

Zululand Anthracite Colliery SECONDARY PRODUCTS

Zululand Anthracite Colliery 18% Middlings



As Received Basis		As Received Basis	Dry Basis	Min/Max
Total Moisture % (Loss on drying @ 105)	8.0			<11
Air Dry Basis				
Moisture in Analysis Sample %	2.5			
Ash Content (ISO) %	16.0	15.1	16.4	<18
Volatile Matter (ISO) %	3.8	3.6	3.9	<6,5
Fixed Carbon % (By Difference)	77.7	73.3	79.7	>77
Total Sulphur %	1.35	1.27	1.38	<1,4
Gross CV MJ/kg	26.80	25.29	27.49	
Carbon %	76.06	71.77	78.01	
Hydrogen %	2.03	1.92	2.08	
Nitrogen %	1.57	1.48	1.61	
NCV (As Received) MJ/kg	24.71			
NCV (As Received) Kcal/kg	5903			>5800

As Received Basis	
Phosphorus in Coal, P %	0.058
HGI	38
Sulphate Sulphur %	0.09
Pyritic Sulphur %	0.67
Organic Sulphur %	0.49
FSI	0
Ash Fusion Temperature (Reducing)°C	
Initial Deformation Temperature (IDT)	1370
Spere Temperature (STI)	1400
Hemisphere Temperature (HT)	1430
Flow Temperature (FT)	1460

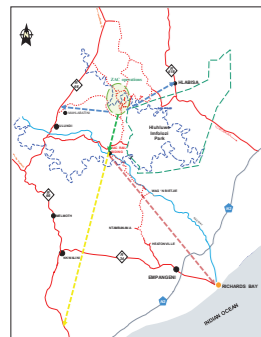
Analysis of the Ash	
SiO ₂	49.74%
Al ₂ O ₃	28.19%
Fe ₂ O ₃	11.70%
CaO	2.14%
MgO	0.81%
TiO ₂	1.44%
K ₂ O	3.34%
Na ₂ O	0.41%
SO ₃	1.21%
P ₂ O ₅	0.37%
MnO ₂	0.15%

Air Dry Basis - Sizing	
+10mm	29.6
10 x 8mm	10.6
8 x 6.7mm	7.4
6.7 x 4mm	14.5
4 x 2mm	12.3
2 x 1mm	8.0
1 x 0.5mm	5.6
-0.5mm	12.0

LOCATION OF OPERATIONS & LINK TO INFRASTRUCTURE

The ZAC resource was discovered in 1985 by BHP Billiton. Mining operations were started in 1987. The Mine is located on the border of the Hluhluwe-Umfolozi Game Reserve, about 100km from Richards Bay in Northern KwaZulu-Natal. The closest town is Ulundi. Menar (Pty) Ltd acquired Zululand Anthracite Colliery in September 2016.

TEST	METHOD
Total Moisture	ISO 589
Moisture in Analysis Sample	SANS 5925
Ash Content	ISO 1171
Volatile Matter	ISO 562
Total Sulphur	ASTM D4239
* Sizing	ISO 1953
# Hardgrove Gridability Index	ASTM D409
* Phosphorus in Coal	XRF
# Free Swellinh Index	ISO 501
# Ash Fusion Temperature - Reducing	ASTM D1857 & ISO 540
# Major and Minor Elements, in Ash (Dry Basis)	AS 1038.14.2:2003
# Ultimates	DS373



HEAD OFFICE

7th Floor, Fredman Towers,
13 Fredman Drive, Sandown,
Johannesburg, Gauteng 2196
South Africa

CONTACT US

marketing@zulac.co.za
+27 35 874 7309
www.zac.co.za

PLANT ADDRESS

Emakhalathini
KwaZulu-Natal

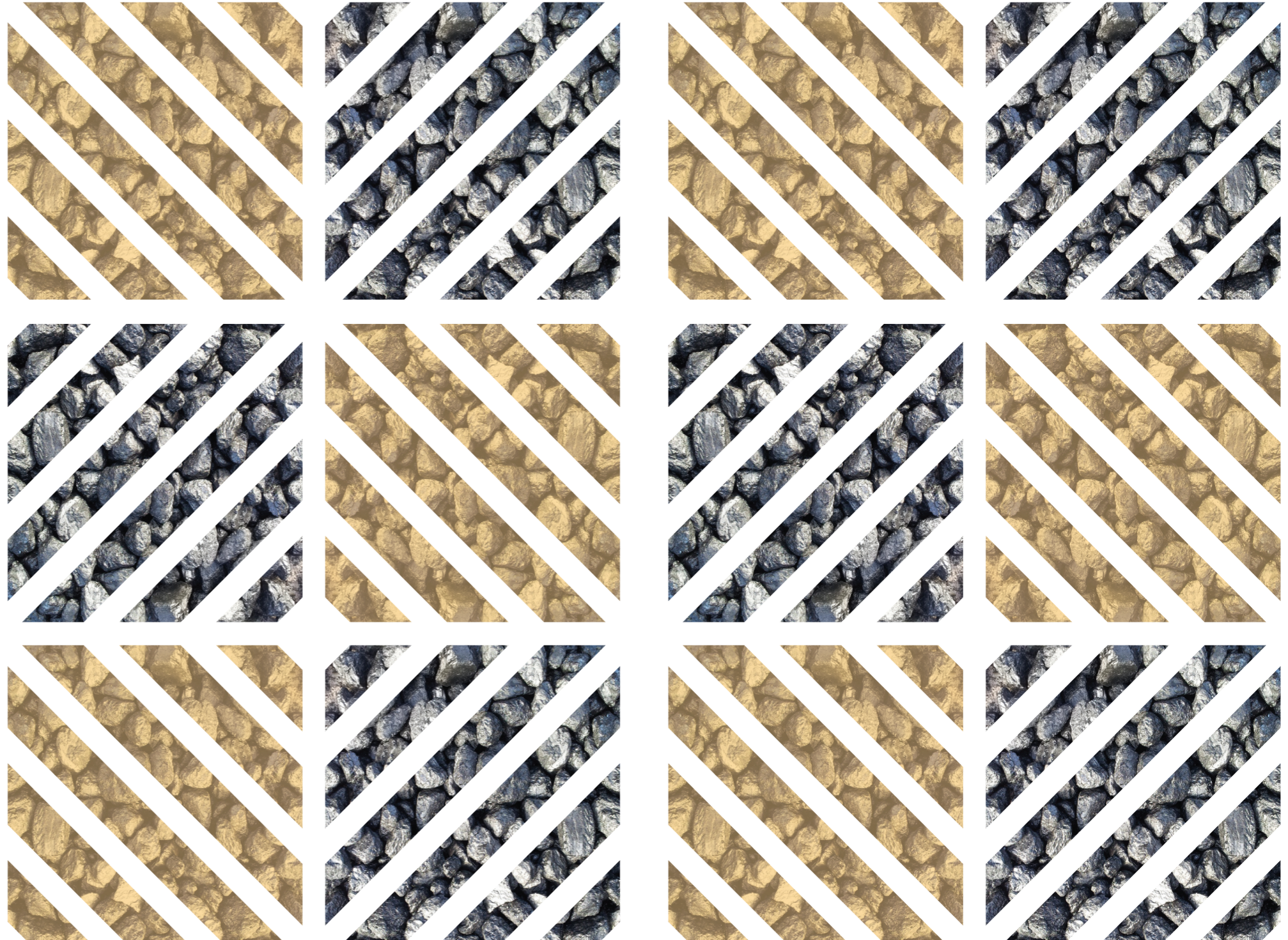
SOCIAL MEDIA

- @Zulac_SA
- @zululandanthracitecolliery
- ZAC Zululand Anthracite Colliery
- @zululandanthracitecolliery



Zululand Anthracite Colliery

QUALITY CHARACTERISTICS
OF PRODUCTS FROM
ZULULAND ANTHRACITE COLLIERY



Zululand Anthracite Colliery CORE PRODUCTS

Zululand Anthracite Colliery Prime Duff

Typical or indicative		Prime Duff 0.5 x 10mm	Min/Max
Maximum total moisture	%	8	10
Size distribution Indicative		Size range (mm)	%
		+10	3
		10 x 6	20
		6 x 1	70
		1 x 0.5	5
		-0.5mm	2
Moisture in analysis sample (ad)	%	2,3	
Volatile Matter (db)	%	4,8	<6.5
Ash Content (db)	%	9	<10
Fixed Carbon (db)	%	86,2	>84.0
Total Sulphur (db)	%	0,9	<1.0
Gross CV (db)	MJ/kg	31,6	
Gross CV (db)	Kcal/kg	7547	
NCV (as received) @ max total H2O	MJ/kg	27,89	
NCV (as received) @ max total H2O	Kcal/kg	6662	>6500
Ultimates			
Carbon (daf)	%	94,15	
Hydrogen (daf)	%	2,96	
Nitrogen (daf)	%	1,69	
Phosphorus in Coal	%	0,015	
Chlorine	%	0,014	
Flourine	%	0,005	
Hardgrove Index		28	
Abrasive Index	mgFe	265	
Forms of Sulphur			
Sulphate Sulphur	%	0,24	
Pyritic Sulphur	%	0,17	
Organic Sulphur	%	0,44	
Total Sulphur	%	0,85	
Forms of Silica			
Total Silica	%	48,7	
Free Silica	%	6,63	
Combined Silica	%	42,1	
AFT (reducing)			
Deformation	°C	1450	
Softening	°C	1460	
Hemisphere	°C	1465	
Flow	°C	1480	
ASH Cinsituents			
SiO ₂	%	48,7	
Al ₂ O ₃	%	28,9	
Fe ₂ O ₃	%	12,2	
CaO	%	1,56	
MgO	%	0,76	
TiO ₂	%	1,89	
K ₂ O	%	3,3	
Na ₂ O	%	0,24	
SO ₂	%	0,53	
P ₂ O ₃	%	0,39	

Zululand Anthracite Colliery Prime Coarse

Typical or indicative		Prime 20 x 50mm	Min/Max	Prime 8 x 20mm	Min/Max
Maximum total moisture	%	5.0	8.0	7.0	8.0
Size distribution Indicative		Size range (mm)	%		%
		+53	<5	+25	<1
		53 x 40	10	25 x 20	4
		40 x 31,5	23	20 x 16	29
		31,5 x 25	30	16 x 10	59
		25 x 20	22	10 x 8	5
		-20	10	-8	2
Moisture in analysis sample (ad)	%	2,4		2,4	
Volatile Matter (db)	%	4,7	<6.5	4,7	<6.5
Ash Content (db)	%	9,5	<10.5	9	<10.5
Fixed Carbon (db)	%	85,8	>83.0	86,3	>83.0
Total Sulphur (db)	%	0,9	<1.10	0,9	<1.10
Gross CV (db)	MJ/kg	31,56		31,83	
Gross CV (db)	Kcal/kg	7538		7604	
NCV (as received) @ max total H2O	MJ/kg	28,48		28,73	
NCV (as received) @ max total H2O	Kcal/kg	6802	>6700	6862	>6700
Ultimates					
Carbon (daf)	%	94,19		94,13	
Hydrogen (daf)	%	2,94		2,93	
Nitrogen (daf)	%	1,75		1,81	
Phosphorus in Coal	%	0,021		0,016	
Chlorine	%	0,016		0,012	
Flourine	%	0,004		0,003	
Hardgrove Index		27		27	
Abrasive Index	mgFe	165		264	
Forms of Sulphur					
Sulphate Sulphur	%	0,08		0,08	
Pyritic Sulphur	%	0,2		0,2	
Organic Sulphur	%	0,6		0,56	
Total Sulphur	%	0,88		0,84	
Forms of Silica					
Total Silica	%	48,6		49,3	
Free Silica	%	6,8		6,97	
Combined Silica	%	41,8		42,3	
AFT (reducing)					
Deformation	°C	1450		1460	
Softening	°C	1455		1465	
Hemisphere	°C	1465		1470	
Flow	°C	1480		1480	
ASH Cinsituents					
SiO ₂	%	48,6		49,36	
Al ₂ O ₃	%	29,9		30	
Fe ₂ O ₃	%	11,5		11	
CaO	%	1,8		1,31	
MgO	%	0,56		0,6	
TiO ₂	%	1,65		1,17	
K ₂ O	%	3,03		3,19	
Na ₂ O	%	0,22		0,23	
SO ₂	%	0,25		0,1	
P ₂ O ₃	%	0,52		0,42	

Zululand Anthracite Colliery 15,5% Middlings

Typical or indicative		Middlings 0 x 10mm	Min/Max
Maximum total moisture	%	8	10
Size distribution Indicative		Size range (mm)	%
		>10	<5
		10 x 6	10
		6 x 1	50
		1 x 0.5	10
		<0.5	20
Moisture in analysis sample (ad)	%	2,3	
Volatile Matter (db)	%	5	<6.5
Ash Content (db)	%	15,5	<16.5
Fixed Carbon (db)	%	79,5	>77.0
Total Sulphur (db)	%	0,9	>1.20
Gross CV (db)	MJ/kg	29,06	
Gross CV (db)	Kcal/kg	6942	
Ultimates			
Carbon (daf)	%	93,93	
Hydrogen (daf)	%	2,89	
Nitrogen (daf)	%	1,68	
Phosphorus in Coal	%	0,018	
Chlorine	%	0,013	
Flourine	%	0,004	
Hardgrove Index		27	
Abrasive Index	mgFe	232	
Forms of Sulphur			
Sulphate Sulphur	%	0,06	
Pyritic Sulphur	%	0,4	
Organic Sulphur	%	0,45	
Total Sulphur	%	0,9	
AFT (reducing)			
Deformation	°C	1330	
Softening	°C	1340	
Hemisphere	°C	1345	
Flow	°C	1355	

High Ash

		Typical	Limits	Rejection
Total Moisture	(As Received Basis)	8.3%	13.0% max	-
Inherent Moisture	(Air Dried Basis)	3.5%	-	-
Ash	(Air Dried Basis)	28.0%	32.0% max	-
Volatile Matter	(Air Dried Basis)	6.0%	10.0% max	-
Total Sulphur	(Air Dried Basis)	1.45%	1.45% max	1.60% max
Net Caloric Value	(As Received Basis)	4,300 - 4800kcal/kg	4,300kcal/kg min	4,200kcal/kg min
Hardgrove Grindability Index (HGI)	-	40	-	-
Size	0 - 10mm	90%	-	-
Size	10mm above		10% max	-