MOUNT KLAPPAN COAL PROJECT
LOST - FOX AREA
GEOLOGICAL REPORT
1984

709

GULF CANADA RESOURCES INC.

COAL DIVISION

GR MOUNT KLAPPAN 84(1)A

GULF CANADA RESOURCES INC.

Mount Klappan Coal Project Geological Report
Lost-Fox Area

1984

Coal Project Licence Numbers
7118 to 7177
7381 to 7392
7416 to 7432
7487 to 7539
7559 to 7561
and
7714 to 7757

Cassiar Land District

NTS Map Number 104 H

Latitude Between 57° 06' and 57° 23'
Longitudes Between 128° 37' 30" and 129° 15'

Gulf Canada Resources Inc.

January, 1985

CONFIDENTIAL

PREFACE

The Mount Klappan Coal Project is located in northwest British Columbia and is wholly owned and operated by Gulf Canada Resources Inc.

The 1984 Lost-Fox Area Geological Report provides a current assessment of the geology, coal quality, and resource potential of the Lost-Fox Area, which is situated in the central region of the Mount Klappan property. This report presents the assimilation of the results from four subsequent exploration programs in the Lost-Fox Area undertaken since the initial acquistion of coal licences in 1981.

Table of Contents

MOUNT KLAPPAN COAL PROPERTY

LOST-FOX AREA

1984 GEOLOGICAL REPORT

TABLE OF CONTENTS - cont'd

Page No.

TABLE OF CONTENTS - Cont'd

TABLE OF CONTENTS - Cont'd

TABLE OF CONTENTS - Cont'd

TABLE OF CONTENTS - Cont'd

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES - cont'd

LIST OF APPENDICES

- Appendices Within Text -

- Appendices External to Text -

LIST OF APPENDICES - cont'd

APPENDIX I

1:50 000 Maps, Correlation Charts, Measured Sections

		Drawing No.
1:50 000 Maps:		
	1984 Coal Licence Map	KPN84B01
	1984 Traverse Location Map	KPN84B02
Correlation Charts:		
	Drill Hole Correlation Chart Sheet 1	KPN84LF-001
	Sheet 2	KPN84LF-002

Measured Sections:

KPNLROTC 84009
KPNLROTC 84010
KPNLROTC 84011
KPNLROTC 84012
KPNLROTC 84013

Stratigraphic Logs

APPENDIX II

Geology Maps and Cross-Sections

	Drawing No.
Volume I	
1:2 500 Maps:	
Sheet 1	KPN84LF-21
Sheet 2	KPN84LF-22
Sheet 3	KPN84LF-23
Sheet 4	KPN84LF-24
Sheet 5	KPN84LF-25
Sheet 6	KPN84LF-26
1:2 500 Cross-Sections:	
500N	KPN84LF-41
750N	KPN84LF-42
1000N	KPN84LF-43
1250N	KPN84LF-44
1500N	KPN84LF-45
1750N	KPN84LF-46
2000N	KPN84LF-47
2250N	KPN84LF-48
2500N	KPN84LF-49

APPENDIX II - Cont'd

	Drawing No.
1:2 500 Cross-Sections (Cont'd.)	
2750N	KPN84LF-50
3000N	KPN84LF-51
3250N	KPN84LF-52
3500N	KPN84LF-53
3750N	KPN84LF-54
4000N	KPN84LF-55

Volume II

1:5 000 Maps:

Map H-8	KPN84LF-61
Map H-9	KPN84LF-62
Map I-8	KPN84LF-63
Map I-9	KPN84LF-64
Map I-10	KPN84LF-65
Map J-8	KPN84LF-66
Map J-9	KPN84LF-67
Map J-10	KPN84LF-68
Map K-8	KPN84LF-69
Map K-9	KPN84LF-70

APPENDIX II - Cont'd

1:5000 Cross-Sections:	Drawing No.
5000S	KPN84LF-81
3000S	KPN84LF-82
1000S	KPN84LF-83
1000N	KPN84LF-84
3000N	KPN84LF-85
5000N	KPN84LF-86

APPENDIX III

Adit Data

1983 Bulk Sample Program

Part I Procedures

Part II Coal Quality

APPENDIX IV

Diamond Drill Hole Data

Volume I

1982 and 1983 Diamond Drill Hole Data: (9 Holes)

KPNLRDDH82005

KPNLRDDH83001

KPNLRDDH83002

KPNLRWKD83001

KPNLRWKD83002

KPNLRWKD83003

KPNLRWKD83004

KPNLRWKD83005

KPNLRWKD83006

- Data Source Summaries
- Descriptive Logs
- Sample Summaries
- Coal Seam Data Sheets
- Stratigraphic Logs
- Geophysical Logs
- Deviation Surveys

1:10 000 Drill Hole Location Map

APPENDIX IV - Cont'd

Diamond Drill Hole Data

Volume II

1984 Diamond Drill Hole Data: (4 Holes)

KPNLRDDH84005

KPNLRDDH84006

KPNLRDDH84007

KPNLRDDH84008

- Data Source Summaries
- Descriptive Logs
- Sample Summaries
- Coal Seam Data Sheets
- Stratigraphic Logs
- Geophysical Logs
- Deviations Surveys

1:10 000 Drill Hole Location Map

APPENDIX V

Rotary Drill Hole Data

Volume I

1984 Rotary Drill Hole Data: (12 Holes)

KPNLRRDH84001

to

KPNLRRDH84012:

- Data Source Summaries
- Descriptive Logs
- Stratigraphic Logs
- Geophysical Logs
- Deviation Surveys

1:10 000 Drill Hole Location Map

Volume II

1984 Rotary Drill Hole Data: (5 Holes)

KPNLRRDH84013

to

KPNLRRDH84017:

APPENDIX V

Rotary Drill Hole Data

Volume II cont'd

Data Source Summaries

Descriptive Logs

Stratigraphic Logs

Geophysical Logs

Deviation Surveys

1:10 000 Drill Hole Location Map

APPENDIX VI

Trench Data

Volume I

1981, 1982, 1983 Trench Data: (72 Trenches)

- Data Source Summaries (bound)
- Descriptive Logs
- Stratigraphic Logs
- Coal Quality Analyses seperate
- 1981 Reflectance Data

1:10 000 Trench Location Maps KPN84LF-C03 -C04

Volume II

1984 Trench Data (143 Trenches)

- Data Source Summaries
- Descriptive Logs
- Stratigraphic Logs
- Sample Summaries seperate
- Coal Quality Analyses

1:10 000 Trench Location Maps

APPENDIX VII

Diamond Drill Hole

Coal Quality Data

Volume I

1982, 1983 Diamond Drill Hole Coal Quality Data

KPNLRDDH 82005

KPNLRDDH 83001

KPNLRWKD 83002

KPNLRWKD 83004

Data Source Summaries

Sample Summaries

Coal Seam Data Sheets

Coal Quality Data

Volume II

1984 Diamond Drill Hole Coal Quality Data

KPNLRDDH 84006

KPNLRDDH 84007

KPNLRDDH 84008

Data Source Summaries

Sample Summaries

Coal Seam Data Sheets

Coal Quality Data

1.0 SUMMARY

Gulf Canada Resources Inc.'s Mount Klappan Coal Project is located in the Bowser Basin of northwest British Columbia, 288 kilometres north of Smithers, and 150 kilometres northeast of Stewart, British Columbia. The property is composed of 189 crown coal licences totalling 50 014 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.

To facilitate exploration expansion and subsequent logistics in 1984, the Mount Klappan property was divided into three projects: the Hobbit-Broatch Area, the Summit-Nass-Skeena Areas, and the Lost-Fox Area, the latter to which this report pertains. Two reports covering exploration activities on the remaining projects have been completed as well.

Encouraging results in terms of quantity, quality and accessability of coal provided a basis for increased attention to the Lost-Fox Area each year. Results from detailed geological mapping, hand and mechanical trenching, diamond and rotary drilling, as well as adit driveage, have contributed to the delineation of economic resource areas in the Lost-Fox Area. In 1982 a Mining Assessment of the area was completed and Gulf is currently preparing a Stage I submission to the Government of British Columbia with respect to development of the Lost-Fox Area.

Combined exploration activity on the Mount Klappan property during 1984 comprised 8 diamond drill holes totalling 1507 metres, 17 rotary drill holes totalling 897 metres, and 223 trenches totalling 1 457 metres. In addition, the property was mapped at scales of 1:5000 and 1:2500, and new air photo coverage was produced for the Lost-Fox and Hobbit-Broatch Areas at scales of 1:8 000 and 1:20 000.

The Mount Klappan property covers sedimentary strata ranging in age from Upper Jurassic to Lower Cretaceous. These strata are interpreted to have been subjected to two phases of structural deformation resulting in NW-SE trending folds of the first phase (F_1) and generally NE-SW trending folds of the second phase (F_2). More apparent within the first phase, thrust and minor normal faulting is associated with both phases of deformation. The Lost-Fox Area is well within this structural regime, and exhibits results of both deformation phases.

The sediments underlying the property have been subdivided into four sequences: the Spatsizi, Klappan, Malloch, and Rhondda, in ascending order. The Klappan Sequence is the main coal-bearing unit and is presently interpreted to attain a thickness of up to 900 metres. The Lost-Fox Area is predominantly underlain by strata of the coal-bearing Klappan Sequence.

The Mount Klappan property contains a total resource of 5.3 billion tonnes of coal, with each resource category contributing as indicated below. These coal resources are contained within up to 16 seams ranging in thickness up to 8 metres.

The Lost-Fox Area contributes 1067 million tonnes to the total resource of the Mount Klappan property, with each resource category contributing as indicated below. In the Lost-Fox Area, there are 16 seams with an aggregate true thickness ranging up to over 44 metres interpreted to exist within the coal-bearing Klappan Sequence.

COAL RESOURCES
(million tonnes)

	Mount Klappan Property	Lost-Fox Area
Measured	44.2	32.1
Indicated	70.8	46.3
Inferred	604.6	194.1
Speculative	4 622.4	794.9
Total	5 342.0	1 067.4

The coal, which is of anthracite rank, can be cleaned to simultaneously produce a variety of sized products, ranging in ash content from 5% ash premium coals to briquetting coals of 25% ash or greater. The anthracite products are characterized by low sulphur values (less than 1% and usually 0.5%), high calorific values, and only traces of chlorine.

2.0 RECOMMENDATIONS

Geological interpretation of exploration data collected to date has identified several areas with potential for surface mineable coal resources in the Lost-Fox Area. Based on the results of the data assimilation and interpretation, the following recommendations are made:

1. Continue data collection through adit driveage, drilling, trenching and detailed mapping in central Lost Ridge and the Hogback vicinity to the immediate north and east of Lost Ridge.

2. Investigate, through detailed structural and stratigraphic mapping, the areas south, east and west of Lost Ridge where little data is available but preliminary work (hand trenching and mapping) has indicated the presence of coal seams.

3. Continue detailed studies of the structural and depositional characteristics of the coal-bearing sequence in the Lost-Fox Area. The results of these studies will augment and enable refinement of the ongoing interpretation and resource delineation.

4. Investigate the areas of Mount Klappan and south west of Lost Ridge toward the Little Klappan River to provide conclusive data regarding the coal potential in these areas.

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; Appendix G).

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 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-Cassier Highway (Hwy 37).

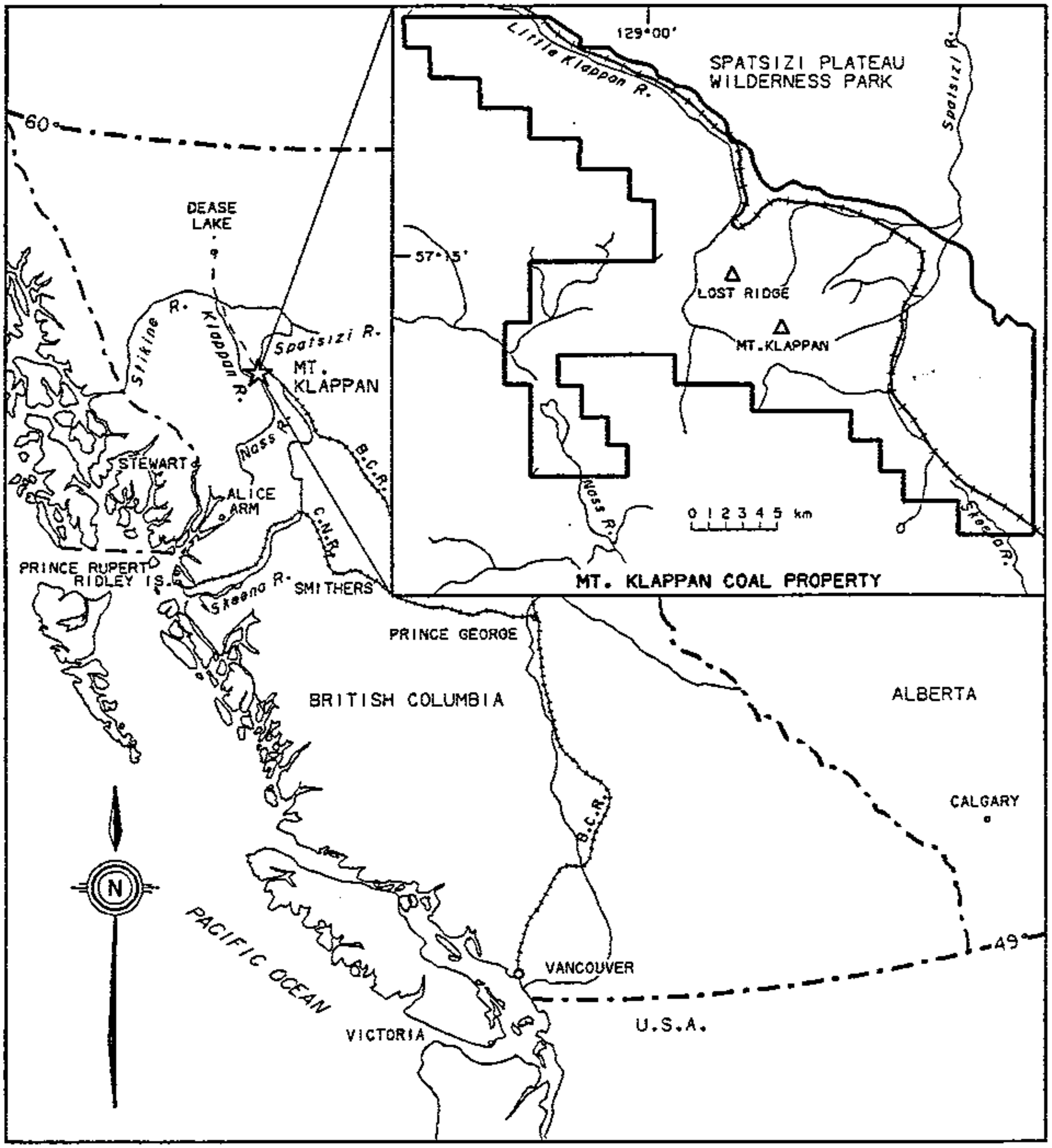
3.1.2 Access

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 COAL PROPERTY

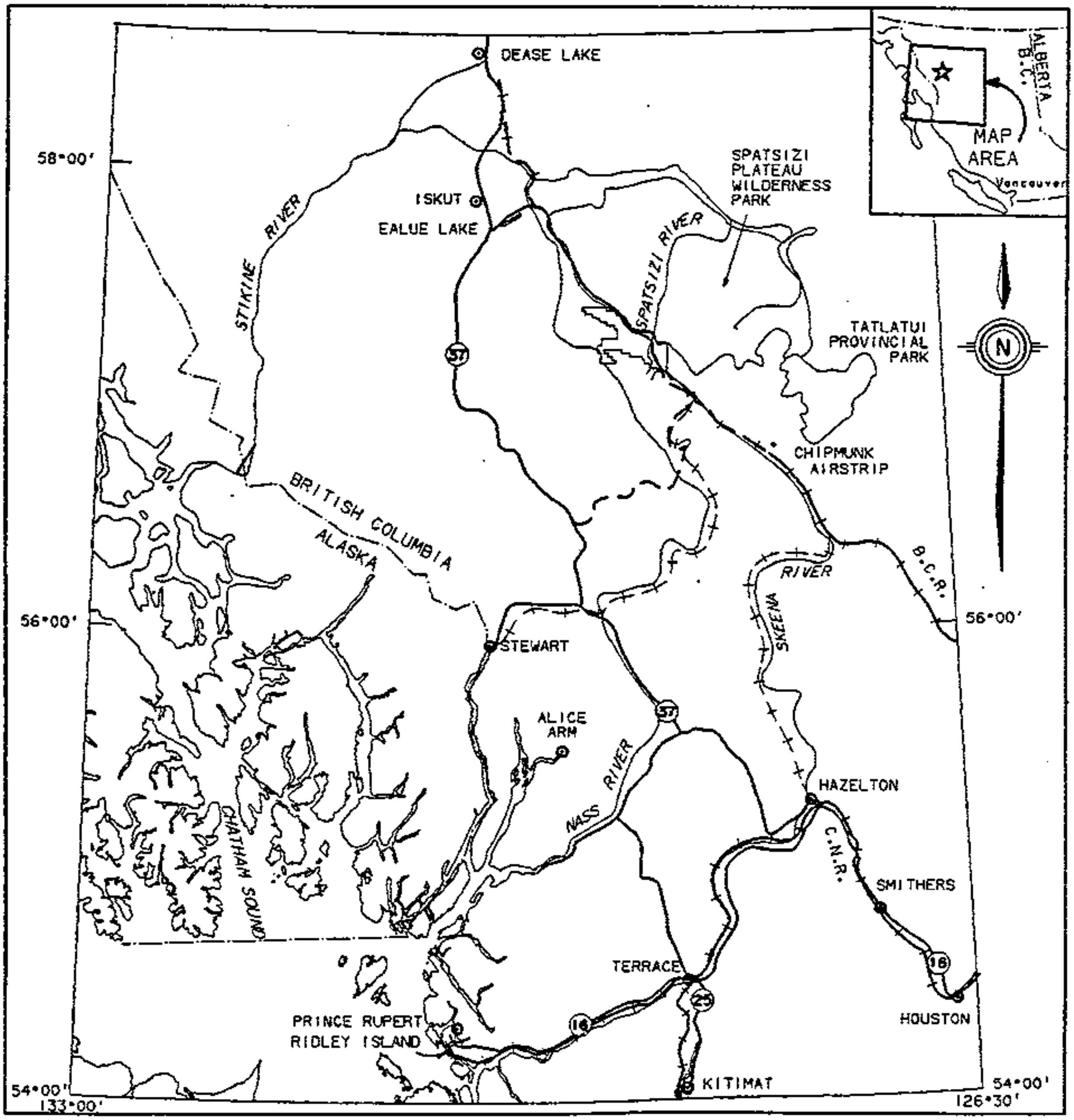
LOCATION MAP



MT. KLAPPAN LICENCE AREA

GULF CANADA RESOURCES INC.
10/01/85

FIGURE 3.2
MOUNT KLAPPAN COAL PROPERTY
PROPERTY ACCESS



LEGEND

- ROAD ACCESS
- PROPOSED ROAD ACCESS
- EXISTING RAILWAY
- EXISTING RAILWAY SUBGRADE
- POSSIBLE RAILWAY ROUTES
- MT. KLAPPAN LICENCE AREA

SCALE

0 20 40 60 80 100 km

GULF CANADA RESOURCES INC.
10/01/85

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

The Mount Klappan property comprises 189 coal licences totalling 50 014 hectares of land (Appendix B). The property was acquired in four separate applications from 1981 to 1984 (Figure 3.3).

3.1.4 Ownership

Gulf Canada Resources Inc., wholly owns the coal licences comprising the Mount Klappan property.

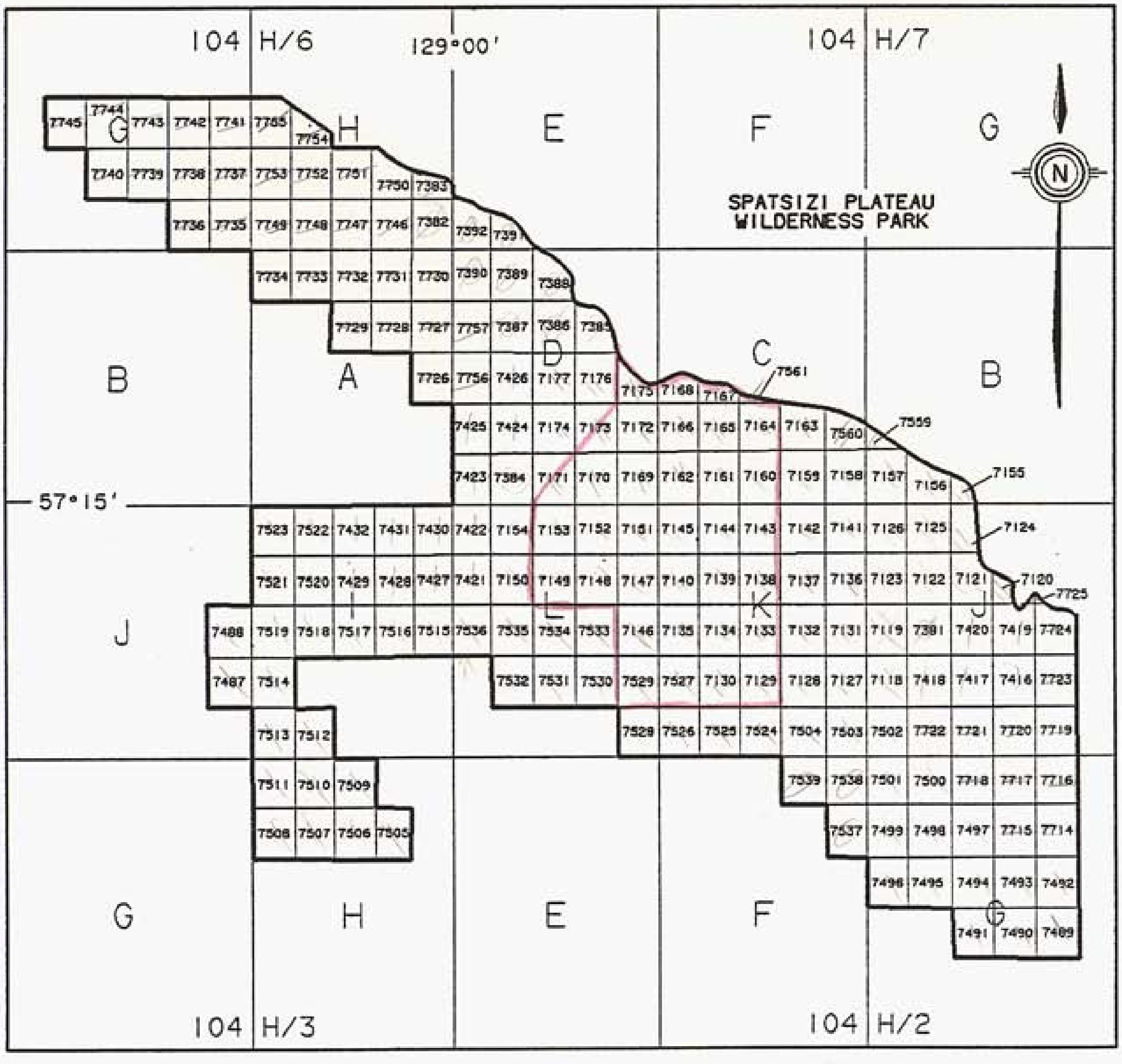
3.1.5 Property Geography and Biophysical Environment

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

FIGURE 3.3

MOUNT KLAPPAN COAL PROPERTY

LICENCES



LEGEND

LICENCE AREA

7386 LICENCE NUMBER

SCALE

0 1 2 3 4 5 km

GULF CANADA RESOURCES INC.
05/12/84

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 1127 metres in the Spatsizi 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 three 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 Lost-Fox Area

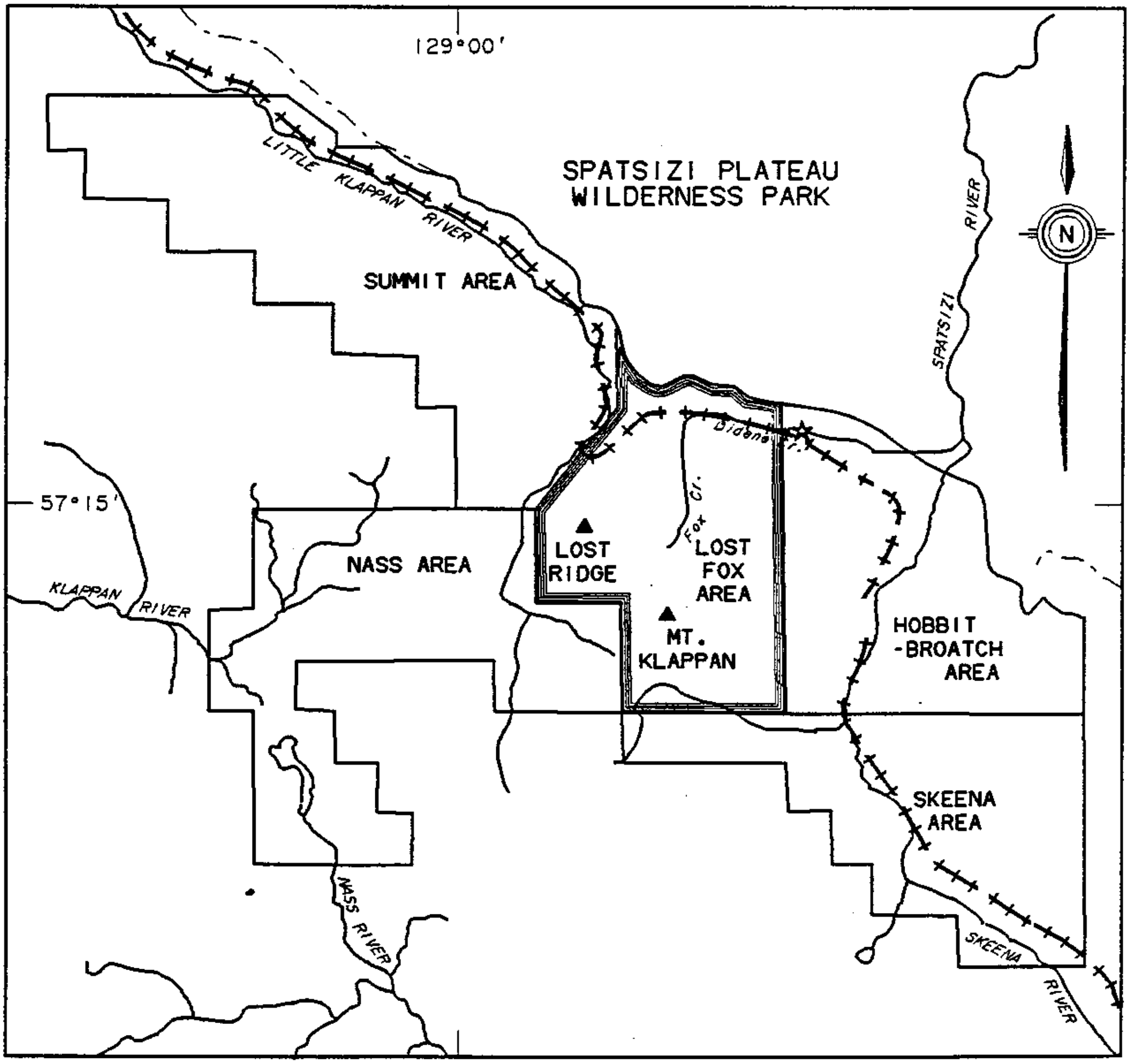
3.2.1 Location

The Mount Klappan property was divided into three projects in 1984 to facilitate exploration expansion and subsequent logistics. (Figure 3.4). The Lost-Fox Area is

FIGURE 3.4

MOUNT KLAPPAN COAL PROPERTY

1984 EXPLORATION AREAS



LEGEND

- PREPARED RAIL BED
- PROVINCIAL PARK BOUNDARY
- LICENCE AREA
- ☆ DIDENE CREEK CAMP

SCALE

0 1 2 3 km

GULF CANADA RESOURCES INC.
10/12/84

situated in the central region of the Mount Klappan property. Major geographic features included in the area are Lost Ridge, Mount Klappan and Fox Creek.

3.2.2 Access

The British Columbia Railway subgrade provides road access to the northern extremity of the Lost-Fox Area, however the area was reached primarily by helicopter from Didene Creek Camp. Track-mounted vehicles were used to transport rotary drilling and support equipment where road access was not available during the 1984 exploration season.

3.2.3 Area Description

The Lost-Fox Area covers 8 757.5 hectares and includes 35 of the 189 licences comprising the Mount Klappan Coal Project (Appendix B). Two licences, 7171 and 7173, are divided between the Lost-Fox Area and the Summit Area, the latter concerned with the northwest portion of each of those licences, which includes the area around the Summit Airstrip.

3.2.4 Biophysical Environment

With tree line at approximately 1500 metres a.s.l., the Lost-Fox Area is characterized by alpine tundra, grasses, and shrubs, with swamps and some scattered coniferous stands at lower elevations.

The Mount Klappan massif influences the physical character of much of the area. The valley separating it from the second predominant feature, Lost Ridge, expresses the influence of Fox Creek, the major drainage in the Lost-Fox Area.

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 concentrating 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 in 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 studies 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 in the Panorama-Groundhog Coal Measures. This was followed in 1981 by the acquisition of the Mount Klappan property.

4.1.2 Summary of Exploration 1981-1983

Prior to 1984, Gulf undertook three separate exploration programs on the Mount Klappan property. The exploration included geological mapping, hand trenching, diamond drilling, and adit driveage, as summarized in Table 4.1. The results of these exploration activities have been documented in three separate reports: Mount Klappan Coal Project - Geological Report 1981, 1982 and 1983.

Table 4.1

MOUNT KLAPPAN COAL PROJECT

EXPLORATION SUMMARY 1981 TO 1983

	1981	1982	1983	Total
Adits				
Number	--	--	1	1
Tonnes	--	--	39.2	39.2
Diamond Drill Holes				
Number (HQ)	--	7	3	10
Total Metres	--	1223	603	1 826
Number (AIX)	--	--	6	6
Total Metres	--	--	126	126
Hand Trenching				
Number	24	51	93	168
Total Metres	89	289	527	905
Geological Mapping				
Scales	1:10 000	1:10 000	1:5 000 1:10 000	

4.2 Lost-Fox Area

4.2.1 Summary of Exploration 1981-1983

During each of the three exploration programs undertaken prior to 1984, the Lost-Fox Area has received further investigation in the form of geological mapping and trenching with subsequent drilling and adit driveage after preliminary mapping results were assessed. Encouraging results in terms of quantity, quality and accessability of coal, provided a basis for increased attention to the Lost-Fox Area each year. Each exploration program has supported a growing data base and has provided a continuing delineation of economic resource areas. The Lost-Fox Area exploration activities prior to those of the 1984 program are summarized in Table 4.2.

Table 4.2

LOST-FOX AREA

EXPLORATION SUMMARY 1981 TO 1983

	1981	1982	1983	Total
Adits				
Number	--	--	1	1
Tonnes	--	--	39.2	39.2
Diamond Drill Holes				
Number (HQ)	--	1	2	3
Total Metres	--	244	411	655
Number (AIX)	--	--	6	6
Total Metres	--	--	126	126
Hand Trenching				
Number	9	14	49	72
Total Metres	27	93	199	378
Geological Mapping				
Scales	1:10 000	1:10 000	1:5 000 1:10 000	

5.0 1984 EXPLORATION PROGRAM

5.1 Program Objectives

In summary, the objectives of the 1984 Lost-Fox Area exploration program were:

1. To geologically map in detail all outcrop in the Lost-Fox Area where surface mineable resources were interpreted to exist;

2. To provide sufficient control through mapping, trenching, seam tracing and drilling to determine resources to an indicated level in a potential mine area;

3. To explore the remainder of the Lost-Fox Area to delineate further surface mineable coal potential.

In general, all objectives were met through detailed geological mapping on a priority basis, diamond and rotary drilling, and hand and mechanical trenching.

5.2 Summary of Exploration

5.2.1 Mount Klappan Coal Project

In four 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 investigated,

Table 5.1

MOUNT KLAPPAN COAL PROJECT
EXPLORATION SUMMARY 1981 TO 1984

	1981	1982	1983	1984	Total
Adits					
Number	--	--	1	--	1
Tonnes	--	--	39.2	--	39.2
Diamond Drill Holes					
Number (HQ)	--	7	3	8	18
Total Metres	--	1223	603	1507	3333
Number (AIX)	--	--	6	--	6
Total Metres	--	--	126	--	126
Rotary Drill Holes					
Number	--	--	--	17	17
Total Metres	--	--	--	897	897
Mechanical Trenches (Seam Tracing)					
Number	--	--	--	128	128
Total Metres	--	--	--	1041	1041
Hand Trenches					
Number	24	51	93	95	263
Total Metres	84	289	527	416	1321
Geological Mapping					
Scales	1:10 000	1:10 000	1:5 000 1:10 000	1:2 500 1:5 000 1:10 000	

exploration is proceeding on those areas which have immediate economic interest. During 1984, geological mapping and hand trenching were undertaken on all areas of the property. In addition, diamond and rotary drilling, mechanical trenching, and seam tracing were undertaken on areas in more advanced exploration stages, the Lost-Fox and Hobbit-Broatch areas.

During the first three years, the exploration programs were supported by air transport and personnel were accomodated in tent camps. In early 1984, Gulf constructed three bridges along the British Columbia Railway subgrade, providing road access to the property from Highway 37. Gulf subsequently purchased and erected a trailer camp along the subgrade 10 kilometres south of the Summit Airstrip, next to Didene Creek. Didene Creek Camp (Figure 3.4), provided lodging and working space for up to 50 Gulf and support personnel throughout the exploration program.

An exploration road was built in late 1984 to provide surface access to the central region of the Lost-Fox Area. Construction commenced in mid-November and was completed in December. The construction and support personnel utilized the Didene Creek Camp.

During the 1984 exploration program, geological as well as drilling and support crews were transported to their work stations from camp by helicopter where road access was not available. A Hughes 500D, as well as a Bell 206B on occasion, were used for crew transport within the property area. A larger Bell 204 or 205 helicopter was utilized for transporting heavy equipment and drilling rigs. At all times a helicopter was available on site equipped with a stretcher carrying kit for medical emergencies. Four-wheel-drive trucks were used where road access was available. The British Columbia Railway subgrade provided an excellent roadway through the property, and joined with Highway 37 via the Ealue Lake Road (Figure 3.2). A four-wheel-drive Emergency Transportation Vehicle was on standby at all times for use in a medical emergency.

Commercial as well as charter fixed wing aircraft linked the Summit Airstrip on the property to major centres and provided convenient air transportation for personnel and cargo throughout the exploration program.

5.2.2 Lost-Fox Area

The exploration programs undertaken from 1981 to 1983 provided encouraging and supportive data for the continued definition of the coal resources of the Lost-Fox Area. During the 1984 exploration program, the Lost-Fox Area received detailed investigations through diamond and rotary drilling, hand and mechanical trenching (seam tracing), and detailed geological mapping. The program commenced in late June, 1984 and field investigations continued for three months until late September. Road construction began in mid-November and was completed in December; the road access will provide access to the central region of the Lost-Fox Area during future exploration programs. Bridge construction along the BCR subgrade earlier in the year established road access to the Mount Klappan property and permitted the transport of exploration equipment such as backhoes and rotary drilling rigs which had not been used previously on the property.

A summary of Lost-Fox Area exploration activities is provided in Table 5.2. The 1984 Lost-Fox Area Geological Report contains all the exploration data from drilling, trenching and adit driveage completed to date on the Lost-Fox Area. Referral to the Table of Contents provides the location of the data within this report.

The geological interpretation presented in this report has been built upon the work completed in previous as well as the 1984 exploration programs.

5.3 Cartography

Topographic maps at 1:5:00 and 1:2 500 scales were used for plotting of exploration data and subsequent technical interpretation. The 1:5000 maps were produced from 1:30 000 British Columbia Government air photographs taken in 1971 prior to the construction of the BCR subgrade. The 1:2 500 maps were produced by Western Photgrammetry early in 1984 to provide topographic detail over areas of immediate concern such as the Lost-Fox and Hobbit-Broatch resource areas. These maps were produced from 1:30 000 airphotos taken in the early autumn of 1982.

Ground survey control was provided late in the 1984 season through a comprehensive survey and air photo program. Air

Table 5.2

LOST FOX AREA
EXPLORATION SUMMARY 1981 to 1984

	1981	1982	1983	1984	Total
Adits					
Number	-	-	1	-	1
Tonnes	-	-	39.2	-	39.2
Diamond Drill Holes					
Number (HQ)	-	1	2	4	7
Total Metres	-	244	411	1 017	1 672
Number (AIX)	-	-	6	-	6
Total Metres	-	-	126	-	126
Rotary Drill Holes					
Number	-	-	-	17	17
Total Metres	-	-	-	897	897
Mechanical Trenches					
Number	-	-	-	88	88
Total Metres	-	-	-	808	808
Hand Trenches					
Number	9	14	49	55	127
Total Metres	27	86	265	260	638
Geological Mapping					
Scales	1:10 000	1:10 00	1:10 000 1: 5 000	1:5 000 1:2 500	

photographs were flown over the Lost-Fox and Hobbit-Broatch Areas at scales of 1:8 000 and 1:20 000 in early September of 1984. Controlled topographic maps of these areas will now be prepared for the next exploration season form this controlled air photography.

5.4 Geological Mapping

Detailed geological mapping of most of the Lost-Fox Area was completed during the 1984 exploration program. Due to time constraints, the southern-most part of the area, south of Mount Klappan, was not mapped in detail. However, this area has been previously investigated.

Up to four two-person mapping teams contributed to the geological investigation of the Lost-Fox Area. Mapping was completed using chain and compass, air photo, as well as "stadia and level" methods of traversing. Important outcrops, trenches and drill holes were located using a theodolite.

To provide more accuracy in the location of outcrops and other data points, a system of "Survey Cairns" was established over the Lost-Fox resource area. Nineteen cairns were constructed to be highly visible from great distances as well as photo identifiable. They were located using a theodolite and stadia and plotted on the 1:2 500 maps produced in the spring of 1984. The fixed datum for these survey cairns was KPNLRDDH82005, a photo identifiable point which was highlighted in the 1:2 500 mapping. Routine traverses were carefully documented, and tied into these survey cairns where possible. When the new mapping is completed from the recent survey and air photo program, these cairns will be located and plotted on the maps. Traverses and key points will be transferable to the new maps using the documented traverse information.

All data obtained from measured sections, trenches and drill holes were entered into an on-site data storage system operating on a HP9816 microcomputer. Uploading onto Gulf's mainframe Coal Data Base was subsequently completed in Calgary.

Detailed geological maps and cross-sections are provided in Appendix II. A 1:50 000 regional geology map is located in Appendix E with this text.

5.5 Trenching

Both hand and mechanical trenching were undertaken on the Lost-Fox Area during the 1984 exploration program. Forty-five hand trenches and 88 mechanical trenches comprising a total of 1 068 metres of excavation were completed.

The hand trenching was completed by Gulf personnel either on routine traverses wherever coal spoil was found, or by a team whose assignment it was to hand dig trenches in prospective coal seams. Trenches were excavated at right angles to the slope where possible; overburden and topsoil were stockpiled separately and in most cases backfilled. Some trenches remain open for further investigation. All trenches were logged by Gulf geologists upon completion.

The mechanical trenching program was completed in two phases. The first phase was undertaken using a skidder-mounted John Deere backhoe capable of travelling over wet and hummocky terrain, and with a depth capacity adequate to penetrate overburden easily. A wide-track mounted John Deere backhoe was utilized for the second phase of mechanical trenching. This latter machine proved to be more suitable for traversing the local terrain with minimal disturbance. In some cases, the mechanically dug trenches could not be logged due to hazardous sloughing conditions, however, the presence of coal was recorded in these areas.

Most trenches were sampled for coal quality analysis; the coal quality is discussed in Section 8.0 and analysis results are provided in Appendix VI. The remaining trench data, including location maps, descriptive logs, and pictorial lithological logs can also be found in the same Appendix.

5.6 Diamond Drilling

The diamond drilling phase of the 1984 Lost-Fox Area exploration program commenced August 13, 1984, and was completed on September 1, 1984. A Longyear Super 38 drill rig was utilized to complete four holes for a total of 1 017 metres over a period of 18 days. All holes were geophysically logged upon completion.

All drill core was lithologically logged by Gulf geologists, and all significant coal intersections were sampled for coal quality analyses. The coal quality is discussed in Section 8.0 and analyses results are provided in Appendix VII. Table 5.4 summarizes the diamond drilling program statistics.

Table 5.3

LOST-FOX AREA
1984 DIAMOND DRILL HOLE SUMMARY

Drill Hole	Easting (m)	Northing (m)	Elevation (m)	Length (m)	Inclination (°)	Azimuth	Licence Number
KPNLRDDH84005	506370.00	6343938.00	1 740.00	160.70	88.6	304.4	7151
KPNLRDDH84006	506518.00	6344008.00	1 736.00	270.36	58.4	32.1	7151
KPNLRDDH84007	507378.00	6345034.00	1 590.00	288.30	57.9	322.2	7169
KPNLRDDH84008	506520.00	6344710.00	1 654.50	297.50	78.7	349.6	7151

The diamond drill rig was capable of being dismantled for transportation by a Hughes 500 D helicopter. However, a Bell 205 or 204 helicopter was utilized to move the drill rig between drill hole locations. This proved to be a more efficient and cost effective method to mobilize the drilling equipment. The Hughes 500 D was used for rig supply and crew transport throughout the drill program. Crews operated on a two-shift, 24 hour per day basis, with a driller and helper on each shift. At the completion of the drilling program, the drill rig was demobilized from the property to Smithers.

All drill hole locations were established using chain and compass or theodolite. In addition, they were targetted for photo identification in the recent air photo program in order that accurate locations could be obtained once the eventual maps are prepared. All drill holes are clearly indicated on all geological maps and cross-sections with this report. A drill hole location map and all diamond drill hole data are located in Appendix IV.

5.7 Rotary Drilling

The rotary drilling activities of the Lost-Fox Area exploration program were completed in two phases. The first phase commenced June 23 and ended July 4. The second phase commenced September 13 and was completed September 22, 1984. A total of 897 metres were drilled in 17 holes, 18 metres of which were cored for bedding orientation information. Table 5.4 summarizes the rotary drilling program statistics.

Chip samples were collected in all but twinned holes, and subsequently, lithologically described. An attempt was made to

Table 5.4

1984 ROTARY DRILL HOLE SUMMARY

Drill Hole	Easting (m)	Northing (m)	Elevation (m)	Length (m)	Inclination (°)	Azimuth	Licence Number
KPNLRRDH84001	505964.00	6344140.00	1 825.00	54.60	79.5	248.3	7152
KPNLRRDH84002	505779.00	6344145.00	1 833.80	68.60	90.0		7152
KPNLRRDH84003	504693.00	6342342.00	1 651.88	59.43	82.2	297.3	7148
KPNLRRDH84004	504315.00	6342797.00	1 707.32	44.20	90.0		7149
KPNLRRDH84005	505803.00	6344137.00	1 832.50	5.49	82.0	308.0	7152
KPNLRRDH84006	505965.00	6344147.00	1 825.50	36.57	90.0		7152
KPNLRRDH84007	506095.00	6344094.00	1 780.16	29.86	90.0		7151
KPNLRRDH84008	505969.00	6344283.00	1 827.00	36.60	86.5	333.6	7152
KPNLRRDH84009	505888.00	6344198.00	1 842.40	76.20	82.8	306.3	7152
KPNLRRDH84010	506220.00	6344022.00	1 757.50	13.72	90.0		7151
KPNLRRDH84011	505958.00	6344134.00	1 824.50	54.86	86.5	324.0	7152
KPNLRRDH84012	506068.00	6344088.00	1 782.00	50.30	90.0		7151
KPNLRRDH84013	505266.00	6343940.00	1 823.00	86.87	88.4	188.4	7152
KPNLRRDH84014	506030.00	6343042.00	1 677.50	22.56	90.0		7152
KPNLRRDH84015	506012.00	6343050.00	1 678.00	78.94	90.0		7152
KPNLRRDH84016	507440.00	6344496.00	1 602.50	100.58	85.9	208.3	7151
KPNLRRDH84017	506659.00	6345234.00	1 537.50	77.72	87.1	13.5	7169

geophysically log each hole; however, varying hole conditions permitted logging of all but five of the 17 drill holes.

A Mayhew 1000 air-water rig was utilized for the first phase and a Mayhew 1000 water rig with separately mounted 1500 gallon water tank was utilized for the second phase of drilling. In both phases, the drilling equipment was mounted on 110 Nodwells which permitted easy travelling over all types of terrain and resulted in minimal disturbance.

All drill hole locations were established using chain and compass or theodolite. In addition, they were targetted for photo identification in the recent air photo program in order that more accurate locations could be obtained once the eventual maps are prepared. All drill holes are clearly indicated on all geological maps and cross-sections with this report. A drill hole location map and all rotary drill hole data are located in Appendix V.

5.8 Geophysical Logging

All diamond drill holes and most rotary drill holes were geophysically logged at the completion of drilling of each hole. Every effort was made to obtain open hole logs; however, in some cases, logs were obtained through the drill rods. Prints of the geophysical logs are available at scales of 1:100, 1:200, 1:400, as well as 1:40 over significant coal intervals. These logs are located with the drill hole data in Appendices IV and V.

Geophysical logging equipment with downhole digitizing capabilities was utilized to obtain the following suite of logs:

- Gamma
- Neutron
- Sidewall Density
- Focused Resistivity
- Caliper
- Direction Deviation

The logging equipment was compact and portable, requiring only a Hughes 500D or Bell 206B for mobilization.

5.9 Data Management

Throughout the 1984 exploration program, an HP 9816 microcomputer 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 subsequent and immediate uploading of outcrop, trench, and drill hole data onto Gulf's mainframe Coal Data Base set up on an AMDAHL V8 computer in Calgary. Coal quality data was also stored in the Coal Data Base. System 2000 data base management and Act 1 software provided the tools for data entry, retrieval and manipulation on the mainframe computer.

5.10 Reclamation

All aspects of the drilling programs on the Lost-Fox Area resulted in minimal disturbance during the 1984 exploration program. The diamond drilling program was helicopter supported and each of the four sites was cleaned of drilling equipment and garbage upon completion of drilling. As each of the sites was at or above tree line, no significant clearing of sub-alpine trees was undertaken. The rotary drilling program utilized nodwell-mounted (track) vehicles which are designed for off-road transport These vehicles resulted in minimal disturbance due to the wide tracks over which their load was distributed. No site preparation was required for the rotary holes and each site was cleaned of drilling equipment and garbage upon completion of drilling.

Mechanical trenching operations were undertaken using skidder and track-mounted backhoes. Although the track-mounted backhoe proved to be more suitable to the local terrain, both vehicles are designed to distribute their load, thus reducing ground disturbance. Wherever possible, soft and/or wet areas were avoided, and a more suitable path scouted before the vehicles proceeded. Mechanical trenches were backfilled except where further investigation was planned.

Hand trenching operations also resulted in minimal disturbances with trenches being excavated at right angles to the slope where possible; overburden and topsoil piled separately and later backfilled. Some trenches remained open for further investigation.

The Didene Creek Camp was erected alongside the existing British Columbia Railway subgrade, on a large flat area which required some work to level. Approved gravel was obtained to provide a suitable septic drainage area next to the camp, within the guidelines set out in the Health Act.

All garbage was burned in an approved incinerator located a regulation distance from the camp.

5.11 Exploration and Camp Permits

Approvals for the 1984 exploration programs on the Mount Klappan property were received in April, 1984, following submission of Coal Exploration Forms 6 and 7 to the Government of British Columbia. Subsequently, the following permits/approvals were issued to Gulf Canada Resources Inc. with respect to the Mount Klappan Coal Project 1984 exploration program:

Name	B.C. Ministry of
Reclamation Permit C-160	Energy, Mines and Petroleum Resources
Free Use Permit 12565	Forests
Water Use Approval No. 610012	Environment
Operating Permit No. 15286	Health
Class B Burning Permit B23675	Forests
Inspection Report 16227	Forests
Water Analysis Report 23298	Health

5.12 Depositional Environments Study

Field geological data and samples were collected throughout the Mount Klappan property during the 1984 and previous exploration programs. These data are currently undergoing detailed sedimentological and paleontological analyses to determine environments of deposition within the property and to help delineate further prospective coal-bearing regions. The results of these studies will be available in a separate report in early 1985.

5.13 Project Management and Contractors

The Mount Klappan Coal Project was managed by B. P. Flynn, Coordinator - Coal Projects, Gulf Canada Resources Inc.

The following professional and technical personnel contributed to the Lost-Fox Area 1984 exploration program:

V. L. Duford, P.Geol.	Senior Geologist
K. A. Jenner	Geologist
B. W. Glover	Geologist
J. Thumult	Geologist
B. M. Leece, P.Eng.	Senior Engineer-Mining
K. Fujita, P.Eng.	Coal Preparation Engineer
D. Mazurkewich	Geotechnical Engineer
J. Innis	Senior Geologist
S. Rowe	Geologist
A. Sali	Administrator
T. Sampietro	Camp Manager
J. Blanchard	Geological Assistant
D. Kunkle	Geological Assistant
B. Lawson	Geological Assistant
G. Murray	Geological Assistant
W. Quinn	Geological Assistant
S. Wiseman	Geological Assistant

S. Bregazzi	Technical Assistant
C. Earle	Bookkeeper
C. Jacobs	Maintenance
J. Barclay	First Aid Attendant
D. Fedderly	First Aid Attendant
D. Bomback	Geophysical Engineer
K. Scarbo	Geophysical Engineer
D. Ferguson	Helicopter Pilot
G. Gillick	Helicopter Pilot
J. Goats	Helicopter Pilot
S. Hannah	Helicopter Pilot
G. Dennis	Trencher
M. Henyu	Trencher
F. Louie	Trencher
R. Bonang	Chef
D. Anderson	Chef's Helper

In addition to the above, the following companies provided services and/or supplies to the program which may have included personnel too numerous to mention here.

Able Electric	Terrace, B.C.
Aero Expediting	Smithers, B.C.

Alpine Wiring and Plumbing Ltd.	Smithers, B.C.
Apollo Automotive Parts	Smithers, B.C.
Aqua North Plumbing Ltd.	Smithers, B.C.
Avcon Aviation Consulting Ltd.	Calgary, Alta.
A.V.M. Construction	Edson, Alta.
Best Caps and Sportswear Ltd.	Calgary, Alta.
Birtley Coal and Minerals Testing	Calgary, Alta.
British Columbia Telephone Co.	Vancouver, B.C.
Business Flights Ltd.	Calgary, Alta.
Butler Survey Supplies Ltd.	Calgary, Alta.
Calgary Shoe Hospital	Calgary, Alta.
Canadian Freightways Ltd.	Calgary, Alta.
Central Mountain Air Services Ltd.	Smithers, B.C.
Century Geophysical Corporation of Canada	Calgary, Alta.
Chevron Canada Ltd.	Smithers, B.C.
Commercial Testing and Engineering	Chicago, Ill.
Cullen Detroit Diesel Ltd.	Houston, B.C.
Dease Lake Contracting	Dease Lake, B.C.
Hugh Denham Drilling	Wetaskiwin, Alta.
Dietrich-Post Co.	Calgary, Alta.
Don Davidson Trucking	Smithers, B.C.
Economy Bookbindery Company Ltd.	Calgary, Alberta
Gordon Elias Contracting	Prince George, B.C.
Fleck Brothers	Kitimat, B.C.
Forty Mile Flats	Iskut, B.C.
Gulf Canada Ltd.	Terrace, B.C.
HGL Data Systems Ltd.	Calgary, Alta.
Hardy Associates (1978) Ltd.	Calgary, Alberta
Helicom Avionics	Prince George, B.C.

Higgins Lake Contract(ors?)	Dawson Creek, B.C.
Hudson Bay Taxidermy	Smithers, B.C.
ICG Liquid Gas Ltd.	Terrace, B.C.
Iskut Band Council	Iskut, B.C.
Iskut Coop	Iskut, B.C.
Jamieson Consulting Ltd.	Halkirk, Alta.
Lindsay's Cartage & Storage	Terrace, B.C.
Loring Laboratories Ltd.	Calgary, Alta.
McElhanney Surveying and Engineering Ltd.	Vancouver, B.C.
Orville McLean Services Ltd.	Dease Lake, B.C.
Munroe Systems for Business	Calgary, Alta.
Mountain Equipment Coop	Calgary, Alta.
Neville Crosby Inc.	Vancouver, B.C.
Northern Mountain Helicopters Inc.	Prince George, B.C.
Northland Communications	Terrace, B.C.
Northmount Camp Services (1975) Ltd.	Vancouver, B.C.
Northwest Pipe and Equipment Ltd.	Terrace, B.C.
Northwestel Inc.	Whitehorse, Yukon
Omineca Building Supplies	Terrace, B.C.
Pacific Western Airlines	Vancouver, B.C.
Pearson, David E. & Assoc. Ltd.	Victoria, B.C.
Permasteel Construction Ltd.	Vancouver, B.C.
Petrocraft Products	Calgary, Alta.
Petur Instrument Co.	Port Coquitlum, B.C.
Professional Computer Centre	Calgary, Alta.
Ribtor Sales	Calgary, Alta.
Sandman Inn	Terrace, B.C.
Smithers Lumber	Smithers, B.C.
Smithers Transport	Smithers, B.C.

Southern Frontier Airlines	Calgary, Alta.
Starr Industries Ltd.	Fort St. John, B.C.
T & R Services Ltd.	Dease Lake, B.C.
Tatogga Triangle Service Ltd.	Iskut, B.C.
Tenajon Lodge and Motel	Iskut, B.C.
Terrace Builders Centre Ltd.	Terrace, B.C.
Terrace Coop Association	Terrace, B.C.
Terrace Equipment Sales Ltd.	Terrace, B.C.
Terrace Totem Ford	Terrace, B.C.
Territorial Trailers Ltd.	Prince George, B.C.
J.T. Thomas Diamond Drilling Ltd.	Smithers, B.C.
Tom and Jerry's Construction Ltd.	Edson, Alta.
Trans-Provincial Airlines (Air B.C.)	Terrace, B.C.
Wayside Industrial Supply Ltd.	Smithers, B.C.
Westcan Electronic Services Ltd.	Calgary, Alta.
Western Photogrammetry	Edmonton, Alta.

6.0 GEOLOGY

6.1 Introduction

Geological mapping and hand trenching activities were undertaken in all of the three areas of the Mount Klappan property during the 1984 exploration program. In addition, mechanical trenching and drilling operations proceeded on the Lost-Fox and Hobbit-Broatch Areas. The results of this exploration program combined with previous years' work provided the basis for geological interpretations presented in this report.

The Mount Klappan property is underlain by upper Jurassic to Lower Cretaceous strata which consist of marine to non-marine sediments deposited in 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 located in Appendix E with this text).

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 over 8 metres in 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 Upper 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).

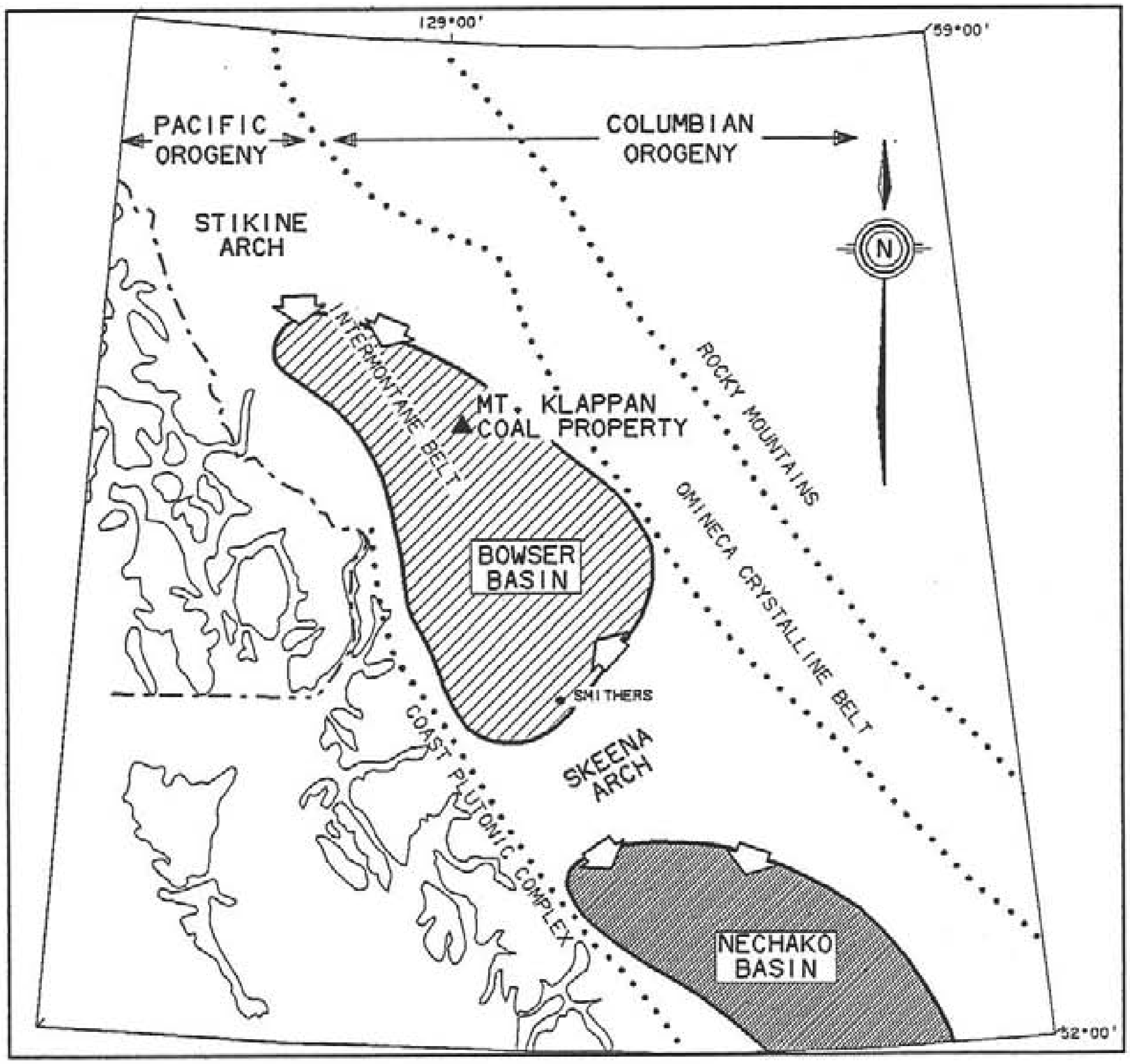
The formation and development of the Bowser Basin was controlled by the "collision and subsequent isostatic uplift of several crustal blocks in the Cordilleron Orogen of western Canada" (Eisbacher, 1981). These crustal blocks include the Stikine Terrane (volcanic arc complex) which directly underlies 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

FIGURE 6.1

MOUNT KLAPPAN COAL PROPERTY

JURASSIC-CRETACEOUS BOWSER BASIN



LEGEND

- BOWSER BASIN
- NECHAKO BASIN

(AFTER TIPPER AND RICHARDS, 1976)

SCALE

0 100 200 km

GULF CANADA RESOURCES INC.
15/06/84

FILE NAME [205.57]831024026.LOC

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.

In the southern portion of the Bowser Basin, the assemblage has been subdivided into three groups by Tipper and Richards (1976). These groups, in ascending order are: the Early Jurassic to Middle Jurassic Hazelton Groups, the Upper Jurassic Bowser Lake Group, and the Early Cretaceous Skeena Group. In the area discussed by Tipper and Richards (1976), the Skeena Group contains the major coal occurrences with some coal occurring at the top of the Bowser Lake Group.

In the Northern Bowser Basin comprehensive work has not been done and the sedimentary package associated with the coal in the Klappan Area has been variously named:

the Skeena Series (Malloch, 1914); Upper Hazelton (Buckham and Latour, 1950); Groundhog-Gunanoot (Eisbacher, 1974a), and has been dated as Lower Cretaceous (Malloch, 1914; Buckham and Latour, 1950) and Upper Jurassic to Lower Cretaceous (Eisbacher, 1974a) (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 kilometers along strike (Eisbacher, 1976).

The large scale forces resulting from collision of a remnant volcanic arc and cratonic margin subjected the area to northeast-southwest compression (F_1) 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 (F_2) 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.

TABLE 6.1

MOUNT KLAPPAN COAL PROPERTY

REGIONAL STRATIGRAPHY - TABLE OF FORMATIONS

AGE	SUBDIVISION OF AGE	GROUP	LITHOLOGY
TERTIARY	LOWER		QUARTZ PEBBLE CONGLOMERATE, TO PEBBLY SANDSTONE, SANDSTONE SUB QUARTZOSE FELDSPATHIC, DARK GREY TO REDDISH MUDSTONE, THIN COAL SEAMS, SHALE, AND ASH FALL TUFFS IN UPPER PORTION OF UNIT.
CRETACEOUS	UPPER		
	MIDDLE		
	LOWER	SKEENA	CHERT PEBBLE RICH;BROWN-GREY CONGLOMERATE, BLACK, BROWN, AND ORANGEY CLAYSTONE, SILICEOUS AND CLAYEY SANDSTONE, WITH SILTSTONE, CLAYSTONE AND COAL INTERBEDS. BASE OF UNIT DARK GREY TO BLACK TUFFS, TUFFACEOUS SANDSTONE AND CARBONACEOUS SHALE.
JURASSIC	UPPER	BOWSER BASIN	FELDSPATHIC TO QUARTZOSE SANDSTONE, DARK GREY TO BLACK SHALE, SILTSTONE, GREYWACKE, CHERT PEBBLE CONGLOMERATE AND MINOR COAL SEAMS.
	MIDDLE		
	LOWER	HAZELTON	REDDISH, PURPLE, GREY AND GREEN PYROCLASTIC AND FLOW VOLCANICS, WITH CALC-ALKALINE CHEMICAL AFFINITIES, REDDISH SANDSTONE, SILTSTONE, MUDSTONE, MINOR CONGLOMERATE, AND LIMESTONE AND THEIR TUFFACEOUS EQUIVALENTS.
TRIASSIC	UPPER	TAKLA	GREY-GREEN TO DARK GREEN FLOW AND PYROCLASTIC, BASALTIC AND ANDESITIC VOLCANIC ROCKS,PELITIC SEDIMENTARY ROCKS AND MINOR CARBONATE ROCKS.
	MIDDLE		

GULF CANADA RESOURCES INC.
10/01/85

6.3 Mount Klappan Coal Project Geology

6.3.1 Stratigraphy

The Upper Jurassic to Lower Cretaceous sedimentary package underlying the Mount Klappan property has been subdivided into four sequences which, in ascending order are the Spatsizi, Klappan, Malloch, and Rhondda Sequences. (Figure 6.2). These conformable sequences have a combined estimated thickness of about 3400 metres and together represent a gradual overall marine regression. Table 6.2 briefly outlines the lithologies and sedimentary features observed within each sequence.

6.3.1.1 Spatsizi Sequence

The Spatsizi Sequence, which represents the lowest stratigraphic sequence within the Mount Klappan property, is generally comprised of sediments deposited under open marine conditions with minor coastal environment influences. Strata consist of mudstones, siltstones, sandstones, and discontinuous massive conglomerates in the upper portion of the sequence. Exposures of the Spatsizi Sequence are located in the northern Summit Area and the south-western Nass Area of the Mount Klappan property (Figure 3.4; Appendix E).

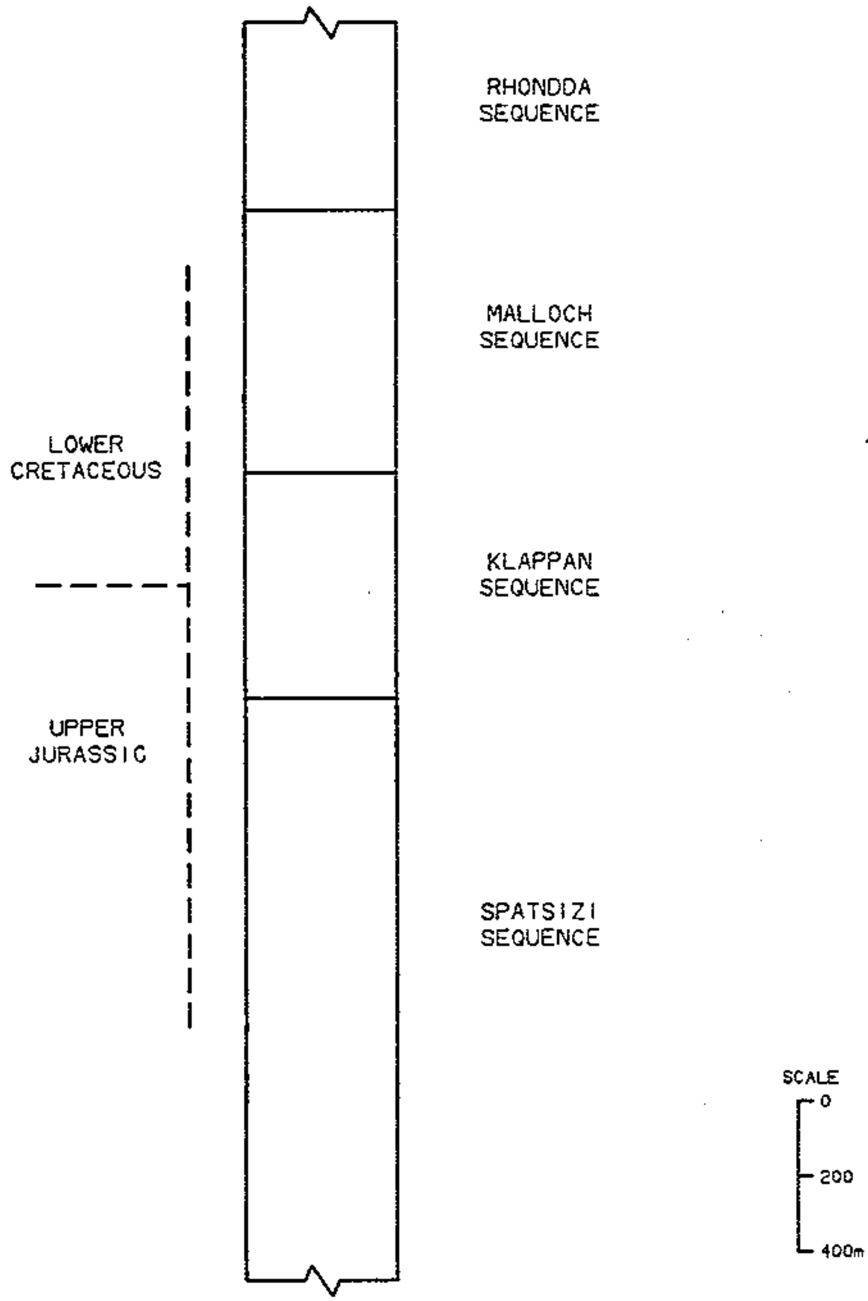
6.3.1.2 Klappan Sequence

The Klappan Sequence, the main coal-bearing

FIGURE 6.2

MOUNT KLAPPAN COAL PROPERTY

SCHEMATIC STRATIGRAPHIC COLUMN



GULF CANADA RESOURCES INC.
04/12/84

TABLE 6.2

MOUNT KLAPPAN COAL PROPERTY

TABLE OF FORMATIONS

JKr **RHONDDA SEQUENCE**

SEQUENCE OF THICK MASSIVE CONGLOMERATES AND MINOR GRITTY SANDSTONES INTERBEDDED WITH AN INCREASING ABUNDANCE OF SILTSTONES AND MUDSTONES TOWARDS THE BASAL CONTACT.

JKm **MALLOCH SEQUENCE**

THICK INTERBEDS OF MUDSTONES, ARGILLACEOUS SILTSTONES, FINE GRAINED ARGILLACEOUS SANDSTONES AND THIN BEDS OF ORANGE WEATHERING SILICEOUS NODULAR SILTSTONES. CONGLOMERATE BEDS TEND TO BE LATERALLY DISCONTINUOUS. THICK CLEAN SANDSTONE BEDS AND THIN COAL SEAMS INCREASE IN ABUNDANCE TOWARDS THE BASAL GRADATIONAL CONTACT. SEQUENCE CAN CONTAIN PETRIFIED WOOD AND PLANT FOSSILS. BIVALVES ARE RARE.

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

SEQUENCE OF 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. SEVERAL SPECIES OF PELECYPODS AND PLANTS ARE COMMON. BELEMNITES AND AMMONITES ARE RARE.

Js **SPATSIZI SEQUENCE**

PREDOMINANTLY A MARINE SEQUENCE COMPRISED OF BEDS OF MUDSTONES, SILTSTONES AND LESSER AMOUNTS OF SANDSTONES AND CONGLOMERATES. THE UPPER CONTACT IS DEFINED AS THE FIRST OCCURRENCE OF A NON-MARINE BED. DISCONTINUOUS MASSIVE CONGLOMERATE BEDS LIE IN THE UPPER PORTION OF THE SEQUENCE. BIVALVES ARE ABUNDANT AND BELEMNITES ARE RARE.

unit on the property, was deposited in a coastal marine environment in which extensive peat marshes had developed. Evidence of marine influxes increase toward the base of the sequence. Strata consist of fine to coarse-grained sandstones interbedded with mudstones, siltstones, congomerates, and abundant coal seams. The Klappan Sequence attains thicknesses of approximately 400 to 900 metres and is exposed throughout the Mount Klappan property. At least 16 coal seams, ranging in thickness up to over 8 metres, are interpreted to exist in the coal-bearing Klappan Sequence.

6.3.1.3 Malloch Sequence

The Malloch Sequence is exposed in the Nass, Skeena, Hobbit-Broatch, and Lost-Fox Areas of the Mount Klappan property. The strata consist of interbedded argillaceous sandstone, siltstone, mudstone, thick bedded to massive lenticular chert pebble conglomerates and minor coal increasing towards the base of the sequence. The sequence is interpreted to be approximately 700 metres in thickness.

6.3.1.4 Rhondda Sequence

The Rhondda Sequence is exposed in the Skeena Area only and consists primarily of thick and laterally extensive chert pebble conglomerates interbedded with lesser amounts of sandstone, siltstone, and mudstone; the finer sediments increase in abundance towards the base of the sequence. The sediments were deposited in an alluvial environment and the sequence attains a thickness of about 500 metres.

6.3.2 Structure

The fold style on the Mount Klappan property is the result of two phases of non-coaxial deformation, both of which postdate the deposition of the youngest sediments in the area.

The original, and major, compressional event resulted in the development of first phase folds (F_1) trending in a northeast to southeast direction. The result of this was the formation of two major folds that transect the property; the Beirnes Synclinorium (Richards and Gilchrist 1979) and the Nass River Anticlinorium (Moffat and Bustin 1983), (Appendix E). Parasitic folds within these structures are upright to overturned to the northeast on the eastern limb of the synclinorium and to the southwest on the western limb. Fold vergence swings back to the northeast on the western limb of the anticlinorium. It is the vergence of these folds that has determined the approximate positioning of the major fold axial traces. The majority of the Mount Klappan property lies to the northeast of the Beirnes Synclinorium. Southwest dipping thrust faults have also developed from this stage and display varying displacements in the order of tens to hundreds of metres.

A second, less intense, deformational period resulted in broad open second phase folds (F_2) that trend in a northeast to southwest direction. The imprint of these folds on the F_1 folds is seen as a series of plunge changes approaching maximum regional measured values of between 14 degrees northeast and 22 degrees southeast. Low angle north dipping thrust faults, of undetermined displacement, are associated with this event as are north to northeast trending high angle strike slip faults. These strike slip faults formed either during the F_2 event or were the result of post F_2 relaxation and suggest minimal displacement.

6.4 Lost-Fox Area Geology

6.4.1 Introduction

The Lost-Fox Area is underlain primarily by sediments of the coal-bearing Klappan Sequence. The overlying non-marine Malloch Sequence becomes predominant in the southern region of the area, south of Fox Creek toward Mount Klappan and Knooph Hill, as the stratigraphic package plunges regionally within the Lost-Fox Area toward the southwest (Appendix E).

The strata have been subjected to two successive non-coaxial phases of deformation. The first phase (F_1) resulted in major folds which trend in a northwest-southeast direction and generally plunge shallowly to the northwest or southeast. The second phase (F_2) resulted in discontinuous asymmetric folds which trend roughly east-west. The F_2

event has resulted in plunge reversals on the F_1 structures and refolded them into a series of disharmonic, tight and occasionally overturned folds in some areas of the Lost-Fox Area.

Exploration to date has determined that the Klappan Sequence of the Lost-Fox Area contains at least 16 coal seams with a total aggregate thickness of over 44 metres. The seams average 2.8 metres in thickness and range up to over 8 metres. They have been intersected in drilling and trenching operations primarily in the vicinity of Lost Ridge as well as the hogback area to the north of Lost Ridge. It is presently interpreted that these seams occur within approximately 510 metres of the Klappan Sequence. The entire thickness of the Klappan Sequence has not been intersected in exploration to date on the Lost-Fox Area. The sequence is interpreted to attain thicknesses of up to 900 metres in the Mount Klappan property and approximately 700 metres in the Lost-Fox Area; hence, there is potential for the existence of further coal seams.

Detailed geological maps and cross-sections pertaining to the Lost-Fox Area are located in Appendix II. Outcrop measured sections data are located in Appendices D an I. Ad 1:50 000 Regional Geology Map of the Mount Klappan property is located in Appendix E with this text.

6.4.2 Klappan Sequence

The Klappan Sequence extends throughout Lost Ridge to the base of Mount Klappan in the south and into the valley separating Knooph Hill from Lost Ridge in the east. Based on field observation and drill core analysis sediments of this sequence range from marine to non-marine over a coastal plain environment.

To date, exploration operations have not delineated the total thickness of the sequence. Based on drill hole and trench information there are at least 510 to 550 metres of coal-bearing Klappan Sequence strata within the Lost Fox Area. Surrounding areas have reported thicknesses of up tod 900 metres, however it is suggested, based on detailed geologic interpretation, that within the Lost-Fox Area the Klappan Sequence may attain a thickness of about 700 metres.

Fine-grained sandstones interbedded with siltstones, minor calcareous siltstones and mudstones are the dominant lithologies of the Klappan Sequence. Conglomerates occur locally. The existence of sharp contacts of these conglomerates with underlying sandstones points to fluvial reworking with the migration of streams evident in the lateral gradation from conglomerates to well sorted sandstones. Cross and trough-trough cross-bedding of the sandstones on the lower hogbacks of Lost Ridge, suggest aeolian processes. A coastal environment is further supported by the presence of asymmetrical ripple marks, planar bedding, low angle cross-bedding, drowned forests, and the abundance of coals.

The contact between the Klappan Sequence and the underlying, marine, Spatsizi Sequence is transitional. In the Lost-Fox Area brief transgressive periods are represented in the middle and lower Klappan Sequence by the presence of pelecypods intersected in DDH83001, DDH83002, DDH84007, and DDH84008. Towards the base of the Klappan Sequence, thinly bedded siltstone and mudstone units increase in abundance while coal thicknesses decrease.

6.4.3 Malloch Sequence

Mount Klappan, Knooph Hill, Grizzley Ridge and Cincie's Ridge have been interpreted to be of Malloch Sequence. Up to approximately 250 metres of the lower portion of the the Malloch Sequence are interpreted to be present in the souther region of the Lost-Fox Area. Thicknesses of approximately 700 metres for this sequence are reported in other areas of the Mount Klappan property.

The Malloch Sequence contains repetitive sequences of fine to coarse-grained sandstones, interbedded argillaceous siltstones, mudstones, thick bedded conglomerates and thin coals which indicate a non-marine environment. Sandstones and interbedded siltstones are the dominant lithologies based on only the lower Malloch Sequence outcropping in the Lost-Fox Area. Cross-bedded conglomerates are laterally discontinuous indicating fluvial reworking similar to that of the Klappan Sequence.

The contact between the Malloch and Klappan Sequences has not been observed in the field but is interpreted as gradational by the gradual change in lithologies and coal seam character from one sequence to the next.

6.4.4 Coal Seam Development

6.4.4.1 Klappan Sequence

The 1982, 1983 and 1984 drilling and trenching programs, based on the present correlation, have proved the existence of 16 seams (Table 6.3). The stratigraphic package containing seams C to M has been intersected through winkie, rotary and diamond drilling (Tables 6.4 to 6.6) while seams N, O, and P have been trenched where they are exposed along the southeastern ridge slope and Fox Creek (Table 6.7). Seams C to P comprise an aggregate average seam thickness of 44.5 metres over an interval of 508 metres. Coal seam thicknesses vary from 0.73 metres to 8.13 metres with an average thickness of 2.78 metres. Trenches where the roof and floor of the coal seam were defined were included with drilled data to provide accurate coal seam thicknesses (Tables 6.4 to 6.6). Other trenches proved the existence and continuity of seams (Table 6.8) however accurate thicknesses were unobtainable.

Excellent exposure on the north face of Lost Ridge combined with trench and drill hole information reveal the continuity of the coal seams. Seam I is traceable along structure for 1300 metres while a

Table 6.3

LOST-FOX COAL SEAM SUMMARY

Seam	Number Valid Data Points	Average True Thickness (m)	Approximate True Interseam Thickness (m)
P	4	1.98	
O	4	2.09	50
N	3	3.16	50
M	5	4.38	40
L	4	2.71	37
K	5	4.11	34
J	8	3.28	35
I	29	5.04	41
H	6	3.58	40
Phantom	1	3.02	20
G Upper	5	1.79	12
G Lower	5	1.35	10
F	3	2.25	32
E	4	1.21	22
D	4	1.64	20
C	5	2.93	20
	Total Coal:	44.52 m	
	Total Interseam:		465 m
	Total Coal + Interseam:		508 m

Table 6.4

LOST-FOX AREA - SEAM THICKNESS SUMMARY · Filename:THKSUM

Data Source	P	O	N	M	L	K	J	I	H	PHANTO	Gu	G1	F	E	D	C
DDH82005					2.24	5.75	5.16	4.98								
DDH83001								5.51	4.54		3.93	2.25	4.79	1.32		
DDH84005											0.78					
DDH84006						2.88	3.56	5.04								
DDH84007								5.43	3.98	3.02	0.28	0.89	0.00	1.07	1.00	3.79
DDH84008						3.92	0.14	3.86	3.84		0.92	0.29				
WKD83002								4.64								
WKD83003								4.70								
WKD83004								4.91								
WKD83005								3.84								
ADT83100								4.92								
RDH84001								5.00								
RDH84002								5.00								
RDH84013															2.04	3.40
RDH84014																
RDH84015															1.63	5.80
RDH84016			0.00	5.67												
RDH84017												1.99	1.96			
TRC82031				4.28												
TRC82032							1.68									
TRC82036		2.39														
TRC82045														1.09		
TRC82047															1.88	
TRC82048																0.94
TRC82049														1.38		
TRC83003				2.49												
TRC83004		2.44														
TRC83005		1.25														
TRC83006		2.26														
TRC83047												1.32				
TRC83092								4.92								
TRC83093								3.49								
TRC84200								4.47								
TRC84201								6.68								
TRC84202								5.30								
TRC84203								5.53								
TRC84210									3.22							
TRC84212							2.67									
TRC84213					2.45											
TRC84215				5.41												
TRC84216					2.92											
TRC84217							3.71									
TRC84218						2.03										
TRC84220									1.04							
TRC84221									4.85							
TRC84223								7.58								
TRC84224								5.51								
TRC84225								2.98								
TRC84226								3.42								
TRC84227							3.97									
TRC84228							5.37									
TRC84233								6.84								
TRC84235								5.50								
TRC84237								7.48								
TRC84240								5.44								
TRC84265					3.23											
TRC84266			8.13													
TRC84267	2.13															
TRC84269	1.84															
TRC84272	1.94															
TRC84273	2.00															
TRC84281								5.58								
TRC84283																0.73
TRC84288											3.05					
TRC84290			1.36													
TRC84295								1.92								
TRC84297								5.74								
TRC84298						5.96										
TRC84299				4.04												
TOTAL:	7.91	8.34	9.49	21.89	10.84	20.54	26.26	146.21	21.47	3.02	8.96	6.74	6.75	4.86	6.55	14.66
# Data Pts:	4	4	3	5	4	5	8	29	6	1	5	5	3	4	4	5
Av Seam Thk(m):	1.98	2.09	3.16	4.38	2.71	4.11	3.28	5.04	3.58	3.02	1.79	1.35	2.25	1.21	1.64	2.93

Total Aggregate Thickness: 44.52 metres

Table 6.5

SUMMARY OF DIAMOND DRILLED SEAM INTERSECTIONS

Diamond Drill Hole	Seam	Drilled Interval (m)	True Seam Thickness (m)	True Interseam Thickness (m)	Coal (m)/ Coal + Rock (m)
KPNLRDDH 82005	L	236.14 - 238.92	2.24		1.43/2.24
				34.11	
	K	186.89 - 193.81	5.75		2.75/5.75
				22.26	
	J	148.09 - 154.34	5.16		3.99/5.16
				69.72	
	I	54.02 - 60.30	4.98		4.26/4.98
KPNLRDDH 83001	I	26.90 - 32.68	5.51		4.96/5.51
				40.34	
	H	74.73 - 79.38	4.54		3.83/4.54
				51.47	
	Gup	133.42 - 137.43	3.93		3.00/3.93
				4.87	
	Glo	142.45 - 144.75	2.25		1.23/2.25
				35.11	
	F	180.62 - 185.52	4.79		3.88/4.79
				23.61	
	E	209.60 - 210.94	1.32		0/1.32
KPNLRDDH 84005	Gup	83.40 - 84.78	0.78		0/0.78
KPNLRDDH 84006	I Upright	15.44 - 22.56	6.67		5.31/6.67
				57.87	
	I Over-turned	109.99 - 116.94	5.04		4.67/5.04
				16.68	

Diamond Drill Hole	Seam	Drilled Interval (m)	True Seam Thickness (m)	True Interseam Thickness (m)	Coal (m)/ Coal + Rock (m)
KPNLRDDH 84006	J Over- turned	154.04 - 159.35	3.56		3.20/3.56
				58.13	
	K Over- turned	257.54 - 260.95	2.88		2.27/2.88
KPNLRDDH 84007	I	56.87 - 62.32	5.43		5.11/5.43
				40.18	
	H	103.00 - 107.18	3.98		3.26/3.98
				16.43	
	Phantom	124.73 - 127.86	3.02		2.45/3.02
				21.28	
	G up	151.43 - 151.72	0.28		0.28/0.28
				11.75	
	G lo	164.64 - 165.53	0.89		0.72/0.89
				57.94	
	E	227.26 - 228.36	1.07		0.97/1.07
				22.15	
	D	251.62 - 252.70	1.00		1.00/1.00
				12.01	
	C	272.00 - 282.45	3.79		3.75/3.79
KPNLRDDH 84008	L	23.20 - 24.50	1.29		0.94/1.29
				35.77	
	K	61.40 - 65.37	3.92		3.33/3.92
				26.32	
	J	93.24 - 93.39	0.14		0.14/0.14
				38.18	
	I	133.60 - 137.71	3.86		3.40/3.86
				41.17	
	H	180.08 - 189.53	6.41		5.89/6.41
				11.70	
	H	218.82 - 234.37	3.84		3.64/3.84
				35.09	
	G up	271.11 - 272.07	0.92		0.79/0.92
				18.06	
	G lo	290.90 - 291.21	0.29		0.29/0.29

Diamond Drill Hole	Seam	Drilled Interval (m)	True Seam Thickness (m)	True Interseam Thickness (m)	Coal (m)/ Coal + Rock (m)
KPNLRWKD 83002	I	12.41 - 17.18	4.64		4.22/4.64
KPNLRWKD 83003	I	15.63 - 20.50	4.70		4.21/4.70
KPNLRWKD 83004	I	25.69 - 30.69	4.91		4.48/4.91
KPNLRWKD 83005	I	23.62 - 29.87	3.84	(hole ended in coal)	3.63/3.84

Table 6.6

SUMMARY OF ROTARY DRILLED SEAM INTERSECTIONS

Rotary Drill Hole	Seam	Drilled Interval (m)	True Seam Thickness (m)	True Interseam Thickness (m)	Notes
KPNLRRDH 84001	I	41.56 - 48.64	5.00		
KPNLRRDH 84002	I	48.55 - 55.62	5.00		
KPNLRRDH 84003	?	36.15 - 41.78			Bedding undetermined
KPNLRRDH 84004	?				No geophysical logs
KPNLRRDH 84005					Twinned Hole 2
KPNLRRDH 84006					Twinned Hole 1
KPNLRRDH 84007	I				No geophysical logs
KPNLRRDH 84008	I	22.72 - 27.84			Bedding undetermined
KPNLRRDH 84009	I	56.88 - 60.80			Bedding undetermined
KPNLRRDH 84010					Abandoned. No geophysical logs.
KPNLRRDH 84011	I	42.36 - 47.68			Twinned Hole 1
KPNLRRDH 84012	I	8.06 - 10.87			Hole interpreted to be in slump zone.
	H	34.04 - 37.08			

Rotary Drill Hole	Seam	Drilled Interval (m)	True Seam Thickness (m)	True Interseam Thickness (m)	Notes
KPNLRRDH 84013	D	38.45 - 40.54	2.04		
	C	78.28 - 81.77	3.40		
KPNLRRDH 84014	E	4.00 - 7.60	3.29		Dirty seam
KPNLRRDH 84015	D	20.74 - 22.47	1.63		
				41.12	
	C	66.23 - 72.40	5.80		
KPNLRRDH 84016	M	84.60 - 89.50	4.63		
				1.22	
	M	90.79 - 91.89	1.04		
KPNLRRDH 84017	Glo	11.90 - 13.25	1.23		
				2.48	Major rock split
	Glo	15.97 - 16.88	0.76		
				27.47	
	F	46.87 - 49.02	1.96		

Table 6.7

LOST-FOX VALID TRENCH DATA POINTS

Trench Number	Seam Identification	Coal (m)/ Coal + Rock (m)
KPNLRTRC 82031	M	3.95/4.28
KPNLRTRC 82032	J	1.48/1.68
KPNLRTRC 82036	O	0.74/2.39
KPNLRTRC 82045	E	0.85/1.09
KPNLRTRC 82047	D	1.88/1.88
KPNLRTRC 84048	C	0.94/0/94
KPNLRTRC 82049	E	1.27/1.38
KPNLRTRC 83003	M	2.24/2.49
KPNLRTRC 83004	O	1.16/2.44
KPNLRTRC 83005	O	0.80/1.25
KPNLRTRC 83006	O	2.05/2.26
KPNLRTRC 83047	G lo	1.15/1.32
KPNLRTRC 83092	I	4.83/4.92
KPNLRTRC 83093	I	3.32/3.49
KPNLRTRC 84200	I	4.32/4.47
KPNLRTRC 84201	I	5.96/6.68
KPNLRTRC 84202	I	4.54/5.30
KPNLRTRC 84203	I	4.23/5.53
KPNLRTRC 84210	H	2.75/3.22
KPNLRTRC 84212	J	2.13/2.67
KPNLRTRC 84213	L	2.23/2.45
KPNLRTRC 84215	M	5.07/5.41
KPNLRTRC 84216	L	2.59/2.92
KPNLRTRC 84217	J	2.96/3.71
KPNLRTRC 84218	K	1.83/2.03
KPNLRTRC 84220	H	0.85/1.04

Trench Number	Seam Identification	Coal (m)/ Coal + Rock (m)
KPNLRTRC 84221	H	4.53/4.85
KPNLRTRC 84223	I	6.23/7.58
KPNLRTRC 84224	I	4.35/5.51
KPNLRTRC 84225	I	2.61/2.98
KPNLRTRC 84226	I	2.90/3.42
KPNLRTRC 84227	J	3.76/3.97
KPNLRTRC 84228	J	4.76/5.37
KPNLRTRC 84233	I	6.42/6.84
KPNLRTRC 84235	I	4.94/5.50
KPNLRTRC 84237	I	7.10/7.48
KPNLRTRC 84240	I	5.31/5.44
KPNLRTRC 84265	L	2.31/3.23
KPNLRTRC 84266	N	6.27/8.13
KPNLRTRC 84267	P	1.73/2.13
KPNLRTRC 84269	P	1.31/1.84
KPNLRTRC 84272	P	1.67/1.94
KPNLRTRC 84273	P	1.02/2.00
KPNLRTRC 84281	I	4.90/5.58
KPNLRTRC 84283	C	0.60/0.73
KPNLRTRC 84288	Gup	2.67/3.05
KPNLRTRC 84290	N	1.19/1.36
KPNLRTRC 84295	I	1.73/1.92
KPNLRTRC 84297	I	5.21/5.74
KPNLRTRC 84298	K	4.73/5.96
KPNLRTRC 84299	M	3.43/4.04

Table 6.8

LOST-FOX AREA
1984 TRENCH - SEAM SUMMARY

Filename: APP6VOL2

	TRENCH	SEAM		TRENCH	SEAM		TRENCH	SEAM
*	KPNLRTRC84200	I		KPNLRTRC84248	?		KPNLRTRC84296	I
*	KPNLRTRC84201	I		KPNLRTRC84249	?	*	KPNLRTRC84297	I
*	KPNLRTRC84202	I		KPNLRTRC84250	?	*	KPNLRTRC84298	K
*	KPNLRTRC84203	I		KPNLRTRC84251	?	*	KPNLRTRC84299	M
	KPNLRTRC84204	?		KPNLRTRC84252	?		KPNLRTRC84300	N
	KPNLRTRC84205	I		KPNLRTRC84253	?		KPNLRTRC84301	O
	KPNLRTRC84206	I		KPNLRTRC84254	?		KPNLRTRC84302	?
	KPNLRTRC84207	I		KPNLRTRC84255	?		KPNLRTRC84303	?
	KPNLRTRC84208	I		KPNLRTRC84256	?		KPNLRTRC84304	?
	KPNLRTRC84209	Gu		KPNLRTRC84257	?		KPNLRTRC84305	?
*	KPNLRTRC84210	H		KPNLRTRC84258	?		KPNLRTRC84306	?
	KPNLRTRC84211	Gu		KPNLRTRC84259	P		KPNLRTRC84307	?
*	KPNLRTRC84212	J		KPNLRTRC84260	K		KPNLRTRC84308	?
*	KPNLRTRC84213	L		KPNLRTRC84261	I		KPNLRTRC84309	?
	KPNLRTRC84214	M		KPNLRTRC84262	I		KPNLRTRC84310	?
*	KPNLRTRC84215	M		KPNLRTRC84263	C		KPNLRTRC84311	?
*	KPNLRTRC84216	L		KPNLRTRC84264	K		KPNLRTRC84312	?
*	KPNLRTRC84217	J	*	KPNLRTRC84265	L		KPNLRTRC84313	?
*	KPNLRTRC84218	K	*	KPNLRTRC84266	N		KPNLRTRC84314	G1
	KPNLRTRC84219	M	*	KPNLRTRC84267	P		KPNLRTRC84315	?
*	KPNLRTRC84220	H		KPNLRTRC84268	P		KPNLRTRC84316	?
*	KPNLRTRC84221	H	*	KPNLRTRC84269	P		KPNLRTRC84317	?
	KPNLRTRC84222	I		KPNLRTRC84270	P		KPNLRTRC84318	?
*	KPNLRTRC84223	I		KPNLRTRC84271	P		KPNLRTRC84319	?
*	KPNLRTRC84224	I	*	KPNLRTRC84272	P		KPNLRTRC84320	?
*	KPNLRTRC84225	I	*	KPNLRTRC84273	P		KPNLRTRC84321	?
*	KPNLRTRC84226	I		KPNLRTRC84274	P		KPNLRTRC84322	N
*	KPNLRTRC84227	J		KPNLRTRC84275	P		KPNLRTRC84323	N
*	KPNLRTRC84228	J		KPNLRTRC84276	O		KPNLRTRC84324	N
	KPNLRTRC84229	L		KPNLRTRC84277	N		KPNLRTRC84325	N
	KPNLRTRC84230	M		KPNLRTRC84278	I		KPNLRTRC84326	O
	KPNLRTRC84231	L		KPNLRTRC84279	I		KPNLRTRC84327	O
	KPNLRTRC84232	J		KPNLRTRC84280	H		KPNLRTRC84328	O
*	KPNLRTRC84233	I	*	KPNLRTRC84281	I		KPNLRTRC84329	?
	KPNLRTRC84234	I		KPNLRTRC84282	E		KPNLRTRC84330	N
*	KPNLRTRC84235	I	*	KPNLRTRC84283	C		KPNLRTRC84331	I
	KPNLRTRC84236	I		KPNLRTRC84284	I		KPNLRTRC84332	I
*	KPNLRTRC84237	I		KPNLRTRC84285	I		KPNLRTRC84333	I
	KPNLRTRC84238	I		KPNLRTRC84286	D		KPNLRTRC84334	H
	KPNLRTRC84239	I		KPNLRTRC84287	?		KPNLRTRC84335	Gu
*	KPNLRTRC84240	I	*	KPNLRTRC84288	Gu		KPNLRTRC84336	Gu
	KPNLRTRC84241	G1		KPNLRTRC84289	H		KPNLRTRC84337	Gu
	KPNLRTRC84242	E	*	KPNLRTRC84290	N		KPNLRTRC84338	Gu
	KPNLRTRC84243	F		KPNLRTRC84291	I		KPNLRTRC84339	Gu
	KPNLRTRC84244	I		KPNLRTRC84292	I		KPNLRTRC84340	Gu
	KPNLRTRC84245	?		KPNLRTRC84293	H		KPNLRTRC84341	Gu
	KPNLRTRC84246	?		KPNLRTRC84294	I		KPNLRTRC84342	?
	KPNLRTRC84247	I	*	KPNLRTRC84295	I			

* : Data Point Used in Resource Calculations

total of 8.7 kilometers of seam tracing by mechanical trenching was undertaken along the southeast slope and lower north face of Lost Ridge. Laterally, seam thicknesses remain fairly constant although structural thickening and stratigraphic thinning of the coals were observed. The character of seams G and I could be easily recognized on geophysical logs over a data spacing of 750 metres. Seams J and K, containing a high ash content, demonstrate local pinch-outs.

Stratigraphically higher in the Klappan Sequence seams N, O, and P appear to be duller in hand specimen and contain more rock partings than the lower coals. This difference in character of the coal may be due to the proximity of this part of the Klappan Sequence to the Malloch contact.

Coal seams are indicated on all detailed maps and cross-sections located in Appendix II.

6.4.4.2 Malloch Sequence

Coals of the Malloch Sequence in the Lost-Fox Area are thinner and separated by greater interval thicknesses than those of the Klappan Sequence. As a result a seam correlation has not yet been established. Based on hand trench data from 1982, 1983 and 1984, the coals range from 0.5 metres to 2.41 metres in thickness with an average thickness of 1.26 metres.

6.4.5 Structure

Strata of the Lost-Fox Area have been subjected to two chronologically distinctive phases of deformation. Folds of the first phase (F_1) generation trend at approximately 135° and plunge shallowly to the northwest or southeast. The Lost Ridge anticline - syncline pair, typical of this fold style, maintains vertical northeast limbs in the vicinity of Fox Creek, which become overturned as much as 50° towards the ridge crest. Wavelengths are up to 800 metres with amplitudes up to 300 metres. Annealed quartz breccia zones and associated bedding plane slippages were observed along some axes.

Parasitic synclines, anticlines and monoclines involving packages of 150 metres occur on both limbs of F_1 folds. This fold style is localized yielding to bedding plane slippage higher and lower in the section. Fold axes may be structurally thickened by tight folding within tec-tonically incompetent units.

Less competent units have acted as decollement surfaces during the first generation of folding. This has been observed on the eastern end and middle of Lost Ridge where monoclines have become detached along coal horizons, from larger overturned structures.

The second deformational phase (F_2) is related to a north- south left-lateral regional shear couple and may be observed in many of the topographically low areas away from

Lost Ridge. F_1 limbs were refolded into a disharmonic series of tight, asymmetrical folds which appear to be discontinuous across F_1 axes. These F_2 structures trend roughly east-west with a steep to overturned northerly limb and a local plunge of up to 33°. Wavelengths are approximately 750 metres with amplitudes of up to 150 metres.

Fold related cleavages are nearly always of the fracture type. Rare argillaceous beds show crenulation cleavages. F_1 cleavages are usually more densely spaced and more consistent in attitude than F_2 cleavages. The F_2 domain is characterized by the rotation of first cleavage surfaces, refraction of second cleavage surfaces, and variable bedding attitudes. Quartz filled longitudinal, oblique and cross joints were observed in the hinge areas of both F_1 and F_2 anticlinal structures.

Brittle deformation affects the area with two major fracture sets, one of easterly, the other of northerly trend. Both sets are post folding. The easterly trending future set appears to be the most systematic, and possibly older. Minor strike slip and dip slip displacements along these high angle fractures are common. Vertical components of displacement may locally reach 50 metres.

Thrust faulting occurs in the southeast corner of the Lost-Fox Area where the Klappan Thrust traces along the west sice of Cincies Ridge and Grizzley Ridge before terminating on the northeast side of Knooph Hill. Ths displacement reaches 100 metres along the thrust.

The structure of the Lost-Fox Area is outlined on the 1:50 000 Regional Geology Map located in Appendix E with this text. In addition, detailed geological maps and crosssections located in Appendix II illustrate the structural styles of the area.

7.0 RESOURCES

7.1 Mount Klappan Coal Project

7.1.1 Summary

The coal resources of the Mount Klappan Coal Project total 5.3 billion tonnes in seams greater than 0.5 metres in thickness to a maximum depth of 500 metres below surface. The following table summarizes the resource contributions from the areas of the property as well as the representation by resource category. A 1:50 000 Coal Resource Map (Appendix F) presents the distribution of resources over the Mount Klappan property.

Table 7.1

MOUNT KLAPPAN COAL PROJECT
COAL RESOURCES (MT)

Area	Category			
	Measured	**Indicated**	**Inferred**	**Speculative**
Lost-Fox	32.1	46.3	194.1	794.9
Hobbit-Broatch	12.1	24.5	369.1	613.3
Summit			41.4	1860.1
Nass				1121.8
Skeena				232.3
Total	44.2	70.8	604.6	4622.4

Mount Klappan Coal Project Total Coal Resources: 5342.0

The coal seams are contained within the strata of the Klappan Sequence. There are also coal measures in the Malloch Sequence; however, they are not presently considered of economic importance.

The parameters within which the coal resources were classified and the procedures utilized in resource calculations are outlined in Section 7.3. A standardized method was utilized for the 1984 resource calculations over the Mount Klappan property.

7.2 Lost-Fox Area

7.2.1 Summary

The coal resources of the Lost-Fox Area are contained within 16 seams and total 1 067 million tonnes in seams greater than 0.5 metre in true thickness to a maximum depth of 500 metres below surface. Table 7.2 summarizes the resource contributions from the seams in the Lost-Fox Area as well as the representation by resource category.

Increased density of data points resulting from continued exploration in 1984 has provided areas which now contain measured and indicated resources. The 1:50 000 Coal Resource Map (Appendix F) highlights the resource areas. All Resource Data for the Lost-Fox Area is located in Appendix C.

Table 7.2

LOST-FOX AREA

COAL RESOURCES (MT)

Seam	Measured	Category Indicated	Inferred	Total
P	0.4	0.2	0.1	0.7
O	.5	1.0	3.3	4.8
N	1.4	1.3	5.1	7.8
M	3.4	5.3	12.9	21.6
L	1.6	0.9	5.3	7.8
K	3.4	5.5	11.9	20.8
J	3.6	4.1	10.9	18.6
I	11.1	7.6	22.2	40.9
H	1.8	4.2	20.9	26.9
Phantom	0.3	1.1		1.4
G upper	1.1	2.7	9.0	12.8
G lower	0.7	1.7	12.0	14.4
F	0.2	3.4	18.4	22.0
E	0.7	1.3	9.8	11.8
D	0.6	1.6	15.3	17.5
C	1.3	4.4	37.0	42.7
Total:	32.1	46.3	194.1	272.5

Total Speculative Resources: 794.9

Lost-Fox Area Total Coal Resources: 1067.4 mt

7.3 Procedures and Parameters

7.3.1 Introduction

In-situ coal resources are defined as the in place coal (coal and partings) that is contained in seams occurring 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.

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

The parameters for resource categorization generally follow those set out for the Cordillera Region by Energy, Mines and Resources Canada in Report ER79-9: Coal Resources and Reserves of Canada. The parameters utilized for the 1984 Mount Klappan Coal Project are described in Section 7.3.3.

7.3.2 Procedures

Utilizing valid data points (drill holes, adits, trenches, measurable seams in outcrops), a distribution of data points for each seam was established. Subsequently, based on maximum allowable data point spacing (Section 7.3.3), resources were calculated for a specific category.

For each of the measured, indicated, and inferred categories, the seam thickness used for tonnage calculations was a weight averaged thickness derived using the "polygon method": polygons were constructed horizontally around each data point in the resource area. (In some cases they may have been circles if there was only one data point in the resource area.) Polygon boundaries were defined by the midpoints between data points; at the maximum, the distance limit from the data point was one-half the allowable data point spacing for the category under consideration. The areas of the polygons provided the basis for the weight-averaging factors.

An area of coalescing polygons defined one specific resource area for the category under consideration. The limits to this area were projected perpendicularly onto the cross- section(s) passing through the area. The seam length was then measured within these limits.

The third dimension required for the coal volume calculation, after the seam thickness and length were determined, was the "influence" or "strike length" of the seam. This measurement was usually the cross-section spacing, as this should have been less than or equal to the required data point spacing for the resource category under consideration. In some cases, where a seam projected to surface before the assumed influence limit was reached, the influence was measured to the seam subcrop (or outcrop).

To calculate coal tonnage, a weight-average specific gravity for each seam was used. It was calculated using the polygon method and available coal quality data. A review of the Mount Klappan Coal Project coal quality data demonstrated that, in general, specific gravity data provided a weight-average specific gravity of 1.70 tonnes per cubic metre. For the purposes of the 1984 resource calculations, the value of 1.70 tonnes per cubic metre was used.

The following equation summarizes the resource calculation procedure:

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 area indicated on the 1:50 000 Regional Geology Map (Appendix E) to be Klappan Sequence within the Lost-Fox Area but outside the 1:2500 map area, was planimetered. The seam thickness applied to this area was 25% of the average total aggregate coal thickness for the Lost-Fox and Hobbit-Broatch Areas, as this figure appeared to be a reasonable estimate of the proportionate coverage of coal-bearing section within the area. The specific gravity of 1.70 tonnes per cubic metre was used for this category also. The following equation summarizes the Speculative Resource calculation:

Speculative Resource Tonnes of Coal =

Area (m^2) x .25 x Seam Thk (m) x Specific Gravity (t/m_3)

Within the 1:2500 map area on Lost-Fox, the speculative resources were calculated by measuring the lengths of the seams on the cross-sections, beyond the inferred resource areas and applying an average seam thickness to each. The standard specific gravity of 1.70 t/m_3 and an influence of 250 metres for each cross-section was used to arrive at a total tonnage figure for speculative resources within the 1:2500 map area.

The sum of speculative resources from within the 1:2500 map area and from the outer areas of Lost-Fox comprises the total speculative resource for the Lost-Fox Area.

7.3.3 Parameters

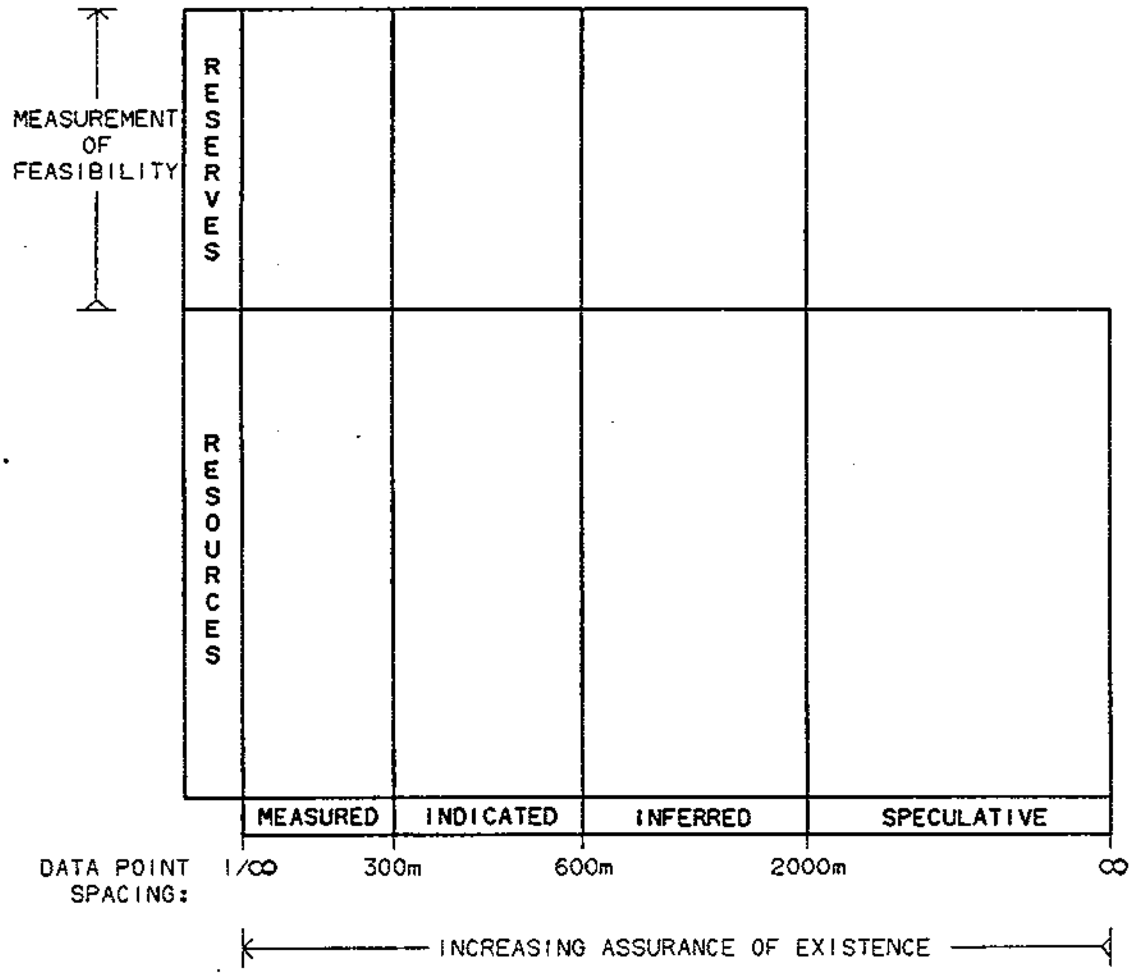
The minimum seam thickness used for the 1984 Mount Klappan Coal Project was 0.5 metres where the dip of the seam was less than or equal to 30° and 1 metre where the dip was in excess of 30°. Seams were included to a maximum depth of 500 metres from surface.

The following resource category parameters were used for the calculations. The classification scheme is illustrated in Figure 7.1

FIGURE 7.1

MOUNT KLAPPAN COAL PROPERTY

1984 RESOURCE CLASSIFICATION SCHEME



GULF CANADA RESOURCES INC.
12/12/84

7.3.3.1 Measured Resources

Measured Resources include those 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.

7.3.3.2 Indicated Resources

Indicated Resources include 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 resources which are delineated utilizing regional geological data including data points which predict the continuity of coal seams. Report ER79-9 does not state a data point spacing for this category. For the purposes of standardization for the 1984 Mount Klappan Coal Project resource calculations, a maximum data point spacing of 2000 metres was used for the inferred level. However, in the Hobbit-Broatch Area, inferred resources were calculated over the entire 1:2500 map area due to the continuity of coal seams in that area.

7.3.3.4 Speculative Resources

Speculative Resources include those resources which are calculated from a few scattered coal occurrences in areas of little or no exploration data where the coal-bearing sequence(s) is/are interpreted to exist. There is no maximum spacing in this category.

8.0 COAL QUALITY

8.1 Summary

The 1984 program for coal quality examination has broadened the spectrum of information available on the quality and production potential of the Mount Klappan anthracite resource.

The trenching program had as a goal the tracing of seam subcrops in the Lost-Fox Area. Trench analyses have verified the accuracy of the correlations projected from geological rank and indicated the basis for further resource expansion. Seams M, N, O, and P, intersected by trenches, have not yet been cored in drilling, though occurrences with substantial thickness and acceptable ash levels do exist.

Size analysis of drill core has provided the first step to a systematic treatment of the natural behaviour of Mount Klappan coal in the circumstances of preparation of sized products. The extensive suite of size distributions available, taken from every drill core sample analyzed, demonstrates that there is an average size distribution to which all coals on the property can be compared. Further, the 1984 size analyses augment the information drawn from the 1983 adit sample and suggest a much higher production of coarse coal product may be possible.

Four more drill holes were bored in the Lost-Fox Area in 1984 and these at least double the amount of data available on seams of the area. Quality and yield figures when combined on an equal basis with earlier collected data support all previous positive indications as to the potential of the coal resources. Two new seams, C and D, not intersected in drill holes before, have substantial thickness and very high quality.

The accompanying table reports average quality values for raw coals and all products. The product values are straight averages of all product analyses performed at each ash level. There is virtually no variation in the quality of product coal regardless of the seam or size fraction from which it is drawn.

8.2 Procedures and Parameters

8.2.1 Introduction

The 1984 Lost-Fox exploration program concentrated on the delineation and characterization of the resource beneath and surrounding Lost Ridge. Several different programs contributed structural and stratigraphic data on the distribution of the Lost-Fox coal resource.

A continuation of the hand trenching program conducted in previous years provided seam logs and samples from coal occurrences in inaccessible areas. A more ambitious element of the trenching program in 1984 involved the use of a backhoe to excavate complete exposures of seams and allow tracing of seam subcrops through covered areas. The backhoe was limited in its range of travel by topography, necessitating supplemental hand trenching.

TABLE 8.1
AVERAGE COAL QUALITY
LOST RIDGE AREA

	RAW COAL	5% ASH PRODUCT	10% ASH PRODUCT	BRIQUETTING PRODUCT
PROXIMATE ANALYSIS				
Residual Moisture	1.44	1.12	1.28	1.81
Ash	33.15	5.21	10.00	21.27
Volatiles	8.15	6.41	7.70	8.32
Fixed Carbon	57.26	87.26	81.02	68.63
H.G.I.	51			
Specific Gravity	1.69			
Carbon Dioxide	3.78			
Chlorine (ppm)	650			
Phosphorous in Coal	0.164			
Total Sulphur	0.52	0.53	0.51	0.45
Combustible Sulphur	0.22			
Gross C.V.(MJ/KG)	21.55	33.21	31.20	26.41
Gross C.V.(cal/gm)	5150	7937	7457	6312
ULTIMATE ANALYSIS				
Carbon	59.23	87.51	81.68	
Hydrogen	2.02	2.72	2.58	
Nitrogen	0.66	0.95	0.88	
Oxygen	2.99	1.96	3.07	
ASH FUSION (Deg.C.)				
OXIDIZING Initial	1250			
Softening	1315			
Hemispherical	1350			
Fluid	1390			
REDUCING Initial	1205			
Softening	1275			
Hemispherical	1310			
Fluid	1360			
ASH ANALYSIS				
SiO2	52.24			
Al2O3	20.64			
Fe2O3	8.00			
TiO2	0.56			
P2O5	1.13			
CaO	5.10			
MgO	4.37			
SO3	2.27			
Na2O	1.46			
K2O	1.26			

Four diamond drill holes were bored at various points on and around Lost Ridge to help elucidate the distribution of the seams and stratigraphy defined in previous years. A full sampling program was carried out involving all coal seams intersected by the drill holes.

8.2.2 Trenching Program

8.2.2.1 Objectives

The objectives of the 1984 Lost-Fox trenching program were as follows:

1. To establish the continuity of identified seams through areas lacking detailed control.
2. Through sampling, to detect variations in seam character and add to the accumulated data on average seam quality.

8.2.2.2 Methodology

The procedures for siting, orienting and excavating trenches are discussed in Section 5.5. On occasion seams exposed by hand trenching were not sufficiently thick or contained too many rock partings to warrant sampling. In some cases, due to erosion, soil creep or excessive overburden, it was impossible to make a full transect of the seam with sharp definition of the roof and floor. Sampling and analyses were not carried out for these trenches either.

A different set of conditions were encountered in excavating trenches with the backhoe. Movement of volumes of cover was facilitated with the backhoe, but the depth reached in some of the trenches was such that they could not be safely entered. Samples could be taken in these circumstances but the seam intersections could not be logged and there was therefore no guarantee of sample representation.

Where there were no encumbrances to executing the routine procedure for trench sampling, a small channel of constant dimensions was incised perpendicular to the strike and dip of the seam. The seam was logged in detail (down to 1 centimetre intervals) prior to trenching and the sampling intervals chosen were guided by the seam log. Substantial partings or changes in coal character were cause for sampling of the seam by ply, so that the nature of variations across the seam could be traced. For the most part, however, a single sample was taken to transect and represent the whole seam.

8.2.2.3 Analytical Procedure

Among the 103 trenches sampled there was considerable duplication and some areas of closely spaced samples due to the intent of tracing the seam subcrops. From the collection of samples 30 were chosen to represent the distribution of seams over the area.

The analytical program applied to trench samples is outlined in Figure 8.1. All analyses except vitrinite reflectance determinations were completed at Loring Laboratories Ltd. of Calgary, Alberta. Samples for vitrinite reflectance measurement were sent to David E. Pearson and Associates Ltd. of Victoria, British Columbia. Trenches were analyzed on a raw basis only, all washability studies were performed on diamond drill core samples.

8.2.3 Diamond Drilling Program

8.2.3.1 Objectives

The objectives of the 1984 Lost-Fox diamond drilling program were as follows:

1. To broaden control on the current understanding of coal seam stratigraphy through intersection of the established section of interest in new areas.
2. To contribute to the growing data base on quality characteristics and variation in each identified seam.

FIGURE 8.1

Trench Sample Analysis

CRUSH SAMPLE TO
3/8 INCH

RIFFLE 3 TIMES

RAW HEAD ANALYSIS
Proximate, Total Sulphur
Calorific Value
Vitrinite Reflectance

8.2.3.2 Methodology

The drill core consisting of coal derived from the intersection of each seam was logged in detail prior to sampling. The sample increments were determined by the internal stratigraphy of the seam, guided by seam partings and changes in coal character. Samples were subjected to a comprehensive series of analyses as outlined in Figure 8.2.

Of the four diamond drill holes bored in the Lost-Fox Area in 1984, one, 84-005, contained no coal seams of substantial thickness. Coal quality studies concentrated on the seams intersected in the remaining three holes, 84-006, 84-007, and 84-008.

All analyses except vitrinite reflectance determinations were carried out by Cyclone Engineering Sales Ltd. of Edmonton, Alberta.

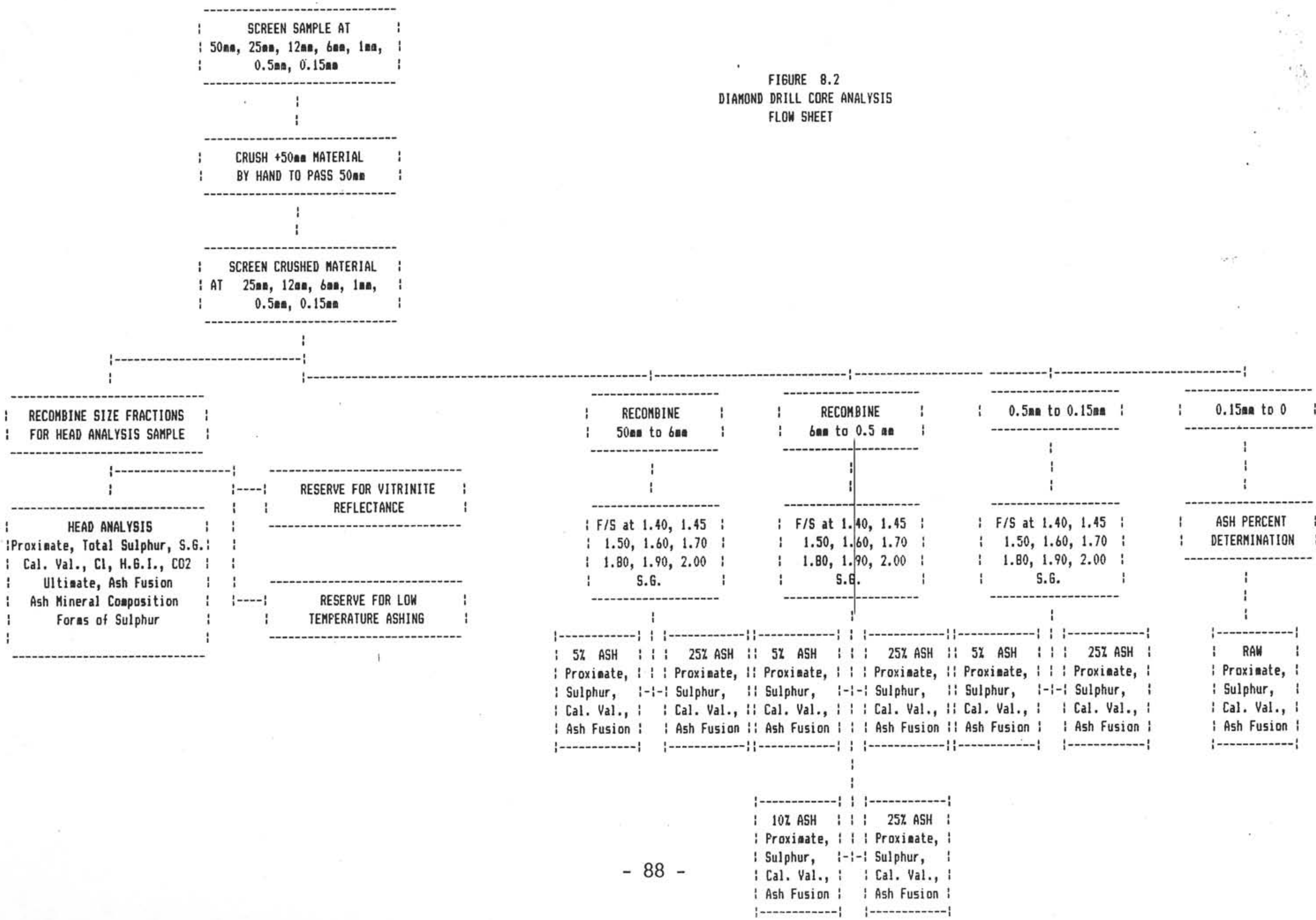
Vitrinite reflectance measurements were performed by David E. Pearson and Associates of Victoria, British Columbia.

8.2.3.3 Analytical Procedures

The flow sheet may be divided into four main sections:

[redacted]

FIGURE 8.2
DIAMOND DRILL CORE ANALYSIS
FLOW SHEET



1. Size Analysis
2. Head Analysis
3. Washability Studies
4. Product Analysis

8.2.3.3.1 Size Analysis

A more in-depth program of size analysis has been undertaken in 1984 than in previous years. This is in response to the growing need for information on the characteristics of sized coal required by Gulf Canada Resources Inc.'s marketing studies. Each sample was screened at several sizes (50 mm, 25 mm, 12 mm, 6 mm, 1 mm, 0.5 mm, 0.15 mm) both in its natural state, and after crushing the coarsest material (larger than 50 millimetres) to less than 50 millimetres.

8.2.3.3.2 Head Analysis

A complete analysis of the raw coal from each sample was undertaken. The number of samples involved and their relatively small size precluded the possibility of head analysis on each size fraction.

8.2.3.3.3 Float Sink Data

Limitations on sample quantity

also prevented the performance of complete washability studies on each size fraction. A compromise measure included the combination of the size fractions between 50 millimetres and 6 millimetres (2 inches by 1/4 inch) and between 6 millimetres and 0.5 mm into two single samples for each seam. Less sample was required for representative analysis of the 0.5 mm by 0.15 mm fraction so this material was floated separately. Previous studies indicated that virtually all pertinent information could be gleaned from floatation at 0.10 S.G. intervals between 1.40 and 2.00 S.G. with one extra floatation point at 1.45 S.G. The 0.15 millimetre x 0 (100 Mesh x 0) fraction was not frothed, but an ash determination was made.

8.3 Coal Quality - Trenching Program

8.3.1 Introduction

As all coal derived from trench samples is weathered, analysis of these samples will not be indicative of the true character of the coal. Proximate analyses are generally useful only in that an indication of ash level is provided. Due to the extended period of oxidation that outcropping coal is subjected to, moisture levels, and frequently also volatile contents are artificially elevated. What is reported as inherent or residual moisture for oxidized trench samples is far different from the trace residual moisture content measured from unoxidized drill core sample. Total moisture levels for trench samples frequently exceed 30%, and when the routine laboratory procedure applied to drill cores is used for trench samples, the moisture level reached in air drying does not approach that achieved in a pure coal.

The volatiles are affected because the ash material is so saturated with moisture that not all moisture can be driven out of hydrated ash minerals (clays) at the low temperature (104°-110°C) used in residual moisture determination. The remaining moisture reports as water vapour to the volatile component.

An accompanying effect is that ash levels appear depressed below true levels for the coal in unoxidized state because of the raised moisture and volatile contents. This is offset somewhat by oxidation of combustible elements creating more residue (ash) than would remain after the burning of unoxidized coal.

Seam tracing by backhoe excavation requires closer spacing of trenches than does a program simply to monitor lateral variation in seam coal quality. For this reason, although 143 trenches were excavated by machine and by hand, a suite of 30 samples were chosen to represent the trends detectable in the coal quality of surface coal seam exposures. These samples are taken from seams designated as G through L, also intersected by drill holes, as well as seams M, N, and P, thought to be stratigraphically above the sequence intersected in cored drill holes.

8.3.2 Discussion

Seams G and H are only sampled once each. Ash levels are comparable to drill core samples, but moisture and volatile levels are, of course, dramatically higher than in the drill core samples. Nothing of real significance can be interpreted from these trenched intersections except a general correspondence (through ash level) with the drilled intervals.

Seam I is represented by nine trenched coal occurrences. Despite the wide scatter of the sample points, from north, south and east of Lost Ridge, and both sides of Lost Ridge anticline, there is remarkable consistency in the ash level. Ash varies from 12 - 30% with most samples lying in the 13 - 18% range. Some of the higher ash occurrences are noted as slumped, which would contribute to contamination of the coal sample by roof or floor rock. Moisture levels average 9% for the trenches compared with 2% for drill core. Volatiles average 19.5% compared with drill core levels of 6.9%. Coal quality results support the correlation drawn between these trenches.

The trench samples for seams J, K, and L illustrate the necessity of having more than coal quality data available to draw correlations between coal occurrences. The tracing of these seams along subcrop lines, and geological interpretation is what allows their identification. From a quality standpoint, all six samples (two from each seam) indicate an ash level between 28 and 35%; five are between 31 and 33%.

Volatiles range from 22 to 24% and moisture after air drying is mostly between 9.5 and 11%. On the other hand, quality analyses of drill core (see Section 8.5) indicate that seams J, K, and L are not too dissimilar from each other and the trench analyses do reflect, to some extent, a real situation.

Seams M and N were transected by trenches and sampled for the first time in 1984. There are no drill hole intersections to provide more reliable quality data and some slumping was noted in the trenches that were sampled. The material sampled from seam M was described as spoil. The ash level of this sample is just under 34%, which is promising for a trench sample, but may not be representative. The two samples from seam N range in ash content from 37 - 44%. There is also a substantial difference between trenched seam thickness (1.36 metres at one location - TRC 84290 - 37.43% ash, and 8.13 metres at TRC 84266 with 44.44% ash). More reliable sample intersections of seam N are required but at present a 8.13 metre seam even at 44% ash is worthy of further investigation.

Although several occurrences of seam O were trenched, there were no sufficiently well defined sample intervals to warrant sampling and analysis. The seam intersected was not even bounded above and below distinctly enough to allow thickness measurements. Determination of the quality of coal at this stratigraphic level will have to await further exploration.

Seam P, by contrast, was trenched several times with quite consistent thicknesses: 1.8 to 2.5 metres, averaging 2.10 metres in seven occurrences. There is, however, considerable variety in ash levels, with values between 17% and 54%. Shearing and breakage of coal could account for some of the higher ash contents. If the ash levels on the lower end of the scale could be substantiated as reliable with future work, seam P would also be of interest.

8.4 Size Analysis - Diamond Drilling Program

8.4.1 Introduction

Due to an increasing interest in establishing a data base on the size consist of Mount Klappan coal, 1984 marked a departure from the previous procedures of drill core analysis. Previously, crushing of coal to 3/8" and screening at 0.5 mm and 0.15 mm was based on considerations of the limits imposed by preparation plant equipment. Information is now required on the quality of coarse coal and therefore, after determination of the natural size distribution, the coal is crushed no finer than two inches (50 mm) and then screened to a series of diminishing sizes (as described in 8.2.3.3.1).

8.4.2 Discussion

Studies of the size distributions of Appalachian coals (Frumerman and Baetens, 1984) have yielded several noteworthy observations. The study was based on channel samples taken from the face of seams exploited at 159 mines through Pennsylvania, West Virginia, and Wyoming. As size distribution data is usually presented graphically with log scales along both axes, it follows that a linear regression for size data could be calculated using the logs of both size and weight percent data. In practice, for each single sample the correlation coefficient (r) is generally very high (greater than 0.99) indicating a very strong relationship between the populations.

The linear regression formula is expressed as:

$$\log [\log(100/R(x))] = n \log(x) + b$$

In this expression "x" is the screen size expressed in millimetres (or any constant unit of convenience) and R(x) is the cumulative amount of sample - by percentage - retained on the screen at that size. The letter "n" is described as the distribution constant and represents the slope of the line that would appear as a graphical representation. The letter "b" is the intercept along the ordinate (vertical axis). Both "n" and "b" have numerical values when the regression is calculated for an actual population of size distribution points. By examining these values a significance for the whole population can be derived.

Where the slope (n) is a larger value the line on the graph appears steeper. As size distribution graphs are usually drawn with large size to the right and zero to the left, and with 0% retained at the top and 100% at the bottom, a steeper line means that as the size of the screen is reduced (a move from right to left), the amount retained increases quickly (the move downward on the graph is rapid). This situation would occur in a material with a high proportion of coarse material. By contrast, if the slope is a low number, the graphed line has a shallow slope, and there is relatively more fine material.

The same relationship exists with the intercept value. The intercept is determined through eliminating the function n log (x) by setting log (x) equal to zero. This occurs when x equals 1 (1 millimetre), and the intercept can therefore be evaluated to provide the weight percent retained when the screen size is 1 millimetre. A small number as the intercept means that less material is retained at 1 millimetre because more material is finer than this size.

In the cited study, it was found that coals from all mines visited, if handled in a similar manner, had comparable size distributions, particularly with regard to slope. In fact, an average equation could be generated that expressed representative size distribution for all coals from all mines.

Identical treatment was applied to the size distributions measured from 1984 Mount Klappan drill core. The numbers derived from linear regression calculations were, of course, different from those found in the Appalachian study, but a surprisingly close relationship was discovered, not only within each seam, but also among all seams. For all drill core samples representing whole, unoxidized seams, the slope of the regression line varied between 0.59 and 0.72 with an average expression being:

$$\log\left(\log \frac{100}{\text{weight}}\right) = 0.645\,[\log(\text{size})] - 1.17$$

(where the weight is the cumulative weight of sample retained at the respective screen size.)

The intercept for the same group of samples varies generally from -1.04 to -1.65 with two exceptions which will be discussed later (see Table 8.2).

Not only has this regression formula established that there is a general property wide correspondence in the size distribution of Mount Klappan coal seams (which extends through the Hobbit Creek Area), it also provides a yardstick with which new samples can be easily compared. Among the 1984 samples is an intersection of seam I at the top of drill hole 84006 (at 15 metres) that is very broken and poorly represented in core. The linear regression of the size distribution for this seam is quite different from the noted average, with a slope of 0.55 and an intercept of - 0.87, both indicating a generally finer than normal size consistency that most likely results from weathering.

TABLE 8.2
SIZE CONSIST
LOST RIDGE AREA

SEAM	DRILL HOLE	SLOPE	INTERCEPT	% + 6mm	CORRELATION COEFFICIENT
C	84-007	0.61	-0.81	29.39	0.989
D	84-007	0.67	-0.72	20.38	0.995
E	84-007	0.71	-1.32	63.46	0.997
G	84-008	0.72	-1.65	81.61	0.998
H	84-007	0.61	-1.14	58.87	0.997
H	84-008	0.65	-1.10	50.01	0.995
H	84-008	0.59	-1.05	52.05	0.995
I	84-006	0.55	-0.87	38.27	0.995
I	84-006	0.67	-1.34	69.08	0.999
I	84-007	0.59	-1.19	63.23	0.994
I	84-008	0.64	-1.14	53.36	0.998
I	ADIT	0.62	-0.86	34.60	0.988
J	84-006	0.63	-1.04	47.90	0.995
K	84-006	0.62	-1.15	58.14	0.997
K	84-008	0.65	-1.51	78.48	0.999

Two other samples (noted above) also appear unusual on the basis of regression calculation. These are the intersections of seams C and D near the bottom (272 metres and 252 metres respectively) of drill hole 84007. At these depths, it is very unlikely that the coal is oxidized, yet the size distributions are far from typical (see Table 8.2). The different character of these seams, suggested by the size regression, is borne out by the head analysis of the coal (see Sections 8.5.2 and 8.5.3) and particularly in their high Hardgrove Grindability values.

Prior to the 1984 exploration season, the only size information on Klappan coal was drawn from the Lost Ridge adit bulk sample taken in 1983 (Appendix III). The measured size distribution for this sample is also different from the general average. The slope is very similar (0.62) but the intercept (-0.86) indicates that the adit sample contains a higher proportion of fine material than was measured in the procedure applied to the drill core samples.

Frumerman and Baetens (1984) also note in their study that different size distributions are apparent for two samples of the same coal excavated by two different methods. In their research a continuous miner produced a different average size distribution than was seen in coal mined using conventional methods. This observation provides the explanation for the difference between adit excavated coal and drill core.

The adit sample consisted of several tonnes including some very large pieces. Handling of this bulk of coal required mechanical assistance and the use of a jaw crusher for the larger pieces. Screening of a representative sample of coarse coal required repeated handling of some portions which also contributed to a degree of attrition. As a result, the proportion of coarse coal in the adit sample was reduced [35% coarser than 1/4" (6 mm) as compared with 50% to over 80% for most of the drill core samples]. By contrast, the drill core samples were handled quite carefully and crushed by hand, preserving a large percentage of coarse coal. The end result of this difference in procedures is not only a different size distribution but also a difference in the character of the material contained in the various size fractions. This will be discussed further in Section 8.6.

Size distribution analysis has demonstrated that a real, representative, average size distribution can be derived for drill core samples, but this average analysis should only be compared with other drill core samples. The different handling involved in bulk samples and so far seems to produce a different size distribution. Further analysis and further bulk samples will be required before a reliable link can be drawn between the size results drawn from different exploration programs and also with the expected size consist of commercial product, however mined.

8.5 Raw Coal Quality

Reliable coal quality data on unweathered intersections of coal seams are most efficiently gathered through the analysis of diamond drill core. In 1984 the diamond drilling program furnished 15 new intersections of coal seams in the Lost Ridge Area. These were found in drill holes 84006, 84007, and 84008; DDH 84005 did not transect any coal seams of significance. The seams have been variously identified as C through I, seams C and D being intersected for the first time in this area in 1984. Through structural disturbance in some holes and lateral thinning between holes, seam F was not intersected. Similarly, an additional seam appearing between G and H in hole 84007 could not be confidently linked stratigraphically with any other seam and must at present be considered an isolated and unique occurrence. For this reason, the seam is not included in overall yield calculations. Finally, seam L, intersected in DDH 82005, was not encountered in 1984 as none of the drill holes were spudded at this stratigraphic level. The youngest strata cored include 30 to 35 metres of sediment above seam K in 84008.

8.5.1 Average Raw Coal Quality

The average raw coal quality for the 22 seam intersections from the five holes in the Lost Ridge Area (82005, 83001, and 84006-84008) is tabulated in the far right column of Table 8.3. These figures have been generated through an average, weighted for each seam by thickness multiplied by specific gravity (providing a simulation of weighting by tonnage for equivalent volumes). This overall average includes only one set of quality for each seam, multiple analyses for seams having been previously averaged and reported in the other columns of Table 8.3.

TABLE 8.3

RAW COAL QUALITY
BY SEAM

SEAM	C	D	E	F	G upper	H	I	J	K	L	AVERAGE
NO. OF OCCURRENCES	1	1	2	1	2	4	5	2	3	1	22
PROXIMATE ANALYSIS											
Residual Moisture	1.18	0.99	1.28	1.42	1.21	1.38	2.10	1.76	1.58	0.57	1.44
Ash	17.92	17.75	27.18	36.68	52.23	33.03	21.52	27.67	40.95	42.00	33.15
Volatiles	6.43	5.51	6.27	6.30	6.37	7.87	6.88	8.52	7.97	20.49	8.15
Fixed Carbon	74.47	75.75	65.27	55.60	40.19	57.72	69.50	62.05	49.50	36.94	57.26
H.G.I.	67	63	57	49	53	55	39	45	49	50	51
Specific Gravity	1.52	1.51	1.62	1.70	1.88	1.64	1.55	1.63	1.73	2.01	1.69
Carbon Dioxide	1.77	1.18	2.60	3.37	2.58	3.55	1.68	3.40	3.16	15.90	3.78
Chlorine (ppm)	448	939	695	799	791	837	665	412	590	477	650
Phosphorous in Coal	0.248	0.212	0.084	0.114	0.050	0.130	0.091	0.147	0.177	0.189	0.14
Total Sulphur	0.37	0.53	1.66	0.86	0.67	0.38	0.38	0.36	0.37	0.30	0.52
Combustible Sulphur	0.04	0.27	1.41	0.44	0.46	0.12	0.18	0.08	0.10	0.17	0.22
Gross C.V.(MJ/KG)	28.17	28.38	24.52	20.74	14.90	22.03	25.25	23.75	18.95	14.47	21.55
Gross C.V.(cal/gm)	6733	6783	5860	4957	3561	5265	6035	5676	4529	3458	5150
ULTIMATE ANALYSIS											
Carbon	75.25	75.80	64.56	56.45	40.98	60.47	70.75	64.74	52.10	43.97	59.23
Hydrogen	2.77	2.38	2.00	1.83	1.55	2.07	2.40	2.17	1.78	1.38	2.02
Nitrogen	0.86	0.82	0.72	0.49	0.47	0.60	0.81	0.78	0.63	0.54	0.66
Oxygen	1.65	1.73	2.60	2.27	2.89	2.07	2.04	2.52	2.59	11.24	2.99
ASH FUSION (Deg.C.)											
OXIDIZING Initial	1230	1245	1230	1265	1250	1225	1245	1240	1255	1310	1250
Softening	1280	1300	1305	1315	1335	1275	1340	1305	1325	1340	1315
Hemispherical	1320	1340	1325	1355	1390	1310	1375	1325	1365	1380	1350
Fluid	1335	1430	1355	1395	1445	1380	1425	1375	1410	1340	1390
REDUCING Initial	1230	1245	1175	1185	1205	1190	1205	1170	1195	1290	1205
Softening	1280	1290	1235	1280	1285	1250	1300	1230	1275	1330	1275
Hemispherical	1320	1300	1260	1315	1360	1280	1340	1250	1315	1335	1310
Fluid	1335	1350	1290	1350	1385	1350	1395	1335	1390	1350	1360
ASH ANALYSIS											
SiO_2	43.05	46.06	51.27	53.46	62.73	55.80	57.01	49.56	54.79	34.65	52.24
Al_2O_3	25.32	28.71	17.80	19.96	17.55	18.25	22.55	22.31	22.97	12.94	20.64
Fe_2O_3	5.23	5.11	12.62	7.71	5.83	6.31	6.06	11.94	8.28	13.57	8.00
TiO_2	0.57	0.63	0.59	0.59	0.52	0.53	0.59	0.63	0.67	0.23	0.56
P_2O_5	3.17	2.74	0.71	0.71	0.22	0.90	0.97	1.22	0.99	1.03	1.13
CaO	8.61	5.82	2.35	2.36	1.83	6.73	2.52	3.68	2.68	19.84	5.10
MgO	4.13	3.21	2.54	4.43	2.10	3.99	2.96	5.34	3.48	12.16	4.37
SO_3	4.55	3.60	2.32	2.87	1.00	1.97	2.29	2.53	1.66	0.75	2.27
Na_2O	2.88	1.47	1.12	1.43	1.29	1.34	1.38	1.29	1.47	0.70	1.46
K_2O	1.56	1.88	1.35	0.72	1.90	1.11	1.11	1.15	1.87	0.30	1.26
SiO_2/Al_2O_3 Ratio	1.70	1.60	2.88	2.68	3.57	3.06	2.53	2.22	2.39	2.68	2.53
Fouling Factor	0.94	0.34	0.32	0.32	0.21	0.35	0.24	0.42	0.33	0.68	0.40
Base/Acid Ratio	0.33	0.23	0.29	0.22	0.16	0.26	0.18	0.32	0.23	0.97	0.27

The quality values resulting for the "average" coal are quite representative for the most part, at 33% ash, 1.69 S.G., 0.5% sulphur, 5 100 gross calories per gram and typical ash fusion and mineral characteristics. The one exception is in volatiles, which are raised by the grossly inflated values of seam L. This anomaly is caused by an extraordinary carbonate content (note carbon dioxide, calcium and magnesium in ash) but a second intersection of seam L which might be used to normalize this situation is not yet available.

8.5.2 Seam C

8.5.2.1 Occurrence

Seam C has only been penetrated once in the Lost Ridge Area at 272 metres in DDH 84007. It has very little internal character (no partings) but is of substantial thickness (3.79 metres) and very attractive quality.

8.5.2.2 Coal Quality

Seam C has relatively low levels of residual moisture, ash and sulphur, a moderate volatile content and high heat value. It also has a rather unusual ash chemistry, contributing to a high fouling tendency (due to high sodium levels) and a relatively large phosphorous content, but still a moderate to low slagging tendency (note low base/acid ratio and silica/alumina ratio. The coal also appears to be fairly soft (see Hardgrove and size distribution in Appendix VII).

8.5.3 Seam D

8.5.3.1 Occurrence

Seam D also occurs only at 252 metres in DDH 84007. Seam D is one metre thick (with a small amount of coal loss), is quite close to seam C in section, and shares many of its characteristics.

8.5.3.2 Coal Quality

The quality of seam D is very similar to that of C with the exception that volatiles are slightly lower and sulphur levels slightly higher. The ash content of D is comparable to C but just different enough that the effects on slagging and fouling are moderated. The coal in D is also softer than average.

8.5.4 Seam E

8.5.4.1 Occurrence

Seam E is intersected at 227 metres in 84007 and also at 210 metres in 83001 with thicknesses of 1.07 and 1.32 metres respectively. One thin parting is noted in the 84007 occurrence.

8.5.4.2 Coal Quality

Though the general appearance of the two intersections of seam E are similar, there are distinct differences in the quality of the two sample points that do not show up in the average values tabulated. Most of these differences can be traced to a higher ash content and the present of pyrite in 84007. Ash and sulphur values here are 37% and 2.9% compared with 17% and 0.45% in 83001. The pyrite also manifests itself in raised iron levels in the ash mineral analysis and in a measure of 78% pyritic sulphur in the forms of sulphur determination (see Appendix IV.

8.5.5 Seam F

8.5.5.1 Occurrence

Seam F occurs only in 83001 at 181 metres though there are thin coaly horizons at the level of seam F in both 84007 and 84008. In the one interval sampled for coal quality seam F is quite thick (4.79 metres) but has an increasing number of partings beginning in the middle of the seam and going downward. This, no doubt, contributes to the ash content of the seam.

8.5.5.2 Coal Quality

Table 8.3 illustrates that in most respects, seam F is an average seam, though with higher than average sulphur due to the presence of some pyrite. It is noteworthy that while the seam as a whole has an ash level of 37%, the ash content of the upper 2.36 metres is only 23.5%

8.5.6 Seam G

8.5.6.1 Occurrence

The character of the carbonaceous zone designated as seam G is consistent in that there are no two intersections of the zone that can be compared in detail. For this reason, there is likely some discrepancy between the two intervals chosen to represent seam G upper in 83001 (133 metres) and in 84008 (271 metres). In 83001 the 3.93 metre upper interval overlies another 2.25 metre coaly zone of inferior quality by 3 metres, which is designated G lower. If G lower exists in 84008 it is more sketchily defined, much thinner, and at a greater distance (16 metres) beneath the 3.28 metre zone of G upper. A 0.89 metre zone in 84007 is designated G lower and lies a similar distance (12 metres) beneath another thin coaly band.

8.5.6.2 Coal Quality

The two instances of G upper averaged together, differ in ash content by virtue of the number and thickness of their respective contained partings. The interval in 84008 has 62% ash and 5.5% volatiles compared with 43% ash and 7.2% volatiles in 83001. In most other parameters not affected by the difference in ash, the two occurrences of seam G upper are comparable and the average is representative.

8.5.7 Seam H

8.5.7.1 Occurrence

Seam H occurs in most drill holes in the Lost Ridge area with the exception of 82005. The four intersections averaged together in Table 8.3 are from 103 metres in 84007, 180 metres and 219 metres (repeat) in 84008 and 75 metres in 83001. The seam also appears much reduced in thickness in the core of a fold at 49 metres in 84006. Seam H ranges from 3.84 to 4.58 metres in undisturbed thickness. The 6.41 metre thickness at 180 metres in 84008 is due to almost symmetrical repetition of the seam in the cone of a minor overturned syncline. The quality of this interval, however, is virtually identical to the lower undisturbed repetition, so it is included in the average.

8.5.7.2 Coal Quality

There is relatively little variation in quality between the various samples of seam H. The average is therefore quite representative. There is minor departure from the average values in carbon dioxide and CaO in ash content in the lower occurrence of H in 84008. It is very likely that this is a feature of secondary alteration of the coal, perhaps related to the structural disturbance immediately above the seam.

8.5.8 Seam I

8.5.8.1 Occurrence

As seam I has been the target of drilling since the very earliest indications of its superior quality, it is not surprising that the seam is intersected in every drill hole under discussion here. Intersections occur at 54 metres (overturned) in DDH 82005, at 27 metres in 83001, at 15 metres (upright) and 110 metres (overturned) in 84006, at 57 metres in 84007 and at 61 metres in 84008. The upper intersection in 84006 is not included in the quality report here as the seam occurred immediately beneath the overburden and core loss was severe. Thicknesses vary from 3.86 metres to 5.54 metres and average 5.11 metres.

8.5.8.2 Coal Quality

As with seam H, there is very little variation in quality, and each sampled interval yielded quality data very like the average. Residual moisture and volatile levels are slightly elevated over what they would otherwise be by the high values from 83001. Here the coal is somewhat oxidized due to the limited depth of cover above it.

8.5.9 Seam J

8.5.9.1 Occurrence

Seam J occurs at 154 metres in 84006 (overturned) and at 148 metres in 82005 (also overturned). There is substantial variation in thickness in seam J from 3.56 metres in 84006 to 5.16 metres in 82005. There are also losses of coal and rock core in the intersection from 82005 which may have some effect on coal quality relative to a complete sample.

8.5.9.2 Coal Quality

The only significant differences in seam J coal quality between 84006 and 82005 are in ash mineral analyses, and even here the effects on ash behaviour are not large. Most of these are due to the greater number of partings in 82005 than in 84006.

8.5.10 Seam K

8.5.10.1 Occurrence

Seam K has been sampled from 187 metres in 82005 (overturned), 258 metres in 84006 (also overturned) and 61 metres in 84008. Thicknesses vary from 2.88 metres to 5.75 metres with an average of 4.18 metres. Seam K is like seam J in that the thickness varies directly with the number of partings included in the seam. On the other hand, though the intersection in 84006 is the thinnest and contains relatively few partings, those that are present are quite thick.

8.5.10.2 Coal Quality

The result of the partings in both thick and thinner seams is the same; ash levels are over 45% while the seam occurrence of intermediate thickness (3.93 metres) has an ash content of 28%. Not surprisingly, with this apparent variation in character, there is also quite a variation in quality (see Appendix VII) and the average is not really of general value. Seam K (like seam G) shows considerable lateral variability and must be sampled locally to establish local control.

8.5.11 Seam L

8.5.11.1 Occurrence

The single occurrence of seam L, at 236 metres (overturned) in 82005, lies near the core of a prominent synclinal feature. It is therefore circumscribed in distribution, largely deeply buried, steeply dipping when near surface, and therefore difficult to sample with frequency.

8.5.11.2 Coal Quality

The one sample that is available is contaminated by an extremely high content of carbon dioxide (28%) that is apparently derived from a parting in the lower part of the seam. This seems likely to be a localized phenomenon that may not be present elsewhere, but the seam overall has a relatively high ash level that the partings also contribute to. The ash level of the total 2.24 metre thickness of the seam is 42% but this contains a central band of 0.90 metre thickness and only 21% ash.

8.6 Product Coal Quality

8.6.1 Introduction

As described in the introductory portion of this coal quality section (see Section 8.2) the analysis program for 1984 was designed so that more practical information could be derived that might be applied in production situations. For this reason, a different screening program was employed and a broader range of size fractions subjected to float/sink testing. This provides more information from the 1984 suite of samples, but creates some difficulty with regard to comparison with previous years' data. Two charts of yield data are therefore provided (Table 8.4, 8.5), one indicating only the data available in the current format, and the other comprising all data collected to date, and involving mathematical manipulation of 1984 data to conform with earlier standards (which manipulation could be much more realistically accomplished than the reverse process). Both these tables list yields of these products, successively produced from each seam as calculated using the simulated washplant program. Drum (heavy media vessel) equipment efficiencies were used in all yield calculations, and totals are provided for the amount of product possible from each size of coal, the amount of product at each ash level (5%, 10%, and 25% ash) and the amount of product (by percent) from each seam.

Restrictions imposed by the simulated washplant program dictated that the product quality results tabulated are quoted directly from laboratory analyses. They are not adjusted by the washplant program to the exact target ash levels assigned during yield calculations because there is no capacity presently established for reporting quality individually by size fraction. The quality values do indicate what may be expected from each product and the level of

Table 8.4

CLEAN COAL YIELDS
1984 DATA

Seam	Ash	50 x 6 mm	6 x 0.5 mm	0.5 x 0.15 mm	0.15 mm x 0	Total
C	5	1.07	16.90	4.97	-	22.94
	10	0.34	2.96	2.99	-	6.29
	25	20.07	22.51	5.17	8.29	56.04
	TOTAL	21.48	42.37	13.13	8.29	85.27
D	5	1.82	25.02	3.86	-	30.70
	10	2.35	6.15	6.01	-	14.51
	25	5.27	15.42	4.01	9.91	34.61
	TOTAL	9.44	46.59	13.88	9.91	79.82
E	5	1.01	4.19	0.88	-	6.08
	10	1.07	2.19	0.56	-	3.82
	25	18.37	9.64	1.12	2.50	31.63
	TOTAL	20.45	16.02	2.56	2.50	41.53
H	5	0.72	8.60	2.75	-	12.07
	10	2.45	4.34	0.76	-	7.55
	25	18.95	13.76	2.06	4.86	39.86
	TOTAL	22.12	26.70	5.57	4.86	59.25
I	5	6.24	14.65	3.10	-	23.99
	10	24.59	2.89	0.18	-	27.66
	25	16.61	7.81	1.17	3.87	27.46
	TOTAL	47.44	25.35	4.45	3.87	81.11
J	5	1.72	10.61	3.50	-	15.83
	10	0.82	10.03	0.49	-	11.34
	25	30.01	8.91	2.46	5.34	46.72
	TOTAL	32.55	29.55	6.45	5.34	73.89
K	5	1.44	5.95	1.09	-	8.48
	10	1.88	2.68	0.82	-	5.58
	25	36.15	8.56	1.24	3.10	49.05
	TOTAL	39.47	17.19	3.15	3.10	62.91

Table 8.5

CLEAN COAL YIELDS
1982-1984 DATA

Seam	Ash	10 x 0.6 mm	0.6 x 0.15 mm	0.15 mm x 0	Total
C	5	14.80	4.97	-	19.77
	10	8.30	2.99	-	11.29
	25	41.20	5.17	8.29	54.66
	TOTAL	64.30	13.13	8.29	85.72
D	5	26.54	3.86	-	30.40
	10	8.96	6.01	-	14.97
	25	20.35	4.01	9.91	34.27
	TOTAL	55.85	13.88	9.91	79.64
E	5	14.51	4.27	-	18.78
	10	3.33	1.96	-	5.29
	25	32.85	3.16	5.14	41.15
	TOTAL	50.69	9.39	5.14	65.22
F	5	14.69	3.69	-	18.38
	10	0.74	0.16	-	0.90
	25	19.70	3.29	4.62	27.61
	TOTAL	35.13	7.14	4.62	46.89
G	5	5.04	1.77	-	6.81
	10	1.41	1.33	-	2.74
	25	16.47	0.58	4.01	21.06
	TOTAL	22.92	3.68	4.01	30.61
H	5	7.18	2.61	-	9.79
	10	13.20	0.78	-	13.98
	25	28.60	2.12	4.62	35.34
	TOTAL	48.98	5.51	4.62	56.11
I	5	29.94	3.68	-	33.62
	10	18.81	0.24	-	19.05
	25	23.74	1.61	4.23	29.58
	TOTAL	72.49	5.53	4.23	82.25

. . . 2/

Seam	Ash	10 x 0.6 mm	0.6 x 0.15 mm	0.15 mm x 0	Total
J	5	4.84	2.67	-	7.51
	10	31.92	1.42	-	33.34
	25	18.71	2.90	5.61	27.22
	TOTAL	55.47	6.99	5.61	68.07
K	5	7.07	1.35	-	8.42
	10	5.85	0.90	-	6.75
	25	27.93	1.19	3.87	34.99
	TOTAL	42.85	3.44	3.87	50.16
L	5	10.27	2.35	-	12.62
	10	6.77	2.27	-	9.04
	25	11.61	4.22	7.79	23.62
	TOTAL	28.65	8.84	7.79	45.28
Avg.	5	13.14	2.80	-	15.94
	10	8.52	1.43	-	9.95
	25	26.28	2.63	5.27	34.18
	TOTAL	47.94	6.86	5.27	60.07

consistency to be expected in generating product coal from different seams.

8.6.2 5% Ash Product

8.6.2.1 Yields

Table 8.4 lists yields by seam for 5% ash products sized from 50 mm downwards. Immediately apparent is the fact that, from drill core analyses, yields of 5% ash product above 6 mm for all seams is quite low. Relatively, yields for the 6 mm x 0.5 mm fraction are much higher and then drop off again below 0.5 mm. No attempt was made to calculate low ash coal yields from coal finer than 0.15 mm. The 1984 data on Table 8.4 suggests the highest yield of 5% ash coal may be extracted from seams C, D, and I, with the highest yield of coarse 5% ash coal coming from I.

Table 8.5, includes the same data as Table 8.4, as well as all 1982 and 1983 drill hole data. In essence, the top two size fractions are combined into one, for which yields might be expected to be the same as the sum of the yield for two coarse fractions before combination. In some instances (seams C and D), this is more or less true as the same seam intersections are involved in both cases. For most other seams, however, (E, H, I, J, and K) additional seam intersections from the 1982 and 1983 drill holes change the combined yields for the seam. The yields for seam E are much improved in Table 8.5 as the added intersection in drill hole 83001 contains much higher quality coal than the intersection in drill hole 84007 reported alone in Table 8.4. The opposite situation, with the addition of a lower quality material from 83001 appears to be the case for seam H. For seam I, three seam intersections are reported in Table 8.4 and two more are added in Table 8.5. Head analyses are very similar for all five intersections, suggesting that washabilities should also be similar. The increase in total yield of 5% ash material from Table 8.4 to 8.5 then, may be due to the liberation effect of crushing coal to 10 mm rather than 50 mm.

It is also noted that yields of low ash coal from coarse fractions in the 1983 adit sample were substantially higher than those measured from drill core. This is also explained as a function of the liberation effect. The coarse coal in drill core samples is derived by preserving as many large pieces as possible from a sample initially limited in top size by the diameter of the core. The coarse coal of the bulk sample is that material surviving, with no special handling, after crushing and screening operations. It has been established in previous years that unoxidized coal in Mount Klappan seams is generally harder than the rock around and within it. The remaining coarse material in the bulk sample is therefore more likely to be coal than rock, while there is no real mechanism for separation of the two in the handling of the drill core samples, and the coarse material therefore contains more ash. In actual mining situations the coal extracted will be in much larger pieces than drill core and likely even than the adit sample. The likelihood is, therefore, that after crushing and screening coarse coal from production will have a washability more similar to the bulk sample than to the drill core samples. At present, drill core analyses do provide data for comparison between seams and the opportunity for establishing in future a relationship between more readily available size distribution data (from drill core) and size distribution from actual mining.

8.6.2.2 Coal Quality

Proximate, total sulphur, calorific value, and ultimate analyses were performed on each 5% ash product composited from drill core. It is apparent from Table 8.6 that there is general consistency between all seams and all size fractions in quality of 5% ash products. There is fluctuation in ash level due to laboratory technique but beyond those fluctuations in other parameters linked to ash, there is little significant variation in product quality. Moisture levels range between 0.8% and 1.5%, volatiles span 5.5% to 7.0% (average 6.4%) and sulphur is constant at around 0.5%.

TABLE 8.6
PROXIMATE ANALYSIS
5% ASH COAL

SIZE		50 x 6 mm	6 x 0.5 mm	0.5 x 0.15 mm
Seam	C			
Residual Moisture		1.40	1.04	1.23
Ash		6.23	5.32	5.08
Volatiles		6.66	7.23	6.96
Fixed Carbon		85.71	86.41	86.68
Total Sulphur		0.52	0.48	0.51
Calorific Value (cal/g)		7801	7887	7851
Seam	D			
Residual Moisture		1.12	1.02	1.32
Ash		4.94	4.93	4.92
Volatiles		5.26	7.24	6.93
Fixed Carbon		88.68	86.81	86.83
Total Sulphur		0.52	0.52	0.53
Calorific Value (cal/g)		7904	7923	7940
Seam	E			
Residual Moisture		1.48	1.26	1.06
Ash		4.93	5.54	5.04
Volatiles		5.29	6.06	6.36
Fixed Carbon		88.30	87.14	87.54
Total Sulphur		0.54	0.61	0.54
Calorific Value (cal/g)		8064	7947	7992
Seam	H			
Residual Moisture		1.37	0.95	1.18
Ash		5.55	5.12	5.10
Volatiles		6.39	6.63	7.22
Fixed Carbon		86.69	87.30	86.50
Total Sulphur		0.48	0.49	0.52
Calorific Value (cal/g)		7954	7978	7918
Seam	I			
Residual Moisture		1.24	0.81	1.29
Ash		5.33	5.18	5.13
Volatiles		6.38	7.39	6.71
Fixed Carbon		87.05	86.62	86.87
Total Sulphur		0.49	0.50	0.44
Calorific Value (cal/g)		8014	7983	7940
Seam	J			
Residual Moisture		0.90	0.84	1.08
Ash		4.59	5.24	4.54
Volatiles		6.05	6.10	5.63
Fixed Carbon		88.46	87.82	88.75
Total Sulphur		0.49	0.54	0.55
Calorific Value (cal/g)		8028	7887	7949
Seam	K			
Residual Moisture		1.16	0.69	1.00
Ash		6.25	5.36	5.22
Volatiles		6.11	6.07	5.98
Fixed Carbon		86.48	87.88	87.80
Total Sulphur		0.57	0.61	0.59
Calorific Value (cal/g)		7858	8002	7963

Ultimate analyses are also quite uniform, except perhaps for a slight increase in nitrogen levels in seams I, J, and K, relative to the lower seams (see Table 8.7).

8.6.3 10% Ash Product

8.6.3.1 Yields

The yields of 10% ash product listed in Tables 8.4 and 8.5 are yields possible after the preliminary extraction of the 5% ash product. The apparent loss of 5% ash coal due to equipment efficiencies in moving from laboratory yield figures to simulated washplant figures, is recovered in the 10% ash product. Seams that are marginal in their ability to produce 5% ash coarse coal (see Table 8.4) often can produce more 10% ash product that 5% ash product (seams D, H, and K, for example). Even seam I with the highest potential for 5% ash coal production, has a substantially higher potential for 10% ash product generated from coal sized below 50 mm. As with the 5% ash product yield figures, 10% ash yields rise to the 6 x 0.5 mm size fraction and then decline again, though the effect is not so pronounced as with the 5% ash case. This is true for all seams, with the solitary exception of I, which has a very large potential for coarse (50 x 6 mm) 10% ash coal product. With a minor adjustment to the handling and cleaning specifications it is conceivable that much of this

TABLE 8.7
ULTIMATE ANALYSIS
5% ASH COAL

SIZE		50 x 6 mm	6 x 0.5 mm	0.5 x 0.15 mm
Seam	C			
Residual Moisture		1.40	1.04	1.28
Ash		6.23	5.32	5.08
Total Sulphur		0.52	0.48	0.51
Carbon		85.89	86.52	86.69
Hydrogen		2.68	2.73	2.8
Nitrogen		0.97	0.94	1.02
Oxygen		2.31	2.97	2.62
Seam	D			
Residual Moisture		1.12	1.02	1.32
Ash		4.94	4.93	4.92
Total Sulphur		0.52	0.52	0.53
Carbon		88.72	88.13	86.87
Hydrogen		2.79	2.68	2.48
Nitrogen		0.85	0.84	0.92
Oxygen		1.06	1.88	2.96
Seam	E			
Residual Moisture		1.48	1.26	1.06
Ash		4.93	5.54	5.04
Total Sulphur		0.54	0.61	0.54
Carbon		88.33	87.20	87.85
Hydrogen		2.67	2.88	2.53
Nitrogen		0.86	0.64	0.85
Oxygen		1.19	1.87	2.13
Seam	H			
Residual Moisture		1.37	0.95	1.18
Ash		5.55	5.12	5.10
Total Sulphur		0.48	0.49	0.52
Carbon		86.94	87.54	87.06
Hydrogen		2.75	2.93	2.88
Nitrogen		0.90	0.88	0.84
Oxygen		2.01	2.09	2.42
Seam	I			
Residual Moisture		1.24	0.81	1.29
Ash		5.33	5.18	5.13
Total Sulphur		0.49	0.50	0.44
Carbon		87.67	88.34	86.98
Hydrogen		2.73	3.07	2.72
Nitrogen		1.07	1.04	0.95
Oxygen		1.47	1.06	2.49
Seam	J			
Residual Moisture		0.90	0.84	1.08
Ash		4.59	5.24	4.54
Total Sulphur		0.49	0.54	0.55
Carbon		88.65	87.84	88.82
Hydrogen		2.51	2.54	2.61
Nitrogen		1.02	0.99	1.05
Oxygen		1.84	2.01	1.35
Seam	K			
Residual Moisture		1.16	0.69	1.00
Ash		6.25	5.36	5.22
Total Sulphur		0.57	0.61	0.59
Carbon		86.53	87.93	88.50
Hydrogen		2.37	2.89	2.89
Nitrogen		1.08	1.09	1.10
Oxygen		2.04	1.43	0.70

medium ash coal product could be converted to low ash material. This possibility is demonstrated by the yields tabulated for less than 10 mm coals in Table 8.5.

While the tendency is preserved in most seams to produce more 5% ash product than 10% ash product in total when moving from a top size of 50 mm to a top size of 10 mm, a reversal takes place in seam I. Due perhaps in part to the increased liberation resulting from more intensive crushing, and also due to subtle variations in washability, much of the material that was part of the 10% ash coarse product in Table 8.4 (crushing to 50 mm) reports to the 5% ash product with the additional size reduction (to 10 mm) of Table 8.5. In the latter table the amount of 5% ash product substantially exceeds the production of 10% ash coal.

As a second product after 5% ash coal, the 10% ash production is limited by the general nature of Mount Klappan seam washabilities. The seams providing the best opportunities are I, of course, followed by D, H, and L. Seam J is unique in yielding much higher quantities of 10% ash product in the finer case than the coarser case, and in fact, exceeds I in yields of 10% ash product at less than 10 mm. The tendency for seam J is opposite to that for seam I as 5% ash drops and 10% ash rises in moving from 50 mm to 10 mm top size. The added washability from 82005 included in Table 8.5 should not be the cause of this effect as it is quite similar to the one reported alone for 84006 in Table 8.4.

8.6.3.2 Coal Quality

Ten percent ash product quality analyses were conducted for the 6 x 0.5 mm fraction only as peak demand for coal of this ash content is expected in this size range. These analyses were performed on primary 10% ash products from splits of the 6 x 0.5 mm samples rather than on secondary product samples after 5% ash production. Samples of 10% ash product available from drill core after laboratory separation of 5% ash products are too small for analysis due to the cut points being extremely close together (0.1-0.3 S.G.). The analyses available on Table 8.8 give an indication of what is to be expected from production situations with the exception that there may be variation in volatiles (see discussion in Section 8.6.4.2). Ultimate analyses are also quite consistent from seam to seam, but again (see Section 8.6.2.2) nitrogen levels rise through seams J and K.

8.6.4 Briquetting Product

8.6.4.1 Yields

Yields of "25%" ash briquetting product are larger than yields for any other product for almost

TABLE 8.8
10% ASH COAL ANALYSIS

	PROXIMATE		ULTIMATE
SIZE	6 x 0.5 mm		6 x 0.5 mm
Seam C		C	
Residual Moisture	1.31	Residual Moisture	1.31
Ash	10.18	Ash	10.18
Volatiles	7.34	Sulphur	0.50
Fixed Carbon	81.17	Carbon	81.18
Total Sulphur	0.50	Hydrogen	2.42
Calorific Value (cal/g)	7464	Nitrogen	0.89
		Oxygen	3.52
Seam D		D	
Residual Moisture	1.35	Residual Moisture	1.35
Ash	9.73	Ash	9.73
Volatiles	7.67	Sulphur	0.50
Fixed Carbon	81.25	Carbon	81.41
Total Sulphur	0.50	Hydrogen	2.45
Calorific Value (cal/g)	7464	Nitrogen	0.7
		Oxygen	3.84
Seam H		H	
Residual Moisture	1.67	Residual Moisture	1.67
Ash	10.12	Ash	10.12
Volatiles	7.94	Sulphur	0.48
Fixed Carbon	80.27	Carbon	81.19
Total Sulphur	0.48	Hydrogen	2.64
Calorific Value (cal/g)	7371	Nitrogen	0.76
		Oxygen	3.14
Seam I		I	
Residual Moisture	1.10	Residual Moisture	1.10
Ash	10.16	Ash	10.16
Volatiles	7.49	Sulphur	0.48
Fixed Carbon	81.25	Carbon	81.68
Total Sulphur	0.48	Hydrogen	2.58
Calorific Value (cal/g)	7454	Nitrogen	0.89
		Oxygen	3.11
Seam J		J	
Residual Moisture	1.15	Residual Moisture	1.15
Ash	9.69	Ash	9.69
Volatiles	8.99	Sulphur	0.52
Fixed Carbon	80.17	Carbon	82.4
Total Sulphur	0.52	Hydrogen	2.48
Calorific Value (cal/g)	7507	Nitrogen	1.01
		Oxygen	2.75
Seam K		K	
Residual Moisture	1.07	Residual Moisture	1.07
Ash	10.12	Ash	10.12
Volatiles	6.77	Sulphur	0.56
Fixed Carbon	82.04	Carbon	82.15
Total Sulphur	0.56	Hydrogen	2.63
Calorific Value (cal/g)	7469	Nitrogen	1.05
		Oxygen	2.41

every seam. The specific ash level of the briquetting product (which is unsized) varies seam by seam even if the washing of reject after low ash production in the size fractions above 0.15 is targetted at a specific ash level, because the 0.15 mm x 0 material is added raw. In production, judicious balancing of briquetting coal from various seams, and monitoring of the ash level of the very fine tailings can fairly easily ensure that the quality does not fall into unacceptable ranges. The sort of control described above is only necessary if two products (5% and 10% ash) are taken out before the briquetting material. With a single 5% ash product the ash level of the sinks is low enough that the maximum separation gravity of drum equipment (1.80 S.G.) is reached well before the briquetting ash approaches 25%.

The yield of briquetting coal ranges between 30% and 50% for seams sized to 50 mm (Table 8.4). It is frequently highest in the coarsest size fraction, reflecting the low yields of the lower ash products. The possibility for rewashing the coarse reject after crushing to a smaller size therefore exists and could provide some gain. There is not much difference between briquetting yields of less than 50 mm coal and the yields of less than 10 mm product. In the cases where the added washabilities in Table 8.5 have not been the overriding cause for variation from Table 8.4 (seam I and perhaps J) yields of briquetting coal remain essentially constant while all the movement takes place between 5% and 10% ash products.

8.6.4.2 Coal Quality

No ultimate analysis was undertaken for briquetting coals. Proximate, sulphur and calorific value analyses are reported in Table 8.9. No really meaningful analyses of briquetting products can be provided until the exact specifications of the primary products are determined. Table 8.9 reports results of washing reject from 5% ash coal production only, and the ash values are therefore somewhat lower than they would be if two primary products were first extracted. A characteristic of briquetting coals to be noted, however, is the higher moisture and volatile contents and lower sulphur content, compared with the premium products. This has been discussed previously (see 1983 Geological Report) and is a function of the character of accumulated ash in middlings products. It appears that the ash found with coal in the middle ranges of specific gravity contains minerals (chiefly clays) capable of retaining moisture until release is prompted by the applied heat of proximate analysis. This moisutre augments both the residual moisture and volatile contents as increasing temperature promotes progressive release. This character of ash is not found in the lighter, low ash coals nor in the heavier reject material, and moisture and volatiles for both these fractions are lower. Neither are the moisture and volatile values of raw coals as high as in the middlings briquetting product, as the presence of the material lower and higher in specific gravity

TABLE 8.9
PROXIMATE ANALYSIS
BRIQUETTING COAL

SIZE	50 x 6 mm	6 x 0.5 mm	0.5 x 0.15 mm	0.15 mm x 0
Seam C				
Residual Moisture	1.99	2.58	2.13	0.99
Ash	21.11	23.21	18.49	15.86
Volatiles	8.38	9.52	9.83	6.57
Fixed Carbon	68.52	64.69	69.55	76.58
Total Sulphur	0.35	0.43	0.33	0.47
Calorific Value (cal/g)	6319	5980	6388	6890
Seam D				
Residual Moisture	2.00	2.48	2.17	0.75
Ash	22.54	19.23	18.36	15.07
Volatiles	8.58	9.06	10.06	6.81
Fixed Carbon	66.88	69.23	69.41	77.37
Total Sulphur	0.39	0.37	0.50	0.54
Calorific Value (cal/g)	6195	6403	6467	7053
Seam E				
Residual Moisture	1.93	2.03	2.38	0.98
Ash	24.44	24.61	21.59	29.01
Volatiles	7.25	8.57	8.23	7.36
Fixed Carbon	66.38	64.79	67.80	62.65
Total Sulphur	0.59	0.72	0.57	0.63
Calorific Value (cal/g)	6123	5977	6216	5736
Seam H				
Residual Moisture	2.21	2.69	2.85	0.97
Ash	23.82	18.92	17.86	23.36
Volatiles	8.92	9.33	9.43	7.39
Fixed Carbon	65.05	69.06	69.86	68.28
Total Sulphur	0.38	0.48	0.44	0.42
Calorific Value (cal/g)	5961	6398	6494	6322
Seam I				
Residual Moisture	1.47	1.95	1.76	1.13
Ash	19.32	19.58	19.61	21.97
Volatiles	7.22	9.03	9.11	6.73
Fixed Carbon	71.99	69.44	69.52	70.17
Total Sulphur	0.38	0.39	0.38	0.4
Calorific Value (cal/g)	6618	6405	6422	6312
Seam J				
Residual Moisture	1.79	1.77	2.10	1.39
Ash	21.08	18.49	20.43	24.14
Volatiles	8.67	7.98	9.06	6.66
Fixed Carbon	68.46	71.76	68.41	67.81
Total Sulphur	0.41	0.44	0.40	0.41
Calorific Value (cal/g)	6343	6522	6298	6195
Seam K				
Residual Moisture	1.61	1.64	1.94	1.05
Ash	22.52	20.60	19.39	30.76
Volatiles	8.29	8.83	8.62	7.43
Fixed Carbon	67.58	68.93	70.05	60.76
Total Sulphur	0.49	0.48	0.32	0.4
Calorific Value (cal/g)	6236	6374	6467	5581

moderates the total average contents of each of these.

Similarly, sulphur values are lower because sulphur content normally seems to be part of the pure coal rather than the ash component. Removal of the coaly low ash material reduces the sulphur content (by proportion) of the middlings briquetting coal.

9.0 LIST OF REFERENCES

AMERICAN SOCIETY for TESTING and MATERIALS, 1980, Part 26 Gaseous Fuels; Coal and Coke; Atmospheric Analysis.

BUCKHAM, A.F., and LATOUR, B.A., 1950, The Groundhog Coalfield, British Columbia, Geological Survey of Canada, Bulletin 16, 81 pg.

BUSTIN, R.M., and MOFFAT, IAN, 1983, Groundhog Coalfield, Central British Columbia: Reconnaissance Stratigraphy and Structure. Bulletin of Canadian Petroleum Geology v. 31, p. 231-245.

EISBACHER, G.H., 1974(a), Deltaic Sedimentation in the Northeastern Bowser Basin, British Columbia, Geological Survey of Canada, Paper 73-33, 13 pg.

EISBACHER, G.H, 1974(b), Evolution of Successor Basins in the Canadian Cordillera: in Dott, R.H. and Shaver, R.H. eds, Modern and Ancient Geosyncline Sedimentation: Society of Economic Paleontologists and Mineralogists, Special Publication No. 19, 274-291 p.

EISBACHER, G.H., 1981, Late Mesozoic - Paleogene Bowser Basin Molasse and Cordilleran Tectonics, Western Canada: in Miall, A.D., ed., Sedimentation and Tectonics in Alluvial Basins: Geological Association of Canada, Special Paper 23, 125 - 151 pg.

FRUMERMAN, R. and BAETENS, C., 1984, Universal Size Distribution of Run of Mine Bituminous Coals in the Eastern U.S.A., Fuel, Vol. 63, May, 1984.

ENERGY, MINES and RESOURCES, CANADA, Report 79-9, Coal Resources and Reserves of Canada, 1979.

GULF CANADA RESOURCES INC., 1981 Mount Klappan Coal Project Geological Report.

GULF CANADA RESOURCES INC., 1982, Mount Klappan Coal Project Geological Report.

GULF CANADA RESOURCES INC., 1983, Mount Klappan Coal Project Geological Report.

MALLOCH, G.S., 1914, The Groundhog Coalfield, B.C.; Geol. Surv., Canada, Sum. Rept. 1912, pp. 69-101.

RICHARDS, T.A., and GILCHRIST, R.D., 1979, Groundhog Coal Area, British Columbia: Geological Survey of Canada Paper 79-1B, 411-414 pg.

TIPPER, H.W., and RICHARDS, T.A., 1976. Jurassic Stratigraphy and History of North-Central British Columbia: Geological Survey of Canada Bulletin 270, 73 pg.

APPENDIX A

STATEMENTS OF QUALIFICATIONS

STATEMENT OF QUALIFICATIONS

VIRGINIA L. DUFORD
P.GEOL.

This is to certify that I obtained a Bachelor of Science Degree in Geology and Chemistry at the University of Western Ontario in 1979.

My geological experience has included mineral exploration in Quebec and Ontario, and coal, oil, and gas exploration in the western provinces of Canada. I have been employed as a geologist in the Coal Division of Gulf Canada Resources since October, 1981.

STATEMENT OF QUALIFICATIONS

BRIAN W. GLOVER

This is to certify that I obtained my Bachelor of Science degree from the University of Waterloo, and a Master of Science degree in Geopgraphy from the University of Alberta in 1979.

Since graduation my geological experience includes involvement in coal exploration, hydrogeological studies and regional stratigraphic analyses programs. I have been directly involved in several coal exploration programs throughout southern Saskatchewan, eastern and west-central Alberta and southeastern British Columbia, where my responsibilites have included structural (mapping, core and geophysical log analyses, reserve calcualtions and supervision of field rotary and diamond drilling operations. I an currently on contract to Gulf Canada Resources Inc. and have participated in the evaluation of Gulf's Mount Klappan coal property.

STATEMENT OF QUALIFICATIONS

JOHN W. INNIS

This is to certify that I obtained a Bachelor of Science Degree in Geological Science at Queen's University in 1977, and a Master of Science Degree in Geology at the University of Western Ontario in 1980.

My geological experience includes involvement in mineral exploration and mapping programs in Newfoundland, Saskatchewan and British Columbia for three summers, and latterly seven summers in coal exploration in northeastern and north-central British Columbia. I have been employed as a Geologist in the Coal Division of Gulf Canada Resources Inc. since 1980 and have participated in the continuing evaluation and development of Gulf's Mount Klappan property, the last two years with specialization in geological and coal quality interpretation.

STATEMENT OF QUALIFICATIONS

KIMBERLEY A. JENNER

This is to certify that I obtained a Bachelor of Science Degree in Geology from Dalhousie University in 1982.

My geological experience has been gained through mineral exploration in the Atlantic Provinces and Quebec and coal exploration and drilling programs in northwestern British Columbia. I have been employed as a Geologist with the Coal Division of Gulf Canada Resources Inc. since my graduation in May, 1982.

STATEMENT OF QUALIFICATIONS

JURGEN THUMULT

This is to certify that I obtained a B.A. degree in Geography and Geology at Concordia University of Montreal, Quebec, in 1981. At the prsent time, I am completing a M.Sc. degree in geological applications of remote sensing at McGill University of Montreal.

During the past five field seasons I worked in exploration for uranium, base and precious metals in the Appalachians, the Canadian Shield and the Cordillera. Two of those seasons were spent as party chief. Two years I have been a teaching assistant for structural geology at Concordia University. I led numerous field excursions for structural geology in the Appalachians and contributed several times to international conferences on remote sensing and exploration geology.

APPENDIX B

MOUNT KLAPPAN COAL PROJECT
LEGAL DESCRIPTION OF LICENCES
1984

Appendix B

MOUNT KLAPPAN COAL PROJECT LICENCES
1984

Lost-Fox Area

Licence	Effective Date	Hectares	Series	Block
7129	Sept. 1/81	281	104-H-2	K
7130	Sept. 1/81	281	104-H-2	K
7133	Sept. 1/81	281	104-H-2	K
7134	Sept. 1/81	281	104-H-2	K
7135	Sept. 1/81	281	104-H-2	K
7138	Sept. 1/81	281	104-H-2	K
7139	Sept. 1/81	281	104-H-2	K
7140	Dec. 31/82	281	104-H-2	K
7143	Dec. 31/82	281	104-H-2	K
7144	Dec. 31/82	281	104-H-2	K
7145	Dec. 31/82	281	104-H-2	K
7146	Sept. 1/81	281	104-H-2	L
7147	Dec. 31/82	281	104-H-2	L
7148	Sept. 1/81	281	104-H-2	L
7149	Sept. 1/81	281	104-H-2	L
7151	Dec. 31/82	281	104-H-2	L
7152	Dec. 31/82	281	104-H-2	L
7153	Sept. 1/81	281	104-H-2	L
7160	Dec. 31/82	281	104-H-7	C
7161	Dec. 31/82	281	104-H-7	C
7162	Dec. 31/82	281	104-H-7	C
7164	Dec. 31/82	280	104-H-7	C
7165	Dec. 31/82	280	104-H-7	C
7166	Dec. 31/82	280	104-H-7	C
7167	Sept. 1/81	75	104-H-7	C
7168	Sept. 1/81	142	104-H-7	C
7169	Dec. 31/82	281	104-H-7	D

Lost-Fox Area (cont'd)

Licence	Effective Date	Hectares	Series	Block
7170	Dec. 31/82	281	104-H-7	D
7171*	Dec. 31/82	140.5	104-H-7	D
7172	Dec. 31/82	280	104-H-7	D
7173*	Dec. 31/82	140	104-H-7	D
7175	Sept. 1/81	94	104-H-7	D
7527	Oct. 21/82	281	104-H-2	K
7529	Oct. 21/82	281	104-H-2	L
7561	June 30/83	21	104-H-7	C

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

Lost-Fox Area Total Hectares = 8 757.5

Appendix B

MOUNT KLAPPAN COAL PROJECT LICENCES
1984

Hobbit-Broatch Area

Licence	Effective Date	Hectares	Series	Block
7118	Sept. 1/81	281	104-H-2	J
7119	Sept. 1/81	281	104-H-2	J
7120	Sept. 1/81	32	104-H-2	J
7121	Sept. 1/81	224	104-H-2	J
7122	Dec. 31/82	281	104-H-2	J
7123	Dec. 31/82	281	104-H-2	J
7124	Sept. 1/81	98	104-H-2	J
7125	Dec. 31/82	281	104-H-2	J
7126	Dec. 31/82	281	104-H-2	J
7127	Sept. 1/81	281	104-H-2	K
7128	Sept. 1/81	281	104-H-2	K
7131	Sept. 1/81	281	104-H-2	K
7132	Sept. 1/81	281	104-H-2	K
7136	Dec. 31/82	281	104-H-2	K
7137	Sept. 1/84	281	104-H-2	K
7141	Dec. 31/82	281	104-H-2	K
7142	Dec. 31/82	281	104-H-2	K
7155	Sept. 1/81	61	104-H-7	B
7156	Sept. 1/81	167	104-H-7	B
7157	Sept. 1/81	265	104-H-7	B
7158	Dec. 31/82	281	104-H-7	C
7159	Dec. 31/82	281	104-H-7	C
7163	Dec. 31/82	257	104-H-7	C
7381	Mar. 18/82	281	104-H-2	J
7416	Mar. 15/83	281	104-H-2	J
7417	Mar. 15/83	281	104-H-2	J
7418	Mar. 15/83	281	104-H-2	J
7419	Mar. 15/83	278	104-H-2	J
7420	Mar. 15/83	281	104-H-2	J

Hobbit-Broatch Area (cont'd)

Licence	Effective Date	Hectares	Series	Block
7559	June 30/83	22	104-H-7	B
7560	June 30/83	153	104-H-7	C
7723	Jan. 10/84	281	104-H-2	J
7724	Jan. 10/84	250	104-H-2	J
7725	Jan. 10/84	7	104-H-2	J

Hobbit-Broatch Area Total Hectares = 7 996

Appendix B

MOUNT KLAPPAN COAL PROJECT LICENCES
1984

SUMMIT-NASS-SKEENA AREA

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

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

Summit Area Total Hectares = 13 582.5

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

Nass Area Total Hectares = 10 678

Skeena Area

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

Skeena Area (cont'd)

Licence	Effective Date	Hectares	Series	Block
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
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 = 9000

Summit-Nass-Skeena Area Total Hectares = 33 260.5

APPENDIX C

LOST-FOX AREA

RESOURCE DATA AND CALCULATIONS

LOST-FOX AREA

1984 RESOURCE SUMMARY

LOST-FOX AREA RESOURCE SUMMARY Filename:SUMMARY

	Category			
Seam:	MEASURED	INDICATED	INFERRED	TOTAL
P	441490.0	206125.0	64940.0	712555.0
O	516205.0	982464.0	3332059.0	4830728.0
N	1425450.0	1317712.5	5052187.5	7795350.0
M	3375477.5	5254126.3	12938530.0	21568133.8
L	1635442.5	899521.5	5295988.8	7830952.8
K	3443222.5	5517180.0	11898495.5	20858898.0
J	3569107.5	4112300.0	10855775.0	18537182.5
I	11060837.6	7578217.7	22190334.0	40829389.3
H	1753519.4	4190712.5	20904262.5	26848494.4
Ph	301622.5	1129480.0		1431102.5
Gu	1096457.5	2665982.5	9019664.8	12782104.8
Gl	695682.5	1733978.8	11990355.0	14420016.3
F	232220.0	3441437.5	18381398.8	22055056.3
E	714935.0	1325936.3	9788940.0	11829811.3
D	557557.5	1588692.5	15355653.8	17501903.8
C	1311738.7	4408457.0	37034711.5	42754907.2
	MEAS:	IND:	INF:	TOTAL:
	32130965.7	46352324.1	194103296.2	272586586.0 tonnes

Speculative Resource: 794887327.0 tonnes

LOST-FOX AREA TOTAL RESOURCE: 1067473913.0 TONNES

LOST-FOX AREA

1984 SEAM SUMMARIES

LOST-FOX AREA - SEAM THICKNESS SUMMARY Filename:THKSUM

Data Source	P	O	N	M	L	K	J	I	H	PHANTO	Gu	Gl	F	E	D	C
DDH82005					2.24	5.75	5.16	4.98								
DDH83001								5.51	4.54		3.93	2.25	4.79	1.32		
DDH84005											0.78					
DDH84006						2.88	3.56	5.04								
DDH84007								5.43	3.98	3.02	0.28	0.89	0.00	1.07	1.00	3.79
DDH84008						3.92	0.14	3.86	3.84		0.92	0.29				
WKD83002								4.64								
WKD83003								4.70								
WKD83004								4.91								
WKD83005								3.84								
ADT83100								4.92								
RDH84001								5.00								
RDH84002								5.00								
RDH84013															2.04	3.40
RDH84014																
RDH84015															1.63	5.80
RDH84016			0.00	5.67												
RDH84017												1.99	1.96			
TRC82031				4.28												
TRC82032							1.68									
TRC82036		2.39														
TRC82045														1.09		
TRC82047															1.88	
TRC82048																0.94
TRC82049														1.38		
TRC83003				2.49												
TRC83004		2.44														
TRC83005		1.25														
TRC83006		2.26														
TRC83047												1.32				
TRC83092								4.92								
TRC83093								3.49								
TRC84200								4.47								
TRC84201								6.68								
TRC84202								5.30								
TRC84203								5.53								
TRC84210									3.22							
TRC84212							2.67									
TRC84213					2.45											
TRC84215				5.41												
TRC84216					2.92											
TRC84217							3.71									
TRC84218						2.03										
TRC84220									1.04							
TRC84221									4.85							
TRC84223								7.58								
TRC84224								5.51								
TRC84225								2.98								
TRC84226								3.42								
TRC84227							3.97									
TRC84228							5.37									
TRC84233								6.84								
TRC84235								5.50								
TRC84237								7.48								
TRC84240								5.44								
TRC84265					3.23											
TRC84266			8.13													
TRC84267	2.13															
TRC84269	1.84															
TRC84272	1.94															
TRC84273	2.00															
TRC84281								5.58								
TRC84283																0.73
TRC84288											3.05					
TRC84290			1.36													
TRC84295								1.92								
TRC84297								5.74								
TRC84298						5.96										
TRC84299				4.04												
TOTAL:	7.91	8.34	9.49	21.89	10.84	20.54	26.26	146.21	21.47	3.02	8.96	6.74	6.75	4.86	6.55	14.66
# Data Pts:	4	4	3	5	4	5	8	29	6	1	5	5	3	4	4	5
Av Seam Thk(m):	1.98	2.09	3.16	4.38	2.71	4.11	3.28	5.04	3.58	3.02	1.79	1.35	2.25	1.21	1.64	2.93

Total Aggregate Thickness: 44.52 metres

SEAM P RESOURCE SUMMARY Filename:PSUM PSUM

Section	--------- MEASURED	Category INDICATED	-------- INFERRED	TOTAL
4000				0.0
3750				0.0
3500				0.0
3250				0.0
3000				0.0
2750				0.0
2500		61837.5		61837.5
2250	199920.0			199920.0
2000	179095.0			179095.0
1750	62475.0	144287.5		206762.5
1500			64940.0	64940.0
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	441490.0	206125.0	64940.0	712555.0 Tonnes

SEAM D RESOURCE SUMMARY Filename:DSUM

Section	--------- MEASURED	Category INDICATED	-------- INFERRED	TOTAL
4000				0.0
3750				0.0
3500				0.0
3250				0.0
3000				0.0
2750				0.0
2500				0.0
2250				0.0
2000				0.0
1750			490875.0	490875.0
1500			765765.0	765765.0
1250		325584.0	804053.3	1129637.3
1000	255425.0	323680.0	284707.5	863812.5
750	260780.0	333200.0	201258.8	795238.8
500			785400.0	785400.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	516205.0	982464.0	3332059.6	4830728.6 Tonnes

SEAM N RESOURCE SUMMARY Filename:NSUM

Section	--------- MEASURED	Category INDICATED	-------- INFERRED	TOTAL
4000				0.0
3750				0.0
3500				0.0
3250				0.0
3000			318750.0	318750.0
2750			525937.5	525937.5
2500	712725.0	111562.5		824287.5
2250	712725.0	347225.0	297500.0	1357450.0
2000		858925.0	127500.0	986425.0
1750			775625.0	775625.0
1500			1275000.0	1275000.0
1250			1731875.0	1731875.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	1425450.0	1317712.5	5052187.5	7795350.0 MT

SEAM M RESOURCE SUMMARY Filename:MSUM

Section	--------- MEASURED	Category INDICATED	-------- INFERRED	TOTAL
4000				0.0
3750				0.0
3500				0.0
3250			69190.0	69190.0
3000		505006.3	345950.0	850956.3
2750	1133687.5	309187.5		1442875.0
2500	824500.0	288575.0	518925.0	1632000.0
2250		762662.5	1176230.0	1938892.5
2000	578340.0	1643475.0	397842.5	2619657.5
1750	669630.0	1438327.5	605412.5	2713370.0
1500			2992467.5	2992467.5
1250			2698410.0	2698410.0
1000			1504882.5	1504882.5
750	169320.0	148155.0	1228122.5	1545597.5
500		158737.5	1401097.5	1559835.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	3375477.5	5254126.3	12938530.0	21568133.8 Tonnes

SEAM L RESOURCE SUMMARY Filename:LSUM

Section	MEASURED	INDICATED	INFERRED	TOTAL
	---------	Category	--------	
4000				0.0
3750				0.0
3500			73482.5	73482.5
3250			293930.0	293930.0
3000		359805.0	241442.5	601247.5
2750	545147.5	211650.0	110223.8	867021.3
2500	518160.0	169329.0	430397.5	1117886.5
2250	572135.0	158737.5	514377.5	1245250.0
2000			1406665.0	1406665.0
1750			1270197.5	1270197.5
1500			955272.5	955272.5
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	1635442.5	899521.5	5295988.8	7830952.8 MT

SEAM K RESOURCE SUMMARY Filename:KSUM

Section	MEASURED	INDICATED	INFERRED	TOTAL
	---------	Category	--------	
4000				0.0
3750				0.0
3500			511938.0	511938.0
3250			1076695.0	1076695.0
3000		927180.0	507875.0	1435055.0
2750	1575050.0	550800.0		2125850.0
2500		1707480.0	609450.0	2316930.0
2250	614337.5	293760.0	1249372.5	2157470.0
2000		1101600.0	1625200.0	2726800.0
1750	1253835.0	275400.0	1422050.0	2951285.0
1500		660960.0	1808035.0	2468995.0
1250			2011185.0	2011185.0
1000			1076695.0	1076695.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	3443222.5	5517180.0	11898495.5	20858898.0 MT

SEAM J RESOURCE SUMMARY Filename:JSUM

	Category			
Section	MEASURED	INDICATED	INFERRED	TOTAL
4000				0.0
3750				0.0
3500			679575.0	679575.0
3250			958375.0	958375.0
3000		1184900.0	435625.0	1620525.0
2750	1019745.0	505325.0	174250.0	1699320.0
2500	953955.0	749275.0	688287.5	2391517.5
2250	773032.5	357212.5	1454987.5	2585232.5
2000	822375.0	261375.0	1394000.0	2477750.0
1750		1054212.5	1289450.0	2343662.5
1500			1934175.0	1934175.0
1250			1324300.0	1324300.0
1000			522750.0	522750.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	3569107.5	4112300.0	10855775.0	18537182.5 MT

SEAM I RESOURCE SUMMARY Filename:ISUM

Section	--------- Category		--------	
Section	MEASURED	INDICATED	INFERRED	TOTAL
4000				0.0
3750			1236771.3	1236771.3
3500	309272.5	439513.8	459956.3	1208742.6
3250	642961.3	357743.8	960797.5	1961502.6
3000	1350352.5	1246992.5	1788718.8	4386063.8
2750	2950860.0	776815.0	1226550.0	4954225.0
2500		2854895.0	1124337.5	3979232.5
2250	2121515.0	706371.3	1584293.8	4412180.1
2000	1267350.0	419071.3	3281021.3	4967442.6
1750	1362401.3	449735.0	3413897.5	5226033.8
1500	1056125.0	327080.0	3250357.5	4633562.5
1250			2289560.0	2289560.0
1000			899470.0	899470.0
750			674602.5	674602.5
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	11060837.6	7578217.7	22190334.0	40829389.3 Tonnes

SEAM H RESOURCE SUMMARY Filename:HSUM

Section	MEASURED	INDICATED	INFERRED	TOTAL
	---------	Category	--------	
4000				0.0
3750			785400.0	785400.0
3500			1107975.0	1107975.0
3250			1963500.0	1963500.0
3000	546434.4	1197862.5	1767150.0	3511446.9
2750	620160.0	910350.0	1893375.0	3423885.0
2500	214795.0	1519375.0	1640925.0	3375095.0
2250	372130.0	563125.0	2552550.0	3487805.0
2000			3772725.0	3772725.0
1750			3632475.0	3632475.0
1500			1788187.5	1788187.5
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	1753519.4	4190712.5	20904262.5	26848494.4 MT

SEAM Phantom RESOURCE SUMMARY Filename:PhSUM

Section	Category MEASURED	INDICATED	INFERRED	TOTAL
4000				0.0
3750				0.0
3500				0.0
3250				0.0
3000				0.0
2750				0.0
2500		564740.0		564740.0
2250	301622.5	564740.0		866362.5
2000				0.0
1750				0.0
1500				0.0
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	301622.5	1129480.0	0.0	1431102.5 Tonnes

SEAM G upper RESOURCE SUMMARY Filename:GUSUM

Section	MEASURED	INDICATED	INFERRED	TOTAL
	---------	Category	--------	
4000			256772.3	256772.3
3750			698700.0	698700.0
3500			593895.0	593895.0
3250	370812.5	266985.0	762747.5	1400545.0
3000	444975.0	957227.5	902487.5	2304690.0
2750	101660.0	858925.0	576427.5	1537012.5
2500		403835.0	425042.5	828877.5
2250	179010.0	23205.0	704552.5	906767.5
2000		155805.0	1275127.5	1430932.5
1750			1630300.0	1630300.0
1500			1193612.5	1193612.5
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	1096457.5	2665982.5	9019664.8	12782104.8 Tonnes

SEAM G lower RESOURCE SUMMARY Filename:GLSUM

Section	MEASURED	INDICATED	INFERRED	TOTAL
	--------- Category --------			
4000			464100.0	464100.0
3750			842010.0	842010.0
3500			855270.0	855270.0
3250	209992.5	132217.5	941460.0	1283670.0
3000	402475.0	566291.3	1067430.0	2036196.3
2750		713957.5	974610.0	1688567.5
2500		192907.5	1451970.0	1644877.5
2250	83215.0	128605.0	1322685.0	1534505.0
2000			1614405.0	1614405.0
1750			1445340.0	1445340.0
1500			1011075.0	1011075.0
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	695682.5	1733978.8	11990355.0	14420016.3 Tonnes

SEAM F RESOURCE SUMMARY Filename:FSUM

Section	Category MEASURED	INDICATED	INFERRED	TOTAL
4000				0.0
3750			1677390.0	1677390.0
3500			1736528.8	1736528.8
3250	23970.0	1302880.0	1795667.5	3122517.5
3000	208250.0	401625.0	1967707.5	2577582.5
2750		1736932.5	2236520.0	3973452.5
2500			2634362.5	2634362.5
2250			1494597.5	1494597.5
2000			2064480.0	2064480.0
1750			1612875.0	1612875.0
1500			1161270.0	1161270.0
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	232220.0	3441437.5	18381398.8	22055056.3 Tonnes

SEAM E RESOURCE SUMMARY Filename:ESUM

Section	--------- MEASURED	Category INDICATED	--------- INFERRED	TOTAL
4000				0.0
3750			476595.0	476595.0
3500			589050.0	589050.0
3250		406980.0	947835.0	1354815.0
3000	614890.0	101745.0	1365525.0	2082160.0
2750		428400.0	1338750.0	1767150.0
2500		229648.8	1333395.0	1563043.8
2250	100045.0	159162.5	1338750.0	1597957.5
2000			1017450.0	1017450.0
1750			803250.0	803250.0
1500			578340.0	578340.0
1250				0.0
1000				0.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	714935.0	1325936.3	9788940.0	11829811.3 Tonnes

SEAM D RESOURCE SUMMARY Filename:DSUM

Section	MEASURED	INDICATED	INFERRED	TOTAL
4000			275400.0	275400.0
3750			535500.0	535500.0
3500	75905.0	127840.0	589050.0	792795.0
3250		163795.0	1418650.0	1582445.0
3000	238425.0	355470.0	1455965.0	2049860.0
2750			1866600.0	1866600.0
2500		212500.0	1696855.0	1909355.0
2250	97750.0	140250.0	1376298.8	1614298.8
2000	145477.5	228607.5	1237217.5	1611302.5
1750		360230.0	1391662.5	1751892.5
1500			1517335.0	1517335.0
1250			997560.0	997560.0
1000			997560.0	997560.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	557557.5	1588692.5	15355653.8	17501903.8 Tonnes

SEAM C RESOURCE SUMMARY Filename:CSUM

Section	MEASURED	INDICATED	INFERRED	TOTAL
	--------- Category		--------	
4000			1241680.0	1241680.0
3750	31808.7	34272.0	1226720.0	1292800.7
3500		64260.0	1481040.0	1545300.0
3250		404600.0	3504380.0	3908980.0
3000	375700.0	570775.0	3769622.5	4716097.5
2750			4776277.5	4776277.5
2500		821482.5	3433660.0	4255142.5
2250	386580.0	467117.5	3307095.0	4160792.5
2000	517650.0	788800.0	3312662.0	4619112.0
1750		1257150.0	3488697.0	4745847.0
1500			4007197.5	4007197.5
1250			2184160.0	2184160.0
1000			1301520.0	1301520.0
750				0.0
500				0.0
	MEAS:	IND:	INF:	TOTAL:
TOTAL:	1311738.7	4408457.0	37034711.5	42754907.2 Tonnes

LOST-FOX AREA

1984 RESOURCE CALCULATIONS

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND500

SECTION: 500
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M	2.49	1.70	150	250	158737.5	158737.5	158737.5
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	158737.5	158737.5	158737.5

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF500

SECTION: 500
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.31	1.70	800	250	785400.0	785400.0	785400.0
N							
M	4.07	1.70	810	250	1401097.5	1401097.5	1401097.5
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	2186497.5	2186497.5	2186497.5

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES750

SECTION: 750
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.08	1.70	295	250	260780.0	260780.0	260780.0
N							
M	2.49	1.70	160	250	169320.0	169320.0	169320.0
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	430100.0	430100.0	430100.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND750

SECTION: 750
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.24	1.70	350	250	333200.0	333200.0	333200.0
N							
M	2.49	1.70	140	250	148155.0	148155.0	148155.0
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	481355.0	481355.0	481355.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF750

SECTION: 750
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.31	1.70	205	250	201258.8	201258.8	201258.8
N							
M	4.07	1.70	710	250	1228122.5	1228122.5	1228122.5
L							
K							
J							
I	4.81	1.70	330	250	674602.5	674602.5	674602.5
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	2103983.8	2103983.8	2103983.8

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984   FILE NAME: MES1000

SECTION: 1000
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.08	1.70	220	250	194480.0	194480.0	194480.0
O	2.39	1.70	60	250	60945.0	60945.0	60945.0
N							
M							
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	255425.0	255425.0	255425.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND1000

SECTION: 1000
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.24	1.70	340	250	323680.0	323680.0	323680.0
N							
M							
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	323680.0	323680.0	323680.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF1000

SECTION: 1000
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.31	1.70	290	250	284707.5	284707.5	284707.5
N							
M	4.07	1.70	870	250	1504882.5	1504882.5	1504882.5
L							
K	4.78	1.70	530	250	1076695.0	1076695.0	1076695.0
J	4.10	1.70	300	250	522750.0	522750.0	522750.0
I	4.81	1.70	440	250	899470.0	899470.0	899470.0
H							
Gu							
Gl							
F							
E							
D	1.63	1.70	1440	250	997560.0	997560.0	-
C	3.52	1.70	870	250	1301520.0	1301520.0	1301520.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	6587585.0	6587585.0	5590025.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND1250

SECTION: 1250
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.24	1.70	380	225	325584.0	325584.0	325584.0
N							
M							
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	325584.0	325584.0	325584.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF1250

SECTION: 1250
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.31	1.70	910	225	804053.3	804053.3	804053.3
N	2.50	1.70	1630	250	1731875.0	1731875.0	1731875.0
M	4.07	1.70	1560	250	2698410.0	2698410.0	2698410.0
L							
K	4.78	1.70	990	250	2011185.0	2011185.0	2011185.0
J	4.10	1.70	760	250	1324300.0	1324300.0	1324300.0
I	4.81	1.70	1120	250	2289560.0	2289560.0	2289560.0
H							
Gu							
Gl							
F							
E							
D	1.63	1.70	1440	250	997560.0	997560.0	
C	3.52	1.70	1460	250	2184160.0	2184160.0	2184160.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	14041103.3	14041103.3	13043543.3

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES1500

SECTION: 1500
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I	4.97	1.70	500	250	1056125.0	1056125.0	1056125.0
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	1056125.0	1056125.0	1056125.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND1500

SECTION: 1500
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K	4.32	1.70	360	250	660960.0	660960.0	660960.0
J							
I	4.81	1.70	160	250	327080.0	327080.0	327080.0
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	988040.0	988040.0	988040.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF1500

SECTION: 1500
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P	1.91	1.70	80	250	64940.0	64940.0	
O	2.31	1.70	780	250	765765.0	765765.0	765765.0
N	2.50	1.70	1200	250	1275000.0	1275000.0	1275000.0
M	4.07	1.70	1730	250	2992467.5	2992467.5	2992467.5
L	2.47	1.70	910	250	955272.5	955272.5	955272.5
K	4.78	1.70	890	250	1808035.0	1808035.0	1808035.0
J	4.10	1.70	1110	250	1934175.0	1934175.0	1934175.0
I	4.81	1.70	1590	250	3250357.5	3250357.5	3250357.5
H	3.30	1.70	1275	250	1788187.5	1788187.5	1788187.5
Gu	1.37	1.70	2050	250	1193612.5	1193612.5	
Gl	1.56	1.70	1525	250	1011075.0	1011075.0	
F	2.53	1.70	1080	250	1161270.0	1161270.0	1161270.0
E	1.26	1.70	1080	250	578340.0	578340.0	
D	1.63	1.70	1540	250	1066835.0	1066835.0	
D	1.00	1.70	1060	250	450500.0	450500.0	
C	3.79	1.70	1090	250	1755717.5	1755717.5	
C	3.52	1.70	1505	250	2251480.0	2251480.0	2251480.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	24303030.0	24303030.0	18182010.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES1750

SECTION: 1750
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P	1.96	1.70	75	250	62475.0	62475.0	
O							
N							
M	4.04	1.70	390	250	669630.0	669630.0	669630.0
L							
K	5.96	1.70	495	250	1253835.0	1253835.0	1253835.0
J							
I	4.97	1.70	645	250	1362401.3	1362401.3	1362401.3
H							
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	3348341.3	3348341.3	3285866.3

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND1750

SECTION: 1750
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P	1.94	1.70	175	250	144287.5	144287.5	
O							
N							
M	4.04	1.70	150	250	257550.0	257550.0	257550.0
M	5.67	1.70	490	250	1180777.5	1180777.5	1180777.5
L							
K	4.32	1.70	150	250	275400.0	275400.0	275400.0
J	4.10	1.70	605	250	1054212.5	1054212.5	1054212.5
I	4.81	1.70	220	250	449735.0	449735.0	449735.0
H							
Gu							
Gl							
F							
E							
D	1.63	1.70	520	250	360230.0	360230.0	
C	5.80	1.70	510	250	1257150.0	1257150.0	1257150.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	4979342.5	4979342.5	4474825.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF1750

SECTION: 1750
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O	2.31	1.70	500	250	490875.0	490875.0	490875.0
N	2.50	1.70	730	250	775625.0	775625.0	775625.0
M	4.07	1.70	350	250	605412.5	605412.5	605412.5
L	2.47	1.70	1210	250	1270197.5	1270197.5	1270197.5
K	4.78	1.70	700	250	1422050.0	1422050.0	1422050.0
J	4.10	1.70	740	250	1289450.0	1289450.0	1289450.0
I	4.81	1.70	1670	250	3413897.5	3413897.5	3413897.5
H	3.30	1.70	2590	250	3632475.0	3632475.0	3632475.0
Gu	1.37	1.70	2800	250	1630300.0	1630300.0	
Gl	1.56	1.70	2180	250	1445340.0	1445340.0	
F	2.53	1.70	1500	250	1612875.0	1612875.0	1612875.0
E	1.26	1.70	1500	250	803250.0	803250.0	
D	1.63	1.70	1150	250	796662.5	796662.5	
D	1.00	1.70	1400	250	595000.0	595000.0	
C	3.79	1.70	1330	250	2142297.5	2142297.5	2142297.5
Ċ	3.52	1.70	900	250	1346400.0	1346400.0	1346400.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	23272107.5	23272107.5	18001555.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES2000

SECTION: 2000
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P	1.96	1.70	215	250	179095.0	179095.0	
O							
N							
M	5.67	1.70	240	250	578340.0	578340.0	578340.0
L							
K							
J	3.87	1.70	500	250	822375.0	822375.0	822375.0
I	4.97	1.70	600	250	1267350.0	1267350.0	1267350.0
H							
Gu							
Gl							
F							
E							
D	1.63	1.70	210	250	145477.5	145477.5	
C	5.80	1.70	210	250	517650.0	517650.0	517650.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	3510287.5	3510287.5	3185715.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND2000

SECTION: 2000
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N	4.30	1.70	470	250	858925.0	858925.0	858925.0
M	4.04	1.70	480	250	824160.0	824160.0	824160.0
M	5.67	1.70	340	250	819315.0	819315.0	819315.0
L							
K	4.32	1.70	600	250	1101600.0	1101600.0	1101600.0
J	4.10	1.70	150	250	261375.0	261375.0	261375.0
I	4.81	1.70	205	250	419071.3	419071.3	419071.3
H							
Gu	0.78	1.70	470	250	155805.0		
Gl							
F							
E							
D	1.63	1.70	330	250	228607.5	228607.5	
C	5.80	1.70	320	250	788800.0	788800.0	788800.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	5457658.8	5301853.8	5073246.3

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF2000

SECTION: 2000
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N	2.50	1.70	120	250	127500.0	127500.0	127500.0
M	4.07	1.70	230	250	397842.5	397842.5	397842.5
L	2.47	1.70	1340	250	1406665.0	1406665.0	1406665.0
K	4.78	1.70	800	250	1625200.0	1625200.0	1625200.0
J	4.10	1.70	800	250	1394000.0	1394000.0	1394000.0
I	4.81	1.70	1605	250	3281021.3	3281021.3	3281021.3
H	3.30	1.70	2690	250	3772725.0	3772725.0	3772725.0
Gu	1.37	1.70	2190	250	1275127.5	1275127.5	
Gl	1.56	1.70	2435	250	1614405.0	1614405.0	
F	2.53	1.70	1920	250	2064480.0	2064480.0	2064480.0
E	1.26	1.70	1900	250	1017450.0	1017450.0	
D	1.63	1.70	970	250	671967.5	671967.5	
D	1.00	1.70	1330	250	565250.0	565250.0	
C	3.52	1.70	890	250	1331440.0	1331440.0	1331440.0
C	3.79	1.70	1230	250	1981222.5	1981222.5	1981222.5
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	22526296.3	22526296.3	17382096.3

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES2250

SECTION: 2250
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P	1.96	1.70	240	250	199920.0	199920.0	
O							
N	4.30	1.70	390	250	712725.0	712725.0	712725.0
M							
L	2.54	1.70	530	250	572135.0	572135.0	572135.0
K	2.45	1.70	590	250	614337.5	614337.5	614337.5
J	3.87	1.70	470	250	773032.5	773032.5	773032.5
I	4.97	1.70	780	250	1647555.0	1647555.0	1647555.0
I	5.44	1.70	205	250	473960.0	473960.0	473960.0
H	3.98	1.70	220	250	372130.0	372130.0	372130.0
Ph	3.02	1.70	235	250	301622.5	301622.5	301622.5
Gu	0.78	1.70	540	250	179010.0		
Gl	0.89	1.70	220	250	83215.0		
F							
E	1.07	1.70	220	250	100045.0	100045.0	
D	1.00	1.70	230	250	97750.0	97750.0	
C	3.79	1.70	240	250	386580.0	386580.0	386580.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	6514017.5	6251792.5	5854077.5

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND2250

SECTION: 2250
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N	4.30	1.70	190	250	347225.0	347225.0	347225.0
M	4.85	1.70	370	250	762662.5	762662.5	762662.5
L	2.49	1.70	150	250	158737.5	158737.5	158737.5
K	4.32	1.70	160	250	293760.0	293760.0	293760.0
J	4.10	1.70	205	250	357212.5	357212.5	357212.5
I	5.44	1.70	195	250	450840.0	450840.0	450840.0
I	4.81	1.70	125	250	255531.3	255531.3	255531.3
H	3.98	1.70	250	250	422875.0	422875.0	422875.0
H	3.30	1.70	100	250	140250.0	140250.0	140250.0
Ph	3.02	1.70	440	250	564740.0	564740.0	564740.0
Gu							
Gu	0.78	1.70	70	250	23205.0		
Gl	0.89	1.70	340	250	128605.0		
F							
E	1.07	1.70	350	250	159162.5	159162.5	
D	1.00	1.70	330	250	140250.0	140250.0	
C	3.79	1.70	290	250	467117.5	467117.5	467117.5
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	4672173.8	4520363.8	4220951.3

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF2250

SECTION: 2250
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N	2.50	1.70	280	250	297500.0	297500.0	297500.0
M	4.07	1.70	680	250	1176230.0	1176230.0	1176230.0
L	2.47	1.70	490	250	514377.5	514377.5	514377.5
K	4.78	1.70	615	250	1249372.5	1249372.5	1249372.5
J	4.10	1.70	835	250	1454987.5	1454987.5	1454987.5
I	4.81	1.70	775	250	1584293.8	1584293.8	1584293.8
H	3.30	1.70	1820	250	2552550.0	2552550.0	2552550.0
Gu	1.37	1.70	1210	250	704522.5	704522.5	
Gl	1.56	1.70	1995	250	1322685.0	1322685.0	
F	2.53	1.70	1390	250	1494597.5	1494597.5	1494597.5
E	1.26	1.70	2500	250	1338750.0	1338750.0	
D	1.63	1.70	1545	250	1070298.8	1070298.8	
D	1.00	1.70	720	250	306000.0	306000.0	
C	3.79	1.70	660	250	1063095.0	1063095.0	1063095.0
C	3.52	1.70	1500	250	2244000.0	2244000.0	2244000.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	18373260.0	18373260.0	13631003.8

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES2500

SECTION: 2500
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N	4.30	1.70	390	250	712725.0	712725.0	712725.0
M	4.85	1.70	400	250	824500.0	824500.0	824500.0
L	2.54	1.70	480	250	518160.0	518160.0	518160.0
K							
J	3.87	1.70	580	250	953955.0	953955.0	953955.0
I							
H	2.66	1.70	190	250	214795.0	214795.0	214795.0
Gu							
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	3224135.0	3224135.0	3224135.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND2500

SECTION: 2500
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P	1.94	1.70	75	250	61837.5	61837.5	
O							
N	2.50	1.70	105	250	111562.5	111562.5	111562.5
M	4.85	1.70	140	250	288575.0	288575.0	288575.0
L	2.49	1.70	160	250	169320.0	169320.0	169320.0
K	4.32	1.70	930	250	1707480.0	1707480.0	1707480.0
J	4.10	1.70	430	250	749275.0	749275.0	749275.0
I	4.81	1.70	1340	250	2739295.0	2739295.0	2739295.0
I	5.44	1.70	50	250	115600.0	115600.0	115600.0
H	3.84	1.70	500	250	816000.0	816000.0	816000.0
H	3.98	1.70	250	250	422875.0	422875.0	422875.0
H	3.30	1.70	200	250	280500.0	280500.0	280500.0
Ph	3.02	1.70	440	250	564740.0	564740.0	564740.0
Gu	0.92	1.70	380	250	148580.0		
Gu	0.78	1.70	770	250	255255.0		
Gu							
Gl	0.89	1.70	510	250	192907.5		
F							
E	1.07	1.70	505	250	229648.8	229648.8	
D	1.00	1.70	500	250	212500.0	212500.0	
C	3.79	1.70	510	250	821482.5	821482.5	821482.5
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	9887433.8	9290691.3	8786705.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF2500

SECTION: 2500
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M	4.07	1.70	300	250	518925.0	518925.0	518925.0
L	2.47	1.70	410	250	430397.5	430397.5	430397.5
K	4.78	1.70	300	250	609450.0	609450.0	609450.0
J	4.10	1.70	395	250	688287.5	688287.5	688287.5
I	4.81	1.70	550	250	1124337.5	1124337.5	1124337.5
H	3.30	1.70	1170	250	1640925.0	1640925.0	1640925.0
Gu	1.37	1.70	730	250	425042.5	425042.5	
Gl	1.56	1.70	2190	250	1451970.0	1451970.0	
F	2.53	1.70	2450	250	2634362.5	2634362.5	2634362.5
E	1.26	1.70	2490	250	1333395.0	1333395.0	
D	2.04	1.70	1565	250	1356855.0	1356855.0	1356855.0
D	1.00	1.70	800	250	340000.0	340000.0	
C	3.52	1.70	1520	250	2273920.0	2273920.0	2273920.0
C	3.79	1.70	720	250	1159740.0	1159740.0	1159740.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	15987607.5	15987607.5	12437200.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES2750

SECTION: 2750
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M	4.85	1.70	550	250	1133687.5	1133687.5	1133687.5
L	2.54	1.70	505	250	545147.5	545147.5	545147.5
K	5.75	1.70	440	250	1075250.0	1075250.0	1075250.0
K	3.92	1.70	300	250	499800.0	499800.0	499800.0
J	3.87	1.70	620	250	1019745.0	1019745.0	1019745.0
I	5.34	1.70	1040	250	2360280.0	2360280.0	2360280.0
I	3.86	1.70	360	250	590580.0	590580.0	590580.0
H	3.84	1.70	380	250	620160.0	620160.0	620160.0
Gu	0.92	1.70	260	250	101660.0		
Gl							
F							
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	7946310.0	7844650.0	7844650.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND2750

SECTION: 2750
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M	4.85	1.70	150	250	309187.5	309187.5	309187.5
L	2.49	1.70	200	250	211650.0	211650.0	211650.0
K	4.32	1.70	300	250	550800.0	550800.0	550800.0
J	4.10	1.70	290	250	505325.0	505325.0	505325.0
I	4.81	1.70	380	250	776815.0	776815.0	776815.0
H	3.30	1.70	300	250	420750.0	420750.0	420750.0
H	3.84	1.70	300	250	489600.0	489600.0	489600.0
Gu	3.49	1.70	500	250	741625.0	741625.0	741625.0
Gu	0.92	1.70	300	250	117300.0		
Gl	1.83	1.70	570	250	443317.5	443317.5	
Gl	1.99	1.70	320	250	270640.0		
F	1.96	1.70	350	250	291550.0		
F	4.79	1.70	710	250	1445382.5	1445382.5	1445382.5
E	1.26	1.70	800	250	428400.0	428400.0	
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	7002342.5	6322852.5	5451135.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF2750

SECTION: 2750
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N	2.50	1.70	495	250	525937.5	525937.5	525937.5
M							
L	2.47	1.70	105	250	110223.8	110223.8	110223.8
K							
J	4.10	1.70	100	250	174250.0	174250.0	174250.0
I	4.81	1.70	600	250	1226550.0	1226550.0	1226550.0
H	3.30	1.70	1350	250	1893375.0	1893375.0	1893375.0
Gu	1.37	1.70	990	250	576427.5	576427.5	
Gl	1.56	1.70	1470	250	974610.0	974610.0	
F	2.53	1.70	2080	250	2236520.0	2236520.0	2236520.0
E	1.26	1.70	2500	250	1338750.0	1338750.0	
D	1.00	1.70	1800	250	765000.0	765000.0	
D	1.80	1.70	1440	250	1101600.0	1101600.0	
C	3.52	1.70	1330	250	1989680.0	1989680.0	1989680.0
C	3.79	1.70	1730	250	2786597.5	2786597.5	2786597.5
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	15699521.3	15699521.3	10943133.8

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES3000

SECTION: 3000
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I	5.34	1.70	595	250	1350352.5	1350352.5	1350352.5
H	4.54	1.70	295	240	546434.4	546434.4	546434.4
Gu	3.49	1.70	300	250	444975.0	444975.0	444975.0
Gl	1.83	1.70	300	250	233325.0	233325.0	
Gl	1.99	1.70	200	250	169150.0	169150.0	
F	1.96	1.70	250	250	208250.0	208250.0	
E	1.24	1.70	560	250	295120.0	295120.0	
E	1.32	1.70	570	250	319770.0	319770.0	
D	2.04	1.70	275	250	238425.0	238425.0	238425.0
C	3.40	1.70	260	250	375700.0	375700.0	375700.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	4181501.9	4181501.9	2955886.9

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND3000

SECTION: 3000
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M	4.85	1.70	245	250	505006.3	505006.3	505006.3
L	2.49	1.70	340	250	359805.0	359805.0	359805.0
K	4.32	1.70	505	250	927180.0	927180.0	927180.0
J	4.10	1.70	680	250	1184900.0	1184900.0	1184900.0
I	4.81	1.70	610	250	1246992.5	1246992.5	1246992.5
H	3.30	1.70	505	250	708262.5	708262.5	708262.5
H	3.84	1.70	300	250	489600.0	489600.0	489600.0
Gu	3.49	1.70	590	250	875117.5	875117.5	875117.5
Gu	0.92	1.70	210	250	82110.0		
Gl	1.99	1.70	150	250	126862.5	126862.5	
Gl	1.83	1.70	565	250	439428.8	439428.8	
F	4.79	1.70	140	250	285005.0	285005.0	285005.0
F	1.96	1.70	140	250	116620.0	116620.0	
E	1.26	1.70	190	250	101745.0	101745.0	
D	2.04	1.70	410	250	355470.0	355470.0	355470.0
C	3.40	1.70	395	250	570775.0	570775.0	570775.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	8374880.0	8292770.0	7508113.8

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF3000

SECTION: 3000
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N	2.50	1.70	300	250	318750.0	318750.0	318750.0
M	4.07	1.70	200	250	345950.0	345950.0	345950.0
L	2.47	1.70	230	250	241442.5	241442.5	241442.5
K	4.78	1.70	250	250	507875.0	507875.0	507875.0
J	4.10	1.70	250	250	435625.0	435625.0	435625.0
I	4.81	1.70	875	250	1788718.8	1788718.8	1788718.8
H	3.30	1.70	1260	250	1767150.0	1767150.0	1767150.0
Gu	1.37	1.70	1550	250	902487.5	902487.5	
Gl	1.56	1.70	1610	250	1067430.0	1067430.0	
F	2.53	1.70	1830	250	1967707.5	1967707.5	1967707.5
E	1.26	1.70	2550	250	1365525.0	1365525.0	
D	2.04	1.70	895	250	775965.0	775965.0	775965.0
D	1.00	1.70	1600	250	680000.0	680000.0	
C	3.79	1.70	910	250	1465782.5	1465782.5	1465782.5
C	3.52	1.70	1540	250	2303840.0	2303840.0	2303840.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	15934248.8	15934248.8	11918806.3

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES3250

SECTION: 3250
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I	3.83	1.70	395	250	642961.3	642961.3	642961.3
H							
Gu	3.49	1.70	250	250	370812.5	370812.5	370812.5
Gl	1.83	1.70	270	250	209992.5	209992.5	
F	1.88	1.70	30	250	23970.0	23970.0	
E							
D							
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	1247736.3	1247736.3	1013773.8

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND3250

SECTION: 3250
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I	4.81	1.70	175	250	357743.8	357743.8	357743.8
H							
Gu	3.49	1.70	180	250	266985.0	266985.0	266985.0
Gl	1.83	1.70	170	250	132217.5	132217.5	
F	4.79	1.70	640	250	1302880.0	1302880.0	1302880.0
E	1.26	1.70	760	250	406980.0	406980.0	
D	1.88	1.70	205	250	163795.0	163795.0	
C	3.40	1.70	280	250	404600.0	404600.0	404600.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	3035201.3	3035201.3	2332208.8

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF3250

SECTION: 3250
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M	4.07	1.70	50	200	69190.0	69190.0	69190.0
L	2.47	1.70	280	250	293930.0	293930.0	293930.0
K	4.78	1.70	530	250	1076695.0	1076695.0	1076695.0
J	4.10	1.70	550	250	958375.0	958375.0	958375.0
I	4.81	1.70	470	250	960797.5	960797.5	960797.5
H	3.30	1.70	1400	250	1963500.0	1963500.0	1963500.0
Gu	1.37	1.70	1310	250	762747.5	762747.5	
Gl	1.56	1.70	1420	250	941460.0	941460.0	
F	2.53	1.70	1670	250	1795667.5	1795667.5	1795667.5
E	1.26	1.70	1770	250	947835.0	947835.0	
D	1.80	1.70	1410	250	1078650.0	1078650.0	
D	1.00	1.70	800	250	340000.0	340000.0	
C	3.79	1.70	880	250	1417460.0	1417460.0	1417460.0
C	3.52	1.70	1395	250	2086920.0	2086920.0	2086920.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	14693227.5	14693227.5	10622535.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES3500

SECTION: 3500
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I	3.83	1.70	190	250	309272.5	309272.5	309272.5
H							
Gu							
Gl							
F							
E							
D	1.88	1.70	95	250	75905.0	75905.0	
C							
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	385177.5	385177.5	309272.5

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND3500

SECTION: 3500
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I	4.81	1.70	215	250	439513.8	439513.8	439513.8
H							
Gu							
Gl							
F							
E							
D	1.88	1.70	160	250	127840.0	127840.0	
C	0.84	1.70	180	250	64260.0		
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	631613.8	567353.8	439513.8

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF3500

SECTION: 3500
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L	2.47	1.70	100	175	73482.5	73482.5	73482.5
K	4.78	1.70	280	225	511938.0	511938.0	511938.0
J	4.10	1.70	390	250	679575.0	679575.0	679575.0
I	4.81	1.70	225	250	459956.3	459956.3	459956.3
H	3.30	1.70	790	250	1107975.0	1107975.0	1107975.0
Gu	1.37	1.70	1020	250	593895.0	593895.0	
Gl	1.56	1.70	1290	250	855270.0	855270.0	
F	2.53	1.70	1615	250	1736528.8	1736528.8	1736528.8
E	1.26	1.70	1100	250	589050.0	589050.0	
D	1.80	1.70	770	250	589050.0	589050.0	
C	3.52	1.70	990	250	1481040.0	1481040.0	1481040.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	8677760.5	8677760.5	6050495.5

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: MES3750

SECTION: 3750
RESOURCE TYPE: MEASURED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C	0.84	1.70	135	165	31808.7		
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	31808.7	0.0	0.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: IND3750

SECTION: 3750
RESOURCE TYPE: INDICATED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I							
H							
Gu							
Gl							
F							
E							
D							
C	0.84	1.70	120	200	34272.0		
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	34272.0	0.0	0.0

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF3750

SECTION: 3750
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I	4.81	1.70	605	250	1236771.3	1236771.3	1236771.3
H	3.30	1.70	560	250	785400.0	785400.0	785400.0
Gu	1.37	1.70	1200	250	698700.0	698700.0	
Gl	1.56	1.70	1270	250	842010.0	842010.0	
F	2.53	1.70	1560	250	1677390.0	1677390.0	1677390.0
E	1.26	1.70	890	250	476595.0	476595.0	
D	1.80	1.70	700	250	535500.0	535500.0	
C	3.52	1.70	820	250	1226720.0	1226720.0	1226720.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	7479086.3	7479086.3	4926281.3

LOST-FOX AREA : RESOURCE CALCULATIONS December 1984 FILE NAME: INF4000

SECTION: 4000
RESOURCE TYPE: INFERRED

SEAM NAME	SEAM THK (m)	SPEC GRAV (t/m3)	SEAM LENGTH (m)	INFLUENCE (m)	TOTAL TONNES SEAMS >=0.5m	TOTAL TONNES SEAMS >=1.0m	TOTAL TONNES SEAMS >=2.0m
P							
O							
N							
M							
L							
K							
J							
I							
H							
Gu	1.37	1.70	490	225	256772.3	256772.3	
Gl	1.56	1.70	700	250	464100.0	464100.0	
F							
E							
D	1.80	1.70	360	250	275400.0	275400.0	
C	3.52	1.70	830	250	1241680.0	1241680.0	1241680.0
B							
A							

	SEAMS >=0.5M:	SEAMS >=1.0M:	SEAMS >=2.0M:
TOTAL TONNES THIS SECTON:	2237952.3	2237952.3	1241680.0

LOST-FOX AREA: 1984 SPECULATIVE RESOURCE CALCULATIONS   Filename: SPECRES

AREA 1:   1:2500 MAP AREA
Specific Gravity: 1.70 t/m3
Section   Influence:250 m

		SECTION															TOTAL
		500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	TONNES
SEAM	THK(m)							seam	length(m)								
P	1.98																0
O	2.09				100		250	725	650	325							1820913
N	3.16	1200	1400	1500	250												5842050
M	4.38	280	413	525	250							50					2825757
L	2.71	1370	1513	1738	1950	1163	338	150				175					9671245
K	4.11	1463	1575	1263	1000	900	463	288				300					12667431
J	3.28	1553	1675	1475	1188	1050	950	450				420					12212834
I	5.04	1750	1738	1200	1050	125											12558546
H	3.58	2955	2000	2000	2275	113									300		14671825
Ph	3.02				2425												3112488
Gu	1.79	3825	3000	2225	2625	650											9376244
GI	1.35	3825	3300	2650	2625	1175											7788656
F	2.25	3738	3675	3550	3775	2420	1913	1105								950	20201738
E	1.21	3750	3788	3850	3850	2370	1925	1150						850	900	1125	12114702
D	1.64	3750	3788	2950	2950	750	625	550				575	1180	1625	1250	875	14544996
C	2.93	3600	3750	2925	2925	655	770	630				500	1245	1780	1485	800	26231191

AREA 1 TOTAL SPECULATIVE RESOURCE= 165640614 tonnes

AREA 2: 1:5000 MAP AREA

Tonnes of Coal= Area * [25% * Average Aggregate Seam Thk] * Specific Gravity
[(LF+HB)/2]

AREA = 42,050,000 m2
AVERAGE AGGREGATE SEAM THICKNESS = [25.90 + 44.52] / 2 = 35.21m
SPECIFIC GRAVITY = 1.70 tonnes/m3

AREA 2 SPECULATIVE RESOURCE = 42,050,000 m2 * [25% * 35.21m] * 1.70 t/m3 629246713 tonnes

----

LOST-FOX AREA TOTAL SPECULATIVE RESOURCE: 794887327 tonnes

APPENDIX D

LOST-FOX AREA
MEASURED SECTIONS DESCRIPTIONS

APPENDIX D

LOST-FOX AREA
MEASURED SECTIONS DESCRIPTIONS

KPNLROTC 84009

KPNLROTC 84010

KPNLROTC 84011

KPNLROTC 84012

KPNLROTC 84013

Descriptive Logs

(Stratigraphic logs are in Appendix I)

PROJECT: KPN BLOCK: LR DATA SOURCE: 0TC84009

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
* 90	0.00	5.00	5.00			CONGLOMERATE	SECTION A BEGINS 504950 E, 6344020 N; TOP ERODED
90	5.00	15.00	10.00			SANDSTONE	FG-.M.GY.MB.XBDG MEDIUM TO THICK BEDDED; WEATHERS GREY BROWN; SOME FRIABLE LAYERS (10 CM); BEDDING 035/28 E; SHALLOW TROUGH CROSS-BEDDED
90	15.00	16.00	1.00			COAL	BLK APPROXIMATE THICKNESS; NOT TRENCHED
90	16.00	35.00	19.00			OVERBURDEN	SILTSTONE AND THIN BEDDED SANDSTONE
90	35.00	36.52	1.52			COAL	BLK TRC84282
90	36.52	41.52	5.00			OVERBURDEN	SILTSTONE AND THIN BEDDED SANDSTONE
90	41.52	59.52	18.00			SANDSTONE	FG.LT.BN.MB WEATHERS GREY BROWN; MEDIUM TO THICK BEDDED; BEDDING 056/08 E
90	59.52	61.52	2.00			SANDSTONE	FG.LT.BN.MB THIN BEDDED, DARK GREY SILTSTONE; GOOD PARTING PARALLEL TO BEDDING; BEDDING 045/25 E
90	61.52	93.52	32.00			OVERBURDEN	CONGELIFRACTATE

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: LR DATA SOURCE: 0TC84009

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	93.52	94.52	1.00			SANDSTONE	MB WEATHERS GREY BROWN; SILTSTONE PARTINGS
90	94.52	97.52	3.00			SILTSTONE	DK.GY.THNB THIN BEDDED, GREY BROWN WEATHERING SANDSTONE
90	97.52	104.52	7.00			SANDSTONE	FG.GY WEATHERS GREY BROWN; MASSIVE
90	104.52	106.52	2.00			SANDSTONE	FG.GY WEATHERS GREY BROWN; MASSIVE; THIN, OCRE, WAVY SILTSTONE PARTINGS (<1 CM); BEDDING 012/14 E
90	106.52	112.52	6.00			SANDSTONE	FG.GY.THNB WEATHERS GREY BROWN; THIN TO THICK BEDDED; THIN BEDDED AT BASE; THIN SILTSTONE PARTINGS
90	112.52	125.52	13.00			SANDSTONE	FG.M.GY.XBDG WEATHERS GREY BROWN; SOME OCRE SILTSTONE BEDS (<10 CM); THIN BEDDED, DARK GREY SANDSTONE AND SILTSTONE TOWARDS BASE; SHALLOW TROUGH CROSS-BEDDING,WAVY BEDDING,OSCILLATION RIPPLE MARKS AND PENECONTEMPORANEOUS NECKING INDICATE TOPS UP; 030/20 E

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84009

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	125.52	145.52	20.00			OVERBURDEN	COVER CONSISTS OF THIN BEDDED, DARK GRE Y SILTSTONE
90	145.52	152.52	7.00			SANDSTONE	FG.GY.MB WEATHERS GREY BROWN; MEDIUM TO THICK BE DDED; SOME SUSPENDED PEBBLES TOWARDS BA SE; THIN BEDDED OCRE WEATHERING SILTSTO NE LENSES NEAR BASE; SHEAR ZONE; SEVERA L STRIKE-SLIP FAULT PLANES 042/72 E; SO ME PLANT FRAGMENTS; SUPRATENUOUS FOLDS
90	152.52	154.02	1.50			COAL	BLK APPROXIMATE THICKNESS; NOT TRENCHED
90	154.02	167.02	13.00			OVERBURDEN	CONGELIFRACTATE
90	167.02	177.02	10.00			OVERBURDEN	COARSE CLASTS; SECTION A ENDS 504855 E, 6344360 N

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84010

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
* 90	0.00	10.50	10.50			SANDSTONE	GY.MAS SECTION A BEGINS 507945 E, 6341885 N; WEATHERED GREEN; CLIFF; SOME UNITS WITH TREE BRANCHES
90	10.50	32.50	22.00			OVERBURDEN	ANGULAR FRAGMENTS OVERLYING FINE-GRAINED SANDSTONE AND SILTSTONE
90	32.50	66.50	34.00			OVERBURDEN	WITH SOLIFLUCTION
90	66.50	67.50	1.00			COAL	SPOIL NEAR SWAMP; APPROXIMATE THICKNESS
90	67.50	107.50	40.00			OVERBURDEN	CONGELIFRACTATE; BEDDING APPROXIMATES 080/20S
90	107.50	115.50	8.00			SANDSTONE	FG.GY.THNB WITH INTERBEDDED SILTSTONE; OCRE; LEDGES
90	115.50	123.50	8.00			OVERBURDEN	FINE GRAINED SANDSTONE WITH INTERBEDDED SILTSTONE.OCRE AND GREY, FINE GRAIN
90	123.50	124.50	1.00			COAL	MINOR SEAM; CARBONACEOUS MUDSTONE; APPROXIMATE THICKNESS
90	124.50	131.50	7.00			OVERBURDEN	SWAMP
90	131.50	132.50	1.00			COAL	MINOR CARBONACEOUS SHALE WITH COAL STRINGERS; APPROXIMATE THICKNESS

* DENOTES MEASURED BCA

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84010

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	132.50	140.00	7.50			SILTSTONE	DK.GY.THNB WITH INTERBEDDED FINE GRAINED SANDSTONE , MODERATELY BEDDED; SANDSTONE TOWARDS THE TOP
90	140.00	142.00	2.00			SANDSTONE	GY.THKB BROWN; WITH THIN BUFF YELLOW LAMINATED SILTSTONE PARTINGS
90	142.00	144.50	2.50			OVERBURDEN	DARK GREY SILTSTONE, THIN BEDDED
90	144.50	151.00	6.50			SANDSTONE	GREY BROWN COLOUR, THIN TO THICK BEDDED; SOME SILTSTONE PARTINGS
90	151.00	156.50	5.50			SANDSTONE	GY.MB WITH INTERBEDDED VERY FINE GRAINED SANDSTONE AND INTERBEDDED BUFF, MEDIUM BEDDED SILTSTONE
90	156.50	160.50	4.00			OVERBURDEN	SILTSTONE, THIN BEDDED; STRUCTURAL BENCH
90	160.50	164.50	4.00			SANDSTONE	GY BROWN; MEDIUM TO THICK BEDDED, WAVY SURFACES
90	164.50	168.00	3.50			SANDSTONE	VFG.THNB GOOD PARTINGS PARALLEL TO BEDDING

* DENOTES MEASURED BCA

FORM 4001

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 3

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84010

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	168.00	170.00	2.00			SILTSTONE	WITH INTERBEDDED DARK GREY, THIN BEDDED SHALE AND FINE GRAIN, OCRE SANDSTONE
90	170.00	177.00	7.00			SANDSTONE	FG.GY.RIPMK THIN TO MEDIUM BEDDED; SHALLOW TROUGH B EDS; GOOD PARTINGS PARALLEL TO BEDDING
90	177.00	178.00	1.00			COAL	CARBONACEOUS MUDSTONE WITH COAL STRINGE RS; APPROXIMATE THICKNESS
90	178.00	187.00	9.00			OVERBURDEN	FINE GRAINED, BROWN SANDSTONE WITH INTE RBEDDED OCRE SILTSTONE LAMINAE
90	187.00	197.50	10.50			SANDSTONE	FG.GY TROUGH BEDDED
90	197.50	232.50	35.00			OVERBURDEN	SWAMP
90	232.50	238.50	6.00			SANDSTONE	GY TROUGH BEDDED WITH INTERBEDDED GREY BRO WN, TROUGH BEDDED FINE GRAINED SANDSTON E, MODERATELY TO THICK BEDDED
90	238.50	240.50	2.00			OVERBURDEN	GREY, FINE GRAINED SANDSTONE WITH INTER BEDDED BUFF THIN BEDDED SILTSTONE

* DENOTES MEASURED BCA

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 4

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84010

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	240.50	242.50	2.00			SANDSTONE	MG.GY WITH INTERBEDDED BUFF SILTSTONE CLASTS AND FINE TO MEDIUM GRAINED, GREY, MEDIU M BEDDED SANDSTONE
90	242.50	243.50	1.00			COAL	CARBONACEOUS MUDSTONE WITH COAL STRINGE RS OVERLYING GREY MUDSTONE WITH INTERBE DDED FINE GRAINED, BUFF SANDSTONE; APPR OXIMATE THICKNESS
90	243.50	256.50	13.00			CONGLOMERATE	SOME LAYERS WITH PLANT STEMS; BEDDING O 85/19S
90	256.50	257.50	1.00			COAL	MINOR CARBONACEOUS MUDSTONE WITH COAL S TRINGERS; APPROXIMATE THICKNESS
90	257.50	297.50	40.00			OVERBURDEN	
90	297.50	300.50	3.00			SANDSTONE	FG-.GY.THNB
90	300.50	305.00	4.50			SANDSTONE	FG-.GY WITH INTERBEDDED GREY-BROWN, THIN BEDDE D CONGLOMERATE

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84010

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	305.00	319.00	14.00			CONGLOMERATE	GY.XBDG WITH SMALL CHERT PEBBLES, STRONGLY TROUGH BEDDED, WAVY, UNDULATING BEDDING; INTERBEDDED THICKLY TROUGH BEDDED, GREY-BROWN, FINE TO MEDIUM GRAINED SANDSTONES ; TOPS UP; BEDDING 110/14SW
90	319.00	339.00	20.00			SANDSTONE	FG.GY.THNB WITH INTERBEDDED GREY, THIN BEDDED SILTSTONE AND BUFF, THIN TO MEDIUM BEDDED SILTSTONE; FOSSIL TREES IN FOX CREEK

* DENOTES MEASURED BCA

NEWPAGE

FORM 4001

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84011

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
* 90	0.00	2.00	2.00			SILTSTONE	DK.GY.THNB SECTION A BEGINS 507830 E, 6341830 N; S TRATIGRAPHIC TOP
90	2.00	4.50	2.50			SANDSTONE	M.GY.THKB
90	4.50	24.50	20.00			OVERBURDEN	SILTSTONE, DARK GREY, THIN BEDDED WITH INTERBEDDED GREY-BROWN, THIN BEDDED SAN DSTONE; STEEP ATTITUDES OF BEDDING
90	24.50	54.50	30.00			OVERBURDEN	BEDDING 110/64S; VERY FOSSILIFEROUS; PL ANT FRAGMENTS; THIN BEDDED, DARK GREY S ILTSTONE WITH INTERBEDDED THICK BEDDED, OCRE SILTSTONE
90	54.50	89.50	35.00			OVERBURDEN	PART OF TIGER STRIPES UNIT
90	89.50	90.50	1.00			COAL	NOT TRENCHED; PART OF TIGER STRIPES UNI T
90	90.50	98.50	8.00			OVERBURDEN	PART OF TIGER STRIPES UNIT
90	98.50	122.50	24.00			OVERBURDEN	SCREE, PART OF TIGER STRIPES UNIT
90	122.50	131.50	9.00			SANDSTONE	M.GY.THKB PART OF TIGER STRIPES UNIT

* DENOTES MEASURED BCA

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84011

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	131.50	146.50	15.00			SANDSTONE	FG.GY.MB WITH INTERBEDDED OCRE SILTSTONE LAMINAE , MEDIUM TO THICK BEDDED; PART OF TIGER STRIPES UNIT
90	146.50	147.50	1.00			COAL	NOT TRENCHED
90	147.50	184.50	37.00			OVERBURDEN	BEDDING 125/46SW
90	184.50	204.50	20.00			CONGLOMERATE	GY MATRIX GREY SANDSTONE; SMALL CHERT PEBB LES; TROUGH BEDS; SANDSTONE LENSES; BED DING 122/27SW
90	204.50	224.50	20.00			SANDSTONE	FG.GY.MAS.XBDG TROUGH BEDDING
90	224.50	226.50	2.00			OVERBURDEN	COVER CONSISTS OF THINBEDDED SILTSTONE; CORE OF ANTICLINE; SECTION A ENDS 5077 50 E, 6341550 N

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 1

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84012

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
* 90	0.00	10.00	10.00			OVERBURDEN	SECTION A BEGINS 504280 E, 6342250 N; STRATIGRAPHIC TOP; UPSLOPE FROM CREEK
90	10.00	15.00	5.00			SANDSTONE	FG.GY.THNB WEATHERED WITH INTERBEDDED THIN TO MEDIUM BEDDED SILTSTONE, OCRE; BEDDING 115/17S
90	15.00	20.00	5.00			OVERBURDEN	SCREE; SANDSTONE WITH INTERBEDDED SILTSTONE
90	20.00	23.00	3.00			SANDSTONE	GY GREENISH WEATHERED; MASSIVE TO THICK BEDDED; INTERBEDDED THIN LENSES OF OCRE SILTSTONE
90	23.00	28.50	5.50			SILTSTONE	DK.GY.BIOTR THIN TO THICK BEDDED; INTERBEDDED GREY-BROWN; FINE GRAIN; THICK BEDDED SANDSTONE; WORM BURROWS (<50.0 MM DIAMETER); OSCILLATION RIPPLES
90	28.50	38.00	9.50			SANDSTONE	M.GY.THNB OCRE WEATHERED; THIN TO MEDIUM BEDDED; RIPPLE SURFACES
90	38.00	41.00	3.00			SANDSTONE	FG.M.GY.THNB INTERBEDDED DARK GREY, THIN BEDDED SILTSTONE

* DENOTES MEASURED BCA

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 2

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84012

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	41.00	55.00	14.00			OVERBURDEN	THIN BEDDED, MEDIUM GREY, FINE GRAINED SANDSTONE WITH INTERBEDDED DARK GREY SILTSTONE; TO TOP OF ESCARPMENT
90	55.00	73.00	18.00			OVERBURDEN	THIN BEDDED SANDSTONE WITH INTERBEDDED SILTSTONE; TO FOOT OF CLIFF
90	73.00	81.00	8.00			SANDSTONE	FG.GY.THNB THIN TO MEDIUM BEDDING; INTERBEDDED GREY TO OCRE, THIN TO MEDIUM BEDDED SILTSTONE; TIGER STRIPES UNIT
90	81.00	115.00	34.00			SANDSTONE	FG.GY.THKB INTERBEDDED THICK BEDDED, FINE GRAINED, OCRE SANDSTONE AND MEDIUM TO THICK BEDDED, GREY TO OCRE SILTSTONE; SOLE CURRENT MARKS
90	115.00	120.00	5.00			SILTSTONE	BF.MB INTERBEDDED THIN BEDDED DARK GREY SILTSTONE; CURRENT SOLE MARKS; BEDDING 102/43S
90	120.00	155.00	35.00			OVERBURDEN	THIN TO MEDIUM BEDDED, GREY SANDSTONE WITH INTERBEDDED THIN BEDDED, GREY TO OCRE SILTSTONE; THIS UNIT MAY BE FOLDED INTO A LARGE PARASITIC Z-FOLD, DOUBLING THE OUTCROP OF THE UNDERLYING COAL SEAM

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84012

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
90	155.00	177.00	22.00			OVERBURDEN	THIN TO MEDIUM BEDDED, GREY SANDSTONE W ITH INTERBEDDED THIN TO MEDIUM BEDDED, GREY TO OCRE SILTSTONE
90	177.00	179.12	2.12			COAL	TRC84249
90	179.12	196.12	17.00			OVERBURDEN	TIGER STRIPES LITHOLOGY; CONGELIFRACTAT E
90	196.12	202.12	6.00			SILTSTONE	DK.GY.THNB WITH INTERBEDDED OCRE SILTSTONE
90	202.12	204.82	2.70			SANDSTONE	FG.GY.THKB WITH INTERBEDDED THIN BEDDED, DARK GREY SILTSTONE AND THIN TO MEDIUM BEDDED, O CRE SILTSTONE; SOME BOUDINAGE STRUCTURE S IN THE OCRE
90	204.82	208.82	4.00			SANDSTONE	GY.THNB THIN TO MEDIUM BEDDED; INTERBEDDED DARK GREY SILTSTONE
90	208.82	214.32	5.50			SANDSTONE	FG.GY.THKB WITH INTERBEDDED DARK GREY, THIN BEDDED SILTSTONE AND THIN TO MEDIUM BEDDED, O CRE SILTSTONE; BEDDING300/85N; CLEAVAGE 053/24S; BEDDING SHOWS TOPS UPC LOSE T O ANTICLINAL HINGE; SECTION A ENDS 5041 40 E, 6343000 N

* DENOTES MEASURED BCA
NEWPAGE

FORM 4001

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84013

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
00	0.00	3.00	3.00			OVERBURDEN	SECTION A BEGINS 506405 E, 6344570 N; COVER CONSISTS OF FINE GRAINED SANDSTONE AND INTERBEDDED SILTSTONE
00	3.00	8.00	5.00			SANDSTONE	GY.THNB.XBDG SHALLOW TROUGH CROSS-BEDDING; THIN OCRE SILTSTONE LENSES
00	8.00	22.00	14.00			OVERBURDEN	COVER CONSISTS OF FINE GRAINED SANDSTONE AND INTERBEDDED SILTSTONE
00	22.00	24.50	2.50			SILTSTONE	GY.THNB HEMATITE SPOTTED; WELL DEVELOPED CLEAVAGE; GOOD PARTING PARALLEL TO BEDDING
00	24.50	45.50	21.00			SANDSTONE	FG.GY.MB.RIPMK WEATHERS PURPLISH GREY; INTERBEDDED SILTSTONE
00	45.50	49.70	4.20			SILTSTONE	THNB INTERBEDDED FINE GRAINED SANDSTONE; UNIT GRADES INTO MORE MASSIVE SANDSTONE TOWARDS TOP
00	49.70	60.30	10.60			OVERBURDEN	COVER CONSISTS OF SILTSTONE AND INTERBEDDED FINE GRAINED, DARK GREY SANDSTONE

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84013

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
00	60.30	63.80	3.50			SILTSTONE	GY.THNB THICK BEDDED, OCRE SILTSTONE; BOUDINAGED
00	63.80	70.30	6.50			SANDSTONE	FG.M.GY WEATHERS GREY-BROWN, HEMATITE SPOTTED; INTERBEDDED THIN OCRE SILTSTONE LENSES
00	70.30	92.13	21.83			OVERBURDEN	COVER CONSISTS OF SILTSTONE AND THIN BEDDED, DARK GREY SHALE
00	92.13	126.63	34.50			SILTSTONE	M.GY.THNB WEATHERS DARK GREY; THINLY LAMINATED, MEDIUM GREY,FINE GRAINED SANDSTONE; THIN TO MEDIUM BEDDED, OCRE WEATHERED, DARK GREY SILTSTONE CONTAINING BIVALVES NEAR TOP OF UNIT; TIGERSTRIPES LITHOLOGY
00	126.63	131.24	4.61		M	COAL	BLK TRC82031
00	131.24	196.24	65.00			OVERBURDEN	COVER CONSISTS OF INTERBEDDED SILTSTONE, SHALE AND THIN BEDDED, FINE GRAINED SANDSTONE; UNIT IS A LARGE SCREE SLOPE REPRESENTING A POSSIBLE FRACTURE ZONE
00	196.24	198.04	1.80		J	COAL	BLK TRC82032, COAL AND INTERBEDDED MUDSTONE ; COVERED

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84013

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
00	198.04	199.04	1.00			SANDSTONE	FG.GY
00	199.04	202.04	3.00			SILTSTONE	THIN BEDDED, GREY SHALE; MEDIUM BEDDED, OCRE SILTSTONE
00	202.04	205.04	3.00			SANDSTONE	GY.MB WEATHERS GREY-GREEN; THIN BEDDED, OCRE SILTSTONE; COMPETENT UNIT
00	205.04	208.04	3.00			SILTSTONE	DK.GY THIN BEDDED OCRE SILTSTONE; LAMINATED
00	208.04	214.04	6.00			SANDSTONE	FG.MB THIN TO MEDIUM BEDDED, OCRE SILTSTONE; SANDSTONE IS THIN BEDDED TOWARDS TOP OF UNIT
00	214.04	218.54	4.50			SANDSTONE	GY.THNB MEDIUM BEDDED, OCRE SILTSTONE; TIGERSTR IPES LITHOLOGY
00	218.54	225.54	7.00			SILTSTONE	DK.GY DARK GREY SHALE; VERY THIN BEDDED, OCRE SILTSTONE WITH PARALLEL LAMINAE; RECES SIVE UNIT

* DENOTES MEASURED BCA

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84013

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
00	225.54	231.04	5.50			OVERBURDEN	COVER CONSISTS OF SHALE AND THIN BEDDED SILTSTONE
00	231.04	234.54	3.50			SANDSTONE	FG.GY.THNB SOME NODULAR WEATHERING SANDSTONE
00	234.54	239.54	5.00			SANDSTONE	FG.GY.THNB SANDSTONE THIN TO MEDIUM BEDDED WITH SO ME WAVY BEDDING
00	239.54	244.04	4.50			SANDSTONE	GY.THNB
00	244.04	247.54	3.50			SANDSTONE	FG.GY.THNB THIN TO MEDIUM BEDDED; THIN BEDDED SILT STONE SHOWS WAVY BEDDING; GOOD PARTING PARALLEL TO BEDDING
00	247.54	251.54	4.00			SANDSTONE	THIN BEDDED, GREY SILTSTONE
00	251.54	255.54	4.00			SANDSTONE	LT.BN.THKB INTERBEDDED GREY SANDSTONE; CLAYEY; FRI ABLE; DECOMPOSES RAPIDLY TO BUFF-BROWN SOIL

* DENOTES MEASURED BCA

FORM 4001

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 5

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84013

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
00	255.54	263.04	7.50			SANDSTONE	FG.DK.GY.MB MEDIUM TO THICK BEDDED; THIN BEDDED, DA RK GREY SILTSTONE; UNIT DISPLAYS UNDULA TING BEDDING
00	263.04	270.04	7.00			SILTSTONE	DK.GY.THNB INTERBEDDED OCRE SILTSTONE GIVES BANDED APPEARANCE
00	270.04	275.05	5.01		I	COAL	BLK TRC83092; SECTION A ENDS 506120 E, 6344 390 N
00	275.05	276.05	1.00			MUDSTONE	SECTION B BEGINS 505690 E, 6344350 N
00	276.05	280.05	4.00			SANDSTONE	FG.GY.THKB WEATHERS GREY BROWN; SINGLE LAYERS OF S PACED DARK GREY CHERT PEBBLES AND SOME RIP-CLASTS; LAMINATED OCRE SILTSTONE BE DS, SOME BROKEN UP IN SITU
00	280.05	283.05	3.00			OVERBURDEN	COVER CONSISTS OF FINE GRAINED, THIN BE DDED, GREY SILTSTONE
00	283.05	286.05	3.00			SANDSTONE	FG.GY WEATHERS GREY BROWN; WEATHERED ORANGE B ROWN SANDSTONE LAMINAE; UNIT THIN TO ME DIUM BEDDED

* DENOTES MEASURED BCA

84/12/07 GULF CANADA RESOURCES INC. - COAL DIVISION - DESCRIPTIVE LOG PAGE 6

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84013

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
00	286.05	290.05	4.00			SILTSTONE	DK.GY THIN BEDDED, OCRE SILTSTONE LAMINAE; TH IN BEDDED, FINE GRAINED, MEDIUM BROWN S ANDSTONE
00	290.05	319.05	29.00			OVERBURDEN	
00	319.05	320.43	1.38		H	COAL	BLK TRC84289
00	320.43	333.43	13.00			OVERBURDEN	
00	333.43	334.93	1.50			SILTSTONE	DK.GY.THNB INTERBEDDED, OCRE WEATHERING SILTSTONE
00	334.93	336.93	2.00			SANDSTONE	BN INTERBEDDED, FINE GRAINED, FRIABLE, ORA NGE BROWN WEATHERING SANDSTONE
00	336.93	347.43	10.50			SILTSTONE	DK.GY.THKB NODULAR WEATHERING, FEW OCRE BANDS
00	347.43	356.43	9.00			SANDSTONE	FG.DK.GY.THKB THICK BEDDED (<40 CM),FINE GRAINED, BOU DINAGED, OCRE SANDSTONE; CLIFF FORMING (NEAR DEPOSITIONAL WEDGE)

* DENOTES MEASURED BCA

FORM 4001

PROJECT: KPN BLOCK: LR DATA SOURCE: OTC84013

BCA	DEPTH FROM	DEPTH TO	INTRVAL THICK.	SAMP. ID	SEAM ID	LITHOLOGY	DESCRIPTION
00	356.43	385.43	29.00			OVERBURDEN	FROST SHATTERED; SCREE CONSISTS OF SAND STONE AND THIN TO THICK BEDDED, GREY SI LTSTONE
00	385.43	389.25	3.82		G	COAL	BLK TRC84288
00	389.25	404.25	15.00			OVERBURDEN	SCREE CONSISTS OF THIN BEDDED, DARK GRE Y SILTSTONE
00	404.25	411.25	7.00			SANDSTONE	GY.MB WEATHERES GREY BROWN; THIN BEDDED, ORAN GE WEATHERING SANDSTONE; THIN OCRE SILT STONE LENSES INFILLING GREY SANDSTONE R IPPLES; LEDGE FORMING; TOPS UP INDICATE D

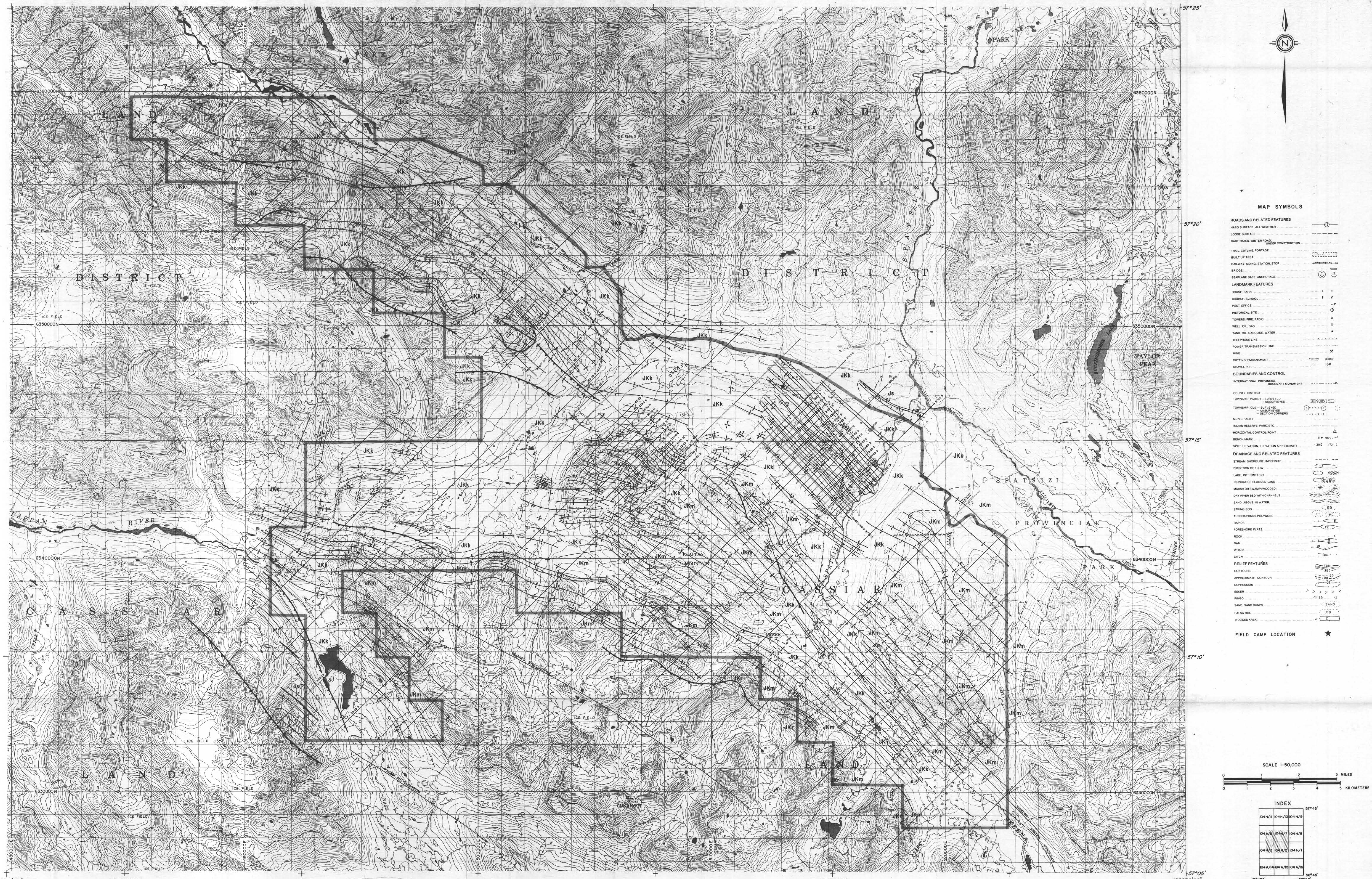
-854- NOW IN CONTACT WITH SYSTEM 2000 -
***** GEX - 03.01 - COCC COAL/21 ALLOCATED.
-855- NO LONGER IN CONTACT WITH SYSTEM 2000 -

FORM 4001

APPENDIX E

MOUNT KLAPPAN PROPERTY

1:50000 GEOLOGY MAP



LEGEND

- LICENCE BOUNDARY
- GEOLOGICAL CONTACT (APPROXIMATE
- ANTICLINE(DEFINED) ARROW INDICATES PLUNGE DIRECTION
- SYNCLINE (DEFINED) ARROW INDICATES PLUNGE DIRECTION
- OVERTURNED ANTICLINE (DEFINED)
- OVERTURNED SYNCLINE (DEFINED)
- MONOCLINE (DEFINED)
- THRUST FAULT (DEFINED) TEETH INDICATE UPTHRUST SIDE
- FAULT (DEFINED) UPTHROWN, DOWNTHROWN SIDE
- FAULT (DEFINED) SHOWING RELATIVE MOVEMENT
- 3000 N — CROSS SECTION LINE

TABLE OF FORMATIONS

RHONDDA SEQUENCE

JKr Sequence of thick massive conglomerates and minor gritty sandstones interbedded with an increasing abundance of siltstones and mudstones towards the basal contact.

MALLOCH SEQUENCE

JKm Thick interbeds of mudstones, argillaceous siltstones, fine grained argillaceous sandstones and thin beds of orange weathering siliceous nodular siltstones. Conglomerate beds tend to be laterally discontinuous. Thick clean sandstone beds and thin coal seams increase in abundance towards the basal gradational contact. Sequence can contain petrified wood and plant fossils. Bivalves are rare.

KLAPPAN SEQUENCE (main coal-bearing unit)

JKk Sequence of 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. Several species of pelecypods and plants are common. Belemnites and ammonites are rare.

SPATSIZI SEQUENCE

Js Predominantly a marine sequence comprised of beds of mudstones, siltstones and lesser amounts of sandstones and conglomerates. The upper contact is defined as the first occurrence of a non-marine bed. Discontinuous massive conglomerate beds lie in the upper portion of the sequence. Bivalves are abundant and belemnites are rare.

GR-MOUNT KLAPPAN 84(2)A

709

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

MOUNT KLAPPAN COAL PROPERTY

1984

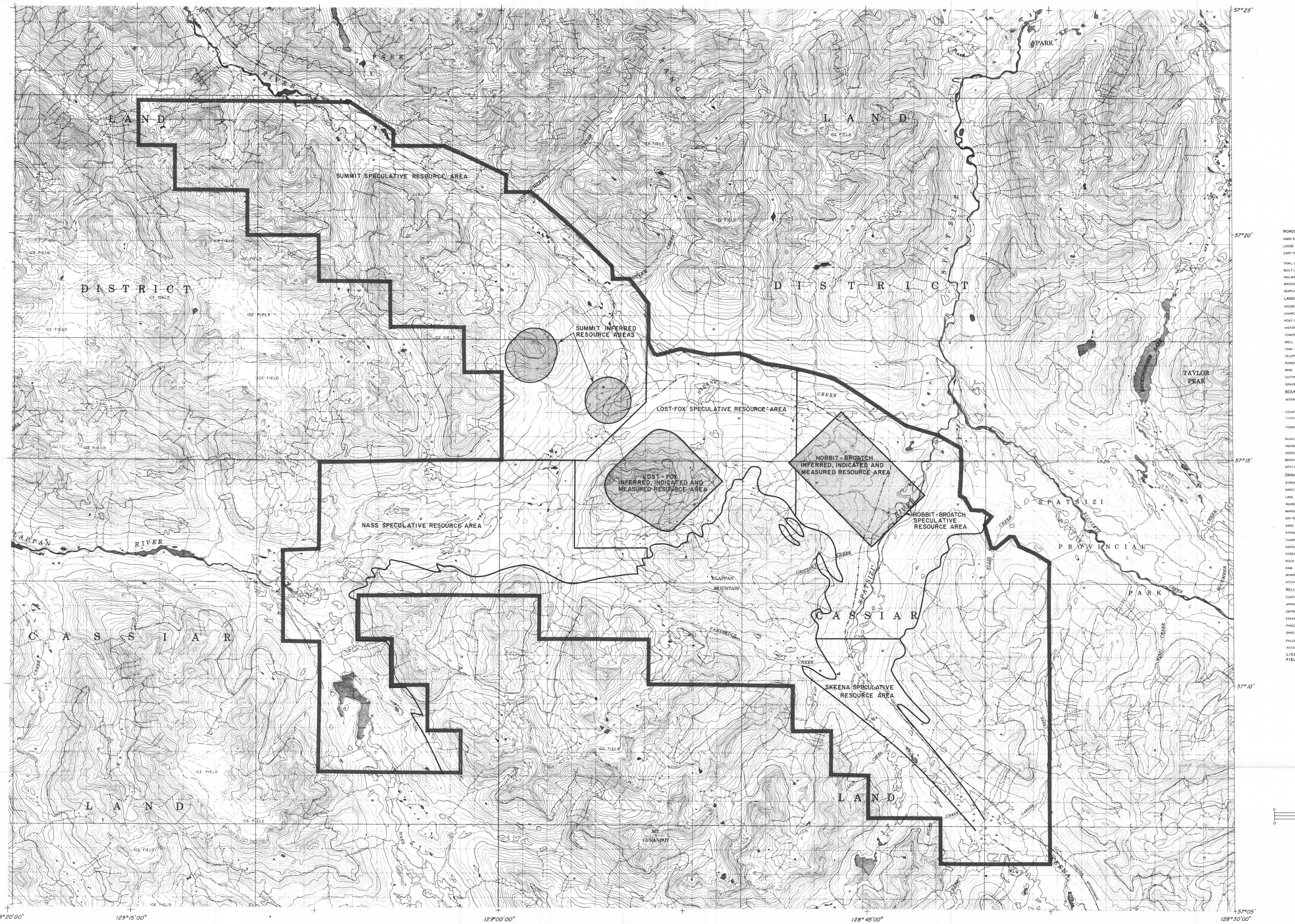
REGIONAL GEOLOGY MAP

PREPARED BY: 1984 GEOLOGICAL STAFF
APPROVED BY: DATE: DEC. 1984
DRAWING No. KPN 84 A001

APPENDIX F

MOUNT KLAPPAN PROPERTY

1:50000 COAL RESOURCE MAP



GR-MOUNT KLAPPAN 84(7)A

709

GULF CANADA RESOURCES INC.
Coal Division

CALGARY ALBERTA

Gulf

MOUNT KLAPPAN COAL PROPERTY

1984

COAL RESOURCE AREA MAP

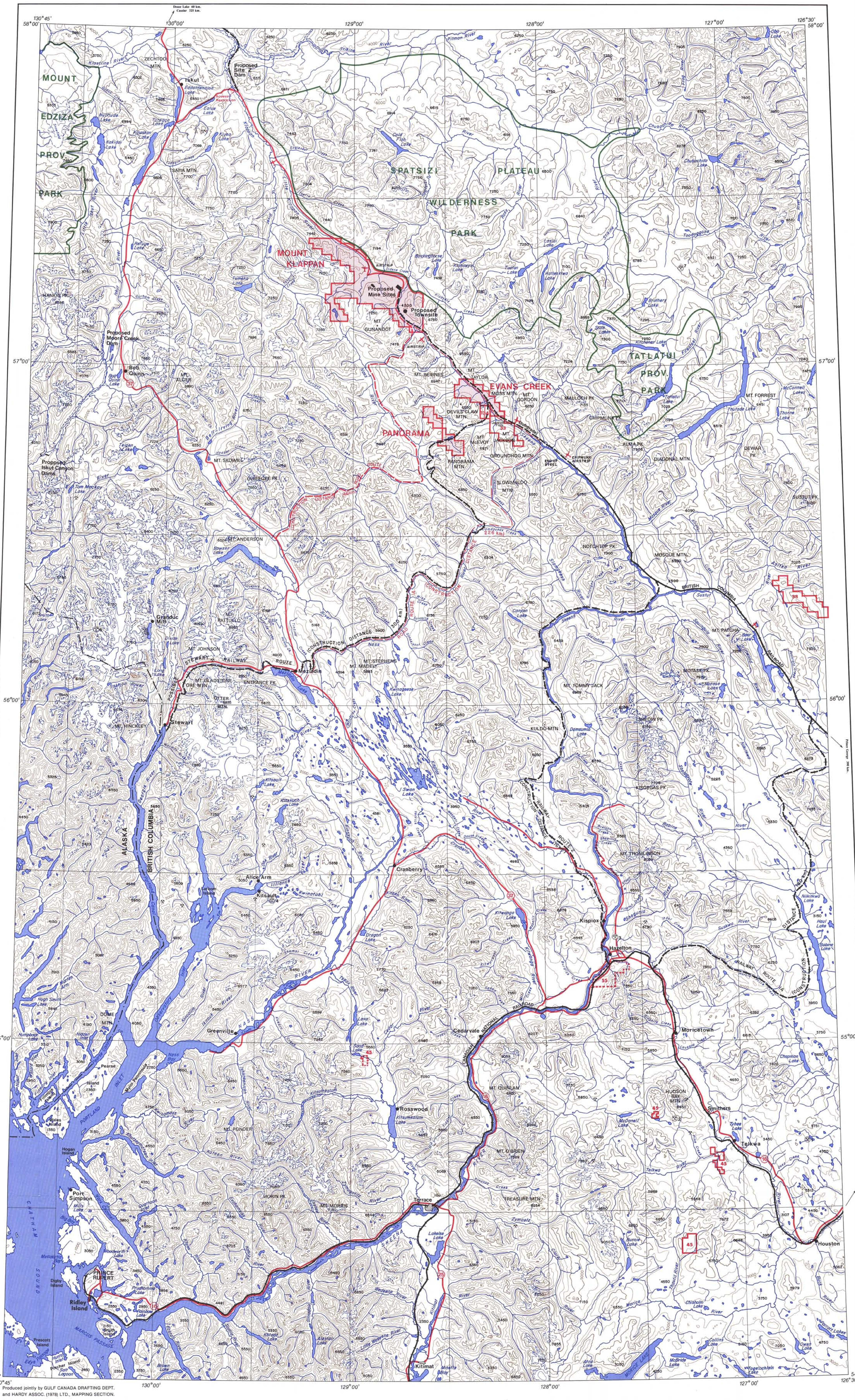
PREPARED BY: K. J.

APPROVED BY: G.S., E.S., V.L.D. DATE: FEB., 1985

DRAWING No. KPN84A02

APPENDIX G

REGIONAL MAP
NORTHWEST BRITISH COLUMBIA
1:500 000



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

Revised to June, 1984

LEGEND

- Highway
- Road, possible
- Road, alternate
- Railway
- Possible Railway Route
- Proposed Dam Site
- Proposed Pits, Mt. Klappan property
- Proposed Townsite, Mt. Klappan property
- Boundary, Park or Reserve
- Boundary, International
- Spot Elevation (feet above sea level) · 6750
- Contours (1000 Foot Interval) 2000
- Mine (see separate list) 4
- Prospect
- City, Town

COAL PROPERTIES

- GULF CANADA RESOURCES INC.
- 33 SUNCOR INC.
- 134 GROUNDHOG COAL LTD.
- 45 SHELL CANADA RESOURCES LTD.
- 55 D. GROOT LOGGING LTD.
- COAL LICENCES UNDER APPLICATION

MINES

1 DOME MOUNTAIN — Ag, Pb, Zn
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

GULF CANADA RESOURCES INC.

NORTHWEST BRITISH COLUMBIA

709

SCALE 1: 500,000

GR-MOUNT KLAPPAN 84 (2)A

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