PR- Windfall 80(1)A

GULF CANADA RESOURCES INC.
WINDFALL COAL PROJECT

December, 1980
Geological Report

MAP AND LICENCE NUMBERS

NTS Map 93/P4W and 93P/4E

Licence Numbers	5635 - 5669 inclusive 5770 - 5777 inclusive

Approximate centre of Windfall property: Latitude N 55° 10'; Longitude 121° 45'.

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1.0 SUMMARY

Gulf Canada Resources' Windfall coal property is situated in the Inner Foothills of the Rocky Mountains, approximately 70 road kilometres south of Chetwynd, British Columbia.

The property consists of 45 Crown coal licences covering some 13 324 hectares. The block is located to cover the coal-bearing Lower Cretaceous Minnes Group strata.

G.C.R.I. conducted a short exploration program in the form of reconnaissance mapping during the summer of 1980. The mapping project undertaken on a 1:25 000 map scale, established the regional stratigraphic and structural trend of the Minnes strata. The Windfall property essentially consists of a sequence of folded sediments trending in a northwesterly direction.

Significant coal exposures were not identified on the Windfall block at this time. Generally, extensive vegetation cover precludes the identification of coal-bearing strata.

A detailed mapping program for 1981 will be undertaken so that areas of coal resource potential can be delineated.

2.0 INTRODUCTION

2.1 Property Location and Access

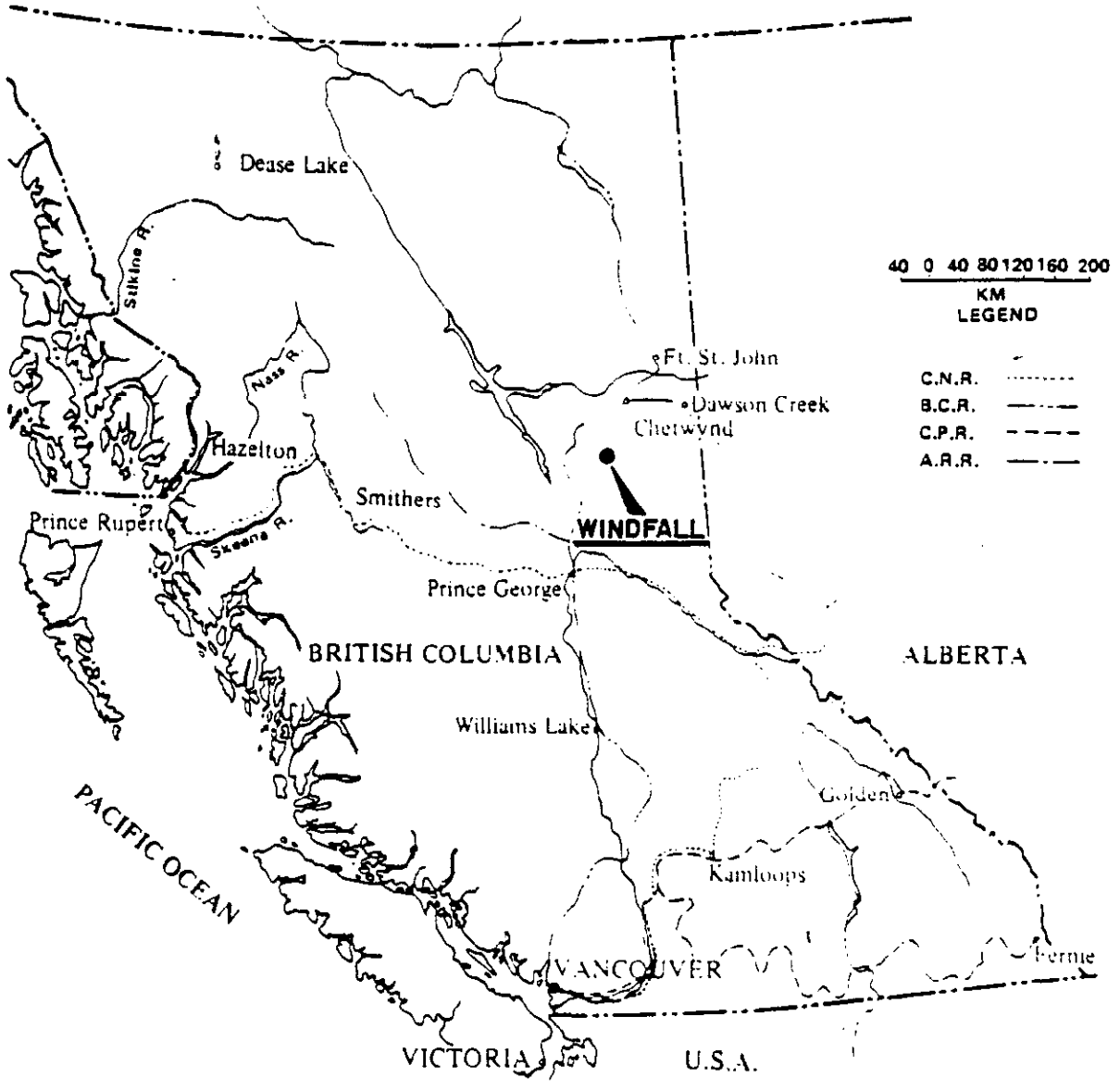
The Windfall coal property is situated in the Inner Foothills region of northeastern British Columbia, approximately 70 kilometres by road south of Chetwynd (see Figure 1). The property consists of 45 Crown coal licences covering an area of some 13 324 hectares. Figure 2 illustrates the relative position of the Windfall block to the existing northeast coal block. The property contains coal-bearing Lower Cretaceous sediments of the Minnes Group.

The Windfall property is accessible only via the Sukunka Road which crosses the property from mile 39 (63 kilometres) to mile 47.5 (75 kilometres). The Sukunka River disects the property and constitutes the major river valley. The areas' main tributary is Windfall Creek.

In general, the Windfall block is heavily wooded and only a small portion, the higher peaks, are above treeline. The Sukunka River Valley has an average elevation of 750 metres rising to approximately 1 750 metres in the southeast and 1 450 metres in the northwest of the property.

2.2 History of Land Tenure

Observations of coal seams within the Minnes Group in surface exposure at a number of locations along the Rocky Mountain Foothills of northeastern British Columbia led to a reconnaissance exploration program being undertaken by Gulf



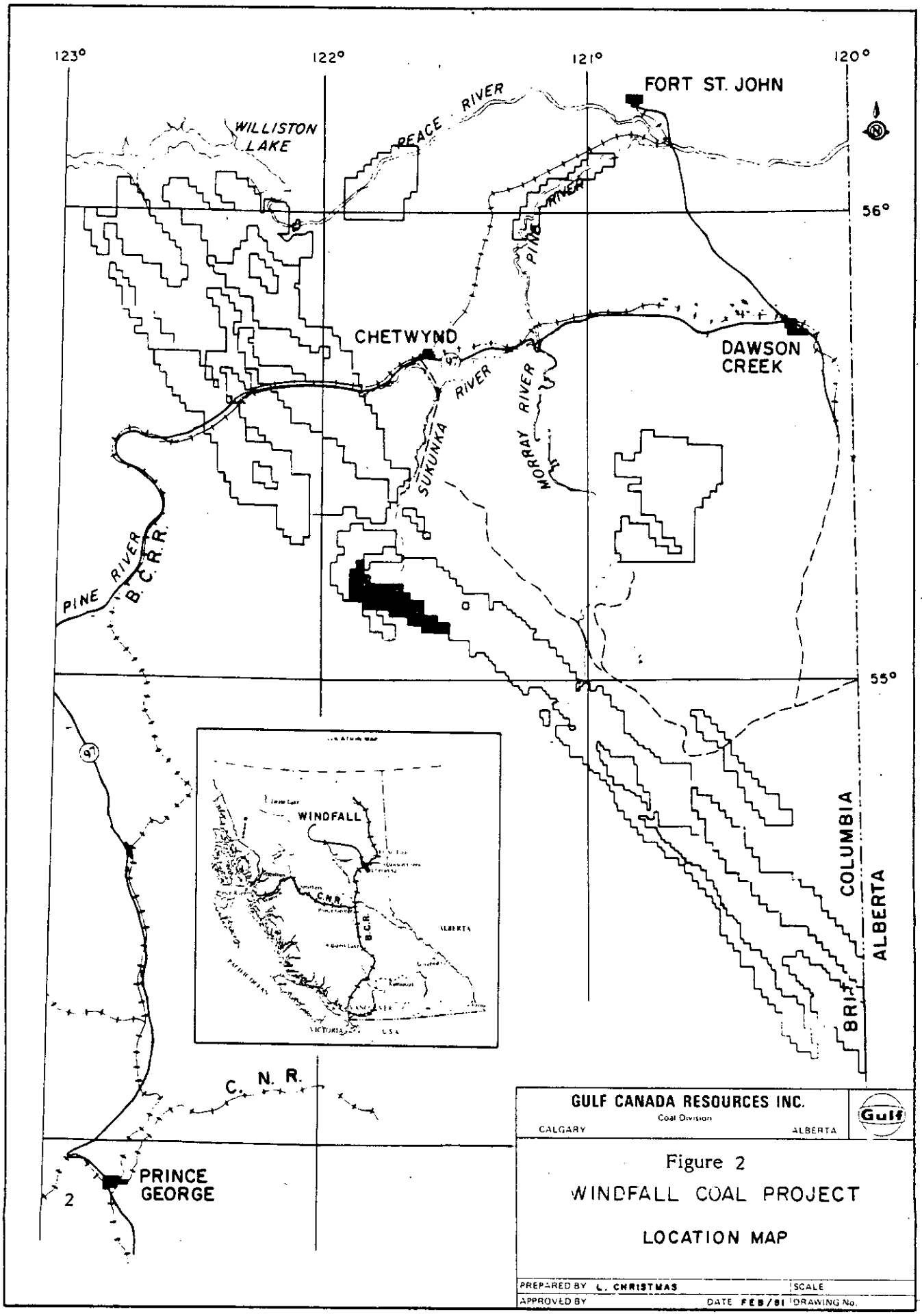
GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

Figure 1

LOCATION MAP

WINDFALL COAL PROJECT

PREPARED BY: H. ZSCHACH	SCALE
APPROVED BY: DATE: 2. 1981	DRAWING No.

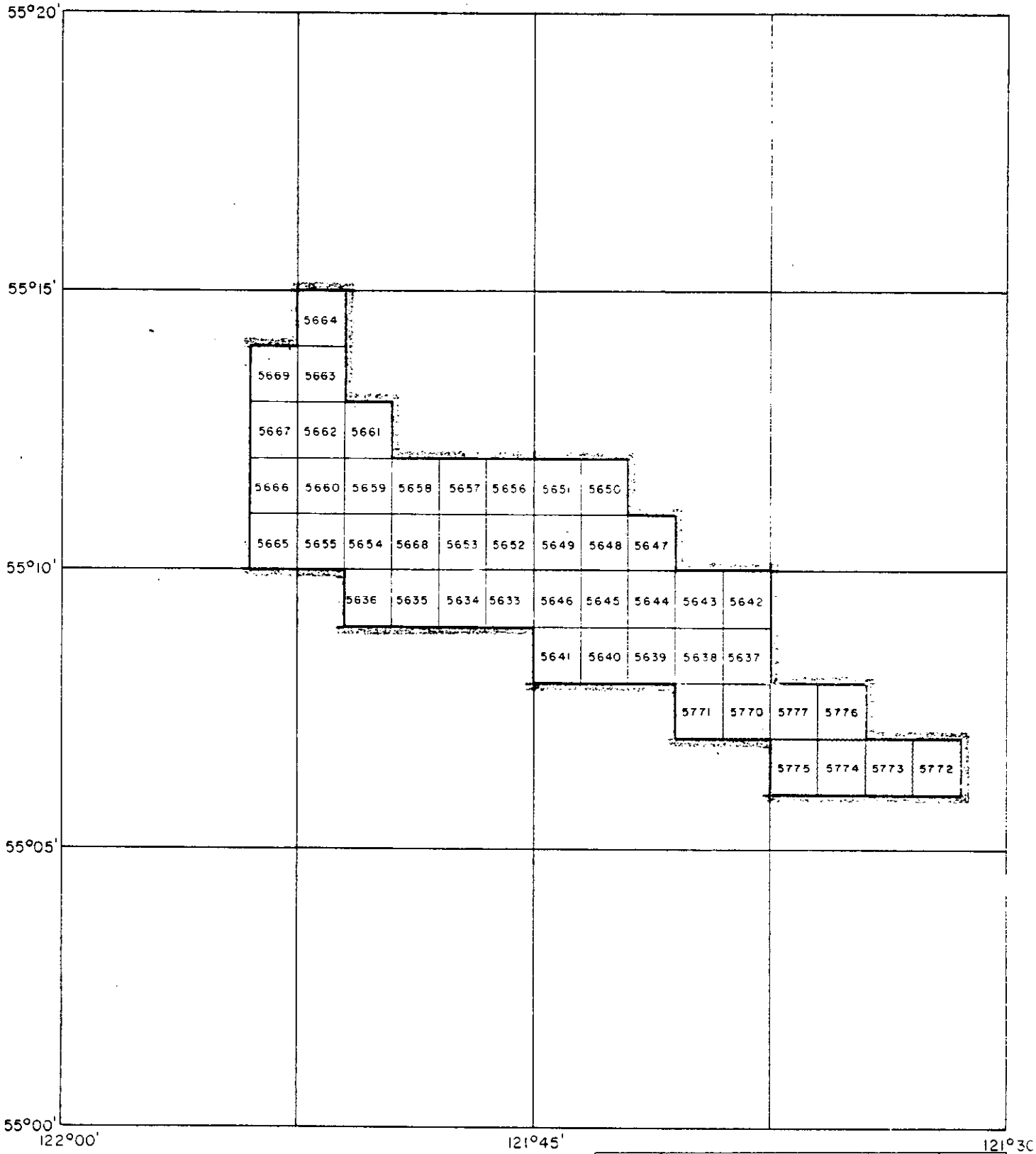

123°
122°
121°
120°
56°
55°
FORT ST. JOHN
WILLISTON LAKE
PEACE RIVER
PINE RIVER
CHETWYND
DAWSON CREEK
SUKUNKA RIVER
MURRAY RIVER
PINE RIVER
B.C.R.R.
COLUMBIA
ALBERTA
BRI
WINDFALL
C.N.R.
B.C.R.
ALBERTA
C. N. R.
PRINCE GEORGE
2
GULF CANADA RESOURCES INC.
Coal Division
CALGARY
ALBERTA
Gulf
Figure 2
WINDFALL COAL PROJECT
LOCATION MAP
PREPARED BY L. CHRISTMAS
SCALE
APPROVED BY
DATE FEB/81
DRAWING No.

Canada Resources Inc. during the summer of 1979. Norwest Resource Consultants Ltd. was commissioned by Gulf to undertake this exploration program.

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 indicates that a large part of the area is underlain by the younger Cadomin and Gething Formations, as well as by Minnes Group strata.

Based on the data collected in 1979, G.C.R.I. acquired 37 coal licences totalling some 10 952 hectares. Another 8 coal licences, covering an area of 2 372 hectares, were issued on January 25, 1980 to bring the existing Windfall block to 45 coal licences for a total of 13 324 hectares.

Figure 3 illustrates the Windfall licence distribution listed in Table 1.



LEGEND

LICENCE NO.	DATE OF ACQUISITION
5633 - 5669	DECEMBER 20, 1979
5770 - 5777	JANUARY 25, 1980

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CALGARY ALBERTA

WINDFALL COAL PROJECT

Figure 3

COAL LICENCES

PREPARED BY SCALE
APPROVED BY DATE DRAWING No.

3.0 1980 EXPLORATION PROGRAM

3.1 Objectives

A field mapping program on the Windfall block was established with the following objectives:

1) to map the stratigraphy and structure on a 1:25 000 scale,
2) to locate coal seam exposures for a future trenching and coal seam logging program,
3) to establish areas favourable to the formation of thickened coal, and
4) to delineate possible drilling targets.

3.2 Field Camp and Logistics

Exploration on Gulf's Windfall property commenced on June 1, 1980. All field personnel were housed in motels in Chetwynd, B.C. A two-man geological party was assigned to the Windfall block, who carried out a field mapping program during the months of June to September.

Accessibility to and from the Windfall area was provided by a Bell 206 helicopter chartered from Maple Leaf Helicopters of Chetwynd, B.C. Field investigation on the property along the Sukunka road was done using a four-wheel drive vehicle leased from Minchuk Leasing Ltd. of Calgary.

Communications were provided by B.C. Telephone. A battery-operated repeater, owned by Gulf Resources and located on Mt. Le Hudette, provided good communication between field

parties and Chetwynd. Small portable field radios were provided by West Can Electronics.

Table 2 provides a list of personnel, contractors, and service companies.

3.3 Surveying and Photogrammetry

R.M. Hardy and Associates provided 1:25 000 scale topographic base maps for most of the Windfall property. Airphotos were available at a 1:60 000 and 1:15 000 scale.

3.4 Geological Mapping

Mapping and subsequent interpretation of the Windfall property was carried out by Gulf's staff with assistance from Norwest Resource Consultants Ltd.

Mapping was done on a reconnaissance scale. All field observations were plotted on 1:25 000 base maps or 1:15 000 scale aerial photographs.

3.5 Cost Analysis

Total expenditures on the Goodrich project in 1980 were $123 586.00. Table 3 provides an approximate cost breakdown.

TABLE 1

Licence and Acreage Summary of
the Windfall Property

Licence No.	Date of Acquisition	No. of Licences	Hectares
5633 - 5669 incl.	December 20, 1979	37	10 952
5770 - 5777 incl.	January 25, 1980	8	2 372
TOTAL		45	13 324

TABLE 2

PERSONNEL EMPLOYED

Gulf Personnel

G.D. Childs	Co-ordinator, Coal Geology
A.E. Bienia	Project Supervisor
H.D. Zschach	Geologist
J. LaMarre	Geological Assistant
S. McKenzie	Geological Assistant
J. Forrest	Field Bookkeeper
J. Hamp	Secretary

Consultants

Norwest Resources Consultants Ltd.:

G. Hoffman	Professional Geologist
G. Jordan	Professional Geologist

LIST OF CONTRACTORS AND SERVICES

ACCOMMODATION	
Stagecoach Inn	Chetwynd, B.C.
AIRCRAFT	
Maple Leaf Helicopters	Chetwynd, B.C.
EQUIPMENT AND FUEL	
Chetwynd Pacific	Chetwynd, B.C.
Esso	Chetwynd, B.C.
TRUCK RENTALS	
Minchuk Leasing Ltd.	Calgary, Alberta
COMMUNICATIONS	
A.G.T.	Calgary, Alberta
B.C. Telephones	Vancouver, B.C.
West Can Electronics	Calgary, Alberta

TABLE 3

WINDFALL COAL PROJECT

Cost Breakdown

Surveys		
Supplies and Services		20,611.10
	SUBTOTAL	20,611.10
Pre and Post Field Studies		
Wages and Salaries		9,689.90
Consultant Fees		8,197.00
	SUBTOTAL	17,886.90
Field Examination		
Wages and Salaries		15,709.90
Consultant Fees		21,100.41
Equipment Purchases & Rentals		2,691.64
Supplies and Services		1,253.02
Chartered Aircraft		21,689.87
	SUBTOTAL	62,444.84
Field Camp		
Equipment Purchases & Rental		1,000.00
Supplies and Services		437.32
Personnel Expenses		9,192.25
	SUBTOTAL	10,629.57
General Costs		
General		778.50
Overhead @ 10%		11,235.09
	SUBTOTAL	12,013.59
	TOTAL	123,586.00

TABLE 3

Costs Applied for 1980 Work Credits:

1) Amount of Expenditure - $123 586.00

2) At approximately 296 hectares per licence, the costs were distributed as follows:

39 licences @ $7.50 (1 year) = $86 580.00

Licences: 5633, 5634, 5635, 5636, 5637, 5638, 5639, 5640, 5641, 5645, 5646, 5648, 5649, 5652, 5653, 5654, 5655, 5656, 5657, 5658, 5659, 5660, 5661, 5662, 5663, 5664, 5665, 5666, 5667, 5668, 5669, 5770, 5771, 5772, 5773, 5774, 5775, 5776, 5777.

6 licences @ $20.00 (2 years) = $35 520.00

Licences: 5642, 5643, 5644, 5647, 5650, 5651.

3) Total applied for - $122 100.00

4.0 GEOLOGY OF THE WINDFALL BLOCK

The Windfall block is centered at Kilometre 70 on the Sukunka River Road and covers an area of Minnes Group strata on both sides of the river. The location of this block is shown on Figure 2.

Only geological mapping has been carried out to date on the Windfall block. Some significant differences between the geology of this block and the Goodrich and Lossan blocks have been observed. The following section of this report will deal with these differences.

4.1 Stratigraphy

4.1.1 The Minnes Group

The reconnaissance field investigations of 1979 and the geological mapping program of 1980 shows that the Minnes Group of the Windfall block has a signficantly different stratigraphy to the Minnes Group on the Brazion Creek block. None of the quartzitic beds, which defines the top of the Monach and Monteith Formations, have been identified in the Sukunka River block. In fact, the whole of the exposed Minnes Group section in this area has the appearance of being essentially non-marine, since coal seams and carbonaceous sediments are a prominent feature of the entire exposed section; however, the base of the Minnes Group is nowhere exposed within the Windfall block.

It should also be noted that there is no evidence to show that any sediments younger than the Minnes Group lie

within the Windfall block. The Cadomin Formation can be clearly observed on coal licences lying immediately east of the block, so the location of the top of the Minnes Group section is known.

Near the Sukunka River, the Minnes Group consists of mudstone, medium to coarse-grained lithic sandstone and siltstone, as well as carbonaceous mudstone and coal seams. The thickness of the Minnes Group in the Windfall block cannot be measured at the surface since the whole of the group is nowhere exposed; however, thicknesses of as much as 2 500 metres of Minnes Group sediments have been recorded on gas well geophysical logs drilled in this area.

The geological mapping program of 1980 identified three units of strata within the Minnes Group sediments of the Windfall block. These units have been assigned to the Brenot Formation and are delineated on the geology map (Map No. 1) which can be found in the back pocket of this text. The oldest sequence consists predominantly of carbonaceous mudstones, with frequent beds of siltstones and occasional sandstone horizons. Overlying this mudstone sequence is a section which consists mainly of medium-grained sandstones, including some carbonaceous mudstone units and coal seams. The youngest beds of the Brenot Formation consists mainly of coarse-grained sandstones and grits which tend to form small cliffs wherever this portion

of the section is exposed. Scree deposits forming at the base of these cliffs has made it impossible to determine whether any coal seams are located at the base of this sandstone sequence. The three-unit subdivision is shown in the stratigraphic column in Table 4.

4.1.2 Cadomin Formation

Although the Cadomin Formation is not, at this time, known to exist on the Windfall block, the formation is easily recognizable in nearby exposures. The Cadomin Formation is a well-developed conglomerate containing clasts usually about 3 centimetres in diameter over a stratigraphic interval of about 20 metres. This formation can be clearly observed on the coal licence blocks lying east of the Windfall block and south of the Sukunka River.

4.2 Coal Occurrences

4.2.1 Minnes Group

Minnes Group coal occurrences which may be of commercial significance were located adjacent to the Sukunka River in the Windfall block. One coal seam about 1.5 metres thick, was found within a fairly well-exposed coal-bearing section on the north bank of the Sukunka River at Kilometre 65. Two further coal exposures, each about 1.5 metres thick, were located on the south side of the Sukunka River at Kilometre 63 on the Sukunka River Road and along the creek which flows into the Sukunka River at

TABLE 4

Stratigraphic Column

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

that point. Other exposures of coal in the coal-bearing section of the Minnes Group are found between Kilometres 75 and 80 on the Sukunka River Road. All of these coal exposures and their thicknesses are shown on Geological Map No. 1.

4.3 Geologic Structure

The most prominent structural features of the Windfall block are an abrupt and major synclinorium which trends along Windfall Creek, and an adjacent major anticline located to the west of the syncline. These two structures are truncated by a major thrust fault located to the west which places Palaeozoic sediments adjacent to the Mesozoic strata. Numerous smaller scale parasitic anticlines and synclines trending parallel to the major features have also been defined within the block.

All of the structures of the Windfall block trend in a northwesterly direction and no plunge has been determined for any of the folds. The structures are illustrated on accompanying Geological Map No. 1. Two cross-sections (A-A and B-B, see Map No. 1) illustrating the regional structure of this area are also included in the map pocket.

5.0 CONCLUSION

A regional mapping program of 1:25 000 scale comprised the major exploration objective of the 1980 Windfall project.

A preponderance of Upper Minnes strata has been mapped and tentatively assigned to three mappable stratigraphic units in the Brenot Formation. The field mapping program identified a number of north-westerly trending, sometimes closely spaced, anticlines and synclines that are disrupted by only a few and widely separating, sub-parallel trending, west dipping thrust faults.

With exception of the coal exposures along the north side of the Sukunka River, other significant coal seam exposures (greater than 1.0 metres) were not as yet found on the Windfall property. Generally, coal exposures are hidden by extensive ground cover.

An intensive program of detailed geological mapping will be necessary to further delineate the stratigraphy, structure and distribution of the coal-bearing Minnes strata in this area. Concurrent with this program, coal seams will be trenched to obtain samples for an assessment of the quality of coal on the Windfall block.

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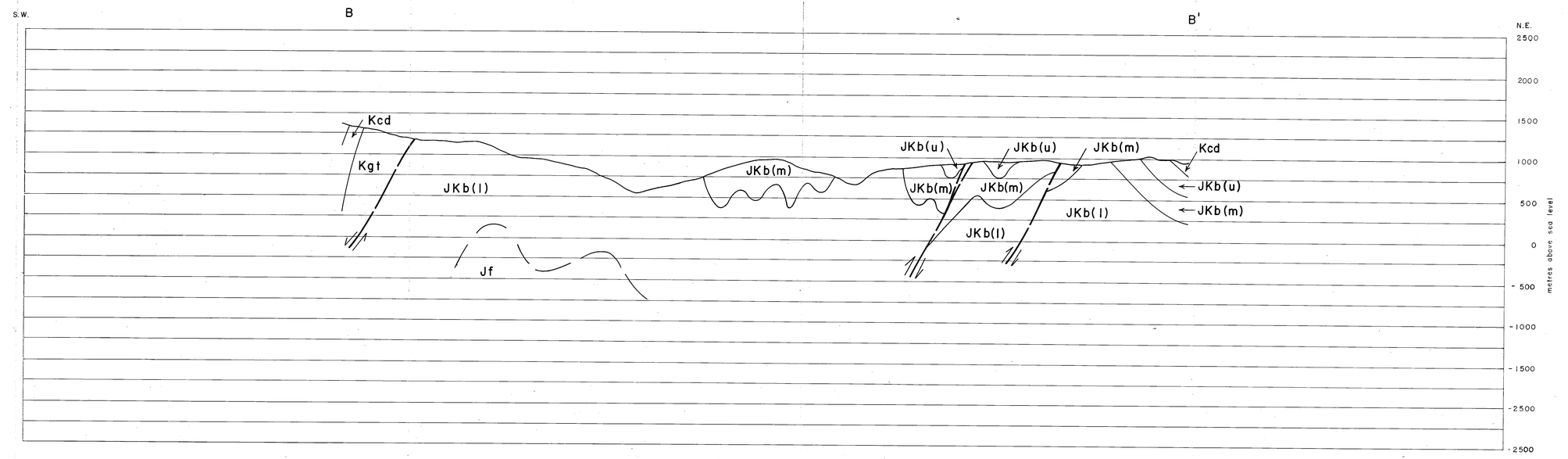

Jurassic — Transitional — Lower Cretaceous

	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.
	JKb	BRENOT FORMATION
	JKb(u)	UPPER BRENOT Resistant coarse and medium grained lithic sandstone, COAL and fine grained sandstone at top.
	JKb(m)	MIDDLE BRENOT Moderately resistant, massive, fine, and medium grained sandstone.
	JKb(l)	LOWER BRENOT Recessive fine grained sandstone, siltstone, and carbonaceous mudstone, COAL.
	JKmc	MONACH FORMATION Marine lithic and quartzose sandstone, with thick beds of beds of clean, coarse grained white quartzite at top, COAL.
	JKbp	BEATTIE PEAKS Sandstone, marine siltstone and mudstone, COAL.
	JKmt	MONTEITH FORMATION Marine lithic and quartose sandstone, siltstone, with thick beds of clean, coarse-grained white quartzite at top.
	Jf	FERNIE FORMATION Mudstone, siltstone, sandstone.

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Coal Division
CALGARY ALBERTA

Gulf

WINDFALL COAL PROJECT
GENERALIZED CROSS SECTION
CROSS-SECTION B-B'

692

PR-Windfall 80(2)A *(1)

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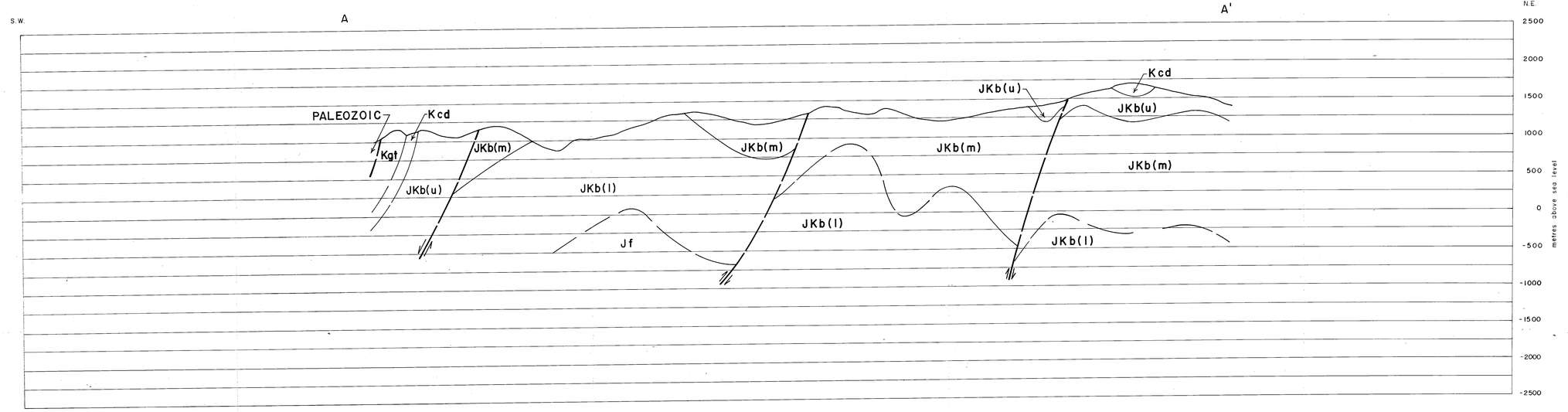
APPROVED BY: DATE: FEB. '81	DRAWING No.



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	
JKb(u)	UPPER BRENOT	Resistant coarse and medium grained lithic sandstone, COAL and fine grained sandstone at top.
JKb(m)	MIDDLE BRENOT	Moderately resistant, massive, fine, and medium grained sandstone.
JKb(l)	LOWER BRENOT	Recessive fine grained sandstone, siltstone, and carbonaceous mudstone, COAL.
JKmc	MONACH FORMATION	Marine lithic and quartzose sandstone, with thick beds of beds of clean, coarse grained white quartzite at top, COAL.
JKbp	BEATTIE PEAKS	Sandstone, marine siltstone and mudstone, COAL.
JKmt	MONTEITH FORMATION	Marine lithic and quartose sandstone, siltstone, with thick beds of clean, coarse-grained white quartzite at top.
Jf	FERNIE FORMATION	Mudstone, siltstone, sandstone.

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WINDFALL COAL PROJECT
GENERALIZED CROSS SECTION
CROSS-SECTION A-A'

692

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122°00'
55°15'
121°30'
55°02'30"

ROCKY MOUNTAIN FOOTHILLS

MOUNT MERRICK
MOUNT CHAMBERLAIN
MOUNT PALSSON

Skeeter Creek
Chamberlain Creek
Windfall Creek
Baker Creek
Lean-to Creek
McLean Creek
Bullmoose Creek

LITHOLOGICAL SYMBOLS

- CONGLOMERATE
- SANDSTONE
- SILTSTONE
- MUDSTONE
- CARBONACEOUS MUDSTONE
- COAL

GEOLOGIC LEGEND

AGE	GROUP	FORMATION		SYMBOL
LOWER CRETACEOUS	BULLHEAD	GETHING		Kgt
		CADOMIN		Kcd
JURASSIC / LOWER CRETACEOUS	MINNES	BRENOT	UPPER	JKb(u)
			MIDDLE	JKb(m)
			LOWER	JKb(l)
		MONACH		JKmc
		BEATTIE PEAKS		JKbp
		MONTEITH		JKmt
JURASSIC	FERNIE	FERNIE		Jf

- ROADS
- TRAILS
- STRIKE AND DIP OF BEDS
- STRIKE AND DIP OF OVERTURNED BEDS
- FAULTS (showing dip) : (defined, approximate)
- ANTICLINE : (defined, approximate)
- SYNCLINE : (defined, approximate)
- MAPABLE STRATIGRAPHIC UNITS : (defined, approximate)
- GEOLOGICAL CONTACTS : (defined, approximate)
- MONOCLINE

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WINDFALL PROPERTY GEOLOGY MAP

MILES 0
METRES 0 1000

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APPROVED BY:
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