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PRELIMINARY REPORT

ON THE

EVALUATION OF SULPHUR PROSPECTING

PERMIT NO. 130

Held By

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By:

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October, 1968

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PRELIMINARY REPORT

ON THE

EVALUATION OF SULPHUR PROSPECTING PERMIT NO. 130

INTRODUCTION:

This report has been prepared at the request of Abtec Equipment Ltd. for the purpose of determining the possibility of Sulphur Prospecting Permit No. 130 containing an economically mineable sulphur deposit. In order to do this it was suggested that a review of the circumstances thought to have influenced deposition of Sulphur in the area in which sulphur prospecting permits have been issued would be of interest and this information, if possible, related to Sulphur Prospecting Permit No. 130.

SUMMARY:

The geology of the area and its relation to the deposition of sulphur are discussed herein. Also, some of the factors thought to influence the accumulation of sulphur compounds at or near ground surface are reviewed in addition to the circumstances that are considered necessary for economic mining and extraction. Attachment No. 1 shows the area of Sulphur Prospecting Permit No. 130 in relation to other permits in the

area. Attachment No. 2 is a Topographic Map of the general Permit No. 130 area, on which is shown the location of the Chinchaga Fault, areas of most likely sulphur accumulation and location of test holes. The testing done to date indicates the area in the vicinity of the Chinchaga fault to be the most attractive area within the permit. A detailed analysis of mining and extraction costs will be needed to determine if the sulphur content is sufficiently high to support an economic operation.

CONCLUSIONS:

The extreme north portion of Sulphur Prospecting Permit No. 130 contains a low lying, poorly drained area which is thought to be suggestive of the conditions needed for the accumulation of sulphur compounds. Field work in the form of a drilling and sampling program has not confirmed a definite trend that would lead to firm conclusions on the most likely areas of finding an economic sulphur deposit. It would appear, however, that areas adjacent to the Chinchaga fault within the Permit No. 130 area have a higher sulphur content than adjacent swampy areas which may indicate poor drainage from the fault zone to the swampy areas. Further field testing will be required to fully evaluate sulphur content in the richest areas. Before this is done, it would be worthwhile to determine if the maximum values encountered (1.99% sulphur) are adequate for an economic extraction process.

DISCUSSION:

The area of Sulphur Prospecting Permit No. 130 is generally flat lying with occasional water accumulation in muskeg swamps. The Peace River flows eastward between four and eight miles north of the Permit and the Wabasca River with its tributaries flow through the south portion of the Permit providing drainage for that portion of the Permit area. A low lying muskeg area is evident in the northern part of the Permit which is part of a large swamp bordering the south bank of the Peace River.

GEOLOGY:

The permit area is underlain by Cretaceous rocks having a thickness of between 100 and 150 feet. The Cretaceous and underlying Devonian rocks have been truncated seqentially to the northeast by glacial action which has covered the entire area with a blanket of unconsolidated material of varying thickness. The Chinchaga fault passes through the south portion of the Permit area (see attachment No. 2) and no doubt less significant faulting is present in the area.

SULPHUR OCCURENCES:

Several factors are thought to be of significance in the accumulation of sulphur in the general area in which sulphur permits have been issued. These factors independantly or in conjunction with each other warrant investigation in order that prospecting may be confined to the more likely areas of sulphur accumulation.

In general the occurences of sulphur in the form of native sulphur and as components of sulphur springs has been observed and is well known in the areas of the Devonian truncation in the northeast portion of the Province extending from the Saskatchewan border to as far north as the Liard River. Perhaps the best known sulphur accumulation is the 4% to 6% sulphur content of the McMurray Tar Sands. The origin of the tar content of these sands is generally associated with the underlying Devonian formation and the sulphur content associated therewith to be from the same formation. The occurrence of sulphur in the area of the Devonian truncation is consistent with what is found in nearly all areas of the Province in which fluids from the Devonian are produced. The existence of sulphur compounds in the Devonian is therefore to be expected and the process by which these compounds may become concentrated in surface deposits is of interest in sulphur prospecting.

The slope of the Devonian formation being generally to the southwest toward the Alberta Syncline provides a means whereby waters within the Devonian may migrate updip by hydrostatic and thermal influences to flow out the Devonian at multitudinous points where springs may be observed. Water migrating through a formation such as the Devonian will become saturated with the constituents of the formation through which it passes, making it possible to deposit minerals at the points of exit. Sulphur either in elemental form or as chemical compounds such as dissolved hydrogen sulphide gas may be transported by the formation waters and deposited in surface accumulations.

The most likely access of Devonian waters to the surface is through faults and fractures in the strata to the overlying glacial deposition. The spring waters upon reaching the surface will migrate towards the local drainage basin which may provide access to a flowing stream or an evaporitic basin. The fluids that are transported to a stream or river are no doubt lost by the process of dilution however the fluids that end in a stagnent pool may in time, through the process of evaporation, form economic sulphur deposits. The possibility of the transporting and accumulation of finely divided elemental sulphur is readily apparent. Hydrogen sulphide gas, however, would require oxidation to elemental sulphur which process is a little more difficult to visualize in the formation of sulphur deposits.

The latter process would entail the direct oxidation of hydrogen sulphide at the ground surface by contact with the atmosphere. The accumulation of sulphur by this process would not require the presence of water and would result in sulphur accumulations at the location of gas escape. If such deposits exist they are subject to loss by forest fire but the possibility of such deposits existence should not be discounted. Hydrogen sulphide gas however may be oxidized to elemental sulphur by dissolved oxygen contained to surface waters. This latter process which would entail the contact of sulphur spring water with surface waters or the percolation of hydrogen sulphide gas through surface water offers one plausible scheme by which elemental sulphur may be formed and preserved on the ground surface. In any event from what is presently known it appears that poorly drained areas offer the best opportunities for finding sulphur deposits.

Sulphur has been noted to exist in the surface layer of glacial origin in areas of poor drainage or in areas which were swamps at one time and have since dried up. Sulphur has also been noted in the general area of faulting.

The prospects of obtaining sulphur in surface deposits in which large scale mining procedures may be employed is certainly attractive if adequate concentration of sulphur can be obtained. Large volume surface mining methods such as those currently employed in the coal mining industry however demand that the material to be removed be unconsolidated. Surface mining of consolidated material such as that employed in the copper industry is a much more complex operation and would demand higher concentrations of the mineral in the mine in order to meet economic requirements. Fortunately, it appears that most of the sulphur deposition in the general area in which sulphur permits have been issued occur at or near the ground surface in the layer of glacial deposition.

The recovery of sulphur existing in a porous media at depth by means similar to that employed by the Frasch process is at the present time discounted because of the prospective high heat losses to the formation that would occur in such a process. Some means of interstitial combustion for the eventual recovery of sulphur dioxide would appear to be more feasible when the price of sulphur compounds justify such an operation.

It may be stated with some assurance that the most attractive method of recovery is by surface mining procedures. Machinery for such operations is readily available and accurate estimates of mining costs can be made. Any of the other methods discussed will require some experimentation and the concentrations and price of sulphur will probably have to be higher than that presently experienced to justify the additional expenditures.

The test hole data shown on attachment No. 3 indicates that the area adjacent to the Chinchaga fault has a higher sulphur content than that of the northern, swampy portion of the Permit No. 130 area. This situation may indicate poor drainage from the fault zone to the northern swamp area which may also be observed from the topographic maps. The faulted zone area would appear to be drained by the Bear River system possibly resulting in some loss of sulphur compounds that may have migrated to the surface through the Chinchaga fault. Test holes 1 to 38 bordering the north portion of the permit through the swamp area show an average sulphur content of 1.25% whereas those in the area of the Chinchaga fault, holes 260 to 277, show an average sulphur content of 1.99%.

Both of these average values appear to be lower than that required for an economic mining and extraction operation, however, a detailed study will be required to determine the minimum sulphur content needed to support a economic operation.

Attachment No. 3

Results of Test Hole Sampling

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULPHUR (% by weight)
Cl - 1	10-20	0.78
Cl - 2	"	1.05
Cl - 3	"	1.10
Cl - 4	7-17	0.81
Cl - 5	"	1.14
Cl - 6	"	0.98
Cl - 7	"	1.15
Cl - 8	"	0.95
Cl - 9	10-20	0.87
Cl - 10	"	1.26
Cl - 11	"	0.76
Cl - 12	"	0.99
Cl - 13	"	0.61
Cl - 14	"	0.99
Cl - 15	"	0.08
Cl - 16	"	1.03
Cl - 17	7-17	1.91
Cl - 18	10-20	1.75
Cl - 19	"	1.35
Cl - 20	7-17	1.76
Cl - 21	10-20	1.49
Cl - 22	7-27	1.60
Cl - 23	7-17	2.21
Cl - 24	10-20	1.75
Cl - 25	"	2.06
Cl - 26	7-17	1.64
Cl - 27	10-20	0.78
Cl - 28	7-17	0.96
Cl - 29	"	1.84
Cl - 30	"	1.57
Cl - 31	"	1.79
Cl - 33	"	1.98
Cl - 34	"	1.47
Cl - 35	"	1.49
Cl - 36	7-17	1.72
Cl - 37	"	1.88
Cl - 38	"	0.96
C2 - 260	17	1.29
C2 - 261	7-17	0.60
C2 - 262	"	2.04
C2 - 263	"	1.73
C2 - 264	"	1.85
C2 - 265	"	2.38
C2 - 266	"	1.45

Attachment No. 3 (Continued)

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULPHUR (% by weight)
C2 - 274	7	2.41
C2 - 275	10-20	1.77
C2 - 276	7-17	1.77
C2 - 277	"	2.55

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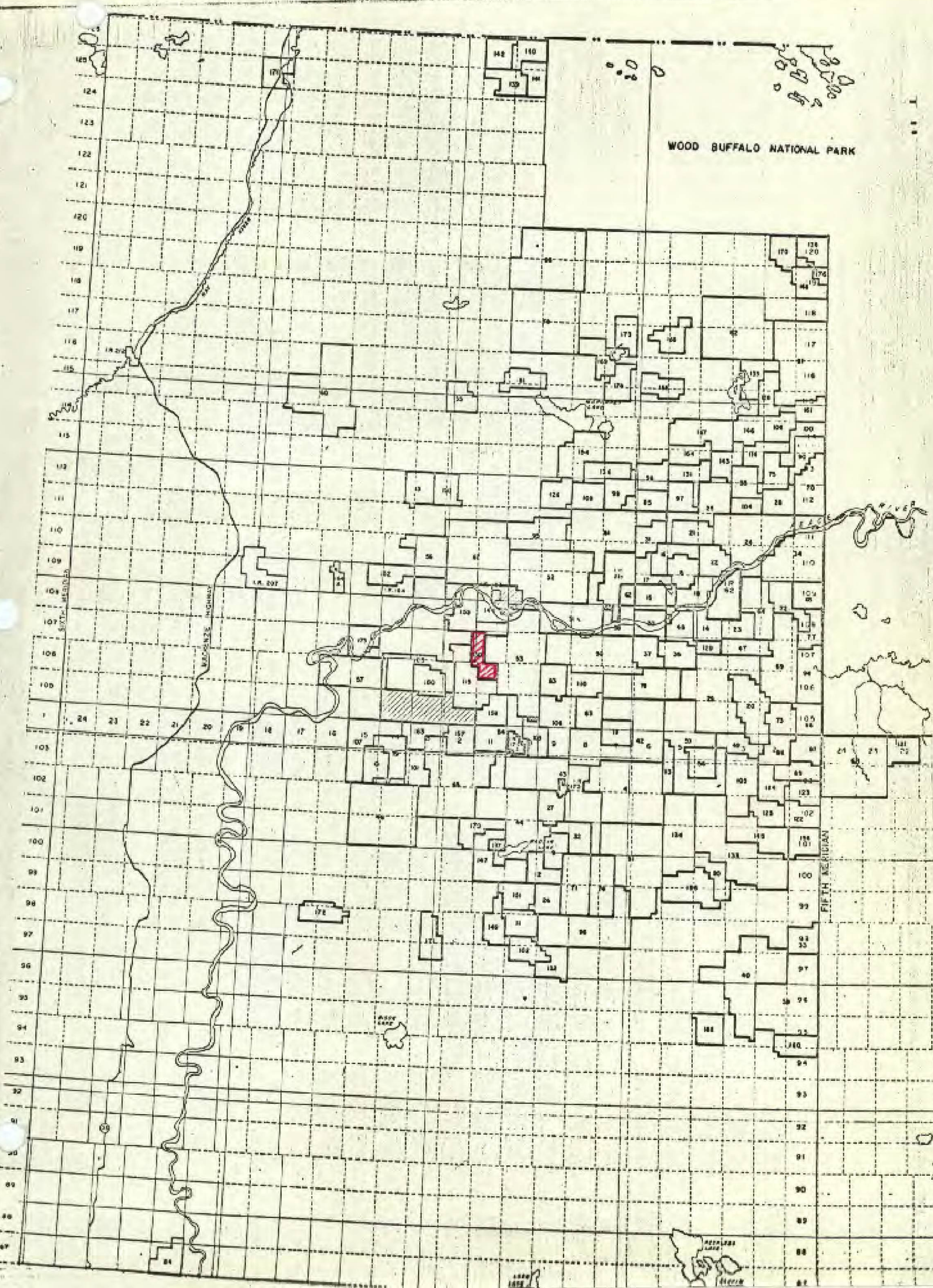
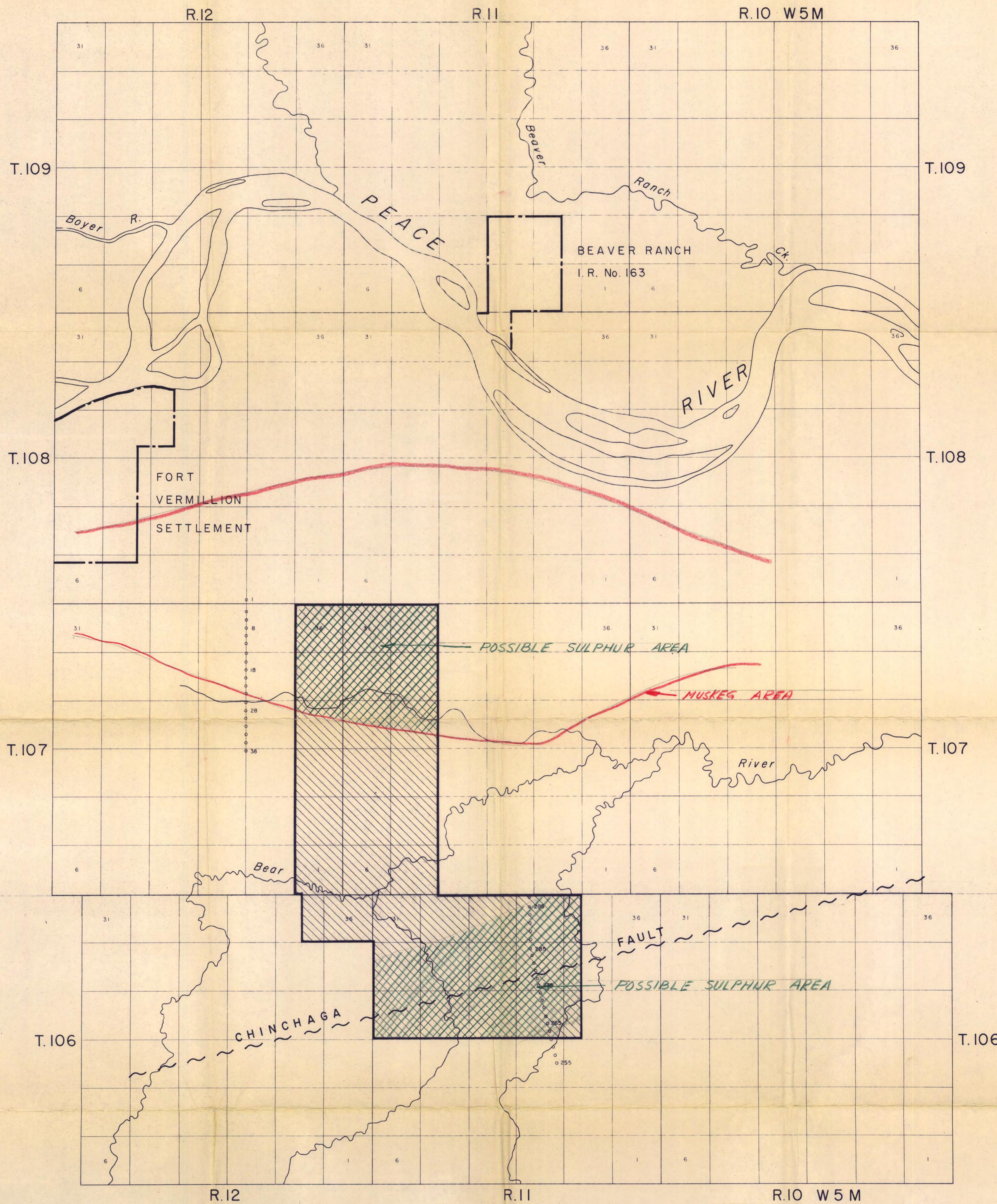
ATTACHMENT NO. 1





SULPHUR PROSPECTING PERMIT No. 130

SCALE: 1" = 1 Mile

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Attachment No. 2

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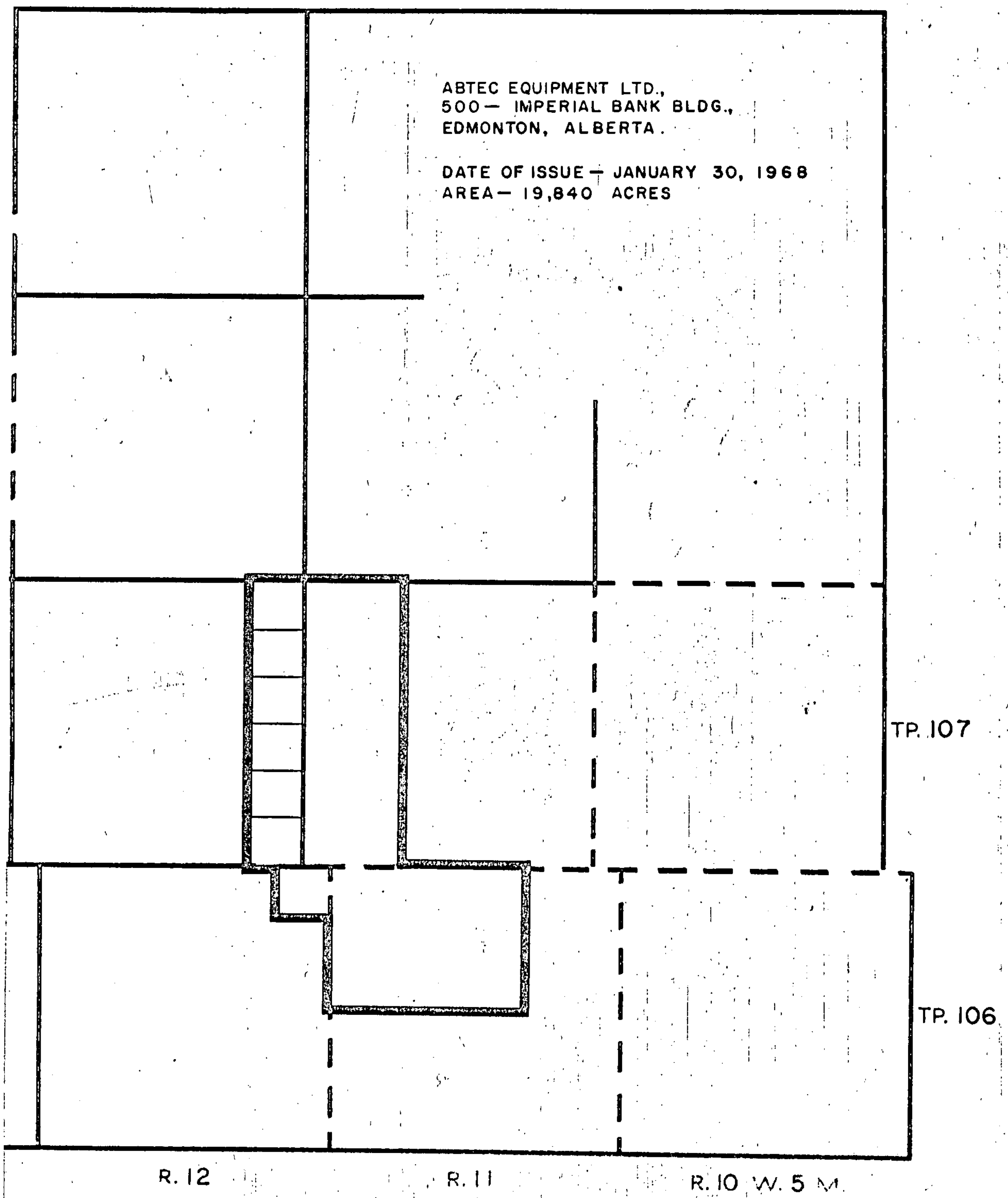
SULPHUR PROSPECTING PERMIT No. 130



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SULPHUR PROSPECTING PERMIT No. 130 (DC)