MOUNT KLAPPAN ANTHRACITE PROJECT

SUMMIT - NASS - SKEENA AREA

GEOLOGICAL REPORT

1986

GEOLOGICAL REPORT

GULF CANADA CORPORATION

COAL DIVISION

GULF CANADA CORPORATION

Mount Klappan Coal Project Geological Report

Summit-Nass-Skeena Area

1986

Coal Project Licence Number

7118 to 7177

7381 to 7392

7416 to 7432

7487 to 7539

7559 to 7561

7714 to 7757

8032 to 8053

Cassiar Land District

NTS Map Number 104 H

Latitude Between 57° 06' and 57° 23'

Longitude Between 128° 37' and 129° 15'

Gulf Canada Corporation

April, 1987

PREFACE

The 1986 Summit-Nass-Skeena Geological Report combines current and previous exploration work to provide an assessment of the geology, coal quality and resource potential of the Summit-Nass-Skeena Area.

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Coal Trench Data and Coal Quality Data

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K-12	KPN86SA-07
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	Drawing No.
1:5 000 Cross-Sections	
13 000 NE + W	KPN86SA-16
11 000 NE + W	KPN86SA-17
10 500 NE + W	KPN86SA-18
10 000 NE + W	KPN86SA-19
9 500 NE + W	KPN86SA-20
9 000 NE + W	KPN86SA-21
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6 000 NE + W	KPN86SA-23
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1:10 000 Cross-Sections	
17 000 NE + W	KPN86SA-25
15 000 NE + W	KPN86SA-26
13 000 NE + W	KPN86SA-27
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Nass Area	
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F12	KPN86NA-01
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	Drawing No.
F14	KPN86NA-03
G10	KPN86NA-04
G11	KPN86NA-05
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H13	KPN86NA-13
H14	KPN86NA-14
H15	KPN86NA-15
I11	KPN86NA-16
I12	KPN86NA-17
I13	KPN86NA-18
I14	KPN86NA-19
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104 H/3 G	KPN86NA-23
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	Drawing No.
1:5 000 Cross-Sections	
11 000 NW	KPN86NA-25
9 000 NW	KPN86NA-26
7 000 NW	KPN86NA-27
5 000 NW	KPN86NA-28
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17 000 NW	KPN86NA-32
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19 000S	KPN86SK-17
17 000S	KPN86SK-18
15 000S	KPN86SK-19
13 000S	KPN86SK-20
11 000S	KPN86SK-21
9 000S	KPN86SK-22
7 000S	KPN86SK-23
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E7	KPN86SK-04
F4	KPN86SK-05
F5	KPN86SK-06
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F7	KPN86SK-08
F8	KPN86SK-09
G4	KPN86SK-10
G5	KPN86SK-11
G6	KPN86SK-12
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G9	KPN86SK-15
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1.0 SUMMARY

Gulf Canada Corporation's Mount Klappan Anthracite Property is located in the Bowser Basin of northwest British Columbia, 290 kilometres north of Smithers, and 150 kilometres northeast of Stewart, British Columbia. The property is composed of 211 crown coal licences, totalling 56 194 hectares of land.

The Mount Klappan property has been a focus of Gulf's coal exploration activities since 1981. Several areas with economic coal potential have been highlighted or further defined during each of the exploration programs undertaken since the acquisition of the property. Three areas of concentration have emerged over time: the Lost-Fox Area, the Hobbit-Broatch Area and the Summit-Nass-Skeena Area. This report pertains to the Summit-Nass-Skeena Area. A 1986 report covering exploration activities in the Lost-Fox Area has been completed as well. There was no activity this year in the Hobbit-Broatch Area.

Since 1981, exploration in the peripheral Summit, Nass and Skeena areas of the Mount Klappan property has prompted periodic acquisition, investigation and sometimes relinquishment of additional coal licences. The object of this continuous review of the frontier areas bounding the Mount Klappan property is to ensure that the limits of the established resource are well defined, and that no further resource has been overlooked. This is accomplished largely through lateral tracking of the coal-bearing Klappan Sequence.

With the exception of two drill holes in 1982 and 1983, spudded during the programs that helped to identify the Lost-Fox Area as the primary resource area, the exploration of the Summit, Nass and Skeena

areas has relied on fundamental mapping and trenching to expand geological understanding. Though lacking access to the technological support afforded the Lost-Fox Area (drilling, mechanical trenching and bulk sampling), the Summit-Nass-Skeena Area has been effectively interpreted through efficient use of its superior outcrop and application of a range of stratigraphic tools, including sedimentological, paleontological and coal petrographic analyses.

The Upper Jurassic to Lower Cretaceous sedimentary strata underlying the Mount Klappan property have been subdivided into four sequences: the Spatsizi, Klappan, Malloch and Rhondda, in ascending order. An interpretation of the cumulative data to 1986 determines that the Summit Area is predominantly underlain by strata of the coal-bearing Klappan Sequence, but also contains substantial distribution of the lower Spatsizi Sequence to the northwest. The three lower sequences are represented in the Nass Area, with the Klappan Sequence encountered most often and the Spatsizi and Malloch sequences occupying much more restricted areas. The Skeena Area is dominated by the Malloch Sequence with local exposures of both the Klappan and the Rhondda.

All strata appear to have been subjected to two phases of structural deformation resulting in dominant northwest-southeast trending folds with associated thrust and some normal faulting, and subordinate overprinting northeast-southwest trending folds with much less associated faulting.

Revision of the geology map as a result of 1986 exploration produced several recommendations for release of licences deemed

unlikely to be prospective. These are almost all located at the extreme extensions of the property. Blocks of licences to the north in the Summit Area, to the north and west of the Nass Area and along the east and west margins of the Skeena Area are all now considered to hold little promise for resource development.

The Summit-Nass-Skeena Area contains 4160 million tonnes of largely speculative resources (Table 1.1). These resource estimates do not imply mineability or economic viability. They represent estimated in-place anthracite resources only.

Table 1.1

COAL RESOURCE SUMMARY

(million tonnes)

	Summit-Nass-Skeena Area
Measured	0
Indicated	0
Inferred	31.8
Speculative	4128.1
	4159.9

2.0 RECOMMENDATIONS

Based on the compilation and interpretation of exploration data from the Summit-Nass-Skeena Area, the following recommendations are proposed:

1. Relinquish licences 7524-7526, 7528, 7530, 7531, 7537, 7539, 7489-7492, 7496 and 7714-7722. These Skeena and Ellis Ridge licences, which have abundant outcrop exposure, are interpreted to lie within the middle to lower Malloch Sequence. They contain no exposed coal seams.

2. Relinquish Nass Area licences 7505, 7508, 8045, 8046 and 8049-8053. The first two licences, located south of Nass Lake, are interpreted to lie within the middle Malloch Sequence. Although both blocks have excellent exposure, no coal seams are present. The remainder of the licences lie in a block in the northwest Nass Area. They have been interpreted as Spatsizi Sequence strata on the basis of abundant marine fauna and an absence of Klappan Sequence flora and coal.

3. Relinquish northern Summit Area licences 7731-7745, 7747 and 7753. This block has been interpreted as uppermost Spatsizi to lowermost Klappan Sequence. Although outcrop exposure is excellent, no significant coal seams are present. Carbonaceous mudstone bands, many of which have been hand trenched, are discontinuous and less than 1.0 metres in thickness.

4. Initiate a mechanical trenching program in the Summit South Area to facilitate seam correlations from exposures in the valley north of Marshall and Layton ridges to coal seams in Summit South.

5. Acquire a single licence block south of block 8047 and west of 7423. A trench, TRC86030, excavated in this area contained a coal seam with a coal to coal plus rock ratio of C/C+R = 2.47/2.78. This represents a minimum coal thickness as the floor was not reached due to ice.

6. Increase exploration activity in general in the Summit South Area. A limited diamond drilling program would enhance interpretation in an area with substantial coal occurrence.

3.0 INTRODUCTION

3.1 Mount Klappan Coal Project

3.1.1 Location

The Mount Klappan coal licences are situated in northwest British Columbia approximately 930 kilometres north of Vancouver, 150 kilometres northeast of Stewart and 530 kilometres northwest of Prince George (Figure 3.1).

Geographically the coal licences are at the northern extremity of the Skeena Mountains between 57° 06' and 57° 23' north latitude, and 128° 37' and 129° 15' west longitude, and cover the headwaters of the Klappan, Little Klappan, Spatsizi, Skeena and Nass Rivers.

The nearest community to the property is the community of Iskut (population 500) located 100 kilometres to the northwest on the Stewart-Cassiar Highway (Hwy 37).

3.1.2 Access

The Mount Klappan property straddles the partially completed British Columbia Railway line between Prince George and Dease Lake (Figure 3.2). Prior to cessation of work on the construction of the line, steel was laid to within 80 kilometres south of the property. With the exception of a 24 kilometre stretch north of the Kluatantan River, the railway

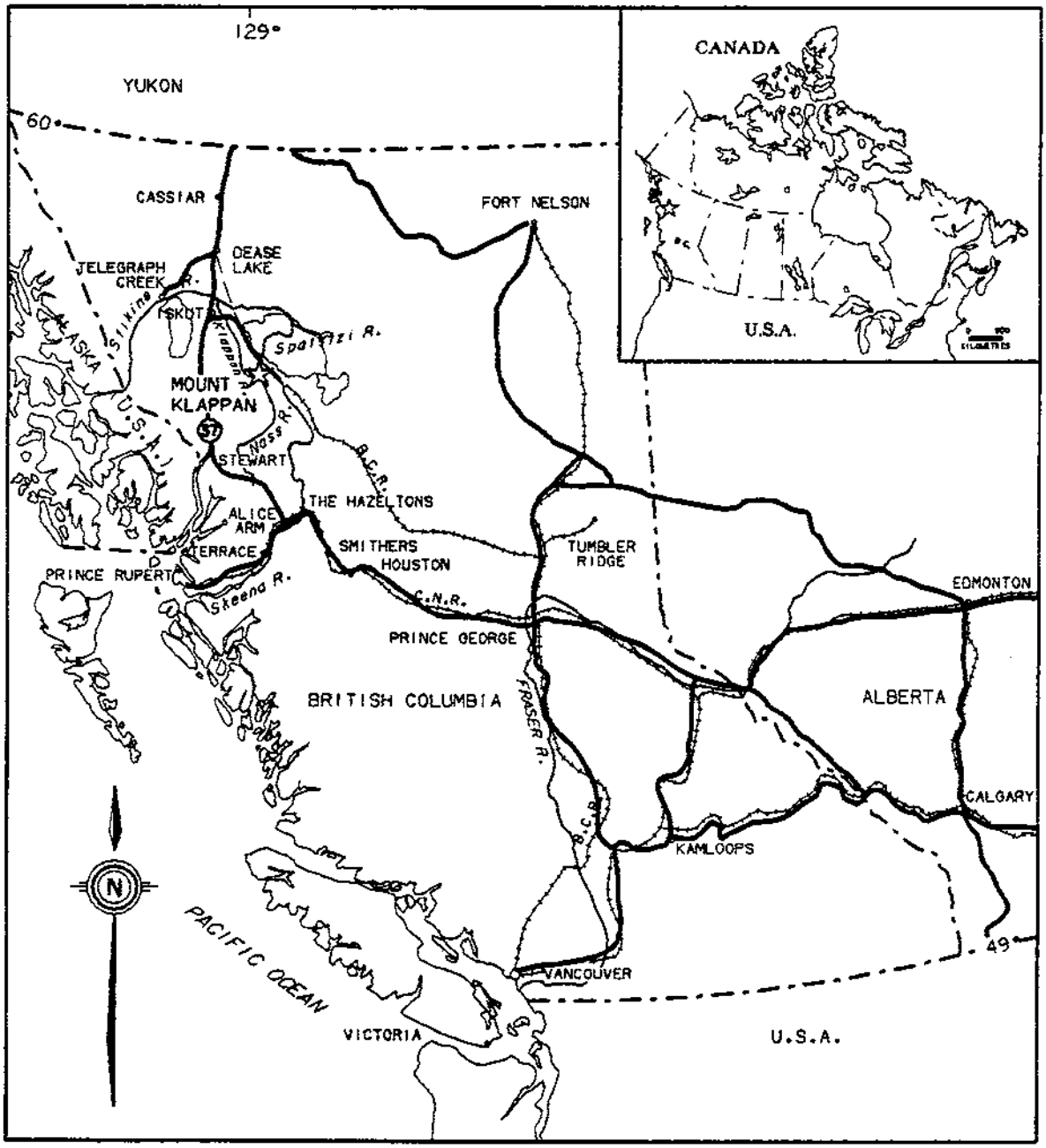

FIGURE 3-1

MOUNT KLAPPAN ANTHRACITE PROJECT

LOCATION MAP

GULF CANADA CORPORATION

GULF CANADA CORPORATION
26/01/87
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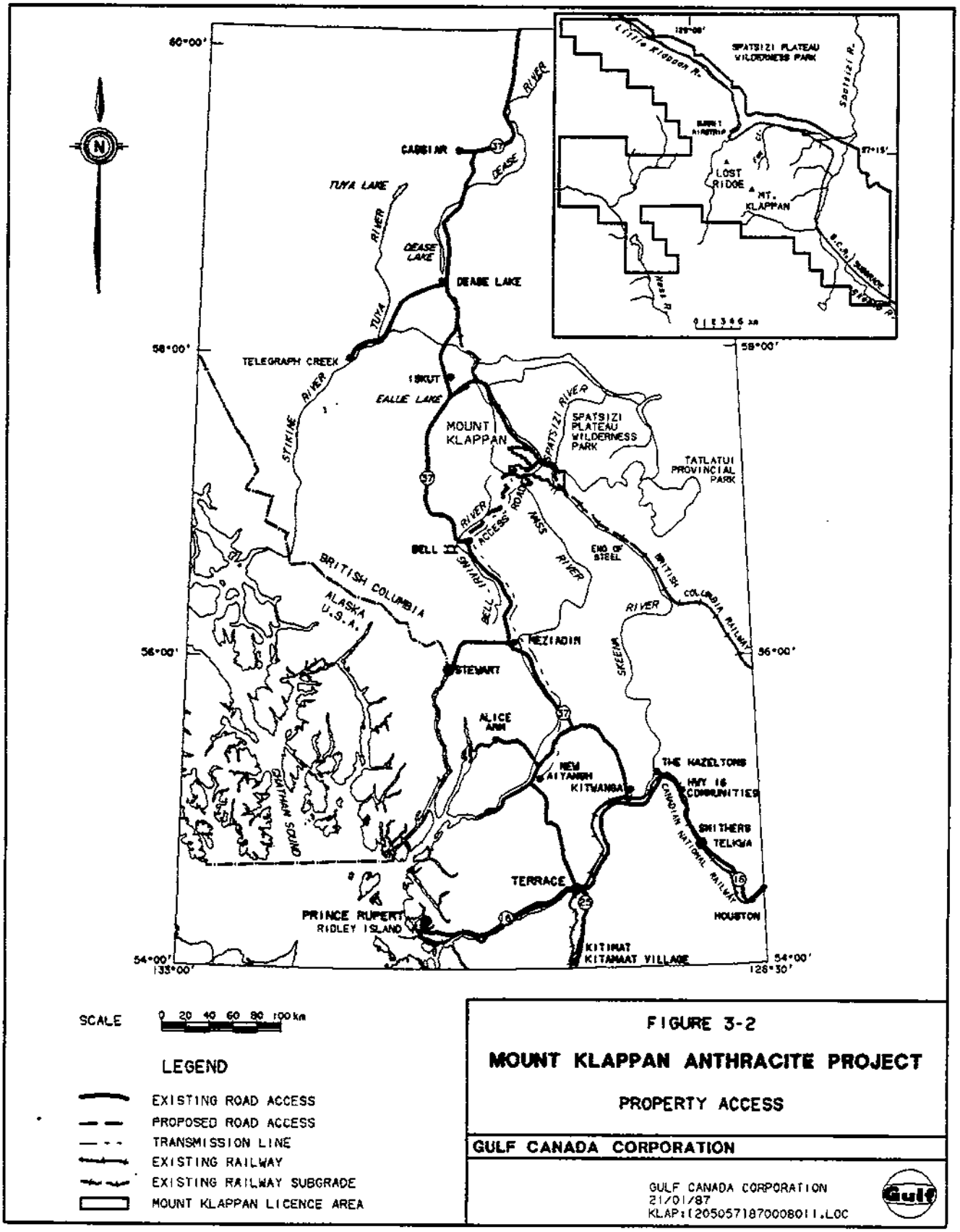


FIGURE 3-2

MOUNT KLAPPAN ANTHRACITE PROJECT

PROPERTY ACCESS

GULF CANADA CORPORATION

GULF CANADA CORPORATION
21/01/87
KLAP:I20505718700080II.LOC

subgrade was constructed through and beyond the property to the Stikine River just south of Dease Lake.

Road access to the property from Highway 37 via Ealue Lake Road, is provided along the British Columbia Railway subgrade. Three bridges were constructed along the subgrade early in 1984 to permit surface access to the property. Road distances from Terrace and Stewart to the property are 575 kilometres and 426 kilometres respectively.

Fixed wing aircraft provide access by air and use the 1000 metre Summit Airstrip located along the railway subgrade in the central region of the property.

3.1.3 Property Description

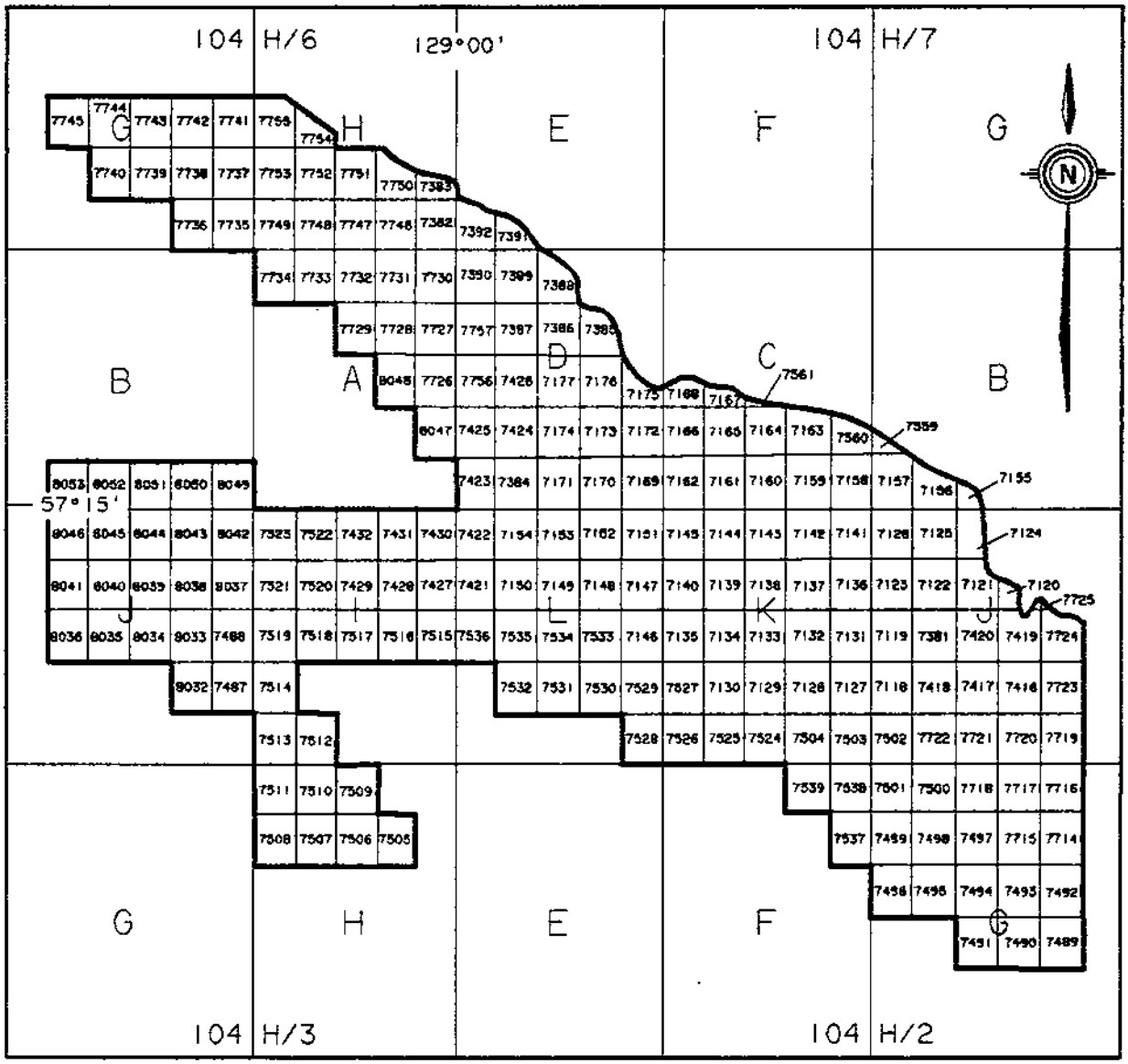
Through the 1986 exploration program, the Mount Klappan property comprised 211 coal licences totalling 56 194 hectares of land (Appendix A; Figure 3.3). The property was acquired in five separate applications from 1981 to 1985.

3.1.4 Ownership

Gulf wholly owns the coal licences comprising the Mount Klappan property.

3.1.5 Property Geography and Biophysical Environment

The Mount Klappan property is located at the head-waters of the Little Klappan, Klappan, Nass, Skeena, and



SCALE

0 1 2 3 4 5 km

LEGEND

LICENCE AREA

7386 LICENCE NUMBER

FIGURE 3-3

MOUNT KLAPPAN ANTHRACITE PROJECT

LICENCES

GULF CANADA CORPORATION

GULF CANADA CORPORATION
10/30/86
KLAP:(2050571831024020.LOC

Spatsizi Rivers (Figure 3.1). This area is within the northern extremity of the Skeena Mountains physiographic region. The regional physiography is of mountainous terrain with broad northwest to southeast trending valleys of the aforementioned rivers.

Elevations on the property range from 991 metres in the Klappan River Valley to over 2000 metres on Mount Klappan and the adjacent ridge tops.

The climatic regime of the area is in the Northern and Central Plateau and Mountain Zone. Precipitation values average 300 to 400 mm per year with the mean daily temperatures comparable to Fort Nelson and Prince George. This information is derived from weather stations located on the northeastern edge of the property which have been monitored monthly since their installation five years ago.

Tree line in the area is at approximately 1500 metres. Valley bottoms are partially covered with scattered coniferous forests, grasses, shrubs, meadows, and bogs. The higher elevations are characterized by alpine tundra.

3.2 Summit-Nass-Skeena Area

3.2.1 Location

The Mount Klappan property has been divided into five project blocks to facilitate exploration expansion and subsequent logistics. The Summit-Nass-Skeena Area

encompasses the northwestern, southwestern and southeastern extensions of the Mount Klappan property (Figure 3.4).

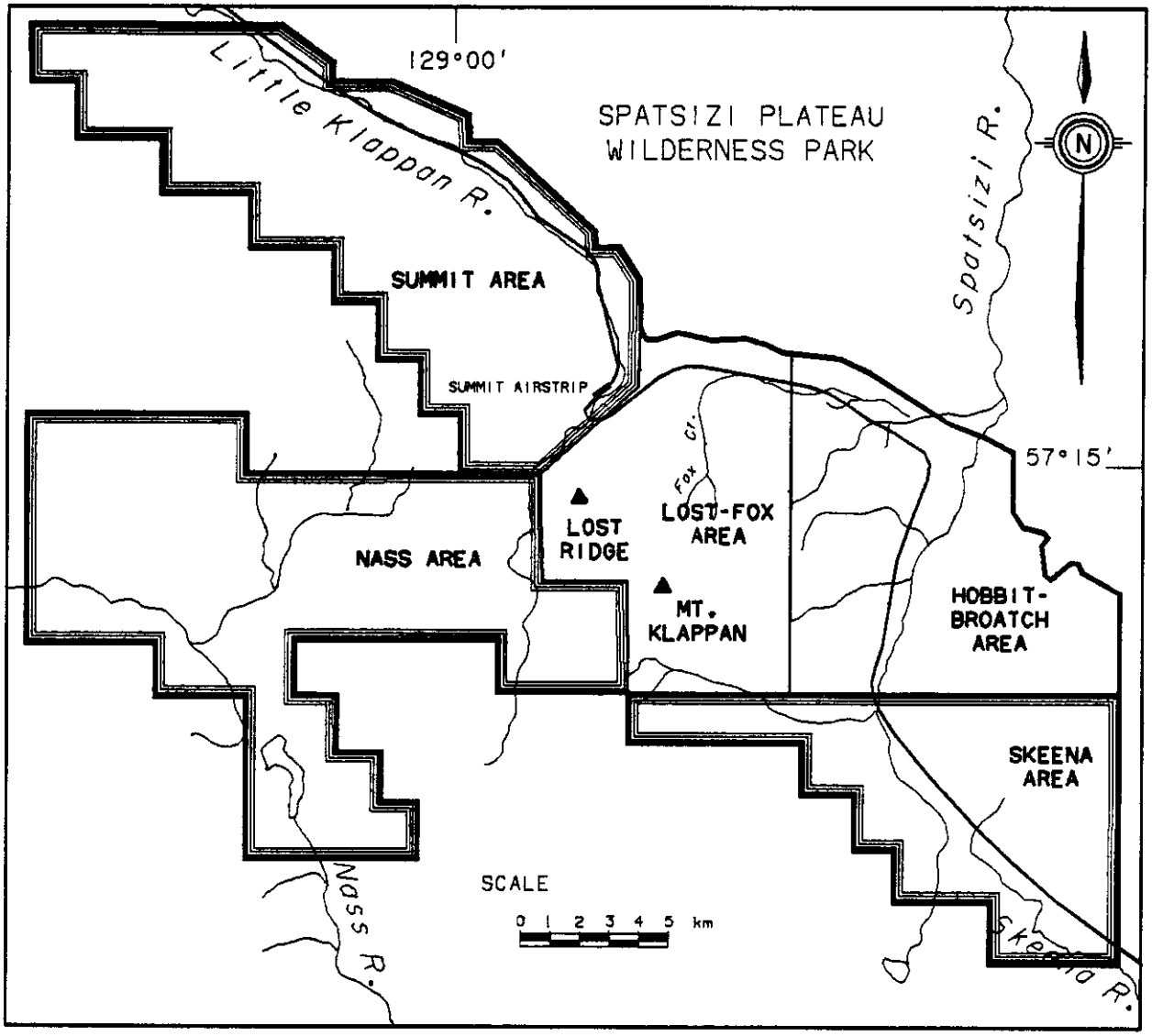
The Summit Area is cut by the Little Klappan River to the northeast and extends to the southwest into a series of ridges. The Nass Area has a common northeast boundary with Summit south while its western and southern borders are bounded by several small ice fields. Drainage valleys of the Klappan and Nass Rivers occupy a large portion of the Nass Area. The Skeena Area has a common northern boundary with the Lost-Fox and Hobbit Broatch areas and it is cut by Tahtsedle Creek and the Skeena River.

3.2.2 Access

The low lying portions of the Summit and Skeena areas are accessible by truck along the British Columbia Railway subgrade. Exploration at higher elevations in Summit and Skeena and everywhere in the Nass Area requires helicopter support from the Didene Creek base camp.

3.2.3 Area Description

The Summit-Nass-Skeena Area covers 40 283.5 hectares and includes 144 of the 211 licences comprising the Mount Klappan Coal Project (Appendix B). Of the 54 Licences (totaling 14 142.5 hectares) of the Summit block, two licences, 7171 and 7173, are divided in the southwest corner between the Summit-Nass Area and the Lost-Fox Area. The Nass block contains 58 coal licences equalling 16 298.0 hectares



SCALE

0 1 2 3 4 5 km

LEGEND

BRITISH COLUMBIA RAILWAY SUBGRADE

LICENCE AREA

FIGURE 3-4

MOUNT KLAPPAN ANTHRACITE PROJECT

SUMMIT-NASS-SKEENA 1986 EXPLORATION AREAS

GULF CANADA CORPORATION

GULF CANADA CORPORATION
20/01/87
KLAP1:[205057]84!165015.LOC

and the Skeena Area is made up of 32 licences totalling 9 843.0 hectares.

3.2.4 Biophysical Environment

The regional physiography of the Summit-Nass-Skeena Area is one of mountainous terrain and broad northwest to southeast and east-west trending valleys.

Vegetation is variable with alpine tundra characterizing higher elevations above treeline and thick coniferous forests, shrubs, meadows and bogs occupying valley floors. Elevations range from approximately 1 050 metres in the Nass and Skeena Valleys to over 2 100 metres in the Summit Area.

The headwaters of the Little Klappan, Klappan, Nass and Skeena rivers and Tahtsedle Creek all occur within the Summit-Nass-Skeena licence boundary. These rivers are generally broad and meandering forming deep gorges only when cutting through steep terrain.

Heavy precipitation and ground fog occurred on approximately 10 percent of the field days. Higher elevations of the Summit, Skeena and northern Nass areas, depending on weather conditions, may remain snow covered year around. Several small ice fields are located just beyond the western property boundary in Summit and the northern property boundary in Nass.

4.0 EXPLORATION HISTORY

4.1 Mount Klappan Property

4.1.1 Exploration Prior to Gulf's Acquisition

V.H. Dupont made the first published description of coal in the Northern Bowser Basin in 1900 for the Canadian Department of Railways and Canals (Figure 6.1). In his report, he describes a coal outcrop near the confluence of Didene Creek and the Spatsizi River. This outcrop is now recognized as part of the Klappan coal occurrences.

The Geological Survey of Canada has initiated five exploration programs into the area. The first, in 1911, was led by G.S. Malloch (Malloch, 1914) who undertook a geological evaluation of the Bowser Basin centered 55 miles to the south of Mount Klappan in the Groundhog Coal Measures. The second, in 1948, was led by Buckham and Latour (Buckham and Latour, 1950) which also concentrated on the Groundhog area. The third study in 1957 was called "Operation Stikine". The fourth and fifth programs, which broadly covered the Klappan coal measures, were led by Eisbacher in 1974 and in 1981. These studies resulted in some of the first stratigraphic and structural interpretations of the area. In addition, Eisbacher tried to relate the depositional history of the Bowser Basin to the tectonic history of the area.

In 1979, Richards and Gilchrist from the B.C. Department of Mines published stratigraphic studies primarily

in the Groundhog area. However, they also included reference to the coal sequences of the Northern Bowser Basin.

Further interest in the Klappan coal occurrences during the late 1970's resulted in both Esso Minerals and Petrofina acquiring licences in the area. These licences were allowed to lapse in 1980 following minimal geological exploration of the area.

Initially, Gulf entered the Bowser Basin in 1979 concentrating on the Panorama-Groundhog Coal Measures. This was followed in 1981 by the acquisition of the Mount Klappan property.

4.1.2 Summary of Exploration 1981-1985

Prior to 1986, Gulf undertook eight separate exploration programs on the Mount Klappan property. The exploration included geological mapping, hand trenching, diamond drilling, rotary drilling and adit driveage, as summarized in Table 4.1. The results of these exploration activities have been documented in eight separate reports:

Mount Klappan Coal Project - Geological Report	1981
Mount Klappan Coal Project - Geological Report	1982
Mount Klappan Coal Project - Geological Report	1983
Mount Klappan Coal Project - Lost-Fox Area	1984
Mount Klappan Coal Project - Hobbit-Broatch Area	1984
Mount Klappan Coal Project - Summit-Nass-Skeena Area	1984

Table 4.1

MOUNT KLAPPAN COAL PROJECT
EXPLORATION SUMMARY 1981 TO 1985

	1981	1982	1983	1984	1985	Total
Adits						
Number	--	--	1	--	--	1
Tonnes	--	--	39.2	--	--	39.2
Diamond Drill Holes						
Number (HQ)	--	7	3	8	34	52
Total Metres	--	1 223	603	1 507	6 146	9 479
Number (AIX)	--	--	6	--	--	6
Total Metres	--	--	126	--	--	126
Rotary Drill Holes						
Number	--	--	--	17	6	23
Total Metres	--	--	--	897	620	1 517
Hand Trenching						
Number	24	51	93	95	45	308
Total Metres	89	289	527	416	178	1 499
Mechanical Trenches						
Number	--	--	--	128	--	128
Total Metres	--	--	--	1 041	--	1 041
Measured Sections						
Number	--	--	--	13	19	31
Total Metres	--	--	--	2 736	3 347	6 083
Geological Mapping Scales	1:10 000	1:10 000	1: 5 000 1:10 000	1: 2 500 1: 5 000 1:10 000	1:2 500 1:5 000 1:10 000	

Mount Klappan Coal Project - Lost-Fox Area	1985
Mount Klappan Coal Project - Summit-Nass Area	1985

4.2 Summit-Nass-Skeena Area

4.2.1 Summary of Exploration 1981-1985

Exploration work in the Summit-Nass-Skeena Area commenced in 1981 and has continued annually, during summer field seasons, until the present. The programs consisted of air photo interpretation, geologic mapping, hand trenching and diamond drilling (Table 4.2).

Table 4.2

SUMMIT-NASS-SKEENA AREA EXPLORATION SUMMARY 1981-1985

Summit Area

	1981	1982	1983	1984	1985	Total
Hand Trenches						
Number	2	2	26	18	10	58
Length (m)	12.9	25.4	188.7	90.10	38.64	355.74
Diamond Dril Holes						
Number	--	1	1	--	--	2
Length (m)	--	192.6	130.2	--	--	322.80

Nass Area

Hand Trenches						
Number	--	2	16	13	2	33
Length (m)	--	8.5	56.0	45.5	8.78	118.78

Skeena Area

Hand Trenches						
Number	--	--	--	1	--	1
Length (m)	--	--	--	4	--	4.00

5.0 1986 EXPLORATION PROGRAM

5.1 Summit-Nass-Skeena Area Program Objectives

The objectives of the 1986 exploration program in the Summit-Nass-Skeena Area were:

1. To continue geological mapping of the Summit-Nass-Skeena Area at scales of 1:5 000 and 1:10 000 to further enhance understanding of the structure and stratigraphy of the area.

2. To increase resolution of the general stratigraphy and better define sequence boundaries through collection and identification of floral and faunal macrofossils.

2. To better define the extent and character of the Klappan Sequence in the Summit-Nass-Skeena area and by integrating a program of structural interpretation with seam trenching and subcrop tracing, to identify areas having particular resource potential.

5.2 Summary of Exploration

5.2.1 Mount Klappan Coal Project

In six years of exploration programs on the Mount Klappan property, Gulf has advanced through regional investigations to seam tracing, drilling, and adit driveage (Table 5.1). While new areas are constantly being in-

Table 5.1

MOUNT KLAPPAN COAL PROJECT
EXPLORATION SUMMARY 1981 TO 1986

	1981	1982	1983	1984	1985	1986	Total
Adits							
Number	--	--	1	--	--	1	2
Tonnes	--	--	39.2	--	--	30	69.2
Diamond Drill Holes							
Number (HQ)	--	7	3	8	34	38	90
Total Metres	--	1223	603	1507	6146	5620	15099
Number (AIX)	--	--	6	--	--	--	6
Total Metres	--	--	126	--	--	--	126
Rotary Drill Holes							
Number	--	--	--	17	6	--	23
Total Metres	--	--	--	897	620	--	1517
Mechanical Trenches (Seam Tracing)							
Number	--	--	--	128	--	--	128
Total Metres	--	--	--	1041	--	--	1041
Hand Trenches							
Number	24	51	93	95	45	36	374
Total Metres	89	289	527	416	178	95	1594
Measured Sections							
Number	--	--	--	13	19	6	37
Total Metres	--	--	--	2736	3347	745	6828
Geological Mapping Scales	1:10 000	1:10 000	1:5 000 1:10 000	1:2 500 1:5 000 1:10 000	1:2 500 1:5 000 1:10 000	1:2 000 1:5 000 1:10 000	

vestigated, exploration is being focussed on those areas which have immediate economic interest.

In 1986 the area of the Mount Klappan property subjected to the most intensive exploration activity was the Lost-Fox Area. Continuing investigation of the geological frontier on the property was carried out in the Summit, Nass and Skeena areas. Logistical support for both projects was provided out of the Didene Creek camp, constructed by Gulf in 1984. Detail of the facilities and equipment used by both projects may be found in the 1986 Lost-Fox Geological Report.

5.2.2 Summit-Nass-Skeena Area

Exploration of the Summit-Nass-Skeena Area began on June 1, 1986 and was completed August 30, 1986. A summary of the Summit-Nass-Skeena exploration activities is outlined in Table 5.2.

The 1986 Summit-Nass-Skeena report contains geologic interpretations based on all exploration information collected to date.

5.3 Cartography

Topographic maps used in this exploration program are at 1:5 000 and 1:10 000 scales. The 1:5 000 metric maps were prepared from 1:30 000 British Columbia Government air photos flown prior to subgrade construction. For the areas of north-

Table 5.2

SUMMIT-NASS-SKEENA AREA EXPLORATION SUMMARY

1986

	1986	1981-1986 Total
Diamond Drill Holes (HQ)		
Number	--	2
Total Metres	--	322.8
Hand Trenches		
*Number	18	110
Total Metres	38.9	513.5
Measured Sections		
Number	4	17
Total Metres	651.3	3313.3

*Includes trenches that have been relogged.

western Summit and western Nass where 1:5 000 map coverage did not exist 1:50 000 imperial Government topographic maps were blown up to 1:10 000 scale.

5.4 Geologic Mapping

Reconnaissance and detailed geological mapping were carried out at scales of 1:5 000 and 1:10 000. The Summit-Nass-Skeena Area was mapped on a priority basis commencing with Summit south, northern Nass, intermediate and peripheral areas; the latter was mapped on 1:50 000 government air photos and plotted on 1:50 000 imperial topographic maps.

Three crews each consisting of a geologist and a geological assistant were responsible for the areas. Transportation of crews to the field was provided by helicopter and in some instances by truck.

5.5 Trenching

Eighteen trenches intersecting coal seams with an aggregate thickness of 38.9 metres were excavated in the Summit-Nass-Skeena Area. Coal exposures in excess of 0.5 metres were logged at true thickness and sampled during daily traverses.

Tables 6.6, 6.8 and 6.9 summarize 1981-1986 trench information. A more detailed description of coal trench data is contained in Appendix I.

5.6 Data Management

Throughout the 1986 exploration program, an IBM PC computer was utilized for cost accounting and budget control. During the field season it also served as an on-site data storage system which facilitated the uploading of outcrop, trench, drill hole coal quality and washability data onto Gulf's mainframe Coal Data Base, set up on an AMDAHL V8 computer, in Calgary. System 2000 data base management and Act 1 software provided data entry retrieval and manipulation of stored data on the mainframe computer.

5.7 Reclamation

The Summit-Nass exploration program produced very minor environmental disturbances. Most hand excavated trenches were backfilled.

5.8 Additional Geological Studies

Concentrated exploration in the Lost-Fox Area over the past four years has permitted the undertaking of a number of detailed geological investigations. The result of these ongoing studies has been an improvement in the confidence of seam identification and correlation. A thorough and complete understanding of the seam and interseam characteristics and continuity as well as the pattern of coal seam deposition is the major objective of these studies.

A marker horizon study initiated in 1985 has proven to be invaluable in correlating strata intersected by diamond drilling. During the past season a new key bed (above seam K) has been added to those already identified (see Table 5.3). There are now seven key beds that have demonstrated a reliable consistency of occurrence across the Lost-Fox Area and that may prove vital in establishing stratigraphic links with the Summit-Nass-Skeena Area.

Table 5.3 indicates that several of the Marker Horizons are products of volcanic ash fall. Results from a study of these bentonites completed in 1986 suggest that through mineralogical and chemical analysis the Mount Klappan area bentonites can be used to determine stratigraphic position by using discriminant function statistics. In future drill programs and where encountered in outcrop, bentonites will continue to be sampled and analysed to expand the data base, improve statistical reliability, and increase the area across which they can be used for correlation.

Regional studies undertaken in previous years have drawn broad scale conclusions with regard to paleocurrent directions and general depositional environments. The studies conducted this year concentrated on the interpretation of specific small scale features, in drill core and outcrop, with the intent of extrapolating into the larger scale.

Separate fault and cleavage studies were worked on in 1986 but as of writing this report, the results of these studies were not yet available. The fault study concentrated on the Summit and

TABLE 5.3

LOST-FOX AREA
KEY STRATIGRAPHIC HORIZONS

Seam	Marker Horizon	Description
P O Nu	Crest Zone	Thick white ash layer (>20 cm); in distinct contrast with dark mudstone above and below; marks a point 10-15m above N seam.
N M/N M L/M L K/L		Hard tuffaceous zone with extremely fine grained uniform texture and conchoidal fracture; becomes thinner and more mixed in with the surrounding sediment westward; occurs at a variable stratigraphic level above K seam.
K	Porcelaneous Tuffite Zone Coaster Zone	Rhythmitic, extremely fissile dark grey mudstone; marks occurrence of J seam zone which always lies immediately beneath the Coaster Zone.
J I H/I H	Tuffite Zone	Variable thickness containing a mixture of tuffaceous material and siltstone; normally has a sharp base and gradational top; occurs always in association with I seam but at a variable stratigraphic level above it.
PH Gu G Gl F/G	Recrystallized Zone	Diagenetic recrystallization of carbonate in mudstone; sensitive to facies but occurs widely within 10 m below H seam.
F E D	Milky Way Zone	Mudstone speckled with dispersed angular white quartz clasts; variable in thickness and abundance of quartz clasts; marks a point 12 m above F seam.
C B	Gastropod Zone	Gastropods occur only in a very restricted portion of the coal sequence; several thin bands densely packed with gastropods can occur above and below D seam (mostly below); bivalves are found in association.

Nass areas whereas the cleavage study also included the Lost-Fox Area. Conclusions from these projects will be incorporated into the 1987 Geological Report.

Work continued for a third year on the collection of fossil, flora and fauna samples. The results of this work are discussed in section 6.3.3 of this report, and shown in table form in Appendix D.

5.9 Project Management and Contractors

The 1986 exploration program was co-ordinated by V. Duford of Gulf Canada Corporation. Field operations in the Summit-Nass-Skeena Area were supervised by K. Jenner with assistance from S. MacLeod. Coal quality analyses were performed by Loring Laboratories Ltd. and interpreted by J. Innis. D.E. Pearson and Associates Limited conducted coal petrology studies. The report was written by S. MacLeod and L. Savoie, with supervision and editing done by E. Swanbergson.

The following personnel contributed to the Summit-Nass-Skeena exploration program.

V. Duford	Co-ordinator, Coal Geology
E. Swanbergson	Project Geologist
K. Jenner	Geologist
S. MacLeod	Geologist
L. Savoie	Geologist
S. Lee	Geological Assistant

K. Hunter	Geological Assistant
P. Tydemers	Geological Assistant
D. Willis	Geological Assistant
J. Matthews	Geological Assistant
P. Campbell	Geological Assistant
G. Murray	Geological Assistant
A. Sali	Administrator
R. Aftergood	Administrative Analyst
T. Sampietro	Camp Manager
R. Quock	Computer Operator
C. Ireland	Secretary
G. Gillick	Helicopter Pilot
R. Bonang	Cook

The following companies provided services and/or supplies to the Summit-Nass exploration program.

Canadian Freightways Ltd.	Calgary, Alberta
Central Mountain Air Services Ltd.	Smithers, B.C.
D.E. Pearson & Associates Ltd.	Calgary, Alberta
Kenn Borek Air	Calgary, Alberta
Loring Laboratories Ltd.	Calgary, Alberta
Neville Crosby Inc.	Vancouver, B.C.

Northern Mountain Helicopters Inc.	Prince George, B.C.
Northmount Camp Services (1974) Ltd.	Vancouver, B.C.
Pacific Western Airlines	Vancouver, B.C.
Starr Industries Ltd.	Fort St. John, B.C.
Terrace Totem Ford	Terrace, B.C.
Trans-Provincial Airways	Terrace, B.C.
Westcan Electronic Services Ltd.	Calgary, Alberta

6.0 GEOLOGY

6.1 Introduction

Geological mapping and hand trenching activities were undertaken in the Summit, Nass and Lost-Fox areas of the Mount Klappan property during the 1986 exploration program. Concurrently, diamond drilling and trial cargo operations proceeded in the Lost-Fox Area. The results of this exploration program combined with previous years' work provide the basis for geological interpretations presented in this report.

The Mount Klappan property is underlain by uppermost Jurassic to Lower Cretaceous strata which consist of marine to non-marine sediments deposited in the Bowser Basin of northcentral British Columbia. The strata have been subjected regionally to two successive non-coaxial phases of deformation, F_1 and F_2, which resulted in folding and faulting trending in NW-SE (F_1) and E-W (F_2) directions generally. (See 1:50 000 Regional Geology Map; Appendix I).

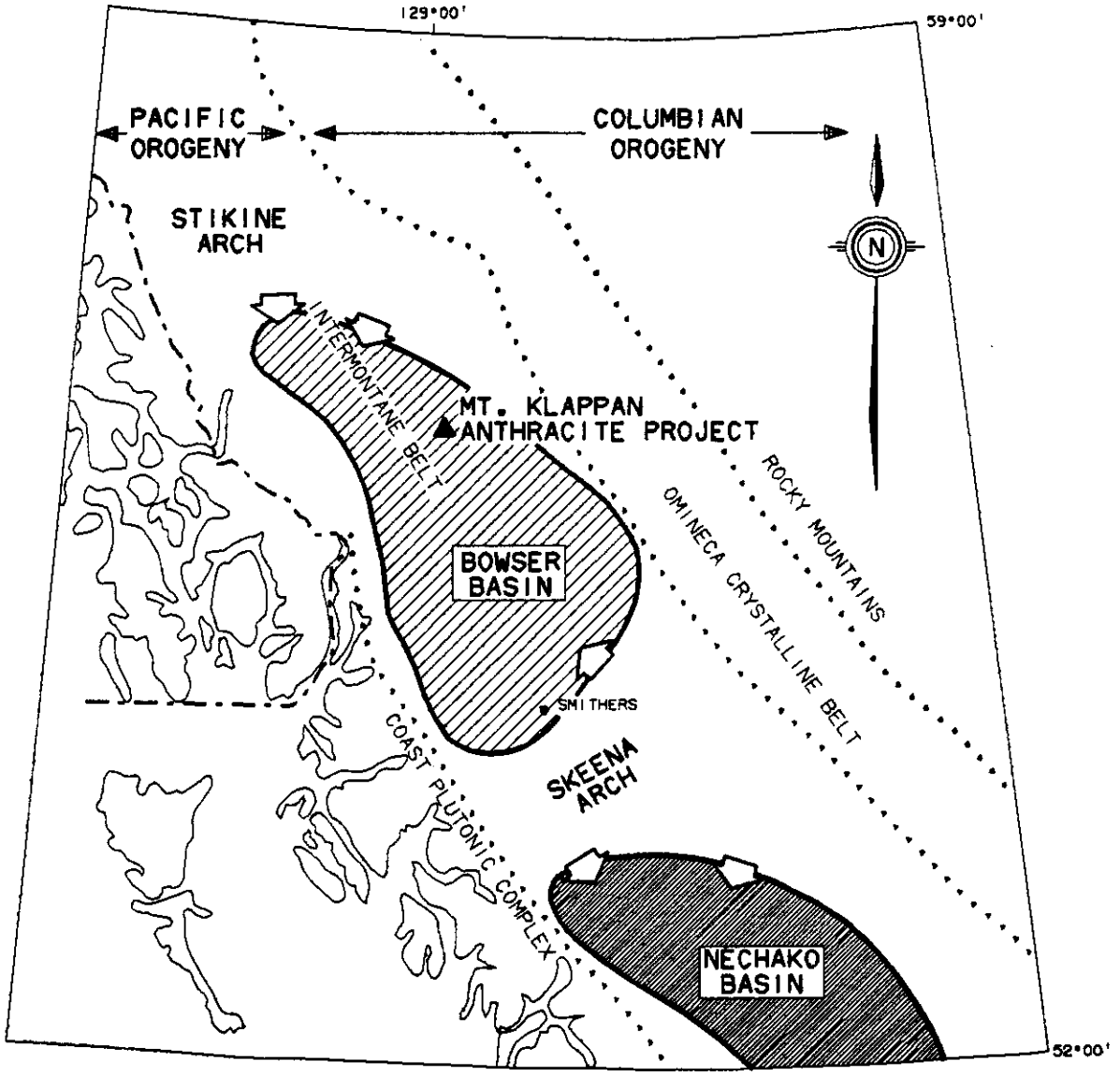
The coal seams of the Mount Klappan property occur primarily in the Klappan Sequence; in addition, some minor seams have been trenched in the Malloch Sequence. Coal seams range up to 8.36 metres in maximum true thickness in the Lost-Fox Area and are usually found to be laterally continuous over broad areas although some seams thin locally.

6.2 Regional Geologic Setting

The coal measures of the Mount Klappan property are contained within a series of sediments ranging in age from uppermost Jurassic to Lower Cretaceous. These sediments were deposited in the Bowser Basin, a successor basin to the volcanogenic Hazelton Trough (Tipper and Richards 1976). The Bowser Basin is bounded to the north and south by the Stikine and Skeena Arches respectively, and to the east by the Columbia Orogen (Omineca Crystalline Belt). The western margin is thought to have been open to the sea at the time of Bowser sediment deposition (Figure 6.1).

The formation and development of the Bowser Basin was controlled by the "collision and subsequent isostatic uplift of several crustal blocks in the Cordilleran Orogen of western Canada" (Eisbacher, 1981). These crustal blocks include the Stikine Terrane (volcanic arc complex) which directly underlies the Bowser sediments, the Atlin Terrane (remnant oceanic crust) and the Omineca Crystalline Belt (western margin of the North American Craton).

During the Middle Jurassic, the Skeena Arch was uplifted and the subsidence of the Stikine Terrane divided the Hazelton Trough into the Bowser Basin to the north and the Nechako Basin to the south. Uplift of the Atlin Terrane to the north and northeast of the Bowser Basin, coupled with continued subsidence of the Stikine Terrane and collision and suturing of both these terranes with the



SCALE

0 100 200 km

LEGEND

BOWSER BASIN

NECHAKO BASIN

(AFTER TIPPER AND RICHARDS, 1976)

FIGURE 6-1

MOUNT KLAPPAN ANTHRACITE PROJECT

JURASSIC-CRETACEOUS BOWSER BASIN

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Omineca Crystalline Belt (Eisbacher, 1981) resulted in a progradation of non-marine over marine sediments within the basin.

Paleocurrent measurements indicate a centripetal flow into the Bowser Basin from highlands to the north, northeast, and south.

Bowser sediment source rocks originate within the Atlin Terrane (high chert; low volcanic content) for the north and northeastern margins of the Basin, and from the remnant volcanic arc assemblage of the Stikine Terrane, (high volcanic; low chert content) for the southern portion of the Basin. Sediments from the Lower Cretaceous (youngest marine succession of the Bowser Basin) through to the Paleocene are found only on the eastern, and in part, the southern margins of the Basin.

Geologic studies in the southern and northern Bowser Basin sediments have resulted in several reports and descriptions of the sedimentary package associated with the Mount Klappan Area. These studies are summarized in Table 6.1.

Structural deformation of Bowser Basin sediments resulted from intermittent tectonic stresses at the western cratonic margin from Cretaceous to recent time. The deformation caused an extensive, shallow decollement, recumbent folds, and local thrust faults extending a few kilometres along strike (Eisbacher, 1974b).

TABLE 6.1
MOUNT KLAPPAN COAL PROPERTY
REGIONAL STRATIGRAPHY - TABLE OF FORMATIONS

		MALLOCH, 1914	BUCKHAM & LATOUR, 1950		SOUTHER & ARMSTRONG, 1966	EISBACHER, 1974c		TIPPER & RICHARDS, 1976	RICHARDS & GILCHRIST, 1979	BUSTIN & MOFFAT, 1983
		SOUTHERN GROUNDHOG COALFIELD	GROUNDHOG COALFIELD		NORTHERN BRITISH COLUMBIA	NORTHERN BOWSER BASIN		SOUTHERN BOWSER	SOUTHERN GROUNDHOG COALFIELD	GROUNDHOG COALFIELD
CRETACEOUS	UPPER				SUSTUT-SIFTON ASSEMBLAGE	SUSTUT-SIFTON ASSEMBLAGE		SUSTUT GROUP		
	LOWER	SKEENA SERIES	HAZELTON GROUP	UPPER PART	BOWSER ASSEMBLAGE	BOWSER ASSEMBLAGE	JENKINS CREEK FACIES	SKEENA GROUP	GUNANOOT ASSEMBLAGE	DEVILS CLAW UNIT
							GUNANOOT-GROUNDHOG FACIES			McEVOY UNIT
JURASSIC	UPPER	HAZELTON GROUP		LOWER PART			DUTI RIVER SLAMGEESH FACIES	BOWSER LAKE GROUP		CURRIER / PRUDENTIAL
	MIDDLE				TAKLA-HAZELTON ASSEMBLAGE	TAKLA-HAZELTON ASSEMBLAGE		HAZELTON GROUP		JACKSON UNIT
	LOWER									
TRIASSIC	UPPER							TAKLA GROUP		
	MIDDLE									

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18/12/85

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The large scale forces resulting from collision of a remnant volcanic arc and cratonic margin subjected the area to northeast-southwest compression (D1) creating the general structural trend of northwest-southeast.

Later position of the former volcanic arc terrain northwards along interlaced right lateral high angle faults (Eisbacher, 1981) may account for the later north-south compressional (D2) event. This deformation event resulted in generally broad, open NE to SW trending folds with relatively rare, flat lying thrusts expressed in several Klippen fault structures.

The final deformational event which produced strike-slip and some dip-slip faulting may have resulted from a change in the rotational component of the western crustal block, terminating compression.

6.3 Mount Klappan Coal Project Geology

6.3.1 Stratigraphy

Based on age-dating of collected species of plant macrofossils and fauna, the sediments underlying the Mount Klappan property range from uppermost Jurassic to Lower Cretaceous in age (Section 6.3.3). This sedimentary package has been subdivided into four gradational sequences which in ascending order are the Spatsizi, Klappan, Malloch and Rhondda sequences (Figure 6.2). These conformable sequences occur within approximately 3 000 metres of section and

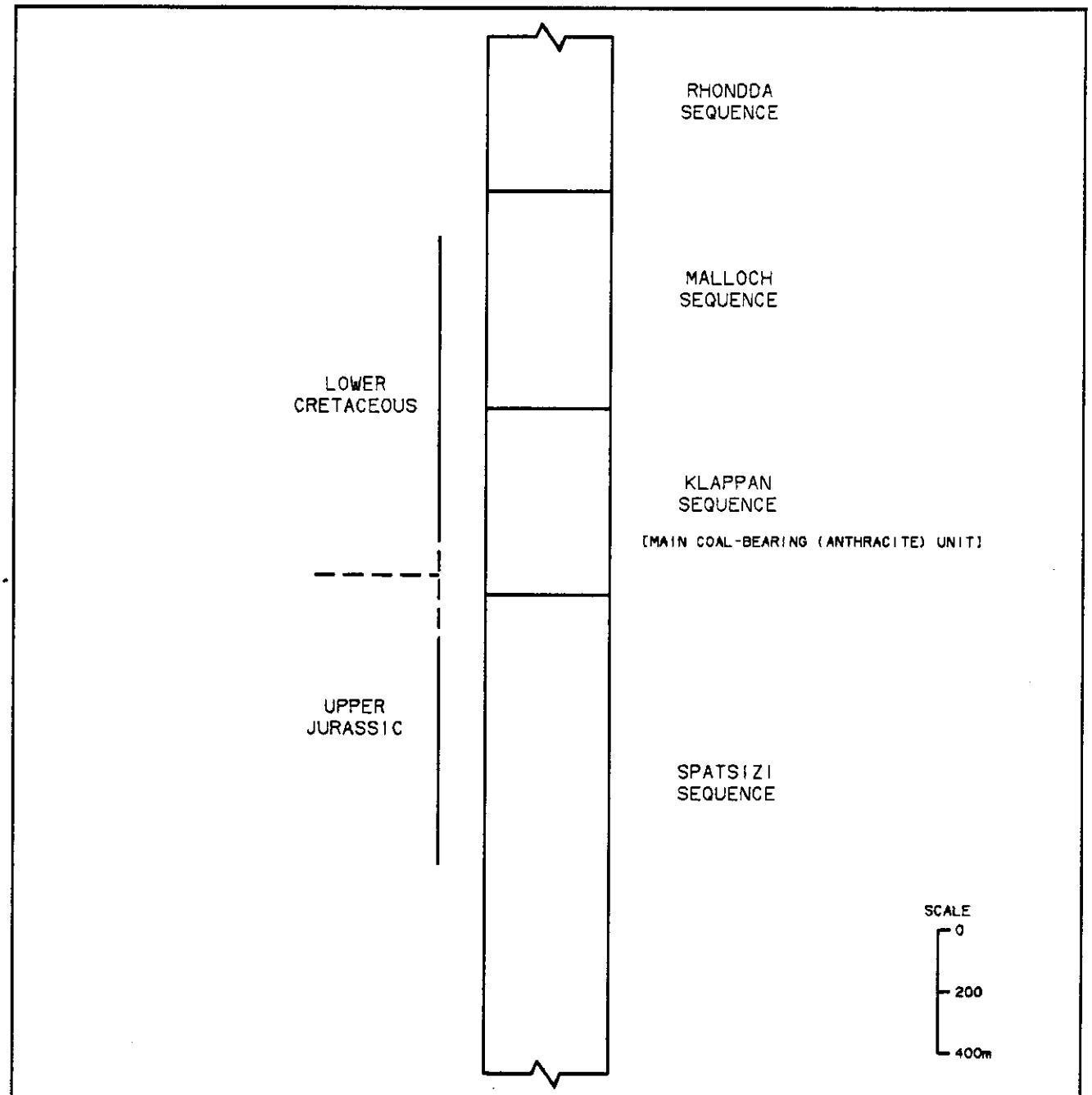

FIGURE 6-2

MOUNT KLAPPAN ANTHRACITE PROJECT

SCHEMATIC STRATIGRAPHIC COLUMN

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represent a gradual marine regression. Table 6.2 briefly outlines the sedimentological characteristics observed within each sequence.

6.3.1.1 Spatsizi Sequence

The Spatsizi Sequence is the lowest stratigraphic unit within the Mount Klappan property. Approximately 600 metres of this section has been measured and although the base has not been observed the stratigraphic thickness is estimated to be in excess of 1 200 metres. Interbedded mudstones, siltstones and sandstones are found throughout the sequence while thin coal seams and massive conglomerates exist within the upper portion. The overall trend is a coarsening upward sequence with marine conditions throughout and increasing coastal environment influences toward the upper transitional contact with the Klappan Sequence.

Exposures of the Spatsizi Sequence are located in the western and northern Summit Area and in the northern Nass Area of the Mount Klappan property.

6.3.1.2 Klappan Sequence

The Klappan Sequence, the main coal-bearing unit, conformably overlies the Spatsizi Sequence and occurs over the majority of the property. It represents a transition from marine conditions, at the

TABLE 6-2
TABLE OF FORMATIONS

Kr **RHONDDA SEQUENCE**

SEQUENCE OF THICK CHERT PEBBLE CONGLOMERATES AND MINOR GRITTY SANDSTONES INTERBEDDED WITH AN INCREASING NUMBER OF SILTSTONES AND MUDSTONES TOWARDS THE BASAL CONTACT. LARGE SCALE TROUGH AND TABULAR CROSS BEDS ARE COMMON. SIX SPECIES OF PLANT FOSSILS ARE FOUND AT THE BASE OF THE SEQUENCE.

Km **MALLOCH SEQUENCE**

THICK INTERBEDS OF MUDSTONES, ARGILLACEOUS SILTSTONES, FINE GRAINED SANDSTONES AND THIN INTERBEDS OF ORANGE WEATHERING NODULAR SILTSTONES. MANY CONGLOMERATE BEDS DISPLAY LARGE SCALE CROSS BEDDING AND TEND TO BE LATERALLY DISCONTINUOUS. THICK CLEAN SANDSTONE BEDS AND THIN COAL SEAMS INCREASE IN ABUNDANCE TOWARDS THE BASAL GRADATIONAL CONTACT. TWENTY-THREE SPECIES OF PLANT FOSSILS OCCUR WITHIN THE SEQUENCE.

JKk **KLAPPAN SEQUENCE (MAIN COAL-BEARING UNIT)**

FINE TO COARSE GRAINED SANDSTONES INTERBEDDED WITH MUDSTONES, SILTSTONES, OCCASIONAL THIN BANDS OF ORANGE WEATHERING CALCAREOUS SILTSTONES, CONGLOMERATES AND ABUNDANT COAL SEAMS. CONGLOMERATE BEDS GRADE LATERALLY INTO SANDSTONE. SANDSTONES OFTEN DISPLAY TABULAR OR TROUGH CROSS BEDDING. RHYTHMITES OCCUR IN THE MIDDLE OF THE SEQUENCE. TWENTY-THREE SPECIES OF BIVALVES AND UP TO TWENTY-FIVE SPECIES OF PLANTS OCCUR THROUGHOUT. PETRIFIED WOOD AND RARE COQUINA MAY BE PRESENT TOWARDS THE UPPER CONTACT.

Js **SPATSIZI SEQUENCE**

PREDOMINANTLY A MARINE SEQUENCE OF INTERBEDDED MUDSTONES, SILTSTONES, SANDSTONES AND CONGLOMERATES. CARBONACEOUS MUDSTONES, COARSENING UPWARDS SEQUENCES AND CHERT PEBBLE CONGLOMERATES ARE MORE ABUNDANT IN THE UPPER PART OF THE SEQUENCE. NINETEEN SPECIES OF BIVALVES ARE PRESENT. BELEMNITES ARE RARE. PLANT DEBRIS MAY OCCUR NEAR THE UPPER GRADATIONAL CONTACT.

base of the unit, to more coastal influenced sediments toward the top. The stratigraphy consists of cyclic packages of interbedded fine to coarse-grained sandstones, siltstones, mudstones, laterally discontinuous conglomerates and abundant coal seams. Up to 29 coal horizons with seam true thicknesses of as much as 8.36 metres occur within the Klappan Sequence. The sequence is interpreted to attain a thickness of up to 900 metres though both the upper and lower contacts are transitional.

6.3.1.3 Malloch Sequence

The Malloch Sequence conformably overlies the Klappan Sequence and outcrops in the central, western and southeastern areas of the property. The strata consist of interbedded argillaceous sandstone, siltstone and mudstone with the development of thin coal seams towards the base of the sequence. Chert pebble conglomerates are laterally discontinuous. Approximately 700 metres of Malloch Sequence is exposed within the Klappan property.

6.3.1.4 Rhondda Sequence

The Rhondda Sequence is the youngest stratigraphic package on the Mount Klappan property and has a gradational and conformable contact with the underlying Malloch Sequence. Outcroppings of the Rhondda are restricted to the southeast of the

property in the Skeena Area. Lithologically this unit consists of thick, laterally extensive chert pebble conglomerates. Thin interbeds of sandstones, siltstones and mudstones increase in thickness towards the bottom of the sequence. The top of the Rhondda has not been observed but approximately 500 metres of exposed section exists within the Mount Klappan property. It is interpreted that the Rhondda Sequence represents a prograding alluvial fan system over a transitional coastal-marine environment.

6.3.2 Structure

Deformation of sediments within the Mount Klappan property is the result of two regimes of non-coaxial stress which differ in the intensity of their effect on the stratigraphic package. The dominant structural features are the Beirnes Synclinorium and the parallel Nass River Anticlinorium which trend northwest to southeast. These major folds and all associated structures result from the dominant deformational phase (D1). On the Mount Klappan property the synclinorium axis can be observed in the competent Rhondda strata as bisecting a broad, open, upright feature. Smaller folds on both sides of the synclinorium have axes that dip toward the synclinorium axis. The adjacent major anticlinorium is not so clearly discerned as it is defined solely by the alignment of subordinate folds in the less competent Malloch strata.

Across the Mount Klappan property both outcrop and

drilling information indicate a structure comprised of south-westwardly dipping fold and thrust faults that are all part of the D1 regime. The secondary deformation (D2) produces primarily low amplitude, long wavelength folds trending northeast - southwest. These are superimposed on the F1 folding, producing a series of plunge reversals averaging 8 to 10 degrees to the northwest and southeast.

Cleavage is associated with both fold patterns. The F1 cleavage is pervasive and well developed in all fine grained lithologies. It has been observed in different areas either as axial plane divergent or convergent, trending generally at 135 degrees. Cleavage related to the F2 folding may also be convergent or divergent and trends anywhere from 030 to 110 degrees.

Non-compressional structures are also a feature of the Mount Klappan area. High angle normal faults trending north - south and large scale fracture zones trending east - west have been recorded regionally. These may have resulted from reactivation by D2 stresses of zones of weakness formed during D1 deformation; they may be relaxation features dating from before or after the D2 event; or they may be related to an entirely separate deformational event.

6.3.3 Plant Macrofossils and Fossil Fauna

During the 1984 to 1986 field seasons 1 100 specimens of fossil flora and fauna were collected from 590 sites on

the Mount Klappan property during routine traverses and the drill core logging program. The 27 species of fossil fauna and up to 25 species of plant macrofossils collected have aided in age determination, paleoenvironmental interpretations, stratigraphic delineation and, to a lesser extent, detailed stratigraphic correlation. The 1984 to 1986 Fossil Location Map in Appendix I documents all collection sites and a complete listing of fossils with stratigraphic and geographic positions is given in Appendix E.

6.3.3.1 Fossil Evidence for Stratigraphic Age

Nineteen species of plant macrofossils previously identified within the Klappan and Malloch Sequences on the Mount Klappan property were dated as Lower Cretaceous on the basis of floristic comparisons with other western Canadian Lower Cretaceous formations with similar collections (Table 6.3). During the 1986 field season an additional four species were identified from the Klappan Sequence and each of these species is present in at least four other Lower Cretaceous coal-bearing formations in western Canada.

An age ambiguity is present at the Klappan-Spatsizi contact zone where limited Lower Cretaceous plant species and abundant Jurassic-Cretaceous marine fauna co-exist. Age dating confidence increases, however, towards the middle and upper Klappan Sequence where there is a marked increase in plant species

diversity and numbers (Table 6.4). For this reason, the Jurassic-Cretaceous contact, previously placed at or near the Spatsizi-Klappan contact zone, remains unchanged.

6.3.3.2 Fossil Distribution and Limitations as Index Fossils

During the 1986 field season an additional 624 specimens were collected at 255 sites, including all documentation made from drill core, bringing the total specimen and collection site totals to 1 100 and 590 respectively. Despite the increasing data and stratigraphic control, few individual species are believed to be true index fossils, except on a localized basis. A few key trends of fossil groups, noted in 1985, have been confirmed by further collection.

To date, the Spatsizi Sequence remains the only Mount Klappan strata to be characterized by the presence of lytoceratid ammonites and to lack in-situ plant fossils. Belemnites, previously thought to be relatively abundant only within the Spatsizi Sequence, have been recently documented in the lower Klappan Sequence at one location below A seam on Lost Ridge and on Repeater Ridge in the Summit Area.

The Klappan Sequence contains the only

brackish water bivalves (the oyster, Ostrea, and Modiolus, both of which have been found only in the lower Klappan Sequence. Ferganoconcha, a large fresh water bivalve, has been documented five times within the upper Klappan Sequence in the Lost-Fox N - O interseam, in drill core and in outcrop, but at no other stratigraphic or geographic location on the Mount Klappan property. The Malloch Sequence continues to be characterized by abundant flora, with 23 of the 25 species represented, and a lack of marine fauna. The Rhondda Sequence has no marine fauna and rare flora. Tables 6.4 and 6.5 illustrate the stratigraphic position of all species documented on the Mount Klappan property. Given the present control, property wide correlations on the basis of individual species are not advisable. Although increased data has confirmed a few previously noted fossil group trends, it has also proven that a number of seemingly rare species have a wider stratigraphic and geographic distribution than previously throught.

6.4 Summit-Nass-Skeena Area Geology

6.4.1 Introduction

The Summit-Nass-Skeena Area collectively contains approximately 2000 to 2300 metres of exposed Spatsizi, Klappan, Malloch and Rhondda Sequences. Measured type sections have been established and illustrated except for the

KLAPPAN - MALLOCH - RHONDDA SEQUENCE
PLANT MACROFOSSILS

		FORMATIONS	CLADOPHLEBIS VIRGINIENSIS	SPHENOPTERIS BRULENSIS	EQUISETITES LYELLI	BAIERA FURCATA	BAIERA GRACILIS	GINKGO LEPIDA	GINKGO MAW	GINKGO PLURIPARTITA	CZEKANOWSKIA RIGIDA	PTEROPHYLLUM RECTANGULARE	PTEROPHYLLUM PLICATUM	NILSSONIA BROMENHARTI	NILSSONIA CANADENSIS	NILSSONIA TENUICAULIS	NILSSONIA SCHAUMBERGENSIS	CTENIS BOREALIS	NILSSONIA NIGRADOLIENSIS	PITYOPHYLLUM NORDENSKIOLDII	PODOZAMITES LANCEOLATUS	SAGENOPTERIS WILLIAMSII	PHLEBOPHYLLUM MINNANENSE	ELATIDES CURVIFOLIA	CONIOPTERIS BERRY
LOWER	A	BLAIRMORE FM (UPPER FLORA)	●	•															? •						
		PASAYTEN GP	◎													? •									
		HAZELTON GP (SKEENA BEDS)				•		•	•		•		•						•			◎	•		
		JACKASS MOUNTAIN GP	●								•											•	•		
		SPENCE BRIDGE GP																					•		
	NEOCOMIAN - BARREMIAN	KOOTENAY FM	◎		◎	•	•	●	◎	●	◎			•		◎	◎	•	◎	◎	•				
		NIKANASSIN FM			•	?			•	●	●							●	•	•					
		HAZELTON GP (HAZELTON AREA)	◎		◎	•			◎		◎			•			•		•	◎	•	●			
		HAZELTON GP (GROUNDHOG AREA)	◎						•	•						•	●		◎		•				
		TANTALUS FM	•											•		•				•					•

* PARTIAL SPECIES LISTS ARE GIVEN FOR ALL FORMATIONS. ONLY THOSE SPECIES COMMON TO BOTH MT. KLAPPAN AND OTHER FORMATIONS ARE INCLUDED.

TABLES INDICATES A LOWER CRETACEOUS AGE FOR COAL-BEARING STRATA OF MT. KLAPPAN BY FLORISTIC COMPARISONS WITH OTHER WESTERN CANADIAN LOWER CRETACEOUS FORMATIONS WITH SIMILAR COLLECTIONS.

- • 1 - 2 DOCUMENTED OCCURENCES
- ● 3 - 4 DOCUMENTED OCCURENCES
- ◎ 5 OR MORE DOCUMENTED OCCURENCES

(BASED ON DATA FROM BELL, 1956)

TABLE 6-3

MOUNT KLAPPAN ANTHRACITE PROJECT

AGES OF MOUNT KLAPPAN PLANT MACROFOSSILS IN OTHER WESTERN CANADIAN FORMATIONS

GULF CANADA CORPORATION
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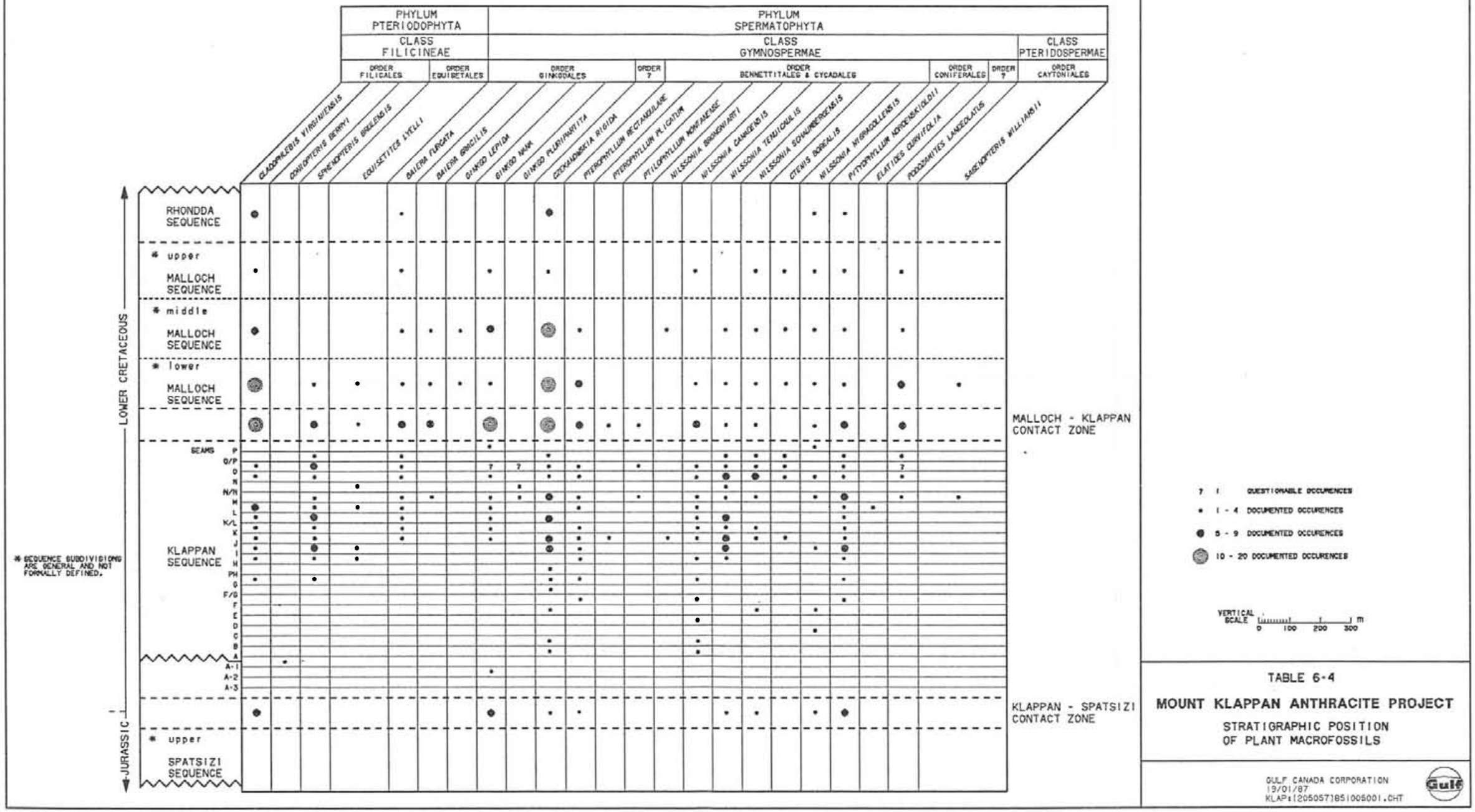

TABLE 6-4

MOUNT KLAPPAN ANTHRACITE PROJECT

STRATIGRAPHIC POSITION OF PLANT MACROFOSSILS

GULF CANADA CORPORATION
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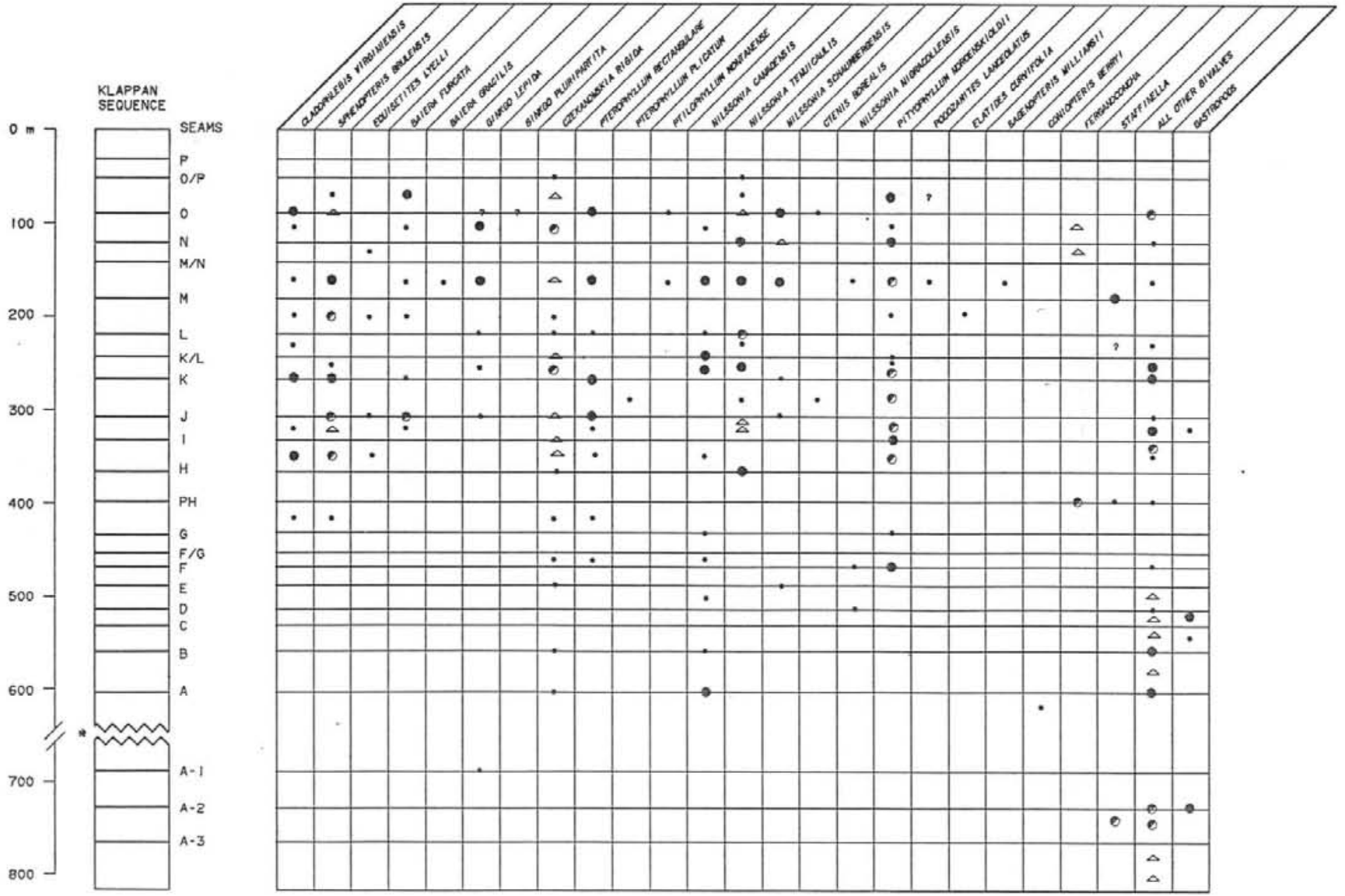

* LOWER SECTION, REPRESENTED BY DDH86026, TENTATIVELY INTERPRETTED TO BE BELOW SEAM A
NO SPECIFIC A/A-1 INTERSEAM IS IMPLIED (MAY BE AS MUCH AS 150-200m)

& & INTERSECTIONS/OCCURENCES BASED ON 1986 DRILLING OR 1986 INTERPRETATION OF TRENCH SEAMS

?	1	QUESTIONABLE INTERSECTION
•	1	INTERSECTION/OCCURENCES
●	2	INTERSECTION/OCCURENCES
◐	3	INTERSECTION/OCCURENCES
△	4 - 6	INTERSECTION/OCCURENCES

TABLE 6-5

MOUNT KLAPPAN ANTHRACITE PROJECT

KLAPPAN SEQUENCE
STRATIGRAPHIC POSITION OF
FOSSIL FLORA AND FAUNA

GULF CANADA CORPORATION
19/01/87
KLAP:[2050S7]870006002.CHT

Gulf

Klappan Sequence which is not entirely exposed in the Summit-Nass-Skeena Area and is best understood in terms of drill core from the Lost-Fox Area. The type sections are thought to represent typical sequences of maximum thickness within the Mount Klappan licence boundaries although thickening within the Rhondda Sequence is documented toward the south and the Spatsizi Sequence thickens northward into Spatsizi Wilderness Park.

The stratigraphic section represents a coarsening upwards megacycle deposited during a major marine regression. The sequence is interpreted to have been deposited in environments ranging from marine deltaic at the base of the sequence, through delta plain, fluvial and an alluvial fan environment at the stratigraphic top (Rhondda Sequence). The structure and stratigraphy observed in the Summit-Nass-Skeena Area differs slightly in interpretation from that described in the 1985 report.

Most of the changes are represented by minor movements of contact boundaries.

Firstly, the Malloch-Klappan sequence contact in the Skeena Area has been adjusted slightly to incorporate a Klappan Sequence trench excavated this season on Tahtsedle Creek. Limited outcrop exposures on the lower south side of Mount Klappan, previously interpreted as Malloch Sequence, may also be Klappan Sequence strata, correlative with or slightly higher in section than the Tahtsedle Creek exposures. This observation is based on numerous spoil

occurrences on the south side of Mount Klappan, although an extensive mapping and trenching program is required to determine the thickness of seams and the extent to which seams are repeated by folding.

A detailed measured section of the east side of Nass Lake has resulted in a slight adjustment of the Malloch-Klappan contact in this region as well, resulting in the inclusion of 3 trenches, previously interpreted as Malloch Sequence, within Klappan Sequence boundaries.

The Rhondda-Malloch "contact zone" described in the 1985 report has been re-interpreted as well. Although the environments of deposition are transitional between the two sequences, the continuity of the first conglomerate greater than 10 metres in thickness at the base of the Rhondda, makes this lithological marker mappable by airphoto interpretation and groundwork. The contact zone between the Spatsizi and Klappan Sequences has been retained as no single distinct lithological marker with which to delineate the boundary between these sequences is present.

The Spatsizi-Klappan contact in the northwestern Nass Area has been adjusted slightly in order to include trench TRC85010 (C/C+R = 3.16/4.50) in the Klappan Sequence instead of the Spatsizi Sequence. The marine nature of the lower Klappan Sequence has been reinforced by several drill holes immediately north of the Lost-Fox resource area (particularly DDH 86-020, 86-028 and 86-038), and by the stratigraphy of the northern Summit Area. Therefore, the interpretation of

the strata containing this trench as Spatsizi Sequence, strictly on the basis of its marine nature is not definitive and the observation that the the Spatsizi Sequence is essentially non coal-bearing is still true.

A majority of the northern Summit Area (recommended for relinquishment) is considered to be virtually barren of any coal seams greater than 1.0 metres thick. This assessment is made on the basis of extensive traverses in areas of excellent outcrop exposures. All previously documented occurrences of spoil were excavated and found to be thin, dirty, laterally discontinuous coal or carbonaceous mudstone.

The most significant structural re-interpretations were based on an extensive brittle deformation study undertaken in the Summit-Nass-Skeena Area. The pre-completion results of this study are summarized in Section 6.4.5.

6.4.2 Summit Area

6.4.2.1 Spatsizi Sequence

A maximum of 200 metres of Spatsizi Sequence strata is present within the Mount Klappan licence boundary in the northwestern Summit Area although 450 metres of section have been measured (OTC85015) southwest of Repeater Ridge. This sequence is predominantly a fine grained marine coarsening upwards megacycle with a siltstone and mudstone to sandstone ratio of (1.9:1).

Six well developed coarsening upwards cycles, found predominantly in the upper half of the unit, are 15 to 45 metres in thickness. They consist of thinly interbedded or laminated, rippled siltstones and dark grey mudstone overlain by laminated, frequently bioturbated and rippled siltstones. Fine grained sandstone interbeds increase towards the overlying capping sandstones. Minor rip-up clasts, abundant bivalves and low angle planar cross beds are features commonly associated with the sandstone topping each coarsening upwards cycle. Coal and carbonaceous mudstone are virtually absent in this sequence although laterally discontinuous mudstone is locally developed in some exposures.

Six bivalve horizons, all found within coarser grained lithologies, are present, and only one very minor plant horizon has been documented. The brackish water oyster, Ostrea, and marine bivalves, such as Acesta, Hypoxytoma and Buchia concentrica are a common Summit Area, Spatsizi Sequence faunal assemblage. The latter species has been dated as Upper Jurassic (Lower Kimmeridgian) by Stelck (personal communication).

The Spatsizi-Klappan contact is considered to be gradational over up to 200 metres in the Summit Area. The lack of precision possible in delineating this boundary is a function of the transitional marginal marine to marine nature of the upper

Spatsizi-lower Klappan Sequence strata and a lack of distinctive marker horizons present in the boundary area in the Summit region. Whereas a 10 to 15 metre conglomerate capping the Spatsizi Sequence has been used in the past to mark the Spatsizi-Klappan contact in the region to the north and east of the B.C.R., this unit is absent in the Summit Area. The gradational contact is thus recognized where in-situ plant fossils become abundant and strictly marine fauna decrease in significance. These paleontological trends coincide with a marked decrease in the prominent cyclicity of coarsening upwards sequences as well as a marked decrease in the coarse to fine lithologies ratio, and the coal and carbonaceous mudstone occurrences.

6.4.2.2 Klappan Sequence

Most of the Summit Area is underlain by Klappan Sequence sediments which are interpreted to reach a maximum thickness of 300 to 900 metres although no single outcrop exposure exceeds 150 metres in thickness. The informal subdivisions adapted in 1985 on the basis of coal thickness and quality, fossil content, sedimentary structures and, to a lesser extent, lithotypes, have been retained. Unit boundaries are subjective and transitional.

The lowermost 100 to 200 metres of the Klappan Sequence is exposed in all of the northern

Summit Area north of Marshall-Layton Ridge and the Summit South Area. It was intersected in the lower half of DDH83003 located in Summit South and in DDH82007 on the B.C.R., adjacent to the Mount Klappan airstrip. A similar package was intersected in the Lost-Fox diamond drill holes DDH86028 and DDH86038, both located in the preparation plant area just south of the B.C.R. The sedimentological and paleontological similarites between the Lost-Fox lower Klappan Sequence strata and the lower unit of the Summit Area indicates that these units may be stratigraphic equivalents.

Lithologically, the unit is characterized by 50 to 70 percent thinly intercalated, grey to black, highly burrowed mudstones and siltstones with lesser amounts of salt and pepper to grey, medium to fine grained sandstones. Lenticular, discontinuous chert pebble and granule conglomerates up to four metres thick exist locally. Thin, generally discontinuous, dirty, pyrite-rich coal seams may be found in association with fine grained sediments although they do not exceed one metre in thickness in any exposures in northern Summit, north of the Marshall-Layton Ridge Area.

This sequence is interpreted as marginal marine on the basis of the limited number and extent of pyritic coal seams, a predominance of graded beds and gradational contacts with very minor scours and

rip-up clasts, occasional moderately low angle planar cross bedded, clean sandstone units greater than 25 metres thick, and most significantly by the fossil content. This sequence is characterized by an abundance of turritellid gastropods, marine bivalves, belemnites and a high incidence of burrows including Helminthopsis, a shallow marine indicator. Plant fossils are very low in number and species diversity with respect to the remainder of the Klappan Sequence. No fresh water fauna has been documented, either in drill core or in outcrop, for this unit.

The middle Klappan Sequence, exposed in the Marshall-Layton Ridge and Valley area and in Summit South, and intersected in the upper part of DDH83003 (located in Summit South), is believed to reach a maximum thickness of 200 to 250 metres based on a composite section measured on Marshall-Layton Ridge (Figure 6.3). It grades upward from underlying strata and is distinguished from the latter by the presence of thick, continuous coal seams.

Lithologically, the fine grained portion of this unit is characterized by thinly interbedded, often rippled to laminated, brown to dark grey or orange weathering siltstone, grey to black, commonly carbonaceous mudstone, and fine grained sandstone. Burrowing, including Helminthopsis is less common than in the lower unit. Orange and black colour banding resulting in a "tiger-striped" appearance is best

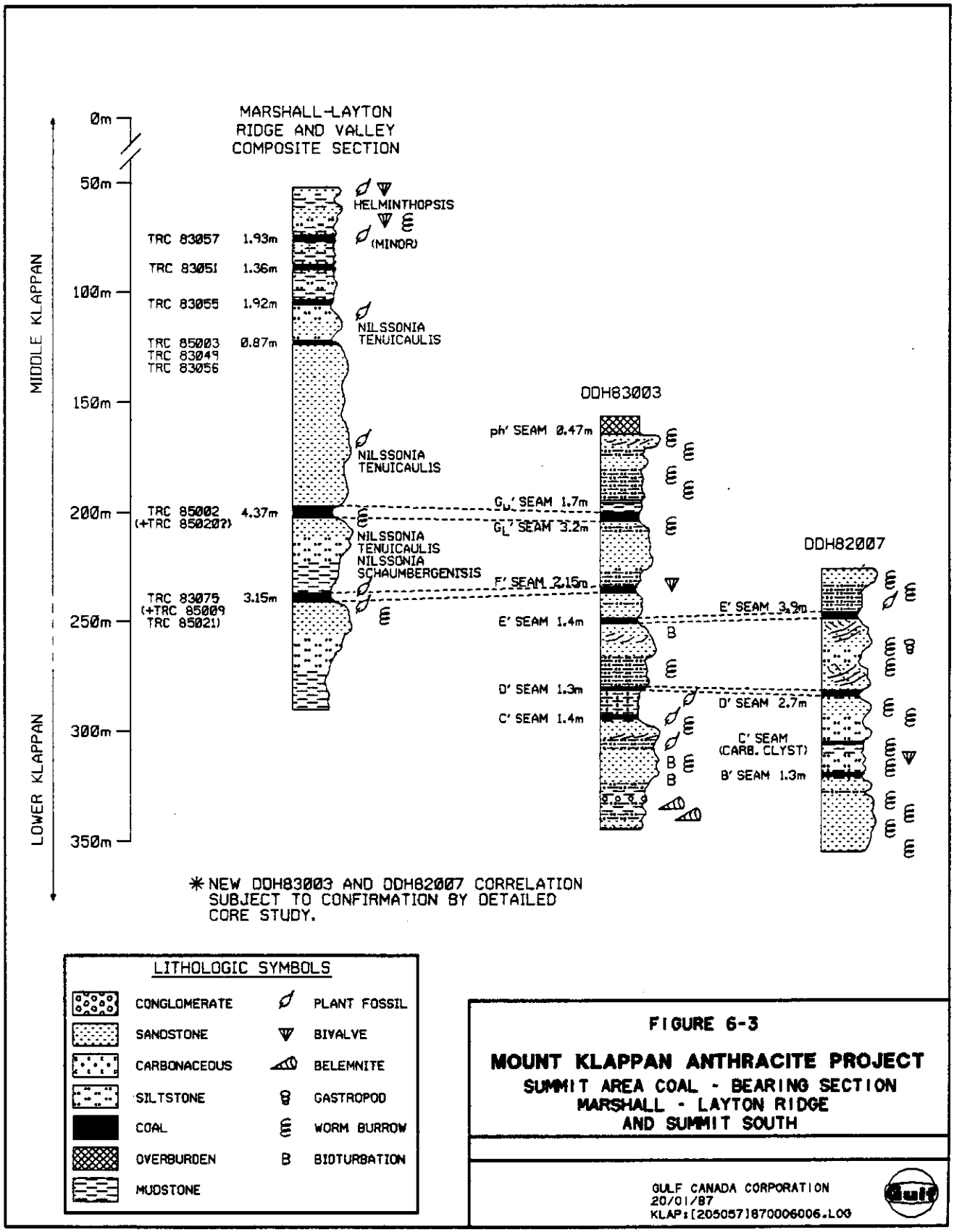

FIGURE 6-3

MOUNT KLAPPAN ANTHRACITE PROJECT

SUMMIT AREA COAL - BEARING SECTION
MARSHALL - LAYTON RIDGE
AND SUMMIT SOUTH

GULF CANADA CORPORATION
20/01/87
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exhibited in the vicinity of TRC85001. Fine grained packages, which rarely exceed 25 metres in total thickness, constitute up to 50 percent of the entire unit.

In contrast to the fine grained packages, sandstone units may be as thick as 75 metres. They are light to medium grey, frequently iron stained and they commonly display medium to large scale tabular and trough cross beds. Measured section OTC84009 illustrates pebble lags and basal scouring, features rarely observed in the limited outcrop exposure. These thick-bedded to massive, medium grained sandstone units frequently cap and underly numerous coal seams up to 4 metres thick. Pyrite content in the coal is very low.

The middle Klappan Sequence in the Summit Area is interpreted to have formed in a transitional lower to upper delta plain environment with only a minor fluvial influence near the top, where it is transitional into the upper Klappan Sequence. this interpretation is supported by the lateral extent and thickness of coal, moderate scouring and erosional contacts, abundant ripple and trough cross beds, moderately clean sandstones often greater than 25 metres in thickness, an abundance of shale and siltstone units 5 to 25 metres thick, and by fossil content.

Paleontologically, this unit is characterized by approximately 20 species of plant fossils and a similar number of predominantly marine bivalves. A single brackish water oyster, Ostrea, is commonly present. The fresh water bivalve, Ferganoconcha, also present higher in the Klappan Sequence, is present in middle Klappan strata in the Lost-Fox Area but it has not been found in the Summit area to date. Gastropods and belemnites are absent. The fossil content of this unit reflects the predominantly brackish to marine influence indicative of this environment.

The upper Klappan Sequence, which is 150 to 200 metres thick or more in the Lost-Fox Area is not present in the Summit Area but is well represented by outcrop and drill core on Lost Ridge. It has a gradational contact with the middle Klappan Sequence. This unit may have been deposited in a transitional upper delta plain-fluvial environment as it grades upwards into the fluvial Malloch Sequence which is not exposed in the Summit Area.

Although the seams and stratigraphy in Summit South resemble those of the lower Klappan Sequence on Lost Ridge, a direct correlation of seams is not yet attainable with present data. With a horizontal stratigraphic distance of greater than three kilometres separating these two anthracite bearing areas, the possibility of facies changes cannot be ignored. Using the same naming convention as on Lost

Ridge only implies that the stratigraphy is thought to be of lower to mid Klappan Sequence.

6.4.2.3 Coal Seam Development

6.4.2.3.1 Klappan Sequence

The Summit South Area, and to a lesser extent, Marshall Ridge, Layton Ridge and the cirque south of Repeater Ridge continue to be of greatest interest in the Summit Area. Summit South offers favorable structural conditions and relatively thick laterally extensive coal seams. Marshall and Layton Ridges expose many anthracite seams but due to the structural complexity seam tracing is problematic. Caribou Cirque south of Repeater Ridge appears promising in that it contains a seam of greater than 2.5 metres thickness and has a vitrinite reflectance of 5.2 with 40% ash (TRC86030).

In total 64 hand trenches have been excavated to date, 7 in the 1986 field season (Table 6.6). Seam tracing in the Summit South Area has led to a much clearer understanding of the position of seams between trenches. Two diamond drill holes, DDH83003 and DDH82007, both drilled in the Summit South Area intersected a total of 7 distinct coal horizons.

Table 6.6

SUMMIT AREA TRENCH SUMMARY

Year	Trench	C/C + R (m)	Sequence
1981	81007	3.98/4.97	Klappan
	81008	3.07/4.45	Klappan
1982	82035	3.29/3.48	Klappan
	82039	6.36/7.72	Klappan
1983	83048*	6.60/7.00	Klappan
	83049	0.87/1.37	Klappan
	83051	1.36/1.47	Klappan
	83052	3.50/3.50; 4.83/5.20	Klappan
	83054	1.71/1.91	Klappan
	83055	2.32/2.74	Klappan
	83056	1.92/2.32	Klappan
	83057	1.93/2.54	Klappan
	83058	5.33/5.68	Klappan
	83059	0.91/1.13; 1.89/2.27	Klappan
	83060	7.68/9.24; 0.90/0.90	Klappan
	83061	1.40/1.90	Klappan
	83062	1.79/1.89	Klappan
	83063	0.00/4.20	Klappan
	83064	0.50/0.70	Klappan
	83065	0.08/0.08	Klappan
	83066	6.18/7.02	Klappan
	83067	1.10/1.81	Klappan
	83074	1.53/2.95	Klappan

*retrenched (85003) therefore not included in average coal seam thickness

Table 6.6
Cont'd

SUMMIT AREA TRENCH SUMMARY

Year	Trench	C/C + R (m)	Sequence
1983 (cont'd)	83075	3.15/3.25	Klappan
	83078	0.60/0.60	Klappan
	83079	0.70/0.70	Klappan
	83080	0.50/0.50	Klappan
	83081	0.80/0.80	Klappan
	83089	0.15/0.15	Klappan
	83090	3.75/4.85	Klappan
1984	84001	0.80/0.80	Klappan
	84002	0.75.0.75	Klappan
	84008	0.54/0.80	Klappan
	84009	0.48/0.48	Klappan
	84013	0.72/1.55	Klappan
	84016	0.59/2.13	Klappan
	84017	0.85/0.86	Klappan
	84020	1.53/2.91	Klappan
	84021	0.82/0.97	Klappan
	84022	2.55/2.65	Klappan
	84023	1.20/1.44	Klappan
	84024	0.75/0.75	Klappan
	84025	0.89/1.72	Klappan
	84026	1.63/1.83	Klappan
	84027	2.69/3.32	Klappan
	84028	0.75/1.58	Klappan
	84029	2.52/2.88	Klappan
	84030	0.32/0.43	Klappan

Table 6.6
Cont'd

SUMMIT AREA TRENCH SUMMARY

Year	Trench	C/C + R (m)	Sequence
1985	85001	1.22/2.27	Klappan
	85002	4.37/4.37	Klappan
	85003+	0.72/0.72	Klappan
	85005	1.06/1.23	Klappan
	85009	1.44/2.47	Klappan
	85011	2.44/3.00	Klappan
	85012	1.87/2.52	Klappan
	85019	1.30/1.50	Klappan
	85020	1.30/1.06	Klappan
	85021	1.39/1.63	Klappan
1986	86019	1.27/1.39	Klappan
	86030	2.47/2.78	Klappan
	86031	1.46/1.59	Klappan
	86033	1.36/1.45	Klappan
	86034	0.96/1.16	Klappan
	86035	2.16/3.15	Klappan

Note: TRC86032 with a C/C+R = 0.60/0.62 was logged for the purpose of seam tracing but is not included in above due to insufficient coal thickness.

+ relogged trench 83048

A similar seam naming convention has been used in the Summit Area as on Lost Ridge but does not yet imply seam continuity between the two areas. Based on available stratigraphic data, though, it has been determined that the Summit South Area is equivalent in age to the lower portion of the Klappan Sequence. Diamond drill hole DDH83003 intersected 6 seams with aggregate true thickness of 10.42 metres over an interval thickness of 126.61 metres. These seams have been named Ph', G', Gl', F', E', D', and C'.

Diamond drill hole DDH82007 located near the airstrip, intersected four seams designated as E', D', C', and B' (Table 6.7). They have a total true thickness of 8.36 metres over an interval of 78.66 metres.

6.4.2.4 Structure

Summit Area strata have been folded, and to a minor extent, faulted during at least two distinct phases of non-coaxial compression resulting in fold patterns tending northwest-southeast (F_1) and northeast - southwest (F_2). This pattern is also recognizable on a regional scale throughout the Mount Klappan property. Pronounced east - west trends,

Table 6.7

Summary of Summit Area Drilled Seam Intersections

Drill Hole	Seam**	Drilled Interval (m)	Seam True Thickness (m)	Interseam True Thickness (m)	Coal (m)/ Coal + Rock
82007	E'	19.19 - 23.10	3.91		2.13/3.91
				33.85	
	D'	57.14 - 59.85	2.71		1.95/2.71
				21.41	
	C'	81.26 - 81.71	0.45		Coal Loss
				14.85	
	B'	96.56 - 97.85	1.29		0.80/1.29
83003	ph'	In casing	0.47		0.97/0.47*
				27.34	
	Gu'	40.30 - 42.05	1.72		1.05/1.72
				2.71	
	G1'	44.80 - 48.00	3.20		1.93/3.20
				32.59	
	F'	80.59 - 82.74	2.15		Coal Loss
				4.20	
	E'	86.94 - 87.16	0.22		Coal Loss
				39.79	
	D'	126.95 - 128.24	1.26		1.06/1.26
				9.15	
	C'	137.68 - 139.10	1.40		1.09/1.40

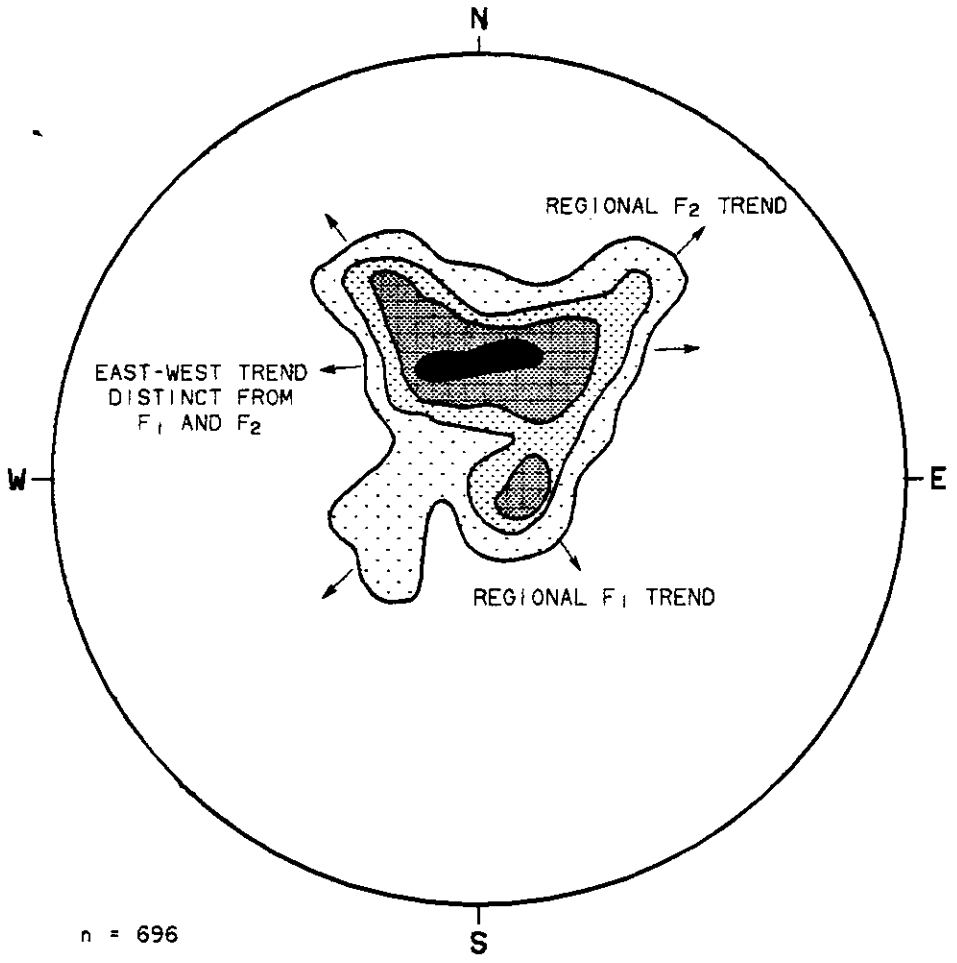
* Spudded into seam, coal unconsolidated and represents a minimum thickness.
** Seam designations are subject to confirmation by future drilling.

interpreted as being unrelated to D_1 and D_2 deformational events, are locally distinct.

An equal area plot of poles to bedding planes in the Summit Area demonstrates three prominent fold directions (Figure 6.4). The scatter of points (n = 696) does not allow graphical determination of F_1 or F_2 average plunges but Figure 6.5 clearly exhibits a shallow plunge, 2 to 5 degrees for the east - west trending fold direction.

Regional F_1 folds are typically upright to overturned to the north with a shallow southeasterly plunge of 5 to 6 degrees. Axial planes commonly dip steeply to moderately to the southwest with northern fold limbs generally steeper than southern limbs. In incompetent lithologies, where fold styles are tighter and of higher amplitudes, plunges may locally steepen to 28 degrees.

Second phase folds which typically trend northeast - southwest are of limited extent throughout most of the Summit region, but are significant locally at the east end of Marshall Ridge and in Summit South, southwest of DDH83003. Plunges appear to be shallower than those measured on F_1 structures, although this observation may be biased by the competency of the strata in which they are contained. Axial planes dip moderately to steeply in either a northwest or southeast direction. Both have been observed in Summit south.



5 - 6% (34 - 41 MEASUREMENTS)
4 - 5% (26 - 34)
3 - 4% (20 - 26)
2 - 3% (14 - 20)
0 - 2% (0 - 14)

FIGURE 6-4

MOUNT KLAPPAN ANTHRACITE PROJECT

1986 SUMMIT AREA
KLAPPAN SEQUENCE
EQUAL AREA PLOT OF POLES TO BEDDING PLANES

GULF CANADA CORPORATION

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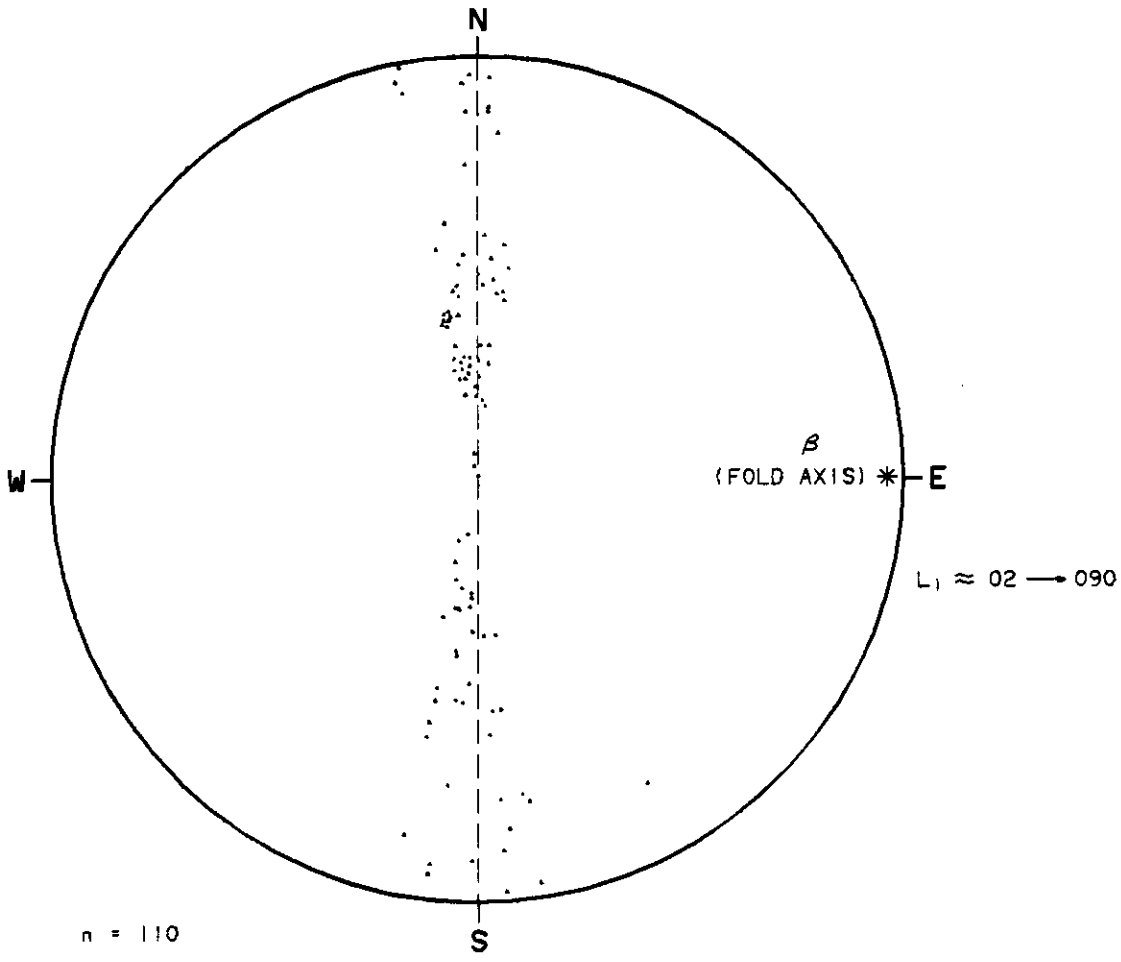

· POLE TO BEDDING PLANE

FIGURE 6-5

MOUNT KLAPPAN ANTHRACITE PROJECT

1986 SUMMIT AREA-KLAPPAN SEQUENCE
S-POLE PLOT OF EAST-WEST TRENDS

GULF CANADA CORPORATION

GULF CANADA CORPORATION
19/03/87
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Small scale localized faulting associated with D_1 or D_2 compressional events is of minimal significance. Dextral strike-slip and normal faults with displacements of less than 10 metres have been observed.

Thrust faulting is believed to be of a smaller scale than previously interpreted. The thrust fault originally drawn west of Marshall Ridge and extending through Repeater Valley has been reinterpreted as a syncline trending 103 degrees and plunging 20 degrees to the southeast. Well developed axial planar cleavage which fans from near vertical in the core to 15 degrees on the limbs supports this interpretation.

The low angle thrust fault in Summit South has been reinterpreted as a broad anticline west of TRC83060, although outcrop exposure is very poor. Where this thrust trace falls between TRC83052, TRC83054, and TRC85011, recently collected data suggests that a series of tightly folded, overturned, northwest and southeast plunging anticlines of F_1 generation exist. Axial planes dip southeast with fold vergence to the northeast.

A shallowly southeast dipping thrust has been observed on Repeater Ridge with an inferred displacement of tens of metres. This localized feature exhibits tightly hinged drag folds with axes

perpendicular to the direction of movement of the thrust sheet. Drag folds indicate the area of slippage but disappear laterally, possibly into planar slip with very little apparent disturbance. Maximum amplitude of the drag folds is approximately 25 metres.

6.4.3 Nass Area

6.4.3.1 Spatsizi Sequence

The Spatsizi Sequence, which is exposed only in the northwest corner of the Nass licence blocks, is the lowest stratigraphic unit which outcrops on the Mount Klappan property. Although only 100 metres of middle to upper Spatsizi Sequence strata are exposed in the Nass Area, the total sequence thickness is probably up to 900 metres or greater, based on Spatsizi Park exposures.

On the basis of features noted property-wide, such as a highly diversified marine fauna, a total absence of in-situ plant fossils, and the general coarsening upwards trend of the strata, the sequence is interpreted to have been deposited during a marine regression which continued through Lower Cretaceous time. Bivalve and plant hash, minor large fossil logs, limited carbonaceous zones, very thin coal development and a predominance of low angle cross-bedded sandstones attest to the coastal processes in

effect during deposition of the uppermost Spatsizi Sequence.

Lithologically, this sequence is characterized by a generally coarsening upwards trend of interbedded, fine grained, wave rippled, medium to light grey sandstone containing abundant marine fauna and dark grey, laminated, siltstone and mudstone with lesser amounts of massive to channelled chert pebble conglomerate.

The prominent cyclicity of two to forty metre coarsening upward cycles, the presence of massive to trough cross-bedded and occasionally channelled conglomerate, and a fine to coarse sediment ratio of approximately 1.9:1, are key features of the sequence observed elsewhere on the property but not all evident in the Nass Area due to limited exposure. A number of diagnostic features of the Spatsizi-Klappan contact zone area such as crudely oriented fossil logs, low angle cross-bedded sandstones, minor carbonaceous mudstone and very thin coal seam development, and plant and bivalve hash are also absent in the limited Nass Area Spatsizi Sequence outcrops.

Due to the transitional nature of the marginal marine to marine upper Spatsizi-lower Klappan Sequence strata, a 200 metre gradational boundary is interpreted to be present between these two sequences.

6.4.3.2 Klappan Sequence

The Klappan Sequence, which gradationally overlies the marine Spatsizi Sequence, is the main coal-bearing unit of the Mount Klappan property. It outcrops in the Klappan River and Nass Lake valleys and on lower Helm Creek. The abundance of vegetated cover in the valleys limits the thickness of measured sections. A 225 metre section of uppermost Klappan has been measured east of Nass Lake (OTC86004) and a 90 metre section of strata, interpreted to be middle Klappan Sequence, is exposed on Clyde Creek (OTC86003). No lower Klappan Sequence sediments are exposed in the Nass Area although they are interpreted to exist in the Nass Lake and Klappan River valleys.

Lithologically, the sequence is dominated by poorly developed, 10 to 30 metre fining upward and coarsening upward sequences of discontinuous chert pebble conglomerate, thinly bedded, rippled, and occasionally channelled sandstone, thinly laminated orange to grey weathered siltstone, laminated dark grey mudstone and coal.

The middle Klappan Sequence Clyde Creek section lacks the marine bivalves and belemnites which are more commonly found in the lower Klappan Sequence, but it is characterized by abundant plant fossils, particularily Nilssonia tenuicaulis. This fern is

also dominant adjacent to thick coal seams in Summit South. Horizontal burrows are abundant in the finer lithologies. Four correlateable coal seams up to 2.16 metres thick exist in the Clyde Creek strata.

Sedimentological features of the upper Klappan Sequence are best exhibited in the measured section OTC86004, located east of Nass Lake. This 225 metre exposure consists of dominantly orange to buff weathered sandstone, minor discontinuous chert pebble conglomerates up to 10 metres thick, and packages of orange to grey weathering, thinly laminated, mudstone, coal and siltstone which weather in patterns similar to the "tiger stripes" on Summit South and Lost Ridge. The fine grained (mudstone and siltstone) to coarse grained (sandstone) ratio is approximately 0.5:1. Coarsening upwards sequences and fining upwards sequences, 1 to 30 metres thick, are generally poorly developed. Plant species are abundant and diverse. Unlike Lost Ridge upper Klappan Sequence strata which contains several marine sections which are identified by the presence of particular marine bivalves, the east Nass Lake upper Klappan Sequence section contains no marine fauna suggesting that the fluvial influence was far greater than the marine influence at this location.

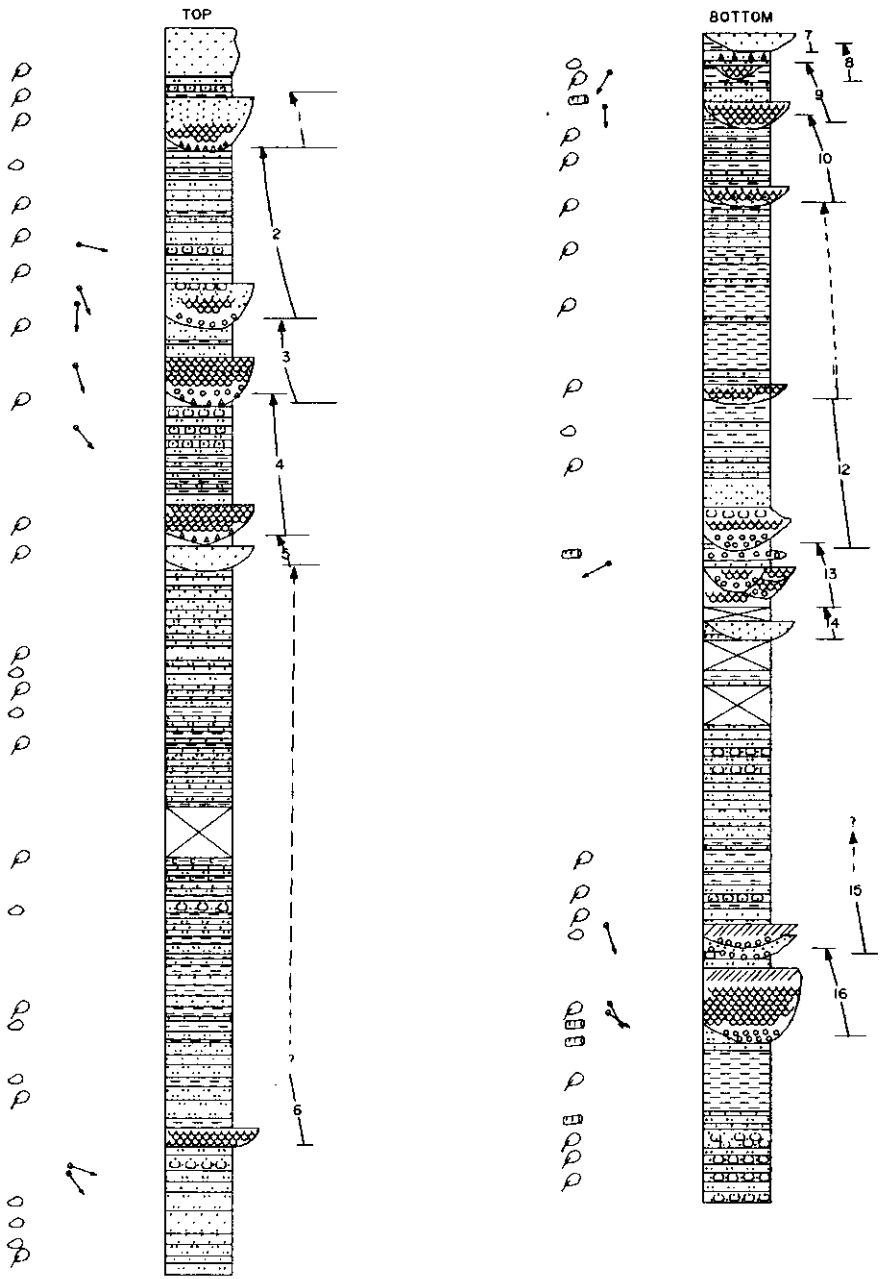
The environmental interpretation for the middle and upper Klappan Sequence does not differ markedly from that of the Klappan Sequence exposed in

the Summit Area. The strata is believed to have been deposited in a transitional upper delta plant to fluvial environment. This interpretation is supported by the lateral extent and thickness of coal, moderately thick sequences of clean sandstones which are commonly ripple and trough cross-bedded, an abundance of 5 to 25 metre thick shale and siltstone sequences and by paleontological evidence.

6.4.3.3 Malloch Sequence

The Malloch Sequence, which gradationally overlies the Klappan Sequence, has limited distribution within the Nass Area proper although it reaches a maximum thickness of 950 metres just east of the Nass Lake Area. Thinner exposures up to 400 metres are present west of Nass lake. The Malloch Sequence type section, considered to be the thickest and most typical exposure, is represented by Figure 6.6.

The most diagnostic feature of the Malloch Sequence is the presence of 1 to 10 metre thick sandstone and conglomerate channels which are often less than 20 metres in lateral extent, overlain by thinly interbedded, fine grained lithologies. These packages comprise 16 distinct channel sequences. Each channel sequence is defined by the presence of an active channel facies. Sequences interpreted to be abandoned channel and flood plain facies are present also in most cases.



LEGEND

- INTACT PLANT FOSSILS
- LOGS OR IMPRESSIONS
- SIDERITE NODULES
- TROUGH CROSS-STRATIFICATION
- RIPPLE CROSS-STRATIFICATION
- RIP-UP CLASTS
- PALEOCURRENT DIRECTION
- DISTINCT CHANNEL SEQUENCES

SCALE 1:2000

FIGURE 6-6

MOUNT KLAPPAN ANTHRACITE PROJECT

MALLOCH SEQUENCE TYPE SECTION

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The laterally accreted active channel facies is characterized by trough cross-stratified and plane-bedded, medium to fine grained sandstones and chert pebble conglomerates. Rip-up clasts, chert pebble lags and scouring are ubiquitous within this facies and high to medium angle planar cross stratification is rare. Logs or log impressions, trough orientation and channel morphology demonstrate current direction which, for the 14 measurements taken, was consistently southwest to southeast in orientation.

Overlying this facies in section is either a sequence interpreted to be formed by vertical accretion in a flood plain environment or one representative of an abandoned channel. The former is characterized by ripple cross-laminated or plane-bedded argillaceous siltstones and mudstones which commonly contain up to 15 species of intact plant fossils. The fern Cladophlebis virginiensis is most abundant in this facies. Thin, laterally discontinuous, carbonaceous mudstone bands and coal seams less than 0.5 metres thick may be present.

The abandoned channel facies is slightly coarser grained than the flood plain facies. Ripple cross-laminated or planar, fine grained sandstones, argillaceous siltstone and orange-weathered, sideritic siltstone nodules up to 1.5 metres wide are the dominant lithologies. In most cases, the sideritic siltstone units, interpreted as "bog irons" are

comprised of approximately 30 percent plant hash. This facies, like the flood plain facies, contains up to 15 plant fossil species and the conifer Czekanowskia rigida is the dominant species. Typically the active channel facies have sharp, scoured contacts with the abandoned channel facies. In a few cases "bog iron" rip-up clasts are present at the base of a channel which incised a unit of thin bedded argillaceous siltstone with scattered bog iron nodules.

The presence and vertical distribution of these three dominant facies has been interpreted to be the result of deposition within a meandering to distal braided system rather than within a distal alluvial system as previously suggested. There are three main lines of evidence to support this modified interpretation.

Firstly, braided stream models typically have a much greater range of paleocurrent directions than the 80 degree maximum divergence measured at 13 vertical positions within the Malloch type section. It is not uncommon for a braided stream to have paleocurrent directions which differ by as much as 180 degrees.

In-channel sandstones in a meander model are often lenticular and scoured and are generally characterized by trough cross-bedding or planar

bedding, whereas a braided stream channel sand is more sheet-like and most often displays planar cross-stratification. Within the Malloch type section, planar cross-stratification was documented only twice compared to the 15 occurrences of trough cross-bedding or plane bedding within channel sandstones.

The larger percentage of vertical accretion deposits (flood plain) compared to point bar (active channel) deposits of the meander model is a further line of evidence. If the Malloch Sequence was deposited in an end-member braided system the percentage of flood plain fines would be much lower than is evident in the type section.

The sharp, conformable contact with the overlying Rhondda Sequence is arbitarily marked by the first appearance of a laterally continuous, mappable conglomerate bed greater than 10 to 15 metres (and up to 35 metres) thick.

6.4.3.4 Coal Seam Development

6.4.3.4.1 Spatsizi Sequence

Thin discontinuous coal seams, usually less than one metre in thickness, occur at the very top of the Spatsizi Sequence in the transitional contact zone with the Klappan Sequence. Sediments in this

sequence are predominantly marine in nature and the few observed coal seams are not expected to be of economic importance.

6.4.3.4.2 Klappan Sequence

Within the Nass Area a total of 35 trenches have been excavated in the Klappan Sequence ranging from 0.77 to 4.47 metres in thickness (Table 6.8). The average thickness of all seams is 1.82 metres.

The Clyde Creek area, situated approximately 8 kilometres west southwest of Lost Ridge was concentrated on during part of the 1986 field season. Eleven trenches have shown that there are at least four coal zones ranging from less than a metre to approximately 3 metres in thickness (Figure 6.7). These seams dip generally to the southwest but outcrop data is limited and the continuance of this structure is uncertain. Problems associated with this area include an abundance of small scale normal faulting.

Trench TRC85010, interpreted to be stratigraphically near the Spatsizi/Klappan Sequence boundary has a coal/coal + rock thickness of 3.15/4.47 metres. This seam dips at 40 to 50 degrees to the southeast and

Table 6.8

NASS AREA TRENCH SUMMARY

Year	Trench	C/C + R (m)	Sequence
1982	82021	3.26/3.57	Klappan
	82022	1.13/2.60	Klappan
1983	83068	0.63/0.86	Klappan
	83069	0.91/0.91	Klappan
	83070	0.67/0.95	Klappan
	83071	3.62/3.96	Klappan
	83072	3.13/3.51	Klappan
	83073	3.01/3.36	Klappan
	83076	1.20/1.54	Klappan
	83077	1.32/1.48	Klappan
	83082	1.00/1.27	Klappan
	83083	1.13/1.50	Klappan
	83084	0.90/1.59	Klappan
	83085	0.80/0.90	Klappan
	83086	1.51/1.96	Klappan
	83087	0.70/0.80	Klappan
	83088	1.15/1.50	Klappan
	83091'	3.26/3.57	Klappan
1984	84003	1.50/1.50	Klappan
	84004	0.74/1.39	Spatsizi
	84005*	2.58/2.95	Klappan
	84006	1.31/1.46	Klappan
	84007	0.90/0.90	Klappan

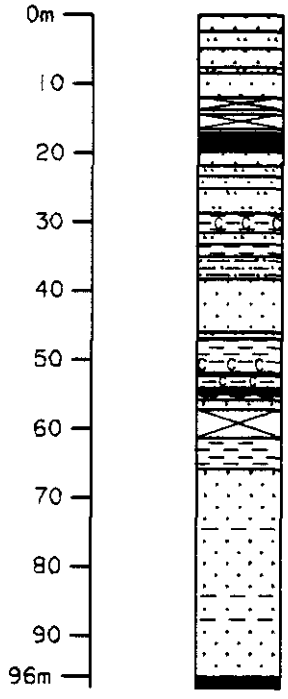
Table 6.8
Cont'd

NASS AREA TRENCH SUMMARY

Year	Trench	C/C + R (m)	Sequence
1984	84010	1.05/1.05	Klappan
(cont'd)	84011	3.36/3.74	Klappan
	84012	1.00/1.00	Klappan
	84014	1.95/2.16	Klappan
	84015	1.55/1.70	Klappan
	84018	1.10/1.68	Klappan
	84031+	0.95/1.09; 0.97/1.00	Klappan
	84032°	1.55/1.82	Klappan
1985	85010-	3.15/4.47	Klappan
	85018	0.73/0.93	Klappan
1986	86021	2.16/3.07	Klappan
	86022	1.52/1.71	Klappan
	86023	1.08/1.08	Klappan
	86024	1.06/1.56	Klappan
	86025	1.00/1.07	Klappan
	86026	0.97/0.97	Klappan
	86027	0.71/0.77	Klappan
	86028	0.94/0.94	Klappan
	86036	1.09/1.19	Klappan

NOTE: TRCNR86029 with a C/C+R = 0.32/0.40 was logged for the purpos of seam tracing but has not been included in above due to insufficient coal thickness.

' retrench of 82021
* retrench of 83073
+ retrench of 83071
° retrench of 82072
- retrench of 84004



COAL ZONE 1: TRC86021 (C/C+R=2.6/3.07)

COAL ZONE 2: NOT TRENCHED (<1.0m THICK)
COAL ZONE 3: TRC86022 (C/C+R=1.52/1.71)

COAL ZONE 4: TRC86026 (C/C+R=0.97/0.97)

SCALE: 1:1000

FIGURE 6-7

MOUNT KLAPPAN ANTHRACITE PROJECT

CLYDE CREEK, CENTRAL NASS AREA
COAL SEAM DEVELOPMENT
KLAPPAN SEQUENCE

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now lies within the lowermost part of the Klappan Sequence. Two other trenches, TRC83087 and TRC83088, approximately 2 kilometres east southeast of TRC85010 also have a similar coal/coal + rock ratio.

The Nass Area should contain the complete equivalent section of the Klappan Sequence. Due to the low percentage of outcrop in the Nass and Klappan valleys and the lack of diamond drill hole information, seam correlations and an understanding of the extent of seam development are tenuous.

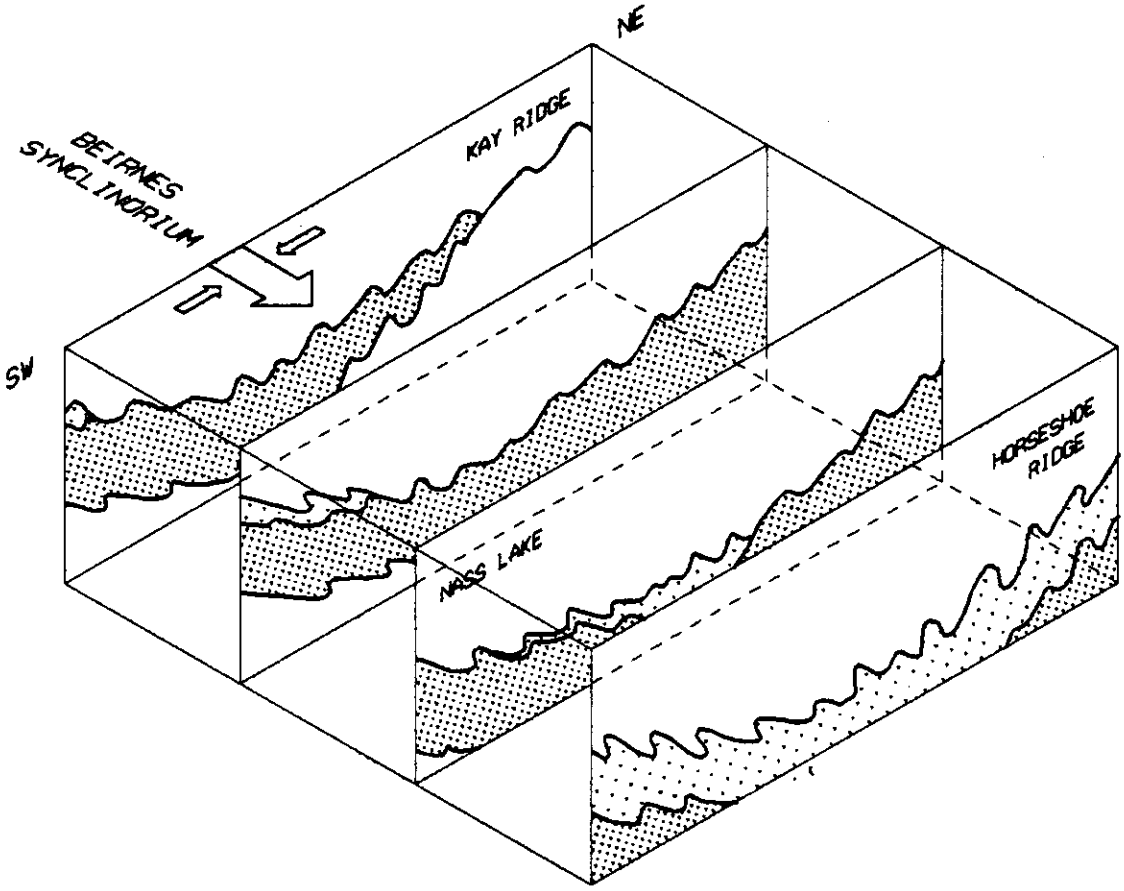
6.4.3.4.3 Malloch Sequence

In the Nass Area thin discontinuous seams only occur near the very base of the Malloch Sequence. Five trenches that were previously thought to be part of the Malloch Sequence in 1985 have been reinterpreted to be part of the uppermost Klappan Sequence. Generally the basal Malloch contains very thin discontinuous coal seams and carbonaceous mud which quickly gives way to coarser grained lithologies higher in the section.

6.4.3.5 Structure

Structural deformation within the Nass Area is the result of two phases of non-coaxial stress. The dominant structural features resulting from the first deformational phase (D_1) are the Beirnes Synclinorium and, outside the western property boundary, the Nass River anticlinorium. The synclinorium is easily identified on Beirnes Ridge as a shallow dish trending northwest - southeast within competent upper Malloch and lower Rhondda strata. The southerly plunge of the structure exposes lower Spatsizi sediments to the northwest and Rhondda Sequence strata to the southeast. East of the synclinorium axis folds verge northeast with generally long shallowly dipping southwest limbs and short northeast limbs. West of the axis folds display a southwesterly vergence. See Figure 6.8. In the area surrounding the synclinal axis fold styles vary but tend to be upright. One notable exception is the large scale recumbent folding of the upper Klappan strata northeast of Nass Lake.

Stratigraphically up section, into the Malloch Sequence, fold wavelengths generally become larger, amplitudes smaller and there is a definite decrease in the occurrence of overturned fold limbs. The primary structural trend is 130 degrees with plunges ranging from 14 degrees northwest to 10 degrees southeast. Locally plunges can be very steep.



MALLOCH SEQUENCE

KLAPPAN SEQUENCE

SPATSIZI SEQUENCE

FIGURE 6-8

MOUNT KLAPPAN ANTHRACITE PROJECT

NASS AREA GEOLOGICAL SCHEMATIC

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Thrusting, related to the first deformational event, is of minor importance. Two thrust faults have been recognized in the Malloch Sequence, on the western and southern boundaries of the Nass Area, each dipping southwest and each with displacements of tens of metres.

Primary cleavage is well developed throughout the Nass Area, particularly in fine grained lithologies. It commonly occurs in an axial plane convergent or divergent pattern and trends at 10 degrees.

The second deformational event, D_2, produced broad, open fold styles which can be identified as plunge reversals on primary folds. Axial trends vary from 90 to 110 degrees and have been traced for a maximum of 300 metres.

F_2 cleavage is evident in many localities but is better developed within siltstones and mudstones. It is axial plane convergent and divergent and parallels axial traces.

Strike slip faults trending from 10 degrees to 40 degrees east are believed to be associated with either the second deformational phase or a later structural event. Lateral translation of sediments up to 75 metres is common. On a smaller scale, two sets of minor faults have been observed, one trending 35°

the other at approximately 170°. Preliminary results from a fault study, initiated by K. Hunter, suggests that there is dual movement along some fault planes in the Summit and Nass regions. Movement appears to be both normal and strike slip in direction and shows displacements of anywhere from 2 - 30 metres. Final results of this study are not yet available but will be incorporated into the 1987 geological report.

6.4.4 Skeena Area

6.4.4.1 Klappan Sequence

Klappan Sequence sediments, which conformably overly the Spatsizi Sequence, are not exposed in sections greater than 100 metres in the Skeena Area and are tightly folded when present. They are interpreted to reach typical Mount Klappan property thicknesses of over 600 metres in the Tahtsedle Creek and Skeena River valleys on the basis of the interpreted stratigraphic position of the exposed sediments in the Tahtsedle Creek gorge. This gorge, at the headwaters of Tahtsedle Creek, exposes approximately 75 metres of upper Klappan Sequence strata and contains the only two Skeena Area coal seams thus far excavated.

Lithologically, the upper Klappan Sequence sediments consist of thickly bedded to finely laminated, medium grey sandstone in units up to 10

metres thick, orange weathered, thinly laminated, dark grey siltstone, minor chert pebble conglomerate up to 5 metres thick and thin sequences of carbonaceous mudstone with coal stringers and coal.

Approximately 8 to 10 plant macrofossil species are abundant, predominantly in the finer grained lithologies. No marine fauna is present.

The upper Klappan Sequence has a gradational upper contact with the Malloch Sequence. The Malloch-Klappan contact zone, which exhibits features of the transitional upper delta plain to fluvial upper Klappan Sequence and the fluvially-dominated Malloch Sequence, may be as thick as 200 metres in this region.

6.4.4.2 Malloch Sequence

The Malloch Sequence, which conformably and gradationally overlies the Klappan Sequence, has a maximum measured thickness of 355 metres in the Skeena Area, although it is interpreted to exceed 800 metres based on measured Malloch Sequences in the southern Nass Area.

Lithologically, the sequence does not differ greatly from the measured type section of the Nass Area (Figure 6.6). Distinctly channelled packages of scoured, clast to matrix-supported chert pebble

conglomerates fine upwards into trough and planar-bedded, medium to fine grained sandstone, and interbedded siltstone, fine grained sandstone and mudstone sequences. These fine grained, interbedded sequences have sharp, commonly scoured, upper contacts which are interpreted to represent successive channel incisions. Minor coal bands do not exceed 30 cm in thickness and are laterally discontinuous.

Approximately 10 to 15 plant species are abundant and no marine fauna has been documented to date.

The meandering fluvial model interpreted for the Malloch type section is believed to apply in the Skeena Area as well. Active channel facies of conglomerate or trough to planar-bedded medium grained sandstone fine upward to fine grained, thinly interbedded floodplain or abandoned channel facies. These distinct channel/floodplain sequences are diagnostic features of the Malloch Sequences and are described in detail in Section 6.4.3.3.

A sharp, conformable upper contact with the overlying Rhondda Sequence is arbritarily marked by the first appearance of a laterally continuous, massive conglomerate in excess of 10 to 15 metres.

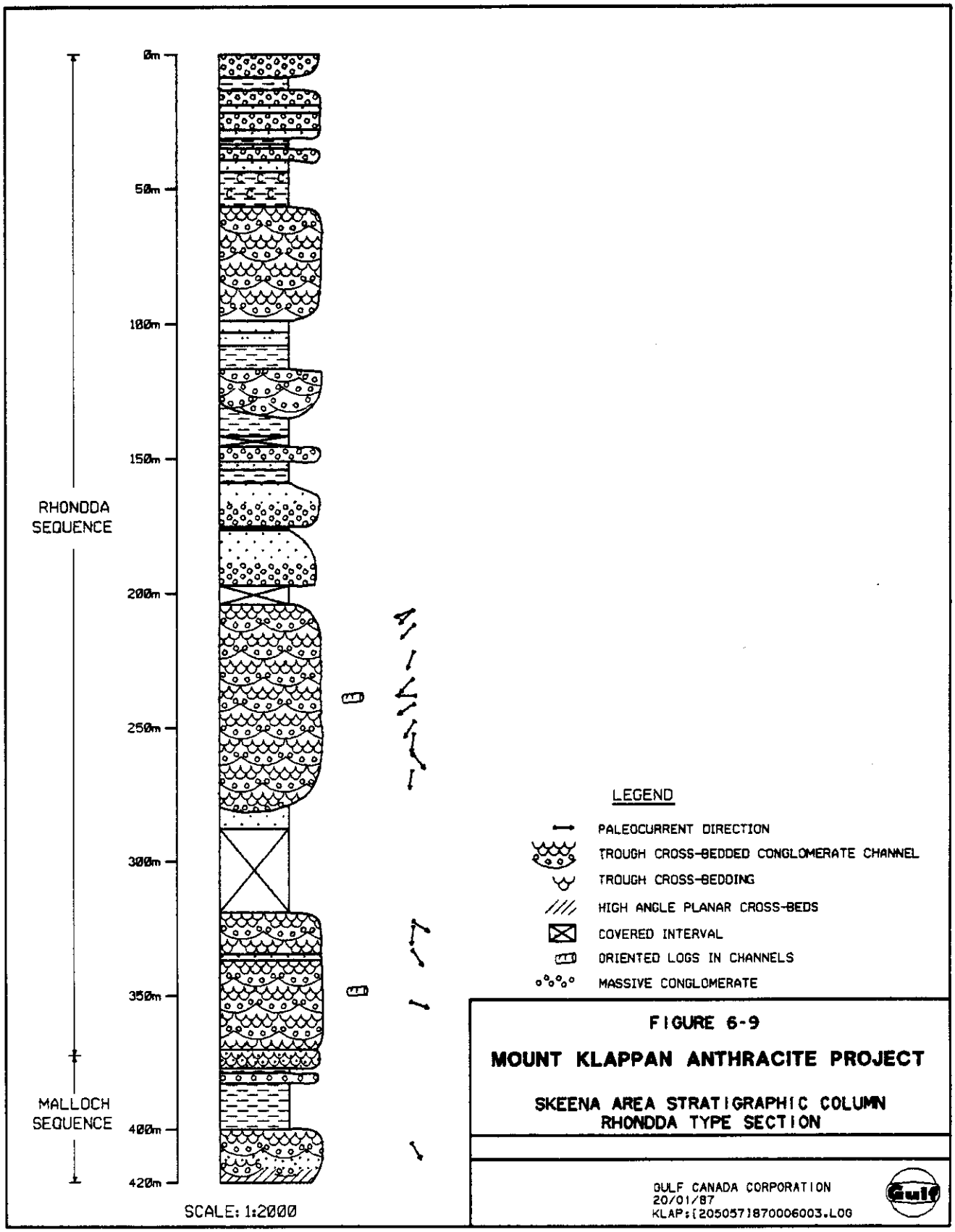
6.4.4.3 Rhondda Sequence

Rhondda Sequence sediments, which conformably overly the Malloch Sequence, have a very limited distribution throughout the Mount Klappan property. Although only 110 metres of section is measurable on the southeast boundary of the Skeena Area, the sequence attains a maximum thickness of 365 metres at the type section one ridge southeast of Mount Gunanoot. The vertical distribution of sediments within the type section is illustrated in Figure 6.9.

The basal, conformable contact is marked by the first appearance of a conglomerate in excess of 15 metres. Although the sequence is gradational in ennvironment of deposition with the underlying Malloch Sequence, an arbitrary lithological contact is used to delineate the boundary since the basal conglomerate is laterally continuous and easily mappable by airphoto or groundwork.

Lithologically, the Rhondda Sequence is characterized by thick units of trough cross-stratified chert pebble conglomerate channels with a lesser amount of trough cross-stratified or plane-bedded medium grained, grey sandstone, argillaceous siltstone and minor carbonaceous mudstone.

The conglomerate units are of great lateral extent and consist of abundant stacked conglomerate


0m
50m
100m
150m
200m
250m
300m
350m
400m
420m
RHONDDA SEQUENCE
MALLOCH SEQUENCE
SCALE: 1:2000
LEGEND
PALEOCURRENT DIRECTION
TROUGH CROSS-BEDDED CONGLOMERATE CHANNEL
TROUGH CROSS-BEDDING
HIGH ANGLE PLANAR CROSS-BEDS
COVERED INTERVAL
ORIENTED LOGS IN CHANNELS
MASSIVE CONGLOMERATE
FIGURE 6-9
MOUNT KLAPPAN ANTHRACITE PROJECT
SKEENA AREA STRATIGRAPHIC COLUMN
RHONDDA TYPE SECTION
GULF CANADA CORPORATION
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Gulf

channels with two predominant fossil log orientations, some crude pebble imbrication at the bottom of channel sequences, high clast angularity, and poor clast sorting. The conglomerates are predominantly clast-supported with a smaller percentage of matrix-supported units. Locally they may be openmict in character (limited to absent matrix) indicating very rapid deposition. The individual channels, which are highly variable in maximum height and lateral extent, have scoured bases, rip-up clasts, fining upwards cycles and sharp upper contacts with minor fine grained units consisting of thin-bedded, argillaceous siltstone and carbonaceous mudstone. Conglomerates make up to 70% of this sequence.

This sequence has been interpreted to have been deposited in an alluvial fan system on the basis of the radiating paleocurrent pattern (16 measurements), the predominance of trough cross-bedded or high angle cross-bedded conglomerate facies and a marked, often systematic, clast size variation within each conglomerate channel. The fine-grained component represents interlobe deposits.

Alternatively, conglomerates deposited in a braid plain environment would be characterized by a much more gradual clast size change over the same vertical distance, a predominance of horizontally bedded, highly imbricate conglomerate, and much higher paleocurrent divergences.

The conglomerates of the Rhondda Sequence differ from those found in the Spatsizi Sequence on a number of counts. The pebbles are generally larger (some up to 8 to 10 cm.) and more angular, and the units are more extensively channelled and cross bedded. In addition, the Rhondda Sequence has a greater frequency of large wood logs (commonly oriented parallel or perpendicular to channels) and a virtual absence of the marine fauna which typifies the Spatsizi Sequence. Although plant fossils are rare and poorly preserved, probably owing to the high energy environment of deposition, five species have been identified in the finer grained, interlobe sequence (Table 6.4).

6.4.4.4 Coal Seam Development

6.4.4.4.1 Klappan Sequence

The Skeena Area has a very limited amount of Klappan Sequence exposed but it is generally felt that the uppermost Klappan lies within the valleys of the area. Exposures of carbonaceous mudstone and minor anthracite seams occur in the Tahtsedle Creek area south of Klappan mountain. A single trench in this area uncovered a 1.02 metre seam (TRC86020) (Table 6.9).

Table 6.9

SKEENA AREA TRENCH SUMMARY

Year	Trench	C/C + R	Sequence
1984	84019	1.81/3.67	Klappan
1986	86020	0.96/1.02	Klappan

NOTE: In 1981 six grab samples were taken from coal spoil locations for reflectance.

6.4.4.4.2 Malloch Sequence

The Malloch Sequence, exposed in its entirety in the Skeena Area, is devoid of any seams greater than a metre in thickness. These seams tend to be dirty, are of limited lateral extent and are deemed to be uneconomic.

6.4.4.5 Structure

The outcropping of the Rhondda Sequence in the Skeena Area is due to the southeasterly plunging Beirnes Synclinorium. The plunge on the major structure has preserved the sequence in the southeast and eroded it elsewhere on the Mount Klappan property.

The Rhondda and uppermost Malloch Sequences are characterized by large broad open folds with low angle limbs. Stratigraphically lower in the Malloch fold amplitudes increase and overturns or high angle limbs are apparent. This change in deformational style is attributed to variations in rock competency between the conglomerates and finer sediments. Moffat and Bustin (1983) indicate the presence of a "structural detachment surface" within Gulf's Malloch Sequence in the Skeena mapping area.

This open fold style is observed on the ridges east of the Skeena and suggest the presence of

more competent lithologies as might be expected in the uppermost Malloch Sequence. West of the Skeena, mid Malloch stata is represented by an increase in the complexity of fold styles down section toward the Klappan Sequence.

6.4.5 Summit, Nass, Skeena Area Fault Study (Kent Hunter)

During the 1986 field season several hundred fault plane attitudes were measured principally in the central and southern Summit and Nass valley areas, with the purpose of determining the orientation and extent of brittle deformation. Airphoto lineations and trends were analyzed and oriented slickenside samples collected and thin sectioned. Three prominent fault directions and styles were observed.

Preliminary analysis suggests that the most consistent lineation noted across the property is a north-south trending set of predominantly dip-slip faults with an azimuth of 155 to 185 degrees and a steep dip of 70 degrees west to 85 degrees east. Where observed, normal fault displacement may be as large as 18 metres. This fault set is believed to be the most recent set on the property.

A second common fault set, which is believed to be cut by the north-south set, trends northeast to southwest with an azimuth to 020 to 035 degrees. This predominantly strike-slip fault set has an average dip of 75 degrees west.

Displacements of approximately 30 metres (maximum of 75 m) are interpreted on the basis of airphoto analysis.

A northwest to southeast trending set of strike-slip to dip-slip faults with azimuths of approximately 125 degrees has a limited distribution in central Summit, particularly along the B.C.R. and on west Lost Ridge. These faults are believed to be the earliest set, and they may be controlled by folding.

Results of this study have not been completed but will be incorporated into the 1987 Geological Report.

7.0 RESOURCES

7.1 Mount Klappan Coal Project

7.1.1 Summary

The in-situ, largely speculative level of coal resources of the Mount Klappan Coal Project total over 6.0 billion tonnes in seams greater than 0.5 metres in thickness to a maximum depth of 500 metres below surface. Of this total potential, 86.2 million tonnes are defined as being measured resources. The following table summarizes the resource contributions from each area of the property as well as the representation by resource category. These resource estimates do not imply mineability or economic viability. They represent estimated in-place anthracite resources only. The 1:50 000 Coal Resource Map (Appendix I) presents the distribution of resources over the Mount Klappan property.

Table 7.1
MOUNT KLAPPAN COAL PROJECT
COAL RESOURCES (MT)

	Category			
Area	Measured	Indicated	Inferred	Speculative
Lost-Fox	74.1	73.4	84.8	765.7
Hobbit-Broatch	12.1	24.5	369.1	731.6
Summit			31.8	1 859.1
Nass				1 991.7
Skeena				277.3
Total	86.2	97.9	485.7	5 625.4

Total Coal Resource Potential: 6 295.2 million tonnes

The coal seams of interest are contained within the strata of the Klappan Sequence. Coal measures of the Malloch and Spatsizi Sequences are not presently considered to be of economic importance and therefore, were not included in resource calculations.

The parameters within which the coal resources were classified and the procedures utilized in resource calculations are outlined in Section 7.3.3.

7.2 Summit-Nass-Skeena Area

7.2.1 Summary

The majority of the 4.2 billion tonnes of coal resource in the Summit-Nass-Skeena Area is at the speculative level (Table 7.2). At the inferred level, 31.8 million tonnes of resource lies within the southern part of Summit in two separate resource areas.

Two inferred resource areas are based on diamond drill hole seam intersections (DDH82007 and DDH83003) which have been tentatively designated as Klappan Sequence seams E' to B' and Ph' to C' respectively (Table 7.3). No overlap was included between these two adjacent resource areas due to the lack of outcrop control and the uncertainty of the stratigraphic position of the seams exposed in the trenches.

Table 7.2

SUMMIT-NASS-SKEENA AREA

COAL RESOURCES

(in million tonnes)

	Measured	Indicated	Inferred	Speculative
Summit Area			31.8	1 859.1
Nass Area				1 991.7
Skeena Area				277.3
Total				4 128.1

Total Resource: 4 159.9 million tonnes

7.3 Procedures and Parameters

7.3.1 Introduction

In-situ coal resources are defined as in place coal (coal and partings) contained in seams occuring within specified limits of thickness and depth from surface. Resources are further defined through classification into "measured", "indicated", "inferred", and "speculative" categories based on the existence and relative spacing of coal seam exploration data. None of the figures in any of the categories make any implications as to the practical mineability of the resource.

The procedures for the resource calculations include standard methods utilizing geological cross-sections and maps as described in Section 7.3.2.

The Energy Mines and Resources Report ER79-9: Coal Resources and Reserves of Canada outlines guidelines for coal resource calculations in the Cordilleran Region. These EMR parameters were modified for use in the Mount Klappan Coal Project as outlined in Section 7.3.2.

The parameters utilized for the 1986 Mount Klappan Coal Project are described in Section 7.3.3.

7.3.2 Procedures

A distribution of valid data points for each seam was established through diamond drill hole intersections and trenches. Based on maximum allowable data point spacing resources were calculated for a specific category.

Measured and indicated resource figures are derived from polygons constructed horizontally around valid data points within the resource area. To date, in the Summit Area, only inferred resources have been established due to the existence of just one data point in the resource area. In this case a horizontal circle was drawn around the data point and projected perpendicularly onto the cross-sections(s) intersecting the circles area of influence. The seam length was then measured within these limits.

In the Summit Area each resource area is represented by a single diamond drill hole. Each drill hole has been assigned a one kilometre radius influence.

The third dimension required for coal volume calculation after seam thickness and length have been determined is "strike length" or "influence" of the seam. This measurement usually equals the cross-section spacing if it is less than or equal to the required data point spacing for the resource category under consideration. Where a seam projects to the surface within the influence boundary the influence is measured to the point of outcrop.

To calculate coal tonnage in all categories a straight average of Mount Klappan coal quality data provided a specific gravity of 1.66 tonnes per cubic metre.

The resource calculation procedure is summarized by the following equation:

Tonnes of Coal =

Seam Thickness x *Seam Length* x *Influence* x *Specific Gravity*

(m) (m) (m) (t/m^3)

Speculative resources were calculated using a slightly different procedure. The areal extent, on the 1:50 000 Regional Geology Map (Appendix I), of the Klappan Sequence outside areas of a higher resource confidence was planimetered. The representative seam thickness of 11.25 metres applied to this area is 25 percent of the average of the combined coal thicknesses from the Lost-Fox (63.56 metres) and Hobbit-Broatch (26.40 metres) areas. This figure appears to be a reasonable estimate of the thickness of the coal-bearing section within the speculative resource area.

The previously determined specific gravity of 1.66 tonnes per cubic metre was used in the following equation summarizing speculative resource calculations.

$$\text{Tonnes of Coal} = \underset{(m^2)}{\text{Planimetered Area}} \times \underset{(m)}{11.25} \times \underset{(t/m^3)}{1.66}$$

7.3.3 Parameters

Resource parameters described below were used throughout the property, however due to data point density only inferred and speculative resources apply directly to the Summit-Nass-Skeena Area. The classification scheme is illustrated in Figure 7.1.

Seams with thicknesses greater than 0.5 metres were projected to a maximum depth of 500 metres for resource calculations.

7.3.3.1 Measured Resources

Measured resources include those in-situ resources delineated through establishment of exploration data points and therefore reported with confidence as to the character and continuity of the coal seams. The maximum distance between data points, which may include adits, drill holes, trenches and outcrops, is 300 metres.

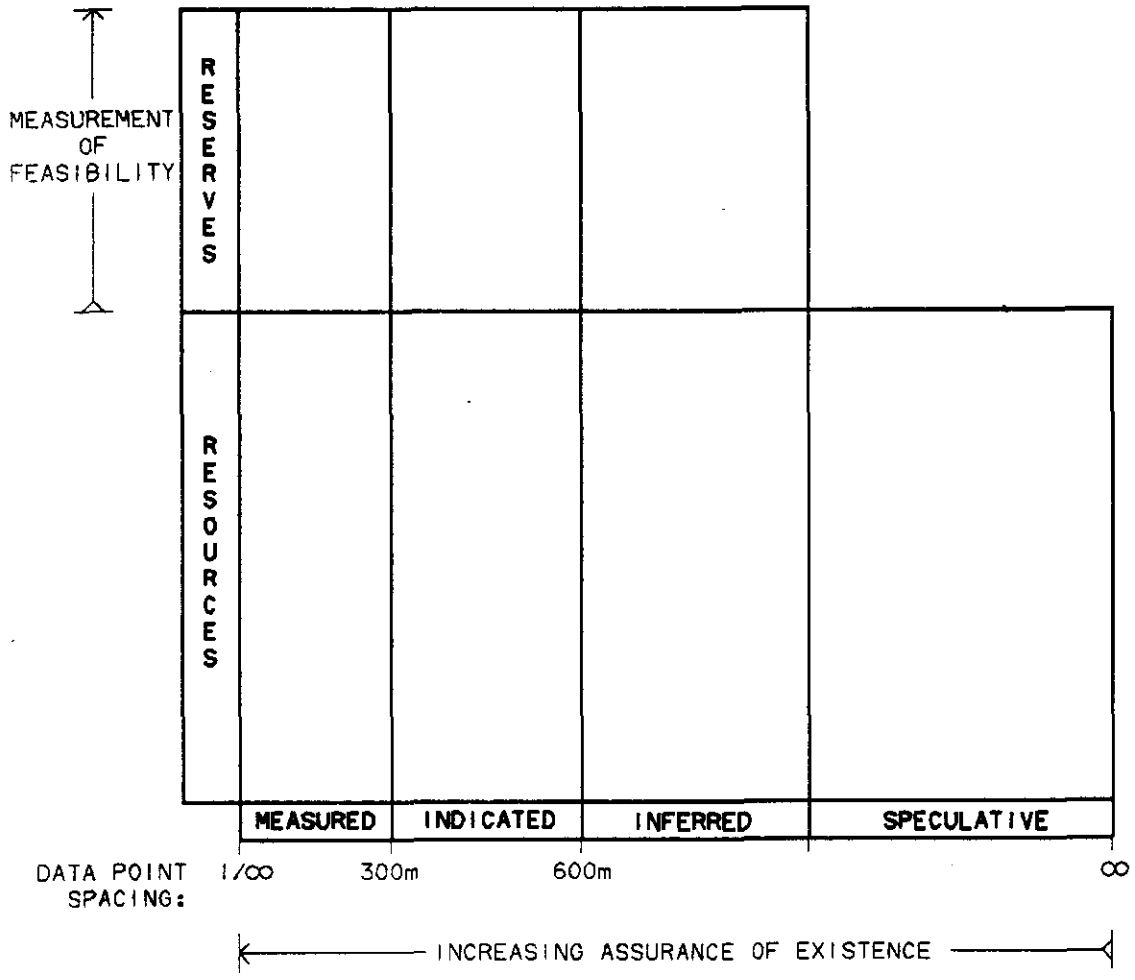

FIGURE 7-1

MOUNT KLAPPAN ANTHRACITE PROJECT

1986 RESOURCE CLASSIFICATION SCHEME

GULF CANADA CORPORATION

GULF CANADA CORPORATION
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7.3.3.2 Indicated Resources

Indicated resources include in-situ resources which are delineated using established data points as well as reasonable geological projections. The maximum distance between data points is 600 metres.

7.3.3.3 Inferred Resources

Inferred resources include in-situ resources which are delineated utilizing regional geological data points which aid in the prediction of coal seam continuity. Report ER79-9 does not state a data point spacing for this category. For the purposes of standardization for the 1986 Mount Klappan Coal Project resource calculations, a maximum data point spacing of 2000 metres was used for the inferred level. The inferred resource summary for the Summit Area is given in Table 7.4.

Inferred resources within the Summit-Nass Resource Areas were based on seams containing 60 percent coal. Where a coal zone contained two distinct seams, thicknesses were summed.

7.3.3.4 Speculative Resources

Speculative Resources include those in-situ resources calculated from a few scattered coal occurrences in areas of little or no geologic data

where the coal-bearing sequence is interpreted to exist. There is no maximum spacing in this category.

Speculative resources are only a broad geological indication of the amount of coal which could be contained within the Klappan Sequence; the vast majority of this would not be mineable under current economic conditions.

8.0 COAL QUALITY

8.1 Summary

The 1986 coal quality program for the Summit-Nass Area consisted of proximate, gross calorific and sulphur analyses for 18 hand trenches. Vitrinite reflectance determinations were performed on 6 of these samples (Table 8.1).

Coal quality analyses were performed by Loring Laboratories. D.E. Pearson and Associates Limited conducted the coal petrology studies.

8.2 Procedures and Parameters

Accessible coal explosures greater than 0.5 metres in true thickness were trenched, logged in detail and channel sampled during the course of the routine traverse. Sample intervals were chosen from the descriptive log and reflected changes in the character of the coal seam. Substantial partings and obvious differences in coal composition were sampled individually to enable tracing of these variations throughout the seam.

Appendix I contains all of the coal quality data for the 1986 trenches.

8.3 Summit Area

Six trenches were excavated in the southern Summit Area and one in the far north of the Summit Area to further define existing

Table 8.1

SUMMIT-NASS-SKEENA AREA

TRENCH SAMPLE

AVERAGE COAL QUALITY SUMMARY

1986

	Summit	Nass	Skeena
No. of Trenches Analysed	7	10	1
No. of Samples Included In Avg.	4	6	1
Proximate Analysis			
Residual Moisture (%)	3.5	4.1	2.3
Ash (%)	29.6	21.1	35.1
Volatile Matter (%)	19.3*	11.3*	7.4
Fixed Carbon (%)	47.6	63.5	55.2
Total Sulphur (%)	0.35	0.47	0.45
Gross Calorific Value (MJ/Kg)	18.5	23.7	20.2
Vitrinite Reflectance	--	3.9*	3.6*

*The volatile matter contents are very high due to the highly oxidized nature of the samples. Vitrinite reflectance confirms that these seams are actually of anthracite rank.

resource potential. All seams were analysed for proximate, gross calorific and sulphur values and three of these seams underwent vitrinite reflectance studies (Table 8.2).

The trenches in the Summit Area were excavated for several different reasons. Trenches 86-019, -030 and -031 were situated, by intent, very close to the interpreted Spatsizi-Klappan boundary and the samples from these were used primarily for vitrinite reflectance determination to assist in defining the boundary more systematically. Reflectance values are all quite high for these samples (see Table 8.2), verifying the supposition that the boundary trace should be in close proximity to the trenches. A normal range in the region of Summit with the best coal development is 3.15 to 3.50. As mapped, the trenches, in stratigraphically descending order, are 86-019 and then 86-030 in the very lowest Klappan sequence, with 86-031 perhaps right at the boundary with the Spatsizi.

The remaining trenches, 86-032 to -035, are all in the extensively trenched southern portion of the Summit Area. The same phenomenon affects the 1986 trench analyses as strongly influenced 1985 results. Very heavy weathering is detected in each proximate analysis. The total moisture values are in the range of 20% to 30% as compared with an average of just over 5% for unoxidized drill-core samples. Weathering is also reflected in high residual moisture values (3% to 4% as compared with under 2%) and high volatiles (over 24% where less than 8% would be expected). As the latter two parameters are interrelated in the proximate analysis with ash values, the numbers reported on Table 8.2 are artificially depressed by the inflation of residual

moisture and volatile matter. The average reported on Table 8.1 includes only these main Klappan sequence coals and should be used only for rough reference.

Curiously, the samples from very low Klappan strata reflect a relatively normal balance between the proximate values. Trenches 86-019, 86-030 and 86-031 show no signs of weathering except for slightly elevated total moisture content. This may be a function of the increase in rank of coal at this greater stratigraphic depth, but could be related to something as simple as the physiographic setting of the trench or some other factor that is controlled more by the site and circumstances of sampling than by significant variation in the nature of the coal.

8.4 Nass Area

Two separate clusters of coal occurrences were investigated by trenching in the Nass Area. The Clyde Creek area, discussed in the Geology section (see 6.4.3.4.2) was the site of trenches TRC86-021 to 86-026. The extreme weathering so apparent in most of the Summit trenches is not in evidence here. Total moistures fall generally near the 15% level and volatiles range between 10% and 15%, which, though high for a completely unoxidized coal, is fairly normal for a trench sample of weathered anthracite. The other area includes trenches TRC86-027 to 86-029 and -036, all situated on the west face of the ridge to the east of Nass Lake. Here the weathering does seem to be consistently pronounced, with total moistures up to almost 26% and volatile matter contents over 24%.

At Clyde Creek, the Geology section describes the identification of four distinct coal zones, three of which were thick enough to sample, and the results of proximate analysis indicate variance in the nature of the coal between zones. Trench 86-021 represents a 3 metre zone (Zone 1 as diagrammed on Figure 6.7) with an ash level of 27.59%. Zone 3 is transected by TRC86-022 and reports over 1.5 metres of coal with an ash content of 24.85%. TRC86-026 is chosen to represent Zone 4 and exposes a seam of almost 1 metre thickness and an ash level of 9.60%. TRC86-023 and 86-025 are excavated in close proximity to 86-026, on the same side of Clyde Creek, and appear to indicate a zone with similar thickness and low ash level. A single vitrinite reflectance value of 3.94 from TRC86-022 places the Clyde Creek area firmly in the stratigraphic range of the Klappan coal measures. The occurrence of several coal zones within a short stratigraphic span, with the quality as indicated, may hold significant promise for further investigation at Clyde Creek.

Low ash levels also appear in samples from the trenches at Nass Lake. TRC86-028, -029 and -036 have ash values between 9% and 16% but these are also the samples with the greatest evidence of weathering, and therefore artificial reduction of proximate ash values. TRC86-027 reports a normally balanced proximate analysis with an ash value of 26.99. It is expected that unoxidized samples from the other seams in the area would give similar values. Ash at this level does not make an unattractive prospect, but all these seams, except 86-036, have trenched thicknesses of less than 1 metre. TRC86-036 is just over 1 metre. A vitrinite reflectance reading of 3.23 from this trench suggests that the seams may be placed near the upper limit of coal occurrence in the

Klappan measures. The range of vitrinite reflectance values established for the Klappan sequence since 1981 is from just under 2.50 to just under 5.00.

8.5 Skeena Area

As described in the Geology section (see 6.4.4.4.1) there is no coal potential of note within the Skeena Area. The seam (1 metre) that was trenched was thought to be located in the higher strata of the Klappan coal measures. A vitrinite reflectance determination of 3.63 bears this out to some extent. The coal in the seam is of only moderate interest with a reliable ash value of 35.05%. The minimal exposures reported from Skeena suggest it has no great potential as a resource area.

9.0 LIST OF REFERENCES

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APPENDIX A

LEGAL DESCRIPTION OF LICENCES

Appendix A

MOUNT KLAPPAN COAL PROJECT LICENCES
1986

Summit Area

Licence	Effective Date	Hectares	Series	Block
7171*	Dec. 31/82	140.5	104-H-7	D
7173*	Dec. 31/82	140.0	104-H-7	D
7174	Dec. 31/82	280.0	104-H-7	D
7176	Dec. 31/82	277.0	104-H-7	D
7177	Sept. 1/81	280.0	104-H-7	D
7382	Mar. 15/82	280.0	104-H-6	H
7383	Mar. 15/82	108.0	104-H-6	H
7384	Mar. 15/82	281.0	104-H-7	D
7385	Mar. 15/82	204.0	104-H-7	D
7386	Mar. 15/82	280.0	104-H-7	D
7387	Mar. 15/82	280.0	104-H-7	D
7388	Mar. 15/82	172.0	104-H-7	D
7389	Mar. 15/82	275.0	104-H-7	D
7390	Mar. 15/82	280.0	104-H-7	D
7391	Mar. 15/82	115.0	104-H-7	E
7392	Mar. 15/82	260.0	104-H-7	E
7423	Mar. 15/83	281.0	104-H-7	D
7424	Mar. 15/83	280.0	104-H-7	D
7425	Mar. 15/83	280.0	104-H-7	D
7426	Mar. 15/83	280.0	104-H-7	D
7726	Jan. 10/84	280.0	104-H-6	A
7727	Jan. 10/84	280.0	104-H-6	A
7728	Jan. 10/84	280.0	104-H-6	A
7729	Jan. 10/84	280.0	104-H-6	A
7730	Jan. 10/84	280.0	104-H-6	A

Summit Area (cont'd)

Licence	Effective Date	Hectares	Series	Block
7731	Jan. 10/84	280.0	104-H-6	A
7732	Jan. 10/84	280.0	104-H-6	A
7733	Jan. 10/84	280.0	104-H-6	A
7734	Jan. 10/84	280.0	104-H-6	A
7735	Jan. 10/84	280.0	104-H-6	G
7736	Jan. 10/84	280.0	104-H-6	G
7737	Jan. 10/84	280.0	104-H-6	G
7738	Jan. 10/84	280.0	104-H-6	G
7739	Jan. 10/84	280.0	104-H-6	G
7740	Jan. 10/84	280.0	104-H-6	G
7741	Jan. 10/84	280.0	104-H-6	G
7742	Jan. 10/84	280.0	104-H-6	G
7743	Jan. 10/84	280.0	104-H-6	G
7744	Jan. 10/84	280.0	104-H-6	G
7745	Jan. 10/84	280.0	104-H-6	G
7746	Jan. 10/84	280.0	104-H-6	H
7747	Jan. 10/84	280.0	104-H-6	H
7748	Jan. 10/84	280.0	104-H-6	H
7749	Jan. 10/84	280.0	104-H-6	H
7750	Jan. 10/84	261.0	104-H-6	H
7751	Jan. 10/84	280.0	104-H-6	H
7752	Jan. 10/84	280.0	104-H-6	H
7753	Jan. 10/84	280.0	104-H-6	H
7754	Jan. 10/84	154.0	104-H-6	H
7755	Jan. 10/84	274.0	104-H-6	H
7756	Jan. 10/84	280.0	104-H-6	D
7757	Jan. 10/84	280.0	104-H-6	D
8047	Mar. 29/85	280.0	104-H-6	A
8048	Mar. 29/85	280.0	104-H-6	A

* Licence split between Summit-Nass-Skeena and Lost-Fox Areas.

Summit Area Total Hectares = 14 142.5

Nass Area Licence	Effective Date	Hectares	Series	Block
7150	Sept. 1/81	281	104-H-2	L
7154	Sept. 1/81	281	104-H-2	L
7421	Mar. 15/83	281	104-H-2	L
7422	Mar. 15/83	281	104-H-2	L
7427	Mar. 15/83	281	104-H-3	I
7428	Mar. 15/83	281	104-H-3	I
7429	Mar. 15/83	281	104-H-3	I
7430	Mar. 15/83	281	104-H-3	I
7431	Mar. 15/83	281	104-H-3	I
7432	Mar. 15/83	281	104-H-3	I
7487	Oct. 21/82	281	104-H-3	J
7488	Oct. 21/82	281	104-H-3	J
7505	Oct. 21/82	281	104-H-3	H
7506	Oct. 21/82	281	104-H-3	H
7507	Oct. 21/82	281	104-H-3	H
7508	Oct. 21/82	281	104-H-3	H
7509	Oct. 21/82	281	104-H-3	H
7510	Oct. 21/82	281	104-H-3	H
7511	Oct. 21/82	281	104-H-3	H
7512	Oct. 21/82	281	104-H-3	I
7513	Oct. 21/82	281	104-H-3	I
7514	Oct. 21/82	281	104-H-3	I
7515	Oct. 21/82	281	104-H-3	I
7516	Oct. 21/82	281	104-H-3	I
7517	Oct. 21/82	281	104-H-3	I
7518	Oct. 21/82	281	104-H-3	I
7519	Oct. 21/82	281	104-H-3	I
7520	Oct. 21/82	281	104-H-3	I

Nass Area (cont'd)

Licence	Effective Date	Hectares	Series	Block
7521	Oct. 21/82	281	104-H-3	I
7522	Oct. 21/82	281	104-H-3	I
7523	Oct. 21/82	281	104-H-3	I
7530	Oct. 21/82	281	104-H-2	L
7531	Oct. 21/82	281	104-H-2	L
7532	Oct. 21/82	281	104-H-2	L
7533	Oct. 21/82	281	104-H-2	L
7534	Oct. 21/82	281	104-H-2	L
7535	Oct. 21/82	281	104-H-2	L
7536	Oct. 21/82	281	104-H-2	L
8032	Mar. 29/85	281	104-H-3	J
8033	Mar. 29/85	281	104-H-3	J
8034	Mar. 29/85	281	104-H-3	J
8035	Mar. 29/85	281	104-H-3	J
8036	Mar. 29/85	281	104-H-3	J
8037	Mar. 29/85	281	104-H-3	J
8038	Mar. 29/85	281	104-H-3	J
8039	Mar. 29/85	281	104-H-3	J
8040	Mar. 29/85	281	104-H-3	J
8041	Mar. 29/85	281	104-H-3	J
8042	Mar. 29/85	281	104-H-3	J
8043	Mar. 29/85	281	104-H-3	J
8044	Mar. 29/85	281	104-H-3	J
8045	Mar. 29/85	281	104-H-3	J
8046	Mar. 29/85	281	104-H-3	J
8049	Mar. 29/85	281	104-H-6	B
8050	Mar. 29/85	281	104-H-6	B
8051	Mar. 29/85	281	104-H-6	B
8052	Mar. 29/85	281	104-H-6	B
8053	Mar. 29/85	281	104-H-6	B

Nass Area Total Hectares = 16 298.0

Skeena Area Licence	Effective Date	Hectares	Series	Block
7489	Oct. 21/82	282	104-H-2	G
7490	Oct. 21/82	282	104-H-2	G
7491	Oct. 21/82	282	104-H-2	G
7492	Oct. 21/82	282	104-H-2	G
7493	Oct. 21/82	282	104-H-2	G
7494	Oct. 21/82	282	104-H-2	G
7495	Oct. 21/82	282	104-H-2	G
7496	Oct. 21/82	282	104-H-2	G
7497	Oct. 21/82	281	104-H-2	G
7498	Oct. 21/82	281	104-H-2	G
7499	Oct. 21/82	281	104-H-2	G
7500	Oct. 21/82	281	104-H-2	G
7501	Oct. 21/82	281	104-H-2	G
7502	Oct. 21/82	281	104-H-2	J
7503	Oct. 21/82	281	104-H-3	K
7504	Oct. 21/82	281	104-H-3	K
7524	Oct. 21/82	281	104-H-2	K
7525	Oct. 21/82	281	104-H-2	K
7526	Oct. 21/82	281	104-H-2	K
7528	Oct. 21/82	281	104-H-2	L
7537	Oct. 21/82	281	104-H-2	F
7538	Oct. 21/82	281	104-H-2	F
7539	Oct. 21/82	281	104-H-2	F
7714	Jan. 10/84	281	104-H-2	G
7715	Jan. 10/84	281	104-H-2	G
7716	Jan. 10/84	281	104-H-2	G
7717	Jan. 10/84	281	104-H-2	G
7718	Jan. 10/84	281	104-H-2	G
7719	Jan. 10/84	281	104-H-2	G

Skeena Area (cont'd)

Licence	Effective Date	Hectares	Series	Block
7720	Jan. 10/84	281	104-H-2	G
7721	Jan. 10/84	281	104-H-2	G
7722	Jan. 10/84	281	104-H-2	G

Skeena Area Total Hectares = 9 000.0

Summit-Nass-Skeena Area Total Hectares = 39 440.5

APPENDIX B

DESCRIPTION OF WORK BY LICENCE

APPENDIX B

Distribution of Work by Licence

1986

Trench Number	Licence Number
KPNSNTRC86019	7755
KPNSKTRC86020	7529
KPNNRTRC86021	*7429 - 7517
KPNNRTRC86022	7429
KPNNRTRC86023	7429
KPNNRTRC86024	7429
KPNNRTRC86025	7429
KPNNRTRC86026	7429
KPNSSTRC86031	8047
KPNSSTRC86032	7726
KPNSSTRC86033	7728
KPNSSTRC86034	7727
KPNSSTRC86035	7756
KPNNRTRC86036	7509

* Trench located on boundary between these two licences.

Vitrinite Reflectance

GULF CANADA CORPORATION
Sample #5301

BASIC STATISTICS

Total Number of Observations.....	100
Mean Maximum Reflectance (Romax)...%	4.43
Standard Error of the Mean.....	.02
Coefficient of Variation.....%	4.64
Variance.....	.0424
Standard Deviation.....	.2058
Skewness.....	-.0265
Kurtosis.....	2.8900

CELL STATISTICS

Cell Number	Lower Limit	Number of Observations	Frequency (%)
5	[illegible]	1	1.00
6	[illegible]90	1	1.00
7	4.00	3	3.00
8	4.10	6	6.00
9	4.20	15	15.00
10	4.30	18	18.00
11	4.40	22	22.00
12	4.50	10	10.00
13	4.60	13	13.00
14	4.70	9	9.00
15	4.80	1	1.00
16	4.90	1	1.00

VITRINITE TYPE DISTRIBUTION

Vitrinite Type	Frequency (%)
V38	1.00
V39	1.00
V40	3.00
V41	6.00
V42	15.00
V43	18.00
V44	22.00
V45	10.00
V46	13.00
V47	9.00
V48	1.00
V49	1.00

Vitrinite Reflectance

GULF CANADA CORPORATION
Sample #5303

BASIC STATISTICS

Total Number of Observations	100
Mean Maximum Reflectance (Romax)...%	3.63
Standard Error of the Mean	.02
Coefficient of Variation...%	4.40
Variance	.0256
Standard Deviation	.1599
Skewness	.2159
Kurtosis	3.1412

CELL STATISTICS

Cell Number	Lower Limit	Number of Observations	Frequency (%)
3	3.20	1	1.00
4	3.30	6	6.00
5	3.40	13	13.00
6	3.50	22	22.00
7	3.60	25	25.00
8	3.70	20	20.00
9	3.80	8	8.00
10	3.90	3	3.00
11	4.00	2	2.00

VITRINITE TYPE DISTRIBUTION

Vitrinite Type	Frequency (%)
V32	1.00
V33	6.00
V34	13.00
V35	22.00
V36	25.00
V37	20.00
V38	8.00
V39	3.00
V40	2.00

Vitrinite Reflectance

GULF CANADA CORPORATION
Sample #5306

BASIC STATISTICS

Total Number of Observations	100
Mean Maximum Reflectance (Romax)...%	3.94
Standard Error of the Mean	.02
Coefficient of Variation...%	4.55
Variance	.0321
Standard Deviation	.1791
Skewness	.1291
Kurtosis	3.0487

CELL STATISTICS

Cell Number	Lower Limit	Number of Observations	Frequency (%)
2	3.50	2	2.00
3	3.60	9	9.00
4	3.70	10	10.00
5	3.80	19	19.00
6	3.90	24	24.00
7	4.00	17	17.00
8	4.10	12	12.00
9	4.20	5	5.00
10	4.30	1	1.00
11	4.40	1	1.00

VITRINITE TYPE DISTRIBUTION

Vitrinite Type	Frequency (%)
V35	2.00
V36	9.00
V37	10.00
V38	19.00
V39	24.00
V40	17.00
V41	12.00
V42	5.00
V43	1.00
V44	1.00

Vitrinite Reflectance

GULF CANADA CORPORATION
Sample #5454

BASIC STATISTICS

Total Number of Observations	100
Mean Maximum Reflectance (Romax)...%	5.20
Standard Error of the Mean	.02
Coefficient of Variation...%	4.33
Variance	.0507
Standard Deviation	.2251
Skewness	.1810
Kurtosis	2.3141

CELL STATISTICS

Cell Number	Lower Limit	Number of Observations	Frequency (%)
3	4.70	1	1.00
4	4.80	9	9.00
5	4.90	10	10.00
6	5.00	14	14.00
7	5.10	18	18.00
8	5.20	13	13.00
9	5.30	12	12.00
10	5.40	10	10.00
11	5.50	9	9.00
12	5.60	2	2.00
13	5.70	2	2.00

VITRINITE TYPE DISTRIBUTION

Vitrinite Type	Frequency (%)
V47	1.00
V48	9.00
V49	10.00
V50	14.00
V51	18.00
V52	13.00
V53	12.00
V54	10.00
V55	9.00
V56	2.00
V57	2.00

Vitrinite Reflectance

GULF CANADA CORPORATION
Sample #5455

BASIC STATISTICS

Total Number of Observations	100
Observations Selected for Statistics	99
Mean Maximum Reflectance (Romax)...%	4.95
Standard Error of the Mean	.02
Coefficient of Variation...%	4.03
Variance	.0396
Standard Deviation	.1991
Skewness	.2386
Kurtosis	2.7719

CELL STATISTICS

Cell Number	Lower Limit	Number of Observations	Frequency (%)
2	4.50	3	3.03
3	4.60	9	9.09
4	4.70	10	10.10
5	4.80	23	23.23
6	4.90	15	15.15
7	5.00	18	18.18
8	5.10	9	9.09
9	5.20	6	6.06
10	5.30	4	4.04
11	5.40	2	2.02

VITRINITE TYPE DISTRIBUTION

Vitrinite Type	Frequency (%)
V45	3.03
V46	9.09
V47	10.10
V48	23.23
V49	15.15
V50	18.18
V51	9.09
V52	6.06
V53	4.04
V54	2.02

Vitrinite Reflectance

GULF CANADA CORPORATION
Sample #5311

BASIC STATISTICS

Total Number of Observations	100
Mean Maximum Reflectance (Romax)...%	3.23
Standard Error of the Mean	.01
Coefficient of Variation...%	4.32
Variance	.0195
Standard Deviation	.1397
Skewness	.4385
Kurtosis	2.8095

CELL STATISTICS

Cell Number	Lower Limit	Number of Observations	Frequency (%)
4	2.90	2	2.00
5	3.00	13	13.00
6	3.10	29	29.00
7	3.20	26	26.00
8	3.30	14	14.00
9	3.40	13	13.00
10	3.50	2	2.00
11	3.60	1	1.00

VITRINITE TYPE DISTRIBUTION

Vitrinite Type	Frequency (%)
V29	2.00
V30	13.00
V31	29.00
V32	26.00
V33	14.00
V34	13.00
V35	2.00
V36	1.00

Table 7.3
SUMMIT AREA INFERRED RESOURCE DATA POINTS

Data Source	Seam	Drilled Interval (m)	True Thickness (m)	Interseam True Thickness (m)	Coal (m) Coal + Rock (m)
DDH82007	E'	19.19 - 23.10	3.91		2.31/3.91
				33.85	
	D'	57.14 - 59.85	2.71		1.95/2.71
				21.41	
	C'	81.26 - 81.71	0.45		Coal Loss
				14.85	
	B'	96.56 - 97.85	1.29		0.80/1.29
DDH83003	Ph'	in casing	0.47*		0.47/0.47*
				27.84	
	Gu'	40.30 - 42.05	1.72		1.05/1.72
				2.71	
	Gl'	44.80 - 48.00	3.20		1.93/3.20
				32.59	
	F'	80.59 - 82.74	2.15		Coal Loss
				4.20	
	E'	86.94 - 87.16	0.22		Coal Loss
				39.79	
	D'	126.95 - 128.24	1.26		1.06/1.26
				9.15	
	C'	137.68 - 139.10	1.40		1.09/1.40

*Spudded into seam, unconsolidated therefore minimum thickness; average thickness in surface exposures is 0.50 m

Table 7.4
INFERRED RESOURCE DATA SUMMARY TABLE
(Seam Tonnage in Million Tonnes)

DDH82007 Resource Area

Section	5500N	6000N	Total (per seam)
Seam			
E'	1.7	1.1	
D'	1.5	1.1	
B'	1.0	0.7	
Total (per section)	4.2	2.9	

Total Inferred Resource for DDH82007 Resource Area: **7.1mt**

DDH83003 Resource Area

Section	9 500N	10 000N	10 500N	11 000N	Total (per seam)
Seam					
Gu'	.9	.4			
Gl'	2.1	1.5			
F'	2.0	1.8	2.5	2.6	
D'	1.2	1.0	1.4	1.5	
C'	1.3	1.2	1.6	1.7	
Total (per section)	7.5	5.9	5.5	5.8	

Total Inferred Resource for DDH83003 Resource Area: **24.7mt**

Table 8.2

SUMMIT-NASS-SKEENA AREA

ASH AND REFLECTANCE SUMMARY

1986

Area	Location	Ash (%)	Reflectance	Sequence
Summit	TRC86019	37.20	4.43	Klappan
	TRC86030	44.64	5.20	Klappan
	TRC86031	36.45	4.95	Klappan
	TRC86032	35.62	--	Klappan
	TRC86033	22.57	--	Klappan
	TRC86034	28.61	--	Klappan
	TRC86035	31.62	--	Klappan
Nass	TRC86021	27.59	--	Klappan
	TRC86022	24.85	3.94	Klappan
	TRC86023	18.34	--	Klappan
	TRC86024	29.97	--	Klappan
	TRC86025	16.08	--	Klappan
	TRC86026	9.60	--	Klappan
	TRC86027	26.99	--	Klappan
	TRC86028	15.87	--	Klappan
	TRC86029	10.05	--	Klappan
	TRC86036	9.41	--	Klappan
Skeena	TRC86020	35.05	3.23	Klappan

APPENDIX C

RESOURCE DATA AND CALCULATIONS

1986 SPECULATIVE RESOURCE CALCULATIONS

AREA NAME	PLANIMETERED AREA (M2)	SEAM THICKNESS (M)	SPECIFIC GRAVITY (T/M3)	TOTAL TONNES SEAMS >=0.5m
SUMMIT	99550000	11.25	1.66	1859096250
LOST-FOX	41000000	11.25	1.66	765675000
HOBBIT	39175000	11.25	1.66	731593125
SKEENA	14850000	11.25	1.66	277323750
NASS	106650000	11.25	1.66	1991688750

TOTAL SPECULATIVE RESOURCES: 5625376875

OR 5.63 Billion Tonnes

SUMMIT AREA

INFERRED RESOURCES

SUMMIT AREA : RESOURCE CALCULATIONS March 1987. INF5500

SECTION : 5500 N
RESOURCE TYPE :INFERRED

SEAM NAME	DIAMOND DRILL HOLE	SEAM THICKNESS (m)	SPECIFIC GRAVITY (T/m3)	SEAM LENGTH (M)	WIDTH INFLUENCE (M)	TOTAL TONNES SEAMS >=0.5m
E'	82007	3.91	1.66	510	500	1655103
D'	82007	2.71	1.66	680	500	1529524
B'	82007	1.29	1.66	950	500	1017165
						SEAMS >=0.5m

TOTAL TONNES FOR THIS SECTION : 4201792 Tonnes

SUMMIT AREA : RESOURCE CALCULATIONS March 1987. INF6000

SECTION : 6000 N
RESOURCE TYPE :INFERRED

SEAM NAME	DIAMOND DRILL HOLE	SEAM THICKNESS (m)	SPECIFIC GRAVITY (T/m3)	SEAM LENGTH (M)	WIDTH INFLUENCE (M)	TOTAL TONNES SEAMS >=0.5m
E'	82007	3.91	1.66	330	500	1070949
D'	82007	2.71	1.66	480	500	1079664
B'	82007	1.29	1.66	680	500	728076
						SEAMS >=0.5m

TOTAL TONNES FOR THIS SECTION : 2878689 Tonnes

SUMMIT AREA : RESOURCE CALCULATIONS March 1987. INF9500

SECTION : 9500 N
RESOURCE TYPE :INFERRED

SEAM NAME	DIAMOND DRILL HOLE	SEAM THICKNESS (m)	SPECIFIC GRAVITY (T/m3)	SEAM LENGTH (M)	WIDTH INFLUENCE (M)	TOTAL TONNES SEAMS >=0.5m
GU'	83003	1.72	1.66	605	500	863698
GL'	83003	3.2	1.66	800	500	2124800
F'	83003	2.15	1.66	1120	500	1998640
D'	83003	1.26	1.66	1130	500	1181754
C'	83003	1.4	1.66	1120	500	1301440
					SEAMS >=0.5m	

TOTAL TONNES FOR THIS SECTION : 7470332 Tonnes

SUMMIT AREA : RESOURCE CALCULATIONS March 1987. INF10000

SECTION : 10000 N
RESOURCE TYPE :INFERRED

SEAM NAME	DIAMOND DRILL HOLE	SEAM THICKNESS (m)	SPECIFIC GRAVITY (T/m3)	SEAM LENGTH (M)	WIDTH INFLUENCE (M)	TOTAL TONNES SEAMS >=0.5m
GU'	83003	1.72	1.66	290	500	414004
GL'	83003	3.2	1.66	580	500	1540480
F'	83003	2.15	1.66	990	500	1766655
D'	83003	1.26	1.66	1000	500	1045800
C'	83003	1.4	1.66	990	500	1150380
					SEAMS >=0.5m	

TOTAL TONNES FOR THIS SECTION : 5917319 Tonnes

SUMMIT AREA : RESOURCE CALCULATIONS March 1987. INF10500

SECTION : 10500 N
RESOURCE TYPE :INFERRED

SEAM NAME	DIAMOND DRILL HOLE	SEAM THICKNESS (m)	SPECIFIC GRAVITY (T/m3)	SEAM LENGTH (M)	WIDTH INFLUENCE (M)	TOTAL TONNES SEAMS >=0.5m
F'	83003	2.15	1.66	1400	500	2498300
D'	83003	1.26	1.66	1360	500	1422288
C'	83003	1.4	1.66	1370	500	1591940
					SEAMS >=0.5m	

TOTAL TONNES FOR THIS SECTION : 5512528 Tonnes

SUMMIT AREA : RESOURCE CALCULATIONS March 1987. INF11000

SECTION : 11000 N
RESOURCE TYPE :INFERRED

SEAM NAME	DIAMOND DRILL HOLE	SEAM THICKNESS (m)	SPECIFIC GRAVITY (T/m3)	SEAM LENGTH (M)	WIDTH INFLUENCE (M)	TOTAL TONNES SEAMS >=0.5m
F'	83003	2.15	1.66	1480	500	2641060
D'	83003	1.26	1.66	1440	500	1505952
C'	83003	1.4	1.66	1460	500	1696520
					SEAMS >=0.5m	

TOTAL TONNES FOR THIS SECTION : 5843532 Tonnes

SUMMIT-NASS AREA

SPECULATIVE RESOURCES

SUMMIT SOUTH INFERRED RESOURCE DATA

DDHB3003 RESOURCE AREA

Seam	Section	Seam Thickness	Seam Length	Influence	Specific Gravity	Million Tonnes
Ph	9000N	0.50	145	460	1.68	0.06
G		4.92	700	460	1.68	2.66
F		2.15	910	460	1.68	1.51
D		1.26	950	460	1.68	0.93
C		1.40	990	460	1.68	1.07

Total inferred resource this section: 6.23mt

Ph	9500N	0.50	125	500	1.68	0.05
G		4.92	705	500	1.68	2.91
F		2.15	915	500	1.68	1.65
D		1.26	1510	500	1.68	1.60
C		1.40	1560	500	1.68	1.83

Total inferred resource this section: 8.04mt

Ph	10000N	0.50	400	500	1.68	0.17
G		4.92	350	500	1.68	1.45
F		2.15	910	500	1.68	1.64
D		1.26	1050	500	1.68	1.11
C		1.40	1090	500	1.68	1.28

Total inferred resource this section: 5.65mt

F	10500N	2.15	400	340	1.68	0.49
D		1.26	900	340	1.68	0.65
C		1.40	1025	340	1.68	0.82

Total inferred resource this section: 1.96mt

DDH82007 RESOURCE AREA

E	6000N	3.91	500	500	1.68	1.64
D		2.71	720	500	1.68	1.64
B		1.29	810	500	1.68	0.88

Total inferred resource this section: 4.16mt

E	5500N	3.91	360	500	1.68	1.19
D		2.71	480	500	1.68	1.09
B		1.29	700	500	1.68	0.76

Total inferred resource this section: 3.03mt

TRC84026-TRC84027-TRC83060 RESOURCE AREA

TRC84026	10000N	3.32	700	500	1.68	1.95
TRC84027	10500N	3.32	240	500	1.68	0.67
TRC830608	9500N	7.61	360	500	1.68	2.30
	10000N	7.61	220	500	1.68	1.79

Total inferred resource this area: 6.71mt

SUMMIT AREA TOTAL INFERRED RESOURCE: 35.78mt

SUMMIT-NASS AREA

SPECULATIVE RESOURCES

SUMMIT-NASS AREA SPECULATIVE RESOURCE DATA

SUMMIT AREA

Area	Planimetered Surface Area (m^2)	Aggregate Lava Thickness (m)	Specific Gravity (t/m^3)	Coal Tonnage (MT)
Basalt	142270000	9.53	1.65	1 389.3
Nass	106050000	9.53	1.65	1 706.5
Total	248320000	9.53	1.65	3 095.8

APPENDIX D

LISTING OF FOSSILS

SAMPLE NUMBER	GEOGRAPHIC LOCATION	STRATIGRAPHIC LOCATION	IDENTIFICATION (IF KNOWN)
MS86001	Mt Gunanoot near spire	Malloch, 10m below Rhondda contact	Czekanowskia rigida Nilssonia nigracollensis Ginkgo nana
OTC85011	two ridges W of Horseshoe Ridge	mid Malloch	Ctenis borealis Podozamites lanceolatus Czekanowskia rigida Cladophlebis virginiensis fisher Nilssonia nigracollensis
MSC86002	Hobbit cliff above J seam	above J seam in tiger stripe	Ctenis borealis Cladophlebis virginiensis Pityophyllum nordenskioldii
MSC86003	in pit, 3 cm below I seam	3 cm below I seam	Nilssonia tenuicaulis ONLY
MSC86004	in pit on high wall	above I seam	Sphenopteris brulensis
MSC86005	Outfitters Gate	lowermost Klappan	bivalves
SM860101	corkscrew ocp on BCR	lower Klappan-Spatsizi	Pityophyllum nordenskioldii Czekanowskia rigida Cladophlebis virginiensis Nilssonia tenuicaulis Helminthopsis bivalves
KH86001	"	"	unknown-sampled
SM860202	ocp after corkscrew, 91 km mark	Klappan?	bivalves
SM860203	ocp after above, 90 km mark	spatsizi	belemnite
PC86001	south side of Lost Ridge	roof of N	Ferganoconcha
SM860301	On BCR, 100m south of 98km mark	lowermost Klappan	bivalve
SM860302	On BCR, between 98-99 km mark	lowermost Klappan	large trunk, coalified plants
KJ860101	on BCR, 90 km mark	Spatsizi	belemnites
SL860101	L.R. tiger stripes at TRC82032	floor of K	bivalves Nilssonia tenuicaulis Pityophyllum nordenskioldii

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
			Czekanowskia rigida
			Sphenopteris?
SL860102	L.R. tiger stripes at TRC82031	1m above M	Sphenopteris brulensis
			Staffinella
			minor Czekanowskia rigida
			minor Baiera furcata
			minor Ptilophyllum montanense
SL860103	L.R. tiger stripes above TRC82031	30m above M	Sphenopteris brulensis?
SL860104	L.R. on slopes,TRC84290	seam O	Cladophlebis virginiensis
			Podozamites?Ginkgo nana?Nilssonia?
SL860105	Avalanche area	N-O interseam	Pityophyllum nordenskioldii
			Nilssonia schaumbergensis
			Nilssonia tenuicaulis
			Ginkgo nana
			Czekanowskia rigida
SL860106	Haul road, TRC84324	seam K-M?	Nilssonia tenuicaulis
			Nilssonia canadensis
			Czekanowskia rigida
			Nilssonia schaumbergensis
			Pityophyllum nordenskioldii
			Ptilophyllum montanense
			Pterophyllum rectangulare
			Sphenopteris?
			Baiera furcata?
			bivalves
			others
SL860107	Haul Rd, TRC84325	near seam N	Nilssonia schaumbergensis
			Pityophyllum nordenskioldii
			Nilssonia tenuicaulis
SM850201	L.R. large and small hogbacks	floor of J	Nilssonia tenuicaulis
			Czekanowskia rigida
			Sphenopteris
			Pterophyllum rectangulare
			Baiera furcata
			Cladophlebis virginiensis
BV8602	Haul road,TRC84297	I seam	gastropod
			Nilssonia tenuicaulis
			Czekanowskia rigida
			Pityophyllum nordenskioldii
			Sphenopteris
			Cladophlebis virginiensis
			Pterophyllum rectangulare

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
			Nilssonia sp.(cf. N. tenuicaulis)
BV8601	Haul Rd east of km 6	10 cm below J	Czekanowskia rigida Nilssonia tenuicaulis Baiera furcata Nilssonia schaumbergensis bivalve
SM860401	outside of pit above I	just above I	bivalve Czekanowskia rigida unknown plant(sampled)
SM860402	Haul Rd,TRC84203	I seam	Baiera furcata Czekanowskia rigida Pityophyllum nordenskioldii *Sphenopteris
SM860403	Haul Rd area,TRC84210	H seam	Czekanowskia rigida(minor) seeds?
SM860404	Haul Rd,TRC85026	J seam roof	Nilssonia tenuicaulis Baiera furcata
SM860405	Haul Rd roadcut	above J	Pityophyllum nordenskioldii other plants unidentified
SM860406	20 m west of TRC84295	K seam	Cladophlebis virginiensis *Baiera furcata Pterophyllum rectangulare
SM851903	Haul Rd,TRC85029	M seam	Czekanowskia rigida Nilssonia schaumbergensis Pityophyllum nordenskioldii
SM860407	Haul Rd,TRC84295	K seam	Nilssonia schaumbergensis Czekanowskia rigida Pityophyllum nordenskioldii Sphenopteris
SM860408	Haul Rd,TRC84299	K seam	plant scraps only
SM860409	Haul Rd,TRC84300	K seam	plant scraps only
SM860410	Haul Rd,east of TRC84300	L seam	Sphenopteris Pityophyllum nordenskioldii Czekanowskia rigida Baiera furcata Cladophlebis virginiensis Ginkgo nana

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
DDH84006	L.R,116m from top	10 m above I seam	Sphenopteris brulensis Nilssonia tenuicaulis
DDH84005	L.R,32m from top	between Ph and above G seam	Czekanowskia rigida
SM85002	L.R,west end	above F seam	Nilssonia tenuicaulis Pityophyllum nordenskioldii Czekanowskia rigida Pterophyllum rectangulare Nilssonia nigracollensis
SM850201	Lost Ridge	I-J interseam	Spenopteris brulensis Nilssonia sp. Czekanowskia rigida
SM850303	L.R.(AntiSyn Hill)	F-G interseam	Nilssonia sp. A Baiera furcata Czekanowskia rigida
SM851806	Haul Rd south of s.p. 2971	coaster zone above J	Ginkgo nana
SM851903	Haul Rd,TRC85029	above N seam	Czekanowskia rigida Nilssonia schaumbergensis Pityophyllum nordenskioldii
OTC85014	Lost Ridge	around O seam	Sphenopteris brulensis Nilssonia schaumbergensis Nilssonia tenuicaulis Pityophyllum nordenskioldii Baiera furcata Podozamites lanceolatus Ctenis borealis bivalves
JT85A	L.R. front east slope	around M seam	Pityophyllum nordenskioldii Nilssonia canadensis Nilssonia nigracollensis Ginkgo nana Sphenopteris brulensis Podozamites lanceolatus Nilssonia schaumbergensis Nilssonia tenuicaulis Pterophyllum rectangulare bivalves
JT85001	Lost Ridge	around N seam	C. virginiensis fisheri
DDH85003	Lost Ridge	10-20m above K seam	Pityophyllum nordenskioldii

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
			Nilssonia sp. Czekanowskia rigida Ginkgo nana Spenopteris
JT858	L.R. west end	just below G seam	Sphenopteris Cladophlebis virginiensis Nilssonia canadensis Pterophyllum rectangulare Pityophyllum nordenskioldii
JT8507	L.R. near s.c.# 19	near J seam	Sphenopteris brulensis Pterophyllum rectangulare
MB85001	L.R. east side	K-M interseam area	Ginkgo pluripartita
MB85001B	L.R. east side	just above N seam	Nilssonia sp.
SM860501	L.R. Haul Rd.	up to 3m above M seam	Nilssonia canadensis Cladophlebis virginiensis Czekanowskia rigida Baiera furcata Pityophyllum nordenskioldii Sagenopteris williamsii?
SM860502	L.R. Haul Rd	M-N interseam	Baiera furcata (sparse)
SM860503	L.R. Haul Rd.	N-O-P interseams	all barren
KJ860601	L.R. S.E. slope	N-O interseam?	bivalve
KJ860602	L.R. TRC84230	roof of M seam	Ginkgo nana
JT860902	Haul Road	N-O interseam	Ginkgo nana Nilssonia sp. Nilssonia tenuicaulis Baiera furcata wood branches
JT860901	Haul Road	M-N interseam	Staffinella
BV86F03	Haul Road	G-I region	bivalves Nilssonia tenuicaulis
KJ86071A	L.R. S.E. slope	upper section	Podozamites lanceolatus
KJ860601	L.R. S.E. slope	floor of M	Staffinella
SL8602	Mt Klappan canyon	above K	Nilssonia canadensis Nilssonia tenuicaulis

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
			Ginkgo nana Cladophlebis virginiensis Baiera furcata Baiera gracilis Podozamites lanceeolatus Czekanowskia rigida Pterophyllum rectangulare Pityophyllum nordenskioldii Sphenopteris Staffinella Equisitites lyelli
SM86070104	Tahtsedle canyon	uppermost Klappan	Ginkgo nana Nilssonia schaumbergensis Pityophyllum nordenskioldii Cladophlebis virginiensis Baiera furcata Czekanowskia rigida
LS860103	Tahtsedle Creek area	lowermost Malloch	Cladophlebis virginiensis fisheri
LS860104	"	"	Podozamites lanceolatus
KH86003	Hobbit Creek	upper Klappan	Nilssonia canadensis Nilssonia tenuicaulis Ginkgo nana Baiera furcata Sphenopteris Pityophyllum nordenskioldii worm burrows helminthopsis bivalves
SM860802	Tahtsedle Creek area	upper Klappan	Pterophyllum rectangulare Ginkgo nana Baiera furcata Nilssonia tenuicaulis Czekanowskia rigida Podozamites lanceolatus?
PT860702	Baiera Peak	mid to upper Klappan	Baiera furcata** Cladophlebis virginiensis martiniana Nilssonia schaumbergensis Nilssonia tenuicaulis Nilssonia nigracollensis Nilssonia sp.(new) petrified wood
BV8611	L.R. TRC84219	M seam	Pterophyllum rectangulare Nilssonia tenuicaulis

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
			Czekanowskia rigida
SM860901	westernmost Nass	Klappan-lower Malloch	Czekanowskia rigida
SM860903	"	"	Podozamites lanceolatus Sphenopteris Pityophyllum nordenskioldii Czekanowskia rigida
SM861001	west Nass Lake	uppermost Klappan	Nilssonia canadensis** Czekanowskia rigida Pityophyllum nordenskioldii Podozamites lanceolatus bivalve
SM861002	"	"	Cladophlebis virginiensis fisheri** Baiera furcata Sphenopteris
SM861003	"	"	Pterophyllum rectangulare Cladophlebis virginiensis fisheri Podozamites lanceolatus
KH8602	creek flowing into Klappan River	upper Klappan?	bivalves
SM861101	Mount Klappan Baiera Peak	Malloch	Pterophyllum rectangulare Cladophlebis virginiensis fisheri Cladophlebis virginiensis martiniana Baiera furcata Nilssonia tenuicaulis Nilssonia schaumbergensis Pterophyllum plicatum Ptilophyllum montanense Pityophyllum nordenskioldii tree branches
SM861102	Mount Klappan south side	upper Klappan?	Ginkgo nana Sphenopteris Cladophlebis virginiensis Baiera furcata Pterophyllum rectangulare Nilssonia canadensis Ptilophyllum montanense Pityophyllum nordenskioldii
SL860301	Summit in Big Valley	lower Klappan	bivalves Nilssonia tenuicaulis Ginkgo nana? Ostrea

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
SL860302	Summit in Big Valley down from 01	lower Klappan	bivalves Ostrea
SL860304	Summit Big Valley N. fork	lower Klappan	bivalves
SM8611	Nass Clyde Creek	Klappan	Pityophyllum nordenskioldii Pterophyllum rectangulare Nilssonia tenuicaulis Ginkgo nana Baiera furcata new species
LS86009	ridge east of Nass Lake	upper Klappan	Nilssonia schaumbergensis Baiera furcata Ginkgo nana Cladophlebis virginiensis acuta Sphenopteris
SM861401	east of Nass Lake	upper Klappan	Baiera furcata Cladophlebis virginiensis martiniana Czekanowskia rigida
SM861501	OTC86002 east of Nass Lake	lower Malloch	Cladophlebis virginiensis Nilssonia tenuicaulis Pityophyllum nordenskioldii Czekanowskia cf. rigida
SM861502	"	"	Cladophlebis virginiensis? Podozamites lanceolatus Nilssonia tenuicaulis Cladophlebis virginiensis fisheri Czekanowskia rigida seeds
SM861503	"	"	Czekanowskia rigida Podozamites lanceolatus Nilssonia canadensis Ginkgo nana Baiera furcata
SM861504	"	"	Sphenopteris? Baiera furcata large trees
SM861505	"	"	Cladophlebis virginiensis martiniana Baiera furcata Baiera gracilis? Nilssonia schaumbergensis bivalves

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
SM861506	"	"	Gingo nana Cladophlebis virginiensis Pityophyllum nordenskioldii
SM861507	"	"	Nilssonia schaumbergensis Sagenopteris williamsii Podozamites lanceolatus Nilssonia sp.(cf. tenuicaulis) Ginkgo nana
SM8616 (KJ8611)	5 miles SW of Nass Lake	Malloch	Nilssonia nigracollensis Czekanowskia rigida Cladophlebis virginiensis Baiera furcata
JT862101	NW Lost Ridge	seam E	wood pieces Nilssonia schaumbergensis Czekanowskia rigida Nilssonia sp.
		seam F	bivalve Pityophyllum nordenskioldii wood pieces Nilssonia?
JT862102	"	below seam B	bivalves Czekanowskia rigida Nilssonia tenuicaulis wood pieces
JT862103	"	below seam D	bivalves Nilssonia nigracollensis
JT862204	"	at A'-2 seam	Czekanowskia rigida Nilssonia tenuicaulis new species?(cf. N. canadensis)
JT862205	"	A-B interseam	bivalves
SM861701 (KJ8613)	N. Nass new leases	upper Spatsizi	bivalves
SM861702	"	"	bivalves
SM861703	"	"	bivalves
SM861704	"	"	bivalves
SM861705	"	"	bivalves

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
JT862306	NW Lost Ridge	below B seam	bivalves (2+ species)
SM861801	NW Nass	upper Spatsizi-lowermost Klappan	bivalves
SM861702	"	30m above 01	bivalves
SM861703	"	10m above 02	bivalves
SM861704	"	above 03 in roof and floor of coal	Pterophyllum rectangulare Nilssonia tenuicaulis Czekanowskia rigida? new species Pterophyllum plicatum
SM861705	"	3m above 04;roof of carb mdst	bivalves
SM861706	"	15 above 05	bivalves
SM861707	"	5m above 06;floor of coal	Cladophlebis virginiensis Pityophyllum nordenskioldii bivalves
SM861708	"	20m above 07;roof of carb mdst	Pityophyllum nordenskioldii Sphenopteris Nilssonia tenuicaulis
SM861709	"	10m above last;roof of carb mdst	Pityophyllum nordenskioldii
SM861710	"	30m above 09	bivalves(Herzogina?) belemnites
SM861711	"	same bed as 10 repeated	Herzogina?
SM861712	"	"	bivalves
SM861713	"	10m below 12; same as 08	Sphenopteris bruiensis Pityophyllum nordenskioldii Nilssonia tenuicaulis
LS86014	N Summit	upper Spatsizi-lower Klappan	bivalve
JT862408	NW Lost Ridge	below seam B	bivalves plant hash
JT862409	NW Lost Ridge	D Seam	Nilssonia tenuicaulis plant hash bivalve infills
JT862410	NW Lost Ridge	Below b seam	bivalves plant hash

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
JT862411	NW Lost Ridge	A-B interseam	small bivalves Cladophlebis virginiensis
JT862412	NW Lost Ridge	below A seam	small bivalves
SM861901	SC Summit	lowermost Klappan sequence	Staffinella and other bivalves
SM861902	SC Summit	lowermost Klappan sequence	Nilssonia tenuicaulis Pityophyllum nordenskioldii
SM861903	SC Summit	25 m above SM861901	Staffinella and other bivalves
SM861904	SC Summit	lowermost Klappan sequence	Nilssonia tenuicaulis Pityophyllum nordenskioldii
SM862006	SC Summit	lowermost Klappan sequence	Staffinella and other bivalves
SM862009	SC Summit	lowermost Klappan sequence	belemnite (in skree) bivalve
JT862613	W of West Pond	below seam A-2 ?	Nilssonia tenuicaulis Nilssonia nigracollensis Cladophlebis virginiensis
JT862614	W of West Pond	seam A-3 or A-4 ?	bivalve infills Nilssonia tenuicaulis plant hash
JT862615	below TRC84249	2 m below A-5 ?	Nilssonia tenuicaulis Equisetites lyelli
JT862616	below TRC84250	1 m below A-5 ?	Ginkgo nana Ginkgo pluripartita Baiera furcata small bivalves Nilssonia tenuicaulis Pityophyllum nordenskioldii Elitides curvifolia
BV862501	Lost Ridge	Klappan sequence	bivalves (2 species) Helminthopsis
SM862101	SC Summit	lower Klappan sequence	bivalves
SM862201	SC Summit	mid-lower Klappan sequence	Pityophyllum nordenskioldii Czekanowskia rigida Baiera furcata

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
LS861701	E Skeena	lower Malloch sequence	Cladophlebis virginiensis martiniana Cladophlebis virginiensis fisheri
KJ861701	N Summit	upper Spatsizi sequence	Ostrea Modiolus
KJ861702	N Summit	lowermost Klappan sequence	small bivalves Ostrea
KJ861703	N Summit	lower Klappan sequence	bivalves belemnites Ostrea
KJ861704	N Summit	upper Spatsizi sequence	turritellid gastropods snails bivalve
DW86002	N Summit	lower Klappan sequence	Ptilophyllum montanense Pityophyllum nordenskioldii Podozamites lanceolatus
LS86018-5	S Summit	mid-lower Klappan sequence	bivalve casts
JT863001	W Lost Ridge	2-3 m above seam A-1 ? 1 m above seam A-1 ?	belemnites bivalves
DW86004	Lost Ridge waste dump	"lower I seam"	Nilssonia canadensis Pityophyllum nordenskioldii Baiera furcata Pterophyllum rectangulare
DW86005	Lost Ridge waste dump	scree below DW86004	bivalve
GM860105	C Summit	uppermost Spatsizi	Modiolus and other bivalves
SM86STF-2	Spatsizi type section	543 m from top of section	Trigonia and other bivalves
SM86STF-3	Spatsizi type section	520 m from top of section	bivalves
SM86STF-5	Spatsizi type section	507 m from top of section	bivalves
SM86STF-6	Spatsizi type section	475 m from top of section	bivalves
SM86STF-7	Spatsizi type section	465 m from top of section	Trigonia
SM86STF-11	Spatsizi type section	222 m from top of section	bivalves
SM86STF-12	Spatsizi type section	195 m from top of section	bivalves

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
SM86STF-13	Spatsizi type section	135 m from top of section	bivalves belemnites ammonite
SM86STF-14	Spatsizi type section	47 m from top of section	bivalves serpulid worm ? belemnite
SM86RTF-1	Rhondda type section	lowermost Rhondda sequence	Czekanowskia rigida Baiera furcata
SM86RTF-2	Rhondda type section	lowermost Rhondda sequence	petrified wood
SM86MTF-1	Malloch type section	25-30 m from top	Czekanowskia rigida conifer seeds fresh water pelecypod
SM86MTF-1A	Malloch type section	25-30 m from top	Podozamites cf. lanceolatus Cladophlebis virginiensis martiana
SM86MTF-1B	Malloch type section	25-30 m from top	Cladophlebis virginiensis
SM86MTF-1C	Malloch type section	25-30 m from top	Czekanowskia rigida
SM86MTF-2	Malloch type section	942 m from top	Nilssonia tenuicaulis Ctenis borealis Czekanowskia rigida Podozamites ?
SM86MTF-2B	Malloch type section	932 m from top	Czekanowskia rigida
SM86MTF-2C	Malloch type section	909 m from top	Czekanowskia rigida
SM86MTF-2D	Malloch type section	840 m from top	Czekanowskia rigida Cladophlebis virginiensis fisheri Podozamites lanceolatus
SM86MTF-3	Malloch type section	800 m from top	Cladophlebis virginiensis
SM86MTF-3B	Malloch type section	673 m from top	Cladophlebis virginiensis Czekanowskia rigida
SM86MTF-3C	Malloch type section	646 m from top	Czekanowskia rigida
SM86MTF-3D	Malloch type section	646 m from top	Cladophlebis virgininsis Ginkgo nana Czekanowskia rigida Pityophyllum nordenskioldii

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
SM86MTF-3E	Malloch type section	564 m from top	Czekanowskia rigida Cladophlebis virginiensis
SM86MTF-3F	Malloch type section	564 m from top	Equisetites lyelli
SM86MTF-3G	Malloch type section	564 m from top	Czekanowskia rigida
SM86MTF-4	Malloch type section	516 m from top	petrified wood
SM86MTF-4B	Malloch type section	410 m from top	Czekanowskia rigida
SM86MTF-4C	Malloch type section	410 m from top	Czekanowskia rigida
SM86MTF-5	Malloch type section	492 m from top	petrified wood
SM86MTF-5B	Malloch type section	483 m from top	Podozamites lanceolatus
SM86MTF-5C	Malloch type section	442 m from top	Czekanowskia rigida
SM86MTF-5D	Malloch type section	414 m from top	Nilssonia tenuicaulis Podozamites lanceolatus Czekanowskia rigida
SM86MTF-5E	Malloch type section	391 m from top	Pityophyllum nordenskioldii Czekanowskia rigida Baiera furcata
SM86MTF-5F	Malloch type section	353 m from top	Cladophlebis virginiensis Czekanowskia rigida
SM86MTF-5G	Malloch type section	341 m from top	Czekanowskia rigida
SM86MTF-5H	Malloch type section	292 m from top	Czekanowskia rigida
SM86MTF-5I	Malloch type section	266 m from top	Czekanowskia rigida
SM86MTF-5J	Malloch type section	265 m from top	Czekanowskia rigida Cladophlebis virginiensis
SM86MTF-5K	Malloch type section	186 m from top	Czekanowskia rigida
SM86MTF-5L	Malloch type section	185 m from top	Czekanowskia rigida
SM86MTF-5M	Malloch type section	153 m from top	Czekanowskia rigida Pityophyllum nordenskioldii Cladophlebis virginiensis
SM86MTF-5N	Malloch type section	142 m from top	Ginkgo nana
SM86MTF-5O	Malloch type section	125 m from top	Czekanowskia rigida

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
SM86MTF-5P	Malloch type section	110 m from top	Pityophyllum *nordenskioldii* Czekanowskia rigida
SM86MTF-5Q	Malloch type section	96 m from top	Cladophlebis virginiensis
SM86MTF-5R	Malloch type section	80 m from top	Czekanowskia rigida Pityophyllum nordenskioldii
KH8601301	Summit South	low-mid Klappan sequence	wood fragments
KH8601303	Summit South	low-mid Klappan sequence	wood fragments Nilssonia tenuicaulis Czekanowskia rigida ? bivalves Sphenopteris
KH8601304	Summit South TRC83065	E seam ?	Nilssonia canadensis Pityophyllum nordenskioldii branches
KH8601307	Summit South	lower Klappan	Czekanowskia rigida Pitophyllum nordenskioldii
KH8601401	Summit South TRC83075	Klappan sequence	Pityophyllum nordenskioldii Czekanowskia rigida ?
KH8601404	Summit South	Klappan sequence	bivalves plant fragments
SL8600402	Summit South	Klappan sequence	bivalves plant fragments
SL8600403	Summit South TRC85009	Klappan sequence	Pterophyllum rectangulare Pityophyllum nordenskioldii Cladophlebis virginiensis
SL8600502	Fox Ck. at SC 11	mid Klappan around K seam	tree trunks Pityophyllum nordenskioldii Baiera furcata Nilssonia tenuicaulis Pterophyllum rectangulare Nilssonia schaumbergensis Podozamites lanceolatus Staffinella Sphenopteris brulensis
SL8600507	Fox Ck. at SC 11	mid Klappan around K sear	logs Staffinella Nilssonia sp.

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
SL8606	Summit South TRC83052	1 m above G upper seam	Nilssonia tenuicaulis Baiera furcata Cladophlebis virginiensis Sphenopteris brulensis Czekanowskia rigida Nilssonia schaumbergensis Pityophyllum nordenskioldii Pterophyllum rectangulare Coniopteris sp. Nilssonia canadensis Sagenopteris williamsii Podozamites lanceolatus
GM860102	Summit South	lower Klappan-upper Spatsizi	Ostrea bivalves belemnites
GM860104	Summit South	upper Spatsizi sequence	bivalves
JM860201	Summit Big Valley	upper Spatsizi sequence	bivalves
JM860202	Summit Big Valley	upper Spatsizi sequence	bivalves
DW860201	Summit South east of OTC84004	lower Klappan sequence	Cladophlebis virginiensis Pityophyllum nordenskioldii Helminthopsis
DW860202	Summit South below OTC84004	lower Klappan sequence	Ostrea
DW860203	Summit South below Otc84004	lower Klappan sequemce	Nilssonia tenuicaulis Coniopteris sp. Czekanowskia rigida Sphenopteris brulensis Cladophlebis virginiensis Podozamites lanceolatus Baiera gracilis Equisetites lyelli
JT863804	Summit Repeater Ridge	lower Klappan-upper Spatsizi	belemnites bivalves
JT863314	Lower Klappan River gorge	200-300 m below A seam	large turritellid gastropod bivalves
JT863804	Repeater Ridge TRC85005	lower Klappan-upper Spatsizi	Baiera furcata Baiera gracilis Nilssonia tenuicaulis cone seed pod

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
			Coniopteris sp.
JT862601	Lost Ridge West Pond	Klappan sequence below TRC84249	Elatides curvifolia Coniopteris berryi Nilssonia tenuicaulis
DDH86022A	Box 42, 98 m from top	1 m below K seam	Nilssonia canadensis Cladophlebis virginiensis Czekanowskia rigida
DDH86022B	Box 44, 100 m from top	few m below K seam	bivalves
DDH86030A	Box 12, 41 m from top	I-J interseam	Pterophyllum rectangulare Equisetites lyelli Nilssonia tenuicaulis Pityophyllum nordenskioldii Czekanowskia rigida
DDH86030B	Box 34, 71 m from top	floor of I seam	Nilssonia tenuicaulis
DDH86030C	Box 43, 89 m from top	just below I seam	Czekanowskia rigida
DDH86030D	Box 48, 99 m from top	just below I seam	Czekanowskia rigida Pityophyllum nordenskioldii Cladophlebis virginiensis Equisetites lyelli Pterophyllum rectangulare
DDH86030E	Box 49, 101 m from top	just below I seam	Czekanowskia rigida
DDH86030F	Box 51, 106 m from top	just below I seam	Sphenopteris brulensis Czekanowskia rigida
DDH86030G	Box 52, 107 m from top	just below I seam	Sphenopteris brulensis Czekanowskia rigida
DDH86030H	Box 68, 140 m from top	just below Ph seam	Staffinella Ferganoconcha
DDH86030I	Box 69, 142 m from top	just above Ph seam	bivalves
DDH86030J	Box 70, 146 m from top	just above Ph seam	Ferganoconcha
DDH86030K	Box 72, 150 m from top	within Ph seam	Nilssonia sp.
DDH86034A	Box 3, 20 m from top	roof of K/L seam	Czekanowskia rigida Nilssonia tenuicaulis Nilssonia canadensis
DDH86034B	Box 6, 25 m from top	floor of K/L seam	Cladophlebis virginiensis

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
			Nilssonia canadensis Pityophyllum nordenskioldii Czekanowskia rigida
DDH86034C	Box 38, 19 m from top	just below K/L seam	Czekanowskia rigida Nilssonia sp. cf. tenuicaulis
DDH86034D	Box 72, 153 m from top	floor of H/I seam	Nilssonia sp. Pityophyllum nordenskioldii
DDH86034E	Box 73, 155 m from top	floor of H/I seam	Pityophyllum nordenskioldii
DDH86022C	Box 32, 73 m from top	just below L seam	Equisetites lyelli Pterophyllum rectangulare Pityophyllum nordenskioldii Sphenopteris brulensis
DDH86022D	Box 33, 74 m from top	just below L seam	Sphenopteris brulensis
DDH86022E	Box 38, 87 m from top	just above K/L seam	Czekanowskia rigida
DDH86022F	Box 43, 96 m from top	midway between K/L and L seams	Nilssonia tenuicaulis
DDH86022G	Box 45, 101 m from top	midway between K/L and L seams	Staffinella ?
DDH86028A	Box 22, 54 m from top	D-C interseam	bivalve fragments
DDH86028B	Box 23, 56 m from top	D-C interseam	bivalve fragments
DDH68028C	Box 23, 57 m from top	D-C interseam	bivalve fragments
DDH86028D	Box 24, 59 m from top	D-C interseam	bivalve fragments
DDH86022E	Box 25, 60 m from top	D-C interseam	bivalve fragments
DDH86028F	Box 25, 60 m from top	D-C interseam	bivalves turritellid gastropods
DDH86028G	Box 39, 85 m from top	C-B interseam	bivalve fragments
DDH86028H	Box 40, 88.5 m from top	C-B interseam	bivalve fragments
DDH86028I	Box 41, 94 m from top	C-B interseam	bivalve fragments gastropods
DDH86028J	Box 44, 97 m from top	C-B interseam	bivalve fragments
DDH86028K	Box 45, 98 m from top	C-B interseam	bivalve fragments
DDH86028L	Box 60, 130 m from top	A-B interseam	bivalve fragments

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
DDH86028M	Box 61, 131 m from top	A-B interseam	bivalve fragments
DDH86028N	Box 71, 151 m from top	A-B interseam	Czekanowskia rigida Pityophyllum nordenskioldii
DDH86037A	Box 3, 14 m from top	just above O seam	Czekanowskia rigida
DDH86037B	Box 4, 16 m from top	just above O seam	Czekanowskia rigida Pityophyllum nordenskioldii
DDH86037C	Box 5, 17.5 m from top	just above O seam	Czekanowskia rigida Pityophyllum nordenskioldii Baiera furcata
DDH86037D	Box 5, 18 m from top	just above O seam	Pterophyllum rectangulare
DDH86037E	Box 7, 21 m from top	floor of O seam	Pityophyllum nordenskioldii Czekanowskia rigida Ginkgo pluripartita ?
DDH86037F	Box 29, 64 m from top	just above M seam	Pityophyllum nordenskioldii
DDH86037G	Box 47, 100 m from top	20 m below M seam	Pityophyllum nordeskioldii
DDH86037H	Box 49, 103 m from top	about 20 m below M seam	Podozamites lanceolatus
DDH86038I	Box 54, 114 m from top	about 30 m below M seam	Podozamites lanceolatus Czekanowskia rigida Pityophyllum nordenskioldii
DDH86023A	Box 8, 25 m from top	above and below A zone	bivalves
DDH86023B	Box 19, 44 m from top	above and below A zone	Nilssonia canadensis
DDH86023C	Box 21, 49 m from top	above and below A zone	Nilssonia canadensis Czekanowskia rigida Nilssonia sp.
DDH86024A	Box 43, 86 m from top	10 m above A-5	gastropods unknown star shaped species
DDH86025A	Box 2, 7 m from top	roof of O seam	Sphenopteris brulensis Nilssonia sp.
DDH86025B	Box 29, 66 m from top	floor of O seam	Nilssonia tenuicaulis
DDH86025C	Box 31, 70 m from top	4 m below O seam	Ferganoconcha
DDH86025D	Box 32, 72 m from top	6 m below O seam	Ferganoconcha

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
DDH86025E	Box 33, 73 m from top	7 m below O seam	bivalves
DDH86025F	Box 33, 75 m from top	8 m below O seam	Ferganoconcha ?
DDH86025G	Box 44, 95 m from top	floor of N seam	Nilssonia schaumbergensis
DDH86025H	Box 44, 96.5 m from top	floor of N seam	Nilssonia tenuicaulis
DDH86025I	Box 51, 110 m from top	15 m below N seam	Nilssonia schaumbergensis
DDH86025J	Box 89. 189 m from top	floor of J seam	Nilssonia tenuicaulis Czekanowskia rigida Pityophyllum nordenskioldii Pterophyllum rectangulare
DDH86026A	Box 10, 28 m from top	just above A-2 seam	Ginkgo nana
DDH86026B	Box 11, 29.5 m from top	just above A-2 seam	turritellid snail bivalves
DDH86026C	Box 12, 31 m from top	just above A-2 seam	turritellid gastropods bivalves Staffinella
DDH86026D	Box 13, 32.5 m from top	just above A-2 seam	bivalves
DDH86026E	Box 14, 34 m from top	just above A-2 seam	Staffinella turritellid gastropods
DDH86026F	Box 15, 36 m from top	roof of A-2 seam	bivalves
DDH86026G	Box 24, 53 m from top	A-2-A-3 interseam	bivalves
DDH86026H	Box 26, 58 m from top	A-2-A-3 interseam	bivalves
DDH86026I	Box 27, 60 m from top	A-2-A-3 interseam	bivalves
DDH86026J	Box 28, 62 m from top	A-2-A-3 interseam	bivalves
DDH86026K	Box 29, 63 m from top	A-2-A-3 interseam	bivalves
DDH86026L	Box 52, 109 m from top	Below A-3 seam	bivalve and plant hash
DDH86026M	Box 53, 110 m from top	below A-3 seam	bivalve and plant hash
DDH86026N	Box 54, 112 m from top	below A-3 seam	bivalves
DDH86026O	Box 55, 114 m from top	below A-3 seam	bivalves

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
DDH86026P	Box 57, 120 m from top	below A-3 seam	bivalves
DDH86026Q	Box 58, 121 m from top	below A-3 seam	bivalves
DDH86026R	121-126 m from top	below A-3 seam	bivalves
DDH86026S	Box 64, 133 m from top	below A-3 seam	bivalves
DDH86026T	Box 65, 135 m from top	below A-3 seam	bivalves
DDH86026U	Box 68, 141 m from top	below A-3 seam	bivalves
DDH86026V	Box 70, 145 m from top	below A-3 seam	bivalves
DDH86026W	146-155 m from top	below A-3 seam	bivalves
DDH86031A	Box 16, 41 m from top	2 m above I seam	bivalves
DDH86027A	Box 34, 81 m from top	floor of K/L seam	Nilssonia tenuicaulis
DDH86032A	Box 11, 29 m from top	10-15 m below I seam	Nilssonia canadensis
DDH86004A	Box 25, 64 m from top	8 m below K/L seam	bivalve
DDH86004B	Box 28, 71 m from top	13 m below K/L seam	Nilssonia tenuicaulis
DDH86004C	Box 83, 177 m from top	10-15 m above H seam	bivalve
DDH86006A	Box 17, 62 m from top	I-H interseam	bivalves
DDH86006B	Box 22, 72 m from top	10 m above H seam	Nilssonia tenuicaulis Cladophlebis virginiensis
DDH86008A	Box 29, 79 m from top	I-H interseam	bivalves
DDH86008B	Box 31, 83 m from top	roof of H seam	Nilssonia tenuicaulis
DDH86009A	Box 3, 21 m from top	30 m above K seam	bivalves
DDH86009B	Box 5, 29 m from top	20 m above K seam	bivalves
DDH86012A	Box 16, 36 m from top	15 m below O seam	bivalves
DDH86012B	99-105 m from top	O-N interseam	bivalves
DDH86012C	119-121 m from top	floor of N seam	bivalves
DDH86017A	Box 41, 86 m from top	15-20 m below I seam	bivalves
DDH86020A	Box 2, 18 m from top	20 m above C seam	bivalves

SAMPLE NO.	LOCATION	POSITION	IDENTIFICATION
DDH86020B	Box 20, 53 m from top	midway between C and A seams	bivalves
DDH86020C	Box 31, 76 m from top	5 m below A seam	bivalves
SM86027-6	DDH85016	roof of I seam	Sphenopteris brulensis
SMKT85016	DDH85016	floor of J seam	Nilssonia tenuicaulis
SA2712=SA1612	DDH85016	10 m below D seam	gastropods bivalves
SA2714	DDH85027	40 m above O seam	Czekanowskia rigida Nilssonia tenuicaulis Nilssonia new sp ?
SM2712	DDH85027	0.25 m below O seam	Nilssonia canadensis Cladophlebis virginiensis Pterophyllum rectangulare Sphenopteris brulensis
SM27MSC	DDH85027	5 m below K seam	Nilssonia tenuicaulis
DDH85016A	DDH85016	5 m below J seam	Nilssonia tenuicaulis
SM86027-6	DDH85016	8 m above I seam	Sphenopteris brulensis
SM86027-14	DDH85016	C-B interseam	bivalves gastropods

APPENDIX E

KLAPPAN SEQUENCE BIOSTRATIGRAPHY CHART

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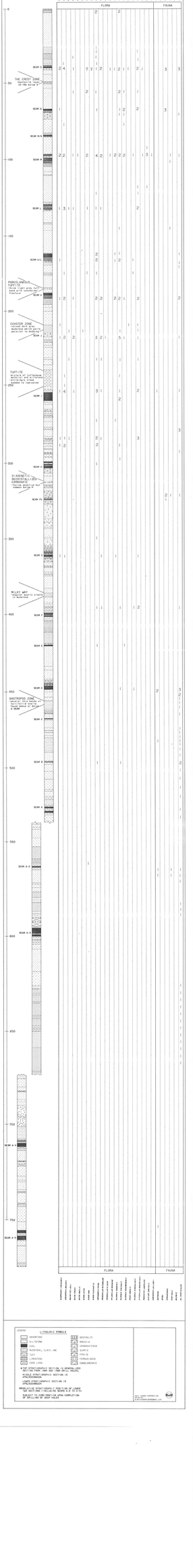
KLAPPAN SEQUENCE BIOSTRATIGRAPHY AND MARKER HORIZONS

MOUNT KLAPPAN ANTHRACITE PROJECT



APPENDIX F

1:500 000 NORTHWESTERN BRITISH COLUMBIA MAP

NORTHWEST BRITISH COLUMBIA

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GULF CANADA CORPORATION

SCALE 1: 500,000

Kilometres 10 5 0 10 20 30 40 50 Kilometres

Miles 5 0 10 20 30 Miles

Legend

- Paved Highway
- Gravel Highway
- Gravel Road (Restricted use)
- Proposed Road
- Railway
- Existing Transmission Lines
- Proposed Transmission Lines
- Electrical Sub Stations
- Proposed Dam Site
- Proposed Pit, Mount Klappan Property
- Boundary, Park or Reserve
- Boundary, International
- Spot Elevation (feet above sea level)
- Mine (see separate list)
- Prospect
- Cities, Towns
- Contours (1000 foot interval)

COAL PROPERTIES

- GULF CANADA PROPERTIES LTD.
- 33 SUNCOR INC.
- 134 DOMINION ANTHRACITE LTD.
- 45 SHELL CANADA RESOURCES INC.
- 55 D. GROOT LOGGING LTD.
- 1 ESSO RESOURCES CANADA LTD.
- 2 ASHTON W. MULLAN
- 3 JOE HIDBER

MINES

2 DUTHIE — Ag, Pb, Zn, Au, Cd, Cu
3 SILVER STANDARD — Ag, Pb, Zn, Au, Cu
4 KITSAULT — Mo
5 SCOTTIE GOLD — Au, Ag
6 GRANDUC — Cu, Ag, Au
7 BAKER — Au, Ag

Produced jointly by GULF CANADA DRAFTING DEPT. and HARDY ASSOC. (1978) LTD., MAPPING SECTION.
Revised to Sept., 1986

This map has been compiled by Gulf from several sources and is presented as a convenience to the user. Gulf does not guarantee or warrant its accuracy in any respect. Any reliance placed on this map is at the user's risk.

REFERENCE NOTE

Mines: from The Northwest Region - B.C. Regional Economic Study, 1982.

Prospects: from Kitimat-Stikine Regional District - 1:500,000 Regional Resource Map, 1981.

Base Map: from Dept. of Energy, Mines and Resources, Surveys and Mapping Branch, current N.T.S. series maps.

KEY MAP

MOUNT KLAPPAN ANTHRACITE PROJECT

SUMMIT - NASS - SKEENA AREA

GEOLOGICAL REPORT

1986

APPENDIX I

COAL TRENCH DATA
MEASURED SECTIONS

GULF CANADA CORPORATION
COAL DIVISION

APPENDIX I

SUMMIT-NASS-SKEENA AREA

COAL TRENCH DATA

DATA SOURCE

SUMMARY

GULF CANADA CORPORATION - COAL DIVISION

13/MAR/87 PROJECT DATA SOURCE SUMMARY PAGE 1

DATA SOURCE	LOCATION NORTHING	LOCATION EASTING	ELEVATION	LENGTH	ANGLE	AZIMUTH	LOG TYPE
KPNSNTRC86019	6358890.0	493950.0	1150.0	1.6	35.0	49.0	
KPNSKTRC86020	6338426.0	507400.0	1548.0	2.1	28.0	80.0	
KPNNRTRC86021	6341400.0	496750.0	1412.0	3.6	54.0	3.0	
KPNNRTRC86022	6341456.0	496600.0	1374.0	2.3	30.0	49.0	
KPNNRTRC86023	6341564.0	498660.0	1410.0	1.1	17.0	272.0	
KPNNRTRC86024	6341480.0	499720.0	1415.0	2.5	44.0	30.0	
KPNNRTRC86025	6341545.0	497980.0	1390.0	2.5	42.0	187.0	
KPNNRTRC86026	6341573.0	496080.0	1373.0	1.4	29.0	111.0	
KPNNRTRC86027	6336950.0	496075.0	1662.0	1.1	45.0	240.0	
KPNNRTRC86028	6336670.0	495945.0	1620.0	3.6	15.0	205.0	
KPNNRTRC86029	6336640.0	495905.0	1580.0	1.2	27.0	216.0	
KPNSSTRC86030	6346250.0	498700.0	1825.0	2.8	44.0	182.0	
KPNSSTRC86031	6347660.0	498960.0	1935.5	2.7	40.0	0.0	
KPNSSTRC86032	6348895.0	499445.0	1731.0	1.4	40.0	56.0	
KPNSNTRC86033	6352625.0	497800.0	1860.0	1.6	15.0	355.0	
KPNSSTRC86034	6351255.0	498500.0	1720.0	1.8	20.5	0.0	

GULF CANADA CORPORATION - COAL DIVISION

13/MAR/87 PROJECT DATA SOURCE SUMMARY PAGE 2

DATA SOURCE	LOCATION NORTHING	LOCATION EASTING	ELEVATION	LENGTH	ANGLE	AZIMUTH	LOG TYPE
KPNSSTRC86035	6349875.0	501795.0	1770.0	4.0	0.0	50.0	
KPNNRTRC86036	6336485.0	495680.0	1475.0	1.7	3.0	10.0	

SIMPLE SAMPLE

SUMMARY

GULF CANADA CORPORATION - COAL DIVISION

23/MAR/87 SIMPLE SAMPLE SUMMARY PAGE 1

TRUE THICKNESS

KLAPPAN PROJECT

DATA SOURCE	SEAM	SAMPLE ID	DEPTH FROM	DEPTH TO	PERCENT REC	RECOVERED COAL	RECOVERED ROCK	MISSING COAL	MISSING ROCK	TOTAL COAL - ROCK
TRC86019		5301	0.29	1.68	100.00	1.270	0.120			1.270- 0.120
TRC86020		5303	0.12	1.19	100.00	0.960	0.110			0.960- 0.110
TRC86021		5304	0.84	2.30	100.00	1.260	0.200			1.260- 0.200
		5305	3.01	3.91	100.00	0.900				0.900- 0.000
TRC86022		5306	0.29	2.00	100.00	1.520	0.190			1.520- 0.190
TRC86023		5307	0.16	1.24	100.00	1.080				1.080- 0.000
TRC86024		5308	1.45	3.01	100.00	1.060	0.500			1.060- 0.500
TRC86025		5309	0.00	1.07	100.00	1.000	0.070			1.000- 0.070
TRC86026		5310	0.15	1.12	100.00	0.970				0.970- 0.000
TRC86027		5451	0.40	1.23	100.00	0.710	0.120			0.710- 0.120
TRC86028		5452	0.65	1.59	100.00	0.940				0.940- 0.000
TRC86029		5453	1.04	1.44	100.00	0.320	0.080			0.320- 0.080
TRC86030		5454	0.31	3.05	100.00	2.470	0.270			2.470- 0.270
TRC86031		5455	2.00	3.59	100.00	1.430	0.160			1.430- 0.160
TRC86032		5456	0.22	0.84	100.00	0.600	0.020			0.600- 0.020

GULF CANADA CORPORATION - COAL DIVISION
SIMPLE SAMPLE SUMMARY

TRUE THICKNESS
KLAPPAN PROJECT

DATA SOURCE	SEAM	SAMPLE ID	DEPTH FROM	DEPTH TO	PERCENT REC	RECOVERED COAL	RECOVERED ROCK	MISSING COAL	MISSING ROCK	TOTAL COAL - ROCK
TRC86033		5312	0.00	1.45	100.00	1.360	0.090			1.360- 0.090
TRC86034		5313	7.25	8.41	100.00	0.960	0.200			0.960- 0.200
TRC86035		5314	0.85	4.00	100.00	2.160	0.990			2.160- 0.990
TRC86036		5311	0.00	1.19	100.00	1.090	0.100			1.090- 0.100

KPNSNTRC86019

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSNTRC86019 DATE - 02/13/87

- H I S T O R Y -

START DATE - 11/06/86
END DATE - 11/06/86

CONTRACTOR -
GEOLOGIST - HUNTER
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - SEAM ?, UPRIGHT, ON BCR (93.5 KM MARK). BIVALVES N EARBY, PLANTS ABSENT. C/C+R=1.27/1.39 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1150.00
ZONE - 9
NORTHING - 6358890.00
EASTING - 493950.00

LICENCE/LEASE NUMBER -

LATITUDE - 572229
LONGITUDE - 1290602

- O R I E N T A T I O N -

LENGTH - 1.60
INCLINATION - 35.0
AZIMUTH - 49.0

SIZE WIDTH - 0.2
SIZE HEIGHT - 0.3

ROOF STRIKE - 79
ROOF DIP - 14
ROOF DIR - S

FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: SN DATA SOURCE: TRC86019

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.29	0.29	*90			MUDSTONE	CARB.BLK.THNB FISSILE, 30% COAL STRINGERS UP TO .005 CM THICK.
	0.29	0.33	0.04	*90	05301		COAL	C-2.BLK WELL CLEATED, YELLOW MINOR FE STAINING.
	0.33	0.45	0.12	*90	05301		MUDSTONE	CARB.BLK.VTHNB MINOR COAL STRINGERS (5%) UP TO 1 CM TH ICK.
	0.45	0.49	0.04	*90	05301		COAL	C-2.BLK WELL CLEATED, VERY MINOR FE STAINING.
	0.49	0.60	0.11	*90	05301		COAL	C-3.BLK CONCHOIDAL FRACTURE, SEVERAL THIN BEDS UP TO 1 CM C-2 COAL (5%).
	0.60	0.75	0.15	*90	05301		COAL	C-4.BLK POORLY CONSOLIDATED.
	0.75	1.08	0.33	*90	05301		COAL	C-2.BLK.THNB WELL CLEATED, MODERATE FE STAINING.
	1.08	1.68	0.60	*90	05301		COAL	C-3.BLK VERY THIN CARB MUDST BEDS, WEATHERS TO A SOOTY APPEARANCE.

* DENOTES MEASURED BCA

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: SN DATA SOURCE: TRC86019

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.68	4.68	3.00	*90			SANDSTONE	FG.MOD.DK.GN.MAS WEATHERS TO A TAN BROWN.

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN SN TRC86019 SEAM : INTERVAL(M) : 0.29 - 1.68 ELEVATION(M) : 1150.0

GEOLOGIST : HUNTER SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

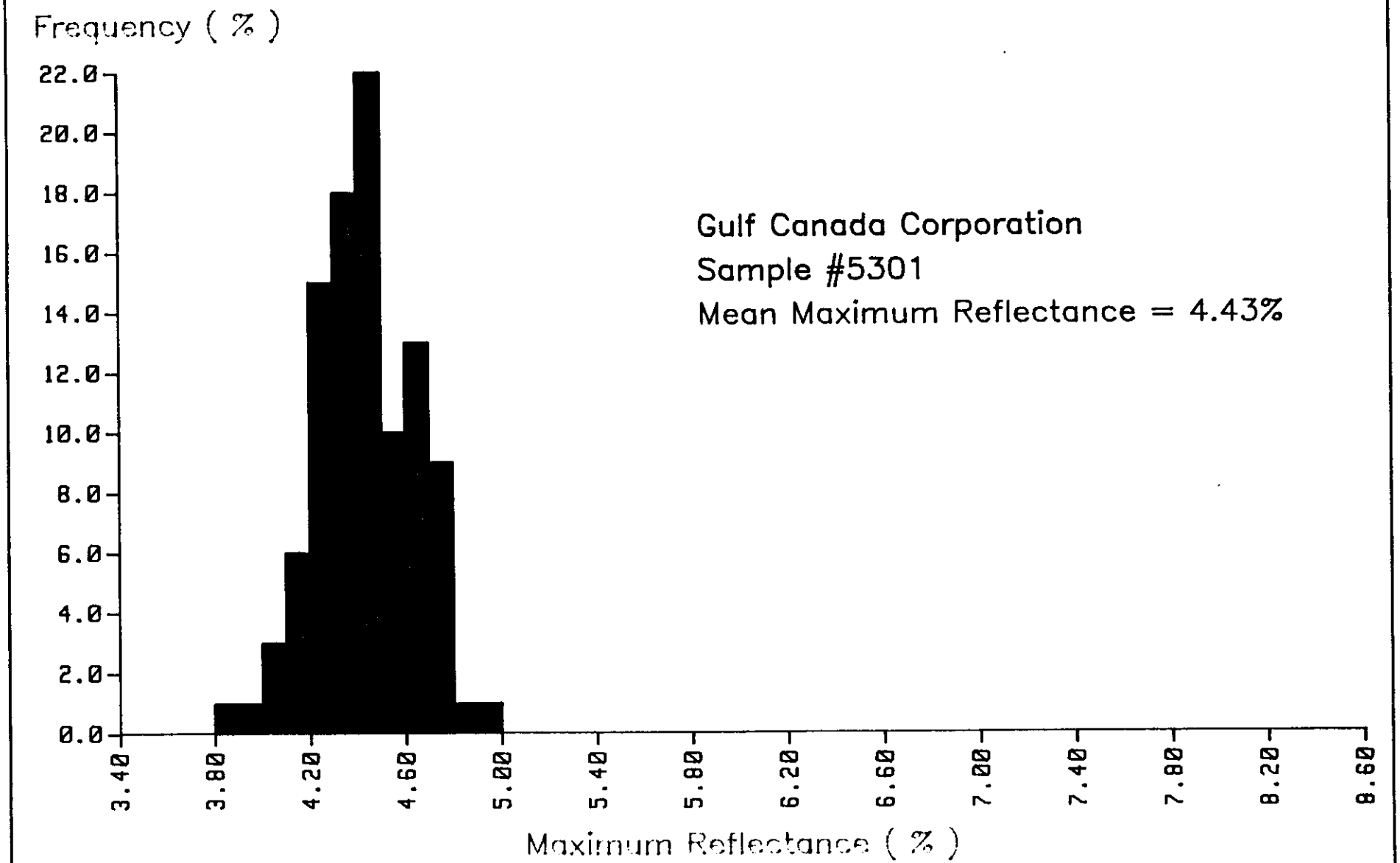
SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.29		0.12													
				1.23	100.0	5301	5301	1.27 / 0.12 1.39		1.45	37.20	5.78	55.57	0.66	20.26	—
	1.68															

GCRI COAL DIVISION	HEAD	PROJ KFN	BLK SN	DS TRCS6019	
SAMPLE ID	05301	DATA TYPE (REAL,BORO,AVER,CALC)			REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED	14/10/86		
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)			AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO)			ASTM		

TOP SIZE (MM)	___.__		
SURFACE MOISTURE %	__.__	TOTAL SULPHUR %	0.66
TOTAL MOISTURE %	9.00	PHOSPHOROUS %	_.___
EQUILIBRIUM MOISTURE %	__.__	CHLORINE (PPM)	_____
		SPECIFIC GRAVITY	_.__
RESIDUAL MOISTURE %	1.45	FSI	__._
ASH %	37.20	HGI	___._
VOLATILE MATTER %	5.78	CO2 %	__.__
FIXED CARBON %	55.57		

GROSS CALORIFIC VALUE (MJ/KG)	20.28
NET CALORIFIC VALUE (MJ/KG)	__.__

VITRINITE HISTOGRAM



David E. Pearson & Associates Ltd.

KPNSKTRC86020

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSKTRC86020 DATE - 02/13/87

- H I S T O R Y -

START DATE - 23/06/86
END DATE - 23/06/86

CONTRACTOR -
GEOLOGIST - CAMPBELL
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - SEAM ?, SUBHORIZONTAL, TAHTSEDLE CK AREA. C/C+R= 0
.96/1.02. UPPER MOST KLAPPAN SEQUENCE.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1548.00
ZONE - 9
NORTHING - 6338426.00
EASTING - 507400.00

LICENCE/LEASE NUMBER -

LATITUDE - 571127
LONGITUDE - 1285239

- O R I E N T A T I O N -

LENGTH - 2.10
INCLINATION - 28.0
AZIMUTH - 80.0

SIZE WIDTH - 0.4
SIZE HEIGHT - 0.5

ROOF STRIKE - 57
ROOF DIP - 40
ROOF DIR - S
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: SK DATA SOURCE: TRC86020

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.12	0.12	*90			MUDSTONE	CARB.DK.GY FRIABLE, COALIFIED PLANT HASH, 1 CM IRO N STAINED QUARTZ BAND AT BASE.
	0.12	0.16	0.04	*90	05303		COAL	C-1 HIGHLY IRON STAINED WITH CARB MUDST & V ITRINITE BANDS UP TO 3 MM.
	0.16	0.46	0.30	*90	05303		COAL	C-5 WELL CONSOLIDATED WITH C-1 BANDS UP TO 1 CM, HIGHLY IRON STAINED. BANDS OF CAR B MUDST UP TO 2.5 CM ARE DISCONTINUOUS.
	0.46	0.48	0.02	*90	05303		MUDSTONE	CARB.LT.BLK
	0.48	0.71	0.23	*90	05303		COAL	C-2 WELL CONSOLIDATED, CONCHOIDAL FRACTURE, MODERATE CLEATING, MINOR OXIDATION.
	0.71	0.76	0.05	*90	05303		MUDSTONE	CARB.DK.BN VERY SOFT.
	0.76	0.78	0.02	*90	05303		COAL	C-1 WELL CLEATED, MINOR OXIDATION, SOME CON CHOIDAL FRACTURE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SK DATA SOURCE: TRC86020

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.78	0.82	0.04	*90	05303		MUDSTONE	M.BN WELL CONSOLIDATED, DK BN ON FRESH SURFA CE, MINOR COALIFIED PLANT HASH. THIN CA RB MUDST BANDS (.5 CM) NEAR BASE OF UNI T.
	0.82	0.89	0.07	*90	05303		COAL	C-2 HIGHLY SHEARED, WELL CLEATED, THIN QUAR TZ VEINS LOCALLY.
	0.89	1.06	0.17	*90	05303		COAL	C-2 WELL CLEATED , THIN, DISCONTINUOUS CARB MUDST BANDS UP TO 1 CM, VERY MINOR IRO N STAINING, WELL CONSOLIDATED.
	1.06	1.13	0.07	*90	05303		COAL	C-3 HIGHLY SHEARED, QUARTZ VEINING, MINOR I RON STAINING, VERY RESISTANT.
	1.13	1.19	0.06	*90	05303		COAL	C-3 VERY RESISTANT, POORLY CLEATED, WITH TH IN BANDS OF MUDST UP TO 5 MM.
	1.19	1.85	0.66	*90			MUDSTONE	CARB.DK.GY SOFT WITH THIN COAL BANDS UP TO 1 CM, P LANT FRAGMENTS (CLADOPHLEBIS VIRGINIENS IS MARTINIANA, CZEKANOWSKIA?), HIGHLY S HEARED, WEATHERS LT GY.

* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN SK TRC86020 SEAM : INTERVAL(M) : 0.12 – 1.19 ELEVATION(M) : 1548.0

GEOLOGIST : CAMPBELL SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.12			0.34	100.0	6303	5303	0.96/ 0.11 1.07		2.30	35.05	7.43	55.22	0.45	20.23	—
			0.03	0.23												
				0.37												
	1.19															

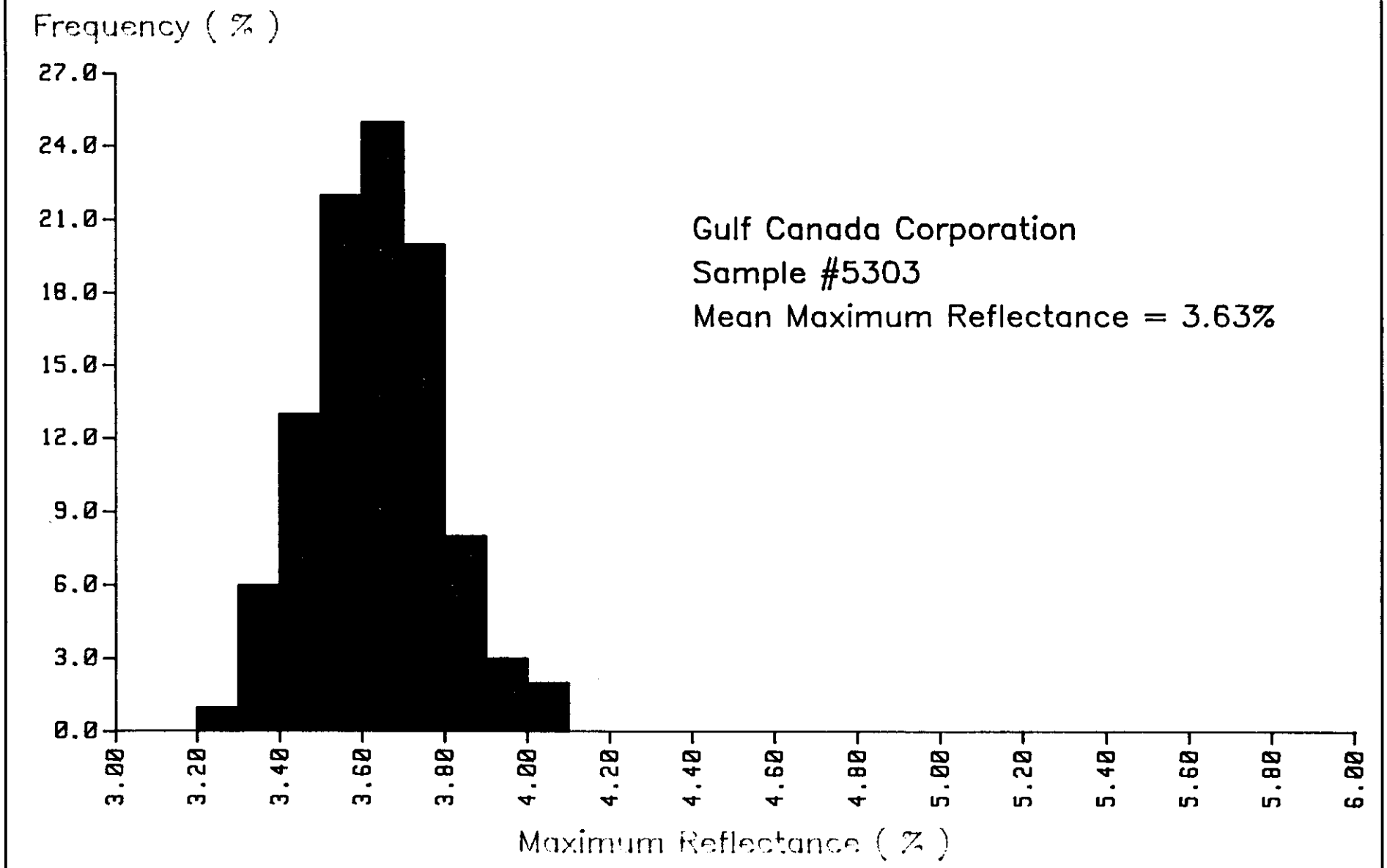
GCRI COAL DIVISION	HEAD	PROJ	KPN	BLK	SK	DB	TRC86020

SAMPLE ID	05303	DATA TYPE (REAL,BORO,AVER,CALC)	REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED	14/10/86
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)	AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO)			ASTM

TOP SIZE (MM)	___.__		
SURFACE MOISTURE %	__.__	TOTAL SULPHUR %	0.45
TOTAL MOISTURE %	8.56	PHOSPHOROUS %	_.___
EQUILIBRIUM MOISTURE %	__.__	CHLORINE (PPM)	______
		SPECIFIC GRAVITY	_.__
RESIDUAL MOISTURE %	0.30	FSI	__._
ASH %	35.05	HGI	___._
VOLATILE MATTER %	7.43	CO2 %	__.__
FIXED CARBON %	55.22		

GROSS CALORIFIC VALUE (MJ/KG)	20.23
NET CALORIFIC VALUE (MJ/KG)	__.__

VITRINITE HISTOGRAM



David E. Pearson & Associates Ltd.

KPNNRTRC86021

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86021 DATE - 02/13/87

- H I S T O R Y -

START DATE - 07/07/86
END DATE - 07/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - OVERLIES TRCNR86004 BY 30 - 40M STRATIGRAPHICALLY HIGHLY WEATHERED; C/C+R=2.16/3.07; ON CLYDE CK.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1412.00
ZONE - 9
NORTHING - 6341400.00
EASTING - 496750.00

LICENCE/LEASE NUMBER -

LATITUDE - 571303
LONGITUDE - 1290314

- O R I E N T A T I O N -

LENGTH - 3.60
INCLINATION - 54.0
AZIMUTH - 3.0

SIZE WIDTH - 0.6
SIZE HEIGHT - 0.5

ROOF STRIKE - 54
ROOF DIP - 16
ROOF DIR - S

FLOOR STRIKE - 90
FLOOR DIP - 10
FLOOR DIR - S

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86021

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.52	0.52	*90			MUDSTONE	BLK SOFT; HIGHLY WEATHERED; CARBONACEOUS; T HIN COAL LAMINAE (UP TO 1MM).
	0.52	0.74	0.22	*90			SANDSTONE	VFG WEATHERED DARK GREY; MINOR PLANT HASH; COARSENS TO FINE GRAINED AT BASE; HIGHL Y WEATHERED.
	0.74	0.84	0.10	*90			SANDSTONE	FG.BF UNCONSOLIDATED; MAY NOT BE PART OF ORIG INAL BEDDING.
	0.84	1.03	0.19	*90	05304		COAL	C-3.BLK HIGHLY FE STAINED; WELL CONSOLIDATED; W ELL CLEATED.
	1.03	1.25	0.22	*90	05304		COAL	C-4.BLK *HIGHLY WEATHERED; POORLY CONSOLIDATED;* MINOR FE STAINING.
	1.25	1.33	0.08	*90	05304		SANDSTONE	FG WEATHERED GREY-BROWN; MINOR THIN COAL L AMINAE; WELL CONSOLIDATED.
	1.33	1.72	0.39	*90	05304		COAL	C-4.BLK HIGHLY WEATHERED; MINOR FE STAINING; QU ITE POORLY CONSOLIDATED.

* DENOTES MEASURED BCA

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86021

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.72	1.84	0.12	*90	05304		MUDSTONE	BN SOFT; POORLY CONSOLIDATED; CONCAVED SHE AR SURFACES.
	1.84	2.30	0.46	*90	05304		COAL	C-4.BLK MODERATELY WELL CLEATED; WELL CONSOLIDA TED; HIGHLY FE STAINED.
	2.30	2.78	0.48	*90	99999		MUDSTONE	BLK CARBONACEOUS; HIGHLY WEATHERED; CONCAVE SHEAR SURFACES.
	2.78	3.01	0.23	*90	99999		SILTSTONE	LT.BN WEATHERED MEDIUM BROWN; THIN LAMINAE (< 1MM) TOWARDS BASE; VERY COMPETENT.
	3.01	3.16	0.15	*90	05305		COAL	C-3.BLK QUITE WELL CONSOLIDATED; WELL CLEATED.
	3.16	3.31	0.15	*90	05305		COAL	C-3.BLK HIGHLY FE STAINED; MODERATELY WELL CLEA TED.
	3.31	3.61	0.30	*90	05305		COAL	UNCONSOLIDATED; HIGHLY WEATHERED; SMALL PIECES OF C-4 TO C-5.
	3.61	3.70	0.09	*90	05305		COAL	C-6.BLK MODERATELY WELL CONSOLIDATED; HIGHLY FE STAINED.

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86021

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	3.70	3.91	0.21	*90	05305		COAL	UNCONSOLIDATED; SMALL PIECES OF C-5 TO C-6 COAL.
	3.91	4.91	1.00	*90			SANDSTONE	FG.LT.GY WEATHERS BUFF TO LIGHT GREY.

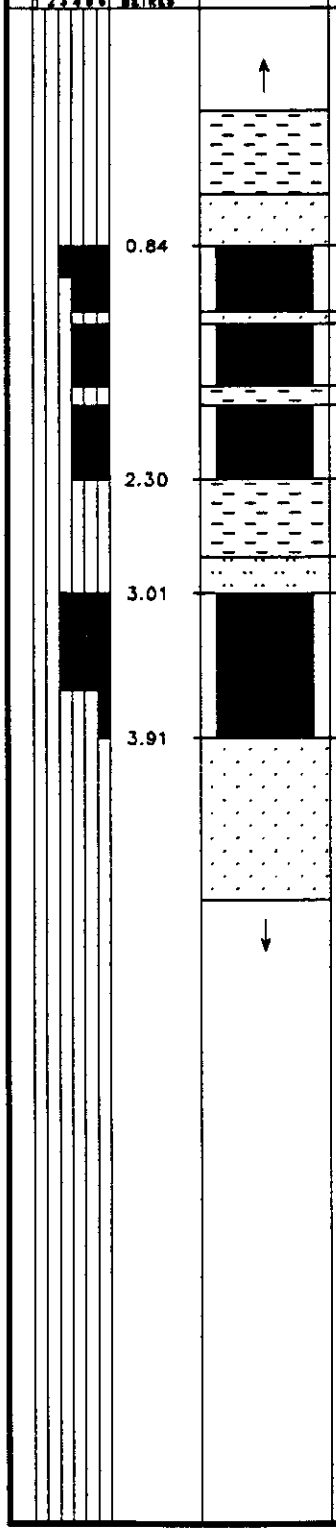
* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86021 SEAM : INTERVAL(M) : 0.84 – 3.91 ELEVATION(M) : 1412.0

GEOLOGIST : MACLEOD SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :



SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.84			0.41												
			0.08													
				0.39	100.0	5304										
			0.12													
				0.46												
	2.30		0.48		100.0	99999	5304	2.16 / 0.81 3.07		3.70	27.58	9.90	58.81	0.45	21.84	—
			0.23													
	3.01			0.90	100.0	5305										
	3.91															

GCRI COAL DIVISION	HEAD	PROJ KPN	BLK NR	DS TRC86021	
SAMPLE ID	05304	DATA TYPE (REAL,BORD,AVER,CALC)			REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED	14/10/86		
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)			AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO)			ASTM		

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.45
TOTAL MOISTURE %	15.60	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	------
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	3.70	FSI	--.-
ASH %	27.59	HGI	---.-
VOLATILE MATTER %	9.90	CO2 %	--.--
FIXED CARBON %	58.81		

GROSS CALORIFIC VALUE (MJ/KG)	21.64
NET CALORIFIC VALUE (MJ/KG)	--.--

KPNNRTRC86022

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86022 DATE - 02/13/87

- H I S T O R Y -

START DATE - 07/07/86
END DATE - 07/07/86

CONTRACTOR -
GEOLOGIST - LEE
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - SEAM UNDERLIES TRCNR86003 BY 30 - 40M STRATIGRAPHI
CALLY; ON CLYDE CK.; C/C+R=1.52/1.71 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1374.00
ZONE - 9
NORTHING - 6341456.00
EASTING - 496600.00

LICENCE/LEASE NUMBER -

LATITUDE - 571305
LONGITUDE - 1290323

- O R I E N T A T I O N -

LENGTH - 2.26
INCLINATION - 30.0
AZIMUTH - 49.0

SIZE WIDTH - 0.8
SIZE HEIGHT - 0.5

ROOF STRIKE - 39
ROOF DIP - 59
ROOF DIR - E
FLOOR STRIKE - 57
FLOOR DIP - 34
FLOOR DIR - E

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86022

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.14	0.14	*90			MUDSTONE	DK.GY SOFT; MODERATELY WELL CONSOLIDATED.
	0.14	0.27	0.13	*90			MUDSTONE	LT.GY POORLY CONSOLIDATED; WITH COAL LAMINAE (C-1) UP TO 1 CM THICK; HIGHLY WEATHERED.
	0.27	0.29	0.02	*90			MUDSTONE	UNCONSOLIDATED; WEATHERS TAN; HIGHLY FE STAINED.
	0.29	0.39	0.10	*90	05306		COAL	C-6 UNCONSOLIDATED; HIGHLY WEATHERED; WITH COAL (C-2) FRAGMENTS; MINOR FE STAINING.
	0.39	0.51	0.12	*90	05306		COAL	C-4.BLK POOR TO MODERATELY CONSOLIDATED.
	0.51	0.54	0.03	*90	05306		MUDSTONE	LT.GY MODERATELY CONSOLIDATED; HIGHLY FE STAINED; WEATHERS TAN - ORANGE.
	0.54	0.66	0.12	*90	05306		COAL	C-4.BLK HIGHLY WEATHERED; POORLY CONSOLIDATED.

* DENOTES MEASURED BCA

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86022

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.66	0.68	0.02	*90	05306		MUDSTONE	TAN COLOUR IS TAN TO LT. BROWN; MODERATELY FE STAINED; POORLY CONSOLIDATED; VERY FINE COAL LAMINAE.
	0.68	0.83	0.15	*90	05306		COAL	C-4 SHEARED; VERY SOFT; POORLY CONSOLIDATED.
	0.83	0.90	0.07	*90	05306		MUDSTONE	CARBONACEOUS; UNCONSOLIDATED; FLECKS OF COAL.
	0.90	1.11	0.21	*90	05306		COAL	C-2.BLK WELL CONSOLIDATED; WELL CLEATED; MINOR FE STAINED; MINOR QTZ VEIN.
	1.11	1.17	0.06	*90	05306		COAL	C-3.BLK MINOR FE STAINING; MODERATELY WELL CLEATED; MODERATELY WELL CONSOLIDATED; MINOR QTZ VEINING.
	1.17	1.24	0.07	*90	05306		MUDSTONE	M.BN HIGHLY FE STAINED
	1.24	2.00	0.76	*90	05306		COAL	C-3.BLK MODERATELY CLEATED; MINOR FE STAINED BANDS CROSS CUTTING BEDS; MINOR QTZ VEINING.

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86022

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	2.00	2.07	0.07	*90			MUDSTONE	CARBONACEOUS; WEATHERS DARK GREY; FINE YELLOW MUDSTONE LAMINAE AND COAL LAMINAE.
	2.07	2.17	0.10	*90			MUDSTONE	LT.GY.THNB FE STAINED; WEATHERS MEDIUM GREY; DIP SLOPE FORMING.

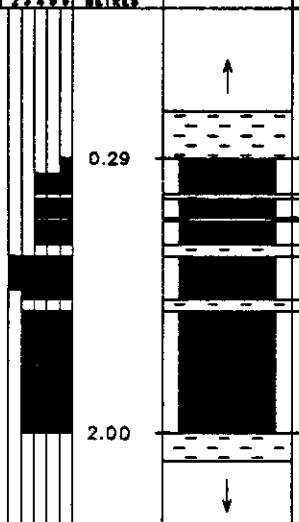
* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86022 SEAM : INTERVAL(M) : 0.29 - 2.00 ELEVATION(M) : 1374.0

GEOLOGIST : LEE SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :



SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG
	0.29			0.22											
			0.03	0.12											
			0.03	0.15											
			0.07												
				0.27											
			0.07		100.0	6306	5306	1.82 / 0.19		4.38	24.85	14.32	56.45	0.46	21.57
								1.71							
				0.78											
	2.00														

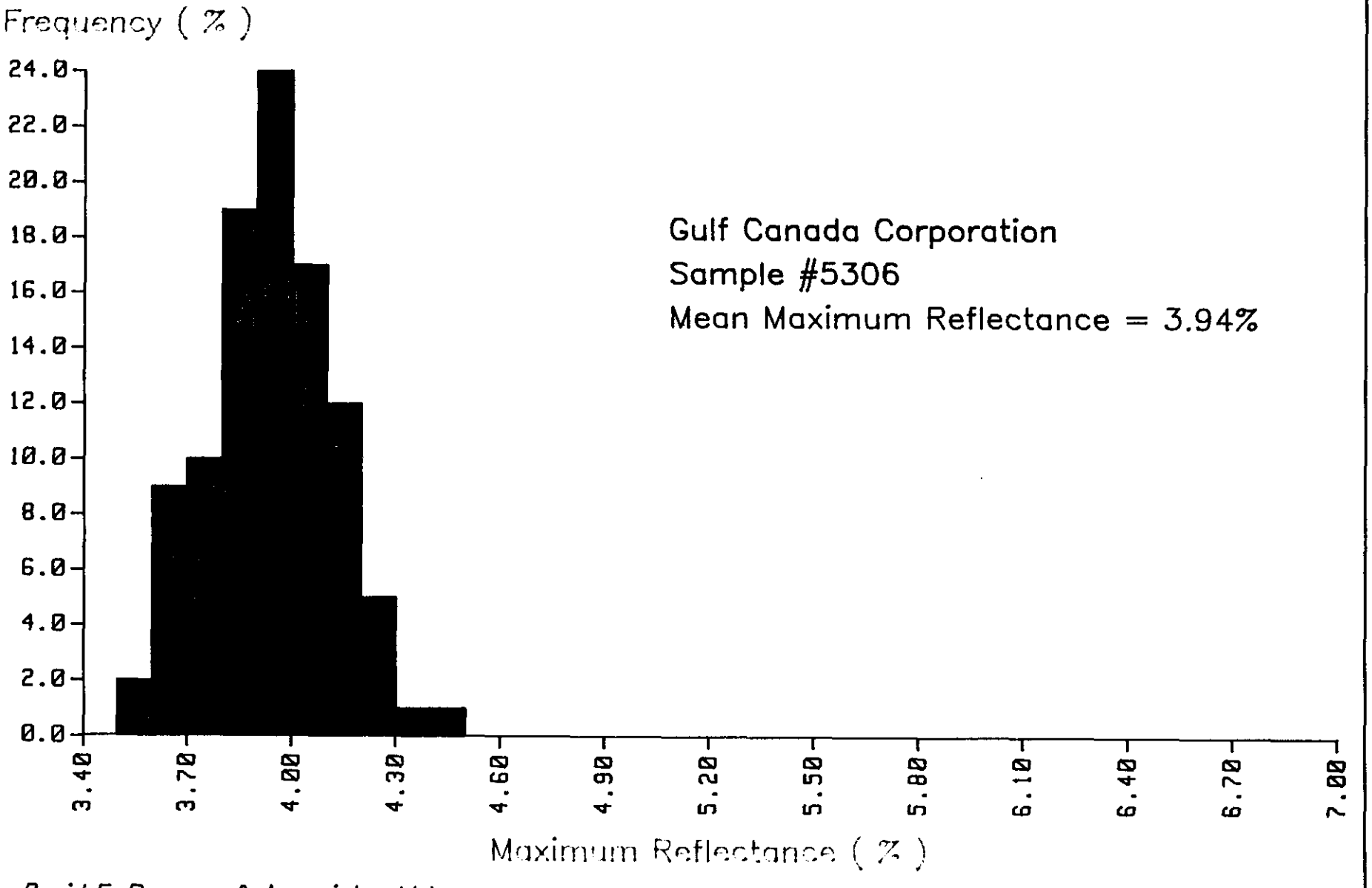
GCRI COAL DIVISION HEAD PROJ KPN BLK NR DS TRC86022

SAMPLE ID 05306 — DATA TYPE (REAL,BCRC,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 — DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.46
TOTAL MOISTURE %	21.01	PHOSPHORCUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	------
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	4.38	FSI	--.-
AEH %	24.85	HGI	---.--
VOLATILE MATTER %	14.32	CO2 %	--.--
FIXED CARBON %	56.45		

GROSS CALORIFIC VALUE (MJ/KG) 21.57
NET CALORIFIC VALUE (MJ/KG) --.--

VITRINITE HISTOGRAM



David E. Pearson & Associates Ltd.

KPNNRTRC86023

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86023 DATE - 02/13/87

- H I S T O R Y -

START DATE - 08/07/86
END DATE - 08/07/86

CONTRACTOR -
GEOLOGIST - LEE
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - SAME SEAM AS TRCNR86021 AND TRCNR86024; ON CLYDE C REEK; C/C+R = 1.08/1.08 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1410.00
ZONE - 9
NORTHING - 6341564.00
EASTING - 498660.00

LICENCE/LEASE NUMBER -

LATITUDE - 571309
LONGITUDE - 1290120

- O R I E N T A T I O N -

LENGTH - 1.12
INCLINATION - 17.0
AZIMUTH - 272.0

SIZE WIDTH - 0.4
SIZE HEIGHT - 0.4

ROOF STRIKE - 87
ROOF DIP - 52
ROOF DIR - E

FLOOR STRIKE - 132
FLOOR DIP - 40
FLOOR DIR - E

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86023

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.11	0.11	*90			MUDSTONE	M.GY.MB WEATHERS GREY; MINOR FE STAIN; NODULAR WEATHERING.
	0.11	0.16	0.05	*90			MUDSTONE	CARBONACEOUS; POORLY CONSOLIDATED; THIN COAL LAMINAE.
	0.16	0.24	0.08	*90	05307		COAL	C-5.BLK HIGHLY WEATHERED; POORLY CONSOLIDATED; FE STAINED.
	0.24	0.59	0.35	*90	05307		COAL	C-4.BLK POOR TO MODERATELY CLEATED; HIGHLY FE STAINED; HIGHLY WEATHERED; POORLY CONSOLIDATED.
	0.59	1.24	0.65	*90	05307		COAL	C-3.BLK MODERATELY CLEATED; WELL CONSOLIDATED; CONCHOIDAL FRACTURING; MINOR FE STAINING; MINOR SHEARING TOWARDS BASE; QTZ VEIN (.5CM).
	1.24	1.28	0.04	*90			MUDSTONE	LT.GY.THNB VERY FINE COAL LAMINAE; WEATHERS LT. GREY; WELL CONSOLIDATED.
	1.28	1.49	0.21	*90			MUDSTONE	DK.GY.THNB WEATHERS LT. GREY.

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86023 SEAM : INTERVAL(M) : 0.16 – 1.24 ELEVATION(M) : 1410.0

GEOLOGIST : LEE SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.16			1.08	100.0	5307	5307	1.08 / 0.00 1.08		3.38	16.34	13.39	84.89	0.47	24.57	—
	1.24															

GCRI COAL DIVISION	HEAD	PROJ KPN	BLK NR	DS TRC86023	
SAMPLE ID	05307	DATA TYPE (REAL,BORO,AVER,CALC)			REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED	14/10/86		
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)			AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO)			ASTM		

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.47
TOTAL MOISTURE %	15.66	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	-----
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	3.38	FSI	--.-
ASH %	18.34	HGI	---.-
VOLATILE MATTER %	13.39	CO2 %	--.--
FIXED CARBON %	64.89		

GROSS CALORIFIC VALUE (MJ/KG)	24.57
NET CALORIFIC VALUE (MJ/KG)	--.--

KPNNRTRC86024

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86024 DATE - 02/13/87

- H I S T O R Y -

START DATE - 09/07/86
END DATE - 09/09/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - 200M UPSTREAM FROM TRCNR86021; SAME SEAM; ON CLYDE CK.; C/C+R = 1.06/1.56 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1415.00
ZONE - 9
NORTHING - 6341480.00
EASTING - 499720.00

LICENCE/LEASE NUMBER -

LATITUDE - 571306
LONGITUDE - 1290017

- O R I E N T A T I O N -

LENGTH - 2.45
INCLINATION - 44.0
AZIMUTH - 30.0

SIZE WIDTH - 1.2
SIZE HEIGHT - 1.3

ROOF STRIKE - 140
ROOF DIP - 32
ROOF DIR - S
FLOOR STRIKE - 115
FLOOR DIP - 18
FLOOR DIR - S

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86024

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	1.00	1.00	*90			SANDSTONE	FG.M.GY.THNB WEATHERS TAN TO MEDIUM GREY.
	1.00	1.40	0.40	*90			MUDSTONE	BLK CARBONACEOUS; HIGHLY WEATHERED; POORLY CONSOLIDATED; SHEARED.
	1.40	1.45	0.05	*90			SANDSTONE	VFG.M.BN
	1.45	2.16	0.71	*90	05308		COAL	C-3 WELL CLEATED; WELL CONSOLIDATED; MODERATELY FE STAINED.
	2.16	2.66	0.50	*90	05308		MUDSTONE	CARBONACEOUS; HIGHLY SHEARED; LISTRIC SURFACES; MODERATELY FE STAINED; VERY SOFT.
	2.66	3.01	0.35	*90	05308		COAL	C-4 MODERATELY CONSOLIDATED; HIGHLY FE STAINED; MODERATELY CLEATED.
	3.01	3.38	0.37	*90			MUDSTONE	CARBONACEOUS; HIGHLY WEATHERED; VERY SOFT; VERY MINOR FE STAIN.
	3.38	4.03	0.65	*90			SANDSTONE	MG.LT.GY.THNB MINOR ORANGE WEATHERED MUDSTONE LAMINAE; VERY THIN COAL LAMINAE (<.05CM).

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86024 SEAM : INTERVAL(M) : 1.45 – 3.01 ELEVATION(M) : 1415.0

GEOLOGIST : MACLEOD SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG
	1.45			0.71											
			0.50		100.0	5308	5308	1.08 / 0.50 1.58		4.58	29.87	12.34	53.11	0.41	19.48
				0.35											
	3.01														

GCRI COAL DIVISION HEAD PROJ KPN BLK NR DS TRC86024

SAMPLE ID 05308 DATA TYPE (REAL,BORO,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD

NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.41
TOTAL MOISTURE %	14.48	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	-----
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	4.58	FSI	--.-
ASH %	29.97	HGI	---.-
VOLATILE MATTER %	12.34	CO2 %	--.--
FIXED CARBON %	53.11		

GROSS CALORIFIC VALUE (MJ/KG) 19.48
NET CALORIFIC VALUE (MJ/KG) --.--

KPNNRTRC86025

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86025 DATE - 02/13/87

- H I S T O R Y -

START DATE - 10/07/86
END DATE - 10/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - ROOF ERODED; SAME SEAM AS TRCNR86022; ON CLYDE CK;
C/C+R = 1.00/1.07 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1390.00
ZONE - 9
NORTHING - 6341545.00
EASTING - 497980.00

LICENCE/LEASE NUMBER -

LATITUDE - 571308
LONGITUDE - 1290200

- O R I E N T A T I O N -

LENGTH - 2.50
INCLINATION - 42.0
AZIMUTH - 187.0

SIZE WIDTH - 0.6
SIZE HEIGHT - 1.2

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 110
FLOOR DIP - 27
FLOOR DIR - S

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86025

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.34	0.34	*90	05309		COAL	C-3 MODERATELY CONSOLIDATED; WELL CLEATED; VERY MINOR FE STAINING.
	0.34	0.41	0.07	*90	05309		MUDSTONE	CARB CARBONACEOUS; HIGHLY SHEARED; FE STAINE D; THIN MINOR COAL LAMINAE.
	0.41	1.07	0.66	*90	05309		COAL	C-3 WELL CLEATED; MINOR FE STAINED; WELL CO NSOLIDATED; 1CM FE STAINED QTZ VEIN.
	1.07	1.18	0.11	*90			MUDSTONE	M.GY VERY COMPETENT; MINOR FE STAIN; VERY MI NOR THIN COAL LAMINAE.

* DENOTES MEASURED BCA

NEWPAGE

FORM 4G01

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86025 SEAM : INTERVAL(M) : 0.00 - 1.07 ELEVATION(M) : 1390.0

GEOLOGIST : MACLEOD SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.00			0.34												
			0.07													
				0.66	100.0	5309	5309	1.00 / 0.07 1.07		2.67	15.08	7.55	73.70	0.57	27.37	—
	1.07															

GCRI COAL DIVISION HEAD PROJ KPN SLK NR DS TRC86025

SAMPLE ID 05309 DATA TYPE (REAL,BORO,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.57
TOTAL MOISTURE %	14.19	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	-----
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	2.67	FSI	--.-
ASH %	16.08	HGI	---.-
VOLATILE MATTER %	7.55	CO2 %	--.--
FIXED CARBON %	73.70		

GROSS CALORIFIC VALUE (MJ/KG) 27.37
NET CALORIFIC VALUE (MJ/KG) --.--

KPNNRTRC86026

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86026 DATE - 02/13/87

- H I S T O R Y -

START DATE - 10/07/86
END DATE - 10/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - SEAM STRATIGRAPHICALLY UNDERLIES TRCNR86025; ON CL
YDE CK; ROOF SLUMPED; C/C+R= 0.97/0.97 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1373.00
ZONE - 9
NORTHING - 6341573.00
EASTING - 496080.00

LICENCE/LEASE NUMBER -

LATITUDE - 571309
LONGITUDE - 1290354

- O R I E N T A T I O N -

LENGTH - 1.36
INCLINATION - 29.0
AZIMUTH - 111.0

SIZE WIDTH - 0.5
SIZE HEIGHT - 0.9

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 93
FLOOR DIP - 20
FLOOR DIR - S

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86026

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.15	0.15	*90			MUDSTONE	DK.GY WEATHERED DARK BROWN.
	0.15	0.71	0.56	*90	05310		COAL	C-3 WELL CLEATED; MODERATELY WELL CONSOLIDATED.
	0.71	0.82	0.11	*90	05310		COAL	C-4 QUITE WEATHERED; POORLY CONSOLIDATED.
	0.82	1.12	0.30	*90	05310		COAL	C-3 VERY WELL CONSOLIDATED AND CLEATED; CONCHOIDAL FRACTURES.
	1.12	1.17	0.05	*90			MUDSTONE	DK.BN WELL CONSOLIDATED.
	1.17	1.65	0.48	*90			MUDSTONE	M.GY.THNB MINOR PLANT HASH; WEATHERS MEDIUM GREY; WELL CONSOLIDATED.

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86025 SEAM : INTERVAL(M) : 0.15 - 1.12 ELEVATION(M) : 1373.0

GEOLOGIST : MACLEOD SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.15			0.97	100.0	5310	5310	0.97/ 0.00 0.97		5.66	9.60	10.44	74.30	0.48	27.51	—
	1.12															

GCRI COAL DIVISION	HEAD	PROJ KPN	BLK NR	DS TRC86026	
SAMPLE ID	05310	DATA TYPE (REAL,BORO,AVER,CALC)			REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED	14/10/86		
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)			AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO)					ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.48
TOTAL MOISTURE %	11.77	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	------
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	5.66	FSI	--.-
ASH %	9.60	HGI	---.-
VOLATILE MATTER %	10.44	CO2 %	--.--
FIXED CARBON %	74.30		

GROSS CALORIFIC VALUE (MJ/KG)	27.51
NET CALORIFIC VALUE (MJ/KG)	--.--

KPNNRTRC86027

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86027 DATE - 02/13/87

- H I S T O R Y -

START DATE - 10/07/86
END DATE - 10/07/86

CONTRACTOR -
GEOLOGIST - SAVOIE
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - C/C+R = .71/.77 SUBHORIZONTAL UPRIGHT, SLIGHTLY DE FORMED, BASE OF C U S.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1662.00
ZONE - 9
NORTHING - 6336950.00
EASTING - 496075.00

LICENCE/LEASE NUMBER -

LATITUDE - 571040
LONGITUDE - 1290354

- O R I E N T A T I O N -

LENGTH - 1.10
INCLINATION - 45.0
AZIMUTH - 240.0

SIZE WIDTH - 0.2
SIZE HEIGHT - 1.0

ROOF STRIKE - 143
ROOF DIP - 21
ROOF DIR - N

FLOOR STRIKE - 148
FLOOR DIP - 25
FLOOR DIR - N

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86027

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.40	0.40	*90			SILTSTONE	SSY.M.GY FLOOR-GRADES SHARPLY INTO SANDSTONE. BA SE OF COARSENING UPWARD SEQUENCE.
	0.40	0.45	0.05	*90	05451		MUDSTONE	CARB
	0.45	0.46	0.01	*90	05451		SILTSTONE	ORNG FE-STAINED SILTSTONE WITH FLECKS OF COA L (ALMOST LIKE A BROWN POWDER).
	0.46	0.50	0.04	*90	05451		COAL	C-5.BLK
	0.50	0.53	0.03	*90	05451		MUDSTONE	CARB.DK.BLK VERY SOFT
	0.53	0.59	0.06	*90	05451		COAL	C-2.BLK
	0.59	0.63	0.04	*90	05451		COAL	C-4.BLK
	0.63	0.67	0.04	*90	05451		COAL	C-1.BLK WELL CLEATED

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86027

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.67	0.72	0.05	*90	05451		COAL	C-4
	0.72	0.75	0.03	*90	05451		COAL	C-3.BLK
	0.75	0.78	0.03	*90	05451		MUDSTONE	CARB
	0.78	0.87	0.09	*90	05451		COAL	C-3
	0.87	0.96	0.09	*90	05451		COAL	C-5.BLK
	0.96	1.06	0.10	*90	05451		COAL	C-3
	1.06	1.10	0.04	*90	05451		COAL	C-2.BLK
	1.10	1.14	0.04	*90	05451		COAL	C-3.BLK
	1.14	1.17	0.03	*90	05451		COAL	C-2.BLK
	1.17	1.21	0.04	*90	05451		COAL	C-3.BLK

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86027

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.21	1.23	0.02	*90	05451		COAL	C-2.BLK
	1.23	1.24	0.01	*90	00000		MUDSTONE	CARB.M.BLK
	1.24	1.44	0.20	*90			SILTSTONE	CLYY.LT.BLK GRADES INTO SILTSTONE. 5 METER COARSENI NG UPWARD SEQUENCE ABOVE SEAM.

* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — COAL DIVISION — MOUNT KLAPPAN PROJECT — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86027 SEAM : INTERVAL(M) : 0.40 – 1.23 ELEVATION(M) : 1662.0

GEOLOGIST : SAVOIE SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.40			0.22	100.0	5451	5451	0.71 / 0.12 0.83		2.62	26.99	7.67	62.72	0.47	23.56	—
				0.45												
	1.23															

GCRI COAL DIVISION HEAD PROJ KPN BLK NR DS TRC86027

SAMPLE ID 05451 DATA TYPE (REAL,BORO,AVER,CALC) REAL

SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86

ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD

NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.47
TOTAL MOISTURE %	11.36	PHOSPHOROUS %	-.----
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	------
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	2.62	FSI	--.-
ASH %	26.99	HGI	---.-
VOLATILE MATTER %	7.67	CO2 %	--.--
FIXED CARBON %	62.72		

GROSS CALORIFIC VALUE (MJ/KG) 23.56

NET CALORIFIC VALUE (MJ/KG) --.--

KPNNRTRC86028

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86028 DATE - 02/13/87

- H I S T O R Y -

START DATE - 18/07/86
END DATE - 18/07/86

CONTRACTOR -
GEOLOGIST - SAVOIE
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - OVERTURNED LIMB OF ANTICLINE, PARTIALLY FROZEN, FL OOR NOT FOUND; C/C+R= 0.94/0.94 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1620.00
ZONE - 9
NORTHING - 6336670.00
EASTING - 495945.00

LICENCE/LEASE NUMBER -

LATITUDE - 571030
LONGITUDE - 1290401

- O R I E N T A T I O N -

LENGTH - 3.60
INCLINATION - 15.0
AZIMUTH - 205.0

SIZE WIDTH - 0.9
SIZE HEIGHT - 0.8

ROOF STRIKE - 117
ROOF DIP - 58
ROOF DIR - N
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86028

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.50	0.50	*90			MUDSTONE	M.GY.THNB ABUNDANT CLADOPHLEBIS FOSSILS. ROOF ROC K.
	0.50	0.60	0.10	*90			MUDSTONE	LT.BLK FE STAINED, VERY FISSILE.
	0.60	0.65	0.05	*90			MUDSTONE	CARB.DK.BLK MINOR FE STAINING, VERY FISSILE, MINOR COALY STRINGERS.
	0.65	0.76	0.11	*90	05452		COAL	C-6.BLK
	0.76	0.84	0.08	*90	05452		COAL	C-4.DK.BLK SOME CONCHOIDAL FRACTURES, VERY FISSILE .
	0.84	0.88	0.04	*90	05452		COAL	C-5.BLK
	0.88	0.99	0.11	*90	05452		COAL	C-3.BLK VERY WEATHERED.
	0.99	1.09	0.10	*90	05452		COAL	C-2.BLK HIGHEST QUALITY IN SEAM.

* DENOTES MEASURED BCA

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86028

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.09	1.11	0.02	*90	05452		COAL	C-2 HEAVY FE STAINING.
	1.11	1.14	0.03	*90	05452		COAL	C-6
	1.14	1.18	0.04	*90	05452		COAL	C-5
	1.18	1.21	0.03	*90	05452		COAL	C-3 MINOR FE STAINING.
	1.21	1.22	0.01	*90	05452		COAL	C-6
	1.22	1.25	0.03	*90	05452		COAL	C-5
	1.25	1.27	0.02	*90	05452		COAL	C-6
	1.27	1.30	0.03	*90	05452		COAL	C-3
	1.30	1.41	0.11	*90	05452		COAL	C-4 ABUNDANT FE STAINING.
	1.41	1.43	0.02	*90	05452		COAL	C-3.BLK GOOD BAND OF COAL.

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86028

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.43	1.44	0.01	*90	05452		COAL	C-4
	1.44	1.51	0.07	*90	05452		COAL	C-5
	1.51	1.56	0.05	*90	05452		COAL	C-6
	1.56	1.59	0.03	*90	05452		COAL	C-4 FLOOR NOT FOUND. FROZEN IMPENETRABLE COAL ENCOUNTERED.

* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86028 SEAM : INTERVAL(M) : 0.65 - 1.59 ELEVATION(M) : 1620.0

GEOLOGIST : SAVOIE SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.65															
				0.94	100.0	5452	5452	0.94/ 0.00 0.94		7.16	15.87	21.86	55.11	0.41	20.37	—
	1.59															

GCRI COAL DIVISION HEAD PROJ KPN BLK NR DS TRC86028

SAMPLE ID 05452 DATA TYPE (REAL,BORD,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.41
TOTAL MOISTURE %	25.89	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	-----
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	7.16	FSI	--.-
ASH %	15.87	HGI	---.-
VOLATILE MATTER %	21.86	CO2 %	--.--
FIXED CARBON %	55.11		

GROSS CALORIFIC VALUE (MJ/KG) 20.37
NET CALORIFIC VALUE (MJ/KG) --.--

KPNNRTRC86029

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86029 DATE - 02/13/87

- H I S T O R Y -

START DATE - 18/07/86
END DATE - 18/07/86

CONTRACTOR -
GEOLOGIST - MATTHEWS
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - ON OVERTURNED LIMB OF ANTICLINE; C/C+R= .32/.40 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1580.00
ZONE - 9
NORTHING - 6336640.00
EASTING - 495905.00

LICENCE/LEASE NUMBER -

LATITUDE - 571029
LONGITUDE - 1290404

- O R I E N T A T I O N -

LENGTH - 1.15
INCLINATION - 27.0
AZIMUTH - 216.0

SIZE WIDTH - 0.9
SIZE HEIGHT - 0.9

ROOF STRIKE - 125
ROOF DIP - 46
ROOF DIR - N
FLOOR STRIKE - 118
FLOOR DIP - 38
FLOOR DIR - N

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86029

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	1.00	1.00	*90			MUDSTONE	DK.GY ROOF ROCK, LISTRIC SURFACES.
	1.00	1.04	0.04	*90			MUDSTONE	CARB.BLK
	1.04	1.13	0.09	*90	05453		COAL	C-2.BLK SOME CONCHOIDAL FRACTURES.
	1.13	1.23	0.10	*90	05453		COAL	C-5 MM THICK MUDST BANDS THROUGHOUT.
	1.23	1.28	0.05	*90	05453		COAL	C-3.DK.BLK MODERATELY WELL CLEATED.
	1.28	1.36	0.08	*90	05453		MUDSTONE	CARB.BLK COAL FLECKS, VERY WEATHERED.
	1.36	1.44	0.08	*90	05453		COAL	C-6.BLK SOFT, SOME MM THICK MUDST BANDS.
	1.44	1.57	0.13	*90			MUDSTONE	CARB.BLK SOME COALY STRINGERS.
	1.57	1.69	0.12	*90			SILTSTONE	CLYY.GY.LAM FLOOR ROCK, FE STAINED, WEATHERS TO BUF F COLOUR.

* DENOTES MEASURED BCA

NEWPAGE

FORM 4001

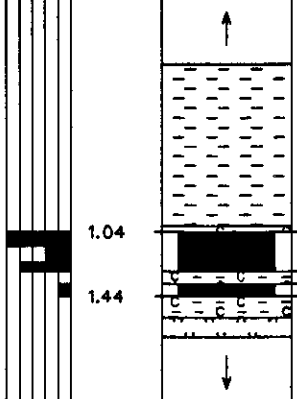
GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86029 SEAM : INTERVAL(M) : 1.04 - 1.44 ELEVATION(M) : 1580.0

GEOLOGIST : MATTHEWS SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	1.04			0.24	100.0	5453	5453	0.32/ 0.08		6.97	10.05	24.49	58.49	0.44	22.77	—
			0.08	0.08				0.40								
	1.44															



GCRI COAL DIVISION HEAD PROJ KPN BLK NR DS TRC86029

SAMPLE ID 05453 DATA TYPE (REAL,BORD,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.44
TOTAL MOISTURE %	22.64	PHOSPHOROUS %	-.----
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	-----
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	6.97	FSI	--.-
ASH %	10.05	HGI	---.-
VOLATILE MATTER %	24.49	CO2 %	--.--
FIXED CARBON %	58.49		

GROSS CALORIFIC VALUE (MJ/KG) 22.77
NET CALORIFIC VALUE (MJ/KG) --.--

KPNSSTRC86030

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSSTRC86030 DATE - 02/13/87

- H I S T O R Y -

START DATE - 09/08/86
END DATE - 09/08/86

CONTRACTOR -
GEOLOGIST - TYEDMERS
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - DEFORMED, MINOR FOLDING, C/C+R = 2.47/2.78 M. SEAM QUALITY IMPROVING WITH DEPTH. FLOOR NOT FOUND.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1825.00
ZONE - 9
NORTHING - 6346250.00
EASTING - 498700.00

LICENCE/LEASE NUMBER -

LATITUDE - 571540
LONGITUDE - 1290118

- O R I E N T A T I O N -

LENGTH - 2.80
INCLINATION - 44.0
AZIMUTH - 182.0

SIZE WIDTH - 0.6
SIZE HEIGHT - 1.5

ROOF STRIKE - 142
ROOF DIP - 44
ROOF DIR - N
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86030

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.20	0.20	*90			SILTSTONE	ORNG WS - LT BN. FRIABLE, VERY WEATHERED.
	0.20	0.31	0.11	*90			MUDSTONE	CARB.DK.GY WEATHERED AND FRIABLE.
	0.31	0.33	0.02	*90	05454		COAL	C-2 FRACTURED , WEATHERED.
	0.33	0.44	0.11	*90	05454		COAL	C-5.BLK MINOR FE STAINING, THIN VITRINITE STRIN GERS.
	0.44	0.47	0.03	*90	05454		COAL	C-1 WELL CLEATED, HARD, CONCHOIDAL FRACTURE .
	0.47	0.62	0.15	*90	05454		COAL	C-3 TWO VITRINITE BANDS (<.5 CM.), FRACTURE D.
	0.62	0.76	0.14	*90	05454		COAL	C-4 .5 CM BAND OF VITRINITE.
	0.76	0.80	0.04	*90	05454		COAL	C-2.BLK MOD. HARD.
	0.80	0.89	0.09	*90	05454		MUDSTONE	CARB.M.GY MINOR FE STAINING, WEATHERED, FRIABLE.

* DENOTES MEASURED BCA

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86030

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.89	0.93	0.04	*90	05454		COAL	C-2 HIGHLY FRACTURED.
	0.93	1.00	0.07	*90	05454		COAL	C-3.BLK AS ABOVE.
	1.00	1.04	0.04	*90	05454		COAL	C-2 AS ABOVE, CLEATED.
	1.04	1.07	0.03	*90	05454		COAL	C-1 FRACTURED, MOD. HARD, MINOR CONCHOIDAL FRACTURE.
	1.07	1.08	0.01	*90	05454		MUDSTONE	BN MTHD, HIGH FE CONTENT.
	1.08	1.26	0.18	*90	05454		COAL	C-2 FRACTURED.
	1.26	1.32	0.06	*90	05454		COAL	C-5
	1.32	1.36	0.04	*90	05454		COAL	C-2.BLK FRACTURED.
	1.36	1.46	0.10	*90	05454		COAL	C-3 FRACTURED, FRIABLE.

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86030

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.46	1.50	0.04	*90	05454		COAL	C-2 MINOR SULFUR STAINING, POORLY CLEATED.
	1.50	1.57	0.07	*90	05454		COAL	C-4.BLK HIGHLY FRACTURED.
	1.57	1.73	0.16	*90	05454		COAL	C-3 SILICA INJECTED, 4CM QUARTZ VEIN LATTERALY DICONTINUOUS.
	1.73	1.87	0.14	*90	05454		COAL	C-2 MINOR SULFUR, HARD, MODERATELY FRACTURED.
	1.87	1.94	0.07	*90	05454		COAL	C-2.BLK MINOR FE AND SULFUR STAINING, HIGHLY FRACTURED, LATERALLY DISCONTINUOUS QTZ VEINING.
	1.94	1.99	0.05	*90	05454		MUDSTONE	M.BLK ROCK SPLIT, DK GREY, HARD, MINOR FRACTURING.
	1.99	2.09	0.10	*90	05454		COAL	C-4.BLK FRACTURED, FRIABLE, FE AND SULFUR STAINING.
	2.09	2.26	0.17	*90	05454		COAL	C-5 FE STAINING, UNDULATORY BEDDING.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86030

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	2.26	2.31	0.05	*90	05454		COAL	C-3.BLK FE STAINED, PLANT FRAGMENTS ON BEDDING PLANES.
	2.31	2.34	0.03	*90	05454		MUDSTONE	M.BN WS-DK BROWN, FE STAINED.
	2.34	2.40	0.06	*90	05454		COAL	C-2.THNB MOD CLEATED.
	2.40	2.49	0.09	*90	05454		MUDSTONE	CARB WS-BN ROCK SPLIT, SOME SLTY BANDS, MINOR VITRINITE STRINGERS, HARD.
	2.49	2.55	0.06	*90	05454		COAL	C-3.BLK MINOR FE STAINING, HARD.
	2.55	2.58	0.03	*90	05454		COAL	C-1.BLK MINOR FE STAINING, FRIABLE, MOD HARD, CLEATED.
	2.58	2.64	0.06	*90	05454		COAL	C-5.BLK.THNB MOD HARD.
	2.64	2.74	0.10	*90	05454		COAL	C-3.BLK MINOR FE AND SULFUR STAINING.
	2.74	2.87	0.13	*90	05454		COAL	C-4 FRIABLE, SULFUR STAINING, CLEATED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86030

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	2.87	2.92	0.05	*90	05454		COAL	C-2 MOD CLEATED, HARD, SULFUR STAINING.
	2.92	3.00	0.08	*90	05454		COAL	C-4.BLK FRIABLE, FE AND SULFUR STAINING.
	3.00	3.05	0.05	*90	05454		COAL	C-2 MOD HARD, POORLY CLEATED. FLOOR NOT FOU ND.

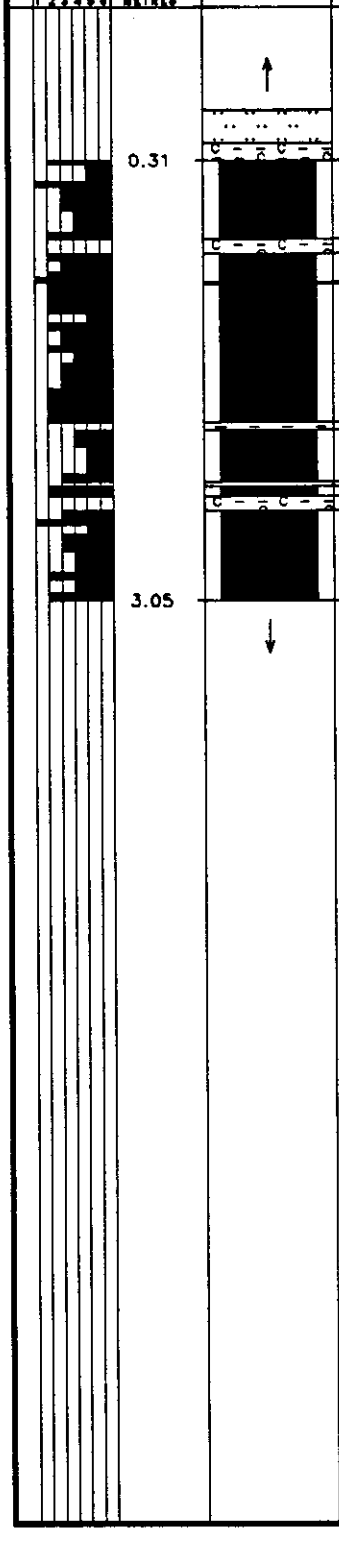
* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — COAL DIVISION — MOUNT KLAPPAN PROJECT — **TRUE THICKNESS**

DATA SOURCE: KPN SS TRC86030 SEAM : INTERVAL(M) : 0.31 – 3.05 ELEVATION(M) : 1825.0

GEOLOGIST : TYEDMERS SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :



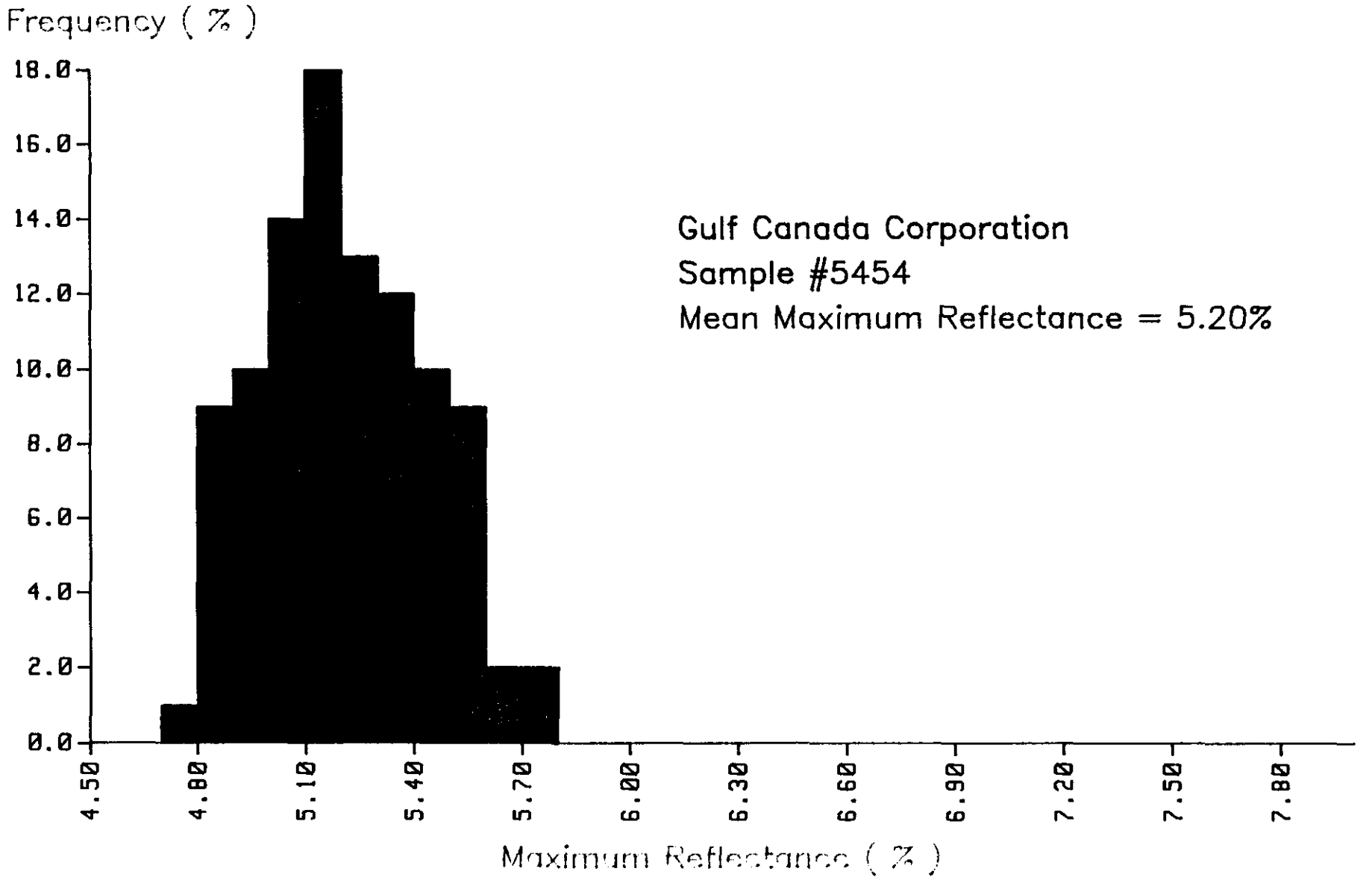
SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.31			0.49												
			0.09													
			0.61	0.18												
				0.86	100.0	8484	8484	2.47 / 0.27 2.74		2.73	44.64	10.13	42.50	0.25	18.14	—
			0.06													
				0.32												
			0.03													
			0.09													
	3.05			0.56												

GCRI COAL DIVISION	HEAD	PROJ KPN	BLK SS	DS TRC86030
SAMPLE ID	05454	DATA TYPE (REAL,BORD,AVER,CALC)		REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED	14/10/86	
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)		AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO)		ASTM		

TOP SIZE (MM)	___.__		
SURFACE MOISTURE %	__.__	TOTAL SULPHUR %	0.25
TOTAL MOISTURE %	14.20	PHOSPHOROUS %	_.___
EQUILIBRIUM MOISTURE %	__.__	CHLORINE (PPM)	_____
		SPECIFIC GRAVITY	_.__
RESIDUAL MOISTURE %	2.73	FSI	__._
ASH %	44.64	HGI	___._
VOLATILE MATTER %	10.13	CO2 %	__.__
FIXED CARBON %	42.50		

GROSS CALORIFIC VALUE (MJ/KG)	15.14
NET CALORIFIC VALUE (MJ/KG)	__.__

VITRINITE HISTOGRAM



David E. Pearson & Associates Ltd.

KPNSSTRC86031

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSSTRC86031 DATE - 02/13/87

- H I S T O R Y -

START DATE - 12/08/86
END DATE - 12/08/86

CONTRACTOR -
GEOLOGIST - TYEDMERS
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - HEAVILY FE AND SULFUR STAINED, TOP .5M FROZEN. C/C +R = 1.46/1.59 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1935.50
ZONE - 9
NORTHING - 6347660.00
EASTING - 498960.00

LICENCE/LEASE NUMBER -

LATITUDE - 571626
LONGITUDE - 1290102

- O R I E N T A T I O N -

LENGTH - 2.70
INCLINATION - 40.0
AZIMUTH - 0.0

SIZE WIDTH - 1.8
SIZE HEIGHT - 1.7

ROOF STRIKE - 80
ROOF DIP - 18
ROOF DIR - S
FLOOR STRIKE - 85
FLOOR DIP - 17
FLOOR DIR - S

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86031

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	1.50	1.50	*90			SILTSTONE	DK.BN.THNB ROOF ROCK.
	1.50	2.00	0.50	*90			CLAYSTONE	SLTY.M.GY FROZEN, WET, IMPERMEABLE, SULFUR AT BAS E.
	2.00	2.07	0.07	*90	05455		COAL	C-3.BLK FROZEN SOME VITRINITE STRINGERS.
	2.07	2.24	0.17	*90	05455		COAL	C-4.M.BLK MINOR SULFUR STAINING, .5CM VITRINITE S TRINGERS, FROZEN.
	2.24	2.30	0.06	*90	05455		COAL	C-4 LARGE AMOUNT OF SULFUR STAINING, EXTREM ELY HARD, FROZEN.
	2.30	2.36	0.06	*90	05455		COAL	C-3 HIGH AMOUNT OF FE STAIN, FROZEN, WS - B N TO RED.
	2.36	2.60	0.24	*90	05455		COAL	C-3 FROZEN. APPEARS FLAKY, MINOR FE AND SUL FUR STAINING. BDG NOT VISIBLE.
	2.60	2.67	0.07	*90	05455		COAL	C-3.BLK MODERATE FE AND SULFUR STAINING, MOD WE LL CLEATED.

* DENOTES MEASURED BCA

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86031

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	2.67	2.75	0.08	*90	05455		COAL	C-2 MOD FE AND SULFUR STAINING.
	2.75	2.82	0.07	*90	05455		COAL	C-5.BLK HIGH FE AND SULFUR STAINING.
	2.82	2.84	0.02	*90	05455		COAL	C-3 AS ABOVE WTHD.
	2.84	2.88	0.04	*90	05455		COAL	C-6 ORANGE WTHD FACES, HIGH FE AND SULFUR S TAINING.
	2.88	2.94	0.06	*90	05455		MUDSTONE	DK.BN FE STAINED, ROCK SPLIT.
	2.94	2.97	0.03	*90	05455		SANDSTONE	DK.GY FRAGMENTED, WTHD, FE STAINED, ROCK SPLI T.
	2.97	3.00	0.03	*90	05455		COAL	C-2 EXTREMELY FE STAINED, WELL CLEATED, HAR D.
	3.00	3.07	0.07	*90	05455		SILTSTONE	BLK FE STAINED, HARD, WEATHERS ORG/RED.
	3.07	3.11	0.04	*90	05455		COAL	C-2 LIGHT FE AND SULFUR STAINING.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86031

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	3.11	3.13	0.02	*90	05455		COAL	C-6 FE AND SULFUR STAINED.
	3.13	3.21	0.08	*90	05455		COAL	C-2 WELL CLEATED, FE AND SULFUR STAINED.
	3.21	3.25	0.04	*90	05455		COAL	C-4
	3.25	3.27	0.02	*90	05455		COAL	C-6 HEAVILY FE STAINED, WTHD, FRACTURED.
	3.27	3.35	0.08	*90	05455		COAL	C-2 FRACTURED, MOD CLEATED, HARD, HEAVY FE STAINING.
	3.35	3.38	0.03	*90	05455		COAL	C-1 CONCHOIDAL FRACTURE, WELL CLEATED, FE S TAINED.
	3.38	3.41	0.03	*90	05455		COAL	C-3 FRACTURED.
	3.41	3.43	0.02	*90	05455		COAL	C-5 FE STAINED.
	3.43	3.49	0.06	*90	05455		COAL	C-1 HARD, CONCHOIDAL FRACTURE, WELL CLEATED .

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86031

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	3.49	3.54	0.05	*90	05455		COAL	C-3,DK.GY POORLY CLEATED, HEAVILY FE STAINED.
	3.54	3.56	0.02	*90	05455		COAL	C-6,DK,BN FRACTURED.
	3.56	3.59	0.03	*90	05455		COAL	C-4 HEAVILY FE STAINED, HARD, MODERATELY CL EATED.
	3.59	3.99	0.40	*90			MUDSTONE	CARB.BLK WEATHERS RED BROWN, FE STAINED.

* DENOTES MEASURED BCA
NEWPAGE

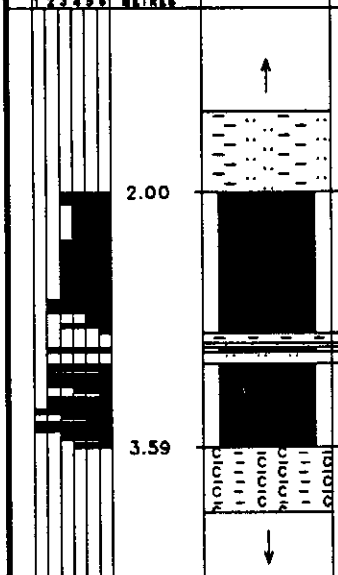
GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **TRUE THICKNESS**

MOUNT KLAPPAN PROJECT

DATA SOURCE: KPN SS TRC86031 SEAM : INTERVAL(M) : 2.00 – 3.59 ELEVATION(M) : 1935.5

GEOLOGIST : TYEDMERS SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :



SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	2.00			0.88	100.0	5455	5455	1.43 / 0.16 1.59		1.78	36.45	8.05	55.72	0.74	19.84	—
				0.52												
	3.59															

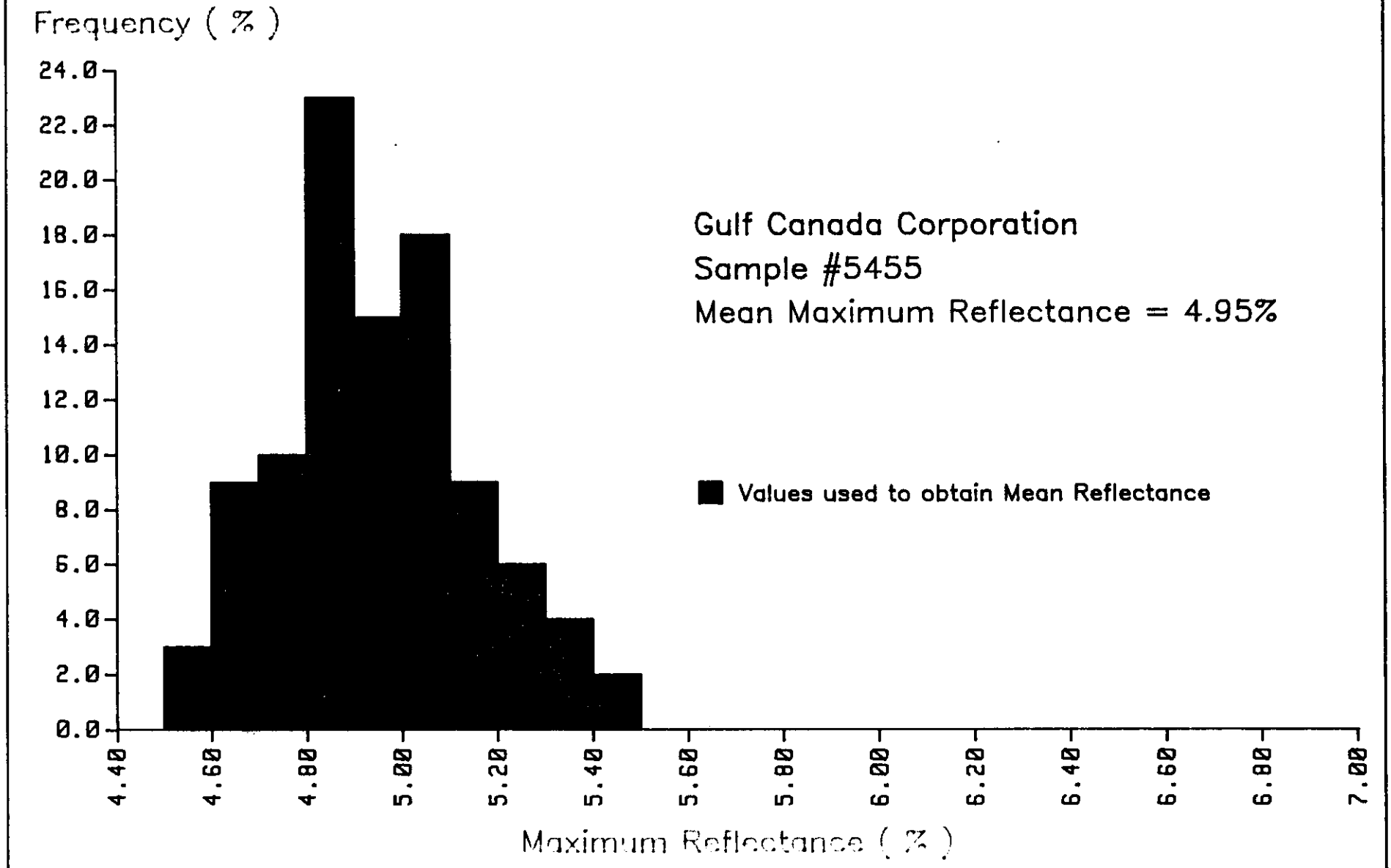
GCRI COAL DIVISION HEAD PROJ KPN BLK SS DS TRC86031

SAMPLE ID 05455 DATA TYPE (REAL,BORO,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	___.__		
SURFACE MOISTURE %	__.__	TOTAL SULPHUR %	0.74
TOTAL MOISTURE %	14.60	PHOSPHOROUS %	_.___
EQUILIBRIUM MOISTURE %	__.__	CHLORINE (PPM)	_____
		SPECIFIC GRAVITY	_.__
RESIDUAL MOISTURE %	1.78	FSI	__._
ASH %	36.45	HGI	___.-
VOLATILE MATTER %	6.05	CO2 %	__.__
FIXED CARBON %	55.72		

GROSS CALORIFIC VALUE (MJ/KG) 19.64
NET CALORIFIC VALUE (MJ/KG) __.__

VITRINITE HISTOGRAM



David E. Pearson & Associates Ltd.

KPNSSTRC86032

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSSTRC86032 DATE - 02/13/87

- H I S T O R Y -

START DATE - 14/08/86
END DATE - 14/08/86

CONTRACTOR -
GEOLOGIST - CAMPBELL
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - SEAM ? SUBHORIZONTAL. NO ROOF C/C+R= 0.60/0.62 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1731.00
ZONE - 9
NORTHING - 6348895.00
EASTING - 499445.00

LICENCE/LEASE NUMBER -

LATITUDE - 571706
LONGITUDE - 1290033

- O R I E N T A T I O N -

LENGTH - 1.40
INCLINATION - 40.0
AZIMUTH - 56.0

SIZE WIDTH - 0.6
SIZE HEIGHT - 1.3

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 102
FLOOR DIP - 28
FLOOR DIR - S

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86032

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.22	0.22	*90			MUDSTONE	CARB.BLK HIGHLY WEATHERED, IRON STAINED, MINOR C OALY STRINGERS.
	0.22	0.24	0.02	*90	05456		COAL	C-2.BLK WEATHERED, WELL CLEATED, MINOR IRON STA INING.
	0.24	0.52	0.28	*90	05456		COAL	C-5.BLK HIGHLY WEATHERED, IRON STAINED, MODERAT E CLEATING.
	0.52	0.54	0.02	*90	05456		MUDSTONE	MAR IRON STAINED, VERY WEATHERED, FERRUGINO US, COALY FLECKS.
	0.54	0.57	0.03	*90	05456		COAL	C-3.BLK WELL CLEATED, HIGHLY WEATHERED, MINOR I RON STAINING.
	0.57	0.84	0.27	*90	05456		COAL	C-5.BLK IRON STAINED, SULFUR, HIGHLY WEATHERED.
	0.84	3.34	2.50	*90			CLAYSTONE	BF WEATHERS TAN, HIGHLY WEATHERED, CONCENT RATED SULFUR, MODERATELY HARD.

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN SS TRC86032 SEAM : INTERVAL(M) : 0.22 – 0.84 ELEVATION(M) : 1731.0

GEOLOGIST : CAMPBELL SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.22			0.30												
			0.03		100.0	5456	5456	0.60/ 0.02		3.13	35.82	24.27	36.98	0.40	15.06	—
	0.84			0.30				0.62								

GCRI COAL DIVISION HEAD PROJ KPN BLK SS DS TRC86032

SAMPLE ID	05456	DATA TYPE (REAL,BORO,AVER,CALC)	REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED 14/10/86	
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)	AD

NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.40
TOTAL MOISTURE %	28.40	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	------
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	3.13	FSI	--.-
ASH %	35.62	HGI	---.-
VOLATILE MATTER %	24.27	CO2 %	--.--
FIXED CARBON %	36.98		

GROSS CALORIFIC VALUE (MJ/KG) 15.06
NET CALORIFIC VALUE (MJ/KG) --.--

KPNSNTRC86033

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSNTRC86033 DATE - 02/13/87

- H I S T O R Y -

START DATE - 26/07/86
END DATE - 26/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - HIGHLY WEATHERED; ROOF NOT REACHED DUE TO EXCESSIV
E SKREE; C/C+R=1.36/1.45 .

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1860.00
ZONE - 9
NORTHING - 6352625.00
EASTING - 497800.00

LICENCE/LEASE NUMBER -

LATITUDE - 571906
LONGITUDE - 1290211

- O R I E N T A T I O N -

LENGTH - 1.64
INCLINATION - 15.0
AZIMUTH - 355.0

SIZE WIDTH - 0.7
SIZE HEIGHT - 1.2

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 180
FLOOR DIP - 28
FLOOR DIR - N

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: SN DATA SOURCE: TRC86033

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.20	0.20	*90	05312		COAL	BLK UNCONSOLIDATED FLECKS OF C3 AND C4 COAL .
	0.20	0.22	0.02	*90	05312		MUDSTONE	LT.BN PARTLY UNCONSOLIDATED.
	0.22	0.34	0.12	*90	05312		COAL	BLK UNCONSOLIDATED; FLECKS OF C3 AND C4 COA L.
	0.34	0.45	0.11	*90	05312		COAL	C-3.BLK MOD. CONSOLIDATED; MODERATE CLEATING.
	0.45	0.50	0.05	*90	05312		MUDSTONE	CARB.BLK HIGHLY WEATHERED AND SOFT.
	0.50	0.68	0.18	*90	05312		COAL	BLK UNCONSOLIDARED; FLECKS OF C-1 TO C-5 CO AL;MAY ALSO CONTAIN CARB MUDST BANDS.
	0.68	0.70	0.02	*90	05312		MUDSTONE	BN ORANGE WEATHERING; MODERATELY CONSOLIDA TED.
	0.70	1.45	0.75	*90	05312		COAL	C-4.BLK PARTLY UNCONSOLIDATED; MODERATE CLEATIN G.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SN DATA SOURCE: TRC86033

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.45	1.55	0.10	*90			MUDSTONE	M.BN PARTLY UNCONSOLIDATED.

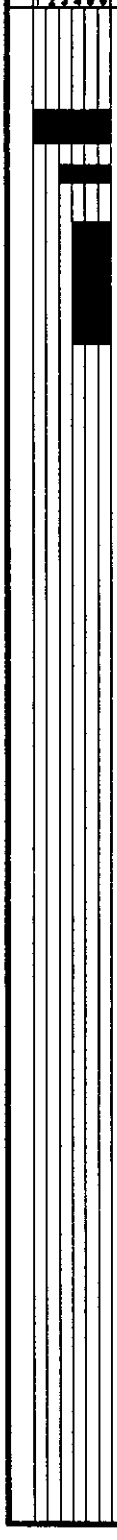
* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN SN TRC86033 SEAM : INTERVAL(M) : 0.00 - 1.45 ELEVATION(M) : 1860.0

GEOLOGIST : MACLEOD SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :



SEAM COMP. 1 2 3 4 0 0	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	0.00			0.20												
				0.23												
				0.18												
				0.75	100.0	5312	5312	1.36 / 0.09 1.45		3.31	22.87	19.44	54.88	0.36	21.35	—
	1.45															

GCRI COAL DIVISION	HEAD	PROJ KPN BLK SN DS TRC86033	
SAMPLE ID	05312	DATA TYPE (REAL,BORO,AVER,CALC)	REAL
SPLIT SAMPLE ID	HD1	DATE ANALYSED 14/10/86	
		ANALYSIS BASIS TYPE (AD,DB,AR,EM)	AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO)		ASTM	

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.36
TOTAL MOISTURE %	24.77	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	-----
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	3.31	FSI	--.-
ASH %	22.57	HGI	---.-
VOLATILE MATTER %	19.44	CO2 %	--.--
FIXED CARBON %	54.68		

GROSS CALORIFIC VALUE (MJ/KG)	21.35
NET CALORIFIC VALUE (MJ/KG)	--.--

KPNSSTRC86034

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSSTRC86034 DATE - 02/13/87

- H I S T O R Y -

START DATE - 12/08/86
END DATE - 12/08/86

CONTRACTOR -
GEOLOGIST - WILLIS
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - NEAR SURFACE, TOP ERODED BY OVERBURDEN, C/C+R= 0.9
6/1.16 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1720.00
ZONE - 9
NORTHING - 6351255.00
EASTING - 498500.00

LICENCE/LEASE NUMBER -

LATITUDE - 571822
LONGITUDE - 1290130

- O R I E N T A T I O N -

LENGTH - 1.80
INCLINATION - 20.5
AZIMUTH - 0.0

SIZE WIDTH - 0.7
SIZE HEIGHT - 1.1

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 20
FLOOR DIP - 30
FLOOR DIR - N

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86034

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	7.25	7.25	*90			MUDSTONE	CARB.DK.GY FLOOR.
	7.25	7.43	0.18	*90	05313		COAL	C-4 V. WEATHERED, 1 CM. QTZ. STRINGERS.
	7.43	7.56	0.13	*90	05313		COAL	C-3 MOD. WELL CLEATED, V. WEATHERED, 1 MM. MUD STRINGERS IN COAL.
	7.56	7.76	0.20	*90	05313		MUDSTONE	CARB SOFT, V. WEATHERED, FLECKS OF VITRAIN I N MUD.
	7.76	7.93	0.17	*90	05313		COAL	C-1 WELL DEFINED VITRAIN BANDS, CONCHOIDAL FRACTURE, WELL DEVELOPED CLEAT, SOME WE ATHERING, THIN C-2 STRINGERS.
	7.93	8.04	0.11	*90	05313		COAL	C-3 V. WEATHERED, WITH MUDDY STRINGERS.
	8.04	8.41	0.37	*90	05313		COAL	C-4 COAL VARIES FROM C-2 TO C-6 WITH MUD ST RINGERS VERY WEATHERED, NO DISTINCT BAN DING IN COAL TO SURFACE.
	8.41	8.61	0.20	*90			OVERBURDEN	NO ROOF.

* DENOTES MEASURED BCA
NEWPAGE

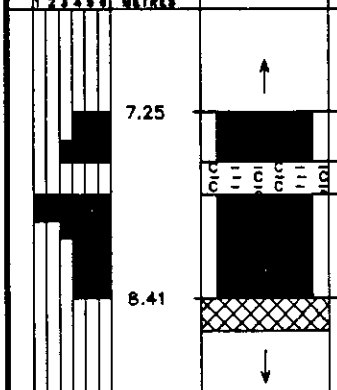
FORM 4001

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN SS TRC86034 SEAM : INTERVAL(M) : 7.25 - 8.41 ELEVATION(M) : 1720.0

GEOLOGIST : WILLIS SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :



SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG	
	7.25			0.31												
			0.20													
				0.85	100.0	5313	5313	0.96/ 0.20 1.16		3.73	28.81	17.48	50.20	0.35	18.29	—
	8.41															

GCRI COAL DIVISION HEAD PROJ KPN BLK SS DS TRC86034

SAMPLE ID 05313 DATA TYPE (REAL,BORO,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	___.__		
SURFACE MOISTURE %	__.__	TOTAL SULPHUR %	0.35
TOTAL MOISTURE %	21.78	PHOSPHOROUS %	_.___
EQUILIBRIUM MOISTURE %	__.__	CHLORINE (PPM)	_____
		SPECIFIC GRAVITY	_.__
RESIDUAL MOISTURE %	3.73	FSI	__._
ASH %	28.61	HGI	___.-
VOLATILE MATTER %	17.46	CO2 %	__.__
FIXED CARBON %	50.20		

GROSS CALORIFIC VALUE (MJ/KG) 19.29
NET CALORIFIC VALUE (MJ/KG) __.__

KPNSSTRC86035

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNSSTRC86035 DATE - 02/13/87

- H I S T O R Y -

START DATE - 13/08/86
END DATE - 13/08/86

CONTRACTOR -
GEOLOGIST - WILLIS
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - IN AXIS OF SYNCLINE, BEDDING CONTORTED, STRUC THIC KENED, C/C+R= 2.16/3.15 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1770.00
ZONE - 9
NORTHING - 6349875.00
EASTING - 501795.00

LICENCE/LEASE NUMBER -

LATITUDE - 571738
LONGITUDE - 1285813

- O R I E N T A T I O N -

LENGTH - 4.00
INCLINATION - 0.0
AZIMUTH - 50.0

SIZE WIDTH - 1.2
SIZE HEIGHT - 2.1

ROOF STRIKE - 135
ROOF DIP - 9
ROOF DIR - S

FLOOR STRIKE - 148
FLOOR DIP - 79
FLOOR DIR - S

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86035

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.10	0.10	*90			MUDSTONE	CARB.BLK HIGHLY WEATHERED, FE STAINED, C-3 FLECKS.
	0.10	0.23	0.13	*90			MUDSTONE	CARB.BLK UNCONSOLIDATED; C3-C4 FLECKS, FE STAINED, 1 CM. QTZ VEIN AT TOP.
	0.23	0.43	0.20	*90			MUDSTONE	LT.GY WELL CONSOLIDATED.
	0.43	0.57	0.14	*90			MUDSTONE	CARB.BLK WELL CONSOLIDATED, C3 BANDS UP TO 5 CM.
	0.57	0.68	0.11	*90			MUDSTONE	CARB.BLK HIGHLY WEATHERED, C3 FLECKS.
	0.68	0.80	0.12	*90			MUDSTONE	CARB.BLK C3 BANDS UP TO 1 CM.
	0.80	0.85	0.05	*90			MUDSTONE	M.GY SOFT, C5 FLECKS.
	0.85	1.09	0.24	*90	05314		COAL	C-2.BLK MODERATELY CONSOLIDATED, WELL CLEATED.
	1.09	1.24	0.15	*90	05314		COAL	C-3.BLK WELL CLEATED, FE STAINED, WELL CONSOLIDATED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86035

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.24	1.36	0.12	*90	05314		COAL	C-2.BLK WELL CLEATED, WELL CONSOLIDATED, FE STAINED, CONCHOIDAL FRACTURE.
	1.36	1.43	0.07	*90	05314		MUDSTONE	DK.GY WELL CONSOLIDATED, 1 CM. BAND OF QTZ.
	1.43	1.64	0.21	*90	05314		MUDSTONE	CARB.BLK ABUNDANT VITRAIN BANDS .5 CM.- 1 CM.
	1.64	1.71	0.07	*90	05314		COAL	C-5.BLK FE STAINED, SOFT, HIGHLY WEATHERED.
	1.71	1.77	0.06	*90	05314		COAL	C-2.BLK WELL CLEATED, WELL CONSOLIDATED, CONCHOIDAL FRACTURE, MINOR FE STAIN.
	1.77	1.79	0.02	*90	05314		COAL	C-4.BLK HIGHLY WEATHERED.
	1.79	2.00	0.21	*90	05314		COAL	C-2.BLK FE STAINED, WELL CONSOLIDATED, 1 CM. STRINGER OF C-4, MODERATE CLEATING.
	2.00	2.08	0.08	*90	05314		COAL	C-4.BLK FE STAINED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86035

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	2.08	2.16	0.08	*90	05314		COAL	C-3.BLK FE STAINED, THIN MUDST LAMINAE 1-2 MM., SOFT.
	2.16	2.25	0.09	*90	05314		COAL	C-4.BLK FE STAINED, WELL CLEATED, 1 CM. BAND OF C-2.
	2.25	2.31	0.06	*90	05314		MUDSTONE	M.GY
	2.31	2.53	0.22	*90	05314		COAL	C-6.BLK SOFT, HIGHLY WEATHERED.
	2.53	2.68	0.15	*90	05314		COAL	C-3.BLK FE STAINED BANDS, 0.5 CM. BAND OF C-2, SOFT, FE STAINED, WELL CLEATED, CONCHOI DAL FRACTURE, 0.5 CM. BANDS OF C-2.
	2.68	2.71	0.03	*90	05314		COAL	C-2.BLK WELL CLEATED, CONCHOIDAL FRACTURE.
	2.71	2.77	0.06	*90	05314		MUDSTONE	CARB.BLK SOFT, WEATHERED, C-4 FLECKS.
	2.77	2.85	0.08	*90	05314		COAL	C-4.BLK FE STAINED, 0.5 CM. MUDST BANDS.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86035

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	2.85	2.87	0.02	*90	05314		MUDSTONE	CARB.BLK SOFT, BROKEN, VITRAIN FLECKS.
	2.87	2.90	0.03	*90	05314		COAL	C-5.BLK BROKEN, SOFT, HIGHLY WEATHERED, 1-2 MM. MUDST STRINGERS.
	2.90	2.97	0.07	*90	05314		MUDSTONE	CARB.BLK SOFT, WEATHERED, PARTLY FROZEN, C-5 FLE CKS.
	2.97	3.19	0.22	*90	05314		MUDSTONE	CARB.BLK VITRAIN FLECKS, PARTLY FROZEN.
	3.19	3.29	0.10	*90	05314		COAL	C-6.BLK THIN VITRAIN LAMINAE, WEATHERED.
	3.29	3.32	0.03	*90	05314		MUDSTONE	CARB.BLK COAL FLECKS, WEATHERED.
	3.32	3.46	0.14	*90	05314		COAL	C-4.BLK WEATHERED, PARTLY FROZEN.
	3.46	3.53	0.07	*90	05314		MUDSTONE	CARB.BLK COAL FLECKS, SOFT, WEATHERED, MINOR FE STAINED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86035

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	3.53	3.61	0.08	*90	05314		COAL	C-4.BLK WEATHERED, THIN MUDST, BANDS UP TO 2 MM
	3.61	3.65	0.04	*90	05314		MUDSTONE	CARB.BLK FE STAINED, VITRAIN FLECKS, HIGHLY WEAT HERED.
	3.65	3.69	0.04	*90	05314		COAL	C-5.BLK VERY WEATHERED, MUDST FRAGMENTS.
	3.69	3.76	0.07	*90	05314		MUDSTONE	CARB.BLK FE STAINED, ABUNDANT VITRAIN FLECKS.
	3.76	3.80	0.04	*90	05314		COAL	C-6.BLK WEATHERED.
	3.80	3.83	0.03	*90	05314		MUDSTONE	CARB.BLK FE STAINED, VITRAIN FLECKS.
	3.83	3.86	0.03	*90	05314		COAL	C-6.BLK WEATHERED.
	3.86	3.90	0.04	*90	05314		MUDSTONE	CARB.BLK FE STAINED, HIGHLY WEATHERED.
	3.90	4.00	0.10	*90	05314		COAL	C-6.BLK 2 MM. MUDST BANDS, HIGHLY WEATHERED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: SS DATA SOURCE: TRC86035

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	4.00	4.05	0.05	*90			MUDSTONE	CARB.BLK HIGHLY WEATHERED.

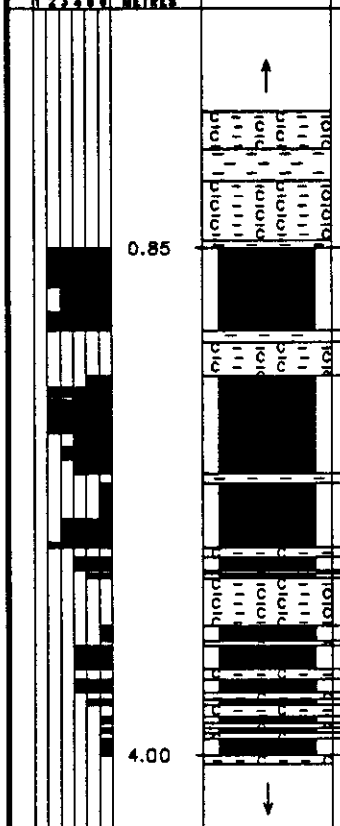
* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION

SEAM DETAIL — **COAL DIVISION** — **MOUNT KLAPPAN PROJECT** — **TRUE THICKNESS**

DATA SOURCE: KPN SS TRC86035 SEAM : INTERVAL(M) : 0.85 - 4.00 ELEVATION(M) : 1770.0

GEOLOGIST : WILLIS SCALE: 1:40 DATE : FEB 13/87 DRAWING NO. :



SEAM COMP. 1 2 3 4 6 8	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/KG
	0.85			0.31											
			0.87												
			0.21												
				0.61											
			0.88												
				0.40	100.0	5314	5314	2.18 / 0.89 3.15		3.81	31.62	15.86	48.81	0.30	18.18
			0.16												
			0.03	0.02											
			0.29												
				0.10											
			0.04	0.14											
			0.37												
				0.08											
			0.07												
			0.03	0.05											
	4.00			0.10											

GCRI COAL DIVISION HEAD PROJ KPN BLK SS DS TRC86035

SAMPLE ID 05314 DATA TYPE (REAL,BORO,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	___.__		
SURFACE MOISTURE %	__.__	TOTAL SULPHUR %	0.30
TOTAL MOISTURE %	25.63	PHOSPHOROUS %	_.___
EQUILIBRIUM MOISTURE %	__.__	CHLORINE (PPM)	_____
		SPECIFIC GRAVITY	_.__
RESIDUAL MOISTURE %	3.91	FSI	__.-
ASH %	31.62	HGI	___.-
VOLATILE MATTER %	15.86	CO2 %	__.__
FIXED CARBON %	48.61		

GROSS CALORIFIC VALUE (MJ/KG) 18.16
NET CALORIFIC VALUE (MJ/KG) __.__

KPNNRTRC86036

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNRTRC86036 DATE - 02/13/87

- H I S T O R Y -

START DATE - 12/07/86
END DATE - 12/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - SEAM ?, WEATHERED. NO ROOF DUE TO EROSION. C/C+R= 1.09/1.19 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1475.00
ZONE - 9
NORTHING - 6336485.00
EASTING - 495680.00

LICENCE/LEASE NUMBER -

LATITUDE - 571024
LONGITUDE - 1290417

- O R I E N T A T I O N -

LENGTH - 1.70
INCLINATION - 3.0
AZIMUTH - 10.0

SIZE WIDTH - 0.6
SIZE HEIGHT - 1.5

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 55
FLOOR DIP - 50
FLOOR DIR - N

*** NOTE *** 0 INDICATES NO VALUE

87/02/13 GULF CANADA CORPORATION - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: NR DATA SOURCE: TRC86036

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.20	0.20	*90	05311		COAL	C-3 HIGHLY WEATHERED, CONTAINS FLECKS OF C-3 TO C-4, REPRESENTS A MINIMUN THICKNESS BECAUSE ROOF ERODED.
	0.20	0.40	0.20	*90	05311		COAL	C-4 POORLY CONSOLIDATED, HIGHLY IRON STAINED.
	0.40	0.86	0.46	*90	05311		COAL	C-4 MODERATELY WELL CONSOLIDATED, POOR CLEATING, MAJOR IRON STAINING, DISCONTINUOUS, IRON STAINED MUDSTONE BANDS (1 CM).
	0.86	0.96	0.10	*90	05311		MUDSTONE	CARB ABUNDANT COAL LAMINAE, MODERATELY WELL CONSOLIDATED.
	0.96	1.19	0.23	*90	05311		COAL	EXTREMELY WEATHERED, POORLY CONSOLIDATED, IRON STAINED, CONTAINS FLECKS OF C-3 TO C-4.
	1.19	1.41	0.22	*90			MUDSTONE	CARB.M.BLK VERY WELL CONSOLIDATED, THIN, DISCONTINUOUS COAL STRINGERS <.5 MM. MINOR COAL LAMINAE UP TO .5 CM.

-854- NOW IN CONTACT WITH SYSTEM 2000 -
***** GEX - 03.01 - COCC.COAL/21 ALLOCATED.
-855- NO LONGER IN CONTACT WITH SYSTEM 2000 -

FORM 4001

GULF CANADA CORPORATION

SEAM DETAIL — COAL DIVISION, MOUNT KLAPPAN PROJECT — **TRUE THICKNESS**

DATA SOURCE: KPN NR TRC86036 | SEAM : | INTERVAL(M) : 0.00 – 1.19 | ELEVATION(M) : 1475.0

GEOLOGIST : MACLEOD | SCALE: 1:40 | DATE : FEB 13/87 | DRAWING NO. :

SEAM COMP. 1 2 3 4 5 6	DRILL DEPTH METRES	COAL SEAM LOG	INTERVAL METRES ROCK	INTERVAL METRES COAL	% REC.	SAMPLE ID SIMP	SAMPLE ID COMP	COAL/ROCK TOTAL COMPOS	COAL/ROCK TOTAL MINING SECTION	COAL QUALITY A.D.B. RES MOIST	ASH	VM	FC	TS	CAL.VAL MJ/Kg	
	0.00															
				0.86	100.0	5311	5311	1.09 / 0.10		2.95	9.41	17.39	70.25	0.53	27.06	—
			0.10					1.19								
				0.23												
	1.19															

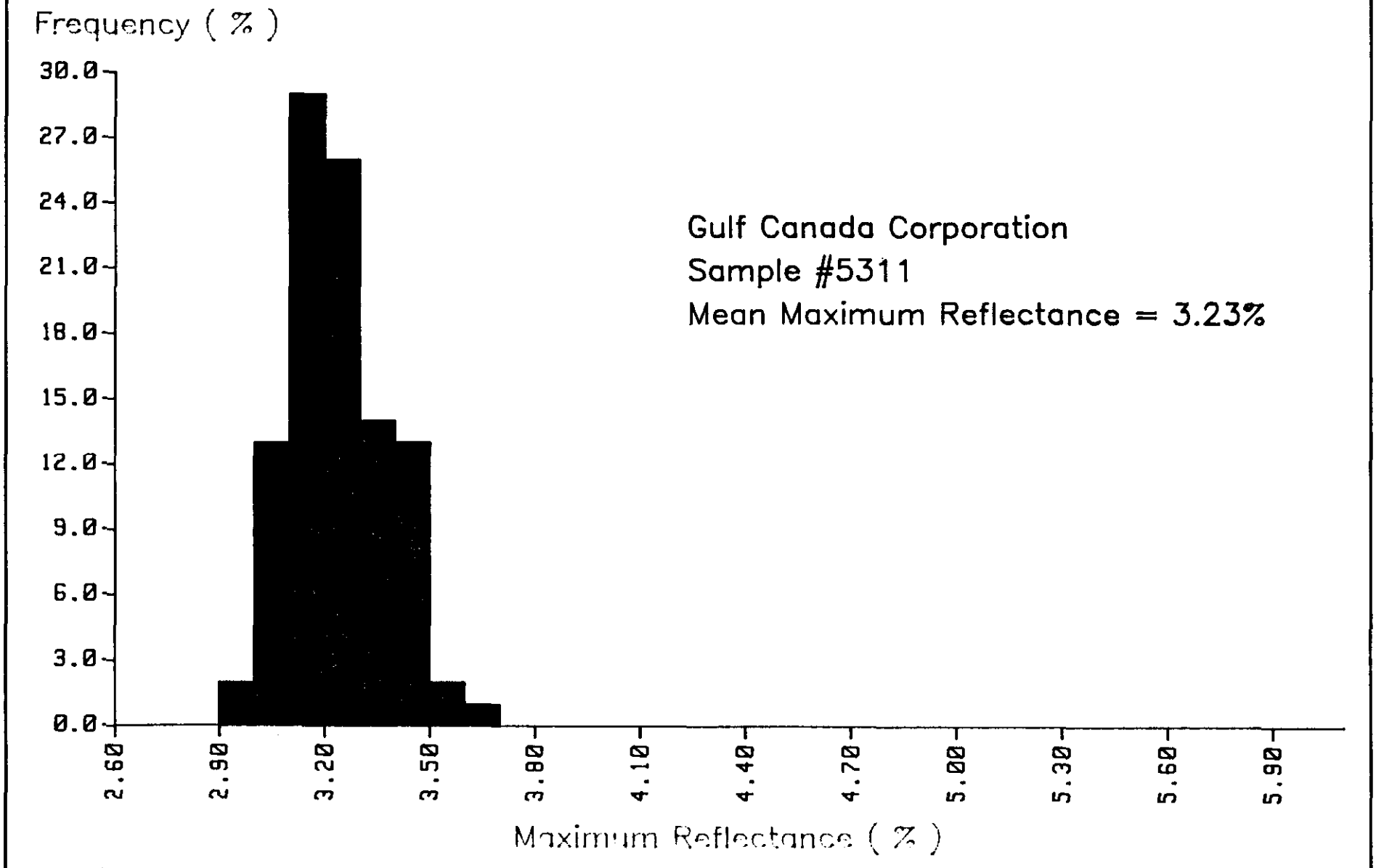
GCRI COAL DIVISION HEAD PROJ KPN BLK NR DS TRC86036

SAMPLE ID 05311 DATA TYPE (REAL,BORO,AVER,CALC) REAL
SPLIT SAMPLE ID HD1 DATE ANALYSED 14/10/86
ANALYSIS BASIS TYPE (AD,DB,AR,EM) AD
NAME OF STANDARD (ASTM,JIS,DIN,BS,AS,GOST,ISO) ASTM

TOP SIZE (MM)	---.--		
SURFACE MOISTURE %	--.--	TOTAL SULPHUR %	0.53
TOTAL MOISTURE %	20.69	PHOSPHOROUS %	-.---
EQUILIBRIUM MOISTURE %	--.--	CHLORINE (PPM)	-----
		SPECIFIC GRAVITY	-.--
RESIDUAL MOISTURE %	2.95	FSI	--.-
ASH %	9.41	HGI	---.-
VOLATILE MATTER %	17.39	CO2 %	--.--
FIXED CARBON %	70.25		

GROSS CALORIFIC VALUE (MJ/KG) 27.06
NET CALORIFIC VALUE (MJ/KG) --.--

VITRINITE HISTOGRAM



David E. Pearson & Associates Ltd.

APPENDIX I

SUMMIT-NASS-SKEENA AREA

MEASURED SECTIONS

DATA SOURCE

SUMMARY

GULF CANADA CORPORATION - COAL DIVISION

13/MAR/87 PROJECT DATA SOURCE SUMMARY PAGE 1

DATA SOURCE	LOCATION NORTHING	LOCATION EASTING	ELEVATION	LENGTH	ANGLE	AZIMUTH	LOG TYPE
KPNLROTC86001	6341800.0	506740.0	1769.0	24.1			
KPNNROTC86002	6338600.0	488300.0	1464.0	221.4			
KPNNROTC86003	6341450.0	497000.0	1375.0	96.7			
KPNNROTC86004	6336930.0	496220.0	1825.0	230.2			
KPNLROTC86005	6341860.0	506560.0	1751.0	69.1			
KPNNROTC86006	6339000.0	498100.0	1829.0	102.9			

KPNLROTC86001

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNLROTC86001 DATE - 02/13/87

- H I S T O R Y -

START DATE - 21/06/86
END DATE - 21/06/86

CONTRACTOR -
GEOLOGIST - LEE
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - OTC IS IN MT. KLAPPAN CANYON. OTC86001 IS STRAT. B ELOW OTC86005 BY 10 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1769.00
ZONE - 9
NORTHING - 6341800.00
EASTING - 506740.00

LICENCE/LEASE NUMBER -

LATITUDE - 0
LONGITUDE - 0

- O R I E N T A T I O N -

LENGTH - 24.10
INCLINATION - 0.0
AZIMUTH - 0.0

SIZE WIDTH - 0.0
SIZE HEIGHT - 0.0

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC86001

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.13	0.13	*90			MUDSTONE	DK.GY UNCONSOLIDATED. COAL BANDS (C-1) UP TO .5CM THK (30-40%).
	0.13	0.17	0.04	*90			MUDSTONE	DK.GY FE STAIN.
	0.17	0.23	0.06	*90			COAL	C-1.BLK C-1 TO C-2. WELL CLEATED. CONCHOIDAL FRACTURES. POSSIBLY K-L SEAM.
	0.23	0.31	0.08	*90			MUDSTONE	DK.GY HIGHLY FE STAINED. MINOR COAL BANDS (UP TO 3 MM THICK) SOFT. BEDDING 124/ 28 NE.
	0.31	0.38	0.07	*90			COAL	C-3
	0.38	0.60	0.22	*90			MUDSTONE	DK.GY UNCONSOLIDATED. FE STAINED. INTERBEDDED WITH COAL (C-3) <1 CM THICK.
	0.60	0.90	0.30	*90			MUDSTONE	DK.GY POORLY CONSOLIDATED. FE STAINED.
	0.90	1.11	0.21	*90			OVERBURDEN	COVERED INTERVAL.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC86001

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	1.11	1.19	0.08	*90			MUDSTONE	M.GY WTHERS LT. GREY.
	1.19	1.51	0.32	*90			MUDSTONE	DK.GY WTHERS M-DK GREY. HIGHLY FRACTURED. PLANT HASH.
	1.51	6.77	5.26	*90			SILTSTONE	M.GY FE STAINED. WTHERS TO GREY & DISCONTINUOUS ORANGE BANDS. ORANGE BANDS ARE .3 M THICK. GREY BANDS ARE .4 M THICK. NODULAR WTHERING. HIGHLY FRACT. PLANT HASH.
	6.77	8.27	1.50	*90			SILTSTONE	M.BN WTHERS GREY - BROWN. EXTREMELY FRACTURED. FINE GRAIN SS LAMINATIONS (30%).
	8.27	8.64	0.37	*90			SANDSTONE	FG.M-DK.GY WTHERS ORANGE. VERY RESISTIVE. BLOCKY FRACTURE.
	8.64	9.25	0.61	*90			SANDSTONE	FG.M-DK.GY WTHERS M. GREY & LT BROWN. BEDS 8 CM THICK. INTERBED WITH DK GREY MDST <5 CM THICK. RECESSIVE.

* DENOTES MEASURED BCA

GULF CANADA CORPORATION
COAL DIVISION
KLAPPAN PROJECT
STRATIGRAPHIC LOG
KPN LR 0TC86001

722

GEOLOGIST : LEE	DATE : FEB 24/87	DRAWING NO. :

SCALE : 1:200 1:40

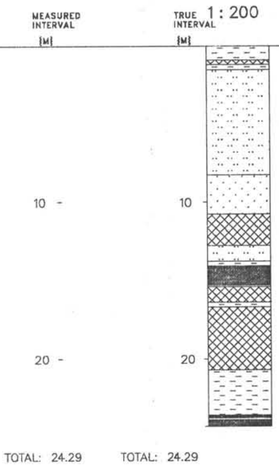
0 — 5 [M]

0 — .5 — 1 [M]

NORTHING: 6341800.0 N
EASTING: 506740.0 E

LITHOLOGIC SYMBOLS

	SANDSTONE		BENTONITE
	SILTSTONE	2 2 2	BRECCIA
	COAL	C C C	CARBONACEOUS
	OVERBURDEN	Q Q Q	QUARTZ
	MUDSTONE, CLAYSTONE	P P P	PYRITE
V V V V V	TUFF	FE FE FE	FERRUGINOUS
	LIMESTONE	o o o	CONGLOMERATE
	COVERED	F	FOSSIL BED



TOTAL: 24.29 TOTAL: 24.29

KPNNROTC86002

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNROTC86002 DATE - 02/13/87

- H I S T O R Y -

START DATE - 04/07/86
END DATE - 04/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - MEASURED SECT. WEST OF NASS LAKE AND SOUTH OF KLAP PAN R. SECT IS PROBABLY LOWER MALLOCH.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1464.00
ZONE - 9
NORTHING - 6338600.00
EASTING - 488300.00

LICENCE/LEASE NUMBER -

LATITUDE - 0
LONGITUDE - 0

- O R I E N T A T I O N -

LENGTH - 221.43
INCLINATION - 0.0
AZIMUTH - 0.0

SIZE WIDTH - 0.0
SIZE HEIGHT - 0.0

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86002

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	2.50	2.50	*90			SANDSTONE	MG.M.GY.THNB WEATHERS M. GREY TO LT. BROWN. BEDS UP TO 1CM THICK. MOD. RESISTIVE. FINER GRAINED TOWARDS BASE.
	2.50	2.85	0.35	*90			MUDSTONE	M.GY WEATHERS ORANGE. VERY RESISTENT,PLANT FOSSILS:NILSSONIA SCHAUMBERGENSIS.
	2.85	4.35	1.50	*90			SILTSTONE	M.GY.THNB WEATHERS LT. GREY.
	4.35	5.35	1.00	*90			OVERBURDEN	COVERED INTERVAL: GRASSY.
	5.35	6.35	1.00	*90			SILTSTONE	M.GY.THNB AS ABOVE.
	6.35	9.35	3.00	*90			SANDSTONE	FG.THNB WEATHERS M. BROWN. MINOR ORANGE SLTST LENSES.
	9.35	12.35	3.00	*90			OVERBURDEN	COVERED INTERVAL: GRASSY.
	12.35	13.35	1.00	*90			SANDSTONE	FG.M.GY.THNB WEATHERS M. BROWN.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86002

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	13.35	16.25	2.90	*90			SILTSTONE	M.GY.THNB.RIPMK WEATHERS M. BROWN. THINLY LAMINATED. MINOR DISC. FE STAINING.PLANT FOSSILS:NILSSONIA CANADENSIS, CZEKANOWSKIA RIGIDA, PITYOPHYLLUM NORDENSKIOLDII, PODOZAMITES LANCEOLATUS. BDG 121/48S.
	16.25	18.75	2.50	*90			SANDSTONE	FG.M.GY.THNB WEATHERS LT. GREY. BLOCKY FRACTURES. FAINT DARKER GREY LAMINATIONS.
	18.75	20.25	1.50	*90			SILTSTONE	DK.GY.THNB WEATHERS M. GREY. COARSENS DOWNWARDS INTO NEXT UNIT.
	20.25	29.25	9.00	*90			SANDSTONE	MG.DK.GY.THNB WEATHERS LT. GREY TO ORANGE. QUITE RESISTIVE. BLOCKY FRACTURES. MINOR 15CM TWIGS.
	29.25	32.25	3.00	*90			OVERBURDEN	COVERED INTERVAL: GRASSY AND SNOW.
	32.25	35.30	3.05	*90			SANDSTONE	FG.M.GY.THNB WEATHERS LT. GREY TO LT. BROWN WITH LENSES OF ORANGE WEATHERED M. GREY SLTST. FINER GRAINED TOWARDS BASE.PLANT FOSSILS:NILSSONIA SCHAUMBERGENSIS,CLADOPHLEBIS VIRGINIENSIS FISHERI.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86002

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	35.30	36.50	1.20	*90			SANDSTONE	MG.M.GY.THNB WEATHERS AS ABOVE.
	36.50	36.60	0.10	*90			MUDSTONE	M.GY WEATHERS ORANGE. VERY RESISTIVE.
	36.60	37.25	0.65	*90			SILTSTONE	DK.BN.THNB WEATHERS DK. GREY TO ORANGE. HIGHLY FRACTURED. SHARP PLANAR CONTACT WITH ABOVE UNIT. BDG 109/52S.
	37.25	37.58	0.33	*90			MUDSTONE	M.GY AS ABOVE THE SLTST UNIT. PLANT HASH.
	37.58	39.68	2.10	*90			SILTSTONE	M.GY.THNB WEATHERS M. BROWN TO M. GREY. DISCONT. FE STAINING. HIGHLY FRACTURED. APPEARS TO COARSEN DOWNWARDS INTO VFG SS. MINOR PLANTS:CZEKANOWSKIA RIGIDA AND BAIERA FURCATA.
	39.68	50.68	11.00	*90			SANDSTONE	MG.M.GY.THKB WEATHERS LT. GREY TO TAN. EXTREMELY RESISTIVE. BLOCKY FRACTURES. 5M CHERT PEBBLE CONGLOMERATE CHANNEL IS EQUIVALENT AND ALONG TREND.
	50.68	54.68	4.00	*90			OVERBURDEN	COVERED INTERVAL: SNOW.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86002

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	54.68	64.18	9.50	*90			SANDSTONE	MG.M.GY.THNB WEATHERS LT. GREY TO LT. BROWN. MOD. FE STAINED. THIN LENSES OF FINER GRAINED SS. THICK BEDDED TOWARDS BASE. BDG:125/35S;S1:119/75E;L1:41-->029
	64.18	69.18	5.00	*90			OVERBURDEN	COVERED INTERVAL: SNOW. MINOR COAL FLECKS IN SCREE BELOW.
	69.18	82.18	13.00	*90			SANDSTONE	MG.M.GY.THNB WEATHERS LT. GREY TO M. BROWN. MINOR PLANT HASH ON BEDDING PLANES. THIN BRIGHT ORANGE MUDST BAND (2CM THICK) AT BASE OF UNIT. BEDDING IS THICKEST AT BASE. BLOCKY FRACTURING. MINOR PLANT FOSSILS:SPHENOPTERIS BRULENSIS.
	82.18	85.18	3.00	*90			OVERBURDEN	COVERED INTERVAL: SCREE. MAY BE PART OF UNIT ABOVE.
	85.18	92.68	7.50	*90			SANDSTONE	MG.M.GY.THNB AS ABOVE.
	92.68	93.48	0.80	*90			SANDSTONE	MG.M.GY.THNB AS ABOVE.
	93.48	93.78	0.30	*90			SANDSTONE	MG.M.GY.THNB AS ABOVE. PLANT FOSSILS:CLADOPHLEBIS VIRGINIENSIS FISHERI.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86002

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	93.78	94.38	0.60	*90			MUDSTONE	DK.GY.VTHNB WEATHERS M. GREY. COARSENS TO SLTST AT BASE. DISCONT. FE STAIN.PLANT FOSSILS:CLADOPHLEBIS VIRGINIENSIS FISHERI,MINOR BAIERA FURCATA,SPHENOPTERIS BRULENSIS.
	94.38	94.53	0.15	*90			SILTSTONE	DK.GY.THNB WEATHERS ORANGE AND DK. GREY. ORANGE WEATHERING NODULES. GRADATIONAL UPPER CONTACT.PLANT FOSSILS AS ABOVE.
	94.53	95.13	0.60	*90			SANDSTONE	MG.M.GY.MB WEATHERS LT. GREY TO ORANGE.
	95.13	95.33	0.20	*90			SILTSTONE	M.GY.VTHNB WEATHERS ORANGE.PLANT FOSSILS: CZEKANOWSKIA RIGIDA AND BAIERA FURCATA ?).
	95.33	97.33	2.00	*90			SANDSTONE	FG.DK.GY.THKB WEATHERS LT. GREY TO LT. BROWN. COMPETENT. BLOCKY FRACTURING.
	97.33	104.33	7.00	*90			OVERBURDEN	COVERED INTERVAL: SCREE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86002

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	104.33	106.33	2.00	*90			SILTSTONE	DK.GY.THNB WEATHERS M-DK GREY. HIGHLY FRACTURED. DISCONT. ORANGE WEATHERED MUDST NODULES. PLANT FOSSILS:PTEROPHYLLUM RECTANGULARE ,CLADOPHLEBIS VIRGINIENSIS FISHERI,PODOZAMITES LANCEOLATUS.
	106.33	156.33	50.00	*90			SANDSTONE	FG.DK.GY.THKB WEATHERS LT. GREY TO LT. TAN. MASSIVE APPEARANCE.
	156.33	206.33	50.00	*90			OVERBURDEN	COVERED INTERVAL: LOW BUSH AND TREES.
	206.33	211.33	5.00	*90			SANDSTONE	FG.DK.GY.THKB AS ABOVE. BDG: 096/17S
	211.33	211.43	0.10	*90			MUDSTONE	CARB NOT LATERALLY CONTINUOUS.
	211.43	221.43	10.00	*90			CONGLOMERATE	PBLY NOT LATERALLY CONTINUOUS.

* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION
COAL DIVISION
KLAPPAN PROJECT
STRATIGRAPHIC LOG
KPN NR OTC86002

722

GEOLOGIST : MACLEOD | DATE : FEB 24/87 | DRAWING NO. :

SCALE : 1:200 1:40

NORTHING: 6338600.0 N
EASTING: 488500.0 E

LITHOLOGIC SYMBOLS

	SANDSTONE		BENTONITE
	SILTSTONE	B R C	BRECCIA
	COAL	C C C	CARBONACEOUS
	OVERBURDEN	Q Q Q	QUARTZ
	MUDSTONE,CLAYSTONE	P P P	PYRITE
	TUFF	FE FE FE	FERRUGINOUS
	LIMESTONE	C O C	CONGLOMERATE
	COVERED	f	FOSSIL BED

MEASURED INTERVAL (m) | TRUE INTERVAL 1 : 200 (m)

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220

TOTAL: 221.43 TOTAL: 221.43

KPNNROTC86003

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNROTC86003 DATE - 02/13/87

- H I S T O R Y -

START DATE - 07/07/86
END DATE - 10/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - CLYDE CK COMP SECT INCL 4 COAL ZONES & 10 CORRELAT
EABLE UNITS ON THE BASIS OF LITHOLOGY AND DISTINCT
IVE WEATHERING.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1375.00
ZONE - 9
NORTHING - 6341450.00
EASTING - 497000.00

LICENCE/LEASE NUMBER -

LATITUDE - 0
LONGITUDE - 0

- O R I E N T A T I O N -

LENGTH - 96.69
INCLINATION - 0.0
AZIMUTH - 0.0

SIZE WIDTH - 0.0
SIZE HEIGHT - 0.0

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86003

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	0.50	0.50	*90			SANDSTONE	M.BN UNIT 1A. WEATHERS ORANGE-BROWN.
	0.50	3.30	2.80	*90			SILTSTONE	DK.GY.VTHNB BEDDING APPROX. 3CM THICK. WEATHERS YEL LOW-ORANGE.
	3.30	6.80	3.50	*90			SANDSTONE	VFG.DK.GY.MB VERY THIN SILTY LAMINATIONS. NODULAR WE ATHERING.
	6.80	7.10	0.30	*90			SANDSTONE	VFG.DK.GY.MB WEATHERS ORANGE AND NODULAR.
	7.10	8.20	1.10	*90			SILTSTONE	DK.GY.THNB WEATHERS GREY AND NODULAR. WITH THIN MU DST LAMINAE.
	8.20	10.10	1.90	*90			SANDSTONE	FG.LT.GY.THNB THIN SILTY DARK GREY LAMINATIONS. INTER BEDDED WITH V. THIN BD. SLTST (20%).
	10.10	12.80	2.70	*90			OVERBURDEN	COVERED INTERVAL. COAL IN OVERBURDEN?
	12.80	13.04	0.24	*90			SILTSTONE	LT.GY.LAM WEATHERS BUFF.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86003

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	13.04	13.24	0.20	*90			SILTSTONE	M.GY WEATHERS PALE BROWN TO MEDIUM GREY. PEN CIL CLEAVAGE.
	13.24	15.24	2.00	*90			OVERBURDEN	COVERED INTERVAL. SCREE.
	15.24	15.76	0.52	*90			MUDSTONE	TRCNR86003 ROOF.
	15.76	16.08	0.32	*90			SANDSTONE	
	16.08	19.15	3.07	*90			COAL	C-4 COAL ZONE 1. TRCNR86003. C/C+R = 2.16/3 .07.
	19.15	20.15	1.00	*90			SANDSTONE	TRCNR86003 FLOOR.
	20.15	21.15	1.00	*90			SANDSTONE	FG.M.GY.MB UNIT 1B. WEATHERS LT. BROWN. VERY RESIS TIVE.
	21.15	25.15	4.00	*90			SILTSTONE	M.GY.THNB HIGHLY FRACTURED. MINOR ORANGE NODULAR WEATHERING.NODULES UP TO 11 CM. INTERBE DDED WITH INC. AMTS. OF FG SS TOWARDS B ASE. ABUNDANT PLANT FOSSILS ESP.NILSSON IA TENUICAULIS.

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86003

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	25.15	26.45	1.30	*90			SILTSTONE	M.GY WEATHERS ORANGE NODULAR. ABUND. PLANT H ASH.
	26.45	26.89	0.44	*90			MUDSTONE	DK.GY UNIT 2. WEATHERS M GREY. HIGHLY RECESSI VE.
	26.89	29.74	2.85	*90			MUDSTONE	CARB.BLK HIGHLY SHEARED. VERY RECESSIVE.
	29.74	31.54	1.80	*90			SANDSTONE	MG.LT.GY.XBDG UNIT 3. WEATHERS LT. GREY WITH 10CM ORA NGE BANDS APPROX 30CM APART. MINOR NILS SONIA TENUICAULIS PARALLEL TO BEDDING P LANES. TOPS UP.
	31.54	32.18	0.64	*90			SILTSTONE	LT.GY WEATHERS ORANGE. PLANT FOSSIL PTEROPHYL LUM RECTANGULARE.ORANGE NODULAR WEATHER ING.
	32.18	34.87	2.69	*90			MUDSTONE	M.GY WEATHERS LT. GREY. VERY FISSILE. RECESS IVE. THIN COAL BANDS (<20CM). HIGHLY WE ATHERED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86003

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	34.87	35.79	0.92	*90			SILTSTONE	DK.GY.THNB WEATHERS DK. GREY. PLANT FOSSIL: NILSSO NIA TENUICAULIS.
	35.79	36.35	0.56	*90			SILTSTONE	GY.THNB UNIT 4. WEATHERS ORANGE AND NODULAR. RE CESSIVE. HIGHLY FRACTURED. INTERBD WITH M. GREY MUDST BEDS, 20CM THICK AND 10- 20CM APART. ABUND. PLANT FOSSILS:BAIERA FURCATA,BAIERA GRACILIS,NILSSONIA TENU ICAULIS AND GINKGO NANA. .
	36.35	37.15	0.80	*90			SILTSTONE	M.GY.THKB SOLID ORANGE WEATHERED. EXTREMELY RESIS TIVE. BEDDING 060/40SE.
	37.15	45.25	8.10	*90			SANDSTONE	MG.M.GY UNIT 5 WTHRS GY-OR.MINOR LENSES OF LT. GY MG SS IN TOP 25% OF UNIT.LAMINAE OF DK GY MUDST. BLOCKY FRACT. CLIFF FORMIN G. GRADUAL INC. FG SS NEAR TOP. MINOR < 5CM BANDS OF OR WTHRD SLST. BOTTOM 25 C M CONTAINS THIN MDST LAMINAE .
	45.25	46.95	1.70	*90			SILTSTONE	M.GY.THNB UNIT 6. WEATHERS ORANGE TO M. GREY. ORA NGE BANDS 20CM APART. STRIKING DECREASE IN RESISTIVENESS FROM ABOVE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86003

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	46.95	49.95	3.00	*90			MUDSTONE	BLK VERY FISSILE. HIGHLY FRACTURED. VERY TH IN QTZ VEINS. MINOR COAL LAMINAE DISCON TINUOUS NODULES OF M. GREY ORANGE WEATH ERED SLTST 10-20CM THICK.
	49.95	50.15	0.20	*90			MUDSTONE	CARB WITH COAL LAMINAE.
	50.15	50.35	0.20	*90			COAL	C-2 COAL ZONE 2. C-2 TO C-3. FE STAINED. WE LL CLEATED.COAL STRUCTURALLY THICKENED IN TRC83084.
	50.35	50.45	0.10	*90			MUDSTONE	CARB
	50.45	50.75	0.30	*90			MUDSTONE	M.GY MINOR DISCONT. COAL LAMINAE.
	50.75	51.04	0.29	*90			MUDSTONE	TRCNR86004 ROOF.
	51.04	52.75	1.71	*90			COAL	C-3 COAL ZONE 3. TRCNR86004. C/C+R = 1.52/1 .71.
	52.75	52.92	0.17	*90			MUDSTONE	TRCNR86004 FLOOR.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86003

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	52.92	53.75	0.83	*90			SANDSTONE	MG.LT.GY.THKB UNIT 7. WEATHERS BUFF TO LT. GREY-BROWN . MINOR FE STAIN. BLOCKY FRACT. MOSTLY THICK BEDDED. MINOR THIN BEDS < 2CM. IN 20CM THICK PACKAGES 10-20CM APART. INC REASE IN THIN BEDS TO BASE. MINOR NODUL AR SLST WEATHERING. CLIFF FORMING.
	53.75	60.75	7.00	*90			OVERBURDEN	UNIT 8. COVERED INTERVAL.
	60.75	64.25	3.50	*90			MUDSTONE	DK.GY.THNB WEATHERS M. GREY AND ORANGE NODULAR. HI GHLY FRACTURED. CONTAINS MINOR 20CM BAN DS OF ORANGE WEATHERED SLST. VERY RECES SIVE.
	64.25	65.54	1.29	*90			SANDSTONE	FG.M.GY.MB WEATHERS M. GREY. SOME LIGHTER COLOURED MED GR.SS RESULTING IN MOTTLED APPEARA NCE. COMPETENT.BLOCKY FRACTURE.
	65.54	72.04	6.50	*90			SANDSTONE	MG.M.GY.THKB UNIT 9. WEATHERS M. GREY TO TAN. MINOR BRANCHES PARALLEL TO BEDDING. 2D RIPPLE S. BLOCKY FRACTURING. CLIFF FORMING. AB UND. STRIKE AND OBLIQUE SLIP SLICKENSID ES.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86003

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	72.04	80.54	8.50	*90			SANDSTONE	MG.M.GY.THKB WTHRS M. BR TO GY. MINOR FE STAIN. MINOR PLANT HASH PARALLEL TO BDG. DK GREY MUDST INTERBD. <1CM THICK IN TOP 10%. MINOR FG SS AND DK GY MDST LAM. (< 5%). HORIZ. BURROWS. FG SS LENSES. OR BANDS < 5CM THICK,15 CM APART 50%. QUITE RESISTIVE.
	80.54	80.72	0.18	*90			SANDSTONE	MG.M.GY WEATHERS YELLOW. A DISTINCTIVE UNIT DUE TO WEATHERING AND THICK BEDDING COMPARED TO SURROUNDING UNITS.
	80.72	88.72	8.00	*90			SANDSTONE	FG.M.GY THINLY INTERBEDDED WITH DK. GREY MUDST (20%). HIGHLY FRACTURED.
	88.72	95.72	7.00	*90			SANDSTONE	FG UNIT 10; MEDIUM TO THICK BEDDED; WEATHERS TAN-GREY; PLANT FOSSILS ABSENT.
	95.72	96.69	0.97	*90			COAL	C-3 COAL ZONE 4. TRCNR86008. C/C+R = .97/.97.
	96.69	101.69	5.00	*90			SANDSTONE	

* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION
COAL DIVISION
KLAPPAN PROJECT
STRATIGRAPHIC LOG
KPN NR OTC86003

722

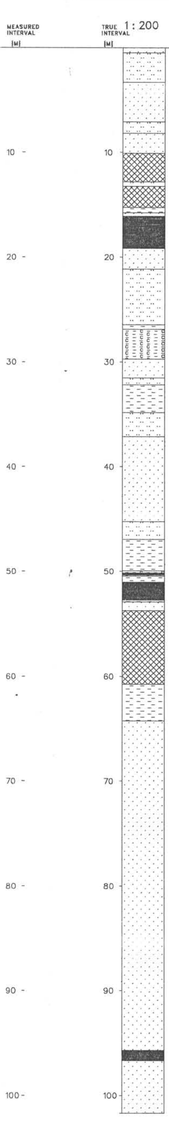
GEOLOGIST : MACLEOD	DATE : FEB 24/87	DRAWING NO. :

SCALE : 1:200 1:40

NORTHING: 8341450.0 N
EASTING: 487000.0 E

LITHOLOGIC SYMBOLS

	SANDSTONE		BENTONITE
	SILTSTONE	B B B	BRECCIA
	COAL	C C C	CARBONACEOUS
	OVERBURDEN	Q Q Q	QUARTZ
	MUDSTONE, CLAYSTONE	P P P	PYRITE
	TUFF	FE FE FE	FERRUGINOUS
	LIMESTONE	○ ○ ○	CONGLOMERATE
	COVERED	f	FOSSIL BED



TOTAL: 101.69 TOTAL: 101.69

KPNNROTC86004

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNROTC86004 DATE - 02/13/87

- H I S T O R Y -

START DATE - 11/07/86
END DATE - 15/07/86

CONTRACTOR -
GEOLOGIST - SAVOIE
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - UPRIGHT LIMB OF RECUMBENT SYNCLINE. PLANT FOSSILS(CLADOPHLEBIS VIRGINIENSIS ACUTA,NILSSONIA SCHAUMBE RGENSIS,BAIERA FURCATA,SPHENOPTERIS BRULENSIS,GINK GO NANA). UPPER KLAPPAN SEQUENCE.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1825.00
ZONE - 9
NORTHING - 6336930.00
EASTING - 496220.00

LICENCE/LEASE NUMBER -

LATITUDE - 0
LONGITUDE - 0

- O R I E N T A T I O N -

LENGTH - 230.24
INCLINATION - 0.0
AZIMUTH - 0.0

SIZE WIDTH - 0.0
SIZE HEIGHT - 0.0

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	1.40	1.40	*90			SANDSTONE	FG.M.GY.MAS WTHRS OR-BR. SILTIER TOWARD BASE. MINOR LENSOIDAL SLTST. NODULAR WEATHERING. BDG:113/26N
	1.40	2.60	1.20	*90			SILTSTONE	LT.BLK.LAM WTHRS OR-BLK.
	2.60	7.00	4.40	*90			SANDSTONE	FG.M-DK.GY.MAS WTHRS OR-BR.BDG:121/36N.
	7.00	8.05	1.05	*90			SILTSTONE	M-DK.GY.THNB WTHRS OR-BUFF. INTERB FG SS. PLANT FOSSIL BAIERA FURCATA IN SLST.
	8.05	9.15	1.10	*90			SANDSTONE	VFG.M.GY WTHRS GY-BR. NO FOSSILS.BDG:121/34N.
	9.15	9.95	0.80	*90			OVERBURDEN	OVERBURDEN
	9.95	10.75	0.80	*90			SANDSTONE	MG.LT-M.GY WTHRS LT BR.
	10.75	14.55	3.80	*90			SILTSTONE	CLYY.FG.M.GY.LAM WTHRS BR, OR AND GY INTERB. SIMILAR TO TIGER STRIPES.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	14.55	14.85	0.30	*90			MUDSTONE	BLK SOFT. V RECESSIVE FINING UPWARDS SEQUENCEOF 3-6 M OF SS/SLST/MDST WITH SHARP CONTACT AT BASE OF SS. WTHRS DK GY.
	14.85	15.75	0.90	*90			SANDSTONE	FG.M.GY.MAS WELL FRACTURED. WTHRS BR.
	15.75	16.55	0.80	*90			MUDSTONE	LT.BLK THIN SLTST INTERBEDS AT TOP GRADES DOWN TO MUDSTONE. WTHRS DK GY.
	16.55	18.35	1.80	*90			SANDSTONE	FG.M.GY MG SS FINES DOWN TO FG SS TO FINER G SS TO FG SS WITH SLST LAM.(COARSENING UP SEQUENCE). EROSIONAL BASE.SS WTHRS BRN. SLTST WTHRS MED GY.BEDDING: 110/16N.
	18.35	18.70	0.35	*90			SILTSTONE	M-DK.GY.MAS EROSIONAL BASE AND TOP. FOSSIL HASH WITH BAIERA FURCATA (?) FRAGMENTS. WTHRS BUFF.
	18.70	19.50	0.80	*90			MUDSTONE	SLTY.DK.GY.MAS WTHRS BR-GY.
	19.50	19.70	0.20	*90			SILTSTONE	M-DK.GY.MAS DEFORMED BEDDING. PLANT HASH. DISCONTINOUS. WTHRS BUFF.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	19.70	20.20	0.50	*90			MUDSTONE	SLTY,DK.GY BDG:134/21N. CLVG:064/SUBV. WTHRS BR-GY .
	20.20	23.20	3.00	*90			SANDSTONE	FG,M,GY,MAS CLVG:089/SUBV. FRAC:170/SUBV. WTHRS BUF F.
	23.20	28.20	5.00	*90			OVERBURDEN	OVERBURDEN
	28.20	29.04	0.84	*90			COAL	SEAM SAME AS TRC86028. SAMPLE 05451.
	29.04	29.44	0.40	*90			SILTSTONE	CLYY,M-DK.GY THIS PART OF SECTION MAY HAVE SLUMPED S O BDG MAY NOT BE ACCURATE. WTHRS BR-RED .
	29.44	29.64	0.20	*90			SILTSTONE	SSY,M,GY DISCONTINUOUS, DEFORMED BEDDING, PLANT FOSSIL FRAGS. WTHRS BUFF.
	29.64	31.64	2.00	*90			SANDSTONE	MG,M,GY,MAS WELL CONSOLIDATED. WTHRS BUFF.
	31.64	32.44	0.80	*90			MUDSTONE	SLTY,M,GY WTHRS OR & GY STRIPES. EROSIONAL TOP. T HICKNESS VARIABLE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	32.44	32.69	0.25	*90			MUDSTONE	CARB,BLK
	32.69	32.76	0.07	*90			COAL	C-3,BLK SMALL COAL SEAM
	32.76	33.36	0.60	*90			MUDSTONE	M,GY WTHRS BN-GY.
	33.36	35.26	1.90	*90			SANDSTONE	FG,M,GY,MB SLTST INTERBEDS. THIN STRINGERS OF COAL SURROUNDEDBY QTZ. WTHRS OR (SLST) AND GY (SS).
	35.26	38.76	3.50	*90			MUDSTONE	DK,GY SOFT RECESSIVE UNIT. CARB AT TOP. SOME PLANT FOSSIL HASH. MUCH OF UNIT COVERED BY OVERBURDEN. WTHRS MED GY.
	38.76	39.56	0.80	*90			SANDSTONE	CLYY,MG,M,GY WTHRS BRT OR-YEL. V POORLY SORTED COARS E AND MEDS AND GRAINS IN CLYY MATRIX. S OME PLANT HASH.
	39.56	40.06	0.50	*90			MUDSTONE	MH ASHY CLAY WITH FINE SAND. 3CM CARB MUD STRINGER (CLAY -BENTONITIC?). WTHRS LT GY.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	40.06	40.36	0.30	*90			SILTSTONE	M.GY PLANT FOSSIL FRAGMENTS. DEFORMED BDG. W THRS BUFF.
	40.36	40.71	0.35	*90			MUDSTONE	SLTY.DK.GY.MAS WTHRS DK GY-RED BN.
	40.71	41.51	0.80	*90			SANDSTONE	MG.M.GY.MAS WTHRS BR-BUFF.
	41.51	42.89	1.38	*90			MUDSTONE	SLTY.M-DK.GY SLIGHT COARSENING UP SEQUENCE. MUDST AT BOTTOM WITH V THIN SLST LAM.GRADES UP INTO V SLTY MUDST. NODULAR WTHRG. WTHRS GY-BN.
	42.89	43.03	0.14	*90			SILTSTONE	M.GY V DISCONTINOUS. DEFORMED BEDDING. WTHRS OR-BUFF.
	43.03	43.73	0.70	*90			MUDSTONE	SLTY.M-DK.GY NODULAR WEATHERING. WTHRS MED GY-BN.
	43.73	44.43	0.70	*90			MUDSTONE	SLTY.M-DK.GY NODULAR WEATHERING. SOME SANDY LENTICUL AR BEDS. MORE PROMINENT THAN ABOVE UNIT . BDG: 110/28N. WTHRS MED GY-BN.
	44.43	64.43	20.00	*90			OVERBURDEN	OVERBURDEN.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	64.43	64.68	0.25	*90			SILTSTONE	DK.GY WTHRS OR-BUFF. PLANT FRAGS. BDG-150/30N .
	64.68	65.47	0.79	*90			SANDSTONE	SLTY.M-DK.GY.THNB WTHRS BN-GY. V FINE SLTY SS WITH SLST L AM.
	65.47	66.57	1.10	*90			SANDSTONE	MG.M.GY WTHRS OR-BUFF.VERTICAL QTZ FILLED FRACT URES AND MINOR FRACTURES PARALLEL TO BE DDING.RIP UP CLASTS.
	66.57	68.17	1.60	*90			MUDSTONE	DK.GY WTHRS BN-GY. MUDST GRADES UP TO SLIGHTL Y SLTY MUDST AND BACK TO MUDST.
	68.17	68.45	0.28	*90			COAL	C-6.BLK
	68.45	68.85	0.40	*90			MUDSTONE	CARB.LT.BLK WTHRS DK GY. SMALL NORMAL FAULT - DISPL ACEMENT APPROX .5M.
	68.85	69.75	0.90	*90			MUDSTONE	SLTY.DK.GY WTHRS BN-RED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	69.75	70.15	0.40	*90			SILTSTONE	SSY.M.GY.MAS QTZ INFILLED FRACTURES PERPENDICULAR TO BEDDING. WTHRS GY/BUFF/GRN.
	70.15	70.85	0.70	*90			MUDSTONE	DK.BN V SOFT AND RECESSIVE.
	70.85	74.85	4.00	*90			OVERBURDEN	OVERBURDEN.
	74.85	76.95	2.10	*90			MUDSTONE	DK.GY WTHRS YEL/RED. GETS PROGRESSIVELY MORE RECESSIVE DOWN SECTION.NODULAR WEATHERING
	76.95	77.10	0.15	*90			MUDSTONE	DK.GY.THNB WTHRS OR.V FISSILE. PLANT FRAGMENTS: BAIERA FURCATA.
	77.10	78.40	1.30	*90			SANDSTONE	SLTY.FG.M.GY.MAS WTHRS YEL-GRN.
	78.40	78.64	0.24	*90			MUDSTONE	SLTY.LT.BLK WTHRS DK GY. RECESSIVE.
	78.64	79.64	1.00	*90			SILTSTONE	SSY.DK.GY.MAS WTHRS YEL-GRN. BLOCKY FRACTURE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	79.64	79.84	0.20	*90			MUDSTONE	DK.GY RECESSIVE. FISSILE. DISCONTINOUS. WTHRS MED GY.
	79.84	79.99	0.15	*90			MUDSTONE	SLTY.M.GY WTHRS OR-BUFF. DISCONTINUOUS. MORE PROMINENT THAN ABOVE UNIT.
	79.99	80.64	0.65	*90			SILTSTONE	CLYY.DK.GY WTHRS GRN-BN.PLANT IMPRESSIONS. BDG: 12 6/28 N.
	80.64	80.88	0.24	*90			SANDSTONE	SLTY.M.BN.VTHNB WTHRS BN-GY.VERY THIN SS/SLTST INTERLAMINATIONS (APPROX 0.5 CM). SLTST FRESH COLOR DK GY.
	80.88	81.58	0.70	*90			SILTSTONE	M.GY WTHRS BUFF.VERY WELL CONSOL. ABUNDANT PLANT FOSSILS: BAIERA FURCATA. QTZ VEINING IN FRACTURES.
	81.58	81.98	0.40	*90			MUDSTONE	DK.GY WTHRS MED GY. VERY FISSILE. THINLY BEDDED.
	81.98	82.28	0.30	*90			MUDSTONE	SLTY.M.GY WTHRS OR-BUFF. DISCONTINUOUS.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	82.28	84.38	2.10	*90			SILTSTONE	SSY.FG.DK.GY.THNB.SSD REPETITION OF SS/SLST INTERBEDS.SILT IN FILLS IN SS.TOPS UP. SS MED GY (FRESH) AND OR (WTHRD). SLST DK GY (FRESH) AND MED GY (WTHRD).
	84.38	86.58	2.20	*90			MUDSTONE	SLTY.DK.GY RECESSIVE UNIT COVERED WITH SOME OVERBU RDEN. MUDSTWTHRS MED GY. SLTY MUDST WTH RS OR. THO OR SLTY BANDS FURTHER ALONG CLIFF (15 CM THK).
	86.58	87.02	0.44	*90			SANDSTONE	FG.M-DK.GY.MAS BLOCKY CLEAVAGE. WTHRS YEL-BN.
	87.02	87.32	0.30	*90			SILTSTONE	DK.GY.MAS WTHRS BUFF. WELL CONSOL. THICKNESS VARI ES. BDG: 120/20 N. PLANT FRAGS (BAIERA?). VERY THIN MINOR QTZ VEINING ALONG BE DDING.
	87.32	88.42	1.10	*90			SILTSTONE	SSY.M-DK.GY.MAS WTHRS BN-OR. BLOCKY. SOME NODULAR WEATH ERING NEAR THE TOP. BEDDING GETS THINNE R DOWN SECTION.
	88.42	88.60	0.18	*90			SANDSTONE	MG.LT.BN.THKB WTHRS BN.A THICK HOMOGENOUS BED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	88.60	89.60	1.00	*90			MUDSTONE	DK.GY WTHRS MED GY. VERY RECESSIVE.
	89.60	89.72	0.12	*90			SANDSTONE	SLTY.FG.LT.GY WTHRS BUFF.
	89.72	91.02	1.30	*90			SILTSTONE	SSY.M-DK.GY WTHRS BN-YEL.NODULAR WEATHERING.
	91.02	91.17	0.15	*90			OVERBURDEN	VERY SOFT MUD.
	91.17	93.47	2.30	*90			SILTSTONE	CLYY.DK.GY WTHRS MED GY. THIN LAM (1 MM) OF CLAY N EAR MIDDLE OF UNIT.
	93.47	98.47	5.00	*90			OVERBURDEN	OVERBURDEN. APPEARS DARKER TOWARD BASE. POSSIBLY CARBONACEOUS. CLIFF FACE.
	98.47	99.47	1.00	*90			SANDSTONE	WTHRS BN.RESISTANT BLOCKY UNIT ON CLIFF . INACCESSIBLE. RESEMBLES SS SEEN PREVI OUSLY.
	99.47	101.97	2.50	*90			OVERBURDEN	
	101.97	104.62	2.65	*90			SANDSTONE	FG.M.GY.MAS WTHRS BUFF-RED. MINOR SILT IN SS (MIDDL E OF UNIT).BDG 146/20 N .

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	104.62	105.12	0.50	*90			MUDSTONE	CARB.BLK SOFT. GRADES TO A LESS CARBONACEOUS BN COLOR TOWARD BASE.
	105.12	106.92	1.80	*90			SANDSTONE	FG.MAS WTHRS OR-BN. BLOCKY. QTZ FILLED FRACTURES PARALLEL TO BDG.
	106.92	108.42	1.50	*90			MUDSTONE	CARB.BLK PLANT FRAGMENTS. VERY RECESSIVE UNIT. COVERED WITH SCREE.
	108.42	117.12	8.70	*90			SANDSTONE	FG.M.GY.MAS WTHRS MED GY. BUFF/ORG BANDING. SOME VERY THIN QTZ VEINING.
	117.12	121.32	4.20	*90			SANDSTONE	PBLY.MG.M.GY OLIGOMICTIC PARACONGLOMERATE (SS MATRIX, CHERT PEBBLE CLASTS) GRADING UP INTO SS (APPROXIMATELY 1 M THICK) THEN BACK INTO A CONGL. LARGEST CHERT CLAST- 3 CM. TREE FRAGMENTS ABUNDANT. BDG: 149/35 N. WTHRS BN-GY.
	121.32	121.53	0.21	*90			COAL	C-3.BLK SEAM POSSIBLY ERODED BY OVERLYING HIGH ENERGY SS AND CONGL.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	121.53	122.23	0.70	*90			MUDSTONE	SLTY.DK.GY.THNB WTHRS GY-BN.VERY FISSILE.SILTIER AT BOTTOM.
	122.23	123.23	1.00	*90			SILTSTONE	DK.GY.THKB WTHRS BUFF-RED.BECOMES SANDIER AT BASE. PLANT FRAGMENTS:BAIERA FURCATA.
	123.23	124.03	0.80	*90			SANDSTONE	SLTY.FG.M.GY.MAS WTHRS BUFF.BLOCKY WEATHERING.
	124.03	124.43	0.40	*90			MUDSTONE	DK.GY WTHRS DK.GY.VERY RECESSIVE. FISSILE. SCREE COVERED.
	124.43	124.83	0.40	*90			SILTSTONE	DK.GY WTHRS BUFF.DISCONTINUOUS BED. PLANT FRAGMENTS. DEFORMED BEDDING.
	124.83	125.78	0.95	*90			SANDSTONE	MG.M.GY.MAS WTHRS OR-BN.
	125.78	125.96	0.18	*90			MUDSTONE	SLTY.DK.GY WTHRS LT GY.SOME THIN SILTY LAMINATIONS, MINOR PLANT FRAGMENTS.
	125.96	126.56	0.60	*90			MUDSTONE	CARB.DK.BN WTHRS DK GY.VERY RECCESIVE. COVERED WITH SCREE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	126.56	128.51	1.95	*90			SANDSTONE	FG.M.GY.MAS WTHRS BN-GY.MINOR SLTST INTERBEDDING. B DG 148/28 N.
	128.51	129.01	0.50	*90			SILTSTONE	SSY.DK.GY WTHRS MED GY. NODULAR WTHRG. VERY FISSI LE.
	129.01	130.31	1.30	*90			MUDSTONE	DK.GY WTHRS BN-GY.VERY RECESSIVE. SCREE COVER ED.
	130.31	131.59	1.28	*90			SANDSTONE	FG.DK.GY.MAS WTHRS MED GY-BN. SLIGHTLY SILTY AT TOP.
	131.59	135.79	4.20	*90			SILTSTONE	SSY.PR.DK.GY WTHR BUFF/BN. SOME NODULAR WEATHERING. FISSILE. QTZ VEINING PARALLEL TO BEDDIN G. BDG. 125/44 N.
	135.79	137.29	1.50	*90			SANDSTONE	FG.M.GY.MAS WTHR BUFF/BN. QTZ VEINING. SLICKENSIDES . SOME FISSILE SSY SLTST INTERBEDS APPR OXIMATELY 6 CM THICK.
	137.29	137.79	0.50	*90			SANDSTONE	SLTY.M.GY.MAS WTHR BUFF. THICKNESS VARIES FROM 1 M TO 0 M (AVG .5 M).

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	137.79	140.79	3.00	*90			SILTSTONE	SSY.MAS RECESSIVE. COVERED IN SCREE. INACESSIBL E. WTHRS TAN.
	140.79	142.79	2.00	*90			OVERBURDEN	.
	142.79	143.79	1.00	*90			MUDSTONE	M-DK.GY.THNB WTHR BUFF/GY. VERY FISSILE.
	143.79	144.09	0.30	*90			MUDSTONE	CARB.DK.BN WTHR DK GY. SOFT. RECESSIVE.
	144.09	145.59	1.50	*90			MUDSTONE	SLTY.LT.BLK WTHR DK GY. VERY HARD. WELL CONSOLIDATE D.
	145.59	147.74	2.15	*90			SANDSTONE	SLTY.FG.M.GY.MAS WTHR BN/GY. BLOCKY FRACTURE. SOME NODUL AR WEATHERING NEAR TOP. SILTIER NEAR TO P. SLICKENSIDES PLANE 005/85 W , 070--> 45 (INDETERMINATE DIREC.). BDG:1 50/20 N; CLVG:078/78N,068/88 N,080/88 N; L1:0 78 --> 17. LARGE TREE FRAGMENTS.
	147.74	148.84	1.10	*90			SILTSTONE	M-DK.GY.THNB WTHR BN/GY. RECESSIVE. SCREE COVERED.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	148.84	149.84	1.00	*90			SANDSTONE	FG.M.GY WTHR BUFF/OR. SMALL NORMAL FAULTING (DI SPLACEMENT OF 30 CM) 045/32 N. BLOCKY C LEAVAGE. MINOR SLTST/ MUDST LAMINATIONS (1MM). CUS (30 CM AT BASE) .
	149.84	151.94	2.10	*90			SILTSTONE	CLYY.DK.GY WTHR BUFF/ORG. SLTST GRADES DOWN TO A C LYY SLTST THEN TO A CARB MUDST WITH COA LY STRINGERS. NODULAR WEATHERING. PLANT FOSSILS: BAIERA FURCATA AND CLADOPHLEB IS VIRGINIENSIS.
	151.94	152.29	0.35	*90			COAL	C-3.BLK BDG AT FLOOR 135/27 N.
	152.29	152.44	0.15	*90			MUDSTONE	DK.GY WTHR ORG/BN. FE STAINED. FOSSIL HASH. S OME MINOR COAL STRINGERS.
	152.44	153.79	1.35	*90			SILTSTONE	DK.GY WTHR BN/BUFF. LARGE COALIFIED TREE FRAG MENTS. NODULAR WEATHERING. MINOR QTZ VE INING AND INCOMPLETE SILICIFCATION OF C OALIFIED TREE FRAGMENTS.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	153.79	153.89	0.10	*90			MUDSTONE	CARB.BLK WTHR DK GY. FISSILE.RECESSIVE CARB MUDS T GRADES DOWN TO A COALY MUDST (C-6 COA L). MINOR QTZ VEINING.
	153.89	155.49	1.60	*90			SANDSTONE	FG.M-DK.GY WTHR ORG/BUFF. ABUNDANT TREE FRAGMENTS, COALIFIED PLANT STEMS. BDG:130/30 N. P LANT FOSSIL: BAIERA FURCATA. CURVILINEA R FRACTURING. MINOR BLK MDST LAM.MUCH S ILTIER AT BOTTOM WITH NODULAR WEATHERIN G.
	155.49	163.69	8.20	*90			SANDSTONE	SLTY.M.GY.MAS WTHRS BUFF-OR. BLOCKY WEATHERING. SOME TREE FRAGMENTS. SILTIER TOWARD BASE. CU RVILINEAR FRACTURING AND MINOR FAULTING .
	163.69	164.49	0.80	*90			SILTSTONE	DK.GY WTHRS OR-BN. COALIFIED QTZ VEINING. TRE E FRAGMENTS. NODULAR WEATHERING.
	164.49	168.29	3.80	*90			SANDSTONE	MG.LT-M.GY WTHR BN/BUFF. BDG:142/45 N. CLVG:067/79 S. COALIFIED TREE FRAGMENTS. QTZ VEINI NG IN FRACTURE ZONES ALONG BEDDING. SOM E SLTST/MUDST STRINGERS AND INFILLS.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	168.29	169.29	1.00	*90			MUDSTONE	CARB.DK.BN WTHR DK GY. CARB MUD GRADES DOWN TO VER Y COALY MUD (C-5) APPX 30 CM BED.
	169.29	169.89	0.60	*90			SILTSTONE	SSY.DK.GY WTHR BUFF. FUS. NODULAR WEATHERING. SSY AT BASE, MUDST LAM AT TOP.
	169.89	172.19	2.30	*90			SANDSTONE	FG.M.GY.MAS WTHR BN/GY. BDG:145/34 N, VERY MINOR QT Z INFILLING IN FRACTURES PERPENDICULAR TO BEDDING.
	172.19	172.34	0.15	*90			MUDSTONE	LT.BLK WTHR DK GY.VERY FISSILE AND RECESSIVE. SCREE COVERED.
	172.34	173.44	1.10	*90			SANDSTONE	FG.MOD.M.GY WTHR YEL-BUFF,SLIGHTLY NODULAR WEATHERI NG. COALIFIED FOSSIL HASH.
	173.44	173.94	0.50	*90			SILTSTONE	DK.GY WTHR OR-BUFF. BDG THICKNESS 1M-0.3M. DE FORMED BEDDING. COALIFIED PLANT FOSSIL HASH.
	173.94	175.54	1.60	*90			SANDSTONE	SLTY.M.GY.MAS WTHR BUFF-BN.BLOCKY CLEAVAGE. SOME SLTS T LAMINATIONS.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	175.54	175.79	0.25	*90			SILTSTONE	SSY.DK.GY WTHR BN-GY.FISSILE. NODULE WEATHERING. CUS.
	175.79	176.09	0.30	*90			SILTSTONE	M-DK.GY WTHR BN-BUFF.THICKNESS VARIES FROM 0.2M -0.5M. DEFORMED BEDDING.BDG: 105/30N
	176.09	176.79	0.70	*90			SILTSTONE	SSY.DK.GY WTHR GY-BN.PLANT FOSSIL CLADOPHLEBIS VI RGINIENSIS ABUNDANT.
	176.79	177.34	0.55	*90			SANDSTONE	SLTY.M.GY.MAS WTHR GY-BN.MINOR QTZ INFILLING OF FRACT URES PARALELL TO BEDDING.
	177.34	177.74	0.40	*90			SILTSTONE	DK.GY WTHR BUFF. THICKNESS OF BEDS 0.1-1 M. D EFORMED BDG. FOSSIL FRAGMENTS.
	177.74	177.84	0.10	*90			MUDSTONE	CARB.BLK COALY STRINGERS WITH SIDERITE VEINS. WT HRS RED-BN.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	177.84	184.34	6.50	*90			SANDSTONE	SLTY.M-DK.GY.THKB WTHR BN-RED.THICK INTERBEDS OF SLTY SS & SSY SLST.NODULAR WEATHERING IN SSY SLTST, BLOCKY IN SLTY SS. LENTICULAR LENSES OF BUFF SLTST IN MIDDLE OF UNIT APPROX .5M THICK
	184.34	192.34	8.00	*90			SANDSTONE	FG.MOD.M.GY.MAS WTHR BUFF. BLOCKY FRAC. ABUNDANT TREE FRAGMENTS ATBASE, SOME COALIFIED.
	192.34	192.84	0.50	*90			MUDSTONE	SLTY.DK.GY WTHR GY. V RECESSIVE. SCREE COVERED. PLANT FOSSILS: CZEKONOWSKIA, BAIERA FURCATA.
	192.84	197.44	4.60	*90			SANDSTONE	FG.M.GY.MAS WTHR RED-BUFF. BLOCKY CLEAV. TREE FRAGMENTS NEAR BASE. FAULT-O/64M, 174--08, SINISTRAL
	197.44	198.84	1.40	*90			CONGLOMERATE	SSY.VPR.M.GY.MAS OLIGOMICTIC ORTHO/PARACONGLOMERATE, CLAST SUPP BEDS GRADING INTO MATRIX SUPP BEDS IN CYCLES (RANDOM THK). MATRIX -MG SS, CLASTS - CHERT PEBBLES, AVE-1CM DIA, LRG - 6 CM A AXIS, SML - 2 MM DIA. VERY A BUNDANT TREE FRAGS AT BASE, MINOR QTZ VEINS.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	198.84	202.54	3.70	*90			SANDSTONE	SLTY.M.GY WTHR RED-BUFF. LATERAL CHANGES FROM VERY SILTY SS TO TO FG SS V SLTY SS . NODULAR WTHRING OF FGR SS, BLOCKY. FRAGMENTED PLANT STEMS.
	202.54	219.54	17.00	*90			CONGLOMERATE	M.GY OLIGOMICTIC ORTHOCGL. SAME LITHO AS ABOVE CONGL. INTENSE QTZ VEINING (PERP TO BDG) AND BRECCIATION (AXIS). LENTICULAR MG SAND LENSES. ABUNDT TREE FRAGS. LAST METER IS PARACONGL. SLKSD-008/52M 222-40 RT OBLIQUE. LAT EXTENT 100M. ALLUVIA
	219.54	220.54	1.00	*90			SILTSTONE	SSY.DK.GY.THNB FISSILE. WTHRS RED-BUFF.
	220.54	222.54	2.00	*90			SILTSTONE	SSY.DK.GY.THKB WTHRS OR-BUFF.ABUNDANT PLANT HASH, STEMS.
	222.54	224.54	2.00	*90			MUDSTONE	BLK V FISSILE. CARB AT TOP. PLANT HASH. WTHRS DK GY. RECESSIVE. SCREE COVERED.
	224.54	226.24	1.70	*90			SILTSTONE	SSY.M-DK.GY WTHRS YEL-BN. FOSSIL FRAGS. NODULAR WEATHERING. SCREE COVERED AT BASE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86004

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	226.24	230.24	4.00	*90			SANDSTONE	FG,M-DK.GY,MAS MUDST RIPUP CLASTS APPROX 3 CM DIA. BLOCKY. WTHRS BUFF.

* DENOTES MEASURED BCA
NEWPAGE

GULF CANADA CORPORATION
COAL DIVISION
KLAPPAN PROJECT
STRATIGRAPHIC LOG
KPN NR 07C86004

722

GEOLOGIST : SAVOIE | DATE : FEB 24/87 | DRAWING NO. :

SCALE : 1:200 1:40

NORTHING: 8326930.0 N
EASTING: 486220.0 E

LITHOLOGIC SYMBOLS

	SANDSTONE		BENTONITE
	SILTSTONE		BRECCIA
	COAL	C C C	CARBONACEOUS
	OVERBURDEN	Q Q Q	QUARTZ
	MUDSTONE, CLAYSTONE	P P P	PYRITE
	TUFF	FE FE FE	FERRUGINOUS
	LIMESTONE		CONGLOMERATE
	COVERED	F	FOSSIL BED

MEASURED INTERVAL [m] | TRUE INTERVAL [m] 1 : 200

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230

TOTAL: 230.24 TOTAL: 230.24

KPNLROTC86005

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNLROTC86005 DATE - 02/13/87

- H I S T O R Y -

START DATE - 19/08/86
END DATE - 21/08/86

CONTRACTOR -
GEOLOGIST - LEE
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - OTC IS IN MT KLAPPAN CANYON. OTC86005 IS STRAT. AB
OVE OTC86001 BY 10 M.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1751.00
ZONE - 9
NORTHING - 6341860.00
EASTING - 506560.00

LICENCE/LEASE NUMBER -

LATITUDE - 0
LONGITUDE - 0

- O R I E N T A T I O N -

LENGTH - 69.12
INCLINATION - 0.0
AZIMUTH - 0.0

SIZE WIDTH - 0.0
SIZE HEIGHT - 0.0

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC86005

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	2.07	2.07	*90			COAL	TRCLR86015. C/C+R=.94/1.01. POSSIBLY L SEAM.
	2.07	3.84	1.77	*90			MUDSTONE	M-DK.GY MTHERS LT GREY. MED BD. SHEAR SURFACES. MINOR WOOD FRAGMENT.
	3.84	4.81	0.97	*90			SILTSTONE	THNB MTHERS MED BN-YEL. NODULAR WTHERING. BD THICKNESS VARIES VTHNB TO 5 CM.
	4.81	4.99	0.18	*90			SILTSTONE	M.GY MTHERS YELLOW. NODULAR WTHERING.
	4.99	5.78	0.79	*90			SILTSTONE	M.GY.THNB WITH MUDST LAMINAE. V. FRACTURED. MTHER S DK GREY-BROWN WITH ORANGE BANDS.
	5.78	5.97	0.19	*90			SILTSTONE	LT.GY MTHERS YELLOW WITH MUDST LENSES. MORE T HKB THAN EAST UNIT.
	5.97	8.67	2.70	*90			SILTSTONE	THNB WITH SOME FG SS INTERBEDS. NODULAR WTHE RING. MTHERS YELLOW, BROWN AND M GREY. QUITE FRACTURED. INTERBEDS OF THNB DK G REY MUDST. PLANT FRAGMENTS(CZEKANOWSKIA ?)

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC86005

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	8.67	9.17	0.50	*90			SANDSTONE	VFG.M.GY.THNB MTHERS YELLOW WITH SOME GREY BANDS.
	9.17	9.59	0.42	*90			SILTSTONE	M.GY.THNB MTHERS M GREY. HIGHLY FRACTURED.
	9.59	10.24	0.65	*90			SANDSTONE	VFG.LT.GY.MB WITH INTERBEDS OF SLTST. MTHERS YELLOW. MINOR GREYBANDS. FRACTURED.
	10.24	13.74	3.50	*90			OVERBURDEN	COVERED INTERVAL.
	13.74	14.89	1.15	*90			COAL	HIGHLY MTHERED. MOSTLY UNCONSOLIDATED.
	14.89	33.36	18.47	*90			SILTSTONE	DK.GY INTERB OF FG SS. MTHERS OR AND LT-M GRE Y AND BR GY.HIGHLY FRAC. OCC. THIN (<1 CM)DK GY MDST BEDS. B DG:096/69; PLANT FOSSILS; PODOZAMITES LANCEOLATUS,CLADOP HLEBIS VIRGINIENSIS,PITYOPHYLLUM NORDEN SKIOLDII,CZEKANOWSKIA RIGIDA,GINKGO NAN A,SPHENOPTERIS.
	33.36	34.36	1.00	*90			OVERBURDEN	COVERED INTERVAL.
	34.36	38.51	4.15	*90			COAL	TRCLR86018. C/C+R= 2.12/3.6. POSSIBLY M SEAM.

* DENOTES MEASURED BCA

PROJECT: KPW BLOCK: LR DATA SOURCE: OTC86005

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	RCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	63.76	69.12	5.36	*90			SANDSTONE	M.GY.THKB WTHERS M GREY. VERY MINOR SILTSTONE PEB BLES IN ONE LOCALITY. SOME BROWN MEATHE RED BANDS.

* DENOTES MEASURED RCA
NEWPAGE

GULF CANADA CORPORATION
COAL DIVISION
KLAPPAN PROJECT
STRATIGRAPHIC LOG
KPN LR 07C86005

722

GEOLOGIST : LEE	DATE : FEB 24/87	DRAWING NO. :

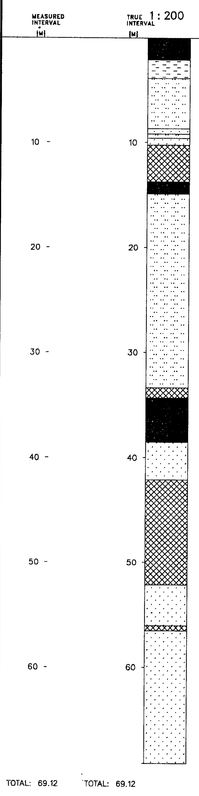
SCALE : 1:200 1:40

0 5 [M] 0 .5 1 [M]

NORTHING: 6341850.0 N
EASTING: 506560.0 E

LITHOLOGIC SYMBOLS

SANDSTONE	BENTONITE
SILTSTONE	BRECCIA
COAL	CARBONACEOUS
OVERBURDEN	QUARTZ
MUDSTONE,CLAYSTONE	PYRITE
TUFF	FERRUGINOUS
LIMESTONE	CONGLOMERATE
COVERED	FOSSIL BED



TOTAL: 69.12 TOTAL: 69.12

KPNNROTC86006

GULF CANADA CORPORATION

- D A T A S O U R C E S U M M A R Y -

DATA SOURCE - KPNNROTC86006 DATE - 02/13/87

- H I S T O R Y -

START DATE - 15/07/86
END DATE - 15/07/86

CONTRACTOR -
GEOLOGIST - MACLEOD
OPERATOR - G.C.C.
SURVEYOR -

REMARKS - UPPER KLAPPAN SEQUENCE; VISUAL THICKNESS ESTIMATE.

- L O C A T I O N -

PROVINCE - BC
ELEVATION - 1829.00
ZONE - 9
NORTHING - 6339000.00
EASTING - 498100.00

LICENCE/LEASE NUMBER -

LATITUDE - 0
LONGITUDE - 0

- O R I E N T A T I O N -

LENGTH - 102.90
INCLINATION - 0.0
AZIMUTH - 0.0

SIZE WIDTH - 0.0
SIZE HEIGHT - 0.0

ROOF STRIKE - 0
ROOF DIP - 0
ROOF DIR -
FLOOR STRIKE - 0
FLOOR DIP - 0
FLOOR DIR -

*** NOTE *** 0 INDICATES NO VALUE

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86006

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	0.00	5.00	5.00	*90			SANDSTONE	MG.M.GY.MAS CHANNEL OF CLAST SUPPORTED CHERT PEBBLE CONGLOMERATE.
	5.00	11.00	6.00	*90			OVERBURDEN	COVERED INTERVAL . SCREE IS COMPRISED O F MED. SS, ORG. HEATH. SLTST, AND CARBO NACEOUS MUDST.
	11.00	13.00	2.00	*90			SANDSTONE	MG.M.GY.THNB MINOR FE STAINING, PLANT HASH (CZEKANOW SKIA, GINKGO NANA, BAIERA FURCATA).
	13.00	15.00	2.00	*90			OVERBURDEN	COVERED INTERVAL.
	15.00	16.00	1.00	*90			SANDSTONE	SLTY.M.GY.LAM HEATH, ORNG/GY, CARB MUDST BAND (10 CM) . ABUNDANT PLANT FOSSILS (CZEKANOWSKIA, PODOZAMITES, NILSSONIA CANADENSIS).
	16.00	18.00	2.00	*90			SANDSTONE	SLTY.FG.M.GY.THNB
	18.00	18.30	0.30	*90			SILTSTONE	M.GY WEATHERS BRIGHT ORANGE.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: OTC86006

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	18.30	21.30	3.00	*90			SANDSTONE	MG.M.GY.THNB IRON STAINED. INTERBEDDED WITH FINE GRA INED SANDSTONE.
	21.30	24.80	3.50	*90			SANDSTONE	MG.M.GY.THKB AS ABOVE.ABUNDANT PLANT FOSSILS : SPHEN OPTERIS BRULENSIS AND BAIERA FURCATA.
	24.80	24.90	0.10	*90			SILTSTONE	M.GY WEATHERS BRIGHT ORANGE.
	24.90	25.90	1.00	*90			SANDSTONE	MG.M.GY.THKB
	25.90	35.90	10.00	*90			OVERBURDEN	COVERED INTERVAL . CARBONACEOUS MUDSTON E SPOIL IN SCREE.
	35.90	37.90	2.00	*90			SANDSTONE	MG.LT.GY.THKB
	37.90	42.90	5.00	*90			SANDSTONE	MG.M.GY.MB 8 CM ORANGE WEATHERING MUDSTONE BANDS E VERY 20 CM, ABUNDANT ORANGE WEATHERING RIP-UP CLASTS.
	42.90	48.90	6.00	*90			SANDSTONE	MG.M.GY ORANGE SILTSTONE BANDING 0.5 - 1 M APAR T AND THICKENED FROM ABOVE UNIT.

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: NR DATA SOURCE: DTC86006

BOX	DEPTH FROM	DEPTH TO	INTRVAL THICK.	BCA	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
	48.90	52.90	4.00	*90			SANDSTONE	MG.M.GY.MAS CLIFF FORMING AND HIGHLY FRACTURED. ABU NDANT PLANTS : CLADOPHLEBIS VIRGINIENSI S,BAIERA FURCATA, NILSSONIA SCHAUMBERGE NSIS, AND A SINGLE FRESH WATER BIVALVE.
	52.90	62.90	10.00	*90			CONGLOMERATE	PR.MAS DISCONTINUOUS CHANNEL.
	62.90	67.90	5.00	*90			SANDSTONE	MG.M.GY
	67.90	72.90	5.00	*90			OVERBURDEN	COVERED INTERVAL. SCREE CONTAINS CARBON ACEOUS MUDSTONE & ORANGE WEATHERING SIL TSTONE.
	72.90	77.90	5.00	*90			SANDSTONE	MG.M.GY AS ABOVE.
	77.90	97.90	20.00	*90			OVERBURDEN	COVERED INTERVAL.
	97.90	102.90	5.00	*90			SANDSTONE	FG.M.GY WEATHERS ORANGE. FOSSILS: G.NANA, CLADO PHLEBIS VIRGIENSIS, PITYOPHYLLUM NORDEN SKIOLDI.

-854- NOW IN CONTACT WITH SYSTEM 2000 -
***** GEX - 03.01 - COCC.COAL/21 ALLOCATED.
-855- NO LONGER IN CONTACT WITH SYSTEM 2000 -

GULF CANADA CORPORATION
COAL DIVISION
KLAPPAN PROJECT
STRATIGRAPHIC LOG
KPN NR OTC86006

722

GEOLOGIST : MACLEOD	DATE : FEB 24/87	DRAWING NO. :

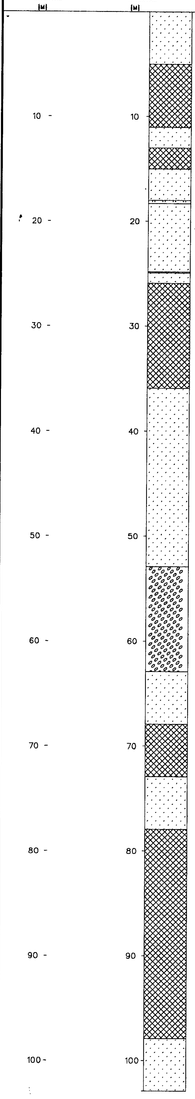
SCALE : 1:200 1:40

NORTHING: 6539000.0 N
EASTING: 498100.0 E

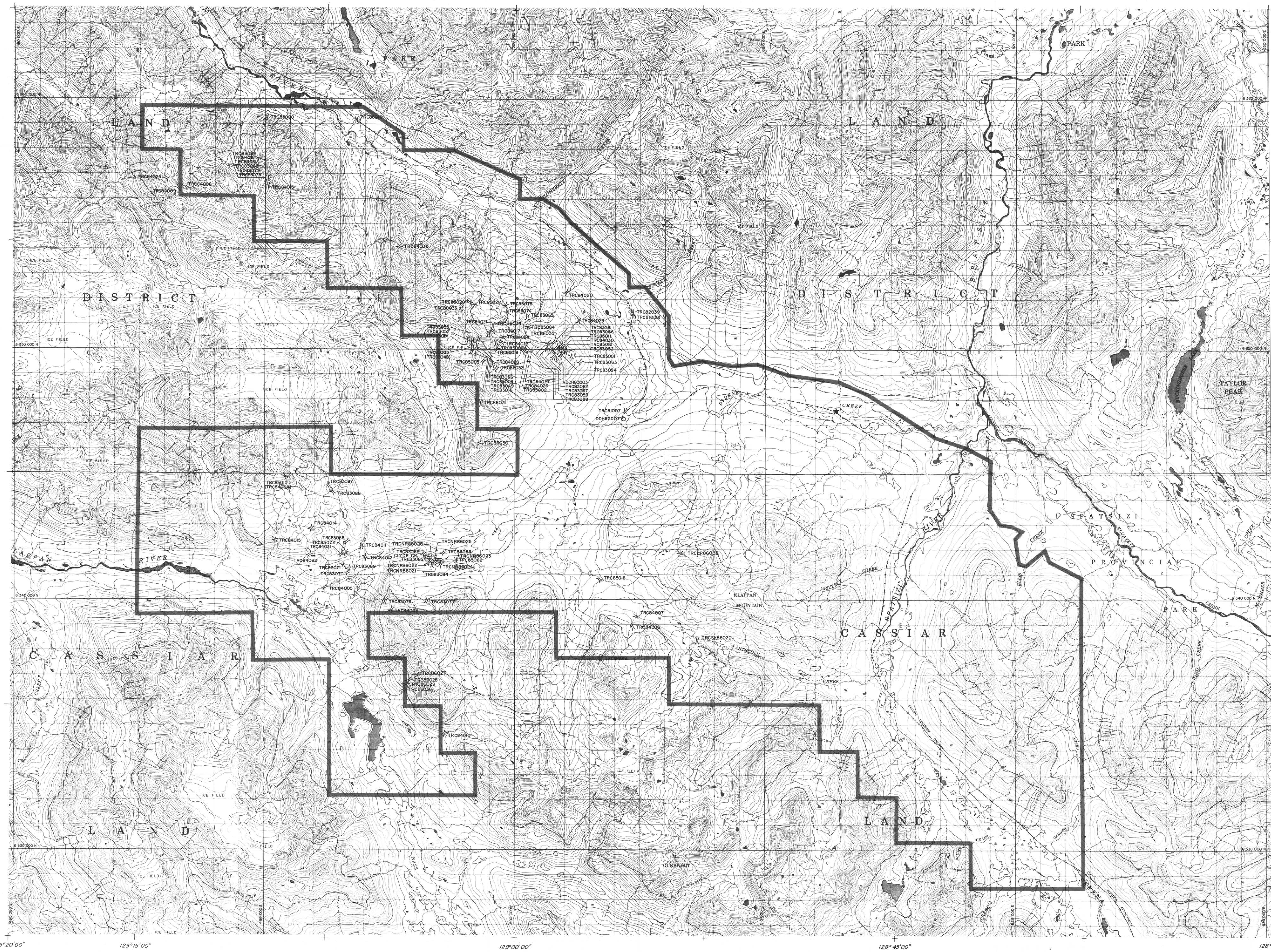
LITHOLOGIC SYMBOLS

	SANDSTONE		BENTONITE
	SILTSTONE	B B B	BRECCIA
	COAL	C C C	CARBONACEOUS
	OVERBURDEN	Q Q Q	QUARTZ
	MUDSTONE,CLAYSTONE	P P P	PYRITE
	TUFF	FE FE FE	FERRUGINOUS
	LIMESTONE	O O O	CONGLOMERATE
	COVERED	F	FOSSIL BED

MEASURED INTERVAL (M) | TRUE INTERVAL (M) 1 : 200



TOTAL: 102.90 TOTAL: 102.90



LEGEND

ROADS AND RELATED FEATURES
HARD SURFACE, ALL WEATHER
LOOSE SURFACE
CART TRACK, WINTER ROAD, UNDER CONSTRUCTION
TRAIL, CUTLINE, PORTAGE
BUILT UP AREA
RAILWAY, SIDING, STATION, STOP
BRIDGE
SEAPLANE BASE, ANCHORAGE

LANDMARK FEATURES
HOUSE, BARN
CHURCH, SCHOOL
POST OFFICE
HISTORICAL SITE
TOWERS, FIRE, RADIO
WELL, OIL, GAS
TANK, OIL, GASOLINE, WATER
TELEPHONE LINE
POWER TRANSMISSION LINE
MINE
CUTTING, EMBANKMENT
GRAVEL PIT — GP

BOUNDARIES AND CONTROL
INTERNATIONAL, PROVINCIAL, BOUNDARY MONUMENT
COUNTY, DISTRICT
TOWNSHIP, PARISH — SURVEYED — UNSURVEYED
TOWNSHIP, DLS — SURVEYED — UNSURVEYED — SECTION CORNERS
MUNICIPALITY
INDIAN RESERVE, PARK, ETC.
HORIZONTAL CONTROL POINT
BENCH MARK — BM 965
SPOT ELEVATION, ELEVATION APPROXIMATE — ·390 ·721±

DRAINAGE AND RELATED FEATURES
STREAM, SHORELINE, INDEFINITE
DIRECTION OF FLOW
LAKE, INTERMITTENT
INUNDATED, FLOODED LAND
MARSH OR SWAMP (WOODED)
DRY RIVER BED WITH CHANNELS
SAND, ABOVE, IN WATER
STRING BOG — SB
TUNDRA PONDS, POLYGONS — TP PG
RAPIDS
FORESHORE FLATS — FF
ROCK
DAM
WHARF
DITCH

RELIEF FEATURES
CONTOURS — 500 350
APPROXIMATE CONTOUR — 125 100
DEPRESSION — 25
ESKER
PINGO — 125
SAND, SAND DUNES — SAND
PALSA BOG — PB
WOODED AREA — W C

PROPERTY BOUNDARY
TRENCH LOCATION
DRILL HOLE LOCATION
FIELD CAMP LOCATION

SCALE 1:50,000

0 1 2 3 MILES
0 1 2 3 4 5 KILOMETERS

104H/11	104H/10	104H/9
104H/6	104H/7	104H/8
104H/3	104H/2	104H/1
104A/14	104A/15	104A/16

57°45' 56°45' 129°30' 128°00'

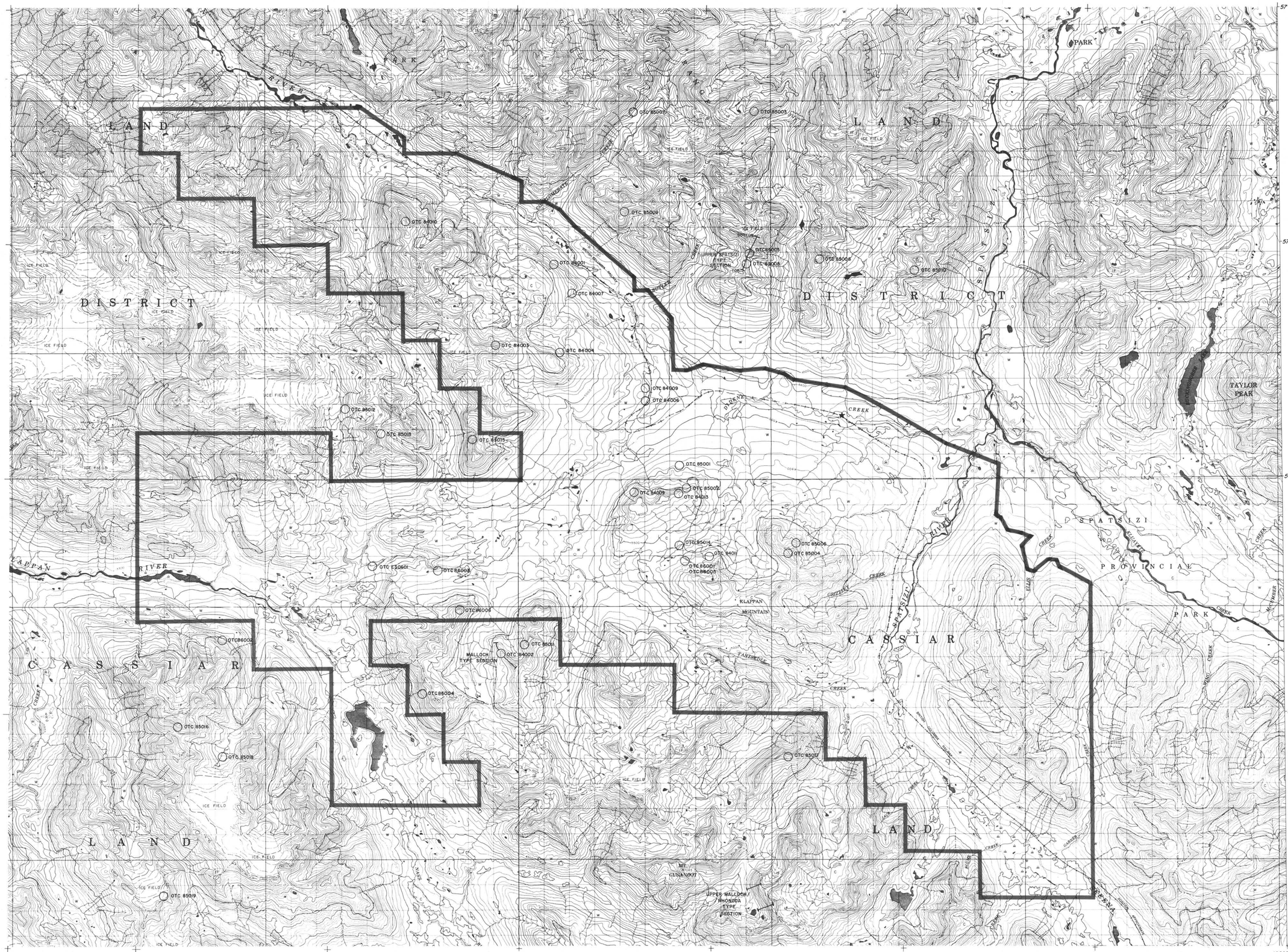
722

GULF CANADA CORPORATION
Coal Division
CALGARY ALBERTA
Gulf

MT. KLAPPAN COAL PROPERTY

1981 - 1986 TRENCH AND DRILL HOLE LOCATION MAP

PREPARED BY: S. MACLEOD
APPROVED BY: E. SWANBERGSON DATE: MAR. 1987
DRAWING No. KPN86001



LEGEND

ROADS AND RELATED FEATURES
- HARD SURFACE, ALL WEATHER
- LOOSE SURFACE
- CART TRACK, WINTER ROAD, UNDER CONSTRUCTION
- TRAIL, CUTLINE, PORTAGE
- BUILT UP AREA
- RAILWAY, SIDING, STATION STOP
- BRIDGE
- SEAPLANE BASE, ANCHORAGE

LANDMARK FEATURES
- HOUSE, BARN
- CHURCH, SCHOOL
- POST OFFICE
- HISTORICAL SITE
- TOWERS: FIRE, RADIO
- WELL: OIL, GAS
- TANK: OIL, GASOLINE, WATER
- TELEPHONE LINE
- POWER TRANSMISSION LINE
- MINE
- CUTTING, EMBANKMENT
- GRAVEL PIT

BOUNDARIES AND CONTROL
- INTERNATIONAL, PROVINCIAL, BOUNDARY MONUMENT
- COUNTY, DISTRICT
- TOWNSHIP, PARISH — SURVEYED / UNSURVEYED
- TOWNSHIP, DLS — SURVEYED / UNSURVEYED / SECTION CORNERS
- MUNICIPALITY
- INDIAN RESERVE, PARK, ETC.
- HORIZONTAL CONTROL POINT
- BENCH MARK: BM 985
- SPOT ELEVATION, ELEVATION APPROXIMATE: 390 7210

DRAINAGE AND RELATED FEATURES
- STREAM, SHORELINE, INDEFINITE
- DIRECTION OF FLOW
- LAKE, INTERMITTENT
- INUNDATED, FLOODED LAND
- MARSH OR SWAMP (WOODED)
- DRY RIVER BED WITH CHANNELS
- SAND, ABOVE, IN WATER
- STRING BOG (SB)
- TUNDRA PONDS, POLYGONS (TP, PG)
- RAPIDS
- FORESHORE FLATS (FF)
- ROCK
- DAM
- WHARF
- DITCH

RELIEF FEATURES
- CONTOURS: 500, 250
- APPROXIMATE CONTOUR: 100, 125, 25
- DEPRESSION
- ESKER
- PINGO: 125
- SAND, SAND DUNES (SAND)
- PALSA BOG (PB)
- WOODED AREA (W, C)

PROPERTY BOUNDARY
MEASURED SECTION
FIELD CAMP LOCATION

SCALE 1:50,000

0 1 2 3 MILES
0 1 2 3 4 5 KILOMETERS

104 H/11	104 H/10	104 H/9
104 H/6	104 H/7	104 H/8
104 H/3	104 H/2	104 H/1
104 A/14	104 A/15	104 A/16

57°45' 56°45' 129°30' 128°00'

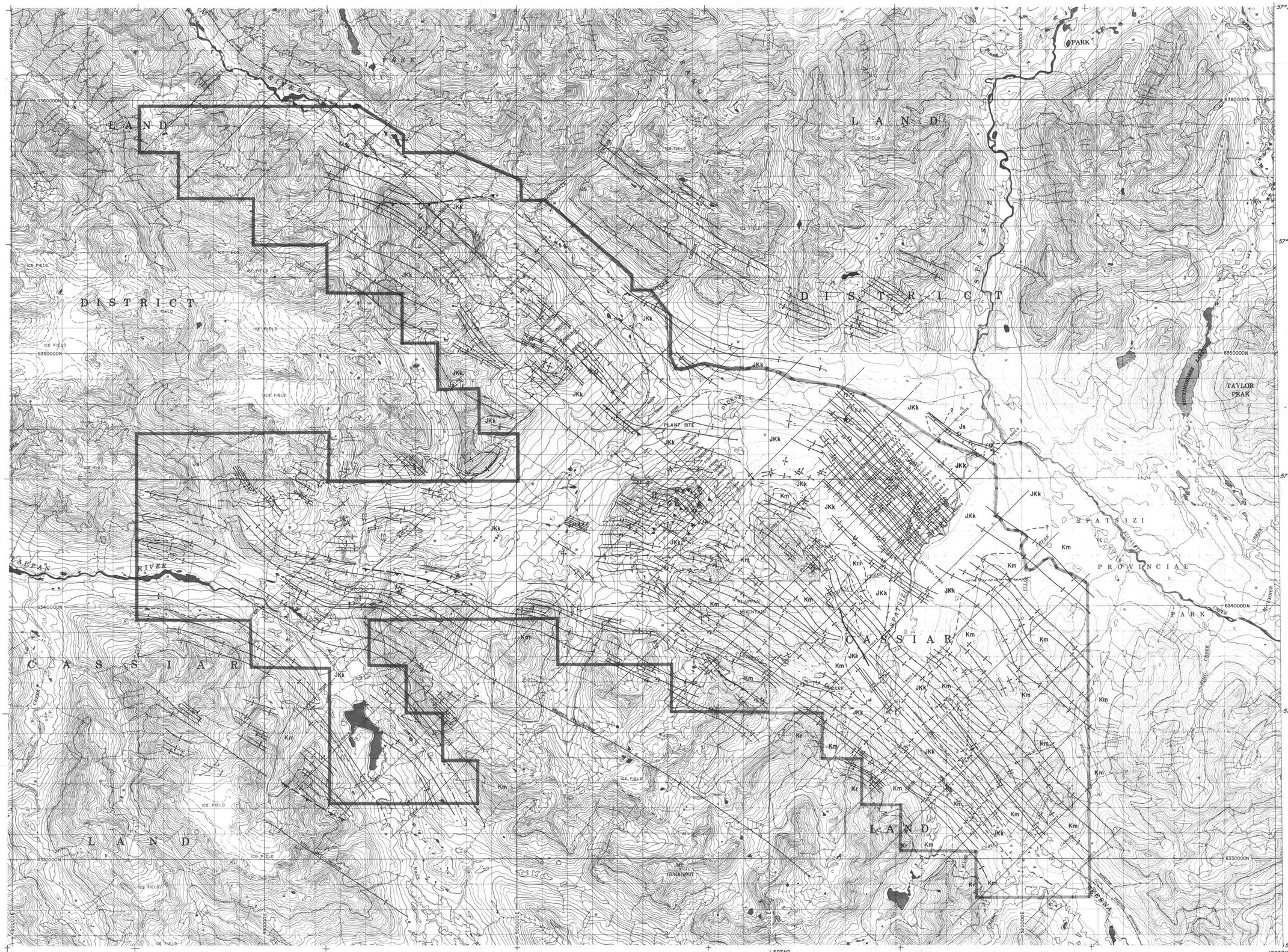
722

GULF CANADA CORPORATION
Coal Division
CALGARY ALBERTA

MT. KLAPPAN COAL PROPERTY

1981 - 1986 MEASURED SECTION MAP

PREPARED BY: S. M.
APPROVED BY: E. S. DATE: MAR. 1987
DRAWING No. KPN86002



LEGEND

ROADS AND RELATED FEATURES

- HARD SURFACE, ALL WEATHER
- LOOSE SURFACE
- CART TRACK, WINTER ROAD, UNDER CONSTRUCTION
- TRAIL, CUTLINE, PORTAGE
- BUILT UP AREA
- RAILWAY, SIDING, STATION, STOP
- BRIDGE
- SEAPLANE BASE, ANCHORAGE

LANDMARK FEATURES

- HOUSE, BARN
- CHURCH, SCHOOL
- POST OFFICE
- HISTORICAL SITE
- TOWERS, FIRE, RADIO
- WELL: OIL, GAS
- TANK: OIL, GASOLINE, WATER
- TELEPHONE LINE
- POWER TRANSMISSION LINE
- MINE
- CUTTING, EMBANKMENT
- GRAVEL PIT — GP

BOUNDARIES AND CONTROL

- INTERNATIONAL, PROVINCIAL, BOUNDARY MONUMENT
- COUNTY, DISTRICT
- TOWNSHIP, PARISH — SURVEYED / UNSURVEYED — UNSURVEYED
- TOWNSHIP, DLS — SURVEYED / UNSURVEYED — SECTION CORNERS
- MUNICIPALITY
- INDIAN RESERVE, PARK, ETC.
- HORIZONTAL CONTROL POINT
- BENCH MARK — BM 965
- SPOT ELEVATION, ELEVATION APPROXIMATE — 350 / ±721

DRAINAGE AND RELATED FEATURES

- STREAM, SHORELINE: INDEFINITE
- DIRECTION OF FLOW
- LAKE: INTERMITTENT
- INUNDATED, FLOODED LAND
- MARSH OR SWAMP (WOODED)
- DRY RIVER BED WITH CHANNELS
- SAND: ABOVE, IN WATER
- STRING BOG — SB
- TUNDRA PONDS, POLYGONS — TP / PG
- RAPIDS
- FORESHORE FLATS
- ROCK
- DAM
- WHARF
- DITCH

RELIEF FEATURES

- CONTOURS — 500 / 250
- APPROXIMATE CONTOUR — 125 / 100 / 25
- DEPRESSION
- ESKER
- PINGO — 125
- SAND, SAND DUNES — SAND
- PALSA BOG — PB
- WOODED AREA — W / C

SCALE 1:50,000

0 1 2 3 4 5 KILOMETERS

0 2 3 MILES

	57°45'		
104H/11	104H/10	104H/9	
104A/14	104A/15	104A/16	104H/8
			104H/1
129°30'		128°00'	56°45'

RHONDDA SEQUENCE

Kr Sequence of thick chert pebble conglomerates and minor gritty sandstones interbedded with an increasing number of siltstones and mudstones towards the basal contact. Large scale trough and tabular cross beds are common. Six species of plant fossils are found at the base of the sequence.

MALLOCH SEQUENCE

Km Thick interbeds of mudstones, argillaceous siltstones, fine grained sandstones and thin interbeds of orange weathering nodular siltstones. Many conglomerate beds display large scale cross bedding and tend to be laterally discontinuous. Thick clean sandstone beds and thin coal seams increase in abundance towards the basal gradational contact. Twenty-three species of plant fossils occur within the sequence.

KLAPPAN SEQUENCE (main coal-bearing unit)

JKk Fine to coarse grained sandstones interbedded with mudstones, siltstones, occasional thin bands of orange weathering calcareous siltstones, conglomerates and abundant coal seams. Conglomerate beds grade laterally into sandstone. Sandstones often display tabular or trough cross bedding. Rhythmites occur in the middle of the sequence. Twenty-three species of bivalves and up to twenty-five species of plants occur throughout. Petrified wood and rare coquina may be present towards the upper contact.

SPATSIZI SEQUENCE

Js Predominantly a marine sequence of interbedded mudstones, siltstones, sandstones and conglomerates. Carbonaceous mudstones, coarsening upward sequences and chert pebble conglomerates are more abundant in the upper part of the sequence. Nineteen species of bivalves are present. Belemnites are rare. Plant debris may occur near the upper gradational contact.

LEGEND

- LICENCE BOUNDARY
- GEOLOGICAL CONTACT (APPROXIMATE, INFERRED)
- COAL SEAM (DEFINED, INFERRED)
- ANTICLINE (DEFINED, APPROXIMATE) ARROW INDICATES PLUNGE DIRECTION
- SYNCLINE (DEFINED, APPROXIMATE) ARROW INDICATES PLUNGE DIRECTION
- OVERTURNED ANTICLINE (DEFINED, APPROXIMATE)
- OVERTURNED SYNCLINE (DEFINED, APPROXIMATE)
- MONOCLINE (DEFINED, APPROXIMATE)
- BEDDING (HORIZONTAL, INCLINED, OVERTURNED, VERTICAL, UPRIGHT, ESTIMATED)
- FOLIATIONS (INCLINED, VERTICAL, HORIZONTAL)
- JOINTS (INCLINED, VERTICAL, HORIZONTAL)
- THRUST FAULT (DEFINED, APPROXIMATE) TEETH INDICATE UPTHRUST SIDE
- FAULT (DEFINED, APPROXIMATE) UPTHROWN, DOWNTHROWN SIDE
- FAULT (DEFINED, APPROXIMATE) SHOWING RELATIVE MOVEMENT
- ADIT, TRENCH, COAL SPOIL
- DIAMOND, ROTARY, WINKIE DRILL HOLE (VERTICAL, INCLINED WITH SURFACE PROJECTION)
- MEASURED SECTION
- SURVEY CAIRN
- CROSS SECTION LINE

722

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

MT. KLAPPAN COAL PROPERTY
1986
GEOLOGY MAP

PREPARED BY: A.P., E.S.	DRAWING No. KPN.86003
APPROVED BY: E.S., K.J. DATE: APR. 1987	

SUMMIT SPECULATIVE RESOURCES AREA

SUMMIT INFERRED RESOURCE AREAS

LOST-FOX SPECULATIVE RESOURCE AREA

LOST - FOX INFERRED, INDICATED AND MEASURED RESOURCE AREA

HOBBIT - BROATCH INFERRED, INDICATED AND MEASURED RESOURCE AREA

HOBBIT - BROATCH SPECULATIVE RESOURCE AREA

NASS SPECULATIVE RESOURCE AREA

SKEENA SPECULATIVE RESOURCE AREA

SET GUNANOOT

KLAPPAN MOUNTAIN

TAYLOR PEAK

SPATSIZI PROVINCIAL PARK

CASSIAR DISTRICT LAND

ICE FIELD

LEGEND

ROADS AND RELATED FEATURES
- HARD SURFACE, ALL WEATHER
- LOOSE SURFACE
- CART TRACK, WINTER ROAD, UNDER CONSTRUCTION
- TRAIL, CUTLINE, PORTAGE
- BUILT UP AREA
- RAILWAY, SIDING, STATION, STOP
- BRIDGE
- SEAPLANE BASE, ANCHORAGE

LANDMARK FEATURES
- HOUSE, BARN
- CHURCH, SCHOOL
- POST OFFICE
- HISTORICAL SITE
- TOWERS, FIRE, RADIO
- WELL, OIL, GAS
- TANK, OIL, GASOLINE, WATER
- TELEPHONE LINE
- POWER TRANSMISSION LINE
- MINE
- CUTTING, EMBANKMENT
- GRAVEL PIT (GP)

BOUNDARIES AND CONTROL
- INTERNATIONAL, PROVINCIAL, BOUNDARY MONUMENT
- COUNTY, DISTRICT
- TOWNSHIP, PARISH — SURVEYED, — UNSURVEYED (25 24 23 22 21)
- TOWNSHIP, DLS — SURVEYED, — UNSURVEYED, — SECTION CORNERS
- MUNICIPALITY
- INDIAN RESERVE, PARK, ETC.
- HORIZONTAL CONTROL POINT
- BENCH MARK (BM 985)
- SPOT ELEVATION, ELEVATION APPROXIMATE (350, 721.1)

DRAINAGE AND RELATED FEATURES
- STREAM, SHORELINE, INDEFINITE
- DIRECTION OF FLOW
- LAKE, INTERMITTENT
- INUNDATED, FLOODED LAND
- MARSH OR SWAMP (WOODED)
- DRY RIVER BED WITH CHANNELS
- SAND, ABOVE, IN WATER
- STRING BOG (SB)
- TUNDRA PONDS, POLYGONS (TP, PG)
- RAPIDS
- FORESHORE FLATS (FF)
- ROCK
- DAM
- WHARF
- DITCH

RELIEF FEATURES
- CONTOURS (500, 250)
- APPROXIMATE CONTOUR (100, 50, 25)
- DEPRESSION
- ESKER
- PINGO (125)
- SAND, SAND DUNES (SAND)
- PALSA BOG (PB)
- WOODED AREA (W, C)

SCALE 1:50,000

0 1 2 3 MILES

0 1 2 3 4 5 KILOMETERS

104H/11	104H/10	104H/9	57°45'
104H/6	104H/7	104H/8	
104H/3	104H/2	104H/1	
104A/14	104A/15	104A/16	56°45'

129°30' 128°00'

722

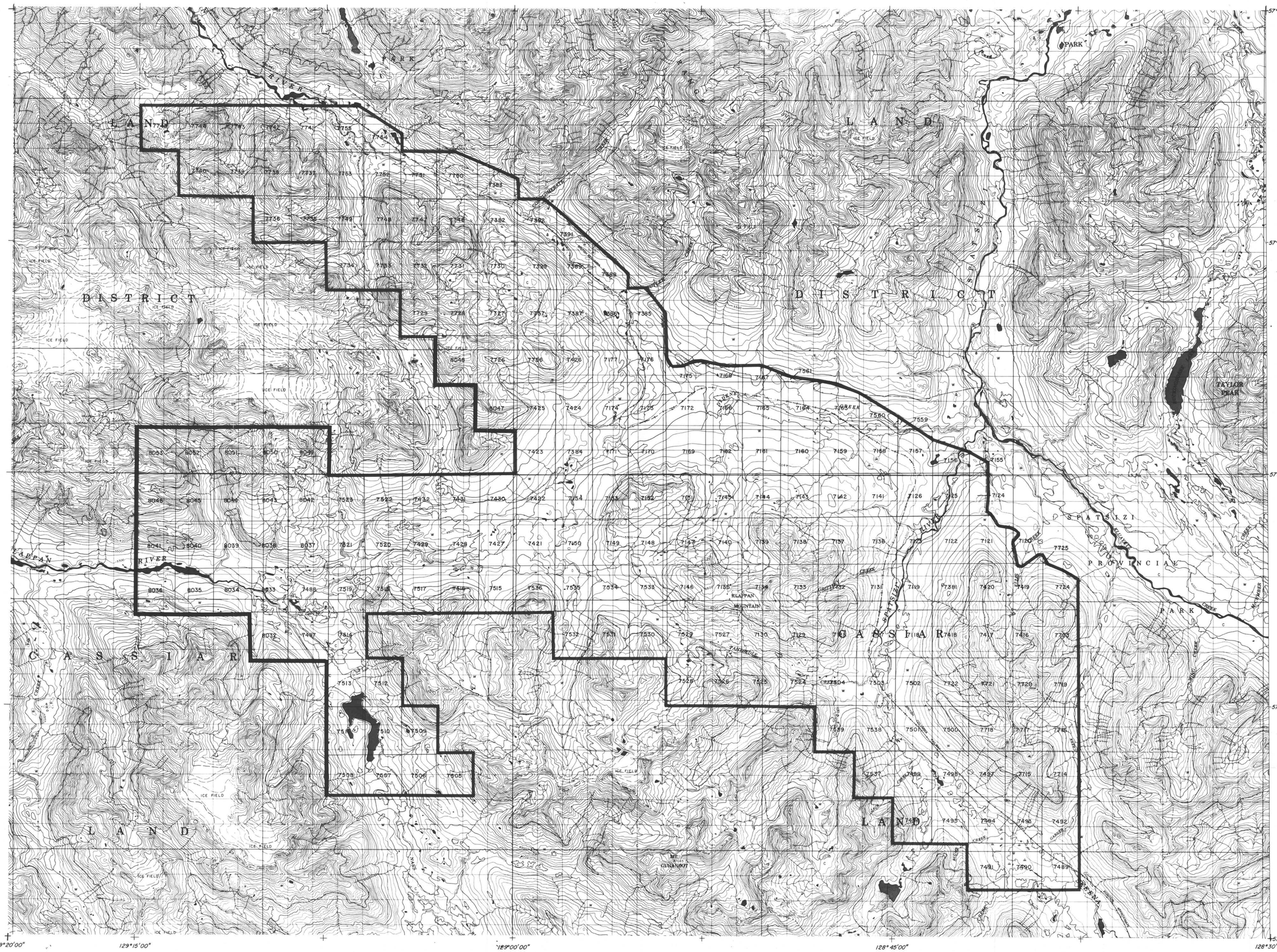
GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

MOUNT KLAPPAN COAL PROPERTY

1986

COAL RESOURCE AREA MAP

PREPARED BY: A.P.
APPROVED BY: E.S. DATE: MAR. 1987
DRAWING No. KPN86004



LEGEND

ROADS AND RELATED FEATURES

- HARD SURFACE, ALL WEATHER
- LOOSE SURFACE
- CART TRACK, WINTER ROAD, UNDER CONSTRUCTION
- TRAIL, CUTLINE, PORTAGE
- BUILT UP AREA
- RAILWAY, SIDING, STATION, STOP
- BRIDGE
- SEAPLANE BASE, ANCHORAGE

LANDMARK FEATURES

- HOUSE, BARN
- CHURCH, SCHOOL
- POST OFFICE
- HISTORICAL SITE
- TOWERS, FIRE, RADIO
- WELL, OIL, GAS
- TANK, OIL, GASOLINE, WATER
- TELEPHONE LINE
- POWER TRANSMISSION LINE
- MINE
- CUTTING, EMBANKMENT
- GRAVEL PIT

BOUNDARIES AND CONTROL

- INTERNATIONAL, PROVINCIAL, BOUNDARY MONUMENT
- COUNTY, DISTRICT
- TOWNSHIP, PARISH — SURVEYED, UNSURVEYED
- TOWNSHIP, DLS — SURVEYED, UNSURVEYED, SECTION CORNERS
- MUNICIPALITY
- INDIAN RESERVE, PARK, ETC.
- HORIZONTAL CONTROL POINT
- BENCH MARK — BM 965
- SPOT ELEVATION, ELEVATION APPROXIMATE — 350 -721

DRAINAGE AND RELATED FEATURES

- STREAM, SHORELINE, INDEFINITE
- DIRECTION OF FLOW
- LAKE, INTERMITTENT
- INUNDATED, FLOODED LAND
- MARSH OR SWAMP (WOODED)
- DRY RIVER BED WITH CHANNELS
- SAND, ABOVE, IN WATER
- STRING BOG — SB
- TUNDRA PONDS, POLYGONS — TP, PG
- RAPIDS
- FORESHORE FLATS — FF
- ROCK
- DAM
- WHARF
- DITCH

RELIEF FEATURES

- CONTOURS — 500, 375
- APPROXIMATE CONTOUR — 100, 75
- DEPRESSION — 75
- ESKER
- PINGO — 125
- SAND, SAND DUNES — SAND
- PALSA BOG — PB
- WOODED AREA — W, C

PROPERTY BOUNDARY

LICENCE BOUNDARY

LICENCE NUMBER 7425

SCALE 1:50,000

0 1 2 3 MILES

0 1 2 3 4 5 KILOMETERS

104H/11	104H/10	104H/9
104H/6	104H/7	104H/8
104H/3	104H/2	104H/1
104A/14	104A/15	104A/16

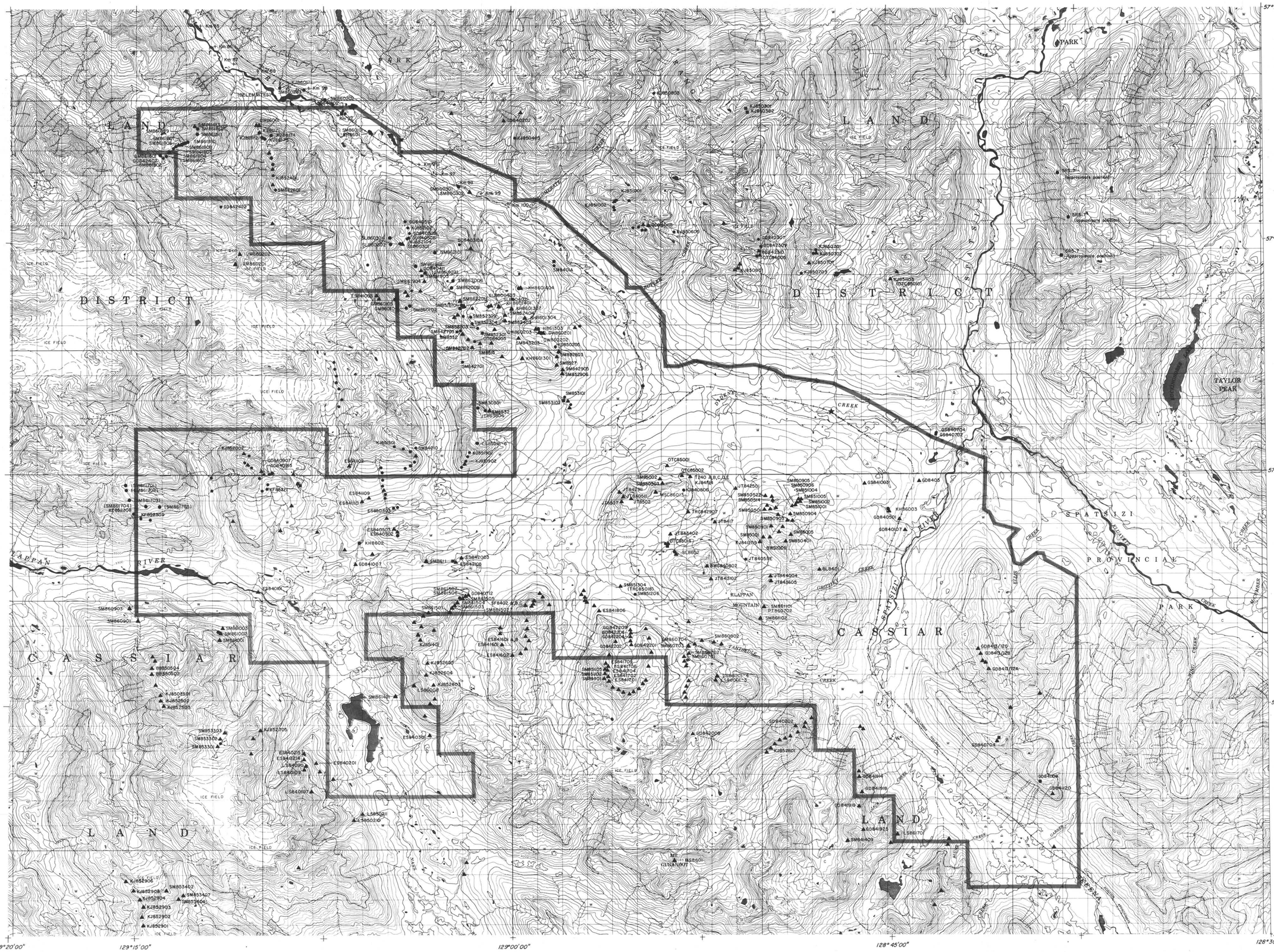
57°45' 129°30' 128°00' 56°45'

722

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

MOUNT KLAPPAN COAL PROPERTY
1986
COAL LICENCE MAP

PREPARED BY: E.S.	DRAWING No. KPN86005
APPROVED BY: E.S. DATE: MAR. 1987	



LEGEND

ROADS AND RELATED FEATURES
- HARD SURFACE, ALL WEATHER
- LOOSE SURFACE
- CART TRACK, WINTER ROAD, UNDER CONSTRUCTION
- TRAIL, CUTLINE, PORTAGE
- BUILT UP AREA
- RAILWAY, SIDING, STATION, STOP
- BRIDGE
- SEAPLANE BASE, ANCHORAGE

LANDMARK FEATURES
- HOUSE, BARN
- CHURCH, SCHOOL
- POST OFFICE
- HISTORICAL SITE
- TOWERS: FIRE, RADIO
- WELL: OIL, GAS
- TANK: OIL, GASOLINE, WATER
- TELEPHONE LINE
- POWER TRANSMISSION LINE
- MINE
- CUTTING, EMBANKMENT
- GRAVEL PIT

BOUNDARIES AND CONTROL
- INTERNATIONAL, PROVINCIAL, BOUNDARY MONUMENT
- COUNTY, DISTRICT
- TOWNSHIP, PARISH — SURVEYED; — UNSURVEYED
- TOWNSHIP, DLS — SURVEYED; UNSURVEYED; SECTION CORNERS
- MUNICIPALITY
- INDIAN RESERVE, PARK, ETC.
- HORIZONTAL CONTROL POINT
- BENCH MARK
- SPOT ELEVATION, ELEVATION APPROXIMATE

DRAINAGE AND RELATED FEATURES
- STREAM, SHORELINE, INDEFINITE
- DIRECTION OF FLOW
- LAKE, INTERMITTENT
- INUNDATED, FLOODED LAND
- MARSH OR SWAMP (WOODED)
- DRY RIVER BED WITH CHANNELS
- SAND, ABOVE, IN WATER
- STRING BOG
- TUNDRA PONDS, POLYGONS
- RAPIDS
- FORESHORE FLATS
- ROCK
- DAM
- WHARF
- DITCH

RELIEF FEATURES
- CONTOURS
- APPROXIMATE CONTOUR
- DEPRESSION
- ESKER
- PINGO
- SAND, SAND DUNES
- PALSA BOG
- WOODED AREA

- PROPERTY BOUNDARY
- FIELD CAMP LOCATION
- FLORA MACROFOSSILS
- FAUNA MACROFOSSILS
- TRACE FOSSILS

SCALE 1:50,000

0 1 2 3 MILES
0 1 2 3 4 5 KILOMETERS

104H/11	104H/10	104H/9	57°45'
104H/6	104H/7	104H/8	
104H/3	104H/2	104H/1	
104A/14	104A/15	104A/16	56°45'
129°30'		128°00'	

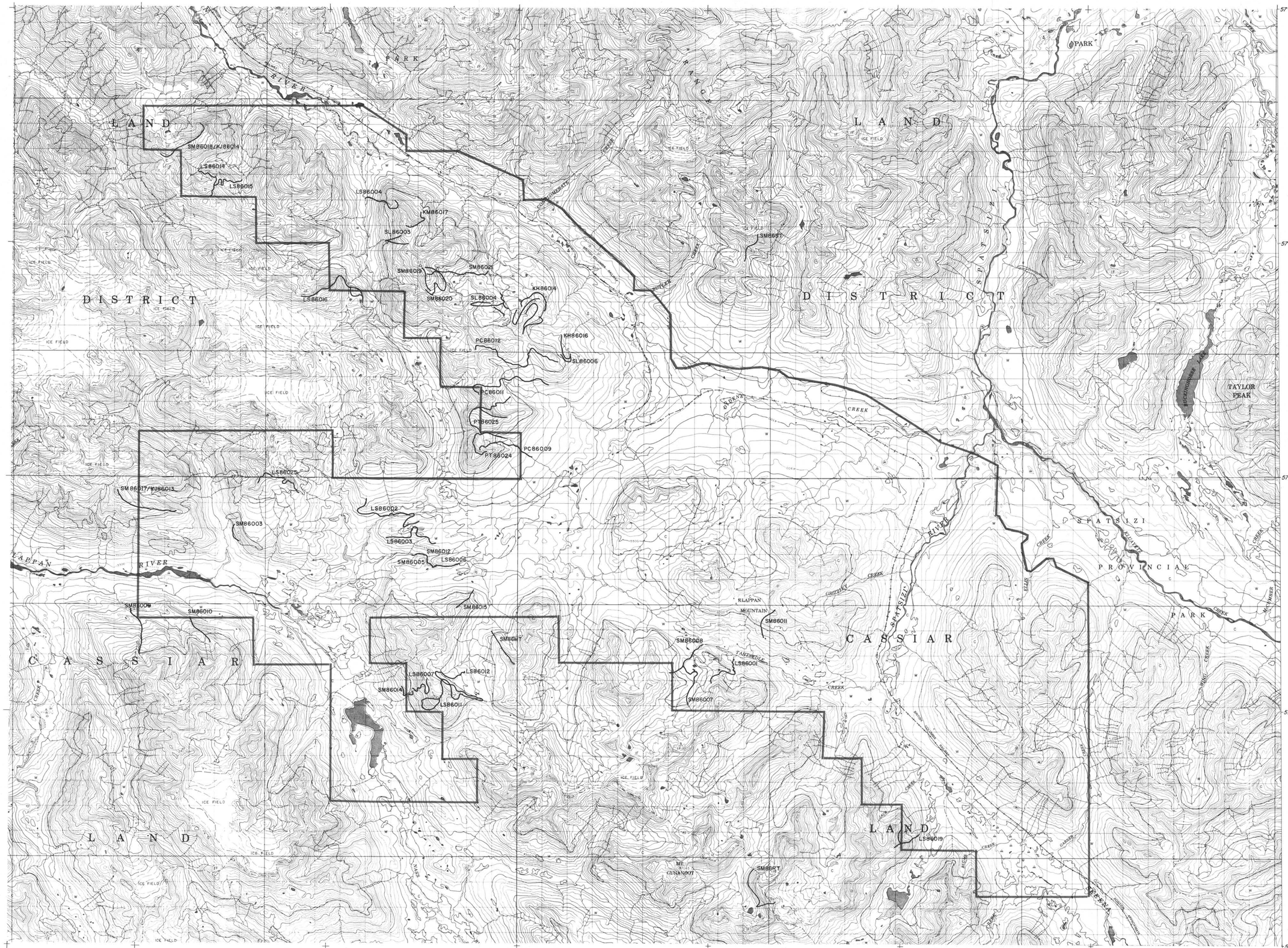
722

GULF CANADA CORPORATION
Coal Division
CALGARY — ALBERTA

MT. KLAPPAN COAL PROPERTY

1984 - 1986 FOSSIL LOCATION MAP

PREPARED BY: S. MACLEOD
APPROVED BY: E. SWANSBERGSON DATE: MAR. 1987
DRAWING No. KPN86006



LEGEND

ROADS AND RELATED FEATURES
- HARD SURFACE, ALL WEATHER
- LOOSE SURFACE
- CART TRACK, WINTER ROAD, UNDER CONSTRUCTION
- TRAIL, CUTLINE, PORTAGE
- BUILT UP AREA
- RAILWAY, SIDING, STATION, STOP
- BRIDGE
- SEAPLANE BASE, ANCHORAGE

LANDMARK FEATURES
- HOUSE, BARN
- CHURCH, SCHOOL
- POST OFFICE
- HISTORICAL SITE
- TOWERS: FIRE, RADIO
- WELL: OIL, GAS
- TANK: OIL, GASOLINE, WATER
- TELEPHONE LINE
- POWER TRANSMISSION LINE
- MINE
- CUTTING, EMBANKMENT
- GRAVEL PIT

BOUNDARIES AND CONTROL
- INTERNATIONAL, PROVINCIAL, BOUNDARY MONUMENT
- COUNTY, DISTRICT
- TOWNSHIP, PARISH — SURVEYED, UNSURVEYED
- TOWNSHIP, DLS — SURVEYED, UNSURVEYED, SECTION CORNERS
- MUNICIPALITY
- INDIAN RESERVE, PARK, ETC.
- HORIZONTAL CONTROL POINT
- BENCH MARK
- SPOT ELEVATION, ELEVATION APPROXIMATE

DRAINAGE AND RELATED FEATURES
- STREAM, SHORELINE: INDEFINITE
- DIRECTION OF FLOW
- LAKE: INTERMITTENT
- INUNDATED, FLOODED LAND
- MARSH OR SWAMP (WOODED)
- DRY RIVER BED WITH CHANNELS
- SAND: ABOVE, IN WATER
- STRING BOG
- TUNDRA PONDS, POLYGONS
- RAPIDS
- FORESHORE FLATS
- ROCK
- DAM
- WHARF
- DITCH

RELIEF FEATURES
- CONTOURS
- APPROXIMATE CONTOUR
- DEPRESSION
- ESKER
- PINGO
- SAND, SAND DUNES
- PALSA BOG
- WOODED AREA

SCALE 1:50,000

0 1 2 3 MILES

0 1 2 3 4 5 KILOMETERS

104H/11	104H/10	104H/9
104H/6	104H/7	104H/8
104H/3	104H/2	104H/1
104A/14	104A/15	104A/16

57°45' 129°30' 128°00' 56°45'

722

GULF CANADA CORPORATION
Coal Division
CALGARY ALBERTA

MOUNT KLAPPAN COAL PROPERTY
1986
TRAVERSE LOCATION MAP

PREPARED BY: S.M./L.S.
APPROVED BY: E.S. DATE: MAR. 1987
DRAWING No. KPN86007