

SUMMARY REPORT - 1988 EXPLORATION
TEXT & ILLUSTRATIONS

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FORDING RIVER OPERATIONS
SUMMARY REPORT
1988 EXPLORATION PROGRAM

~~CONFIDENTIAL~~

OPEN FILE

750

SCHEDULE C

PROVINCE OF
BRITISH COLUMBIA

MINISTRY OF
ENERGY, MINES AND
PETROLEUM RESOURCES

TITLE PAGE OF
ASSESSMENT REPORT

GENERAL NATURE OF WORK

TOTAL COST

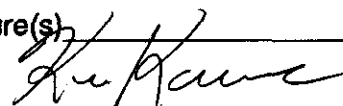
Exploration

\$555,000.00

Author or Landsman

Signature(s)

K.A. Komenac (P.Eng.)



Date report filed

Nov 24/89

Year of work 1988

Property Name

Fording River Operations

Coal type (if applicable) Medium to High Volatile Bituminous

Mining Division Fort Steele

NTS 82J2W

Latitude 50° 10'

Longitude 114° 52'

Coal Licence Numbers; Coal Leases; Freehold B.C. Coal Leases 1, 2 and 5;

Coal Licences 330, 331, 332, 336 and 356.

Owner(s)

(1) FORDING COAL LIMITED

Box 100, Elkford, B.C. V0B 1H0

Operator(s)

(1) Same

References to Previous Work

Annual Assessment Reports since 1970.

TABLE OF CONTENTS

<u>I.</u>	<u>INTRODUCTION</u>	<u>Page</u>
1.	General Geography & History	1
2.	Geology	
	1) Stratigraphy	3
	2) Structure	5
3.	Summary of Work Done in 1988	9
<u>II.</u>	<u>INDIVIDUAL AREA PROGRAMS</u>	
1.	Eagle Mountain Area	11
	i) Objectives	
	ii) Summary of Work Done	
	iii) Results and Conclusions	
2.	North Castle Mountain Area	13
	i) Objectives	
	ii) Summary of Work Done	
	iii) Results and Conclusions	
3.	Lake Mountain Area	15
	i) Objectives	
	ii) Summary of Work Done	
	iii) Results and Conclusions	
4.	Henretta Creek Area	17
	i) Objectives	
	ii) Summary of Work Done	
	iii) Results and Conclusions	

III. LIST OF APPENDICES

1. Drillhole Logs

- i) Geophysical logs
- ii) Directional logs

2. Sample Analyses

- i) Proximate analyses, sulphur, and FSI Determinations
- ii) Petrographic Analyses

3. Depth to Bedrock Survey - Lake Mountain

LIST OF ILLUSTRATIONS

<u>ILLUSTRATION NO.</u>	<u>DESCRIPTION</u>
1	a. Index Map - Coal Properties Scale 1:50,000
	b. General Geology Map Scale 1:25,000
2	a. 1988 Exploration Program Scale 1:10,000
3	a. Eagle Mountain Area Program Scale 1:2000
	b. Geological Cross Section 150,000 N. Scale 1:2000
4	a. North Castle Mountain Area Program Scale 1:2000
	b. Geological Cross Section 147,100 N. 1:2000
5.	a. Lake Mountain Area Program Scale 1:2000
	b. Geological Cross Section 151,800 N. 1:2000
6.	a. Henretta Creek Area Program Scale 1:2000
	b. Geological Cross Section 154,200 N 1:2000

Statement of Author's Academic and Professional Qualifications

The author of this report, K. A. Komenac, in 1973 received the degree of Bachelor of Science (Geology Major) from the University of British Columbia, and is registered as a Professional Engineer with the Association of Professional Engineers of the Province of British Columbia. The author has been an employee of Fording Coal Limited at the Fording River Operation since November of 1973, as Assistant Pit Geologist, Exploration Geologist, Senior Exploration Geologist and since 1988 Senior Geologist.

FORDING RIVER OPERATIONS

SUMMARY REPORT

1988 EXPLORATION PROGRAM

I. INTRODUCTION

1. General Geography and History

The Fording River Coal property is located in the Fording River and Upper Elk Valleys, approximately twenty-five (25) kilometres north of Elkford, B.C. Access is by paved road north from Elkford along the Fording River Valley, or north along the Elk River Valley via the Forestry Service gravel road or the Kan-Elk Powerline road.

The Fording River minesite is situated within the front range of the southern Canadian Rocky Mountains. At least eight (8) major coal seams, generally greater than four (4) metres thick, are contained in the Mist Mountain Formation of the Kootenay Group.

The Elk River portion of the property was actively explored by the Canadian Pacific Railway Company in the period 1902 - 1908. Until 1947, the property was comprised of 10,276 hectares in forty (40) Crown Granted Lots. In that year, the holdings were reduced to 2,979 hectares in fifteen (15) Crown Granted Lots. In 1967 and 1968, Canadian Pacific Oil and Gas re-acquired part of the coal lands which had been abandoned in 1947. At the present time, the Fording Coal Property consists of 15,504 hectares, held on three (3) Coal Leases and sixty (60) Coal Licences.

I. INTRODUCTION (Cont'd)

1. General Geography and History (cont'd)

Mining operations which commenced in 1972, have produced more than 54.9 million tonnes of clean metallurgical and thermal coal for markets in North and South America, Europe and Asia. Of this total, 5.7 million tonnes were produced in 1988.

Reference:

- i) Illustration No. 1a: Index Map - Coal Properties

2. Geology

i) Stratigraphy

The general stratigraphic succession on the Fording River Property is summarized in the following table:

PERIOD	LITHO-STRATIGRAPHIC UNITS		PRINCIPAL ROCK TYPES
Recent			Colluvium
Quaternary			Clay, silt, sand, gravel, cobbles
Lower Cretaceous	Blairmore Group		Massive bedded sandstones and conglomerates
Lower Cretaceous to Upper Jurassic	KOOTENAY	Elk Formation	Sandstone, siltstone, shale, mudstone, chert pebble conglomerate, minor coal
		Mist Mountain Formation	Sandstone, siltstone, shale, mudstone, thick coal seams
	GROUPE	Moose Mountain Member	Medium to coarse grained quartz-chert sandstone
		Weary Ridge Member	Fine to coarse grained, slightly ferruginous quartz-chert sandstone
Jurassic	Fernie Formation		Shale, siltstone, fine-grained sandstone
Triassic	Spray River Formation		Sandy shale, shaley quartzite
Mississippian	Rundle Group		Limestone

The oldest rocks present on the Fording River property are the Rundle Group limestones, located on the west bank of the Fording River, near the southern property boundary. They are in faulted contact with the Kootenay Group to the west, and unconformable contact with Spray River quartzites to the north. The latter are best exposed on the eastern slope of the Brownie Creek Valley.

2. Geology (Cont'd)

i) Stratigraphy (Cont'd)

The Fernie Formation shales occur throughout the area, generally along the sides of valleys on the lower flanks of the mountains. The shales are recessive and, therefore, poorly exposed. The Fernie Formation is in conformable contact with the Morrissey, through the "Passage Beds", which are a transitional zone from marine to non-marine sedimentation.

The Morrissey Formation, which is the "basal sandstone" of the Kootenay Group, is a prominent cliff-forming marker horizon in many locations. On the Fording River Property, the top of the Moose Mountain member (Morrissey Formation) is in sharp contrast with #1 or A seam, the lowermost bed of the Mist Mountain Formation.

The Mist Mountain Formation contains all of the economic coal seams, and is the most widely occurring formation on Fording River Property. This economically important formation is an interbedded sequence of sandstones, siltstones, silty shales, mudstones, and medium to high volatile bituminous coal seams. The volatile content of the coal increases up section, with decreasing rank. Lenticular sandstones comprise about 1/3 of the Mist Mountain sediments at Fording River, but very few laterally extensive sandstone beds exist.

The sandstone above and below seam #4 (B) and above #9 (F), are the most persistent units, and are often cliff-forming marker horizons.

2. Geology (Cont'd)

i) Stratigraphy (Cont'd)

The Mist Mountain Formation is conformably overlain by strata of the Elk Formation. On the Fording property, this formation is commonly a succession of sandstones, siltstones, shales, mudstones, chert pebble conglomerates and sporadic, thin, high volatile bituminous coal seams. The coal seams are characterized by a high alginate content and referred to as "Needle" coal. The Elk Formation is observed near the tops of the mountains, mainly on the east side of the Elk Valley on the Greenhills Range, and northward to the Mount Tuxford area.

The top of the Elk Formation marks the upper boundary of the Kootenay Group, which is unconformably overlain by the basal member of the Blairmore Group. This thick bedded, cliff forming sandstone and conglomerate unit is observed on the upper slopes of Mount Tuxford.

ii) Structure

Subsequent to deposition, the sediments were involved in the mountain building movements of the late Cretaceous to early Tertiary Laramide orogeny. The major structural features of the Fording River property are the north-south trending synclines with near horizontal to steep westerly dipping thrust faults, and a few high angle normal faults. Some of the thrust faults probably were folded late in the tectonic cycle.

2. Geology

ii) Structure (Cont'd)

The formation of the major fold structures began early in the tectonic cycle. In the current mining area, two (2) asymmetric synclines are evident; the Greenhills Syncline to the west, and the Alexander Creek Syncline to the east of the Fording River.

The thrust faulting (i.e. the Ewin Pass and Brownie Ridge Thrusts), was probably contemporaneous with the later stages of folding. The intervening anticline was subsequently faulted (Ericson Fault), then eroded.

The Alexander Creek Syncline can be traced from the southern property boundary on Castle Mountain to the northern end of the property on Weary Ridge. The strata of the west limb, on the west face of Eagle Mountain, dips easterly at 20 to 25°, decreasing gradually to zero (0) as the axis is approached. The east limb, however, attains a 20° westerly dip within a much shorter (500m) distance of the axis. This asymmetry is possibly due, at least in part, to the influence of the Ewin Pass Thrust which subcrops 600 to 800 metres east of the synclinal axis.

Further to the east, on Brownie Ridge, the strata dips westerly at a mean dip of 42°. The Brownie Ridge Thrust, which subcrops near the crest of the ridge, probably contributes to this steepening.

2. Geology (Cont'd)

ii) Structure (Cont'd)

Within the mining areas, the axis of the Alexander Creek Syncline plunges to the north at an average of 4° . Turnbull Mountain exhibits a localized series of en echelon fold structures, plunging both to the north and south. These subsidiary folds may be related to thrust faulting. From the south end of Mount Tuxford, the synclinal axis continues north-northwest along the base of Mount Veits and into the Elk River Valley near Aldridge Creek.

On Mount Tuxford, the beds exposed are those of the Elk Formation and the overlying (non-coal bearing) Cadomin Formation. The area has not been extensively explored. The stratigraphic sequence of the east limb, in the more extensively explored Mist Mountain strata near Aldridge Creek (Elco property), closely resembles the east limb strata found on Henretta Mountain, ten (10) kilometres to the south.

On the northwest corner of Eagle Mountain, the lower Kootenay-upper Fernie section is the locus for a zone of near horizontal thrust faulting. The effect is to cause a double repetition of the lower coal seams and basal sandstone on the west synclinal limb. This fault zone is synclinal in form, and continuous with the Ewin Pass Thrust zone found on the east limb.

2. Geology (Cont'd)

ii) Structure (Cont'd)

The Greenhills Syncline in the mining area, is essentially a "mirror-image" of the Alexander Creek structure. The east limb of the asymmetric syncline dips westerly at 15 to 25°, except in areas near the Ericson Fault, where 45 to 55° dips are common. The west limb exhibits much steeper dips; commonly in the 35 to 45° range. The Greenhills Syncline plunges northward (340 to 350°), at less than 5°, then apparently dies out to the north in the area of the Osborne Creek Depression.

The Ericson Fault, which locally runs along the base of the Greenhills Range west of the Fording River, is one of the major regional faults. From south to north, this westerly dipping (40 to 70°) normal fault, brings Mist Mountain strata progressively into contact with Rundle, Spray River, Fernie, and Morrissey strata. The downthrown block is to the west.

Near the south end of Lake Mountain, the Ericson Fault begins to "splay" into two (2) zones. The main fault runs along the eastern margin of Lake Mountain, and the subsidiary fault runs to the west, and appears to "die out" northward. The steep northward dip exhibited in the Lake Mountain strata could be due to influence from these flanking "splays" of the fault. The flat lying region to the north of Lake Mountain (Osborne Creek Depression area) is completely void of outcrop, and the Ericson Fault has not been traced either through or to the north of this area.

2. Geology

ii) Structure (Cont'd)

Reference:

- i) Illustration No. 1b - General Geology Map

3. Summary of Work Done in 1988

Sixty-seven (67) reverse circulator rotary holes were drilled, for a total of 10,285 meters.

Drilling was done by S.D.S. Drilling using Ingersol-Rand TH-60 and TH-70 drilling rigs. All holes were geophysically logged through the rods using the gamma-neutron method. Holes that remained open after the rods were pulled, were logged for hole deviation.

Coal seams encountered by rotary drilling were sampled in 0.5m intervals. Representative composite samples for each coal seam encountered in the hole were prepared at Fording's Process Plant Laboratory. Each seam composite was tested for proximate analysis, % Sulphur, and Free Swelling Index. Samples from selected seam composites were sent to David E. Pearson and Associates for petrographic analysis.

Road and drillsite construction was done by Elkford Industries Ltd. and Fording Coal Limited. Staff surveyors provided the required survey control and drillhole pickups.

3. Summary of Work done in 1988 (Cont'd)

The following table shows the drillhole locations with respect to coal lease and licence boundaries:

<u>Lease/Licence</u>	<u>Drillhole</u>
B.C. Coal Lease #1	RH #1985, 1986, 2128 and 2142.
B.C. Coal Lease #2	RH #1984, 1987, 1988, 1989, 1990, 1991, 2080, 2084, 2086, 2140 & 2146.
B.C. Coal Lease #5	RH#2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2143, 2145, 2147 and 2148.
Coal Licence #330	RH#2076, 2077, 2078, 2079, 2091, 2092, 2093, 2151, 2152, 2153, 2155 & 2156.
Coal Licence #331	RH#2083.
Coal Licence #332	RH#2154.
Coal Licence #336	RH#2081, 2082, 2085, 2087, 2088, 2089, 2090, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166 & 2167.
Coal Licence #356	RH#2094, 2096, 2097, 2098 & 2099.

Reference:

- i) Illustration No. 2 - 1988 Exploration Program

II INDIVIDUAL AREA PROGRAMS

1. Eagle Mountain Area

ii) Objectives

Inadequate drillhole density does not provide sufficient information to accurately determine the quantity and quality of high and medium volatile coal in the Eagle Stages 3, 4 and 6 mining areas.

The objective of the drilling program in this area was to supply the additional seam definition and coal quality information required to accurately determine coal volumes and quality.

ii) Summary of Work Done

Eight (8) reverse circulation rotary holes were drilled for a total of 2184.5 metres. Three (3) holes (RH1988, 1990 and 1991) were logged for density in addition to the usual gamma-neutron and deviation.

iii) Results and Conclusions

Three (3) holes drilled in Eagle Stage 4 (RH1984, 85 and 86) intersected seams 18 to 11. Seam thickness and quality are as anticipated, except for 14 upper seam in the northernmost hole (RH1986). In this hole, 14 upper has split into three (3) bands with an aggregate thickness of 3.8 metres. In holes to the south, 14 upper is a single seam (with one (1) minor parting) with a thickness of 5 to 6 metres.

1. Eagle Mountain Area (Cont'd)

iii) Results and Conclusions (Cont'd)

Three (3) holes drilled in Eagle Stage 6 (RH1987, 88 and 89) intersected seams 21 to 11. As in Stage 4, seam thickness and quality is as anticipated with the exception of 14 upper in the northernmost hole (RH#1987).

The two (2) holes drilled in Stage 3 (RH1990 and 1991) intersected seams 14 upper to 11. Coal seam thickness and quality are as anticipated from previous drilling programs.

References:

- i) Illustration 3a: Eagle Mountain Area Program
- ii) Illustration 3b:: Geological Cross Section 150,000 N.
- iii) Appendix 1: Drillhole logs
- iv) Appendix 2: Sample Analyses

2. North Castle Mountain Area

i) Objectives

The objectives of the drilling program in this area were to:

- a) delineate the sub-crop of the top of Moose Mountain sandstone on the north-west flank of Castle Mountain. This subcrop marks the southward limit of the proposed Eagle South Spoil dump as the formation stratigraphically below Moose Mountain is void of coal measures.
- b) investigate the potential for economic coal reserves in seams 4, 3, 2 and 1; *located stratigraphically above the Moose Mountain sandstone.*

ii) Summary of Work Done

Five (5) reverse circulation rotary holes were drilled for a total of 912 meters.

iii) Results and Conclusions

All of the holes intersected Moose Mountain sandstone. Four of the holes were drilled to an average of 140 metres below Moose Mountain without intersecting any thrust fault or coal seams. One hole, RH2097, drilled through 110 metres of sandstone and Fernie shale, before passing through the Ewen Pass Thrust fault into Mist Mountain strata. A thin (1.5m) coal seam was intersected at 142 metres. Reflectance (1.31) indicates that this seam is from near the bottom of the Mist Mountain Formation.

2. North Castle Mountain Area (Cont'd)

iii) Results and Conclusions (Cont'd)

Two holes, RH#2098 and 2099 intersected seams 4 (5.2 metres and 11.7 metres thick respectively) and 4 lower (3.5 metres and 3.0 metres respectively). Four (4) holes intersected seams 3, 2 and 1. Average thickness for these seams is 3.0, 3.2 and 1.1 metres respectively.

The North Castle drilling program located the Moose Mountain subcrop, and therefore established the southward limit of the proposed Eagle South Spoil. The drillholes also prove that no economic coal is evident for at least 100 metres below the valley floor.

Thickness and quality of seams 4, 4 lower, 3 and 2 are very encouraging but significant additional drilling is required before the economic potential can be accurately assessed.

References:

- i) Illustration 4a: North Castle Area Program
- ii) Illustration 4b: Geological Cross Section 147,100 N.
- iii) Appendix 1: Drillhole logs
- iv) Appendix 2: Sample Analyses

3. Lake Mountain Area

i) Objectives

The objectives of the Lake Mountain exploration program were to:

- a) supply additional thickness, location and quality information for seams K to G lower, in the potential dragline mining area on Lake Mountain, and
- b) determine the depth to bedrock in the Lake Mountain Creek marsh area, east of Lake Dragline Pit.

ii) Summary of Work Done

Nineteen (19) reverse circulation rotary holes were drilled for a total of 2,394 metres. In addition, 1.85 km of seismic refraction survey were completed in three (3) sub-parallel lines spaced at 30 - 60m apart. Geophones were spaced at 10m intervals.

iii) Results and Conclusions

The 1988 drilling program in Lake Mountain provided additional seam location, thickness and quality data, primarily for seams K, I, HM1 and H. The primary target area is located on the west flank of Lake Mountain, bounded to the south by east-west striking normal faults, to the west by a splay of the Ericson normal fault, to the east by subcrops, and to the north by increasing seam depths. Seams strike to the north-east and dip to the north-west at 15 to 25 degrees.

3. Lake Mountain Area (Cont'd)

iii) Results and Conclusions (Cont'd)

"K" seam, the uppermost economically important seam in the program area, was intersected in seven (7) drillholes located in the north-west corner of the area. Average thickness for "K" seam is 2.8 metres.

Seams I, HM1 and H, the most economically important seams in the Lake Mountain area, were intersected in the majority of drillholes. Average thickness of these seams is 5.2, 2.6 and 4.6 metres respectively. Additional drilling will be required to establish the economic pit limits.

The seismic refraction survey determined the depth to bedrock in the Lake Mountain Creek bottom area. Overburden depths range from 5 to 20 metres, generally increasing from north to south. Determination of the subcrop location will allow the western pit limit to be established.

References:

- i) Illustration 5a: Lake Mountain Area Program
- ii) Illustration 5b: Geological Cross Section 151,800 N.
- iii) Appendix 1: Drillhole Logs
- iv) Appendix 2: Sample Analyses
- v) Appendix 3: Depth to Bedrock Survey - Lake Mountain

4. Henretta Creek Area Program

i) Objectives

The objective of the drilling program in the Henretta Creek area was to obtain seam location, thickness and coal quality data required to assess the dragline mining potential in the area.

ii) Summary of Work Done

Thirty-five (35) reverse circulation rotary drillholes were completed for 4,794.5 metres.

iii) Results and Conclusions

The majority of holes drilled in 1988 intersected four (4) economically significant seams contained in the middle 1/3 of the Mist Mountain formation.

Seam 12, the uppermost of the four, is generally split into two (2) to four (4) bands with an average aggregate thickness of 6.2 metres. Seam 11 upper, the primary economic seam, is generally a single seam, but may contain a thin parting in some areas. Thickness varies from 5.0 to 12.8 metres and averages 7.7 metres.

Seam 11, located 10 to 30 metres below 11 upper, averages 2.3 metres in thickness. Seam 9 is generally split into two (2) or three (3) coal bands, with an average aggregate thickness of 5.1 metres. The section below 9 seam is void of economic coal seams for approximately 120 metres. All thicknesses and distances mentioned in this section are vertical measurements.

4. Henretta Creek Area Cont'd

iii) Results and Conclusions (Cont'd)

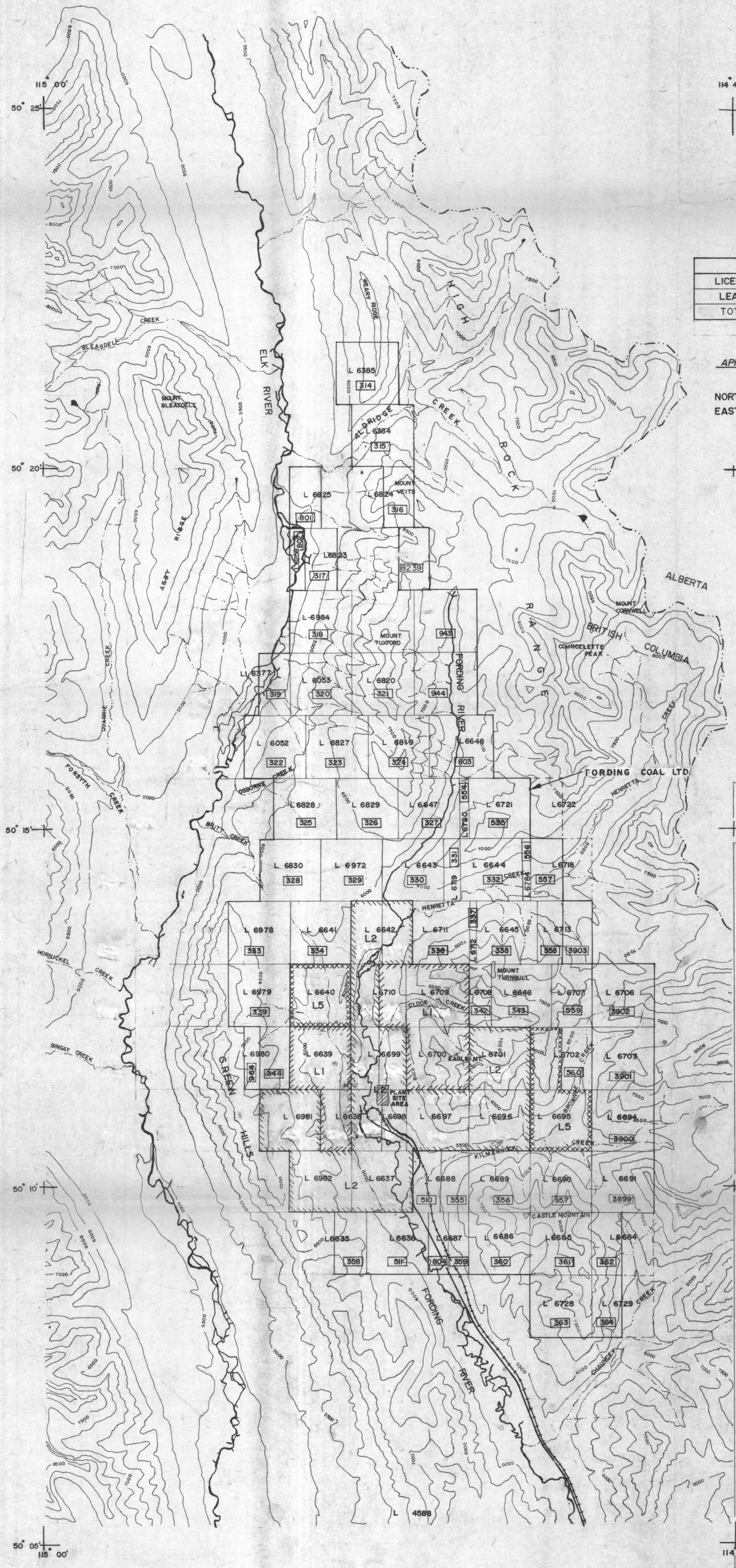
The dominant structural feature in the program area is a tight, northeast plunging syncline. The east limb decreases in dip very abruptly, becoming almost horizontal within 200 metres of the synclinal axis. The west limb also flattens abruptly, becoming a broad anticline before being cut off against a splay of the Ericson normal fault. Minor thrust faulting is evident in the synclinal axis region; particularly in RH#2166, where #9 seam has been repeated.

Results from the 1988 drilling program allowed preliminary dragline mine planning to be completed. Additional exploration is required to determine economic limits and allow the final mining plan to be completed.

References:

- i) Illustration No. 6a: Henretta Creek Area Program
- ii) Illustration No. 6b: Geological Cross Section 154,200 N.
- iii) Appendix 1: Drillhole Logs
- iv) Appendix 2: Sample Analyses

(KAK-9)



LAND TENURE

	NO.	AREA - ACRES	AREA - HECTARES
LICENSES	60	28,648	11,601
LEASES	3	9,638	3,903
TOTAL		38,286	15,504

APPROXIMATE MAXIMUM PROPERTY DIMENSIONS

NORTH-SOUTH 15.9 MILES ; 25.5 KILOMETRES
 EAST-WEST 6.9 MILES ; 11.0 KILOMETRES

LEGEND

COAL LEASES (NOS. , OWNERSHIP)

L 2 FORDING COAL LTD.

COAL LICENSES (NOS. , OWNERSHIP)

557 FORDING COAL LTD.

RAILROAD
 EXISTING HIGHWAYS

750

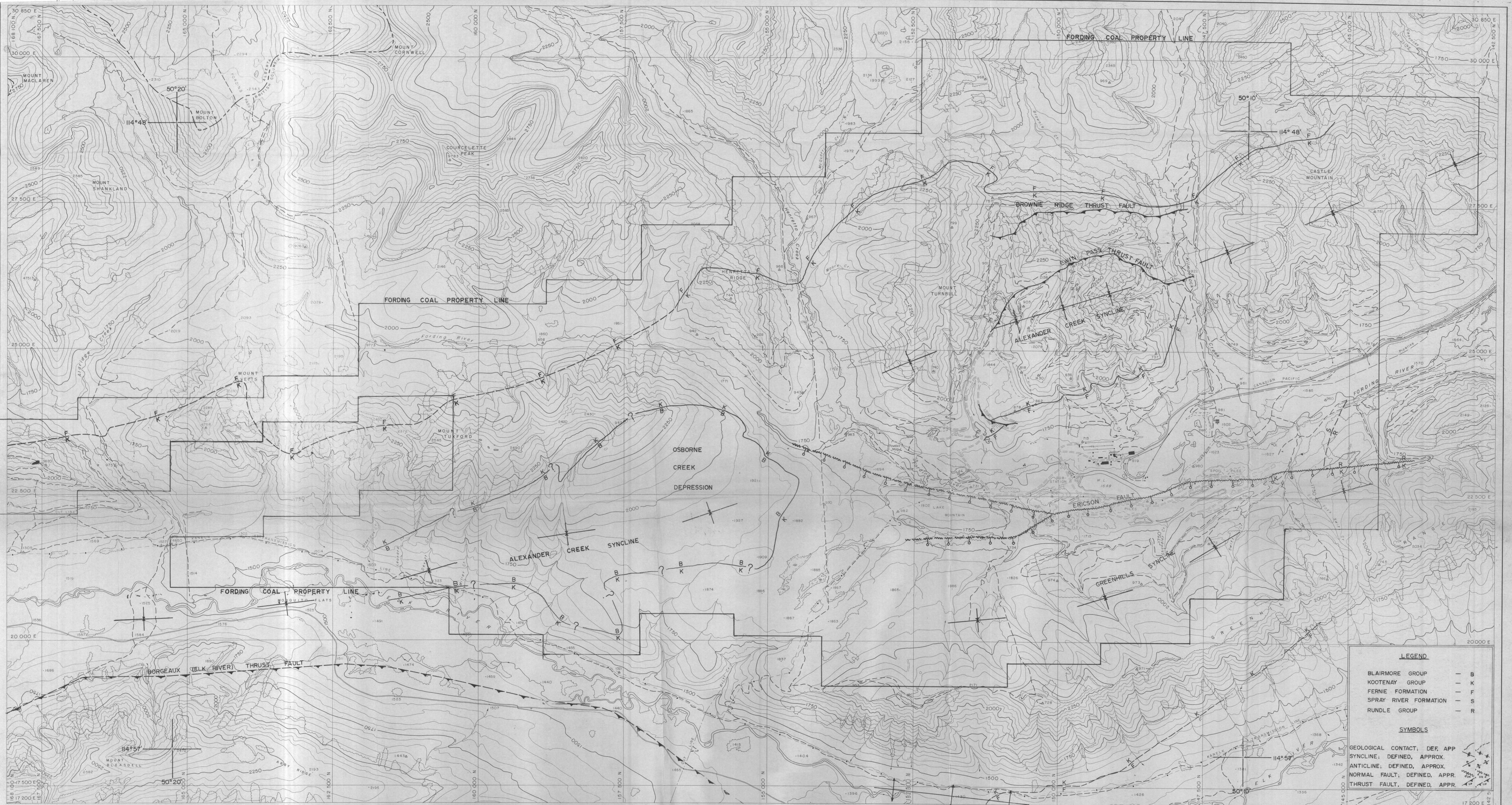
FORDING RIVER OPERATIONS ILLUSTRATION 1a

Drawn by	RK	Checked by	RK
RK	JULY 78		
J.S.	JUNE 83		
D.J.D.	MAY 88		

COAL PROPERTIES
FORDING COAL LIMITED

1 : 50,000 OCT. 31, 1972

500 0 500 1000 1500 2000 2500



LEGEND

BLAIRMORE GROUP — B
 KOOTENAY GROUP — K
 FERNIE FORMATION — F
 SPRAY RIVER FORMATION — S
 RUNDLE GROUP — R

SYMBOLS

GEOLOGICAL CONTACT, DEF, APP

SYNCLINE, DEFINED, APPROX.

ANTICLINE, DEFINED, APPROX.

NORMAL FAULT, DEFINED, APPR.

THRUST FAULT, DEFINED, APPR.



Job No. 06333-7 Date Plwn: August 1977
 McELHANNAY SURVEYING & ENGINEERING LTD.

Function:
 Activity:
 Section:
 Job:

Revisions	No.	Made by	Date	Description
	1	D.D.	JULY 88	PROPERTY BOUNDARY

Drawn by: J.S. JUNE
 Checked by:
 Design Eng:
 Proj. Eng: Approved

GEOLOGY MAP — ILLUSTRATION 1b

750

