Brameda

CHAMBERLAIN PROSPECT : SUKUNKA AREA

PROGRESS REPORT ON DRILLING AND EVALUATING, 1969

PREFACE

After geological mapping, October 1969, the Gething
Formation at Chamberlain Creek was tested by diamond
drilling (November and December 1969). The drilling
indicates a potential of 29 million tons of coal reserves
in place in the Chamberlain seam plus considerable, though
undetermined reserves, in the middle seams of the Gething
Formation. This report deals with the geologic aspects
of the drilling and evaluation.

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Pencilled Amendments   21-2-70
to be typed   23-2-70

RESULTS

The drilling programme (November and December 1969) tested the upper 1,115 feet of the Gething Formation.

Coal of commercial significance was found in the intervals:

1 to 12 feet	"Top Seam"
125 to 145 feet	Upper seams of the Chamberlain Member
150 to 180 feet	The Chamberlain Seam - the lowest seam of the Chamberlain Member.
550 to 630 feet and varying to 590 to 690 feet	"Middle Coals"

(measurements in stratigraphic order from the top of the Gething Formation).

The Chamberlain Seam is of outstanding importance. The drilling programme was mostly directed to explore its extent and thickness.

THE CHAMBERLAIN SEAM

Reserves:

The seam ranges from a minimum 4.5 feet to 14.0 feet, in core recovery. Table III lists the cored intersections and recovery. The core recovery was incomplete for several D.D.H.'s.

Estimates for the reserves in place are:

A   22.3 million tons

B   29.2 million tons

Estimate A is based on core recovery.

Estimate B is based on the maximum possible thickness of the Chamberlain Seam.

The premises applying to the estimate are specified in Appendix I, and illustrated in diagrams, Figures 1 and 2.

The estimates are of interim nature, intended for guidance in planning.

Geological factors, mostly faulting, may reduce the mineable reserves to corresponding values : A, 20.0 million tons, and B, 26.0 million tons.

There remains one factor which may affect the reliability of the estimates, namely penecontemporaneous erosion of the seam. This possibility cannot be assessed from the core data at hand. However, there is no evidence that such erosion reduces the foregoing estimates.

More drilling is necessary to make a firm evaluation of the Chamberlain seam.

Characteristics:

     The structure of the Chamberlain Seam in the drilling
area, between Chamberlain and Skeeter Creek, is mostly flat
lying and uniform, with dips averaging 2° to 8°. Reverse
faults occur in D.D.H.s S-5 and S-7, with vertical displacements
100 and 245 feet respectively. They are inferred to belong to a
common fault system trending east-northeast (see Figure 3).
A zone of folding and faulting limits the flat lying structure
on the northeast. The zone lies between D.D.H.s S-5 and S-6,
and outside the previously mapped ground.

     The Chamberlain Seam has a large areal extent - proved
by correlating the drilled sections. Its maximum thickness,
assigned as 14 feet in D.D.H. S-2 is uncertain due to missing
core and to possible folding and faulting.

     The roof cover of the Chamberlain seam ranges from zero
at outcrop to about 1,500 feet on the east border of the
drilled area (approximately 118,000 feet ordinate).

THE "TOP SEAM"

This seam lies at the top of the Gething Formation, and was drilled in D.D.H.s S-1, 2, and 6. The seam varies in thickness from zero to 3.7 feet, in core recovery. Its maximum possible thickness ranges from less than 2 to 7 feet (Table I).

Drilling is insufficient to evaluate the economic potential of the seam. The preservation and continuity of the seam is subject to erosion preceding deposition of the Moosebar beds.

STRATIGRAPHY

The drilled section of the Gething beds is described in Appendix 2 - the description is simplified for stratigraphic purposes (see Figure 6).

The Gething Formation in the Sukunka area differs from its development in the Pine and Peace River areas in the following characteristics:

1) the marine beds occupying the uppermost 450 to 500 feet of the formation:

2) the predominant sandstone section of 300 to 350 feet at the top of the formation:

3) a relative scarcity of coals in the upper 550 feet - the Chamberlain Seam is separated from lower coals by a wide interval of barren beds:

4) the high proportion of coal partings, and very thin coals, (less than 6 inches) in the non-marine intervals:

5) the tendency for cyclotherms to be incomplete and modified, shown by the lack of sandstones in the non-maring parts.

The Gething Formation at Chamberlain Creek contains two environments of coal deposition: the paralic environment of the Chamberlain Seam and overlying seams and the limnic (shoreline) environment of the "Middle Coals". On stratigraphic grounds, fresh water) the paralic environment tends to offer better prospects for exploration and mining. However, there are many exceptions to this generalization.

J. E. HUGHES

January 26, 1970.

THE UPPER SEAMS OF THE CHAMBERLAIN
MEMBER

A group of two or ?three seams overlie the Chamberlain Seam, with a separation of 20 to 25 feet.

The highest seam of the group attains mineable thickness in two places only: 5.0 feet core recovery in S-1, and a possible maximum of 4.5 feet (recovery 3.25 feet) in S-5 (see Table II).

There are three solutions for correlating the coals (Figures 4 and 5). The most probable, Figure 5A, suggests a small potential, perhaps 0.85 million tons in place.

THE "MIDDLE COALS"

This group includes 3 coals of mineable thickness, according to the record of D.D.H. S-7. The interval containing the Middle Coals was drilled in D.D.H. S-2, 4 and 7. Recovery and maximum possible thickness of coal are listed in Table IV.

Detailed accounts for each coal are as follows:

A. The coal of D.D.H. S-7, intersection 526' to 536', has recovery 6'7", and maximum possible thickness 8'2".
It is correlatable with: the twin coals of D.D.H. S-2, intersections 547' to 552', and 559' to 563', for which the respective recoveries and maximum possible thicknesses are 3'11", 4'9", and 2'11", 2'11". The coal is correlatable with a shale interval in D.D.H. S-4.

B. The coal of D.D.H. S-7, intersection 609' to 629', has recovery 6'7", and maximum possible thickness 17'0".
It has no defineable correlation with D.D.H. S-2 and 4.
Much of the coal in the recovery seen by me is sheared.
It is possible that this coal is a faulted repetition of the underlying coal, intersection 667' to 680', in D.D.H. S-7.

C. The coal D.D.H. S-7, intersection 667' to 680', has recovery 6'6", and maximum possible thickness 12'0".
It is correlatable with a group of thin coal partings and interbedded shales in D.D.H. S-2, interval 623' to 632'.
It is correlatable with a group of thin coals 0'4" to 0'10" thick, and including a possible maximum thickness of 4'1" in the interval 505' to 512' of D.D.H. S-4.

A lower coal in D.D.H. S-7, intersection 763' to 767' has recovery 2'4", and maximum possible thickness 3'1". It has no correlative of economic significance in the drilled sections of S-2 and S-4.

Coal A, shows the best continuity. The "Middle Coals" tend to split and thin southeastwards from D.D.H. S-7. These coals merit further exploration if they are of commercial quality.

The foregoing correlations of coals A, B and C are tentative. Coals in the stratigraphic interval of the "Middle Coals" may lack quality. A number of the core recoveries show benches of dull coal, bands and passages with organic and mineral detritus, waxy layers, and also shaly selvages. This interval has numerous, very thin seams and partings; many of these have limited extent.

ESTIMATES OF RESERVES, CHAMBERLAIN SEAM

Area of the drilled subcrop between Skeeter
and Chamberlain Creek, and contained within
the limit A B C D, E F of Figures 1 and 2.

A) Estimates based on core recoveries
    Limit of 5 feet mining thickness
    Volume = 19.8 sq. mile/feet
    Tonnage = 22.3 million tons.

B) Estimates based on the maximum possible
    thickness of seam, with allowance of 14.0
    feet for D.D.H. S-2.
    Limit of 5 feet mining thickness
    Volume = 25.95 sq. mile/feet
    Tonnage = 29.2 million tons

Mass/volume = 1.125 million tons per sq. mile
feet, for ton of 2,000 lbs.

CHAMBERLAIN PROSPECT : SUKUNKA AREA

COMPOSITE SECTION OF GETHING FORMATION

Interval (feet)	Thickness (feet)	Gething Formation
1 to 12	1 to 12	Sandstones, shales, mudstones, coal: marine and non-marine. Includes the "Top Seam" - thickness, nil to 4 feet (recovery).
12 to 120	119 - 108	Sandstones, with minor shale members: marine mostly.
120 to 180	40 to 60	Chamberlain Member. Shales and mudstones with lesser thin interbedded siltstones and sandstones; coals with thick coals in two major seams: non-marine with marine phases. The Chamberlain Seam (proposed name), of the order of 5 to 14 feet thick, marks the base of this member.
180 to 340	110 to 160	Sandstones, with minor shale members: marine.
290 to 575	285 to 235	Shales, and shales with thin interbedded siltstones and sandstones: some minor sandstone beds and lenses 5 to 15 feet thick: single non-marine phase at base: marine mostly. Includes: (a) glauconitic marker horizon, 100 to 135 feet above the base of this unit; (b) sandstone member 10 to 20 feet thick, at base.
575 to 775	190 to 200	Shales: shales and mudstones with thin interbedded siltstone and sandstones: several groups of thin coal seams and partings: one to three thick coal seams of uncertain and limited extent, the "Middle Coals"; recoveries, 7, 7 and 8 feet. Non-marine mostly.
775 to 815	40	Sandstones and conglomerates, with inter-lensing shales: regarded as non-marine.

Interval	Thickness	
805 to 1,115	300 to 310	Shales, mudstones, and minor thin interbedded shales, siltstones and sandstones; numerous thin coal seams and partings: non-marine.
	1,115	End of drilled section.

Note: Description and measurements simplified from core data (D.D.H.s S-1,2, 4, 5, 6, 7, 8.

Range of stratigraphic thickness for section is 1,080 to 1,135 feet: the extreme variation of stratigraphic thickness is 100 feet where differences in thickness for subordinate units of the formation are accumulative.

Thickness listed for coal seams represent measurements of coal recovered in core.

	S-1	S-5	S-6	S-2, 4, 7, 8
TABLE I			**TOP SEAM**	
I R/M	(271'0" (273'6" 1'3"/2'6" No Assay	254'2" 256'4" 1'0"/2'2" Hanging Wall No sample	Coal missing due *to penecontemp. erosion. ?/2'0"	Absent, not drilled
		>FAULT		
I R/M	((	S-051 353'8" 360'0" 3'9"/6'4" Footwall		
			*No trace of coal in core, missing core=2'(assoc. with non-marine mudst.)	

I = Interval
R = Recovery in core = coal recovered in core
M = Maximum possible width of seam

SEAM		S-8	S-1	S-2	S-4	S-5	S-6	S-7
P	I ((				18'2" 20'9"	478'1" 482'7"		
	R/M				0'3"/2'7" No sample	3'3"/4'6" No sample		
Q	I ((			Absent due to erosion and faulting	30'6" 32'9"	487'6" 489'2"	Absent : several deformed thin graphitic streaks present. Absence due to sedimentation: also thin coals streaked out on fault planes.	Absent: post-Cretaceous erosion.
	R/M				0'3"/2'9" , No sample	0'9"/1'8" No sample		
R	I ((	113'8" 116'11"	S-011 405'0" * 412'6"					
	R/M	2'8"/3'3" No sample	Assign 5'0"/5'0"					
	I ((	119'0" 121'7"	S-011 405'0"* 412'6"					
	R/M	Nil/2'7" No sample	0'10"/1'0"					

* Adjust from report of N.N. Assign recovery of Seams R and S
to common interval.

I = Interval
R = Recovery in core = coal recovered in core
M = Maximum possible width of seam

Seams P, Q, R and S form the upper seams of the Chamberlain Member.

TABLE III

CHAMBERLAIN SEAM (= LOWER SEAM) OF
THE CHAMBERLAIN MEMBER

			S-8	S-1	S-2	S-4	S-5	S-6	S-7
Chamberlain Seam	I	((	141'6" 146'1"	432'0" 437'1"	100'9" 129'6"	54'0" 63'2"	512'9" 521'10"	912'0" 917'6"	Absent: post- Cretaceous erosion.
	R/M		4'7"/4'7"	4'6" + 0'1"/5'1"	14'0"/28'9"	6'6"/9'2"	8'0"/9'1"	1'10"/5'5"*i 1'7"/4'8"*t	?
			S-081	S-012	S-2 JAPAN	S-041	S-052	∅ No SAMPLE	

*iS-6 = vertical interval, dip 30°.

*tS-6 = Thickness

I = Interval
R = Recovery in core = coal recovered in core
M = Maximum possible width of seam

∅ Chamberlain seam in S-6
contains 0'4" shale in core -
not included in statement of
coal recovered from core.

TABLE IV

MIDDLE COALS

		S - 7	S - 2	S - 4	S-1,5,6, 8.
I	((	SAMPLE S-071 526'6" 535'10"	547'0" 551'9"		SAMPLE S8-3 Absent : not-drilled 606.5 - 612.5
R/M		6'9"/9'4"	3'11"/4'9"		2.5 / 6.0
M^S		8'2"	S- 022		
I	((		559'6" 562'5"		SAMPLE S8-4 612.5 # 617.5
R/M			2'11"/2'11" NO SAMPLE		3.0/5.0
I	((	NO SAMPLE 609'3" 628'11"			SAMPLE S8-5
R/M		6'9"/19'8"			799.0 - 8003.0
M^S		17'0"			3.0/4.0
I	((	667'4" 680'0"		NO SAMPLE 505'0" 512'0"	"
R/M		6'6"/12'8"		2'0"/5'3"	
M^S		10'11" NO SAMPLE		3 seams: indiv. max. thick 4'1"	
I	((	763'4" 766'5"	Absent: probably not drilled		"
R/M		2'4"/3'1"			
M^S		3'1" NO SAMPLE			

I = Interval   R = Recovery in core = coal recovered in core.
M = Maximum possible width of seam
M^S = Maximum possible thickness of seam (=M x correction for dip).

TABLE V

CHAMBERLAIN SEAM : ELEVATION OF BASE OF SEAM

D.D.H.	D.D.H. Elevn.	Chamberlain Seam			
		Depth	Elevn.		
S-1	4102.³ 4220	437	3665 3783	*	
S-2	3454 3480	130	332⁴ 3350	*	
S-3	2885 2930	Absent - no projection available			
S-4	3547 3620	63	3484 3357	*	
S-5)	4080 4190	Absent	3568	P	Hw
S-5 }	4190	522	3558 3668	*	Fw
S-6	3975 4105	917	3058 3188	*	
S-7 }	3600 3640	Absent	3565 3605	P	Hw
S-7 }	3660 3640	Absent	4076 3853	P	Fw
S-8	386³ 3960	146	3717 3814	*	

S-11   4000   283   3717   3813

* :DDH's which cut the Chamberlain Seam

P :Projected elevation of the base of Chamberlain Seam, from stratigraphic correlations.

Hw:Elevation in hanging wall of reserve fault, real or projected.

Fw:Elevation in footwall of reverse fault, real or projected.
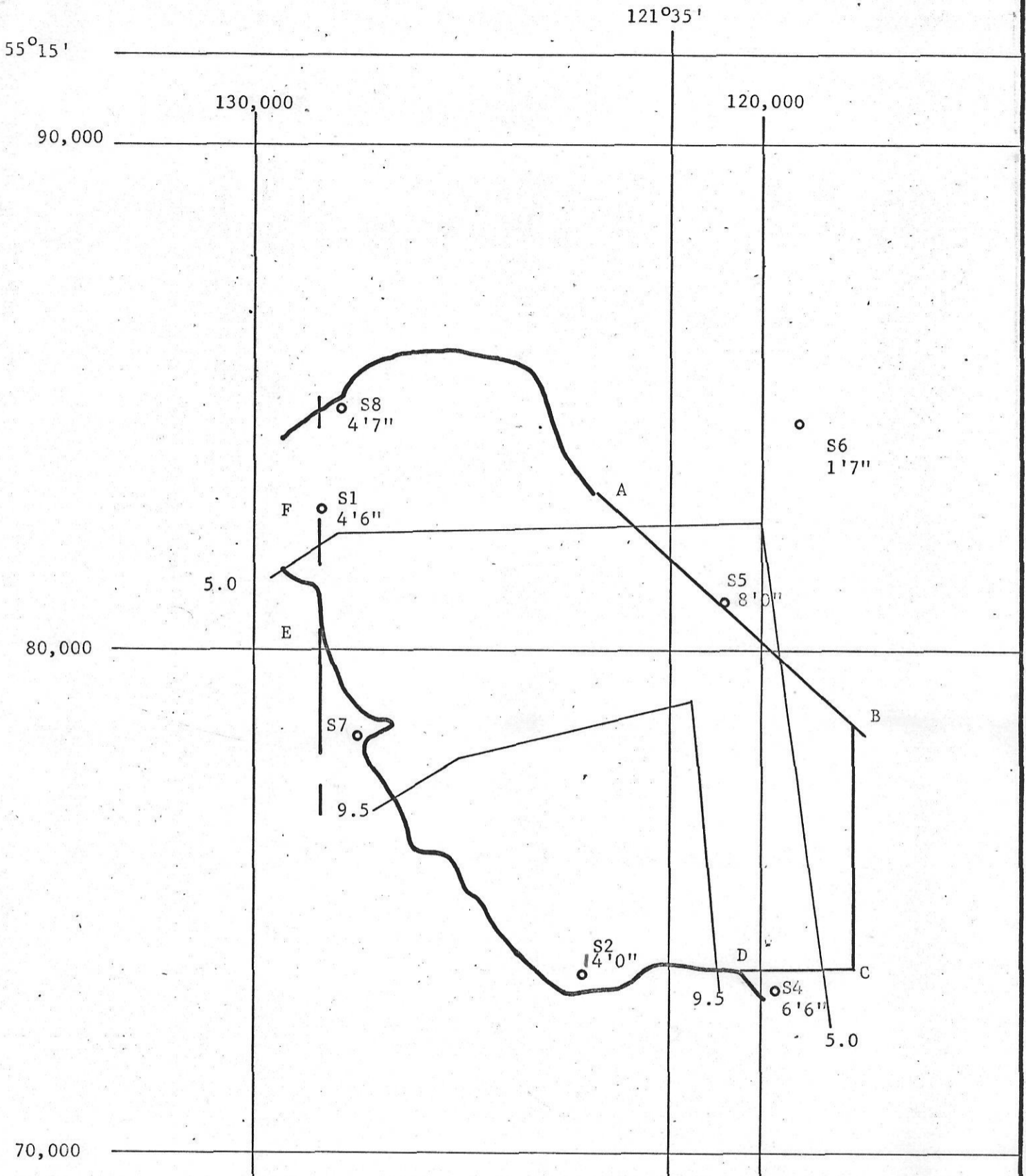
Elevations from an aneroid altimeter.

TABLE VI

TOP OF GETHING FORMATION

STRUCTURAL ELEVATIONS

D.D.H.	D.D.H. Elevn.	Top of Gething			Dist to C. seam
		Depth	Elevn.		
S-1	~~4220~~ 4102	271	~~3949~~ 3831	*	166
S-2	~~3480~~ 3454	+17	~~3497~~ 3471	P	147 -3
S-3	~~2930~~ 2885				
S-4	~~3620~~ 3547	+103	~~3723~~ 3650	P	166
S-5)	~~4190~~ 4080	249	~~3941~~ 3831	* Hw	
S-5)	~~4190~~ 4080	348	~~3842~~ 3732	* Fw	164
S-6	~~4105~~ 3975	750	~~3355~~ 3225	*	
S-7)	3640 3600	+400	4040	P Hw	167
S-7)	3640 3600	+155	~~3795~~ 3755	P Fw	
S-8	~~3960~~ 3863	+ 12	~~3972~~ 3875	P	168

* : D.D.H.s which cut Moosebar Gething contact

P : Projected elevation of the top of the Gething, from stratigraphic correlations.

Hw : Elevation in hanging wall of reverse fault, real or projected.

Fw : Elevation in footwall of reverse fault, real or projected.

Elevations from aneroid altimeter.

BRAMEDA RESOURCES LIMITED

SUKUNKA COAL TESTING

Hole No.	Sample No.	From	To	Recovery Feet	Seam	Total Moisture As received	Surface Moisture	Inherent Moisture	Ash %	Volat.	Fixed C	B.T.U. Air Dry	S %	F.S.I.
S-1	S-011	405.0	420.0 (412.5)	5.0	UC	3.81	3.28	0.55	6.40	24.55	68.50	14,920	0.42	8.5
	S-012	432.0	437.8 (437.1)	4.5	C	3.25	2.57	0.70	3.45	25.05	70.80	15,220	0.38	8.0
S-2	(a)	104.0 (100.7)	127.5 (129.5)	14.0	C	} Analysed in Japan		0.90	7.40	25.90	65.80	14,300	0.34	3.5
	(b)	104.0 (100.7)	127.5 (129.5)	14.0	C	-	-	1.12	7.90	24.02	66.96	14,800	0.57	8.0
S-2	S-022	547.0	552.0	4.0	M	1.77	1.33	0.45	24.75	19.13	55.67	11,377	0.38	1.5
S-4	S-041	54.0	63.2	6.5	C	1.83	1.29	0.55	8.65	22.78	68.02	14,546	0.48	5.0
S-5	S-051	354.0 (353.6)	361.5 (360.0)	3.7	T	1.93	1.63	0.30	46.00	16.15	37.55	8,258	2.25	5.0
S-5	S-052	512.7 (512.7)	521.6 (521.8)	8.0	C	3.16	2.70	0.47	6.90	19.66	72.97	14,970	0.64	6.0
S-7	S-071	526.5	535.8 (535.8)	6.75	M	2.82	2.33	0.50	7.75	21.90	69.85	14,521	0.46	1.5
S-8	S-081	141.5	146.0	4.6	C	2.92	2.17	0.77	3.50	24.28	71.45	15,095	0.52	7.5
S-8	S8-3	606.5	612.5	2.5	M	2.98	2.25	0.75	7.30	20.00	-	14,421	0.74	3.0
S-8	S8-4	612.5	617.5	3.0	M	4.40	3.63	0.80	7.75	19.70	-	14,721	0.30	2.0
S-8	S8-5	799.0	803.0	3.0	M	2.19	1.43	0.77	18.50	17.58	-	12,800	0.45	1.5
Arithmetic Average	CHAMBERLAIN	C						0.75	6.03	23.34	69.92	14,876	0.49	6.4
"	MIDDLE	M						0.65	13.21	19.66	-	13,568	0.46	1.9

FIGURE 1.

CHAMBERLAIN PROSPECT : SUKUNKA AREA

121°35'

55°15'

130,000   120,000

90,000

S8
4'7"

S6
1'7"

A

F   S1
4'6"

S5
8'0"

5.0
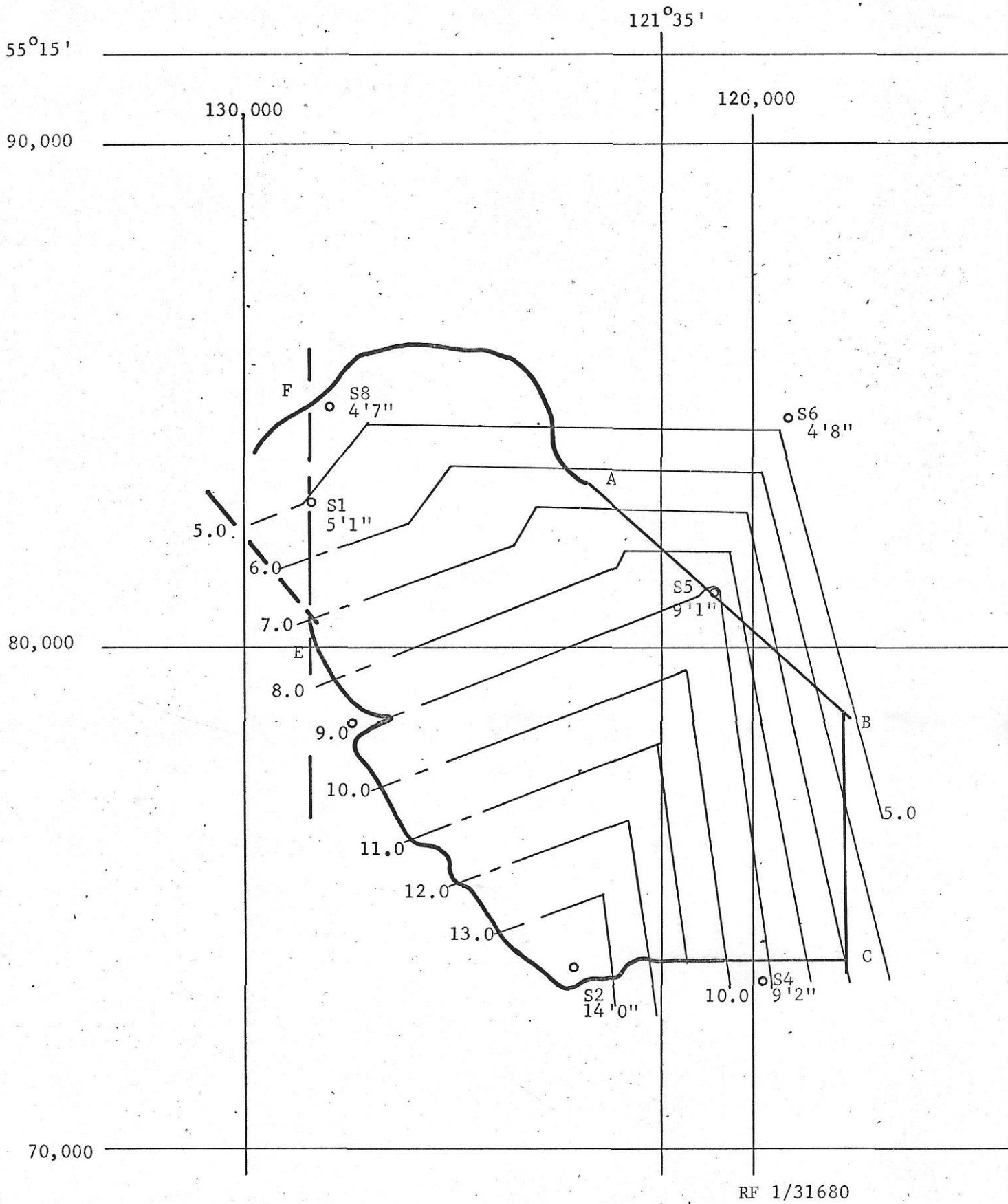
E

80,000

B

S7

9.5

S2
4'0"

D

C

9.5

S4
6'6"

5.0

70,000

RF 1/31680

⌇   outcrop

───   cut-off limit

Chamberlain Seam:
isopach map - thickness according to core recovery.

Scale : 1" = ½ mile

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FIGURE 1

FIGURE 2

CHAMBERLAIN PROSPECT : SUKUNKA AREA

55°15'

121°35'

130,000

120,000

90,000

F

S8
4'7"

S6
4'8"

A

S1
5'1"

5.0

6.0

S5
9'1"

7.0

80,000

E

8.0

B

9.0

5.0

10.0

11.0

12.0

13.0

C

S2
14'0"

10.0

S4
9'2"

70,000

RF 1/31680
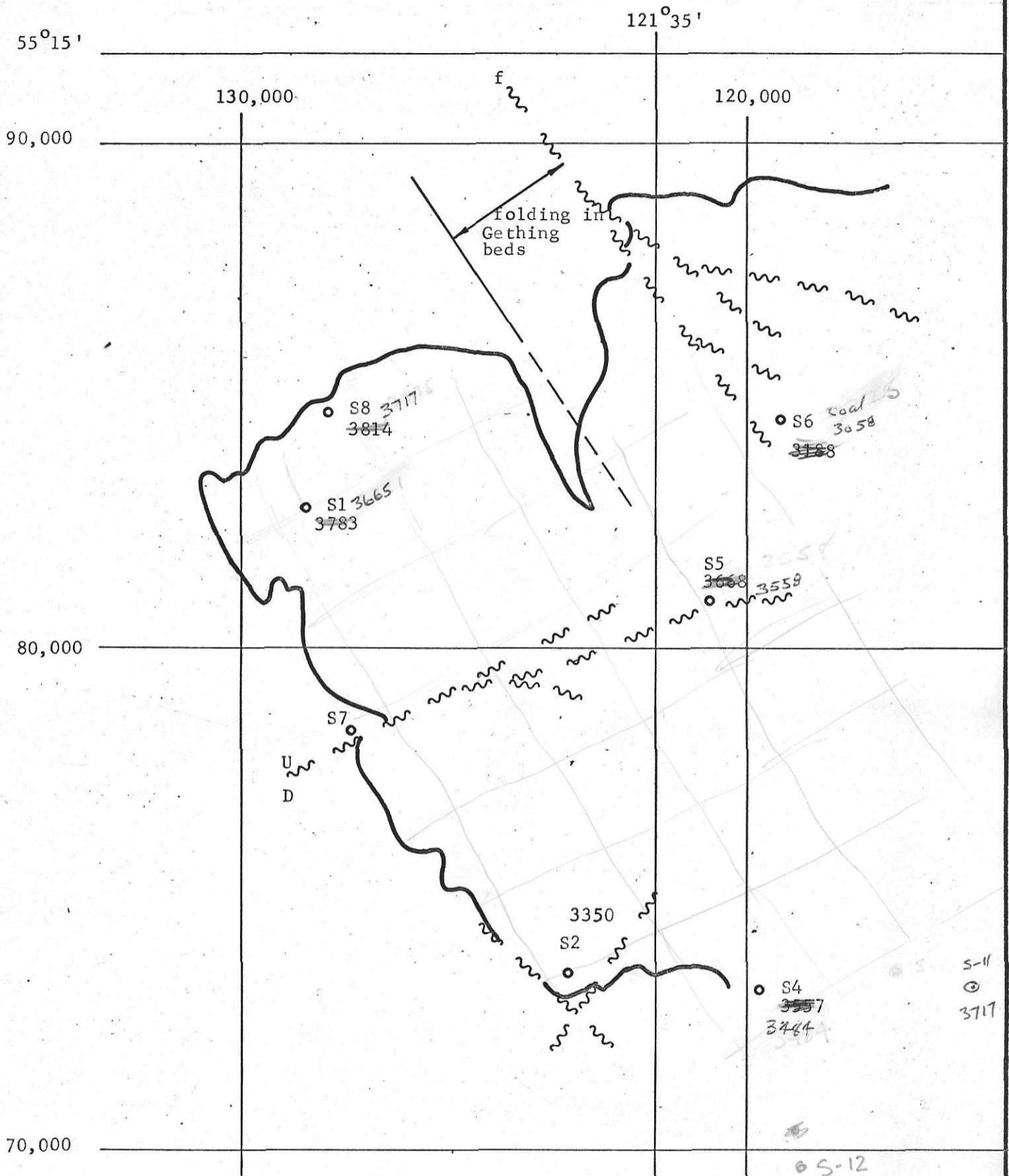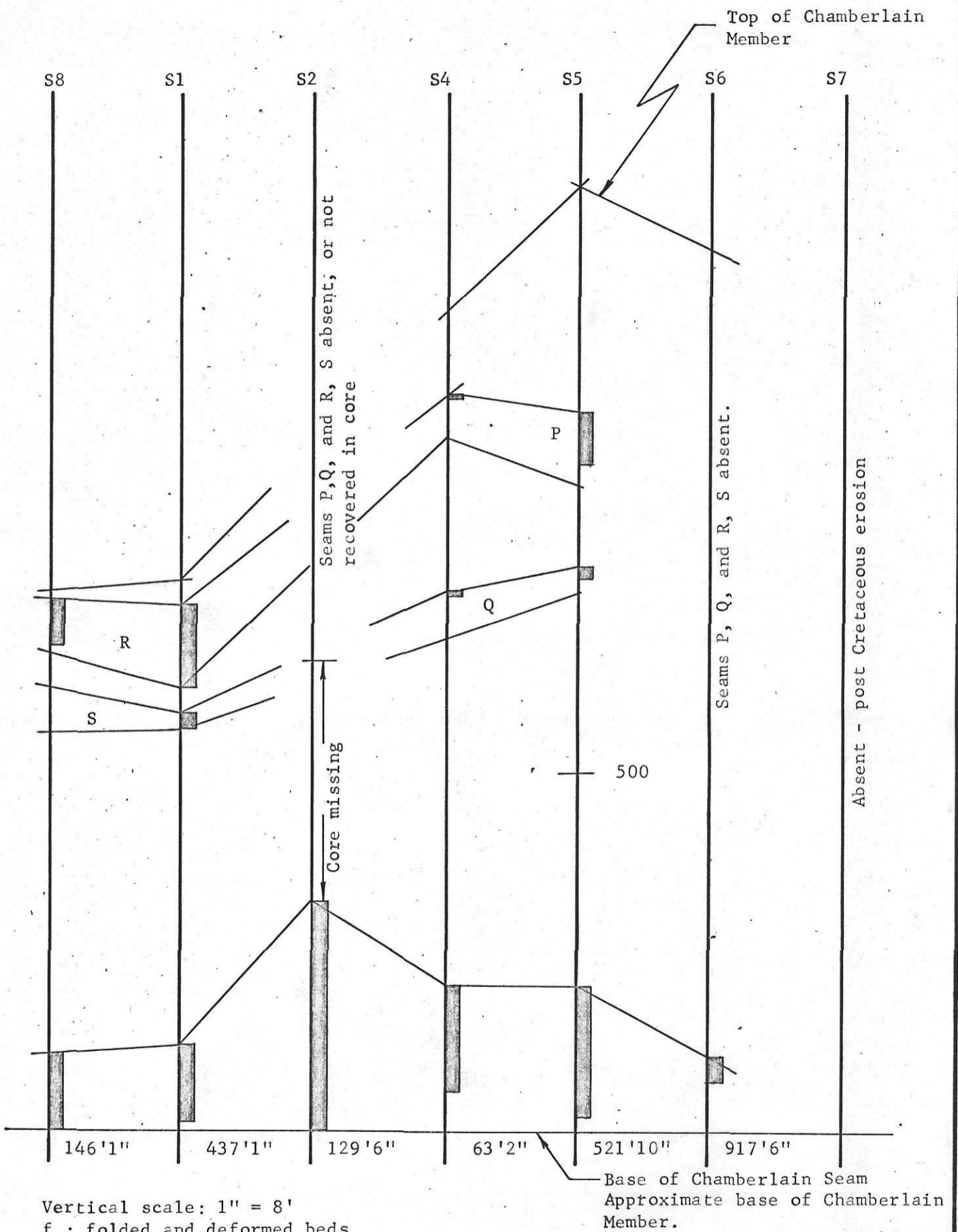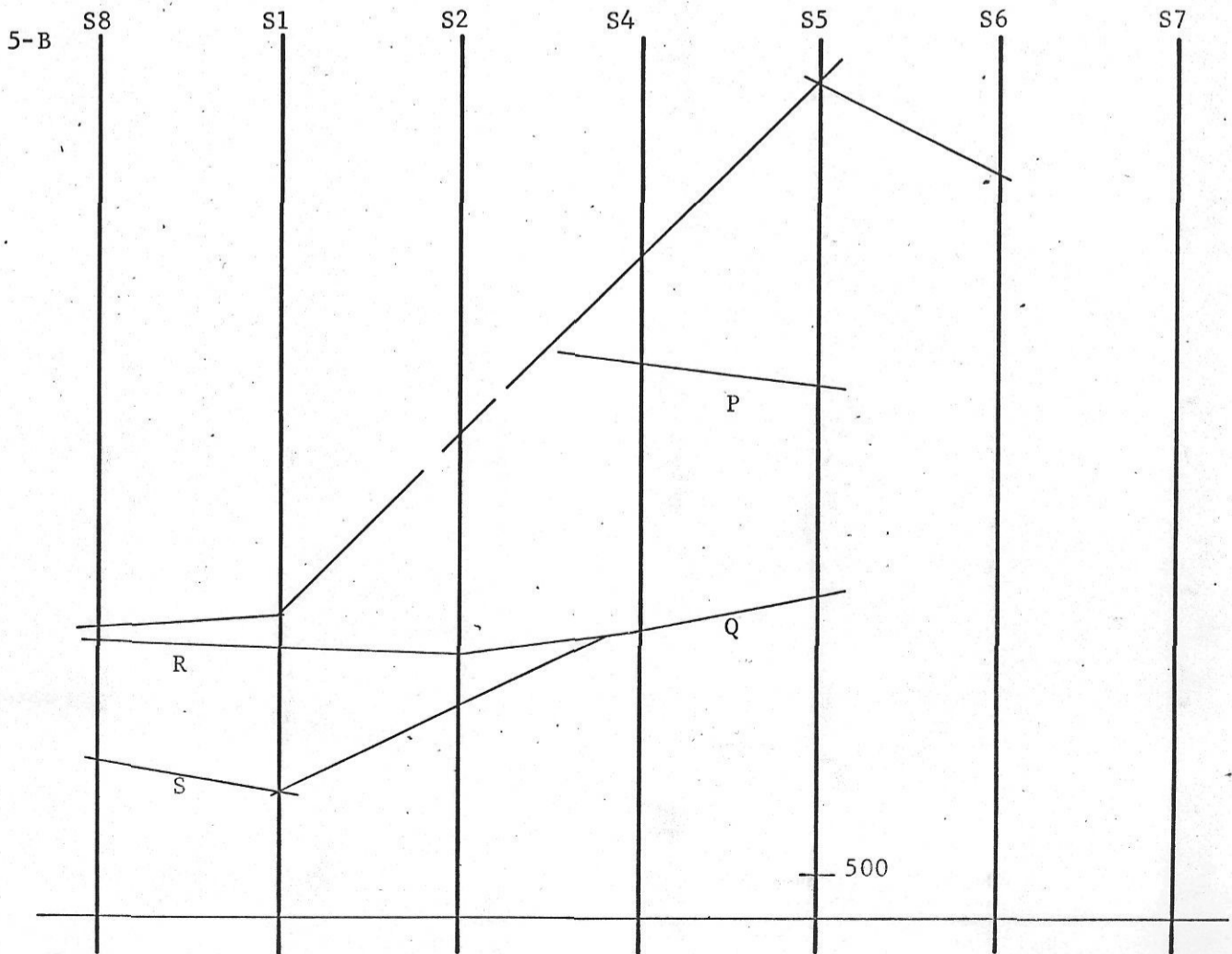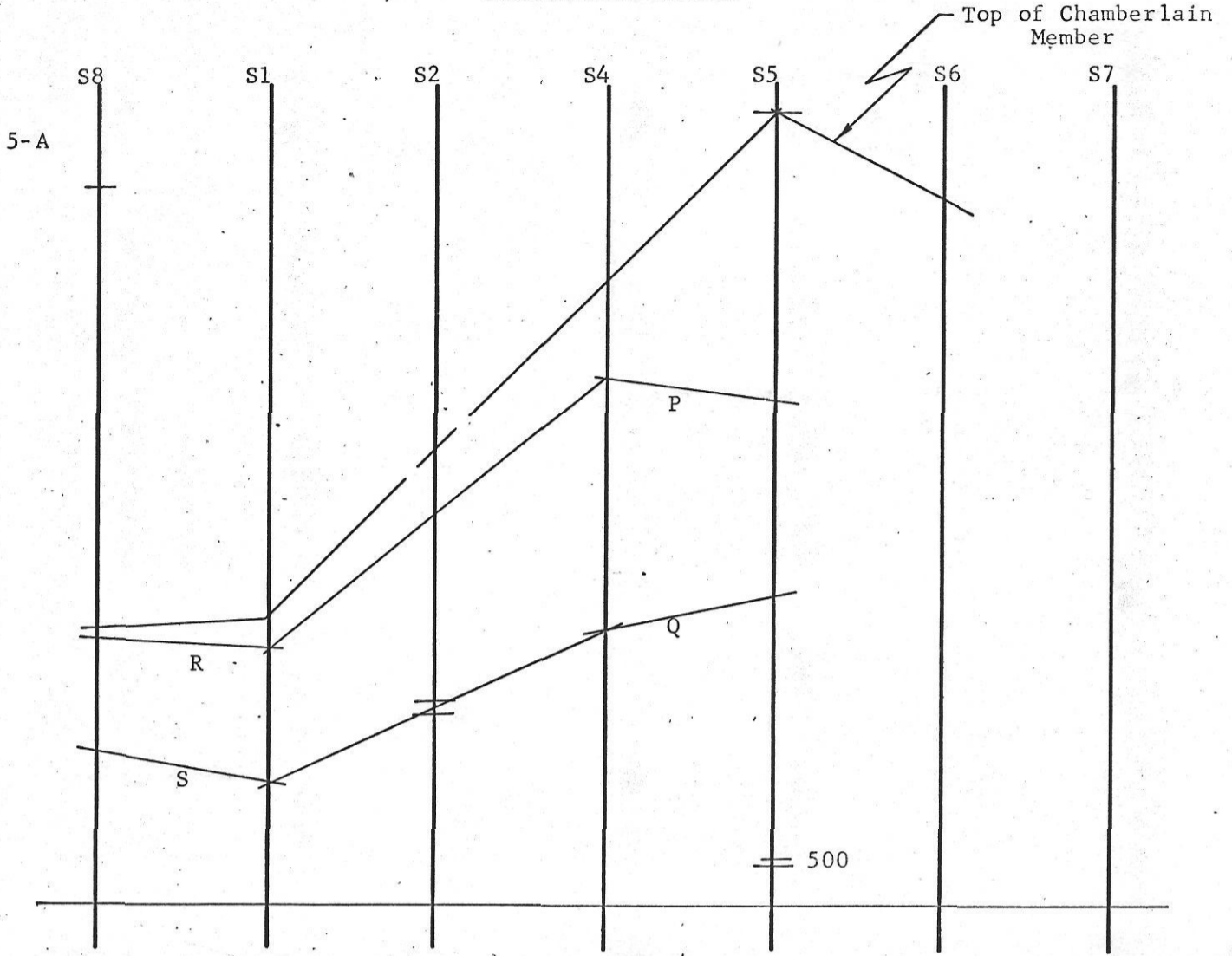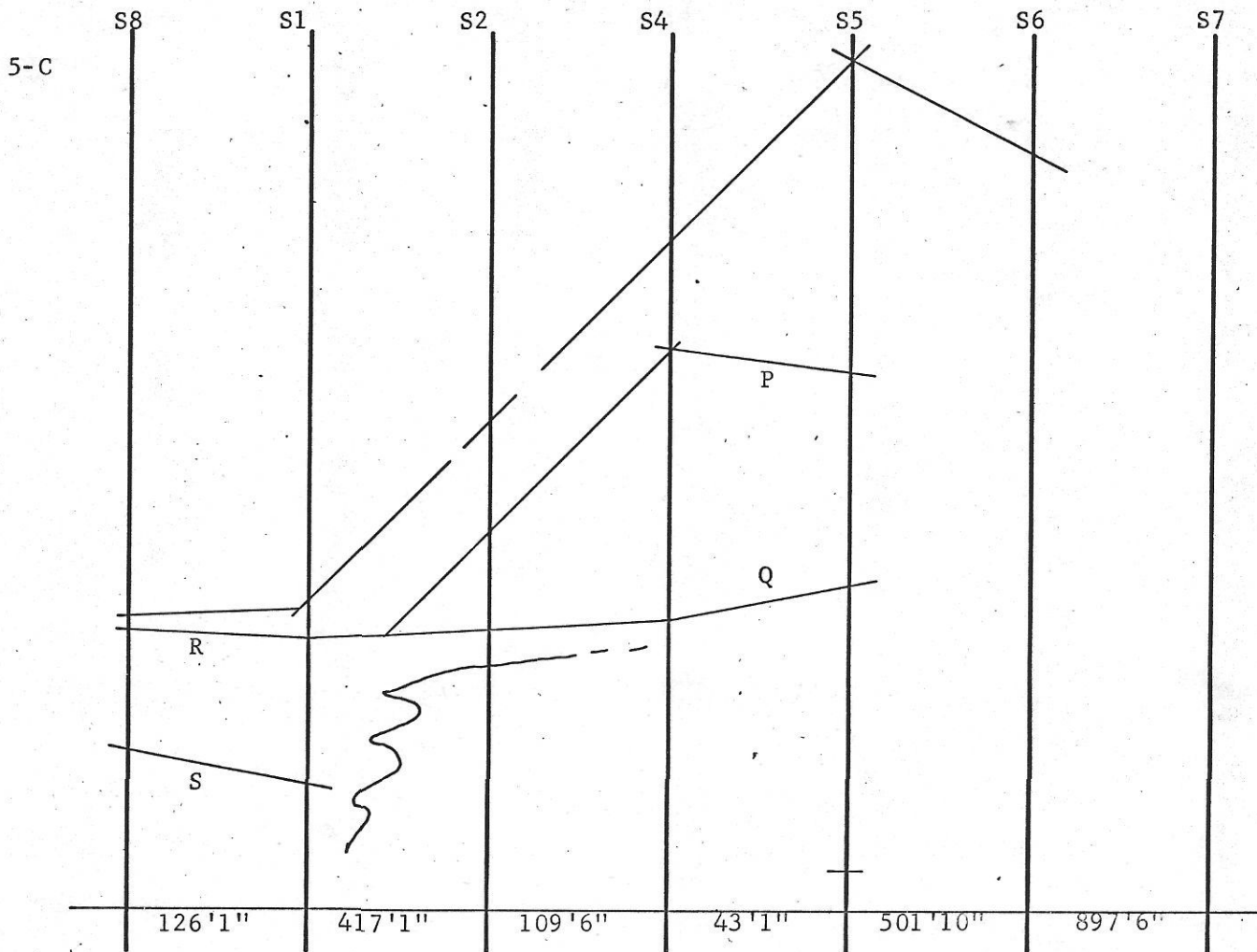
~~~~ outcrop

───── cut off limit

Chamberlain Seam :
isopach map of maximum possible thickness

Scale 1" = ½ mile

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FIG. 2

FIGURE 3.   CHAMBERLAIN PROSPECT : SUKUNKA AREA

RF 1/31680

~~~ outcrop

~~~ faulting

Chamberlain Seam :
outcrop and structure.

Scale : 1" = ½ mile

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FIGURE 4   CHAMBERLAIN PROSPECT : SUKUNKA AREA

COAL SEAMS OF CHAMBERLAIN MEMBER

Top of Chamberlain Member

S8   S1   S2   S4   S5   S6   S7

Seams P,Q, and R, S absent, or not recovered in core

P

R

Q

S

Seams P, Q, and R, S absent.

Absent - post Cretaceous erosion

Core missing

500

146'1"   437'1"   129'6"   63'2"   521'10"   917'6"

Base of Chamberlain Seam
Approximate base of Chamberlain Member.

Vertical scale: 1" = 8'
f : folded and deformed beds

Seams : maximum range of seam width, shown by bounding lines.

Coal : coal recovered in core, shown by shaded blocks.

See: Tables II and III

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FIGURE 5   CHAMBERLAIN PROSPECT : SUKUNKA AREA

Possible Correlations for Upper Seams of the
Chamberlain Member

Scale: 1" = 8'

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FIGURE 5.   CHAMBERLAIN PROSPECT : SUKUNKA AREA

Possible Correlation for Upper Seams of the
Chamberlain Member

5-C

| S8 | S1 | S2 | S4 | S5 | S6 | S7 |

126'1"   417'1"   109'6"   43'1"   501'10"   897'6"

Vertical Scale : 1" = 8'

Correlations shown for top of coal beds

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FIGURE 6.   CHAMBERLAIN PROSPECT : SUKUNKA AREA

Composite Section of the Gething Formation

Feet
0

Moosebar Fm.
Gething Fm. ——————————— Top Seam

Chamberlain Member

Chamberlain Seam

500

Middle Coals

Shales, Mudstones with lesser
thin interbeds of siltstones and
sandstones.

Siltstones

Sandstones

Conglomerate

———— c ——— c ——— Coal, thin seams, partings
3.0 feet

Coal, thick seams   3.0 feet

1,000

End of Section

Schematic diagram = data from D.D.H.'s S1,
S2, S4, S6, S7, S8
Nov. Dec. 1969.

J. E. Hughes January 1970

SUKUNKA COAL TESTING

Hole No.	Sample No.	From	To	Recovery Feet	Seam	Total Moisture As received	Surface Moisture	Inherent Moisture	Ash %	Volat.	Fixed C	B.T.U. Air Dry	S %	F.S.I.
S-1	S-011	405.0	412.5	5.0	UC	3.81	3.28	0.55	6.40	24.55	68.50	14,920	0.42	8.5
S-1	S-012	432.0	437.1	4.5	C	3.25	2.57	0.70	3.45	25.05	70.80	15,220	0.38	8.0
S-2	(a)	100.7	129.5	14.0	C	) Analysed in	-	0.90	7.40	25.90	65.80	14,300	0.34	3.5
	(b)	100.7	129.5	14.0	C	) Japan))	-	1.12	7.90	24.02	66.96	14,800	0.57	8.0
S-2	S-022	547.0	552.0	4.0	M	1.77	1.33	0.45	24.75	19.13	55.67	11,377	0.38	1.5
S-4	S-041	54.0	63.2	6.5	C	1.83	1.29	0.55	8.65	22.78	68.02	14,546	0.48	5.0
S-5	S-051	353.6	360.0	3.7	T	1.93	1.63	0.30	46.00	16.15	37.55	8,358	2.25	5.0
S-5	S-052	512.7	521.8	8.0	C	3.16	2.70	0.47	6.90	19.66	72.97	14,970	0.64	6.0
S-7	S-071	526.5	535.8	6.75	M	2.82	2.33	0.50	7.75	21.90	69.85	14,521	0.46	1.5
S-8	S-081	141.5	146.1	4.6	C	2.92	2.17	0.77	3.50	24.28	71.45	15,095	0.52	7.5
S-8	S8-3′	606.5	612.5	2.5	M	2.98	2.25	0.75	7.30	20.00	-	14,421	0.74	3.0
S-8	S8-4	612.5	617.5	3.0	M	4.40	3.63	0.80	7.75	19.70	-	14,721	0.30	2.0
S-8	S8-5	799.0	803.0	3.0	M	2.19	1.43	0.77	18.50	17.58	-	12,800	0.45	1.5
Arithmetic Average			CHAMBERLAIN		C			0.75	6.03	23,34	69.92	14,876	0.49	6.4
" "			MIDDLE		M			0.65	13.21	19.66	-	13,568	0.46	1.9