MAR 19680103: BEAR RIVER

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REPORT ON

SULPHUR PROSPECTING PERMIT

NO. 115

PREPARED BY:

[redacted] P. Eng.
W. J. BLACKSTOCK

October, 1968

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REPORT ON

SULPHUR PERMIT NO. 115

INTRODUCTION:

The general geological setting of Sulphur Prospecting Permit No. 115, together with the circumstances believed most favourable to sulphur accumulation and their relation to this permit, are reviewed in this report. Also presented are the results of a drill hole sampling program conducted to evaluate sulphur content of the strata within the permit area.

CONCLUSIONS AND RECOMMENDATIONS:

Analysis of the general topographic setting of the permit area and the low values of sulphur content encountered in the drill hole tests do not offer encouragement for the existance of an economic sulphur deposit existing within the permit area. If the permit is retained, further correlation work may be worthwhile to determine if the data indicates that a trend exists in association with geological features to provide possible leads for further exploration work.

TOPOGRAPHY OF THE PERMIT AREA:

The permit area is generally flat-lying and has small areas of muskeg in the southern portion of the area. The upper reaches of the Bear River provide reasonably effective drainage for most of the permit area. Even though the Peace River flows only seven miles north, drainage from the permit area is eastward through the aforementioned Bear River which enters the Wabasca River before joining the Peace River some 18 miles to the north-east.

DISCUSSION:

The origin of the sulphur occurrences in the general area in which sulphur permits have been issued, is at the present time conjectural. It is possible that several factors influenced sulphur deposition working in conjunction with one another or independantly. Some observations however, are of interest and are discussed below.

The bedrock in the area of the sulphur permits consists of Devonian rocks to the north-eastward which are overlayed by Cretaceous rocks in the general permit area. A blanket of sediment of glacial origin overlies the entire area in various thicknesses up to 100 feet. Sulphur occurrences have been noted in the upper layer which has sparked the current interest in sulphur prospecting.

The possibility of sulphur mining by large scale surface mining procedures in the unconsolidated surface layer of glacial debris offers the hope of large-scale economic operations. The possibility of mining the consolidated Cretaceous or Devonian rocks is far less hopeful. In addition, the possibility of extracting sulphur from the Cretaceous and Devonian rocks by a Frasch-type process would appear to offer little hope of success because of the large heat losses to the formation that would attend such an operation. At the present time, therefore, the best hope of economic sulphur extraction would appear to be associated with the unconsolidated glacial deposits and utilization of surface mining procedures. An investigation of the factors that may be associated with such accumulations of sulphur is therefore of interest.

It is noteworthy that sulphur occurences are prominent in the northeast portion of the province near the location of Devonian rock outcrops. The sulphur content of the McMurray Tar Sands is well known and it is generally theorized that the origin of the tar is from the underlying Devonian rocks. Sulphur springs are also noted to exist all along the Devonian outcrop northeastward as far as the Liard River. The existance of sulphur bearing fluids along the Devonian outcrop is consistant with what is generally found with oil and gas production from the Devonian in other parts of the province.

The presence of sulphur compounds in the Devonian formations is therefore to be expected and the existance of sulphur near the areas

of the Devonian truncation is not surprising. The process by which sulphurous material is transmitted from the Devonian to the overlying glacial material may be explained by two possibilities; namely:

1. Water migrating through the Devonian accumulates sulphur compounds. The water then percolates through fractures or faults to the surface where, in the areas of poor drainage conditions are established through evaporation for the accumulation of sulphur.

2. The escape of hydrogen sulphide gas through faults and fractures which upon contact with air is oxidized to elemental sulphur.

The former possibility appears the more reasonable to explain a widespread sulphur deposit as it would appear likely that hydrogen sulphide oxidation by the atmosphere would result in surface deposits of sulphur which would be subject to loss by forest fire. There is a strong possibility, however, that elemental sulphur deposition could be aided by hydrogen sulphide gas bubbling through surface water containing oxygen. In any event, low lying areas above faulted zones appear to offer the best possibility of having commercial sulphur deposits.

The above observation appears to be borne out by the results of the drill hole analysis taken at locations shown on attachment No. 1. The analyses show concentrations between 0.7% and 2.7% with an average of 1.5%. Since the samples were collected in relatively well drained

land, the low values encountered would appear to substantiate the aforementioned theory of sulphur accumulation.

The expected cost of mining and transporting to a central point is estimated at about 25¢ per short ton (2,000 lbs.). Removal of 100 short tons of sulphur bearing material at a cost of $25.00, would yield about 1.4 long tons (2,240 lbs.) of sulphur at the average composition noted having a value, after processing, of $35.00. The allowance for processing would, therefore, be only $10.00 per long ton. Sulphur content, much above that found to date on Sulphur Prospecting Permit No. 115, would, therefore, be required for an economic mining and processing operation.

[redacted] P.Eng.

October, 1968

W. J. Blackstock

C.G.L. C4

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

OPERATOR: SINCLAIR CANADA OIL COMPANY REPORT NUMBER: C68-3560

Kind of Sample: Soils DATE RECEIVED April 22, 1968 DATE REPORTED May 8, 1968

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)
C1- 1	10-20	0.78
C1- 2	"	1.05
C1- 3	"	1.10
C1- 4	7-17	0.81
C1- 5	"	1.14
C1- 6	"	0.98
C1- 7	" "	1.15
C1- 8	"	0.95
C1- 9	10-20	0.87
C1-10	"	1.26
C1-11	"	0.76
C1-12	"	0.99
C1-13	"	0.61
C1-14	"	0.99
C1-15	"	0.08
C1-16	"	1.03
C1-17	7-17	1.91
C1-18	10-20	1.75
C1-19	"	1.35
C1-20	7-17	1.76
C1-21	10-20	1.49
C1-22	7-27	1.60
C1-23	7-17	2.21
C1-24	10-20	1.75
C1-25	"	2.06
C1-26	7-17	1.64
C1-27	10-20	0.78
C1-28	7-17	0.96
C1-29	"	1.84
C1-30	"	1.57
C1-31	"	1.79
C1-33	"	1.98
C1-34	"	1.47
C1-35	"	1.49

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)
C1-36	7-17	1.72
C1-37	"	1.88
C1-38	"	0.96
C1-39	"	1.55
C1-40	"	1.75
C1-41	"	2.42
C1-42	"	0.64
C1-43	"	Trace
C1-44	10-20	1.70
C1-45	"	1.71
C1-46	7-17	0.79
C1-47	10-20	1.66
C1-48	7-17	1.09
C1-49	"	Trace
C1-50	"	0.73
C1-51	"	1.54
C1-52	"	1.33
C1-53	10-20	0.70
C1-54	7-17	2.11
C1-55	10-20	2.27
C1-56	7-17	1.66
C1-57	"	1.51
C1-58	"	1.97
C1-59	10-20	2.34
C1-60	"	1.13
C2-61	7-17	1.07
C2-62	"	1.47
C2-63	"	0.86
C2-64	"	1.85
C2-65	"	2.54
C2-66	"	2.37
C2-67	"	0.82
C2-68	"	1.18
C2-69	"	1.18
C2-70	17	1.66

continued.....

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OPERATOR: SINCLAIR CANADA OIL COMPANY REPORT NUMBER: C68-3560

Kind of Sample: Soils DATE RECEIVED April 22, 1968 DATE REPORTED May 8, 1968

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)
C2- 71	7-17	2.50
C2- 72	"	1.20
C2- 73	"	1.51
C2- 74	"	2.14
C2- 75	10-20	1.53
C2- 76	"	1.65
C2- 77	7-17	2.31
C2- 78	"	1.19
C2- 79	10-20	0.63
C2- 80	7-17	0.77
C2- 81	"	1.27
C2- 82	10-20	0.58
C2- 83	"	1.40
C2- 84	"	1.22
C2- 85	7-17	2.72
C2- 86	"	1.61
C2- 87	10-20	1.23
C2- 88	10-20	1.63
C2- 89	7-17	1.91
C2- 90	"	1.44
C2- 91	10-20	2.97
C2- 92	"	2.02
C2- 93	7-17	1.54
C2- 94	"	1.03
C2- 95	"	0.99
C2- 96	10-20	0.57
C2- 97	"	0.96
C2- 98	7-17	1.10
C2- 99	"	1.63
C2-100	"	1.70
C2-101	"	1.33
C2-102	"	1.15
C2-103	"	0.72
C2-104	"	1.62
C2-105	7-17	1.12
C2-106	"	0.99
C2-107	"	1.20
C2-108	"	0.87
C2-109	"	1.06
C2-110	"	1.18
C2-111	"	1.15
C2-112	"	0.72
C2-113	10-20	0.45
C2-114	"	0.92
C2-115	"	0.34
C2-116	7-17	0.40
C2-117	10-20	0.29
C2-118	7-17	0.67
C2-119	10-20	0.41
C2-120	7-17	1.02
C2-121	"	0.58
C2-122	10-20	0.83
C2-123	7-17	0.57
C2-124	"	1.33
C2-125	10-20	0.73
C2-126	7-17	0.85
C2-127	"	1.07
C2-128	"	1.90
C2-129	10-20	1.07
C2-130	7-17	1.22
C2-131	"	1.13
C2-132	10-20	2.69
C2-133	7-17	1.03
C2-134	10-20	2.00
C2-135	7-17	0.91
C2-136	10-20	0.79
C2-137	7-17	0.97
C2-138	10-20	1.75

continued.....

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

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Kind of Sample: Soils DATE RECEIVED April 22, 1968 DATE REPORTED May 8, 1968

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)
C2-139	10-20	2.20
C2-140	"	1.26
C2-141	"	1.96
C2-142	7-17	1.17
C2-148	"	1.49
C2-149	"	0.67
C2-150	"	0.67
C2-151	"	1.18
C2-152	10-20	1.04
C2-153	7-17	1.92
C2-154	"	1.08
C2-155	"	1.37
C2-156	10-20	1.34
C2-157	7-17	0.67
C2-158	10-20	0.99
C2-159	"	1.29
C2-160	7-17	1.32
C2-161	"	1.05
C2-162	10-20	0.43
C2-163	7-17	1.13
C2-164	"	1.80
C2-165	"	1.33
C2-166	"	0.63
C2-167	"	1.33
C2-168	10-20	2.38
C2-169	7-17	0.94
C2-170	10-20	1.11
C2-171	"	1.09
C2-172	7-17	1.89
C2-173	10-20	3.16
C2-174	7-17	0.86
C2-176	"	1.18
C2-177	10-20	1.69
C2-178	7-17	0.79
C2-181	10-20	2.66
C2-183	7-17	2.14
C2-184	"	1.99
C2-185	"	2.48
C2-187	"	1.93
C2-188	10-20	2.16
C2-189	7-17	0.51
C2-190	"	1.35
C2-192	"	1.11
C2-193	"	1.09
C2-194	"	0.96
C2-195	10-20	0.97
C2-196	"	0.87
C2-197	"	1.26
C2-198	"	0.36
C2-199	7-17	1.18
C2-200	"	2.47
C2-201	"	1.62
C2-202	"	1.93
C2-203	"	1.95
C2-204	"	1.93
C2-205	10-20	1.36
C2-206	7-17	1.68
C2-207	"	0.82
C2-208	"	1.09
C2-209	"	1.26
C2-210	"	1.67
C2-211	"	1.18
C2-212	"	1.49
C2-213	7	1.38
C2-214	7	Trace
C2-215	7-17	Trace
C2-216	"	Trace
C2-217	"	Trace

continued.....

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

OPERATOR: SINCLAIR CANADA OIL COMPANY

REPORT NUMBER: C68-3560

Kind of Sample: Soils

DATE RECEIVED April 22, 1968

DATE REPORTED May 8, 1968

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)
C2-218	7-17	Trace
C2-219	"	0.20
C2-220	"	Trace
C2-221	"	Trace
C2-222	"	Trace
C2-223	"	Trace
C2-224	"	Trace
C2-225	"	0.12
C2-226	"	Trace
C2-227	"	Trace
C2-228	"	2.18
C2-229	"	2.89
C2-230	"	3.00
C2-231	10-20	2.52
C2-232	"	1.80
C2-233	"	2.92
C2-234	"	2.14
C2-235	"	0.57
C2-236	"	1.89
C2-237	7-17	1.72
C2-238	"	1.78
C2-239	10-20	1.18
C2-240	7-17	1.74
C2-241	"	2.53
C2-242	10-20	0.50
C2-243	7-17	0.73
C2-244	"	1.02
C2-245	10-20	0.47
C2-246	7-17	1.55
C2-248	"	0.96
C2-249	10-20	0.83
C2-250	17	0.98
C2-253	7-17	1.48
C2-254	7	1.93
C2-255	10-17	2.64
C2-256	7-17	2.04
C2-257	"	1.42
C2-258	10-20	1.42
C2-259	7-17	0.49
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
C2-274	7	2.41
C2-275	10-20	1.77
C2-276	7-17	1.77
C2-277	"	2.55
C3-353	"	2.49
C3-355	"	Trace
C3-356	"	Trace
C3-357	"	Trace
C3-358	10-20	Trace
C3-359	"	1.79
C3-360	"	2.94
C3-364	7-17	2.62
C3-365	"	0.66
C3-366	"	1.08
C3-368	"	0.46
C3-369	"	2.23
C3-367	"	1.09
C3-370	"	1.50
C3-371	"	1.39
C3-372	"	1.88
C3-373	"	1.56
C3-374	"	1.35

continued.....

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OPERATOR: SINCLAIR CANADA OIL COMPANY REPORT NUMBER: C68-3560

Kind of Sample: Soils DATE RECEIVED April 22, 1968 DATE REPORTED May 8, 1968

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)
C3-375	7-17	0.52
C3-361	10-20	1.62
C3-362	"	1.76
C3-363	"	1.41
C3-388	7-17	1.35
C3-389	10-20	0.99
C3-390	"	1.69
C3-391	7-17	0.44
C3-392	"	0.19
C3-393	"	0.50
C3-394	"	0.99
C3-395	"	0.98
C3-396	"	0.26
C3-397	"	0.45
C3-398	10-20	0.79
C3-399	7-17	0.40
C3-292	10-20	2.15
C3-293	7-17	1.47
C3-294	"	1.60
C3-295	"	1.81
C3-297	"	0.96
C3-298	"	1.28
C3-299	"	3.04
C3-300	10-20	0.61
C3-301	"	1.35
C3-302	"	1.07
C3-303	7-17	0.37
C3-304	10-20	1.33
C3-305	"	Trace
C3-306	"	0.88
C3-307	"	1.64
C3-308	7-17	1.52
C3-309	10-20	1.81
C3-310	"	0.26
C3-311	10-20	1.54
C3-312	"	1.77
C3-313	"	0.30
C3-314	7-17	0.97
C3-315	"	0.38
C3-316	"	0.46
C3-317	"	1.32
C3-318	"	0.48
C3-319	"	1.65
C3-320	"	0.56
C3-321	10-20	0.51
C3-322	"	0.40
C3-323	"	1.63
C3-324	"	0.28
C3-325	"	0.77
C3-326	"	0.69
C3-327	7-17	1.00
C3-328	"	1.11
C3-329	10-20	1.14
C3-330	7-17	1.78
C3-331	"	1.15
C3-332	10-20	1.38
C3-333	7-17	0.84
C3-334	"	0.88
C3-335	10-20	1.67
C3-336	7-17	0.80
C3-337	"	0.98
C3-338	10-20	Trace
C3-339	7-17	0.17
C3-340	"	Trace
C3-341	10-20	Trace
C3-342	7-17	Trace
C3-343	"	Trace
C3-344	10-20	Trace

continued.....

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OPERATOR: SINCLAIR CANADA OIL COMPANY REPORT NUMBER: C68-3560

Kind of Sample: Soils DATE RECEIVED April 22, 1968 DATE REPORTED May 8, 1968

SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)	SAMPLE NUMBER	DEPTH IN FEET	ELEMENTAL SULFUR (% by weight)
C3-345	7-17	Trace			
C3-346	"	Trace			
C3-347	10-20	Trace			
C3-348	7-17	Trace			

R. 12

R. 11

W. 5 M.

T. 107

T. 106

T. 105

LINE 2

0.61 0.70 0.80 0.90 0.100 0.110 0.115A 0.116A 0.120 0.130 0.140 0.150 0.160 0.170 0.180 0.190 0.200 0.210 0.220 0.230 0.240 0.250 0.260 0.270 0.279

5 1 6 1

31 36 31 36

6 1 6 1

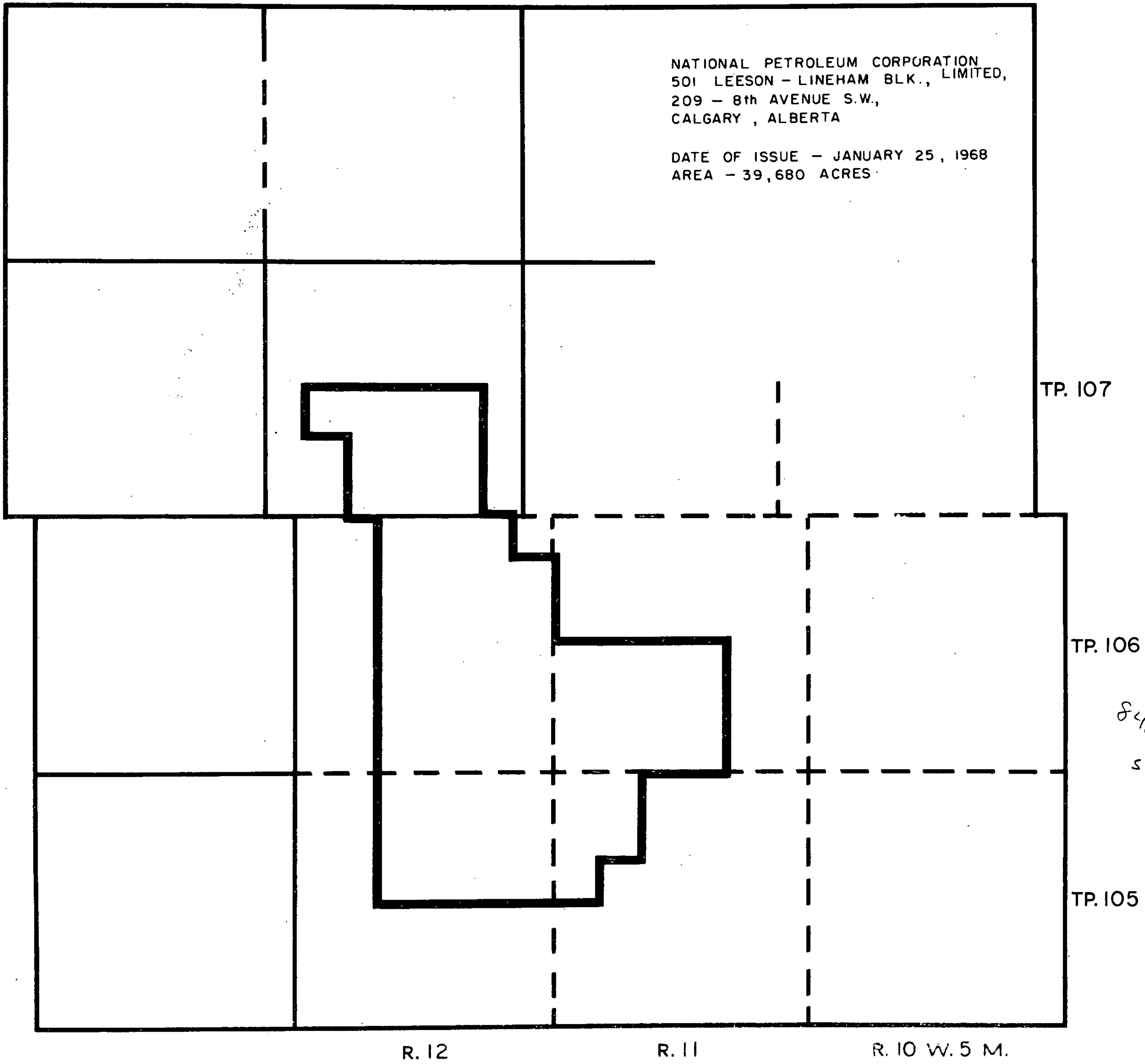
31 36 31 36

6 1 6 1

ABCON ENGINEERING LTD.	
BEAR RIVER AREA	
Drawn by: Central Drafting Services Ltd.	Project Area:
Checked:	
Approved by:	Scale:
Date:	Dwg. No.

19680103 Figure 1

SULPHUR PROSPECTING PERMIT No. 115



84J/4+5 SW.