MAR 19680128: NORTHERN ALBERTA

Received date: Dec 31, 1968

Public release date: Jan 01, 1970

PHOTOGEOLOGICAL STUDY

H. L. BANTING SULPHUR PERMIT # 158

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INTRODUCTION

This photogeological study is made for the purpose of selecting areas of special interest to guide field investigations and prospecting for sulphur on Permit #158. Reference is made to G.S.C. Memoir 313 Devonian Stratigraphy of Northeastern Alberta and Northwestern Saskatchewan, and Topographic Sheet 74B Waterways.

Location and Access:

Permit #158 is located on the Clearwater River, 22 miles east of Ft. McMurray in northeastern Alberta.
Access to the Permit is by canoe up river 30 miles from Ft.McMurray as there are no roads in the area.

Photostudy:

The prominent topographic feature of the area is the Clearwater River which has cut a valley 2 1/4 to 2 3/4 miles wide and 500 to 600 feet deep, which extends through the permit (See Figure 10- in Pocket).
Beyond the river valley the area is flat to gently rolling.
The area is thickly forested, except for a large number of burnt areas. The valley walls are cut by numerous streams, largely intermittent, which terminate in large slump areas near the confluence with the river.
The river has developed the valley in a thick mantle of glacial deposits and several hundred feet of Cretaceous lightly consolidated sands and shales. There is no bedrock visible in the part of the permit outside of the valley due to the thick glacial drift. The only area to locate Cretaceous and Devonian outcrops, the anticipated host for sulphur, is in the river valley and sulphur prospecting should therefore be confined to this area.

The following program for prospecting is recommended:

(1) Detailed examination of the Devonian outcrops along the river as indicated in G.S.C. Memoir 313.

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(2) Systematic traverses to be run at right angles to the valley, at one mile intervals, to locate Cretaceous outcrops.

(3) Test borings to be made with the Acker Soil Sampler at appropriate locations to cut the Cretaceous-Devonian contact.

Further work will depend on the results of the above program.

June 10, 1968

[redacted]

C. A. L. HOGG

calh/ab

REPORT ON

FIELD INVESTIGATION

SULPHUR PROSPECTING

PERMIT #158

June - 1968

C. A. LuVerne Hogg

Consulting Geologist

INTRODUCTION

This report presents the results of a field investigation for elemental sulphur on Sulphur Prospecting Permit #158 in the Clearwater River area of northern Alberta, carried out between June 13th and July 1, 1968.

PROPERTY

The subject Permit #158, comprising 19,840 acres, is located approximately 22 miles east of Ft. McMurray and extends 14 miles east along the Clearwater River. (See Fig. 8 - In Pocket).
The permit area has not been previously prospected for sulphur.

Accessibility:

Ft. McMurray, at the junction of the Athabaska and Clearwater Rivers, is the northern terminal of the Great Northern Railway. It is connected by a gravel road to Edmonton, 250 miles south-southwest, and by daily air service. The permit area is only accessible by canoes or small boats in the summer months, as there are no roads. It is approximately 30 miles by river from Ft. McMurray to the western boundary of the Permit and 44 miles to the eastern boundary. During the winter months, the river ice will support small tractor-trains.

Topography:

Approximately 35% of the Permit area lies within the river valley which is 2 1/4 to 2 3/4 miles wide and 65% lies on the plateau on the south side of the river. There is a flat area adjacent to the river 1/4 to 3/4 miles wide at an elevation of 900 feetabove sea level, then the slope of the valley rises steeply 500 feet in the next mile to the valley rim to an elevation of 1500 feet above sea level. The valley sides are cut by many streams, continuous and intermittent, which are associated with slumping and mud flows.
The topographic development has concealed practically all bedrock. The flat area adjacent to the river is covered with muskeg and the steepness of the valley sides has produced slumping of the glacial drift over the Cretaceous so that the only actual bedrock outcrop on the permit occurs in andalong the river banks (See Photos 2, 4 and 5) (See Fig. 9. - in Pocket).

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#1

Clearwater River Area- Lower Cretaceous Sand on valley ridge

#2

Clearwater River Permit Area typical forest cover

#3

Clearwater River Permit Area typical undergrowth

The valley is covered by a thick growth of spruce, poplar, jack-pine, tamerack and birch with thick alder undergrowth, willow thickets, ferns and wild roses. (See Photo #3).

Geology of the Permit Area:

There are 5 discontinuous exposures of Devonian limestone, dolomite and shale, along the Clearwater River (See Photos #4 & 5) on the permit area. A. W. Norris in G.S.C. Memoir 313. designates two members as the Firebag and Calumet of the Waterways formation, underlying the permit area. The rocks dip gently southwest at 20 to 30 feet per mile, with progressively younger formation exposed to the west and older to the east. The rocks exposed to the east of the permit will therefore underly it at depth. The top of the Devonian succession is an erosion surface and is unconformably overlain by Lower Cretaceous strata. A thick mantle of glacial till covers the Cretaceous. The Cretaceous-Waterways contact is not exposed on the permit, being obscured by slumping and river silts and sand. The sample records of the Meymarn #1 Well, located approximately 5 miles east of the permit indicates that the total stratigraphic section on the permit above the Precambrian basement consists of 100-200 feet of glacial drift, 400 to 500 feet of Cretaceous and 550 feet of Devonian.

Method of Investigations:

All outcrop on the Clearwater River from Ft. McMurray across the permit to Cascade Rapids, a total distance of 60 miles was prospected for evidence of native sulphur. Dynamite was used on many outcrops to obtain fresh samples 3 or 4 feet from weathered face. Fourteen traverses, 1 to 1½ miles in length, were made across the valley on Permit #158 at one-mile intervals (See Fig. 9 - in Pocket). An Acker Soil Sampling Kit was used to drill 6 hand auger test holes, 5 of which are on the permit area. However. due to frozen ground, the holes could only be drilled to a depth of 1½ to 3 feet. The test holes were drilled in fluviatile sands above the Waterways formation.

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#4

Clearwater River Permit Area, Upper Devonian Waterways formation-Limestone

#5

Clearwater River Permit Area. Waterways formation - Shale

#6

Clearwater River Area East of Permit #158 - Middle Devonian Methy Formation Dolomite

Results of Survey:

No sulphur was found in the permit area. The only exposed rock in the permit area is the Upper Devonian Waterways formation, composed of limestone, argillaceous limestone and shales. The Lower Cretaceous-Devonian Contact was not exposed at any point between Ft. McMurray and the east boundary of the permit. Glaciation, subsequent slumping and stream action has covered this contact. Three sulphur springs were found on the river 2 miles, 7 miles and 8½ miles east of the permit boundary.

The first of these is located on an island in the Clearwater River opposite the mouth of the High Hill Creek. It is a small spring, 5 feet from the edge of the river, approximately one foot above river level. It is slow-flowing with a small amount of sulphur precipitated on twigs and stones leading from the spring to the river. The spring has a strong odour of H_2S which can be smelled for ¼ mile down wind. There is also a spring in the river bottom.

The second sulphur spring is situated 7 miles east of the permit boundary and covers an area approximately 300 feet long by 30 feet wide, on the north bank of the river. There are two strong seepages with several smaller seepages in the described area. The water is cold and gassy, smelling strongly of hydrogen sulphide (H_2S) (Water Sample #3 & #4). A water analysis of Samples 3 and 4 gave the following results:

pH	- 7.45	Calcium	- 516mg/l
Chloride	- 8,622mg/l	Magnesium	- 157mg/l
Sulfate	- 1,117mg/l	Sulphur	- 0.6mg/l
Bicarbonate	- 405 mg/l	H_2S	- Absent

The third spring is 1½ miles further up the Clearwater River. It consists of three separate seepage areas, 100 feet apart. One seepage forms a small pool 15 feet wide, 30 feet long and 2 feet deep. A small amount of native sulphur precipitation was noted on rocks in the bottom of this pool and on the edge of the pool (See Photo #9). A small amount of sulphur was noted precipitated on the rocks and mud in the spring bed in the other two seepages. There is a strong smell of hydrogen sulphide in the immediate vicinity. A sample of mud from the bottom of the spring assayed 0.25% sulphur.

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#7

Clearwater River-7 miles east of Permit Area-Sulphur Spring #2

#8

Clearwater River-8½ miles east of Permit Area-Sulphur Spring #3

#9

Clearwater River-8½ miles east of Permit Area-Sulphur Spring #3

Well Data:

The old Weymarn #1 Well is located on the south bank of the river approximately 5.5 miles southeast of the Permit boundary (See Fig. 8- in Pocket), in Section 16, Twp. 89, Range 3, West of the 4th Meridian. The well was drilled in 1928 to a depth of 495 feet with a cable tool rig. The sample description given on Page 137-139 of G.S.C. Memoir 313 is summarized below:

Depth	Formation and generalized Lithology
0 - 39	No samples
39 - 72	Waterways Formation (top eroded) Limestone, dense
72 - 90	Livock River Formation, dolomite, dense with some quartz sand.
90 - 350	Elk Point Group Methy formation, dolomite, fossiliferous dense, with porous streaks, some dark brown dead oil in porosity. Some chert, and traces of anhydrite.
350 - 400	McLean River Formation, siltstone with quartz grains, gypsum, anhydrite, some dolomite.
400 - 495	LaLoche Formation, Sandstone, reddish brown to pink and white, minor shale and dolomitic siltstone.
	Total Depth 495 feet. Precambrian not reached.

Samples from a cable tool drilled well constitute a much more complete record of the section drilled than rotary samples. If there had been any sulphur in the well it would certainly have appeared in the samples.

The well did not reach the Precambrian, but it must have stopped short by less than 10 feet, as the normal thickness of the LaLoche formation, which overlies the Precambrian, indicated by wells to the west, is a maximum of 98 feet. Since the formations dip westerly, the Weymarn #1 Well indicates the thickness of the Devonian section above the Precambrian on Permit #158 area is approximately 550 feet. The log of this well eliminates any possibility of sulphur occurring in the Devonian formations on Permit #158.

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SUMMARY

A reconnaissance survey of the valley section and detailed examination of limestone outcrops, failed to locate any sulphur. Traces of sulphur were found in springs carrying sulphate chlorides and hydrogen sulphide at three locations along a 10 mile section of the river east of the permit boundary.
No sulphur was found in samples of the Weymarn #1 Well drilled to within a few feet of the Precambrian basement.

CONCLUSIONS AND RECOMMENDATIONS

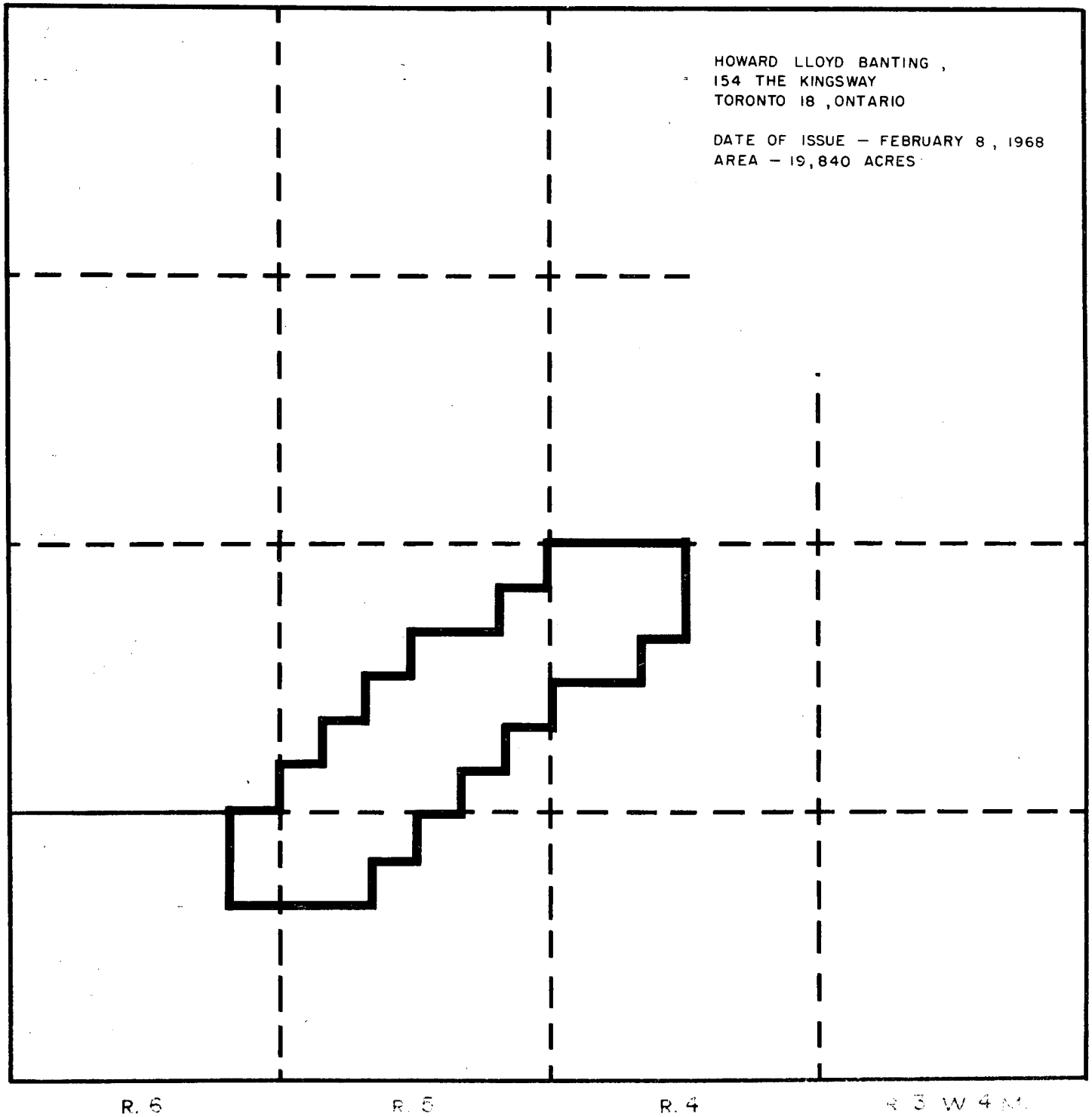
There is no prospect of a commercial sulphur deposit occurring on Permit #158 either near surface or at depth and it does not merit any further work. It is recommended that the Permit #158 be allowed to expire.

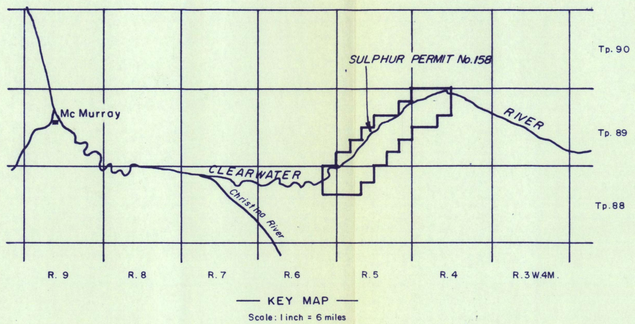
[redacted]

C. A. L. Hogg

August 27, 1968
calh/ab

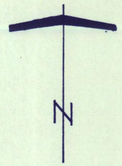
SULPHUR PROSPECTING PERMIT No. 158





— KEY MAP —

Scale: 1 inch = 6 miles



LEGEND

MESOZOIC

LOWER CRETACEOUS

Undivided

PALEOZOIC

DEVONIAN

UPPER DEVONIAN

WATERWAYS FORMATION Limestone, clastic limestone argillaceous limestone, shale, minor sandy limestone and sandstone

MIDDLE DEVONIAN

ELK POINT GROUP

'FIRST SALT' FORMATION: not exposed; anhydrite rock salt, dolomite, and shale

METHY FORMATION: reefold dolomite, calcareous dolomite, minor gypsiferous dolomite, in part brecciated

Rock outcrop

Geological boundary (assumed)

Bedding (horizontal, inclined)

Apparent dip

Bore-hole (abandoned)

Test hole

SULPHUR PERMIT No. 158

MAP SHOWING

LOCATION OF PROSPECTING TRAVERSES

FOR

SULPHUR, TEST HOLES AND SAMPLE LOCATIONS

1 0 1 2 3 miles

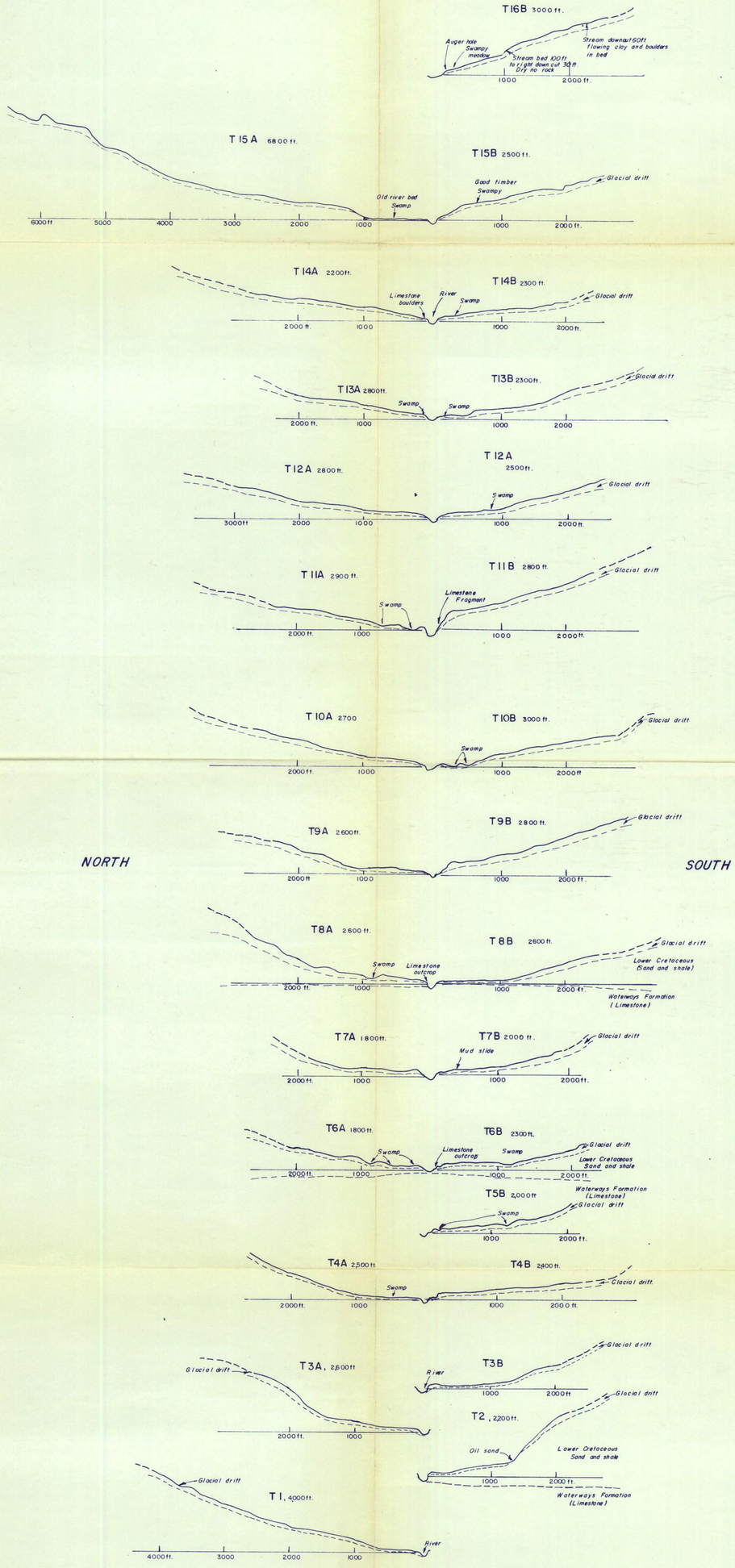
Scale: 1 inch = 1 mile

Geology from G.S.C. Mem. 313
A.W. Norris

By: C.A.L. HOGG
Consulting Geologist

Date: July 10, 1968

19680128 *Figure 8*



SULPHUR PERMIT 158

PROFILES AND CROSS-SECTIONS
ALONG
TRAVERSES T1 to T16B

Vertical scale: 1" = 300'
Horizontal scale: = 1000'

By: C.A.L. HOGG
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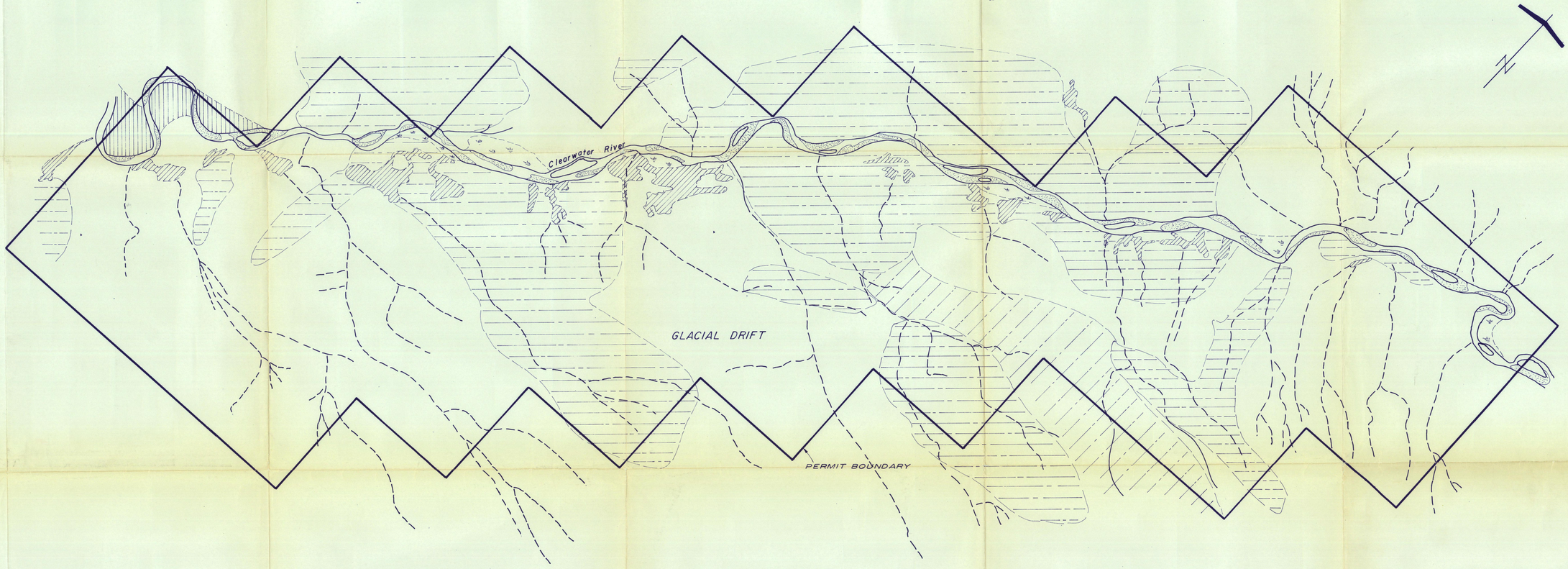
DATE: JULY 10, 1968

Figure 9



— LEGEND —

- Streams
- Old river channel area
- Mud slide area
- Sandbars
- Swamp
- Timber stand area
- Old burn

SULPHUR PERMIT 158

MAP FOR
PHOTOGEOLOGICAL STUDY

Scale: 3.6" = 1 mile

By: C.A.L. HOGG
Consulting Geologist

June 10, 1968

1968128 Figure 10