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Prospectus for
SUKUNKA/BULLMOOSE
PROPERTY
BP Exploration Canada Ltd.

Submitted to:

Deputy Minister of Mines and Petroleum Resources
Government of British Columbia
Victoria, B.C.

August, 1977

TABLE OF CONTENTS

	Page
List of Figures	
List of Tables	
Abstract	1
History of Exploration	4
Geology	6
Coal Geology	13
Coal Quality	16
Future Exploration	17
Reserves	19
Mine Plan and Development	23
Washery	28
Power Requirements	32
Manpower	29
Townsite	31

List of Figures:

	Page
Figure 1: Location Map	2
Figure 2: Sukunka/Bullmoose - Boreholes Penetrating the Upper Gething	4
Figure 3: Sukunka/Bullmoose - Stratigraphic Column	7
Figure 4: Sukunka/Bullmoose Composite Graphic Section - Gething Sequence	8
Figure 5: Geologic Map of Area Showing the Plates	10
Figure 6: Typical Schematic of Sukunka Cross-Section	11
Figure 7: Typical Schematic of Bullmoose Cross-Section (looking northwest)	12
Figure 8: Sukunka/Bullmoose Seam Section	14
Figure 9: Sukunka/Bullmoose Exploration Programme 1977	18
Figure 10: Sukunka Property Saleable Reserves of Skeeter Seam	20
Figure 11: Sukunka Property Saleable Reserves of Bird Seam	21
Figure 12: Sukunka Property Saleable Reserves Map	22
Figure 13: Detail of Sukunka Project - Stage 1	24
Figure 14: Sukunka Project Flow Chart	25
Figure 15: Sukunka/Bullmoose Conceptual Mine Plan	28

List of Tables:

Table 1: Sukunka Reserves Table	19a
Table 2: Production Schedule - Sukunka/Bullmoose Project	26
Table 3: Development Schedule	30

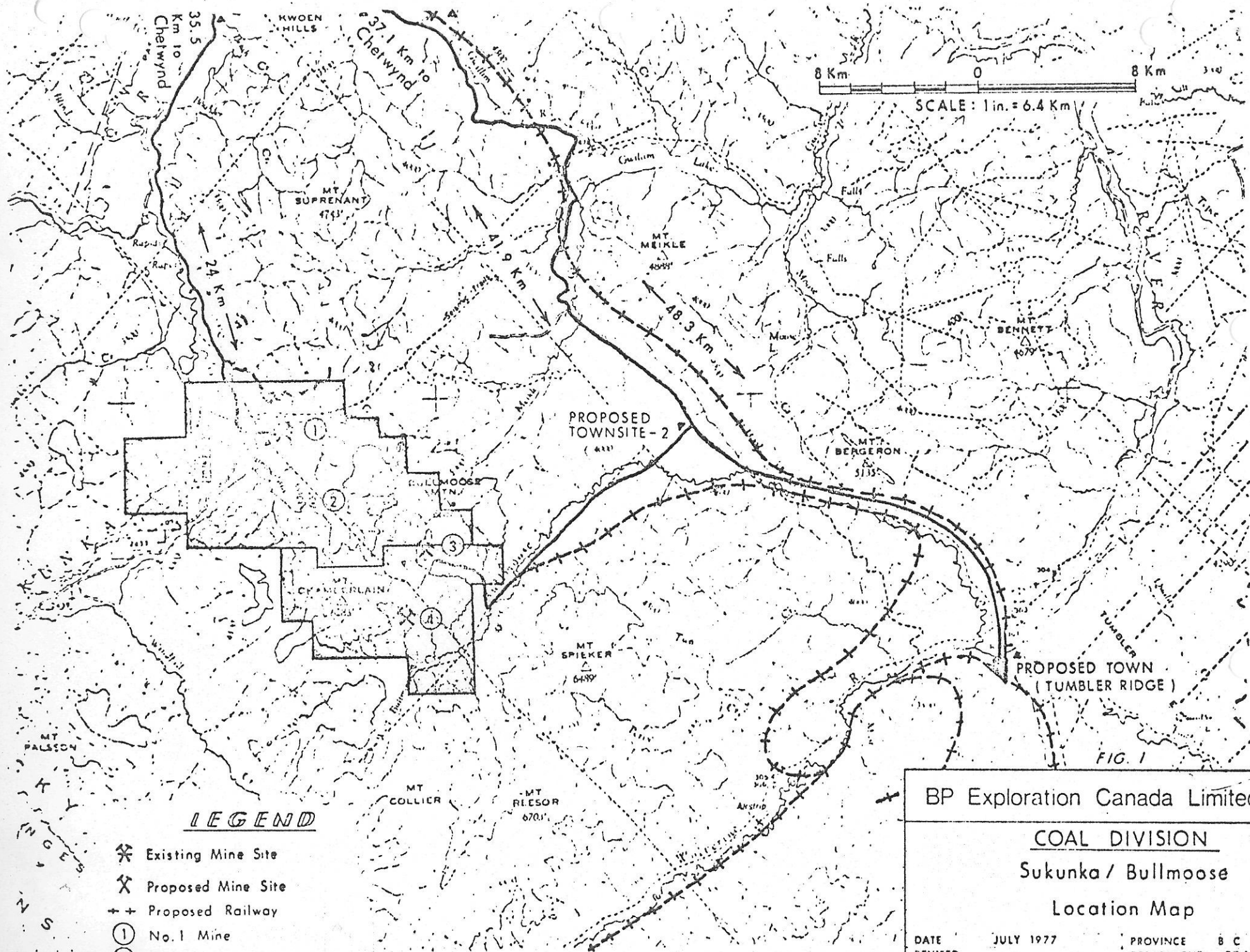
ABSTRACT

BP Canada in conjunction with BP Canada Holdings have acquired from Brameda Resources 100% of the Bullmoose and Chamberlain Properties (from now on called the Bullmoose Property collectively), and 87.5% of the adjoining Sukunka Property. Brascan Resources holds the remaining 12.5% of the Sukunka Property.

The Properties are located about 60 km south of Chetwynd (Fig. 1), and cover approximately 165 sq. km. The Commotion and Gething Formations, which underlie most of the Properties, are the coal bearing horizons of interest. Although several coal seams are present in these formations, only the Skeeter and Chamberlain Seams are considered viable operations. Further exploration may show other seams to be economically viable.

BP proposes to mine the Skeeter and Chamberlain Seams principally by underground methods. To date sufficient reserves have been indicated to support an annual rate of production of 3 million tonnes of saleable coal for at least 20 years. The mine development will be in two stages. In the first stage, which is planned to start in 1979 and continue for about 5 years, use will be made of existing infrastructure, viz., Chetwynd, rail from Chetwynd to Vancouver, and Neptune Terminals. It is felt that these facilities would support the production of approximately 500 000 t of saleable coal. During this stage production will be trucked to Chetwynd where it will be washed in a small pilot plant before being put on rail to Vancouver. Mine personnel will be housed at Chetwynd and at an existing camp at the mine site.

Stage 2, which will see capacity increased to a maximum of 3 000 000 t of saleable coal, can only be undertaken if the infrastructure being considered by the Government is in place. During this stage coal from the mine will be washed



LEGEND

- ✱ Existing Mine Site
- ✕ Proposed Mine Site
- +-+ Proposed Railway
- ① No. 1 Mine
- ② Chamberlain Window Mine
- ③ Saddle Creek Mine
- ④ Teck Corp. Mine

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COAL DIVISION
Sukunka / Bullmoose
Location Map

DATE	JULY 1977	PROVINCE	B C
REVISED		DEPARTMENT	COAL
SCALE	AS SHOWN	DRAWN BY	
AUTHOR	A. KAHL	DRWG NO	CP 3652

in a major coal preparation plant, probably located at town-site 2, before being placed on rail. The location of the rail spur that will connect with the new mainline is not known at present. The town of Tumbler Ridge will be used to house the personnel. Figures 13 and 14 are simplified networks of the project until 1984.

HISTORY OF EXPLORATION

Brameda began exploring the Sukunka portion of the Property in 1969 by carrying out field mapping and the drilling of about 50 cored boreholes. In 1970 Brascan with partners obtained an option and commissioned Clifford McElroy to explore the Property. This resulted in the drilling of an additional 128 boreholes, the drivage of adits (totalling 42 m), and the stripping of 4 510 m of coal outcrop. The effective borehole spacing is on a 610 m grid in a rectangular block 3 x 6 km (Fig. 2). In addition two mines were started; one located in the northern end of the Property (No. 1 Mine in 1972) and the other in the western part of the property on the north wall of Chamberlain Creek (Chamberlain Window Mine in 1976) (Fig. 1). A total of 6 218 m of roadways were driven, of which 5 944 were in the No. 1 mine.

In the Bullmoose portion of the Property, 60 boreholes were drilled as of June 1977 of which only 28 are sufficiently deep to have encountered the Chamberlain Seam. The others falling within the Brameda area of interest on the Gates Coal. In addition about 805 m of Chamberlain Seam outcrop were stripped mostly on the eastern side of the Property.

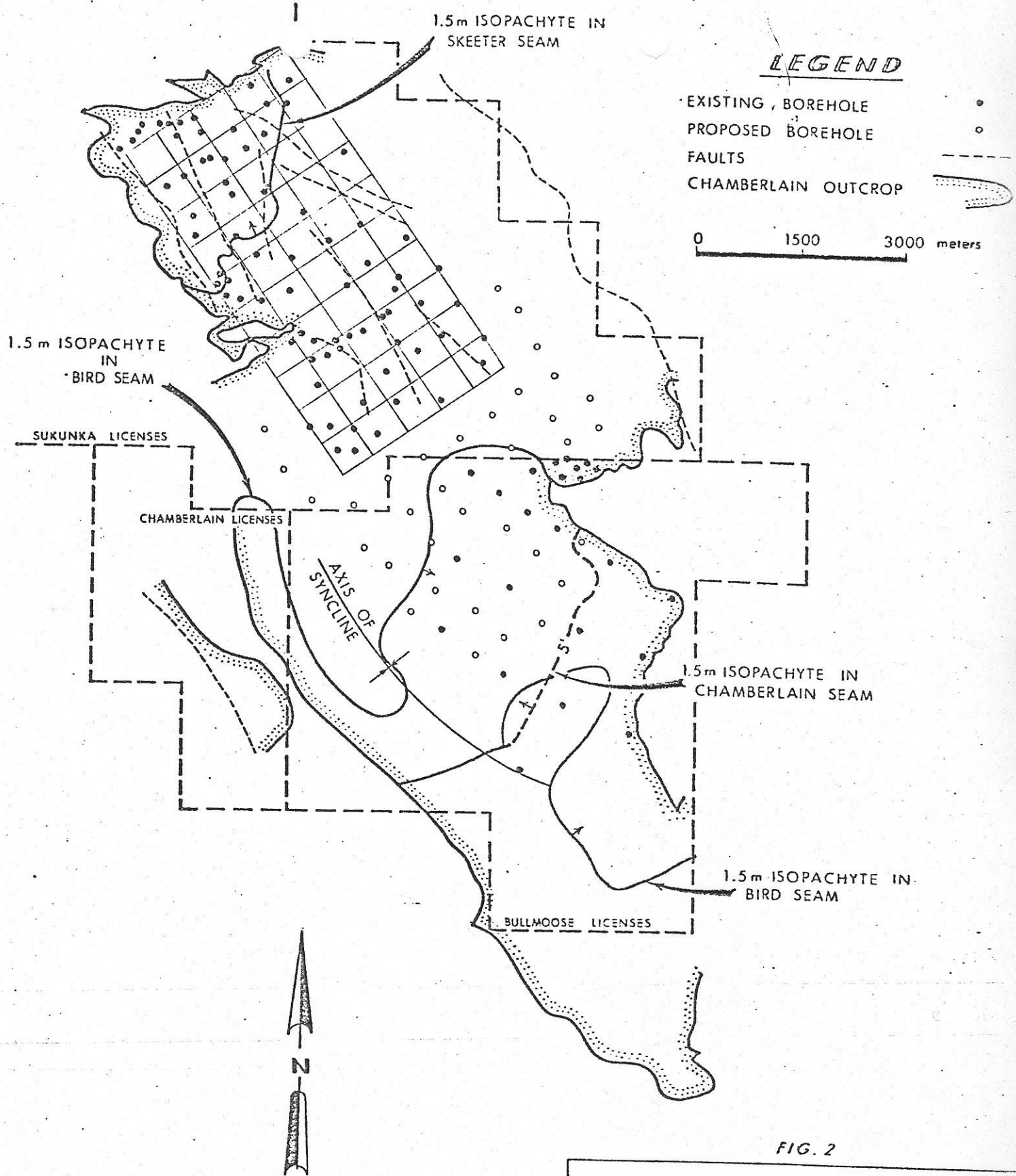



FIG. 2

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COAL DIVISION

Sukunka / Bullmoose
Boreholes Penetrating the
Upper Gething

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AUTHOR	A KAHIL	DRWG NO	CP 3641

GEOLOGY

The formations of interest in the Sukunka/Bullmoose area are all of Lower Cretaceous age. The Gething Formation which is the oldest coal bearing formation of interest conformably overlies the Cadomin Formation (Fig. 3). It is about 245 m thick and contains 8 coal seams. Two thin bands of coal occur in the lowermost 15 m while two seams, commonly referred to as the Middle Coal, are present at less than 45 m from the base of the formation. A thin coal band is present about 175 m above the base of the formation while the two seams known to be economically minable in places on the Property are 185 m to 190 m above the base. These are called Chamberlain and Skeeter Seams respectively. The Bird Seam is located in the uppermost 3 m of the formation. The stratigraphic position of these seams with a description of the intervening strata are shown in Figure 4.

Most of the exploration undertaken to date concentrated on the portion of the Gething above the floor of the Chamberlain Seam, therefore very little is known of the portion of the formation below that, commonly called the Lower Gething.

Overlying the Gething is the marine Moosebar Formation which is about 90 m thick. The Moosebar is not coal bearing. It is overlain by the Commotion Formation which is about 455 m to 610 m thick. The Gates Member of the Commotion Formation is known to have coal seams of economic interest in areas south of the Property. In the Sukunka portion of the Property the Gates Coals were extensively explored but were generally found to be too thin and discontinuous for underground mining. They have not been sufficiently explored in the Bullmoose portion of the Property to determine their economic viability. This will be done in the summer of 1977.


The structural setting of the coals appears to be different in the Sukunka portion of the Property than that in the Bullmoose

Age	Group	Formation	Member	Thickness (meters)	Coal Seams	
Lower Cretaceous	Ft. St. John	Comotion	Hasler	140		
			Boulder Creek Mb	60-180		
			Mulcross Member	105		
			Gates Member	180-190	Gates	
			Sukunka Member	120-130		
			Moosebar		90	
	Bullhead	Gething	Upper	35-65	Bird Skeeter Chamberlain	
			Lower	180-300	Middle-	
			Cadomin	90		



Coal bearing Fm.

FIG. 3

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COAL DIVISION	
Sukunka/ Bullmoose	
Stratigraphic Column	
DATE	JULY 1977
REVISION	
SCALE	
AUTHOR	A. KAHIL
PROVINCE	B.C.
DEPARTMENT	COAL
DRAWN BY	
DRWG NO	CP 3654

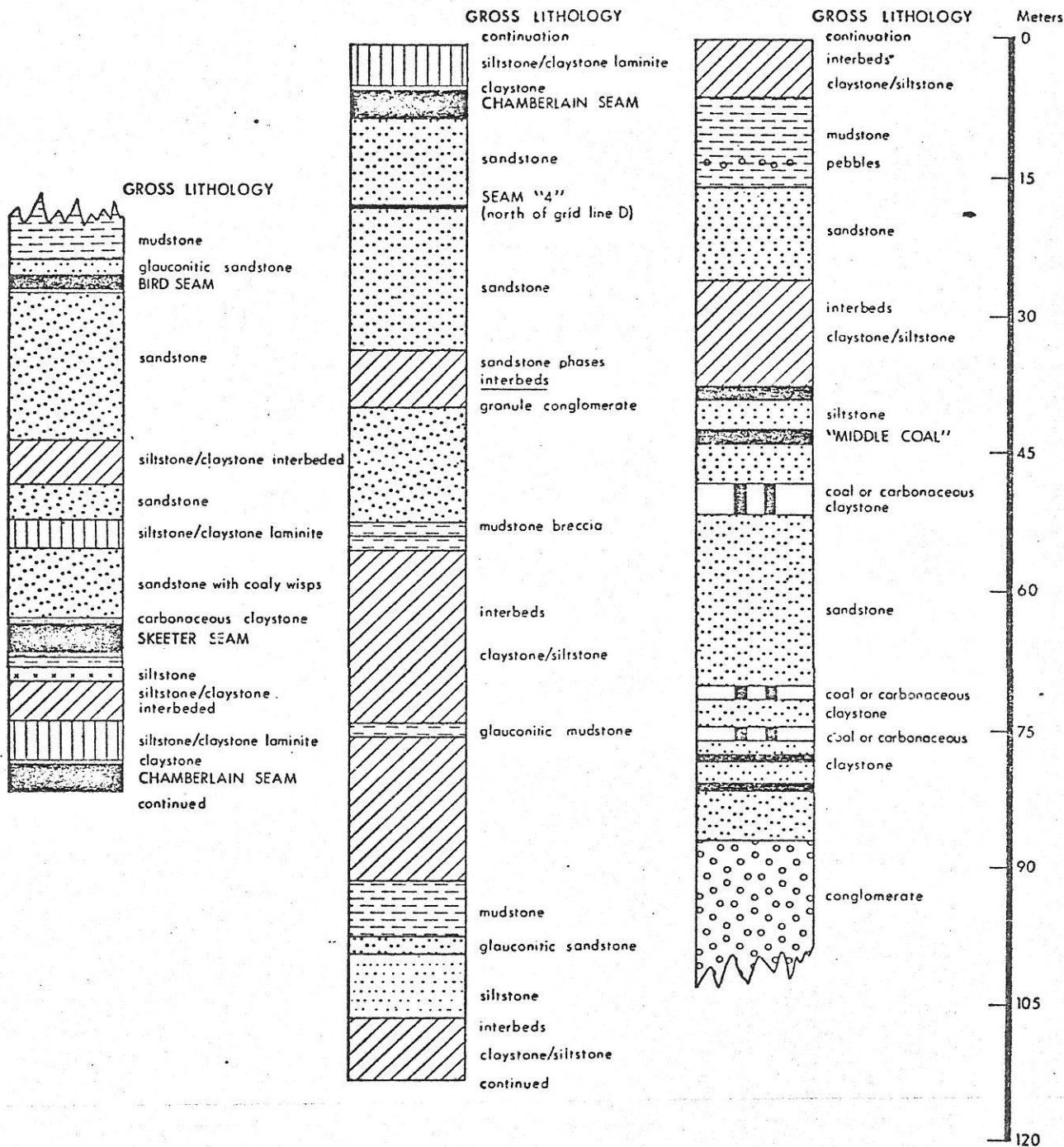



FIG 4

BP Exploration Canada Limited 	
COAL DIVISION	
Sukunka / Bullmoose	
Composite Graphic Section	
Getting Sequence	
DATE JULY, 1977	PROVINCE B.C.
REVISION	DEPARTMENT COAL
SCALE 1" = 50 FEET	DRAWN BY J.W.
AUTHOR A. KAHL	DRWG NO CP-3621

portion. In Sukunka, two major faults have divided the area into three plates shown in Figure 5 which have been numbered from west to east 1, 2 and 3. Other smaller faults break up the plates into smaller sections identified by a lower case letter, example 2a, 2b, etc., again from west to east. A typical cross section is shown in Figure 6. Nearly all the known faults in the Property are thrust faults with the fault plane dipping westwards.

Faulting does not appear to be as extensive in the Bullmoose portion of the Property. The area is folded in an asymmetric syncline with the western limb being the more inclined (Fig. 7). Because in the Sukunka area, faults tend to die out southwards, it is probable that the apparent lesser faulting in the Bullmoose area is real and not only due to a paucity of information. This, however, will be determined in the future exploration programs.

In the Sukunka portion of the Property the beds dip at an average of about 8° . Dips on the eastern side of the syncline in the Bullmoose area average about 9° westward while on the western limb they reach angles of about 70° . A simplified geologic map of the area is given in Figure 5.

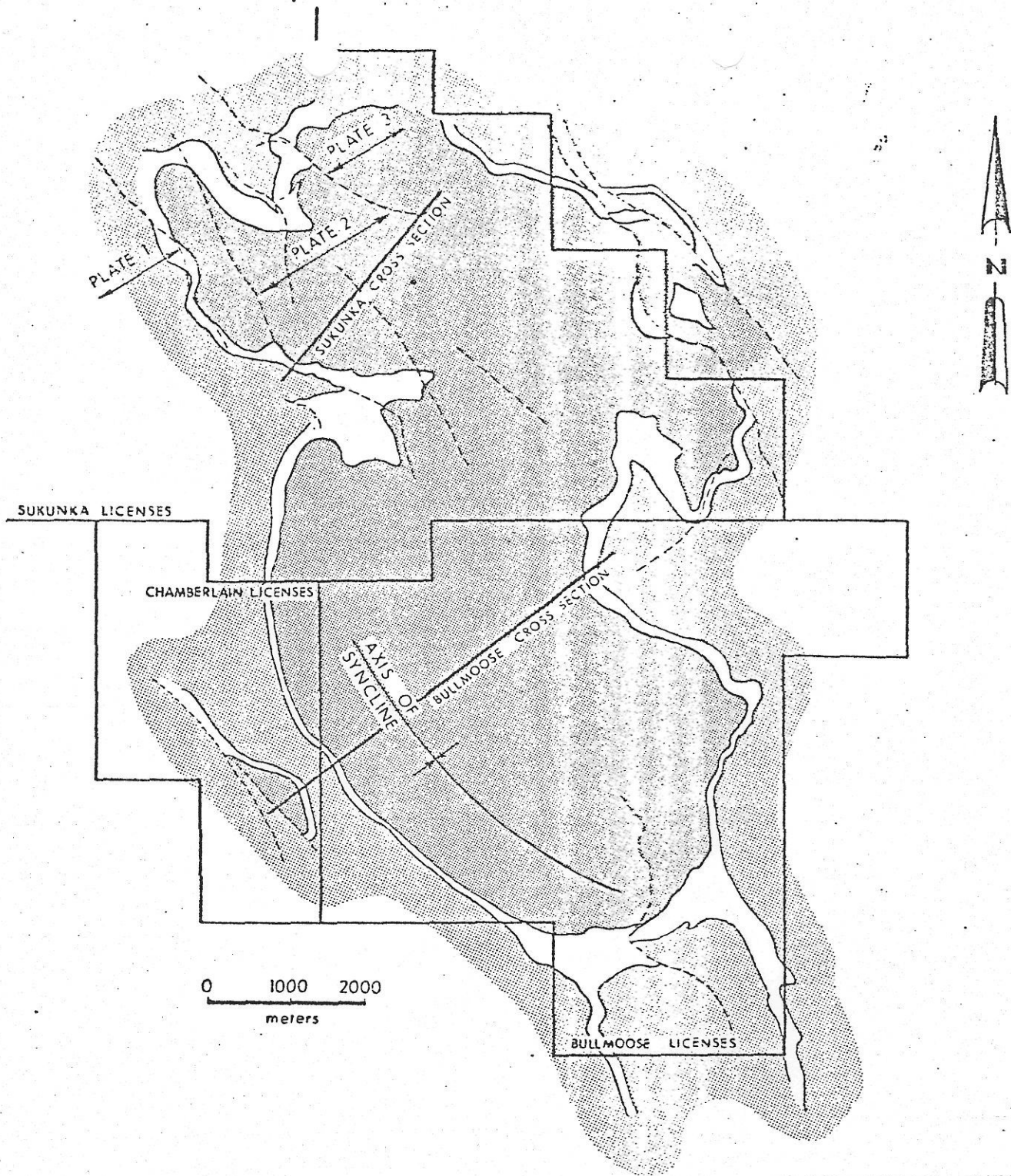


FIG. 5

LEGEND

- COMMOTION FM.
- MOOSEBAR FM.
- GETHING FM.

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<u>COAL DIVISION</u>	
Sukunka / Bullmoose	
Geologic Map	
DATE JULY 1977	PROVINCE B C
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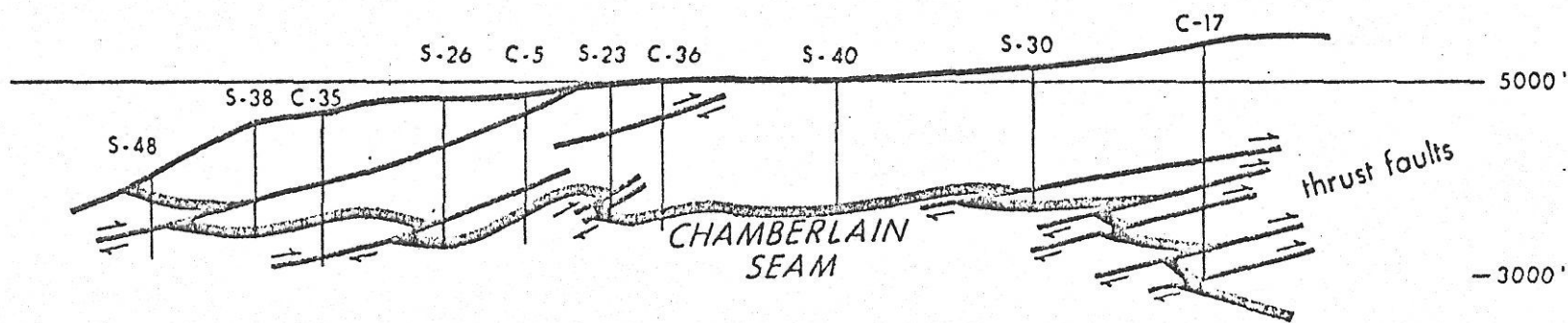


FIG. 6

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COAL DIVISION

Typical Schematic of
Sukunka Cross-Section
(Looking Northwest)

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DEPARTMENT COAL

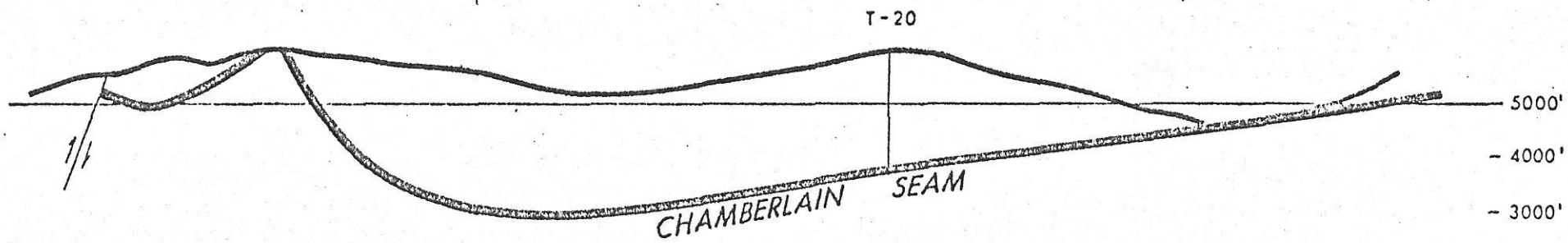


FIG. 7

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COAL DIVISION

Typical Schematic of
Bullmoose Cross-Section
(Looking Northwest)

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PROVINCE B.C.
DEPARTMENT COAL

COAL GEOLOGY

The Skeeter and Chamberlain Seams vary laterally, both in thickness and in quality. The lower, Chamberlain Seam, ranges in thickness from 1.37 m to 4.42 m with an average of about 2.59 m. A typical detailed section is given in Figure 8. It does not contain any consistent parting within it. However, towards the southern part of the property a top leaf does split off which is generally too thin to be mined. Further south, the seam as a whole thins and becomes uneconomic. The roof of the Chamberlain seam typically consists of a carbonaceous mudstone, often called bone, overlain by laminated mudstone and siltstone. It is expected that this material will be part of the run-of-mine product and will have to be removed at the washery. The floor of the seam is almost always a hard, very abrasive sandstone.

The Skeeter Seam, which is separated from the Chamberlain Seam by 5 to 12 m of siltstone and claystone, ranges in thickness from 1.2 to 4.0 m. It is considered commercial only when over 1.5 m thick which restricts the working section to the northern portion of the Sukunka area (Fig. 10). The seam is a composite seam with a dirt band composed of about 0.6 m of a strong carbonaceous siltstone. This band divides the seam into an upper leaf, about 1.7 m thick, of cleaner coal (average ash 6%) and a lower leaf, about 0.5 m thick, of dirtier coal (average ash 18%). The roof of the seam generally consists of a silty mudstone, overlain by a sandstone. The floor is generally composed of a strong siltstone. BP is planning to mine, in most areas, both leaves of coal.

The Bird Seam, which lies from 30 to 45 m above the Chamberlain Seam, is not considered commercially mineable in the Sukunka area because of a high sulphur content and too thin a working section. These problems appear greatly reduced southward. However, because the information in this area is not sufficient

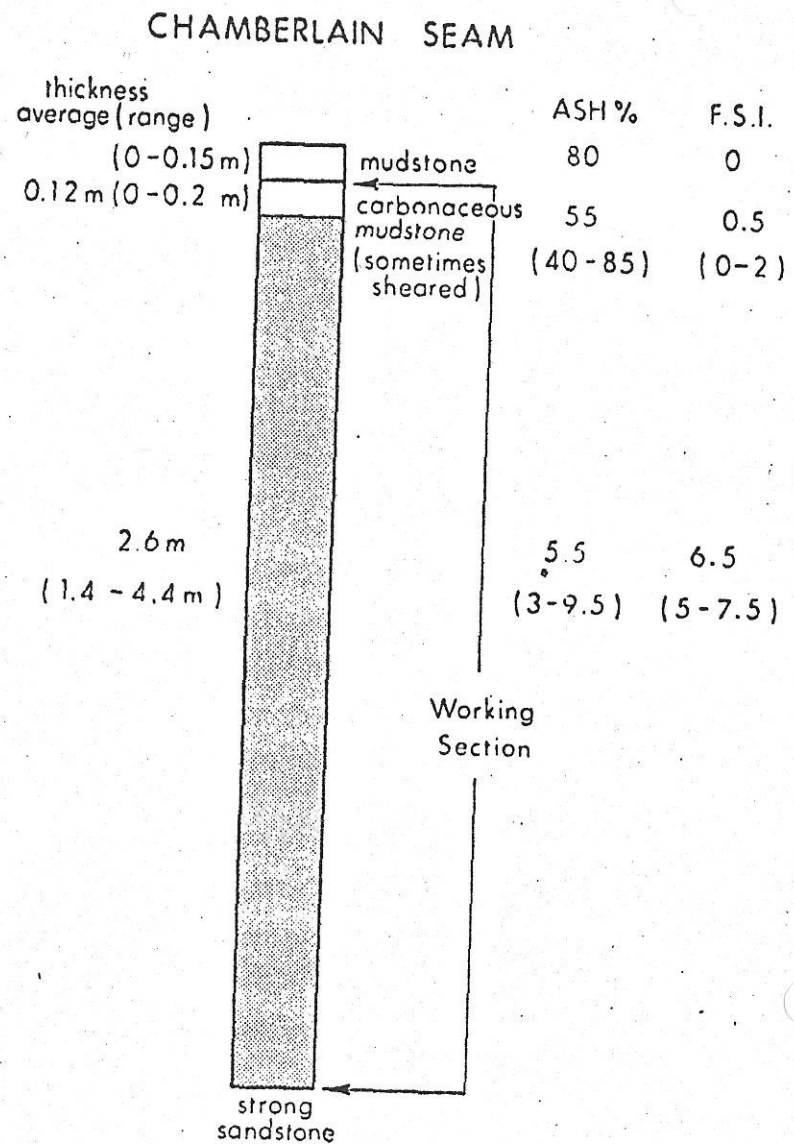
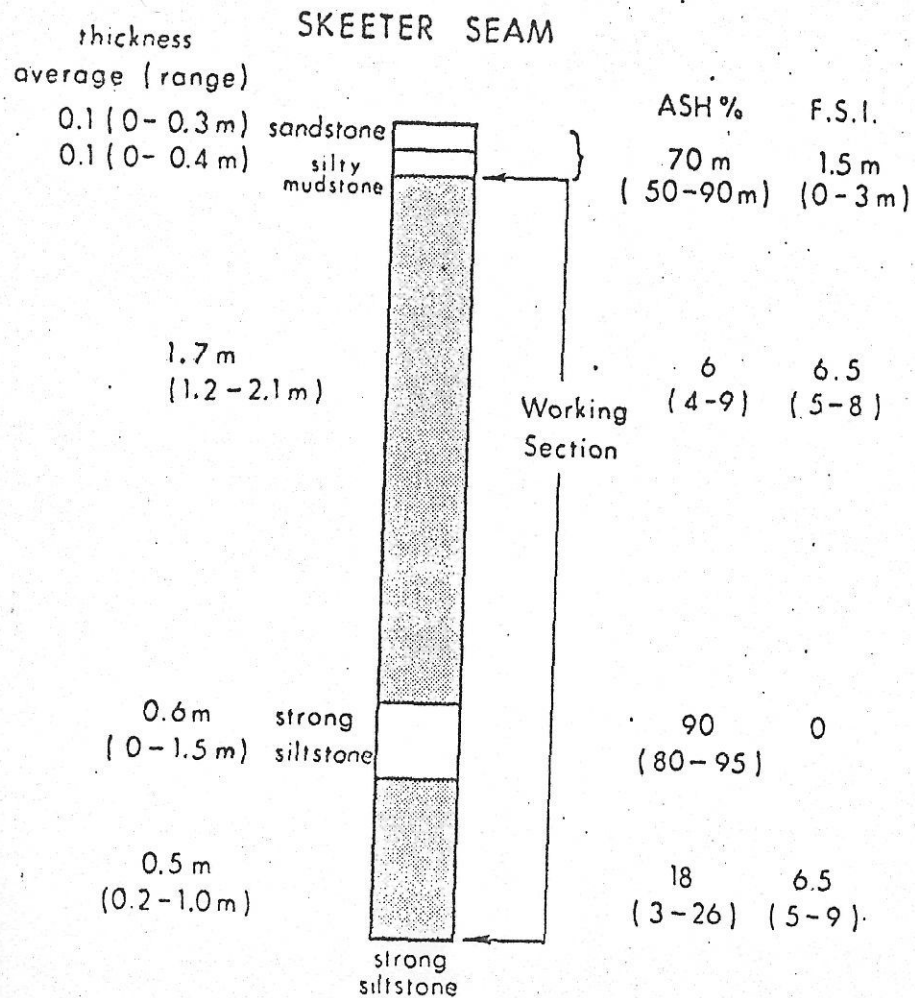


FIG. 8

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COAL DIVISION

Sukunka / Bullmoose

Seam Section

DATE JULY, 1977
REVISED
SCALE

PROVINCE B. C.
DEPARTMENT COAL
DRAWN BY L. E. L.

to evaluate the seam, a decision on its minability would have to wait till the completion of the 1977 exploration program.

An insufficient amount of information in the Bullmoose portion is available on the Gates Coals and the Middle Coals to judge their economic viability. Additional information will be obtained from this years', and future, exploration programs.

COAL QUALITY

The quality of the coal in the Chamberlain and Skeeter Seams on the Property change laterally only within narrow limits. The following are believed to be average values.

	<u>Moisture</u>	<u>VM</u>	<u>Ash</u>	<u>Fsi</u>	<u>S</u>
	(ad)	(ad)	(ad)		(ad)
Skeeter Seam	0.9%	22.2%	5.7%	7	0.45%
Chamberlain Seam	0.9%	21.9%	4.1%	7.5	0.4 %

It is estimated that a product of the following quality, on an 'as received' basis, will be prepared from the Chamberlain Seam during Stage 1 of the project.

	<u>Moisture</u>	<u>VM</u>	<u>Ash</u>	<u>Fsi</u>	<u>S</u>
Washed Chamberlain Seam	8%	17.5-20.5%	6%	7.5-8.5	0.5%(max.)

FUTURE EXPLORATIO

In 1977 BP plans to core about 18 300 m in the Bullmoose and Sukunka portions of the Property. The drilling is expected to prove the coal reserves on the eastern limb of the syncline in the Bullmoose area, and between the Saddle Creek area and the area extensively explored previously. The distribution of the 38 boreholes that will be drilled in 1977 is shown in Figure 9. All these boreholes will investigate the Gates, Bird, Skeeter and Chamberlain Seams, while 5 holes (Fig. 9) will be extended to the Cadomin to evaluate the Middle Coals. In addition, certain holes drilled in the exploration program conducted by Brameda for the Gates coals will be deepened at the expense of BP to evaluate the Bird, Skeeter, and Chamberlain Seams.

The Chamberlain Seam outcrop area in Saddle Creek will be investigated in detail to select the site of the two new mine portals. At least 4 samples weighing 10 tonnes each will be collected and analysed. These will be collected from the following locations:

- Chamberlain Seam at Mine #1
- Skeeter Seam at Mine #1
- Chamberlain Seam at the Window Mine
- Chamberlain Seam at the Saddle Creek Mine

Subsequent exploration programs will investigate the coal reserves on Plate 3 in the Sukunka area, the west limb of the syncline in the Bullmoose area and the Chamberlain area.

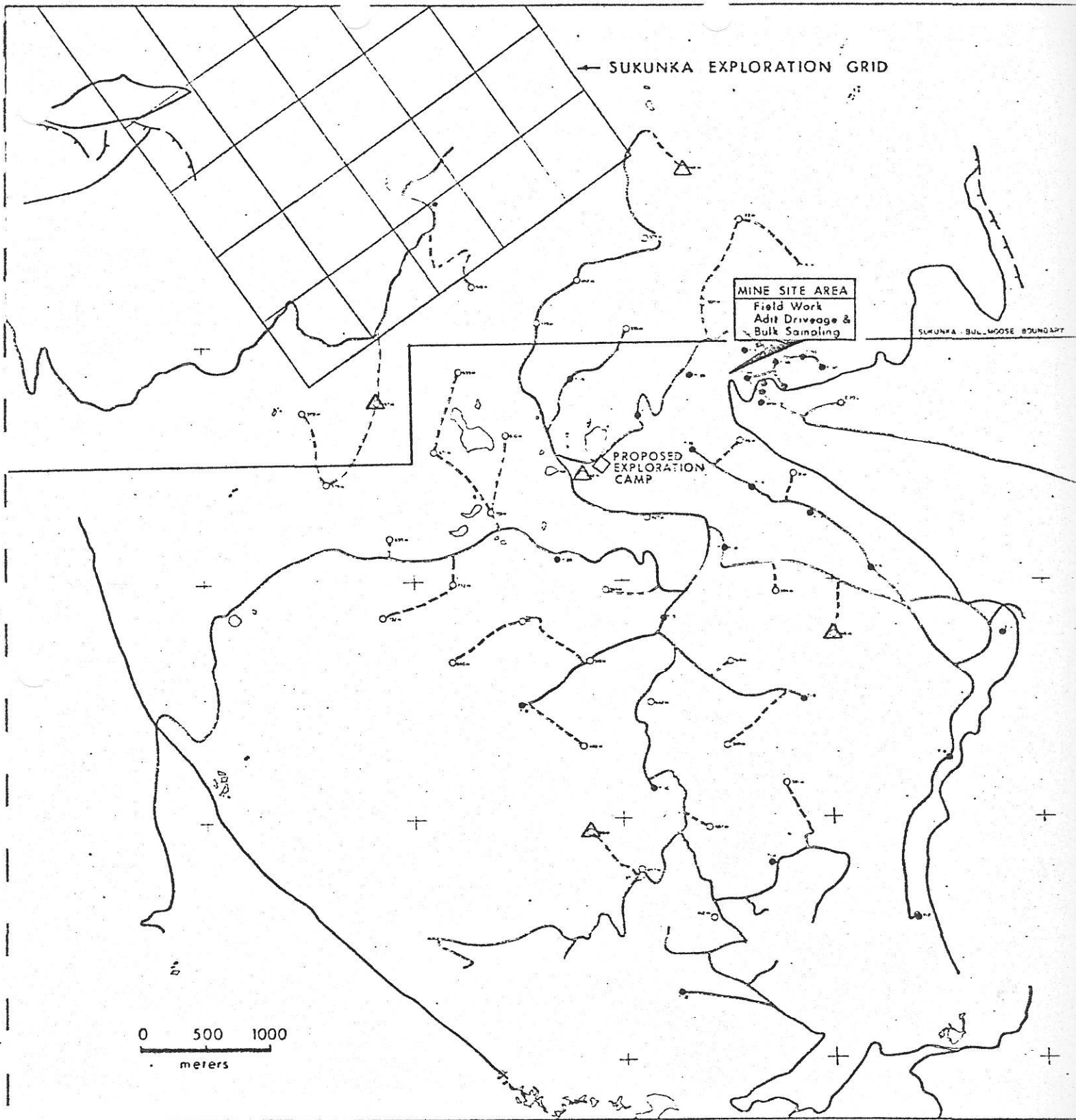


FIG. 9

LEGEND

- CHAMBERLAIN SEAM OUTCROP (mainly unproved)
- - - - FAULT
- EXISTING BOREHOLE TO CHAMBERLAIN SEAM
- PROPOSED BOREHOLE TO MIDDLE COAL
- △
- ==== EXISTING EXPLORATION ROADWAYS
- == == PROPOSED EXPLORATION ROADWAYS

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COAL DIVISION

Sukunka / Bullmoose Exploration Programme 1977

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SCALE	AS SHOWN	DRAWN BY	L.E.L.
AUTHOR	A. KAHIL	DRWG NO	CP 3647

RESERVES

Reserves for the Chamberlain, Skeeter and Bird Seams are given in Table 1 along with some of the other seams that may be minable. The reserves are divided into 5 categories. The principal difference between the first three is the spacing of points of information. In class 4 are coals that are not considered marketable because of factors such as ash, sulphur, etc. In the "additional" class, are placed reserves that may exist but cannot be accurately assessed. In determining the raw mineable reserves a deduction of 30, 40 and 50% for classes 1, 2 and 3 respectively was made for mining losses. The higher deductions for the higher numbered classes mostly reflect the greater uncertainty about the presence of these reserves and not necessarily more difficult mining conditions. An additional factor was deducted to reflect the yield from the coal preparation plant to give the saleable coal reserves. The location of these reserves on the property are shown in Figures 10, 11 and 12.

SUKUNKA RESERVES TABLE

(MILLION TONNES.)

AREA	CHAMBERLAIN SEAM				SKEETER SEAM			OTHER SEAMS		SKEETER & CHAMBER	ALL SEAMS
	CLASS 1	CLASS 2	CLASS 3	ADDI-TIONAL	CLASS 1	CLASS 2	CLASS 3	CLASS 4	ADDI-TIONAL	CLASSES 1-3	ALL CLASSES
<u>TOTAL</u> IN PLACE	55	64	48	26	12	1		80	40	180	326
<u>TOTAL</u> RAW MINEABLE	38	37	24	13	9	1		47	20	109	189
<u>TOTAL</u> SALEABLE	32	30	19	10	6	1		36	15	88	145

CLASSIFICATION CRITERIA

CLASS 1

CLASS 2

CLASS 3

CLASS 4

ADDITIONAL

INTERVAL BETWEEN POINTS OF PROVING < 610 m

610 - 1 220 m > 1 220 m

RESERVES

> 1 220 m

GENERALLY < 10°

< 15°

PROBABLY < 15°

ARE COALS OF
DOUBTFUL
SALEABLE
QUALITY,

MAY BE > 15°

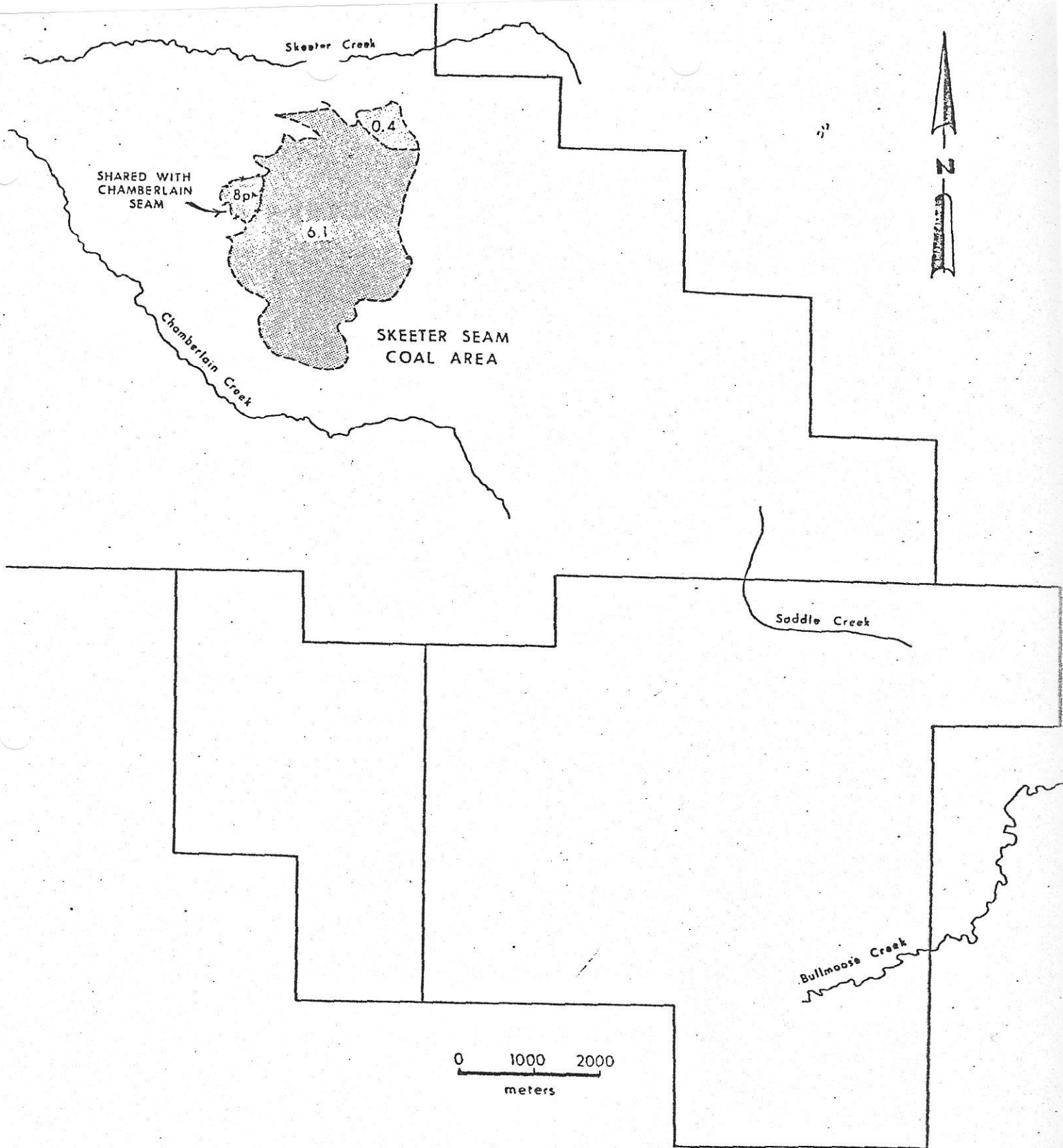
DIPS (OF SECONDARY IMPORTANCE IF
LESS THAN 15°) (< 1 IN 6)

(1 IN 6 TO 1 IN 4) (1 IN 4)

(> 1 IN 4)

ONLY COALS IN SECTIONS 1.5 m OR GREATER IN THICKNESS HAVE BEEN INCLUDED.

E.G. -
EITHER TOO
HIGH ASH OR
SULPHUR
CONTENT.



LEGEND





-  CLASS 1
-  CLASS 2
-  STRIPPABLE COAL

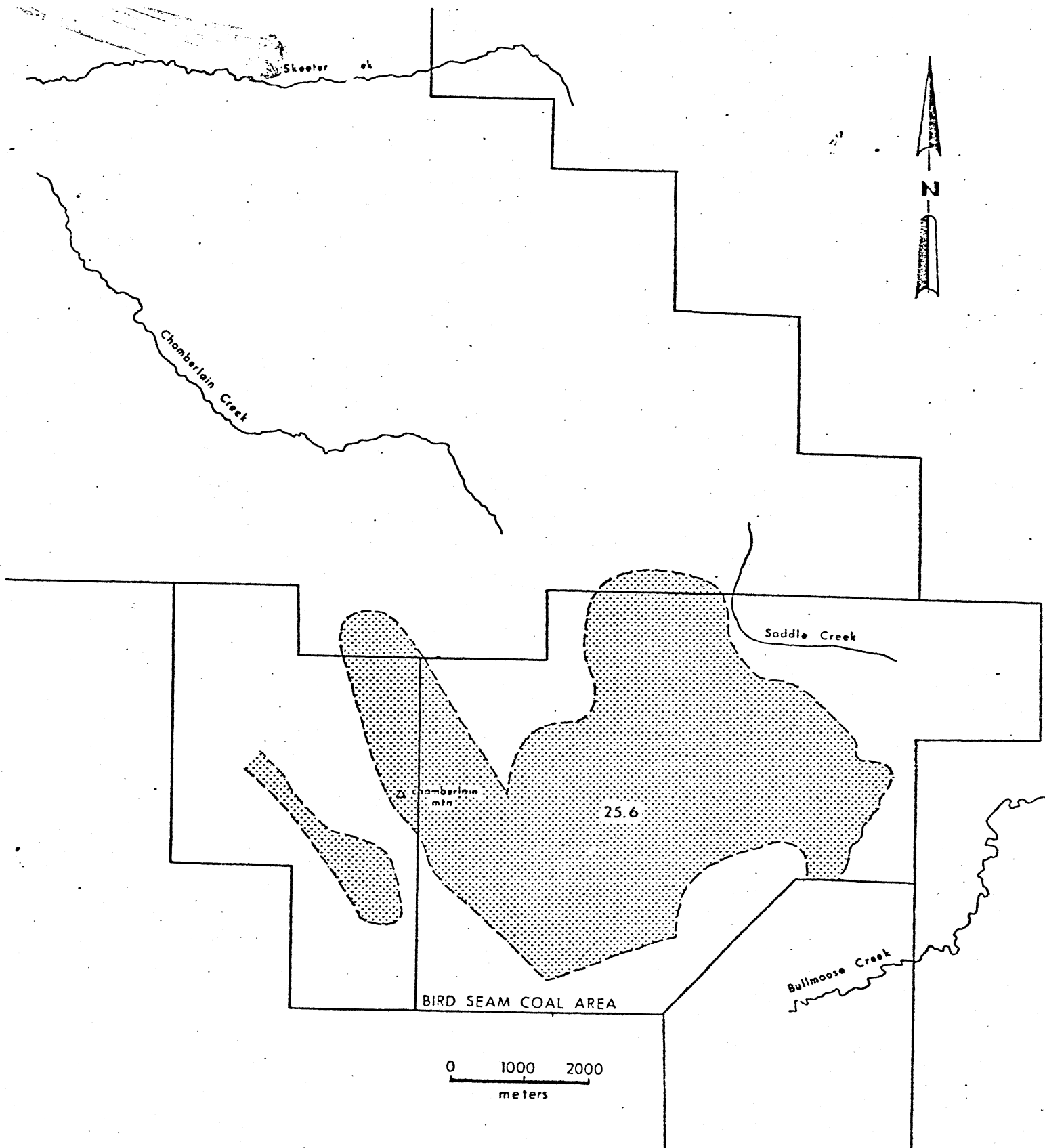
FIG. 10

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COAL DIVISION

Sukunka / Bullmoose
 Saleable Reserves of Skeeter Seam.
 (figures in million tonnes of coal)

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REVISED		DEPARTMENT	COAL
SCALE	AS SHOWN	DRAWN BY	L.E.L.
AUTHOR	A. KAHIL	DRWG NO	CP 3643



LEGEND



 CLASS 4

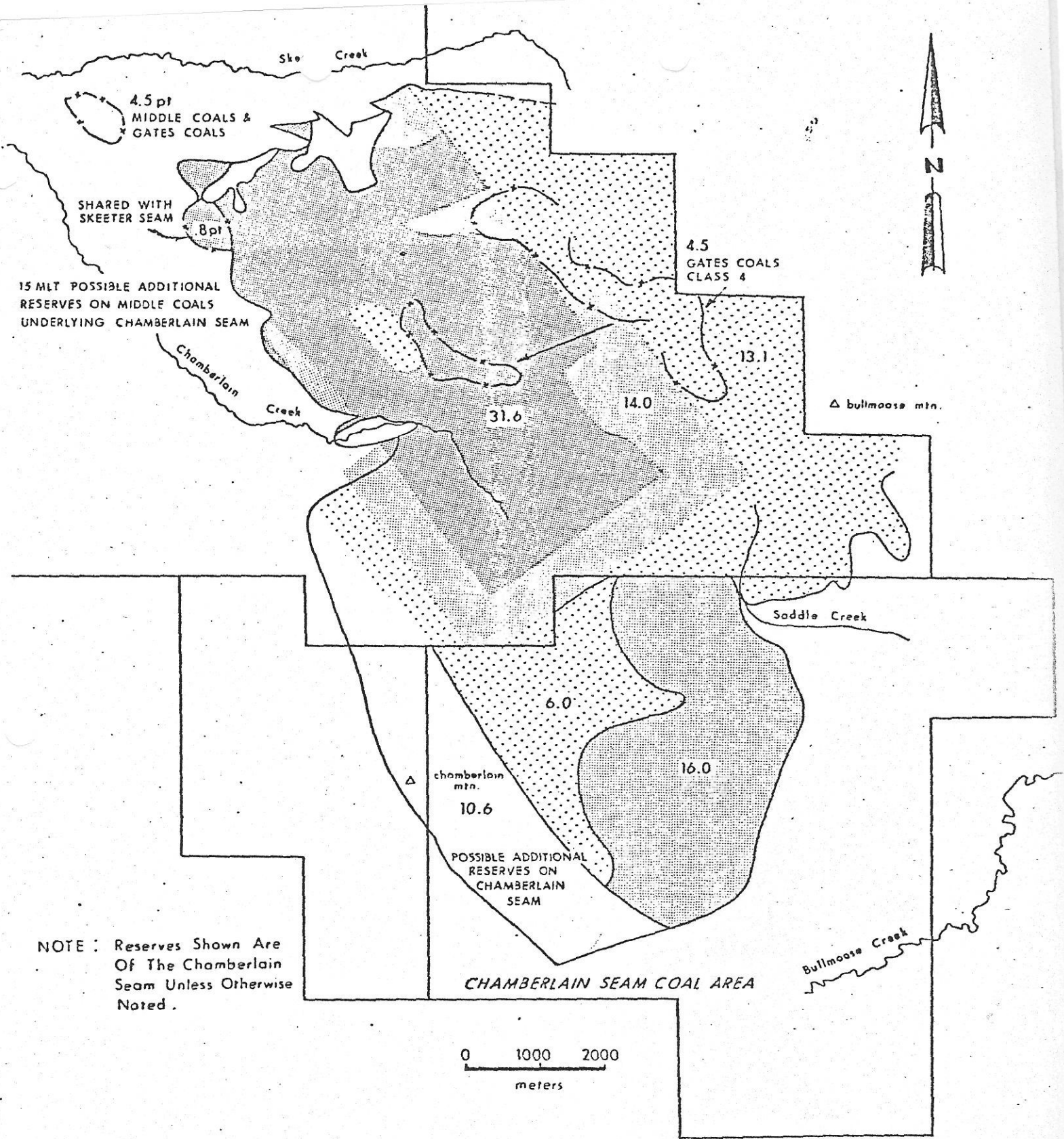
FIG. 11

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COAL DIVISION

Sukunka / Bullmoose
Saleable Reserves of Bird Seam
(figures in million tonnes of coal)

DATE	JULY 1977	PROVINCE	B.C.
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SCALE	AS SHOWN	DRAWN BY	L.E.L.
AUTHOR	A. KAHIL	DRWG NO	CP 3646



NOTE : Reserves Shown Are Of The Chamberlain Seam Unless Otherwise Noted .

0 1000 2000
meters

LEGEND







-  CLASS 1
-  CLASS 2
-  CLASS 3
-  POSSIBLE ADDITIONAL RESERVES
-  STRIPPABLE COAL

FIG. 12

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COAL DIVISION

Sukunka / Bullmoose
Saleable Reserves Map
(figures in million tonnes of coal)

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SCALE	AS SHOWN	DRAWN BY	L.E.L.
AUTHOR	A. KAHIL	DRWG NO	CP 3645

MINE PLAN AND DEVELOPMENT

BP is planning a phased development of the property which can be divided into two stages. The first stage is prior to the construction of the proposed infrastructure by the Government and the other after the infrastructure is completed. The infrastructure consists of a new townsite closer to the property, a new rail line, and a new port at Prince Rupert. A simplified network diagram for the two stages is given in Figures 13 and 14. Table 2 gives a breakdown of the coal to be produced during each year and from where it is to be produced. Figure 15 is a conceptual mine plan.

In the initial phase coal is to be produced from both the Sukunka and Bullmoose parts of the Property. The first years of production coal will be obtained mostly from the drivage of roadways. These roadways will be driven across the geologic grain to encounter most of the structure that will form part of the constraints in the mining of the area. Two sets of roadways will be started in the Saddle Creek area and the workings in the Window Mine extended towards the Saddle Creek mines. The coal produced during this period will be trucked to Chetwynd via roads in the Sukunka and Bullmoose Valleys. Once the connection is made between a Saddle Creek Mine and the Window Mine (about 1981) then all the coal produced can be trucked from the Chamberlain Window Mine as the distance to Chetwynd is much shorter.

Production of coal in Stage 1 will be increasing from the starting date to 0.5 million tonnes in 1980 to 1981 and will remain at this level until Stage 2 begins. Once Stage 2 begins production will be increased over 4 years to 3 million tonnes. On completion of Stage 2 all production will be brought out of the Saddle Creek Mines.

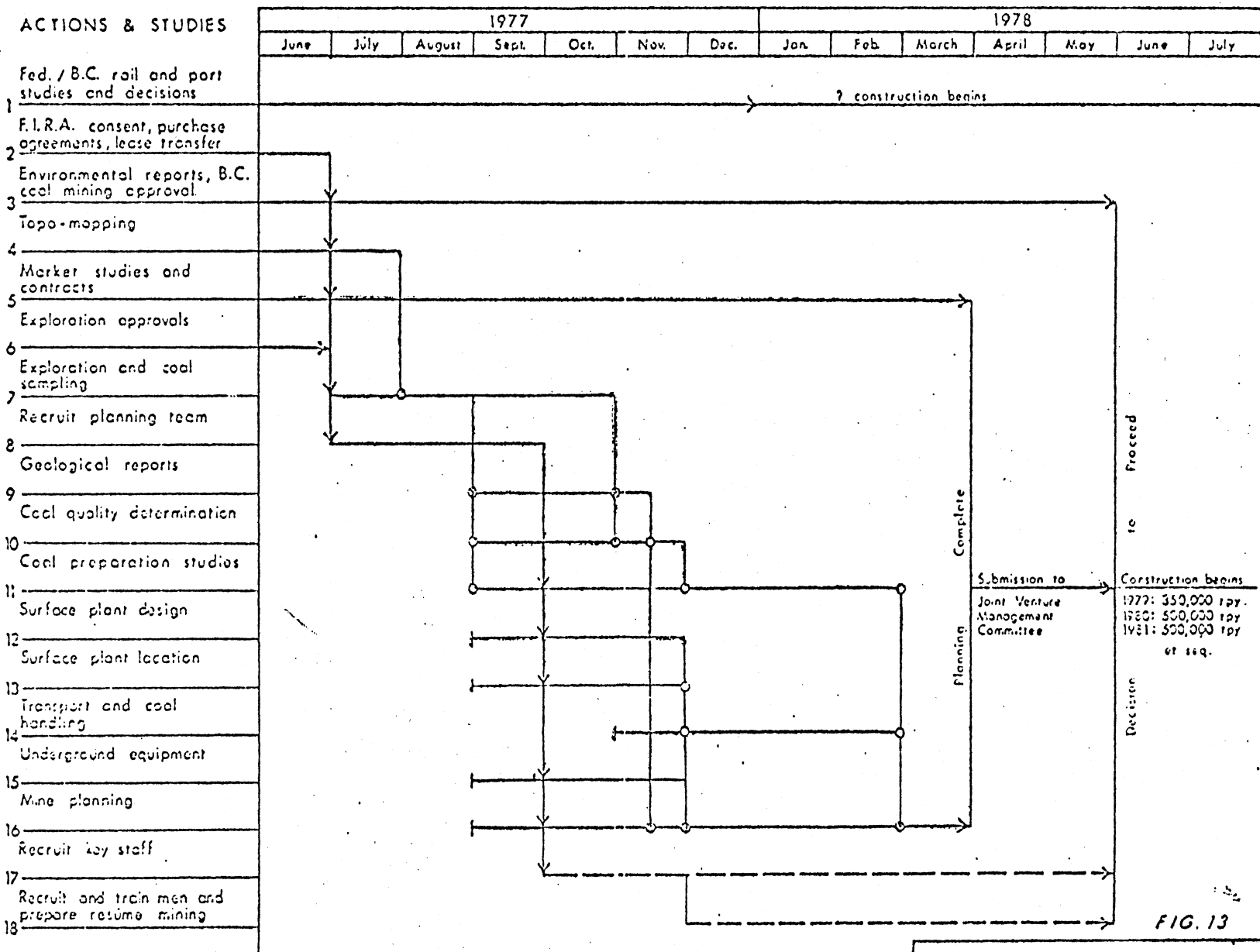


FIG. 13

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Detail of Sukunka Project
 Stage 1

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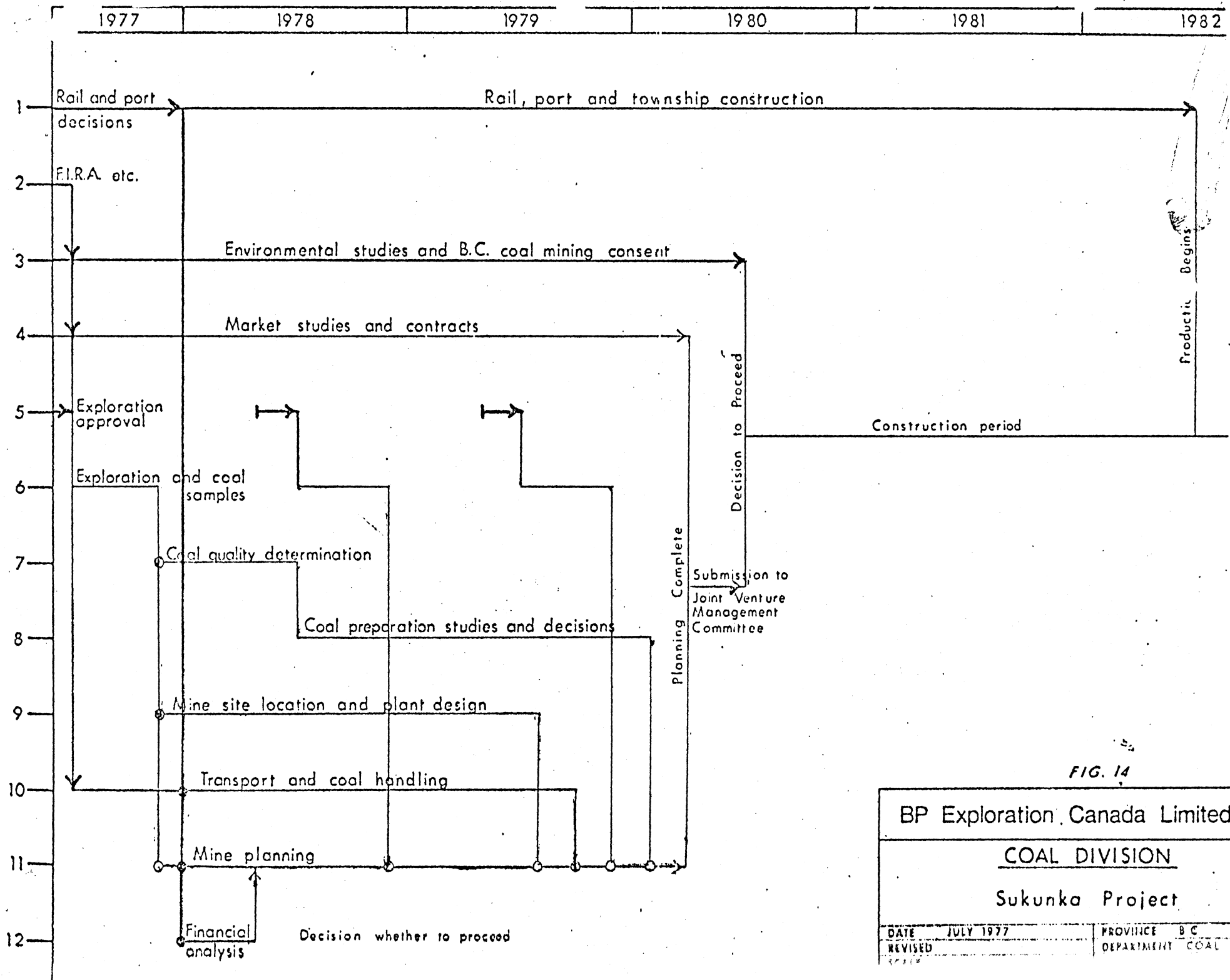


FIG. 14

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COAL DIVISION	
Sukunka Project	
DATE	JULY 1977
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PROVINCE	B.C.
DEPARTMENT	COAL

TABLE 2

PRODUCTION SCHEDULE

SUKUNKA-BULLMOOSE PROJECT

<u>Year</u>	<u>Saleable Tonnes</u>	<u>Sources</u>
1978	40 000	Production permit for limited output
1979	350 000	Mine development in Chamberlain Seam from Sukunka and Bullmoose with balance from production units at Sukunka
1980	500 000	Mine development in Chamberlain Seam from Sukunka & Bullmoose with balance from Sukunka
1981	500 000	Mine development in Chamberlain Seam from Sukunka and Bullmoose with balance from Sukunka
1982	800 000	Increased mine development in Chamberlain Seam from Sukunka and Bullmoose with balance from Sukunka.
1983	1 100 000	Mine production in Chamberlain Seam from Sukunka and Bullmoose with continuing mine development in Bullmoose
1984	2 000 000	Mine production in Skeeter and Chamberlain Seams
1985 to 2005	3 000 000	Mine production in Skeeter and Chamberlain Seams.

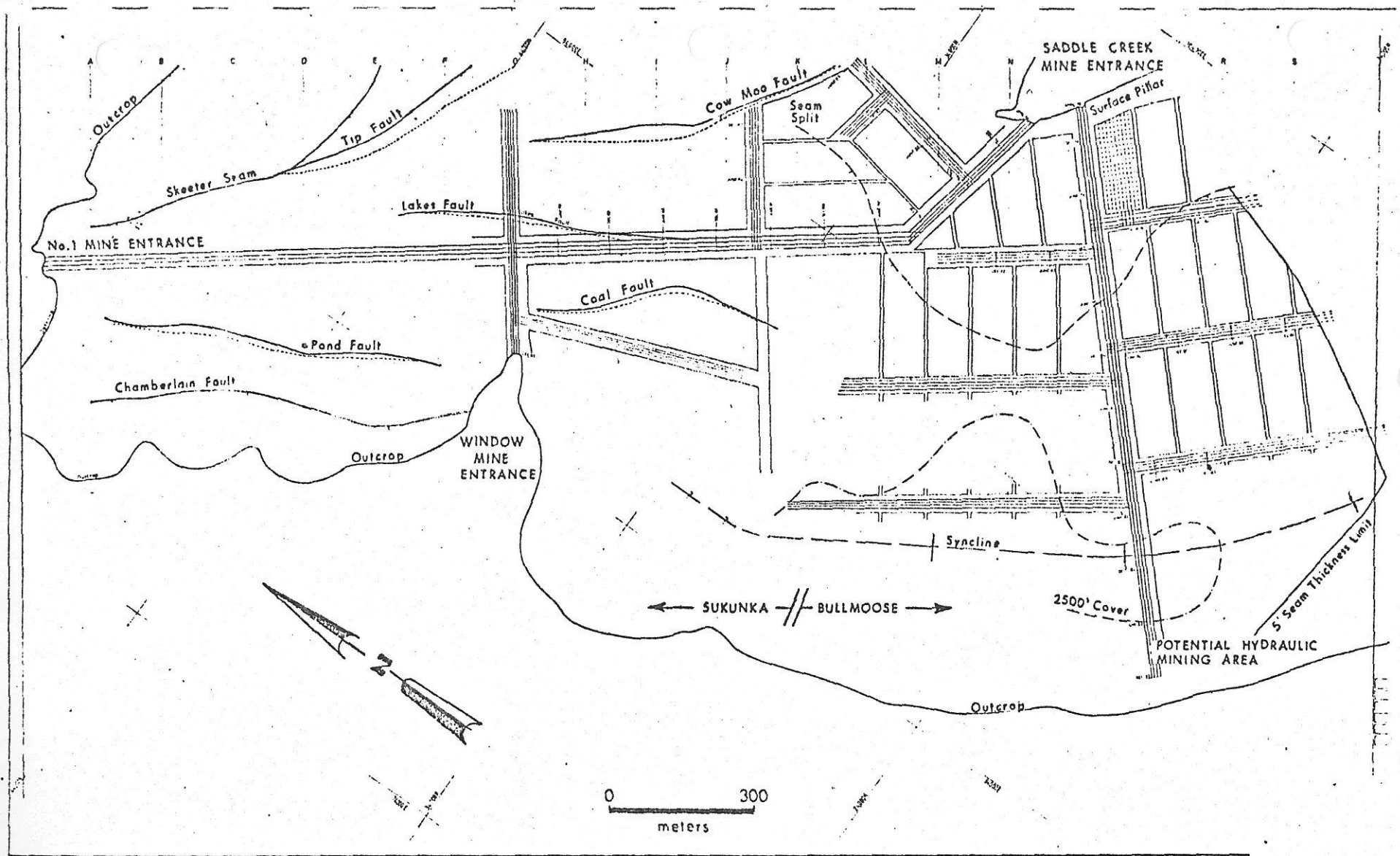



FIG. 15

BP Exploration Canada Limited 

COAL DIVISION
Sukunka / Bullmoose
Conceptual Mine Plan

DATE	JULY 1977	PROVINCE	B.C.
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SCALE	AS SHOWN	DRAWN BY	
APPROVED	A. YAHIL		

WASHERY

Coal produced during Stage 1 will be processed through a small washery that will have a capacity of 150 tonnes per hour. This washery is a "package" type which means that it is built at the factory in separate units that are transported onto the site by truck and assembled there. It is expected that this washery will be in use for about 5 years. After that it could be dismantled and removed or could be used to wash coal from another mine. This type of washery comes as an off-the-shelf purchase and although possibly not as efficient as a plant specifically designed for a particular coal, has the advantage of being flexible. One advantage of using a small washery initially, is that it provides data on the washing characteristics of the coal which will assist in the design of a more efficient final plant, to sell the coal at a specification close to that of the final product and therefore secure a market early, and to train plant operators.

The location of the small washery can either be at Martin Creek or at the east end of Chetwynd, near or in the BC Rail yard. At present, the Chetwynd location is preferred as it would minimize handling of the coal by eliminating the need to load the coal onto trucks again after washing. This will reduce breakage and consequently the fines content of the coal.

The location of the full scale washery has not been selected but consideration has been given to a location at the confluence of Saddle Creek and Bullmoose Creek, at Townsite 2 and along the new rail line west of Tumbler Ridge. Studies will be undertaken to determine which of these sites is the most desirable.

EMPLOYMENT

The employment schedule that BP expects if the development of the proposed program is followed is given in Table 3. BP has decided to employ the manpower locally, to as great an extent as possible. Following this policy it is prepared to train the miners and other underground personnel. However, it will be seeking assistance from the Government for facilities to train craftsmen such as electricians, mechanics, etc. Discussion of this subject are presently taking place with the government.

TABLE 3

DEVELOPMENT SCHEDULE

<u>YEAR</u>	<u>OUTPUT SALES, TONNES</u>	<u>PERMANENT WORK FORCE</u>	<u>CONSTRUCTION WORK FORCE</u>
1977		-	-
1978	40,000	30	100
1979	350,000	160	250
1980	500,000	240	230
1981*	500,000	240	230
1982	800,000	400	300
1983	1,100,000	520	300
1984	2,000,000	740	200
1985	3,000,000	920	100

* SCHEDULES FROM 1981 ARE LARGELY DEPENDENT ON THE TIMING AND ROUTE OF RAILWAY, ALLIED WITH THE AVAILABILITY OF NEW PORT FACILITIES.

TOWNSITE

During Stage 1 some of the labour force will be housed in Chetwynd, the rest at an existing camp near the mine. The location of the camp is 60 km south of Chetwynd in the Sukunka River Valley. The employees housed in this camp will probably consist of the single men who will be working at the Chamberlain Window only, as the drive around the mountain to the Saddle Creek Mine would be longer than that from Chetwynd to the Saddle Creek Mine.

When the town of Tumbler Ridge is completed then all the employees will be housed in that town for by then all the production will be coming out of the Saddle Creek Mines.

POWER

It is expected that the power requirements for the mine and washery will be supplied by BC Hydro. However, in the interim before such power is available, BP is planning to use diesel powered generators both at the Window Mine and at the Saddle Creek Mines. The total estimated power requirements for the mines and washery are as follows:

<u>Year</u>	<u>Power Requirements</u> MV.A
1979	5
1980	10
1981	10
1982	15
1983	20
1984	25
onwards	