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PRELIMINARY REPORT

PEACE RIVER COAL PROJECT

Prepared for: Texacal Resources Ltd. (N.P.L.)
Vancouver, B. C.

by: Paul Dyson Consultants and
Holdings Limited,
Calgary, Alberta.

January 1972.

PR-DOWLING CR. 71(4)A.

CONFIDENTIAL

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ABSTRACT

Texacal Resources Ltd. is the operator for a block of twenty seven coal licences in the Peace River Canyon area of northeastern British Columbia. These licences were acquired during the spring and summer of 1971 on the basis of published geological information and regional assumptions regarding the quality of the coal.

Exploration of the coal licences has consisted of ground traversing to confirm the geological interpretation of the area and a limited drilling programme. This programme consisted of four drill holes totalling 2,791 feet of NQ diamond drill hole. All significant coal samples recovered were analyzed by a laboratory familiar with the requirements for coal analyses. This programme was completed in December 1971.

An assessment of all available data from the above programme indicates the coal licences to be underlain by a seam which has the potential of supporting a mine producing one million tons per year of an excellent medium volatile low sulphur coking coal. Further exploration is recommended.

INTRODUCTION

This report reviews acquisition and initial exploration of the joint coal interests of Texacal Resources Limited and Hogan Mines Ltd. in the Peace River area of British Columbia. These coal interests consist of twenty seven coal licences acquired during the spring and summer of 1971.

The licences were acquired to cover portions of a large synclinal area underlain by the coal bearing Gething formation. The report reviews the potential of this area as indicated from old data and as seen in the light of the initial exploration.

The merit of the coal licences is reviewed from three basic points of'view. These are:

a. the presence and probable extent of coal seams in the area,

b. the quality of the coal present in these seams, and,

c. the possibilities for the economic production of coal.

Each of the above is influenced by several other factors including access, adjacent exploration projects, etc. All of these are considered in this report.

PROPERTIES

The properties consist of a total of twenty seven coal licences as shown on Fig. 2. These licences were all acquired during the spring and summer of 1971.

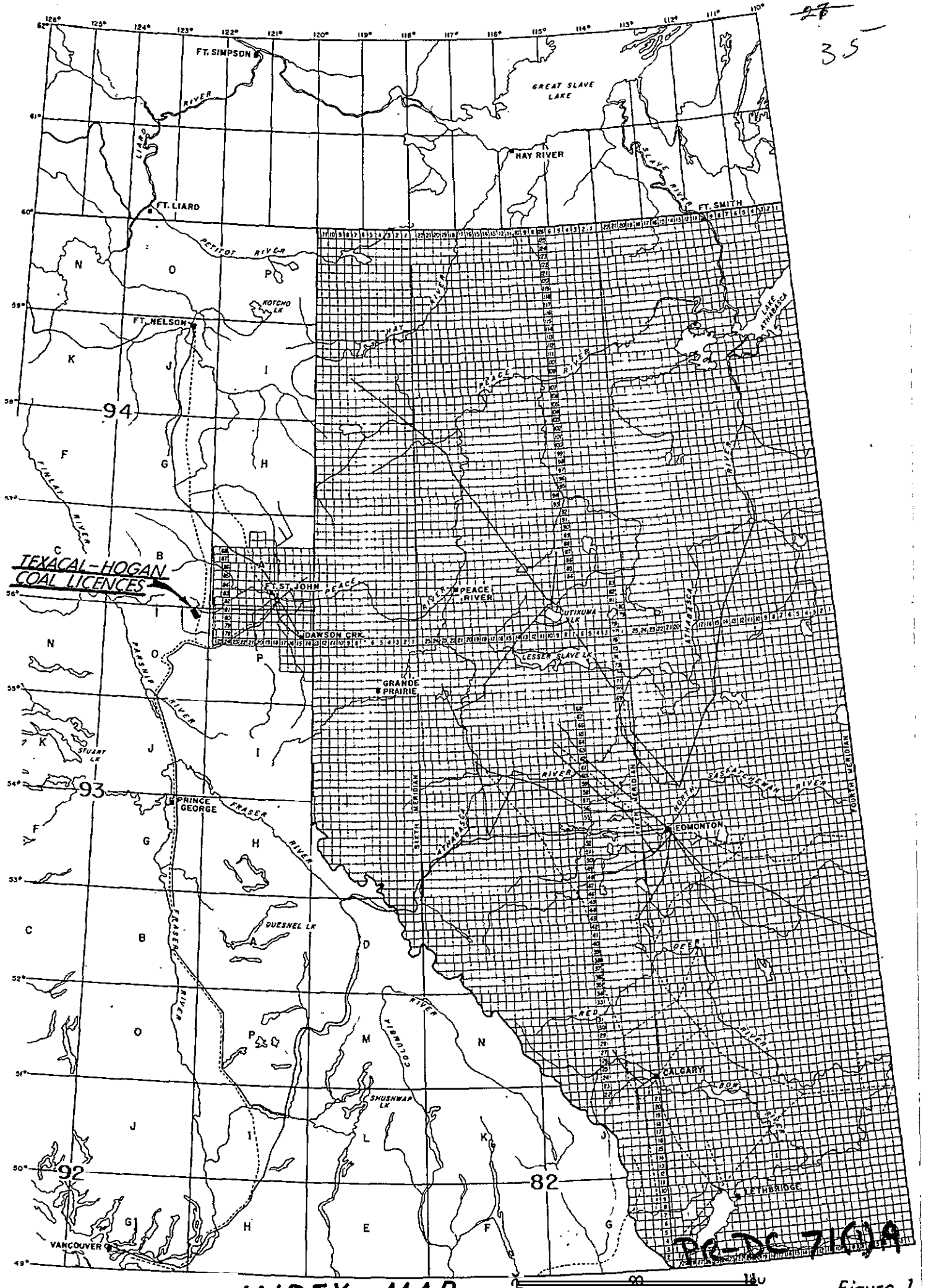
Details as to the ownership and interests in the licences are not contained in this report. Texacal Resources Ltd. is the operator of the licences at this time and have available all information as to ownership.

LOCATION AND ACCESS

The area lies adjacent to the Williston Reservoir in north east British Columbia approximately 90 miles west north west of Dawson Creek and 480 miles almost due north of Vancouver (Fig. 1). An all weather paved road extends from both Dawson Creek and Fort St. John to within two miles of the north east corner of the block of coal licences. A good gravel road being used for logging extends into the coal licences along Johnson Creek in the south east corner of the licence block.

The initial exploration took place at the north end of the licence block (Fig. 2). Existing access in this area was by an old winter trail cut by the Pacific Great Eastern Railroad in the winter of 1959/60. While this trail was impassable as found, it was upgraded to provide access to drill sites at a minimum of cost. Only a minor amount. of new road construction was required for the initial exploration.

The Pacific Great Eastern Railroad passes within 35 miles of the property and further discussion of possible connections to this railroad are contained in the section which reviews the possible economic production of coal from the properties.



INDEX MAP

Figure 1

EXPLORATION

Objectives.

The coal licences were acquired on the basis of certain broad assumptions regarding the potential of the area. These assumptions and the conclusions drawn from them are laid out in some detail in a previous report (Dyson 1971).

Following the acquisition of the licences, an initial exploration programme was carried out having the following technical objectives in mind:

a. a geological understanding of the distribution of the coal bearing rocks in the area of the licences,

b. the confirmation of the presence of coal on the licences,

c. the preliminary delineation of both seam thickness and seam distribution within the coal bearing formation,

d. the establishment of some initial data regarding coal quality, and

e. an initial assessment of the mining possibilities of the properties.

Methods.

These objectives were achieved during the second half of 1971 by the following exploration programme.

All the available data for the area obtainable both from published reports and from private sources was assembled. This information was transferred to a suitable base map and checked with the available air photography for the area. Following this, initial ground work

commenced and approximately one week in mid-August was spent in checking both access and geology on the ground. This work was done on foot with personnel staying in the town of Hudson Hope some 12 miles east of the project area. Attempts were made to locate as many seams at outcrop as possible. However, outcrop was found to be generally non-existent except along the actual creeks. Some areas proved to be too far from vehicular access to be reached on foot. To field check these areas a helicopter was retained for one day early in September. This programme enabled initial drill sites to be located advantageously with respect to the coal measures of the Gething formation.

The drilling method selected was designed to obtain the best information possible as to coal quality and thickness. To this end it was decided to use a diamond drill equipped with NQ wireline equipment. The contract was awarded to Connors Drilling Limited on the basis of a competitive bid.

Short stretches of very soft ground on the access route to the drill sites prevented the commencement of the drilling programme before mid-November. Four drill holes totalling 2,791 feet of drilling were completed by December 15th and the drill moved out. In general, the quality of work performed by the contractor was satisfactory although it is felt that slightly improved core recovery might be attainable.

All the drill holes were logged with a gamma-ray neutron down hole logging device. Where possible a density device was also

utlized. This work was carried out by Roke Oil Enterprises Ltd. and the logs provided a valuable record of the section penetrated. They further provided an excellent aid to correlation from hole to hole.

The coal recovered in the core was analyzed in Calgary by Loring Laboratories Limited. These laboratories were chosen on the basis both of location and of excellent service. The laboratory has also been carrying out extensive analytical progrsmmes for both Canadian Pacific and Scurry Rainbow.

All of the data obtained from the above programme is incorporated into this report.

GEOLOGY

The geology of the Peace River Canyon area is not described in detail in this report. Numerous excellent descriptions of the various rock formations and the lithological variations within the formations are contained in the literature. The stratigraphy is probably best summarized in Stott 1968. However, a few comments with regard to both the stratigraphy and the structure follow.

Stratigraphy.

The Jurassic and Cretaceous stratigraphy of the Peace River foothills has historically been most difficult to resolve. This has resulted in numerous alternate nomenclature systems having been proposed. Some of these are illustrated on Table 1. The nomenclature of Stott 1971 has been used in this report.

As can be seen from the map (Fig. 2), the only formations which are of concern in an evaluation of the Texacal/Hogan properties are the Gething formation and the lower formations of the Fort St. John group, namely the Moosebar formation and the Commotion formation. Descriptions of these three formations follows

a. The Gething Formation.

The Gething formation is the oldest formation occuring in the area of the Texacal/Hogan coal properties. In general, the Gething formation consists of interbedded mudstones, coals and sandstones. The sandstones are usually in thin units and the frequent repetitions of these units are a characteristic

LOWER CRETACEOUS FORMATIONAL NOMENCLATURE

PEACE RIVER CANYON AREA

STOTT 1971 (This Report)	BEACH & SPIVAK 1944	MATHEWS 7947	HUGHES 7964	McLEARN 7923
FORT ST JOHN GROUP: COMMOTION FM. — BOULDER CRK MB. / HVLCROSS MB. / GATES MB.	GATES FM.	GATES FM.	COMMOTION FM.	FORT ST. JOHN GROUP: GATES FM.
FORT ST JOHN GROUP: MOOSE BAR F M.	MOOSE BAR FM.	MOOSEBAR FM.	MOOSEBAR FM.	FORT ST. JOHN GROUP: MOOSEBAR FM.
BULLHEAD GROUP: GETH I NG FM.	GETHING FM.	NON-MARINE BULLHEAD	BULLHEAD SUCCESSION: CRASSIER GROUP: GETHING FM.	BULLHEAD MOUNTAIN FORMATION: GETHING; MB.
BULLHEAD GROUP: CADOMIN FM.	DUNLEVY FM.		CRASSIER GROUP: BRENOT FM.	LOWER MB.
MINNES GP.: MONACH FM.		MARINE BULLHEAD: MONACH FM.	BEAUDETTE GROUP: MONACH FM.	
MINNES GP.: BEATTIE PEAKS FM.		BEATTIE PEAKS FM.	BEAUDETTE GROUP: BEATTIE PEAKS FM.	
MINNES GP.: MONTEITH FM.		MONTEITH FM.	BEAUDETTE GROUP: MONTEITH FM.	

feature of the Gething formation. The thickness of the Gething formation in the Peace River Canyon area is believed to be approximately 1500'. A detailed description of the Gething formation of the Peace River Canyon area has been published by Stott.

It is the coal seams of the Gething formation that are the objective of the coal exploration being carried out in the Peace River area. In general, these coal seams vary from a few inches up to 10 to 15 feet with isolated occurrences being reported of greater thicknesses.

b. Moosebar Formation.

The Moosebar formation directly overlies the Getbing formation. It consists of a monotonous sequence of dark grey to black friable shale. In places thin layers of clay and ironstone occur and'a few thin sandstone lenses are present in the upper part of the formation. The formation has been measured at 1336' by Beach and Spivak 1944 on Track Creek. This location lies within the Texacal/Hogan coal properties.

The contact of the basal shales of the Moosebar formation with the upper sandstone of the Gething formation is abrupt. In the area under consideration, the lower 5' or so of the Moosebar formation is marked by highly glauconitic beds which are readily recognizable both in outcrop and in drill cores. This contact is exposed adjacent to drill sites 1 and 2.

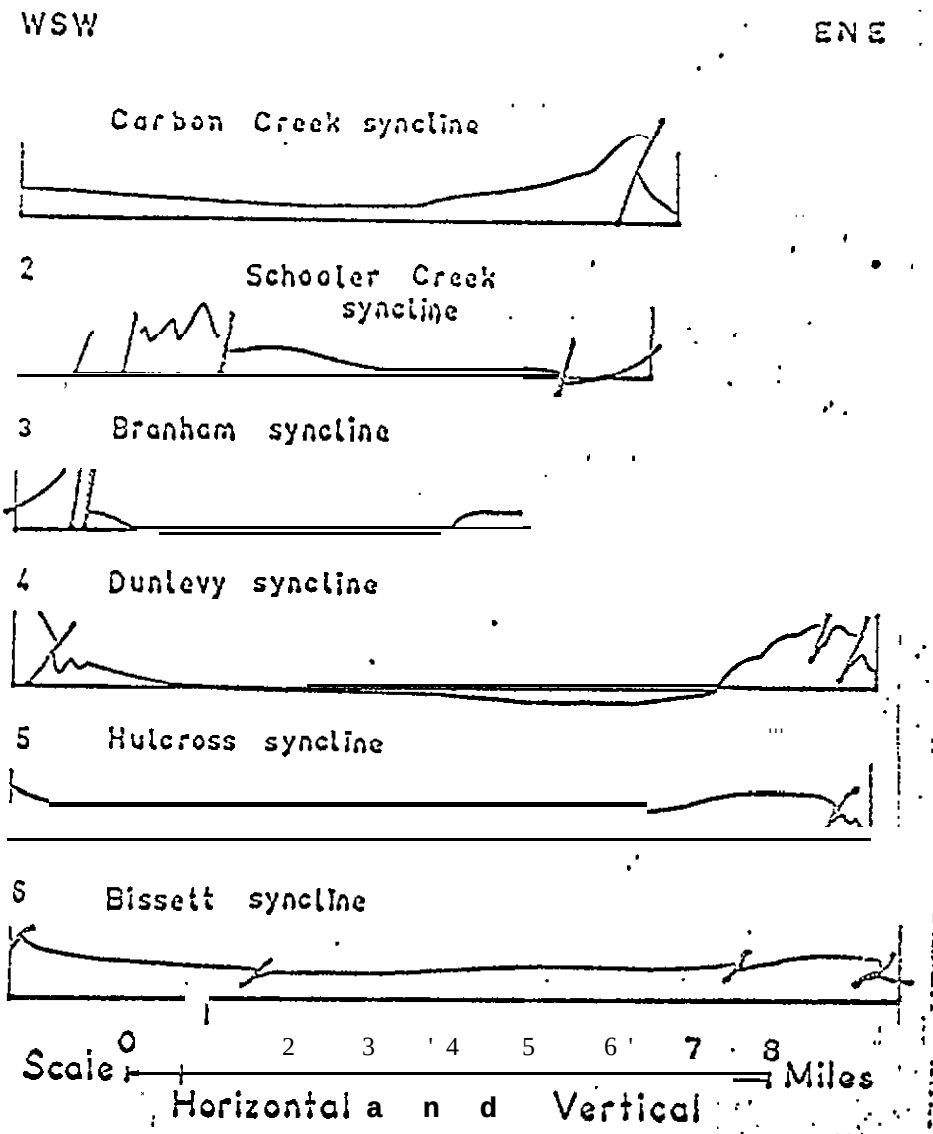
c. Commotion Formation.

The Commotion formation overlies the Moosebar formation with a gradational contact. The top of the Moosebar formation is drawn at the base of the first thick succession of sandstone which is assigned to the Commotion formation. In the area under consideration, the upper contact of the Commotion formation has not been mapped as the mainly sandstone succession of the Commotion is shaling out in this area. The upper contact of the Moosebar formation shown on Fig. 2 is placed at the base of the lowest prominent sandstone of the Commotion formation (the Gates member). This contact is poorly exposed in the map are and has been located from air photographs.

Structure.

The coal properties of Texacal and Hogan lie within the foothills 'structural belt of the Rocky Mountains. This structural belt extends from the United States border to the Yukon along the east side of the Rocky Mountains. It is, for the most part, characterized by a series of synclines, anticlines and west dipping thrust faults. The intensity of deformation varies from one area to another and the Peace River area is characterized by a particular structural style. This structural style has been well illustrated by Hughes 1967 and has been discussed in some detail by Irish 1968 and Fitzgerald 1968. Essentially the Peace River area consists of large relatively broad synclines between sharply faulted anticlines.

34 35 43 IDA



Structural Styles, Peace River Area (Hughes 1967)

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It appears that relatively little faulting is associated with the synclines. On Fig. 2, two prominent anticlines can be seen - one east of the Texacal/Hogan properties and one west of the Texacal/Hogan properties. The coal properties themselves are situated in the area between these two coal properties. Geological field work has confirmed the gentle dipping of the syncline which is well illustrated on cross sections AB and AC (Fig. 2).

Exposuresin the lower part of Gething Creek and along Gaylard Creek do not show any indication of faults existing with more than a few feet in displacement. Even these very small faults were noted in only two or three places. The syncline is believed to be essentially of low dip and unfaulted.

G

COAL

Introduction

The presence of coal in the Peace River area was first recognized by Alexander McKenzie in 1793. This coal was referred to in several reports both of the Geological Survey of Canada and of the B.C. Department of Mines between that date and 1922. In 1922 a detailed description of the coal occurrences of the Peace River Canyon was made by McLearn (McLearn 1922). In this report at least five seams are reported to exceed 4' in thickness and three to exceed 5' 9" in thickness. These three seams were referred to as the Trojan seam, the Murray seam and the Grant seam. The Trojan seam was described as lying some 120 feet below the top of the Gething formation. The Murray and the Grant seams occur over 1000 feet lower in the Gething formation. As the coal licences of Texacal and Hogan cover, for the most part, areas underlain by either pre-Gething or Younger formations, it is the Trojan seam which is of most interest. The exploration programme was laid out with this in mind and has been directed towards evaluation of the possible economic potential of this seam. At the same time the initial drill hole was used to evaluate the upper 1000 feet of Gething formation which might contain other viable coal seams not reported by earlier workers.

Occurrences and Distribution.

a. Trojan Seam.

As this seam is the main prospect it is discussed separately and in some detail. It has previously been reported to lie from 115' to 130' below the Moosebar contact (McLearn 1923) and to vary from almost 9' in thickness on Gething Creek down to a thickness of 3' 6" at contact point, its most easterly exposure. The drilling indicated the seam to vary from 8.3' to 0'. The distance below the Moosebar contact varied from 92' to 99'. All these known occurrences of the Trojan seam are shown on the map (Fig. 2).

An examination of this data shows the seam to be apparently continuous from Coalbed Creek in the south along the Gething outcrop to Gething and Gaylard Creeks in the north. Beyond this point no outcrop of the Trojan seam has been reported to the southwest along Dowling Creek. This lack of reported occurrences of the seam in this area is believed to be due not to the absence of the Trojan seam in this area but rather to the lack of outcrop.

The absence of the seam in Drill Hole #2 is not wholly understood. An examination of the core together with the gamma-ray neutron logs (Fig. 3) shows a distinct variation in lithology for that part of the section within which the Trojan seam should occur. The interval from 140' to 175' 'in this hole is not represented in the other drill holes. It would appear that the Trojan seam has been eroded in this area and that the above interval represents a different sedimentary sequence. In view of the apparent continuity of the Trojan seam

over many miles, it is suggested that this sequence represents a localized deposit. It is probable that the Trojan seam will again be present to the south and west of Drill Hole #2.

The Trojan seam is characterized by the presence of thin sandstone partings. These are present in all the known sections of the seam. They are, however, distinct from,rather than gradational into, the coal. In general, the coal appears to be a clean low ash coal with a slight tendency to increasing siltiness in the lower one foot or so.

b. Other Seams.

It was not believed that any other seams of economic thickness would be present in the upper 1000' of the Gething formation. However, as any seam occurring in this upper 1000 of Gething formation would be of potential economic interest, Drill Hole #1 was completed at a depth of 1007'. The seams penetrated are illustrated on Fig. 3 and where possible are named in accordance with the descriptions of McLearn 1923. The only seam exceeding 5' in thickness other than the Trojan seam was that penetrated from 815' to 821'. This seam was not of acceptable quality (see Table 3) and has not been tested in any other drill holes. The Falls seam (328' to 33' in Drill Hole No. 1) is recognized in Drill Hole #4 but is apparently not present in Drill Holes #2 and #3. It does not appear to be prospective. Similarly, the Titan seam (272' to 274' in Drill Hole #1) is not prospective but can be carried as a marker through the Gaylard and Gething Creeks area.

In Drill Hole #4 a 4' seam (582' to 586') was encountered approximately 40' below the Trojan seam. As can be seen from Table 3 this seam is apparently of excellent coking quality and should be considered as a prospect. Drill Hole #4 is the most southerly drill hole completed to date and so this seam may well be present in the south west portions of the properties.

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for

COAL QUALITY AND

TABLE 2

NEW ANALYSES OF TROJAN SEAM

TABLE 3

NEW ANALYSES OTHER THAN TROJAN SEAM

Refer to:

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CONFIDENTIAL ANALYSIS FILE
PAGES 16 - 22

MINING POTENTIAL

The problems of producing coal economically in Western Canadian foothills are well known. Three main factors affect the viability of a property. These are:

a. a suitable mining method,

b. sufficient recoverable reserves to support a mine, and,

c. an adequate transportation system.

Mining Methods.

The possibility of mining large volumes of coal in the Peace River Canyon area by some form of open pit is believed to be remote. This conclusion is reached as maximum seam thicknesses in general appear to be in the 6' to 8' range and such thicknesses do not permit the removal of large amounts of overburden. This being the case, primary consideration must be given to underground mining.

For the development of a successful underground mine, certain basic geological factors are desirable. The most significant of these are the location of an area of structural simplicity containing seams of a thickness suited to the optimum operation of modern mechanized equipment. In general, increases in dips above 15^{0} causes a rapid decrease in efficiency of modern underground machinery and the increase in seam thickness to greater than 8' also causes problems.. Another limiting factor is the total cover. Conversations with experienced Rocky Mountain

coal mining engineers would indicate that a total cover of 2000 to 2500 feet is probably a reasonable maximum in the relatively undisturbed Peace River Canyon area.

Applying the above parameters to the properties under consideration, it is apparent that good possibilities for underground mining exist. The Trojan seam, where explored by the drilling programme, averages 7.3' in thickness. The outside thickness limits recognized are 8.5' and 5.5' with a notable exception of Drill Hole No. 2 (see Coal - Occurrences and Distribution). Outside the area of the Texacal/Hogan licences the Trojan seam is reported to vary from 3.5' to 7.2' in thickness. It should be noted that the thinner seam occurrences occur for the most part in the more easterly areas (Fig. 2). While no information is available for the thickness of the Trojan seam underlying the greater portion of the Texacal/Hogan licences, it is likely to be thicker than these eastern occurrences. A reasonable assumption would be that the seam will average around 7' in thickness.

Dips measured throughout the area of the coal licences, in general, are significantly less than 15^{0}. A reasonable average dip for the area would appear to be about 10^{0}. Such a dip is well suited to the use of modern mechanized mining equipment.

While insufficient data is as yet available to establish the area over which the Trojan seam is covered by less than 2000' of overburden. it would appear that this area is approximately 10 square miles.

Insufficient information is available on other potentially mineable seams, but the structurally low dip would apply equally to these. Of interest would be the seam represented by sample TEX 4-2 and the Gething seam. It is likely that both of these seams have some potentially mineable reserves.

Recoverable Reserves.

It is premature to estimate probable recoverable coal reserves for the properties prior to further exploration work. However, enough data is available to establish a reasonable estimate of recoverable reserves per square mile for the Trojan seam. Such an estimate is dependent on four basic assumptions. These are:

a. a one foot seam over one square mile contains approximately 1.1 million long tons,

b. the Trojan seam averages 7' in thickness,

c. an underground mining method giving a recovery of 50% of the coal in place,

d. a preparation plant could be constructed to produce a 75% yield of metallurgical grade coking coal at 7% ash from the raw coal.

Using the above assumptions, the Trojan seam would probably produce 2.9 million tons of metallurgical grade coking coal per square mile.

If it is further assumed that 2.0 million tons of product coal are required to support a contract calling for one million tons per year, then approximately 7 square miles of the properties

must be underlain by the Trojan seam at depths where it is mineable. This would appear to be the case.

No consideration has been given in the above reserve estimates to possible recovery of coal by open pit from the Trojan seam. It is possible that the Trojan seam might be mined by open pit methods over limited areas between Gaylard and Gething Creeks. Similarly, some reserves might well be recoverable from seams other than the Trojan seam.

It would appear that the properties have the potential of producing sufficient coal to support a one million ton per year contract.

Transportation.

Transportation from this area would utilize the Pacific Great Eastern Railroad. The total distance to port by the Pacific Great Eastern Railroad would be shorter than the distance to many of the existing coal mining areas by as much as 100 miles. Transportation of coal from the properties to the existing Pacific Great Eastern Railroad should be either by

a. a barge on the Williston Reservoir to McKenzie on the existing railroad (a distance of 110 miles) or,

b. by a rail spur to the Bennett Dam (approximately 30 miles].

The first alternative is not believed to be realistic as the reservoir is frozen for some four to five months of the year and it'is the second alternative that must be considered. It is unlikely that a 30 mile rail spur could be built to service one mine producing only one million tons per year. However, also active in the area are

Utah Construction and Mining Co. and Ayrshire Coal Co., a subsidiary of Amax (see Fig. 4). Utah have conducted extensive exploration on their Carbon Creek properties approximately 12 miles west of the Texacal/Hogan properties and are planning to continue work in 1972. Ayrshire initiated exploration on their properties in the Fall of 1971, but have not as yet reached the drilling stage on the licences west of the Texacal/Hogan properties. The exploration activity of these two major corporations adjacent to the Texacal/Hogan properties is encouraging and should either prove up sufficient reserves to support a mine, then a rail spur serving the area would be built.

RECOMMENDATIONS

It is recommended that further exploration be carried out on the coal licences held by Texacal Resources Ltd. and Hogan Mines Ltd. Exploration to date has been limited to the easily accessible area near the junction of Gaylard and Gething Creeks, Further drilling should be carried out along Dowling Creek area to the south east. This drilling would be primarily designed to prove up the lateral extent of the Trojan seam. At the same time other seams could be more fully evaluated.

When the lateral extent of the Trojan seam has been proved up, adits should be driven at selected points and bulk samples of the seam recovered. These samples would enable full scale testing of the coking properties of the coal to be made. A programme to achieve this next stage of exploration would cost approximately $150,000. It could readily be carried out during the summer of 1972.

CONCLUSIONS

The initial exploration of the Texacal/Hogan properties in the Peace River area has confirmed the potential of these properties for the development of a mine producing metallurgical grade coking coal. While only limited drilling has been carried out, sufficient probable reserves are indicated to support a mine producing up to one million tons per year. This coal would be metallurgical grade, medium volatile, low sulphur coking coal.

January 1972.

I. P. Dyson, P. Geol.

"ACKNOWLEDGEMENTS

The completion of the above initial exploration programme would not have been possible without the co-operation of the B. C. Hydro and Power Authority who kindly granted access across the W.A.C. Bennett Dam. This access was an invaluable cost saving to the project as a whole. The co-operation of Mr. P.D. Swoboda, Production Superintendent, at the site is gratefully acknowledged.

Mr. George Bleiler of Hogan Mines Ltd., who completed the staking of the licences originally, assisted both with the field work and with the drilling programme. His assistance with the supervision of the drilling contractors was particularly valuable.

CERTIFICATION

This is to certify that:

1. I, Ion Paul Dyson, am a geologist residing at 326 - 38th Avenue S.W. in Calgary, Alberta.

2. I have received a B.A. (Geology) degree from Cambridge University, England in June, 1957.

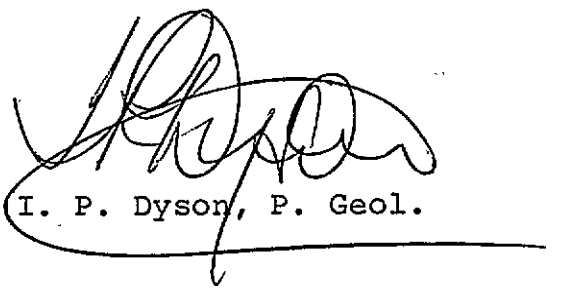
3. I am a Professional Geologist, registered within the Engineering and Related Professions Act, in the Province of Alberta.

4. I have been practising my profession in the petroleum and mining industry since 1957 as an employee until 1968 and as a Consultant Geologist since that time.

5. I have no interest in, nor do I expect to receive any interest, either actual or implicit in the properties described herein, or in any securities pertaining thereto.

6. This report is based upon: personal examination and knowledge of the property, and published and unpublished maps and reports.

DATED at Calgary, in the Province of Alberta, this 7th day of January, 1972.



I. P. Dyson, P. Geol.

To Accompany:

Preliminary Report - Peace River Coal Project
Texacal Resources Ltd. (NPC) dated January, 1972

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* This memoir contains a complete and extensive bibliography of early work.

'APPENDIX 1

GAMMA-RAY NEUTRON LOGS

SEE :

PR DOWLING CREEK 71 (3)

BOW RIVER RESOURSES.

122°30'W 122°25'W 122°20'W 122°15'W 122°10'W 122°05'W 122°00'W

56°05'N 56°00'N 55°55'N 55°50'N 55°45'N

WILLISTON RESERVOIR

BENNETT DAM

PEACE RIVER

THIS CONTACT IS BASE OF GATES MEMBER OF FORT ST. JOHN GROUP

This dip taken on small fold.

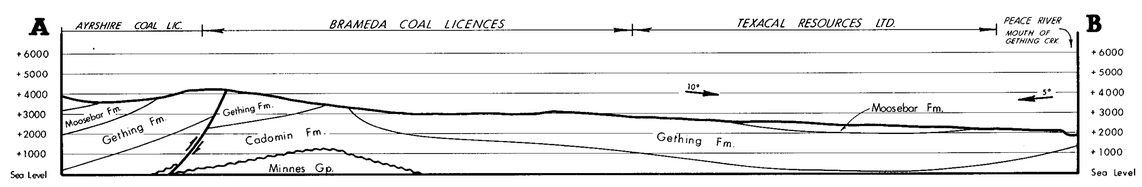
NO OUTCROPS

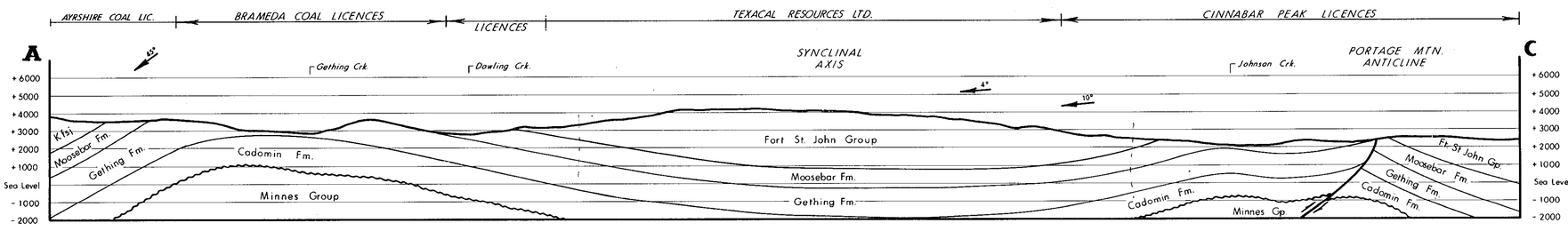
Kg Kcd Km Kmb Kfsj Qal Kdu

GAYLARD CREEK — GETHING CREEK DETAIL

SCALE : 4 INCHES TO 1 MILE

X Y LINE OF CROSS SECTION (see seperate enclosure)





EXPLANATION

RECENT
- Qal — Stream Alluvium

UNCONFORMITY

UPPER CRET.
- Kdu — Sandstone & Conglomerate — Dunvegan Formation

LOWER CRETACEOUS

FORT ST. JOHN GP.
- Kfsj — Fort St. John Group Undivided
- Kmb — Moosebar Shale

BULLHEAD GP.
- Kg — Coal, Sandstone & Mudstone — Gething Formation
- Kcd — Sandstones, Shales & Conglomerates — Cadomin Formation

UNCONFORMITY

MINNES GP.
- Km — Sandstones, Shales & Minor Coals — Minnes Group Undivided

UNCONFORMITY

- Formation Boundary
- Anticline
- Syncline
- Thrust Fault
- 15° Strike & Dip — Published
- Strike & Dip — Measured
- Coal Mine (Abandoned)
- Coal Occurence Greater Than 5' Other Than Trojan Seam.
- Drill Hole
- Existing ======= Constructed —— APPROX. ROUTE OF ACCESS ROADS

THICKNESS OF TROJAN SEAM (INCL. PARTINGS)

7.5 Drilled (8.3) Reported

TEXACAL — HOGAN COAL LICENCES (T)
AYRSHIRE COAL LICENCES (A)
UTAH CONSTRUCTION COAL LICENCES (U)
CINNABAR PEAK COAL LICENCES (C)
BRAMEDA COAL LICENCES (B)

510

PR-DC 71(2)A Figure 2

TEXACAL RESOURCES LTD. (N.P.L.)

PEACE RIVER COAL PROJECT

Jan. 4, 1972

1 : 50,000

0 1 2

SCALE — MILES

PAUL DYSON CONSULTANTS

Figure 4

TEXACAL RESOURCES LTD. (N.P.L.)

PEACE RIVER AREA

COAL LICENCE LOCATIONS

SCALE 1 INCH TO 10 MILES

LICENCES APPLICATIONS

1. MASTER EXPLORATIONS LTD.
2. ASTON RESOURCES LTD.
3.
4. BRAMEDA RESOURCES LTD.
5. BRAMEDA RESOURCES LTD. -TECK CORPORATION LTD.
6.
7. CINNABAR PEAK MINES LTD.
8. DENISON MINES LTD.
9. HOGAN MINES LTD.
10. NICKEL HILL MINES LTD.
11. McINTYRE PORCUPINE MINES LTD.
12. PINE PASS COAL CO. LTD.
13. UTAH CONSTRUCTION + MINING CO.
14. CANADA WEST PETROLEUMS LTD.
15. HOGAN MINES LTD. -TEXACAL RESOURCES LTD.
16. AYRSHIRE COAL COMPANY INC.

94/B

94/A

93/O

93/P

510

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0.85 miles

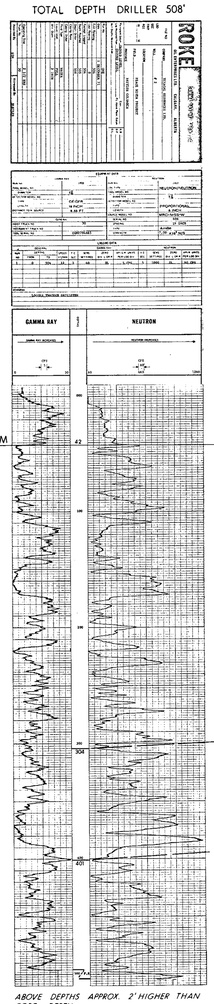
0.75 miles

0.65 miles

X

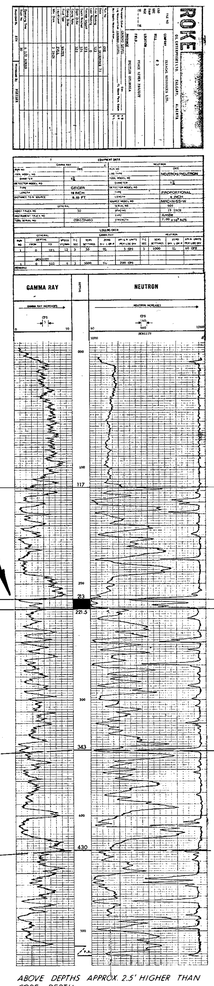
Y

DRILLHOLE 2
TOTAL DEPTH DRILLER 508'



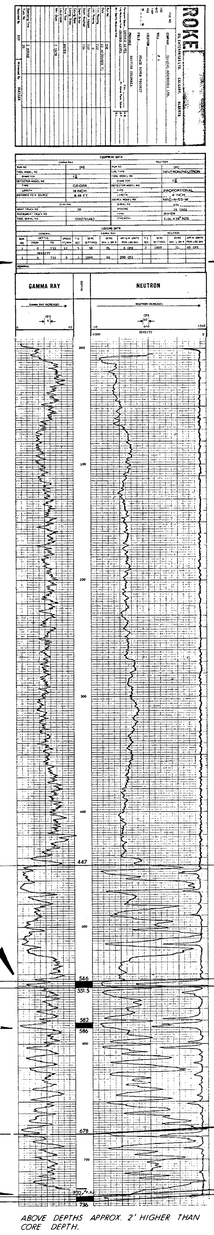
ABOVE DEPTHS APPROX. 2' HIGHER THAN CORE DEPTH.

DRILLHOLE 3
TOTAL DEPTH DRILLER 528'



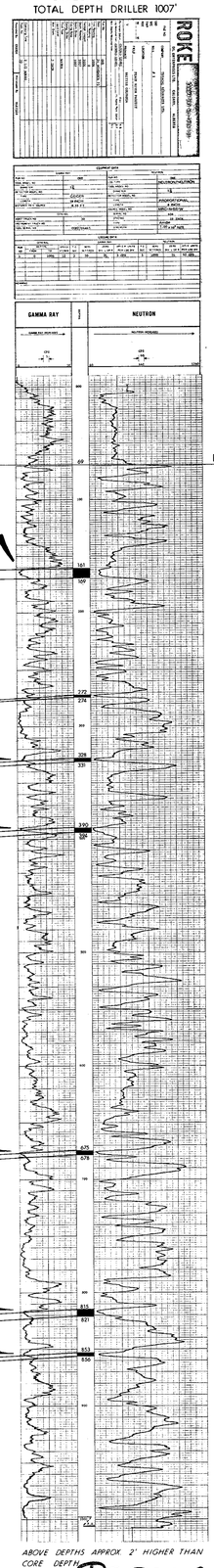
ABOVE DEPTHS APPROX. 2.5' HIGHER THAN CORE DEPTH.

DRILLHOLE 4
TOTAL DEPTH DRILLER 748'



ABOVE DEPTHS APPROX. 2' HIGHER THAN CORE DEPTH.

DRILLHOLE 1
TOTAL DEPTH DRILLER 1007'



ABOVE DEPTHS APPROX. 2' HIGHER THAN CORE DEPTH.

TROJAN SEAM (½" = 1')

THICKNESS 8'6" including 1'4" total partings

SAMPLE TEX. 3-1

213'
216'4" Coal, bright lustre, low ash
217'3" Sandstone, very fine grained, silty in part, lgt. gy. — includes 3" coal
219'8" Coal, bright lustre, low ash
220'11" Sandstone, very fine grained, light gy, soft
221'6" Coal, dull lustre, poorly banded silty in part
Missing core, probably coal

TROJAN SEAM (½" = 1')

THICKNESS 5'6" including 0'2" total partings

SAMPLE TEX. 4-1

546'
546'9" Coal, bright lustre, low ash
546'11" Sandstone, very fine grained, lgt. gy.
550'6" Coal, bright lustre, low ash
551'6" Missing core, probably coal

TROJAN SEAM (½" = 1')

THICKNESS 8'0" including 0' 6" total partings

SAMPLE TEX. 1-1 TEX. 1-2 TEX. 1-3

161'
1½" siltst. parting
167' 0"
167' 3" 1½ siltst. parting
168' 6"
169' Missing core, probably coal

DATUM

Moosebar Fm.
Gething Fm.

TROJAN SEAM

TITAN SEAM MARKER

TITAN SEAM

Sample TEX. 4-2

Sample TEX. 4-3

FALLS SEAM

Sample TEX. 1-4

GETHING SEAM

Sample TEX. 1-5

Sample TEX. 1-6

Sample TEX. 1-7

Sample TEX. 1-8

?

VERTICAL SCALE IN FEET
200'
100'
0

0 250' 500' 750' 1000'
HORIZONTAL SCALE IN FEET

510

PR-DC71(2)A

Figure 3

TEXACAL RESOURCES LTD. (N.P.L.)

PEACE RIVER COAL PROJECT

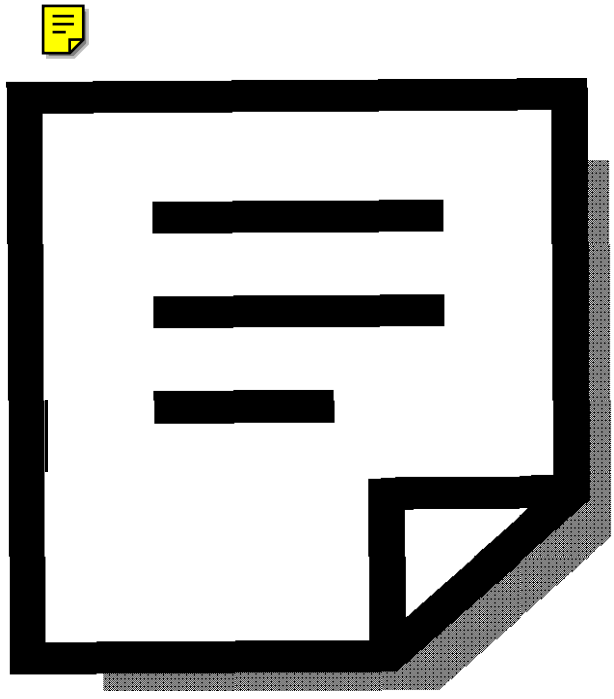
CROSS SECTION X – Y

SCALE: Horizontal 1 Inch = 250 Feet
Vertical 2½ Inches = 100 Feet

PAUL DYSON CONSULTANTS

NOTE: ALL DEPTHS ARE GAMMA-RAY NEUTRON LOG DEPTHS

PR-DC71(2)A



PR - DOWLING CR 71(4)A

BOW RIVER RESOURCES LTD

NOTE: COAL ANALYSIS DATA WAS REMOVED FROM OPEN FILE - 71(1)A

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PRELIMINARY REPORT

PEACE RIVER COAL PROJECT

(COAL QUALITY)

Prepared for: Texacal Resources Ltd. (N.P.L.)
Vancouver, B. C.

by: Paul Dyson Consultants and
Holdings Limited,
Calgary, Alberta.

January 1972..

Quality

Exploration of the area is intended to prove up a viable deposit of metallurgical grade coking coal. This market for Canadian coals is relatively new and althqugh numerous analyses exist for the coals of the Peace River area in published reports (Appendix 2), very few of these were made with this market in mind. Significant parameters for the initial evaluation of a potential coking coal are: volatile matter, ash, sulphur, and coking quality. The old analyses are believed to accurately reflect the ash, volatile and sulphur contents of the coals bearing in mind at all times that the sampling technique is as often as not unknown. The coking quality of the coal was not of prime interest when the old analyses were made and coking information is vague.

A few comments regarding the desirable values of the above parameters are in order.

a. Volatile matter.

The volatile matter should be as low as possible consistent with the coal retaining its coking properties. This low volatile matter is not of specialvalue in itself but is of significance as the coking yield per ton of raw coal increases inversely with the volatile matter content; thus a ton of low volatile coal produces more coke than a ton of high volatile. In practice, it is found that most western Canadian coals fail to produce a coke when the volatile matter content falls below approximately 17%. Analyses of the'various coals from the Peace River area

indicate the volatile matter content to range from approximately 18% up to 26%. These values were confirmed by the new analyses and this 'range is well within that acceptable to present world markets.

b. Ash content.

Ash content for the Peace River coals as reported by the old analyses are unique in that they are far lower than those for the majority of coals found elsewhere in Western Canada. According to these old assays 'it is not uncommon for raw coal to assay as low as 6% ash. However, the new analyses would aopear to indicate that these old analyses were very selective and did not, in fact, include‘minor sandstone or shale partings found within the seams. Further discussion of the ash content is included with a review of the new analyses.

c. Sulphur content.

The sulphur content of Peace River coals has always been shown to be below 1% and this is confirmed by the new analyses. These values below 1% are acceptable for metallurgical coals.

d. Coking quality.

The coking quality of a coal can only be fully determined by the evaluation of the coal by a large scale test in a coke oven. However, a preliminary indicator of the coking quality is the Free Swelling Index (FSI). This is an arbitrary index set up by the American Society of Testing Materials. It measure the

degree of swelling which the coal undergoes when subjected to heating. This test was not in use at the time the majority of analyses were carried out for the Peace River coals. In general, all that was known from previous analyses was that some of the coals were referred to as having agglomerating properties. This property of the coal to agglomerate is an indicator of the probable coking quality of the coal.

The coking property of the coal may be destroyed by the weathering of the coal and its resultant oxidation. This being the case, the new analyses were made on samples obtained from below the probable depth of weathering.

Bearing the above facts in mind, a meaningful review of the new analytical data can be made. All of the analyses for the Trojan seam are summarized on Table 2 and all analyses for other seams are summarized in Table 3.

a. Trojan Seam.

The Trojan seam is represented by five samples from three intersections. As can be seen, Analysis TEX 1-1, 1-2 and 1-3 represent the Trojan seam as in Drill Hole No. 1, TEX 3-1 represents the Trojan seam as intersected in Drill Hole No. 3 and TEX 4-1 represents the Trojan seam as intersected in Drill Hole No. 4. In Drill Hole No. 1 the seam was sampled in three portions as shown on Fig. 3 and Table 2. As can be seen, the raw coal analyses

for all three samples show ash content above 17% ranging up to almost 26% for the lowest coal interval. This high ash content was not unexpected as the samples all contained recognizable silt and sandstone intervals ranging up to 3" in thickness, in fact; for sample TEX l-3 silt and very fine sandstone comprised approximately 16% by volume of the sample. Despite this high ash the raw coal shows FSI's ranging from 3½ to 7 which are very encouraging. In order to get an indication of the possible washability of the coal, a sink-float analyses was carried out at a specific gravity of 1.6. Float yields vary from 85% to 50% for the lowest sample interval. Analyses of these floats show the ash to be reduced to less than 8% in all cases. FSI's are all improved now ranging from 5½ to 8, sulphurs are all below 0.6% and volatiles range from 23 to 26%. In summary, the Trojan seam where penetrated by Drill Hole No. 1 would appear to contain coal which will readily yield a low ash, low sulphur, medium volatile metallurgical grade coking coal.

The analysis of the Trojan seam from Drill Hole No. 3 (TEX 3-l) is very similar to that obtained from the lowest portion of the Trojan seam in Drill Hole No. 1. Raw coal ash exceeds 30% but this high ash is directly attributable to over 18" of siltstones and sandstones included in the sample. The sink-float analyses indicate a float yield of over 60% with an ash content below 6.5%, the sulphur content is 0.65% and the FSI is 6.

The analysis for the Trojan seam from Drill Hole No, 4 (TEX 4-1) shows a raw coal ash content of almost 17%, but here again a 2" sandstone stringer is included in the sample. The sink-float analysis give a yield of 83% with an ash content of 7.4%, .8% sulphur and an FSI of 6%. In summary, while the Trojan seam would appear to contain several partings of very fine sandstone and siltstone which directly contribute to high ash contents in the raw coal, it would appear that these silty intervals are easily removed by a simple washing process. Averaging the sink-float analysis, a yield in excess of 70% containing less than 7% ash has been easily achieved. Using more refined techniques, it is likely that a yield approaching 80% of coal containing less than 8% ash might be achieved. This coal will probably have an FSI of around 7 and a sulphur content below 0.7%. The percentage of volatile matter may well be as high as 25%. The coal of the specifications above could find a ready market in the near future.

b. Other Seams.

Analyses TEX 1-4 to TEX 1-8 and TEX 4-2 and TEX 4-3 represent analyses from other seams. Of these analyses, TEX 1-4 and TEX 4-3 both appear to represent sampling of the same seam - probably the Falls seam (see Fig. 3). The remaining analyses represent distinct seams penetrated in Drill Hole No. 1. The analyses for the Falls seam (TEX 1-4 and TEX 4-3) are not very encouraging.

-68 ~~4~~ 5 5-4

Table 2

NEW ANALYSES OF' TROJAN SEAM

AIR DRIED BASIS

Hole No.	Sample No.	Depth (GRN) TC	Depth (GRN) BC	Thick. Ft.	Recov. Ft.	Yield %	Raw Coal Moisture %	Raw Coal V.M. %	Raw Coal Ash %	Raw Coal FC %	Raw Coal FSI	Float @ 1.6 SG Yield %	Float @ 1.6 SG Moisture %	Float @ 1.6 SG V.M. %	Float @ 1.6 SG Ash %	Float @ 1.6 SG FC %	Float @ 1.6 SG S %	Float @ 1.6 SG FSI
1	TEX 1-1	161	164.5				0.70	22.43	17.35	59.52	3½	85.4	0.60	23.75	7.82	67.83	0.54	4½
	TEX 1-2	164.5	167	8.0	7.5	94	0.62	22.39	17.77	59.22	6	80.9	0.51	23.86	6.43	69.20	0.55	7
	TEX 1-3	167.25	169				0.35	30.29	25.86	43.50	7	49.8	0.44	26.15	6.52	66.89	0.59	8
3	TEX 3-1	213	221.5	8.5	7.9	93	0.49	19.85	32.16	47.48	3½	60.4	0.35	24.30	6.46	68.89	0.64	6
4	TEX 4-1	546	551.5	5.5	4.5	82	0.42	22.55	16.68	60.35	5	83.1	0.37	23.45	7.40	68.78	0.80	6½
	Average:			7.33								71.9	0.45	24.30	6.76	68.32	0.62	(6½)

Abbreviations: TC - Top contact

BC - Bottom'contact

GRN - Gamma-Ray Neutron log

V.M.- Volatile Matter

FC - Fixed Carbon

FSI - Free Swelling Index

S - Sulphur

SG - Specific Gravity

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The yield of float averages only 63.4% while the ash is still almost 10%. The sulphur exceeds 0.9% and the FSI ranges from 2 to 5. This seam would not appear to be a prime prospect for a metallurgical grade coking coal. The seam represented by sample TEX 1-5 was not penetrated by any other drill hole (see Fig. 3). It is tentatively correlated with the Gething seam. The analysis of the float (approximately 80%) shows the ash to be approximately 9% and the FSI to be 7½. The sulphur content of 0.86% is disturbing, but further exploration of this seam is worthwhile as the coal is a potential metallurgical grade coking coal. Samples TEX 1-6 to 1-8 represent seams lower in the Gething formation penetrated by Drill Hole No. 1 only (see Fig. 3). No sink-float analyses were carried out for these seams on the basis of the raw coal analyses. TEX 1-7 represents a particularly dirty seam while the other two samples have raw coal analyses containing very low ash. Nevertheless, the FSI of all three samples is practically non-existent probably due to the low volatile content of the coals. These coals are probably approaching a sub-anthracite in grade and do not appear to have any great potential as metallurgical grade coking coals.

Sample TEX 4-2 which represents a 4' seam approximately 40' below the Trojan seam in Drill Hole No. 4 is of interest for the excellent FSI obtained. While this drill hole represents the only known occurrence of the seam, it should be borne in mind as a prospect during further exploration in the area.

NEW ANALYSES OTHER THAN TROJAN SEAM

Hole No.	Sample No.	Depth (GRN) TC	BC	Thick. Ft.	Recov. Ft.	Yield %	AIR DRIED BASIS — Raw Coal: Moisture %	V.M. %	Ash %	FC %	FSI	Float @ 1.6 SG: Yield %	Moisture %	V.M. %	Ash %	FC %	S %	FSI
1	TEX 1-4	328	331	3.0	3.0	100	0.53	20.29	22.98	56.20	3½	73.6	0.42	23.07	10.66	65.85	0.94	5
	TEX 1-5	390	394	4.0	4.0	100	0.414	25.79	16.26	57.51	7	79.7	0.45	24.35	9.14	66.06	0.86	7½
	TEX 1-6	675	678	3.0	2.25	75	0.46	18.38	3.80	77.36	½	Not analyzed						
	TEX 1-7	815	821	6.0	6.0'	100	0.46	14.43	32.41	52.70	½	Not analyzed						
	TEX 1-8	853	856	3.0,	3.0	100	0.49	18.73	8.43	72.35	1	Not analyzed						
4	TEX 4-2	582	586	4.0	4.0	100	0.32	26.51	22.84	50.33;	8½	61.0	0.33	28.49	6.31	64.87	0.73	9
	TEX 4-3	733.75	737.25	3.5	3.5	100	0.34	18.05	27.86	53.75'	34	53.2	0.27	21.40	8.65	69.68	0.91	2

Note: See Figure 3 for Seam Names and Correlation.

Abbreviations:

- TC - Top contact
- BC - Bottom contact
- GRN - Gamma-Ray Neutron log
- V.M. - Volatile Matter
- FC - Fixed Carbon
- FSI - Free Swelling Index
- S - Sulphur
- SG - Specific Gravity

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In summary, the Trojan seam as explored to date in the area of the Texacal/Hogan coal licences would appear to have the potential of yielding excellent medium volatile coking coal. It is realistic to assume a probable 75% yield of coking coal from the raw coal mined. Of the other seams tested by the drilling programme, only the Gething seam would appear to have any potential.

PR-DOWLING CREEK-71(4)A
BOW RIVER RESOURCES LTD.

APPENDIX 2

MISCELLANEOUS PUBLISHED ANALYSES

MISCELLANEOUS ANALYSIS
Peace River Canyon Area.

Analyses of samples from the Trojan seam are as follows:

—	Moisture	Ash	Volatile matter	Fixed carbon	Caking property[1]	Colour ash	S	B.t.u.
Upper half seam, Contact Point	0·7	10·1	24·8	53·4	Agglomerate	Grey		
Lower half seam, Contact Point	0·6	11·2	26·7	61·5	Good	Cream		
Coal Creek, top 4½ feet	1·1	21·5	18·8	58·6	Non-agglomerate	White		
Coal Creek, middle benches, 1 foot 7 inches and 2 feet 2 inches	1·2	10·6	24·1	64·1	Poor	Flesh		
Coal Creek, lowest bench, upper 1 foot 3 inches	0·7	0·1	26·6	64·6	Good	Flesh		
Main Gething Creek	1·6	8.4	26·0	64·0	Non-agglomerate	Light brown	0·6	13,350
North branch Gething Creek	1·0	8·6	24·5	65·9	Non-agglomerate	Grey	0·7	13,820

These coal samples are of medium volatile bituminous rank.

Analyses of coal samples from the King seam in the King Gething mine are as follows:

—	0·7-foot bench		1·6-foot bench		2·0-foot bench		0·6-foot bench	
	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
Moisture condition								
Proximate analysis								
Moisture.....%	3·8		5·9		5·7		4·5	
Ash.....%	10·5	10·9	16·1	17·1	3·3	3·4	1·3	1·4
Volatile matter.....%	22·1	23·0	26·8	28·5	21·4	22·7	26·2	27·4
Fixed carbon (by difference).....%	63·6	66·1	51·2	54·4	69·1	73·9	68·0	71·2
Ultimate analysis								
Sulphur.....%	1·8	1·8	0·8	0·9	0·8	0·9	0·0	0·0
Calorific value								
B.t.u. per lb. gross...	12,000	13,420	11,080	11,770	13,840	14,690	14,480	15,170
Caking properties	Agglomerate		Agglomerate		Agglomerate		Good	
Softening temperature of ash.....	2,050°F.		2,300°F.		2,710°F.		2,680°F.	
Colour of ash.....	Light mauve		Light brown		Very light pink		Light salmon-pink	

These coals are all of medium volatile bituminous rank.

MISCELLANEOUS ANALYSIS
Peace River Canyon Area

Analyses from the Grant seam.

——	Moisture	Ash	Volatile matter	Fixed carbon	Caking property	Colour ash	S	B.t.u.	A.S.T.M. classification[1]
Cliff 300 feet west of W. crosscut. Bottom 9 inches	0·6	3·4	23·6	72·4	Good	Flesh			Med. vol. bitum.
Cliff 300 feet west of W. crosscut. Middle and top 5 feet	0·8	3·4	20·4	75·4	Poor	Flesh			Low vol. bitum.
Cliff entrance to W. crosscut. Bottom 11 inches	0·7	2·1	24·6	72·6	Good	Flesh			Med. vol. bitum.
Cliff entrance to W. crosscut. Middle and top 4 feet 6 inches	0·6	2·6	18·7	78·1	Non-agglomerate	Flesh			Low vol. bitum.
Tunnel 35 feet from portal. Bottom 8 inches	0·7	6·5	22·0	70·8	Good	Cream	0·7	14,440	Med. vol. bitum.
Tunnel 35 feet from portal. Middle 1 foot 11 inches	0·6	2·9	19·5	77·0	Non-agglomerate	Brown	0·7	14,940	Low vol. bitum.
Tunnel 35 feet from portal. Top 3 feet 2 inches	0·7	5·3	19·6	74·4	Non-agglomerate	Brick	0·7	14,420	Low vol. bitum.
Tunnel at E. crosscut. Bottom 9 inches..	0·7	2·4	22·9	74·0	Good	Flesh	0·7	15,130	Med. vol. bitum.
Tunnel at E. crosscut. Middle 1 foot 9 inches	0·8	2·6	19·3	77·3	Agglomerate	Flesh	0·7	14,960	Low vol. bitum.
Tunnel at E. crosscut. Top 3 feet.....	0·7	6·1	18·7	74·5	Non-agglomerate	Cream	0·6	14,300	Low vol. bitum.
Face tunnel Sept. 26, 1923. Bottom 9 inches	0·6	2·4	24·8	72·2	Good	Flesh			Med. vol. bitum.
Face tunnel Sept. 26, 1923. Middle 1 foot 10 inches	0·6	2·6	19·5	77·3	Non-agglomerate	Cream			Low vol. bitum.
Face tunnel Sept. 26, 1923. Top 2 feet 8 inches	0·6	4·1	20·1	75·2	Non-agglomerate	Grey			Low vol. bitum.

[1] *See* Table III.

	Deposits in or near the Peace River Canyon												Packwood mine, slope of Butler Bridge, 1 mile north of Peace River; 22 miles west of Hudson Hope	
	Twin seams, below Curved Tree Point				Knight, 3½-foot seam; Galloway slope, south of Ice or Heron Creek				Boring (Curved Tree Point), 3½-foot, seam; at Boring Point, below Ice or Heron Creek; upper 1½-foot, "cannoloid" bench		Murray, 5-foot seam; top of cliff, just below Bridge or Larry Creek		run-of-mine sizes	
	Upper, 2-foot seam		Lower, 2·3-foot seam		Entire seam		Lower 1½ feet							
Sample No.	25381		25380		25382		25383		25378		25377		30096	
Moisture condition	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
Proximate Analysis—														
Moisture, per cent	2·3	....	3·5	....	11·0	....	11·0	....	2·2	....	13·1	....	0·9	....
Ash "	8·2	8·4	5·8	6·0	14·9	16·8	9·3	10·4	11·5	11·7	13·7	15·8	9·9	10·0
Volatile matter "	20.5	21·0	20·3	21·1	21·7	24·4	22·2	25·0	19·5	20·0	22·0	25·3	24·8	25·0
Fixed carbon "	69·0	70·6	70·4	72·9	52·4	58·8	57·5	64·6	66·8	68·3	51·2	58·9	64·4	65·0
Ultimate Analysis—														
Ash, per cent	8·2	8·4	5·8	6·0	14·9	16·8	9·3	10·4	11·5	11·7	13·7	15·8	9·9	10·0
Sulphur "	0·8	0·8	0·6	0·7	0·6	0·7	0·7	0·8	0·7	0·7	0·4	0·4	0·6	0·6
Calorific Value—														
B.t.u. per lb., gross	13,610	13,830	13,810	14,310	9,080	11,210	11,370	12,780	13,060	13,360	9,750	11,210	13,270	13,390
Fuel ratio	3·35		3·45		2·40		2·60		3·40		2·30		2·60	
Caking properties	Agglomerating		Agglomerating		Nonagglomerating		Nonagglomerating		Agglomerating		Nonagglomerating		Agglomeratin	
Ash softening temperature, °F.	....		Above 2850		2140		2140		....		2050		2020	
Rank classification	a		a				....		Low volatile bituminous		....		Medium volat bituminous	
Taken by	F. H. McLearn and E. J. W. Irish, Geological Survey												Coal dealer, Fort St. Jo	
Date	Season of 1943												March 1919	

aBorder-line coals, but almost undoubtedly would be low volatile bituminous underneath outcrop.

	Deposits in or near the Peace River Canyon											
	Quentin, 2·7-foot, seam; roadside near King Gething mine	King Gething mine on King Creek, east slope of Bullhead or Portage Mountain, 12 (road) miles west of Hudson Hope, 1,200 feet above river level; King, 5·2-foot, seam, including 0·3-foot shale parting							Mogul seam			
		Top 0·7 foot; dull detrital coal		Next 1·65 feet; dull and bright coal		Next 2 feet; bright and dull cord		Bottom 0·6 foot bright coal	Mogul Creek; 8-foot 2-inch seam		Earle Narrows south side; 41-foot seam	
Sample No.	25360	25370		25371		25272		25373	2230		2210	
Moisture condition	As rec'd Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd Dry	As rec'd	Dry	As rec'd	Dry
Proximate Analysis—												
Moisture, per cent	24·1	3·8	....	5·9	....	5·7	....	4·5	1·2	....	1·4	....
Ash, "	12·9 17·0	10·5	10·9	16·1	17·1	3·3	3·4	1·3 1·4	4·6	4·7	4·2	4·3
Volatile matter, "	23·0 30·3	22·1	23·0	26·8	28·5	21·4	22·7	26·2 27·4	22·9	23·2	22·7	23·0
Fixed carbon, "	40·0 52·7	63·0	66·1	51·2	54·4	69·6	73·9	68·0 71·2	71·3	72·1	71·7	72·7
Ultimate Analysis—												
Carbon, per cent									82·0	83·0		
Hydrogen, "									4·4	4·3		
Ash, "	12·9 17·0	10·5	10·9	16·1	17·1	3·3	3·4	1·3 1·4	4·6	4·7	4·2	4·3
Sulphur, "	0·6 0·7	1·8	1·8	0·8	0·9	0·8	0·9	0·9 0·9	0·9	0·9	0·9	0·9
Nitrogen, "	....	....	....	....	....	....	....	....	1·0	1·0	....	....
Oxygen, "	....	....	....	....	....	....	....	....	7·1	6·1	....	....
Calorific Value—												
B.t.u. per lb., gross	7,720 10,180	2,000	13.420	1,080	11,770	13,840	14,68(	14,480 15,170	....	....	14,220	14,420
Fuel ratio	1·75	2·00		1·90		3·25		2·60	3·10		3·15	
Caking properties	Non-agglomerating	Agglomerating		Agglomerating		Agglomerating		Goal	Non-agglomerating		Non-agglomerating	
Ash softening temperature, °F.	....	2050		2300		2710		2680	....			
Rank classification	....	Medium volatile bituminous		....		Medium volatile bituminous		Medium volatile bituminous	Medium volatile bituminous		Medium volatile bituminous	
Taken by	F. B. McLearn and E. J. W. Irv	Geological Survey							F. H. McLearn			
Date	Season of 1913								Season of 1922			

	Peace River Area—Concluded						Halfway and Sikanni Chief Area				—	
	Packwood Mine, slope of Butler Ridge, 1 mile north of Peace River, 650 feet above river level, 22 miles west of Hudson Hope; No. 1 seam				Deposit on Carbon Creek, entering Peace River a few miles west of Rocky Mountain Canyon		Deposit on Carbon River, Peace River district; No. 1 working; first cross-measure tunnel coming north		Deposit on south end of Pink Mountain, north side of Halfway River; base of Bullhead formation		Deposit on creek at north end of Pink Mountain, 2 miles south of Sikanni Chief River; top of Bullhead formation		Deposit on Coal River, about 6 miles above mile 251 N. Alaska Highway	
	Upper entry or level; 2·6-foot face		Lower entry; 1·6-foot face											
Sample No.	25374		25375		2520		20042		25426		25427		25428	
Moisture condition	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
Proximate Analysis—														
Moisture, per cent	5·0	.....	4·6	....	1·0	....	3·5	....	5·6	....	0·6	....	15·4	....
Ash	0·1	0·4	4·7	4·9	5·1	5·2	4.0	4.7	4·4	4·6	13·4	13·5	6·2	7·4
Volatile matter, "	18·9	19·9	19·1	20·0	23·3	23·8	25·8	26·8	12·5	13·3	25·9	26·1	45·6	53·9
Fixed carbon, "	70·0	73.7	71·7	75·1	69·7	71·0	66·1	68·5	77·5	82·1	60·1	60·4	32·8	38·7
Ultimate Analysis—														
Ash, per cent	0·1	0·4	4·7	4·9	5·1	5·2	4·6	4·7	4·4	4·6	13·4	13·5	6·2	7·4
Sulphur	0·6	▭▭	0·6	0·6	0·7	0·7	0·7	0·7	0·9	0·3	3·8	3·9	0·3	0·3
Calorific Value—														
B.t.u. per lb., gross	13,220	13,920	13,580	14,230	13,970	14,240	13,530	14,030	12,670	13,420	13,270	13,350	8,970	10,600
Fuel ratio	2·70		2·75		3·00		2·55		0·20		2·30		0·72	

Coking properties	Agglomerating	Agglomerating	Nonagglomerating	Agglomerating	Nonagglomerating	Good	Nonagglomerating	
Ash softening temperature, °F.	2750	....	....	2260	2600	Above 2650	2490	
Rank classification	Low volatile bituminous		Medium volatile bituminous	Medium volatile bituminous	Semianthracite a	Medium volatile bituminous	b	
Taken by	F. H. McLearn and E. J. W. Irish, Geological Survey		Private individuals		0.0; Hage, Geological Survey		M. Y. Williams, Geologist	
Date	September 1943		Season of 1923	October 7, 1944	July 16, 1943	July 20, 1943	August 21, 1943	

aSample No. 25426 showed signs of agglomeration. If (as seems unlikely) an unweathered sample of Halfway River coal should prove to be agglomerating by the standard test, the coal would have to be classed as low volatile bituminous.

bOwing to the very dry condition of the sample, it was not feasible to classify it by the usual means. However, there is no reasonable doubt that the analysis indicates lignite.

APPENDIX 3

ASSAY CERTIFICATES

To: PAUL DYSON CONSLTS & HLDS LTD.
Ste. 3004, 505 6th St. S.W.,
Calgary 1, Alta

File No. 4802
Date Nov. 26, 1971
Samples Coal

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	INH. %H2O	% V.M.	% ASH	% F.C.	FSI
RAW COAL					
TEX 1-1	.70	22.43	17.35	59.52	3½
TEX 1-2	.62	22.39	17.77	59.22	6
3 EX 1-3	.35	30.29	25.86	43.50	7
TEX 1-4	.53	20.29	22.98	56.20	3½
TEX 1-5	.44	25.79	16.26	57.51	7
TEX 1-6	.46	18.38	3.80	77.36	½
TEX 1-7	.46	14.43	32.41	52.70	½
TEX 1-8	.49	18.73	8.43	72.35	1

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed *Assayer* of British Columbia

To: PAUL DYSON CONSLTS & HLDGS LTD.
Ste. 3004 505 6th St. S.W.,
Calgary 1, Alta.

Attn. Mr. Paul Dyson

File No. 4802
Date Nov. 26, 1971
Samples Coal

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	% Float	% Sink
SINK-FLOAT ANALYSIS		
1.60 S.G.		
TEX-1-1	85.4	14.6
TEX-1-2	80.9	19.1
TEX-1-3	49.8	50.2
TEX-1-4	73.6	26.4
TEX-1-5	79.7	20.3

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed Assayer of British Columbia

To: PAUL DYSON CONSLTS & HLDNS LTD.
Ste. 3004 505 6th St. S.W.,
Calgary 1, Alta.

Attn: Mr. Paul Dyson

File No. 4802
Date Nov. 26, 1971
Samples Coal

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	INH %H2O	% V.M.	% ASH	% F.C.	% S	FSI
ANALYSIS OF FLOATS						
1.60 S.G.						
TEX-1-1	.60	23.75	7.82	67.83	.54	4½
TEX-1-2	.51	23.86	6.43	69.20	.55	7
TEX-1-3	.44	26.15	6.52	66.89	.59	8
TEX-1-4	.42	23.07	10.66	65.85	.94	5
TEX-1-5	.45	24.35	9.14	66.06	.86	7½

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.
Pulps Retained one month unless specific arrangements made in advance.

A. Loring

Licensed Assayer of British Columbia

Td: PAUL DYSON CONSULTANTS & HOLDINGS LTD.
Ste. 3004 505 Sixth Street S.W.
Calgary 1, Alberta

Attn: Mr. Paul Dyson

File No. 4860
Date Dec. 13, 1971
Samples Coal

Certificate of ASSAY of
LORING LABORATORIES LTD.

SAMPLE No.	INH %H2O	% V.M.	% ASH	% F.C.	FSI
RAW COAL					
4-1	.42	22.55	16.68	60.35	5'
4-2	.32	26.51	22.84	50.33	8½
4-3	.34	18.05	21.86	53.75	1
TEX 3-l	.49	19.85	32.16	47.48	3½

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.
Pulps Retained one month unless specific arrangements made *in* advance.

C. L. McInnes
Licensed Assayer of British Columbia

To: PAUL DYSON CONSULTANTS & HOLDINGS LTD.
Ste. 3004 505 Sixth St. S.W.
Calgary 1, Alberta
Attn: Mr. Paul Dyson

File No. 4860
Date Dec. 13, 1971
Samples Coal

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	% Float	% Sink
SINK-FLOAT ANALYSIS		
S.G. 1.60		
4-1	83.1	16.9
4-2	61.0	39.0
4-3	53.2	46.8
TEX 3-1	60.4	39.6

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.
Pulps Retained one month unless specific arrangements made in advance.

A. L. McInnes
Licensed Assayer of British Columbia

To: PAUL DYSON CONSULTANTS & HOLDINGS LTD.
Ste. 3004 505 Sixth Street S.W.
Calgary 1, Alberta
Attn: Mr. Paul Dyson

File No. 4860
Date Dec. 13, 1971
Samples Coal

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	INH %H2O	% V.M.	% ASH	% F.C.	% S	FSI
ANALYSIS OF FLOATS						
4-1	.37	23.45	7.40	68.78	.80	6½
4-2	.33	28.49	6.31	64.87	.73	9
4-3	.27	21.40	8.65	*69.68*	.91	2
TEX3-1	.35	24.30	6.46	68.89	.64	6

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.
Pulps Retained one month unless specific arrangements made in advance.

A. Lane Grace

Licensed Assayer of British Columbia