

# APPENDIX H

## WELL LOG DATA

### 1972 GEOLOGICAL PROGRAMME

#### RADIATION LOGS

(Gamma Ray and Neutron Logs)

D.D.H. C-42  
D.D.H. C-43  
D.D.H. C-44  
D.D.H. C-45  
D.D.H. C-46  
D.D.H. C-47  
D.D.H. C-48  
D.D.H. C-49  
D.D.H. C-50  
D.D.H. C-51  
D.D.H. C-52

#### TEMPERATURE LOGS

D.D.H. C-42  
D.D.H. C-43  
D.D.H. C-44  
D.D.H. C-45  
D.D.H. C-46  
D.D.H. C-47

Prepared By: Clifford McElroy & Associates Pty., Limited

NOTES TO ACCOMPANY APPENDIX H

RADIATION AND TEMPERATURE LOGS

The eleven diamond drill holes of the 1972 field programme were logged by Roke Oil Enterprises Limited of Calgary, Alberta. A combined gamma ray / neutron probe was used in all drill holes and six of the holes were logged with a temperature probe.

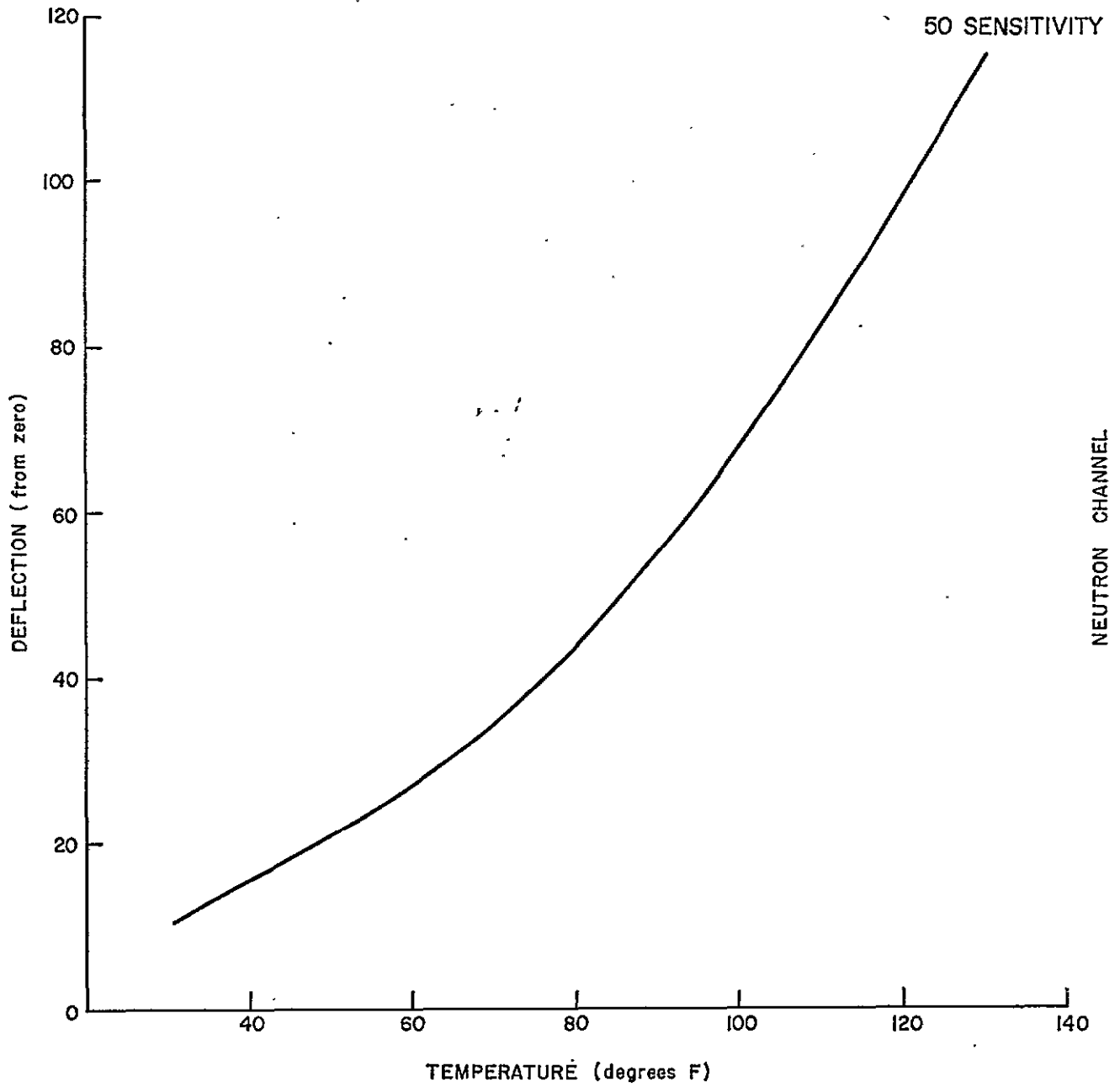
TEMPERATURE LOGS

The temperatures were calculated from the logs using the calibration chart, included here as Figure H-1. The data is summarised on Table H-1 and Figure H-2 shows the temperature variation with respect to both depth and the geological formations for the deeper drill holes, C-42, C-43, and C-44. The overall temperature gradient in the three deeper holes is in the order of 1°F per 120 feet. The temperature gradient in these drill holes is minimal for about 1,000 feet, but increases to 1°F per 80 to 90 feet below about 1,000 feet. The cover over the Chamberlain Seam is less than 1,250 feet for the greater part of the Sukunka area.

TABLE H-1  
TEMPERATURE GRADIENTS

D.D.H. NO.	TOTAL DEPTH (FT.)	TEMP. AT BASE OF HOLE (°F)	TEMP. DIFFERENTIAL (°F)	TEMP. GRADIENT (°F/FT)
C-42	2250	58°	16°	1:140
C-43	1940	56°	16°	1:105
C-44	1656	53°	13°	1:112
C-45	290	43°	4°	1:72
C-46	310	42°	3°	1:103
C-47	187	41°	2°	1:143

# TEMPERATURE CALIBRATION CHART



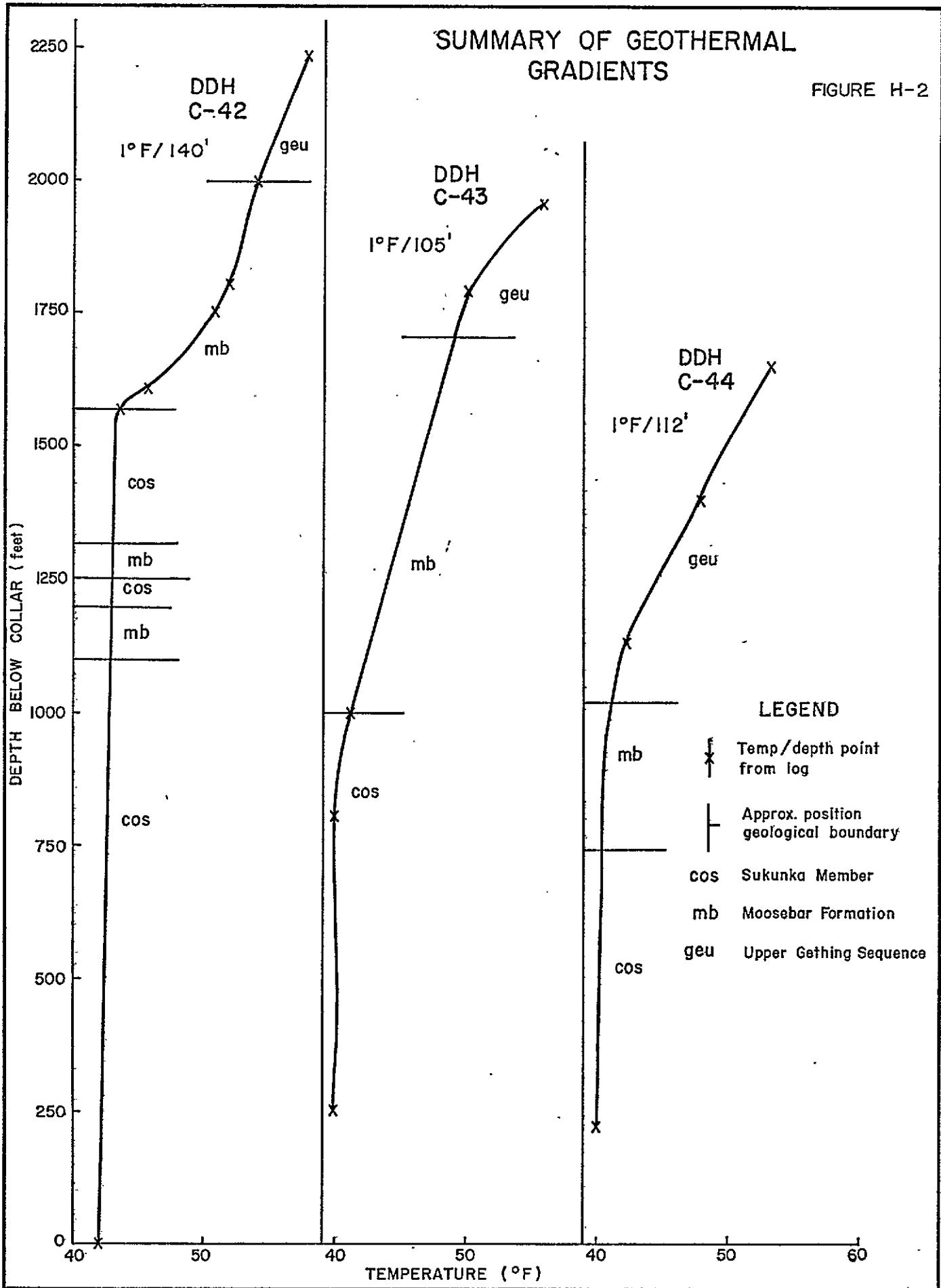
Prepared by :  
 CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
 for  
 COALITION MINING LIMITED

To accompany Appendix H

DATE: January, 1973

# SUMMARY OF GEOTHERMAL GRADIENTS

FIGURE H-2



## LEGEND

- Temp/depth point from log
- Approx. position geological boundary
- cos Sukunka Member
- mb Moosebar Formation
- geu Upper Gething Sequence



## RADIATION LOGS

The radiation logs are included in this appendix at a scale of 20 feet = 1 inch. A graphic log, compiled from the written and corrected detailed log of the drill hole has been added to the radiation log to enable direct comparison of the two types of log.

While the radiation logs are useful for indicating the nature of the strata in the drill hole, they are best used in conjunction with the detailed descriptive log, rather than as a substitute for the geological log. The gamma ray log is useful to distinguish between carbonaceous claystone and coal, but does not usually enable the floor and roof of the seam to be accurately defined.

The neutron log was used to verify the corrected thickness of coal recorded in the written log, particularly where a core loss occurred in tectonically disturbed zones near major faults.

The base of the Chamberlain Seam is clearly defined in all neutron logs between the two inflection points on the chart. The accurate delineation of this rock boundary is due to the sharp contrast between the sandstone floor and the coal of the Chamberlain Seam. The top of the Chamberlain Seam and the top of the Skeeter Seam is often difficult to accurately define where the coal is overlain by carbonaceous claystone or where there is a narrow rock band below an upper split of either seam.

The radiation logs were used to check the thickness of all coal intersections and there is excellent agreement between the two

methods, indicating that there were no irregularities in the drilling.

The recovery of coal in three drill holes, D.D.H.'s C-44, C-46 and C-50, was significantly low due to tectonic disturbance close to faults. The radiation logs were used particularly for these holes to confirm the thickness of coal that was obtained by correcting the log for core losses. Table H-2 below gives the corrected thickness, as recorded in the written log, compared with the thickness estimated from the radiation log.

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TABLE H-2

D.D.H. No.	SEAM	CORRECTED THICKNESS (Written Log) (ft)	RADIATION LOG (ft)
C-44	Skeeter	4.23	4.0
	Chamberlain	9.52	10.0
C-46	Skeeter(u.p.)	7.63	8.0
	Skeeter (l.p.)	5.76	7.0
	Chamberlain (l.p.)	4.54	6.0
C-50	Skeeter (c.p.)	7.25	8.0
	Chamberlain (c.p.)	7.81	8.0

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u.p. - upper plate  
l.p. - lower plate  
c.p. - centre plate

The thickness of the coal, as determined from the radiation log, can be determined with an accuracy of about  $\pm 1$  foot. For the above three drill holes, the radiation logs validate the methods used to correct for core loss, though the methods are perhaps conservative.



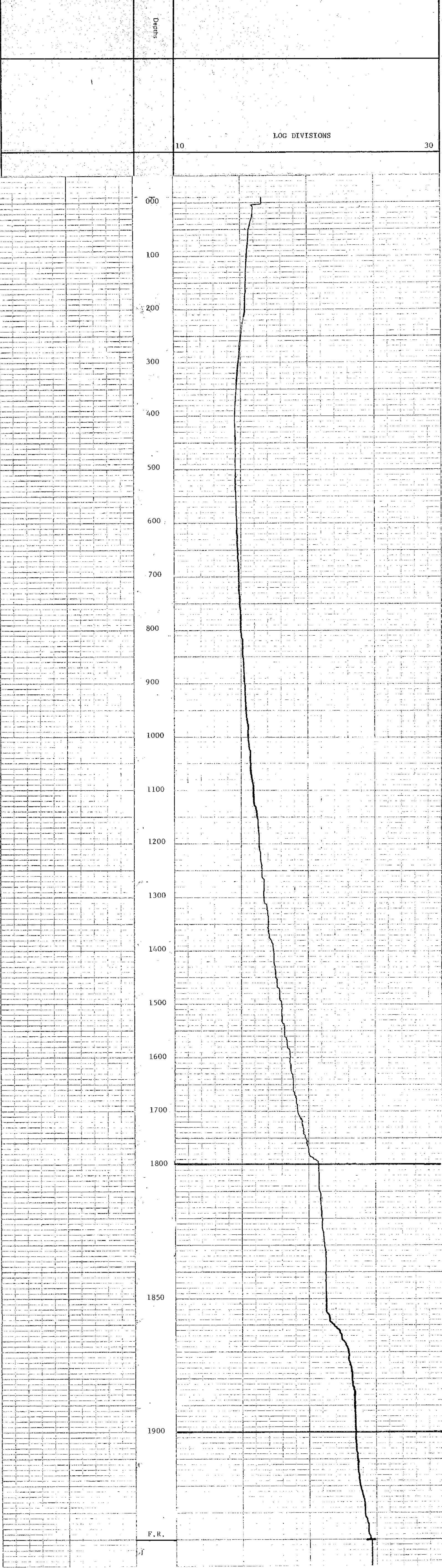
# ROKE

TEMPERATURE LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C - 43
SEC	TWP	
RGE	RGE	
W	M	
LOCATION	FIELD	SUKUNKA PROJECT
PROVINCE	BRITISH COLUMBIA	Other Services
Permanent Datum	GROUND LEVEL	K. B.
Log Measured from	RIG FLOOR	Elev
Well Depth Measured from	RIG FLOOR	2. Ft. Above Perm. Datum
		CSG
		G.L.
Run No.	ONE	
Date	4. OCTOBER 72	
First Reading	1940	
Last Reading	0	
Footage Logged	1940	
Depth Reached	1940	
Depth Driller	1945	
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm. @ 9F		
Operating Time	4 HOURS	
Truck No.	20	
Recorded By	PETERSON	Witnessed By
		BRYAN

Remarks: SENSITIVITY - 50 10 DIVISIONS LEFT  
 LOG SCALED AT 1 INCH PER 100 FT. FROM ZERO FT. TO 1800 FT.  
 LOG SCALED AT 5 INCH PER 100 FT. FROM 1800 FT. TO 1940 FT.



650



# ROKE

TEMPERATURE LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO. COMPANY COALITION MINING LIMITED

LSD SEC. WELL C-42

TWP RGE M LOCATION

FIELD SUKINKA PROJECT

PROVINCE BRITISH COLUMBIA

Permanent Datum GROUND LEVEL ELEV. K.B. GRN

Log Measured from RIG FLOOR 1.5 Ft. Above Perm. Datum

Well Depths Measured from RIG FLOOR G.L.

Run No. ONE

Date 22 SEPTEMBER 72

First Reading 2248

Last Reading 0

Footage Logged 2248

Depth Reached 2248

Depth Driller 2252

Casing Roke

Casing Driller

Fluid Type WATER

Liquid Level

Min. Diam. 3 INCH

Rm. @ 9f

Operating Time 4 HOURS

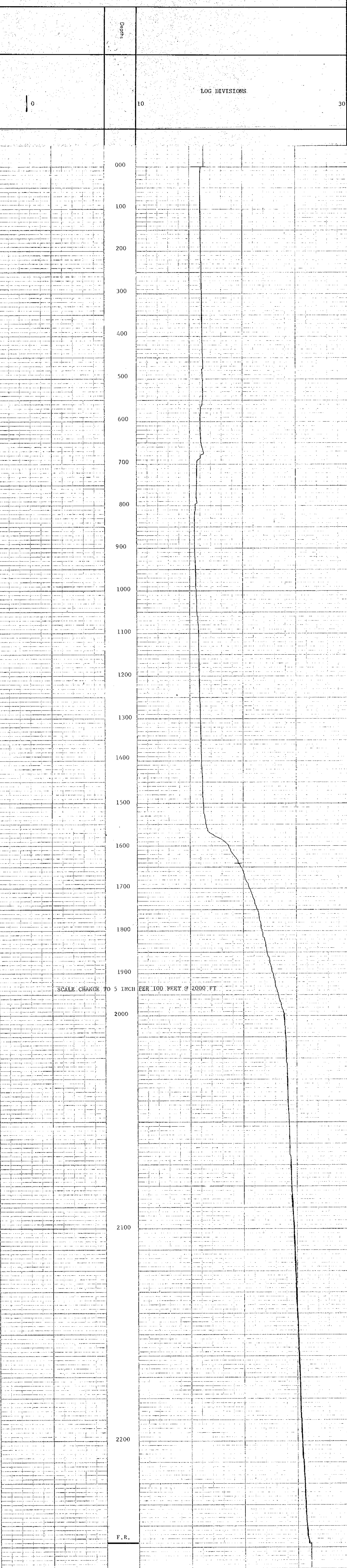
Truck No. 20

Recorded By: PETERSON

Witnessed By: BRYAN

650

Remarks: SENSITIVITY - 50, 10 DIVISIONS LEFT.  
 LOG SCALED AT 1 INCH PER 100 FT. FROM ZERO TO 2000 FT.  
 LOG SCALED AT 5 INCH PER 100 FT. FROM 2000 FT TO 2248 FT.







# ROKE

GAMMA RAY NEUTRON LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD SEC TYPE	WELL	C - 52
RGE	LOCATION	
W	FIELD	SUKUNKA PROJECT
M	PROVINCE	BRITISH COLUMBIA
Permanent Datum	GROUND LEVEL	Elev. _____
Log Measured from	RIG FLOOR	1.5 F. Above Perm. Datum
Well Depths Measured from	RIG FLOOR	G.L. _____
Run No.	ONE	
Date	6 NOVEMBER 72	
First Reading	486	
Last Reading	0	
Footage Logged	486	
Depth Reached	487	
Depth Driller	487	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level	4 1/2	
Min. Diam.	3 INCH	
Rm @ 9F		
Operating Time	2 HOURS	
Truck No.	20	

650

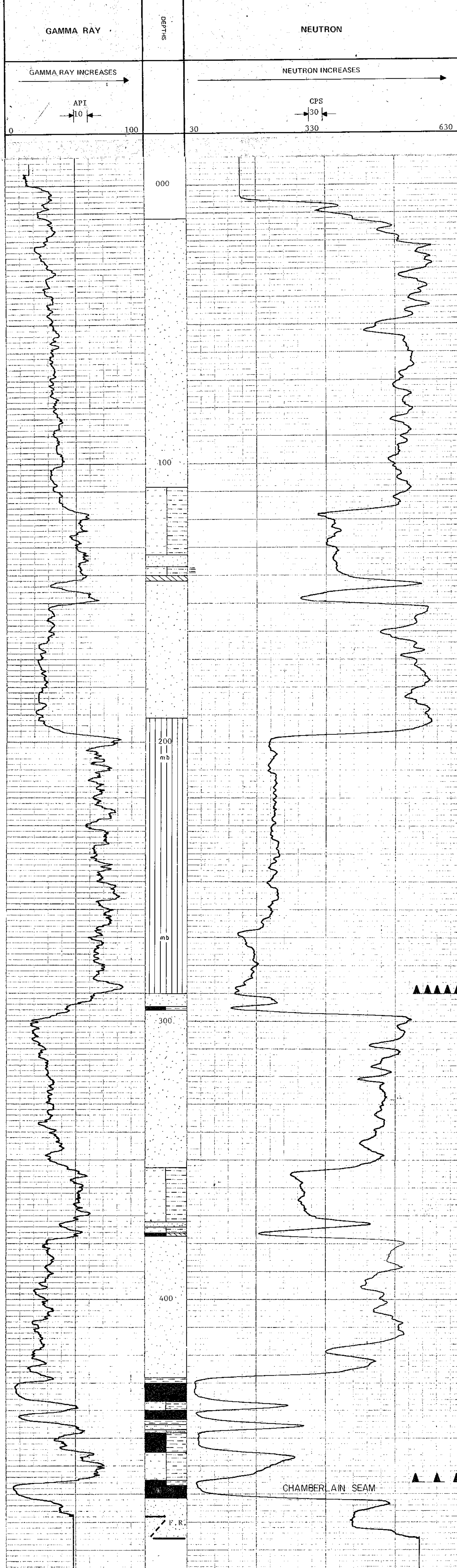
### EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 1/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 1/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
		SERIAL NO.	598
HOIST TRUCK NO.	20	SPACING	19 INCH
INSTRUMENT TRUCK NO.		TYPE	AmBe
TOOL SERIAL NO.	CGN27U4A65	STRENGTH	6.94 x 10 <sup>6</sup> N/S

### LOGGING DATA

RUN NO.	GENERAL			GAMMA RAY			NEUTRON				
	DEPTHS	SPEED	T.C.	ZERO	API G. R. UNITS	T. C.	SENS	ZERO	API N. UNITS		
	FROM	TO °	FT/MIN	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.
1	0	486	12	4	17	0L	10	4	.23	1L	30 CPS

REMARKS



# ROKE

GAMMA RAY NEUTRON LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
WELL	C - 51	
LOCATION	SURUNKA PROJECT	
PROVINCE	BRITISH COLUMBIA	
Permanet Datum: GROUND LEVEL	Entire	
Log Measured from: RIG FLOOR	1.5	Ft Above Perm. Datum
Well Depth Measured from: RIG FLOOR		
Run No.	ONE	
Date	2 NOVEMBER 72	
First Reading	431	
Last Reading	0	
Footage Logged	431	
Depth Reached	432	
Depth Driller	432	
Casing Role		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rim @ of		
Operating Time	2 HOURS	
Truck No.	20	
Recorded By: PETERSON	Witnessed By: JORDAN	

650

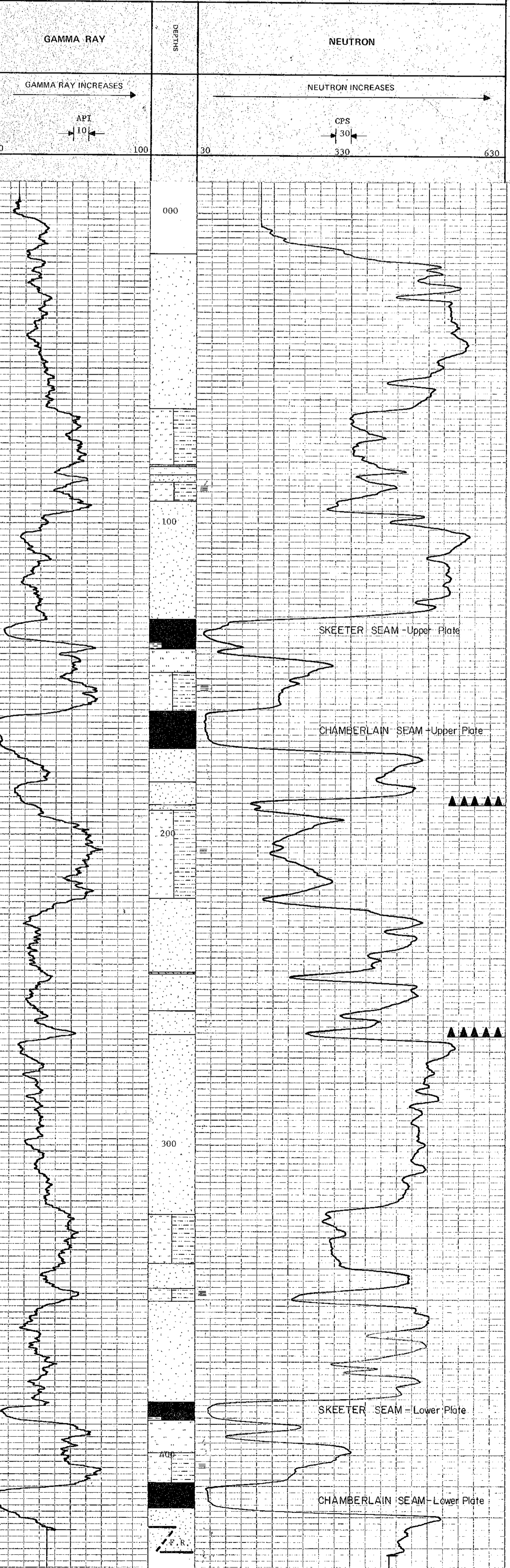
### EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 11/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 11/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
		SERIAL NO.	598
HOIST TRUCK NO.	20	SPACING	19 INCH
INSTRUMENT TRUCK NO.		TYPE	AmBe
TOOL SERIAL NO.	CCN27U4A65	STRENGTH	6.94 x 10 <sup>6</sup> N/S

### LOGGING DATA

GENERAL			GAMMA RAY				NEUTRON				
RUN NO.	DEPTHS FROM	SPEED TO FT/MIN	T.C. SEC	SENS SETTINGS	ZERO DIV. L OR R	API G. R. UNITS PER LOG DIV	T. C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV	
1	0	431	12	4	17	0L	10	4	.23	1L	30 CPS

REMARKS





# ROKE

GAMMA RAY NEUTRON LOG

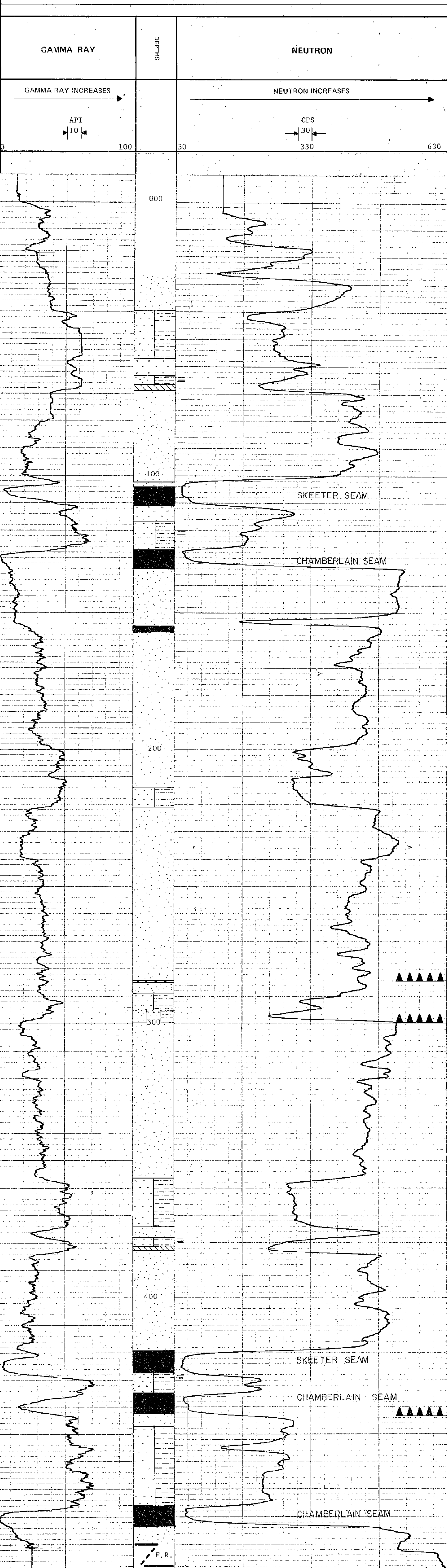
OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C - 50
SEC	LOCATION	
TWP	FIELD	SURUNKA PROJECT
RGE	PROVINCE	BRITISH COLUMBIA
M	Other Services:	
Permanent Datum	GROUND LEVEL	Elev. _____
Log Measured from	RIG FLOOR	1.5 Ft. Above Perm. Datum
Well Depths Measured from	RIG FLOOR	G.L. _____
Run No.	ONE	
Date	30 OCTOBER 72	
First Reading	498	
Last Reading	0	
Footage Logged	498	
Depth Reached	499	
Depth Driller	499	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm. @ 9'		
Operating Time	2 HOURS	
Truck No.	20	
Recorded By	PETERSON	Witnessed By
		JORDAN

EQUIPMENT DATA			
GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 1/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 1/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
		SERIAL NO.	598
		SPACING	19 INCH
		TYPE	AmBe
		STRENGTH	6.94 x 10 <sup>6</sup> N/S
GENERAL		GENERAL	
HOIST TRUCK NO.	20		
INSTRUMENT TRUCK NO.			
TOOL SERIAL NO.	CGN27U4A65		

LOGGING DATA											
GENERAL			GAMMA RAY				NEUTRON				
RUN NO.	DEPTHS	SPEED	T.C.	SENS.	ZERO	API G. R. UNITS	T. C.	SENS.	ZERO	API N. UNITS	
	FROM	TO	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	
1	0	498	12	4	17	0L	10	4	.23	1L	30 CPS

REMARKS



# ROKE

OIL ENTERPRISES LTD. CALGARY ALBERTA  
 GAMMA RAY NEUTRON LOG

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C-49
SEC	LOCATION	
TWP	FIELD	SUKUNKA PROJECT
RGE	PROVINCE	BRITISH COLUMBIA
W		
M		
Other Services:		
Permanent Datum	GROUND LEVEL	Elev.
Log Measured from	RIG FLOOR	1.5 ft. Above Perm. Datum
Well Depth Measured from	RIG FLOOR	G.S.G.
Run No.	ONE	
Date	27 OCTOBER 72	
First Reading	490	
Last Reading	0	
Footage Logged	490	
Depth Reached	491	
Depth Driller	491	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm @ 9'		
Operating Time	2 HOURS	
Truck No.	20	
Recorded By	PETERSON	Witnessed By
		JORDAN

650

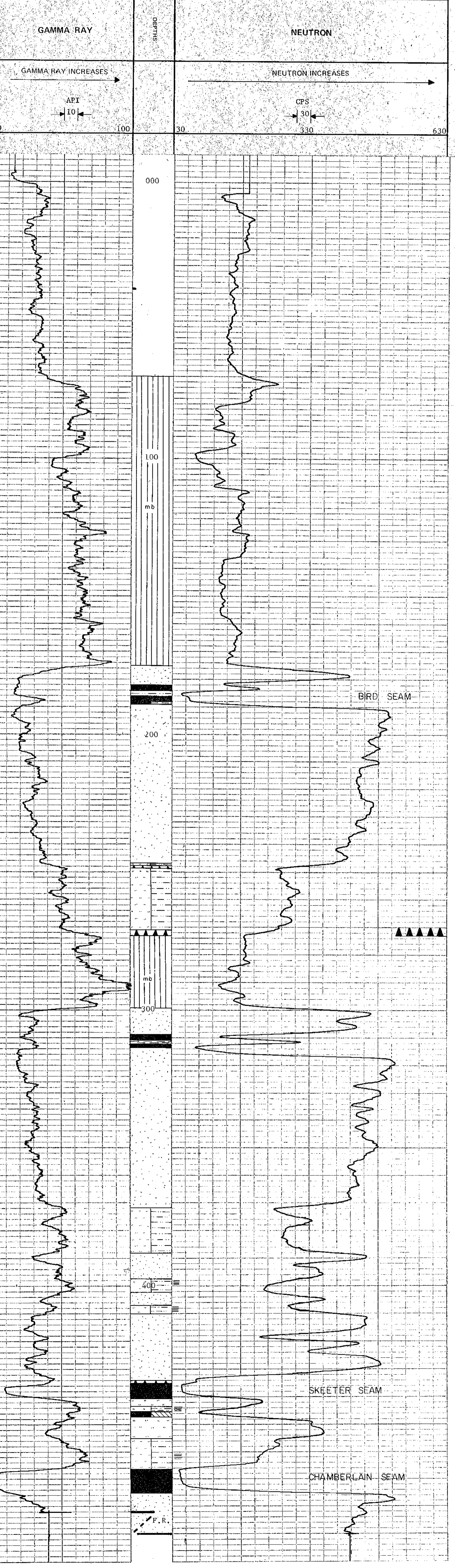
### EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 11/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 11/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
GENERAL		SERIAL NO.	598
HOIST TRUCK NO.	20	SPACING	19 INCH
INSTRUMENT TRUCK NO.		TYPE	AmBe
TOOL SERIAL NO.	CCN27U4A65	STRENGTH	6.94 x 10 <sup>6</sup> N/S

### LOGGING DATA

RUN NO.	GENERAL		GAMMA RAY				NEUTRON				
	FROM	TO	SPEED FT/AMIN	T.C. SEC.	SENS. SETTINGS	ZERO DIV. L OR R	API G. R. UNITS PER LOG DIV.	T.C. SEC.	SENS. SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV.
1	0	490	12	4	17	0L	10	4	23	1L	30 CPS

REMARKS





# ROKE

GAMMA RAY NEUTRON LOG

OIL ENTERPRISES, LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
SEC	WELL	C - 48
TWP	LOCATION	
RGE	FIELD	SUMUNKA PROJECT
M	PROVINCE	BRITISH COLUMBIA
	Other Services	
Permanent Datum	GROUND LEVEL	Elev. _____
Log Measured from	RIG FLOOR	1.5 Ft. Above Perm. Datum
Well Depths Measured from	RIG FLOOR	CSG _____ G.I. _____
Run No.	ONE	
Date	24 OCTOBER 72	
First Reading	476	
Last Reading	0	
Footage Logged	476	
Depth Reached	477	
Depth Driller	477	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm @ 9F		
Operating Time	2 HOURS	
Track No.	20	
Recorded By	PETERSON	Witnessed By
		JORDAN

650

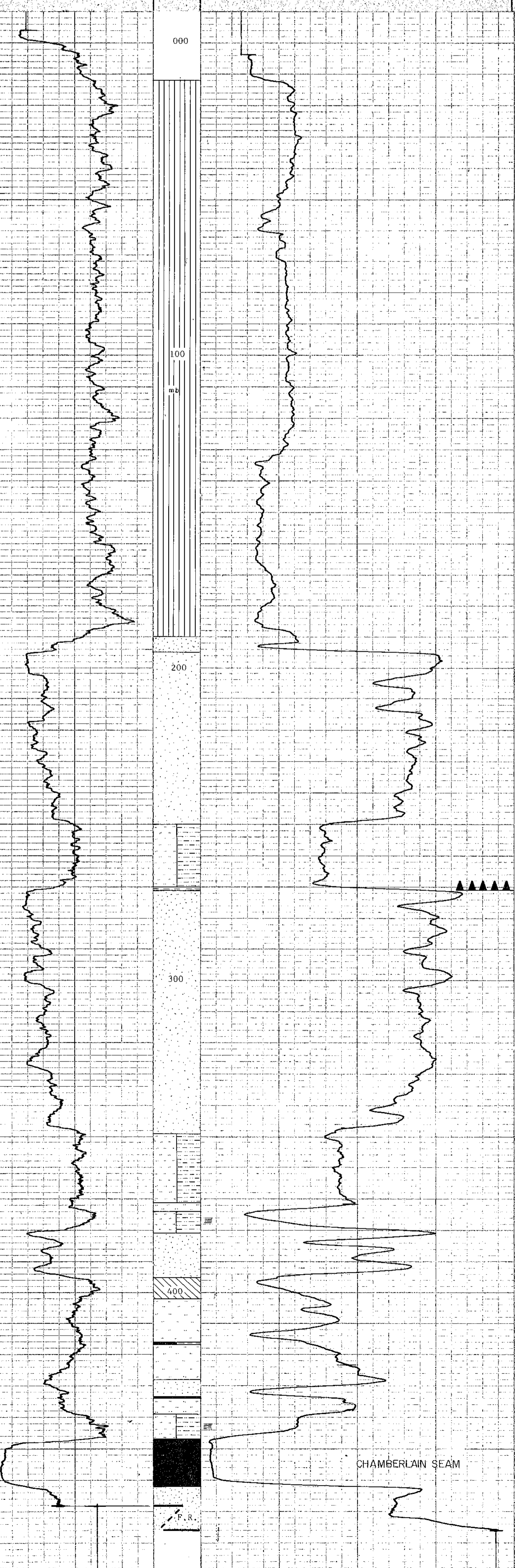
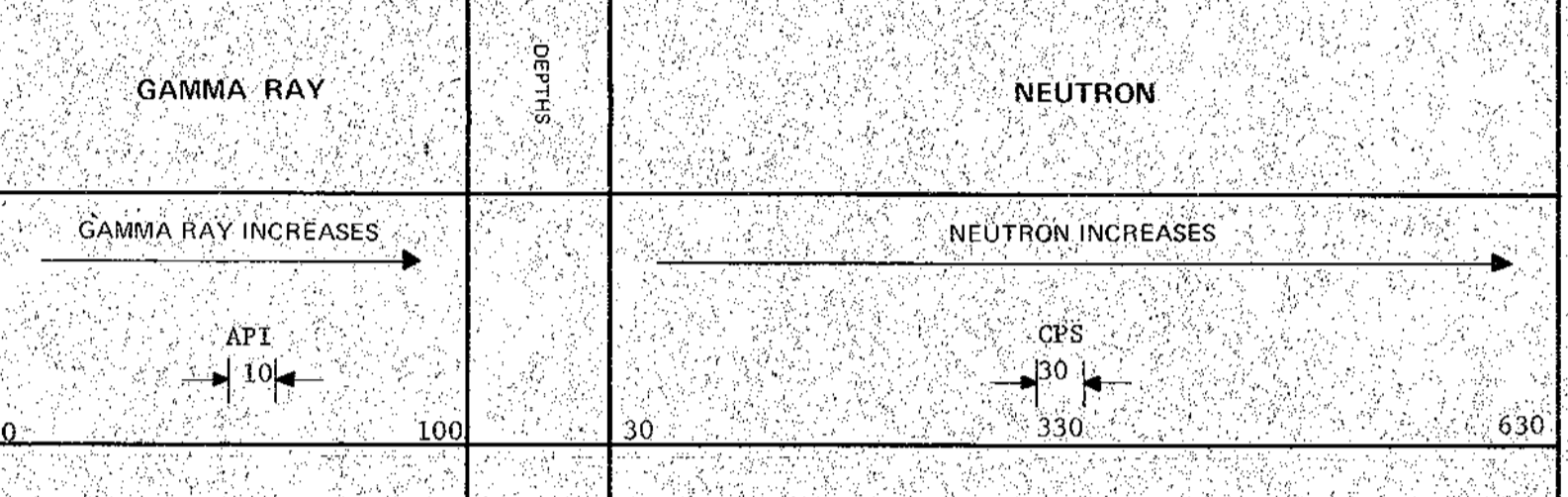
### EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 1/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 1/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
GENERAL		SERIAL NO.	598
HOIST TRUCK NO.	20	SPACING	19 INCH
INSTRUMENT TRUCK NO.		TYPE	AmBe
TOOL SERIAL NO.	CGN27U4A65	STRENGTH	6.94 x 10 <sup>6</sup> N/S

### LOGGING DATA

GENERAL		GAMMA RAY				NEUTRON				
RUN NO.	DEPTHS FROM TO	SPEED FT/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API G. R. UNITS PER LOG DIV.	T. C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV.
1	0 476	12	4	17	0L	10	4	.23	1L	30 CPS

REMARKS



# ROKE

GAMMA RAY NEUTRON LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C - 47
SEC	LOCATION	
TWP	FIELD	SUKUNKA PROJECT
RGE	PROVINCE	BRITISH COLUMBIA
W	Other Services:	TEMP
	Permanent Datum	GROUND LEVEL
	Log Measured from	RIG FLOOR
	Well Depths Measured from	RIG FLOOR
	Elev.	
	2. Ft. Above Perm. Datum	
	K.B.	
	CSG	
	G.L.	
Run No.	ONE	
Date	22 OCTOBER 72	
First Reading	185	
Last Reading	0	
Footage Logged	185	
Depth Reached	187	
Depth Driller	187	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm. @ 0'		
Operating Time	2 HOURS	
Truck No.	20	
Recorded By	PETERSON	Witnessed By
		BRYAN

650

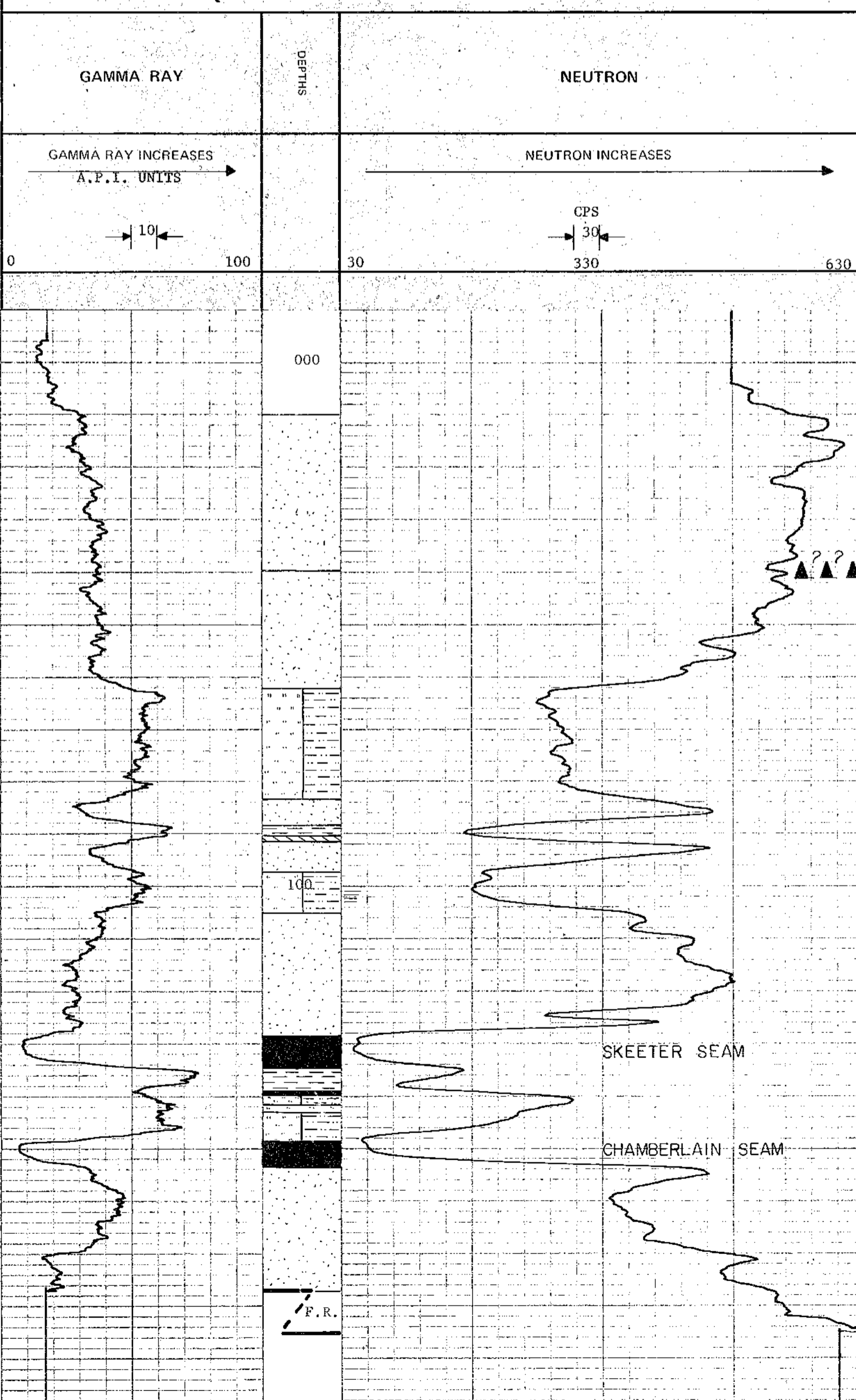
### EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 11/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 11/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
GENERAL		SERIAL NO.	598
HOIST TRUCK NO.	20	SPACING	19 INCH
INSTRUMENT TRUCK NO.		TYPE	AmBe
TOOL SERIAL NO.	CGN27U4A65	STRENGTH	6.94 x 10 <sup>6</sup> N/S

### LOGGING DATA

GENERAL			GAMMA RAY				NEUTRON				
RUN NO.	DEPTHS		SPEED FT/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API G. R. UNITS PER LOG DIV.	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV.
	FROM	TO									
1	0	185	12	4	17	1L	10	4	.23	1L	30 CPS

REMARKS





# ROKE

GAMMA RAY NEUTRON LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C - 46
SEC	LOCATION	SUKUNKA PROJECT
TWP	FIELD	BRITISH COLUMBIA
RGE	PROVINCE	TEMP
W	Other Services:	
M		
Permanent Datum	GROUND LEVEL	Elev.
Log Measured from	RIG FLOOR	1.5 Ft. Above Perm. Datum
Well Depths Measured from	RIG FLOOR	GL
Run No.	ONE	
Date	21 OCTOBER 72	
First Reading	311	
Last Reading	0	
Footage Logged	311	
Depth Reached	312	
Depth Driller	312.6	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm @ 9F		
Operating Time	2 HOURS	
Truck No.	20	

650

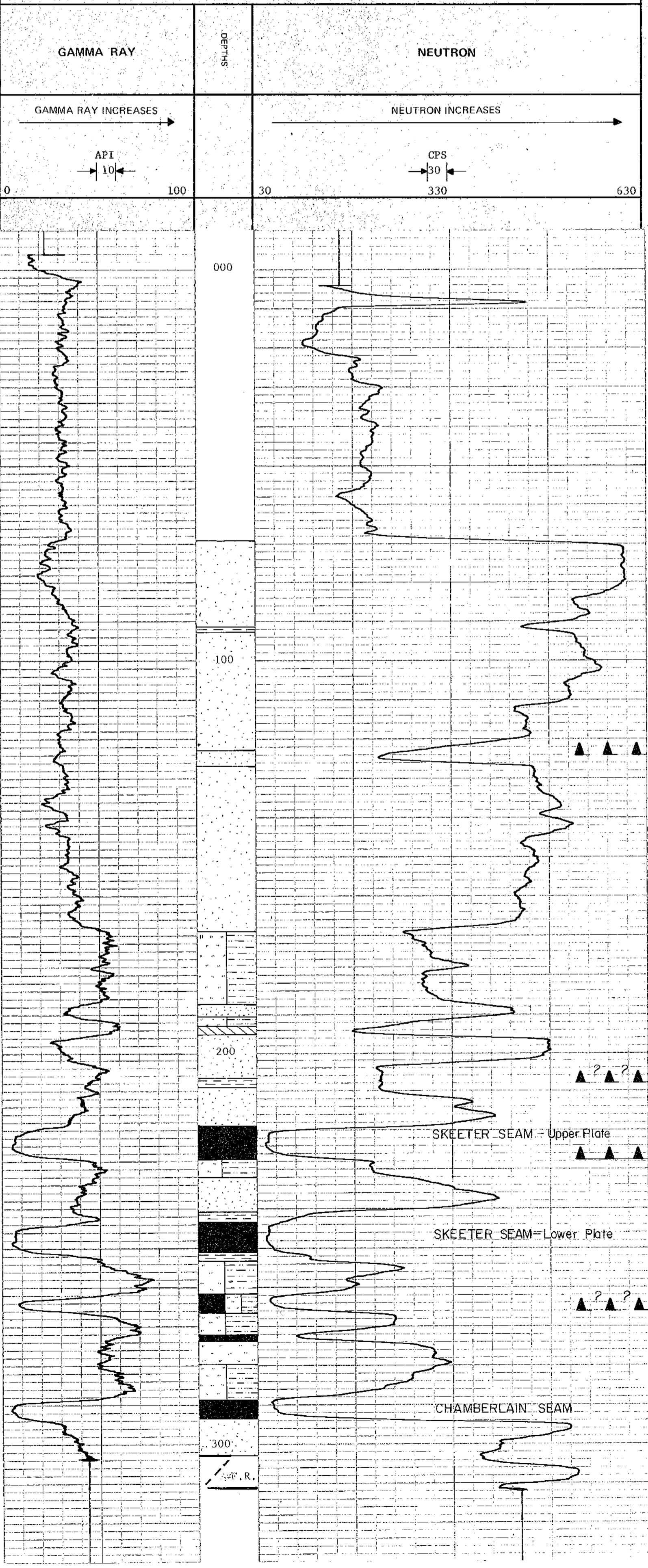
### EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 11/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 11/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
		SERIAL NO.	598
		SPACING	19 INCH
		TYPE	AmBe
		STRENGTH	6.94 x 10 <sup>6</sup> N/S
GENERAL			
HOIST TRUCK NO.	20		
INSTRUMENT TRUCK NO.			
TOOL SERIAL NO.	CGN27U4A65		

### LOGGING DATA

RUN NO.	GENERAL		GAMMA RAY				NEUTRON				
	DEPTHS	SPEED	T.C.	SENS	ZERO	API G. R. UNITS	T. C.	SENS	ZERO	API N. UNITS	
	FROM	TO	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	
1	0	311	12	4	17	0L	10	4	.23	1L	30 CPS

REMARKS



# ROKE

TEMPERATURE LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED	
LSD	WELL	C - 47	
SEC	LOCATION	M	
TWP	FIELD	SUKUNKA PROJECT	
RGE	PROVINCE	BRITISH COLUMBIA	
W.	PERMANENT DATUM	GROUND LEVEL	Elev.
M	LOG MEASURED FROM	RIG FLOOR	2 F. Above Perm. Datum
	WELL DEPTHS MEASURED FROM	RIG FLOOR	G.L.
	Run No.	ONE	
	Date	22 OCTOBER 72	
	First Reading	187	
	Last Reading	0	
	Footage Logged	187	
	Depth Reached	187	
	Depth Driller	187	
	Casing Roke		
	Casing Driller		
	Fluid Type	WATER	
	Liquid Level		
	Min. Diam.	3 INCH	
	Rm @ 9F		
	Operating Time	1 HOUR	
	Truck No.	20	
Recorded By	PETERSON	Witnessed By	BRYAN

Remarks SENSITIVITY - 50 10 DIVISIONS LEFT  
 SCALED AT 5 INCH PER 100 FT



# ROKE

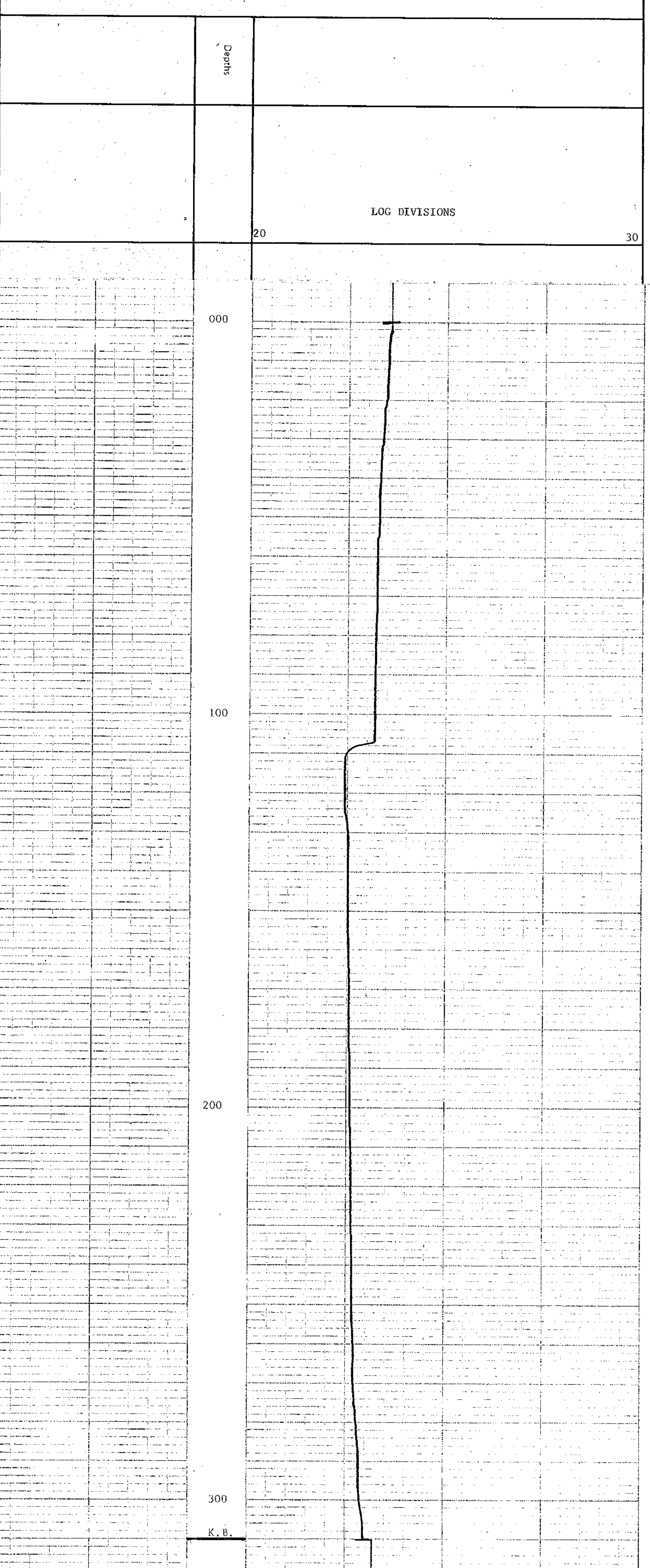
TEMPERATURE LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C - 46
SEC	LOCATION	
TWP	FIELD	SUKUNKA PROJECT
RGE	PROVINCE	BRITISH COLUMBIA
W	Other Services:	GRN
Permanent Datum	GROUND LEVEL	Elev. _____
Log Measured from	RIG FLOOR	1.5 Ft. Above Perm. Datum
Well Depths Measured from	RIG FLOOR	K.B. _____
		CSG _____
		G.L. _____
Run No.	ONE	
Date	21 OCTOBER 72	
First Reading	310	
Last Reading	0	
Footage Logged	310	
Depth Reached	310	
Depth Driller	312.6	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm @ 9F		
Operating Time	1.5 HOURS	
Truck No.	20	
Recorded By	PETERSON	Witnessed By
		BRYAN

650

Remarks SENSITIVITY - 50 10 DIVISIONS LEFT  
LOG SCALED AT 5 INCH PER 100 FT





# ROKE

GAMMA RAY NEUTRON LOG

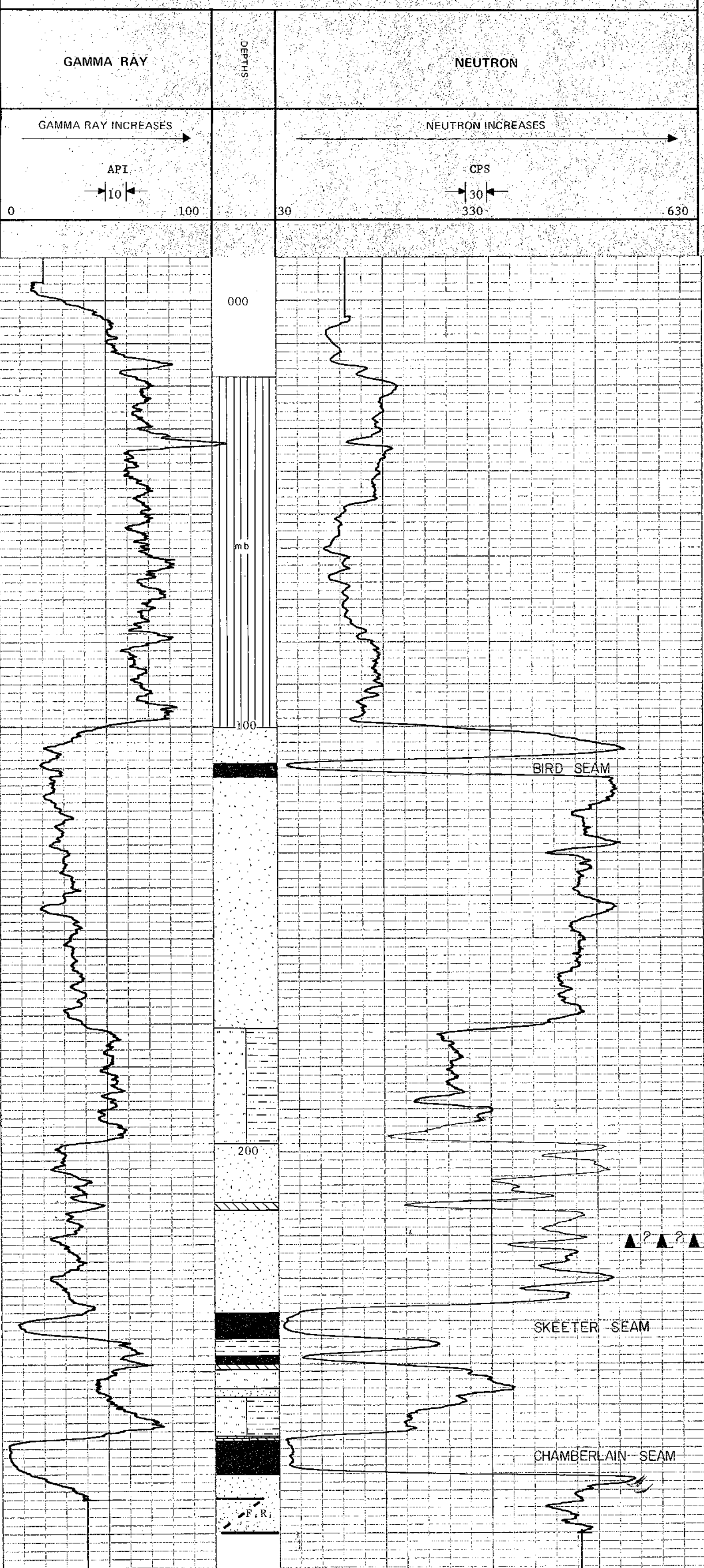
OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C-45
SEC	LOCATION	SUKUMKA PROJECT
TWP	FIELD	BRITISH COLUMBIA
RGE	PROVINCE	BRITISH COLUMBIA
W	PERMITS	GRIND LEVEL
	LOG MEASURED FROM	RIG FLOOR
	WELL DEPTH MEASURED FROM	RIG FLOOR
	Other Services:	TEMP
		K.B.
		CSG
		GL
Run No.	ONE	
Date	18 OCTOBER 72	
First Reading	290	
Last Reading	0	
Footage Logged	290	
Depth Reached	291	
Depth Driller	291	
Casing Rock		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm @ OF		
Operating Time	2 HOURS	
Tick No.	20	
Recorded By	PETERSON	Witnessed By
		BRYAN

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 11/16	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 11/16
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
		SERIAL NO.	598
HOIST TRUCK NO.	20	SPACING	19 INCH
INSTRUMENT TRUCK NO.		TYPE	AmBe
TOOL SERIAL NO.	CGN27U4A65	STRENGTH	6.94 x 10 <sup>6</sup> N/S

GENERAL		GAMMA RAY				NEUTRON					
RUN NO.	DEPTHS	SPEED	T.C.	SENS.	ZERO	API G. R. UNITS	T.C.	SENS.	ZERO	API N. UNITS	
	FROM	TO	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	
1	0	290	12	4	17	0L	10	4	.23	1L	30 CPS

REMARKS





# ROKE

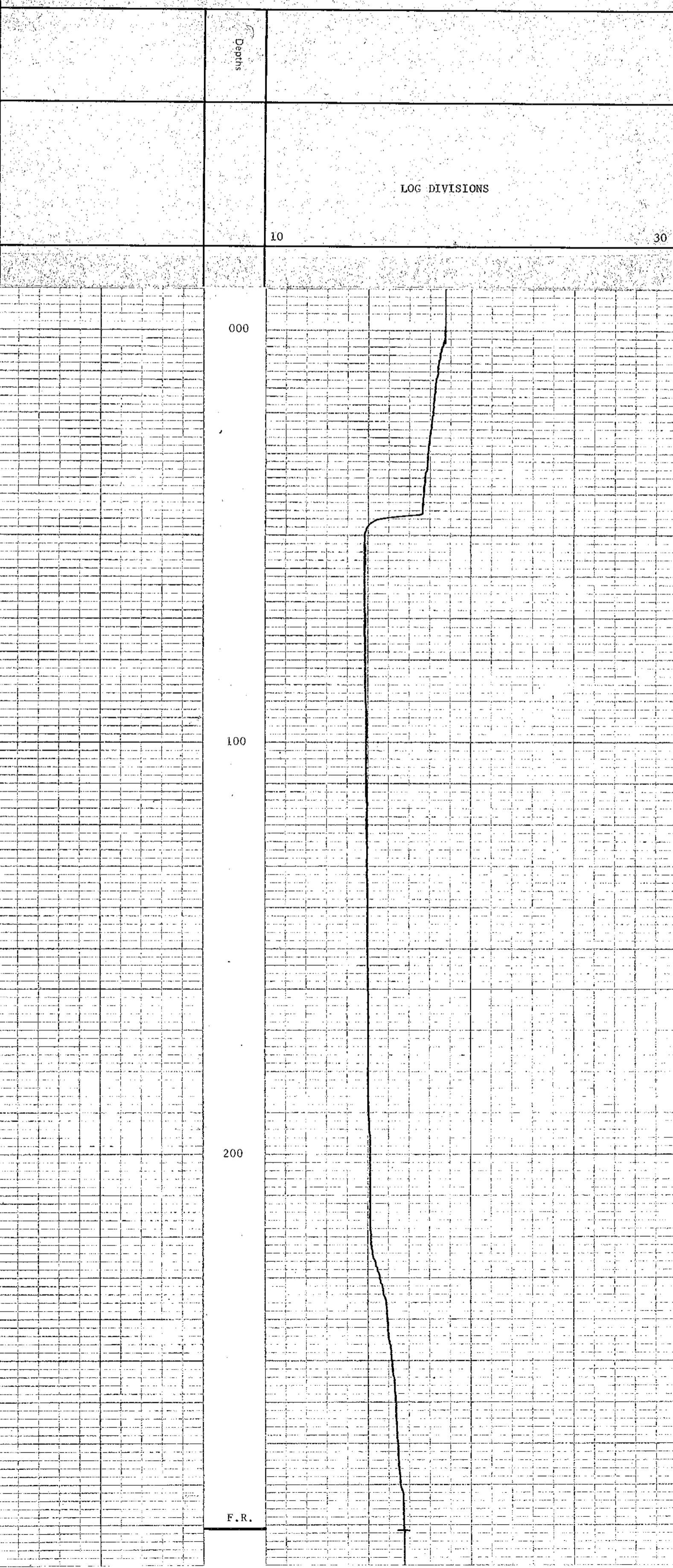
TEMPERATURE LOG

OIL ENTERPRISES LTD. CALGARY ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C - 45
SEC	TWP	
RGE	LOCATION	
W.	FIELD	SUKUNKA PROJECT
M.	PROVINCE	BRITISH COLUMBIA
Permanent Datum	GROUND LEVEL	Elev. _____
Log Measured from	RIG FLOOR	2. Ft. Above Perm. Datum
Well Depths Measured from	RIG FLOOR	G.L. _____
Other Services:	GRN	
Run No.	ONE	
Date	18 OCTOBER 72	
First Reading	291	
Last Reading	0	
Footage Logged	291	
Depth Reached	291	
Depth Driller	291	
Casing-Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm @ 9F		
Operating Time	1.5 HOURS	
Truck No.	20	
Recorded By	PETERSON	Witnessed By
		BRYAN

650

Remarks: SENSITIVITY - 50 10 DIVISIONS LEFT  
LOG SCALED AT 5 INCH PER 100 FT



# ROKE

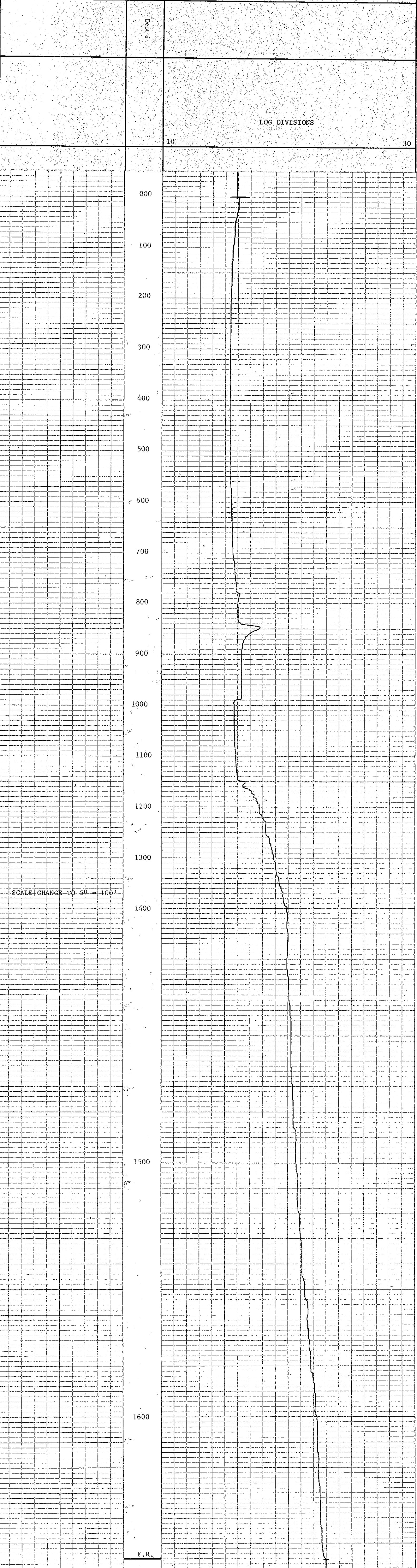
TEMPERATURE LOG

OIL ENTERPRISES LTD. CALGARY ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD	WELL	C. L. 44
SEC	TWP	
RGE	LOCATION	
W	FIELD	SUKINKA PROJECT
	PROVINCE	BRITISH COLUMBIA
	GROUND LEVEL	
Permanent Datum	RIG FLOOR	2
Log Measured from	RIG FLOOR	
Well Depths Measured from	RIG FLOOR	
	Other Services	GRN
	K.B.	
	CSG	
	CL	
Run No.	ONE	
Date	15 OCTOBER 72	
First Reading	1656	
Last Reading	0	
Footage Logged	1656	
Depth Reached	1656	
Depth Driller	1659' 9"	
Casing Roke		
Casing Driller		
Fluid Type	WATER	
Liquid Level		
Min. Diam.	3 INCH	
Rm @ 9F		
Operating Time	3 HOURS	
Truck No.	20	
Recorded By	PETERSON	Witnessed By
		BRYAN

650

Remarks SENSITIVITY - 50 10 DIVISIONS LEFT  
 LOG SCALED AT 1 INCH PER 100 FT FROM ZERO FT. TO 1400 FT.  
 LOG SCALED AT 5 INCH PER 100 FT FROM 1400 FT. TO F.R.





# ROKE

GAMMA RAY NEUTRON LOG

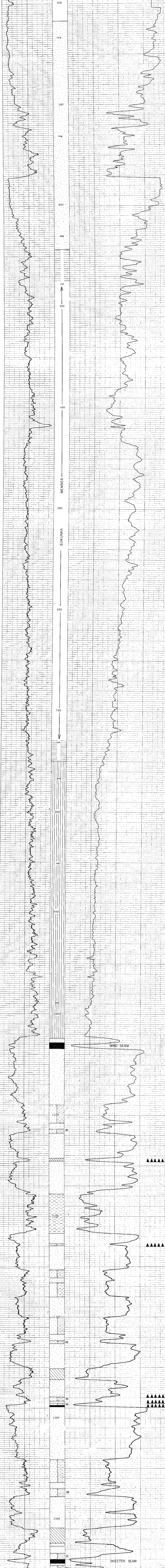
OIL ENTERPRISES LTD. CALGARY ALBERTA

FILE NO.	COMPANY	COALITION MINING LIMITED
LSD SEC	WELL	C-44
RCE	LOCATION	
W	FIELD	SUKUNKA PROJECT
	PROVINCE	BATCHELOR ALBERTA
Permanant Datum	GROUND LEVEL	
Log Measured from	RIG FLOOR	RIG FLOOR
Well Depth Measured from	2 ft. Above Perm. Datum	
Run No.	ONE	
Date	15 OCTOBER 72	
First Reading	1656	
Last Reading	0	
Footage Logged	1656	
Depth Reached	1656' 9"	
Depth Driller	1656' 9"	
Casing Driller		
Fluid Type	WATER	
Mud Diam.	3 INCH	
Ann. Diam.		
Flow @ 90'		
Flowing Time	4 HOURS	
Flow No.	ZO	
Flowing Time		
Flow No.		

EQUIPMENT DATA			
GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.	1116	LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 1/2	TOOL MODEL NO.	1116
DETECTOR MODEL NO.		DIAMETER	1 1/2
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT.	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
		SERIAL NO.	598
		SPACING	19 INCH
		TYPE	AmBe
		STRENGTH	6.94 x 10 <sup>6</sup> N/S

LOGGING DATA											
GENERAL				GAMMA RAY				NEUTRON			
RUN NO.	DEPTH	SPEED	T.C.	SENS	ZERO	API G. R. UNITS	T.C.	SENS	ZERO	API N. UNITS	
NO.	FROM	TO	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	SEC.	SETTINGS	DIV. L OR R	PER LOG DIV.	
1	0	1656	12	4	17	0L	10	4	23	11	30

REMARKS



Recorded By: PETERSON Withread By: BRYAN

650



PR-SUKUNKA - 72(3) 2  
NATIONAL TRUST CO. LTD. (AS TRUSTEE)

COALITION MINING LIMITED

SUKUNKA COAL PROJECT

GEOLOGY  
VOLUME 2 SUPPLEMENT

**CONFIDENTIAL**  
**OPEN FILE**

**GEOLOGICAL BRANCH**  
**ASSESSMENT REPORT**

**00 650**

APPENDIX E

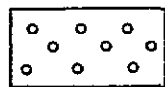
ROOF STRATA LITHOLOGIES  
SUKUNKA MINE NO. 1 HEADINGS

Reference for Graphic  
Sections of Drill Hole Data

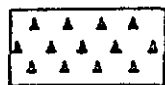
See reverse side

DETAIL OF GETHING FORMATION

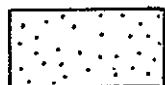
Scale 1" = 50'



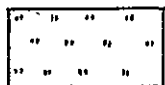
CONGLOMERATE  
pebble to granule



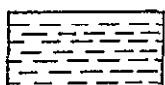
BRECCIA



SANDSTONE



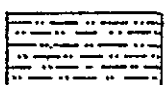
SILTSTONE



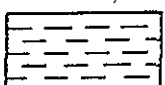
CLAYSTONE



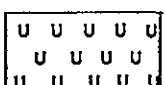
STONE COALY or  
CLAYSTONE  
CARBONACEOUS



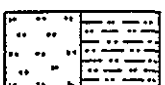
MUDSTONE



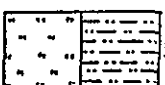
SHALE, SILTSHALE,  
CLAYSHALE



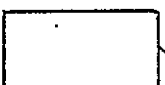
SOIL, WEATHERED and  
UNCONSOLIDATED  
MATERIAL



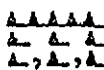
INTERBEDDED



LAMINITE



45° INCLINED STRATA

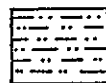


FAULT

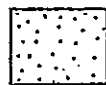
established  
probable  
possible

TOTAL DRILL HOLE SECTIONS

Scale 1" = 200'

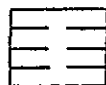


HULLCROSS MEMBER



COMMOTION  
FORMATION

GATES MEMBER



SUKUNKA MEMBER

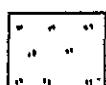


MOOSEBAR  
FORMATION



GETHING  
FORMATION

UPPER GETHING  
SEQUENCE



GETHING  
FORMATION

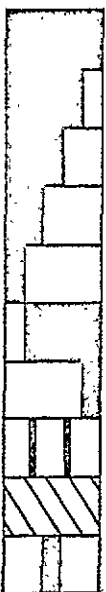
LOWER GETHING  
SEQUENCE



CADOMIN  
FORMATION

COAL SEAMS

Scale 1" = 2'



COAL BRIGHT or UNDIFFERENTIATED

COAL MAINLY BRIGHT with MINOR DULL  
BANDS

COAL DULL and BRIGHT

COAL MAINLY DULL with MINOR BRIGHT  
BANDS

COAL DULL

COAL INTERLAYED with NON-COAL

NON-COAL INTERLAYED with COAL

COAL STONY

STONE COALY

COAL WEATHERED

REFERENCE FOR GRAPHIC SECTIONS

of

DRILL HOLE DATA

PREPARED BY CLIFFORD McELROY & ASSOCIATES PTY LIMITED

COALITION MINING LIMITED

SUKUNKA COAL PROJECT

January 1972

## APPENDIX E

### ROOF STRATA LITHOLOGIES

#### NO. 1 MINE HEADINGS

##### INTRODUCTION

The roof strata of both the Chamberlain and Skeeter Seams were logged in detail for those drill holes lying along the No. 1 Mine headings between the portals and Chamberlain Creek. The written detailed logs, graphic logs and two sections are included here to provide information on the roof strata as development of the headings proceeds.

It should be recognised that the points of observation (the drill holes) are as much as 2,000 feet apart and that the data gives some indication of the nature and extent of overall changes in the roof lithologies. The continuity of the roof strata lithologies, as indicated from the drill hole data and from outcrop observations, suggests that similar roof conditions should prevail throughout the mine, where there are no other contributing factors.

The roof strata were logged in the following drill holes; C-3, C-7, C-11, C-12, C-33, CS-3, CS-4, CS-5, CM-1, CM-2, CM-3, CM-4, CM-5 and S-22.

##### NOTES ON LOGGING TECHNIQUES

Observations have been made on the nature of the boundary at changes in lithology, the nature of the bedding within each unit and the thickness of each lithology or sedimentation unit where



relevant. The relative parting strength of each rock type has been noted in terms of the ease with which the core could be manually broken.

Joints, fractures, calcite veins, breccia zones and slickensided or listric surfaces have been recorded in the written logs. For these planar features the relation to this core axis is recorded, but it is not possible to determine the true attitude of these planar features. From observations both in the outcrop and underground it has become apparent that while some slickensides parallel to bedding may be continuous over several hundred feet, others are of very limited extent. The small breccia zones and calcite veins are also of limited extent.

#### THE ROOF OF THE CHAMBERLAIN SEAM

The roof of the Chamberlain Seam, along the No. 1 Mine headings, is a laminite unit which is everywhere in excess of 8 feet thick. At the portals and in D.D.H. CM-2, the siltstone laminae are less distinct, or are absent, and the term mudstone or carbonaceous claystone is more appropriate in that area. Section E-1 shows the roof lithologies above the Chamberlain Seam.

As a continuous, lithologically uniform unit, between 8 feet and 14 feet thick the laminite roof is considered to be a relatively stable rock unit, when the structural environment is regular, considered in relation to coal extraction by continuous miner. The alternating siltstone and mudstone layers are commonly about 0.03 feet thick. Parting may occur along some of the bedding planes and along subconchoidal fractures immediately above the coal if the roof is not supported or if roof bolting is not accomplished soon after extraction of the coal.

In some of the drill holes, where the roof strata were logged in detail, slickensided and listric surfaces and thin breccia zones were recorded at various intervals above the seam. These are considered to be associated with local shear or thrust planes which are coincident with, or sub-parallel to bedding planes, though some of the individual surfaces are oblique to the bedding planes. Except where these low angle shear zones occur in the strata immediately above the coal, they are not expected to affect the roof stability. Some measure of the frequency and effect of these structures will be determined during the development mining along the headings of No. 1 Mine.

The laminite roof of the Chamberlain Seam is overlain by between 3 feet and 12 feet of siltstone and/or sandstone, which underlies the thin mudstone floor of the Skeeter Seam.

The following observations are significant in terms of roof stability.

(a) The roof of the Chamberlain Seam is a laminite unit more than 8 feet thick, that is remarkably uniform in drill holes throughout Plate 2a.

(b) The weathered drill core indicates that the laminite roof will tend to part along bedding planes in units between 0.03 feet and 0.3 feet thick. Variations in temperature and/or moisture content may tend to increase the tendency to part along bedding planes and fractures, causing fretting of the roof.

(c) The presence of planar surfaces, oblique to bedding,

are considered to reflect the presence of 'sigmoidal laminite zones' or 'slip wedges' such as those observed underground and described in Section 4.3 of this report.

(d) In only one drill hole that was studied in detail, D.D.H. C-11, does such a zone occur within 5 feet of the roof of the Chamberlain Seam. In that drill hole, a slickensided zone 1.95 feet thick occurs 1.13 feet above the roof of the seam.

#### THE ROOF OF THE SKEETER SEAM

The immediate roof of the Skeeter Seam along the direction of the No. 1 Mine headings is a mudstone or carbonaceous mudstone generally between 0.5 feet and 1 foot thick. This mudstone parts readily along bedding planes and may frequently be taken during mining. Section E-2 shows the roof lithologies along the No. 1 Mine headings. It should be noted that the working section of the Skeeter Seam does not extend as far south as Chamberlain Creek. The southern limit of the working section is indicated on Section E-2.

The datum of the cross section is the geological roof of the Skeeter Seam, that is, the top of the coal. In some areas the working section will not include the uppermost coal, and the working roof will then be the Upper Rock Band of the Skeeter Seam.

A thick sandstone unit overlies the mudstone roof of the uppermost coal, but between S-22 and CM-5 an additional mudstone unit is present in the lower 5 feet of the roof strata.

In the drill cores that were studied in detail the roof strata are notably free of shear zones, slickensides, listric surfaces or other planar zones of weakness that might result in poor roof conditions. The sandstone is relatively massive and well cemented, with irregular thin coaly wisps which do not detract from the overall competent nature of the unit.

The strata above the Skeeter Seam will provide sound roof conditions, though up to 1 foot of mudstone immediately above the coal may come down or be necessarily taken during mining in the same areas.

LOGS OF ROOF ROCKS OVER SKEETER  
AND CHAMBERLAIN SEAMS

The following section contains the stratigraphic sections and detailed logs of the rocks overlying the Skeeter and Chamberlain Seams.

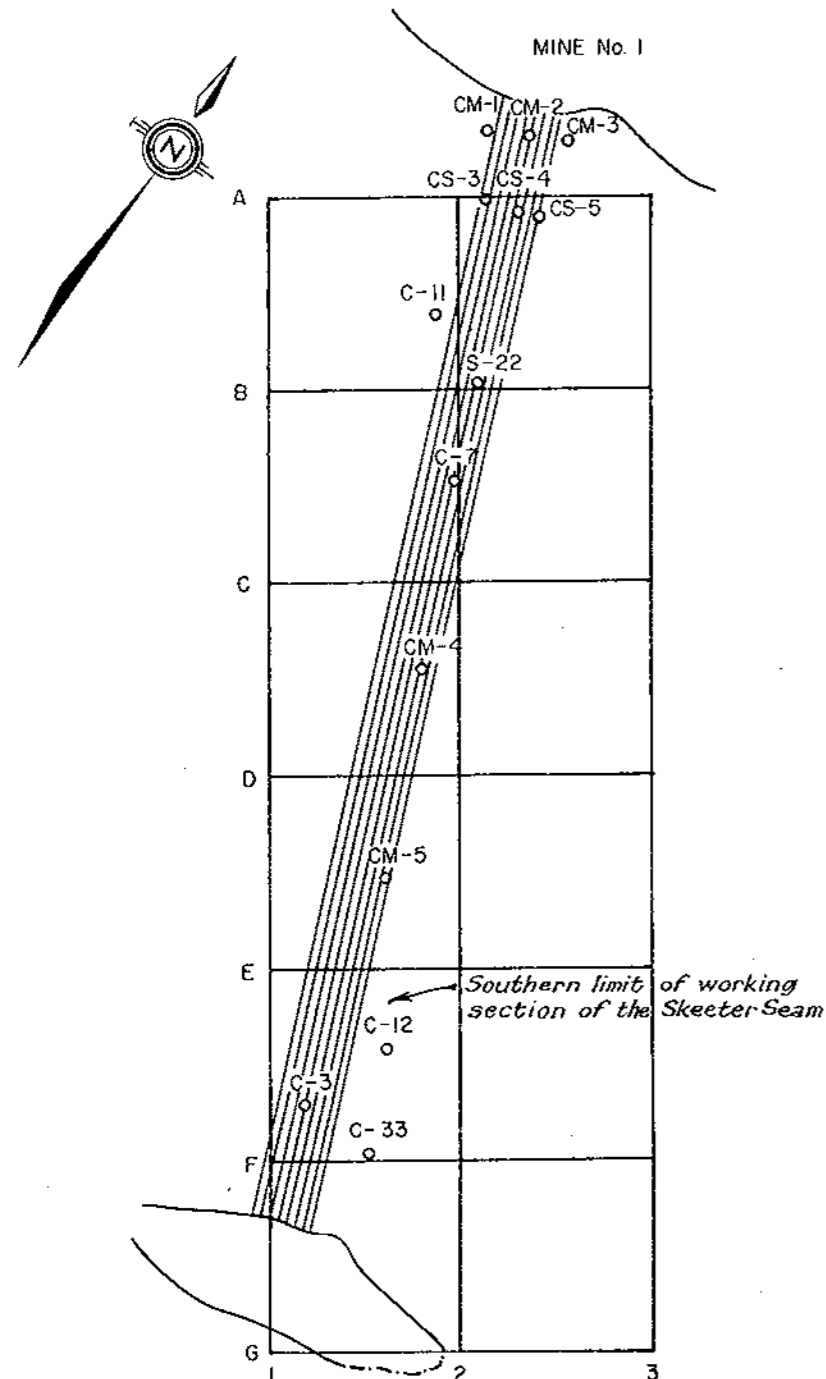
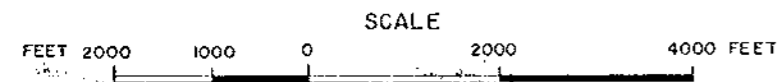
Data are included for the following diamond drill holes.

<u>D.D.H.</u>	<u>Page</u>	<u>D.D.H.</u>	<u>Page</u>
C - 3	1	CM - 2	37
C - 7	7	CM - 3	41
C - 11	14	CM - 4	47
C - 12	18	CM - 5	53
C - 33	22	CS - 3	63
S - 22	28	CS - 4	67
CM - 1	33	CS - 5	73

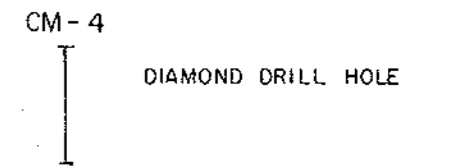
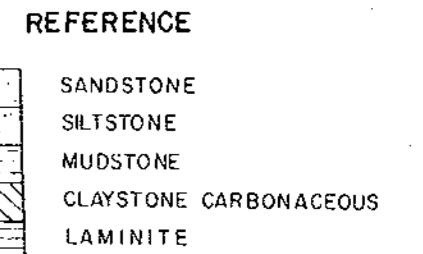
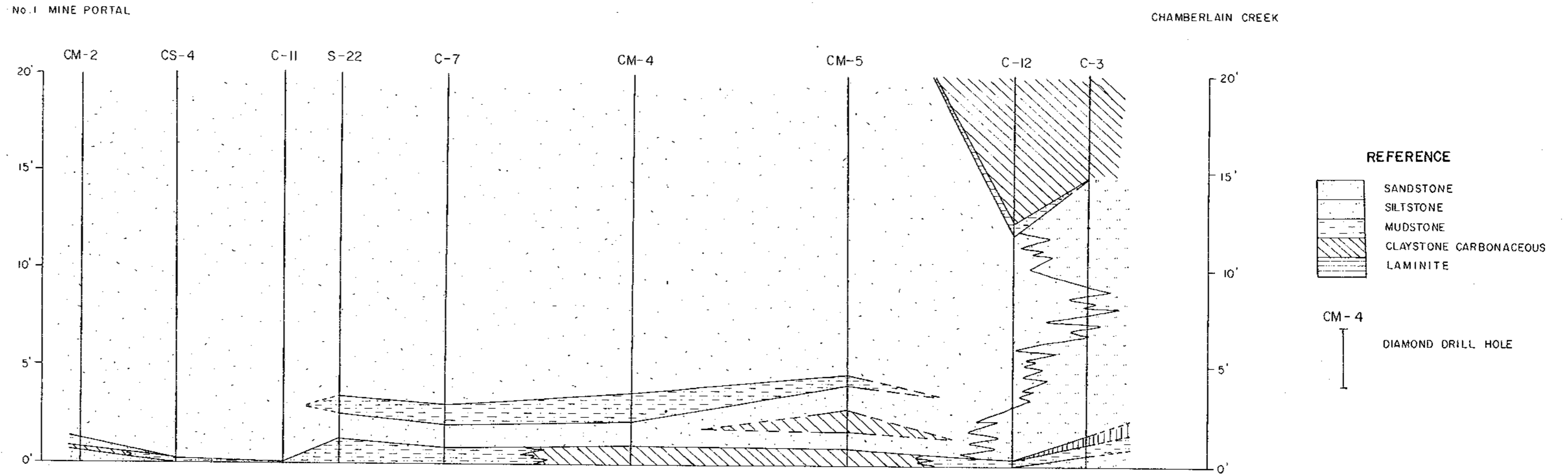
# SECTION E-2

To accompany Appendix E

## LOCATION MAP



# 650 GEOLOGICAL CROSS SECTION - ROOF LITHOLOGIES - SKEETER SEAM



DATUM : ROOF OF SKEETER SEAM

DIAGRAMMATIC ONLY

HORIZONTAL SCALE : 1" = 1000'  
VERTICAL SCALE : 1" = 5'

Prepared by  
CLIFFORD McELROY & ASSOCIATES Pty. Limited.  
for  
COALITION MINING LIMITED

DRAWN BY : M.G.

DATE : 6-11-72

REF No: SKR 186

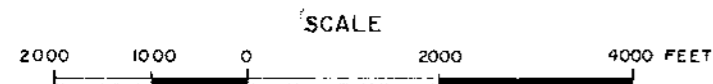
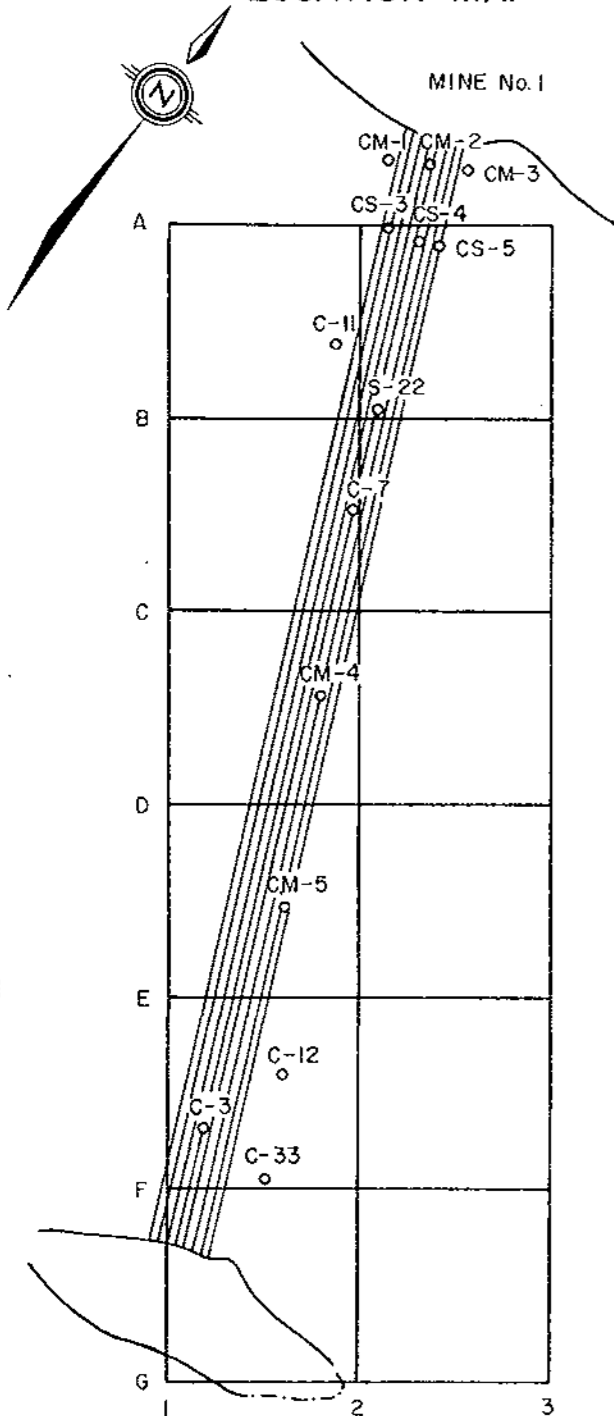
# SECTION E-1

To accompany Appendix E

# 650

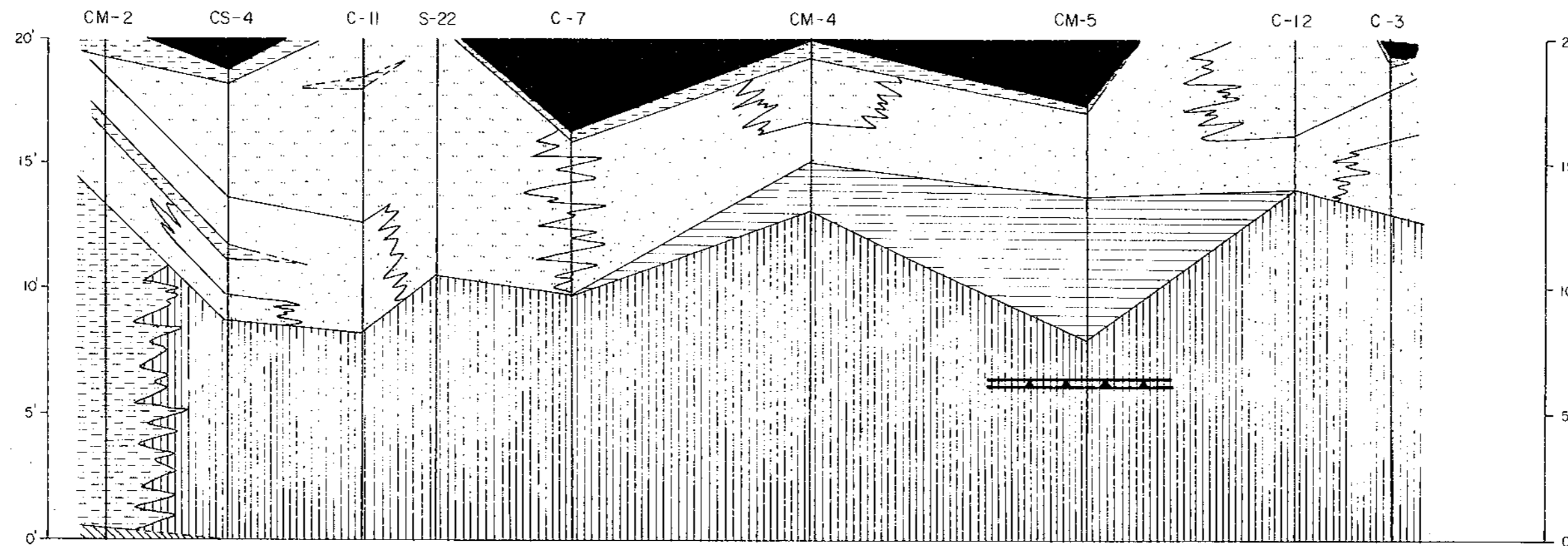
## GEOLOGICAL CROSS SECTION — ROOF LITHOLOGIES — CHAMBERLAIN SEAM

### LOCATION MAP



No. 1 MINE PORTAL

CHAMBERLAIN CREEK



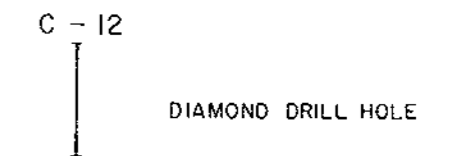
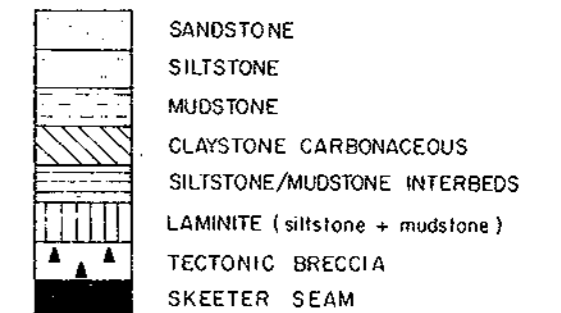
DATUM - ROOF OF CHAMBERLAIN SEAM

DIAGRAMMATIC ONLY

HORIZONTAL SCALE : 1" = 1000'

VERTICAL SCALE : 1" = 5'

### REFERENCE

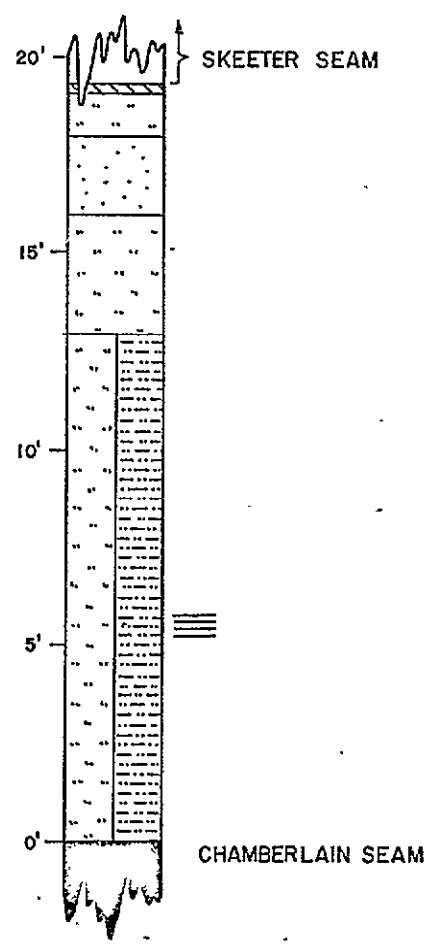
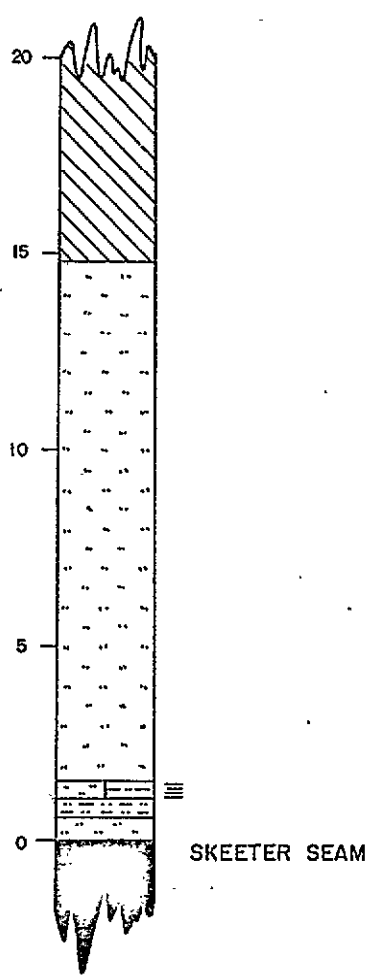


Prepared by  
CLIFFORD McELROY & ASSOCIATES Pty Limited.  
for  
COALITION MINING LIMITED

DRAWN BY: M.G.

DATE: 6-11-72

REF. No: SKR 185



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH C - 3

DRAWN BY M.G. DATE: NOVEMBER, 1972



LOG OF ROOF ROCKS  
SUKUNKA D.D.H. C-3

Logged By: F.H.S. Tebbutt <sup>Skeeter Seam</sup>

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, fine grained, lithic, coaly wisps, lenses and irregular masses. Well cemented and compact, breaking along carbonaceous layers or coaly wisps into 0.5' thicknesses. Sharp boundary with unit below from which it parts only with some difficulty</p>	25.74	1.92
<p>SILTSTONE, grey, but black and carbonaceous in top 0.7' and carbonaceous with grey interbeds in basal 1.3'. Central section with numerous carbonaceous interbeds and coaly wisps. Breaks readily into 0.15' thicknesses along coaly wisps. Basal boundary sharp.</p>	23.82	3.58
<p>CLAYSTONE, carbonaceous, with a few thin phases of stone coaly and coaly bands. Shelly fossils in top 0.45'. Breaks readily into 0.05' thicknesses. A fracture occurs parallel to core axis for 0.85' beginning 0.38' from base and</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-3

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>running upwards (no calcite).</p>	20.24	5.41
<p>SILTSTONE, grey to brownish grey, with interbeds of mudstone and fine grained sandstone, the latter being prominent in centre of unit.</p> <p>Mudstone interbeds in basal 1.8'. Bedding disturbed by minor slumping and cross-bedding. Rock breaks mainly in mudstone interbeds in top part into 0.15' thicknesses. It resists breaking in centre of unit but in basal mudstone interbeds it parts readily to 0.06' thicknesses. Grades into unit below. A thin calcite vein occurs 5.42' above base parallel to the bedding.</p>	14.83	13.28
<p>LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded units. Rock parts readily into 0.03' thicknesses.</p>	1.55	0.46
<p>MUDSTONE, dark grey, becoming carbonaceous at base. A few</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-3

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>siltstone interbeds. Breaks roughly but readily along bedding planes into 0.03' thicknesses which crumble to small pieces when weathered.</p>	1.09	0.45
<p>SILTSTONE, grey, with mudstone interbeds and coaly wisps. Breaks into 0.1' thicknesses.</p>	0.64	0.64
<p>Skeeter Seam</p> <p>Roof at 515.98 feet below collar.</p>		

LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-3

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
All bedding at 90° to core axis unless otherwise specified		
<u>COAL</u> , stony	19.27	0.17
SILTSTONE, darkish grey, carbonaceous at top and diminishing towards base. Coaly wisps, breaks into 0.2' thicknesses. Irregular but sharp junction with underlying unit.	19.10	1.10
SANDSTONE, grey, fine grained, mudstone interbeds and coaly wisps. Breaks along coaly wisps and mudstone interbeds into thicknesses as low as 0.15' but averaging 0.3'.	18.00	2.03
SILTSTONE, grey with numerous darker grey mudstone interbeds. Breaks roughly along bedding planes to 0.2' thicknesses, reducing to 0.7' in basal 0.7'. Grades into unit below	15.97	3.01
LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded units. Some slickensided planes at 70° to core axis 4.38' from top with heavy slickensided		

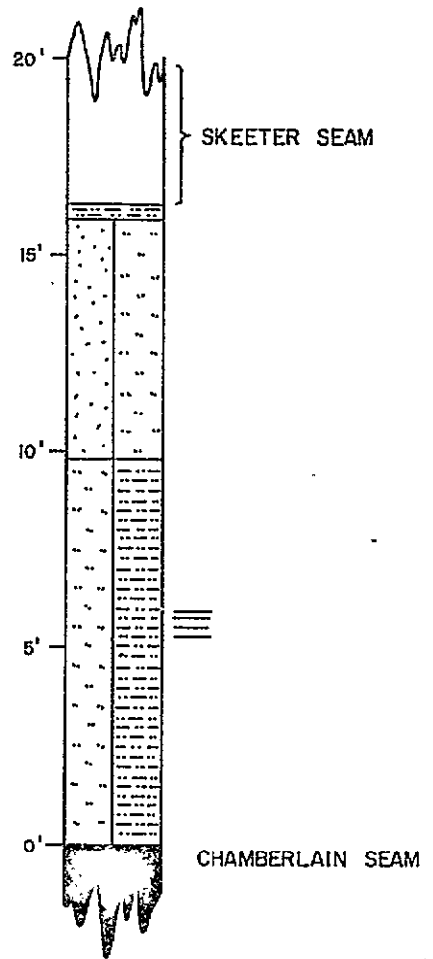
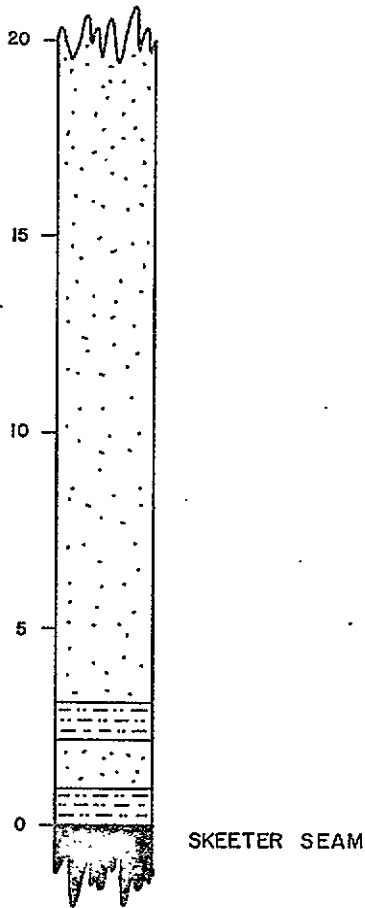
## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-3  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>calcite vein at 60° to core axis 4.98' from top. At 5.68' from top, a listric surface separates a sudden discontinuity in the bedding, the bedding below being at 70° to core axis and curving back towards 90° to core axis along listric surfaces over a thickness of 0.08' with some calcite. Rock parts readily into 0.03' thicknesses, is broken in the curved bedded section referred to above, and in basal 0.5' the partings are 0.01' and tend to crumble when weathered.</p>	12.96	12.96
Chamberlain Seam		
Roof at 528.37 feet below collar.		



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH C-7

DRAWN BY M.G.

DATE: NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H.C-7

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, very fine grained, lithic, numerous thin siltstone interbeds and coaly wisps. Well cemented and hard to break.</p>	32.88	3.24
<p>SILTSTONE, grey, thin mudstone interbeds becoming more numerous and regular towards base. Minor slump structure 0.95' from top. Breaks readily, though roughly along bedding planes into 0.08' thicknesses in lower half. Junction with overlying sandstone sharp and well cemented. A fracture plane at 18° to core axis exists 1.6' from top.</p>	29.68	4.60
<p>MUDSTONE, dark grey, parts readily. Junction with overlying siltstone gradual.</p>	25.08	0.91
<p>SANDSTONE, grey with a few fine brown interbeds, medium grained with fine grained phases. Numerous coaly wisps and thin carbonaceous phases along which the sandstone</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-7

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>tends to part at intervals of about 0.3'. Two fractures at 16° to core axis (no calcite) occur at 1.8' and 2.8' from base.</p>	24.17	21.16
<p>MUDSTONE, dark grey. Junction with overlying sandstone sharp and well compacted. Breaks readily though roughly parallel to bedding planes.</p>	3.01	0.92
<p>SANDSTONE, grey, fine grained, lithic, numerous coaly wisps, some very small brown sandstone blebs. Generally well cemented (only one parting). Junction with overlying mudstone sharp.</p>	2.09	1.15
<p>MUDSTONE, dark grey. Thin interbeds of fine grained, grey sandstone. Readily parts roughly along the bedding planes into thin layers and weathers into small fragments.</p>	0.94	0.94
<p>Skeeter Seam Roof at 819.95 feet below collar.</p>		



## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-7  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>N.B. The core box containing all but the lower 2' of this log was upset and disarranged <u>after</u> logging during the 1971 season. The core was preserved, and the log below was prepared using the stratigraphic sequence and measurements from the original detailed log, adding information in relation to roof strength obtained by testing approximate specimens of core from the disarranged core.</p>		
<p>MUDSTONE, dark grey, some coaly partings, well compacted, grading gradually into the unit below.</p>	16.39	0.44
<p>SANDSTONE and SILTSTONE INTERBEDDED, sandstone grey, and pale brown, mainly fine grained containing fine carbonaceous phases and small irregular carbonaceous structures interbedded with siltstone grey with coaly partings. Rock breaks along coaly phases and partings into thicknesses ranging 0.1' to 0.45'</p>	15.95	6.15

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-7  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>LAMINITE, siltstone, brownish grey and mudstone dark grey interbedded in graded units. Parts readily parallel to bedding into thicknesses of 0.08', grades to a dark grey mudstone in basal 0.6' which parts into thicknesses of 0.01'.</p> <p>Chamberlain Seam Roof at 849.95 feet below collar.</p>	9.80	9.80

LOG OF ROOF ROCKSD.D.H. C-10

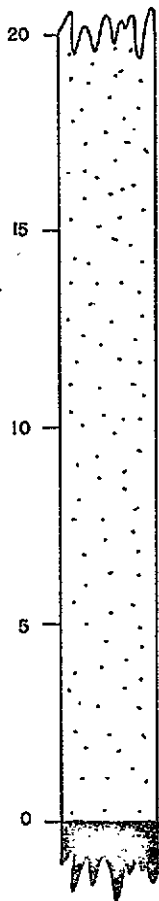
No stratigraphic section has been drawn for this drill hole as the core is structurally disturbed.

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. C-10

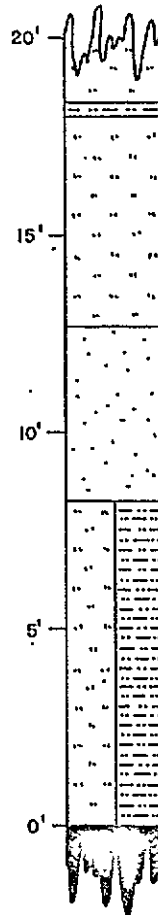
Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at <math>90^{\circ}</math> to core axis unless otherwise specified</p> <p>Not logged in detail as the Skeeter Seam in this hole is in Plate 2A, and was intersected between two faults; consequently it is unlikely that the area will be mined.</p> <p>Bedding angle of Skeeter Seam roof <math>42^{\circ}</math> to core axis.</p> <p>Bedding angle in Chamberlain Seam roof <math>50^{\circ}</math> to core axis, closely resembling the Skeeter Seam floor</p> <p>Bedding angle on Chamberlain Seam floor <math>52^{\circ}</math> to core axis.</p>		



SKEETER SEAM



CHAMBERLAIN SEAM

SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.

for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS

DDH C-II

DRAWN BY M.G.

DATE: NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-11

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded units. Carbonaceous in basal 0.35'. Breaks readily into 0.05' thicknesses.</p>	30.52	1.38
<p>SANDSTONE, grey, fine to medium grained, lithic, numerous coaly wisps, lenses and thin carbonaceous phases. Breaks along coaly partings averaging about 0.3'</p>	29.14	29.14
<p>Skeeter Seam</p> <p>Roof at 811.37 feet below collar.</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-11  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
All bedding at 90° to core axis unless otherwise specified		
MUDSTONE, grey, a few coaly wisps. Breaks readily to 0.06' thickness	21.62	0.80
SILTSTONE, grey, sharp boundaries at top and bottom, well compacted. Breaks along coaly wisps to 0.3' thicknesses.	20.82	2.37
MUDSTONE, dark grey, some light grey siltstone interbeds. Breaks readily into 0.04' thicknesses	18.45	0.41
SILTSTONE, grey, numerous brownish fine grained sandstone interbeds with coaly wisps in centre section. A small fold in a zone of 0.2', 2.54 ft. from top and with a calcite vein through its axis at 70° to core axis. Other veins above and below are at 55° to core axis. The acute angle between the planes of the two types of calcite veins is normal to the core axis. Breaks into 0.25' thicknesses.	18.04	5.39
SANDSTONE, grey, fine grained, lithic, minor scale cross bedding,		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-11

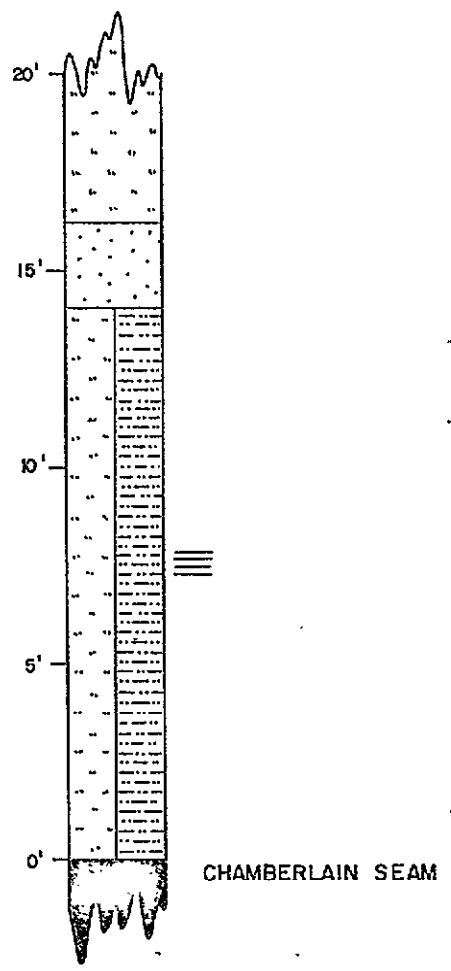
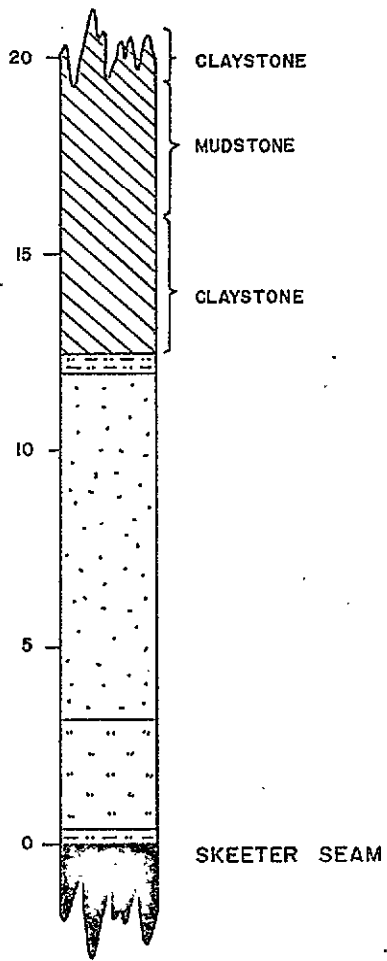
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>numerous mudstone interbeds and coaly wisps. Breaks along mudstone interbeds to about 0.35' thicknesses</p>	12.65	4.32
<p>LAMINITE, siltstone brownish grey and mudstone grey interbedded into graded units. At 5.25' from top beds become inclined to a minimum of 32° to core axis over a thickness of 1.95'. In this zone, all fractures have listric surfaces to about 0.07' apart. Breaks into 0.04' thicknesses readily.</p>	8.33	8.33
<p>Chamberlain Seam</p> <p>Roof at 843.58 feet below collar.</p>		





SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
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COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH C-12

DRAWN BY M.G. DATE: NOVEMBER, 1972

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. C-12  
Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>N.B. This log is a composite of the C-12 detailed log made in the 1971 Season and of roof structure study done in the 1972 Season in which one of the core boxes had been overturned and disarranged.</p>		
<p>CLAYSTONE, carbonaceous, with a few coaly bands, extensively sheared and with numerous listric surfaces at 40° to core axis and also at 30° to core axis in the opposite direction across the core axis.</p>	22.53	3.40
<p>MUDSTONE, carbonaceous, stressed and weathered into small fragments. Probably parts readily when fresh.</p>	19.13	3.13
<p>CLAYSTONE, carbonaceous. Extensively sheared, listric surfaces, some with calcite veins. Parts readily along listric surfaces at 46° to core axis.</p>	16.00	3.50

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-12

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, grey, weathered into small fragments. Probably parts readily. Moderately sharp boundary with lower unit.</p>	12.50	0.52
<p>SANDSTONE, brownish grey, fine grained, lithic, very fine grained at top. Difficult to break, well cemented and compact.</p>	11.98	5.27
<p>SANDSTONE, as above, but no fine grained phases. Difficult to break</p>	6.71	3.61
<p>SILTSTONE, grey, fine grained sandstone and mudstone interbeds. Sharp junction with overlying sandstone. Breaks along thin coaly wisps into 0.25' thicknesses.</p>	3.10	2.69
<p>MUDSTONE, dark grey, coaly wisps. Breaks readily into 0.07' thicknesses.</p>	0.41	0.41
<p>Skeeter Seam Roof at 838.41 feet below collar.</p>		

## LOG OF ROOF ROCKS

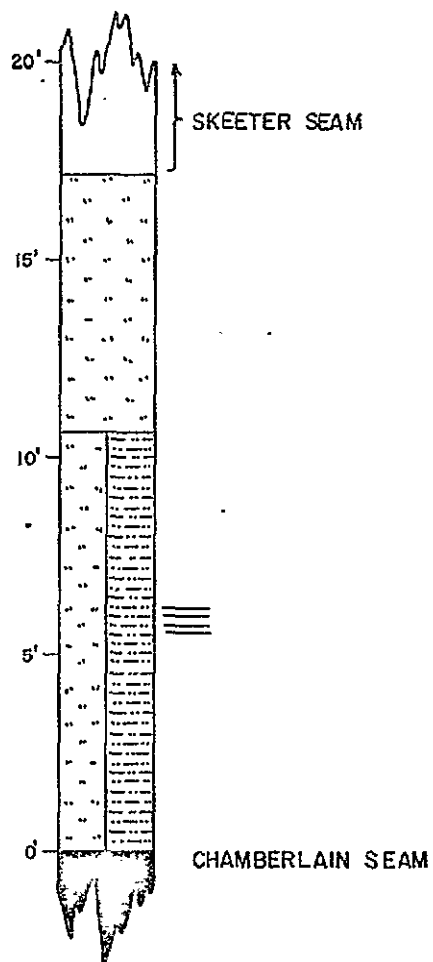
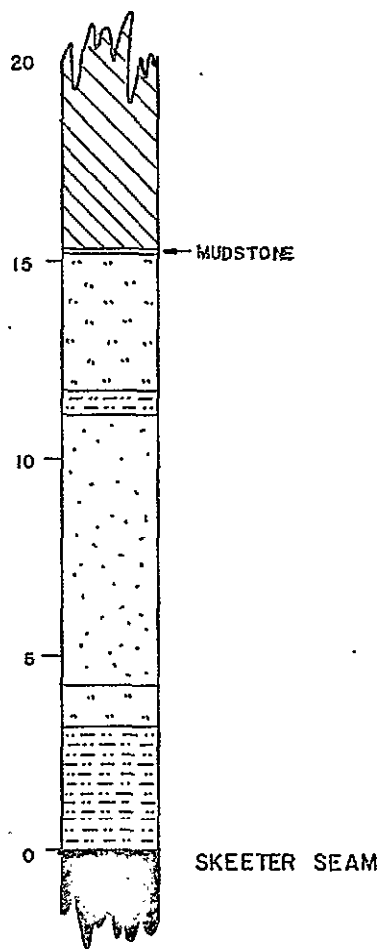
SUKUNKA D.D.H. C-12

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SILTSTONE, grey, sandstone and mudstone interbeds, bedding irregular coaly wisps. Carbonaceous in basal 0.25'. Calcite vein, slickensided at 70° to core axis. 5.12' from top. Breaks with difficulty.</p>	26.74	10.53
<p>SANDSTONE, grey, fine to medium grained, lithic, numerous mudstone blebs in lower half. Calcite vein, slickensided 0.85' from top at 70° to core axis. Breaks with difficulty.</p>	16.21	2.14
<p>LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded units. Separates easily into 0.04' thicknesses except for 0.30' at base where it parts, to 0.01' thicknesses. A zone of 2.53', 6.37' from top has been disturbed to give curved bedding with listric surfaces.</p>	14.07	14.07
<p>Chamberlain Seam Roof at 872.58 feet below collar.</p>		



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH C-33

DRAWN BY M.G.

DATE: NOVEMBER, 1972

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. C-33

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, fine grained, lithic, numerous coaly wisps, very compact and well cemented. Resists breaking. Grades into unit below.</p>	27.50	0.54
<p>SILTSTONE, grey, but black and carbonaceous in top and bottom thirds. Centre section is a very fine sandstone phase with numerous carbonaceous interbeds and coaly wisps. Very fine grained sandstone interbeds towards base. A fracture occurs 1.1' from top at 16° to core axis (no calcite). A few thin shelly fossils occur in lower carbonaceous phase. Breaks readily into 0.1' thicknesses. Grades into unit below.</p>	26.96	4.06
<p>CLAYSTONE, carbonaceous, shelly fossils in 0.3' zone 0.35' from top. Tendency to fracture at 30° to core axis in a 1.8' zone 3.6' from top, with listric surfaces and broken core in the lower part of</p>		



## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-33

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>the zone. A few coaly bands. Rock breaks readily into 0.08' thicknesses. Sharp boundary at base.</p>	22.90	7.54
<p>MUDSTONE, dark grey - somewhat carbonaceous and highly friable - almost earthy in core base. Little strength likely when fresher. Sharp boundary at base.</p>	15.36	0.19
<p>SILTSTONE, grey, sandstone very fine grained as interbeds and phases, some sedimentary irregularities in bedding. A few coaly wisps. Well cemented. Breaks with difficulty into 0.5' thicknesses. A narrow gradation into the unit below. Well compacted junction.</p>	15.17	3.41
<p>MUDSTONE, dark grey, with thin siltstone interbeds and blebs. Parts readily though roughly along bedding planes into 0.07' thicknesses.</p>	11.76	0.60

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. C-33

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, mainly medium grained, lithic, occasional siltstone interbeds and blebs. A few coaly wisps and slightly darker interbeds of a possibly carbonaceous nature. A slump structure in 0.8' zone 3.7' from top. Bedding angle beneath slump is 50° to core axis, but is probably cross bedding. Fracture (no calcite) at 30° to core axis 0.45' from base. Calcite veins 0.35' above base. Well cemented and resists breaking except where there are siltstone interbeds. Thicknesses average about 1'. Sharp boundary at base which is well cemented.</p>	11.16	6.88
<p>SILTSTONE, grey, minor scale cross bedding, coaly wisps. Well cemented, and resists breaking into thin pieces. Thinnest piece 0.47'. A calcite vein occurs 0.03' from top parallel to the bedding and which allows parting.</p>	4.28	1.06

## LOG OF ROOF ROCKS

SUKUNKA D.D.H.C-33

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, with thin brownish grey siltstone interbeds making it almost a laminite. Bedding angle varies from 81° to 90° to core axis. Very well bedded. Breaks readily into 0.07' thicknesses.</p> <p>Skeeter Seam Roof at 331.30 feet below collar.</p>	3.22	3.22

LOG OF ROOF ROCKS

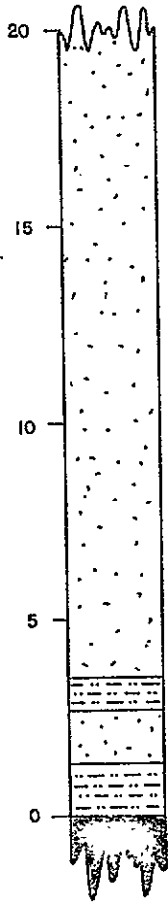
SUKUNKA D.D.H. C-33

Chamberlain Seam

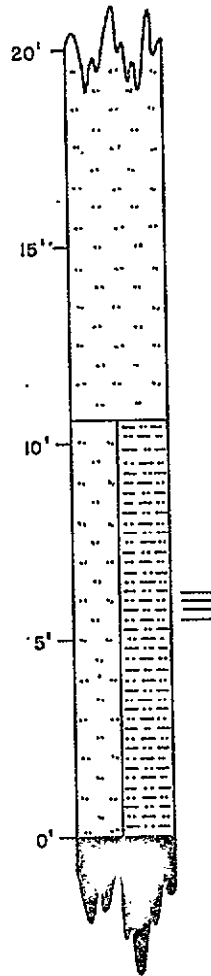
Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SILTSTONE, grey, sandstone fine grained and mudstone interbeds and zones, and associated irregularity in bedding of sedimentary origin in the top 3'. Below this, mudstone interbeds increase till rock becomes laminite as described below. Rock breaks along mudstone interbeds to 0.4' thicknesses at top, and down to 0.1' at base. Grades into unit below.</p>	17.18	6.59
<p>LAMINITE, siltstone brownish grey and mudstone dark grey interbedded in graded units. Rock parts readily into 0.04' thicknesses, reducing to 0.01' in 0.2' zone 4.9' from top, and also in the basal 0.3'. At 5.4' from base there is a listric surface on a fracture at 50° to core axis.</p>	10.59	10.59
<p>Chamberlain Seam Roof at 354.76 feet below collar.</p>		



SKEETER SEAM



CHAMBERLAIN SEAM

SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH S-22

DRAWN BY M.G.

DATE: NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. S-22

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, fine to medium grained, lithic, well cemented, numerous coaly wisps and partings allowing the rock to break into units of about 0.35' average, but down to 0.06'. Partings sometimes irregular due to minor sedimentary irregularities. Three thin calcite veins at angles greater than 85° to core axis towards centre of unit.</p>	27.54	24.07
<p>MUDSTONE, dark grey, sharply bounded at top and moderately so at base. Breaks into thin pieces roughly along bedding planes and these break up into small fragments on weathering.</p>	3.47	0.87
<p>SANDSTONE, grey, fine grained, lithic, irregular carbonaceous phases and wisps, small brown sandstone blebs. Well cemented does not break easily.</p>	2.60	1.21



## LOG OF ROOF ROCKS

SUKUNKA D.D.H. S.22

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, some irregular siltstone interbeds, top 0.34' breaks up readily into pieces less than 0.01' thick and the lower section more coarsely into units of about 0.13'</p> <p>Skeeter Seam Roof at 593.0 feet below collar</p>	1.39	1.39

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. S-22  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, carbonaceous, plant fossils. Parts very roughly along bedding direction into units approximately 0.04' thick.</p>	21.54	1.04
<p>SILTSTONE, greyish brown, numerous interbeds of fine grey carbonaceous sandstone fine and of greyish brown sandstone. A few minor sedimentary structures. Upper boundary grades to the mudstone, lower boundary sharp. Rock is well cemented and does not break readily.</p>	20.50	9.94
<p>LAMINITE, siltstone brownish grey and mudstone dark grey interbedded in graded sequences of about 0.03' thickness which part readily from one another. 4.55' from top, the bedding at 90° to core axis gives way abruptly to bedding at 55° to core axis along a plane with some calcite at 72° to core axis. Bedding returns to 90° to core axis after 0.5' angled beds having</p>		

## LOG OF ROOF ROCKS

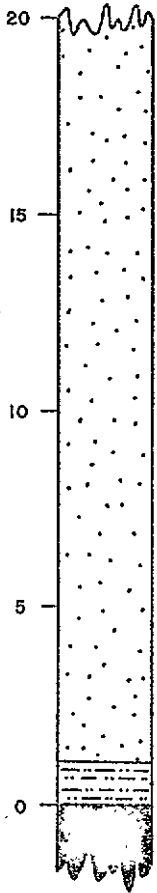
SUKUNKA D.D.H. S-22

Chamberlain Seam

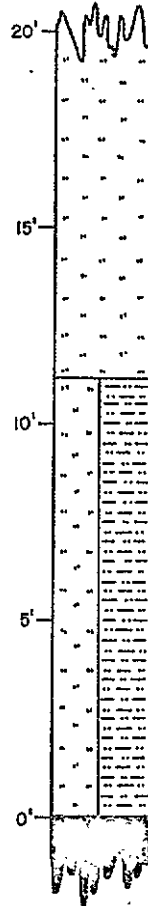
Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>listric surfaces. Fracture plane 6.85' from top at 20° to core axis having listric surfaces and a little calcite veining. A zone 0.13' thick 7' from top in which numerous listric surfaces range from approximately 45° to core axis at top to 90° to core axis at base. Minor calcite veins are also present here. Partings closer together towards base of laminite unit. Weathers into small fragments having parted along bedding planes 0.01' apart.</p>	10.56	10.56
<p>Chamberlain Seam Roof at 625.5 feet below collar.</p>		



SKEETER SEAM



CHAMBERLAIN SEAM

SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH CM - I

DRAWN BY M.G.

DATE: NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-1

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SILTSTONE, grey, mudstone interbeds and some fine, coaly wisps along which it parts into 0.35' lengths. Junction with sandstone at base gradational, well cemented.</p>	31.52	3.03
<p>SANDSTONE, grey, medium grained, lithic, well cemented, compact.</p>	28.49	1.43
<p>MUDSTONE, dark grey, parts readily along rough bedding planes into 0.05' thicknesses. Easily separated from sandstone beneath along a sharp boundary.</p>	27.06	4.58
<p>SANDSTONE, grey, medium grained, lithic, sharp boundaries at top and bottom. Thin carbonaceous phases, coaly wisps, lenses and small irregular masses, these all being more abundant in the lower half. In the upper half the core has been broken to thicknesses of 0.15' but mostly they are over 1'. In the lower half, the rock parts to 0.03' thicknesses, but 0.1' is the more</p>		

LOG OF ROOF ROCKS  
 SUKUNKA D.D.H. CM-1  
 Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>usual. 0.4' from base there is a fracture (no calcite) for 1.1' parallel to core axis.</p>	<p>22.48</p>	<p>21.38</p>
<p>MUDSTONE, dark grey, coaly wisps, breaks readily to 0.08' thicknesses</p>	<p>1.10</p>	<p>1.10</p>
<p>Skeeter Seam        Roof at 123.00 feet below collar.</p>		



## LOG OF ROOF ROCKS

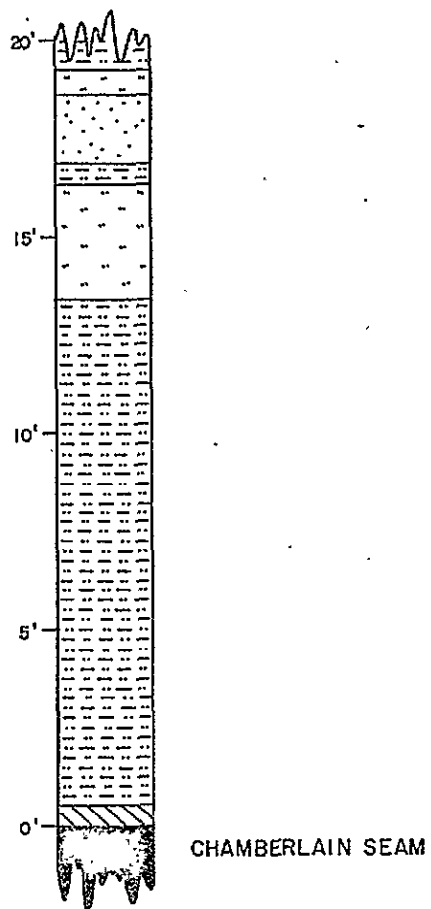
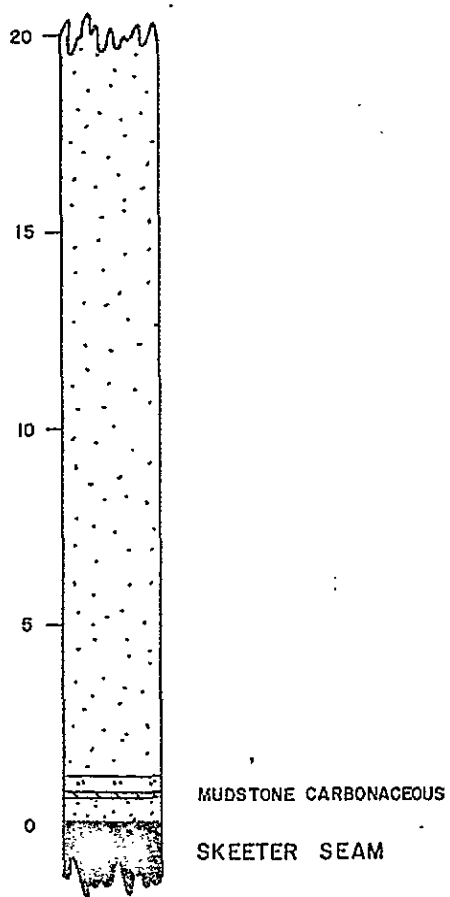
SUKUNKA D.D.H. CM-1

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, top 0.55' containing coal bands, but all unit is weathered into small fragments and the coal is mixed with it. Probably easily split into thin pieces.</p>	22.10	1.70
<p>SILTSTONE, grey, interbeds of mudstone and fine sandstone, coaly wisps and plant fragments, a small slump structure 2.4' from base, small scale cross bedding in sandstone-rich sections. Breaks with some difficulty into 0.3' thicknesses on average, but down to 0.05' grades into unit below.</p>	20.40	8.23
<p>LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded units. Breaks readily into thicknesses of 0.03', but becoming thinner (0.01') in basal 0.95'.</p>	12.17	12.17
<p>Chamberlain Seam Roof at 151.90 feet below collar.</p>		



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH CM-2

DRAWN BY M.G.

DATE: NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-2

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, fine to medium grained, lithic; numerous coaly wisps, lenses and small irregular coaly masses becoming more frequent in lower half. Rock well cemented but breaking with a little difficulty along coaly partings to thicknesses as little as 0.01' from 10' from top down to the base.</p>	29.01	27.82
<p>SILTSTONE, grey, a few coaly wisps. Well cemented. Breaks into 0.2' units.</p>	1.19	0.50
<p>MUDSTONE, carbonaceous, fairly sharp boundary with overlying siltstone, and separates readily from it and the sandstone beneath.</p>	0.69	0.11
<p>SANDSTONE, grey, fine grained, a few thin coaly wisps. Breaks only with difficulty along coaly wisps.</p>	0.58	0.58
<p>Skeeter Seam</p>		
<p>Roof at 116.67' below collar.</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-2

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
All bedding at 90° to core axis unless otherwise specified		
MUDSTONE, grey, mostly weathered into small fragments in the bore. Probably parts readily when fresh.	16.90	0.50
SILTSTONE, brownish grey, thin sandstone interbeds. Parts along thin carbonaceous interbeds to thickness of about 0.2'. Sharp boundaries at top and bottom.	16.40	2.92
MUDSTONE, dark grey, occasional thin siltstone interbeds in top half. Parts readily along rough bedding planes into units of 0.05' thickness, but reducing to 0.01' in basal 1'. A fairly sharp boundary with the unit below.	13.48	12.98
CLAYSTONE, carbonaceous. Compact in top half, breaking with difficulty with conchoidal fracture. Lower half contains coaly partings and breaks readily along these to 0.05' thicknesses.	0.50	0.50
Chamberlain Seam Roof at 144.29 feet below collar.		

## LOG OF ROOF ROCKS

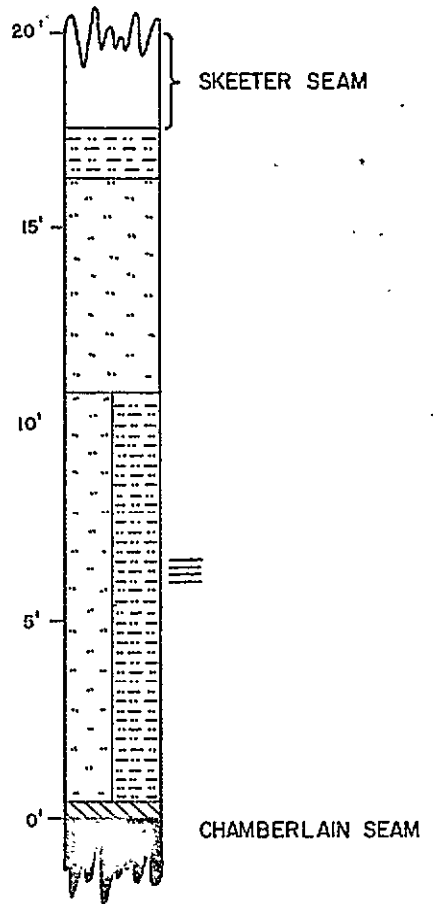
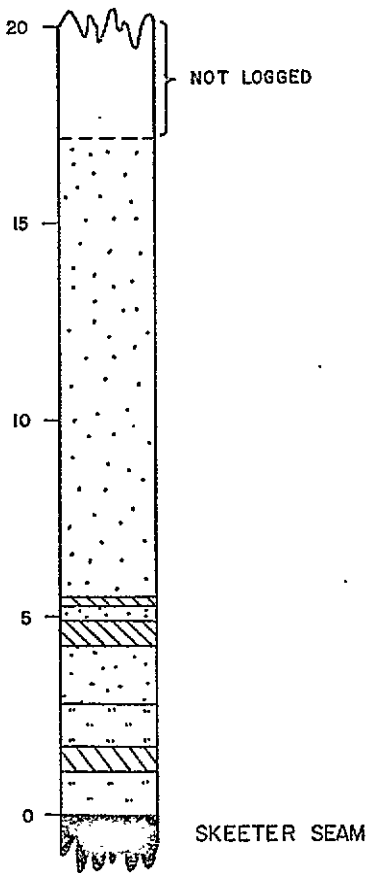
SUKUNKA D.D.H. CM-2

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, weathered in the bore to small fragments. When originally logged, it was described as claystone with some siltstone interbeds and a bedding angle of 80° to core axis. When fresh it probably would part readily into fairly thin pieces.</p>	20.62	1.26
<p>SILTSTONE, brownish grey, some thin sandstone interbeds and coaly wisps. Parts along coaly wisps into 0.1' thicknesses. Grades into the unit above and below.</p>	19.36	0.65
<p>SANDSTONE, brownish grey, fine grained at top, becoming medium grained towards base, thin interbeds of finer carbonaceous material along which parting-takes place into units of about 0.25' thick. Boundary with mudstone below sharp but well compacted and cemented.</p>	18.71	1.81



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH CM-3

DRAWN BY M.G.

DATE: NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-3

SKEETER SEAM

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, mainly fine grained, lithic, bedding angle variable from 90° to 72° to core axis. Oblique fractures ranging from those parallel to bedding, to those of a curved nature roughly parallel to the core axis. Thin calcite infillings in some fractures. Core extensively broken though well cemented from 7.1' above base to 4' above start of this log. Coaly wisps are numerous, but rock is hard, breaking into thicknesses of about 0.3' in lower unbroken section. Lower junction sharp and separated in the core box.</p>	17.28	11.79
<p>MUDSTONE, carbonaceous, easily parted into 0.03' thicknesses.</p>	5.49	0.15
<p>SANDSTONE, grey, fine grained, lithic, compact, sharp boundaries on top and bottom, easily parted from boundary rocks.</p>	5.34	0.46



## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-3

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>CLAYSTONE, dark brown, carbonaceous grades into underlying sandstone. Parts along the bedding readily into 0.04' thicknesses.</p>	4.88	0.61
<p>SANDSTONE, grey, fine grained lithic, rather carbonaceous, a few small sandstone blebs. Well cemented and compact, though tending to break along carbonaceous interbeds towards base into 0.25' pieces.</p>	4.27	1.37
<p>SILTSTONE, brownish grey, carbonaceous, with sandstone interbeds. Breaks along bedding planes to 0.2' thicknesses. Sharp and easily parted boundaries at top and bottom.</p>	2.90	1.16
<p>CLAYSTONE, brownish grey, carbonaceous, some coaly wisps and lenses. Parts along bedding to thicknesses of 0.02'. Sharp basal boundary easily parted.</p>	1.74	0.69

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-3

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SILTSTONE, grey, thin coaly wisps, difficult to break, well cemented</p> <p>Skeeter Seam Roof at 150.60 feet below collar.</p>	1.05	1.05

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CM-3  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, easily broken to 0.04' thickness along bedding planes 0.09' section in top 0.3' where core is broken and mixed, contains heavy calcite veins and coaly bands.</p>	17.53	1.25
<p>SILTSTONE, grey, well cemented and compact. Some sandstone phases which grade into the siltstone. Curved fracture roughly parallel to core axis runs for 1.5' from base upwards. Pyrite crystals on the fracture surfaces.</p>	16.28	5.41
<p>LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded units. Mudstone phases. Laminite units easily parted to 0.03' thicknesses, but in basal 1.7' these reduce to 0.01' thicknesses which weather into small fragments.</p>	10.87	10.42
<p>CLAYSTONE, carbonaceous, with coaly bands. Parts to 0.05' thicknesses. Sharp and easily separated upper boundary.</p>	0.45	0.45

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-3

Chamberlain Seam

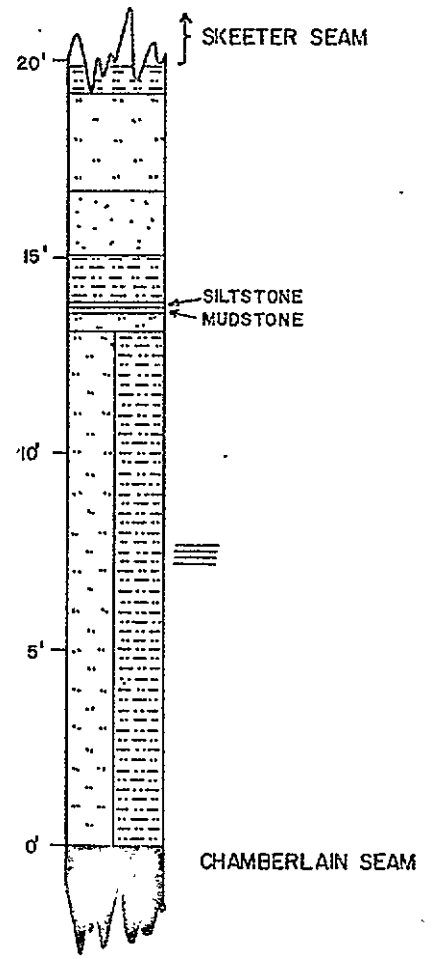
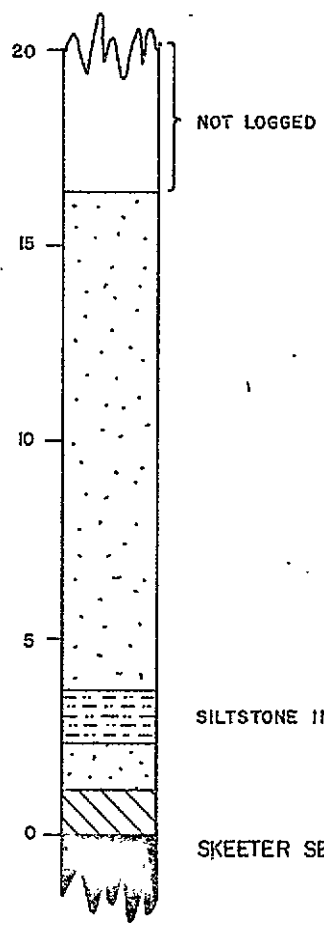
Logged By:

F.H.S. Tebbutt

Date:

September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>Chamberlain Seam Roof at 171.97 ft. below collar.</p>		



SCALE : 1" to 5'

Prepared by :  
 CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
 for  
 COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
 DDH CM - 4

DRAWN BY M.G. DATE NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-4

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, fine grained, lithic, thin carbonaceous zones and coaly wisps along which rock breaks with some difficulty. Sandstone otherwise well cemented. A thin calcite vein running roughly parallel with core axis for 0.2', 6.8' from top. Junction grading into rock unit below.</p>	16.41	12.80
<p>MUDSTONE, dark grey, discontinuous thin grey siltstone lenses and interbeds. Breaks roughly but readily along bedding plane directions into 0.05' thicknesses. Core fractured (no calcite) parallel to core axis.</p>	3.61	1.34
<p>SANDSTONE, grey, very fine grained, coaly wisps and thin carbonaceous phases along which core breaks with difficulty into lengths of about 0.4'. Sharp boundaries at top and bottom. Well cemented.</p>	2.27	1.21

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-4

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, carbonaceous, breaks readily into units of about 0.03' along rough partings parallel to bedding planes.</p> <p>Skeeter Seam Roof at 1055.55 feet below collar.</p>	1.06	1.06



## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-4  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>very thin calcite veins associated.</p> <p>Chamberlain Seam Roof at 1082.95 feet below collar.</p>	13.16	13.16

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-4

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
All bedding at 90° to core axis unless otherwise specified		
SILTSTONE, brownish grey, sharply defined at top and base. Compact	13.92	0.13
MUDSTONE, grey, fractures readily parallel to bedding planes. No calcite, but fractured along several planes parallel to core axis.	13.79	0.17
SILTSTONE, brownish grey, compact at top, but breaking into 0.05' sections with difficulty towards base.	13.62	0.46
LAMINITE, siltstone, brownish grey and mudstone dark grey interbedded into graded units which readily part. Units approximately 0.02' thick, but partings more numerous in basal 0.32' where mudstone fraction of laminite predominates. At 3.62' from base, listric surfaces appear over thickness of 0.18' of core, surfaces ranging from 47° to 65° to core axis. Some		

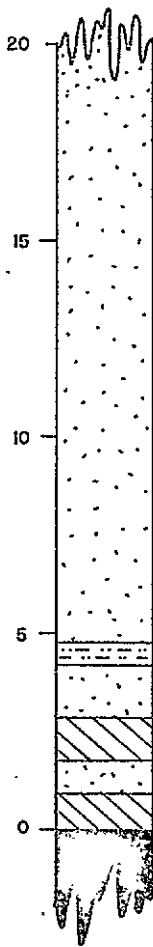
## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-4  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

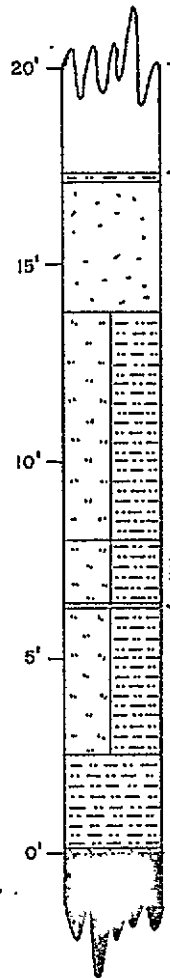
Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, carbonaceous. Numerous coaly partings at the top. Parts readily into units of about 0.02'</p>	19.89	0.67
<p>SILTSTONE, grey, becoming brown towards base, a few mudstone interbeds near top. Fractures roughly parallel to bedding along mudstone interbeds or coaly wisps at intervals of about 0.25' but only with difficulty.</p>	19.22	2.52
<p>SANDSTONE, greyish brown, fine grained, thin calcite vein at 12° to core axis displaced at points of crossing four other calcite veins at 60° to 80° to core axis. Some slickensiding along the calcite vein at 60° to core axis. Rock well cemented and difficult to break</p>	16.70	1.69
<p>MUDSTONE, grey, with a brown phase at base. Breaks roughly but readily along bedding planes into units of 0.05' approximately,</p>	15.01	1.09



SILTSTONE INTERBEDS

SKEETER SEAM



SKEETER SEAM

TECTONIC BRECCIA

CHAMBERLAIN SEAM

SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH CM-5

DRAWN BY M.G.

DATE: NOVEMBER, 1972

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CM-5  
Skeeter Seam

Logged By: G.R. Jordan

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
All bedding at 90° to core axis unless otherwise specified		
SANDSTONE, fine grained, lithic, some shale wisps, bedding poorly defined, sub-massive, well cemented forming core lengths of 1.5'. Bedding planes more prominent in top half.	37.67	1.29
SANDSTONE, as above but containing sedimentary mud breccia fragment 0.03' in length. No distinct lithologic change.	36.38	0.03
SANDSTONE, as above but no breccia fragments	36.35	0.22
SANDSTONE, as above, but with sedimentary breccia fragments as above.	36.13	0.05
SANDSTONE, fine grained, lithic, grading to siltstone phases. Slickensided surfaces, with thin calcite vein at 0.06' from top. District lithologic break at top of unit.	36.08	0.07

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CM-5  
Skeeter Seam

Logged By: G.R. Jordan

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, as above. Mudstone breccia band at 0.007' from top. One fine sandstone phase 0.09' thick 1.07' from top. Irregular sedimentary contact at base. Contacts intact and well cemented.</p>	36.01	1.21
<p>SILTSTONE, several slickensided surfaces at 64° and 67° to core axis with the obtuse angle 132° through the core axis.</p>	34.80	0.17
<p>SANDSTONE, grey, medium grained, lithic, containing irregular shaly wisps in lower half, irregular basal contact. Well compacted and cemented with underlying unit.</p>	34.63	0.26
<p>SILTSTONE, grey as above, irregular basal contact. Well compacted and cemented with underlying unit.</p>	34.37	0.21
<p>SANDSTONE, medium grained, lithic, containing sedimentary breccia fragments of siltstone to 0.06' across. Well compacted and cemented. One irregular fracture</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-5

Skeeter Seam

Logged By: G.R. Jordan

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>of core without slickensides or calcite at 0.18' from top. Irregular basal contact with underlying unit.</p>	34.16	0.35
<p>SANDSTONE, medium grained, lithic, sharp contact with underlying unit. Well compacted.</p>	33.81	0.12
<p>LAMINITE, light grey siltstone and finer grained, dark grey, mudstone forming graded sequences, 0.57' thick. Breaks to core lengths 0.3' within the mudstone. Bedding angle 86° to core axis. Finer grained in lower half.</p>	33.69	4.45
<p>MUDSTONE, dark grey to black, some mica grains present on fracture surfaces. Breaks to units of 0.1' and appears to be partly weathered. One listric surface 0.01' from base. Gradational contact with underlying unit. Well compacted and cemented.</p>	29.24	1.04



## LOG OF ROOF ROCKS

SUKUNKA D.D.H.CM-5

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90<sup>0</sup> to core axis unless otherwise specified</p> <p>SANDSTONE, medium grained, lithic, contains irregular coaly wisps and inclusions.</p>	28.20	0.55
<p>SANDSTONE, as above, coaly wisps at approximately 0.3' intervals. Some coaly bands and lenses to 0.01' thick. Sandy blebs 1.92' from top.</p>	27.65	21.06
<p>SANDSTONE, medium to coarse grained, lithic, containing coaly wisps and fragments. There is a coaly band with a listric surface 1.45' from top. Regular basal contact, well compacted.</p>	6.59	1.80
<p><u>N.B.:</u> In all the above sandstone units the core breaks into 0.5' units along coaly bands and wisps.</p>		
<p>MUDSTONE, dark grey, with grey siltstone interbeds. Irregular basal contact, well compacted and cemented. Carbonaceous</p>	4.79	0.60

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CM-5  
Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, fine grained, mid-grey, numerous irregular bands of claystone carbonaceous of up to 0.02' thickness. No distinct lithologic break at base. Bedding angle 78° to core axis.</p>	4.19	1.37
<p>MUDSTONE, carbonaceous, interbeds of mid-grey sandstone, lithic grading to sandstone at base. Friable, breaks into 0.1' units. No distinct lithologic break at base.</p>	2.82	1.13
<p>SANDSTONE, fine grained, lithic, with irregular carbonaceous mudstone interbeds and bright coal bands. Worm burrows throughout and some sandy blebs. Gradational lower contact over 0.05'</p>	1.69	0.73
<p>MUDSTONE, carbonaceous. A few interbeds of sandstone at top. A 0.02' pyrite band 0.2' from top, and another 0.02' thick at 0.67'</p>		

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CM-5  
Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>from top. Pyrite blebs near base. Core breaks into units 0.12' in thickness.</p> <p>Skeeter Seam Roof at 1105.75 feet below collar.</p>	0.96	0.96

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-5

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>from top and at base. Breaks to 0.02' thicknesses and is weathered.</p>	2.51	2.44
<p>MUDSTONE, carbonaceous</p>	0.07	0.07
<p>Chamberlain Seam</p> <p>Roof at 1134.92 feet below collar.</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CM-5

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

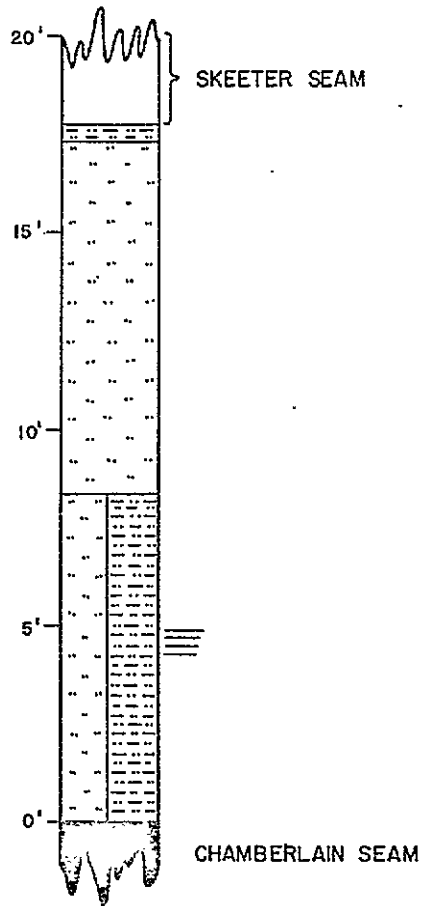
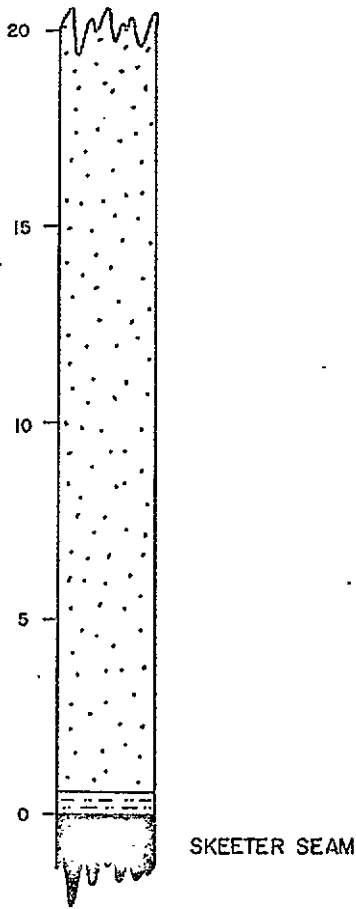
<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>less than 1cm. Polished surfaces mainly in broken rock of top 0.4', then at 0.71', 0.73', 0.90', 0.97', 1.05', 1.30', 1.45', and 1.60' from top. Zone of calcite filled fractures 0.04' thick, 1.4' from top. Sharp basal contact to underlying unit. In basal 0.2' bedding angle changes to 60° to core axis.</p>	8.00	1.64
<p>TECTONIC BRECCIA, well cemented. Country rock with calcite</p>	6.36	0.04
<p>LAMINITE, as above, with siltstone becoming less towards base. Breaks to core lengths of 0.05' with polished surfaces at 0.37', 0.70' and 2.55' from top.</p>	6.32	3.81
<p>MUDSTONE, darker grey, gradational change from overlying unit. Bedding angle 78° to core axis 0.04' from top. Polished surfaces at 0.05'</p>		

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CM-5  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, grading towards a siltstone at base where coaly wisps are included. Two thin coal bands (0.01' thick) near top. Carbonaceous mudstone interbeds.</p>	17.35	0.28
<p>SANDSTONE, lithic, fine grained, grading to siltstone and dark grey mudstone interbeds.</p> <p>Sandstone phase with coaly wisps (phase 0.49') 2.32' from top. Bedding at 78° at 0.92' from top. Fracture (joint?) at 22° to core axis 0.92' from top of units.</p>	17.07	3.27
<p>SILTSTONE and MUDSTONE INTERBEDDED, form-graded units. Bedding angle 78° to core axis. Polished surfaces at points where core breaks at 0.6', 1.85', 4.77', 5.38', 5.58', 5.80' from top. Breaks into units of 0.2' thicknesses.</p>	13.80	5.80
<p>LAMINITE, siltstone and mudstone interbedded as above, but in units</p>		



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH CS-3

DRAWN BY M.G.

DATE: NOVEMBER, 1972



LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CS-3  
Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, grey, some very thin siltstone interbeds, pyritic worm casts in upper half. Becomes darker grey in lower half. Breaks readily but roughly along bedding planes into units of 0.05'. Bedding angle 80° to core axis increasing to 84° at base. A fracture plane at 30° to core axis occurs 2' from top, and another at 12° to 3.5' from top.</p>	31.28	3.72
<p>MUDSTONE, dark grey, carbonaceous, numerous coal partings which allow breakage into units of about 0.04' thickness. Upper boundary sharp but lower boundary grades into next unit.</p>	27.56	0.90
<p>SANDSTONE, grey, fine grained at top and bottom with a medium grained phase in middle. Coaly wisps and thin carbonaceous phases, numerous, especially in medium grained section. Lithic. Rock breaks into units of 0.05' where</p>		

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SOIL AND UNCONSOLIDATED MATERIAL TO 12.84'	12.84	12.84		
SANDSTONE, grey, fine grained, fractures at 50' to core axis 6.6' from top and at 28° to core axis, 16.4' from top, coaly band (thin) with a few pebbles 3.7' from base	24.71	37.55	24.71	
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained and mudstone dark grey, some worm casts and irregular bedding; a few pebbles at 49', 64.5' conglomerate band (0.5') at 68', a few thin coaly bands towards base, soft and clay-like in basal 0.5'	45.25	82.80	44.91	
<u>COAL</u> , dull with frequent bright bands, boundaries at 50° to core axis and signs of listric surfaces	1.89	84.14	0.18	
CONGLOMERATE, greenish grey, pebbles mainly small (averaging about 0.02') but with coarser and finer phases. Varied lithology, pebbles rounded to sub-angular; matrix of sandstone only towards base; basal 1.5' chalcedonic (?) and of a darker colour.	39.13	123.27	38.38	

## LOG OF ROOF ROCKS

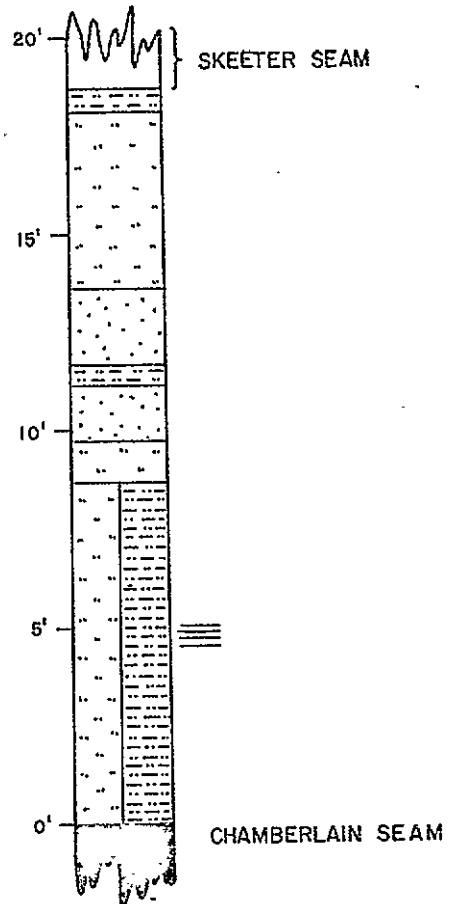
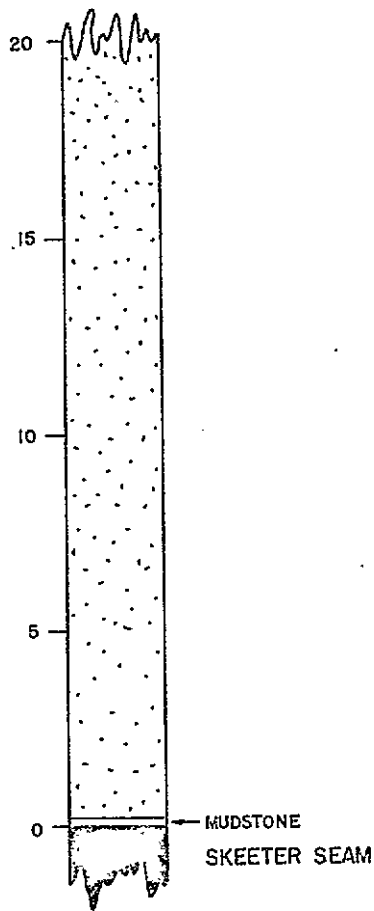
SUKUNKA D.D.H. CS-3

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, coaly lenses in top half, breaks readily into 0.06' units</p>	17.79	0.38
<p>SILTSTONE, brownish grey, mudstone and fine sandstone interbeds towards top, mudstone interbeds only towards base, and these becoming carbonaceous near base. Breaks into 0.6' thicknesses in top half, but into increasingly thin pieces (0.01') towards base.</p>	17.41	8.96
<p>LAMINITE, brownish grey siltstone and grey mudstone interbedded into graded units. Bedding angle varies to a maximum of 80° to core axis. Each graded unit separates readily from the adjacent units into 0.03' at top, but reducing to 0.01' at base which weather into small fragments</p>	8.45	8.45
<p>Chamberlain Seam Roof at 357.76 ft. below collar.</p>		



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH CS-4

DRAWN BY M.G.

DATE: NOVEMBER, 1972

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CS-4

Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SILTSTONE, darkish grey, mudstone interbeds and blebs and a few worm casts. Parts at intervals of about 0.17' roughly along bedding planes.</p>	43.27	6.74
<p>SANDSTONE, grey, fine grained, lithic, sharp upper and lower boundaries. Well cemented. Broken parallel to core axis. (no calcite)</p>	36.53	0.28
<p>MUDSTONE, dark grey. Parts readily though roughly along the bedding planes.</p>	36.25	0.12
<p>SANDSTONE, grey, fine to medium grained, mudstone interbeds and blebs. Boundaries sharp, the basal one separated from the underlying unit by a thin calcite vein parallel to the bedding.</p>	36.13	0.81
<p>MUDSTONE, dark grey; plant fragments. Parts readily though roughly parallel to bedding planes.</p>	35.32	0.63

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CS-4

SKEETER SEAM

Logged By: F.H.S. Tebutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, lithic, fine grained, coaly wisps. Well cemented. There is an irregular fracture (no calcite) roughly parallel to the core axis.</p>	34.69	1.28
<p>MUDSTONE, dark grey, some calcite veining, fractured at 70° to core axis along listric surface. Junction with overlying sandstone sharp and at 47° to core axis. Junction with basal sandstone sharp but irregular and at approximately 90° to core axis.</p>	33.41	0.09
<p>SANDSTONE, grey, fine grained, a few very thin siltstone interbeds and coaly wisps. Compact, almost massive. One slickensided calcite vein 1.7' from top.</p>	33.32	2.41
<p>LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded units. Pyritic worm casts near base, and associated</p>		

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CS-4  
SKEETER SEAM

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>oxidation of sulphur on weathering. Rock parts readily to units as thin as 0.01'.</p>	30.91	3.64
<p>SANDSTONE, grey, fine grained at top and bottom, but becoming medium grained at centre, lithic. Numerous coaly wisps and thin carbonaceous phases along which parting may take place revealing listric surfaces. Thickness of parted units down to 0.11' but mostly thicker than 0.4'. Bedding variations of sedimentary origin, within 10° of 90° to core axis. Very thin calcite veins roughly parallel to core axis along which parting takes place starting 2.18' from top and visible in core for 1.1'.</p>	27.27	27.11
<p>MUDSTONE, grey, sharp boundary with overlying sandstone from which it readily parts. Breaks roughly in a direction parallel to bedding.</p>	0.16	0.16
<p>Skeeter Seam Roof at 299.18 feet below collar.</p>		

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CS-4  
Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, carbonaceous at top, thin coaly lenses and irregular masses, partings down to 0.05' intervals. A listric surface occurs 0.28' from base at 50° to core axis.</p>	18.77	0.58
<p>SILTSTONE, darkish grey with a mudstone matrix, well cemented and compacted. Some very fine coaly partings, but these are infrequent and the rock is in general compact.</p>	18.19	4.56
<p>SANDSTONE, grey, fine grained, lithic, thin siltstone interbeds along which parting takes place with difficulty. Fractured parallel to core axis and with pyrite aggregates along plane of parting (no calcite).</p>	13.63	1.92
<p>MUDSTONE, dark grey, roughly parts along the bedding planes. Sharp upper and lower boundaries.</p>	11.71	0.63
<p>SANDSTONE, grey, very fine grained and with siltstone interbeds, lithic</p>		



## LOG OF ROOF ROCKS

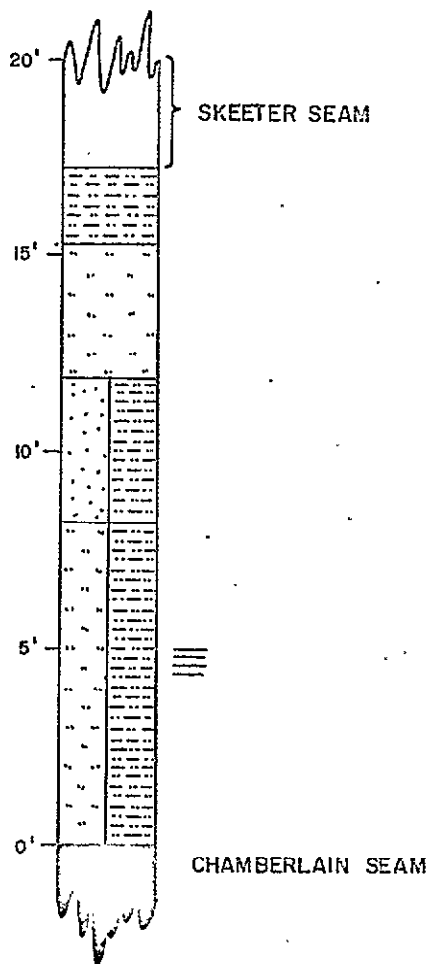
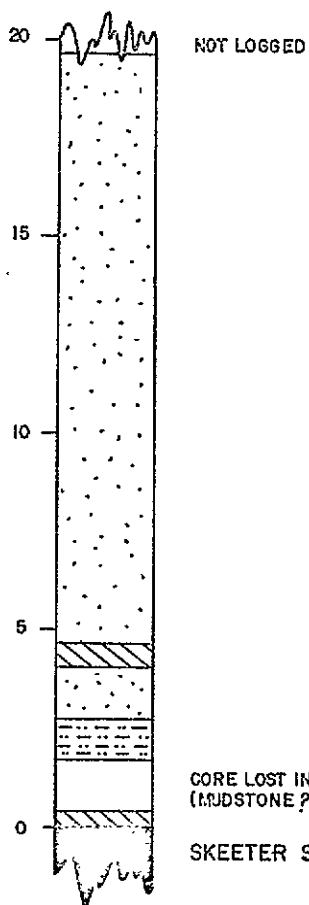
SUKUNKA D.D.H.CS.4

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September , 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
All bedding at 90° to core axis unless otherwise specified		
compact. One fracture (no calcite) roughly, parallel to core axis.	11.08	1.33
SILTSTONE, grey, mudstone interbeds, well cemented and generally fairly compact. A fracture parallel to core axis continues from overlying unit but has thin calcite filling. Ill-defined upper and lower boundaries.	9.75	1.03
LAMINITE, siltstone grey and mudstone dark grey interbedded in graded units. Parts readily into thicknesses of 0.02' decreasing in basal 0.65' to 0.01' thicknesses .	8.72	8.72
Chamberlain Seam Roof at 326.54 feet below collar.		



SCALE : 1" to 5'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

ROOF STRATA GRAPHIC LOGS  
DDH CS-5

DRAWN BY M.G.

DATE: NOVEMBER, 1972

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CS-5  
Skeeter Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>SANDSTONE, grey, fine grained top half and grading to medium grained in bottom half. Coaly wisps, small lenses and irregular masses. Irregular thin calcite veins 1.25' and 2.05' from top and core broken to small pieces around top of vein system. Well cemented, breaking along major coaly lenses into thicknesses of about 0.6'</p>	19.67	14.98
<p>CLAYSTONE, carbonaceous, upper 0.08' containing 0.02' blebs of unit above. Easily broken into 0.03' thicknesses. Sharp and easily separated lower boundary.</p>	4.69	0.6-
<p>SANDSTONE, grey, fine grained, lithic sandstone blebs at top, very numerous coaly wisps making sandstone almost carbonaceous. Well cemented. Breaks with difficulty into 0.5' thicknesses. Graded lower boundary. A fracture occurs 0.9' from top at 15° to core axis.</p>	4.02	1.26

LOG OF ROOF ROCKS  
SUKUNKA D.D.H. CS-5  
SKEETER SEAM

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE, dark grey, with interbeds and phases of siltstone brownish grey. All tending to carbonaceous. Mudstone easily parted to 0.03' thicknesses, but siltstone phases vary from 0.1' to 0.25' thicknesses.</p>	2.76	1.08
<p>CORE LOSS, 280'4" to 281'7" driller's depth. Claimed as mud by drillers, but could be mudstone or claystone very easily broken or already weakened by some small structural change.</p>	1.68	1.25
<p>CLAYSTONE, carbonaceous, easily broken along rough bedding planes to 0.06' thicknesses.</p>	0.43	0.43
<p>Skeeter Seam Roof to 282.00 feet below collar.</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CS-5

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>MUDSTONE black, carbonaceous, the top 0.35' tending to be soft and crumbly. A few coaly bands, plant fossils. Well compacted, breaking into 0.2' thicknesses. Grades into lower rock type.</p>	17.25	1.92
<p>SILTSTONE, grey, sandstone and mudstone phases, 2.25' above base is a zone of minor puckering and the rock is displaced along a thin slickensided calcite vein at 70° to core axis. Several other thin veins (not slickensided) are on either side. A series of parallel fractures occur closely spaced 0.4' below top at 8° to core axis (no calcite). Another fracture occurs at base at 20° to core axis with a thin calcite filling.</p>	15.33	3.45
<p>SANDSTONE, and MUDSTONE INTERBEDDED, sandstone brown and fine grained and mudstone grey interbedded at intervals up to 0.15', coaly wisps sandstone phases. Breaks readily into 0.25' thicknesses. Grades into</p>		

## LOG OF ROOF ROCKS

SUKUNKA D.D.H. CS-5

Chamberlain Seam

Logged By: F.H.S. Tebbutt

Date: September, 1972

<i>Geological Description of Strata</i>	<i>Estimated Height Above Seam Roof (ft.)</i>	<i>Measured Thickness (ft.)</i>
<p>All bedding at 90° to core axis unless otherwise specified</p> <p>the unit below. A fracture occurs 1.4' from top at 18° to core axis, and having small pyrite crystals on fracture surfaces.</p>	11.88	1.69
<p>LAMINITE, siltstone brownish grey and mudstone grey interbedded in graded sequences. Mudstone phases. At 5.26' from top there is a sudden change of bedding angle along curved listric surfaces at 60° to core axis. This bedding angle is terminated just as abruptly 7.0' from base with a 0.1' zone of fractured core. Bedding angle at base 81° to core axis.</p>	8.19	8.19
<p>Chamberlain Seam</p> <p>Roof at 315.83 feet below collar.</p>		

SUPPLEMENT REPORT.

PR SUKUNKA 72(3)A3

APPENDIX

E

GATES MEMBER COAL PROJECT

(INC. BORE HOLE DATA.)

**CONFIDENTIAL**

**GEOLOGICAL BRANCH  
ASSESSMENT REPORT**

**00 650**



APPENDIX F

GATES MEMBER COAL PROJECT

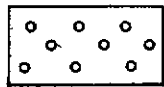
Reference for Graphic  
Sections of Drill Hole Data

See reverse side

Prepared by CLIFFORD McELROY & ASSOCIATES PTY. LIMITED

**DETAIL OF GETHING FORMATION**

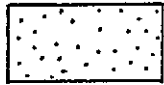
Scale 1" = 50'



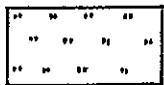
CONGLOMERATE  
pebble to granule



BRECCIA



SANDSTONE



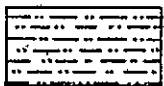
SILTSTONE



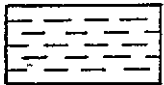
CLAYSTONE



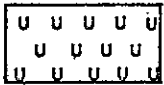
STONE COALY or  
CLAYSTONE  
CARBONACEOUS



MUDSTONE



SHALE, SILTSHALE,  
CLAYSHALE



SOIL, WEATHERED and  
UNCONSOLIDATED  
MATERIAL



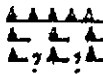
INTERBEDDED



LAMINITE



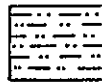
45° INCLINED STRATA



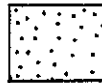
FAULT established  
probable  
possible

**TOTAL DRILL HOLE SECTIONS**

Scale 1" = 200'



HULLCROSS MEMBER



COMMOTION  
FORMATION

GATES MEMBER



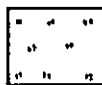
SUKUNKA MEMBER



MOOSEBAR  
FORMATION

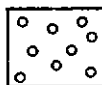


UPPER GETHING  
SEQUENCE



GETHING  
FORMATION

LOWER GETHING  
SEQUENCE



CADOMIN  
FORMATION

**COAL SEAMS**

Scale 1" = 2'



COAL BRIGHT or UNDIFFERENTIATED

COAL MAINLY BRIGHT with MINOR DULL  
BANDS

COAL DULL and BRIGHT

COAL MAINLY DULL with MINOR BRIGHT  
BANDS

COAL DULL

COAL INTERLAYED with NON-COAL

NON-COAL INTERLAYED with COAL

COAL STONY

STONE COALY

COAL WEATHERED

REFERENCE FOR GRAPHIC SECTIONS

of

DRILL HOLE DATA

PREPARED BY CLIFFORD McELROY & ASSOCIATES PTY LIMITED

COALITION MINING LIMITED

SUKUNKA COAL PROJECT

January 1972

APPENDIX F

GATES MEMBER COAL PROJECT

## GATES MEMBER COAL PROJECT

### 1. INTRODUCTION.

In the 1971 season, the level of activity directed towards the assessment of the potential of the Skeeter and Chamberlain Seams did not allow more than a passing consideration of other coal seams, which are present elsewhere in the Cretaceous sequence. In areas adjacent to the Coalition licences at Sukunka, seams of workable dimensions occur in the Gates Member of the Commotion Formation.

Consequently an investigation of the Gates Member coals, limited to drill cores already available and to those being drilled during the 1972 season, was carried out. Thirteen pre-1972 season drill holes and three drill holes of the 1972 season were selected to give suitably spaced information over that part of the exploration grid where the Gates Member was known to exist. Some 5,230 feet of drill core was logged in detail, being made up of 2,653 feet of core from the S-series (pre-1971 season), 1,383 feet from the 1971 season and 1,194 feet from the 1972 season. Some of the older core which had been moved and stacked a number of times had been disturbed, but nevertheless, sufficient data was obtained to establish the stratigraphic sequence and delineate the major coal bearing units in the Gates Member. The detailed logs and graphic sections of the selected drill holes are included in this appendix. The structure contours on Seam B are shown on Map 36 in Volume 5 of this report. It should be pointed out that no outcrop mapping was carried out and no drilling or other work of an exploratory nature was undertaken specifically for this project. The sampling and analysis of coal from two seams, which appeared of workable thickness, was carried out in a few selected drill holes. Analytical data and graphic sections

of those coal seams are included.

## 2. STRATIGRAPHY

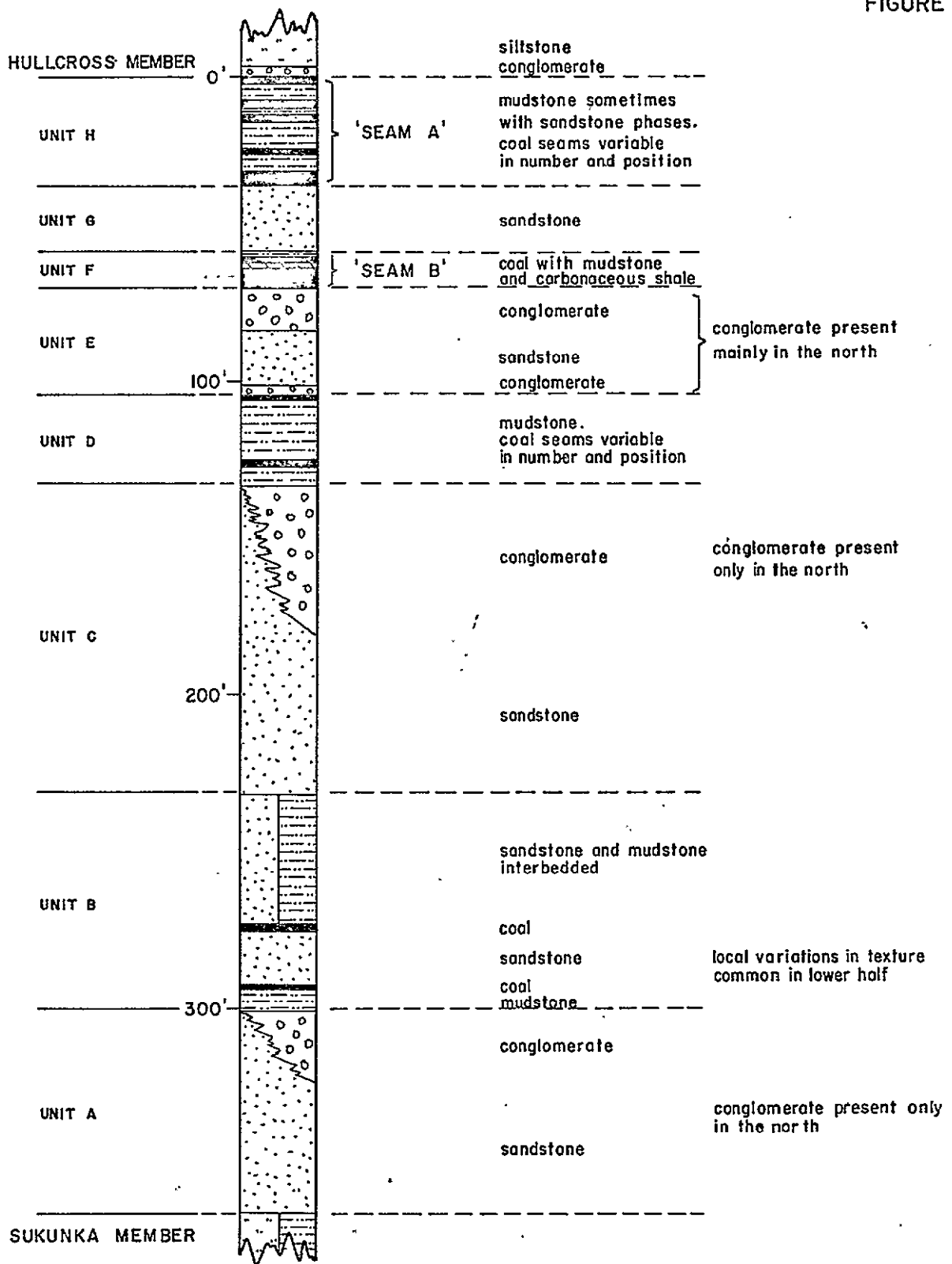
The Gates Member of the Commotion Formation is some 700 feet stratigraphically above the top of the Gething Formation and is separated from it by the Moosebar Formation and the Sukunka Member. Within the exploration area, the Gates Member occupies much of the area above 4,500 feet, and in the highest parts of the area this unit is overlain by the Hullcross Member. The base of the Gates Member varies from 4,676.3 feet in D.D.H. C-5 and 4,586.3 feet in D.D.H. S-16 and rises gently to the west where it crops out on the north salient above Skeeter and Chamberlain Creeks. The base of the Gates Member also rises eastwards from D.D.H. C-5 and is at 5,386.9 feet in D.D.H. S-32, thus forming a gentle synclinal structure trending north-south.

The Gates Member is an alternating sequence of fresh water arenaceous and argillaceous sediments, the latter being associated with coal seams of variable thickness and extent. For purposes of correlation and description, the Gates Member has been divided into eight units designated A to H, each of which is described below.

The composite graphic section of the Gates Member, Figure F-1, illustrates the nature of the sequence as determined from drill hole data. The Fence Diagram, Map 35, shows the distribution and variation in thickness of units D to H over much of the exploration grid.

### UNIT A

The base of the Gates Member is taken as the point where the



SCALE  
1" = 50 Feet

COMPOSITE GRAPHIC SECTION  
OF GATES MEMBER  
COMMOTION FORMATION.

COALITION MINING LIMITED  
SUKUNKA COAL PROJECT  
February, 1973

underlying siltstone and mudstone interbeds of the Sukunka Member give way to a predominance of sandstones and/or conglomerate bands. This is not everywhere a well defined boundary and there are some drill holes in which there is a transition zone some 20 feet thick where the boundary was determined with less certainty.

Unit A is dominantly composed of sandstone, with the uppermost part becoming conglomeratic, particularly north of grid line F. At the base, the lithic sandstone is grey and fine grained with mudstone interbeds being more common to the west. Large worm burrows and pebble bands are occasionally present in this sandstone. The upper 15 to 30 feet is coarser grained, and this change is accompanied by a significant increase in the proportion of black mineral grains. In an otherwise light grey to light brownish grey rock, this addition is quite distinctive. A similar sandstone unit, described as the "salt and pepper sandstone", has been described from the Gates Member elsewhere in the Foothills.

Unit A attains a maximum thickness in the centre of the grid area where in D.D.H. C-1 it is 100.11 feet thick, but is about 50 feet thick over much of the area. In the north and north-east the sandstone is overlain by a lenticular conglomerate which is generally 20 to 40 feet thick. The conglomerate is grey to greenish grey in colour and is composed mainly of small rounded to sub-rounded pebbles, with very little or no matrix. The pebbles are usually fine grained green, white, brown or black chert and are well compacted.

The sandstone and conglomerate together, vary in thickness from 42.98 feet in D.D.H. C-21 to 100.11 feet in D.D.H. C-1, but Unit A is between 60 to 80 feet thick for most of the area.

## UNIT B

This is the lowermost of the more argillaceous units; it is composed of sandstone and mudstone interbeds, similar to those of the Sukunka Member. Light grey, fine grained sandstone and dark grey mudstone are interbedded in units of 0.25 feet to 1 foot thick. The bedding in the mudstone tends to be irregular and has been disturbed by worm burrows. The detailed logs and graphic sections of some drill holes show that the sediments in this unit are described as sandstone with mudstone interbeds, or as mudstone with sandstone interbeds. A thin coal seam occurs over a large part of the area in the lower to middle part of Unit B. The seam is everywhere less than 2 feet thick and does not warrant further evaluation. A few of the drill holes encountered some other thin coaly lenses within this unit.

Unit B varies in thickness from 29.16 feet in D.D.H. S-44 to 65.97 feet in D.D.H. C-44. This unit may thicken towards the south-eastern corner of the grid.

## UNIT C

A lithic sandstone overlies Unit B throughout the area. This sandstone is grey to brownish grey and medium grained, but becoming finer grained towards the base. There is an increase in the content of black mineral grains in the upper coarser grained sandstone. Large worm burrows are present 20 feet from the top of the unit in the south. Worm burrows are also present in the finer grained sandstones near the base where mudstone interbeds are also more frequent.

The sandstone at the base of Unit C is thickest in the south, being 98.76 feet in D.D.H. S-16 and thinning to 33.61 feet in



D.D.H. C-17 in the north-east. In the north and north-east a thick bed of conglomerate overlies the sandstone. In D.D.H. C-17, the conglomerate is 83.88 feet thick and thins quite rapidly to the south. The upper 5 feet to 15 feet of this unit is a well compacted granule conglomerate with no matrix. Below this it is a pebble conglomerate with a sandstone or siltstone matrix. In some of the drill holes this lower conglomerate is a darker greenish colour with well cemented pebbles.

Unit C is thinnest in a zone trending east-west through the centre of the grid where the thickness is approximately 80 feet. To the north, the thickness increases to 117.40 feet in D.D.H. C-17 and 118.46 feet in D.D.H. S-31, while to the south where the unit is entirely sandstone, the thickness reaches a maximum of 98.76 feet in D.D.H. S-16.

#### UNIT D

This is essentially an argillaceous unit composed of dark grey mudstone and claystone with carbonaceous phases, and coal seams. In the south and south-east, siltstone and sandstone occur in D.D.H.'s S-35 and S-36.

This unit is thinnest in the northern part of the grid (D.D.H. C-17, 18.58 feet; D.D.H. S-31, 18.21 feet) while the thickest intersection was recorded in the south-east in D.D.H. S-42 (49.44 feet).

The mudstone of Unit D is dark grey with occasional lighter coloured brownish grey phases. Thin siltstone interbeds occur within the mudstone.

A coal seam at the base of the unit is the most widespread of

the coaly units in Unit D. It occurs in almost all the drill holes that were logged and though it is generally less than 2 feet thick, it increases to 2.79 feet in D.D.H. S-32 and 2.57 feet in D.D.H. S-36. In the south other lenses of coal are found, these reaching a maximum of five in D.D.H. S-42. They are generally less than 2 feet thick. The thickest of the seams in D.D.H. S-42 is the third seam from the top (3.79 feet), with two of the other seams being 1.12 feet and 2.49 feet thick.

### UNIT E

Unit E is predominantly an arenaceous unit, thickest in the north at D.D.H. C-42 (46.78 feet) and in the south at D.D.H. S-42 (51.14 feet), while for most of the central part of the grid the average thickness is about 30 feet.

In the south-east this unit is predominantly sandstone, which thins to the west and is overlain by siltstone. To the north and north-east, conglomerate lenses appear above and below the sandstone, and make up the greater part of the unit in some drill holes such as D.D.H. C-44. Unit E is conglomerate, with only minor sandstones.

The siltstone, where present, is grey to brownish grey and frequently contains interbeds of sandstone and mudstone. The sandstone is grey to brownish grey and while mainly fine grained in the south, it varies from fine to coarse and includes phases of granule conglomerate. Within the sandstone there are numerous coaly wisps, lenses and irregular coaly masses and occasional mudstone blebs. The sandstones often exhibit, cross bedding.

The conglomerate is variable in grainsize, there being both granule and pebble conglomerate with varying amounts of sand-size matrix. In some drill holes, such as D.D.H. S-31, there are darker greenish horizons where the pebbles are well cemented. In most of the drill holes that were logged the conglomerate includes interbeds of sandstone and/or mudstone. Worm burrows occur in some of the finer grained interbeds.

#### UNIT F

This unit and those stratigraphically higher have been removed by erosion in the west and north-western part of the grid. To the north and north-east this unit appears as a banded coal seam, 6.90 feet thick in D.D.H. C-17, and thickening to the south-east by additions principally of mudstone (D.D.H. S-44, 35.62 feet). In this direction the coal seam is split by rock bands and additional coaly lenses are present. In the south the coal becomes subordinate to mudstone, as is illustrated in the graphic sections and the Fence Diagram, Map 35. Unit 5 is informally referred to here as 'Seam B'.

Coal makes up most of the unit in the north and north-east and the basal part of the unit to the south. 'Seam B' is 7.73 feet thick in D.D.H. C-42, 7.8 feet to the south-east in D.D.H. S-35, and is 7.0 feet thick in the west at D.D.H. S-25. (March, 1971 Brameda Report). The seam is therefore present in quite a large area of the north to north-eastern part of the exploration grid as illustrated in the Fence Diagram, Map 35. The extent beyond the grid to the north-east is unknown. Sketch structure contours on the base of 'Seam B' and the inferred outcrop of that seam are shown on Map 36.

'Seam B' was sampled from D.D.H.'s S-44, C-1, C-17, C-21 and C-42 during the 1972 geological programme. Analyses of this seam were given for D.D.H.'s S-25 and S-35 in the March, 1971 Report by Brameda Resources.

The mudstone of Unit F is dark grey, frequently has carbonaceous phases with coaly lenses, and include very thin light grey siltstone interbeds and siltstone phases.

#### UNIT G

Unit G is composed of sandstone with siltstone interbeds and/or siltstone with sandstone interbeds. These coarser sediments sometimes contain interbeds of mudstone. The siltstones are grey, but dark grey when mudstone interbeds are present. The sandstones are light grey to brownish grey, fine to medium grained at the top but becoming coarser towards the base. Coaly wisps are often present with occasional plant fossils. From those holes where this unit is present it appears that Unit G thins from the west (D.D.H. S-25, 54.83 feet) towards the east (D.D.H. S-35, 19.24 feet).

#### UNIT H

This argillaceous, coaly unit is only represented in six of the selected drill holes which are located at higher elevations. These are in the central and central north-eastern area of the exploration grid. This unit is predominantly composed of mid to dark grey mudstone and claystones, frequently carbonaceous phases, coaly wisps and lenses and in some drill holes includes siltstone interbeds.

This unit contains up to five thin coal seams as in D.D.H. C-17.

No attempt has been made to correlate these seams, though a seam at or near the top of the Gates Member sequence persists throughout the area, while a seam at the base of Unit H occurs in almost all of the drill holes selected. Other seams in between these two are less persistent. Though the uppermost seam, designated Seam A, in the north attains a thickness of 4 feet in D.D.H. C-42 only 2.52 feet of this is not stony coal, and in D.D.H. C-17 only 1 foot of good coal exists in the 8 feet thick seam. However, the seam does thicken to the north and it may prove to be of greater interest outside the exploration grid. The seam at the base of Unit H is of useful thickness in D.D.H.'s S-35 (6.98 feet) and S-44 (7.14 feet). Of these, D.D.H. S-35 (sampled and analysed in 1972) contains only 2.33 feet of coal, plus a possible 0.84 feet of coal lost during drilling. In D.D.H. S-44 the seam is 7.14 feet thick but contains a 1.22 foot stone band, 1.34 feet from the base.

The base of the Hullcross Member and the top of the Gates Member have been taken as the top of the highest coal seam in Unit H. This coal seam is overlain by a thin bed of conglomerate, which has been regarded as the basal conglomerate of the Hullcross Member.

Unit H varies only slightly in thickness across the area, the maximum being 35.07 feet in D.D.H. S-35 and the minimum 21.83 feet in D.D.H. C-1. There is insufficient information to determine any particular trend as far as thickness is concerned.

### 3. ECONOMIC ASPECTS

Two intervals of coal bearing strata are recognised within the Gates Member from drill holes located within the exploration grid. These are Units F and H in Figure F-1, each of which is



TABLE F-2 - SUMMARY OF ANALYTICAL DATA

## GATES MEMBER, SEAM B

BORE NO.	SAMPLE NO.	ANAL. THICK. (FT.)	RAW COAL		WASH		WASHED PRODUCT - PROXIMATE ANALYSIS, A-D BASIS							
			S.G.	ASH %	S.G.	YIELD %	MOIST. %	V.M. %	ASH %	F.C. %	C.S. NO.	C.V. BTU/lb.	S %	P %
* S 23	36.0' -45.5'	8.0	-	21.56	RAW	COAL	1.18	23.45	21.56	53.81	4	11619	0.35	-
* S 25	155.0' -162.0'	7.0	-	-	*	74	1.14	26.21	9.20	63.45	8	13856	0.40	-
* S 27	58.0' -64.0'	5.7	-	16.86	RAW	COAL	0.97	24.85	16.86	57.32	5½	12275	0.35	-
* S 30	39.0' -47.0'	8.0	-	-	*	28	1.23	22.01	10.41	66.35	6½	13719	0.44	-
* S 35	197.2' -205.0'	6.4	-	-	*	42	1.05	27.16	7.86	63.93	8	14054	0.45	-
S 44	G 17	1.45	1.351	21.4	1.60	84	1.0	23.7	13.1	62.2	6	13160	0.42	0.005
C 1	G 12	1.61	1.329	5.6	1.60	98	1.0	27.7	4.7	66.6	8½	14560	0.48	0.011
	G13-16	3.44	1.465	21.1	1.60	83	1.0	24.1	11.7	63.2	7½	13410	0.91	0.051
C 17	G6-11	6.36	1.637	39.9	1.60	53	1.0	26.2	7.5	65.3	7	13980	0.37	0.011
C 21	G 21	1.56	1.347	10.0	1.60	99	1.0	25.2	9.5	64.3	7½	13830	0.51	0.056
C 42	G1-5	7.73	-	-	1.60	60	1.0	25.0	6.9	67.1	7½	14350	0.37	0.025

\* Data from Brameda, March 1971 Report  
 Values for Wash S.G. not given





composed of a number of coal and claystone bands of varying thickness. Since correlation of the coal bearing units has been established it is appropriate to refer to these as "seams" when considering the quality of the coal and the distribution of the rock bands. The lower part of Unit F is informally referred to as 'Seam B' and Unit H is informally referred to as 'Seam A'.

The accompanying tables F-1 to F-3 summarize the analytical data resulting from both the 'A' and 'B' Seams. In this data are a number of analyses carried out on the core from Brameda Resources drilling in 1971. In D.D.H.'s S-23 and S-27 the "Commotion Seam A" of Brameda is tentatively correlated with Seam 'B'.

The data collated has indicated an improvement in the coal quality of Seam B to the north-east, outside the current grid area. The total thickness of Seam B varies up to 10 feet, split by a 5 foot band.

The quality of the raw coal in Seam B, excluding stone bands, is moderately good. A recovery of between 50% and 60% at a S.G. of 1.60 with an ash content of 7% to 8% in the washed product has been indicated as being possible. Table F-3 shows that coal from Seam B has moderately high fluidities, ranging from 68 d.d.m. to 1,290 d.d.m., and a mean plastic range of 109<sup>0</sup>C. The maximum fluidities are somewhat higher than for the Skeeter and Chamberlain seams, which is in accord with the lower rank of the coal in Seam B. The crucible swelling number of the washed product (Table F-2) is in the range 6 to 8½, and the sulphur content is uniformly low and in the range 0.37% to 0.51% with only one sample, G13-16, being somewhat higher at 0.91%.

However, in view of the inconsistent thickness of the seam no

reserves can be validly calculated for this seam. Seam A appears to be divided into a number of beds of coal which cannot be correlated between adjacent holes. The ash content of the raw coal varies between 18% and 23%.

#### 4. CONCLUSIONS

This study has shown that the various lithological units of the Gates Member can be correlated over the area investigated. Eight separate units have been identified, of which two, Units F and H, have been termed Seam 'B' and 'A' respectively.

The economic thickness and quality of Seam 'B' is too variable to allow reserves to be calculated.

Seam 'A' comprises a number of coal beds and cannot be readily correlated between adjacent holes.

As a consequence it is concluded that the economic potential of the Gates Member is too low to warrant further expenditure.

GATES MEMBER

BORE NUMBER: C-1

Grid Reference: 41481.2N 89473.7E

Exploration Grid Reference: G/4

Date Commenced: 20th July, 1971

Completed: 6th August, 1971

Collar R.L.: 5074.5'

Standard Datum:

Total Depth: 1681.5'

Electrically Logged: Yes

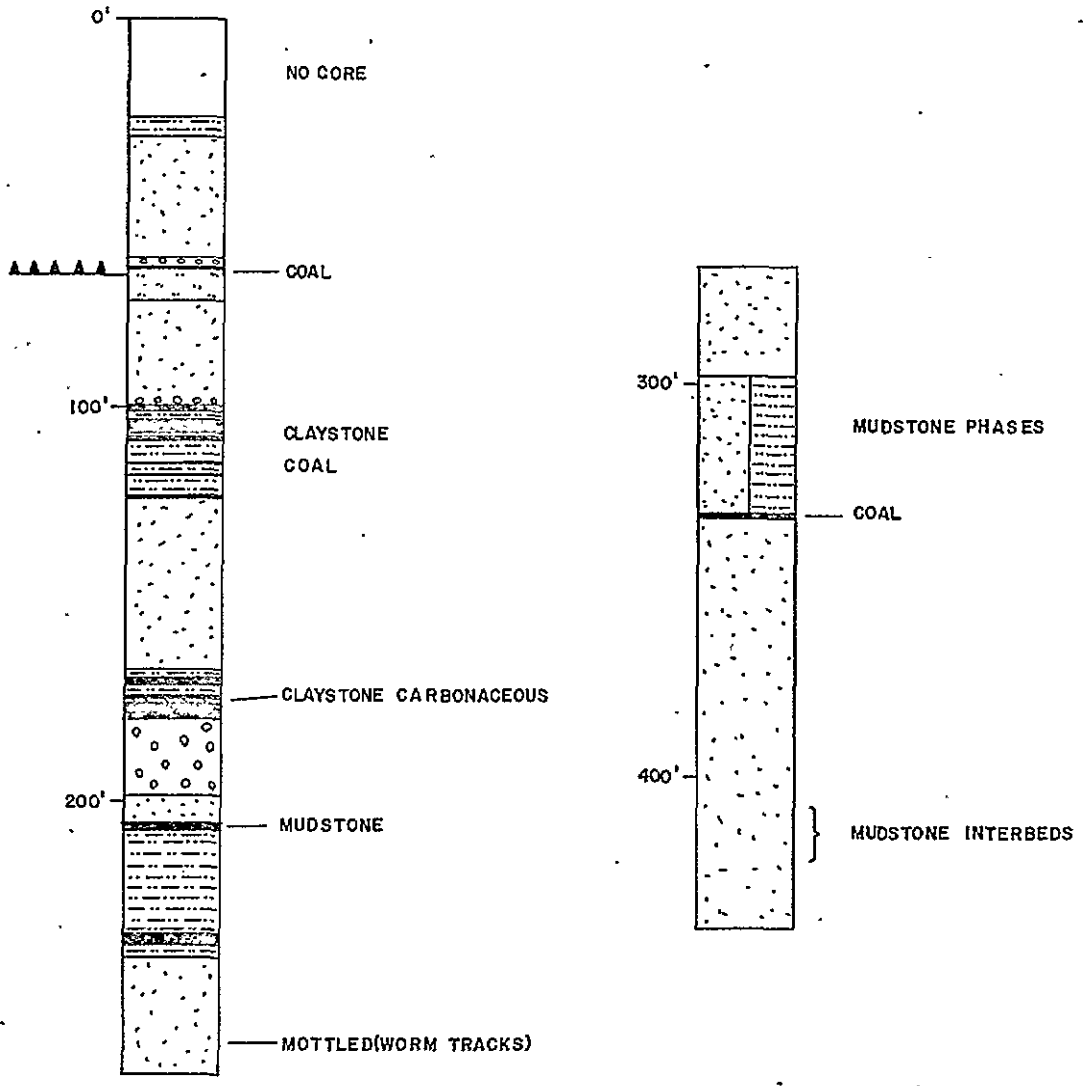
Drilled By: Connors Drilling Ltd.

For: Coalition Mining Limited

Logged By: F.H.S. Tebbutt, G.R. Jordan  
and C.W. Farrell

COAL SEAM INTERSECTIONS

<u>Seam</u>	<u>Floor</u> <u>R.L.</u>	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
B	4896.32'	10.03'	96.11%	Sampled December, 1972



DETAIL OF GATES  
MEMBER

SCALE: 1" to 50'

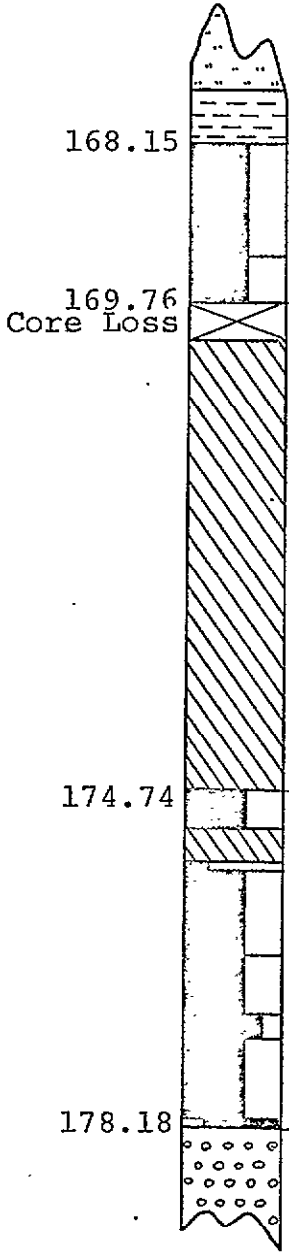
Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH C-1

SEAM SECTION  
 D.D.H. C-1  
 SEAM B  
 GATES MEMBER

ASH %  
 CUMULATIVE  
 FROM FLOOR

WT%	ASH%	C. S. N°	INCL. BANDS	EXCL. BANDS
-	5.6	7½		
4.98      Not Analysed				
-	21.1	5		



Prepared by:  
 CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
 for  
 COALITION MINING LIMITED  
 DRAWN BY M.G.      DATE JANUARY, 1973

SEAM SECTIONS  
 DDH C-1

SCALE: 1" to 2'

PAGE 1 of 1

Telegrams and Cables:  
"Visor", Sydney

# CARGO SUPERINTENDENTS

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

Telephone: 241 1105

CO. (A/SIA.) PTY. LTD.

## Certification

### This is to Certify

APPLICANT:

COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED

REPORT TO:

CLIFFORD McELROY & ASSOCIATES PTY. LIMITED.

SUBJECT:

SUKUNKA SAMPLE NO. G12  
CORE NO. DDH C1  
SEAM - GATES  
SEAM B

REPORT NO.

K72 - 1612

ORDER NO.

28021

DATE RECEIVED:

22. 12. 72

DATE REPORTED:

17. 1. 73



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*M Bradley*  
Chief Chemist.  
A.R.A.C.I.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*[Signature]*

INTRODUCTION:

One (1) only coal ply sample, designated Sample No. G12 Gates SEam, was received from Clifford McElroy & Associates on 22. 12. 72.

METHOD:

The sample was weighed, crushed to a 3/4" top size, sized at 30# BSS and the +30# BSS raw coal fraction was washed in organic liquids from 1.30 S.G. to 1.60 S.G. in 0.05 steps.

The float and sink fractions and the raw -30# BSS coal fraction were weighed, prepared and analysed for ash% and crucible swelling number in accordance with BS1016.

A composite raw coal sample was reconstituted for the determination of true specific gravity and a composite floats 1.60 S.G. fraction of the +30# BSS raw coal was reconstituted for the determination of proximate analysis total sulphur, C.S.No. phosphorus, calorific value and gieseler plastometer tests.

The results are given in this report.

RESULTS:

TABLE 1: gives the sizing, washability and analytical data for the sample after hand crushing to -3/4".

TABLE 1: WASHABILITY DATA FOR SAMPLE NO. G12 (after hand crushing to -3/4")

<u>FRACTION</u>	<u>INDIVIDUAL ANALYSIS</u>				<u>CUMULATIVE ANALYSIS</u>		
	<u>WT.GM.</u>	<u>WT.%</u>	<u>ASH%</u>	<u>C.S.NO.</u>	<u>WT.%</u>	<u>ASH%</u>	<u>C.S.NO.(calc)</u>
Fl.30 SG	289	38.1	3.0	9	38.1	3.0	9
Sl.30 - Fl.35 SG	364	48.0	4.7	7½	86.1	3.9	8
Sl.35 - Fl.40 SG	72	9.5	10.0	2½	95.6	4.5	7½
Sl.40 - Fl.45 SG	12	1.6	11.8	1½	97.2	4.7	7½
Sl.45 - Fl.50 SG	3	0.4	14.1	1	97.6	4.7	7½
Sl.50 - Fl.55 SG	1	0.1	17.2	½	97.7	4.7	7½
Sl.55 - Fl.60 SG	1	0.1	22.2	½	97.8	4.7	7½
Sl.60 SG	16	2.2	40.2	0	100.0	5.5	7½
-30# BSS RC	55	6.8	6.3	8			

SHEET THREE ATTACHED:

TOTAL WEIGHT (gms) = 813 THICKNESS = 1.61' TRUE S.G. = 1.329

ANALYSIS OF FLOATS 1.60 S.G. FRACTION OF +30# BSS RAW COAL

YIELD%	97.8
AIR DRIED MOISTURE%	1.0
ASH%	4.7
VOLATILE MATTER%	27.7
FIXED CARBON%	66.6
TOTAL SULPHUR%	0.48
C.S.NO.	8½
CALORIFIC VALUE BTU/lb	14,560 (air dried basis)
PHOSPHORUS%	0.011

GIESELER PLASTOMETER TEST (A.S.T.M. D1812-69)

INITIAL SOFTENING TEMPERATURE (0.1 ddm)	366°C
INITIAL SOFTENING TEMPERATURE (1.0 ddm)	396°C
FUSION TEMPERATURE AT 5 ddm	412°C
MAXIMUM FLUIDITY TEMPERATURE	442°C
MAXIMUM FLUIDITY	1,290 ddm
RESOLIDIFICATION TEMPERATURE	470°C
RANGE SOFTENING (0.1 ddm) - RESOLIDIFICATION	104°C
RANGE SOFTENING (1.0 ddm) - RESOLIDIFICATION	74°C
RANGE AT 1 ddm	69°C

SYDNEY  
17th January, 1973.



Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

**C A R G O**  
**SUPERINTENDENTS**  
**CO. (A/SIA.) PTY. LTD.**

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

**Certification**

**This is to Certify**

APPLICANT: COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED

REPORT TO: CLIFFORD McELROY & ASSOCIATES PTY. LTD.

SUBJECT: SUKUNKA SAMPLE NO. G13 - 16 INCLUSIVE  
CORE NO. DDH C1  
SEAM - GATES  
SEAM B

REPORT NO. K72 - 1613

DATE RECEIVED: 22. 12. 72

DATE REPORTED: 17. 1. 73

ORDER NO. 28021



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*A. Bradley*  
A. R. A. C. I. Chief Chemist.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*[Signature]*

INTRODUCTION:

One (1) only coal ply sample designated Sample No. G13-16 inclusive - Gates Seam was received from Clifford McElroy & Associates Pty. Ltd.

METHOD:

The sample was weighed, crushed to a 3/4" top size, sized at 30# BSS and the +30# BSS raw coal fraction was washed in organic liquids from 1.30 SG to 1.60 SG in 0.05 steps.

The float and sink fractions and the raw -30# BSS coal fraction were weighed, prepared and analysed for ash% and crucible swelling number in accordance with BS1016.

A composite raw coal sample was reconstituted for the determination of true specific gravity and a composite floats 1.60 SG fraction of the +30# BSS raw coal was reconstituted for the determination of proximate analysis, total sulphur, C.S.No. phosphorus, calorific value and gieseler plastometer tests.

The results are given in this report.

RESULTS:

TABLE 1: gives the sizing, washability and analytical data for the sample after hand crushing to -3/4".

TABLE 1: WASHABILITY DATA FOR SAMPLE NO. G13-16 inclusive (after hand crushing to -3/4")

<u>FRACTION</u>	<u>INDIVIDUAL ANALYSIS</u>				<u>CUMULATIVE ANALYSIS</u>		
	<u>WT.GM.</u>	<u>WT.%</u>	<u>ASH%</u>	<u>C.S.NO.</u>	<u>WT.%</u>	<u>ASH%</u>	<u>C.S.NO.(calc)</u>
Fl.30 SG	274	17.7	2.8	9	17.7	2.8	9
Sl.30 - Fl.35 SG	313	20.2	6.0	8	37.9	4.5	8½
Sl.35 - Fl.40 SG	229	14.8	11.5	4½	52.7	6.5	7½
Sl.40 - Fl.45 SG	215	13.9	16.5	2	66.6	8.6	6
Sl.45 - Fl.50 SG	141	9.1	21.7	1	75.7	10.1	5½
Sl.50 - Fl.55 SG	77	5.0	27.4	1	80.7	11.2	5½
Sl.55 - Fl.60 SG	35	2.3	29.8	½	83.0	11.7	5
Sl.60 SG	268	17.0	70.2	0	100.0	21.7	4½
-30# BSS RC	110	6.6	12.1	8½			

SHEET THREE ATTACHED:

TOTAL WEIGHT = 1662 gms

THICKNESS = 3.44'

TRUE S.G. = 1.465

---

ANALYSIS OF FLOATS 1.60 S.G. FRACTION OF +30# BSS RAW COAL

YIELD%	83.0
AIR DRIED MOISTURE%	1.0
ASH%	11.7
VOLATILE MATTER%	24.1
FIXED CARBON%	63.2
TOTAL SULPHUR%	0.91
C.S.NO.	7½
CALORIFIC VALUE BTU/lb	13,410 (air dried basis)
PHOSPHORUS%	0.051

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GIESELER PLASTOMETER TEST (A.S.T.M. D1812-69)

INITIAL SOFTENING TEMPERATURE (0.1 ddm)	381°C
INITIAL SOFTENING TEMPERATURE (1.0 ddm)	404°C
FUSION TEMPERATURE AT 5 ddm	423°C
MAXIMUM FLUIDITY TEMPERATURE	455°C
MAXIMUM FLUIDITY	130 ddm
RESOLIDIFICATION TEMPERATURE	484°C
RANGE SOFTENING (0.1 ddm) - RESOLIDIFICATION	103°C
RANGE SOFTENING (1.0 ddm) - RESOLIDIFICATION	80°C
RANGE AT 1 ddm	71°C

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SYDNEY

17th January, 1973.

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, pebble, numerous sandstone phases with cross bedding displayed; sandstone matrix on the basal part of the unit, coaly partings towards base	2.01	62.52	2.14	BASE OF HULLCROSS MEMBER
<u>COAL</u> , dull and bright, interbanded	0.54	63.06	0.54	TOP OF GATES MEMBER
SILTSTONE, breccia, core broken (perhaps a fault at base of <u>coal</u> )	0.10	63.16	0.10	
<u>CORE LOSS</u> , presumed to be part of fault zone above	2.82	65.98	3.00	
SILTSTONE, with mudstone and sandstone phases, core broken and extensively weathered, plant fossils along <u>coal</u> partings	4.14	70.12	4.40	HULLCROSS MEMBER
SANDSTONE, fine grained, light grey, quartz-lithic, core broken into small pieces, some small calcite infillings and listric surfaces. Bedding to core axis at 7.32' from top is 74° with some minor current bedding. Bedding angle returns to 90° to core axis towards base of unit. Some mudstone phases towards base showing slickensides. At 15.94' from top, a calcitic fracture, attitude 10° to the core axis	28.79	98.91	30.60	

## SUKUNKA D.D.H. C-1

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, pebble, sand matrix, average size of pebble is .02' - .03'; <u>coal</u> matrix towards the lower contact	1.06	99.97	1.13	BASE OF HULLCROSS MEMBER
<u>COAL</u> , dull with frequent bright bands	1.08	101.05	1.08 )	GATES MEMBER
MUDSTONE, weathered to small fragments, some listric surfaces, medium grey	1.72	102.77	1.85 )	SEAM A
<u>COAL</u> , stony, highly sheared; <u>coal</u> type impossible to determine	0.96	103.73	0.96 )	
<u>COAL</u> , dull with frequent bright bands , stony, sheared	0.17	103.90	0.17 )	
CLAYSTONE, carbonaceous with numerous coaly blebs	1.71	105.61	1.71 )	
<u>COAL</u> , dull with frequent bright bands	0.80	106.41	0.86 )	
MUDSTONE, numerous coaly bands, generally tends to be continuous, medium to dark grey with the occasional siltstone interbed, some listric surfaces, considerable amount of core broken	0.40	106.81	0.40 )	
	7.57	114.38	8.13 )	

## SUKUNKA D.D.H. C-1

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , dull and bright interbanded	0.17	114.55	0.17 )	
, bright with dull bands	0.17	114.72	0.17 )	
MUDSTONE, quite soft, medium grey, tending carbonaceous with occasional coaly bands	2.33	117.05	2.50 )	
<u>COAL</u> , dull with frequent bright bands	0.37	117.42	0.37 )	
MUDSTONE, some listric surfaces, dark grey, numerous coaly bands, top part of the unit has a broken core	4.38	121.80	4.70 )	
SANDSTONE, fine grained, light grey, a few siltstone blebs and coaly wisps, variable bedding and cross bedding; some fractures with calcite and slickensides. A few plant fossils, siltstone phases towards base	45.43	167.23	46.00	
MUDSTONE, dark grey, tending carbonaceous, occasional coaly wisps, and siltstone phases	0.92	168.15	4.14	
<u>COAL</u> , dull and bright	1.15	169.30	1.15 )	
, dull and bright, slight shearing	0.46	169.76	0.46 )	
CORE LOSS, probably <u>coal</u>	0.39	170.15	0.00 )	SEAM B
CLAYSTONE, carbonaceous, sheared throughout, bright <u>coal</u> bands.	4.59	174.74	4.59 )	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , dull and bright	0.36	175.10	0.36 )	
CLAYSTONE, dark grey, bright <u>coal</u> bands	0.33	175.43	0.33 )	
<u>COAL</u> , dull	0.10	175.53	0.10 )	
, dull and bright	0.85	176.38	0.85 )	
, dull and bright, minor shearing	0.60	176.98	0.60 )	
, bright with minor dull bands	0.26	176.24	0.26 )	
, dull and bright	0.85	178.09	0.85 )	
<u>COAL</u> AND ROCK PEBBLES, of underlying conglomerate	0.09	178.18	0.09 )	
CONGLOMERATE, granule conglomerate (for 4.68') as top of unit with bright white, blue and turquoise green pebbles. Increase in pebble size to 0.01' - 0.02'. Calcitic cementing material, sandstone phases towards the base of unit, coarser sandstone phases to the base	20.37	198.55	20.52	
SANDSTONE, grey, medium grained, with occasional pebbles and pebble bands	6.72	205.27	6.72	
MUDSTONE, mid grey, a few coaly wisps evident, sharp upper contact with the conglomerate	0.13	205.40	0.13	
<u>COAL</u> , dull and bright interbanded	1.34	206.74	1.03	

## SUKUNKA D.D.H. C-1

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , stony , dull with frequent bright bands	0.23 0.33	206.97 207.30	0.18 0.25	
MUDSTONE, dark grey, weathered, some fine coaly bands are present	3.35	210.65	3.60	
SILTSTONE, grey, with numerous sandstone interbeds towards base, occasional mudstone phases towards the top of unit	6.28	216.93	6.74	
MUDSTONE, weathered, fractures quite easily, a few carbonaceous phases towards the base	17.46	234.39	18.73	
<u>COAL</u> , attitude of listric surface 65° and 60° to the core axis, in opposite directions, dull with minor bright bands.	1.09	235.48	1.25	
CLAYSTONE, carbonaceous	0.17	235.65	0.17	
<u>COAL</u> , dull with minor bright bands	0.91	236.56	1.04	



<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, broken and weathered, grading to siltstone at base, occasional listric surfaces.	3.83	240.39	4.38	
SANDSTONE, medium grained with coarse phase; light grey; mudstone phase at top of unit, some cross bedding, worm cast in a zone from 15.06' to 20.54', 15.06' below the top, second zone of worm casts 31.20' below the top of the sandstone, for a zone of 1.83', mottled (worm casts) seen immediately above the zone of larger worm casts.	57.15	297.54	57.98	
SANDSTONE and MUDSTONE INTERBEDDED, sandstone grey, fine grained and mudstone dark grey interbedded	35.81	333.35	36.89	
<u>COAL</u> , dull with minor bright bands	0.93	334.28	1.16	
, bright with dull bands	0.15	334.43	0.18	
, dull with minor bright bands	0.14	334.57	0.17	
SANDSTONE, with mudstone phases and interbeds throughout, fine grained to medium grained, light grey with coaly wisps; an occasional coaly band (.1')	20.33	354.90	20.21	

## SUKUNKA D.D.H. C-1

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<p>SANDSTONE, 'salt and pepper' variety, fine grained becoming finer grained towards base, cross bedding common. Zone of worm casts (.29') 30.3' below top to 42' from the top (worm burrows, .02' - .03' diameter), pyrite band (.05') at 43' below top. Mudstone interbeds from 408' to 421.5' and an occasional one from 421.5' to base.</p>	79.78	434.68	79.29	BASE OF GATES MEMBER
<p>SILTSTONE and MUDSTONE INTERBEDDED, siltstone grey and mudstone dark grey interbedded</p>				TOP OF SUKUNKA MEMBER

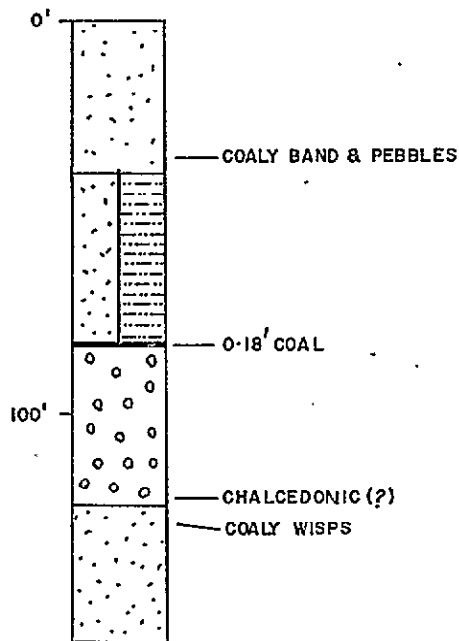
GATES MEMBER

BORE NUMBER: C-5

Grid Reference: 43093.3N 84733.2E  
Exploration Grid Reference: E/2 + 1000' E

Date Commenced: 7th August, 1971 Completed: 16th August, 1971

Collar R.L.: 4834.4' Standard Datum:  
Total Depth: 1468' Electrically Logged: Yes  
Drilled By: Connors Drilling Ltd.  
For: Coalition Mining Limited  
Logged By: F.H.S. Tebbutt



DETAIL OF GATES  
MEMBER  
SCALE: 1" to 50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH C-5

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SOIL AND UNCONSOLIDATED MATERIAL TO 12.84'	12.84	12.84		
SANDSTONE, grey, fine grained, fractures at 50' to core axis 6.6' from top and at 28° to core axis, 16.4' from top, coaly band (thin) with a few pebbles 3.7' from base	24.71	37.55	24.71	
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained and mudstone dark grey, some worm casts and irregular bedding; a few pebbles at 49', 64.5' conglomerate band (0.5') at 68', a few thin coaly bands towards base, soft and clay-like in basal 0.5'	45.25	82.80	44.91	
<u>COAL</u> , dull with frequent bright bands, boundaries at 50° to core axis and signs of listric surfaces	1.89	84.14	0.18	
CONGLOMERATE, greenish grey, pebbles mainly small (averaging about 0.02') but with coarser and finer phases. Varied lithology, pebbles rounded to sub-angular; matrix of sandstone only towards base; basal 1.5' chalcedonic (?) and of a darker colour.	39.13	123.27	38.38	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, grey, medium grained at top and becoming finer grained towards base, coaly wisps near top; joints parallel to core axis and up to 15° to core axis with iron staining in lower half.	34.82	158.09	35.59	Base of Gates Member X

GATES MEMBER

BORE NUMBER: C-17

Grid Reference: 47261.3N 90422.0E

Exploration Grid Reference: E/6

Date Commenced: 2nd Sept., 1971

Completed: 22nd Sept., 1971

Collar R.L.: 5357.0'

Standard Datum:

Total Depth: 2506.2'

Electrically Logged: Yes

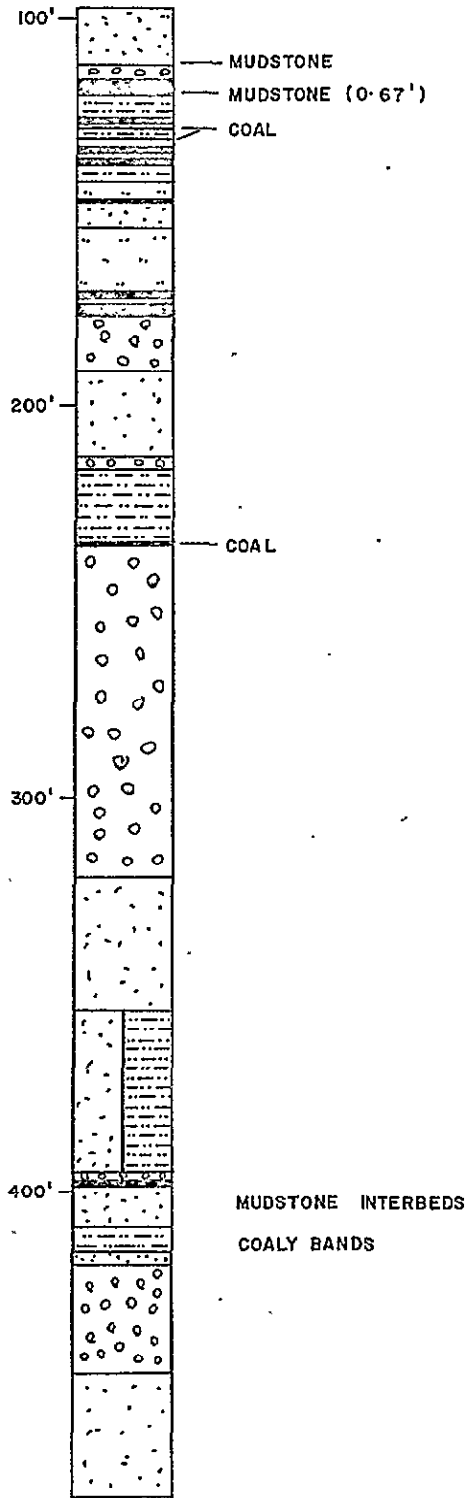
Drilled By: Connors Drilling Ltd.

For: Coalition Mining Ltd.

Logged By: F.H.S. Tebbutt, G.R. Jordan  
and C.W. Farrell

COAL SEAM INTERSECTIONS

<u>Seam</u>	<u>Floor</u> <u>R.L.</u>	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
B	5179.54'	6.36'	87.9%	Sampled December, 1972



DETAIL OF GATES  
MEMBER

SCALE 1" to 50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH C-17



SEAM SECTION  
 D.D.H. C-17  
 SEAM B  
 GATES MEMBER

ASH %  
 CUMULATIVE  
 FROM FLOOR

		WT%	ASH%	C. S. N <sup>o</sup>	INCL. BANDS	EXCL. BANDS
171.10		-	5.1	7	0	0
173.02		-	81.8	0	0	0
174.85		-	22.7	4	0	0
177.46		-	22.7	4	0	0

Prepared by:  
 CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
 for  
 COALITION MINING LIMITED

SEAM SECTIONS  
 DDH C-17

DRAWN BY M.G.

DATE JANUARY, 1973

SCALE: 1" to 2'

PAGE 1 of 1

Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

# CARGO SUPERINTENDENTS

CO. (A/SIA.) PTY. LTD.

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

## Certification

This is to Certify

APPLICANT: COALITION MINING LIMITED  
C/- AUSTEN & BUTTA LIMITED

REPORT TO: CLIFFORD McELROY & ASSOCIATES PTY. LTD.

REPORT ON: SUKUNKA SAMPLES Nos. G6, G7 and G8 - 11 inclusive  
CORE No. DDH C17  
SEAM GATES  
SEAM B

REPORT NO. K72-1614

ORDER NO. 28021

DATE RECEIVED: 22.12.1972.

DATE REPORTED: 17.1.1973.



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*M. Bradley*  
A.R.A.C.I. Chief Chemist.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*[Signature]*

INTRODUCTION:

Two (2) only coal ply samples and one (1) only non-coal ply sample designated SamplesNumbers G6, G8 - 11 inclusive and G7 respectively - Gates Seam were received on 22.12.1972 from Clifford McElroy and Associates Pty. Ltd.

METHOD:

The non coal ply ie G7 was weighed, prepared and analysed for ash% and true SG.

The two coal plies were each weighed, crushed to a  $\frac{3}{4}$ " top size, sized at 30 mesh BSS and the plus 30 mesh BSS raw coal fractions were washed in organic liquids from 1.30 SG to 1.60 SG in 0.05 steps.

The float and sink fractions and the raw minus 30 mesh BSS coal fractions were weighed, prepared and analysed for ash% and crucible swelling number in accordance with BS 1016.

A composite floats 1.60 SG fraction of the plus 30 mesh BSS raw coal was reconstituted for the full seam and the sample was analysed for proximate analysis, total sulphur%, C.S. No., calorific value, phosphorus and Gieseler Plastometer test.

The results are included in this report.

NOTE:

Sample weights have been adjusted to compensate for core loss.

RESULTS:

Fig 1 is the graphic log of the seam

Tables 1 and 2 gives the sizing, washability and analytical data for the two coal plies ie G6 and G8 - 11 inclusive, after hand crushing to  $\frac{3}{4}$ ".

Table 3 gives the calculated washability data for the full seam ie G6 - 11 inclusive, and the analysis of the Floats 1.60 SG fraction of the full seam is also given.

SHEET THREE ATTACHED

TABLE 1

WASHABILITY DATA FOR SAMPLE NO. G6 (after hand crushing to  $-\frac{3}{4}$ " )

FRACTION	INDIVIDUAL ANALYSIS				CUMULATIVE ANALYSIS		
	WEIGHT (gms)	WEIGHT%	ASH%	CS No.	WEIGHT%	ASH%	CS No. (CALC)
F1.30 SG	287	32.4	2.5	9	32.4	2.5	9
S1.30 - F1.35 SG	461	51.9	4.9	7½	84.3	4.0	8
S1.35 - F1.40 SG	85	9.6	7.6	3½	98.9	4.3	7½
S1.40 - F1.45 SG	29	3.3	11.0	2	97.2	4.6	7½
S1.45 - F1.50 SG	8	0.8	12.3	1½	98.0	4.6	7½
S1.50 - F1.55 SG	10	1.1	13.3	0	99.1	4.7	7½
S1.55 - F1.60 SG	1	0.1	16.3	0	99.2	4.7	7½
S1.60 SG	6	0.8	24.7	0	100.0	4.9	7
-30 mesh RC	63	6.6	8.3	7½			

TOTAL WEIGHT (gms) = 950 : THICKNESS = 1.92 : TRUE SG = 1.338

SAMPLE G7 WEIGHT (gms) = 1345 : THICKNESS = 1.83 : TRUE SG = 2.299 ASH% = 81.8

TABLE 2

WASHABILITY DATA FOR SAMPLE NO. G8 - 11 inclusive (after hand crushing to  $-\frac{3}{4}$ " )

FRACTION	INDIVIDUAL ANALYSIS				CUMULATIVE ANALYSIS		
	WEIGHT (gms)	WEIGHT%	ASH%	CS No.	WEIGHT%	ASH%	CS No. (CALC)
F1.30 SG	210	16.4	2.9	9	16.4	2.9	9
S1.30 - F1.35 SG	325	25.4	6.2	7½	41.8	4.9	8
S1.35 - F1.40 SG	231	18.1	10.3	2	59.9	6.5	6
S1.40 - F1.45 SG	71	5.6	15.5	1	65.5	7.3	6
S1.45 - F1.50 SG	32	2.5	21.2	1	68.0	7.8	5½
S1.50 - F1.55 SG	53	4.1	26.6	1	72.1	8.9	5½
S1.55 - F1.60 SG	45	3.5	33.0	1	75.6	10.0	5
S1.60 SG	311	24.4	64.0	0	100.0	23.2	4
-30 mesh RC	78	5.8	14.4	8			

TOTAL WEIGHT (gms) = 1356 : THICKNESS = 2.61 : TRUE SG = 1.449

SHEET FOUR ATTACHED

TABLE 3

CALCULATED WASHABILITY DATA FOR FULL SEAM ie G6 - 11 inclusive

FRACTION	INDIVIDUAL ANALYSIS				CUMULATIVE ANALYSIS		
	WEIGHT (gms)	WEIGHT%	ASH%	CS No.	WEIGHT%	ASH%	CS No. (CALC)
F1.30 SG	497	14.2	2.7	9	14.2	2.7	9
S1.30 - F1.35 SG	789	22.4	5.4	7½	36.6	4.4	8
S1.35 - F1.40 SG	316	9.0	9.6	3	45.6	5.4	7
S1.40 - F1.45 SG	100	2.8	14.2	2	48.4	5.9	7
S1.45 - F1.50 SG	40	1.1	19.4	1½	49.5	6.2	7
S1.50 - F1.55 SG	63	1.8	24.5	1	51.3	6.8	6½
S1.55 - F1.60 SG	46	1.3	32.6	½	52.6	7.5	6½
S1.60 SG	1662	47.4	78.2	0	100.0	41.0	3½
- 30 mesh RC	141	3.9	11.7	8			

TOTAL WEIGHT (gms) = 3651 : THICKNESS = 6.36t : TRUE SG = <sup>1.637</sup>~~1.733~~

ANALYSIS OF FLOATS 1.60 SG FRACTION OF FULL SEAM ie G6 - 11 inclusive

YIELD %	52.6	
AIR DRIED MOISTURE %	1.0	
ASH %	7.5	
VOLATILE MATTER %	26.2	
FIXED CARBON %	65.3	
TOTAL SULPHUR %	0.37	
CS No.	7	
CALORIFIC VALUE B.T./lb	13.980	(air dried basis)
PHOSPHORUS %	0.011	

GIESELER PLASTOMETER TEST ( ASTM D1812 - 69)

INITIAL SOFTENING TEMPERATURE (0.1 DDM)	364 °C
INITIAL SOFTENING TEMPERATURE (1.0 DDM)	400 °C
FUSION TEMPERATURE AT 5 DDM	415 °C
MAXIMUM FLUIDITY TEMPERATURE	438 °C
MAXIMUM FLUIDITY	690 DDM
RESOLIDIFICATION TEMPERATURE	477 °C
RANGE SOFTENING (0.1 DDM) - RESOLIDIFICATION	113 °C
RANGE SOFTENING (1.0 DDM) - RESOLIDIFICATION	77 °C
RANGE AT 1 DDM	72 °C

SYDNEY  
17th January, 1973.

COALITION MINING LTD.

1/0 AUSTEN & BUTTA LTD.

K72-1614

G6-11 - GATES SEAM.

PLY NO	THICK	WT	ASH	CS NO	ASH % CUT FROM FLOOR	
					INC BAND	EXC BAND
					40.0	15.7
G6	1.92	26.0	4.9	7		
					52.3	23.2
G7	1.83	36.8	81.8	0		
					23.2	
G8-11	2.61	37.2	23.2	4		

A

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, pebble horizon 0.04' to 0.05' being average pebble size, pyrite, white and grey pebbles, sandstone matrix with coaly wisps also present; not well consolidated	1.09	116.59	1.09	Base of Hullcross Member
<u>COAL</u> , dull with minor bright bands	0.80	117.39	0.66	) Top of Gates Member
, dull with frequent bright bands	0.24	117.63	0.20	)
, dull with minor bright bands	0.33	117.96	0.27	)
, dull with minor bright bands	0.44	118.40	0.36	) SEAM A
MUDSTONE, dark grey, core badly broken, slickensided surfaces at 45° to core axis	0.67	119.07	0.55	) Note: The 3.56' core loss between 116.59 and 137.62 ft. has been distributed proportionally throughout the full sequence. The core
<u>COAL</u> , stony, broken core, extensively sheared with listric surface, core broken into coarse flakes	0.54	119.61	0.45	) distributed
, stony	0.05	119.66	0.04	) proportionally
, stony, extensively sheared with listric surfaces, core broken into coarse flakes	0.36	120.02	0.30	) throughout
, stony	0.34	120.36	0.28	) the full sequence. The core

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, dark grey with interbedded siltstone and sandstone phases, coal lenses toward top of unit; fractures with somewhat listric surface at 30° to core axis, 3.51' from top and at 43°, 4.90' from top	6.47	126.83	5.35 )	had lain in the core boxes for 15 months before
<u>COAL</u> , band, dull	0.04	126.87	0.03 )	detailed logging and in most cases
MUDSTONE, as above	0.08	126.95	0.07 )	the mudstone units were
<u>COAL</u> , band, dull	0.01	126.96	0.01 )	badly broken up, making
MUDSTONE, carbonaceous, coaly wisps	0.12	127.08	0.10 )	recognition of individual
<u>COAL</u> , <u>coal</u> type and cleat observed by deformation and development of listric surfaces at an angle of 75° to core axis, cleat poorly developed, very fine calcite vein parallel to core axis and parallel to bedding	0.68	127.76	0.56 )	zones of core loss impossible.
MUDSTONE, mid grey, with listric surfaces at 60° to core axis, <u>coal</u> band .02' at base of mudstone	0.24	128.00	0.20 )	



<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, coaly wisps to base, becoming coaly bands at the base. Listric surface at 40° to core axis at 75' from top dark grey to black.	1.33	129.33	1.12 )	
<u>COAL</u> , stony with calcite phases parallel to bedding	0.16	129.49	0.13 )	
MUDSTONE, carbonaceous with a few coaly wisps, <u>coal</u> band .02' at base; dark grey	0.26	129.75	0.22 )	
MUDSTONE, dark grey to black, coaly wisps and bands	0.53	130.28	0.44 )	
CLAYSTONE, carbonaceous with occasional <u>coal</u> bands	0.77	131.05	0.64 )	
<u>COAL</u> , dull with frequent bright bands	0.07	131.12	0.06 )	
CLAYSTONE, carbonaceous, as above with <u>coal</u> wisps and lenses	0.91	132.03	0.76 )	
MUDSTONE, dark grey, sheared and weathered, <u>coal</u> bands .65' from top of unit	2.17	134.20	1.82 )	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , <u>coal</u> type and cleat obscured, somewhat stony	0.95	135.15	0.79 )	
CLAYSTONE, carbonaceous, dark black	1.15	136.30	0.97 )	
<u>COAL</u> , dull with minor bright bands, pennybands of carbonaceous claystone at .03', .05' and .17' from top	0.72	137.02	0.60 )	
, bright	0.04	137.06	0.03 )	
, dull with minor bright bands	0.22	137.28	0.18 )	
, dull with frequent bright bands	0.34	137.62	0.28 )	
MUDSTONE, carbonaceous, coaly wisps at .9' below top	0.18	137.80	0.18 )	
MUDSTONE, with silty interbeds and coaly wisps	1.73	139.53	1.70 )	
CLAYSTONE, dark black with coaly bands (.05') in centre of unit	0.37	139.90	0.36 )	
SANDSTONE, light grey, quartz-lithic with siltstone interbeds that are carbonaceous, siltstone at base of unit with coaly wisps.	2.06	141.96	2.02 )	
MUDSTONE, carbonaceous in top .09'; coaly bands and wisps in middle.	0.96	142.92	0.94 )	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, fine grained, grey, lithic, coaly wisps; slump structure, .08' from top, followed by cross bedding down to 1.5' from top. Fracture parallel to core axis from .18' from top for .5'	2.17	145.09	2.13	)
SILTSTONE, numerous mudstone interbeds, fracture at 25° to core axis	0.70	145.79	0.69	)
CLAYSTONE, carbonaceous, grading to carbonaceous siltstone at base, zone (.10') of broken core with slickensided surfaces and 60° to core axis, 52' from top	1.65	147.44	1.62	)
SANDSTONE, with siltstone phases and interbeds, medium grey, quartz-lithic, coaly wisps throughout	5.17	152.61	5.06	)
SILTSTONE, medium grey, quartz-lithic, sandstone phases interbedded at top, degenerating to a mudstone matrix at base of unit. Some slight sedimentary descriptions, some coaly wisps in middle of unit, bedding angle 90° to core axis, occasional worm casts at 167'	18.49	171.10	18.11	)

Geological Description of Strata	Estimated Thickness (ft)	Estimated Depth to Stratum Floor (ft)	Footage Recovered (ft)	Remarks
<u>COAL</u> , dull and bright, minor bands to .01' of 'sooty' coal in slightly sheared zones.	0.70	171.80	0.70 )	SEAM B
dull with minor bright bands, some sooty bands, minor shearing	1.22	173.02	0.83 )	
CLAYSTONE, grey, to claystone carbonaceous, sheared, fragments in box.	1.83	174.85	1.45 )	
<u>COAL</u> , dull and bright	0.55	175.40	0.55 )	
, dull	0.13	175.53	0.13 )	
, dull and bright, minor shearing	0.57	176.10	0.57 )	
CLAYSTONE, black, carbonaceous	0.20	176.30	0.20 )	
<u>COAL</u> , dull and bright	0.62	176.92	0.62 )	
, dull	0.36	177.28	0.36 )	
<u>COAL AND PEBBLES</u> , dull and bright banded coal with white pebbles of underlying conglomerate included	0.18	177.46	0.18 )	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<p>CONGLOMERATE, devoid of matrix with coarse sandstone phases, carbonaceous at top .19', white, blue and turquoise green pebbles, average size of pebble .01'; sandstone phases as 3.96' below 178.0' mark; pebble band at 6.25' below top (.42'), pebble conglomerate; rounded pebbles, as above, average size .02' - .04'</p>	15.43	192.89	15.36	
<p>SANDSTONE, medium to coarse grained, pebble bands, light grey, quartz-lithic, mudstone band (.09') .3' from base of unit. Bedding 82° to core axis</p>	3.80	196.69	3.78	
<p>CONGLOMERATE, pebble, average size .03' - .04' with a sandstone matrix towards the top of the unit, decreasing to base, rounded pebbles with sandstone and granule phases, worm casts 2.16' from base in sandstone phase, graded bedding evident, 2.4' - 2.84' below 198.0' depth is a granule conglomerate</p>	8.67	205.36	8.63	
<p>SANDSTONE, fine to medium grained, light grey, quartz-lithic, with siltstone interbeds, coaly wisps and blebs, bedding 83° to core axis, pebble band (.13'), .51' from base</p>	5.18	210.54	5.15	

## SUKUNKA D.D.H. C-17

<i>Geological Description of Strata.</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, pebble	0.25	210.79	0.25	
SANDSTONE, fine to medium grained, granules to base, with <u>coal</u> wisps and bands at base, bedding 28° to core axis	1.35	212.14	1.34	
CONGLOMERATE, with sandstone phases, pebbles .03'- .04' size occasional mudstone band with sandstone matrix towards base	4.99	217.13	4.96	
MUDSTONE, carbonaceous with sandstone phases (.13') .15' from top	1.75	218.88	1.74	
MUDSTONE, dark grey with increasing number of siltstone beds towards the base; graded bedding from a dark mudstone to siltstone phases in the mudstone and fine grained sandstone.	3.79	222.67	3.77	
SANDSTONE, brownish grey, very fine grained, siltstone interbedded and coaly wisps	3.12	225.79	3.10	

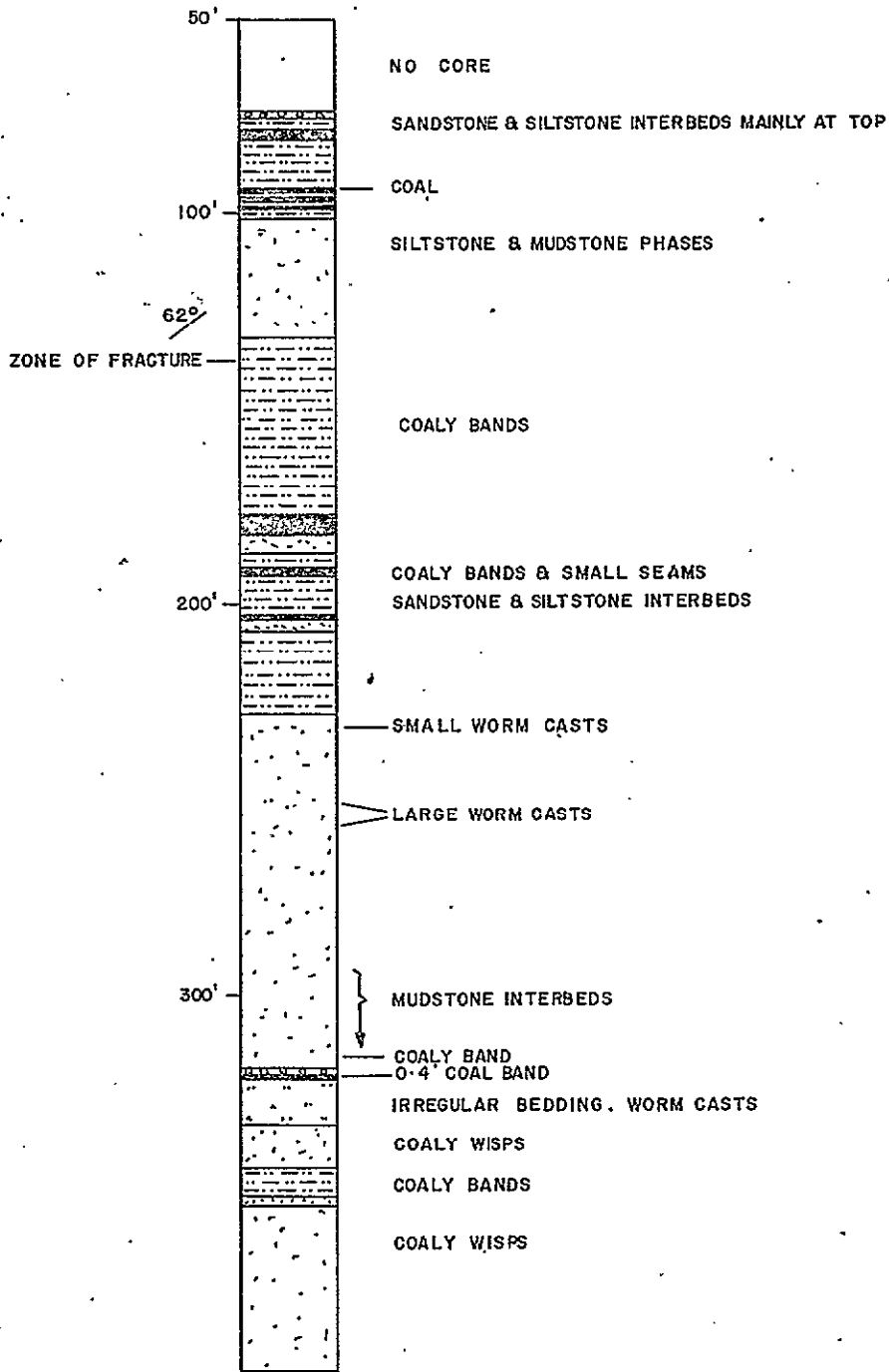
<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, mid grey, bedding perpendicular to core axis, a few carbonaceous phases towards the base, bedding 90° to core axis	9.62	235.41	9.57	
<u>COAL</u> , dull and bright	0.30	235.71	0.30	
CONGLOMERATE, granule, gradational contact at upper end of unit with carbonaceous matrix for .5' below coal and no matrix	14.20	249.91	14.30	
CONGLOMERATE, pebble, light grey and green and white, pebbles to .18" in diameter, granule conglomerate matrix and phases, subrounded pebbles; quite large pebbles to base	7.59	257.50	7.64	
CONGLOMERATE, sandstone phases and pebble horizons throughout, a granule conglomerate; some pebbles randomly scattered towards base of unit; graded bedding is evident throughout with the sequence of fine grained, light grey sandstone and granule conglomerate, occasional siltstone unit and carbonaceous phases, carbonaceous unit 5.0', 10.3', 19.0' - 19.9'	62.09	319.59	62.53	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<p>SANDSTONE, light grey, quartz-lithic, fine grained "salt and pepper style", at top of unit there are numerous granule conglomerate bands for the first 2.9'; pebble conglomerate horizons, average size of pebbles .03' - .04' at 3.37' and at 9.05', from top. Occasional coaly wisps current bedding evident, bedding angle 76° to core axis</p>	33.61	353.20	33.85	
<p>SANDSTONE, and MUDSTONE INTERBEDDED, sandstone, light grey, mudstone dark grey, with individual unit of variable thickness .05' - 1'; sandstone fine grained light grey, phases throughout, some coaly wisps throughout, bedding is irregular throughout, a few calcite veins with slickensides; fractures at 40° to core axis, up to 70° to core axis, all displaying listric surfaces; evidence of small (?) faulting in zones of brecciation located 0.20' and 6.2' above base. Plane of dislocation is about 70° to core axis in the zone located 6.2' from base</p>	43.25	396.45	43.57	
<p>CONGLOMERATE, pebble with medium grained sandstone matrix, coaly band at base, large pebbles to .03' - .04'</p>	0.70	397.15	0.70	



<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
COAL, type cannot be determined, some listric surfaces evident	0.85	398.0	0.85	
SANDSTONE, light grey, fine grained, quartz-lithic with numerous mudstone (dark grey) layers throughout. At base grades into a dark grey mudstone. Shear plane at 9.86' from the top, at 6.50' and 9.89' at 70° in opposite directions.	11.25	409.25	11.41	
MUDSTONE, dark grey with semi- carbonaceous tendencies to the base of unit. Coal bands (.06') towards the base as well. Coal is quite friable in layers. Shear planes with slickensides at 60° in zone starting 1.17' to 2.57' from the base of unit	7.18	416.43	7.28	
SANDSTONE, grey, fine grained, coaly wisps, mudstone band (.03') at base, immediately overlying a coal layer (0.2') thick	2.74	419.17	2.78	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<p>CONGLOMERATE, pebbles not much matrix with pebbles white, black and light green, average size .02' - .03', sandstone matrix appears about midway to base of unit; sandstone phase .9' at 3.2' from base; round to sub-rounded pebbles in large fraction. Pebbles somewhat more angular in upper parts with smaller pebbles. From 2.30' from top for zone of .8' core is broken along fractures at 55° to core axis.</p>	27.19	446.36	27.56	
<p>SANDSTONE, light grey, fine to medium grained, quartz lithic, a few scattered pebbles in the top 1.5'</p>	32.82	479.18	35.72	Base of Gates Member
<p>SILTSTONE and MUDSTONE INTERBEDDED, siltstone grey and mudstone dark grey interbedded</p>				Top of Sukunka Member



DETAIL OF GATES  
MEMBER

SCALE: 1" to 50'

Prepared by:  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH C-21

GATES MEMBER

BORE NUMBER: C-21

Grid Reference: 37866.2N 92869.2E

Exploration Grid Reference: J + 1000'N/ 4 + 1000'E

Date Commenced: 25th Sept., 1971

Completed: 11th Oct., 1971

Collar R.L.: 5301.5'

Standard Datum:

Total Depth: 1437.6'

Electrically Logged: Yes

Drilled By: Connors Drilling Ltd.

For: Coalition Mining Ltd.

Logged By: F.H.S. Tebbutt & G.R. Jordan

COAL SEAM INTERSECTIONS

<u>Seam</u>	<u>Floor</u> <u>R.L.</u>	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
B(?)	5120.34'	3.41'	100%	Sampled December, 1972



Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

# CARGO SUPERINTENDENTS

CO. (A/SIA.) PTY. LTD.

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

## Certification

### This is to Certify

APPLICANT: COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED

REPORT TO: CLIFEORD McELROY & ASSOCIATES PTY. LTD.

SUBJECT: SUKUNKA SAMPLE NO. G21  
CORE NO. DDH C21  
SEAM - GATES  
SEAM B

REPORT NO. K72 - 1615

ORDER NO. 28021

DATE RECEIVED: 22. 12. 72

DATE REPORTED: 17. 1. 73



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*M Bradley*  
A.R.A.C.I. Chemist.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*[Signature]*

INTRODUCTION:

One (1) only coal ply sample, designated Sample No. G21 - Gates Seam, was received from Clifford McElroy & Associates Pty. Ltd. on 22. 12. 72.

METHOD:

The sample was weighed, crushed to a 3/4" top size, sized at 30# BSS and the +30# BSS raw coal fraction was washed in organic liquids from 1.30 S.G. to 1.60 S.G. in 0.05 steps.

The float and sink fractions and the raw -30# BSS coal fraction were weighed, prepared and analysed for ash% and crucible swelling number in accordance with BS1016.

A composite raw coal sample was reconstituted for the determination of true specific gravity and a composite floats 1.60 S.G. fraction of the +30# BSS raw coal was reconstituted for the determination of proximate analysis, total sulphur, C.S.No. phosphorus, calorific value and gieseler plastometer tests.

The results are given in this report.

RESULTS:

TABLE 1: gives the sizing, washability and analytical data for the sample after hand crushing to -3/4".

TABLE 1: WASHABILITY DATA FOR SAMPLE NO. G21 (after hand crushing to -3/4")

FRACTION	INDIVIDUAL ANALYSIS				CUMULATIVE ANALYSIS		
	WT.%GM.	WT.%	ASH%	C.S.NO.	WT.%	ASH%	C.S.NO.) calc)
Fl.30 SG	102	18.6	2.5	9	18.6	2.5	9
Sl.30 - Fl.35 SG	213	38.9	6.4	7½	57.5	5.1	8
Sl.35 - Fl.40 SG	124	22.7	11.5	5½	80.2	6.9	7½
Sl.40 - Fl.45 SG	40	7.3	17.0	3½	87.5	7.8	7
Sl.45 - Fl.50 SG	44	8.0	22.2	1	95.5	9.0	6½
Sl.50 - Fl.55 SG	14	2.6	25.2	1	98.1	9.4	6½
Sl.55 - Fl.60 SG	3	0.5	28.8	1	98.6	9.5	6½
Sl.60 SG	7	1.4	53.4	0	100.0	10.1	6
-30# BSS RC	39	6.7	8.8	8			

SHEET THREE ATTACHED:

TOTAL WEIGHT GMS = 586

THICKNESS = 1.56'

TRUE S.G. = 1.347

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ANALYSIS OF FLOATS 1.60 S.G. FRACTION OF +30# BSS RAW COAL

YIELD%	98.6
AIR DRIED MOISTURE%	1.0
ASH%	9.5
VOLATILE MATTER%	25.2
FIXED CARBON%	64.3
TOTAL SULPHUR%	0.51
C.S.NO.	7½
CALORIFIC VALUE BTU/lb	13,830 (air dried basis)
PHOSPHORUS%	0.056

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GIESELER PLASTOMETER TEST (A.S.T.M. D1812-69)

INITIAL SOFTENING TEMPERATURE (0.1 ddm)	366°C
INITIAL SOFTENING TEMPERATURE (1.0 ddm)	405°C
FUSION TEMPERATURE AT 5 ddm	422°C
MAXIMUM FLUIDITY TEMPERATURE	446°C
MAXIMUM FLUIDITY	68 ddm
RESOLIDIFICATION TEMPERATURE	479°C
RANGE SOFTENING (0.1 ddm) - RESOLIDIFICATION	113°C
RANGE SOFTENING (1.0 ddm) - RESOLIDIFICATION	74°C
RANGE AT 1 ddm	65°C

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SYDNEY

17th January, 1973.



SUKUNKA D.D.H. C-21

Geological Description of Strata	Estimated Thickness (ft)	Estimated Depth to Stratum Floor (ft)	Footage Recovered (ft)	Remarks
CONGLOMERATE, white, black and green pebbles, average size .01' - .02', minor sandstone matrix, well compacted well rounded pebbles	2.05	74.94	2.05	Base of Hullcross Member
MUDSTONE, dark grey, with sandstone phases	0.66	75.60	0.66 )	Top of Gates Member
SANDSTONE, light grey, <u>coal</u> wisps, fine grained	0.51	76.11	0.43 )	
MUDSTONE, grey with pyritic worm burrows, some siltstone interbeds, carbonaceous at base	2.68	78.79	2.26 )	
<u>COAL</u> , dull with frequent bright bands, some stony <u>coal</u> bands <.01' throughout.	1.74	80.53	1.47 )	
CLAYSTONE, carbonaceous	0.19	80.72	0.16 )	SEAM A
<u>COAL</u> , dull with frequent bright bands	0.12	80.84	0.10 )	
SILTSTONE, medium grey, plant remnants, <u>coal</u> partings, fracture 30° to core axis, .85' from top of unit (some calcite)	1.96	82.80	1.65 )	

Geological Description of Strata	Estimated Thickness (ft)	Estimated Depth to Stratum Floor(ft)	Footage Recovered (ft)	Remarks
MUDSTONE, with carbonaceous phases and coaly bands, dark grey in colour	3.73	86.53	3.73	)
CORE LOSS	1.07	87.60		)
MUDSTONE, dark grey, carbonaceous, numerous coal bands, some listric surfaces along coaly partings, less carbonaceous to base	6.56	94.16	6.43	)
<u>COAL</u> , dull with frequent bright bands, calcite in cleats	0.31	94.47	0.30	)
SILTSTONE, carbonaceous with coaly partings, dark grey.	0.15	94.62	0.15	)
<u>COAL</u> , dull with frequent bright bands with 2 pennybands of stony <u>coal</u> near the base	0.29	94.91	0.28	)
CLAYSTONE, dark grey, with listric surfaces; angle of shear fracture is 55° to core axis, 1.70' from top	1.73	96.64	1.70	)
<u>COAL</u> , dull and bright	0.14	96.78	0.14	)
, stony	0.15	96.93	0.15	)
, dull with minor bright bands	0.22	97.15	0.22	)

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SILTSTONE, carbonaceous, dark grey, grading to a mudstone, carbonaceous and black	1.01	98.16	0.99 )	
<u>COAL</u> , dull with minor bright bands, some calcite infillings along fractures; occasional stone coaly bands	0.92	99.08	0.90 )	
MUDSTONE, carbonaceous with coaly bands; dark grey; a gradational change to a lower lying sandstone.	0.99	100.07	0.97 )	
SANDSTONE, light grey to brown, disturbed bedding with highly irregular siltstone interbeds. Several mudstone phases, medium grey to black, some cross bedding. Bedding angle 62° to core axis, towards base of unit. Slickensided fractures at 40° to core axis at the base. Vertical fractures at 119'.	30.85	130.92	30.23	
MUDSTONE, dark grey to black with occasional sandstone blebs, some evidence of stress along near vertical fractures rare coaly bands towards middle of unit. Numerous angular fractures with slickensided surfaces. Occasional carbonaceous bands. At 5.25' below the top is a fracture zone with very parallel fractures to core axis. Mudstone				

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
(towards base) becomes soft and apparently more weathered. A few siltstone phases to base. At the base the mudstone changes from a dark grey to a light to medium grey	46.83	177.75	45.56	
<u>COAL</u> , dull with minor bright bands	0.14	177.89	0.14 )	
CORE LOSS, recorded by drillers, probably <u>coal</u>	0.95	178.84	0.95 )	
CLAYSTONE, carbonaceous, bright <u>coal</u> bands	0.31	179.15	0.31 )	SEAM B
<u>COAL</u> , dull and bright	1.15	180.30	1.15 )	(in part)
, dull with minor bright bands	0.41	180.71	0.41 )	
CLAYSTONE, carbonaceous, black, bright <u>coal</u> bands	0.17	180.88	0.17 )	
<u>COAL</u> , dull and bright, fragments in box	0.28	181.16	0.28 )	
SANDSTONE, fine to medium grained, light grey to brownish, carbonaceous towards top of unit with major sandstone carbonaceous phase, from 3.30' to 3.90'. Gradational change from sandstone to siltstone to the claystone over final 1.3'	5.87	187.03	5.84	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CLAYSTONE, light grey, coaly bands to 0.3' in thickness, and carbonaceous phase, towards the base	4.78	191.81	4.74	
<u>COAL</u> , fragmented	0.11	191.92	0.11	
CLAYSTONE, carbonaceous	0.14	192.06	0.14	
<u>COAL</u> , fragmented	0.43	192.49	0.43	
MUDSTONE, dark grey, coaly bands	0.24	192.73	0.24	
<u>COAL</u> , fragmented	0.11	192.84	0.11	
MUDSTONE, dark grey, coaly bands	1.86	194.70	1.85	
SILTSTONE, grey, some mudstone interbeds and coaly wisps and lenses. Plant fossils	2.68	197.38	2.66	
CLAYSTONE, grey, siltstone interbeds increasing towards base, coaly wisps near base	2.80	200.18	2.78	

## SUKUNKA D.D.H. C-21

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
COAL, fragmented, chips do not exhibit much bright banding. Some mud-possibly introduced during drilling	0.39	200.57	0.39	
MUDSTONE, grey, two parallel fractures, iron stained, parallel to core axis (joints?)	2.65	203.22	2.63	
SANDSTONE, grey, fine to very fine grained, siltstone interbeds of irregular nature, mudstone phases towards base. Iron stained joint (?) parallel to core axis in upper 0.9'	3.94	207.16	3.91	
MUDSTONE, grey, some carbonaceous phases, also sandstone and siltstone phases towards base. Iron-stained joints (?) parallel to core axis at various depths. Core broken in parts and weathered	20.44	227.60	16.84	
SANDSTONE, grey, medium grained in top 20', becoming fine towards base, lithic, small worm casts in 4' zone 4.9' from top, large worm casts in 2.6' zone, 21.29' from top and in 4' zone 25.75' from top	65.67	293.27	65.48	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, grey, fine grained, dark grey mudstone interbeds, mudstone interbeds becoming predominant towards base. Thin coaly band 2.48' above base	25.99	319.26	25.92	
CONGLOMERATE, pebble and granule, varied lithology; pebbles rounded and sub-angular, sandstone matrix	0.73	319.99	0.73	
<u>COAL</u> , dull with frequent bright bands	2.16	322.15	0.44	
SILTSTONE, grey, with worm burrows and somewhat irregular bedding. Sandstone and mudstone interbeds; a joint (?) near centre approximately parallel to core axis, carbonaceous in top 0.4'	10.45	332.60	10.46	
SANDSTONE, grey, medium grained, lithic, numerous coaly wisps, becomes finer 5.75' from top and includes siltstone interbeds and phases of somewhat irregular nature. Some irregular mudstone lenses at base	12.96	345.56	12.97	
MUDSTONE, dark grey, siltstone interbeds in top 2.5', weathered. Carbonaceous at base with some coaly wisps.	6.79	352.35	6.79	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
COAL AND CLAYSTONE INTERBEDDED, <u>coal</u> interbedded with claystone carbonaceous 60:40 respectively	0.16	352.51	0.16	
MUDSTONE, dark grey, a few thin coaly bands	1.08	353.59	1.08	
SANDSTONE, brownish grey at top, becoming grey after about 15', medium grained at top, grading to fine grained at base. Numerous thin carbonaceous (?) interbeds gives a salt and pepper appearance in medium grained section, minor scale cross bedding	42.98	396.57	43.01	Base of Gates Member
SILTSTONE AND MUDSTONE INTERBEDDED				Top of Sukunka Member



GATES MEMBER

D.D.H.'s C-42

C-43

C-44

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Drill hole data relating to the  
Gates Member for these three  
holes is included in the main  
drill hole appendix.

The relevant cover pages to that  
data is included herein.

BORE NUMBER C-42

Grid Reference: 48,388 89,201

Exploration Grid Reference: E + 1600' / 5 + 1600'

Date Commenced: 31st August, 1972 Completed: 22nd September, 1972

Collar R.L.: 5242.9 ft. Standard Datum  
Total Depth: 2252.00 ft. Electrically Logged: Yes  
Hole Cemented: Yes Temperature Log: Yes  
Drilled By: Canadian Longyear Ltd.  
For: Coalition Mining Ltd.  
Logged By: G.R. Jordan

COAL SEAM INTERSECTIONS (True Thickness)

<u>Seam</u>	<u>Floor R.L.</u> (ft.)	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
Gates Member "B"	5059.13	7.73	82.9%	
Chamberlain (upper split)	3020.14	3.70	64.9%	
Chamberlain (lower split)	3005.23	11.67	81.32%	

Grid Reference: 49,028 87,760  
Exploration Grid Reference: D+1000' / 5+820

Date Commenced: 25th September, 1972 · Completed: 3rd October, 1972

Collar R.L.:	4897.9 ft.	Standard Datum
Total Depth:	1945.00 ft.	Electrically Logged: Yes
Hole Cemented:	Yes	Temperature Log: Yes
Drilled By:	Canadian Longyear Ltd.	
For:	Coalition Mining Ltd.	
Logged By:	F.H.S. Tebbutt	

COAL SEAM INTERSECTIONS (True Thickness)

<u>Seam</u>	<u>Floor R.L.</u> <u>(ft.)</u>	<u>Thickness</u> <u>(ft.)</u>	<u>Recovery</u>	<u>Comment</u>
Chamberlain (upper split) (plate 2c)	2986.03	2.70	57.7%	
Chamberlain (upper split) (plate 3)	2979.81	2.09	73.2%	
Chamberlain (lower split) (plate 3)	2969.84	7.30	77%	

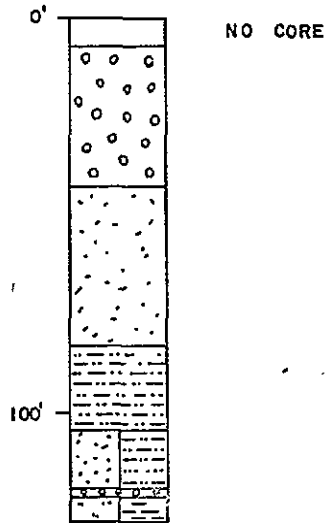
Grid Reference 47,778.2 86,435.6  
Exploration Grid Reference C + 700' / 4 + 1200'

Date Commenced: 5th October, 1972 Completed: 15th October, 1972

Collar R.L.: 4918.4 ft. Standard Datum  
Total Depth: 1657.29 ft. Electrically Logged: Yes  
Hole Cemented: No Temperature Log: Yes  
Drilled By: Canadian Longyear Ltd.  
For: Coalition Mining Ltd.  
Logged By: G.R. Jordan

COAL SEAM INTERSECTIONS (True Thickness)

<u>Seam</u>	<u>Floor R.L.</u> (ft.)	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
Skeeter	3374.6	4.23	58.6%	Not Redrilled- Thin Seam
Chamberlain	3354.6	9.52	58.7%	Coal Sheared



DETAIL OF GATES  
MEMBER

SCALE 1" to 50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH CM-5

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
Soil and unconsolidated material	7.00		7.00	
CONGLOMERATE, granule, average size of granule <.01' to .01', no matrix, coloured pebbles, green, white, black	7.90	14.90	3.90	
CONGLOMERATE, pebble, with pebble size from .03' to .04' numerous granule conglomerate phases present from 25.0' (some micaceous grains in partings)	26.56	41.46	22.42	
SANDSTONE, fine grained, light brownish grey, quartz-lithic, numerous coaly wisps (<.01')	0.72	42.18	0.68	
CONGLOMERATE, granule to pebble, as above; average size is .02'	1.06	43.24	1.00	
SANDSTONE, coaly wisps, fine grained, well compacted, quartz-lithic, generally light grey, some slickensides 0.37' from base, pebble bands towards centre of unit, mudstone (dark grey) interbeds at base of unit.	39.86	83.10	37.45	
MUDSTONE, black, well compacted and consolidated, numerous sandstone interbeds and small phases	9.72	92.82	10.25	

## SUKUNKA D.D.H. CM-5

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, the above sandstone interbedded with black, mudstone and mudstone phases	12.31	105.13	12.98	
SANDSTONE AND MUDSTONE INTERBEDS, very finely interbedded sandstone and carbonaceous mudstone units .01' thick, with bedding approximately 85° to core axis	15.09	120.22	15.90	
CONGLOMERATE, as above, pebbles .02' - .03', numerous sandstone phases towards base	1.59	121.81	1.68	
SANDSTONE, fine grained, quartz-lithic, light grey with a carbonaceous mudstone unit at top of the sandstone, bedding at 72° to core axis	5.62	127.43	5.92	
SILTSTONE AND CLAYSTONE INTERBEDDED, siltstone light grey and claystone mid to dark grey, graded bedding evident, bedding is 70° to 75° to core axis, carbonaceous to bottom of unit with coaly partings				Base of Gates Member
				Top of Sukunka Member

GATES MEMBER

BORE NUMBER: S-16

Grid Reference: 33111.3N 88970.0E

Exploration Grid Reference: K + 1100' / 1+ 600'

Date Commenced: 18th March, 1970

Completed: 1st April, 1970

Collar R.L.: 4889.1

Standard Datum:

Total Depth: 1290'

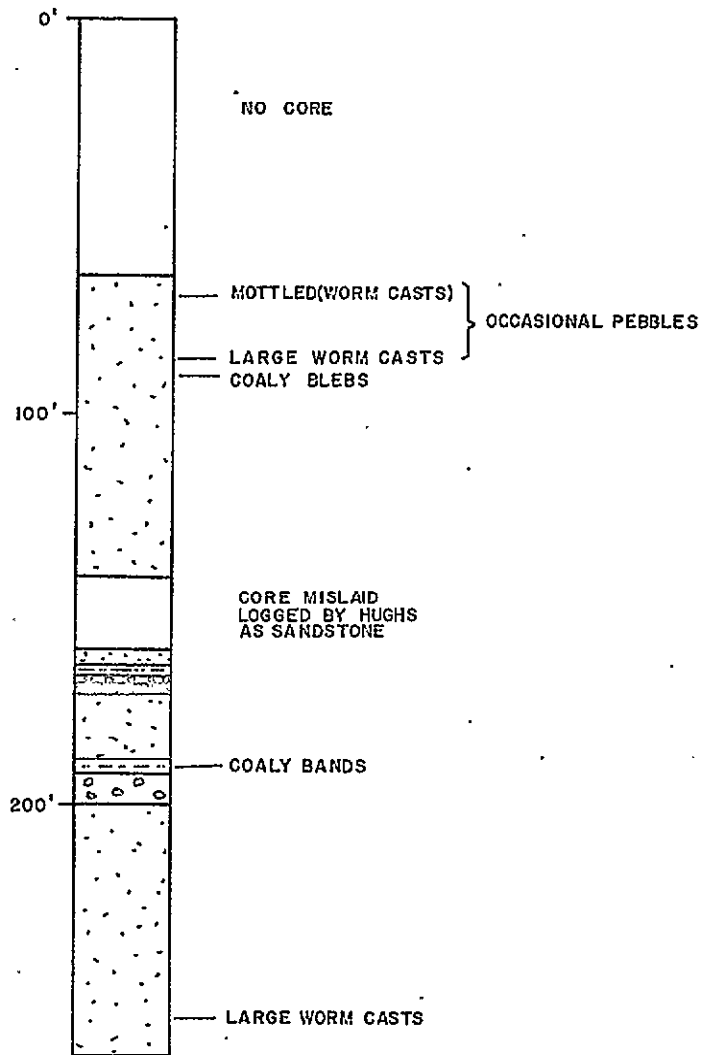
Electrically Logged: No

Drilled By: Connors Drilling Ltd.

For: Brameda Resources Ltd.

Logged By: F.H.S. Tebbutt





DETAIL OF GATES  
MEMBER

SCALE 1" to 50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.

for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS

DDH S-16

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SOIL AND UNCONSOLIDATED MATERIAL	65.3	65.3	65.3	
SANDSTONE, grey with brownish grey phases and iron oxide-stained zones around joints. Medium-grained with occasional pebble bands to 88.5'. Prominent mottled appearance (worm casts) from 68.5' to 73'. A 0.5' zone of large worm burrows at 86'. From 88.5' downwards the unit is fine grained and massive. A 0.8' zone of coaly blebs 90.5'	76.94	142.24	76.94	
CORE MISLAID SINCE 1970 SEASON, recorded as sandstone by Hughs	17.78	160.02	10.00	
SANDSTONE, grey, fine grained, with a few transitional mudstone interbeds in basal 2'	4.04	164.06	4.04	
MUDSTONE, dark grey, weathered and fragmented, sandstone interbeds mainly in basal 1'	3.94	168.00	3.94	
CONGLOMERATE, greenish grey, pebbles mainly averaging about 0.03', very little matrix, pebbles rounded to sub-angular and pressed one into the other	2.97	170.97	2.97	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
COAL, dull with minor bright bands. Joint planes at about 50° to core axis	1.42	172.39	1.45	
SANDSTONE, grey, medium grained with fine grained phase at top, coaly wisps, siltstone interbeds. One coaly band near top	2.71	175.10	2.68	
MUDSTONE, dark grey	1.84	176.94	1.82	
SANDSTONE, grey at top, but becoming brownish grey with much miniature cross bedding and coaly wisps, mainly fine grained. A 0.25' zone of mudstone 1.6' from top, with other mudstone bands in basal 8.2'	11.41	188.35	11.28	
MUDSTONE, dark grey, weathered and fragmented, tendency to be carbonaceous in 0.35' zone, 1.2' from top	2.85	191.20	2.82	
CLAYSTONE, carbonaceous, with numerous bright coaly bands, core broken (badly)	0.66	191.86	0.65	
MUDSTONE, dark grey	0.58	192.44	0.57	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, greenish to blue-grey, pebbles averaging about 0.03', rounded and sub-angular, sandstone matrix and sandstone phases; varied lithology. Some coaly partings. core broken (0.25') at 198' with a little slickensides beneath	6.76	199.20	6.68	
SANDSTONE, grey, brownish grey in top 18' where rock is medium grained. Numerous black grains in this upper section and a few pebble bands. Has salt and pepper appearance, lithic. Below 218' rock is fine grained and massive. Small zone of large worm casts at 255'. A few thin mudstone interbeds near base	64.27	263.47	63.50	
SANDSTONE AND MUDSTONE INTERBEDS, sandstone grey, fine grained and mudstone dark grey interbedded, bedding irregular and with worm burrows	20.71	284.18	20.47	
SANDSTONE, brownish grey, fine grained, some mudstone interbeds with worm burrows in basal 5'	18.41	302.59	18.19	
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained and mudstone dark grey interbedded. Bedding irregular and with worm burrows				Base of Gates Member  Top of Sukunka Member

GATES MEMBER

BORE NUMBER: S-25

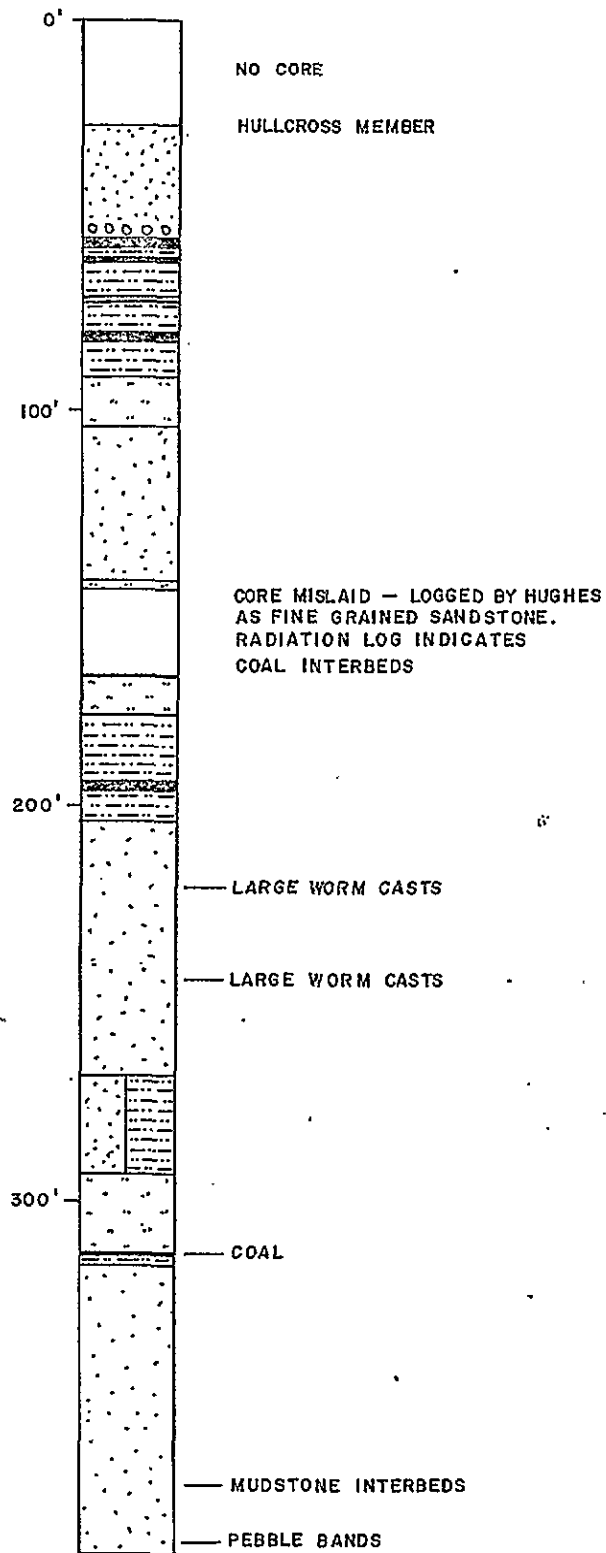
Grid Reference: 42613.7N 86679.7E  
Exploration Grid Reference: F + 300' / 3 + 300'

Date Commenced: 20th June, 1970 Completed: 29th June, 1970

Collar R.L.: 5001.9 Standard Datum:  
Total Depth: 1488 Electrically Logged: Yes  
Drilled By: Connors Drilling Ltd.  
For: Brameda Resources Ltd.  
Logged By: F.H.S. Tebbutt

COAL SEAM INTERSECTIONS

<u>Seam</u>	<u>Floor</u> <u>R.L.</u>	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
B	4840'	7.0'	7.0'	This information extracted from Brameda Report March, 1971 in referenc to "Commotio Seam A" (called Sea "B" in this report).



DETAIL OF GATES  
MEMBER

SCALE: 1" to 50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH S-25

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, greenish grey, granules and small pebbles, sulphur from weathering on core surface. Varied lithology	0.72	56.24	0.72	Base of Hullcross Member
<u>COAL</u> , dull with minor bright bands	0.87	57.11	0.75 )	Top of Gates Member
CONGLOMERATE, grey, mainly granules, sandstone matrix, varied lithology	0.37	57.48	0.37 )	
<u>COAL</u> , dull with minor bright bands	1.50	58.98	1.29 )	SEAM A
MUDSTONE, grey, tending carbonaceous towards base and having some thin coaly bands. Weathered and fragmented.	2.79	61.77	2.40 )	
<u>COAL</u> , dull and bright interbanded , stony, some thin bright bands	0.17	61.94	0.15 )	
MUDSTONE, grey, weathered and fragmented	0.08	62.02	0.07 )	
MUDSTONE, grey, weathered and fragmented	0.26	62.28	0.22 )	
SILTSTONE, grey mudstone interbeds and phases, thin sandstone interbeds in lower half	6.60	68.88	6.60 )	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, dark grey, weathered and fragmented, carbonaceous with thin coaly bands in basal 0.9'	3.43	72.31	2.95 )	
<u>COAL</u> , dull and bright interbanded	0.17	72.48	0.15 )	
MUDSTONE, grey, with thin coaly bands in upper 1.7'. Weathered and fragmented	8.43	80.91	7.25 )	
<u>COAL</u> , stony	0.12	81.03	0.10 )	
, dull with minor bright bands	0.34	81.37	0.29 )	
, stony	0.08	81.45	0.07 )	
MUDSTONE, grey, weathered and fragmented with siltstone phases and hard brown zones	8.91	90.36	8.83 )	
SILTSTONE, grey, with mudstone phases and hard brown zones	13.03	103.39	12.91	
SANDSTONE, brownish grey, fine grained, numerous thin coaly wisps, some cross bedding, siltstone interbeds towards base	40.12	143.51	39.74	
SILTSTONE, grey, mudstone interbeds	2.52	146.03	2.52	



<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CORE MISLAID, since 1971 Season, core possibly same unit in part as that in box above and below. Analysis of <u>coal</u> seam from 155' to 162', Brameda Report, March 1971	20.69	166.72	0.00	SEAM B 155' to 162'
SILTSTONE, grey, sandstone and mudstone interbeds, core broken in part	9.74	176.46	9.74	
MUDSTONE, grey, weathered, and fragmented	11.83	188.29	13.22	
CLAYSTONE, carbonaceous	1.53	189.82	1.53	
MUDSTONE, grey, carbonaceous towards base	4.14	193.96	4.14	
<u>COAL</u> , dull and bright interbanded	0.51	194.47	0.51	
MUDSTONE, grey	0.03	194.50	0.03	
<u>COAL</u> , dull and bright interbanded	0.48	194.98	0.48	
MUDSTONE, grey	0.09	195.07	0.09	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , dull with minor bright bands	0.44	195.51	0.44	
MUDSTONE, grey, tending carbonaceous in 2' zone, 1' from top	8.86	204.37	8.84	
SANDSTONE, brownish grey, down to 221' medium grained, lithic with numerous black grains in thin layers giving salt and pepper appearance. Below 221' rock is fine grained. Zones of large worm casts at 220' and 243'. Mudstone interbeds in basal 5'	62.44	266.81	62.33	
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained, and mudstone dark grey interbedded. Bedding irregular, large worm burrows-particularly in central section	31.70	298.51	31.64	
SILTSTONE, grey, thin sandstone and mudstone interbeds. Thin carbonaceous zone (0.3') at 309' and another such zone (0.03') at 311', coaly bands in bottom 0.3'	14.84	313.35	14.81	
<u>COAL</u> , dull with minor bright bands	0.17	313.52	0.17	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, dark grey, coaly bands	0.10	313.62	0.10	
<u>COAL</u> , stony	0.11	313.73	0.11	
MUDSTONE, dark grey, a few coaly lenses and wisps	1.68	315.41	1.68	
SANDSTONE, grey, medium grained down to 346' then fine grained, numerous black grains in medium grained section giving salt and pepper appearance. Minor cross bedding in places. Mudstone interbeds, numerous from 366' to 380'. Thin pebble bands (brown pebbles) at 387' and 388'. Numerous short coaly lenses in top 1'	74.77	390.18	74.59	
SANDSTONE, AND MUDSTONE INTERBEDDED, sandstone grey, fine grained, and mudstone dark grey interbedded. Slickensides beginning at base of logged section				Base of Gates Member  Top of Sukunka Member

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, grey, fine grained, dark grey mudstone interbeds, mudstone interbeds becoming predominant towards base. Thin coaly band 2.48' above base	25.99	319.26	25.92	
CONGLOMERATE, pebble and granule, varied lithology; pebbles rounded and sub-angular, sandstone matrix	0.73	319.99	0.73	
<u>COAL</u> , dull with frequent bright bands	2.16	322.15	0.44	
SILTSTONE, grey, with worm burrows and somewhat irregular bedding. Sandstone and mudstone interbeds; a joint (?) near centre approximately parallel to core axis, carbonaceous in top 0.4'	10.45	332.60	10.46	
SANDSTONE, grey, medium grained, lithic, numerous coaly wisps, becomes finer 5.75' from top and includes siltstone interbeds and phases of somewhat irregular nature. Some irregular mudstone lenses at base	12.96	345.56	12.97	
MUDSTONE, dark grey, siltstone interbeds in top 2.5', weathered. Carbonaceous at base with some coaly wisps.	6.79	352.35	6.79	

GATES MEMBER

BORE NUMBER: CM-5

Grid Reference: 42952.9N 82706.6E

Exploration Grid Reference: E + 800' / 1 + 1300'

Date Commenced: 30th October, 1971

Completed: 4th November, 1971

Collar R.L.: 4842.8'

Standard Datum:

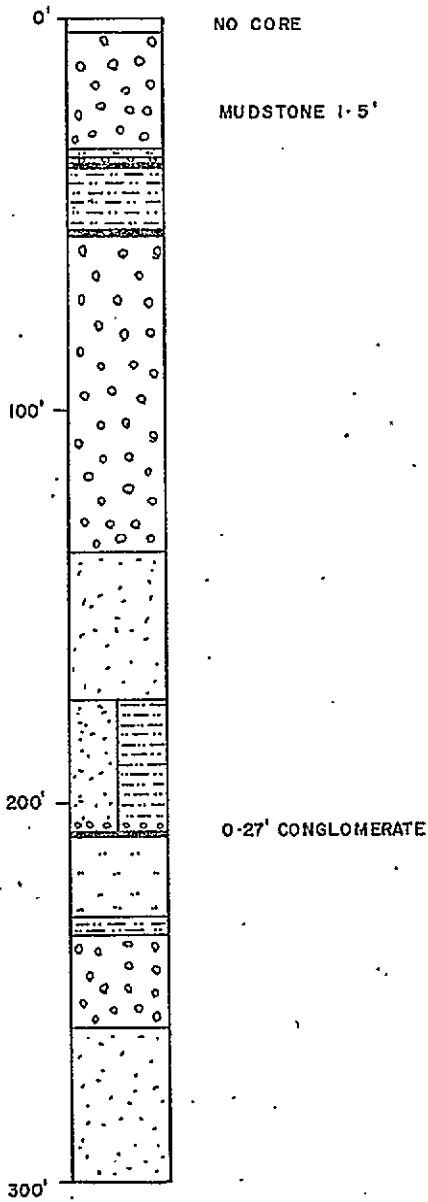
Total Depth: 1158.0'

Electrically Logged: No

Drilled By: Canadian Longyear Ltd.

For: Coalition Mining Ltd.

Logged By: C.W. Farrell



DETAIL OF GATES  
MEMBER  
SCALE: 1" to 50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH S-31

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, grey, pebble and granule phases with some thin sandstone phases. Pebbles up to 0.05' and rounded to sub-angular, sandstone matrix. Granules sub-angular to rounded with little or no matrix. Iron-stained joints at 90° to core axis	20.90	24.32	20.74	
MUDSTONE, dark grey, sandstone interbeds, worm burrows at top. Pebble band 0.95' from top. Grades to sandstone, fine grained in basal 0.48'	1.80	26.12	1.79	
CONGLOMERATE, grey, mainly small pebbles with granule phases. Coarse phase at top with one pebble much larger than core diameter. Darker phase (0.59') below 29'.	5.89	32.01	5.85	
MUDSTONE, dark grey, thin siltstone interbeds, some cross bedding, carbonaceous at top	1.21	33.22	1.20	
CONGLOMERATE, grey, pebbles up to 0.05' in diameter, mainly rounded, sandstone matrix, varied lithology, mudstone phase 0.12', 0.1' from top	0.79	34.01	0.78	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SILTSTONE, grey, grading to sandstone fine grained at top and bottom	3.08	37.09	3.06	
CONGLOMERATE, grey, small pebbles reaching up to 0.08' at base, rounded to sub-angular, varied lithology, fine sandstone matrix	0.45	37.54	0.45	
MUDSTONE, dark grey, weathered and fragmented	0.46	38.00	0.46	
<u>COAL</u> , stony, thin bright bands	0.67	38.67	0.70	
SANDSTONE, brownish grey, siltstone interbeds, grading to siltstone at top and bottom	5.28	43.95	5.28	
MUDSTONE, dark grey, some brown, hard horizons, carbonaceous zones 0.35' at 2.35' from base and 0.54' zone at base. Mudstone weathered and fragmented	10.77	54.72	11.19	
<u>COAL</u> , dull with minor bright bands	0.11	54.83	0.11	
, stony	0.07	54.90	0.08	
, interbedded <u>coal</u> and claystone carbonaceous, core broken and partly mixed	0.85	55.75	0.88	



<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, grey, mainly granule but with pebble phase. 10' phase 10' from top with pebble diameter up to core size. Some dark phases and several sandstone phases. A few thin coaly bands towards base.	79.56	135.31	80.60	
SANDSTONE, brownish grey, fine to medium grained, lithic, granule bands and scattered grains in upper 4', 0.3' pebble band at 154'. Mudstone band (0.25') 1.1' from base	38.58	173.89	39.08	
SANDSTONE, AND MUDSTONE INTERBEDDED, sandstone grey, fine grained, interbedded with mudstone dark grey, irregularly bedded, worm burrows	32.93	206.82	33.36	
CONGLOMERATE, greenish grey, pebbles, rounded, up to 0.06' in diameter, very fine hard matrix	0.27	207.09	0.27	
<u>COAL</u> , dull, core broken	0.91	208.00	0.88	
SILTSTONE, grey, irregular bedding, sandstone interbeds and phases in lower half	21.01	229.01	21.40	

GATES MEMBER

BORE NUMBER: S-31

Grid Reference: 47574.6N 87825.4E

Exploration Grid Reference: E + 1800'/4 + 1800'

Date Commenced: 14th August, 1970

Completed: 31st August, 1970

Collar R.L.: 4970.7'

Standard Datum:

Total Depth: 1558'

Electrically Logged: No

Drilled By: Connors Drilling Ltd.

For: Brameda Resources Limited

Logged By: F.H.S. Tebbutt

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, dark grey, weathered, crumbly, tending carbonaceous near centre.	5.11	234.12	5.21	
CONGLOMERATE, grey, pebbles averaging about 0.03' sandstone matrix, and sandstone phases towards base. A few coaly bands	23.22	257.34	23.66	
SANDSTONE, brownish grey and medium grained down to 271', then fine grained and grey with coaly wisps. Medium grained section with black grains in thin beds and having a salt and pepper appearance. Thin mudstone interbeds towards base. A few scattered pebbles	40.19	297.53	40.93	
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained and mudstone dark grey interbedded				Base of Gates Member  Top of Sukunka Member

GATES MEMBER

BORE NUMBER: S-32

Grid Reference: 39031.8N 97483.2E

Exploration Grid Reference: K + 1200'/6 + 1100'

Date Commenced: 16th Aug., 1970

Completed: 23rd Aug., 1970

Collar R.L.: 5651.5'

Standard Datum:

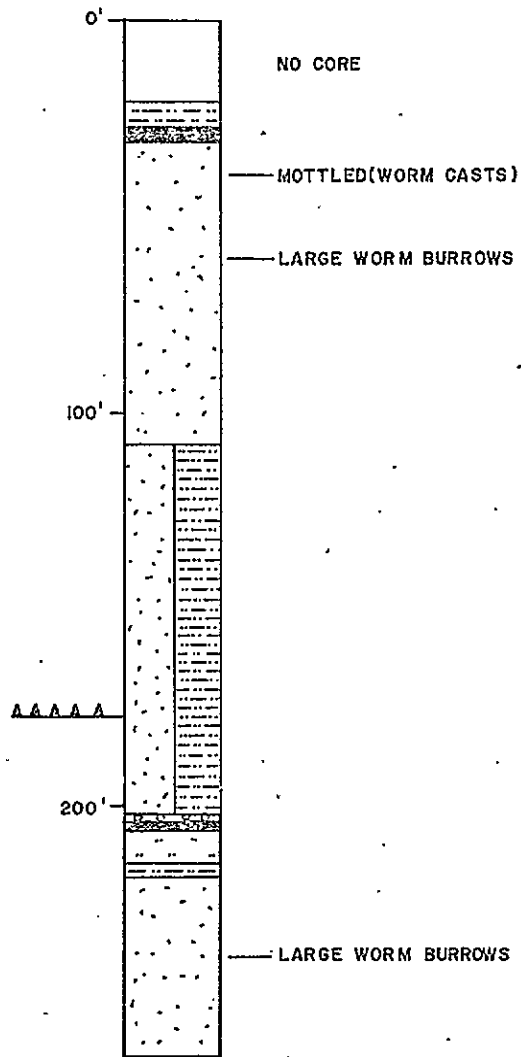
Total Depth: 1168'

Electrically Logged: No

Drilled By: Connors Drilling Ltd.

For: Brameda Resources Limited

Logged By: F.H.S. Tebbutt



DETAIL OF GATES  
 MEMBER  
 SCALE: 1" to 50'

Prepared by :  
 CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
 for  
 COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
 DDH S-32

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SOIL AND UNCONSOLIDATED ROCK MATERIAL				
MUDSTONE, dark grey, carbonaceous from 2.9' to 3.6' from top. An occasional hard brownish band. Core weathered into fragments. Grades to siltstone in basal 0.8'.	6.27	28.27	6.27	
<u>COAL</u> , dull with minor bright bands. A small amount of iron oxide staining, but <u>coal</u> seems unweathered	1.44	29.71	1.17	
MUDSTONE, dark grey, weathered to fragments	0.12	29.83	0.12	
<u>COAL</u> , dull with minor bright bands	1.01	30.84	0.82	
SANDSTONE, grey, fine grained, carbonaceous, coaly wisps	0.05	30.89	0.05	
<u>COAL</u> , dull, some sand grains disseminated in upper 0.08'	0.27	31.16	0.22	
SANDSTONE, grey, medium grained to depth 53' and containing a large number of dark grains, remainder is fine grained with iron stained joints. A few mudstone interbeds (very thin). Mottled (worm casts) from depth 38' to 43'. Carbonaceous in top 1'. Small zone of large worm burrows at 61'	77.52	108.68	77.58	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained, interbedded with mudstone dark grey, mudstone bedding irregular and having large worm burrows filled with sandstone. Bedding angle 90° to core axis from top to 122' diminishing to 60° at 139', 55° at 151', 27° at 167' and parallel to core axis from 170' with small flexures to 178'. Here there are listric surfaces, and bedding returns abruptly to 75° to core axis, increasing to 90° by 200' depth. Core broken and with some listric surfaces from about 156' to 183'. Cross bedding in sandstone phase from 196' to 198'. An occasional pebble band	93.42	202.10	88.12	Faults at 178' causing repetition within unit, extra thickening due to steep attitude of beds above fault plane
CONGLOMERATE, grey, mainly pebbles in top half, granules in bottom half. Pebbles up to 0.1' and these mainly rounded. Varied lithology	1.90	204.00	1.90	
<u>COAL</u> , dull with minor bright bands, weathered	0.34	204.34	0.30	
SANDSTONE, grey, fine grained	0.05	204.39	0.05	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<p><u>COAL</u>, dull with minor bright bands  , dull and bright interbanded  , dull with minor bright bands</p>	<p>0.55  0.20  0.79</p>	<p>204.94  205.14  205.93</p>	<p>0.49  0.18  0.69</p>	
<p>SILTSTONE, grey, mudstone interbeds mainly in top half, sandstone interbeds in lower half, bedding angle 90° to core axis</p>	<p>8.92</p>	<p>214.85</p>	<p>8.89</p>	
<p>MUDSTONE, dark grey, weathering into small pieces but not disarranged yet.</p>	<p>2.84</p>	<p>217.69</p>	<p>2.83</p>	
<p>SANDSTONE, grey, brownish grey in top 20' where medium grained with numerous black grains in thin beds to give salt and pepper effect. Below this it is fine grained with some mudstone interbeds which become thicker towards base. Large worm burrows in 1' zone below 238.5'. Iron stained joint (sub-vertical) at 234', Slump structures (1') at 163'</p>	<p>46.92</p>	<p>264.61</p>	<p>46.79</p>	<p>Base of Gates Member   Top of Sukunka Member</p>



GATES MEMBER

BORE NUMBER: S-35

Grid Reference: 45498.1N 91459.3E

Exploration Grid Reference: F/5+1800'

Date Commenced: 2nd Sept., 1970

Completed: 20th Sept., 1970

Collar R.L.: 5451.0'

Standard Datum:

Total Depth: 1754'

Electrically Logged: No

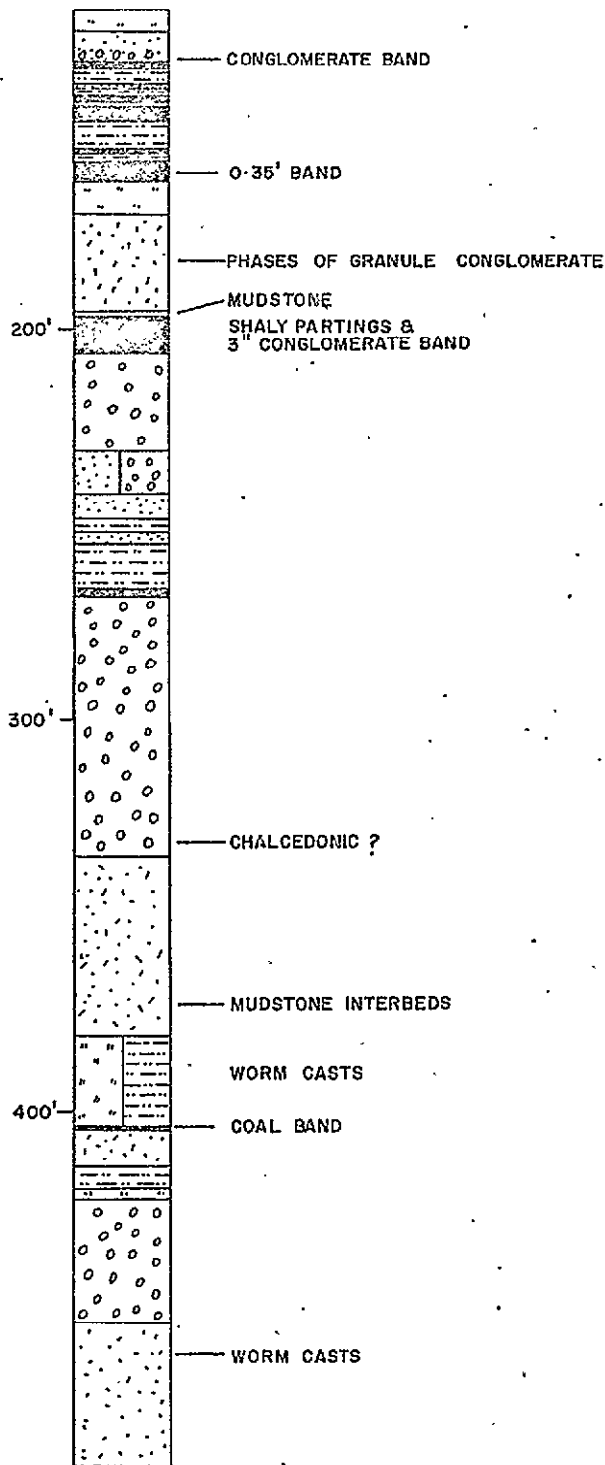
Drilled By: Connors Drilling Ltd.

For: Brameda Resources Limited

Logged By: F.H.S. Tebbutt & G.R. Jordan

COAL SEAM INTERSECTIONS

<u>Seam</u>	<u>Floor</u> <u>R.L.</u>	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
Basal Ply A	5290.0'	7.64'	89.0%	Sampled December, 1972
B	5246.0	7.8'	82.1%	Information From Brameda Report March, 1971



Details of Gates  
 Member  
 SCALE: 1" to 50'

SCALE: 1"=200'

Prepared by :  
 CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
 for  
 COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
 DDH S-35


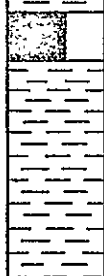
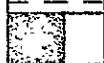

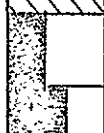
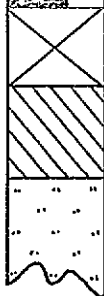
SEAM SECTION

D.D.H. S-35

SEAM A

GATES MEMBER

ASH %  
CUMULATIVE  
FROM FLOOR

		WT%	ASH%	C. S. N <sup>o</sup>	INCL. BANDS	EXCL. BANDS
154.02		0.50	-	12.1	3½	
154.52		2.30		Not Analysed		
156.82		0.55	-	25.6	1	
157.37		1.51		Not Analysed		
158.88		1.28	-	19.0	3	
160.16	Core Loss					
161.95						

Prepared by:  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

SEAM SECTIONS  
DDH S-35

DRAWN BY M.G.

DATE JANUARY, 1973

SCALE: 1" to 2'

PAGE 1 of 1

Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

C A R G O  
SUPERINTENDENTS  
CO. (A/SIA.) PTY. LTD.

Scottish House,  
19 BRIDGE ST.,  
SYDNEY. 2000

Certification

This is to Certify

APPLICANT: COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED.

REPORT TO: CLIFFORD McELROY & ASSOCIATES PTY. LTD.

SUBJECT: SUKUNKA SAMPLE NO. G18  
CORE NO. S35  
SEAM - GATES  
SEAM A

REPORT NO. K72 - 1616

ORDER NO. 28021

DATE RECEIVED: 22. 12.. 72

DATE REPORTED: 16. 1. 73



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*A. Bradley*  
Chief Chemist.

A. R. A. C. I.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*[Signature]*

INTRODUCTION:

One (1) only coal ply sample designated sample no. G18 - Gates SEam was received on 22.12.72 from Clifford McElroy & Associates Pty. Limited.

METHOD:

The sample was air dried, weighed, prepared and analysed for proximate analysis, C.S.no. and true specific gravity.

RESULTS:

THICKNESS	0.50 feet
WEIGHT	248 gms
AIR DRIED MOISTURE%	1.0
ASH%	12.1
VOLATILE MATTER	23.4
FIXED CARBON%	63.5
C.S.NO.	3½
TRUE SPECIFIC GRAVITY	1.325

SYDNEY  
16th January, 1972.

A

Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

**C A R G O**  
**SUPERINTENDENTS**  
**CO. (A/SIA.) PTY. LTD.**

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

**Certification**

**This is to Certify**

APPLICANT: COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED

REPORT TO: CLIFFORD McELROY & ASSOCIATES PTY. LTD.

SUBJECT: SUKUNKA SAMPLE NO. G19  
CORE NO. S35  
SEAM - GATES  
SEAM A

REPORT NO. K72-1617

ORDER NO. 28021

DATE RECEIVED: 22.12.72

DATE REPORTED: 16.1.73



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National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*M. Bradley*  
A.R.A.C.I. Chief Chemist.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*[Signature]*

INTRODUCTION:

One (1) only coal ply sample designated Sample No. G19 - Gates Seam, was received on 22.12.72 from Clifford McElroy & Associates Pty. Ltd.

METHOD:

The sample was air dried, weighed, prepared and analysed for Proximate Analysis, C.S.No. and True Specific Gravity.

RESULTS:

THICKNESS	0.55 feet
WEIGHT	200 gms
AIR DRIED MOISTURE%	1.0
ASH%	25.6
VOLATILE MATTER%	18.6
FIXED CARBON%	54.8
C.S.NO.	1
TRUE SPECIFIC GRAVITY	1.538

SYDNEY  
16th January, 1973.

Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

**C A R G O**  
**SUPERINTENDENTS**  
**CO. (A/SIA.) PTY. LTD.**

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

**Certification**

**This is to Certify**

APPLICANT:

COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED.

REPORT TO:

CLIFFORD McELROY & ASSOCIATES PTY. LIMITED.

SUBJECT:

SUKUNKA SAMPLE NO. G20  
CORE NO. S35  
SEAM - GATES  
SEAM A

REPORT NO.

K72 - 1618

ORDER NO.

28021

DATE RECEIVED:

22. 12. 72

DATE REPORTED:

17. 1. 73



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*M. Bralley*  
Chief Chemist.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*[Signature]*

A. R. A. C. I.



INTRODUCTION:

One (1) only coal ply sample designated Sample No. G20 Gates Seam was received from Clifford McElroy & Associates Pty. Ltd., on 22.12.72

METHOD:

The sample was weighed, crushed to a 3/4" top size, sized at 30# BSS and the +30# BSS raw coal fraction was washed in organic liquids from 1.30 SG to 1.60 SG in 0.05 steps.

The float and sink fractions and the raw -30# BSS coal fraction were weighed, prepared and analysed for ash% and crucible swelling number in accordance with BS1016.

A composite raw coal sample was reconstituted for the determination of true specific gravity and a composite floats 1.60 SG fraction of the +30# BSS raw coal was reconstituted for the determination of proximate analysis, total sulphur, C.S.No., phosphorus, calorific value and gieseler plastometer tests.

The results are given in this report.

RESULTS:

TABLE 1: gives the sizing, washability and analytical data for the sample after hand crushing to -3/4"/

TABLE 1: WASHABILITY DATA FOR SAMPLE NO. G20 (after hand crushing to -3/4")

<u>FRACTION</u>	<u>INDIVIDUAL ANALYSIS</u>				<u>CUMULATIVE ANALYSIS</u>		
	<u>WT.GM.</u>	<u>WT.%</u>	<u>ASH%</u>	<u>C.S.NO.</u>	<u>WT.%</u>	<u>ASH%</u>	<u>C.S.NO. (calc)</u>
FL. 30 SG	42	5.7	2.8	9	5.7	2.8	9
Sl. 30 - Fl. 35 SG	111	15.1	6.5	8	20.8	5.5	8½
Sl. 35 - Fl. 40 SG	114	15.5	11.6	5	36.3	8.1	7
Sl. 40 - Fl. 45 SG	220	30.0	14.9	1½	66.3	11.2	4½
Sl. 45 - Fl. 50 SG	90	12.3	18.4	1	78.6	12.3	4
Sl. 50 - Fl. 55 SG	31	4.2	22.7	1	82.8	12.8	4
Sl. 55 - Fl. 60 SG	15	2.0	24.7	1	84.8	13.1	3½
Sl. 60 SG	111	15.2	52.5	0	100.0	19.1	3
-30# BSS RC	42	5.4	16.5	6½			

SHEET THREE ATTACHED:

TOTAL WEIGHT = 776 gms

THICKNESS = 1.28'

TRUE S.G. = 1.404

ANALYSIS OF FLOATS 1.60 S.G. FRACTION OF +30# BSS RAW COAL

YIELD%	84.8
AIR DRIED MOISTURE%	1.0
ASH%	13.1
VOLATILE MATTER%	23.8
FIXED CARBON%	62.1
TOTAL SULPHUR%	0.30
C.S.NO.	4½
CALORIFIC VALUE BTU/lb	13,460 (air dried basis)
PHOSPHORUS%	0.007

GIESELER PLASTOMETER TEST (A.S.T.M. D1812-69)

INITIAL SOFTENING TEMPERATURE (01 ddm)	375 °C
INITIAL SOFTENING TEMPERATURE (1.0 ddm)	418 °C
FUSION TEMPERATURE AT 5 ddm	Not reached
MAXIMUM FLUIDITY TEMPERATURE	442 °C
MAXIMUM FLUIDITY	2.5 ddm
RESOLIDIFICATION TEMPERATURE	468 °C
RANGE SOFTENING (0.1 ddm) - RESOLIDIFICATION	93 C°
RANGE SOFTENING (1.0 ddm) - RESOLIDIFICATION	50 C°
RANGE AT 1 ddm	37 C°

SYDNEY

17th January, 1973.

A

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, grey, wide variety of grainsizes from granules to pebbles 0.15' across. Siltstone matrix	0.18	130.86	0.19	Base of Hullcross Member
SANDSTONE, brownish grey, fine grained, quartz-lithic	0.60	131.46	0.60 )	Top of
<u>COAL</u> , dull with frequent bright bands	0.70	132.16	0.70 )	Gates Member
MUDSTONE, grey, carbonaceous in parts and with some coaly bands. Weathered and largely reduced to fragments, some showing listric surfaces.	4.61	136.77	3.08 )	
SANDSTONE, brownish grey, medium grained, quartz lithic, coaly wisps, an orange material making up part of the matrix, coaly partings are listric	1.23	138.00	1.23 )	
SILTSTONE, grey, sandstone interbeds	0.57	138.57	0.57 )	SEAM A
MUDSTONE, dark grey, weathered, and breaking up into flakes	0.98	139.78	0.75 )	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks.</i>
<u>COAL</u> , lightly sheared introducing finely spaced oblique planes and making detection of <u>coal</u> type impossible. Some fragments could be dull with frequent bright bands	1.45	141.00	1.45	)
MUDSTONE, grey, weathered to fragments	1.00	142.00	0.50	)
<u>COAL</u> , stony , dull and bright	3.05	145.05	1.93	)
	0.84	145.89	0.53	)
MUDSTONE, dark grey, carbonaceous with a few coaly bands in part, siltstone interbeds	8.13	154.02	7.93	)
<u>COAL</u> , dull and bright	0.50	154.52	0.50	)
CLAYSTONE, grey, phases of black carbonaceous claystone with bright <u>coal</u> bands	2.30	156.82	2.30	)
<u>COAL</u> , dull and bright	0.55	157.37	0.55	)
CLAYSTONE, carbonaceous, black, bright <u>coal</u> bands	1.51	158.88	1.51	)

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , dull with minor bright bands	0.75	159.63	0.75 )	
, dull and bright	0.53	160.16	0.53 )	
CORE LOSS	0.84	161.00	0.00 )	
CLAYSTONE, black, carbonaceous with bright <u>coal</u> bands	0.95	161.95	0.95 )	
SILTSTONE, grey, mudstone interbeds at top and bottom, sandstone fine grained interbeds in centre, bedding angle 89° to core axis	9.69	171.64	9.69	
SANDSTONE, grey in top 7', becoming brownish grey below, grey section fine grained, remainder medium and coarse grained with phases of granule conglomerate. Blebs of mudstone and <u>coal</u> , coaly wisps, lenses and small irregular masses. Cross bedded in part	23.04	194.68	23.04	
MUDSTONE, dark grey	2.40	197.08	2.40	
STRATA REMOVED, presumed to be <u>coal</u> , note in box states CM-351, 197.2-205' 7.8/6.4. Logged as <u>coal</u> with shaly partings and 3" of conglomerate by R.E. Shields, 1970 Season, Brameda Resources Ltd.	7.80	204.88	0.00 )	SEAM B

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks.</i>
CONGLOMERATE, greenish grey, granule and pebble phases, no matrix except where granules are matrix for pebbles, grains rounded and sub-angular, varied lithology, some cross-bedding in finer grained sections. Some slickensided planes at 83° to core axis	28.98	233.86	25.91	
SANDSTONE AND CONGLOMERATE INTERBEDDED, sandstone grey, fine and medium grained phases interbedded with conglomerate bluish grey, mainly pebbles, rounded and sub-angular of varied lithology, a few mudstone interbeds	10.51	244.37	10.09	
SANDSTONE, grey, fine grained, grading to siltstone towards base, mudstone interbeds	5.56	249.93	5.34	
MUDSTONE, grey, core broken (some lost?)	2.19	252.12	2.10	
SANDSTONE, brownish grey, disturbed bedding, siltstone and mudstone interbeds	4.17	256.29	4.00	
MUDSTONE, grey, weathered, breaking up, carbonaceous at base	11.10	267.39	10.65	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , stony	0.13	267.52	0.13	
, dull with frequent bright bands	0.63	268.15	0.63	
, stony	0.25	268.40	0.25	
CONGLOMERATE, greenish grey, pebbles rounded and sub-angular, sandstone matrix towards base, this bedding darker in basal 3.42'	66.44	334.84	60.85	
SANDSTONE, grey fine grained, a few mudstone interbeds in 6.14' zone 33.76' from top	45.99	380.83	46.42	
SILTSTONE AND MUDSTONE INTERBEDDED, siltstone grey and mudstone dark grey interbedded; bedding with irregular boundaries, worm casts, sandstone interbeds coaly band at 404.6' with a few pebbles beneath it.	23.97	404.80	24.20	
<u>COAL</u> , broken and somewhat weathered in the box. Probably dull with minor bright bands	0.12	404.92	0.12	
SANDSTONE, grey, very fine grained, coaly wisps, lenses and irregular masses, a few mudstone bands	9.15	414.07	8.96	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, dark grey at top, becoming grey at centre and base. Plant fragments, siltstone interbeds in centre section with some coaly wisps	5.11	419.18	5.00	
SILTSTONE, grey to brownish grey, weathered and broken in upper half, becoming sandstone towards base, but with a 0.15' mudstone band at base	4.29	423.47	4.20	
CONGLOMERATE, greenish grey, becoming darker in zone of 11.4' at base. Pebbles mainly small averaging 0.02' to 0.03' at top, but in darker base they average 0.03' rising to 0.05' across. Pebbles are rounded to sub-angular. No matrix at top, but a small amount of matrix (sandstone) towards base.	32.15	455.62	31.49	
SANDSTONE, brownish grey, medium grained (salt and pepper sandstone) at top 6.2', then fine grained. Lithic, coaly wisps and cross bedding in medium grained section. A few pebbles in top 1'. Fine slickensided calcite veins at 73° to core axis at 474', worm casts from 482' to 488'	35.36	490.98	36.01	



<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SUKUNKA MEMBER, sandstone and siltstone interbeds				Base of Gates Member  Top of Sukunka Member

GATES MEMBER

BORE NUMBER: S-36

Grid Reference: 42379.4N 93871.3E

Exploration Grid Reference: H/6

Date Commenced: 2nd Sept., 1970

Completed: 10th Sept., 1970

Collar R.L.: 5367.7'

Standard Datum:

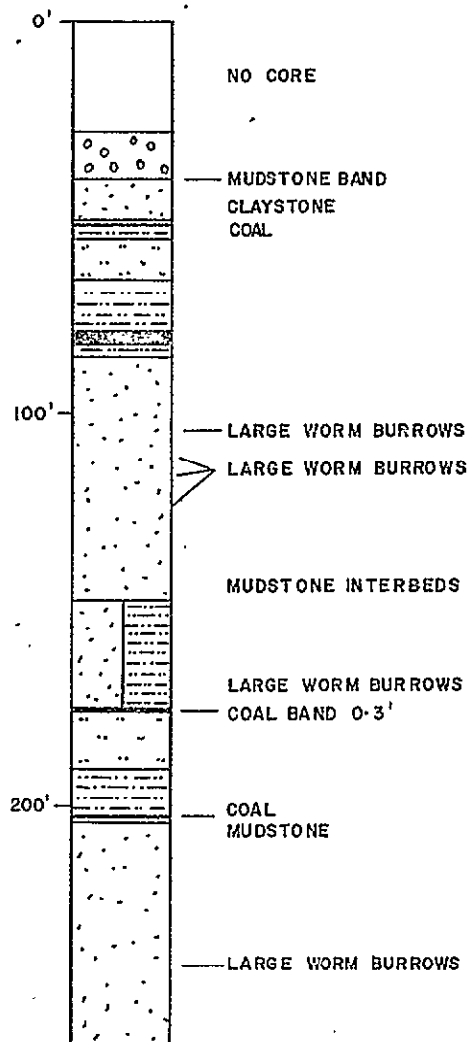
Total Depth: 1228'

Electrically Logged: No

Drilled By: Connors Drilling Ltd.

For: Brameda Resources Limited

Logged By: F.H.S. Tebbutt



DETAIL OF GATES  
MEMBER

SCALE: 1" to 50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDH S-36

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CORE BOX MISLAID SINCE 1970 SEASON				
CONGLOMERATE, grey, mainly rounded pebbles with a few granule phases. Pebbles up to 0.08' but mainly around 0.04'. Sandstone matrix sparse. Sandstone and mudstone phases towards base. Coaly wisps in sandstone phases	10.98	41.28	10.98	
MUDSTONE, grey at top and bottom, but central section hard and brownish with numerous curved slickensided planes in various directions, core here being broken	2.63	43.91	2.78	
SANDSTONE, grey, medium grained, quartz-lithic; occasional pebbles and pebble bands included at base. Some cross bedding. A thin mudstone band 2.7' from base	6.87	50.78	7.26	
CLAYSTONE, carbonaceous, upper 0.45' broken to flakes along bedding, some thin bright coaly bands	1.08	51.86	0.85	
<u>COAL</u> , dull with minor bright bands	0.05	51.91	0.04	
CALSYTONE, carbonaceous, some thin coaly bands	0.30	52.21	0.24	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, dark grey, fragmented from weathering in box except for basal 0.64', which is a little carbonaceous and has thin coaly wisps	3.15	55.36	3.15	
SILTSTONE, grey, irregular bedding, mudstone interbeds and in lower half sandstone interbeds and phases	2.64	58.00	2.64	
CLAYSTONE, carbonaceous, coaly bands	0.60	58.60	0.60	
SILTSTONE, grey, irregular bedding, mudstone interbeds, sandstone interbeds, and phases in lower half	8.73	67.33	8.73	
MUDSTONE, dark grey, weathered into fragments in box, lower 1' carbonaceous	14.67	82.00	12.87	
<u>COAL</u> , dull with minor bright bands	0.77	82.77	0.77	
MUDSTONE, dark grey, carbonaceous and with coaly bands in top 1.4'. One sandstone band (0.03') 0.15' above base	3.68	86.45	3.60	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, grey, medium grained in top 13', then fine grained to base, lithic, numerous black grains in thin layers in medium grained section. Large worm casts from 101' to 109' and thinner zones at 112', 116.5' and 125.5'. A few thin mudstone interbeds near base	62.19	148.64	60.79	
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained and mudstone dark grey interbedded. Mudstone interbeds irregular and containing worm burrows in lower half	27.26	175.90	26.65	
<u>COAL</u> , dull with minor bright bands, broken core	0.30	176.20	0.30	
SILTSTONE, grey, with mudstone interbeds in upper half, grading to sandstone near base, and then back to siltstone with more mudstone interbeds and blebs	14.57	190.77	14.81	
MUDSTONE, dark grey, a few sandstone interbeds near centre, becoming carbonaceous in basal 0.2' with some thin coaly bands	12.85	203.62	13.06	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , bright with dull bands	0.09	203.71	0.09	
MUDSTONE, carbonaceous, a few thin coaly bands	0.84	204.55	0.84	
SANDSTONE, grey, medium grained in upper 29' below which it is fine grained. Medium grained section with numerous black grains in thin layers giving salt and pepper appearance. Large worm burrows in fine grained section in 3' zone below 239'. Mudstone interbeds below 244'	57.55	262.10	58.10	
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained, and mudstone dark grey interbedded				Base of Gates Member  Top of Sukunka Member.

GATES MEMBER

BORE NUMBER: S-42

Grid Reference: 36956.2N .91956.3E

Exploration Grid Reference: J + 700' / 3 + 1200'

Date Commenced: 3rd Oct., 1970

Completed: 19th Oct., 1970

Collar R.L.: 5248.5'

Standard Datum:

Total Depth: 1488'

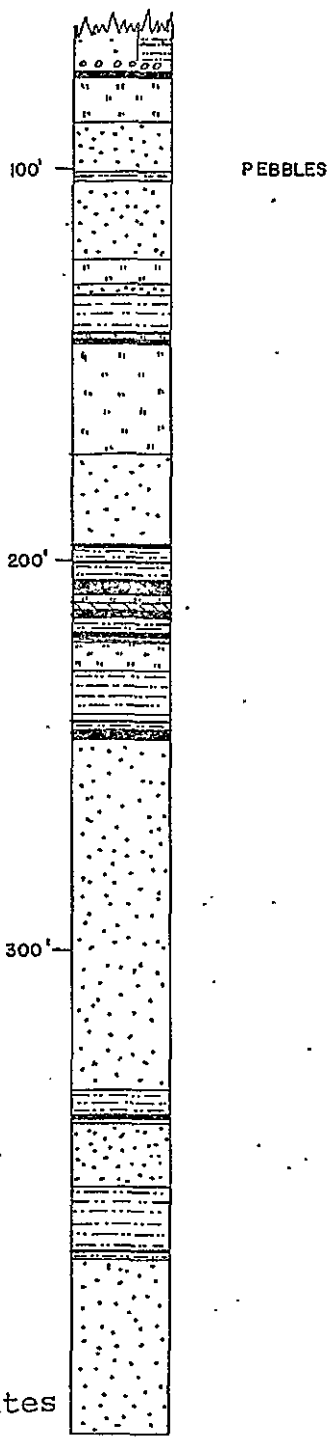
Electrically Logged: NO

Drilled By: Connors Drilling Ltd.

For: Brameda Resources Limited

Logged By: F.H.S. Tebbutt & G.R. Jordan





Detail of Gates  
Member

SCALE: 1"=50'

Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.

STRATIGRAPHIC LOGS

for  
COALITION MINING LIMITED

DDH S-42

DRW BY TR

DATE:

PAGE of

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, greenish grey, small pebble and granule	0.42	75.79	0.42	Base of Hullcross Member
<u>COAL</u> , dull with minor bright bands, cleat poorly developed , stony , bright with dull bands.	0.80	76.59	0.80 )	Top of
	0.06	76.65	0.06 )	Gates
	0.05	76.70	0.05 )	Member
				SEAM A
SILTSTONE, grey, with phases of sandstone, fine to medium grained, some ironstained joints roughly parallel to core axis	11.28	87.98	11.47	
SANDSTONE, grey, medium grained, lithic, basically a white sandstone with numerous fine bands of black grains; some siltstone interbeds, bedding angle 83° to core axis. Mudstone blebs and a few pebbles toward base	12.92	100.90	8.47	
CONGLOMERATE, brownish grey, mainly granules of varied lithology, siltstone blebs	0.81	101.71	0.82	
MUDSTONE, dark grey, siltstone interbeds at top. Some iron stained joints sub-parallel to core axis	1.21	102.92	1.23	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, grey, mainly fine grained, lithic, thin bands of black grains, some coaly wisps, worm burrows, occasionally towards base, siltstone interbeds and blebs. Some cross bedding	20.48	123.40	20.83	
SILTSTONE, darkish grey with phases of mudstone, dark grey	5.31	128.71	5.40	
SANDSTONE, pale grey, very fine grained, siltstone, dark grey interbeds	2.44	131.15	2.48	
MUDSTONE, dark grey, a few thin coaly bands near base. Some phases tending carbonaceous	10.90	142.05	11.08	)
<u>COAL</u> , dull with minor bright bands	0.31	142.36	0.24	) SEAM B
SILTSTONE, dark grey, tending carbonaceous	0.72	143.08	0.72	)
<u>COAL</u> , stony	0.53	143.61	0.42	)
, dull with minor bright bands	0.36	143.97	0.28	)
, stony, a few bright bands	0.13	144.10	0.10	)
MUDSTONE, dark grey, carbonaceous	0.27	144.37	0.27	)

## SUKUNKA D.D.H. S-42

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , stony, a few bright bands , dull with minor bright bands	0.29	144.66	0.23 )	
	0.34	145.00	0.27 )	
SILTSTONE, brownish grey, phases of fine grained sandstone, joints (iron stained) parallel to core axis	28.30	173.30	28.65	
SANDSTONE, brownish grey, mainly fine grained, lithic, siltstone interbeds, coaly wisps, some thin banding due to black grains, 0.05' <u>coal</u> band 6.7' from base. Siltstone phases towards and at base. Joints at 30° to core axis, iron stained.	22.86	196.16	23.14	
MUDSTONE, dark grey, tending carbonaceous, coaly bands in basal 0.1'	1.54	197.70	1.56	
<u>COAL</u> , dull and bright interbanded , stony with some bright bands	0.08	197.78	0.07	
	0.40	198.18	0.36	
MUDSTONE, dark grey, carbonaceous phase at base	2.74	200.92	2.74	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , dull and bright interbanded	0.36	201.28	0.32	
, stony with some bright bands	0.16	201.44	0.14	
MUDSTONE, dark grey, carbonaceous at top	3.67	205.11	3.67	
<u>COAL</u> , dull and bright interbanded	0.33	205.44	0.30	
, dull to stony, broken into flakes	0.24	205.68	0.22	
, dull	0.30	205.98	0.21	
, dull with minor bright bands	0.23	206.21	0.21	
, stony	0.04	206.25	0.04	
, dull and bright interbanded	0.62	206.89	0.56	
, dull	0.37	207.24	0.33	
, dull and bright interbanded	0.46	207.70	0.41	
, stony to dull	0.47	208.17	0.42	
, dull with minor bright bands	0.62	208.79	0.57	
, dull and bright interbanded	0.08	208.87	0.07	
, stony	0.03	208.90	0.03	
SILTSTONE, grey, mudstone interbeds and phases, coaly wisps and lenses	3.00	211.90	3.00	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CLAYSTONE, carbonaceous, coaly bands	1.98	213.88	1.98	
<u>COAL</u> , dull and bright interbanded	0.22	214.10	0.20	
, stony, a few bright bands	0.08	214.18	0.07	
, bright with minor dull bands	0.18	214.36	0.16	
, stony, a few bright bands	0.32	214.68	0.29	
, bright with minor dull bands	0.16	214.84	0.14	
, stony, a few bright bands	0.16	215.00	0.14	
CLAYSTONE, carbonaceous, a few thin coaly bands	0.85	215.85	0.85	
MUDSTONE, dark grey, coaly bands towards base	3.51	219.36	3.51	
<u>COAL</u> , stony, with some bright bands	0.10	219.46	0.09	
, dull with minor bright bands	0.13	219.59	0.12	
MUDSTONE, dark grey, tending carbonaceous at top	3.47	223.06	3.47	
SILTSTONE, grey, mudstone interbeds, coaly wisps	4.94	228.00	4.94	
MUDSTONE, dark grey	11.63	239.63	12.43	

## SUKUNKA D.D.H. S-42

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SILTSTONE, brownish grey, mudstone phase one third the way down	1.55	241.18	1.66	
MUDSTONE, dark grey, tending carbonaceous	1.91	243.09	2.04	
<u>COAL</u> , dull and bright interbanded	0.52	243.61	0.52	
, dull with minor bright bands	0.48	244.09	0.48	
, dull and bright interbanded	0.23	244.32	0.23	
SILTSTONE, carbonaceous	0.04	244.36	0.04	
<u>COAL</u> , stony	0.20	244.56	0.20	
, dull with minor bright bands	0.57	245.13	0.57	
, stony	0.23	245.36	0.23	
, dull with minor bright bands	0.22	245.58	0.22	
SANDSTONE, brownish grey, mainly medium grained, lithic, worm burrows (mottled appearance) in 4.3' zone 6.1' from top. Zone of large worm burrows from 270' to 273'. Occasional pebble bands from 269' to 283'. Joints at a wide variety of angles in lower half, all iron stained.				
Sandstone becomes finer grained at 268'	79.32	324.90	1.90	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SANDSTONE, grey, very fine grained, with siltstone and mudstone interbeds and phases	10.97	335.87	11.03	
MUDSTONE, dark grey, tending carbonaceous, siltstone and fine sandstone interbeds and phases. A bright coaly band (0.08') 2.16' from base	7.31	343.18	7.35	
<u>COAL</u> , dull and bright interbanded	0.70	343.88	0.70	
SANDSTONE, grey, medium and fine grained phases, lithic cross bedded in places, coaly wisps near top, siltstone and mudstone interbeds, some iron stained joints of sub-vertical attitude	17.20	361.08	17.44	
MUDSTONE, dark grey, tending carbonaceous in parts, siltstone and sandstone phases - all with mudstone matrix, thin coaly bands towards base	16.63	377.71	16.87	
<u>COAL</u> , dull and bright interbanded	0.11	377.82	0.11	
MUDSTONE; dark grey, coaly lenses near top	1.15	378.97	1.15	



## SUKUNKA D.D.H. S-42

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor(ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<p>SANDSTONE, brownish grey and medium grained (salt and pepper) in top 20' (approx.), grey and fine grained below this, lithic, some cross bedding, thin pebble bands 11.45', 12' and 13.15' from top, zone (1.4') of broken core with calcitic irregular veining at 406.3'. An occasional mudstone interbed near base. A few coaly wisps in top 5', zone (.179') of mudstone interbeds 17.83' from top</p>	80.79	459.76	81.12	Base of Gates Member
<p>SANDSTONE AND MUDSTONE INTERBEDS, sandstone grey, fine grained, lithic, and mudstone dark grey, bedding disturbed in mudstone phases and bearing worm burrows</p>				Top of Sukunka Member

GATES MEMBER

BORE NUMBER: S-44

Grid Reference: 42609:8N 90828.2E

Exploration Grid Reference: G/4+1700'

Date Commenced: 11th Oct., 1970

Completed: 22nd Oct., 1970

Collar R.L.: 5346.5'

Standard Datum:

Total Depth: 1528

Electrically Logged: Yes

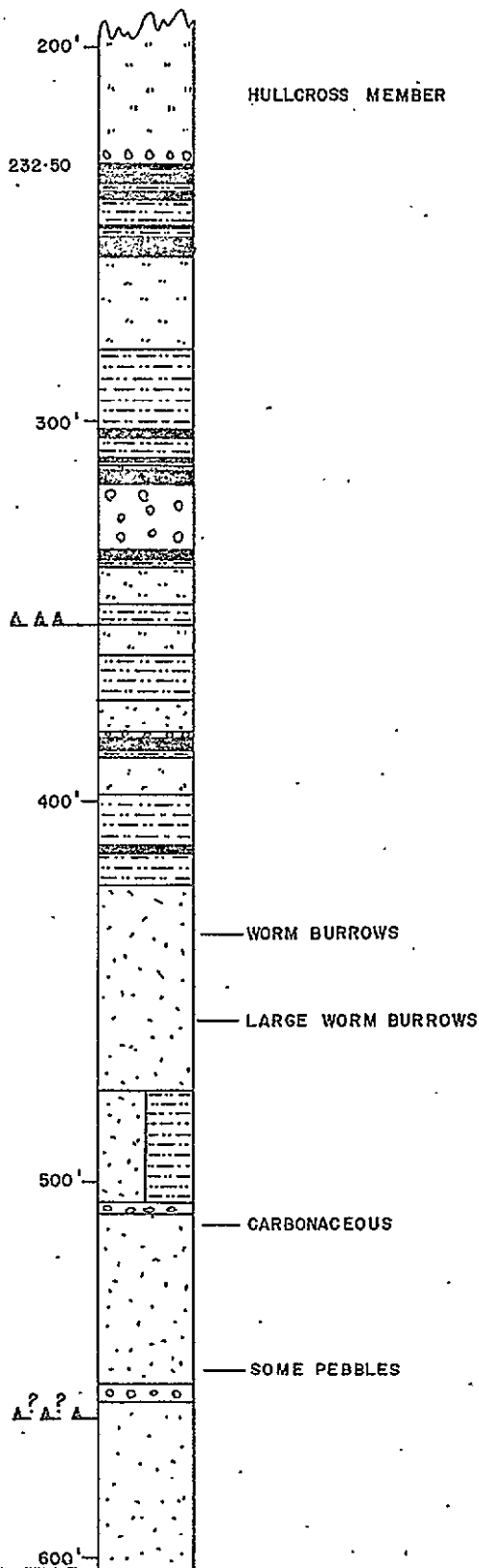
Drilled By: Connors Drilling Ltd.

For: Brameda Resources Limited

Logged By: F.H.S. Tebbutt and G.R. Jordan

COAL SEAM INTERSECTIONS

<u>Seam</u>	<u>Floor</u> <u>R.L.</u>	<u>Thickness</u> (ft.)	<u>Recovery</u>	<u>Comment</u>
B	5029.72'	13.91	94.5%	Sampled December, 1972



DETAIL OF GATES  
MEMBER  
SCALE: 1" to 50'

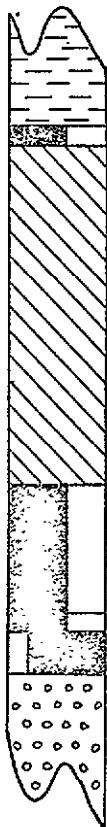
Prepared by :  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED

STRATIGRAPHIC LOGS  
DDHS-44

SEAM SECTION  
 D.D.H. S-44  
 SEAM B  
 GATES MEMBER

ASH %  
 CUMULATIVE  
 FROM FLOOR

	WT%	ASH%	C. S. N <sup>o</sup>	INCL. BANDS	EXCL. BANDS
311.24	3.65	Not Analysed			
314.89	1.45	-	21.4	3½	
316.34	0.44	Not Analysed			
316.78					



Prepared by:  
 CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
 for  
 COALITION MINING LIMITED

SEAM SECTIONS  
 DDH S-44

DRAWN BY M.G.

DATE JANUARY, 1973

SCALE: 1" to 2'

PAGE 1 of 1

Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

**C A R G O**  
**SUPERINTENDENTS**  
**CO. (A/SIA.) PTY. LTD.**

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

**Certification**

**This is to Certify**

APPLICANT:

COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED

REPORT TO:

CLIFFORD McELROY & ASSOCIATES PTY. LTD.

SUBJECT:

SUKUNKA SAMPLE NO. G17,  
CORE NO. S44  
SEAM - GATES  
SEAM B

REPORT NO.

K72 - 1619

ORDER NO.

28021

DATE RECEIVED:

22. 12. 72

DATE REPORTED:

18. 1. 73



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*M. Bradley*  
A. R. A. C. I. Chief Chemist.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*P. W. Jensen*

INTRODUCTION:

One (1) only coal ply sample, designated Sample No. G17 - Gates Seam, was received from Clifford McElroy & Associates Pty. Ltd. on 22.12.72.

METHOD:

The sample was weighed, crushed to a 3/4" top size, sized at 30# BSS and the +30# BSS raw coal fraction was washed in organic liquids from 1.30 SG to 1.60 SG in 0.05 steps.

The float and sink fractions and the raw -30# BSS coal fraction were weighed, prepared and analysed for ash% and crucible swelling number in accordance with BS1016.

A composite raw coal sample was reconstituted for the determination of true specific gravity and a composite floats 1.60 specific gravity fraction of the +30# BSS raw coal was reconstituted for the determination of proximate analysis, total sulphur, C.S.No., phosphorus, calorific value and Gieseler Plastometer tests.

The results are given in this report.

RESULTS:

TABLE 1: gives the sizing, washability and analytical data for the sample after hand crushing to -3/4".

TABLE 1: WASHABILITY DATA FOR SAMPLE NO. G17 (after hand crushing to -3/4")

FRACTION	INDIVIDUAL ANALYSIS				CUMULATIVE ANALYSIS		
	WT.GM.	WT.%	ASH%	C.S.NO.	WT.%	ASH%	C.S.NO. (calc)
Fl.30 SG	50	7.9	3.3	9	7.9	3.3	9
Sl.30 - Fl.35 SG	144	22.7	7.4	7½	30.6	6.3	8
Sl.35 - Fl.40 SG	173	27.3	11.9	3	57.9	9.0	5½
Sl.40 - Fl.45 SG	57	9.0	16.1	1	66.9	9.9	5
Sl.45 - Fl.50 SG	60	9.5	21.8	1	76.4	11.4	4½
Sl.50 - Fl.55 SG	25	3.9	28.5	½	80.3	12.2	4½
Sl.55 - Fl.60 SG	21	3.3	34.3	½	83.6	13.1	4
Sl.60 SG	104	16.4	64.8	0	100.0	21.6	3½
-30# BSS RC	30	4.5	17.8	7½			

TOTAL WEIGHT = 664 gm

THICKNESS = 1.45'

TRUE S.G. = 1.351

ANALYSIS OF FLOATS 1.60 S.G. FRACTION OF +30# BSS RAW COAL

YIELD%	83.16
AIR DRIED MOISTURE%	1.0
ASH%	13.1
VOLATILE MATTER%	23.7
FIXED CARBON%	62.2
TOTAL SULPHUR%	0.42
C.S.NO.	6
CALORIFIC VALUE BTU/lb	13,160 (air dried basis)
PHOSPHORUS%	0.005

GLESELER PLASTOMETER TEST (A.S.T.M. D1812-69)

INITIAL SOFTENING TEMPERATURE (0.1 ddm)	364°C
INITIAL SOFTENING TEMPERATURE (1.0 ddm)	406°C
FUSION TEMPERATURE AT 5 ddm	425°C
MAXIMUM FLUIDITY TEMPERATURE	445°C
MAXIMUM FLUIDITY	70 ddm
RESOLIDIFICATION TEMPERATURE	478°C
RANGE SOFTENING (0.1 ddm) - RESOLIDIFICATION	114°C
RANGE SOFTENING (1.0 ddm) - RESOLIDIFICATION	72°C
RANGE AT 1 ddm	63°C

SYDNEY

18th January, 1973.

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
CONGLOMERATE, greenish grey, small pebbles and granules mainly sub-angular, varied lithology, no matrix	0.79	232.50	0.79	
CORE MISSING, Note in box stating <u>coal</u> sampled	1.25	233.75	0.00 )	
MUDSTONE, dark grey	0.30	234.05	0.30 )	
CONGLOMERATE, greenish grey, small pebbles and granules, sub-angular, varied lithology, no matrix	0.25	234.30	0.25 )	SEAM A
CORE MISSING, note in box stating <u>coal</u> sampled	2.12	236.42	0.00 )	
MUDSTONE, dark grey, breaking down in the box	1.58	238.00	1.70 )	
CORE MISSING, stated to be coal sampled (note in box "CM-44, 232.5-241')	3.71	241.71	0.00 )	
SANDSTONE, grey, fine grained, coaly wisps, siltstone interbeds, carbonaceous in top 0.76'	1.74	243.45	1.74 )	



<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
MUDSTONE, dark grey, a siltstone phase near top, coaly bands up to 0.05' in lower half, carbonaceous in part	5.05	248.50	5.05 )	
<u>COAL</u> , finely sheared at 40° to core axis, but retaining compact form and having an appearance not unlike cindered coal, <u>coal</u> type masked by shearing, but mainly dull	0.70	249.20	0.48 )	
MUDSTONE, dark grey and clayey, breaking up in box	2.37	251.57	2.37 )	
<u>COAL</u> , dull with minor bright bands, hard and possibly slightly stony	1.51	253.08	1.03 )	
STONE, coaly	1.22	254.30	1.22 )	
<u>COAL</u> , dull with minor bright bands	1.34	255.64	0.92 )	
CLAYSTONE, carbonaceous, coaly bands and lenses	0.75	256.39	0.75 )	
SANDSTONE, grey, fine grained, coaly wisps at top	1.34	257.73	1.34	
SILTSTONE, grey, mudstone interbeds and phases	6.69	264.42	6.73	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
SILTSTONE, grey, mudstone interbeds and irregular bedding, with medium grained sandstone phases, some coaly wisps	16.30	280.72	16.60	
MUDSTONE, dark grey, with lighter grey siltstone interbeds (thin and numerous)	21.72	302.44	21.16	
CLAYSTONE, dark grey, carbonaceous, coaly bands	0.43	302.87	0.43	
<u>COAL</u> , dull with minor bright bands	0.25	303.12	0.12	)
, stony, some bright bands	0.47	303.59	0.23	)
, dull with minor bright bands	0.41	304.00	0.20	)
				)
CORE LOSS	0.70	304.70	0.00	)
				)
CLAYSTONE, grey, carbonaceous claystone phases with bright <u>coal</u> bands	6.54	311.24	6.54	)
				)
<u>COAL</u> , dull and bright	0.21	311.45	0.21	SEAM B
				)
CLAYSTONE, carbonaceous, black, bright <u>coal</u> bands	3.44	314.89	3.44	)
				)
				)

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , dull and bright	1.45	316.34	0.17 )	
<u>COAL</u> AND ROCK PEBBLES, pebbles reworked from underlying conglomerate	0.44	316.78	0.44 )	
CONGLOMERATE, greenish grey, small pebble and granule phases, and phases of sandstone with mudstone interbeds. Conglomerate phases grade upwards to sandstone. A few coaly wisps. Carbonaceous in top 0.65'. Basal conglomerate phases of heavy pebbles up to 0.2'	17.81	334.59	18.16	
<u>COAL</u> , stony (0.34', core loss of 1.45' assumed here - may not all be stony)	1.79	336.38	0.34	
MUDSTONE, dark grey, with coaly bands, all weathered to fragments in core box	1.34	337.72	1.32	
SILTSTONE, light grey, fine grained sandstone interbeds and phases	10.28	348.00	10.09	
MUDSTONE, dark grey with several pale brownish grey phases. Bedding apparently 90° to core axis throughout, but not easy to see. In basal 1' there are acute angled				

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
slickensides in two opposite directions with relation to core axis and calcite tension cracks.	5.68	353.68	6.01	
BRECCIA, mudstone breccia filled with calcite, some friable mud	0.20	353.88	0.20	
SILTSTONE, grey, with irregular bedding and mudstone interbeds, sandstone phases, calcite tension cracks in top 2'	7.62	361.50	7.65	
MUDSTONE, dark grey, lighter brownish grey phases, some listric surfaces, basal 1.5' weathered to fragments, but no <u>coal</u>	12.08	373.58	12.13	
SANDSTONE, grey, medium grained, lithic, some siltstone interbeds, and occasional pebbles, slickensided surfaces parallel to bedding. Bedding angle 75° to core axis. Calcite tension cracks in 0.4' zone below 375'	8.62	383.20	8.66	
CONGLOMERATE, brownish grey, pebbles, rounded to sub-angular, a small amount of sandy matrix	0.59	382.79	0.59	

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
<u>COAL</u> , dull and bright interbanded	0.38	383.17	0.13	
CLAYSTONE, carbonaceous	0.10	383.27	0.10	
<u>COAL</u> , dull with minor bright bands, core a little sheared towards base	2.33	385.60	0.79	
MUDSTONE, dark grey	2.85	388.45	2.85	
SILTSTONE, grey, irregular bedding, mudstone interbeds and sandstone phases	9.35	397.80	9.35	
MUDSTONE, dark grey, becoming black and carbonaceous in basal 1.5', some brownish grey horizons in upper half	13.45	411.25	14.46	
<u>COAL</u> , stony , dull with minor bright bands, core broken badly	0.37 2.32	411.62 413.94	0.22 1.37	
SANDSTONE, grey, fine grained, carbonaceous	0.07	414.01	0.07	
MUDSTONE, dark grey, weathered to fragments in part, some carbonaceous phases, one half way down containing				

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
sulphur released by weathering. Sand grains disseminated in basal 1'.	8.30	422.31	8.28	
SANDSTONE, grey, medium grained in top 15' then fine grained, numerous black grains in thin layers in medium grained section, lithic, large worm burrows in 2' zone below 437'. Several mudstone bands in top 10'. Large worm casts in 0.5' zone below 457'	53.91	476.22	53.74	
SANDSTONE, AND MUDSTONE INTERBEDDED, sandstone grey, fine grained, and mudstone dark grey interbedded, worm burrows mainly in mudstone interbeds which are irregular	29.16	505.38	29.07	
SANDSTONE, grey, fine grained	0.87	506.25	0.87	
CONGLOMERATE, greenish grey, pebble, pebbles mainly rounded, pebbles all sizes up to 0.12', varied lithology, sandstone matrix	2.36	508.61	2.35	
SANDSTONE, grey, fine and medium grained phases, top 3' has scalloped pattern of carbonaceous layers as if due to small scale washouts. Irregular coaly masses in 1'				

<i>Geological Description of Strata</i>	<i>Estimated Thickness (ft)</i>	<i>Estimated Depth to Stratum Floor (ft)</i>	<i>Footage Recovered (ft)</i>	<i>Remarks</i>
zone below 512', carbonaceous for about 2' below 518' with occasional coaly wisps and granules and siltstone bands in lower section, coaly wisps being numerous in basal 7' which is coarse grained with occasional granules and pebbles	46.11	554.72	45.97	
CONGLOMERATE, greenish grey, pebbles and granules, most pebbles being in the central section. Grains are rounded to sub-angular, no matrix, varied lithology; some irregular coaly masses	3.66	558.38	3.65	
SANDSTONE, grey, medium grained at top, becoming finer towards base. At 563' sandstone core is broken and bedding angle increases from 90° to core axis to 50° at 565' where there is a small slickensided calcite vein. Other slickensided surfaces just above 565'. Below this, bedding is immediately 90° to core axis. Numerous large worm burrows from 581' to 593'. Sub-vertical iron stained joints near base	46.42	604.80	46.28	Base of Gates Member
SANDSTONE AND MUDSTONE INTERBEDDED, sandstone grey, fine grained and mudstone dark grey interbedded				Top of Sukunka Member

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COAL ANALYSES  
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From

(VOL 1, APPENDIX A)





APPENDIX A

COAL QUALITY DATA

GEOLOGICAL BRANCH  
ASSESSMENT REPORT

00 650

APPENDIX A

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NOTES TO ACCOMPANY APPENDIX A

The following appendix is a compilation of the coal quality data which has resulted from testing drill cores, bulk and channel samples obtained during the geological exploration programme which commenced in July, 1972.

For data relating to the previous phase of exploration, refer to Appendix A of the Geological Report on the Sukunka Coal Project submitted to Coalition Mining Limited on March 10, 1972.

APPENDIX A - 1

List of Sample Numbers Used  
and Summary of Drill Core  
Recoveries

Table A - 1.1

Means and Standard Deviations  
for Analytical Data for Washed  
Product at S.G. 1.60

Table A - 1.2

TABLE A - 1.1

LIST OF SAMPLE NUMBERS USED  
AND SUMMARY OF DRILL CORE RECOVERIES

NOTES TO ACCOMPANY TABLE A - 1.1

1. Estimated Linear Recovery is defined as:

$$\frac{\text{Footage Recovered}}{\text{Estimated Thickness}}$$

2. Calculated Volumetric Recovery is defined as:

$$\frac{\text{Volume of Sample}}{\text{Estimated Total Volume of Strata Sampled}}$$

and has been calculated according to the formula:

$$\text{Calc. Vol. Rec.} = \frac{\text{Mass of Sample (gm)}}{\text{True S.G.} \times \text{Estimated Thickness (ft)} \times 487.00}$$

based on a radius of 2.255 cm. for NQ-3 core.

3. The volumetric recovery of the footage recovered has not been tabulated, but may be calculated as:

$$\frac{\text{Calculated Volumetric Recovery}}{\text{Estimated Linear Recovery}}$$

4. Bores S-35 and S-44 - NQ-2 core, radius 2.380 cm.

5. Abbreviations Used:

up	-	Upper Plate
cp	-	Centre Plate
lp	-	Lower Plate
us	-	Upper Split
ls	-	Lower Split
Ga.	-	Gates Member
Sk.	-	Skeeter
Ch.	-	Chamberlain

TABLE A - 1.1

## LIST OF SAMPLE NUMBERS USED AND

DRILL CORE RECOVERIES

(1972 FIELD PROGRAMME)

Bore No.	Seam	Sample No.	Wt (gm)	True S.G.	Est. Thick. (ft)	Est. Linear Loss (ft)	Est. Linear Recov.	Calc. Vol. Recov.
*S35	Ga.A	G18	248	1.325	0.50	0.00	1.00	0.69
	Ga.A	G19	200	1.538	0.55	0.00	1.00	0.44
	Ga.A	G20	776	1.404	1.28	0.00	1.00	0.80
*S44	Ga.B	G17	664	1.351	1.45	0.00	1.00	0.63
C1	Ga.B	G12	813	1.329	1.61	0.00	1.00	0.78
	Ga.B	G13-16	1662	1.465	3.44	0.00	1.00	0.68
C17	Ga.B	G6	757	1.338	1.92	0.39	0.80	0.61
		G7	1066	2.299	1.83	0.38	0.79	0.52
		G8-11	1356	1.449	2.61	0.00	1.00	0.74
C21	Ga.B	G21	586	1.347	1.56	0.00	1.00	0.57
C42	Ga.B	G1	1182	1.351	2.71	0.64	0.76	0.66
		G2	1318	2.336	1.30	0.00	1.00	0.89
		G3-5	1951	1.471	3.72	0.68	0.82	0.73
	Ch.us	C1	511	2.199	0.50	0.00	1.00	0.95
		C2	1051	1.397	3.20	1.30	0.59	0.48
	Ch.ls	C4	5130	1.337	11.67	2.18	0.81	0.68
C43	Ch.	C5	1927	1.325	7.30	1.68	0.77	0.41
C44	Sk.	S4	655	1.300	2.48	0.00	1.00	0.42
	Ch.	C10	1609	1.282	5.59	0.00	1.00	0.46

Bore No.	Seam	Sample No.	Wt (gm)	True S.G.	Est. Thick. (ft)	Est. Linear Loss (ft)	Est. Linear Recov.	Calc. Vol. Recov.
C45	Sk.	S1-3	1812	1.429	5.66	1.36	0.76	0.46
	Ch.	C6	60	2.579	0.10	0.00	1.00	0.48
		C7	3434	1.282	6.49	0.64	0.90	0.85
		C8	107	2.548	0.11	0.00	1.00	0.78
		C9	681	1.262	1.45	0.14	0.90	0.76
C46	Sk. up	S6	552	1.340	1.73	0.00	1.00	0.49
	Sk. lp	S7	765	1.339	2.30	0.30	0.87	0.51
	Ch.	C13	1529	1.299	4.54	1.32	0.71	0.53
C47	Sk.	S5	2934	1.318	6.31	0.00	1.00	0.72
	Ch.	C11-12	2121	1.325	5.25	0.00	1.00	0.63
C48	Ch.	C14-16	4771	1.342	14.41	2.41	0.83	0.51
C49	Sk.	S8	2347	1.329	5.19	0.00	1.00	0.70
	Ch.	C17	4457	1.338	8.11	0.00	1.00	0.84
C50	Sk. up	S9	2963	1.329	5.27	0.00	1.00	0.87
	Ch. up	C18	2796	1.320	6.48	0.00	1.00	0.67
	Sk. cp	S10-12	1825	1.399	7.05	2.49	0.65	0.38
	Ch. cp	C19-21	1325	1.394	5.51	1.90	0.66	0.35
	Ch. lp	C22	2409	1.314	5.20	0.00	1.00	0.72



Bore No.	Seam	Sample No.	Wt (gm)	True S.G.	Est. Thick. (ft)	Est. Linear Loss (ft)	Est. Linear Recov.	Calc. Vol. Recov.
C51	Sk.up	S15-17	4080	1.351	7.17	0.00	1.00	0.86
	Ch.up	C24	5683	1.333	11.24	0.00	1.00	0.78
	Ch.lp	C25	4162	1.316	7.98	0.00	1.00	0.81
C51A	Sk.lp	S18-20	1952	1.343	4.76	0.00	1.00	0.63
C52	Sk.	S13	3655	1.333	7.44	0.86	0.88	0.76
		S14	1686	1.299	3.21	0.00	1.00	0.83
	Ch.	C23	2408	1.303	4.52	0.00	1.00	0.84

\* See Note 4

TABLE A - 1.2

MEANS AND STANDARD DEVIATIONS FOR ANALYTICAL

DATA FOR WASHED PRODUCT AT S.G. 1.60

TABLE A - 1.2

MEANS AND STANDARD DEVIATIONS FOR ANALYTICAL DATA  
FOR WASHED PRODUCT AT S.G. 1.60  
 (1972 FIELD PROGRAMME)

SKEETER SEAM		Proximate Analysis, Air Dried Basis							
		Moist. %	V.M. %	ASH %	F.C. %	C.S. No.	C.V. BTU/lb	S %	P %
Plate 2b	Mean	1.0	22.9	5.0	71.2	8	14740	0.37	0.064
	S.D.	0.00	0.04	0.25	0.30	0	27	0.015	0.002
	No.	2	2	2	2	2	2	2	2
Plate 2c	Mean	1.0	22.0	4.8	72.1	8	14710	0.47	0.044
	S.D.	0.00	1.27	0.98	0.61	1/2	273	0.092	0.025
	No.	4	4	4	4	4	4	4	4
Plate 3	Mean	1.0	21.2	5.0	72.8	7 1/2	14760	0.59	0.063
	S.D.	0.00	1.29	0.57	0.82	1 1/2	169	0.195	0.064
	No.	5	5	5	5	5	5	5	5
CHAMBERLAIN SEAM									
Plate 2b	Mean	1.6	21.8	3.2	73.3	4 1/2	14730	0.43	0.021
	S.D.	0.48	0.72	0.38	0.14	2 1/2	279	0.039	0.003
	No.	2	2	2	2	2	2	2	2
Plate 2c	Mean	1.0	21.6	4.8	72.6	8	14740	0.37	0.020
	S.D.	0.00	1.00	1.24	0.51	1/2	210	0.022	0.010
	No.	5	5	5	5	5	5	5	5
Plate 3	Mean	1.0	19.9	4.4	74.7	7 1/2	14800	0.32	0.019
	S.D.	0.00	0.78	0.86	0.88	1/2	218	0.050	0.006
	No.	7	7	7	7	7	7	7	7

S.D. = Standard Deviation

No. = Number of Observations

APPENDIX A - 2

QUALITY DATA

GATES MEMBER SEAM B

Summary of Analytical Data                      Table A - 2.1

Summary of Gieseler Plasto-                      Table A - 2.2  
meter Tests

Note: "Analysed Thickness" is the estimated thickness of strata and is not the footage recovered. Refer to Table A - 1.1 for the linear and volumetric recoveries of each sample.

TABLE A - 2.1

SUMMARY OF ANALYTICAL DATA

GATES MEMBER SEAM B

BORE NO.	SAMPLE NO.	ANAL. THICK. (FT.)	RAW COAL		WASH		WASHED PRODUCT - PROXIMATE ANALYSIS, A-D BASIS							
			S.G.	ASH %	S.G.	YIELD %	MOIST. %	V.M. %	ASH %	F.C. %	C.S. NO.	C.V. BTU/lb.	S %	P %
S44	G17	1.45	1.351	21.4	1.60	83	1.0	23.7	13.1	62.2	6	13160	0.42	0.005
C1	G13-14 -15-16	3.44	1.465	21.1	1.60	83	1.0	24.1	11.7	63.2	7 1/2	13410	0.91	0.051
C17	G6 -11 incl.	6.36	1.637	39.9	1.60	53	1.0	26.2	7.5	65.3	7	13980	0.37	0.011
C21	G21	1.56	1.347	10.0	1.60	99	1.0	25.2	9.5	64.3	7 1/2	13830	0.51	0.056

TABLE A - 2.2

SUMMARY OF GIESELER PLASTOMETER TESTS

GATES MEMBER, SEAM B

Bore	Analysed Thickness (ft)	GIESELER PLASTOMETER TEST							
		Comp. Floats at S.G.	Initial Softening Temp. (°C) (0.1 ddm)	Fusion Temp. at 5 ddm (°C)	Max. Fluidity (ddm)	Max. Fluidity Temp. (°C)	Resolid. Temp. (°C)	Temp. Range, Soften To Resolid. (°C)	Temp. Range at 1 ddm (°C)
S44	1.45	1.60	364	425	70	445	478	114	63
C1	3.44	1.60	381	423	130	455	484	103	71
C17	6.36	1.60	364	415	690	438	477	113	72
C21	1.56	1.60	366	422	68	446	479	113	65

APPENDIX A - 3

QUALITY DATA

SKEETER SEAM

Summary of Analytical Data	Table A - 3.1
Summary of Gieseler Plasto- meter Tests	Table A - 3.2

Notes:

- (1) "Analysed Thickness" is the estimated thickness of strata and is not the footage recovered. Refer to Table A - 1.1 for the linear and volumetric recoveries of each sample.
- (2) Abbreviations:
  - up - Upper Plate
  - cp - Centre Plate
  - lp - Lower Plate
- (3) See Appendix A - 1 for Mean Values and Standard Deviations of Analytical Data.





TABLE A - 3.2

SUMMARY OF GIESELER PLASTOMETER TESTS  
SKEETER SEAM (1972 FIELD PROGRAMME)

Bore	Analysed Thickness (ft)	GIESELER PLASTOMETER TEST							
		Comp. Floats at S.G.	Initial Softening Temp. (°C) (0.1 ddm)	Fusion Temp. at 5 ddm (°C)	Max. Fluidity (ddm)	Max. Fluidity Temp. (°C)	Resolid. Temp. (°C)	T Temp. Range, Soften To Resolid. (°C)	Temp. Range at 1 ddm (°C)
C44	2.48	1.60	405	-	2	451	492	87	36
C45	5.66	1.60	392	437	28	455	490	98	64
up C46	1.73	1.60	398	437	167	463	491	93	66
lp C46	2.30	1.60	396	432	244	460	493	97	71
C47	6.31	1.60	398	437	74	466	492	94	65
C49	5.19	1.60	391	436	60	459	492	101	66
up C50	5.27	1.60	383	425	268	450	487	104	75
cp C50	7.25	1.60	381	423	340	457	493	112	80
up C51	7.17	1.60	381	430	126	458	489	108	82
lp C51-A	4.76	1.60	386	430	279	457	497	111	77
C52	7.44	1.60	382	435	168	465	495	79	71

### Appendix A-3

#### Notes on Gieseler Plastometer Tests.

The Gieseler Plastometer tests were carried out according to ASTM Standard D 1812 - 1969 on the cumulative floats at S.G. 1.60 of all samples analysed by Cargo Superintendents, Sydney. The Gieseler apparatus measures the plasticity or fluidity characteristics of a coal sample when it is heated in the absence of air at heating rates ordinarily obtained in coke ovens and any relationship between these measured characteristics and the nature of the coke produced in a coke oven from the same coal is essentially empirical. In particular it should be noted that, for coals of similar chemical composition, the measured maximum fluidity can show large variations and that the characteristic temperature points are fairly constant. Also, the maximum fluidity is greatly affected by oxidation (the greater the oxidation, the lower the maximum fluidity) and there is a relationship between rank of coal, as expressed by volatile matter content, and maximum fluidity.

In the light of all the above, it can be said however that a plastic range of approximately 80°C and a minimum value for the maximum fluidity in the range 10-100 d.d.m. indicate good coking potential. It is not recommended that prediction of the physical properties of coke (e.g. coke strength) be made on the basis of the results of the Gieseler Plastometer test on the parent coal.

Appendix A, Table A-3.2 demonstrates that, while the range of

maximum fluidities for the Skeeter Seam is substantial (2 to 340 d.d.m.), the ranges of the characteristic temperatures is quite small. The sample from D.D.H. C-44 shows a low value of 2 d.d.m. for the maximum fluidity which is consistent with the C.S. No. of 3, but there is no other evidence to indicate oxidation of the sample. The low fluidity could also be explained by a local increase in rank of the coal due to tectonism. This would be consistent with the lower than average volatile matter content.

The single result obtained from Adit No. 5 during the 1971 field program falls within the range of results obtained during 1972 and it can be tentatively concluded that, on the basis of the Gieseler Plastometer test, washed coal from the Skeeter Seam has good coking potential.

APPENDIX A - 4

QUALITY DATA

CHAMBERLAIN SEAM

Summary of Analytical Data                      Table A - 4.1

Summary of Gieseler Plasto-  
meter Tests    Table A - 4.2

Notes:

(1) "Analysed Thickness" is the estimated thickness of strata and is not the footage recovered. Refer to Table A - 1.1 for the linear and volumetric recoveries of each sample.

(2): Abbreviations:

up - Upper Plate

cp - Centre Plate

lp - Lower Plate

(3) See Appendix A - 1 for Mean Values and Standard Deviations of Analytical Data.



TABLE A - 4.2

SUMMARY OF GIESELER PLASTOMETER TESTS  
 CHAMBERLAIN SEAM (1972 FIELD PROGRAMME)

Bore	Analysed Thickness (ft)	GIESELER PLASTOMETER TEST							
		Comp. Floats at S.G.	Initial Softening Temp. (°C) (0.1 ddm)	Fusion Temp. at 5 ddm (°C)	Max. Fluidity (ddm)	Max. Fluidity Temp. (°C)	Resolid. Temp. (°C)	Temp. Range, Soften To Resolid. (°C)	Temp. Range at 1 ddm (°C)
C42	9.89	1.60	388	442	32	457	487	99	66
C43	7.30	1.60	393	436	194	458	495	102	66
C44	5.59	1.60	391	429	208	455	492	101	77
C45	8.15	1.60	390	430	200	460	497	107	79
C46	4.54	1.60	401	441	37	461	490	89	57
C47	5.25	1.60	406	453	9	463	488	72	51
C48	14.41	1.60	406	451	11	464	488	82	57
C49	8.11	1.60	384	428	320	456	493	99	56
up C50	6.48	1.60	383	433	60	457	491	108	68
cp C50	3.61	1.60	393	440	28	459	493	100	66
lp C50	5.20	1.60	393	438	63	464	497	104	68
up C51	11.24	1.60	403	-	0.2	456	492	88	-
lp C51	7.98	1.60	379	436	90	464	499	120	75
C52	4.52	1.60	399	447	36	465	490	91	62

## Appendix A-4

### Notes on Gieseler Plastometer Tests.

The Gieseler Plastometer tests were carried out according to ASTM Standard D1812 - 1969 on the cumulative floats at S.G. 1.60 of all samples analysed by Cargo Superintendents, Sydney. Refer to Appendix A-3 for general comments on Gieseler plastometer tests.

The range of maximum fluidities for the Chamberlain Seam (0.2 to 320 d.d.m.) is similar to that of the Skeeter Seam, as is the small range of the characteristic temperatures (Appendix A, Table A-4.2). The very low fluidity value of 0.2.d.d.m. for D.D.H. C-51 (upper plate) is assumed to be due to oxidation of the sample, the assumption being based on the low CVS. No. (2½) and the relatively high air dried moisture (2%).

The range of values for maximum fluidity is such that it was felt that some factor other than random variation has influenced the range of measured values, and therefore the values given in Table A-4.2 (excluding the presumed oxidised sample from D.D.H. C-51) plus the value for bulk sample CM1-A+B were used to calculate a Spearman Rank Order Correlation Coefficient ( $r_s$ ) for volumetric core recovery - maximum fluidity, and volatile matter % - maximum fluidity.  $r_s$  for volumetric core recovery - maximum fluidity is 0.35, which is not significant at the  $p$  (probability) = 0.10 level, and the  $r_s$  for volatile matter % - maximum fluidity is 0.58 which is significant at the  $p = 0.025$  level. The Spearman test was chosen since it was considered unrealistic to assume normal distribution of the data. The significant positive correlation between volatile matter %

and maximum fluidity is consistent with the general view of increasing fluidity with decreasing rank for low to medium volatile coals.

The data obtained during the 1970 and 1971 field programmes : falls within the range of the 1972 data, with the exception that the plastic ranges for the 1970 and 1971 data are consistently less than those for the 1972 data. The different sets of data are probably compatible however in that the initial softening temperatures for the 1972 data is taken at 0.1 d.d.m. while that for the 1970 and 1971 data is not reported and is therefore assumed to be 0.5 d.d.m. It can be concluded that, on the basis of the Gieseler Plastometer test, washed coal from the Chamberlain Seam has good coking potential.



APPENDIX A - 5

ANALYTICAL RESULTS

OF

CHANNEL AND BULK SAMPLES

Analytical Results of Channel Samples CM-1A and CM-1B (Analysed by Commercial Testing & Engineering Co., Vancouver)	A - 5.1
Analytical Results of Channel Samples CM-1A and CM-1B (Analysed by Cargo Superintendents, Sydney)	A - 5.2
Analytical Results of Drill Core From D.D.M. CM-1	A - 5.3
Analytical Results of Bulk Sample CML-1	A - 5.4
Analytical Results of Bulk Sample CML-2	A - 5.5
Comparison of Test Results Obtained on Channel Samples CM-1A and CM-1B and Core From D.D.H. CM-1	A - 5.6

## NOTES TO ACCOMPANY APPENDIX A-5

Included in this appendix are the analytical results of two channel samples taken adjacent to D.D.H. CM-1, Appendices A-5.1 and A-5.2, with the analytical results of D.D.H. CM-1 (Appendix A-5.3), for completeness. Also included are the analytical results of two bulk samples, CML-1 and CML-2, representative of the run-of-mine coal; Appendices A-5.4 and A-5.5

The two channel samples were taken 3 feet from the underground intersection of D.D.H. CM-1 in No. 3 cut-through 5 feet from A heading toward B heading in Mine No. 1. The two sample numbers are CM-1A and CM-1B, being sheared coal and stony coal, and unsheared bright and dull coal of the main seam, respectively.

Eight tables are included as Appendix A-5.6 illustrating the comparisons between various elements of the analyses of these samples.

It will be seen that the channel samples CM-1A and CM-1B were analysed by two different laboratories. The sample was split in Vancouver, with half being analysed by Commercial Testing and Engineering in Vancouver, and the other half by Cargo Superintendents in Sydney. The close agreement between these two laboratories' analytical results is also demonstrated in the accompanying tables.

The two bulk samples, CML-1 and CML-2 were collected as the shuttle car was being unloaded into the boot-end of the conveyor belt; these are included as Appendices A-5.4 and A-5.5

APPENDIX A - 5.1

ANALYTICAL RESULTS

OF

CHANNEL SAMPLES CM-1A AND CM-1B

Location:

Adjacent to D.D.H. CM-1  
in right rib of #3 cut  
through 5 feet from A  
Heading toward B Heading

Sampled By:

G. R. Wallis,  
Clifford McElroy & Associates  
Pty. Limited

Analysed By:

Commercial Testing & Engineering  
Co. - Vancouver

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



December 8, 1972

## CERTIFICATE OF ANALYSIS FOR:

Coalition Mining Ltd.,  
1103-1177 W. Hastings St.,  
Vancouver 1, B.C.

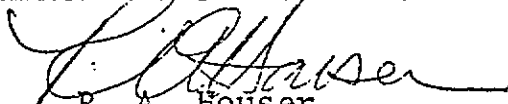
Sample Identification:  
Channel Samples  
CMIA and CMIB

Report No. 67-3838  
67-3839

Sample	CMIA	CMIB	Calculated Composite
Footage	0.75'	5.10'	5.85'
% Moisture, as received	2.38	2.63	2.60
<u>DRY BASIS</u>			
% Ash	43.26	3.38	8.49
% Volatile	14.55	24.14	22.91
% Fixed Carbon	42.19	72.48	68.60
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
BTU	8277	15103	14228
% Sulfur	1.52	0.39	0.53
FSI	1	8½	7½

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

  
R. A. Houser,  
Division Manager



COALITION MINING LTD.

Vancouver B.C.

SAMPLE CM-1B

TESTED DECEMBER, 1972

Sample Identification:

Report No. 67-3852

Composite of 1.60 Float.  
This fraction is 99.3% of  
sample crushed to 3/4" x 0.

---

---

Moisture, %, Air Dry Basis

1.28

Dry Basis

% Ash

3.29

% Volatile

23.71

% Fixed Carbon

73.00

100.00

BTU / lb.

15117

% Sulfur

0.41

FREE SWELLING INDEX:

8½

COALITION MINING LTD.

Vancouver B.C.

SAMPLE CM-1A

FLOAT & SINK ANALYSIS

TESTED DECEMBER 1972

Lab No. 67-3840 - 67-3841

SPECIFIC GRAVITY

CUMULATIVE RECOVERY

<u>Sink</u>	<u>Float</u>	<u>% Wt.</u>	<u>% Ash</u>	<u>% Sul.</u>	<u>% Wt.</u>	<u>% Ash</u>	<u>% Sul.</u>	<u>FSI</u>
		<u>3/4" x 30M = 88.2% of sample crushed to 3/4" x 0</u>						
	1.60	7.6	16.81	0.62	7.6	16.81	0.62	3
1.60		92.4	47.35	XXXX	100.0	45.03	XXXX	XXX

Lab No. 67-3842

30M x 0 = 11.8% of sample crushed to 3/4" x 0

100.0      42.63      XXXX      1

True specific gravity of Raw Coal - 1.790

COMMERCIAL TESTING & ENGINEERING CO.

COALITION MINING LTD.

Vancouver B. C.

SAMPLE CM-1B

FLOAT & SINK ANALYSIS

TESTED DECEMBER 1972

Lab No. 67-3843 - 67-3850

SPECIFIC GRAVITY

CUMULATIVE RECOVERY

CUMULATIVE REJECT

<u>Sink</u>	<u>Float</u>	<u>% Wt.</u>	<u>% Ash</u>	<u>FSI</u>	<u>% Wt.</u>	<u>% Ash</u>	<u>FSI</u>	<u>% Wt.</u>	<u>% Ash</u>	<u>FSI</u>
<u>3/4" x 30M = 84.0% of sample crushed to 3/4" x 0</u>										
	1.30	71.3	2.43	8½	71.3	2.43	8½	100.0	3.60	7
1.30	1.35	22.1	3.78	2½	93.4	2.75	7	28.7	6.50	2½
1.35	1.40	4.0	9.42	2½	97.4	3.02	7	6.6	15.61	2
1.40	1.45	1.1	15.51	2½	98.5	3.16	7	2.6	25.13	2
1.45	1.50	0.4	17.38	2	98.9	3.22	7	1.5	32.19	1½
1.50	1.55	0.3	20.02	1½	99.2	3.27	7	1.1	37.57	1
1.55	1.60	0.1	25.83	1	99.3	3.29	7	0.8	44.15	1
1.60		0.7	46.77	1	100.0	3.60	7	0.7	46.77	1

Lab No. 67-3851

30M x 0 = 16.0% of sample crushed to 3/4" x 0

100.0      3.46      8½

True specific gravity of Raw Coal - 1.325

COMMERCIAL TESTING & ENGINEERING CO.

APPENDIX A - 5.2

ANALYTICAL RESULTS

OF

CHANNEL SAMPLES CM-1A AND CM-1B

Location: Adjacent to D.D.H. CM-1  
in right rib of #3 cut  
through 5 feet from A  
Heading toward B Heading

Sampled By: G. R. Wallis,  
Clifford McElroy & Associates  
Pty. Limited

Analysed By: Cargo Superintendents Co.  
(A/Asia) Pty. Ltd. - Sydney



Telegrams and Cables:  
"Visor", Sydney

# CARGO SUPERINTENDENTS

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

Telephone: 241 1105

CO. (A/SIA.) PTY. LTD.

## Certification

### This is to Certify

APPLICANT: COALITION MINING LIMITED,  
C/- AUSTEN & BUTTA LIMITED.

REPORT TO: CLIFFORD McELROY & ASSOCIATES PTY. LTD.,

SUBJECT: SUKUNKA SAMPLES NOS. CML-A and CML-B  
CHAMBERLAIN SEAM.

REPORT NO. K72 - 1620

ORDER NO. 28021

DATE RECEIVED: 22. 12. 72

DATE REPORTED: 16. 1. 73



This Laboratory is Registered by the  
National Association of Testing Authorities,  
Australia. The tests reported herein have  
been performed in accordance with its  
terms of registration.

*M Bradley*  
A.R.A.C.I. Ch. of Chemist.

For  
CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.

*M. J. ...*

INTRODUCTION:

Two ( 2 ) only coal ply samples designated CML-A and CML-B - CHAMBERLAIN SEAM - were received on 22.12.1972 from Clifford McElroy and Associates Pty. Ltd.

METHOD:

SAMPLE NO. CML-A was weighed, crushed to a 3/4" top size, sized at 30# BSS and +30# BSS raw coal fraction was washed in organic liquids at 1.60 S.G.

The float and sink fractions were weighed, prepared and analysed for Ash% and Crucible Swelling Number in accordance with BS 1016.

A composite raw coal sample was reconstituted for the determination of Proximate Analysis and True Specific Gravity.

SAMPLE NO. CML-B was weighed, crushed to a 3/4" top size, sized at 30# BSS and the +30# BSS raw coal fraction was washed in organic liquids from 1.30 S.G. to 1.60 S.G. in 0.05 steps.

The float and sink fractions and the raw -30# BSS coal fraction were weighed, prepared and analysed in accordance with BS 1016 for Ash% and Crucible Swelling Number.

A composite raw coal sample was reconstituted for the determination of Proximate Analysis and True Specific Gravity.

A Full Seam composite floats 1.60 S.G. sample was prepared for the +30# BSS raw coal for SAMPLES CML-A + B and this sample was analysed for Proximate, Total Sulphur%, C.S. No., Calorific Value, Phosphorus and Gieseler Plastometer Tests as given in this report.

RESULTS:

- FIGURE 1 - is the graphic log of the seam
- TABLE 1 - gives the washability and raw coal data for SAMPLE CML-A after hand crushing to -3/4"
- TABLE 2 - gives the washability and raw coal data for SAMPLE CML-B after hand crushing to -3/4"
- TABLE 3 - gives the washability and raw coal data for the Full Seam ie. CML-A + CML-B

The analysis of the floats 1.60 S.G. fraction of the Full Seam is also given.

*A;*

TABLE 1: WASHABILITY DATA FOR SAMPLE CML-A (after hand crushing to -3/4")

FRACTION	INDIVIDUAL ANALYSIS				CUMULATIVE ANALYSIS		
	WT.GM.	WT.%	ASH%	C.S.NO.	WT.%	ASH%	C.S.NO. (calc)
Fl.60 SG	111	8.9	16.5	2	8.9	16.5	2
Sl.60 SG	1132	91.1	47.0	0	100.0	44.3	½
-30# RC	86	6.5	45.2	0			

ANALYSIS OF RAW COAL CML-A

WEIGHT GM.	THICKENSS	TRUE S.G.	ADM%	ASH%	V.M.%	F.C.%
1329	0.75'	1.694	1.0	44.7	11.6	42.7

TABLE 2: WASHABILITY DATA FOR SAMPLE CML-B (after hand crushing to -3/4")

Fl.30 SG	4440	62.5	1.8	9	62.5	1.8	9
Sl.30 - Fl.35 SG	2200	31.0	3.3	4	93.5	2.3	7
Sl.35 - Fl.40 SG	309	4.3	7.9	3½	97.8	2.5	7
Sl.40 - Fl.45 SG	74	1.0	14.5	3	98.8	2.7	7
Sl.45 - Fl.50 SG	24	0.3	15.1	1	99.1	2.7	7
Sl.50 - Fl.55 SG	13	0.2	19.8	1	99.3	2.7	7
Sl.55 - Fl.60 SG	8	0.1	25.0	½	99.4	2.8	7
Sl.60 SG	36	0.6	43.6	0	100.0	3.0	7
-30# RC	610	7.9	3.5	9			

ANALYSIS OF RAW COAL COAL CML-B

WEIGHT GM.	THICKENSS	TRUE S.G.	ADM%	ASH%	V.M.%	F.C.%
7714	5.10'	1.235	1.0	3.1	21.4	74.5

SHEET FOUR ATTACHED:

P

ANALYSIS OF FLOATS 1.60 S.G. FRACTION OF CMI-B

YIELD%	99.4
AIR DRIED MOISTURE%	1.0
ASH%	2.8
VOLATILE MATTER%	21.0
FIXED CARBON%	75.2
TOTAL SULPHUR%	0.47
C.S.NO.	8
CALORIFIC VALUE BTU/lb	15,080 (air dried basis)
PHOSPHORUS%	0.008

TABLE 3: CALCULATED WASHABILITY DATA FOR FULL SEAM (CMI - A + B)

FRACTION	INDIVIDUAL ANALYSIS				CUMULATIVE ANALYSIS		
	WT.GM.	WT.%	ASH%	C.S.NO.	WT.%	ASH%	C.S.NO. (calc)
FL.60 SG	7179	86.0	3.0	7	86.0	3.0	7
SL.60 SG	1168	14.0	46.9	0	100.0	9.2	6
-30# RC	696	7.7	8.7	9			

ANALYSIS OF RAW COAL CMI-A + CMI - B

WEIGHT GM	THICKNESS	TRUE S.G.	ADM%	ASH%	V.M.%	F.C.%
9043	5.85 <sup>1</sup>	<del>1.286</del> 1.302	1.0	9.2	20.0	69.8

ANALYSIS OF FLOATS 1.60 S.G. FRACTION OF FULL SEAM i.e. CMI - A + B

YIELD%	86.0
AIR DRIED MOISTURE%	1.0
ASH%	3.0
VOLATILE MATTER%	21.0
FIXED CARBON%	75.0
TOTAL SULPHUR%	0.47
C.S.NO.	7½
CALORIFIC VALUE BTU/lb	15,000
PHOSPHORUS%	0.008

SYDNEY  
18th January, 1973.

A

GIESELER PLASTOMETER TEST FOR FLOATS 1.60 S.G. FRACTION OF FULL SEAM  
i.e. CMI-A + CMI-B

INITIAL SOFTENING TEMPERATURE (0.1 ddm)	390 <sup>o</sup> C
INITIAL SOFTENING TEMPERATURE (1.0 ddm)	412 <sup>o</sup> C
FUSION TEMPERATURE AT 5 ddm	429 <sup>o</sup> C
MAXIMUM FLUIDITY TEMPERATURE	456 <sup>o</sup> C
MAXIMUM FLUIDITY	370 ddm ✓
RESOLIDIFICATION TEMPERATURE	483 <sup>o</sup> C
RANGE SOFTENING (0.1 ddm) - RESOLIDIFICATION	93 <sup>o</sup> C
RANGE SOFTENING (1.0 ddm) - RESOLIDIFICATION	71 <sup>o</sup> C
RANGE AT 1 ddm	65 <sup>o</sup> C

SYDNEY  
18th January, 1973.

A

CORNING MINING LTD.  
 c/o AUSTEN & BOTTLE LTD  
 K72-1620

C.M.I. - A / C.M.I. - B  
 CHAMBERLAIN SEAM

RY NO	THICK	WT /	ASIF /	CNO	ASH %	C.M. INCHES	FEET
C.M.I. "A"	0.75'	14.7	44.3	1/2		9.1	
						3.0	
C.M.I. "B"	5.10'	85.3	3.0	7			

X

APPENDIX A - 5.3

ANALYTICAL RESULTS

OF

DRILL CORE FROM D.D.H. CM-1

The drill hole was intersected underground  
in #3 cut through 5 feet from A Heading  
toward B Heading.

Telegrams and Cables:  
"Visor", Sydney

Telephone: 241 1105

# CARGO SUPERINTENDENTS

CO. (A/SIA.) PTY. LTD.

Scottish House,  
19 BRIDGE ST.,  
SYDNEY, 2000

## Certification

This is to Certify

APPLICANT:

COALITION MINING

REPORT ON:

SUKUNKA SAMPLE NO. 242  
CORE NO. CMI  
CHAMBERLAIN SEAM

REPORT NO.

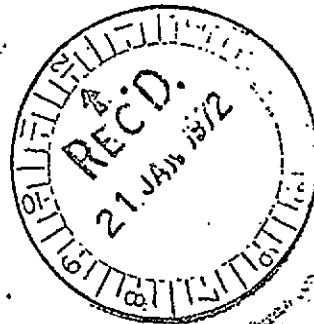
K71-2028

RECEIVED:

16. 12. 1971

REPORTED:

20. 1. 1972



This Laboratory is Registered by the  
National Association of Testing Authorities  
Australia. The tests reported herein have  
been performed in accordance with the  
terms of registration.

*M. Bradley*  
A.R.A.C.F. Chief Chemist.

For

CARGO SUPERINTENDENTS CO. (A/SIA.) PTY. LTD.



INTRODUCTION:

One (1) Coal Sample designated CORE NO. CMI CHAMBERLAIN SEAM was received on 16. 12. 1971 from Clifford McElroy & Associates.

METHOD:

The Coal Sample No. 242 was hand crushed to  $\frac{3}{8}$ " , sized at 30 mesh BSS and the +30 mesh BSS fraction washed in organic liquids at 1.30 to 1.60 specific gravity in 0.05 steps.

The float and sink fractions, raw -30 mesh coal fraction were weighed, prepared and analysed for Ash and Crucible Swelling Number and the composite raw coal sample reconstituted and the true specific gravity of the sample determined.

A cumulative Floats 1.60 SG fraction was prepared for Sample No. 242 and the analysis is given in this report.

RESULTS:

TABLE 1 : gives the sizing, washability and analytical data for the sample after hand crushing to  $\frac{3}{8}$ " top size.

TABLE 1

WASHABILITY DATA FOR SAMPLE NO. 242 (after hand crushing to  $\frac{3}{8}$ " )

FRACTION	INDIVIDUAL				CUMULATIVE		
	WEIGHT	WT.%	ASH%	C.S.NO.	WT. %	ASH%	C.S.NO.
F1.30 SG	1632	60.7	1.9	9	60.7	1.9	9
S1.30 - F1.35 SG	812	30.2	3.7	8	90.9	2.5	9
S1.35 - F1.40 SG	120	4.5	8.3	5	95.4	2.8	8½
S1.40 - F1.45 SG	14	0.5	11.4	5	95.9	2.8	8½
S1.45 - F1.50 SG	12	0.4	18.6	5	96.3	2.9	8½
S1.50 - F1.55 SG	15	0.6	21.7	4½	96.9	3.0	8½
S1.55 - F1.60 SG	14	0.5	26.4	1	97.4	3.1	8½
S1.60 SG	68	2.6	34.0	½	100.0	3.9	8
-30 Mesh RC	253	8.6	4.2	8½			

Total Weight of Sample = 2940 grams

True Specific Gravity = 1.286

Thickness = 5.02'

ANALYSIS OF F1.60 SG FRACTION OF SAMPLE NO. 242

Yield %	97.4
Air Dried Moisture %	1.0
Ash %	3.1
Volatile Matter %	22.2
Fixed Carbon %	73.7
Total Sulphur %	0.43
C.S.NO.	8½
Calorific Value	14640 BTU/LB

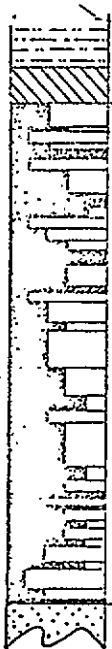
SYDNEY

20th January 1972

ASH %  
CUMULATIVE  
FROM FLOOR

CHAMBERLAIN SEAM

		WT%	ASH%	C. S. N <sup>o</sup>	INCL. BANDS	EXCL. BANDS
152.23					3.9	
157.25		5.02	3.9	8		



Prepared by:  
CLIFFORD McELROY & ASSOCIATES PTY. LTD.  
for  
COALITION MINING LIMITED  
DRAWN BY pm. DATE Feb '72

SEAM SECTIONS  
DDH CM-1

SCALE: 1' to 2'

PAGE 1 of 1

APPENDIX A - 5.4

ANALYTICAL RESULTS

OF

BULK SAMPLE CML-1

Location: 80 feet inbye of #2 cut  
through in A Heading

Seam Section: Not recorded

Sampled By: P. Appleby,  
Coalition Mining Ltd.

Analysed By: Commercial Testing &  
Engineering Co. - Vancouver

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-8434



Dec. 1, 1972

## CERTIFICATE OF ANALYSIS FOR:

Coalition Mining Ltd.,  
1103-1177 W. Hastings St.,  
Vancouver 1, B. C.

Sample Identification:

Report No. 67-3830 - 67-3833

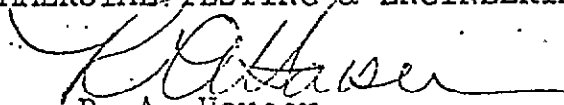
Run of Mine Coal  
crushed to  $1\frac{1}{2}$ " Rd. x 0

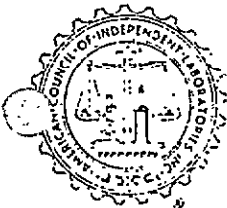
### SCREEN ANALYSIS

<u>Passing</u>	<u>Retained on</u>	<u>% Wt.</u>	<u>% Dry Ash</u>
$1\frac{1}{2}$ " Rd.	$\frac{1}{2}$ " Rd.	27.8	12.77
$\frac{1}{2}$ " Rd.	$\frac{1}{4}$ " Rd.	17.2	13.08
$\frac{1}{4}$ " Rd.	0.5 MM	40.0	9.26
0.5 MM		15.0	6.18
		<u>100.0</u>	<u>10.43</u>

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

  
R. A. Houser,  
Division Manager.



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Dec. 1, 1972

## CERTIFICATE OF ANALYSIS FOR:

Coalition Mining Ltd.,  
1103-1177 W. Hastings St.,  
Vancouver 1, B.C.

Sample Identification:

Report No. 67-3834

Run of Mine Coal crushed  
to 1½" Rd. x 0.

### PROXIMATE ANALYSIS

	<u>Dry Basis</u>
% Ash	10.58
% Volatile	22.11
% Fixed Carbon	67.31
	<u>100.00</u>
BTU	13975
% Sulfur	0.70
FREE SWELLING INDEX:	8
% Equilibrium Moisture	1.59

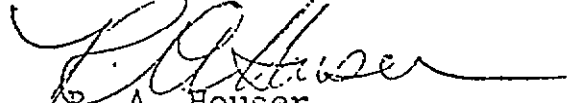
### COAL PLASTICITY (GIESELER PLASTOMETER)

Maximum Fluidity, D.D.P.M.	100
Temp. at Maximum Fluidity, °C	464
Temp. at Initial Fluidity, °C	421
Temp. at Final Fluidity, °C	486
Range, °C	65
Torque - 40 gram inches	

Date Tested: Nov. 30, 1972

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

  
R. A. Houser,  
Division Manager.



Coalition Mining Ltd.

Tested Nov. 30, 1972

Report No. 67-3834

10000

1000

100

10

Maximum Fluidity: D.D.P.M. = 100

Temp. at Maximum Fluidity

°C 464

Dial Divisions/Minute

370 80 90 400 10 20 30 40 50 60 70 80 90 500 10

Temperature °C

SEMI-LOGARITHMIC  
5 CYCLES X 70 DIVISIONS  
KEUFFEL & ESSER CO.  
MADE IN U.S.A.  
46 6212

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



December 4, 1972

## CERTIFICATE OF ANALYSIS FOR:

Coalition Mining Ltd.,  
1103-1177 W. Hastings St.,  
Vancouver 1, B. C.

Sample Identification:

Report No. 67-3836  
67-3837

Raw Coal. This is a representative portion of Crushed  $1\frac{1}{2}$ " x 0 sample reported under Report No. 67-3834. This portion had been crushed in hammer mill to minus 4 mesh before Float-Sink test.

---

	<u>% Wt.</u>	<u>% Dry Ash</u>
1.60 Float	78.6	2.74
1.60 Sink	<u>21.4</u>	<u>39.35</u>
	100.0	10.57

Respectfully submitted;

COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser  
Division Manager



APPENDIX A - 5.5

ANALYTICAL RESULTS

OF

BULK SAMPLE CML-2

Location: At intersection of #5  
cut through in B Heading

Seam Section: 0.42' Sheared coal & coal, stony  
5.50' Dull & bright coal  
5.90'

Sampled By: G. R. Wallis,  
Clifford McElroy & Associates  
Pty. Limited

Analysed By: Commercial Testing &  
Engineering Co. - Vancouver



**COMMERCIAL TESTING & ENGINEERING CO.**

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Please address all correspondence to:  
147 Riverside Drive, North Vancouver, B.C.

Office: Tel. (604) 929-2228  
Roberts Bank Tel. (604) 946-7021

January 8, 1973.

**CERTIFICATE OF ANALYSIS FOR:**

Coalition Mining Ltd.,  
1103-1177 West Hastings St.  
VANCOUVER 1, B.C.

Sample Identification: Report No. 67-3919

Run of Mine Coal crushed  
to 1½" Rd. x 0.

Sample CML-2

PROXIMATE ANALYSIS

	<u>Dry Basis</u>
% Ash	8.05
% Volatile	23.62
% Fixed Carbon	68.33
	<u>100.00</u>
BTU	14357
% Sulfur	0.63

FREE SWELLING INDEX: 8

% Moisture, Air Dry Basis: 1.35

Respectfully submitted  
COMMERCIAL TESTING & ENGINEERING CO.

*R.A. Houser*  
R.A. Houser  
Division Manager.

RAH/oh



**COMMERCIAL TESTING & ENGINEERING CO.**

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147 Riverside Drive, North Vancouver, B.C.Office: Tel. (604) 929-2228  
Roberts Bank Tel. (604) 946-7021

January 8, 1973

CERTIFICATE OF ANALYSIS FOR:  
 COALITION MINING LTD.  
 1103-1177 W. Hastings St.  
 Vancouver 1, B. C.

Sample identification:  
 Sample CML-2  
 Run of Mine Coal crushed  
 1½"Rd. x 0

Report No. 67-3907 -  
 67-3910

SCREEN ANALYSIS

<u>Passing</u>	<u>Retained on</u>	<u>% Wt.</u>	<u>% Dry Ash</u>
1½"Rd.	½"Rd.	33.1	11.94
½"Rd.	¼"Rd.	16.8	8.64
¼"Rd.	0.5 mm	32.4	5.70
0.5 mm		17.7	3.94
		100.0	7.95

Respectfully submitted,

COMMERCIAL TESTING &amp; ENGINEERING CO.

R. A. Houser,  
 Division Manager

RAH/oh



CERTIFICATE OF ANALYSIS FOR:  
 COALITION MINING LTD.  
 1103-1177 W. Hastings St.  
 Vancouver 1, B. C.

January 8, 1973

Sample identification:  
 Sample CML-2

Report No. 67-3911 - 67-3918

Run of Mine Coal crushed to  $1\frac{1}{2}$ "Rd. x 0

FLOAT & SINK ANALYSIS

Specific Gravity  
Sink      Float      % Wt.      % Dry Ash

$1\frac{1}{2}$ "Rd. x  $\frac{1}{2}$ " Rd. = 33.1%

1.60	1.60	81.8	3.67
1.60		18.2	50.24
		<u>100.0</u>	<u>12.15</u>

$\frac{1}{2}$ " Rd. x  $\frac{1}{2}$ " Rd. = 16.8%

1.60	1.60	87.9	3.27
1.60		12.1	48.89
		<u>100.0</u>	<u>8.79</u>

$\frac{1}{2}$ " Rd. x 0.5 mm = 32.4%

1.60	1.60	93.3	2.58
1.60		6.7	48.02
		<u>100.0</u>	<u>5.62</u>

0.5 mm x 0 = 17.7%

1.60	1.60	82.9	1.83
1.60		17.1	14.10
		<u>100.0</u>	<u>3.93</u>

Comp.  $1\frac{1}{2}$ " Rd. x 0 = 100% of Sample

1.60	1.60	86.7	2.91
1.60		13.3	41.41
		<u>100.0</u>	<u>8.03</u>

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

*R. A. Houser*  
 R. A. Houser,  
 Division Manager



APPENDIX A-5.6

COMPARISON OF ANALYTICAL RESULTS  
FROM CHANNEL SAMPLES CM-1A AND  
CM-1B AND FROM CORE FROM D.D.H. CM-1

NOTES TO ACCOMPANY APPENDIX A-5.6

Abbreviations Used:

- BSI - British Standards Institution
- ASTM - American Society for Testing and Materials
- C.T.E. - Commercial Testing and Engineering Co. Ltd., Vancouver
- Cargo - Cargo Superintendents Co. (A/sia) Pty. Ltd., Sydney

1. Analyses by Cargo Superintendents are to B.S. 1016 : Parts 1-16 : 1957-1967 (endorsed as Australian Standard K 152, Parts 1-16, 1965-1969).
2. Analyses by Commercial Testing and Engineering are to ASTM D 271 and ASTM D 720 standards.
3. The methods of test of the BSI and ASTM standards are such that, as a broad generalisation, results determined according to the ASTM standards will be, when compared with the BSI standard:
  - (a) for Ash, C.S. No. and Calorific Value - comparable
  - (b) for Air Dried Moisture - slightly lower
  - (c) for Total Sulphur - higher
  - (d) for Volatile Matter - higher
  - (e) for Fixed Carbon - lower
- 4.1 From an inspection of Tables (i), (ii) and (v) to (viii) it can be seen that the analytical results obtained on channel samples CM-1A and CM-1B by the two laboratories are generally in fair agreement and the results of the

float and sink testing are in good agreement. The significant difference in the results obtained by the two laboratories is in the determination of raw coal ash of Sample CM-1A (Table (i) ) and the S.G. of Samples CM-1A and CM-1B (Tables (i) and (ii) ). It is probable that C.T.E.'s value for the raw coal ash of CM-1A is wrong because, when one compares the measured value with the one calculated from the raw coal ash of the +30 and -30 mesh fractions, the following is obtained.

C.T.E.	Raw coal ash of CM-1A (measured)	43.3%
	Calculated raw coal ash (+30 & -30 mesh)	44.7%
Cargo	Raw coal ash of CM-1A (measured)	45.2%
	Calculated raw coal ash (+30 & -30 mesh)	44.8%

4.2 The difference in the S.G. determinations is both less unexpected and more difficult to explain in that the true S.G. of coal is not normally determined and there is no British or Australian Standard for the procedure. It can be assumed however that the fineness to which the coal is crushed will affect the determination of true S.G. (the smaller the size of the coal particles, the fewer the voids and hence the higher the S.G.) and in this respect it can be noted that in crushing the coal to a top size of 3/4", C.T.E. produced almost twice the quantity of -30 mesh fines as Cargo. In the absence of Standards on the procedure it is also possible that Cargo's determination of S.G. was carried out on a sample of coarser size than C.T.E.'s. No further comment is possible in the absence of additional data.

5. The agreement between Cargo's analyses of channel sample CM-1B and the corresponding section of coal from D.D.H. CM-1 is excellent (Table (vii) ). Not only are the two sets of results very similar, and hence supportive of the validity of using drill core data to predict the washed product characteristics of the R.O.M. coal, but the small difference that does exist is consistently in the direction of indicating that the raw coal ash of sample D.D.H. CM-1 is slightly higher than that of channel sample CM-1B, as indeed shown in Table (viii). This in itself is in keeping with the general expectation that the raw coal ash of a drill core sample will be higher than the raw coal ash of the corresponding section of in situ coal, due to the differential loss of low S.G., low ash coal in the drilling process.

APPENDIX A-5.6

COMPARISON OF TEST RESULTS OBTAINED ON CHANNEL  
SAMPLES CM-1A and CM-1B AND ON CORE FROM D.D.H. CM-1

(i) Raw Coal CM-1A

	DRY BASIS			
	<u>VM%</u>	<u>FC%</u>	<u>ASH%</u>	<u>S.G.</u>
C.T.E.	14.5	42.2	43.3	1.790
Cargo	11.7	43.1	45.2	1.694

(ii) Raw Coal CM-1B

C.T.E.	24.1	72.5	3.4	1.325
Cargo	21.6	75.3	3.1	1.235
D.D.H. CM-1 (Cargo)	-	-	3.9	1.286

(iii) Composite Raw Coal CM-1A and CM-1B

C.T.E. (Calculated)	22.9	68.6	8.5	1.385
Cargo (Calculated)	20.2	70.5	9.3	1.286

(iv) Size Analysis of Raw Coal, CM-1A and CM-1B after  
crushing to 3/4" top size

	<u>CM-1A</u>		<u>CM-1B</u>	
	<u>+30 Mesh%</u>	<u>-30 Mesh%</u>	<u>+30 Mesh%</u>	<u>-30 Mesh%</u>
C.T.E.	88.2	11.8	84.0	16.0
Cargo	93.5	6.5	92.1	7.9
D.D.H. CM-1 (Cargo)	-	-	91.4	8.6

(v) Cumulative Floats at S.G. 1.60, +30 Mesh CM-1A

	<u>YIELD %</u>	<u>ASH %</u>	<u>C.S. NO.</u>
C.T.E.	7.6	16.8	3
Cargo	8.9	16.5	2



(vi) Raw Coal, -30 Mesh, CM-1A

	<u>ASH %</u>	<u>C.S. NO.</u>
C.T.E.	42.6	1
Cargo	45.2	0

(vii) Cumulative Floats at S.G. 1.60, +30 Mesh CM-1B

	<u>YIELD%</u>	<u>ADM%</u>	<u>VM%</u>	<u>FC%</u>	<u>ASH%</u>	<u>C.S. NO.</u>	<u>S%</u>	<u>CV BTU/lb</u>
C.T.E.	99.3	1.0	23.5	72.3	3.2	8½	0.41	14970
Cargo	99.4	1.0	21.0	75.2	2.8	8	0.47	15080
D.D.H. CM-1 (Cargo)	97.4	1.0	22.2	73.7	3.1	8½	0.43	14640

(viii) Raw Coal, -30 Mesh, CM-1B

	<u>ASH %</u>	<u>C.S. NO.</u>
C.T.E.	3.5	8½
Cargo	3.5	9
D.D.H. CM-1 (Cargo)	4.2	8½

---

C.T.E. - Commercial Testing and Engineering Co., Vancouver  
 Cargo - Cargo Superintendents Co. (A/sia) Pty. Ltd., Sydney

APPENDIX B

COMMENTS ON EXAMINATION  
OF STRUCTURAL ASPECTS  
OF SUKUNKA COAL PROJECT

by Dr. M.J. Rickard

B-1

TREND SURFACE ANALYSIS  
OF CHAMBERLAIN SEAM  
STRUCTURE

by Dr. A.C. Cook

B-2

## NOTES TO ACCOMPANY APPENDIX B

In this appendix are two reports by consultants retained because of their special expertise in their particular field.

Dr. Rickard was retained to provide independent advice on the detailed structural analysis carried out on data collected during the underground mapping programme.

Included in the 1972 Report is a trend surface analysis carried out by Dr. A.C. Cook to which reference may be made for the methods of analysis employed, Appendix C-2.

The area analysed for the current report is to the south-west of the previously analysed area. In this analysis a false topography was assumed to exist over the incised, and therefore non-continuous seam outcrop region of Chamberlain Creek..

APPENDIX B-1

COMMENTS ON EXAMINATION  
OF  
STRUCTURAL ASPECTS OF  
SUKUNKA COAL PROJECT

by

M.J. RICKARD  
AUSTRALIAN NATIONAL UNIVERSITY  
CANBERRA, A.C.T.  
AUSTRALIA

COMMENTS ON EXAMINATION OF STRUCTURAL ASPECTS  
OF SUKUNKA COAL PROJECT

---

1. Validity of Structural Approach

The treatment of gross structural data by C.M.A. geological staff is excellent. The treatment of detailed structural data is not yet sufficiently advanced for valid conclusions to be drawn, as discussed in points (4) and (7) below.

2. Discussions

Emphasis on discussions was placed on the importance of the "slip wedges" in laminites. I concur with the importance of these and with the general pattern deduced. In general discussion, I have strongly emphasised the difficulties of making stress predictions. The slip wedges are of special interest as, so far as I am aware, the origin and structural significance is unknown. There appears to be no references to this unusual structure in geological literature.

3. References

It is recommended that the following literature references on Jointing and Stress Analysis be consulted.

W.R. Judd, 1964 - State of Stress in the Earth's Crust; Elsevier.

J.C. Jaeger & Cook - Rock Mechanics.

D. Seccor - Paper on Joint Formation; Kink Band Conference, Canada.

N. Gay, 1972 - Virgin Rock Stresses at Doornfontein Gold Mine, Carletonville, South Africa; Jour. Geol. Vol. 80, p. 61-80.

N.J. Price - The Influence of Geological Factors on the Strength of Coal Measure Rocks; Geol. Mag. V.100, p. 428.

G.W. Crosby & P.K. Link, 1972 - Stress Reorientation during folding; Geologische Rundschau Bd 61, p.413.

Other references will be supplied later.

4. Relation of Stress Conditions to Structure

The establishment of the relation of stress conditions to structure is a very difficult step. Some structures, e.g. thickening associated with thrust steps or wedges,

indicate a semi-ductile condition in places. Hence, this is at the limit of application of the "elastic" condition assumption for stress treatment. Treatment of stresses, and in particular reorientation of stress, is unwarranted from the data which is at present available. (Refer to 1973 Supplementary Report, Sections 4.3.6.(iii) and (iv). The joint analysis undertaken in the mine indicates major differences between the joint patterns in the coal seam and in the roof. Those in the coal do not fit the simple geometric patterns of the major structure. A detailed examination of colour transparencies of adjacent areas shows that similar joints occur in both coal and roof. Therefore, there is some doubt as to whether the coal joints measured are representative. On both sets of the relevant diagrams, there are approximately 10% of readings on the original plots that depart from the simple geometry presented. The final diagrams should show total plots.

The sigmoidal laminite slip wedges have clearly behaved differently from the enclosing layers at the time of joint formation, indicating that movement on the laminae occurred. Joints terminate or originate or are deflected across these zones. It is this observation that suggests that the stress relief behaviour of these bands would be different from the enclosing layers.

From discussions and study of the work of Gay (1972), it seems likely that residual stresses will be active at all depths to which it is anticipated that the mine will be worked. These stresses will probably be approximately horizontal. At depths of 1000 to 2000 feet, there will, of course, be a significant increase in the vertical stress due to the weight of the overburden. More specific comment must await more detailed work in this field.

N.B. Nevertheless one can say with confidence that the sigmoidal laminites, dipping at  $30^{\circ}$  to  $60^{\circ}$ , will cause dangerous stress perturbations and where close to the seam roof, will cause failure since they are oriented close to the optimum shear angle in relation to either vertical or horizontal maximum principal stress.

## 5. Checks

As an internal check on the geological techniques used by Clifford McElroy & Associates in the structural interpretation, I selected section line C and studied

this in some detail in relation to the Structure Contour Map and the drill logs. Other sections were also examined. The structural interpretation is convincing. The Structure Map and stereograms of the mine area were also checked. Comments on the latter have been given in point (4) above.

#### 6. Prediction

Given the simple fold pattern shown by the Structure Contour Map, there should be good scope for prediction of structures over relatively large distances (i.e. thousands of yards) within uniform structural domains.

The bedding, joints, minor faults, thrust zones, slip wedges etc., should be determined separately for each of three domains, i.e. -

- (i) Flat zones,
- (ii) Steeply dipping zones,
- (iii) Fault zones.

In this regard, the central zone of plate 2 between section lines F and H should be treated separately. This area is a cross zone of steeper warping located in the core of a gentle salient in the main fold trends.

Short range prediction should be possible from data collected within the mine, provided that workings do not cross domain boundaries.


#### 7. Value of Detailed Structural Mapping

The concept and the implementation of the current detailed structural mapping is excellent and should be extended, particularly in view of the conclusions in point (8) below. Underground measurements in the seams as mined are obviously difficult and the area mined to date is relatively small in the overall area. It is felt that much more information could be gained with further attention to detailed structural work on available surface outcrops, both natural and those that have been exposed by bulldozing or other surface work. If the pattern of minor structural elements is established for the homogeneous domains outlined in point (6) above, this would act as a guide and form a basis for any future rock mechanics studies and subsequently the pattern of future development of the mine.

8. Recommendations

- (i) In view of their undoubted importance to mining operations, the distribution pattern and structural geometry of the sigmoidal laminite slip wedges should be determined.
- (ii) The detailed structural analysis should be extended to cover all significant surface outcrops. Joint patterns underground should be evaluated. The patterns of structurally homogeneous domains of large extent could then be predicted and used to guide further studies in mining operations.
- (iii) In view of the following unusual situations:-
  - (a) the short stratigraphic interval separating the Chamberlain and Skeeter Seams;
  - (b) the relative weakness of the interseam strata due to the laminites and slip wedges, and
  - (c) the flat thrust situation,

it would be advisable to initiate a rock mechanics study at an early date. In situ measurements of stress in the different structural situations, combined with the structural analysis, should enable accurate predictions as to the state of stress and likelihood of roof failure. Such a study could well provide data which would be a major deciding factor in the overall mining feasibility.



M.J. Rickard,

6th February, 1973.



APPENDIX B-2

TREND SURFACE ANALYSIS OF  
CHAMBERLAIN SEAM STRUCTURE

by

A.C. COOK  
WOLLONGONG UNIVERSITY COLLEGE  
WOLLONGONG, N.S.W.  
AUSTRALIA

## TREND SURFACE ANALYSIS OF CHAMBERLAIN SEAM STRUCTURE

Thirty five data points relating to the floor level of the Chamberlain Seam were analysed using partial trend surface methods similar to those used for data from the north-west of the Sukunka area. The data for the present study came from an area defined by eastings between 83,300 and 95,130 and northings between 36,340 and 44,600. The data points are non-random with an arcuate array of points being present in the southern part of the area and the points in the northern part also tending to lie along a line. The Chamberlain Seam within the area is affected by some known faults trending N.W.-S.E. The aim of the present study was to determine the likelihood of other structures being present.

### TREND SURFACES

Summary statistics are presented in tabular form below and the statistically significant surfaces (degrees 1 & 3) are attached. The degree 1 surface shows that the dominant structural element is a W.S.W. homoclinal dip. The degree 3 surface suggests that there is a weak regional syncline trending parallel with the known thrust faults. The present study suggests a N.W. plunge; the previous study suggested a S.E. plunge. The structure may therefore be a weak basin.

Table 1 Summary statistics for trend surfaces

Degree	1	2	3
Correlation Coefficient	0.742	0.774	0.918
Incremental F Value	13	1.4	13
Confidence Level	99.99%	75%	99.99%

RESIDUAL MAPS

The degree 3 residual map is attached. This shows a series of lows and highs which are generally elongate in a N.W.-S.E. direction but which tend to alternate in sign along traverses in this direction. A similar pattern is shown by the other residual maps but the elongation of the residual domains is more marked in the maps for the lower degree surfaces.

The pattern of residuals suggests that other possible structures (such as some N.E.-S.W. cross faults) make as significant a contribution to the overall variance in seam level as do the known N.W.-S.E. thrust faults. No more definite conclusions can be drawn from the present data since its areal distribution is such that control in relation to structures trending other than N.W.-S.E. is minimal. If further holes are to be drilled, the most useful places would appear to be zones of high residual gradients especially those trending N.E.-S.W.

A.C. COOK

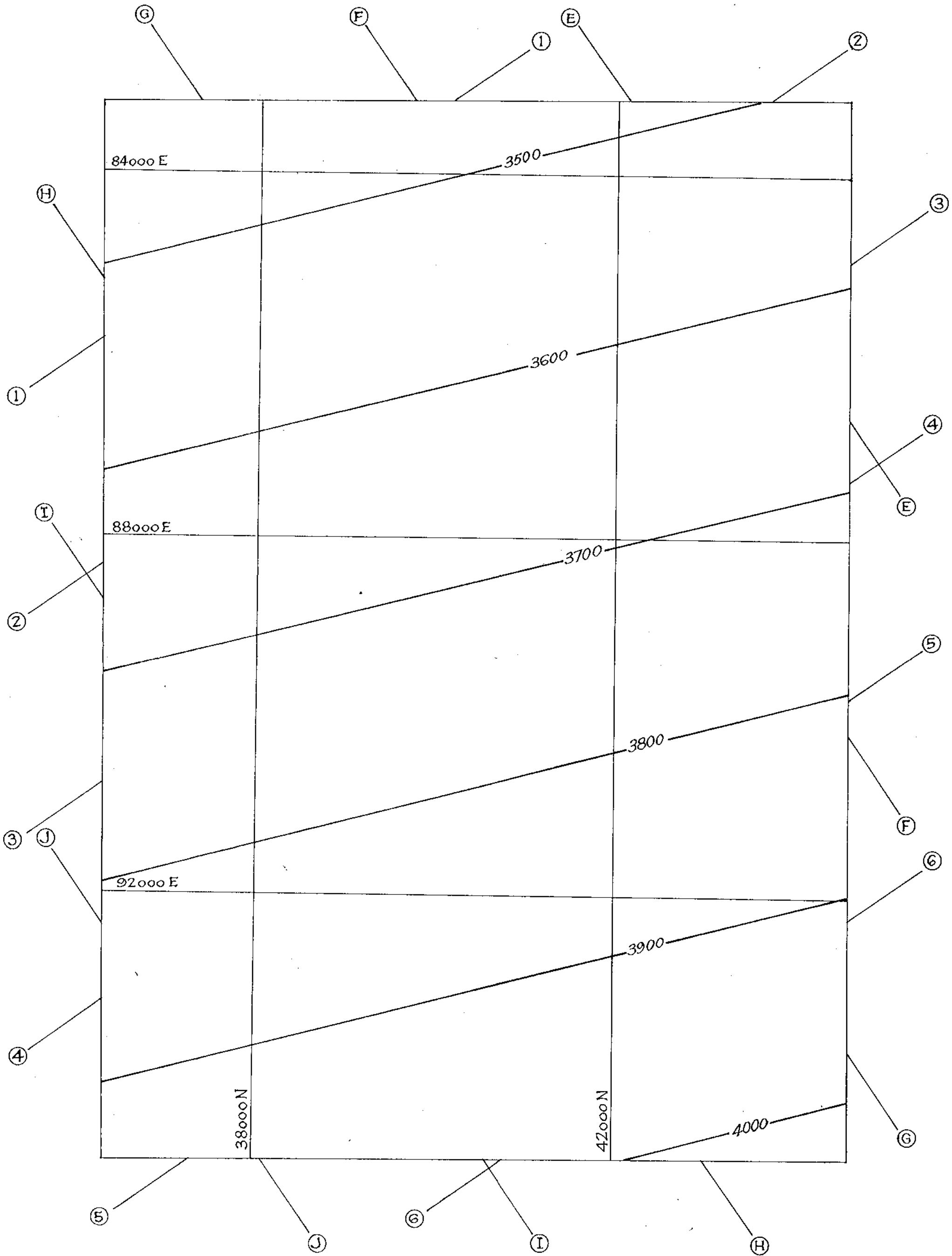
9.2.73

# 650

## SEAM STRUCTURE

DEGREE 1 TREND

### SUKUNKA COAL PROJECT



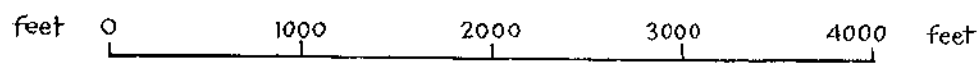
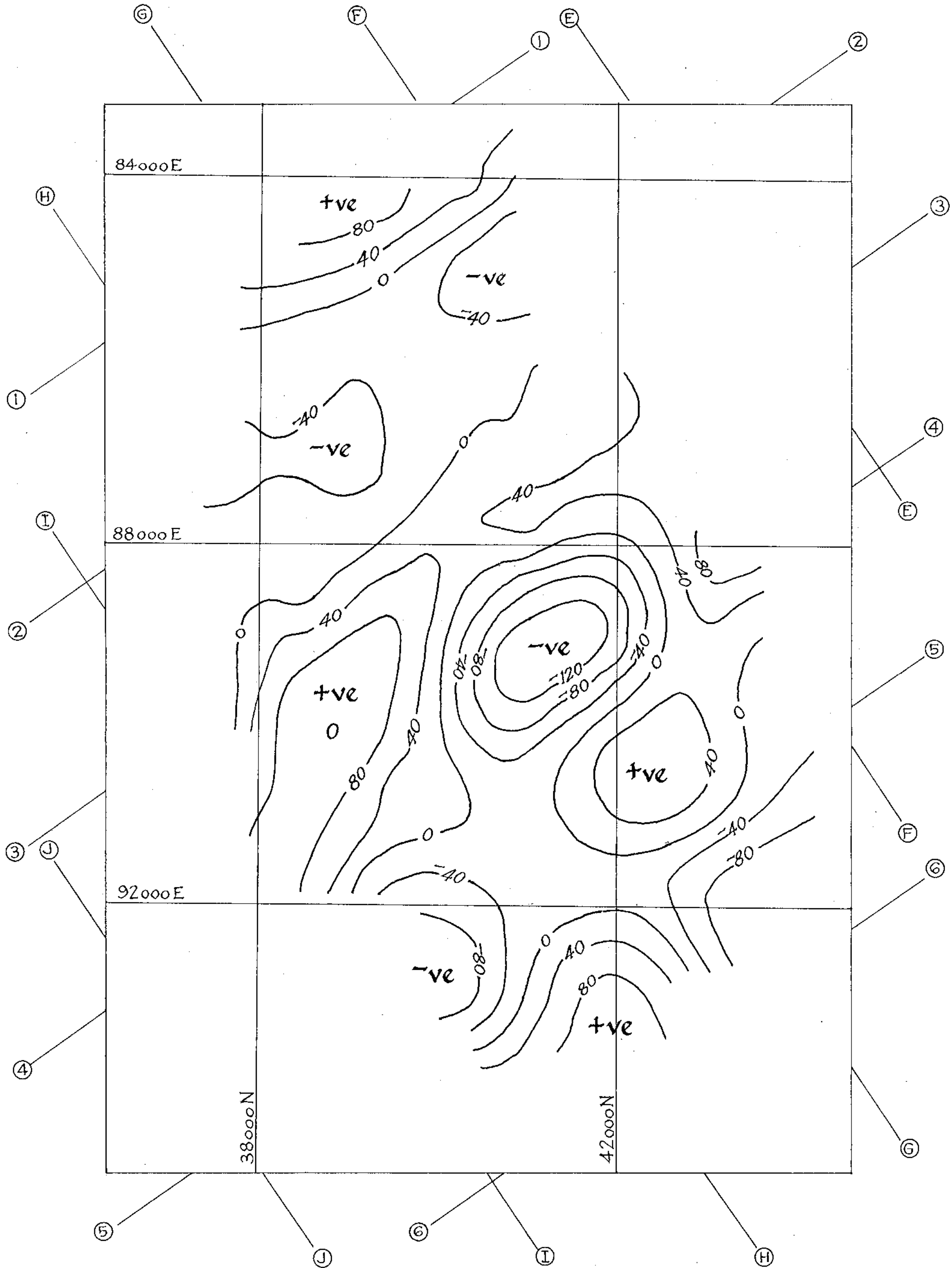
feet 0 1000 2000 3000 4000 feet

Contour Interval 100ft.

650

SEAM STRUCTURE  
DEGREE 3 RESIDUALS

SUKUNKA COAL PROJECT

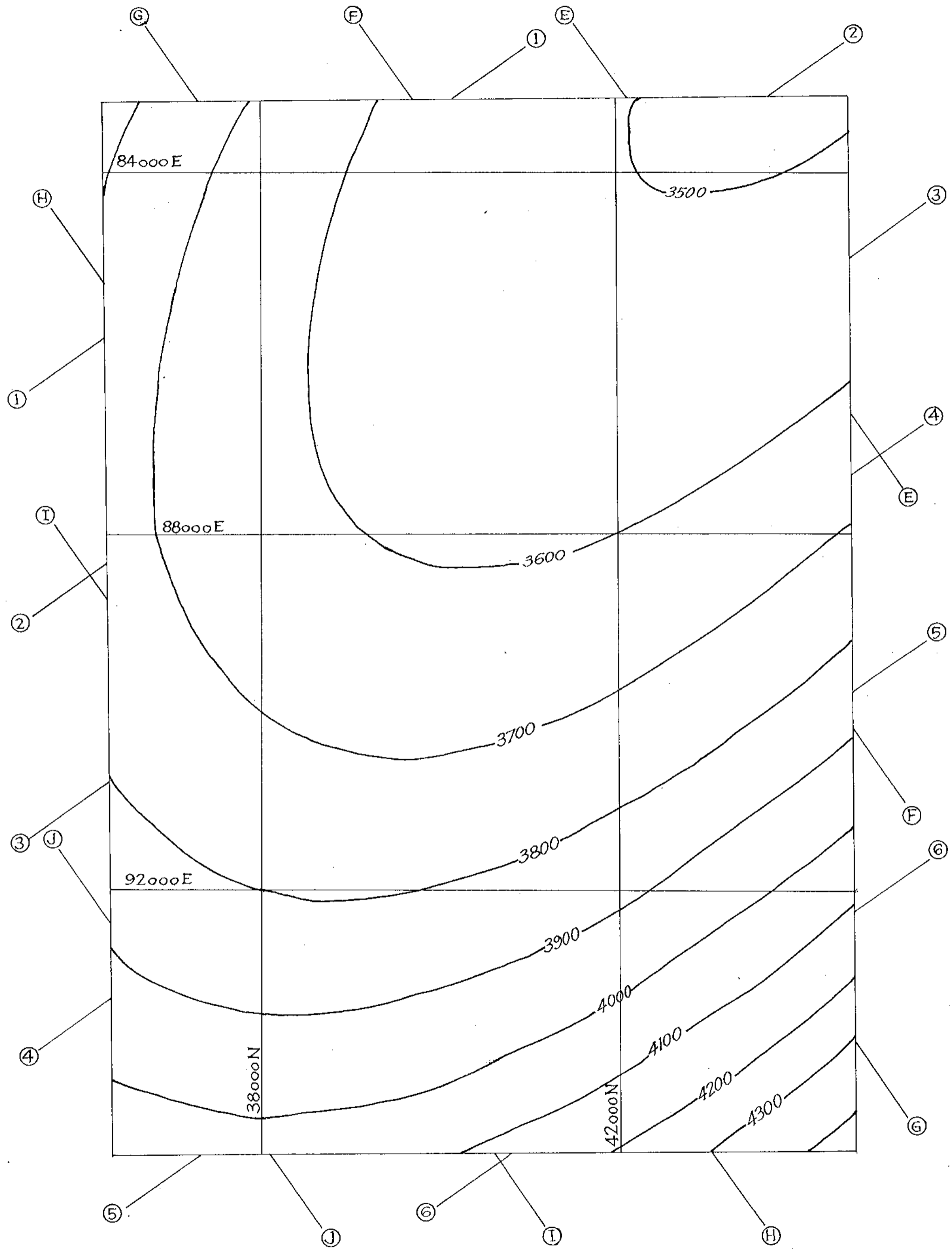


Contour Interval 40 ft.

650

SEAM STRUCTURE  
DEGREE 3 TREND

SUKUNKA COAL PROJECT



feet 0 1000 2000 3000 4000 feet

Contour Interval 100 ft.

APPENDIX C

PETROGRAPHIC AND RELATED ANALYSES OF FOUR ADIT  
COAL SAMPLES FROM THE CHAMBERLAIN AND SKEETER  
SEAMS FROM THE SUKUNKA RIVER PROPERTY OF  
COALITION MINING LIMITED, CHETWYND,  
BRITISH COLUMBIA

by

J.G. Jorgensen

CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

MINES BRANCH

OTTAWA

METALS REDUCTION AND ENERGY CENTRE  
DIVISIONAL REPORT MREC 72/101

PETROGRAPHIC AND RELATED ANALYSES OF FOUR ADIT COAL SAMPLES  
FROM THE CHAMBERLAIN AND SKEETER SEAMS FROM THE SUKUNKA RIVER  
PROPERTY OF COALITION MINING LIMITED,  
CHETWYND, BRITISH COLUMBIA.

PROJECT 03-3-1/6-1

by

J. G. Jorgensen

SEPTEMBER 1972



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PETROGRAPHIC AND RELATED ANALYSES OF FOUR ADIT  
COAL SAMPLES FROM THE CHAMBERLAIN AND  
SKEETER SEAMS FROM THE SUKUNKA RIVER PROPERTY  
OF THE COALITION MINING LIMITED,  
CHETWYND, BRITISH COLUMBIA.

Project 03-3-1/6-1

by

J. G. Jorgensen\*

INTRODUCTION

This report deals with the petrographic and related analyses of Adit samples identified as follows:

- No. 4 Adit -- Chamberlain Sample # 1
- No. 2 Adit -- Chamberlain Sample # 2
- No. 5 Adit -- Skeeter Sample # 1
- No. 4 Adit -- Chamberlain Seam Raw Coal.

The coals were obtained from the property of Coalition Mining Limited located in the Sukunka River area, 35 miles south of Chetwynd, B.C.

The samples were prepared for petrographic analyses according to ASTM Tentative Standard D-2797-69T<sup>(1)</sup>. The maceral composition and mean maximum reflectance were determined according to ASTM Tentative Standards D-2798-69T<sup>(2)</sup> and D-2799-69T<sup>(3)</sup>. From the petrographic data the potential stability factor was calculated according to a modification of method proposed by N. Schapiro and R. J. Gray<sup>(4)</sup>. The petrographic results are listed in Tables 1, 2, 3 and 4. The potential stability factors are plotted in Figure 1.

---

\*Head, Petrography and Laboratory Services Section, Metals Reduction & Energy Centre, Department of Energy, Mines and Resources, Mines Branch, Ottawa, Canada

The chemical analyses and physical tests conducted on the samples include proximate analyses, ultimate analyses, calorific value, and Hardgrove grindability. These results are listed in Table 5.

The rheological properties were characterized by Gieseler plasticity, Ruhr dilatation and the Free Swelling Index. These results are listed in Table 6.

### DISCUSSION

#### A. Coking Merits of Chamberlain No. 1, Chamberlain No. 2 and Skeeter Coals.

(a) Rank:- based on the ASTM classification<sup>(5)</sup>, these coals are medium volatile bituminous coals. According to the International Classification System of Hard Coals they are placed in class 4, group 3 and sub-group 3 (i.e. 433 coal). The Specific Volatile Index (S.V.I.)<sup>(6)</sup>, developed at the Mines Branch to classify coals numerically, indicates the Chamberlain seam coals average 201 and the Skeeter Seam coal is 192. The Specific Volatile Index is defined as the heat value expressed in B.t.u. per 1% volatile matter content of a coal computed on a unit coal basis by the following formula:

$$\text{S.V.I.} = \frac{\text{Btu/lb, dmmfb} - (14,500 \times \text{Wt. of Fixed carbon, dmmfb})}{\text{Per cent Volatile Matter, dmmfb.}}$$

(b) Ash value:- the ash content on a dry basis averages 4.9 percent for the Chamberlain seam and 4.5 for the Skeeter Seam. These low ash values are appreciated by blast furnace operators in order to keep the slag volume low. With the softening temperature averaging 2100°F for the Chamberlain Seam coal and 2340°F for the Skeeter Seam coal, the ashes from these coals do slag at a lower temperature than most Western coking coals whose softening temperatures generally average greater than 2600°F.

- (c) Sulphur:- the average sulphur value on the dry basis is 0.55 percent for the Chamberlain Seam coal and 0.52 for the Skeeter Seam coal. These low values are well within metallurgical coal specifications which usually set an upper limit of 1% and are also acceptable by pollution standards which set an upper limit of sulphur dioxide emission at the coke batteries.
- (d) Grindability:- the average Hardgrove Grindability index value of 88 for the Chamberlain Seam coal and 95 for the Skeeter Seam coal indicates coal which is relatively easy to crush, but one which should not produce an excess of fines if the proper crushing equipment is employed.
- (e) Petrography:- the maceral composition of these coals reveals a good balance between reactive and inert components resulting in predicted stability factors of 58.3, 60.8 and 58.3 for the Chamberlain No. 1, No. 2 and Skeeter coals, respectively. The reflectance values, 1.31, 1.30, and 1.26 percent, indicate a mature medium volatile coal.
- (f) Thermal Rheological Properties:- the coals exhibit good swelling properties with an average Free Swelling Index of 8. The coals are moderately fluid with maximum Gieseler fluidity values of 159 and 310 dial divisions per minute for Chamberlain No. 1 and No. 3 coals, and 165 ddpm for the Skeeter coal. The maximum dilatation values as determined in the Ruhr dilatometer are 31 and 63 percent for Chamberlain No. 1, and No. 2 coals and 43 percent for Skeeter No. 1 coal. According to Hoffmann and Hoehne<sup>(7)</sup> these coals would be classified as the ortho-plastic type of eu-plastic coals. Coke manufacturers prefer coal with the closest resemblance to the ortho-plastic type and generally blend several types of coals to achieve this end. The Sole-heated oven results

calculated to a bulk density of 52 lb/ft<sup>3</sup> at a moisture of 2% indicate contraction values of 11.0 and 15.7 percent for Chamberlain No. 1 and No. 2 coals, and 12.0 percent for Skeeter No. 1 coal. In order to avoid "stickers", that is, coke-oven charges which expand and are difficult to push (consequently resulting in brick-work damage), the contraction value of the coke-oven charge must be at least 8 percent.

(g) Summary:- these coals exhibit good coking propensity and under the proper conditions should produce excellent metallurgical coke. In fact, these coals could be carbonized without blending in other coals. However, most steel plants prefer, for economic as well as technological reasons, to blend various ranks of coking coals to produce a satisfactory blast furnace reductant. The medium volatile coals from Sukunka River area could be utilized as a main component in bridging fluid properties between low volatile bituminous (lvb) coals and high volatile bituminous (hvb) coals. The exact ratio of the blend would depend on the properties of the lvb and hvb coals, however, it is conceivable that a blend of 20% lvb, 50% hvb and 30% mvb from the Sukunka River area would produce excellent metallurgical coke.

#### B. Raw Coal Sample from the Chamberlain Seam.

The results of the raw coal from the Chamberlain Seam are confusing since the raw coal has a lower ash value, higher dilatation and F.S.I. values and a higher predicted stability factor than the cleaned prepared coal from the same adit. A better understanding of the history of this coal sample is required to properly explain the rather unusual analytical values.

TABLE 1

PETROGRAPHIC DATA ON: CHAMBERLAIN # 1  
No. 4 ADIT.

Project No. 03-3-1/6-1

Sample No. 2370-72

Pellet No. 257

I Petrographic Composition

Reactive Components

Distribution of Vitrinoid Types

Type	Percent
11	1.0
12	26.8
13	34.7
14	2.9

Total Vitrinoid	%
Reactive Semi-fusinoid (1/3)	7.3
Exinoid + Resinoid	0.0
<b>Total Reactive Components</b>	<b>72.7</b>

Inert Components

Inert Semi-fusinoids (2/3)	14.5
Micrinoids	6.5
Fusinoids	3.8
Mineral Matter	2.5
<b>Total Inert Components</b>	<b>27.3</b>

II Petrographic Indices

Mean Reflectance	1.31
Balance Index	1.80
Strength Index	5.43
Stability Index	58.3

TABLE 2

PETROGRAPHIC DATA ON: CHAMBERLAIN NO. 2  
No. 2 ADIT

Project No. 03-3-1/6-1

Sample No. 2371-72

Pellet No. 258

I Petrographic Composition

Reactive Components

Distribution of Vitrinoid Types

Type	Percent
11	3.1
12	28.1
13	37.4
14	2.1

Total Vitrinoid	70.7
Reactive Semi-fusinoid (1/3)	4.3
Exinoid + Resinoid	0.0
Total Reactive Components	75.0

Inert Components

Inert Semi-fusinoids (2/3)	8.9
Micrinoids	5.6
Fusinoids	7.5
Mineral Matter	3.0
Total Inert Components	25.0

II Petrographic Indices

Mean Reflectance	1.30
Balance Index	1.57
Strength Index	5.42
Stability Index	60.8

TABLE 3

PETROGRAPHIC DATA ON: SKEETER # 1  
No. 5 ADIT

Project No. 03-3-1/6-1

Sample No. 2372-72

Pellet No. 259

I Petrographic Composition

Reactive Components

Distribution of Vitrinoid Types

Type	Percent
11	10.4
12	38.1
13	13.9
14	1.2
15	1.1

	%
Total Vitrinoid	64.7
Reactive Semi-fusinoid (1/3)	6.0
Exinoid + Resinoid	0.0
<b>Total Reactive Components</b>	<b>70.7</b>
<u>Inert Components</u>	
Inert Semi-fusinoids (2/3)	12.0
Micrinoids	6.8
Fusinoids	8.0
Mineral Matter	2.5
<b>Total Inert Components</b>	<b>29.3</b>

II Petrographic Indices

Mean Reflectance	1.26
Balance Index	1.57
Strength Index	4.99
Stability Index	58.3



TABLE 4

PETROGRAPHIC DATA ON: CHAMBERLAIN SEAM RAW COAL  
No. 4 ADIT

Project No. 03-3-1/6-1

Sample No. 2405-72

Pellet No. 261

I Petrographic Composition

Reactive Components

Distribution of Vitrinoid Types

Type	Percent
11	1.0
12	15.3
13	49.9
14	5.1

Total Vitrinoid

%

71.3

Reactive Semi-fusinoid (1/3)

5.3

Exinoid + Resinoid

0.0

Total Reactive Components

76.6

Inert Components

Inert Semi-fusinoids (2/3)

10.6

Micrinoids

6.1

Fusinoids

4.9

Mineral Matter

1.8

Total Inert Components

23.4

II Petrographic Indices

Mean Reflectance	1.33
Balance Index	1.56
Strength Index	5.72
Stability Index	61.9

TABLE 5

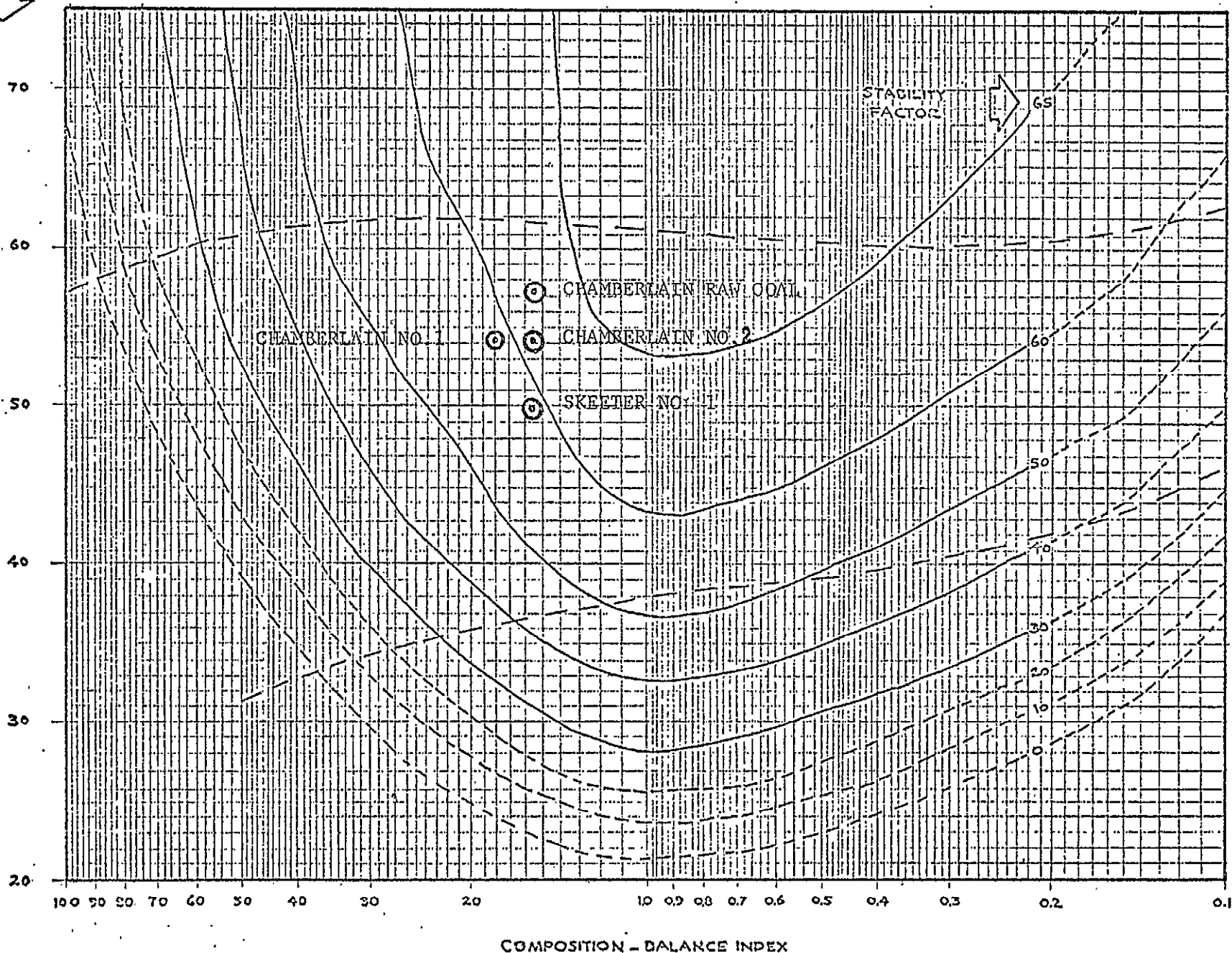
CHEMICAL AND PHYSICAL ANALYSES

Identification	2370-72	2371-72	2372-72	2405-72
Laboratory No.				
Description	CHAMBERLAIN#1 ADIT NO.4	CHAMBERLAIN#2 ADIT NO. 2	SKEETER#1 ADIT NO.5	CHAMBERLAIN SEAM RAW COAL ADIT NO. 4
Classification				
Rank (ASTM).....	mvb	mvb	mvb	mvb
Specific Volatile Index.....	199	203	192	-
Volatile Matter (dmmfb).....%	23.9	24.3	24.8	-
Carbon (dmmfb)..%	90.7	90.2	90.2	-
Proximate Analysis (db)				
Ash.....%	4.4	5.4	4.5	3.0
Volatile Matter.%	23.3	23.4	23.9	23.7
Fixes Carbon (By Difference)....%	72.3	71.2	71.6	73.3
Ultimate Analysis (db)				
Carbon.....%	86.3	84.8	85.7	-
Hydrogen.....%	4.6	4.6	4.6	-
Sulphur.....%	0.60	0.50	0.52	0.72
Nitrogen.....%	1.2	1.2	1.0	-
Ash.....%	4.4	5.4	4.5	-
Oxygen (By Difference)...%	2.9	3.5	3.7	-
Calorific Value(db) Btu/lb Gross	15020	14960	14980	-
Fusibility of Ash				
Initial Deform- ation Temperature °F	2000	1990	2210	-
Softening Temper- ature..... °F	2140	2070	2340	-
Hemispherical Temperature..... °F	2190	2160	2550	-
Fluid Temperature °F	2350	2370	2700+	-
Grindability Index, Hardgrove.....	86	90	95	87

TABLE 6  
THERMAL RHEOLOGICAL PROPERTIES  
 (Project No. 03-3-1/6-1)

<u>Identification</u>				
Laboratory Number.....	2370-72	2371-72	2372-72	2405-72
Description.....	Chamberlain #1 Adit No. 4	Chamberlain #2 Adit No. 2	Skeeter #1 Adit No. 5	Chamberlain Seam Raw Coal Adit No. 4
<u>Linear Expansion</u>				
Bd. 52 lb/ft <sup>3</sup> at 2% moisture.....%	-11.0	-15.7	-12.0	-9.3
<u>Gieseler Plasticity</u>				
Start.....°C	426	426	418	430
Fusion Temp.....°C	442	442	441	447
Max. Fluid Temp.....°C	463	466	464	464
Final Fluid Temp.....°C	490	494	489	488
Solidification Temp.....°C	495	498	492	493
Melting Range.....°C	64	68	71	58
Max. Fluidity.....dd/m	159	310	165	90
<u>Dilatation</u>				
Ti - Softening Temp. °C	408	401	404	401
Tii - Max. Contraction Temp.....°C	456	450	454	445
Tiii - Max. Dilatation Temp.....°C	483	479	482	475
Contraction.....%	27	29	28	29
Dilatation.....%	31	63	43	38
Free Swelling Index	7 1/2	8 1/2	8	8

STRENGTH INDEX



COMPOSITION - BALANCE INDEX

FIGURE 1. POTENTIAL STABILITY FACTORS OF CHAMBERLAIN NO. 1 AND NO. 2, RAW COAL AND SKEETER NO. 1.

ACKNOWLEDGEMENT

The author is grateful to the Fuels Research Centre for the chemical analyses of the coal sample.

REFERENCES

1. ASTM Designation: D-2797-69T, "Tentative Method of Preparing Coal Samples for Microscopical Analysis by Reflected Light".
2. ASTM Designation: D-2798-69T, "Tentative Method for Determining Microscopically the Reflectance of the Organic Components in a Polished Specimen of Coal".
3. ASTM Designation: D-2799-69T, "Tentative Method for Microscopical Determination of Volume Percent of Physical Components of Coal".
4. N. Schapiro and R. J. Gray, "Petrographic Classification Applicable to Coals of all Ranks", Proc. Ill. Min. Inst., 1960, 68, 83-97.
5. ASTM Designation: D-388-64T "Classification of Coal by Rank".
6. Burrough, E. J., "Specific Volatile Index", Fuels Division Memorandum 97/58-CG, Fuels and Mining Practice Division, Mines Branch, Dept. of Mines and Technical Surveys, Ottawa, Canada (1958).
7. H. Hoffmann, and K. Hoehne, Brenstoff Chemie, 35, (1954), pp 202, 236, 269 and 298.

APPENDIX D

GAS ANALYSIS DATA

## NOTES TO ACCOMPANY APPENDIX D

### GAS SAMPLING DATA

#### INTRODUCTION

A limited gas sampling programme was undertaken, both in adits and of fresh core samples, during the 1971 programme. The results are incorporated in a report by A.J. Hargraves included in the Engineering Feasibility Study submitted by Austen & Butta Limited to Coalition Mining Limited in 1972.

In conjunction with the 1972 drilling programme gas samples were obtained from fresh drill core of nine coal intersections. Eight samples are from the Chamberlain Seam and one from the Skeeter Seam.

#### SAMPLING PROCEDURE

The split inner tube containing the coal is removed from the core barrel and immediately placed inside a 2 inch diameter steel pipe that is sealed at one end. The pipe is then sealed at the flanged end using a rubber gasket and a blank flange to which a needle valve has been welded.

After 24 hours at room temperature the gas is bled off through the needle valve into an evacuated steel sample cylinder.

The sealed cylinders were shipped to Edmonton, Alberta where gas analyses were carried out by Core Laboratories - Canada Limited.

## ANALYTICAL RESULTS AND ASSESSMENT

The gas analysis data is included in Table D-1. Table D-2 gives the oxygen content of each sample. The analytical results of each gas sample have been used to compute the composition of the seam gas. Table D-3 gives the proportions of the main constituents in the seam gas, Nitrogen ( $N_2$ ), Carbon dioxide ( $CO_2$ ) and Methane ( $CH_4$ ). Carbon dioxide is less than 5% of the seam gas except in D.D.H. C-43 where it comprises 15.35% of the seam gas. The ratio of nitrogen to methane varies from 1:2.7 to 1:1 for the Chamberlain Seam and for the one Skeeter Seam sample is 2:1.

The relative gassiness of the coal seam can be assessed on the basis of the oxygen content of the gas sample. The gas emitted from the coal will have reached equilibrium in the air space in the steel pipe after 24 hours and will have contaminated the air to varying degrees depending on the amount of gas emitted by the coal. Where only minor amounts of gas are emitted, the sample submitted for analysis will contain a significant amount of oxygen, while a highly gassy coal would substantially reduce the proportion of oxygen in the sample.

Table D-2 includes a classification used by Dr A.J. Hargraves to describe the relative gassiness of the coal. This classification is based on empirical observations in Australian coalfields by Dr Hargraves. The coal varies on that classification from moderately gassy to highly gassy. Where the Skeeter Seam is worked out above and ahead of the Chamberlain Seam the latter seam will be substantially degassed into the goaf of the Skeeter Seam.



TABLE D-1

GAS ANALYSIS DATA  
(UNCORRECTED ANALYTICAL RESULTS OF GAS FROM COAL SEAM  
- 1972 DRILLING PROGRAMME)

SEAM	CHAMB.	CHAMB.	CHAMB.	CHAMB.	CHAMB.	CHAMB.	CHAMB.	CHAMB.	SKEETER
DRILL HOLE	C-42	C-43	C-44	C-45	C-46	C-49	C-51	C-52	C-52
Component									
Hydrogen	0.01	0.01	0.04	0.11	0.00	0.00	0.00	0.00	0.00
Helium	0.11	0.01	0.04	0.05	0.00	0.12	Trace	0.01	0.07
Nitrogen	35.79	50.98	48.21	36.97	47.98	35.78	58.15	56.90	67.81
Carbon Dioxide	0.00	8.93	3.90	3.73	2.57	0.34	1.49	0.51	3.20
Oxygen	3.53	8.39	3.04	2.59	0.00	0.51	0.00	6.19	4.38
Methane	60.56	29.91	44.69	56.55	49.02	63.25	40.36	36.39	25.54
Ethane	0.00	0.72	0.08	0.00	0.02	0.00	0.00	Trace	0.00
Propane	0.00	0.46	0.00	0.00	Trace	0.00	0.00	Trace	0.00
Iso Butane	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Normal Butane	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iso Pentane	0.00	Trace	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Normal Pentane	0.00	Trace	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexanes	0.00	Trace	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heptanes Plus	0.00	Trace	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ALL RESULTS ARE IN MOLE %

TABLE D-2

GASSINESS OF SEAMS FROM D.D.H. CORES

<u>D.D.H. NO.</u>	<u>O<sub>2</sub> CONTENT (MOLE%)</u>	<u>GASSINESS</u>
C-42	3.53	Gassy
C-43	8.39	Moderately Gassy
C-44	3.04	Gassy
C-45	2.59	Gassy
C-46	0.00	Highly Gassy
C-49	0.51	Highly Gassy
C-51	0.00	Highly Gassy
C-52	6.19	Moderately Gassy
C-52) <i>Skeeter Seam</i>	4.38	Gassy

<u>O<sub>2</sub> CONTENT OF</u>	<u>GASSINESS</u>
<u>ORIGINAL ANALYSIS</u>	
0- 2% O <sub>2</sub>	Highly Gassy
2- 6% O <sub>2</sub>	Gassy
6-16% O <sub>2</sub>	Moderately Gassy
>16% O <sub>2</sub>	Low Gassiness

TABLE D-3

COMPOSITION OF SEAM GASES FROM DRILL CORES

SEAM DRILL HOLE COMPONENTS	CHAMB. C-42	CHAMB. C-43	CHAMB. C-44	CHAMB. C-45	CHAMB. C-46	CHAMB. C-49	CHAMB. C-51	CHAMB. C-52	SKEETER C-52
Nitrogen	27.04	33.25	43.04	31.08	48.19	34.75	58.15	47.63	64.10
Carbon Dioxide	0.00	15.35	4.57	4.26	2.58	0.34	1.49	0.71	3.99
Methane	72.96	51.40	52.39	64.66	49.23	64.91	40.36	51.66	31.91

ALL RESULTS ARE IN MOLE %

## Notes:

1. Composition of seam gas has been calculated by deducting that part of the nitrogen and all of the oxygen, which is due to air, and neglecting the minor components in the gas.

$$\text{Nitrogen in seam gas} = N_2 - \text{Mole \% } O_2 \times \frac{79.04}{20.93}$$

2. The results are then corrected such that  $CO_2 + N_2 + CH_4 = 100\%$

The results of the previous gas tests at Sukunka by Dr Hargraves indicated comparatively low gassiness, but some doubts were expressed at that time by Dr Hargraves as to the accuracy of the testing and of the analyses. Dr Hargraves commented that leakages may have occurred prior to sampling. As the samples were collected and shipped in glass containers sealed with ground glass stoppers, additional leakages could have occurred in transit.

In the 1972 programme, special precautions were taken to seal the 2 inch diameter pipes and new flanges with brass needle valves were used to ensure that leakage did not occur. The more elaborate evacuated steel cylinders in which the gas samples were collected and shipped, ensured that the entire sampling procedure prevented contamination or the loss of seam gas.

Table D-3 shows considerable variation in the composition of the gas from the Chamberlain Seam coal. The drill holes from which the coal was sampled vary in depth from less than 300 feet to nearly 2,000 feet, and are located at distances of between 600 feet and 6,000 feet from the outcrop. A number of trial plots have been made to establish significant patterns or trends in gas composition and gassiness. It appears that the composition of the seam gas is not related in any consistent manner to either the depth of cover or the distance from outcrop. The gassiness, Table D-2, also shows a random distribution when compared with depth of cover and distance from outcrop. One of the deeper drill holes, D.D.H. C-43 (1,920 feet), contains a significantly higher proportion of carbon dioxide (15.35%).

It is considered that factors related to gassiness and seam gas need a broader study by a specialist in the field working in close co-operation with the geological personnel.

APPENDIX D

GAS SAMPLING DATA

CHAMBERLAIN SEAM

D.D.H. C-42

D.D.H. C-43

D.D.H. C-44

D.D.H. C-45

D.D.H. C-46

D.D.H. C-49

D.D.H. C-51

D.D.H. C-52

SKEETER SEAM

D.D.H. C-52



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GAS ANALYSIS

Company Coalition Mining Limited Page 1 of 1  
 Well Coal Core Sample File 901-2471  
 Field Sukunka Valley, B.C. Analyst MY  
 Location \_\_\_\_\_ Elevation: K B. \_\_\_\_\_ Grd 1  
 Formation \_\_\_\_\_ Depth \_\_\_\_\_  
 Sampled from Core Barrel C-42: (Chamberlain) by Coalition Mining Limited  
 Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
 Date sampled \_\_\_\_\_ Date received Sept. 27/72 Date analysed Sept. 28/72  
 Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
 Recovery or flowrate: \_\_\_\_\_

<u>COMPONENT</u>	<u>MOLE %</u>	<u>IMP. GPM @ 14.65 psia and 60°F</u>	<u>SPECIFIC GRAVITY</u>
Hydrogen	<u>0.01</u>		Calculated _____ Measured _____
Helium	<u>0.11</u>		
Nitrogen	<u>35.79</u>		<u>GROSS B.T.U. per SCF</u> _____
Carbon Dioxide	<u>0.00</u>		Calculated @ 14.65 psia, 60°F, moisture and acid gas free.
Hydrogen Sulphide	<u>0.00</u>		
Methane	<u>60.56</u>		<u>VAPOR PRESSURE of PENTANES PLUS</u>
Oxygen	<u>3.53</u>		(calculated) _____
Propane	<u>0.00</u>		
Iso Butane	<u>0.00</u>		Pseudo Critical Pressure _____ psia
Normal Butane	<u>0.00</u>		Pseudo Critical Temperature _____ °F
Iso Pentane	<u>0.00</u>		
Normal Pentane	<u>0.00</u>		Remarks <u>Cylinder No. C-149</u>
Hexanes	<u>0.00</u>		<u>Work No. 236</u>
Heptanes Plus	<u>0.00</u>		<u>Assignment No. 6.11</u>
Total	<u>100.00</u>		



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**GAS ANALYSIS**

Company Coalition Mining Limited Page 1 of 1  
 Well Coalition C-43 File 901-2492  
 Field Sukunka Valley, British Columbia Analyst JP  
 Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
 Formation Gething Depth \_\_\_\_\_  
 Sampled from Coal Seam (Chamberlain) by Coalition Mining Limited  
 Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
 Date sampled Oct. 4/72 Date received Oct. 10/72 Date analysed Oct. 11/72  
 Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
 Recovery or flowrate: \_\_\_\_\_

<u>COMPONENT</u>	<u>MOLE %</u>	<u>IMP. GPM @ 14.65 psia and 60°F</u>	<u>SPECIFIC GRAVITY</u>
Hydrogen	<u>0.01</u>		Calculated _____ Measured _____
Helium	<u>0.01</u>		
Nitrogen	<u>50.98</u>		<u>GROSS B.T.U. per SCF</u> _____
Carbon Dioxide	<u>8.93</u>		Calculated @ 14.65 psia, 60°F, moisture and acid - gas free.
Oxygen	<u>8.39</u>		
Methane	<u>29.91</u>		<u>VAPOR PRESSURE of PENTANES PLUS</u>
Ethane	<u>0.72</u>		(calculated) _____
Propane	<u>0.46</u>		
Iso Butane	<u>0.20</u>		Pseudo Critical Pressure _____ psia
Normal Butane	<u>0.39</u>		Pseudo Critical Temperature _____ °F
Iso Pentane	<u>Trace</u>		
Normal Pentane	<u>Trace</u>		Remarks <u>Cylinder No. C-127</u>
Hexanes	<u>Trace</u>		
Heptanes Plus	<u>Trace</u>		
Total	<u>100.00</u>		

Pentanes Plus





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GAS ANALYSIS

Company Coalition Mining Limited Page 1 of 2  
 Well Coalition C-44 File 901-2517  
 Field Sukunka Valley, British Columbia Analyst JK  
 Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
 Formation Gething Depth \_\_\_\_\_  
 Sampled from DD4 Coal Seam (Chamberlain) by Coalition Mining Limited  
 Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
 Date sampled Oct. 16/72 Date received Oct. 23/72 Date analysed Oct. 30/72  
 Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
 Recovery or flowrate: \_\_\_\_\_

<u>COMPONENT</u>	<u>MOLE %</u>	<u>IMP. GPM @ 14.65 psia and 60° F</u>	<u>SPECIFIC GRAVITY</u>
Hydrogen	<u>0.04</u>	_____	Calculated _____ Measured _____
Helium	<u>0.04</u>	_____	
Nitrogen	<u>48.21</u>	_____	<u>GROSS B.T.U. per SCF</u> _____
Carbon Dioxide	<u>3.90</u>	_____	Calculated @ 14.65 psia, 60°F, moisture and acid - gas free.
Oxygen	<u>3.04</u>	_____	
Methane	<u>44.69</u>	_____	<u>VAPOR PRESSURE of PENTANES PLUS</u>
Ethane	<u>0.08</u>	_____	(calculated) _____
Propane	<u>0.00</u>	_____	
Iso Butane	<u>0.00</u>	_____	Pseudo Critical Pressure _____ psia
Normal Butane	<u>0.00</u>	_____	Pseudo Critical Temperature _____ °F
Iso Pentane	<u>0.00</u>	_____	
Normal Pentane	<u>0.00</u>	_____	Remarks <u>Cylinder No: C-44</u>
Hexanes	<u>0.00</u>	_____	
Heptanes Plus	<u>0.00</u>	_____	
Total	<u>100.00</u>	_____	
Pentanes Plus	_____	_____	



GAS ANALYSIS

Company Coalition Mining Limited Page 2 of 2  
 Well Coalition C-45 File 901-2517  
 Field Sukunka Valley, British Columbia Analyst JK  
 Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
 Formation Gething Depth \_\_\_\_\_  
 Sampled from DD4 Coal Seam (Chamberlain) by Coalition Mining Limited  
 Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
 Date sampled Oct. 16/72 Date received Oct. 23/72 Date analysed Oct. 30/72  
 Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
 Recovery or flowrate: \_\_\_\_\_

<u>COMPONENT</u>	<u>MOLE %</u>	<u>IMP. GPM @ 14.65 psia and 60°F</u>	<u>SPECIFIC GRAVITY</u>
Hydrogen	<u>0.11</u>	_____	Calculated _____ Measured _____
Helium	<u>0.05</u>	_____	
Nitrogen	<u>36.97</u>	_____	<u>GROSS B.T.U. per SCF</u> _____
Carbon Dioxide	<u>3.73</u>	_____	Calculated @ 14.65 psia, 60°F, moisture and acid - gas free.
Oxygen	<u>2.59</u>	_____	
Methane	<u>56.55</u>	_____	<u>VAPOR PRESSURE of PENTANES PLUS</u>
Ethane	<u>0.00</u>	_____	(calculated) _____
Propane	<u>0.00</u>	_____	
Iso Butane	<u>0.00</u>	_____	Pseudo Critical Pressure _____ psia
Normal Butane	<u>0.00</u>	_____	Pseudo Critical Temperature _____ °F
Iso Pentane	<u>0.00</u>	_____	
Normal Pentane	<u>0.00</u>	_____	Remarks <u>Cylinder No. C-41</u>
Hexanes	<u>0.00</u>	_____	
Heptanes Plus	<u>0.00</u>	_____	
Total	<u>100.00</u>	_____	
Pentanes Plus	_____	_____	



CORE LABORATORIES — CANADA LTD.  
PETROLEUM RESERVOIR ENGINEERING



Company Coalition Mining Limited Page 1 of 5  
Well Coalition C-46 File 901-2566  
Field Sukunka Valley, British Columbia. Analyst M. Yeomans  
Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
Formation \_\_\_\_\_ Depth \_\_\_\_\_  
Sampled from Chamberlain Seam DDH C-46 by Coalition Mining Limited  
Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
Date sampled \_\_\_\_\_ Date received Nov. 22/72 Date analysed Nov. 27/72  
Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
Recovery or flowrate: \_\_\_\_\_

Gas Analysis

<u>Component</u>	<u>Mole %</u>
Hydrogen	0.00
Helium	0.00
Nitrogen	47.98
Carbon Dioxide	2.57
Oxygen	0.00
Methane	49.02
Ethane	0.02
Propane	Trace
Iso Butane	0.00
Normal Butane	0.00
Iso Pentane	0.00
Normal Pentane	0.00
Hexanes	0.00
Heptanes Plus	0.00
TOTAL	100.00

Cylinder No. 5C-1



CORE LABORATORIES - CANADA LTD.  
PETROLEUM RESERVOIR ENGINEERING



Company Coalition Mining Limited Page 2 of 5  
Well Coalition C-49 File 901-2566  
Field Sukunka Valley, British Columbia Analyst M. Yeomans  
Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
Formation \_\_\_\_\_ Depth \_\_\_\_\_  
Sampled from Chamberlain Seam DDH C-49 by Coalition Mining Limited  
Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
Date sampled \_\_\_\_\_ Date received Nov. 22/72 Date analysed Nov. 27/72  
Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
Recovery or flowrate: \_\_\_\_\_

Gas Analysis

<u>Component</u>	<u>Mole %</u>
Hydrogen	0.00
Helium	0.12
Nitrogen	35.78
Carbon Dioxide	0.34
Oxygen	0.51
Methane	63.25
Ethane	0.00
Iso Butane	0.00
Propane	0.00
Normal Butane	0.00
Iso Pentane	0.00
Normal Pentane	0.00
Hexanes	0.00
Heptanes Plus	0.00
TOTAL	100.00

Cylinder No. V-170



CORE LABORATORIES — CANADA LTD.  
PETROLEUM RESERVOIR ENGINEERING



Company Coalition Mining Limited Page 3 of 5  
Well Coalition C-51 File 901-2566  
Field Sukunka Valley, British Columbia Analyst M. Yeomans  
Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
Formation \_\_\_\_\_ Depth \_\_\_\_\_  
Sampled from Chamberlain Seam DDH C-51 by Coalition Mining Limited  
Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
Date sampled \_\_\_\_\_ Date received Nov. 22/72 Date analysed Nov. 27/72  
Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
Recovery or flowrate: \_\_\_\_\_

Gas Analysis

<u>Component</u>	<u>Mole %</u>
Hydrogen	0.00
Helium	Trace
Nitrogen	58.15
Carbon Dioxide	1.49
Oxygen	0.00
Methane	40.36
Ethane	0.00
Propane	0.00
Iso Butane	0.00
Normal Butane	0.00
Iso Pentane	0.00
Normal Pentane	0.00
Hexanes	0.00
Heptanes Plus	0.00
TOTAL	100.00

Cylinder No. 291



**CORE LABORATORIES - CANADA LTD.**  
**PETROLEUM RESERVOIR ENGINEERING**



Company Coalition Mining Limited Page 4 of 5  
 Well Coalition C-52 File 901-2566  
 Field Sukunka Valley, British Columbia Analyst M. Yeomans  
 Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
 Formation \_\_\_\_\_ Depth \_\_\_\_\_  
 Sampled from Chamberlain Seam DDH C-52 by Coalition Mining Limited  
 Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
 Date sampled \_\_\_\_\_ Date received Nov. 22/72 Date analysed Nov. 27/72  
 Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
 Recovery or flowrate: \_\_\_\_\_

Gas Analysis

<u>Component</u>	<u>Mole %</u>
Hydrogen	0.00
Helium	0.01
Nitrogen	56.90
Carbon Dioxide	0.51
Oxygen	6.19
Methane	36.39
Ethane	Trace
Propane	Trace
Iso Butane	0.00
Normal Butane	0.00
Iso Pentane	0.00
Normal Pentane	0.00
Hexanes	0.00
Heptanes Plus	0.00
TOTAL	100.00

Cylinder No. V-452



**CORE LABORATORIES – CANADA LTD.**  
**PETROLEUM RESERVOIR ENGINEERING**



Company Coalition Mining Limited Page 5 of 5  
 Well Coalition C-52 File 901-2566  
 Field Sukunka Valley, British Columbia Analyst M. Yeomans  
 Location \_\_\_\_\_ Elevation: K.B. \_\_\_\_\_ Grd. \_\_\_\_\_  
 Formation \_\_\_\_\_ Depth \_\_\_\_\_  
 Sampled from Skeeter Seam DDH C-52 by Coalition Mining Limited  
 Sampling pressure \_\_\_\_\_ psig Sampling temp. \_\_\_\_\_ °F Ambient temp. \_\_\_\_\_ °F  
 Date sampled \_\_\_\_\_ Date received Nov. 22/72 Date analysed Nov. 27/72  
 Container pressure \_\_\_\_\_ Mud \_\_\_\_\_ Water cushion \_\_\_\_\_  
 Recovery or flowrate: \_\_\_\_\_

Gas Analysis

<u>Component</u>	<u>Mole %</u>
Hydrogen	0.00
Helium	0.07
Nitrogen	67.81
Carbon Dioxide	3.20
Oxygen	4.38
Methane	25.54
Ethane	0.00
Propane	0.00
Iso Butane	0.00
Normal Butane	0.00
Iso Pentane	0.00
Normal Pentane	0.00
Hexanes	0.00
Heptanes Plus	0.00
TOTAL	100.00

Cylinder No. V-156