MAR 19690072: FORT MCMURRAY

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INTER-OFFICE COMMUNICATION

TO: J. B. Etnyre

DATE: January 29, 1969

FROM: B. N. Rolfe

SUBJECT: Report on Color Photographic Survey of Sulfur Prospects in Fort McMurray Area, Canada - Tech Service Request 9-91-2360, May 22, 1968, Submitted by S. W. Paskevich, Sinclair Canada

Attached please find a report on the photogeological investigation of sulfur prospects in the Fort McMurray area, Canada. The basis for the study was an anticipated association between color photo characteristics and known sulfur deposits. Economic deposits of sulfur were not located during the 1968 season; therefore, the presumed association of sulfur with photo criteria could not be tested. We did, however, find a geomorphic analogy between features noted in sulfur-bearing terrain of West Texas and those noted in the Bitumount Basin in Canada.

The color photo approach was not tested; geomorphic study indicated a prospective area.

B. N. Rolfe

BNR:wi

cc: S. W. Paskevich
J. L. Martin, Jr.

SULFUR EXPLORATION
FORT McMURRAY AREA, ALBERTA

R. P. Jacobson

Tech Service Request 9-91-2360

January, 1969

SULFUR EXPLORATION
FORT McMURRAY AREA, ALBERTA

R. P. Jacobson

ABSTRACT

Color photographs capture a large variety of surface detail, but nothing that can be satisfactorily related to surface sulfur deposits. Study of standard black and white photo-mosaics revealed features resembling salt collapse structures (some with associated sulfur) in other areas. Exploration should emphasize biogenic sulfur in the evaporite section and concentrate on geomorphic features which are probably related to salt collapse.

INTRODUCTION

This report presents the results of a two-part photogeologic study of six sulfur exploration lease blocks in the Fort McMurray area of N.E. Alberta, Canada.

Adverse photographic conditions prevailed throughout the summer of 1968. Most of the photographs were taken early in the morning--producing images having heavy shadows and poor color balance. Missions flown in August exhibit strong color differences related to fall foliage changes. In spite of these departures from normal specifications, the color photography was generally satisfactory.

Because of time limitations, blocks 188, 186, 185 and the small blocks west of 189 were not flown. The remainder of the leases (184, 187, 189, 190, 191, and 192) were photographed at a scale of 1" = 800' (1:10,000) on positive color transparency film (Kodak type 8442). In all, approximately twenty-six 75' rolls were used. The camera was the 6" focal length, 9"x9" format, Wild RC8.

The first part of this study was a careful examination of this imagery for surface expression of mineralization that might be evidence for sulfur occurrence. Particular attention was paid to field sample locations made by Sproule and Associates (Reconnaissance Report, Sulphur Prospecting Permits Nos. 184 to 192, Bituminous Sand Permits Nos. 82 and 93, Fort McMurray Area, Alberta).

The second part of the study was an examination of regional geomorphology as expressed on 1"=1 mile mosaics purchased from the Canadian Government. Subsurface geology used in arriving at conclusions and recommendations is largely derived from Sproule and Sinclair reports.

COLOR PHOTOGRAPHY

Index maps of the color coverage are enclosed (Plates I-V in pocket).

Each photograph is labeled as to the center point, the flight line number, and the lease block number. The Athabaska and Clearwater Rivers are shown for rough planimetric positioning. Locations of samples taken by Sproule geologists are also plotted.

It is well known that glacial terrains are highly variable in vegetative cover, drainage pattern and pond distribution, local relief, and soil and "rock" type. Color photographs capture that variability in great detail. Unfortunately, color patterns and tones cannot be satisfactorily related to surface occurrences of sulfur except in that spring deposits commonly contain a few percent of sulfur.

Detailed examination of over 100 sample locations were made. Except in the case of springs and marl deposits, nothing related to sulfur content could be reliably interpreted. Some sulfur-bearing localities are associated with brightly colored stream or pond waters (or bottom sediments) but such features are quite common in the area. (Brief notes concerning 37 sample localities are given in the Appendix.)

No attempt was made to discover broad regional color trends because of a lack of facilities for handling transparencies at the mosaic level.

REGIONAL GEOMORPHOLOGY

The geomorphology of the area is dominated by three topographic features.

1) Uplands (approx. 1500' above sea level) that are outliers of the High Plains of Alberta.

2) A generally flat plane (averaging 1000' above sea level) that is the Second Prairie Level.

3) The incised stream channels of the Athabaska and Clearwater Rivers.

Both Plains are covered with glacial sediments, muskegs, and ponds in various stages of development. Extensive variations in the glacial cover, profuse traces of linear features, and many peculiar drainage patterns were not mapped or studied in detail because it is doubtful that such information can be related to sulfur occurrence at this time.

Based on our experience with the geomorphic expression of salt collapse structures in glaciated areas of Central Alberta and the occurrence of sulfur in collapse structures in the evaporite section of West Texas, we feel that Bitumount Basin, north of Fort Mckay, is a promising geomorphic feature with respect to sulfur exploration.

This area (figure 1) is geomorphically anomalous for several reasons:

- It is a local high not clearly related to known highs in the subsurface.

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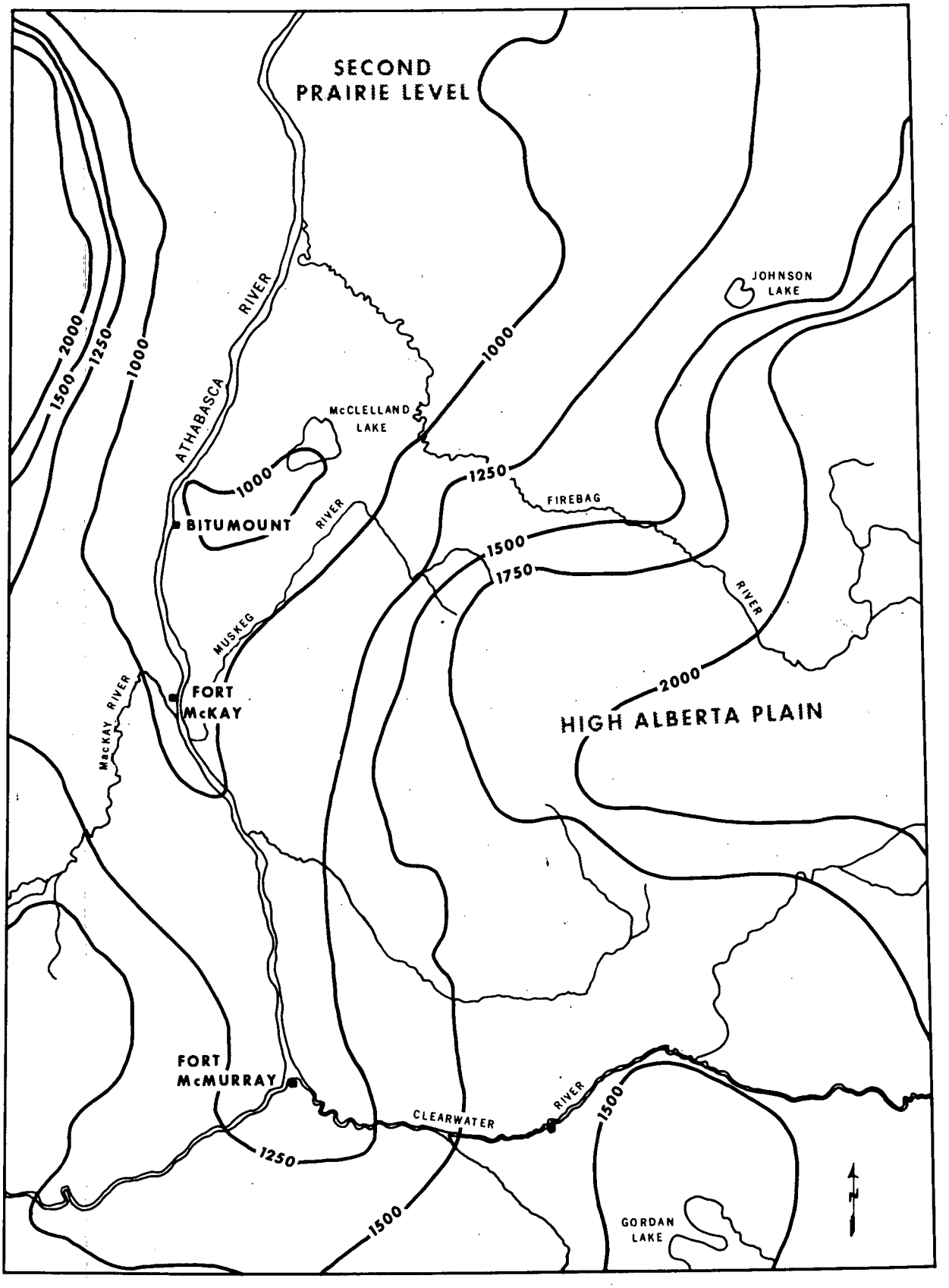


GROSS GEOMORPHIC FEATURES
GENERALIZED TOPOGRAPHY
FORT McMURRAY SULFUR AREA
ALBERTA, CANADA

Figure 1

- The Muskeg River flows into the area in a normal pattern but turns south, contrary to the regional slope, and toward structural or erosional highs in the subsurface.

- Both the Mckay and the Muskeg Rivers are barbed to the Athabaska.

- The Athabaska, Firebag and Muskeg Rivers all deflect around the central high.

CONCLUSIONS

1) This study was not an adequate test of the possible association between surface sulfur deposits and color photo or topographic character. All that is certain is that such features are not consistently related to the sulfur content of the Sproule samples.

The presence or absence of economic sulfur deposits has not been established, hence this is not a valid area for testing empirical exploration criteria.

2) Color photography permits mapping glacial terrains in great detail but the relevancy of such detail to economic sulfur deposits is unknown.

3) Most of the surface occurrences of sulfur in this area are related to sulfur in the tar sands and associated ground water.

4) The geologic setting in the subsurface is, in part, analogous to that of other occurrences of sulfur in evaporite sections.

5) Geomorphic criteria are of unknown value in assessing subsurface geology of sulfur occurrence in this area since no such deposits have yet been found. The Bitumount Basin anomaly is an exception in that it resembles some other areas of known sulfur occurrence.

RECOMMENDATIONS

Any sulfur exploration effort should include a consideration of the following:

1. Sulfur of biogenic origin in the evaporite section has the highest probability of economic importance.

2. Structures due to collapse following salt solution and sulfur mineralization are the most promising geomorphic features.

3. If the zero edge of salt occurrence is due to non-deposition rather than solution then exploration obviously should be restricted to the area west of the zero edge.

RPJ:wi

APPENDIX

Notes on Photographic Expression in the Vicinity of Field Samples (Refer to Sproule Report)

Sample No.

190- 2	- "Flowing well" area. Only spot along a 2-3 mile stretch of the river showing reddish-orange staining in back water swampy area.
190- 6	- "Oil sand detritus" not recognized on photograph.
190- 3	- "Oil sand" sample. Nothing of note. Large dead tree area about 4800' to the SW.
190- 7	- "Iron Spring". Not located.
190- 8	- Negative
190-17	- Some orange-red staining inland from river bank.
190- 9	- "Pevonian outcrop". Negative.
190- 5	- Negative.
190- 1 & 16	- Mckay townsite. Negative
190-13	- "Oil sand" sample. Nearby bushes bright red and yellow.
192- 4	- Negative.
192- 5	- Negative.
192- 6	- "Area of Fir Trees - 7% Sulfur". En echelon bar development. Spruce trees on ridges separated by back swamps.
192- 7	- Negative.
192- 1	- Negative.
192- 2	- Negative, bar ridges and back swamps.
192- 3	- Negative
192-10	- Negative, lake area and muskeg
192- 9	- Large muskeg area, low bushes turned yellow (August 20). Fracture trans.
192- 8	- "8% sulfur" - muskeg and ponds - negative.
191- 3 (1 & 2)	- White area in pond may be marl deposition.

191- 4A - Spring area?

191-13 - Negative.

191-11 - Negative.

187- 1 - Negative.

187- 2 - Black sediment in river.

187- 3 - Negative.

187-22 - Marl deposit is brilliant white and nearby pond is reddish-yellow.

187-23 - No vegetation in down slope drainage area below spring.

187- 7 - Negative.

187-18 - "Iron spring". Dead trees. Negative.

187-14 - Large spring area, no trees, brown to yellow staining.

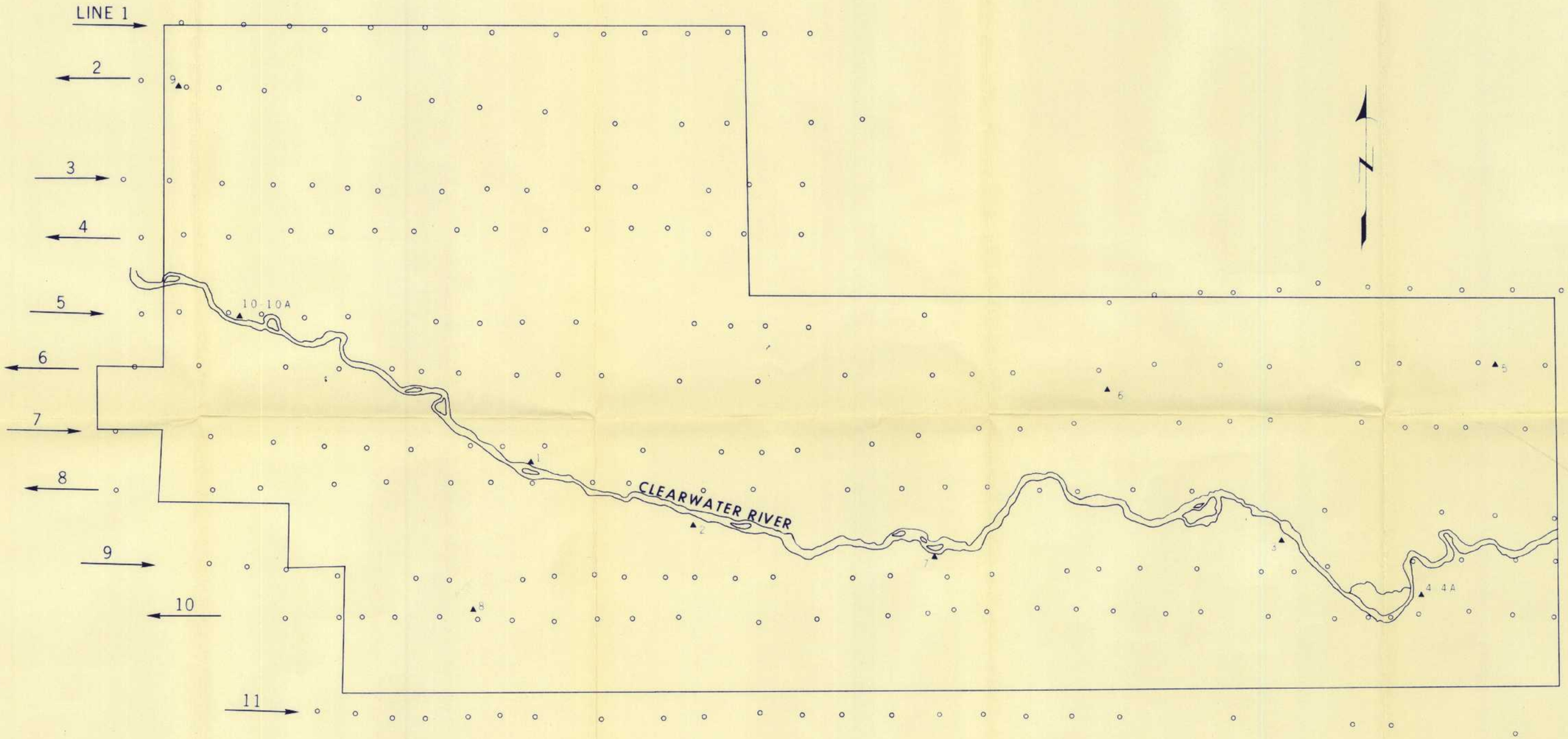
189- 3 - "Iron spring", negative. These areas in uplands (muskegs and swamps) have such widely varying tones and geomorphology that nothing unique stands out. Autumn colors are quite evident on these flight strips.

184- 1 - Small spring area, white deposit (1% in sulfur) along river bank apparently came from spring.

184- 4 - Small pond. Negative.

184- 7 - "Sulfur spring", white to light tan sediment along stream bank.

184- 8 - Muskeg area. Negative.



BLOCK 184

FORT McMURRAY SULFUR LEASES

o Photo Center

▲ Field Sample

Scale 1" = 1 mile

PLATE I

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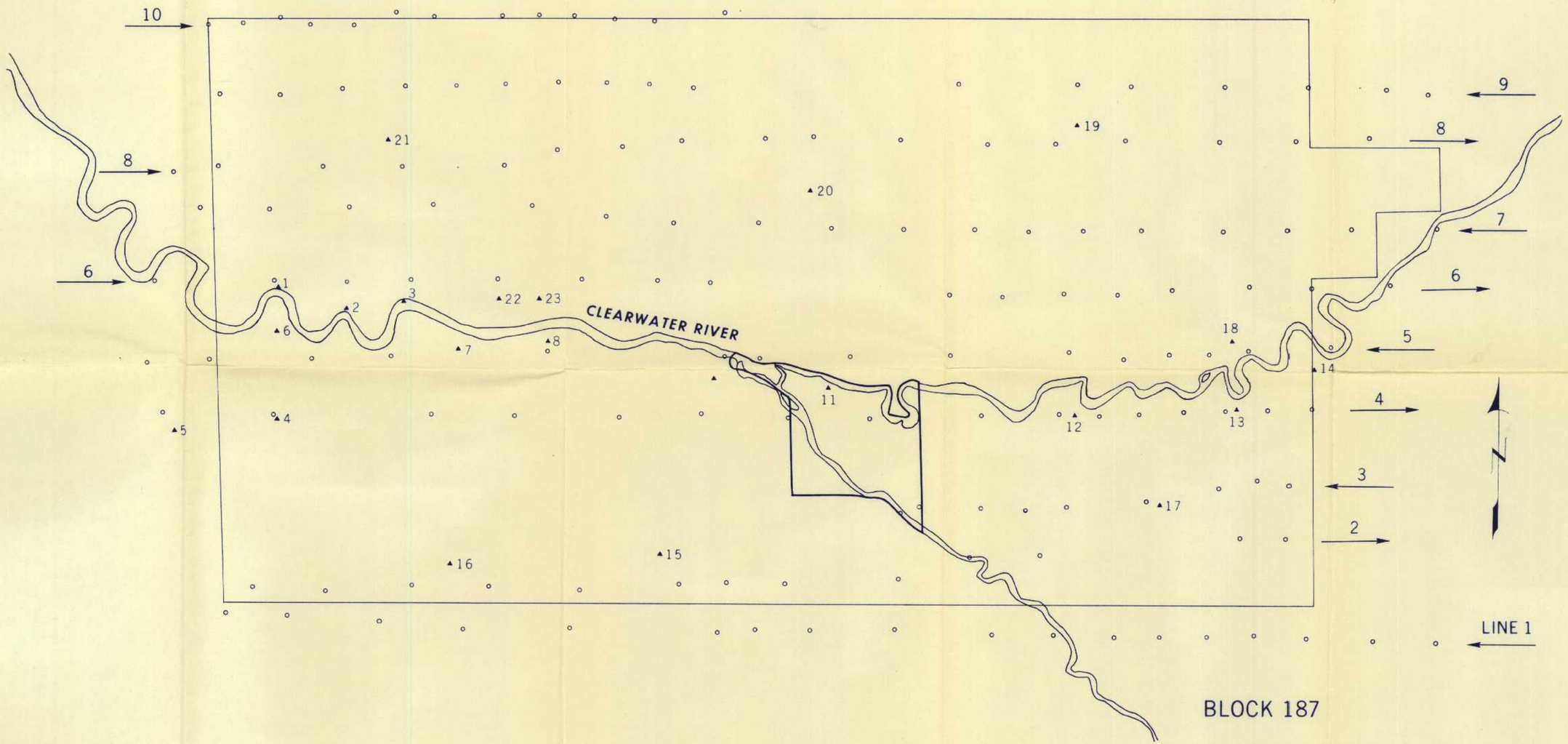


BLOCK 187

FLIGHT LINE INDEX MAP

FORT McMURRAY SULFUR LEASES

∘ Photo Center

▲ Field Sample

Scale 1'' = 1 mile

PLATE II

1969072

LINE 1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

15A

20

21

CLEARWATER RIVER

BLOCK 189

FLIGHT LINE INDEX MAP

FORT McMURRAY SULFUR LEASES

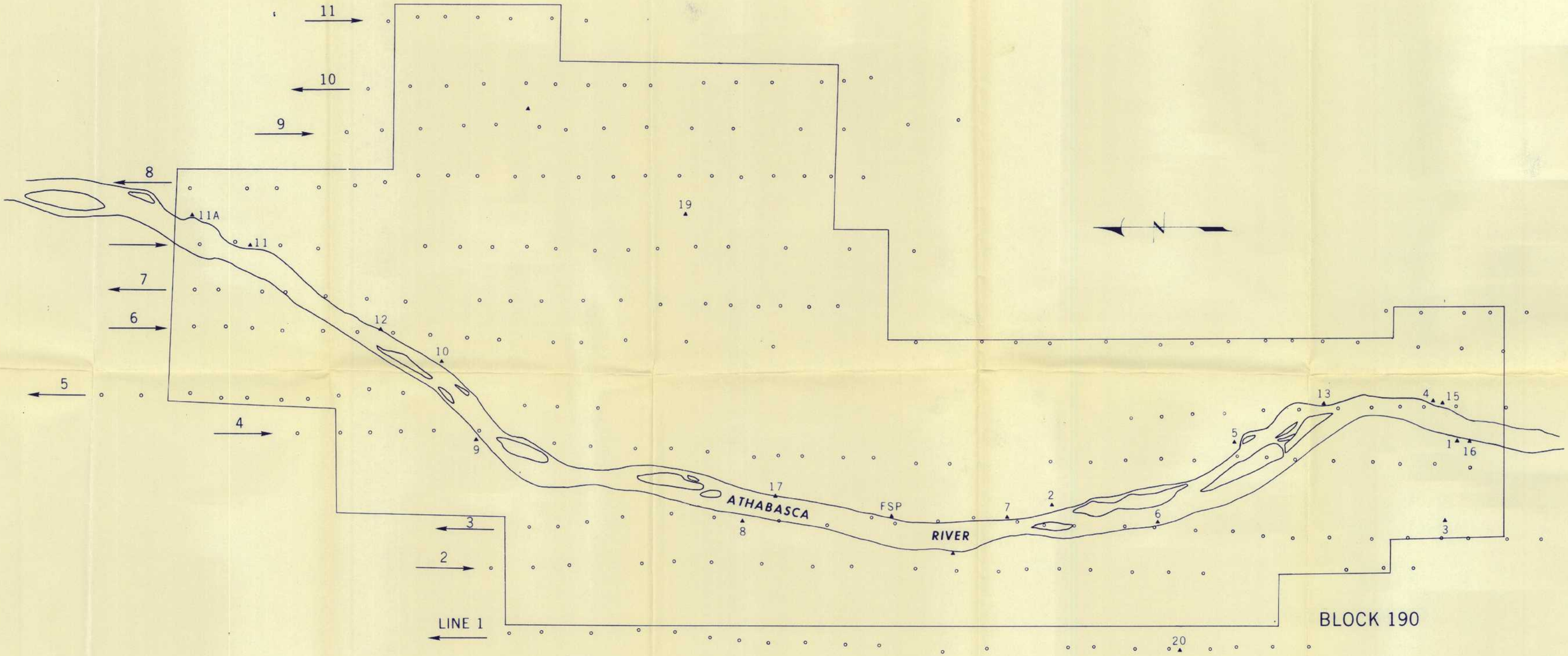
○ Photo Center

▲ Field Sample

Scale 1" = 1 mile

PLATE III

1967 0072



FLIGHT LINE INDEX MAP

FORT McMURRAY SULFUR LEASES

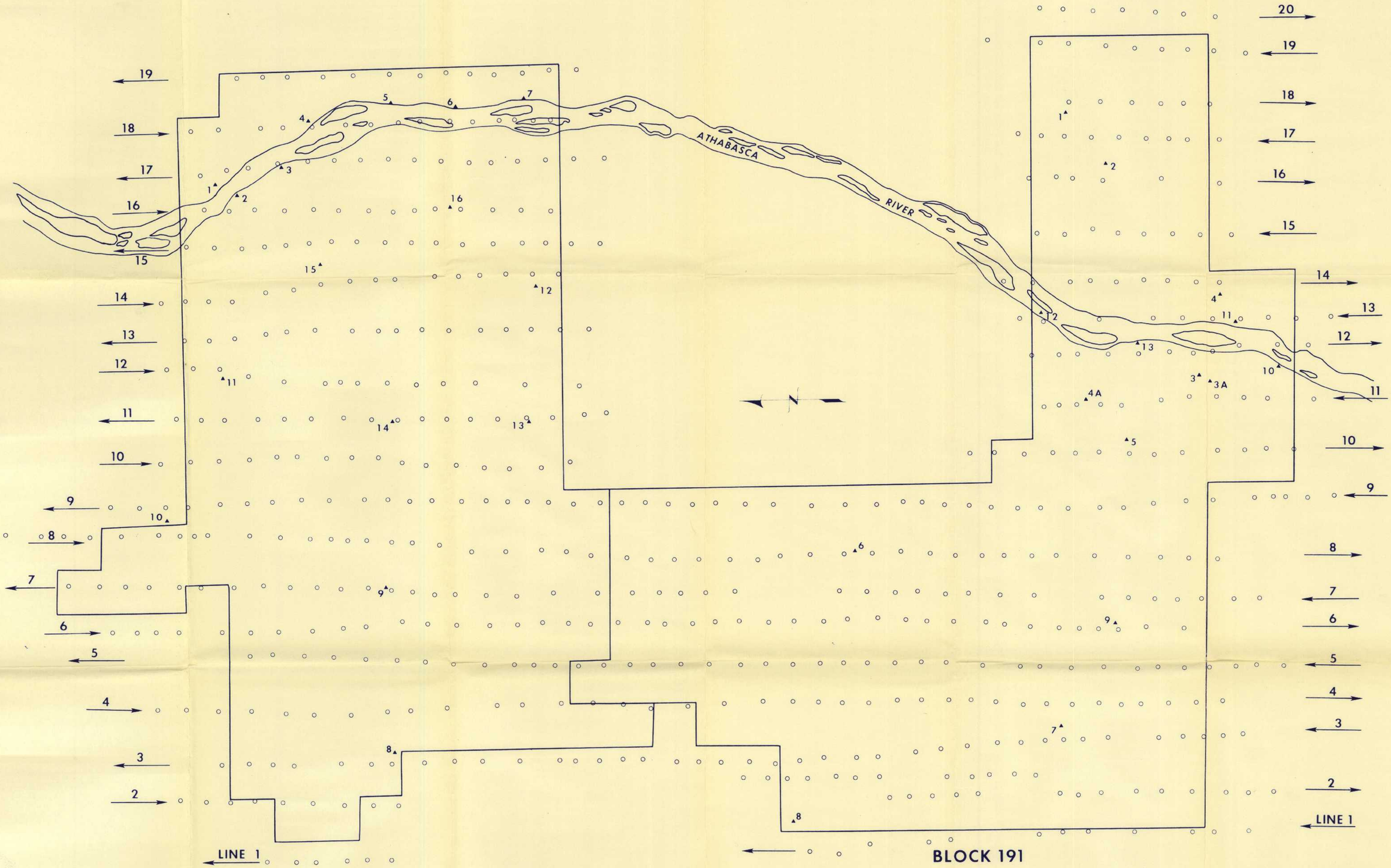
○ Photo Center

▲ Field Sample

Scale 1" = 1 mile

PLATE IV

1969072



FLIGHT LINE INDEX MAP

FORT McMURRAY SULFUR LEASES

○ Photo Center

▲ Field Sample

Scale 1" = 1 mile

PLATE V

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