PR-BULLMOOSE 76-1-A

GEOLOGY AND COAL POTENTIAL OF THE GATES COAL MEASURES OF THE COMMOTION FORMATION--BULLMOOSE PROPERTY FOR TECK CORPORATION LIMITED AND BRAMEDA RESOURCES LIMITED

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Vancouver, B. C. February, 1977

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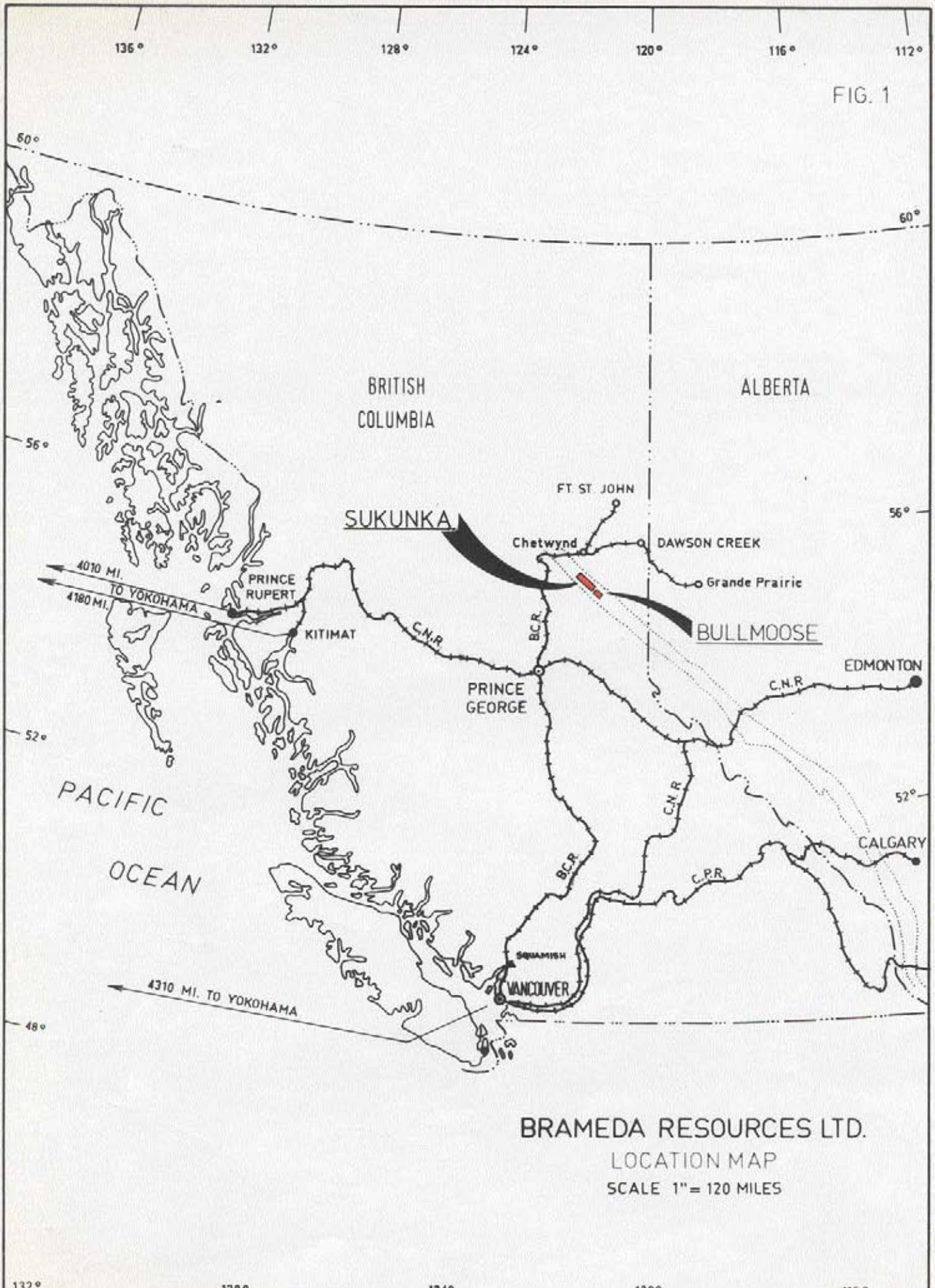
INTRODUCTION

An exploration program was carried out during 1976 on the Bullmoose and Chamberlain coal properties in the Sukunka area by Teck Corporation under its option agreement with Brameda Resources Ltd. The program, which consisted mainly of core drilling, was primarily aimed at investigating the potential of strippable coal in the Gates Coal Measures of the Commotion Formation. Later in the program an adit was driven on the "B" seam for the purpose of obtaining bulk samples.

Two areas were selected as specific drilling targets on the basis of photo interpretation which suggested that substantial quantities of surface-mineable coal might be present in the Gates Member. These areas were designated as South Fork and West Fork with reference to the adjacent branches of Bullmoose Creek. The program, which included 25 drill holes at South Fork and 19 holes at West Fork has provided sufficient data for a preliminary evaluation of the quantity and quality of coal which is potentially available to surface mining.

FIG. 1

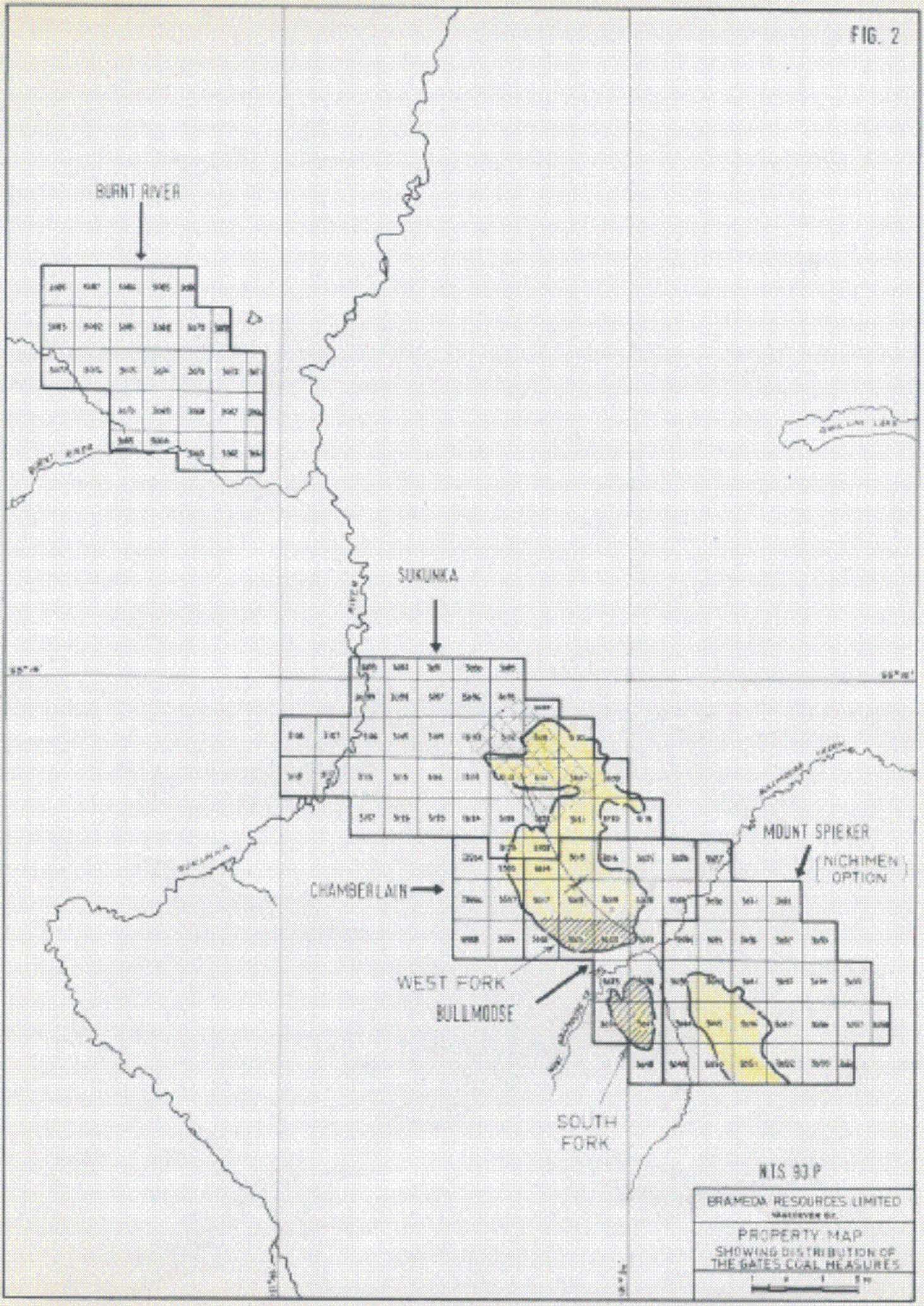


BRAMEDA RESOURCES LTD.

LOCATION MAP

SCALE 1" = 120 MILES

FIG. 2


BURNT RIVER
SUKUNKA
CHAMBERLAIN
MOUNT SPIEKER
(NICHIMEN OPTION)
WEST FORK
BULLMOOSE
SOUTH FORK
NTS 93 P
BRAMEDA RESOURCES LIMITED
PROPERTY MAP
SHOWING DISTRIBUTION OF
THE GATES COAL MEASURES

On January 17 Brameda Resources and Teck Corporation Ltd. announced the sale of certain licences in the Sukunka area to B.P. Canada Ltd., but retained the right to mine the Gates coal seams on the Bullmoose and Chamberlain properties. The current property ownership is indicated on Figure 3.

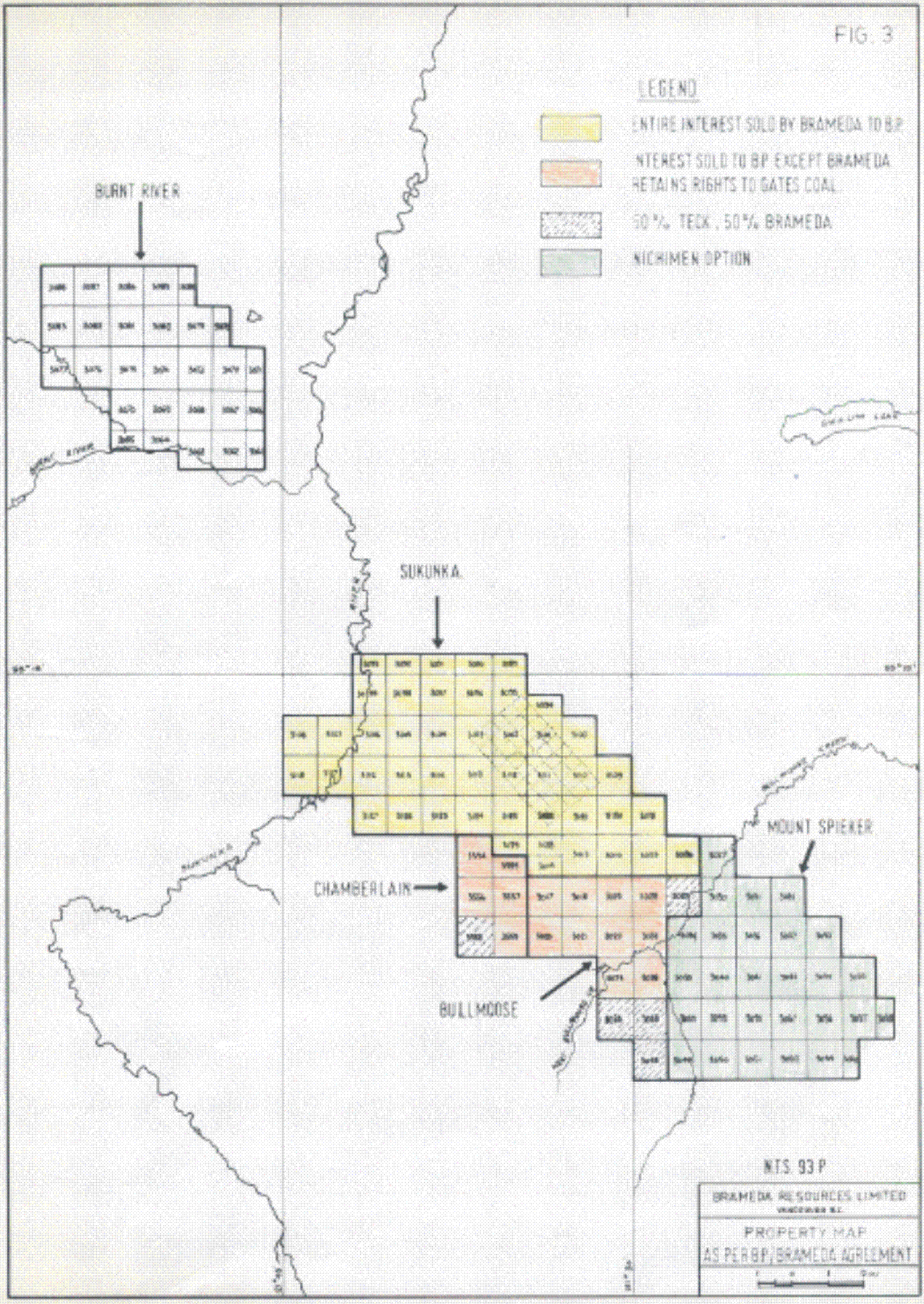
This report summarizes the results of the 1976 program with particular emphasis on the general character and potential reserves of the Gates coal seams on the Bullmoose property.

SUMMARY AND CONCLUSIONS

Exploration done to date on the Bullmoose property indicates a large area underlain by the Gates Coal Measures which contains at least six distinct coal seam horizons. The seams appear to improve in quality and thickness southwards with a corresponding decrease in coarse clastics within certain sedimentary units. The coal seams are generally gently dipping and no structural complexities appear to exist.

Analyses show that the coal seams are of metallurgical quality and washability tests indicate high yields of clean coal, particularly from the "A" and "B" seams.

FIG. 3


LEGEND
ENTIRE INTEREST SOLD BY BRAMEDA TO BP
INTEREST SOLD TO BP EXCEPT BRAMEDA RETAINS RIGHTS TO GATES COAL
50% TECK, 50% BRAMEDA
NICHIMEN OPTION
BURNT RIVER
SUKUNKA
CHAMBERLAIN
BULLMOOSE
MOUNT SPIEKER
NTS 93 P
BRAMEDA RESOURCES LIMITED
PROPERTY MAP
AS PER BP/BRAMEDA AGREEMENT

Computation of coal reserves indicate a total of 60,702,374 metric tons of strippable coal in place with overburden ratios of 4.21 M^3/MT for the "A", "B", "C" and "D" seams combined in the South Fork and 5.6 M^3/MT for the "A", "B", and "C" seams combined in the West Fork.

In addition some 38,000,000 metric tons of underground coal in place from the "A" and "B" seams is possible northwards of the West Fork area up to the Mount Chamberlain area.

In order to further define coal reserves on the Bullmoose property a program of diamond drilling, detailed geologic mapping and seam tracing is proposed.

GEOLOGY

GENERAL

Detailed information on the structure and stratigraphy of the area are available from previous company reports as well as various government publications and need not be repeated. However, since the main object of the 1976 program was the Gates coal seams a further discussion of geologic features relating to the Gates Coal Measures is appropriate.

STRATIGRAPHY (GATES)

The Gates Member is one of three that comprise the Commotion Formation of the Fort St. John Group (Stott, 1968). In the Bullmoose and Sukunka area a fourth "member" was introduced by previous Brameda geologists to distinguish a recognizable and consistent sequence of sandstone and shales from the underlying dominantly mudstone Moosebar Formation and assigned it to the Commotion Formation (Table 1). This "Member",called the Sukunka, conformably underlies the Gates with its upper contact at the base of the lowest massive sandstone unit of the Gates Member

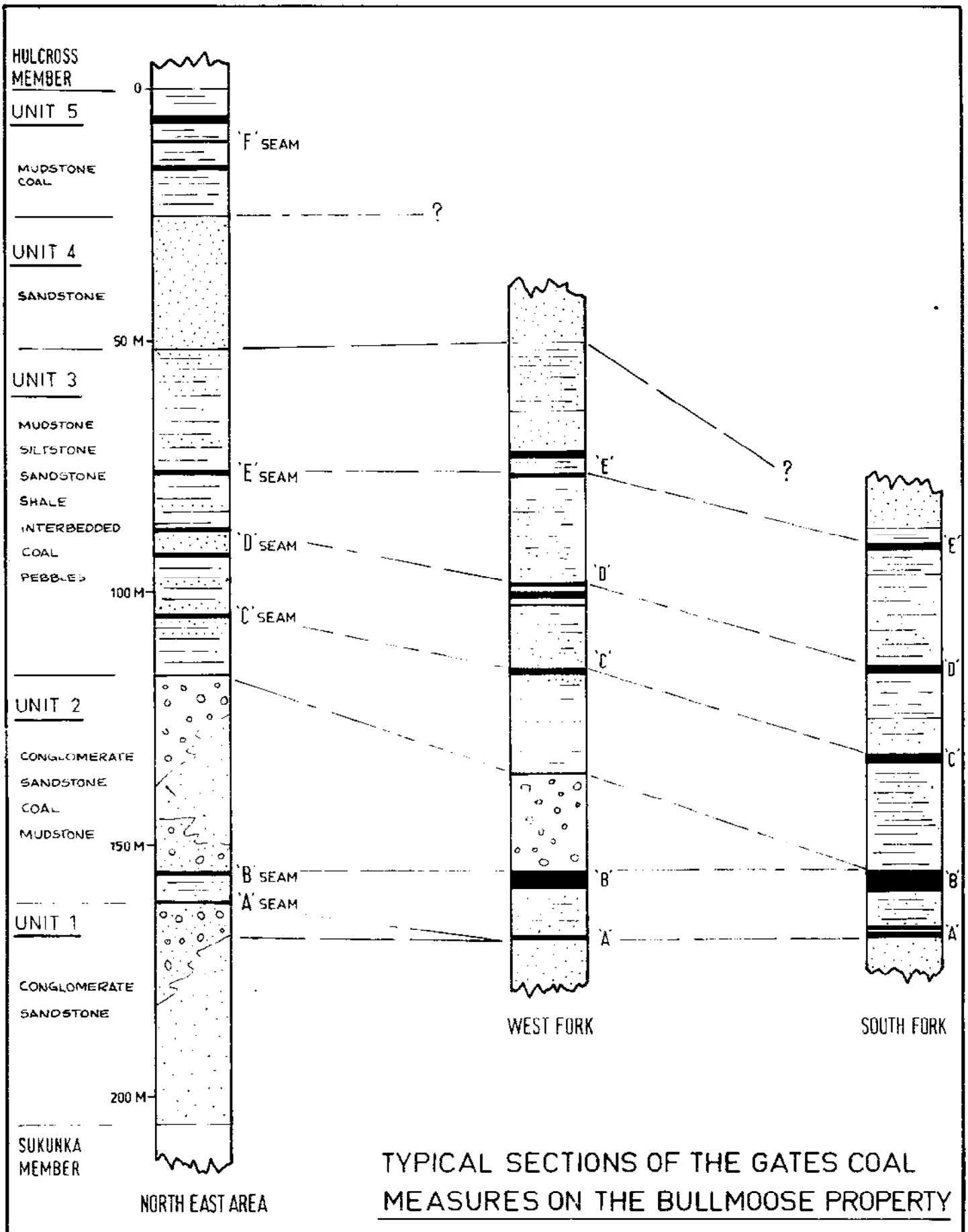
The Gates Member underlies half of the Bullmoose property (Figure 3). It extends well northward into the Sukunka property and southeastward into the adjoining Mount Spieker property. Further southeast the Gates reportedly becomes more widespread and is the source of the several billion tons of coal reserves announced by Denison Mines Ltd.

Figure 4 shows correlated typical sections of the Gates Coal Measures on the Bullmoose property. The Gates on the northeast part of the property where complete sections were drilled, indicate thicknesses slightly greater than 200 metres.

STRATIGRAPHIC AND CORRELATION CHART

Bullmoose Area (1975)				Stott (1968)			Bullmoose Area
Group	Formation		Thickness (Feet)	Formation		Thickness (Feet)	Lithology
Fort St. John	Hasler		450	Hasler		500?-1500	Dark grey interbedded shale, siltstone and mudstone with ferruginous concretions and layers. Local minor conglomerate.
	Commotion	Boulder Creek Mb	>600	Commotion	Boulder Creek Mb	240 - 560	Fine to medium-grained sandstone; interbedded siltstone and mudstone, in parts conglomerati
		Hulcross Member	340		Hulcross Member	0 - 450	Dark grey marine shale and mudstone with common pyritic and ferruginous concretions.
		Gates Member	650		Gates Member	220 - 900	Fine to medium to coarse sandstone with interbedded shale, mudstone and siltstone. Coal. Layers of massive pebble conglomerate.
		Sukunka Member	430	Moosebar		100 - 1000	Interbedded fine-grained sandstone, mudstone and siltstone.
	Moosebar		300				Dark grey mudstone with pyritic and ferruginous concretions and layers
Bullhead	Gething	Upper	113-205	Gething		75 - 1000	Fine to medium to coarse-grained sandstone with interbedded shale, mudstone and siltsto Chamberlain Seam at base. Glauconitic mudstone at top.
		Lower	1200				Fine to medium to coarse-grained sandstone with interbedded shale, mudstone and siltsto Locally carbonaceous. Coal and coaly seams near base. Local thin conglomerates.
	Cadomin		>300	Cadomin		45 - 600	Pebble to cobble conglomerate with interton of coarse sandstone.
	Unconformity						
	Nikanassin		>300				Medium to coarse grained sandstone, carbonaceous to coaly shales

TABLE I: Stratigraphic Chart of the Lower Cretaceous in the Bullmoose Area.



TYPICAL SECTIONS OF THE GATES COAL MEASURES ON THE BULLMOOSE PROPERTY

FIG. 4

febr. '77/pv.

Detailed lithologic logging of cores drilled through the Gates enables the division of the Member into five distinct units as follows:

Unit 1 consists of thick-bedded to massive, medium-to coarse-grained sandstone. The unit is usually carbonaceous. In the northeastern area pebble conglomerate occurs in the upper part of the unit but rapidly wedges out north of the West Fork area.

The "A" seam occurs at the base of Unit 2. It is overlain by interbedded siltstone and mudstone which separate it from the "B" seam. Thick conglomerate and sandstone overlie the "B" seam in the north but wedge out rapidly in the eastern part of West Fork area.

A fairly thick carbonaceous mudstone unit forms the base of Unit 3. This is succeeded by a succession of mudstone, siltstone, sandstone and coal. Several coaly horizons are present in addition to the named "C", "D" and "E" seams. In South Fork area distinctive pebbly bands occur between the "D" and "E" seams.

Unit 4 consists mainly of fine-to medium-grained, medium-bedded sandstone. A minor amount of shale is present locally.

Unit 5 does not occur within the area tested during 1976. It consists of carbonaceous mudstone with some sandy and silty phases. Coal seams locally are well developed in the northern portion of the Gates occurrence.

STRUCTURE

Folds:

The most prominent structural feature of the Bullmoose property is a broad syncline that plunges gently toward the northwest. On the Chamberlain property the fold is strongly asymmetrical with dips of up to 70° on the west flank and less than 20° on the east. Farther south the dips on both limbs become more gentle. The West Fork and South Fork areas lie along the axial portion of the fold.

Subsidiary minor folds have been noted in the subjacent rocks. These generally are not reflected in the Gates formation.

Faults:-

Two minor thrust faults were intersected in drill holes both of which had vertical displacements of less than 40 feet. Both are northwesterly and dip southwestward at approximately 25 degrees. The fault intersected in T-31 in the West Fork appears to be related to a nearby major fault showing appreciably large displacements in the Gates and older strata The fault intersected in T-54 on the South Fork could be part of a much more extensive fault although of very little displacement. The observed faults on the Bullmoose property are generally the same as those mapped on the Sukunka area, all of which reflect the regional structural configuration of the foothills.

COAL SEAMS

GENERAL

Only the coal seams of the Gates Coal Measures, which were the main object of the 1976 programme, will be discussed. The Gates on the Bullmoose property include a minimum of six distinct coal seam horizons. In ascending stratigraphic order the seams are referred to as the "A", "B", "C", "D", "E", and "F" seams (Figure 4). Wide variations in quality and thickness exist not only from one seam to another but also within the individual seams. In general the overall characteristics of the seams appear to improve from younger to older although most of the seams laterally improve southwards. In the West and South Forks the individual seams are

easily recognizable and simpler to correlate in contrast to those found in the northern part of the property where the seams more often split into several layers with inclusions of rock partings. Figures 7a-d and 10a-c show local variations of seam thicknesses.

SEAM DESCRIPTIONS

"A" Seam:-

The "A" seam is widespread in the Bullmoose property. It starts as a thin coaly horizon in the northeastern part of the property improving to a clean,hard and bright seam southwards. In the West Fork area the seam averages 1.8 metres thick and may include a shaly parting of up to 0.6 metres thick. The seam further thickens in the South Fork area where it exceeds 4.5 metres with a corresponding increase in the rock parting of up to 1.8 metres. The seam rests on massive coarse sandstone on the South Fork and partly on conglomerate on the West Fork.

"B" Seam:-

The "B" seam is widespread on the property and because of its thickness appears to be the most important. It is generally free of rock partings and usually appears hard and bright. The seam although reasonably thick in the northern part of the property is exceedingly shaly but gets cleaner and thicker southwards where it averages some 3.4 metres on the West Fork and 4.8 metres on the South Fork.

The "B" seam is separated from the underlying "A" seam by approximately 7 metres of interbedded mudstone and sandstone. It is locally roofed by conglomerate in the northeastern part of the property and by interbedded mudstone and sandstone on the South Fork and most of the West Fork.

"C" Seam:-

The "C" seam has been indentified with certainty only in West Fork and South Fork. It has a thickness of 1.9 metres in 3 splits in West Fork area and 1.6 metres at South Fork, including some dirt bands. In general, the "C" seam appears dull but includes some bright bands.

The seam is both floored and roofed by interbedded sandstone and mudstone.

"D" Seam:-

In the West Fork area the "D" seam is highly variable in both thickness and quality. The thicker sections tend to be very high in ash. The seam becomes more uniform, with an average thickness of 1.5 metres, in South Fork. Like the "C" seam the "D" generally is dull in appearance and includes rock partings and/or dirt bands.

"E" Seam:-

The "E" seam is recognizable as a distinct coal seam only at West Fork and South Fork. It may be correlated with one of several coaly horizons in the northern part of the property. The seam is best developed at South Fork where it is mainly hard and bright with minor shale partings.

It ranges in thickness from less than a metre at West Fork to slightly more than one metre at South Fork.

"F" Seam:-

The "F" seam does not occur at South Fork or West Fork. It is represented by one or more coaly seams or coaly horizons in several of the deeper drill holes in the southern part of Bullmoose property. The seam appears to correlate with the so-called "A" seam of Gates member on the Sukunka property to the north.

COAL RESERVES

Exploration work to date has consisted of relatively closely-spaced drilling at South Fork and West Fork, and widely-spaced drill holes elsewhere on the properties. In addition,

geological mapping has provided a large amount of information on the location and thickness of the seams and on the local structural conditions. The data are sufficient to enable a preliminary evaluation of the coal reserves of the Gates seams on the Bullmoose property.

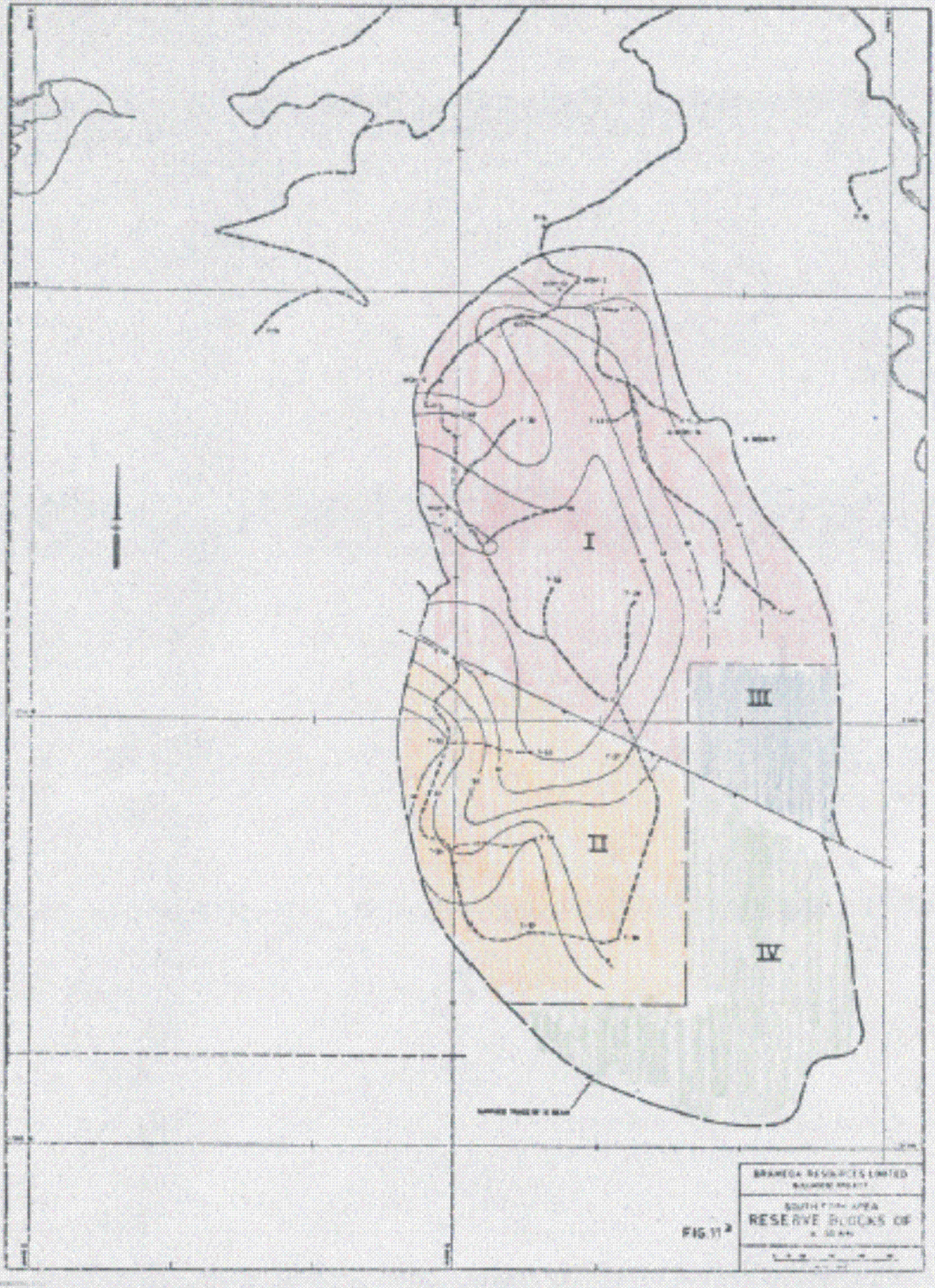
Calculation of probable surface-mineable coal reserves was made for the "A", "B", "C", and "D" seams in the South Fork area, and for the "A", "B" and "C" seams at West Fork. Potential underground reserves for the "A" and "B" seams have been calculated for the area north of West Fork, based on relatively sparse data.

The computation of reserves was made using standard methods. The average thicknesses of the individual seams were derived from lithologic logs, gamma ray/neutron, and sidewall density logs of drill holes. The difference between thicknesses of seam intersections measured from the radiation logs and those measured from the drill cores were found to be negligible. Consequently in cases where core loss was excessive (below 60%) the estimation of a coal intersection was, at times, based solely on the radiation log. This is particularly true of the softer "C", "D", and "E" seams. Recoveries in the "A" and "B" seams were mostly above 90 per cent, such that the estimation of seam thicknesses from drill cores are considered accurate. In the computation of tonnages the average specific gravities

for each seam applied for the whole area were derived from laboratory measurements of composites of raw core samples of the individual seams intersected in the South Fork area.

The computation of the areas was done with the aid of a planimeter. In the southwestern part of the South Fork area no correction factor was applied for the steeply dipping seams since the area involved covers only a narrow band. However, the dip of seams was considered in calculating areas near Mount Chamberlain.

The coal reserve areas were divided into reserve blocks to ease computation (Figures 11a-11h). The placement of boundaries of the reserve blocks were governed by such factors as geologic (e.g. seam traces, thickness of seams, dips of beds, fault, etc.) overburden ratios and property limits. In the West Fork area an area of influence around DDH T-63 for the "A" and "B" seams was included as part of a reserve block even though the "A" and "B" seams were not recovered. A summary of the computation of the tonnages of individual seams and reserve blocks are as follows:



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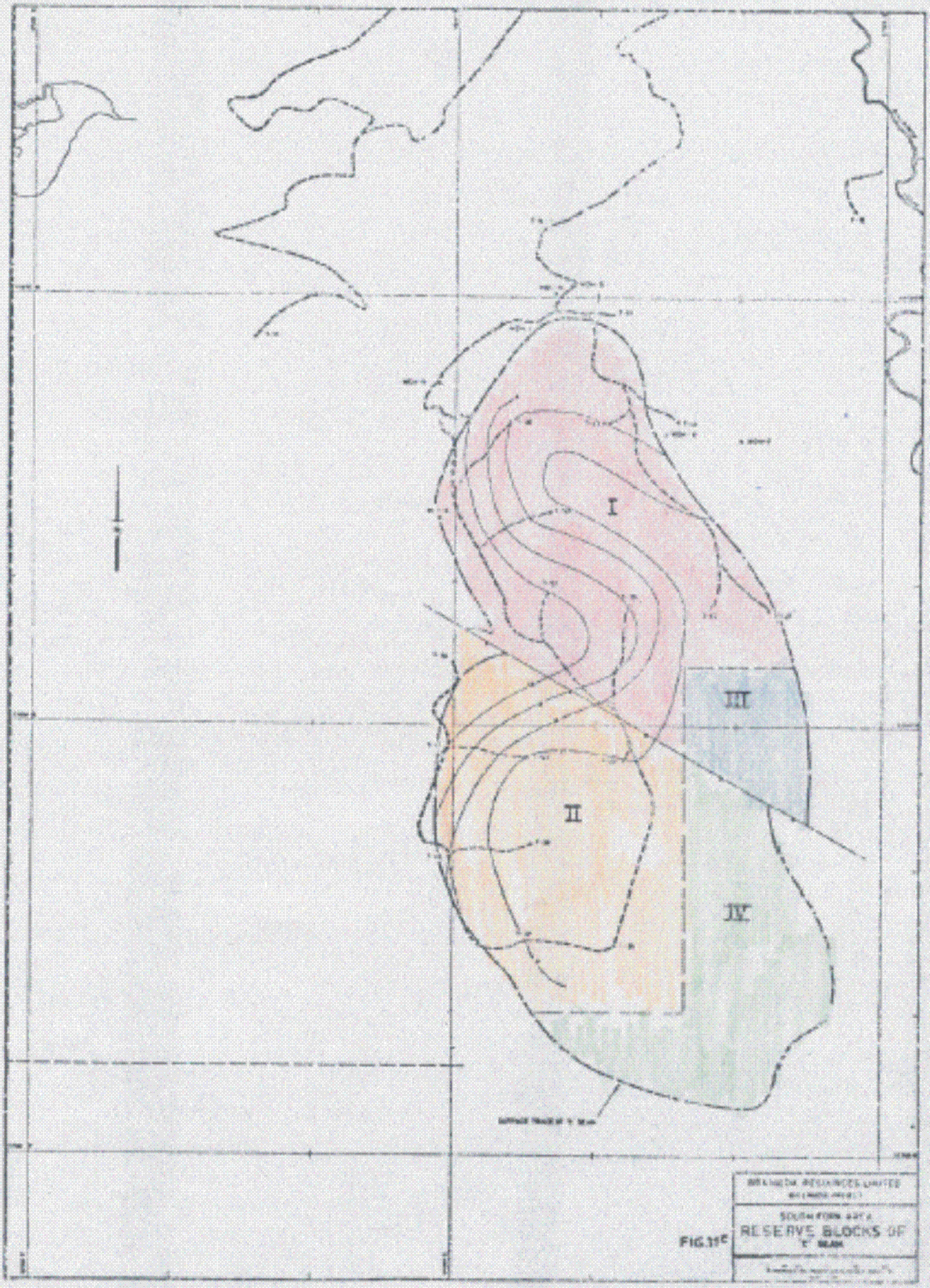
SOUTHERN AREA

RESERVE BLOCKS OF

FIG. 11

RESERVE BLOCKS OF

FIG.11b



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SOUTH FORK AREA

RESERVE BLOCKS OF 'C' SEAM

FIG.11C

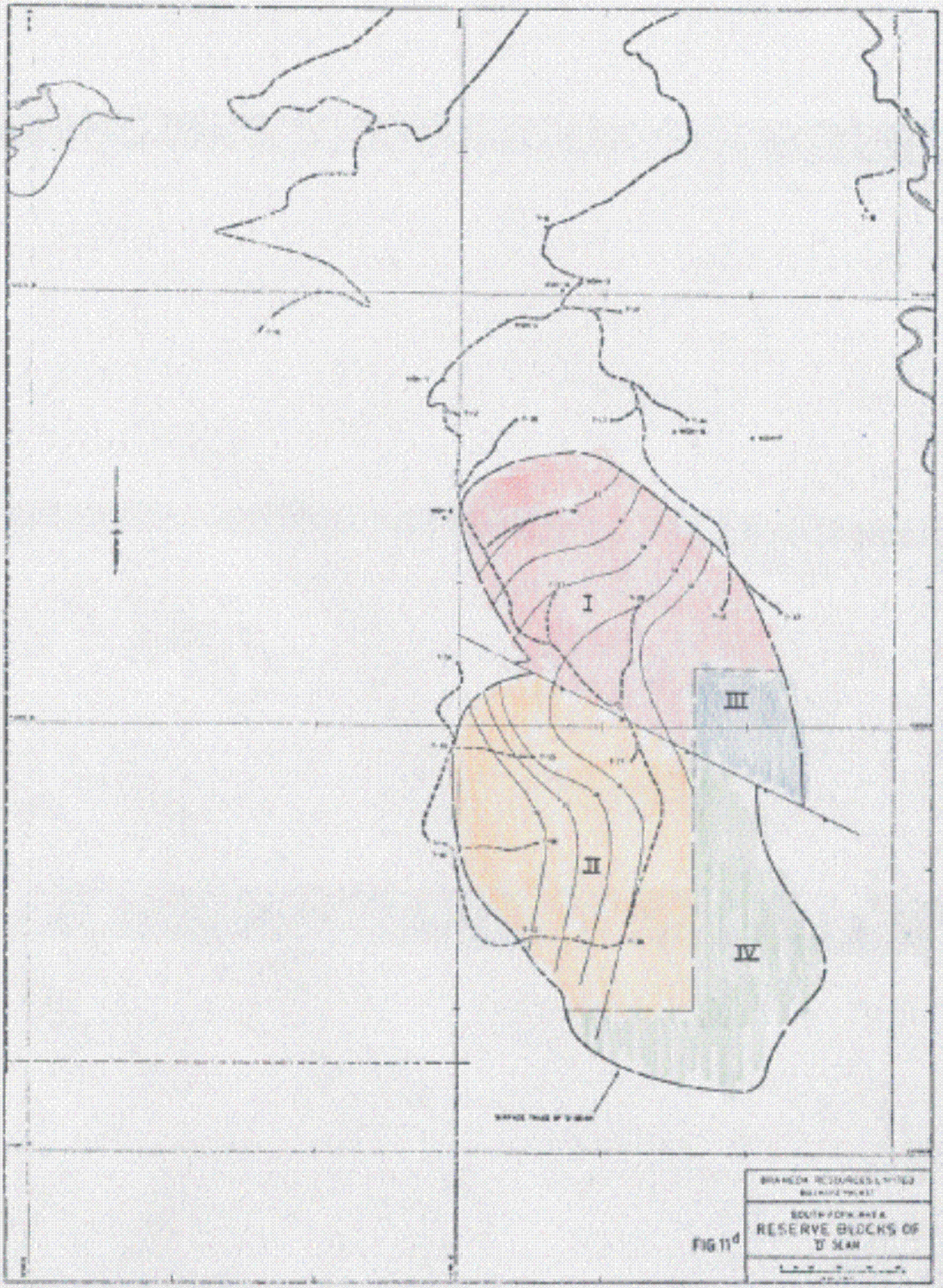
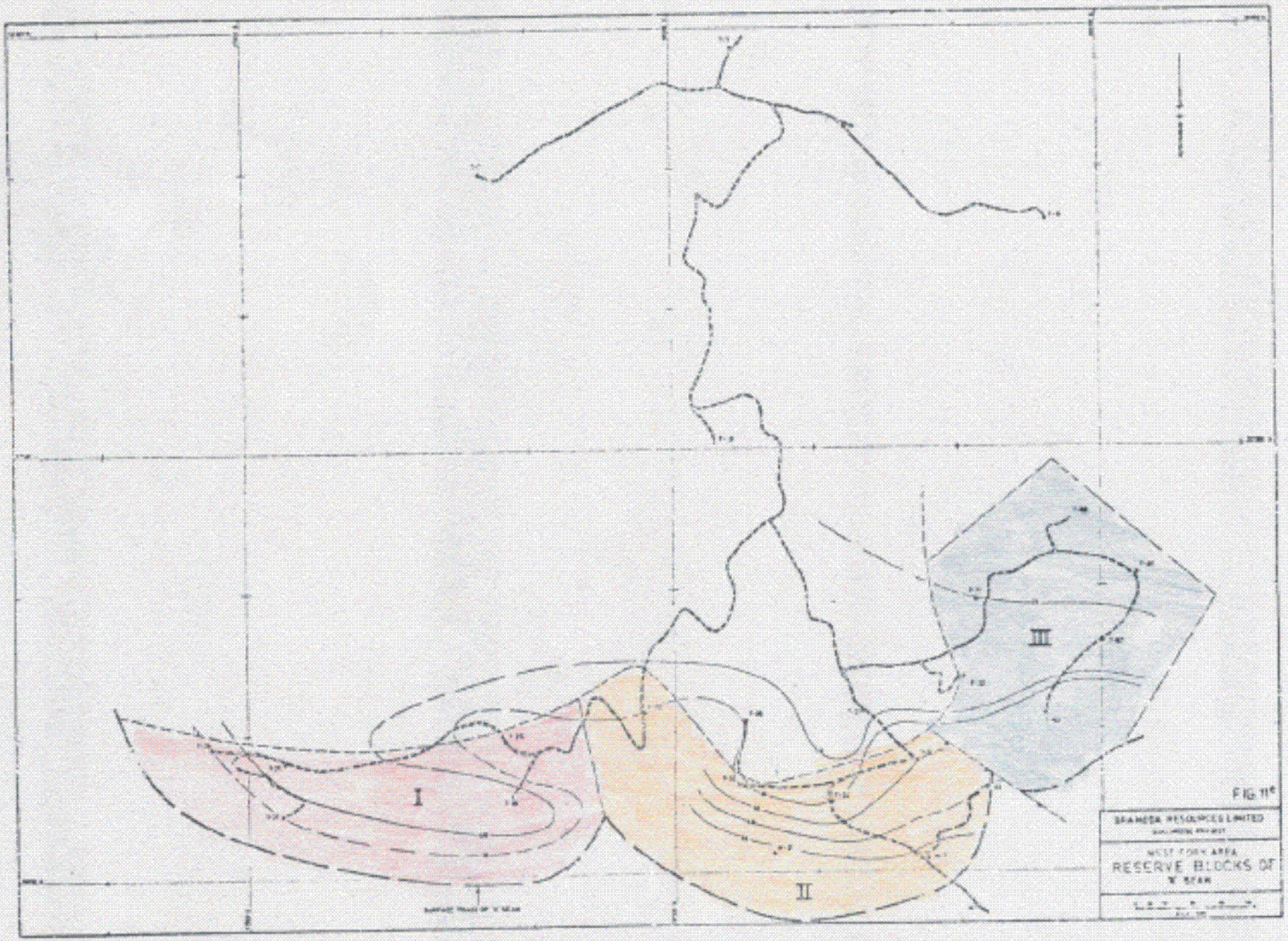
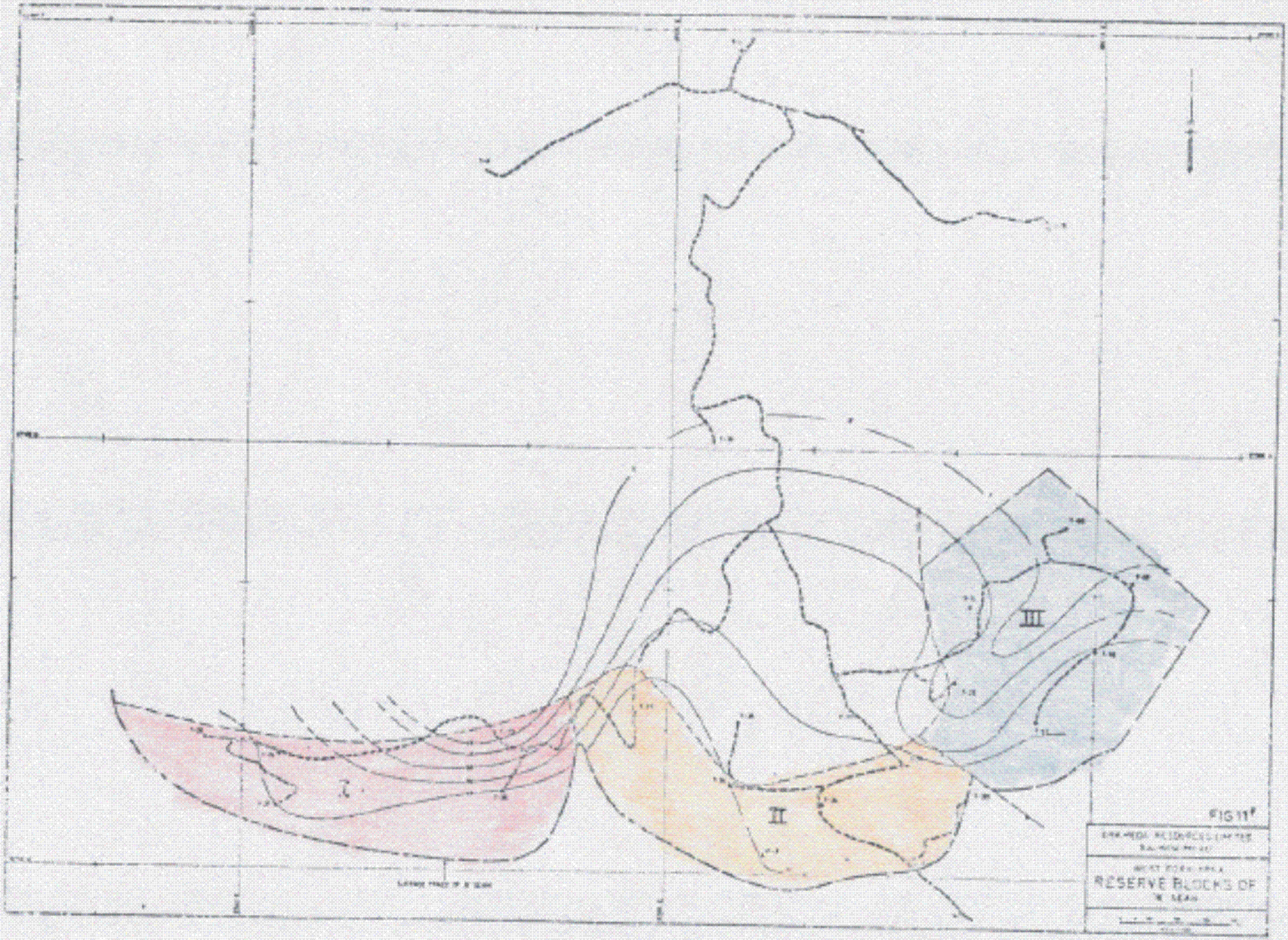
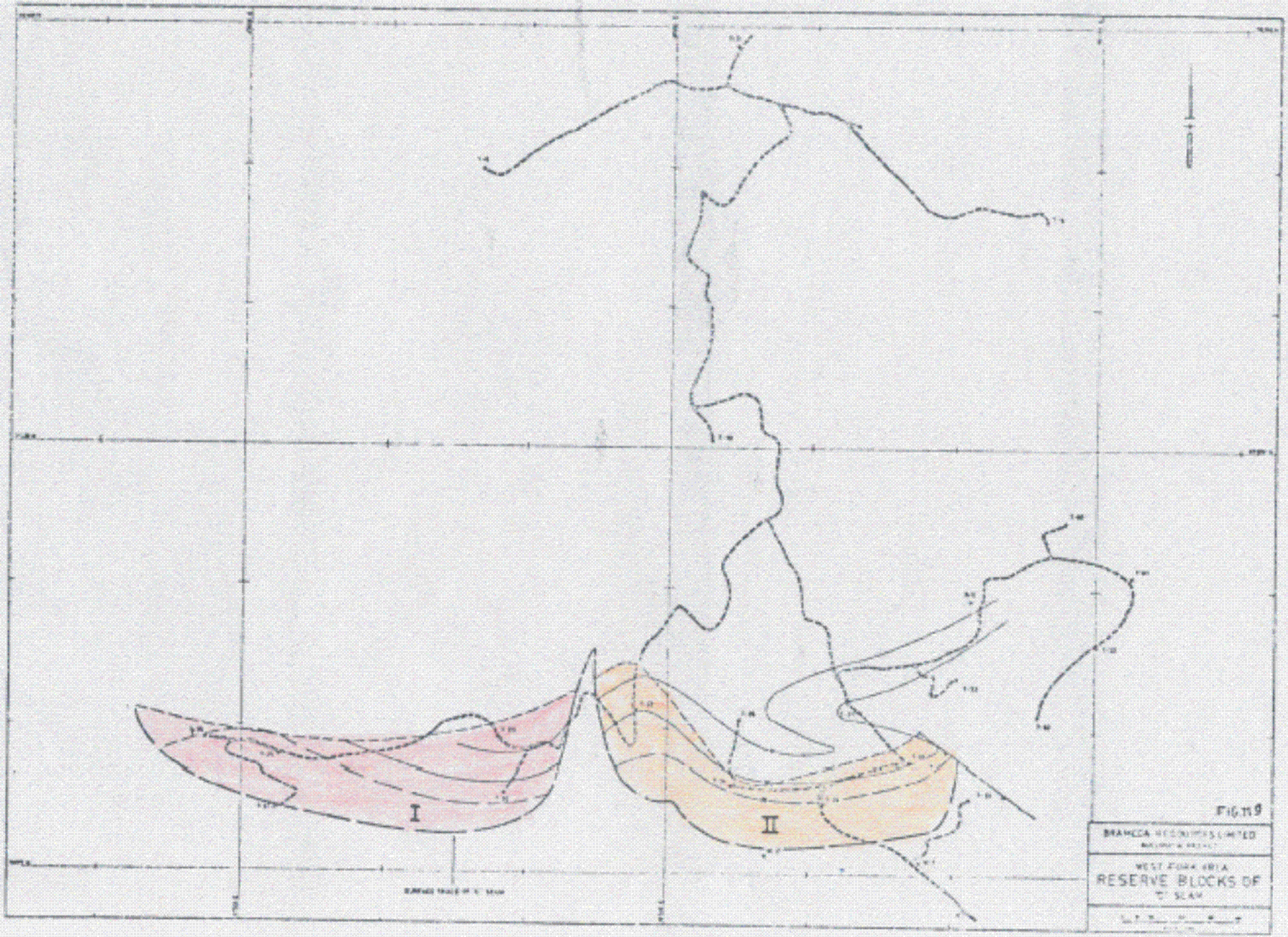


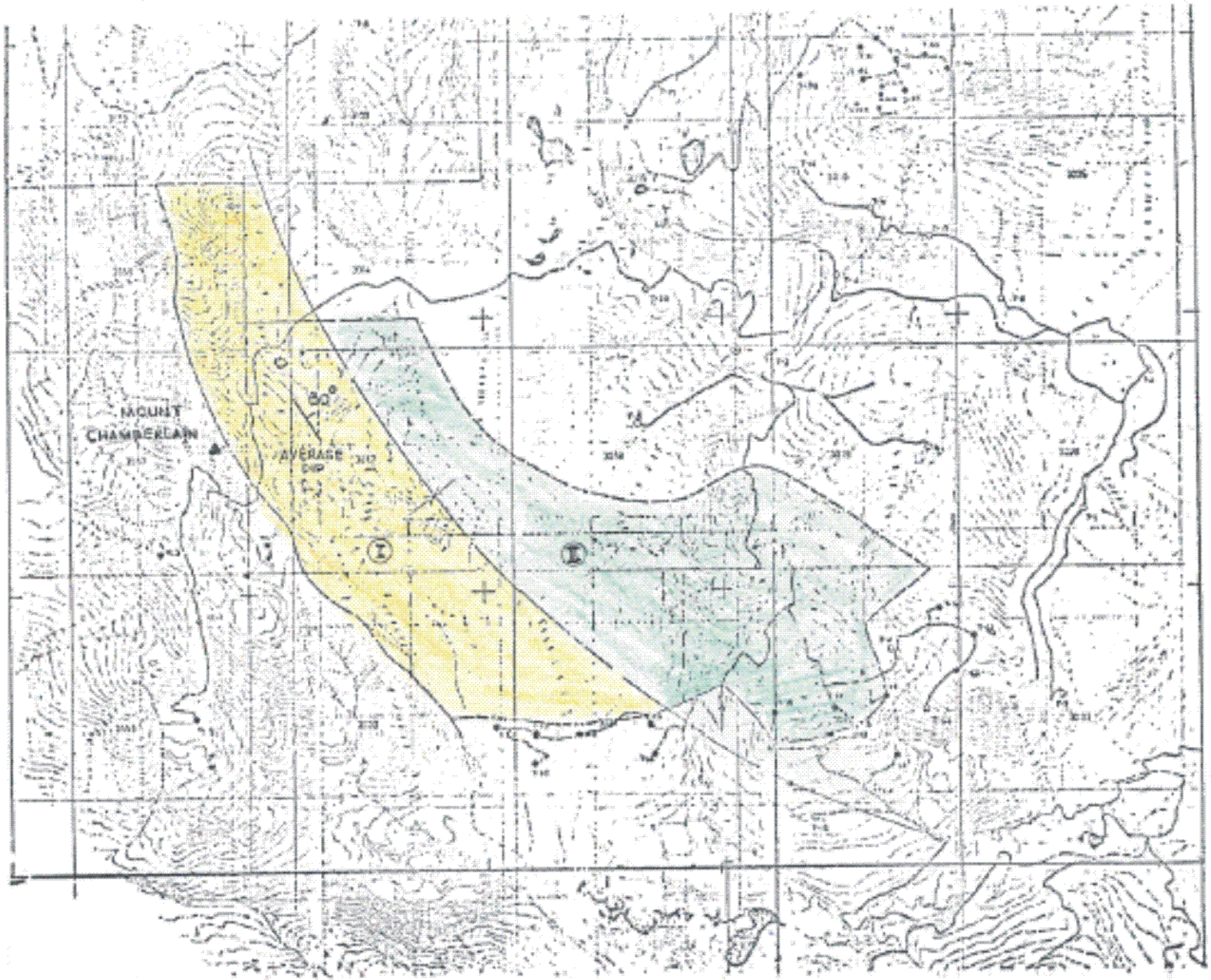
FIG 11d

SOUTH FORK AREA
RESERVE BLOCKS OF
'D' SEAM


I
II
III
FIG. 11
RESERVE BLOCKS OF


III
II
FIG 11
RESERVE BLOCKS OF
SEAM


I
II
Fig. 11.9
RESERVE BLOCKS OF



RESERVE BLOCKS FOR THE 'A' & 'B' SEAMS

(GATES COALS)

WEST FORK - MOUNT CHAMBERLAIN

SCALE = 1: 40000

FIG. 11b

SOUTH FORK

Seam	Block Number	Area (m^2)	Average Thick.	Vol.(m^3)	Sp.G.	Tons (MT)	Category
"A"	I	1,667,500	2.35	3,918,625	1.34	5,250,958	Drill Indicated
	II	967,500	2.62	2,534,850	1.34	3,396,699	Drill Indicated
	III	252,500	2.3	580,750	1.34	778,205	Inferred
	IV	732,500	2.5	1,831,250	1.34	2,453,875	Inferred
						(11,879,737)	
"B"	I	1,442,500	4.52	6,520,100	1.37	8,932,537	Drill Indicated
	II	987,500	5.07	5,006,625	1.37	6,859,076	Drill Indicated
	III	210,000	4.5	945,000	1.37	1,294,650	Inferred
	IV	677,500	5.0	3,387,500	1.37	4,640,875	Inferred
						21,727,138	
			TOTAL "A" AND "B"			33,606,875	
"C"	I	1,055,000	1.73	1,825,150	1.45	2,646,468	Drill Indicated
	II	880,000	1.73	1,522,400	1.45	2,207,480	Drill Indicated
	III	175,000	1.5	262,500	1.45	380,625	Inferred
	IV	560,000	1.5	840,000	1.45	1,218,000	Inferred
						6,452,573	
"D"	I	672,500	1.8	1,210,500	1.61	1,948,905	Drill Indicated
	II	780,000	1.8	1,404,000	1.61	2,260,440	Drill Indicated
	III	135,000	1.3	175,500	1.61	282,555	Inferred
	IV	437,500	1.0	437,500	1.61	704,375	Inferred
						5,196,275	
			TOTAL SOUTH FORK			45,255,723 M.T.	

WEST FORK

"A"	I	680,000	1.76	1,196,800	1.34	1,603,712	Drill Indicated
	II	730,000	2.12	1,547,600	1.34	2,073,784	Drill Indicated
	III	742,500	1.5	1,113,750	1.34	1,492,425	Drill Indicated
"B"	I	562,500	3.98	2,238,750	1.37	3,067,088	Drill Indicated
	II	580,000	3.93	2,279,400	1.37	3,122,778	Drill Indicated
	III	592,500	2.35	1,392,375	1.37	1,907,554	Drill Indicated
			TOTAL "A" AND "B"			13,267,341	
"C"	I	412,500	2.00	825,000	1.45	1,196,250	Drill Indicated
	II	362,500	1.87	677,875	1.45	982,919	Drill Indicated
			TOTAL WEST FORK			15,446,510 M.T.	

WEST FORK--MOUNT CHAMBERLAIN

"A"	I	4,295,486	1.67	7,173,461	1.34	9,612,438	Possible
"B"	I	4,295,486	2.6	11,168,263	1.37	15,300,521	Possible
	II	4,280,000	2.3	9,844,000	1.37	13,486,280	Possible
			TOTAL			38,399,239 M.T.	

NOTE: Average dip on block I = 30°

SUMMARY OF GATES COAL RESERVES IN PLACE

Strippable:-

South Fork	"A" Seam	12,411,665 M.T.	
	"B" Seam	22,995,876 M.T.	
	"C" Seam	6,675,075 M.T.	
	"D" Seam	4,841,250 M.T.	
	TOTAL	45,255,723 M.T.	
West Fork	"A" Seam	5,401,410 M.T.	
	"B" Seam	8,570,260 M.T.	
	"C" Seam	2,791,168 M.T.	
	TOTAL	15,446,651 M.T.	
	TOTAL STRIPPABLE		60,702,374 M.T.

Underground (Possible)

West Fork-Mount Chamberlain

	"A" Seam	9,612,438 M.T.	
	"B" Seam	28,786,801 M.T.	
	TOTAL	38,399,239 M.T.	
	TOTAL UNDERGROUND		38,399,239 M.T.
	TOTAL GATES COAL IN PLACE		99,101,613 M.T.

OVERBURDEN RATIOS

Calculations of overburden ratios were made for both the South and West Forks. Essentially the procedure involved the calculation of the total volume of material immediately above the "A" seam and subtracting the volume occupied by overlying seams that were included in the reserves to derive the net volume of waste rock. In the process of calculation it was deemed desirable to show the variations of overburden ratios on contoured maps (Figures 8,8a,9).

The total stripping ratio for the South Fork is 4.21 cubic metres per metric ton of coal in place for the "A", "B", "C" and "D" seams combined, and that of the West Fork is 5.6 cubic metres per metric ton of coal in place for the "A", "B", and "C" seams.

If the overlying "C" and "D" seams in the South Fork be arbitrarily considered waste, the total overburden ratio just for the "A" and "B" seams combined would rise only slightly to 5.9 cubic metres per metric ton coal in place.

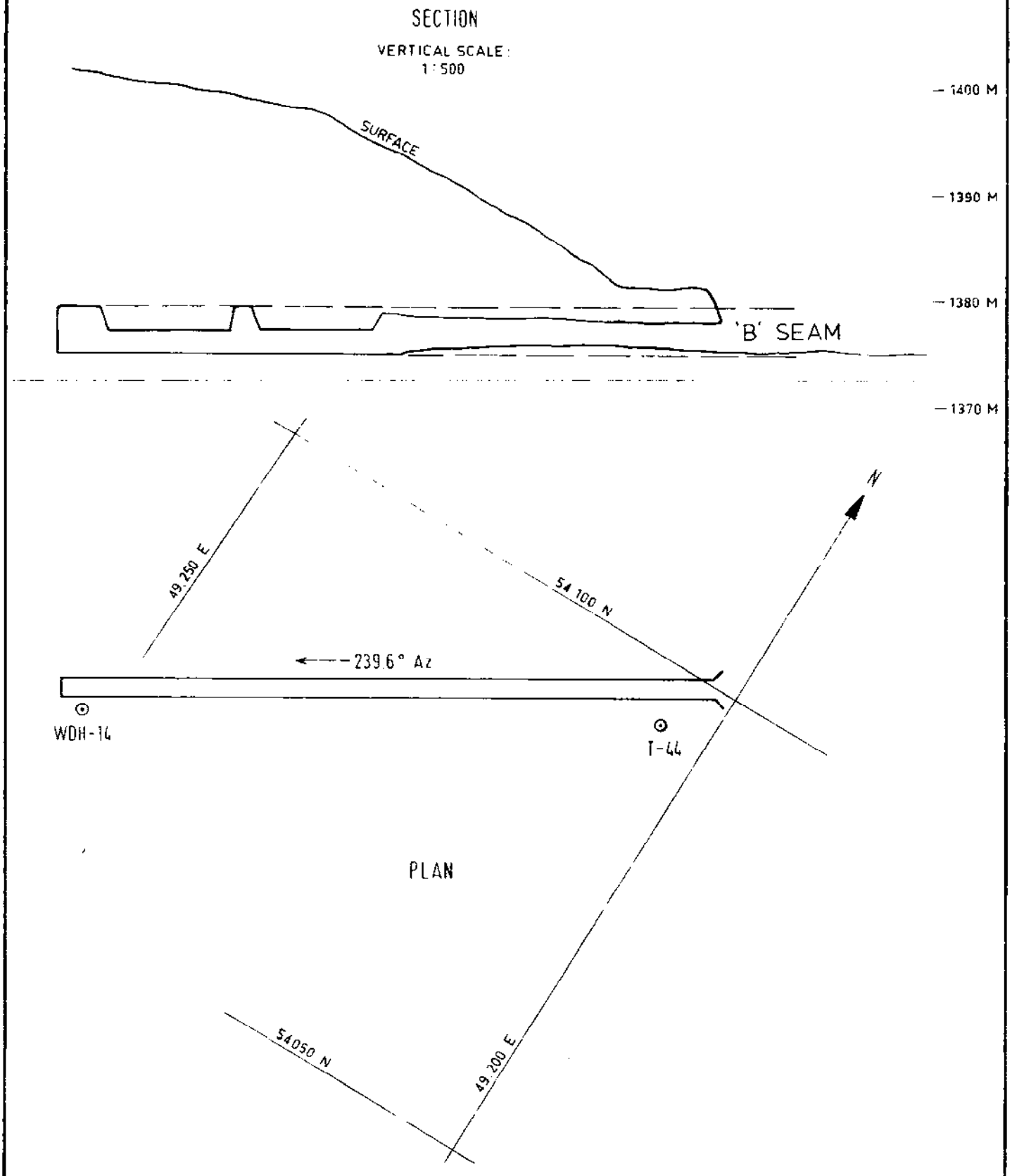
The maximum depth to the floor of "A" seam in the South Fork would be nearly 130 metres.

BULK SAMPLING

An adit measuring 1.8 metres wide and 2.1 metres high was driven for 61 metres on the "B" seam in the South Fork (Figure 13), for the purpose of obtaining bulk samples for washability and coke oven tests. The selection of the adit site was made after two pilot holes were drilled to verify seam quality. Other factors such as topography and environmental protection were considered.

The bulk samples were taken from the face of the adit and consisted of two types. One was taken from a carefully cut channel measuring 0.6 metres wide and 0.3 metres deep across the full thickness of the seam of 4.57 metres. The sample was contained in six 200-litre drums lined with polyethylene sheets. The other sample was taken from a blasted round measuring 4.57 metres high, 1.8 metres wide and 0.6 metres dip and were contained in thirty-three 200-litre drums. In addition, 3-kilogram samples were taken every 30 cm from a channel cut across the full width of the seam at the adit face.

The samples were sent for analysis to Cyclone Engineering in Edmonton. Arrangements have also been made to utilize the Department of Energy, Mines and Resources' laboratory in Edmonton for washability and coke oven tests.



BRAMEDA RESOURCES LIMITED
VANCOUVER BC

GATES 'B' SEAM ADIT
SCALE 1:500

FIG. 12

COAL QUALITY

SAMPLING

The sampling of coal intersections was carried out after lithologic logging of the drill cores were made and detailed features of the coal seams recorded. In most cases only the coal material was sampled although a few exceptions were made where thin rock partings were included for comparison purposes. Two samples were taken from the "B" seam, one sample coming from the upper dull-looking portion of the seam and the other from the lower and brighter portion of the seam. In cases where the "B" seam appeared uniform throughout, a point of division was arbitrarily chosen.

COAL ANALYSIS

All the samples were submitted to Commercial Testing and Engineering of Vancouver for proximate analysis. Unweighted averages compiled for each of the seams based on raw coal are as follows:

South Fork

	Ash	V.M.	F.C.	S	F.S.I.
"A" Seam (Lower)	7.2%	24.6%	68.2%	0.35%	5
(Upper)	13.2%	22.9%	62.4%	0.45%	4
"B" Seam (Lower)	7.2%	26.6%	66.2%	0.23%	5-1/2
(Upper)	18.0%	23.3%	58.8%	0.23%	3
"C" Seam	22.4%	21.7%	55.8%	0.44%	3
"D" Seam	35.9%	20.6%	43.6%	0.33%	4
"E" Seam	14.1%	26.9%	59.0%	0.51%	5-1/2

Note: Only two samples were submitted from the "E" seam.

West Fork

	Ash	V.M.	F.C.	S	F.S.I.
"A" Seam	18.8%	22.2%	59.0%	0.38%	4-1/2
"B" Seam (Lower)	7.2%	26.6%	66.5%	0.25%	4-1/2
(Upper)	19.8%	23.2%	57.4%	0.25%	3
"C" Seam	20.6%	22.5%	56.9%	0.35%	2-1/2
"D" Seam	34.5%	20.4%	44.9%	0.26%	2-1/2

WASHABILITY TESTS

Composite samples of selected hole groupings were made up of drill cores from each of the "A", "B", "C" and "D" seam intersections in the South Fork. Owing to the particle size of the composites only two fractional sizes were prepared where the +28 mesh was treated using heavy media and the -28 mesh by froth flotation. The results of the tests for each composite sample are shown in Appendix I. The tests show high yields for the "A" and "B" seams in contrast to the lower yields for both the "C" and "D" seams. It may be

recalled that core recoveries from the "C" and "D" seams were generally less than satisfactory, such that the possible loss of the softer coal material during drilling would consequently degrade the samples.

The results of washability tests of the bulk channel sample from the "B" seam adit are found in Appendix II. The analysis of the clean product from this test closely correspond with similar analysis of composites from the "B" seam.

RECOMMENDATIONS

1. Further definition of Gates coal reserves will require additional drilling. A minimum of seven shallow holes is proposed for the West Fork and fifteen for the South Fork areas (Figure 13 & 14). In addition, seam tracing by hand trenching in conjunction with detailed geologic mapping for both areas is recommended.

2. A minimum of six prospecting holes is proposed to test for Gates seams in the area north of the West Fork and towards Mount Chamberlain. This should likewise be carried out in conjunction with detailed geologic mapping.

LEGEND

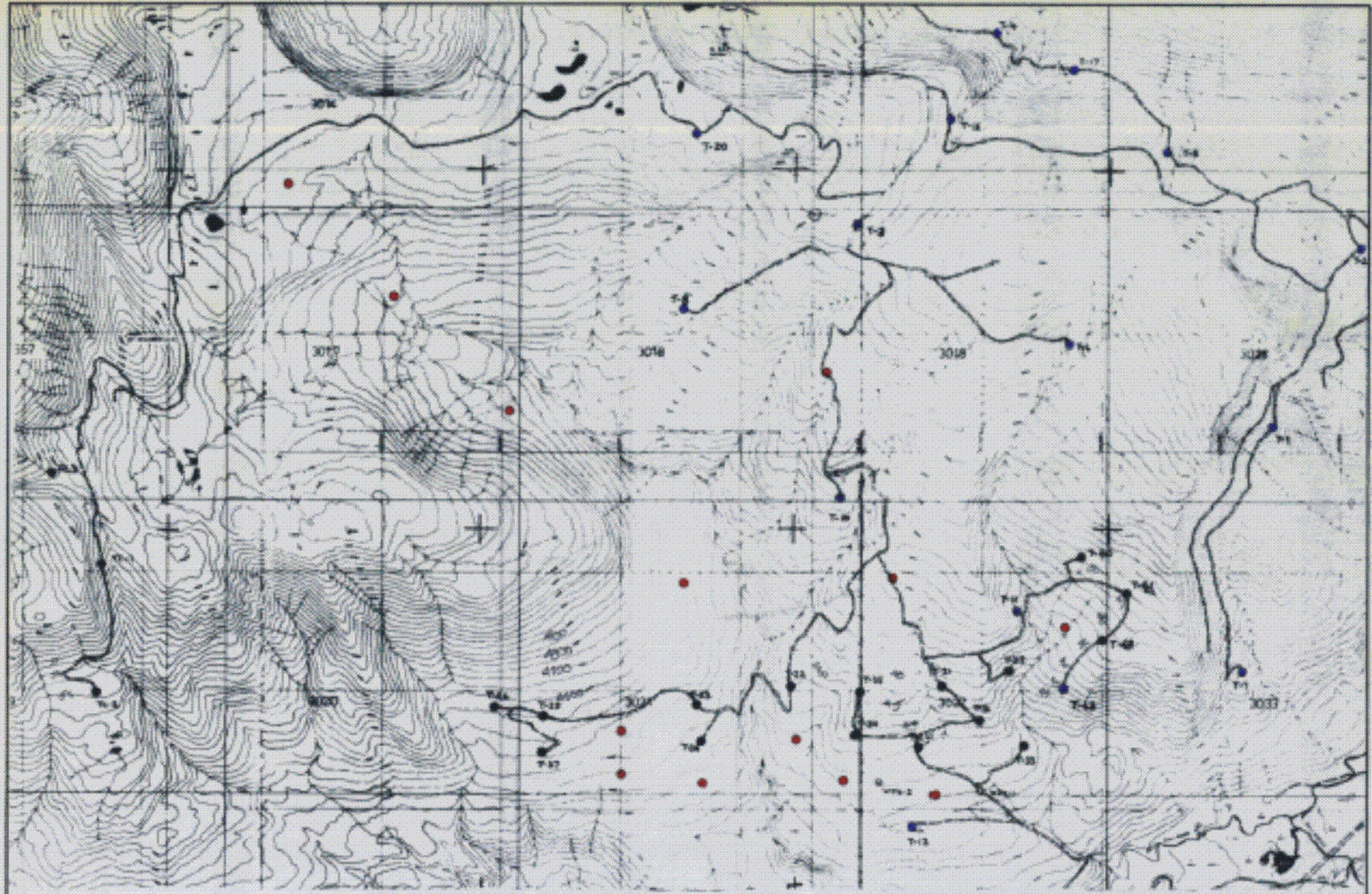
- T-58 PREVIOUS DRILL HOLE
- PROPOSED DRILL HOLES

SOUTH FORK

LOCATION PLAN OF PROPOSED DRILL HOLES

SCALE 1:2000

FIG 13



LEGEND

● T-23 PREVIOUS DRILL HOLE

● PROPOSED DRILL HOLES

WEST FORK-MOUNT CHAMBERLAIN

LOCATION PLAN OF PROPOSED DRILL HOLES

SCALE 1:20000

FIG. 14

48500 E

50000E

51500 E

54500 N

53000 N

51500 N

T-13

T-14

T-15

WDH-13

WDH-3

T-41

WDH-4

WDH-5

T-42

T-30

T-43

ADIT

T-44

WDH-14

WDH-7

WDH-6

T-59

T-52

T-29

T-45

T-47

T-54

T-55

T-53

T-27

T-58

T-56

T-57

T-28

FAULT

BULLMOOSE CREEK

597000

6109000

5971000

cog

cos

H

G

F

E

D

C

B

A

LEGEND

cog GATES MEMBER

cos SUKUNKA MEMBER

PROJECTED SEAM TRACE ON SURFACE

25 DIP OF BEDDING

THRUST FAULT

SYNCLINE

CONTACT

'F' SEAM

'E' SEAM

'D' SEAM

'C' SEAM

'B' SEAM

'A' SEAM

2 3 4

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PR- BULLMOOSE 76(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

SOUTH FORK AREA

GENERALIZED GEOLOGY AND SURFACE TRACES OF SEAMS OF THE GATES COAL MEASURES

0 50 100 200 300 400 M.

SCALE 1:5000

FIG. 5

59 000 N

47000 E

48500 E

50000 E

57500 N

56000 N

LEGEND

- coh — HULLCROSS MEMBER
- cog — GATES MEMBER
- cos — SUKUNKA MEMBER
- PROJECTED SEAM TRACE ON SURFACE
- 25 — DIP OF BEDDING
- THRUST FAULT
- SYNCLINE
- CONTACT

T-3
T-8
T-6
T-10
T-60
T-61
T-11
T-62
T-32
T-63
T-22
T-35
T-21
T-26
T-23
T-25
T-31
T-34
T-36
T-37
T-24
T-33
W-2
W-1
T-12
A13

cos
cog
coh

'E' SEAM
'D' SEAM
'C' SEAM
'B' SEAM
'A' SEAM

A
B
1
2
3
4
5
6
7

611000
592000

477

PR- BULLMOOSE 76 (B) 4.

FIG. 6

BRAMEDA RESOURCES LIMITED
BULLMOOSE PROJECT

WEST FORK AREA
GENERALIZED GEOLOGY
AND
SURFACE TRACES OF SEAMS OF THE
GATES COAL MEASURES

0 50 100 200 300 400 M.
SCALE 1:5000

48500 E

50000E

51500 E

54500 N

53000 N

51500 N

BULLMOOSE CREEK

T-13

T-14

T-15

WDH-13

WDH-3

T-41

WDH-4

WDH-5

T-42

T-30

T-43

T-44

WDH-14

WDH-7

WDH-6

T-59

2.75

4.0

3.5

3.2

3.0

T-52

T-29

T-45

T-47

T-54

T-55

T-53

T-27

3.2

3.3

3.4

3.5

T-58

T-56

T-57

T-28

?

477

PR-BULLMOOSE 76(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

SOUTH FORK AREA

ISOPACH MAP

'A' SEAM

0 50 100 200 300 400 M.

SCALE 1:5000

FIG. 7a

48500 E

50000E

51500 E

BULLMOOSE CREEK

54500 N

53000 N

51500 N

T-13

T-14

T-15

WDH-13

WDH-3

T 41

WDH-4

4.6

4.5

WDH-5

4.4

T-42

T-30

T-43

T-44

WDH-14

WDH-7

5.0

4.75

WDH-6

T-59

4.5

T-52

T-29

T-45

T-47

4.5

4.75

T-54

T-55

T-53

T-27

6.0

5.5

5.0

5.0

T-58

T-56

4.75

T-57

28

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PR-BULLMOOSE 76(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

SOUTH FORK AREA

ISOPACH MAP

'B' SEAM

FIG. 7 b

0 50 100 200 300 400 M.

SCALE 1:5000

48500 E

50000 E

51500 E

54500 N

53000 N

51500 N

BULLMOOSE CREEK

T-13

T-14

T-15

WDH-13

WDH-3

T-41

WDH-4

WDH-5

T-42

T-30

T-43

T-44

WDH-14

WDH-7

WDH-6

T-59

T-52

T-29

T-45

T-47

T-54

2.0

1.9

1.8

T-55

1.7

T-53

T-27

T-58

T-56

T-57

T-28

?

477

PR- BULLMOOSE 7(R)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

SOUTH FORK AREA

ISOPACH MAP

'C' SEAM

0 50 100 200 300 400 M.

SCALE 1:5000

FIG.7c

48500 E

50000E

51500 E

BULLMOOSE

CREEK

54500 N

54500 N

T-13

T-14

T-15

WDH-13

WDH-3

T-41

WDH-4

WDH-5

T-42

T-30

T-43

T-44

WDH-14

WDH-7

WDH-6

T-59

2.2

2.1

2.0

1.9

1.7

T-52

T-29

T-45

T-47

T-54

53000 N

53000 N

T-55

T-53

T-27

1.9

2.0

2.1

2.2

T-58

T-56

T-57

T-28

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PR- BULLMOOSE 76(2)A.

51500 N

51500 N

48500 E

50000 E

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

SOUTH FORK AREA

ISOPACH MAP

'D' SEAM

0 50 100 200 300 400 M.

SCALE 1:5000

FIG. 7d

48500 E

50000E

51500E

54500 N

54500N

53000 N

53000N

51500 N

51500N

48500 E

50 000 E

BULLMOOSE CREEK

T-13

T-14

T-15

WDH-13

WDH-3

T-41

WDH-4

WDH-5

T-42

T-30

T-43

T-44

WDH-14

WDH-7

WDH-6

T-59

?

T-52

T-29

T-45

T-47

T-54

T-55

T-53

T-27

T-58

T-56

T-57

T-28

10:1

8:1

6:1

4:1

3:1

2:1

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PR- BULLMOOSE 76(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

SOUTH FORK AREA

OVERBURDEN RATIO MAP $M^3/MT.$ FOR

A & B SEAMS

0 50 100 200 300 400 M.

SCALE 1:5000

FIG. 8

48500 E

50000E

51500 E

BULLMOOSE CREEK

54500 N

53000 N

51500 N

T-13

T-14

T-15

WDH-13

WDH-3

T-41

WDH-4

WDH-5

T-42

T-30

T-43

T-44

WDH-14

WDH-7

WDH-6

T-59

?

T-52

T-29

T-45

T-47

T-54

T-55

T-53

T-27

T-58

T-56

T-57

T-28

7:1

6:1

5:1

4:1

3:1

2:1

477

PR- BULLMOOSE 7(6)(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

SOUTH FORK AREA

OVERBURDEN RATIO MAP M³/MT. FOR

A, B, C & D SEAMS

0 50 100 200 300 400 M.

SCALE 1:5000

FIG. 8ª

59 000 N

47000 E

48500 E

50000 E

59000 N

57500 N

57500 N

T-3

T-8

T-6

T-10

T-60

T-61

T-11

T-62

T-32

10:1

8:1

6:1

5:1

4:1

T-63

T-22

T-35

T-21

T-26

T-23

T-25

T-31

T-34

T-24

T-33

T-36

T-37

W-2

W-1

56000 N

47000 E

48500 E

477

OR- BULLMOOSE 76(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

WEST FORK AREA

OVERBURDEN RATIO MAP $M^3/MT.$ FOR

A,B&C SEAMS

0 50 100 200 300 400 M

SCALE 1:5000

FIG. 9

59 000 N

47000 E

48500 E

50000 E

59000 N

57500 N

57500 N

56000 N

47000 E

48500 E

T-3

T-8

T-6

T-10

T-60

T-61

T-11

1.5

T-62

T-32

T-22

T-35

T-21

T-63

T-26

T-23

T-25

1.75

T-31

T-34

1.8

T-24

T-33

2.0

2.25

2.5

W-2

W-1

T-36

T-37

1.75

1.8

477

PR- BULLMOOSE 7B(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

WEST FORK AREA

ISOPACH MAP

'A' SEAM

0 50 100 200 300 400 M

SCALE 1:5000

FIG. 10[a]

59 000 N

47000 E

48500 E

50000 E

59000 N

57500 N

57500 N

T-3

T-8

T-6

T-10

?

?

?

T-60

T-61

T-11

T-62

T-32

T-22

T-21

T-35

T-63

T-23

T-26

2.0

2.5

3.0

3.5

4.0

T-25

T-31

T-34

T-24

T-33

T-36

T-37

W-2

?

W-1

56000 N

47000 E

48500 E

477

PR-BULLMOOSE 76(2)A.

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

WEST FORK AREA

ISOPACH MAP

'B' SEAM

0 50 100 200 300 400 M

SCALE 1:5000

FIG. 10b

59 000 N

47000 E

48500 E

50000 E

59000 N

57500 N

57500 N

T-3

T-8

T-6

T-10

T-60

T-61

T-11

T-62

T-32

T-63

T-22

T-35

T-21

T-23

T-26

T-25

T-31

T-34

T-24

T-33

T-36

T-37

W-2

W-1

2.5

2.0

1.75

56000 N

47000 E

48500 E

477

PRE-BULLMOOSE 76(2)A

BRAMEDA RESOURCES LIMITED

BULLMOOSE PROJECT

WEST FORK AREA

ISOPACH MAP

'C' SEAM

0 50 100 200 300 400

SCALE 1:5000

FIG. 10C

3. A small area west of the South Fork reserves may contain both the A and B seams although under a thin veneer of cover. The area should be thoroughly prospected and if warranted drilled.

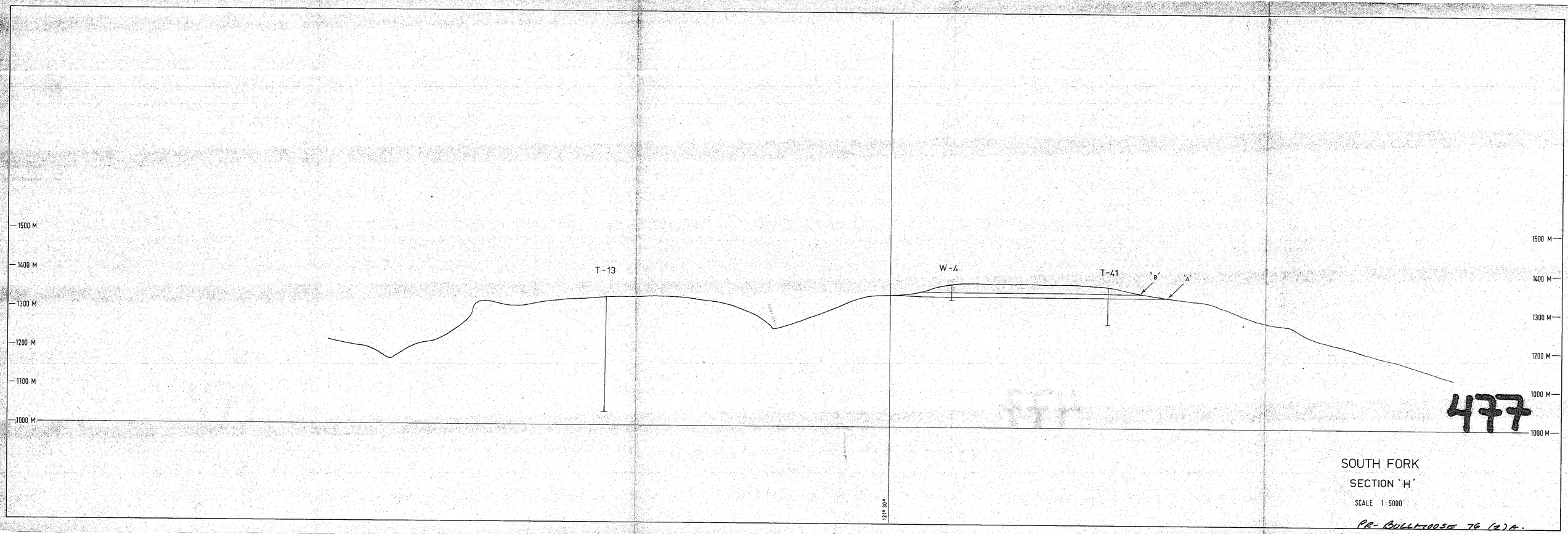
Respectfully submitted,

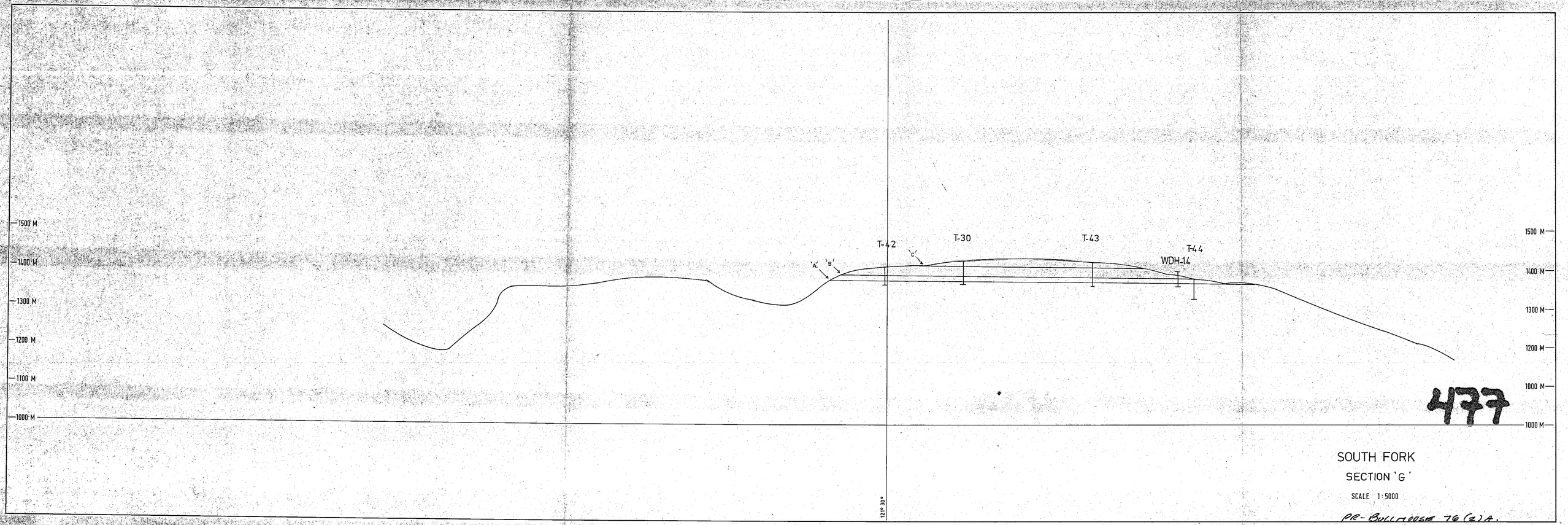
R. S. Verzosa

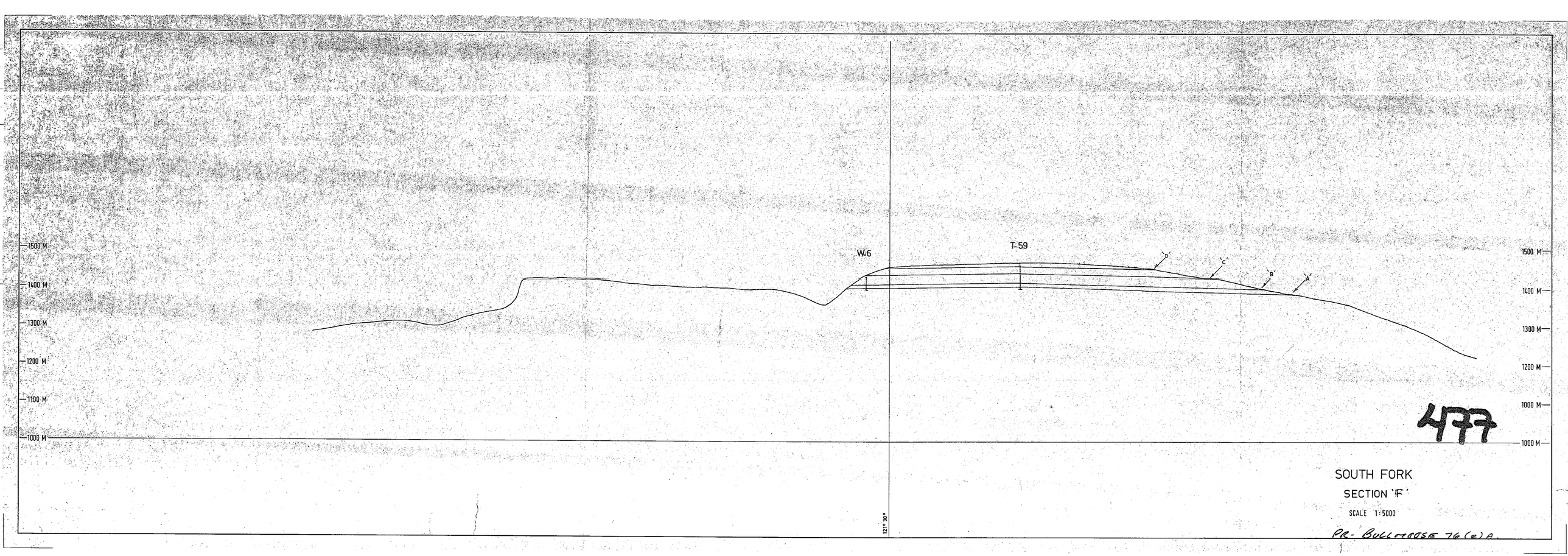
R. S. Verzosa

B. I. McClymont

RSV:mjb


1500 M
1400 M
1300 M
1200 M
1100 M
1000 M
T-13
W-4
T-41
'B'
'A'
121° 30°
1500 M
1400 M
1300 M
1200 M
1000 M
1000 M
477
SOUTH FORK
SECTION 'H'
SCALE 1:5000
PRE-BULLMOOSE 76 (2) A.


1500 M
1400 M
1300 M
1200 M
1100 M
1000 M
T-42
T-30
T-43
T-44
WDH-14
A
B
C
121° 30°
1500 M
1400 M
1300 M
1200 M
1000 M
477
SOUTH FORK
SECTION 'G'
SCALE 1:5000
PR-BULLETIN 76 (2) A.

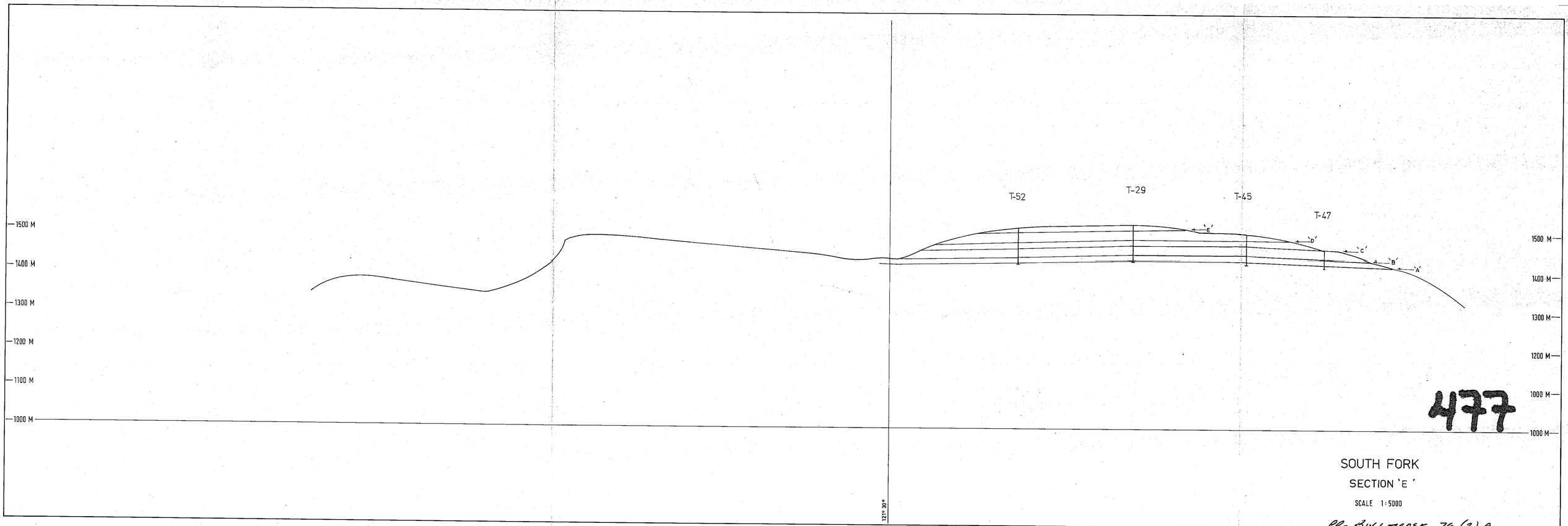


SOUTH FORK

SECTION 'F'

SCALE 1:5000

RE: BULLMOOSE 76(2)A.



477

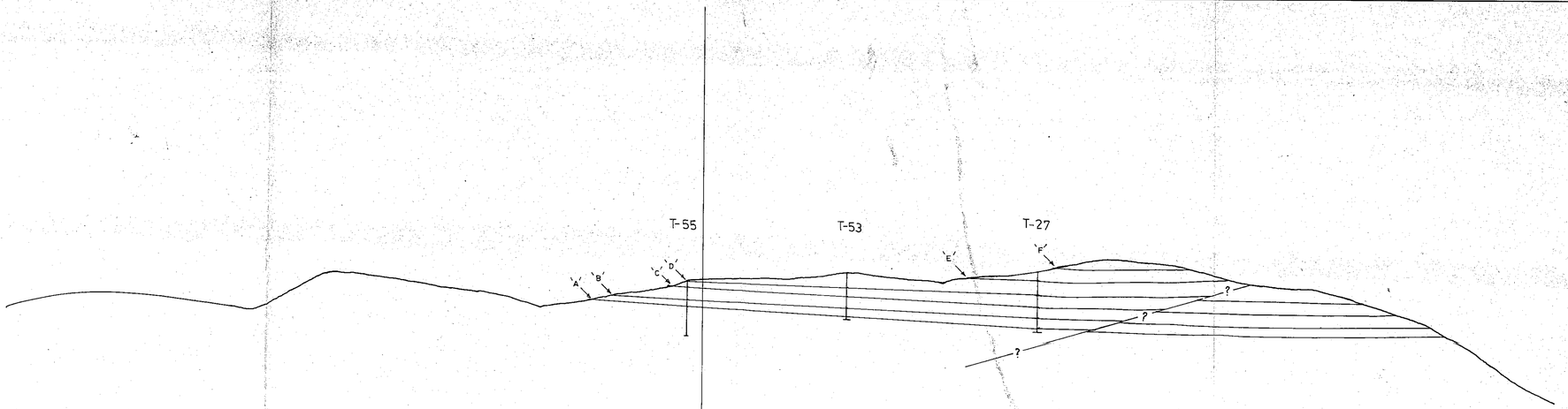
SOUTH FORK

SECTION 'E'

SCALE 1:5000

PR-BULLMOOSE 76 (2) A.


1500 M
1400 M
1300 M
1200 M
1100 M
1000 M
T-54
F'
E'
D'
C'
B'
A'
121° 30°
1500 M
1400 M
1300 M
1200 M
1000 M
1000 M
477
SOUTH FORK
SECTION 'D'
SCALE 1:5000
PR. BULLMOOSE 76 (2) A



1500 M
1400 M
1300 M
1200 M
1100 M
1000 M

1500 M
1400 M
1300 M
1200 M
1000 M
1000 M

121° 30°

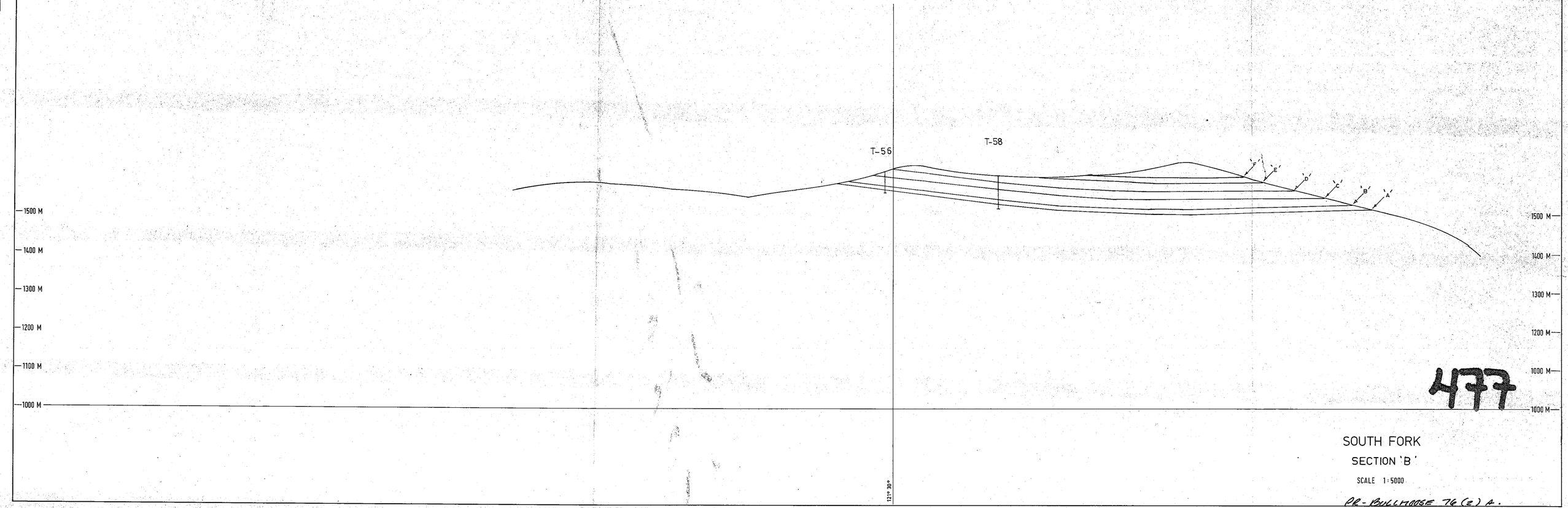
477

SOUTH FORK

SECTION 'C'

SCALE 1:5000

OR-BULLMOOSE 76(2)A.



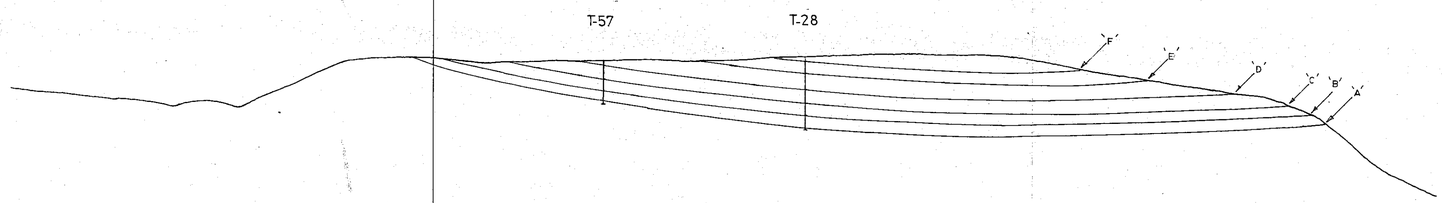
477

SOUTH FORK

SECTION 'B'

SCALE 1:5000

PR-BULLMOOSE 76(2)A.



1500 M
1400 M
1300 M
1200 M
1100 M
1000 M

121° 30'

1500 M
1400 M
1300 M
1200 M
1000 M
1000 M

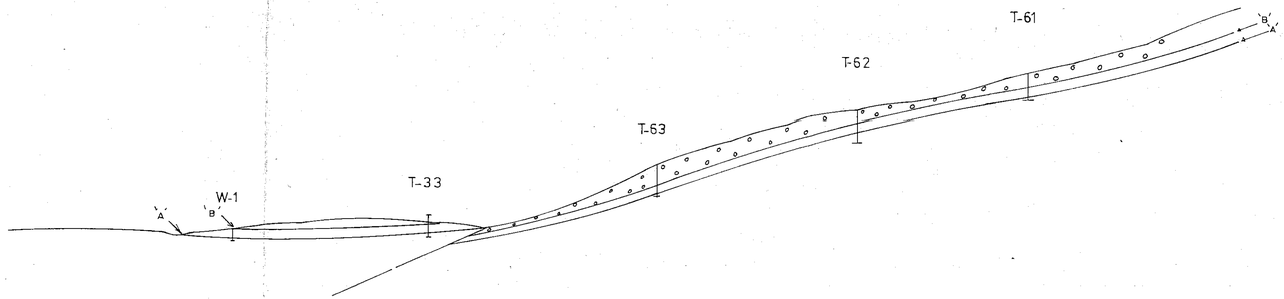
477

SOUTH FORK

SECTION 'A'

SCALE 1:5000

RR- BULLMOOSE 76 (2) 4.



1500 M
1400 M
1300 M
1200 M
1100 M
1000 M

1500 M
1400 M
1300 M
1200 M
1000 M
1000 M

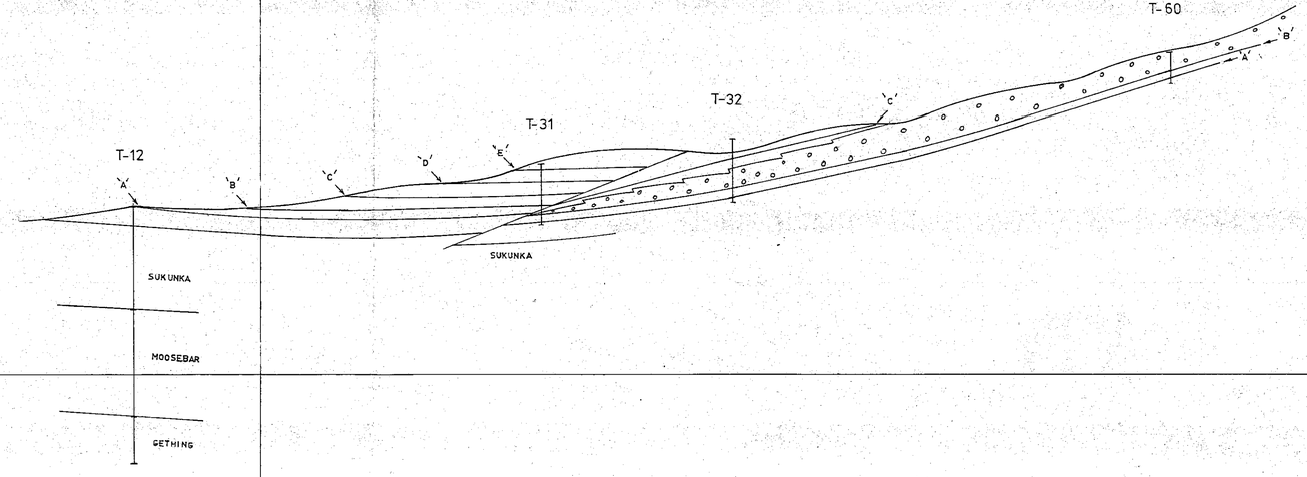
477

WEST FORK

SECTION '7'

SCALE 1:5000

RE- BULLMOOSE 76(2)A.



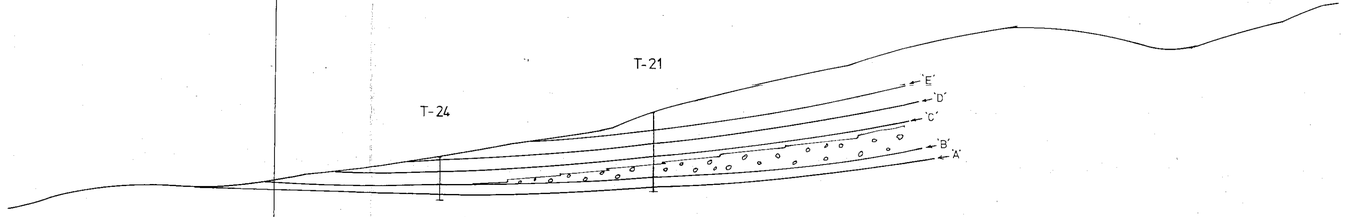
477

WEST FORK

SECTION '6'

SCALE 1:5000

PR. BULLMOOSE 76 (2) A.



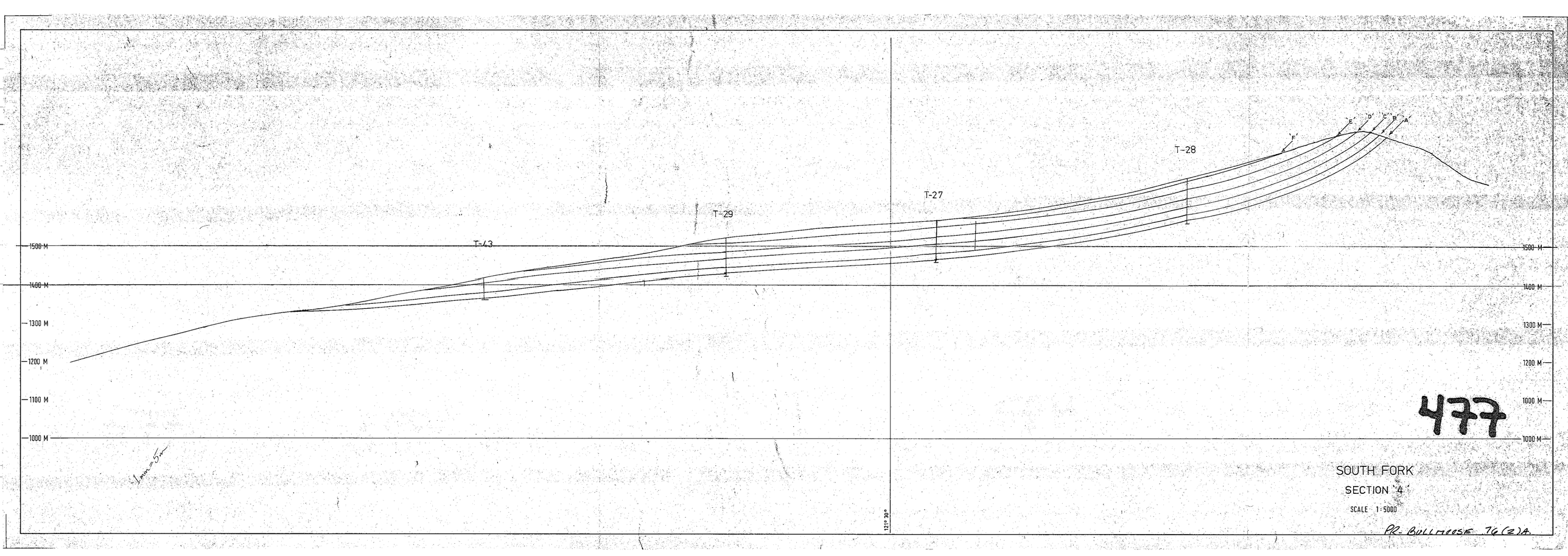
1500 M
1400 M
1300 M
1200 M
1100 M
1000 M

1500 M
1400 M
1300 M
1200 M
1000 M
1000 M

477

WEST FORK
SECTION '5'
SCALE 1:5000

AR-BULLMOOSE 76 (2) A.



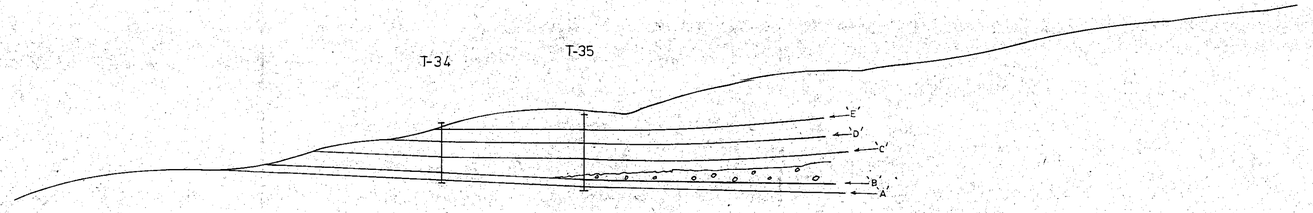
477

SOUTH FORK

SECTION '4'

SCALE 1:5000

PR- BULLMOOSE 76(2)A.



1500 M
1400 M
1300 M
1200 M
1100 M
1000 M

477

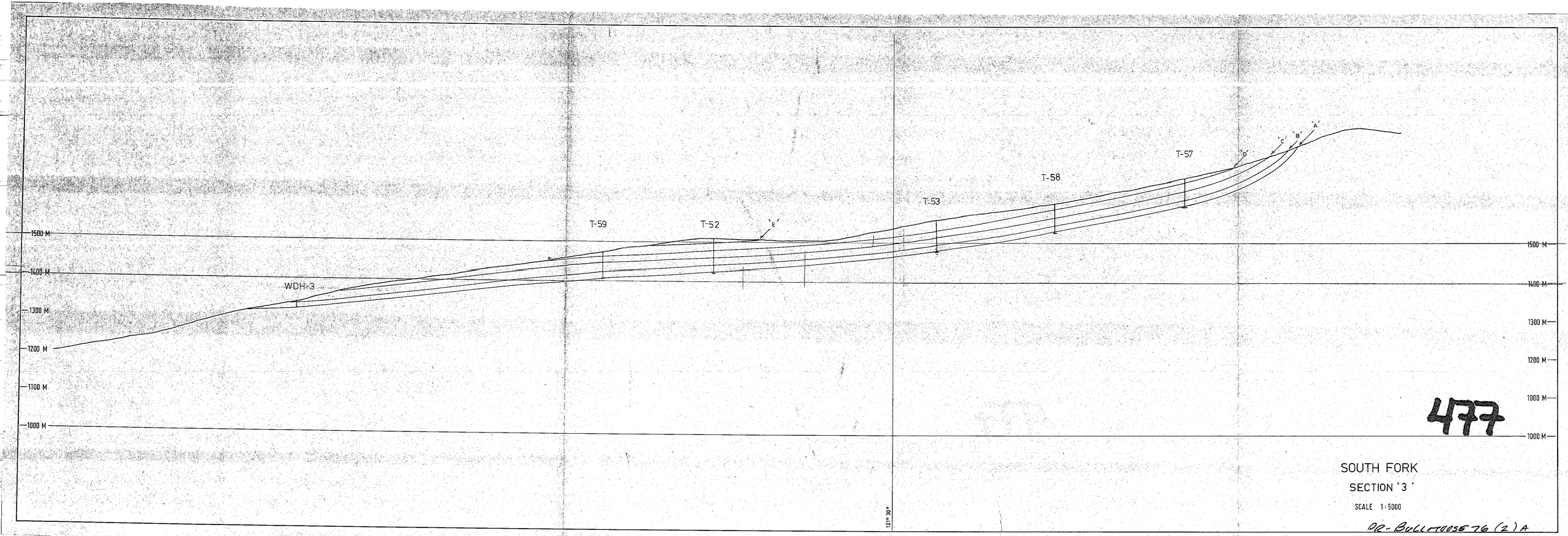
WEST FORK

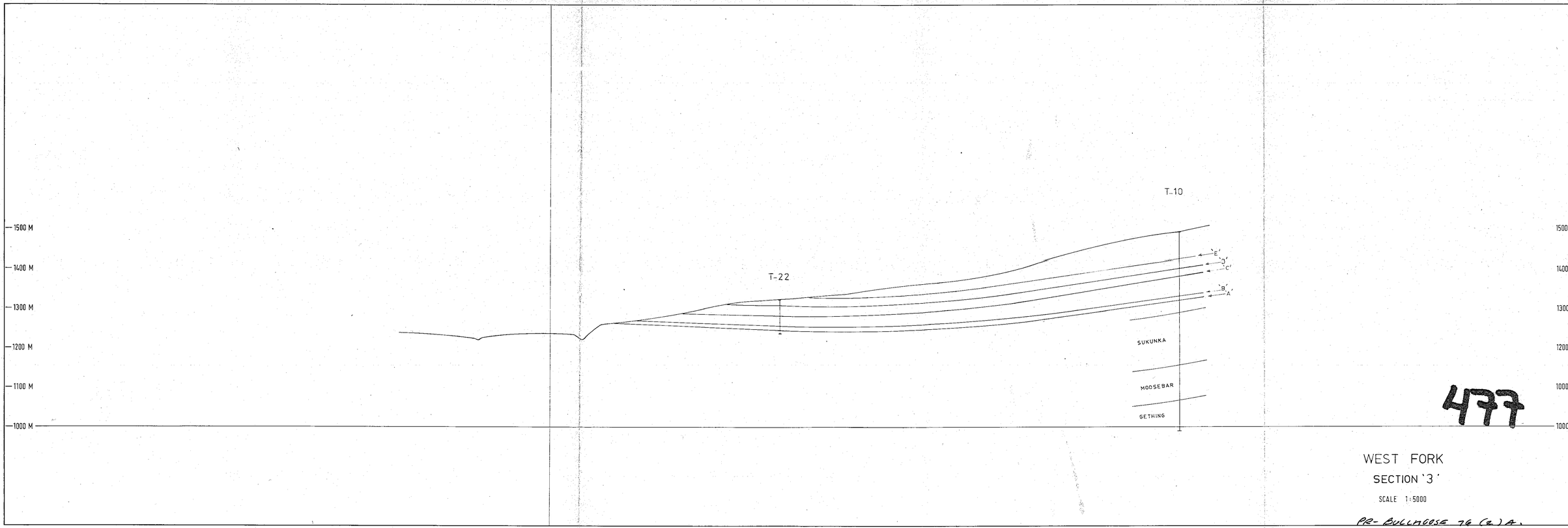
SECTION '4'

SCALE 1:5000

Pre-Bullmoose 76 (2) a.

4


T-59
T-52
E
T-53
T-58
T-57
D
C
B
A
WDH-3
1500 M
1400 M
1300 M
1200 M
1100 M
1000 M
121° 30°
477
SOUTH FORK
SECTION '3'
SCALE 1:5000
PR-BULLMOOSE 76 (2) A



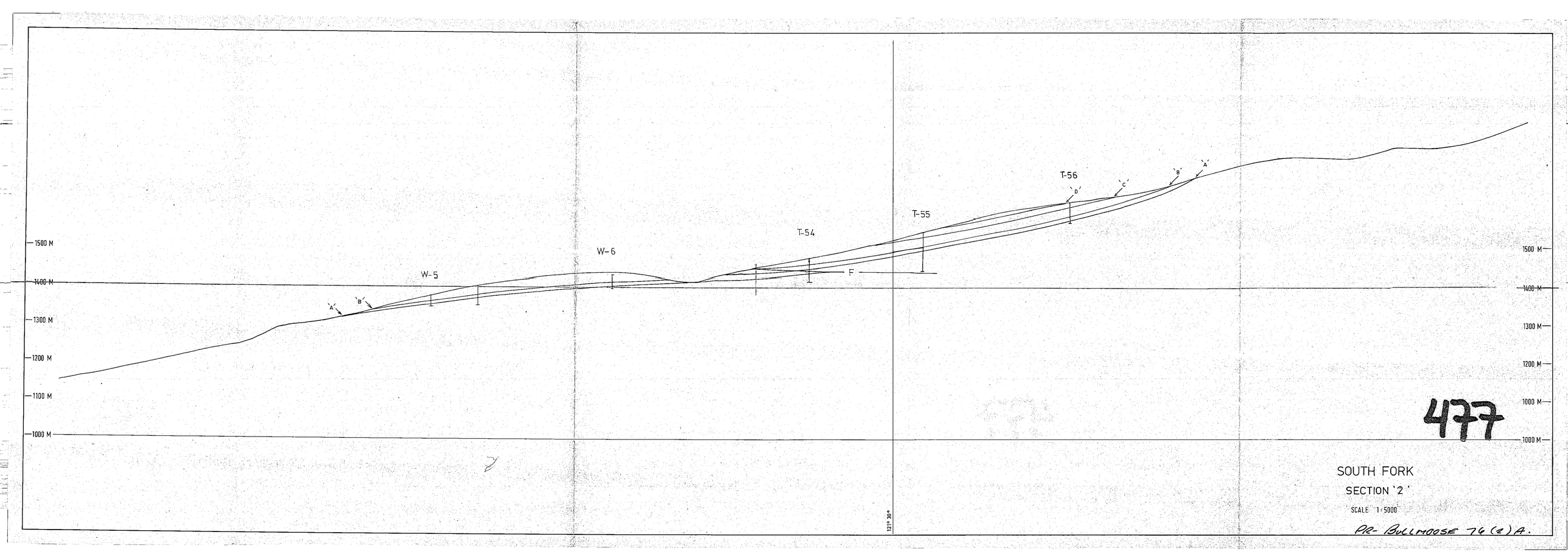
477

WEST FORK

SECTION '3'

SCALE 1:5000

PR- BULLMOOSE 76 (2) A.



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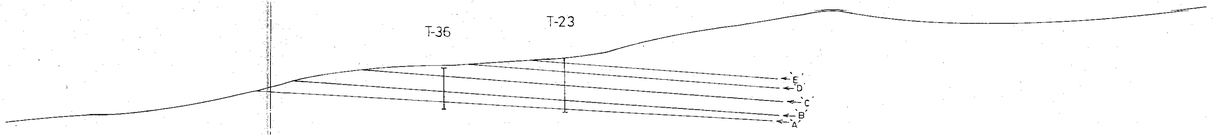
SOUTH FORK

SECTION '2'

SCALE 1:5000

AR-BULLMOOSE 76(2)A.



1500 M
1400 M
1300 M
1200 M
1100 M
1000 M

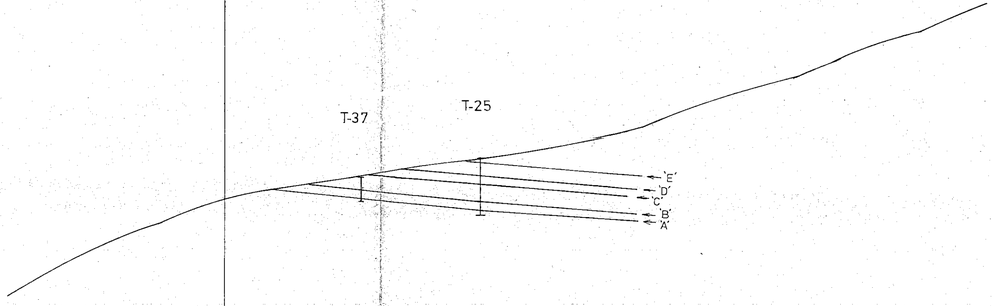
477

WEST FORK

SECTION '2'

SCALE 1:5000

PR- BOLLHOOSE 76(2)A.



1500 M
1400 M
1300 M
1200 M
1100 M
1000 M

477

WEST FORK
SECTION '1'
SCALE 1:5000

RR-BULLMOOSE 76(2)A.

PR-BULLMOOSE 76(4)A

PETROGRAPHIC REPORT ON SAMPLES

T1, T28, T37, T40

R.S. VERZOSA (BOOK B-2)
B.I. McCLYMONT

FEB. 1977

CYCLONE ENGINEERING SALES LTD.

SEPARATION OF BULK MATERIALS

Manufacturing, Engineering, Testing Services

9751 - 51 Avenue
Edmonton, Alberta T6E 4Z5
Telephone: (403) 436-1385

Cable Address:
Cyclone, Edmonton
Telex: 037-3793

Ref: SI-220

March 22, 1977

Teck Mining Group Ltd.
1199 West Hastings Street
Vancouver, B. C.
V6E 2K5

Attention: Mr. R. Verzosa, P. Eng.

Dear Rubin:

Enclosed please find a copy of Petrographic Analysis on your coal samples T1, T28, T37 and T40 prepared by Cascade Coal Petrography Ltd.

All these samples are clean coal fractions and their identifications as follows:

T1 Bulk samples from Gate Seam

T28 Drill core sample, Seam A (T41 to T43 inclusive)

T37 Drill core sample, Seam C (T43, T59, T52, T29, T45)

T40 Drillcore sample, Seam D (T59, T52, T29)

I trust this is satisfactory.

Yours truly,

CYCLONE ENGINEERING SALES LTD.

Per: B.Y.H. Wong

BYHW/ejr

Encl.

PETROGRAPHIC REPORT ON SAMPLES

T1, T28, T37, T40

Sample Reception

Samples arrived at the laboratory from Cyclone Engineering in four brown paper bags labelled: T1, T28, T 37 and T40.

Sample Preparation

Each sample was crushed to -20 mesh, then coned and quartered till a representative eight grams was obtained. The eight grams was then mixed with plastic, pelletized and polished.

Methodology

Fifty points were run on each pellet for Reflectance. The same technique as used by the Japanese was employed. The Reflectance was taken at Mean Maximum Reflectance and using a filter of 525 nanometers. In European laboratories, random Reflectance and a filter of 546 nanometers is used. The former tends to give a reading approximately 1 V-type higher than the latter and consequently tallies very closely with Petrography carried on by the Japanese.

In the case of the Macerals and Microlithotypes, 500 points were run for each group. The Macerals and Microlithotypes used are described:

Macerals

Vitrinite
Exinite
Semi-Fusinite
Macrinite
Micrinite
Fusinite
Mineral Matter

Microlithotypes

Table 21. Microlithotype analysis using the 20-point graticule

Microlithotype	Position of the graticule intersections with respect to macerals
Vitrite	All intersections on vitrinite
Liptite	All intersections on exinite
Inertite	All intersections on inertinite
Clarite	All intersections on vitrinite and exinite with at least 1 intersection on each
Durite	All intersections on inertinite and exinite, with at least 1 intersection on each
Vitrinertite	All intersections on vitrinite and inertinite, with at least 1 intersection on each
Trimacerite*	At least one intersection on each of the three maceral groups

* Trimacerite can be subdivided into:
Duroclarite (V > I + E), Clarodurite (I > V + E), Vitrinertoliptite (E > V + I).

The above were carried out using the International Committee of Coal Petrology (ICCP) standards as laid out by Professor M. M. Mackowsky.

The results for the Reflectance and Macerals were then combined and Coke Stability calculations were calculated by the computer and then checked by hand.

Sample Designation

Cyclone Engineering No.		Cascade Coal Petro. No.	Gate Seam?
T1	Bulk	CCP 21	(T41, T42, T43)
T28	Seam A	CCP 22	(T43, T59, T52, T29 T45)
T37	Seam C	CCP 23	(T59, T52, T29)
T40	Seam D	CCP 24	

Results

Reflectance Data

	Ro	VM%
CCP 21	1.16	26.5
CCP 22	1.18	26.5
CCP 23	1.13	29
CCP 24	1.13	29

Maceral Data

	CCP 21	CCP 22	CCP 23	CCP 24
Vitrinite	56.53	55.56	60.04	66.9
Exinite	4.28	4.68	3.75	4.35
Semi-Fusinite	20.34	21.05	19.43	14.45
Macrinite	10.49	10.72	10.81	5.96
Micrinite	5.57	2.53	2.87	3.89
Fusinite	0.64	3.12	0.88	1.83
Mineral Matter	2.14	2.14	2.20	2.52

Microlithotype Data

	CCP 21	CCP 22	CCP 23	CCP 24
Vitrite	37.73	38.21	46.32	53.84
Clarite	0.04	0.81	1.98	2.96
Durite	1.03	1.42	0.99	0.80
Liptite	-	-	-	-
Vitrinertite	31.96	33.54	28.63	27.81
Inertite	23.72	20.12	16.89	10.26
Trimacerite	2.47	2.84	4.17	2.17
Carbargilite	2.68	3.05	0.99	2.17

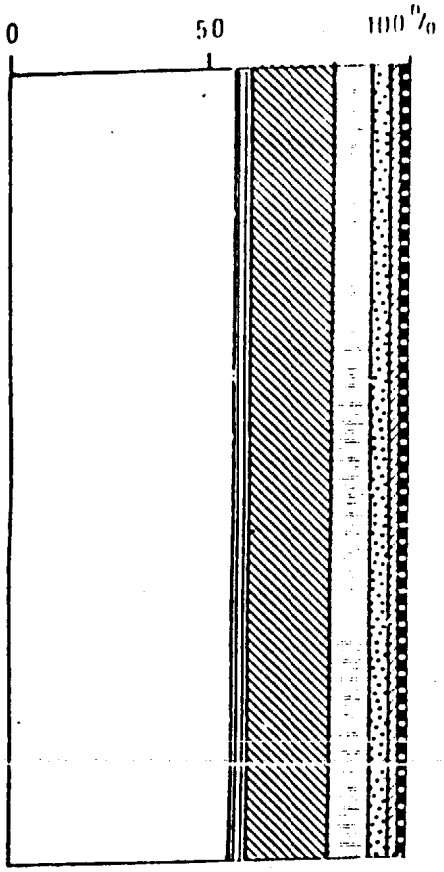
Pellet No.	Ro	C.B.I.	S.I.	I.I.S.	F.S.I.	VM%
CCP 21	1.16	1.18	4.45	92+	6½	26.5
CCP 22	1.18	1.26	4.53	92+	4½	26.5
CCP 23	1.13	1.011	4.40	92+	6	29
CCP 24	1.13	0.79	4.39	92+	8	29

In addition to the results printed, the Maceral and Microlithotypes are presented in diagramatic form for ease of correlation between the four samples, Figures (1,2,3 & 4)

SAMPLE NO: CCP 21

Figure 1

MACERAL



Vitrinite

Exinite

Semi-Fusinite

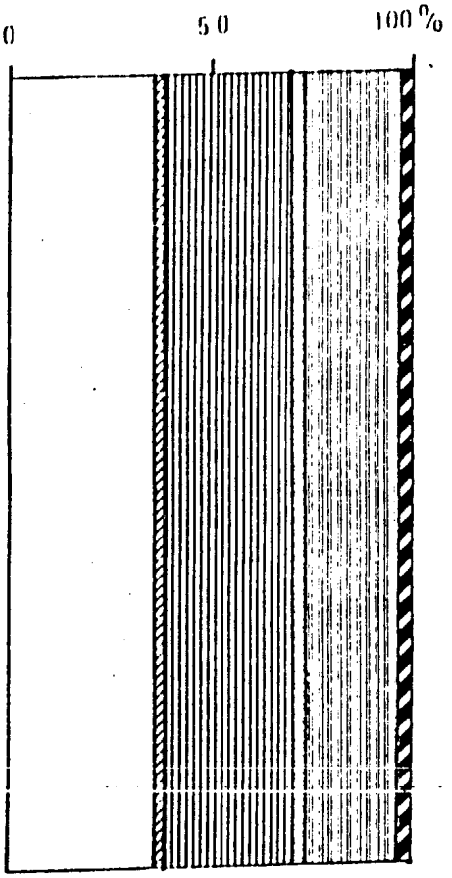
Macrinite

Micrinite

Fusinite

Mineral Matter

MICROLITHOTYPE



Vitrite

Clarite

Durite

Vitrinertite

Inertite

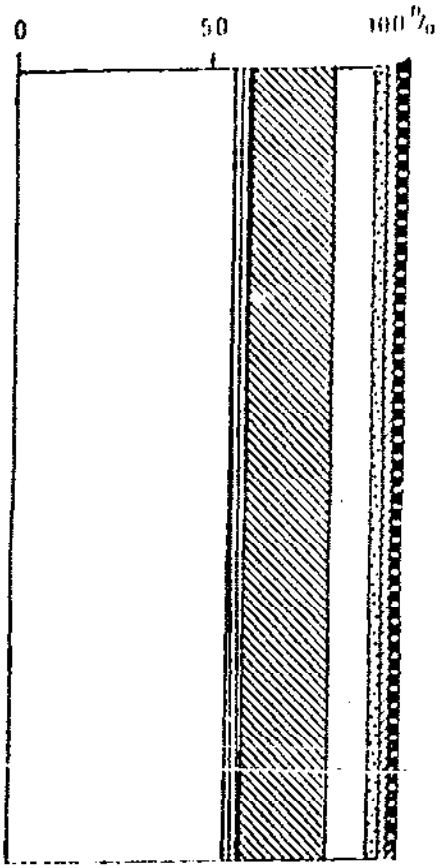
Trimacerite

Carbargilite

SAMPLE NO: CCP 22

Figure 2

MACERAL



Vitrinite

Exinite

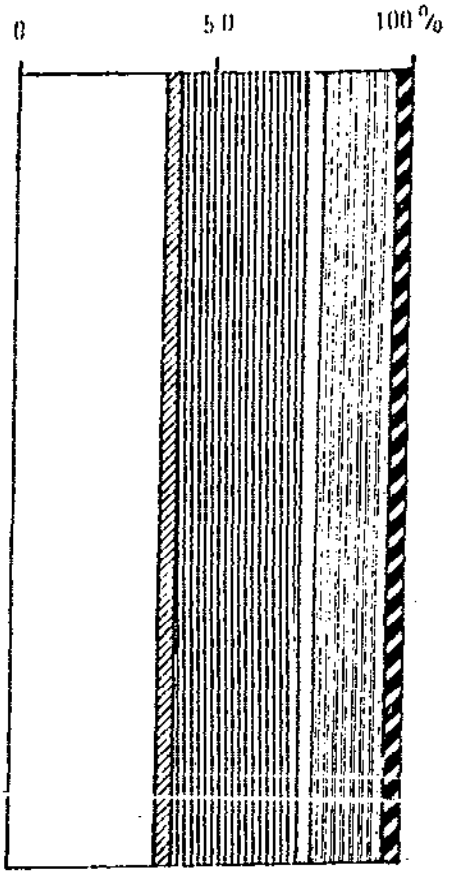
Semi-Fusinite

Macrinite

Micrinite

Fusinite

MICROLITHOTYPE



Vitrite

Clarite

Durite

Vitrinertite

Inertite

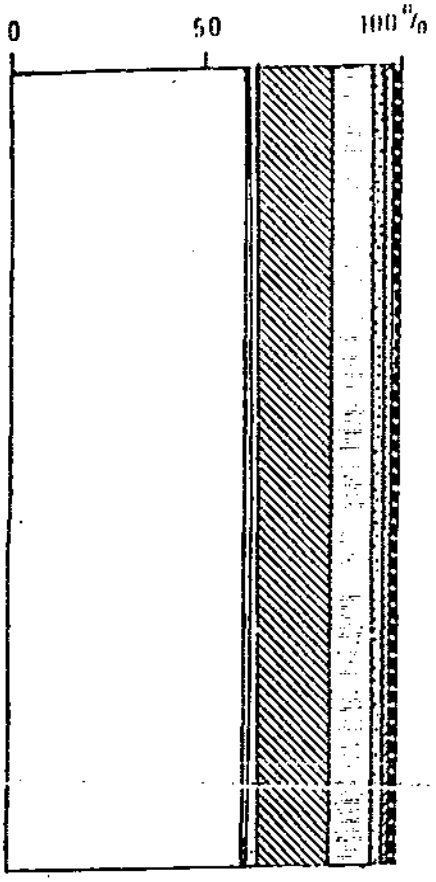
Trimacerite

Carbargilite

SAMPLE NO. CCP 23

Figure 3

MACERAL



Vitrinite

Exinite

Semi-Fusinite

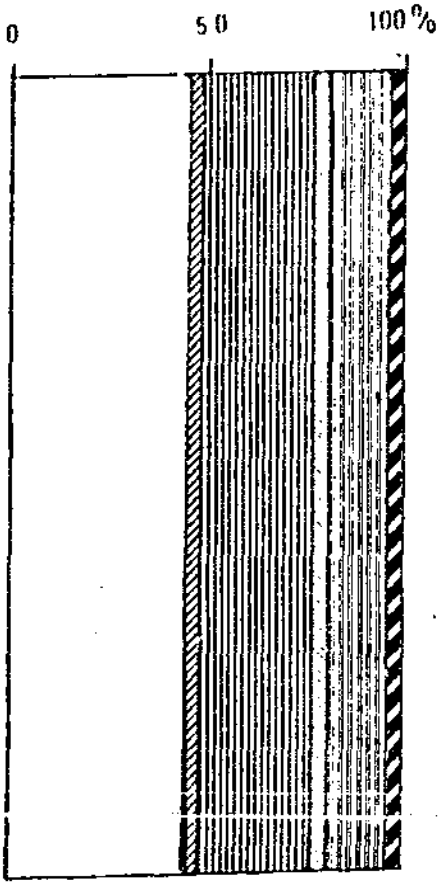
Macrinite

Micrinite

Fusinite

Mineral Matter

MICROLITHOTYPE



Vitrite

Clarite

Durite

Vitrinertite

Inertite

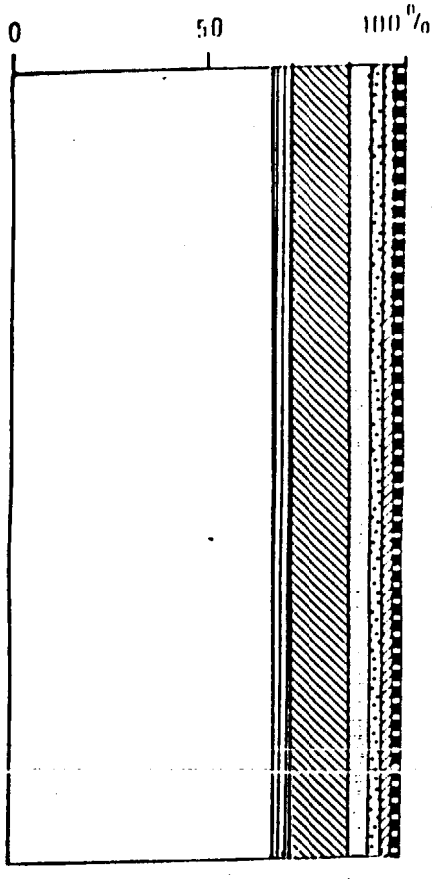
Liptite

Carbargilite

SAMPLE NO. CCP 24

Figure 4

MACERAL



Vitrinite

Exinite

Semi-Fusinite

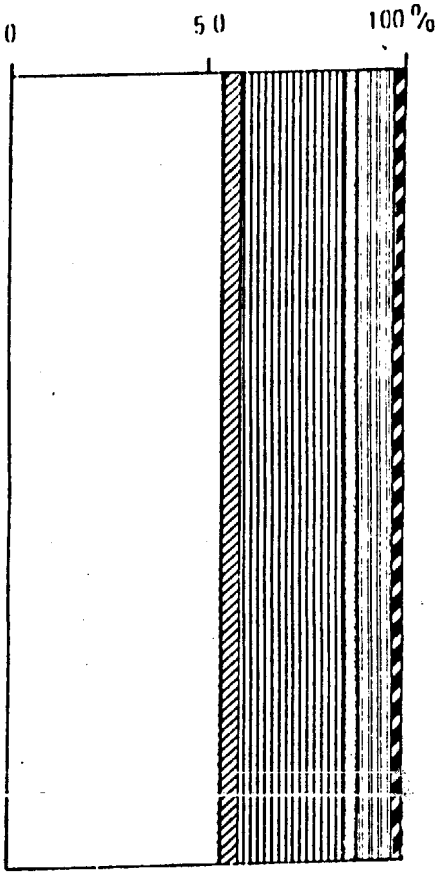
Macrinite

Micrinite

Fusinite

Mineral Matter

MICROLITHOTYPE



Vitrite

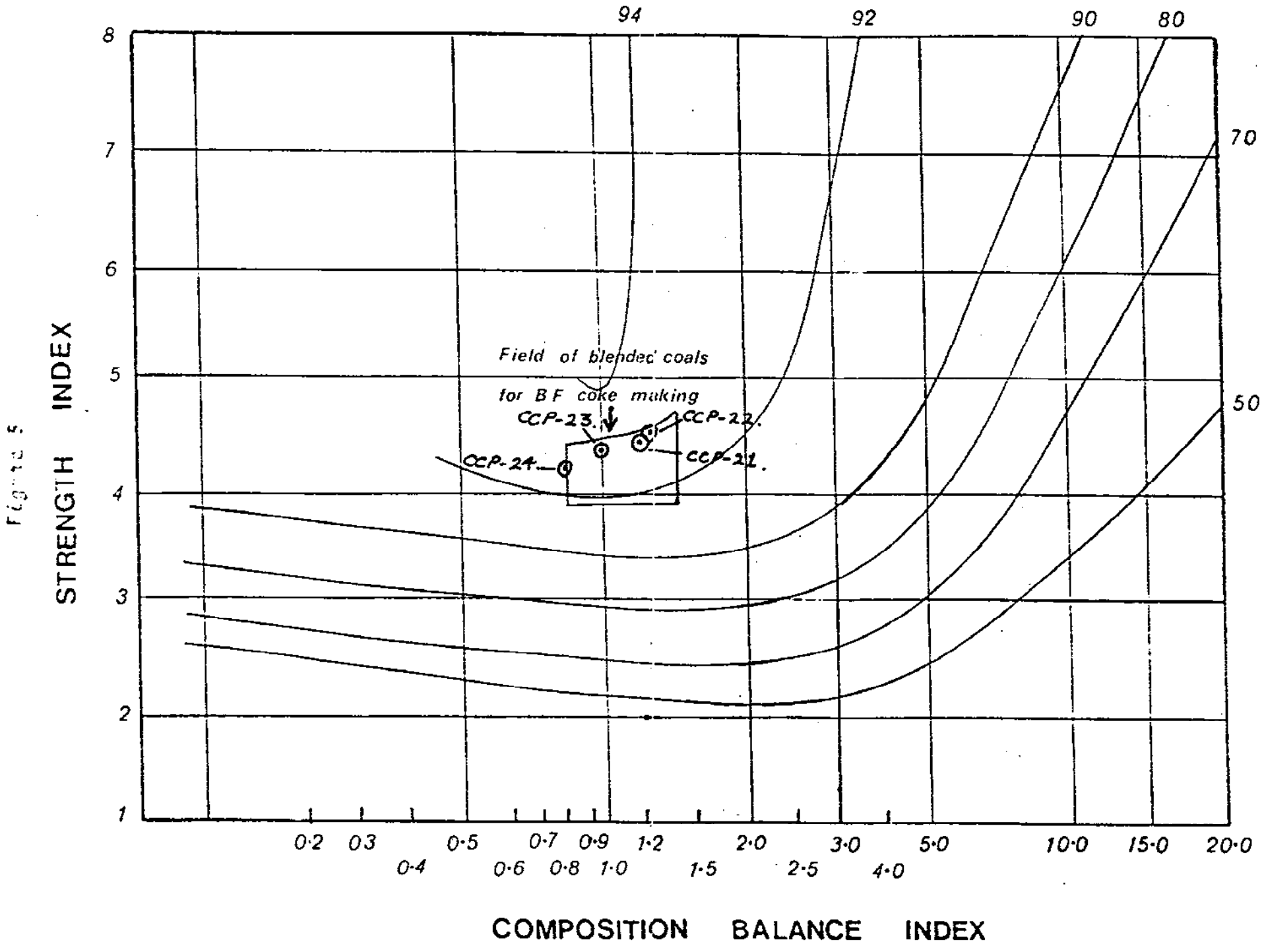
Clarite

Durite

Vitrinertite

Inertite

Carbargilite


94
92
90
80
70
50
8
7
6
5
4
3
2
1
STRENGTH INDEX
Field of blended coals
for B F coke making
CCP-23.
CCP-22.
CCP-21.
CCP-24.
0·2
0·3
0·4
0·5
0·6
0·7
0·8
0·9
1·0
1·2
1·5
2·0
2·5
3·0
4·0
5·0
10·0
15·0
20·0
COMPOSITION BALANCE INDEX

```
[illegible]
81 DATA 112,115,115,120,116,115,111,119,113,117
82 DATA 116,113,112,117,115
170 DATA 118,121,126,119,119,118,122,121,109,108
171 DATA 109,115,106,117,112,122,120,112,120,120
172 DATA 113,116,115,111,119
RUN
```

```
                                 THE PELLET NUMBER IS   CCP-21


 THE SUM OF COLUMN ONE IS                     29.05

 THE SUM OF COLUMN TWO IS                     29.08

 THE AVERAGE OF COLUMN ONE IS                 1.162

 THE AVERAGE OF COLUMN TWO IS                 1.1632

 THE GRAND TOTAL IS                           58.13

 A COMPARISON OF SUB-AVERAGES IS             -.12 /100

 THE AVERAGE MAXIMUM REFLECTANCE IS           1.1626
                                             ----------

 THE STANDARD DEVIATION IS                    4.86762 /100

 THE VOLATILE MATTER CONTENT IS               26.5 %


THE V-TYPES ARE
            V 10 = 5
            V 11 = 33
            V 12 = 12
THE HISTOGRAM FOLLOWS!
                         01234567890123456789012345678901
. 105 -. 109             I    X
. 110 -. 114             I          X
. 115 -. 119             I                     X
. 120 -. 124             I       X
. 125 -. 129             I   X
A DIFFERENT STD DEV IS    14.2785 /100


                         CASCADE COAL PETROGRAPHY LTD.



READY
```

```
82 DATA 122,113,117,118,116
170 DATA 125,111,117,117,122,120,118,121,116,124
171 DATA 121,120,11 3,117,119,129,116,128,126,122
172 DATA 119,119,119,116,120
RUN
```

THE PELLET NUMBER IS CCP-22

THE SUM OF COLUMN ONE IS	29.44
THE SUM OF COLUMN TWO IS	29.96
THE AVERAGE OF COLUMN ONE IS	1.1776
THE AVERAGE OF COLUMN TWO IS	1.1984
THE GRAND TOTAL IS	59.4
A COMPARISON OF SUB-AVERAGES IS	-2.08 /100
THE AVERAGE MAXIMUM REFLECTANCE IS	1.188
THE STANDARD DEVIATION IS	4.30945 /100
THE VOLATILE MATTER CONTENT IS	26.5 %

THE V-TYPES ARE
V 10 = 1
V 11 = 28
V 12 = 21

THE HISTOGRAM FOLLOWS:

```
                    01234567890123456789012345678901234567890
. 105 -. 109        X
. 110 -. 114        I
. 115 -. 119        I
. 120 -. 124        I
. 125 -. 129        I
A DIFFERENT STD DEV IS   13.8098 /100
```

CASCADE COAL PETROGRAPHY LTD.

READY

```
80 DATA 104,112,109,117,112,116,1 7,107,117,115
81 DATA 102,106,112,112,117,121,115,123,114,107
82 DATA 118,113,120,110,113
170 DATA 107,112,112,116,117,115,122,121,116,119,1__
171 DATA 104,104,113,117,120,112,108,119,113,123
172 DATA 105,115,110,118,115
RUN
```

THE PELLET NUMBER IS CCP-23

THE SUM OF COLUMN ONE IS	28.29
THE SUM OF COLUMN TWO IS	28.53
THE AVERAGE OF COLUMN ONE IS	1.1316
THE AVERAGE OF COLUMN TWO IS	1.1412
THE GRAND TOTAL IS	56.82
A COMPARISON OF SUB-AVERAGES IS	-.96 /100
THE AVERAGE MAXIMUM REFLECTANCE IS	1.1364
THE STANDARD DEVIATION IS	5.3528 /100
THE VOLATILE MATTER CONTENT IS	29 %

THE V-TYPES ARE
V 10 = 11
V 11 = 32
V 12 = 7

THE HISTOGRAM FOLLOWS:

```
                    0123456789012345678901234567890
. 100 -. 104        I   X
. 105 -. 109        I    X
. 110 -. 114        I     X
. 115 -. 119        I      X
. 120 -. 124        I       X
A DIFFERENT STD DEV IS   12.7495 /100
```

CASCADE COAL PETROGRAPHY LTD.

READY

```
81 DATA 114,122,118,113,120,104,103,112,118,119
82 DATA 116,115,114,103,108
170 DATA 110,108,108,111,119,110,112,109,103,112
171 DATA 111,115,113,110,107,116,125,116,114,108
172 DATA 112,115,119,124,122
RUN
```

THE PELLET NUMBER IS CCP-24

THE SUM OF COLUMN ONE IS	28.36
THE SUM OF COLUMN TWO IS	28.37
THE AVERAGE OF COLUMN ONE IS	1.1344
THE AVERAGE OF COLUMN TWO IS	1.1348
THE GRAND TOTAL IS	56.73
A COMPARISON OF SUB-AVERAGES IS	-.04 /100
THE AVERAGE MAXIMUM REFLECTANCE IS	1.1346
THE STANDARD DEVIATION IS	5.5897 /100
THE VOLATILE MATTER CONTENT IS	29 %

THE V-TYPES ARE
V 10 = 12
V 11 = 33
V 12 = 5

THE HISTOGRAM FOLLOWS:

```
                  0123456789012345678901234567890
. 100 -. 104      I
. 105 -. 109      I
. 110 -. 114      I
. 115 -. 119      I
. 120 -. 124      I
. 125 -. 129      I
```

A DIFFERENT STD DEV IS 8.14405 /100

CASCADE COAL PETROGRAPHY LTD.

READY

```
RUN

                                MARCH 10,1977
THE PELLET NUMBER IS                                        CCP-21
THE PERCENT VITRINITE IS                                    60.81
THE PERCENT SEMI-REACTIVE IS                                30.83
THE PERCENT INERTS IS                                       6.21
THE PERCENT MINERAL MATTER IS                               2.14
THE PERCENT MINERAL MATTER FREE IS                           97.86
 ON A MINERAL MATTER FREE BASIS THE
THE PERCENT VITRINITE IS                                    62.1397
THE PERCENT SEMI-REACTIVES IS                               31.5041
THE PERCENT INERTS IS                                       6.3458

TOTAL REACTIVES ARE                                         93.6438

 FOR A REVISED CALCULATION OF MACERAL GROUPS
 USING MINERAL MATTER OBTAINED FROM PROXIMATE ANALYSIS
 INPUT THE ASH PERCENT,  OTHERWISE INPUT  -1

?6.55
 NOW THE SULPHUR PERCENT
?0.22
PARR'S MINERAL MATTER IS                                    3.5975
TOTAL MACERALS ARE                                          96.402 %
 REVISED MACERALS ARE

 VIT       S-R        INERTS     M.M.
 59.9039    30.3706    6.11748    3.5975
 WHAT ARE THE FIRST AND LAST V-TYPES?
?10,12
 INPUT THE COUNTS FOR V-TYPES  10  TO  12
V 10 10
V 11 66
V 12 24

REFLECTANCE VITRINITE TYPES
V 10 V 11 V 12
 10   66   24
 5.99039   39.5366   14.3769

 REACTIVE SEMI-INERTS ARE                                   10.1235
INERT SEMI-REACTIVES ARE                                    20.247
MICRINOIDS(INERTS)ARE                                       6.11748
MINERAL MATTER IS                                           3.5975


SO TOTAL INERTS ARE:                                        29.962

 USING TOTAL INERTS OBTAIN FROM TABLE AND INPUT
 STRENGTH FACTORS FOR V-TYPES  10  TO  12
V 10 3.85
V 11 4.45
V 12 4.70

 VIT. VOL%    REACT.S-F    TOTAL REACT.    OPT.    STRENGTH FAC.
 5.99039   1.01235   7.00274   2.4   3.85
 39.5366   6.68151   46.2181   2.7   4.45
 14.3769   2.42964   16.8065   3.2   4.7
OPTIMUM INERT INDEX = 25.2876
                                THE BALANCE INDEX = 1.18484
OPTIMUM STRENGTH  311.623
                                THE STRENGTH INDEX = 4.45001



                                THE STABILITY FACTOR=59


                                CASCADE COAL PETROGRAPHY LIMITED.



READY
```

MARCH 10,1977

THE PELLET NUMBER IS	CCP-22
THE PERCENT VITRINITE IS	60.24
THE PERCENT SEMI-REACTIVE IS	31.97
THE PERCENT INERTS IS	5.65
THE PERCENT MINERAL MATTER IS	2.14
THE PERCENT MINERAL MATTER FREE IS	97.86
ON A MINERAL MATTER FREE BASIS THE	
THE PERCENT VITRINITE IS	61.5573
THE PERCENT SEMI-REACTIVES IS	32.6691
THE PERCENT INERTS IS	5.77355
TOTAL REACTIVES ARE	94.2264

```
 FOR A REVISED CALCULATION OF MACERAL GROUPS
 USING MINERAL MATTER OBTAINED FROM PROXIMATE ANALYSIS
 INPUT THE ASH PERCENT,  OTHERWISE INPUT  -1

?7.30
 NOW THE SULPHUR PERCENT
?0.36
```

PARR'S MINERAL MATTER IS	4.041
TOTAL MACERALS ARE	95.959 %

```
 REVISED MACERALS ARE

 VIT       S-R        INERTS     M.M.
 59.0698    31.3489    5.54024    4.041
 WHAT ARE THE FIRST AND LAST V-TYPES?
?10,12
 INPUT THE COUNTS FOR V-TYPES  10  TO  12
V 10 2
V 11 56
V 12 42

REFLECTANCE VITRINITE TYPES
V 10 V 11 V 12
 2  56  42
 1.1814  33.0791  24.8093
```

REACTIVE SEMI-INERTS ARE	10.4496
INERT SEMI-REACTIVES ARE	20.8992
MICRINOIDS(INERTS)ARE	5.54024
MINERAL MATTER IS	4.041
SO TOTAL INERTS ARE:	30.4804

```
 USING TOTAL INERTS OBTAIN FROM TABLE AND INPUT
 STRENGTH FACTORS FOR V-TYPES  10  TO  12
V 10 3.84
V 11 4.44
V 12 4.69

 VIT. VOL%   REACT.S-F   TOTAL REACT.   OPT.   STRENGTH FAC.
 1.1814   .208992   1.39039   2.4   3.84
 33.0791   5.85178   38.9309   2.7   4.44
 24.8093   4.38883   29.1981   3.2   4.69
OPTIMUM INERT INDEX = 24.1225
                                THE BALANCE INDEX = 1.26356
OPTIMUM STRENGTH  315.131
                                THE STRENGTH INDEX = 4.53299



                                THE STABILITY FACTOR=59


                                CASCADE COAL PETROGRAPHY LIMITED.



READY
```

```
RUN

                                MARCH 10,1977

THE PELLET NUMBER IS                                        CCP-23
THE PERCENT VITRINITE IS                                    63.04
THE PERCENT SEMI-REACTIVE IS                                30.24
THE PERCENT INERTS IS                                       3.75
THE PERCENT MINERAL MATTER IS                               2.20
THE PERCENT MINERAL MATTER FREE IS                           97.8
 ON A MINERAL MATTER FREE BASIS THE
THE PERCENT VITRINITE IS                                    64.458
THE PERCENT SEMI-REACTIVES IS                               30.9202
THE PERCENT INERTS IS                                       3.83435

TOTAL REACTIVES ARE                                         95.3782

 FOR A REVISED CALCULATION OF MACERAL GROUPS
 USING MINERAL MATTER OBTAINED FROM PROXIMATE ANALYSIS
 INPUT THE ASH PERCENT,  OTHERWISE INPUT  -1

?6.38
 NOW THE SULPHUR PERCENT
?0.49
PARR'S MINERAL MATTER IS                                    3.57995
TOTAL MACERALS ARE                                          96.42 %
 REVISED MACERALS ARE

 VIT       S-R        INERTS     M.M.
 62.1504    29.8133    3.69708    3.57995
 WHAT ARE THE FIRST AND LAST V-TYPES?
?10,12
 INPUT THE COUNTS FOR V-TYPES  10  TO  12
V 10 22
V 11 64
V 12 14

REFLECTANCE VITRINITE TYPES
V 10 V 11 V 12
 22  64  14
 13.6731  39.7763  8.70106
 REACTIVE SEMI-INERTS ARE                                   9.93776
INERT SEMI-REACTIVES ARE                                    19.8755
MICRINOIDS(INERTS)ARE                                       3.69708
MINERAL MATTER IS                                           3.57995

SO TOTAL INERTS ARE:                                        27.1526

 USING TOTAL INERTS OBTAIN FROM TABLE AND INPUT
 STRENGTH FACTORS FOR V-TYPES  10  TO  12
V 10 3.87
V 11 4.51
V 12 4.74

 VIT. VOL%   REACT.S-F    TOTAL REACT.    OPT.    STRENGTH FAC.
 13.6731   2.18631   15.8594   2.4   3.87
 39.7763   6.36017   46.1365   2.7   4.51
 8.70106   1.39129   10.0923   3.2   4.74
OPTIMUM INERT INDEX = 26.8494
                                THE BALANCE INDEX = 1.01129

OPTIMUM STRENGTH  317.29
                                THE STRENGTH INDEX = 4.40141


                                THE STABILITY FACTOR=60

                                CASCADE COAL PETROGRAPHY LIMITED.


READY
```

MARCH 10,1977

THE PELLET NUMBER IS	CCP-24
THE PERCENT VITRINITE IS	71.32
THE PERCENT SEMI-REACTIVE IS	20.41
THE PERCENT INERTS IS	5.72
THE PERCENT MINERAL MATTER IS	2.52
THE PERCENT MINERAL MATTER FREE IS	97.48
ON A MINERAL MATTER FREE BASIS THE	
THE PERCENT VITRINITE IS	73.1637
THE PERCENT SEMI-REACTIVES IS	20.9376
THE PERCENT INERTS IS	5.86787
TOTAL REACTIVES ARE	94.1013

FOR A REVISED CALCULATION OF MACERAL GROUPS
USING MINERAL MATTER OBTAINED FROM PROXIMATE ANALYSIS
INPUT THE ASH PERCENT, OTHERWISE INPUT -1

?7.25
NOW THE SULPHUR PERCENT
?0.55

PARR'S MINERAL MATTER IS	4.06625
TOTAL MACERALS ARE	95.934 %

REVISED MACERALS ARE

VIT	S-R	INERTS	M.M.
70.1889	20.0863	5.62928	4.06625

WHAT ARE THE FIRST AND LAST V-TYPES?
?10,12
INPUT THE COUNTS FOR V-TYPES 10 TO 12
V 10 24
V 11 66
V 12 10

REFLECTANCE VITRINITE TYPES

V 10	V 11	V 12
24	66	10
16.8453	46.3247	7.01889

REACTIVE SEMI-INERTS ARE	6.69543
INERT SEMI-REACTIVES ARE	13.3908
MICRINOIDS(INERTS)ARE	5.62928
MINERAL MATTER IS	4.06625
SO TOTAL INERTS ARE:	23.0864

USING TOTAL INERTS OBTAIN FROM TABLE AND INPUT
STRENGTH FACTORS FOR V-TYPES 10 TO 12
V 10 3.82
V 11 4.54
V 12 4.78

VIT. VOL%	REACT.S-F	TOTAL REACT.	OPT.	STRENGTH FAC.
16.8453	1.6069	18.4522	2.4	3.82
46.3247	4.41898	50.7437	2.7	4.54
7.01889	.669543	7.68843	3.2	4.78

OPTIMUM INERT INDEX = 28.8849

THE BALANCE INDEX = .799254

OPTIMUM STRENGTH 337.614

THE STRENGTH INDEX = 4.39119

THE STABILITY FACTOR=60

CASCADE COAL PETROGRAPHY LIMITED.

READY

Computer Print Out

Reflectance

All four samples indicated extremely good bell curves on their respective histograms indicating that the coal was not blended or contaminated.

Coke Stability

All four samples indicated stability factors between 59 & 60. These samples were blended theoretically with poorer quality coals and with Low Volatile coals and would appear to be an excellent coal to use in blast-furnace coke making. In figure 5 can be seen where CCP 21 to CCP 24 fit into the specifications for coke making.

Conclusions

1. It would appear from all the data regarding Reflectance, Macerals and Microlithotypes that these coals could be from the same seam.

2. It would appear from the maceral and microlithotype data that these samples were washed and floated fractions.

3. An ideal coking coal on its own merits, this is the only coal that appears to fit every Japanese specification regarding coking.

Recommendations

Further study of the seam or seams involved to establish future quality control on this very good coking coal should be made.

PR-BULLMOOSE 76(4)A

APPENDIX I

Summary Data of Washability Tests of Composite Core Samples of the "A", "B", "C" and "D" Seams.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-53, T-57, T-58, T-28

SEAM: D

LAB COMPOSITE #41

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.58	1.45	--	--
Ash %	34.85	6.88	9.51	7.06
V.M. %	19.21	26.82	26.07	26.76
R.M. %	0.67	0.46	0.53	0.48
F.C. %	45.27	65.84	63.89	65.70
S. %	0.38	0.52	0.48	0.50
F.S.I.	3 1/2	8	7 1/2	8
Contribution to Product %	--	89.91	10.09	--
Recovery %	--	41.73	29.41	40.04

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-59, T-52, T-29

SEAM: D

LAB COMPOSITE # 40

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.65	1.45	--	--
Ash %	35.72	7.26	7.01	7.25
V.M. %	17.75	27.13	26.54	27.10
R.M. %	1.12	0.43	0.54	0.45
F.C. %	45.41	65.18	65.91	65.20
S. %	0.28	0.55	0.54	0.55
F.S.I.	3 1/2	8	8 1/2	8
Contribution to Product %	--	91.65	8.35	--
Recovery %	--	36.18	16.33	32.85

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-53, T-57, T-58, T-28

SEAM: C

LAB COMPOSITE # 39

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.43	1.40	--	--
Ash %	18.85	6.64	8.69	6.84
V.M. %	19.38	23.14	24.31	23.20
R.M. %	0.56	0.39	0.48	0.41
F.C. %	61.21	69.83	66.52	69.55
S. %	0.43	0.52	0.52	0.52
F.S.I.	4	4½	5½	4½
Contribution to Product %	--	92.38	7.62	--
Recovery %	--	52.69	40.12	51.46

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-55, T-56

SEAM: C

LAB COMPOSITE # 38

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.46	1.43	--	--
Ash %	20.72	7.21	8.10	7.40
V.M. %	19.51	24.12	23.97	24.09
R.M. %	0.63	0.51	0.53	0.52
F.C. %	59.14	68.16	67.40	67.99
S. %	0.40	0.47	0.50	0.48
F.S.I.	3	5	5½	5
Contribution to Product %	--	90.06	9.94	--
Recovery %	--	60.09	42.31	57.68

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-43, T-59, T-52, T-29, T-45

SEAM: C

LAB COMPOSITE # 37

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.48	1.40	--	--
Ash %	24.88	6.64	8.79	6.83
V.M. %	20.08	24.19	24.07	24.18
R.M. %	0.62	0.47	0.47	0.47
F.C. %	54.42	68.70	66.67	68.52
S. %	0.42	0.51	0.47	0.49
F.S.I.	4	6	6	6
Contribution to Product %	--	85.82	14.18	--
Recovery %	--	44.53	37.85	43.44

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-53, T-57, T-58, T-28

SEAM: B

LAB COMPOSITE # 36

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.37	1.50	--	--
Ash %	11.37	6.86	6.05	6.78
V.M. %	23.88	24.34	25.97	24.52
R.M. %	0.60	0.61	0.48	0.57
F.C. %	64.15	68.19	67.50	68.13
S. %	0.19	0.21	0.20	0.21
F.S.I.	6	6	6½	6
Contribution to Product %	--	86.05	13.95	--
Recovery %	--	82.01	70.42	80.17

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-54, T-55, T-56

SEAM: B

LAB COMPOSITE # 35

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.36	1.53	--	--
Ash %	10.48	7.12	6.35	7.10
V.M. %	23.35	23.65	25.19	23.80
R.M. %	0.76	0.63	0.79	0.64
F.C. %	65.41	68.60	67.67	68.46
S. %	0.20	0.22	0.19	0.21
F.S.I.	3½	4	5	4
Contribution to Product %	--	87.51	12.49	--
Recovery %	--	86.52	55.20	80.79

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-59, T-52, T-45, T-47, T-29

SEAM: B

LAB COMPOSITE # 34

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.40	1.57	--	--
Ash %	11.54	6.78	6.45	6.60
V.M. %	23.68	24.59	25.93	24.86
R.M. %	0.60	0.49	0.49	0.49
F.C. %	63.88	68.14	67.13	68.05
S. %	0.18	0.20	0.23	0.20
F.S.I.	3½	6	6	6
Contribution to Product %	--	84.79	15.21	--
Recovery %	--	89.52	80.40	88.00

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-41, T-42, T-43

SEAM: B

LAB COMPOSITE # 33

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.36	1.58	--	--
Ash %	11.44	6.97	6.50	6.78
V.M. %	22.34	23.61	24.33	23.84
R.M. %	0.57	0.42	0.38	0.40
F.C. %	65.65	69.00	68.79	68.98
S. %	0.19	0.20	0.21	0.20
F.S.I.	4	5½	6½	5½
Contribution to Product %	--	85.96	14.04	--
Recovery %	--	85.25	77.34	84.04

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-53, T-57, T-58, T-28

SEAM: A

LAB COMPOSITE # 32

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.34	1.53	--	--
Ash %	9.64	6.92	5.90	6.76
V.M. %	23.82	23.94	25.12	24.10
R.M. %	0.46	0.61	0.63	0.62
F.C. %	66.08	68.53	68.35	68.52
S. %	0.41	0.39	0.35	0.39
F.S.I.	5	5	7	5
Contribution to Product %	--	91.72	8.28	--
Recovery %	--	94.09	68.85	91.32

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-54 (U), T-55, T-56

SEAM: A

LAB COMPOSITE # 31

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.36	1.60	--	--
Ash %	10.82	6.80	6.62	6.69
V.M. %	23.74	23.93	24.53	24.04
R.M. %	0.61	0.70	0.76	0.72
F.C. %	64.83	68.57	68.09	68.55
S. %	0.40	0.36	0.40	0.38
F.S.I.	3 1/2	5	7	5 1/2
Contribution to Product %	--	90.18	9.82	--
Recovery %	--	91.86	69.22	89.00

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-29

SEAM: A

LAB COMPOSITE # 30

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.54	1.50	--	--
Ash %	32.78	6.86	14.16	7.32
V.M. %	19.21	24.40	24.48	24.44
R.M. %	0.44	0.59	0.59	0.59
F.C. %	47.57	68.15	60.77	67.65
S. %	0.31	0.39	0.38	0.39
F.S.I.	3	5 1/2	5 1/2	5 1/2
Contribution to Product %	--	93.07	6.93	--
Recovery %	--	63.15	52.12	62.24

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-59, T-52, T-45, T-47

SEAM: A

LAB COMPOSITE # 29

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.33	--	--	--
Ash %	6.90	--	--	6.90
V.M. %	24.55	--	--	24.55
R.M. %	0.44	--	--	0.44
F.C. %	68.11	--	--	68.11
S. %	0.36	--	--	0.36
F.S.I.	5 1/2	--	--	5 1/2
Contribution to Product %	--	--	--	--
Recovery %	--	--	--	100.00 %

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LTD.

DATA SUMMARY

PROJECT: Bullmoose

AREA: Gate

DRILL HOLE # T-41, T-42, T-43

SEAM: A

LAB COMPOSITE # 28

ANALYTICAL DATA

SAMPLE	HEAD	+ 28 MESH FLOAT	- 28 M FROTH PRODUCT	SIMULATED PRODUCT
Sp. Gr.	1.33	1.75	--	--
Ash %	8.24	7.13	7.63	7.30
V.M. %	22.12	22.31	22.85	22.31
R.M. %	0.45	0.63	0.61	0.62
F.C. %	69.19	69.93	68.91	69.77
S. %	0.35	0.38	0.34	0.36
F.S.I.	4 1/2	4 1/2	5 1/2	4 1/2
Contribution to Product %	--	85.64	14.36	--
Recovery %	--	96.84	100.00	97.28

CYCLONE ENGINEERING SALES LTD.

APPENDIX II

Washability Data of Bulk Channel Sample from the "B" Seam, Adit No. 1, South Fork, Bullmoose Property.

TECK MINING GROUP LIMITED

BULLMOOSE PROPERTY

SAMPLE: Channel 1

TABLE 1: HEAD SAMPLE ANALYSES

PROXIMATE ANALYSIS

Ash %	11.35
Volatile Matter %	23.85
Residual Moisture %	0.47
Fixed Carbon %	64.33

OTHER TESTS

Sulphur %	0.23
Phosphorous %	0.05
Calorific Value (B.T.U./lb.)	13,500
Free-Swelling Index	4 1/2
Hardgrove Grindability Index	75

TABLE 2: ESTIMATION OF +4" FRACTION

Quantity: 5.0%

Quality: Good

February 17, 1977

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LIMITED

TABLE 3: SIZE CONSIST BY DRY SCREENING

SIZE	WEIGHT %
4" x 2"	15.73
2" x 3/4"	17.45
3/4" x 1/4"	22.19
1/4" x 28m	32.68
28m x 0	11.95
TOTAL	100.00

TABLE 4: DETAIL SIZE CONSIST BY WET SCREENING FOR 28 MESH X 0 FRACTION

SIZE	WEIGHT %	% OF TOTAL
28m x 48m	42.77	5.11
48m x 60m	8.27	0.99
60m x 100m	16.10	1.92
100m x 200m	15.59	1.86
200m x 325m	6.99	0.84
325m x 0	10.28	1.23
TOTAL	100.00	11.95

TECK MINING GROUP LIMITED

TABLE 5a: WASHABILITY FOR SIZE FRACTION 4" x 2"

SP. GR.	FRACTIONAL		CUMULATIVE			
			Floats		Sinks	
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %
- 1.30	4.21	3.32	4.21	3.32	100.00	14.78
1.30 - 1.40	45.98	7.27	50.19	6.94	95.79	15.28
1.40 - 1.45	10.54	13.43	60.73	8.07	49.81	22.69
1.45 - 1.50	13.03	19.02	73.76	10.00	39.27	25.16
1.50 - 1.60	18.01	23.71	91.77	12.69	26.24	28.20
1.60 - 1.70	6.70	32.39	98.47	14.03	8.23	38.04
1.70 - 1.80	0.57	40.09	99.04	14.18	1.53	62.78
+ 1.80	0.96	76.25	100.00	14.78	0.96	76.25
TOTAL	100.00	14.78				

TECK MINING GROUP LIMITED

TABLE 5b: WASHABILITY FOR SIZE FRACTION 2" x 3/4"

SP. GR.	FRACTIONAL		CUMULATIVE			
			Floats		Sinks	
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %
- 1.30	10.43	3.46	10.43	3.46	100.00	14.17
1.30 - 1.40	41.20	8.03	51.63	7.11	89.57	15.42
1.40 - 1.45	6.32	13.38	57.95	7.79	48.37	21.71
1.45 - 1.50	15.04	15.83	72.99	9.45	42.05	22.96
1.50 - 1.60	17.27	21.99	90.26	11.85	27.01	26.93
1.60 - 1.70	6.15	27.42	96.41	12.84	9.74	35.69
1.70 - 1.80	1.98	35.91	98.39	13.30	3.59	49.85
+ 1.80	1.61	66.99	100.00	14.17	1.61	66.99
TOTAL	100.00	14.17				

TECK MINING GROUP LIMITED

TABLE 5c: WASHABILITY FOR SIZE FRACTION 3/4" x 1/4"

SP. GR.	FRACTIONAL		CUMULATIVE			
			Floats		Sinks	
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %
- 1.30	18.34	2.68	18.34	2.68	100.00	11.54
1.30 - 1.40	47.34	6.61	65.68	5.51	81.66	13.54
1.40 - 1.45	8.88	13.29	74.56	6.44	34.32	23.09
1.45 - 1.50	6.51	17.22	81.07	7.30	25.44	26.51
1.50 - 1.60	11.24	23.12	92.31	9.23	18.93	29.70
1.60 - 1.70	3.67	30.52	95.98	10.04	7.69	39.33
1.70 - 1.80	2.01	35.34	97.99	10.56	4.02	47.37
+ 1.80	2.01	59.39	100.00	11.54	2.01	59.39
TOTAL	100.00	11.54				

CYCLONE ENGINEERING SALES LTD.

TECK MINING GROUP LIMITED

TABLE 5d: WASHABILITY FOR SIZE FRACTION 1/4" x 28 Mesh

SP. GR.	FRACTIONAL		CUMULATIVE			
			Floats		Sinks	
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %
- 1.30	49.09	2.29	49.09	2.29	100.00	8.20
1.30 - 1.40	35.60	6.86	84.69	4.21	50.91	13.91
1.40 - 1.45	2.89	14.95	87.58	4.57	15.31	30.30
1.45 - 1.50	3.26	20.02	90.84	5.12	12.42	33.87
1.50 - 1.60	3.47	24.51	94.31	5.83	9.16	38.79
1.60 - 1.70	2.17	32.26	96.48	6.43	5.69	47.50
1.70 - 1.80	1.09	36.60	97.56	6.76	3.52	56.90
+ 1.80	2.43	66.01	100.00	8.20	2.43	66.01
TOTAL	100.00	8.20				

TECK MINING GROUP LIMITED

TABLE 5e: WASHABILITY FOR SIZE FRACTION 28 Mesh x 48 Mesh

SP. GR.	FRACTIONAL		CUMULATIVE			
			Floats		Sinks	
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %
- 1.30	64.89	1.80	64.89	1.80	100.00	6.55
1.30 - 1.40	24.17	6.60	89.06	3.10	35.11	15.34
1.40 - 1.45	2.15	13.45	91.21	3.35	10.94	34.66
1.45 - 1.50	1.96	15.32	93.17	3.60	8.79	39.85
1.50 - 1.60	2.93	28.55	96.10	4.36	6.83	46.88
1.60 - 1.70	0.66	32.34	96.76	4.55	3.90	60.66
1.70 - 1.80	0.43	38.36	97.19	4.70	3.24	66.43
+ 1.80	2.81	70.72	100.00	6.55	2.81	70.72
TOTAL	100.00	6.55				

TECK MINING GROUP LIMITED

TABLE 5f: WASHABILITY FOR SIZE FRACTION 48 Mesh x 100 Mesh

SP. GR.	FRACTIONAL		CUMULATIVE			
			Floats		Sinks	
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %
- 1.30	59.70	1.73	59.70	1.73	100.00	7.27
1.30 - 1.40	25.31	5.50	85.01	2.85	40.30	15.49
1.40 - 1.45	2.33	12.90	87.34	3.12	14.99	32.35
1.45 - 1.50	2.63	14.98	89.97	3.47	12.66	35.93
1.50 - 1.60	5.67	24.92	95.64	4.74	10.03	41.43
1.60 - 1.70	0.42	33.28	96.06	4.86	4.36	62.90
1.70 - 1.80	0.36	41.14	96.42	5.00	3.94	66.05
+ 1.80	3.58	68.56	100.00	7.27	3.58	68.56
TOTAL	100.00	7.27				

TECK MINING GROUP LIMITED

TABLE 5g: WASHABILITY FOR SIZE FRACTION 4" x 100 Mesh
(Reconstituted)

SP. GR.	FRACTIONAL		CUMULATIVE			
			Floats		Sinks	
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %
- 1.30	28.78	2.36	28.78	2.36	100.00	11.02
1.30 - 1.40	40.11	7.05	68.89	5.09	71.22	14.52
1.40 - 1.45	6.09	13.62	74.98	5.78	31.11	24.15
1.45 - 1.50	7.66	17.59	82.64	6.88	25.02	26.72
1.50 - 1.60	10.19	23.22	92.83	8.67	17.36	30.74
1.60 - 1.70	3.85	30.50	96.68	9.54	7.17	41.44
1.70 - 1.80	1.32	36.33	98.00	9.90	3.32	54.12
+ 1.80	2.00	65.86	100.00	11.02	2.00	65.86
TOTAL	100.00	11.02				

TECK MINING GROUP LIMITED

TABLE 6: FROTH-FLOTATION AND ANALYSES OF PRODUCTS

TEST CONDITIONS:

Reagents	MIBC & Fuel Oil
Reagent Composition	1:4
Reagent Consumption	1.05 lb./ton
Solids Weight % in Pulp	10

A. SIZE FRACTION 48 MESH X 0

TIME	YIELD %	ASH %	V.M. %	R.M. %	F.C. %	S %	P %	F.S.I
30 sec.	81.37	5.62	25.54	0.73	68.11	0.25	0.03	8 1/2
30 - 60	5.18	12.48	25.31	0.74	61.47	0.20	--	7 1/2
60 - 90	2.29	23.67	--	--	--	0.16	--	4 1/2
90 - 120	1.79	28.76	--	--	--	0.18	--	--
120 - 150	--	--	--	--	--	--	--	--
Tailings	9.37	41.27	--	--	--	0.11	--	--
TOTAL	100.00	10.14	--	--	--	0.23	--	--

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B. SIZE FRACTION 48 MESH X 100 MESH

TIME	YIELD %	ASH %	V.M. %	R.M. %	F.C. %	S %	P %	F.S.I.
30 sec	93.59	5.37	25.37	0.48	68.78	0.22	0.03	8 1/2
30 - 60	1.83	17.27	--	--	--	0.21	--	7 1/2
60 - 90	--	--	--	--	--	--	--	--
90 - 120	--	--	--	--	--	--	--	--
120 - 150	--	--	--	--	--	--	--	--
Tailings	4.58	58.13	--	--	--	0.04	--	--
TOTAL	100.00	8.00	--	--	--	0.21	--	--

C. SIZE FRACTION 100 MESH X 0

TIME	YIELD %	ASH %	V.M. %	R.M. %	F.C. %	S %	P %	F.S.I.
30 sec.	68.38	5.72	25.77	0.43	68.08	0.28	0.03	8 1/2
30 - 60	7.19	7.09	25.39	0.48	67.04	0.22	--	8
60 - 90	5.75	7.43	24.98	0.56	67.03	0.23	--	7 1/2
90 - 120	2.80	10.99	24.79	0.54	63.68	0.22	--	7
120 - 150	--	--	--	--	--	--	--	--
Tailings	15.88	50.67	--	--	--	0.07	--	--
TOTAL	100.00	10.84	--	--	--	0.24	--	--

TABLE 7: CLEAN COAL COMPOSITES FROM SIZE FRACTIONS & ANALYSES

SIZE	SP. GR.	YIELD %	ASH %	F.S.I.
4" x 2"	1.40	50.19	6.94	4
2" x 3/4"	1.40	51.63	7.11	4 1/2
3/4" x 1/4"	1.50	81.07	7.30	5
1/4" x 28m	1.80	97.57	6.76	7 1/2
28 m x 48 m	--	100.00	6.55	8
48 m x 100 m	--	100.00	7.27	8 1/2

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TABLE 8: ANALYSES OF CLEAN COAL

SPECIFIC GRAVITY	1.50
YIELD %	83.27
PROXIMATE ANALYSIS:	
Ash %	6.55
Volatile Matter %	24.22
Residual Moisture %	0.71
Fixed Carbon %	68.52
ULTIMATE ANALYSIS:	
Ash %	6.55
Carbon %	81.70
Hydrogen %	4.72
Oxygen %	5.72
Nitrogen %	1.09
Sulphur %	0.22
OTHER TESTS:	
Phosphorous %	0.03
Calorific Value (B.T.U./lb.)	14,450
Free Swelling Index	6 1/2
Hardgrove Grindability Index	77

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TABLE 9: ANALYSES OF REJECT

YIELD %	16.73
PROXIMATE ANALYSIS:	
Ash %	34.18
Volatile Matter %	22.02
Residual Moisture %	0.63
Fixed Carbon %	43.17
SULPHUR %	0.14
MINERAL ANALYSIS OF ASH:	
SiO_2 %	48.44
Al_2O_3 %	19.66
Fe_2O_3 %	3.23
CaO %	15.40
MgO %	3.75
Na_2O %	0.75
TiO_2 %	0.80
P_2O_5 %	1.01
SO_3 %	0.62
K_2O %	0.67

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TABLE 9 continued

ASH FUSIBILITY:

	Oxidizing Atmosphere	Reducing Atmosphere
Initial Deformation Temperature	2180 °F	2160 °F
Softening Temperature (Spherical)	2220 °F	2180 °F
Softening Temperature (Hemispherical)	2280 °F	2260 °F
Fluid Temperature	2520 °F	2500 °F

TABLE 10: ESTIMATION OF CLAY CONTENT FOR REJECT

Clay Content: Low

FIGURE

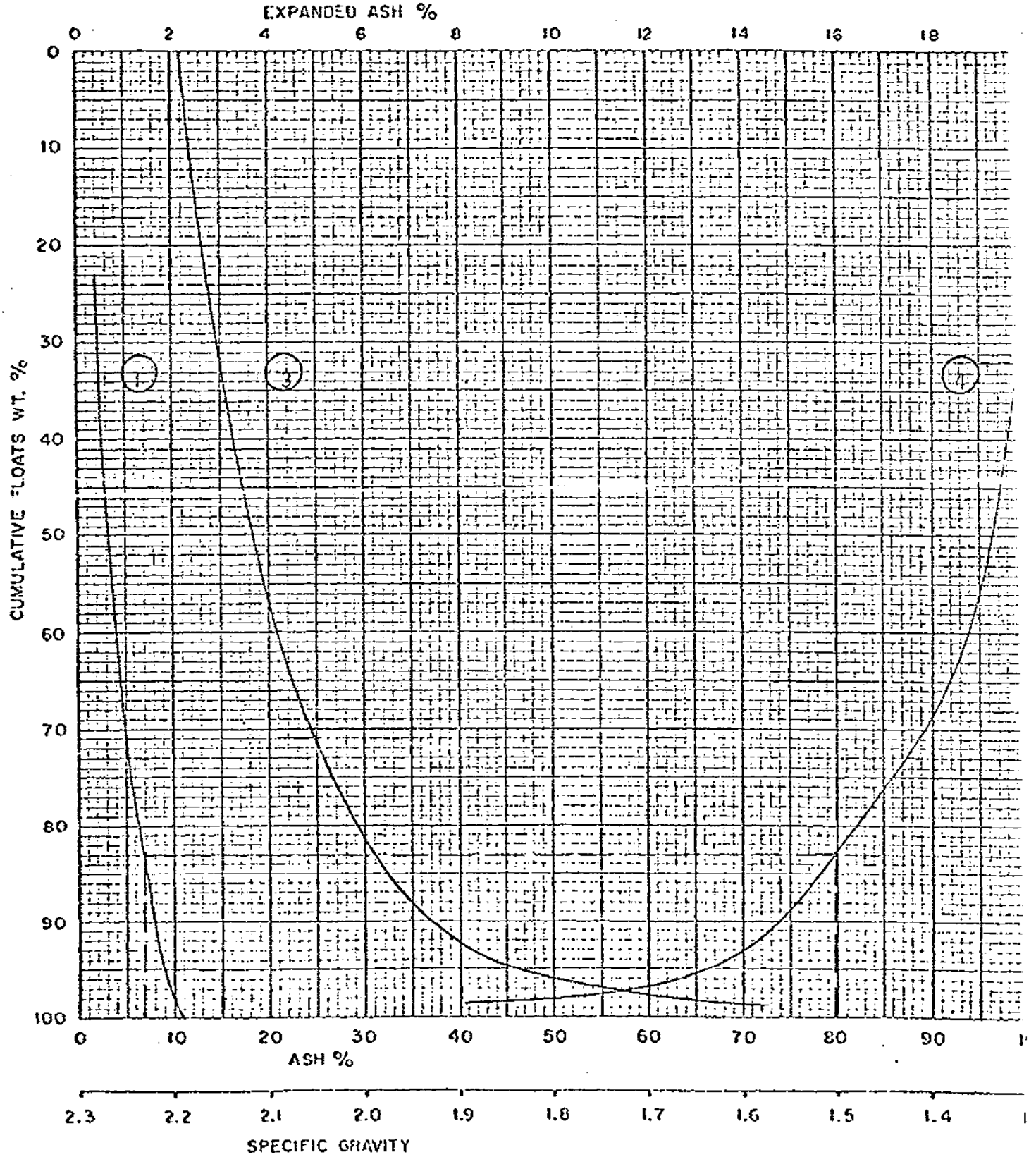
COMPANY TECK MINING GROUP LIMITED

SAMPLE Channel 1

Size 4" x 100 Mesh

WASHABILITY CURVES

1 - FLOATS
2 - EXPANDED FLOATS
3 - SINKS
4 - SPECIFIC GRAVITY
5 - ELEMENTARY ASH
6 - NEAR GRAVITY MATERIAL



February 17, 1977