

# MAR 19690064: NORTHERN ALBERTA

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SUMMARY GEOLOGICAL REPORT  
SULPHUR PROSPECTING PERMIT NO. 106  
NORTHERN ALBERTA

1969 0064

Prepared For  
Cleveland Mining & Smelting Ltd. (N.P.L.)  
January, 1969

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J. C. SPROULE AND ASSOCIATES LTD.  
OIL AND GAS ENGINEERING AND GEOLOGICAL CONSULTANTS

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
GEOLOGY AND TOPOGRAPHY	1
MODE OF OCCURRENCE AND RELATIONSHIP OF SULPHUR TO GENERAL GEOLOGY	2
PHOTOGEOLOGICAL STUDY	3
CONCLUSIONS AND RECOMMENDATIONS	3

## SUMMARY GEOLOGICAL REPORT

### SULPHUR PROSPECTING PERMIT NO. 106

#### NORTHERN ALBERTA

#### INTRODUCTION

This report has been prepared by J. C. Sproule and Associates Ltd. at the request of Mr. J. E. Cleveland, acting for Cleveland Mining & Smelting Ltd. (N.P.L.), hereinafter referred to as the "Company." The Company beneficially owns a 50 percent interest in Sulphur Prospecting Permit No. 106, comprising 19,840 acres, more or less, in north-central Alberta, which permit is held in the name of Cleveland Power Corporation Ltd. We understand that application has been made to reduce the size of Permit No. 106 to 7,040 acres, as of January 16, 1969. Permit No. 106 is in the general area where Sulphur Prospecting Permits covering some 7,500,000 acres were issued during late 1967 and in 1968. Many of these permits were issued to large national and international corporations, including some of the principal sulphur producers and consumers. The region has been under active exploration. No definite commercial bodies of sulphur have yet been reported but one of the reported deposits is of considerable size and several permits are reported to show high sulphur values.

The property description and interest held, as supplied by the Company, have been accepted as correct without our further investigation.

The writer has not visited the Company's permit but is a co-author of the report entitled, "Photogeological Study, Sulphur Prospecting Permit No. 106, Northern Alberta," prepared by J. C. Sproule and Associates Ltd. in December, 1968.

#### GEOLOGY AND TOPOGRAPHY

Sulphur Prospecting Permit No. 106 is located along the north side of the valley of the Peace River on the eastern flank of the Caribou Mountains, some 70 miles northeast of Fort Vermilion. The Cretaceous-Devonian boundary runs in a southwest-northeast direction between the Caribou Mountains and the Peace River, crossing the southeastern segments of Sulphur Prospecting Permit No. 106, so that Devonian rocks immediately underlie the surficial sediments throughout the southeastern portion of the Permit area.

The topography in the area of Permit No. 106 presents a sloping, irregular surface with generally well developed drainage and locally incised streams.

#### MODE OF OCCURRENCE AND RELATIONSHIP OF SULPHUR TO GENERAL GEOLOGY

Within the general area of interest in which Sulphur Prospecting Permits have been issued, the principal bedrock formations are of Cretaceous age, but, to the north and northeast, erosion has stripped off the Cretaceous beds exposing older Devonian rocks. The Devonian, as well as overlying Cretaceous rocks, are generally inclined gently westward into the Alberta Syncline so that progressively younger rocks of both Paleozoic and Mesozoic ages are present in that direction.

The bedrock, whether of Devonian or Cretaceous age, is overlain by a variable thickness of glacial and related sediments. The surficial 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 surficial deposits.

Sulphur occurrences in the general region of north-central Alberta may be placed into three groups, as follows:

- (1) In muskeg or other poorly drained lacustrine or "dried lacustrine" areas. The most important known apparent example of this type is the Sulphur Prospecting Permit No. 8 discovery occurrence.
- (2) Deposits of elemental sulphur in connection with active springs with or without associated gas.
- (3) Cretaceous shales in the area frequently contain finely disseminated sulphur, although concentrations of significant size have not been reported from the Cretaceous.

It is of general interest to sulphur exploration in this region that continuous flowing sulphur springs have been known in the area for nearly 200 years and that such springs are still known within a broad area along the Mesozoic-Paleozoic surface geological contact that extends from Western Saskatchewan, through the McMurray oil sands area, and across the present region of sulphur permits into the southern part of the Northwest Territories.

It is considered that what is needed to produce an economic sulphur deposit in this area is a favourable combination of faults and fractures for sulphate spring exits, sulphur supply in the connate waters and poorly drained lacustrine or other flat basin areas immediately adjacent to the spring exits. All these individual circumstances are known to exist. Under the proper combination of circumstances, there is no definite limit to the amount of sulphur that could be formed. Whether or not, or where, commercial deposits are present remains to be seen.

### PHOTOGEOLOGICAL STUDY

The photogeological study that has been made has outlined several alluvium-filled depressions. These normally represent areas of flattening within the general surface slope, which explains the sporadic distribution and irregular outlines of these muskegs. The area is patterned by numerous alignments that are presumed to represent bedrock faults or joints. One prominent fracture set trends northeast-southwest but the many parallel northwest-southeast trending fractures may indicate that this is also a major structural trend. A subsidiary east-west fracture development also exists in the area as well as other diversely trending alignments.

The permit lies partly within the Devonian subcrop adjacent to the Cretaceous unconformity. This situation is comparable geologically to that which exists in Sulphur Prospecting Permit No. 8, the sulphur discovery permit. Topographically, however, these two permits differ in that Permit No. 8 is flat and swampy and Permit No. 106 is sloping with an irregular surface and fewer poorly drained areas. These areas should, however, be investigated.

### CONCLUSIONS AND RECOMMENDATIONS

From our overall sulphur studies in the general area, we conclude that the most likely sources of commercial sulphur are surficial deposits. We also conclude that surficial deposits of sulphur are likely to occur in muskegs, lakes or abandoned lacustrine depressions, with particular reference to such areas that are along or adjacent to fractures and/or faults. A number of such features have been outlined on the aerial photographs covering Permit No. 106.

It is recommended that a field check of representative muskeg localities within the subject permit be undertaken. An initial examination is best accomplished under summer conditions.

Further evaluation of Sulphur Prospecting Permit No. 106 should be carried out in stages with the continuation and the intensity of any given stage being dependent on the results obtained during previous stages. The more expensive stages need only be undertaken if earlier results offer tangible encouragement. The recommended stages and estimated costs are as follows:

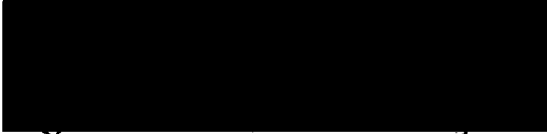
Stage 1 - A preliminary field examination by helicopter-borne geological crew to collect surface and/or auger samples from selected locations to determine the presence or absence of sulphur. Estimated cost is \$1,500.

Stage 2 - A further program of geological field work, including shallow auger testing should be undertaken if the results of Stage 1 give sufficient encouragement. Estimated cost if \$4,000.



Stage 3 - A core-hole program for objectives beyond the reach of shallow auger equipment should be undertaken if the results of Stages 1 and 2 justify this more costly step. Estimated cost is \$10,000 upward.

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S. R. L. Harding, P. Geol.

1009 Fourth Avenue S. W.,  
Calgary, Alberta.  
January 27, 1969.  
SRLH/fc

CERTIFICATE

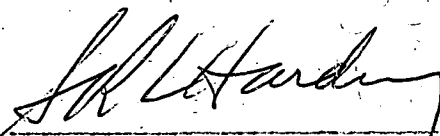
I, Stanley Russell Lauck Harding, consulting geologist, of [REDACTED]  
[REDACTED] Calgary, Alberta, do declare:

1. That I graduated as a Geologist from the University of Saskatchewan with the degree of Bachelor of Arts in 1941 and I obtained the degree of Master of Science from McGill University in 1943.
2. That I am a Fellow of the Geological Association of Canada, and that I am a Member of the American Association of Petroleum Geologists, a Member of the Association of Professional Engineers of Alberta and the Alberta Society of Petroleum Geologists, and a Member of the Canadian Institute of Mining and Metallurgy, and that I am a registered Professional Geologist for the Province of Alberta.
3. That I have no interest direct or indirect, nor do I expect to receive any interest, direct or indirect, in the properties described in the attached report entitled:

"Summary Geological Report, Sulphur Prospecting Permit No. 106, Northern Alberta," dated January 27, 1969,

nor have I any interest, present or expected, in the securities of the Company.

4. The above report is based on my geological knowledge, and that of my Associates, of the area described therein and upon a consideration of available pertinent data for the area.

  
S. R. L. Harding, P. Geol.

[REDACTED]  
Calgary 2, Alberta.

January 27, 1969.