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PHOTOGEOLOGICAL STUDY

SULPHUR PROSPECTING PERMIT NO. 77

NORTHERN ALBERTA

Prepared For

Kamalta Exploration Limited

June, 1968

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INTRODUCTION

This report has been prepared at the request of Mr. W.B. Ruck, acting for Kamalta Exploration Limited, hereinafter referred to as the "Company." The request made was for a photogeological analysis of the Company's Sulphur Prospecting Permit No. 77, integrated with other available geological information. The results of the study are presented visually on a photogeological mosaic (Figure 2) and an index map (Figure 1) which shows the general geological setting of the Company's permit and its relationship to known sulphur occurrences in the area.

The immediate objective of this photogeological study was to identify from the study of aerial photographs those areas that, from our present knowledge, would be the most favourable from the standpoint of the occurrence of sulphur. Such areas could then be examined in the field to determine the presence or absence of sulphur.

The Permit concerned comprises a total of approximately 19,840 acres.

General background information pertaining to the development of the sulphur play in northern Alberta, regional geological setting and mode of occurrence has been presented in earlier preliminary geological reports and will not, therefore, be repeated here. This report will rather present more detailed information on the Company's Sulphur Prospecting Permit No. 77.

BEDROCK GEOLOGY AND TOPOGRAPHY

Most of the area of the Permit concerned is underlain by Mesozoic rocks, although the northern and the southeastern edges are underlain by Paleozoic. From the standpoint of the regional occurrence of sulphur, therefore, this Permit is relatively well located (see Figure 1).

The Cretaceous rocks consist of shales, sandy shales and sandstones. The Devonian rocks consist of limestones, dolomites, shales and evaporites. Outcrops of bedrock are sparse. Cretaceous rocks are poorly consolidated and bentonitic in character. Slumping is common in these sediments along the steeper slopes and stream cuts. The Devonian limestones and dolomites, being more resistant to erosion, create chutes and rapids on the Peace River between Vermilion Rapids and Vermilion Falls. Other Devonian outcrops are present down-river from Vermilion Falls, as well as along Harper Creek to the southwest of the Permit area.

The bedrock, whether of Devonian or Cretaceous age, is overlain by a variable thickness of glacial till, glacio-lacustrine and recent deposits.

The general topography of the area has not been altered significantly by glaciation. Large topographic features, such as the Caribou Mountains in the northeastern corner of the general sulphur permit map-area and the Birch Mountains, located just to the southeast of the general sulphur permit map-area, represent

pre-glacial erosional remnants rising abruptly from 1,000 feet to 2,000 feet above the surrounding lowlands. The permit map-area itself is situated in broad lowlands with very little topographic relief.

SUPERFICIAL GEOLOGY IN RELATION TO SULPHUR OCCURRENCE

The superficial geology of the area is of particular interest to the subject of possible economic occurrences of sulphur because of the probability that any economic deposits in this area are in superficial deposits.

The last glacier to cover the subject area was of Wisconsin age. Dating by 'carbon 14' method indicates that this advancement over the region occurred over 31,000 years ago. Ice flow features on the Glacial Map of Canada indicates that this glacier came from an area west of Hudson Bay. The thickness of the glacier is estimated to have been approximately 5,000 feet (Bayrock, 1960)(1) and the average direction of flow in the subject area was to the west-southwest.

The absence of terminal moraines and other ice marginal features indicates that the retreat of the glacier was mainly by rapid stagnation. Dead-ice moraine forms the surface or underlies lacustrine deposits over much of the area.

As the glacier retreated, the lowland to the northwest was blocked by ice and meltwaters and could not drain freely. Extensive proglacial and superglacial lakes were formed, resulting in the deposition of glacio-lacustrine deposits which vary in thickness from a few inches to 50 feet.

(1) Names and dates in brackets are referred to in the Bibliography at the end of this report.

Several periods of still-stand of one of these Pleistocene lakes is suggested by R.S. Taylor (1960) from mapped deposits in the Peace River Valley. Three large areas of sandy aeolian and alluvial material, adjacent to the modern Peace River at elevations of approximately 1,400 feet, 1,100 feet and 900 feet above sea-level, are interpreted as deltas that have been partly reworked into dunes by wind action. The lowest occurring, and by far the largest, of these sandy deposits is in the subject area. It commences on the west side of the mapped area, near Vermilion Chutes, and extends to the northeast adjacent to the Peace River. It also covers most of the area south of the Peace River with the exception of some of the areas of higher ground. The eastern limits extend beyond the mapped area.

Present-day drainage was established soon after the lakes were drained and conforms generally to preglacial lowlands.

From our overall sulphur studies in the general area we conclude that the most likely sources of commercial sulphur are superficial deposits. It is of interest in this connection to note that the nearby reservoir of McMurray oil, reputed to amount to about 600 million barrels of oil-in-place, contains four to five percent sulphur by weight. The sulphur in this oil reservoir would, therefore, amount to about eight to ten billion long tons. Since that sulphur is also of secondary origin, probably common to the present occurrences, it is not impossible to postulate the occurrence of commercial deposits in the area, other than in the oil sands.

We also conclude from our regional studies of the sulphur prospects of the subject area that superficial deposits of sulphur are most likely to occur in muskegs, lakes or in abandoned lacustrine depressions, with particular reference to such areas that are along or adjacent to fractures and/or faults responsible for sulphate water springs.

PHOTOGEOLOGICAL STUDY WITH RECOMMENDATIONS FOR FIELD EVALUATIONS

Aerial photographs of the subject permit area were examined stereoscopically for the purpose of selecting general areas of interest, that, from our present knowledge, would appear to be the most favourable for the occurrence of sulphur.

Topographically, the area is level to slightly undulating. Few drainage channels are present within the Permit boundary and, as a result, much of the area is inhabited by muskeg. The slightly higher ground, mainly in the southern portion of the Permit, supports most of the vegetation.

The subject area is part of a regional lowland that is covered by glaciolacustrine deposits. Locally, there is evidence of small basinal areas where these lacustrine deposits increase in thickness to such a degree that underlying glacial deposits are concealed. During the post-glacial period, these depressions apparently persisted and served as local catchment basins. Today, they are inhabited by muskeg, alluvium and/or dried up (post-glacial) lake deposits. We believe that such features, when developed along fracture trends, offer excellent opportunities for possible sulphur deposition.

Evidence of bedrock faulting or fracturing in the area is indicated by numerous photo alignments. These alignments assume a general southwesterly trend except near the centre of the Permit, where their pattern becomes more complex.

The following areas of special interest within Sulphur Prospecting Permit No. 77 are recommended for field examination.

'Area 1' includes three patches of muskeg in the northwestern corner of the subject Permit that are interpreted as representing old lake beds. These features are oriented in a northwesterly direction following the apparent trend

of fracturing. 'Area 1' is considered the most prospective from the standpoint of possible occurrences of sulphur and it is recommended that initial field work on the Permit commence here. This investigation should also include augering of selective sites.

'Area 2' is a closed muskeg area in the northeastern portion of the subject Permit. The very light tone on the mosaic near the centre of this area is of interest and should be examined in the field.

'Area 3' is an east-west trending depressional area that is rather anomalous to other surface geological trends developed within the subject Permit. This feature could be related to the Cretaceous-Devonian contact.

'Area 4' Three small areas having slightly darker tones on the mosaic are of special interest here. They appear to be local closed areas within this general feature.

'Area 5' is similar to 'Area 4' and warrants only a cursory examination if the results from 'Area 4' are negative.

The two small muskegs that comprise 'Area 6' are considered to be of secondary importance, but should be checked on a reconnaissance basis.

CONCLUSIONS AND RECOMMENDATIONS

From our overall sulphur studies in the general area, we conclude that the most likely sources of commercial sulphur are superficial deposits.

We also conclude from our regional studies of the sulphur prospects of the subject area that superficial deposits of sulphur are most likely to occur in muskegs, lakes or in abandoned lacustrine depressions, with particular reference to such areas that are along or adjacent to fractures and/or faults responsible for sulphate water springs.

We have determined that a number of such features show well on the photomosaics and these areas have been outlined on the accompanying Figure 2, a photogeological mosaic.

In view of the above, it is recommended that a field check of representative localities within the subject permit be made by a helicopter-borne geological crew. This crew should be prepared to conduct spot-sampling trenching and/or auger testing as the occasion demands. We are, however, not yet prepared to recommend that the Company conduct the full detailed field geological survey described in our Preliminary Report of February 20, 1968. It is proposed rather that the Company authorize the preliminary field check referred to above at a total cost of $800. The results of that preliminary field work will then inform the Company as to whether or not the full-scale field work should be proceeded with. If the preliminary results do not indicate that further work should be done, it would then be recommended that the Company apply immediately for return of their $2,500 deposit, for which abandonment is indicated.

[redacted]

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June 28, 1968.
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This page was inserted by the Coal and Minerals Development Branch, to provide a reference that the Illustrations mentioned in the table of contents (i.e. Figure 1 & 2) are missing from the original document.