PR-Goodrich 80 (1)A

OPEN FILE

GULF CANADA RESOURCES INC.

GOODRICH COAL PROJECT

December, 1980

Geological Report

CONFIDENTIAL

MAP AND LICENCE NUMBERS

Map Numbers:	93-O-8-E
	93-O-8-W
	93-O-9-W
	93-O-10-E
	93-0-15-E
	93-O-15-W
	93-0-16-W
Licence Numbers:	4750, 4751
	5521 - 5604
	5605 - 5632
	5670 - 5678
	5679 - 5739
	5742 - 5769
	5778 - 5783
	5800 - 5828

Approximate centre of Goodrich property:

Latitude N55° 35' Longitude 122° 25'

Prepared by

Gulf Canada Resources Inc.
Norwest Resource Consultants Ltd.
J.E. Hughes, Consultant

December, 1980

GULF CANADA RESOURCES INC.

GOODRICH COAL PROJECT
December, 1980
Geological Report

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93-0-8-EB
93-0-8-EG
93-0-8-EH
93-0-8-EI
93-0-8-EJ
93-0-8-WF
93-0-8-WK
93-0-8-WL
93-0-9-WC
93-0-9-WD
93-0-9-WE
93-0-9-WL
93-0-10-EA
93-0-10-EH
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SUMMARY

Gulf Canada Resources' Goodrich coal property is located in the Inner Foothills of the Rocky Mountains, approximately 500 kilometres by air east of Prince Rupert, British Columbia. Coal licences forming the property are located to cover coal-bearing Gething Formation and Minnes Group Strata.

Gulf Canada Resources Inc. conducted exploration in the form of reconnaissance mapping, trenching and drilling during the summer and fall of 1980. During that time period, GCRI secured an option for the Whiterabbit and Lossan Blocks of coal licences, bringing the property to a size of 72 429 hectares within 247 coal licences.

Exploration to date has identified numerous coal seams in the Minnes Group, as well as tectonically thickened seams in the Gething Formation. At present, exploration efforts are concentrated on the Gething seams in and around the Lossan Block in order to determine their mining potential. Several other interesting areas have been identified and will later be explored to determine their potential.

The Goodrich coal property consists of a sequence of folded strata trending in a southeasterly direction. The structures are complicated by numerous faults and smaller-scale folds.

The Goodrich coal property has the potential for containing large tonnages of coal, much of which is contained within geological structures that appear to be amenable to surface mining methods. In addition, the property is suitably located near existing railway lines and infrastructure that could provide GCRI with a competitive advantage over the other potential producers of the Northeastern Coal Block.

INTRODUCTION

2.1 Property Location and Access:

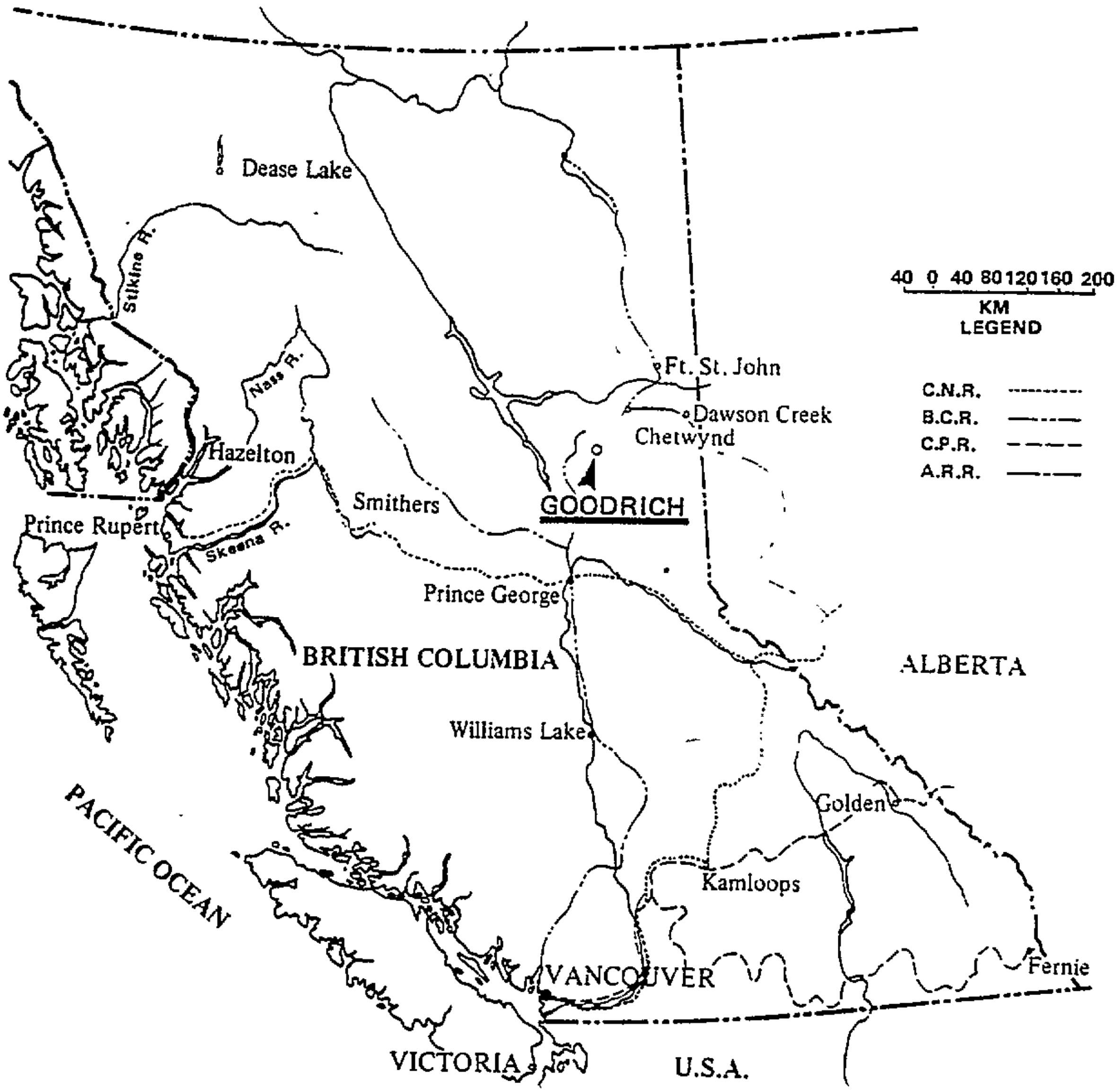
The Goodrich coal property is situated in the Inner Foothills region of northeastern British Columbia, approximately 60 Kilometres by road west of Chetwynd, British Columbia (see Figure I). The property includes an elongated tectonic slice of coal-bearing Lower Cretaceous strata, extending from the Moberly River in the north to the Sukunka River in the south, a distance of approximately 80 kilometres. The property consists of 247 Crown coal licences and has an area of 72 429 hectares. Figure II shows the location of the Goodrich property with respect to the existing northeastern coal block.

The British Columbia Railway crosses the centre of the Goodrich property, as does the John Hart Highway. An all-weather gravel road also runs adjacent to Brazion Creek some 27 kilometres south of the Hart Highway. Extensive logging activities are currently being carried out in Brazion Creek area by Canfor Limited, providing a considerable amount of access via trails and roads which have been constructed in conjunction with these activities.

In general, the area is heavily wooded and only a small portion, the higher peaks, are above treeline. The highest elevation in the area is 2 043 metres at Mount Stephenson, and the average elevation of the valley floors is approximately 1 060 metres.

2.2 History of Land Tenure:

Observations of coal seams within the Minnes Group in surface exposures at various locations along the Rocky Mountain Foothills of northeastern British Columbia led to a reconnaissaince exploration program being undertaken by Gulf Canada Rsources Inc. during the summer of 1979. This exploration program was conducted for Gulf by Norwest Resource Consultants Ltd.



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Gulf

FIGURE I

LOCATION MAP

GOODRICH COAL PROJECT

PREPARED BY:	SCALE
APPROVED BY: DATE: JAN. 81	DRAWING No.

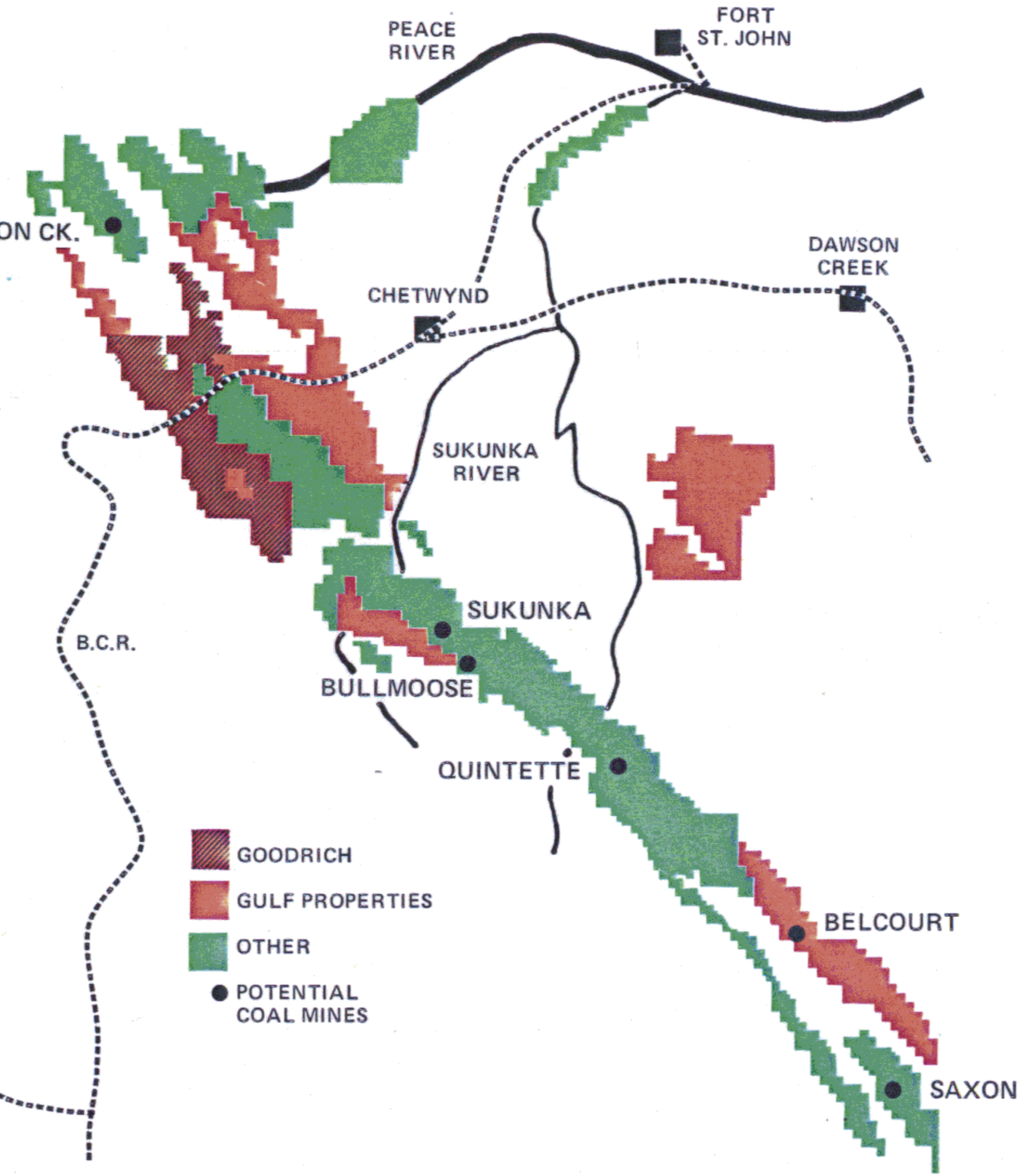


FIGURE II
COAL PROPERTIES
NORTHEASTERN
BRITISH COLUMBIA

The regional geological investigation conducted by Norwest in 1979 resulted in the collection of a large amount of data which strongly suggests that the area between the Moberly River in the north and the Burnt River in the south is incorrectly shown on published geological maps. The published maps indicate that almost all of that area includes an eroded section of Minnes Group strata at the surface; however, the regional exploration and current reconnaissance geological mapping indicate that a large part of the area is underlain by the younger Cadomin and Gething Formations, as well as by Minnes Group strata.

Historically, the Gething Formation has been considered to be one of the formations which has the greatest potential to include coal deposits of economic thicknessess in this area. Thus, based on the data collected in 1979, GCRI acquired 209 coal licences totalling 61 325 hectares. In July of 1980, GCRI was successful in securing an option on the Whiterabbit and Lossan coal licence blocks, which contain an additional 38 coal licences totalling 11 104 hectares, as shown Figure III. This increased the size of Gulf's holdings to 247 licences containing 72 429 hectares. Table I contains a summary of licences and acreages included in Gulf's Goodrich property.

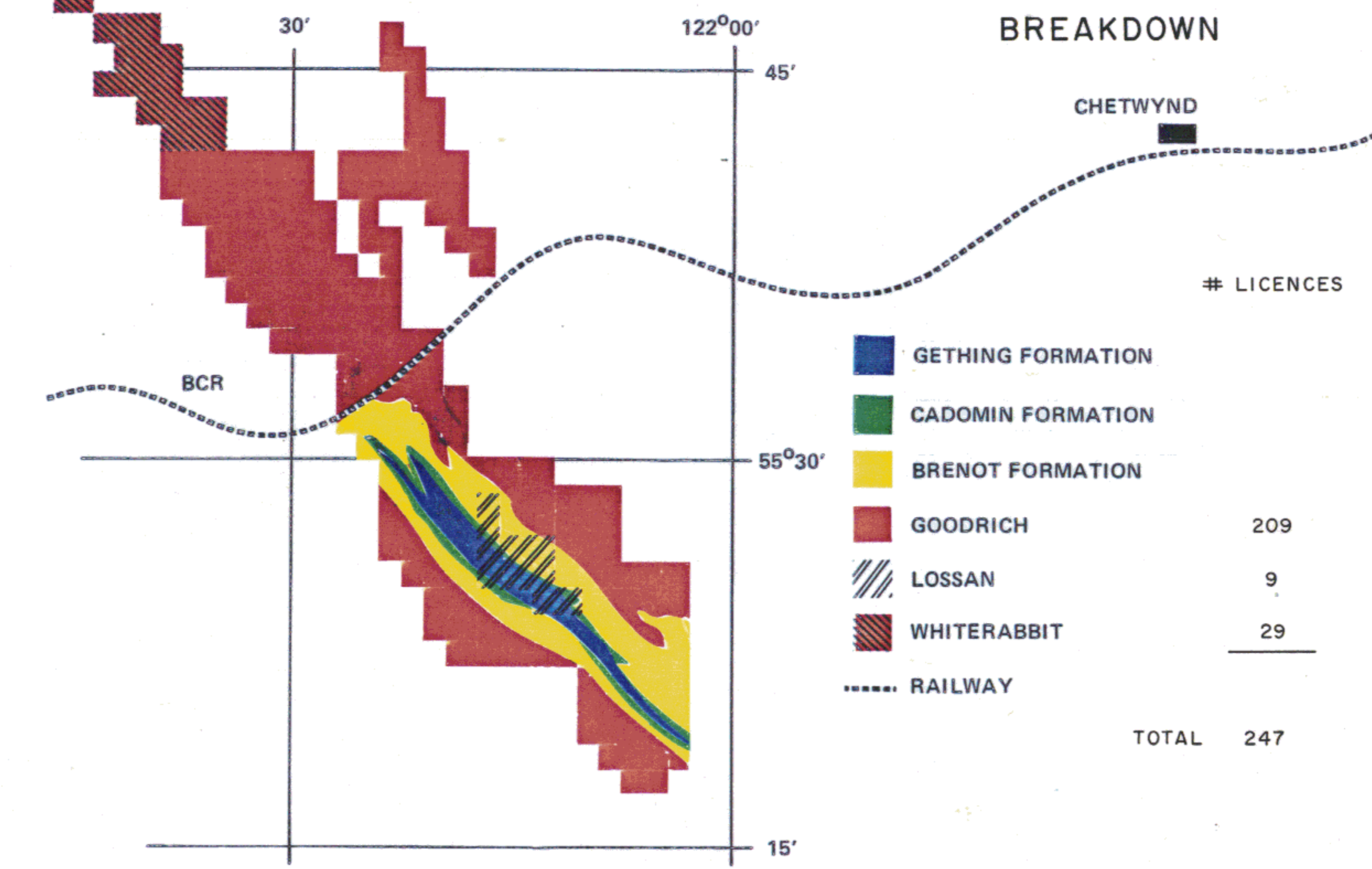
2.3 Exploration History:

Exploration of the Goodrich coal licences began in June, 1980, and consisted of two phases. Phase I involved reconnaissance geological mapping of the entire property. The construction of numerous hand trenches and the drilling of 17 rotary drill holes. Phase II included the completion of a further 19 diamond drill holes bringing the total number of holes drilled on the property by November 7 of 1980, to thirty-six.

For the purpose of further discussion, the Goodrich property has been broken into five blocks which are shown in Figure IV and named as follows:

FIGURE III

GULF'S GOODRICH PROPERTY BREAKDOWN



	# LICENCES	HECTARES
GETHING FORMATION		
CADOMIN FORMATION		
BRENOT FORMATION		
GOODRICH	209	61,325
LOSSAN	9	2,646
WHITERABBIT	29	8,458
RAILWAY		
TOTAL	247	72,429

TABLE I

LICENCE AND ACREAGE SUMMARY OF THE GOODRICH PROPERTY

Licence No.	Date of Acquisition used as anniversaries	No. of Licences	Hectares
Goodrich 5679 - 5739	November 19, 1979	61	17 943
Goodrich 5521 - 5604	November 26, 1979	84	24 671
Goodrich 5605 - 5632	November 26, 1979	28	8 189
Goodrich 5742 - 5769	January 25, 1980	28	8 182
Goodrich 5778 - 5783	February 1, 1980	6	1 754
Goodrich 4750, 4751	April 23, 1979	2	586
Goodrich 5670 - 5678	November 9, 1979	9	2 646
Goodrich - Whiterabbit 5800 - 5828	January 14, 1980	29	8 458
TOTALS		247	72 429

1) The Goodrich Block - This block lies between the John Hart Highway to the north and the North Burnt River to the south, including the northwesterly-trending ranges of both Mt. Stephenson and Mt. Le Hudette.

2) The Lossan Block - This optioned block lies within the Goodrich Block and is located immediately north of Brazion Creek.

3) North Moberly Block - This block covers the northern structural extension of the coal-bearing strata between the John Hart Highway and the Moberly River to the north.

4) East Moberly Block - The northern and eastern extention of coal-bearing strata north of the John Hart Highway (including and licences 4750 & 4751 previously referred to as the Fisher Creek licences).

5) The Whiterabbit Block - This optioned block is located along the structural trend north of the Moberly River.

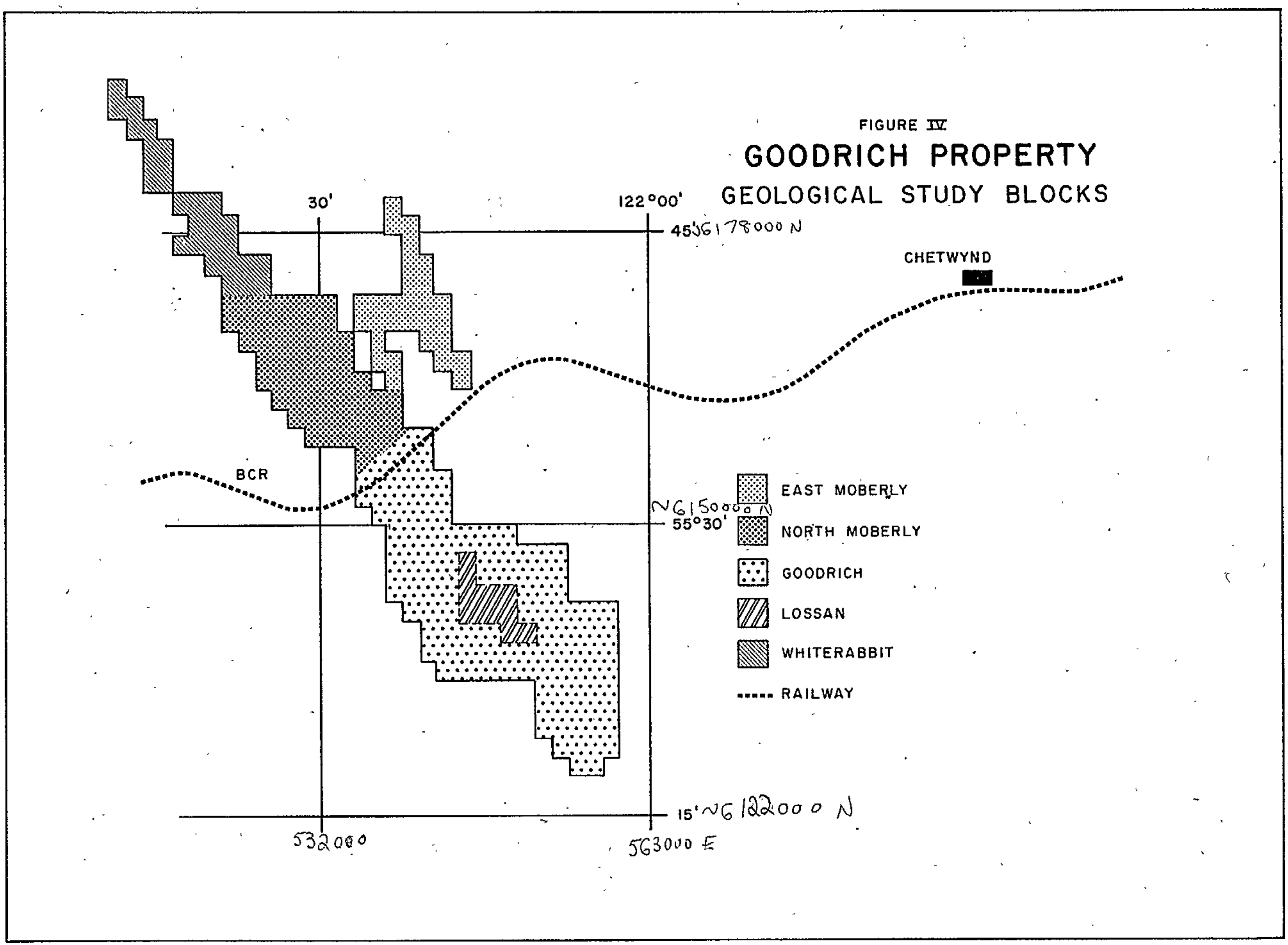


FIGURE IV
GOODRICH PROPERTY
GEOLOGICAL STUDY BLOCKS

1980 EXPLORATION PROGRAM

3.1 Objectives:

The objectives of the 1980 exploration program were:

1) To identify the extent of the coal-bearing formations on the property through reconnaissance mapping.

2) To trench, measure and log all coal seam exposures.

3) To identify structures favorable to the formation of thickened coal.

4) To outline the structure along Brazion Creek by a rotary drilling program.

5) To further delinate by diamond drilling, the development and quality of the coal seams which are found along a southerly-flowing tributary to Brazion Creek.

3.2 Field Camp and Logistics:

Exploration commenced on June 1, 1980. Field personnel were housed in motels in Chetwynd, British Columbia. From June to September, a geological field staff of sixteen carried out a reconnaissance mapping and trenching program. The second phase of the program began early in October and is presently continuing. ~~For the purpose of this report, all work and activities up to November 7, 1980 are included.~~ November 7, 1980 represents the anniversary date of the first group of Goodrich coal licences, and is the date that rental fees on the licences were due and subsequently paid.

Helicopter support for the first phase of work was provided by Maple Leaf Helicopters of Chetwynd, B.C. Maple Leaf and Northern Mountain Helicopters provided air support for the second phase of the program.

Communications were provided by B.C. Telephone. A battery-operated repeater, owned by Gulf and located on Mt. Le Hudette, provided good communications between field parties and Chetwynd. Small portable field radios were provided by West Can Electronics.

Tables II and III on the following pages provide lists of personnel, contractors, and services.

TABLE II
PERSONNEL EMPLOYED

Gulf Personnel

G. D. Childs	Co-ordinator, Coal Geology
A. E. Bienia	Project Supervisor
H. D. Zschach	Project Geologist
G. Seve	Geologist
L. Klatzel	Geologist
V. Tapley	Geologist
E. Bogoslowski	Geological Assistant
D. Dauphinee	Geological Assistant
B. Davidson	Geological Assistant
R. Galant	Geological Assistant
J. LaMarre	Geological Assistant
S. McKenzie	Geological Assistant
A. Petzold	Geological Assistant
S. Hansen	Field Assistant
T. Holmes	Field Assistant
M. Johnson	Field Assistant
R. McRae	Field Assistant
D. McVicar	Field Assistant
F. Pedersen	Field Assistant
J. Gilkinson	Expediter
G. Hellyer	Expediter
J. Forrest	Field Bookkeeper
W. Heck	Field Bookkeeper
A. Avor	Bookkeeper
J. Hamp	Secretary

Consultants

Norwest Resource Consultants Ltd.:

G. Hoffman	Professional Geologist
G. Jordan	Professional Geologist
C. Williams	Geologist
J. Perry	Geologist

Independant Consultants

J. E. Hughes	Professional Engineer
T. Sampietro	Expediter

TABLE III

LIST OF CONTRACTORS AND SERVICES

ACCOMMODATION	
Cascade Motel	Calgary, Alberta
Pine Cone Motor Inn	Chetwynd, B.C.
Stagecoach Inn	Chetwynd, B.C.
AIRCRAFT	
Maple Leaf Helicopters	Chetwynd, B.C.
Northern Mountain Helicopters	Prince George, B.C.
COAL QUALITY STUDIES	
Loring Laboratories	Calgary, Alberta
DRILLING	
Acadia Drilling	Kamloops, B.C.
Alberta Southern Exploration Ltd.	Calgary, Albert
D. W. Coates Enterprises Ltd.	Richmond, B.C.
EQUIPMENT AND FUEL	
P. Demeulemeester	Chetwynd, B.C.
W. J. Schilling	Chetwynd, B.C.
Chetwynd Pacific	Chetwynd, B.C.
Esso	Chetwynd, B.C.
GEOPHYSICAL LOGGING	
Roke Oil Enterprises	Calgary, Alberta
MAPPING SERVICES	
R. M. Hardy & Associates	Calgary, Alberta
D. E. Watson Surveys Ltd.	Delta, B.C.
TRUCK RENTALS	
Minchuk Leasing Ltd.	Calgary, Alberta
Western Truck Rentals	Calgary, Alberta
TRUCKING	
Tortor Trucking	Chetwynd, B.C.
COMMUNICATIONS	
A.G.T.	Calgary, Alberta
B. C. Telephones	Vancouver, B.C.
West Can Electronics	Calgary, Alberta
MISCELLANEOUS	
Bassani Shothole Plug & Control Services Ltd.	Edmonton, Alberta

3.3 Surveying and Photogrammetry:

R.M. Hardy and Associates provided 1:10 000 scale topographic base maps for most of the Goodrich property. Maps at a scale of 1:25 000 were prepared for the areas not covered by the 1:10 000 maps.

A new set of aerial photographs, taken in October by R.M. Hardy and Associates, were produced for the Goodrich property, at a scale of 1:30,000.

Don E. Watson Surveys Ltd. of Delta, B.C., provided survey control for the drill sites as well as control for new photogrammetry which is presently being carried out by R.M. Hardy and Associates.

3.4 Geological Mapping:

Mapping and subsequent geological interpretation of the Goodrich property was carried out by Gulf's staff with assistance from Norwest Resource Consultants Ltd., and J.E. Hughes, Consultant.

Mapping was done on a reconnaissance scale. All field observations were plotted on either 1:10 000 base maps or 1:5 000 scale aerial photographs.

3.5 Trenching:

During the months of July and August, 1980, one hundred and ninety-seven trenches were dug by hand. All trenches were measured and logged. The trench logs are presented in Appendix A and the locations are shown on a 1:50 000 Trench Location Map contained in the back pocket of Appendix A.

3.6 Rotary Drilling:

Alberta Southern Exploration Ltd. provided an Ingersoll Rand Cyclone 60 drill rig for the Phase I rotary drilling program. This drilling commenced on July 7 and was completed by August 5, 1980, and was designed to evaluate the coal occurrences and geologic structure along the Brazion Creek road at the south end of the Lossan Block. No attempt was made to obtain coal quality data from these holes; geophysical logging was the only form of testing carried out.

A total of 17 holes were drilled in the Gething and Brenot Formations. Existing road access was utilized. Because of the encouraging results obtained from the rotary drill program, the decision was made to continue exploration in the area using a diamond drill. Table IV summarizes the available rotary drill hole data.

3.7 Diamond Drilling:

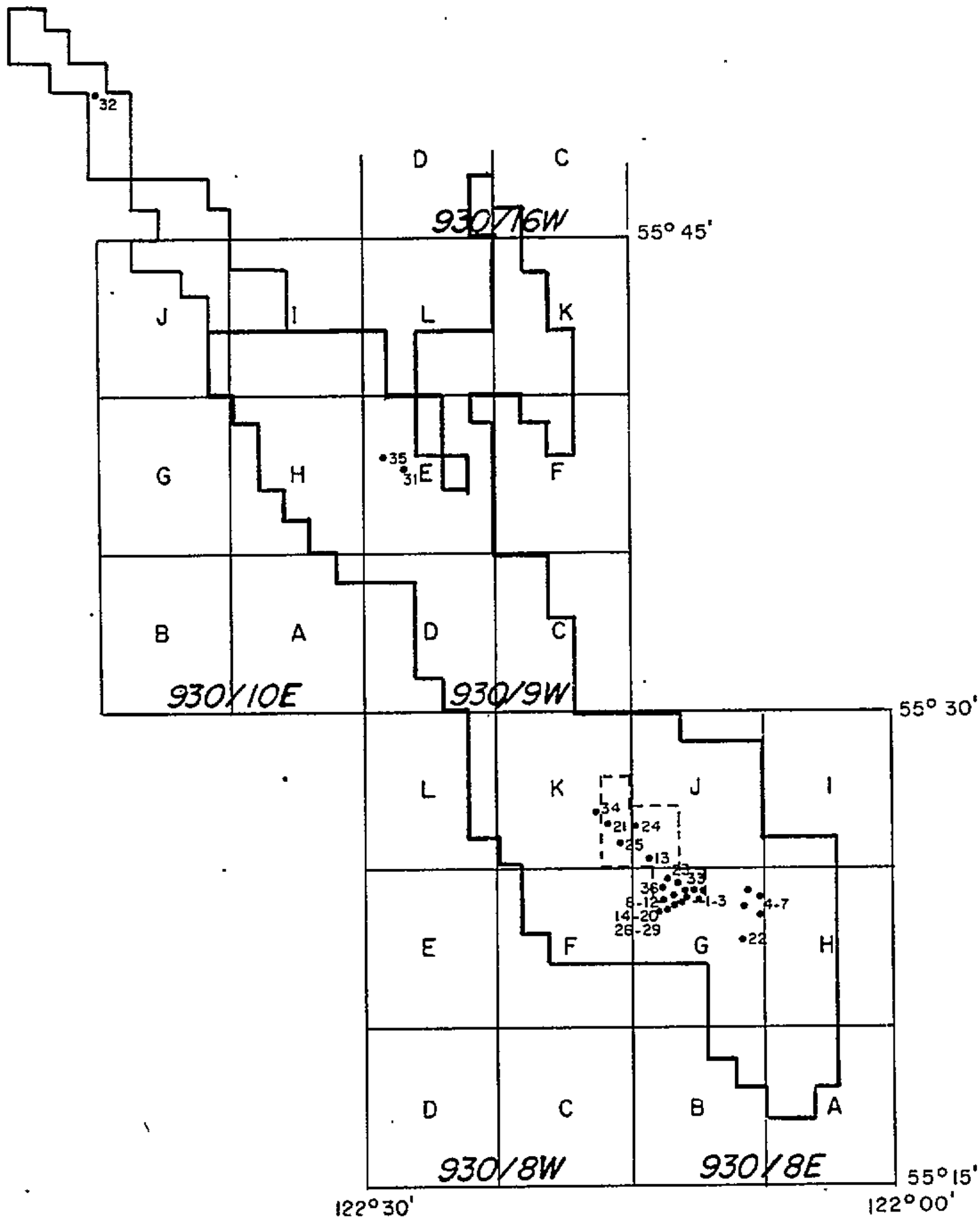
The diamond drilling program for Phase I began on August 14, 1980, and continued until September 24. Acadia Drilling provided a Longyear Super 38 and D.W. Coates Enterprises supplied two Longyear 44 drills, standard HQ core was extracted by the wireline method using a standard 10 foot core barrel. A total of 12 holes were drilled. All drillsites were accessed by existing roads, or were helicopter supported. Coal core was sampled and sent to Loring Laboratories for analysis. Geophysical logs were produced for all holes by Roke Oil Enterprises. Table V summarizes the available data from diamond drill holes.

Phase II diamond drilling program commenced on October 12. A total of 7 drill holes were completed by November 7, utilizing three helicopter supported Longyear 44 drills supplied by D.W. Coates. The locations of these drill holes are shown on Figure V and the diamond drill hole data is summarized by Table V.

TABLE IV

(Geophysical Well logs)

ROTARY DRILL HOLE DATA						GEOPHYSICAL LOGGING PROGRAM			
Hole No.	Location (UTM)	Licence	Elevation (metres)	Depth (metres)	Overburden (metres)	Cal/Den	FBL	GR-N	Deviation
RDH-80-01	139 572.26 N 552 322.86 E	5703	1038.40	111.25	1.22	Run	--	Run	Run
RDH-80-02	139 524.24 N 552 150.07 E	5670	1038.70	256.00	3.66	Run	Run	Run	Run
RDH-80-03	139 509.71 N 552 063.53 E	5670	1034.24	154.00	3.05	Run	Run	Run	Run
RDH-80-04	139 277.26 N 554 211.31 E	5697	1047.37	170.70	3.66	Run	Run	Run	Run
RDH-80-05	140 133.38 N 554 628.91 E	5702	1145.19	192.50	8.84	Run	Run	Run	Run
RDH-80-06	140 389.00 N 554 499.80 E	5702	1191.50	178.31	6.10	Run	Run	Run	Run
RDH-80-07	139 531.92 N 553 823.53 E	5697	1057.90	207.87	4.27	Run	Run	Run	Run
RDH-80-08	139 338.34 N 550 690.35 E	5670	1029.91	281.40	24.69	Run	Run	Run	Run
RDH-80-09	139 106.65 N 550 319.02 E	5700	1042.75	35.36	35.36	--	--	--	--
RDH-80-10	139 407.52 N 550 868.53 E	5670	1030.16	262.50	16.46	Run	Run	Run	Run
RDH-80-11	139 189.40 N 550 424.33 E	5700	1038.91	281.03	26.52	Run	Run	Run	Run
RDH-80-12	139 098.15 N 550 160.44 E	5700	1045.47	262.50	25.91	Run	Run	Run	Run
RDH-80-13	141 516.84 N 548 432.54 E	5672	1047.68	244.10	4.88	Run	--	Run	Run
RDH-80-14	139 496.29 N 550 962.59 E	5670	1031.48	257.56	35.05	--	--	Run	Run
RDH-80-15	139 554.90 N 551 125.26 E	5670	1030.09	243.80	57.91	--	--	Run	Run
RDH-80-16	139 934.46 N 550 537.72 E	5670	1049.26	226.70	21.34	Run	--	Run	Run
RDH-80-17	139 989.48 N 550 883.32 E	5670	1052.66	239.30	4.27	Run	--	Run	Run



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CALGARY ALBERTA

Gulf

FIGURE V

GOODRICH PROPERTY

DRILL HOLE LOCATION MAP

PREPARED BY.	SCALE
APPROVED BY. DATE JAN. '81	DRAWING No.

TABLE V

DIAMOND DRILL HOLE DATA									GEOPHYSICAL LOGGING PROGRAM			
Hole No.	Location (U.T.M.) * Approx.	Licence	Elevation (metres) *Approx.	Inclination	Direction	Depth (metres)	Core Size	Overburden (metres)	Cal/Den	FBL	GR-N	Deviation
DDH-80-18	139 901.24 N 550 634.78 E	5671	1047.50	Vertical	--	291.7	HQ	9.14	Run	Run	Run	Run
DDH-80-19	139 488.99 N 550 960.49 E	5670	1031.11	Vertical	--	339.5	HQ	33.32	Run	Run	Run	Run
DDH-80-20	Same as DDH-80-30	5671	1164.36	Vertical	--	--	--	--	--	--	--	--
DDH-80-21	143 496.70 N 546 646.39 E	5675	1318.64	Vertical	--	273.1	HQ	3.54	Run	Run	--	Run
DDH-80-22	137 738.42 N 553 760.35 E	5698	*1066.74	Vertical	--	312.4	HQ	12.43	Run	Run	--	Run
DDH-80-23	140 680.42 N 549 629.13 E	5671	1187.89	Vertical	--	187.1	HQ	15.50	Run	Run	--	Run
DDH-80-24	143 146.61 N 548 022.55 E	5676	1333.18	Vertical	--	303.6	HQ	3.66	Run	Run	--	Run
DDH-80-25	142 606.85 N 547 022.52 E	5678	1387.72	60^{o}	270^{o}	284.0	HQ	4.09	Run	Run	--	Run
DDH-80-26	139* 365.00 N 550 770.00 E	5699	*1021.03	Vertical	--	202.0	HQ	15.22	Run	--	Run	Run
DDH-80-27	139 388.33 N 550 827.91 E	5670	1028.14	Vertical	--	292.3	HQ	15.70	--	--	Run	Run
DDH-80-28	139 901.33 N 550 634.59 E	5671	1047.84	Vertical	--	320.6	HQ	64.30	Run	Run	Run	Run
DDH-80-29	139 189.70 N 550 515.77 E	5700	1026.56	Vertical	--	200.5	HQ	22.24	Run	Run	Run	Run
DDH-80-30	140 881.09 N 549 883.64 E	5671	1164.36	Vertical	--	332.8	HQ	77.37	Run	Run	Run	Run
DDH-80-31	164 013.84 N 532 310.62 E	5600	1306.17	Vertical	--	367.0	HQ	52.85	Run	Run	Run	--
DDH-80-32	187* 325.00 N 514 650.00 E	5811	1305.97	Vertical	--	312.1	HQ	9.75	Run	Run	Run	Run
DDH-80-33	140 422.03 N 550 086.87 E	5671	1102.58	Vertical	--	374.0	HQ	12.59	Run	Run	Run	Run
DDH-80-34	143 757.01 N 545 846.05 E	5551	1357.00	Vertical	--	130.0	HQ	25.11				
DDH-80-35	165 273.60 N 531 997.93 E	5602	1309.61	Vertical	--	419.4	HQ	15.50	Run	Run	Run	Run
DDH-80-36	140 119.31 N 549 835.07 E	5671	1125.87	Vertical	--	384.2	HQ	10.55	Run	Run	Run	Run

3.8 Other Surveys:

E.M. Electromag Exploration Ltd. ran approximately 2 kilometres of electrical (resistivity) survey along the Brazion Creek road. The survey will be repeated at a later date as the results remain somewhat inconclusive. All data pertaining to the resistivity survey is presented in Appendix B.

3.9 Coal Quality:

The cores obtained by diamond drilling were analysed for coal quality information. Analysis of the samples was carried out by Loring Laboratories and the results are shown on the Coal Seam Data Sheets in Appendix C.

3.10 Reclamation:

Careful planning prior to and during the field program resulted in a limited amount of land disturbance. Reclamation work will be completed to conform to the British Columbia "Guidelines for Coal and Mineral Exploration".

3.11 Cost Analysis:

Total expenditures on the Goodrich project in 1980 were $1 516 164.90. Table VI on the following pages provides an approximate cost breakdown.

TABLE VI

SUMMARY OF COST BREAKDOWN
GOODRICH COAL PROJECT

Surveys		
	Supplies and Services	$ 3 940.65
	Contractor's Charges	26 976.00
	Subtotal	$ 30 916.65
Pre and Post Field Studies		
	Wages and Salaries	$ 7 267.43
	Consultant Fees	9 206.25
	Supplies and Services	12.95
	Subtotal	$ 16 486.63
Field Examination		
	Wages and Salaries	$ 68 931.97
	Consultant Fees	78 685.96
	Communications and General Costs	28 212.10
	Transportation	7 289.89
	Aircraft Charter	86 759.48
	Subtotal	$ 269 879.40
Camp		
	Equipment Purchase and Rental	$ 7 545.70
	Supplies and Services	5 390.23
	Personnel Food and Lodging	82 730.21
	Subtotal	$ 95 666.14

Drilling		
Slashers	$	13 411.10
Supplies and Services		31 273.47
Aircraft		199 159.09
Analysis		14 734.60
Rotary Drill Holes		124 935.47
Diamond Drill Holes		674 738.80
Subtotal		$1 058 252.53
Geophysical Logging	$	37 142.07
Road Construction	$	815.00
General Expenses	$	7 006.48
Total Expenditure		$1 516 164.90

REGIONAL GEOLOGY AND STRUCTURAL SETTING

4.1 Stratigraphy of the Goodrich and Lossan Blocks:

The Goodrich and Lossan Blocks lie between Pine Pass to the north and North Burnt River to the south, and include the northwesterly-trending ranges of Mt. Stephenson and Mt. Le Hudette (see Figures VI & VII). Various aspects of their geology are described below and summarized in Table VII.

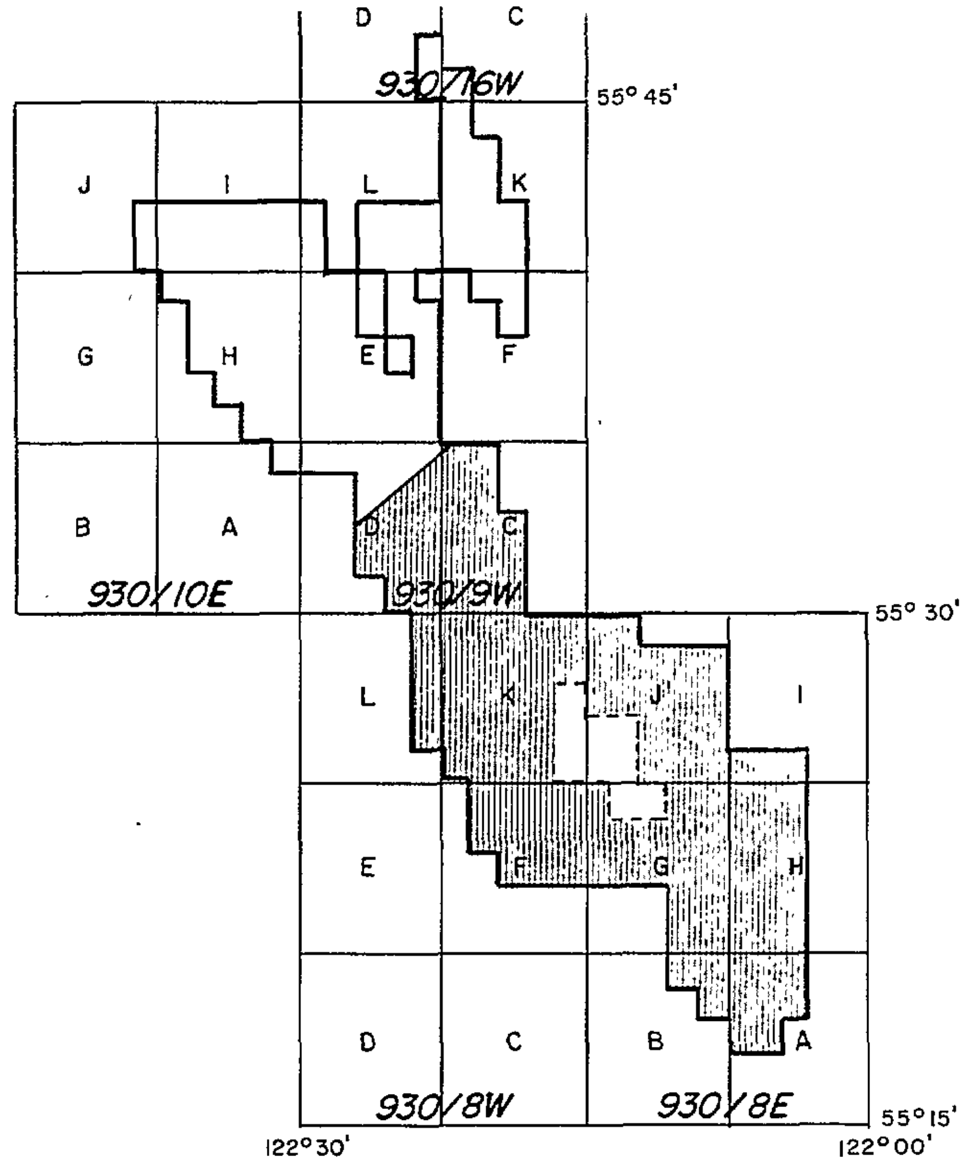
4.1.1 The Minnes Group

The stratigraphy of the Minnes Group north of this area has been fully defined by Mathews *1946 in his publication "Geology and Coal Resources of the Carbon Creek - Mount Bickford Map Area" (B.C. Dept. Mines Bulletin 24). Mathews has identifed four separate formations within the Minnes Group; these are, in ascending order, the Monteith Formation, the Beattie Peaks Formation, the Monach Formation, and a fourth unnamed formation. Recently, geologists form the British Columbia Department of Mines and Petroleum Resources have referred to that unnamed formation as the Brenot Formation.

The Monteith Formation consists mainly of marine lithic and quartzose sandstones and is characterized by some thick beds of coarse-grained white quartzite at the top. The formation is 535 metres thick near the type area. The Monteith Formation was not studied in any detail during the 1980 exploration program.

The Beattie Peaks Formation lies conformably above the Monteith Formation, and is 375 metres thick at the type area at the Beattie Peaks.

Like the Monteith Formation, the Beattie Peaks Formation is a marine unit, but it includes a prepônderance of argillaceous sediments. The reconnaissance geological mapping of 1980



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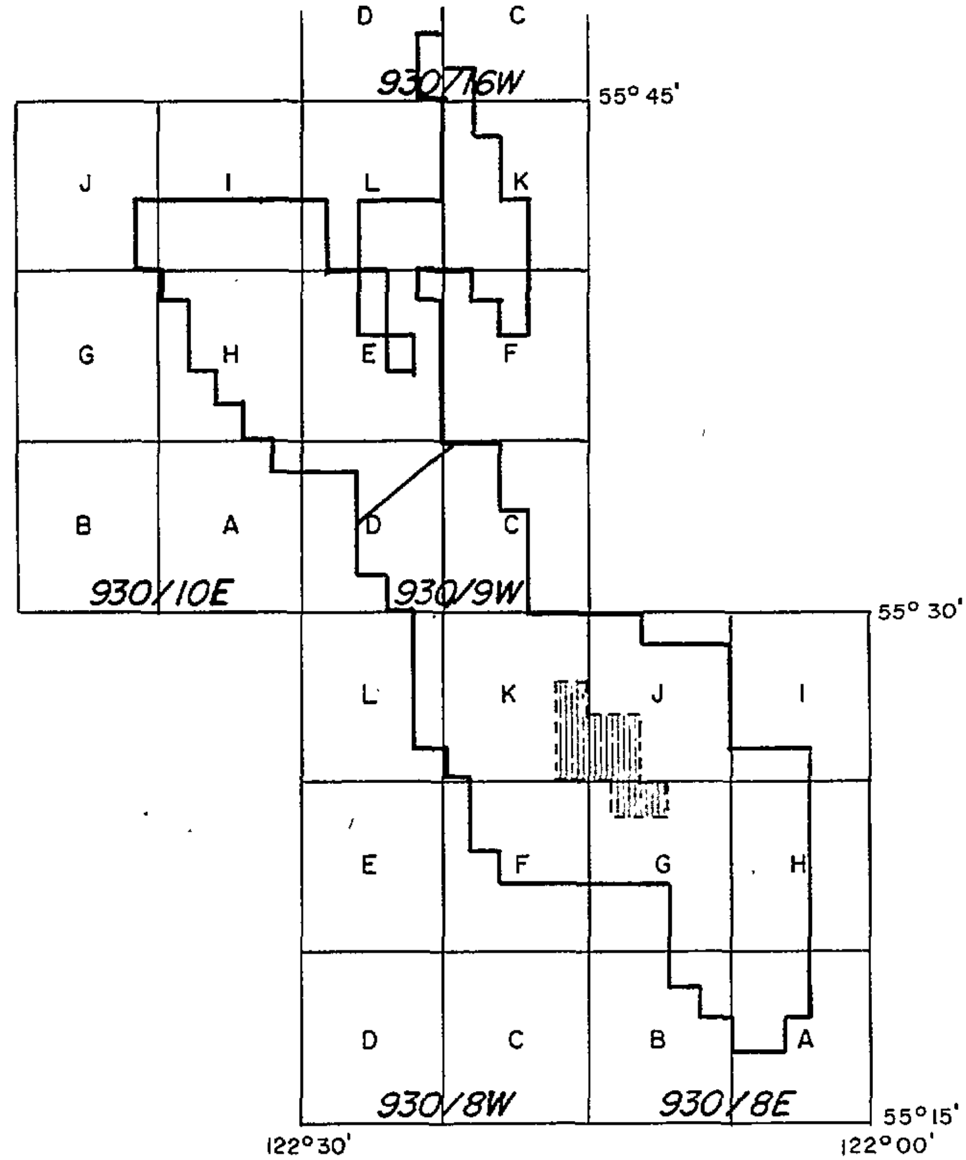
Coal Division
CALGARY ALBERTA

FIGURE VI

GOODRICH BLOCK

PREPARED BY | SCALE
APPROVED BY | DATE JAN. 81 | DRAWING No.



GULF CANADA RESOURCES INC.
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CALGARY ALBERTA

FIGURE VII

LOSSAN BLOCK

PREPARED BY		SCALE
APPROVED BY	DATE JAN. 81	DRAWING No.

TABLE VII

STRATIGRAPHIC COLUMN

PERIOD	GROUP	FORMATION	LITHOLOGY	UNIT THICKNESS
Lower Cretaceous	Bullhead	Gething	Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.	Incomplete
		Cadomin	Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.	100 M
Transitional	Minnes	Brenot	Lithic "salt and pepper" sandstone, siltstone, mudstone, carbonaceous mudstone, quartzite, COAL.	2668 M
		Monach	Marine lithic and quartzose sandstone, with thick beds of clean, coarse-grained white quartzite at top, COAL.	100 M
		Beatty Peaks	Sandstone, marine siltstone	375 M
		Monteith	Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse-grained white quartzite at top.	535 M
Jurassic		Fernie	Marine mudstone, with minor siltstone, and sandstone. Gradational contact with Monteith	Incomplete Section

has shown that the upper third of this formation, or its equivalent is coal-bearing in the vicinity of Goodrich peak. In fact, two seams of 1.5 m thickness have been trenched in the Beattie Peaks Formation in the Mt. Stephenson area.

The Monach Formation conformably overlies the Beattie Peaks Formation, and is similar in character to the Monteith Formation. Thick beds of clean, coarse-grained white quartzite are characteristic of the top of the Monach Formation south of the Pine Pass. These quartzite beds are especially resistant to erosion and are readily identifiable in surface outcrops. The presence of these quartzite beds at the top of the Monach Formation was traced as far south as the Burnt River, but they have not been identified at any location farther south to the Alberta Provincial Boundary. The Monach Formation is about 100 metres thick in the type area.

Studies of the unnamed formation at the top of the Minnes Group, which has recently been referred to as the Brenot Formation, shows that this unit is only poorly developed north of the Pine Pass. In that area, the Brenot Formation has been identified as a non-marine, coal-bearing deltaic unit, but the economic significance of that coal is yet to be determined. The thickness of the Brenot Formation increases rapidly in a southerly direction, and at Goodrich Peak, the Brenot Formation was found to be 2 668 metres thick. South of Goodrich peak, the coal-bearing portion of the Minnes Group continues to increase and achieves a thickness in the order of 2 000 metres in the Mt. Reesor area.

At Goodrich Peak, the Brenot Formation consists of medium to coarse-grained "salt and pepper' lithic sandstones, the grains of which are markedly angular and poorly sorted in addition to siltstone, mudstone, carbonaceous mudstone, and coal seams. Figure VIII is a measured section of the Brenot

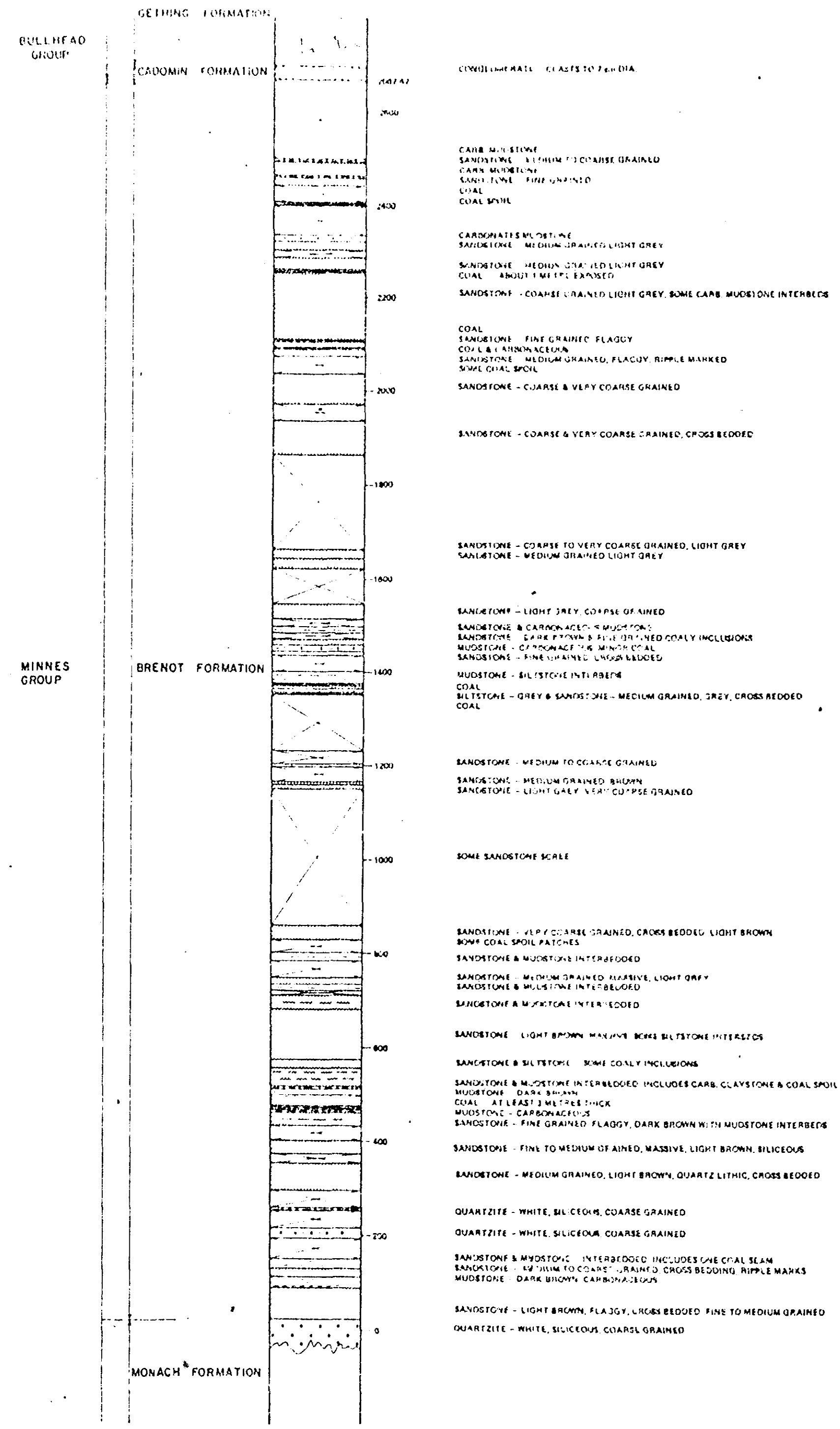

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FIGURE VIII

MEASURED SECTION OF THE BRENOT FORMATION

MEASURED AT THE WEST FLANK OF GOODRICH PEAK, NE BC

DRAWN BY | DATE | SCALE
PREPARED BY | DRAWING No.
APPROVED BY | DATE JAN 81

PREPARED BY NORWEST RESOURCE CONS LTD.

Formation at Goodrich Peak. Numerous coal seams up to and in excess of three metres have been trenched in the Brenot Formation along Goodrich Peak and one seam with an average thickness of approximately three metres has been trenched in two localities and intersected in two drill holes, two miles north of the Brazion Creek Road near the eastern margin of the Goodrich Block. An illustration of those seams is included in the trench seam profiles of Appendix A.

4.1.2 The Cadomin Formation

A considerable amount of time was spent during the 1980 field program studying several occurrences of conglomerate outcrops which are found at the surface within the Goodrich property. The purpose of the work was to try to ascertain whether these conglomerate outcrops represented the Cadomin Formation, because the presence of the coal-bearing Gething Formation which overlies the Cadomin Formation could then be confirmed.

In his work in the Pine Pass region, carried out in the early and middle 1950's Dr. J. Hughes showed that the stratigraphy of the Gething and older Lower Cretaceous sediments at Pine Pass was significantly different from the stratigraphy of the same section located farther to the south. In areas south of Pine Pass, the Cadomin Formation is an easily identifiable stratigraphic unit consisting of very subrounded clasts, which at times are as large as 10 centimetres in diameter. No other conglomerate beds in the Lower Cretaceous sequence include clasts of this size, and this is one of the characteristics which is often used for the identification of the Cadomin Formation. At Pine Pass, Dr. Hughes was unable to locate the presence of a conglomerate that had this characteristic; he found only a thick unit of coarse-grained sand and grit lying below a section which is believed to be

Gething Formation. Dr. Hughes referred to that arenaceous unit as the Dresser Formation, and no Cadomin Formation appears in his stratigraphy.

A most significant conglomerate outcrop is located east of the Goodrich Block at Brazion Creek. This outcrop has been identified as Cadomin Formation by Geological Survey of Canada geologists. The base of this exposure consists of conglomerate containing clasts about 2 centimetres in diameter, supported in a matrix of medium to coarse-grained sandstone.

About 90 metres farther up the section at the top of the exposure is another bed of conglomerate which again contains 2 centimetre clasts. In this upper bed, the matrix is significantly different and consists of grey angular chert clasts of a grit size. Sporadic outcrops of a very uniform and apparently silicified grey grit are found between these two conglomeratic beds.

Gas well geophysical logs from this area show the Cadomin Formation to be approximately 100 metres thick, and in some instances, thicknesses as great as 200 metres have been recorded. Figure IX is a section of a gas well geophysical log illustrating the log response of the Cadomin Formation in the Pine Pass area.

A coal geophysical log from the Pan Ocean property immediately adjacent to the Goodrich Block was made available to Norwest for inspection. This log was taken from a fully-cored drill hole which had clearly penetrated the Cadomin Formation. This geophysical log showed that the Cadomin Formation was about 100 metres thick, but the core description showed that beds of conglomerate with large clasts only existed at the top and base of that formation. The intervening material was described as a silicious grit and

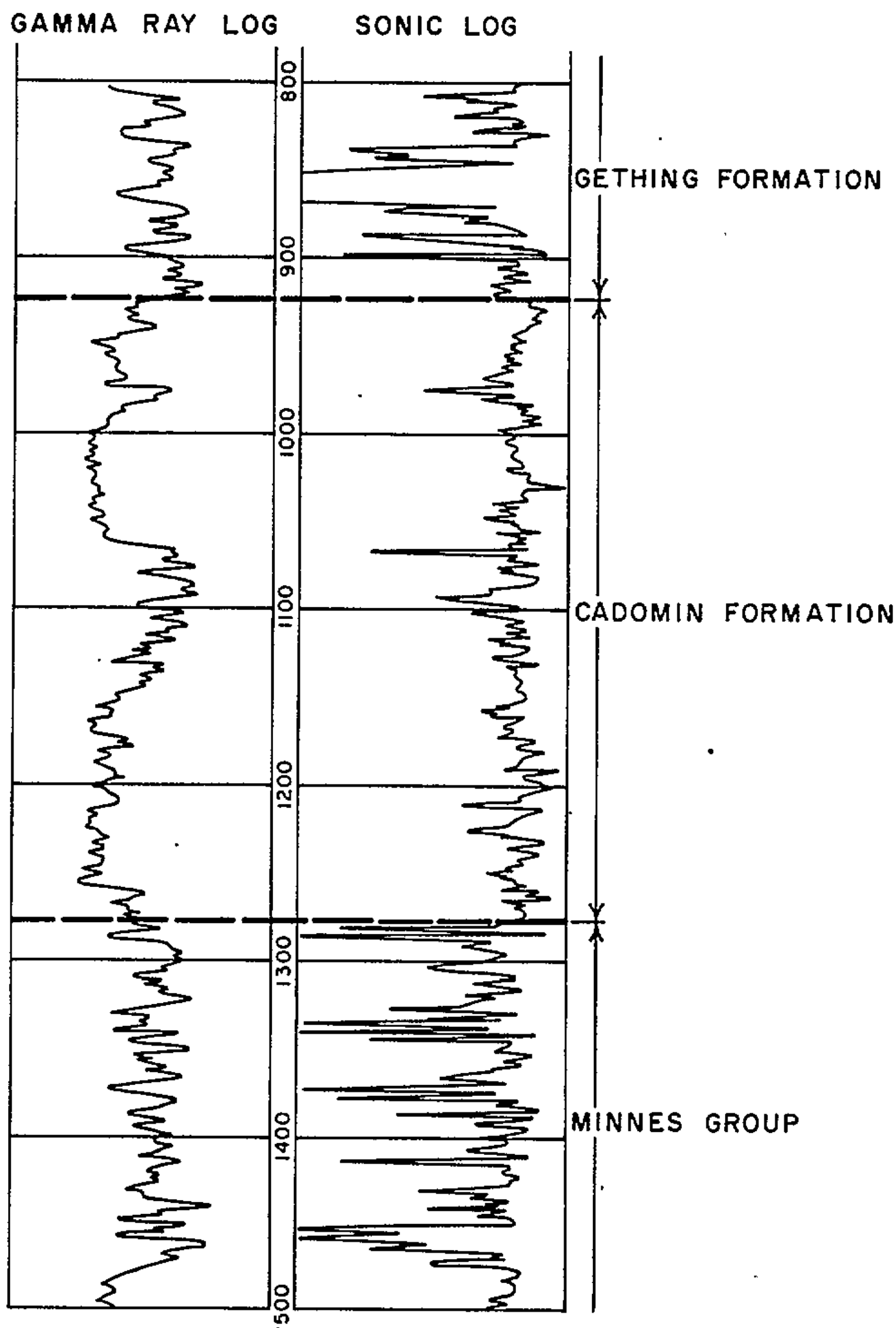

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FIGURE IX

TYPICAL LOG RESPONSE ON THE CADOMIN FORMATION

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DATE
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SCALE
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carbonaceous mudstone, and even a thin coal seam was present.

About 5 metres of conglomerate were observed at Goodrich Peak, the lower two-thirds of which included grit-supported chert clasts about 2 centimetres in diameter, while the upper third of the section consisted of chert clasts up to 7 centimetres in diameter contained in a sandstone matrix.

Scree from a further bed of conglomerate was found on the west flank of Mt. Gilliland, but this material always consisted of grit or chert clasts 1 to 2 centimetres in diameter in a grit matrix. A large exposure of conglomerate was also located immediately north of Brazion Creek, and in that case, the beds always contained the same kind of material as was observed in the scree at Mt. Gilliland. Another exposure was noted about 5 kilometres north of Brazion Creek, and only grit was present at that locality. Several other chert pebble conglomerate beds were found along creeks and ridges on the east-facing slope of the Mt. Stephenson Range.

The exposure at Goodrich Peak has been positively identified as Cadomin Formation by geologists from the Geological Survey of Canada, and the reconnaissance mapping conducted during the 1980 field season suggests that all of the exposures described above come from the same formation. Thus it would appear that the Goodrich Block is located at a point where the coarse conglomeratic nature of the Cadomin Formation to the south displays facies changes to its equivalent more fine-grained beds in the north at Pine Pass. In some localities, a coarse-grained facies of this conglomerate may also be present, but the distribution of this material is sporadic. This identification of the Cadomin Formation on the Goodrich Property means that the overlying strata must represent the coal-bearing Gething Formation and younger beds.

4.1.3 The Gething Formation

A sequence of strata of the Gething Formation is located in the centre of the Goodrich Block along a northwesterly trend between Pine Pass in the north and the Burnt River in the south. This stratigraphic unit was first identified in the Brazion Creek area, and subsequent mapping showed its direct relationship to a sequence of rocks in the Pine Pass area which had been identified as Gething Formation by Dr. Hughes.

At Brazion Creek, the Gething Formation contains a large proportion of mudstone with minor siltstone and sandstone, as well as carbonaceous mudstone and several coal seams. Casts of plants are a very common feature of these strata, and the beds have a distinctly uniform colour as opposed to the "salt and pepper" appearance of the rocks which lie below the conglomerate beds of the Cadomin Formation.

There is as yet no measurement available for the thickness of this unit in the Goodrich Block.

4.1.4 The Moosebar Formation

An apparently thick sequence of a monotonous mudstone, which is believed to be of marine origin, overlies those beds which have been tentatively identifed as Gething Formation. The mudstone occupies the core of a major syncline which trends northwest through the centre of the Goodrich and Lossan Blocks. This mudstone unit may be the Moosebar Formation, or possibly another marine mudstone within the Gething Formation such as the marine unit found within the Gething Sequence on BP Canada Ltd.'s Sukunka property.

4.2 Coal Occurrences in the Goodrich and Lossan Blocks:

Coal occurrences which may be of commercial significance were found both in the Minnes Group strata and in the Gething Formation on the Goodrich and Lossan Blocks. These occurrences are described in detail below.

4.2.1 The Minnes Group

Numerous coal occurrences were noted on the Goodrich Block in the upper strata of the Minnes Group which are referred to as Brenot Formation. In many cases, the thicknesses of coal seams were too small to be of significance, but in several instances, seams in excess of 1 metre in thickness were observed, and in some cases seams in excess of 3 metres were drilled or trenched.

A program of hand trenching of coal seam and coal spoil exposures was conducted in the Brenot Formation west of Goodrich Peak. Those trenches show that numerous seams are present in the Brenot Formation, and the trench logs of those seams are included in Appendix A. The maximum thickness found was 3.16 metres. Six additional coal outcrops in excess of 1 metre in thickness were identified. A 1:50 000 trench location map contained in Appendix A.

Brenot Formation coal seams were also located on the flanks of Mt. Gilliland, Mt. Stephenson, and Mt. Le Hudette. As many of these seams were trenched as time would allow, and the logs of those trenches are also included in Appendix A.

Numerous other exposures of Brenot Formation coal seams were located in the southeastern portion of the Goodrich Block. One seam with an average thickness of approximately 3 metres was exposed by a bulldozer carrying out construction work for a logging company in the area, and this seam was intersected in rotary drill holes GDR-RDH-05 GDR-RDH-06.

Coal seams were also found interbedded with the quartzites of the Monach Formation at Goodrich Peak. Only a few such outcrops have been found at the present time, and their maximum thickness appears to be about 1.5 metres.

Two coal seams, each having an approximate thickness of 1 metre were exposed by bulldozers constructing the new logging road which follows Brazion Creek. Those coal exposures are located on the southwest slope of Mt. Stephenson, and those seams are contained in a section of the Beattie Peaks Formation. A further exposure of one of those seams was observed west of Mt. Gilliland.

The locations of all of the above coal exposures are shown on the accompanying reconnaissance geological maps.

It should also be noted that geologists from the British Columbia Department of Mines and Petroleum Resources have reported the presence of three seams, each in excess of 1.5 metres in thickness, in the extension of the geological structures of the Brazion Creek Block to the south of the Burnt River. All of those coal exposures are believed to lie within the upper part of the Brenot Formation.

4.2.2 The Gething Formation

The most significant coal seam exposures of the Gething Formation on the Goodrich and Lossan Blocks were located along a southerly-flowing tributary to Brazion Creek. Four well-exposed coal seams were observed within an interval of about 200 metres along this creek. These seams have been referred to as Seams A to D respectively, and the thicknesses of these seams range from 8.24 m, to 1.92 m. The upper two seams were trenched by hand and sampled for analysis in 1979. Several other coal exposures in adjacent creeks were noted, and those exposures are believed to represent the same coal seams. All of these coal exposures are shown on the accompanying reconnaissance geological maps and the logs of the trenches are included in Appendix A.

Both rotary and diamond drilling in the vicinity of the Lossan Block have shown the presence of at least two coal seams which are characterized by a significant degree of tectonic thickening. Rotary drill holes GDR-RDH-80-08, 80-10, 80-11, 80-14 and 80-15 as well as diamond drill holes DDH-80-18, 80-19, 80-21, 80-22, 80-28, 80-29 and DDH-80-33, have all intersected seams in excess of 3 metres thickness, with some intersections being as much as 50 metres in thickness. The intersections in this area to date have made this the most significant exploration target located to date. The locations of the drill holes are shown in Figure V, and the seam profiles and geophysical logs from those holes are included in Appendix C. The complexity of the geology in this area will require a considerable amount of exploration work before meaningful seam isopach maps can be prepared.

Several coal spoil exposures were located on the saddle extending west from Goodrich Peak at the top of the measured Brenot section. Logs of the trenches constructed in those locations are also included in Appendix A. The location of those exposures is shown on the reconnaissance maps.

Several seams were found and trenched at the headwaters of Beaudette Creek. These seams have thicknesses in excess of 1 metre, and their locations are shown on the reconnaissance geological maps. Other exposures of Gething Formation coal seams were observed farther north towards the Hart Highway along the same structural trend. Only a few of those exposures have been trenched and logged at this time.

4.3 Geologic Structure of the Goodrich and Lossan Blocks:

The geologic structure of the Goodrich and Lossan Blocks consists of a large northwesterly-trending synclinorium flanked on the east by a major anticline, and truncated to the west by a major thrust fault which dips steeply to the west. The axis of the synclinorium trends along the centre of these blocks to Pine Pass and beyond, as well as to Burnt River to the south. The plunge of the synclinorium is shallow at about 7° in a southerly direction from Pine Pass to Brazion Creek. At Goodrich Peak, the plunge of the synclinorium is shallow in a northerly direction. The plunge steepens rapidly to about 30° at Mt. Gilliland until the plunge reversal at Brazion Creek is encountered. Figure X is a cross-section illustrating the structure in the vicinity of Goodrich Peak.

Adjacent to the thrust fault to the west, the beds of the synclinorium dip very steeply, and are in fact overturned along most of the trend. The smaller-scale folds which are parasitic to the synclinorium within the Lossan Block are often strongly asymmetrical, usually including one very steeply dipping limb and very abrupt fold hinge regions. The pattern of the geological structure is interrupted in at least one locality near Brazion Creek where cross-trending folds and thrust faults are present.

The general pattern of the geological structure of the Goodrich and Lossan Blocks indicates that the strata in these areas have been subjected to a very intense level of tectonic deformation. Rotary and diamond core drilling to date, which has been concentrated in the Brazion Creek area of the Goodrich and Lossan Blocks, has located a deposit of coal which warrants a concentrated amount of exploration to determine its mine-ability. Consequently, the geolocial structure of that area is discussed in some detail below.

Drilling data and mapping traverses along the spur trending east from Mt. Gilliland and along the creeks and roads within the Lossan Block have improved the definition of the structure of this area. South of Brazion

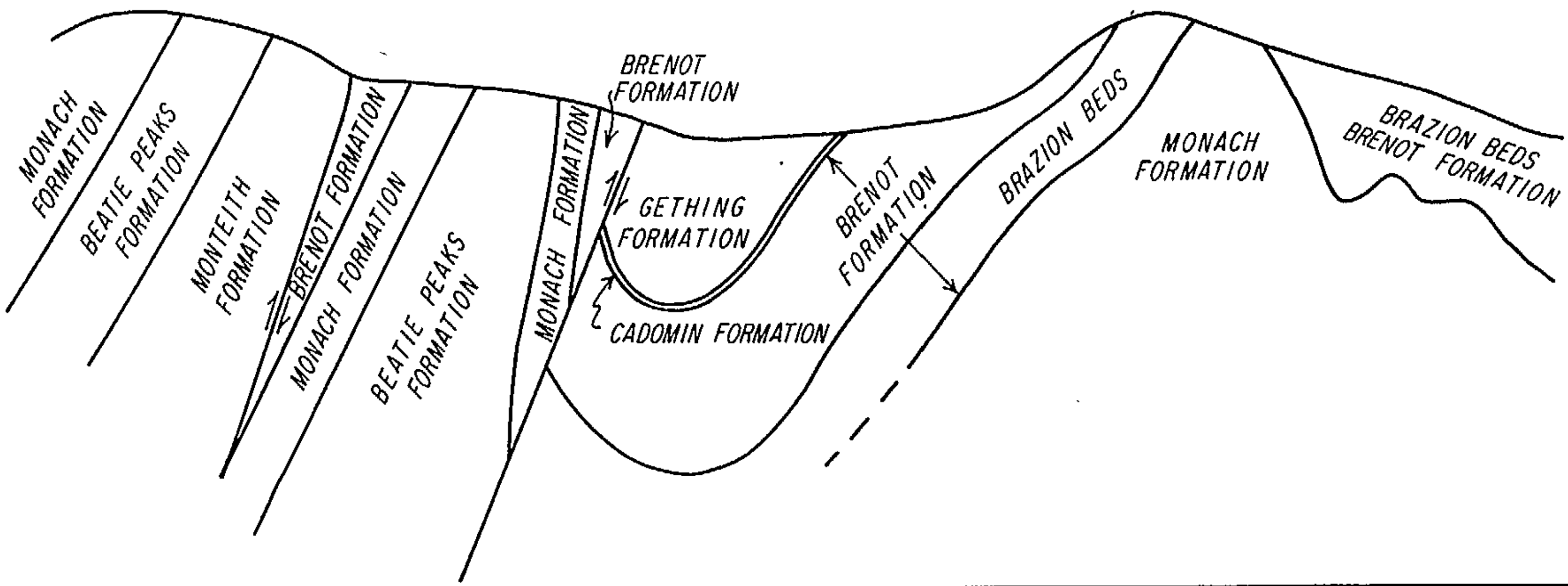

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FIGURE X

SKETCH SECTION LOOKING NORTHWEST THROUGH GOODRICH PEAK,

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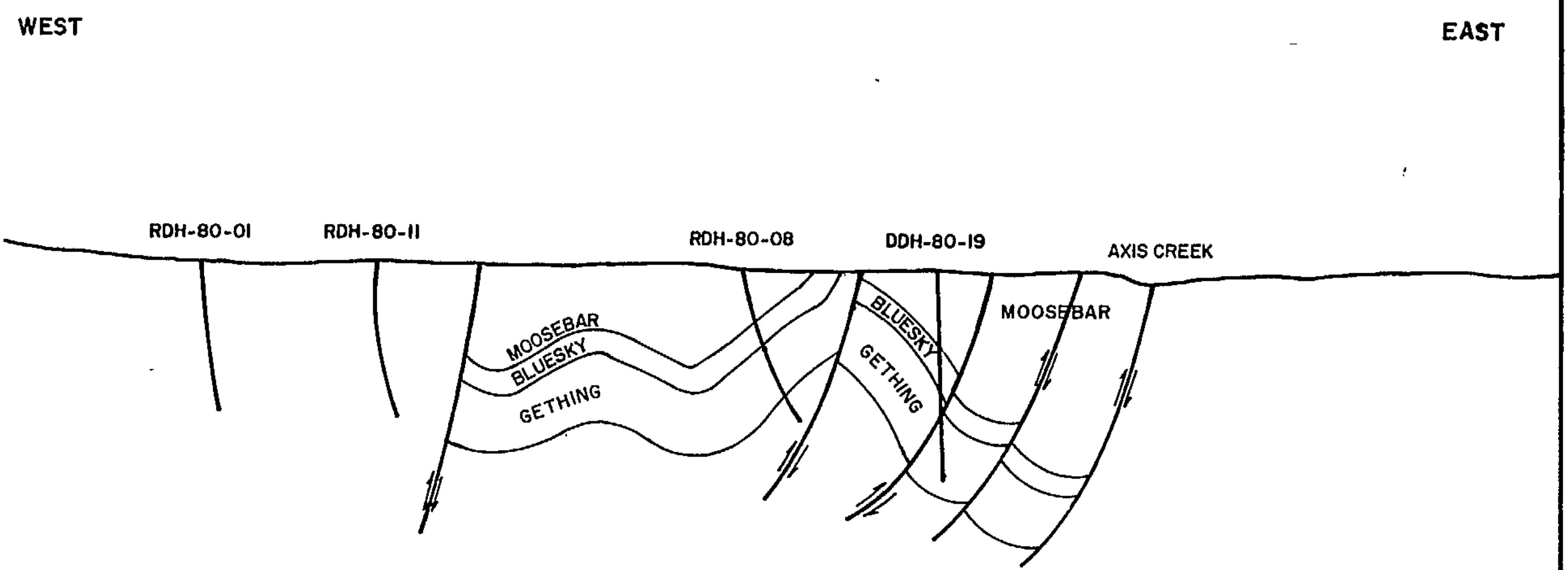
PREPARED BY: DRAWING No.

APPROVED BY: DATE: JAN. 81



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Gulf

FIGURE XI

SKETCH OF POSSIBLE STRUCTURE ALONG BRAZION CREEK

PREPARED BY:		SCALE 1 : 10,000
APPROVED BY:	DATE: JAN. 81	DRAWING No.

Creek, a series of very tight chevron-style anticlines and synclines have disturbed the Gething Formation strata. The amplitude of these folds appears to be as great as 300 metres, and the half-wavelength is usually on the order of 400 metres. Similar structures are knows to exist within the central portion of the Lossan Block. A major cross-trending thrust fault is believed to follow Brazion Creek east of the Lossan Block, thus having a west-northwesterly trend in that area. In the vicinity of the Brazion Creek road, the trend of this structure turns to a northwesterly direction, to become coincident with the regional structural trend. This structure may be responsible for the extreme tectonic thickening of coal near the Brazion Creek road. A cross-section illustrating one interpretation of the geological structure along trhe Brazion Creek Road in this area is included as Figure XI. Geological Maps No. 930/8E/J and 930/8E/G, included in the map box further illustrate the structure of this area.

5.1 Stratigraphy of the North Moberly Block:

The North Moberly Block is part of the northern extension of Gulf Canada's coal licences, located between the Pine and Moberly Rivers.

These licences cover coal-bearing strata of the Gething Formation and Minnes Group, which form the northern extension of the regional geological trend of the Goodrich Block. The location of the North Moberly Block is shown on Figure XII.

Geological mapping and hand trenching were carried out on the North Moberly Block during 1980. Three diamond drill holes were drilled in the North Moberly Block during Phase II, and the information from these holes is contained in Appendix C. The geology of this block is described in the following section of this report.

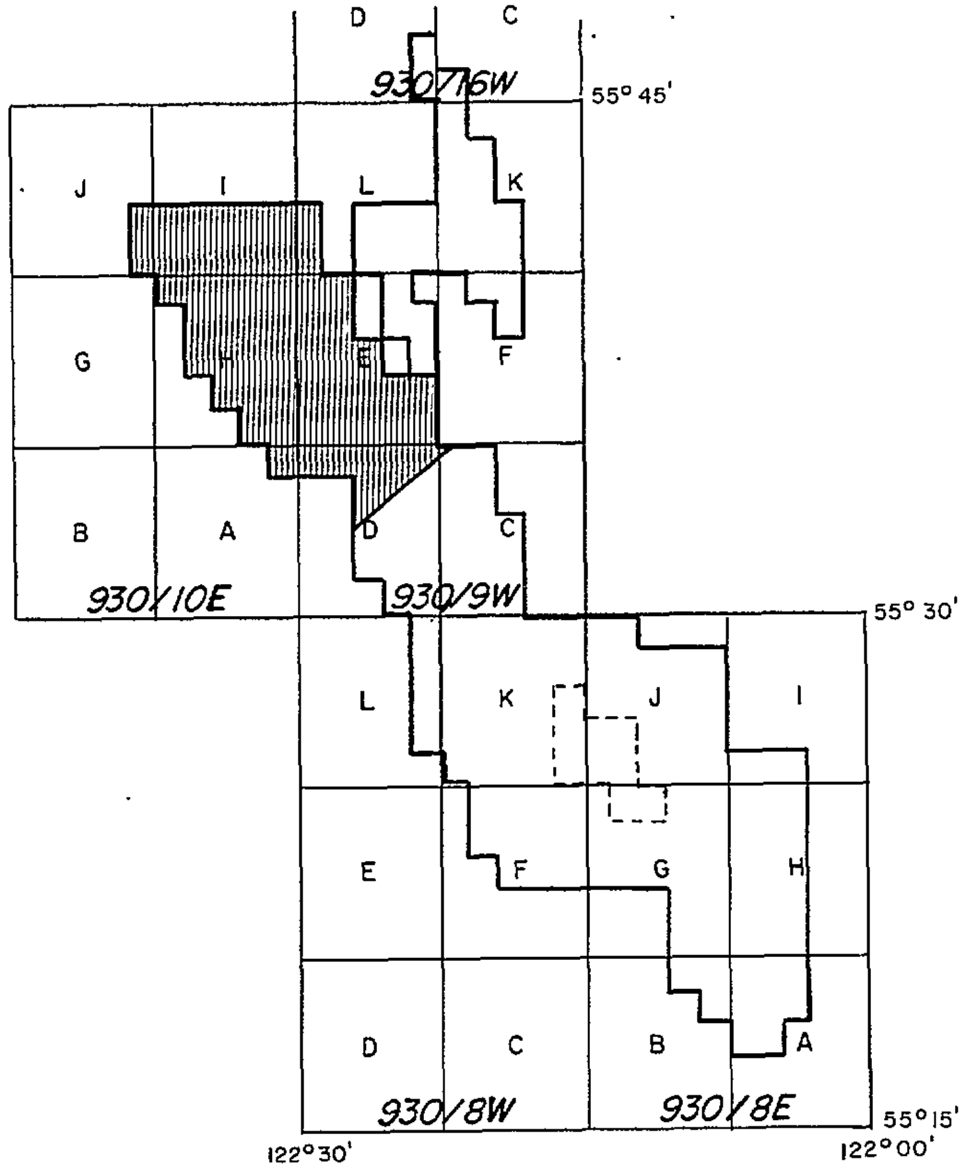

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FIGURE XII

NORTH MOBERLY

PREPARED BY:		SCALE
APPROVED BY:	DATE. JAN. 81	DRAWING No

5.1.1 The Minnes Group

The type sections for the formations within the Minnes Group are located near the northeast corner of the North Moberly Block. Facies changes appear to take place within the Minnes Group between those type sections and the Minnes Group measured sections located farther south at Goodrich Peak. Consequently, the stratigraphic variations of the Minnes Group between the Goodrich Block and the North Moberly Block must be detailed.

Unlike the Monteith strata of the Goodrich Block, the Monteith Formation of the North Moberly Block appears to be particularly monotonous. This formation has a pronounced marine character in the North Moberly Block, and consists of an interbedded sequence of medium to coarse-grained sandstone, siltstone and mudstone, with occasional marine fossil horizons throughout. The prominant sandstone beds typical of the Monteith Formation at Goodrich Peak are not present in the North Moberly area.

Numerous workers have studied the Beattie Peaks Formation of this area in detail. The Beattie Peaks Formation is known to be entirely marine in the North Moberly Block and is predominately argillaceous in character, consisting of mudstone with relatively minor amounts of siltstone and sandstone.

The Monach Formation is essentially the same in lithology as the Monach sequence observed at Goodrich Peak; however, no coal occurrences have been reported within the Monach strata of the North Moberly Block.

The Brenot Formation in the North Moberly area is lithologically similar to sections measured at Goodrich Peak. The formation contains abundant medium to coarse-gained 'salt and pepper' sandstone, with carbonaceous mudstone and numerous coal seams. In the North Moberly Block, the Brenot Formation also contains several beds of conglomerate characterized by an unusual number of clasts of carbonaceous mudstone and coaly material. The formation thins rapidly towards the north, where its true thickness appears to be as little as 100 metres.

5.1.2 Cadomin Formation

The Cadomin Formation has been readily defined during field traverses in the North Moberly Block, and has been observed to be very similar in character to the Cadomin Formation of the Goodrich Block. A prominant sequence of coarse-grained Cadomin conglomerate is located near the southeastern corner of the North Moberly Block on the west slope of Mt. Bickford. In most other areas, the Cadomin Formation consists of grits and coarse-grained sandstones with occasional lenticular beds of chert pebble conglomerate.

5.1.3 The Gething Formation

In the North Moberly Block the Gething Formation is the youngest formation present; only an incomplete section of Gething strata is present, and the upper portion of the formation has been removed by erosion. Like the Gething Formation of the Goodrich Block, the Gething sediments of the North Moberly block consist predominately of fine to medium-grained sandstones which have a pronounced monotonous appearance. The sandstones are quartz-lithic, and often contain an abundance of plant casts. Carbonaceous mudstone and siltstone also constitute a significant portion of the Gething sediments. Numerous coal seams and occasional beds of conglomerate are also typical of the sequence.

The distribution of the various formations present in the North Moberly Block is shown on accompanying Geological

Map Nos. 93-0-9-WD, 93-0-9-WE, 93-0-10-EH, and 93-0-10-EI, 93-0-10-EJ, 93-0-10-EA.

5.2 Coal Occurrences in the North Moberly Block:

Several hand trenches were constructed within the North Moberly Block so that the seam thicknesses and characteristics could be studied. The logs from those trenches are included within Appendix A of this report. Most of the trenches were dug in seams exposed on the ridges and sloping ground on the west side of Boulder Creek. The maximum seam thickness encountered was 1.82 metres in trench number JHN-GT-7, and there appears to be at this time the potential for four seams with thicknesses in excess of one metre.

The locations of the trenches are shown on the relevant geological maps of the North Moberly Block. At this time, hand trenching of coal exposures on this block is incomplete, and further exploration work will be required.

5.3 Geological Structure of the North Moberly Block:

The geological structure of the North Moberly Block is essentially a continuation of the regional features observed within the Goodrich Block. The basic structure consists of a northwesterly-trending synclinorium, which appears to have a shallow plunge towards the north near the Pine River, and a shallow southerly plunge at the Moberly River. The axis of this synclinorium is located close to Boulder Creek. Major thrust faults, which have a steep westerly dip, trend parallel to the axis of the synclinorium, and are found within the adjacent parallel-trending ridges.

A series of smaller scale cross-trending folds and faults are located within the synclinorium and meet the axis of the latter structure about 8 kilometres north of the Pine River Valley. The structural relationships at this point are similar to those observed at Brazion Creek. Consequently, the potential for tectonically thickened coal deposits may exist in this area.

The geological structure of the North Moberly Block is illustrated on the accompanying geological maps and cross-section $F\text{-}F^1$.

6.1 Stratigraphy of the East Moberly Block:

Dr. John E. Hughes carried out reconnaissance geological mapping of the East Moberly Block during the 1980 Goodrich exploration program. He mapped the strata of this block according to the stratigraphic nomenclature described in his publications. A comparison between this nomenclature and that used in other areas of the Goodrich property is shown on Table VIII.

The East Moberly Block includes coal licences 5742 to 5769 on the easterly outcrops of the Crassier coal measures (Non-Marine Bullhead), the ground proposed for applications as part of the reconnaissance of the Western Foothills, 1979, as well as licence 4750 and 4751, previously reported as the Fisher Creek licences, (see Figure XIII). The coal licences extend from the middle of Fisher Creek, northward across the Moberly Valley to the east front of Mount Frank Roy.

The strata of the East Moberly Block are of Triassic to Lower Cretaceous age, belonging to the Schooler Creek, Fernie, Bullhead, and Fort St. John Groups.

Upper Jurassic - Lower Cretaceous strata of the Bullhead succession form most of the outcrops. They are classified in the terms: Beaudette Group (= Lower Marine Bullhead) and its divisions, Monteith, Beattie Peaks, and Monach Formations): Crassier Group (= Non-Marine Bullhead), the sequence of coal measures divisible into the Brenot, Dresser, and Gething Formations.

In addition to this schema concerns the Beaudette - Crassier boundary. Beds underlying the Crassier coal measures and separable from the marine Beaudette sequence are described by the terms Chetwynd for subsurface sections, and Brazion for outcrops in the Foothills (Hughes 1967, 1979).

TABLE VIII

STRATIGRAPHIC TERMINOLOGY
FOR
GOODRICH COAL PROJECT 1980

GULF CANADA RESOURCES LTD. J.E. HUGHES

AGE	GROUP	FORMATION
LOWER CRETACEOUS	FORT ST. JOHN	COMMOTION
		MOOSEBAR
	BULLHEAD	GETHING
		CADOMIN
JURASSIC OR LOWER CRETACEOUS	MINNES	UPPER BRENOT
		MIDDLE BRENOT
		LOWER BRENOT
		MONACH
		BEATTIE PEAKS
		MONTIETH
JURASSIC	FERNIE	FERNIE

FORMATION	GROUP	AGE
COMMOTION	FORT ST. JOHN	LOWER CRETACEOUS
MOOSEBAR		
GETHING	CRASSIER	
DRESSER		
BRENOT		
BRAZION BEDS	BEAUDETTE	
MONACH		
BEATTIE PEAKS		
MONTIETH		
FERNIE	FERNIE	JURASSIC
	SCHOOLER CREEK	TRIASSIC

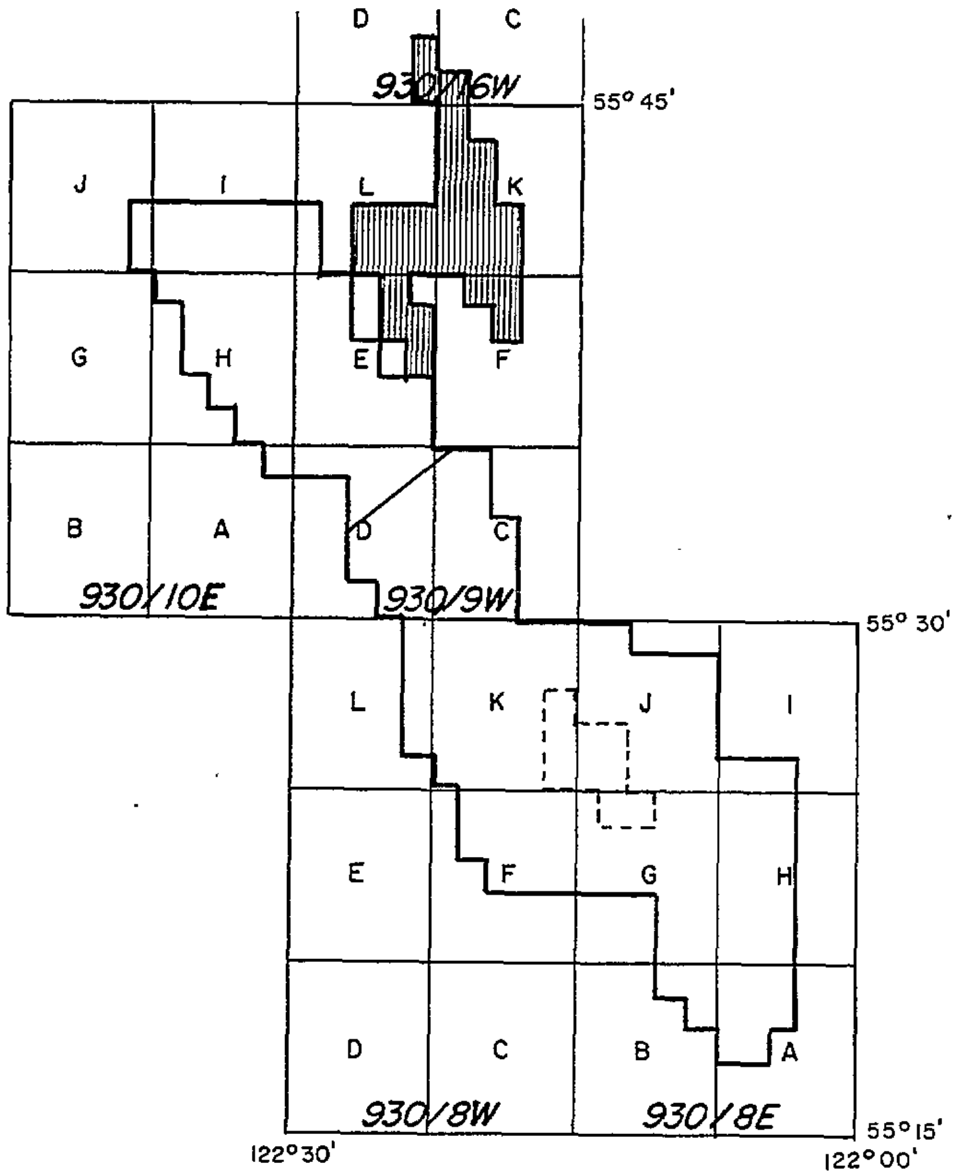

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FIGURE XIII

EAST MOBERLY

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The Brazion contains quartzites in single beds, two or more quartzites with concealed intervals, or quartzites with shales mudstones, sandstones, carbonaceous shales and coals in interbeds or in a subjacent set. They represent deposits of shifting shorelines, local fills, and coastal swamps consequent on a marine retreat and uplift. The sequence indicates emergence and probably a disconformity.

The Brazion beds vary in thickness, from 1 to 40 m (3 to 130 feet). They are absent from outcrop south of the Moberly River where Brenot coal measures overly beds referred to the Beattie Peaks Formation.

6.1.1 Beaudette Group

Monteith Formation (480 to 550 m, 1600 to 1800 feet). - Sandstones, quartzitic sandstones, and quartzites in thick beds, few coarse-grained quartzites with grits; lesser black shales, and thin interbedded mudstones, siltstones and sandstones: quartzitic sandstones and quartzites, dominant and characteristic of upper third part.

Beattie Peaks Formation (140 to 290 m, 460 to 950 feet). - Thin interbedded shales, mudstones, siltstones and sandstones: sandstones in beds of 1.5 to 4.5 m (5 to 15 feet), more common in upper third part, in transition to the Monach.

The formation thins southeastwards across the Foothills: 200 to 260 m (650 to 850 feet), in the east limb of the Bickford anticline; and about 140 m (460 feet) in the east limb of the Fisher anticline in the Moberly Valley; in the latter section sandstones are prominent, and the Monach beds are unseen.

Monach Formation (0 to 105 m, 0 to 350 feet). - Sandstones, flaggy, planar and current bedded; lesser thin intervals of finer grained sandstones interbedded with siltstones and shales.

The quartzites overlying the Monach sandstones and formerly treated as the Upper Member of the Monach Formation are included in the Brazion beds, in the present terminology.

The Monach is mapped as an independent unit where exposures suffice. Much of its outcrop is indistinct or concealed, and for this reason it becomes objective and expedient to represent the formation in a combined map unit of the Beattie Peaks, Monach, Brazion interval.

The Monach sandstones are about 90 m (300 feet) thick in the Bickford anticline. They have not been seen in the Fisher anticline south of the Moberly Valley.

<u>Brazion Beds</u> (0 to 40 m, 0 to 130 feet). - Quartzites, one or several beds: quartzites with intervals or subjacent beds of shales, mudstones, siltstones, sandstones, carbonaceous shales, and coals.

For the purpose and scale of mapping, the Brazion beds are represented under map units of Beaudette strata, and the outcrops indicated by separate note.

A single bed of quartzite is present in the Bickford anticline, south of Bickford Lake, ranging in thickness from 1.5 to 9 m (5 to 30 feet).

On the south side of the Moberly Valley, the west limb of the Fisher anticline shows about 15 m (50 feet) of quartzites with layers of quartzitic grits and pebbles: the east limb about 40 m (130 feet) of the Brazion interval, - quartzites with grit layers and few concealed parts. The Monach and Brazion beds have not been found across the Fisher anticline, 1 to 3 miles south of the Moberly: in its west limb here, Brenot coal measures overlie sandstones, which are referred to as the Beattie Peaks Formation. The crest and plunge of the Fisher anticline, facing the Pine Valley, exposes a section:

Brenot Formation

m	(feet)	
+ 3.0	(10)	Coal Measures

Brazion Beds

m	(feet)	
8.0	(26)	Quartzites
5.5	(18)	Concealed
4.6	(15)	Quartzites
--		Concealed

The Brazion interval contains a variable sequence, however the quartzite is characteristic and prevalent, though reduced in thickness in places.

6.1.2 Crassier Group

The Crassier coal measures amount to about 1160 m (3 800 feet) in a continuous sequence. Its division into the Brenot, Dresser, and Gething Formations depends on several factors; sand to shales ratios; grain size of sandstones, and inclusion of grits and conglomerates, or associations of conglomerate beds; distribution and frequency of thick sandstone beds, frequency of coal seams and the nature of cyclothems. The multiple criteria may suggest complexity, but the characteristics affinitive or exclusive, tend to converge on the respective formations. Their division is more simplified by concentration of thick beds of coarser-grained sandstones in the Dresser Formation.

The three formations are related by changes and transitions. The intermediate boundaries require judgement, or some degree of arbitrary placement. They are more distinct in uniform structures, ie. the west limb of the Fisher anticline, where they are accentuated by the relief. It is difficult to map the formations in complex structures, especially where lack of exposures call for extended interpretations.

Brenot Formation (180 to 260 m, 600 to 850 feet). -Coal measures; thin cyclothems mostly lean or barren; shales, mudstones, siltstones, sandstones, carbonaceous shales, coals; sandstones increase in upper part.

The cyclothems of the lower part tend to be more complete, and this interval contains 8 thin coal seams, in the lowest 60 m (200 feet). A gradation of increasing sandstones occur about 90 m (300 feet) above the base, mostly platy, thin and rough bedded types; thick sandstones appear about 150 m (500 feet) above the base and introduce the transition to the Dresser Formation.

Dresser Formation (360 m to 430 m, 1200 to 1400 feet). - Coal measure sequences and sandstones in thick beds and sets 3 to 12 m (10 to 40 feet); the coarse clastics, the thick sandstones and lesser interbeds of grits, and conglomerate and few conglomerates in places, composing about one third of the formation; total sandstones amounting to two thirds of the formation; cyclothems with much sandstone, some barren, and some with thin coals in relatively few exposures. Apparently, the coals tend to be more frequent in upper parts or in transition to the Gething Formation.

Gething Formation (490 to 570 m, 1600 to 1875 feet). -Coal measures: shales, mudstones, siltstones, sandstones, carbonaceous shales, coals; cyclothems simple and compound, and well developed; shales of cyclothems increasing from base to upper part of the formation; coal seams relatively frequent, more so in upper parts; thicker sandstones in sets to 6 m (20 feet), in places containing grits and conglomeratic layers of bottom sets, more numerous in lower half and in gradation to the Dresser Formation.

6.1.3 Fort St. John Group

The Moosebar and Commotion Formations outcrop in the East Moberly Block and surroundings.

Moosebar Formation (390 to 420 m, 1300 to 1400 feet). - Shales, silty shales, and mudstones, lesser argillaceous siltstones and sandstones; interbeds of sandstones in transition to the Commotion Formation; glauconitic beds with argillaceous sandstones near the base; basal conglomerate of chert pebbles, 0.3 to 7.6 m (1 to 25 feet).

The Moosebar Formation overlies the Gething with disconformity. Much of the formation is concealed, and estimates of thickness represent its stratigraphic interval in the east limb of the Crassier anticline, outcropping under the scarp of the Commotion beds. On the west, Moosebar beds outcrop in the Fisher syncline. The shales and mudstones are relatively soft and easily weathered, as shown by their recessed outcrops and valley forms.

Commotion Formation (not measured). - Shales, sandstones, conglomerates, and lesser coal measures.

6.2 Coal Occurrences:

Coals occur throughout the Crassier sequence. Most information relevant to the East Moberly Block concern the Gething coals.

6.2.1 Brenot Formation

Cyclothems with thin coals are present in the lower 90 m (300 feet), the seams mostly thin, 0.4 m (1.3 feet) and less. The upper part appears to be more barren on the ground east of Fisher Creek. A few records of thicker seams indicate some potential.

A coal seam 0.95 m (3.1 feet) occurs northeast of Bickford Lake, "about 300 feet from the base of the coal measures" (Mathews, 1946).

A cutting of the B.C. Railway, on the southwall of the Pine Valley, exposes 0.91 m (3.0 feet) coal in the east of the Bickford anticline. The seam lies at the base of the Brenot Formation and rests on the Brazion quartzite.

6.2.2 Dresser Formation

The Dresser coal measures are less visible than others of the Crassier and are more frequently covered, though adjacent sandstones are prominent.

A number of Dresser cyclothems end in carbonaceous shales or mudstones with plant remains; a few in thin coals usually less than 0.3 m (1.0 feet). The transition to the Gething Formation contains some thicker coals to 0.91 m (3.0 feet).

Mathews' record (1946) indicates the thickest coal found in outcrop, 1.22 m (4.0 feet), about 400 m (1300 feet) above the base of the Crassier coal measures "exposed 0.3 miles farther east", of the Brenot coal showing, northeast of Bickford Lake (ibid: <u>see</u> - under Brenot Formation).

6.2.3 Gething Formation

The Gething coals are numerous, but the majority are thin. A thickness of 1.0 m (3.3 feet) is a useful index to distinguish seams of potential interest for introductory mapping and evaluation.

<u>Field Work</u>, 1980: This work found two showings of interest.
1) A coal seam in the west limb of the Crassier anticline, exposed in a small cut along the power line of B.C. Hydro and Power Authority, on the south side of the Moberly Valley - (see attached Goodrich - East Moberly Geology Map (1:25 000).

Section L 33; Coal Licence 5759

m	(feet)	
—	—	Subsoil
0.61	(2.0)	Coal, weathered spoil
0.52	(1.7)	Waste
3.41	(11.2)	Coal, weathered spoil
—	—	Concealed

The structural relations are concealed, and the reference to the Gething Formation indicates a fault on the west, an interpretation derived from the reduced interval of Dresser beds: detailed mapping is left for following schedules.

2) A seam of 2.96 m (9.7 feet) coal in one bench, exposed in an unnamed tributary of the Moberly River, Lat 55° 48.2', Long 1212° 22.4'.

Abstracts of the Results of Coal Investigation, 1946 -51, Government of British Columbia: An investigation of the coal resources accessible to the John Hart Highway (97), by the Department of Lands, Forests and Water Resources included parts of the Pine Valley about the south border of the Moberly coal licences. Their findings are reviewed here.

Parts of the Bickford and Pine River anticline were drilled and trenched in three localities (Figure 4).

Cleveland Creek. - The following record comes from a locality described "west of Cleveland Creek" (McKechine 1955).

m	(feet)	
2.0	(6.5)	No. 92 Seam
29.4	(96.0)	Interval
1.2	(3.8)	No. 95 Seam
3.7	(12.0)	Interval
5.5	(18.1)	No. 97 Seam
14.3	(47.0)	Interval
2.4	(8.0)	No. 100 Seam
19.8	(65.0)	Interval

Base of Gething Formation

(Stratigraphic intervals approximate)

The section contains 7.3 m (23.8 feet) net coal in interval about 59 m (195 feet).

No. 100 Seam has 2.4 m (8.0 feet) clean coal.

No. 97 Seam, described as 5.5 m (18.1 feet) contains 1.7 m (5.5 feet) net coal in three benches within an interval of 4.4 m (14.3 feet); together with coals and interbedded shales.

No. 95 Seam, reported 1.2 m (3.8 feet), - probably clean coal.

No. 92 Seam, reported 2.0 m (6.5 feet), - contains several thin shale beds.

The stratigraphic levels of the coal seams may be redefined, but their general reference to the Gething/Dresser transition is acceptable at present time. The reported elevations for localities of this section should be corrected by +50 m (+150 feet), - perhaps more.

Noman Area. - Drilling tested the upper half of the Gething in its faulted and repeated outcrop: across the Noman anticline, on the west side of Fisher Creek. The strata are:

	Moosebar Formation	
	Gething Formation	
m	(feet)	
168.0 - 229.0	(550 - 750)	Interval
1.5 - 6.7	(5 - 22)	No. 78 Seam
15.0 - 30.0	(50 - 100)	Interval
0.3 - 3.7	(1 - 12)	No. 76 Seam
+61.0	(+200)	Interval

No. 76 Seam: the thickness ranges from 0.3 to 3.7 m (1 to 12 feet) to (?) absent, and reported as "thickness of main bench" (= clean coal for the most part but containing few waste partings in places).

No. 78 Seam: the seam attains a maximum thickness of 6.7 m (22 feet), average 4.9 m (16 feet), minimum 1.5 m (5 feet); the net coal 6.4 m (21 feet) maximum, and otherwise exceeding 85% of the seam thickness as described under the term "main bench" (ibid.).

The variation of Nos. 76 and 78 Seams occur in 975 m (3200 feet) of the section across the structure. Apparently the coals may not be greatly affected by deformation.

Other seams of the Noman area are thinner. No 60 Seam, reported to lie 15 to 50 m (50 to 160 feet) below the base of the Moosebar Formation may be of interest.

Narod Creek. - Trenching and drilling, (DDH = PR 1A, and 2), on the Narod anticline covered a stratigraphic interval about 655 m (2150 feet) below the Gething/Moosebar contact. The coal seams are indicated in a summary form (abstract from North 1948).

m	(feet)	
Moosebar Formation		
Gething Formation		
6.1	(20.0)	Interval
2.2	(7.3)	Coal Seam (includes few waste bands)
51.8	(170.0)	Interval
1.6	(5.3)	Coal Seam
60.9	(200.0)	Interval
+3.5	(+11.5)	Coal Seam (total coal = 3.5 m in four benches)
51.8	(170.0)	Interval
2.1	(7.0)	Coal Seam
54.9	(180.0)	Interval
1.2	(4.0)	Coal Seam
30.5	(100.0)	Interval
1.1	(3.5)	Coal Seam
198.1	(650.0)	Interval
2.2	(7.2)	Coal Seam
?182.9	? (600.0)	Interval

Correlations of the Narod and Noman coals are uncertain, and were not made explicit in the subsequent publication (McKechnie 1955).

6.3 Geologic Structure:

The major structures of the East Moberly Block are of regional scale. They are compound; and their forms much modified by component and auxiliary folds. The folds share a regional plunge to the southeast, a feature of the tectonic framework of the Peace and Pine River areas.

6.3.1 The Bickford Anticline

A large fold of angular form and amplitude, split by faulting along the axial plane, - it brings up Fernie and Monteith beds in the core. Anticlines of the auxiliary folds in the east limb contain Beaudette beds and younger beds in progress eastwards, down dip to the Fisher syncline.

6.3.2 The Fisher Syncline

The Moosebar outcrop expanding to the southeast describes the form of the syncline. Several auxiliary folds in the trend of the axial zone complicate the outline of the Moosebar/Gething contact. Their anticlines bring up narrow, linear sectors of Gething beds, some have overthrusts on axial plane faults. The southeast plunge limits the Mooebar outcrop to the watershed of Fisher Creek. Extensions of Moosebar in the auxiliary synclines may enter the south centre of the Moberly coal licences, but they are not detailed at present time.

6.3.3 The Pine River Anticline

This structure has two component anticlines, Fisher and Crassier on the east. The latter has a subordinate form, but is distinct for its length, and its assemblage of minor folds.

6.3.4 Fisher Anticline

A simple, subangular fold form partly modified by flexure of the limbs, it exposes Monteith beds in its core along the Moberly Valley. To the southeast the axis maintains the Beaudette-Crassier boundary at elevations 1500 to 1400 m (4900 to 4600 feet), and a cover of Brenot beds on high ground on the divide of Crassier and Fisher Creeks. The anticline ends in a steep southeast plunge on the north slope of the Pine Valley. For much of its length the east limb joins the Fisher syncline in steep uniform dip, about 56^{o}. Its dip is reduced by a sharp flexure near the anticlinal axis: the flexure is lined by minor breaks.

The form of the Fisher anticline changes about the north face of the Pine Valley, where its plunge is surrounded by an envelope of folds, and faulted folds in the Crassier coal measures (B.C. Dept. Mines, Bull. 51).

6.3.5 Crassier Anticline

The structure is compounded of several folds of linear trend, developed in Dresser and Gething beds. South of the Moberly Valley, their outcrop narrows: the component anticlines converge on a set of oblique folds, mid-way to the Pine Valley. The oblique structures may incorporate, or offset the medial anticlinal axis en echelon (subordinate faulting may be present).

The Crassier and Fisher anticlines converge southeastwards and the intervening syncline becomes closed in a northwest plunge. It is inferred that the syncline is faulted along the axial plane, and overridden by a thrust fault on the east front of the Fisher anticline, northward to the Moberly Valley.

The east limb of the Crassier anticline attains an overall displacement of 2440 m (8000 feet) to the contraflexure with the Hulcross syncline, an index of its differential amplitude. The dip of Gething beds forming the east limb varies progressively from vertical north of the Moberly, 70 to 75^{o} on its south, and 30 to 35^{o} at the Pine Valley.

6.3.6 Fold Forms and Structural Patterns

Most of the fold forms are angular, and many of them cut by faults parallel to the axial plane. The faulting may affect only some levels of the fold, but it can accomodate large vertical displacements. Axes of angular folds are potential locii for disjunctive structures, and for thickened nodes of coal.

In vertical and steep limbs, anticlinal beds are sheared and flexured with overfold sectors which can contain thickened coals. The east limb of the Crassier anticline, where it parallels the hanging wall of a thrust fault, north of the Moberly Valley, has thin coals thickened three times or greater in shear wedges of vertical and overfolded beds.

Oblique folds of different scale, drag folds to auxiliary folds, occur in several places in the major anticlines. The structures are disharmonic, of shallow origin. Monteith exposures indicate the nature of the folds, in the hill Lat 55^{o} 50', Long 122^{o} 27', - the parent anticline forms the hanging wall of the Carbon thrust. The oblique folds are formed in quartzites and quartzitic sandstones, dislocated from underlying beds: the interbedded shales and siltstones, at the base of folds and in the axial modes indicate different levels of decollement. The amplitude and frequency of folding may be reinforced or diminished at higher stratigraphic levels. On the dip face of the anticline, overlying beds are deformed in large open flexures. There are several examples of note.

1) An oblique, salient anticline of the Bickford anticline Lat 55^{o} 40', Long 122^{o} 26': the fold axis is steep and closed in sharp southeast plunge. part of the oblique north limb separates from the lower Monteith beds in a sharp flexure, whereas underlying beds preserve the main structure of the Bickford anticline.

2) Folding of disharmonic form in Monteith beds across the axis of the Fisher anticline, elevation south of the Moberly Valley (air observation).

3) Oblique structures in Dresser beds across the axis of the Crassier anticline (see - under Crassier anticline).

4) Some folds in the Crassier coal measures around the southeast plunge of the Fisher anticline on the north face of the Pine valley (B.C. Dept. Mines, Bull. 51). The oblique

folds have common features of their structural relationships: they occur within parent anticlines, some of them crossing over the axis: they develop about steep pitches of the anticlinal plunge. Some examples, or perhaps all the oblique folds noted, are associated with flexures or dislocations of the fold axes of the anticlines, or of their adjacent structures.

7.1 Stratigraphy of the Whiterabbit Block:

The Whiterabbit Block is the most northerly group of coal licences in the Goodrich coal property. The area is located north of the Moberly River, covering the northwesterly trend of the formations being explored on the Goodrich and North Moberly Blocks. The formations present on the Whiterabbit Block and the nature of their lithologies are the same as those found on the North Moberly Block, and the distribution of those formations is shown on the geological map (see Figure XIV).

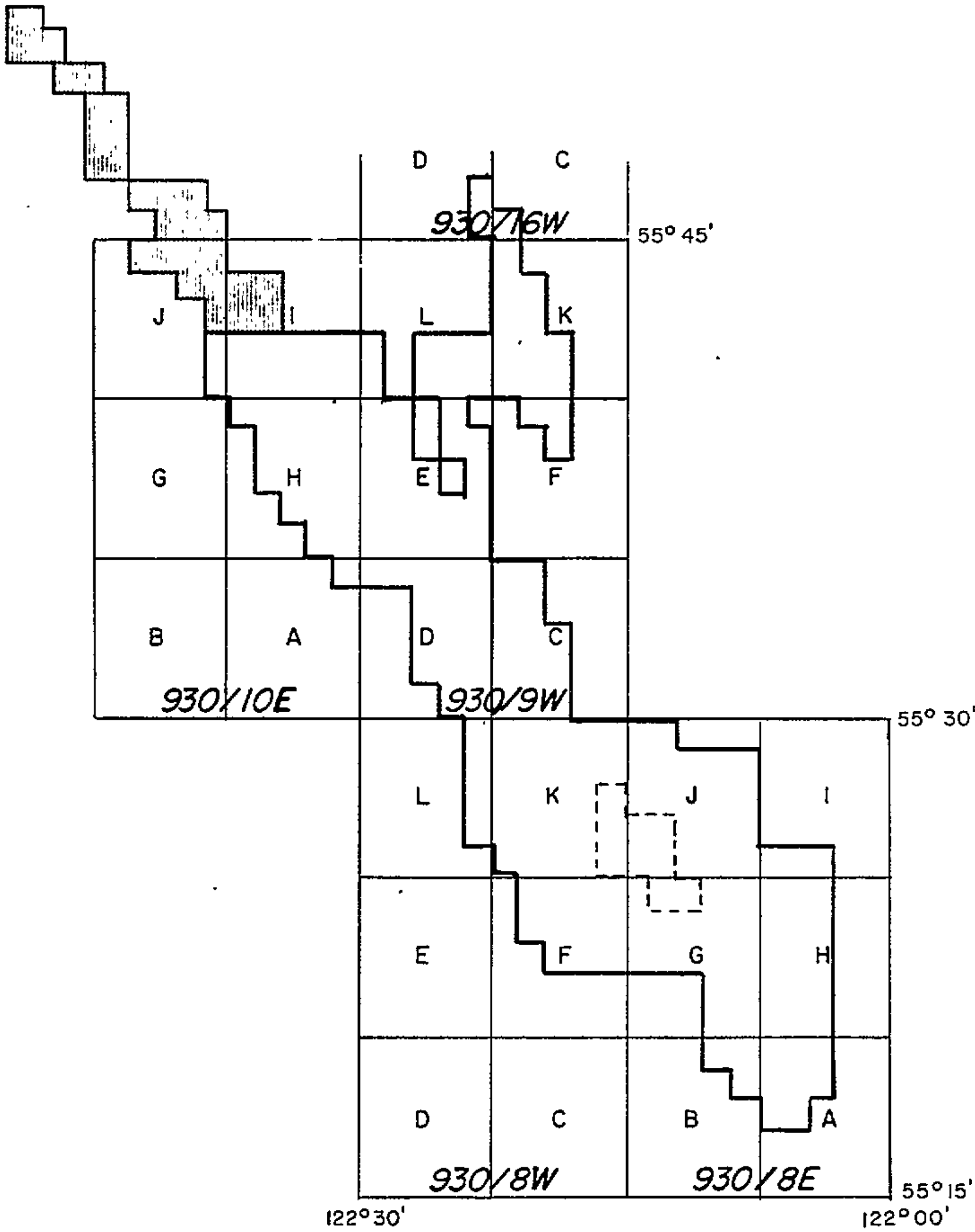
Time contraints have allowed only a very limited amount of geological mapping to be undertaken on the Whiterabbit Block to date. The exploration results available at the present time are illustrated on Geological Map Nos. 93-0-10-EI and 93-0-1O-EJ. One diamond drill hole, DDH-80-32, was located on the Whiterabbit Block as detailed in Appendix C.

7.2 Coal Occurrences:

Several exposures of coal which appear to achieve thicknesses as great as 2.5 metres were located within the Whiterabbit Block, but no attempt has been made to trench those seams at this time. A large amount of work of this kind remains to be done during future exploration programs.

7.4 Geological Structure:

The geological structure of the Whiterabbit Block is a continuation of the regional features observed within the North Moberly Block. The coal licences follow the trend of the synclinorium in a northwesterly direction, with the axis of that structure lying near the centre of the licence trend. The plunge of the synclinorium appears to be consistantly shallow in a southerly direction. The attached geological map illustrates the geological structure of the Whiterabbit Block.



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Coal Division
CALGARY ALBERTA

Gulf

FIGURE XIV

WHITERABBIT

PREPARED BY:	SCALE
APPROVED BY: DATE. JAN. 81	DRAWING No.

8.1 Coal Quality:

Coal core samples from 18 diamond drill holes were shipped to Loring Laboratories in Calgary, for analysis. Results of the raw analysis are shown on the coal seam data sheets in Appendix C.

8.1.1 Goodrich Lossan Block

These blocks contain the majority of the diamond drill holes, fifteen in total. The holes are concentrated in the central portions of these blocks.

Drill hole 80-33 attained the greatest depth, sampling coal to a depth of 370 metres. A considerable variety of coal quality is indicated by these drill holes.

The metallurgical coals range from medium volatile to high volatile bituminous, with generally good F.S.I.s, ranging from 4.5 to 9. The low F.S.I.s are likely indicative of higher ash in the sample rather than poor coking characteristics. The sulphur content of the metallurgical coal indicates the presence of two distinct domains. There is a high sulphur zone, ranging from 2% to 0.8%, mainly associated with the medium volatile coal. The high volatile metallurgical coals show a much reduced sulphur content, in the 0.6% to 0.2% range.

The thermal coals range from low volatile to medium volatile bituminous. Heat values range from 14 800 to 15 600 BTU/lb. Sulphur content is generally low, ranging from 0.2% to 0.4%, with the occasional high value of up to 0.9%.

The ash in both the metallurgical and thermal coals is generally low, except where rock bands are included in the samples. Inherent ash ranges from a low of 3.9% to about 16%. Values higher than 16% include rock partings in the samples.

8.1.2 North Moberly Block

Two holes, 80-31 and 80-35 are located within this block. Hole 80-35 intersected one relatively shallow seam at a depth of 66.7 to 67.6 metres. This sample was determined to be low volatile, bituminous thermal coal with a calorific value of approximately 15 500 BTU/lb. The sulphur content is approximately 0.65% and ash content at 2.9% is very low.

The second hole, 80-31, intersected several coal seams with the lowermost lying at a depth of about 30 metres. The samples were analysed as medium volatile, bituminous metallurgical coals near the top of the hole. F.S.I.s range from 4 to 9 and the sulphur ranges from 0.77 to 1.05 percent.

The lower seams were low volatile, bituminous thermal coals with calorific values up to approximately 15 500 BTU/lb. Sulphur in these coals ranged from 0.46 to 0.79 percent.

Ash was low in both the metallurgical and thermal coals, ranging from about 5 to 25 percent. The higher value likely indicates an inclusion of rock partings in the sample rather than reflecting the inherent ash of the coal sample.

8.1.3 Coal Quality of East Moberly Block

The Crassier coals are medium to low volatile bituminous, of low ash and sulphur, and high calorific value - ideal steam coals for the most part.

Records of the Coal Investigation do not specify coking characteristics of coals from the Cleveland, Narod, and Noman localities. For the Willow area on the same trend of the Pine River anticline south of the Pine River, Gething coals are reported to range from good, moderate, to poor coking, and a minority agglomerating to non-coking (McKechnie 1955).

The results of coking tests on No. 76 Seam from the Noman locality are not available (B.C. Dept. Mines, 1958,9: Pine Pass Coal Company, and Brameda 1968,9): the coal was said to qualify for metallurgical use.

8.1.4 Whiterabbit Block

Only one drill hole, 80-32, is located within this block. Core recovery in this hole is poor, amounting to about 7% of the coal intersection. The analysis indicates the coal to be medium volatile bituminous metallurgical coal with an F.S.I. of 8.5. The sulphur at 0.7% is relatively high and ash at 13.04% is at a low to medium range.

CONCLUSIONS

Exploration on the Goodrich coal property to date indicates that the area is structurally complex. A significant amount of coal, which may be of economic significance, has been located in the Goodrich-Lossan Block area. Several other structures have been identified as targets for future exploration.

Additional exploration will be necessary on the property to clarify a number of stratigraphic and structural problems. Further data is necessary in the Goodrich-Lossan area prior to a full evaluation of that structure and its possible mining potential. This work will be undertaken in the 1981 and subsequent field programs.

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See 1:25,000
GOODRICH - WHITERABBIT
GEOLOGY MAP
LOSSAN BLOCK
MOUNT BULLROSS
ROCKY
HART RANGES
MOUNTAINS
ROCKY MOUNTAINS
LEGEND
Kcm Commotion Formation
Kmb Moosebar Formation
Kgt Gething Formation
Kcd Cadomin Formation
JKb Brenot Formation
JKmc Monach Formation
JKbp Beattie Peaks Formation
JKmt Monteith Formation
Jf Fernie Formation
Fault
Approximate Fault Location
Anticline
Approximate Anticline Location
Syncline
Approximate Syncline Location
Formation Boundary
A——A' Location of Cross Sections
55°15'
122°00'
122°30'
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Coal Division
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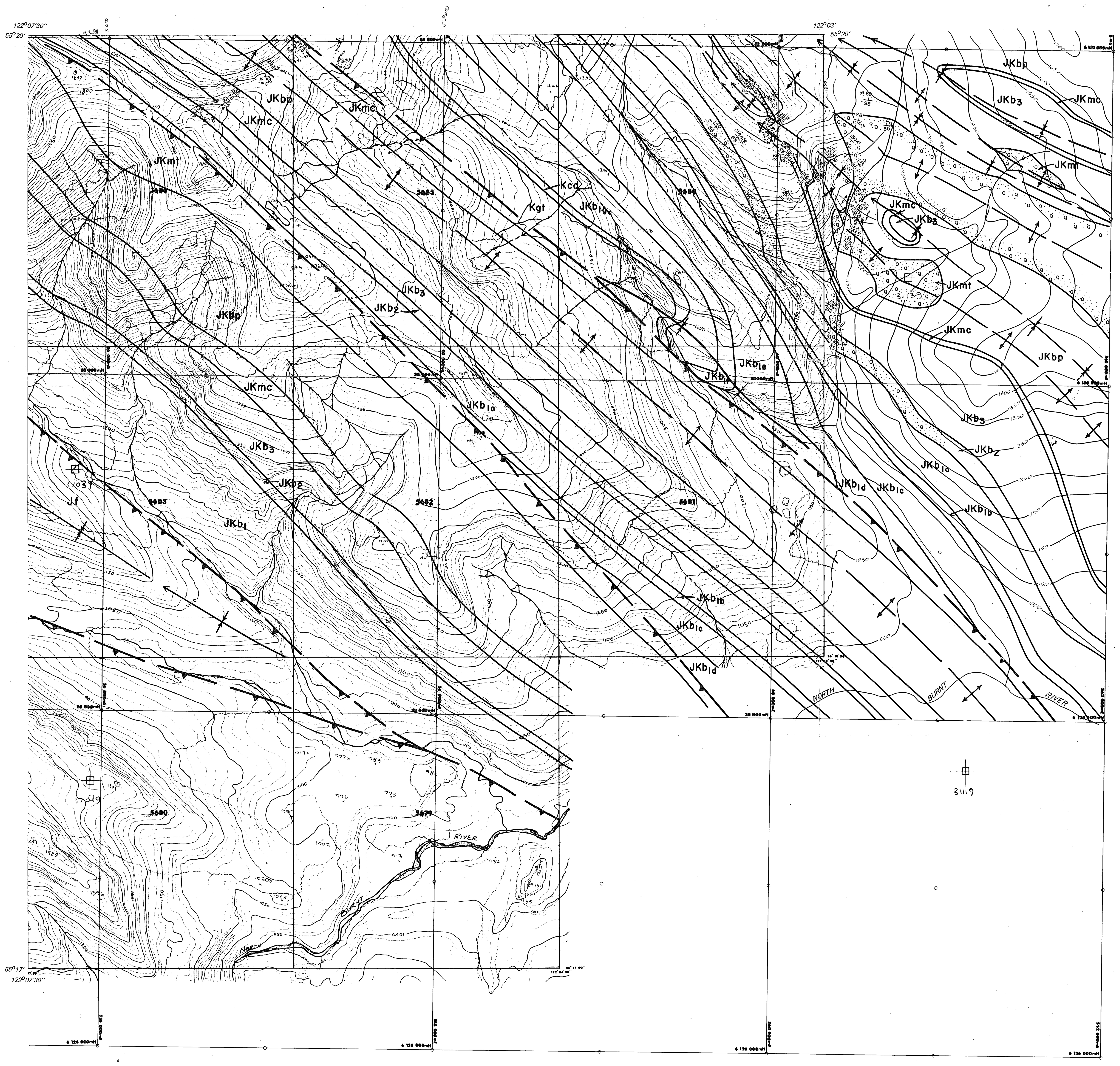
Gulf
GOODRICH COAL PROJECT
GEOLOGY
531
PREPARED BY:
APPROVED BY:
SCALE: 1:50,000
DATE: JAN. 1981
DRAWING No.
PR-Goodrich 80(2)A



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

Kgt	GETHING FORMATION	Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
Kcd	CADOMIN FORMATION	Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

JKb - JKb_1 - JKb_2 - JKb_3	BRENOT FORMATION	Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb_{1a-g} indicate different JKb_1 index beds.
JKmc	MONACH FORMATION	Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
JKbp	BEATTIE PEAKS FORMATION	Sandstone, marine siltstone and mudstone, COAL.
JKmt	MONTEITH FORMATION	Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic

Jf	FERNIE FORMATION	Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY : (defined, approximate)

ANTICLINE : (defined, approximate)

SYNCLINE : (defined, approximate)

ANTICLINE AND SYNCLINE : (overturned)

FAULT : (defined showing dip; approx. position of fault.)

STRIKE AND DIP : (bedding, overturned bedding)

BEDDING : (vertical, horizontal)

A ——— A' CROSS SECTION LOCATION

MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES (000, 1050)
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

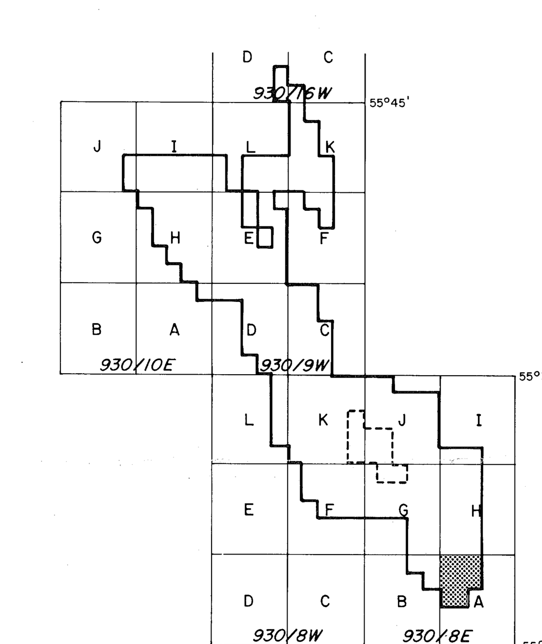
FORM LINE INTERVAL 10 METRES

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.

0 1/8 1/4 1/2 3/4 1 MILE

0 100 200 400 600 800 1000 METERS

SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

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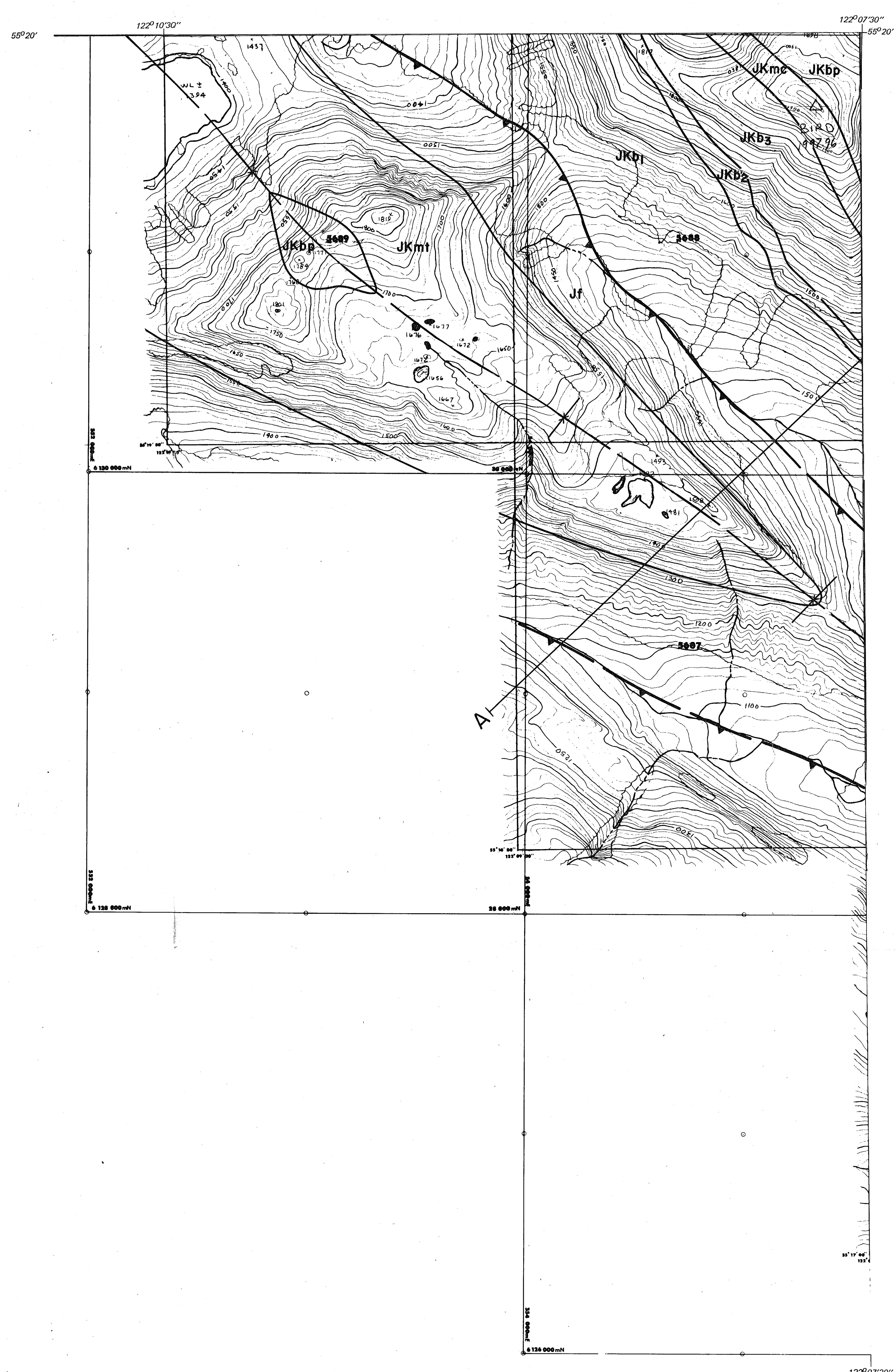
APPROVED BY: DATE: JAN. 1981	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous	Kgt	**GETHING FORMATION** Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
	Kcd	**CADOMIN FORMATION** Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
Transitional	JKb -JKb$_1$ -JKb$_2$ -JKb$_3$	**BRENOT FORMATION** Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb$_{1a-g}$ indicate different JKb$_1$ index beds.
	JKmc	**MONACH FORMATION** Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
	JKbp	**BEATTIE PEAKS FORMATION** Sandstone, marine siltstone and mudstone, COAL.
	JKmt	**MONTEITH FORMATION** Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.
Jurassic	Jf	**FERNIE FORMATION** Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

- GEOLOGICAL BOUNDARY : (defined, approximate)
- ANTICLINE : (defined, approximate)
- SYNCLINE : (defined, approximate)
- ANTICLINE AND SYNCLINE : (overturned)
- FAULT : (defined showing dip; approx. position of fault.)
- STRIKE AND DIP : (bedding, overturned bedding)
- BEDDING : (vertical, horizontal)
- A —— A' CROSS SECTION LOCATION
- MONOCLINE

LITHOLOGICAL SYMBOLS

- CONGLOMERATE
- SANDSTONE
- SILTSTONE
- CLAYSTONE (MUDSTONE)
- CARBONACEOUS CLAYSTONE
- COAL
- SILTY CLAYSTONE

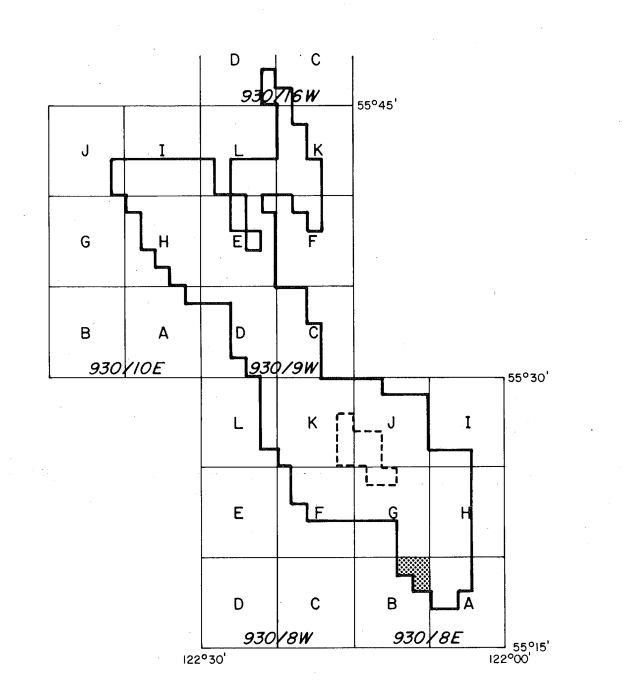
LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT × 1012
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5857

FORM LINE 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.

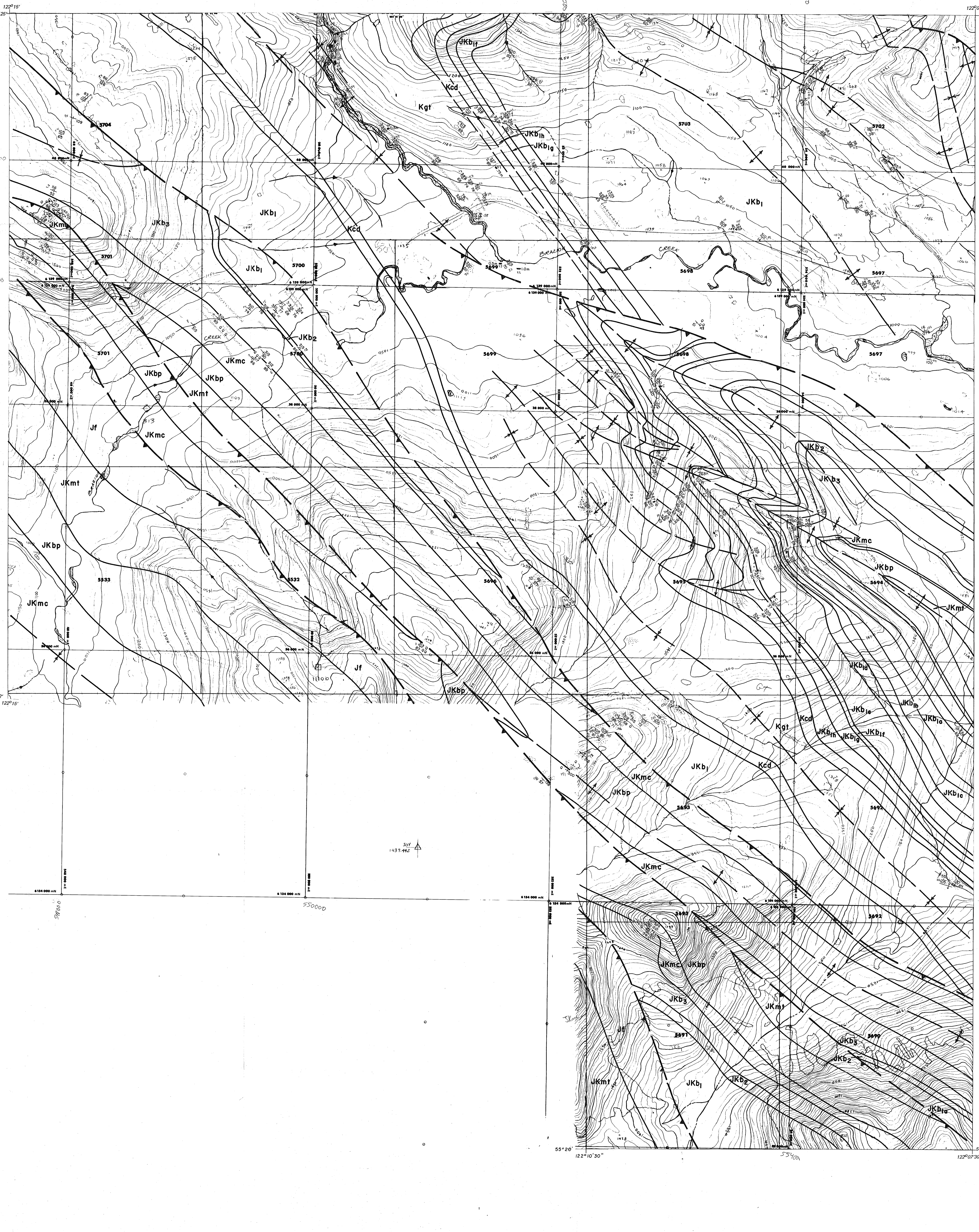
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80 (2)A

GULF CANADA RESOURCES INC. Coal Division CALGARY ALBERTA	Gulf
No Outcrops 93O/8E B	
GOODRICH COAL PROJECT GEOLOGY 531	
PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. 81	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous	Kgt	GETHING FORMATION Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
	Kcd	CADOMIN FORMATION Chert clasts about 2 cm. in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
Transitional	JKb - JKb_1 - JKb_2 - JKb_3	BRENOT FORMATION Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb_{1a-g} indicate different JKb_1 index beds.
	JKmc	MONACH FORMATION Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
	JKbp	BEATTIE PEAKS FORMATION Sandstone, marine siltstone and mudstone, COAL.
	JKmt	MONTEITH FORMATION Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.
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GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY: (defined, approximate)
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SYNCLINE: (defined, approximate)
ANTICLINE AND SYNCLINE: (overturned)
FAULT: (defined showing dip; approx. position of fault.)
STRIKE AND DIP: (bedding, overturned bedding)
BEDDING: (vertical, horizontal)
A —— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

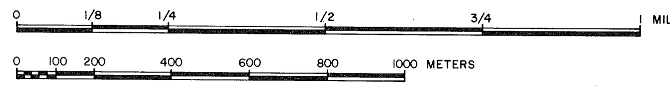
CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.



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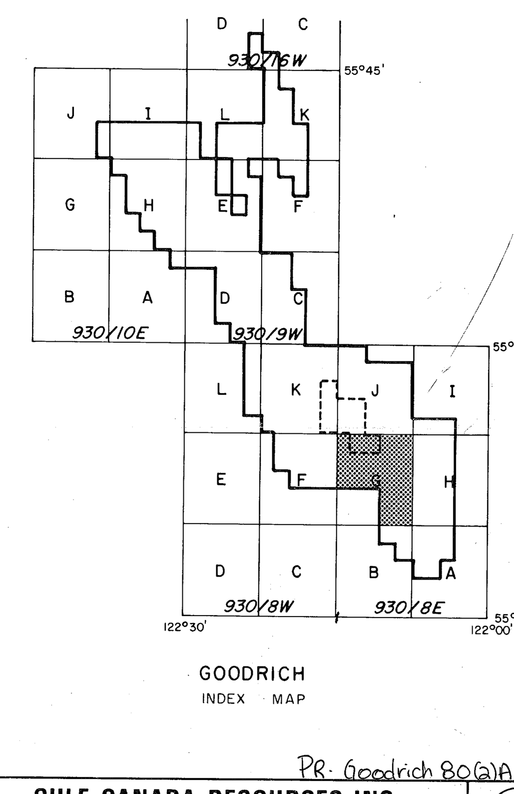


GOODRICH
INDEX MAP

PR. Goodrich 80(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

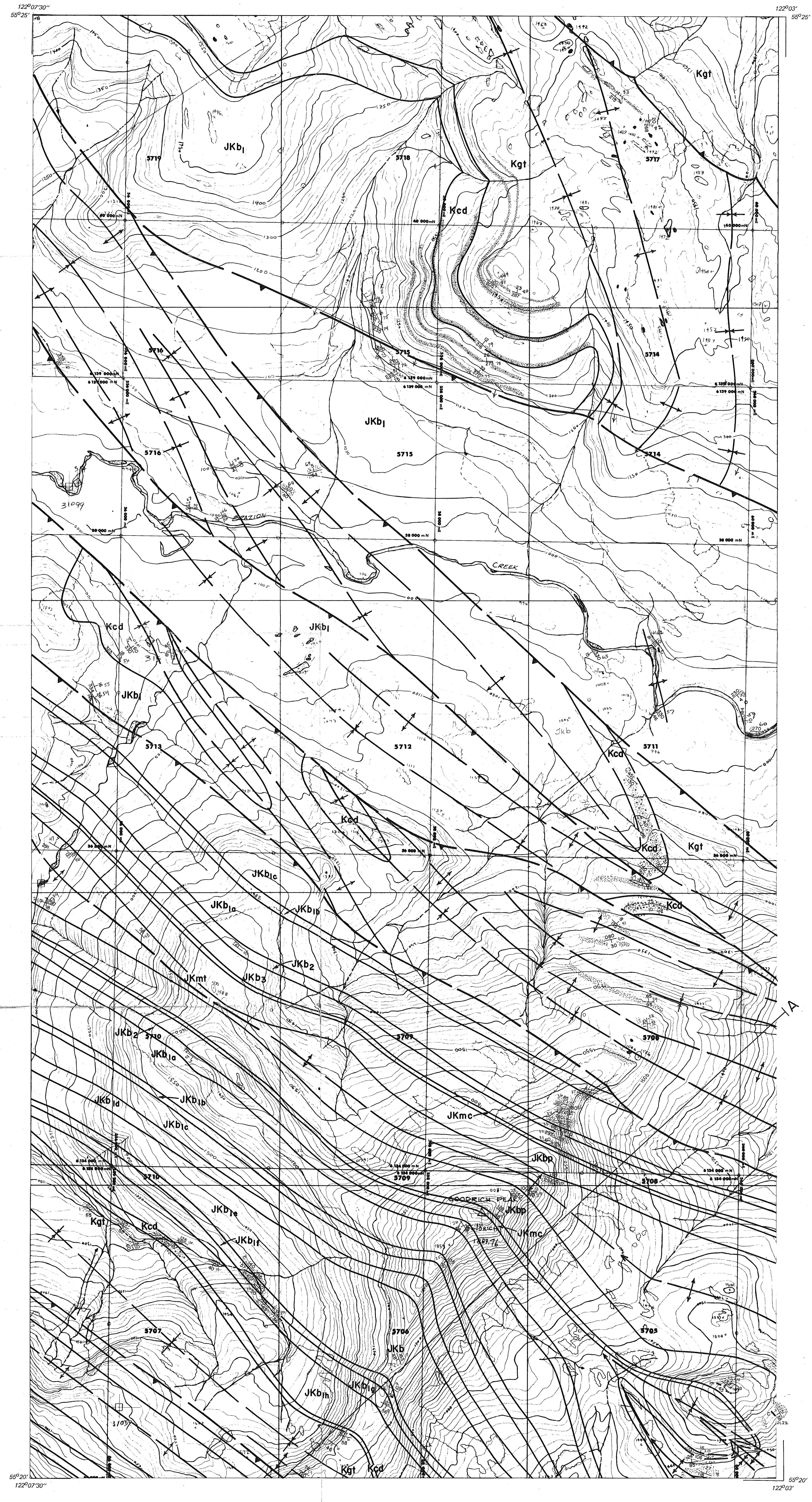
Digitized by B.S.
File = Good Gulf
map id: 5310/8EG

930/8E G

GOODRICH COAL PROJECT
GEOLOGY MAP

531

PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. 1981	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous	Kgt	GETHING FORMATION Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
Lower Cretaceous	Kcd	CADOMIN FORMATION Chert clasts about 2 cm. in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
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Transitional	JKbp	BEATTIE PEAKS FORMATION Sandstone, marine siltstone and mudstone, COAL.
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BEDDING : (vertical, horizontal)
A —— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

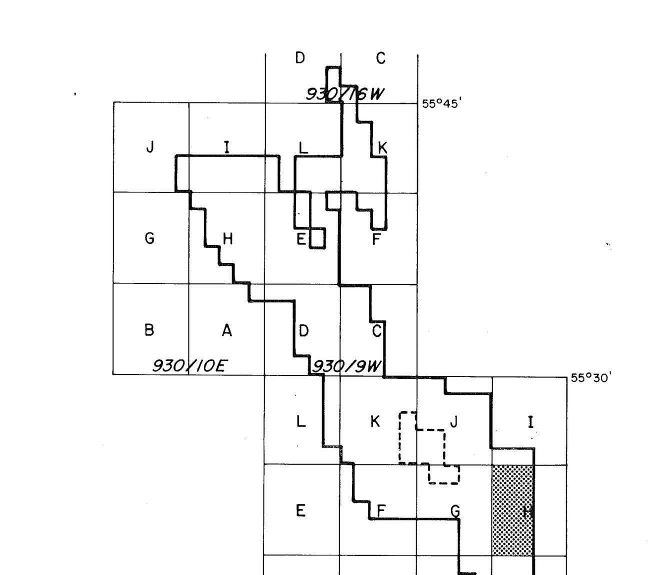
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

digitized May 28/91 fc
file GOODGULF
mapid 531-018EH

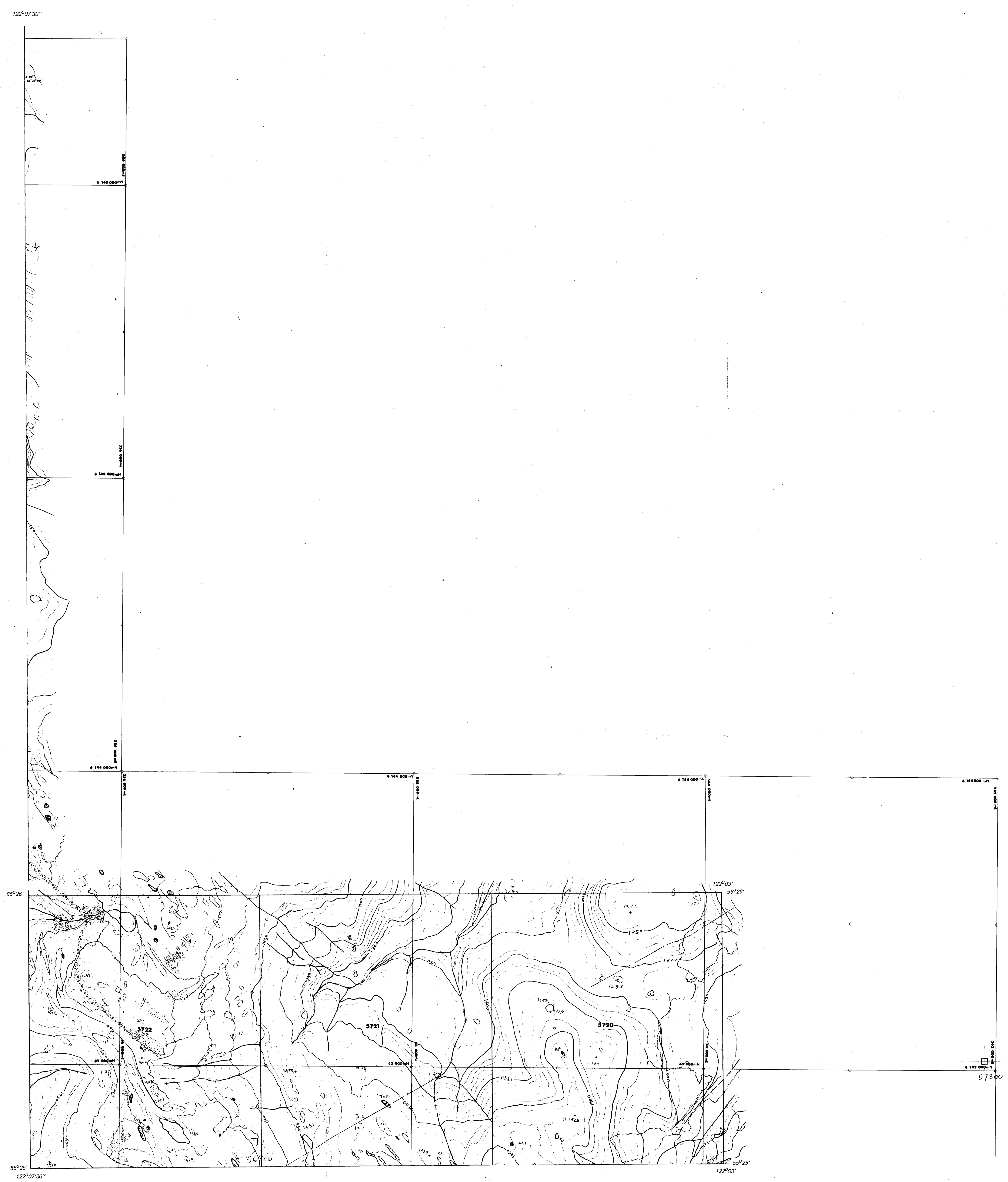
930/8E H

GOODRICH COAL PROJECT
GEOLOGY

531

PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. '81	DRAWING No.

531 93O/8 EH



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous
- Kgt — GETHING FORMATION
  Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
- Kcd — CADOMIN FORMATION
  Chert clasts about 2 cm. in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional
- JKb — BRENOT FORMATION
  - JKb_1
  - JKb_2
  - JKb_3

  Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb_{1a-g} indicate different JKb_1 index beds.
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- JKbp — BEATTIE PEAKS FORMATION
  Sandstone, marine siltstone and mudstone, COAL.
- JKmt — MONTEITH FORMATION
  Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic
- Jf — FERNIE FORMATION
  Mudstone, siltstone, sandstone.

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BEDDING: (vertical, horizontal)
A —— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES 000 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE INTERVAL 10 METRES

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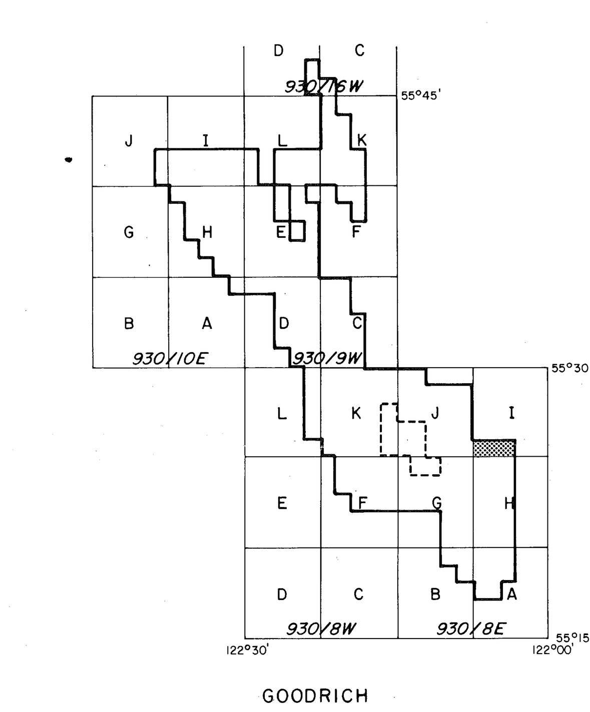
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS

SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

Digitized by BS
File= Good Gulf
mapid= 531-0/8EI

930/8E I

GOODRICH COAL PROJECT

GEOLOGY

531

PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. 81	DRAWING No.

GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous	Kgt	**GETHING FORMATION** Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
Lower Cretaceous	Kcd	**CADOMIN FORMATION** Chert clasts about 2 cm. in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
Transitional	JKb -JKb1 -JKb2 -JKb3	**BRENOT FORMATION** Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb1a-g indicate different JKb1 index beds.
Transitional	JKmc	**MONACH FORMATION** Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
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Transitional	JKmt	**MONTEITH FORMATION** Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.
Jurassic	Jf	**FERNIE FORMATION** Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY : (defined, approximate)
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STRIKE AND DIP : (bedding, overturned bedding)
BEDDING : (vertical, horizontal)
A —— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

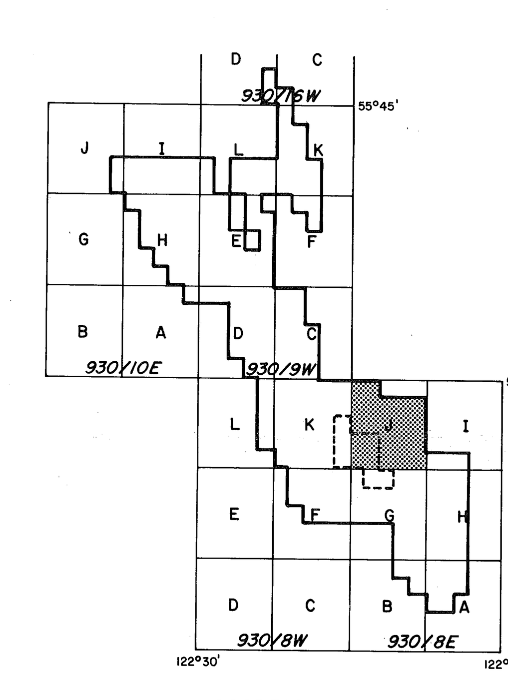
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES 1000 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR- Goodrich 80(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

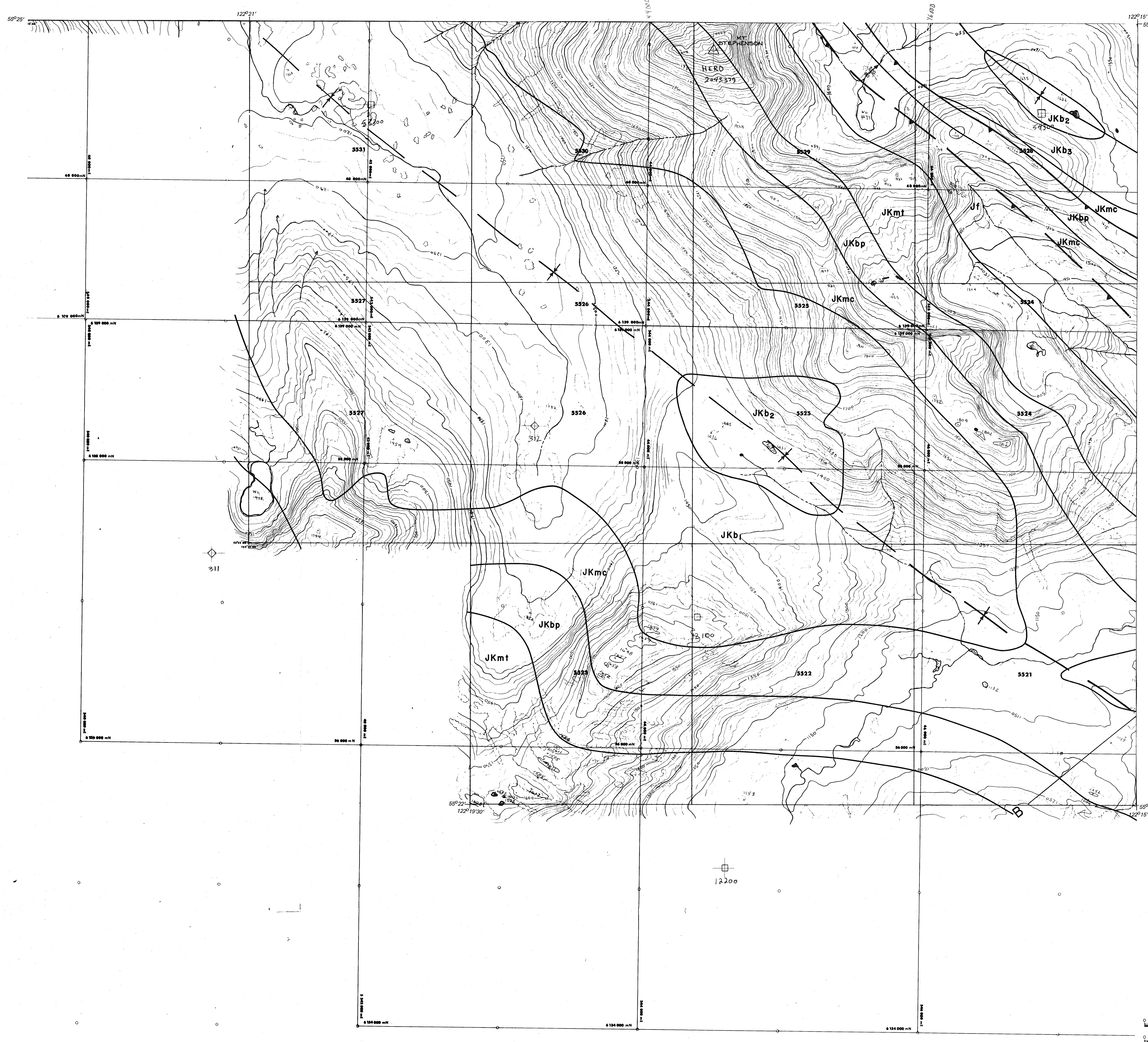
map digitized May31/91
jc
file GOODGULF
map id 531-0/8EJ

930/8E J

GOODRICH COAL PROJECT
GEOLOGY

531

PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. 1981	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

- Kgt — GETHING FORMATION
  Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
- Kcd — CADOMIN FORMATION
  Chert clasts about 2 cm. in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

- JKb — BRENOT FORMATION
  - JKb_1
  - JKb_2
  - JKb_3

  Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb_{1a-g} indicate different JKb_1 index beds.
- JKmc — MONACH FORMATION
  Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
- JKbp — BEATTIE PEAKS FORMATION
  Sandstone, marine siltstone and mudstone, COAL.
- JKmt — MONTEITH FORMATION
  Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic

- Jf — FERNIE FORMATION
  Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

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BEDDING : (vertical, horizontal)
A — A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE INTERVAL 10 METRES

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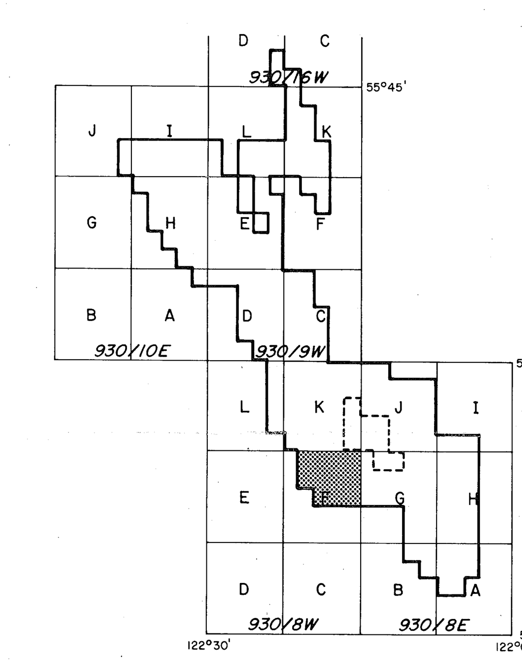
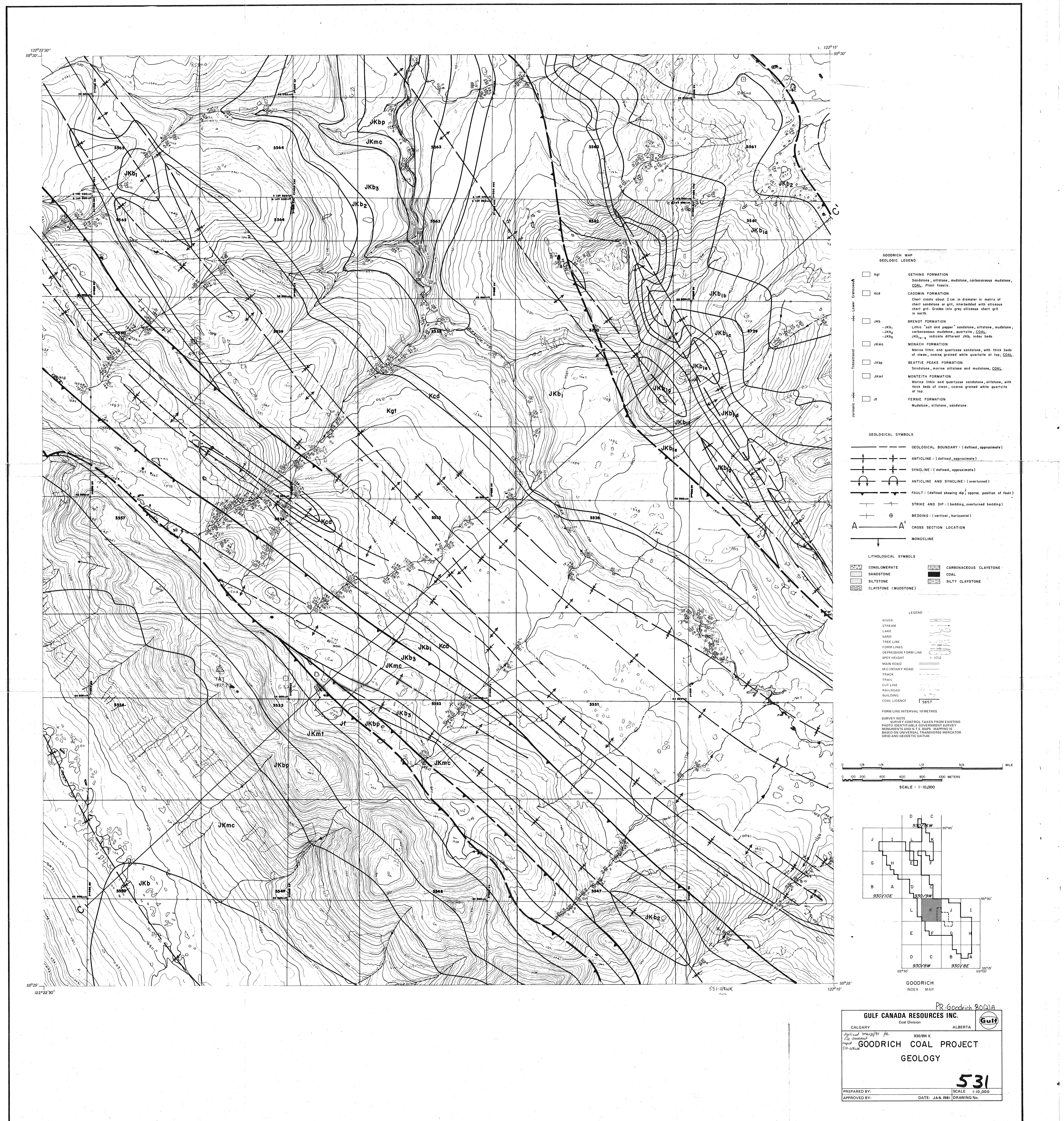
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC. Coal Division CALGARY ALBERTA	Gulf
Digitized by BS File = Good Gulf Map Id = 531-018WF 930/8W F GOODRICH COAL PROJECT GEOLOGY 531	
PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. '81	DRAWING No.



122°22'30"
55°30'
122°15'
55°30'
JKbp
JKmc
JKb1
JKb3
JKb2
JKb2
JKb1a
JKb1b
JKb1c
JKb1e
JKb1g
JKb1f
JKb1d
JKb1e
JKb1g
Kgt
Kcd
JKb1
Kcd
JKb1
Kcd
JKb3
JKmc
JKb3
Jf
JKbp
JKmt
JKbp
JKmc
JKmc
JKb
JKb2
C
C'
55°25'
122°22'30"
55°25'
122°15'
GOODRICH MAP
GEOLOGIC LEGEND
Lower Cretaceous
Transitional
Jurassic
Kgt GETHING FORMATION
Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
Kcd CADOMIN FORMATION
Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
JKb BRENOT FORMATION
-JKb1
-JKb2
-JKb3
Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL.
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Mudstone, siltstone, sandstone.
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FAULT: (defined showing dip; approx. position of fault.)
STRIKE AND DIP: (bedding, overturned bedding)
BEDDING: (vertical, horizontal)
A A'
CROSS SECTION LOCATION
MONOCLINE
LITHOLOGICAL SYMBOLS
CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE
LEGEND
RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES
DEPRESSION FORM LINE
SPOT HEIGHT
1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE
5857
FORM LINE INTERVAL 10 METRES
SURVEY NOTE
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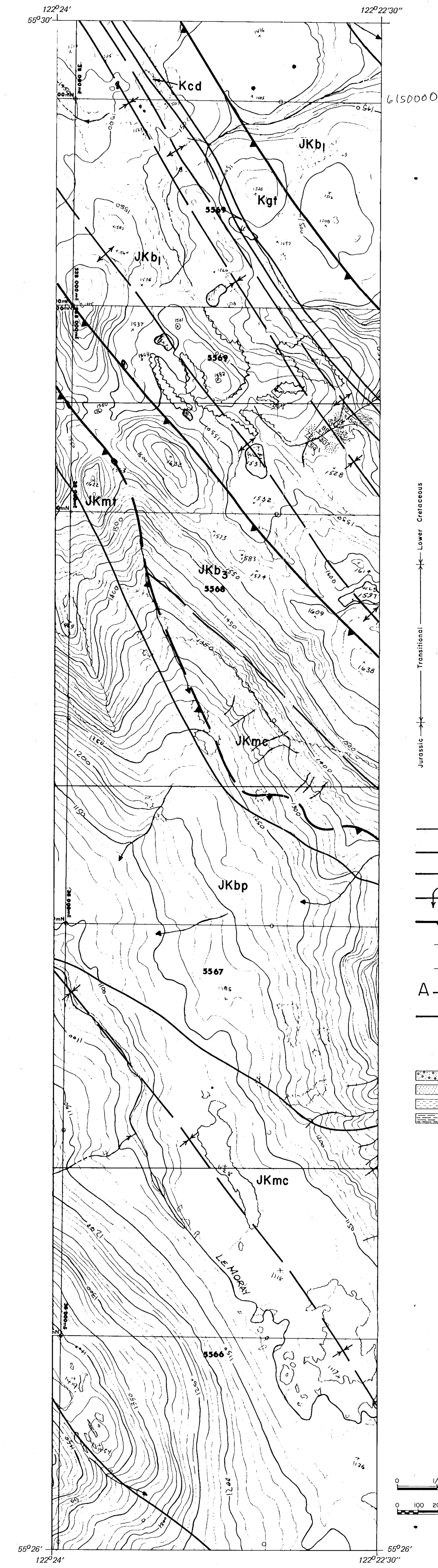
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000
930/16W
55°45'
930/10E
930/9W
55°30'
930/8W
930/8E
55°15'
122°30'
122°00'
GOODRICH
INDEX MAP
PR-Goodrich 80(2)A
GULF CANADA RESOURCES INC.
Coal Division
CALGARY
ALBERTA
Gulf
digitized Mar30/91 to file GOODGULF mapid 531-018WK
930/8W K
GOODRICH COAL PROJECT
GEOLOGY
531
PREPARED BY:
SCALE 1:10,000
APPROVED BY:
DATE: JAN. 1981
DRAWING No.
531-018WK



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

- Kgt — **GETHING FORMATION**
  Sandstone, siltstone, mudstone, carbonaceous mudstone, <u>COAL</u>. Plant fossils.
- Kcd — **CADOMIN FORMATION**
  Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

- JKb (- JKb_1, - JKb_2, - JKb_3) — **BRENOT FORMATION**
  Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, <u>COAL</u>. JKb_{1a-g} indicate different JKb_1 index beds.
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  Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic

- Jf — **FERNIE FORMATION**
  Mudstone, siltstone, sandstone.

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SYNCLINE: (defined, approximate)
ANTICLINE AND SYNCLINE: (overturned)
FAULT: (defined showing dip; approx. position of fault.)
STRIKE AND DIP: (bedding, overturned bedding)
BEDDING: (vertical, horizontal)
A ——— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

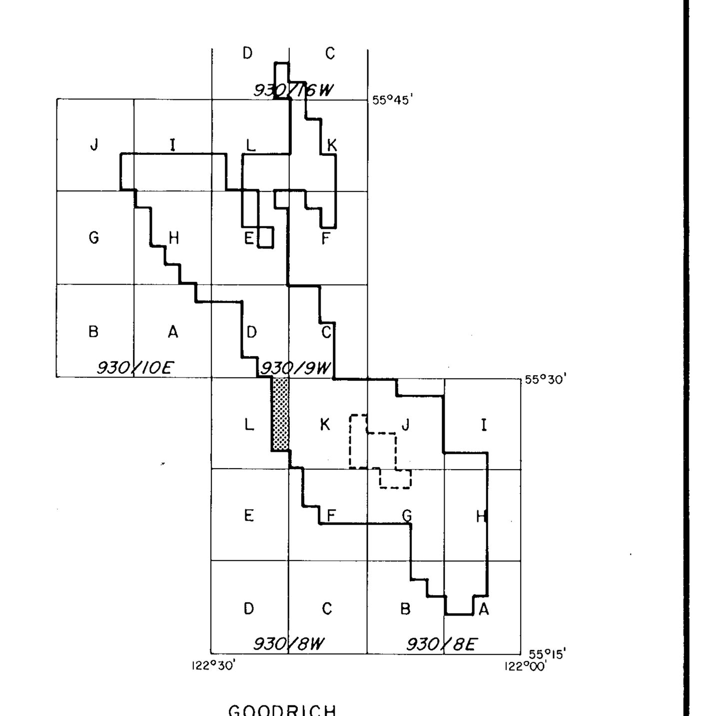
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES — 000 — 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE: 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

Gulf

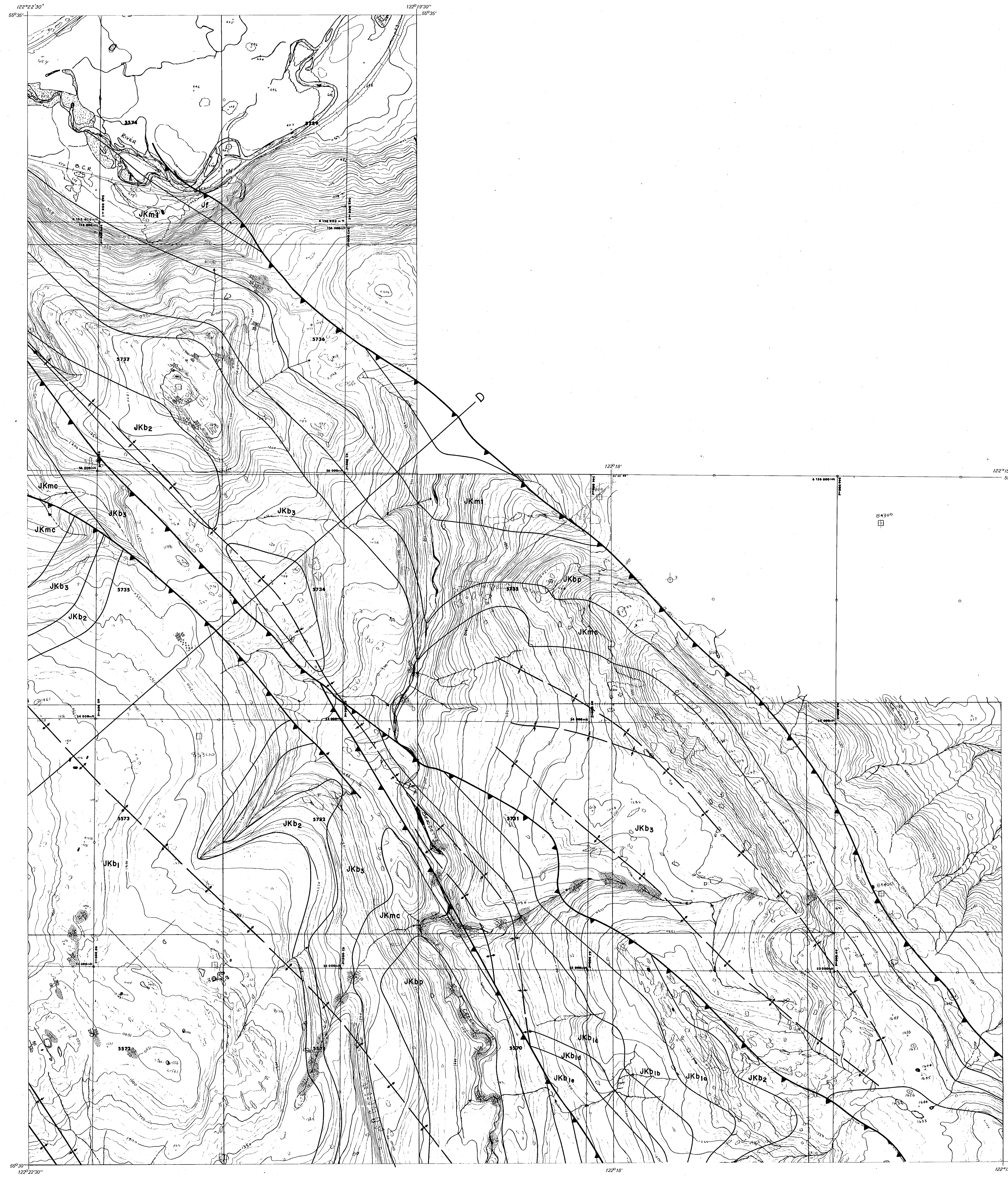
Digitized By BS
File= Good Gulf
Map id= 531-0/8WL

93O/8W L

GOODRICH COAL PROJECT
GEOLOGY

531

PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN '81	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

- Kgt — GETHING FORMATION
  Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
- Kcd — CADOMIN FORMATION
  Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

- JKb — BRENOT FORMATION
  - JKb1
  - JKb2
  - JKb3

  Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL.
  JKb_{1a-g} indicate different JKb_1 index beds.
- JKmc — MONACH FORMATION
  Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
- JKbp — BEATTIE PEAKS FORMATION
  Sandstone, marine siltstone and mudstone, COAL.
- JKmt — MONTEITH FORMATION
  Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic

- Jf — FERNIE FORMATION
  Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY: (defined, approximate)
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SYNCLINE: (defined, approximate)
ANTICLINE AND SYNCLINE: (overturned)
FAULT: (defined showing dip; approx. position of fault.)
STRIKE AND DIP: (bedding, overturned bedding)
BEDDING: (vertical, horizontal)
A —— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

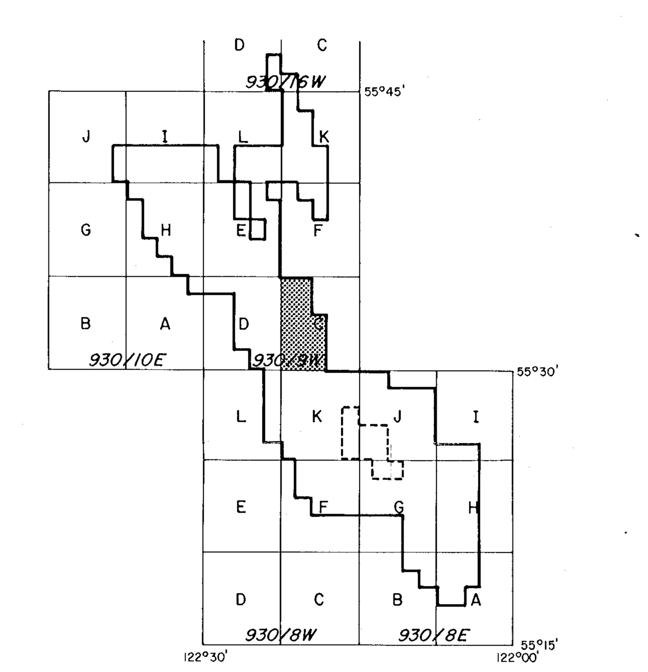
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES — 000 — 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

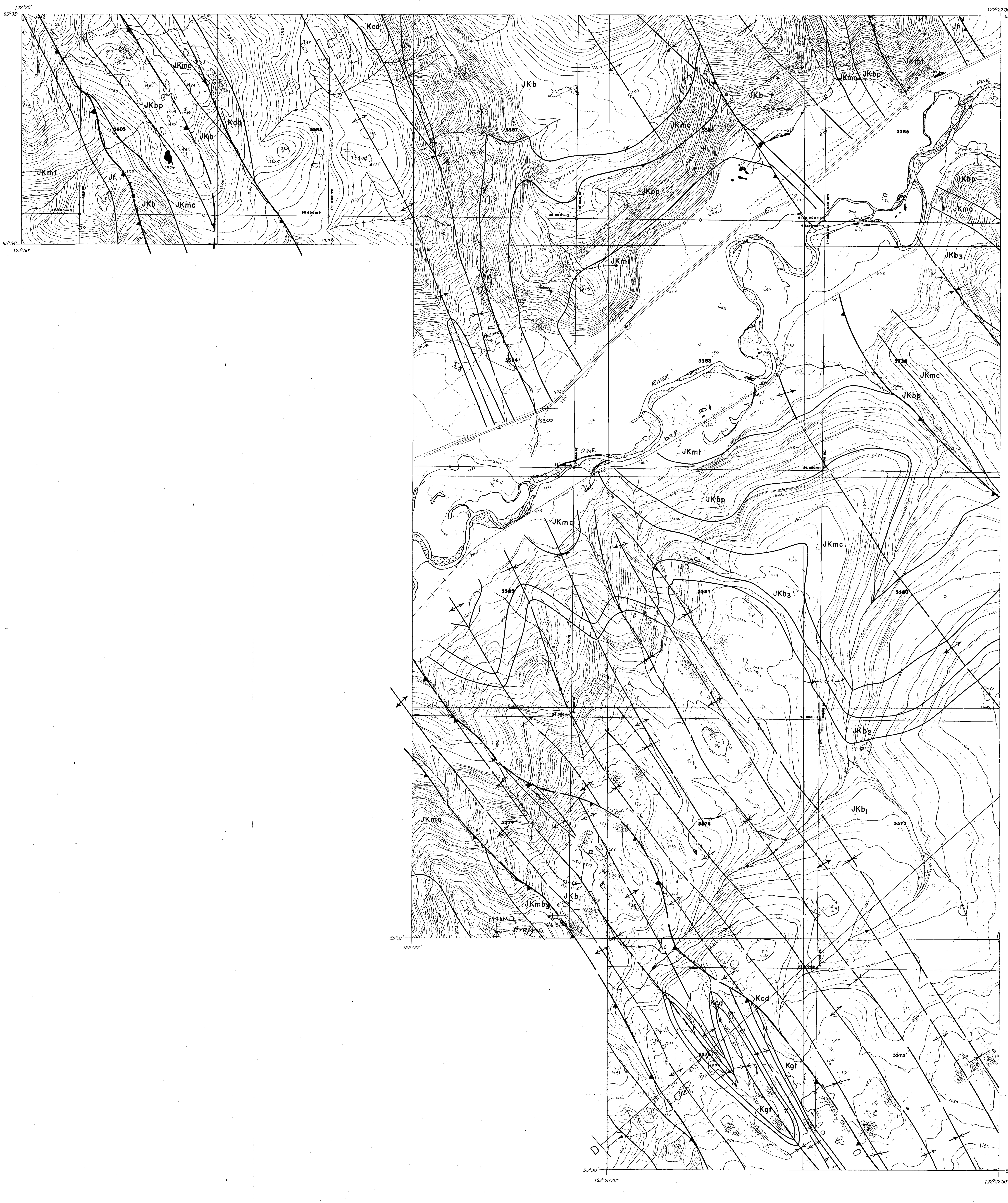
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE: 1:10,000



GOODRICH
INDEX MAP

PR- Goodrich 80(2)A

GULF CANADA RESOURCES INC. Coal Division CALGARY ALBERTA	Gulf
930/9W C GOODRICH COAL PROJECT GEOLOGY 531	
PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. '81	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous — Transitional — Jurassic

Kgt	GETHING FORMATION	Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
Kcd	CADOMIN FORMATION	Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
JKb - JKb_1 - JKb_2 - JKb_3	BRENOT FORMATION	Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb_{1a-g} indicate different JKb_1 index beds.
JKmc	MONACH FORMATION	Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
JKbp	BEATTIE PEAKS FORMATION	Sandstone, marine siltstone and mudstone, COAL.
JKmt	MONTEITH FORMATION	Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.
Jf	FERNIE FORMATION	Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY: (defined, approximate)
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SYNCLINE: (defined, approximate)
ANTICLINE AND SYNCLINE: (overturned)
FAULT: (defined showing dip; approx. position of fault.)
STRIKE AND DIP: (bedding, overturned bedding)
BEDDING: (vertical, horizontal)
A —— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

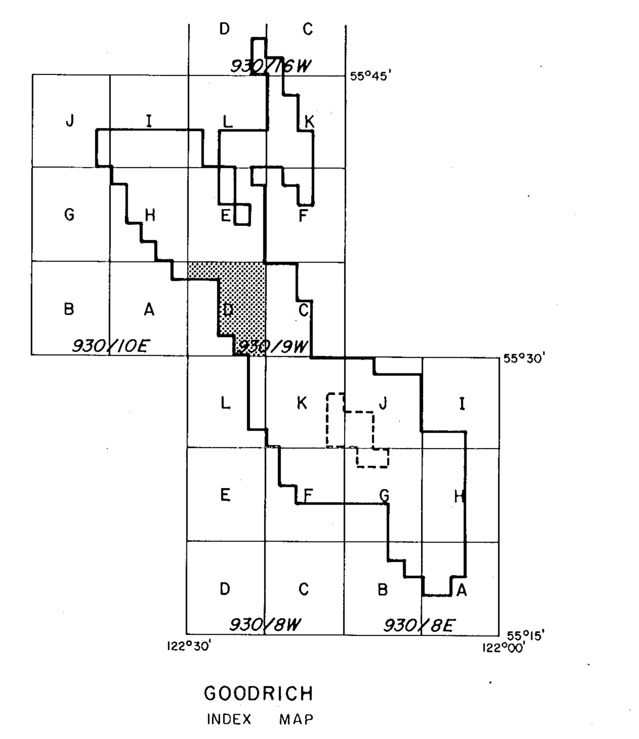
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES 1000 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

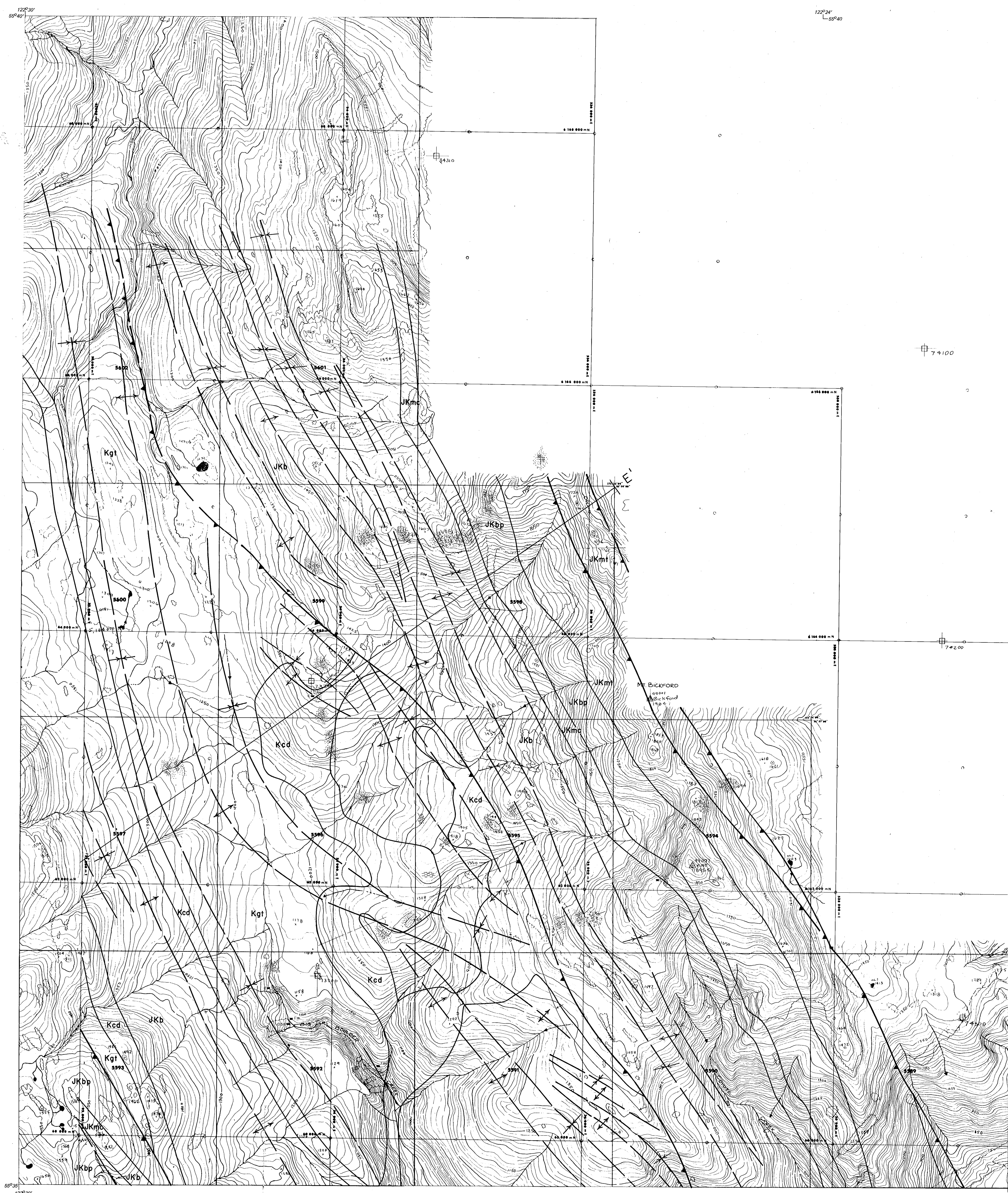
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC. Coal Division CALGARY ALBERTA	Gulf
930/9W D GOODRICH COAL PROJECT GEOLOGY 531	
PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. '81	DRAWING No.



122°22'30"
55°39'

GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

- **Kgt** — GETHING FORMATION
  Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
- **Kcd** — CADOMIN FORMATION
  Chert clasts about 2 cm. in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

- **JKb** (- JKb_1, - JKb_2, - JKb_3) — BRENOT FORMATION
  Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb_{1a-g} indicate different JKb_1 index beds.
- **JKmc** — MONACH FORMATION
  Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.
- **JKbp** — BEATTIE PEAKS FORMATION
  Sandstone, marine siltstone and mudstone, COAL.
- **JKmt** — MONTEITH FORMATION
  Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic

- **Jf** — FERNIE FORMATION
  Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY: (defined, approximate)
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BEDDING: (vertical, horizontal)
A —— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

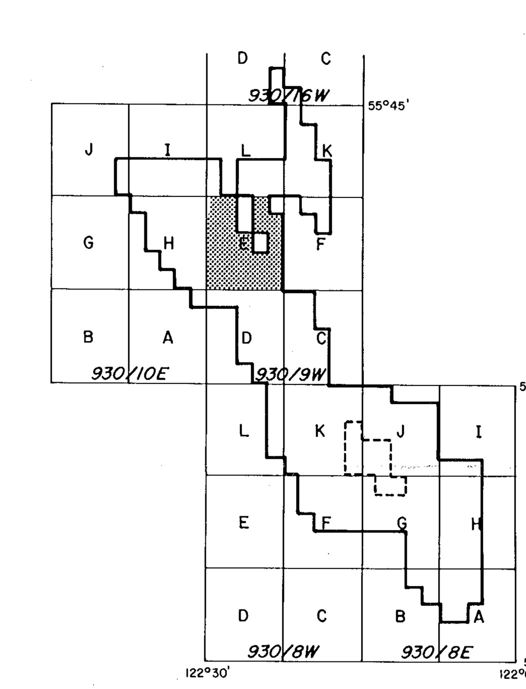
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES — 1000 — 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE: 1:10,000



GOODRICH
INDEX MAP

55°35'
122°22'30"

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

93O/9W E

GOODRICH COAL PROJECT
GEOLOGY

531

PREPARED BY: A. BIENA	SCALE 1:10,000
APPROVED BY: DATE: JAN.'81	DRAWING No.

GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

Kgt — GETHING FORMATION
Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.

Kcd — CADOMIN FORMATION
Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

JKb — BRENOT FORMATION
- JKb_1
- JKb_2
- JKb_3

Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL.
JKb_{1a-g} indicate different JKb_1 index beds.

JKmc — MONACH FORMATION
Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.

JKbp — BEATTIE PEAKS FORMATION
Sandstone, marine siltstone and mudstone, COAL.

JKmt — MONTEITH FORMATION
Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic

Jf — FERNIE FORMATION
Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY: (defined, approximate)
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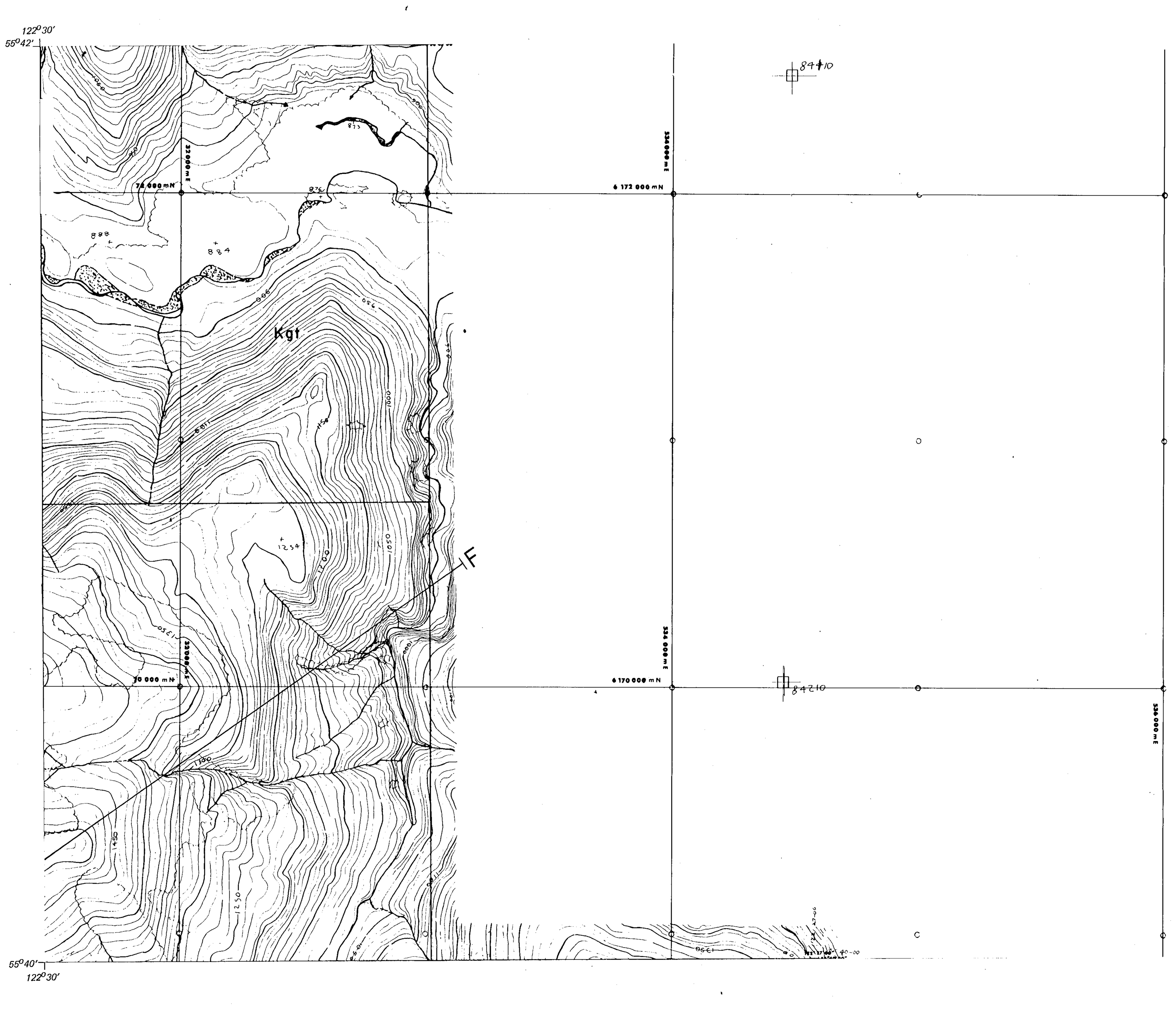
ANTICLINE AND SYNCLINE: (overturned)
FAULT: (defined showing dip; approx. position of fault.)
STRIKE AND DIP: (bedding, overturned bedding)
BEDDING: (vertical, horizontal)
A ——— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE



122°22'30"
55°42'

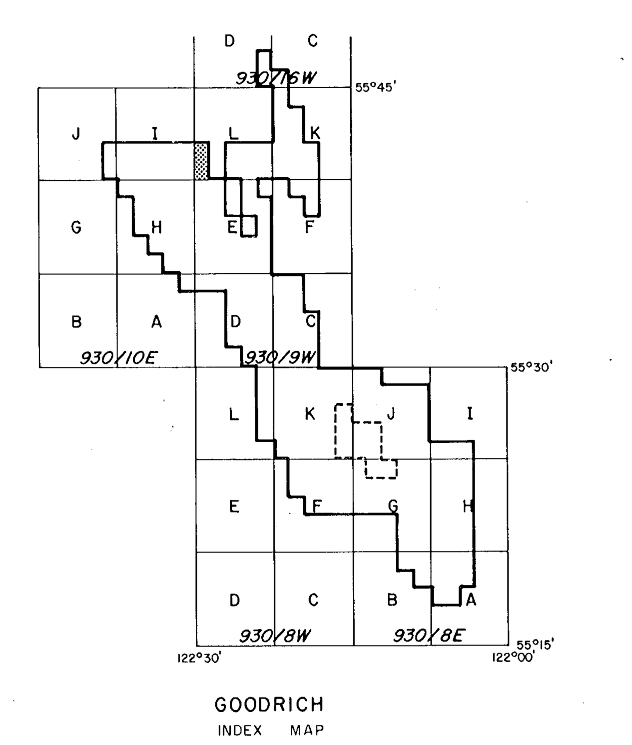
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000

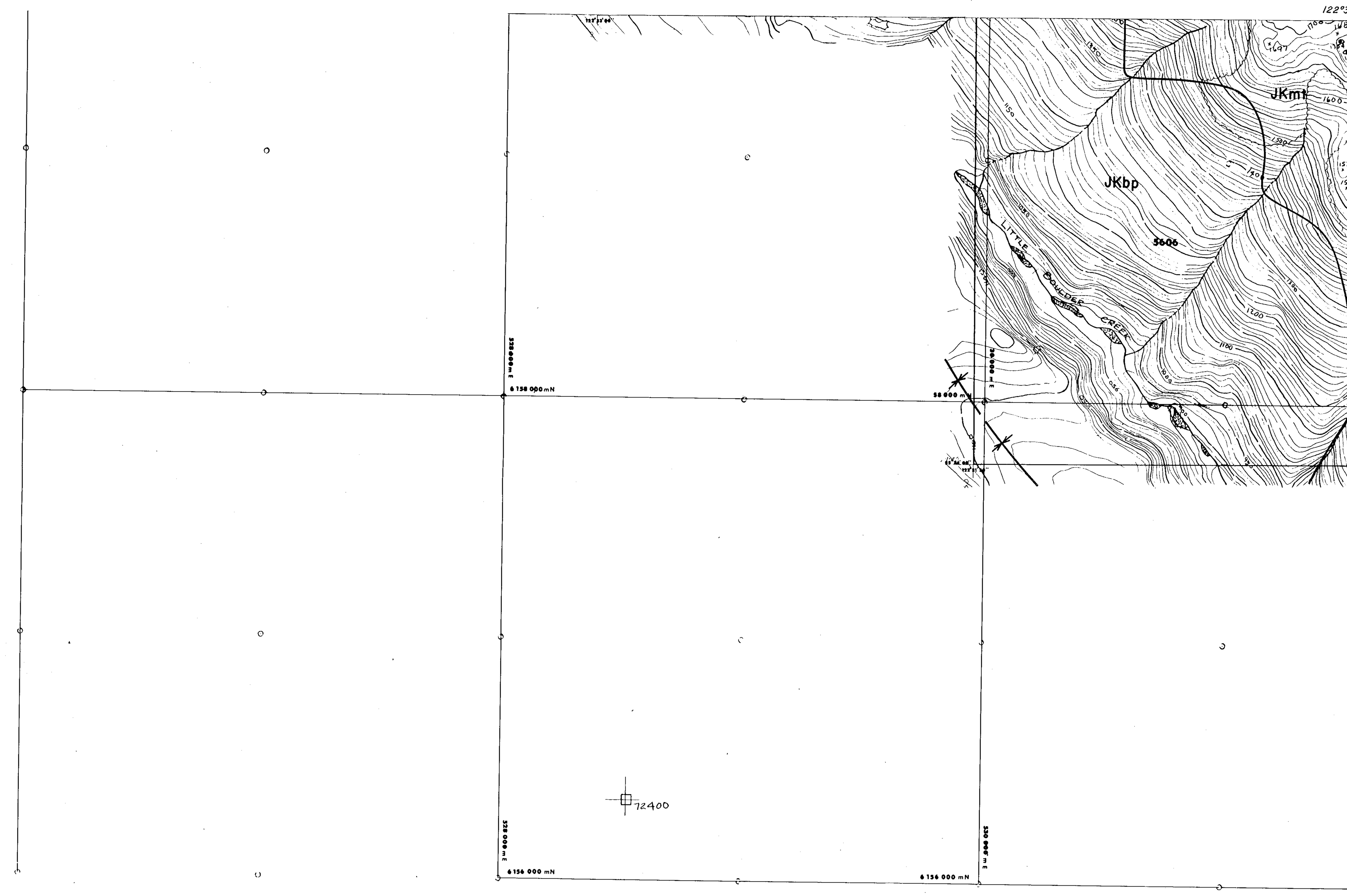


GOODRICH
INDEX MAP

55°40'
122°22'30"

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC. Coal Division CALGARY ALBERTA	
93O/9W L GOODRICH COAL PROJECT GEOLOGY 531	
PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN '81	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

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Transitional

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  - JKb$_1$
  - JKb$_2$
  - JKb$_3$

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BEDDING: (vertical, horizontal)
A — A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
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SILTY CLAYSTONE

LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES — 1000 — 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE INTERVAL 10 METRES

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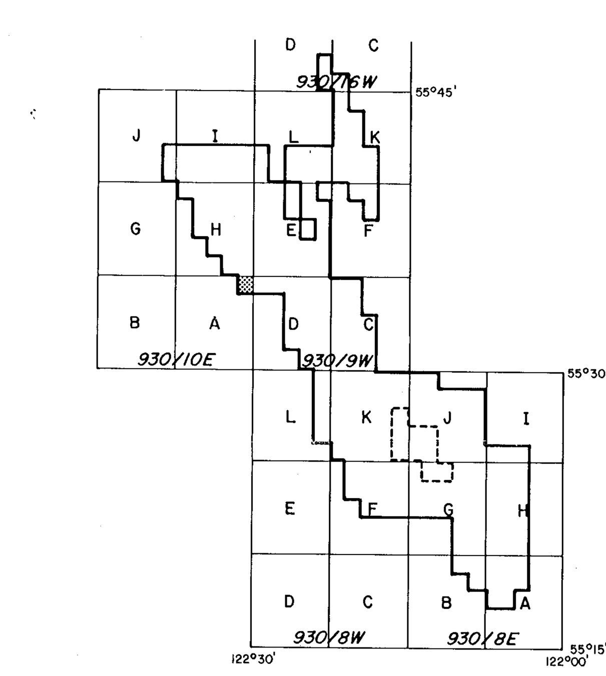
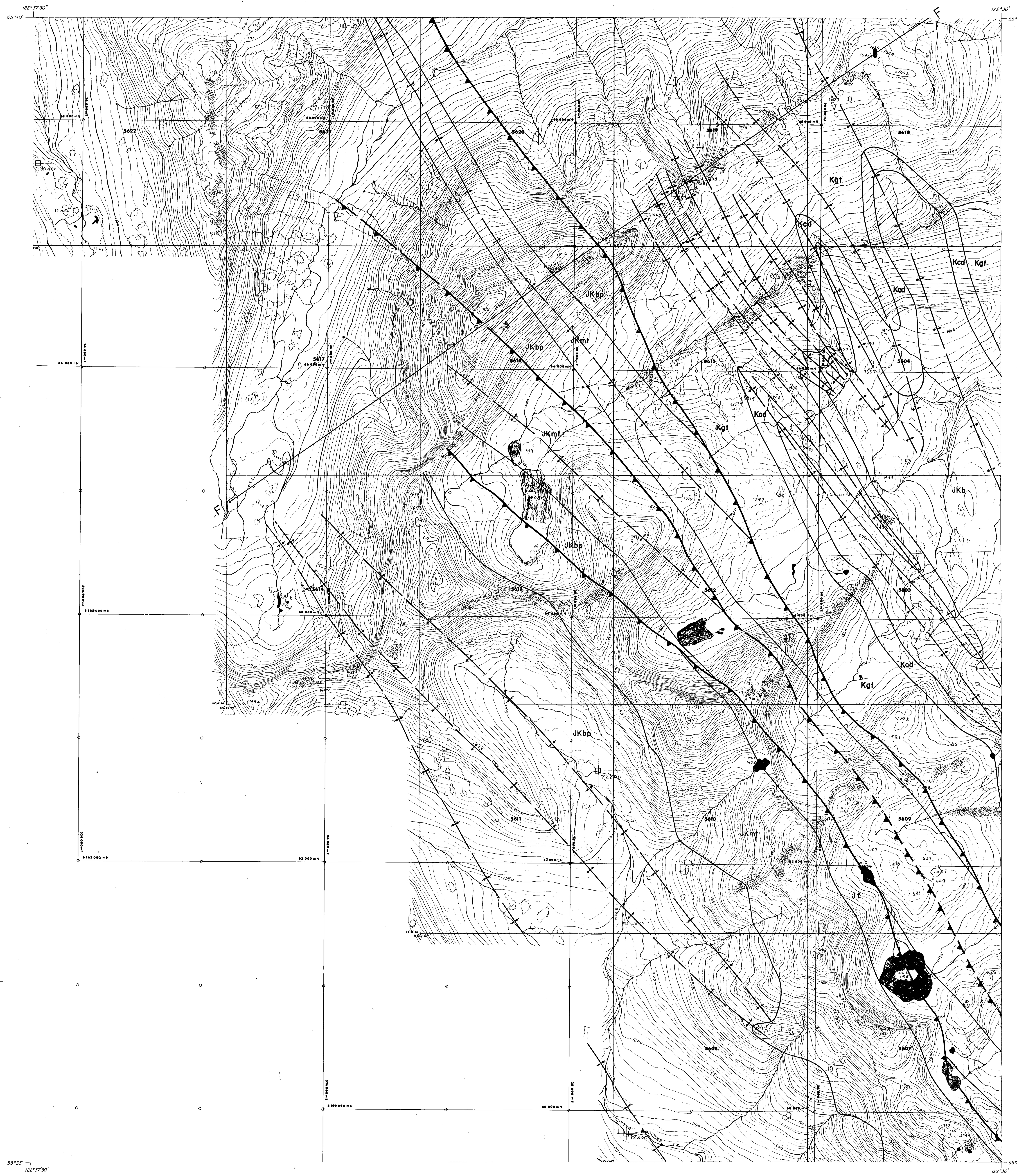
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC. Coal Division CALGARY ALBERTA	Gulf
930/10E A GOODRICH COAL PROJECT GEOLOGY 531	
PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. 81	DRAWING No.



GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

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Transitional

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- JKb_2
- JKb_3

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Jurassic

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Mudstone, siltstone, sandstone.

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BEDDING : (vertical, horizontal).
A — A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES — 1000 — 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE INTERVAL 10 METRES

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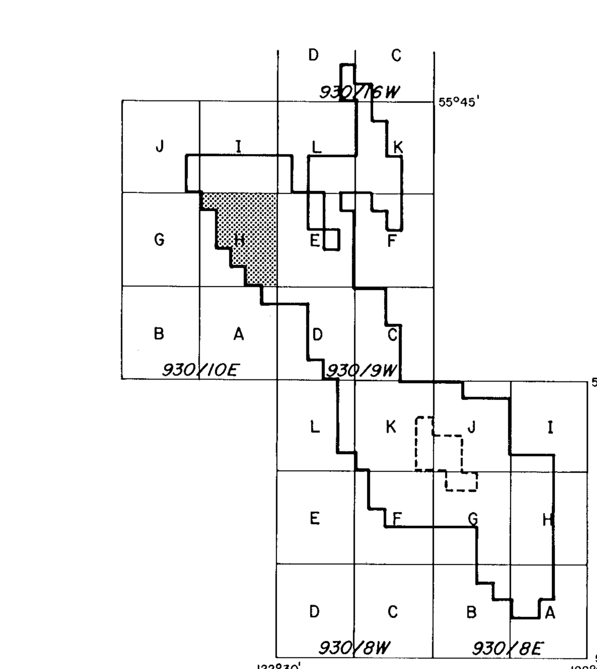
0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80 (2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/10E H

GOODRICH COAL PROJECT
GEOLOGY

531

PREPARED BY:	SCALE 1:10,000
APPROVED BY: DATE: JAN. 1981	DRAWING No.

GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous	Kgt	GETHING FORMATION	Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
Lower Cretaceous	Kcd	CADOMIN FORMATION	Chert clasts about 2 cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
Transitional	JKb - JKb_1 - JKb_2 - JKb_3	BRENOT FORMATION	Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL. JKb_{1a-g} indicate different JKb_1 index beds.
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Transitional	JKbp	BEATTIE PEAKS FORMATION	Sandstone, marine siltstone and mudstone, COAL.
Transitional	JKmt	MONTEITH FORMATION	Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.
Jurassic	Jf	FERNIE FORMATION	Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

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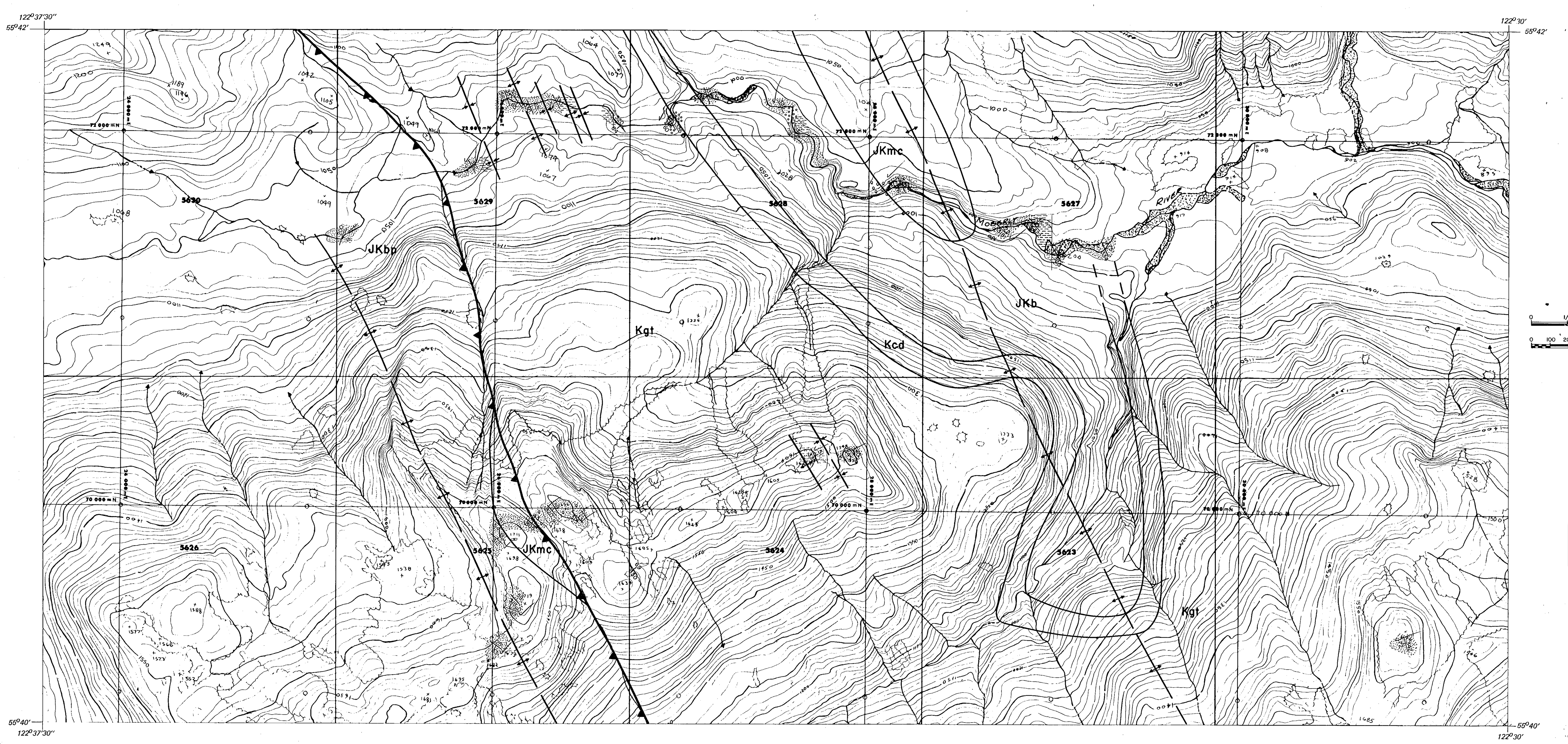
- SYNCLINE: (defined, approximate)
- ANTICLINE AND SYNCLINE: (overturned)
- FAULT: (defined showing dip; approx. position of fault.)
- STRIKE AND DIP: (bedding, overturned bedding)
- BEDDING: (vertical, horizontal)
- A ——— A' CROSS SECTION LOCATION
- MONOCLINE

LITHOLOGICAL SYMBOLS

- CONGLOMERATE
- SANDSTONE
- SILTSTONE
- CLAYSTONE (MUDSTONE)
- CARBONACEOUS CLAYSTONE
- COAL
- SILTY CLAYSTONE



LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT × 1012
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5857

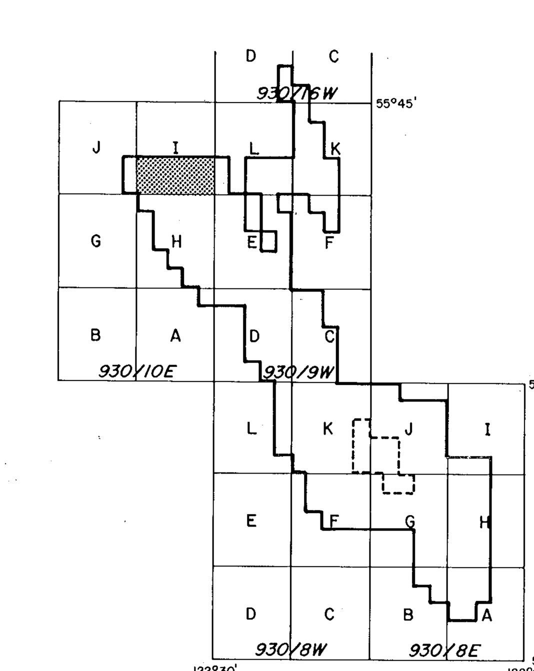
FORM LINE INTERVAL 10 METRES

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.

0 1/8 1/4 1/2 3/4 1 MILE

0 100 200 400 600 800 1000 METERS

SCALE : 1:10,000



GOODRICH
INDEX MAP

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/10E I
GOODRICH COAL PROJECT
GEOLOGY

531

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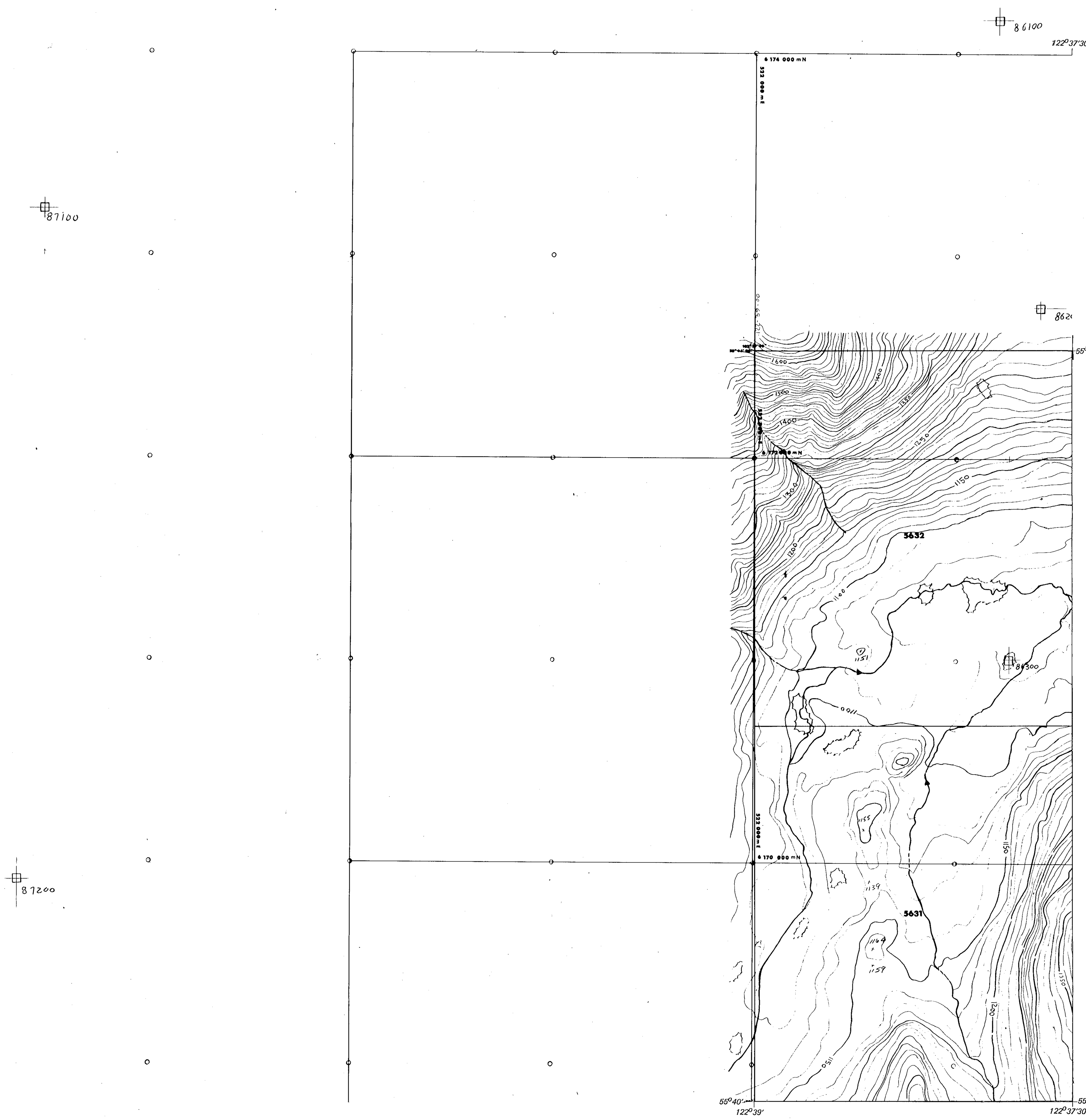


GOODRICH MAP
GEOLOGIC LEGEND

Lower Cretaceous

Kgt — GETHING FORMATION
Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.

Kcd — CADOMIN FORMATION
Chert clasts about 2 cm. in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

JKb — BRENOT FORMATION
- JKb_1
- JKb_2
- JKb_3

Lithic "salt and pepper" sandstone, siltstone, mudstone; carbonaceous mudstone, quartzite, COAL.
JKb_{1a-g} indicate different JKb_1 index beds.

JKmc — MONACH FORMATION
Marine lithic and quartzose sandstone, with thick beds of clean, coarse grained white quartzite at top, COAL.

JKbp — BEATTIE PEAKS FORMATION
Sandstone, marine siltstone and mudstone, COAL.

JKmt — MONTEITH FORMATION
Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse grained white quartzite at top.

Jurassic

Jf — FERNIE FORMATION
Mudstone, siltstone, sandstone.

GEOLOGICAL SYMBOLS

GEOLOGICAL BOUNDARY: (defined, approximate)
ANTICLINE: (defined, approximate)
SYNCLINE: (defined, approximate)
ANTICLINE AND SYNCLINE: (overturned)
FAULT: (defined showing dip; approx. position of fault.)
STRIKE AND DIP: (bedding, overturned bedding)
BEDDING: (vertical, horizontal)
A ——— A' CROSS SECTION LOCATION
MONOCLINE

LITHOLOGICAL SYMBOLS

CONGLOMERATE
SANDSTONE
SILTSTONE
CLAYSTONE (MUDSTONE)
CARBONACEOUS CLAYSTONE
COAL
SILTY CLAYSTONE

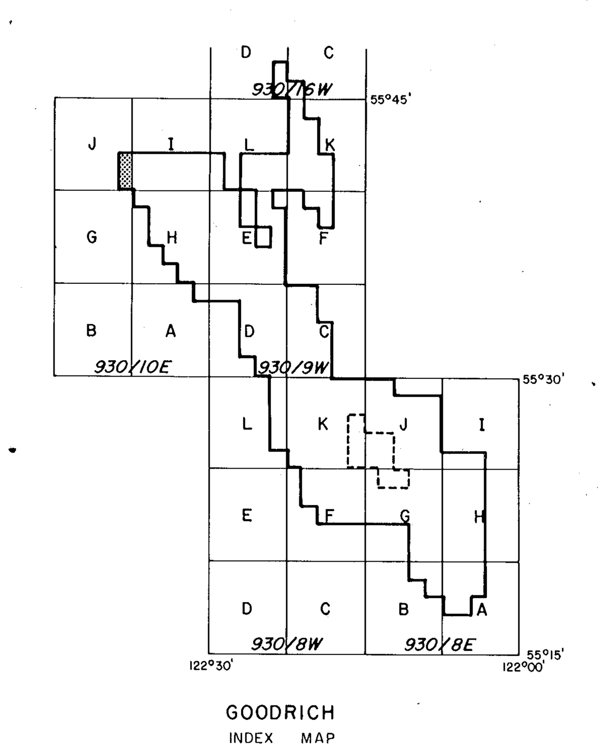
LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES 1000 1050
DEPRESSION FORM LINE
SPOT HEIGHT × 1012
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5857

FORM LINE 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.

0 1/8 1/4 1/2 3/4 1 MILE
0 100 200 400 600 800 1000 METERS
SCALE : 1:10,000



GOODRICH
INDEX MAP

PR- Goodrich 80(2)A

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Coal Division
CALGARY ALBERTA

93O/10E J

GOODRICH COAL PROJECT

GEOLOGY

531

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GEOLOGIC LEGEND

Lower Cretaceous

- Kgt — **GETHING FORMATION**
  Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils
- Kcd — **CADOMIN FORMATION**
  Chert clasts about 2cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

Transitional

- JKb — **BRENOT FORMATION**
  - JKb 1
  - JKb 2
  - JKb 3

  Lithic "salt and pepper" sandstone, siltstone mudstone; carbonaceous mudstone, quartzite, COAL. $JKb_{1\,a-g}$ indicate different JKb_1 index beds.
- JKmc — **MONACH FORMATION**
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  Sandstone, marine siltstone and mudstone, COAL.
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Jurassic

- Jf — **FERNIE FORMATION**
  Mudstone, siltstone, sandstone.

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Coal Division
CALGARY ALBERTA

Gulf

GOODRICH COAL PROJECT
GENERALIZED CROSS SECTION
A – A'
NEAR GOODRICH PEAK 531

PREPARED BY: G. HOFFMAN	SCALE 1:10,000
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GEOLOGIC LEGEND

Lower Cretaceous — Transitional — Jurassic

Kgt — GETHING FORMATION
Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils

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- JKb_3

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Marine lithic and quartzose sandstone, siltstone, with thick beds of clean, coarse-grained white quartzite at top.

Jf — FERNIE FORMATION
Mudstone, siltstone, sandstone.

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GOODRICH COAL PROJECT
GENERALIZED CROSS SECTION
B - B'
NEAR BRAZION CREEK ROAD 531

PREPARED BY: G. HOFFMAN	SCALE 1:10,000
APPROVED BY: DATE: DEC., 1980	DRAWING No.

GEOLOGIC LEGEND

Lower Cretaceous / Transitional / Jurassic

Kgt	GETHING FORMATION	Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils
Kcd	CADOMIN FORMATION	Chert clasts about 2cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
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Jf	FERNIE FORMATION	Mudstone, siltstone, sandstone.

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GOODRICH COAL PROJECT
GENERALIZED CROSS SECTION
C - C'

531

NEAR HEADWATERS OF BEAUDETTE CREEK

PREPARED BY: G. HOFFMAN	SCALE 1:10,000
APPROVED BY: DATE: DEC., 1980	DRAWING No.

GEOLOGIC LEGEND

Lower Cretaceous / Transitional / Jurassic

Kgt	GETHING FORMATION	Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.
Kcd	CADOMIN FORMATION	Chert clasts about 2cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
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Jf	FERNIE FORMATION	Mudstone, siltstone, sandstone.

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GOODRICH COAL PROJECT
GENERALIZED CROSS SECTION
D-D'

SOUTH OF HART HIGHWAY NEAR PYRAMIS PEAK

PREPARED BY: G. HOFFMAN	SCALE 1:10,000
APPROVED BY: DATE: DEC., 1980	DRAWING No.

GEOLOGIC LEGEND

Lower Cretaceous — Transitional — Jurassic

Kgt — GETHING FORMATION
Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils.

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Chert clasts about 2cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.

JKb (-JKb 1, -JKb 2, -JKb 3) — BRENOT FORMATION
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Jf — FERNIE FORMATION
Mudstone, siltstone, sandstone.

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Coal Division
CALGARY ALBERTA

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GOODRICH COAL PROJECT
GENERALIZED CROSS SECTION
E - E'
NEAR MT. BICKFORD NORTH OF HART HIGHWAY

PREPARED BY: G. HOFFMAN	SCALE 1:10,000
APPROVED BY: DATE: DEC., 1980	DRAWING No.

GEOLOGIC LEGEND

Lower Cretaceous — Transitional — Jurassic

Kgt	GETHING FORMATION	Sandstone, siltstone, mudstone, carbonaceous mudstone, COAL. Plant fossils
Kcd	CADOMIN FORMATION	Chert clasts about 2cm in diameter in matrix of chert sandstone or grit, interbedded with siliceous chert grit. Grades into grey siliceous chert grit in north.
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Jf	FERNIE FORMATION	Mudstone, siltstone, sandstone.

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Coal Division
CALGARY ALBERTA

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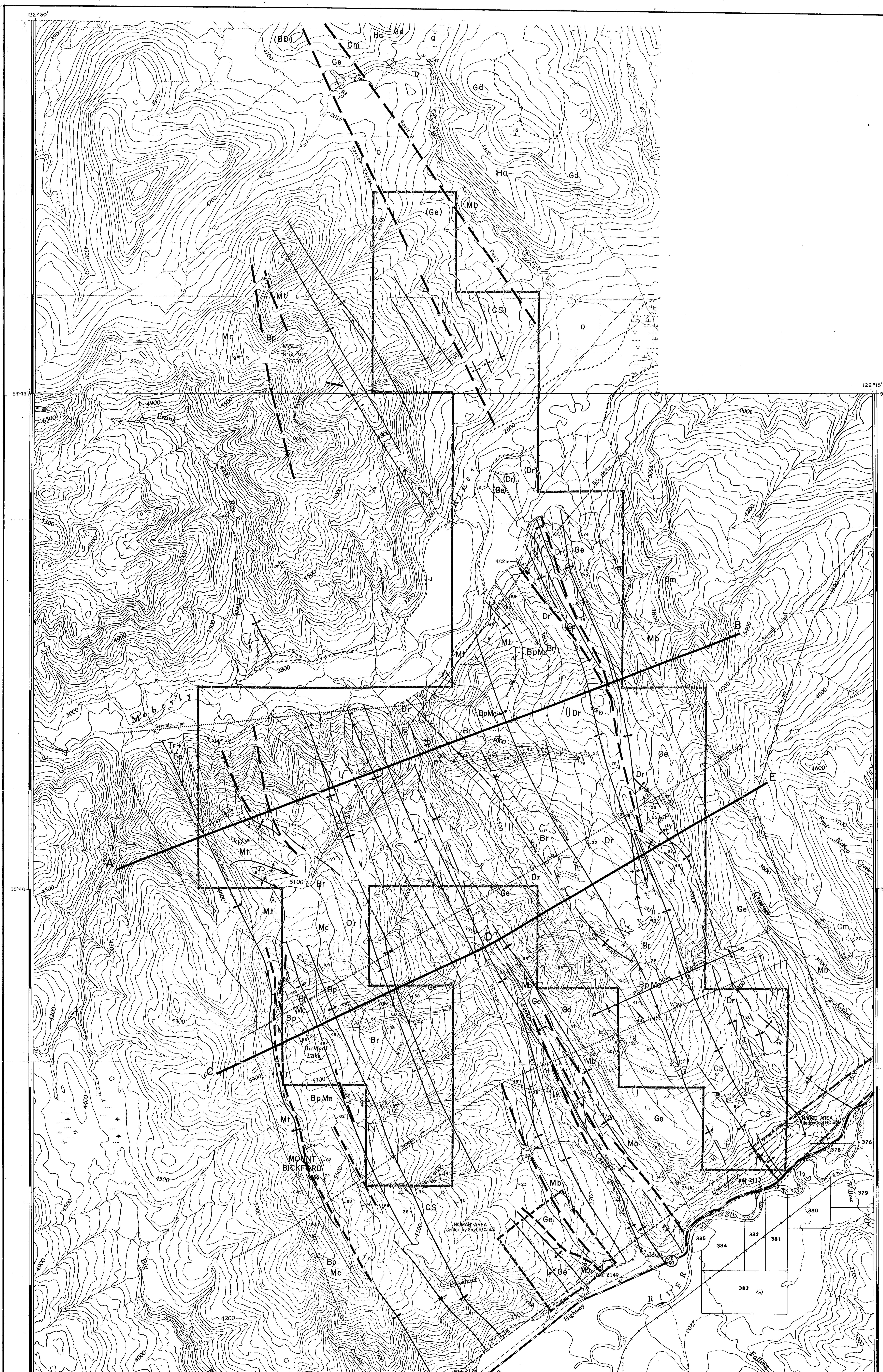
GOODRICH COAL PROJECT
GENERALIZED CROSS SECTION
F - F'

NORTH OF JOHN HART HIGHWAY NEAR MOBERLY RIVER

PREPARED BY: G. HOFFMAN	SCALE 1:10,000
APPROVED BY: DATE: DEC., 1980	DRAWING No.



FORT ST. JOHN GROUP

- Cm — Commotion Formation
- Mb — Moosebar Formation

CRASSIER GROUP - CS : (Non-marine Bullhead)

- Ge — Gething Formation
- Dr — Dresser Formation
- Br — Brenot Formation

BEAUDETTE GROUP - BD : (Marine Bullhead)

- Bz — Brazion Beds : mapped with Monach and Monach-Beattie Peaks
- Mc — Monach Formation
- Bp — Beattie Peaks Formation
- BpMc — Beattie Peaks and Monach
- Mt — Monteith Formation

FERNIE GROUP

- Fe — Fernie beds, undivided.

SCHOOLER CREEK GROUP

- Tr — Schooler Creek beds, undivided.

(   ) = Interpretation of stratigraphic unit.

FORMATION BOUNDARY : (indicated, observed)

INDEX BED : (stratigraphic or structural reference)

BOUNDARY OF QUATERNARY DRIFT

FAULT : (indicated)

ANTICLINE AXIS

SYNCLINE AXIS

PLUNGE

FLEXURE AXIS : (v makes dip of steeper limb)

DRAG FOLD

STRIKE AND DIP (degrees) : (vertical, overturned)

OUTCROP

ANTICLINE AND SYNCLINE : (overturned)

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FIGURE I

GOODRICH PROJECT 1980
MOBERLY PROSPECT
COAL LICENCES 5743,-5769

531

PREPARED BY: J E HUGHES	SCALE R/F 1:25,000
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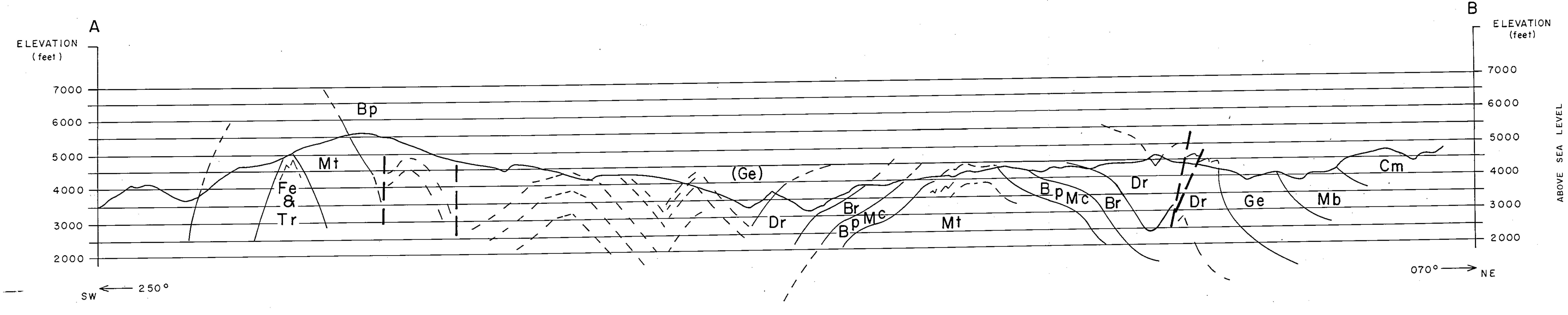

GOODRICH MAP
GEOLOGIC LEGEND

FORT ST. JOHN GROUP

- Cm — Commotion Formation
- Mb — Moosebar Formation

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( ) = Interpretation of stratigraphic unit.

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Coal Division
CALGARY ALBERTA
Gulf

GOODRICH PROJECT 1980
MOBERLY PROSPECT
STRUCTURE PROFILE A-B

531

PREPARED BY: J E HUGHES		SCALE 1 : 25,000
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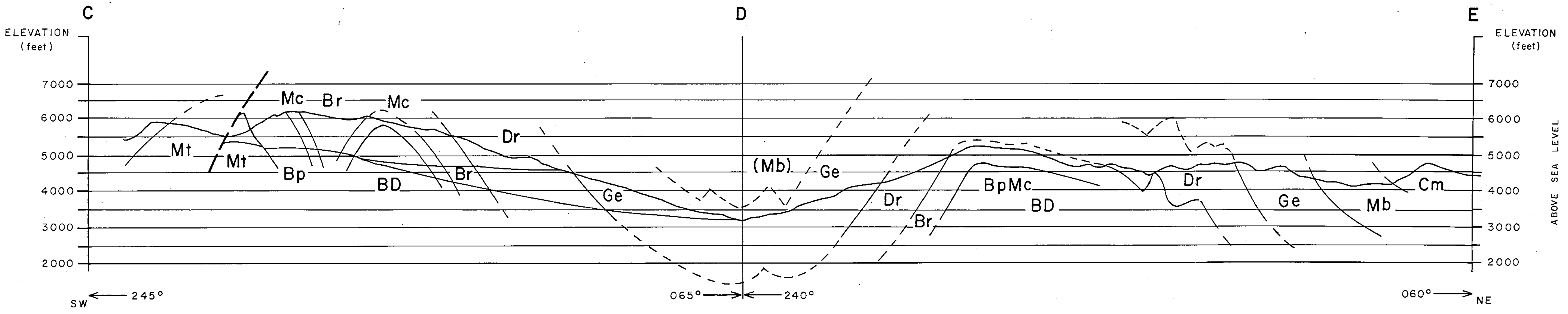

GOODRICH MAP
GEOLOGIC LEGEND

FORT ST. JOHN GROUP

☐	Cm	Commotion Formation
☐	Mb	Moosebar Formation

CRASSIER GROUP - CS : (Non-marine Bullhead)

☐	Ge	Gething Formation
☐	Dr	Dresser Formation
☐	Br	Brenot Formation

BEAUDETTE GROUP - BD : (Marine Bullhead)

	Bz	Brazion Beds : mapped with Monach and Monach-Beattie Peaks
☐	Mc	Monach Formation
☐	Bp	Beattie Peaks Formation
☐	Mt	Monteith Formation

Mc and Bp: ☐ BpMc — Beattie Peaks and Monach

FERNIE GROUP

☐	Fe	Fernie beds, undivided.

SCHOOLER CREEK GROUP

☐	Tr	Schooler Creek beds, undivided.

( ) = Interpretation of stratigraphic unit.

PB-Goodrich 80(2)A

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Coal Division
CALGARY ALBERTA
Gulf

GOODRICH PROJECT 1980
MOBERLY PROSPECT
STRUCTURE PROFILE C-D-E

531

PREPARED BY: JE HUGHES		SCALE 1:25,000
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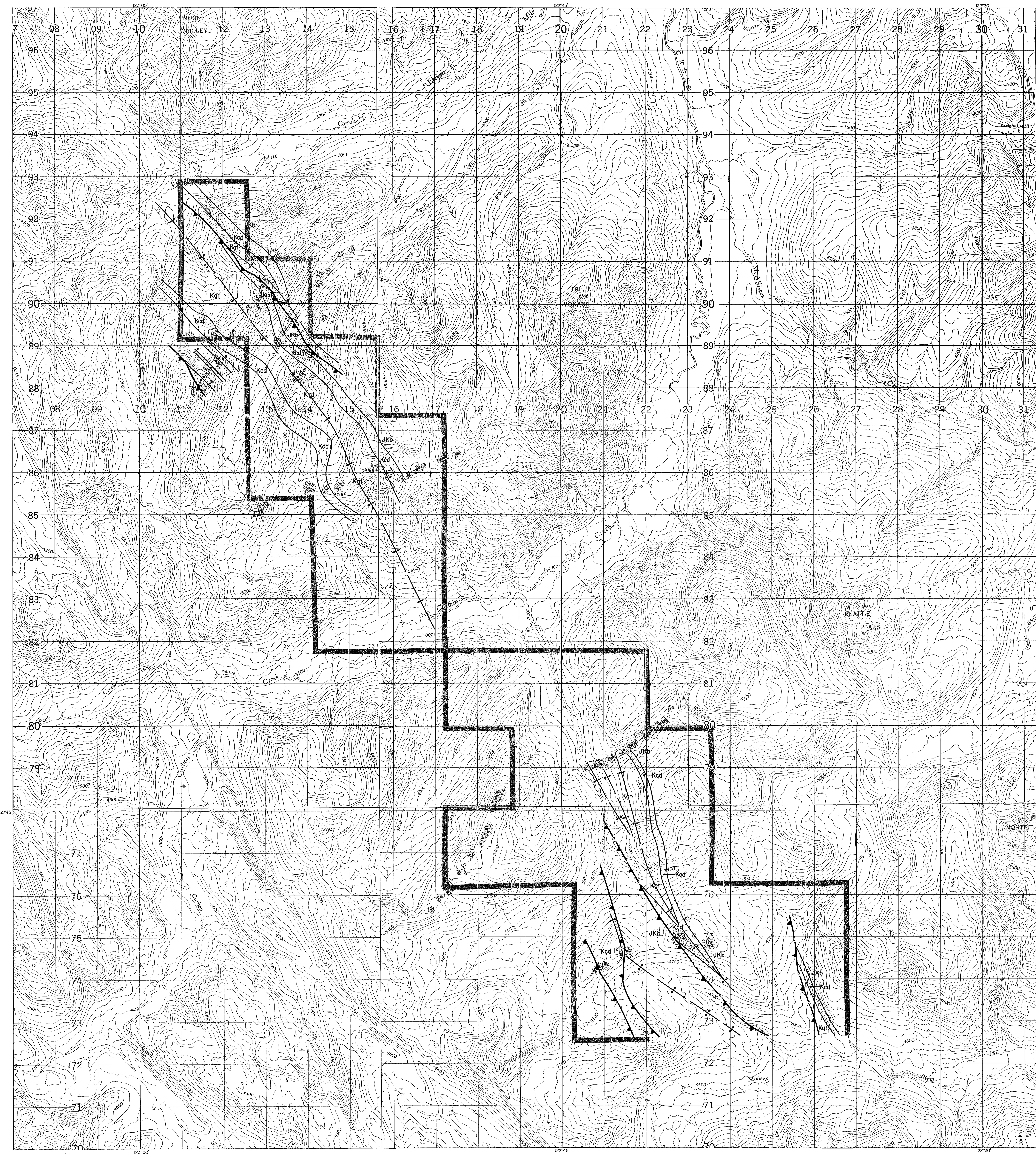

LEGEND

Kgt *Gething Formation*	*Conglomerate*	*Fault; definite, approximate, dip shown.*	
Kcd *Cadomin Formation*	*Sandstone*	*Syncline; definite, approximate.*	
JKb *Brenot Formation*	*Claystone (Mudstone)*	*Anticline; definite, approximate.*	
	c *Coal*	*Geological contact*	
	Q *Quartzitic*	327/30 *Dip and strike of bedding*	
		Dip and strike, overturned beds.	

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CALGARY ALBERTA
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GOODRICH - WHITERABBIT

GEOLOGY

531

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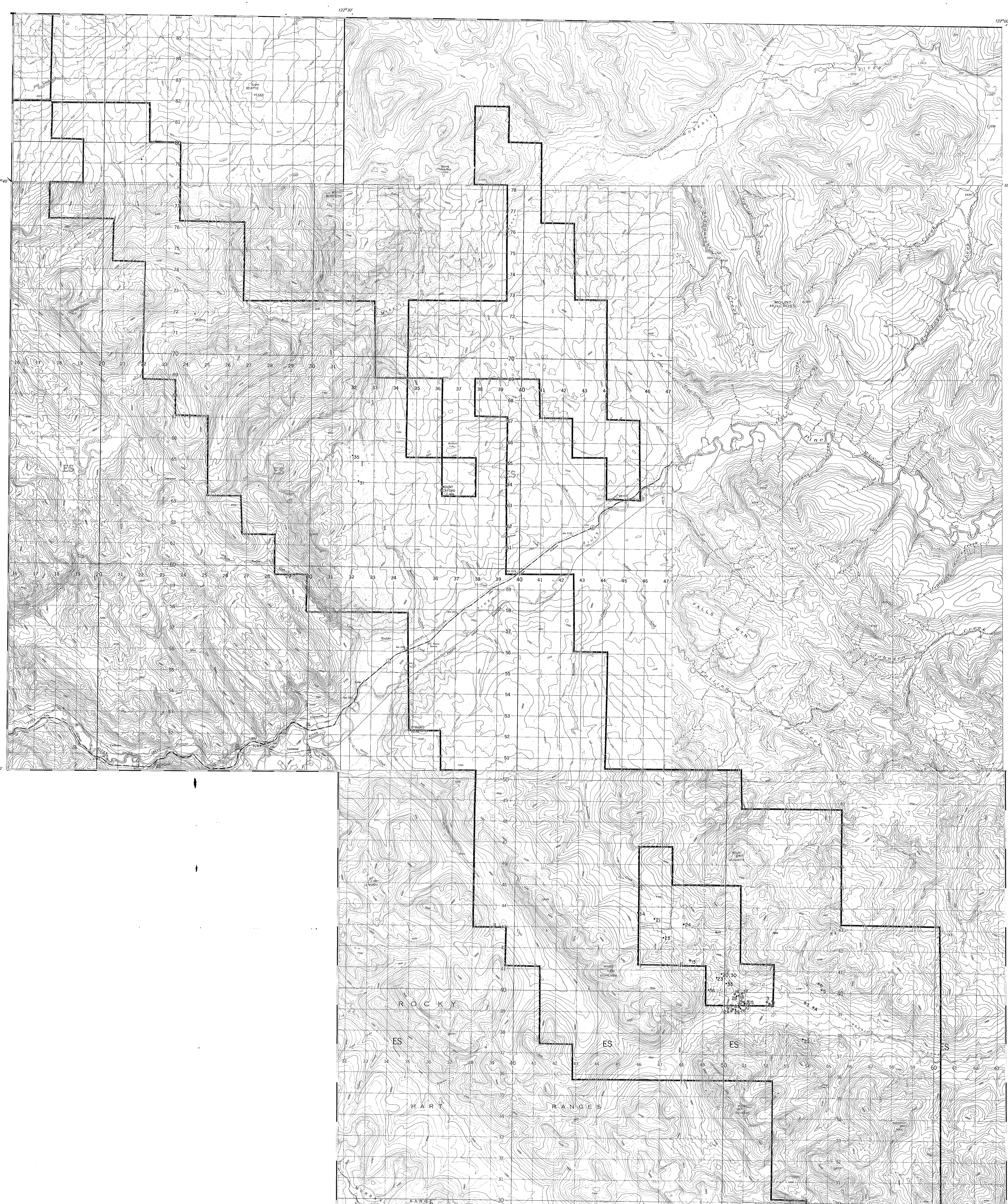

⊙ ROTARY DRILL HOLES (1-17)

• DIAMOND DRILL HOLE (18-36)

Note : Diamond drill hole 32 is located at UTM co-ordinates 6 187 325.00 N 514 650.00 E which is outside this map area.

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Coal Division
CALGARY ALBERTA

Gulf

GOODRICH DRILL HOLE LOCATIONS

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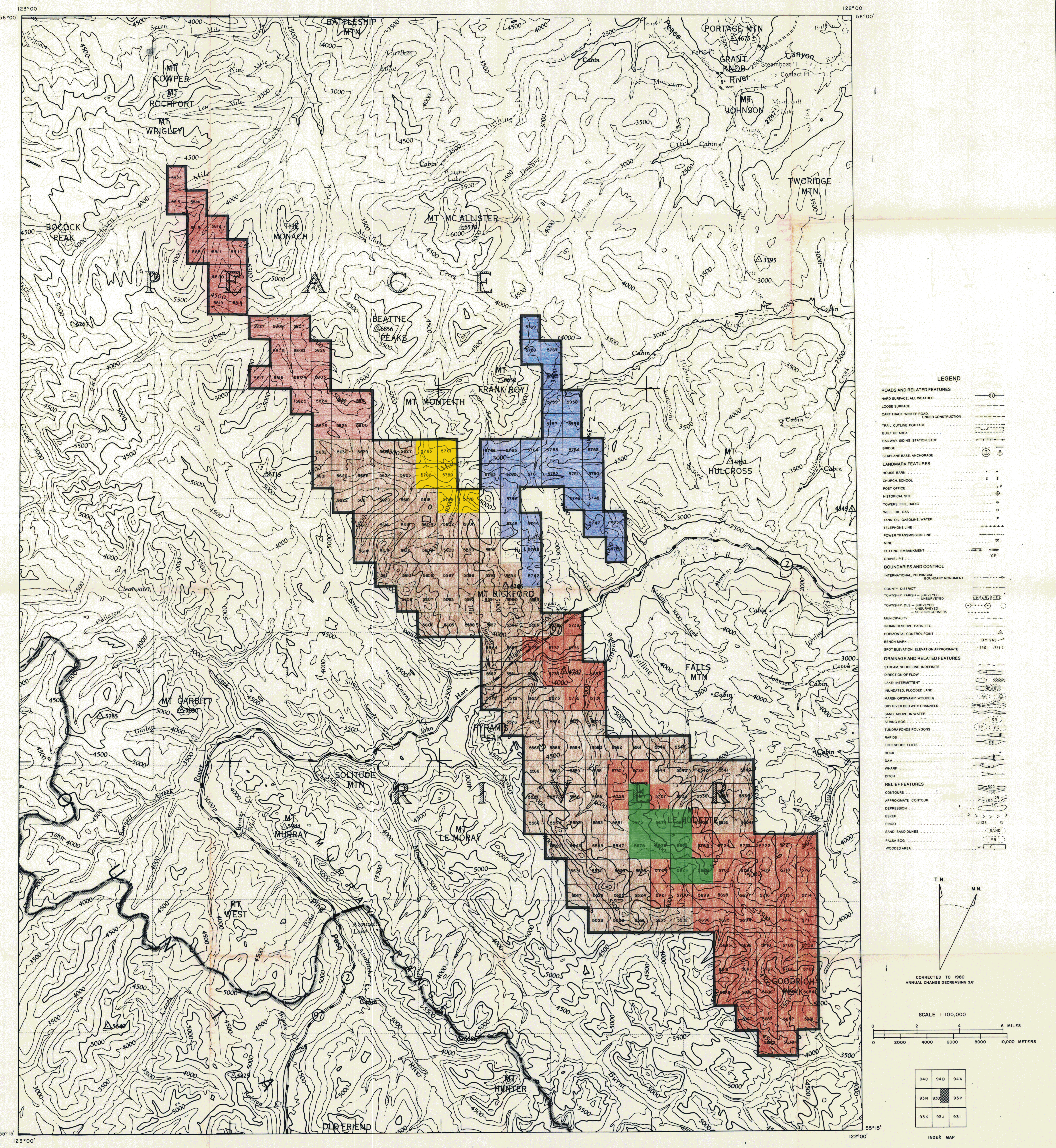
APPROVED BY:	DATE: JAN. 1981	



LEGEND

NOVEMBER 7, 1979 LOSSAN BLOCK	WHITERABBIT JANUARY 14, 1980
NOVEMBER 19, 1979 GOODRICH	JANUARY 25, 1980 GOODRICH NO. 4
NOVEMBER 26, 1979 GOODRICH NO. 2 & 3	FEBRUARY 1, 1980 GOODRICH NO. 5

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CALGARY ALBERTA

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GOODRICH COAL LICENCE MAP

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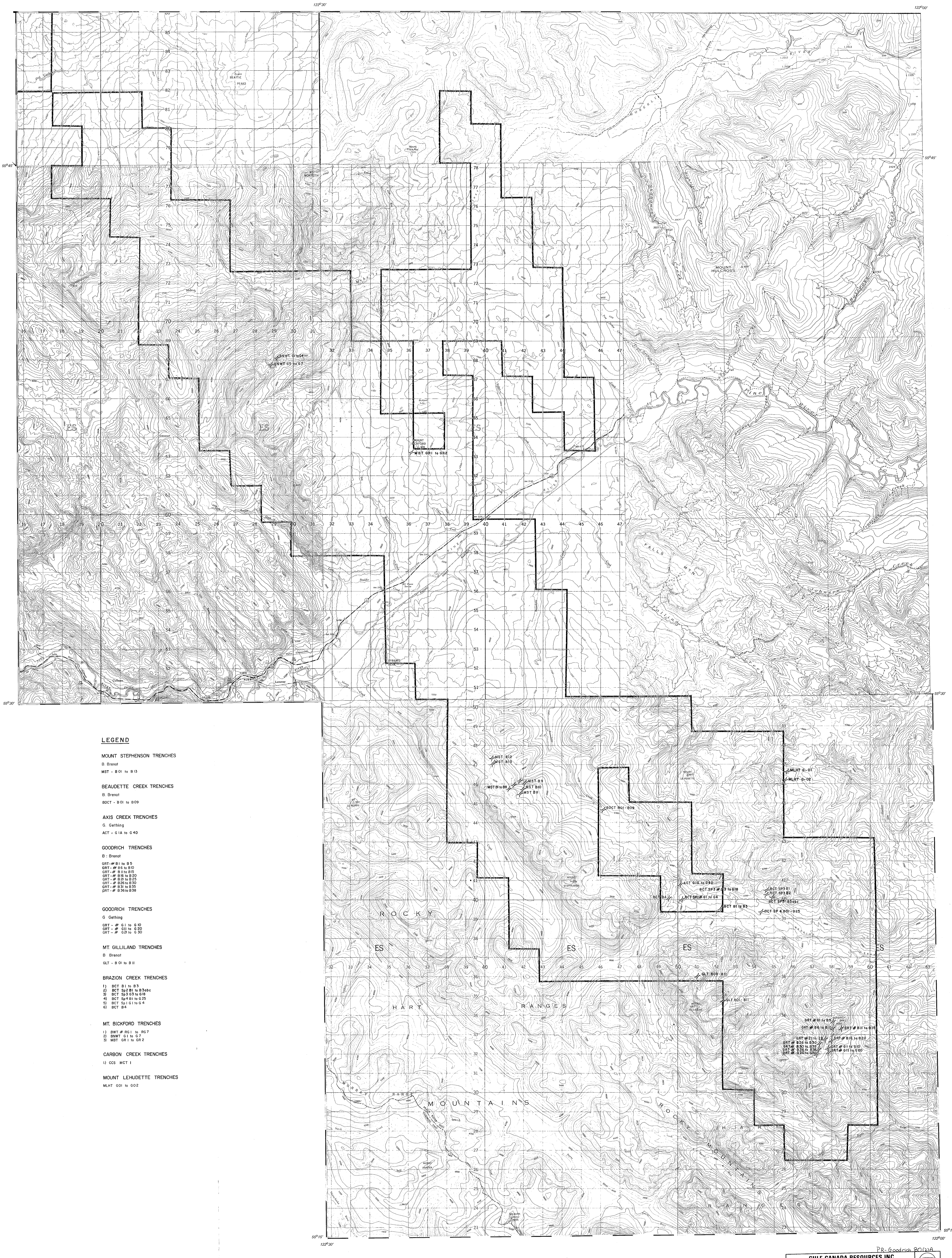
APPROVED BY: DATE: JAN. 1981
DRAWING No.



LEGEND

MOUNT STEPHENSON TRENCHES
B. Brenot
MST - B 01 to B 13

BEAUDETTE CREEK TRENCHES
B. Brenot
BDCT - B 01 to B 09

AXIS CREEK TRENCHES
G. Gething
ACT - G 1A to G 4D

GOODRICH TRENCHES
B : Brenot
GRT-# B 1 to B 5
GRT-# B 6 to B 10
GRT-# B 11 to B 15
GRT-# B 16 to B 20
GRT-# B 21 to B 25
GRT-# B 26 to B 30
GRT-# B 31 to B 35
GRT-# B 36 to B 38

GOODRICH TRENCHES
G Gething
GRT - # G 1 to G 10
GRT - # G 11 to G 20
GRT - # G 21 to G 30

MT. GILLILAND TRENCHES
B Brenot
GLT - B 01 to B 11

BRAZION CREEK TRENCHES
1) BCT B 1 to B 3
2) BCT Sp 2 B 1 to B 3abc
3) BCT Sp 3 G 3 to G 18
4) BCT Sp 4 B 1 to G 25
5) BCT Sp 1 G 1 to G 4
6) BCT B 4

MT. BICKFORD TRENCHES
1) BWT # RG 1 to RG 7
2) BNWT G 1 to G 7
3) MBT GR 1 to GR 2

CARBON CREEK TRENCHES
1.) CCS MCT 1

MOUNT LEHUDETTE TRENCHES
MLHT G01 to G02

PR-Goodrich 80(2)A

GULF CANADA RESOURCES INC. Coal Division CALGARY ALBERTA	Gulf
GOODRICH PROPERTY TRENCH LOCATIONS	
PREPARED BY: SCALE: 1:50,000	DRAWING No. 531
APPROVED BY: DATE: JAN. 1981	