

Canada  
Province of **Alberta**

To Wit:

In the matter of Coal Licenses 314 to 364  
inclusive  
Fort Steele Mining Division, British Columbia

I, **Henry Glen Rushton, Geologist**  
of **456 Willow Park Drive, Calgary**  
in the Province of **Alberta**

**OPENFILE**

do solemnly declare that I have examined the accounts and records of Canadian Pacific Oil and Gas Limited, of 205 Ninth Avenue S.E., Calgary, Alberta, and that total expenditures on Coal Licenses 314 to 364 inclusive up to and including the thirty-first day of January, 1968 are as follows:

Exploration expenditures	\$ 133,593.49
License acquisition and rentals	15,100.00
Taxes	3,108.10
	<hr/>
Total	\$ 151,801.59

**GEOLOGICAL BRANCH  
ASSESSMENT REPORT**

**00 308**

AND I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath, and by virtue of the Canada Evidence Act.

DECLARED before me at *Calgary*

in the Province of *Alberta*

this *6<sup>th</sup>* day of *March*

A.D. 19*68*.

*Henry Glen Rushton*

*Donald Joseph Murphy*  
*A Notary Public*

in and for the Province of *Alberta*

**OPEN**

CANADIAN PACIFIC OIL AND GAS LIMITED

MINING DIVISION

REPORT ON ELK RIVER COAL PROJECT, 1967

by

H. G. RUSHTON



FRONTISPIECE - SOUTH SIDE, EAGLE MOUNTAIN, VALLEY OF KILMARNOCK  
CREEK AND VALLEY OF FORDING RIVER (LEFT). THE  
SYNCLINAL STRUCTURE IS SEEN NEAR THE SUMMIT.  
NOTE STRIPPING ALONG COAL SEAMS.

C O N T E N T S

	<u>PAGE</u>
SUMMARY	-
INTRODUCTION	1
PROPERTY	3
LOCATION AND ACCESS	5
TOPOGRAPHY	7
GEOLOGY	9
STRUCTURE	12
COAL SEAMS	16
COAL RESERVES	21
ECONOMICS	23
CONCLUSIONS AND RECOMMENDATIONS	25
ACKNOWLEDGEMENTS	27
REFERENCES	28
LIST OF APPENDICES	29

## S U M M A R Y

The coal licenses, lying 40 miles north of Michel, B.C., total some 27,000 acres. During the summer of 1967 access roads were constructed, the licenses were mapped geologically, 2,528 feet of drilling was conducted, an adit and raise were driven for a combined advance of 158 feet, and numerous trenches were excavated on coal exposures.

Eighteen seams of coal were located, of which four are considered to be of potential economic importance viz No. 2, No. 4, No. 7 and No. 12. The area east of the Fording River is of greatest economic value, and the reserves of coal, dipping at less than 25°, contained in these four seams in this area are estimated to yield a recoverable tonnage of 170 million tons, contained in a total reserve, for the four seams, of 430 million tons.

A program to further evaluate this property, with special emphasis on seams No. 2 and No. 4, is recommended for the summer of 1968. The cost of this program is estimated to cost some \$260,000, as compared to an expenditure of some \$150,000 during 1967.

## 1. INTRODUCTION

The occurrence of coals within the Kootenay formations of the Elk and Fording River Valleys, north of Michel, B.C., has been known for many years. In the period 1900 to 1910 the Canadian Pacific Railway did a great deal of work on the Elk Valley coals, while a lesser amount of work was done by the Union Pacific Railway on the coals of the Fording Valley. No further development of these deposits was undertaken, although large reserves of bituminous coal were indicated. Most of the coal licenses were allowed to lapse, and the remainder, kept in good standing by Canadian Pacific until 1939, were then partially transferred to Cominco. The transfer was completed in 1947, and further licenses were dropped at that time. Up until the present work, the only coal licenses in good standing formed a narrow strip along the eastern side of the Elk Valley covering the area of best accessibility. Some exploration work related to strip coal was conducted by Utah Construction in 1957-58 on the eastern side of the Fording Valley.

The work at the start of the century indicated, in a general fashion, that the coal measures have a synclinal structure between the Elk and Fording Valleys. The structure to the east of the Fording Valley was ill-defined, but generally thought to be another syncline. The inter-relationships of these structures were not examined and no attempt had been made to correlate seams along strike or between areas.

With the advent of a growing market for coking coal in Japan, this general area was re-examined, as the previous work had indicated the presence of coking coals. Also, with the growing use of mechanical mining methods, it was realized from the outset that flat-lying or low-dip seams were a necessity. Work related to oil exploration in the area had, as a by-product, indicated that the structures on the Elk-Fording section were more complex than had been apparent, and that the area east of the Fording River was underlain by a

relatively simple syncline. Accordingly, C.P.O.G. applied for licenses to cover this latter syncline and the axial portions of other synclines bordering Cominco's ground to the east. Application was made in January, 1967 and the coal licenses were granted on May 9, 1967, covering some 26,980 acres.

The program of exploration carried out in 1967 consisted of the following:

- (a) Photo-geological study
- (b) Geological mapping
- (c) Road construction - 10 miles
- (d) Trenching by hand (34 trenches) and bulldozer (four miles) of coal seams
- (e) Percussion drilling - 2,528 feet
- (f) One adit - 121 feet x 5' x 5' and one raise 37' x 5' x 5'
- (g) Gamma-ray and neutron logging of drill holes
- (h) New aerial photography of the area, and preparation of a contour map on the scale of 1" = 1000'.

The work was concentrated in areas where dips were generally indicated to be below 25°, and where coal exposures occurred entirely above valley level.

2. PROPERTY

C.P.O.G. holds the following coal licenses, dated May 9, 1967, in the Elk and Fording River Valleys, some 30 to 45 miles due north of Michel, B.C.

<u>COAL LICENSE NO.</u>	<u>AREA (Acres)</u>	<u>LOT NO.</u>	<u>COAL LICENSE NO.</u>	<u>AREA (Acres)</u>	<u>LOT NO.</u>
314	640	6385	339	640	6979
315	640	6384	340	628	6640
316	320	E½ 6824	341	640	6709
317	320	W½ 6813	342	230	6708
318	640	6984	343	640	6646
319	320	E½ 6377	344	320	E½ 6980
320	640	6053	345	631	6639
321	615	6820	346	640	6700
322	640	6052	347	640	6701
323	640	6827	348	320	W½ 6702
324	618	6819	349	640	6981
325	640	6828	350	313	W½ 6638
326	640	6829	351	640	6697
327	620	6647	352	640	6696
328	640	6830	353	640	6695
329	640	6972	354	636	6982
330	623	6643	355	280	6688 (E 35 chs)
331	160	6719	356	640	6689
332	640	6644	357	640	6690
333	640	6978	358	320	E½ 6635
334	626	6641	359	200	6687 (E 25 chs)
335	320	E½ 6642	360	640	6686
336	570	6711	361	640	6685
337	70	6712	362	320	W½ 6684
338	640	6645	363	640	6728
			364	320	W½ 6729

The total acreage held under coal license is 26,980 acres.

Coal licenses are issued by the Government of British Columbia and are renewable from year to year upon payment of a rental fee of fifty cents per acre. Rentals are rebated if development work of \$7.50 or more per acre is carried out. An additional fee of \$25.00 is charged for the renewal of each license. Should production in excess of 10,000 tons per annum be achieved, then a 20-year lease is obtainable, at an annual rental of \$1.00 per acre. Royalties of twenty-five cents per short ton are payable upon all production.

All coal licenses held by C.P.O.G. cover surveyed lots, and no further property surveys are required.

Road construction within the licenses falls under a Special Use Permit granted by the British Columbia Forest Service, and while the coal licenses allow the holder limited use of timber for immediate purposes, damaged timber is assessed and damages are payable to the Crown. To date, the amounts assessed have not been excessive.

### 3. LOCATION AND ACCESS

The C.P.O.G. property lies from 30 to 45 miles north of Michel, B.C. The eastern boundary lies from four to seven miles west of the B.C.-Alberta boundary. The camp is located on Kilmarnock Creek at latitude  $50^{\circ}10'29''$  N, longitude  $114^{\circ}50'54''$  W, at an elevation of 5,440 feet above sea level.

The Elk River Valley is accessible by a forestry road, running northwards from Michel, which is passable during the summer months only. The road is not suitable for heavy equipment. From this road, two branch roads connect with the valley of the Fording River, the southerly one from Round Prairie and the northerly one from Britt Creek. Both roads were found in poor condition when work commenced this spring.

A logging road, constructed by Crows Nest Industries, follows the east side of the Elk River from Michel, then runs through the Fording River canyon and into the upper Fording Valley. The road then crosses to the west side of the Fording River above Chauncey Creek. This road is used throughout the year for some 20 miles above Michel, and in winter for all its distance. The logging operations preclude its use without special arrangements.

To obtain access to the C.P.O.G. work area, the following arrangements were made:

- (a) The existing forestry road in the Elk Valley was repaired, and connection established to the disused C.N.I. winter road in the Fording Valley by repair work on the road from Round Prairie.
- (b) The C.N.I. winter road from its connection with the Round Prairie road to the crossing of the Fording River was repaired and made passable for heavy equipment.
- (c) From the latter point, use was made of an old fire-break trail leading north, and some two to three miles of new road was constructed within the boundaries of C.P.O.G.'s coal licenses.
- (d) Arrangements were made with Crows Nest Industries to move heavy equipment over their logging road at times when this would not interfere with their operations.

Work on the roads commenced on June 7, 1967, and was sufficiently advanced to permit a trailer camp to be established temporarily some four miles south of Kilmarnock Creek by July 1, 1967. The trailers were moved to the final camp location at Kilmarnock Creek on July 13. Geological reconnaissance commenced on July 3, and all operations were completed and equipment moved out on September 22, 1967.

Road construction was continued throughout the summer. Two miles of very difficult construction were completed to the north and east of the camp on Eagle Mountain, to provide access to the sites of the adit and drill holes 1 to 3. A road was also constructed west and north of the camp, following the west flank of Eagle Mountain, to connect with the existing road from Britt Creek, to provide access to Clode and Henretta Creeks. From this road, which comprised approximately four miles of new construction, a drill access road some two miles in length was constructed along the south side of Clode Creek to drill hole 4. Two to three bulldozers were employed throughout the program.

A helicopter was employed to aid geological mapping of the area for a period of two weeks near the end of the program.

#### 4. TOPOGRAPHY

All of the C.P.O.G. coal licenses lie in mountainous country. The dominant features of the area are the wide, flat-bottomed valleys containing the Elk and Fording Rivers. Both valleys run almost due north-south, and contain deep alluvial gravels, within which both rivers have meandering water courses.

The Elk Valley has no major tributaries south of Aldridge Creek, the remaining creeks being seasonal run-off gullies. Between the Elk and Fording Valleys lie the Green Hills, which have a steep western slope and a more gradual and variable slope to the east. There is approximately a thousand-foot difference in elevation between the Elk (4,400') and Fording (5,400') Valleys, and the Green Hills between reach heights of 7,500 feet above sea level.

The Fording River has several major tributaries, all entering the river on the east side. These tributaries also occupy relatively flat-bottomed valleys, and provide convenient access to the mountain ranges lying east of the Fording. Within C.P.O.G.'s coal licenses, from south to north, these are Chauncey, Kilmarnock, Clode and Henretta Creeks. These divide the mountain range into three main mountains, from south to north, known as Castle Mountain, Eagle Mountain and Mount Turnbull. All have summits lying over 8,000 feet above sea level.

The north faces of each of these mountains are prominent cirques, the one on Castle Mountain being the best developed, with cliffs some 800 to 1,200 feet in height. The other slopes of these mountains are more regular, although all are deeply dissected by steep gullies.

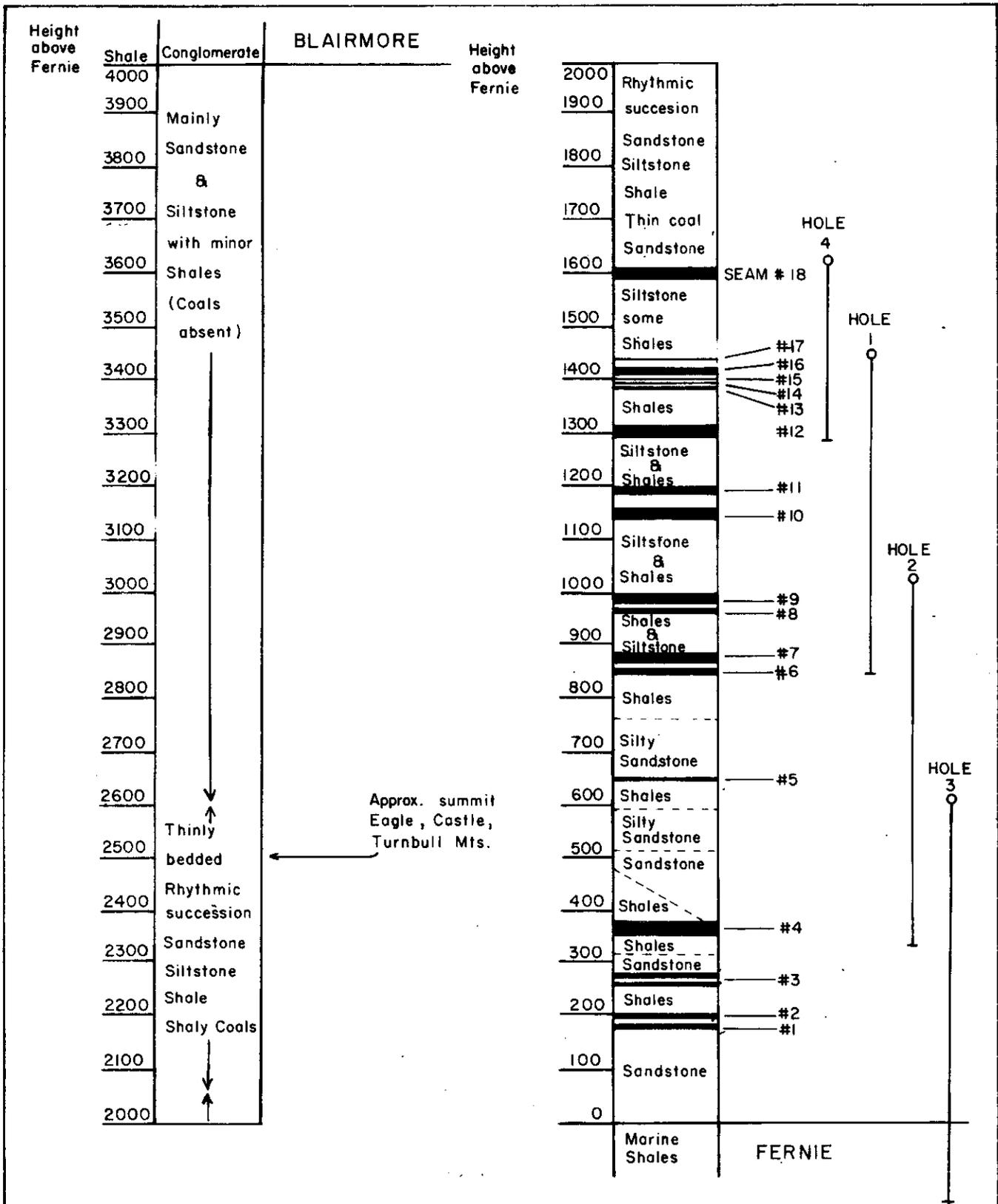
All valley bottoms and the lower slopes of the mountains are heavily timbered. The Green Hills are mostly timbered near their tops, although a few open patches do occur. Eagle Mountain and Mount Turnbull are predominantly bare and grassy above 6,300 feet, while Castle Mountain is partially covered with windfall and second growth. A peculiar feature of the vegetation is that trees extend to much higher elevations on north-facing slopes than on south-facing

slopes. This may be a function of moisture retention during the spring run-off.

Permanently frozen ground and snow patches persist throughout the summer on all north-facing slopes east of the Fording River. The frozen ground became a problem at times during road building.

Weather conditions were excellent throughout the season, and no appreciable time was lost due to rain or snow. Snow in significant quantities fell on July 24 and September 11, while frost was a common occurrence throughout the summer.

Forest fire hazard was extreme throughout the summer, and a minor interruption due to a large fire some seven miles south of the camp occurred at the end of July.



**Canadian Pacific**  
**OIL AND GAS LIMITED**  
**MINING DIVISION**

<b>ELK RIVER COAL PROJECT</b> GENERALIZED, STRATIGRAPHIC SECTION	DATE - 10/67 CONT. INT. AUTHOR - H.G.R. APPROVAL BY - SCALE - 1" = 200' FILE NO.
--	---

## 5. GEOLOGY

Geological mapping was carried out using aerial photographs, on a scale of 1" = 1/4 mile, as initial base. Considerably more time was expended on the west flanks of Castle, Eagle and Turnbull Mountains, than in other parts of the area, because of the relative importance of the structure in this particular section. Much of the general information was gathered by helicopter-aided traverses along mountain ridges. Altimeter control was confined to the main area east of the Fording River. Results were subsequently plotted on the contour plan of the area prepared on a scale of 1" = 1000'. Emphasis was laid on determining the sequence of coals, their attitude, quality and continuity. Mapping was almost entirely confined to the Kootenay sediments.

The mapping carried out shows that the bulk of C.P.O.G.'s license area is underlain by Kootenay formation. The age of the Kootenay is generally thought to be late Jurassic or early Cretaceous. The base of the Kootenay is generally placed at the bottom of the first sandstone overlying the Fernie shales, and is dependent more on lithological change than on unconformable relationships. From the work conducted this summer, there is no apparent unconformity at the base of the Kootenay in the Fording River area, although there is a very marked change of sedimentary conditions, from marine to littoral. There is some suggestion of a partial return to marine conditions in some parts of the area, before the littoral conditions of the Kootenay became established.

The Kootenay formations in the Elk-Fording area are from 3,500 to 4,000 feet in thickness. Coals of mineable width are confined to the basal 2,000 feet of the succession.

The succession consists of fine to medium grained sandstones, siltstones, grey to black shales and coals. Current-bedding is common in the sandstones, and the detailed succession is highly variable over relatively short distances, in-

dicating the unstable depositional conditions. In general, it may be stated that the thicker sandstone lenses are confined to the lower half of the succession, while the upper half is represented by a more rhythmic and thinner-bedded succession of sandstones, siltstones and shales.

A stratigraphic section, based upon the results from drill holes 1, 2, 3 and 4 is presented in this report. While some of the lower sandstones form prominent cliffs for distances up to one-half mile, it was found that it was not generally possible to follow a cliff-marker for any considerable distance on the ground. The conclusions drawn are that all the lithologic types present, apart from the coal seams themselves, are lenticular in occurrence. Consequently, detailed sections, and their comparison from place to place, are of limited value, and can lead to confusion in correlation of coal seams. The sediments, especially in the coal-bearing half of the succession, represent a series of littoral and deltaic deposits, where rapid changes both horizontally and vertically are the rule rather than the exception. Some of the sediments, as evidenced by buried tree roots, must have been deposited over very short time intervals. A more rhythmic succession of sediments, in which coals are notably poorly developed to absent, occupies the upper half of the stratigraphic section. This material was not examined in any detail, and is not preserved throughout the license area.

The upper Kootenay is in contact with an overlying white-pebble conglomerate to the west of the Fording River, near Henretta Creek. Some writers have assigned this formation, and part of the upper Kootenay, to the Elk formation. However, in keeping with present knowledge and terminology, this conglomerate is basal Blairmore. There is a marked change in lithology at this contact, while some inter-fingering of the conglomerate with the uppermost sands of the Kootenay was noted in places. No evidence to indicate an unconformity was noted, although the unbedded nature of the conglomerate does not allow accurate

structural evidence to be obtained. The whole succession, Fernie-Kootenay-Blairmore, represents two fairly radical changes in general type of sedimentation, yet very little or no evidence of unconformity is found.

The coal seams, which are described in more detail elsewhere in this report, are confined to the lower half of the Kootenay section. Several major seams are present, all remarkable for their thicknesses and continuity over large areas. The coal seams present a marked contrast to the discontinuous, lenticular sediments within which they occur, and represent a relatively stable set of conditions which continued for long periods at a time. The bulk of the geological work carried out was concentrated on prospecting for occurrences of coal, opening up the exposures by trenching and tracing selected seams along strike by bulldozer to determine continuity. The coals are generally deeply weathered, and do not outcrop. However, by tracing coal rubble and black soil, often excavated by animals burrowing into the mountainside, several hundred individual coal occurrences were located. Having determined an approximate succession of coals on the south side of Eagle Mountain, it was then possible to be somewhat selective in locating hand trenches. These were generally dug to expose the total seam, some four to five feet below the surface of the mountain. From this work, it became obvious that the coals were close enough to each other stratigraphically that the correlation along strike remained in doubt. Accordingly, two seams were traced around the west side of Eagle Mountain by means of continuous bulldozer stripping. The coals themselves appear to form very continuous and reliable marker horizons, especially when more than one known seam has been located, and are apparently continuous throughout the area of C.P.O.G.'s licenses.

## 6. STRUCTURE

The entire C.P.O.G. license area lies within the Lewis Thrust plate of the eastern Rocky Mountains. This thrust has been shown to have a progressively increasing horizontal displacement from north to south, and is one of the major structural features of the Cordillera. The Elk River Valley follows the toe of the next thrust-plate to the west, where Palaeozoic limestones are again overthrust on top of the Kootenay formations.

Structurally, the permit area may be divided into four distinct areas within the C.P.O.G. license area, which are defined in decreasing order of economic importance below:

- (a) An asymmetric syncline with an axial direction varying from N 14° W on Castle Mountain to N 30° W at Henretta Creek.
- (b) An apparently symmetric syncline with an axial direction of N 35° W running from near the Henretta Creek-Fording River junction to the Elk River Valley.
- (c) A synclinal structure, modified by anticlines and cross-faulting, lying in the southern Green Hills portion of the C.P.O.G. license area.
- (d) A complex area of folding, minor overthrusting and faulting in the Aldridge Creek area.

### (1) Castle, Eagle, Turnbull and Henretta Mountains

This area of the license is of major economic importance. Geologically, the lower two-thirds of the Kootenay sequence, and all mineable coal seams, are found throughout the area. The upper coals have been partially eroded by the cross-cutting valleys of Kilmarnock, Clode and Henretta Creeks, while the lower coals are affected to a lesser extent by these erosional features. The Fording River Valley itself occupies the crest of an anticline, within which the underlying Fernie shales occur. To the east, the valleys of Brownie Creek and Chauncey Creek in part, follow the approximate base of the Kootenay, where the Fernie shales are again brought to surface by the synclinal structure occupying this mountain chain east of the Fording River.

In general, it may be stated that this syncline is asymmetric, with relatively steep inward dips on its eastern side and much more shallow dips on its western side. A series of sections have been drawn on Eagle Mountain to illustrate this structure. (Appendix 3)

As the dip increases on the eastern side, some overthrusting appears to occur in places, generally at a low angle or parallel to the beds themselves. The structure is further modified, in places, on this eastern side, by secondary anticlines and accompanying synclines, which appear to die out on strike in both directions, and are accordingly periclinal or canoe-shaped folds respectively. To the east of the main synclinal axis, dips rapidly increase from zero at the axis to plus  $25^{\circ}$  some 1,300 feet east of the axis. Thereafter, there is a swift upsweep to dips generally in excess of  $45^{\circ}$ .

The western side of this syncline contains dips below  $25^{\circ}$  in general, and occupies an area in excess of one mile in width on Castle and Eagle Mountains. Some narrowing of this area occurs on Turnbull Mountain, but the whole structure is remarkably uniform. This area is of great economic importance, in that all of the known coal seams occur within it above river level with attitudes in which mechanical mining methods can be readily applied. There do not appear to be any major interruptions in this low-dip sequence, apart from a tear fault near the southern boundary of the property on Castle Mountain, and a minor syncline-anticline pair with subsidiary faulting on the south side of Eagle Mountain. To the south of the former structure, dips are steep, while the Eagle Mountain fold-fault zone is several hundred feet wide, but somewhat triangular in section, in that the lower beds are much more extensively affected than the upper. This latter zone appears to die out both north and south, and it is not anticipated that any substantial effects of this structural feature will be found beyond its immediate outcrop area. Certainly no effects were noted in work on strike on the western flank of Eagle Mountain. While the main syncline is relatively easy to

define on Castle and Eagle Mountains, its plunge appears to reverse from place to place. (See Section X-X'). However, these rolls in the syncline are not pronounced until the region of Clode Creek, where the syncline appears to adopt a steeper plunge to the northwest, and at the same time dips towards the centre become first more and then less pronounced. This feature does not appear to carry the lowest coal below river elevation at outcrop as the Fernie-Kootenay contact is exposed at this elevation at Henretta Creek.

(2) Henretta Creek-Fording River Junction to Elk River

A broad syncline, with an axis striking N 35° W, occupies the area from Henretta Creek-Fording River junction to the Elk River at Britt Creek. The structure is apparently symmetric, although there may be a more rapid tendency to steep dips on the southwest limb than on the northeast limb.

All Kootenay formations from the vicinity of the fire lookout tower on the Green Hills, north to the headwaters of Aldridge Creek, at Mount Veits, are affected by this structure. There is a marked plunge of the structure to the southeast, which results in much lower stratigraphic units being exposed on the Elk Valley side than are found at the Fording River. This syncline was, in all probability, originally a continuation of the syncline on Turnbull Mountain to the southeast. However, the geological mapping indicates that a large fault, striking somewhat east of north, occurs to the east of the Fording River at Henretta Creek, resulting in the northwestern side being downthrown and the synclinal axis displaced horizontally in a southerly direction. (Section Y-Y'). The presence of this fault is easily demonstrated, in comparing the Fernie-Kootenay contact exposed at Henretta Creek with the Blairmore-Kootenay contact exposed to the west of the Fording River at an elevation some 500 feet above river level. This indicates that the vertical displacement of this fault, presuming a Kootenay section of 3,500 to 4,000 feet in thickness, is from 3,000 to 3,500 feet. The throw of this fault appears to decrease rapidly to the northeast, hence movement may be of a hinged nature.

The syncline may be modified to some extent on the Elk Valley by subsidiary structures due to the overthrust to the west of the valley.

This structure is of potential economic importance, as it contains large quantities of relatively flat-lying coal. However, at its eastern end, these coals are very deeply buried, and are not considered to be economically recoverable by present methods. As the plunge carries these coals to outcrop on the Elk Valley side, some coal of economic interest may be present here. Whether entries to these coals could be established within the C.P.O.G. holdings remains to be proven.

(3) Southern Green Hills to Fording River

Little geological mapping was carried out on this portion of the property. Cominco, in their work on the western portion of this area, indicated that some coal at relatively low dips is present on the western limb of a northerly trending syncline. Scattered dips on the eastern side of this structure are relatively steep, and helicopter reconnaissance work indicated that this area also contains subsidiary anticlines and some cross-faulting. While very little work has been done, preliminary impressions are that this area is of limited economic value or importance.

(4) Aldridge Creek

C.P.O.G. holds three coal licenses on the upper reaches of Aldridge Creek, which do not adjoin the main license area. Coals and structures were examined briefly on the lower portion of Aldridge Creek, and helicopter reconnaissance of the remainder was carried out. The area is complex in structure, with many minor folds, some of which are overturned. The Kootenay has been contorted by the Elk Valley thrust to the west. This area is of no economic interest.

7. COAL SEAMS

The only coals examined in any detail are those lying to the east of the Fording River. Most detailed information was gathered on the succession of seams on Eagle Mountain, and fairly good correlation of this succession was made along this mountain between Kilmarnock and Clode Creeks. It is assumed that this general succession of coals is present on Castle Mountain to the south and on Turnbull Mountain to the north. While some evidence of correlation between the mountains has been gathered, much more detailed information will be required before a positive correlation can be made.

Based on the results from four drill holes, the following table summarizes the positions of the main coal seams within the stratigraphic column on Eagle Mountain:

<u>Seam Number</u>	<u>Indicated Width</u>	<u>Remarks</u>	<u>Base of Seam to Top of Fernie</u>
18	19'	shaly partings	1,588'
17	4'	clean	1,434'
16	12'	dirty	1,408'
15	4'	"	May all (1,396' represent one dirty (1,386' seam (
14	4'	"	
13	3'	"	(1,378'
12 ✓	22-27'	clean	1,287'
11	16'	dirty	1,180'
10	22'	"	1,138'
9	19-20'	"	980'
8	6-7'	"	962'
7 ✓	18-30'	shaly partings	859'

<u>Seam Number</u>	<u>Indicated Width</u>	<u>Remarks</u>	<u>Base of Seam to Top of Fernie</u>
6	4-5'	very dirty	845'
5	4-8'	clean	648'
4 ✓	26-27'	clean	356'
3	20'	6' shale band - dirty	247'
2 ✓	8-13'	clean	186'
1	4-5'	clean	174'

From the table it will be seen that there is some two hundred feet or more of coal contained in the lower sixteen hundred feet of the Kootenay on Eagle Mountain. Higher seams are quite frequent above seam No. 18, but were not examined in any detail owing to their very limited areal extent. These upper seams gradually become less and less frequent, no coal of any significance being found in the upper half of the Kootenay succession.

The same general succession of coal seams appears to be present throughout Eagle Mountain, although even in this area, where the most work has been done, there remain many places where further investigation is required. The initial approach to the area was prospecting on foot, followed by hand-trenching of some of the many coal occurrences located. Once a coal occurrence was located, it was often possible to follow the seam for some distance along its exposure. On the southwest end of Eagle Mountain, where most of this initial work was done, the coals were located adjacent to several prominent sandstone bluffs. Accordingly, an attempt was made to follow these bluffs on the ground, and locate the coals from these. Many coal exposures were found during the course of this work, but as more information became available, it was apparent that some of the correlations obtained on the ground were not correct. Further study showed that while sandstone bluffs could be followed over limited distances, no reliance could be placed on correlating coal seams by this method over large distances, owing to the

lenticular nature of the sandstones. The best illustration of this was between trench No. 6 and trench No. 15, where three careful and separate traverses by three different geologists, one of whom was the writer, resulted in three separate courses being flagged as trench No. 15 was approached, none of which proved, eventually, to be the correct one for seam No. 7. However, in spite of these initial problems, the early work on Eagle Mountain showed that many coals, some of great thickness, were present, and revealed the approximate succession of seams.

Prospecting in a similar manner was also carried out on Castle Mountain. On this mountain again, many individual coal occurrences were located, and some seams were traced over limited distances. However, because of heavier overburden and vegetation, this phase of the work on Castle Mountain was not as successful in determining the succession of coals as the work on Eagle Mountain. Accordingly, it was decided to concentrate on Eagle Mountain, and determine the complete succession of coals there.

The lowest coal indicated on Eagle Mountain by prospecting was seam No. 5. Above this seam, trench No. 6 and No. 7 had indicated that seam No. 7 appeared to be reasonably continuous, of great thickness, and of sufficient quality to warrant an underground test. The first site picked for the adit, some five hundred feet east of trench No. 7, proved to be unsuitable when excavated, owing to heavy slide material. The final adit site was located at trench No. 7, and an adit was driven on the footwall of the seam along its strike. The adit was driven horizontally for 121 feet,  $5\frac{1}{2}$  x  $5\frac{1}{2}$  feet in section. From the end of the adit, a 40-degree raise was driven for 37 feet to intersect the hanging-wall of the seam, and bulk samples were taken by a representative of Mitsui Mining Co. Ltd. In addition, several samples were taken by a representative of Marubeni-Iida Ltd., and samples were also shipped to the Department of Mines, Energy and Resources in Ottawa. Results of the Mitsui and Ottawa sampling are not available

at the time of writing this report, while results of the Marubeni-Iida samples will be found in Appendix 8. Preliminary results indicate that this seam is of good coking quality, and can be treated to yield an acceptable product.

The samples taken in surface trenches are of limited value in assessing the coal seams. Weathering, which extends well beyond the reach of hand or bulldozer trenches, destroys any coking properties which the coal may have, and the high moisture content of the samples affects the validity of the proximate analyses. These surface samples do, however, indicate the general qualities of the seam. (Appendix 6).

In order to test the whole of the coal-bearing section, a line of three drill holes (1, 2 and 3) was laid out on the south side of Eagle Mountain, designed to drill from near the top of the coal-bearing section into the underlying Fernie shales. The holes were located so that one known seam at least would be intersected by the bottom of one hole and the top part of the next succeeding hole. An additional hole (4) was also drilled to test part of the succession near Clode Creek. All holes lie approximately in the same vertical section as the adit driven on No. 7 seam. The drilling achieved all of its objectives, and located the bottom four seams in the coal succession. Gamma-ray-neutron logs were run on holes 1, 2 and 3, and proved of great value in correlating seams from hole to hole. (Hole 4 was not logged owing to its being abandoned owing to cave). In addition, the Fernie-Kootenay contact was also located accurately. (Appendix 4). Sampling was carried out on all of the seams intersected by the holes, by collecting the drill cuttings. Care was taken in sampling that the coal-interval sampled was kept small (2 - 3 feet) and that the hole was flushed between samples. In spite of this, the samples taken by this method were found to be highly contaminated. Some additional test work done on these samples will be found in Appendix 6. The lack of good samples in the drill holes may be corrected by the addition of a specially-designed core barrel,

now on order from Japan.

At the same time as the drilling program was being carried out, the continuity of two seams, No. 7 and No. 12, was being confirmed on Eagle Mountain by continuous bulldozer stripping along their outcrop. This stripping was carried out from the vicinity of the drill holes all the way to Clode Creek, and proved to be an invaluable aid for correlation and structural purposes. Even with the bulldozer, care had to be taken at all times to stay in the same seam and not to be misled by coaly soil which could have migrated down the mountainside. The prospecting done on foot proved valuable at this stage, as the known coal exposures could then be quickly selected as the bulldozer came close to them.

The initial results indicated that:

- (a) Contaminated drill samples indicate that seam No. 2 contains 19% volatiles and seam No. 4, 21% volatiles.
- (b) The gamma-ray-neutron logs showed that seams No. 2 and No. 4 have excellent ash contents.
- (c) All seams in the succession have good to moderate coking properties.
- (d) Of the upper seams, No. 7 and No. 12 appear to be the cleanest and thickest.
- (e) Detailed geological sections of the strata and the seams themselves are of little or no value in correlating the coal exposures, because of the extremely variable depositional pattern.

The program was completed at too late a date to allow much work to be done on the two lower seams this season. However, it is felt that these seams probably offer a higher quality coal (lower volatile and less ash) than any others known on the property.

The combination of prospecting, bulldozer stripping and drilling has been proved successful for tracing coal seams, and further work will involve all three methods. The prospecting work has already been done on Castle Mountain and Mount Turnbull, although drill holes will be required in these areas to locate the lower seams prior to stripping. Seam No. 4 has already been trenched below hole No. 3 on Eagle Mountain, while seam No. 2 has been located, and correlated to hole No. 3, on the north side of Castle Mountain near Kilmarnock Creek. There is no positive correlation between Eagle Mountain and Mount Turnbull as yet, but several coal seams have been located on the latter mountain.

8. COAL RESERVES

The permit area contains large reserves of coking coal. Insufficient work has been done on all areas west of the Fording River to allow calculations of reserve potential to be carried out, but indications are that similar quantities of coal per unit area are present.

In the area east of the Fording River, the work done indicates that the coals may be divided, for purposes of calculation, into those underlying Castle, Eagle and Turnbull Mountains. In each sub-area, all coal having dip in excess of 25°, or lying within minor disturbed areas, has been eliminated from the calculations. Only seams No. 2, No. 4, No. 7 and No. 12 have been considered. In each case a total reserve, a reserve utilizing the uppermost 15 feet of the seam, and a recoverable tonnage of 60 percent of the latter figure have been calculated. It must be emphasized that these figures are based upon a minimum amount of information, and that much further work remains to be done to arrive at a proven or possible reserve tonnage.

(a) Total Reserves - 25°

	<u>Seam 2</u>	<u>Seam 4</u>	<u>Seam 7</u>	<u>Seam 12</u>	<u>Total Field</u>
Eagle Mountain	39,000,000	71,000,000	46,000,000	30,000,000	186,000,000
Castle Mountain	27,000,000	79,000,000	52,000,000	33,000,000	191,000,000
Turnbull Mountain	8,000,000	23,000,000	14,000,000	4,000,000	49,000,000
<b>Total</b>	<u>74,000,000</u>	<u>173,000,000</u>	<u>112,000,000</u>	<u>67,000,000</u>	<u>426,000,000</u>

(b) Top 15' of Seam Only

	<u>Seam 2</u>	<u>Seam 4</u>	<u>Seam 7</u>	<u>Seam 12</u>	<u>Total Field</u>
Eagle Mountain	39,000,000	41,000,000	29,000,000	17,000,000	126,000,000
Castle Mountain	27,000,000	46,000,000	32,000,000	19,000,000	124,000,000
Turnbull Mountain	8,000,000	13,000,000	8,000,000	2,000,000	31,000,000
<b>Total</b>	<u>74,000,000</u>	<u>100,000,000</u>	<u>69,000,000</u>	<u>38,000,000</u>	<u>281,000,000</u>

(c) Assuming 60% Recovery of Reserves, Mining Top 15' of Seam

	<u>Seam 2</u>	<u>Seam 4</u>	<u>Seam 7</u>	<u>Seam 12</u>	<u>Total Field</u>
Eagle Mountain	23,400,000	24,600,000	17,400,000	10,200,000	75,600,000
Castle Mountain	16,200,000	27,600,000	19,200,000	11,400,000	74,400,000
Turnbull Mountain	4,800,000	7,800,000	4,800,000	1,200,000	18,600,000
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total	<u>44,400,000</u>	<u>60,000,000</u>	<u>41,400,000</u>	<u>22,800,000</u>	<u>168,600,000</u>

These preliminary figures indicate that there is ample coal recoverable from the two lower seams to support a large-scale operation. If it is presumed that 80 percent recovery is obtained by the washing plant on the run-of-mine product, then these two seams could yield up to 80 million tons of marketable coal. A more flexible, and consequently more economic, operation would result if the upper seams were mined in conjunction with the lower seams.

## 9. ECONOMICS

Until estimates of production cost and shipping charges are available, it is impossible to evaluate this property. There is enough information available for a preliminary estimate of these costs to be made, but it is not within the scope of this report to make such an estimate. Also, until test work on samples from several seams has been completed for the Japanese steel mills, no firm price structure can be established. However, it is felt that a preliminary estimate of mining, treatment and shipping costs is essential at this time, as this will enable the total project to be evaluated in terms of what is known about the probable realizable price of the coal. Alternately, these studies will also show what price must be paid for the coal, by the Japanese steel mills, if the property is to be put into production.

The work conducted to date has indicated that the property contains extremely large reserves of high-grade, bituminous coking coal. Some of these reserves are recoverable by modern methods, if a market can be found. This market must eventually come, as a reserve of coking coal such as this cannot lie idle indefinitely as reserves elsewhere are depleted.

The main economic advantages are:

- (a) Reserves of coal are large.
- (b) Seams have relatively low dips, and structures are simple.
- (c) All entries to seams are above river level, hence shafts are eliminated.
- (d) Convenient access to the seams is available at suitable intervals along strike, obviating excessively long haulage.
- (e) Adequate water supplies are available near the coal seams.
- (f) Electric power is available from the East Kootenay Power main line in the Elk River Valley.
- (g) The broad, flat-bottomed valleys of the Fording River, Henretta Creek and Kilmarnock Creek provide good access for railway connections.
- (h) Adequate sites for townsite are available in the valley of the Fording River.

The main disadvantages are:

- (a) Permanent, all-weather road access is lacking.
- (b) A townsite must be established to work the mine.

- (c) Mine waste disposal will be a problem.
- (d) Lack of trained miners for opening up the operation.
- (e) The only market open for the coal at this time is in Japan.
- (f) The B.C. Government royalty of 25¢ per short ton imposes a 15¢ per short ton penalty on the coal produced as compared to mines operating in Alberta. Also, this royalty is not payable by mines operating outside Crown lands (Crows Nest Industries), and would give such mines an advantage of \$500,000 per annum on production of 2,000,000 short tons of coal.

10. CONCLUSIONS AND RECOMMENDATIONS

As a result of the program carried out during 1967, it is concluded that:

- (a) The property contains reserves of coking coal sufficient to support a large production rate, and that the area lying east of the Fording River is the most important from this point of view.
- (b) Within this area only coals dipping at 25° or less are of economic interest.
- (c) Within the coal succession, seams No. 2, No. 4, No. 7 and No. 12 have the best ash contents and potential as sources of coking coal.
- (d) The best method of exploring for, and evaluating, these seams is by continuous exposure by bulldozer, combined with cored sections of drill holes and adits where necessary.
- (e) At the moment, these coals are only of value if preliminary cost estimates indicate that they can be produced at a price competitive in the present Japanese market.

It is recommended that:

- (a) A study of production and shipping costs from the property be made, using the available information.
- (b) Depending upon the results of (a), and assuming for the purposes of this report that further work is justified, the following program is recommended for the 1968 season.
  - (1) Strip seams No. 2 and No. 4 along their outcrop on Eagle, Castle and Turnbull Mountains.
  - (2) Test and sample seams No. 2 and No. 4 by means of adits on Eagle, Castle and Turnbull Mountains.
  - (3) Two deep drill holes on each of Castle and Turnbull Mountains, and one on the north end of Eagle Mountain, to confirm the coal succession at depth throughout the area.
  - (4) Short drill holes at proposed adit locations prior to commencement of underground work.
  - (5) Gamma-ray/neutron logging of all drill holes.
  - (6) One or two drill holes west of the Fording River to test the coal succession in the syncline there.
  - (7) Some helicopter reconnaissance to determine if strip mining possibilities exist, particularly on the east flank of

Castle Mountain. (The feasibility of the whole project would be upgraded if some strippable reserves were located. There remains some doubt if coking coal can be exposed on benches to allow mining without atmospheric degradation).

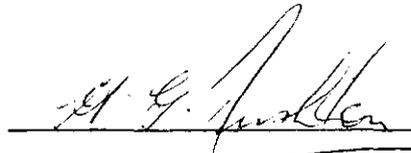
- (8) The establishment of survey control in the area of major interest.
- (9) All contractors employed in the 1967 program be re-engaged for this work. (All contractors gave extremely satisfactory service throughout their operations).
- (10) Methods of driving adits be re-examined to see whether some acceleration in the slow rate of advance can be obtained.
- (11) That the three isolated coal licenses, numbers 314 (L 6385), 315 (6384) and 316 (E $\frac{1}{2}$  6824) be allowed to lapse. The remainder of the coal licenses should be kept in good standing. This will bring the total acreage held under license to 25,280 acres.
- (12) That two additional licenses, covering the east half of L 6710 and L 6699 be obtained, to protect possible extensions of No. 2 and No. 4 seam. This involves some 640 acres, and will bring the net holding to 25,920 acres.

The cost of the above program is estimated at \$260,000. A summary budget estimate and equipment and personnel requirements will be found in Appendix 10.

A C K N O W L E D G M E N T S

The writer wishes to express his keen appreciation of the work carried out by E.J. Wendeborn, G.N. Wright, P. Kho and A.C. Doulis of the Oil and Gas Division of C.P.O.G. Without their efforts and enthusiasm, the information presented in this report would not have been gathered.

All permanent and temporary Mining Division personnel performed well. The initial photo-geological studies were made by C.W. Wright-Broughton of C.P.O.G., and provided invaluable guidance for the field work.



---

H.G. RUSHTON, P.Geol.  
Mining Geologist.

Calgary, Alberta.

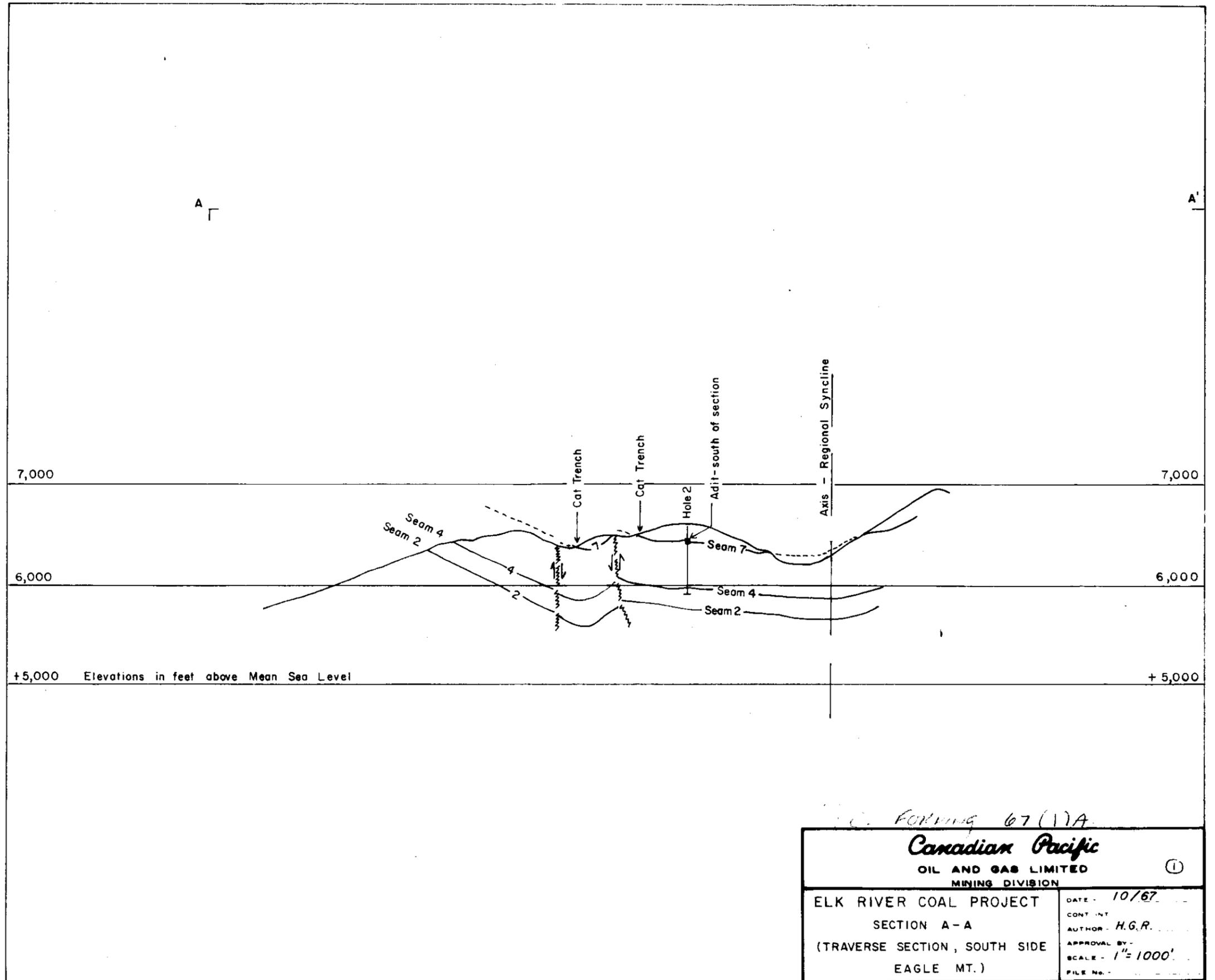
December 1, 1967.

R E F E R E N C E S

1. "Coal Fields of British Columbia" by D.B. Dowling.  
Memoir 69, Geol. Survey of Canada, 1915 pp. 33-51
2. "Geology of the Crowsnest Coal Basin" by C.B. Newmarch  
Bull. 33, B.C. Department of Mines, 1953
3. "Elk River Coal Fields" by A.W.C. Wilson  
C.P.R. private report, 1905
4. "Coal Lands of the Imperial Coal and Coke Co. Ltd." by J. McNeil  
Union Pacific Railway, private report, 1909
5. "The Lewis Thrust at Fording Mountain, B.C." by C.D.A. Dahlstrom,  
R.E. Daniel and G.G.L. Henderson (California Standard Oil Co.)  
Jour. Alberta Soc. Pet. Geol. Vol. 10, No. 7, July-August,  
1962, pp 373-395
6. "Geological Report, Elk River Coal" by M.R. Wolfhard  
Cominco Ltd., private report, September, 1967.

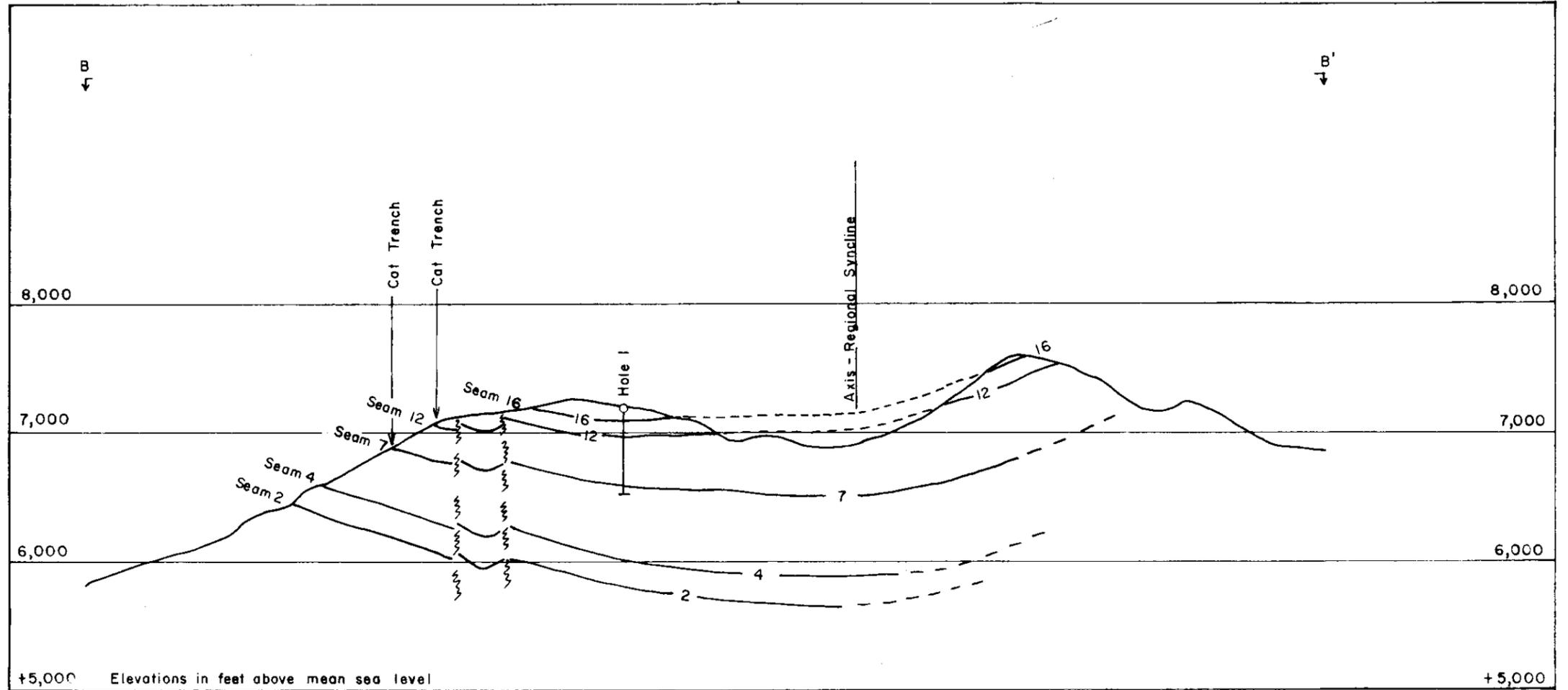
A P P E N D I C E S

1. Property Plan (1:50,000) with Location Map (insert).
2. Geological Plan (1" = 1000').
3. Sections A-A', B-B', C-C', D-D', E-E', X-X', Y-Y' (1" = 1000').
4. Detailed Correlation Holes 1, 2, 3, 4 (1" = 20').
5. Logs of Surface Trenches.
6. Analyses of Coal Seams and Other Tests.
7. Section, Adit in No. 7 Seam (1" = 20').
8. Marubeni-Lida Sample - No. 7 Seam.
9. Mitsui Sampling - No. 7 Seam.
10. Equipment, Methods and Personnel Requirements.  
Budget Estimate of Recommended Program.
11. Contractors and Personnel, 1967.  
Cost Summary, 1967 Program



C. FORKING 67(17A)

<b>Canadian Pacific</b> OIL AND GAS LIMITED MINING DIVISION		①
ELK RIVER COAL PROJECT SECTION A-A (TRAVERSE SECTION, SOUTH SIDE EAGLE MT.)		DATE - 10/67 CONT. INT. AUTHOR - H.G.R. APPROVAL BY - SCALE - 1" = 1000' FILE No. -

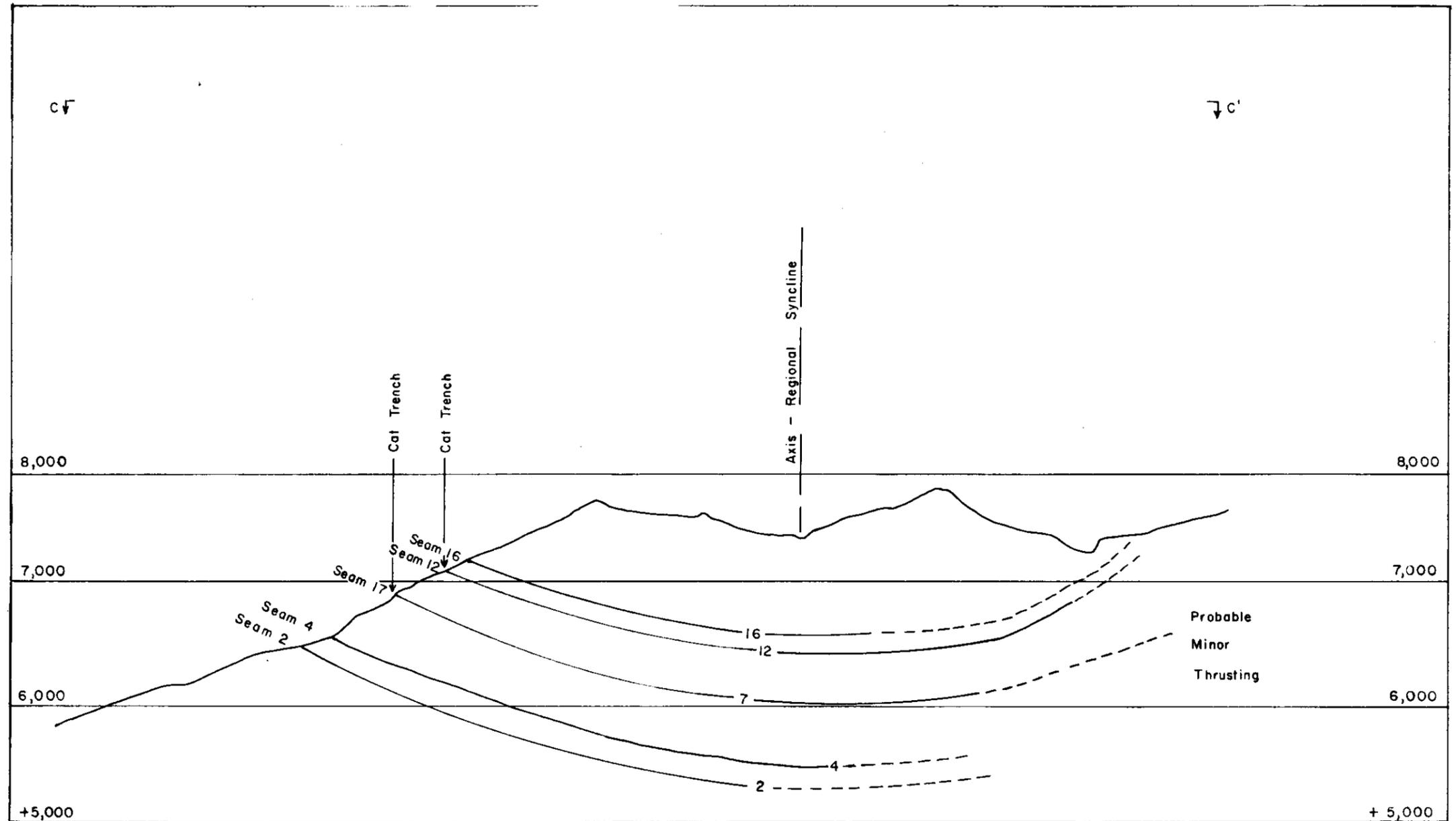


+5,000 Elevations in feet above mean sea level

+5,000

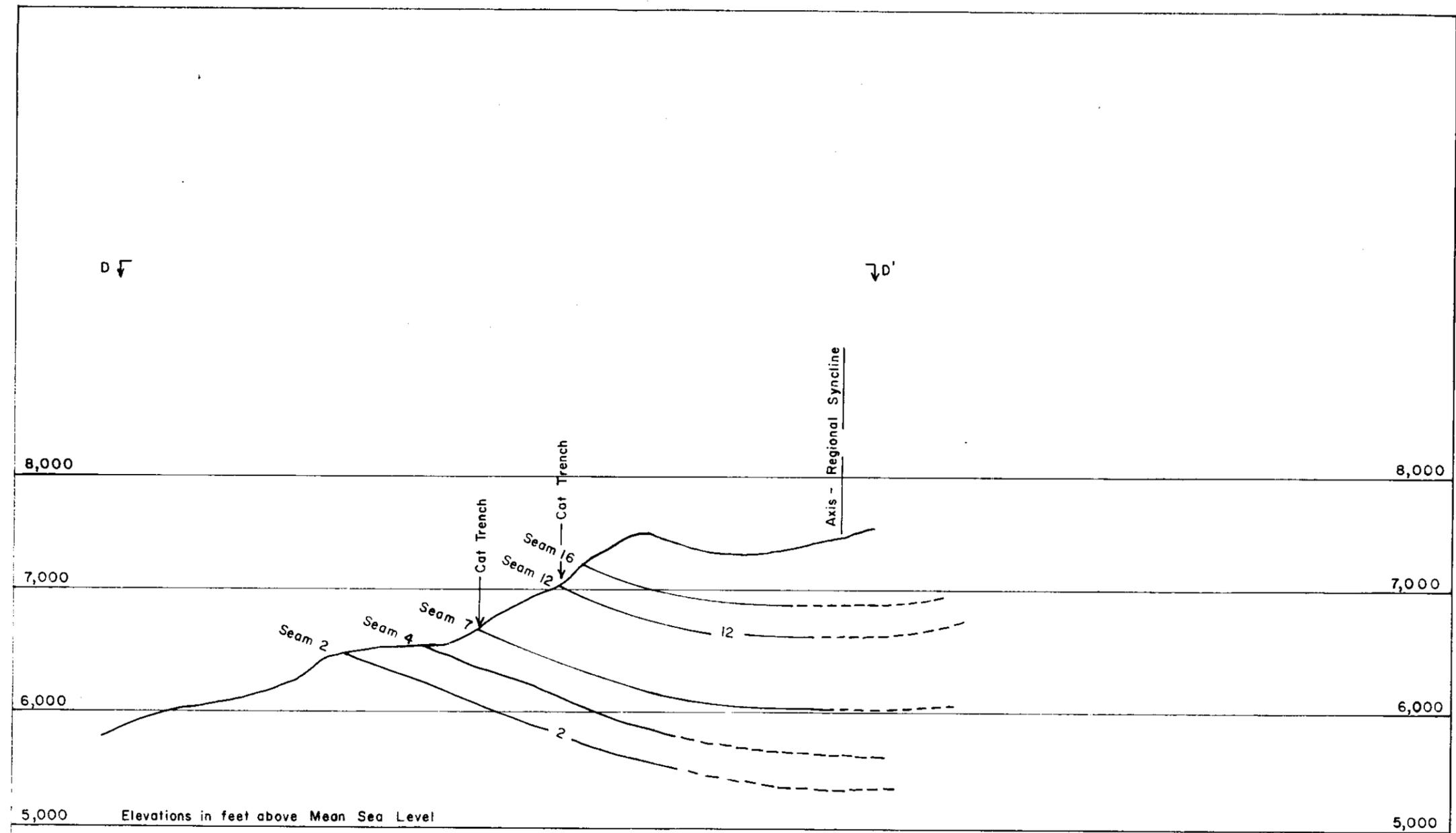
*K. FORDING, 67 (1) A*

<b>Canadian Pacific</b>	
OIL AND GAS LIMITED	
MINING DIVISION	
ELK RIVER COAL PROJECT	DATE - 10/67
SECTION B - B'	CONT. INT.
(TRANSVERSE SECTION THROUGH	AUTHOR - H.G.R.
EAGLE MOUNTAIN)	APPROVAL BY -
	SCALE - 1" = 1,000'
	FILE NO. -



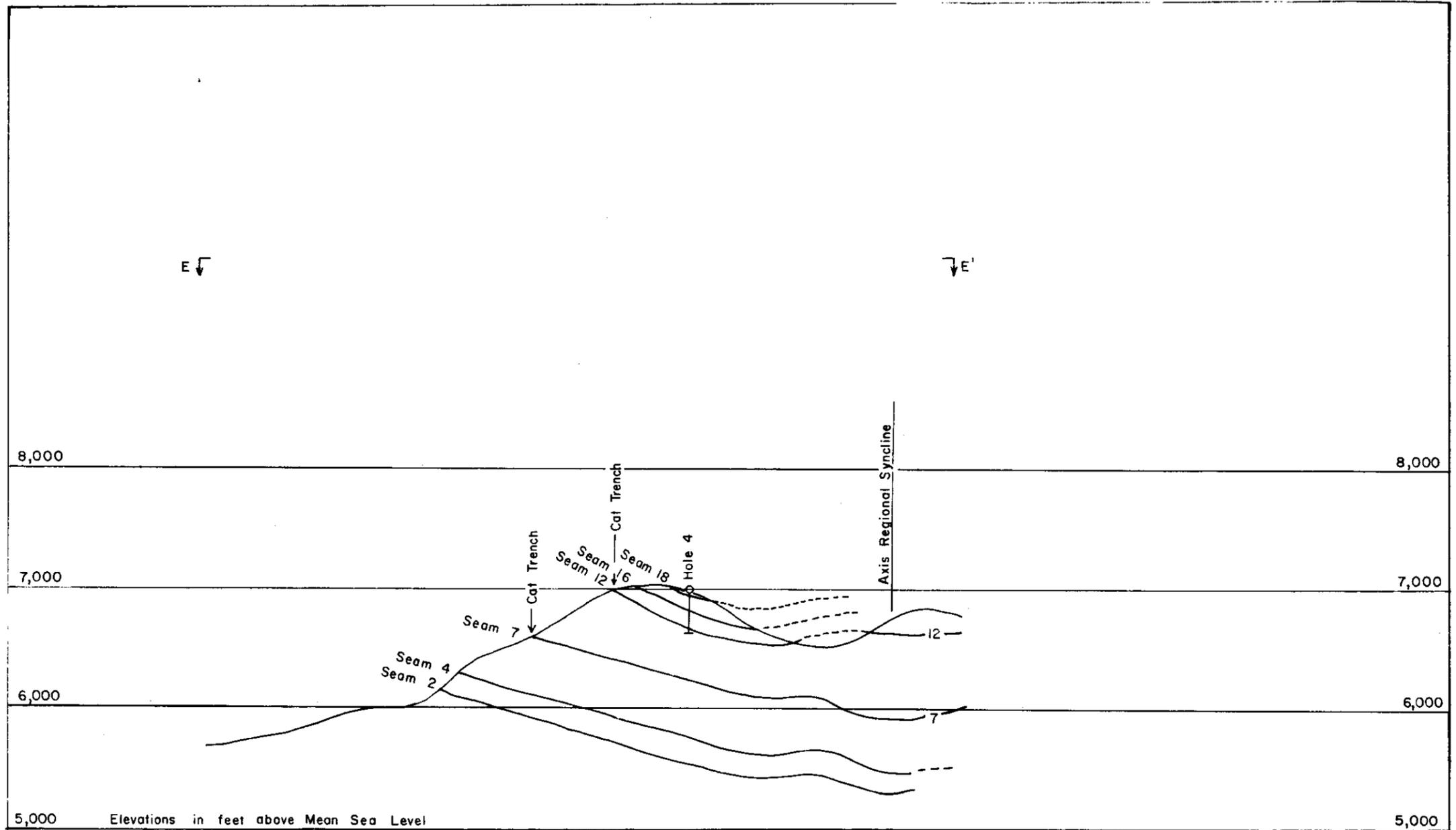
K. FORBING 67(1)A

<b>Canadian Pacific</b> OIL AND GAS LIMITED MINING DIVISION		③
ELK RIVER COAL PROJECT SECTION C - C' (TRANSVERSE SECTION THROUGH EAGLE MOUNTAIN)		DATE - 10/67 CONT INT AUTHOR - H.G.R. APPROVAL BY - SCALE - 1" = 1,000' FILE NO. -



K-FORDING 67 (1)A

<b>Canadian Pacific</b> OIL AND GAS LIMITED MINING DIVISION	
ELK RIVER COAL PROJECT SECTION D - D' (TRANSVERSE SECTION, NORTH SIDE EAGLE MOUNTAIN)	DATE - 10/67 CONT. INT. AUTHOR - H.G.R. APPROVAL BY - SCALE - 1" = 1,000' FILE NO. -



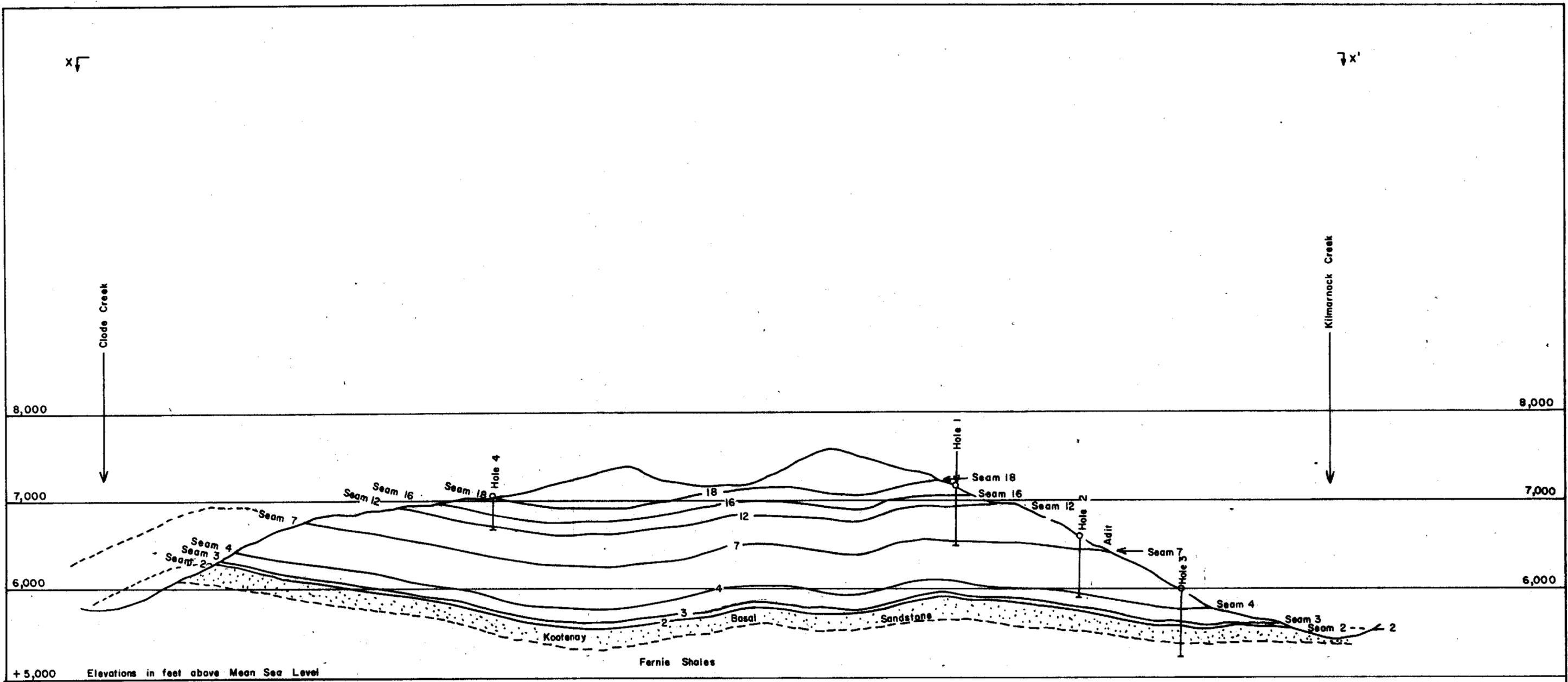
16 FORGING 67 (1) A

**Canadian Pacific**  
 OIL AND GAS LIMITED  
 MINING DIVISION

(5)

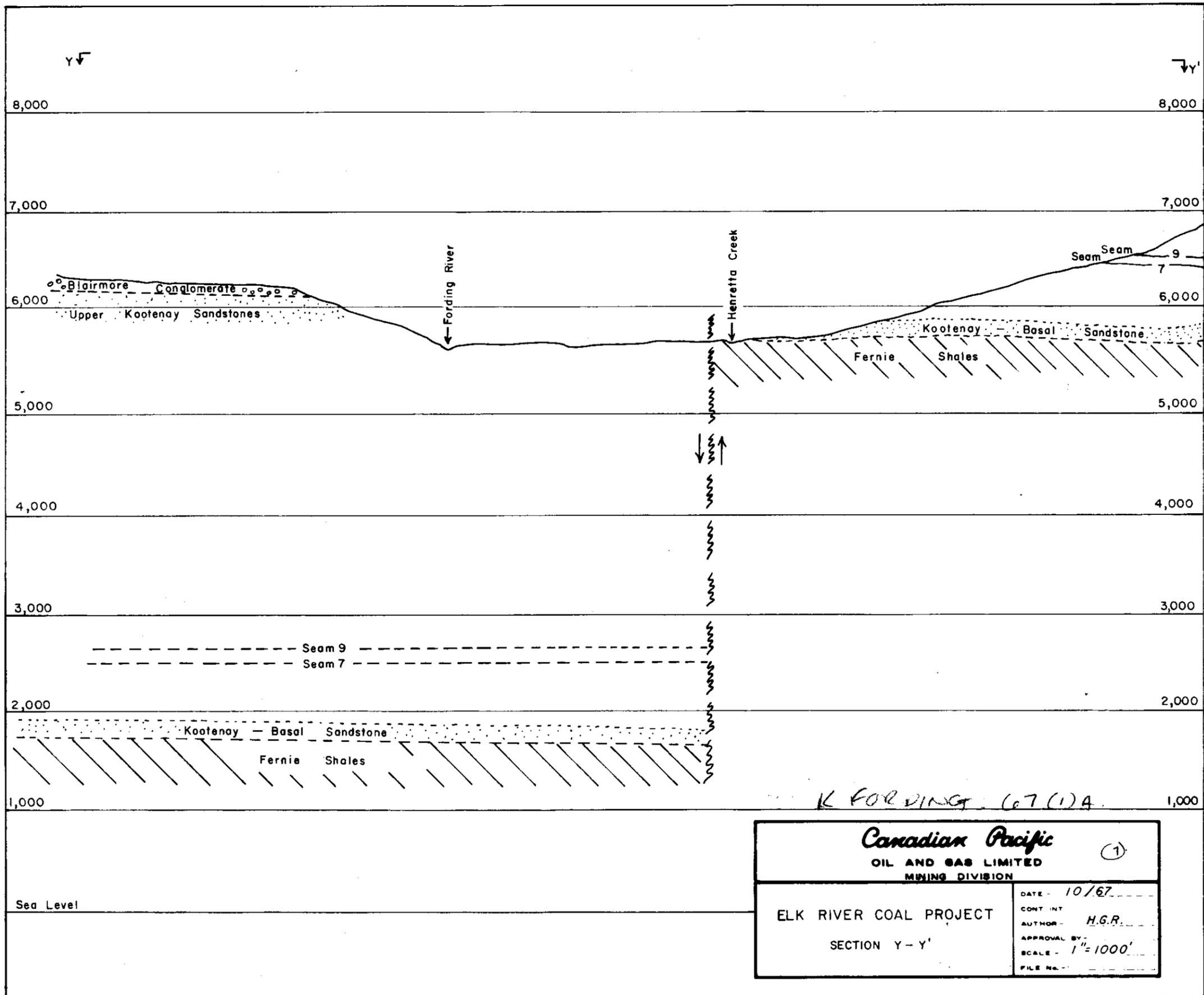
ELK RIVER COAL PROJECT  
 SECTION E - E'  
 (TRANSVERSE SECTION, NORTH  
 SIDE EAGLE MOUNTAIN)

DATE - 10/67  
 CONT. NT  
 AUTHOR - H.G.R.  
 APPROVAL BY  
 SCALE - 1" = 1,000'  
 FILE NO.



*L-FORDING (67(T)A.*

<b>Canadian Pacific</b>	
OIL AND GAS LIMITED	
MINING DIVISION	
ELK RIVER COAL PROJECT SECTION X-X' (LONGITUDINAL SECTION, EAGLE MOUNTAIN)	DATE: 10/57 CONT. INT. AUTHOR: H.G.R. APPROVAL BY: SCALE: 1" = 1,000' FILE NO.:



A P P E N D I X 5

LOGS OF SURFACE TRENCHES

TRENCH NO. 1

WEST SIDE, CASTLE MOUNTAIN

Uncorrelated seam

Measurements on vertical face

	<u>Waste</u>	<u>Coal</u>
Shale roof		
0 - 2' - very soft, weathered coal	-	2
2 - 4' - soft, weathered coal	-	2
4 - 8' - bright, hard coal	-	4
	-----	-----
Shale floor		8'
Totals		

TRENCH NO. 2

WEST SIDE, CASTLE MOUNTAIN

Uncorrelated seam. May be Seam No. 7

Measurements on 70° slope

	<u>Waste</u>	<u>Coal</u>
Siltstone roof		
0 - 5' - coal	-	5.0
5 - 5.5' - bony coal	0.5	-
5.5 - 7.5' - coal	-	2.0
7.5 - 8.3' - bony coal	0.8	-
8.3 - 16.7' - coal	-	8.4
16.7 - 16.9' - shale	0.2	-
16.9 - 18.4' - coal	-	1.5
18.4 - 18.6' - bony coal	0.2	-
18.6 - 21.2' - coal	-	2.6
21.2 - 21.3' - shale	0.2	-
21.3 - 26.0' - coal	-	4.7
	-----	-----
Shale floor	1.9'	24.2'
Totals		

TRENCH NO. 3

SOUTH SIDE, EAGLE MOUNTAIN

Seam No. 5 (true width 6.5')

Measurements on 37° slope

	<u>Waste</u>	<u>Coal</u>
Sandstone roof		
0 - 2' - soft, weathered coal	-	2
2 - 4' - shiny, brittle coal	-	2
4 - 10' - hard, dull and bright coal	-	6
	-----	-----
Shale floor		10'
Totals		

TRENCH NO. 4

SOUTH SIDE, EAGLE MOUNTAIN

Seam No. 5 (true width 6.0')

Measurements on 30° slope

	<u>Waste</u>	<u>Coal</u>
Sandstone roof		
0 - 10' - very hard, bright coal	-	10
	-----	-----
Shale floor		10'
Totals		

TRENCH NO. 5

SOUTH SIDE, EAGLE MOUNTAIN

Seam No. 6 (true width 7.0')

Measurements on 37° slope

	<u>Waste</u>	<u>Coal</u>
Shale roof		
0 - 4' - soft coal	-	4.0
4 - 5.7' - coal	-	1.7
5.7 - 6.0' - shale	0.3	-
6.0 - 11.0' - coal	-	<u>5.0</u>
Shale floor		
Totals	0.3'	10.7'

TRENCH NO. 6

SOUTH SIDE, EAGLE MOUNTAIN

Seam No. 7 (true width 24.0')

Measurements on 60° slope

	<u>Waste</u>	<u>Coal</u>
Shale roof		
0 - 5.5' - coal	-	5.5
5.5 - 5.7' - bone	0.2	-
5.7 - 6.2' - coal	-	0.5
6.2 - 6.4' - bone	0.2	-
6.4 - 8.2' - coal	-	1.8
8.2 - 8.9' - sandy shale	0.7	-
8.9 - 26.1' - coal	-	17.2
26.1 - 26.6' - bone	0.5	-
26.6 - 32.7' - coal	-	<u>6.1</u>
Shale floor		
Totals	1.6'	31.1'

TRENCH NO. 7

SOUTH SIDE, EAGLE MOUNTAIN (at adit entry before excavation)

Seam No. 7 (true width 22.5')

Measurements on 75° slope

	<u>Waste</u>	<u>Coal</u>
Shale roof		
0 - 9.4' - coal	-	9.4
9.4 - 9.9' - bone	0.5	-
9.9 - 18.9' - coal	-	9.0
18.9 - 19.4' - bone	0.5	-
19.4 - 27.1' - coal, few thin shale partings	<u>0.5</u>	<u>7.2</u>
Shale floor		
Totals	1.5'	25.6'

TRENCH NO. 8

SOUTH SIDE, EAGLE MOUNTAIN - CAT TRENCH

Seam No. 12

Measurements are true width

	<u>Waste</u>	<u>Coal</u>
Siltstone roof		
0 - 5.5' - coal	-	5.5
5.5 - 7.5' - silty shale	2.0	-
7.5 - 8.5' - coal	-	1.0
8.5 - 9.5' - bone	1.0	-
9.5 - 24.0' - coal	-	<u>14.5</u>
Shale floor		
Totals	3.0'	21.0'

TRENCH NO. 9

SOUTH SIDE, EAGLE MOUNTAIN - CAT TRENCH

Seam No. 16

Measurements are true width

	<u>Waste</u>	<u>Coal</u>
Silty sandstone roof		
0 - 2.4' - coal	-	2.4
2.4 - 2.6' - bone	0.2	-
2.6 - 4.4' - coal	-	1.8
4.4 - 4.9' - bone	0.5	-
4.9 - 5.1' - coal	-	0.2
5.1 - 5.6' - dirty coal	0.2	0.3
5.6 - 5.8' - bone	0.2	-
5.8 - 7.2' - coal	-	1.4
7.2 - 7.5' - bone	0.3	-
7.5 - 7.7' - coal	-	0.2
7.7 - 7.9' - dirty coal	0.1	0.1
7.9 - 8.3' - coal	- 0.4	-
8.3 - 8.5' - dirty coal	0.1	0.1
8.5 - 8.9' - coal	-	0.4
8.9 - 9.9' - bone	1.0	-
9.9 - 12.2' - coal	-	2.3
12.2 - 12.6' - bone	0.4	-
12.6 - 13.3' - coal	-	<u>0.7</u>
Carbonaceous shale floor		
Totals	3.0'	10.3'

TRENCH NO. 10

WEST SIDE, CASTLE MOUNTAIN

Uncorrelated seam

Measurements are true width

	<u>Waste</u>	<u>Coal</u>
Siltstone roof		
0 - 8' - coal	-	<u>8.0</u>
Silty shale floor		
Totals		8.0'

TRENCH NO. 11

NORTH SIDE, CASTLE MOUNTAIN

Uncorrelated seam -  
Trench not logged

TRENCH NO. 12

WEST SIDE, CASTLE MOUNTAIN

Uncorrelated seam -  
Measurements on 50° slope  
Sandstone roof  
0 - 6' - coal  
Floor of seam not located owing to heavy sandstone rubble and  
overhang of cliff

TRENCH NO. 13

WEST SIDE, CASTLE MOUNTAIN

Uncorrelated coal exposure -  
Trench found only thin (6") coals within series of shales and car-  
bonaceous shales

TRENCH NO. 14

WEST SIDE, EAGLE MOUNTAIN

No. 8 or No. 9 seam  
Measurements on 80° slope (true width 16')  
Silty shale roof

	<u>Waste</u>	<u>Coal</u>
0 - 4.8' - coal	-	4.8
4.8 - 4.9' - bone	0.1	-
4.9 - 11.7' - coal	-	7.2
11.7 - 12.7' - bone	1.0	-
12.7 - 19.3' - coal	-	6.3
Shale floor		
Totals	1.1'	18.3'

TRENCH NO. 15

WEST SIDE, EAGLE MOUNTAIN

No. 7 seam  
Measurements on 80° slope (true width 14')  
Silty, carbonaceous shale roof

	<u>Waste</u>	<u>Coal</u>
0 - 6.0' - coal	-	6.0
6.0 - 6.1' - bone	0.1	-
6.1 - 7.0' - coal	-	0.9
7.0 - 7.5' - slightly bony coal	0.2	0.3
7.5 - 10.7' - coal	-	3.2
10.7 - 10.9' - bone	0.2	-
10.9 - 13.4' - coal	-	2.5

TRENCH NO. 15 (Continued)

	<u>Waste</u>	<u>Coal</u>
13.4 - 14.4' - bone	1.0	-
14.4 - 15.3' - coal	<u>-</u>	<u>0.9</u>
Slightly carbonaceous shale floor Totals	1.5'	13.8'

TRENCH NO. 16

WEST SIDE, EAGLE MOUNTAIN

No. 5 seam (?)

Measurements on 30° slope (true width 6.8')

	<u>Waste</u>	<u>Coal</u>
Shale roof		
0 - 5.6' - coal	-	5.6
5.6 - 5.8' - sandstone	0.2	-
5.8 - 8.5' - coal	-	2.7
8.5 - 9.0' - sandstone	0.5	-
9.0 - 13.7' - coal	<u>-</u>	<u>4.7</u>
13.7 - 19.0' - shaly coal	0.7'	13.0'
Shale floor		
Totals		

TRENCH NO. 17

WEST SIDE, EAGLE MOUNTAIN

No. 2 seam (??) not well correlated, may be discontinuous coal

Measurements at true width

Sandstone roof

0 - 4.5' - dirty coal (20% shale)

Shale floor

TRENCH NO. 18

WEST SIDE, EAGLE MOUNTAIN

No. 7 seam

Measurements on 80° slope. Trench did not reach floor of seam, stopped at parting

	<u>W.</u>	<u>C.</u>
Shale roof		
0 - 3.5' - coal	-	3.5
3.5 - 3.6' - bone	0.1	-
3.6 - 5.5' - coal	-	1.9
5.5 - 5.6' - sandy shale	0.1	-
5.6 - 6.2' - coal	-	0.6
6.2 - 6.4' - sandy shale	0.2	-
6.4 - 10.7' - coal	<u>-</u>	<u>4.3</u>
10.7 - shale	0.4	10.3
Floor not found - heavy overburden		

TRENCH NO. 19

WEST SIDE, EAGLE MOUNTAIN

No. 8 or No. 9 seam

Measurements on 40° slope

	<u>Waste</u>	<u>Coal</u>
Shale roof		
0 - 4.0' - coal	-	4.0
4.0 - 4.2' - sandstone	0.2	-
4.2 - 7.0' - coal	-	2.8
7.0 - 7.2' - shale	0.2	-
7.2 - 11.2' - coal	-	4.0
11.2 - 11.4' - coaly shale	0.2	-
11.4 - 13.9' - coal	-	<u>2.5</u>
Shale floor		
Totals	0.6'	13.3'

TRENCH NO. 20

NORTH SIDE, EAGLE MOUNTAIN

No. 18 Seam

Measurements on 35° slope. Trench did not reach floor of seam  
owing to heavy overburden

Shale roof	<del>1.2</del>	<u>6</u>
0 - 1.3' - coal	-	1.3
1.3 - 2.5' - bone	<u>1.2</u>	-
2.5 - 3.7' - coal	0.2	<u>1.2</u>
3.7 - 3.9' - bone	-	7.9
3.9 - 11.8' - coal	<u>1.4</u>	<u>10.4</u>
Floor not located		

TRENCH NO. 21

WEST SIDE, MT. TURNBULL

Uncorrelated seam

Measurements at true width

	<u>Waste</u>	<u>Coal</u>
Shale roof		
0 - 1.5' - coaly shale	0.8	0.7
1.5 - 4.5' - coal	-	<u>3.0</u>
Shale floor		
Totals	<u>0.8'</u>	3.7'

TRENCH NO. 22

WEST SIDE, MT. TURNBULL

Uncorrelated seam - same seam as trench No. 21

Measurements at true width

Shale roof	
0 - 1.5' - coaly shale	
Shale floor	

TRENCH NO. 23

WEST SIDE, MT. TURNBULL

Uncorrelated seam - same seam as trench No. 21  
Measurements at true width  
Silty sandstone roof  
0 - 3.0' - dirty coal and shale  
Shale floor

TRENCH NO. 24

WEST SIDE, MT. TURNBULL

Uncorrelated seam - same seam as trench No. 25  
Not logged in detail - 16.5' of coal (true width)

TRENCH NO. 25

SOUTH SIDE, MT. TURNBULL

Uncorrelated seam - same seam as trench No. 24  
Not logged in detail - bottom of seam not found - + 14' of coal

TRENCH NO. 26

SOUTH SIDE, MT. TURNBULL

Uncorrelated seam - same seam as trench No. 27  
Not logged in detail - 6' of coal (true width)

TRENCH NO. 27

SOUTHWEST SIDE, MT. TURNBULL

Uncorrelated seam - same seam as trench No. 26  
Not logged in detail - 3' of coal (true width)

TRENCH NO. 28

SOUTHWEST SIDE, MT. TURNBULL

Uncorrelated seam  
Not logged in detail - 3.3' of coal (true width)

TRENCH NO. 29

WEST SIDE, EAGLE MOUNTAIN

No. 7 seam  
Not logged in detail - seam 18' thick (true width)

TRENCH NO. 30

WEST SIDE, EAGLE MOUNTAIN

No. 5 seam  
Not logged in detail - seam 5' thick (true width)

TRENCH NO. 31

WEST SIDE, EAGLE MOUNTAIN

No. 7 seam

Not logged in detail - seam 24' thick (true width)

TRENCH NO. 32

WEST SIDE, EAGLE MOUNTAIN

No. 13 seam (?)

Not logged in detail - seam 3' thick (true width)

TRENCH NO. 33

SOUTH SIDE, EAGLE MOUNTAIN - CAT TRENCH

No. 4 seam

Measurements are true width

Silty sandstone roof

0 - 28.3' - clean, shiny coal

occasional thin shaly partings, very discontinuous

Shale floor

TRENCH NO. 34

NORTH SIDE, CASTLE MOUNTAIN - CAT TRENCH

No. 1 and No. 2 seam

Measurements are true width

Siltstone roof

0 - 8.0' - coal - clean (seam No. 2)

8.0 - 15.0' - shaly siltstone, few coaly partings

15.0 - 16.0' - coal )

16.0 - 16.7' - bone ) seam No. 1

16.7 - 19.0' - coal )

	<u>Waste</u>	<u>Coal</u>
	-	1.0
	0.7	-
	-	<u>2.3</u>

Fine-grained sandstone floor (basal sandstone)

0.7'      3.3'

A P P E N D I X 6

ANALYSES OF COAL SEAMS AND OTHER TESTS

1. Trench Samples

Seam No. 5

<u>Location</u>	<u>M</u>	<u>A</u>	<u>V.M.</u>	<u>F.C.</u>	<u>FSI</u>	<u>S</u>	<u>B.t.u.</u>
Trench No. 3	12.7	11.9	23.0	52.4	0	0.7	9,837
Trench No. 4	6.5	34.2	18.6	40.6	1	0.7	7,586

Seam No. 6

<u>Location</u>	<u>M</u>	<u>A</u>	<u>V.M.</u>	<u>F.C.</u>	<u>FSI</u>	<u>S</u>	<u>B.t.u.</u>
Trench No. 5	9.45	23.15	23.03	44.37	0	0.43	8,435

Seam No. 7

<u>Location</u>	<u>M</u>	<u>A</u>	<u>V.M.</u>	<u>F.C.</u>	<u>FSI</u>	<u>S</u>	<u>B.t.u.</u>
Trench No. 2	16.1	16.5	20.9	46.5	0	0.6	8,365
Trench No. 6	16.2	13.2	36.0	40.0	0	0.4	9,270
Trench No. 7	22.2	14.4	22.3	41.2	0	0.3	7,686
Face at Adit Entry	4.86	14.17	19.72	61.25	1½	0.40	-
Face at Adit Entry	1.65	5.50	21.25	71.60	1½	0.43	-

FOR OTHER ANALYSES OF SEAM NO. 7, SEE APPENDIX 7 (ADIT SECTION)

Seam No. 12

<u>Location</u>	<u>M</u>	<u>A</u>	<u>V.M.</u>	<u>F.C.</u>	<u>FSI</u>	<u>S</u>	<u>B.t.u.</u>
Trench No. 8	13.20	6.36	25.22	55.22	1	0.79	11,348
Trench No. 8	8.44	6.95	27.64	56.97	0	-	-

FOR OTHER ANALYSES OF SEAM NO. 12, SEE APPENDIX 8 (NARUBENI-IIDA SAMPLING)

Seam No. 16

<u>Location</u>	<u>M</u>	<u>A</u>	<u>V.M.</u>	<u>F.C.</u>	<u>FSI</u>	<u>S</u>	<u>B.t.u.</u>
Trench No. 9	5.08	15.81	27.41	51.70	1	0.71	10,339

Seam No. 18

Location	<u>M</u>	<u>A</u>	<u>V.M.</u>	<u>F.C.</u>	<u>FSI</u>	<u>S</u>	<u>B.t.u.</u>
Trench No. 20	11.73	5.40	26.08	56.89	0	-	-

2. Tests on Drill Hole Samples

(a) Comparison of Adit Results With Drill Hole Samples

As noted in the body of the report, the samples obtained from the drill holes were found to be highly contaminated. Both wet and dry samples were contaminated, while depth of hole from which the samples are taken may introduce a further variable. The degree of contamination is best illustrated by seam No. 7 which was sampled in the adit (Appendix 7) and by wet samples in drill hole No. 1 and dry samples in drill hole No. 2. Averages of these samples are as follows:

(1) Adit samples from face, unweathered portion of seam

Moisture	1.71%
Ash	10.81%
Volatiles	22.87%

(NOTE: Ash content in these samples is probably lower than the overall ash content of the seam, which is 14.17% in sample No. 28 - see Appendix 7.)

(2) Dry samples of seam, drill hole No. 2

Moisture	1.44%
Ash	21.62%
Volatiles	21.53%

(3) Wet samples of seam, drill hole No. 1

Moisture	8.41%
Ash	43.44%
Volatiles	17.76%

If a straight linear relationship is presumed between the above results, comparison of (1) and (2) above indicates that for each 1% increase in ash content above the true content, the volatiles indicated are 0.18%

below the true value. Ignoring the increased moisture content, a comparison of (1) and (3) above gives the result that each 1% increase in ash content above the true value cause a 0.17% decrease in volatiles below the true value.

The close correspondence of these ratios may be purely coincidental, but may give some means of determining the true volatile content of seams No. 2 and No. 4, sampled by the drill holes.

Applying this correction factor gives the following results:

(1) Seam No. 2

Wet samples, hole No. 3

Moisture	6.85%
Ash	19.75%
Volatiles	17.87%

Gamma-ray logs indicate that this seam is very clean, hence a 12% ash content may be presumed.

$$\begin{aligned}\text{True volatiles} &= (19.75 - 12.00) 0.17 + 17.87 \\ &= 1.32 + 17.87 \\ &= 19.19\%\end{aligned}$$

(2) Seam No. 4

Dry samples, hole No. 3

Moisture	3.23%
Ash	20.41%
Volatiles	19.59%

Gamma-ray logs indicate that this seam is very clean, hence a 12% ash content may be presumed.

$$\begin{aligned}\text{True volatiles} &= (20.41 - 12.00) 0.18 + 19.59 \\ &= 1.51 + 19.59 \\ &= 21.10\%\end{aligned}$$

Wet samples, hole No. 2

Moisture	9.00%
Ash	30.43%
Volatiles	16.42%

$$\begin{aligned} \text{True volatiles} &= (30.43 - 12.00) 0.17 + 16.42 \\ &= 3.13 + 16.42 \\ &= 19.55\% \end{aligned}$$

These results indicate that these two seams have a lower volatile matter content than seam No. 7.

(b) Free Swelling Indices, Seams No. 2 and No. 4

F.S.I. seam No. 7 adit face samples - 4 to 7½  
F.S.I. seam No. 7 wet samples, hole No. 1 - 2 to 4½  
F.S.I. seam No. 7 dry samples, hole No. 2 - 1½ to 8½

These samples indicate that the increased ash content, due to contamination, tends to depress the F.S.I. below its true value.

F.S.I. seam No. 2 wet samples, hole No. 3 - 3½ to 5  
F.S.I. seam No. 4 dry samples, hole No. 3 - 1 to 8  
F.S.I. seam No. 4 wet samples, hole No. 2 - 1 to 4

It is concluded that seams No. 2 and No. 4 have coking qualities comparable to seam No. 7.

(c) The contaminated drill hole samples from the seams were treated by Coast Eldridge of Vancouver. The purpose of these tests was to eliminate extraneous material as far as possible, and to obtain some indication of the qualities of a commercial product from each seam.

(1) Preliminary Testing to Establish the Best Specific Gravity at Which to Float the Coal

Only two composite samples were used in this work.

Sample A - Seam No. 16 - dry samples from hole No. 1  
Sample B - Seams 13, 14 and 15 - dry samples from hole No. 1.

Results obtained are enumerated below:

<u>Sample</u>	<u>Specific Gravity</u>	<u>Float%</u>	<u>Sink%</u>	<u>%Ash in Coal</u>
A	1.3	20.07	79.93	2.11
A	1.4	44.74	55.26	4.66
A	1.5	58.83	41.17	7.44
A	1.6	69.18	30.82	8.88
B	1.3	16.24	83.76	2.09
B	1.4	32.39	67.61	4.13
B	1.5	38.53	61.47	6.00
B	1.6	52.32	47.68	7.09

On the basis of these results, it was decided that all drill hole samples would be evaluated using a sink-float standard of 1.6 specific gravity.

(2) Composite samples of the seams were tested at a specific gravity of 1.6.

(SEE ATTACHED)

ANALYSIS OF FLOAT FRACTION

<u>Sample</u>	<u>Ash</u>	<u>Inherent Moisture</u>	<u>Volatile Matter</u>	<u>Cal. Value B.t.u./lb.</u>	<u>F.S.I.</u>	<u>Sink</u>	<u>Float</u>	<u>Sulphur</u>	<u>Phosphorus</u>
<u>Seam 1</u>									
- wet samples - Hole 3	19.20	0.90	19.52	12,400	7½	5.69	94.31	0.52	0.011
<u>Seam 2</u>									
- wet samples - Hole 3	13.93	0.60	20.58	13,373	5	16.69	83.31	0.41	0.057
<u>Seam 3</u>									
- wet samples - Hole 3	26.55	0.44	18.59	11,327	2	64.88	35.12	0.43	0.031
<u>Seam 4</u>									
- wet samples - Hole 2	22.70	0.57	19.21	11,702	1½	16.68	83.32	0.27	0.049
- dry samples - Hole 3	8.25	0.55	22.00	14,222	6	23.06	76.94	0.29	0.027
<u>Seam 7</u>									
- wet samples - Hole 1	26.55	0.57	20.41	10,903	4	63.82	36.18	0.37	0.067
- dry samples - Hole 2	9.14	0.62	23.34	14,371	7	28.53	71.47	0.49	0.045
<u>Seam 9</u>									
- wet samples, Hole 1	26.14	0.53	20.44	11,053	4	48.81	51.19	0.47	0.161
- upper ½ - dry samples - Hole 2	8.10	0.80	23.32	14,122	7	35.95	64.05	0.55	0.030
- lower ½ - dry samples - Hole 2	7.45	0.44	23.42	14,770	6	35.14	64.86	0.57	0.084
<u>Seam 10</u>									
- dry samples - Hole 1	12.96	0.64	25.05	13,124	8	58.01	41.99	0.80	0.049
<u>Seam 11</u>									
- dry samples - Hole 1	9.62	0.53	25.23	13,847	7	51.24	48.76	0.60	0.088
<u>Seam 12</u>									
- dry samples - Hole 1	8.42	0.72	27.03	14,147	8	41.17	58.83	0.61	0.045
- wet samples - Hole 4	15.90	0.87	24.11	13,149	8	49.27	50.73	0.75	0.039

Continued ....

ANALYSIS OF FLOAT FRACTION (Continued)

<u>Sample</u>	<u>Ash</u>	<u>Inherent Moisture</u>	<u>Volatile Matter</u>	<u>Cal. Value B.t.u./lb.</u>	<u>F.S.I.</u>	<u>Sink</u>	<u>Float</u>	<u>Sulphur</u>	<u>Phosphorus</u>
<u>Seams 13, 14 and 15</u> - dry samples - Hole 1	7.15	0.83	29.40	14,546	8½	47.68	52.32	0.76	0.062
<u>Seam 16</u> - dry samples - Hole 1	8.87	1.40	28.16	14,271	8½	30.82	69.18	0.68	0.095
<u>Seam 18</u> - dry samples - Hole 4 (weathered coal)	10.45	7.25	26.41	11,078	nil	26.59	73.41	0.49	0.054

From the above results, it will be seen that:

(a) The wet samples from the drill holes are of little value, owing to the very high degree of contamination and losses of fines which have affected the free swelling indices.

(b) The lower coals are lower in volatiles.

(c) The upper coals are somewhat better coking coals.

(d) The best qualities are shown by Seams 2, 4, 7 and 12.

(e) Sulphur and phosphorus contents are well within the requirements for metallurgical coals.

(3) Samples of coal from adit No. 1 driven on seam No. 7 were taken by the Department of Energy, Mines and Resources, and tested in their laboratories in Ottawa. Results of this test work are appended.

The following comments and conclusions have been made by the writer:

(a) The abnormally high ash content shown for Sample B is not explained by the lithology.

(b) Sulphur and phosphorus content of the coal is low.

(c) The finer fractions of the coal have the best coking properties.

(d) Recoveries of coal at suitable ash content are acceptable.

(e) All F.S.I.'s given in Table 5 are lower than those obtained in other samples.

Canada  
Department of Energy, Mines and Resources  
Mines Branch  
Ottawa

Fuels Research Centre  
Divisional Report 67/128-Prep.

A Study of the Physical, Chemical, Cleaning  
and Coking Characteristics of Coal from Elk River  
Prospect, Elk River, Alberta

by  
T.A. Lloyd  
and  
T.E. Tibbetts

November 1967

A Study of the Physical, Chemical, Cleaning and Coking  
Characteristics of Coal from Elk River Prospect, Elk River Alberta

This report contains, in a series of tables, analytical data on the physical, chemical, cleaning and coking characteristics of a channel sample of coal from adit #1, Elk River Prospect, Elk River, Alberta. This investigation was conducted at the request of the Canadian Pacific Oil and Gas Limited.

The following description of the samples is from a memorandum to the Chief, Fuels and Mining Practice Division, from C.F.J. Rozenhart, Western Regional Laboratory, Edmonton, who collected the samples for this study:

"A channel sample was collected at C.P.O.G. Elk River Prospect adit #1. The sample location was 121 feet from the entry. Seam thickness was 20' 7".

The channel samples were collected of four sections and marked A, B, C and D (See Figure 1).

Sample A - Total height 72" with a band of shale 1" thick 55" from the top and a 1/4" band of shale 26" from the top.

Sample B - Total height 48".

Sample C - Total height 45". A band of bone 1" thick appeared at 39" from the top.

Sample D - Total height 82" with 5" bony coal 46" from top. This bony coal was sampled separately."

Physical, chemical and coking tests were conducted on the four sections as well as the bony coal as described above in sample D. Cleaning tests were carried out on all of these with the exception of the bony coal. Float-sink analyses were conducted on the plus 28 mesh fractions while flotation tests were conducted on the minus 28 mesh. The flotation tests

were carried out until maximum yields were obtained.

In addition to the above samples, a bulk sample of the whole seam was collected for a movable-wall coke oven test. The results of the coking and cleaning tests of the channel samples indicate that this bulk sample should be washed before the coke oven test is conducted.

TABLE 1

Chemical and Physical Properties

		Sample A	Sample B	Sample C	Sample D	Bony Coal
<u>Proximate Analysis</u>						
Ash .....	%	19.8	35.1	17.0	10.3	17.6
Volatile Matter .....	%	21.9	20.2	22.2	23.5	27.9
Fixed Carbon .....	%	58.3	44.7	60.8	66.2	54.5
<u>Ultimate Analysis</u>						
Carbon .....	%	69.6	55.1	71.9	79.1	69.3
Hydrogen .....	%	4.4	4.0	4.2	4.6	3.6
Sulphur .....	%	0.4	0.4	0.4	0.4	0.4
Nitrogen .....	%	0.7	1.0	1.0	1.1	0.9
Ash .....	%	19.8	35.1	17.0	10.3	17.6
Oxygen .....	%	5.1	4.4	5.5	4.5	8.2
Calorific Value .....	Btu/lb	11,940	9,560	12,550	13,810	12,010
Grindability .....		82	87	81	81	83
<u>Ash Fusibility</u>						
Initial Deformation Temp. ....	°F	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	1950
Softening Temp. Spherical .....	°F	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	2080
Softening Temp. Hemispherical .	°F	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	2220
Fluid Temp. ....	°F	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	2670 <sup>+</sup>	2260
<u>Ash Analysis</u>						
SiO <sub>2</sub>		53.8	63.7	55.2	54.0	20.2
Al <sub>2</sub> O <sub>3</sub>		37.3	30.3	36.9	36.0	12.4
Fe <sub>2</sub> O <sub>3</sub>		2.4	1.7	1.1	4.9	50.0
TiO <sub>2</sub>		1.8	0.7	1.6	1.3	0.2
P <sub>2</sub> O <sub>5</sub>		0.2	0.1	0.1	0.6	3.2
CaO		1.7	1.3	1.5	2.2	7.7
MgO		0.3	0.7	0.1	1.1	3.3
SO <sub>3</sub>		0.3	0.0	0.1	0.4	3.2
Na <sub>2</sub> O		0.1	0.2	0.2	0.0	0.5
K <sub>2</sub> O		0.1	1.8	0.1	0.0	0.2

TABLE 2

Screen Analysis and Ash Contents

Sample	Plus 28 mesh		Minus 28 mesh	
	Yield %	Ash %	Yield %	Ash %
A	96.0	18.2	4.0	7.9
B	91.1	33.3	8.9	27.4
C	91.6	18.1	8.4	9.2
D	90.2	12.2	9.8	6.5

TABLE 3

Float-Sink Data - Plus 28 mesh

Sample A

		Yield %	Ash %	Cumulative				Free Swelling Index
				Float		Sink		
				Yield %	Ash %	Yield %	Ash %	
	Float 1.30	18.3	3.9	18.3	3.9	100.0	18.2	9
Sink 1.30	Float 1.35	34.7	4.5	53.0	4.3	81.7	21.4	2-1/2
Sink 1.35	Float 1.40	15.2	9.7	68.2	5.5	47.0	33.9	1-1/2
Sink 1.40	Float 1.50	10.1	19.6	78.3	7.3	31.8	45.5	-
Sink 1.50	Float 1.60	4.1	26.9	82.4	8.3	21.7	57.6	-
Sink 1.60	Float 1.80	3.9	42.9	86.3	9.9	17.6	64.7	-
Sink 1.80		13.7	70.9	100.0	18.2	13.7	70.9	-

Sample B

		Yield %	Ash %	Cumulative				Free Swelling Index
				Float		Sink		
				Yield %	Ash %	Yield %	Ash %	
	Float 1.30	20.9	3.1	20.9	3.1	100.0	33.3	9+
Sink 1.30	Float 1.35	17.3	8.2	38.2	5.4	79.1	41.2	8-1/2
Sink 1.35	Float 1.40	11.2	13.1	49.4	7.1	61.8	50.5	5-1/2
Sink 1.40	Float 1.50	6.1	22.1	55.5	8.8	50.6	58.8	5
Sink 1.50	Float 1.60	5.1	23.6	60.6	10.0	44.5	63.8	5-1/2
Sink 1.60	Float 1.80	4.3	41.3	64.9	12.1	39.4	69.0	1
Sink 1.80		35.1	72.4	100.0	33.3	35.1	72.4	-

Sample C

		Cumulative						Free Swelling Index
		Yield %		Ash %		Free Swelling Index		
		Yield %	Ash %	Yield %	Ash %	Yield %	Ash %	
	Float 1.30	12.5	3.6	12.5	3.6	100.0	18.1	9
Sink 1.30	Float 1.35	28.0	6.9	40.5	5.9	87.5	20.1	3-1/2
Sink 1.35	Float 1.40	22.9	10.0	63.4	7.4	59.5	26.3	1-1/2
Sink 1.40	Float 1.50	19.6	20.7	83.0	10.5	36.6	36.6	-
Sink 1.50	Float 1.60	5.4	25.8	88.4	11.5	17.0	54.8	-
Sink 1.60	Float 1.80	2.9	36.8	91.3	12.2	11.6	68.4	-
Sink 1.80		8.7	73.9	100.0	18.1	8.7	73.9	-

Sample D

		Cumulative						Free Swelling Index
		Yield %		Ash %		Free Swelling Index		
		Yield %	Ash %	Yield %	Ash %	Yield %	Ash %	
	Float 1.30	21.5	3.1	21.5	3.1	100.0	12.2	9
Sink 1.30	Float 1.35	28.6	6.1	50.1	4.8	78.5	14.6	7
Sink 1.35	Float 1.40	21.8	10.6	71.9	6.6	49.9	19.6	2-1/2
Sink 1.40	Float 1.50	16.3	19.5	88.2	9.0	28.1	26.5	1
Sink 1.50	Float 1.60	5.2	27.6	93.4	10.0	11.8	36.2	-
Sink 1.60	Float 1.80	5.0	37.2	98.4	11.4	6.6	42.9	-
Sink 1.80		1.6	60.9	100.0	12.2	1.6	60.9	-

TABLE 4

Flotation Test - 28 mesh x 0

	Float			Sink	
	Yield %	Ash %	F.S.I.	Yield %	Ash %
Sample A	96.3	6.4	8	3.7	48.2
Sample B	70.9	15.3	8-1/2	29.1	57.1
Sample C	91.7	7.0	8	8.3	33.7
Sample D	92.3	5.6	8-1/2	7.7	17.8

TABLE 5  
Coking Properties\*

		A	B	C	D	Bony Coal
Free Swelling Index (ASTM)		1-1/2	6-1/2	2	4-1/2	1
<u>Plastic Properties</u> (Gieseler Plasticity)						
Start (b) .....	°C	447	440	456	447	459
Fusion Temp. ....	°C	-	453	-	-	-
Maximum Fluid Temp. ....	°C	466	468	472	466	459
Final Fluid Temp. (a) .....	°C	482	493	475	480	462
Solid Temp. ....	°C	490	497	497	491	482
Melting Range (a-b) .....	°C	35	52	29	33	3
Maximum Fluidity .....	dd/m	4.4	5.2	1.8	3.9	1
<u>Dilatation Properties</u>						
Maximum Dilatation .....	%	-23.33	-29.17	-26.67	-25.00	-20.83
Maximum Contraction .....	%	-24.17	-29.17	-26.67	-25.00	-20.83 (0)
Softening Temperature (Ti) .....	°C	375	375	360	387	390
Temp. of Max. Contraction (Tii).	°C	459	441	456	454	480
Temp. of Max. Dilatation (Tiii).	°C	462	468	456	454	480

\* Analyses conducted by Carbonization Section.

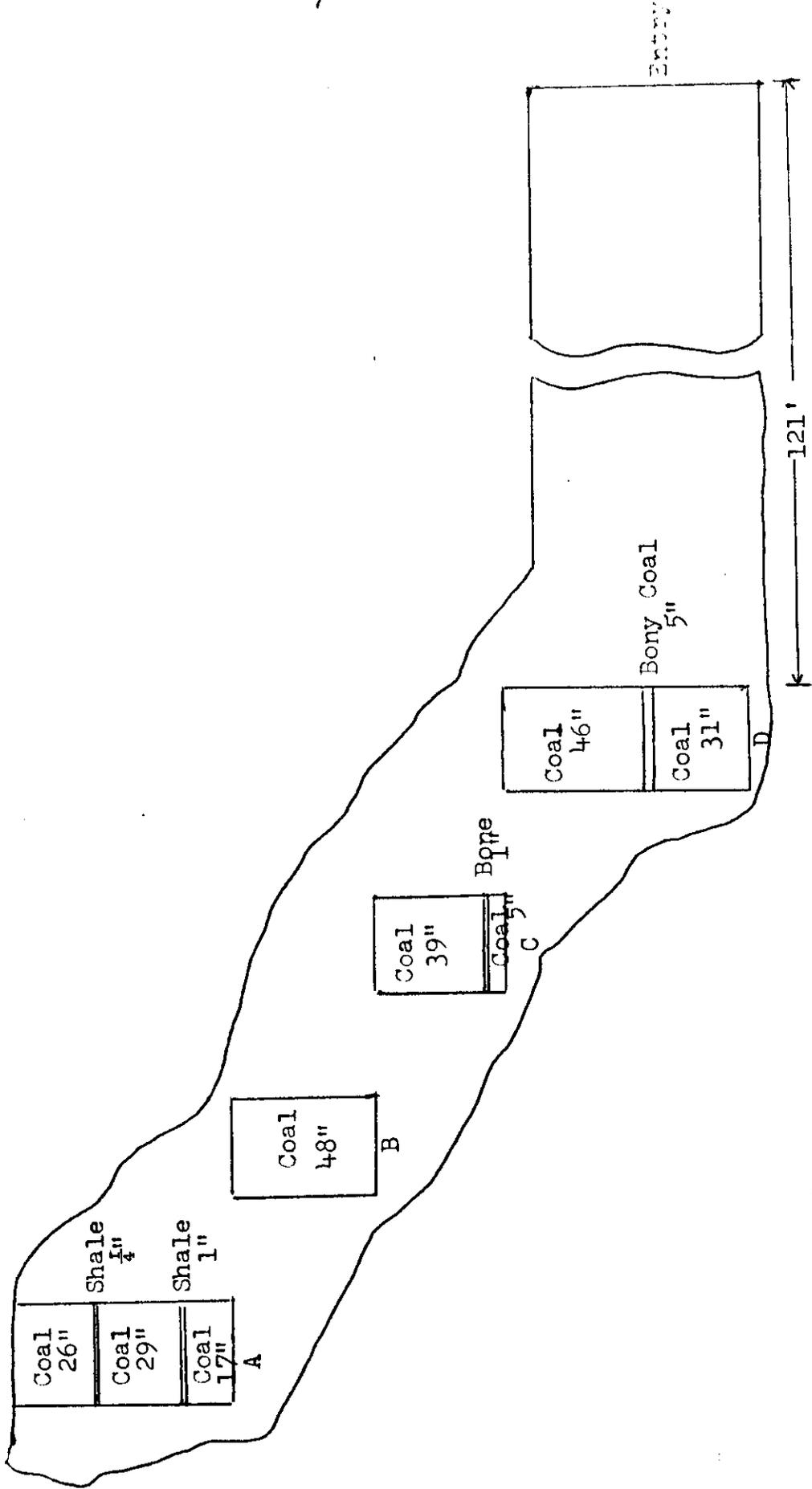


Figure 1 - Sectional Channel Samples from Elk River Prospect Adit #1.  
Canadian Pacific Oil and Gas Limited.

Figure 1 - Washability Curves - Sample A - Plus 20 mesh

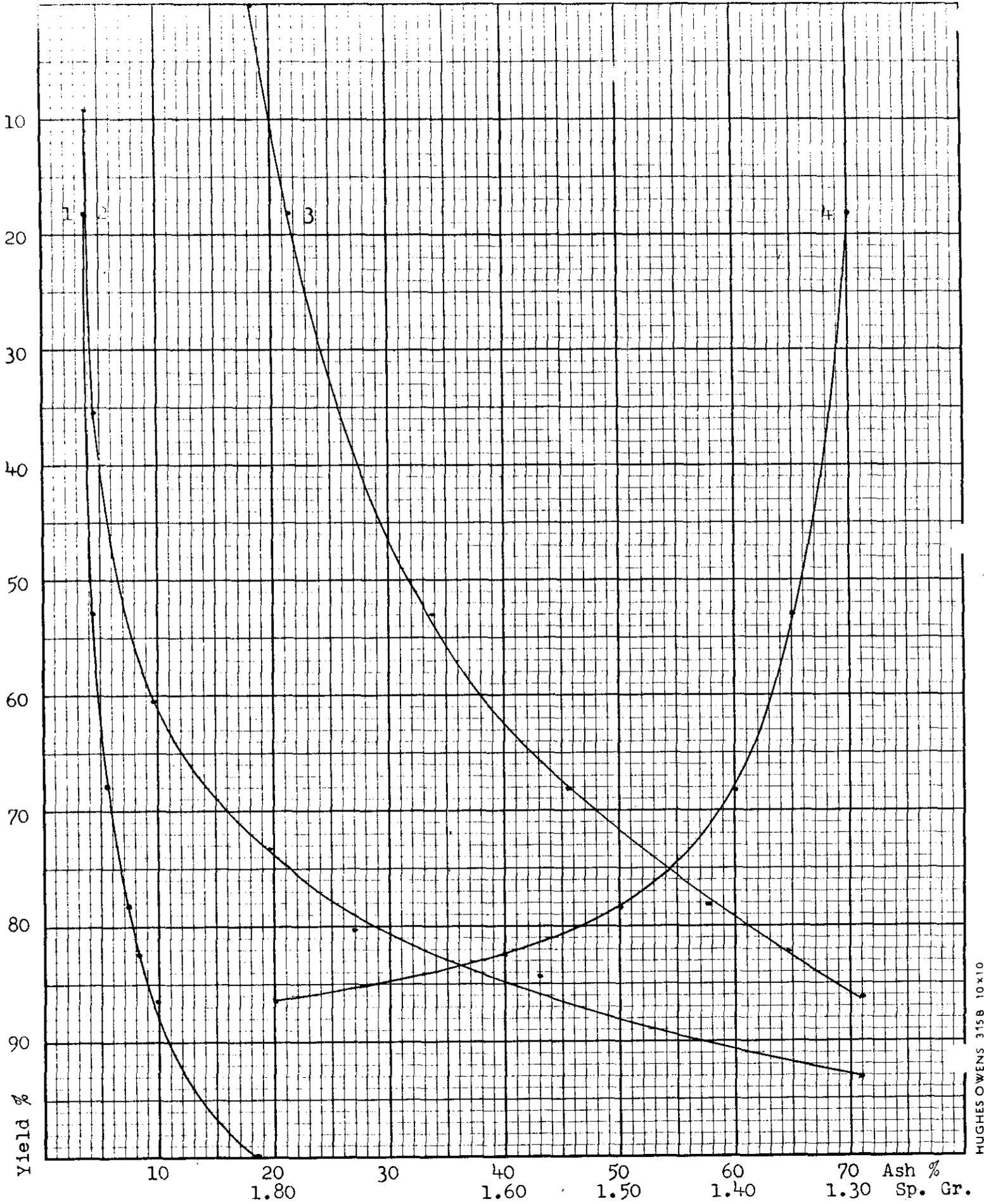


Figure 3 - Stability Curves - Sample B - Plus 28 mesh

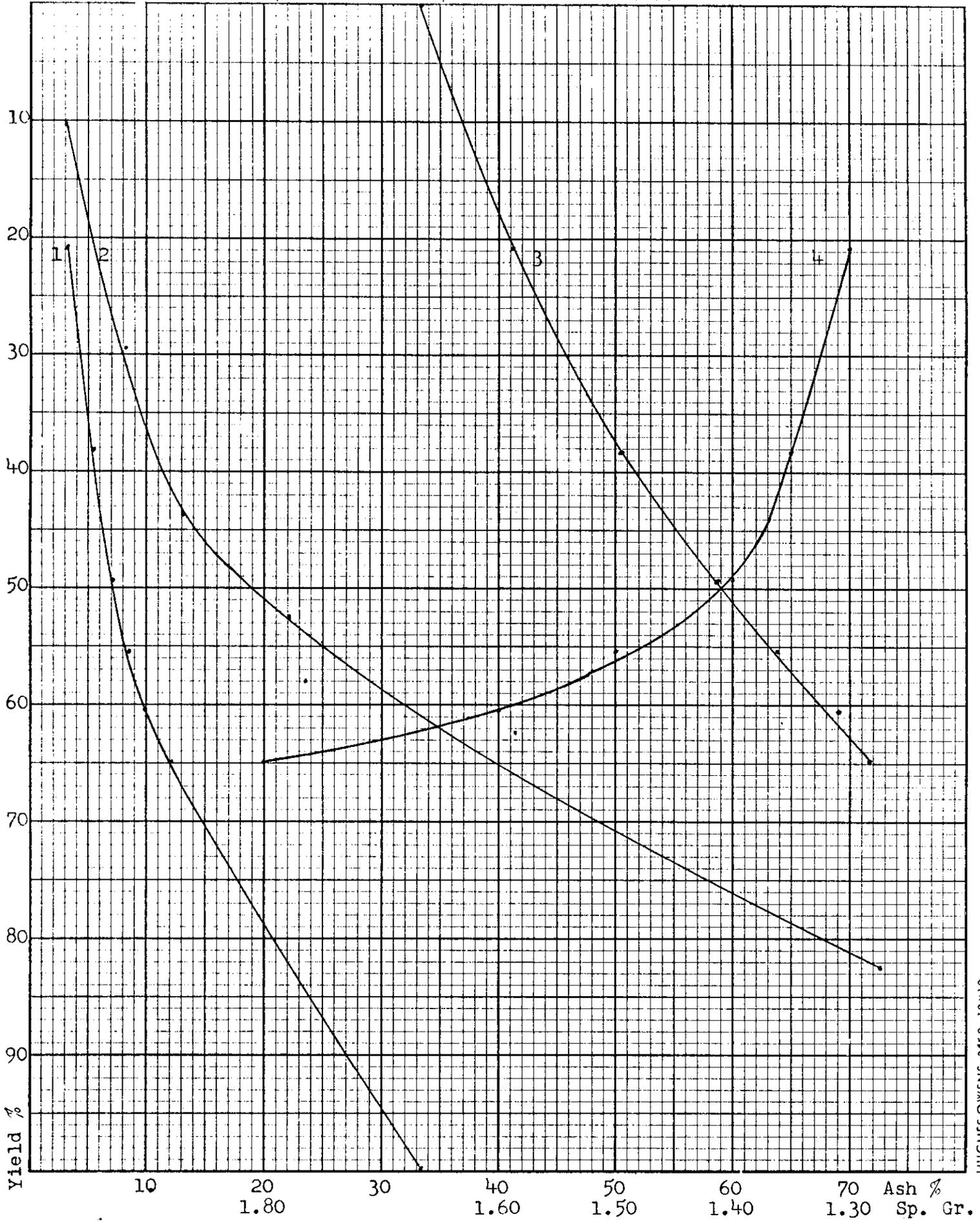


Figure 4 - Washability Curves - Sample C - Plus 28 mesh

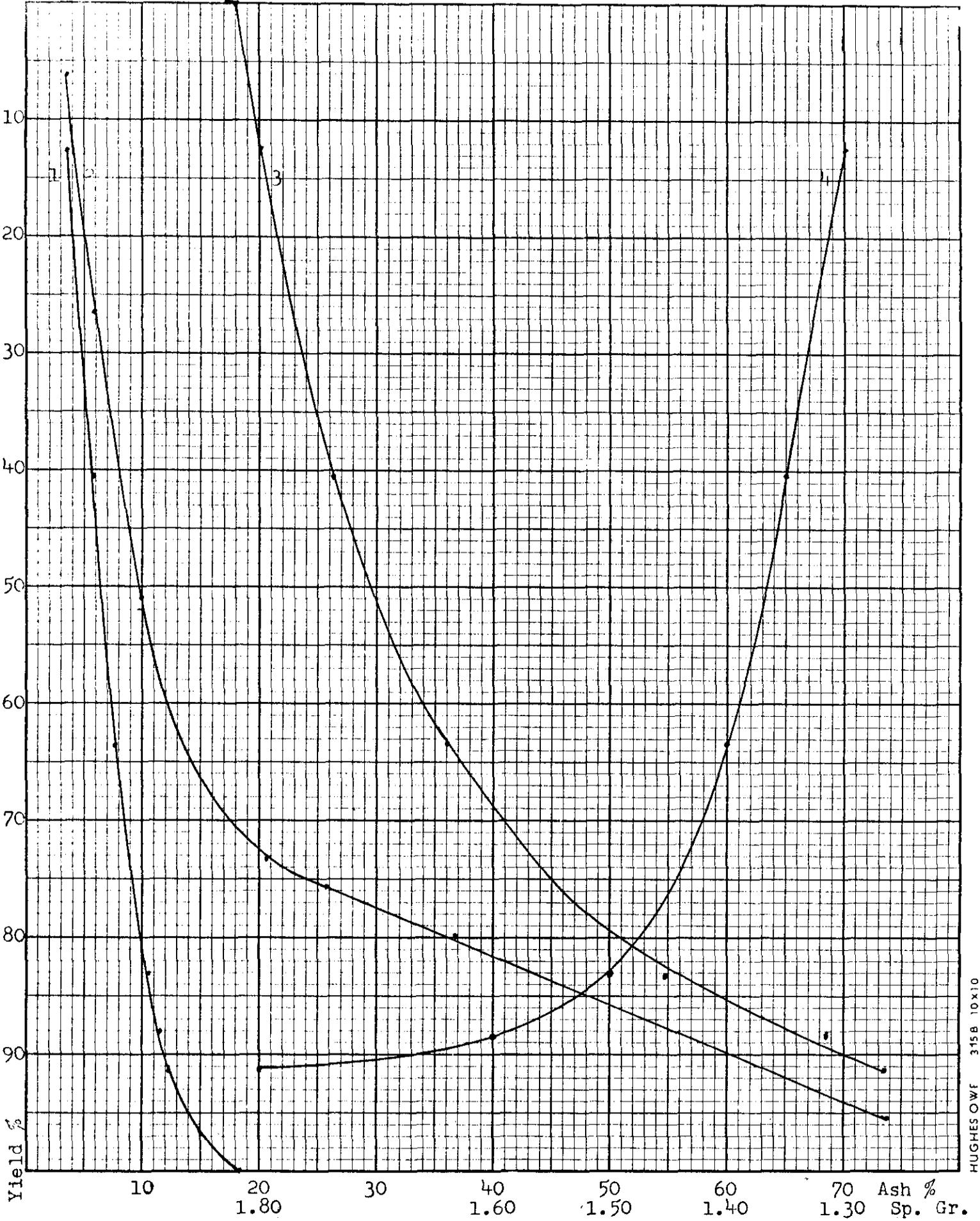
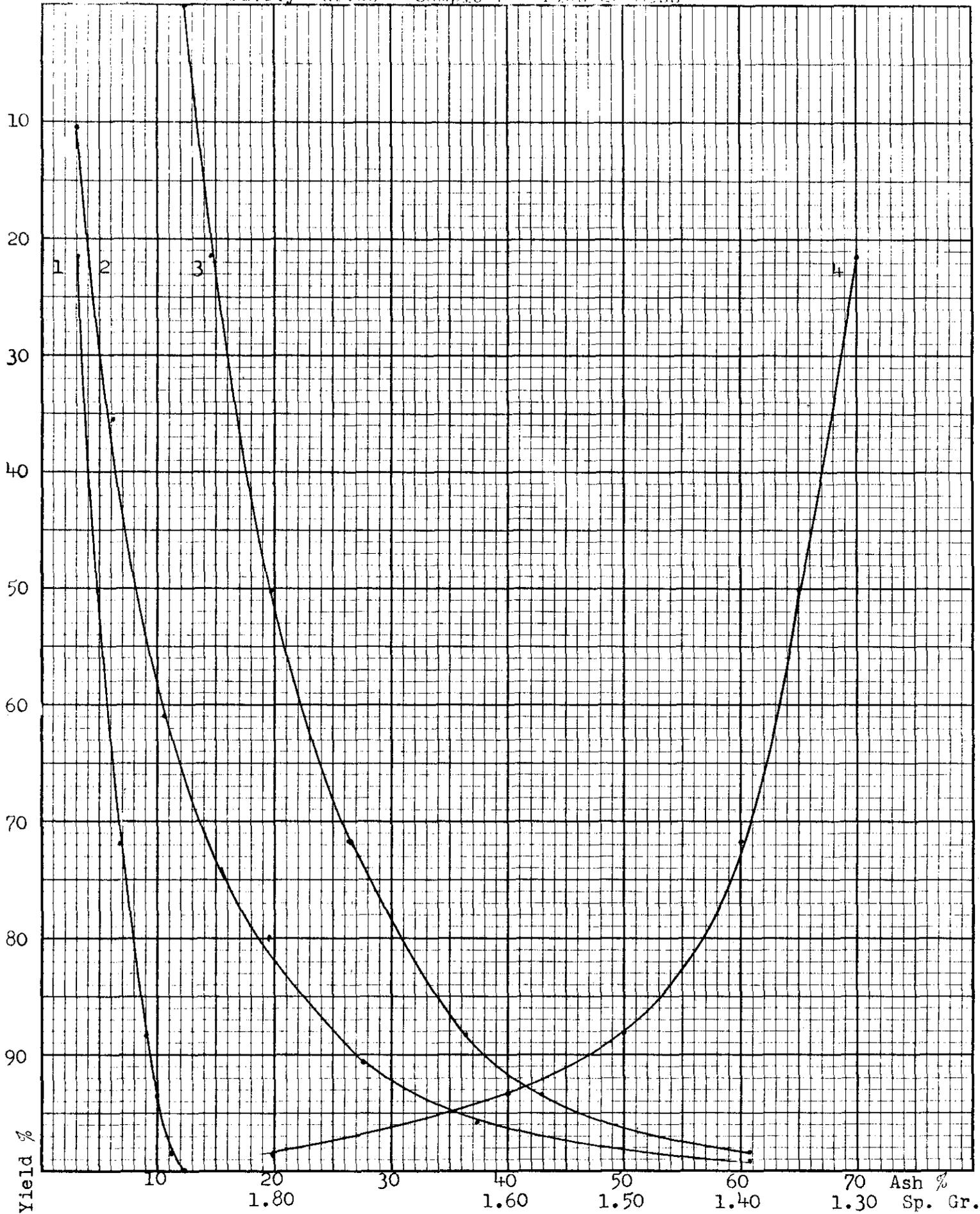
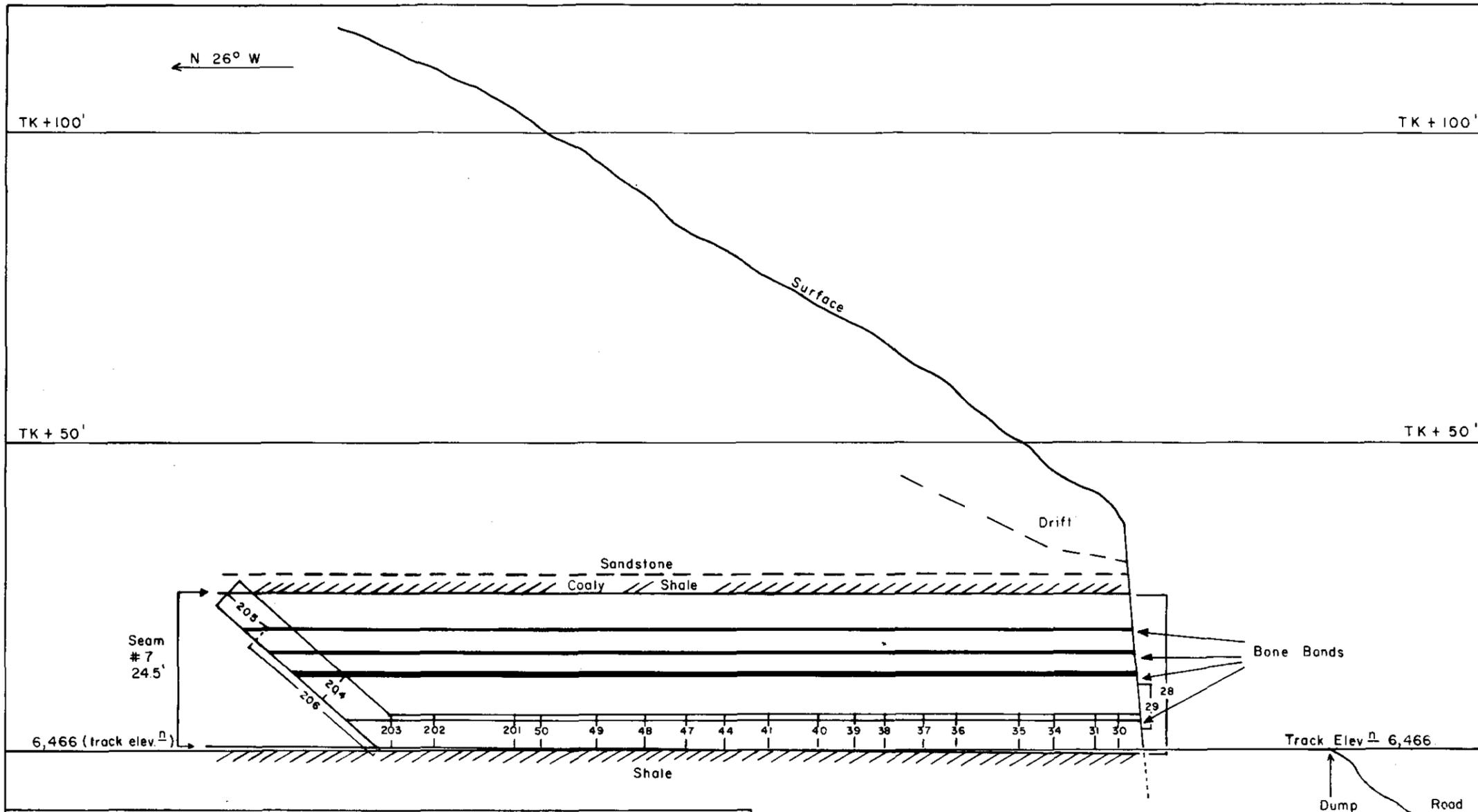


Figure 5 - Washability Curves - Sample D - Plus 28 mesh





**SAMPLING RESULTS**

SAMPLE	MOISTURE	ASH	VOL. MAT.	FIX. CARB.	F.S.I.	SULPHUR	B.T.U.
28	4.68 ✓	14.17	19.72	61.25	1 1/2	0.40	11,542
29	1.65 ✓	5.50	21.25	71.60	1 1/2	N.D.	14,257
30	3.65	13.28	22.64	60.43	1	N.D.	N.D.
31	4.34	10.36	23.10	62.20	1	N.D.	N.D.
34	4.37	11.56	20.65	63.42	2	N.D.	N.D.
35	3.74	12.78	22.30	61.18	2	N.D.	N.D.
36	4.03	12.32	22.08	61.55	1 1/2	N.D.	N.D.
37	2.32	10.82	23.10	63.76	1 1/2	N.D.	N.D.
38	1.84	8.45	23.19	66.52	7 1/2	N.D.	N.D.
39	2.72	10.70	23.62	62.96	7	N.D.	N.D.
40	2.07	10.92	22.54	64.47	7	N.D.	N.D.
41	1.71	11.58	24.30	62.41	6 1/2	N.D.	N.D.
44	1.48	9.21	23.84	65.47	7 1/2	N.D.	N.D.
47	1.55	13.73	23.29	61.43	7 1/2	N.D.	N.D.
48	2.31	9.19	22.86	65.64	7 1/2	N.D.	N.D.
49	1.78	8.80	22.15	67.27	2 1/2	N.D.	N.D.
50	1.64	7.49	22.80	-	5 1/2	N.D.	N.D.
201	1.11	10.22	21.60	-	4	N.D.	N.D.
202	1.12	11.73	22.26	-	6 1/2	N.D.	N.D.
203	1.98	11.59	22.15	-	5	N.D.	N.D.
204	0.96	16.93	22.79	-	7 1/2	N.D.	N.D.
205							
206							

Adit X-Section: 5.5' X 5.5' Nominal

<b>Canadian Pacific</b>	
OIL AND GAS LIMITED	
MINING DIVISION	
ELK RIVER COAL PROJECT	DATE - 10/67
ADIT # 1	CONT. INT.
(#7 SEAM)	AUTHOR - H.G.R.
VERTICAL SECTION WEST WALL	APPROVAL BY -
	SCALE - 1"=20'
	FILE NO. -

A P P E N D I X 8

TEST WORK ON SAMPLES TAKEN BY T. OTAKI, GEOLOGIST, MARUBENI-IIDA CO.  
LTD. TEST WORK BY MEIJI MINING CO. LTD., TOKYO. (CHIEF ENGINEER  
T. NOMIZU)

NOTE: Elk 1 - 5 - taken in adit on No. 7 seam  
Elk 6 - composite of 1 - 5, + "Elk River"  
Elk River - No. 7 seam - adit face at 60'  
Elk 7 - No. 12 seam - trench No. 8 (cat trench)

RAW COAL TEST - ELK SEAM

Date: October 14, 1967

Sample: Elk - 1, 2, 3, 4, 5, 7

1. Proximate Analysis and Swelling Test

<u>Sample</u>	<u>Th (cm)</u>	<u>I.M%</u>	<u>V.M%</u>	<u>F.C%</u>	<u>Ash%</u>	<u>Total Sulphur%</u>	<u>Cal.</u>	<u>C.B.I.</u>	<u>Fuel Ratio</u>
Elk - 1	90	1.3	22.2	70.7	5.8	0.4	7990	5½	3.2
Elk - 2	15	0.9	32.4	36.9	29.8	0.2	5030	1½	1.1
Elk - 3	50	1.0	19.5	55.9	23.6	0.3	6290	2	2.9
Elk - 4	175	1.3	22.4	65.7	10.6	0.3	7560	6	2.9
Elk - 5	250	1.3	19.4	51.4	27.9	0.4	5990	6½	2.7
Elk River		1.1	22.7	62.8	13.4	0.4	7980	7½	2.8
Elk - 7		7.2	23.3	63.1	6.4	0.7	6850	-	2.7

RAW COAL TEST - ELK SEAM

Date: October 14, 1967

Sample: Elk - 6 (Elk 1 - 5 Integrated), Elk River

1. Float and Sink Test - F. 1.40, F. 1.50, Sinks

<u>Sample</u>	<u>Th (cm)</u>	<u>Sp.gr.</u>	<u>Wt%</u>	<u>Ash%</u>	<u>Cum. Wt%</u>	<u>Cum. Ash%</u>
Elk - 6	580	- 1.40	51.7	5.1	51.7	5.1
		1.50	21.0	14.8	72.7	7.9
		+ 1.50	27.3	38.7	100.0	16.3
Elk River		- 1.40	43.2	5.2	43.2	5.2
		1.50	27.5	15.0	70.7	9.0
		1.50	29.3	37.4	100.0	17.3

2. Proximate Analysis and Swelling Test

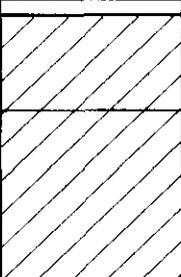
<u>Sample</u>	<u>Th (cm)</u>	<u>Sp.gr.</u>	<u>I.M%</u>	<u>V.M%</u>	<u>F.C%</u>	<u>Ash%</u>	<u>Total Sulphur%</u>	<u>Cal.</u>	<u>C.B.I.</u>
Elk - 6	580	1.40	1.5	23.4	70.0	5.1	0.4	8060	5½
		- 1.50	1.2	21.9	67.9	9.0	0.4	7680	3½

Fuel Ratio

Elk - 6	- 1.40	- 1.50
	3.0	3.0
Elk River	3.2	3.1

#7 SEAM

**COLUMNAR SECTION OF 19' SEAM**  
( AT NORTH END OF ADIT )

WIDTH		DESCRIPTION	SAMPLE NO.
		(HW) Silty stone	
1.8		Bright coal, incl. thin shale band	
0.05		Shale band	
0.5		Bright coal	ELK 5
1.0		Laminated bright coal Incl. thin shale band	
1.0		Laminated bright coal	
0.9		Bright coal	ELK 4
0.15		Shaly band	
0.7		Bright coal	
0.15		Somewhat shaly band	
0.5		Hard bright coal and thin shale band	ELK 3
0.15		Black silty band, incl. coal band	ELK 2
0.9		Coal, medium soft, bright coal, somewhat hard in upper part	ELK 1
2.3			(FW) Shale

ALL MEASUREMENTS IN METERS  
Sampling and section by T.Ohtaki  
MARUBENI - IIDA CO.

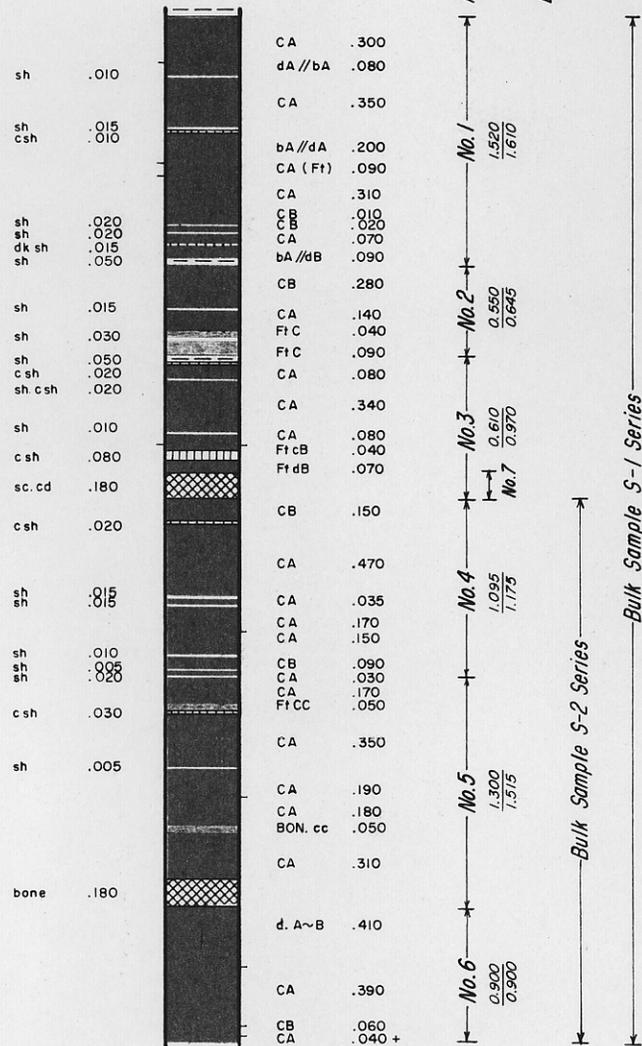
ELK RIVER No.1 ADIT

A/5/A

**#7 SEAM**

**DETAILED SECTION**

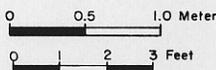
( AT NORTH END OF ADIT )



ALL MEASUREMENTS IN METERS

Sampling and section by T. Shimoyama  
MITSUI MINING

Scale: 1:50



## A P P E N D I X 10

### Equipment, Methods and Personnel Requirements, 1968

#### 1. Bulldozers

The program would be aided by the addition of one bulldozer with rippers for rock excavation. Three D-7's will be required in all, throughout the season.

#### 2. Drilling

The mobile rig employed is satisfactory, and the addition of a core barrel should solve the sampling problem. Some consideration should be given to the economics of pumping water to the drill sites versus the hauling in mobile tanks employed this summer. Suitable pressure gauges for tool and for fluid circulation should be added to the equipment for use while coring. Two rigs will be necessary for the program outlined.

#### 3. Adits

Progress recorded in the adit driven this summer was very slow. This rate of advance must be improved if the underground work recommended is to be accomplished in the season available. Accordingly, it is recommended that the mining crews work longer shifts, and that work on the headings be continuous on a 24-hour basis.

#### 4. Personnel

To supervise two drill rigs, the adits and fill-in geological mapping will require:

- 1 senior geologist - C.P.O.G.
- 2 junior geologists - C.P.O.G.
- 4 drill site samplers (all temporary)

#### 5. Camp

To accommodate the personnel, camp accommodation for the following will be required:

bulldozer operators

Drillers + Foreman	13
Miners + Foreman	9 - 13
C.P.O.G.	7
Survey Crew	3 - 4
Japanese Observers	2 - 4
Catering Crew	4
	<hr/>
Total	42 - 48 men

In addition, some temporary accommodation for visitors and helicopter crew will also be required.

Two eight-man and three 11-man trailers will be required, together with adequate dining, kitchen and washing facilities.

Elk River Project - Preliminary Budget Estimate - 1968 Program

Camp Costs	\$ 15,000
Catering	27,000
Drilling (7,800)	81,000
Bulldozing	37,000
Adits (6)	41,000
Surveying	7,000
Helicopter	7,000
Transportation	4,000
Engineering and other salaries	18,000
	<hr/>
	\$ 237,000
Plus 10% contingency	23,000
	<hr/>
Total direct exploration	\$ 260,000
	<hr/> <hr/>
Coal license renewals	15,000
School taxes	4,000
	<hr/>
Total	\$ 279,000
	<hr/> <hr/>

A P P E N D I X 11

Contractors and Personnel Employed - 1967

Bulldozers	- Nohels Logging, Fernie, B.C.
Fuel	- Imperial Oil, Fernie, B.C.
Trailer Camp	- Pre-Built Rentals, Calgary
Catering	- M.S.P. Consultants, Calgary
Drilling	- Big Indian Drilling Co. Ltd., Calgary
Logging (Gamma Ray- Neutron)	- Roke Oil Enterprises, Calgary
Underground Adits	- Lethbridge Collieries, Lethbridge
Aerial Survey	- Spartan Air Services, Ottawa
Helicopter	- Associated Helicopter, Edmonton

---

Project Manager	- H.G. Rushton, C.P.O.G., Mining Division
Geologists	- E.J. Wendeborn, C.P.O.G., Geological Research Dept.
	- G.N. Wright, C.P.O.G., Geological Exploration Dept.
	- P. Kho, C.P.O.G., Geological Exploration Dept.
	- A.C. Doulis, C.P.O.G., Data Processing Dept.
Engineering Asst.	- J. Csehi, C.P.O.G., Mining Division
Geological Asst.	- W. Shenfield, C.P.O.G., Mining Division (temporary)
Field Assistants	- P. Tanner C.P.O.G., Mining Division (temporary)
	- J. Baugh, C.P.O.G., Mining Division, (temporary)
	- M. Taylor, C.P.O.G., Mining Division (temporary)
	- R. Matthews, C.P.O.G., Mining Division (temporary)

ELK RIVER PROJECT - SUMMARY OF COSTS

May, 1967 to December 31, 1967

1. Camp

Camp catering and subsistence	\$ 11,484.52
Trailer rentals	6,486.60
Generator rentals	1,197.00
Labor to install camp	86.00
	<hr style="width: 100%;"/>
	\$ 19,254.12
	<hr style="width: 100%;"/>

2. Fuel

Fuel (including delivery charges)	\$ 1,980.38
	<hr style="width: 100%;"/>

3. Transportation

Auto and four-wheel drive vehicles	\$ 2,611.70
Helicopter	8,809.51
	<hr/>
	11,421.21
	<hr/> <hr/>

4. Road Construction, Trenching and Stripping

Caterpillar rentals	\$ 31,433.62
	<hr/> <hr/>

5. Drilling and Sampling

Drilling	\$ 19,355.35
Gamma ray/neutron logging	1,155.00
Adit No. 1	11,591.36
Freight on samples	946.10
Coal analyses and tests	5,177.70
	<hr/>
	\$ 38,255.51
	<hr/> <hr/>

6. Surveying and Drafting

Aerial photography	\$ 875.50
Topographic map preparation	7,286.40
Reproductions	150.97
	<hr/>
	8,312.87
	<hr/> <hr/>

7. Geology and Engineering

Salaries	\$ 19,975.73
	<hr/> <hr/>

8. Miscellaneous Supplies

Supplies and miscellaneous equipment	\$ 1,801.37
	<hr/> <hr/>

9. Permits and Timber Damage

S.U.P.	\$ 50.00
Damage to timber	279.83
	<hr/>
	\$ 329.83
	<hr/> <hr/>

SUB-TOTAL

\$132,734.64

10. License Fees and Taxes

Coal license rentals and fees	\$ 15,100.00
Advertising re license applications	40.12
School taxes	3,108.10
	<hr/>
	\$ 18,248.22
	<hr/> <hr/>

TOTAL

\$150,982.86

Camp

Board .....	\$7.09 per man per day
Lodging .....	\$4.00 per man per day
Drilling and logging .....	\$8.11 per foot
Adit .....	\$73.36 per foot



PLATE III - CAT TRENCH (TRENCH NO. 9) IN NO. 16 SEAM.

PLATE I - TYPICAL ANIMAL BURROW WITH COAL DEBRIS.



PLATE IV - CAT TRENCH (TRENCH NO. 8) IN NO. 12 SEAM.  
ROAD RUNS THROUGH MIDDLE OF SEAM.



PLATE III - CAT TRENCH (TRENCH NO. 9) IN NO. 16 SEAM.

PLATE I - TYPICAL ANIMAL BURROW WITH COAL DEBRIS.

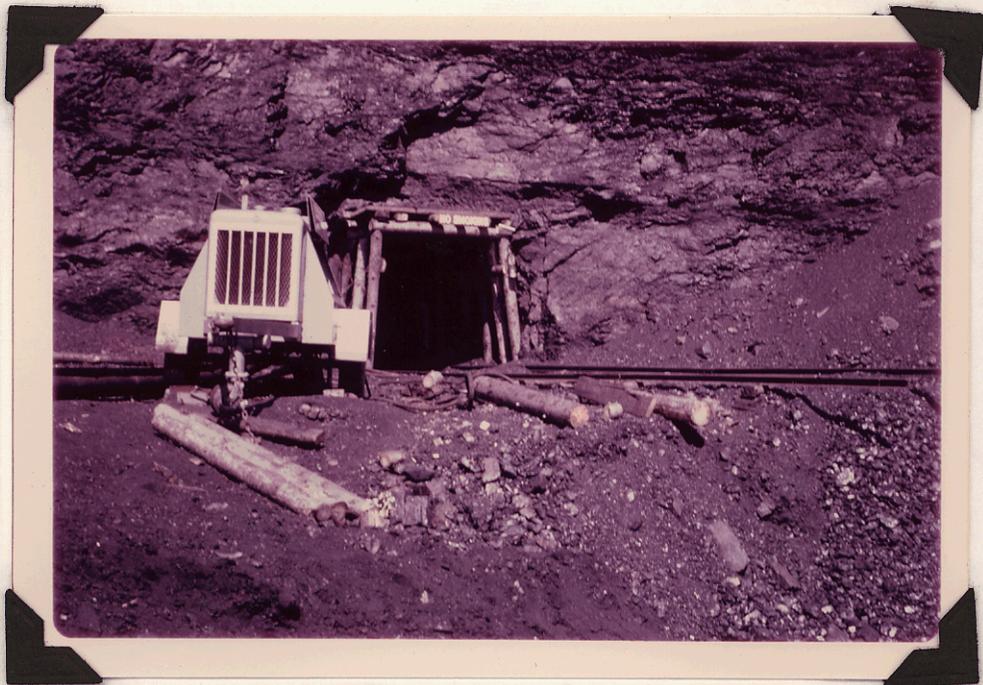


PLATE IV - ADIT ENTRY, SEAM NO. 7. TOP OF SEAM NOT VISIBLE IN PHOTOGRAPH.

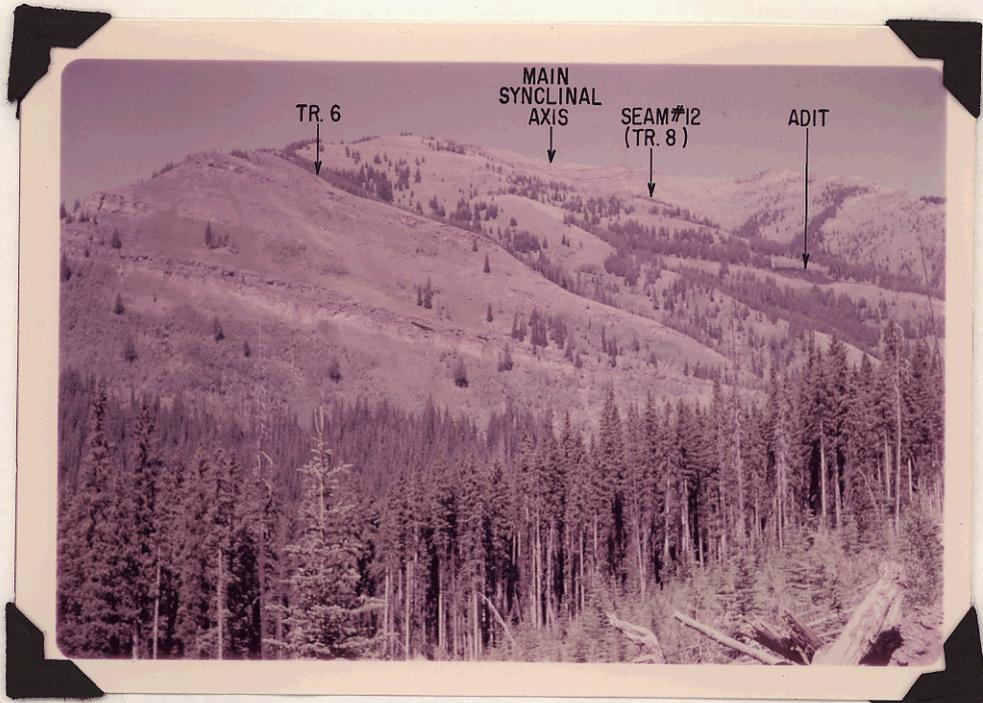


PLATE V - SOUTH SIDE, EAGLE MOUNTAIN, PRIOR TO STRIPPING OF COAL SEAMS. ADIT AND TRENCH NO. 6 ARE IN SEAM NO. 7.



PLATE VI - NORTH FACE, EAGLE MOUNTAIN, FROM DRILL HOLE 4. NOTE FLAT-LYING BEDS AT TOP OF CIRQUE.



PLATE VII - NORTH FACE, CASTLE MOUNTAIN. - NOTE  
SYNCLINAL STRUCTURE AND HEAVY TIMBER  
COVER.



PLATE VIII - EAST SIDE, CASTLE MOUNTAIN, ABOVE  
CHAUNCEY CREEK. NOTE STEEP DIP OF  
KOOTENAY. MOST OF SECTION IS ABOVE  
COAL MEASURES.



PLATE IX - VALLEY OF CLODE CREEK AND MOUNT TURN-  
BULL, WITH BLAIRMORE CONGLOMERATE AND  
SYNCLINAL STRUCTURE VISIBLE ACROSS THE  
FORDING RIVER.



PLATE X - FOSSILIZED TREE STUMP, WITH PARTIALLY  
COALIFIED ROOTS, IN SANDSTONE. NO. 2  
DRILL SITE.

K- FORDS 6162 27(3)B

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

SURVEYS:

PROJECT: Elk River **EAGLE Mt.**  
 HOLE #1  
 INCL. \_\_\_\_\_  
 AZ. \_\_\_\_\_

LOGGED BY: EJW/WS

HOLE SIZE: 5 1/2"

CASING DETAILS: 4 1/2" of 8 5/8"  
Cemented with CaCl<sub>2</sub>

R. 5' 10"  
Spudded Aug 23/67 @ 3:00 p.m.

**308**

COLLAR LOCATION: 71 N  
13 E  
 COLLAR ELEVATION: 7177'

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
Surf.	10'	Siltstone - grey-black, argillaceous, hard, massive											High level sample at 10' depth
10'	12'	Siltstone - scattered con. stringers											
12'	21'	Siltstone - partly shaly, softer											
27'	33'	Siltstone - grey-black, argillaceous, hard, massive											Depth read from H.T.
33'	42'	Shale - grey-brown, sideritic marlstone											
42'	49'	Siltstone - brown-black, argillaceous, sideritic, hard											
49'	53'	Siltstone - increasingly sideritic, traces of calcite						9		6638	25		
53'	56'	Siltstone - dark brown-black, hard, massive						7		6530	30		
56'	69'	Siltstone - very sideritic, becoming softer											
69'	76'	Shale - dark grey, silty, fine carbonaceous specs.											
76'	80'	Siltstone - dark grey, argillaceous to shaly											

RH  
 Hole No. 1 Elev. 7150  
 Lat. 488460 Dep. 83420  
 Elev. 711  
 Top of 13 or 14 @ 7060 | 13'  
 Top of 12 @ 6949 | 23'  
 Top of 11 @ 6836 | 12'  
 Top of 11 @ 6804 | 14'

Gamma Ray Neutron Log  
 Yes  No

Ground Measure

R.S. Measure

R-Feeling P. 6-3-R

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: EJW/WS

WELL SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS:

PROJECT: Elk River

HOLE #1 \_\_\_\_\_

INCL. \_\_\_\_\_

AZ. \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

K.B.  
Measure

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S
80'	82'	Coal - brown-black, firm <i>NO COAL</i>	0051	80'	82'	2'	2.13	19.80	23.21	54.86	3	
82'	84'	Shale - dark brown, compact, carbonaceous	0052	82'	84'	2'	0.77	58.03	15.69	25.51	1	
84'	94'	Shale - brown-black, fine texture, carbonaceous										
94'	96'	Siltstone - dark grey, argillaceous to shaly										
96'	98'	Coal and shale - brown-black, carbonaceous	0053	96'	98'	2'	1.53	13.57	27.76	57.14	8 1/2	
98'	100'	Coal - trace of shale <i>NO COAL</i>	0054	98'	100'	2'	1.35	17.37	26.55	54.73	7 1/2	
100'	102'	Coal - black, shiny	0055	100'	102'	2'	1.11	17.83	28.28	52.78	6 1/2	
102'	104'	Coal - track of shale	0056	102'	104'	2'	1.72	11.85	28.48	57.95	8	
104'	106'	Coal - increasingly shaly	0057	104'	106'	2'	0.71	33.80	13.62	41.37	7 1/2	
106'	108'	Coal - black, shiny, firm <i>NO COAL</i>	0058	106'	108'	2'	1.92	9.04	18.93	60.06	6 1/2	
108'	110'	Coal - black, hard, shiny	0059	108'	110'	2'	1.83	29.59	23.95	44.63	6	
110'	111'	Coal and coaly shale <i>III-III-A COAL</i>	0060	110'	111'	1'	0.87	55.48	27.99	15.66	1 1/2	
111'	114'	Shale - brown-black, coaly and coal	0061	111'	114'	3'	0.98	42.37	21.84	34.81	5 1/2	
114'	118'	Shale - grey-black, carbonaceous, trace of coal										
118'	120'	Coal - black, shiny <i>NO COAL</i>	0062	118'	120'	2'	1.65	20.44	29.46	48.45	8	



CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: 170-200 - EJV/WS/GNW  
200-220 - GNW/P/AD

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS:

PROJECT: Elk River

HOLE #1 \_\_\_\_\_ PAGE \_\_\_\_\_

INCL. \_\_\_\_\_ T.D. \_\_\_\_\_

AZ. \_\_\_\_\_ STARTED \_\_\_\_\_

COMPLETED \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
170'	175'	Grey silty shale and grey shale											
175'	180'	"											
180'	185'	"											
185'	190'	Grey shale, light brown silt, trace of coal											
190'	195'	As above, without coal											
195'	200'	Dark grey shale											
200'	205'	Grey shale, grey-brown silt											
205'	207'	"											
		200-223' COAL											
207'	208'	Coal	0072	207'	208'	1'	7.11	62.00	16.16	14.73	1		501-11
208'	210'	"	0073	208'	210'	2'	4.52	43.55	20.77	31.16	2 1/2		
210'	212'	Coal, small amount shale	0074	210'	212'	2'	3.96	63.06	15.00	1.96	1		
212'	214'	Coal,	0075	212'	214'	2'	3.65	35.59	22.77	37.99	7 1/2		
214'	216'	Coal, "	0076	214'	216'	2'	4.89	28.40	23.87	42.84	7		
216'	218'	Coal, "	0077	216'	218'	2'	4.21	24.62	23.24	47.93	7 1/2		
218'	220'	Coal, "	0078	218'	220'	2'	4.02	29.47	23.39	43.12	7		

\*12



CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: 265-295 - GNW/P  
295-331 - GNW/P

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS:

PROJECT: Elk River

HOLE #1 \_\_\_\_\_ PAGE 2  
INCL. \_\_\_\_\_ T.D. \_\_\_\_\_  
AZ. \_\_\_\_\_ STARTED \_\_\_\_\_  
COMPLETED \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
265'	270'	Light brown silt											
270'	275'	Light brown silt											
275'	280'	Light brown silt											
280'	285'	Grey and brown silt											
285'	290'	Grey-brown silt											
290'	295'	Hard & soft brown silt, tr. cb. shale											
295'	300'	Light brown silt											
300'	305'	Light brown silt & silty shale, tr. grey sh.											
305'	310'	Dark grey shale, silt, clay											
310'	315'	Clay, dark grey shale, brown silt											
315'	323'	"											
323'	325'	Coal	0087	323'	325'	2'	1.77	63.22	14.94	20.07	nil		1'-3' different
325'	327'	Coal and Sandstone (v. cr./silt light brown)	0088	325'	327'	2'	2.21	29.05	23.29	45.45	7½		between these
327'	329'	Coal	0089	327'	329'	2'	4.52	29.05	22.53	43.90	7		depths 1'
329'	331'	"	0090	329'	331'	2'	3.65	28.90	22.42	45.03	6½		(plus 12 diff.)

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: 331-342 - GNS/P  
342-370 - GNW/P

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS:

PROJECT: Elk River  
 HOLE #1 \_\_\_\_\_ PAGE \_\_\_\_\_  
 INCL. \_\_\_\_\_ T.B. \_\_\_\_\_  
 AZ. \_\_\_\_\_ STARTED \_\_\_\_\_  
 \_\_\_\_\_ COMPLETED \_\_\_\_\_  
 COLLAR LOCATION: \_\_\_\_\_  
 COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
331'	333'	Coal & Coaly shale	0091	331'	333'	2'	3.39	41.63	18.87	36.11	3½		
333'	335'	Coal, coaly shale, shale	0092	333'	335'	2'	2.56	37.03	19.65	40.76	3		
335'	337'	Coal, tr. cb. sh. <i>NO COAL</i>	0093	335'	337'	2'	2.79	36.80	20.15	40.26	6½		
337'	339'	Coal, trace shaly coal	0094	337'	339'	2'	3.79	58.18	14.96	23.07	1		
339'	341'	Coal, some coaly shale	0095	339'	341'	2'	2.53	37.80	15.84	43.83	3		
341'	342'	Shale, dark grey, tr. coal, tr. coaly sh.											
342'	345'	Brown silt & med. grey shale											
345'	350'	Cb. shale & grey shale <i>346-352 COALY SHALE</i>											
350'	357'	Grey shale & cb. shale <i>352-360 COAL</i>											
357'	359'	Coal & cb. shale 1:1 & trace of shale	0096	357'	359'	2'	1.34	56.59	20.52	21.55	5½		
359'	361'	" & shale	0097	359'	361'	2'	1.44	47.52	18.29	32.75	4		
361'	363'	Coal, trace of shale	0098	361'	363'	2'	0.98	29.05	21.85	48.12	5		
363'	366'	" & shaley coal	0099	363'	366'	3'	1.26	20.99	24.95	52.80	8		
366'	368'	Coal <i>366-370 COAL</i>	0100	366'	368'	2'	6.24	46.41	18.08	29.27	1½		
368'	370'	"	0101	368'	370'	2'	3.41	36.48	19.80	40.31	6½		









CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

SURVEYS:

PROJECT: Elk River  
 HOLE: 1 PAGE: 11  
 INCL. \_\_\_\_\_ T.D. \_\_\_\_\_  
 \_\_\_\_\_ STARTED \_\_\_\_\_  
 AZ. \_\_\_\_\_ COMPLETED \_\_\_\_\_  
 COLLAR LOCATION: \_\_\_\_\_  
 COLLAR ELEVATION: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
632'	635'	Coal and coaly shale											
		<i>620-651' COAL ON READJUSTMENT LOG</i>											
635'	638'	Coal and coaly shale	0118	635'	638'	3'	5.82	58.01	15.53	20.64	2		
638'	641'	Coal	0119	638'	641'	3'	9.20	59.72	14.91	16.17	2		
641'	644'	Coal	0120	641'	644'	3'	9.53	50.90	15.61	23.96	2 1/2		
644'	647'	Coal, trace carbonaceous shale, limonitic	0121	644'	647'	3'	8.16	43.96	18.00	29.83	3		hard 1' at top
647'	650'	Coal	0122	647'	650'	3'	8.13	29.69	20.60	41.53	4		
650'	653'	Coal, some very fine sand stone	0123	650'	653'	3'	11.58	31.22	20.23	36.97	4 1/2		550-551.5' 47 551.5-552' 47
653'	656'	Coal, grey shale, brown silt	0124	653'	656'	3'	8.62	38.26	17.70	36.42	3 1/2		
656'	659'	Coal and coaly shale	0125	656'	659'	3'	8.52	38.26	19.25	33.97	3		2' at top, also bottom 5"
659'	660.5'	Coal with trace grey brown silt	0126	659'	660.5'	1.5'	6.08	41.92	18.02	33.93	3		bottom 5" part clay
660.5'	665'	Grey shale, trace brown sandstone, coaly shale											
665'	670'	Grey shale, brown silt											
670'	675'	Coal, carbonaceous shale, coaly shale											Remarkably silty
675'	677'	Coal, carbonaceous shale, coaly shale											
677'	680'	Coal, carbonaceous shale, coaly shale	0127	677'	680'	3'	6.29	71.40	11.51	10.60	1 1/2		



K-F.R. 67(2)B

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: GMW/P

HOLE SIZE: 5 1/2"

CASING DETAILS: KP-Surface 5'

SURVEYS:

**308**

PROJECT: Elk River EAGLE MT.  
 HOLE #2 PAGE 1  
 INCL. \_\_\_\_\_ T.D. \_\_\_\_\_  
 AZ. \_\_\_\_\_ STARTED 11/11  
 \_\_\_\_\_ COMPLETED \_\_\_\_\_  
 COLLAR LOCATION: 12915  
31SE  
 COLLAR ELEVATION: 6518

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
5'	9'	Light grey silt shale occ. carbon											
9'	15'	Brown grey silty shale and brown silt											
15'	20'	Grey silty shale, brown silt											
20'	25'	Light brown, very fine sandy silt											
25'	30'	Light brown silt, grey shale, trace brown grey											
30'	35'	Grey silty shale, brown silt											
35'	40'	Silty and shale as above											
40'	44'	Grey & brown laminitic silty shale							4		5933	29'	
44'	46'	Coaly and carbonaceous shale	0151	44'	46'	2'	1.30	55.69	14.73	28.28	1		
46'	48'	Coal and carbonaceous shale	0152	46'	48'	2'	1.46	48.99	15.82	33.73	1 1/2		
48'	50'	Coal, trace carbonaceous shale	0153	48'	50'	2'	0.61	23.37	20.49	55.53	6		
50'	52'	Coal <u>43-52' COAL</u>	0154	50'	52'	2'	1.30	13.43	22.81	62.46	7		
52'	54'	Coal	0155	52'	54'	2'	2.56	3.65	23.11	70.83	3		
54'	56'	Coal <u>54-61' COAL</u>	0156	54'	56'	2'	1.94	5.43	23.62	69.01	3		
56'	58'	Coal, carbonaceous shale	0157	56'	58'	2'	0.94	73.12	10.09	15.35	Nil		50-55' silty 56-58' carbon

Gamma Ray Neutron Log  
 Yes  No

Hole No. 2 Elev. 6585  
 Lat. 48° 37' 00" N Long. 84° 30'  
 E.F.V. Th.  
 Top of #9 @ 6546 | 14'  
 Top of #7 @ 6439 | 27'  
 Top of #5 @ 6194 | 7'  
 Top of 3 @ 6105 | 10' } very dirty











CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

SURVEYS:

PROJECT: \_\_\_\_\_  
 HOLE: \_\_\_\_\_ PAGE \_\_\_\_\_  
 INCL. \_\_\_\_\_ T.D. \_\_\_\_\_  
 AZ. \_\_\_\_\_ STARTED \_\_\_\_\_  
 \_\_\_\_\_ COMPLETED \_\_\_\_\_  
 COLLAR LOCATION: \_\_\_\_\_  
 COLLAR ELEVATION: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
340'	345'	Sandstone, fine even grain, grey & black	-										
345'	350'	Shale and silt, grey	-										
350'	355'	Sandstone, fine even grain, grey & black	-										
355'	360'	Fine sandstone, grey-black grains, laminated	-										
360'	365'	Fine sandstone as above, some grey silt	-										
365'	371'	Grey silty shale, shaley silt 66-68	-										base of sandstone 1 foot
371'	373'	Grey shale, trace coal	-										no sample taken
373'	376'	Grey shale, trace coal	-										
375'	381'	Dark grey shale	-										
381'	385'	Shaley coal and coaly shale	-										
385'	387'	As above with more shaley coal	0186	385'	387'	2'	2.62	74.44	9.30	13.64	1		
387'	390'	Grey shale	-										
390'	396'	Dark grey carbonaceous shale, trace shale	-										
396'	398'	Coal, carbonaceous, coal, coaly shale, grey shale	0187	396'	398'	2'	4.40	66.89	12.50	16.21	1		
398'	401'	Carbonaceous shale, some coal	0188	398'	401'	3'	6.83	71.52	10.74	10.91	1		





CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: \_\_\_\_\_

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS:

PROJECT: Wlk River

HOLE 32 PAGE \_\_\_\_\_

INCL. \_\_\_\_\_ T.D. \_\_\_\_\_

AZ. \_\_\_\_\_ STARTED \_\_\_\_\_

COMPLETED \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI		REMARKS
510'	545'	Grey fine grain silt, sandstone, few carb. ptgs.	-										
545'	550'	Grey-brown fine grain silt	-										
550'	555'	" " "	-										
555'	560'	" " "	-										
560'	565'	" " "	-										
565'	570'	Grey fine grain silt, sandstone	-										
570'	575'	Grey fine grain silty sandstone	-										
575'	580'	Grey fine grain silty sandstone	-										
580'	585'	" " "	-										
585'	590'	" " (shiny qtz argill. " grns, black)	-										Drilling 3-11-51
590'	595'	" " " "	-										
595'	600'	Shale med. grey silt (20%) lt. grey	-										Drilling 3-11-51
600'	605'	Shale med. grey, partly with slick & calc.	-										
605'	613'	" " , trace fine coal	-										Drilling 3-11-51
613'	615'	Silt, sandy, med. grey black grains	-										Drilling 3-11-51

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: \_\_\_\_\_

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS: \_\_\_\_\_

PROJECT: \_\_\_\_\_

HOLE \_\_\_\_\_

INCL. \_\_\_\_\_

AZ. \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

DATE \_\_\_\_\_

T.D. \_\_\_\_\_

STARTED \_\_\_\_\_

COMPLETED \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
615'	620'	Silt, lt. grey with black grains, fine sandy trace brown lst shale at 620	-										
620'	625'	Shale, grey in part silty (10%)	-										
625'	630'	Shale, " " (30%)	-										
630'	635'	Shale, med. grey, trace silt	-										
635'	640'	Shale, grey, silt, trace brown (5-10%)	-										
640'	645'	" " " calcite " " " " coal streaks	-										
645'	650'	Silt, lt. med. grey, brown grey shale (50) trace sandstone grey, med, grn at 650	-										
650'	655'	Silt, grey, silty shale 12 min. (60%) trace dark grey silty shale, coal streaks	-										
655'	660'	Silt, lt. med. grey, argillaceous, trace coal	-										1st samples at need.
660'	663'	Coal clean 652-680' COAL	191	660'	663'	3'	6.11	52.81	12.60	23.48	1		
663'	666'	Coal " ON RADIATION LOG	192	663'	666'	3'	3.98	42.87	16.90	36.25	1 1/2		
666'	669'	Coal "	193	666'	669'	3'	8.55	25.39	17.71	43.35	1		
669'	672'	Coal "	194	669'	672'	3'	11.10	19.27	17.62	52.01	4		
672'	675'	Coal "	195	672'	675'	3'	11.05	23.51	16.62	43.22	3		
675'	678'	Coal "	196	675'	678'	3'	8.23	21.12	13.25	51.30	3 1/2		

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

SURVEYS:

PROJECT: Elk River  
 HOLE 42 PAGE 1  
 INCL. \_\_\_\_\_ T.D. \_\_\_\_\_  
 AZ. \_\_\_\_\_ STARTED \_\_\_\_\_  
 COMPLETED \_\_\_\_\_

LOGGED BY: \_\_\_\_\_

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
675'	681'	Coal clean	197	678'	681'	3'	10.23	22.68	17.20	49.84	2½		
681'	683'	Coal "	198	681'	683'	2'	11.64	23.32	16.80	43.24	3½		
683'	686'	Coal	199	683'	686'	3'	9.45	42.36	14.11	33.58	1½		
686'	689'	Coal and shale	200	686'	689'	3'	8.89	40.74	14.21	36.16	2		marker in 16 feet
689'	692'	" "	251	689'	692'	3'	4.78	53.53	12.37	29.32	1		
692'	695'	Shale and coal	252	692'	695'	3'	6.27	61.04	12.70	19.99	1		695-696 in ft
695'	700'	Shale, dark grey and grey-brown	-						17.5				700-701 in ft
700'	704'	Shale, grayish brown	-										" "
		T.D.											

NO COAL ON RADIATION LOG

K. FRODO P. 5713B

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: B 5

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS:

# 308

PROJECT: Elk River EAGLE MT.

HOLE 73 DATE \_\_\_\_\_

INCL. \_\_\_\_\_ T.O. \_\_\_\_\_

AZ. \_\_\_\_\_ STAPLED \_\_\_\_\_

COMPLETE \_\_\_\_\_

COLLAR LOCATION: 3493

1522

COLLAR ELEVATION: 5770

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
0'	7'	Grey silt, occ. sandy calcite											
7'	10'	as above but limonitic weathering											
10'	15'	Silt and carb. shale, minor coal (6")											
15'	20'	Silt, limonitic weather, black shale, siltstone											
20'	25'	Black carb. shale, dark grey silt occ. calcite											
25'	27'	" " "											
27'	29'	Coal and shale	253	27'	29'	2'	2.43	80.81	7.22	9.71	131		
29'	31'	" "	254	29'	31'	2'	1.47	84.04	7.38	7.11	Nil		
31'	35'	" "	-	-	-								
35'	40'	Black carbon. shale, dark grey silt (occ. calcite)											
40'	45'	Dark siltstone with some calcite											
45'	50'	Dark siltstone carb. in part occ. sandy some calcite											
50'	56'	Nil. calcite siltstone and carb. shale											
56'	58'	Shaley, coal very dirty	255	56'	58'	2'	0.93	74.66	10.75	13.66	1		
58'	60'	Silty in part, carb. shale black											

Hole No. 3 Elev. 5960  
 Lat. 48° 30' S Dep. 84° 66'  
 Elev. Th.  
 Top of 4 @ 5742 | 25'  
 Top of 2 @ 5558 | 12'  
 Top of 1 @ 5939 | 15'  
 Top of \_\_\_\_\_ @ \_\_\_\_\_ | \_\_\_\_\_

Gamma Ray Neutron Log  
 Yes  No





CANADIAN PACIFIC OIL AND GAS LIMITED HOLE LOGGED:

LOGGED BY: \_\_\_\_\_

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

SURVEYS:

PROJECT: \_\_\_\_\_

HOLE \_\_\_\_\_

INCL. \_\_\_\_\_

AZ. \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

Elk River

PAGE \_\_\_\_\_

T.D. \_\_\_\_\_

STARTED \_\_\_\_\_

COMPLETED \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
195'	200'	Silty shale, light brown-grey	-										
200'	205'	" " (30%) shale grey	-										
205'	210'	" " (30%) "	-										
210'	215'	" " (10%) "	-										
215'	220'	Shale med-dark grey, silty in part	-										
220'	221'	" " "	-										
221'	226'	Coal, clean, powdery 218-244' COAL	261	224'	226'	2'	2.31	24.43	17.17	56.09	2 1/2		Top of seam
226'	228'	" " " ON RADIATION LOG	262	226'	228'	2'	2.53	19.63	18.90	48.89	4 1/2		
228'	230'	" " "	263	228'	230'	2'	3.52	32.49	18.89	37.10	2 1/2		
230'	232'	" " "	264	230'	232'	2'	3.59	16.57	19.84	60.00	7 1/2		
232'	234'	" " "	265	232'	234'	2'	2.75	12.22	21.95	63.03	1		
234'	236'	" " "	266	234'	236'	2'	2.57	23.43	19.75	54.25	3		
236'	238'	" " "	267	236'	238'	2'	2.76	11.39	20.23	65.62	4 1/2		
238'	240'	" " "	268	238'	240'	2'	2.98	13.13	22.18	61.71	6		
240'	242'	" " "	269	240'	242'	2'	2.92	10.80	20.17	66.11	2 1/2		



CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: \_\_\_\_\_

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

SURVEYS:

PROJECT: Elk River

HOLE #3 PAGE 2

INCL. \_\_\_\_\_ T.D. \_\_\_\_\_

AZ. \_\_\_\_\_ STARTED \_\_\_\_\_

COMPLETED \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
285'	290'	Lt. grey-brown grey silt, acc. shale											
290'	295'	Grey calcite silt, brown shale, some limonitic											
295'	300'	Grey silty calcite silt, occ. shaly trace coal											
300'	305'	Grey silt, slightly silt											
305'	310'	Grey silt, black shale, occ. limonitic											
310'	315'	Grey silt											
315'	320'	F.G. sandstone, occ. silty											
320'	325'	Grey silt, occ. calcite											
325'	330'	Dark grey silt											
330'	335'	Dark grey silt, silt in part											
335'	340'	Shale, black, carbonaceous											
340'	343'	Coal, some shale	0129	340'	343'	3'	7.54	43.72	14.13	34.56	1		
343'	346'	Coal	0130	343'	346'	3'	5.44	40.57	15.42	38.57	1		
346'	349'	Coal, some shale	0131	346'	349'	3'	6.77	46.84	14.13	32.26	1		
349'	352'	Coal, shaly	0132	349'	352'	3'	4.38	64.01	11.69	19.92	1		

PROJECT: \_\_\_\_\_  
 HOLE NO. \_\_\_\_\_  
 INCL. \_\_\_\_\_  
 AZ. \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	N	A	VM	FC	FSI	S	REMARKS
352'	355'	Coal, shaly	0133	352'	355'	3'	7.93	60.71	11.89	19.47	1		
355'	358'	" "	0134	355'	358'	3'	6.25	50.93	11.5	21.12	1		
358'	361'	Coal (shale predominant)	0135	358'	361'	3'	7.52	74.13	9.63	8.60	1		
361'	364'	" "	0136	361'	364'	3'	9.87	69.24	9.19	11.16	1.33		
364'	367'	Shale, black coaly											
367'	370'	Black carbonaceous shale, occ. coaly											
370'	375'	Grey-black shale, carbonaceous, occ. coaly & laminae											
375'	380'	Black carbonaceous shale occ. silty, coaly											
380'	385'	" "											
385'	390'	Black carbonaceous shale occ. coaly											
390'	395'	Grey carbonaceous shale											
395'	400'	Black carbonaceous shale											
400'	405'	Black-grey carbonaceous shale											
405'	410'	Silty in part, black shaley coaly, bottom 6" believed coal	0137	410'	413'	3'	9.31	26.10	13.00	46.59	1.2		
410'	413'	Coal, good, hard											

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_





CANADIAN PACIFIC OIL AND GAS LIMITED

WELL PLUGGED:

SURVEYS:

PROJECT: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_

HOLE # \_\_\_\_\_ PAGE \_\_\_\_\_

WELL SIZE: \_\_\_\_\_

INCL. \_\_\_\_\_ T.D. \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

STARTED \_\_\_\_\_

AZ. \_\_\_\_\_ COMPLETED \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
535'	535'	Grey sandstone, coarse grained											
535'	540'	" " " " , grey & limonitic concret. st. ?											
540'	545'	" " " " , grey & limonitic silt											
545'	550'	" " " " occ. silty											
550'	555'	Grey silt, coal frag. sandstone grey coaly?											sandstone ag- grey silt
555'	560'	" " " "											some sandstone fragments
560'	565'	" " " "											some sandstone fragments
565'	570'	" " no coal frag.											may be sandstone
570'	575'	Grey sandstone-silty frags. & limonitic stain											see for description
575'	580'	" " " "											sandstone is grey silt
580'	585'	Grey sandstone & silt, carbonaceous shale, low coaly plant remains num. coal chunks											
585'	590'	" " " " , some carbonaceous, coaly shale, limonitic silt											
590'	595'	" " " " , carbonaceous black shale silt, occ. limonitic st.											
595'	600'	" " " " " "											
600'	605'	" " " " " "											some coal present at bottom

(shale much more abundant)







K-F.P. 67(3)B

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

SURVEYS:

PROJECT: ELK River EAGLE MT.

LOGGED BY: JOAS

HOLE FL PAGE 1

HOLE SIZE: \_\_\_\_\_

INCL. -90 T.D. \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

STARTED \_\_\_\_\_

AZ. \_\_\_\_\_ COMPLETED \_\_\_\_\_

# 308

COLLAR LOCATION: 1181M

COLLAR ELEVATION: 7035

No

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
0'	4'	Casing											
4'	6'	Coal	0279	4'	6'	2'	17.47	19.18	28.46	34.89	N11		
6'	8'	Coal	0280	6'	8'	2'	17.13	11.57	33.33	37.92	N11		
8'	10'	"	0281	8'	10'	2'	14.21	7.11	37.19	41.49	N11		
10'	12'	"	0282	10'	12'	2'	12.04	9.77	36.18	42.01	N11		
12'	14'	"	0283	12'	14'	2'	11.09	26.60	35.63	36.58	N11		
14'	16'	"	0284	14'	16'	2'	7.46	29.07	24.42	39.05	N11		
16'	18'	"	0285	16'	18'	2'	7.01	20.68	22.02	30.47	N11		
18'	20'	"	0286	18'	20'	2'	7.52	27.75	20.93	43.80	N11		
20'	22'	"	0287	20'	22'	2'	5.18	34.16	22.55	38.11	N11		
22'	23'	"	0288	22'	23'	1'	2.63	79.70	10.68	7.09	N11		
23'	25'	Light grey shale, sandstone, silt											
25'	30'	Sandstone, brown shale											
30'	35'	Sandstone											
35'	40'	" dark grey shale, silt											

Hole No. 4 Elev. 7035  
 Lat. 49° 32' 54" Dep. 81° 05' 18"  
 F.E.V. 118

Gamma Ray Neutron Log  
 Yes  No

Mh

45

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

SURVEYS:

LOGGED BY: \_\_\_\_\_  
 HOLE SIZE: \_\_\_\_\_  
 CASING DETAILS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

PROJECT: \_\_\_\_\_  
 HOLE INCH. \_\_\_\_\_  
 TIME \_\_\_\_\_  
 STARTED \_\_\_\_\_  
 AZ. \_\_\_\_\_  
 COMMENTS \_\_\_\_\_  
 COLLAR LOCATION: \_\_\_\_\_  
 COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VH	FC	PSI	S	MINUTE
45	50	Sandstone, dark grey shale, silt											
50	55	Sandstone											
55	60	" dark shale, trace carbonaceous shale											
60	65	" trace dark coaly shale											
65	70	Grey very fine grain sandstone, trace coal											
67.5	67.5	Coal	Not sample										
67.5	70	Grey very fine grain sandstone in silt with											
70	75	Grey fine grain sandstone											
75	80	Grey sandstone, silt in part, traces of coal											
80	85	Lt. brown silt & carbonaceous shale, some coal											
85	90	Shaly coal											
90	95	Lt. brown sandstone, black fine grain sandstone											
95	96	Shale, mostly powder											
96	96	Coal, some shale	0289	96	98	21	1.62	75.91	10.91	11.56	141		

CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

LOGGED BY: \_\_\_\_\_

HOLE SIZE: \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

SURVEYS:

PROJECT: \_\_\_\_\_

HOLE \_\_\_\_\_

INCL. \_\_\_\_\_

AZ. \_\_\_\_\_

STARTED \_\_\_\_\_

COMPLETED \_\_\_\_\_

COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
98'	100'	Coaly shale	0290	98'	100'	2'	0.36	34.40	2.70	6.04	N51		
100'	105'	Shale, grey, light brown, soft											
105'	110'	Shale, grey, very fine											
110'	115'	" " "											
115'	120'	Shale, grey, trace coal											
120'	125'	" " "											
125'	130'	" " , light brown silty											
130'	135'	" " , shale, silty											
135'	140'	" " , silty											
140'	145'	Silty, grey shale, trace carbonaceous shale											
145'	150'	Shale grey to dark grey											
150'	155'	" , carbonaceous shale											
155'	160'	Shale black, coaly shale											
160'	165'	" "											
165'	168'	Coal, shaly	0291	165'	168'	3'	6.75	15.34	24.08	53.33	1		

2, 1/2"





CANADIAN PACIFIC OIL AND GAS LIMITED HOLE PLUGGED:

SURVEYS:

PROJECT: \_\_\_\_\_

LOGGED BY: \_\_\_\_\_

HOLE \_\_\_\_\_ PAGE \_\_\_\_\_

HOLE SIZE: \_\_\_\_\_

INCL. \_\_\_\_\_ T.D. \_\_\_\_\_

CASING DETAILS: \_\_\_\_\_

STARTED \_\_\_\_\_

AZ. \_\_\_\_\_ COMPLETED \_\_\_\_\_

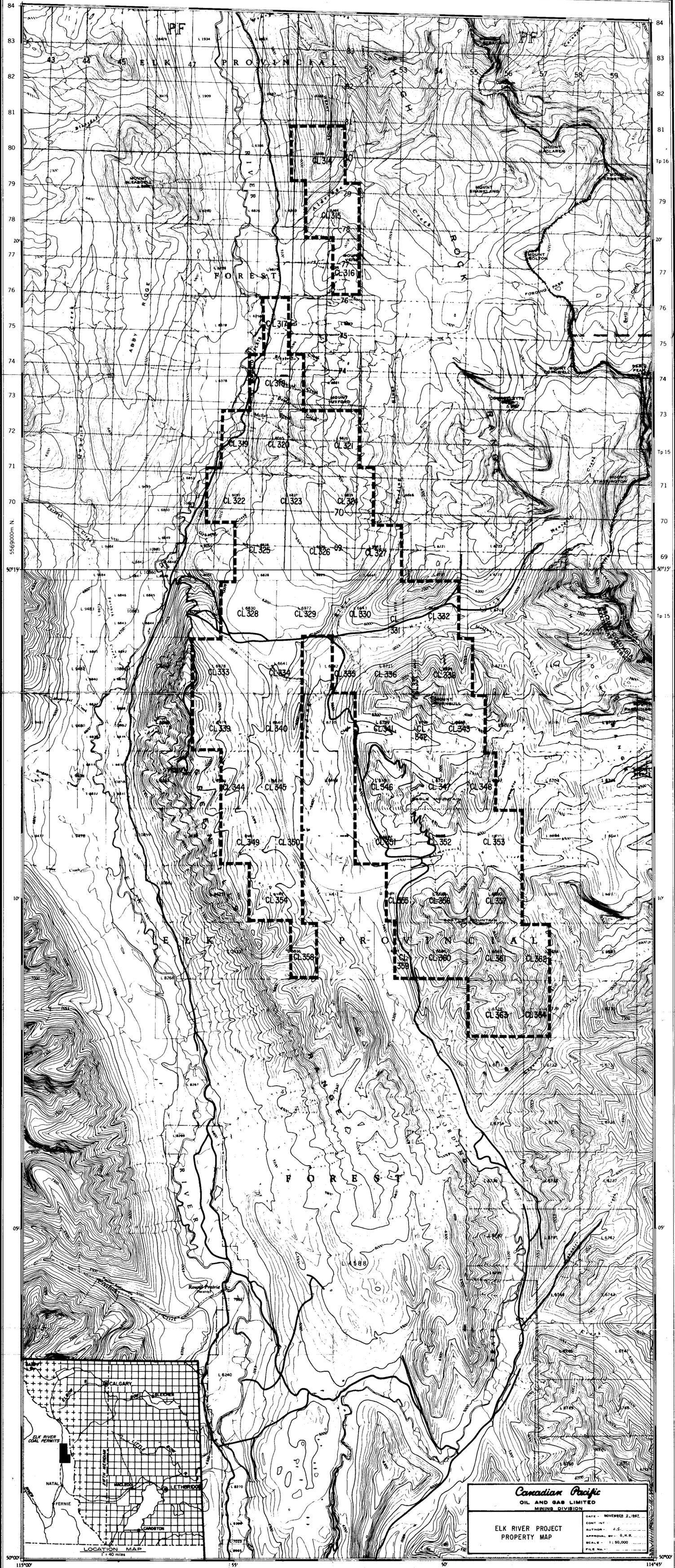
COLLAR LOCATION: \_\_\_\_\_

COLLAR ELEVATION: \_\_\_\_\_

FROM	TO	DESCRIPTION	NUMBER	FROM	TO	WIDTH	M	A	VM	FC	FSI	S	REMARKS
295'	300'	Shale, gray-dark grey, silt 5%	-										
300'	305'	Shale, grey, silt 5%	-										
305'	307'	" " "	-										
							Seam II						
X 307'	309'	Coal, some shale (10%)	297	307'	309'	2'	1.79	52.50	16.73	28.92	1	No	
309'	311'	" " "	298	309'	311'	2'	5.35	35.79	19.57	39.29	4		
311'	313'	" clean (large brown silt caving 5%)	299	311'	313'	2'	1.71	30.17	21.15	46.97	4		
313'	315'	" " " "	300	313'	315'	2'	3.34	35.80	19.37	41.49	2		
315'	317'	" " " "	301	315'	317'	2'	1.41	24.67	22.65	51.29	5		
317'	320'	" " " "	302	317'	320'	3'	3.30	36.86	19.55	40.26	3		
X 320'	323'	" " " "	303	320'	323'	3'	4.14	50.84	16.10	28.92	3	No	
323'	326'	" " " "	304	323'	326'	3'	7.04	26.31	20.01	46.04	5		
X 326'	329'	" " " "	305	326'	329'	3'	4.09	49.91	16.85	29.15	1	No	
X 329'	332'	" " " "	306	329'	332'	3'	4.43	51.10	17.04	27.43	2	No	
X 332'	335'	Coal, grey shale	307	332'	335'	3'	1.33	75.47	13.32	9.38	1	No	
335'	340'	Shale, grey, calcite @ 340'	-	-	-	-							

14' }  
" " }





**Canadian Pacific**  
 OIL AND GAS LIMITED  
 MINING DIVISION

ELK RIVER PROJECT  
 PROPERTY MAP

DATE - NOVEMBER 2, 1957  
 CONT. BY  
 AUTHOR - J.C.  
 APPROVAL BY - G.H.R.  
 SCALE - 1:50,000  
 FILE NO.

**FORDING RIVER**  
 BRITISH COLUMBIA - ALBERTA  
 WEST OF FIFTH MERIDIAN - OUEST DU CINQUIÈME MÉRIDIEN

**308**

Map - 1

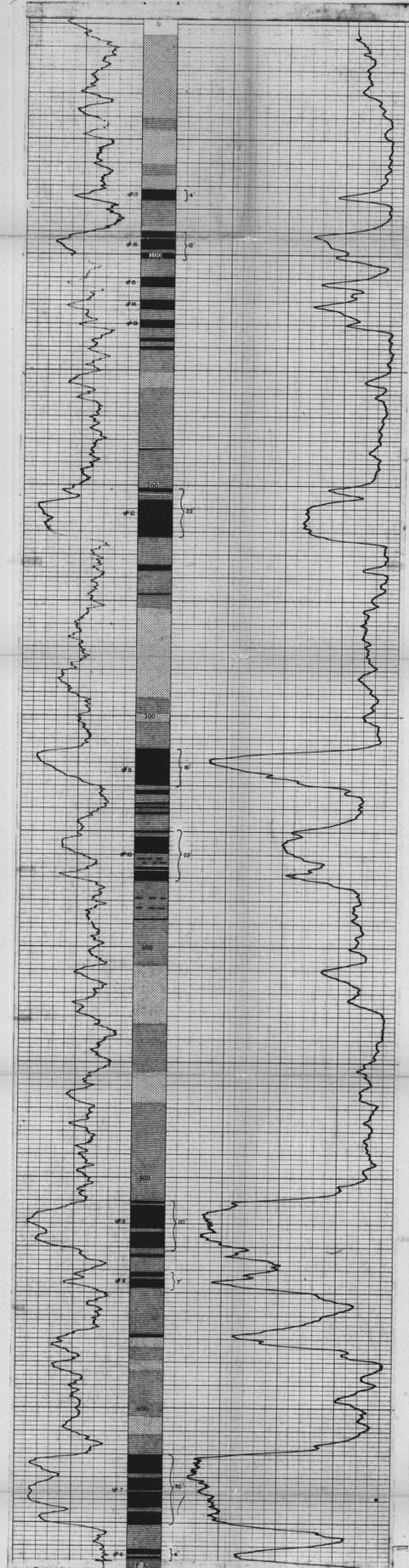
K-FORDING RIVER 67(2)B



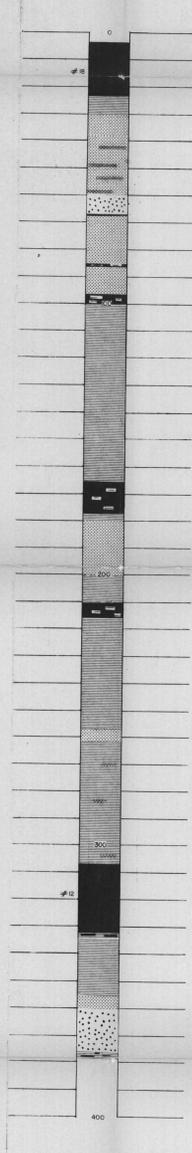
DRILL HOLE NO. 1

GAMMA RAY  
GAMMA RAY INCREASES  
API UNITS

NEUTRON  
NEUTRON INCREASES  
API UNITS



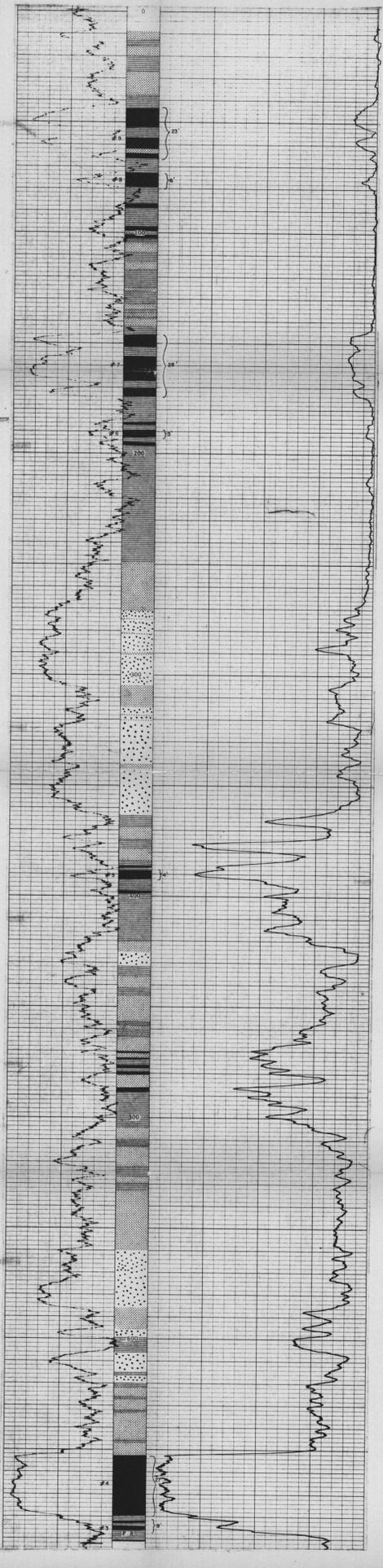
DRILL HOLE NO. 4



DRILL HOLE NO. 2

GAMMA RAY  
GAMMA RAY INCREASES  
API UNITS

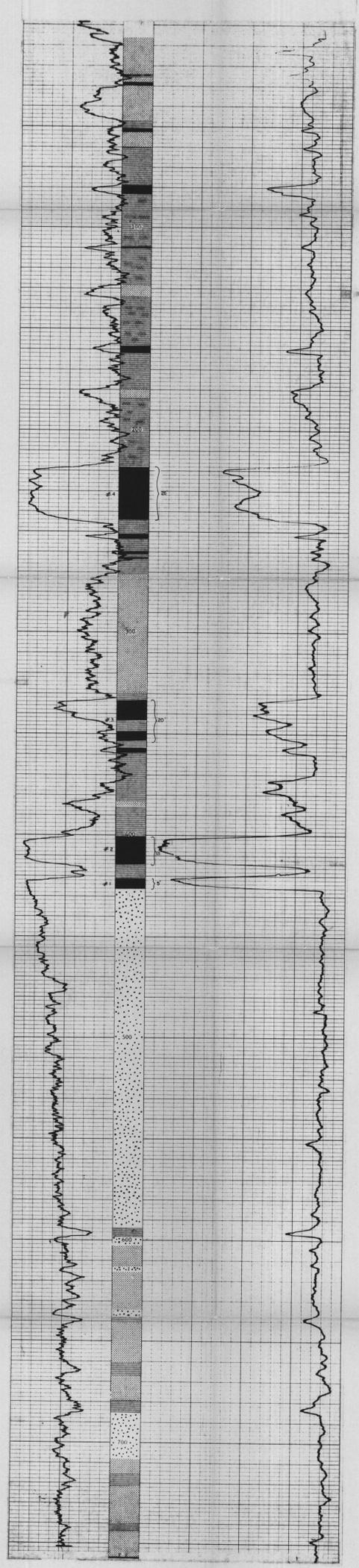
NEUTRON  
NEUTRON INCREASES  
API UNITS



DRILL HOLE NO. 3

GAMMA RAY  
GAMMA RAY INCREASES  
API UNITS

NEUTRON  
NEUTRON INCREASES  
API UNITS



LEGEND

- COAL
- SHALE
- SANDSTONE
- SILTSTONE

Canadian Pacific  
OIL AND GAS LIMITED  
MINING DIVISION

ELK RIVER COAL PROJECT  
DETAILED CORRELATION HOLES 1 - 4

DATE - NOV. 1957  
CONT. INT. -  
AUTHOR - PER  
APPROVAL BY -  
SCALE - 1" = 50'  
FILE NO. -