will underlie Permits No. 3886, 3887, 3888 and possibly 3889, 3890 and 3893. The rocks will probably be in the graptolitic shale facies under No. 3889, 3890 and 3893. However, no Ordo-Silurian outcrop is reported in the Aklavik Range immediately Southeast of Permit No. 3893.

Middle Devonian carbonates have been reported in the White Mountains South of the Permits, but are not present in the Aklavik Range.

The Upper Devonian has been eroded in the area unless it is present from a northward direction dipping under the Beaufort Sea.

The Mississippian may be present under the western Permits but has been eroded from the Aklavik Range area.

Recommendations :

1. Photogeologic mapping, with limited photogrammetric work to indicate the order of magnitude of the structures involved, combined with field examination of reported outcrops of potential reservoir strata.

It is recommended that V. Zay Smith Associates be engaged to conduct the photogeologic and photogrammetric work. In addition, preliminary access studies should be undertaken in order to assess terrain problems for any seismic work to be done or any future drilling. Calgary Exploration Services Ltd. are involved in access work in the Territories and it is recommended that they be engaged for preliminary studies.

Yours very truly,

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