

NORCO RESOURCES LTD.

VANCOUVER, B. C.

THE PROPOSED  
NORCO COAL MINE

OPEN FILE

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785



**NORCO**

Proposed railway

Proposed road

SCALE 1 : 250 000



## THE PROPOSED NORCO COAL MINE

### 1. Location and Licenced Area

The central point and probable plant-site of the Norco coal property lies 56 kilometers east of Prince George, in the valley of the Bowron River. Highway 16 runs only 7 km to the north, and will eventually be connected to the plant-site by a road 11 km long. By this connecting road the plant-site will be 65 km from Prince George. The property is presently served by an industrial road from Prince George.

Eventually the property can be connected to the Canadian National Railway at Hansard by the construction of a rail link 37 km long. By this connection the plant-site will be 875 km from a deep-sea shipping point at Prince Rupert, or 1100 km from the deep-sea port at Roberts Bank near Vancouver.

The vicinity of the Norco property is uninhabited. The nearest community is Sinclair Mills, 27 km to the north-east.

The coal property consists of 16 coal licences totalling an area of 15.6 square miles, or 4,040 hectares. This area covers the complete coal basin, as far as it can be defined at this time.

## 2. History

The Norco property was first identified in 1870 by G. M. Dawson of the Geological Survey of Canada. In the years following, the mine supplied small amounts of coal to nearby communities. After 1960, with improved transportation, the property received more intensive study.

In 1966 Mr. M. Menzies obtained an option to the property from the owners, Northern Coal Company. Six diamond-drill holes were driven, the deepest cutting coal at a depth of 670 m in the centre of the basin. A decline was driven to the uppermost coal seam. The company represented by Mr. Menzies dropped its option at this time because of the poor market for coal.

In 1971 Mr. Menzies became president of Northern Coal Company and negotiated an option with Bethlehem Copper Ltd., who drilled five deep holes, then withdrew. Their work is incorporated in the current evaluation of the property. The company was reorganized and refinanced in 1976 in the name of Norco Resources Ltd.

In 1976 the decline was dewatered and an 11-ton sample removed from the upper seam for testing in the laboratory of the Department of Energy, Mines and Resources in Edmonton. The results of these tests are reported under "Coal Quality".

In 1977 a substantial drilling programme was completed under the direction of John R. Kerr, P. Eng., a consulting geologist. 25 holes totalling 6,700 m were drilled and the cores logged and tested.

3. Geological Setting and Preliminary  
Estimate of Coal Reserves

The Bowron Coal Basin was formed in Late Cretaceous or Early Tertiary times in a quiet inland lake. Three distinct seams of coal have been identified by drilling, suggesting that conditions suitable for coal formation existed over most of the basin in at least three periods. The sequence is generally as follows:

Barren	Variable Barren Cover
Upper Seam	0.1 to 2.4 m thick
Barren	18 m
Middle Seam	0.3 to 3.0 m thick
Barren	24 to 30 m
Lower Seam	1.5 to 9.0 m thick
Barren	18 to 36 m
	Basement

The trend of the beds, as shown in the attached map, is N 30° W and the dip varies from 35° near the western limit to 20° as the formation approaches the center of the trough-like structure.

At least one fault has been identified in the area of intensive drilling. The fault strikes N 50° W, and dips nearly vertically, with a displacement of about 75 m.

In his report of January 5, 1978, John Kerr provided an estimate of coal reserves as follows:

Proven Reserves: Kerr lists a total of 5.94 million tonnes of coal in place as 90% proven, the remaining 10% being probable.

Drill-Indicated or Possible Reserves: Following a review of all work done on the property, Kerr lists a total of 55 million tonnes as drill-indicated.

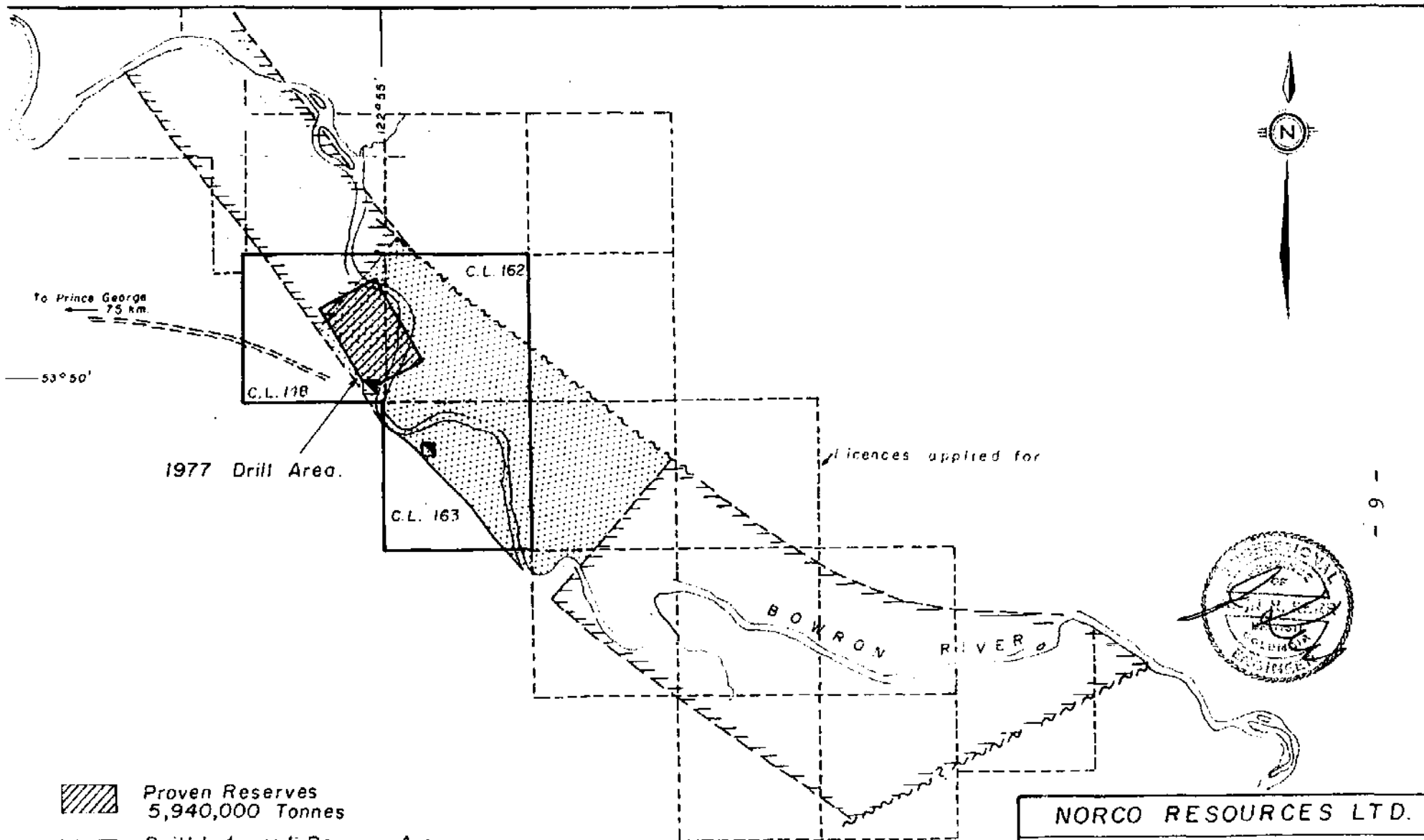
Potential Reserves: Kerr has referred to work by others in listing from 100 million to 250 million tonnes in the potential category. In this calculation the coal measure is considered to extend over the basin delimited by outcrop of the Bowron River sediments and by known faults.

The following summarizes the total geological reserves in the Bowron Coal Basin:

Proven Reserves	6 million tonnes
Drill-Indicated Reserves	55 million tonnes
Potential Reserves	100 to 250 million tonnes
Total Reserve Potential	<hr/> 161 to 311 million tonnes <hr/>





The attached figure indicates the areas occupied by the three categories of reserves. (See page 6.)

Assuming 50% mineable, the 61 million tonnes of proven and drill-indicated reserves can be expected to yield 30.5 million tonnes of raw coal, or at least 20 million tons of clean coal, enough to supply a million ton operation for twenty years.



1977 Drill Area.

licences applied for

-  Proven Reserves  
5,940,000 Tonnes
-  Drill Indicated Reserve Area  
55,000,000 Tonnes
-  Unexplored Bowron River Sediments  
Potential Reserves
-  Mine entry

<b>NORCO RESOURCES LTD.</b>	
<b>BOWRON RIVER COAL DEPOSIT</b>	
Cariboo Mining Division British Columbia	
Tech Work by K.D.A.	Scale 1 in = 1 mi
Drawn by W.S.	Date December 1977
Approved by J.R.K.	Fig. No. 152-2



#### 4. Coal Quality and Resin Potential

Coal from the Norco property has been described as a good quality thermal coal, ranking as High Volatile B Bituminous. The 11-ton sample of coal sent to Edmonton in 1976 received the most thorough test to date. After washing to an ash content of 9.8%, the coal produced 6,870 calories per gram, or 12,370 BTU per pound, and contained 0.9% Sulphur. The attached sheet entitled "Coal Analysis" records the results of these tests.

Coal samples from drill-core were tested by Commercial Laboratories in 1977. The results were consistent with the EMR tests, and demonstrate a high degree of consistency across the area explored. The attached chart "Relationship of Calorific Value to Ash Content" illustrates the results of these tests.

The sulphur contained in this coal is present in sulphide form, as pyrite and marcasite. These heavy minerals may be removed readily in washing coal, but this possibility must be confirmed by further laboratory work.

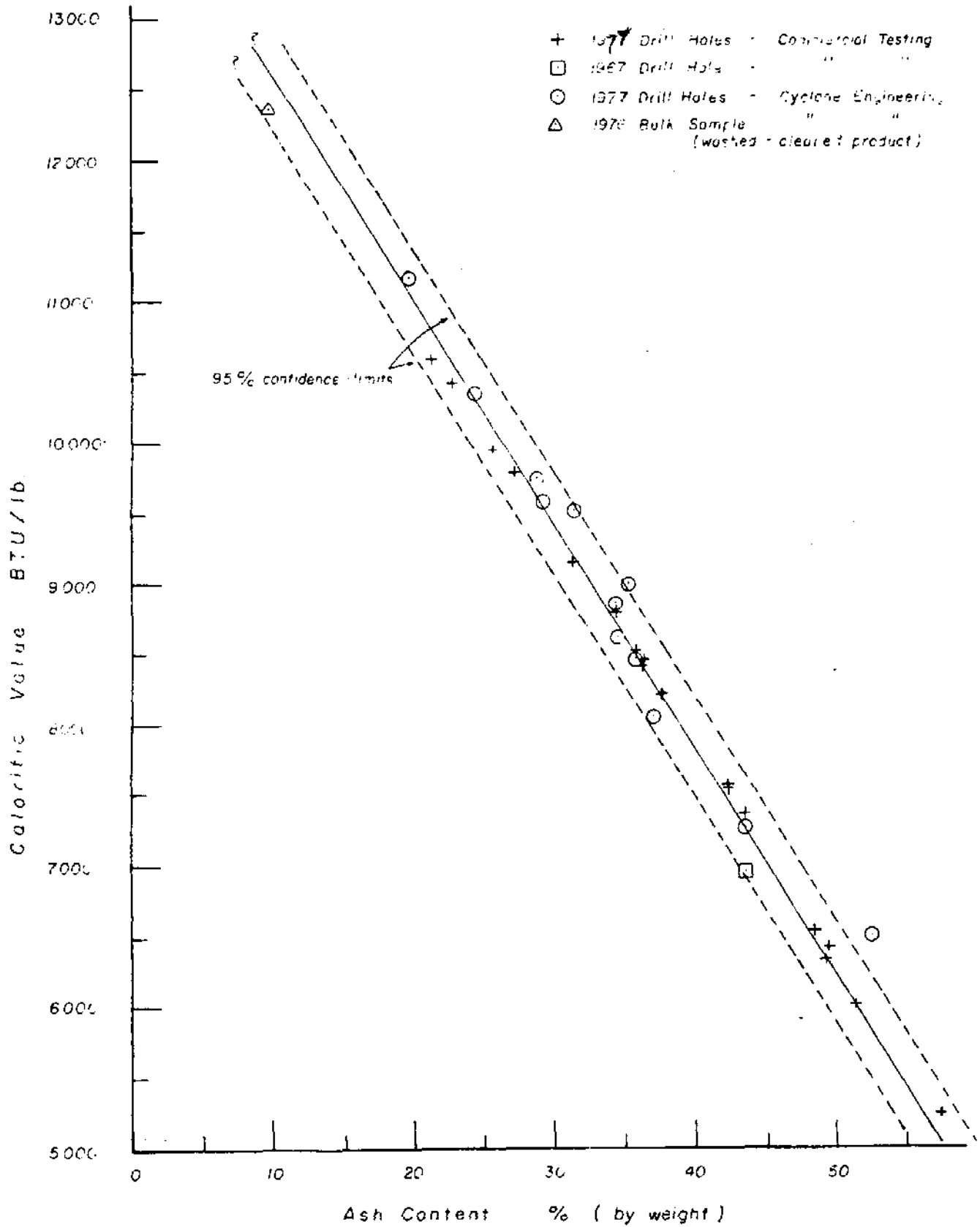
The Norco coal deposit is unusual in containing a high-grade amber resin. This material is described more fully in Norco's "Memo Describing Amber Resin Found in Norco Coal Deposit".

COAL ANALYSIS

(As Reported by Cyclone Engineering Sales Ltd.)

	<u>Feed Sample</u>	<u>Washed Sample (Prepared by E.M.R.)</u>	
<u>Proximate Analysis</u>			
Ash %	36.1	9.8	
Retained Moisture %	2.2	2.5	
Volatile Material %	31.0	34.9	
Fixed Carbon %	30.7	52.7	
<u>Ultimate Analysis</u>			
Ash %	36.1	9.8	
Carbon %	48.6	67.9	
Hydrogen %	3.8	4.9	
Nitrogen %	0.9	1.2	
Sulphur %	1.0	0.9	
Oxygen (by difference)	9.7	15.4	
<u>Ash Fusibility</u>		<u>Red. Atm.</u>	<u>Ox. Atm.</u>
Initial Deformation Temp. °C	1270	1170	1240
Softening Temp. (spherical)	1360	1240	1280
Softening Temp. (hemispherical)	1390	1280	1320
Fluid Temp.	1480	1430	1480
Calorific Value cal/g	4620	6870	
Free Swelling Index	N/A	1/2	
Hardgrove Grindability Index	58.0	N/A	

↑  
upper seam



**BOWRON RIVER COAL DEPOSIT**  
RELATIONSHIP OF CALORIFIC VALUE TO ASH CONTENT

## 5. Environmental Considerations

### 5 (a) The Setting

The Norco property is located in the broad, flat-bottomed valley of the Bowron River, bordered by low benches rising gradually to hills about 500 m above the valley floor. The feature of the environmental setting is the Bowron River, an attractive stream that is important for recreational and fishing values. The project must be planned, built, and operated to maintain its present desirable features.

The climate of the area reflects the northern interior setting. Summer temperatures range from an average monthly minimum of 8° C to an average monthly maximum of 22° C. Winter temperatures fall to minus 18° C as an average monthly minimum. The average annual precipitation is 925 mm, much of it falling as snow in the winter months.

The use of the land is primarily forestry, and the land around the mine has been either logged or burned off.

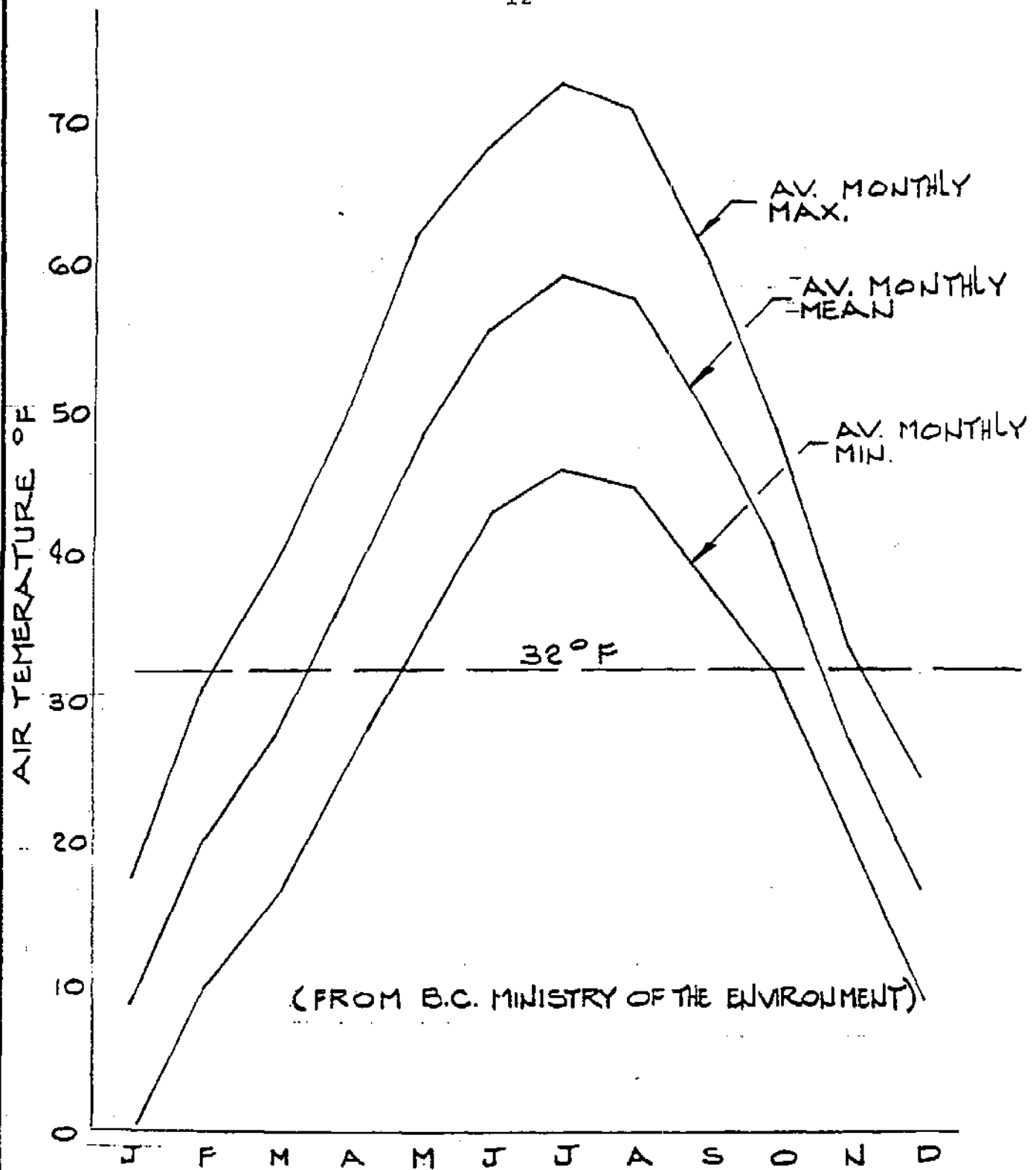
### 5 (b) The Development

The surface evidence of the proposed development will be two mine portals leading to the underground workings, a group of modern plant buildings for cleaning the coal and refining the associated resin, smaller service buildings, and storage and waste piles and lagoons. The area occupied by the surface

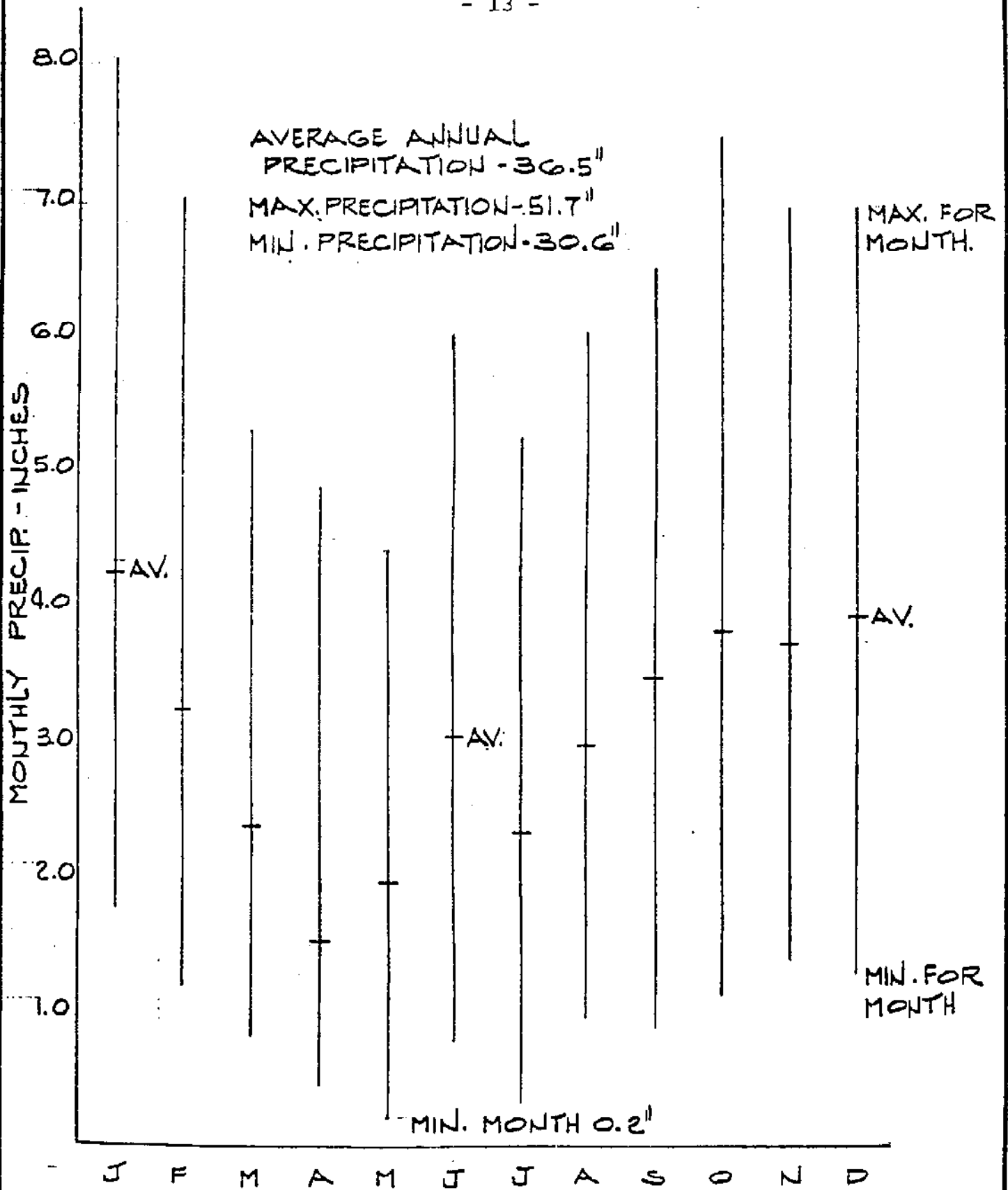
facilities will be about 60 hectares. A pump-house built on the bank of the Bowron River will be the only impact on the river itself. Access to the property for personnel and product haulage will be constructed to the highway and railway, generally along established transportation corridors. The mine staff will live in nearby communities.

5 (c) Mitigation and Reclamation

Waste piles and lagoons will be designed and built to minimize the possibility of polluting the Bowron River, as required by provincial agencies. After the operation is complete, all such facilities will be restored to a condition that is consistent with the surrounding area. Buildings will be removed, paved areas broken up, and in general the area will be restored to further use.



AIR TEMPERATURE  
ALEZA LAKE STATION NO 109009  
FOR YEARS 1952-74



MONTHLY PRECIPITATION RECORDS  
ALEZA LAKE  
FOR YEARS 1952-74

6. Proposed Development Plan

6 (a) Schedule

In brief, the schedule of development is as follows:

STAGE I - PREPRODUCTION

(A) 1979 - 1980: Exploration

Diamond Drilling

Preliminary Underground

Metallurgical Study

(B) 1980 - 1982: Development

Dual Entries, Haulage Tunnel,  
Seam Drifting

Trial Mining, Short Wall, Room  
and Pillar, Hydraulic

STAGE II - CONSTRUCTION

1981 - 1983: Mine

Surface Plant, Coal Cleaning  
and Shipping

Environmental and Reclamation  
Requirements

STAGE III - OPERATION - 1984

(Full-scale operation in 1985)

6 (b) Summary of Activities Associated with Feasibility Study, 1979-80

In preparing for the proposed on-site activity, a new and larger camp must be assembled, with adequate facilities for drilling crews, underground workers, and technical staff. At the same time, existing photography and ground control will be used to prepare detailed topographic maps of the area.



The existing pattern of drilling will be extended, but on wider spacing, to prove up coal reserves in the central portion of the Bowron River coal basin. The drilling contract will be for 3,000 m of NQ wireline. A parallel contract will provide for electrologging of all holes, including those of the 1977 drilling programme that remain open. The geological staff will use the information from this programme to develop accurate estimates of coal reserves.

The existing decline will be extended to explore all three coal seams. During this operation the coal will be sampled extensively, and the coal measures will be studied to determine the best techniques to employ in mining, and the cost of development and mining will be calculated by coal-mining specialists.

With bulk samples of coal available, the coal processing facility will be designed by a competent firm of coal specialists. The design will provide the cost of the plant and the cost of operation required to produce the quality of coal to export. Included in the design will be the separation of amber resin from the coal, although further processing of the resin would be conducted separately.

The feasibility study will also discuss transportation of coal to shipping ports, training and accommodation of mine staff, the environmental aspects of the development, and

similar considerations. The study will be conducted with the collaboration of regulatory agencies, and with the cooperation of local authorities and people.

The final activity in this study will be the analysis of all data to establish the feasibility of the project.

In brief, Norco intends to proceed with all speed toward the development of a modern underground coal mine that will deliver one million tonnes of high-quality clean coal per year.