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REPORT NO. 17
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BRANDSTOFNAVORSINGSINSTITUUT
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FUEL RESEARCH INSTITUTE
OF SOUTH AFRICA

SURVEY REPORT NO. 354

ONDERWERP:
SUBJECT: REPORT ON 9 BOREHOLES DRILLED ON THE FARM SPRINGBOKDRAAI 277 I.S. IN THE STANDERTON DISTRICT.

AFDELING:
DIVISION: SURVEY

NAAM VAN AMPTENAAR:
NAME OF OFFICER: W.H.D. SAVAGE and J.M. BRIEL

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FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

REPORT NO. 17 OF 1969.

SURVEY REPORT NO. 354.

REPORT ON 9 BOREHOLES DRILLED ON THE FARM SPRINGBOKDRAAI 277 I.S. IN THE STANDERTON DISTRICT.

INTRODUCTION.

During the years 1956 and 1957, Messrs. Union Corporation Ltd., drilled 9 boreholes on the farm Springbokdraai 277 I.S. situated approximately 10 miles south-east of Leslie, Transvaal.

The coal cores were sent to the East Geduld Gold Mine, Springs, where they were sampled by officers of the Institute. Samples were crushed at the Institute to pass a 1 inch screen and subjected to float and sink tests at a specific gravity of 1.58.

PRESENTATION OF RESULTS.

The data on which this report is based are contained in tables and figures at the end of the report. Table 1 contains the borehole records. Table 2, the details of sampling and Table 3 the analysis of the samples taken. Average seam analyses for the better portions of the various seams are given in Table 4. Table 5 gives the constitution of composite samples for further analysis. The remaining tables give the analysis of the composite samples containing data on proximate analysis and calorific value (Table 6), ultimate analysis (Table 7), and sulphur distribution and ash fusion temperature (Table 8). Figure 1 is a plan showing the positions of the boreholes, and Figure 2 gives borehole sections to the bottom of the Karroo system -

corrected ...../

corrected for collar elevations - showing coal seams and dolerite intrusions, as well as Dwyka Tillite at the bottom of the boreholes. The appendix gives a brief description of the analytical methods used and their significance.

GENERAL CONSIDERATIONS.

The normal succession of seams of the Bethal coalfield is present on the farm. The succession varies as follows:

	Maximum	Minimum
Overburden	±340'	139'
Seam C		
Parting	112'	86'
Upper B Seam		
Parting	6'3"	2'7"
Seam B		
Parting	123'	91'
Seam A		
Parting	136'	83'
Dwyka Tillite		

The overburden is at a maximum in the north-western corner of the farm in borehole 209 where Seam C is absent. Apart from boreholes 209, 269 and 193 the maximum overburden is 222 ft. The overburden contained from 4 ft to 59 ft of dolerite in the north, the dolerite occurring 115 ft to 120 ft above Seam C in boreholes 187, 193 and 251, and about twice as far above Seam C in boreholes 209 and 269. This dolerite has not affected the coal.

The Dwyka Tillite is absent in borehole 197, and only 71 ft of sandstone represents the lower part of the Karroo system here. Dolerite is also present below the coal in five boreholes (187, 192, 204, 215 and 269) at thicknesses of 48 ft to 65 ft. The dolerite has presumably destroyed Seam A in borehole 215, the top of the dolerite occurring at about the expected level of the seam. In the other boreholes the dolerite is from 54 ft to 105 ft below Seam A, but only in borehole 204 are there definite indications that the coal has

been...../

been affected by dolerite - the indications being a definite decrease in moisture content, and a possible slight decrease in volatile matter.

Two occurrences of burnt coal are not associated with dolerite penetrated in the boreholes. In borehole 193, Seam B has been burnt presumably by a nearby dyke. In borehole 197 Seam A has been burnt, either by a dyke or by underlying dolerite at a depth greater than 511 ft.

The elevation of the floor of Seam B is at a maximum of 4882 ft above sea-level in borehole 197, and is between 4867 ft and 4858 ft in boreholes 187, 192, 215 and 269. In boreholes 204 and 251 the elevation is 4826 ft and 4827 ft, and the lowest elevations are 4811 ft in borehole 209 and 4795 ft in borehole 193. It appears likely that there is a fault between boreholes 193 and 187 with downthrow to the north, as the elevations differ by 72 ft. This fault may extend between boreholes 269 and 209, and may also continue to the south-east so that borehole 251 is also down-faulted. Support for the existence of such a fault is given by the fact that no dolerite was found below the coal in boreholes 193, 209 and 251, whereas dolerite was present in the other boreholes except 197, where its presence at greater depth may be indicated by the burning of Seam A.

THE COAL SEAMS.

Seam C

This seam is absent in borehole 209, and otherwise varies in thickness from 24 inches to 51 inches. In borehole 215 the 33" seam contained sandstone bands in the top 17" and 4" of carbonaceous shale near the floor; no samples were taken.

The seam consists of mainly bright coal often with some carbonaceous shale, which amounted to 15" in borehole 269. The seam was generally not more than 30" thick, and although fairly low in ash has no value except in boreholes 192 and 204 where the seam exceeds three feet in thickness. These boreholes are fairly far apart, but it is possible that a thickness of three feet is maintained between them. Average data for the seam in these two boreholes are as follows:

Coal...../

Coal Ins.	42
Exclusions Ins.	0
Raw Coal Ash %	19.6
Floats at 1.58 s.g. on -1" Coal	
Yield %	81.2
Calorific Value lb/lb	12.0
Moisture %	4.5
Ash %	12.7
Volatile Matter %	32.0
Fixed Carbon %	50.8
Swelling No.	0

Top Split of B Seam.

This seam is absent in borehole 193, and otherwise varies in thickness from 12" to 35", of which at most the coal amounts to 24". The coal is mainly bright and high in volatile matter, but ash contents normally exceed 20%. The seam has no economic value.

Seam B

This seam is the best developed seam of the Bethal coalfield, and this applies also to the coal on this farm. The seam is not very deep over most of the property with overburden in the boreholes of 260 ft to 320 ft except in the north in boreholes 269, 193 and 209, where the overburden varies between 370 ft and 440 ft.

The seam varies in thickness from a little less than 10 ft to a little more than 15 ft, and normally has a fairly consistent make-up. Borehole 193 is an exception with 35" of carbonaceous shale and 25" of burnt coal recovered from a 10 ft seam. In the other boreholes, the bottom coal averaging rather more than 4 ft is reasonably clean with about 14% ash except in borehole 209 with 20% ash. Above this comes about 3 ft of intermediate quality coal with about 22% ash, and the upper portion of the seam is definitely inferior, and of variable thickness. Carbonaceous shale is a prominent feature of the upper coal except in borehole 209, where the ash content of

the...../

the whole upper portion was 29.6%, and can comprise the whole or the major portion of the upper coal. In three boreholes from 12½" to 25" of better quality coal (ash content about 24%) at the top of the seam was separately sampled. Other samples taken of the upper coal had 38% ash or more.

Core losses occurred in most of the boreholes, and in some cases were so great that the validity of the samples taken is dubious. These core losses were as follows:

Borehole	192	193	204	209	215	251	269
Loss. Ins.	30	60	24	39	14	2	50

Borehole 193 has already been discussed. In borehole 269, apart from the high losses, there was a departure from the normal procedure in that the B sample included a 9" carbonaceous shale band, which can be regarded as the bottom of the upper inferior coal. The 30" core loss in borehole 192 is shown in Table 2 as occurring near the top of the seam, and this view has been accepted as correct. In the other boreholes for which average data appear in Table 4 losses have been allocated proportionately to the coal or carbonaceous shale recovered, and estimated full core thicknesses are given in this table.

Average data, excluding borehole 193 with excessive core loss and burnt coal and borehole 269 which also had much core loss and where sampling was not comparable with the other boreholes, for the better quality coal at the bottom of the seam are as follows:

Coal Ins.	93
Exclusions Ins.	½
Raw Coal Ash %	17.7
<u>Floats at 1.58 s.g. on -1" Coal</u>	
Yield %	75.8
Calorific Value lb/lb	11.5
Moisture %	5.0
Ash %	13.4
Volatile Matter %	25.3
Fixed Carbon %	56.3
Swelling No.	0

The...../

The above data are straight averages of the results for the individual boreholes. No weighting has been done for irregular representation due to the very uneven distribution of the boreholes. In any case the data are liable to be in error due to core losses. Weighting of boreholes for areas represented would tend to decrease the thickness slightly with a slight concomitant increase in quality. Although no raw coal calorific values have been done, it is estimated that the raw coal would have a calorific value of about 10.8 lb/lb.

Seam A.

Seam A is absent in borehole 215, where it has presumably been assimilated by the dolerite sill. The seam is variable in thickness and quality. In boreholes 193 at 6" and 209 at two bands of 12" separated by 2 ft of sandstone the seam was not sampled. In the other boreholes the seam varied in thickness from 58" to 100". In borehole 204 the coal was very inferior at 45% ash and had been affected - possibly by underlying dolerite. In borehole 197 the coal was burnt, and the only sample taken was 26" thick and had 26.5% ash. In borehole 192 where the seam was at its thickest, only 24" at 25.9% ash had less than 35% ash.

In the other three boreholes - namely 187, 251 and 269 - the coal was of better quality and varied from 58" to 82" in thickness. Average data for these three boreholes are given in Table 4, and the average of the three boreholes is as follows:

Coal Ins.	72
Raw Coal Ash %	18.7
Floats at 1.58 s.g. on -1" coal	
Yield %	80.0
Calorific Value lb/lb	11.7
Moisture %	4.5
Ash %	13.7
Volatile Matter %	26.5
Fixed Carbon %	55.3
Swelling No.	0

It...../

It is not certain that these three boreholes form a continuous patch of better quality coal. The calorific value on the raw coal is probably about 10.8 lb/lb.

FURTHER ANALYSES.

The composite samples were made up for further analysis. They represent raw coal and floats of Seam C in boreholes 192 and 204, raw coal and floats for Seam B in all but borehole 192, and floats for Seam A in boreholes 187, 251 and 269.

The coal is of fairly low rank as can be seen from the carbon contents of about 80.5% for the mainly dull B and A Seams and 79.6% for the mainly bright C Seam. Hydrogen is about 4.6% for Seams B and A and 5.3% for Seam C. Nitrogen and organic sulphur contents are normal. The higher dry ash-free calorific value of Seam C is due to the higher hydrogen content.

Sulphur contents of the raw coal were 1.5% and 1.2% for Seams C and B and these were reduced to 0.7% and 0.5% in the float samples, indicating that pyrites is easily removed by washing. Ash fusion temperatures for both seams were 1360°C on the floated coal; the raw coal shows a slight increase for Seam C, but Seam B had a value of 1320°C, a reduction of 40°C.

SUMMARY.

Nine boreholes were drilled on the farm Springbokdraai 277 I.S., situated about 10 miles south-east of Leslie, Transvaal.

Dolerite up to 60 ft thick was present well above the coal in five northerly boreholes, but had no effect on the coal. Dolerite of 48 ft to 65 ft was present below the coal in 5 boreholes and may be present at greater depth in borehole 197. Seam A is absent in borehole 215, possibly assimilated by the dolerite, and is burnt in borehole 197 and affected and very inferior in borehole 204. In borehole 193 Seam B has been burnt, presumably by a dyke.

A fault, with downthrow of about 70 ft to the north is probably present, and separates boreholes 209, 193 and 251 from the rest of the area.

Seam C is absent in borehole 209, and is generally less than 3 ft thick. In boreholes 192 and 204 the seam is thicker and average data are given below.

The Upper B Seam is absent in borehole 193 and otherwise from one to three ft thick. It never has more than 2 ft of coal, which is generally over 20% in ash content.

Seam B occurs about 100 ft below Seam C, and is about 300 ft below surface except in the north, where the overburden increases. The seam is 10 ft to 15 ft thick, and the seam typically varies from fairly good quality to very inferior from bottom to top. Average data in seven boreholes, excluding borehole 193 with burnt coal and 269 where core losses were high, are given below.

Seam A occurs rather more than 100 ft below Seam B. The seam is absent in one borehole, thin in two, and inferior in three more boreholes. Average data for boreholes 187, 251 and 269 are given below. These boreholes do not necessarily represent a continuous block of better quality coal.

<u>AVERAGE DATA</u>

Seam	C	B	A
No. of boreholes	2	7	3
Coal, Ins.	42	93	72
Exclusions, Ins.	0	½	0
<u>Raw Coal</u>: Ash %	19.6	17.7	18.7
Sulphur %	1.5	1.2	-
Ash Fusion Point °C	1380	1320	-
<u>Floats at 1.58 s.g. on -1" Coal</u>			
Yield %	81.2	75.8	80.0
Calorific Value lb/lb	12.0	11.5	11.7
Moisture %	4.5	5.0	4.5
Ash %	12.7	13.4	13.7
Volatile Matter %	32.0	25.3	26.5

Fixed...../

Floats at 1.58 s.g. on -1" Coal (Cont.)

Fixed Carbon %	50.8	56.3	55.3
Sulphur %	0.7	0.5	-
Ash Fusion Point °C	1360	1360	-
ON A DRY ASH-FREE BASIS			
Carbon %	79.6	80.6	80.5
Hydrogen %	5.3	4.5	4.7
Nitrogen %	2.1	2.1	-

W.H.D. SAVAGE
Chief Research Officer

J.M. BRIEL
Assistant Research Officer

PRETORIA.
16th October, 1969.

TABLE 1.

BOREHOLE RECORDS

BOREHOLE NO. 187

FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,199

Thickness Ft.	Thickness In.	Description of Strata	Depth Ft.	Depth In.
18	0	Soil	18	0
85	0	Sandstone	103	0
4	0	Dolerite	107	0
115	4	Sandstone	222	4
2	5	Coal. C Seam	224	9
91	9	Sandstone	316	6
2	6	Coal. Top Split of B Seam	319	0
3	2	Sandstone	322	2
9	8	Coal. B Seam	331	10
111	11	Sandstone	443	9
4	10	Coal. A Seam	448	7
83	5	Sandstone	532	0
5	0	Dwyka Tillite	537	0
48	0	Dolerite	585	0
6	0	Dwyka Tillite	591	0

BOREHOLE NO. 192

FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,139

Thickness Ft.	Thickness In.	Description of Strata	Depth Ft.	Depth In.
20	0	Soil	20	0
141	4	Sandstone and sandy shale	161	4
4	3	Coal. C Seam	165	7
95	11	Sandstone	261	6
1	0	Coal. Top Split of B Seam	262	6
4	0	Sandstone	266	6
14	6	Coal. B Seam	281	0
106	11	Sandstone	387	11
8	4	Coal. A Seam	396	3
64	9	Sandstone	461	0
50	0	Dolerite	511	0
17	0	Sandstone	528	0
0	4	Dwyka Tillite	528	4

BOREHOLE NO. 193

FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,195

Thickness Ft.	Thickness In.	Description of Strata	Depth Ft.	Depth In.
19	0	Soil	19	0
11	0	Sandstone	30	0
38	0	Shale	68	0
55	0	Sandstone	123	0
44	0	Dolerite	167	0

116'6"...../

TABLE 1 (CONTINUED)

Thickness Ft.	In.	Description of Strata	Depth Ft.	In.
		BOREHOLE NO. 193 (Cont.)		
		FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,195		
116	6	Sandstone	283	6
2	6	Coal. C Seam	286	0
104	0	Sandstone and sandy shale	390	0
10	0	Coal. B Seam	400	0
107	6	Sandstone	507	6
	6	Coal. A Seam	508	0
94	0	Sandstone	602	0
20	0	Dwyka Tillite	622	0
		BOREHOLE NO. 197		
		FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,202		
10	0	Soil	10	0
16	0	Sandstone	26	0
35	0	Shale	61	0
145	9	Sandstone	206	9
2	6	Coal. C Seam	209	3
92	9	Sandstone	302	0
1	2	Coal. Top Split of B Seam	303	2
5	4	Sandstone	308	6
11	9	Coal. B Seam	320	3
112	9	Sandstone	433	0
7	0	Coal. A Seam	440	0
71	0	Sandstone	511	0
		BOREHOLE NO. 204		
		FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,097		
13	0	Soil	13	0
125	10	Sandstone and sandy shale	138	10
3	2	Coal. C Seam	142	0
106	8	Sandstone	248	8
1	6	Coal. Top Split of B Seam	250	2
6	1	Sandstone	256	3
15	3	Coal. B Seam	271	6
23	6	Sandstone	295	0
32	0	Shale	327	0
54	0	Sandstone	381	0
7	3	Coal. A Seam	388	3
53	9	Sandy shale and sandstone	442	0
57	0	Dolerite	499	0
7	0	Sandstone	506	0
20	0	Dwyka Tillite	526	0

BOREHOLE NO. 209...../

TABLE 1 (CONTINUED)

Thickness Ft.	In.	Description of Strata	Depth Ft.	In.
		BOREHOLE NO. 209		
		FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,268		
57	0	No core recovered	57	0
22	0	Dolerite	79	0
4	0	Sandstone	83	0
21	0	Dolerite	104	0
48	0	Sandstone and sandy shale	152	0
29	0	Shale	181	0
39	0	Sandstone	220	0
20	0	Shale	240	0
58	0	Sandstone and sandy shale	298	0
6	0	Shale	304	0
29	0	Sandstone	333	0
21	0	Shale	354	0
85	4	Sandstone and sandy shale	439	4
1	8	Coal. Top Split of B Seam	441	0
2	7	Sandstone	443	7
13	0	Coal. B Seam	456	7
91	5	Sandstone and sandy shale	548	0
1	0	Coal)	549	0
2	0	Sandstone) A Seam	551	0
1	0	Coal)	552	0
86	0	Sandstone	638	0
36	0	Dwyka Tillite	674	0
		BOREHOLE NO. 215		
		FARM: SPRINGBOKDRAAI 277 I.S. — COLLAR ELEVATION: 5,139		
33	0	No core recovered	33	0
79	0	Sandstone	112	0
9	0	Shale	121	0
19	0	Sandstone	140	0
2	9	Coal. C Seam	142	9
111	9	Sandstone	254	6
2	11	Coal. Top Split of B Seam	257	5
4	1	Sandstone	261	6
13	6	Coal. B Seam	275	0
39	0	Sandstone	314	0
12	0	Shale	326	0
63	0	Sandstone	389	0
65	0	Dolerite	454	0
36	0	Sandstone	490	0
1	0	Dwyka Tillite	491	0

BOREHOLE NO. 251...../

TABLE 1 (CONTINUED)

Thickness Ft.	In.	Description of Strata	Depth Ft.	In.
		BOREHOLE NO. 251		
		FARM: SPRINGBOKDRAAI 277 I.S.		COLLAR ELEVATION: 5,153
4	0	No core recovered	4	0
31	0	Sandstone	35	0
59	0	Dolerite	94	0
119	6	Sandstone	213	6
2	0	Coal. C Seam	215	6
81	6	Sandstone	297	0
9	9	Shale	306	9
2	0	Coal. Top Split of B Seam	308	9
6	3	Sandstone	315	0
11	0	Coal. B Seam	326	0
123	4	Sandstone	449	4
6	10	Coal. A Seam	456	2
85	10	Sandstone	542	0
59	0	Dwyka Tillite	601	0
		BOREHOLE NO. 269		
		FARM: SPRINGBOKDRAAI 277 I.S.		COLLAR ELEVATION: 5,250
17	0	Soil	17	0
21	0	Dolerite	38	0
40	0	Sandstone	78	0
40	0	Shale	118	0
116	0	Sandstone	234	0
7	0	Shale	241	0
37	9	Sandstone	278	9
2	3	Coal. C Seam	281	0
85	8	Sandstone	366	8
2	3	Coal. Top Split of B Seam	368	11
4	9	Sandstone	373	8
14	4	Coal. B Seam	388	0
100	0	Sandstone	488	0
6	4	Coal. A Seam	494	4
82	8	Sandstone	577	0
22	0	Dwyka Tillite	599	0
48	0	Dolerite	647	0
11	0	Dwyka Tillite	658	0

TABLE 2...../

TABLE 2

DESCRIPTION OF SAMPLES

B.H. No.	Sample No.	Thickness in.	Depth Ft.	Depth Ins.	Description
C SEAM					
187			222	4	Roof: Sandstone.
	56/59 A	29			Mixed coal with 4" carbonaceous shale 10" from bottom excluded, calcitic in cleats, pyritic.
			224	9	Floor: Sandstone
192			161	4	Roof: Sandstone.
	56/52 A	46			Mixed coal, highly pyritic and calcitic and containing 4" carbonaceous shale 9" from bottom
		5			Carbonaceous shale. Not sampled.
			165	7	Floor: Sandstone.
193			283	6	Roof: Sandstone.
		1			Carbonaceous shale. Not sampled.
	56/262A	(13			Bright coal with a few shaly coal bands.
		(2			Carbonaceous shale. Excluded.
		(2			Bright coal.
			286	0	Floor: Sandstone.
					Note: 12" of core lost.
197			206	9	Roof: Sandstone.
	56/273A	(16			Bright coal with an occasional thin carbonaceous shale band.
		($3\frac{1}{2}$			Carbonaceous shale. Excluded.
		($10\frac{1}{2}$			Mainly bright coal.
			209	3	Floor: Sandstone.
204			138	10	Roof: Sandy shale.
	56/288A	38			Bright coal, calcitic, with a few thin carbonaceous shale bands.
			142	0	Floor: Sandstone.
215			140	0	Roof: Sandstone.
	56/456	17			Coal and sandstone.) Not sampled.
		9			Bright coal, calcitic in cleats.) Not sampled.
		4			Carbonaceous shale.) Not sampled.
		3			Mixed coal.) Not sampled.
			142	9	Floor: Sandstone.
251			213	6	Roof: Sandstone
	57/28 A	12			Mainly bright coal with 1" carbonaceous shale 1" from bottom.

TABLE 2 (Cont.) ...../

TABLE 2 (Cont.)

B.H. No.	Sample No.	Thickness in.	Depth Ft.	Depth Ins.	Description
C SEAM (Cont.)					
	57/28 A	($2\frac{1}{2}$			Carbonaceous shale. Excluded.
		($9\frac{1}{2}$			Bright banded coal with a few shaly bands.
			215	6	Floor: Sandstone.
269			278	9	Roof: Sandstone.
	57/284A	12			Mixed coal.
		15			Carbonaceous shale. Not sampled.
			281	0	Floor: Sandstone.
187			316	6	Roof: Sandstone.
		1			Sandstone. Not sampled.
	56/60 A	28			Mixed mainly bright coal with 4" carbonaceous shale 9" from top excluded.
		1			Sandstone. Not sampled.
			319	0	Floor: Sandstone.
192			261	6	Roof: Sandstone.
	56/53 A	12			Bright banded coal with 2" dull coal at top.
			262	6	Floor: Sandstone.
197			302	0	Roof: Sandstone.
	56/274A	14			Mainly bright coal, calcitic, with 1" shale in middle excluded.
			303	2	Floor: Sandstone.
204			248	8	Roof: Sandstone.
		2			Sandstone and carbonaceous shale. Not sampled.
	56/289A	16			Finely banded bright coal.
			250	2	Floor: Sandstone.
209			439	4	Roof: Sandstone.
	56/306A	16			Mainly bright coal.
		4			Carbonaceous shale. Not sampled.
			441	0	Floor: Sandstone.
TOP SPLIT OF B SEAM					
215			254	6	Roof: Sandstone.
	56/456	16			Carbonaceous shale.) Not sampled.
		12			Mixed coal.)
		7			Carbonaceous shale.)
			257	5	Floor: Sandstone.

TABLE 2 (Cont.) ...../

TABLE 2 (Cont.)

B.H. No.	Sample No.	Thickness in.	Depth Ft.	Depth Ins.	Description
TOP SPLIT OF B SEAM (Cont.)					
251			306	9	Roof: Shale.
		1			Carbonaceous shale and sandstone lenses. Not sampled.
	57/29 A	$3\frac{1}{2}$			Mixed mainly dull coal.
		$3\frac{1}{2}$			Coal and sandstone. Excluded.
		16			Finely banded bright coal.
			308	9	Floor: Sandstone.
269			366	8	Roof: Sandstone.
	57/285A	10			Mixed mainly dull coal.
		6			Carbonaceous shale. Excluded.
		10			Mixed coal.
		1			Carbonaceous shale. Not sampled.
			368	11	Floor: Sandstone.
B SEAM					
187			322	2	Roof: Sandstone.
		10			Carbonaceous shale. Not sampled.
	56/61 C	26			Dull coal, shaly in parts and containing $1\frac{1}{2}$" carbonaceous shale 8" from top.
	B	40			Mixed mainly dull coal containing calcite in nodular form in bottom 2".
	A	40			Mixed mainly bright coal, slightly calcitic and pyritic.
			331	10	Floor: Sandstone.
192			266	6	Roof: Sandstone.
	56/54 D	$12\frac{1}{2}$			Dull coal.
		30			Core lost.
		$17\frac{1}{2}$			Carbonaceous shale. Not sampled.
	C	29			Dull shaly coal.
	B	23			Mainly dull coal containing calcite in nodular form in bottom 5", highly pyritic at bottom.
	A	62			Mixed mainly bright coal, brighter towards bottom and duller towards top, calcitic and pyritic.
			281	0	Floor: Sandstone.

TABLE 2 (Cont.) ...../

TABLE 2 (Cont.)

B.H. No.	Sample No.	Thickness in.	Depth Ft.	Depth Ins.	Description
B SEAM (Cont.)					
193			390	0	Roof: Sandstone.
		35			Carbonaceous shale. Not sampled.
	56/263A	25			Mainly dull burnt coal with 1" micaceous sandy shale 3" from bottom excluded.
			400	0	Floor: Sandstone.
					Note: 60" of core lost.
197			308	6	Roof: Sandstone.
		35			Carbonaceous shale and coaly shale. Not sampled.
	56/275B	36			Dull coal very shaly in parts
	A	(11			Mainly dull coal.
		(4			Carbonaceous dolomite limestone. Excluded.
		(55			Mainly dull coal brighter at bottom, with occasional shaly coal bands.
			320	3	Floor: Sandstone.
204			256	3	Roof: Sandstone.
	56/290C	25			Mainly dull coal shaly in parts.
		46			Carbonaceous shale, coaly shale and shaly coal. Not sampled.
	B	37			Mainly dull coal with an occasional thin bright coal band.
	A	51			Alternating bands of dull and bright coal.
			271	6	Floor: Sandstone.
					Note: 24" of core lost.
209			443	7	Roof: Sandstone.
	56/307C	36			Mainly dull coal shaly in parts.
	B	31			Mainly dull coal with a little mixed coal, highly calcitic at bottom.
	A	50			Alternating bands of dull and mixed coal, calcitic at bottom.
			456	7	Floor: Sandstone.
					Note: 39" of core lost.

TABLE 2 (Cont.) ...../

TABLE 2 (Cont.)

B.H. No.	Sample No.	Thickness in.	Depth Ft.	Depth Ins.	Description
B SEAM (Cont.)					
215			261	6	Roof: Sandstone.
	56/456D	14			Mixed mainly dull coal.
		11			Carbonaceous shale. Not sampled.
	C	57			Dull coal, mainly shaly, containing a few carbonaceous shale bands.
	B	26			Dull coal.
	A	40			Mixed mainly dull coal, pyritic.
			275	0	Floor: Sandstone.
					Note: 14" of core lost.
251			315	0	Roof: Sandstone
	57/30 D	18			Carbonaceous shale and dull coal.
	C	29			Mainly dull coal, shaly in parts.
	B	24			Mainly dull coal with a 4" bright calcitic band in centre pyritic, and calcite in nodular form in bottom 4".
	A	(44			Mainly dull coal, pyritic.
		(15			Mainly bright coal with calcite nodules.
			326	0	Floor: Sandstone.
					Note: 2" of core lost.
269			373	8	Roof: Sandstone.
		8			Dull coal.) Not sampled.
		15			Carbonaceous shale.) Not sampled.
		(18			Dull coal.
	57/286B	(9			Carbonaceous shale. Excluded.
		(40			Dull coal.
		3			Siderite. Not sampled.
	A	29			Mixed and dull coal.
			388	0	Floor: Sandstone.
					Note: 50" of core lost.
A SEAM					
187			443	9	Roof: Sandstone.
	56/62 A	58			Alternating bands of dull and bright coal, pyritic where bright.
			448	7	Floor: Sandstone.

TABLE 2 (Cont.) ...../

TABLE 2 (Cont.)

B.H. No.	Sample No.	Thickness in.	Depth Ft.	Depth Ins.	Description
A. SEAM (Cont.)					
192			387	11	Roof: Sandstone.
	56/55 C	21			Dull shaly coal.
		7			Carbonaceous shale. Not sampled.
	B	48			Dull coal, shaly in top part, calcitic in cleats, pyritic.
	A	24			Dull coal with a little bright coal at bottom.
			396	3	Floor: Sandstone.
197			433	0	Roof: Sandstone.
		49			Dull shaly, burnt coal with carbonaceous shale bands. Not sampled.
	56/276A	26			Dull to mixed burnt coal.
		9			Dull shaly coal and coaly shale. Not sampled.
			440	0	Floor: Sandstone.
204			381	0	Roof: Sandstone.
	56/291A	75			Carbonaceous shale and shaly coal with an occasional bright coal band.
			388	3	Floor: Sandy shale.
					Note: 12" of core lost.
251			449	4	Roof: Sandstone.
	57/31 B	50			Mainly dull coal with occasional bright coal bands, slightly shaly in parts.
	A	32			Alternating bands of mixed and dull coal, pyritic.
			456	2	Floor: Sandstone.
269			488	0	Roof: Sandstone.
	57/287B	40			Dull and mixed coal.
	A	(10			Dull coal.
		(26			Mixed coal with 1" coarse sandstone band 4" from bottom, included in sample.
			494	4	Floor: Sandstone.

TABLE 3 ...../

TABLE 5

COMPOSITION OF SAMPLES FOR FURTHER ANALYSIS

Sample No.	Components	Parts	Description
C SEAM			
58/118	56/52 A1	344	Floats of -1" coal at 1.58 s.g. Mainly bright coal over whole seam excluding partings, in boreholes 192, 204. Average thickness = 42" Average float yield = 81.2%.
	56/288A1	338	
58/119	56/52 A1	344	Raw coal. Mainly bright coal over the whole seam excluding partings, in boreholes 192, 204. Average thickness = 42".
	A2	116	
	56/288A1	338	
	A2	42	
B SEAM			
58/120	56/307B1	198	Floats of -1" coal at 1.58 s.g. Mainly dull coal to mixed coal at bottom of seam, in boreholes 209, 251, 187, 197, 192, 204, 215, 269. Average thickness = 87½" Average float yield = 76.4%.
	A1	364	
	57/30 C1	146	
	B1	199	
	A1	531	
	56/61 B1	218	
	A1	382	
	56/275B1	150	
	A1	558	
	56/54 B1	163	
	A1	575	
	56/290B1	268	
	A1	477	
	56/456B1	204	
	A1	362	
	57/286B1	309	
	A1	253	
58/121	56/307B1	198	Raw coal. Mainly dull coal to mixed coal at bottom of seam, in boreholes 209, 251, 187, 197, 192, 204, 215 and 269. Average thickness = 87½".
	B2	112	
	A1	364	
	A2	136	
	56/54 B1	163	
	B2	67	
	A1	575	
	A2	45	
	57/30 C1	146	
	C2	144	
	B1	199	
	B2	41	
	A1	531	
	A2	59	

TABLE 5 (Cont.) ...../

TABLE 5 (Cont.)

Sample No.	Components	Parts	Description
B SEAM (Cont.)			
58/121 (Cont.)			
	56/290B1	268	
	B2	102	
	A1	477	
	A2	33	
	56/61 B1	218	
	B2	182	
	A1	382	
	A2	18	
	56/456B1	204	
	B2	56	
	A1	362	
	A2	38	
	56/275B1	150	
	B2	210	
	A1	558	
	A2	102	
	57/286B1	309	
	B2	271	
	A1	253	
	A2	37	
A SEAM			
	57/31 B1	308	Float of -1" coal at 1.58 s.g.
	A1	276	Mainly dull coal to mixed coal over
58/122	56/62 A1	559	the whole seam, in boreholes 251, 187
	57/287B1	238	and 269.
	A1	318	Average thickness = 72"
			Average float yield = 78.7%.

TABLE 6 ...../

TABLE 6

PROXIMATE ANALYSIS AND CALORIFIC VALUES OF COMPOSITE SAMPLES

Sample No.	Seam	H_2O %	Ash %	Vol. Mat. %	Fix. Carb. %	Cal. Val. lb/lb
58/118	C	5.1	12.5	32.0	50.4	11.8
58/120	B	5.5	13.3	26.2	55.0	11.3
58/122	A	4.9	13.5	26.6	55.0	-

Analysis, in Table 6, done on floats -1" at 1.58 s.g.

TABLE 7

DRY ASH-FREE ULTIMATE ANALYSIS, CALORIFIC VALUES AND VOLATILE MATTER

Sample No.	Seam	C %	H %	N %	Org.S %	O and Errors %	C.V. lb/lb	Vol. mat. %
58/118	C	79.6	5.3	2.1	0.6	12.4	14.3	38.8
58/120	B	80.6	4.5	2.1	0.5	12.4	13.9	32.3
58/122	A	80.5	4.7	-	-	-	-	32.6

Analysis, in Table 7, done on floats of -1" coal at 1.58 s.g.

TABLE 8

SULPHUR DISTRIBUTION AND ASH FUSION TEMPERATURES

Sample No.	Seam	Total S %	Organic S %	Mineral S %	A.F.T. °C
58/118**	C	0.70	0.50	0.20	1360
58/119	C	1.53	-	-	1380
58/120**	B	0.52	0.39	0.13	1360
58/121	B	1.16	-	-	1320

**Analysis done on floats of -1" coal at 1.58 s.g.

FIG. 1.

LOCATION OF BOREHOLES.

SPRINGBOKDRAAI 277 IS

SCALE 1:31,000

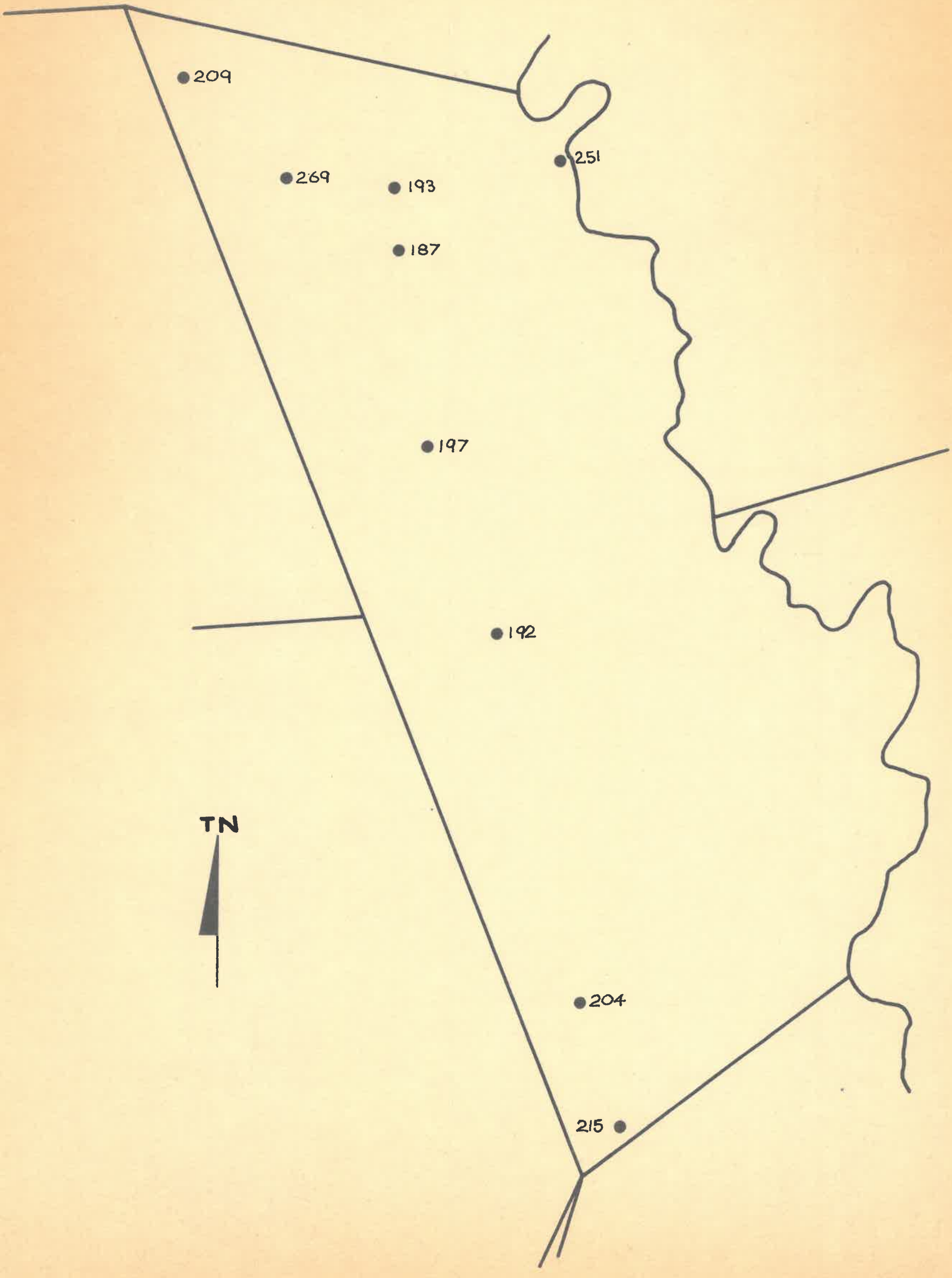
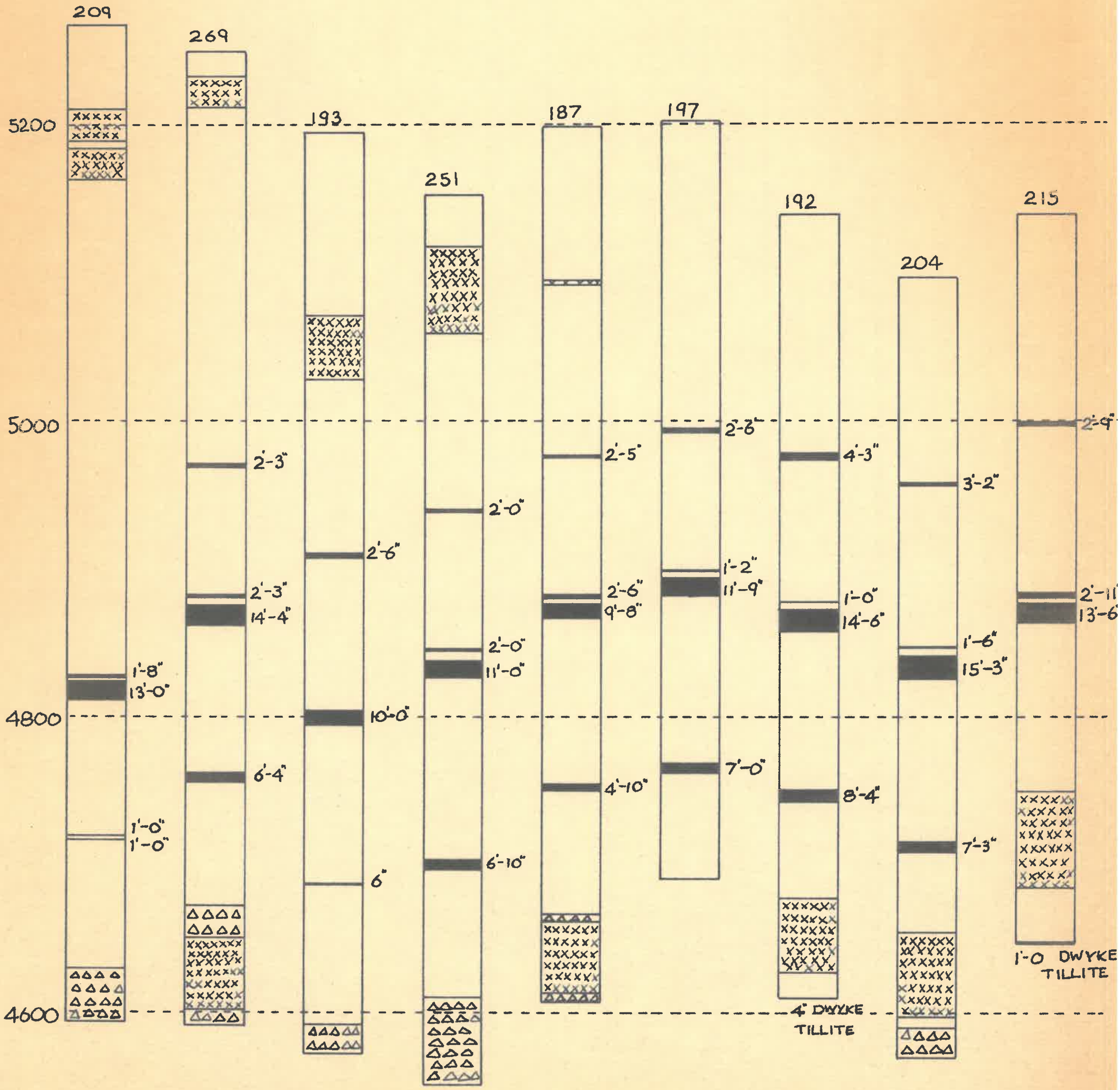


FIG. 2.

BOREHOLE SECTIONS.

VERTICAL SCALE: 1MM. — 4'-0"



FUEL RESEARCH INSTITUTE OF SOUTH AFRICA

A P P E N D I X.

ANALYTICAL METHODS AND THEIR SIGNIFICANCE

I. SAMPLING AND PREPARATION.

Sampling and preparation are carried out according to South African Standard Specification, S.A. No. 13 of 1937, "Standard Methods for the Sampling of Coal in South Africa," issued by the South African Standards Institution.

NOTE: 1. ALL ANALYSES ARE CARRIED OUT ON AIR-DRY COAL.

2. Unless otherwise stated analyses are according to B.S.S. 1016 of 1942, "British Standard Methods for the Analysis and Testing of Coal and Coke".

II. PROXIMATE ANALYSIS:

(1) Moisture Content: This is the loss of weight when heating 1 gram of coal at 105 - 110°C for one hour, expressed as a percentage. Since 1955 all determinations have been conducted in a vacuum oven with nitrogen atmosphere.

(2) Ash Content: This is the residual ash after combusting 1 gram of coal in a muffle furnace. The coal is slowly heated to 775°C (± 25°C) and kept at this temperature until constant weight is reached while air circulates through the furnace. The result is expressed as a percentage.

(3) Volatile Matter Content: This is calculated from the loss of weight obtained by heating 1 gram of coal at 925°C for 7 minutes by subtracting the weight of moisture present in the coal, and expressing the result as a percentage.

(4) Fixed Carbon Content: This is obtained by subtracting the sum of moisture, ash and volatile matter contents, expressed as percentages, from 100.

III. CALORIFIC VALUE:

This value, reported in Evaporative Units (lb/lb), is calculated from the amount of heat generated by combusting 1 gram of coal in oxygen at 25 to 30 atmospheres pressure in a Berthelot or Scholes type of combustion bomb.

The determination...../

The determination is carried out according to South African Standard Specification, S.A. No. 5 of 1940, "The Determination of the Comparative Calorific Values of Coals in South Africa".

IV. SWELLING NUMBER OR INDEX:

This is the ratio of the final to the initial volume of 1 gram of coal heated strongly under standard conditions and is a measure of the swelling propensities of the coal.

This test is based on the "Swelling Index" test described in British Standard Methods for the Analysis and Testing of Coal and Coke, No. 1016 - 1942, p.64.

1 or 1Ag denotes a residue of definite coke structure but no swelling. F denotes a residue easily friable and possessed of no coke structure. P denotes a residue in powder form. A value of 3 or more indicates definite coking possibilities.

V. ULTIMATE ANALYSIS:

For the purpose of further and more detailed investigation composite samples are usually prepared by mixing - in proportion to the amount of coal which they represent - samples of the same type of coal from the same seam. The composition of such samples is usually based on the characteristics of various bands of coal as revealed by their description and proximate analyses, or may be such as to represent a whole seam or an extractable portion thereof.

The ultimate analysis is generally carried out on the float at a s.g. of 1.58 (-16 mesh B.S.S. coal). This procedure is adopted in order to eliminate, as far as possible, the effects due to the presence of adventitious mineral matter.

(a) Carbon and Hydrogen: Two methods are in use viz.,

1. The Fenton Modification of the Belcher and Spooner Method. See: Fenton, G.W., Jnl. Soc. Chem. Ind. (Trans.) 62, 160-3 (1943).

2. The Sheffield High Temperature Method. See: Belcher and Spooner, Fuel Sci. Pract. 20, 130-3 (1941).

In both methods combustion is carried out in a rapid flow of oxygen; the former at 800°C and the latter at ± 1300°C. In the latter method the coal is covered with 0.5 grams of calcined alumina.

(b) Nitrogen: The method followed is that described by Beet, Fuel in Science and Practice, Vol XI, p.196 (1932); Vol. XIII, p.343 (1934) and Hall, Jnl. Chem. Met. and Min. Soc. of S.Afr., Vol. XXVI, No. 2, p.28 (1935), with slight modifications.

(c) Total Sulphur: This is determined by an Eschka fusion method, the sulphur being determined as barium sulphate.

The...../

The results are expressed on a dry ash-free basis, so as to present the composition of the organic substance itself, unmixed with mineral matter.

The oxygen content is obtained by subtracting the sum of the carbon, hydrogen, nitrogen and sulphur percentages from 100. The value obtained therefore includes all analytical errors.

VI. FORMS OF SULPHUR:

The figures showing the forms of sulphur in a sample are on an "as received" basis, i.e. including adventitious mineral matter.

The extraction of the mineral (i.e. "Sulphate" + "Pyritic") sulphur from a sample is done with dilute nitric acid.

The Organic Sulphur is obtained by difference, viz. the difference between the Total Sulphur and the Mineral Sulphur.

The total sulphur content of the floats at 1.58 s.g. is usually also included in the "forms of sulphur" table. This is done for comparative purposes since it indicates the minimum sulphur content obtainable by washing large coal, if the pyrites occur in nodular form. With finely disseminated pyrites in the coal the sulphur content will not be reduced to the extent shown.

VII. CARBONISATION ASSAYS:

Two forms of carbonisation assays are done, viz: the low temperature (600°C) and the higher temperature (900°C). The apparatus and methods are based on those described in "Methods of Analysis of Coal and Coke", D.S.I.R., Fuel Research, Physical and Chemical Survey of the National Coal Resources No. 44, (London, H.M. Stationery Off., 1940).

The Low Temperature assay is used mainly for assessing the coking properties of the coal. Values of D to F for the coke type indicate that the coal may produce metallurgical coke if used as the major component in a blend with a suitable strongly coking coal. Values of G or better indicate that the coal is suitable for coking on its own.

In the High Temperature assay the coal is heated to 900°C and the vapours evolved pass through a cracking unit kept at 800°C. The yields of products obtained are approximately the same as are obtained in coke ovens, or in gas works without steaming.

VIII. FLOAT AND SINK ANALYSIS:

(a) Relatively coarse samples.

In order to assess the beneficiation possible by washing, samples crushed to minus 2" or 1" are subjected to float and sink tests at a selected specific gravity. The yields and quality of the

float are...../

float are comparable with products that could be obtained by washing normal commercial sizes of coal in an efficient heavy medium plant, the quality of the floats being only slightly better than that of the corresponding commercial products.

In certain cases the samples are separated at more than one specific gravity into floats, intermediate fractions and sinks. This gives more complete information, and the quality of the products at different yields and the washability of the coal can be assessed. (The accuracy of the assessment increases with the number of specific gravity fractions).

Separations are sometimes conducted at finer sizes e.g. minus ¼" or 3/16". The results obtained are not normally comparable with washing of ordinary commercial sizes of coal, but indicate results theoretically obtainable if the coal were all crushed to this size before washing.

Analytical samples are prepared of the various fractions. Floats and intermediate fractions are extensively analysed, but only ash content is determined on the sinks.

(b) <u>Samples crushed to -16 mesh B.S.S. (minus 1mm.)</u>

Float and sink tests are conducted on minus 1 mm. coal on 20 gram samples in a centrifuge according to the method described by P.E. Hall in Jnl. Chem. Metal. Min. Soc. of S.A. Vol. 34, No. 8, p.263 (1934).

Samples for ultimate analysis, carbonisation assays, etc., are normally floated at 1.58 s.g. in order to remove high ash components and adventitious mineral matter such as shale, pyrites and carbonates.

Further, in order to obtain information on the specific gravity distribution of the sample, float and sink tests are conducted at a series of specific gravities. The yields are reasonably comparable with results on coarse coal, except that there is a tendency for concentration in the lightest and heaviest fractions. Thus some idea of the ease with which a coal can be washed at various specific gravities can be obtained and, consequently, also of types of suitable washing plants. The ash contents of the cumulative floats are, however, lower than for coarse coal at similar yields, the difference varying from about 1% to 6%, depending on the type of coal and the yield. This difference makes it very difficult to estimate the ash contents on commercial sizes from fine coal float and sink tests.

IX. <u>ASH FUSION TEMPERATURES</u>:

Ash fusion temperatures are usually determined by heating cones of the ash at a standard rate inside a tube furnace in a mildly reducing atmosphere, and observing the

minimum...../

minimum temperature at which the cone will fuse.

Ash fusion temperatures are normally determined on raw coal or coarse coal float samples, and are thus comparable with hand-picked and washed coal. In some cases, where coarse coal float and sink tests were not carried out, ash fusion temperatures are determined on -1mm. coal floated at 1.58 s.g.; the results obtained can only be regarded as giving an indication of the effects of washing.

A direct correlation between ash fusion temperature as determined in the laboratory and behaviour of the ash in practice has not so far been possible. Although the determinations are carried out under conditions designed to resemble as closely as possible those actually obtaining in a furnace, the differences between small and large scale conditions are appreciable. The results indicate, however, the probable behaviour of the ash in practice and the following scheme may be used for interpreting the laboratory results:-

<u>Ash Fusion Temperatures</u>:

(a) below 1250°C - likely to cause clinkering trouble under all furnace conditions;

(b) 1250 - 1400°C - unlikely to produce clinker under general conditions, although trouble may be experienced with appliances like producers and forced draught boilers;

(c) above 1400°C - highly refractory ash which will probably not clinker under any conditions.

_____________oOo_____________

TABLE 3

PROXIMATE ANALYSIS AND CALORIFIC VALUES, (AIR-DRY BASIS)

Bore-hole No.	Sample No.	Thickness in. Excl-uded	Samp-led	Analysis of raw coal Cal. Val. lb/lb	H2O %	Ash %	Vol. Mat. %	Fix. Carb. %	Sw. No.	Analysis of floats (-1" coal) S.G.	Float Yield %	Cal. Val. lb/lb	H2O %	Ash %	Vol. Mat. %	Fix. Carb. %	Sw. No.	Sink Ash %
C SEAM																		
187	56/59 A	4	25	11.7	4.4	13.4	31.8	50.4	0	-	-	-	-	-	-	-	-	-
192	56/52 A		46	-	-	21.8	-	-	-	1.58	74.8	12.1	4.2	11.4	31.2	53.2	0	52.6
193	56/262A	2	15	-	3.9	14.8	30.7	50.6	0	-	-	-	-	-	-	-	-	-
197	56/273A	3½	26½	-	-	13.3	-	-	-	1.58	90.5	12.4	4.7	10.6	32.7	52.0	0	38.8
204	56/288A		38	-	-	17.0	-	-	-	1.58	89.0	11.9	4.9	14.1	32.8	48.2	0	40.4
251	57/28 A	2½	21½	-	-	17.0	-	-	-	1.58	81.0	12.2	6.0	9.6	32.4	52.0	0	48.6
269	57/284A		12	-	4.9	11.3	31.8	52.0	0	-	-	-	-	-	-	-	-	-
TOP SPLIT OF B SEAM																		
187	56/60 A	4	24	11.1	3.3	20.0	33.0	43.7	0	-	-	-	-	-	-	-	-	-
192	56/53 A		12	-	2.9	26.7	31.7	38.7	0	-	-	-	-	-	-	-	-	-
197	56/274A	1	13	-	3.0	18.0	36.1	42.9	½	-	-	-	-	-	-	-	-	-
204	56/289A		16	-	3.4	25.3	31.5	39.8	0	1.58	58.4	-	-	-	-	-	-	-
209	56/306A		16	-	3.2	21.7	33.8	41.3	0	-	-	-	-	-	-	-	-	-
251	57/29 A	3½	19½	11.2	3.3	20.8	33.9	42.0	0	-	-	-	-	-	-	-	-	-
269	57/285A	6	20	-	-	14.5	-	-	-	1.58	91.3	12.4	3.8	12.2	33.3	50.7	0	39.2
B SEAM																		
187	56/61 C		26	-	-	38.2	-	-	-	1.58	16.8	-	-	-	-	-	-	-
	B		40	-	-	23.7	-	-	-	1.58	54.6	10.7	5.3	16.5	25.3	52.9	0	32.4
	A		40	-	-	12.7	-	-	-	1.58	95.5	11.6	5.2	11.9	26.3	56.6	0	29.7
192	56/54 D		12½	-	4.7	24.4	20.4	50.5	0	-	-	-	-	-	-	-	-	-
		17½																
	C		29	-	-	39.0	-	-	-	1.58	4.2	-	-	-	-	-	-	-
	B		23	-	-	21.7	-	-	-	1.58	70.9	11.0	5.4	15.5	25.8	53.3	0	36.8
	A		62	-	-	13.8	-	-	-	1.58	92.7	11.6	5.5	12.2	25.3	57.0	0	34.5
193	56/263A	1	24	-	-	23.3	-	-	-	1.58	74.4	12.1	3.4	15.9	7.2	73.5	0	44.8
197	56/275B		36	-	-	25.3	-	-	-	1.58	41.6	11.0	4.6	16.1	22.9	56.4	0	31.9
	A	4	66	-	-	16.1	-	-	-	1.58	84.6	11.6	4.2	13.0	24.0	58.8	0	33.3
204	56/290C		25	-	-	25.2	-	-	-	1.58	55.7	10.7	4.4	20.3	23.0	52.3	0	31.3
		46																
	B		37	-	-	19.6	-	-	-	1.58	72.5	11.3	5.1	14.1	23.9	56.9	0	34.0
	A		51	-	-	13.2	-	-	-	1.58	93.6	11.8	4.8	12.0	26.1	57.1	0	31.1
209	56/307C		36	8.7	4.9	29.6	22.5	43.0	0	1.58	35.9	-	-	-	-	-	-	-
	B		31	-	-	25.4	-	-	-	1.58	63.8	11.3	5.2	15.2	26.5	53.1	0	43.4
	A		50	-	-	20.1	-	-	-	1.58	72.7	11.7	5.3	12.3	27.2	55.2	0	41.0
215	56/456D		14	10.3	4.0	22.6	24.5	48.9	0	1.58	61.9	-	-	-	-	-	-	-
		11																
	C		57	-	3.7	40.3	16.8	39.2	0	1.58	4.8	-	-	-	-	-	-	-
	B		26	-	-	20.1	-	-	-	1.58	78.6	10.9	4.6	16.5	22.6	56.3	0	33.1
	A		40	-	-	16.4	-	-	-	1.58	90.5	11.7	4.1	14.0	23.5	58.4	0	39.7
251	57/30 D		18	-	-	43.6	-	-	-	1.58	23.5	10.5	4.8	19.3	21.5	54.4	0	51.1
	C		29	-	-	25.7	-	-	-	1.58	50.2	10.4	5.5	17.9	26.2	50.4	0	33.6
	B		24	-	-	19.2	-	-	-	1.58	83.0	11.1	5.3	14.7	25.8	54.2	0	41.2
	A		59	-	-	13.9	-	-	-	1.58	90.0	11.8	5.3	11.4	26.2	57.1	0	36.0
269	57/286B	9	58	-	-	23.8	-	-	-	1.58	53.3	10.8	4.9	16.7	25.0	53.4	0	31.8
		3																
	A		29	-	-	14.7	-	-	-	1.58	87.3	12.1	4.8	9.7	29.6	55.9	0	49.1

TABLE 3 (Cont.)

Bore-hole No.	Sample No.	Thickness in.		Analysis of raw coal						Analysis of floats (-1" coal)								Sink
		Excl-uded	Samp-led	Cal. Val. lb/lb	H_2O %	Ash %	Vol. Mat. %	Fix. Carb. %	Sw. No.	S.G.	Float Yield %	Cal. Val. lb/lb	H_2O %	Ash %	Vol. Mat. %	Fix. Carb. %	Sw. No.	Ash %
A SEAM																		
187	56/62 A		58	-	-	14.4	-	-	-	1.58	96.4	11.8	4.7	13.0	25.6	56.7	0	50.7
192	56/55 C	7	21	-	4.3	36.8	18.0	40.9	0	1.58	2.5	-	-	-	-	-	-	-
	B		48	-	4.2	35.9	19.4	40.5	0	1.58	18.0	-	-	-	-	-	-	-
	A		24	-	-	25.9	-	-	-	1.58	70.3	10.5	3.9	20.9	22.2	53.0	0	37.7
197	56/276A		26	-	-	26.5	-	-	-	1.58	59.7	11.4	2.5	21.4	10.6	65.5	0	34.0
204	56/291A		75	-	2.5	44.7	15.0	37.8	0	1.58	16.4	-	-	-	-	-	-	-
251	57/31 B		50	-	-	20.9	-	-	-	1.58	61.6	11.5	4.9	14.3	27.7	53.1	0	31.5
	A		32	-	-	16.4	-	-	-	1.58	86.4	11.6	4.6	14.0	27.7	53.7	0	31.4
269	57/287B		40	-	-	21.9	-	-	-	1.58	59.5	11.8	4.4	12.5	26.6	56.5	0	35.8
	A		36	-	-	21.0	-	-	-	1.58	88.3	11.7	3.8	14.8	25.8	55.6	0	67.9

TABLE 4

PROXIMATE ANALYSIS AND CALORIFIC VALUES. (AIR-DRY BASIS)

AVERAGE SEAM ANALYSIS

Bore-hole No.	Sample No.	Thickness in.		Analysis of raw coal	Analysis of floats (-1" coal)						
		Excl-uded	Samp-led	Ash %	S.G.	Float Yield %	Cal. Val. lb/lb	H_2O %	Ash %	Vol. Mat. %	Fix. Carb. %
B SEAM											
187	56/61 AB		80	18.2	1.58	75.1	11.3	5.2	13.6	25.9	55.3
192	56/54 AB		85	15.9	1.58	81.8	11.5	5.5	12.9	25.4	56.2
197	56/275AB	4	102	19.3	1.58	63.1	11.5	4.3	13.7	23.8	58.3
204	56/290AB		88	15.9	1.58	83.1	11.6	4.9	12.8	25.3	57.0
209	56/307AB		108*	22.1	1.58	68.3	11.6	5.3	13.3	27.0	54.5
215	56/456AB		72*	17.9	1.58	84.6	11.4	4.3	14.9	23.2	57.6
251	57/30 ABC		114*	18.1	1.58	74.4	11.4	5.3	13.2	26.1	55.3
269	57/286AB	16*	123*	20.8	1.58	70.3	11.4	4.9	13.5	27.1	54.5
A SEAM											
187	56/62 A		58	14.4	1.58	96.4	11.8	4.7	13.0	25.6	56.7
251	57/31 AB		82	19.1	1.58	74.0	11.5	4.8	14.2	27.7	53.4
269	57/287AB		76	21.5	1.58	73.9	11.7	4.1	13.8	26.1	56.0

*These thicknesses include estimated values of the core losses.

TABLE 5 .....