PR-QUINTE = 85(1)A

617

Section 4 and Table 2.3.1 of this report contain coal quality data, and remain confidential under the terms of the *Coal Act Regulation*, Section 2(1). They have been removed from the public version.

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CONFIDENTIAL

1983 QUINTETTE GEOLOGICAL REPORT

APRIL 1984

D. Johnson
Quintette Coal Ltd.

TITLE PAGE

1983 QUINTETTE GEOLOGICAL REPORT

Submitted April 15, 1984.

For work performed on Coal Licence numbers:
3618, 3660, 3346 in the Peace River Land District.

Located between latitudes 54°59'N and 55°01'W and between longitudes 121°07'30"W and 121°09'W.

NTS map sheets 93-I-14-J, 93-P-3-B.

Work conducted between August 14, 1983 and October 30, 1983.

Owner/Operator - Quintette Coal Limited.

Report by D. Johnson, Geologist.

APPENDIX 12

1983 DUPONT LICENCES GEOLOGICAL REPORT

Prepared October 31, 1983.

Submitted March 1, 1985.

Work performed on Coal Licences numbers 3916, 3917, 3920, 3922, and 3923 in the Peace River Land District located between latitudes 54°59'N and 55°05'N and between longitudes 121°03'W and 121°11'W.

NTS map sheets 93-P-3-A and B and 93-I-14-I.

Work conducted during August, 1983.

Owner/Operator - Quintette Coal Limited.

Report by D. Lortie, Geologist.

QUINTETTE COAL LIMITED

This report documents 1983 geological investigations on licences 3618, 3660, and 3346 in the Peace River District of Northeast British Columbia. The licences are covered by NTS Map Sheets 93-I-14 and 93-P-3 between latitudes 54°59'N and 55° 01'N and between Longitudes 121°07'30"W and 121°09'00"W. The licences are owned by Quintette Coal Ltd., a company with the following shareholders:

Denison Mines Ltd.	50.00%
Mitsui Mining Co.	12.50%
Tokyo Boeki	10.49%
Charbonnages de France and Minersa	12.01%
Sumitomo Corp.	5.00%
Nippon Steel Corp.	3.84%
Nippon Kokan Kabushiki Kaisha	1.62%
Kawasaki Steel Corporation	1.50%
Sumitomo Metal Ind.	1.49%
Kobe Steel Ltd.	0.88%
Nisshin Steel Co. Ltd.	0.29%
Nakayoma Steel Works Ltd.	0.20%
Mitsubishi Chemical Ind. Ltd.	0.11%
Godo Steel Ltd.	0.07%

This report was prepared by Quintette Coal Ltd. Geological staff.

Geological discussions are based on all geologic work to date, over the last thirteen years.

This report is submitted April 15, 1984 to support expenditures applied to the licences and grouped licences as a result of the geologic work.

STATEMENT OF QUALIFICATIONS

I, David G.S. Johnson, graduated from Mount Allison University, Sackville, New Brunswick, with a Bachelor of Science in Geology in May 1970. I have worked in Mineral Exploration for six years, managing field exploration programs and writing reports and recommendations on those programs. I have worked in Coal Exploration and mine development for the last six years in Northeast British Columbia. I am responsible for long range geological budgets, planning, interpretations, and reporting for the Geology Department, Quintette Coal Ltd.

David G.S. Johnson
Quintette Coal Limited
Tumbler Ridge, B.C.

PREFACE

This report documents the exploration and development work completed during 1983 on Quintette Coal Limited's coal licences. The work was completed by Quintette Coal staff, contractors and consultants with technical assistance from Denison Mines (Coal Division) staff and I. Kakizaki, Mitsui Mining Company.

The text provides a regional assessment of the geology and detail geology in areas of concentrated investigations (Hermann). Initial indications are that the coal quality is similar to surrounding mine areas.

This report references all previous geologic assessment reports and feasibility studies written over the past thirteen years on Quintette Coal Limited's licences.

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1.0 INTRODUCTION

1.1 LOCATION AND ACCESS

The Quintette property is located in the Rocky Mountain foothills belt of northeastern British Columbia. The coalbearing trend of this region is commonly referred to as the Peace River Coal Block (See location maps, Figures 1.1.1 and 1.1.2).

Air distances to communities surrounding the property are as follows:

The City of Prince George, B.C.	(pop. *71,100)	- 160 km southwest
The City of Dawson Creek, B.C.	(pop. *13,800)	- 106 km northeast
The Village of Chetwynd, B.C.	(pop. * 2,200)	- 98 km north
The Town of Tumbler Ridge, B.C.	(pop. **3,000)	- 20 km east

(* - 1979 Census)

(** - estimate)

The property is accessible by three routes: the Boundary Road (Heritage Highway) from Tupper B.C.; the Fellers Heights Road (Heritage Highway) from Dawson Creek/Fellers Heights; and the road from Chetwynd to the Wolverine River Valley and Tumbler Ridge. The distances for these routes are as follows.

Boundary Rd - Dawson Creek to Tumbler Ridge	210 km
Fellers Heights Road - Dawson Creek to Tumbler Ridge	127 km
Chetwynd to Tumbler Ridge	100 km
Tumbler Ridge to Plantsite	17 km
Plantsite to Hermann Exploration Area	10 km

Access within the property is gained by several existing roads and trails as well as access recently developed for the mine. Figure 1.1.3 shows the main access routes on the Quintette property.

130° 128° 126° 124° 122° 120° 118° 116° 114°

55° 53° 51° 49°

BRITISH COLUMBIA

ALBERTA

Pacific Ocean

U.S.A.

Prince Rupert

Tokyo 7111 km 3838 nmi.

Terrace

Skeena River

Bulkley River

Williston Lake

Dawson Creek

Chetwynd

Peace River

Tumbler Ridge

QUINTETTE

Anzac

Parsnip River

MONKMAN

BELCOURT

SAXON

Wapiti River

Smoky River

Grande Prairie

Valleyview

Lesser Slave Lake

WHITECOURT

Whitecourt

Athabasca River

Prince George

Grande Cache

B.C. ALTA.

WILLMORE PROV. PARK

Edson

Hinton

WILDHAY

COALSPUR

SEABOLT

JASPER

Red Pass

Jasper

NATIONAL PARK

EDMONTON

TWEEDSMUIR PROV. PARK

BOWRON LAKE

WELLS GRAY PROV. PARK

Fraser River

North Thompson River

Columbia River

BANFF NATIONAL PARK

YOHO

Golden

GLACIER

REVELSTOKE

Revelstoke

CALGARY

KOOTENAY

Kamloops

Sparwood

Fort Steele

Cranbrook

Kootenay River

Kootenay Lake

Penticton

Trail

GARIBALDI

STRATHCONA

VANCOUVER

Roberts Bank

Hope

MANNING

Okanagan River

VICTORIA

LEGEND

Denison Mines properties

Major roads

Major rail

Distances shown in kilometres between points

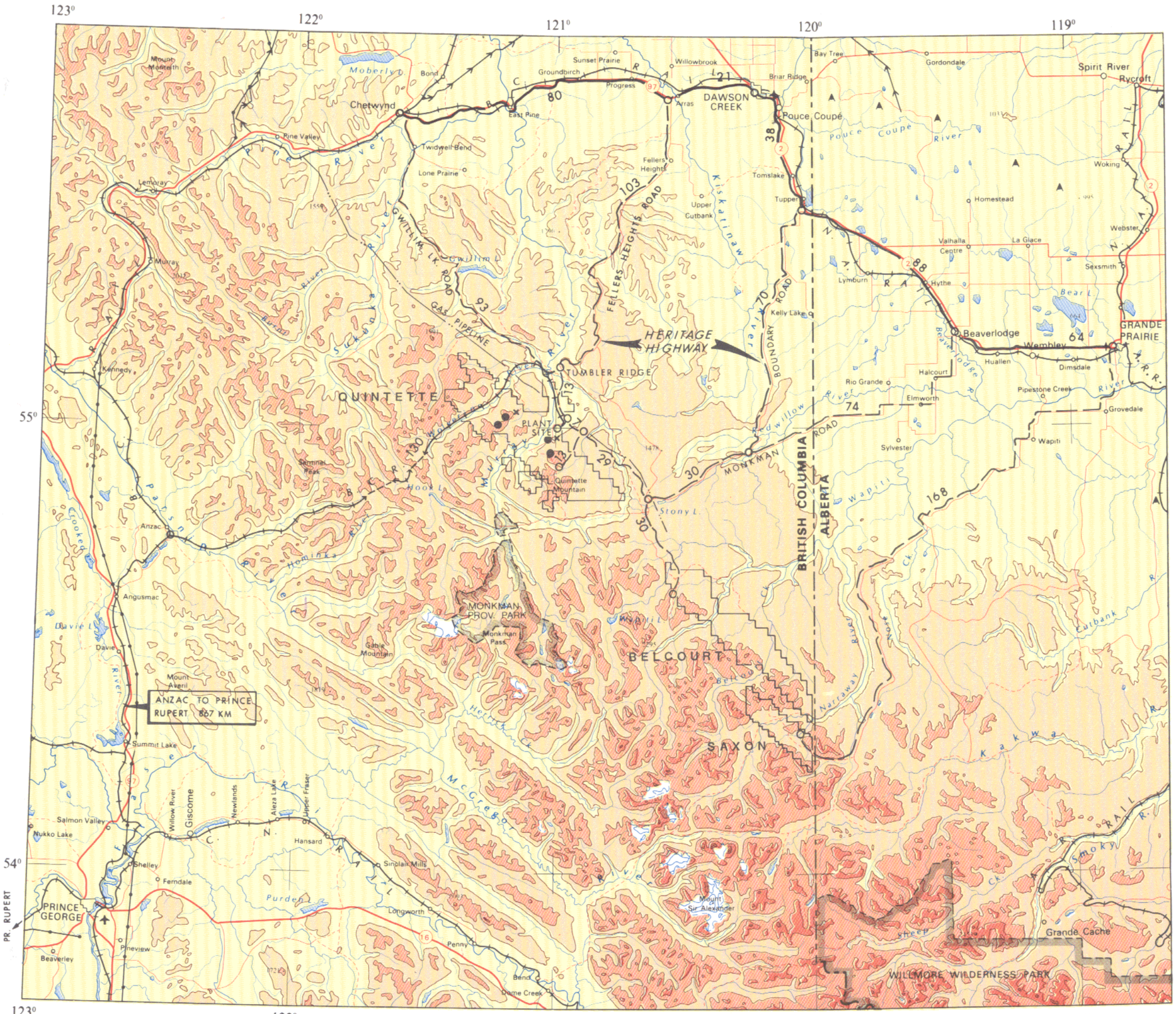
QUINTETTE COAL LIMITED

LOCATION MAP

FIGURE I.1.1

0 50 100 miles

0 50 100 150 200 km



HYPSOMETRIC TINTS

Feet	Metres
9843	3000
8202	2500
6562	2000
4921	1500
3281	1000
1640	500

REFERENCE

- Town, population 5,000 - 25,000 — GRANDE PRAIRIE
- Town, population 500 - 5,000 — Jasper
- Town, population under 500 — Kinuso
- Contours (in metres)
- Power line
- Pipeline
- Elevation (in metres) — 1449.
- Railway
- Main highway — 2
- Secondary road
- Other roads
- Track or trail
- Provincial boundary
- Gas or oil field
- Airport

SCALE 1:1,000,000

Kilometres 10 5 0 10 20 30 40 50 60

1 Millimetre = 1 Kilometre

Statute Miles 10 5 0 10 20 30 40

1 Inch = 15.78 Statute miles

APPROXIMATE DISTANCE (in km) BETWEEN POINTS — 15

PAVED ROAD

ALL WEATHER ROAD

DENISON MINES PROPERTIES

PIT LOCATION

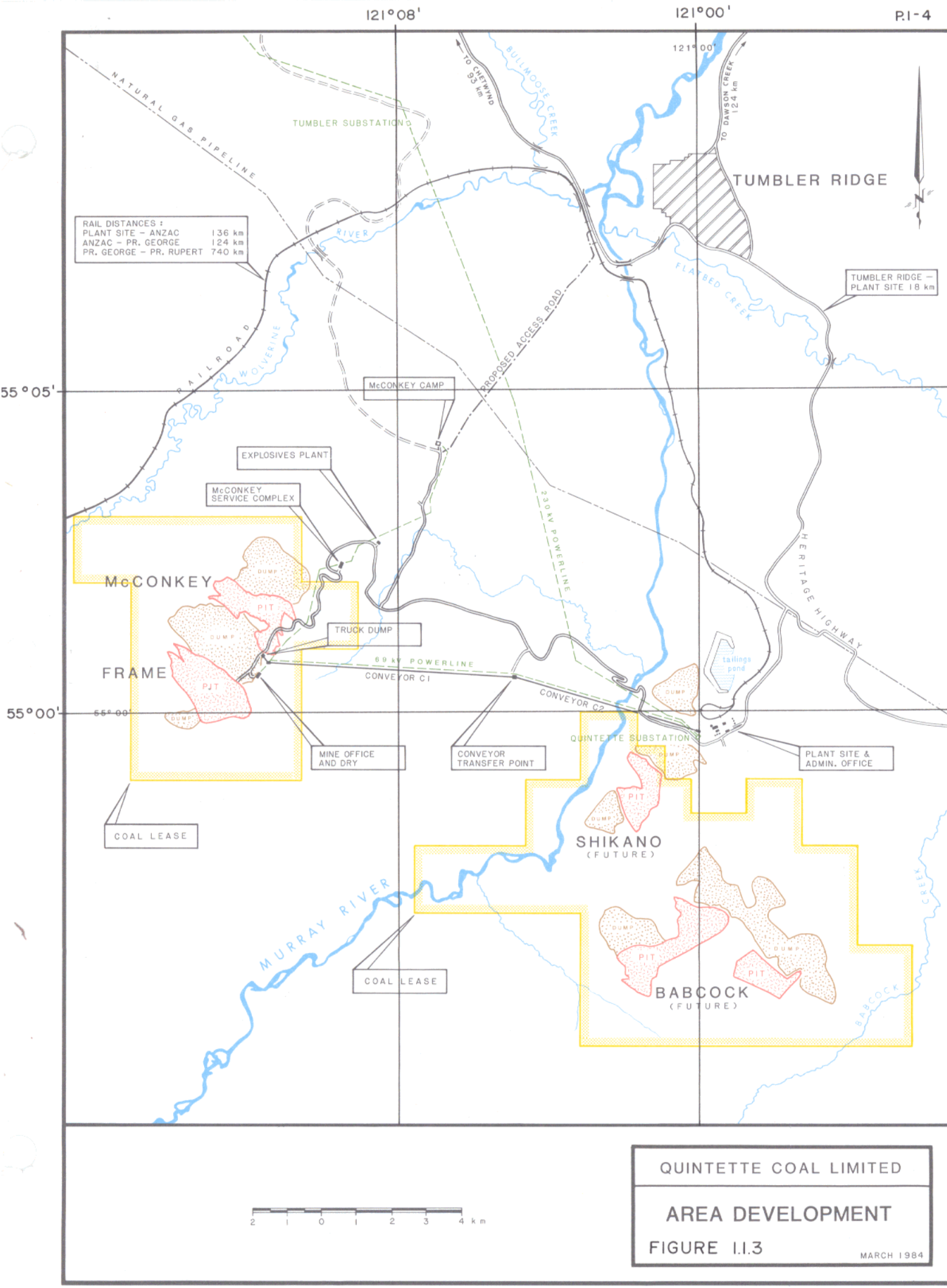
CONSTRUCTION CAMP

DENISON MINES LIMITED
(COAL DIVISION)
VANCOUVER BRITISH COLUMBIA

NORTHEAST B.C. PROPERTIES

FIGURE 1.1.2 OCTOBER 1982

Map information obtained from Department of Energy, Mines and Resources, Ottawa.



QUINTETTE COAL LIMITED

AREA DEVELOPMENT

FIGURE 1.1.3

MARCH 1984

1.2 PROPERTY DESCRIPTION

The Quintette property consists of 156 coal licences covering an area of 37,912 paying hectares and Coal Lease #6 consisting of 11,667 paying hectares. The location of the coal licences are illustrated on the following page (Figure 1.2.1), and legal descriptions of the licences are provided in Appendix 1.

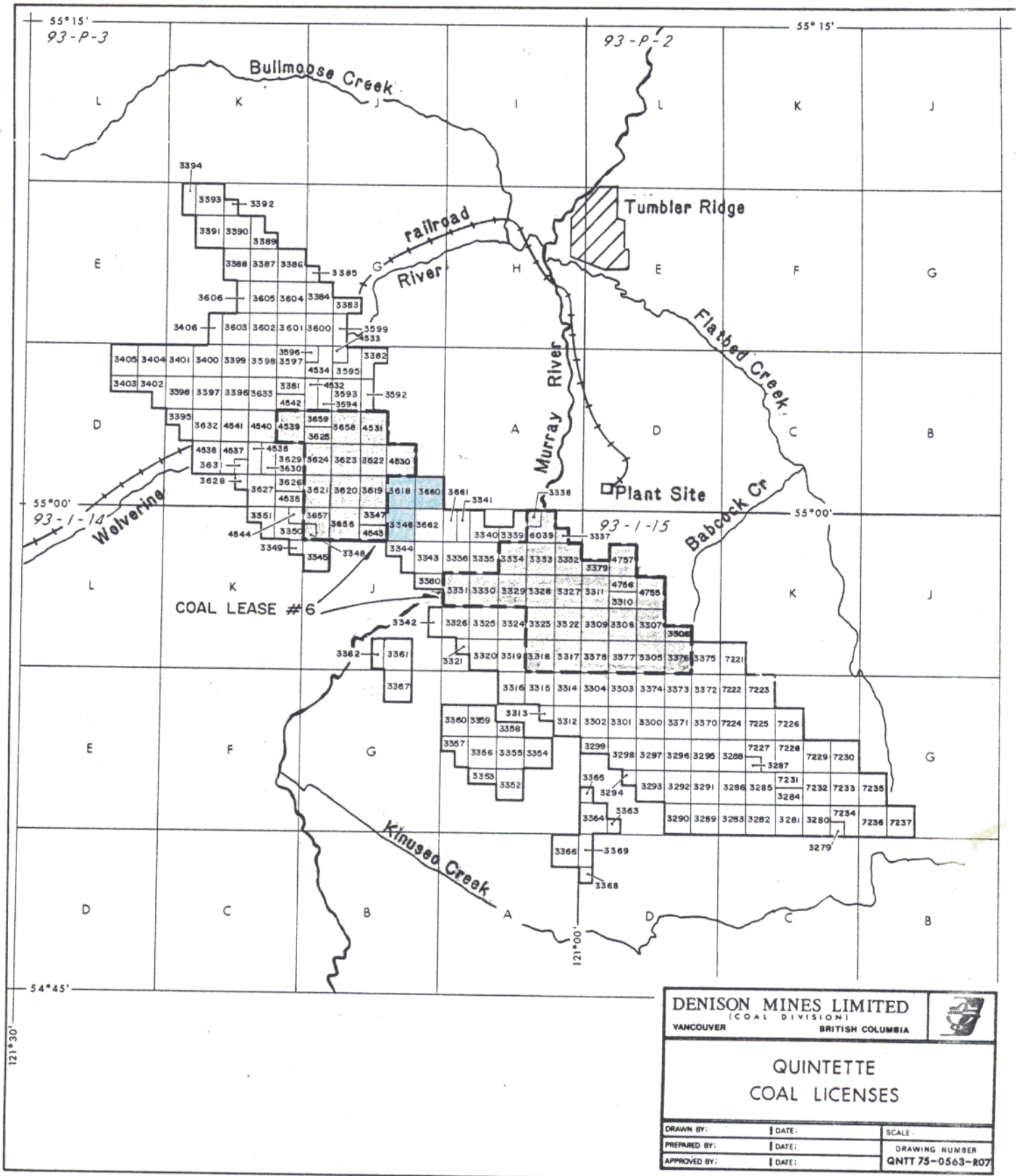
The original Quintette coal licences were acquired by Denison Mines Limited in 1969 and 1970. The first coal exploration on the property was undertaken by Denison in 1971. A significant exploration program was completed each of the following years to 1977. Smaller programs were conducted in 1979 and 1980. In 1981, large scale exploration was again undertaken. Additional licences (7221-7237) were acquired in 1981. In 1982, Dupont Canada Exploration licences (3914-3929) were acquired.

For the purpose of developing the coal licences, Quintette Coal Limited was incorporated under the laws of British Columbia December 20, 1971.

Denison Mines Limited was appointed by Quintette Coal Limited to manage the Quintette project through the feasibility and construction development stages of the project and to assume the ongoing management of the operations during the initial years of operation.

Extensive sampling and testing programs have confirmed that the Quintette coal is a good quality medium volatile coking coal. It is a strong coking coal in its own right, and is capable of replacing most of the world's best medium and low volatile coking coals in blends.

Potential mineable reserves on the Quintette property are estimated at 2.8 billion tonnes of coal in place, to a maximum depth below surface of 500 m.



DENISON MINES LIMITED
(COAL DIVISION)
VANCOUVER BRITISH COLUMBIA

QUINTETTE
COAL LICENSES

DRAWN BY:	DATE:	SCALE:
PREPARED BY:	DATE:	DRAWING NUMBER
APPROVED BY:	DATE:	QNTT 75-0563-R07

FIGURE 1.2.1

2.0 1983 EXPLORATION/DEVELOPMENT PROGRAM

The 1983 program concerned the Herma..n North Area. This area was investigated by geological mapping, rotary drilling, geophysical surveying and analysis of rotary cuttings for FSI. Investigations were conducted by Quintette Coal Limited's on site staff, Denison Mines Ltd. Personnel, and the required contractors. The work period began August 14, 1983 and was completed in October, 1983.

A total of five rotary drill holes were completed in the Hermann North area. All were geophysically logged.

Geological mapping was conducted in the Hermann North at a 1:500 scale. The area of work is highlighted on the 1:50,000 scale Regional Geology and 1983 Exploration Map, Appendix 2.

2.1 GEOLOGIC MAPPING

Geologic mapping of the Hermann North area was conducted in the field on blank map cards at 1:500 scale. Mapping started from surveyed drill hole locations. The traverse then proceeded by chain and compass from that point. This allowed the geologist to maintain his location on the map card. Locations of outcrops were shown on the cards by lithologic symbols; other geologic features were noted by symbol. This information was plotted in the office on 1:5000 scale and 1:1250 scale plans. Copies of the maps where new geologic information was collected are presented in Appendices 5 and 6, the 1:5000 and 1:1250 Geologic Plans respectively. Geologic sections at 1:1250 scale are presented in Appendix 7.

2.2 ROTARY DRILLING SUMMARY

Rotary drilling was contracted to SDS Drilling, Vancouver, B.C.

Drilling equipment used by SDS Drilling was a Gardner-Denver 1700 drill equipped with Drill Systems dual-wall reverse circulation drill stem and using a down the hole hammer drill.

A total of 5 rotary holes were completed for a total of 773.0 metres. Table 2.2.1. summarizes the drilling. Summary sheets for each drill hole are presented in Appendix 3.

The reverse circulation equipment allows for continuous uncontaminated sampling over any interval in the hole. The drill program took continuous samples at one metre intervals.

2.3 ROTARY CUTTING ANALYSIS

Analysis for FSI of the coal cuttings from each hole was done at the mine site laboratory. Results are presented in Table 2.3.1. - CONFIDENTIAL

The coal samples received from the drilling were air dried, riffled, and a representative sample of approximately 300 grams was obtained. No preliminary crushing of the sample was required. The sample was placed in a bath of a solution of Varsol and Tetrachlorethelene that had an S.G. of 1.57. The float material was skimmed off, washed with methyl hydrate and allowed to dry. Three one gram samples were prepared after crushing the material to -60 mesh. These samples were used to determine the F.S.I. Historical data has shown that the 1.57 S.G. provides a clean sample of coal between 7 and 11% ash. Our clean target is 9.5% ash. Ash of the float was not determined. No reserve sample has been retained.

TABLE 2.2.1

ROTARY DRILLING SUMMARY

HERMANN NORTH

DRILL HOLE	NORTHING	EASTING	ELEVATION	TOTAL DEPTH DRILLED (m)
QHR83001	6097092.8	618366.9	1409.9	164.0
QHR83002	6097059.5	618173.7	1389.6	176.0
QHR83003	6097027.3	618131.1	1387.7	96.0
QHR83004	6096943.5	618280.2	1408.1	150.0
QHR83005*	6096807.0	618280.3	1373.0	187.0
			TOTAL METRAGE DRILLED	773.0 m

* Not surveyed - distance measured from QHR8206.

2.4 GEOPHYSICAL LOGGING

Geophysical logging of the rotary holes was conducted by Quintette personnel using a Quintette owned logging unit manufactured by SIE/Geosource, Australia. Two tools were used producing three logs; the T-31 Gamma tool and the T-59 Density/Caliper tool.

All three logs for each hole (when available) are presented with a title block in Appendix 4. The caliper arm was not functioning correctly when these holes were logged and therefore should be disregarded.

2.5 GEOPHYSICAL SURVEYING

Geophysical resistivity surveying was conducted on five lines in the Hermann Syncline/Hermann North area. The surveys were conducted by Denison Mines Limited (Coal Division) staff during August, 1984.

The surveys were conducted on existing roadways and cut lines. A total of 4290 m of line was surveyed.

The complete report by M. Hlava is presented in Appendix 10. Appendices of his report pertaining to mine area surveying and the "Dupont" licences have been deleted. Only Appendix III of his report is included which illustrates the Hermann surveys.

2.6 ROAD CONSTRUCTION

The existing Nabors Road in the Hermann Area was used for some mapping and drilling. However, most of the new work was concentrated on a new road approximately 1.3 km long, off the Nabors Road.

This road was constructed by slashing the timber and then using a Quintette Coal Limited's Komatsu 355 dozer; cleaning a trail approximately 7 m wide. This road provided most of the new geologic mapping data and access to the new drill sites.

Later in the fall, further slashing and burning of timber was conducted as directed by Forestry.

2.7 ACCOMODATION

Quintette Coal Limited staff personnel were either living in the town of Tumbler Ridge or in the McConkey 350 man camp. Some contractors (Samurai Slashing), Denison Mines Ltd. personnel, and summer students were also accomodated in the 350 man camp. SDS Drilling supplied their own sleeping trailer unit, hooked up to Q.C.L. utilities, and Q.C.L. supplied meals from the 350 man camp.

Catering was supplied by Northmount Services Ltd.

2.8 PROJECT MANAGEMENT AND PRIMARY CONTRACTORS

The following permanent Quintette Coal Ltd. staff assisted in the 1982 exploration Program:

D. Johnson	Chief Geologist - Quintette Coal Ltd.
R. Ogilvie	Senior Geologist
D. Lortie	Geologist
H. Bourdages	Geologist
B. Elgby	Geologist
A. France de Ferriere	Geologist

CONTRACTORS:

S.D.S. Drilling Ltd.	Rotary Drilling
Northmount Catering	Catering
Samurai Slashing	Brush Clearing

The following Denison Mines, Coal Division, staff provided assistance:

Raju Sagi	Chief Geologist, Coal Division
Milan Hlava	Project Geologist (geophysical surveying)
Russ Bryden	Geologist (geopysical surveying)

I. Kakizaki, Mitsui Mining Company, conducted mapping in the Hermann North area.

3.0 GEOLOGY

3.1 REGIONAL GEOLOGY

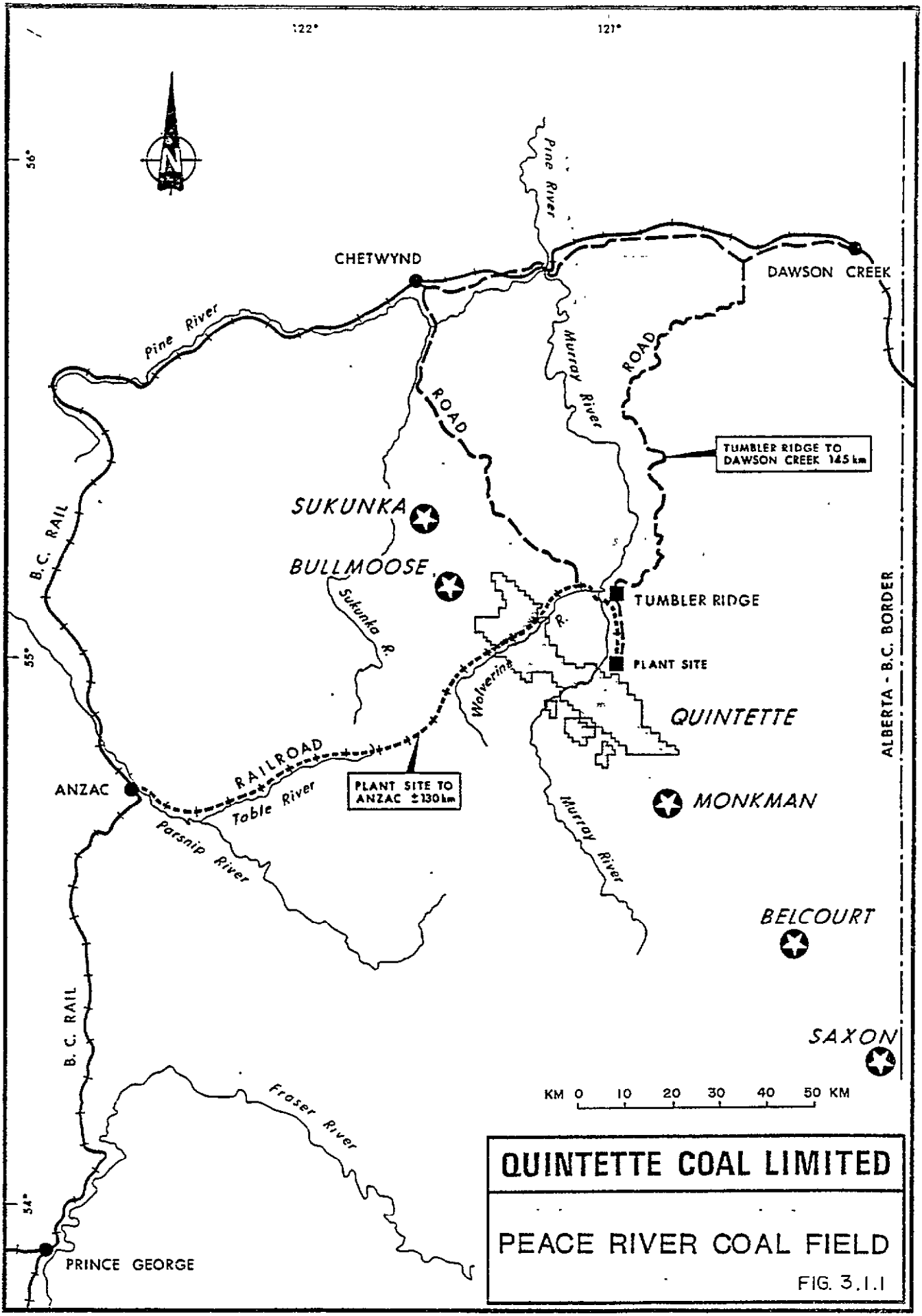
The Quintette Coal property lies within the Peace River Coal Field of northeastern British Columbia. The field extends along the inner foothills of the Rocky Mountains from the Prophet River in the north to the Alberta Boundary in the south. Other major coal properties in the field include Sukunka, Bullmoose, Monkman, Belcourt, and Saxon (Figure 3.1.1).

The coal field is characterized by structural disturbances that resulted from its proximity to the Rocky Mountain structural zone. Major thrusting is common, as is a varying degree of folding. All major features follow a general northwest-southeast trend, reflecting the Rocky Mountain fold structure.

The Gates and Gething Formation are the economically important stratigraphic units in the coal field. Regionally, coal development is most continuous in the Gates Formations, particularly in those areas where mineable reserves have been defined.

In the Quintette property, the folding and faulting has divided the coal-bearing sequence into blocks of varying degrees of mineable potential. The deposits of current economic potential all fall within the Gates Formation.

The geology of the Quintette property is known in detail from photogeological interpretation, extensive field mapping, trenching and drilling. The deposits of current economic interest have been mapped in detail with the major concentration of drilling in those areas.


122°
121°
56°
55°
54°
N
Pine River
CHETWYND
DAWSON CREEK
Pine River
ROAD
Murray River
ROAD
TUMBLER RIDGE TO DAWSON CREEK 145 km
SUKUNKA
BULLMOOSE
B.C. RAIL
Sukunka R.
TUMBLER RIDGE
PLANT SITE
Wolverine R.
QUINTETTE
ALBERTA - B.C. BORDER
RAILROAD
ANZAC
PLANT SITE TO ANZAC ±130km
Table River
Parsnip River
MONKMAN
Murray River
BELCOURT
SAXON
B.C. RAIL
Fraser River
KM 0 10 20 30 40 50 KM
PRINCE GEORGE
QUINTETTE COAL LIMITED
PEACE RIVER COAL FIELD
FIG. 3.1.1

To the end of 1983, in excess of 590 holes (both rotary and core), totalling approximately 62 000 m, have been drilled on the Quintette coal licences and coal lease (in pit areas) for geological and reserve evaluation purposes.

3.1.1 Regional Stratigraphy

The stratigraphic succession (Figure 3.1.1.1) exposed on the Quintette property ranges from Upper Jurassic to Lower Cretaceous in age, and consists of interbedded shales and sands of both marine and continental origin, with most of the coal-bearing strata being from a deltaic environment. The groups of sediments found on the property are from the Minnes Group, the Bullhead Group and the Fort St. John Group from oldest to youngest.

3.1.1.1. Minnes Group

The Minnes Group is Upper Jurassic/Lower Cretaceous in age. The part of the group mapped consists of cyclic beds of argillaceous fine grained sand, siltstone, carbonaceous shale, and coal. The coal is poorly developed (usually less than 150 mm in thickness) and discontinuous. Below 1525 m elevation*, the group generally occurs under low angle slopes which are tree and brush covered; above 1525 m, it generally forms grey-brown pebbly talus. The change from the Minnes to the Bullhead Group is abrupt, with gradation from fine sand to coarse sand to the sharp contrast of cobble conglomerate usually taking place within 6 m. Only the upper portion of the Minnes Group is present at Quintette; however, it is reported to reach 2100 m in thickness (Stott, 1981).

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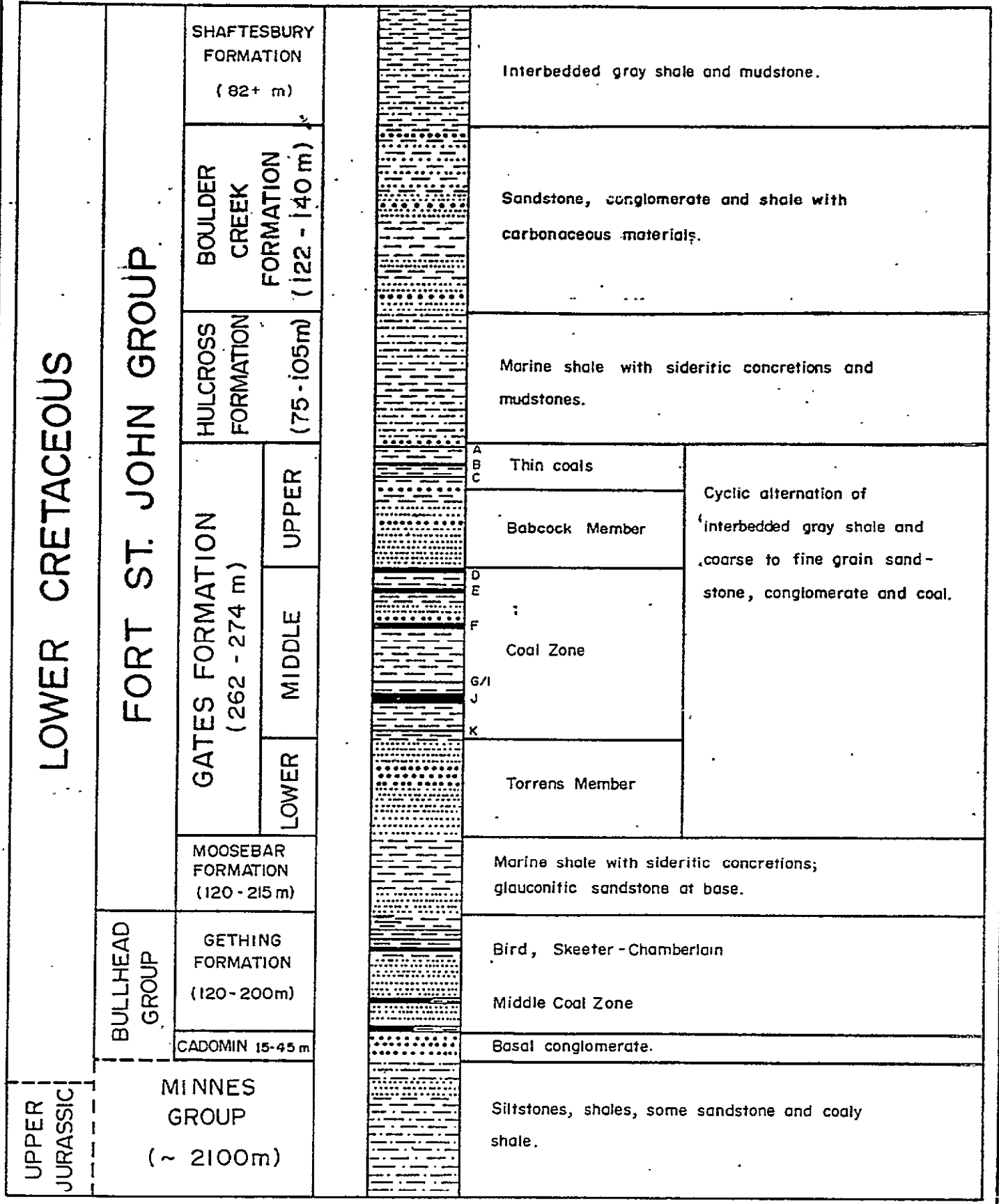
* All elevations given in the report are above sea level (ASL).



QUINTETTE COAL LIMITED

GENERAL STRATIGRAPHIC SECTION

FIGURE 3.1.1.1

3.1.1.2 Cadomin Formation

The Cadomin Formation, the lowest member of the Bullhead Group, consists of well-rounded cobbles and boulders of black, white and green chert, white and grey quartzite and quartz with minor flattened and rounded pebbles of the same material, all of which are bound by siliceous cement. This formation was deposited over an extensive area, ranging in thickness from 15 to 45 m.

The upper contact is defined at the first stratigraphic break in the massive conglomerate. Due to its resistant nature, the formation is usually well exposed. It weathers to a rusty gravel and forms one of the better stratigraphic markers on the property.

3.1.1.3 Gething Formation

The Gething Formation also in the Bullhead Group, consists of alternating units of fine to coarse grained sandstone, carbonaceous shale, coal, sandy shale and conglomerate. The sandstones are thickly bedded to massive, with conglomeratic beds increasing toward the base of the formation. The Gething is poorly exposed on the property, with basal conglomerates forming the only distinctive marker. It varies in thickness from 120 to 200 m.

The upper contact of the Gething is defined by a thin bed of pebble conglomerate followed by a bed of glauconitic sandstone, which signifies the start of marine sediments of the overlying Moosebar Formation. This glauconitic sandstone is probably equivalent to the Bluesky Formation on the Plains area to the east.

In the Gething Formation, three or four coal zones have been distinguished in some localities, although they are not always all present or particularly well developed.

The uppermost Gething coal zone contains the Bird, Skeeter, and Chamberlain Seams, or their equivalents. In some places, the Bird Seam itself becomes a distinct zone and then the main zone must be subdivided into a Bird Zone and a Skeeter-Chamberlain Zone. The Skeeter-Chamberlain Zone seldom exceeds 4 m in thickness. In total, the Bird Seam or Zone may be up to 6 or 7 m thick, although this has only been observed at Roman Mountain along the Quintette trend in the Babcock area.

The middle coal zone of the Gething Formation may not be very persistent. It is now best known in the Hermann Area where the zone is 6 to 7 m thick. In the Wolverine River Area, it is composed of one 2.5 m seam and a 1 m seam or split.

3.1.1.4 Moosebar Formation

The basal sequence of the Moosebar Formation, the oldest member of the Fort St. John Group, consists of homogeneous dark grey to black shale, with thin beds of sideritic concretions up to 0.3 m in thickness and thin beds of bentonite and siltstone. The upper part of the formation consists of banded or fissile sandy shale, very fine sandstone and sandstone with intercalating shales. This latter sequence forms the transition from marine sediments to massive continental sands at the base of the overlying Gates Formation. The variable nature of the transition sequence accounts for the overall variation in the formation which ranges in thickness from 120 to 215 m.

Exposure of Moosebar sediments is normally restricted to areas of high relief where creek channels or gulleys often cut along the strike of the beds.

3.1.1.5. Gates Formation

The Gates Formation ranges in thickness between 250 and 300 m, and lies conformably over the Moosebar Formation. It contains approximately 74% of the regional coal reserves explored to date on the Quintette property. The coal seams have been designated A, B, C, D, E, F, G/I, and K from youngest to oldest.

The lower portion of the formation consists of massive, light-grey, medium-grained sandstones, with minor carbonaceous and conglomeratic horizons, and is tentatively referred to as the Torrens Member. The Middle Gates Member lies above the Torrens Member and contains three, or perhaps four, cyclic sequences of coal deposition within about 90 m of the stratigraphic section, which is terminated by the deposition of the Babcock Member which forms part of the Upper Gates Member.

The cycles of coal deposition in the Middle Gates Member normally begin with laminated medium to fine-grained sandstone and grade to carbonaceous shale and coal. Lenses of conglomerate may also be found in this section which weathers to a light medium orange rubble when exposed above the treeline.

In general, the upper two or three seams reach a maximum thickness of about 3 m (locally 5 m), whereas the lower cycle usually shows the greatest continuity and seam thickness (up to 11 m for seam J). In both the uppermost cycles and the lower cycle, seams may coalesce to form an aggregate thickness up to 12 m, as they do where E and F combine at McConkey , and G/I and J combine in the Roman Mountain area. Excellent correlation of coal seams has been possible over distances up to 13 km in the Babcock area, and additional exploration has provided similarly reliable correlation in the McConkey and Frame areas. It is felt such correlation for the entire property will be possible after more areas have been explored in detail, although at present some regional correlations must be considered tentative.

The Babcock Member, as noted previously, overlies the economic coal zone of the Middle Gates. This unit consists of three distinct units a discontinuous channel conglomerate, a continuous lag conglomerate and a continuous marine sandstone. The unit is resistant and forms a useful marker for the top of the Middle Gates.

The portion of the Upper Gates Member which overlies the Babcock Member contains a predominantly shale sequence with intercalating sandy shale or very fine sandstone and poorly developed coal. Two or three coal cycles (containing seams A, B, and C) have been recognized in this sequence; however, they have not yet been found to contain sufficient thickness, quality and continuity to be given economic consideration. A very thin bed of chert pebbles with ferruginous cement marks the contact of the overlying marine sediments of the Hulcross Formation.

3.1.1.6. Hulcross Formation

The Hulcross Formation consists of 75 to 105m of rubbly or blocky, medium to dark grey shale with thin interbeds of siltstone and very fine sandstone. Sandstone and siltstone interbeds are more prevalent near the top of the formation where a few kaolinite beds have also been observed. The formation is more homogeneous near the base and contains sideritic concretions.

3.1.1.7. Boulder Creek Formation

The Hulcross marine shale grades conformably into shale, sandstones, and conglomerate of the Lower Boulder Creek Formation. The middle part of the Formation consists of alternating fine grained sandstone, shale and thin coals, while the upper part consists of massive conglomerates and conglomeratic sandstones. The Upper Boulder Creek lithology closely resembles that of the Babcock Member of the Gates Formation. A range in thickness of 122 to 140 m has been measured in the Boulder Creek Formation.

3.1.1.8 Shaftesbury Formation

The lower portion of the Shaftesbury Formation, consisting of dark-grey to black marine shale with minor siltstone, overlies the Boulder Creek Member and completes the stratigraphy exposed at Quintette. This formation closely resembles Hulcross shale. Exposures of the Shaftesbury Formation are restricted to the axes of the major synclines at high elevations and to the northeastern border of the licence area.

3.1.2 Regional Structure

Primary structural controls in the Peace River Coal Field are the regional thrust faults which have brought the coal-bearing strata to the surface. Within the Quintette property, in areas which contain the coal- bearing formations, the main geological structures are broad synclines and sharper anticlines which are separated by low to medium angle thrust faults from the more highly deformed Minnes Group. The faults dip to the southwest and have vertical displacements of up to approximately 100 m. Minor folding on the major fold limbs is uncommon, but minor thrusts frequently parallel or splay from the major faults.

Geological structures and topography define to a large extent, the coal reserve areas within the Quintette property. This is most obvious in some of the potential pit areas where the coal reserves are entirely contained within synclines which form topographic highs. Underground reserves are located in large, structurally continuous blocks on limbs of anticlines and synclines. Faulting is not frequent within these structures, although it does become more frequent as the degree of structural deformation increases. For example, the Roman Mountain reserves, which are located in a tight chevron fold, more often contain small faults than those in the much broader (flat) Babcock Mountain structure, where the few faults that have been observed have displacements in the order of only 5 or 10 m.

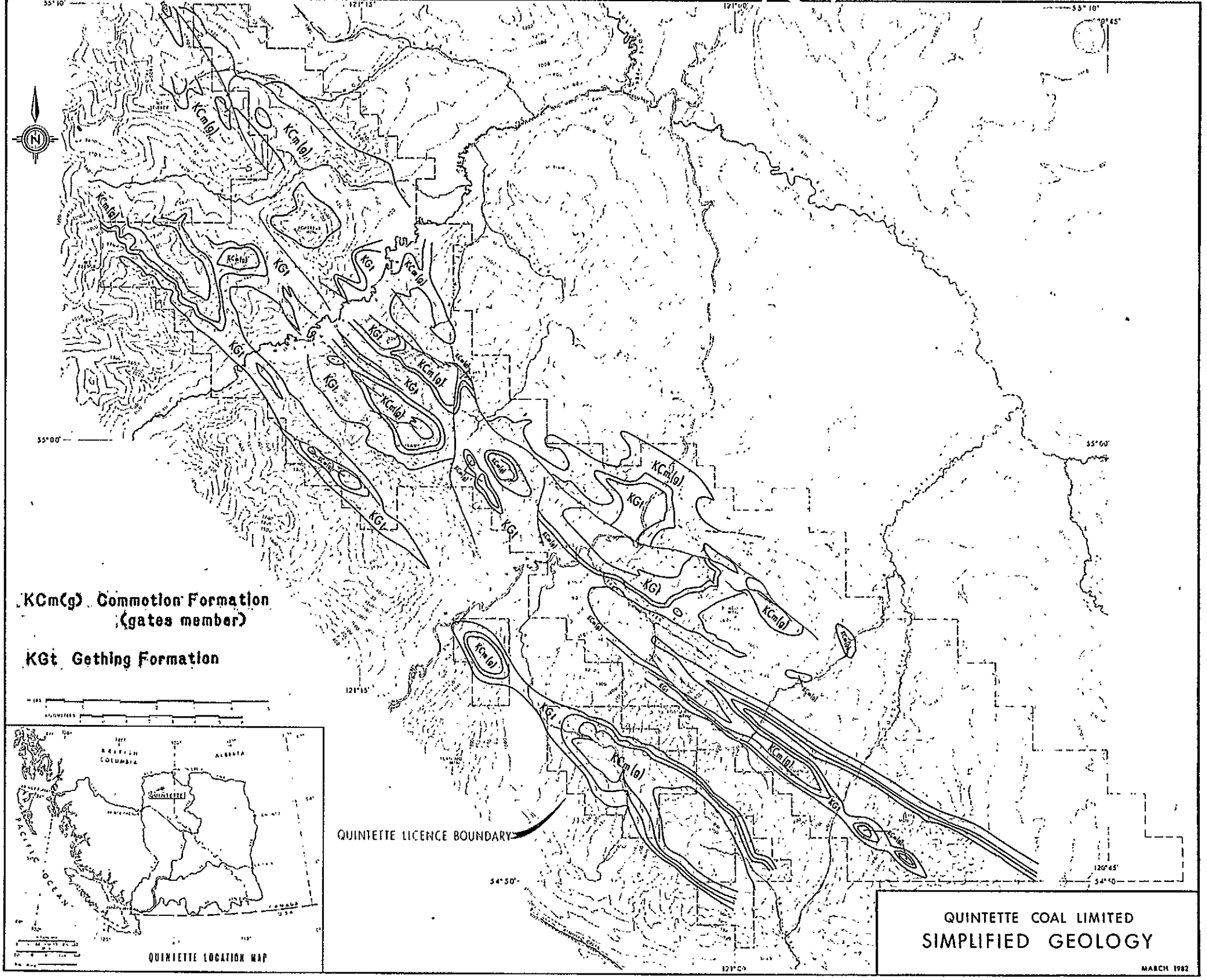

KCm(g) Commotion Formation
(gates member)
KGt Gething Formation
QUINTETTE LICENCE BOUNDARY
QUINTETTE LOCATION MAP
QUINTETTE COAL LIMITED
SIMPLIFIED GEOLOGY
MARCH 1982

FIGURE 3.1.2.1

3.1.3 Regional Coal Seam Correlation

Within the Quintette property, three stratigraphic units are particularly valuable for regional correlation. These are the distinctive Cadomin conglomerate, and the Moosebar and Hulcross shales. Although there is some similarity between the Hulcross and Moosebar shales, they can usually be distinguished by their relationships to surrounding strata and the absence of glauconitic sands at the base of the Hulcross. The two main coal-bearing units, the Gates Formation and the Gething Formation, are easily distinguished.

A regional correlation of the important formations and coal zones on the Quintette property is presented in Appendix 11. Composite sections from each of the major reserve areas demonstrate the regularity of the development of the strata within the property and illustrate that all important coal development within the Gates Formation between the persistent and readily defined Babcock and Torrens Members.

The Babcock Member overlies seam D and this seam has been used as a marker for correlation. Seam J is often located just above the Torrens Member (Quintette sandstone), or occasionally above siltstones and shales that separate it from local development of seam K (for example, in the Babcock and Roman Mountain areas).

Between the D and J coal seams, there is considerable variation in the E and F seam developments which may effectively constitute a separate coal zone. In the McConkey area, these seams appear to coalesce to form a significant coal zone containing approximately 7 m of coal.

Seam G is particularly well developed in the northern regions of the Babcock and Quintette trend deposits, where it attains a thickness ranging from 1.7 to 2.1 m and is developed between 4 and 13 m below

seam F. The 1977 drilling program in the northern and central portions of Babcock Mountain indicated a rapid thickening of the F/G interseam sediments such that G seam can be correlated with seam I in the central and southern portions of the deposit. This finding is further illustrated in the discussions of the Babcock deposit stratigraphy, and indicates that seam G may be equivalent to seam I (G/I) throughout the southern portion of the property. It was originally thought that seams F and G had coalesced in this region. The G/I seam is normally developed between 3 and 10 m above the J seam; however, in some locations the seams essentially coalesce to form very significant widths of mineable coal (Roman Mountain, Quintette Trend, McConkey Mine and Perry Creek Anticline). Seam K is apparently a split from seam J as the two seams nearly merge in the Little Windy portion of Babcock.

The major coal zones of the Gething Formation are not as well documented as they are in the Gates Formation. However, it is clear that the Bird Zone or Seam is regionally continuous. The relationship of the Skeeter and Chamberlain Seams to this zone is uncertain and they may form a separate zone or be part of the Bird Zone. In the Wolverine and Murray (McConkey and Frame) areas of the property, these seams are well separated by about 30 m of strata, but apparently merge in the southern part of the property (Babcock, Quintette Trend, Roman Mountain). At Five Cabin, just a short distance from Roman Mountain, only a remnant of the Bird Zone is present, but a seam which is very similar in characteristics to the Chamberlain Seam is well developed (3 m thick).

The middle coal zone of the Gething Formation has been documented in only a few places, and to date it is known to attain a potentially economic thickness only in the Wolverine area where one split is about 2.5 m thick and in the Hermann area where the zone contains 6 m of coal. More exploration is required before the full significance of this zone can be determined.

The Lower or Basal Coal Zone of the Gething Formation has been observed persistently in the Wolverine West and Meadow Prospect areas only. This seam appears to have a thickness of 3 to 6 m in these areas, and could represent an important source of low volatile coal. In the southern part of the property, this zone appears to be replaced by sandstones and conglomerates.

3.2 DETAILED GEOLOGY - HERMANN AREA

3.2.1 Description

The Hermann area includes all of the area between the Murray River to the south and the drainage divide known as M-20 to the north. Elevations for the area range from 770 m to 1650 m. The area of particular examination during 1983 is known as Hermann North and is adjacent to M-20 drainage. In this area, relief ranges from 1230 m to 1428 m in the coal bearing zone.

Within Hermann area, geologic mapping, core drilling, geophysical surveying, and rotary drilling have been carried out to define the geology. Previous drilling has included three diamond drill holes (QJD7641, 7642, 7643) and seven rotary drill holes (QJR8001, QHR8201, 8202, 8203, 8204, 8205, and 8206). Two of these previous drill holes (QHR8205 and 8206) were drilled in the Hermann North area.

Five rotary holes and geologic mapping were completed in the Hermann North area in 1983.

The geology map, cross sections, and structure contours are presented in Appendices 5, 6, 7 and 8.

3.2.2 Stratigraphy

Within Hermann North, all formation from Moosebar to Boulder Creek are exposed. The coal bearing Gates Formation has an estimated total thickness of 300 metres.

From mapping and drilling, the upper Gates Formation is 160 m thick. This unit is from the bottom of the Hulcross Formation to the top of the first coal seam in the middle Gates Formation (E seam). One samll seam (1.43 m) has been tentatively identified as C seam in the upper Gates. This seam is approximately 50 m above E seam. The major rock type is a relatively monotonous sequence of fine sandstones and siltstones.

In the middle Gates Formation, the rock lithologies have a greater variation between medium grained sandstones to silty claystones, carbonaceous claystones, and coal. The coal seams that have been recognized are C, E, F, G, J and K.

3.2.3 Structure

The structure in the Hermann North area is a simple monocline with a flexure at depth. The flexure is interpreted from surface mapping.

Dips within the area of interest, range from nearly vertical to 10°, although, in general an average dip of the coal seams is approximately 50°.

No significant faulting has been interpreted. A minor fault was interpreted in G seam and another in E seam.

3.2.4 Coal Seam Development and Correlation

As is typical of the Gates Formation coal seams, correlation withn this exploration area is excellent. Seams C, D, E, F, G, J and K are recognized. Table 3.2.4.1 summarizes the seam thicknesses by mapping and drill hole; a summary is also presented. A correlation chart is presented in Appendix 9.

The uppermost seam in the sequence has been named C seam. Its correlation with C seam in McConkey Pit is only tentative. The seam is overlain by a thin pebble conglomerate that probably indicates a marine transgression, similar to that above D seam in other areas. For this reason the seam was initially identified as D seam. However, its stratigraphic position, precludes any correlation with D seam.

The seam is comprised of an upper and lower split separated by a claystone that is usually less than 0.5 m in thickness. The total mining section averages 1.43 m from present data; this includes the rock split.

E seam is consistent throughout the exploration area, averaging 8.84 m in thickness and divided into three distinct seams, E1, E2, and E3. Seam E1 contains many small rock partings averaging 3.95 m. It is separated from E2 by a parting that exceeds 0.5 m. Seams E2 and E3 have few rock partings and are separated by a parting that is less than half a metre thick.

F seam is a thin rider approximately 5.5 meters below E seam. This seam may be correlateable to E4 seam in McConkey Pit. It is a thin seam averaging 0.69 m.

G seam averages 1.76 m and the charactaristic rock split noted in McConkey Pit continues in the Hermann North area. The rock split is approximately 0.4 m thick.

J seam is a very clean seam with an average thickness of 4.11 m. It may be correlateable with the upper part of J seam in McConkey Pit.

Unlike McConkey, the coal below J seam (approximately 9 m below) is considered recoverable and identified as the K zone. Four zones have been distinguished - K1, K2, K3 and K4. Only K2 and K3 contain seams that are considered recoverable (0.61 m and 1.02 m respectively). The entire zone is up to 8 metres thick containing up to 8 small seams.

The total cumulative thickness of mineable coal averages 18.46 m, which is typical for the Gates Formation in the Quintette area.

TABLE 3.2.4.1

SUMMARY OF SEAM TRUE THICKNESSES BY DRILL HOLE AND MAPPING

	SEAM	TRUE THICKNESS (m)**
Mapping	C	2.25
	E1	3.90
	E2 (E)	2.71 (8.37)* 7.56
	E3	0.95
	F	Not mapped
	G	1.52
	J	4.63
	K	Not mapped
QHR8205	K2	0.59
	K3	1.02
QHR8206	C	1.13
QHR83001	C	1.27
QHR83002	E1	4.63
	E2 (E)	2.53 (10.17)* 9.39
	E3	2.23
	F	0.78
	G	1.81
	J	4.27
	K2	0.60
	K3	1.20
QHR83003	F	0.84
	G	1.79
	J	3.80
	K2	0.62
	K3	0.84
QHR83004	E1	3.79
	E2 (E)	2.80 (8.90)* 8.1
	E3	1.43
	F	0.55
	G	1.67
	J	3.73

* Total includes partings between E1 & E2 and E2 & E3

** True thicknesses in rotary core holes are corrected from the interpreted dip angle of the beds with the drill hole.

Section 4 of this report contains coal quality data, and remains confidential under the terms of the *Coal Act Regulation*, Section 2(1). It has been removed from the public version.

http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/10_251_2004

TABLE 3.2.4.1 (Cont.)

SUMMARY OF SEAM TRUE THICKNESSES
BY DRILL HOLE AND MAPPING

	SEAM	TRUE THICKNESS (m)**
QHR83005	C	1.07
	E1	3.47
	E2 (E)	1.91 (7.92)* 6.79
	E3	1.41
	F	0.57
	G	1.98
	J	Not logged
	K	Not logged

	ARITHMETIC AVERAGE	SEAM TRUE THICKNESSESS
	C	1.43
	E1	3.95
	E2 (E)	2.49 (8.84)* 7.95
	E3	1.51
	F	0.69
	G	1.76
	J	4.11
	K2	0.61
	K3	1.02
	Total	17.57 (18.45)*

* Total includes partings between E1 & E2 and E2 & E3
** (See first page of table)

APPENDIX 1

LEGAL DESCRIPTION OF THE QUINTETTE COAL LICENCES

APPENDIX 1..
LEGAL DESCRIPTION OF THE
QUINTETTE COAL LICENCES

Licence No.	Date Issued	Series	Block	Units	Paying Hectares
3633	May 27/75	93-P-3	C	63, 64, 73, 74	297
3632	May 27/75	93-P-3	C	47, 48, 57, 58	297
3631	May 27/75	93-P-3	C	25	75
3630	May 27/75	93-P-3	C	23, 33	149
3629	May 27/75	93-P-3	C	21, 22, 31, 32	298
3628	May 27/75	93-P-3	C	15	75
3627	May 27/75	93-P-3	C	3, 4, 13, 14	298
3236	May 27/75	93-P-3	C	11, 12	
3625*	May 27/75	93-P-3	B	49, 50	149
3624*	May 27/75	93-P-3	B	29, 30, 39, 40	298
3623*	May 27/75	93-P-3	B	27, 28, 37, 38	298
3622*	May 27/75	93-P-3	B	25, 26, 35, 36	298
3621*	May 27/75	93-P-3	B	9, 10, 19, 20	298
3620*	May 27/75	93-P-3	B	7, 8, 17, 18	298
3619*	May 27/75	93-P-3	B	5, 6, 15, 16	298
3618	May 27/75	93-P-3	B	3, 4, 13, 14	298
3606	Apr 29/75	93-P-3	F	25, 35	149
3605	Apr 29/75	93-P-3	F	23, 24, 33, 34	297
3604	Apr 29/75	93-P-3	F	21, 22, 31, 32	297
3603	Apr 29/75	93-P-3	F	5, 6, 15, 16	297
3602	Apr 29/75	93-P-3	F	3, 4, 13, 14	297
3601	Apr 29/75	93-P-3	F	1, 2, 11, 12	297
3600	Apr 29/75	93-P-3	G	9, 10, 19, 20	297
3599	Apr 29/75	93-P-3	G	8, 18	149
3598	Apr 29/75	93-P-3	C	83, 84, 93, 94	297
3597	Apr 29/75	93-P-3	C	81, 82, 91, 92	297
3596	Apr 29/75	93-P-3	B	100	75
3595	Apr 29/75	93-P-3	B	87, 88, 97	223
3594	Apr 29/75	93-P-3	B	69, 79	149
3593	Apr 29/75	93-P-3	B	67, 68, 77, 78	297
3592	Apr 29/75	93-P-3	B	66, 76	149
3406	Feb 1/75	93-P-3	F	7, 17	149
3405	Feb 1/75	93-P-3	D	83, 84, 93, 94	297
3404	Feb 1/75	93-P-3	D	81, 82, 91, 92	297
3403	Feb 1/75	93-P-3	D	73, 74	149
3402	Feb 1/75	93-P-3	D	61, 71, 72	223
3401	Feb 1/75	93-P-3	C	89, 90, 99, 100	297
3400	Feb 1/75	93-P-3	C	87, 88, 97, 98	297
3399	Feb 1/75	93-P-3	C	85, 86, 95, 96	297
3398	Feb 1/75	93-P-3	C	69, 70, 79, 80	297
3397	Feb 1/75	93-P-3	C	67, 68, 77, 78	297
3396	Feb 1/75	93-P-3	C	65, 66, 75, 76	297
3395	Feb 1/75	93-P-3	C	49, 59, 60	223

Licence No.	Date Issued	Series	Block	Units	Paying Hectares
3394	Nov 25/74	93-P-3	F	89, 99	149
3393	Nov 25/74	93-P-3	F	87, 88, 97, 98	296
3392	Nov 25/74	93-P-3	F	86	75
3391	Nov 25/75	93-P-3	F	67, 68, 77, 78	297
3390	Nov 25/74	93-P-3	F	65, 66, 75, 76	297
3389	Nov 25/74	93-P-3	F	63, 64, 74	223
3388	Nov 25/74	93-P-3	F	45, 46, 55, 56	297
3387	Nov 25/74	93-P-3	F	43, 44, 53, 54	297
3386	Nov 25/74	93-P-3	F	41, 42, 51, 52	297
3385	Nov 25/74	93-P-3	G	50	75
3384	Nov 25/74	93-P-3	G	29, 30, 39, 40	297
3383	Nov 25/74	93-P-3	G	27, 28	149
3382	Nov 25/74	93-P-3	B	86, 95, 96	223
3381	Nov 25/74	93-P-3	C	71, 72	149
3380	Nov 25/74	93-I-14	J	51, 52	149
3379*	Nov 25/74	93-I-15	L	69, 70	149
3378*	Nov 25/74	93-I-15	L	9, 10, 19, 20	298
3377*	Nov 25/74	93-I-15	L	7, 8, 17, 18	298
3376*	Nov 25/74	93-I-15	L	3, 4, 13, 14	298
3375	Nov 25/74	93-I-15	L	1, 2, 11, 12	298
3374	Nov 25/74	93-I-15	E	85, 86, 95, 96	298
3373	Nov 25/74	93-I-15	E	83, 84, 93, 94	298
3372	Nov 25/74	93-I-15	E	81, 82, 91, 92	298
3371	Nov 25/74	93-I-15	E	63, 64, 73, 74	298
3370	Nov 25/74	93-I-15	E	61, 62, 71, 72	298
3369	Nov 25/74	93-I-15	D	90, 100	150
3368	Nov 25/74	93-I-15	D	80	75
3367	Nov 25/74	93-I-14	G	83, 84, 93, 94	298
3366	Nov 25/74	93-I-14	A	81, 82, 91, 92	299
3365	Oct 16/74	93-I-15	E	30	75
3364	Oct 16/74	93-I-15	E	9, 10, 19, 20	299
3363	Oct 16/74	93-I-15	E	8	75
3362	Oct 16/74	93-I-14	J	5, 15	149
3361	Oct 16/74	93-I-14	J	3, 4, 13, 14	298
3360	Oct 16/74	93-I-14	H	69, 70, 79, 80	298
3359	Oct 16/74	93-I-14	H	67, 68, 77, 78	298
3358	Oct 16/74	93-I-14	H	65, 66	149
3357	Oct 16/74	93-I-14	H	49, 59, 60	224
3356	Oct 16/74	93-I-14	H	47, 48, 57, 58	298
3355	Oct 16/74	93-I-14	H	45, 46, 55, 56	298
3354	Oct 16/74	93-I-14	H	43, 44, 53, 54	298
3353	Oct 16/74	93-I-14	H	37, 38	149
3352	Oct 16/74	93-I-14	H	25, 26, 35, 36	299

Licence No.	Date Issued	Series	Block	Units	Paying Hectares
3351	Oct 16/74	93-I-14	K	83, 93, 94	223
3350	Oct 16/74	93-I-14	K	81, 82, 92	223
3349	Oct 16/74	93-I-14	K	71	75
3348*	Oct 16/74	93-I-14	J	90	75
3347*	Oct 16/74	93-I-14	J	95, 96	149
3346	Oct 16/74	93-I-14	J	83, 84, 93, 94	298
3345	Oct 16/74	93-I-14	J	69, 70, 79, 80	298
3344	Oct 16/74	93-I-14	J	63, 73, 74	223
3343	Oct 16/74	93-I-14	J	61, 62, 71, 72	298
3342	Oct 16/74	93-I-14	J	21, 31	149
3341	Oct 16/74	93-I-14	I	89, 99	149
3340	Oct 16/74	93-I-14	I	87, 88, 98	223
3339	Oct 16/74	93-I-14	I	85, 86, 95	223
3338*	Oct 16/74	93-I-14	I	94	75
3337*	Oct 16/74	93-I-14	I	82	75
3336	Oct 16/74	93-I-14	I	69, 70, 79, 80	298
3335	Oct 16/74	93-I-14	I	67, 68, 77, 78	298
3334*	Oct 16/74	93-I-14	I	65, 66, 75, 76	298
3333*	Oct 16/74	93-I-14	I	63, 64, 73, 74	298
3332*	Oct 16/74	93-I-14	I	61, 62, 71, 72	298
3331*	Oct 16/74	93-I-14	I	49, 50, 59, 60	298
3330*	Oct 16/74	93-I-14	I	47, 48, 57, 58	298
3329*	Oct 16/74	93-I-14	I	45, 46, 55, 56	298
3328*	Oct 16/74	93-I-14	I	43, 44, 53, 54	298
3327*	Oct 16/74	93-I-14	I	41, 42, 51, 52	298
3326	Oct 16/74	93-I-14	I	29, 30, 39, 40	298
3325	Oct 16/74	93-I-14	I	27, 28, 37, 38	298
3324	Oct 16/74	93-I-14	I	25, 26, 35, 36	298
3323*	Oct 16/74	93-I-14	I	23, 24, 33, 34	298
3322*	Oct 16/74	93-I-14	I	21, 22, 31, 32	298
3321	Oct 16/74	93-I-14	I	19	75
3320	Oct 16/74	93-I-14	I	7, 8, 17, 18	298
3319	Oct 16/74	93-I-14	I	5, 6, 15, 16	298
3318*	Oct 16/74	93-I-14	I	3, 4, 13, 14	298
3317*	Oct 16/74	93-I-14	I	1, 2, 11, 12	298
3316	Oct 16/74	93-I-14	H	85, 86, 95, 96	298
3315	Oct 16/74	93-I-14	H	83, 84, 93, 94	298
3314	Oct 16/74	93-I-14	H	81, 82, 91, 92	298
3313	Oct 16/74	93-I-14	H	73	75
3312	Oct 16/74	93-I-14	H	61, 62, 71, 72	298
3311*	Oct 16/74	93-I-15	L	49, 50, 59, 60	298
3310*	Oct 16/74	93-I-15	L	47, 48	149
3309*	Oct 16/74	93-I-15	L	29, 30, 39, 40	298

Licence No.	Date Issued	Series	Block	Units	Paying Hectares
3308*	Oct 16/74	93-I-15	L	27, 28, 37, 38	298
3307*	Oct 16/74	93-I-15	L	25, 26, 35, 36	298
3306*	Oct 16/74	93-I-15	L	23, 24	149
3305*	Oct 16/74	93-I-15	L	5, 6, 15, 16	298
3304	Oct 16/74	93-I-15	E	89, 90, 99, 100	298
3303	Oct 16/74	93-I-15	E	87, 88, 97, 98	298
3302	Oct 16/74	93-I-15	E	69, 70, 79, 80	298
3301	Oct 16/74	93-I-15	E	67, 68, 77, 78	298
3300	Oct 16/74	93-I-15	E	65, 66, 75, 76	298
3299	Oct 16/74	93-I-15	E	59, 60	149
3298	Oct 16/74	93-I-15	E	47, 48, 57, 58	298
3297	Oct 16/74	93-I-15	E	45, 46, 55, 56	298
3296	Oct 16/74	93-I-15	E	43, 44, 53, 54	298
3295	Oct 16/74	93-I-15	E	41, 42, 51, 52	298
3294	Oct 16/74	93-I-15	E	37	75
3293	Oct 16/74	93-I-15	E	25, 26, 35, 36	299
3292	Oct 16/74	93-I-15	E	23, 24, 33, 34	299
3291	Oct 16/74	93-I-15	E	21, 22, 31, 32	299
3290	Oct 16/74	93-I-15	E	3, 4, 13, 14	299
3289	Oct 16/74	93-I-15	E	1, 2, 11, 12	299
3288	Oct 16/74	93-I-15	F	49, 50, 59, 60	298
3287	Oct 16/74	93-I-15	F	48	75
3286	Oct 16/74	93-I-15	F	29, 30, 39, 40	299
3285	Oct 16/74	93-I-15	F	27, 28, 37, 38	299
3284	Oct 16/74	93-I-15	F	25, 26	150
3283	Oct 16/74	93-I-15	F	9, 10, 19, 20	299
3282	Oct 16/74	93-I-15	F	7, 8, 17, 18	299
3281	Oct 16/74	93-I-15	F	5, 6, 15, 16	299
3280	Oct 16/74	93-I-15	F	3, 4, 13, 14	299
3279	Oct 16/74	93-I-15	F	2	75
3662	Sep 27/76	93-I-14	J	81, 82, 91, 92	298
3661	Sep 27/76	93-I-14	I	90, 100	149
3660	Sep 17/76	93-P-3	B	1, 2, 11, 12	298
3659*	Aug 9/76	93-P-3	B	59, 60	149
3658*	Aug 9/76	93-P-3	B	47, 48, 57, 58	297
3657*	Aug 9/76	93-I-14	J	89, 99, 100	223
3656*	Aug 9/76	93-I-14	J	87, 88, 97, 98	298
4530*	Jan 15/79	93-P-3	B	23, 24, 33, 34	297
4531*	Jan 15/79	93-P-3	B	45, 46, 55, 56	297
4532	Jan 15/79	93-P-3	B	70, 80	149
4533	Jan 15/79	93-P-3	B	98	75

Licence No.	Date Issued	Series	Block	Units	Paying Hectares
4534	Jan 15/79	93-P-3	B	89, 90, 99	223
4535	Jan 15/79	93-P-3	C	1, 2	149
4536	Jan 15/79	93-P-3	C	24, 34	149
4537	Jan 15/79	93-P-3	C	26, 35, 36	223
4538	Jan 15/79	93-P-3	C	27, 28, 37, 38	297
4539*	Jan 15/79	93-P-3	C	41, 42, 51, 52	297
4540	Jan 15/79	93-P-3	C	43, 44, 53, 54	297
4541	Jan 15/79	93-P-3	C	45, 46, 55, 56	297
4542	Jan 15/79	93-P-3	C	61, 62	149
4543*	Jan 15/79	93-I-14	J	85, 86	149
4544	Jan 15/79	93-I-14	K	91	75
4755*	Apr 20/79	93-I-15	L	45, 46, 55, 56	298
4756*	Apr 20/79	93-I-15	L	57, 58	149
4757*	Apr 20/79	93-I-15	L	67, 68, 77, 78	298
6039*	Jan 15/79	93-I-14	I	83, 84, 93	223
7221	Sep 18/81	93-I-15	K	9, 10, 19, 20	298
7222	Sep 18/81	93-I-15	F	89, 90, 99, 100	298
7223	Sep 18/81	93-I-15	F	87, 88, 97, 98	298
7224	Sep 18/81	93-I-15	F	69, 70, 79, 80	298
7225	Sep 18/81	93-I-15	F	78, 77, 68, 67	298
7226	Sep 18/81	93-I-15	F	76, 75, 66, 65	298
7227	Sep 18/81	93-I-15	F	57, 58, 47	224
7228	Sep 18/81	93-I-15	F	55, 56, 45, 46	298
7229	Sep 18/81	93-I-15	F	53, 54, 43, 44	298
7230	Sep 18/81	93-I-15	F	41, 42, 51, 52	298
7231	Sep 18/81	93-I-15	F	35, 36	149
7232	Sep 18/81	93-I-15	F	33, 34, 23, 24	298
7233	Sep 18/81	93-I-15	F	31, 32, 21, 22	298
7234	Sep 18/81	93-I-15	F	11, 12, 1	224
7235	Sep 18/81	93-I-15	G	39, 40, 29, 30	298
7236	Sep 18/81	93-I-15	G	19, 20, 9, 10	299
7237	Sep 18/81	93-I-15	G	7, 8, 17, 18	299

* Licences marked with an asterisk have been converted to Coal Lease #6 in July, 1982.

APPENDIX 12

1983 DUPONT LICENCES GEOLOGICAL REPORT

1983

Dupont Licences Geological Report

October 31, 1983

Appendix 12 to the 1983 Quintette Geological Report

D. Lortie
Geologist

QUINTETTE COAL LIMITED

DUPONT LICENCES GEOLOGICAL REPORT

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PREFACE

This report documents the exploration work completed during 1983 on Quintette coal Limited's licences numbers 3914 - 3929 inclusive. The work was completed by Quintette staff and contractors, with technical assistance from Denison Mines Limited, (Coal Division) staff.

The text provides assessment of the geology in the area of investigations.

This report references all previous geologic assessment reports submitted by Dupont Canada Exploration whose licences (3914 - 39290 were acquired by Quintette.

QUINTETTE COAL LIMITED

This report documents 1983 geological investigations to cover licences 3914-3929 in the Peace River District of Northeast British Columbia. The licences are covered by NTS Map Sheets, 93-I-14 and 93-P-3 between latitudes 54°59'N and 55°05'N and between Longitudes 121°03'W and 121°11'W. The licences are owned by Quintette Coal Ltd.

This report was prepared by Quintette Coal Ltd., geological staff.

Geological discussions are based on all geologic work to date.

This report is submitted October 31, 1983, to support expenditures applied to the licences as a result of the geological work.

STATEMENT OF QUALIFICATIONS

I, David P. Lortie, graduated from Acadia University, Wolfville, Nova Scotia, with a Bachelor of Science in Geology in May, 1976. I have worked in coal exploration in Nova Scotia for one year, supervising field mapping and writing a final report. I have worked in coal exploration for four years in northeast British Columbia. I am responsible for exploration in consultation with the Senior Geologist for Quintette Coal Limited.

David P. Lortie
Geologist
Quintette Coal Limited
Tumbler Ridge, B.C.

SECTION 1

INTRODUCTION

1.1 LOCATION AND ACCESS

The Quintette property is located in the Rocky Mountain foothills belt of northeastern British Columbia (Figure 1.1.1 and 1.1.3). The coal bearing trend of this region is commonly referred to as the Peace River Coal Block.

Air distances to communities surrounding the property are as follows:

The City of Prince George, B.C.	(pop. *71,100)	- 160 km southwest
The City of Dawson Creek, B.C.	(pop. *13,800)	- 106 km northeast
The Village of Chetwynd, B.C.	(pop. *2,200)	- 98 km north
The Town of Tumbler Ridge, B.C.	(pop. growing)	- 20 km east

The property is accessible by three routes: the Boundary Road (Heritage Highway) from Tupper, B.C.; the Fellers Heights Road (Heritage Highway) from Dawson Creek/Feller Heights; and the road from Chetwynd to the Wolverine River Valley and Tumbler Ridge. The distances for these routes are as follows:

Boundary Road - Dawson Creek to Plantsite	210 km
Fellers Heights Road - Dawson Creek to McConkey	150 km
Chetwynd to McConkey	106 km

Access within the property is gained by several existing roads and trails as

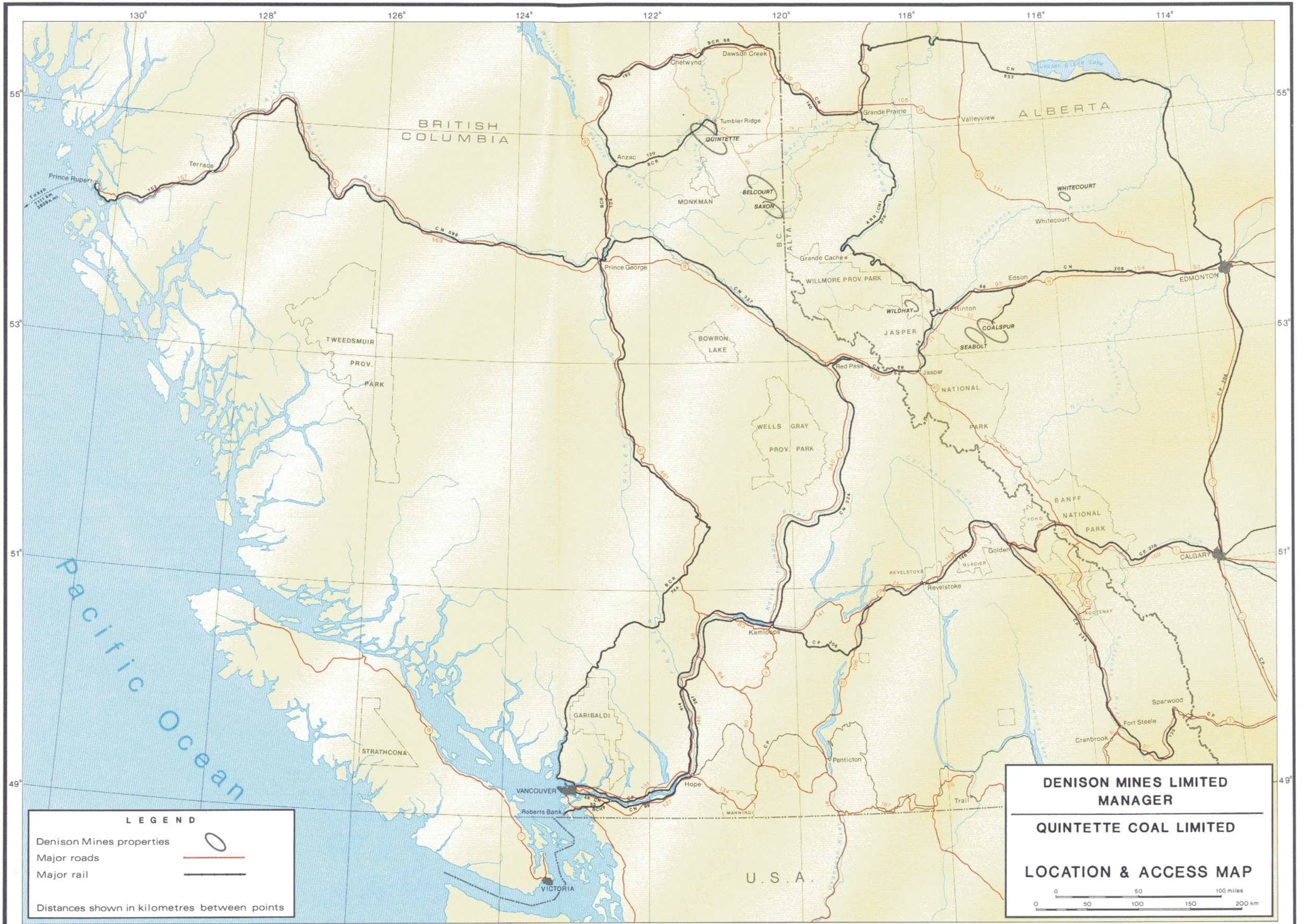
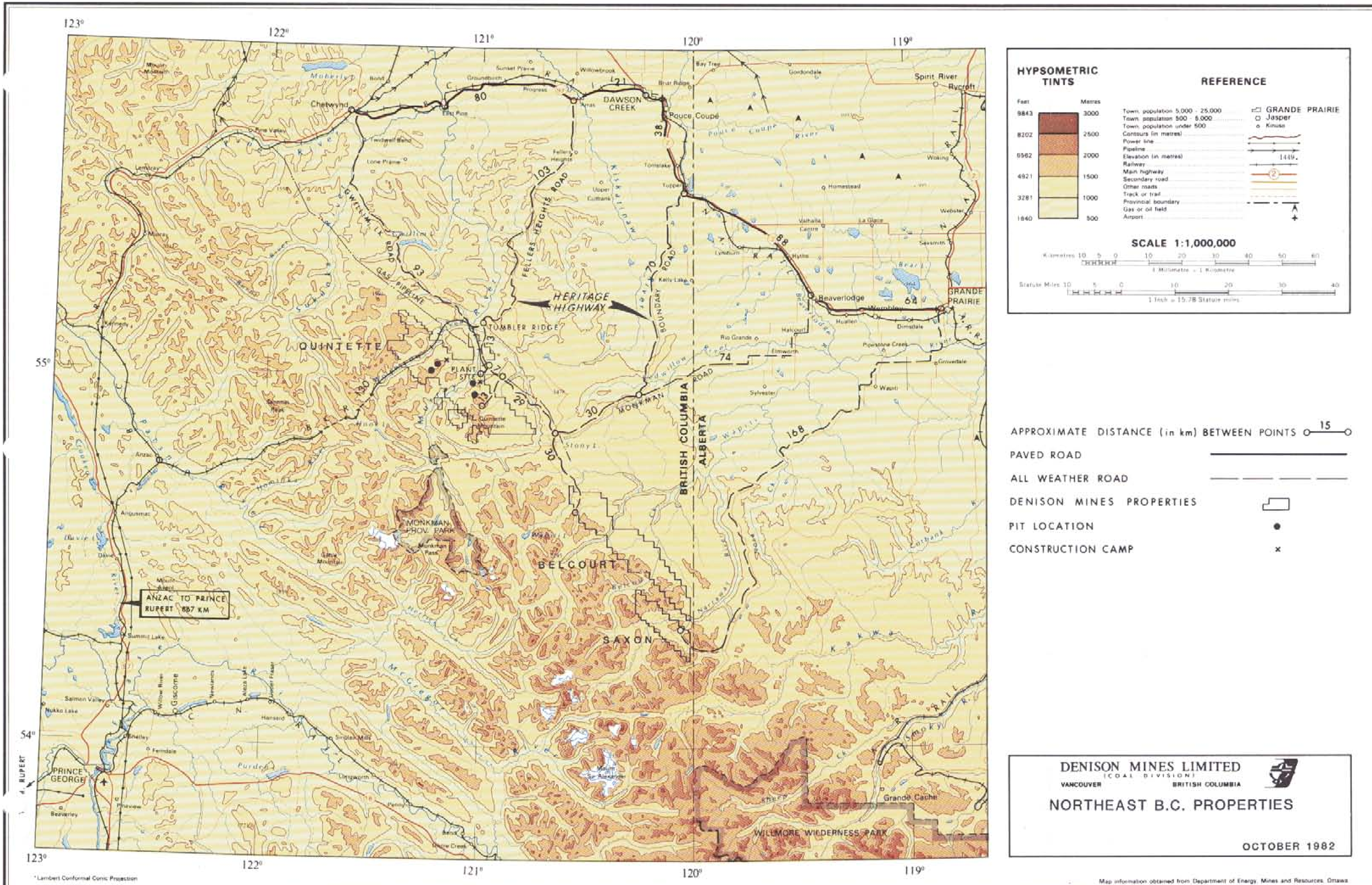

130°
128°
126°
124°
122°
120°
118°
116°
114°
55°
53°
51°
49°
BRITISH COLUMBIA
ALBERTA
Pacific Ocean
U.S.A.
Prince Rupert
Tokyo 7111 km 3839 n.mi.
Terrace
Skeena River
Dawson Creek
Chetwynd
Tumbler Ridge
QUINTETTE
Anzac
MONKMAN
BELCOURT
SAXON
Grande Prairie
Valleyview
Whitecourt
Grande Cache
Prince George
WILLMORE PROV. PARK
Edson
Hinton
WILDHAY
COALSPUR
SEABOLT
JASPER
Jasper
NATIONAL PARK
EDMONTON
TWEEDSMUIR PROV. PARK
BOWRON LAKE
WELLS GRAY PROV. PARK
Red Pass
BANFF NATIONAL PARK
Golden
CALGARY
REVELSTOKE
Revelstoke
GLACIER
KOOTENAY
Kamloops
GARIBALDI
STRATHCONA
VANCOUVER
Roberts Bank
Hope
Penticton
Trail
Sparwood
Fort Steele
Cranbrook
VICTORIA
MANNING
B.C.
ALTA
LEGEND
Denison Mines properties
Major roads
Major rail
Distances shown in kilometres between points
DENISON MINES LIMITED
MANAGER
QUINTETTE COAL LIMITED
LOCATION & ACCESS MAP
0 50 100 miles
0 50 100 150 200 km

FIGURE 1.1.1



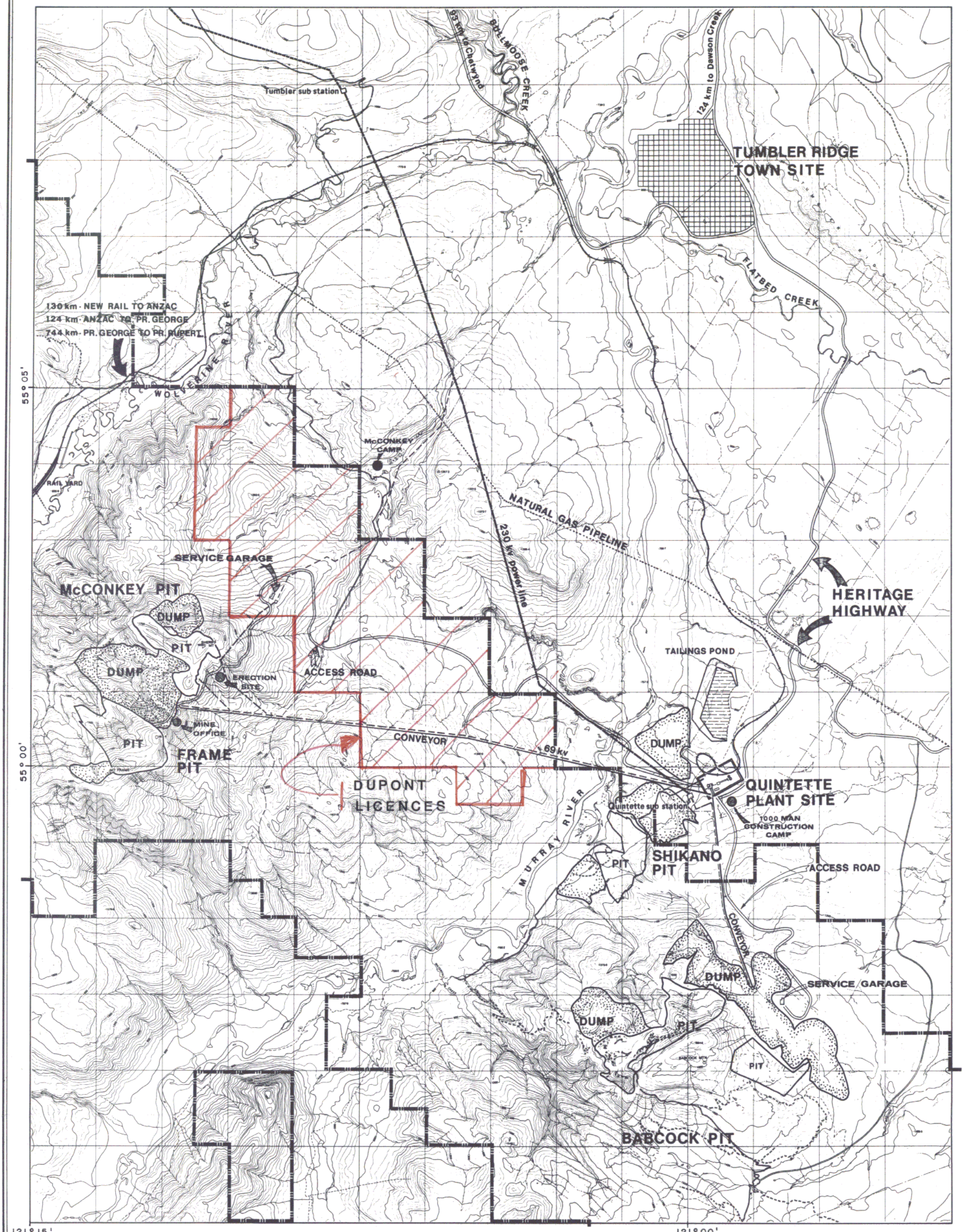
HYPSOMETRIC TINTS
Feet
Metres
9843 3000
8202 2500
6562 2000
4921 1500
3281 1000
1840 500
REFERENCE
Town, population 5,000 - 25,000
GRANDE PRAIRIE
Town, population 500 - 5,000
Jasper
Town, population under 500
Kinuso
Contours (in metres)
Power line
Pipeline
Elevation (in metres)
1449.
Railway
Main highway
Secondary road
Other roads
Track or trail
Provincial boundary
Gas or oil field
Airport
SCALE 1:1,000,000
Kilometres 10 5 0 10 20 30 40 50 60
1 Millimetre = 1 Kilometre
Statute Miles 10 5 0 10 20 30 40
1 Inch = 15.78 Statute miles
APPROXIMATE DISTANCE (in km) BETWEEN POINTS 15
PAVED ROAD
ALL WEATHER ROAD
DENISON MINES PROPERTIES
PIT LOCATION
CONSTRUCTION CAMP
DENISON MINES LIMITED
(COAL DIVISION)
VANCOUVER
BRITISH COLUMBIA
NORTHEAST B.C. PROPERTIES
OCTOBER 1982
123°
122°
121°
120°
119°
55°
54°
Chetwynd
DAWSON CREEK
Pouce Coupe
Spirit River
Rycroft
Beaverlodge
GRANDE PRAIRIE
Wembley
HERITAGE HIGHWAY
TUMBLER RIDGE
QUINTETTE
PLANT SITE
BELCOURT
SAXON
MONKMAN PROV. PARK
BRITISH COLUMBIA
ALBERTA
BOUNDARY ROAD
FELLERS HEIGHTS ROAD
GWILLIM LK ROAD
GAS PIPELINE
MONKMAN
ANZAC TO PRINCE RUPERT 887 KM
Anzac
Summit Lake
PRINCE GEORGE
Giscome
Grande Cache
WILLMORE WILDERNESS PARK
80
121
38
103
93
70
68
64
74
13
29
30
168
Map information obtained from Department of Energy, Mines and Resources, Ottawa
* Lambert Conformal Conic Projection

FIGURE 1.1.3

well as access recently developed for the mine. Figure 1.1.2 shows the main access routes in the construction areas.

1.2 PROPERTY DESCRIPTION

The Dupont Licences option was acquired by Quintette Coal Limited on April 8, 1982. They consist of 16 contiguous coal licences (3914-3929) totalling 3935 hectares. The location of the coal licences are illustrated by the Figure 1.2.1 and legal descriptions of the licences are provided in Table 1.2.1.



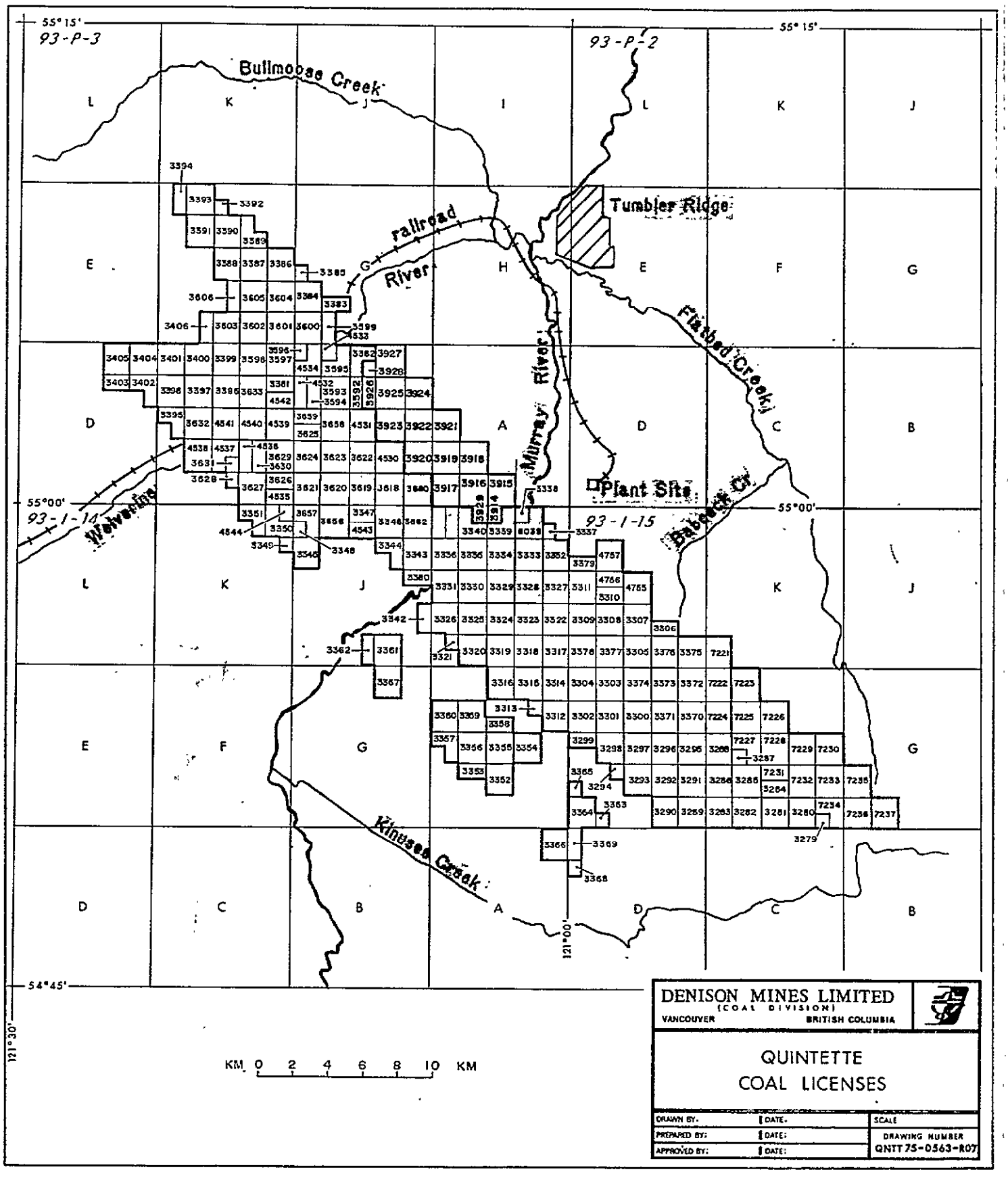
QUINTETTE COAL LIMITED

PROPOSED DEVELOPMENT

KILOMETRES 0 1 2 3 4 5 KILOMETRES

QCL 1·3 January 31, 1983

FIGURE 1.1.2



DENISON MINES LIMITED
(COAL DIVISION)
VANCOUVER BRITISH COLUMBIA

QUINTETTE
COAL LICENSES

DRAWN BY:	DATE:	SCALE
PREPARED BY:	DATE:	DRAWING NUMBER QNTT 75-0563-R07
APPROVED BY:	DATE:	

FIGURE 1.2.1

TABLE 1.2.1

LEGAL DISCRIPTION OF LICENCES

LICENCE NO.	DATE ISSUED	SERIES	BLOCK	UNIT	PAYING HECTARES
3914	June 23, 1978	93-I-14	I	96	74
3915	"	93-P-3	A	5,6,15,16	297
3916	"	93-P-3	A	7,8,17,18	297
3917	"	93-P-3	A	9,10,19,20	297
3918	"	93-P-3	A	27,28,37,38	297
3919	"	93-P-3	A	29,30,39,40	297
3920	"	93-P-3	B	21,22,31,32	297
3921	"	93-P-3	A	49,50,59,60	297
3922	"	93-P-3	B	41,42,51,52	297
3923	"	93-P-3	B	43,44,53,54	297
3924	"	93-P-3	B	61,62,71,72	297
3925	"	93-P-3	B	63,64,73,74	297
3926	"	93-P-3	B	65,75	149
3927	"	93-P-3	B	83,84,93,94	297
3928	"	93-P-3	B	85	74
3929	"	93-I-14	I	97	74
Total 16				Total	3,935

SECTION 2

1983 EXPLORATION WORK

The 1983 exploration work consists of ground geophysical surveys follwed by rotary drilling. All investigations were carried out by Quintette Coal Limited's staff, Denison Mines Coal Division staff and required contractors. Work was undertaken during the month of August, 1983. The work areas are highlighted on the 1:50,000 scale geologic map, Appendix 1.

2.1 GEOPHYSICAL SURVEYS

Ground geophysical surveys were carried out by personnel from Denison Mines, Coal Division, Vancouver, B.C.

2.1.1 Method and Procedure

Along with its ability to determine sub-surface lithologies, the resistivity method is also a valuble tool in the determination of sub-surface geologic structure, and mapping the relief of the bedrock. Direct current or a current from a very low frequency a.c. source is fed into the ground at two points and the voltage difference between two other points is measured, allowing the determination of the apparent resistivity of the ground. Formations carrying conductive ground water will display low resistivities. Other rock formations will show medium to high resistivities and the coal will show very high resistivity.

The resistivity method may not give meaningful results when the surface material is a very poor conductor, or when this material is frozen and when ground contact is poor.

Depth soundings constitute a particular field procedure for determining the variation of electrical earth properties with depth. The surveys are useful

in areas of approximately horizontal geological layering, where the electrical properties of the subsurface materials vary primarily with depth rather than with horizontal position. The final interpretation yields depth and electrical resistivities for the various subsurface layers.

The field procedure in depth soundings consists of taking a succession of apparent resistivity readings for increasing electrode spacings. The method relys on the known fact that a larger spacing between current and potential electrodes normally corresponds to a increased depth of investigation. This survey was carried out using a Slumberger electrode arrangement. The readings were taken as follows: MN = 1m; L = 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15m; MN = 2 m; L = 15, 20, 25, 30, 35, 40, 45, 50, 55, 60 65, 70, 75, 80, 85, and 90m.

The instrument used for the surveys was a RSP-6 D.C., Resistivity and Self-Potential unit manufactured by Scintex Ltd. The maximum power output of this instrument is 180 volts and 645 volts with an auxiliary battery pack which was used for depth soundings.

The results of the depth sounding survey can be found in Appendix 1.3. The locations of the depth sounding survey are found on the map in Appendix 1.1.

2.2 ROTARY DRILLING SUMMARY

Rotary drilling was contracted to S.D.S. Drilling Ltd., Vancouver, B.C. Drilling equipment used by S.D.S. was a Gardener, Denver 1700 drill equipped with Drill Systems dual-wall reverse circulation drill stem and using a down the hole hammer bit.

A total of 2 rotary holes were completed for a total of 361 metres. Table 2.2.1 summarizes the drilling by area, location and depth drilled.

Table 2.2.1

ROTARY DRILLING SUMMARY

DRILL HOLE	NORTHING	EASTING	TOTAL DEPTH
QDR 83001	6098320	618975	150
QDR 83002	6097552	622243	211
		Total Depth	361

2.3 GEOPHYSICAL LOGGING

Geophysical logging of rotary holes drilled on the Dupont Licences was conducted by Quintette personnel using a logging unit from SIE/Geosource, Calgary, Alberta. The tool used was the T-31 Gamma tool. The Gamma Log for hole QDR 83002 is presented in Appendix 1.2.

SECTION 3

GEOLOGY

3.1 PREVIOUS WORK

Previous work carried out by Dupont Canada Explroation in the Dupont licence area, consists of field mapping in 1978 and diamond drilling in 1979 (2 holes). The licence area is underlain by the Lower Fort St. John Group with coal seams occuring in the Gates Formation. Eastward, younger Upper Cretaceous strata overlie the Fort St. John Group, placing the Gates Formation coal at much greater depths. The Dupont Canada ground examination indicated that the geology of the licence area is structurally complex.

3.2 STRATIGRAPHY

The Dupont Licence area contains coal seams which belong to the Gates Formation. Outcrops of the Gates Formation lithologies occur in the core of an anticlinal structure at the southeast end of the licence area, with only the top third of the sequence being exposed. Dupont Canada drill hole DDH 79-2 intersected the complete Gates coal sequence at a depth of 300 m, no other holes drilled on the licence area intersected Gates coal.

The Hulcross Formation outcrops in a steep walled creek in the south limb of the anticlinal structure in the southeast licence area. Hulcross also is exposed on a creek northeast of Site A Sediment Pond in the core of an anticline. The Hulcross Formation is a marine silty claystone unit approximately 100 m thick in the licence area.

The Boulder Creek Formation is exposed in outcrop in the core of the anticlinal structure and in the northern section of the licence area.

Dupont Canada drill hole 79-1 intersected lithologies of the Boulder Creek Formation.

Overlying the Boulder Creek Formation is the Shaftesbury Formation whose lighologies are exposed along the eastern section of the conveyor belt, the Tote Road, and in the area of Site A Sediment Pond. The two rotary drill holes completed during the 1983 exploration program, intersected lithologies of the Shaftesbury Formation.

3.3 STRUCTURE

In the southeast section of the licence area the structure consists of a series of synclines and anticlines which are a continuation of the structure found in the Shikano deposit. The plunge of this structure is to the northwest at 30°.

North of the Tote Road and Nabors Road intersection, an anticline and syncline have been mapped that is inferred to be the continuation of the structure as exposed in the southeast licence area. Two west dipping faults have been inferred in this area.

3.4 COAL SEAM DEVELOPMENT AND CORRELATION

The coal seams of the Gates Formation are not exposed in the Dupont licences area, but were intersected in Dupont Canada drill hole 72-2. They have been identified as D, E, G, and J seams and are similar in appearance to the seams which are being mined in McConkey pit.

APPENDIX 1.1

REGIONAL GEOLOGY MAP

WITH DRILL HOLE LOCATIONS AND GEOPHYSICAL SURVEY LOCATIONS