PR-Falling Creek 80(1)A

GEOLOGY OF THE FALLING CREEK LICENSES

LICENSES 6370 TO 6428 IN THE PEACE RIVER LAND DISTRICT

PRIMARILY ON NTS 93 O/8, ALSO ON 93 O/9, 93 P/4, 93 P/5

CENTERED ON 55° 25' N 122° 00' W

EXTENDING FROM 55° 40' N 122° 24' W TO 55° 10' N 121° 37' W

23

LICENSES OWNED AND OPERATED BY ESSO RESOURCES LTD.

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WORK DONE FROM 20 MAY 1980 TO 4 JULY 1980

SUBMITTED

JULY 1981

ABSTRACT

The Falling Creek Coal licenses total about 15000 hectares of the Peace River Coalfield in northeast British Columbia.

The objectives of the 1980 field season were to map the geology, sample any coal found, make a preliminary evaluation of the economic potential of the licenses and recommend further action.

The stratigraphy is upper Jurassic Minnes Group to Cretaceous Albian Moosebar Formation. The lithology is sandstone to carbonaceous shale with some conglomerate in the Cadomin Formation. The facies are fluvial channel to overbank.

The structure is complex and dominated by closely spaced, angular, tight northwest trending folds. The property is also cut by thrust faults and many high angle faults.

Exposures of good metallurgical coal are found mainly around the headwaters of Hasler Creek in the Gething Formation. The seams range up to 3 m thick and are high volatile A bituminous with .5% sulphur. In this area there may be up to 30 million metric tonnes of speculative resources per license.

It is recommended to retain at least 2600 hectares and possibly up to 6500 hectares around the head waters at Hasler Creek. Extensive drilling will be required within this area.

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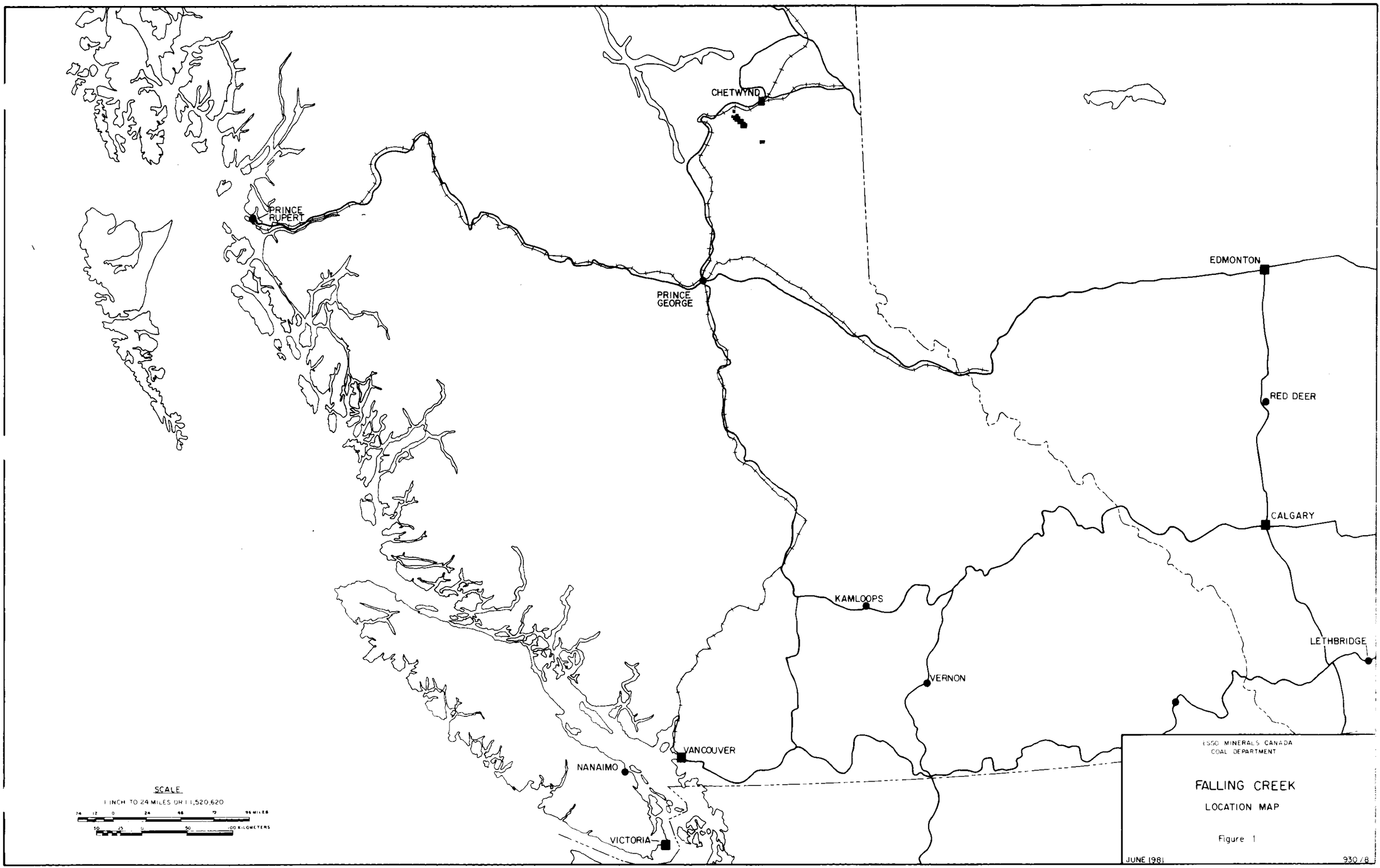


ESSO MINERALS CANADA
COAL DEPARTMENT

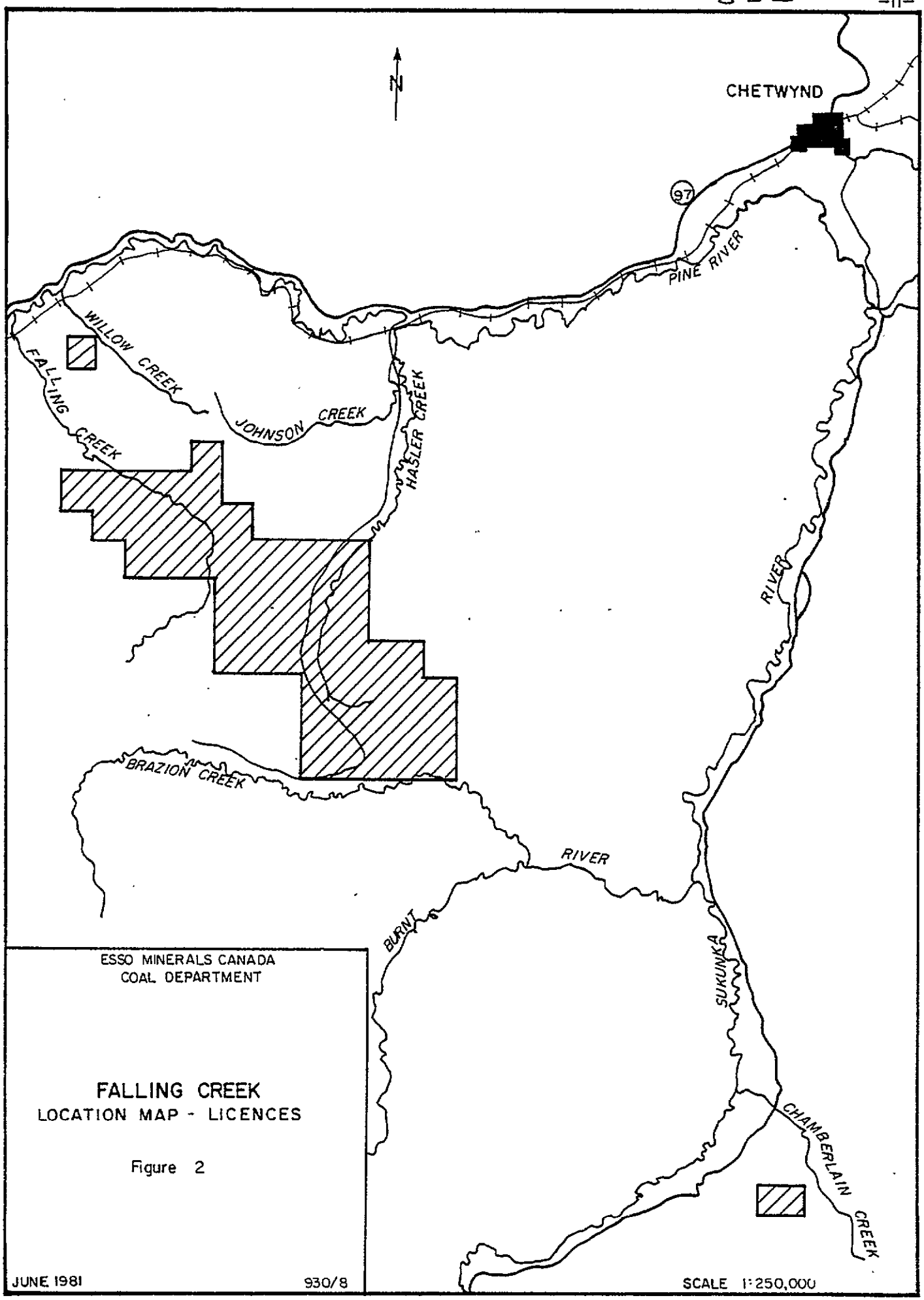
FALLING CREEK

LOCATION MAP

Figure 1

JUNE 1981

930/8


N
CHETWYND
97
PINE RIVER
WILLOW CREEK
FALLING CREEK
JOHNSON CREEK
HASLER CREEK
RIVER
BRAZION CREEK
RIVER
BURNT
SUKUNKA
CHAMBERLAIN CREEK
ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK
LOCATION MAP - LICENCES
Figure 2
JUNE 1981
930/8
SCALE 1:250,000

1. INTRODUCTION

1.1 OBJECTIVES

The objectives of the present study were to evaluate the economic potential of the Falling Creek property by means of detailed mapping, seam tracing, and examination of the coal quality. Areas of greatest potential and suitable drilling locations were to be outlined. Petrographic analyses were carried out on the coal samples to gain additional quality data from the outcrop samples.

1.2 LOCATION

The licenses are in the Peace River Land district, 20 km south of the Pine River and 40 km southwest of Chetwynd (Fig. 1 and 2). The property is in 4 groups of licenses. The main body, 55 out of the 59 licenses, is on the upper reaches of Falling Creek and Hasler Creek. It is mostly on NTS 93 0/8, but also 93 0/9 and 93 P/5. It is centered on 55° 25' N 122° 00' W, but extending from 55° 21'N 122° 00' W to 55° 32' N 122°15' W . There are 2 isolated licenses to the northwest of the main body. The northern-most is 6392 on Fisher Creek which flows into the north side of the Pine River. It is on NTS 93 0/9 at 55° 40' N 122° 24' W. The other license is 6393 on Willow Creek which flows into the south side of the Pine River. It is on NTS 930/9 at 55° 35' N 122° 15' W. There are also 2 licenses together to the southeast of the main body. They are 6400 and 6401 on a hill to the south west of Chamberlain Creek which flows into the south side of the Sukunka River. They are on NTS 93 P/4 at 55° 10' N 120° 39' W.

1.3 ACCESS

The closest population center is Chetwynd, a logging town of approximately 2000 people. It is on highway 97,also called the John Hart Highway. Dawson Creek is 100 km to the east and Prince George is 310 km to the west. B.C. Rail operates a line through the town. Both rail and highway are located along the Pine River. The closest rail approach to the property is at the mouth of Falling Creek from where it is 20 km to the main body of licenses, 250 km to Prince George and 1000 km to the port of Prince Rupert. Chetwynd has an airstrip but with no regular airline service. Three helicopter companies were based there during the field season.

The main body of licenses and the two isolated northern licenses are 40 km by air southwest of Chetwynd. The Chamberlain Creek licenses are 60 km by air south of Chetwynd. The northern most license on Fisher Creek, is 55 km west on highway 97 then approximately 3 km along the access road across

the Noman Creek property and finally 7 km along a powerline access road. These are 4 wheel drive roads and the powerline road may be impassible after a rain. The Willow Creek license is 50 km west on highway 97 where the Pine River may be crossed by a ford at low water on a hand operated cable car, owners of which graciously consented to its use. From there it is 3 km up an abandoned oil well-site access road along Willow Creek. The main body of licenses is 20 km west on highway 97 then 20 to 30 km south on the Hasler Creek logging road owned and maintained by Canfor Ltd. The Chamberlain Creek licenses are 3 km east on highway 97 then 65 km south along the Sukunka River road, a good all weather road. The licenses themselves are 3 km south of the road along a hand cut seismic line and 800 m above the valley bottom.

Access within the property is by the Hasler Creek logging road and several tributary roads to the west of it. ~~Also~~ All license groups were crossed by seismic lines usually running northeast. Most creeks were slow going by foot due to the steep sides and thick dead fall, except Brazion Creek and Falling Creek and the lower reaches of Hasler Creek where broad gravel bars made travel easy. Travel away from roads, cut lines or creeks in the recently burnt over area around Brazion Creek was very difficult and extremely hazardous when wet.

1.4 GEOGRAPHY

The licenses are in the Rocky Mountain Foothills physiographic region. The relief is from 1000 m to 1500 m. The valleys tend to be steep and narrow with broad rounded ridge tops. The countryside is heavily forested up to 1500 m except where logged over in a few places to the west of Hasler Creek and where recently burnt, mainly on either side of Brazion Creek. The area around the Brazion Creek and the upper reaches of Hasler Creek has been recently rejuvinated. This has produced steeper valley sides and good outcrop exposure on those creeks and their tributaries. Other areas of exposure are along the logging roads where it is fair to good and on the ridge tops above the tree line at 1500 m. Here it is fair and usually just off the property to the southwest (See Plates 1, 2 and 3).

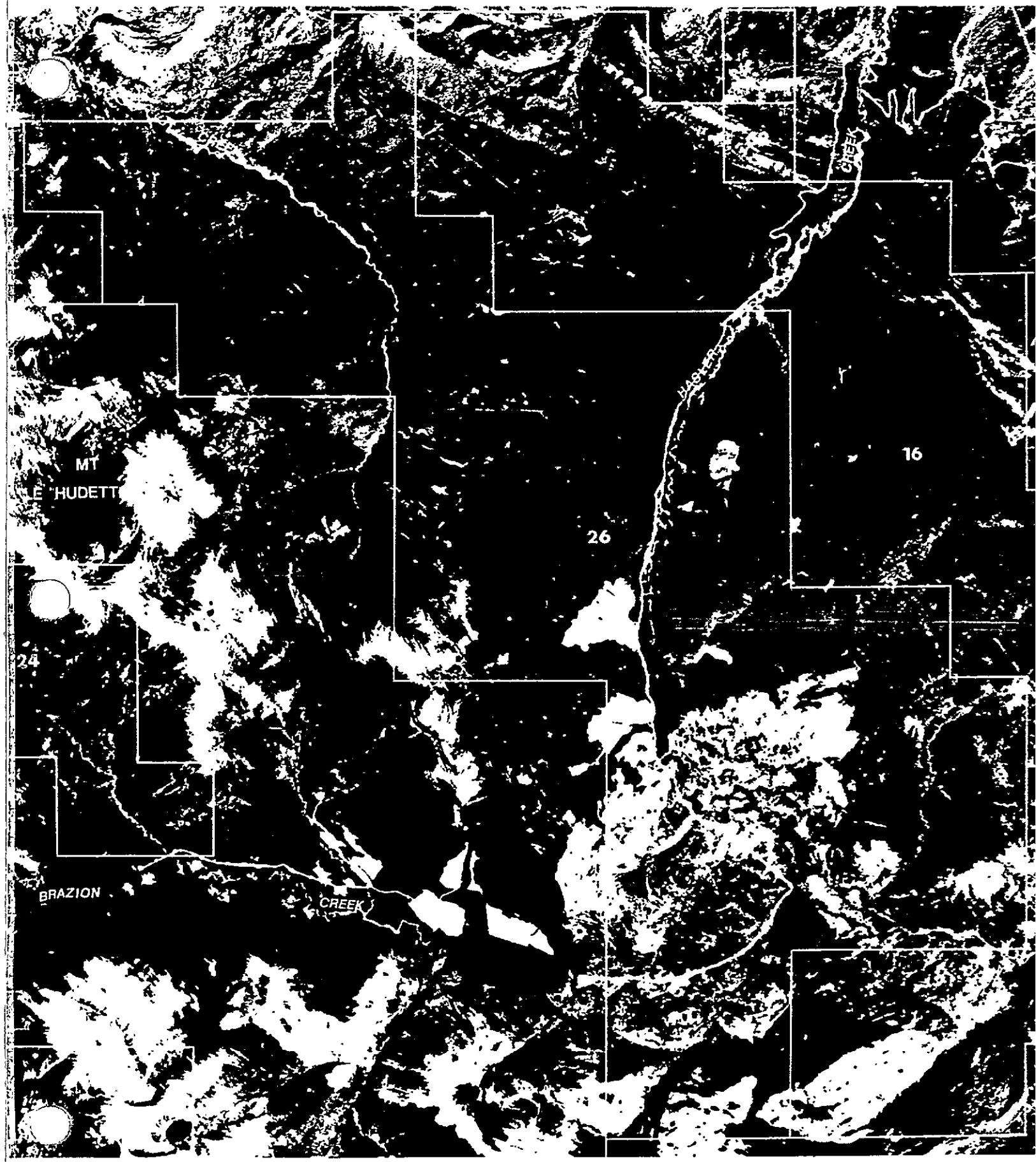


PLATE 1
AIR PHOTO MOSAIC

PLATE 2 a.
Aerial view over Hasler Creek looking northwest down Falling Creek.

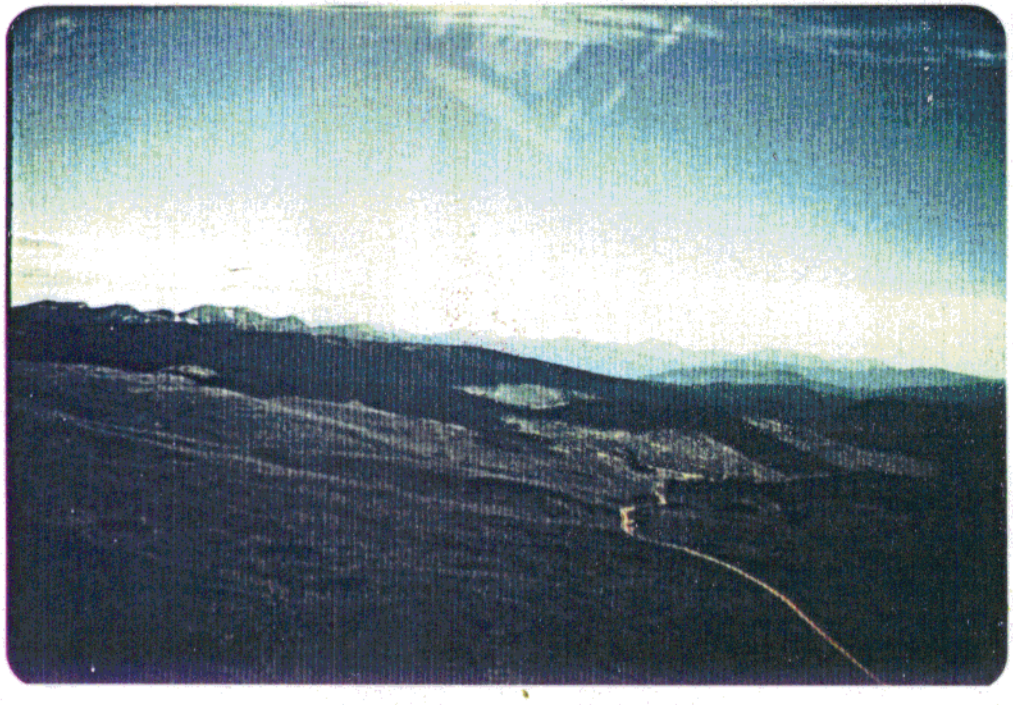


PLATE 2 b.
Aerial view from the head waters of Hasler Creek looking northwest down the Hasler Creek road.

PLATE 3 a.
Aerial view looking north up a tributary of Brazion Creek. The saddle at the head waters of Hasler Creek is in the upper left. Cadomin conglomerate forms the resistant beds at the top of the gorge.

PLATE 3 b.
Aerial view of the Sukunka Claims looking southwest. Chamberlain Creek runs across the middle ground.

1.5 PROPERTY DEFINITION

The property consists of licenses 6370 to 6428 inclusive, granted 24 May, 1980. Licenses 6392 (on Fisher Creek) and 6413 to 6416 (on Brazion Creek) were dropped 19 September 1980. See Table I for a description of the licenses and Figure 3 for their location.

1.5.1 EXPLORATION HISTORY OF THE PROPERTY

1.5.1.1 WORK COMPLETED BY PRIVATE COMPANIES

The only production from this area was from the Hasler Creek mine just north of the property on the east side of Hasler Creek. It produced a small tonnage of coal in 1944 and 1945 (Stott 1973).

The earliest assessment work in this area was a literature search and market study on Noman Creek, on the north side of the Pine River by the Pine Pass Coal Ltd. (Pringle 1969). Brameda Resources farmed in and performed extensive field geology, trenching and drilling in 1969 (Menzies 1970). Reconnaissance geology was done over Chamberlain Creek by Hopkins and Gluskoter (1969). An option on the Falling Creek area was acquired by Pan Ocean in 1972. Geological exploration and drilling was carried out in late 1972 and early 1973 (Dyson (1973). An extension was drilled in 1974 and 1975 (Dyson 1975 a). McIntyre Mines did some geological mapping and drilling on the Willow Creek area in 1975 (Dyson 1975 b). Crowsnest Resources did some field geology in 1979 on the Noman Creek area and the Falling Creek area (Shell 1979).

Shell Canada Resources Ltd. and Pan Ocean have licenses to the north of the property. Gulf Canada Resources Ltd. control all the licenses to the southwest where they were doing surface mapping and extensive drilling in 1980. Teck Corporation was drilling southeast of the property in 1980.

Esso Resources acquired the licenses listed above in the spring of 1980 and did the geological mapping in the summer of 1980. One hole was drilled in the fall of 1980. Esso Resources is the current owner and operator of the property.

TABLE I

Description of coal licenses granted to Esso Resources in the Falling Creek area of the Peace River Land District, B.C.

Coal licenses 6370 to 6428 granted may 24/80.
* Coal licenses 6392 and 6413 to 6416 dropped Sept. 19/80.

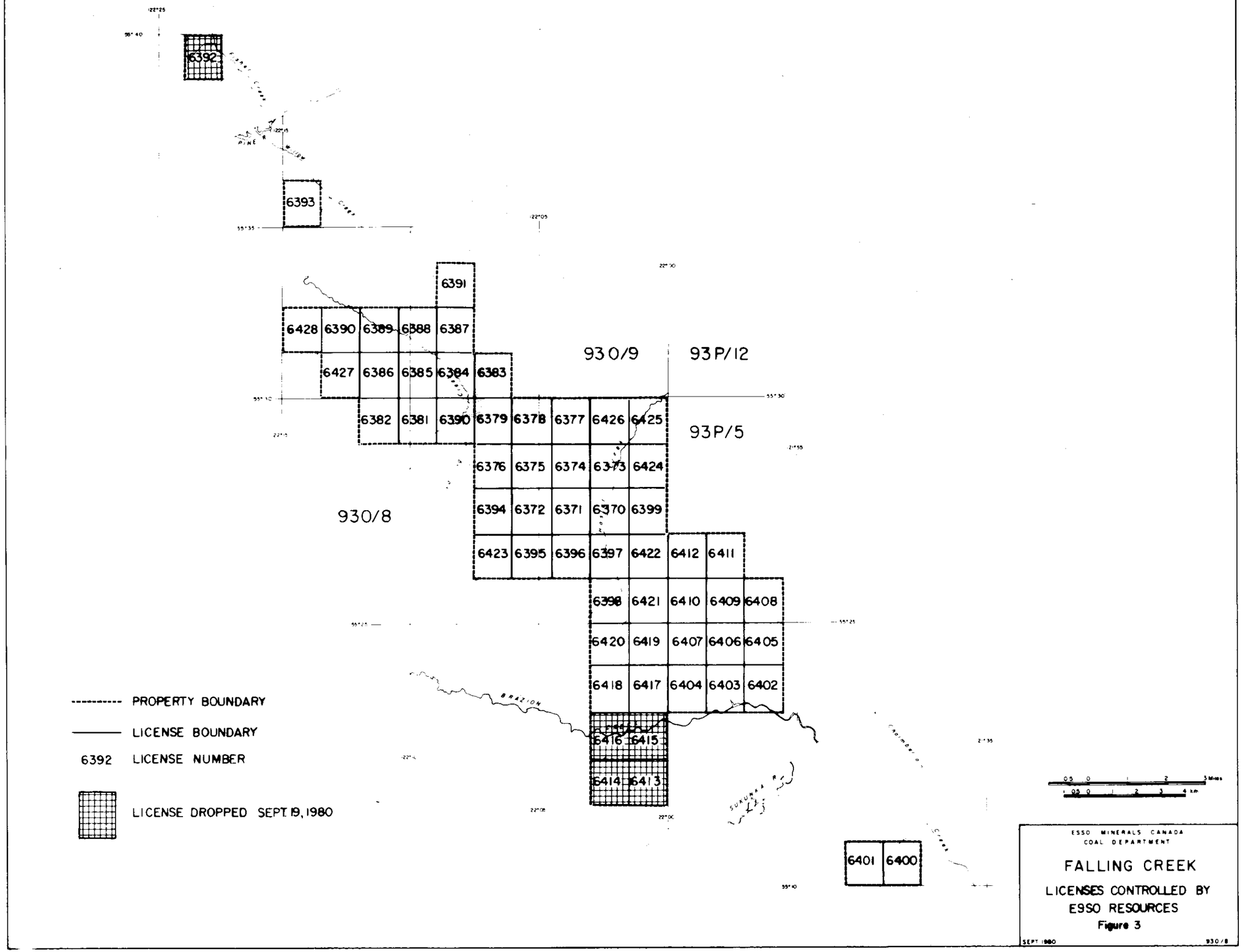
License Number	Description	Hectares
	MAP 93 O/8	
6370	Block I, Units 43, 44, 53, 54	294
6371	Units 45, 46, 55, 56	294
6372	Units 47, 48, 57, 58	294
6373	Units 63, 64, 73, 74	294
6374	Units 65, 66, 75, 76	294
6375	Units 67, 68, 77, 78	294
6376	Units 69, 70, 79, 80	294
6377	Units 85, 86, 95, 96	294
6378	Units 87, 88, 97, 98	294
6379	Units 89, 90, 99, 100	294
6380	Block J, Units 81, 82, 91, 92	294
6381	Units 83, 84, 93, 94	294
6382	Units 85, 86, 95, 96	294
6383	Block A, Units 8, 10, 19, 20	294
6384	MAP 93 O/9 Block B, Units 1, 2, 11, 12	294
6385	Units 3, 4, 13, 14	294
6386	Units 5, 6, 15, 16	294
6387	Units 21, 22, 31, 32	294
6388	Units 23, 24, 33, 34	294
6389	Units 25, 26, 35, 36	294

TABLE I (Continued)

License Number	Description	Hectares
	MAP 93 O/9	
6390	Block B, Units 27, 28, 37, 38	294
6391	Units 41, 42, 51, 52	294
6392	Block E, Units 81, 82, 91, 92	294
6393	Block G, Units 9, 10, 19, 20	294
	MAP 93 O/8	
6394	Block I, Units 49, 50, 59, 60	294
6395	Units 27, 28, 37, 38	294
6396	Units 25, 26, 35, 36	294
6397	Units 23, 24, 33, 34	294
6398	Units 3, 4, 13, 14	294
6399	Units 41, 42, 51, 52	294
6400	MAP 93 P/4 Block J, Units 1, 2, 11, 12	294
6401	Block J, Units 3, 4, 13, 14	294
6402	MAP 93 P/5 Block E, Units 65, 66, 75, 76	294
6403	Units 67, 68, 77, 78	294
6404	Units 69, 70, 79, 80	294
6405	Units 85, 86, 95, 96	294
6406	Units 87, 88, 97, 98	294
6407	Units 89, 90, 99, 100	294
6408	Block L, Units 5, 6, 15, 16	294
6409	Units 7, 8, 17, 18	294
6410	Units 9, 10, 19, 20	294
6411	Units 27, 28, 37, 38	294
6412	Units 29, 30, 39, 40	294

TABLE I (Continued)

License Number	Description	Hectares
6413	MAP 93 O/8 Block H, Units 21, 22, 31, 32	294
6414	Units 23, 24, 33, 34	294
6415	Units 41, 42, 51, 52	294
6416	Units 43, 44, 53, 54	294
6417	Units 61, 62, 71, 72	294
6418	Units 63, 64, 73, 74	294
6419	Units 81, 82, 91, 92	294
6420	Units 83, 84, 93, 94	294
6421	Block I, Units 1, 2, 11, 12	294
6422	Units 21, 22, 31, 32	294
6423	Units 29, 30, 39, 40	294
6424	Units 61, 62, 7, 72	294
6425	Units 81, 82, 91, 92	294
6426	Units 83, 84, 93, 94	294
6427	MAP 93 O/9 Block B, Units 7, 8, 17, 18	294
6428	Units 29, 30, 39, 40	293
TOTAL	Before the 5 licenses were dropped	17346
	After the 5 licenses were dropped	15873


6392
6393
6391
6428 6390 6389 6388 6387
6427 6386 6385 6384 6383
6382 6381 6390 6379 6378 6377 6426 6425
6376 6375 6374 6373 6424
6394 6372 6371 6370 6399
6423 6395 6396 6397 6422 6412 6411
6398 6421 6410 6409 6408
6420 6419 6407 6406 6405
6418 6417 6404 6403 6402
6416 6415
6414 6413
6401 6400
930/9
93P/12
93P/5
930/8
BRAZION
SUKUNKA R.
PROPERTY BOUNDARY
LICENSE BOUNDARY
6392 LICENSE NUMBER
LICENSE DROPPED SEPT 19, 1980
ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK
LICENSES CONTROLLED BY
ESSO RESOURCES
Figure 3
SEPT 1980
930/8

1.5.1.2 GOVERNMENT WORK

The governments, both the GSC and the B.C. Department of Energy Mines, and Petroleum Resources have been doing field reconnaissance geology since the beginning of the century. The best outline of this work is given by Stott (1973). Later work was done by Gilchrist in 1977 to 1979, which will be published in 1981 (Gilchrist 1979).

The most useful government map is the recent compilation by Taylor and Stott, (GSC open file 286.) The only differences with it, found by more detailed mapping, are; slight changes to the outcrop pattern of the Cadomin Formation around Brazion Creek, more intense folding and faulting around Hasler Creek, and the government map did not include very much topographic effect.

1.5.2 BRIEF ECONOMIC ASSESSMENT

Coal is present in both the Gething Formation and the Minnes Group. Only the uppermost portion of the Minnes Group was looked at and no seams of economic interest were found. In the Gething Formation 8 seams greater than 1 m and up to 2.7 m net thickness were found on the property. All but one have low to moderate inertinites and should have good coking qualities.

The structure is very complex and the outcrop spacing usually large in comparison. Therefore it is not possible to make accurate reserve/resource calculations. It is estimated that resources around Hasler Creek are of the order of 30 million tonnes per license.

1.6 SUMMARY OF WORK COMPLETED BY ESSO IN 1980

Topographic and field geological mapping were carried out on most claims and one borehole was drilled. No geochemical or geophysical surveys, line cutting, adit drivage, or mechanized trenching were performed. See Table 2 for licenses on which each type of work was performed.

1.6.1 TOPOGRAPHIC MAPPING

1980

Topographic maps at a scale of 1:10000 with 10 m formlines were prepared from airphotos by Hardy Associates 1978 Ltd. All licenses but 3 were covered; 1 on Willow Creek (6393), and 2 on Chamberlain Creek (6400, 6401). See Figures 4 (in the pocket).

1.6.2 GEOLOGICAL MAPPING

All licenses were covered by geological mapping, most outcrops were visited. Almost all likely creeks were traversed and all roads were traversed, most seams thicker than 1 m were hand trenched, described, and sampled. However some areas, particularly around Falling Creek in the northwest portion of the main body of licenses had very poor exposure. So these areas were not mapped as intensively as the rest of the property. The general traverse spacing was 2 km, but ranged down to 1/2 km around the headwaters of Hasler Creek, see Figure 5.

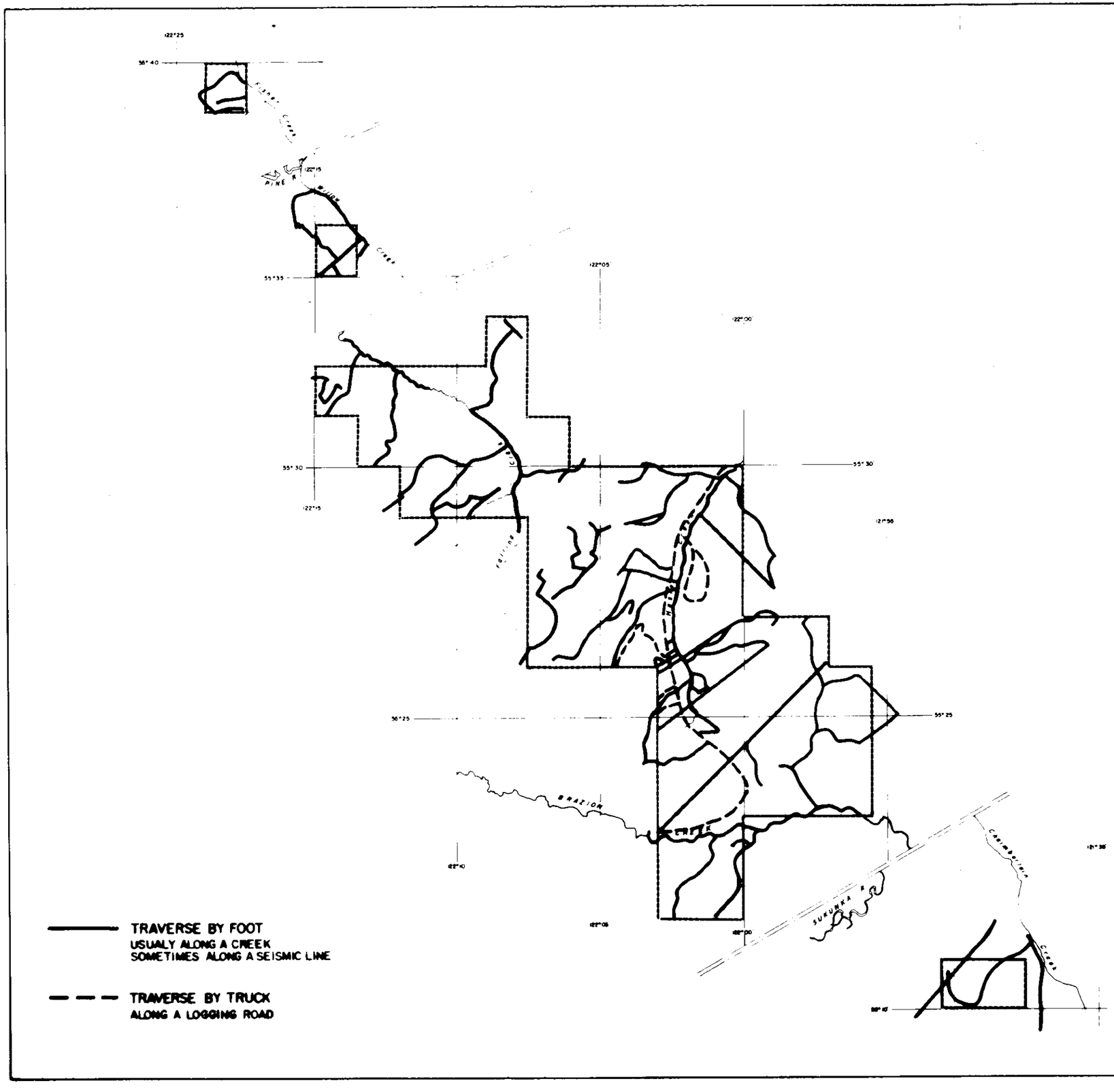
1.6.3 DRILLING

One hole, 80-1, was drilled on license 6396 at UTM coordinates E 559640, N 6144270 to a T.D. of 269 m. The regular suite of logs plus a dipmeter log were run. A detailed description of that program is contained in part (B) of this report.

TABLE 2

List of Work Completed.

License	Geological Mapping		Topographic Mapping	Drilling
	Detailed	Reconnaissance		
6370	x		x	
1	x		x	
2		x	x	
3	x		x	
4	x		x	
5	x		x	
6		x	x	
7	x		x	
8		x	x	
9		x	x	
80	x		x	
1	x		x	
2	x		x	
3		x	x	
4	x		x	
5	x		x	
6		x	x	
7	x		x	
8	x		x	
9	x		x	
90	x		x	
1	x		x	
2	x		x	
3	x		x	
4	x		x	
5	x		x	
6	x		x	x
7	x		x	
8	x		x	
9		x	x	
6400	x			
1	x			
2		x	x	
3	x		x	
4	x		x	
5	x		x	
6	x		x	
7	x		x	
8	x		x	
9	x		x	
10		x	x	



TRAVERSE BY FOOT
USUALY ALONG A CREEK
SOMETIMES ALONG A SEISMIC LINE

TRAVERSE BY TRUCK
ALONG A LOGGING ROAD

ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

METHOD AND EXTENT OF GEOLOGICAL TRAVERSES

Figure 5

SEPT 1980 980/6

TABLE 2 (Continued)

License	Geological Mapping		Topographic Mapping	Drilling
	Detailed	Reconnaissance		
6411 #1	x		x	
2	x		x	
3	x		x	
4	x		x	
5	x		x	
6	x		x	
7	x		x	
8		x	x	
9	x		x	
6420	x		x	
1	x		x	
2	x		x	
3	x		x	
4	x			
5	x			
6	x			
7	x		x	
8	x		x	

2. REGIONAL GEOLOGY

2.1 STRATIGRAPHY

The formations encountered in mapping were; Upper Minnes Group (late Jurassic to earliest Cretaceous), Cadomin Formation (Barremian), Gething Formation (Barremian to earliest Albian) and the Moosebar Formation (early Albian). See Figure 6.

The Minnes Group are continental sands to shales truncated by a low angle regional unconformity. The later formations are the result of a general transgression from the east and north. Lying on the unconformity is the Cadomin Formation, formed of continental sand and conglomerate with a probable source area to the west in the Omineca geanticline. Above is the Gething Formation, formed of continental sand to shale and coal. The uppermost formation encountered is the Moosebar marine shales.

2.2 STRUCTURE

The property is just inside the foothills disturbed zone. There is a regional strike to the northwest and a regional dip to the northeast, so that successively younger formations are exposed in that direction. However the structure is very disturbed, particularly in the Gething, by many tight folds and west dipping thrust faults.

3. PROPERTY GEOLOGY

3.1 INTRODUCTION

Most of the property is underlain by the Gething Formation. The Minnes Group and Cadomin Formation outcrop to the southwest and the Moosebar to the northeast. The structure is dominated by many closely spaced tight folds. There are several west dipping thrust faults with moderate displacement and many transverse faults with small displacements. See Figures 7 and 8 in the pocket.

In the main body of the licenses most outcrops are in the area around Hasler Creek and Brazion Creek because of Holocene rejuvenation (See Plate 3 a) and road building. Unfortunately, to the northwest the exposure is very poor because Falling Creek is aggrading and the Moosebar shales are very recessive. Structure exposed here shows the folding to be as intense as elsewhere. The Pan Ocean drill logs in this area also show moderate faulting with repeat and missing sections. Because the exposure is poor and the geology complex, interpretation was not attempted in the Falling Creek watershed.

3.2 STRATIGRAPHY

See Figure 9 for the distribution of formations. The divisions of Stott 1973 were found to be the most useful.

No good complete or partial sections were found so no thicknesses were measured. In the descriptions below "shale" is used as a grain size description not a textural or structural sense.

3.2.1 MINNES GROUP

The Minnes Group was not sub-divided because of poor exposure. However only the upper portion of the group, the Bickford and Monach Formations, was exposed since it is always geographically and stratigraphically close to the Cadomin Formation. The lower contact is not on the property. The group is exposed along Brazion Creek as it enters and leaves the property, the southern most portion of the main body of licenses, along Chamberlain Creek and on the ridge to the southwest of the Chamberlain Creek licenses the best exposures are along the lower reaches of the northern tributary of Brazion Creek on license 6403, Plate 3 a. The most easily accessible exposures are along the logging road as it leaves the property on license 6418.

The lithology is interbedded sandstone (occasionally silty) and siltstone to carbonaceous shale with minor coal up to 1 m thick. The interbedding usually forms fining-up cycles 1 to 2 m thick. The fresh sandstone colour varies from greyish brown (5 yr 3/2) to greyish orange (10 yr 7/4) and the weathered colour varies from pale brown (5 yr 5/2) to dark yellowish orange (10 yr 6/6). The sandstone is generally fine to medium grained but grades to siltstone. The clasts are predominantly quartz with some chert. The cement is usually silica with minor calcite. The bedding is medium to thick. The lower beds show ripples and crossbeds, the finer grained beds show laminae and roots.

The facies of this group is fluvial channel and overbank, probably formed by a meandering river.

3.2.2 CADOMIN FORMATION

The lower contact is reported as dis - to unconformable. It is only visible high on the canyon walls on the lower reaches of the northern tributary to Brazion Creek on license 6403, (Plate 3) where it is a disconformity. The formation is exposed along Brazion Creek, to the south of it and up the side of and along the top of the ridge to the south west of Hasler Creek. A small patch is exposed on Hasler Creek near its head waters. It is also exposed on top of the ridge to the southwest of Chamberlain Creek. The best exposures are along Brazion Creek and its northern tributary. The most easily accessible exposures are along the logging road on license 6417. No where is a complete thickness observed and the upper contact is gradational with the Gething Formation. However Cadomin outcrops on the southern tributaries to Brazion Creek suggest it may be 10 to 100 m thick.

The lithology is interbedded and intergraded sand and conglomerate with minor silt and shale. The conglomerate units are 1 to 3 m thick. The colour of the conglomerate when fresh is pale greyish brown (5 yr 4/2) which weathers to medium grey (N5). The conglomerate clasts are 2 to 8 cm. in size and predominantly chert usually medium to dark grey, occasionally light grey. There are also quartz and minor pale green volcanic clasts. They are well rounded and sub-spherical. The matrix is medium to coarse sand with a similar mineralogy to the clasts. The cement is silica. The sand is conglomeratic, very coarse to medium grained with a mineralogy similar to the clasts except there is more quartz. The cement is silica. The shale and silt is

similar to the Gething shale and silt except that carbonaceous shale is not as common. The bedding is very thick to thick. The conglomerate and sand is commonly cross-bedded and occasionally graded or channeled. The facies is distal alluvial fan and braided stream (predominantly channel).

3.2.3 GETHING FORMATION

The lower contact is gradational with the Cadomin Formation. It is put at the top of the uppermost well developed conglomerate. Hence it is at a varying stratigraphic level as in the two southernmost licenses 6414 and 6415. It is exposed over most of the main body of the property, all of the Fisher Creek and Willow Creek licenses (6392, 6393) and in a thin synclinally folded pocket on the hillside above Chamberlain Creek (6400, 6401). The best exposures are along the upper reaches of Hasler Creek. The most easily accessible exposures are all along the Hasler Creek logging road. Unfortunately no complete sections or correlatable partial sections are available so that it is not possible to estimate thickness. See Plates 4 and 5.

The lithology is interbedded sand, silt, and shale (usually carbonaceous) with coal seams up to 3 m thick. The beds are usually in fining-upwards cycles 1 to 10 m thick. The fresh colour of the sandstone is pale to dusky, brown to yellowish brown (5 to 10 YR 6/2 to 2/2). It weathers moderate brown (5 YR 4/4) to moderate yellowish brown (10 YR 5/4). The sandstone is medium to fine grained, occasionally crossbedded and rarely has rootlets. The silt and shale is usually laminated. The coal is almost always associated with the silts and shales.

The facies is fluvial channel and overbank, probably from a meandering river, with flood plain coal swamps. Toward the top of the formation, near the Moosebar marine shales, there may be some littoral facies with coastal coal swamps.

3.2.4 MOOSEBAR FORMATION

Neither the lower nor the upper contacts were observed in outcrop. However the geophysical logs from Pan Ocean's drilling program usually show 7 to 10 m of uniformly coarsening up shale to sand between the Gething and the Moosebar formations. This is probably the wedge-edge of the Bluesky Formation. The Moosebar is very poorly exposed. There is one outcrop on the

Plate 4 a
outcrop R005 on Willow Creek. Gething sands and silts with 2 coal seams. Karen Kettles for scale

Plate 4 b
Outcrop J173 on a tributary to the west of Hasler Creek. Sharp anticline of Gething sands and carbonaceous shales. Jim Lee for scale.

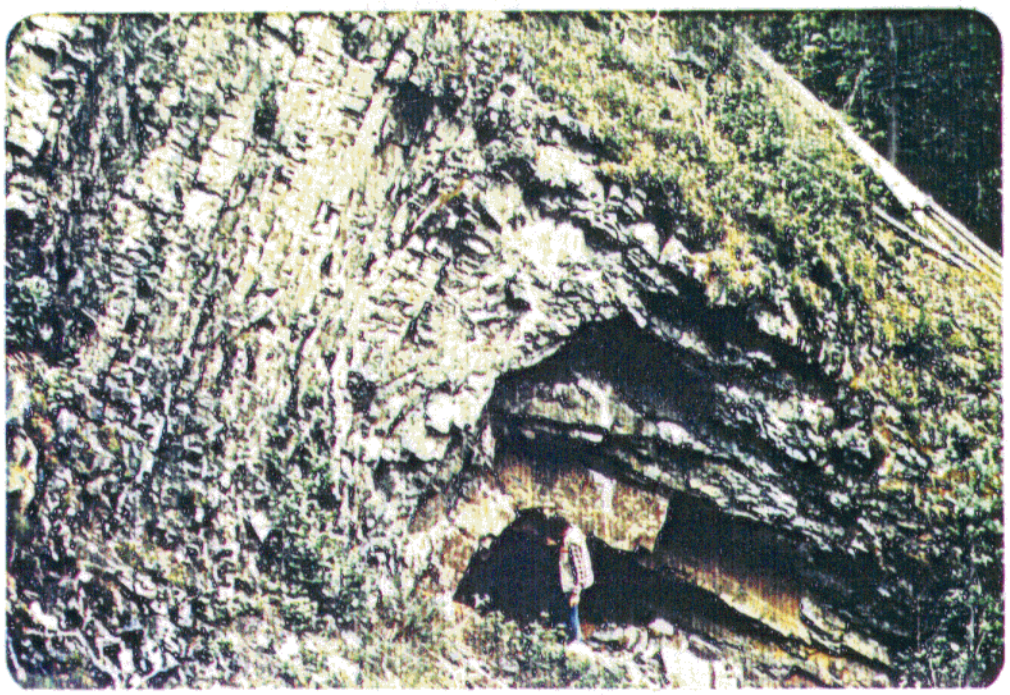


Plate 5 a
Outcrop W208 on a tributary to the east of Hasler Creek.
Faulted anticline of Gething sands.
Jim Lee for scale.

Plate 5 b
Outcrop R005 on
Willow Creek.
Contorted anticline of
Gething sands and silts
with podded coal.
Karen Kettles for scale.

northernmost tributary into the west of Hasler Creek and another possible one on the Hasler Creek logging road on license 6398.

The lithology is carbonaceous shale with occasionally thin beds of silty shale. The shale, when fresh, is dark grey (N 3) to greyish black (N 2) and weathers medium dark grey (N 4) to dark grey (N 3). The silty shale is the same colours as the fresh shale, but weathers dark yellowish brown (10 YR 4/2). The silty beds are sideritic and occasionally nodular. They form distinctive bands on a weathered surface. Both lithologies are finely laminated.

The facies is deep continental shelf clastic muds, possibly prodelta.

3.2.5 PLEISTOCENE DEPOSITS

There is a thick section of at least 3 tills with intercalated outwash sands and gravels on the northern tributary to Brazion Creek on license 6403. The section is at least 50 m thick and just above the mouth of the first tributary on the west. See the upper center of Plate 3 a. Elsewhere the drift cover is thin, probably a meter or so, except in drift filled valleys such as Falling Creek.

The saddle between Brazion Creek and Hasler Creek has several misfit streams in bedrock channels parallel to the contours. These are probably side-glacial channels. The lowermost in the center of the saddle is probably a melt water channel flowing north.

3.2.6 DISTINGUISHING FEATURES OF THE FORMATIONS

The Cadomin and Moosebar Formations can be distinguished lithologically. Occasionally the Gething has conglomerate beds, however they are finer grained, thinner, and have less aerial extent than the beds in the Cadomin Formation. The Gething Formation and Minnes Group have carbonaceous shales like the Moosebar, however they are thinner, less sideritic and siltier than the marine shales.

The Gething Formation and the Minnes Group can be distinguished stratigraphically with respect to the Cadomin Conglomerates and lithologically. The fining up cycles are 1 to 10 m thick in the Gething and 1 to 2 m thick in the Minnes. The fresh colour is more greyish or has less chrome (saturation), ie., the final digit of the Munsell colours is smaller in the Gething than in

the Minnes. Rootlets are less common in the Gething than in the Minnes. Coal seams up to 3 m thick are more common in the Gething than the Minnes where they are up to 1 m.

3.3 STRUCTURE

The structure is complex but well exposed only in the southeast portion of the main body of licenses. This is because of better outcrop exposure there and a large forest fire (on Plates 1 and 2 b) which has made the structure lines more visible on air photos.

The dominant structural elements are tight, angular, horizontally plunging northwest trending folds. There are also several west dipping northwest striking thrust faults and four sets of high angle faults. See figure 10.

3.3.1 FOLDING

The fold axes orientations are generally horizontal and northwest - southeast trending. Using the method of eigen-values (Charlesworth, Langenberg, and Ramsden, 1975), the orientation is 154° azimuth and 12° dip from the Fisher Creek license 6392, 314°/2° from the Willow Creek license 6393, 311°/2° from the main body of licenses, 136°/0.3° from the Chamberlain Creek licenses 6400, 6401 and 125°/5° from the mean of mesoscopic fold axes. The best fit orientation is 311°/0°, close to the value from the main body of claims. The axial plane orientations of outcrop scale folds are vertical to steeply dipping to the west shown on plates 4 b, 5 a and 5 b. This is probably the same for regular sized folds as well. The stereoplots are on Figures 10 to 15. The Fisher Creek value is a little different because there are not many readings and most are on one limb of a fold.

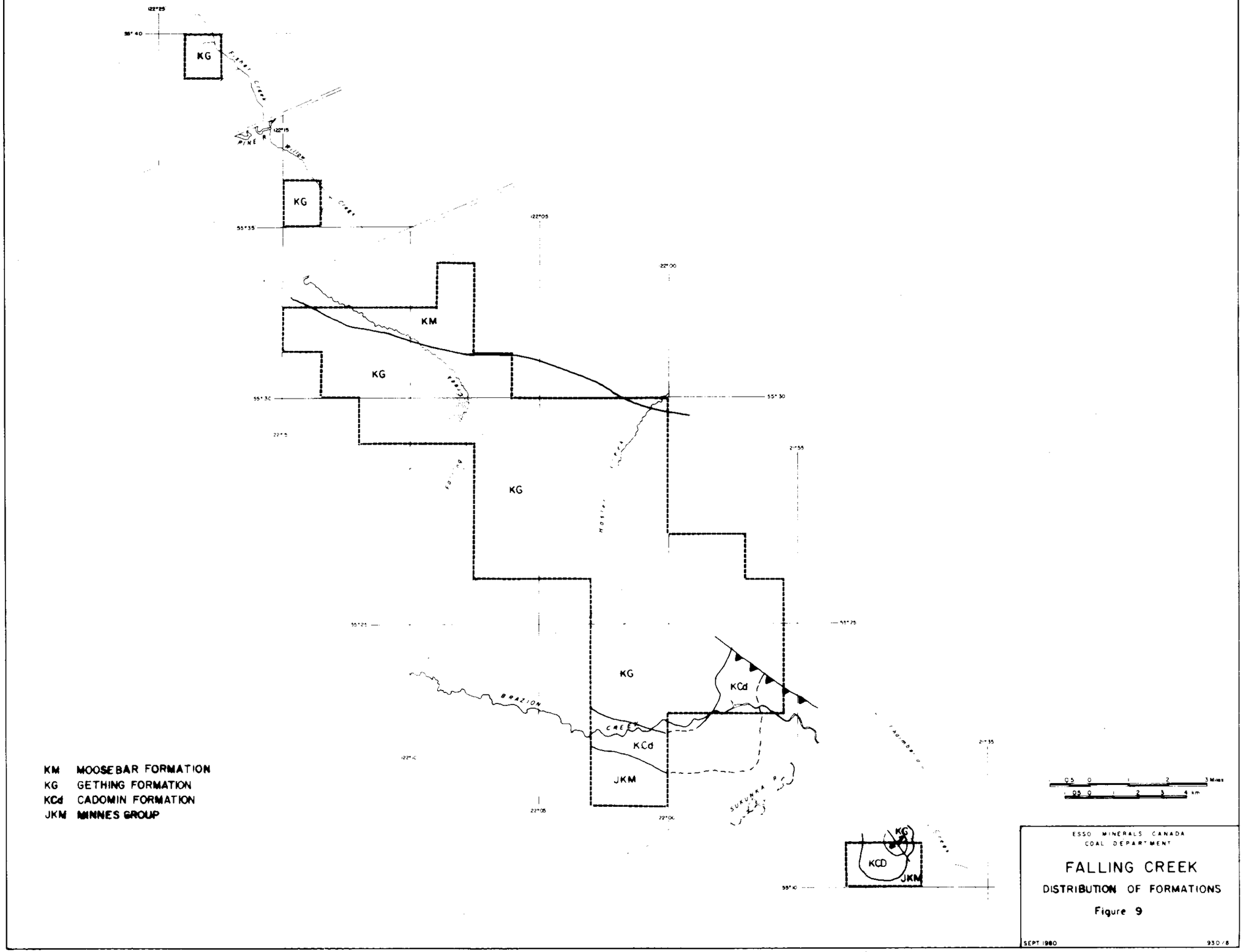
The fold axis orientation is $\pm$ 6° even though widely separated areas were used, Willow Creek to Chamberlain Creek and 2 different methods were used, the eigen-vector associated with the minimum eigen-value obtained from the poles to bedding and the mean mesoscopic fold axes orientation found with the largest eigen-value. The strong similarity in fold-axis orientation over the map area, although not strongly proven suggests cylindrical folding. The hinge-zones are small, and in the coarser lithologies are often faulted as on Plate 5 a or broken by many small faults into a mega-breccia.

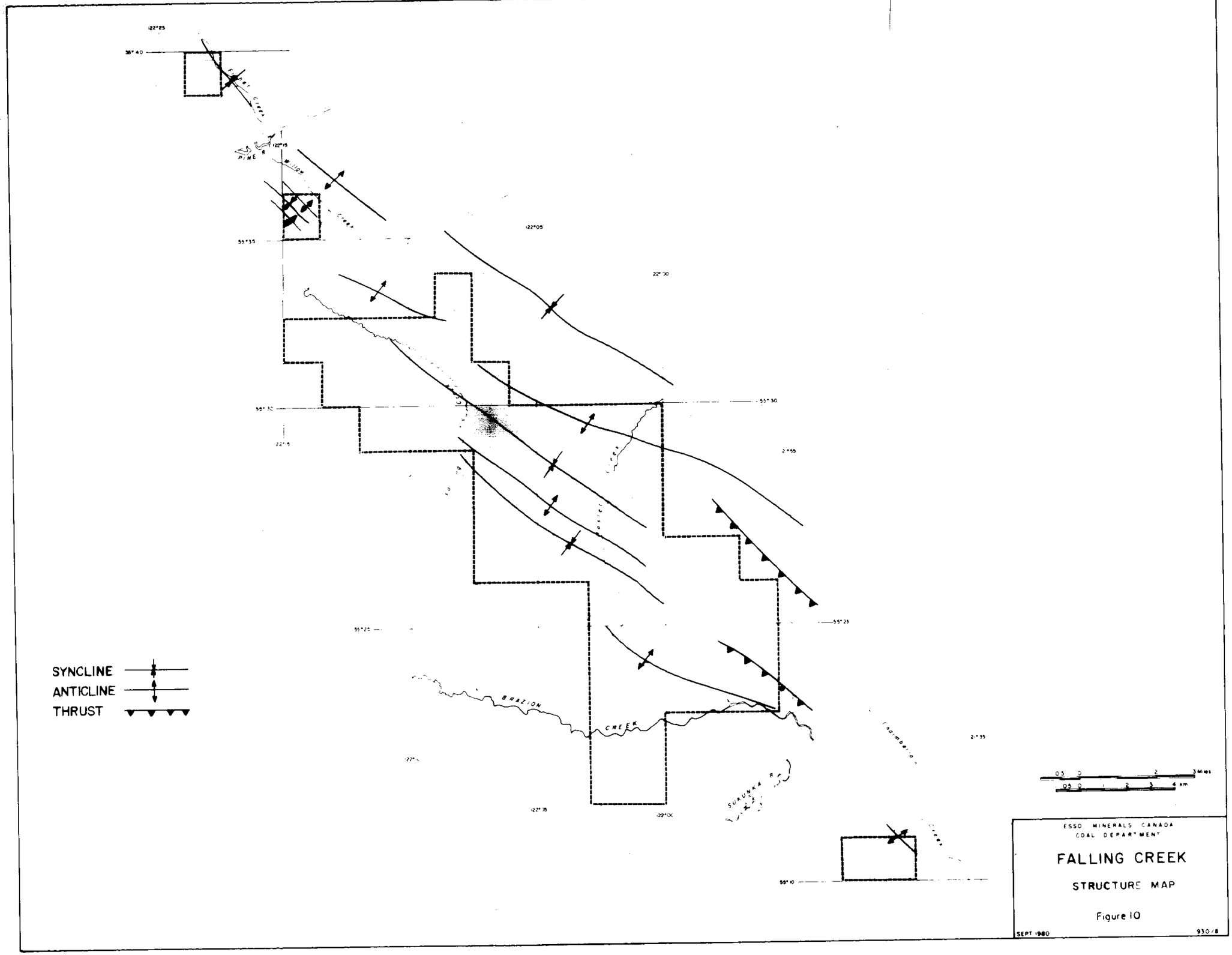
The average distance between folds (1/2 wave length) is 200 m but varies from outcrop scale (about 10 m) to 600 m. Along strike they are up to 6 km long but are seldom traceable over these distances. The extreme folding exposed along Hasler Creek may be due to dragging along a major tear fault along the poor linear of the Hasler Creek valley, however it is more likely due to the better exposure along that creek.

The Cadomin Formation is the most competent and the folding in it tends to be less severe. It is more open, with a broader hinge-zone and longer wave length.

There is one monocline, dipping southwest and striking northwest along the northern tributary to Brazion Creek on license 6403. It is on strike with an airphoto linear to the norhtwest, and may change to a fault in that direction.

Along and north of Brazion Creek on licenses 6403, 6404 and 6417 the Cadomin Formation is fairly flat lying so the structure is fairly simple. However this may be partly due to the lack of outcrop away from the creek.


KG
KG
KM
KG
KG
KG
KCd
KCd
JKM
KG
KCD
JKM
FALLING CREEK
PINE R.
BRAZION CREEK
SUKUNKA R.
122°25
122°15
122°05
22°00
55°40
55°35
55°30
55°25
55°10
21°55
22°10
22°05
KM MOOSE BAR FORMATION
KG GETHING FORMATION
KCd CADOMIN FORMATION
JKM MINNES GROUP
ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK
DISTRIBUTION OF FORMATIONS
Figure 9
SEPT 1980
930/8



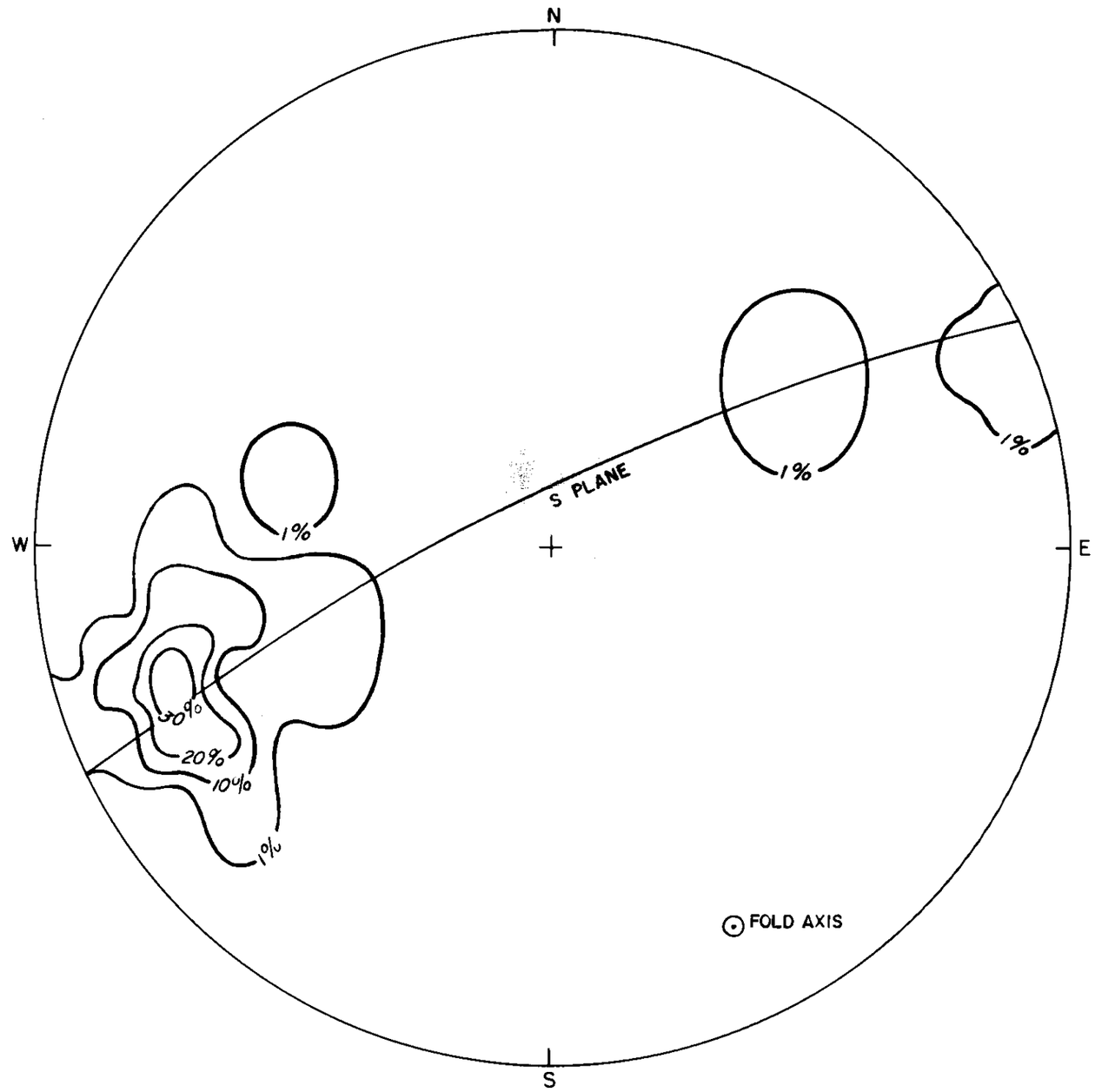
ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

STRUCTURE MAP

Figure 10

SEPT 1980 930/8



FOLD AXIS TREND 154
PLUNGE 12

14 BEDDING ATTITUDES

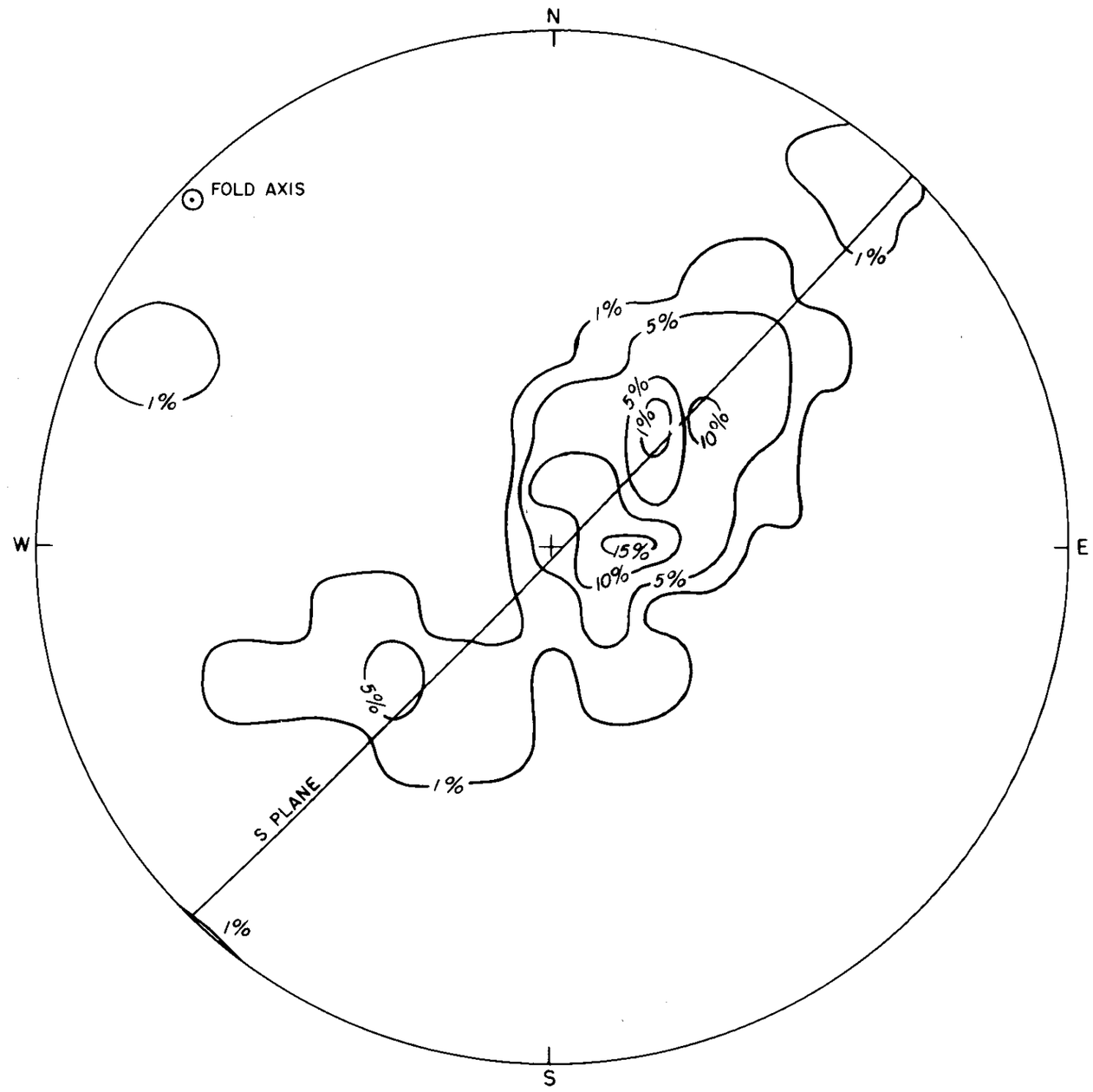
ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

STEREONET OF POLES TO BEDDING
AROUND FISHER CREEK

Figure 11

SEPT. 1980 930/8



FOLD AXIS TREND 314
PLUNGE 2

26 BEDDING ATTITUDES

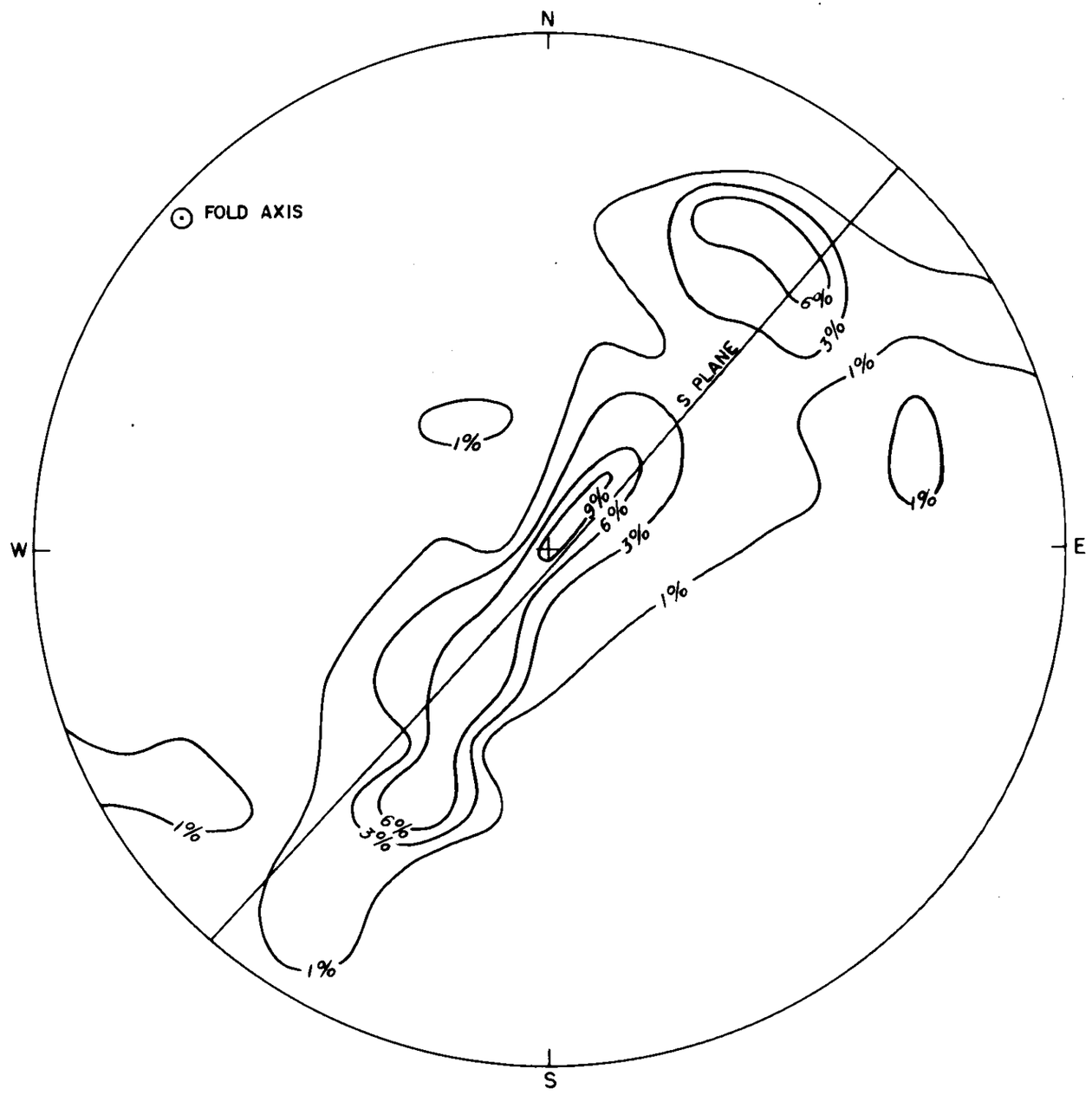
ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

STEREONET OF POLES TO BEDDING
AROUND WILLOW CREEK

Figure 12

SEPT. 1980 930/8



FOLD AXIS TREND 311
PLUNGE 2

42 BEDDING ATTITUDES

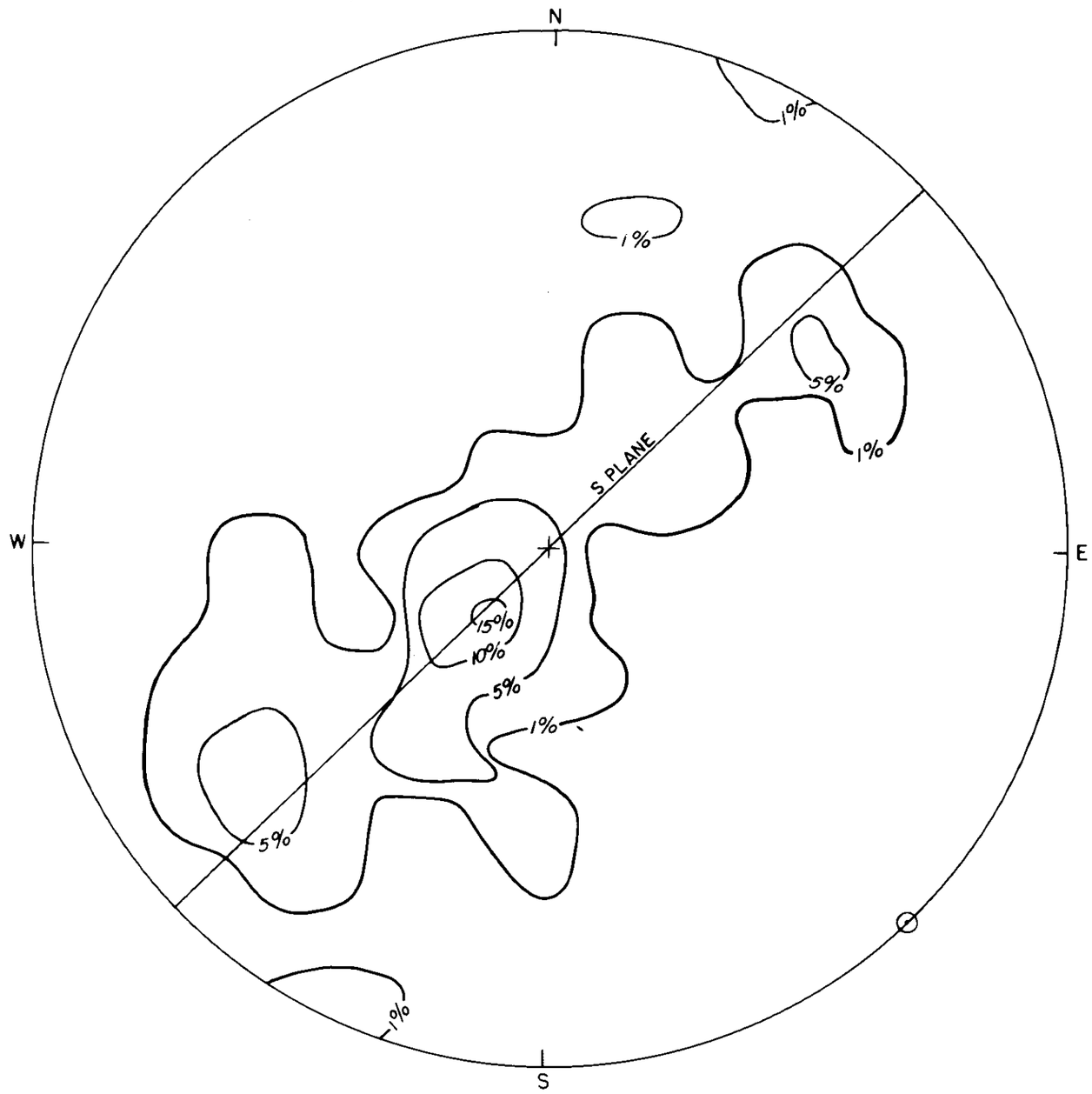
ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

STEREONET OF POLES TO BEDDING AROUND HASLER AND FALLING CREEKS

Figure 13

SEPT. 1980 950/8



FOLD AXIS TREND 136
PLUNGE 0.3

43 BEDDING ATTITUDES

ESSO MINERALS CANADA
COAL DEPARTMENT

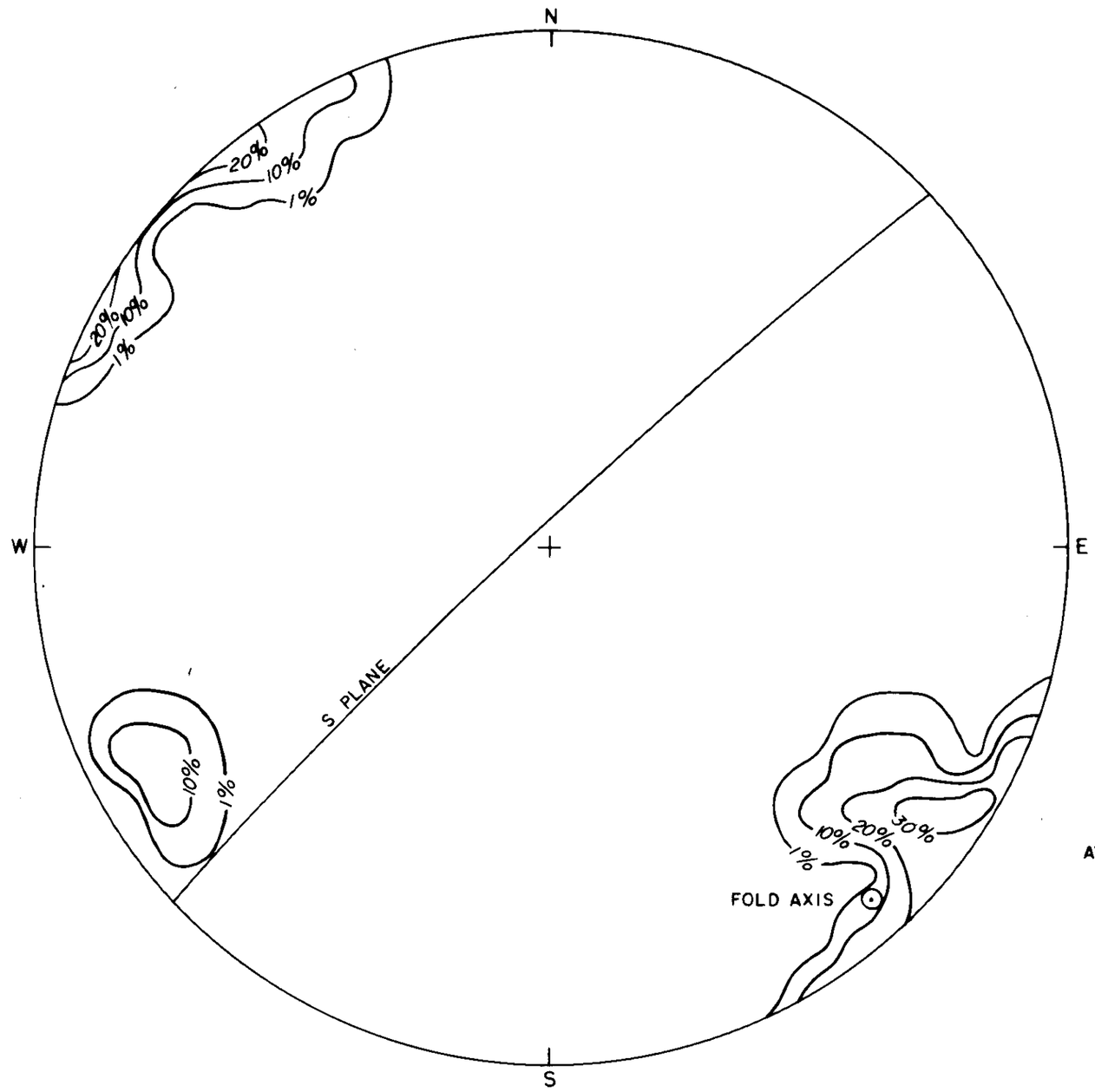
FALLING CREEK

STEREONET OF POLES TO BEDDING AROUND CHAMBERLAIN CREEK

Figure 14

SEPT. 1980

930/8



AVERAGE FOLD AXIS TREND 125
PLUNGE 5

9 MESOSCOPIC FOLD AXES

ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

STEREONET OF MESO-FOLD AXES
AROUND FALLING CREEK

Figure 15

SEPT. 1980 930/8

3.3.2 FAULTING

Faulting is the secondary structural element. It occurs in 2 styles; thrust faults and high angle faults.

3.3.2.1 THRUST FAULTS

There are at least 2 major thrust faults and 2 more doubtful ones. They strike northwest - southeast and dip southwest gently to steeply. They extend many kilometres. They are exposed as areas of intense and irregular folding and minor faulting and may sometimes be traced from the exposure as a poor airphoto linear. No splays or changes along strike to faulting were found. However one does steepen up along strike to have a vertical fault plane.

3.3.2.2 OTHER FAULTS

Other faults are almost always seen as airphoto linears which are particularly well exposed in the burnt-over areas (Plate 26) in the southeast of the main body of licenses. Occasional linears have highly calcareous surficial deposits associated with them. Such deposits are associated only with linears. The faults must have acted as conduits of carbonate charged ground water.

There are 4 sets of linears. The longest and commonest set strikes northeast, perpendicular to the regional strike. The other sets are to the northwest, north and east-northeast. The northwest set may be unidentified thrust faults, or less likely, bedding. It was possible to calculate dips from the topographic effect on a few linears. A north east fault dips 20° to 50° northwest. One northwest fault dips 55° southwest and another dips 30° northeast and an east-northeast fault dips 45°northwest. Movement, from linear offset, was up to 10's of meters. The sense on the northeast set is usually dextral. The age, from rare offsets and truncations is; thrust faults older than northeast faults older than northwest faults older than north faults. The northeast faults are older than the east-northeast faults. In the south of the main body of licenses on 6413 and 6414 is a normal fault striking northwest and dipping steeply to the northeast.

3.4 COAL

3.4.1 INTRODUCTION

Most accessible seams greater than 1 m thick were hand trenched, described in detail, then channel sampled (Plate 6). The emphasis was placed on those seams around the upper reaches of Hasler Creek because of better access higher economic interest (Figure 16). Birtley Coal and Minerals testing did proximate analysis, sulphur percent, and an occasional FSI., on the samples while Geo-optics Ltd. of Ponteland, Northumberland England did a maceral analysis and vitrinite reflectance.

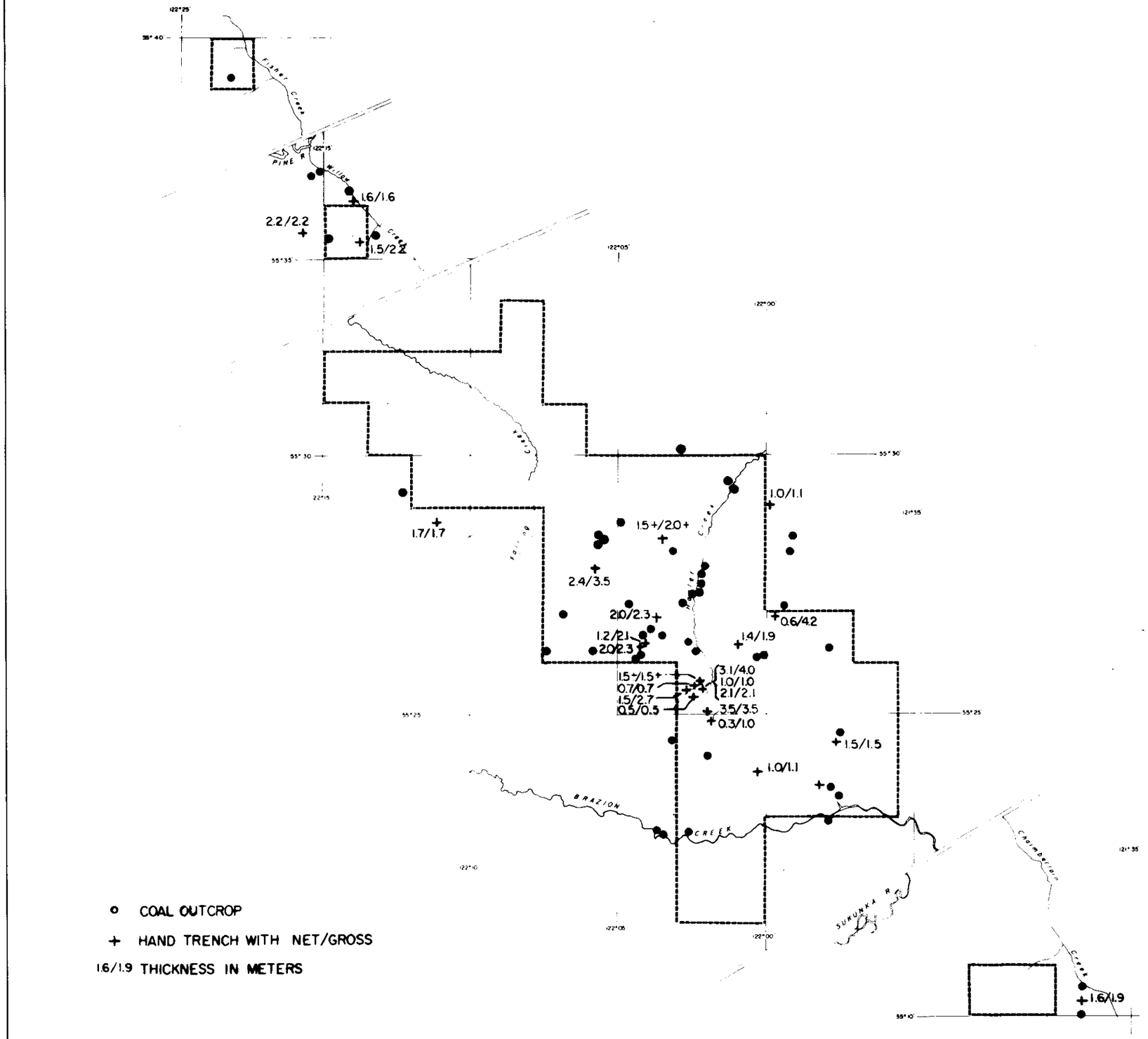
3.4.2 ANALYSES

3.4.2.1 FIELD DESCRIPTION

The field descriptions are on the detailed outcrop sections in the pocket and are summarized in Table 3. All seams are in the Gething Formation except W113 and W224 (Plate 7) which are in the Minnes Group generally the gross thickness ranges up to 3 m with an average of 20% of the seam as partings of shale and coaly shale. There is rare iron staining on the cleats. The roof rocks are either coaly shale, shale or siltstone from the top of a fining upwards cycle, or sandstone to silty sandstone of the base from the next cycle above. The floor is usually carbonaceous to coaly shale. In most outcrops the coal was very friable due primarily to the tectonic crushing of nearby folding. However when fold axial planes were distant and the coal undisturbed it was usually exceedingly tough.

3.4.2.1 PROXIMATE ANALYSES

The proximate analyses by Birtly coal and Minerals testing are given in Appendix 7-1. The average ash content, excluding partings is 19% $\pm$ 11%. The average volatile matter is 23% $\pm$ 6% the average fixed carbon is 54% $\pm$ 13%. The average sulphur content is .52% $\pm$ .15% calculated on a dry basis. All $\pm$ figures given in this report are $\pm$ 1 standard deviation. Most samples were too weathered to agglomerate, however a few samples had an FSI of 0. The rank was calculated according to the ASTM method. Most seams had a rank of high volatile A bituminous. However 40% of them have a rank ranging up to low volatile



ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

DISTRIBUTION OF COAL OUTCROPS

Figure 16

SEPT 1980 930/8

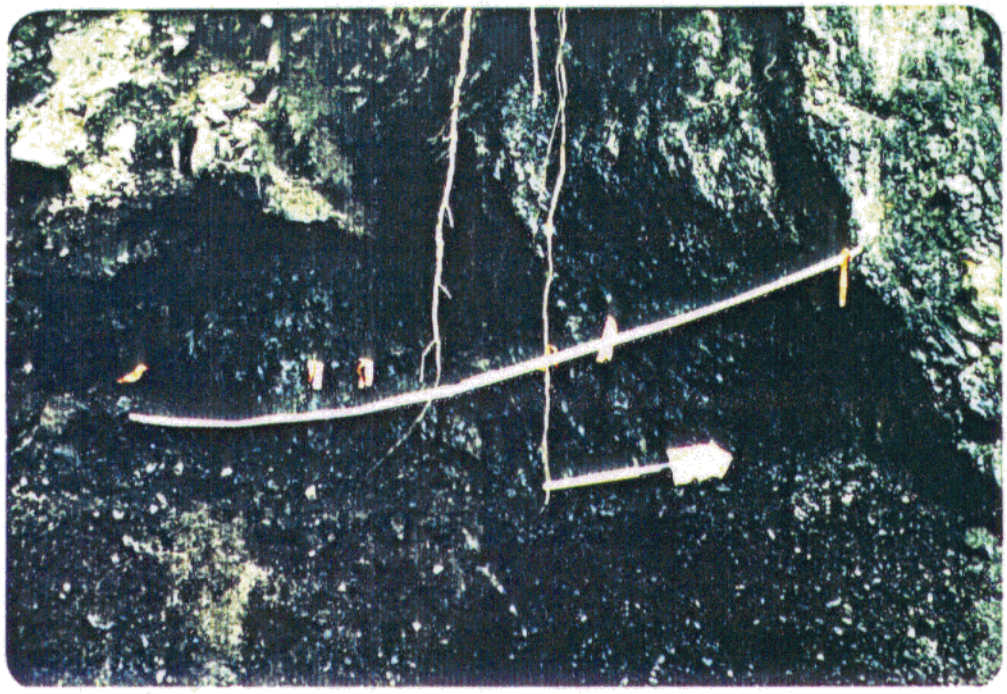


Table 6 a

Coal Seam R054, 2.5 m thick, on a logging road to the west of Hasler Creek. The tape marks the width of the seam, trench showed for scale

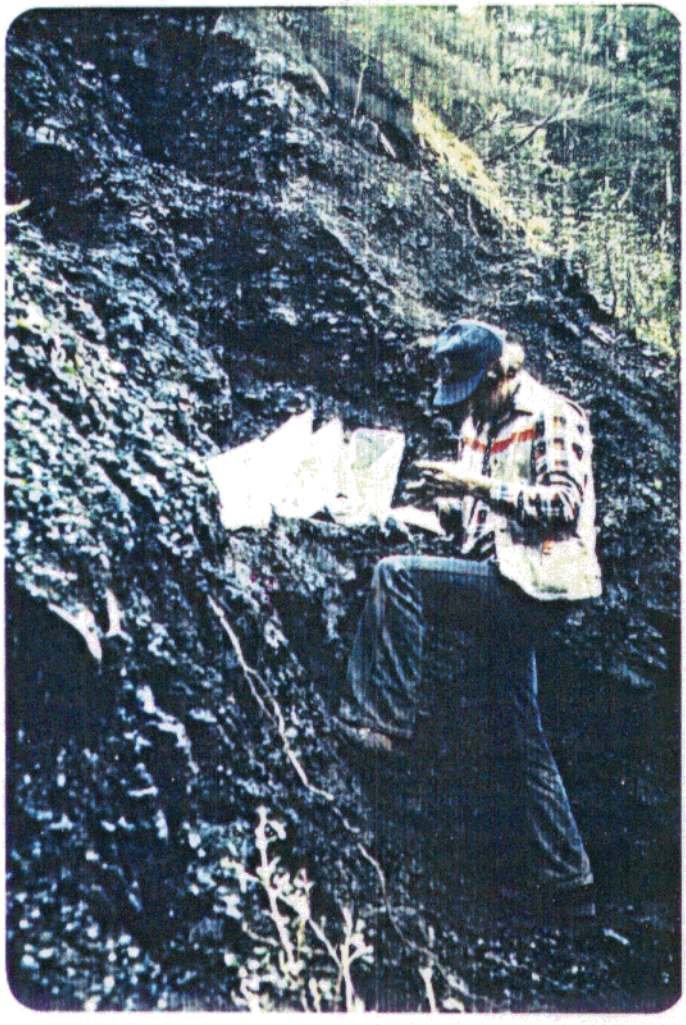


Plate 6 b

Coal seam J128 on a tributory to the west of Hasler Creek Jim Lee for scale

TABLE 3

Summary of Coal Seam Descriptions

Seam	Location UTM East	Location UTM North	(M) Elevation	Strat. Position	Thickness (metres) Gross	Thickness (metres) Net	Partings	Mineralization	Roof	Floor	Comments
J20	546630	6161330	840	Gething FM	2.2	2.2	-	-	silty sandstone	silt stone	
J128	557330	6146590	1195	Gething FM	3.49	2.39	Carb-shale & sandstone	Iron stain	Carb-Shale	Carb-shale	See Plate 6 b
R003	563130	6160790	1053	Gething FM	2.25	1.52	Shale	-	Silty Sandstone	Shale	
R040	563130	6139750	1140	Gething FM	1.13	.97	Sandy shale	-	Sitly Sandstone	Shale	
R046	561015	6141615	1170	Gething FM	1.05	.25	Shale	-	Sandstone	Shale	
R047	560950	6141720	1167	Gething FM	.35	.35	-	-	-	Coaly shale	
R048	556600	6142145	1180	Gething FM	.50	.50	-	-	Shale	Shale	
R049-A	560560	6142375	1150	Gething FM	1.50+	1.50+	-	-	Shale	-	

TABLE 3

Summary of Coal Seam Descriptions

Seam	Location UIM East	North	(M) Elevation	Strat. Position	Thickness (metres) Gross	Net	Partings	Mineralization	Roof	Floor	Comments
R049-13	560650	6142375	1150	Gething FM	.70	.70	-	-	Sandstone	Car- shale	
R051	560465	6142375	1163	Gething FM	2.20	1.45	Mudstone & Shale	-	Sandstone	Carb-shale	
R054A	558970	6143790	1150	Gething FM	2.50	2.08	Mudstone	Yellow stain Sulfur)	Siltstone	Sandstone	See Plate 6 a
R054B	558970	6143740	1150	Gething FM	2.10	1.22	Coaly shale	-	Siltstone	Carb-Siltstone	
R058A	556428	6142205	1130	Gething FM	4.00	3.12	Mudstone	-	Mudstone	Mudstone	
R058B	556428	6142205	1130	Gething FM	1.00	1.00	-	Ironstain	Mudstone	Siltstone	
R058C	556428	6142205	1130	Gething FM	2.10	2.10	-	-	Siltstone	Siltstone	
R071	551610	6148050	1320	Gething FM	1.75	1.75	-	-	Silty Sandstone	Coaly shale	

TABLE 3

Summary of Coal Seam Descriptions

Seam	Location UTM East	Location UTM North	(M) Elevation	Strat. Position	Thickness (metres) Gross	Thickness (metres) Net	Partings	Mineralization	Roof	Floor	Comments
R087	548370	6161850	750	Gething FM	1.60	1.60	-	-	carb-shale	Shale	
R088	559550	6147470	1263	Gething FM	2.0+	1.55+	Coaly Shale	Iron Stain	Siltstone	-	Floor not exposed
W023	559490	6144780	1081	Gething FM	2.3	1.98	Shale	Sulfur?	Shale	Silty shale	
L0090	566200	6140275	1083	Gething FM	1.5	1.5	-	red, rust & peacock stain	carb-shale	carb-shale Coaly shale	
W113	564940	6139260	1004	Minnes GP	2.4	.5	Shale	Ironstain	Coaly Shale	Shale	See Plate 7 a
W123	563220	6148710	906	Gething FM	1.10	.95	-	-	Shale	Shale	
W167	562050	6144240	1143	Gething FM	1.90	1.40	Coal Shale & Clay	-	Siltstone	Shale	
W210	563330	6145030	1187	Gething FM	4.20	.65	Shale	-	-	Shale	

TABLE 3

Summary of Coal Seam Descriptions

Seam	Location UTM East	Location UTM North	(M) Elevation	Strat. Position	Thickness (metres) Gross	Thickness (metres) Net	Partings	Mineralization	Roof	Floor	Comments
W224	514570	6188190	1182	Gething	1.90	1.60	Coaly shale	-	Silty Shale	Silty shale	See Plate W224

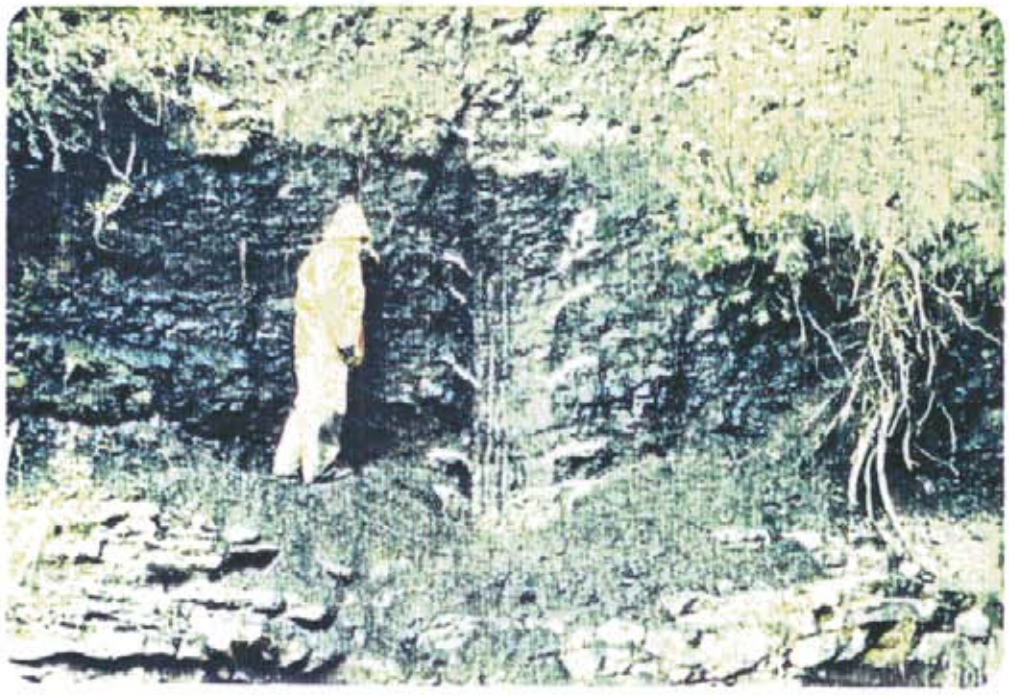


Table 7 a

Coal Seam W113 on a tributary to the north of Brazion Creek, Karen Kettles for scale

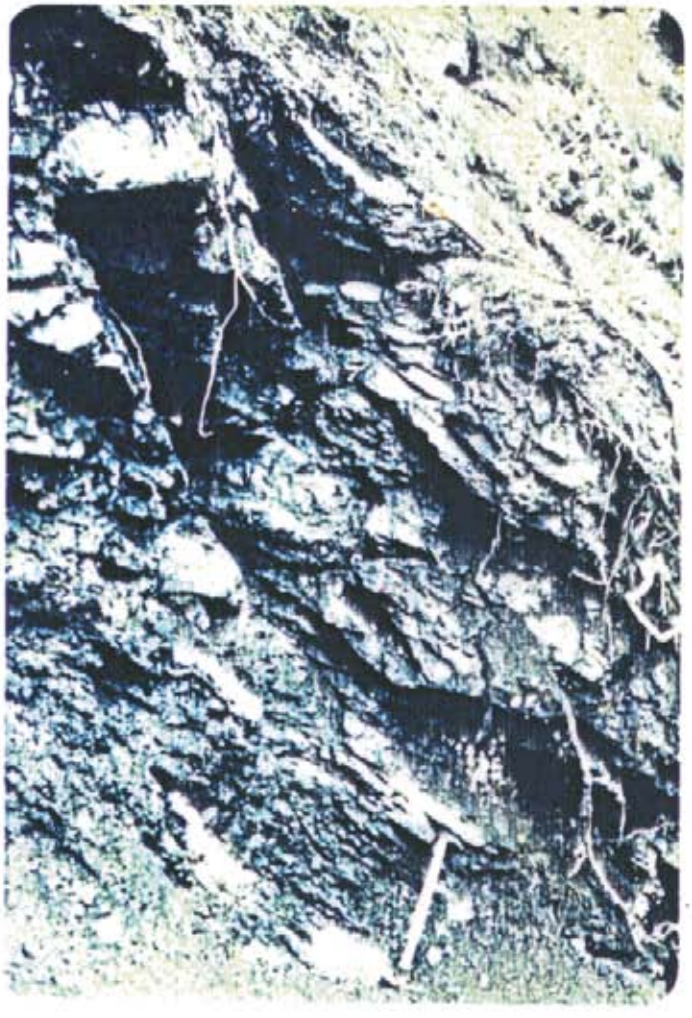


Plate 7 b

Coal seam W224 on Chamberlain Creek, Sukunka claims. Top and bottom of the seam are marked by a hammer and trench shovel. The seam dips to the right parallel with the hammer handle. Note the conjugate shears dipping gently and steeply to the right

bituminous. Most of the high volatile A seams cluster around the central portion of the main body of licenses, 6396 to 6398, while the medium and low volatile seams tend to be within 100 m of a fold axial plane. The anomalously high rank of semi-anthracite for W123 may be due to a forest fire, though it is on the hinge of a fold.

3.4.2.3 MACERAL ANALYSIS

Geo-optics did the maceral analysis which are listed in Table 4 all samples are representative of the seam. Seams with a sample number had a continuous top to bottom channel sample taken. Those with no sample number had only one sample taken from the whole seam.

The macerals have an average of 30% $\pm$ 23% mineral matter because of partings included in the sample and possible clay washed into the weathered coal. When the macerals are recalculated on a mineral matter free basis (numbers in brackets) they fall into 3 groups, a low inertenite group, 0% to 14%, a medium inertinite group, 18% to 31% and a high inertinite group 46% to 61%. The groups also have other distinctions listed in Table 5. With increasing inertinites; the vitrinite becomes less oxidized, the ash decreases, the fixed carbon increases, the rank increases, the enclosing lithology becomes finer and more carbonaceous and the average number of partings per seam decreases. The low inertinite group tends to cluster around the central portion of licenses, 6396 to 6397. The medium inertinite group also clusters here but spreads out to the northwest as well. The high inertinite group tends to be east of Hasler Creek or 122° west. There is no stratigraphic control on the groups. However there is probably a paleo-geographic control, with the higher inertinite coals deposited further from the river channel producing less ash, fine grained roof and floor and fewer partings.

Because of the small sample numbers and large variances, these tendencies have a low significance and may be random.

3.4.2.4 VITRINITE REFLECTANCE

Geo-optics also produced the vitrinite reflectance analysis listed in Table 6 which lists both maximum and average reflectance. However when the reflectance is as low as this the average is a reasonable estimate of the maximum reflectance. Seam J020 and W023 were analysed by both methods and the average reflectance is .03 and .04 below the maximum reflectance. R071 was also analysed by both methods, but the average is .12 above the mean.

The reflectances fall into 3 groups; an intensly oxidized group with a lower reflectance of 1.20 + .15, a slightly to mildly oxidized group with a higher reflectance of 1.50 + .19. The third group has a reflectance of 1.98 + .05, but it is determined from a few grains in samples that are otherwise from the middle group. The grains are probably a minor and/or unusual component of the coal.

A maximum reflectance of 1.50 is used below for predicting the coal properties because it is on the reflectance for mildly oxidized coals and is close to the maximum reflectance for all coals.

Volatile matter can be estimated from 3 graphs. The first, from Zimmerman (1979) Figure 17, gives 21% volatiles. The second from Haquebard (1974) Figure 1, gives 20% volatiles. The third, from Pearson (1980) Figure 6, gives 19% volatiles.

The FSI can be estimated from Pearson (1980) Figure 7. The low inertinite group should have an FSI of 9 +. The medium inertinite group should have an FSI of 8 to 9. The high inertinite group should have an FSI of less than 4. From figure 10 of the same paper the medium inertinite coals are just inside coal quality group G1 and the low inertinite coals are just outside group G2 but on the "optimum inert line". The coking properties for these groups from Table 3 of Pearson (1980) are listed in Table 7.

TABLE 4
MACERAL ANALYSIS
Percentage by Volume

Outcrop	Sample	Vitrinite					Inertinite		Mineral Matter	Maceral Group
		Unoxidized		Oxidized		Strongly Heat Affected				
N	No.									
J020	4	27	(29)	42	(45)	-	24	(26)	7	M
J128	3	17	(59)	5	(17)	-	7	(24)	71	M
R003	8	13	(22)	30	(52)	-	15	(26)	42	M
R040	7	18	(24)	49	(65)	-	8	(11)	25	L
R046	1+2	27	(30)	44	(49)	-	18	(20)	11	M
R047		14	(17)	52	(63)	-	16	(20)	18	M
R048		17	(23)	58	(77)	-	-	-	25	L
R049		10	(12)	66	(80)	-	6	(7)	18	L
R049A		19	(23)	39	(47)	-	25	(30)	17	M
R051	5	21	(35)	24	(40)	-	15	(25)	40	M
R054A	6	1	(2)	45	(87)	-	6	(12)	48	L
R054B	10	6	(11)	47	(82)	-	4	(7)	43	L
R058A	10	9	(13)	51	(73)	-	10	(14)	30	L
R058B		15	(18)	58	(68)	-	12	(14)	15	L
R058C		9	(11)	49	(58)	-	26	(31)	16	M
R071		30	(34)	5	(7)	-	54	(61)	11	H
R087		42	(56)	13	(17)	-	20	(27)	25	M
R088	2	22	(23)	2	(2)	53(56)	17	(18)	6	M
W023	6	19	(24)	37	(46)	-	24	(30)	20	M
W090	3	34	(39)	9	(10)	-	44	(51)	13	H
W113	5	29	(100)	-	-	-	-	-	71	L
W123	5	37	(41)	10	(11)	-	43	(48)	10	H
W167		29	(41)	5	(7)	-	36	(51)	30	H
W210	5	3	(6)	35	(71)	-	11	(22)	51	M
W224	3	27	(39)	11	(16)	-	32	(46)	30	H
Average		20	29	31	44		19	25	28	
Standard Deviation		11	21	21	29		14	16	18	

Note: Numbers in brackets are percentages recalculated on a mineral matter free basis.

TABLE 5

Properties of the 3 Maceral Groups

	Low	Medium	High
Inertinite (mmf)	8 ± 6	25 ± 4	51 ± 6
Percent of Vitrinite Oxidized (mmf)	84 ± 8	62 ± 22	20 ± 5
Proximate Ash	27 ± 10	16 ± 8	72 ± 11
Proximate Fixed Carbon	48 ± 7	60 ± 8	72 ± 11
Rank	High Vol. A	High to Low	Low Vol.
Roof Lithology	Siltyshale	Silty Carb Shale	Carb Shale
Floor Lithology	Siltyshale	Silty Carb Shale	Coaly Shale
Partings/Seam	1	1	0
Number of Numbers	8	12	5

Note: The ± numbers are ± one standard deviation.

TABLE 7

Classification of Coke Quality by Coal Quality Group

	Low Inertinite Seams	Medium Inertinite Seams
Coal Quality Group	92	91
Maximum Reflectance (%)	10 - 14	>1.50
Inert Content (%)	8 - 30	8 - 30
Maximum Dilation %	80 - 260	0 - 70
Maximum Fluidity (D.D.M)	1500 - 30000	5 - 100
FSI	7 - 9+	6 - 9
Volatile Matter	22 - 34	16 - 19
Coke Strength		
JIS D_{15}^{30}	91 - 94	92 - 93.5
ASTM 25 mm	48 - 65+	50 - 60

TABLE 6
Vitrinite Reflectance

Outcrop No.	Sample No.	Ro max	Ro ave	Number of Readings	Intensley Oxidized
J020	4	1.21		41	
J020			1.18		x
J128	3	1.34		49	
R003	8	1.44		49	x
R005			1.56		
R019			1.71		
R023			1.39		
R040	7		1.06		x
R046	1		1.15		x
R046	2		1.05		x
R047			1.06		x
R048			1.01		x
R049			1.10		x
R049A			1.18		x
R051	5		1.15		x
R054A	6		1.01		x
R054B	10		1.25		x
R058A	10		1.32		x
R058B			1.18		x
R058C			1.16		x
R071	1.1 m seam		1.70		
R071	1.7 m seam	1.49	1.61	48	
		(1.93)		3	
R087		1.66		50	
R088		1.48		50	
		(1.98)		3	
W004			1.34		
W006			1.35		
W023	6	1.40		52	x
W023			1.36		x
W090	3	1.58		50	x
W113	5	1.25		51	
W123	5	1.78		50	
W167		1.79		51	
W210	5	1.48		50	x
W224	3	1.27		49	
		(2.02)		1	
Average		1.47	1.27	49	
Standard deviation		.19	.22	3	

Notes:
1. All samples show at least mild oxidation, those indicated show intense oxidation.
2. The average reflectance is low enough that it can be considered as close to the maximum reflectance.
3. The reflectances in brackets are from a separate rase component of the sample.

3.4.3 CORRELATION OF COAL OUTCROPS

The seams were difficult to correlate because rapid lateral changes in the seams, and poor exposures made the outcrops far apart and difficult to describe. The methods used to correlate in order of usefulness were; first, thickness and position of partings, second, proximate analysis particularly the ratio of fixed carbon/volatile matter and sulphur content, thirdly the percentage of inertinite and finally the lithologies of roof and floor. The proximate analysis values used below are unweighted averages of the good coal from each seam.

A good correlation can be made between J020 and R003 on the Willow Creek license 6393. The correlatable properties are listed in Table 8.

TABLE 8

Correlation of Coal Outcrops J020 and R003

	J020	R003
Gross Thickness	2.2	2.25
Ash	8	12
Volatile Matter	30	28
Fixed Carbon	62	56
Sulphur	.69	.65
Inertinite	26	26
Roof	Silty ss	Silty ss

The partings in R003 must pinch out toward J020. The average net thickness is 1.9 m.

A good correlation can also be made between R049A and R058C, both close together on license 6398. The correlatable properties are listed in Table 9.

TABLE 9

Correlation of Coal Outcrops R071, R088, W090, W123, and W167

	R071	R088	W090	W123	W167
Gross Thickness	1.75	2.00+	1.5	1.1	1.2
Ash	10	8	3	7	14
Volatile Matter	18	14	16	14	15
Fixed Carbon	72	78	80	80	71
FC/VM	4.0	5.5	4.9	5.9	4.8
Sulphur	.67	.31	.44	.66	.65
Inertinite	61	18	51	48	51
Roof	Silty ss	Silt	Carb sh	sh	sh
Floor	Coaly sh	?	Carb sh	sh	sh

All but R088 are members of the high inertinite group and have no partings. R071 may also be a separate seam because of the different inertinite and FC/VM ratio. These outcrops have a FC/VM ratio in the range 4.0 to 5.9, while all the other seams have this ratio in the range 1.6 to 2.2. The average net thickness is 1.4 m.

A poor correlation may be made between R040, R046, R047, R048, R049B and the middle portion of R054A, mostly in license 6398 but also in 6417 and 6420. The correlatable properties are listed in Table 11.

TABLE 11

Correlation of Coal Outcrops R040, R046, R047, R048, R049B and R054A

	R040	R046	R047	R048	R049B
Gross Thickness	.98	.25	.35	.50	.7
Ash	15	21	16	30	35
Volatile Matter	30	25	32	23	25
Fixed Carbon	55	54	52	47	40
Sulphur	.47	.47	.33	.27	.36
Inertinite	11	20	20	0	7
Roof	Silty ss	ss	?	sh	ss
Floor	sh	sh	Coaly sh	sh	Carb sh

They are in both the low and medium inertinite group. R040, R046 and R048 also have a trace of liptinite. The average net thickness is .6 m.

A possible correlation maybe made between R051 and R054B in licenses 6398 and 6380 respectively. They have the same gross thickness and changes from top to bottom (but not absolute values) of the proximate analysis. The average net thickness is 1.3 m - a possible correlation may also be made between J128 and R058A in licenses 6372 and 6398. They have similar gross thickness and vaguely similar proximate analysis and pattern of partings. However, the outcrops are 5 km apart. The average net thickness is 2.7 m.

The outcrop of coal at R058A may be the "D" seam. It has the same parting pattern, and is approximately 200 m above the Cadomin Formation.

3.4.4 STRATIGRAPHIC LEVEL OF THE SEAM

It is not possible to subdivide the Gething Formation because it is uniform and the structure is complex. There is a regional dip to the northeast with the Cadomin Formation exposed to the southwest and the Moosebar Formation to the northeast. Since most of the seams are exposed towards the southwest, the majority of the seams may occur in the lower Gething. However this may be due to better exposure to the southwest.

3.4.5 RESERVE CALCULATIONS

Because the structure has not yet been solved and the coal subcrop and detailed attitude are unknown it is not possible to do detailed reserve calculations. The method used here is to total up the net coal thickness of seams greater than 1 meter and multiply this by the area of a license and the density of coal (taken as 1.2 tonnes/cubic metre) to give a rough estimate of speculative inplace tonnes of coal per license.

The Willow Creek license has 2 seams greater than 1 metre; J020 + R003 yield 1.9 m and R87 yield 1.6 m for 3.5 m net coal. The license has an area of 2930000 square metres which gives 12 million tonnes.

The main body of licenses has at least 5 seams with thickness greater than 1 m and good coking qualities.

TABLE 12

Net Thickness of Mineable Seams around Hasler Creek.

Seam	Net Coal (m)
R058A (and J128?)	2.7
R058B	1.0
R058C and Ro49A	1.8
R051 and R054B	1.3
W23	2.0
TOTAL	8.8

A license has an area of 2940000 square metres which gives 30 million metric tonnes per license. There are at least 9 licenses and possibly up to 22 licenses to be retained so that there is between 280 and 680 million tonnes on the property, depending on how many licenses are retained.

The Sukunka license has 1 mineable seam, W242, with a net thickness of 1.6 m. The licenses have an area of 2 x 2960000 square meters. This gives 11 million tonnes of coal.

The above numbers are order of magnitude estimates of speculative resources. They will be drastically altered with any additional information.

4. CONCLUSIONS

4.1 GENERAL GEOLOGY

Most of the outcrops occur in the south-central part the main body of licenses. Mostly Gething Formation is exposed with a little Cadomin Formation and Minnes Group to the southwest. The Gething Formation is usually fluvial fining-up sand to carbonaceous shale and coal.

The regional dip is to the northeast, however the structure is complex with tight, steep limbed, short wavelength folds as the dominant element. There are also several west dipping thrust faults and 4 sets of numerous high angle faults of small displacement.

4.2 COAL GEOLOGY

Most of the coal seams are in the Gething Formation, possibly the lower portion, and 2 are in the Minnes Group. The seams are in the flood plain portion of the fluvial cycles. Though there may be some coastal swamp seams, possibly in the upper portion of the Gething Formation.

The average proximate analysis is; ash = 19%, volatile matter = 23%, fixed carbon = 54%, sulphur = .52%. The commonest rank is high volatile A bituminous with the rank raised to low volatile bituminous by proximity to folding. The macerals are low in inertinites, usually less than 31% and the average maximum reflectance is 1.50. The FSI from unoxidized samples should be around 8 or 9.

The seams range in net thickness up to about 2.7 m and have an areal extent up to 80 km^2.

4.3 RESERVES

Because of the poor exposure in comparison to the complex structure and the lack of drill holes, it is only possible to give an order of magnitude of speculative resources. They are of the order of 100 million tonnes in 5 seams ranging from 1.0 to 2.7 m net of coal, mostly underground recoverable.

5. RECOMMENDATONS

5.1 LAND STATUS CHANGES

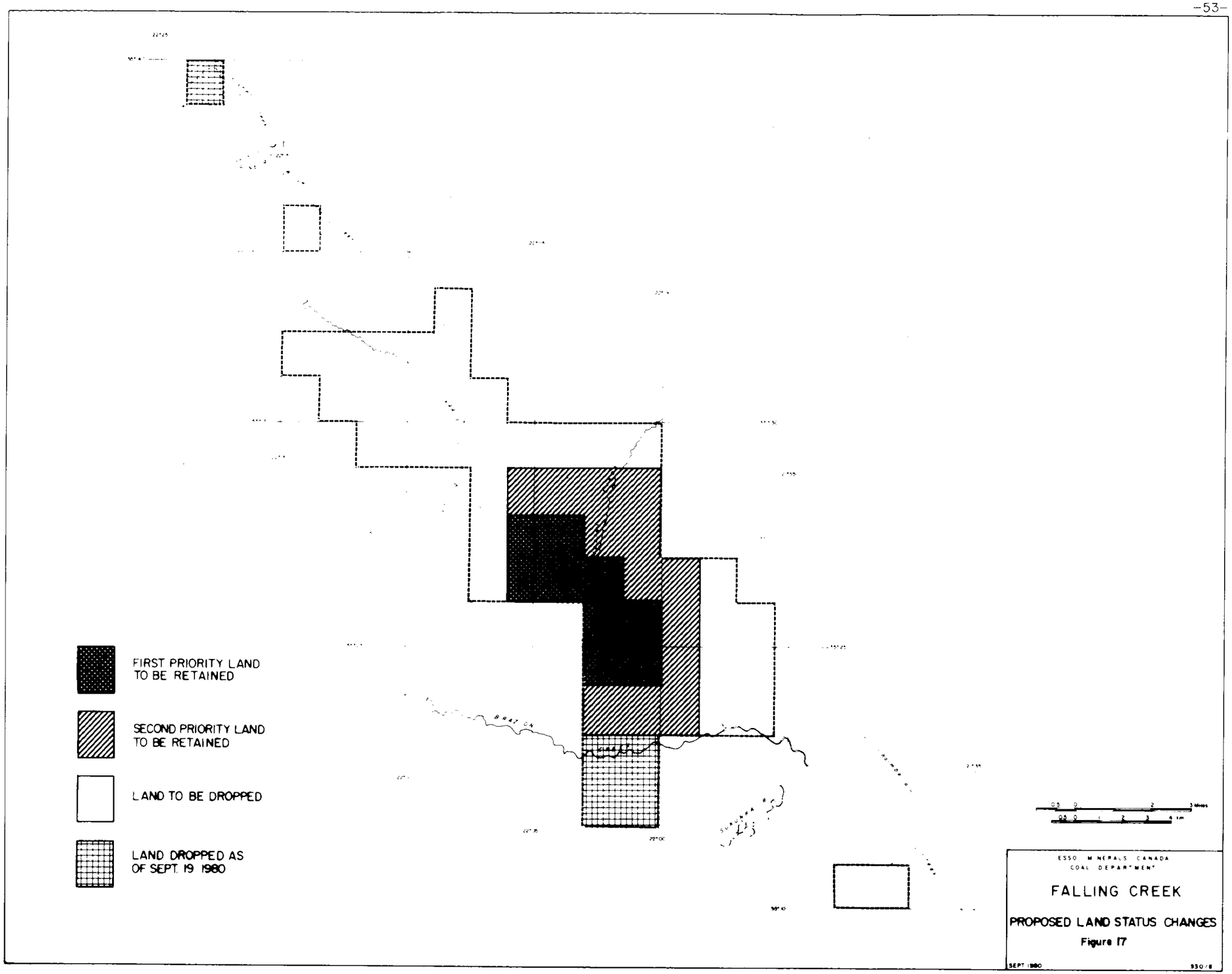
Licenses 6392 and 6416 to 6416 have already been dropped as of 19 September 1980.

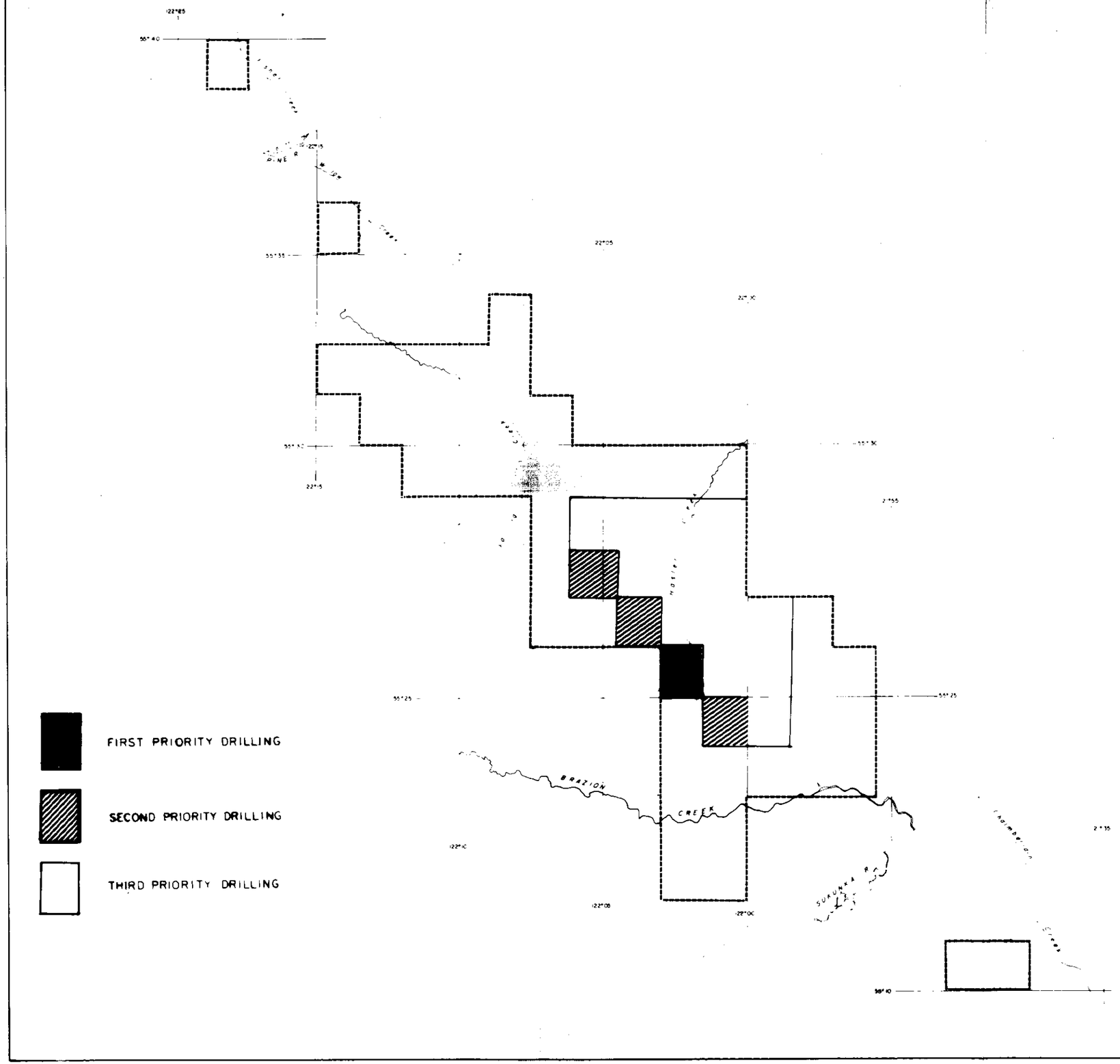
It is recommended to keep only the licenses in the south-central portion of the main body of licenses. In this area there are more coal occurrences and they have better coking characteristics. Also the exposure and drill access is easier here so that there is more chance of solving the structure cheaply.

The first priority of licenses to be retained are; 6371, 6372, 6395 to 6398, 6419 to 6421, for a total of 2646 hectares. The second priority of licenses to be retained are; 6370, 6373 to 6375, 6399, 6404 6407, 6412, 6417, 6418, 6422, 6424, for a total of 3822 hectares. The licenses to be dropped are; 6376 to 6391, 6393, 6394, 6400 to 6403, 6405, 6406, 6408, 6409, 6411, 6423, 6425 to 6428, for a total of 9405 hectares (Figure 17).

5.2 DRILLING PROPOSAL

The highest concentration of coal is on license 6398. Drilling on this license should be the first priortiy. The second priority should be to extend the drilling along strike to the area of licenses 6396, 6372 and 6419. The third priority should be to extend the drilling across strike to the northeast (Figure 18).


FIRST PRIORITY LAND
TO BE RETAINED
SECOND PRIORITY LAND
TO BE RETAINED
LAND TO BE DROPPED
LAND DROPPED AS
OF SEPT. 19 1980
BRAZEAU
ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK
PROPOSED LAND STATUS CHANGES
Figure 17
SEPT 1980
930/8


122°05
55° 40
55°35
22°05
22°00
55°30
22°15
55°25
122°10
122°00
55°35
55°20
FIRST PRIORITY DRILLING
SECOND PRIORITY DRILLING
THIRD PRIORITY DRILLING
BRAZION CREEK
SUKUNKA R.
0.5 0 2 3 kilometres
0.5 0 1 2 3 4 km
ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK
PROPOSED DRILLING AREAS
Figure 18
SEPT. 1980
980/8

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7. APPENDIX

7.1 PROXIMATE ANALYSES BY BIRTLEY COAL AND MINERALS TESTING

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5160	J 020	7.5	3.8	6.4	24.5	65.3	0.69	0	a.d.b.
			11.0	5.9	22.7	60.4	0.64		a.r.b.
				6.7	25.5	67.8	0.72		d.b.
5161	J 037 1.1M	2.9	3.4	3.6	16.8	76.2	0.60	0	a.b.d.
			6.2	3.5	16.3	74.0	0.58		a.r.b.
				3.7	17.4	78.9	0.62		d.b.
5162	J 037 2.3M	4.2	2.9	3.4	17.2	76.5	0.73	0	a.b.d.
			7.0	3.3	16.5	73.2	0.70		a.r.b.
				3.5	17.7	78.8	0.75		d.b.
5163	W 004	1.7	1.3	56.5	12.7	29.5	0.51		a.b.d.
			3.0	55.5	12.5	29.0	0.50		a.r.b.
				57.2	12.9	29.9	0.52		d.b.
5164	W 006	7.6	1.3	9.1	19.3	70.3	0.57		a.d.b.
			8.8	8.4	17.8	65.0	0.53		a.r.b.
				9.2	19.6	71.2	0.58		d.b.
5165	W 023	27.8	8.0	22.8	22.6	46.6	0.50		a.d.b.
			33.6	16.5	16.3	33.6	0.36		a.r.b.
				24.8	24.6	50.6	0.70		d.b.
5166	R 005	1.6	1.7	4.3	16.0	78.0	0.75	0	a.b.d.
			3.3	4.2	15.7	76.8	0.74		a.r.b.
				4.4	16.3	79.3	0.76		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5167	R 019	2.8	1.3	3.5	13.9	81.3	0.71		a.b.d.
			4.1	3.4	13.5	79.0	0.69		a.r.b.
				3.5	14.1	82.4	0.72		a.b.
5168	R 023	2.2	1.7	11.2	18.5	68.6	0.63		a.b.d.
			3.9	11.0	18.1	67.0	0.62		a.r.b.
				11.4	18.8	69.8	0.64		d.b.
5169	R 040	7.8	3.5	10.2	27.9	58.4	0.60		a.d.b.
			11.0	9.4	25.7	53.9	0.55		a.r.b.
				10.6	28.9	60.5	0.62		d.b.
5170	R 040 (1)	25.4	8.6	9.3	29.3	52.8	0.59	0	a.b.d.
			31.8	6.9	21.9	39.4	0.44		a.r.b.
				10.2	32.1	57.7	0.65		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5171	R 040 (2)	16.1	3.7	22.1	30.1	44.1	0.44		a.b.d.
			19.2	18.5	25.3	37.0	0.37		a.r.b.
				22.9	31.3	45.8	0.46		d.b.
5172	R 040 (3)	30.5	4.7	57.3	35.9	2.1	0.48	muskeg	a.d.b.
			33.8	39.8	25.0	1,4	0.33	present	a.r.b.
				60.1	37.7	2.2	0.50		d.b.
5173	R 040 (4)	12.4	3.2	11.8	27.8	57.2	0.20		a.b.d.
			15.2	10.3	24.4	50.1	0.18		a.r.b.
				12.2	28.7	59.1	0.21		d.b.
5174	R 040 (5)	18.7	6.2	13.9	24.9	55.0	0.54		a.b.d.
			23.7	11.3	20.2	44.8	0.44		a.r.b.
				14.8	26.5	58.7	0.58		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5175	R 040 (6)	21.2	6.3	43.6	19.0	31.1	0.50		a.b.d.
			26.2	34.4	15.0	24.4	0.39		a.r.b.
				46.5	20.3	33.2	0.53		d.b.
5176	R 040 (7)	22.8	4.8	27.3	27.8	40.1	0.34		a.b.d.
			26.5	21.1	21.5	30.9	0.26		a.r.b.
	HVABC			28.7	29.2	42.1	0.36		b.d.
5177	R 040 (1)	17.4	10.0	21.3	24.6	44.1	0.36		a.b.d.
			25.7	17.6	20.3	36.4	0.30		a.r.b.
				23.7	27.3	49.0	0.40		d.b.
5178	R 046 (2)	10.9	8.1	19.4	23.3	49.2	0.43	0	a.b.d.
			18.1	17.3	20.8	43.8	0.38		a.r.b.
	HVABC			21.1	25.4	53.5	0.47		d.b.
5179	R 046 (3)	8.8	2.6	61.2	13.8	22.4	0.24		a.b.d.
			11.2	55.8	12.6	20.4	0.22		a.r.b.
				62.8	14.2	23.0	0.25		d.b.
5180	R 047	20.3	14.6	13.2	27.5	44.7	0.28	0	a.b.d.
			31.9	10.5	21.9	35.7	0.22		a.r.b.
	HVABC			15.5	32.2	52.3	0.33		b.d.
5181	R 048	16.2	2.4	29.6	22.4	45.6	0.26		a.b.d.
			18.2	24.8	18.8	38.2	0.22		a.r.b.
	HVABC			30.3	23.0	46.7	0.27		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5182	R 049B	14.9	12.9	30.6	21.3	35.2	0.31		a.b.d.
			25.9	26.0	18.1	30.0	0.26		a.r.b.
	HVABC			35.1	24.5	40.4	0.36		b.d.
5183	R 049 SEAM "A"	17.8	17.6	16.4	23.4	42.6	0.22		a.b.d.
			32.3	13.5	19.2	35.0	0.18		a.r.b.
	HVABC			19.9	28.4	51.7	0.27		d.b.
5184	R 051 (1)	10.6	3.9	45.2	16.9	34.0	0.42		a.b.d.
			14.1	40.4	15.1	30.4	0.38		a.r.b.
				47.0	17.6	35.4	0.44		d.b.
5185	R 051 (2)	6.6	1.8	73.7	9.8	14.7	0.21		a.b.d.
			8.3	68.8	9.2	13.7	0.20		a.r.b.
				75.1	10.0	14.9	0.21		d.b.
5186	R 051 (3)	7.8	5.1	5.0	25.0	64.9	0.75	0	a.b.d.
			12.5	4.6	23.1	59.8	0.69		a.r.b.
				5.3	26.3	68.4	0.79		d.b.
5187	R 051 (4)	7.5	2.3	76.8	10.2	10.7	0.16		a.b.d.
			9.6	71.0	9.4	10.0	0.15		a.r.b.
				78.6	10.4	11.0	0.16		d.b.
5188	R 051 (5)	5.8	6.0	42.0	16.8	35.2	0.43		a.b.d.
			11.5	39.6	15.8	33.1	0.41		a.r.b.
				44.7	17.9	37.4	0.46		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5189	R 054 (1)	10.6	7.5	56.7	15.2	20.6	0.42		a.b.d.
			17.3	50.7	13.6	18.4	0.38		a.r.b.
				61.3	16.4	22.3	0.45		b.d.
5190	R 054 (2)	9.9	3.7	76.6	11.1	8.6	0.28		a.b.d.
			13.2	69.0	10.0	7.8	0.25		a.r.b.
				79.5	11.5	9.0	0.29		d.b.
5191	R 054 (3)	10.6	17.8	19.9	22.5	39.8	0.56		a.d.b.
			26.5	17.8	20.1	35.6	0.50		a.r.b.
				24.2	27.4	48.4	0.68		d.b.
5192	R 054 (4)	11.9	2.4	74.0	12.6	11.0	0.31		a.b.d.
			14.0	65.2	11.1	9.7	0.27		a.r.b.
				75.8	12.9	11.3	0.32		d.b.
5193	R 054 (5)	7.5	7.8	64.6	12.7	14.9	0.34		a.b.d.
			14.7	59.8	11.7	13.8	0.31		a.r.b.
				70.1	13.8	16.1	0.37		d.b.
5194	R 054 (6)	8.3	8.7	55.1	14.7	21.5	0.41		a.b.d.
			16.3	50.5	13.5	19.7	0.38		a.r.b.
				60.4	16.1	23.5	0.45		d.b.
5195	R 054 (7)	12.4	10.6	12.1	23.9	53.4	0.58	0	a.b.d.
			21.7	10.6	20.9	46.8	0.51		a.r.b.
				13.5	26.7	59.8	0.65		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5196	R 054 (8)	6.5	3.3	63.1	12.9	20.7	0.31		a.d.b.
			9.6	59.0	12.1	19.3	0.29		a.r.b.
				65.3	13.3	21.4	0.32		d.b.
5197	R 054 (9)	13.2	9.9	34.2	20.0	35.9	0.44		a.b.d.
			21.8	29.7	17.4	31.1	0.38		a.r.b.
				38.0	22.2	39.8	0.49		d.b.
5198	R 054 (10)	10.8	6.5	43.5	17.9	32.1	0.36		a.b.d.
			16.6	38.8	16.0	28.6	0.32		a.r.b.
				46.5	19.1	34.4	0.39		d.b.
5199	R 058 SEAM "A" (1)	10.6	12.4	28.3	21.1	38.2	0.54		a.b.d.
			21.7	25.3	18.9	34.1	0.43		a.r.b.
				32.3	24.1	43.6	0.62		d.b.
5200	R 058 SEAM "A" (2)	6.6	1.7	87.8	6.9	3.6	0.14		a.d.b.
			8.2	82.0	6.4	3.4	0.13		a.r.b.
				89.3	7.0	3.7	0.14		d.b.
5201	R 058 SEAM "A" (3)	12.0	12.8	32.8	19.4	35.0	0.34		a.d.b.
			23.3	28.9	17.1	30.7	0.30		a.r.b.
				37.6	22.2	40.2	0.39		d.b.
5202	R 058 SEAM "A" (4)	7.9	3.2	80.3	9.3	7.2	0.14		a.d.b.
			10.8	74.0	8.6	6.6	0.13		a.r.b.
				83.0	9.6	7.4	0.14		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5203	R 058 SEAM "A" (5)	17.0	9.4	22.7	23.4	44.5	0.48		a.d.b.
			24.8	18.8	19.4	37.0	0.40		a.r.b.
				25.1	25.8	49.1	0.53		d.b.
5204	R 058 SEAM "A" (6)	6.7	2.7	82.3	8.5	6.5	0.12		a.d.b.
			9.2	76.8	7.9	6.1	0.11		a.r.b.
				84.6	8.7	6.7	0.12		d.b.
5205	R 058 SEAM "A" (7)	13.3	11.4	33.2	20.3	35.1	0.41		a.d.b.
			23.2	28.8	17.6	30.4	0.36		a.r.b.
				37.5	22.9	39.6	0.46		d.b.
5206	R 058 SEAM "A" (8)	10.1	2.6	77.2	9.8	10.4	0.14		a.d.b.
			12.4	69.4	8.8	9.4	0.13		a.r.b.
				79.3	10.1	10.6	0.14		d.b.
5207	R 058 SEAM "A" (9)	22.6	10.6	18.3	24.8	46.3	0.42		a.d.b.
			30.8	14.2	19.2	35.8	0.33		a.r.b.
				20.5	27.7	51.8	0.47		d.b.
5208	R 058 SEAM "A" (10)	14.8	5.7	50.2	17.2	26.9	0.31		a.d.b.
			19.7	42.8	14.7	22.8	0.26		a.r.b.
				53.2	18.2	28.6	0.33		d.b.
5209	R 058 SEAM "A"	23.7	10.2	22.6	26.0	41.2	0.44		a.d.b.
			31.6	17.2	19.8	31.4	0.34		a.r.b.
				25.2	29.0	45.8	0.49		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5210	R 058 SEAM "A"	25.6	16.2	15.5	25.6	42.7	0.25	0	a.d.b.
			37.7	11.5	19.0	31.8	0.19		a.r.b.
				18.5	30.5	51.0	0.30		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5308	R003-1	7.4	2.1	69.8	12.9	15.2	0.25		a.d.b.
			9.3	64.6	11.9	14.2	0.23		a.r.b.
				71.3	13.2	15.5	0.26		d.b.
5309	R003-2	22.9	6.9	10.2	27.6	55.3	0.82		a.d.b.
			28.2	7.9	21.3	42.6	0.63		a.r.b.
				11.0	29.6	59.4	0.88		d.b.
5310	R003-3	10.1	2.4	74.8	11.2	11.6	0.25		a.d.b.
			12.3	67.2	10.1	10.4	0.22		a.r.b.
				76.6	11.5	11.9	0.26		d.b.
5311	R003-4	24.0	6.0	9.3	28.1	56.6	0.45	N.A.	a.d.b.
			28.6	7.1	21.4	42.9	0.34		a.r.b.
				9.9	29.9	60.2	0.48		d.b.
5312	R003-5	14.5	3.4	49.2	18.4	29.0	0.46		a.d.b.
			17.4	42.1	15.7	24.8	0.39		a.r.b.
				50.9	19.0	30.1	0.48		d.b.
5313	R003-6	20.3	5.0	26.5	23.5	45.0	0.62		a.d.b.
			24.3	21.1	18.7	35.9	0.49		a.r.b.
				27.9	24.7	47.4	0.65		d.b.
5314	R003-7	24.3	6.2	13.3	27.7	52.8	0.55		a.d.b.
			29.0	10.1	21.0	39.9	0.42		a.r.b.
				14.2	29.5	56.3	0.59		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5315	R003-8	17.1	4.8	40.8	20.2	34.2	0.45	N.A.	a.d.b.
			21.1	33.8	16.7	28.4	0.37		a.r.b.
				42.9	21.2	35.9	0.47		d.b.
5316	R087	5.0	1.1	19.6	12.9	66.4	0.59		a.d.b.
			6.0	18.6	12.3	63.1	0.56		a.r.b.
				19.8	13.0	67.2	0.60		d.b.
5317	W224-1	2.4	0.9	11.8	17.6	69.7	0.38		a.d.b.
			3.3	11.5	17.2	68.0	0.37		a.r.b.
				11.9	17.8	70.3	0.38		d.b.
5318	W224-2	4.2	1.2	66.5	11.0	21.3	0.21		a.d.b.
			5.3	63.7	10.5	20.5	0.20		a.r.b.
				67.3	11.1	21.6	0.21		d.b.
5319	W224-3	4.6	1.1	28.9	15.3	54.7	0.43		a.d.b.
			5.6	27.6	14.6	52.2	0.41		a.r.b.
				29.2	15.5	55.3	0.43		d.b.
5320	J128-1	6.2	1.6	34.0	17.9	46.5	0.38		a.d.b.
			7.7	31.9	16.8	43.6	0.36		a.r.b.
				34.6	18.2	47.2	0.39		d.b.
5321	J128-2	6.1	1.2	21.3	19.6	57.9	0.40	N.A.	a.d.b.
			7.2	20.0	18.4	54.4	0.38		a.r.b.
				21.6	19.8	58.6	0.40		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5322	J128-3	1.2	1.2	39.3	16.2	43.3	0.36	-	a.d.b.
			7.0	37.0	15.2	40.8	0.34		a.r.b.
				39.8	16.4	43.8	0.36		d.b.
5323	W123-1	4.1	1.2	5.8	13.1	79.9	0.66	-	a.d.b.
			5.3	5.6	12.6	76.5	0.63		a.r.b.
				5.9	13.3	80.8	0.67		d.b.
5324	W123-2	8.1	1.0	3.6	15.2	80.2	0.66	-	a.d.b.
			9.0	3.3	14.0	73.7	0.61		a.r.b.
				3.6	15.4	81.0	0.67		d.b.
5325	W123-3	2.3	0.6	9.9	11.8	77.7	0.66	N.A.	a.d.b.
			2.9	9.7	11.5	75.9	0.64		a.r.b.
				10.0	11.9	78.1	0.66		d.b.
5326	W123-4	1.3	1.0	52.1	9.6	37.3	0.41	-	a.d.b.
			2.3	51.4	9.5	36.8	0.40		a.r.b.
				52.6	9.7	37.7	0.41		d.b.
5327	W123-5	6.0	1.1	12.4	12.5	74.0	0.66	-	a.d.b.
			7.0	11.7	11.8	69.5	0.62		a.r.b.
				12.5	12.6	74.9	0.67		d.b.
5328	R088-2	15.3	4.2	7.4	13.6	74.8	0.30	-	a.d.b.
			18.9	6.3	11.5	63.3	0.25		a.r.b.
				7.7	14.2	78.1	0.31		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5329	R071	15.1	2.1	9.7	17.8	70.4	0.66	-	a.d.b.
			16.9	8.2	15.1	59.8	0.56		a.r.b.
				9.9	18.2	71.9	0.67		d.b.
5330	W023-1	24.1	5.0	21.5	23.1	50.4	0.58	-	a.d.b.
			27.9	16.3	17.5	38.3	0.44		a.r.b.
				22.6	24.3	53.1	0.61		d.b.
5331	W023-2	21.3	4.5	42.9	19.1	33.5	0.38	-	a.d.b.
			24.8	33.8	15.0	26.4	0.30		a.r.b.
				44.9	20.0	35.1	0.40		d.b.
5332	W023-3	18.2	4.0	43.8	17.9	34.3	0.45	-	a.d.b.
			21.5	35.8	14.6	28.1	0.37		a.r.b.
				45.6	18.6	35.8	0.47		d.b.
5333	W023-4	21.4	4.7	37.6	21.0	36.7	0.46	-	a.d.b.
			25.1	29.6	16.5	28.8	0.36		a.r.b.
				39.5	22.0	38.5	0.48		d.b.
5334	W023-5	22.7	4.2	11.2	24.0	60.6	0.62	-	a.d.b.
			25.9	8.7	18.6	46.8	0.48		a.r.b.
				11.7	25.1	63.2	0.65		d.b.
5335	W023-6	22.0	4.5	25.1	21.9	48.5	0.53	-	a.d.b.
			25.5	19.6	17.1	37.8	0.41		a.r.b.
				26.3	22.9	50.8	0.55		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5336	W090-1	9.1	1.7	3.3	16.0	79.0	0.43	-	a.d.b.
			10.6	3.0	14.5	71.9	0.39		a.r.b.
				3.4	16.3	80.3	0.4		d.b.
5337	W090-2	8.7	1.5	38.1	14.8	45.6	0.27	-	a.d.b.
			10.1	34.8	13.5	41.6	0.25		a.r.b.
				38.7	15.0	46.3	0.27		d.b.
5338	W090-3	8.7	1.9	6.7	18.0	73.4	0.45	-	a.d.b.
			10.4	6.1	16.4	67.1	0.41		a.r.b.
				6.8	18.3	74.9	0.46		d.b.
5339	W113-1	4.7	1.1	83.4	7.5	8.0	0.23	-	a.d.b.
			5.7	79.5	7.1	7.7	0.22		a.r.b.
				84.3	7.6	8.1	0.23		d.b.
5340	W113-2	3.8	1.0	38.6	16.5	43.9	1.20	-	a.d.b.
			4.8	37.1	15.9	42.2	1.15		a.r.b.
				39.0	16.7	44.3	1.21		d.b.
5341	W113-3	4.8	1.3	82.0	7.9	8.8	1.07	-	a.d.b.
			6.0	78.1	7.5	8.4	1.02		a.r.b.
				83.1	8.0	8.9	1.08		d.b.
5342	W113-4	2.9	1.0	74.3	10.3	14.4	1.89		a.d.b.
			3.9	72.1	10.0	14.0	1.84		a.r.b.
				75.1	10.4	14.5	1.91		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5343	W113-5	5.3	0.9	65.3	11.8	22.0	1.67	-	a.d.b.
			6.2	61.8	11.2	20.8	1.58		a.r.b.
				65.9	11.9	22.2	1.69		d.b.
5344	W113-6	8.5	0.6	38.9	17.4	43.1	2.04	-	a.d.b.
			9.0	35.6	15.9	39.5	1.87		a.r.b.
				39.1	17.5	43.4	2.05		d.b.
5345	W167-1	8.0	1.5	19.9	13.9	64.7	0.50	-	a.d.b.
			9.4	18.3	12.8	59.5	0.46		a.r.b.
				20.2	14.1	65.7	0.51		d.b.
5346	W167-2	10.5	1.6	7.6	15.2	75.6	0.56	-	a.d.b.
			11.9	6.8	13.6	67.7	0.50		a.r.b.
				7.7	15.4	76.9	0.57		d.b.
5347	W167-3	7.9	1.4	13.7	14.0	70.9	0.57	N.A.	a.d.b.
			9.2	12.6	12.9	65.3	0.52		a.r.b.
				13.9	14.2	71.9	0.58		d.b.
5348	W210-1	7.7	2.2	50.2	14.7	32.9	0.39	-	a.d.b.
			9.7	46.3	13.6	30.4	0.36		a.r.b.
				51.3	15.0	33.7	0.40		d.b.
5349	W210-2	7.8	1.9	14.0	18.7	65.4	0.66	-	a.d.b.
			9.6	12.9	17.2	60.3	0.61		a.r.b.
				14.3	19.1	66.6	0.67		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO MINERALS CANADA

PROJECT: SAMPLES RECEIVED JUNE 24, 1980

LAB NO.	SAMPLE I.D.	AMD%	MOIST	PROXIMATE			S%	F.S.I.	CALC* BASIS
				ASH%	V.M.%	F.C.%			
5350	W210-3	3.9	1.7	49.2	13.5	35.6	0.45	-	a.d.b
			5.5	47.3	13.0	34.2	0.43		a.r.b.
				50.1	13.7	36.2	0.46		d.b.
5351	W210-4	7.8	2.6	35.2	15.7	46.5	0.45	-	a.d.b.
			10.2	32.5	14.	42.8	0.41		a.r.b
				36.1	16.1	47.8	0.46		d.b.
5352	W210-5	6.4	1.8	39.4	14.9	43.9	0.49	-	a.d.b
			8.1	36.9	13.9	41.1	0.46		a.r.b
				40.1	15.2	44.7	0.50		d.b.
5353	J020-1	22.1	5.4	8.7	29.7	56.2	0.57	-	a.d.b
			26.3	6.8	23.1	43.8	0.44		a.r.b.
				9.2	31.4	59.4	0.60		d.b.
5354	J020-2	22.8	4.7	9.4	29.8	56.1	0.61	N.A.	a.d.b.
			26.4	7.3	23.0	43.3	0.47		a.r.b.
				9.9	31.3	58.8	0.64		d.b.
5355	J020-3	13.2	4.1	4.8	26.4	64.7	0.80	-	a.d.b.
			16.8	4.2	22.9	56.1	0.69		a.r.b.
				5.0	27.5	67.5	0.83		d.b.
5356	J020-4	19.7	4.5	9.6	28.1	57.8	0.65	N.A.	a.d.b.
			23.3	7.7	22.6	46.4	0.52		a.r.b.
				10.1	29.4	60.5	0.68		d.b.

* air dried basis - a.b.d.
as received basis - a.r.b.
dry basis - d.b.

CLIENT: ESSO RESOURCES CANADA

PROJECT: SAMPLES RECEIVED OCT.9, 1980
P.O. NO. 02-S0767012 W.Kilby

HEAD RAW ANALYSIS

LAB NO.	SAMPLE NO.	ADM %	MOIST %	ASH %	VOL %	FC %	S %	BTU/LB	FSI	CALC. BASIS
6236	280	11.5	0.7	82.7	7.7	8.9	0.24	-	N.A.	a.d.b.
			12.1	73.2	6.8	7.9	0.21	-	-	a.r.b.
				83.3	7.8	8.9	0.24	-	-	d.b.

SINK-FLOAT ANALYSIS, a.d.b.								
S.G.	WT %	RM %	ASH %	VOL %	FC %	S %	BTU/LB	F.S.I.
-1.60	22.3	1.1	74.2	9.2	15.5	0.31	-	N.A.
+1.60	77.7	-	84.3	-	-	-	-	-

80-1

LAB NO.	SAMPLE NO.	ADM %	MOIST %	ASH %	VOL %	FC %	S %	BTU/LB	FSI	CALC. BASIS
6237	(342)	13.4	0.9	70.8	9.3	19.0	0.35	-	N.A.	a.d.b.
			14.2	61.3	8.1	16.4	0.30	-	-	a.r.b
				71.4	9.4	19.2	0.35	-	-	d.b.

SINK-FLOAT ANALYSIS, a.d.b.								
S.G.	WT %	RM %	ASH %	VOL %	FC %	S %	BTU/LB	F.S.I.
-1.60	22.6	0.8	38.4	N.S.S.	-	0.63	N.S.S.	N.S.S.
+1.60	77.4	-	79.9	-	-	-	-	-

SINK - FLOAT DONE ON - 14M RAW COAL

N.S.S. - Not Sufficient Sample

N.A. - Non - Agglomerating

CLIENT: ESSO RESOURCES CANADA

PROJECT: SAMPLES RECEIVED OCT.9, 1980
P.O. NO. 02-S0767012 W.Kilby

80-1 330 RDH HEAD RAW ANALYSIS

LAB NO.	SAMPLE NO.	ADM %	MOIST %	ASH %	VOL %	FC %	S %	BTU/LB	FSI	CALC. BASIS
6238	402	10.6	0.5	83.0	12.5	4.0	0.09	-	N.A.	a.d.b.
			11.0	74.2	11.2	3.6	0.08	-	-	a.r.b.
				83.4	12.6	4.0	0.09	-	-	d.b.

SINK-FLOAT ANALYSIS, a.d.b.								
S.G.	WT %	RM %	ASH %	VOL %	FC %	S %	BTU/LB	F.S.I.
-1.60	1.0	0.6	13.9	NSS	-	N.S.S	N.S.S.	N.S.S.
+1.60	99.0	-	83.6	-	-	-	-	-

80-1 KDH

LAB NO.	SAMPLE NO.	ADM %	MOIST %	ASH %	VOL %	FC %	S %	BTU/LB	FSI	CALC. BASIS
6239	722	18.8	0.6	72.8	8.6	18.0	0.22	-	N.A.	a.d.b.
			19.3	59.1	7.0	14.6	0.18	-	-	a.r.b
				73.2	8.7	18.1	0.22	-	-	d.b.

SINK-FLOAT ANALYSIS, a.d.b.								
S.G.	WT %	RM %	ASH %	VOL %	FC %	S %	BTU/LB	F.S.I.
-1.60	13.2	0.6	8.3	14.4	76.7	0.65	14672	2
+1.60	86.8	-	82.5	-	-	-	-	-

SINK - FLOAT DONE ON - 14M RAW COAL

N.S.S. - Not Sufficient Sample

N.A. - Non - Agglomerating

CLIENT: ESSO RESOURCES CANADA

PROJECT: SAMPLES RECEIVED OCT.9, 1980
P.O. NO. 02-S0767012 W.Kilby

HEAD RAW ANALYSIS

LAB NO.	SAMPLE NO.	ADM %	MOIST %	ASH %	VOL %	FC %	S %	BTU/LB	FSI	CALC. BASIS
6240	12-18	19.6	0.7	46.1	12.3	40.9	0.42	7784	1	a.d.b.
			20.2	37.1	9.9	32.8	0.34	6258	-	a.r.b.
				46.4	12.4	41.2	0.42	7839	-	d.b.

SINK-FLOAT ANALYSIS, a.d.b.								
S.G.	WT %	RM %	ASH %	VOL %	FC %	S %	BTU/LB	F.S.I.
-1.60	46.7	0.9	16.0	16.5	66.6	0.69	12815	1 1/2
+1.60	53.3	-	72.5	-	-	-	-	-

LAB NO.	SAMPLE NO.	ADM %	MOIST %	ASH %	VOL %	FC %	S %	BTU/LB	FSI	CALC. BASIS
6241	JOB-1	56.2	1.2	16.7	18.1	64.0	0.92	12903	2	a.d.b.
			56.7	7.3	7.9	28.1	0.40	5652	-	a.r.b
				16.9	18.3	64.8	0.93	13060	-	d.b.

SINK-FLOAT ANALYSIS, a.d.b.								
S.G.	WT %	RM %	ASH %	VOL %	FC %	S %	BTU/LB	F.S.I.
-1.60	96.4	0.9	15.5	18.1	65.5	0.94	12945	2
+1.60	3.6	-	57.7	-	-	-	-	-

SINK - FLOAT DONE ON - 14M RAW COAL

N.S.S. - Not Sufficient Sample

N.A. - Non - Agglomerating

7.2 NOTES BY GEO-OPTICS THAT OCCOMPANIED THE MACERAL ANALYSIS

NOTES

1. A subdivision between oxidized and unoxidized vitrinite is to some extent artificial, because the samples are so heavily oxidized (with perhaps the exception of sample R046), that almost certainly all the vitrinite is oxidized to some degree. The least heavily oxidized vitrinite in each sample probably has retained a reflectance close to or at the value of the original vitrinite of the coal.

2. There is also some artificiality in the subdivision between heavily oxidized vitrinite and inertinite. Much of the heavily ozidized vitrinite is high reflecting and can appear to be similar to a high-reflecting semifusinite.

3. The severe oxidation is well supported by the absense of pyrite in the samples. Several samples, e.g. R047, contain masses of mineral matter that has almost certainly been pyrite, but which is now converted to iron oxide or to a hydrated iron oxide and which is often associated with a high-reflecting, but less altered undetermined sulphide. Generally however the pyrite has been removed completely and the principal mineral contaminant is clay.

4. Traces of liptinite occur in some samples, e.g. R040 (7), R046 and R048. The amounts were always no more than could be reported as "trace" and it is difficult to tell if the coals contained much liptinitic material before oxidation. There is little evidence of resinite having been present, but the coals do suggest in the character of their inertinite and the possible occurrence of two teleutospores in one sample, they are very late Mesozoic or Tertiary in age.

5. The second batch of coals again contains many samples that are oxidized. In general, the remarks that were made in relation to the first batch of samples apply. It is clear, however, that this second batch contains material that has not been so heavily oxidised as the coals of the first batch, but all certainly seem to have been affected. Pyrite is present in some samples (for example WO-3-5 and R087 which contains pyrite in an intermediate stage of alteration). While there are some traces of exinite in some samples, the coals have come from a "high inertinite" environment source.

6. The last sample analysed (R088) showed marked influence from heat, with a large amount of the sample affected. Many particles, however, show no obvious sign of the temperature rise in plane polarized light, but under crossed polars, much of the vitrinite which appears unoxidized displays strain anisotropy. From a re-examination of other samples in this batch, much of the vitrinite also shows anisotropic affects which almost certainly must be attributed to raised temperatures. The relationship between the pronounced oxidation effects and the apparent influence of raised temperatures cannot be determined without some further knowledge of the geological environment from which the samples were derived (the appearance of the samples does not immediately suggest ill-treatment prior to preparation but after recovery from outcrop).

DETAIL OF COSTS INCURRED

1980

ACTIVITY DESCRIPTION	COMPANY	AMOUNT	TOTAL
Surface Claims	Enair-mobilization & demobilization		1 400
Drilling	Enair-hourly & footage		16 475
	-materials & hot shot		2 464
	-board for men		570
	-fuel		680
Logging	BPB Instruments Ltd.		4 833
Communications			179
Fuel	Chetwynd Motors Ltd.	823	
	Imperial Oil Limited	610	1 433
Coal Analysis	Birtley Coal & Minerals Testing	3 866	
	Geo-optics Ltd.	2 000	5 866
Helicopter Usage	Maple Leaf Helicopters		11 878
Trucking	Tortor Trucking - hauling of a cat		550
Miscellaneous Trans.	PWA		103
Hotel Accommodation	Pine Motor Inn	9 037	
	Stagecoach Inn	2 154	11 861
	Calgary Inn	670	
Vehicle Rentals	Econo-Car - Dawson Creek	4 284	
	Bill's Recreation Centre Ltd. - Hondas	6 912	13 306
	Other - Tilden & Econo Car	2 110	
Survey's	Hardy Associates	7 900	
	Other	835	8 735
Equipment Repairs	Modern Motors Ltd.	2 801	
	Bill's Recreation Centre Ltd.	111	2 912
Maps & Reports	Riley's	22	
	Teckline Copy Centre Ltd.	198	
	Gulf Oil	1 000	1 385
	Hardy Associates Ltd.	165	
Travel Expenses	Employee Accommodation, meals, and transportation	11 329	
Non-Capital Equipment	Tamshell Holding Ltd.	139	
	Oilind Safety Engineering	217	
	Caldraft Ltd.	843	
	Western Technical Supply Co. Ltd.	297	2 281
	Ribtor Manufacturing & Distributing Co. Ltd.	49	
	Bill's Recreation Centre Ltd.	144	
	Canadian Marconi Company - rental of radios	592	
Wages and Salaries			32 360
		TOTAL EXPENDITURES	130,600

Office Overhead - 20%
TOTAL = $156,720

1981 05 19 CK

WAGES AND SALARIES

DISTRIBUTED 1980

IN FIELD	
Total Charges	$20 582
Technician	854
Level A	4 874
Level B	316
Summer Students	14 538

IN OFFICE	
Total Charges	$11 778
Technician	831
Level A	4 801
Level B	211
Summer Students	5 935

NUMBER OF EMPLOYEES WORKING ON PROJECT

1 Technician
2 Level A
1 Level B
6 Summer Students

AVERAGE RATES

Technician	- $ 1 722/month
Management Level A	- $ 2 071/month
Management Level B	- $ 3 149/month
Summer Students	- $ 1 568/month

1981 05 19 CK

Schedule B

Category of Work	Dimensions (where applicable)	Unit Cost (where applicable)	Cost
Geological Mapping			
Reconnaissance			
Detail - Surface	15,874		88,194
- Underground			
* - Other (specify)			
Geophysical/Geochemical Surveys			
Method	N/A		
Grid			
Topographic			
* Other (specify)			
Road Construction			
On licences Nos.	N/A		
Access to			
Surface Work			
Trenching	N/A		
Seam tracing			
Crosscutting			
*Other (specify)			
Underground Work			
Test adits	N/A		
*Other workings			
Drilling			
Core: Diamond			
Wireline			
Rotary: Conventional	251		21,587
Reverse circulation			
* Other (specify)			
Contractor:	ENAIR DRILLING LTD		
Where core stored	N/A		
Logging			4,833
Sampling			
Testing			5,866
* Other work: (specify details)	TOPO FROM AIR PHOTOGRAPHS		10,120
Reclamation work (Permit No.)			

ON-PROPERTY COSTS	$	118,822
OFF-PROPERTY COSTS	$	37,898
TOTAL EXPENDITURES	$	156,720

Aug 11/81
(date)

(signature and position)

* A full explanation of "Other" work is to be included.

7.4 TIME BREAKDOWN

CATEGORY	MAN-DAYS Number	Percent
Mobilization in Calgary	22	6
Mapping on foot	120	35
by truck	8	2
Trenching and sampling	23	7
Office work in camp	61	18
in Calgary	25	7
Show and tell	1	0
Travel	10	3
Time off	77	22
TOTAL	347	100

STATEMENT OF QUALIFICATIONS

7.5 Bim Waters

This is to certify that I obtained a Bachelor of Science Degree in Geology from the University of Alberta in 1978 and I am presently enrolled in a Master of Science program at the same university.

My relevant experience has included geological mapping in Newfoundland, Quebec and various parts of British Columbia.

Bim Waters

FALLING CREEK GEOLOGY REPORT

1980

(PART B)

WARD E. KILBY

E16.4:74

FALLING CREEK GEOLOGY REPORT (PART B)

BOREHOLE AND RELATED INFORMATION

LIST OF MAPS, FIGURES AND TABLES AND APPENDICES

FALLING CREEK GEOLOGY REPORT (PART B)
BOREHOLE AND RELATED INFORMATION

1.0 DRILLING

1.1 BACKGROUND

Upon completion of field mapping by the summer field crews, most prominent coal exposures and the relative complexity of the geology was known throughout the area (Section Part A, this report). Previous owners had drilled several core holes on the licences. This information was available through the B.C.M.E.M.P.R. openfiles in Victoria and provided the means of obtaining a composite section of the coal-bearing Gething Formation as well as the ability of tying any new drilling into this section (see Map 1).

With one bore-hole we wanted to drill through as much of the lower Gething section as possible, tying into the Cadomin Formation for control and stepping out from the southern area, which had previously been drilled to provide as much new correlatable information as possible.

Two geologists, Caleen Kilby and Ward Kilby spent one week in late August detail mapping around prospective drill locations. Four sites were selected and prioritized. One hole was drilled. Hole 80-1 was selected as it was likely to encounter relatively horizontal strata near the crest of a broad anticline. The hole was targeted to commence just below a pebble conglomerate which had been tentatively correlated with a zone in the top of hole 75-5 and penetrate the lower Gething Formation to the Cadomin Formation.

Hole 80-1 is located along a haulage road in a logged off area of licence number 6396 , UTM coordinates of the hole are 559730mE, 6144260mN, 1197m elevation in UTM zone 10.

1.2 PROCEDURE

1.2.1 Drilling

A contract was let to Enair Drilling Ltd. of Calgary, Alberta to drill one hole with an air rotary rig. The rig was set up on the road with no surface disturbance whatsoever. A 6.25 inch rock bit was used. The hole, 882 feet in total depth, was drilled over the period of September 25 to October 1, 1980. Several mechanical difficulties were encountered resulting in the long drill time.

1.2.2 Chip Logging

As drilling proceeded chip samples were examined every 10 feet in an attempt to correlate the hole with previously drilled holes in the area during drilling.

1.2.3 Wireline Logging

BPB was selected to provide geophysical logging support. Tools run included Gamma Ray, Caliper, Neutron-Neutron, Bulk density, Bed Resolution Density, and Dipmetre. Data from the Dipmetre log was computerized and profiles of the hole generated with the pitchlines to aid in interpretation (these profiles are attached to the Dipmetre log).

1.3.1 Litho-Chip Log

Chips were examined approximately every 10 feet down the hole. The litho-log (Figure 1) is the result of this procedure.

1.3.2 Geophysical Logs

The results of the wireline logging were fair. Some detail was lost above 40 m depth due to a falling water level in the hole. Two small coal seams were likely encountered in this interval, their approximate location may be tentatively obtained from the litho-log and resistivity logs from the dipmetre. Several dead spots occurred in the Neutron-Neutron log near the base of the hole (Figure 2).

1.3.3 Coal Analysis

Several grab samples of coal chips were taken during the drilling. These samples are very contaminated and likely have much of the fines and softer maceral fraction of coal removed. Six samples were collected and floated at a specific gravity of 1.60 to remove the obvious contamination. The results of these tests are included in Appendix 1.

2.0 BOREHOLE CORRELATION

2.1 Borehole Picks

No fewer than a dozen boreholes and their wireline logs were available through the Gething Formation in and around the area of our property. Virtually all holes used for correlation purposes had a form of Neutron and a Gamma Ray log. Figure 20 is a display of the correlation of several of the holes throughout the property and beyond. Two holes 75-3 and H1 were found to have a readily correlatable zone. They are a considerable distance apart and combined cover the complete Gething section. The resultant stratigraphic section will be discussed in Section 3.0

The holes and log picks used in the correlation are summarized in the following table:

TABLE 1

Picks	Holes						
	74-1	80-1	75-7	75-5	75-4	H-1	75-3
H				368	651	815	92
				(131)	(104)	(135)	(156)
G	115	259	228	500	755	951	247
	(85)	(59)	(83)	(75)	(91)	(67)	(39)
F	200	318	311	574	846	1018	286
	(70)	(134)					
E	270	452	(167)	(166)	(137)	(156)	(118)
	(102)	(86)					
D	372	538	478	741	982	1174	404
	(148)	(251)	(85)				
C	520	789	562	(143)			(136)
	(74)	(328)	(55)				
B	594	822	619	884			540
			(86)	(89)			(67)
A			705	973			607

115 down hole length
(86) inter-pick interval

2.2 BOREHOLE THICKNESSES

When correlating geophysical logs the signature of a particular feature is the paramount factor, either a precise pick or a whole zone in correlating the logs. It would be reassuring though if the interval thicknesses between these picks were similar. These intervals must also be estimated if a stratigraphic section is to be built up. Comparison of inter-pick intervals will be complicated by the following: boreholes intersect the strata at differing angles, structural complications may have distorted the interval or genuine stratagraphic differences may be present. A semi-quantitative method adapted from a thickness finding technique successfully used in some Alberta coal fields with outcrop data has been employed (Kilby 1978, Hill 1980). To obtain an approximation of the inter-pick interval all the values outside one standard deviation of the mean are rejected, a new mean is calculated and the interval thickness is placed midway between this new mean and the minimum value in this second population. This method tends to remove values which are structurally thickened and assumes that some exaggeration of the true thickness is present in most holes. The following table is a summary of the result of this method.

TABLE 2a

Interval	First Run		Second Run			Interval Thickness		
	Mean	Std. dev.	Mean	Std. dev.	Points	Mean	Min.	Value
H-G	131.7	21.1	133.4	3.0	2	133.4	131.3	132.3
G-F	76.7	11.8	77.5	8.25	4	77.5	67.2	72.3
F-E	102	45.2	-	-	2	102	70	86
E-D	94	11.3	-	-	2	94	86	90
B-A	85.3	6.4	-	-	3	85.3	78	81.7
F-D	162.2	31.8	159.6	14.0	5	159.6	136.7	148.1
D-B	185.2	65.8	160.5	41.1	4	160.5	135.7	148.1

3.0 STRATIGRAPHIC SECTION

The thickness values obtained above, in section 2.1 may be used in conjunction with logs from H1 and 75-3 to build up a stratigraphic columnm for the Gething throughout the licence area. Figure 4 contains the logs of these two holes and the resultant Cadomin and Gething thickness displayed.

Thickness of the upper portion of the Gething was obtained from Hole H-1 by removing the effect of non-normal bedding to core angles. This interval is possibly somewhat exaggerated.

As displayed on Figure 4 the Gething Fm is 320 m thick and the Cadomin Formation is approximately 60 m thick. Two coal horizons are locally present about 100 m above the Cadomin Fm. These two horizons each may reach up to 3 m in thickness but can be seen to thin out from area to area. The upper coal horizon is located approximately 35 m below the top of the Gething This scan also may reach 3 m in thickness and appears to be more continuous than the lower coals. This stronger continuity is the result of deposition on a lower delta plain compared with the upper delta plain environment of the lower coals. A potential marker horizon of conglomerate located centrally in the Gething section was identified in the south and central portions of the property.

This unit approximately 3 m thick is composed of angular white quartzite pebbles in the 1-2 cm range. The unit was intersected in the top of hole 75-5 and has been located in outcrop in 3 widely spaced areas. Additional mapping will verify the usefulness of this unit.

AR Flatling Creek 80C050 "1

PROJECT: KILBY 907 RM 82007 DWG: 810
AREA: 99999
PATH: HWC0004
KILBY ROAD TRS: W E

Getting from Coal
Inferred Getting
Material Point Contact
Thrust
Getting Indication

Scale 1to1 1:10.000

Geology FAULT Fault Vector 304.8 Faulted 4.0
CROSS-SECTION OF COAL SEAM AND OVERBURDEN ROCK
PROFILE LOOKING IN DIRECTION 305.0 W.O.B. 0.0
Data from Trench scale 1" section 1:40

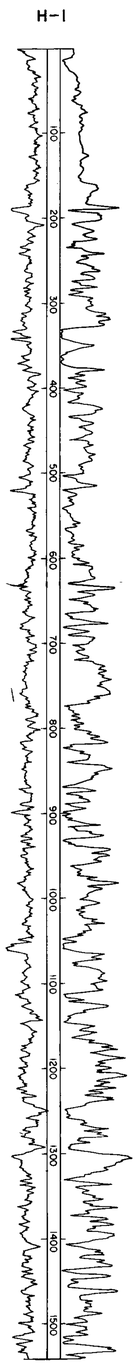
B.M. 60-1

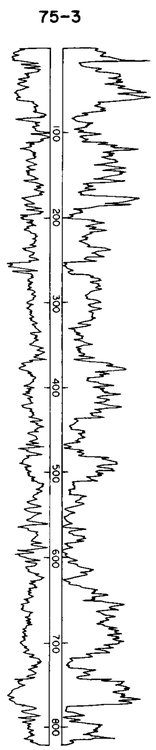
Hooker Creek

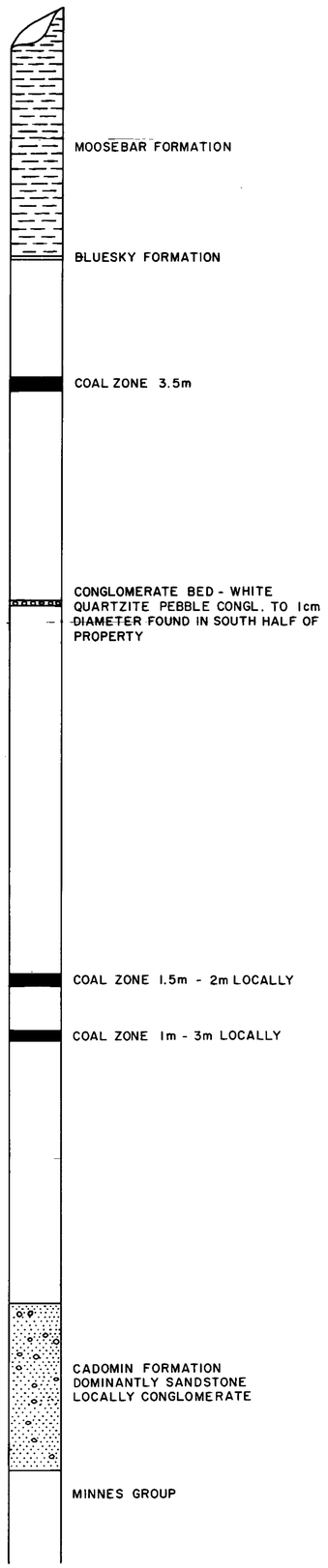
*10 1
121.20
98.60
76.00

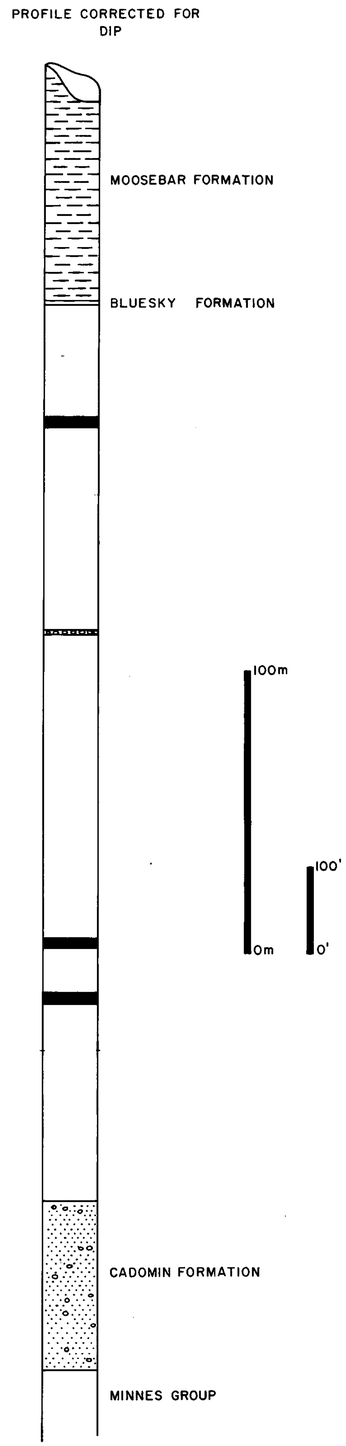
Meters 0.00 38.60 77.20 115.80 154.40 193.00 231.60 270.20 308.80 347.40 386.00 424.60 463.20 501.80 540.40 579.00 617.60 656.20 694.80 733.40 772.00

*10 1









522 PR-Falling Creek 80(2)A

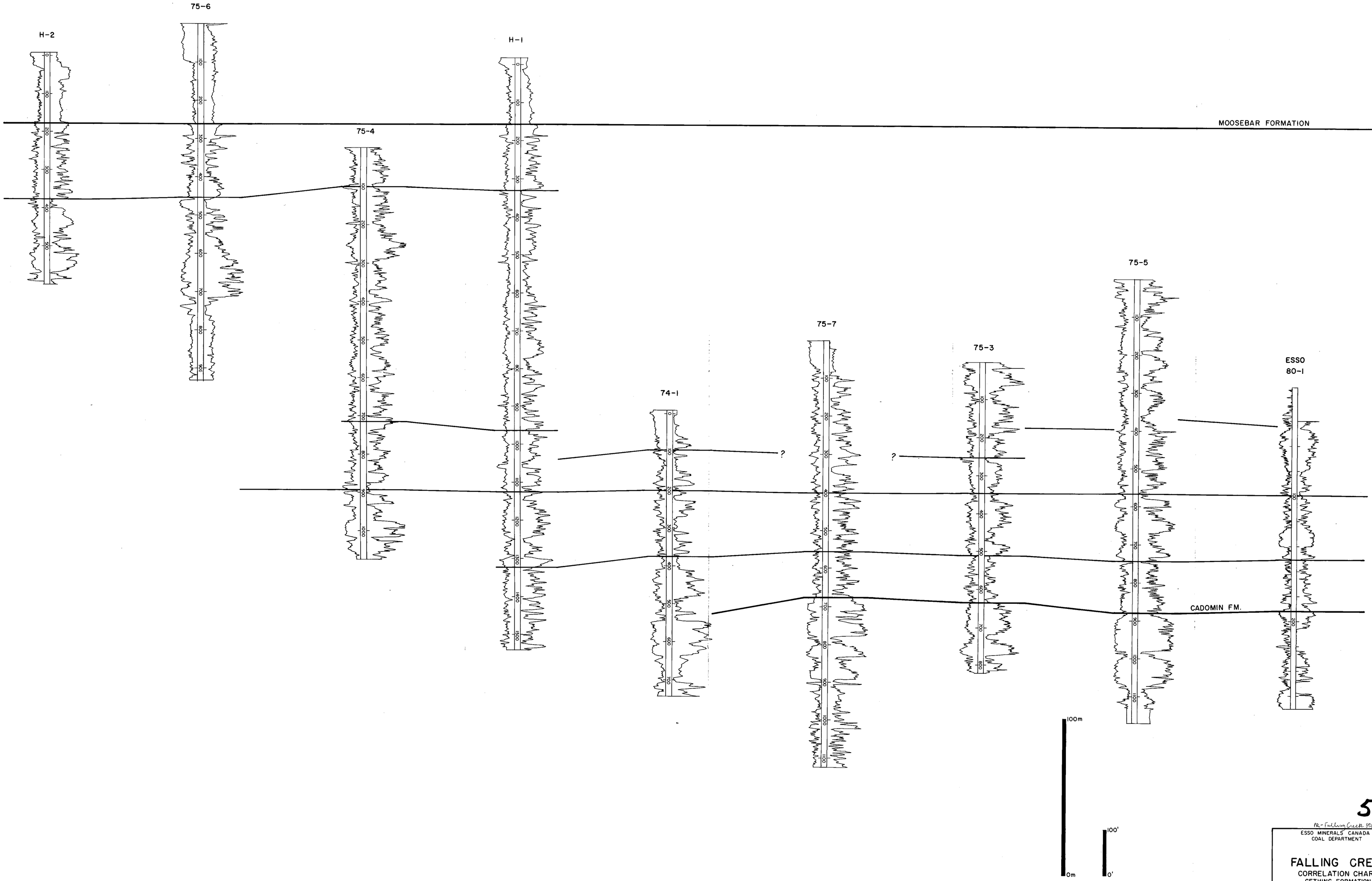
ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK, B.C.

COMPOSITE STRATIGRAPHIC SECTION

Figure 6

MAY, 1981 930-8



522

PR-Falling Creek 80/27

ESSO MINERALS CANADA
COAL DEPARTMENT

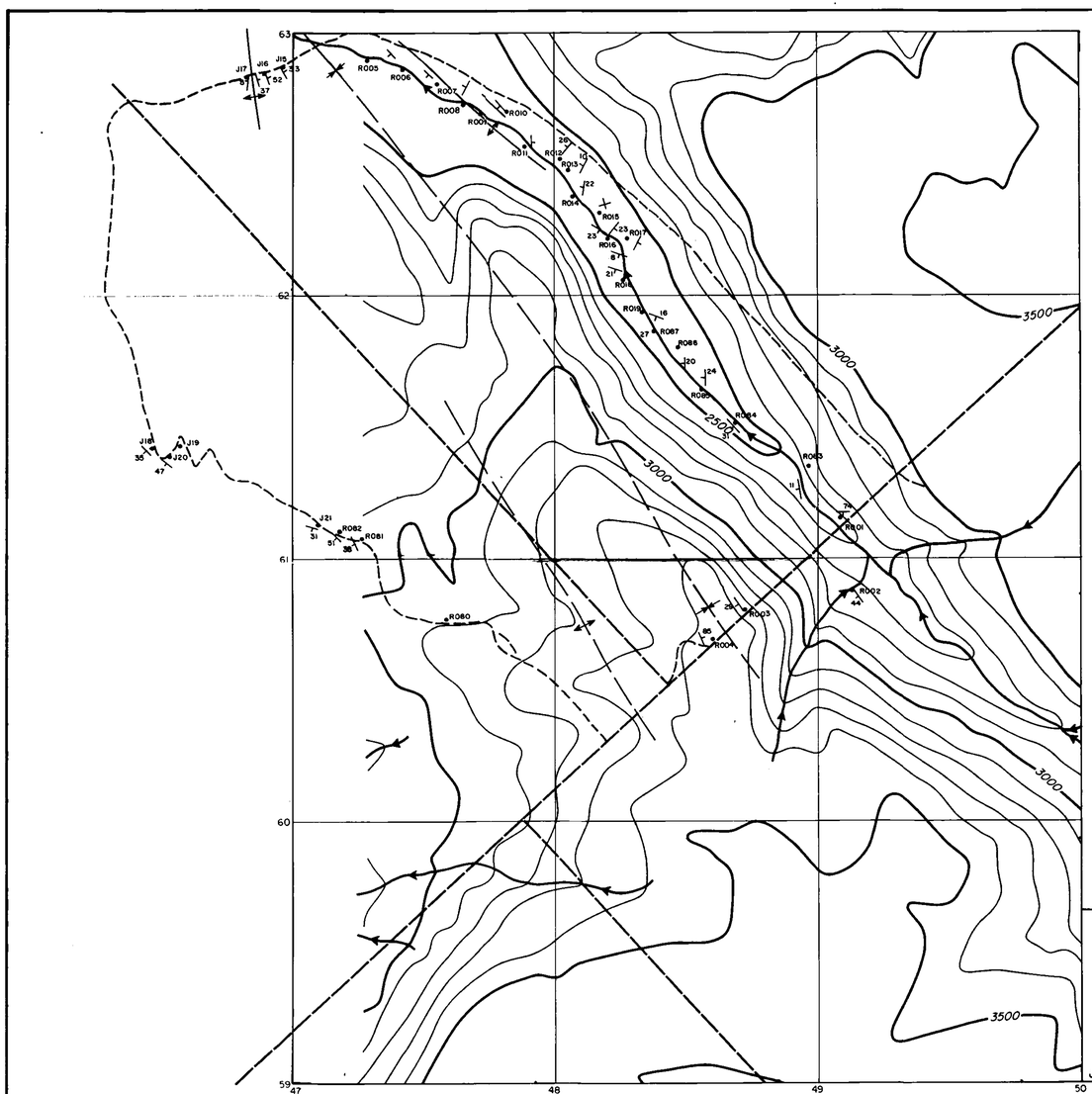
FALLING CREEK

CORRELATION CHART
GETHING FORMATION

Figure 20

MAY, 1981

930-8



OUTCROP IDENTIFICATION NUMBER ●WS01

GEOLOGICAL CONTACT — APPROXIMATE

ASSUMED

BEDDING — HORIZONTAL

INCLINED

VERTICAL

OVERTURNED

ANTICLINE (DEFINED, APPROX.)

SYNCLINE (DEFINED, APPROX.)

THRUST FAULT (TEETH IN DIRECTION OF DIP)

DEFINED

APPROXIMATE

DRILLED LOGGED WITH COAL

CREEK

LOOSE SURFACE

SEISMIC LINE

0 0.5 1 MILE

0 0.5 1 km

pr-Falling Creek 8X(2)A

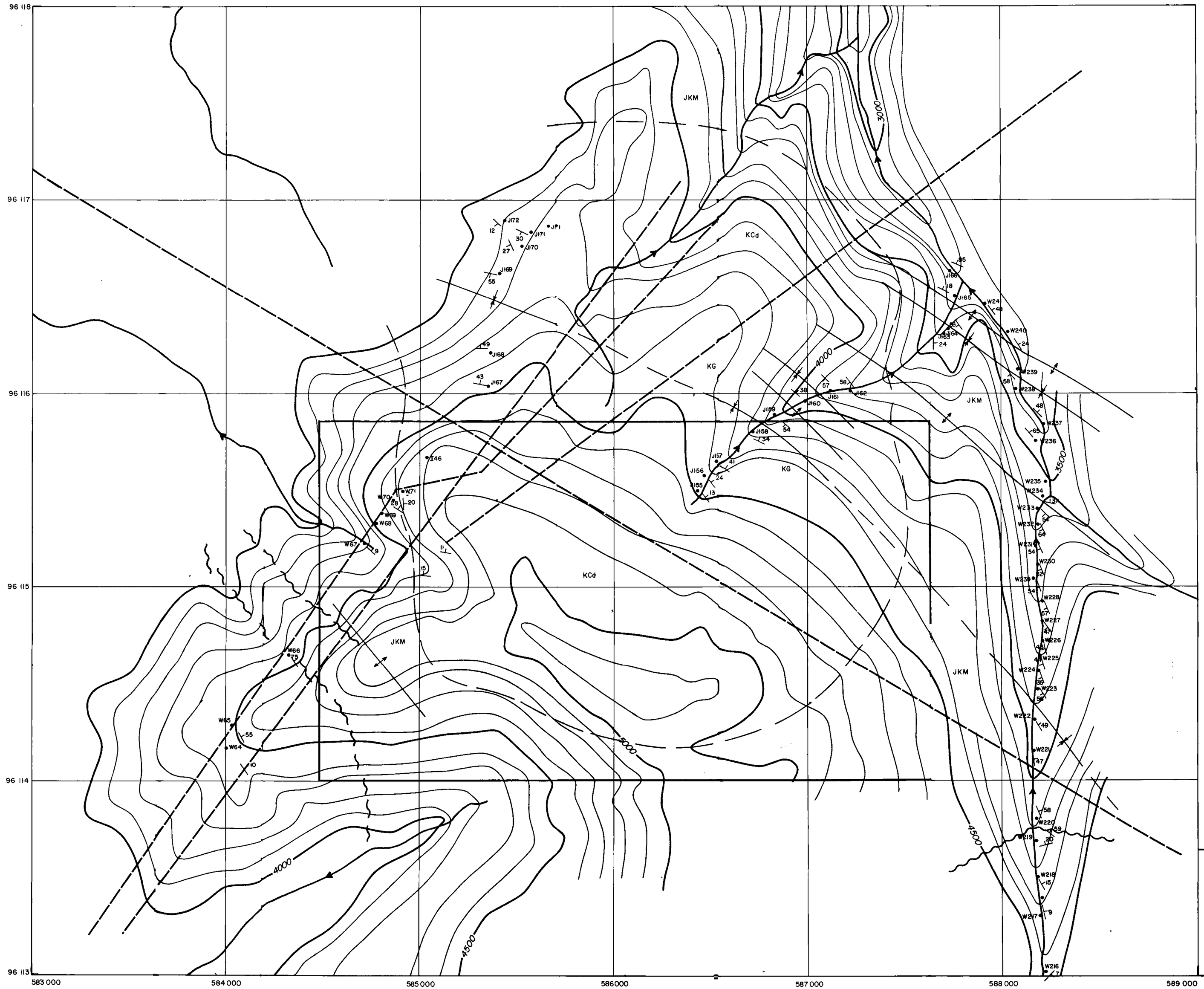
ESSO MINERALS CANADA
COAL DEPARTMENT

WILLOW CREEK
GEOLOGICAL MAP

522

JUNE, 1981

93-O-9E



N

OUTCROP IDENTIFICATION NUMBER •W301

GEOLOGICAL CONTACT — APPROXIMATE
ASSUMED

BEDDING — HORIZONTAL
INCLINED
VERTICAL
OVERTURNED

ANTICLINE (DEFINED, APPROX.)
SYNCLINE (DEFINED, APPROX.)

THRUST FAULT (TEETH IN DIRECTION OF DIP)
DEFINED
APPROXIMATE

DRILLED LOGGED WITH COAL

CREEK

SEISMIC LINE

0 0.5 1 MILE
0 0.5 1 km

R-Falling Creek 80(2)A

ESSO MINERALS CANADA
COAL DEPARTMENT

CHAMBERLAIN CREEK

GEOLOGICAL MAP

JUNE 1981

93-P-4E

522

ESSO MINERALS CANADA
FALLING CREEK
COAL DEPARTMENT

GEOLOGICAL MAP

JUNE 1981

930-7

1 Mile 0 0.5 1

1000 metres 0 500 2 Km

532

ESSO MINERALS CANADA
ESSO RESOURCES CANADA LIMITED
PINE PASS PROJECT

CONTOUR INTERVAL 10 Metre
SURVEY CONTROL: TAKEN FROM EXISTING PHOTO
SURVEY CONTROL SURVEY MONUMENTS
AND NTS MAPS HAVING IS BASED ON UNIVERSAL
TRANSVERSE MERCATOR GRID AND GEODETIC DATUM

LEGEND

MAIN ROAD
SECONDARY ROAD
TRAIL
SAND
CLAY LINE
BULLDOZ
DEPRESSION POWERLINE
COAL LEASE
STREAM
LAKE
FORM LINES
TREE LINE
SPOT HEIGHT

INDEX

930-7

LEGEND

OUTCROP IDENTIFICATION NUMBER
GEOLOGICAL CONTACT
BEDDING
ANTICLINE
SYNCLINE
THRUST FAULT (TEETH IN DIRECTION OF DIP)
DRILLED LOGGED WITH COAL
MOOSEBAR FORMATION
GETHING FORMATION
CADOMIN FORMATION
MINNES GROUP

APPROXIMATE
ASSUMED
HORIZONTAL
INCLINED
VERTICAL
OVERTURNED
(DEFINED,APPROX.)
(DEFINED,APPROX.)
DEFINED
APPROXIMATE

TOPO PINE PASS PROJECT 930-7 GEOLOGY
MAP #1

TOPO. PINE PASS PROJECT 930-7 GEOLOGY
MAP # 2

1:10,870

0.5 0 1 Mile

1000 metres 0 2 km

522 re-falling back 8620

LEGEND

OUTCROP IDENTIFICATION NUMBER		•W101
GEOLOGICAL CONTACT	APPROXIMATE	
	ASSUMED	
BEDDING	HORIZONTAL	+
	INCLINED	✓
	VERTICAL	⊥
	OVERTURNED	⊥
ANTICLINE	(DEFINED, APPROX.)	
SYNCLINE	(DEFINED, APPROX.)	
THRUST FAULT (TEETH IN DIRECTION OF DIP)	DEFINED	
	APPROXIMATE	
DRILLED LOGGED WITH COAL		●

MOOSEBAR FORMATION	KM	CADOMIN FORMATION	Kc
GETHING FORMATION	Kcd	MINNES GROUP	JKM

Dotted as much as possible of this map (1:50,000) - see check route by no. is numbers used - not + for ice location), where no dot used. Centre point of orientation symbol has been used.
J.C. Sept 18/81

ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK
GEOLOGICAL MAP

JUNE 1981 930-7

ESSO MINERALS CANADA
A division of
ESSO RESOURCES CANADA LIMITED
PINE PASS PROJECT

CONTOUR INTERVAL 10 metres
SURVEY NOTE:
SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		STREAM	
TRACK		LAKE	
TRAIL		SAND	
CUT LINE		TREE LINE	
RAILROAD		FORM LINES	
BUILDING		DEPRESSION FORM LINE	
COAL LICENCE		SPOT HEIGHT	x1075

INDEX

930-7

ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK

JUNE 1981

930-7

1 Mile 0 0.5 1

2km 0 1 1000 metres 500

ESSO MINERALS CANADA
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PINE PASS PROJECT

ROAD LINE INTERVAL 10 metre

SURVEY NOTE
SURVEY CONTROL TAKEN FROM EXISTING PHOTO
CONTROL. DEVELOPMENT SURVEY MONUMENTS
AND NTS MAPS MARKED IS BASED ON UNIVERSAL
TRANSVERSE MERCATOR (UTM) GEODETIC DATUM

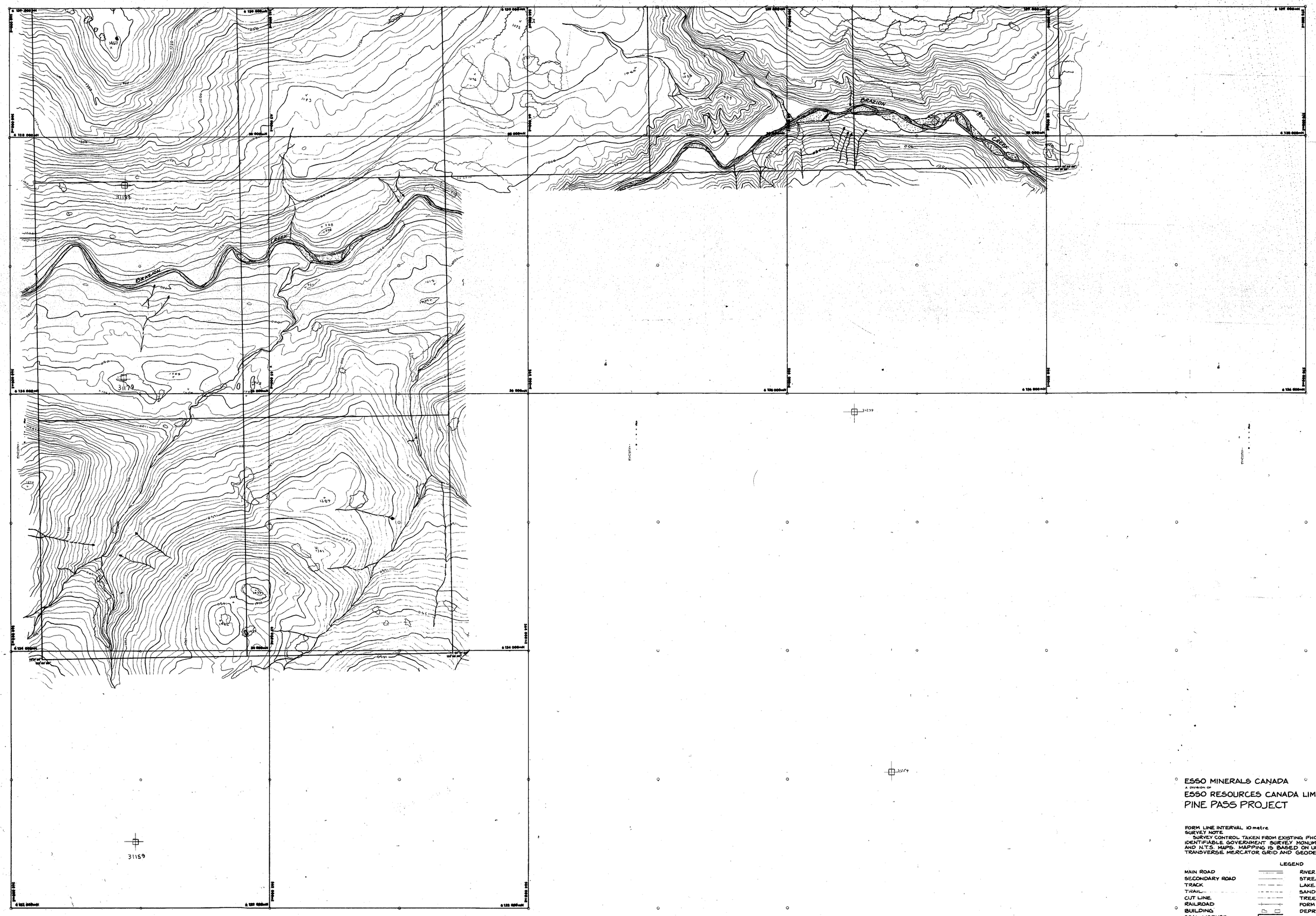
LEGEND
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
TREE LINE
SAND
LAKE
RAILROAD
POWER LINES
RIVER
STREAM
DEPRESSION ROPE LINE
SPOT HEIGHT
COAL LEASE

INDEX
1
2
3

930-7

ROPO PINE PASS PROJECT 930-7
MAP #1

TOPO. PINE PASS PROJECT 930-7
MAP # 3



31139

0.5 0 1 Mile

1000 metres 500 0 2km

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PINE PASS PROJECT

FORM LINE INTERVAL 10 metre
SURVEY NOTE
SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

LEGEND

MAIN ROAD		RIVER	
SECONDARY ROAD		STREAM	
TRACK		LAKE	
TRAIL		SAND	
CUT LINE		TREE LINE	
RAILROAD		FORM LINES	
BUILDING		DEPRESSION FORM LINE	
COAL LICENCE		SPOT HEIGHT	x1049

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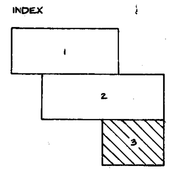

HARDY ASSOCIATES (1978) LTD. JOB NO 80408

522 82-Falling Creek 80(2)A

ESSO MINERALS CANADA
COAL DEPARTMENT

FALLING CREEK

JUNE 1981

930-7

TOPO. PINE PASS PROJECT 930-7
MAP # 2

58400

58200

57200

57200

0.5 0 1 Mile

1000 metres 0 2 km

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PINE PASS PROJECT

FORM LINE INTERVAL 10 metres
SURVEY NOTE
HORIZONTAL CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

LEGEND

MAIN ROAD	RIVER
SECONDARY ROAD	STREAM
TRACK	LAKE
TRAIL	SAND
CUT LINE	TREE LINE
RAILROAD	FORM LINES
BUILDING	DEPRESSION FORM LINE
COAL LICENCE	SPOT HEIGHT

INDEX

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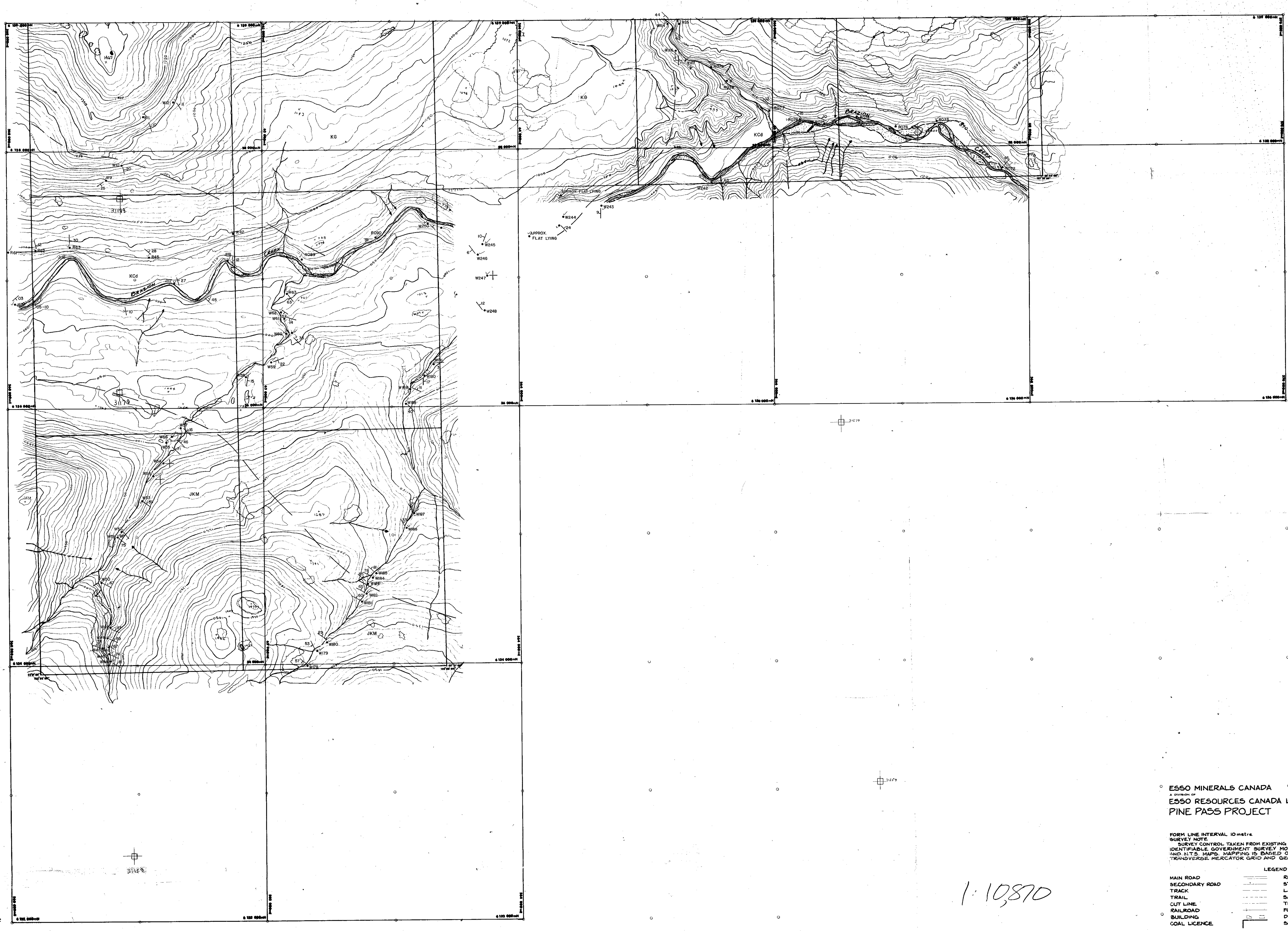
ESSO MINERALS CANADA
COAL DEPARTMENT
FALLING CREEK

JUNE 1981 930-7

930-7

TOPO PINE PASS PROJECT 93 O-7 GEOLOGY
MAP # 3



1:10,870

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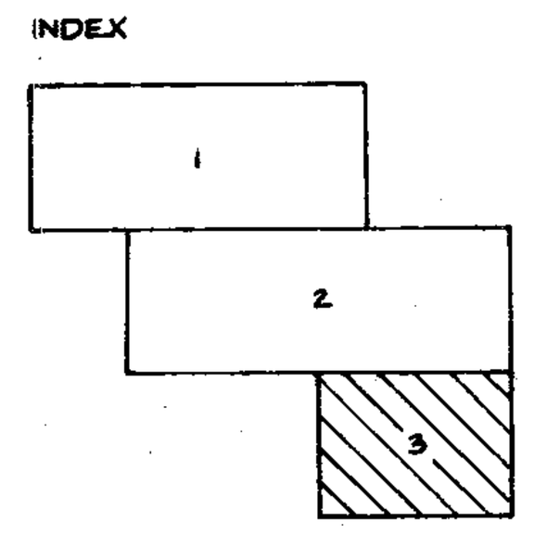
ESSO RESOURCES CANADA LIMITED
PINE PASS PROJECT

FORM LINE INTERVAL 10 metre
SURVEY NOTE
SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

LEGEND

MAIN ROAD	RIVER
SECONDARY ROAD	STREAM
TRACK	LAKE
TRAIL	SAND
CUT LINE	TREE LINE
RAILROAD	FORM LINES
BUILDING	DEPRESSION FORM LINE
COAL LICENCE	SPOT HEIGHT x969

INDEX



HARDY ASSOCIATES (1978) LTD. JOB Nº HO450

0.5 0 1 Mile

1000 metres 500 0 1 2 km

LEGEND

OUTCROP IDENTIFICATION NUMBER		•W301
GEOLOGICAL CONTACT	APPROXIMATE	
	ASSUMED	
BEDDING	HORIZONTAL	
	INCLINED	
	VERTICAL	
	OVERTURNED	
ANTICLINE	(DEFINED, APPROX.)	
SYNCLINE	(DEFINED, APPROX.)	
THRUST FAULT (TEETH IN DIRECTION OF DIP)	DEFINED	
	APPROXIMATE	
DRILLED LOGGED WITH COAL		•

MOOSEBAR FORMATION	KM	CADOMIN FORMATION	KG
GETHING FORMATION	KCd	MINNES GROUP	JKM

522 PR-Falling Creek 80(2)A

ESSO MINERALS CANADA
COAL DEPARTMENT

map is used for 5227bP03 digitized CALGARY file. digitized Apr 23/90

5227bP03

FALLING CREEK
GEOLOGICAL MAP

JUNE 1981

930-7

#3

PR Falling Creek 82C(3)A

APPENDIX I

METERS DEPTH from	to	THICKNESS	DESCRIPTION
0	4.9	4.9	Casing, bedrock encountered at 1 m.
4.9	10.1	5.2	Siltstone; dark grey, hard.
10.1	21.4	11.3	Mudstone; medium grey, silty at 12 m sample 12-18 taken.
21.4	25.0	3.6	Siltstone; dary grey.
25.0	28.3	3.3	Mudstone; grey.
28.3	37.2	8.9	Mudstone; grey-brown, slightly silty.
37.2	43.6	6.4	Siltstone with minor Sandstone; black to dark grey, very hard.
43.6	50	6.4	Siltstone; medium grey, non-calcareous.
50	52.4	2.4	Mudstone; black, carbonaceous.
52.4	55.5	3.1	Sandstone; light grey, medium grained, calcareous.
55.5	58.5	3.0	Sandstone; light grey, medium grained, calcite stringers.
58.5	64.6	6.1	Sandstone; dary brown-grey, medium fine grained, calcarcous.
64.6	67.7	3.1	Sandstone; greyish-brown, fine grained, non-calcareous.
67.7	70.7	3.0	Sandstone; medium grey, fine grained.
70.7	82.0	11.3	Mudstone; dark grey-black, carbonaceous.
82.0	83.8	1.8	Mudstone & Coal zone;
83.8	86.3	2.5	Sandstone; grey, medium - fine grained at 85 sample 280 taken.
86.3	89,0	2.7	Siltstone; dark grey, medium - fine grained, calcareous.
89.0	98.1	9.1	Sandstone; dark grey, fine grained calcareous.
98.1	100.9	2.8	Siltstone; muddy, calcareous.
100.9	104.2	3.3	Coal & mudstone; approx. 1 m of coal in this zone at 104 sample 342 taken.
104.2	107.3	3.1	Mudstone & coal; black.
107.3	110.3	3.0	Mudstone; dark grey-black, slightly calcarcous.
110.3	113.7	3.4	Mudstone; meadium grey-black, minor coal fragments.
113.7	116.4	2.7	Sandstone; dark grey, medium to fine grained, strongly calcareous.
116.4	119.5	3.1	Mudstone; dark grey, silty, slightly calcareous.
119.5	112.8	3.3	Mudstone; carbonaceous at 122.5 sample 402 taken.
122.8	125.9	3.1	Sandstone & siltstone; grey, fine grained.
125.9	128.9	3.0	Sandstone; grey, medium grained, non-calcareous.
128.9	140.5	11.5	Sandstone; grey, medium grained, non-calcareous.

APPENDIX I

METERS DEPTH from	to	THICKNESS	DESCRIPTION
140.5	141.7	1.2	Mudstone; carbonaceous.
141.7	143.9	2.2	Siltstone & Mudstone; carbonaceous.
143.9	147.2	3.3	Siltstone; medium dark grey, strongly calcaceous.
147.2	152.4	5.2	Siltstone; dark grey, strongly calcaceous.
152.4	158.8	6.4	Mudstone; greyish brown, silty, non-calcaceous. some coal fragments.
158.8	165.2	6.4	Mudstone with minor Siltstone; black and grey, some minor coal stringers.
165.2	168.2	3.0	Siltstone, coal & mudstone; dark grey-black fine grained.
168.2	171.3	3.1	Mudstone; black, slightly silty, calcaceous.
171.3	176.2	4.9	Sandstone; grey, medium to fine grained, non-calcaceous.
176.2	189.3	13.1	Mudstone; dark grey-black, silty.
189.3	195.7	6.4	Sandstone; light grey, medium grained, non-calcaceous.
195.7	201.8	6.1	Sandstone; medium grey, medium grained, non-calcaceous.
201.8	207.9	6.1	Siltstone; dark brownish-grey, non-calcaceous at 207.2 mudstone band with strong sulphur dioxide aroma.
207.9	213.4	5.5	Siltstone; dary grey, calcaceous.
213.4	232.3	18.9	Mudstone locally with coal; dark grey, highly carbonceous at 220 sample 722.
232.3	238.4	6.1	Sandstone; dark grey, fine grained.
238.4	240.5	2.1	Siltstone; dark grey, muddy, calcaceous.
240.5	243.2	2.7	Sandstone; dark grey; medium grained, non-calcaceous.
243.2	250.5	7.3	Sandstone, siltstone and mudstone.
250.5	253.0	2.5	Siltstone; dark grey, slightly calcareous.
253.0	256.6	3.6	Sandstone; medium-course grained, slightly calcaceous.
256.6	261.5	4.9	Sandstone; light grey, course grained, slightly calcaceous, very hard drilling.
261.5	268.9	7.4	Sandstone; light grey, medium - course grained, slightly calcaceous, very hard drilling.
TD 268.9			

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522

BR. Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-0-8 DRILL HOLE OR OUTCROP NUMBER J020

SEAM NAME J020 LOCATION UTM EASTING 546630 NORTHING 6161330

FORMATION GETHING FM ELEVATION 840 M

COMMENTS OVERCAST ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 25 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SILTY SAND-STONE								JOINTED, HARD, FINE GRAINED (5 M THICK)
	0		COAL	J020-1	9.2	31.4	59.4	0.60	----		VITRAIN, CUBIC JOINTING
J020-1	99		COAL	J020-2	9.9	31.3	58.8	0.64	----		MORE WEATHERED, NO CUBIC STRUCTURE
J020-4 J020-2				J020-4	10.1	29.4	60.5	0.68	----		
	160		COAL	J020-3	5.0	27.5	67.5	0.83	----		VITRAIN
J020-3	200										
	220		SILT-STONE								FISSILE, HARD (1 M THICK)

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PR - Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-0-8 DRILL HOLE OR OUTCROP NUMBER J128

SEAM NAME J128 LOCATION UTM EASTING 557330 NORTHING 6146590

FORMATION GETHING FM ELEVATION 1195 M

COMMENTS SUNNY & CLEAR ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST J. LEHTINEN DATE 1 JULY 80

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL (CM)	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.	
			CARB SHALE							CARBONACEOUS
	0		COAL	J128-1	34.6	18.2	47.2	0.39	---	VITRAIN
	22		COAL	J128-1						MACERATED WITH IRON STAINING (SIMILAR TO BIRD'S EYE TEXTURE
	38		COAL	J128-1						VITRAIN
J128-1	55		COAL	J128-1						CLARAIN & VITRAIN
	83		SHALE	J128-1						CARBONACEOUS & COALY SHALE
	90		COAL	J128-1						VITRAIN
	107		CARB SHALE INTBDD	J128-1						CARB SHALE WITH VITRAIN BANDS
	119		COAL	J128-1						VITRAIN
	127		SHALE							BROWN, CONTAINS CLAY & MINOR COALIFIED MATERIAL PARTING
	151		COAL							VITRAIN FRACTURED: CONTAINS MINOR FAULTS
J128-3	162		CARB SHALE	J128-3	39.8	16.4	43.8	0.36	---	CARBONACEOUS. DARK GREY BROWN HAS CONCRETIONARY LAYER AT BASE -- IRON STAINED
	206		COAL	J128-2	21.6	19.8	58.6	0.4-	---	VITRAIN
	228		MUD SHALE	J128-2						FINELY FRACTURED & SLICKEN-SIDED SHALE
	237		COAL	J128-2						
	240		SANDSTONE	J128-2						ANGULAR GRAINS, SILICA CEMENT GRAIN SIZE APPROX 3.5 Ø
	245		COAL	J128-2						VITRAIN
J128-2										
	317		SANDSTON	J128-2						SILICA CEMENT, ANGULAR CHALCOPHYRITE ON BEDDING PLANE
	322		COAL	J128-2						VITRAIN
	349		CARB SHALE							CARB., OLIVE GREY

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PR-Falling Creek 82K3A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R003

SEAM NAME R003 LOCATION UTM EASTING 548710 NORTHING 6160790

FORMATION GETHING FM ELEVATION 1053 M

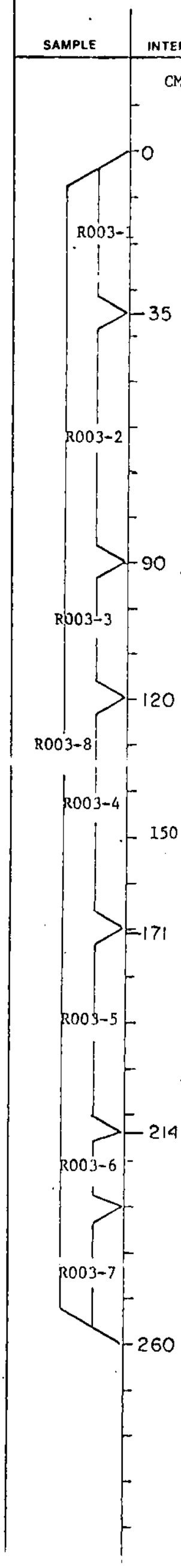
COMMENTS SUNNY, COAL DAMP ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 22 MAY 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION



SAMPLE	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
		SILTY SAND-STONE								(4 M THICK)
R003-1		SHALE	R003-1	71.3	13.2	15.5	0.26	----		SHALE WITH VITRAIN BANDS
R003-2		COAL	R003-2	11.0	29.6	59.4	0.88	----		DURAIN
R003-3		SHALE	R003-3	76.6	11.5	11.9	0.26	----		WEATHERED YELLOW
R003-8		COAL	R003-4	9.9	29.9	60.2	0.48	----		CLARAIN
R003-4			R003-8	42.9	21.2	35.9	0.47	----		
R003-5		SHALY COAL	R003-5	50.9	19.0	30.1	0.48	----		
R003-6		COAL	R003-6	27.9	24.7	47.4	0.65	----		CLARAIN WEATHERED A YELLOW-ORANGE
R003-7		COAL	R003-7	14.2	29.5	56.3	0.59	----		VITRAIN WITH SOME CHARCOAL CUBIC JOINTING
		SHALE								HARD (2.5 M THICK)

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PR Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R040

SEAM NAME R040 LOCATION UTM EASTING 563130 NORTHING 6139750

FORMATION GETHING FM ELEVATION 1140 M

COMMENTS SHADY ON A BRIGHT & SUNNY DAY ORIGIN OF LOG: CORE ____ CHIP SAMPLES ____

COAL HEAVILY WEATHERED GEOPHYSICAL LOG ____ OUTCROP ____

GEOLOGIST P.M. WATERS DATE 12 JUNE 80

RANK: HIGH VOLATILE A BIUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.	
	CM		SILTY SAND-STONE							SILTY, (½ M ± THICK)
		? ?								NB - TOP OF SEAM IS COVERED - PROBABLY NEW COAL
R040-1 R040-7	0		COAL	R040-1	10.2	32.1	57.7	0.65	0	ATTRITAL COAL - CLARAIN TRACE LIMONITE STAINING BED SIZE RANGES FROM .3 - 1 CM CLEATS HAVE SAME SPACING
				R040-7	28.7	29.2	42.1	0.36		
R040-2	31		COAL	R040-2	22.9	31.3	45.8	0.46	---	DULL COAL (CLARAIN/DURAIN) TRACE BRICK RED STAINING 1-2 CM BEDS; CLEATS SAME SPAC
R040-3	50		SANDY CLAY	R040-3	60.1	37.7	2.2	0.50	--	BRICK RED, SANDY DISCONTINUOUS, V. SOFT (COULD BE PART OF SEAM THAT HAS BEEN BURNT)
	66		COAL	R040-4	12.2	28.7	59.1	0.21	--	DULL COAL (CLARAIN/DURAIN) LIMONITE STAINING COMMON
R040-4 R040-5	80		COAL	R040-5	14.8	26.5	58.7	0.58	--	ALTERNATING LAYERS OF VITRAIN & ATTRITAL COAL (MOD. HARD) WITH V.SOFT MUSHY LAYERS TRACE IRON STAINING PRESENT
R040-6	98 100		COAL	R040-6	46.5	20.3	33.2	0.53	--	BLACK, WET, MUSH SHALEY COAL
	113		SHALE							BROWN, MOD. HARD 2-5 CM BEDS - ROOTS (1 M + THICK)

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PR-Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R046

SEAM NAME R046 LOCATION UTM EASTING 561015 NORTHING 6141615

FORMATION GETHING FM ELEVATION 1170 M

COMMENTS SUNNY - DAMP COAL ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 13 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SAND-STONE								FISSILE TO PLATY BLUE CLEAN LOWER CONTACT
R046-1	0		SHALY COAL	R046-1	23.7	27.3	49.0	0.40	---		SHALY HARD
R046-2	40		COAL	R046-2	21.1	25.4	53.5	0.47	0		VITRAIN
R046-3	65		SHALE	R046-3	62.8	14.2	23.0	0.25	---		
	105		SHALE								HARD

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PR-Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R047

SEAM NAME R047 LOCATION UTM EASTING 560950 NORTHING 6141720

FORMATION GETHING FM ELEVATION 1167 M

COMMENTS SUNNY
WET COAL
~100 M from R046

ORIGIN OF LOG: CORE -- CHIP SAMPLES --
GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST R.L. DONALD DATE 13 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		??								
R047	0		COAL	R047	15.5	32.2	52.3	0.33	0		VITRAIN
	35		COALY SHALE								COALY, HARD

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PR - Falling Creek 8(X.3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R048

SEAM NAME R048 LOCATION UTM EASTING 556600 NORTHING 6142145

FORMATION GETHING FM ELEVATION 1180 m

COMMENTS Sunny ORIGIN OF LOG: CORE -- CHIP SAMPLES --

SEAM RAPIDLY FILLING WITH WATER GEOPHYSICAL LOG -- OUTCROP x

GEOLOGIST R.L. DONALD DATE 13 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	cm		SHALE								HARD, CLEAN (.3 m THICK)
R048	0		COAL		30.3	23.0	46.7	0.27	--		VITRAIN
	50		SHALE								HARD

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PR-Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R049

SEAM NAME R049-A LOCATION UTM EASTING 560650 NORTHING 6142375

FORMATION GETHING FM ELEVATION

COMMENTS SUNNY ORIGIN OF LOG: CORE -- CHIP SAMPLES --

WET COAL GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST R.L. DONALD DATE 6 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SHALE								WEATHERED, FISSILE, HARD (1 M THICK)
	0		COAL	R049A	19.9	28.4	51.7	0.27	---		NO PARTINGS
R049A	50										
	100										
	150		?								HIT WATER LEVEL AT 1.5 M THEREFORE COULD NOT DEEPER - POSSIBLE MORE SEAM

522

PR-Falling Creek 80(3)A

ESSO MINERALS CANADA -- COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-0-8 DRILL HOLE OR OUT ROP NUMBER R049

SEAM NAME R049 - B LOCATION UTM EASTING 560650 NORTHING 6142375

FORMATION GETHING FM ELEVATION 1150 M

COMMENTS SUNNY ORIGIN OF LOG: CORE - CHIP SAMPLES -

DAMP COAL GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 13 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SAND-STONE								FINE GRAINED HARD JOINTED (8 M THICK)
R049	0		COAL	R049	35.1	24.5	40.4	0.36	--		NO PARTINGS VITRAIN
	50										
	70		CARB SHALE								FISSILE, HARD GRADATIONAL CONTACT WITH COAL (2 M THICK) N.B, BETWEEN 5.5 & ?COAL IS SLUMPED AREA APPROX 1 1/2 FEET

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PR-Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R051

SEAM NAME R051 LOCATION UTM EASTING 560465 NORTHING 6142375

FORMATION GETHING FM ELEVATION 1163 M

COMMENTS SUNNY ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 13 JUNE 80

RANK: MEDIUM VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SAND-STONE						---		LIMY, HARD (.2 M THICK)
	0		MUD-STONE	R051-4	78.6	10.4	11.0	0.16	---		CONTAINS VITRAIN BANDS MEDIUM HARD
R051-4											
	65		COAL	R051-3	5.3	26.3	68.4	0.79	0		CLARAIN - WITH LINEATIONS
R051-3				R051-5	44.7	17.9	37.4	0.46	---		
R051-5											
	145		SHALE	R051-2	75.1	10.0	14.9	0.21	---		HARD
	155		COAL	R051-1	47.0	17.6	35.4	0.44	---		CLARAIN MANY LINEATIONS
R051-1											
	220		CARB SHALE								FISSILE, HARD (3.5 M THICK)

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PR Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R054 A

SEAM NAME R054-A LOCATION UTM EASTING 558970 NORTHING 6143790

FORMATION GETHING FM ELEVATION 1150 M

COMMENTS SUNNY - WITH CLOUDS ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 15 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SILT-STONE								HARD (3 M THICK)
	0		COAL	R054-1	61.3	16.4	22.3	0.45	----		YELLOW STAINING
R054-1	50										
	83		MUD-STONE	R054-2	79.5	11.5	9.0	0.29	----		HARD WAVY CONTACTS*
R054-2	105		COAL	R054-3	24.2	27.4	48.4	0.68	----		
R054-6				R054-6	60.2	16.1	23.5	0.45	----		
R054-3	150										
	176		MUD-STONE	R054-4	75.8	12.9	11.3	0.32	----		HARD
R054-4	196		COAL	R054-5	70.1	13.8	16.1	0.37	----		
R054-5											
	250		SAND-STONE								HARD, SLUMPED FOR 1.5 M SLICKENSIDES PRESENT (2 M THICK)

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PR - Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R054

SEAM NAME R054-B LOCATION UTM EASTING 558970 NORTHING 6143790

FORMATION GETHING FM ELEVATION 1150 M

COMMENTS CLOUDY - LITTLE BIT OF RAIN ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP x

GEOLOGIST R.L. DONALD DATE 15 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SILT-STONE								PLATY, HARD WITH CLEAN LWR CNT. (3 M THICK)
	0										
R054-7			COAL	R054-7	13.5	26.7	59.8	0.65	0		VITRAIN AND CLARAIN
	50		COALY SHALE	R054-8	65.3	13.3	21.4	0.32	--		CALY, HARD
R054-8											
R054-10	100			R054-10	46.5	19.9	34.4	0.39	--		
	138		COAL	R054-9	38.0	22.2	39.8	0.49	--		VITRAIN & CLARAIN
R054-9											
	200										
	210		CARB SILT-STONE								CARBONACIOUS HARD, FISSILE (1 M THICK)

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PR-Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R058

SEAM NAME R058-A LOCATION

FORMATION GETHING FM ELEVATION

COMMENTS SUNNY ORIGIN OF LOG: CORE - CHIP SAMPLES -

GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 30 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		MUD-STONE								FISSILE, MEDIUM HARD (3 M THICK)
R058A-1	0		COAL	R058A-1	32.3	24.1	43.6	0.62	----		IRON STAINED
R058A-2	49		MUD-STONE	R058A-2	89.3	7.0	3.7	0.14	----		FISSILE, MEDIUM HARD.
R058A-3	91		COAL	R058A-3	37.6	22.2	40.2	0.39	----		MOSTLY VITRAIN
R058A-4	140		MUD-STONE	R058A-4	83.0	9.6	7.4	0.14	----		FISSILE, MEDIUM HARD
R058A-10	158		COAL	R058A-5	25.1	25.8	49.1	0.53	----		VITRAIN AND CLARAIN
R058A-5				R058A-10	53.2	18.2	28.6	0.33	----		
R058A-6	277		MUD-STONE	R058A-6	84.6	8.7	6.7	0.12	----		
	285		COAL	R058A-7	37.5	22.9	39.6	0.46	----		VITRAIN & CLARAIN (AS ABOVE)
R058A-7											
R058A-8	350		MUD-STONE	R058A-8	79.3	10.1	10.6	0.14	----		FISSILE, MEDIUM HARD
R058A-9	370		COAL	R058A-9	20.5	27.7	51.8	0.4-	----		
	400		MUD-STONE								FISSILE, MEDIUM HARD (5 M THICK)

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PR. Falling Creek 82E3A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R058

SEAM NAME R058 - B LOCATION U.T.M. EASTING 556428 NORTHING 6142205

FORMATION GETHING FM ELEVATION 1130 M

COMMENTS CLOUDY
~8 M LATERALLY SOUTH FROM R058 - A

ORIGIN OF LOG: CORE -- CHIP SAMPLES --
GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST R.L. DONALD DATE 30 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I		
	CM		MUD-STONE								FISSILE, MEDIUM HARD (5 M ± THICK)
R058B	0		COAL	R058B	25.2	29.0	45.8	0.49	--		VITRAIN, IRON STAINED BLOCKY CLEAT
	100		SILT-STONE								FISSILE, HARD (5 M + THICK)
	150										

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PR-Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R058

SEAM NAME R058-C LOCATION UTM EASTING 556428 NORTHING 6142205

FORMATION GETHING FM ELEVATION 1130 M

COMMENTS SUNNY ORIGIN OF LOG: CORE -- CHIP SAMPLES ----

SEAM COVING IN WITH RAPID WATER INFILL GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST R.L. DONALD DATE 30 JUNE 80

RANK: HIGH VOLATILE A BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SILT-STONE								HARD, FISSILE (5 M + THICK)
R058C	0		COAL	R058C	18.5	30.5	51.0	0.30	0		VITRAIN - MUSHY
	50										
	100										
	150										
	200										
	210		SILT-STONE								HARD (5 M + THICK)

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PR - Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER R071

SEAM NAME R071 LOCATION U.T.M. EASTING 551640 NORTHING 6/48050

FORMATION GETHING FM ELEVATION 1320 M

COMMENTS SUNNY ORIGIN OF LOG: CORE -- CHIP SAMPLES --

SLOPE SLUMPED GEOPHYSICAL LOG -- OUTCROP --

GEOLOGIST R.L. DONALD DATE 20 JUNE

RANK: LOW VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		NUMBER	ASH%	V.M. %	F.C.%	S%	F.S.I.		
	CM		SILTY SAND-STONE								HARD, JOINTED
R071	0		COAL	R071	9.9	18.2	71.9	0.67	---		VITRAIN, HARD, BRIGHT CUBIC JOINTING
	50										
	100										
	150										
	175		COALY SHALE								HARD

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PR - Falling Creek 8X(3)A

TECK MINERALS CANADA — COAL DEPARTMENT
GRAPHIC COAL SEAM LOG

PROPERTY: FALLING CREEK
NTS LOCATION: 93-0-8
DRILL HOLE OR OUTCROP NUMBER: R087
SEAM NAME: R087
LOCATION UTM EASTING: 548370
LOCATION UTM NORTHING: 6161850
FORMATION: GETHING FM
ELEVATION: 785 M
COMMENTS: SEAM IN SHADE
ORIGIN OF LOG: CORE -- CHIP SAMPLES --
GEOPHYSICAL LOG -- OUTCROP X
GEOLOGIST: R.L. DONALD
DATE: 30 JUNE 80
RANK: LOW VOLATILE BITUMINOUS COAL

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL CM	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.	DESCRIPTION
			CARB. SHALE							CARBONACEOUS, NON-FISSILE, HARD (0.5 M to].0 M THICK)
	0		COAL	R087	19.8	13.0	67.2	0.60	--	VERY HARD SOLID DURAIN CUBIC JOINTING NOT WELL DEFINED
	50									
R087										
	100									
	150									
	160		SHALE							NON-FISSILE, HARD (3 M THICK)

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PR-Falling Creek 80(3)A

FSSO MINERALS CANADA -- COAL DEPARTMENT
GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-0-8 DRILL HOLE OR OUTCROP NUMBER R088

SEAM NAME R.088 LOCATION UTM EASTING 559550 NORTHING 6147470

FORMATION GETHING FM ELEVATION 1263 M

COMMENTS SUNNY WITH OUTCROP IN SHADE
COAL WAS VERY WET WHEN SAMPLED. THE FLOOR WAS NOT EXPOSED

ORIGIN OF LOG: CORE - CHIP SAMPLES -
GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST R.L. DONALD DATE 1 JULY 80

RANK: LOW VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL CM	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.	
			SILT-STONE							LAMINATED, HARD (1 M THICK)
R088-2	0		COAL	R088	7.7	14.2	78.1	0.31	---	DURAIN & CLARAIN IRON STAINED
	60		COALY SHALE	R088						HARD
R088-1	90		COAL	R088						HARD VITRAIN, CLARAIN CLARAIN COAL IRON STAINED
R088-2	155			R088						FAULTED MATERIAL GOUGE, SOFT AND MUSHY
R088-2	170		COAL	R088						HARD SILVER COLORED, HIGHLY JOINTED COAL IRON STAINED
	200									FLOOR IS COVERED

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PR - Falling Creek 80C3DA

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK

NTS LOCATION 93-0-8

DRILL HOLE OR OUTCROP NUMBER W023

SEAM NAME W 023

LOCATION UTM EASTING 559490 NORTHING 6144780

FORMATION GETHING FM

ELEVATION 1081 M

COMMENTS OVERCAST AND RAINY
SEAM VERY BADLY BROKEN UP

ORIGIN OF LOG: CORE - CHIP SAMPLES -
GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST P.M. WATERS
R.L. DONALD

DATE 27 MAY 80
23 JUNE 80

RANK: MEDIUM VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SHALE								BROWN, POORLY JOINTED CALCITE VEINS, HARD (2 M THICK)
	0		COAL	W023-1	22.6	24.3	53.1	0.61	---		VITRAIN & SOME CLARAIN
W023-1				W023-6	26.3	22.9	50.8	0.55	---		
	90		SHALE								TOO SMALL TO SAMPLE
	95		COAL	W023-2	44.9	20.0	35.1	0.40	---		
W023-6	107		SHALE	W023-3	45.6	18.6	35.8	0.47	---		
W023-3	124		COAL	W023-4	39.5	22.0	38.5	0.48	---		
W023-4	146		SHALE	W023-5	11.7	25.1	63.2	0.65	---		
	156		COAL	W023-5							VITRAIN, FISSILE, YELLOW ON SURFACE
W023-5											
	230		SILTY SHALE								BROWN, JOINTED, HARD (1 M+ THICK)

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PR-Falling Creek Rd (3)A

ESSO MINERALS CANADA — COAL DEPARTMENT
GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK

NTS LOCATION 93-0-8

DRILL HOLE OR OUTCROP NUMBER W090

SEAM NAME W090

LOCATION EASTING 566200 UTM NORTHING 6140475

FORMATION GETHING FM

ELEVATION 1083 m

COMMENTS SUNNY DAY, AREA IN SHADE
SEAM SAMPLED IN RAIN
OUTCROP IS WELL EXPOSED

ORIGIN OF LOG: CORE -- CHIP SAMPLES --

GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST P.M. WATERS DATE 7 JUNE 80

RANK: MEDIUM VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		CARB. SHALE								FISSILE, CARBONACEOUS FRACTURED (2M THICK)
W090-3	0		COAL	W090-1	3.4	16.3	80.3	0.44	--		VITRAIN, LARGE CUBES CONTAINS RED STAINS, MOSTLY RUST & SOME PEACOCK STAINING
W090-1	50			W090-3	6.8	18.3	74.9	0.46	--		
	100		COAL	W090-2	38.7	15.0	46.3	0.27	--		VITRAIN, CUBES SMALLER (THAN ABOVE) SOFT
W090-2	150		CARB. SHALE & COALY SHALE (INTBDO)								CARBONACEOUS & COALY FISSILE (1 M THCK)

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PR- Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-0-8 DRILL HOLE OR OUTCROP NUMBER W113

SEAM NAME W113 LOCATION EASTING 564940 UTM NORTHING 6139260

FORMATION BICKFORD FM ELEVATION 1004 M

COMMENTS RAIN DRIZZLE AND CLOUDY ORIGIN OF LOG: CORE -- CHIP SAMPLES --

NOT HEAVILY WEATHERED GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST P.M. WATERS DATE 27 JUNE 80

RANK: LOW VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		COALY SHALE								COALY BROWN, BLOCKY, MODERATELY HARD (.9 M THICK)
	0		SHALE	W113-1	84.3	7.6	8.1	0.23	--		BROWN, LENSES OF SIDERITE AND COAL BALLS PRESENT CONTACT AT BASE IS LENSY
W113-1	50		SHALE	W113-1							BROWN, CONTAINS 10% of 1 to 2 cm VITRAIN LENSES CONTACT AT BASE IS SHARP
	90		COAL	W113-2	39.0	16.7	44.3	1.21	--		80% CLARAIN, 10% VITRAIN 10% SHALE MOSTLY DULL IRON STAINING ON CLEAT
W113-2	100										
	120		SHALE	W113-3	83.3	8.0	8.9	1.08	--		BROWN, HARD CONTAINS RARE 0.5 CM VITRAIN BANDS
W113-3	150										
W113-5				W113-5	65.9	11.9	22.2	1.69	--		CONTACT GRADATIONAL OVER 20 CM
	170		SHALE	W113-4	75.1	10.4	14.5	1.91	--		BROWN, COALY VERY THINNLY LAMINATED CONTACT AT BASE IS SHARP
W113-4	200										
	220		COAL	W113-6	39.1	17.5	43.4	2.05	--		SHALY, MOSTLY DULL CLARAIN CONTACT AT BASE IS SHARP
W113-6	240		SHALE								LIGHT BROWN, HARD IRON STAINS ON JOINTS (2 M THICK)

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PR - Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-0-8 DRILL HOLE OR OUTCROP NUMBER W123

SEAM NAME W123 LOCATION EASTING 563220 U.T.M. NORTHING 6]487]0

FORMATION GETHING FM ELEVATION 906 M

COMMENTS SUNNY DAY ORIGIN OF LOG: CORE -- CHIP SAMPLES --

OUTCROP IN THE SHADE GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST R.L. DONALD DATE 13 JUNE 80

RANK: SEMIANTHRACITE

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SHALE								BUFF TO ORANGE COLOR NON-FISSILE, JOINTED HARD (1.3 m thick)
W123-1	0		COAL	W123-1	5.9	13.3	80.8	0.67	----		DURAIN VERY HARD MASSIVE WITH SOME CLEAT
W123-2	50		COAL	W123-2	3.6	15.4	81.0	0.67	----		CLARAIN
W123-3	65		COAL	W123-3	10.0	11.9	78.1	0.66	----		DURAIN ,a/a
W123-5				W123-5	12.5	12.6	74.9	0.67	----		
W123-4	100		COAL	W123-4	52.6	9.7	37.7	0.41	----		CLARAIN
	110		SHALE								NON-FISSILE, HARD JOINTED (1 m+THICK)
	150										

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PR-Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER W167

SEAM NAME W 167 LOCATION UTM EASTING 562050 NORTHING 6144240

FORMATION GETHING FM ELEVATION 1143 M

COMMENTS OVERCAST
COAL HARD & STANDING UP WELL BUT COVERED
WITH WATER

ORIGIN OF LOG: CORE - CHIP SAMPLES -
GEOPHYSICAL LOG - OUTCROP X

GEOLOGIST P.M. WATERS DATE 23 JUNE 80

RANK: LOW VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SILT-STONE								SANDY, BROWN, LAMINATED CONTAINS ROOTLETS JOINTED GRADATIONAL CONTACT AT BASE
	0		SILTY SHALE								BROWN, SILTY
	30		COALY SHALE								CONTAINS MINOR BENTONITE
	45		COAL	W167-1	20.2	14.1	65.7	0.51	---		BRIGHT, VERY HARD MOSTLY BRIGHT CLARAIN
W167-1											
	100			W167-3	13.9	14.2	71.9	0.58	---		
W167-3											
	130										FAULT - SEVERAL PLANES CUT OBLIQUELY ACROSS SEAM
				W167-2	7.7	15.4	76.9	0.57	---		
W167-2											
	185		CLAY								DARK BROWN, VERY SOFT
	190		SHALE								DARK BROWN, MINOR IRON STAINING AT THE TOP

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PR - Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-O-8 DRILL HOLE OR OUTCROP NUMBER W210

SEAM NAME W210 LOCATION UTM EASTING 563330 NORTHING 6145030

FORMATION GETHING FM ELEVATION 1187 m

COMMENTS OVERCAST ORIGIN OF LOG: CORE -- CHIP SAMPLES --

HIGHLY WEATHERED SEAM GEOPHYSICAL LOG -- OUTCROP X

GEOLOGIST P.M. WATERS DATE 23 JUNE 80

RANK: LOW VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	cm										
	0		SHALE INTBDD Y COAL								80% BROWN SHALE 20% COAL COAL IS BROKEN, SHALE IS MODERATELY RESISTANT NO MINERLIZATION LOWER CONTACT IS SHARP
	50										
	100										
	150										
	200										
W210-1 W210-4 W210-2 W210-5	225		SHALE & COAL	W210-1	51.3	15.0	33.7	0.40	--		50% BROWN SHALE } INTERBEDDED 50% COAL } BADLY BROKEN AND SHEARED NO MINERALIZATION LOWER CONTACT IS SHARP
	265		COAL	W210-2	14.3	19.1	66.6	0.67	--		MOSTLY DULL DURAIN MINOR BRIGHT CLARAIN NO PARTINGS BADLY BROKEN, SHEARED, POWDERY POOR CLEAT DEVELOPMENT NO MINERALIZATION
	300			W210-4	36.1	16.1	47.8	0.46	--		
				W210-5	40.1	15.2	44.7	0.50	--		
	330		SHALE	W120-3	50.1	13.7	36.2	0.46	--		66% BROWN SHALE } INTERBEDDED 33% 1-2 CM COAL BANDS } BADLY SHEARED SOME IRON STAINING ON CLEAT LOWER CONTACT IS SHARP
	350										
W210-3	400										
	420		SHALE								COALY TO CARBONACEOUS BROWN SHALE MASSIVE, HARD (1 M THICK)

LEAVE THIS AREA FOR FILING

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PR Falling Creek 80(3)A

ESSO MINERALS CANADA — COAL DEPARTMENT

GRAPHIC COAL SEAM LOG

PROPERTY FALLING CREEK NTS LOCATION 93-0-8 DRILL HOLE OR OUTCROP NUMBER W224

SEAM NAME W224 LOCATION UTM EASTING 514570 NORTHING 6188190

FORMATION GETHING FM ELEVATION 1182 M

COMMENTS BRIGHT HAZY DAY ORIGIN OF LOG: CORE - CHIP SAMPLES -

COAL IS HARD AND FRACTURED GEOPHYSICAL LOG - OUTCROP X

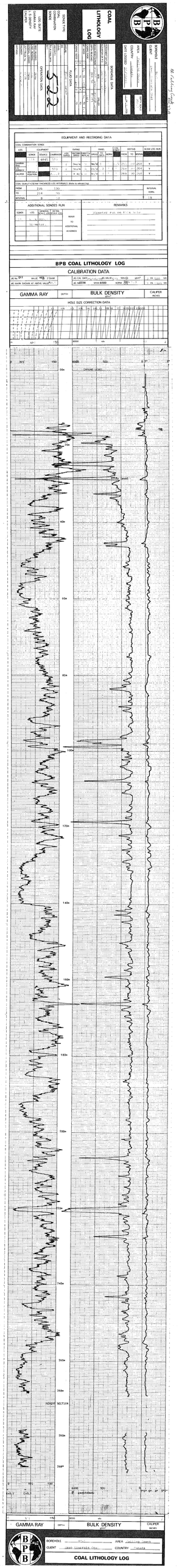
GEOLOGIST P.M. WATERS DATE 30 JUNE 80

RANK: LOW VOLATILE BITUMINOUS COAL

DESCRIPTION

ANALYSES CALCULATED ON A DRY BASIS

SAMPLE	INTERVAL	LITHOLOGY		SAMPLE NUMBER	ASH%	V.M.%	F.C.%	S%	F.S.I.		
	CM		SILTY SHALE								JOINTED FOSSILIFEROUS SHALE GRADING INTO COALY SHALE, HARD (0.5 M THICK)
	0		COAL	W224-1	11.9	17.8	70.3	0.38	---		90% BRIGHT CLARAIN 10% VITRAIN POORLY BEDDED COAL IS HARD CLEATS POORLY DEVELOPED CONJUGATE SHEARS WITH THE NARROW BESECTOR PARALLEL TO BEDDING, SOME SLICKENSIDES, 0 TO 2 CM COAL POWDER AND BRECCIA ON THE PLANES
W224-1	50										
W224-3	100			W224-3	29.2	15.5	55.3	0.43	---		
W224-2	160		COALY SHALE	W224-2	67.3	11.1	21.6	0.21	---		20% COAL 80% SHALE
	190		SILTY SHALE								BROWN SILTY SHALE MODERATE JOINTING GRADATIONAL TO SANDY SILT (2 M THICK)


COAL LITHOLOGY LOG
BPB
EQUIPMENT AND RECORDING DATA
BPB COAL LITHOLOGY LOG
CALIBRATION DATA
GAMMA RAY
BULK DENSITY
CALIPER
HOLE SIZE CORRECTION DATA
BOREHOLE SECTION
BOREHOLE
CLIENT
AREA
COUNTRY
COAL LITHOLOGY LOG

PR-Falling Creek 80(3)A

NEUTRON-NEUTRON 80

BOREHOLE 80-1

CLIENT Esso Minerals Coal

AREA Falling Creek

COUNTRY Canada

DATE LOGGED 01/10/80

DEPTH SCALE 1:500

2 OF 3 LOGS

BOREHOLE DATA

PERMANENT DATUM: See LT-1009/

ELEVATION OF P.D.:

MEASUREMENTS FROM: BPB | DRILLER

DEPTH REACHED:

CASING SHOE:

BIT SIZES: 1 TO 2 TO; 3 TO 4 TO

CASING SIZES: 1 TO 2 TO

FLUID DATA

NATURE: foam/air/water

S.G.:

LEVEL:

VISCOSITY:

Rm at meas. temp:

B.H.T.:

OPERATION DATA

FIRST READING: 269m

LAST READING: 40m

INTERVAL LOGGED: 229m

UNIT-TRUCK No.: 46/26

ENGINEER: MK/BC

WITNESS: WK

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EQUIPMENT AND RECORDING DATA

LOG	SONDE	SOURCE	CALIBRATOR	LOG TAPED	RECORD SPEED	DIRECT or REPLAY	SPEED	T.C. SECS	NORM.	CAL. COEFF.	FROM	TO	INTERVAL
N/N	18	6768	#4	Y	9m/m	D	9m/m	1	.82		269	00	269

ADDITIONAL SONDES RUN

SONDE	LOG	GENERAL SCALE LOG	DETAIL SCALE LOG

REFER TO ADDITIONAL HEADINGS

REMARKS

DEPTH	NEUTRON-NEUTRON LOG
	0 SNU 750

DEPTH	NEUTRON-NEUTRON LOG
	0 SNU 750

BOREHOLE 80-1

CLIENT Esso Minerals Coal

AREA Falling Creek

COUNTRY Canada

MY 95160 R

BPB

SEAM THICKNESS LOG

SONDE TYPE:
COAL COMBINATION SONDE

LOG SUITE:
CALIPER
BR DENSITY

BOREHOLE 80-1
CLIENT Esso Minerals Coal

AREA Falling Creek
COUNTRY Canada
DATE LOGGED 17/10/80

2 m = 5 Logs

Re-reading took place

BOREHOLE DATA — REFER TO LITHOLOGY LOG

OPERATION DATA — REFER TO LITHOLOGY LOG

EQUIPMENT AND RECORDING DATA

COAL COMBINATION SONDE

	LOG	TAPING	SERIAL POSITION	PANEL
CALIPER	1080	1080	3	3
BR	1080	1080	3	3
DENSITY	1080	1080	3	3
NORM	1080	1080	3	3

SOURCE SONDE AND CALIBRATION — REFER TO LITHOLOGY LOG

SEAM THICKNESS LOG INTERVALS

	FROM	TO	INTERVAL
1	234.5 m	237.8 m	3.3 m
2	237.8 m	243.5 m	5.7 m
3	243.5 m	249.9 m	6.4 m
4			
TOTAL INTERVAL			15.4 m

REMARKS

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B P B SEAM THICKNESS LOG

CALIPER INCHES | DEPTH | BED RESOLUTION DENSITY

7 6 5 dia 4 3 2

SBRDU 25000 15000

-94-
-96-
-98-
-100-
-218-
-220-
-222-
-224-

CALIPER INCHES | DEPTH | BED RESOLUTION DENSITY

SBRDU 25000 15000

BPB

BOREHOLE 80-1
CLIENT Esso Minerals Coal
AREA Falling Creek
COUNTRY Canada

SEAM THICKNESS LOG

MY86002B

PR-Falling Creek 80(3)A

COAL QUALITY LOG

BOREHOLE 80-1
CLIENT Esso Minerals Coal
AREA Falling Creek
COUNTRY Canada
DATE LOGGED [illegible]

DEPTH SCALE 20:1

4 OF 4 LOGS

SONDE TYPE: COAL COMBINATION SONDE

LOG SUITE: GAMMA RAY, L.S. DENSITY

BOREHOLE DATA — REFER TO LITHOLOGY LOG

OPERATION DATA — REFER TO LITHOLOGY LOG

EQUIPMENT AND RECORDING DATA

COAL COMBINATION SONDE

LOG	LOG TAPED	TAPING RECORD SPEED	DIRECT OR REPLAY	PANEL SPEED	T.C. SECS	SIDEWALL POSITION NORM.	CAL COEF
GAMMA RAY	[illegible]	2m/m	[illegible]	2m/m	2	[illegible]	[illegible]
L.S. DENSITY	[illegible]	2m/m	[illegible]	2m/m	[illegible]	[illegible]	[illegible]

SOURCE, SONDE AND CALIBRATION — REFER TO LITHOLOGY LOG

COAL QUALITY LOG INTERVALS

FROM	224m	100m
TO	217m	94m
INTERVAL	7m	06m
FROM		
TO		
INTERVAL		
INTERVAL TOTAL		

REMARKS

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BPB COAL QUALITY LOG

DEPTH	GAMMA RAY
	COAL BULK DENSITY g/cm³

HOLE SIZE CORRECTION DATA

1.2 1.25 1.3 1.35 1.4 1.45 1.5 1.55 1.6 1.7 1.8 1.9 2.0 2.2 2.4 3.0

2" 4" 6" 8"

150 API 0

6,000 sdu 0

6,000 sdu 0

150 API 0

DEPTH	COAL BULK DENSITY g/cm³
	GAMMA RAY

BOREHOLE 80-1
CLIENT Esso Minerals Coal
AREA Falling Creek
COUNTRY Canada

COAL QUALITY LOG

MY 88002 R

PR-Falling Creek 80(3)A

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DIPMETER ANALYSIS

CLIENT--- ESSO

BOREHOLE- 80-1

AREA------ FALLING CREEK

COUNTRY-- CANADA

COMMENTS.....

INTERPRETATION PARAMETERS

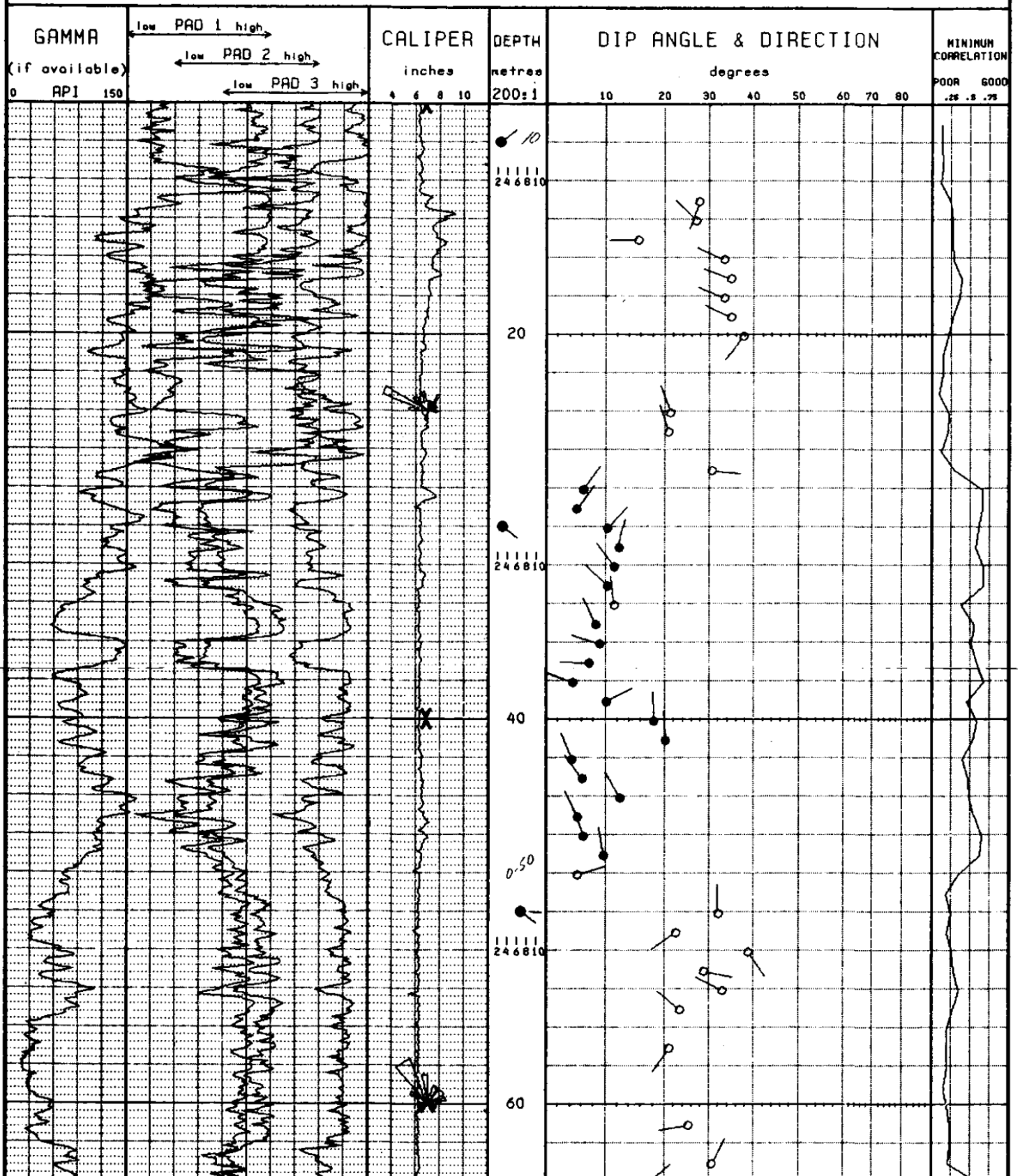
STEP 1.00m.
INTERVAL 2.00m.
SEARCH ANGLE 45°

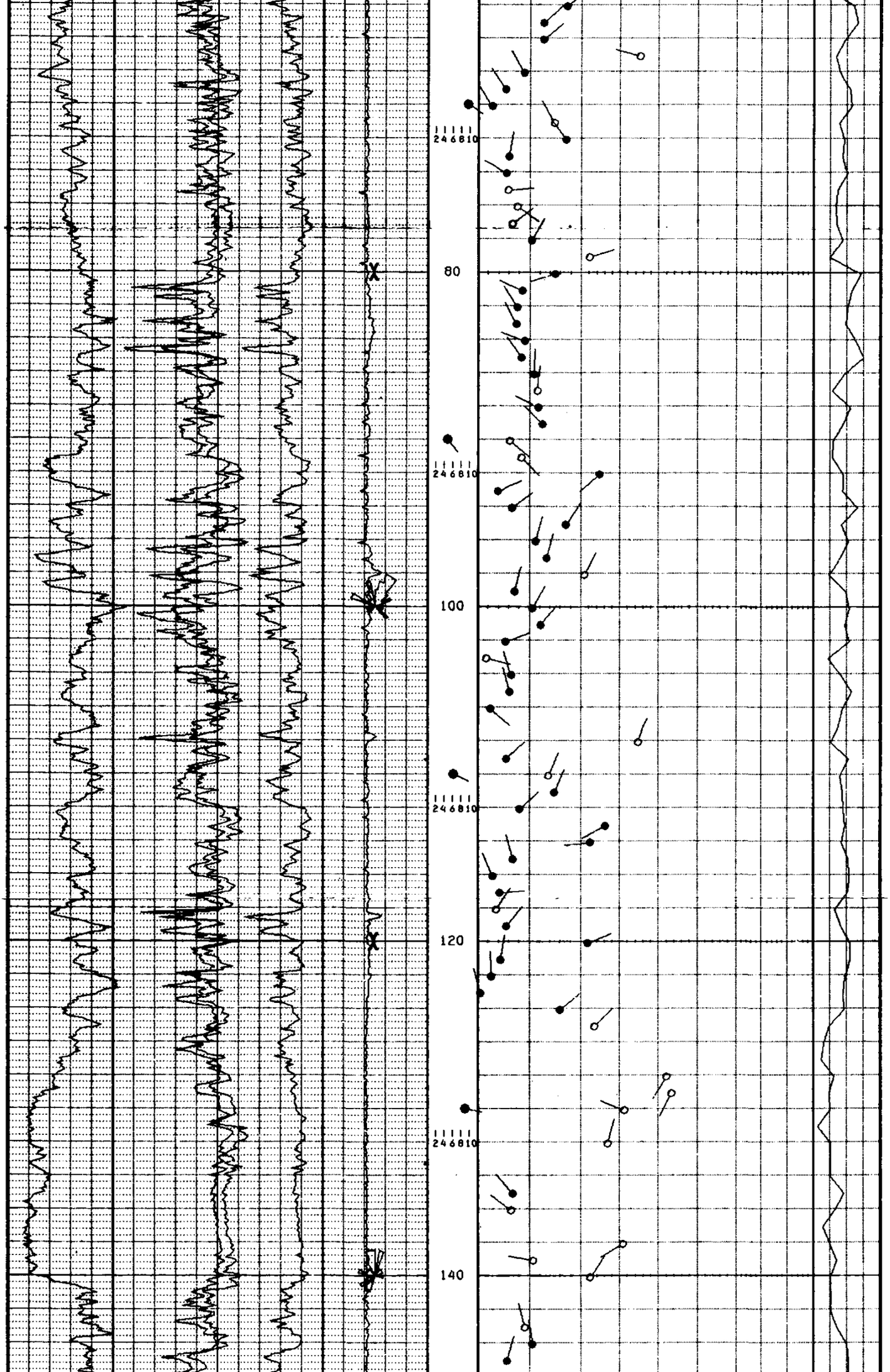
DECLINATION 25.5° East
DEPTH RANGE 8.00 - 268.00m.
DATE PROCESSED 25-NOV-80

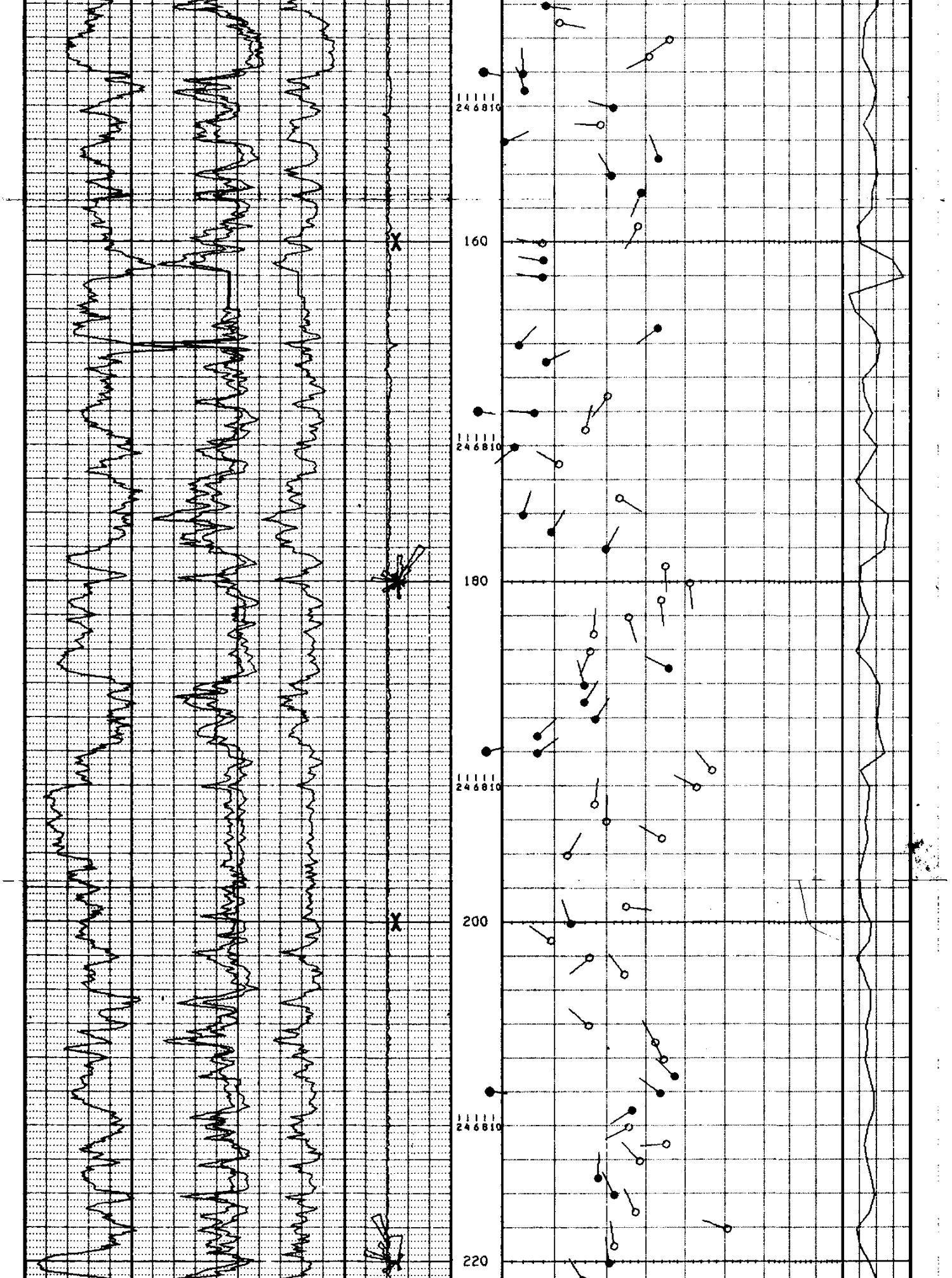
AVERAGE BOREHOLE DEVIATION & DIRECTION ANNOTATED EVERY 20.0m.

ROSE DIAGRAMS SEGMENTED EVERY TEN DEGREES, .1 in. RADIUS/DIP MARKER DISPLAYED

LEGEND:
GOOD (>0.40)
FAIR (>0.20)




80
100
120
140
246810
246810
246810
246810


160
180
200
220
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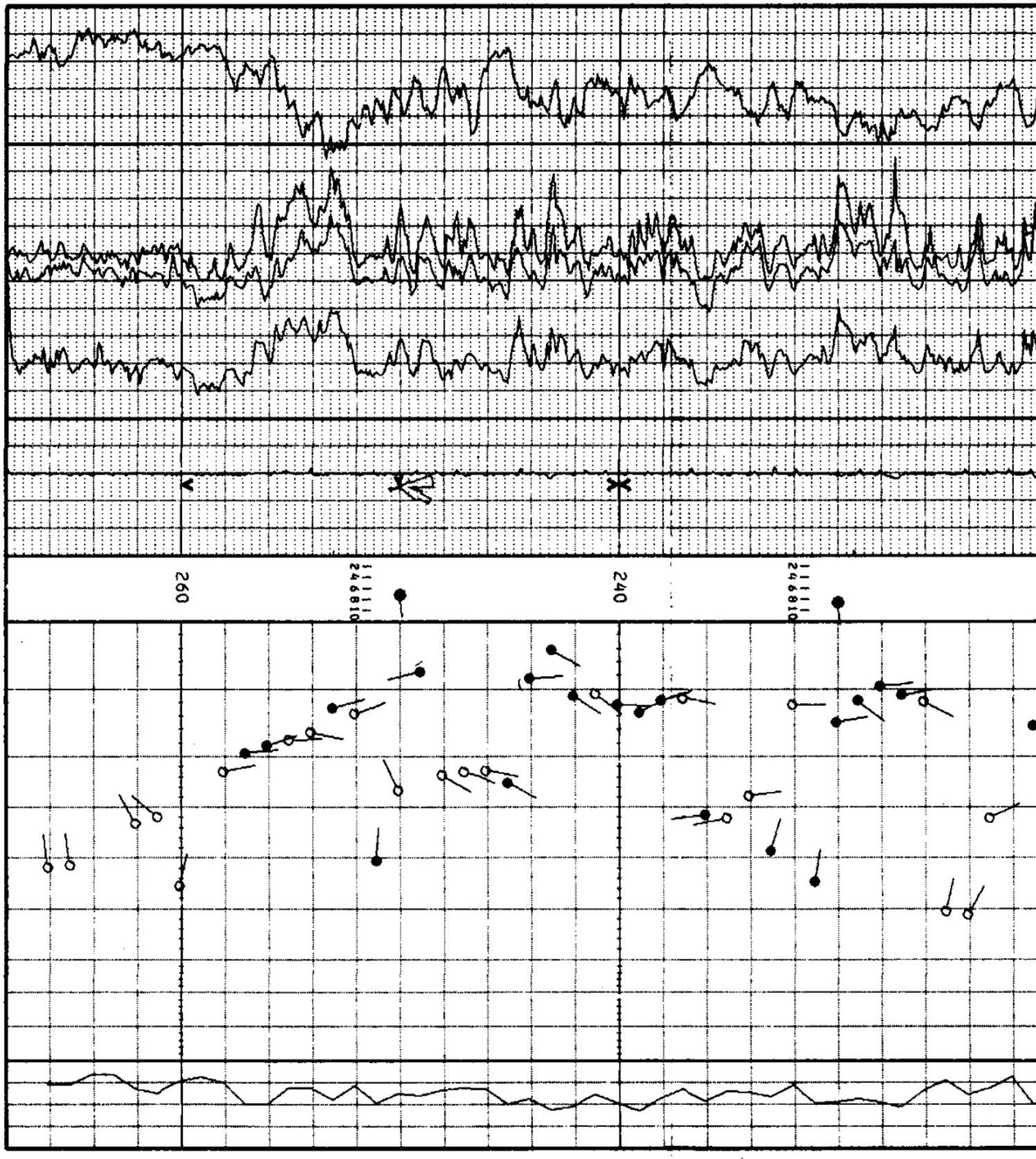
246810
246810
246810


260
240