

McEVOY CREEK
1982 GEOLOGICAL REPORT

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CONFIDENTIAL

GEOLOGICAL BRANCH
ASSESSMENT REPORT

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McEVOY CREEK PROPERTY

Kootenay Land District, British Columbia

B.C. Coal Licence Numbers: 7293, 7294 and 7486

Owner: 211946 Resources Ltd.

NTS: 82G/7E

Longitude: $114^{\circ} 45'$ West

Latitude: $49^{\circ} 25'$ North

Exploration Period: to December 1982

Report Prepared by: R.J. Morris, Consultant
Morris Geological Co. Ltd.
March, 1982
December 1, 1982

R. J. Morris

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TABLE OF CONTENTS

	<u>Page</u>
List of Illustrations	ii
List of Photos	ii
Summary	iii
Introduction	1
- Location and Access	1
- Physiography	1
- Tenure of Land	1
Work Done	
- Summary of Previous Work	2
- Scope and Objectives of 1981 Exploration	2
Geology	
- Regional Geology	3
- McEvoy Creek Property Stratigraphy	4
- Structural Geology, McEvoy Creek Property	5
Coal Reserves	6
Coal Quality	7
Recommendations for Further Work	8
Bibliography	9

LIST OF ILLUSTRATIONS

- 1 - Location Map of the McEvoy Creek Property, B.C.
1: 250 000
- 2 - Access Map, McEvoy Creek Property
1: 50 000
- 3 - Table of Formations
- 4 - Regional Geological Compilation Map
1: 50 000
- 5 - Typical Stratigraphic Section
- 6(2)- Preliminary Geology, McEvoy Creek Property
approx. 1: 10 000
- 7 - Illustrative Structural Cross-Section
approx. 1: 5 000
- 8 - Seam Outcrop Detail
1: 40

LIST OF PHOTOS

- 1 - Access Roads to Licence 7293
- 2 - Panorama of East Exposures, Licence 7293
- 3 - View to the North, Licence 7293
- 4 - View to the South, Licence 7293
- 5 - Panorama of "middle seam", Licence 7293
- 6 - View of Licence 7294

SUMMARY

This report describes the geology and mining potential of the Coal Licences in the McEvoy Creek area held by 211946 Resources Ltd. of Fernie, B.C.

An extensive review of previous work done and mapping on licences 7293 and 7486 forms the basis of the report.

Intense interest by Crows Nest Resources Ltd. for the past two seasons in their Lodgepole and Lilyburt properties necessitates closer examination of all coal licences in the Flathead area. The potential of the Sage Creek Coal Ltd. property beginning production provides haul-road and load-out facilities for the area. Expansion of Byron Creek Collieries Ltd. may create a need for neighbouring coal resources.

The McEvoy Creek property is located within British Columbia coal licences 7293, 7294 and 7486 , covering some 595 hectares. Access to the property is via the Michel Creek - Squaw Creek forestry road from the Byron Creek Collieries load-out facility (15 km) or the Lodgepole Creek - McLatchie Creek forestry road from Morrissey Station (40 km.).

Geology within the area of interest is dominated by west dipping strata with up to 400 metres of coal-bearing. Mist Mountain present. The north licence has at least three coal zones totalling 21 metres of coal and a 10 metre coal seam (very pessimistic) has been projected onto the south licences from Crows Nest Resources Ltd. Lilyburt property.

Coal quality has not been tested though adjacent properties host medium to high volatile bituminous coal and similar quality coal should be expected on the McEvoy

Creek prospects.

Reserve estimates indicate +15 million tonnes clean, geologically in-place coal on the three licences.

The properties are amenable to open-pit mining, the southern licences having some three kilometers of dip-slope strata while the north licence has a wedge of coal-bearing strata atop a small hill.

The nearness of existing infrastructure, the extreme accessibility of the area and the potential of some 15 million tonnes of open-pit mineable coal make the McEvoy Creek properties deserving of further exploration.

INTRODUCTION

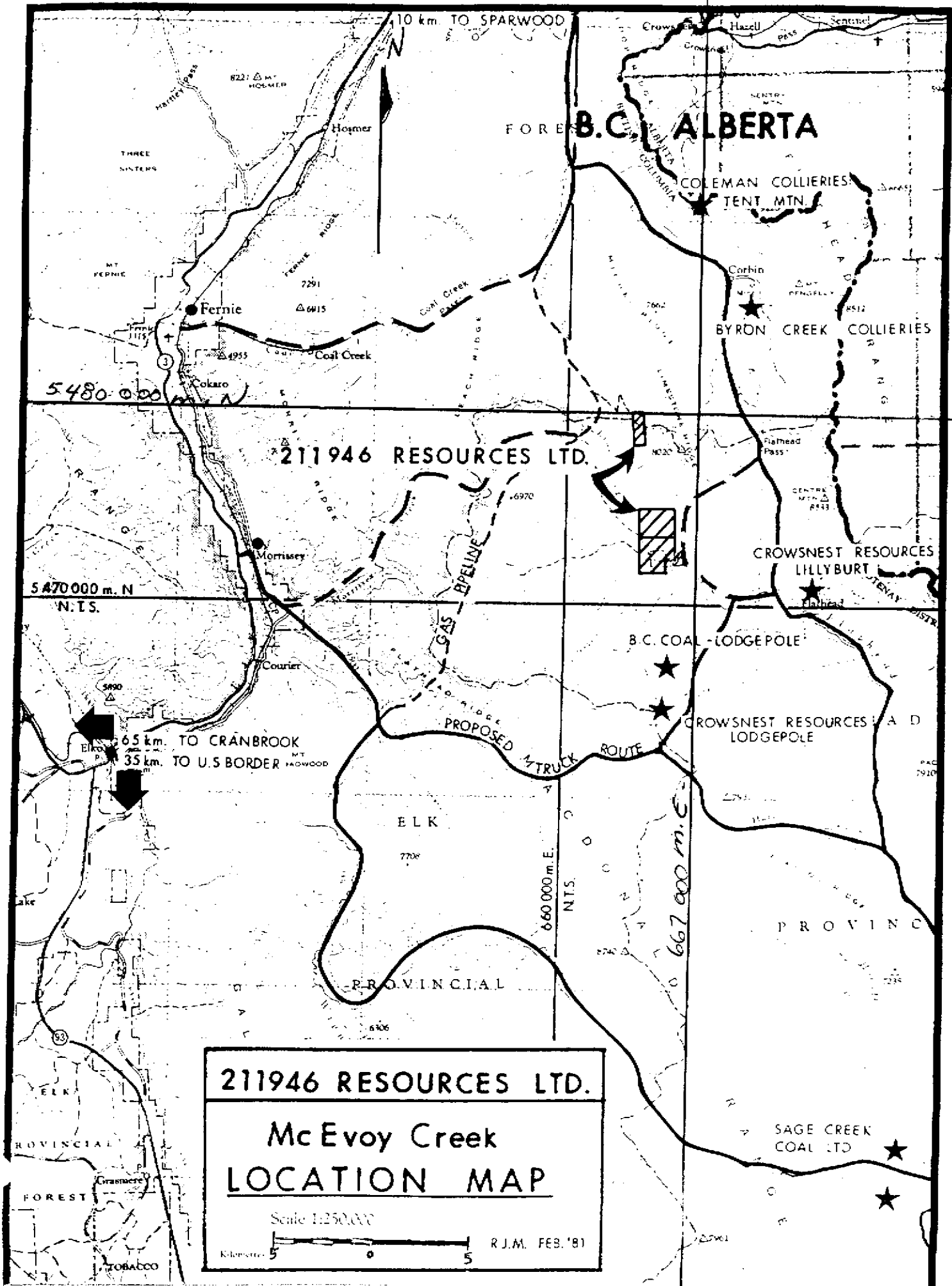
Location and Access - The McEvoy Creek property is located in the Flathead River Valley in the Front Ranges of the Rocky Mountains of southeastern British Columbia.

The property is 16 kilometers from the rail loop at Byron Creek's Coal Mountain mine and 41 kilometers from the station at Morrissey. In addition, it is 48 kilometers by road southerly of Sparwood and 53 kilometers south and east of Fernie.

The most northerly licence, 7293, is accessed from the gas pipeline road and 4 x 4 trail at the headwaters of Leach Creek. Exploration roads built by B.C. Coal Ltd. actually meet the most northerly property edge. The southern licences, 7294 and 7486, are within four kilometers of the McLatchie Creek logging road and have a 4 x 4 trail intersecting them.

Physiography - The southern licences show some 200 meters of topographic relief with the Flathead River forming the southern boundary and McEvoy Creek the west edge. The northern licence has at least 400 meters of relief and straddles the drainage divide between Leach and McEvoy Creeks.

Tenure of Land - The McEvoy Creek property consists of three B.C. coal licences, 7293, 7294 and 7486, held by 211946 Resources Ltd. of Fernie, B.C.



211946 RESOURCES LTD.

Mc Evoy Creek

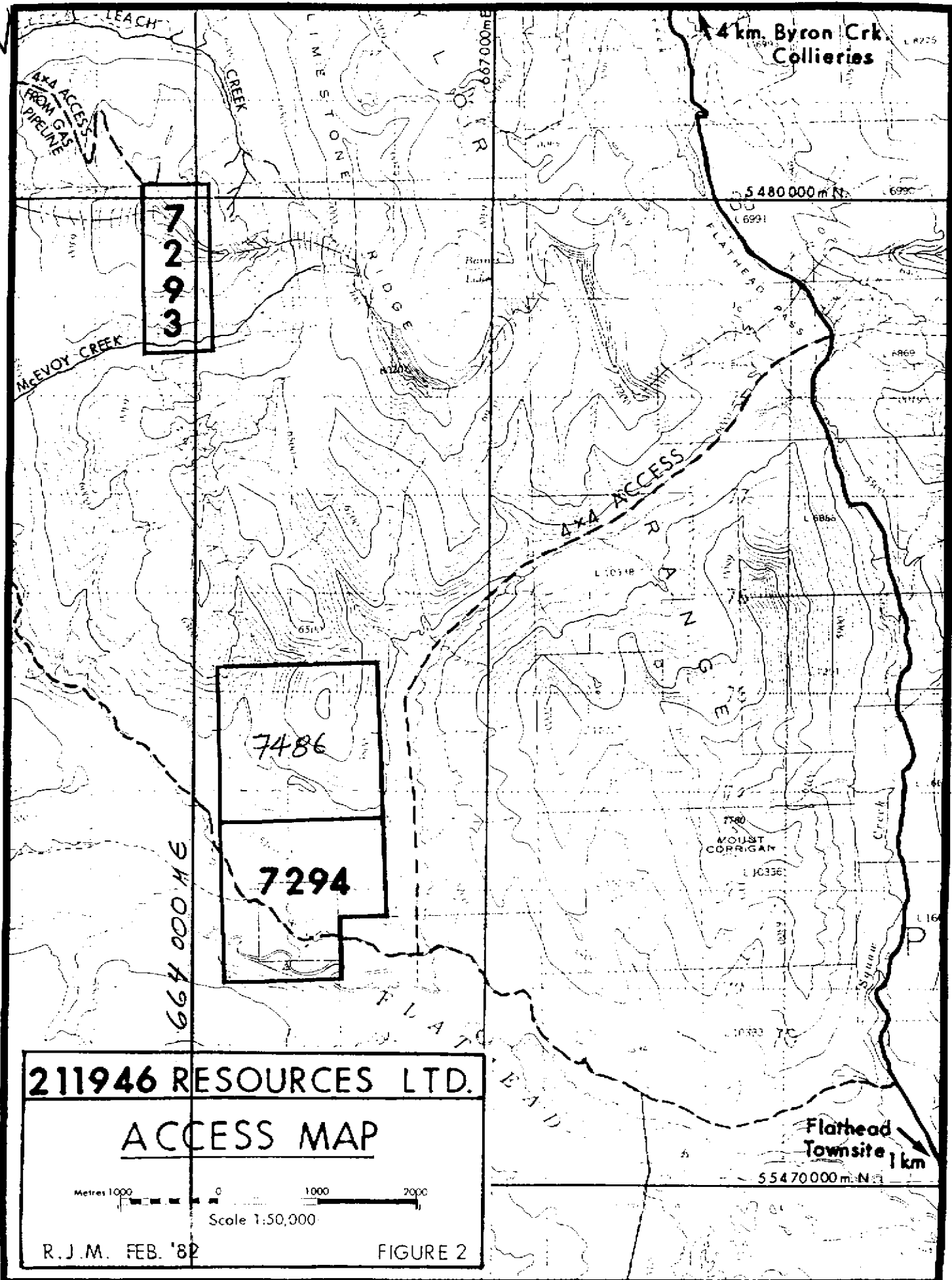
LOCATION MAP

Scale 1:250,000

Kilometers 5 0 5

R.J.M. FEB. '81

RAM 83.02.10



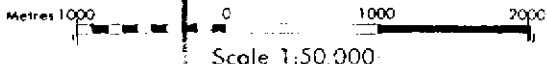
7
2
9
3

7486
7294

664 000 M E

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ACCESS MAP



R. J. M. FEB. '82

FIGURE 2

Flathead Townsite 1 km

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WORK DONE

Summary of Previous Work - Several Geological Survey of Canada maps are available for the area, Map 35-1961 Fernie east-half and Map 1154A Flathead. Both maps indicate the presence of Kootenay Group strata within the property.

Paul Dyson Consultants and Holdings Limited prepared a property evaluation for BP Exploration in 1979. The report included geology, coal quality, reserve estimates and recommendations.

The B.C. Government published preliminary Map 31 in 1979 which just touches the northern edge of licence 7293. The map provides some coal quality data, stratigraphic sections and an update of the structure.

Scope and Objectives of 1982 Exploration - Objectives of the 1982 exploration period included:

- a) extensive study of previous work and communication with Dave Grieve, District Geologist, B.C.M.E.M.P.R., Ray Price, Director G.S.C., and Brian McKinstry, Senior Geologist with C.N.R.L.
- b) reconnaissance tour of area to learn access and take oblique air-photos to aid in mapping.
- c) field check, measure sections, confirm presence of coal, preliminary mapping.
- d) data compilation and report preparation to assess geological favourability of area and describe preliminary mining potential of the property.

GEOLOGY

Regional Geology

The Jurassic-Cretaceous Kootenay Group comprises a westward-thickening wedge of nonmarine, coal-bearing, clastic sediments derived from rising mountain ranges to the south and west. The group lies conformably on marine shales and siltstones of the Jurassic Fernie Formation and is overlain, unconformably, by the Cretaceous Blairmore Group.

The Kootenay Group comprises three formations which are, in ascending order; the Morrissey, Mist Mountain and Elk (Figure 3). The Morrissey Formation comprises a massive, cliff-forming sequence of sandstone with rare interbeds of mudstone, siltstone and coal. The Morrissey Formation thus serves as an important stratigraphic unit useful in defining the base of the Kootenay Group. The Mist Mountain Formation is the economically important lithofacies of the Kootenay Group, comprising a thick, interstratified sequence of siltstone, sandstone, mudstone, shale and coal. The Elk Formation consists of cliff forming sandstone, siltstone, mudstone, shale, conglomerate and thin coal seams.

The McEvoy Creek property is within the thrust fault dominated west limb of the Barnes Anticline. The most prominent structural feature present is the Flathead Fault, a large displacement southeast dipping normal fault.

The northerly licence, 7293, contains the lower portion of the Kootenay Group with the upper section removed by the Flathead Fault. The west edge of the licence shows rocks of the Blairmore Group. The east side of the licence contains the complete lower section of the Kootenay Group.

The southern licences are bounded to the east by the

Flathead Fault and therefore contain the upper section of the Kootenay Group. Blairmore Group rocks are present to the west though here they stratigraphically overlay the Kootenay Group.

McEvoy Creek Property Stratigraphy - On licence 7293 the Moose Mountain Member (Basal Kootenay Sandstone) is readily mapable on the east edge of the ridge. This massive sandstone defines the base of the Kootenay Group. Stratigraphically above the Moose Mountain is a recessive horizon up to 20 metres thick which was not explored in detail but does show several "coal bloom" localities. A massive grey, coarse grained sandstone unit up to 25 metres thick overlies this shale-siltstone-coal(?) horizon. Above the second sandstone there is up to 75 metres of fine-grained sediments which include two and possibly three coal zones. The lowest coal zone is up to seven metres thick, the second zone has one coal seam +4.5 metres thick and the third zone has three seams with an aggregate thickness of 15 metres.

The southern coal licences were examined in the field as well as personal communication with Dr. Ray Price with the Geological Survey of Canada and Brian McKinstry with Crows Nest Resources which led to a proposed stratigraphic section. At the Lilyburt Property of C.N.R.L. some six kilometers to the east there are five seams present with a ten to fifteen metre seam within 75 metres of the Cadomin conglomerate. This fact makes the southern licences very attractive as only the top portion of the Kootenay Group is present. A statement by Paul Dyson in his report on the McEvoy Creek Property concerning an outcrop of Mist Mountain Formation which could not be located, was checked with Dr. Ray Price by telephone in October, 1981. Dr. Price went through his original field notes and air photos and read me his findings, "traversing southeast across a small

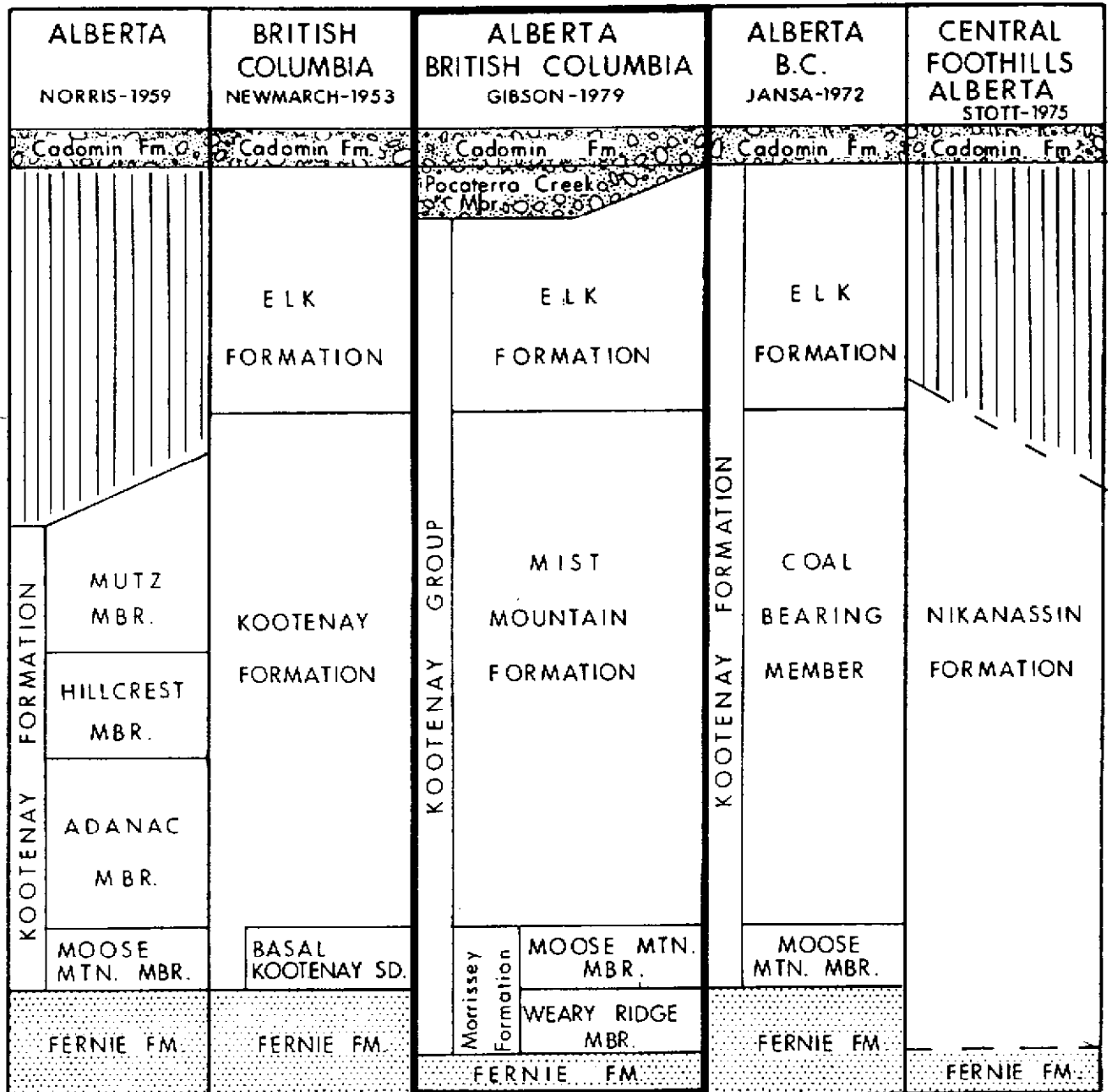
tributary creek east of McEvoy Creek, on typical Kootenay strata, small sandstone outcrops, carbonaceous sandstone and siltstone, attitude $130^{\circ}/90^{\circ}$ elevation 5 200 ft., a small trench was found with coal bloom and debris."

Structural Geology, McEvoy Creek Property - The northern coal licence, 7293, is on the west limb of the Barnes Anticline. The strata dip regularly 40° west though a small anticline was observed on the hanging wall of a proposed west dipping thrust fault. The fault may be the southern extension of a syncline-anticline pair mapped by both Price and Gigliotti. The illustrative structural cross-section (Fig.7) illustrates the thrust fault and a possible repetition coal seam making coal zone #2 equivalent to zone #3.

Structural details of the southern licences are not known though Price's map can provide preliminary information.

TABLE OF FORMATIONS

Nomenclature of the Kootenay Group (after Gibson, 1979)



1:50,000

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A Portion of G.S.C. Map 1154 A

Showing Licence Location

FIG. 4

54800000 m.N

- 22

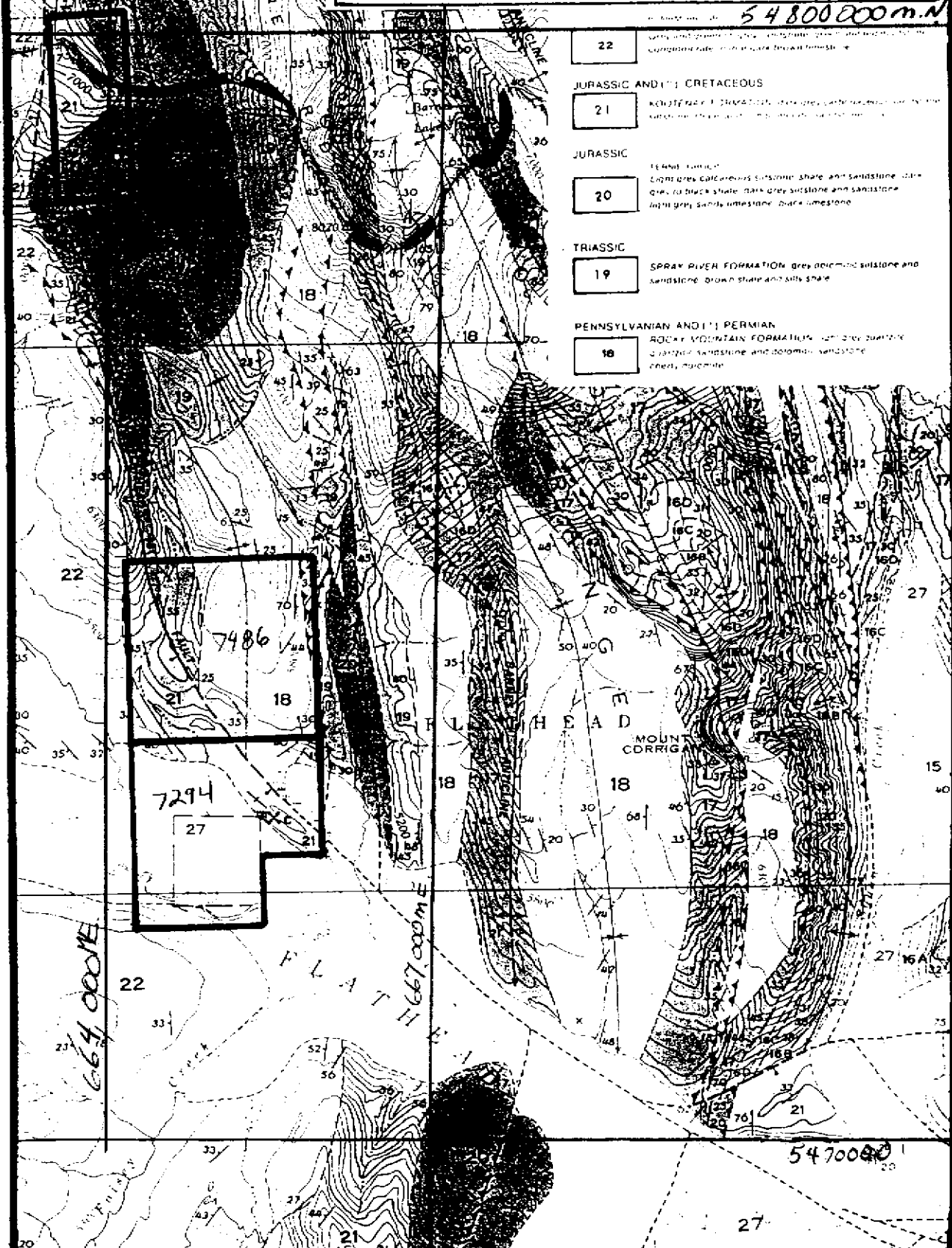
Very and partly clay, calcareous, green and red, with
conglomerate, in part coarse brown limestone
- JURASSIC AND (?) CRETACEOUS**
- 21

Kelly Lake (?) Shale, clay, sandstone, with thin
conglomerate, in part coarse brown limestone
- JURASSIC**
- 20

Fe and tan
Light grey calcareous siltstone, shale and sandstone, dark
grey to black shale, dark grey siltstone and sandstone
Light grey sandy limestone, dark limestone
- TRIASSIC**
- 19

SPRAY RIVER FORMATION grey dolomitic siltstone and
sandstone, brown shale and silt shale
- PENNSYLVANIAN AND (?) PERMIAN**
- 18

ROCKY MOUNTAIN FORMATION tan grey quartzite
and siltstone, sandstone and dolomitic sandstone
chert, dolomite



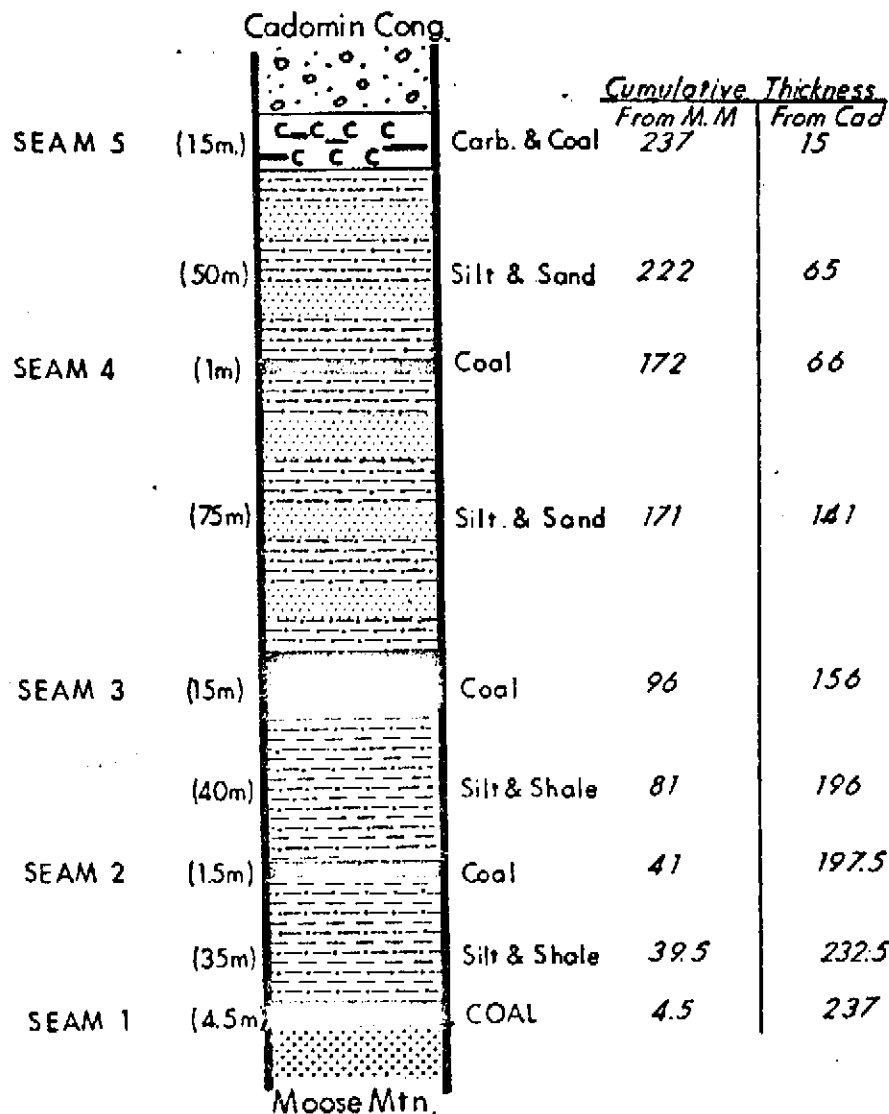
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TYPICAL STRATIGRAPHIC SECTION

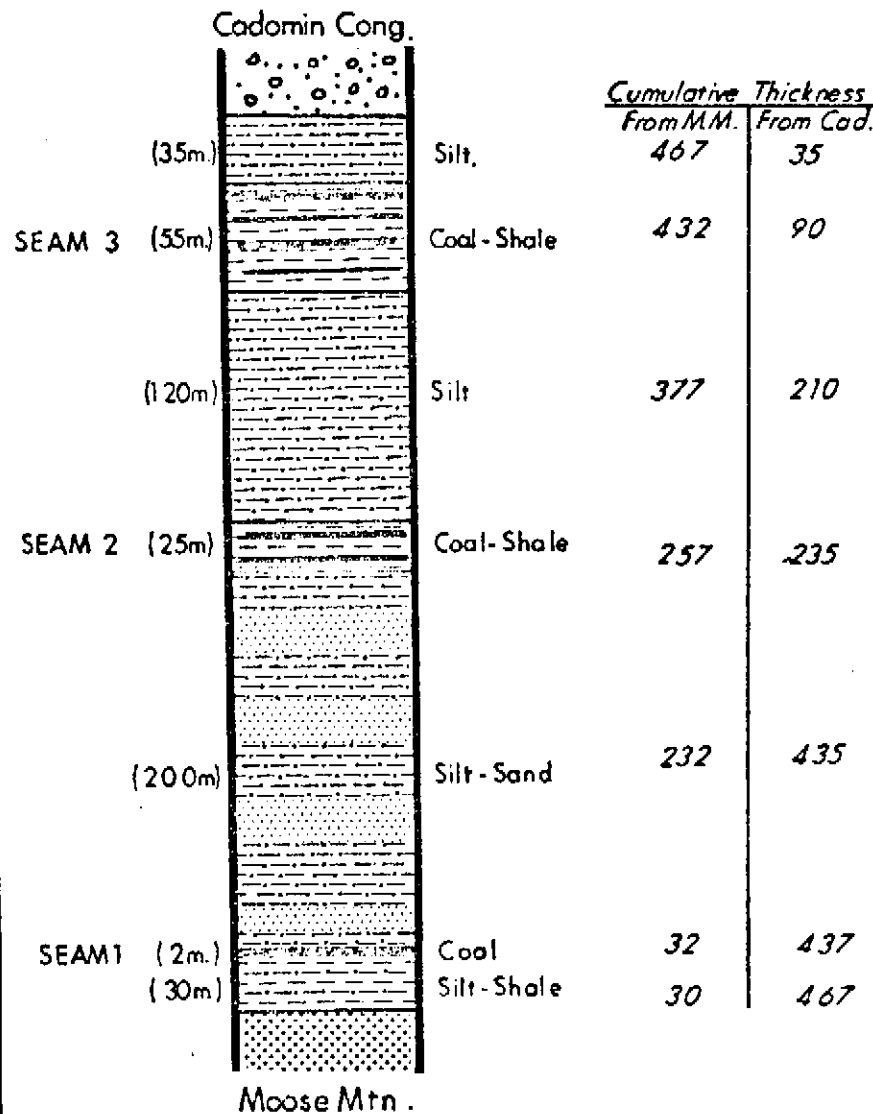
SOUTH LICENCES

1
1:200



NORTH LICENCES

2
1:400



1. Generalized column from Lillyburt & Lodgepole Areas

2. Generalized column from coal licence 7293

FIG 5

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COAL RESERVES

Geologically in place clean coal reserves have been calculated using the best geological information available. Figure #7 is an illustrative structural cross-section which shows the measured strata on the northern coal licence.

Licence 7293:

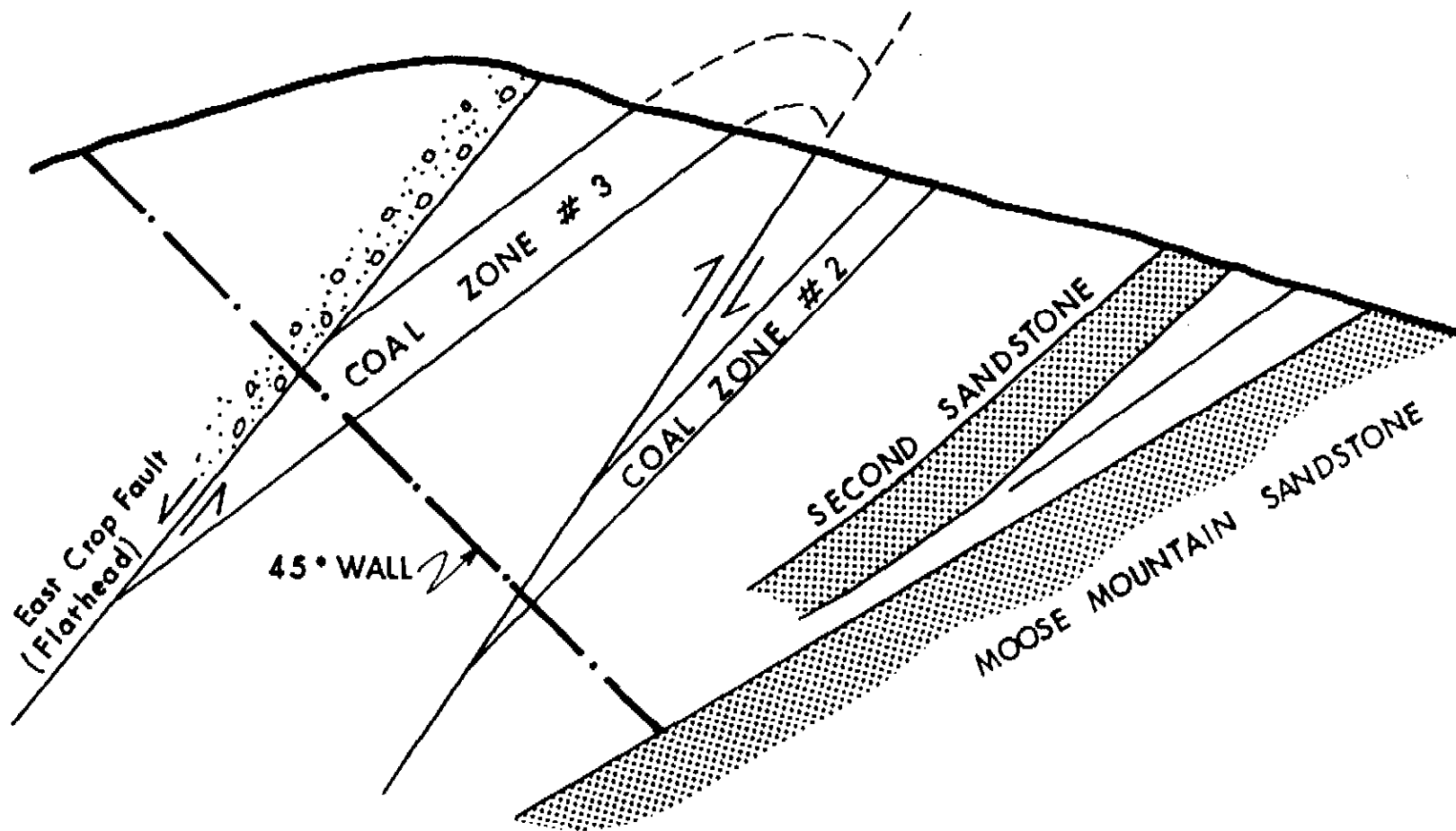
coal zone #1 - thickness = 2 m.
 down dip length = 300 m.
 coal zone #2 - thickness = 4 m.
 down dip length = 400 m.
 coal zone #3 - thickness = 15 m.
 down dip length = 350 m.

total coal area = 7 450 m²
 length of property = 1000 m.
 total volume = 7 450 000 m³
 S.G. of clean coal = 1.45
 total reserves = 10 802 500 tonnes

The southern licences are more difficult to calculate coal reserves due to limited geological data but a conservative estimate is 4.5 million tonnes (clean coal), using 10 m. of coal over 3 kilometres and a down dip length of 100 m. Very easily this figure could be doubled by adding more coal to the section.

* ILLUSTRATIVE STRUCTURAL CROSS-SECTION A-A'

(APPROX. SCALE 1:5,000)



211946 RESOURCES LTD.
COAL LICENCE 7293

FIGURE 7

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211946 RESOURCES LTD.

SEAM OUTCROP DESCRIPTION

Sample No. _____ Seam No. _____ Section _____

Seam Scale	Seam Detail	Cumulative Thickness	Description	SAMPLE No.		QUALITY		
				Field	Lab	Moisture	Ash	V.M.
0			POOR HW CONTACT					
.40			COAL-possibly high ash,dull					
.20		.4	SHALE-coal bands,dommantly shale					
.03		.63	VIT. BAND					
.15		.78	SHALE / COAL					
.35			COAL - minor shale bands					
1.0		1.13						
1.40			Shale					
2.0								
.15		2.53	COAL/ SHALE					
.15		2.68	SHALE					
.40		2.83						
3.0			COAL, minor shale splits					
.02		3.23	IRON BAND- irregular					
.15		3.25	COAL					
.03		3.40	SHALE, black,carb					
.27		3.43	COAL, minor shale					
.05		3.70-3.75	IRON BAND, irreg.,nodular					
.10		3.85	COAL					
.05		3.90	SHALE					
.40			COAL, bright,clean					
.10		4.30	COAL, w. minor iron bands					
.85		4.40						
5.0			COAL, bright,clean					
.02		5.25	IRON BAND					
		5.27						
6.0								
2.0			COAL - bright,clean					
7.0								
		7.27						

COAL ZONE #2

FIG. 8

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COAL QUALITY

Coal quality is very hard to determine though an idea can be gained by comparing the McEvoy Creek coal to adjacent properties.

Gigliotti 1979 reported coals of low volatile bituminous (mean maximum reflectance of vitrinite in oil of 1.62 to 1.68%) in the northern licences. McKinstry (C.N.R.L. Lilyburt) reports medium to high volatile bituminous coals (VM=26-30%) which could represent coal in the southern licences.

RECOMMENDATIONS FOR FURTHER WORK

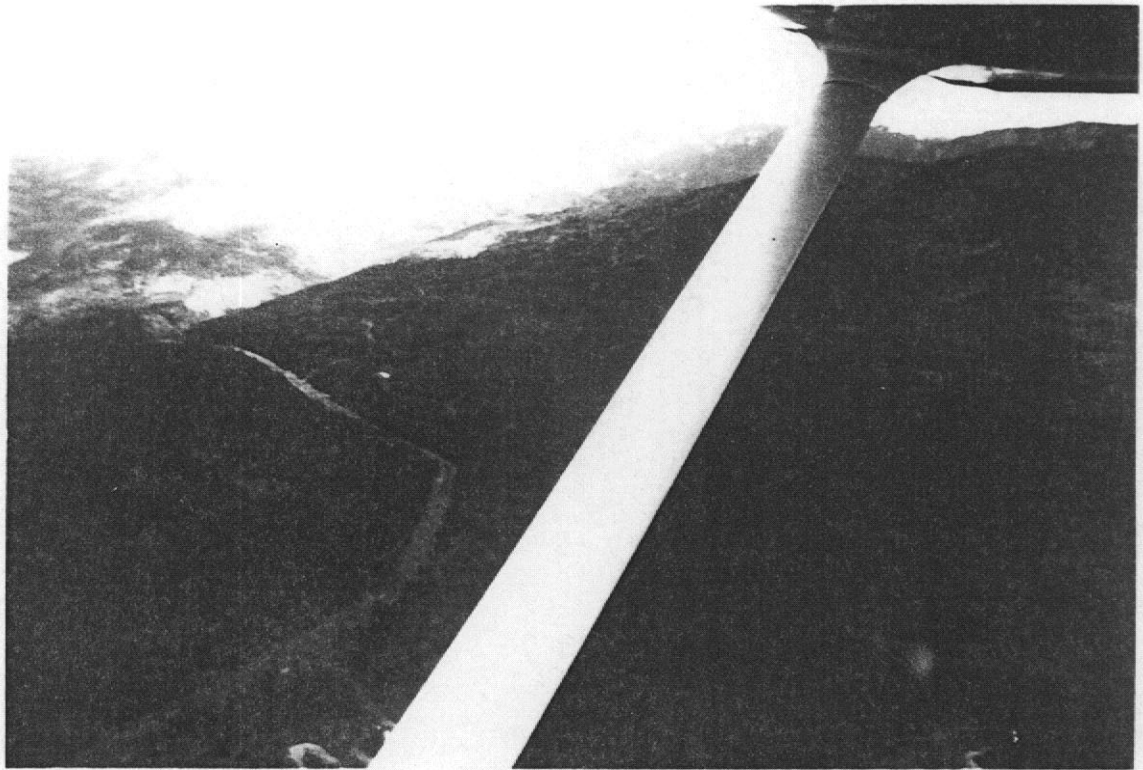
Further exploration work on the McEvoy Creek property is strongly recommended and should address the following:

- preliminary mapping of the southern licences to determine a stratigraphic section and measure the total coal in the section.
- construction of a road to access the southern licences so that a drill site can be chosen to intersect the total Mist Mountain Formation present.
- coal quality tests to predict an ultimate product quality.
- consideration of overall development and assessment of subject deposits vis à vis area coal developments.

BIBLIOGRAPHY

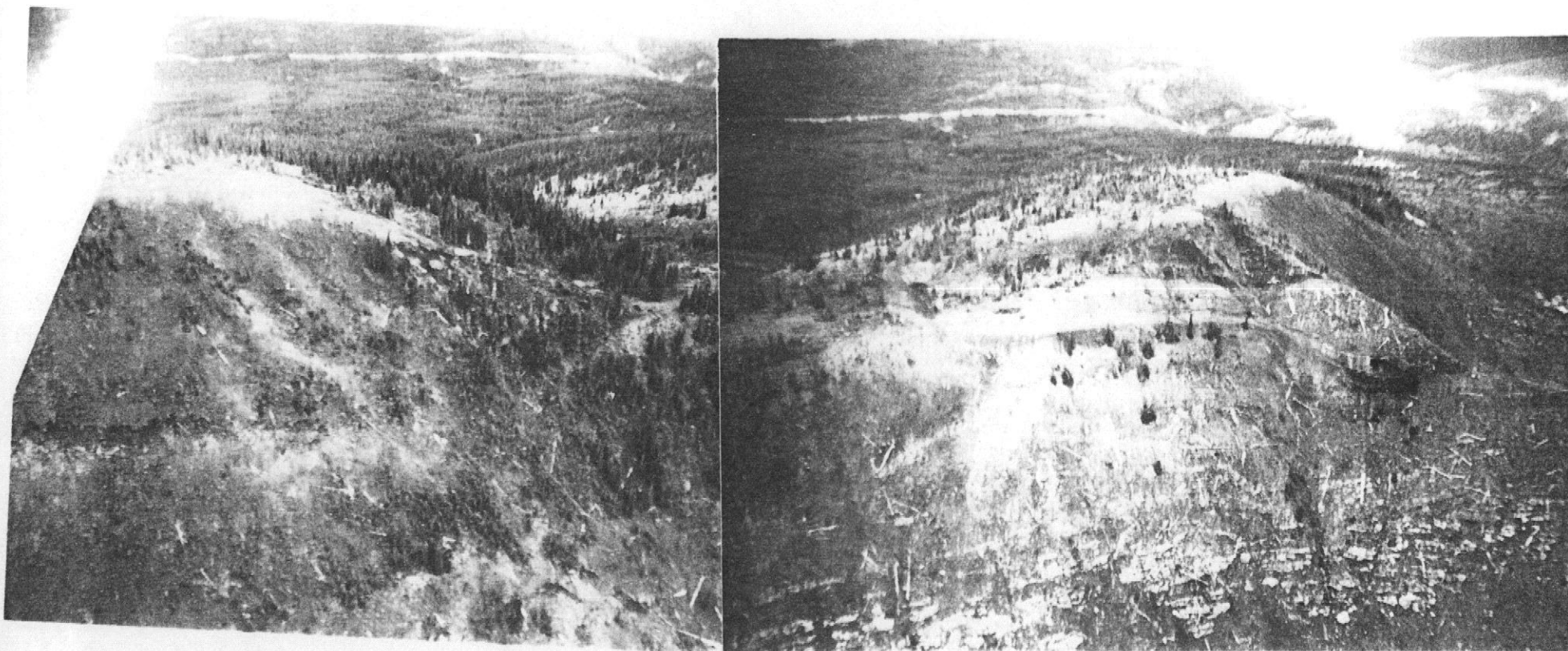
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2. Gibson, D.W., 1977. Sedimentary facies in the Jura-Cretaceous Kootenay Formation, Crowsnest Pass area, southwestern Alberta and southeastern British Columbia. Bull. of Can. Pet. Geology, v.25, p.767-791.
3. Gibson, D.W., 1979. The Morrissey and Mist Mountain Formations - newly defined litho stratigraphic units of the Jura-Cretaceous Kootenay Group, Alberta and British Columbia. Bull. of Can. Pet. Geology, v.27, p.183-208.
4. Gigliotti, F.B. and Pearson, D.E., 1979. Geology of Crowsnest Coalfield, Northeast Part. Prelim. Map 31.
5. Price, R.A., 1965. Flathead Map Area, British Columbia and Alberta, G.S.C. Mem.336. 221 p.

PHOTO #1



- Access roads to the northern coal licence (7293), the major cleared strip is the natural gas pipeline as it crosses from Leach Creek into McEvoy Creek in the foreground. The small trail leading east from the pass is the 4 x 4 access to the licence which includes the top of the hill below the wing of the plane.

PHOTO #2



- Panorama of the east exposure, licence 7293, looking west. The cleared strip in the background is the natural gas pipeline as it crosses the headwaters of Leach Creek. The 4 x 4 access onto the licence is shown to the centre and right. Coal zone #2 is exposed on the east end of the road, zone #3 is exposed at the small pass and traces of it can be seen along to the left of the photo.

PHOTO #3

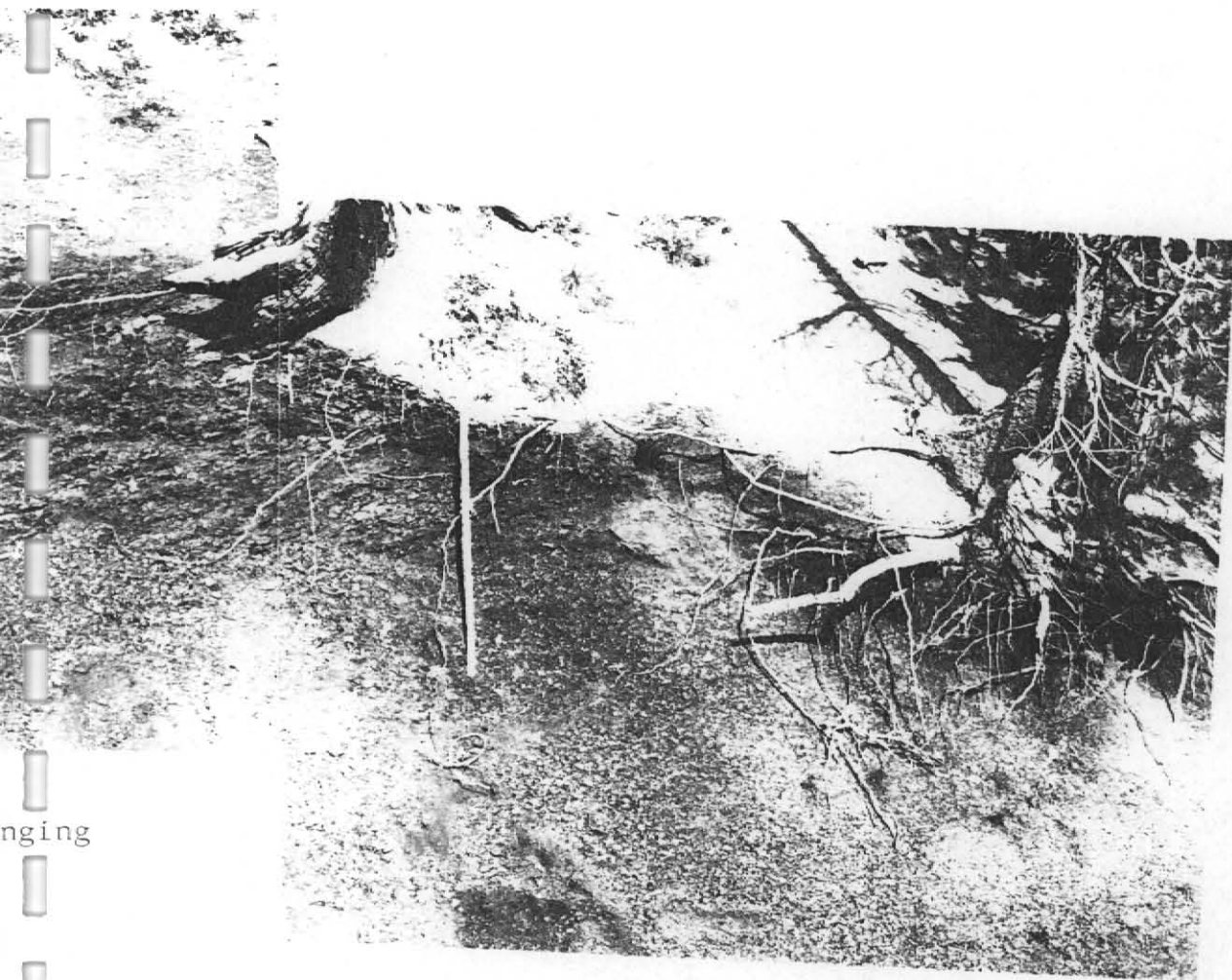


-View of the north licence, 7293, looking north. The Moose Mountain Member is exposed on the extreme east edge of the photo with several traces of coal just above it. Coal zone #2 is exposed in the right centre at the end of the road. The cliff-forming conglomerate in the foreground is a portion of the down-dropped (west of the Flathead fault) Cadomin.

PHOTO #4

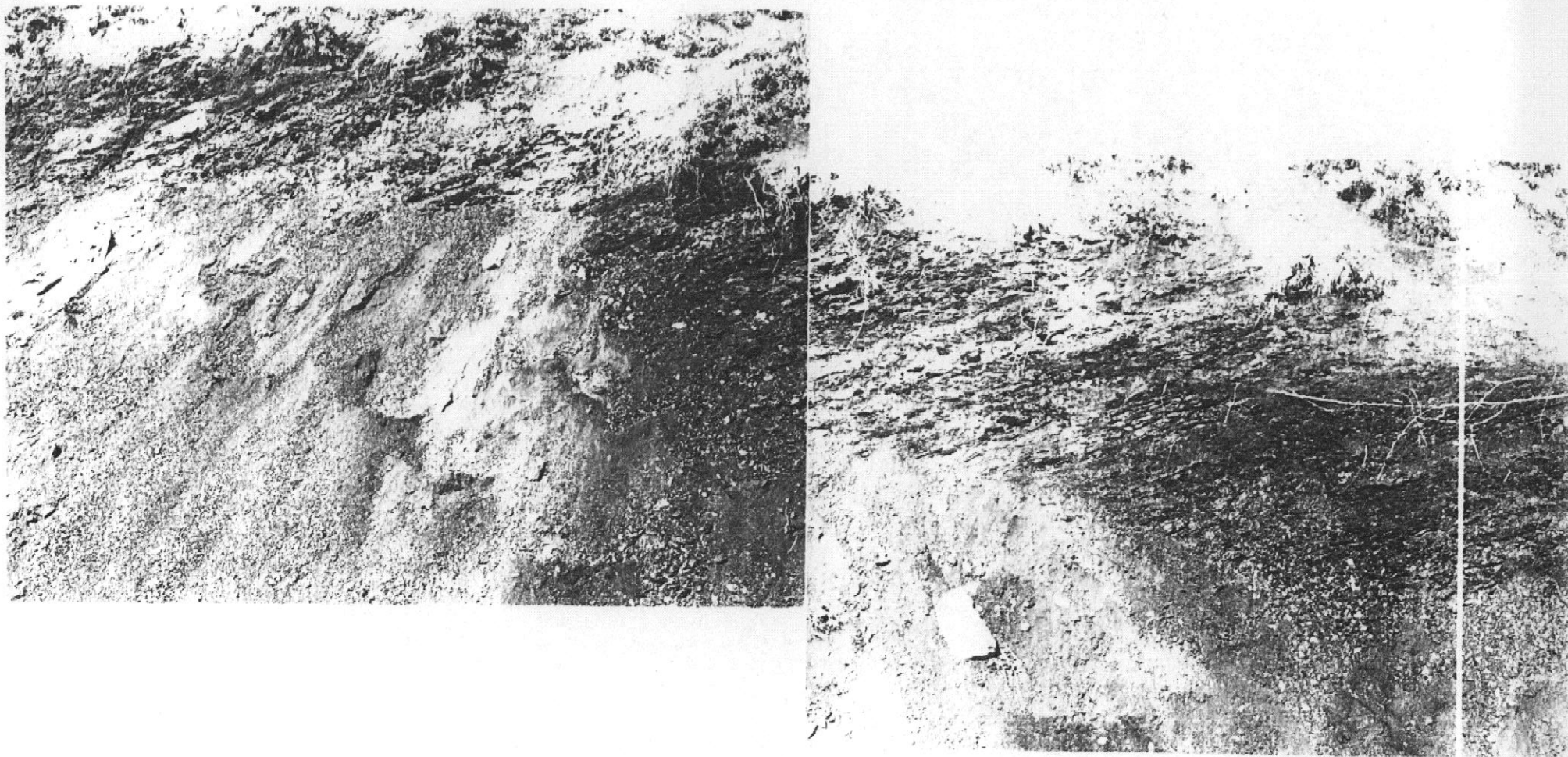


-View of the north licence, 7293, looking south. The Moose Mountain Member forms the extreme left (east) edge of the photo. The pack in the foreground is on coal debris from zone #2.



nging

PHOTO #

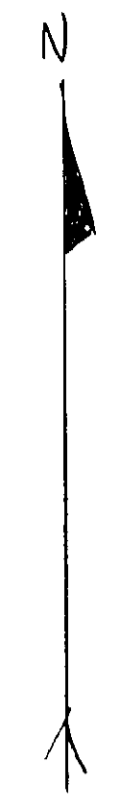
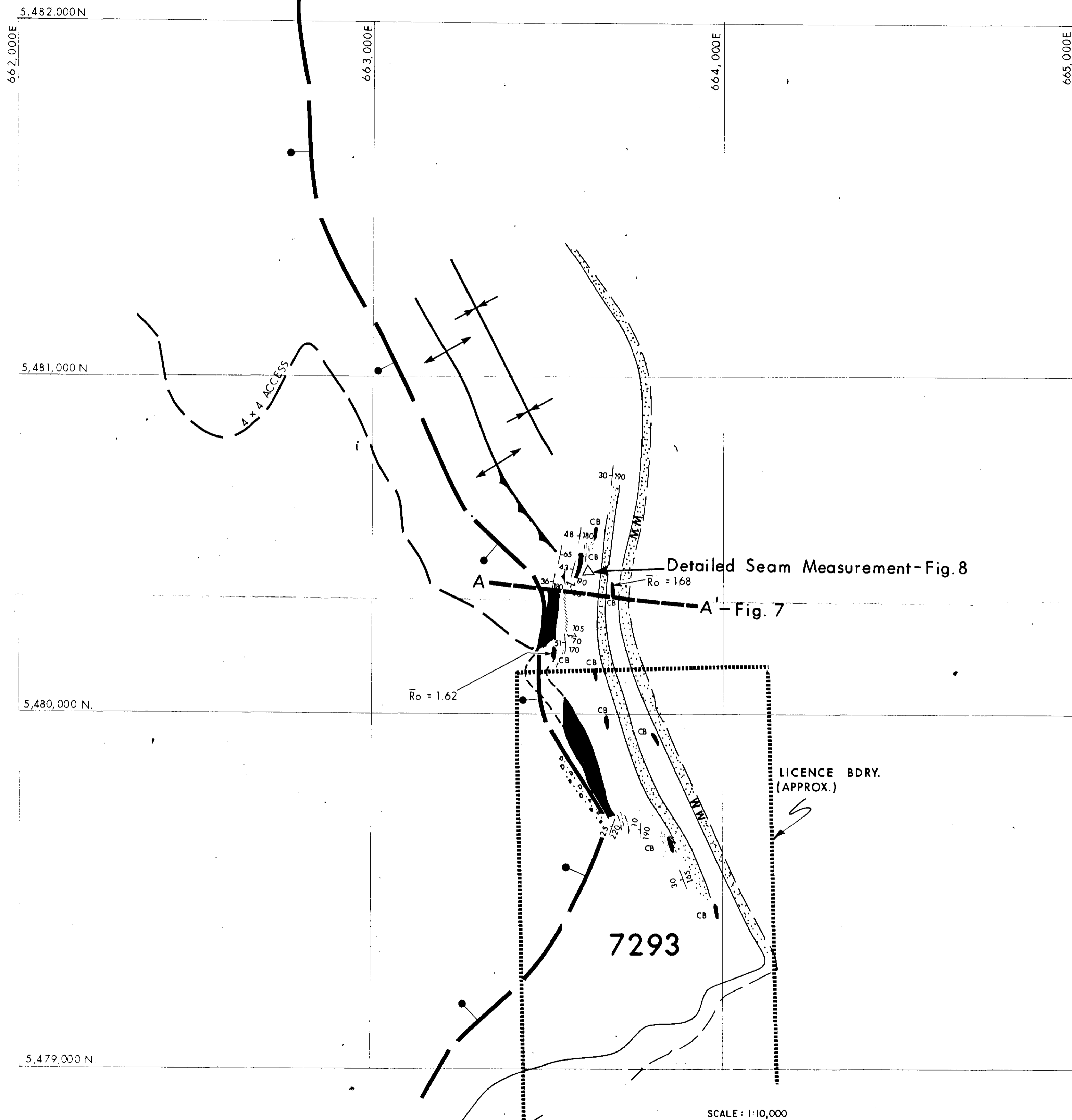


-Panorama of coal zone#2, licence 7293, one metre stick is shown to the right. The hanging wall portion of the seam is shaley but the middle is almost devoid of any splits, no footwall was exposed.

PHOTO #6



-View, looking east, of licence 7294. The Flathead River with McEvoy Creek draining into it from the north is seen in the bottom right. Barnes ranch, the old, abandoned buildings, are in the centre of the photo.



LEGEND

- $\frac{180}{30}$ BEDDING ATTITUDE (TOPS. KNOWN)
- $\frac{90}{80}$ JOINTING
- THRUST FAULT
- COAL
- COAL BLOOM
- SANDSTONE
- MOOSE MTN.
- SILTSTONE
- SHALE
- CONGLOMERATE

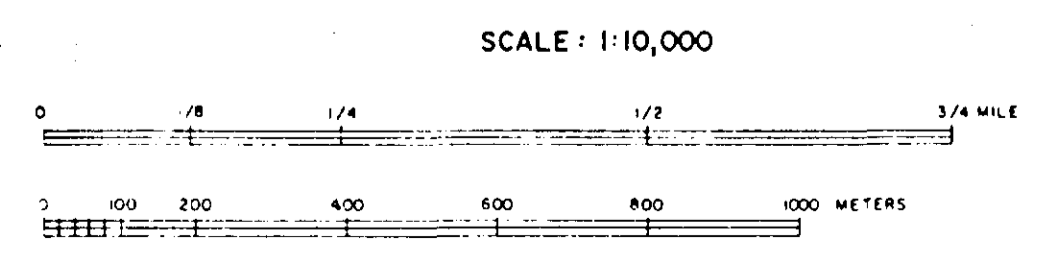
FLATHEAD (EAST CROP)

- NORMAL FAULT FROM G.S.C. MAP 1154A AND PRELIMINARY MAP 31,BCDM
- ANTICLINE
- SYNCLINE
- $\bar{R}_o = 1.68$ \bar{R}_o MEAN MAXIMUM REFLECTANCE OF VITRINITE IN OIL.

7293

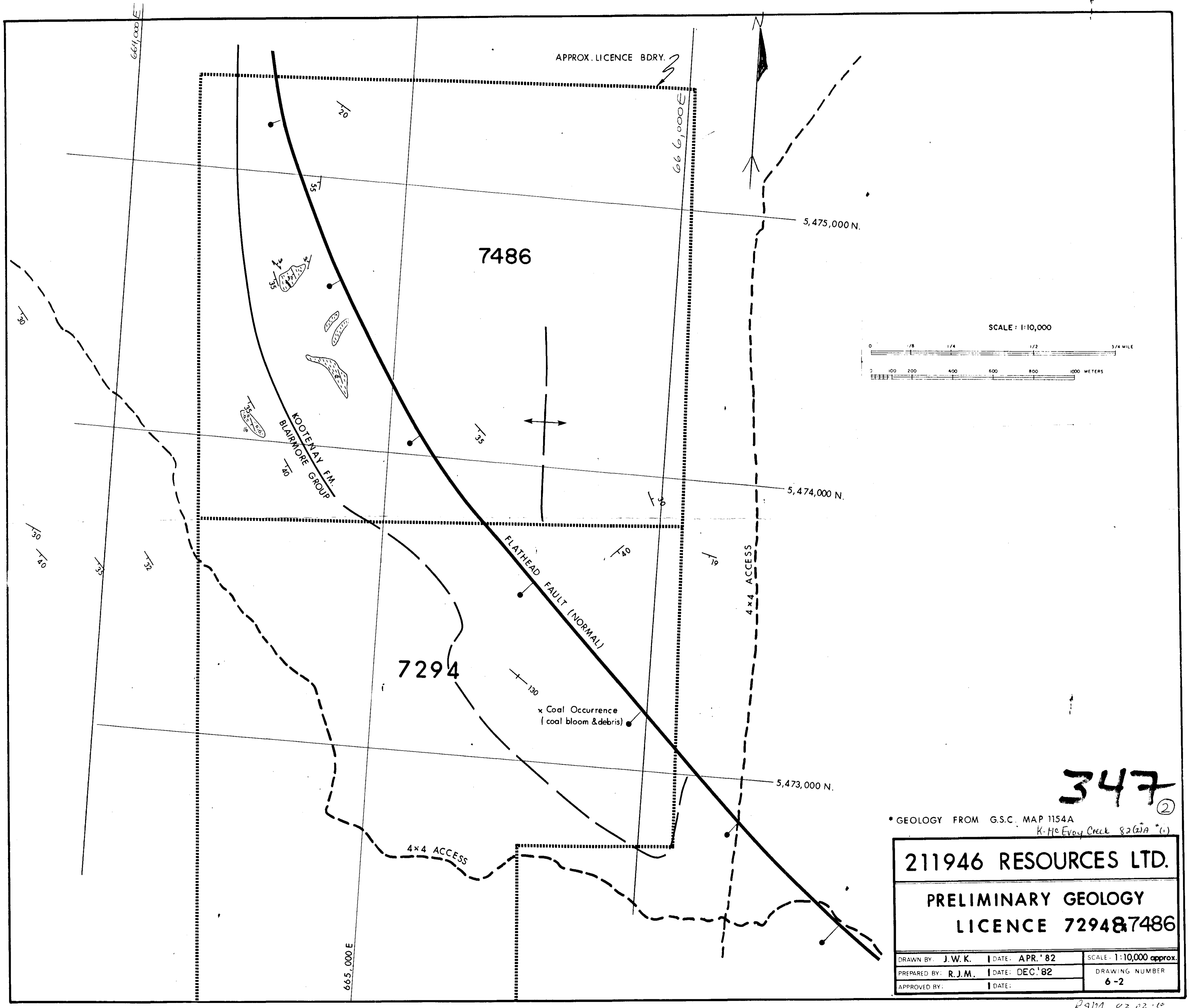
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PRELIMINARY GEOLOGY
LICENCE 7293 ①



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PREPARED BY: R.J.M.	DATE:	DRAWING NUMBER
APPROVED BY:	DATE:	6-1

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347 ②

* GEOLOGY FROM G.S.C. MAP 1154A
K-Ho Evoy Creek 82(2)A (1)

211946 RESOURCES LTD.		
PRELIMINARY GEOLOGY		
LICENCE 7294 & 7486		
DRAWN BY: J.W.K.	DATE: APR. '82	SCALE: 1:10,000 approx.
PREPARED BY: R.J.M.	DATE: DEC. '82	DRAWING NUMBER
APPROVED BY:	DATE:	6-2

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