PR-SUKUNKA 79(1)C

PRELIMINARY REPORT ON THE POTENTIAL RESERVES OF OPEN PIT COAL IN THE UPPER GETHING SEQUENCE

SUKUNKA COAL PROJECT

October 1974

CLIFFORD McELROY & ASSOCIATES

MEMO: 1/4/C39

DATE: October 17, 1974

COPIES: Dr. C.T. McElroy
Mr. R. Austen
Mr. E. Roberts

To: Dr. G. B. Newmarch

From: G. R. Wallis

SUBJECT: OPEN PIT RESERVES - UPPER GETHING SEQUENCE

In response to your request for the documentation of open pit reserves of coal on the Sukunka Property, and the probability of obtaining 10 million tons of such reserves, I am forwarding herewith Report No. 1/4/19 which documents the reserves in the Chamberlain and Skeeter seams. I have included my considered opinion of the degree of confidence which may be applied to these reserves; that degree relates to the presence, or otherwise, of those volumes of coal, not to them as a mined product. Such an evaluation demands a more extensive engineering study.

As to the probability of other reserves being available on the property to increase the total reserves to 10 million tons, it is not at this stage possible to be definite.

The current exploration programme is providing positive evidence of coal-bearing horizons in the Lower Gething sequence ("Middle Coals"), however, a full analysis is not yet available to make any concrete statements.

The coal seams in the Commotion Formation likewise cannot be the subject of a scientifically based statement. Lateral continuity has yet to be established, though evidence of at least 15 ft of coal and bands at two localities indicates that further evaluation is warranted. This I shall do in due course.

No other areas within the currently explored area of the Sukunka Property offer any potential open pit coal seams.

G. R. Wallis

GRW/pjo

PRELIMINARY REPORT

OF THE

POTENTIAL RESERVES

OF OPEN PIT COAL

IN THE

UPPER GETHING SEQUENCE

--

SUKUNKA COAL PROJECT

Prepared by Clifford McElroy & Associates Pty. Ltd.
for Coalition Mining Limited

Report No. 1/4/19
October 14, 1974.

SUMMARY

Reserve figures for the gross tonnage of coal in the Chamberlain and Skeeter Seams on the Sukunka Property which are potentially available for open pit mining, have been calculated. Two stripping ratios have been used as the limit of mining, 5:1 and 7:1, the ratio being bank cubic yards : short tons.

Gross reserves of 4.558 million short tons (m.s.t.) exist within a strip ratio of 5:1. Of this figure, 2.189 m.s.t. are Measured, 1.667 m.s.t. are Indicated, and 0.702 m.s.t. are Inferred. This figure can be increased to in excess of 5.370 m.s.t. if a stripping ratio of 7:1 is practical.

Further definition of seam thickness, and, more importantly, depth of cover over the seam is required to bring all the reserve figures up to the measured category. Additional drilling is also necessary for open pit design.

1. INTRODUCTION

As part of the 1974 Exploration Programme to evaluate the open pit reserves of coal on the Sukunka Coal Project, an assessment of the reserves of coal in the Upper Gething sequence of rocks has been made. This relates to the two seams which have been the subject of exploration for underground mining, namely the Chamberlain and Skeeter Seams.

The analysis is based on existing data which is documented in the reports of the 1971 and 1972 exploration programmes. These reports are:

> Sukunka Coal Project. Geological Report, Vols. 1-12, dated March 19, 1972.

and

> Sukunka Coal Project. Geological Report, 1972 Supplement, Vols. 1-5, dated March 30, 1973.

It is stressed that this report is a preliminary one, to be used as a basis for a more detailed evaluation of the more favourable areas. Such an evaluation would include more closely spaced drilling than is currently available, in order to more accurately define the limits of stripping. Additionally, it is assumed that certain management decisions are necessary, for example, the future of Mine No. 1 which is located approximately in the centre of one area assessed.

Also included in this report is an assessment of the reserves of coal in both seams which might be available for auger mining.

2. GEOLOGICAL OUTLINE

The two seams for which reserve figures have been calculated are the Chamberlain and Skeeter Seams, both occurring toward the base of the upper 200 feet of the Gething Formation, that is, the Upper Gething sequence. At the top of the Gething Formation is the essentially uneconomic Bird Seam.

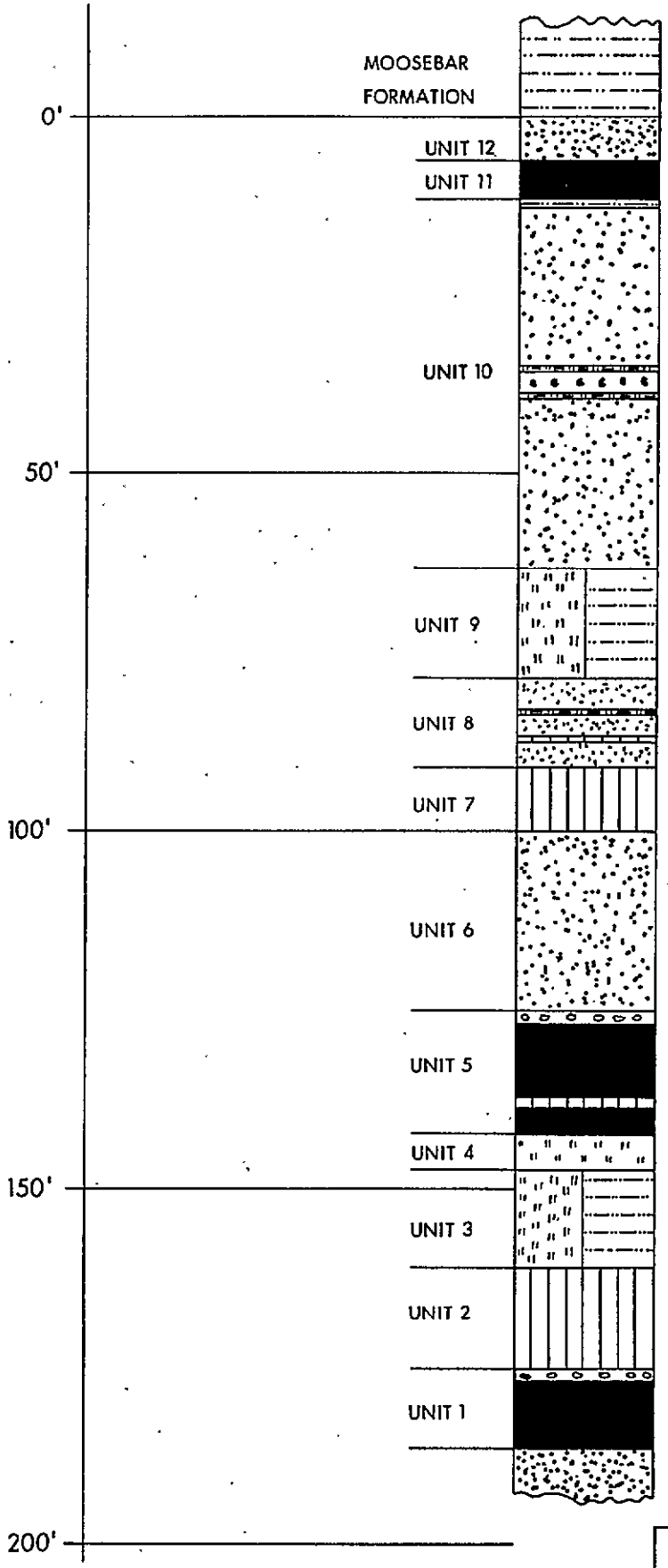
Overlying the Gething Formation, the mudstones of the Moosebar Formation occur.

The Chamberlain Seam is separated from the overlying Skeeter Seam by a sequence of interbedded and laminated siltstone and claystone, overlain by siltstone. The interseam interval varies between 10 and 30 feet in thickness. Adjacent to fault planes an increase in this interval occurs, such that the two seams may be separated by as much as 60 feet. This is a local occurrence due to fault repetition of the strata.

The lithologies present in the overburden and the interseam sediments are illustrated in figure 1, which is a composite graphic section, and is representative of the general sequence. Description of the various lithologies, Units 1 to 12 (Figure 1) are included in Section 4.2.3(ii) of the 1972 Geological Report dated March 19, 1972.

It is significant to note that while an increase in ash content of the raw coal will occur as a result of open pit mining (or a reduction in recoverable reserves), a further reduction can occur in the Skeeter Seam due to the rock band within the seam. Careful evaluation of this fact is warranted in order to gauge the effect on either the reserves or the coal quality. Where this band approaches 1 foot in thickness,

FIGURE 1



COALITION MINING LTD.

COMPOSITE GRAPHIC SECTION

UPPER GETHING SEQUENCE

Drawn By: G. WALLIS	Scale: 1" = 25'
Drafted By: M.E.W.	Contour Interval:
Date: OCT/74 Revised:	Drawing No.

CLIFFORD McELROY & ASSOC.

TO ACCOMPANY REPORT No. 1/4/19

the ash content of the raw coal could approach 30% if the band and coal are mined together. In that the band is a siltstone, selective mining may be possible.

3. BASIS FOR RESERVE CALCULATIONS

Two ratios, 5:1 and 7:1, were selected as the limits of stripping, being

$$\frac{\text{Bank Cubic Yards of Overburden}}{\text{Short Tons of Coal}}$$

Since this ratio is a volumetric one, it was necessary to assume a series of areas for mining purposes, and to calculate the ratios within these areas for increasing distances from the outcrop. The basis used for the assumed area was 1 yard wide. In this manner, the ratios produced are incremental averages along the strip from the outcrop to the point of maximum ratio as defined.

Since the slope of the land surface increases progressively away from the outcrop, so too does the volume of overburden. In view of the time limitation, the volume of overburden was calculated using a triangular formula, assuming an even gradient for the land surface.

Further, since the data was available in map and tabular form, the overburden thickness was taken as the depth of cover over the Chamberlain Seam floor. That is, the thickness of coal in both seams is included in the overburden thickness for extraction. While it may be argued that this is invalid, it nontheless introduces an element of conservatism into the reserve figures.

In calculating the tonnage of coal present in both seams, a figure of 1.10 short tons to the cubic yard has been used. This is based on the established figure of 1770 short tons

per acre-foot for coal with a specific gravity of 1.30.

The total coal thickness has been computed from the drill hole data, and includes the seam thickness of the Chamberlain Seam plus the coal - less bands - in the Skeeter Seam.

Isopach lines for the total coal thicknesses and the overburden thickness are shown on drawing No. SKR 199. This plan also shows the 5:1 and 7:1 limits used to define area under which the reserves have been calculated. The reserve figures as set out in Table 1 are Gross Reserves of coal in place. No allowance has been made for extraction loss or dilution, which will occur due to the presence of the interseam sediments.

The categorization of the reserves into Measured, Indicated, of Inferred relates to the spacing of the data points, which control the definition of coal thickness and strip ratio calculation. In some areas data available are inadequate to allow the reserves to be defined as Measured.

4. RESERVE FIGURES

The Gross Reserves of coal calculated within a 5:1 and 7:1 strip ratio limit are reported in Table 1 (Page 5). The total figure for the 7:1 ratio includes the amount of coal available at a 5:1 ratio. However, for two areas, Plates 1 and 2C, insufficient data are available to allow 7:1 ratio reserves to be computed, due primarily to the paucity of drilling in these areas.

The Gross Reserves, in all categories, within a stripping ratio of 5:1 total 4.558 million short tons (m.s.t.). Of this figure, 2.189 m.s.t. are Measured, 1.667 m.s.t. are Indicated, and 0.702 m.s.t. are Inferred.

TABLE 1

OPEN PIT RESERVES - CHAMBERLAIN AND SKEETER SEAMS

(Millions of Short Tons, Gross)(1)

LOCATION (2)	RESERVE CATEGORY (3)	5:1 TOTAL COAL (4) THICKNESS (ft)	5:1 SUB AREA TONNAGE	5:1 AREA TONNAGE	7:1 (5) TOTAL COAL THICKNESS (ft)	7:1 (5) SUB AREA TONNAGE	7:1 (5) AREA TONNAGE
PLATE 1							
Sub Area A	Measured	9.5 - 14.0	1.264				
Sub Area B	Indicated	15.0	0.664	1.928	-	-	1.928+ (6)
PLATES 2c/2b							
Sub Area C	Measured	8.5 - 10.5	0.363(7)		8.5 - 10.5	0.475(7)	
Sub Area D	Indicated	8.0 - 15.25	1.003		8.0 - 15.25	1.264	
Sub Area E	Inferred	12.0 - 13.5	0.310	1.676	12.0 - 14.0	0.439	2.178
PLATE 2c							
Sub Area F	Inferred	12.0	0.100	0.100			0.100+ (6)
PLATE 3							
Sub Area G	Measured	11.0	0.562		11.0	0.804	
Sub Area H	Inferred	11.0	0.292	0.854	11.0	0.360	1.164
TOTALS				4.558			5.370+

See Next Page for Notes to Accompany this Table.

NOTES TO ACCOMPANY TABLE 1

(1) The figures reported in this table are gross reserves of coal in place.

(2) See Drawing No. SKR 199 for location of areas.

(3) The Reserve Category definition is governed by the spacing of the data points, as they relate to calculating the stripping ratio and the definition of the total coal thickness.

(4) The total coal thickness is the sum of the coal in the two seams, and does not include the thickness of inter-seam sediments.

(5) The reserve figure for 7:1 stripping ratio, when calculated, includes the reserves for the 5:1 ratio areas.

(6) Insufficient data are available to calculate the reserves of coal which would accrue if the stripping ratio were increased to 7:1; the 5:1 ratio reserve figure is reported for consistency within the table.

(7) Contained within the reserve figures for these areas are 0.156 m.s.t. and 0.201 m.s.t. for the 5:1 and 7:1 ratios respectively, which are in the current Mine No. 1 area; this area includes the 7 headings plus a 200 ft barrier to the east and west.

This figure can be increased to in excess of 5.370 m.s.t.if a stripping ratio of 7:1 is practical.

A discussion of the probability of success of extracting these reserves of coal must include not only the presence, or otherwise, of the coal, but such factors as overburden character, the access to the area, both in a local and regional sense, government attitudes, weather conditions, and such like. These various elements relate, to a large degree, to the operating cost and value of the product, in short, a feasibility study.

Consequently, the following comments relating to degrees of confidence are confined to the presence, or otherwise, of the coal. Any percentage quoted is partly subjective, since no probability analysis has been carried out.

In all areas further drilling is required to assess more accurately the limit of the defined strip ratio, particularlyin respect to the 7:1 ratio. The width of weathered coal also requires definition, although where the topography is steep, it is estimated that unweathered coal would be encountered within 50 to 100 feet. Detailed pit planning would also necessitate further drilling.

The Northern section of Plate 1 (Sub Area A), Sub Area C in Plates 2a/2b, and Sub Area G in Plate 3 are all well defined and may be assigned a very high degree of probability, say 90%. Sub Area A possibly requires more drilling, but limited to 2 or 3 holes. 2.189 m.s.t., at a ratio of 5:1, relate to these areas.

Sub Area B (Plate 1) and D (Plates 2a/2b) are reasonably well-defined. Drilling in these areas is required to define the thickness of coal in Sub Areas B and D1, and to define any structural discontinuities in B. A degree of confidence of greater than 75% is assigned to these areas. Reserves of 1.667 m.s.t. relate to these areas, the ratio being 5:1.

The Inferred reserves of 0.702 m.s.t., at a 5:1 ratio, may be assigned a better than 50% degree of probability. Sub Areas F and H are virtually unknown, since no drilling has been carried out which can be applied to these areas, and the outcrop of the seam is not known with any degree of precision.

The final point which warrants mention in this section, is the presence of Mine No. 1. Within the limits of the 5:1 and 7:1 strip ratios, 0.156 m.s.t., and 0.201 m.s.t., respectively, exist in Sub Area C where the mine is located. Some of the coal has been already mined, and headings are currently progressing. The area taken as a basis for this calculation is the distance across the 7 headings, plus a barrier of 200 feet on either side of the eastern and western headings.

5. AUGER MINING POTENTIAL

Reserves of coal which might be extracted by auger mining have been computed for two areas in Plate 1, these being (i) the central portion - Sub Area B (see Drawing No. SKR 200), and (ii) the outcrop from the southern limit of Sub Area B south to the vicinity of Chamberlain Creek. A depth of extraction of 200 feet has been assumed as the maximum practical mining depth.

TABLE 2

POTENTIAL AUGER MINING RESERVES
(Millions of Short Tons, Gross)

Area	Chamberlain Seam		Skeeter Seam	
	Thickness	Tonnage	Thickness	Tonnage
(i)	8.0 ft	0.195	7.0 ft	0.171
(ii)	8.0 ft	0.456	4.0-4.6 ft	0.219
Totals		0.651		0.390

Note: The seam thicknesses for the southern area, (ii), are assumed only; structural continuity has yet to be fully demonstrated.

The figures of Table 2 are gross figures, since the extraction percentage is dependent on seam thickness and type of auger head used. It should be noted that the figures for Area (1) (Sub Area B in Section 4, above) are duplicative, that is, the reserve of 0.366 m.s.t. of auger coal is included in the reserve of 1.264 m.s.t. in Table 1.

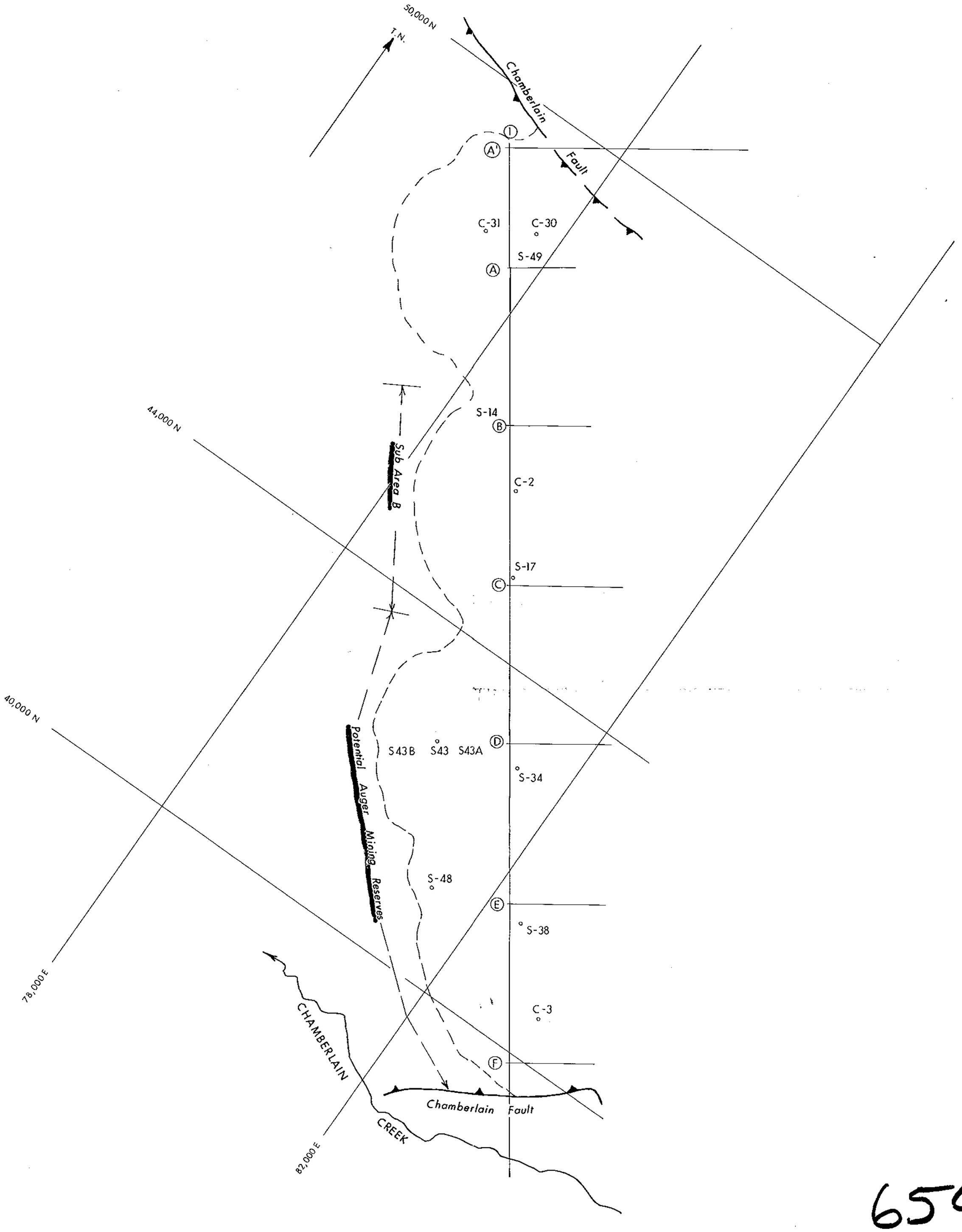
As a guide to auger mining reserves, and on the assumption that such a technique may be employed to extract the coal from the high wall at the limit of open pit mining, a guide to the probable reserves available is here included:

BASIS	RESERVE
1,000 ft lineal face 10 ft seam thickness 200 ft mining depth	81,500 short tons, gross

No consideration is given here to the practicality of auger mining the two areas above, since expert engineering advice is necessary. Topographic factors are bound to influence the mining of the extreme southern part of Plate 1.

G. R. Wallis

Calgary, October 17, 1974
GRW/pjo



SCALE IN FEET

0 500 1000 2000

CLIFFORD McELROY & ASSOC.

TO ACCOMPANY REPORT No. 1/4/19

654

PR-SUKUNKA 74(1)C

COALITION MINING LTD.

PLATE 1

POTENTIAL AUGER MINING RESERVES

Drawn By G. WALLIS
Drafted By M.E.W.
Date OCT. 74 Revised

Scale 1" = 1000'
Contour Interval
Drawing No. SKR 200

76,000 E
78,000 E
80,000 E
82,000 E
84,000 E
86,000 E
52,000 N
50,000 N
48,000 N
T.N.
SKEETER
SUB AREA H
SUB AREA G
SUB AREA F
SUB AREA C
SUB AREA D1
SUB AREA D2
SUB AREA E
SUB AREA A
SUB AREA B
MINE No.1 AREA A B C D E F G
R/M
Road
CHAMBERLAIN
FAULT
AV. TOTAL COAL 12.0'
AV. TOTAL COAL 12.5'
AV. COAL TOTAL 11.0'
AV. TOTAL COAL 13.5'
AV. TOTAL COAL 15'
COAL 11'
AV. TOTAL
Chamberlain Seam absent floor outcrops
EASTERN TRACE OF PLATE 1 AT LEVEL OF CHAMBERLAIN SEAM
NO DATA
R-75
OS-8
CM-1
CM-2
CM-3
CM-6
CM-7
CM-8
S-470
S-19
S-14
CS-1
CS-2
CS-3
CS-4
CS-5
CS-6
CS-7
S-50
C-2
C-4
C-4A
C-31
C-32
C-38
C-39
C-45
C-46
C-47
C-48
C-50
C-51
C-52
5:1
7:1

— LEGEND —

OUTCROP OF SEAMS

POSITION ACCURATE

" APPROXIMATE

" INFERRED

50 ISOPACH LINE: DEPTH OF COVER OVER CHAMBERLAIN SEAM FLOOR

9 ISOPACH LINE: TOTAL COAL THICKNESS IN CHAMBERLAIN & SKEETER SEAMS

5:1 STRIPPING RATIO at 5:1

FAULT TRACE AT SURFACE:

Position Definite

Position Approx.

CM-7 DIAMOND DRILL HOLE LOCATION

EXPLORATION GRID

SUB AREA C AREA OF RESERVE CALCULATION

NOTE: STRIPPING RATIO = Bank cubic yds. of Overburden / Short tons coal in place

SCALE IN FEET
0 200 400 800 1200

TO ACCOMPANY REPORT No. 1/4/19

PREPARED BY: CLIFFORD McELROY & ASSOC. PTY. LTD.

PR-SUKUNKA 74 (1) c 654

COALITION MINING LTD.

SUKUNKA COAL PROJECT

OPEN PIT POTENTIAL
UPPER GETHING SEQUENCE

TOTAL COAL THICKNESS AND
COVER ISOPACH MAP

Drawn By: G. WALLIS
Drafted By: M.E.W.
Date: OCT. 14/74 Revised:

Scale: 1" = 400'
Contour Interval:
Drawing No. SKR 199