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K- Sage Creek 6711A

PRELIMINARY REPORT

FLATHEAD COAL AREA

ROYAL CANADIAN VENTURES LTD.

AND ASSOCIATED COMPANIES

I. P. Dyson, P. Geol.

October 5, 1967

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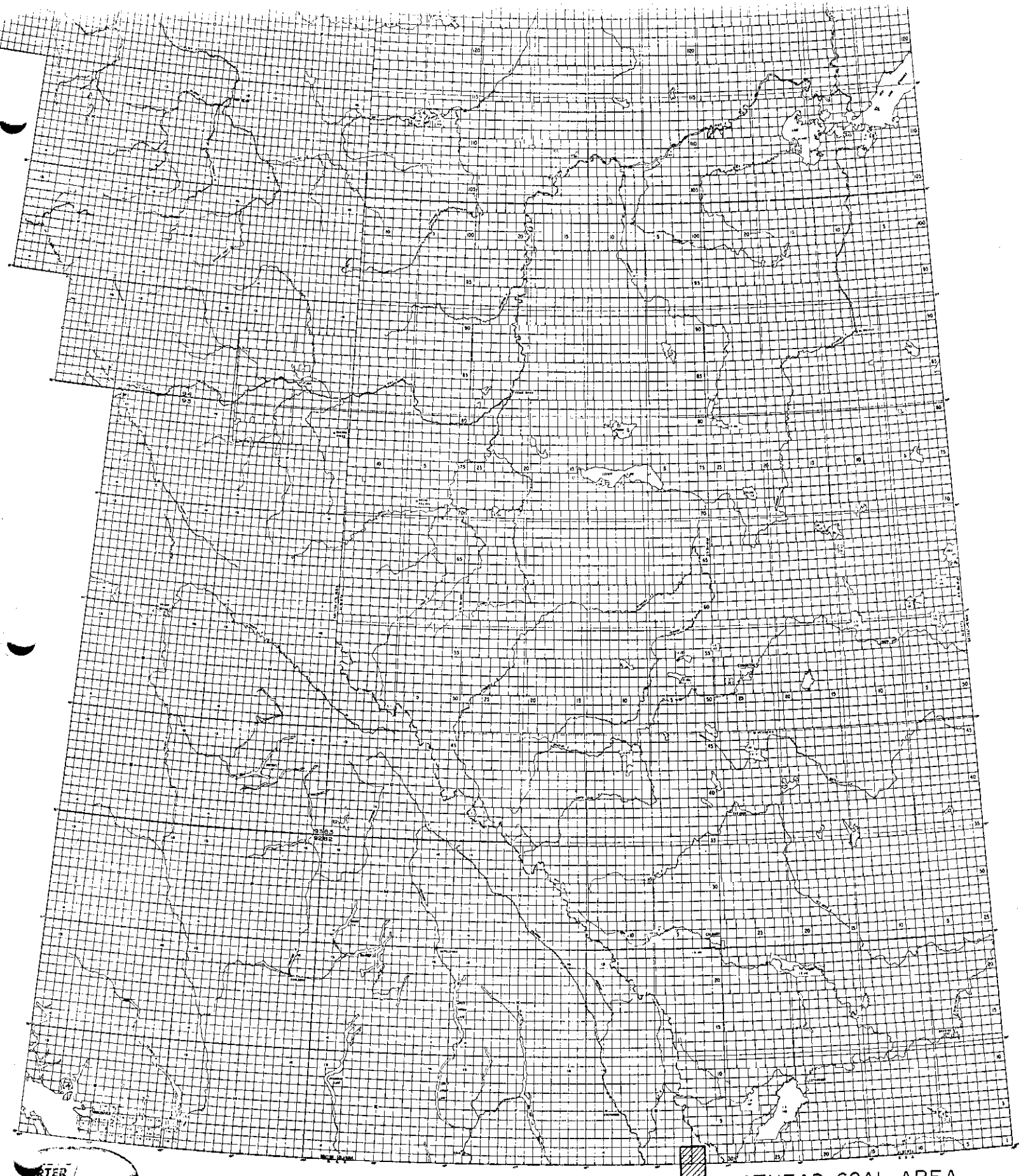
INTRODUCTION

This report is a preliminary investigation of the "Flathead Coal Area" based on the available literature, both published and unpublished, and on a minor amount of field work. No new drilling or trenching has been carried out in connection with the coal licences in British Columbia and the coal prospecting permit in Montana which are held by Royal Canadian Ventures Ltd. and associated companies. The report is accompanied by two maps and a cross-section which illustrate both the land holdings of R.C.V. and the geology of the coal deposits.

LOCATION

The Flathead Coal Area is situated on the west side of the Flathead River Valley about four miles north of the International Boundary between Canada and the United States. This places it some thirty miles west of Waterton Lakes, Alberta, forty miles southeast of Fernie, B.C. and sixty miles north of Kalispell, Montana. It can be reached by gravel road from both Fernie and Kalispell.



ALBERTA

AND EASTERN BRITISH COLUMBIA

PREVIOUS WORK

The first mapping of the area in any detail was carried out by J. D. MacKenzie in the summer of 1914 although the area had previously been mentioned by Daly and Dowling. Interest in the coal deposits was, in the years immediately preceding the 1914-18 war, at an all time high. In the years 1910-1915 much trenching and tunnelling was carried out by a Mr. E. W. Butts who had the coal rights in this area at this time. When J. D. MacKenzie was in the area he had the benefit of most of these pits still being open although even in 1915 many were already caving in. From the end of World War I till the present time little active prospecting was carried out in the area as the plans to build a railroad up the Flathead Valley from Montana had been abandoned and adequate supplies of steam coal were readily available close to the Canadian Pacific Railway in the Crowsnest Pass.

A small amount of steam coal was mined during the years up to 1950 for local consumption, i.e. steam engines on drilling rigs in the area. All signs of this mine have now disappeared.

GENERAL TOPOGRAPHY AND GEOLOGY OF THE AREA

The Flathead Coal Area is situated on the west side of the Flathead River Valley at the extreme south end of the Fernie Basin. The Flathead River at this point lies in a valley about five miles wide at an elevation of approximately 4000' above sea level. The hills immediately surrounding the valley are about 6000 - 7000' in elevation. These relatively low elevations result in the ground being wholly covered with trees. For the most part tree growth is very dense and there is much undergrowth and deadfall. Ground traverses in the area are extremely difficult and places to land a helicopter are few and far between. Similarly outcrops of rocks in the valley area are very few.

Geologically the Flathead Coal Area lies west of the Front Range of the Rocky Mountains and is situated above the Lewis thrust at the south end of the Fernie Basin. The Fernie Basin is an area where a broad synclinal structure above the Lewis thrust has preserved Mesozoic rocks. Much later normal faulting and subsidiary thrusting has left quite a complex structural picture and it is in a small downfaulted block that the coals of the Flathead Coal Area are preserved.

The geological succession of rocks in the area may be broken down as follows:

QUATERNARY		Sands, gravels, etc.
TERTIARY	Eocene (?)	Kishenehn formation
MESOZOIC	Lower Cretaceous	Blairmore Group
		Kootenay Formation
	Jurassic	Fernie Group
	Triassic	Spray River Formation
PALAEOZOIC PROTEROZOIC	Undivided for the purposes of this report	

The coal bearing strata are within the Kootenay formation and it is this formation that has received the most detailed attention. In the Flathead area it is about 1100' thick and consists of an interbedded series of sandstones, shales and coal seams. The sandstones of the Kootenay formation are readily recognized and are characteristically speckled. The coal seams occur in the lower one-third of the formation.

The underlying Fernie group consists of about 1000' of brown and grey shales with occasional thin-bedded sands and silts. It is usually recessive and although rare in outcrop its extent can usually be mapped from topography.

The Kootenay formation is overlain by the coarse Basal conglomerate of the Blairmore group. This conglomerate is a good ridge former and is easily mapped in the field and serves to delineate the extent of the Kootenay formation.

The three foregoing formations are all more or less conformable with each other although a disconformity may be present between the Kootenay formation and the Blairmore group. Overlying these Mesozoic rocks is an unconformable cover of Tertiary rocks - the Kishenehn formation. These Tertiary rocks apparently fill the Flathead Valley and are thought by Price to represent scree deposits and such like filling in post-Laromide topography. They mask the extent of the Kootenay formation in the Flathead area. Up to possibly 3000' of these rocks are present.

The Kooteany formation outcrops over an irregular strip about five miles long and half a mile wide as shown on the geological map. The formation dips to the east and southeast at approximately 20^{o} - 25^{o} over the whole length of the outcrop. No structural complexities of significant size

were noted although the possibility of minor faulting cannot be ruled out. Detailed structural mapping would be impossible without drilling and trenching.

COAL OCCURRENCES

The significant coal occurrences all are within the Kootenay formation of Lower Cretaceous age. A few very minor coal seams of lignitic grade also occur in the Tertiary deposits and were mined for local consumption in Montana a few miles south of the map area.

Traverses across the poor outcrops of Kootenay formation in 1967 yielded very little new quantitative or qualitative data about the coal. No outcrops of coal in place could be located although numerous slopes were covered with a thick mantle of slumped coal for the most part in dust form. The presence of thick seams was confirmed.

The best data for the assessment of the coal is that collected by J. D. MacKenzie as he reported on the coal seams when a large prospecting operation was in progress. His data was collected from trenches and pits open at the time he was there.

In his report he makes a detailed description of the section of Kootenay formation immediately on the north side of Cabin Creek. (Today this is still the best exposed section.) This is Location A on the geological map. All the seams with commercial potential occur in the lower 400' of the Kootenay formation and it is from his report that most of the following data is extracted:

(a) COAL EXTENT

In the coal measures on the north side of Cabin Creek (Location A) five coal seams of mineable thickness exist. From top to bottom these are:

No. 1 Seam	7' 0"	
2	8' 10"	
3	4' 0"	80' 10" of coal
4	36' 0"	
5	25' 0"	

These seams all occur within 496' of section. While some partings of shale are apparent in detailed assessments of these seams they are mostly in the 1" - 2" thickness range. Up to 12' of good clean coal is present in No. 4 Seam without any partings.

It is impossible to trace the seams laterally along strike because of the extremely heavy timber cover and the thick undergrowth, but two seams have been measured south of Cabin Creek. (Location B) These are 8' 8" and 35' 0" thick and possibly correlate with Nos. 2 and 4 Seams respectively. Similarly to the north at Location C three seams have been recognized measuring 10' 0", 15' 0" and 30' 0" in thickness. No definite correlation of these can be made with the Location A section, but they possibly correlate with Nos. 3, 4 and 5 Seams respectively.

The extent of the coal deposits beneath the Flathead Valley is conjectural, but some evidence can be obtained from the cuttings from the abandoned oil well, Canadian Kootenay Oils #1, which is situated right on the bank of the Flathead River.

This well spudded on the Tertiary Kishenehn formation, but at a depth of approximately 2825' passed from the Tertiary into the Kootenay formation. A 5' coal seam was penetrated 3415 - 3420' and although no samples are available below 3485', much coal was reported below 3500'. Total depth of

the hole was 3600'. The most likely structural interpretation of this coal occurrence is shown on the accompanying cross-section.

The northeastern boundary of the coal deposit is probably marked by the normal fault shown on the map. This appears to be a significant fault with large downthrow to the west preserving the coal measures on that side of it.

To the south the extent of the coal measures is problematical. Some Fernie shales, much deformed, lie close to the overthrust carrying Palaeozoic rocks on Couldrey Creek. In Montana, the Fernie shales have been recognized where shown on the geological map. No Kootenay beds have, however, been seen. An elongate topographic feature - shown on the geologic map, is believed to represent a possible Kootenay formation subcrop. The geomorphic configuration and the position of the hill with respect to the Fernie shales are analogous to those of the hills on which the Kootenay outcrops in Canada.

If indeed this hill does represent the Kootenay formation then the extent of the coal measures into Montana is confirmed as far as Trail Creek.

To the west the coal measures are obviously missing by erosion and no possible extensions of the coal area in this direction can be contemplated.

(b) COAL QUALITY

No recent data regarding the coal quality is available. MacKenzie gives four coal analyses for this area as follows:

Moisture	1.4	2.0	4.7	9.2
Ash	15.2	9.4	12.0	10.7
Volatile Matter	21.9	22.6	24.1	24.4
Fixed Carbon	61.5	66.0	59.2	55.7

He further states "the coking qualities of these coals are good". "Their coking quality is good, furnishing a hard, coherent, bright coke."

Beyond this information nothing is available. It is quite possible that better sampling in the subsurface would yield analyses having lower ash contents.

(c) COAL MINEABILITY

The seams are plenty thick enough to be economically mined and dips of up to 30° are well within the capabilities of modern equipment for the mining of pitching seams. While no details of possible complexities in the structure of the coal beds are known it is not felt that they would be too great.

(d) COAL QUANTITIES

Figures for the possible coal reserves of the area are highly speculative, but assuming only 20' of coal over 20 square miles would yield 400 million tons. As both these figures are probably minimal the reserves are obviously sufficient to warrant further exploration.

ACCESS

While the area is presently well served by gravel and other dry weather trails, no railway facilities are presently existing. It does, however, lie within forty miles of both the Great Northern Railway in Montana and the Canadian Pacific Railway in British Columbia. As previously mentioned, prior to 1914 a line was surveyed through the area joining these two lines, but it was never built. Construction would not be a problem if a commercial deposit of coking coal were to be developed.

CONCLUSIONS

The Flathead Coal Area contains large quantities of coal that is economically mineable. The coal is probably a medium volatile coking coal suitable for metallurgical purposes.

The quality of the coal is not fully known and further exploration should be carried out to assess the coal quality before embarking on an extensive drilling program to delineate the extent of the deposits.

The Flathead Coal Area is believed to have high potential for development and has perhaps been overlooked because of its poor outcrops and scanty data.

I. P. Dyson, P. Geol.

BIBLIOGRAPHY

(1) Dowling, D. B.; 1914, Geol. Surv. Can., Summ. Rept., 1913, pp. 139-141.

(2) MacKenzie, J. D., 1916, Geol. Surv. Can., Mem. 87.

(3) Price, R. A.; 1961, Geol. Surv. Can., Paper 61-24.

(4) Lyman, D. C.; 1936, Unpublished M.Sc. Thesis, University of Minnesota.

(5) Barnes, W. C.; 1965(?), Unpublished Ph.D. Thesis, Princeton University.

SUMMARY OF

ROYAL CANADIAN VENTURES LTD.

COAL LICENCES EXPENDITURES

FLATHEAD, BRITISH COLUMBIA

Permit Fees	10,732.25
Materials and Supplies	35.15
Contract Services	1,085.00
Travelling and Subsistence	1,186.65
Auto Expenses	29.40
Maps, Blueprints, etc.	328.57
Supervision	1,087.50
Geological and Drafting	2,660.00
Aircraft Expenses	1,169.44
Taxes	4,553.00
Miscellaneous	49.41
TOTAL	$22,916.37

K-SAGE CREEK 67(2)A.

CONFIDENTIAL

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ROYAL CANADIAN VENTURES LTD. & ASSOC. COS

114°40'
114°30'
114°20'
49°10'
49°00'
TP.37N.
TP.36N.
48°50'

Cabin Creek
Sage Creek
Approx. only
FLATHEAD
Coulrey Creek
Elder Creek
Can. Kootenay Oils #1
BRITISH COLUMBIA
MONTANA
CANADA
U.S.A.
RIVER
GLACIER
NATIONAL
PARK
Kishenena (PARK SERVICE)
Trailcreek
Kintla Lake #1 (position approx)
Kintla Lake
Tuchuck Creek
Whale Creek

396 377 374 392 391 375 376 393 404 388 409 405 389 381 387 386 402 394 395 380 401 400 378 379 390 411 399 406 407 385 382 410 403 384 383 397 398

RGE. 23 W.
RGE. 22 W.

LEGEND

Coal Prospecting Permit M 2449 (U.S. Dept. of Interior)

Coal License Granted by Prov. of Brit. Col.

ROYAL CANADIAN VENTURES LTD.

CALGARY ALBERTA

LAND MAP

SHOWING

COAL RIGHTS OF R.C.V.

AND ASSOCIATED COMPANIES

FLATHEAD COAL AREA

BRITISH COLUMBIA – MONTANA

Date : October 1967	Drawn by : Central Drafting Services Ltd.	Geologist : P. Dyson
Rev. Date :	Scale : 1 : 50,000	DWG. No. 1

SC 67(2)A

357(2)
1

114°40'
114°30'
114°20'
49°10'
49°00'
TP.37N.
TP.36N.
48°50'
RGE.23 W.
RGE.22 W.

P
Q
T
Creek
Sage
Approx only
FLATHEAD
RIVER
Cabin
Coulder
Tuchuck
Whale
Elder
Kintla Lake
Jfe
Kkt
KBl
Topographic Feature
?Kkt
Can. Kootenay Oils *1
Kishenena (PARK SERVICE)
Trailcreek
Kintla Lake *1 (position approx.)
A
B
C
X
X'
BRITISH COLUMBIA
MONTANA
CANADA
U.S.A.
GLACIER
NATIONAL
PARK
Q (Probably Underlain by T)

LEGEND:

Thrust Fault	Q	Quaternary - gravels, alluvium, etc.
Normal Fault	T	Tertiary - Kishenehn formation
	KBl	Cretaceous - Blairmore Group
	Kkt	Cretaceous - Kootenay Formation (may incl. some Jurassic)
	Jfe	Jurassic - Fernie Group
	P	Triassic - Palaeozoic & Proterozoic rocks undivided.

Compiled from:
J.D. MacKenzie 1916
D. Lyman 1936
R.A. Price 1961
W. Barnes 1965 (?)
P. Dyson 1967

ROYAL CANADIAN VENTURES LTD.

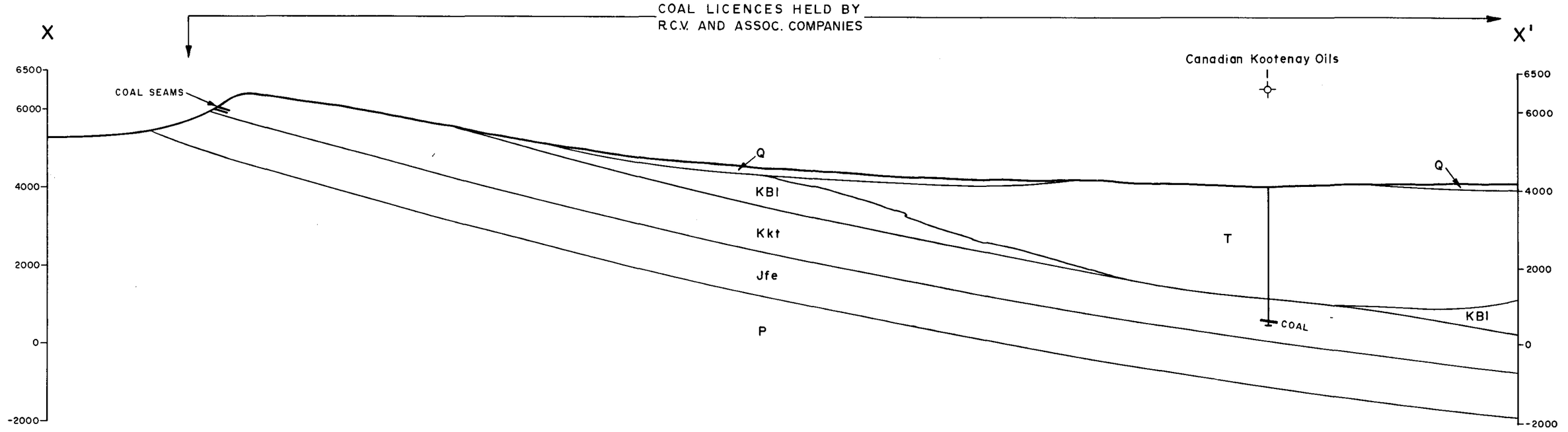
CALGARY ALBERTA

GEOLOGICAL MAP

FLATHEAD COAL AREA

BRITISH COLUMBIA - MONTANA

Date: October 1967	Drawn by: Central Drafting Services Ltd.	Geologist: P. Dyson
Rev. Date:	Scale: 1:50,000	DWG. No. 3



LEGEND

Q	Quaternary – gravels, alluvium, etc.
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KBl	Cretaceous – Blairmore Group
Kkt	Cretaceous – Kootenay Formation (may incl. some Jurassic)
Jfe	Jurassic – Fernie Group
P	Triassic – Palaeozoic & Proterozoic rocks undivided.

357 (1)

SC 67(21)A

(3)

ROYAL CANADIAN VENTURES LTD.
CALGARY, ALBERTA

CROSS – SECTION X – X'
TO ACCOMPANY GEOLOGICAL MAP
of
FLATHEAD COAL AREA

Date: OCT. 1967	Drawn By: C.D.S. Lts.	Geologist: P. Dyson
Rev. Date	Scale 1"=2000' V & H	Dwg. No: 2