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REPORT

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THE GEOLOGICAL EXPLORATION
OF
THE BABCOCK PROPERTY

PR-QUINTETTE 74(1)B

JUNE TO SEPTEMBER, 1974

Prepared by
Mitsui Mining Co., Ltd.

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GEOLOGICAL BRANCH
ASSESSMENT REPORT

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Pages 41-60, and 63-66 of this report contain coal quality data, and remain confidential under the terms of the *Coal Act Regulation*, Section 2(1). They have been removed from the public version.

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FOREWORD

In 1973, an agreement was concluded among the holders of coal licences of Babcock property (Denison Mines Limited and World Resources Company), and Tokyo Boeki Ltd. and Mitsui Mining Co., Ltd. to jointly develop the said coal property.

For the purpose the geological survey was conducted from the year 1973 to 1974 under the overall management of Denison Mines Limited.

In 1974, the Caribou Area, the Babcock Creek Area and the Center Area were undertaken the investigation by Mitsui staffs and the Quintette Area was investigated by Denison staffs. This investigation required about three months and took from June till September, 1974.

This is the report on the geological survey compiled by Mitsui Mining Co., Ltd. The topographical and the geological maps to be attached to the report are contained in the attachment in a separate volume.

The work was done by Messers. I. Kakizaki, K. Kinoshita, K. Furukawa and Y. Kawaguchi.

ACKNOWLEDGEMENT

The writer wishes to express his appreciation, specially to Mr. A. Johnson, Chief Geologist of Denison Mines Ltd. for his co-operation, both officially and privately, at the time of executing this investigation.

Grateful acknowledgement is also made to Mr. G. Gormely who participated together in the field work representing the management operator during the investigation to achieve this investigation.

The writer acknowledges with gratitude the cooperation of Denison Mines', World Resources' and Tokyo Boeki's Staff.

The writer is particularly indebted to Messers. L. Smith and R. Nells for their kind help.

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CHAPTER ONE
INTRODUCTION

Section 1. Location and Accessibility

(1) Location

The Babcock property is located in approximately 65 air miles south-west of Dawson Creek in the Rocky Mountain Foothills in B. C., Canada.

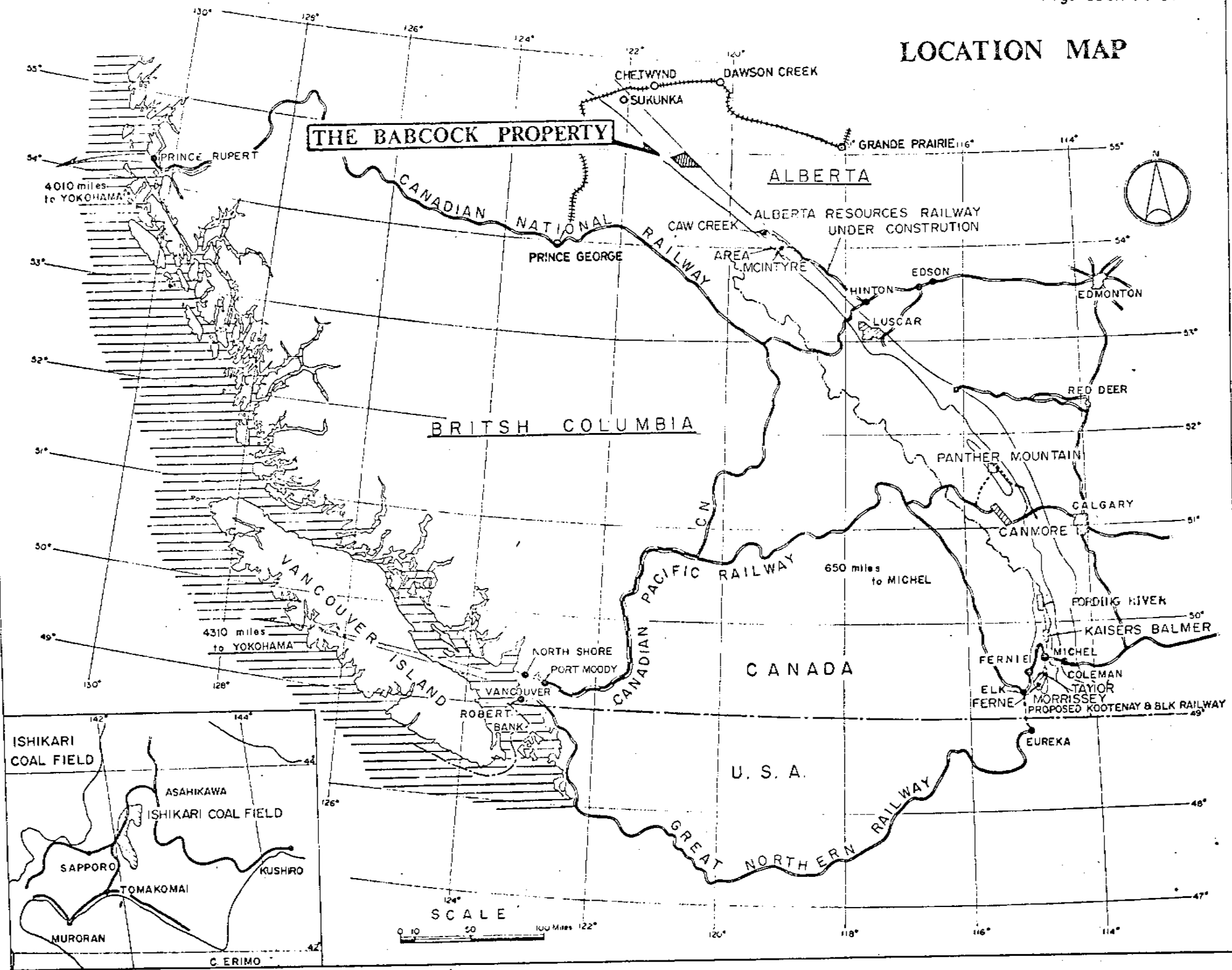
This property covered, the south side, the half of the Quintette property is located in south to the Murray River.

(2) Accessibility

There is a secondary and dry weather road from Beaverlodge, which located midway between Dawson Creek, B. C. and Grand Prairie, Alberta. The road runs westward about 72 miles along the Redwillow River. From which the property access road leads to the property in about 18 miles.

There are two ways of an air line, one way is from Calgary to Dawson Creek by the way of Prince George and other way is from Calgary to Grand Prairie via Edmonton.

LOCATION MAP



Handwritten note: 4010 miles to YOKOHAMA

Section 2. Topography

(1) General description

The area investigated in 1974 were the old 80 properties and the southeast part to the Babcock Creek acrossing the center of the Quintette property. The altitude of this area is more than 3,900 feet above sea level.

This area consists of the ridge running from the Quintette Mountain in a north-western direction, the flat extending from the Babcock Mountain foothill to south-west and the hill extending from the Babcock Creek face of the Babcock Mountain to south-east.

The topography of the area is dominated by the underlying geological structure. Namely, the Quintette ridge runs parallel to the axis of holding from north-west to south-east. The tributary of the Babcock Creek flows in a south-eastern direction along the axis of the Waterfall Creek Syncline and joins with the main stream of the Babcock Creek at near the camp-site. The Waterfall Creek flows in a north-western direction along the axis.

The tree line is about 5,000 feet above sea level. Though the basin of the Babcock Creek is mostly covered by dense forest, there are few outcrops.

In this report the investigated area is devided into 3 areas as Fig. (BBCK-74-09-8).

CHAPTER TWO

GEOLOGY AND COAL RESERVES

Section 1. General Description

The purpose of this survey since the year 1973, was to ascertain coal reserves within the Gates Member suitable for hydraulic mining in the Caribou Area and Center Area of the Bobcock property and to ascertain the ^{? member} member of coal seams of Gething Formation, and at the same time to confirm mineable clean coal reserves as related to present proposed mining plans.

For the matter the scope of investigation was decided as follows:

- 1) to ascertain the number of coal seams, thickness and extent of each seam by core drilling.
- 2) to survey the outcrop by mapping in order to interpret the geological structure.
- 3) to evaluate the coal quality by core samplings and analyses.

During the period of the investigation the follows were executed.

- 1) Surface mapping (scale 1" : 200') 20 mile²
- 2) Diamond drillings 3 holes 2,733 feet
- 3) Lithologic loggings of drill cores.
- 4) Gamma ray, neutron and density loggings of drill holes.
- 5) Trenchings (by caterpillars) 12 Trenches
- 6) Road construction.

Section 2 Geology

(1) Stratigraphy

The formations which are known to occur in this investigated area are most of Lower Cretaceous and Late Jurassic to early Cretaceous in geological age.

The formations have been divided into groups formation and members as shown in the Table of Formation.

These surveys were concentrated on the Gates Member situated in the lower portion of Commotion Formation and the upper portion of the Gething formation in which the main workable coal seams occur.

The brief description of the formations exposed in the investigated area is on the next page.

(A) Nikanassin Formation

The lower formation in this investigated area is the Nikanassin Formation, the Minne^s Group. This formation consists of fine-grained sand stone, sandy shale and shale with a few thin layers of bad coal and carbonaceous materials.

General speaking, this formation appears to be mainly of marine origine.

Fig. BBCK-74-02-1

GEOLOGICAL CORRELATION AND BRIEF DESCRIPTION OF THE FORMATION
IN "THE BABCOCK PROPERTY".

Series	Stage	Group	Formation (Thickness)	Seam	Columnar Section	Description					
UPPER CRETA.	CENOM- ANIAN	FORT ST. JOHN GROUP	Shaftesbury F. (270 ft.+)	A C O D E F I L E		Alternation of interbedded dirty gray shale and mudstone with a few thin sandy shale.					
			COMMOTION Formation			Boulder Cr. M. (400-460 ft.)	Coarse fine grained, well sorted sandstone, massive conglomerate, and non-marine gray shale with thin layers of carbonaceous materials.				
						Halcross M. (300 ft.)	Dark-gray marine shale and sandy shale with a few sideritic concretions and kaolinitic mudstones.				
						GATES Member (860-900 ft.)	Upper Gates Interval	Cyclic alternation of interbedded gray shale and coarse-fine grain sandstone, conglomerate and coal. About five coal seams are workable and other 4 coal seams are unworkable.			
			Babcock Member								
			D.E.F. Zone and Middle Gates Interval								
			Quintette Member								
			Moosebar F. (500-700 ft.)				Dark gray marine shale with sideritic concretions; glauconitic sandstone and pebbles at base.				
			?			APTIAN	BULLHEAD GROUP	Gething F. (450-400 ft.)	Bird		Fine to coarse-grained, brown, calcareous, carbonaceous sand, coal, coaly shale, carbonaceous shale and conglomerate. 2-3 coal seams are workable and 3 coal seams are unworkable.
								Cadomin F. (150 ft.)	S.K. Ch Middle		Massive conglomerate containing chart and quartzite, pebbles, cobbles.
								Nikanassin Formation			Fine-grained sandstone, sandy shale and shale with a few thin bad coal layers.
			LOWER CRETACEOUS			ALBIAN	FORT ST. JOHN GROUP				
LOWER CRETACEOUS	BARREMIAN	MINNES GROUP									

The relation of the Nikanassin Formation and the Cadomin Formation could not be made clear on this survey.

This formation was said to disconformably underlie the Cadomin Formation.

(B) Cadomin Formation

The Bullhead group in this investigated area has been divided two formations ; in ascending order, Cadomin and Gething formation.

The Cadomin formation is exposed on the north limb of the Murray Syncline and both limbs of the Waterfall Creek Anticline in the this surveyed area.

This formation consists of conglomerate, coarse-grained sandstone and thin sandy shale beds.

The conglomerate contains little flattened and rounded pebbles, well rounded cobbles and boulders of black, white and green chart, white and grey quartzite and quartz.

They are firmly bound by silica cement.

The lower contact in this study is drawn at the base of the lowest massive conglomerate.

The upper contact is drawn where conglomerates or grits disappear, and fine sandstone to sandy shale, shale, and coal seam become common.

The thickness of the Cadomin Formation is about 150 feet.

(C) Gething Formation

This Formation which distributed repeatedly with the parallel alignment to folding axes is exposed in the Caribou Area and the Center Area.

The Gething Formation conformably overlies the Cadomin Formation.

The thickness of the Gething Formation is approximately 400 to 450 feet and it decreases slightly in thickness north-west ward from the Gordon Creek. However, the section on the south limb in the Caribou Area is about 750 feet thick. It contains some reverse faults and part of the section have been repeated.

This formation consists of alternation units of sandstone and carbonaceous shale with some coal seams and sandy shale and conglomerate.

Sandstones occur in thick-bedded up to massive and are fine to coarse grained, conglomeratic sandstone and in most place produced several smaller ridges being cliff maker.

In this formation measure, there exist more than six coal seams including thin seams of more than one feet. However, about four workable coal seams including seams of both good and bad continuity, were confirmed by trenches, hand trenches and coal floats.

The workable coal seams of the area are named middle coal, Skeeter, Chamberlain, and Bind Seam in ascending order, and which are included in the upper 200 feet of the Gething Formation.

The upper boundary is placed at the base of marine sediments consisting of glauconitic bed.

(D) Moosebar Formation

The Fort St. John Group has been divided, in ascending order, into the Moosebar, the Commotion and the Shaftesbury Formation in the Quintette Mountain and the Babcock Mountain area.

This Formation occurs between the prominent ridges of the Gething Sandstone and the Gates Member of the Commotion Formation, and is exposed in narrow valleys in parallel with the strike of the strata in this surveyed area.

The thickness of the Moosebar Formation is 500 to 700 feet. The variations in thickness are attributed to decrease in thickness to the Waterfall Creek Syncline from the south limb of the Murray Syncline.

The Moosebar Formation can be separated into two broad subdivisions in this surveyed area.

Shale in the lower part of the Moosebar Formation are dark grey to black and weathered brownish grey and includes .

sideritic concretions, thin layers of bentonite and contains of thin layers of sandy shale in places.

At seventy feet above the base of the formation, a limestone one foot in thickness containing coral fossils was found, in most places. This bed show comparatively consistent in the investigated area.

At the base of this formation, glauconite argillaceous sandstone disseminating small chert pebbles about two feet thick overlies directly the Gething Formation.

The upper part of this formation consists of banded or fissiled sandy shale, very fine sandstone, and sandstone intercalating thin shale.

(E) Gates Member

The Gates Member, exposed in the Caribou area, the Center area and the Babcock Creek area, conformably overlies the Moosebar Formation.

It is approximately 900 feet in thickness, which is almost same thickness as the area investigated in 1973.

The Gates Member is subdivided into four parts; Quintette Member, Middle Gates Interval and D.E.F. zone, Babcock Member and Upper Gates Interval in ascending order.

Subdivisions of Middle Gates Interval and D.E.F. zone, in the report in 1973, are combined in this report. Because it is not necessary to distinguish,

These lithologies are as follows :

Quintette Member

This part consists mainly of sandy shale, containing shale and thin coal seams in some horizons.

Thin conglomeratic sandstone, at the boundary between the Moosebar Formation and the Gates Member, does not develop in this area as well as in the Waterfall Creek area.

Middle Gates Interval and D.E.F. zone

This part, including main workable coal seams, predominantly consists of sandstone and shale which contain some conglomeratic sandstone and sandy shale.

This part shows three to four cycles of sedimentation, beginning with laminated medium grained sandstone and closing shale including coal. The interval between coal seams are not variable.

The thickness of this part is about 300 feet.

Babcock Member

This part consists mainly of hard massive coarse sandstone or conglomerate and grits, interbedded thin shale layers or coal seams in the upper horizon. These conglomerate forming small cliffs, are the markable beds of the Gates Member.

Upper Gates Interval

This part, exposed along the Babcock Creek and on the

drilling access road, predominantly consists of shale, intercalating sandy shale or very fine sandstone beds and coal seams. Those coal seams are correlated to A, B and C seam in the Waterfall Creek area and are too thin to be workable.

(F) Hulcross Member

This formation is exposed in the Caribou area, the Center area and along the Babcock Creek. The lower contact of the Hulcross Member with the Gates Member is conformable and distinct commonly marked by a layer of chert pebbles.

The Hulcross Member consists mainly of rubbly to blocky shale or mudstone with thin sandy shale or very fine sandstone. The shale is dark gray to black, and contains sideritic concretions in lower part. This Member contains 2 or 3 Kaolinite layers in upper part.

Near the top of the member, poorly bedded argillaceous sandy shale beds are common and they contain thin beds of fine grained laminated sandstone.

(G) Boulder Creek Member

This member, the cliff maker forming the south-western ridge of the Babcock Mountain, is exposed on the Caribou area, the Babcock Creek and the Center area.

Above all in the Caribou area, this member forms the saw shape ridge reaching the Babcock Creek.

This member, succeeded conformably from the Hulcross Member, consists of massive graywacke, conglomerate and shale or mudstone in the lower part, the alternation of sandstone and shale in the middle part and massive conglomeratic sandstone in the upper part.

The conglomerate in this Member consists of medium and fine grains and grits of chert. The sandstone is coarse grained and shows cross-beddings well.

The Boulder Creek Member is 400 feet to 450 feet thick, but southwards it slightly thins.

The boundary with the Shaftesbury Formation is determined at the top of the most upper conglomerate in this member.

(H) Shaftesbury Formation

This formation is conformably succeeded from the Compton Formation and is exposed along the axes of the Babcock Syncline and the Murray Syncline in the north-western side of the Babcock Creek. This formation consists of mainly dark grey to black shale or mudstone and includes thin sandy shale. On the lower part of this formation there are some sheets of kaolinitic shale several inches thick. On the basin of the downstream of the Gordon Creek, muddy and sandy shale, ranging about tens feet thick, is exposed but seems to be different from the Shaftesbury Formation. It is hard to fix the stratigraphy of those

muddy,sandy shale beds for few field data, and so that is included in the Shaftesbury Formation in this report.

The Shaftesbury Formation is 300 feet thick in north-west to Babcock Mountain and has possibility of getting thicker at the Gordon Creek.

(2) Geological Structure

An overall picture of the geological structure is afforded by the geological map (Fig. BBCK-74-03), structure contour map (Fig. BBCK-74-05) and cross section (Fig. BBCK-74-04).

This area is divided into two zones as follows:

- 1) Flat structure zone
- 2) Quintette trend folds zone

1) Flat structure zone

This is the Babcock Creek Area in the south-west of the Babcock Mountain. The prevailing dips throughout this zone are 12° - 6° to the south-east and there are some undulations.

On the north-side of this zone there is an anticline. A syncline and another anticline north of the anticline run in parallel. The Gates Member outcrops on the lower of the Babcock Creek owing to those folds.

2) Quintette trend folds zone

This zone has two pairs of anticline and syncline, running from north-west to south-east. Owing to those structures the strata are exposed repeatedly in parallel with the axes of those folds. Folds in this zone are in order north to south,

- (A) Babcock anticline and 2nd Babcock anticline
- (B) Waterfall Creek syncline

(C) Waterfall Creek anticline

(D) Murray syncline

Descriptions in detail for each fold are as follows :

(A) Babcock anticline and 2nd Babcock anticline.

This anticline is located on the boundary between the Babcock Mountain flat area and the Quintette trend folds zone.

The direction of the axis is north-west to south-east with pitching 7° to the southeast. The Babcock syncline is slidden as en échelon and becomes the 2nd Babcock Anticline toward the Gordon Creek. It is asymmetrical anticline with dipping at 12° - 8° in the north limb and 65° in the south.

(B) Waterfall Creek syncline

This syncline runs through the explored area in 1973, the Babcock Creek, the Gordon Creek and the Quintette Mountain. It is one of most main folds in the Quintette trend folds zone and dominates the distribution of coal-bearing strata.

(C) Waterfall Creek anticline

This anticline, extended from the explored area in 1973, runs south-west to the Waterfall Creek syncline in parallel and was traced over the Gordon Creek to the Quintette Mountain. Owing to the axis pitching

at about 7° to the north-west the lower strata are exposed according to the south-east. The dips of the south limb throughout the Caribou area to the Center area vary slightly from 65° to 55°, but the prevailing dips is about 70° uniformly.

This anticline is symmetrical on the whole.

(D) Murray Syncline

This syncline runs south-west to the Waterfall Creek anticline in parallel and was traced to Quintette Mountain beyond the Babcock Creek and the Gordon Creek.

Near the Gordon Creek it slides as an echelon.

Fault ;

(i) Flat structure zone

There are four faults in this block. F-4 fault (a tentative name) confirmed at the downstream of the Babcock Creek, is a reverse fault. In the drill hole 7212 a fault was already confirmed by Denison geologists. At the Gordon Creek, there are F-4' fault (a tentative name) and a minor fault. It is possible F-4 fault and F-4' fault are continued each other.

(ii) Quintette trend fold zone

Several faults are estimated on the south limb of the Murray Syncline. F-1 fault (a tentative name) is

comparatively major and runs from the Boulder Creek to the Babcock Creek with following some faults.

It is estimated that there is a reverse fault (F-2 fault, a tentative name) in the Gething Formation.

In the Center area, a fault is confirmed at the Bird seam in the south limb of the Murray Syncline and a minor fault is estimated near the axis of that syncline.

In the Waterfall Creek side of Babcock Mountain minor faults are estimated but it is hard to infer if those faults influence the coal seams at the deeper area.

Section 3. Coal

(1) Geological Situation of Coal Seam

(A) Coal bearing member

The majority of the coal seam were distributed in a section of the Gething Formation and the Gates Member of the Com-motion Formation.

(A)-1. Gething Formation

This formation contains three to four workable coal seams which named Middle Seam, Chamberlain, Skeeter and Bird Seam in ascending order.

In this investigation the information on the coal seam situation excluding Bird Seam were obtained only in some places, then nothing was made clear on the seam variation toward the strike and dip.

(A)-2. Gates Member

In this property the main coal seams ^{are} ~~situate~~^{cl} near to the center of the Gates Member which section is approximately 900 feet in thickness. Therefore the investigation was centered on this member and 2 drill holes and 12 trenches were carried out.

The workable coal seams of this member are named J, I, F, E and D seam in ascending order. 5 seams

The intervals between D and F, F and J are nearly stable as shown the Correlation Chart Fig. BBCK-74-06.

(B) Seam correlation

Geological correlation and seam correlation and variation are summarized in Fig. BBCK 74-08-1 and BBCK-74-08-2.

The workable coal seams of the Gething Formation are confirmed at drill hole 7403, Trench 21, Trench 19 and Trench 20 in the Center Area. Those seams should be correlated with Bird Seam, Skeeter and Chamberlain, in descending order, confirmed in the Five Cabin and the Wolverine Area. Although we cannot but admit that there remains some ambiguity in relation to details.

General speaking, the workable coal seams of the Gates Member are well traceable through the investigated area.

In the southern limb of the Waterfall Creek Syncline, five workable seams are proved in drill holes 7401, 7402, Trench 7, Trench 5, Trench 4, Trench 14, Trench 13, Trench 11, Trench 12, Trench 15, Trench 16, Trench 17 and Trench 18. These are well correlated to those of the Waterfall Creek Area in 1973, the Babcock Mountain Area and are identified as D, E, F, I and J seam.

In the northern limb of the Murray Syncline of the Caribou Area, those are proved in Trench 9, but that in the southern limb are not confirmed by fault.

In the both limbs of the Murray Syncline of the Center Area, the survey was mainly carried out by surface mapping. The

outcrop of this area is relatively well but the variation and extent of coal seams were not confirmed excluding J seam.

(C) Coal Seam Description

The seam correlation and variation that were confirmed during this investigation are given in Fig. BBCK-74-08-1 and BBCK-74-08-2.

Generally speaking, coal seams of this area are stability in seam succession. This could be considered to be based on a stable environment during the deposition.

The geological behavior of each coal seam shall be explained as follows :

Bird Seam .

This has been confirmed at drill hole 7403, Trench 19, Trench 20, outcrop-1, outcrop-2, outcrop-3, outcrop-4, outcrop-5 and outcrop-6 in the Center Area.

The thickness measured varies maximum of 40.8 feet at drill hole 7403 to minimum of 18.7 feet at Trench 20 in the Center Area. In the Caribou Area, it is considered this has a tendency of thinning out.

This coal seam has three partings 2 to 4 feet thick, shale and sandy shale with thin bad coal layers.

The roof is glauconitic sandstone with chert grains and the floor is shale.

This seam is composed of good coal but the upper part contains lots of pyrite.

J Seam

This seam is well developed and widely distributed in this property. This has been confirmed at drill holes 7401, 7402, Trench 9, Trench 7, Trench 5, Trench 4, Trench 14, Trench 13, Trench 11, Trench 12, Trench 15, Trench 16, and Trench 17 in the southern limb of the Waterfall Creek Area.

The thickness is 21 feet to 16 feet and the coaly shale parting of about 3 feet to 2 feet in the middle divides the seam into two parts. J seam contains some another coaly shale or shale partings of a few inches located about 2 feet below the roof.

Visually lower part is of better quality compared with upper part.

This seam succession is well enough stable as the Waterfall Creek Area in 1973.

The roof is shale or sandy shale.

At Trench 15, Trench 16 and Trench 17 where shale contains carbonaceous material which may give poor roof condition, but in most place the roof is well.

The floor is shale and well.

I seam

1/2 thickened

This seam has a tendency of thickening toward the southern-east from drill hole 7302 in the Waterfall Creek Synclinal Area and is well developed in company with J seam in the Center Area.

This has been confirmed at drill hole 7401, 7402, Trench 9, Trench 7, Trench 5, Trench 4, Trench 14, Trench 13, Trench 11, Trench 12, Trench 15, Trench 16 and Trench 17.

This seam is divided into two parts by a shale parting of about 4 feet in the middle. The upper part is about 11.2 feet in thickness and contains few thin partings of coaly shale in places. The lower part consists of coaly shale and bad coal alternating and is 2 - 4 feet in thickness.

Visually the upper part seemed to be composed of good coal but it has thin partings and the lower part is exceedingly bad quality.

At Trench 5, Trench 4 and Trench 16 where a parting becomes thin this seam is 15 - 16 feet in thickness.

The roof is shale and sandy shale. Shale contains carbonaceous materials in places which may give poor roof condition, but generally the roof is good.

The floor is shale and well.

F seam

This has been confirmed at drill holes 7401, 7402, Trench 9,

Visually this seemed to be of better quality toward the south.

The roof is shale or sandy shale and well. In some places shale is intercalated coal lenses.

The floor is shale and well.

D seam

This seam is highly developed in the both limbs of the Murray Syncline and the Waterfall Creek Syncline.

This has been confirmed at drill holes 7401, 7402, Trench 5, Trench 14, Trench 13, Trench 11, Trench 12, Trench 15, Trench 16, Trench 17 and Trench 18 in the southern limb of the Waterfall Creek Syncline and Trench 9 in the southern limb of the Waterfall Creek Anticline. In the Center Area of the Murray Syncline this is confirmed in such a situation of coal float in many places.

The thickness attains 9 feet at Trench 9 in the northern limb of the Murray Syncline and 8 - 10.5 feet in the southern limb of the Waterfall Creek Syncline. This seam is almost entirely good quality and in the south portion thin coal part of 1 - 2 feet is accompanied about 2 feet below the floor. In some place there is a layer of bony at the top.

The roof is massive sandstone or granule to pebble bearing sandstone and well. The floor is shale.

Trench 5, Trench 4, Trench 14, Trench 13, Trench 11, Trench 12, Trench 15, Trench 16 and Trench 17 in the north limb of the Waterfall Creek Syncline. In the Babcock Creek Area, this seam is exposed on a small scale at the lower Babcock Creek.

This seam attains the maximum thickness of 13 feet of Trench 16 and about 8 feet at Trench 13 in the north limb of the Waterfall Creek Syncline. The average of thickness is about 9.5 - 10 feet, but on the lower Babcock Creek this is 6 feet in thickness due to the fault. In the Waterfall Creek Area in 1973 thin coal part existed about 2 feet below the floor was well developed. However, this part has a not confirmed in most place. south and thins out.

In most place there is a bed of bony at the top which gradually changes to shale of the roof.

The floor is shale and well.

E seam

This has been confirmed at drill holes 7401, 7402, Trench 9, Trench 5, Trench 4, Trench 14, Trench 13, Trench 11, Trench 12, Trench 15, Trench 16 and Trench 17.

This seam is 11 - 13 feet in thickness and traced about 3.5 miles from drill hole 7401 to Trench 17 in this area. The seam contains partings consisting of 2 - 3 shales or coaly shale. The coal portion of the lower part have a tendency of thinning out toward the south and changes carbonaceous shale. On the other hand that of the upper part are gradually thickening toward the south.

Section 2. Coal Reserves

The coal reserves calculation was made on the following bases.

a) The limit of the calculated area is defined by cross section 109 in the west, the Babcock Anticlinal axis in the north and the Gordon Creek in the east. The area is divided by the geological structure and the stage of mining as below.

- 1) Caribou Area
- 2) Center Area
- 3) Babcock Creek Area

b) The limit of the workable seams are defined by the above about 10 feet in thickness.

c) According to the mining engineer's suggestion four computed depth of above ^{*}4,800 feet, above ^{*}3,800 feet, above ^{*}3,000 feet and below 3,000 feet above sea level are adopted. The supposed main entries are from 4 degrees to 7 degrees. The limit of the mineable area on each seam is drawn on the coal reserves calculation map.

d) In the Murray Syncline Area uncertain seams are excluded from calculation.

Method of coal reserves calculation :

It is based on the structure contour map on elevation view in the area above 3,000 feet main entry level and on the structure contour map on plane in the area below 3,000 feet main entry level. The calculation formula~~y~~ is as under and calculation was tabulated in TABLE 1— 1 3

* main entry level.

Theoretical coal reserves = coal thickness (in feet) x sp. gr. of 1.4
x *true area x 0.0283 (conversion factor from pound to metric ton).

* true area is included oxidized zone near the surface and
safety pillar under the creek.

Mineable clean coal reserves = Theoretical coal reserves x
geological factor x *mineable recovery.

* Mineable recovery is including oxidized zone + mining
safety pillar + mining factor + yield.

Coal reserves ;

The estimated coal reserves were based on the method as described
above and were tabulated as TABLE 1 - TABLE 13.

Mineable clean coal reserves, between 2,800' and 5,400' sea level,
were as follows :

	Mineable clean coal reserves (M. Tons)
Calculated in 1973	21,925,000
Reviewed in 1974	11,678,000
Calculated in 1974	60,309,000
Total	93,912,000

TABLE 1

D Seam Reserves (metric tons)

Reserve Block	Level	Seam Thickness (Ft)	Coal Thickness (Ft)	Plan Area (Ft ²)	Dip	Theoretical Coal Reserve (Tons)
Caribou-North	above 3000'S.	8.2	7.5	12,377,000	57°	6,809,000
	below 3000'S.	8.9	8.1	23,464,000	40°	9,764,000
	Total	8.7	7.9	35,841,000	48°	16,573,000
Caribou-South	above 3000'S.	7.8	7.2	16,969,000	52°	7,836,000
	below 3000'S.	6.6	6.1	8,529,000	36°	2,555,000
	Total	7.5	6.9	25,498,000	48°	10,391,000
Center-North	above 3000'S.	9.1	7.3	8,518,000	65°	5,845,000
	below 3000'S.	9.8	7.9	10,715,000	43°	4,548,000
	Total	9.4	7.6	19,233,000	56°	10,393,000
Center-South	Total	8.7	7.0	3,626,000	47°	1,477,000
Reviewed Area	above 3000'SL	12.7	12.5	10,210,000	44°	7,001,000
	below 3000'SL	11.5	11.3	7,596,000	40°	4,442,000
	Total	12.2	12.0	17,806,000	42°	11,443,000
Babcock Creek Area B-1	above 3000'SL	7.9	6.5	10,314,000	35°	3,240,000
	below 3000'SL	9.4	7.8	10,545,000	35°	3,957,000
	Total	8.7	7.2	20,859,000	35°	7,197,000
Babcock Creek Area B-2	above 3000'SL	8.3	6.9	12,840,000	26°	3,879,000
	below 3000'SL	10.2	8.4	10,611,000	15°	3,675,000
	Total	9.1	7.5	23,451,000	22°	7,572,000
Babcock Creek Area B-3	above 3000'SL	9.9	7.6	77,969,000	9°	23,811,000
	below 3000'SL	10.6	8.8	19,303,000	13°	6,929,000
	Total	10.1	7.8	97,272,000	10°	30,740,000
Babcock Creek South	above 3000'SL	10.0	7.9	12,133,000	38°	4,814,000
	below 3000'SL	9.9	7.8	8,232,000	39°	3,288,000
	Total	10.0	7.9	20,365,000	38°	8,102,000
Gross Total	above 3000'			164,956,000		64,730,000
	below 3000'			98,995,000		39,158,000
	Total	9.3	7.9	263,951,000		103,888,000

TABLE 2

E Seam Reserves (metric tons)

Reserve Block	Level	Seam Thickness (Ft)	Coal Thickness (Ft)	Plan Area (Ft ²)	Dip	Theoretical Coal Reserves (Tons)
Caribou-North	above 3000'S.	10.0	7.1	7,469,000	59°	4,060,000
	below 3000'S.	10.0	7.1	10,875,000	34°	3,693,000
	Total	10.0	7.1	18,344,000	48°	7,753,000
Caribou-South	above 3000'S.	11.4	7.5	10,515,000	51°	4,948,000
	below 3000'S.	11.4	7.5	209,000	30°	72,000
	Total	11.4	7.5	10,724,000	51°	5,020,000
Center-North	above 3000'S.	9.8	7.9	8,518,000	65°	6,301,000
	below 3000'S.	8.5	6.9	10,715,000	43°	3,976,000
	Total	9.3	7.5	19,233,000	56°	10,277,000
Center-South	Total	8.6	7.0	3,626,000	47°	1,477,000
Reviewed Area	above 3000'SL	9.1	7.1	9,239,000	45°	3,643,000
	below 3000'SL	9.1	7.1	7,596,000	40°	2,767,000
	Total	9.1	7.1	16,835,000	43°	6,410,000
Babcock Creek Area B-1	above 3000'SL	8.5	6.0	10,314,000	35°	2,989,000
	below 3000'SL	8.5	6.0	10,545,000	35°	3,049,000
	Total	8.5	6.0	20,859,000	35°	6,038,000
Babcock Creek Area B-2	above 3000'SL	8.5	6.0	12,840,000	26°	3,408,000
	below 3000'SL	8.5	6.0	10,611,000	15°	2,617,000
	Total	8.5	6.0	23,451,000	22°	6,025,000
Babcock Creek Area B-3	above 3000'SL	8.5	6.0	77,969,000	9°	18,792,000
	below 3000'SL	8.5	6.0	19,303,000	13°	4,704,000
	Total	8.5	6.0	97,272,000	10°	23,496,000
Babcock-South	above 3000'SL	8.5	6.0	12,133,000	38°	3,636,000
	below 3000'SL	9.2	6.5	8,232,000	39°	2,727,000
	Total	8.8	6.2	20,365,000	38°	6,363,000
Gross Total	above 3000'			152,623,000		49,254,000
	below 3000'			78,086,000		23,605,000
	Total	8.9	6.5	230,709,000		72,859,000

TABLE 3

F Seam Reserves (metric tons)

Reserve Block	Level	Seam Thickness (Ft)	Coal Thickness (Ft)	Plan Area (Ft ²)	Dip	Theoretical Coal Reserves (Tons)	Mining Recovery	Minable Clean Coal Reserves (Tons)
Caribou-North	above 4800'M.E.	10.3	9.5	* 2,920,000	68°	1,186,000	36.4%	432,000
	4800'M.E.-3800'M.E.	9.7	9.0	* 7,266,000	68°	2,819,000	46.0%	1,297,000
	3800'M.E.-3000'M.E.	10.1	9.3	* 12,172,000	63°	5,052,000	53.0%	2,678,000
	Sub-total	10.0	9.2	* 22,358,000	65°	9,057,000	48.7%	4,407,000
	3000'M.E.-3000'SL	10.4	9.6	4,618,000	55°	3,099,000		
	below 3000'SL	9.7	9.0	16,610,000	41°	7,855,000		
	Sub-total	9.8	9.1	21,228,000	45°	10,954,000		
Total	10.0	9.2	43,586,000	54°	20,011,000		4,407,000	
Caribou-South	above 4800'M.E.	10.5	9.6	* 4,230,000	62°	1,805,000	41.8%	755,000
	4800'M.E.-3800'M.E.	10.1	9.3	* 11,057,000	56°	4,916,000	44.2%	2,171,000
	3800'M.E.-3000'M.E.	11.2	10.3	* 11,722,000	59°	5,589,000	43.5%	2,433,000
	Sub-total	10.7	9.8	* 26,989,000	58°	12,310,000	43.5%	5,359,000
	3000'M.E.-3000'SL	10.0	9.2	5,616,000	37°	2,583,000		
	below 3000'SL	11.2	10.3	8,914,000	39°	3,622,000		
	Sub-total	10.7	9.8	12,530,000	38°	6,205,000		
Total	10.7	9.8	39,519,000	51°	18,515,000		5,359,000	
Center-North	above 4800'M.E.	9.5	8.5	* 4,715,000	70°	1,701,000	38.9%	661,000
	4800'M.E.-3800'M.E.	9.6	8.6	* 8,807,000	69°	2,486,000	47.5%	1,182,000
	3800'M.E.-3000'M.E.	10.5	9.4	* 6,583,000	65°	2,704,000	32.5%	879,000
	Sub-total	9.9	8.9	* 18,105,000	68°	6,891,000	39.5%	2,722,000
	3000'M.E.-3000'SL	9.6	8.6	2,686,000	59°	1,774,000		
	below 3000'SL	9.5	8.5	10,623,000	43°	4,894,000		
	Sub-total	9.5	8.5	13,309,000	48°	6,668,000		
Total	9.7	8.7	31,414,000	58°	13,559,000		2,722,000	
Center-South	above Main Entry	9.4	8.4	5,711,000	57°	3,015,000		
Reviewed Area	above 3400'SL	9.1	8.5	8,502,000	53°	4,765,000	54.0%	2,573,000
	3400'SL - 2800'SL	9.2	8.6	5,060,000	47°	2,542,000	51.0%	1,297,000
	below 2800'SL	9.5	8.8	11,009,000	34°	4,622,000	48.0%	2,219,000
	Total	9.4	8.7	24,571,000	45°	11,929,000	51.0%	6,089,000
Babcock Creek Area B-1	above 3800'SL	8.4	7.4	2,053,000	27°	677,000		
	3800'SL - 3000'SL	8.7	7.7	9,934,000	37°	3,801,000		
	below 3000'SL	9.9	8.7	13,176,000	34°	5,449,000		
	Total	9.3	8.2	25,163,000	35°	9,927,000		
Babcock Creek Area B-2	above 3800'SL	8.3	7.3	2,097,000	39°	783,000		
	3800'SL - 3000'SL	8.9	7.8	8,087,000	41°	3,311,000		
	below 3000'SL	10.2	9.0	14,893,000	25°	5,850,000		
	Total	9.5	8.4	25,077,000	33°	9,944,000		
Babcock Creek Area B-3	above 3800'SL	9.4	8.3	553,000	10°	185,000		
	3800'SL - 3000'SL	10.0	8.8	65,252,000	9°	22,980,000		
	below 3000'SL	10.2	9.0	32,007,000	9°	11,510,000		
	Total	10.0	8.8	97,812,000	9°	34,675,000		
Babcock Creek South	above 3000'SL	9.9	8.6	9,852,000	44°	4,549,000		
	below 3000'SL	9.9	8.6	12,142,000	44°	5,709,000		
	Total	9.9	8.6	21,794,000	44°	10,258,000		
Gross Total	10.1	9.2	314,647,000		131,833,000		18,577,000	

Note : SL - Sea Level

M.E. - Main Entry

* - Plan area on the elevation view

TABLE 4

I Seam Reserves (metric tons)

Reserve Block	Level	Seam Thickness (Ft)	Coal Thickness (Ft)	Plan Area (Ft ²)	Dip	Theoretical Coal Reserves (Tons)	Mining Recovery	Minable Clean Coal Reserves (Tons)
Caribou-North	above 4800'M.E.	15.0	12.5	* 3,421,000	69°	1,820,000	37.3%	680,000
	4800'M.E. -3800'M.E.	15.8	13.2	* 8,014,000	67°	4,538,000	46.9%	2,129,000
	3800'M.E. -3000'M.E.	14.6	12.2	* 11,632,000	64°	6,238,000	52.9%	3,299,000
	Sub-total	15.1	12.6	* 23,067,000	66°	12,596,000	48.5%	6,108,000
	3000'M.E. -3000'SL	13.1	10.9	3,364,000	59°	2,816,000		
	below 3000'SL	13.3	11.1	17,969,000	45°	11,154,000		
	Sub-total	13.3	11.1	21,333,000	48°	13,970,000		
Total	14.0	11.7	44,400,000	56°	26,566,000		6,108,000	
Caribou-South	above 4800'M.E.	12.9	9.9	* 4,236,000	62°	1,872,000	41.3%	774,000
	4800'M.E. -3800'M.E.	13.2	10.1	* 8,549,000	60°	3,970,000	46.6%	1,852,000
	3800'M.E. -3000'M.E.	15.9	12.2	* 8,217,000	57°	4,741,000	46.8%	2,221,000
	Sub-total	14.2	10.9	* 21,002,000	59°	10,583,000	45.8%	4,847,000
	3000'M.E. -3000'SL	12.1	9.3	5,484,000	37°	2,520,000		
	below 3000'SL	15.5	11.9	3,985,000	30°	2,179,000		
	Sub-total	13.5	10.4	9,469,000	34°	4,699,000		
Total	13.9	10.7	30,471,000	51°	15,282,000		4,847,000	
Center-North	above 4800'M.E.	14.3	9.9	* 4,758,000	71°	1,980,000	39.2%	776,000
	4800'M.E. -3800'M.E.	14.2	9.8	* 11,406,000	70°	4,694,000	48.5%	2,278,000
	3800'M.E. -3000'M.E.	13.7	9.5	* 12,165,000	65°	5,069,000	53.1%	2,693,000
	Sub-total	14.0	9.7	* 28,329,000	68°	11,743,000	48.9%	5,747,000
	3000'M.E. -3000'SL	13.9	9.6	2,415,000	62°	1,950,000		
	below 3000'SL	13.6	9.4	13,862,000	43°	7,155,000		
Sub-total	13.6	9.4	16,277,000	48°	9,105,000			
Total	13.9	9.6	44,606,000	59°	20,848,000		5,747,000	
Center-South	above Main Entry	13.6	9.4	10,042,000	51°	5,994,000		
Reviewed Area	above 3400'SL	12.1	11.0	5,083,000	46°	3,176,000	54.0%	1,715,000
	3400'SL-2800'SL	12.1	11.0	4,351,000	48°	2,842,000	51.0%	1,933,000
	below 2800'SL	13.2	12.0	11,304,000	35°	6,594,000	48.0%	3,165,000
	Total	12.6	11.5	20,738,000	41°	12,612,000	50.0%	6,813,000
Babcock Creek Area B-1	above 3800'SL							
	3800'SL - 3000'SL							
Babcock Creek Area B-2	above 3800'SL							
	3800'SL - 3000'SL							
Babcock Creek Area B-3	above 3800'SL							
	3800'SL - 3000'SL							
Babcock Creek South	above 3000'SL	13.5	9.7	6,780,000	43°	3,579,000		
	below 3000'SL	13.4	9.6	15,880,000	43°	8,296,000		
	Total	13.5	9.7	22,660,000	43°	11,875,000		
Gross Total				172,918,000	52°	93,177,000		23,515,000

Note: SL - Sea Level M.E. Main Entry * - Plan area on the elevation view

TABLE 5

J Seam Reserves (metric tons)

Reserve Block	Level	Seam Thickness (Ft)	Coal Thickness (Ft)	Plan Area (Ft ²)	Dip	Theoretical Coal Reserves (Tons)	Mining Recovery	Minable Clean Coal Reserves (Tons)	
Caribou-North	above 4800'M.E.	17.8	16.0	* 3,421,000	69°	2,331,000	39.6%	923,000	
	4800'M.E.-3800'M.E.	18.4	16.5	* 8,014,000	67°	5,692,000	48.7%	2,770,000	
	3800'M.E.-3000'M.E.	18.3	16.4	*11,632,000	64°	8,379,000	50.6%	4,242,000	
	Sub-total	18.3	16.4	*23,067,000	66°	16,412,000	48.3%	7,935,000	
	3000'M.E.-3000'SL	16.9	15.2	6,664,000	56°	7,133,000			
	below 3000'SL	18.1	16.2	24,524,000	39°	20,126,000			
	Sub-total	17.7	15.9	31,188,000	44°	27,259,000			
	Total	17.9	16.1	54,255,000	52°	43,671,000		7,935,000	
	Caribou-South	above 4800'M.E.	17.1	15.8	* 4,236,000	62°	2,998,000	42.7%	1,281,000
		4800'M.E.-3800'M.E.	16.7	15.4	* 8,549,000	60°	6,032,000	45.3%	2,735,000
3800'M.E.-3000'M.E.		18.2	16.8	*10,636,000	58°	8,356,000	50.5%	4,223,000	
Sub-total		17.4	16.1	*23,421,000	59°	17,386,000	47.4%	8,239,000	
3000'M.E.-3000'SL		16.3	15.1	7,129,000	42°	5,724,000			
below 3000'SL		18.6	17.4	10,243,000	38°	8,958,000			
Sub-total		17.7	16.4	17,372,000	40°	14,682,000			
Total		17.6	16.3	40,793,000	50°	32,068,000		8,239,000	
Center-North		above 4800'M.E.	18.6	17.3	* 4,758,000	71°	3,461,000	40.3%	1,394,000
		4800'M.E.-3800'M.E.	19.1	17.7	*11,406,000	70°	8,475,000	44.1%	3,740,000
	3800'M.E.-3000'M.E.	18.8	17.5	*12,165,000	65°	9,295,000	48.4%	4,495,000	
	Sub-total	18.8	17.5	*28,329,000	68°	21,231,000	45.4%	9,629,000	
	3000'M.E.-3000'SL	18.0	16.7	2,415,000	62°	3,390,000			
	below 3000'SL	17.1	15.9	13,862,000	44°	12,155,000			
	Sub-total	17.3	16.1	16,277,000	48°	15,545,000			
	Total	18.2	16.9	44,606,000	59°	36,776,000		9,629,000	
	Center-South	above Main Entry	18.4	17.1	10,042,000	51°	10,872,000	48.9%	5,316,000
	Reviewed Area	above 3400'SL	15.7	14.3	5,083,000	46°	4,126,000	54.0%	2,228,000
3400'SL - 2800'SL		16.1	14.7	4,351,000	48°	3,788,000	51.0%	1,932,000	
below 2800'SL		16.0	14.6	11,304,000	35°	8,030,000	48.0%	3,854,000	
Total		16.0	14.6	20,738,000	41°	15,944,000	50.0%	8,014,000	
Babcock Creek Area B-1	above 3800'SL	21.0	21.0	841,000	14°	722,000			
	3800'SL - 3000'SL	20.3	20.3	7,006,000	26°	6,285,000			
	below 3000'SL	20.0	20.0	16,314,000	24°	14,119,000			
	Total	20.1	20.1	24,160,000	24°	21,126,000			
Babcock Creek Area B-2	above 3800'SL	21.0	21.0	633,000	22°	568,000			
	3800'SL - 3000'SL	21.7	21.7	5,886,000	33°	6,043,000			
	below 3000'SL	18.9	18.9	17,723,000	21°	14,215,000			
	Total	19.4	19.4	24,242,000	25°	20,826,000			
Babcock Creek Area B-3	above 3800'SL	19.0	19.0	43,172,000	9°	32,831,000			
	3800'SL - 3000'SL	17.4	17.4	58,005,000	11°	40,725,000			
	Total	18.1	18.1	101,176,000	10°	73,556,000			
Babcock Creek South	above 3000'SL	19.0	17.8	6,780,000	43°	6,555,000			
	below 3000'SL	17.7	16.6	15,880,000	43°	14,296,000			
	Total	18.1	17.0	22,660,000	43°	20,851,000			
Gross Total						342,672,000		275,690,000	
								39,133,000	

Note: SL - Sea Level M.E. - Main Entry *- Plan area on the elevation view

COAL RESERVES

TABLE 6

Area	Level	D	E	Level	F		I		J		Theoretical Reserves	Minable Coal Reserves	Clean Reserves
		Theoretical Reserves	Theoretical Reserves		Theoretical Reserves	Minable Coal Reserves	Theoretical Reserves	Minable Coal Reserves	Theoretical Reserves	Minable Coal Reserves			
CARIBOU - NORTH				Above 4,800 M.E.	1,187,000	432,000	1,821,000	680,000	2,331,000	923,000			
				4,800 M.E. - 3,800 M.E.	2,819,000	1,297,000	4,538,000	2,129,000	5,692,000	2,770,000			
				3,800 M.E. - 3,000 M.E.	5,052,000	2,678,000	6,238,000	3,299,000	8,379,000	4,242,000			
		Above 3,000 M.E.	6,809,000	4,060,000	Sub-total	9,057,000	4,407,000	12,596,000	6,108,000	16,412,000	7,935,000	38,065,000	18,450,000
					3,000 M.E. - 3,000 SL	3,099,000		2,816,000		7,133,000			
					Below 3,000 SL	7,855,000		11,154,000		20,126,000			
		Below 3,000 M.E.	9,764,000	3,693,000	Sub-total	10,954,000		13,970,000		27,259,000			
		Total	16,573,000	7,753,000	Total	20,011,000	4,407,000	26,566,000	6,108,000	43,671,000	7,935,000	114,574,000	18,450,000

COAL RESERVES

TABLE 7

Area	Level	D	E	Level	F		I		J		Theoretical Reserves	Minable Clean Coal Reserves	
		Theoretical Reserves	Theoretical Reserves		Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves			
CARIBOU - SOUTH				Above 4,800 M.E.	1,805,000	755,000	1,872,000	774,000	2,998,000	2,998,000			
				4,800 M.E. - 3,800 M.E.	4,916,000	2,171,000	3,970,000	1,852,000	6,032,000	2,735,000			
				3,800 M.E. - 3,000 M.E.	5,589,000	2,433,000	4,741,000	2,221,000	8,356,000	4,223,000			
		Above 3,000 M.E.	7,836,000	4,948,000	Sub-total	12,310,000	5,359,000	10,583,000	4,847,000	17,386,000	8,239,000	40,279,000	18,445,000
					3,000 M.E. - 3,000 SL	2,583,000		2,520,000		5,724,000			
					Below 3,000 SL	3,622,000		2,179,000		8,958,000			
		Below 3,000 M.E.	2,555,000	72,000	Sub-total	6,205,000		4,699,000		14,682,000			
	Total	10,391,000	5,020,000	Total	18,515,000	5,359,000	15,282,000	4,847,000	32,068,000	8,239,000	81,276,000	18,445,000	

COAL RESERVES

TABLE 8

Area	Level	D	E	Level	F		I		J		Theoretical Reserves	Minable Clean Coal Reserves	
		Theoretical Reserves	Theoretical Reserves		Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves			
CENTER - NORTH				Above 4,800 M.E.	1,701,000	661,000	1,980,000	776,000	3,461,000	1,394,000			
				4,800 M.E. - 3,800 M.E.	2,486,000	1,182,000	2,080,000	1,448,000	5,391,000	2,470,000			
				3,800 M.E. - 3,000 M.E.	2,704,000	879,000	1,705,000 5,069,000	830,000 2,693,000	3,084,000 9,295,000	1,270,000 4,495,000			
		Above 3,000 M.E.	5,845,000	6,301,000	Sub-total	6,891,000	2,722,000	11,743,000	5,747,000	21,231,000	9,629,000	39,865,000	18,098,000
					3,000 M.E. - 3,000 SL	1,774,000		1,950,000		3,390,000			
					Below 3,000 SL	4,894,000		7,155,000		12,155,000			
		Below 3,000 M.E.	4,548,000	3,976,000	Sub-total	6,668,000		9,105,000		15,545,000			
		Total	10,393,000	10,277,000	Total	13,559,000	2,722,000	20,848,000	5,747,000	36,776,000	9,629,000	91,853,000	18,098,000
	CENTER - SOUTH	Total	1,477,000	1,477,000	Total	3,015,000		5,994,000		10,872,000	5,316,000	22,835,000	5,316,000

COAL RESERVES

TABLE 9

Area	Level	D	E	Level	F	I		J		Theoretical Reserves	Minable Clean Coal Reserves
		Theoretical Reserves	Theoretical Reserves		Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves			
REVIEWED AREA				Above 3,400 SL	4,765,000	2,573,000	3,176,000	1,715,000	4,126,000	2,228,000	
	Above 3,000SL	7,001,000	3,643,000	3,400SL - 2,800SL	2,542,000	1,297,000	2,842,000	1,933,000	3,788,000	1,932,000	
	Below 3,000 SL	4,442,000	2,767,000	Below 2,800SL	4,622,000	2,219,000	6,594,000	3,165,000	8,030,000	3,854,000	
	Total	11,443,000	6,410,000	Total	11,929,000	6,089,000	12,612,000	6,813,000	15,944,000	8,014,000	58,388,000

COAL RESERVES

TABLE 10

Area	Level	D	E	Level	F		I		J		Theoretical Reserves	Minable Clean Coal Reserves
		Theoretical Reserves	Theoretical Reserves		Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves		
BABCOCK CREEK AREA B1				Above 3,800 SL		677,000			722,000			
				3,800 SL - 3,000 SL		3,801,000			6,285,000			
	Above 3,000 SL	3,240,000	2,989,000	Sub-total		4,278,000			7,007,000			
	Below 3,000 SL	3,957,000	3,049,000	Below 3,000 SL		5,449,000			14,119,000			
	Total	7,197,000	6,038,000	Total		9,927,000			21,126,000		44,288,000	
BABCOCK CREEK AREA B2				Above 3,800 SL		783,000			568,000			
				3,800 SL - 3,000 SL		3,311,000			6,043,000			
	Above 3,000 SL	3,897,000	3,408,000	Sub-Total		4,094,000			6,611,000			
	Below 3,000 SL	3,675,000	2,617,000	Below 3,000 SL		5,850,000			14,215,000			
	Total	7,572,000	6,025,000	Total		9,944,000			20,826,000		44,367,000	

COAL RESERVES

TABLE 11

Area	Level	E		Level	F		I		J	
		Theoretical Reserves	Theoretical Reserves		Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves	Theoretical Reserves	Minable Clean Coal Reserves
BABCOCK CREEK B3				Above 3,800 SL	185,000					
				3,800 SL - 3,000 SL	22,980,000			32,831,000		
	Above 3,000 SL	23,811,000	18,792,000	Sub-total	23,065,000			32,831,000		
	Below 3,000 SL	6,929,000	4,704,000	Below 3,000 SL	11,510,000			40,725,000		
	Total	30,740,000	23,496,000	Total	34,675,000			73,556,000		
BABCOCK CREEK SOUTH	Above 3,000 SL	4,814,000	3,636,000	Above 3,000 SL	4,549,000		3,579,000		6,555,000	
	Below 3,000 SL	3,288,000	2,727,000	Below 3,000 SL	5,709,000		8,296,000		14,296,000	
	Total	8,102,000	6,363,000	Total	10,258,000		11,875,000		20,851,000	57,449,000
	Gross Total	103,888,000	72,859,000		131,833,000	16,358,000 (18,577,000)*	93,177,000	23,515,000	275,690,000	39,133,000
										79,006,000 (81,225,000)*

Note : * including Minable Clean Coal reserves below 3,000 SL in Reviewed Area.

TABLE 12

BIRD Seam Reserves (metric tons)

Reserve Block	Seam Thickness (Ft)	Coal Thickness (Ft)	Plan Area (Ft ²)	Dip	Theoretical Coal Reserves (Tons)
Center-North	20.0	15.0	13,424,000	65°	19,246,000
Center-South	20.0	15.0	34,659,000	50°	32,318,000
Total	20.0	15.0	48,083,000	56°	51,564,000

SUMMARY OF COAL RESERVES (GATES MEMBER)

TABLE 13
(10³ Metric Tons)

Seam No.	Level	Coal thickness		Surveyed in 1973		Reviewed Area		Surveyed in 1974						Surveyed in 1973 - 1974							
		Seam thickness		Theor. R.	Minable Clean Coal R.	Theor. R.	Minable Clean Coal R.	Level	Caribou Theor. R	Minable Clean Coal R.	Center Theor. R.	Minable Clean Coal R.	Babcock Creek Theor. R.	Minable Clean Coal R.	Surveyed in 1974 Theor. R.	Minable Clean Coal R.	Theor. R.	Minable Clean Coal R.			
D	5,400 SL - 2,800 SL	6.0	11.5	15,570	7,222	7,001		5,400 SL - 3,000 SL	6,809		5,845				57,729		80,300	7,222			
		8.0	14.4							7,836		1,477		35,762							
E		6.0	7.5			3,643				4,060		6,301							45,611	49,254	
		8.5	11.4							4,948		1,477		28,825							
F		8.5	10.30	11,917	5,497	7,307	3,870			9,057	4,407	6,891	2,722					67,559	12,488		21,855
	9.1	13.05						12,310	5,359	3,015		36,286					86,783				
I		8.81	12.57			6,018	3,648		12,596	6,108	11,743	5,747	3,579		38,501	16,702	44,519	20,350			
		10.64	15.65						10,583	4,847											
J		10.50	25.49	17,646	9,206	7,914	4,160		16,412	7,935	21,231	9,629	93,729		159,630	31,119	185,190	44,485			
		13.35	28.09						17,386	8,239	10,872	5,316									
5400 SL - 2800 SL Sub-total				45,133	21,925	31,883	11,678		101,997	36,895	68,852	23,414	198,181		369,030	60,309	446,046	93,912			
D	Below 2,800 SL	6.0	11.5	2,414	(1,005)	4,442		Below 3,000 SL	9,764		4,548		17,849		34,716		41,572	(1,005)			
		8.0	14.4							2,555											
E		6.0	7.5			2,767				3,693		3,976		13,097		20,838		23,605			
		8.5	11.4							72											
F		8.5	10.30	1,353	(589)	4,622	(2,219)			10,954		6,668		28,518		52,345		58,320	(2,808)		
	9.1	13.05						6,205													
I		8.81	12.57			6,594	(3,165)		13,970		9,105										
		10.64	15.65						4,699		5,994		8,296		42,064		48,658	(3,165)			
J		10.50	25.49	24,427	(17,168)	8,030	(3,854)		27,259		15,545				100,116		132,573	(21,022)			
		13.35	28.08						14,682				42,630								
Below 2800 S.L. Sub-total				28,194	(18,762)	26,455	(9,238)		93,853		45,836		110,390		250,079		304,728	(28,000)			
Gross Total				73,327	(40,687)	58,338	(20,916)		195,850	36,895	114,688	23,414	308,571		619,109		750,774	93,912 (121,912)			

Pages 41-60 of this report contain coal quality data, and remain confidential under the terms of the *Coal Act Regulation*, Section 2(1). They have been removed from the public version.

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Section 4. Drillings

(1) Drillings

The 3 drillings with an accumulated footage of 2,733 feet were carried out to obtain fresh samples free from oxidation effect from deeper area and also to confirm the horizon in deeper area.

The excuted locations are given on the Geological map. (Fig. BBCK-74-03). Again the columnar sections of the drill holes are attached to the appendix. (Fig. BBCK-74-06).

In order to reconfirm the depth of coal seam and rock facies in drill holes except 7403, gamma-ray neutron logging has been adopted. The result of loggings is given in the appendix.

(Fig. BBCK-74-07)

The depth of seam and core recovery at drill holes is shown in TABLE 32.

Section 5 Conclusion and future subject

(1) Conclusion

(i) The geological exploration of the Babcock property was carried out from 1973 to 1974. Judging from the geological information obtained at this time, it is considerably effective and appropriate to apply the hydraulic method in this investigated area. The reasons are ;

A) Five seams, named D, E, F, I and J seam with more than 10 feet thick each, have been confirmed as workable ones. The thickness of each seam is very uniform in this area.

B) The geological structure of this area shows a parallel fold and is relatively stable, especially in the proposed plan area the structure is very much stable.

C) The results of coal hardness tests show the fact that it is not difficult to cut the coal by water jet.

(ii) Judging from the analysis data of drill cores, coal quality of this area is much the same compared with that of the Mt. Babcock area. Namely, the coal sample is ranked as medium volatite bituminous and referred to as hard coking coal.

(iii) Supposing application of hydraulic method, mineable clean coal reserves excluding D and E seams is estimated 60.3 million metric tons above the 4^o main entry with the port at EL. 3000 feet.

Pages 63-66 of this report contain coal quality data, and remain confidential under the terms of the *Coal Act Regulation*, Section 2(1). They have been removed from the public version.

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