MAR 19680026: NORTHERN ALBERTA

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PHOTOGEOLOGICAL STUDY

SULPHUR PROSPECTING PERMIT NO. 11

NORTHERN ALBERTA

Prepared For

Spooner Mines and Oils Limited

June, 1968

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NORTHERN ALBERTA

INTRODUCTION

This report has been prepared at the request of Mr. Noble Harbinson, acting for Spooner Mines and Oils Limited, hereinafter referred to as the "Company." The request made was for a photogeological analysis of the Company's Sulphur Prospecting Permit No. 11, integrated with other available geological information. A sketch map, Figure 1, shows the general geological setting of the Company Permits and their relationship to known sulphur occurrences in the area. Figure 2 presents the results of the study on a photogeological mosaic.

The immediate objective of the 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 area 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 earlier in a preliminary geological report prepared for Cam Mines, a company that is affiliated with Spooner Mines and Oils Limited in this project. That report was entitled, "Geological Report, Alberta Sulphur Prospecting

Permits Nos. 11, 21, 22, 23 and 35, North-Central Alberta," and was dated February 23, 1968. The general details given in that report will not be repeated here. This report will rather present more detailed information on the prospects of the Permit concerned.

BEDROCK GEOLOGY AND TOPOGRAPHY

Permit No. 11 is located in an area underlain by Cretaceous rocks. The truncated edge of the Cretaceous, at its surface contact with the Paleozoic, lies about 60 miles up-dip, in a north-northeast direction. The thickness of Cretaceous above the Paleozoic within the Permit area is about 1,300 feet.

The Cretaceous rocks consist of shales, sandy shales and sandstones. The underlying 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 beneath the unconformity present a relatively uniform surface, being competent and resistant to erosion.

The bedrock in the general area, 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 to the north of the area and the Buffalo Head Hills, located immediately to the west of the map-area, represent pre-glacial erosional remnants rising abruptly from 1,000 feet to 2,000 feet above the surrounding lowlands.

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 indicate 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 fifty feet.

Several periods of still stand of one of these Pleistocene lakes are 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

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

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 pre-glacial lowlands.

From our overall sulphur studies in the general area we concluded 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 billion 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 EVALUATION

Photo alignments interpreted to indicate bedrock faulting and/or fracturing are the principal apparent structural features in this area. Due to the greater thickness of softer Cretaceous sediments overlying the Devonian in this area, only the more extensive fractures can be seen.

Major drainage of the area is by way of the Muddy River and the Wabiska River. The Muddy River flows in a southeasterly direction through the centre of the study area and empties into the Wabiska River near the eastern boundary of the Permit. These streams have cut deep gorges into the Cretaceous bedrock and slumping is prominent up to one-half mile on either side, exposing bedrock as well as surficial deposits.

On either side of the Muddy River are areas that appear to represent old lake beds. These are designated as 'Area 1' and 'Area 2' on the accompanying mosaic. The lakes seemingly were drained and the old lake deposits have been partially removed by erosion. Several isolated closed patches of muskeg or remnants of lacustrine deposits occur within these two areas, away from present-day drainage channels. These should be field checked and selected areas should be auger tested and/or drilled.

In 'Area 3' there is a line of small isolated patches of water trending northwest-southeast along a fracture. These might possibly represent springs and should be examined. Paralleling this to the northeast is an area that is void of vegetation. If the occurrence of springs in this area is confirmed, then additional augering is recommended here.

'Area 4' includes that region lying adjacent to the Muddy River and the Wabiska River. Slumping occurs on a large scale along the two rivers. It is not likely that commercial deposits of sulphur will occur here but the area might offer certain clues regarding possible nearby deposits. For instance, a local area (see mosaic) of grey Cretaceous shales has been burned to a bright red colour along successive slump planes. This feature has already been examined by one of our field parties and described in a previous report. Considerable heat is required to redden these shales and it is believed that burning sulphur may provide these high temperatures. The origin of such an occurrence of sulphur locally along slump

planes is not fully understood. One explanation is that the sulphur may have entered the slump plane from above. As successive slumping takes place, these fractures could breach muskegs or lakes and become charged with sulphurous muck from these sources. A more logical explanation is that the sulphur has been deposited along fracture planes from sulphur springs issuing from the underlying Paleozoic. Where slump blocks expose the "veins" they are subject to ignition from forest fires or other causes. In any case, an examination of the higher ground adjacent to these burned shale areas with particular reference to Area 2 lacustrine(?) is warranted.

Several features resembling mud flows occur in this area and should also be checked in the field.

CONCLUSIONS AND RECOMMENDATIONS

From our overall sulphur studies in the general area we concluded 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 photogeological mosaic, Figure 2.

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 letter of February 6, 1968. It is proposed rather that the Company authorize the preliminary field check referred to above at a total cost of $750 for the Permit under consideration. The results of that preliminary field work will then inform the Company as to whether or not the full-scale field work referred to in our letter of February 6 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.

[redacted]

V. A. Farley

[redacted]

J. C. Sproule, P. Geol.

1009 Fourth Avenue S.W.,
Calgary, Alberta.
June 29, 1968.
VAF/JCS/fc

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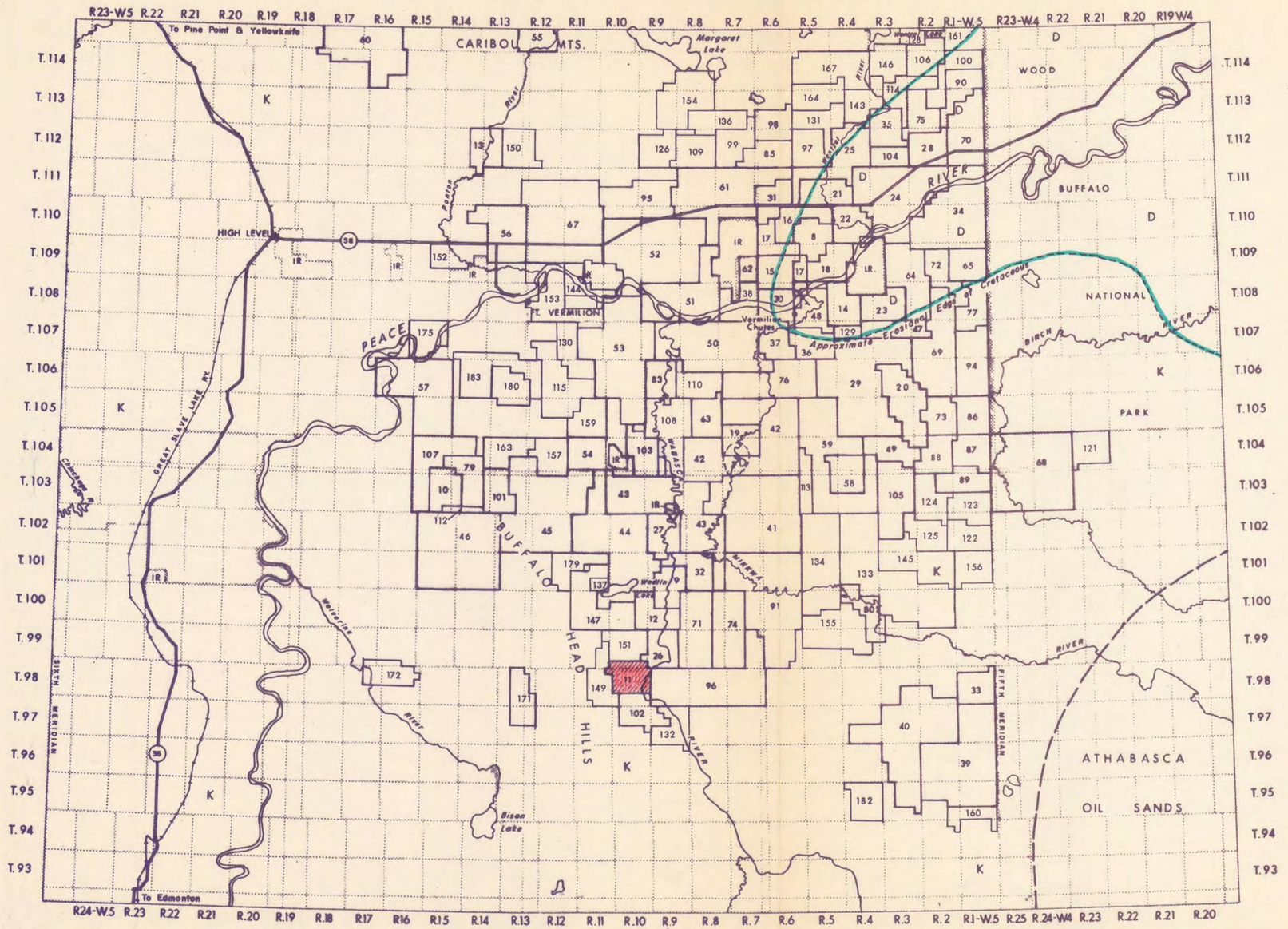

INDEX MAP

LEGEND

- K — Cretaceous Formations
- D — Devonian Formations
- 17 — Sulphur Prospecting Permit
- A — Permit Applied For
- Permit in which Spooner Mines and Oils Limited has interest

NORTH – CENTRAL ALBERTA

showing

SULPHUR PERMIT 11 IN WHICH SPOONER MINES AND OILS LIMITED HAS INTEREST

with reference to

REGIONAL SURFACE GEOLOGY AND PERMITS HELD BY OTHERS

0 16 32 48

SCALE: 1" to 16 MILES

7907

NOTE: Permits as Published to March 29, 1968 (Data on later permits not yet available)

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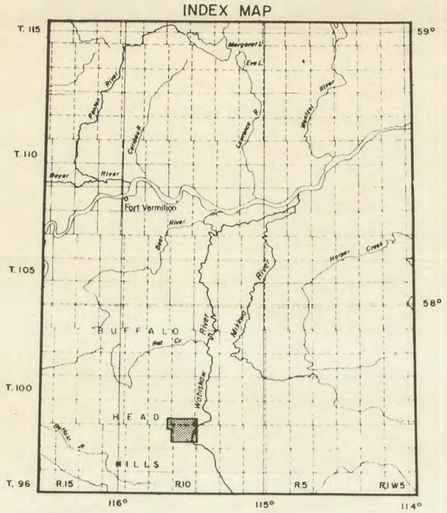
J.C. SPROULE AND ASSOCIATES LTD., CALGARY

INDEX MAP



LEGEND

SURFICIAL DEPOSITS

Muskeg

PHOTOGEOLOGICAL SYMBOLS

Scarp

Alignment interpreted to indicate faulting or fracturing in bedrock

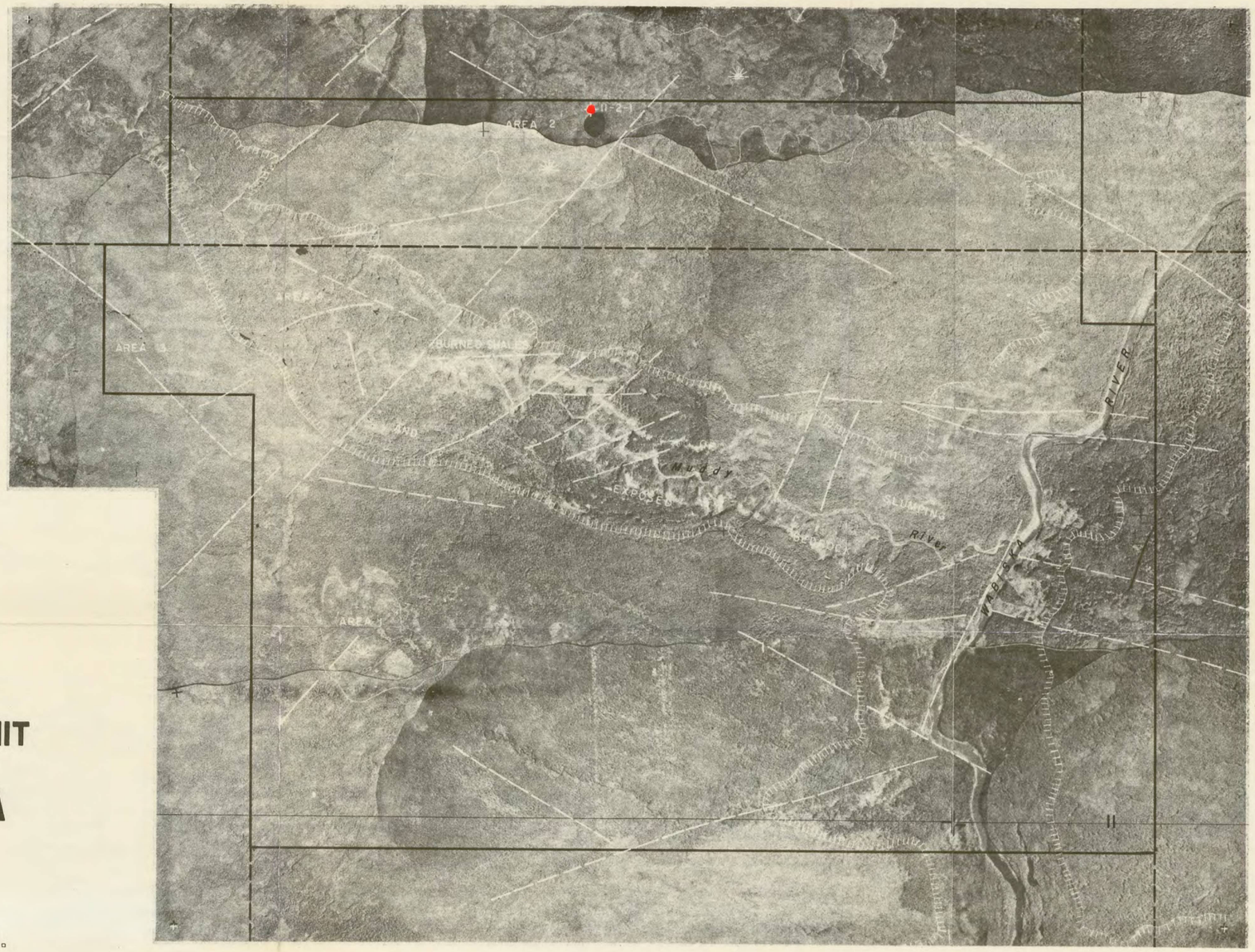
AREA 1, 2 etc. Areas of interest discussed in report

21 Sulphur prospecting permit outline

Sample Location

R.10 W.5

115° 30'



T. 99

T. 98

57° 30'

PHOTOGEOLOGICAL MOSAIC
SULPHUR PROSPECTING PERMIT
No. II.
FORT VERMILION AREA
ALBERTA

PREPARED FOR

SPOONER MINES & OILS LTD.

Mi 1/2 0 1 2 3Mi

APPROXIMATE SCALE IN MILES

THIS IS A SEMICONTROLLED MAP-MOSAIC AND SHOULD NOT BE MISTAKEN FOR AN ACCURATE GEOGRAPHIC BASE

J.C. SPROULE AND ASSOCIATES LTD. CALGARY, ALBERTA

FIGURE I

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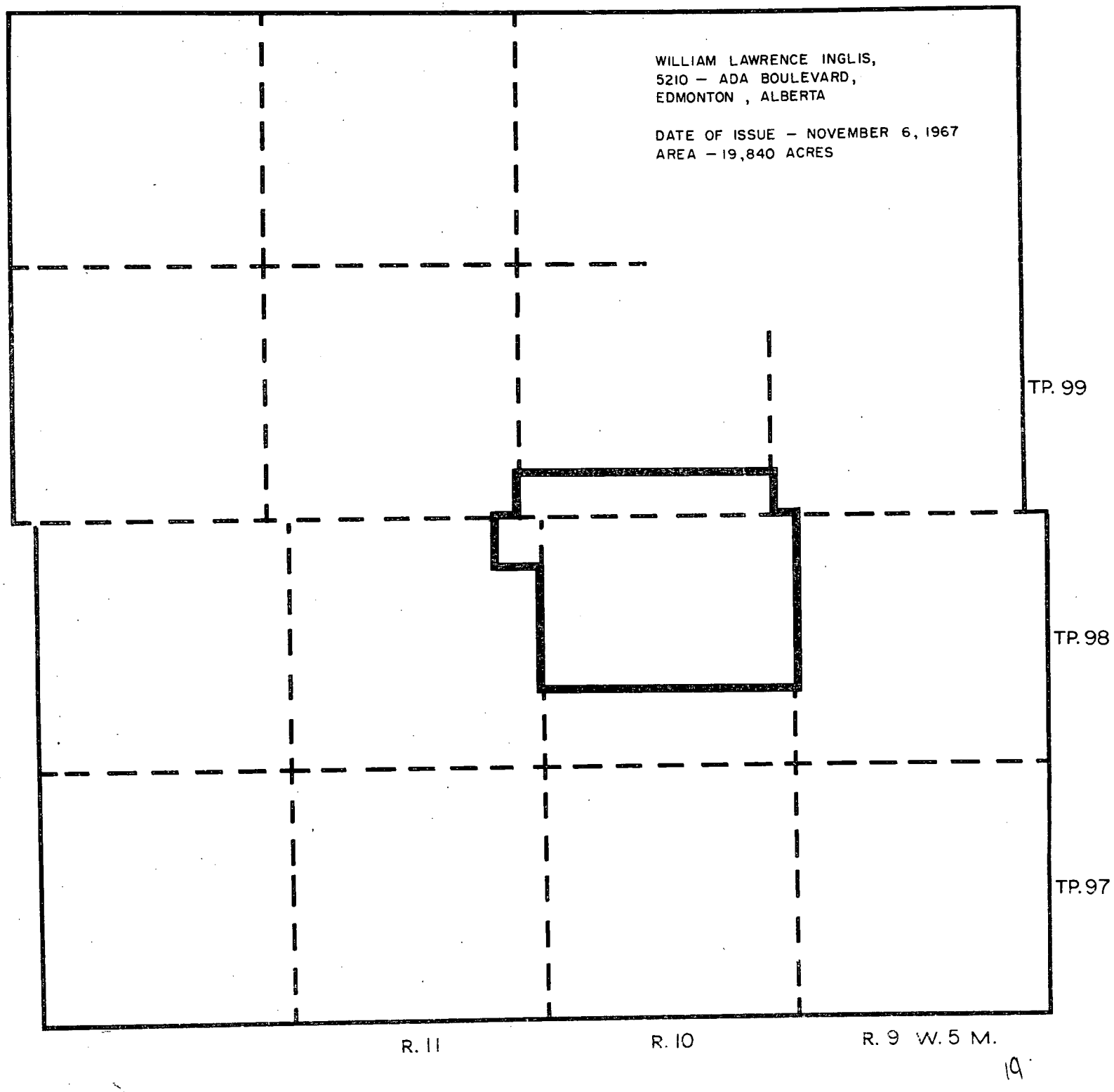
SULPHUR PROSPECTING PERMIT NO. 11



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