MINERGY COAL: MASAMA COAL PROJECT, BOTSWANA: WEST BLOCK COAL RESOURCE, INDEPENDENT COMPETENT PERSONS REPORT

Report Prepared for:

Minergy Coal (Pty) Ltd.

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29 September 2017

EXECUTIVE SUMMARY

GM Geotechnical Consultants CC (GM Geotech) was commissioned by Minergy Coal (Pty) Ltd (Minergy or Client), to prepare a resource estimate and competent persons report on the Coal Resources of the West Block (Focus Area) of the Masama Coal Project in accordance with the SAMREC Code (2016)[1] and applicable requirements of Section 12 of the Botswana Stock Exchange (BSE) Listing Requirements (2003)[4].

The document details the estimate of the Coal Resources as at 30 September 2017 and incorporates all valid exploration and other relevant data available up to this date, viz. historic Shell Coal Botswana (Pty) Ltd. data, information collected by Minergy during an exploration and drilling programme conducted during 2012, 2016 as well as the new information collected by Minergy during an exploration and drilling programme conducted during the first semester of 2017.

Project Outline

The Masama Coal Project is located in the Kweneng and Kgatleng Districts of eastern Botswana and lies approximately 50 km north of Gaborone (Figure 1). The larger Prospecting License (PL278/2012) area is outlined with a solid black line in Figure 1. Minergy has previously defined the West Block (WB), Central Block (CB) and East Block (EB) coal prospects outlined with purple stippled lines in Figure 1 and previously drilled and delineated Coal Resources on the WB and CB. Historically an area overlapping with the WB and CB and the area in between, was extensively explored by Shell Coal Botswana (Pty) Ltd. between 1974 and 1982 (see Table 1). More recently Minergy has identified significant shallow Coal Resources in two coal seams within the "Focus Area" as outlined in red in Figure 1.

The prospecting licence (PL278/2012) for the Masama Coal Project, entitles Minergy Coal (Pty) Ltd. as the holder to the exclusive right to prospect for coal and coalbed methane and to access the land to which the prospecting licence relates. The licence covers an area of 420 km². The current licence is valid until 30 September 2017 and is currently being renewed for a further two-year period.

The entire licence representing the Masama project is in a category of land in Botswana called Communal or Tribal Land. Tribal land is administered by Land Boards who are empowered to grant, acquire, repossess and rezone tribal land.

The Directors of Minergy Coal (Pty) Ltd. have confirmed by means of a written statement that there are no pending or existing legal proceedings against the company that may have an influence on the current prospecting licence or the Company's ability to apply for a mining licence.

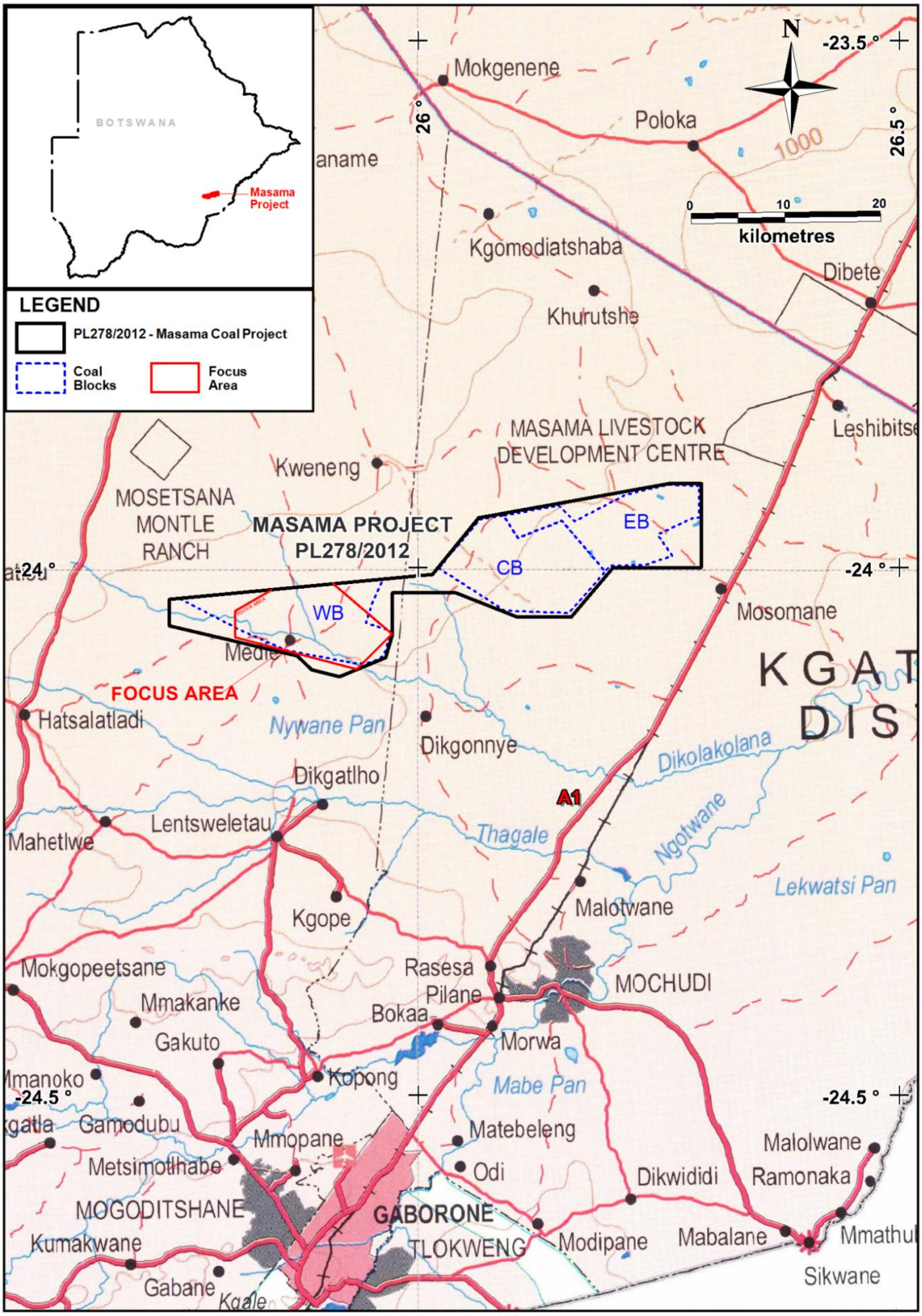

Figure 1: Masama Coal Project locality map. The Masama Project License (PL PL278/2012) area is outlined in solid black; the West Block, Central Block and East Block are outlined in stippled purple and the "Focus Area" in solid red.

Accessibility, Physiography and Infrastructure

Botswana has a well-developed transportation network and the Masama Project can be accessed by gravel roads with further access within the project areas by tracks. The project is located close to Botswana's main A1 highway, which also has a railway line, pipelines and power lines running parallel to it. Collectively this is often referred to as "Botswana's Infrastructure Corridor".

The project area is generally flat with one small drainage line. Vegetation in the area is classified as tree savannah. Land use in the area is predominantly for subsistence agriculture, livestock (cattle) and limited crop cultivation. Land in the area has been extensively utilised and the diversity of natural fauna is low.

One small village (Medie) is located within the "Focus Area". The Masama Coal Project and therefore the "Focus Area" is close to the existing transmission grid in Botswana.

Project History

Parts of the area representing the Masama Coal Project were previously explored by Shell Coal Botswana between 1974 and 1982. Shell confirmed the presence of high quality coal at shallow depths. Minergy was able to source much of the exploration data collected by Shell and have also verified their results.

In 2013 after initial exploration by Minergy, Coffey Mining estimated an Inferred Coal Resource in accordance with the JORC Code (2012)[16] for five seams and in two areas of the project. The current report covers only two coal seams in a much smaller "Focus Area".

During 2014 Minergy conducted a Scoping Study (Coffey, 2014)[6] on a large export focussed opencast mine with Coffey Mining. Only certain aspects of this study such as hydrogeological and environmental studies are considered directly relevant to the current report. The Scoping Study was based on preliminary technical and economic assessments, and included Inferred Mineral Resources.

Geological Setting and Coal Deposit Type

The Masama Coal Project is located within the Mmamabula Area of the Southern Belt of the Central Kalahari Sub-Basin of Botswana. The Mmamabula Coalfield is contiguous with and forms the western extension of the Waterberg Coalfield of South Africa.

Geologically the Masama Coal Project area is underlain by coal, coaly mudstone and sandstone of the Mmamabula Formation of the Ecca Group of the Karoo Supergroup (Figure 2).

Five major coal seams and a coal sequence are developed in the Masama Coal Project area. These are from the base upwards, the E Seam, A Seam, A Sequence, A Upper Seam, K Seam and G Seam. In this report, coal resources were only estimated for the E, A and A Upper Coal Seams in a Focus Area within the western portion (West Block) of the project area.

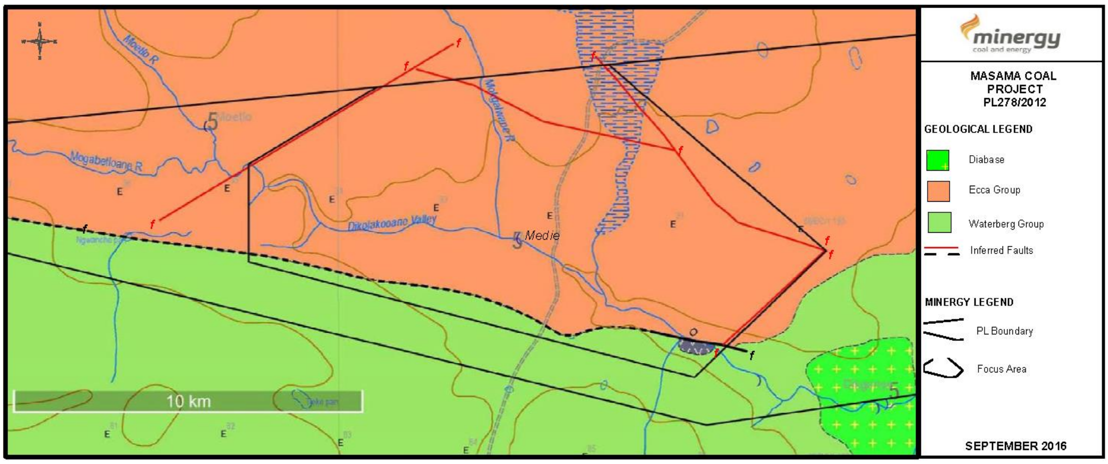

Figure 2: Regional geological map.

The strata in the Masama Coal Project area are generally flat, dipping gently at less than 3° towards the north-east. Two major “structural highs” were regionally identified by Shell in their exploration of the area. These were identified as the large “Central High”, which separates the West and the Central Blocks and also the smaller “South West High”, which lies in the central area of the West Block. The current exploration focused on the environs of the South West High as described by Shell. The “highs” are is now rather interpreted as a sub-crop area of the A and E Coal Seams, that has been impacted by deep weathering. A few faults, trending northeast-southwest and northwest-southeast, were identified by Shell and more recently by GM Geotech. The southern boundary of the coal-bearing Ecca Group with the Waterberg Group is interpreted as a faulted-contact.

Exploration Data and Information

The past (1974 – 1982) and present (2012, 2016 and 2017) exploration drilling programmes conducted by Shell Coal Botswana (Pty) Ltd and Minergy Coal (Pty) Ltd respectively are summarized in Table 1.

Aeromagnetic data flown by the Fugro Airborne Surveys for, and on behalf of, the Botswana Government (DGS) in 1986 were used to identify major geological boundaries, structures and the presence of late Karoo aged intrusives affecting the Masama Coal deposit.

The main objectives of the exploration programmes were to verify the historic results and to infill the historic Shell and Minergy boreholes in order to estimate Inferred, Indicated and Measured Coal Resources on the Masama Coal Project in accordance with the guidelines of the SAMREC code (2016)[1] and SANS guide (SANS10320:2004)[2].

All the boreholes were drilled as either HQ or TNW diameter core. All boreholes were drilled vertically.

Table 1: Summary of exploration programmes (historical reports and information provided by the Client).

COMPANY	DATE	No. OF BH	CORED	OPEN-HOLED	WIRELINE LOGGING	BH SPACING
Shell Coal Botswana (Pty) Ltd	1974-1975	4	3	1*	BPB	-
	1976	11	6	5	BPB	-
	1980	25	14	11	Mini-Logger	±2 – 2.5 km
	1981-1982	76	31	45	BPB	±1.2 – 2 km
Minergy Coal (Pty) Ltd	2012	20*	20	0	Poseidon Geophysics	2.5 -3km
	2016	11	11	0	Poseidon Geophysics	±500 m.
	2017	68	46	22	Poseidon Geophysics	±350 m; 500m & > 1km

*** West Block and Central Block boreholes**

138 Boreholes fall within the Focus area, of which 67 are cored holes.

Down-the-hole geophysical logging was conducted on most boreholes drilled by Shell (1982)[14] and on all boreholes drilled by Minergy. The typical suite of data collected was long spaced density, short spaced density, gamma and calliper.

Core was logged and sampled in accordance with Minergy's protocols and samples were submitted to various SANAS accredited laboratories for coal quality analyses (float sink wash tests at a range of densities); and Letaba Civil Engineering Materials Laboratory (Pty) Ltd. (T0549) for foundation indicator analyses. Samples were prepared and analysed using SABS, ASTM and ISO standard methods.

Various site visits were conducted by Gerhard Mulder (Geologist), Pauline Venter (Technical Assistant), Dan Ferreira (Surveyor and Mine Planner), and by D.S. Coetzee (Geologist) during 2016. Karin van Deventer (CP), Gerhard Mulder (Geologist), Pauline Venter (Technical Assistant), Van Reenen Jewaskiewitz (Mining Consultant) and Dan Ferreira (Surveyor and Mine Planner) visited the site collecting and obtaining various aspects of physical information during 2017.

The CP is not aware of any material changes that have occurred in relation to the Masama Coal Project up to the date of this report. Work undertaken prior to the inspection by the Competent Person has been validated and the information can be relied on.

As far as the CP has been able to ascertain, the information provided by the Client was complete and not incorrect, misleading or irrelevant in any material aspect. The CP has no reason to believe that any material facts have been withheld.

The consultants who have provided input to this CPR are listed alphabetically by name below:

Name	Professional Registration	Qualification	Professional Membership	Company	Discipline
Dan Ferreira		Mine Surveyor's Certificate of Competency	South Africa Institute of Mine Survey (SAIMS)	Dan Ferreira Technical Services cc	Mine Surveying and Mine Planning
Faan Coetzee	Pr. Sci. Nat.	BSc Geol.; BSc Hons Geol.; MSc Geology; PhD. Geology	MGSSA	GM Geotechnical Consultants	Structural & Coal Geology & Coal Resources
Gerhard Mulder		BSc Geol.	MGSSA	GM Geotechnical Consultants	Coal Geology and Geotechnical work
John Astrup	Pr. Sci. Nat.	BSc; BSc Hons Geol.; MSc Exploration Geology	GSSA, FFF	Minergy Coal (Pty) Ltd	Exploration planning and management. Core logging and sampling.
Karin Van Deventer	Pr. Sci. Nat.	BSc Hons Geol.; MSc Geology	GSSA, FFF	Sugar Bush Consultancy in association with GM Geotechnical Consultants	Coal Geology & Coal Resources
Pauline Venter				GM Geotechnical Consultants	CAD Operator and technical field assistant
Van Reenen Jewaskiewitz	Pr. Cert. Eng.	Certificate Mine Overseer (COAL)	ECSA SAIMM	Consultant	Mining Methods and Mine Planning

The author and lead Competent Person responsible for this report is Karin van Deventer of Sugar Bush Consultancy, an experienced coal geologist and an associate of GM Geotech.

Coal Resource Estimates

The Coal Resource estimate was conducted in accordance with the South African Code for Reporting of Mineral Resources and Mineral Reserves Code (SAMREC 2016)[1], as well as considering the South African guide to the systematic evaluation of coal resources and coal reserves (SANS10320:2004)[2]. As part of the resource estimation process all available geological and geophysical data were reviewed in detail and during classification of the resource consideration was given to the consistency of the coal seam thicknesses and coal quality over the West Block as well as the larger Masama Coal Project Prospecting License area.

Dassault Systèmes GEOVIA Minex™ Version 6.5.1, Golden Software Surfer® Version 11 and Model Maker® Version 12.02 were used for the structural, physical and quality modelling of the coal resource. Seam volumes were calculated in Minex™ and utilized to calculate coal tonnages. The Minex growth algorithm was used to interpolate coal qualities and physical parameters.

Boundaries to the resource estimate took into account data derived from Shell Coal Botswana (Pty) Ltd.'s structural interpretation (Shell 1982)[14]; an interpretation of the southern faulted contact from the Botswana Government aeromagnetic data and published geological maps; the Prospecting License boundaries and recent structural as well as sub-outcrop interpretations by the author.

The seam thickness constraint applied to opencast operations of the E, A and A Upper Coal Seams was a minimum thickness of 0.5 m. The coal seams are foreseen to be mined by opencast methods in areas where the in situ strip ratio is less than 5:1 (cubic meters waste per tonnes coal). The remaining resource will be mined by underground methods.

The seam thickness constraint applied for underground operations of the E and A Coal Seams was a minimum thickness of 1.2 m.

The values of the critical coal quality parameters, namely calorific value, ash content, inherent moisture content and volatile matter content as reflected in the resource summary table (Table 2) implies that all the coal meets a raw coal quality of < 50% ash on an air dried basis. Theoretical yields and associated qualities are listed as indication of potential saleable products.

The proposed resource areas for the A Upper, A and the E Coal Seams as defined in accordance with the current information is shown in Figures 3 to 5 respectively.

The Masama Coal Resources is partly classified as Measured and Indicated Resources with the majority as Inferred Resources. A discount factor of 8%, 12% and 20% were respectively applied to the resource classes for unforeseen geological losses. The classification and the discount factors applied is the result of consideration of the confidence levels of drilling techniques, logging, drill sample recovery, sub-sampling techniques and sample preparation, quality of assay data, verification of sampling and assaying, location of sampling points, data density and distribution, database integrity, geological interpretation, seam deposit type, estimation and modelling techniques and consistency of physical coal parameters and coal qualities.

A summary of the Coal Resource estimate is presented in Table 2 below.

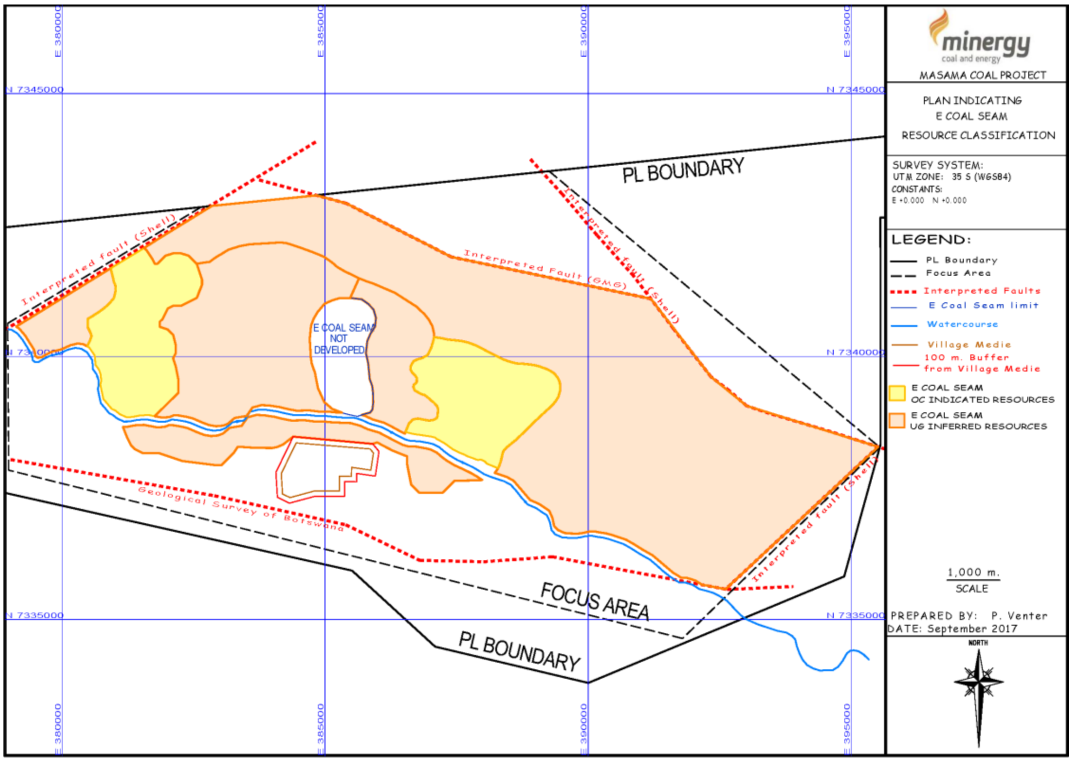

Figure 3: E Coal Seam Resource Classification plan.

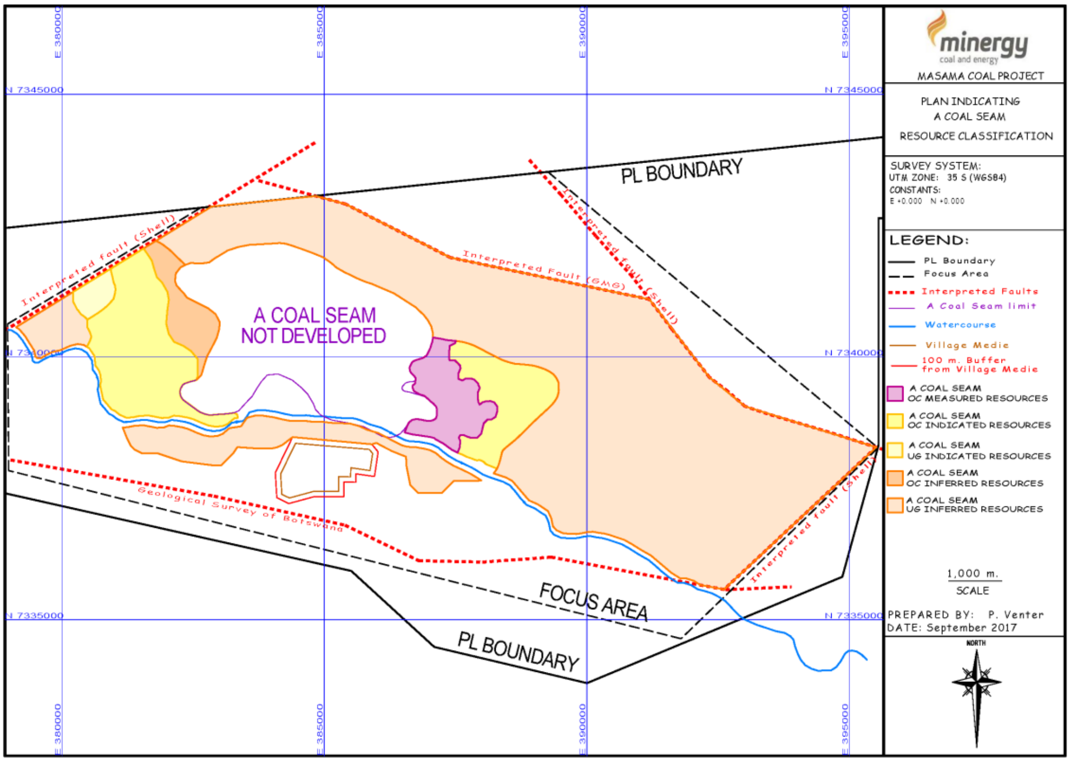

Figure 4: A Coal Seam Resource Classification plan.

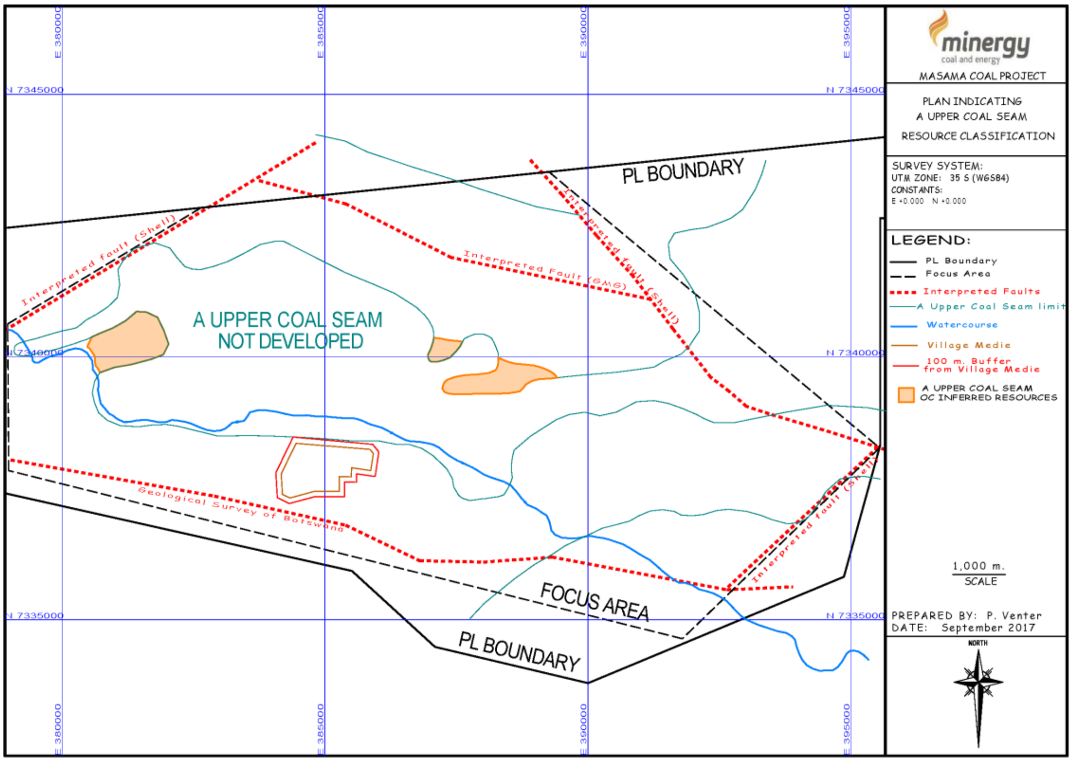

Figure 5: A Upper Coal Seam Resource Classification plan.

Table 2: Mineable Tonnes In Situ Coal Resource Summary – “Focus Area”.

Masama Coal Resources, Raw Coal Qualities and Modelled Theoretical Product Yields and Qualities as at 29 September 2017

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	Seam Thickness	*Raw Coal Qualities on an air dried basis*						
						Raw RD	Raw CV	Raw Ash	Raw Inherent Moisture	Raw Volatile Content	Raw Fixed Carbon	Raw Total Sulphur
			(%)	(tonnes)	(m)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)
OC	*Measured*	A	8%	12 706 952	4.80	1.51	22.5	19.1	5.73	25.5	49.7	2.10
	Indicated	A	12%	47 649 094	5.02	1.57	22.3	19.6	5.69	25.1	49.6	1.75
	Indicated	E	12%	18 486 934	1.55	1.55	21.6	24.3	4.83	25.9	45.0	2.26
	Inferred	AU	20%	3 420 903	1.27	1.66	18.0	33.2	4.70	22.1	40.0	1.53
Opencastable Resource			***12%***	***82 263 884***								

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	Seam Thickness	Raw RD	Raw CV	Raw Ash	Raw Inherent Moisture	Raw Volatile Content	Raw Fixed Carbon	Raw Total Sulphur
			(%)	(tonnes)	(m)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)
UG	*Indicated*	A	12%	7 069 391	4.70	1.58	21.8	20.6	5.83	24.4	49.2	1.51
	Inferred	A	20%	206 375 994	4.68	1.55	22.9	19.3	4.71	25.5	50.4	1.90
	Inferred	E	20%	94 208 868	1.71	1.52	22.0	23.2	5.20	25.9	45.7	1.91
Underground Mineable Resource			***20%***	***307 654 254***								
TOTAL COAL RESOURCE				***389 918 137***								

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	*Product Coal Quality and Theoretical Yields*							
					Product Float RD	Product CV	Product Ash	Product Inherent Moisture	Product Volatile Content	Product Fixed Carbon	Product Sulphur	Product Yield
			(%)	(tonnes)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)	(%)
OC	*Measured*	A	8%	12 706 952	1.55	26.0	10.1	6.55	26.7	56.7	0.40	66.4
	Indicated	A	12%	47 649 094	1.53	26.0	9.7	6.62	26.7	57.0	0.34	58.3
	Indicated	E	12%	18 486 934	1.63	26.5	10.4	5.61	30.7	53.4	0.47	71.3
	Inferred	AU	20%	3 420 903	1.72	21.0	24.4	5.44	24.6	45.6	1.00	66.0

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	Product Float RD	Product CV	Product Ash	Product Inherent Moisture	Product Volatile Content	Product Fixed Carbon	Product Sulphur	Product Yield
			(%)	(tonnes)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)	(%)
UG	*Indicated*	A	12%	7 069 391	1.53	26.0	9.0	6.94	26.7	57.3	0.40	56.3
	Inferred	A	20%	206 375 994	1.61	26.0	11.2	5.31	26.5	56.9	0.37	70.1
	Inferred	E	20%	94 208 868	1.69	26.5	11.2	4.74	30.6	53.4	0.73	71.6

Interpretation and Conclusions

A total Coal Resource of 390 Mt has been estimated for E, A and A Upper Coal Seams within the Focus Area of the West Block of the Masama Coal Project. This Resource can be further broken down as follows:

Opencast: A Seam Coal Resource

- *12.71 Mt Measured Coal Resource*
- *47.65 Mt Indicated Coal Resource*

Opencast: AU Coal Seam Resource

- *3.42 Mt Inferred Coal Resource*

Opencast: E Coal Seam Resource

- *18.49 Mt Indicated Coal Resource*

No A Upper Coal Seam is included into the Underground resource statement due to its localised occurrence and its limited seam thickness.

Underground: A Seam Coal Resource

- *7.07 Mt Indicated Coal Resource*
- *206.4 Mt Inferred Coal Resource*

Underground: E Seam Coal Resource

- *94.21.4 Mt Inferred Coal Resource*

A total of 82.26 Mt of opencast and 307.7 Mt underground mineable coal in situ is reported.

Coal seam thickness distribution on the E, A and A Upper Coal Seams are shown for the Opencast and Underground Resource classes, indicating predominantly thicker coal seams with the exception of the A Upper Coal seam.

Table 3: Coal Seam Thickness distribution within the resource classes.

Resource Class	Mining Method	Seam	Seam TH Class	% of Total
Measured	OC	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.0%
			1.2m to 1.6m	0.0%
			>1.6m	100.0%
Indicated	OC	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.0%
			1.2m to 1.6m	0.0%
			>1.6m	100.0%
Indicated	OC	E Seam	<0.5m	0.0%
			0.5m to 1.2m	0.5%
			1.2m to 1.6m	33.4%
			>1.6m	66.1%
Inferred	OC	AU Seam	<0.5m	0.5%
			0.5m to 1.2m	15.2%
			1.2m to 1.6m	36.4%
			1.2m to 1.6m	47.9%
Indicated	UG	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.0%
			1.2m to 1.6m	0.0%
			>1.6m	100.0%
Inferred	UG	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.1%
			1.2m to 1.6m	0.3%
			>1.6m	99.7%
Inferred	UG	E Seam	<0.5m	0.1%
			0.5m to 1.2m	0.8%
			1.2m to 1.6m	23.2%
			>1.6m	75.9%

The Measured and Indicated Coal Resource Areas show very good potential towards beneficiation practices, and can be washed to a 26.5 MJ/kg product for the E Coal Seam and 26.0 MJ/kg for the A Coal Seam. The A Upper Coal Seam may also be beneficiated to a

21.0 MJ/kg product. Theoretical yields range from more than 55% to 70% on the different product specifications.

Technical Studies

In 2014 Minergy completed a Scoping Study on a large export focussed opencast coal mine, which covered an area that completely overlaps with Section A of the Focus Area in this report. Some of the technical studies completed for the Scoping Study are relevant to a small to medium size coal mine as envisaged for the Masama Coal Project. The Scoping Study referred to above was based on preliminary technical and economic assessments. It is preliminary in nature, and included Inferred Mineral Resources which are insufficient to provide certainty that the conclusions of the Scoping Study will be realised.

Further Technical studies were initiated on the Masama Coal Project during 2016 and 2017, including Geotechnical Studies, Hydrological Studies, Environmental Studies (including several specialist studies, one of which covered Acid Mine Drainage), and a Coal Market Study.

Other Relevant data and Information

The Masama Coal Project is located near to Jindal Steel and Power's 2.4 Bt Mmamabula East Coal Project as well as the 670 Mt Mmamabula South and Central Coal Projects (Anglo Coal Botswana). Morupule Coal Mine, Botswana's only operating coal mine is located some 200 km northeast of Masama near the town of Palapye in southeast Botswana. The Waterberg Coalfield across the border to the east of Masama in the RSA hosts several operating coal operations including the Grootegeluk Coal Mine (Exxaro) as well as other advanced projects like Eskom's Medupi and Matimba coal-fired power stations, which have a combined capacity of ~8 000 MW. Risk factors identified are discussed in Section 9.2 of this report.

Risks to the project are as follows:

- The local influence of large- and small-scale geological structures on the coal deposit;
- Drainage line and roads passing through the potential mining area; as well as the proximity of the village Medie situated near opencast mining areas and on top of potential underground resources within the potential mining area;
- The possible influence of mining operations on groundwater resources;
- Acid Mine Drainage from coal discards or from carbonaceous material that is backfilled into the pit voids;
- The depth of weathering and its impact on the exact position where opencast mining will commence;
- Variation in E Seam thickness impacting on underground coal resources and mining methodologies;
- Majority of the Coal Resource still falls within the Inferred category;

- Insufficient power supply;
- Distance to some potential markets.

Project risks are discussed in full in Section 9.2 of the report.

Recommendations

Much of the coal resource still is classified as Inferred Coal Resources, but continuity in both thickness and coal quality has been proven in the adjacent Measured and Indicated Coal Resources. It is therefore believed that there is good potential to increase the resource base through further exploration.

Infill drilling is recommended to firm up the boundary along the sub-crop on both the A and E Coal Seams.

It is highly recommended that a laser derived ground digital terrain model must be developed for the Masama Coal Project Focus Area prior to finalizing the mine planning.

The potential coal products that could be produced and their potential markets should be examined in more detail.

Minergy has met its historic expenditure commitments, with total spend on the project to June 2017 more than ZAR30 m. Historic expenditure by Shell is estimated at ZAR 6.7 m in present terms. Minergy plans further exploration and related work for the Masama Coal Project as shown in Table 3 over the next two years. The timing and quantum of the proposed expenditure are in line with that proposed to the Department of Mines in the renewal application.

Table 4: Masama Coal Project proposed work programme and budget for period October 2017 to September 2019.

Work Item	Cost ZAR million	Comments
Fully cored (Diamond) Drilling 500 m	1.32	Includes drilling, field costs, assays, DH geophysics, interpretation and updated resource estimates
Percussion Drilling 500 m	0.30	Includes drilling, field support, DH geophysics, and interpretation
Complete EIA and related studies	1.30	Includes all aspects of the EIA studies as well as water studies
Complete Mining and Processing Studies	4.20	Includes all aspects of mining and processing components as well as related studies and preparation of a Mining Licence application
Total	**7.08**	

This Executive Summary represents a true reflection of the content of the full report.

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1. INTRODUCTION

1.1 Terms of reference and scope of work (1.1 (i); 9.1 (i), (ii), (iii); 10.1 (i), (ii))

GM Geotechnical Consultants CC (GM Geotech) was commissioned by Minergy Coal (Pty) Ltd. (Minergy or the Client), to prepare a resource estimate and competent persons report on the Coal Resources in the E, A and A Upper Coal Seams of the West Block (Focus Area) of the Masama Coal Project utilising historic data as well as the new exploration information collected by the Client in collaboration with GM Geotech in 2016 and 2017. This report is prepared in accordance with the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves Code (SAMREC 2016)[1], as well as considering the South African Guide to the Systematic Evaluation of Coal Resources and Coal Reserves (SANS 10320:2004)[2]. This standard provides a detailed framework for public reporting on coal resources and reserves, and define common terminology (Figure 1) to be used. Applicable requirements of Section 12 of the Botswana Stock Exchange Listing Requirements (2003)[4] were considered and complied with.

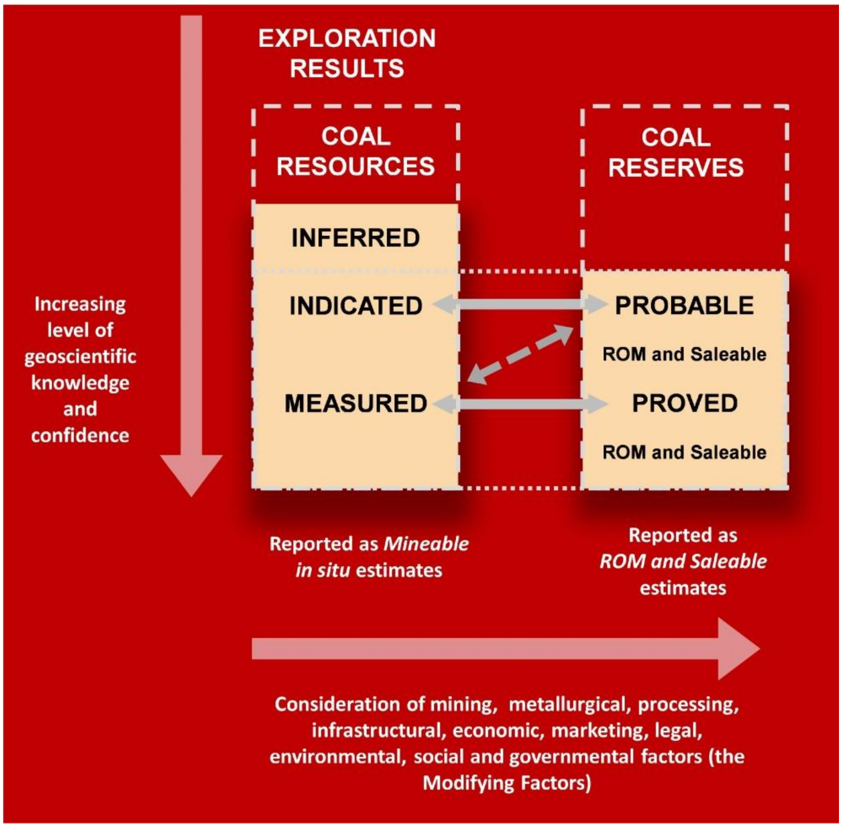

Figure 1: Relationship between Coal Resources and Coal Reserves.

All the relevant requirements of the SAMREC Code (2016)[1] Table 1 have been complied with. A compliance checklist is provided in Appendix 2 of this report, which cross references the SAMREC Table 1 checklist to the content of this report.

The competent person with overall responsibility for reporting of Mineral Resources is Karin van Deventer, MSc Geochemistry; Pr. Sci. Nat. (400705/15); GSSA (965295), who is a consulting geologist at Sugar Bush Consultancy and works in association with GM Geotech. Van Deventer has extensive experience in the field of coal geology including exploration projects to operational opencast and underground mines and the associated data management and modelling thereof.

Neither GM Geotech nor the author employed in the preparation of this report has any beneficial interest in the assets of Minergy Coal (Pty) Ltd. or any of its holding companies or parent companies.

The person responsible for estimating the coal resources is satisfied that, based on the information made available, the estimates presented in this report are reasonable and are appropriate for the type of deposit, its location and the current and proposed methods of exploitation.

The effective date of this report is 29 September 2017.

1.2 Sources of information (3.1 (iii))

Sources of information used to conduct the Coal Resource estimate described in this report include the following:

- Historic drilling data (including borehole logs, downhole geophysical logs, analytical data and interpretations including resource estimates) from Shell Coal Botswana;
- Historical reports by Shell Coal Botswana;
- Drilling data collected by Minergy (2012), and Minergy Coal and GM Geotech (2016 & 2017) including borehole logs, downhole geophysical logs and analytical results and interpretations;
- Independent Competent Persons reports:
    - Coal Resource Estimate of the Masama Coal Project – Coffey Mining (Coffey 2013)[5];
    - Scoping Study – Mine A, Masama Coal Project – Coffey Mining (Coffey 2014)[6] The Scoping Study was based on preliminary technical and economic assessments, and included Inferred Mineral Resources;
    - Minergy Coal (2016): Masama Coal Project, Botswana: West Block Coal Resource, Independent Competent Persons Report (Coetzee, 2016) [32]**;**
    - Masama Coal Asset Valuation – Coffey Mining South Africa (Coffey 2016)[32]**.**
- Published geological maps and reports on the region and some on its coal deposits;
- Reports on adjacent properties;
- Aeromagnetic data collected by Fugro on behalf of the Department of Geological Survey of Botswana (DGS);
- Technical Studies (discussed in Section 8)
    - Geotechnical
    - Geohydrology
    - Environmental
    - Coal Market Report

1.3 Units and currency (1.2 (i))

This report makes use of metric units, coal qualities are reported on an air dried basis.

References to currency in the report are in South African Rand (ZAR) unless otherwise stated.

All maps presented in this report either have co-ordinates in Longitude Latitude (WGS84) or metres using the UTM35S (WGS84) projection and datum, unless otherwise stated.

1.4 Site inspection and field involvement of CP (1.1 (iii))

Various site visits were conducted by Gerhard Mulder (Geologist), Pauline Venter (Technical Assistant), Dan Ferreira (Surveyor and Mine Planner), and by D.S. Coetzee (Geologist) during 2016. Karin van Deventer (CP), Gerhard Mulder (Geologist), Pauline Venter (Technical Assistant), Van Reenen Jewaskiewitz (Mining Consultant) and Dan Ferreira visited the site collecting and obtaining various aspects of physical information during 2017.

As far as the CP has been able to ascertain, the information provided by the Client was complete and not incorrect, misleading or irrelevant in any material aspect. The CP has no reason to believe that any material facts have been withheld.

Activities during site visits included:

- Logging and sampling of fully cored exploration boreholes drilled during the 2016 and 2017 drilling program;
- Examination of selected borehole core from the 2012, 2016 and 2017 drilling program;
- Verification of collar positions of boreholes drilled by Shell and Minergy;
- Examination of surface geological exposures in the project area;
- Structural field mapping (D.S. Coetzee 2016).

1.5 Disclaimers and reliance on other experts or third party information

This Independent Competent Person's Report was prepared by Karin van Deventer (in association with GM Geotechnical Consultants CC (GM Geotech)) based on information largely provided by Minergy; as well as the results of the 2016 and 2017 exploration drilling conducted under supervision of Minergy in collaboration with GM Geotech. The data supplied by Minergy includes independent third party technical reports along with other relevant published and unpublished third-party information. Where possible, GM Geotech have verified the information from independent sources after making due enquiry of all material issues that are required in order to comply with the SAMREC Code (2016)[1].

The consultants who have provided input to this CPR are listed alphabetically by name below:

Name	Professional Registration	Qualification	Professional Membership	Company	Discipline
Dan Ferreira		Mine Surveyor's Certificate of Competency	South Africa Institute of Mine Survey (SAIMS)	Dan Ferreira Technical Services cc	Mine Surveying and Mine Planning
Faan Coetzee	Pr. Sci. Nat.	BSc Geol.; BSc Hons Geol.; MSc Geology; PhD. Geology	MGSSA	GM Geotechnical Consultants	Structural & Coal Geology & Coal Resources
Gerhard Mulder		BSc Geol.	MGSSA	GM Geotechnical Consultants	Coal Geology and Geotechnical work
John Astrup	Pr. Sci. Nat.	BSc; BSc Hons Geol.; MSc Exploration Geology	GSSA, FFF	Minergy Coal (Pty) Ltd	Exploration planning and management. Core logging and sampling.
Karin Van Deventer	Pr. Sci. Nat.	BSc Hons Geol.; MSc Geology	GSSA, FFF	Sugar Bush Consultancy in association with GM Geotechnical Consultants	Coal Geology & Coal Resources
Pauline Venter				GM Geotechnical Consultants	CAD Operator and technical field assistant
Van Reenen Jewaskiewitz	Pr. Cert. Eng.	Certificate Mine Overseer (COAL)	ECSA SAIMM	Consultant	Mining Methods and Mine Planning

The author has reviewed and is satisfied with the work of the various contributors to this report

Neither GM Geotech, nor the author of this report, is qualified to provide extensive comments on legal facets associated with ownership and other rights pertaining to the Masama Coal Project.

GM Geotech and its associates accept no liability for any losses arising from reliance upon the information presented in this report. A final draft of this report was provided to Minergy, along with a written request to identify any material errors or omissions, prior to finalization.

2. PROJECT OUTLINE

2.1 Property description (1.1 (i); 1.2 (i))

The Masama Coal Project is an advanced exploration project located in south eastern Botswana and comprises PL278/2012, a prospecting licence granted to Minergy Coal (Pty) Ltd for Coal and Coalbed Methane. Minergy has been actively exploring the property for shallow coal resources since 2012 and has identified significant coal resources at shallow depths on parts of the project. The project spans an area of 420 km^2 and has been divided into three large blocks, known as the West Block, Central Block and East Block (Figure 2). The focus of most exploration has been the West Block, which covers an area of approximately 120 km^2. The Coal Resources defined in this report are from the E, A and A Upper Coal Seams within a portion of the West Block, referred to as the "Focus Area". At present studies are underway to evaluate an opencast coal mine and associated wash plant and other support infrastructure in the West Block of the project area.

2.2 Property location (1.2 (i); 1.3 (i); 3.1 (iv))

The Masama Coal Project is located in the Kweneng and Kgatleng Districts of eastern Botswana and lies approximately 50 km north of Gaborone (Figure 2). The larger Prospecting License (PL278/2012) area is outlined with a solid black line in Figure 2. Minergy has previously defined the West Block (WB), Central Block (CB) and East Block (EB) coal prospects outlined with purple stippled lies in Figure 6 and previously drilled and delineated Coal Resources on the WB and CB. Historically an area overlapping with the WB and CB and the area in-between, was extensively exploded by Shell Coal Botswana (Pty) Ltd between 1974 and 1982 (see Table 10). More recently Minergy has identified significant shallow Coal Resources in two coal seams within the "Focus Area" (outlined in red in Figure 2).

The Masama Coal Project is located near to Jindal Steel and Power's 2.4 Bt Mmamabula East Coal Project and also proximate to the 670 Mt Mmamabula South and Central Coal Projects (Anglo Coal Botswana). Morupule Coal Mine, Botswana's only operating coal mine is located some 200 km northeast of Masama near the town of Palapye in southeast Botswana. The Waterberg Coalfield across the border to the east of Masama in the RSA hosts several operating coal operations including the Grootegeluk Coal Mine (Exxaro) as well as other advanced projects like Eskom's Medupi and Matimba coal-fired Power Stations, which have a combined capacity of ~8,000 MW.

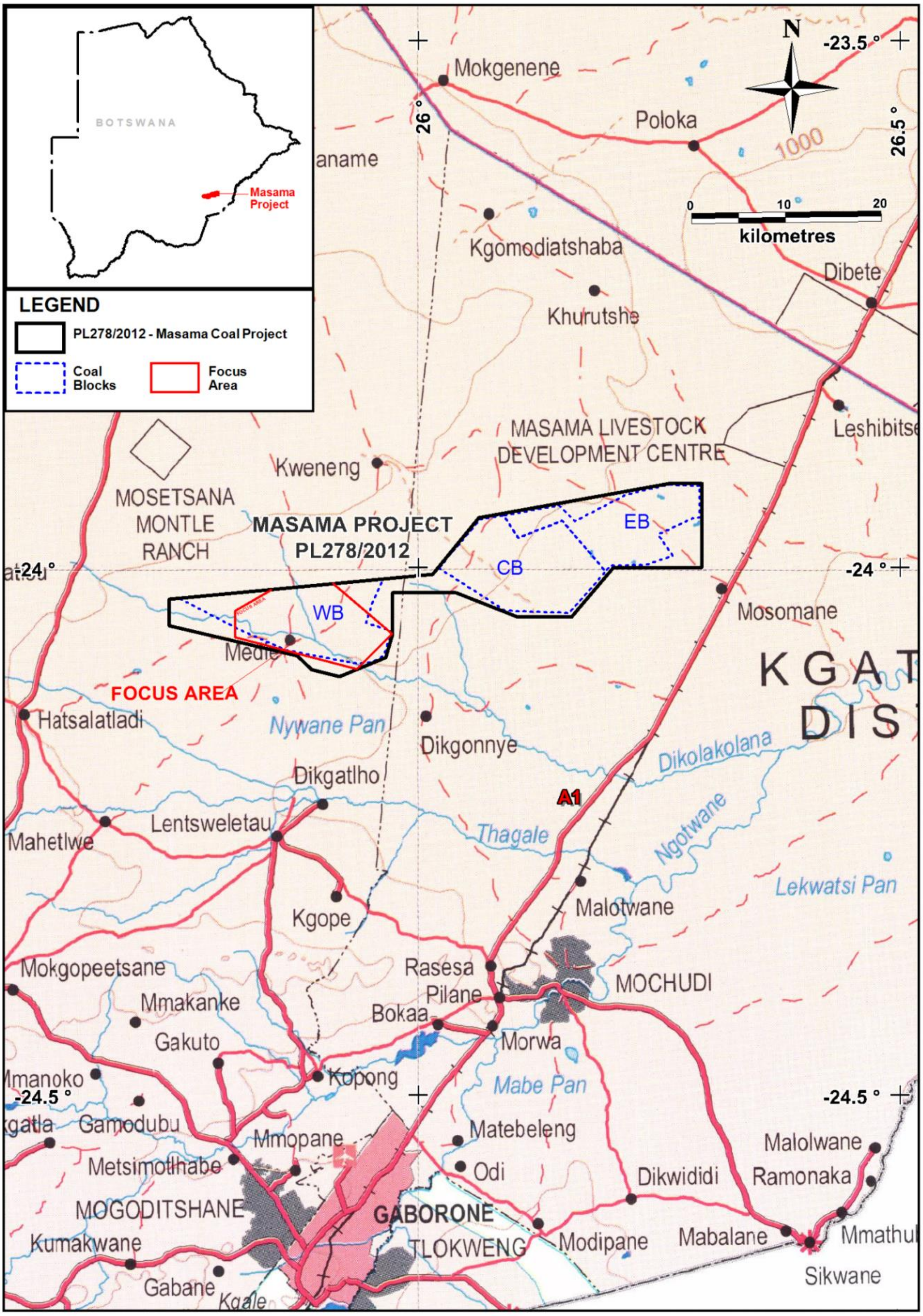

Figure 2: Location of the Masama Coal Project showing the Masama Prospecting Licence area (PL278/2012) outlined in Black; the West Block (WB); the Central Block (CB) and the East Block (EB) as previously defined outlined in purple; as well as the proposed "Focus Area" outlined in red.

2.3 Country profile (1.2 (ii))

Botswana, one of Africa's most stable countries, is a large (581,730 km^2), landlocked country. Botswana gained independence from Britain in 1966 and in the years that followed, supported by the discovery of diamonds, it has been one of the fastest growing economies in the world and moved into the ranks of upper-middle income countries. The country is the continent's longest continuous multi-party democracy. It is relatively free of corruption and has a good human rights record. Gaborone is the capital city of Botswana and the major languages are English (the official language) and Setswana.

Botswana is sparsely populated (~2 million people) and protects some of Africa's largest areas of wilderness. Safari-based tourism, which is tightly-controlled and often upmarket, is an important source of income.

Botswana has a well-established mining industry with many service providers located in Gaborone. A full range of modern banking, shopping, educational and recreational facilities are available within Gaborone. Most Government Ministries and Departments have their main offices in Gaborone.

Botswana is the world's largest producer of diamonds, which has transformed it into a middle-income nation. Botswana faces a key policy dilemma of how to grapple with the predicted decline in previously buoyant diamond revenues. Projections of future diamond revenues are uncertain. While diamonds may not be fully exhausted for another generation, output is already well past its peak. While Botswana has made some progress in reducing its dependence on diamonds in the past twenty years, the level of economic diversification needed to offset diminishing mineral revenues will remain a challenge. Information was obtained from the following websites:

http://www.bbc.com/news/world-africa-13040376[7]

http://www.worldbank.org/en/country/botswana/overview[8]

2.4 Legal aspects and permitting (1.2 (ii); 1.5 (i), (ii), (iii), (iv), (v); 5.5 (i), (ii))

Botswana has a modern mining law, which is comparable to some of the best mining legislation in the world.

A full list of legislation relevant to the project is provided below:

Legislation	Responsible Government Entity	Comments
Mines and Minerals Act, 1999 and regulations	Department of Mines	Provides guidance on the licensing procedure for extraction of all minerals including water.
Explosives Act, 1962	Department of Mines	To provide control of the manufacture, importation, sale, transport, storage, use and disposal of explosives
Mines, Quarries, Works and Machinery and Regulations	Department of Mines	Act to provide for safety, health and welfare of persons engaged in prospecting, mining and quarrying operations (including related works). Makes provision for inspection and regulation of mines, quarries, works and machinery used.

Tribal Land Act, 1968	Land Board	The Act governs access to and administration of land within all tribal areas of Botswana. It sets out regulations and procedures for land allocations. Land Boards handle the administration of land in tribal areas and oversee land allocation and development of all land in all their areas of jurisdiction.
Environmental Assessment Act, 2011	Department of Environmental Affairs (DEA)	The Act provides for the carrying out of an EIA for all projects that may have adverse effects on the environment. DEA is mandated to review the Scoping Report, Terms of Reference (TOR) and Final Report.
Monuments and Relics Act, 2001	Department of National Museum & Monuments	The Act ensures preservation and protection of ancient monuments, ancient workings, relics and other objects of aesthetic, archaeological, historical or scientific interest. It requires that any activity, which may result in the disturbance of the land through excavation and extraction, should be subjected to an Archaeological Impact Assessment to ensure that no archaeological sites are destroyed during excavation. A detailed AIA for the Masama Project will be undertaken.
The Forest Act, 1968	Department of Forestry and Range Resources	The Act provides for the utilization and protection of forest produce. It serves to declare certain areas as forest reserves and provides for regulations for such reserves. Recognition is given to the use by local communities of forest resources for firewood, building materials, medicine and utensils through the forest. The project implementation will ensure adequate protection of the forests within the project area
Water Act, 1968	Department of Water Affairs	The Act defines the ownership of any rights to the use of water and provides for the grant of water rights and servitudes. The Act states that there will be no right of property in public water including groundwater and water in any natural streams, rivers, lakes and dams. It covers all aspects of water abstraction and disposal of effluent into natural streams.
Wildlife Conservation and National Parks Act, 1992	Department of Wildlife and National Parks.	The Act provides for the protection of wildlife and conservation of National Parks. Even though most of the District supports more livestock than wildlife.
Waste Management Act, 1998	Department of Waste Management and Pollution Control	The Act provides for the minimization of pollution of the environment, and the conservation of natural resources; the planning, facilitation and implementation of advanced systems for the regulation of trans-boundary movements of waste and its disposal. Any waste produced during the project should be managed in accordance with the Act.
Herbage Preservation (Prevention of Fires) Act, 1977	Department of Forestry and Range Resources	This Act aims to prevent and control bush and other fires with Sections (4, 6 and 9) concerning fire control and firebreaks, and the penalties for contravention (Section 14). Since the project is implemented in a bushy area, it is important that the provisions of this Act are followed in order to prevent bush fires
Agricultural Resources (Protection) Act, 1973	Department of Forestry and Range Resources	The Act provides for the protection of Botswana's agricultural resources, which are defined as animals, birds, plants, soils, vegetation, veld products, fish etc. There will be vegetation clearing during project development and therefore the Act applies.
Borehole Act, 1956	Department of Water Affairs	Provides guidelines on the manner in which boreholes in the country need to be drilled and the extraction rates.
Road Traffic Act, 2008	Department of Road Transport and Safety	Many sections of this Act are relevant to the proposed development just as they are to everyday life on the roads of Botswana, with general compliance clearly essential to the health and safety of all road users including project contractors.
Atmospheric Pollution (Prevention) Act, 1971	Department of Waste Management and Pollution Control	The Act provides a regulatory framework for industrial activities and other activities that have emissions into the atmosphere in order to reduce pollution. Since the proposed project involves excavation for mining it must be implemented within the provisions of the Act to minimize the dust impact

The various types of mineral licences are briefly explained below:

- Prospecting Licence
    - A prospecting licence is valid for an initial three-year period with two renewals each not exceeding two years. Further extensions may be granted. The maximum size for a prospecting licence is 1,000 km^2 and the area must be

reduced by half at the end of each renewal or at a lower proportion as the Minister may agree.

- Applicants for a prospecting licence must have access to adequate financial resources and technical competence to carry out effective prospecting.

➢ Retention Licence

- A holder of a prospecting licence may apply for a retention licence in relation to an area and a mineral after carrying out a feasibility study in respect of the deposit and the study has established that the deposit cannot be mined profitably at the time of application
- A retention licence is valid for three years, renewable once for a further three years.

➢ Mining Licence

- A holder of a prospecting licence, retention licence or a waiver may apply for a mining licence.
- A mining licence can be granted for a period not exceeding twenty-five years, with unlimited renewal periods not exceeding twenty-five years each.

Minergy's Prospecting Permit (PL278/2012)

The prospecting licence (PL278/2012) for the Masama Coal Project, Minergy Coal (Pty) Ltd. as the holder to the exclusive right to prospect for coal and coalbed methane. The licence covers an area of 420 km². The first term of the licence period for PL278/2012 commenced on 1 October 2012 and expired on 30 September 2015, a period of three years. The licence was then renewed for a two-year period from 1 October 2015 to 30 September 2017. The licence is renewable for a further two-year period, giving a total exploration period of seven years (before extensions). A renewal application of the prospecting licence was lodged on 28 June 2017 and is currently being processed. The Department of Mines in Botswana has provided Minergy Coal with a letter confirming they are working on the renewal and will make a recommendation to the Minister to extend the current licence for a period of 3 months. A prospecting licence confers various rights to its holder, including that the holder may enter upon any land to which his prospecting permit relates together with his servants and agents.

Minergy plans to apply for a mining licence prior to the end of the standard seven-year exploration period. In order to apply for a mining licence Minergy will need to complete an Environmental Impact Assessment and Environmental Management Plan, which are to be approved by the Department of Environmental Affairs. Minergy is not aware of any governmental or statutory requirement that would prevent it from applying for a mining licence.

Surface Rights

A prospecting licence confers various rights to its holder, including that the holder may enter upon any land to which his prospecting permit relates together with his servants and agents, and may, prospect thereon for the mineral(s) to which his prospecting licence relates, drill boreholes and make such excavations as may be necessary, and erect camps and put up temporary buildings for machinery necessary for prospecting purposes.

These rights are accordingly conferred to Minergy in terms of PL278/2012.

The entire licence representing the Masama Coal Project is in a category of land in Botswana called Communal or Tribal Land in accordance with Botswana's Tribal Land Act Chapter 32.02, 2008 (1968)[9], and none of the Masama Coal Project area falls in a national conservation area or similar. Tribal Land is vested in various Land Boards (regulated organisations of the state in terms of the Tribal Land Act) in trust for the benefit and advantage of the citizens of Botswana. The Tribal Land category represents ~70% of all land in Botswana (State Land and Freehold represents the difference), mainly consisting of rural areas, which are not free hold title. Each land board has a specific area of jurisdiction and subject to approval of the Ministry of Lands and Housing has the power to allocate (free of charge) use of land (evidenced by a section 13 certificate of grant from the land board), but not ownership to citizens and non-citizens in accordance with a prescribed process. In the Masama Coal Project area existing land allocations have mainly been for cattle posts and low productivity ploughing fields. Land Boards are empowered to acquire, repossess and rezone tribal land where any customary land rights (e.g. ploughing field) have been granted, and compensation is calculated in accordance with a published schedule which categorises the nature of the buildings or similar relating to the applicable area. Once the Land Board has cleansed the area of any customary land rights, the "Surface rights" to the planned mine at Masama are to be secured mainly by way of Agreement of Grant of Lease (which is a Common Law Grant of lease) between Minergy and the Land board. An Agreement of Grant of Lease may be granted for a period of up to ninety-nine years. The Agreement of Grant of Lease is to be registered with the Deeds Registry, upon the approval by the Director of Surveys and Mapping of various prescribed surveys, plans, diagrams and maps to be completed by a registered surveyor.

Legal Proceedings

From the Effective Date of this CPR until the date this CPR was issued, the CP is not aware of any material changes that have occurred in relation to the Masama Coal Project. Work undertaken prior to the inspection by the Competent Person has been validated and the information can be relied on.

The Directors of Minergy Coal (Pty) Ltd have confirmed by means of a written statement that there are no pending or existing legal proceedings against the company that may have an influence on the current prospecting licence or the Company's ability to apply for a mining licence.

2.5 Royalties and liabilities (1.2 (ii); 1.6 (i); 1.7 (i))

In Botswana, the holder of a Mining Licence is liable to pay royalties on a monthly basis to the government. The royalties are calculated as a percentage of gross market value (defined for the purposes of the royalty calculation as the sale value receivable at the mine gate in an arm's length transaction without discounts, commissions, or deductions) and are as follows for different commodities:

- 10% Precious Stones
- 5% Precious Metals
- 3% Other Mineral or Mineral Products

Coal products produced at Masama would incur a 3% royalty.

Botswana mining companies (for all minerals other than diamonds) are using the following formula to determine tax due:

Annual Tax Rate = 70 – 1500/x

Where x = taxable income/gross income

An effective corporate tax rate of 22% of profit will be applicable.

Mining activities by their nature create changes to the local environment and once mining operations are complete the areas affected will need to be rehabilitated. Minergy intends to conduct progressive rehabilitation of the mined areas as mining progresses. Currently in Botswana there is not a requirement to make a financial provision for mine closure, however, it is understood that as a matter of policy the regulator requires a closure plan as part of the EMP for the project.

3. ACCESSIBILITY, PHYSIOGRAPHY, CLIMATE, LOCAL RESOURCES AND INFRASTRUCTURE

3.1 Access (1.1 (ii), 1.2(i); 5.4 (i))

Botswana has a well-developed transportation network with good quality paved roads as well as numerous gravel roads providing access to most of the country.

The road running north from Gaborone to Lentsweletau and on to Medie provides access to the West Block of the Masama Coal Project, while the A1 highway from Gaborone to Francistown provides access to the east of the Masama Coal Project licence area (refer to Fig. 6). The road from the A1 to the village of Dikonnye provides access to the Central portion of the project area. Running parallel to the A1 highway, are a railway line, pipelines and power lines. Collectively this is often referred to as “Botswana’s Infrastructure Corridor”.

Secondary roads and tracks as well as new drilling tracks provide access within the Masama Coal Project area. Notably several of the old north-south and east-west lines cleared by Shell in the 1970’s and 1980’s, are still visible and in many cases are still in use as field tracks. At present the Masama Coal Project base camp and core shed are in the village of Medie.

Access to the Masama Coal Project area is possible throughout the year. However, during the summer when most rainfall occurs, some of the secondary gravel roads may become muddy at times. The smaller sandy tracks present throughout the Masama Coal Project area remain driveable at all times as the rainwater drains away quickly in the sandy soil.

3.2 Topography, elevation, fauna and flora (1.1 (ii), 1.2 (iii))

The Masama Coal Project area is generally flat with elevation ranging from ~900 to ~1100 m above mean sea level (Figure 3). One small drainage line, the Dikolakolana drainage runs through the west of the area with only very minor drainage lines elsewhere. Most of the area is underlain by sandy soil and rainwater tends to drain away very quickly.

Vegetation in the Masama Coal Project area is classified as tree savannah and more specifically, arid sweet bushveld and northern Kalahari tree and bush savannah.

Land use in the area is predominantly for subsistence agriculture, livestock (cattle) and limited crop cultivation. Land in the area has been well utilised and the diversity of natural fauna tends to be low.

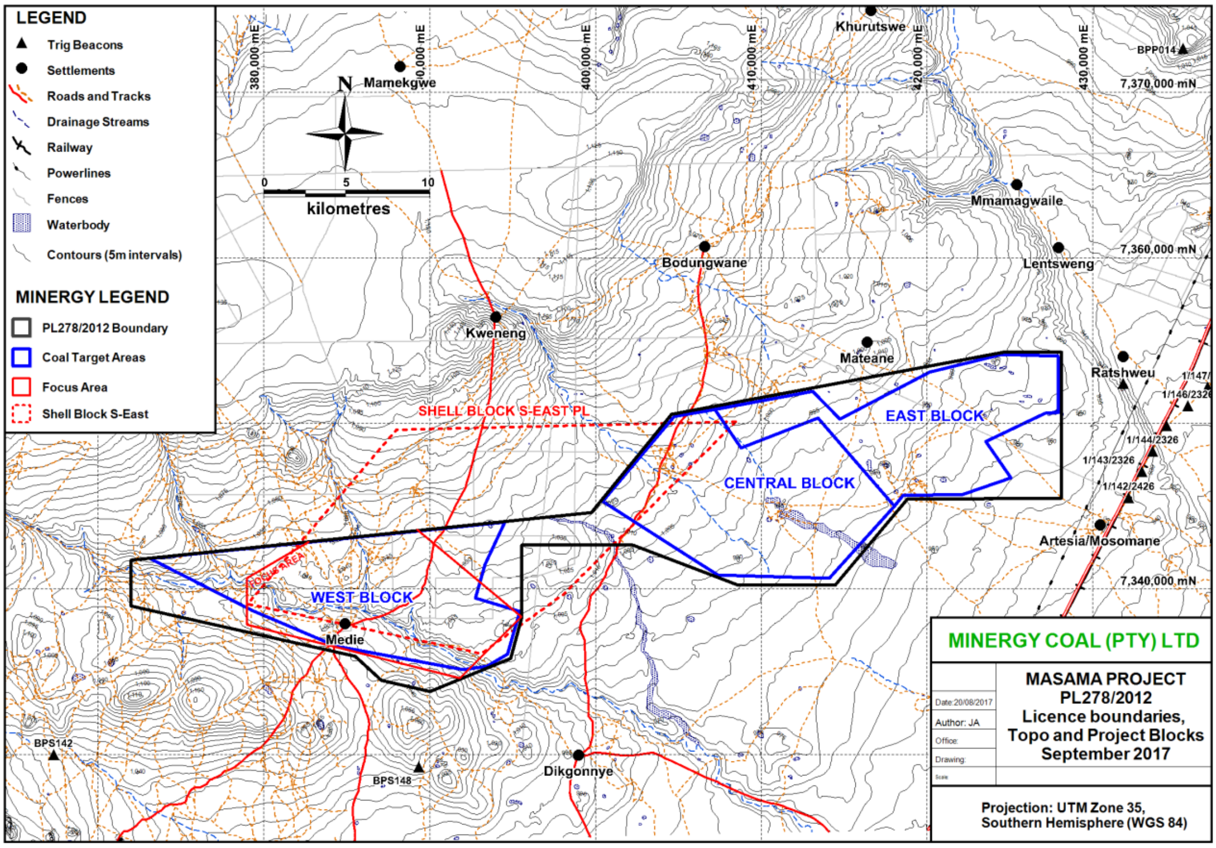

Figure 3: Detailed location of the Masama Coal Project showing project boundaries; coal blocks and topo-cadastral information with 5 m interval contour lines.

3.3 Climate (1.1 (ii); 1.2 (iii))

The south-eastern parts of Botswana have a hot semi-arid climate and fall within the subtropical zone. The winter period is between May and August while the summer is usually from October to March, with April and September as autumn and spring transition months respectively. Droughts are common and vary spatially and temporally.

The annual rainfall in the south-eastern parts of Botswana, where the Masama Coal Project area is located, is ~500 mm, with most falling in the summer months.

Temperatures are high during the summer months with a mean maximum temperature of 27°C, winter temperatures are relatively low with an annual mean minimum of 11°C.

Winds in Botswana are generally light and predominantly from the east or north-east, but become gusty and fairly strong towards the end of winter. Strong winds also occur in association with summer thunderstorms (Botswana National Atlas, 2001)[10].

3.4 Proximity to population centres (1.1 (ii), 1.2(i))

The Masama Coal Project lies approximately 50 km north of Gaborone, Botswana’s capital city and main population centre (population 231,592 in 2011). Smaller villages are present near to and within the project area, the village of Lentsweletau (population 4,916 in 2011) lies approximately 20 km south of the western part of the project and Dikgonnye (population 552 in 2011) is located just south of the central part of the project area. The village of Medie with a population 424 in in 2011 (Botswana Census, 2011)[11] lies within the "Focus Area" of the project area.

3.5 General infrastructure (1.1 (ii))

The Masama Project is close to the existing transmission grid in Botswana, which links into the regional SAPP Grid. The Isang Substation in south east Botswana (with transmission lines up to 400 kV) is located ~20 km from the Masama Coal Project. A set of three 220 kV power lines run just south of the project area (one line operational with two under construction). The village of Medie is not currently connected to the local power grid, but Dikgonnye is connected.

Both villages of Medie and Dikgonnye have water supply systems. In addition to this, there are numerous water boreholes in the area, which indicate the presence of extensive groundwater aquifers.

4. PROJECT HISTORY

4.1 Previous ownership (1.4 (i), 3.1 (iv))

During the period between1974 and 1982, Shell Coal Botswana held prospecting licences (Shell, 1979[12]; 1981[13]; and 1982[14]) that substantially overlapped with the western portion of PL278/2012. During this period Shell Coal Botswana initially conducted regional exploration involving the drilling of wide spaced diamond boreholes over a large area and later focused on a smaller area with detailed drilling and exploration that overlaps with the current West Block of the Masama Coal Project as indicated in Figure 4.

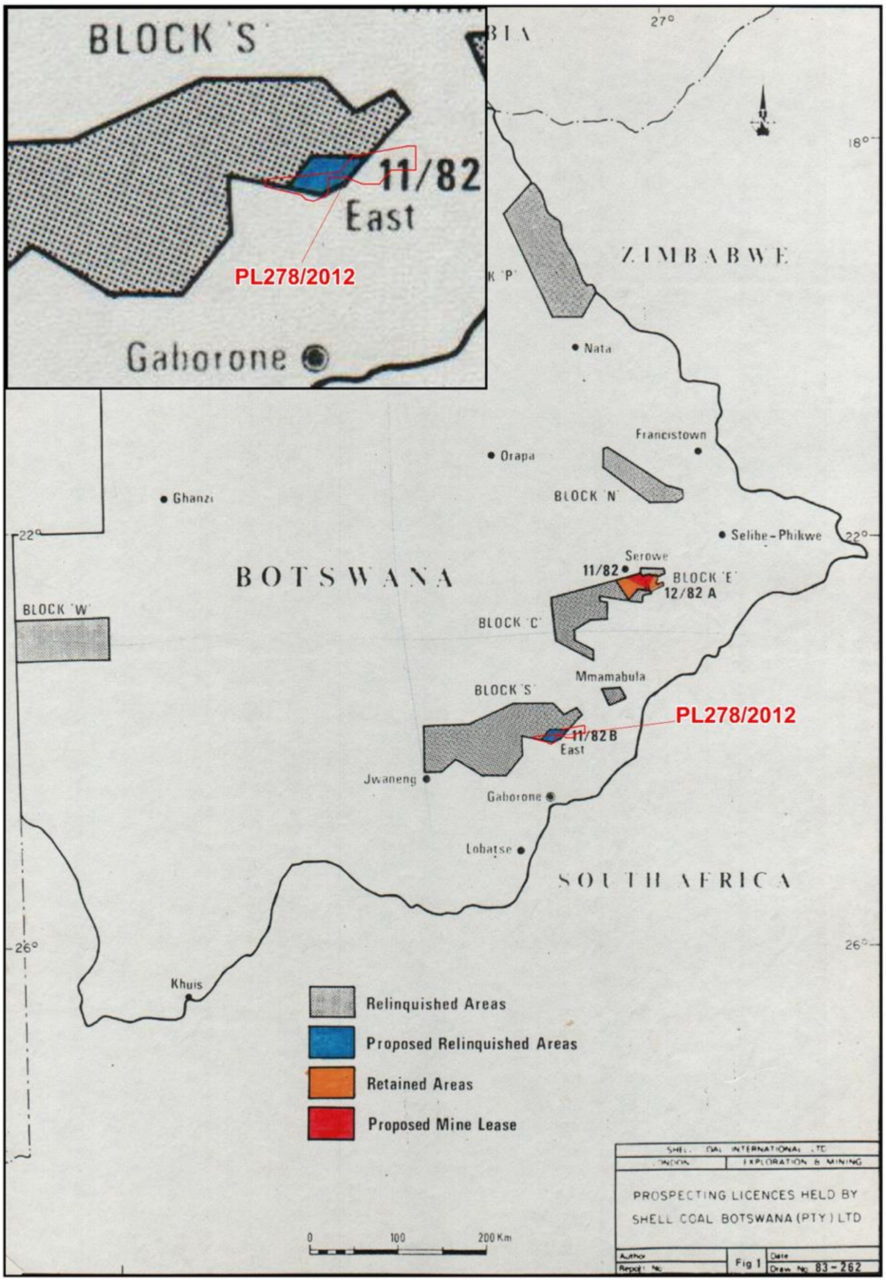

Figure 4: Historic Prospecting Licences held by Shell Coal Botswana, one of which overlaps with Minergy's PL278/2012 (after Shell, 1982)[14].

During the period between 1982 and when PL278/2012 was granted in 2012 there is no record of any company holding prospecting licences for coal or conducting exploration in the Masama Coal Project area.

4.2 Previous exploration development (1.4 (ii))

The only exploration known over the Masama Coal Project (PL278/2012) is that conducted by Shell on their "Block S" (Shell, 1979[12]; 1981[13]; and 1982[14]). Minergy has sourced much of the information from this work including borehole geological logs, geophysical logs, analytical results and some of the relinquishment reports filed with the Department of Geological Survey (DGS).

Between 1974 and 1979, Shell conducted wide spaced (regional) drilling on Block S and defined several "reserves" that met their specifications. More than one hundred mostly fully cored boreholes were drilled in this phase (Shell 1979[12]; and 1981[13]). A handful of these "regional" exploration boreholes fall within the Masama Coal Project and Minergy has managed to source geological logs, downhole geophysics and analytical data for these boreholes.

In Shell's "Block S-East" (Figure 4) a focused exploration programme took place from 1980 to 1982. During this phase Shell drilled a further one hundred and one boreholes, of these forty-five were fully cored and fifty-six percussion boreholes. All boreholes were geophysically logged, but only the fully cored boreholes were sampled, targeting the E Seam and A Seam (with an emphasis on the E Seam). Minergy has sourced the geophysical data for these holes as well as Shells' interpretations, cross sections, resource estimates and summarized coal quality data for the E Seam in their final report compiled by Shell geologists entitled "An assessment of the geology and coal reserves of Block S-East Botswana" (Shell, 1982)[14].

Shell also conducted ground geophysical surveys, magnetics, and gravity as well as some electrical resistivity survey; however, Minergy has not yet been able to source results or the raw data for this work.

Other than the work conducted by Shell, described above, no further exploration is known to have taken place over the Block S-East areas. There is also no record of historic, systematic, coal exploration on the remainder of the Masama Coal Project area. The DGS borehole database records only a few boreholes in the Masama Coal Project area other than those drilled by Shell. One borehole (believed to be part of a fully cored exploration program) drilled in the middle of the East Block, recorded a 9m intersection of "Coal and Carbonaceous Coal" and stopped in a dolerite intrusion immediately below the coal.

During 2014 Minergy conducted a positive Scoping Study on the Masama Coal Project looking at a 7.8 Mt per annum ROM export focussed opencast mine (Coffey Mining, 2014)[6]. This study looked at mining a portion of the West Block termed "Mine A" in a large opencast Mine. Mining targeted the E Seam, A Seam and AU Seam over a twenty-five-year life of mine. The shallow portions of the "Mine A" Area completely overlap with the "Section A" area referred to in this report.

The Scoping was based on preliminary technical and economic assessments and included Inferred Mineral Resources No Historical estimates, Exploration Results or Exploration Targets were included in the Scoping Study.

Certain aspects of the Scoping Study, such as the hydrogeological and environmental sections are considered directly relevant to the current resource estimate. Sections such as mining, mine infrastructure, coal processing, and market analysis are not considered directly relevant to the current resource estimate and are therefore not presented in this report.

4.3 Previous Coal Resource estimates (1.4 (iii))

In 1982 Shell estimated an in-situ coal tonnage of 325.8 Mt for the E2B Seam (E Seam) in their Block S East as indicated in Table 1 below, which is extracted from Shell's 1982[14] final report. The in situ tonnage estimation terminology used is not consistent with the current SAMREC Code and is therefore referenced as a guide to previous work only. Average coal quality for this seam was reported at a float density of 1.5 and on a dry basis.

Table 1: In situ tonnage estimate of Lower Seam (E2B) (E Seam) and average Coal Quality at F1.5 (calculated on a dry basis); (after Shell, 1982[14]).

SEAM E2B							
AREA	R.D. RAW COAL	IN SITU TONNAGE RAW COAL $x10^6t$	AVERAGE QUALITY FLOAT 1.5 (d.b.)				
			ASH %	V.M. %	GCV MJ/kg	Total S %	YIELD %
A	1.45	82.3	9.6	31.2	28.70	0.43	84
C	1.55 1.44	125.6	8.8	30.7	28.49	0.42	69
D1	1.42	74.0	9.8	30.5	28.77	0.37	79
D2	1.46	43.9	9.1	31.3	28.91	0.44	60
TOTAL		**325.8**	**9.3**	**30.9**	**28.66**	**0.41**	**74**

Shell also reported coal quality ranges for the G1 Seam (Minergy's A Seam), as indicated in Table 2 below also extracted from Shell's 1982[14] final report. Shell's exploration was focussed on the E2B (E Seam) and no tonnages for the G1 Seam (A Seam) were reported.

Table 2: Seam G1 (A Seam) – Quality Range and Average Float 1.5 (d.b.) Areas C and D (after Shell, 1982[14]).

RANGE (d.b.)					
AREA	ASH %	V.M. %	GCV MJ/kg	Total S %	YIELD %
C	9.0 – 10.8	26.6 – 30.1	27.71 – 28.54	0.28 – 0.69	40.3 – 59.8
D	8.2 – 10.4	26.9 – 30.6	27.54 – 29.06	0.25 – 0.46	45.8 – 66.5
AVERAGE (d.b.)					
C	9.8	28.3	28.12	0.39	50.0
D	9.2	28.5	28.37	0.33	54.7

Following the drilling program conducted by Minergy in 2012, Coffey Mining conducted a Coal Resource estimate in accordance with the JORC Code (2012)[16] (Coffey Mining, 2013)[5]. Resources were estimated for both the West and Central Blocks for the following seams, E Seam, A Seam, AU Seam, K Seam and G Seam. A total in situ Coal Resource of 2.8 Bt was estimated for both blocks as indicated in Table 3 below.

The current report refers to the Focus Area, which falls within the West Block of the Coffey Resource report, and covers a smaller area. The report also only considers Coal Resources in the E and A Seams and the AU Seam where it falls within the proposed opencast areas.

Table 3: Coal Resource estimate for the West Block and Central Block of the Masama Coal Project by Coffey Mining (2013)[5].

Masama Coal Project

West Block - In-situ Coal Resource and Raw Coal Qualities (air-dried basis)

31 January 2013 (JORC 2012)[16]

Coal Seam	Volume Mm³	Thick-ness m	Area ha	RD t/m³	Ash %	CV MJ/kg	VM %	GTIS Mt	Geol. loss %	TTIS Mt
E Seam	164.377	1.55	10,604	1.51	19.60	23.10	26.00	248	20	199
A Seam	529.231	5.00	10,584	1.52	21.70	21.60	24.50	804	30	563
AU Seam	125.512	1.60	7,845	1.64	31.90	18.80	23.40	205	30	144
K Seam	124.680	3.45	3,614	1.66	31.00	19.10	28.40	207	30	145
G Seam	266.975	18.10	1,475	1.83	46.20	14.00	21.90	489	30	342
Total								**1,954**		**1,393**

Coal Seam	Volume Mm³	Thick-ness m	Area ha	RD t/m³	Ash %	CV MJ/kg	VM %	GTIS Mt	Geol. loss %	TTIS Mt
E Seam	80.695	1.65	4,891	1.51	18.70	23.50	27.30	122	30	85
A Seam	235.073	7.50	3,134	1.70	36.20	15.90	21.40	400	30	280
AU Seam	50.257	1.60	3,141	1.67	34.60	17.70	22.00	84	30	59
K Seam	168.347	3.80	4,430	1.71	31.00	19.10	28.40	288	30	202
G Seam	641.705	11.40	5,629	1.77	43.70	14.30	22.00	1,136	30	795
Total								**2,029**		**1,421**

During 2016 Minergy conducted further drilling on the Masama Coal Project, and completed a revised resource estimate in accordance with the SAMREC Code, which focussed on the E and A Seams in a portion of the West Block of the project area (Coetzee, 2016)[31]. In total, Inferred and Indicated Coal Resources of 347 million tonnes were estimated within the E and A Seams within a focus area of the West Block. The resource was divided into opencast and underground mining portions. A Summary of the resource estimate as estimated by Coetzee (2016)[31] is presented in Table 4 below.

Table 4: Mineable Tonnes In Situ Coal Resource Summary – "Focus Area"(Coetzee 2016)[31]

FOCUS AREA - MASAMA COAL PROJECT: BOTSWANA											
COAL RESOURCES					Raw Coal Qualities (Air Dried)						
SEAM	AREA	CLASSIFFICATION	Average Seam T (m)	MTIS Resource (Mt)	RD	C.V. (MJ/kg)	ASH (%)	IM (%)	V.M. (%)	TS (%)
A Seam	Opencast (Section A)	Indicated	4.88	25.15	1.49	22.62	18.6	6.3	25.5	1.65
A Seam	Opencast (Section B)	Indicated	5.40	36.54	1.53	21.57	19.5	6.7	24.1	1.63
TOTAL A SEAM	Opencast (Sections A & B)	Indicated	5.19	61.69	1.51	22.00	19.1	6.5	24.7	1.64
A Seam	Opencast (Section A)	Inferred	5.93	9.52	1.54	21.18	23.5	5.3	24.6	2.74
TOTAL A SEAM	Opencast (Section A)	Inferred	5.93	9.52	1.54	21.18	23.5	5.3	24.6	2.74
A Seam	Underground (Section A)	Inferred	4.68	166.62	1.51	22.34	20.6	5.3	24.6	2.11
A Seam	Underground (Section B)	Inferred	5.04	15.56	1.60	18.82	28.3	5.3	22.9	0.84
TOTAL A SEAM	Underground (Sections A & B)	Inferred	4.71	182.18	1.52	22.04	21.3	5.3	24.5	2.00
E Seam	Underground (Section A)	Inferred	1.68	52.41	1.44	24.57	16.4	5.2	27.0	1.28
E Seam	Underground (Section B)	Inferred	1.84	41.30	1.59	17.80	36.5	4.0	23.2	1.64
TOTAL E SEAM	Underground (Sections A & B)	Inferred	1.75	93.71	1.51	21.59	25.3	4.7	25.3	1.44
TOTAL A & E SEAMS	Underground (Sections A & B)	Inferred		275.89	1.51	21.89	22.62	5.09	24.75	1.81
TOTAL RESOURCE				347.10	1.51	21.89	22.02	5.35	24.73	1.81

4.4 Previous Coal Reserve estimates (1.4 (iii))

No historic Coal Reserves were reported that would be compatible with modern codes have been reported for the project area.

4.5 Previous production (1.4 (iii))

There has been no previous coal production from the Masama Coal Project area.

5. GEOLOGICAL SETTING AND COAL DEPOSIT TYPES

5.1 Geological setting (10.2 (i), (ii))

5.1.1 Regional geological setting (2.1 (i))

The Karoo Supergroup underlies approximately sixty percent of Botswana (Clark et al. 1986)[17]. The Karoo Supergroup rests with a major unconformity on a Precambrian basement of various ages and types of rock. The Karoo Supergroup is overlain by the Kalahari Group sediments. Coal of Permian age occurs mainly in the middle to lower parts of Karoo Supergroup in the Ecca Group. The regional sub-outcrop geology of the Masama Coal Project area and its environs is shown in Figure 5.

The base of the Karoo Supergroup comprises the Dwyka Group, which is represented mainly by Dukwi Formation (diamictites, pebbly mudstones, siltstones and sandstones). Above this the Ecca Group in the different areas can have thickness ranging from 40 m to 135 m. Within the Ecca Group the five major coal seams are developed. The Ecca Group is overlain by massive, non-carbonaceous mudrocks (Thabala Formation). This formation is succeeded unconformably by Upper Karoo reddish siltstone and sandstone (Lebung Group) and volcanics (Stormberg Lava Group). Figure 6 displays the location of the Masama Coal Project in relation to the Waterberg and Mmamabula Coalfields and to the various areas of the Karoo Supergroup in Botswana.

In accordance with Smith's (1984)[18] divisions, the Masama Coal Project is located within the Mmamabula Area of the Southern Belt of the Central Kalahari Sub-Basin as shown in Figure 7. The Mmamabula Coalfield is contiguous with and forms the western extension of the Waterberg Coalfield of South Africa.

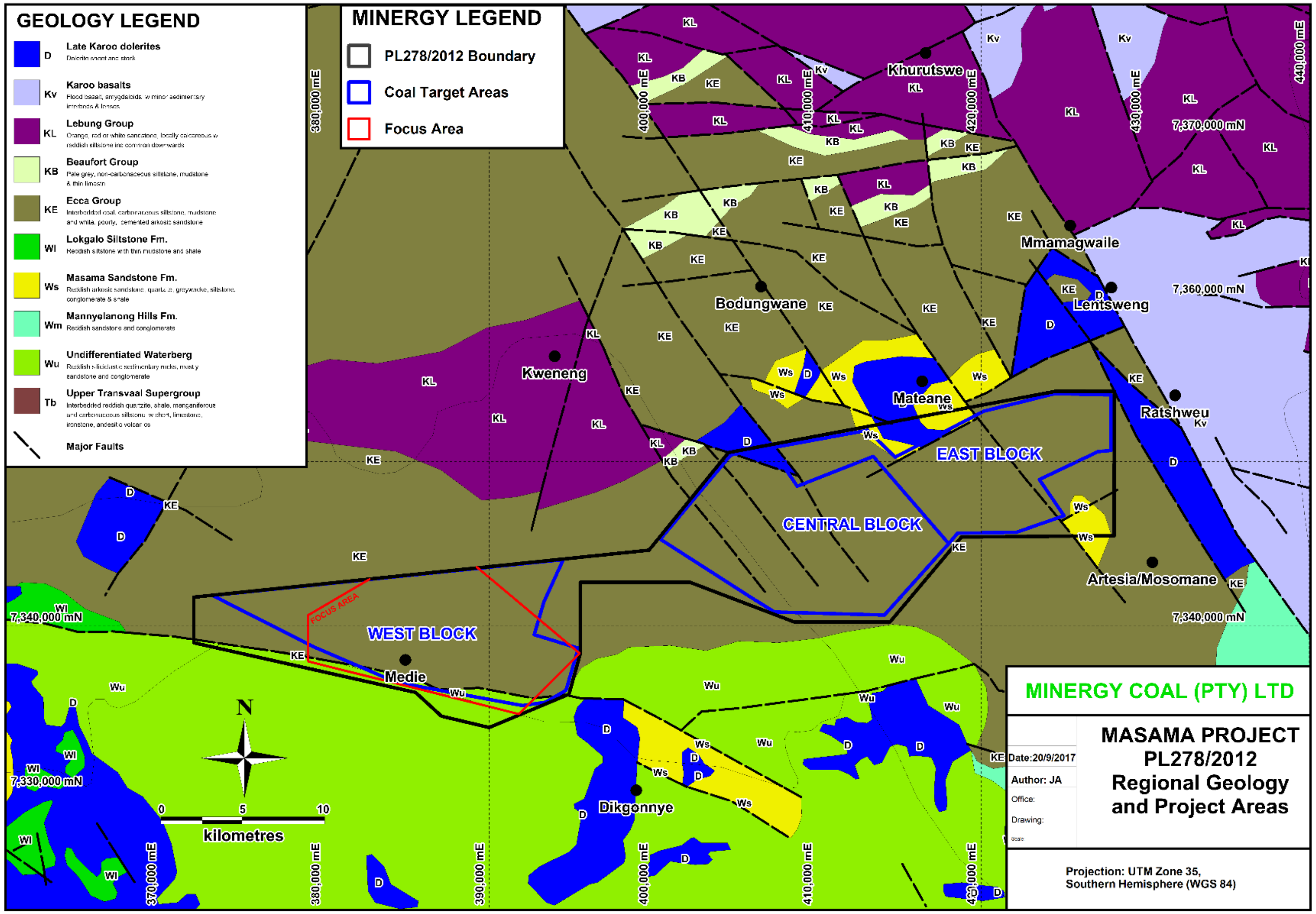

Figure 5: The regional sub-outcrop geology of the Masama Coal Project and its environs.

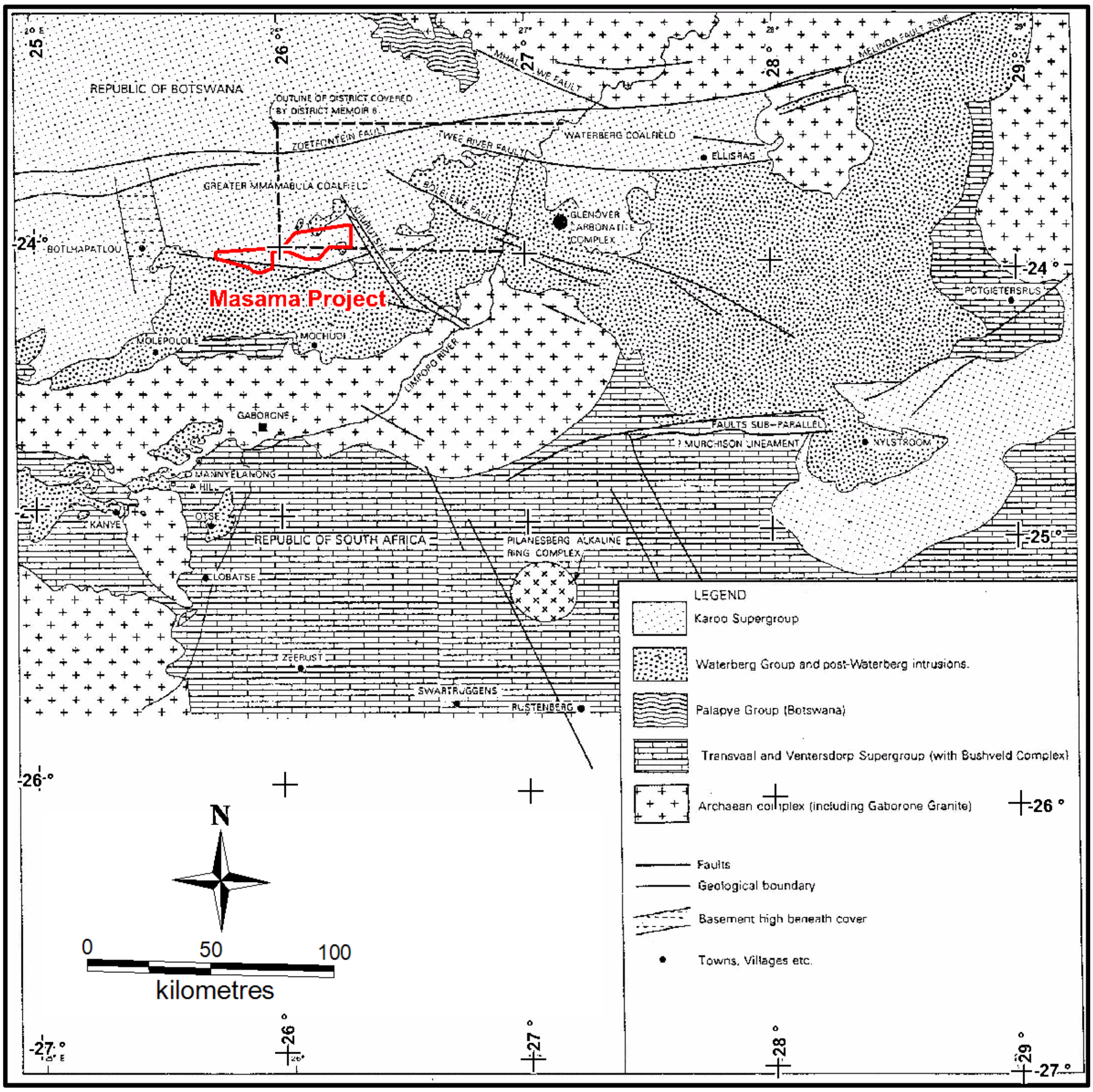

Figure 6: Geological Map showing the Karoo Supergroup in southeast Botswana. The location of the Masama Coal Project in relation to the Waterberg and Mmamabula Coalfields and to the various areas of the Karoo Supergroup in Botswana is shown. (after Williamson, 1996)[19].

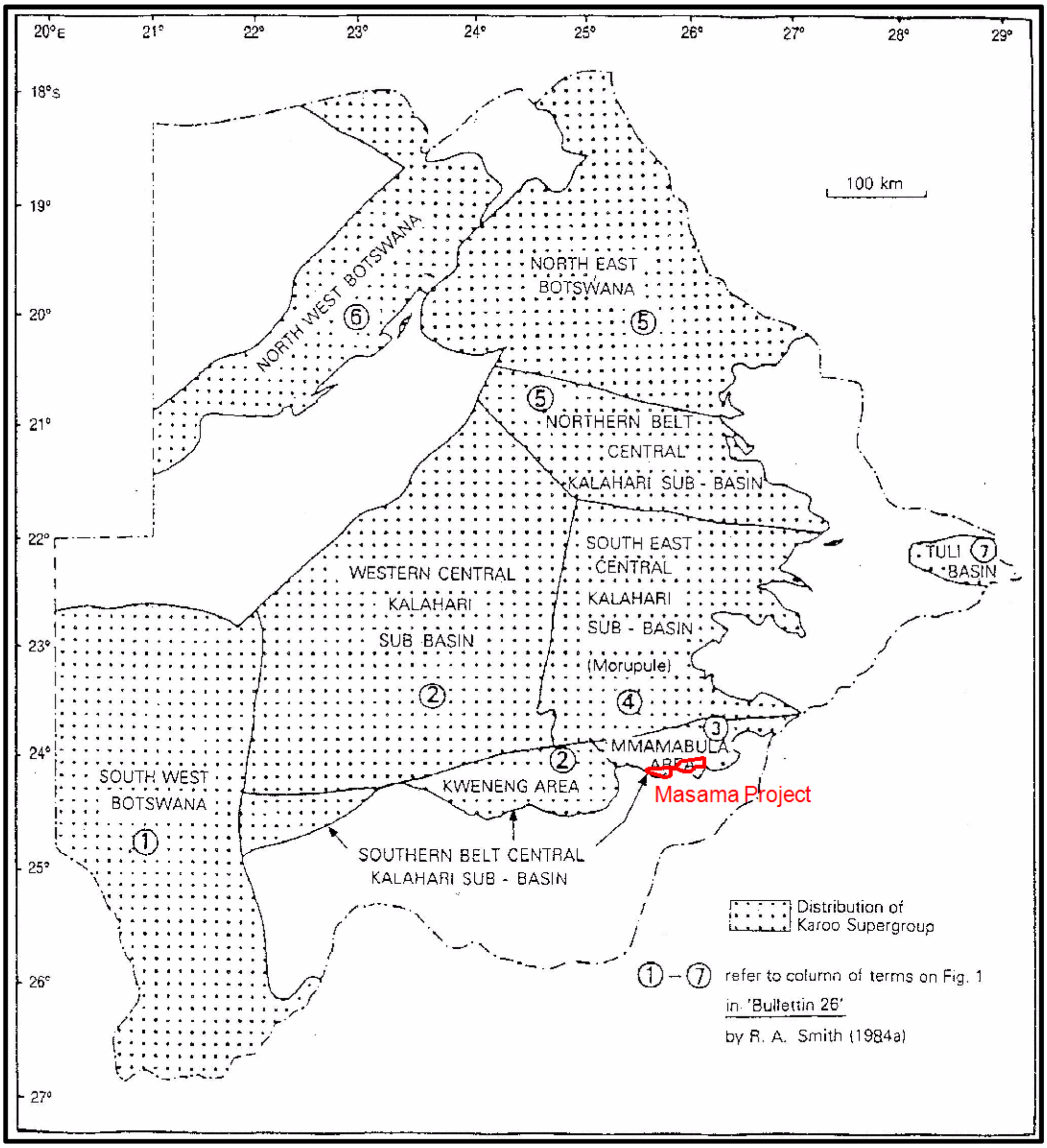

Figure 7: Separate Areas of the Karoo Supergroup in Botswana. The location of the Masama Coal Project is shown after Smith, 1984[18].

Figure 8 shows the stratigraphy of the Waterberg and the Eastern Mmamabula coalfields. Although differences occur in the stratigraphic nomenclature, the stratigraphic profiles are similar. The coal distribution, thickness and quality have been controlled by a combination of pre-Karoo palaeo-topography, pen-contemporaneous depositional processes (occurring immediately after the deposition of a particular stratum), post Permian faulting and subsequent erosion.

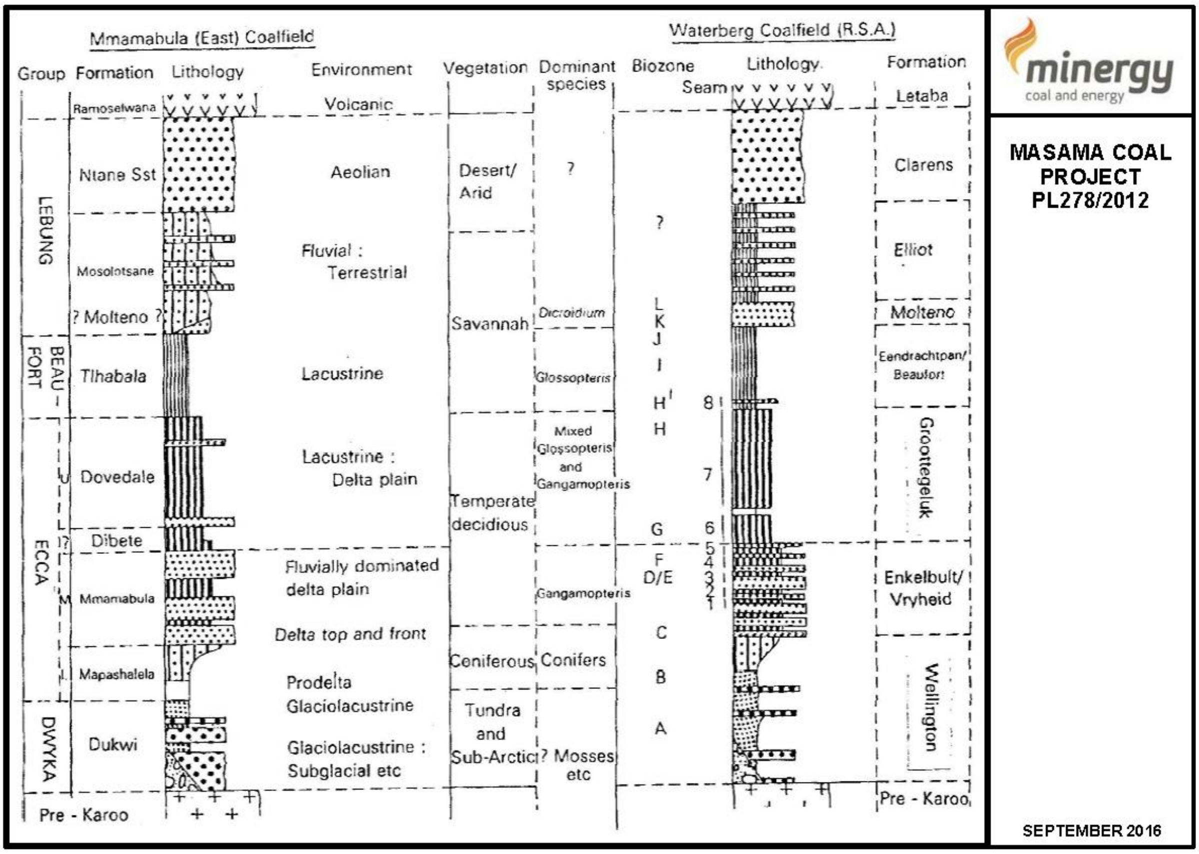

Figure 8: Stratigraphic Correlation of the Waterberg and Mmamabula Coalfields (after Williamson, 1996)[19].

5.1.2 Project geology (2.1 (ii))

In the greater Masama Coal Project area the surface geology is dominated by the presence of Kalahari Sands, which mask the bedrock geology. Only occasional outcrops of the Ecca Group mudstones and sandstones have been observed in the field. In the West Block of the Masama Coal Project area, Kalahari Sands regionally ranges in thickness from 0 m to 15 m and in the Focus Area the sand cover is generally in the region of 5 m to 10 m thick.

Geologically the West Block of the project area is underlain by coaly mudstone and sandstone of the Mmamabula Formation of the Ecca Group ("Middle Ecca") of the Karoo Supergroup (Figure 9).

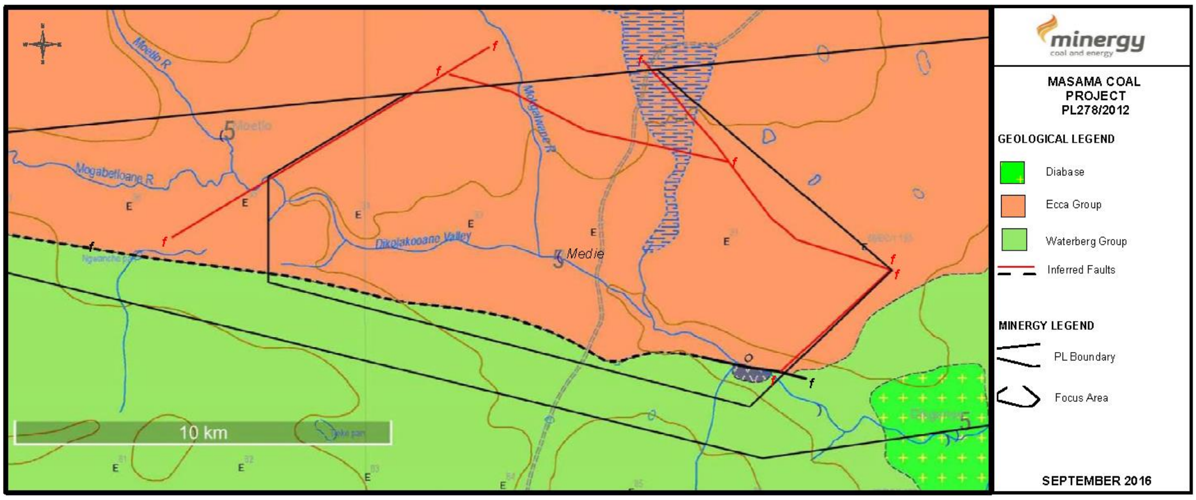

Figure 9: Published 1:125 000 geological map of the Masama Coal Project Focus area.

5.1.3 Stratigraphy and coal seams (2.1 (ii), (v), (vi))

The subsurface geology in the Masama Coal Project in the Focus Area and its immediate environs has been defined with reference to some ninety boreholes drilled since 1974. Five major coal seams are developed in the Masama Coal Project area and they have been named from the bottom to the top as follows: E Seam, A Seam, A Sequence, A Upper Seam, K Seam and G Seam. The coal of Permian age occurs mainly in the Mmamabula Formation of the Ecca Group (“Middle Ecca”) of the Karoo Supergroup. A generalised stratigraphic column is presented in Figure 10 and a summary of each geological unit and coal seam is presented below. Although the E, A and A Upper Coal Seams in the West Block are the primary focus of this report, the other coal seams present and the occurrence of the E and A Coal Seams in the Central Block is also mentioned here for completeness.

5.1.3.1. Dukwi Formation (KDBT and KDBS) (2.1 (ii), (v), (vi))

The Dukwi Formation consists of tillite, siltstone and fine sandstone. It represents the equivalent to the Dwyka Group in South Africa.

5.1.3.2. Lower Mmamabula Sandstone (KELM) (2.1 (ii), (v), (vi))

The Lower Mmamabula sandstone is predominantly a feldspathic sandstone unit with some siltstone and underlies the E Seam.

5.1.3.3. The E Coal Seam (KEES) (2.1 (ii), (v), (vi))

The E Seam represents the lowermost robust coal seam in the succession and is dominated by alternating bright and dull coal layers. In some places, minor sandstone partings are present in the E Seam. The E Seam is high quality coal and represents a predominantly underground mining target. It is however possible that in some areas the E Seam could be mined opencast (this would be after opencast mining of the A Seam in the same area). Coal Resources have been defined for the E Seam within the Focus Area covered in this report.

The E Seam in the Focus Area consists of a single seam ranging from 0.4 m to 2.8 m thick with an average thickness of 1.7 m. Borehole S318 is excluded from the data used to create the geological model due to the intersection being weathered as seen on the geophysical log. The E- Seam has an average coal quality of 23% Ash (ad) and CV of 22 MJ/kg. E Seam is also present in the Central Block (Coffey Mining, 2013)[5], but no coal resources is declared in this report.

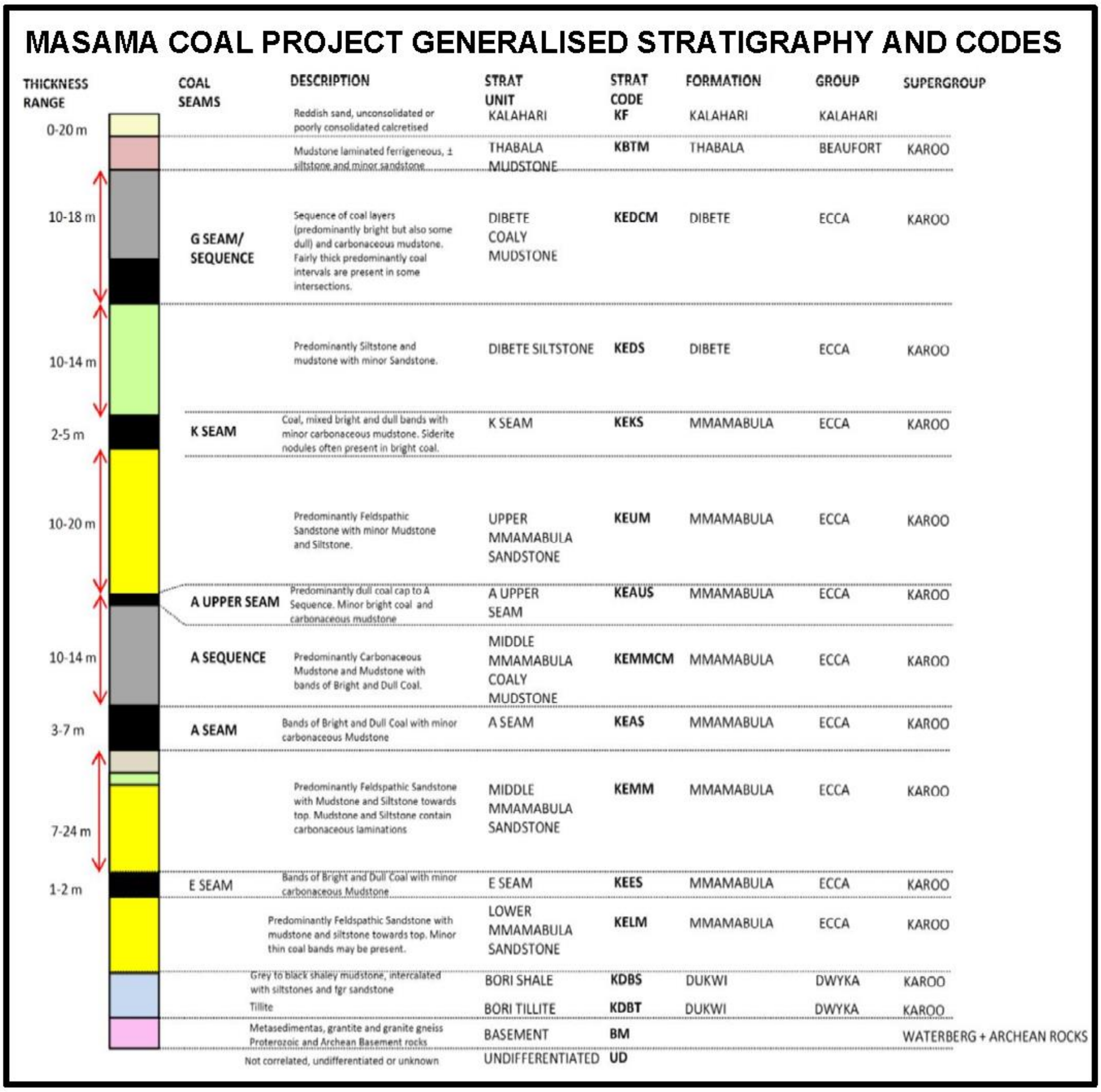

Figure 10: Generalized stratigraphic column for the Masama Coal Project area.

5.1.3.4. Middle Mmamabula Sandstone (KEMM Unit - E to A Seam Interval) (2.1 (ii), (v), (vi))

The Middle Mmamabula Sandstone unit comprises feldspathic sandstone with occasional carbonaceous mudstone and siltstone towards the top.

The thickness of the Middle Mmamabula Sandstone in the Focus Area varies from 6.2 m to 25.8 m with an average thickness of 15.9 m.

5.1.3.5. The A Seam (KEAS) (2.1 (ii), (v), (vi))

The A Seam represents the primary target for opencast mining in the Masama Project area and consists of a robust coal seam at the base of a thicker coal and carbonaceous mudstone sequence. The A Seam has been developed consistently in the project area and consists of interbedded bright and dull coal often with large (centimetre scale) pyrite nodules present.

In the Focus Area the thickness of the A seam is generally greater than 1.2 m up to 5.9 m with an average thickness of 4.7 m. The A Seam is generally of good quality, with an average coal quality of 19.4% Ash (ad) and CV of 22.7 MJ/kg. Quality increases from west to east, with an intensely weathered zone in the central portion, creating a large sub-crop area.

5.1.3.6. Middle Mmamabula Coaly Mudstone (KEMMCM Unit - A to AU Seam Interval) (2.1(ii), (v), (vi))

This unit also termed the "A Sequence" represents the Middle Mmamabula Coaly Mudstone, and consists of alternating layers of coal and carbonaceous mudstone.

The thickness within the Focus Area ranges from 9.5 m to 15.2 m with an average thickness of 12.5 m, but may be less where much of the unit has been removed by weathering.

Potentially usable, but lower quality coal is present in this unit, but has not been included in the current coal resource estimate. Down-the-hole geophysical profiles through this unit show very clearly where the better quality coal bands are located and limited sampling of these coal bands has taken place. According to the geophysical profiles the unit are very constant throughout the Focus Area and correlations between boreholes are possible.

In the recent (2016) shallow A Seam drilling conducted it was found that in some cases the top of this unit is truncated and the top of the sequence (including the A Upper Seam) is not always present.

5.1.3.7. The A Upper Coal Seam (AU Seam – KEAUS unit) (2.1 (ii), (v), (vi))

The A Upper Seam represents the thin layers of a bright/dull coal at the top of the Middle Mmamabula coaly mudstone unit. The A Upper Seam is often intensely weathered and visually of poor quality, e.g. borehole S298.

Where the A Upper Seam is developed within the Focus Area the thickness is very consistent ranging from 1.1 m to 2.3 m with an average thickness of 1.2 m. The A Upper Coal Seam has an average coal quality of 32% Ash (ad) and CV of 18.8 MJ/kg.

Coal Resources for this seam is only reported in the planned opencast area.

5.1.3.8. Upper Mmamabula Sandstone (KEUM Unit - AU to K Seam Interval) (2.1 (ii), (v), (vi))

This unit comprises predominantly feldspathic sandstone and represents the Upper Mmamabula Sandstone. This unit is generally moderately weathered within the Focus Area and although the thickness is extremely variable and ranges from a few meters to over 20.0 m.

5.1.3.9. The K Coal Seam (KEKS) (2.1 (ii), (v), (vi))

The K Seam comprises alternating layers of bright and dull coal with minor carbonaceous mudstone and marks the top of the Mmamabula Formation. As the K Seam occurs higher in the stratigraphy, it is only present in parts of the West Block (within which the Focus Area occurs) and Central Block where the Karoo Supergroup becomes thicker (and other seams become deeper).

This seam occurs in four boreholes in West Block (within which the Focus Area is located) averaging 3.1 m in thickness (Coffey Mining, 2013)[5].

Although this seam is of decent quality no resources were estimated for this seam in this report; coal resources were however previously estimated for this seam in the West and Central Blocks (Coffey Mining, 2013)[5]. Regionally within the West and Central Blocks the seam thickness ranges from 1.4 m to 5.0 m averaging 3.7 m (Coffey Mining, 2013)[5].

5.1.3.10. Dibete Siltstone (KEDS - K to G Seam Interval) (2.1 (ii), (v), (vi))

This unit is represented by Dibete siltstones and mudstones as well as subordinate sandstone ranging in thickness from 10.0 m to 25.0 m. Within the Focus Area this unit is generally moderately to highly weathered.

5.1.3.11. The G Coal Seam (KEDCM) (2.1 (ii), (v), (vi))

The G Seam consists predominately of thin bands of bright, banded coal and carbonaceous mudstone with some areas showing thicker partings of carbonaceous shale.

This seam occurs in two boreholes in West Block (within which the Focus Area is located) averaging 18.1 m in thickness (Coffey Mining, 2013)[5].

In the Central Block the G Seam occurs in five boreholes and thickness ranges from 4.4 m to 16.4 m averaging 11.8 m (Coffey Mining, 2013)[5]. The lower thickness of 4.4 m reflects only partial sampling of the G Seam by Shell.

No Coal Resources are estimated for this seam in this report, but were historically estimated by Coffey Mining (2013)[5].

5.1.3.12. Thabala Mudstone (KBTM) (2.1 (ii), (v), (vi))

The Thabala Formation of the Beaufort Group comprises laminated mudstone and siltstone often bioturbated and ferruginous. This unit, were it occurs above the G Seam within the

Focus Area, is moderately weathered and according to Coffey Mining (2013)[5] the thickness ranges from a few metres to 20.0 m.

5.1.3.13. KF Overburden Unit (2.1 (ii), (v), (vi))

This unit is represented by a layer of Kalahari Sand ranging from 0.0 m to 20.0 m in thickness (Coffey Mining, 2013)[5], which obscures the bedrock geology. This unit unconformably overlies various Karoo lithologies and tends to thin towards the drainage lines.

5.2 Nature of and controls on coal deposition (2.1 (ii), (v), (vi), (vii); 10.2 (i), (ii))

The Karoo aged coal seams in the Masama Coal Project area and in Botswana in general were deposited in a post-glacial environment under cool to temperate climatic conditions. Coal deposits developed as peat in low lying swamps on the edges of lakes fed by rivers with well-developed alluvial flood plains. Intermittent tectonic activity and resultant movement of faulted blocks during sedimentation resulted in the deepening of individual coal basins while rejuvenation of the hinterland topography produced cyclic sedimentary sequences. The coal deposits formed during periods when low energy conditions prevailed.

Limited regional post Karoo faulting has further exerted controls on the distribution of the coal deposits. Structural interpretations incorporating the work done by Shell (1982)[14] as well as published regional geological maps and aeromagnetic data have been used in this study to identify domains, which were applied to the resource estimation. One such example is the southern limit of the Karoo Supergroup lithologies, which is a faulted contact with Proterozoic Waterberg aged rocks.

Most of Botswana's coal deposits are typical Gondwana type coal deposits with high inertinite and low vitrinite contents and have also been noted to contain higher moisture contents than typical coal deposits from the Central Basin of South Africa. Petrographic analyses have indicated that the E Seam at Masama is dominated by vitrinite (~60%) while the A Seam at Masama contains ~ 35% vitrinite. Limited petrographic analyses are available though.

The detailed nature and characteristics of each individual coal seam present in the project area have already been discussed under the section "*Stratigraphy and Coal Seams*" above.

5.3 Geological models (2.1 (iii); 3.1 (ii), (iii); 4.1 (i), (ii); 4.2 (iv); 10.2 (ii))

Coal seam intersections, raw coal quality data and wash density cumulative analytical results for the E, A and A Upper Coal Seams were captured in Microsoft Excel® spread sheets, which are presented in Appendix 5, 6 and 7 respectively. The sources of the information and data used to conduct the Coal Resource estimate described in this report have already been addressed and all the sources of information are listed in the references to this report.

Validation of the geological data took place in a Microsoft Access® Database, checking for missing units, duplicates and generally preparing the data to be loaded into the Minex™

Database for modelling purposes. Correlation graphs for ash and calorific value per sample, as well as density and ash were plotted to validate quality data in the database.

Structural features (faults) and boundaries were transferred from Model Maker® Version 12.02 to Minex^{TM}. First round grids on seam thickness distribution was used to create zero contour lines, to aide in determining eventual resource blocks for resource reporting.

Minex's general growth algorithm method for gridding suits stratiform deposits and related qualities perfectly. It produces smooth surfaces which replicate the regional trends of the geological data, while also reflecting local anomalies around 'odd' data points.

The software first calculates values for the four grid intersections surrounding each data point. After the nodes around all borehole points are calculated, the original points are removed from further consideration. The program then makes a series of passes over the grid. At each pass, it calculates values for any grid node that have not been assigned a value and that are adjacent to an assigned node. In other words, each iteration enlarges the calculated region around the original point locations.

All grids were limited to within the Focus Area, extrapolating 200m beyond any known last point. A search radius of 2 000 m was applied to determine influence of points on any specific unknown point. All structural controls (seam thickness, roof and floor elevations of the coal seams) as well as all quality data was gridded using the Minex^{TM} growth algorithm. Histograms were reported on calculated grid information in Dassault Systèmes GEOVIA Minex™ Version 6.5.1.

Fabric8® software was used for all structural analyses.

All known features limiting the extent of the coal seams were applied to the model, these included; faults, licence boundaries, sub-outcrop limits and weathering. A depth of weathering surface was also applied to limit the resource model. The positions of faults were inferred on the basis of geological and geophysical interpretation, and the examination of seam and formation elevations. The surface topography was supplied by the Client (based on digital elevation data purchased from the Department of Surveys and Mapping in Botswana). This surface was used as a controlling surface for estimating the depth of weathering surface which in turn was used limit the extent of the coal seams.

The Masama Coal Deposit was modelled as a typical tabular and near horizontal, strata bound coal deposit where coal distribution has been controlled by "topographic" or "structural" highs as well as minor faulting and recent weathering. No significantly different interpretations were considered in this report.

5.4 Nature of deposit on the property (2.1 (ii), (iv), (v), (vi), (vii); 3.1 (vii); 4.1 (i), (ii); 10.2 (i), (ii))

The deposit types found within the project area represent strata bound coal seams of various thickness and quality. The original peat accumulations that formed in the Permo-Triassic period underwent compression and lithification to form the sub bituminous coal deposits present today.

The Masama Coal Project coal deposit fundamentally represents a multiple seam deposit type as previously depicted in Figure 15. The A Sequence, between the underlying A Seam and overlying A Upper Seam however comprises carbonaceous mudstone and mudstone with bands of bright and dull coal, which represents an interbedded seam deposit type. Although the E Seam and the A Seam in the West Block are the primary focus of this report, the other seams present and the occurrence of the E Seam and A Seam in the Central Block is also mentioned here for completeness.

In the Masama Coal Project area two ”sub-crop” areas were identified, where the coal seams were highly weathered. Shell previously identified these as “Topographic High’s” (the Central High and smaller South West High (Shell, 1982)[14] which exerted significant local control on the formation of the E Seam and A Seam (Figure 16)), but the seam elevations does not seem to truncate against a “High”. Two cross-sections, one orientated west-east and the other north-south, were drawn. The cross-sections display the relative positions of the various seams, as well as the extent, continuity and the strata thickness through the Focus Area. A vertical exaggeration of twenty times was applied in order to show the small elevation variations of the coal seams. On the eastern side of the west-east section (Figure 11, Section 1) a pinching out effect occurs towards the sub-crop structure. The positions of the section lines are indicated in Figure 16. This influence, although not comprehensively understood, has been considered in the geological interpretations and boundaries applied to the coal resource areas (i.e. areas on the “sub-crop” with no coal development, which have been excluded).

The depth of weathering ranges from 15.4 m below surface to 45.0 m below surface, but is generally in the region of 23.5 m in the potentially opencast portions of the focus area as observed in the 2016 and 2017 drilling, but is on average in the region of 27 m in the Focus Area. In areas adjacent to faults the depth of weathering is usually the most extreme.

The strata in the Focus Area of West Block of the Masama Coal Project area are regionally generally flat, dipping gently at ~3° away from the Southwest sub-crop. The current exploration focuses in the environs of the Southwest High as described by Shell (1982)[14]. All coal seams pinch out towards the “sub-crop area”. A few regional faults, trending northeast-southwest and northwest-southeast, were identified by Shell (1982)[14] and more recently by GM Geotech. The southern boundary of the coal-bearing Ecca Group with the Waterberg Group is interpreted as a faulted-contact.

Preliminary field structural mapping was conducted by Coetzee (2016)[31] in and around an abandoned quarry immediately to the north of Medie. A total of forty structural elements (joints and bedding planes) were measured using a Clar Compass, set for a magnetic declination of -25° as determined with GeoMag® Version 3.0 software on 15 June 2016 (-25.14°). This implies that all azimuth measures noted here are with reference to true north. The orientation of all the planar geological structures was noted as Azimuth of Dip/Dip Angle; that of linear geological structures as Azimuth of Plunge/Plunge Angle; and that of pit faces as Azimuth of Pit Face/Pit Slope Angle.

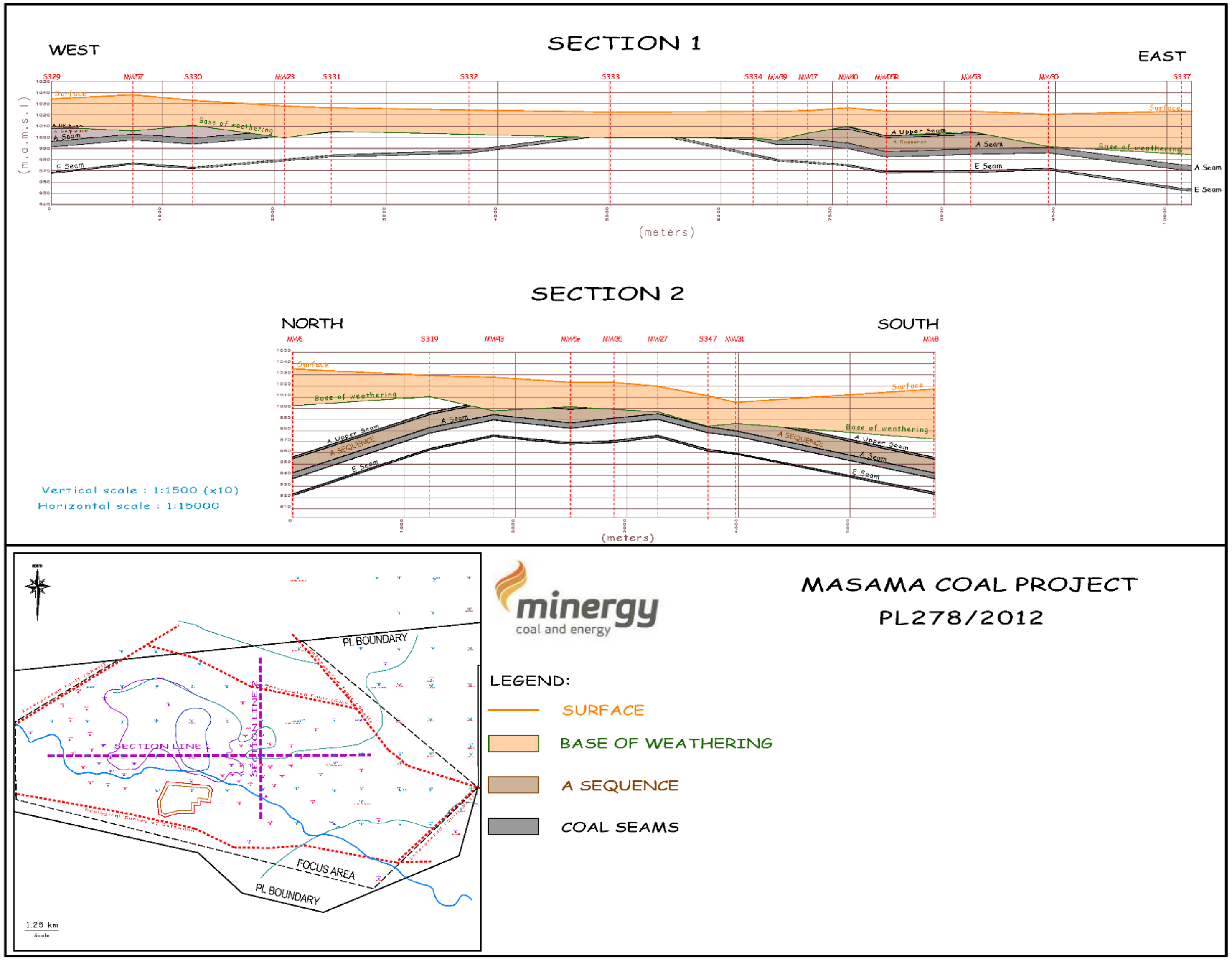

Figure 11: Two cross-sections through the Focus Area.

The structural data were modelled using FABRIC8® VERSION 8.0 software.

The maximum orientation of the six sandstone bedding planes measured in and around the abandoned quarry is 171/06 (Figure 12); the centre of gravity (the orientation of the vector sum of all bedding plane measures) however is at 180/03 and can be considered horizontal for all practical purposes.

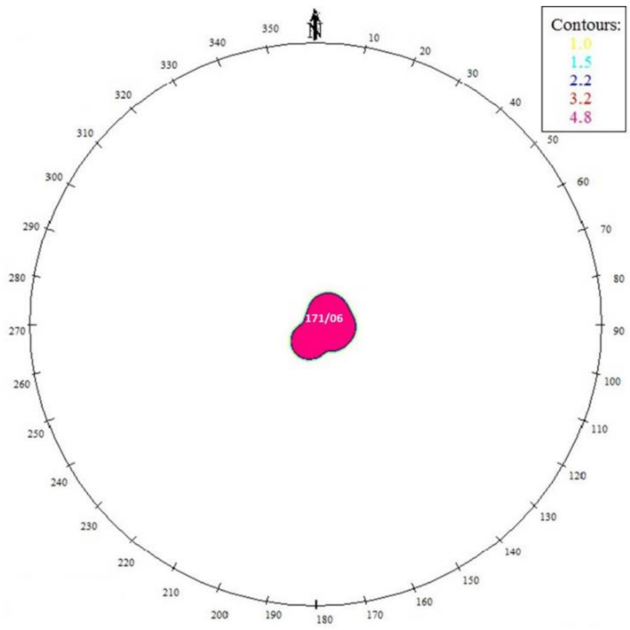

Figure 12: Bedding plane orientation depicted as a maximum by means of a contoured diagram of six measured bedding plane orientations.

Two joint sets, although very ambiguously defined from a total of thirty-four measurements in around the abandoned quarry are distinguished (Figure 13):

- A near vertical joint set (maximum orientation at 165/87) striking more or less east-northeast west-southwest; and
- A less prominent near vertical joint set (maximum orientation at 252/85) striking more or less south-southeast north-northwest;

The joint sets have a strong consistency in strike and dip, however trends within do occur.

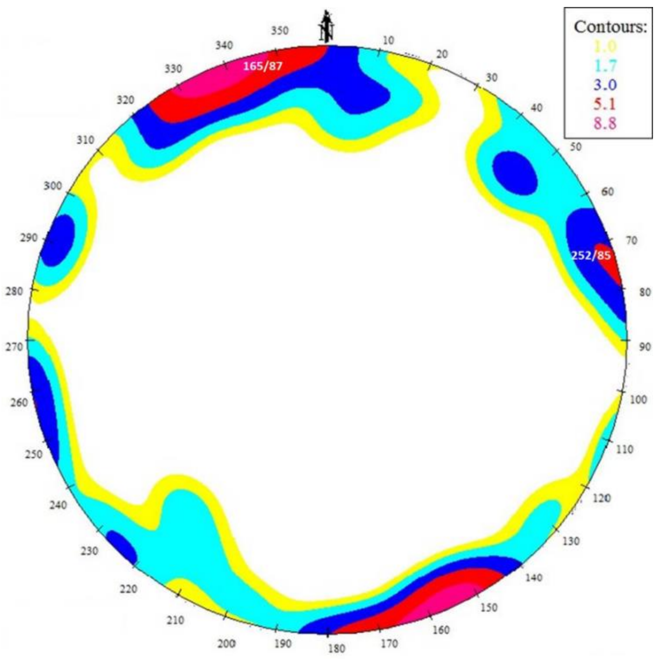

Figure 13: Joint sets orientations depicted as maxima by means of a contoured diagram of thirty-four measured joint plane orientations.

5.5 Coal seam thicknesses, distribution and qualities (2.1 (ii), (iv), (v), (vi); 3.1 (vi), (vii); 4.1 (i); 4.2 (iii); 4.5 (ii); 10.2 (i), (ii))

The coal seam thicknesses and thickness ranges of all the coal seams intersected in boreholes drilled in the Focus Area and which are used in this resource estimation are summarized in Table 5. The current exploration focused only on the E, A and A Upper Seams (opencast) and the E and A Seams (underground), for which resource estimations are reported.

Table 5: Average coal seam depth and thicknesses in the Masama West Block (Focus Area).

COAL SEAM	AVERAGE DEPTH BELOW SURFACE (m)	AVERAGE THICKNESS (m)	MINIMUM THICKNESS (m)	MAXIMUM THICKNESS (m)
G Seam	35.2	18.1	17.2	19.0
K Seam	46.7	3.1	1.4	3.9
A Upper Seam	49.0	1.6	1.1	2.2
A Sequence	50.7	12.5	9.5	15.2
A Seam	50.2	5.0	4.2	6.2
E Seam	72.7	1.7	0.4	2.8

Seam thickness contour plans for the E, A and A Upper Coal Seams were produced using the Minex^{TM} growth algorithm gridding method. The variation in the seam thicknesses of the E, A and A Upper Coal Seams as represented in the seam thickness contour plans in Figures 14 to16 are statistically depicted in Figure 17 to 19.

The E Seam thickness is relatively constant throughout the Focus Area. Minor deviations in thickness occur in the environs of the “sub-crop” (Figure 14), as well as along the southern E Seam resource limit to the extreme east and the west (where thinning of the seam is interpreted). Yet another deviation in E Seam thickness is observed to the northeast of the “sub-crop” can probably be ascribed to contradictory data.

The A Seam thickness is very constant throughout the Focus Area, but is anticipated to thin in the immediate vicinity of the “sub-crop” (Figure 15) where it appears to have been exposed to weathering conditions. Slightly thinner A Seam is observed in the northeast and along parts of the south-eastern boundary of the focus area. Small areas of slightly thicker A Seam are observed immediately south and west of the “sub-crop area”.

The A Upper Seam is not as well developed and is relatively thin throughout the Focus Area (Figure 16).

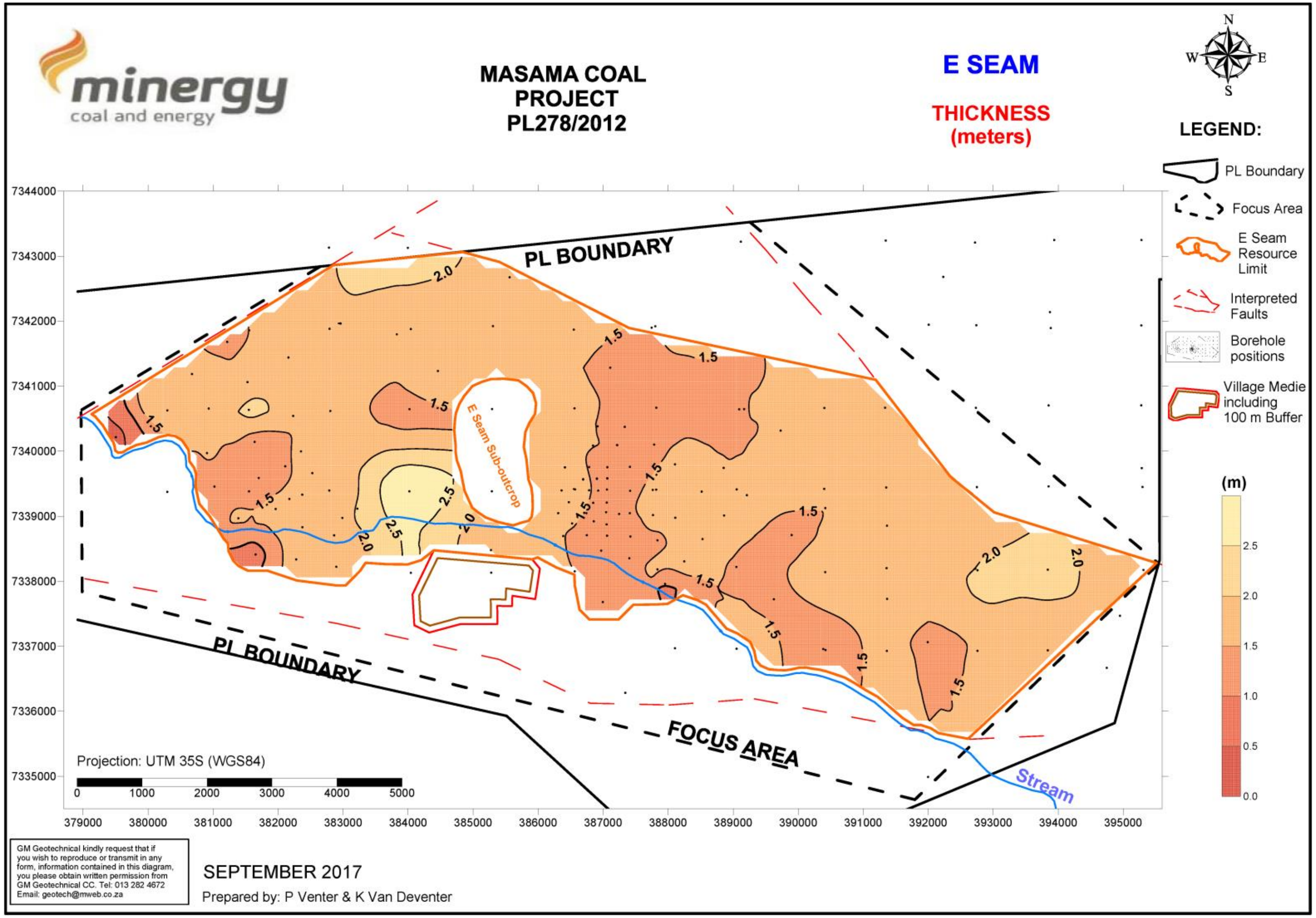

Figure 14: E Seam thickness contour plan.

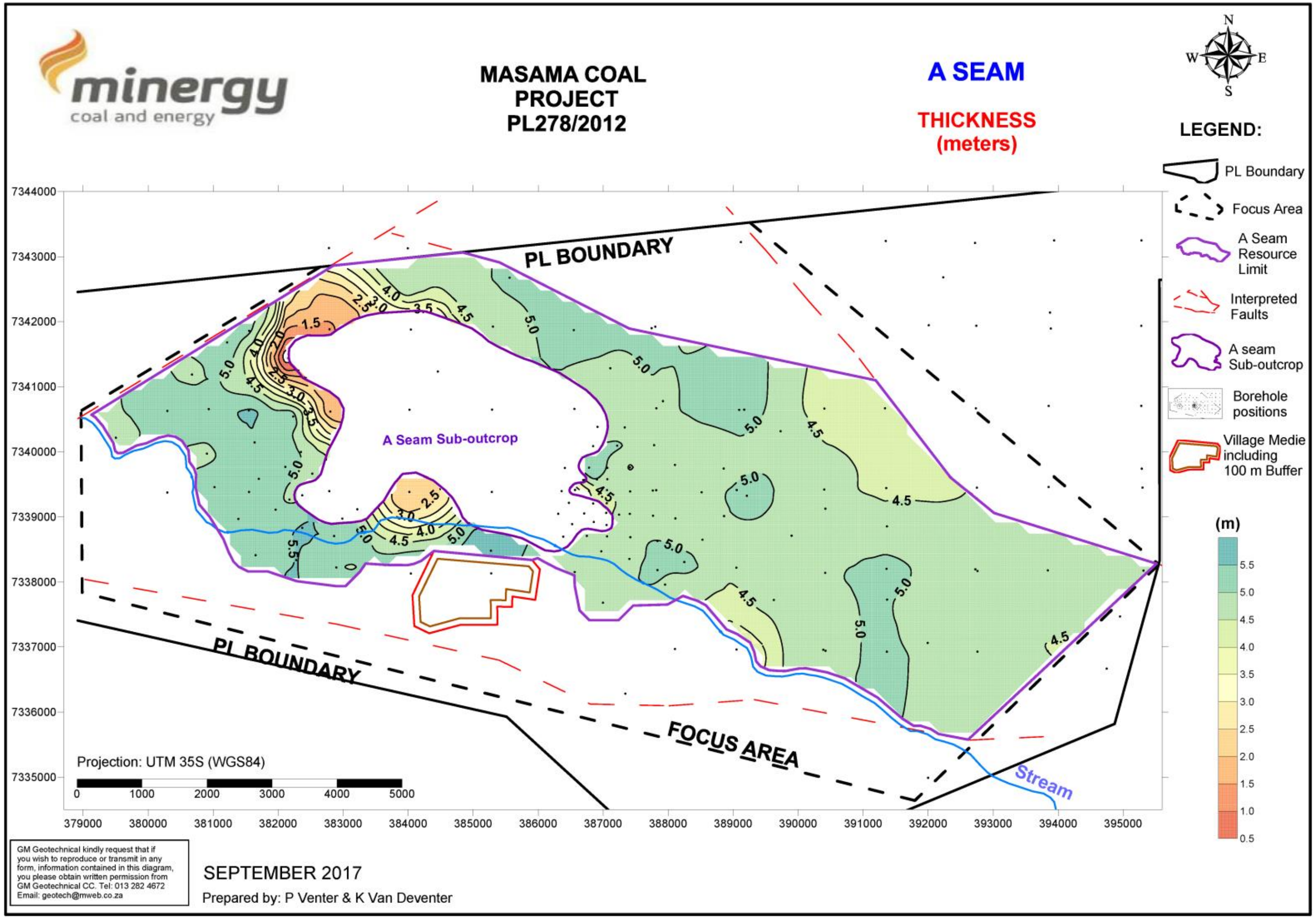

Figure 15: A Seam thickness contour plan.

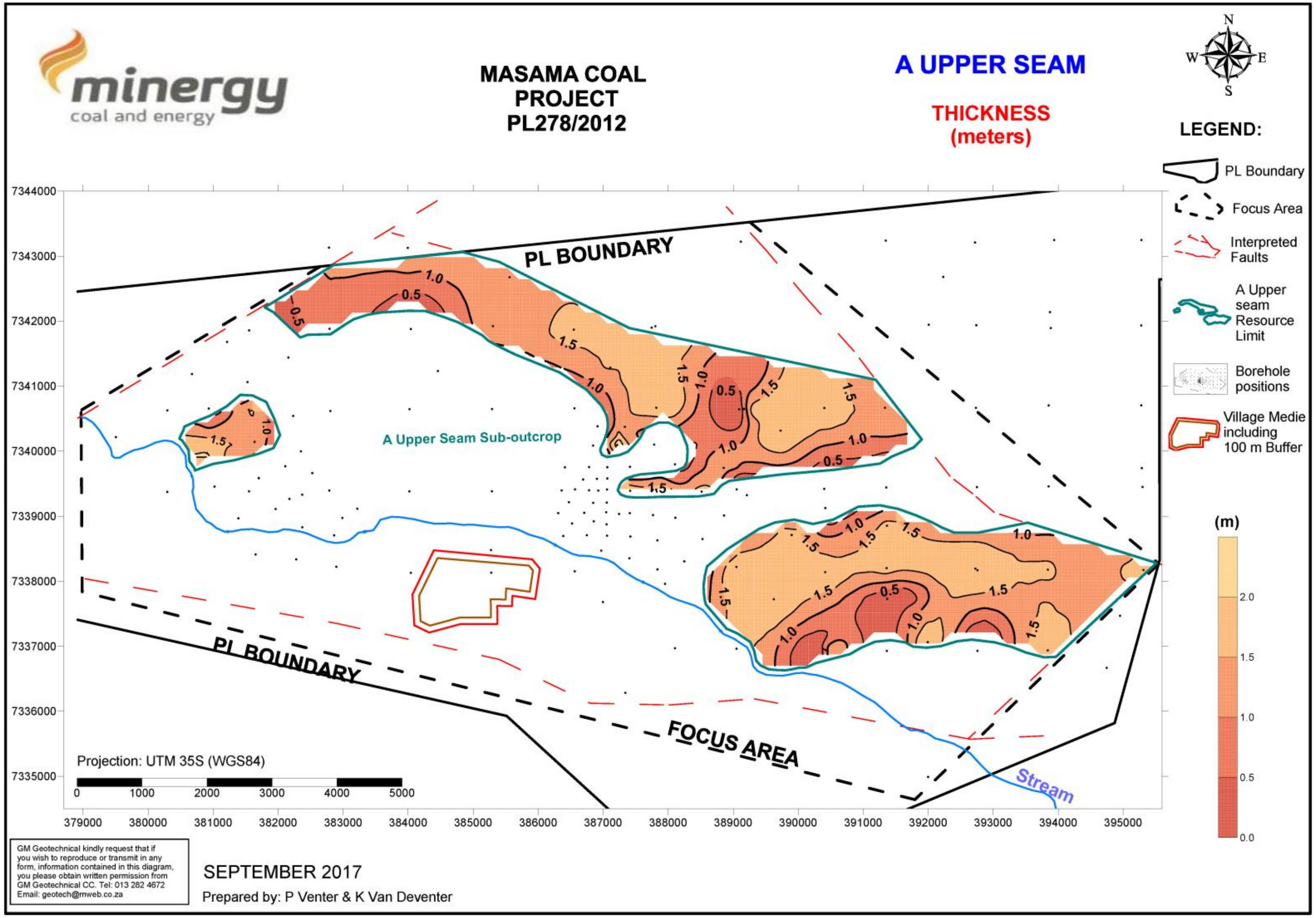

Figure 16: AU Seam thickness contour plan.

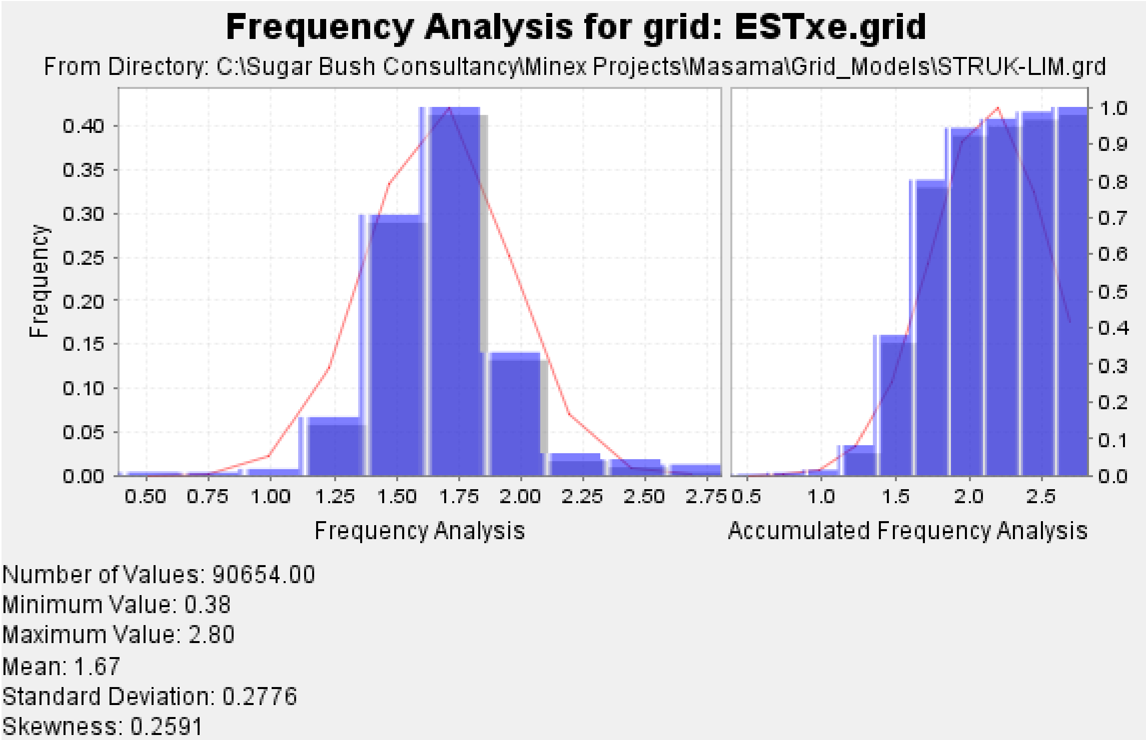

Figure 17: E Seam statistical variation in thickness.

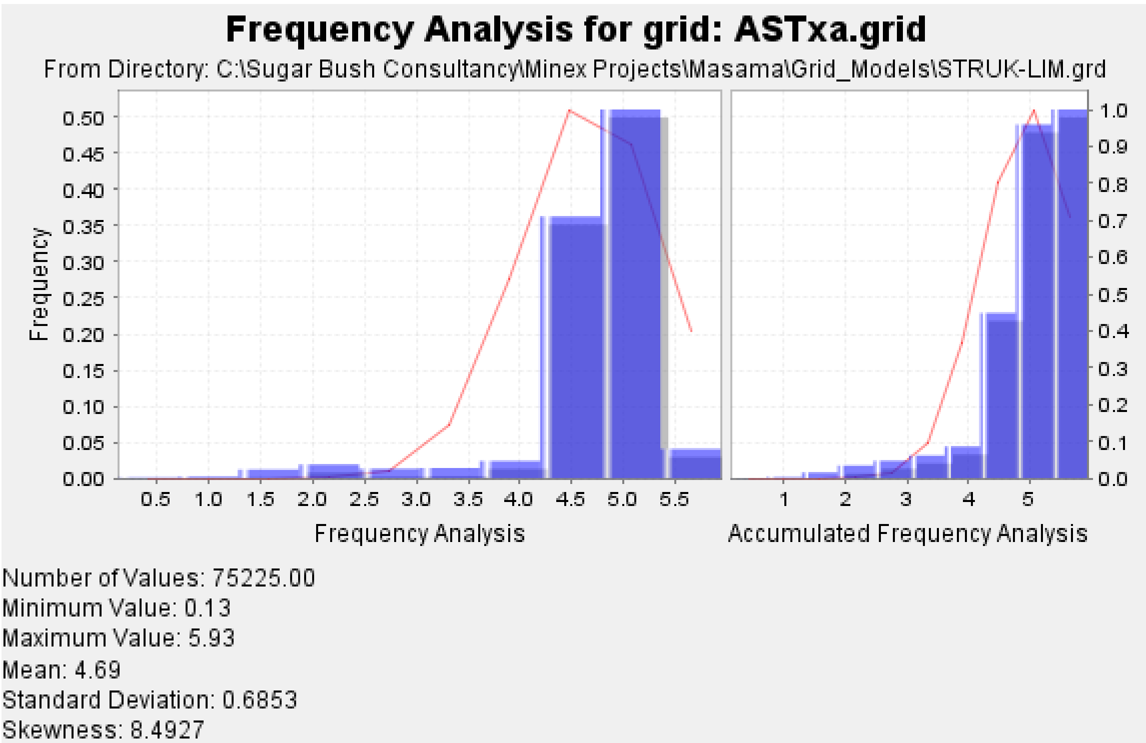

Figure 18: A Seam statistical variation in thickness.

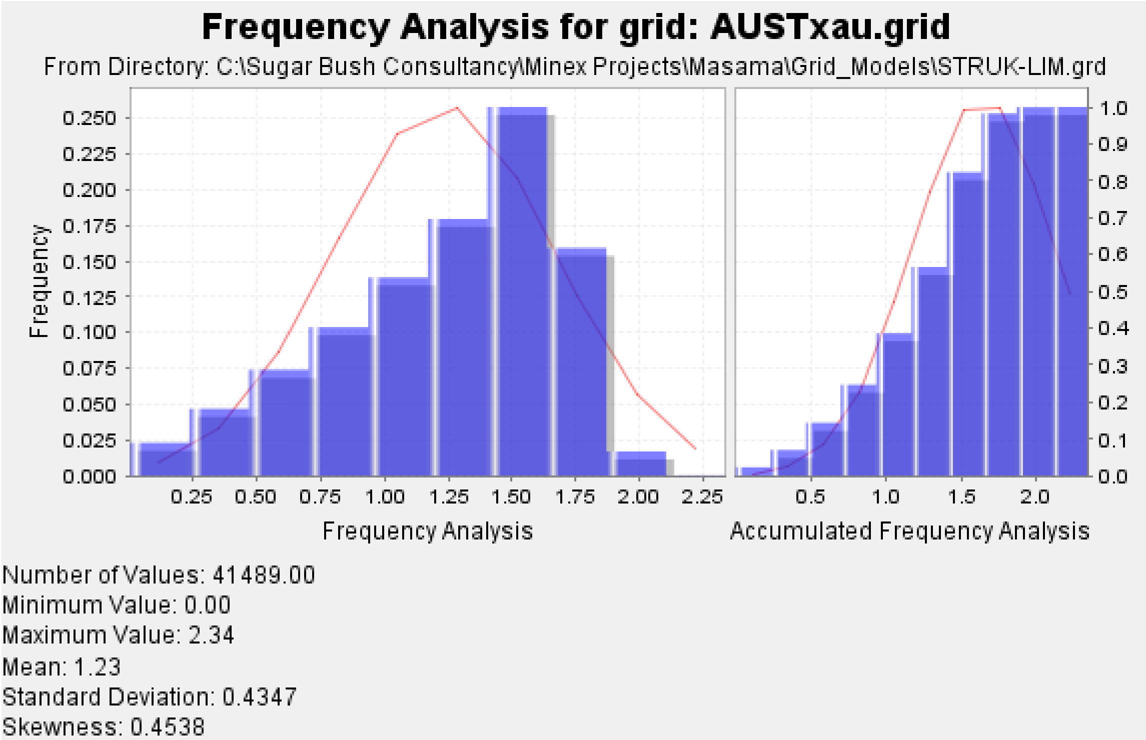

Figure 19: AU Seam statistical variation in thickness.

The following raw coal quality contour plans on an air dried basis for the E, A and the A Upper Coal Seam were produced using Minex growth algorithm gridding method:

- ➢ Calorific Value (MJ/kg)
- ➢ Ash (%)
- ➢ Moisture (%)
- ➢ Volatile Matter (%)
- ➢ Total Sulphur (%)

The raw coal quality contour plans are shown in Figures 20 to 34.

Histograms showing the variation in the Calorific Values (MJ/kg) of the E, A and the A Upper Coal Seams as represented in the Calorific Value contour plans are presented in Figures 35 to 37.

The A and E seams both are of good quality raw coal, with average calorific values of 21.5 to 22.5 MJ/kg on an uncontaminated air dried basis. Raw volatile content is in the region of 25% for both seams.

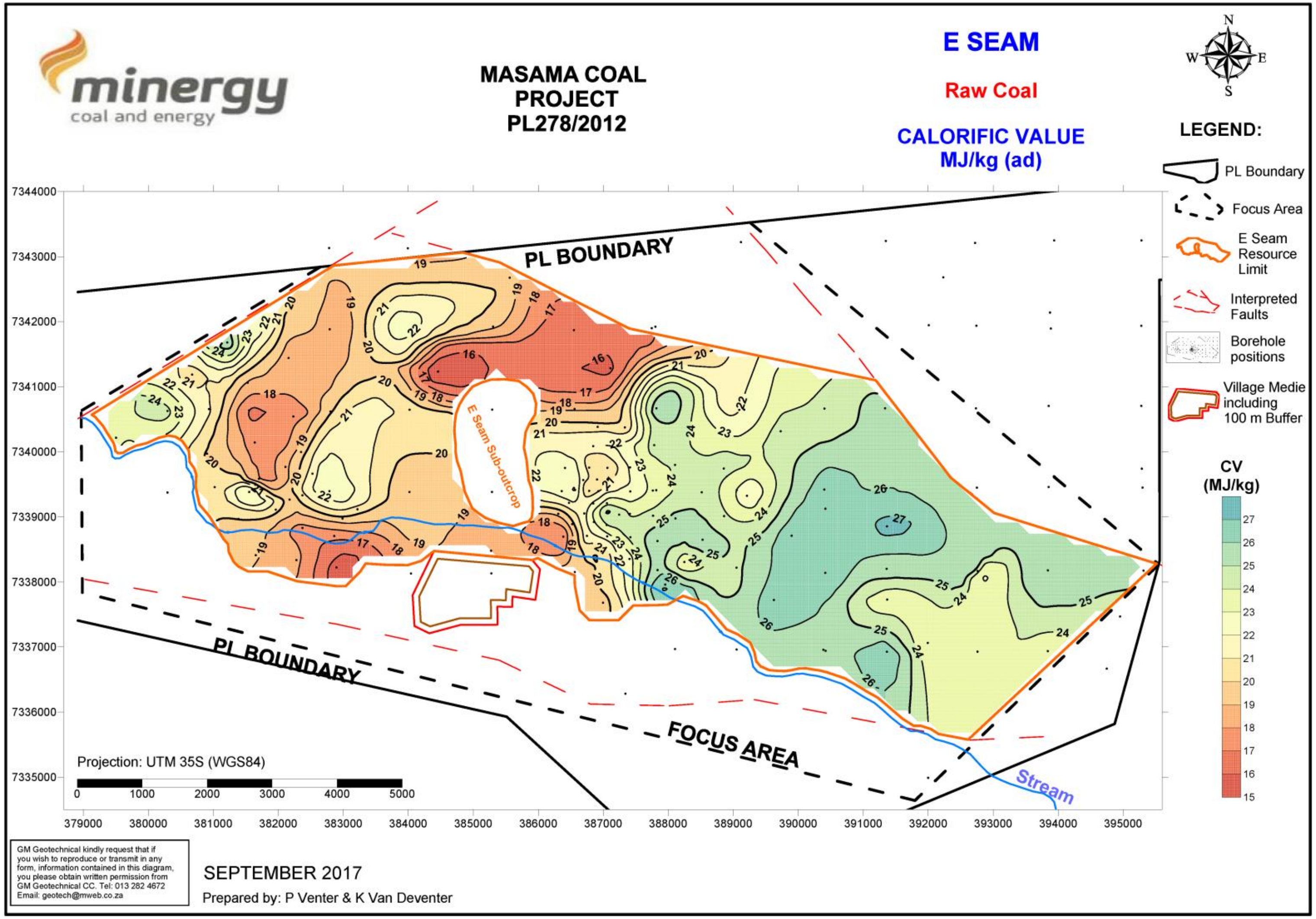

Figure 20: E Seam Raw Coal Calorific Value (MJ/kg) contour plan.

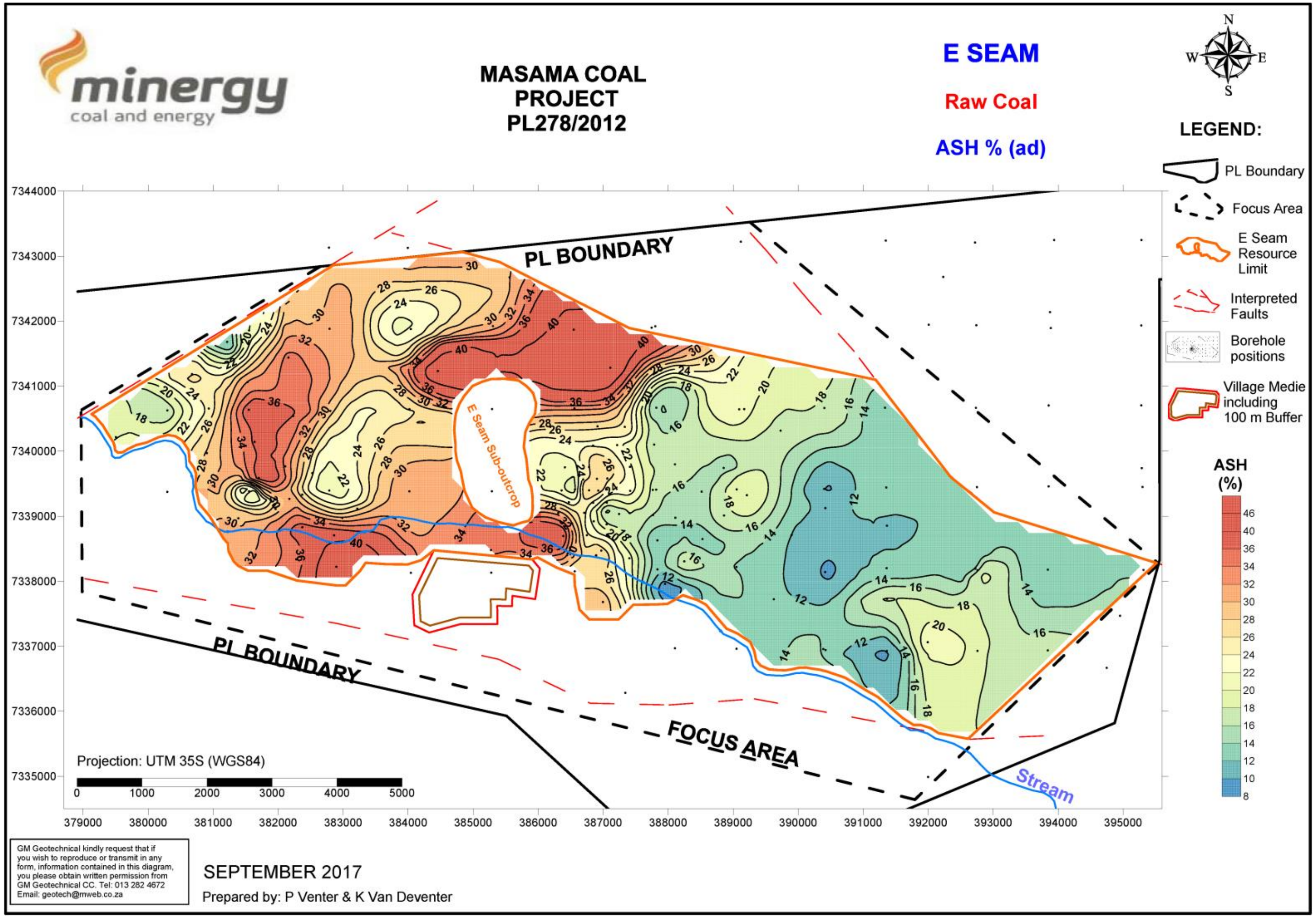

Figure 21: E Seam Raw Coal Ash (%) contour plan.

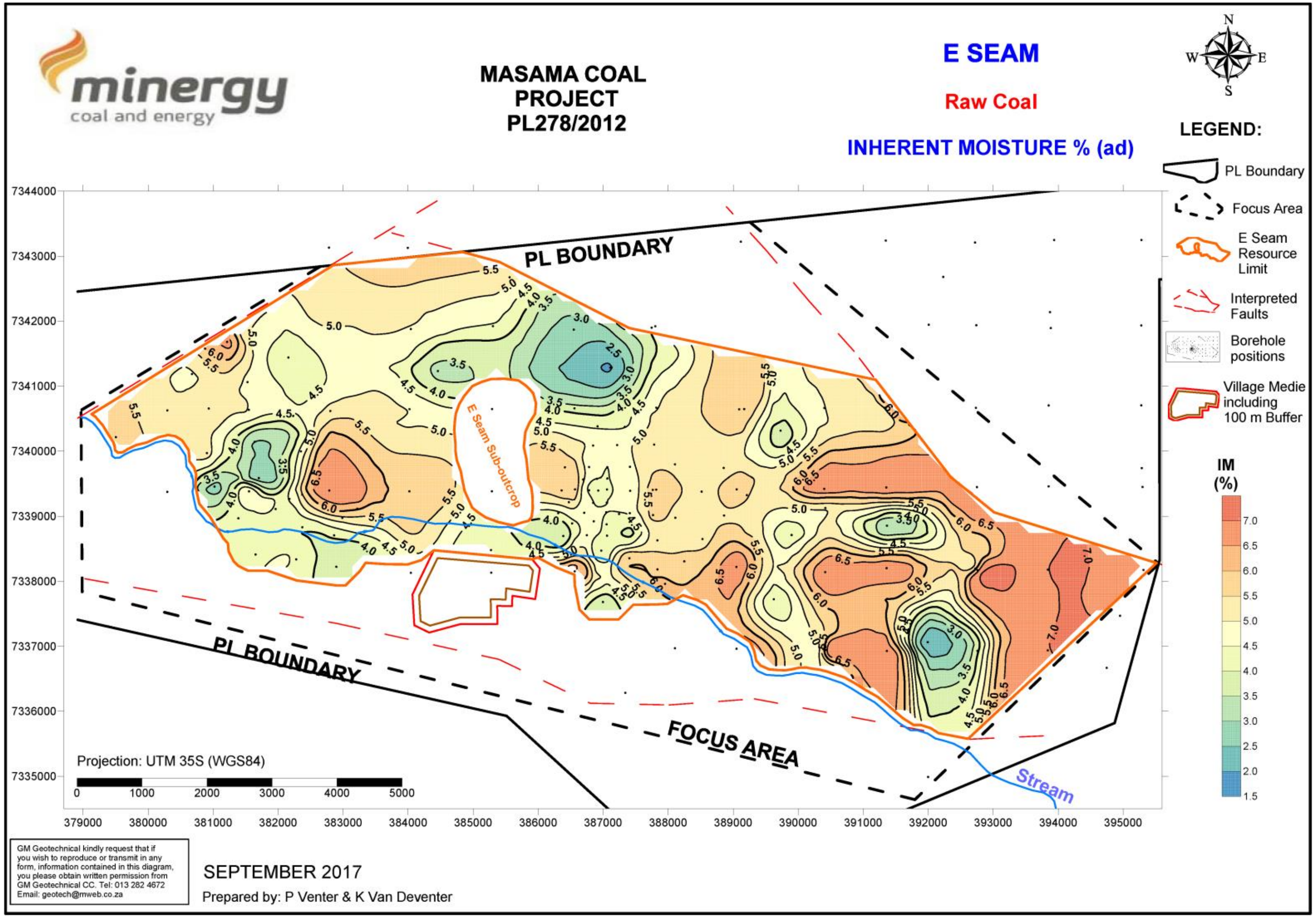

Figure 22: E Seam Raw Coal Moisture (%) contour plan.

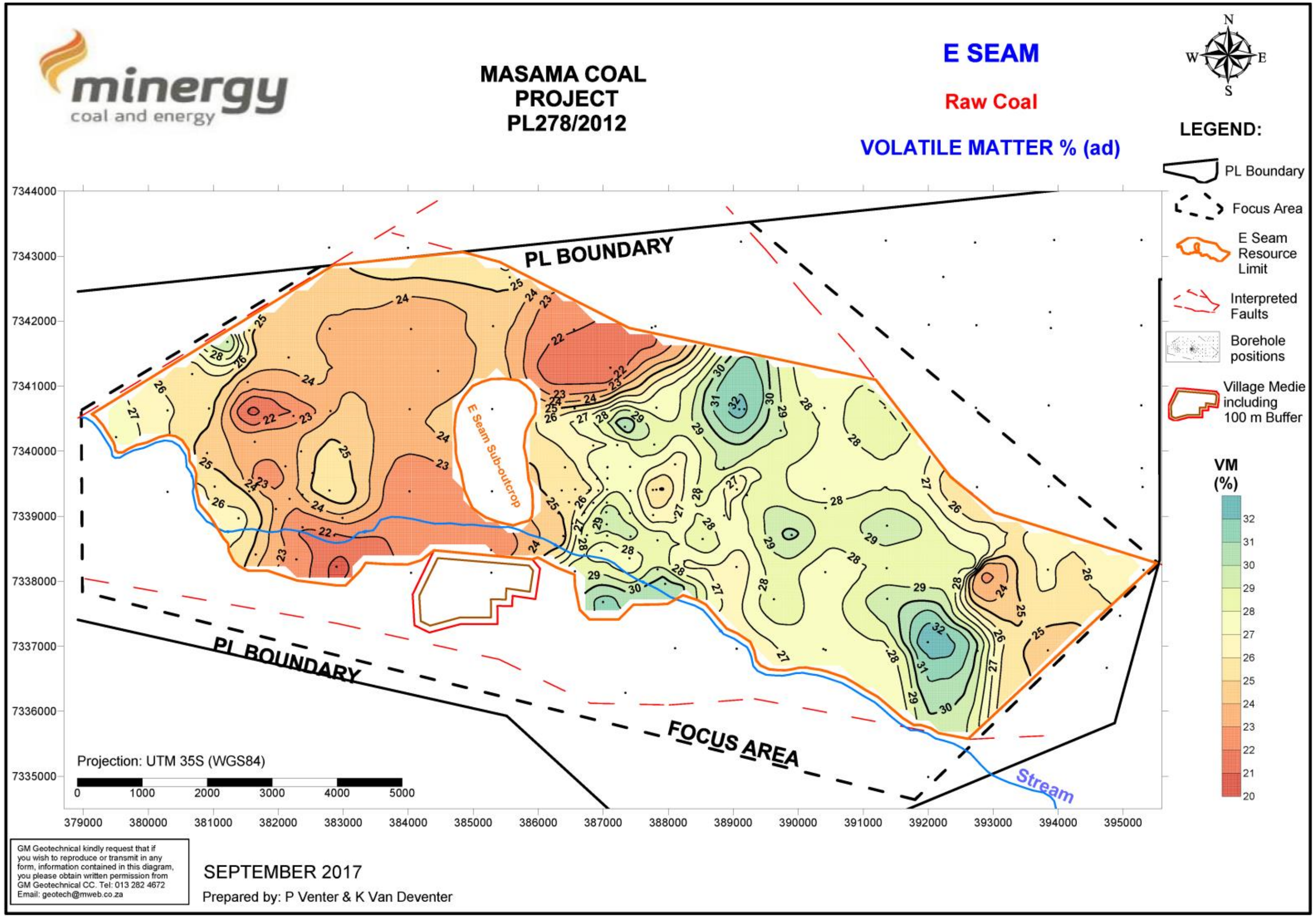

Figure 23: E Seam Raw Coal Volatile Matter (%) contour plan.

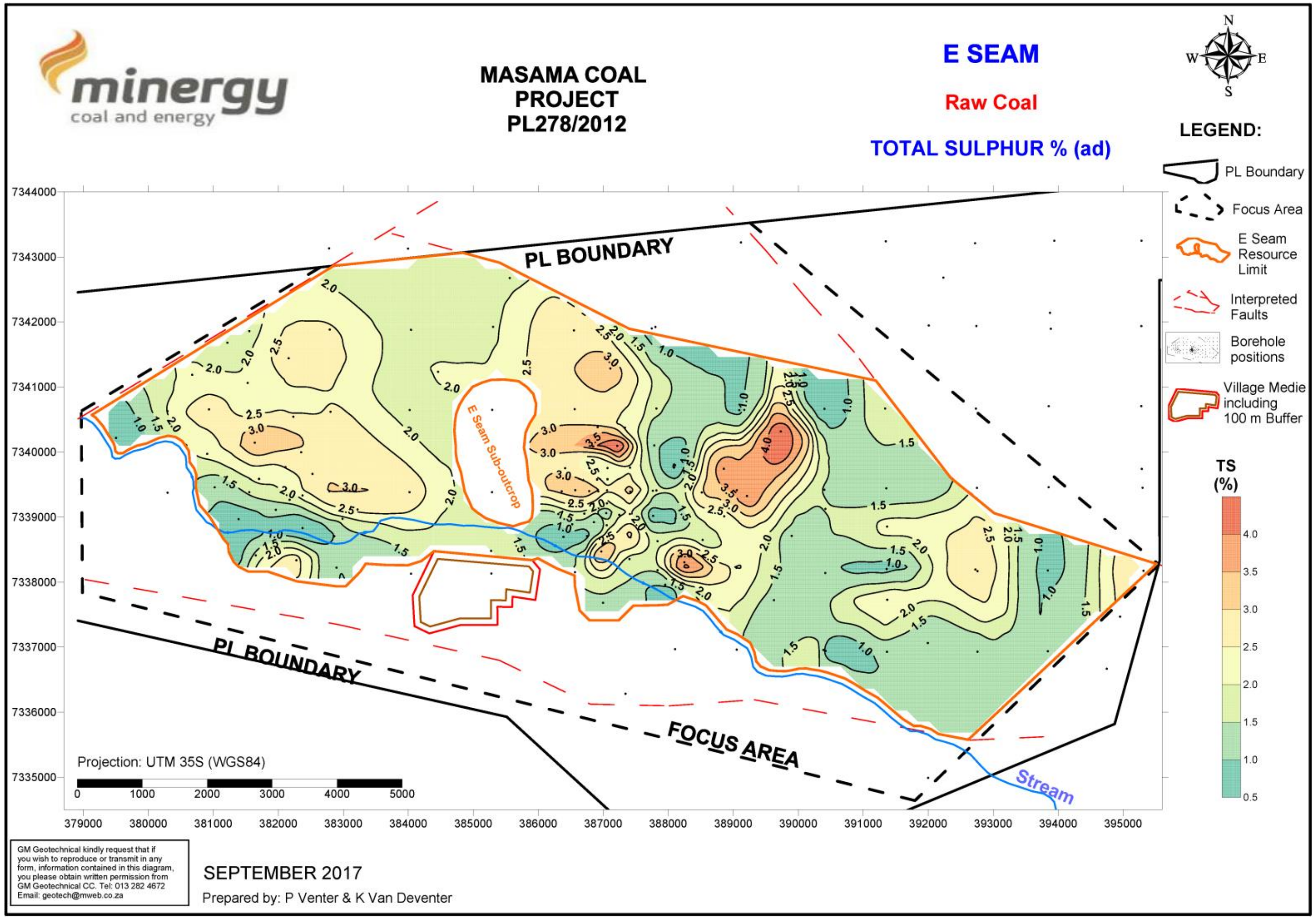

Figure 24: E Seam Raw Total Sulphur (%) contour plan.

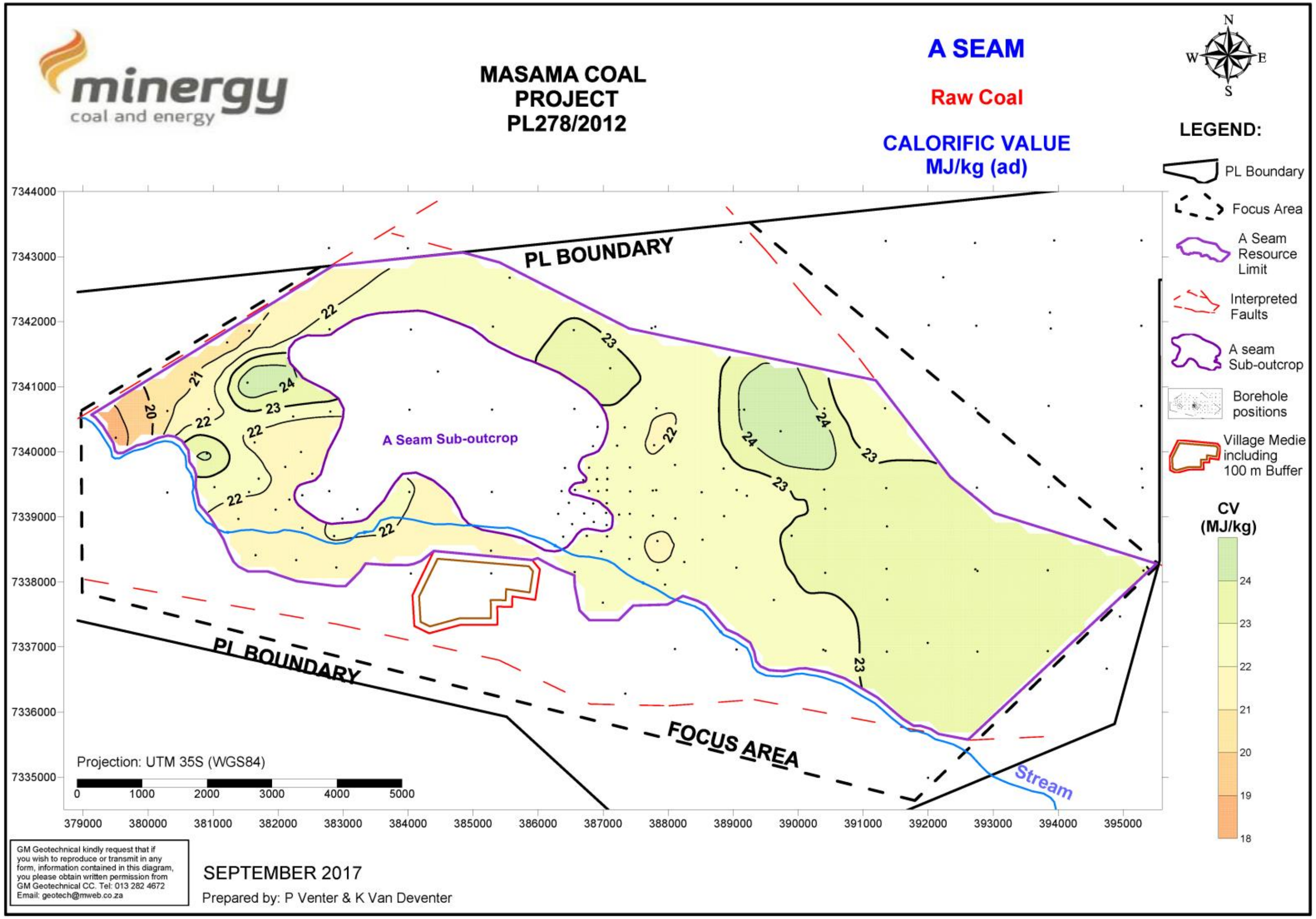

Figure 25: A Seam Raw Coal Calorific Value (MJ/kg) contour plan.

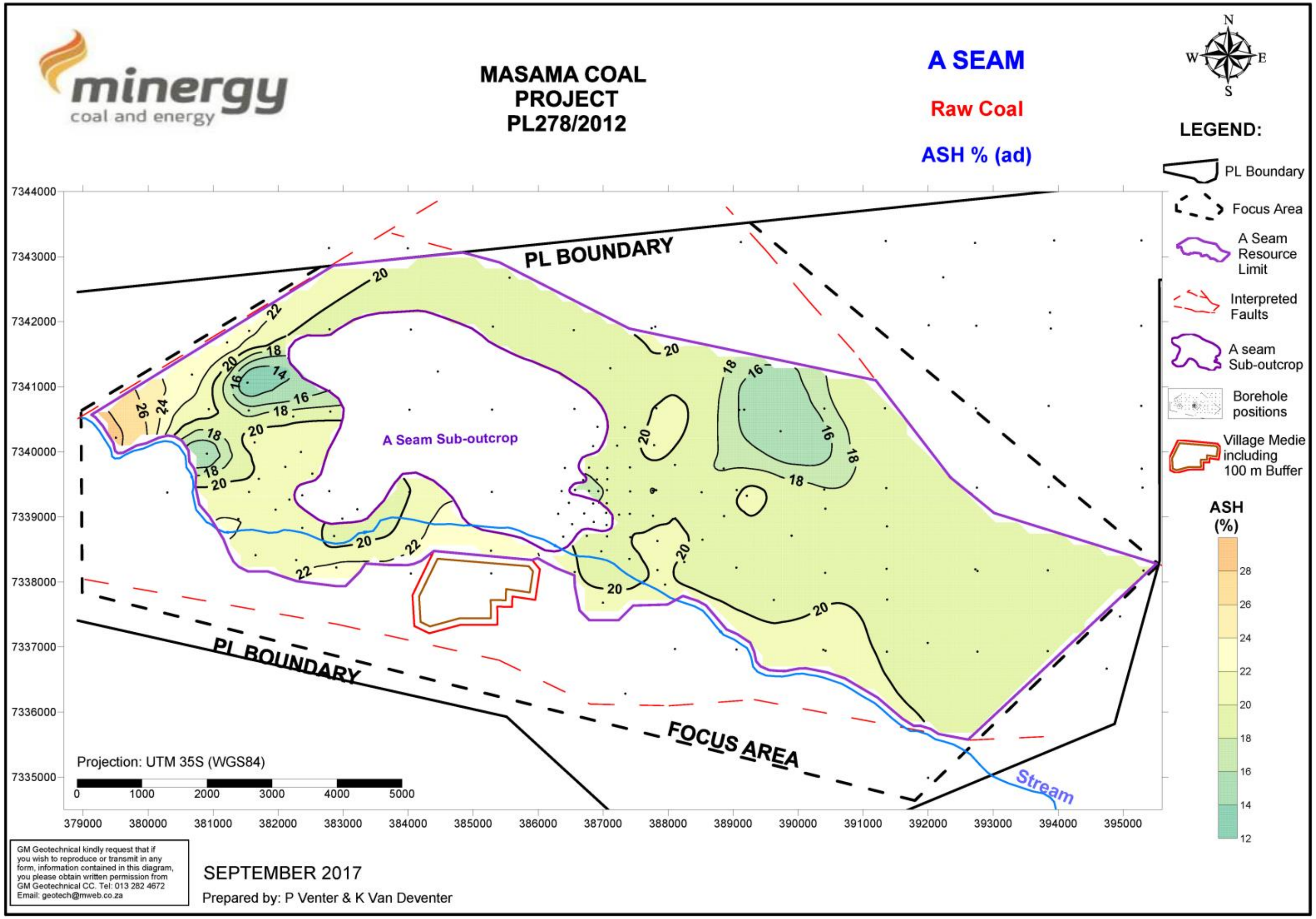

Figure 26: A Seam Raw Coal Ash (%) contour plan.

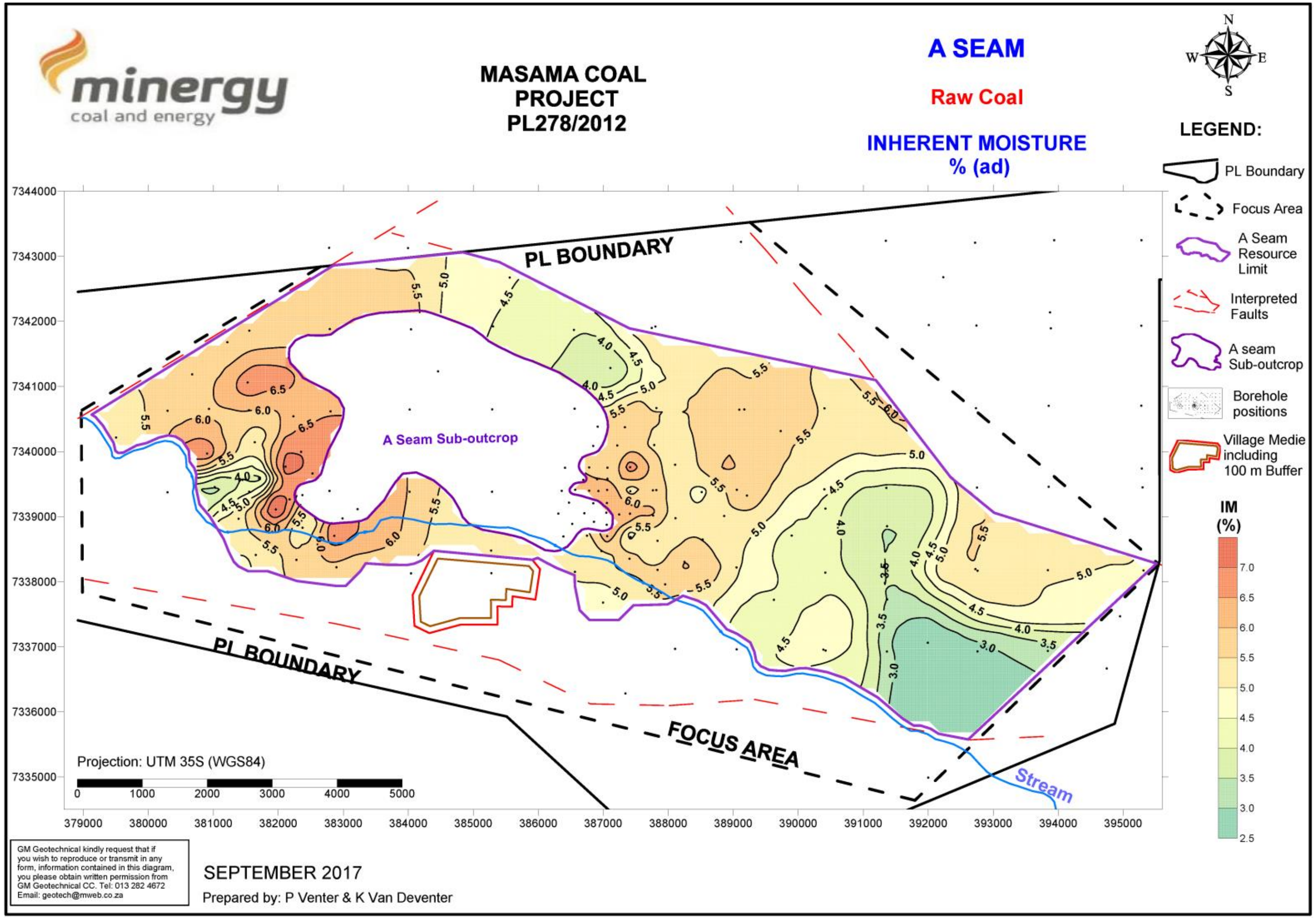

Figure 27: A Seam Raw Coal Moisture (%) contour plan.

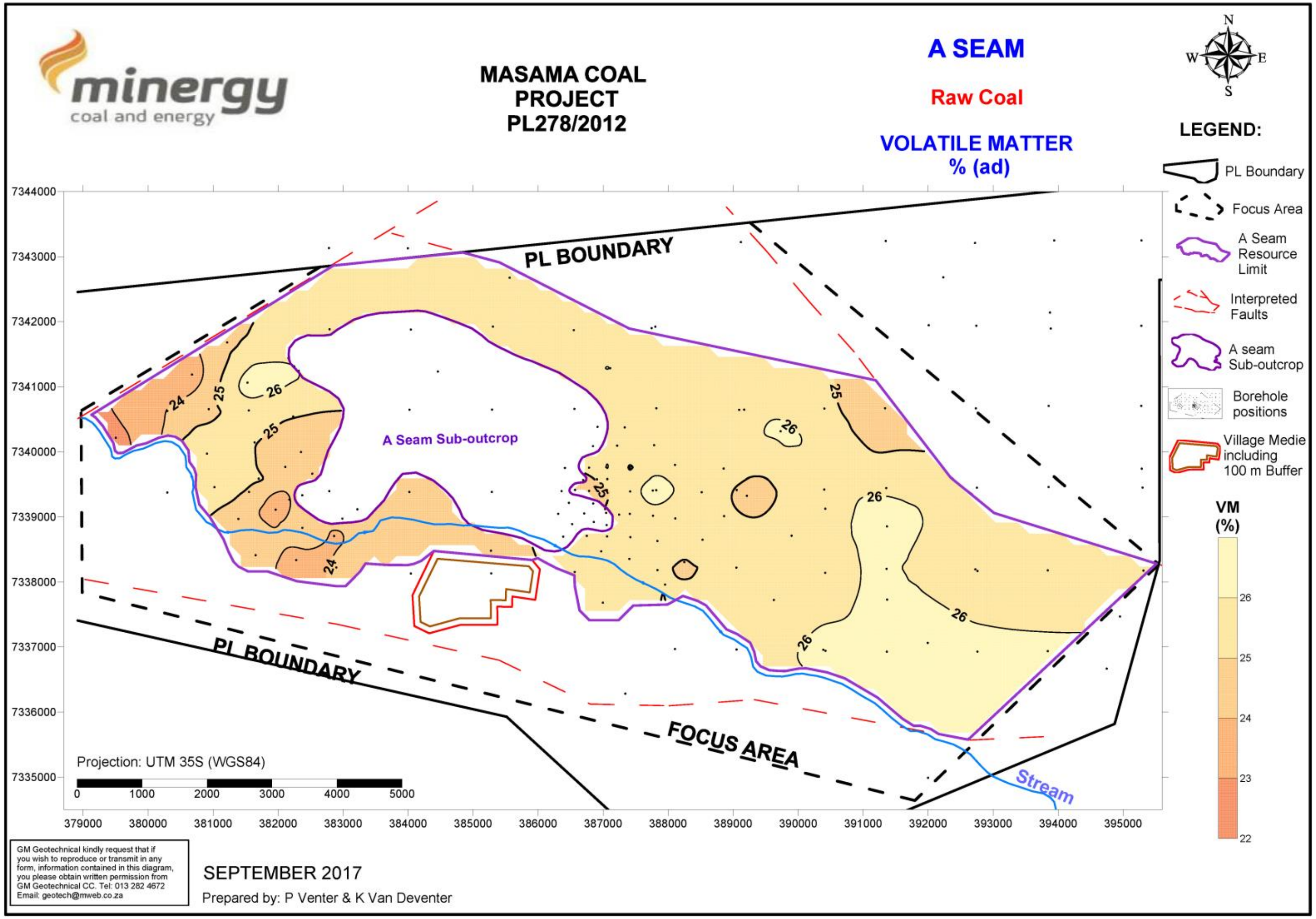

Figure 28: A Seam Raw Coal Volatile Matter (%) contour plan.

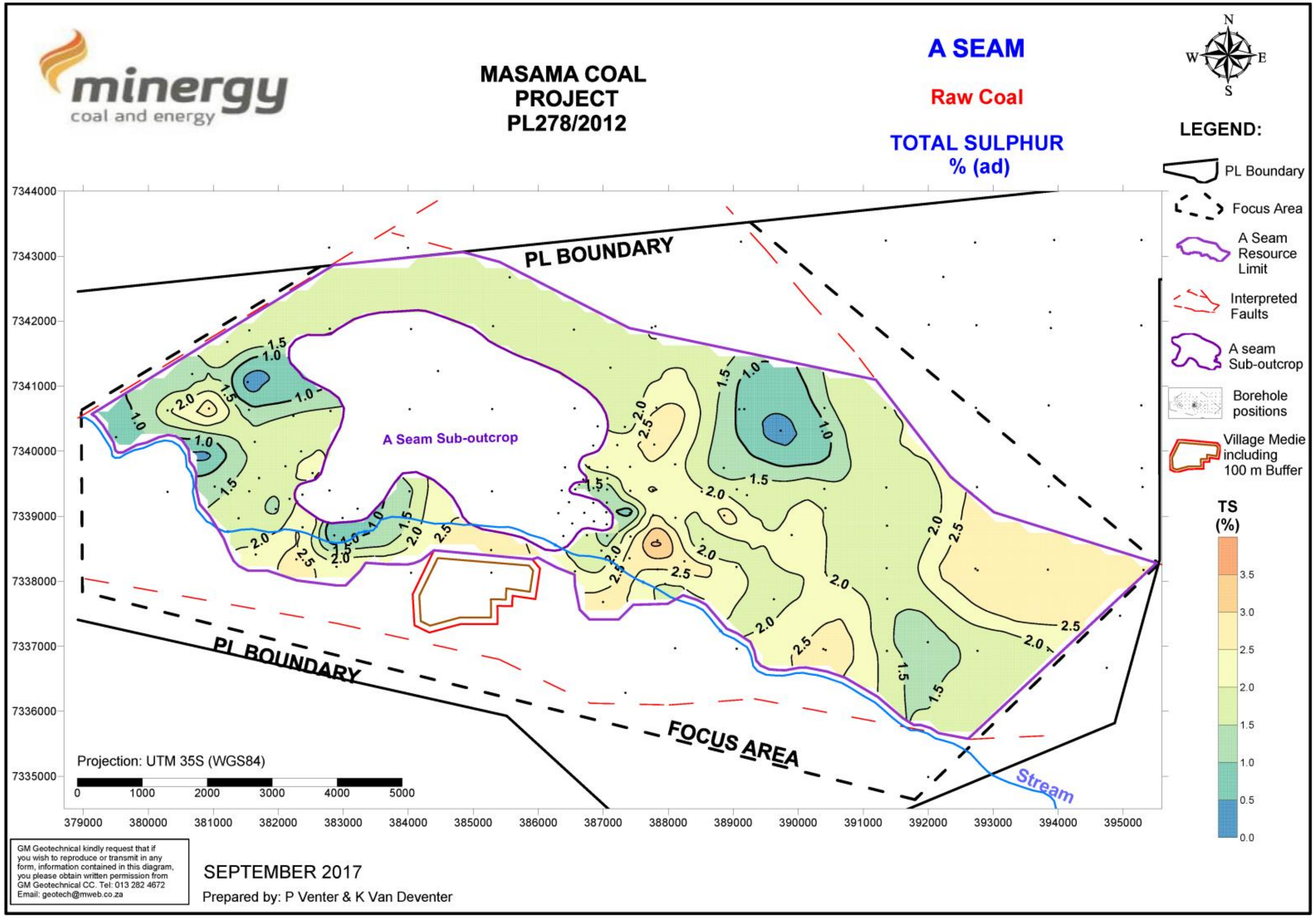

Figure 29: A Seam Raw Coal Total Sulphur (%) contour plan.

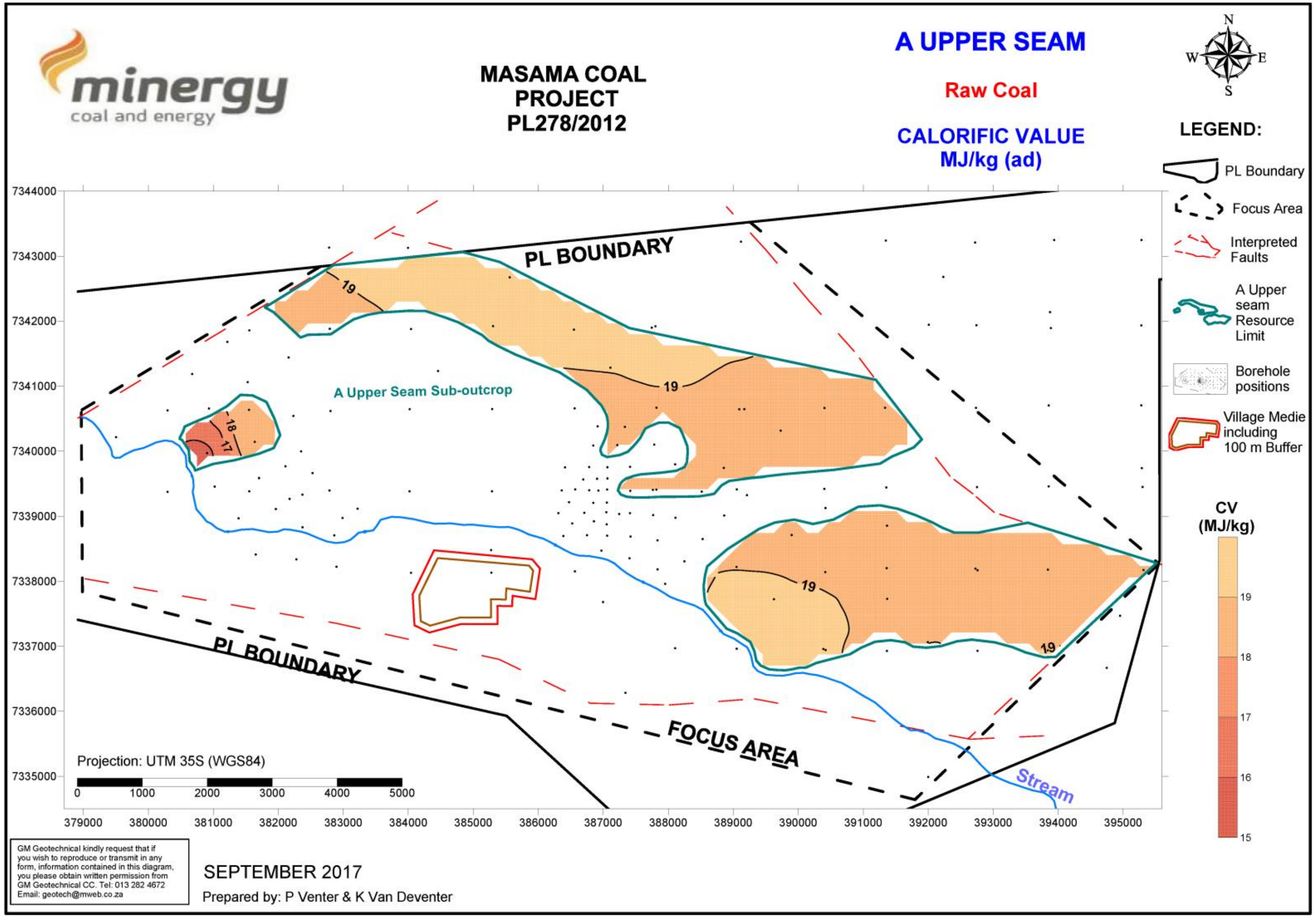

Figure 30: AU Seam Raw Coal Calorific Value (MJ/kg) contour plan.

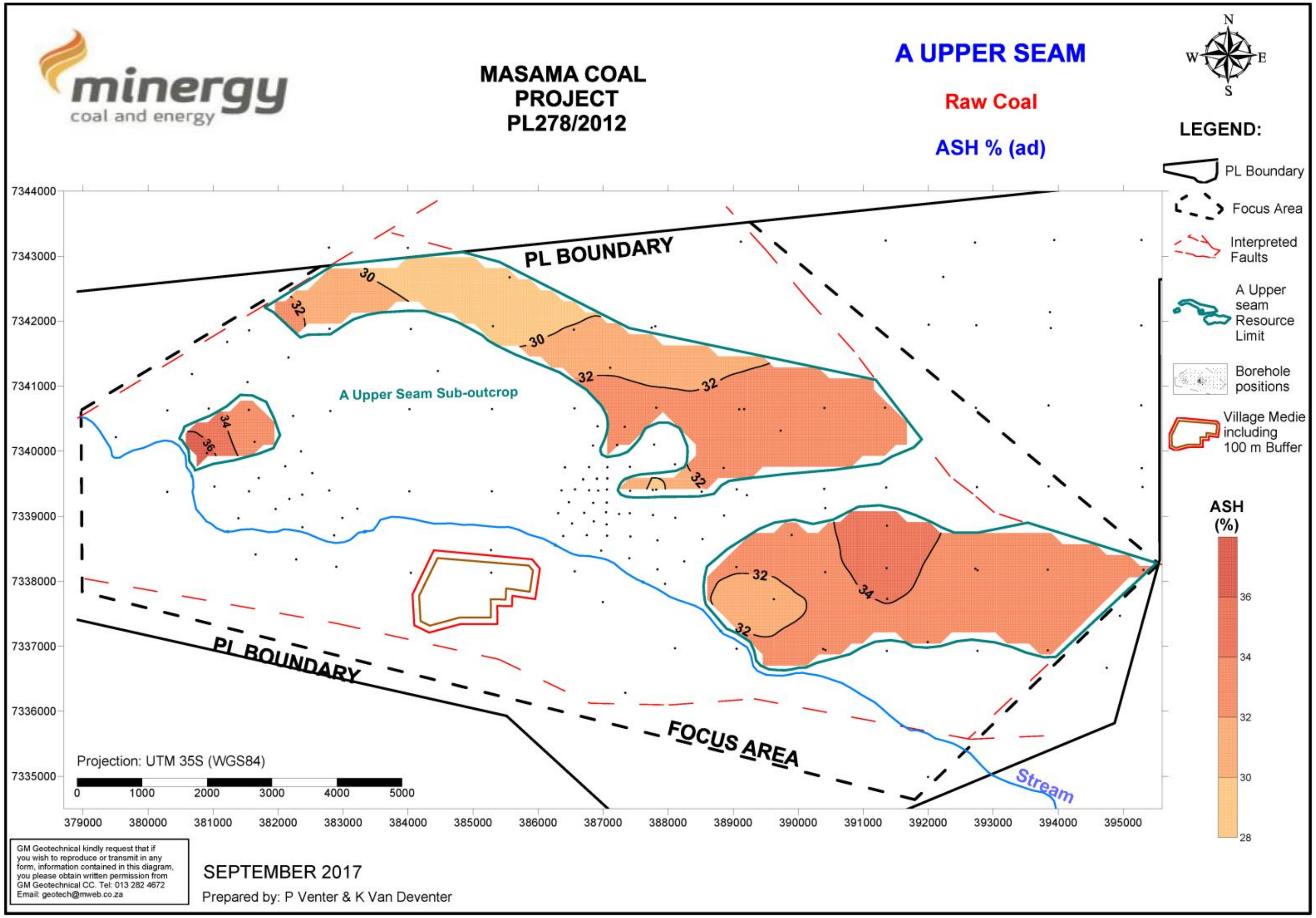

Figure 31: AU Seam Raw Coal Ash (%) contour plan.

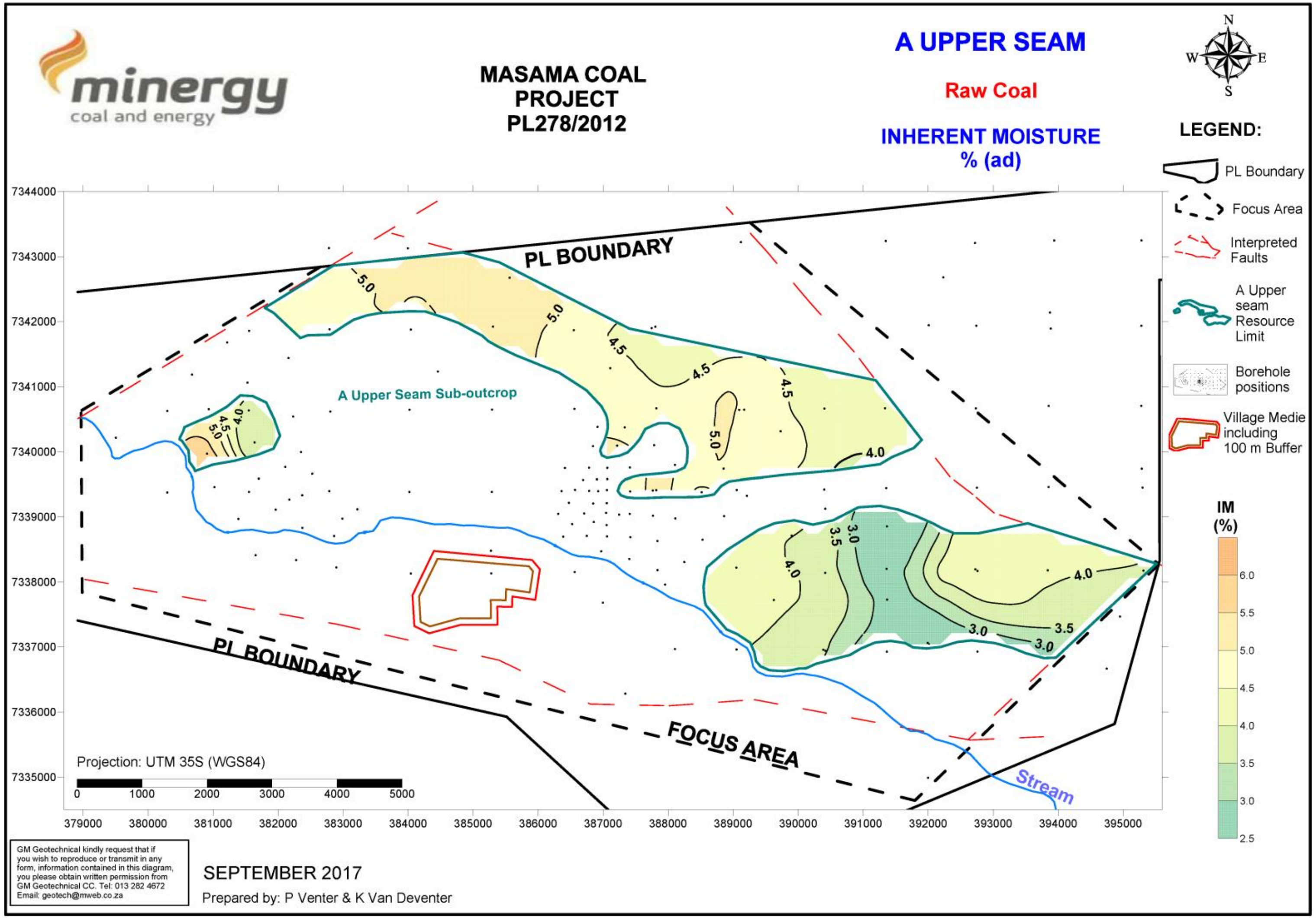

Figure 32: AU Seam Raw Coal Inherent Moisture (%) contour plan.

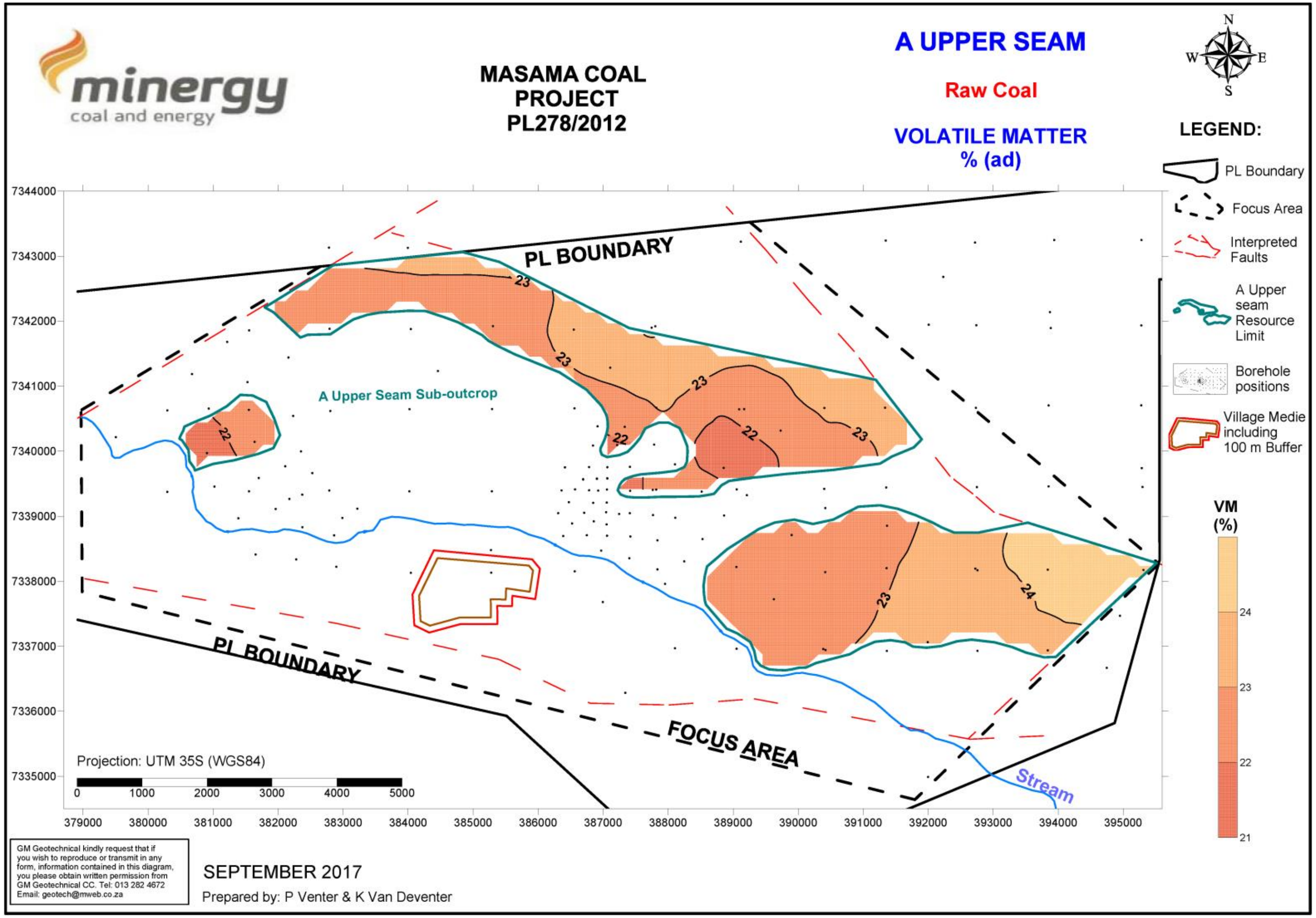

Figure 33: AU Seam Raw Coal Volatile Matter (%) contour plan.

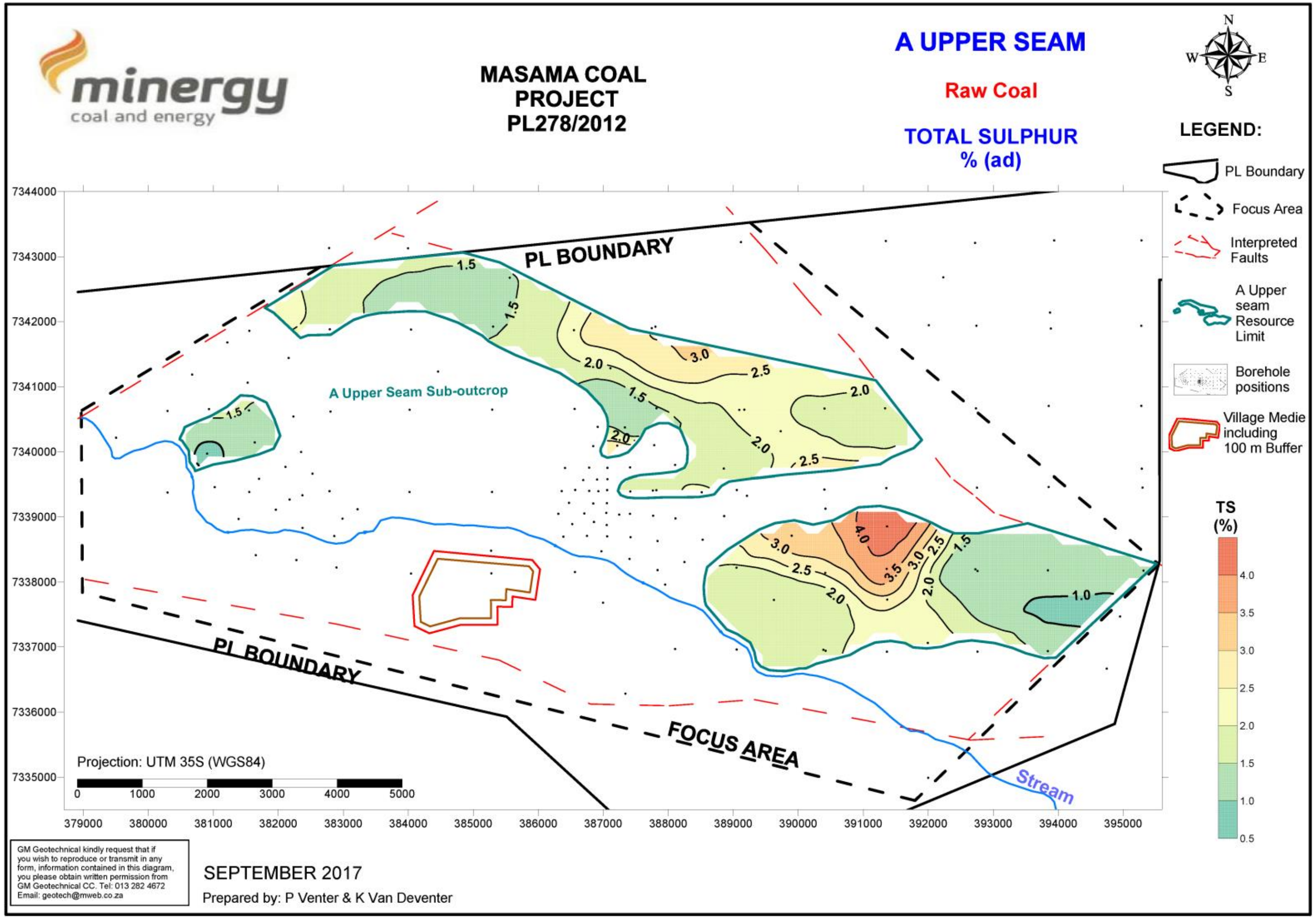

Figure 34: A Seam Raw Coal Total Sulphur (%) contour plan.

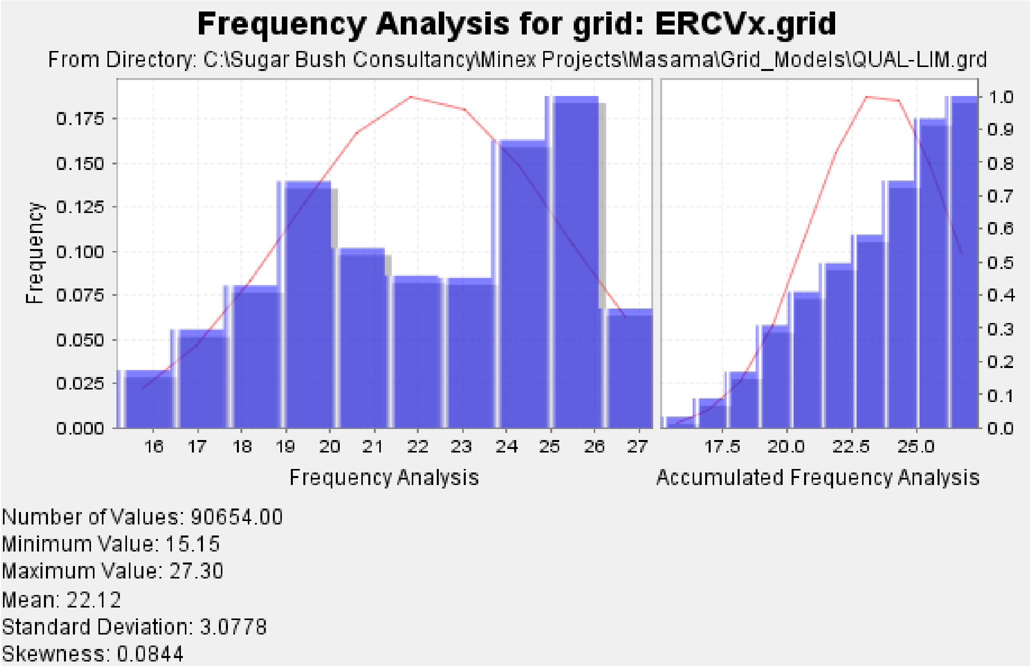

Figure 35: E Seam - Histogram showing distribution of Raw Coal Calorific Value (MJ/kg) (Focus Area of Masama West Block). Two definite populations with specific Calorific Value are present within the data set.

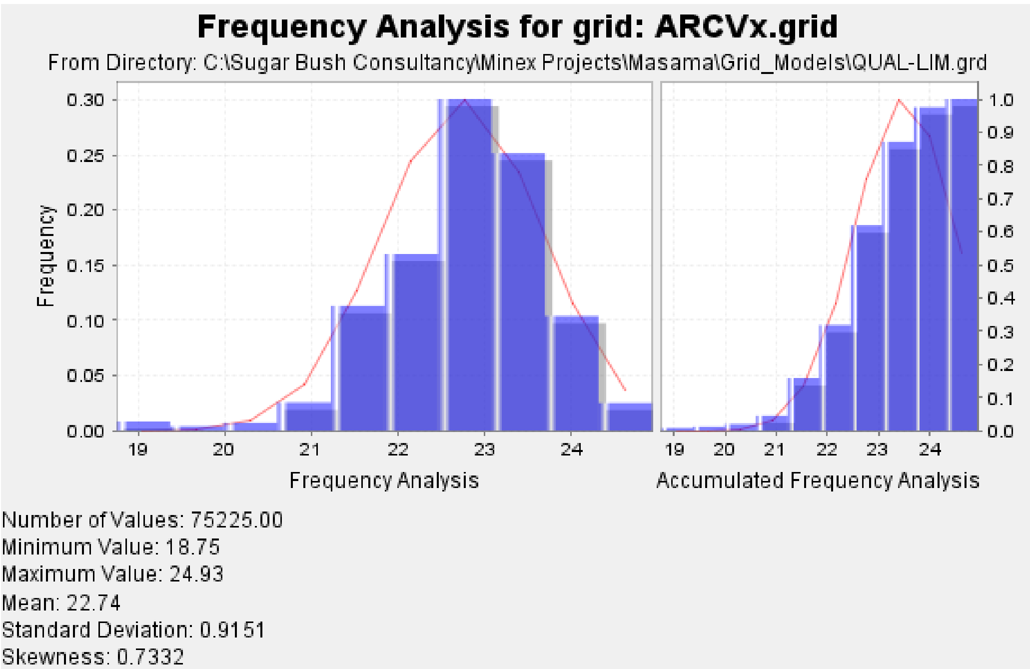

Figure 36: A Seam - Histogram showing distribution of Raw Coal Calorific Value (MJ/kg) (Focus Area of Masama West Block).

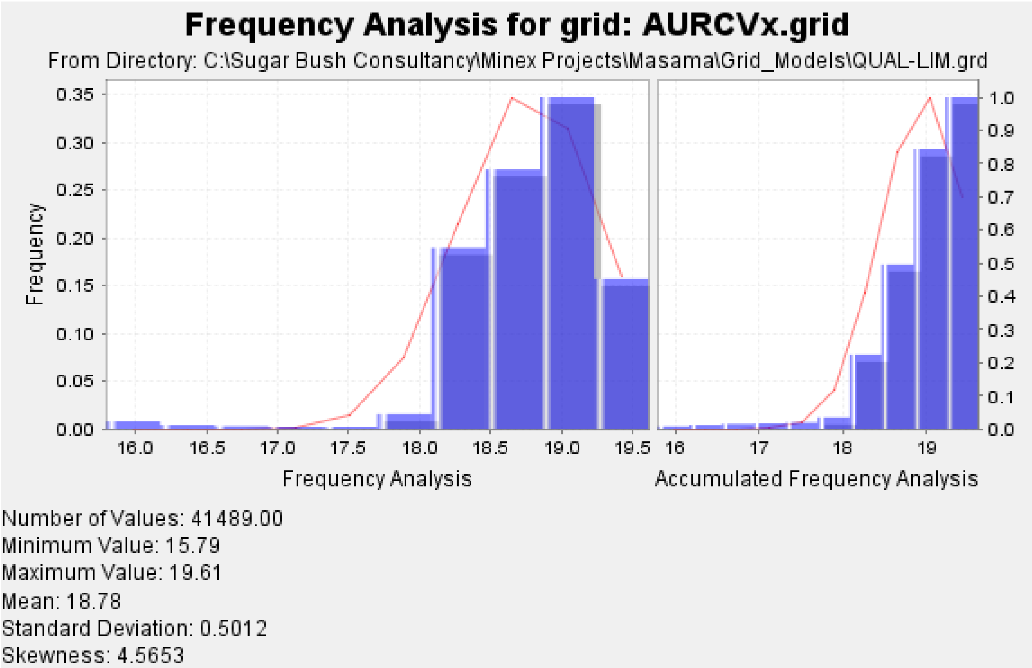

Figure 37: AU Seam - Histogram showing distribution of Raw Coal Calorific Value (MJ/kg) (Focus Area of Masama West Block).

6. EXPLORATION DATA AND INFORMATION

6.1 Remote sensing data and interpretations (3.1 (i))

High resolution satellite images have been compiled from data available on Google Earth Pro® (2012 and 2016). No other satellite imagery has been collected by Minergy for the Masama Coal Project and no interpretations have been done.

6.2 Geophysics (3.1 (i), (iii))

Shell reported that they conducted ground magnetic and gravity surveys but this data or their interpretations could not be sourced.

Aeromagnetic surveys were flown by the Fugro Airborne Surveys for the Department of Geological Survey (DGS) in 1986. This data set is of excellent quality and was flown with a 200 m line spacing, 80 m mean ground clearance and then gridded to a 50 m mesh. Minergy purchased grids of the Total Magnetic Intensity and First Vertical Derivative from the DGS (Figure 38 and Figure 39).

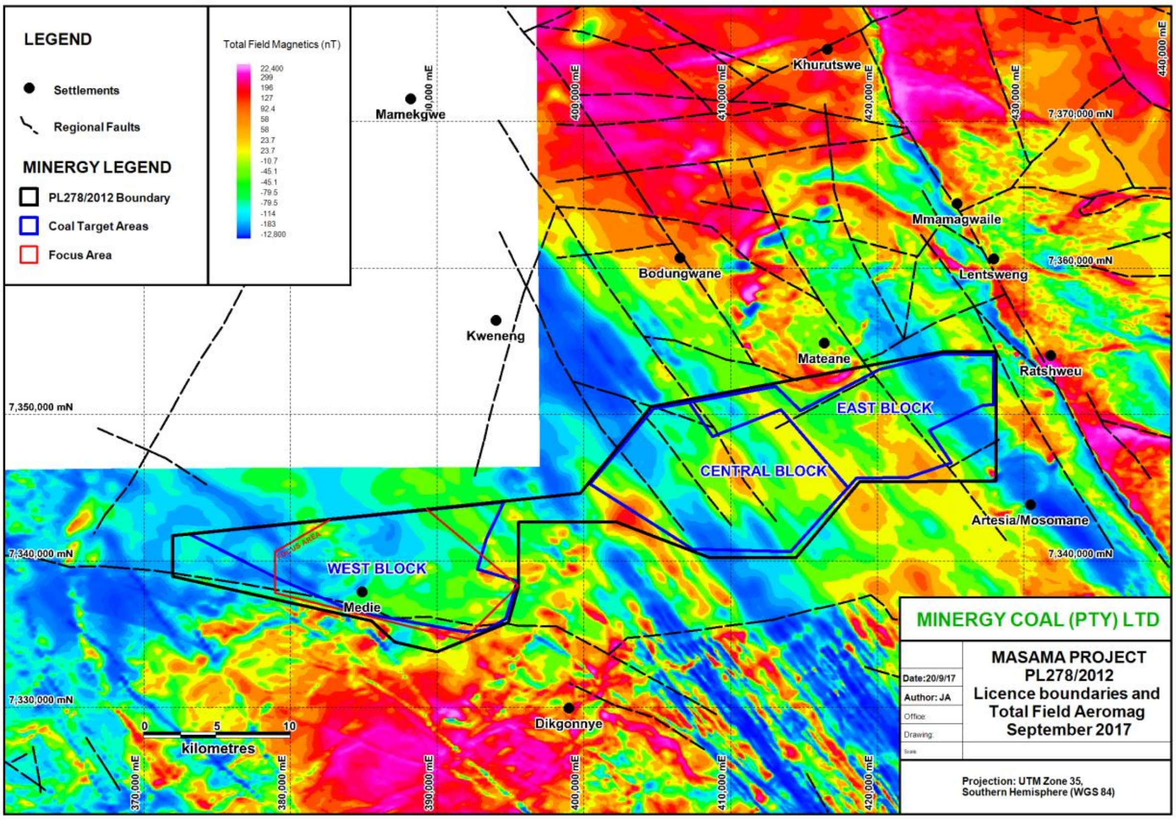

Figure 38: Masama Coal Project: Aeromagnetic Survey Data – Total Field

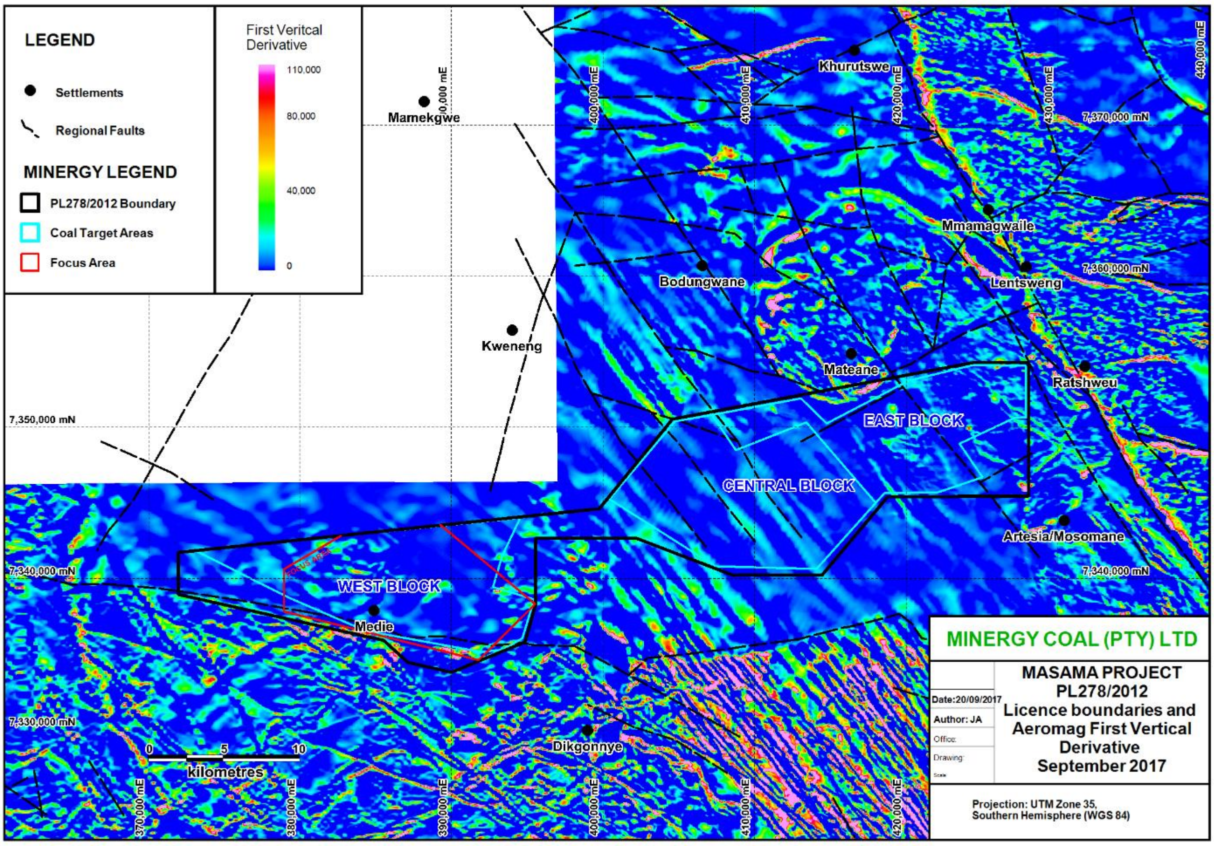

Figure 39: Masama Coal Project: Aeromagnetic Survey Data – First Vertical Derivative.

The aeromagnetic data are particularly helpful in identifying major geological boundaries, structures and the presence of late Karoo aged intrusive rocks affecting the Masama Coal deposit. Boundaries determined from the aeromagnetic data were used to constrain the resource model. The aeromagnetic survey also indicates that very few dykes or sills affect the Masama Coal deposit, but that in the case of the Central Block there are numerous northwest trending structures and dykes in the pre-Karoo basement. Some of these structures have possibly been reactivated in post-Karoo times. Down-the-hole geophysical logging was conducted on most boreholes drilled by Shell (1982)[14] and on all boreholes drilled by Minergy. The typical suite of data collected was, long spaced density, short spaced density, gamma and calliper.

6.3 Mapping (3.1 (i))

No systematic surface mapping other than the structural mapping conducted by Coetzee (2016)[31] in and around an abandoned quarry immediately to the east of Medie is known to have taken place in the Masama Coal Project area. The lack of field mapping is most probably due to the very limited outcrop of bedrock geology beneath the Kalahari Sand. Shell (1982)[14] did however produce maps indicating the estimated thickness of Kalahari Sand present and also a sub-outcrop geological interpretation on the basis of their drilling results.

6.4 Structural studies (3.1 (i))

Shell conducted a structural interpretation (1982)[14] and was incorporated into the analysis done in this report. In addition, the aeromagnetic data was examined and the presence of potential structures interpreted, these were also applied in the determination of boundaries to the Coal Resource estimate.

Coetzee (2016)[31] conducted a preliminary field study on joints; the results of which have already been discussed in Section 5.4 of this report.

6.5 Drilling (3.1 (v), (vi), (vii); 3.2 (i), (v); 7.1 (i))

Between 1974 and 1979, Shell conducted wide spaced (regional) drilling on Block S and defined several “reserves” that met their specifications. In excess of one hundred mostly fully cored boreholes were drilled in this phase (Shell 1979[12] and 1981[13]). A small number of these “regional” exploration boreholes fall within the Masama Coal Project area and Minergy has managed to source geological logs, down-the-hole geophysics and limited analytical data for these boreholes.

In Shell’s S-East Block a focused exploration programme took place from 1980 to 1982. During this phase Shell drilled a further one hundred and one boreholes, of these forty-five were fully cored and fifty-six were percussion boreholes. All boreholes were geophysically logged, and only the fully cored boreholes were sampled, targeting the E Seam and the A Seam (with an emphasis on the E Seam). Minergy has sourced summary data for this drilling programme as well as the geophysical logs.

Twenty fully cored boreholes totalling 1 792 m were drilled by Minergy during the period October to December 2012 in the Masama Coal Project area. All the Minergy boreholes were drilled by Diabor Botswana (Pty) Ltd. using either LY33 or XY44 drill rigs. Boreholes were all completed as either HQ or TNW diameter core. In some cases, tri-cone was used through the soft unconsolidated overburden and then PQ or HQ down to solid rock, Boreholes were then cased to below the depth of weathering and then completed with HQ or TNW diameter core. Some boreholes were drilled with an HQ triple tube core barrel. All boreholes were drilled vertically and down-the-hole orientation surveys were run on the first two, which confirmed very little deviation from the vertical starting position.

During the drilling programme a collar table was maintained, recording the site where each borehole was drilled, hand held GPS co-ordinates, date started and ended, final borehole depth, depth of weathering, core sizes, casing inserted, geologist who logged and sampled the core, geophysical and orientation surveys and collar surveys as well as any other relevant information. Differential GPS (DGPS) collar surveys were conducted once drilling was complete.

Minergy field operations were directed by Mr. John Astrup (Minergy) who is the Exploration Manager and a geologist with twenty-two years of experience including six years spent on coal exploration in Botswana. The coal logging was conducted by Mr. John Astrup and two independent geologists: Mr Vivian Stuart-Williams (BSc, MSc Sedimentology) and Mr Kelebogile Modise (BSc Geology). The field geotechnical logging was conducted by Mr.Blessing Chivasa (National Diploma in Geology).

The Minergy 2012 exploration programme had two main objectives:

- The first objective was to twin selected Shell boreholes to compare their seam depth, thickness and coal qualities in order to obtain the required level of confidence in the historic data. Their collars were located within 50 m of the Shell borehole collars. This objective was achieved as indicated in Table 6.

Table 6: Comparison of the Minergy and Shell twin boreholes.

Minergy BOREID	A Seam Depth	A Seam Thickness	E Seam Depth	E Seam Thickness	Shell BOREID	A Seam Depth	A Seam Thickness	E Seam Depth	E Seam Thickness
MW01	39.12	5	56.24	1.28	**SE355**	39.1	4.7	56	1.28
MW02	103.98	4.71	125.65	1.99	**SE351**	103.45	4.75	124.8	1.98
MW03	58.7	4.48	80.36	1.67	**S110**	59.04	4.32	80.92	1.58
MW05	36.29	4.93	54.13	1.4	**SE335**	37	5	54.8	1.52
MW06	93.32	5.13	112.12	1.46	**SE302**	92.2	5	110.5	1.48

1. E Seam thicknesses from Shell 1982 Report[13]. E and A Seam depth and A Seam thickness from geophysical logs

- The second objective was to infill the Shell boreholes, which were either situated within the Masama Coal Project area or were within a two kilometre radius of the project area, to satisfy the JORC Code (2012)[16] criteria for classification of an inferred coal resource. The borehole spacing of the historic and Minergy boreholes varies from 1.5 km to 3.5 km.

During April and May 2016 Minergy drilled a further eleven fully cored boreholes totalling 374 m at the Masama Coal Project. The drilling specifically targeted shallow A Seam resources with seven of the eleven boreholes intersecting thick, high quality A Seam at depths of between 21.7 m and 26.7 m (top of seam), Seam thicknesses were between 4.5 m and 5.5 m, while boreholes that did not intersect the A Seam were towards the sub-crop area. Drilling took place in two areas, which have been termed Section A in the east and Section B in the west of the Focus Area. Boreholes were stopped approximately 5.0 m below the A Seam and were not drilled down to the E Seam. All the boreholes were drilled by Diabor Botswana (Pty) Ltd as HQ3 diameter core. All the boreholes were drilled vertically.

The drilling programme was supervised by Mr John Astrup (Minergy). All holes were geophysical logged by Poseidon Geophysics who also conducted DGPS surveys of borehole collars. Borehole logging and sampling was conducted by Mr Gerhard Mulder

(Geologist) and Mrs Pauline Venter (Technical Assistant) both of whom have extensive coal experience.

An additional 46 cored boreholes were drilled during the period from February 2017 to June 2017, totalling 2 806 m. This drilling focussed on the shallow portions of Section A and Section B, but also included 5 wider spaced holes within the focus area. All boreholes were drilled down to approximately 5m below the E Seam. Most of the boreholes were drilled by Diabor Botswana (Pty) Ltd as HQ3 or TNW diameter core, however Discovery Drilling Contractors drilled 4 holes (MW64, 65R, 66 and 68). All boreholes were drilled vertically.

The drilling programme was supervised by Mr John Astrup (Minergy). All holes were geophysical logged by Poseidon Geophysics who also conducted DGPS surveys of borehole collars. Borehole logging and sampling was conducted by Mr John Astrup (Geologist), Mr B Chivasa (Geotechnician) and Mr Gerhard Mulder (Geologist) all of whom have extensive coal experience.

A program of RC drilling was undertaken during May 2017, to fill in additional structural control points in particular around the sub-outcrop position of the A Seam. 22 boreholes were completed in total (702m) in both Section A and Section B of the Focus Area. Chips from the RC holes were collected and logged at 1m intervals and where coal seams were intersected, these were sampled at 1m intervals to check relative quality of the coal intersections. Down hole geophysical logging was conducted on all holes. Samples collected were submitted to Bureau Veritas Laboratory in Centurion, South Africa for raw coal proximate analysis.

The borehole locations (historical (Shell) and Minergy boreholes 2012, 2016 and 2017) are shown in Figure 40 and Appendix 5.

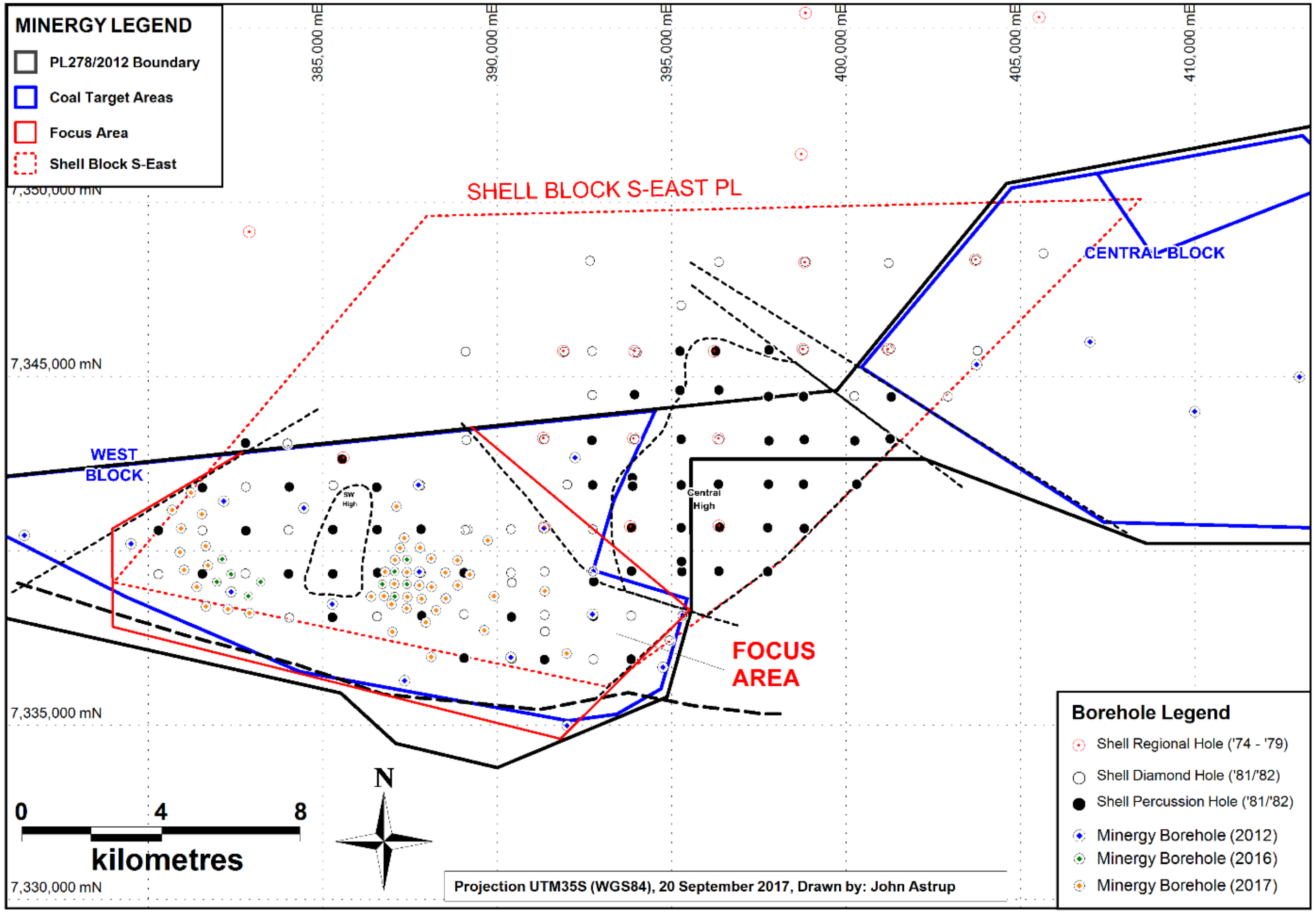

Figure 40: Masama Coal Project: Borehole location map (Shell and Minergy)

The past (1974 – 1982) and present (2012, 2016 and 2017) exploration drilling programmes conducted by Shell Coal Botswana (Pty) Ltd and Minergy Coal (Pty) Ltd respectively up to date are summarized in Table 7. In total 215 boreholes have been drilled at the Masama Coal Project, with 138 boreholes in the focus area.

Table 7: Summary of exploration programmes (historical reports and information provided by the Client).

COMPANY	DATE	No. OF BH	CORED	OPEN-HOLED	WIRELINE LOGGING	BH SPACING
Shell Coal Botswana (Pty) Ltd	1974-1975	4	3	1*	BPB	-
	1976	11	6	5	BPB	-
	1980	25	14	11	Mini-Logger	±2 – 2.5 km
	1981-1982	76	31	45	BPB	±1.2 – 2 km
Minergy Coal (Pty) Ltd.	2012	20*	20	0	Poseidon Geophysics	2.5 -3km
	2016	11	11	0	Poseidon Geophysics	±500 m.
	2017	68	46	22	Poseidon Geophysics	±350 m; 500m & > 1km

*** West Block and Central Block boreholes**

138 Boreholes fall within the Focus area, of which 67 are cored holes.

6.6 Down-the-hole geophysical logging (3.2 (ii), (v))

All Minergy boreholes were geophysically logged by Poseidon Geophysics. Natural gamma, long spaced and short spaced density and calliper were measured in each borehole. The down-the-hole geophysical data were used to assist with depth correlation and adjustments where necessary and were also extensively used to ensure consistency in sample selection. Detailed logistics reports covering the down-the-hole geophysical logging (2012, 2016 and 2017) including equipment specifications and calibration are presented in Appendix 8.

6.7 Borehole logging (3.2 (ii), (iii), (iv), (v); 3.3 (vi); 3.6 (i); 10.3 (i))

For the Minergy 2012, 2016 and 2017 drilling the protocol below was followed:

Core was examined at the rig and a first pass orientation and marking of core was completed. Coal intersections were examined in detail noting zones of bright and dull coal as well as carbonaceous mudstone on the core, using a china marker.

Borehole core was then transported to the central core shed in Medie, foam or rubber mats were placed between core boxes to ensure minimum movement of the core. Special care was taken of boxes containing coal seam intersections. Transportation of the core by vehicle and handling was carried out very carefully, disturbing the core as little as possible.

Once in the core shed the borehole core was laid out for logging. The core was meter marked with depths using reliable drilling breaks and correcting the depths through core runs with over or under recovery of core. The core was joined together wherever possible and from one row of core to the next within the core box. All zones of core loss were identified and noted on the core or on the core box. Where it was exceptionally difficult to accurately meter mark the core, the geophysical logs were used to assist by marking the depths of major lithological changes clearly visible on the geophysical log.

Core recovery was recorded for each sample. However, for the 2012 drilling this was an overall recovery estimate rather than linear core recovery. Generally, the overall core recovery was >90% but in most cases >95%. There were however a few samples which had <90% overall recovery. Samples where overall core recovery estimates were <95% were re-examined (on core photo's) and a linear recovery was estimated. When this was done only six samples had linear core recovery <95% and only two of these were <90%. Where recovery over several samples was low in a particular borehole, these boreholes were re-drilled, as was the case with MW05.

The core was then logged as per Minergy's logging template, noting major lithologies, and providing descriptions of it and also logging zones of "core loss" as intervals where these occur. Regarding the lithology, the following features were noted:

- Colour;
- Grain size;
- Presence of easily visible grains such as "feldspathic" or "biotite" grains within sandstone units;
- Sedimentary features such as bedding, cross bedding, laminations, bioturbation etc.;
- Nature of contacts;
- Dips of contacts, or bedding where clearly visible and consistent;
- Fracturing and weathering.

For the coal zones, the core was closely examined noting zones of various coal lithotypes e.g. bright coal, dull coal, carbonaceous mudstone and grey mudstone. The geophysical logs were used to distinguish between dull coal, coaly mudstone and carbonaceous mudstone. Where bright and dull coal occurs as thin alternating bands, these bands were logged as mixed coal. Core boxes were taken into the sunlight to assist with distinguishing bright and dull coal. All units greater than 10 cm were logged as separate lithotypes. Within the coal zones the following were noted:

- Presence of pyrite nodules, frequency and size;
- Presence of secondary minerals
- Presence and nature of calcite veining;
- Presences and nature of siderite nodules/grains;

- Secondary minerals are described in terms of frequency of occurrence and size;
- Weathering and fracturing;
- Degradation of the coal;
- Lithological coding was carried out as per the list of "Lith" Codes for the Masama Coal Project;
- Interbedded lithologies were described separately as mixed lithologies.
- Secondary properties, which are not related to a specific lithological unit, which were recorded independently of the lithological units, are:
    - Weathering (types and base);
    - Core losses;
    - Indurations;
    - Tectonic structures.
- Stratigraphic coding is carried out as per the list of "Strat" Codes for the Masama Coal Project;
- The depth of weathering was recorded in the log and in the header of the logging template and later in the summary collar table;
- The logging geologist, date logged and changes in core size were also recorded in the header of the logging template;
- Basic validation of the logging was done during data capture and any errors were corrected prior to sampling of the core.

In addition to the geological logging, geotechnical logging was also conducted on all the Minergy boreholes by a suitably experienced rock engineer.

The different lithological types were identified and correlated to the down-the-hole geophysical logs. The detailed sections of the logs were used to distinguish between coal and mudstone as well as contact types. The core was logged using the GBIS Core Description Manual as basis.

The geological setting and characteristics of coal horizons were continuously compared from one borehole to the other.

At the Masama Coal Project it has been possible to identify a consistent sequence of samples, using a combination of the geophysical and geological logs and hence (to the extent possible) the same numbered sample should be taken in the same place in each borehole. This greatly facilitates later correlation, compositing and modelling of the coal seams.

In addition to the geological logging and coal zone inspection, the total core recovery (TCR) and the rock-quality designation (RQD) were recorded on the borehole logs.

The total core recovery (TCR) is the borehole core recovery percentage, which is defined as the quotient:

TCR = $(\frac{l_{sum\ of\ pieces}}{l_{tot\ core\ run}}) \times 100\%$

$l_{sum\ of\ pieces}$ = Sum of length of core pieces

$l_{tot\ core\ run}$ = Total length of core run

The available records do not identify any instances of significant core loss indicating that the core recovery, particularly over the coal intersections, are satisfactory at >95%.

Rock-quality designation (RQD) is a rough measure of the degree of jointing or fractures in a rock mass, measured as a percentage of the drill core in lengths of 10 cm or more. RQD has several definitions. The most widely used definition, originally introduced for use with NX-size core, is: the borehole core recovery percentage incorporating only pieces of solid core that are longer than 100 mm in length measured along the centreline of the core. RQD is defined as the quotient:

RQD = $(\frac{l_{sum\ of\ 100mm}}{l_{tot\ core\ run}}) \times 100\%$

$l_{sum\ of\ 100mm}$ = Sum of length of core sticks longer than 100 mm measured along the centre line of the core

$l_{tpt\ core\ run}$ = Total length of core run

High-quality rock has an RQD of more than 75%, whereas low-quality rock has an RQD of less than 50%.

Where recovery over several samples was low in a particular borehole, these boreholes were re-drilled, as was the case with MW16.

The nature and detail of the geological and geotechnical borehole logging undertaken on the Minergy Coal Project is sufficient to support the classification of Resources described in this report.

6.8 Sampling (3.2 (iii), (v); 3.3 (i), (ii), (iii), (iv), (v), (vi), (vii); 3.6 (i); 10.3 (ii))

Coal samples were obtained from boreholes, which were drilled during the Minergy 2012, 2016 and 2017 exploration programmes. To obtain sufficient sample mass for the required proximate analysis, calorific value, and total sulphur per wash fraction as well as phosphorous content and swelling index, a minimum sample weight of ~2 kg was targeted.

The entire borehole was then photographed. After photographing the core, the core may be split with a chisel and the proportions of bright and dull coal could be more accurately estimated where necessary. Samples were taken and bagged to be submitted to the laboratory.

Prior to sampling, the core was stored in the Medie core shed (out of the sun and in a “cool” and dry environment). Sampling was carried out within two weeks or less of drilling. All sample intervals were determined from geophysical and/or core observations and were clearly marked onto the core with a paint marker or chalk.

At the Masama Coal Project it has been possible to identify a consistent lithological sequence, using a combination of the geophysical logs and lithological descriptions and hence (to the extent possible) the same coal seam interval could be sampled (sample numbering with the same suffix) in each borehole. This greatly facilitated later correlation, compositing and modelling of the coal seams. Details of the geological and geophysical characteristics utilised in the A Seam selection as used by Mr Gerhard Mulder and Mr John Astrup are presented as Figure 41 and Figure 42. The geological setting and characteristics of coal horizons were continuously compared from one borehole to the other. During the Minergy 2012 and 2017 drilling programme the E Seam was sampled as a single sample.

All sample numbers, sampling intervals (from and to depths) as well as thicknesses were recorded on sample tags. The sample tags were prepared in duplicate; one was put inside the bag together with the sample and the other one was stapled to the sample bag. A complete sample list was subsequently completed in duplicate; one to accompany the samples to the laboratory and the other one filed for future reference. Samples were placed in heavy duty PVC sample bags and clearly marked with the sample numbers as described below. To ensure maximum representivity, whole core was sampled in all boreholes.

Export permits were obtained before taking the samples out of Botswana.

Samples were carefully transported to South Africa and submitted to the SANAS accredited, SABS Secunda Laboratory (T0230) (2012), Noko Analytical Services (T0512) and Bureau Veritas Inspectorate (Middelburg) (T0313) (2016) and Bureau Veritas Testing and Inspections South Africa (Pty) Ltd (Centurion) (T0469) for coal quality analyses. During 2016 a selection of samples were sent to Letaba Civil Engineering Materials Laboratory (Pty) Ltd. (T0549) for foundation indictor analyses. Samples were prepared and analysed using SABS, ASTM and ISO standard methods.

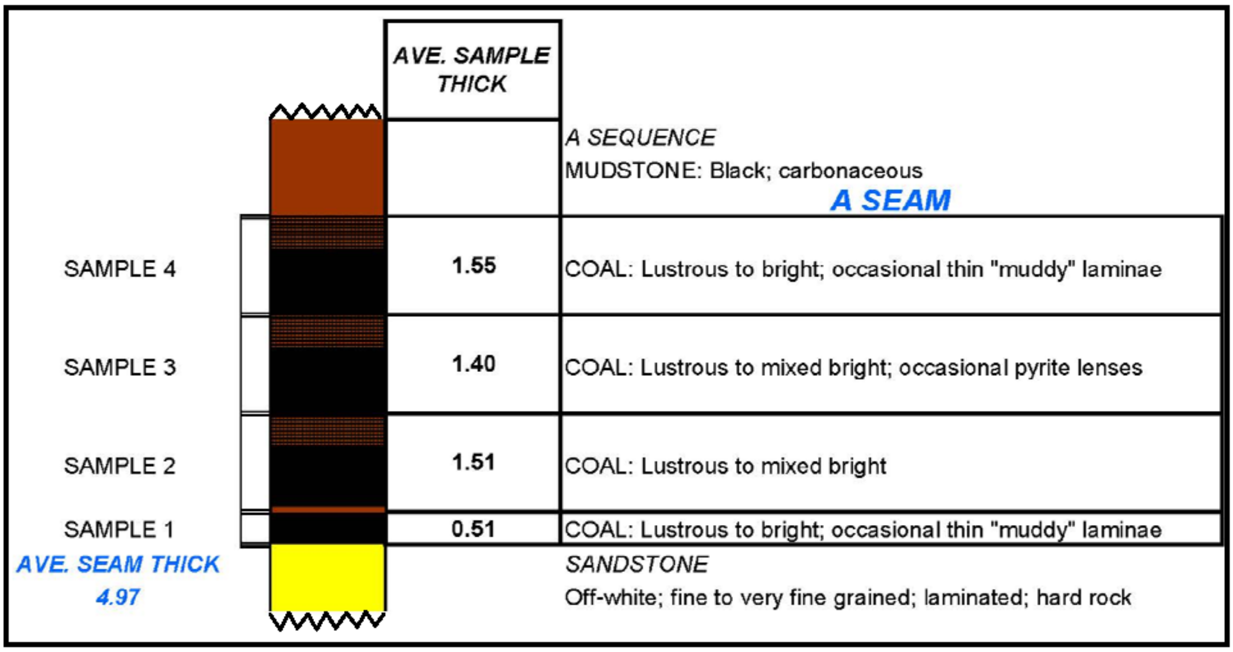

Figure 41: Original sampling methodology as used by Mr Gerhard Mulder during the 2016 drilling programme.

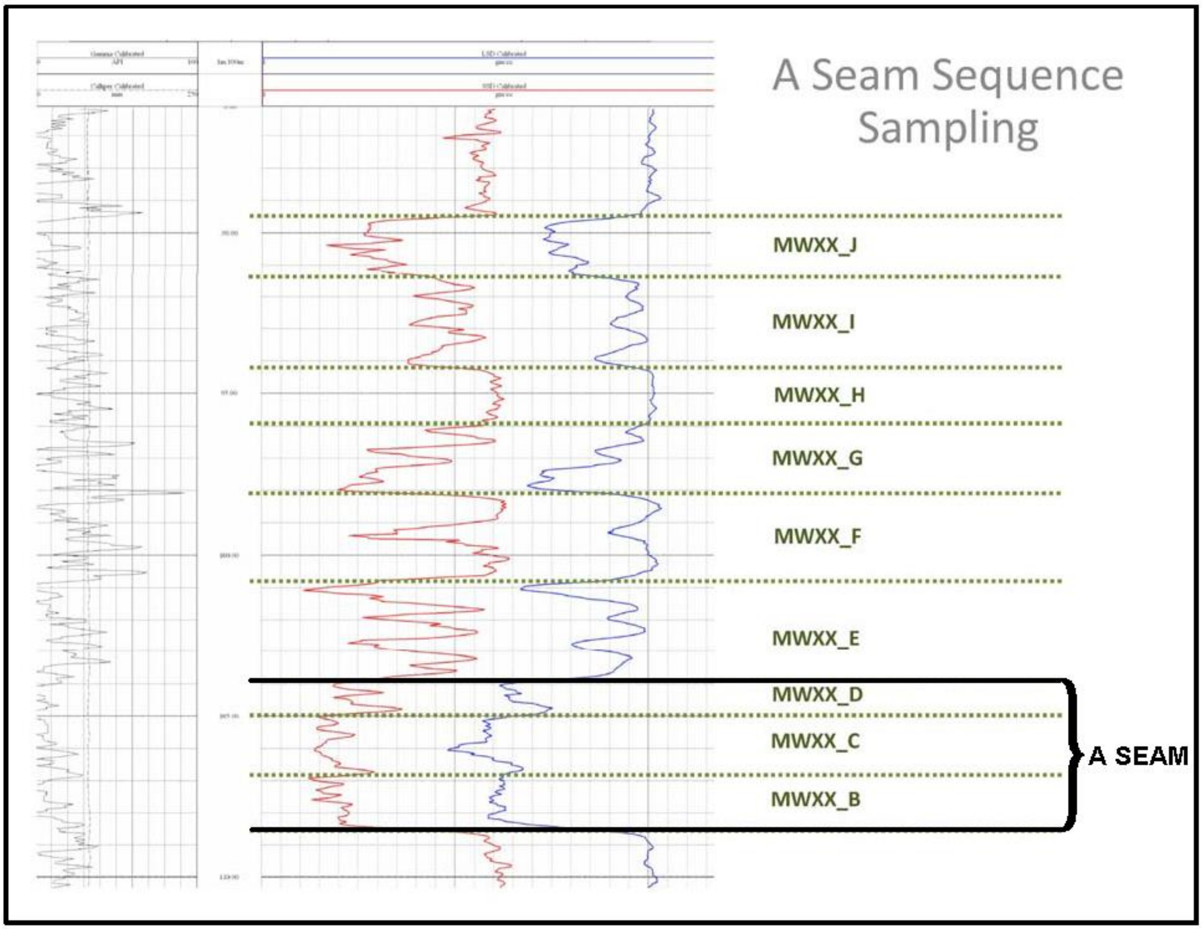

Figure 42: Sampling methodology developed by Mr John Astrup during the 2017 drilling programme.

6.9 Sample preparation and analysis (3.3 (v); 3.4 (i), (ii), (iii); 3.5 (ii); 3.7 (i), (ii), (iii), (iv); 10.3 (ii))

Approximately one hundred and fifty-eight samples (numbers as provided by the Client) from the Minergy 2012 exploration programme were submitted to SABS Secunda Laboratory (SANAS: T0230).

The initial eighteen 2016 coal samples were transported to Middelburg by Mr Gerhard Mulder and personally delivered to Noko Analytical Services, a SANAS accredited testing laboratory (T0512) within twenty-four hours of arrival. The residues of the eighteen samples (pulverized fraction -212 micron) were collected from Noko Analytical Services and submitted to Bureau Veritas Inspectorate Laboratories (Pty) Ltd, a SANAS accredited testing laboratory (T0313) to verify the Moisture Content as reported by Noko Analytical Services.

The second batch of fifteen 2016 coal samples were submitted to Bureau Veritas Inspectorate Laboratories (Pty) Ltd, a SANAS accredited testing laboratory (T0313). These samples were once again transported from the project to the laboratory by Mr Gerhard Mulder.

Three soil samples were submitted to Letaba Civil Engineering Materials Laboratory (Pty) Ltd, a SANAS accredited laboratory (T0549) for foundation indicator tests.

Samples from the 2017 drilling programme were submitted to Bureau Veritas Testing and Inspections South Africa (Pty) Ltd in Centurion a SANAS accredited testing laboratory (T0469). Samples were delivered in several batches either by direct delivery (Mr John Astrup, Mr M Bartle, Mr G Mulder) or by courier (DHL or Botswana Couriers and Logistics).

The ISO and South African National Standard (SANS) have a standard set of tests and methods that are used for coal analysis by South African laboratories. The standard method of coal sample preparation was followed for all samples and is summarised as follows:

- Receipt of the sample into the laboratory's electronic information management and sample tracking system;
- Drying of sample. All drying oven temperatures do not exceed 40° C;
- Measuring mass of sample;
- Determining the relative density of the sample;
- Crushing the sample to -25 mm;
- Screening out of the -0.5 mm fraction for proximate, calorific value (CV) and total sulphur analysis;
- Pulverising the -0.5 mm sample;
- Pulverised material split using a rotary splitter;
- Washing the -25 mm +0.5 mm fraction at client specified relative densities;
- Drying and weighing each fraction;
- Crushing and pulverising each fraction;
- Conditioning each sample for one hour;
- Carrying out the proximate, CV and total sulphur analysis for each fraction and raw coal;
- Automatically generating an electronic laboratory report which is emailed to the client; and
- An officially signed laboratory certificate reporting on the fractional and cumulative results is delivered to the client.
- The determination of Crucible Swelling Index, if required was conducted on instruction of the client.
- Retain all sample residues until further notice.
-

Both Noko Analytical Services and Bureau Veritas Inspectorate Laboratories (Middleburg) used standard methods for the analysis of coal samples as presented in Table 8.

Table 8: Standard tests for coal samples.

PARAMETER	STANDARDS / TEST METHOD
Sample Preparation	ISO 13909-4 / ISO 18283
Calorific Value (Sulphur Corrected)	ISO 1928
Total Sulphur	ASTM D4239
Apparent Relative Density	Water Displacement / ISO 1014 / AS 1038.26 - 2005
Float and Sink (Washability)	ISO 7936
Proximate Analysis	ISO 17246:2010

Proximate, calorific value and total sulphur analysis were determined for each fraction and raw coal. Relative density was determined on each coal sample using the Archimedes principle.

For the Minergy 2012 exploration programme densimetric (float and sink) analyses were conducted on -25 mm to +0.5 mm fraction at the following densities: F1.40, F1.50, F1.60, F1.70, F1.80, and S1.80, or as instructed and air dried. On the lightest fraction of each sample (generally F1.40) determination of Crucible Swelling Number (ISO 501) and Phosphorus in Coal (BS1016 part 14) was conducted.

For the Minergy 2016 exploration programme densimetric (float and sink) analyses for the first eighteen samples were conducted on -25 mm to +0.5 mm fraction at the following densities: F1.45, F1.50, F1.55, F1.60, F1.65, F1.70, F1.75, F1.80, and S1.80, or as instructed and air dried. Phosphorus analysis was conducted at float density 1.65 for these eighteen samples.

For the second batch of fifteen samples densimetric (float and sink) analyses were conducted on -25 mm to +0.5 mm fraction at the following densities: F1.35, F1.40, F1.45, F1.50, F1.55, F1.60, F1.65, F1.70, F1.75, F1.80, and S1.80, or as instructed and air dried.

For the 2017 sample analyses, Bureau Veritas Testing and Inspections South Africa (Pty) Ltd in Centurion used the standard methods of analysis as presented in Table 9 below.

Table 9: Standard tests for coal samples Bureau Veritas Testing and Inspections South Africa.

Description	Procedure / Test Method
Sample Preparation	ACT-TPM-001 based on ISO 13909-4: 2001
Float and Sinks (%)	ACT-TPM-002 based on ISO 7936 – 1992
Inherent Moisture Content (%)	ACT-TPM-010 based on ISO11722: 1999
Total Moisture (%)	ACT-TPM-006 based on SANS 589: 2005 (Not SANAS Accredited)
Ash Content (%)	ACT-TPM-011 based on ISO 1171: 2010
Volatile Matter Content (%)	ACT-TPM-012 based on ISO 562: 2010
Gross Calorific Value (MJ/kg)	ACT-TPM-014 based on ISO 1928: 2009
Total Sulphur (%)	ACT-TPM-013 based on ISO 19579: 2006
Apparent Relative Density	ACT-TPM-009 based on AS 1038.26 – 2005 (Not SANAS Accredited)
True Relative Density	ACT-TPM-008 based on AS 1038.21.1.1-2008 (Not SANAS Accredited)
Crucible Swelling Number	ACT-TPM-015 based on ISO 501: 2003 (Not SANAS Accredited)
%Phosphorus	ICP method (Subcontracted Test)

For the Minergy 2017 exploration programme the analyses outlined below were conducted:

- All Seams, all boreholes: Raw coal - Apparent Relative Density (ARD);
- A and E Seam Samples: Raw Coal - samples from the first 21 holes (MW26-43, MW45, MW46 and MW48) tested for True Relative Density, Inherent Moisture Content and Total Moisture;
- All Seams, all Holes – 0.5mm fraction tested for Proximate Analysis (Inherent Moisture Content, Ash Content, Volatile Matter Content and Fixed Carbon (by difference), Gross Calorific Value (GCV) and Total Sulphur (TS) ;
- All Holes - densiometric (float and sink) analyses conducted on -25 mm to +0.5 mm fraction at the following densities:
  - E Seam: F1.40, F1.50, F1.60, F1.70, F1.80, and S1.80, and air dried >0.5mm fractions tested for Proximate Analysis (Inherent Moisture Content, Ash Content, Volatile Matter Content and Fixed Carbon (by difference), Gross Calorific Value (GCV) and Total Sulphur (TS). Phosphorous in coal and Crucible Swelling Number determined on F1.40, F1.50 and F1.60 fractions.
  - A Seam all samples: F1.40, F1.45, F1.50, F1.55, F1.60, F1.70, F1.80, and S1.80, and air dried >0.5mm fractions tested for Proximate Analysis (Inherent Moisture Content, Ash Content, Volatile Matter Content and Fixed Carbon (by difference), Gross Calorific Value (GCV) and Total Sulphur (TS).
  - AU Seam: F1.50, F1.60, F1.70, F1.80, F1.90 and S1.90, and air dried >0.5mm fractions tested for Proximate Analysis (Inherent Moisture Content, Ash Content, Volatile Matter Content and Fixed Carbon (by difference), Gross Calorific Value (GCV) and Total Sulphur (TS).

6.10 Database management (3.1 (viii); 3.3 (iv); 3.5 (i), (iii); 7.1 (i), (ii))

Borehole data and information from the 2012, 2016 and 2017 Minergy exploration programmes as well as historic exploration were provided to GM Geotech by the Client.

The 2012, 2016 and 2017 and historic borehole data and information was received in Microsoft Excel® format from Minergy and were entered into a combined Microsoft Excel® database. GM Geotech reviewed and validated the historic Shell data and also the drilling and analytical data collected by Minergy in 2012, which included cross checking geological logs and analytical results against down-the-hole geophysical logs. Where discrepancies were identified these were queried and resolved with the Client, the historic data was found to be reliable and was incorporated into the current database.

Validation of the geological data took place in an Microsoft Access® Database, checking for missing units, duplicates and generally preparing the data to be loaded into the Minex™ Database for modelling purposes. Correlation graphs for ash and calorific value per sample, as well as density and ash were plotted to validate quality data in the database.

The following general activities were undertaken during database validation:

- Ensure compatibility of total borehole depth data in each of the collar, assay and geology database files;
- Check for missing and overlapping intervals in geology and overlapping intervals in all files;
- Checking for duplication of information;
- Checking of database coding;
- Comparison of the elevations of surveyed borehole collars and topography and re-surveying discrepancies;
- Correspondence of sampled intervals and seam ‘from-to’ depths;
- Identification of un-sampled intervals within seams;
- Checks on seam correlation;
- Detection of quality data with anomalous or zero values;
- Checks that the sum of moisture, ash, volatile matter and fixed carbon contents equates to 100%.

Queries were reported to the client for correction and the database was then updated.

The seam compositing over the selected horizon was conducted in an early stage of the Masama Coal Project to understand the practical mining horizons which would have economic potential.

All boreholes were drilled vertically and since the sedimentological units are sub-horizontal, the intersections reported are very close to true thicknesses.

The summary of physical data is presented in Appendix 6.

The sample thickness and relative density was used as a weighting for calculation of the cumulative quality results as presented in Appendix 7.

As far as the CP has been able to ascertain, the information provided by the Client was complete and not incorrect, misleading or irrelevant in any material aspect. The CP has no reason to believe that any material facts have been withheld.

6.11 Quality control (3.4 (i), (iv); 3.5 (i), (iv); 3.6 (i); 7.1 (i))

All the SANAS accredited laboratories control of proximate values, calorific value and total sulphur content is maintained by a system of routine analysis of standard samples, during which a control sample is included after every ten analyses. In addition, the laboratories participate in Proficiency Testing Schemes, which provide an external control on the accuracy of the laboratory's results. All laboratories also participate in an inter-laboratory “round robin” system for sample preparation and total moisture determination.

6.12 Survey data verification, audits and reviews (3.1 (v); 3.4 (iv); 3.5 (i); 7.1 (i))

Several of the collars for boreholes drilled by Shell are still visible in the field, in addition the many of the north-south and east-west bulldozed drilling access roads put in by shell are still present and still in use as access tracks. Even where the Shell bulldozed lines are no longer in use – the position of the line is still visible in the field and on aerial images. The positions of several of the Shell boreholes were confirmed by comparison of the field observed hand-held GPS and or DGPS position with that reported by Shell.

Differential GPS (DGSP) surveys were conducted by Poseidon Geophysics on all boreholes drilled by Minergy. On completion of the drilling programme or after a sufficient number of boreholes had been drilled, a differential GPS (DGPS) survey was conducted. This gave very accurate collar positions (Easting, Northing and Elevation) and allowed for collars to be plotted accurately on the DTM (Digital Terrain Model) for coal deposit modelling. The co-ordinate system used for collar surveys is the UTM35S projection, which makes use of the WGS84 ellipsoid and WGS84 datum. A full borehole collar table with DGPS locations is included as Appendix 5.

6.13 Coal quality test work (4.1 (ii); 10.4 (i))

Float sink wash tests were conducted on coal seams intersected in all the boreholes drilled by Minergy during 2012, 2016 and 2017. In 2014 available data was used by DRA to generate wash curves for each seam in the Scoping Study conducted by Coffey Mining in 2014 (Coffey, 2014)[6]. The Scoping Study was based on preliminary technical and economic assessments, and included Inferred Mineral Resources.

The cumulate qualities per density fraction and per sample was loaded into the Minex™ database, which was in turn used to create composite quality grids at each float fraction analysed. In this manner, all sample data became comparable. Further composite wash-ability curves were compiled for the E, A and the A Upper Coal Seams per borehole. From the Minex™ grids that were created per density fraction and per coal quality, wash curves were generated per resource block. The wash-ability curves are presented for the E Seam, A Seam and A Upper Coal Seams according to their Resource Classification in Figures 43 to 54. The washed yield is a theoretical borehole yield. Theoretical yields are based on laboratory analysis only and need to be adjusted by the relevant coal processing discount factor to ascertain what the expected practical product yield would be.

WASHABILITY CURVE :
OPENCAST - E SEAM INDICATED RESOURCE

R.D.	YIELD(%)	CV (MJ/KG)	ASH (%)	VM(%)	IM (%)	TS (%)
1.40	50.5	27.5	7.7	32.8	5.80	0.44
1.50	65.6	26.9	9.2	31.3	5.68	0.44
1.60	72.8	26.5	10.5	30.4	5.62	0.45
1.70	76.1	26.2	11.3	30.0	5.57	0.45
1.80	78.0	25.9	12.0	29.7	5.52	0.47
R.C.	100.0	21.5	24.9	26.2	4.65	2.27

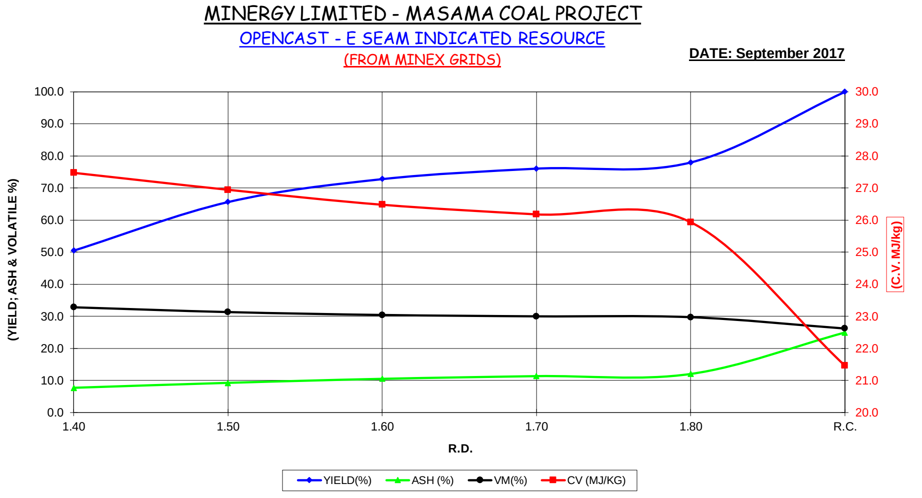

Figure 43: E Seam theoretical wash data and wash-ability curve for the opencast Indicated Coal Resource (air dried basis).

WASHABILITY CURVE : UNDERGROUND - E SEAM INFERRED RESOURCE						
R.D.	YIELD(%)	CV (MJ/KG)	ASH (%)	VM(%)	IM (%)	TS (%)
1.40	48.1	27.9	7.6	32.6	4.85	0.48
1.50	64.3	27.2	9.4	31.2	4.77	0.49
1.60	70.6	26.8	10.6	30.5	4.70	0.51
1.70	72.9	26.6	11.2	30.2	4.70	0.53
1.80	74.7	26.3	12.0	30.0	4.66	0.55
R.C.	99.9	21.0	27.0	26.3	3.91	2.12

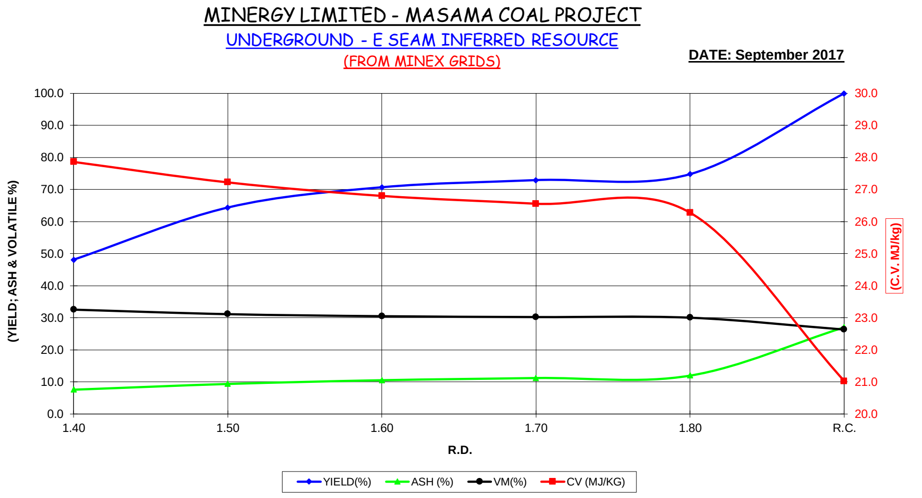

Figure 44: E Seam theoretical wash data and wash-ability curve for the underground Inferred Coal Resource (air dried basis).

WASHABILITY CURVE : OPENCAST - A SEAM MEASURED RESOURCE						
R.D.	YIELD(%)	CV (MJ/KG)	ASH (%)	VM(%)	IM (%)	TS (%)
1.40	33.1	27.6	6.2	29.6	6.53	0.41
1.50	57.7	26.5	8.8	27.3	6.61	0.40
1.60	72.5	25.6	11.1	26.4	6.45	0.40
1.70	82.2	24.8	13.1	26.1	6.29	0.40
1.80	87.2	24.3	14.3	26.0	6.18	0.41
R.C.	100.0	22.5	19.2	25.5	5.72	2.15

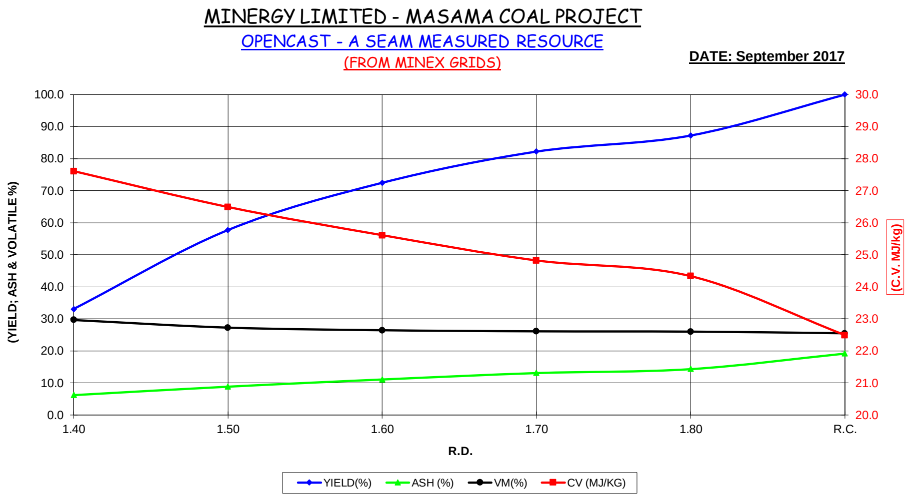

Figure 45: A Seam theoretical wash data and wash-ability curve for the opencast Measured Coal Resource (air dried basis).

WASHABILITY CURVE :
OPENCAST - A SEAM INDICATED RESOURCE

R.D.	YIELD(%)	CV (MJ/KG)	ASH (%)	VM(%)	IM (%)	TS (%)
1.40	27.8	27.3	6.5	29.1	6.81	0.41
1.50	53.4	26.3	8.9	27.0	6.66	0.40
1.60	69.7	25.3	11.6	26.1	6.48	0.40
1.70	78.2	24.5	13.4	25.9	6.26	0.40
1.80	85.8	23.8	15.4	25.6	6.11	0.41
R.C.	100.0	21.9	20.6	24.9	5.59	2.15

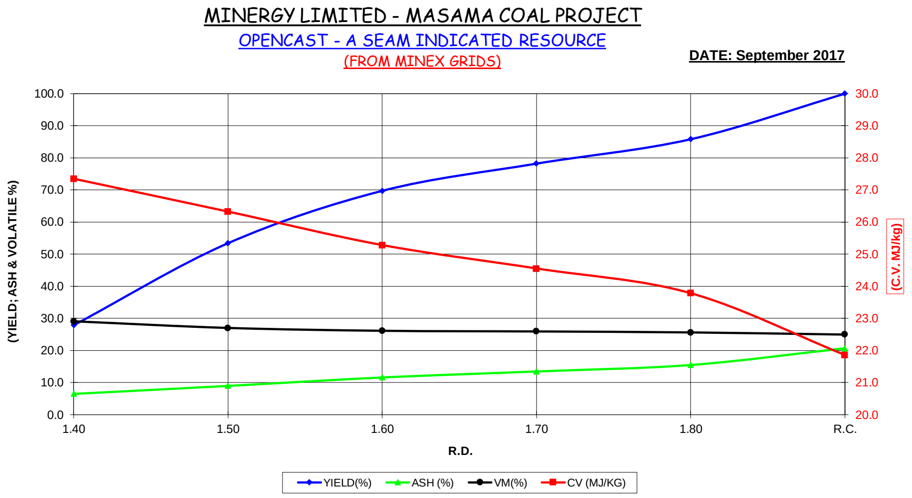

Figure 46: A Seam theoretical wash data and wash-ability curve for the opencast Indicated Coal Resource (air dried basis).

WASHABILITY CURVE :
UNDERGROUND - A SEAM INDICATED RESOURCE

R.D.	YIELD(%)	CV (MJ/KG)	ASH (%)	VM(%)	IM (%)	TS (%)
1.40	30.2	27.2	6.1	28.9	7.01	0.44
1.50	52.3	26.3	8.4	27.0	6.95	0.42
1.60	70.1	25.1	11.4	25.9	6.72	0.38
1.70	78.6	24.4	13.3	25.5	6.54	0.37
1.80	85.4	23.7	15.2	25.2	6.35	0.37
R.C.	100.0	21.7	20.8	24.4	5.81	1.54

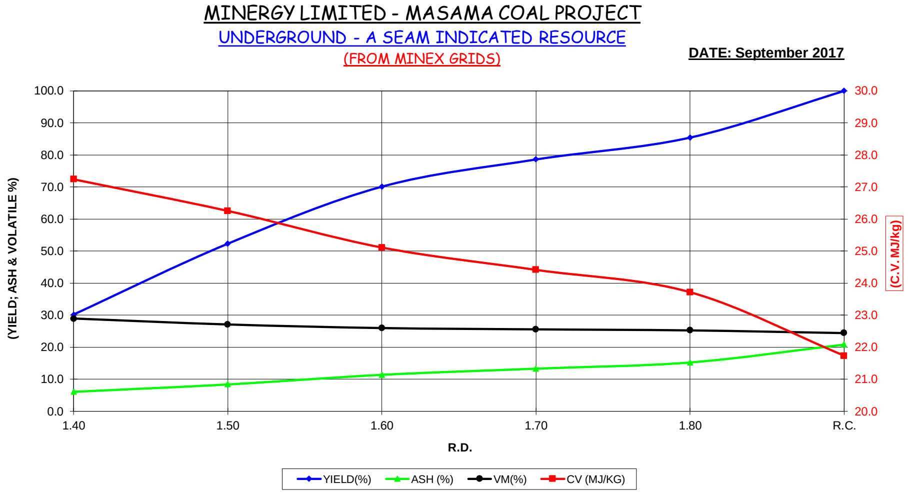

Figure 47: A Seam theoretical wash data and wash-ability curve for the underground Indicated Coal Resource (air dried basis).

WASHABILITY CURVE :

UNDERGROUND - A SEAM INFERRED RESOURCE

R.D.	YIELD(%)	CV (MJ/KG)	ASH (%)	VM(%)	IM (%)	TS (%)
1.40	31.7	28.0	6.5	29.4	5.51	0.38
1.50	56.3	27.0	8.8	27.3	5.41	0.37
1.60	71.3	26.0	11.3	26.4	5.27	0.37
1.70	79.5	25.3	13.0	26.1	5.16	0.37
1.80	86.1	24.6	14.8	26.0	5.01	0.39
R.C.	99.9	22.7	19.8	25.5	4.67	1.97

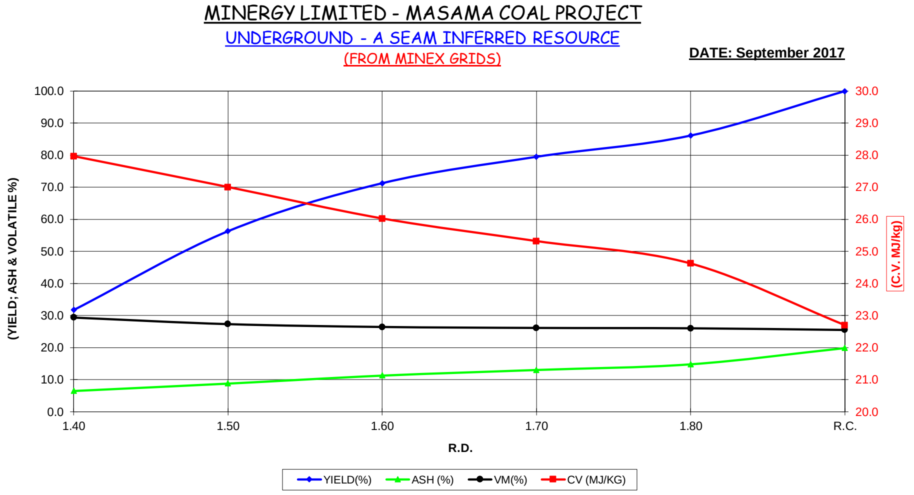

Figure 48: A Seam theoretical wash data and wash-ability curve for the underground Inferred Coal Resource (air dried basis).

WASHABILITY CURVE :

OPENCAST - AU SEAM INFERRED RESOURCE

R.D.	YIELD(%)	CV (MJ/KG)	ASH (%)	VM(%)	IM (%)	TS (%)
1.50	22.4	24.5	14.2	29.6	6.11	1.29
1.60	41.1	22.9	18.9	27.0	5.74	1.17
1.70	63.4	21.2	23.8	24.7	5.44	1.02
1.80	80.7	19.9	27.9	23.4	5.11	0.92
R.C.	100.0	18.0	33.2	22.1	4.70	1.54

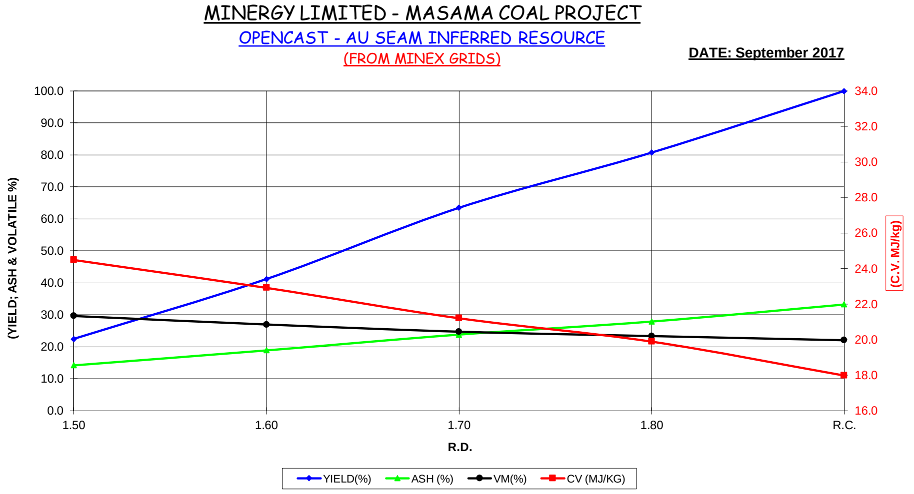

Figure 49: AU Seam theoretical wash data and wash-ability curve for the opencast Inferred Coal Resource (air dried basis).

7. COAL RESOURCE ESTIMATES

7.1 Estimation and modelling techniques (3.1 (vi); 3.7 (ii), (iii), (iv); 4.1 (i), (ii), (iv), (v); 4.2 (ii), (iv); 4.3 (i); (5.2 (i); 10.1 (i), (ii); 10.3 (ii); 10.5 (i), (ii))

The Coal Resource estimates were conducted in accordance with the South African Code for Reporting of Mineral Resources and Mineral Reserves Code (SAMREC 2016)[1], as well as the South African guide to the systematic evaluation of coal resources and coal reserves (SANS10320:2004)[2]. As part of the resource estimation process all available geological and geophysical data were reviewed in detail and during classification of the resource consideration was given to the consistency of the coal seam thicknesses and coal quality over the West Block as well as the larger Masama Coal Project Prospecting License area.

Both the SAMREC Code (2016) and SANS Code 10320 states that “Coal Resources shall be reported on an in situ density basis” and that “the in situ moisture content is the correct basis for reporting Coal Resources in Public Reports”. To make this correction on the reported Masama Coal Resources, a third of the 2017 borehole cores were analysed for both inherent sample moisture and in situ bed (total) moisture. Further to this, both apparent relative density and true relative density were determined for the same samples. The results are shown in Table 10 with the calculated unweighted average difference between total moisture and inherent moisture at 0.34% points and the difference between true relative density and apparent relative density at -0.02g/cm^3.

Table 10: Comparison between Apparent Relative Density and True Relative Density determinations as well as Total Moisture and Inherent Sample Moisture as determined for specific Masama borehole samples.

	Total Moisture (TM)	% Inherent moisture content (IM) (air-dried)	diff	Apparent Relative Density (ARD)	True Relative Density (TRD)	Diff ARD and TRD
	(%)	(%)	(%)	g/cm^3	g/cm^3	g/cm^3
weighted average	5.97	5.63	0.34	1.53	1.56	0.02
minimum	4.24	3.80	0.09	1.37	1.40	-0.03
maximum	6.45	6.30	0.15	1.47	1.49	0.01

The Apparent Relative Density as determined in the laboratory has been applied in the Resource estimations, as well as the Inherent Moisture determinations as the effect of bed moisture on the density and hence the tonnage estimates are not considered to be significant Coal tonnage and the related coal qualities are therefore reported on and air dried basis.

Minex’s (Dassault Systèmes GEOVIA Minex™ Version 6.5.1) general growth algorithm method for gridding suits stratiform deposits and related qualities perfectly. It produces smooth surfaces which replicate the regional trends of the geological data, while also reflecting local anomalies around ‘odd’ data points.

The software first calculates values for the four grid intersections surrounding each data point. After the nodes around all borehole points are calculated, the original points are removed from further consideration. The program then makes a series of passes over the grid. At each pass, it calculates values for any grid node that have not been assigned a value and that are adjacent to an assigned node. In other words, each iteration enlarges the calculated region around the original point locations.

All grids were limited to within the Focus Area, extrapolating 200 m beyond any know last point. A search radius of 2 000 m was applied to determine influence of points on any specific unknown point. All structural controls (seam thickness, roof and floor elevations of the coal seams) as well as all quality data was gridded using the Minex growth algorithm. Histograms were reported on calculated grid information in Minex™.

The impacts of sedimentological and depositional variations; as well as the effect of the structural features have been examined during this study to determine its possible influence on the distribution and mineability of the E and the A Coal Seams.

The Masama Coal Deposit was modelled as a typical tabular and near horizontal, strata bound coal deposit where coal distribution has been controlled by "topographic" or "structural" highs as well as minor faulting and recent weathering. No significantly different interpretations were considered in this report.

The seam thickness lower limit applied for opencast resources of the E, A and A Upper Coal Seams was set at minimum thickness of 0.5 m. Opencast mining methods is only to be applied in those areas where the in situ strip ratio is less than 5:1 (cubic meters waste : tonnes of coal). The remaining resource will be mined by underground methods.

The interburden between the A and E Coal Seams generally is between 14.2 and 19.5 meters, indicating that both seams may be mined underground with or without superimposing pillars. Both seams are therefore included into the underground resource estimation. The seam thickness lower limit applied for underground resources of the E and A Coal Seams was set at a minimum thickness of 1.2 m.

The values of the critical raw coal quality parameters, namely calorific value, ash content, inherent moisture content and volatile matter content as reflected in the resource summary table implies that the raw coal quality for all three coal seams is such that no raw coal quality limits were applied. Table 11 indicates the ranges and mean values per coal seam in the Focus Area resource boundary.

Table 11: Raw coal quality statistics summarised for the Focus Area.

Seam	Stats	Raw RD	Raw CV	Raw Ash	Raw Volatiles	Raw Total Sulphur
		g/cm^3	MJ/kg	%	%	%
AU	Min	1.57	15.8	28.9	21.2	0.82
	Max	1.81	19.6	36.5	24.2	4.30
	Mean	1.66	18.8	32.4	23.0	1.93
A	Min	1.47	18.8	12.3	21.2	0.31
	Max	1.68	24.9	28.4	24.3	3.77
	Mean	1.55	22.7	19.4	23.0	1.87
E	Min	1.37	15.2	8.9	20.6	0.40
	Max	1.88	27.3	44.4	32.8	4.50
	Mean	1.53	22.1	22.9	26.1	1.92

Model validation was conducted by comparing model data to the borehole point data by reporting grid statistics on the model and by checking the gridded data interactively at the borehole positions.

All these above-mentioned examinations and the spacing of points of observation provide a sufficient level of confidence in the Masama Coal Project source data and the geological model to support the Coal Resource classification.

7.2 Coal Resource classification criteria (4.1 (iv); 4.4 (i); 4.5 (v))

According to the South African Code for Reporting of Mineral Resources and Mineral Reserves Code (SAMREC 2016)[1], coal resources may be subdivided in order of increasing geological confidence, into Inferred, Indicated and Measured categories.

Further guidance on the classification of Coal Resources is provided by the South African guide to the systematic evaluation of coal resources and coal reserves (SANS10320:2004)[2].

The Masama Coal Resources in the Focus Area were classified as Measured, Indicated and Inferred Resources as shown in Figures 50 to 52 The key factors considered for classification was borehole density in combination with the consistency of data within and beyond the resource boundaries of the “Focus Area”. A discount of twenty, twelve and eight percent was applied respectively to Inferred, Indicated and Measured Resources to account for unforeseen geological losses. This is despite areas of known non-development of coal seams having already been specifically excluded from the resource areas. This classification and the discount applied was determined considering the confidence levels of drilling techniques, logging, drill sample recovery, sub-sampling techniques and sample preparation, quality of assay data, verification of sampling and assaying, location of sampling points, data density and distribution, database integrity, geological interpretation, seam deposit type, estimation and modelling techniques and consistency of physical coal parameters and coal quality.

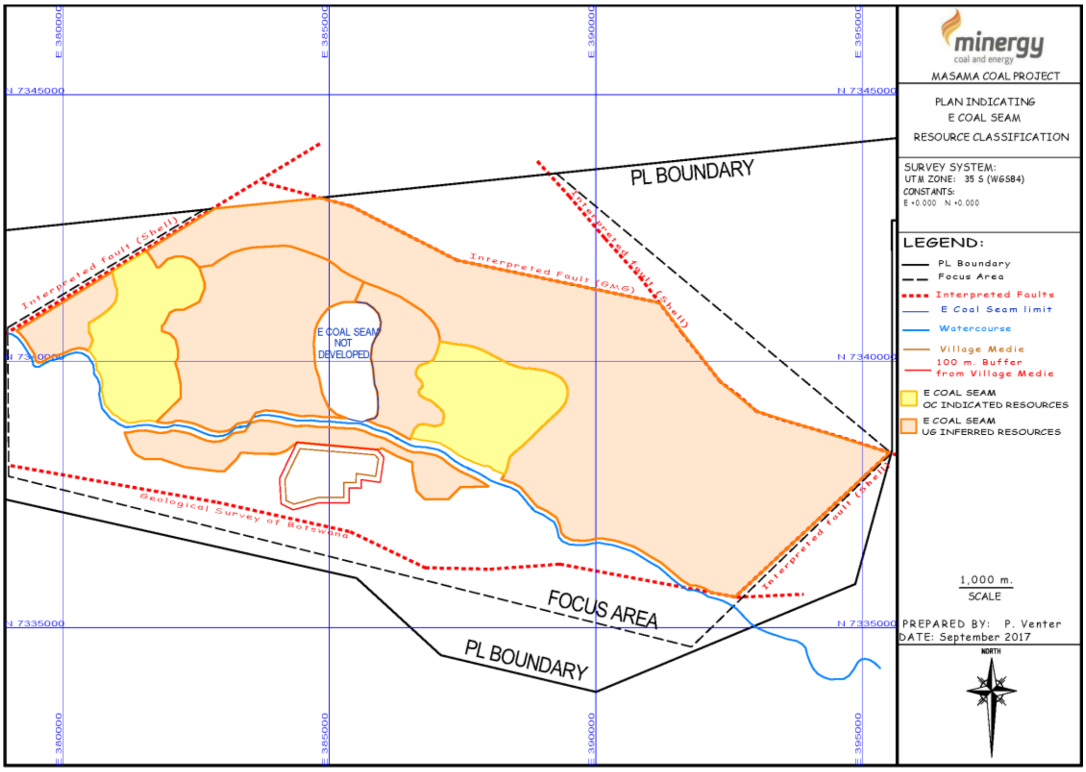

Figure 50: E Coal Seam resource classification plan.

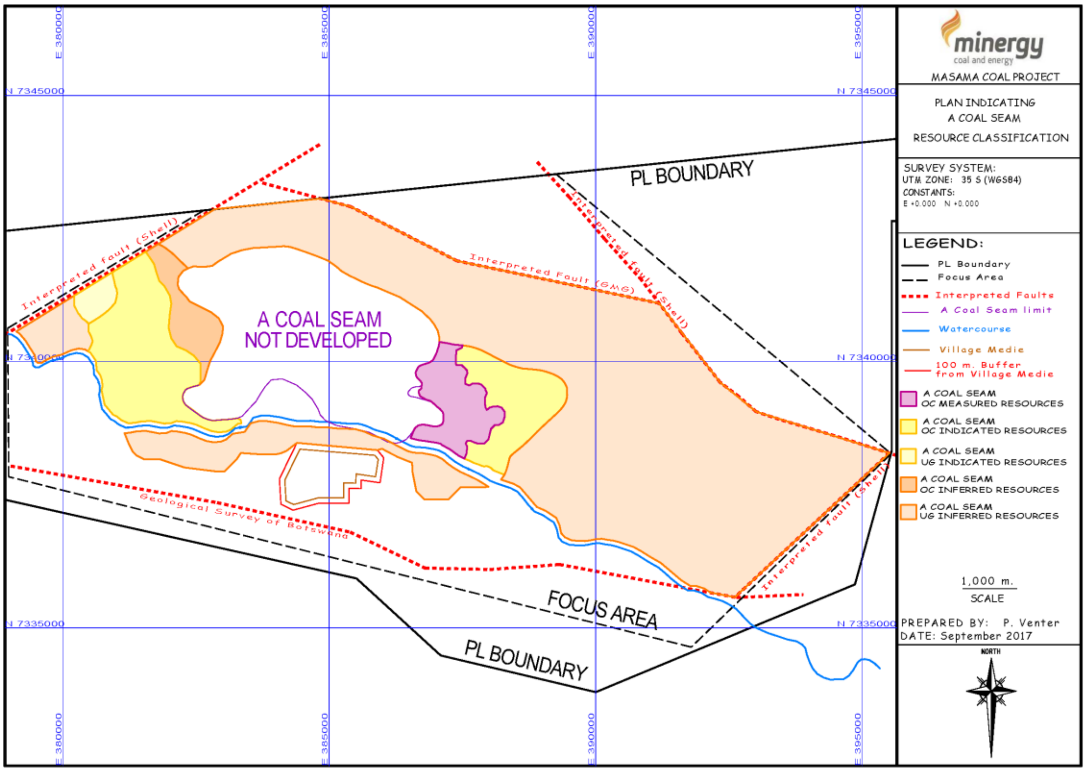

Figure 51: A Coal Seam resource classification plan.

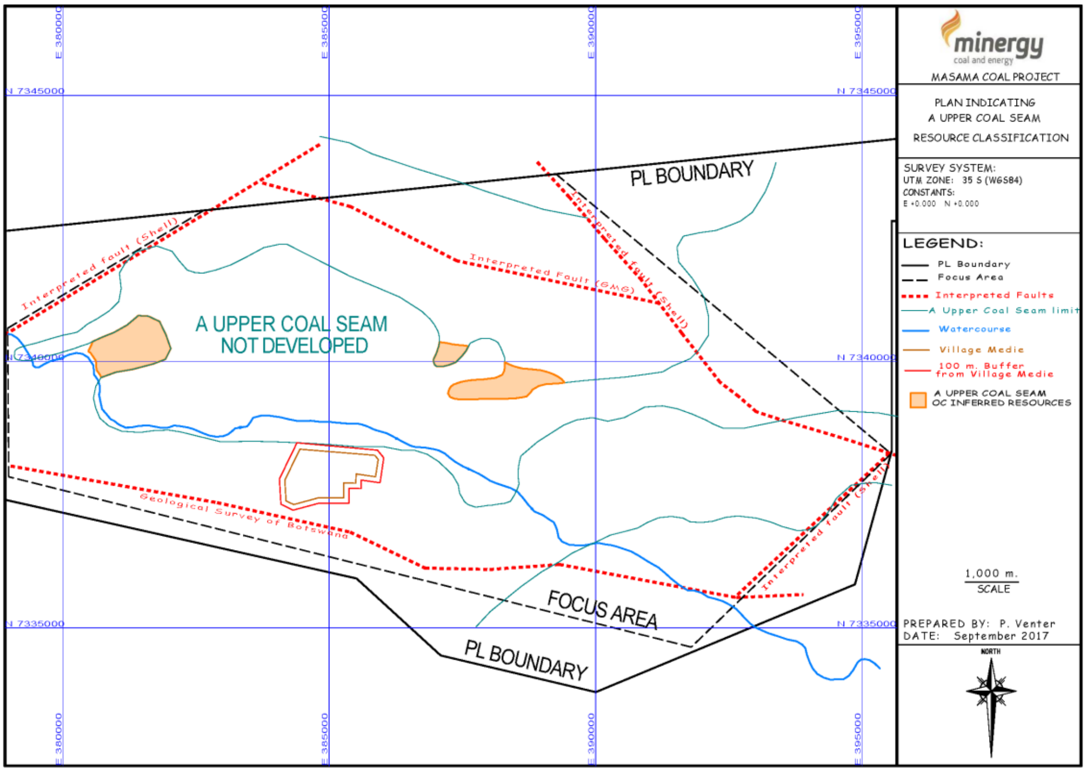

Figure 52: AU Coal Seam resource classification plan.

7.3 Reasonable prospects for eventual economic extraction (1.4 (ii); 4.3 (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix); 4.5 (iii); 5.2 (i); 5.3 (iii); 5.5 (iii); 10.4 (i))

The Coal Resources defined in this report for the Masama Coal Project are considered to have reasonable and realistic prospects for eventual economic extraction on the following basis:

- Geological parameters – as described in Sections 5, 6, and 7 of this report. The coal present in the E, A and A Upper Coal Seams of the Masama Coal Project is of suitable quantity, quality, continuity, seam thickness and depth to be mined using opencast and underground mining methods currently in use in the coalfields of South Africa.

- Based on the resource coal quality estimated and wash tests conducted the targeted coal products from each seam can be produced at acceptable theoretical product yields as described in Section 7.2.

- Mining methods anticipated include opencast mining using truck and shovel, "roll over method" and shallow underground board and pillar mining using continuous miners and/or drill and blast techniques. For opencast mining targeting the E, A and A Upper Coal Seams, a seam thickness cut-off of 0.5 m and an in situ strip ratio cut-off of 5:1 were applied.

  At present, it is considered that in situ strip ratios greater than 5:1 should be mined with underground mining methodology as the costs for opencast mining would begin exceeding those of underground mining (see Table 12). For underground mining, a minimum seam thickness cut-off of 1.2 m was applied. With an average thickness of 4.7 m, the A Seam is considered well suited to exploitation through both conventional opencast and underground mining methods. The E Seam, although thinner, can also be mined using both conventional opencast and underground mining methods. The E Seam resource is on average 1.7m thick, with 77% of the underground classified resource greater than 1.6 m thick and only 23% between 1.2 m and 1.6 m thick (Table 14). The latter will most probably be mined using drill and blast mining methodology or alternative low seam mining methods. The AU Seam will only be mined opencast where this seam is present within the opencast areas.

Table 12: Comparison of opencast and underground mining costs is calculation of strip ratio cut off.

OPENCAST COST ESTIMATE			UNDERGROUND COST ESTIMATE			
Strip Ratio (SR)	Rand per ROM ton per SR	Rand per ROM ton	Seam Thickness (m)	Rand per ROM ton	Seam Thickness (m)	Rand per ROM ton
1	40	40				
2	40	80	5	180	1.5	320
3	40	120	5	180	1.5	320
4	40	160	5	180	1.5	320
5	40	200	5	180	1.5	320
6	40	240	5	180	1.5	320
7	40	280	5	180	1.5	320

- Based on the depth of weathering present in the focus area at Masama (generally 20 to 30m), it is anticipated that underground mining could safely take place at depths >5 m below the weathering surface where the hanging wall is sandstone (E Seam) and >10 below the weathering where the hanging wall is mudstone (A Seam).
- Based on the thickness and nature of the parting between the E and A Seams in the underground parts of the focus area (14 to 20m), both seams can be safely extracted underground. Multiple seam rock engineering principles must however be considered to ensure parting stability. Stability of underground operations would be improved if the A Seam (upper seam) is mined before the E Seam (lower seam). Depending on the depth of mining, mining heights and widths and parting thickness in different parts of the underground mining areas, it may or may not be necessary for superimposition of coal pillars. It is recommended that prior to mining, detailed rock engineering designs be undertaken for each of the underground mining areas as variations in site specific parameters will necessitate slightly different designs.
- Coal from the Masama Coal Deposit would need to be processed in order to produce saleable products and this would be conducted using standard coal industry processing or washing techniques. The results from slim core float sink tests indicate that the coal products targeted at the Masama Coal Project could be produced at acceptable theoretical yields (See Section 6.13). .

- Current road access to the project area is good – however these may require some upgrading to support mining operations and a new access road and rail siding are proposed. The Masama Coal Project is located close to the A1 highway, which provides road access to potential markets in the region. A existing railway line is present approximately 40 km east of the project area and provides rail access to certain potential markets.
- Coal product produced at Masama will be trucked directly to markets identified in the region or will be transported to a proposed new rail siding approximately 41km from the mine and from there will be transported to markets by rail (see Figure 53).
- At present there is one operating coal mine in Botswana, the Morupule Coal Mine, which is described in Section 9.1 of this report. This mine has been operating successfully as an underground coal mine since the 1970's and more recently also as an opencast mine.
- A medium sized coal mine at Masama producing in the region of 3 to 5 Mt per annum ROM coal would have a life of mine in the region of fifty years. This would require that a Mining Licence be granted for twenty-five years and then renewed for a further twenty five years.
- There are no legal, governmental, permitting or statutory aspects that are considered impediments to the prospects for economic extraction. Legislation relevant to the project has been covered in Section 2.4 of this report. Mining Licences in Botswana are granted for an initial period of up to twenty-five years and can be renewed an unlimited number of times for further periods of up to twenty five years each.
- For the Coal Resources presented in this report there are no environmental or social aspects that are considered impediments to the mining operations (See Section 8.3). There is a village present in the resource area and areas underlying the village and up to 100m away from the village boundary have been excluded from the Coal Resource. In addition no Coal Resources have been defined within 100m of the small stream that runs east west through the project area. This applied both to opencast and underground resource areas. Under Botswana legislation no mining may take place within 100 m of any river without written permission from the Department of Mines engineer.
- A road diversion will be required to mine the Section A opencast area.
- The coal products proposed to be produced from the Masama Coal Project are similar to those currently being sold in the regional market and export market and can be produced by washing raw coal from the E Seam and the A Seam at Masama. The yields of potential products are sufficiently high that it would be considered economic.
- The location of the Masama Coal Project means that it has a distance advantage to certain of the coal markets in the region. These markets could be accessed by means of road and rail transport.

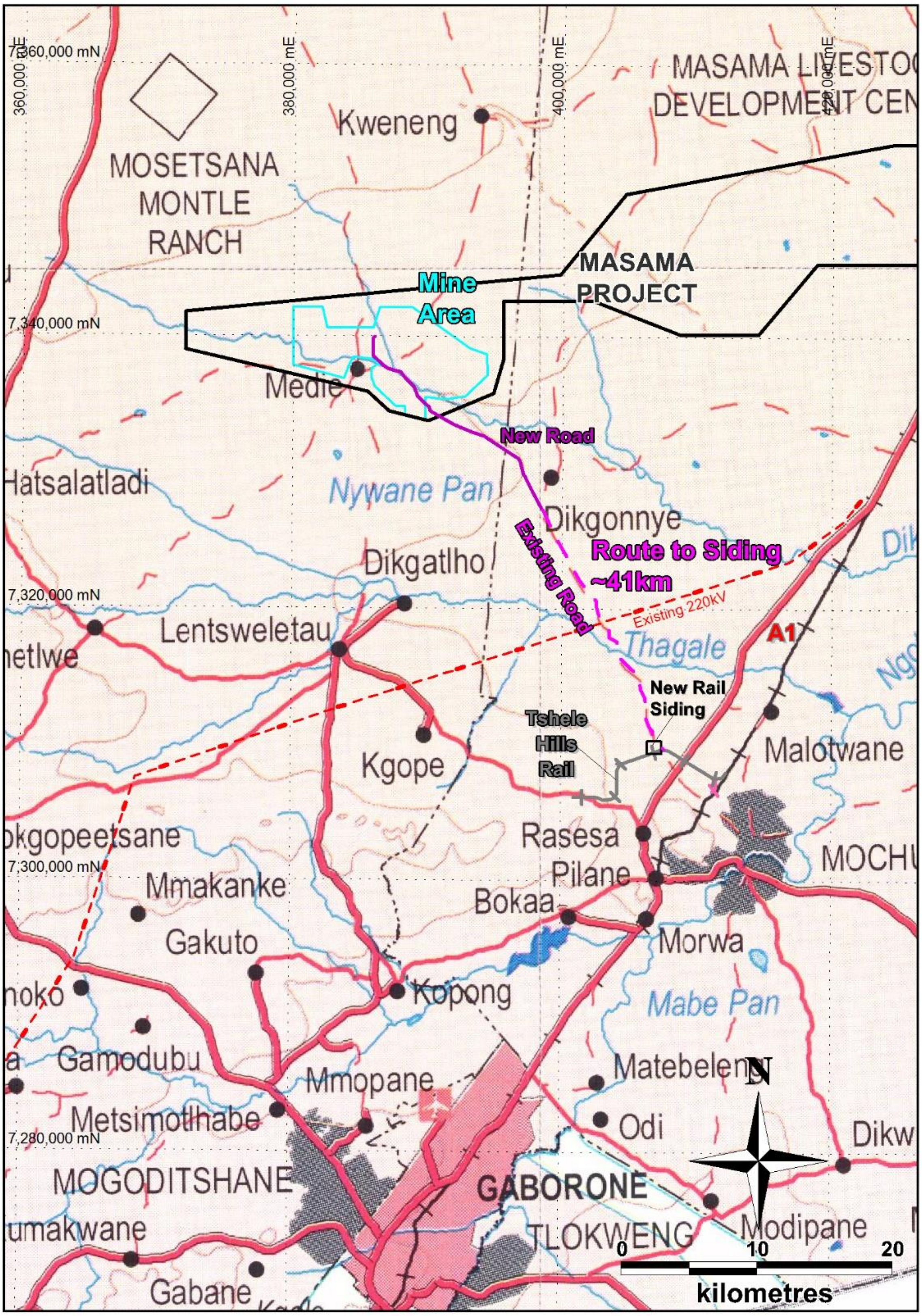

Figure 53: Proposed transport infrastructure for the Masama Coal Project.

- Economic assumptions and parameters considered in assessing reasonable prospects for eventual economic extraction are as follows:
  - Coal products similar to those that could be produced from Masama are currently fetching prices in the region of between R400/t Free-on-Truck (FOT) and R700 / t FOT. Export coal prices from Richards Bay are currently in the region of $90 / t (FOB)

    (http://www.barchart.com/commodityfutures/ICE_Richard_Bay_Coal_Futures/LV)[20]

  - Capex for starting medium sized mine at Masama is anticipated to be similar to what it would be in the Witbank Coalfield of South Africa and based on internal calculations has been estimated to be in the region of R200 million to R400 million.
  - Operating costs for a small to medium sized mine at Masama are anticipated to be similar to those elsewhere in the region and based on quotes received is expected to be in the vicinity of R300 to R400 / sales tonne.
- Material risks are covered under Section 9.2.
- For the Masama Coal Project the Resources declared are seen in the context of “eventual exploitation” in the near to medium term. It is anticipated that it would take less than two years to complete remaining exploration and to establish a mining operation at Masama. The Measured and Indicated Resources declared are anticipated to be mined in an opencast operation with a transition to underground mining later in the life of mine. At a reasonable rate of production most of the Resources identified in this report could be exploited within approximately fifty years.

7.4 Coal Resource statement (4.3 (i), (ii); 4.5 (i), (vii); 10.3 (ii); 10.4 (i); 10.5 (ii); 10.4 (i); 10.5 (i), (ii))

The Minable Tonnes In Situ (MTIS) Resource Estimation for the Masama Coal Project Focus Area on an air-dried basis and discounted for potential geological losses, quality cut-offs as well as strip ratio cut-off (for opencast areas) and minimum mining height cut-off (for underground areas) have been prepared subsequent to the addition of the 2017 drilling results to the geological models. The new resource statement prepared by the author is presented in Table 13 below, including raw coal qualities and relative density (RD) on an air dried basis and at the moisture content indicated. Proposed products and theoretical yields per coal seam is included in the estimation.

Table 13: Masama Project Mineable Tonnes In Situ Coal Resource Summary as estimated within the "Focus Area" as at 29 September 2017

Masama Coal Resources, Raw Coal Qualities and Modelled Theoretical Product Yields and Qualities as at 29 September 2017

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	Seam Thickness	Raw Coal Qualities on an air dried basis						
						Raw RD	Raw CV	Raw Ash	Raw Inherent Moisture	Raw Volatile Content	Raw Fixed Carbon	Raw Total Sulphur
			(%)	(tonnes)	(m)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)
OC	*Measured*	A	8%	12 706 952	4.80	1.51	22.5	19.1	5.73	25.5	49.7	2.10
	Indicated	A	12%	47 649 094	5.02	1.57	22.3	19.6	5.69	25.1	49.6	1.75
	Indicated	E	12%	18 486 934	1.55	1.55	21.6	24.3	4.83	25.9	45.0	2.26
	Inferred	AU	20%	3 420 903	1.27	1.66	18.0	33.2	4.70	22.1	40.0	1.53
Opencastable Resource			***12%***	***82 263 884***								

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	Seam Thickness	Raw RD	Raw CV	Raw Ash	Raw Inherent Moisture	Raw Volatile Content	Raw Fixed Carbon	Raw Total Sulphur
			(%)	(tonnes)	(m)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)
UG	*Indicated*	A	12%	7 069 391	4.70	1.58	21.8	20.6	5.83	24.4	49.2	1.51
	Inferred	A	20%	206 375 994	4.68	1.55	22.9	19.3	4.71	25.5	50.4	1.90
	Inferred	E	20%	94 208 868	1.71	1.52	22.0	23.2	5.20	25.9	45.7	1.91
Underground Mineable Resource			***20%***	***307 654 254***								
TOTAL COAL RESOURCE				***389 918 137***								

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	Product Coal Quality and Theoretical Yields							
					Product Float RD	Product CV	Product Ash	Product Inherent Moisture	Product Volatile Content	Product Fixed Carbon	Product Sulphur	Product Yield
			(%)	(tonnes)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)	(%)
OC	*Measured*	A	8%	12 706 952	1.55	26.0	10.1	6.55	26.7	56.7	0.40	66.4
	Indicated	A	12%	47 649 094	1.53	26.0	9.7	6.62	26.7	57.0	0.34	58.3
	Indicated	E	12%	18 486 934	1.63	26.5	10.4	5.61	30.7	53.4	0.47	71.3
	Inferred	AU	20%	3 420 903	1.72	21.0	24.4	5.44	24.6	45.6	1.00	66.0

Mining Method	Resource Classifiction	Seam	Geo-loss	Mineable Tonnes In Situ	Product Float RD	Product CV	Product Ash	Product Inherent Moisture	Product Volatile Content	Product Fixed Carbon	Product Sulphur	Product Yield
			(%)	(tonnes)	(g/cm^3)	(MJ/kg)	(%)	(%)	(%)	(%)	(%)	(%)
UG	*Indicated*	A	12%	7 069 391	1.53	26.0	9.0	6.94	26.7	57.3	0.40	56.3
	Inferred	A	20%	206 375 994	1.61	26.0	11.2	5.31	26.5	56.9	0.37	70.1
	Inferred	E	20%	94 208 868	1.69	26.5	11.2	4.74	30.6	53.4	0.73	71.6

Interpretation and Conclusions

A total Coal Resource of 390 Mt has been estimated for E, A and A Upper Coal Seams within the Focus Area of the West Block of the Masama Coal Project. This Resource can be further broken down as follows:

Opencast: A Seam Coal Resource

- *12.71 Mt Measured Coal Resource*
- *47.65 Mt Indicated Coal Resource*

Opencast: AU Coal Seam Resource

- *3.42 Mt Inferred Coal Resource*

Opencast: E Coal Seam Resource

- *18.49 Mt Indicated Coal Resource*

No A Upper Coal Seam is included into the Underground resource statement due to its localised occurrence and its limited seam thickness.

Underground: A Seam Coal Resource

- *7.07 Mt Indicated Coal Resource*
- *206.4 Mt Inferred Coal Resource*

Underground: E Seam Coal Resource

- *94.21 Mt Inferred Coal Resource*

A total of 82.26 Mt of opencast and 307.7 Mt underground mineable coal in situ is reported.

Coal seam thickness distribution on the E, A and A Upper Coal Seams are shown in Table 14 for the Opencast and Underground Resource classes, indicating predominantly thicker coal seams with the exception of the A Upper Coal seam. 23% of the E Coal Seam resource falls within the low seam mining category (1.2m to 1.6m) which will be mined using suitable underground mining methods for thin seams.

Table 14: Coal Seam Thickness distribution within the resource classes.

Resource Class	Mining Method	Seam	Seam TH Class	% of Total
Measured	OC	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.0%
			1.2m to 1.6m	0.0%
			>1.6m	100.0%
Indicated	OC	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.0%
			1.2m to 1.6m	0.0%
			>1.6m	100.0%
Indicated	OC	E Seam	<0.5m	0.0%
			0.5m to 1.2m	0.5%
			1.2m to 1.6m	33.4%
			>1.6m	66.1%
Inferred	OC	AU Seam	<0.5m	0.5%
			0.5m to 1.2m	15.2%
			1.2m to 1.6m	36.4%
			1.2m to 1.6m	47.9%

Resource Class	Mining Method	Seam	Seam TH Class	% of Total
Indicated	UG	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.0%
			1.2m to 1.6m	0.0%
			>1.6m	100.0%
Inferred	UG	A Seam	<0.5m	0.0%
			0.5m to 1.2m	0.1%
			1.2m to 1.6m	0.3%
			>1.6m	99.7%
Inferred	UG	E Seam	<0.5m	0.1%
			0.5m to 1.2m	0.8%
			1.2m to 1.6m	23.2%
			>1.6m	75.9%

The Measured and Indicated Coal Resource Areas show very good potential towards beneficiation practices, and can be washed to a 26.5 MJ/kg product for the E Coal Seam and 26.0 MJ/kg for the A Coal Seam. The A Upper Coal Seam may also be beneficiated to a 21.0 MJ/kg product. Theoretical yields range from more than 55% to 70% on the different product specifications.

The potential coal products is shown in Figure 54 to 65, indicating theoretical yield, product ash content, volatile content as well as sulphur content. The washed information available over the inferred resource categories are still widely scattered, but it is believed that the current results should be proven with future drilling and sampling.

The reference point for the Coal Resources presented in Table 13 would be a processing plant in close proximity (<10 km) to the mining areas.

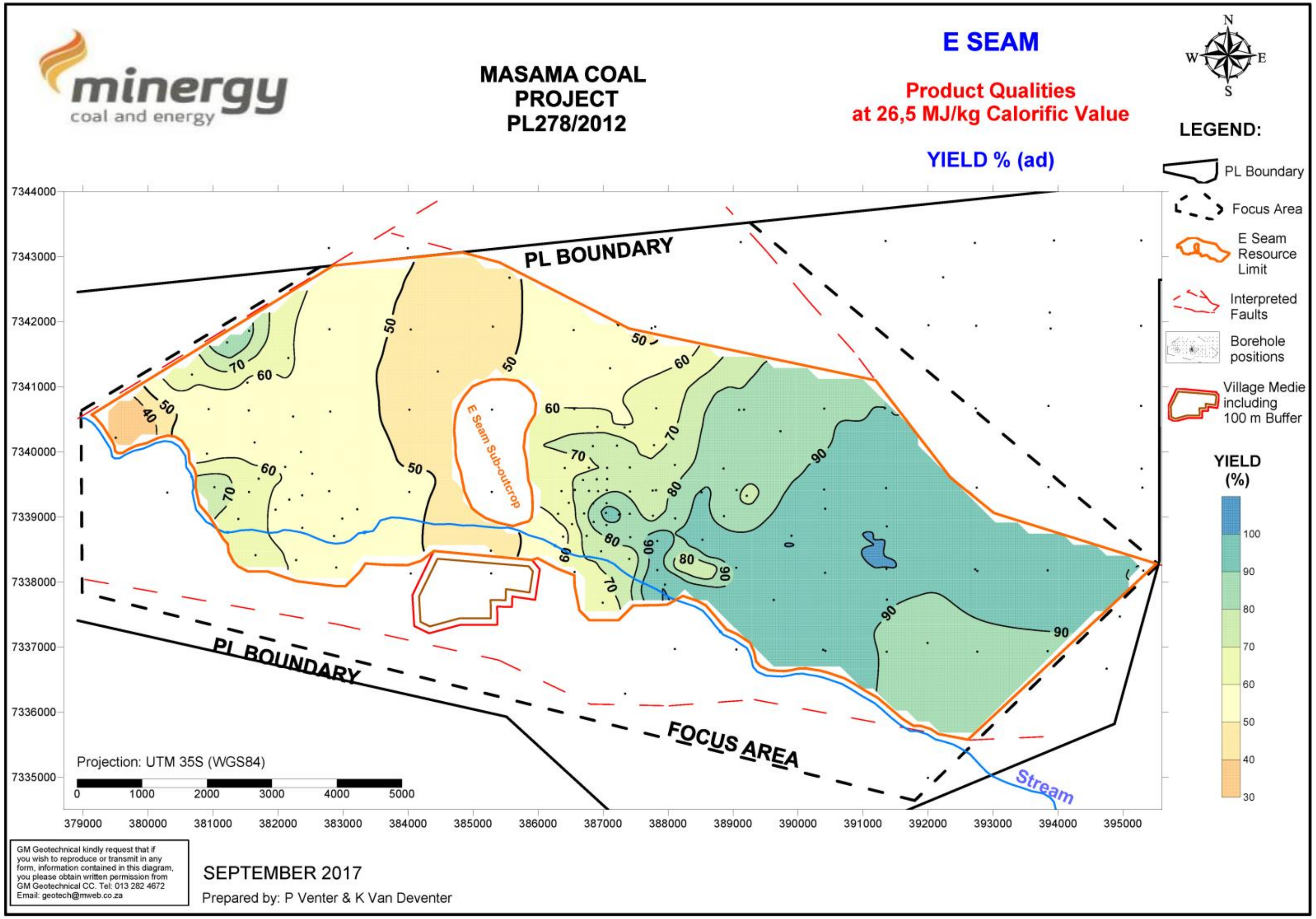

Figure 54: E Seam Theoretical Product Yield % at 26.5 MJ/kg Calorific Value

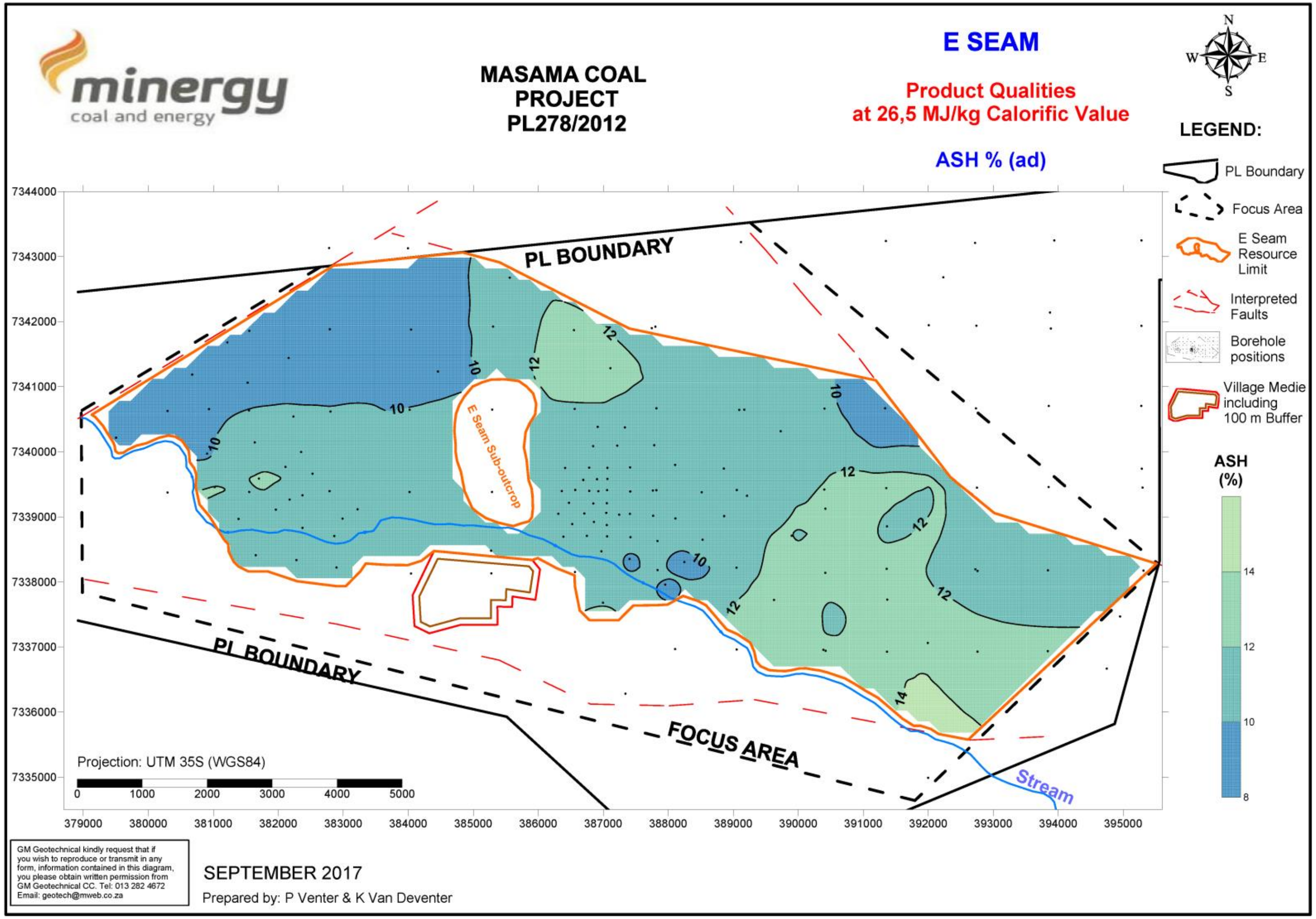

Figure 55: E Seam Product Ash % at 26.5 MJ/kg Calorific Value

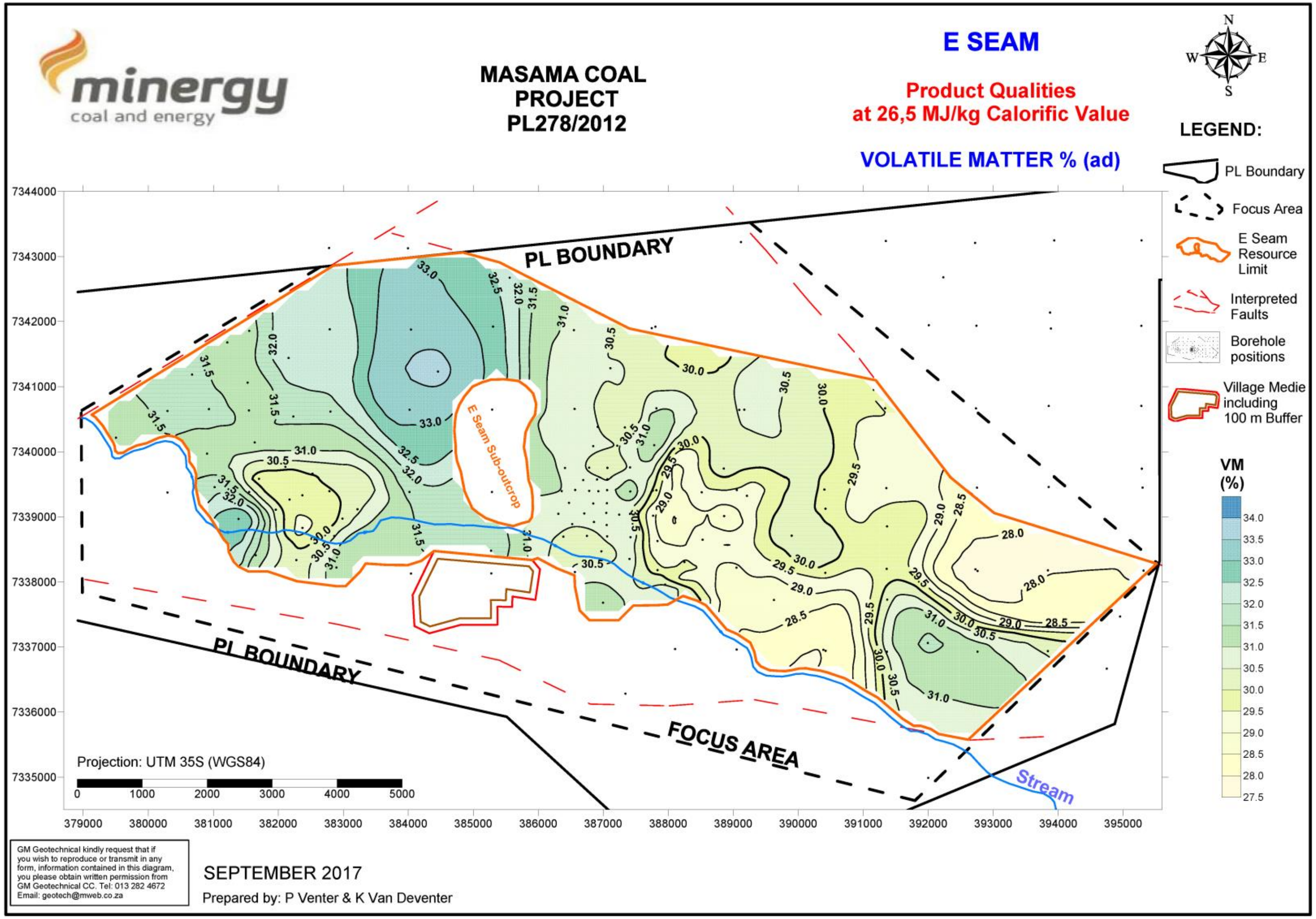

Figure 56: E Seam Product Volatile Matter % content at 26.5 MJ/kg Calorific Value

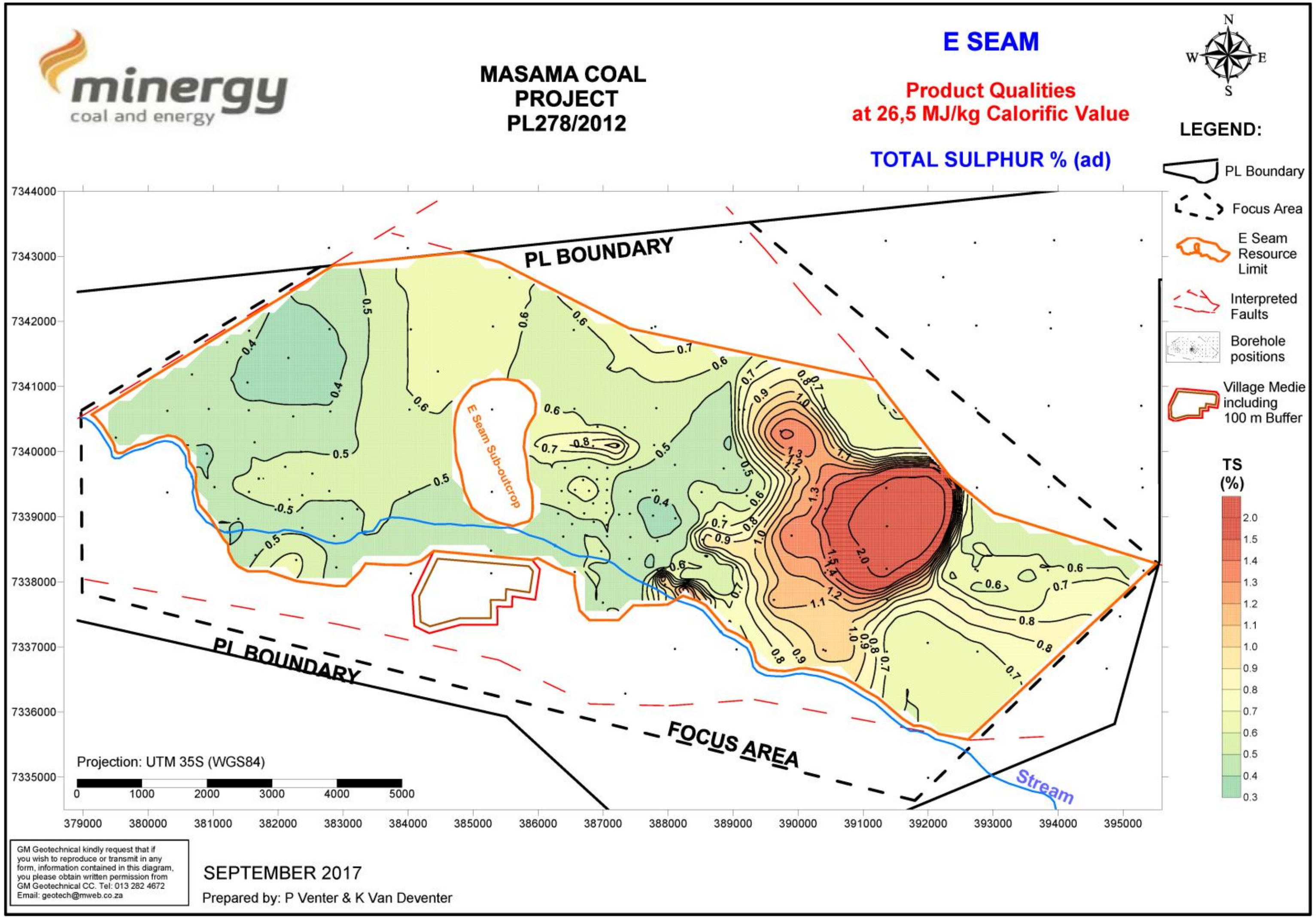

Figure 57: E Seam Product Sulphur % content at 26.5 MJ/kg Calorific Value

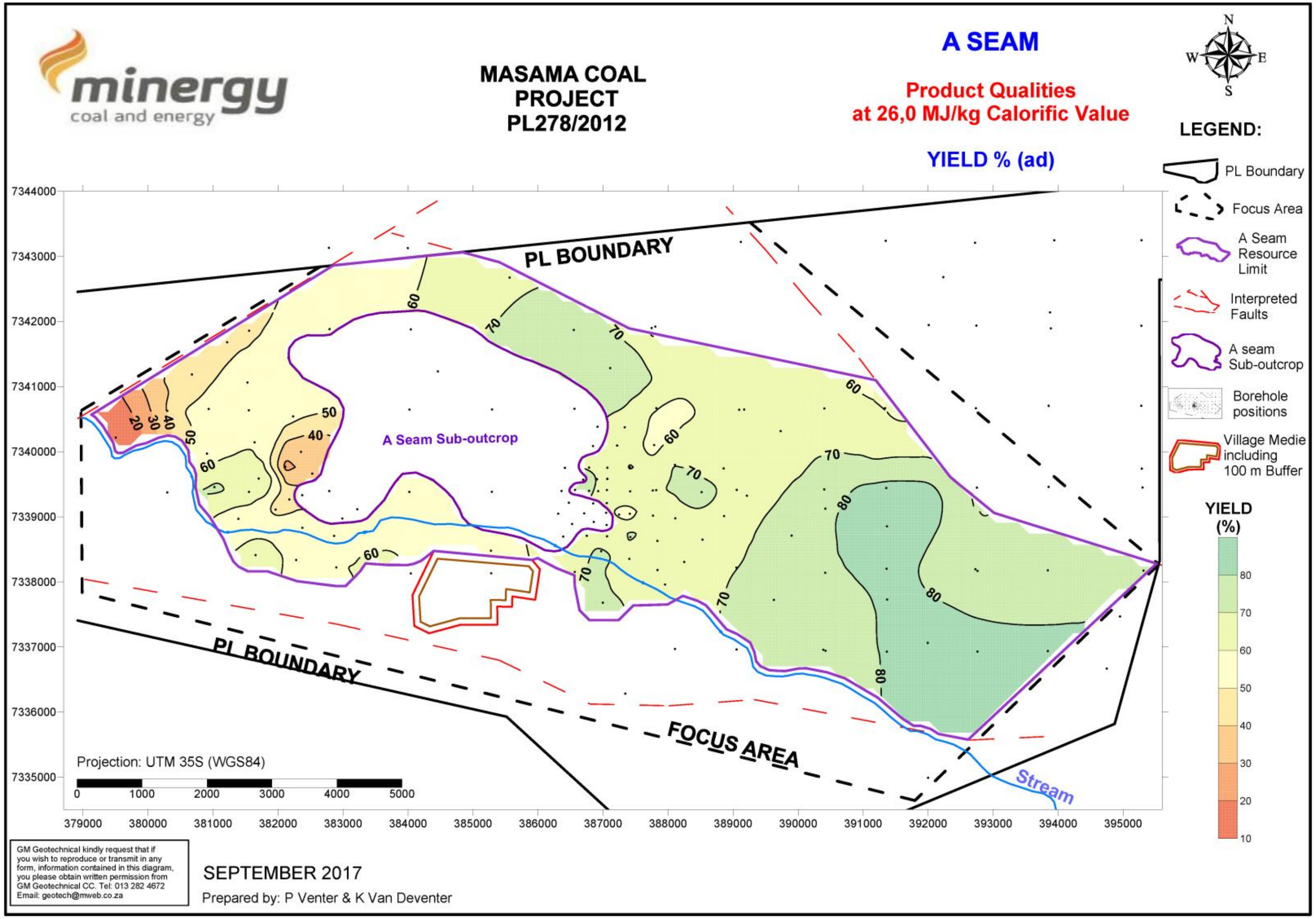

Figure 58: A Seam Theoretical Product Yield % at 26.0 MJ/kg Calorific Value.

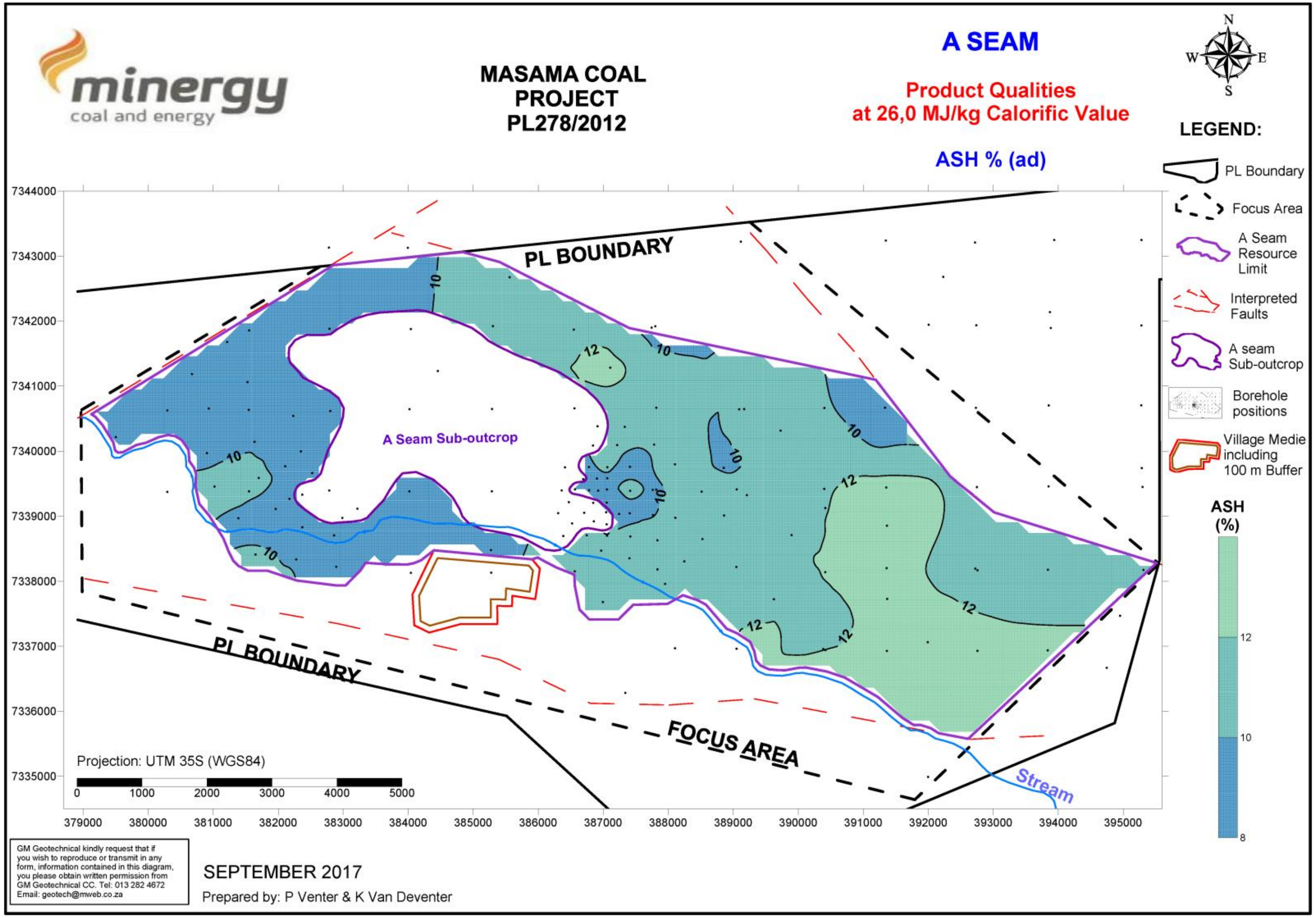

Figure 59: A Seam Product Ash% at 26.0 MJ/kg Calorific Value

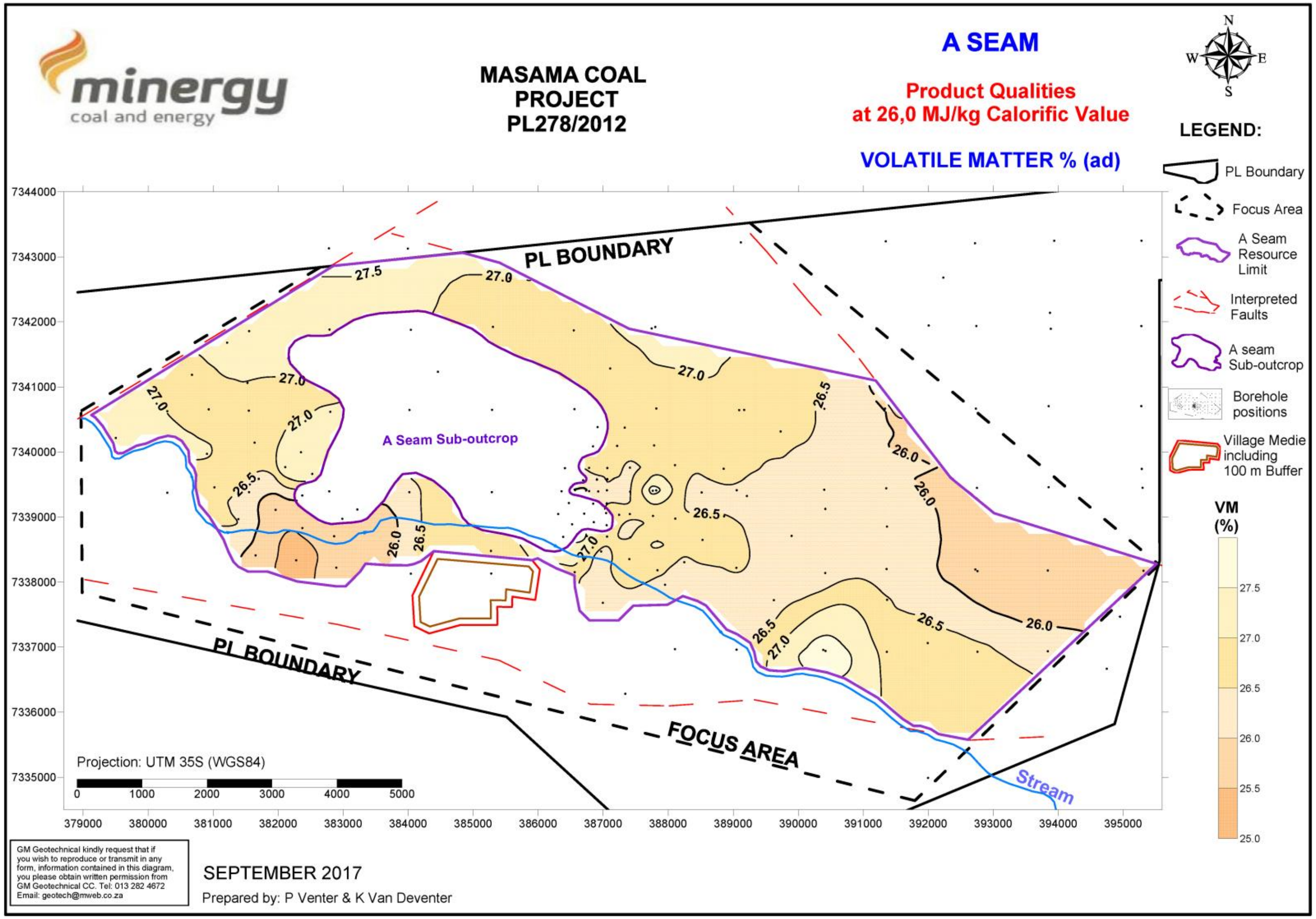

Figure 60: A Seam Product Volatile Matter % content at 26.0 MJ/kg Calorific Value.

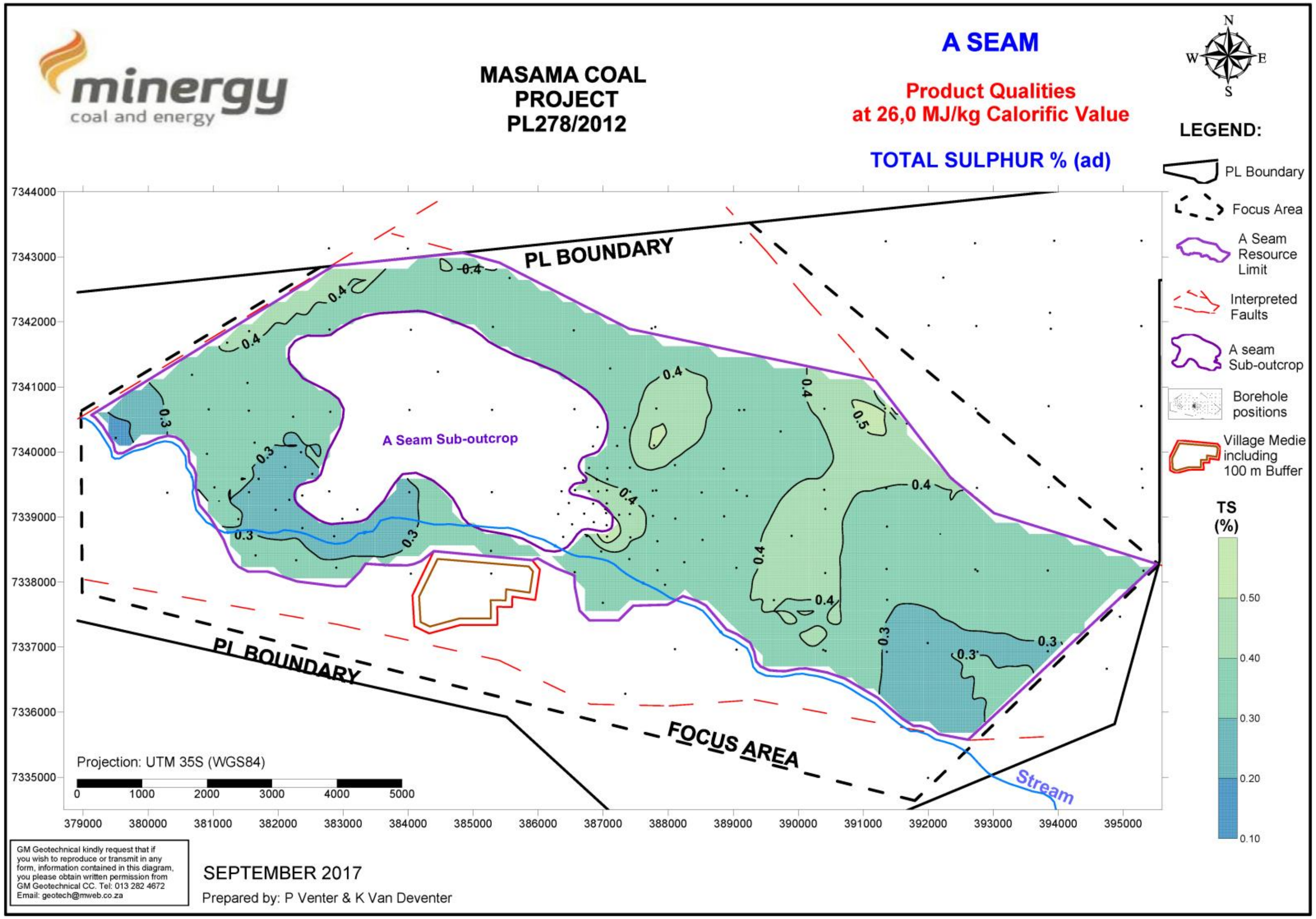

Figure 61: A Seam Product Sulphur % content at 26.0 MJ/kg Calorific Value.

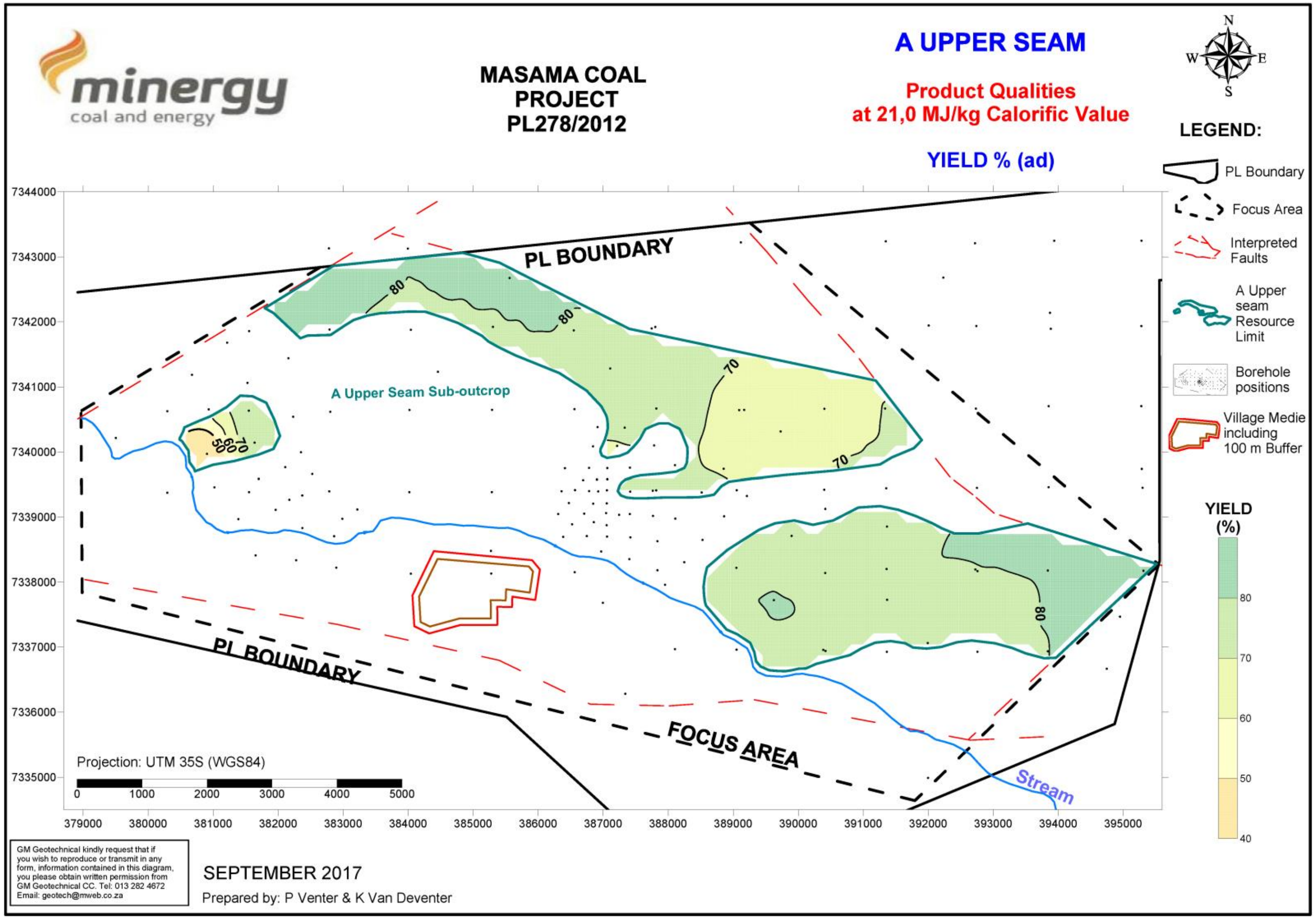

Figure 62: AU Seam Theoretical Product Yield % at 21.0 MJ/kg Calorific Value.

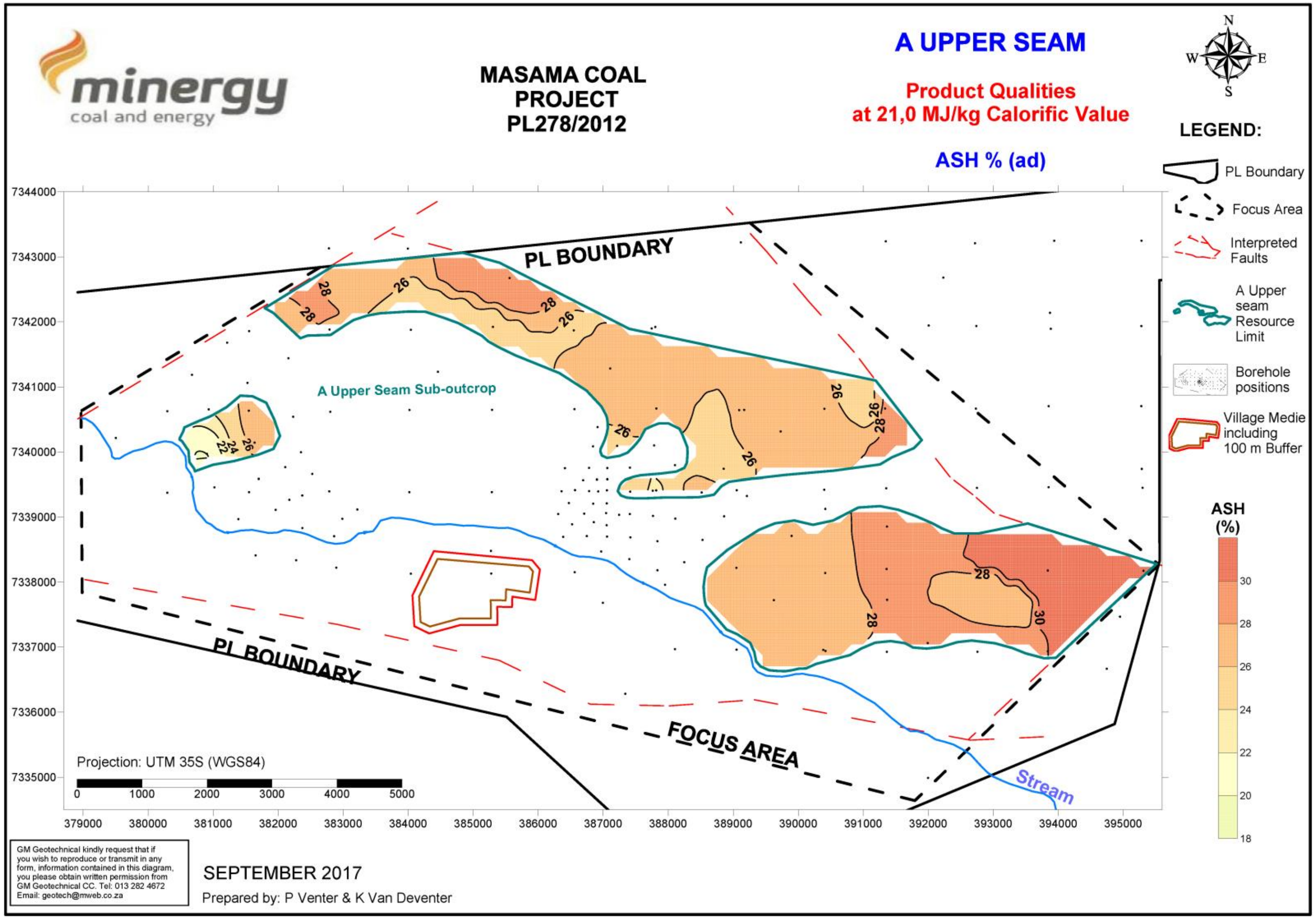

Figure 63: AU Seam Product Ash% at 21.0 MJ/kg Calorific Value.

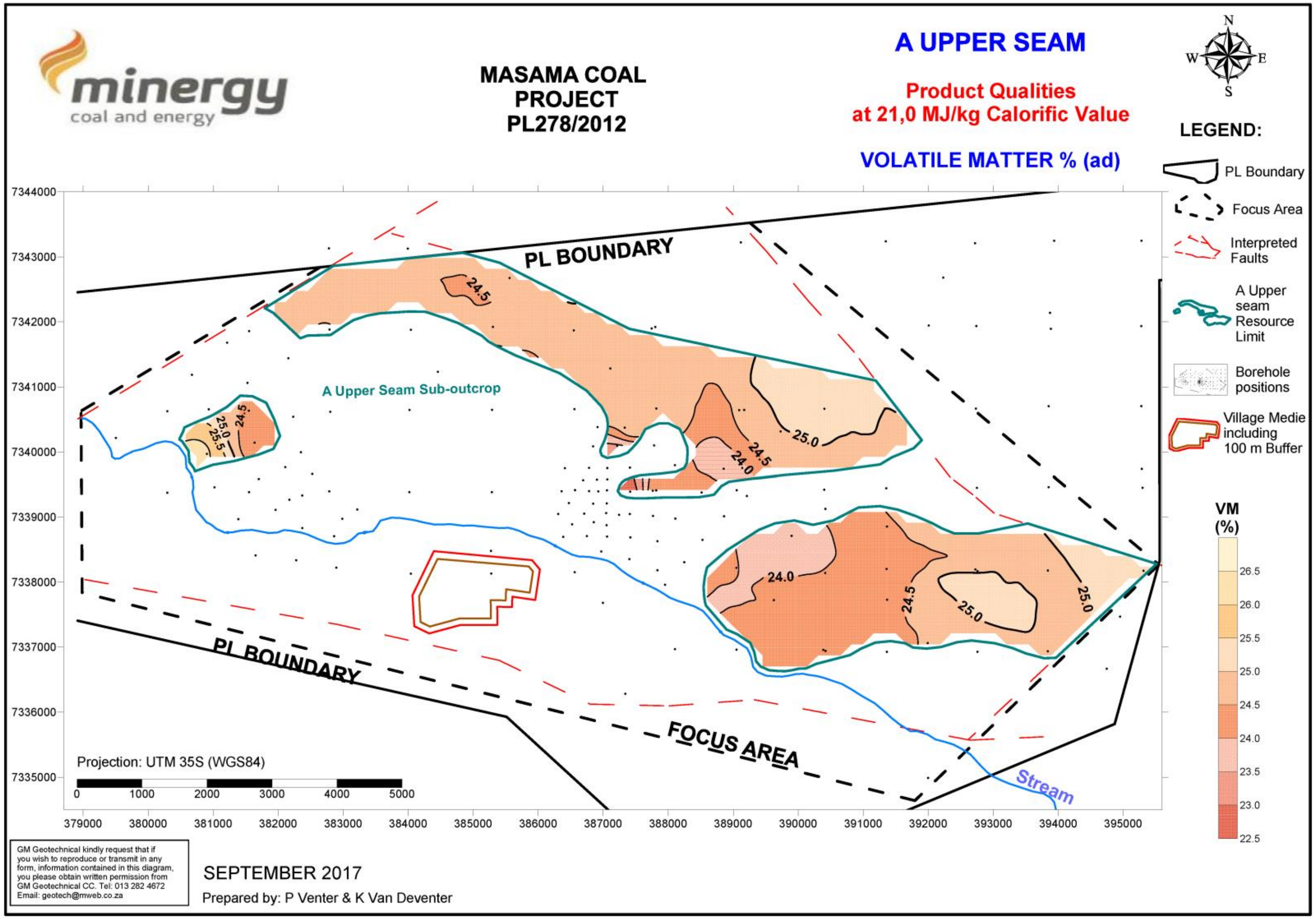

Figure 64: AU Seam Product Volatile Matter % content at 21.0 MJ/kg Calorific Value.

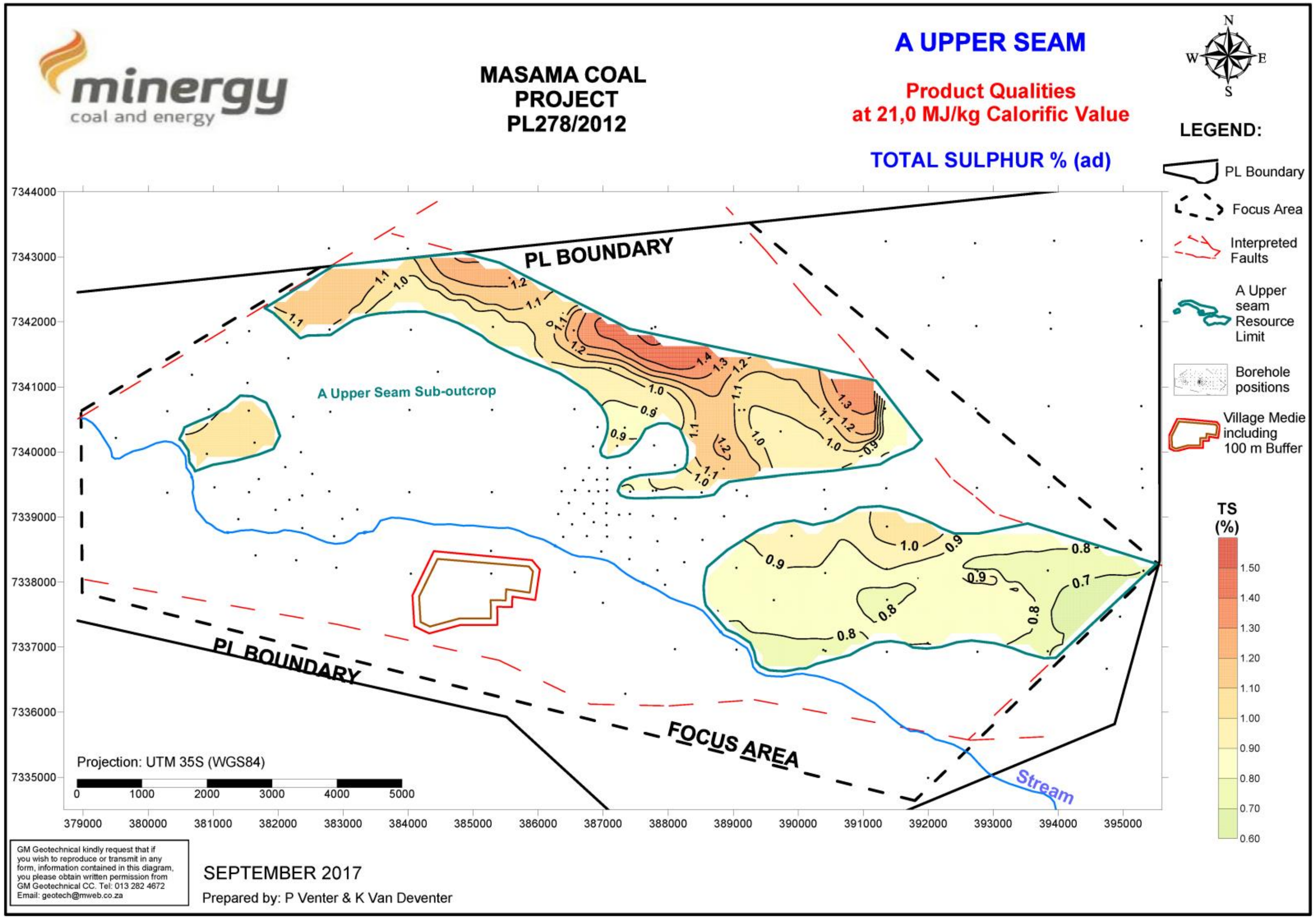

Figure 65: AU Seam Product Sulphur % content at 21.0 MJ/kg Calorific Value.

7.5 Coal Resource reconciliation (4.2 (v); 4.5 (vi))

A detailed coal resource reconciliation is not possible because historic resource estimates have covered different areas and/or coal seams, the following comments can however be made:

- The Resource tonnage of E Seam Resources in the current estimate is less than those estimated by Shell for the same seam (112.7 Mt vs 326 Mt). However, Shell's estimate covered a larger area.
- The Resource tonnage estimated by Coffey Mining (2013)[5] in 2013 for the E Seam and A Seam in the West Block of the project area is also larger than those in the current estimate as shown in Table 15 below. It should however be noted that the area covered by the Coffey Resource estimate is considerably larger than the area covered in the current Resource estimate. Raw coal qualities for the seams are similar in both estimates.
- Comparing the 2016 and current resource estimates, an additional 43 Mt of coal resource has been added across all categories due to the increased drill density and re-definition of Inferred Coal Resources into the Indicated category. Although at Inferred Coal Resource level only, 3.4 Mt of A Upper Seam is now declared over the proposed opencast area, and 18.5 Mt of E Seam is now declared as Indicated Coal Resources. A Measured Resource of 12.7 Mt was declared for the A Seam in the current estimate, which was not formerly declared. Of the increased resource, 11 Mt is opencast resources with the remainder in the underground category.

Table 15: Comparison between Resource tonnages estimated by Coffey Mining (2013)[5], Coetzee (2016)[1] and current Resource estimate

Seam	Classification	Coffey Mining (2013)[5]	Coetzee (2016)[1]	Current Estimate
AU Seam	*Inferred*	144 Mt	nil	3.4 Mt
A Seam	*Measured*	nil	nil	12.7 Mt
	Indicated	nil	71 Mt	54.7 Mt
	Inferred	563 Mt	182 Mt	206 Mt
E Seam	*Indicated*	nil	nil	18.5 Mt
	Inferred	199 Mt	94 Mt	94.2 Mt
TOTAL		**762 Mt**	**347 Mt**	**389 Mt**

8. TECHNICAL STUDIES

In 2014 Minergy completed a Scoping Study on a large (7.8 Mt per annum ROM) export focussed opencast coal mine (Coffey, 2014)[6], which covered an area that completely overlaps with Section A of the Focus Area in this report. Many of the technical studies done in the Scoping Study are relevant to a small to medium size coal mine as envisaged for the Masama Coal Project.

The Scoping Study referred to above was based on preliminary technical and economic assessments. It is preliminary in nature, and included Inferred Mineral Resources which are insufficient to provide certainty that the conclusions of the Scoping Study will be realised.

Further Technical studies were initiated on the Masama Coal Project during 2016 and 2017, including Geotechnical Studies, Hydrological Studies, Environmental Studies (including several specialist studies, one of which covered Acid Mine Drainage), and a coal market study.

8.1 Geotechnical (4.1 (ii), 5.1 (i))

The host rocks for the coal seams are Karoo Supergroup sandstones and shales with estimated uniaxial compressive strengths (UCS) of between 25 MPa and 120 MPa. The coal seams have estimated strengths around 20 MPa. (Coffey, 2014)[6]

The rocks are not highly jointed except for the horizontal bedding partings. The RQDs are generally over 80% in the unweathered material.

The sand and calcrete (soft overburden) are not consolidated and should be treated as soils (Coffey, 2014)[6].

The Coffey (2014)[6] Scoping Study concluded that the Masama coal deposit could be mined in a stable fashion using terrace mining with vertical benches up to 25 m high, but these will generally be 10 m to 15 m vertical high-walls stripping the waste rock above each target coal seam. The unconsolidated sand and calcrete (soft overburden) should be removed from the tops of benches and should not have slopes greater than 40°.

In 2017, a slope design and geotechnical study was conducted on the Masama Coal Project by Big C Rock Engineering CC (Pretorius, 2017)[33]. The Study focussed on the Section A and Section B opencast areas but also covered underground design parameters for the project. Outcomes of the study were as follows:

- Jointing is consistent throughout both areas as well as the varying degree of weathering.
- Three definite geotechnical zones were identified namely: Softs, weathered and hards. These zones were further divided depending on the type of rock and the average thicknesses calculated for each zone. The zones and thicknesses were used in the slope design process.
- In places the weathered zone is severely weathered and fractured (possible free digging material) with a zero RQD whilst in other areas the weathered zone can be considered as hards (blasting required).

- There are prominent joint sets present which must be considered when determining the orientation of the highwall. These sets lie more or less perpendicular to one another which may result in a higher probability for certain modes of failure (especially planar and wedge failures) depending on the orientation of the highwall. Bases on the available data for the proposed mining area, the best suited highwall orientation will be at a dip direction of 165° i.e. a northeast-southwest trending highwall.
- The opencast workings at the Masama Coal Project area will only be conducted in areas where the in-situ strip ratio does not exceed 1:5. For the most part only the consistent A Seam and E Seam will be excavated with opencast mining methods although other seams may also be removed in the process (such as the AU Seam).
- The overburden consists of a Kalahari sand that overlays a somewhat problematic weathered layer followed by a hard mudstone layer and eventually the A seam coal, mining will extend through a competent sandstone parting and then to the E Seam coal. The weathered layer is considered problematic due to its inconsistent structure and depth.

8.2 Geohydrology (5.1 (i); 8.1 (i))

The Coffey (2014)[6] Scoping Study determined that sufficient ground water exists in the vicinity of the Masama Coal Project Area for a large coal mine with an estimated water requirement of 200 L/tonne, equating to approximately 1 560 ML per annum (about 178 m^3/hr).

Numerous potential sources of groundwater were identified near the planned mining area. Most of the potential sources could individually provide the required 1 560 ML per annum. Further groundwater investigations and groundwater exploration drilling were recommended.

Eight sources of sustainable groundwater supply were identified and recommended for further evaluation:

- Use existing boreholes in close proximity to Section A - Masama Coal Project.
- Tap into the artesian wellfield 40 km northeast of Section A - Masama Coal Project.
- Develop a wellfield in the Ecca Group rocks 20 km northeast of Section A - Masama Coal Project.
- Develop a wellfield along the structural contact south of Section A - Masama Coal Project.
- Develop a wellfield in the Lebung Formation inlier.
- Develop a wellfield in the Ntane aquifer north of the Zoetfontein Fault ~45 km north of Section A - Masama Coal Project.
- Develop a wellfield in the “Structural High” west of Section A - Masama Coal Project Area, where sandstone lithologies dominate in the Ecca Group.
- Develop a wellfield in the Proterozoic Waterberg Group metasediments approximately 30 km south of Masama and in the vicinit of the village of Lentsweletau.

During 2017 as part of the Environmental Specialist Studies conducted for the Masama Coal Project three Hydrological Studies were conducted as follows:

- Hydrocensus (KLMCS, 2017)[34]
- Groundwater modelling (Water Surveys Botswana 2017a)35
- Hydrogeological Risk Assessment (Water Surveys Botswana 2017b)35

The main findings of the above reports are as follows:

- The hydrocensus provide baseline environmental data on ground water quality and found generally alkaline ground water conditions in the vicinity of the mine area.
- Three existing boreholes in the mine area have been identified which can provide the ~ 30m3/hr make up water required for the mine.
- Predicted water inflows into the opencast workings (including the backfilled areas) are not likely to be significant and have been estimated to range between ~2m3/day in Year 1 to a maximum of 30m3/day in Year 20.
- Contaminant Transport Modeling indicates that the risk of potential sulphate pollution from surface sources such as the waste rock dumps and coal storage facilities as well as backfill material in the pit voids is minimal with modeled plumes travelling less 200 – 500m away from source. The mine site has a very low hydraulic conductivity ranging from 0.0003 – 0.097m/day and potential plumes are expected to remain well within the mine lease area.
- Contaminant Transport Modeling at the rail siding site indicates that risk of potential contamination of groundwater is low with modeled plumes travelling less than 300m from the siding. Effective pollution control measures (including the pollution control dam) at the rail siding should effectively eliminate the risk of groundwater pollution.
- The impacts of pit dewatering occur within the mine lease area and it is unlikely that they will extend beyond the mine lease area. Water table drawdowns will occur locally around the opencast mine areas and abstraction holes but are unlikely to have a significant impact on surrounding private boreholes.
- It is expected that the groundwater levels will recover once mining is completed and that the water levels in the backfilled pits will recover slowly after mine closure.
- The risks of surface water flooding in the mine area is considered to be low
- A water balance for the mine was developed

The following hydrological impacts were identified and can be anticipated during the mining of the proposed pits:

- Localised dewatering of upper portions of the Ecca Sandstone aquifer due to mining.
- Abstraction from boreholes earmarked for the mine water supply will lower the water table around those holes, potentially affecting nearby private boreholes. The closest private hole to the proposed abstraction holes is 800m away.

- Potential contamination of groundwater from seepage emanating from waste rock dumps, coal stockpiles and mined-out areas that have been backfilled.
- Rebound (recovery) of groundwater water levels at the end of mining is likely to occur once the dewatering is switched-off and all the pits have been backfilled to the original topography.

Various impact management and mitigation measures are recommended and include regular monitoring of groundwater conditions using a network of boreholes.

8.3 Environmental Studies (5.1 (i); 5.5 (i), (ii), (iii), (iv), (v); 5.7 (i))

A desktop environmental screening assessment was undertaken by Coffey Mining as part of the Scoping Study (Coffey 2014)[6]. The focus area of this report is substantially the same vicinity as the areas considered in the Scoping Study and hence the outcomes of the environmental study is applicable to a small to medium size coal mine as envisaged for the project.

Below is a summary from Coffey (2014)[6]:

Landholding and Land Use

Numerous cattle posts are located in the proposed mining area (Section A). These posts are allocated by the Land Board on a grant basis and in this category no permanent structures are supposed to be built. The land in Section A of the Masama Coal Project falls into the category of Communal (or Tribal) Land, portions of which may be allocated, free of charge to citizens, for residential, grazing, arable and commercial/industrial purposes by the Land Board on customary law grant or common law grant (Botswana National Atlas, 2001)[10].

Conclusions

The Coffey (2014)[6] Scoping Study concluded the following; the project area is typically rural and is used for agricultural activities such as subsistence maize and sorghum growing and traditional cattle farming. One local community village known as Medie is in close proximity to the proposed mining area and infrastructure site. The land in the Masama “Section A” area falls into the category of Communal (or Tribal) Land, with portions of which may be allocated free of charge to citizens for residential, grazing, arable and commercial/industrial purposes. There are numerous cattle posts in the mine lease area that have been allocated by the Land Board on a grant basis.

Based on the study, the main area of concern are the possible impacts related to the community of Medie. The direct impacts would be related to noise, dust and the social impacts in terms of in-migration of non-locals seeking employment and the establishment of a mining village disrupting the current social fabric. At present it is not planned to relocate the Medie village.

At this stage of the project development it does not appear that any environmental or social fatal flaws are present.

Botswana Legal Requirements

In Botswana, environmental study is guided by the Environmental Assessment Act No. 10 (2011)[21]. The Act requires that Environmental Impact Assessments (EIA) should be undertaken for all the projects that may have negative impacts on the environment.

EIA Procedural Framework in Botswana

Screening:

In Botswana, the term 'screening' means an initial stage in the EIA process where the Minister determines whether an activity should be subject to an EIA or not. Under the Act, Category A projects require a full EIA, Category B projects require a partial EIA, and projects in Category C do not require an EIA. The Environmental Assessment Act does not specify what activities fall into which category, leaving this to be clarified in the Regulations.

Project Brief:

Under the Act, every application for an Environmental Authorisation for a project must be accompanied by a Project Brief in the form set out in the regulations (currently in draft), and the formulation of policies and programmes must be accompanied by a strategic environmental assessment.

The Project Brief or strategic environmental assessment must include the views and opinions of interested and affected parties. To this end, the Act requires the applicant to do the following:

- Publicise the proposed activity, its effects and benefits in the mass media for a period of at least twenty-one days.
- Hold meetings with affected people or communities.

Under Section 6(5) of the Act, the Department of Environmental Affairs (DEA) may authorise the implementation of the activity if it is satisfied that there are no probable adverse impacts. It may at its discretion, under Subsection 6, request the developer to submit an environmental management plan. However, the DEA may request the applicant to submit more information to allow it to make an informed decision.

If the proposed project is likely to have adverse impacts on the environment, the DEA can reject an application or decide that an EIA is required. It will then direct the applicant to prepare Terms of Reference for the EIA in the prescribed form set out in the regulations.

If the DEA considers the Terms of Reference to be adequate to guide the Environmental Impact Assessment, he may then approve them. Alternatively, the DEA may request more detail from the applicant for the Terms of Reference before approval is granted.

EIA and EIS:

Section 9 of the Act states that the 'EIA shall identify and evaluate the environmental impact of an activity with particular reference to the:

- Health, safety or quality of life of people;
- Archaeological, aesthetic, cultural or sanitary conditions of the environment; and
- Configuration, quality and diversity of natural resources.

Section 10 of the Act requires the DEA to place a notification in the Government Gazette and specified newspapers at least once a week for a period of four weeks, inviting comments and objections from the interested and affected parties. In its decision-making process, the DEA must consider comments or objections raised by the public during this period. In certain circumstances outlined in Section 11 of the Act the DEA may hold a public hearing. The procedure for holding a public hearing is prescribed in the Regulations under the Act. An important component of the Act is that any Terms of Reference, statement, report, decision or any other document produced under the Act shall be accessible to the public.

Review of the EIS:

Section 10 of the Act gives the DEA sixty days in which to review the EIS. After its review, the DEA may invite public comment. Once it is satisfied that the report is adequate and that the proposed mitigation measures will be ‘effective and sufficient’, it may do one of the following:

- Grant an Environmental Authorisation with conditions; or
- Reject the EIS in writing, giving reasons for the decision.

Botswana has not developed guidelines for a formal review process, but Section 17 requires the competent authority (the DEA) to consider the following:

- The contents of the Terms of Reference;
- The EIS;
- The recommendations of other government departments and local authorities;
- The comments and objections made by the interested and affected parties.

A person aggrieved by the decision may appeal to the High Court within thirty days of receiving the decision.

Environmental monitoring and audits:

Section 18 of the Environmental Assessment Act requires the authorities to monitor compliance with the agreed mitigation measures, while Section 19 makes provision for environmental audits. After carrying out an environmental audit the DEA may require a developer to take specific mitigation measures to ensure compliance with predictions made in the statement or, require mitigation measures to address environmental impacts not anticipated at the time of the authorisation. Failure to comply with the provisions of the DEA could result in revocation or modification of an authorization.

During 2016 Minergy Coal appointed Ecosurv Environmental Consultants (Pty) Ltd to undertake an Environmental and Social Impact Assessment for the Masama Coal Project, covering an opencast mine and associated infrastructure. Figure 66 below outlines the EIA Process in Botswana.

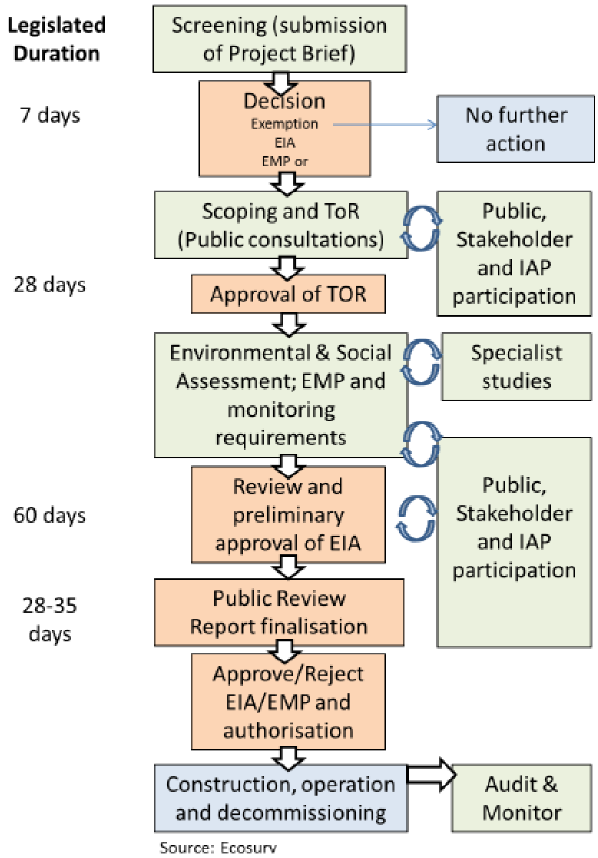

Figure 66: Illustration of Botswana EIA Process.

The project Brief was submitted in December 2016 and on 9 December 2016 the DEA responded confirming the project would require a detailed Environmental Impact Assessment and requested that a draft Scoping Report and Terms of Reference be prepared and submitted. In May 2017 Ecosurv completed the Environmental Scoping Report (Ecosurv 2017)[37] and submitted this to the DEA. The Scoping Report covered all aspects of the project, baseline environmental conditions and also included extensive stakeholder consultations, identification of impacts, project alternatives and proposed Terms of Reference for the Detailed EIA.

Key issues identified from the Scoping Report included potential impacts due to the project as follows:

<u>Archaeological</u>

- Exposure of subsurface remains due to activities such as bush clearing, excavation and topsoil stripping; and
- Surface disturbances to archaeological resources and historical resources, due to ground works during the construction and operation of the coal mine, construction of access roads/tracks and other infrastructure.

<u>Environmental</u>

- Habitat fragmentation due to mining of large areas of natural habitat and increased industrial activity in the area;
- Loss of vegetation biomass due to the clearance of flora to make way for infrastructure developments and open cast mining;
- Displacement of wildlife due to disturbance, loss of habitat and/or loss of food sources across the proposed development area;
- Loss of wildlife due to illegal hunting and unlicensed gathering of veld products by construction workers or other parties;
- Introduction of invasive plant species as a result of the movement of vehicles and humans across the project area;
- Spread of measles in livestock due to the disposal of sewage into the natural environment;
- Air Pollution due to emissions of dust and other particulate matter around the proposed coal mine and along gravel roads;
- Noise and Vibration impacts due to blasting, haulage traffic and increased industrial activities (e.g. from excavation, crushing, and screening);
- Soil erosion as a result of localised exposure of soil to erosion agents (such as water and the wind) by vegetation clearance, digging and stockpiling of surplus soil;
- Soil pollution due to deposition of coal dust downwind of coal stockpiles;
- Water pollution due to long term leakages from the residue disposal facility;
- Water pollution due to fuel and oil spillages from machinery or hydrocarbon (e.g. lubricants) storage areas and workshops; and
- Groundwater drawdown due to the abstraction of groundwater for project operations.

<u>Social</u>

- Creation of employment and business opportunities due to the implementation of the Masama Coal Project;
- Proliferation of illegal settlements and squatter camps due to the migration of outsiders to the area in search of new opportunities to make money;
- Pressure on the existing local infrastructure and services due to increased crime and conflicts between the community and the project personnel;
- Increase in the transmission of HIV/AIDS and other sexually communicable diseases from casual and transactional sexual relationships between male crews and women residing in nearby settlements;
- Increased road safety risks due to an increase in vehicle traffic on local access tracks;
- Damage to existing access tracks due to heavy vehicle traffic;

- Loss of agricultural land due to establishment of the mine and the new road and rail siding areas;
- Loss of grazing pasture due to fire outbreaks caused by spontaneous combustion of coal stockpiles, crew negligence, lightning events and/or electrical faults that may occur within the project area;
- Loss of access to veld products due to access controls implemented by Minergy Coal;
- Increase in respiratory illnesses due to the inhalation of coal dust; and
- Reduction of aesthetic quality due to littering within the project area and other newly populated areas.

The report concluded as follows:

The potential impacts identified for the Masama Coal Project can be assessed in a detailed ESIA and appropriate mitigations proposed thereafter. The development of the project is likely to produce impacts on the archaeological, biophysical and social environments. The extent of these impacts will require further investigation during the detailed ESIA and mitigation measures should be proposed to address the negative impacts and enhance the positive impacts.

The report proposed Terms of Reference for details EIA study which included the framework for the report, including a description of baseline environment, stakeholder consultations, assessment of impacts, analysis of project alternatives, specialist studies, prediction and assessment of the potential impacts, mitigation measures and an Environmental Management Plan (EMP). Specialist studies are underway and include the following:

- Flora Survey;
- Fauna Survey;
- Social Impact Assessment (SIA);
- Archaeological Impact Assessment;
- Hydro census;
- Surface Water Baseline;
- Groundwater and Surface Water Risk Assessment and Management Plan;
- Traffic Study;
- Soils Baseline;
- Air Quality Baseline and Management Plan;
- Noise Quality Management Plan;
- Solid and liquid Waste Management Plan;
- Mineral Residue Management Plan.

In addition to the above specialist studies a study on the potential for Acid Mine Drainage was also conducted (Boer, 2017)[38]. The report concludes as follows:

- The main conclusion from the study was the potential for discard material from the E Seam and AU Seam to produce AMD. The E Seam discard shows definite enhanced values of iron and sulphur in the leachate from samples that were submitted for analyses;
- the A seam discard seems to be suitable for use as backfill material without the risk of AMD formation;
- the borehole core samples did not show any signs of AMD potential. This is true for the footwall and hanging wall samples, as well as the discard samples from the samples from within the interburden waste rock units.
- pyritic material occurs as nodules distributed in an irregular pattern throughout the A seam.
- Most of the discards will arise from washing of the A Seam (84%) and thus if the relatively smaller proportion of discards from the E and AU Seams (16%) were co-disposed with A Seam discards, the overall composition of the discards would remain near neutral or alkaline. Such a co-disposal method as backfill material is considered suitable for all discards from the Masama Coal Project.

8.4 Coal Market Study (5.1 (i); 5.5 (i), (ii), (iii), (iv), (v); 5.7 (i))

A Coal Market Study was conducted on potential regional markets for coal from the Masama Coal Project (Kruger, 2016)[39]. The report concluded that the Masama Coal Project represents unique coal project that is strategically located relative to existing infrastructure and potential markets for its coal. The close proximity of the Project to South African markets in the north of the country opens the door to supply into the domestic markets, this is a major upside to establish some base customers to sustain sales while the mining operation is still ramping up.

Minergy could access the domestic market directly or by using traders. There is great demand in this market for a consistent supply of a reasonable quality coal. With a reasonable sized operation and washing plant producing sized coal, the operation should easily manage to secure market share. Prices are consistent with guaranteed increases annually.

Further opportunities to supply the power generation sector including IPP’s should be explored. In addition the possibility of exporting coal through RBCT should be explored.

The shortage of viable energy sources is highlighted regularly in the press and as coal is still the cheapest form of energy and the supply and demand trend being experienced in the market is set to continue well into this decade.

9. OTHER RELEVANT DATA AND INFORMATION

9.1 Adjacent properties (1.3 (i); 3.1 (iv); 8.1 (i))

The more advanced and relevant adjacent properties to the Masama Coal Project are as follows:

- Mmamabula East Project – Jindal Steel and Power;
- Mmamabula South and Central Projects – Anglo Coal Botswana;
- Morupule Coal Mine – Debswana;
- Waterberg Coalfield – including Grootegeluk Coal Mine (Exxaro) and other advanced projects.

Figure 67 depicts the location of the Masama Coal Project in relation to the other coal projects, as mentioned above.

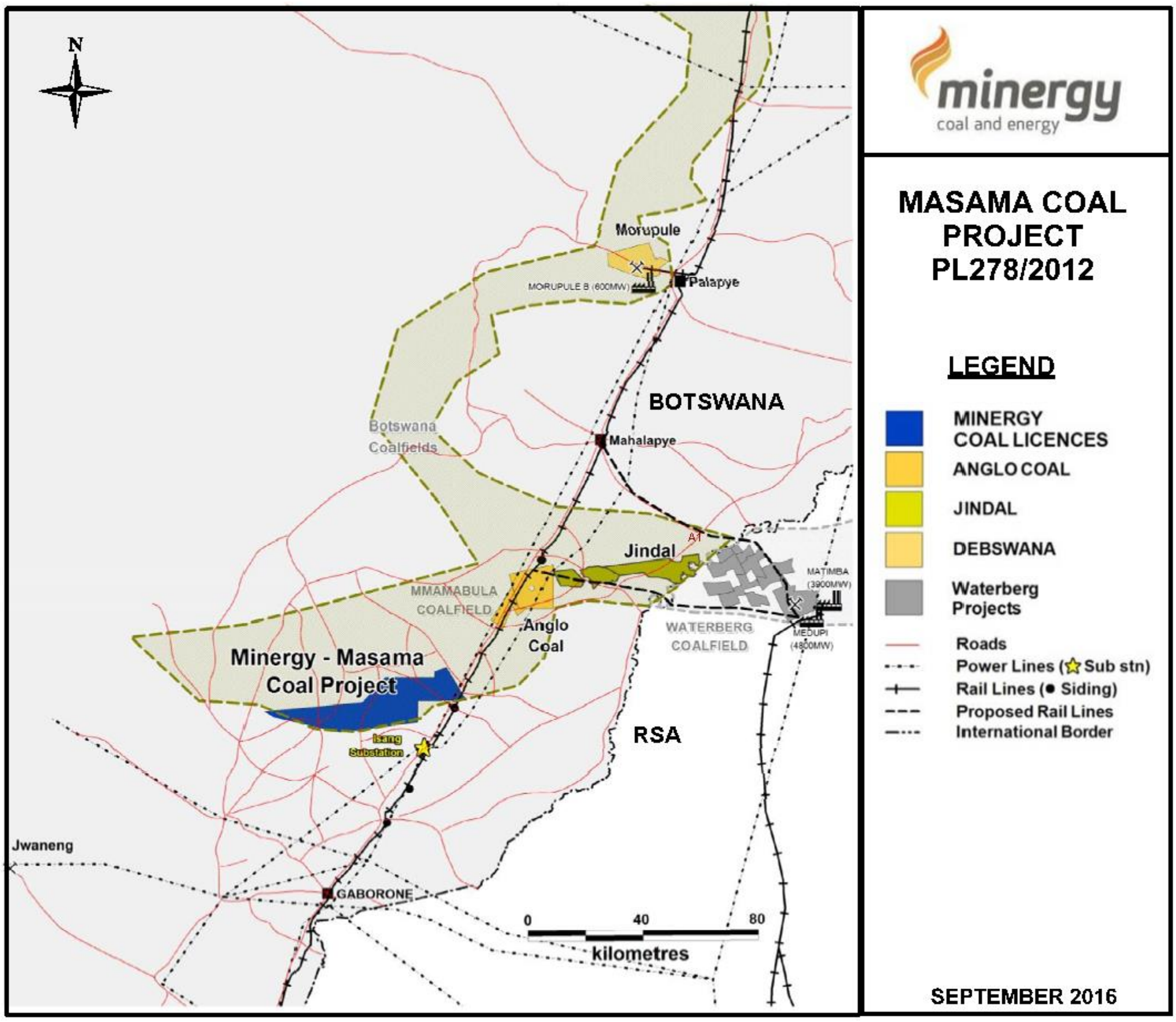

Figure 67: Location of the Masama Coal Project in relation to other nearby coal projects.

Mmamabula East Project (http://www.jindalafrica.com/botswana/Mmamabula-Coalfield)[22]

Located some 100 km east of the Masama Central Block, the Mmamabula Project as seen extensive prospecting for coal since coal was discovered there in the 1960's. Between 2005 and 2012 CIC Energy Corp of Canada conducted extensive drilling and related work on the Mmamabula Project.

CIC defined a total Coal Resource of approximately 2.4 Bt on what they referred to as the Mmamabula East Project as indicated in Table 16 below.

Table 16: Mmamabula In Situ Mineral Resource Estimate (D1 + M2 + D2 Upper Seams: Western, Central and Eastern Blocks) (effective date: 31 March 2011)

CIC Mmamabula East Project Coal Resources	
Classification	**Tonnage (Mt)**
Measured	2 390
Indicated	7.52
Measured + Indicated (total)	**2 397**
Inferred	3.08

The resources were predominantly in two seams, termed the M2 Seam and D1 Seam, which have average thicknesses of ~3 m and ~ 6 m (CIC Technical Reports[23] and CIC Presentations[24]). There is a down faulted graben block between the Mmamabula East area and the Masama Coal Project, and different seam terminology was used during historical exploration in the two areas, tentatively the M2 Seam is correlated with the Masama E Seam and the D1 Seam with the Masama A Seam.

CIC evaluated the Mmamabula Project for several development options including power generation, export coal and also coal to liquids (CIC Presentations)[24].

In 2012, Jindal BVI Limited (JBVI), a subsidiary of an Indian multinational steel and power company, Jindal Steel and Power Limited (JSPL) acquired then Canadian listed coal Company CIC Energy Corp. (CIC) for about US $116 million thus gaining ownership of the Mmamabula Project.

(http://www.jindalafrica.com/countries/botswana/jindal-group-acquires-cic-in-botswana)[25].

Jindal have stated their plans for the project as follows; *"Our aim is to operate three surface mines in the rich coalfields of Mmamabula, as well as a power plant. The mine's development will meet the demands of a 600 MW power station and export region coal markets, with the potential to employ more than 2 000 people".* (http://www.jindalafrica.com/countries/ botswana/botswana-overview)[26].

Mmamabula South and Central Projects

Located just west of the Mmamabula East Project and some 75 km east of Masama Coal Project, the Mmamabula South and Central Projects were put out to tender by the Government of Botswana in 2011 and were awarded to Anglo Coal Botswana in 2013.

Prior to the tender process, the Mmamabula South Block had most recently been explored by CIC Energy Corp who defined Coal Resources of 315 Mt (311 Mt Measured and Indicated and 3.7 Mt Inferred). Seams present are the M2 Seam and D1 Seam (CIC Technical Reports[23] and CIC Presentations[24]).

The Mmamabula Central Block had previously been explored by Shell Coal Botswana in the 1980's who defined total "in-situ raw Reserves" of 487 Mt in three seams they termed the Lower Seam, Middle Seam and Upper Seam. The Lower Seam would correlate to the M2 Seam (Masama E Seam) and the Middle Seam to the D1 Seam (Masama A Seam) (Shell 1982b)[27].

Morupule Coal Mine

Morupule Coal Mine is Botswana's only operating coal mine and is located near the town of Palapye in southeast Botswana some 200 km northeast of the Masama Coal Project.

Morupule Colliery has been operating since 1973 and is 100%-owned by Debswana and operated by the company's coal mining division Morupule Coal Mine.

The coal produced is supplied to Botswana Power Corporation's (BPC) Morupule A thermal power station.

In June 2012, the Morupule Colliery Limited (MCL) 1 expansion project was commissioned. The project was launched in October 2010 at a cost of BWP1.7 billion ($218 million). It was undertaken to supply coal to the new 600 MW Morupule B power station built next to the Morupule A plant.

The mine's capacity has increased from 1 Mt per annum to 3.2 Mt per annum following the expansion (http://www.mining-technology.com/projects/morupule-colliery-expansion-project/)[28].

The Morupule Colliery mines Karoo aged medium to low quality sub-bituminous coal.

Coal is extracted from the 8 m thick Morupule Main Seam and the No. 2 Seam through conventional room and pillar mining methods. These operations are carried out at a depth of 85 m and accessed through a single shaft. Continuous drill and blast methods were originally used until continuous miner operations commenced in 2004.

The number of continuous miners operating at the mine went up from one to four following the expansion. The extracted ore undergoes primary crushing to reduce its size to 300 mm and a secondary crushing, which further reduces the size to less than 32 mm.

The mine is equipped with a 1 Mt per annum capacity coal washing plant, which has been operational since January 2008. The plant removes coal particles that are less than 15 mm. It uses a Dense Media Separation (DMS) process to separate high calorific value coal from low calorific value coal.

The coal is fed to the plant, which includes a slow rotating drum. High calorific value coal floats on the top and low calorific value coal settles at the bottom. Coal from secondary crushing and the washing plant is blended and fed into the conveyor system to feed the power station (http://www.mining-technology.com/projects/morupule-colliery-expansion-project/)[28].

Although the Morupule Colliery is located well north of the Masama Coal Project and in a different Coalfield (the Morupule Coalfield) and predominantly supplies coal to mine mouth power stations, it demonstrates a successful and long life coal mining operation within Botswana.

Waterberg Coalfield

The Waterberg Coalfield is located adjacent to the Mmamabula Coalfield and is reported to contain 50% of South Africa's remaining Coal Resources (The South African Coal Roadmap, July 2013)[29]. Currently there is only one operating coal mine in the Waterberg and that is Exxaro's Grootegeluk Mine.

Situated 25 km from Lephalale in South Africa's Limpopo Province, the Grootegeluk open-pit mine employs two thousand people and produces 18.8 Mt per annum final coal products, using a conventional truck and shovel operation. This mine has an estimated Minable Coal Reserve of 3 261 Mt and a total Measured Coal Resource of 4 719 Mt, from which semi-soft coking coal, thermal coal and metallurgical coal can be produced.

Grootegeluk has the world's largest beneficiation complex where 8 000 tonnes per hour of run-of-mine coal is upgraded in six different plants.

Some 14.8 Mt of annual production is power station coal, transported directly to Eskom's Matimba power station on a 7 km conveyor belt in terms of the existing supply contract. An additional 1.5 Mt per annum of metallurgical coal is sold domestically to the metals and other industries on short-term contracts. Grootegeluk produces 2.5 Mt per annum of semi-soft coking coal, the bulk of which is railed directly to Mittal SA under a long-term supply agreement. Approximately 1 Mt per annum of semi-soft coking coal and thermal coal is exported through Richards Bay Coal Terminal or sold domestically (http://www.exxaro.com/index.php/where-we-operate/coal/grootegeluk/)[30].

Grootegeluk Mine was expanded between 2009 and 2016 to supply an additional 14.6 Mt per annum of thermal coal to Medupi Power Station.

The Waterberg Coalfield also hosts Eskom's 3 690 MW Matimba Power Station and 4 800 MW Medupi Power Station (under construction). There are also advanced projects by Sasol, Anglo Coal, Resource Generation and Waterberg Coal Company among others in the Waterberg Coalfield.

9.2 Risks (4.1 (iii); 5.5 (iii); 5.7 (i))

Possible material technical legal, environmental and other risk factors are:

- The local influence of large- and small-scale geological structures on the coal deposit. The presence of geological structures increases the risks for mining in particular underground mining. Exploration to date has not identified significant large scale structures in the focus area of the Masama Coal Project; this includes drilling, limited surface mapping and examination of aeromagnetic data. The presence of small scale structures is difficult to determine from exploration data, however initial opencast mining will confirm the presence or absence of such structures which can then be properly evaluated prior to the commencement of underground mining.

- Twin drilling suggests there may be local variability in seam thickness which could pose a risk to underground mining in parts of the focus area. Should the seam thickness of the E Seam in particular be found to have significant local variation then this would make underground mining more difficult and potentially costlier. It may also result in higher underground mining dilution and mining losses. During initial opencast mining the seam thickness variability in the E Seam can be properly evaluated prior to the establishment of any underground mining sections.
- Drainage lines or water courses: restrictions to mining apply when rivers are present and thus no Coal Resources have been declared within 100 m of the Dikolakolana Stream.
- There is a gravel road passing through the potential mining area which will have to be diverted to allow for the opencast mining of Section A. This road diversion will be required a few years after mining starts. Minergy Coal sees no impediment to diverting the road but will need to obtain the necessary permissions
- The village of Medie is located relatively close to the proposed opencast and underground mining areas. No Coal Resources have been declared under the village or within a buffer zone of 100 m around the village. Planned opencast mining will generally take place >1km from village houses and a minimum distance of ~500m is planned.
- The possible influence of mining operations on groundwater. Detailed specialist studies have now been conducted and the risk of groundwater pollution is considered low, however a monitoring program on a network of water boreholes has been recommended (See Section 8.2). Opencast mining activities are predicted to locally lower the water table, however this is modelled to recover one the opencast mining is complete.
- Relatively high sulphur contents (more than 2%) are present in some of the raw coal qualities reported for the Masama Coal Project. This could result in product rejection if the sulphur content is not reduced through processing (washing) the raw coal, conversely if the sulphur is removed the high content in the discards may pose a risk for AMD. At Masama much of the sulphur occurs as large pyrite nodules observed in borehole core and wash tests have indicated that most of the pyrite can be removed by processing the coal, thus reducing sulphur contents in the washed product to well below specifications. Leach tests on the likely discard products have indicated that only a small proportion of the discards (from the E and AU seams) are prone to acid generation and that the bulk of the discards which will arise from washing the A Seam are not acid generating.
- Acid Mine Drainage from coal discards or from carbonaceous material that is backfilled into the pit voids. The potential of this material to produce acid mine

drainage has been investigated and it was found that only a relatively small proportion of the discards have potential to produce AMD (See Section 8.3).

- The depth of weathering and its impact on the exact position that opencast mining can commence. Should the depth of weathering be found to be deeper than anticipated in places this will impact on the coal resources potentially available for mining.
- Variation in E Seam thickness – should the thickness of the E Seam show a higher degree variability than predicted, this could have a material impact on how this seam could be mined in underground mining operations.
- Upgrading of resources to higher levels of confidence, there is a risk that not all currently identified Inferred Resources will be upgraded to Indicated Resources with further exploration.
- Insufficient power supply from Botswana Power Corporation. The mine however plans to start using on site diesel generators and will retain these at the mine for backup power supply.
- Distance to some potential markets. For example exporting coal from the Richards Bay Coal Terminal, the cost of transporting coal from Botswana to Richards Bay will be higher than from the existing export coal mines in the Central Basin of the South African Coalfields (Middleburg area of Mpumalanga).

10. INTERPRETATION AND CONCLUSIONS (4.2 (VI); 4.5 (VIII); 10.5 (I))

The Masama Coal Project represents a large coal deposit, which has been historically explored by Shell and also more recently by Minergy (between 2012 and 2017). Exploration data generated by Minergy to date combined with information of the historic Shell exploration, has made it possible to define Measured and Indicated opencast Coal Resources for the A Seam and E Seams and a larger predominantly Inferred underground Coal Resource for the E Seam and the A Seam in the Focus Area of the West Block of the Masama Coal Project area. The Coal Resource has been estimated within the guidelines of the SAMREC Code (2016)[1], while further guidance on the classification of Coal Resources is provided by the South African guide to the systematic evaluation of coal resources and coal reserves (SANS10320:2004)[2].

A total Coal Resource of 390 Mt has been estimated for E, A and A Upper Coal Seams within the Focus Area of the West Block of the Masama Coal Project. This Resource can be further broken down as follows:

Opencast: A Seam Coal Resource

- *12.71 Mt Measured Coal Resource*
- *47.65 Mt Indicated Coal Resource*

Opencast: AU Coal Seam Resource

- *3.42 Mt Inferred Coal Resource*

Opencast: E Coal Seam Resource

- *18.49 Mt Indicated Coal Resource*

No A Upper Coal Seam is included into the Underground resource statement due to its localised occurrence and its limited seam thickness.

Underground: A Seam Coal Resource

- *7.07 Mt Indicated Coal Resource*
- *206.4 Mt Inferred Coal Resource*

Underground: E Seam Coal Resource

- *94.21 Mt Inferred Coal Resource*

A total of 82.26 Mt of opencast and 307.7 Mt underground mineable coal in situ is reported.

Relative to the previous resource estimate, an additional 43 Mt of coal resource has been added due to the increased drill density and re-definition of Inferred Coal Resources into the Indicated category. Of the additional resources, 11 Mt is opencast resources with the remainder in the underground category.

Raw coal qualities for the resource estimates are reported on an air dried basis and accordingly include natural moisture contained within the coal. All of the Coal Resources defined to date lie between depths of ~20 m and ~120 m and the deposit represents a series of discrete sub-horizontal (~3° dip) coal seams separated by sandstone, siltstone or mudstone.

Wash results from borehole core for the Masama Coal Project indicate that different potential products could be produced for the E, A and Au Coal Seams at acceptable theoretical product yields as indicated below:

- The A Upper Coal Seam raw coal quality is on average 18 MJ/kg, and washes to a 21.0 MJ/kg product with 1.0% Sulphur content at an average 66% theoretical yield.
- The A Coal Seam raw coal quality is on average 22.0 MJ/kg, and washes to a 26.0 MJ/kg product with 0.4% Sulphur content at 56% to 71% theoretical yield.
- The E Coal Seam raw coal quality is on average 21.5 MJ/kg, and washes to a 26.5 MJ/kg product with 0.6% Sulphur content at 71% theoretical yield.

The total sulphur (TS) content of all potential products is considered low and well within product specifications. The available phosphorous data indicate this should also be within acceptable limits and may be particularly low for the E Seam products.

11. RECOMMENDATIONS

The opencast pit limits near the sub-crop areas of the E and A Coal Seams, need to be firmed up before the box-cut position is finalised. Coal seam continuity has been proven, but further exploration is recommended over the Indicated and Inferred Coal Resource Categories in order to increase the geoscientific confidence and upgrade these categories to Indicated and Measured Resource status. Infill drilling is also recommended to upgrade the selected Indicated Resources to Measured Resources and the Inferred Resources to Indicated Resources and eventually Measured Resources.

It is highly recommended that a laser derived ground digital terrain model must be developed for the Masama Coal Project Focus Area prior to finalizing the mine planning.

The potential coal products that could be produced and their potential markets should be examined in more detail.

Minergy has met its historic expenditure commitments, with total spend on the project to June 2017 in excess of ZAR30 m. Historic expenditure by Shell is estimated at ZAR 6.7 m in present terms. Minergy plans further exploration and related work for the Masama Coal Project as shown in Table 17 over the next two years. The timing and quantum of the proposed expenditure are in line with that proposed to the Department of Mines in the renewal application.

Table 17: Masama Coal Project proposed work programme and budget for period October 2017 to September 2019.

Work Item	Cost ZAR	Comments
Fully cored (Diamond) Drilling 500 m	1 320 000	Includes drilling, field costs, assays, DH geophysics, interpretation and updated resource estimates
Percussion Drilling 500 m	300 000	Includes drilling, field support, DH geophysics, and interpretation
Complete EIA and related studies	1 300 000	Includes all aspects of the EIA studies as well as water studies
Complete Mining and Processing Studies	4 200 000	Includes all aspects of mining and processing components as well as related studies and preparation of a Mining Licence application
Total	**7 080 000**	

12. REFERENCE LIST

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13. DATE AND SIGNATURE (9.1 (I), (II), (III))

CERTIFICATE OF COMPETENT PERSON

As the author of the report entitled MASAMA COAL PROJECT BOTSWANA: WEST BLOCK COAL RESOURCE, INDEPENDENT COMPETENT PERSONS REPORT, I hereby state:-

1. My name is Karin Van Deventer of Sugar Bush Consultancy (Pty) Ltd working in association with GM Geotechnical Consultants cc., No. 5 Laver Street Middelburg.
2. Earth Scientist; South African Council Scientific Professions (SACNASP) Reg. No. (Pr. Sci. Nat. 400705/15) and a member of the Geological Society of South Africa (GSSA) (965 295)
3. MSc Geochemistry (University of Stellenbosch)
4. The Minergy lead competent person is appointed by the Minergy management team.
5. I am a 'Competent Person' as defined in the SAMREC Code.
6. I have 20 years coal geology experience in exploration, geological data information management, geological modelling, project management, operational geology both underground and opencast, as well as managing the geological functions of a large mining house. She has extensive experience in coal resource reporting, and have been part of several geological audits. Karin has also been a representative of the coal working group updating the SANS Code to be released during 2017.
7. A site visit was conducted on 4 May 2017, to investigate borehole core, borehole locations, project setting and ongoing exploration on the project.
8. I am responsible for the technical aspects, geological aspects and the classification and estimation of the operation's mineral resources.
9. I am not aware of any material fact or material change with respect to the subject matter of the Report that is not reflected in the Report, the omission of which would make the Report misleading.
10. I declare that this Report appropriately reflects the Competent Person's/author's view.
11. I am independent of Minergy Coal (Pty) Ltd.
12. I have read the SAMREC Code (2016) and the Report has been prepared in

accordance with the guidelines of the SAMREC Code.

13. I do not have, nor do I expect to receive, a direct or indirect interest in the Masama Coal Project or Minergy Coal (Pty) Ltd.

14. At the effective date of the Report (29 September 2017), to the best of my knowledge, information and belief, the Report contains all scientific and technical information that is required to be disclosed to make the Report not misleading.

Dated at Middelburg: 29 September 2017

K van Deventer

Karin Van Deventer

14. APPENDICIES

APPENDIX 1 - GLOSSARY, ABBREVIATIONS AND UNITS

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APPENDIX 1 - GLOSSARY, ABBREVIATIONS AND UNITS

Word/Abbreviation/Unit	Definition
Air-dry / Air dried	In equilibrium with prevailing laboratory conditions. Includes inherent moisture content for coal
Analysis	Process of determining chemical properties of a sample
Ash	A measure of the non-combustible material in coal, expressed as a percentage. Determined by proximate analysis tests
Basement	In coal exploration/mining, refers to the rocks underlying the coal-bearing sediments
Bituminous coal	A medium quality coal mostly used in raising steam for the generation of electricity
Borehole	Exploratory drill hole (Core or chips extracted from a cylindrical hole during drilling)
Borehole log	A graphical representation of the information revealed by vertical diamond drilling
BSE	The Botswana Stock Exchange
BWP	Botswana Pula
Cadastral	Relating to property boundaries.
cm	Centimetre
Coal	Carbonaceous sedimentary rock with an ash content of less than 50%
Coal Zone	An interval of strata containing coal seams or “ply’s”. Commonly a close association of mudstone and coal.
Coking	With reference to coal – coal which has suitable properties for use in coke manufacture or other metallurgical processes.
CP	Competent Person
CPR	Competent Person’s Report
Cross-section	A diagram or drawing that shows features transected by a vertical plane, drawn normally at right angles to longer axis of geologic features.
CV	Calorific Value. A measure of the heat content of a sample. Normally measured in MJ/kg
Density	Measure of the relative "heaviness" of objects in terms of constant volume. Density =-mass/volume
Deposit	Mineral or other Earth material that has accumulated through the action of wind, water, ice or other natural agents
DGS	Department of Geological Survey, a government department in Botswana
Dip	The angle that a structural surface, i.e. a bedding or fault plane, makes with the horizontal plane. Measured preferably perpendicular to the strike of the

	structure (=true dip). Apparent dip is that observed without reference to 'strike'
Dolerite	A medium-grained basic igneous rock which is emplaced within the earth's crust in the form of dykes and sills. Dolerite emplacement can result in burnt/devolatilized coal where intrusions intersect coal horizons
DOW	Depth of Weathering
Dyke	Discordant intrusive igneous rock normally emplaced vertically, sub-vertically or at a steeply inclined angle
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
Equilibrium Moisture	See "Inherent Moisture"
ESIA	Environmental and Social Impact Assessment
Estimation	The quantitative judgement of a variable, for example, a resource quantity
Exploration	Prospecting, sampling, mapping, drilling and other tools used in the search for mineralization.
Fault	A fracture in rock material, along which the opposite sides have been displaced parallel to the plane of movement
FOB	Free on Board
FOT	Free on Truck
Graben	A fault structure in which an area between 2 fault planes is displaced downwards
GTIS	Gross Tonnes In Situ with no modifying factors
Ha or Hectare	A measurement of area 100 m by 100 m. 100 Ha = 1 km^2.
Horst	A fault structure in which an area between 2 fault planes is displaced upwards
HQ	Diamond drill core size 63.5mm in diameter
IM	Inherent Moisture see below.
In situ	In its original place. Most often used to refer to the location of mineral resources.
In situ tonnage	Measure of mass of coal or other mineral in the ground
Indicated Coal Resource	An 'Indicated Coal Resource' is that part of a Coal Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and

	grade or quality continuity between points of observation. An Indicated Coal Resource has a lower level of confidence than that applying to a Measured Coal Resource and may only be converted to a Probable Coal Reserve
Inferred Coal Resource	An 'Inferred Coal Resource' is that part of a Coal Resource for which quantity and coal quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Coal Resource has a lower level of confidence than that applying to an Indicated Coal Resource and must not be converted to a Coal Reserve. It is reasonably expected that the majority of Inferred Coal Resources could be upgraded to Indicated Coal Resources with continued exploration.
Inherent Moisture	In South Africa Inherent Moisture refers to the moisture in the analysis sample or residual moisture in equilibrium with the prevailing laboratory conditions. In this report it is equivalent to air-dried moisture.
ISO	International Standards Organization
JORC	The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
JSE	Johannesburg Stock Exchange
kcal/kg	Kilocalorie / Kilogram
m	Metre
MAMSL	Metres above mean sea level
Metallurgical coal	Coal which is suited to coke manufacture or use as a reductant in metallurgical processes
MJ/kg	Mega-Joule per kilogram (unit of energy)
Mt	Million Tonnes
MTIS	Mineable Tonnes In Situ (Resource)
Mudstone	Fine-grained argillaceous rock type consisting mainly of clay minerals. Commonly associated with coal within "Coal Zone"
Opencast, Open Pit	Surface mining in which a commodity is extracted from a pit. The geometry of the pit may vary in terms of the characteristics of the deposit. Mining method normally restricted to shallow occurrences
Overburden	The alluvium or soils and rock that must be removed in order to expose a deposit.
Palaeo topography	Refers to the distribution of an ancient land surface in term of elevation. In coal exploration the pre-Karoo basement surface is commonly used as a reference surface
Palaeo- / Topographic- "High"	An area or zone of increased elevation of an ancient land surface
RD	Relative Density

ROM	Run of Mine. A measure of mined coal.
RQD	Rock Quality Designation
RSA	Republic of South Africa
SAMREC Code	South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves, 2016 Edition
Sandstone	A fine- to very coarse- grained arenaceous sedimentary rock consisting of silicate group minerals
SANAS	South African National Accreditation System: The only national body responsible for carrying out accreditations in respect of conformity assessment, as mandated through the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act (Act 19 of 2006).
SANS	South African National Standard
Sedimentary rocks	Rocks formed by the deposition of fragmental, detrital or chemical material that originates from weathering of older rocks and which is transported from a source to a site of deposition.
Sill	A body of intrusive igneous rock concordantly intruded into a stratigraphic sequence (usually horizontally or near-horizontally, but not necessarily so) and of similar origin to dykes rocks.
Steam coal	Coal, normally bituminous in nature, used to raise steam for power generation or other industrial applications
Strata	Rock sequences
Stratigraphic sequence or column	The geological sequence found at a particular locality in terms of rock types. Normally portrayed as a column with the older rocks at the base and youngest at the top
Stratigraphic, Stratigraphy	A term describing the sequence in time of bedded rocks which can be correlated between different localities
Strike	Describes the orientation (direction) of a geological surface such as a rock unit, dyke or fault plane in terms of its intersection with the horizontal plane
Stripping Ratio or SR	The amount of overburden that must be removed to gain access to a unit amount of coal, expressed as cubic metres of overburden to ROM tonnes of coal. A stripping ratio commonly is used to express the maximum volume or weight of overburden that can be profitably removed to obtain a unit amount of coal.
TCR	Total Core Recovery
Thermal coal	See STEAM COAL
Tonnage	Quantities where the tonne is an appropriate unit of measure. Typically used to measure or estimate quantities of in situ material or quantities of material mined, transported, processed or sold.
TTIS	Total Tonnes In Situ

Volatiles/Volatile Matter	A measure of the volatile component of coal as determined under fixed conditions in a laboratory as part of proximate analysis
VOLS	A measure of the volatile component of coal as determined under fixed conditions in a laboratory as part of proximate analysis
Washability analysis	As applied to coal, refers to a series of tests designed to provide an indication of the amenability of a sample to beneficiation to provide various products with generally enhanced qualities
Yield	A measure of the relative proportion of material which can be obtained by processing thereof. In coal exploration borehole yield is determined on samples by washability tests. Figures need to be discounted to obtain practical plant yields.
ZAR	South African Rand

APPENDIX 2 – SAMREC CODE (2016) TABLE 1 CHECKLIST (10.1 (i))

			MASAMA COAL PROJECT SECTION OF THIS REPORT			SAMREC GUIDANCE		
			Exploration Results	Mineral Resources	Mineral Reserves	Exploration Results	Mineral Resources	Mineral Reserves
Section 1: Project Outline								
1.1	Property Description	(i)	1.1, 2.1	1.1, 2.1		Brief description of the scope of project (i.e. whether in preliminary sampling, advanced exploration, scoping, pre-feasibility, or feasibility phase, Life of Mine plan for an ongoing mining operation or closure).		
		(ii)	3.1, 3.2, 3.3, 3.4, 3.5	3.1, 3.2, 3.3, 3.4, 3.5		Describe (noting any conditions that may affect possible prospecting/mining activities) topography, elevation, drainage, fauna and flora and vege tation, the means and ease of access to the property, the proximity of the property to a population centre, and the nature of transport, the climate, known associated climatic risks and the length of the operating season and to the extent relevant to the mineral project, the sufficiency of surface rights for mining operations including the availability and sources of power, water , mining personnel, potential tailings storage areas, potential waste disposal areas, heap leach pad areas, and potential processing plant sites.		
		(iii)	1.4	1.4		Specify the details of the personal inspection on the property by each CP or, if applicable, the reason why a personal inspection has not been completed.		
1.2	Location	(i)	1.3, 2.1, 2.2, 3.1, 3.4	1.3, 2.1, 2.2, 3.1, 3.4		Description of location and map (country, province, and closest town/city, coordinate systems and ranges, etc.).		
		(ii)	2.3, 2.4, 2.5	2.3, 2.4, 2.5		Country Profile: describe information pertaining to the project host country that is pertinent to the project, including relevant applicable legislation, environmental and social context etc. Assess, at a high level, relevant technical, environmental, social, economic, political and other key risks.		
		(iii)	3.2	3.2, 3.3			Provide a topocadastral map in sufficient detail to support the assessment of eventual economics. State the known associated climatic risks.	Provide a detailed topocadastral map. Confirm that applicable aerial surveys have been checked with ground controls and surveys, particularly in areas of rugged terrain, dense vegetation or high altitude.
1.3	Adjacent Properties	(i)	2.2, 9.1	2.2, 9.1		Discuss details of relevant adjacent properties If adjacent or nearby properties have an important bearing on the report, then their location and common mineralized structures should be included on the maps. Reference all information used from other sources.		
1.4	History	(i)	4.1	4.1		State historical background to the project and adjacent areas concerned, including known results of previous exploration and mining activities (type, amount, quantity and development work), previous ownership and changes thereto.		
		(ii)	4.2, 7.3	4.2, 7.3		Present details of previous successes or failures with reasons why the project may now be considered potentially economic.		
		(iii)		4.3, 4.4, 4.5			Discuss known or existing historical Mineral Resource estimates and performance statistics on actual production for past and current operations.	
	Legal Aspects and Permitting					**Confirm the legal tenure to the satisfaction of the Competent Person, including a description of the following:**		
		(i)	2.4	2.4		Discuss the nature of the issuer's rights (e.g. prospecting and/or mining) and the right to use the surface of the properties to which these rights relate. Disclose the date of expiry and other relevant details.		
		(ii)	2.4	2.4		Present the principal terms and conditions of all existing agreements, and details of those still to be obtained, (such as, but not limited to , concessions, partnerships, joint ventures, access rights, leases, historical and cultural sites, wilderness or national park and environmental settings, royalties, consents, permission, permits or authorisations).		
		(iii)	2.4	2.4		Present the security of the tenure held at the time of reporting or that is reasonably expected to be granted in the future along with any known impediments to obtaining the right to operate in the area. State details of applications that have been made.		
		(iv)	2.4	2.4		Provide a statement of any legal proceedings for example; land claims that may have an influence on the rights to prospect or mine for minerals, or an appropriate negative statement.		
		(v)	2.4	2.4		Provide a statement relating to governmental/statutory requirements and permits as may be required , have been applied for, approved or can be reasonably be expected to be obtained.		
1.6	Royalties	(i)	2.5	2.5		Describe the royalties that are payable in respect of each property.		
1.7	Liabilities	(i)	2.5	2.5		Describe any liabilities, including rehabilitation guarantees that are pertinent to the project. Provide a description of the rehabilitation liability, including, but not limited to, legislative requirements, assumptions and limitations.		

			MASAMA COAL PROJECT			SAMREC GUIDANCE		
			Exploration Results	Mineral Resources	Mineral Reserves	Exploration Results	Mineral Resources	Mineral Reserves
Section 2: Geological Setting, Deposit, Mineralisation								
2.1	Geological Setting, Deposit, Mineralisation	(i)	5.1.1	5.1.1		Describe the regional geology.		
		(ii)	5.1.2, 5.1.3,5.2, 5.4, 5.5	5.1.2, 5.1.3, 5.2, 5.4, 5.5		Describe the project geology including deposit type, geological setting and style of mineralisation.		
		(iii)	5.3	5.3		Discuss the geological model or concepts being applied in the investigation and on the basis of which the exploration program is planned . Describe the inferences made from this model.		
		(iv)	5.4, 5.5	5.4, 5.5		Discuss data density, distribution and reliability and whether the quality and quantity of information are sufficient to support statements , made or inferred, concerning the Exploration Target or Mineralisation.		
		(v)	5.1.3, 5.2, 5.4, 5.5	5.1.3, 5.2 5.4, 5.5		Discuss the significant minerals present in the deposit , their frequency, size and other characteristics. Includes minor and gangue minerals where these will have an effect on the processing steps. Indicate the variability of each important mineral within the deposit.		
		(vi)	5.1.3, 5.2, 5.4, 5.5	5.1.3, 5.2 5.4, 5.5		Describe the significant mineralised zones encountered on the property, including a summary of the surrounding rock types, relevant geological controls, and the length, width, depth, and continuity of the mineralisation, together with a description of the type, character, and distribution of the mineralisation		
		(vii)	5.2, 5.4	5.2, 5.4		Confirm that reliable geological models and / or maps and cross sections that support interpretations exist.		

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Section 3: Exploration and Drilling, Sampling Techniques and Data								
		(i)	6.1, 6.2, 6.4	6.1, 6.2, 6.4		Describe the data acquisition or exploration techniques and the nature, level of detail, and confidence in the geological data used (i.e. geological observations, remote sensing results, stratigraphy, lithology, structure, alteration, mineralisation, hydrology , geophysical, geochemical, petrography, mineralogy, geochronology, bulk density, potential deleterious or contaminating substances, geotechnical and rock characteristics, moisture content , bulk samples etc.). Confirm that data sets include all relevant metadata, such as unique sample number, sample mass, collection date, spatial location etc.		
		(ii)	5.3, 6.10	5.3, 6.10		Identify and comment on the primary data elements (observation and measurements) used for the project and describe the management and verification of these data or the database. This should describe the following relevant processes : acquisition (capture or transfer) , validation, integration, control, storage, retrieval and backup processes. It is assumed that data are stored digitally but hand-printed tables with well organized data and information may also constitute a database.		
		(iii)	1.2, 5.3, 6.2	1.2, 5.3, 6.2		Acknowledge and appraise data from other parties and reference all data and information used from other sources.		
		(iv)	2.2, 4.1, 9.1	2.2, 4.1, 9.1		Clearly distinguish between data / information from the property under discussion and that derived from surrounding properties		
		(v)	6.5, 6.12	6.5, 6.12		Describe the survey methods, techniques and expected accuracies of data . Specify the grid system used.		
		(vi)	5.5, 6.5, 7.1	5.5, 6.5, 7.1		Discuss whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the estimation procedure(s) and classifications applied.		
		(vii)	5.4, 5.5, 6.5	5.4, 5.5, 6.5		Present representative models and / or maps and cross sections or other two or three dimensional illustrations of results, showing location of samples, accurate drill-hole collar positions, down-hole surveys, exploration pits, underground workings, relevant geological data, etc		
3.1	Exploration	(viii)	6.10	6.10		Report the relationships between mineralisation widths and intercept lengths are particularly important, the geometry of the mineralisation with respect to the drill hole angle. If it is not known and only the down-hole lengths are reported, confirm it with a clear statement to this effect (e.g. 'down-hole length, true width not known').		
		(i)	6.5	6.5		Present the type of drilling undertaken (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Banka , sonic, etc) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).		
		(ii)	6.6, 6.7	6.6, 6.7		Describe whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, technical studies, mining studies and metallurgical studies.		
		(iii)	6.7, 6.8	6.7, 6.8		Describe whether logging is qualitative or quantitative in nature; indicate if core photography .(or costean, channel, etc) was undertaken.		
		(iv)	6.7	6.7		Present the total length and percentage of the relevant intersections logged.		
	Drilling Techniques	(v)	6.5, 6.6, 6.7	6.5, 6.6, 6.7		Discuss the results of any downhole surveys of the drill-holes.		
		(i)	6.8	6.8		Describe the nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.		
		(ii)	6.8	6.8		Describe the sampling processes, including sub-sampling stages to maximize representivity of samples. This should include whether sample sizes are appropriate to the grain size of the material being sampled. Indicate whether sample compositing has been applied.		
		(iii)	6.8	6.8		Appropriately describe each data set (e.g. geology, grade, density, quality, diamond breakage, geo-metallurgical characteristics etc .), sample type, sample-size selection and collection methods		
		(iv)	6.8, 6.10	6.8, 6.10		Report the geometry of the mineralisation with respect to the drill-hole angle. State whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type. State if the intersection angle is not known and only the downhole lengths are reported.		
		(v)	6.9	6.9		Describe retention policy and storage of physical samples (e.g. core, sample reject, etc.)		
		(vi)	6.7, 6.8	6.7, 6.8		Describe the method of recording and assessing core and chip sample recoveries and results assessed, measures taken to maximise sample recovery and ensure representative nature of the samples and whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.		
	Sample method, collection, capture and	(vii)	6.8	6.8		If a drill-core sample is taken, state whether it was split or sawn and whether quarter, half or full core was submitted for analysis. If a non- core sample, state whether the sample was riffled, tube sampled, rotary split etc. and whether it was sampled wet or dry.		
		(i)	6.9	6.9		Identify the laboratory(s) and state the accreditation status and Registration Number of the laboratory or provide a statement that the laboratories are not accredited.		
	Sample Preparation and Analysis	(ii)	6.9	6.9		Identify the analytical method. Discuss the nature, quality and appropriateness of the assaying and laboratory processes and procedures used and whether the technique is considered partial or total.		
		(iii)	6.9	6.9		Describe the process and method used for sample preparation, sub-sampling and size reduction , and likelihood of inadequate or non-representative samples (i.e. improper size reduction, contamination, screen sizes, granulometry, mass balance, etc.)		

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3.5	Sampling Governance	(i)	6.10, 6.11, 6.12	6.10, 6.11, 6.12		Discuss the governance of the sampling campaign and process, to ensure quality and representivity of samples and data, such as sample recovery, high grading, selective losses or contamination, core/hole diameter, internal and external *QNQC,* and any other factors that may have resulted in or identified sample bias.		
		(ii)	6.9	6.9		Describe the measures taken to ensure sample security and the chain of custody.		
		(iii)	6.10	6.10		Describe the validation procedures used to ensure the integrity of the data, e.g. transcription, input or other errors, between its initial collection and its future use for modelling (e.g. geology, grade, density, etc.)		
		(iv)	6.11	6.11		Describe the audit process and frequency (including dates of these audits) and disclose any material risks identified.		
3.6	Quality Control/Quality Assurance	(i)	6.7, 6.8, 6.11	6.7, 6.8, 6.11		Demonstrate that adequate field sampling process verification techniques (QA/QC) have been applied, e.g. the level of duplicates, blanks , reference material standards, process audits, analysis, etc. If indirect methods of measurement were used (e .g. geophysical methods), these should be described, with attention given to the confidence of interpretation.		
3.7	Bulk Density	(i)	6.9	6.9		Describe the method of bulk density determination with reference to the frequency of measurements , the size, nature and representativeness of the samples .		
		(ii)	6.9, 7.1	6.9, 7.1		If target tonnage ranges are reported state the preliminary estimates or basis of assumptions made for bulk density.		
		(iii)	6.9, 7.1	6.9, 7.1		Discuss the representivity of bulk density samples of the material for which a grade range is reported.		
		(iv)	6.9, 7.1	6.9, 7.1		Discuss the adequacy of the methods of bulk density determination for bulk material with special reference to accounting for void spaces (vugs , porosity etc), moisture and differences between rock and alteration zones within the deposit.		
3.8	Bulk-Sampling and/or trial-mining	(i)	N/A	N/A		Indicate the location of individual samples (including map).		
		(ii)	N/A	N/A		Describe the size of samples, spacing/density of samples recovered and whether sample sizes and distribution are appropriate to the grain size of the material being sampled.		
		(iii)	N/A	N/A		Describe the method of mining and treatment.		
		(iv)	N/A	N/A		Indicate the degree to which the samples are representative of the various types and styles of m ineralisation and the mineral deposit as a whole.		

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			Exploration Results	Mineral Resources	Mineral Reserves	**Exploration Results**	**Mineral Resources**	**Mineral Reserves**
Section 4: Estimation and Reporting of Exploration Results and Mineral Resources								
4.1	Geological model and interpretation	(i)		5.3, 5.4, 5.5, 7.1		Describe the geological model, construction technique and assumptions that forms the basis for the Exploration Results or Mineral Resource estimate. Discuss the sufficiency of data density to assure continuity of mineralisation and geology and provide an adequate basis for the estimation and classification procedures applied.		
		(ii)		5.3. 5.4, 6.13, 8.1. 7.1		Describe the nature, detail and reliability of geological information with which lithological, structural, mineralogical, alteration or other geological, geotechnical and geo-metallurgical characteristics were recorded.		
		(iii)	9.2			Describe any obvious geological, mining, metallurgical, environmental, social, infrastructural, legal and economic factors that could have a significant effect on the prospects of any possible exploration target or deposit.		
		(iv)		7.2, 7.3, 9.2			Discuss all known geological data that could materially influence the estimated quantity and quality of the Mineral Resource.	
		(v)		5.3, 7.1			Discuss whether consideration was given to alternative interpretations or models and their possible effect (or potential risk) if any, on the Mineral Resource estimate.	
		(vi)		7.2			Discuss geological discounts (e.g. magnitude, per reef, domain, etc.), applied in the model, whether applied to mineralized and / or un-mineralized material (e.g. potholes, faults, dykes, etc).	
4.2	Estimation and modelling	(i)	N/A			Describe in detail the estimation techniques and assumptions used to determine the grade and tonnage ranges.		
		(ii)		7.1			Discuss the nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values (cutting or capping), compositing (including by length and/or density), domaining, sample spacing, estimation unit size (block size), selective mining units, interpolation parameters and maximum distance of extrapolation from data points.	
		(iii)		5.5			Describe assumptions and justification of correlations made between variables.	
		(iv)		7.1, 5.3			Provide details of any relevant specialized computer program (software) used, with the version number, together with the estimation parameters used.	
		(v)		7.5			State the processes of checking and validation, the comparison of model information to sample data and use of reconciliation data, and whether the Mineral Resource estimate takes account of such information.	
		(vi)		10			Describe the assumptions made regarding the estimation of any co-products, by-products or deleterious elements.	
	Reasonable and realistic prospects for eventual economic extraction	(i)		7.3			Disclose and discuss the geological parameters. These would include (but not be limited to) volume / tonnage, grade and value / quality estimates, cut-off grades, strip ratios, upper- and lower- screen sizes.	
		(ii)		7.3			Disclose and discuss the engineering parameters. These would include mining method, dilution, processing, geotechnical, geohydraulic and metallurgical) parameters.	
		(iii)		7.3			Disclose and discuss the infrastructural including, but not limited to, power, water, site- access.	
		(iv)		7.3			Disclose and discuss the legal, governmental, permitting, statutory parameters.	
		(v)		7.3			Disclose and discuss the environmental and social (or community) parameters.	
		(vi)		7.3			Disclose and discuss the marketing parameters.	
		(vii)		7.3			Disclose and discuss the economic assumptions and parameters. These factors will include, but not limited to, commodity prices and potential capital and operating costs	
		(viii)		7.3			Discuss any material risks	
		(ix)		7.3			Discuss the parameters used to support the concept of "eventual"	

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			Exploration Results	Mineral Resources	Mineral Reserves	**Exploration Results**	**Mineral Resources**	**Mineral Reserves**
4.4	Classification Criteria	(i)		7.2			Describe criteria and methods used as the basis for the classification of the Mineral Resources into varying confidence categories.	
		(i)	N/A	N/A		Discuss the reported low and high grades and widths together with their spatial location to avoid misleading the reporting of Exploration Results, Mineral Resources or Mineral Reserves.		
		(ii)	5.5	5.5		Discuss whether the reported grades are regional averages or if they are selected individual samples taken from the property under discussion.		
		(iii)	7.3			State assumptions regarding mining methods, infrastructure, metallurgy, environmental and social parameters. State and discuss where no mining related assumptions have been made.		
		(iv)	N/A			State the specific quantities and grades / qualities which are being reported in ranges and/or widths, and explain the basis of the reporting		
		(v)		7.2			Present the detail for example open pit, underground, residue stockpile, remnants, tailings, and existing pillars or other sources in the Mineral Resource statement	
		(vi)		7.5			Present a reconciliation with any previous Mineral Resource estimates. Where appropriate, report and comment on any historic trends (e.g. global bias).	
		(vii)		7.4			Present the defined reference point for the tonnages and grades reported as Mineral Resources. State the reference point if the point is where the run of mine material is delivered to the processing plant. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported.	
		(viii)		10		If the CP is relying on a report, opinion, or statement of another expert who is not a CP, disclose the date, title, and author of the report, opinion, or statement, the qualifications of the other expert and why it is reasonable for the CP to rely on the other expert, any significant risks and any steps the CP took to verify the information provided.		
		(ix)	N/A	N/A		State the basis of equivalent metal formulae, if applied.		

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Section 5: Technical Studies								
5.1	Introduction	(i)		8.1, 8.2, 8.3			State the level of study - whether Scoping, Pre-Feasibility, Feasibility or ongoing Life of Mine	State the level of study - whether Pre-Feasibility, Feasibility or ongoing Life of Mine. The Code requires that a study to at least a Pre-Feasibility level has been undertaken to convert Mineral Resource to Mineral Reserve. Such studies will have been carried out and will include a mine plan or production schedule that is technically achievable and economically viable , and consider all Modifying Factors.
		(ii)						Provide a summary table of the Modifying Factors used to convert the Mineral Resource to Mineral Reserve for Pre- feasibility, Feasibility or on-going life-of- mine studies.
		(i)		7.1, 7.3			State assumptions regarding mining methods and parameters when estimating Mineral Resources or explain where no mining assumptions have been made.	
		(ii)						State and justify all Modifying Factors and assumptions made regarding mining methods, minimum mining dimensions (or pit shell) and internal and if applicable, external mining dilution and mining losses used for the techno-economic study and signed off , such as mining method, mine design criteria, infrastructure, capacities, production schedule , mining efficiencies , grade control, geotechnical and hydrological considerations, closure plans , and personnel requirements.
		(iii)						State what mineral resource models have been used in the study
		(iv)						Explain the basis of (the adopted) cut-off grade(s) or quality parameters applied. Include metal equivalents if relevant
		(v)						Describe and justify the mining method(s) to be used.
		(vi)						For open-pit mines, include a discussion of pit slopes, slope stability, and strip ratio.
		(vii)						For underground mines, discussion of mining method , geotechnical considerations, mine design characteristics, and ventilation/cooling requirements.
		(viii)						Discussion of mining rate , equipment selected, grade control methods, geotechnical and hydrogeological considerations, health and safety of the workforce, staffing requirements, dilution, and recovery.
		(ix)						State the optimisation methods used in planning, list of constraints (practicality, plant, access, exposed Mineral Reserves, stripped Mineral Reserves, bottlenecks, draw control).

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		(i)						Discuss the source of the sample and the techniques to obtain the sample, laboratory and metallurgical testing techniques.
		(ii)						Explain the basis for assumptions or predictions regarding metallurgical amenability and any preliminary mineralogical test work already carried out.
		(iii)		7.3			Discuss the possible processing methods and any processing factors that could have a material effect on the likelihood of eventual economic extraction. Discuss the appropriateness of the processing methods to the style of mineralisation.	Describe and justify the processing method(s) to be used, equipment, plant capacity, efficiencies , and personnel
		(iv)						Discuss the nature, amount and representativeness of metallurgical testwork undertaken and the recovery factors used. A detailed flow sheet / diagram and a mass balance should exist, especially for multi-product operations from which the saleable materials are priced for different chemical and physical characteristics.
		(v)						State what assumptions or allowances have been made for deleterious elements and the existence of any bulk-sample or pilot-scale test work and the degree to which such samples are representative of the ore body as a whole .
		(vi)						State whether the metallurgical process is well -tested technology or novel in nature.
		(i)		3.1			Comment regarding the current state of infrastructure or the ease with which the infrastructure can be provided or accessed	
		(ii)						Report in sufficient detail to demonstrate that the necessary facilities have been allowed for (which may include, but not be limited to, processing plant, tailings dam , leaching facilities, waste dumps, road, rail or port facilities , water and power supply , offices, housing, security, resource sterilisation testing etc.). Provide detailed maps showing locations of facilities .
		(iii)						Provide a statement showing that all necessary logistics have been considered.
		(i)		2.4, 8.3			Confirm that the company hold ing the tenement has addressed the host country environmental legal compliance requirements and any mandatory and/or voluntary standards or guidelines to which it subscribes	
		(ii)		2.4, 8.3			Identify the necessary permits that will be required and their status and where not yet obtained, confirm that there is a reasonable basis to believe that all permits required for the project will be obtained	
		(iii)		7.3, 8.3, 9.2			Identify and discuss any sensitive areas that may affect the project as well as any other environmental factors including interested and Affected Parties I&AP and/or studies that could have a material effect on the likelihood of eventual economic extraction. Discuss possible means of mitigation.	
		(iv)		8.3			Identify any legislated social management programmes that may be required and discuss the content and status of these	
	Environmental	(v)		8.3			Outline and quantify the material socio-economic and cultural impacts that need to be mitigated, and their mitigation measures and, where appropriate the associated costs.	

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			Exploration Results	Mineral Resources	Mineral Reserves	**Exploration Results**	**Mineral Resources**	**Mineral Reserves**
		(i)						Describe the valuable and potentially valuable product(s), including suitability of products, co-products and by-products for marketing.
		(ii)						Describe product(s) to be sold, customer specifications, testing, and acceptance requirements. Discuss whether there exists a ready market for the product(s) and whether contracts for the sale of the product are in place or expected to be readily obtained.
		(iii)						State and describe all economic criteria that have been used for the study such as capital and operating costs , exchange rates,
		(iv)						Provide a summary description, source and confidence in method used to estimate the commodity price/value profiles used for cut-off grade calculation , economic analysis and project valuation, including applicable taxes, inflation indices, discount rate and exchange rates.
		(v)						Present the details of the point of reference for the tonnages and grades reported as Mineral Reserves, e.g. material delivered to the processing facility or saleable product(s). It is important that , in any situation where the reference point is different, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported .
		(vi)						Justify assumptions made concerning production cost including transportation, treatment, penalties, exchange rates, marketing and other costs. Provide details of allowances that are made for the content of deleterious elements and the cost of penalties.
		(vii)						Provide details of allowances made for royalties payable, both to Government and private concerns.
		(viii)						State type, extent and condition of plant and equipment that is significant to the existing operation(s).
	Market Studies and Economic criteria	(ix)						Provide details of all environmental, social and labour costs considered
5.7	Risk Analysis	(i)		8.3, 9.2		Technical Studies are not applicable to Exploration Results	Report an assessment of technical, environmental, social, economic , political and other key risks to the project. Describe actions that will be taken to mitigate and/or manage the identified risks.	
		(i)		N/A			At the relevant level (Scoping Study, Pre-feasibility , Feasibility or on-going Life-of Mine), provide an economic analysis for the project that includes:	
		(ii)		N/A			Cash Flow forecast on an annual basis using Mineral Reserves or an annual production schedule for the life of the project	
		(iii)		N/A			A discussion of net present value (NPV), internal rate of return (IRR) and payback period of capital	
5.8	Economic Analysis	(iv)		N/A		Technical Studies are not applicable to Exploration Results	Sensitivity or other analysis using variants in commodity price, grade , capital and operating costs, or other significant parameters, as appropriate and discuss the impact of the results.	

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Section 6: Estimation and Reporting of Mineral Reserves								
6.1	Estimation and modelling techniques	(i)		N/A			Describe the Mineral Resource estimate used as a basis for the conversion to a Mineral Reserve.	
		(ii)		N/A			Report the Mineral Reserve Statement with sufficient detail indicating if the mining is open pit or underground plus the source and type of mineralisation, domain or ore body, surface dumps, stockpiles and all other sources.	
		(iii)		N/A				Provide a reconciliation reporting historical reliability of the performance parameters, assumptions and Modifying Factors, including a comparison with the previous Reserve quantity and qualities, if available. Where appropriate, report and comment on any historic trends (e.g. global bias)
6.2	Classification Criteria	(i)		N/A				Describe and justify criteria and methods used as the basis for the classification of the Mineral Reserves into varying confidence categories, based on the Mineral Resource category , and including consideration of the confidence in all the modifying factors .
		(i)		N/A				Discuss the proportion of Probable Mineral Reserves, which have been derived from Measured Mineral Resources (if any), including the reason(s) therefore.
		(ii)		N/A				Present details of for example open pit , underground, residue stockpile, remnants, tailings, and existing pillars or other sources in respect of the Mineral Reserve statement
		(iii)		N/A				Present the details of the defined reference point for the Mineral Reserves. State where the reference point is the point where the run of mine material is delivered to the processing plant. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported. State clearly whether the tonnages and grades reported for Mineral Reserves are in respect of material delivered to the plant or after recovery.
		(iv)		N/A				Present a reconciliation with the previous Mineral Reserve estimates. Where appropriate, report and comment on any historic trends (e.g. global bias).
		(v)		N/A				Only Measured and Indicated Mineral Resources can be considered for inclusion in the Mineral Reserve.
		(vi)		N/A				State whether the Mineral Resources are inclusive or exclusive of Mineral Reserves.
Section 7: Audits and Reviews								
7.1	Audits and Reviews	(i)	6.5, 6.10, 6.11, 6.12	6.5, 6.10, 6.11, 6.12		State type of review/audit (e.g. independent, external), area (e.g. laboratory, drilling, data, environmental compliance etc) , date and name of the reviewer(s) together with their recognized professional qualifications.		
		(ii)	6.10	6.10		Disclose the conclusions of relevant audits or reviews. Note where significant deficiencies and remedial actions are required.		
Section 8: Other Relevant Information								
8.1		(i)	6.1, 9.2	6.1, 9.2		Discuss all other relevant and material information not discussed elsewhere.		
Section 9: Qualification of Competent Person(s) and other key technical staff. Date and Signature Page								
9.1		(i)	1.1, 13	1.1, 13		State the full name, registration number and name of the professional body or Recognised Professional Organisation (RPO), for all the CPs. State the relevant experience of the CP(s) and other key technical staff who prepared and are responsible for the Public Report.		
		(ii)	1.1, 13	1.1, 13		State the CP's relationship to the issuer of the report.		
		(iii)	1.1, 13	1.1, 13		Provide the Certificate of the CP (Appendix 2), including the date of sign-off and the effective date, in the Public Report.		

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Section 10: Reporting of for Coal Resources and Reserves								
10.1	Specific Reporting for Coal	(i)	1.1, Appendix 2	1.1, 7.1, Appendix 2		Confirm that the reports on coal deposits take cognisance of sections 54-74 of the Code and Sections 1 - 9 of Table 1.		
		(ii)	1.1	1.1, 7.1		Confirm that the Coal Exploration Results, Coal Inventory, Coal Resources and Coal Reserves are reported using the South African National Standard 10320 as the guideline.		
10.2	Geological Setting, Deposit, Mineralisation	(i)	5.1, 5.2, 5.4, 5.5	5.1, 5.2, 5.4, 5.5		Describe the project geology including coal deposit type, geological setting and coal seams / zones present.		
		(ii)	5.1, 5.2, 5.3, 5.4, 5.5	5.1, 5.2, 5.3, 5.4, 5.5		Identify and discuss the structural complexity, physical continuity, coal rank, qualitative and quantitative properties of the significant coal seams or zones on the property.		
10.3	Drilling Techniques	(i)	6.7	6.7		Report core recoveries and method of calculation. Confirm that core recoveries in cored boreholes are in excess of 95% by length within the coal seam intersection .		
	Relative Density to replace Bulk Density	(ii)	6.9,	6.9, 7.1. 7.4		Describe the apparent relative density or true relative dens ity of the coal seam(s) determined on coal samples from borehole cores using recogn ized standard laboratory methods or commonly used procedures. State the moisture basis on which the relative density determination is based and the moisture basis on which the final density value is reported (in situ or air-dried basis).		
	Bulk-Sampling and/or trial-mining	(iii)		N/A		Describe the purpose or aim of the bulk sampling programme, the size of samples, spacing/density of samples recovered. Describe the applicability of bulk sampling or large diameter core samples towards providing representative samples for tests. Compare and comment on results obtained from bulk sampling versus exploration sampling.		
10.4	Reasonable and realistic prospects for eventual economic extraction	(i)	7.1, 6.13	7.1, 7.3, 7.4, 6.13		Confirm that an appropriate coal quality is reported for all Coal Resource categories. Present and discuss the type of analysis (e.g. raw coal, washed coal at a specific cut -point density) and the basis of reporting of the coal quality parameters (e.g. air-dried basis, dry basis , etc.).		
10.5	Coal Resource Reporting	(i)		7.1, 7.4, 10			A Coal Resource only includes the coal seam(s) above the minimum thickness cut- off and the coal quality cut-off(s). Present and discuss the MTIS Coal Resource tonnage and quality.	
		(ii)		7.1, 7.4			State the reporting basis for the Coal Resource statement with particular reference to moisture and relative density.	
10.6	Coal Reserve Reporting	(i)						State the reporting basis for the Coal Reserve statement with particular reference to moisture and relative density.
		(ii)						Confirm that the Coal Reserves are reported as run-of-mine tonnages and coal quality, and also as Saleable product/s tonnages and coal quality. Present and discuss the reporting basis for the Coal Reserve statement with particular reference to moisture content and relative density.

APPENDIX 3 – BSE SECTION 12 COMPLIANCE CHECKLIST

Reference to Section 12	**Reference to content in this Report**
12.7 (a)	Section 1.1 and Section 13
12.7 (b)	QP is an individual see 12.7 (a) above
12.7 (c)	Section 1.1 and Section 13
12.7 (d)	To be done if required
12.7 (e)	The Competent Person, Karin van Deventer is independent of Minergy Coal (Pty) Ltd. Section 1.1, Section 13 and Appendix 4
12.8 (a)(i)	Section 2.4
12.8 (a)(ii)	Section 2.4
12.8 (b)(i)	Exploration stage no Environmental Management Programme
12.8 (b)(ii)	Exploration stage
12.8 (b)(iii)	Exploration stage
12.8 (b)(iv)	Not Applicable
12.8 (c)(i)	Sections 5, 6, 7 and 10
12.8 (c)(ii)	Sections 6, 7 and 10
12.8 (c)(iii)	Sections 1.1, 1.2, 4, 5, 6, 7 and 10
12.8 (d)	Section 11
12.7 (e)	Figures 1, 2, 3, 4, 6, 7, 9, 10, 11, 13, 18 and 19

APPENDIX 4: COMPLIANCE STATEMENT

COMPLIANCE STATEMENTS

The information in this report that relates to Exploration Targets, Exploration Results and Mineral Resources is based on information compiled by Karin Van Deventer, a Competent Person who is registered with SACNASP, and is a Member of the GSSA.

> *Karin Van Deventer is an independent consulting geologist at Sugar Bush Consultancy (Pty) Ltd and works in association with GM Geotechnical Consultants cc.*
>
> *Neither Karin Van Deventer, the author employed in the preparation of this report, nor GM Geotechnical Consultants cc. has any beneficial interest in the assets of Minergy Coal (Pty) Ltd. or any of its holding companies or parent companies.*

For all reports:

> *Karin Van Deventer has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2016 Edition of the 'The South African Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Karin Van Deventer consents to the inclusion in the report of the matters based on his (or her) information in the form and context in which it appears.'*

APPENDIX 5: Table of Boreholes drilled over the Masama Prospecting License Area

BH ID	UTM 35S WGS EASTING	UTM 35S WGS NORTHING	ELEVATION m.a.m.s.l.
SHELL BOREHOLES			
S2	398820.6	7355432.8	1096.5
S3	405519.4	7355304.0	1045.9
S4	398792.4	7345816.6	1028.0
S5	398703.1	7351378.1	1040.5
S9	407948.6	7361539.9	1061.7
S15	391927.8	7345761.3	1052.9
S23	382868.0	7349149.0	1074.9
S27	374969.0	7345664.0	1070.6
S31	385561.7	7342674.3	1038.2
S103	396355.5	7343235.4	1030.0
S105	401197.6	7345823.1	1023.0
S106	396273.8	7345770.0	1039.5
S107	398810.8	7343232.5	1024.7
S108	398835.3	7348327.5	1037.6
S109	396382.6	7340721.0	1018.7
S110	391367.5	7340696.2	1028.9
S111	403734.0	7348386.9	1024.9
S112	393939.4	7343248.5	1037.4
S113	393854.2	7340702.5	1023.7
S114	393956.4	7345755.9	1047.3
S120	391347.8	7343239.4	1039.2
S121	395239.4	7344643.7	1038.0
S122	395279.9	7341934.4	1030.4
S123	395273.2	7347086.7	1046.3
S124	393874.8	7342139.6	1033.4
S125	396362.4	7348335.5	1047.7
S126	392735.1	7340665.5	1027.6
S127	392772.2	7339165.1	1020.7
S128	390419.1	7339126.7	1021.7
S129	401230.9	7348292.9	1025.0
S130	391369.4	7337729.5	1014.9
S131	394951.5	7337468.9	1009.5
S132	389092.4	7340642.8	1026.8
S133	389094.0	7345765.3	1052.3
S134	405658.3	7348579.3	1020.0
S135	389118.9	7343222.3	1036.1
S136	403773.5	7345779.0	1014.0
S137	392665.8	7348359.7	1064.9
S138	401267.3	7343259.9	1009.0
S139	397780.0	7344467.1	1026.4
S140	395280.6	7343248.1	1032.7
S141	400241.7	7344476.9	1017.1
S142	395286.7	7339738.0	1018.0
S143	397791.1	7345801.4	1030.7
S144	402925.5	7344469.6	1013.0
S255	392727.8	7345772.0	1051.6
S256	394013.3	7345743.0	1046.8
S257	395241.5	7345773.0	1040.4
S262	401280.0	7345846.0	1023.3
S272	392726.9	7344514.9	1045.3
S273	393939.7	7344521.0	1043.0
S275	396364.5	7344652.0	1031.9
S277	398791.6	7344464.0	1024.2
S279	401299.9	7344461.0	1015.8
S281	382782.1	7343131.0	1048.0
S282	383994.9	7343128.0	1047.3
S289	392721.2	7343209.0	1039.8
S293	397789.1	7343205.0	1029.5
S295	400256.1	7343202.0	1013.9
S297	381554.0	7341858.0	1041.4
S298	382792.0	7341881.0	1041.1
S299	384041.0	7341878.0	1041.1
S300	385305.0	7341922.0	1037.8
S301	386549.0	7341868.0	1036.2
S302	387803.0	7341921.0	1035.4
S305	392008.2	7341943.0	1031.2
S306	392741.1	7341936.0	1032.1
S307	393886.9	7341893.0	1032.2
S309	396342.8	7341952.0	1028.4
S310	397787.6	7341953.0	1028.6
S311	398788.7	7341949.0	1025.6
S312	400306.1	7341950.0	1014.0
S313	380295.0	7340626.0	1037.7
S314	381549.0	7340634.0	1036.3
S315	382803.0	7340616.0	1038.1
S316	384020.0	7340644.0	1039.2
S317	385290.0	7340647.0	1038.2
S318	386559.0	7340657.0	1030.0
S319	387818.0	7340667.0	1029.4
S320	389170.0	7340646.0	1026.5
S321	390403.0	7340663.0	1027.7
S325	395278.4	7340703.0	1024.3
S327	397765.6	7340710.0	1022.3
S328	398808.1	7340687.0	1019.1
S329	380295.0	7339376.0	1034.4
S330	381552.0	7339384.0	1033.1
S331	382787.0	7339397.0	1026.5
S332	384019.0	7339384.0	1024.4
S333	385288.0	7339384.0	1022.6
S334	386568.0	7339415.0	1023.1
S335	387817.0	7339411.0	1023.0
S336	389055.0	7339414.0	1019.5
S337	390402.0	7339421.0	1023.4
S338	391356.0	7339444.0	1022.0
S339	392749.0	7339449.0	1022.4
S340	393853.4	7339461.0	1020.3
S341	395298.1	7339451.0	1016.3
S342	396360.9	7339458.0	1011.7
S343	397764.3	7339448.0	1008.8
S344	384041.0	7338129.0	1025.0
S345	385278.0	7338132.0	1021.3
S346	386563.0	7338154.0	1011.6
S347	387836.0	7338183.0	1011.3
S348	389049.0	7338220.0	1008.2
S349	390416.0	7338141.0	1016.5
S350	391361.0	7338202.0	1015.0
S351	392759.0	7338169.0	1015.8
S352	393842.0	7338179.0	1012.0
S353	395313.0	7338175.0	1009.2
S354	389053.0	7336961.0	997.6
S355	390421.0	7336942.0	1002.1
S356	391365.0	7336927.0	1010.8
S357	392758.0	7336929.0	1011.2
S358	393841.0	7336936.0	1010.0

BH ID	UTM 35S WGS EASTING	UTM 35S WGS NORTHING	ELEVATION m.a.m.s.l.
MINERGY 2012			
MC01	403737.0	7345351.0	1013.0
MC02	407001.8	7346006.5	1004.9
MC03	410000.4	7344003.1	991.7
MC04	413000.0	7345000.0	983.0
MW01	390386.5	7336956.4	1002.6
MW02	392726.1	7338195.3	1015.9
MW03	391336.9	7340666.6	1028.7
MW04	392233.0	7342679.6	1036.8
MW05	387765.0	7339407.3	1023.3
MW05r	387762.9	7339406.9	1023.3
MW06	387745.3	7341898.5	1035.3
MW07	385273.2	7338480.1	1020.3
MW08	387341.5	7336282.5	1017.4
MW09	384457.3	7341231.5	1040.0
MW10	391999.0	7334988.4	1002.8
MW11	382158.5	7341439.9	1039.5
MW12	382372.9	7338832.2	1021.3
MW13	379503.5	7340213.6	1035.0
MW14	394747.9	7336666.3	1008.0
MW15	376444.1	7340452.5	1040.0

BH ID	UTM 35S WGS EASTING	UTM 35S WGS NORTHING	ELEVATION m.a.m.s.l.
MINERGY 2016			
MW16	387408.5	7339045.4	1021.9
MW16r	387409.7	7339047.0	1021.9
MW17	387058.8	7339412.0	1023.9
MW18	387060.1	7338701.8	1015.8
MW19	382861.7	7338707.4	1020.9
MW20	383219.5	7339118.2	1020.4
MW21	386709.0	7339053.3	1020.9
MW22	387412.6	7339757.0	1026.2
MW23	382370.9	7339332.8	1028.0
MW24	381961.5	7339112.4	1029.3
MW25	382110.3	7339765.8	1030.9

BH ID	UTM 35S WGS EASTING	UTM 35S WGS NORTHING	ELEVATION m.a.m.s.l.
MINERGY 2017			
MW26	387403.5	7338354.8	1012.7
MW27	387835.0	7338629.4	1019.7
MW28	388112.3	7338978.0	1021.3
MW29R	388862.8	7339016.0	1018.4
MW30	389211.6	7339325.5	1019.9
MW31	387952.0	7337959.9	1007.6
MW32	388855.3	7339739.8	1024.9
MW33	388247.8	7338305.9	1016.1
MW34	388530.0	7338648.2	1016.5
MW35	387767.4	7339018.6	1024.4
MW36	382895.6	7338221.9	1027.4
MW37	388105.5	7339795.9	1025.3
MW38	387418.4	7338689.9	1020.9
MW39	386783.8	7339400.4	1025.4
MW40	387415.4	7339391.8	1027.1
MW41	382277.8	7338336.3	1028.9
MW42	386971.5	7338472.2	1009.5
MW43	387783.8	7340099.0	1027.9
MW44	381653.1	7338412.7	1031.2
MW45	386748.3	7338708.2	1017.5
MW46	387334.0	7340371.7	1031.4
MW47	387064.8	7339750.7	1028.9
MW48	387215.8	7340091.5	1029.6
MW49	386387.4	7338696.1	1017.4
MW50	387045.0	7339063.0	1023.3
MW51	386994.2	7337682.9	1016.5
MW52	381389.0	7338969.3	1029.5
MW53	388515.7	7339379.0	1023.0
MW54R	387110.0	7341283.1	1035.3
MW55	389627.1	7337722.8	1017.5
MW56	389900.7	7338711.1	1021.1
MW57	381022.0	7339458.1	1037.7
MW58	391366.0	7338854.8	1019.7
MW59	388105.7	7336967.5	1013.0
MW60	381702.6	7339587.0	1035.6
MW61	391994.3	7337062.8	1014.8
MW62	381637.6	7340140.7	1035.7
MW63	389729.8	7340313.5	1024.8
MW64	380933.0	7340654.3	1038.2
MW65R	380905.1	7339969.1	1037.8
MW66	380676.7	7341183.2	1042.5
MW67	381530.8	7341060.4	1039.3
MW68	381216.3	7341678.6	1042.0

NOTE TO TABLE:
Boreholes shaded in yellow (within and in the immediate vicinity of the Focus Area) were used to determine the SAMREC Classification of the resource and for modeling the resource.

APPENDIX 6: Physical Database - Summary of coal intersections for the E; A and A Upper Coal Seams

BH ID	UTM 35S WGS			Base of	A UPPER SEAM			IB	A SEAM			IB	E SEAM			Terminal	REAMARKS
	EASTING	NORTHING	ELEVATION	Weathering	FROM	TO	THICK	THICK	FROM	TO	THICK		FROM	TO	THICK	Depth	
FULLY CORED BOREHOLES DRILLED BY MINERGY BETWEEN 2012 AND 2017																	
MW01	390386.5	7336956.4	1002.6	29.0					39.12	44.12	5.00	12.12	56.24	57.52	1.28	70.14	
MW02	392726.1	7338195.3	1015.9	37.0	89.72	91.60	1.88	12.38	103.98	108.69	4.71	16.96	125.65	127.64	1.99	133.13	
MW03	391336.9	7340666.6	1028.7	26.0	44.07	45.40	1.33	13.30	58.70	63.18	4.48	17.18	80.36	82.03	1.67	91.09	
MW04	392233.0	7342679.6	1036.8	20.0	43.02	44.36	1.34	14.20	58.56	62.80	4.24	14.30	77.10	78.74	1.64	85.19	
MW05	387765.0	7339407.3	1023.3	22.0									54.13	55.53	1.40	64.16	
MW05R	387762.9	7339406.9	1023.3	22.0	22.14	23.83	1.69	12.46	36.29	41.22	4.93	12.91	54.13	55.53	1.4	68.58	(REDRILL)
MW06	387745.3	7341898.5	1035.3	33.0	78.85	80.62	1.77	12.70	93.32	98.45	5.13	13.67	112.12	113.58	1.46	118.02	
MW07	385273.2	7338480.1	1020.3	29.3					38.97	44.90	5.93	16.25	61.15	62.97	1.82	69.70	
MW08	387341.5	7336282.5	1017.4	45.0	61.47	63.13	1.66	12.46	75.59	80.52	4.93	12.34	92.86	94.56	1.70	100.04	
MW09	384457.3	7341231.5	1040.0	34.0									51.80	53.54	1.74	70.30	E Seam Only
MW10	391999.0	7334988.4	1002.8	31.0												102.93	No Coal Borehole
MW11	382158.5	7341439.9	1039.5	30.0									49.60	51.34	1.74	64.15	E Seam Only
MW12	382372.9	7338832.2	1021.3	15.4					20.20	25.77	5.57	18.62	44.39	46.40	2.01	68.75	
MW13	379503.5	7340213.6	1035.0	29.0					39.87	44.78	4.91	10.78	55.56	55.95	0.39	62.85	
MW14	394747.9	7336666.3	1008.0	31.6													Borehole abandoned; no core recovered
MW15	376444.1	7340452.5	1040.0	31.0	58.41	60.53	2.12	13.21	73.74	79.98	6.24	6.24	86.22	86.88	0.66	92.68	
MW16R	387409.7	7339047.0	1021.9	17.87					26.29	31.15	4.86					37.80	Borehole terminated above E Seam
MW17	387058.8	7339412.0	1023.9	20.26					25.58	30.30	4.72					34.59	Borehole terminated above E Seam
MW18	387060.1	7338701.8	1015.8	17.24					21.62	26.17	4.55					31.46	Borehole terminated above E Seam
MW19	382861.7	7338707.4	1020.9	19.51					26.30	31.78	5.48					37.51	Borehole terminated above E Seam
MW20	383219.5	7339118.2	1020.4	20.20												25.79	Borehole terminated above E Seam
MW21	386709.0	7339053.3	1020.9	25.99												31.47	Borehole terminated above E Seam
MW22	387412.6	7339757.0	1026.2	17.10					25.24	29.69	4.45					34.49	Borehole terminated above E Seam
MW23	382370.9	7339332.8	1028.0	28.50												34.54	Borehole terminated above E Seam
MW24	381961.5	7339112.4	1029.3	18.57					26.71	32.10	5.39					37.50	Borehole terminated above E Seam
MW25	382110.3	7339765.8	1030.9	21.75					25.39	30.65	5.26					34.50	Borehole terminated above E Seam
MW26	387403.5	7338354.8	1012.7	21.40					23.24	27.95	4.71	14.33	42.28	43.64	1.36	47.90	
MW27	387835.0	7338629.4	1019.7	22.90					24.60	29.64	5.04	14.36	44.00	45.39	1.39	50.39	
MW28	388112.3	7338978.0	1021.3	21.84					24.99	29.60	4.61	15.21	44.81	46.50	1.69	50.75	
MW29	388862.8	7339016.0	1018.4	22.71					30.79	35.74	4.95					44.86	
MW29R	388862.8	7339016.0	1018.4	22.70					31.07	36.09	5.02	15.86	51.95	53.59	1.64	54.04	
MW29RC	388862.8	7339016.0	1018.4	22.71					30.79	35.74	4.95	16.21	51.95	53.59	1.64	54.04	
MW30	389211.6	7339325.5	1019.9	29.00					29.40	34.71	5.31	13.54	48.25	49.95	1.70	54.20	
MW31	387952.0	7337959.9	1007.6	18.95					25.50	30.20	4.70	15.23	45.43	46.37	0.94	54.03	
MW32	388855.3	7339739.8	1024.9	19.69	19.69	20.94	1.25	12.64	33.58	38.30	4.72	14.33	52.63	54.13	1.50	59.64	
MW33	388247.8	7338305.9	1016.1	27.44					36.84	41.98	5.14	14.19	56.17	57.96	1.79	62.86	
MW34	388530.0	7338648.2	1016.5	24.82					29.75	34.54	4.79	16.43	50.97	52.72	1.75	57.25	
MW35	387767.4	7339018.6	1024.4	24.10					31.93	36.64	4.71	15.37	52.01	53.76	1.75	58.60	
MW36	382895.6	7338221.9	1027.4	36.62	29.71	31.50	1.79	11.55	43.05	48.08	5.03	20.74	68.82	70.47	1.65	74.71	
MW37	388105.5	7339795.9	1025.3	29.67					33.56	38.47	4.91	11.92	50.39	52.09	1.70	56.54	
MW38	387418.4	7338689.9	1020.9	23.19					23.04	28.00	4.96	14.70	42.70	43.87	1.17	49.60	
MW39	386783.8	7339400.4	1025.4	25.89					25.89	29.76	3.87	13.21	42.97	44.47	1.50	48.26	
MW40	387415.4	7339391.8	1027.1	16.53	17.07	19.02	1.95	12.58	31.60	36.48	4.88	14.29	50.77	52.19	1.42	56.54	
MW41	382277.8	7338336.3	1028.9	23.38	36.55	38.3	1.75	11.73	50.03	55.54	5.51	21.72	77.26	78.98	1.72	83.79	
MW42	386971.5	7338472.2	1009.5	15.36					18.32	23.15	4.83	17.01	40.16	41.60	1.44	46.63	
MW43	387783.8	7340099.0	1027.9	30.10					33.41	38.20	4.79	13.60	51.80	53.03	1.23	59.19	
MW44	381653.1	7338412.7	1031.2	29.30	32.74	34.5	1.76	12.05	46.55	51.75	5.20	20.85	72.60	73.42	0.82	80.76	
MW45	386748.3	7338708.2	1017.5	15.40					19.23	23.84	4.61	15.89	39.73	41.03	1.30	46.43	
MW46	387334.0	7340371.7	1031.4	22.80	22.77	24.23	1.46	13.11	37.34	42.15	4.81	15.28	57.43	58.50	1.07	62.39	
MW47	387064.8	7339750.7	1028.9	21.11					28.00	32.97	4.97	13.60	46.57	47.74	1.17	53.05	
MW48	387215.8	7340091.5	1029.6	27.72	16.64	18.97	2.33	11.85	30.82	35.87	5.05	13.57	49.44	50.79	1.35	56.44	
MW49	386387.4	7338696.1	1017.4	22.44									38.01	39.53	1.52	46.44	
MW50	387045.0	7339063.0	1023.3	26.88									41.72	43.00	1.28	47.54	
MW51	386994.2	7337682.9	1016.5	24.61	31.05	32.95	1.9	12.20	45.15	49.85	4.70	15.65	65.50	66.85	1.35	70.41	
MW52	381389.0	7338969.3	1029.5	24.20					28.45	33.75	5.30	22.57	56.32	57.86	1.54	62.64	
MW53	388515.7	7339379.0	1023.0	18.22	19.36	21.14	1.78	12.66	33.80	38.70	4.90	14.60	53.30	54.95	1.65	58.59	
MW54R	387110.0	7341283.1	1035.3	44.90	48.65	50.17	1.52	11.72	61.89	66.80	4.91	12.36	79.16	80.44	1.28	84.16	

APPENDIX 6: Physical Database - Summary of coal intersections for the E; A and A Upper Coal Seams

BH ID	UTM 35S WGS			Base of	A UPPER SEAM			IB	A SEAM			IB	E SEAM			Terminal	REAMARKS
	EASTING	NORTHING	ELEVATION	Weathering	FROM	TO	THICK	THICK	FROM	TO	THICK		FROM	TO	THICK	Depth	
MW55	389627.1	7337722.8	1017.5	49.85	49.85	51.82	1.97	12.84	64.66	69.31	4.65	12.32	81.63	83.03	1.40	88.42	
MW56	389900.7	7338711.1	1021.1	49.06	49.06	50.78	1.72	12.16	62.94	67.51	4.57	15.05	82.56	83.91	1.35	88.27	
MW57	381022.0	7339458.1	1037.7	32.42					35.20	40.51	5.31	20.48	60.99	62.39	1.40	68.59	
MW58	391366.0	7338854.8	1019.7	33.43	61.95	63.58	1.63	12.41	75.99	80.76	4.77	14.76	95.52	97.10	1.58	100.46	
MW59	388105.7	7336967.5	1013.0														Borehole terminated above coal horizons
MW60	381702.6	7339587.0	1035.6	28.28					31.00	36.16	5.16	20.08	56.24	57.49	1.25	62.12	
MW61	391994.3	7337062.8	1014.8	36.00	53.37	55.24	1.87	12.62	67.86	72.58	4.72	15.89	88.47	89.89	1.42	94.30	
MW62	381637.6	7340140.7	1035.7	28.79	17.74	19.19	1.45	12.60	31.79	37.27	5.48	20.26	57.53	58.88	1.35	62.74	
MW63	389729.8	7340313.5	1024.8	47.08	35.36	36.76	1.4	13.92	50.68	55.43	4.75	16.10	71.53	73.07	1.54	78.75	
MW64	380933.0	7340654.3	1038.2	23.04					32.42	37.75	5.33	20.99	58.74	60.34	1.60	64.22	
MW65R	380905.1	7339969.1	1037.8	28.00	19.85	21.95	2.1	11.85	33.80	38.70	4.90	21.54	60.24	61.77	1.53	67.37	
MW66	380676.7	7341183.2	1042.5	29.39	29.61	31.16	1.55	12.79	43.95	48.87	4.92	19.32	68.19	69.89	1.70	76.37	
MW67	381530.8	7341060.4	1039.3	28.52					31.80	36.43	4.63	20.15	56.58	58.30	1.72	59.46	
MW68	381216.3	7341678.6	1042.0	30.95					34.22	39.60	5.38	19.08	58.68	60.06	1.38	67.22	
MC01	403737.0	7345351.0	1013.0	58.05	93.90	95.63	1.73	13.37	109.00	116.24	7.24	6.01	122.25	122.63	0.38	127.38	
MC02	407001.8	7346006.5	1004.9	59.16	116.00	117.57	1.57	14.09	131.66	139.46	7.80	11.12	150.58	152.62	2.04	155.77	
MC03	410000.4	7344003.1	991.7	42.66												118.29	No Coal Borehole
MC04	413000.0	7345000.0	983.0	35.34												97.20	
RC DRILLED BOREHOLES BY MINERGY IN 2017																	
PA01	386521.8	7338890.4	1020.5													30.00	No Coal Borehole
PA02	386308.3	7339047.5	1019.5													24.00	No Coal Borehole
PA03	386472.9	7339217.2	1021.9						21.20	26.05	4.85					29.00	
PA04	386782.9	7339754.1	1028.7						34.00	39.50	5.50					43.00	
PA05	386903.9	7339576.0	1026.3						31.80	36.80	5.00					40.00	
PA06	386856.3	7338921.8	1019.4													27.00	No Coal Borehole
PA07	386847.5	7339207.0	1023.9													33.00	No Coal Borehole
PA08	386914.3	7340380.4	1032.3													25.00	No Coal Borehole
PA09	386361.8	7339397.9	1023.7													28.00	No Coal Borehole
PA10	386844.9	7340085.3	1032.2													25.00	No Coal Borehole
PA11	386923.9	7339394.8	1025.5													37.00	No Coal Borehole
PA12	386411.7	7339749.5	1026.9													25.00	No Coal Borehole
PA14	387055.8	7339210.6	1024.9						24.60	28.70	4.10					32.00	
PA15	387244.7	7339035.0	1021.2						22.10	26.85	4.75					31.00	
PA16	387053.7	7338875.2	1018.4													30.00	No Coal Borehole
PA17	387064.4	7339580.0	1025.9						27.00	32.00	5.00					36.00	
PA18	386692.9	7339566.7	1027.7													37.00	No Coal Borehole
PB02	382988.3	7338974.3	1025.2						26.00	27.00	1.00					30.00	
PB05	382526.1	7339660.9	1034.8						24.80	29.50	4.70					33.00	
PB06	382351.7	7339993.8	1037.4						31.00	36.00	5.00					40.00	
PB07	382232.0	7340540.0	1041.7						29.70	34.90	5.20					37.00	
PB08	382173.5	7339267.4	1029.8						22.20	27.10	4.90					30.00	
HISTORICAL SHELL BOREHOLES																	
S2	398820.6	7355432.8	1096.5													186.10	No Coal Borehole
S3	405519.4	7355304.0	1045.9													106.70	No Coal Borehole
S4	398792.4	7345816.6	1028.0						74.86	80.54	5.68	17.46	98.00	99.7	1.70	170.00	
S5	398703.1	7351378.1	1040.5													201.50	No Coal Borehole
S9	407948.6	7361539.9	1061.7						94.70	100.20	5.50					180.60	
S15	391927.8	7345761.3	1052.9		77.40	78.20	0.80	22.20	100.40	107.80	7.40	17.50	125.30	127.28	1.98	249.40	
S23	382868.0	7349149.0	1074.9		206.62	207.64	1.02	13.94	221.58	225.90	4.32	14.10	240.00	241.36	1.36	246.50	
S27	374969.0	7345664.0	1070.6		194.20	196.00	1.80	13.82	209.82	215.06	5.24	10.14	225.20	225.60	0.40	245.00	
S31	385561.7	7342674.3	1038.2		60.44	61.78	1.34	15.16	76.94	81.50	4.56	15.22	96.72	98.40	1.68	220.55	
S103	396355.5	7343235.4	1030.0										34.56	36.26	1.70	71.60	E Seam Only

APPENDIX 6: Physical Database - Summary of coal intersections for the E; A and A Upper Coal Seams

BH ID	UTM 35S WGS			Base of	A UPPER SEAM			IB	A SEAM			IB	E SEAM			Terminal	REAMARKS
	EASTING	NORTHING	ELEVATION	Weathering	FROM	TO	THICK	THICK	FROM	TO	THICK		FROM	TO	THICK	Depth	
S105	401197.6	7345823.1	1023.0		104.08	105.68	1.60	14.52	120.20	127.66	7.46	8.42	136.08	138.00	1.92	147.40	
S106	396273.8	7345770.0	1039.5													207.17	No Coal Borehole
S107	398810.8	7343232.5	1024.7													78.89	No Coal Borehole
S108	398835.3	7348327.5	1037.6		148.40	149.60	1.20	15.89	165.49	169.80	4.31	20.54	190.34	192.16	1.82	202.00	
S109	396382.6	7340721.0	1018.7													108.78	No Coal Borehole
S110	391367.5	7340696.2	1028.9		44.48	45.92	1.44	13.12	59.04	63.36	4.32	17.56	80.92	82.50	1.58	94.28	
S111	403734.0	7348386.9	1024.9		172.38	173.90	1.52	13.34	187.24	196.74	9.50	7.40	204.14	206.34	2.20	229.20	
S112	393939.4	7343248.5	1037.4						39.28	42.98	3.70	18.06	61.04	62.48	1.44	85.50	
S113	393854.2	7340702.5	1023.7													43.00	No Coal Borehole
S114	393956.4	7345755.9	1047.3		48.90	50.06	1.16	14.02	64.08	69.14	5.06	18.84	87.98	89.22	1.24	103.85	
S120	391347.8	7343239.4	1039.2		69.47	70.64	1.17	13.51	84.15	88.92	4.77	16.88	105.80	107.70	1.90	110.90	
S121	395239.4	7344643.7	1038.0														No data
S122	395279.9	7341934.4	1030.4														No data
S123	395273.2	7347086.7	1046.3										99.70	101.50	1.80		Only E Seam Data recorded
S124	393874.8	7342139.6	1033.4														No data
S125	396362.4	7348335.5	1047.7										187.62	189.10	1.48		Only E Seam Data recorded
S126	392735.1	7340665.5	1027.6										45.17	47.00	1.83		Only E Seam Data recorded
S127	392772.2	7339165.1	1020.7														No data
S128	390419.1	7339126.7	1021.7										70.89	72.40	1.51		Only E Seam Data recorded
S129	401230.9	7348292.9	1025.0										193.85	196.00	2.15		Only E Seam Data recorded
S130	391369.4	7337729.5	1014.9										103.33	105.10	1.77		Only E Seam Data recorded
S131	394951.5	7337468.9	1009.5														No data
S132	389092.4	7340642.8	1026.8										73.28	74.50	1.22		Only E Seam Data recorded
S133	389094.0	7345765.3	1052.3										152.18	153.70	1.52		Only E Seam Data recorded
S134	405658.3	7348579.3	1020.0										158.67	160.70	2.03		Only E Seam Data recorded
S135	389118.9	7343222.3	1036.1										147.59	149.70	2.11		Only E Seam Data recorded
S136	403773.5	7345779.0	1014.0										148.11	150.10	1.99		Only E Seam Data recorded
S137	392665.8	7348359.7	1064.9										112.77	114.30	1.53		Only E Seam Data recorded
S138	401267.3	7343259.9	1009.0														No data
S139	397780.0	7344467.1	1026.4														No data
S140	395280.6	7343248.1	1032.7														No data
S141	400241.7	7344476.9	1017.1														No data
S142	395286.7	7339738.0	1018.0														No data
S143	397791.1	7345801.4	1030.7														No data
S144	402925.5	7344469.6	1013.0										106.95	108.80	1.85		Only E Seam Data recorded
S255	392727.8	7345772.0	1051.6		76.39	77.94	1.55	15.56	93.50	98.25	4.75	15.33	113.58	115.26	1.68		
S256	394013.3	7345743.0	1046.8		50.00	50.8	0.80	14.40	65.20	69.90	4.70	18.50	88.40	89.50	1.10		
S257	395241.5	7345773.0	1040.4														No Coal Borehole
S262	401280.0	7345846.0	1023.3		101.00	102.4	1.40	19.20	121.60	124.20	2.60	7.80	132.00	133.60	1.60		
S272	392726.9	7344514.9	1045.3		69.10	69.80	0.70	15.00	84.80	89.70	4.90	11.28	100.98	103.10	2.12		
S273	393939.7	7344521.0	1043.0		37.95	38.8	0.85	14.70	53.50	56.80	3.30	17.20	74.00	75.50	1.50		
S275	396364.5	7344652.0	1031.9														No Coal Borehole
S277	398791.6	7344464.0	1024.2														No Coal Borehole
S279	401299.9	7344461.0	1015.8										60.90	62.50	1.60		E Seam Only
S281	382782.1	7343131.0	1048.0	44.00	105.80	107.00	1.20	13.10	120.10	124.30	4.20	25.80	150.10	152.00	1.90		
S282	383994.9	7343128.0	1047.3	35.90	66.80	68.00	1.20	12.90	80.90	85.70	4.80	22.30	108.00	110.40	2.40		
S289	392721.2	7343209.0	1039.8		52.30	53.60	1.30	14.00	67.60	72.15	4.55	15.25	87.40	89.00	1.60		
S293	397789.1	7343205.0	1029.5														No Coal Borehole
S295	400256.1	7343202.0	1013.9														No Coal Borehole
S297	381554.0	7341858.0	1041.4	29.00					30.00	35.10	5.10	24.40	59.50	61.00	1.50	42.20	
S298	382792.0	7341881.0	1041.1	31.20	19.40	20.30	0.90	9.50	29.80	31.20	1.40	23.80	55.00	57.00	2.00	62.40	
S299	384041.0	7341878.0	1041.1	35.80									54.30	55.8	1.50	103.00	E Seam Only
S300	385305.0	7341922.0	1037.8	28.10	25.30	26.40	1.10	11.70	38.10	42.80	4.70	17.25	60.05	61.80	1.75		
S301	386549.0	7341868.0	1036.2	39.00	39.30	40.90	1.60	11.80	52.70	58.00	5.30	9.40	67.40	69.20	1.80		
S302	387803.0	7341921.0	1035.4	31.00	78.00	79.80	1.80	12.40	92.20	97.20	5.00	13.30	110.50	112.20	1.70		
S305	392008.2	7341943.0	1031.2										76.24	77.80	1.56		
S306	392741.1	7341936.0	1032.1										43.80	45.30	1.50		
S307	393886.9	7341893.0	1032.2														No Coal Borehole

APPENDIX 6: Physical Database - Summary of coal intersections for the E; A and A Upper Coal Seams

BH ID	UTM 35S WGS			Base of	A UPPER SEAM			IB	A SEAM			IB	E SEAM			Terminal	REAMARKS
	EASTING	NORTHING	ELEVATION	Weathering	FROM	TO	THICK	THICK	FROM	TO	THICK		FROM	TO	THICK	Depth	
S309	396342.8	7341952.0	1028.4														No Coal Borehole
S310	397787.6	7341953.0	1028.6														No Coal Borehole
S311	398788.7	7341949.0	1025.6														No Coal Borehole
S312	400306.1	7341950.0	1014.0														No Coal Borehole
S313	380295.0	7340626.0	1037.7	35.00	27.00	28.20	1.20	11.30	39.50	44.75	5.25	20.55	65.30	67.20	1.90	78.00	
S314	381549.0	7340634.0	1036.3	25.50	19.60	21.20	1.60	11.60	32.80	38.40	5.60	20.05	58.45	60.60	2.15	72.84	
S315	382803.0	7340616.0	1038.1	28.50					24.60	26.20	1.60	18.40	44.60	46.20	1.60	80.00	
S316	384020.0	7340644.0	1039.2	24.00									44.00	45.40	1.40	62.12	E Seam Only
S317	385290.0	7340647.0	1038.2	33.00													No Coal Borehole
S318	386559.0	7340657.0	1030.0	27.00									26.00	27.80	1.80		E Seam Only
S319	387818.0	7340667.0	1029.4	19.00	33.10	35.00	1.90	11.60	46.60	51.60	5.00	13.80	65.40	66.70	1.30		
S320	389170.0	7340646.0	1026.5	36.00	45.30	46.80	1.50	13.20	60.00	65.20	5.20	11.35	76.55	78.10	1.55		
S321	390403.0	7340663.0	1027.7	26.00	45.40	47.10	1.70	12.55	59.65	64.00	4.35	16.45	80.45	82.20	1.75		
S325	395278.4	7340703.0	1024.3														No Coal Borehole
S327	397765.6	7340710.0	1022.3														No Coal Borehole
S328	398808.1	7340687.0	1019.1														No Coal Borehole
S329	380295.0	7339376.0	1034.4	25.00	24.20	26.20	2.00	12.00	38.20	43.15	4.95	22.55	65.70	66.85	1.15	80.00	
S330	381552.0	7339384.0	1033.1	22.40					33.80	39.20	5.40	20.60	59.80	61.20	1.40		
S331	382787.0	7339397.0	1026.5	21.17					16.50	22.00	5.50	20.40	42.40	44.20	1.80		
S332	384019.0	7339384.0	1024.4	21.70					14.70	16.80	2.10	19.20	36.00	38.80	2.80		
S333	385288.0	7339384.0	1022.6	23.00													No Coal Borehole
S334	386568.0	7339415.0	1023.1	23.80					22.00	25.20	3.20	12.80	38.00	40.00	2.00		
S335	387817.0	7339411.0	1023.0	18.10	22.80	24.75	1.95	12.25	37.00	42.00	5.00	12.80	54.80	56.40	1.60		
S336	389055.0	7339414.0	1019.5	30.80					31.35	36.40	5.05	13.40	49.80	51.60	1.80		
S337	390402.0	7339421.0	1023.4	38.50					48.00	52.60	4.60	16.60	69.20	71.00	1.80		
S338	391356.0	7339444.0	1022.0						53.20	57.60	4.40	15.20	72.80	74.55	1.75		
S339	392749.0	7339449.0	1022.4										52.70	54.60	1.90		E Seam Only
S340	393853.4	7339461.0	1020.3														No Coal Borehole
S341	395298.1	7339451.0	1016.3														No Coal Borehole
S342	396360.9	7339458.0	1011.7														No Coal Borehole
S343	397764.3	7339448.0	1008.8														No Coal Borehole
S344	384041.0	7338129.0	1025.0	20.00	28.40	30.40	2.00	12.00	42.40	47.75	5.35	18.05	65.80	68.40	2.60		
S345	385278.0	7338132.0	1021.3	20.00	33.10	34.90	1.80	12.60	47.50	51.80	4.30	18.20	70.00	72.40	2.40		
S346	386563.0	7338154.0	1011.6	20.00	21.40	23.60	2.20	12.60	36.20	41.20	5.00	11.60	52.80	54.30	1.50		
S347	387836.0	7338183.0	1011.3	27.50					27.80	33.20	5.40	14.80	48.00	49.60	1.60		
S348	389049.0	7338220.0	1008.2	30.70	31.45	33.25	1.80	12.25	45.50	50.00	4.50	16.75	66.75	68.20	1.45		
S349	390416.0	7338141.0	1016.5	31.00	63.80	65.50	1.70	12.85	78.35	83.35	5.00	12.65	96.00	97.75	1.75		
S350	391361.0	7338202.0	1015.0		70.20	71.95	1.75	12.45	84.40	89.50	5.10	13.10	102.60	104.20	1.60		
S351	392759.0	7338169.0	1015.8		89.40	91.20	1.80	12.25	103.45	108.20	4.75	16.60	124.80	126.90	2.10		
S352	393842.0	7338179.0	1012.0		74.95	76.50	1.55	12.20	88.70	93.60	4.90	16.40	110.00	112.10	2.10		
S353	395313.0	7338175.0	1009.2		61.80	63.40	1.60	11.90	75.30	80.00	4.70	16.00	96.00	97.60	1.60		
S354	389053.0	7336961.0	997.6	39.00	24.40	26.00	1.60	12.25	38.25	41.90	3.65	11.50	53.40	55.20	1.80		
S355	390421.0	7336942.0	1002.1	30.60	25.25	26.70	1.45	12.40	39.10	43.80	4.70	12.20	56.00	57.25	1.25		
S356	391365.0	7336927.0	1010.8						48.00	53.20	5.20	9.90	63.10	64.70	1.60		
S357	392758.0	7336929.0	1011.2														Borehole Blocked
S358	393841.0	7336936.0	1010.0		60.40	62.20	1.80	11.80	74.00	78.50	4.50	17.10	95.60	97.45	1.85		

AVERAGE	28.15	56.59	58.16	1.57	13.05	52.38	57.25	4.87	15.78	78.86	80.46	1.60
MIN	15.36	16.64	18.97	0.70	9.50	14.70	16.80	1.00	6.01	26.00	27.80	0.38
MAX	59.16	206.62	207.64	2.33	22.20	221.58	225.90	9.50	25.80	240.00	241.36	2.80

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

E SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS			SAMPLE ID.	SEAM THICKN	RAW COAL							
	EASTING	NORTHING	ELEVATION			RAW COAL	LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
MW01	390386.5	7336956.4	1006.3	MW01 - A	1.28	R.C.	1.43	25.72	14.3	4.9	27.6	53.3	1.59
MW02	392726.1	7338195.3	1019.8	MW02 - A	1.99	R.C.	1.42	25.51	13.5	5.7	27.5	53.4	2.81
MW03	391336.9	7340666.6	1032.2	MW03 - A	1.67	R.C.	1.41	25.50	12.5	5.1	28.7	53.6	1.76
MW04	392233.0	7342679.6	1040.6	MW04 - A	1.64	R.C.	1.64	24.05	17.1	5.3	27.8	49.8	1.11
MW05r	387762.9	7339406.9	1028.3	MW05 - A	1.4	R.C.	1.41	25.43	12.6	6.3	27.7	53.5	1.18
MW06	387745.3	7341898.5	1039.0	MW06 - A_E Seam only	1.46	R.C.	1.90	16.60	40.3	4.0	21.5	34.3	0.72
MW07	385273.2	7338480.1	1023.4	MW07 - A_E Seam only	1.82	R.C.	1.68	18.52	35.3	4.1	22.3	38.3	1.77
MW08	387341.5	7336282.5	1021.3	MW08 - A	1.7	R.C.	1.60	21.00	28.1	4.0	23.6	44.3	1.65
MW09	384457.3	7341231.5	1042.5	MW09 - A_E Seam only	1.74	R.C.	1.78	15.15	43.2	3.3	23.6	29.9	2.01
MW10	391999.0	7334988.4	1007.1	No Coal Borehole		R.C.							
MW11	382158.5	7341439.9	1043.4	MW11 - A_E Seam only	1.74	R.C.	1.67	18.57	34.5	4.1	24.3	37.2	2.72
MW12	382372.9	7338832.2	1025.4	MW12 - A_E Seam only	2.01	R.C.	1.70	17.73	36.9	4.0	21.9	37.2	0.45
MW13	379503.5	7340213.6	1037.7	MW13 - A	0.39	R.C.	1.50	23.21	19.8	5.9	27.7	46.6	0.70
MW14	394747.9	7336666.3	1008.0	Abandoned		R.C.							
MW15	376444.1	7340452.5	1040.0	MW15 - A	0.66	R.C.	1.46	23.52	17.1	6.1	25.9	50.9	1.50
MW16r	387409.7	7339047.0	1021.9	Borehole terminated above E Seam		R.C.							
MW17	387058.8	7339412.0	1023.9	Borehole terminated above E Seam		R.C.							
MW18	387060.1	7338701.8	1015.8	Borehole terminated above E Seam		R.C.							
MW19	382861.7	7338707.4	1020.9	Borehole terminated above E Seam		R.C.							
MW20	383219.5	7339118.2	1020.4	Borehole terminated above E Seam		R.C.							
MW21	386709.0	7339053.3	1020.9	Borehole terminated above E Seam		R.C.							
MW22	387412.6	7339757.0	1026.2	Borehole terminated above E Seam		R.C.							
MW23	382370.9	7339332.8	1028.0	Borehole terminated above E Seam		R.C.							
MW24	381961.5	7339112.4	1029.3	Borehole terminated above E Seam		R.C.							
MW25	382110.3	7339765.8	1030.9	Borehole terminated above E Seam		R.C.							
MW26	387403.5	7338354.8	1012.7	MW26_A	1.36	R.C.	1.47	22.59	20.9	6.1	26.9	46.1	1.86
MW27	387835.0	7338629.4	1019.7	MW27_A	1.39	R.C.	1.44	26.00	11.7	5.3	29.0	54.1	1.79
MW28	388112.3	7338978.0	1021.3	MW28_A	1.69	R.C.	1.45	25.17	14.2	5.4	26.8	53.6	0.75
MW29R	388862.8	7339016.0	1018.4	MW29_A	1.64	R.C.	1.52	24.09	17.5	5.4	26.8	50.3	2.28
MW30	389211.6	7339325.5	1019.9	MW30_A	1.70	R.C.	1.52	22.36	20.2	5.5	28.6	45.8	3.91
MW31	387952.0	7337959.9	1007.6	MW31_A	0.94	R.C.	1.37	27.08	8.9	6.1	30.8	54.3	0.93
MW32	388855.3	7339739.8	1024.9	MW32_A	1.50	R.C.	1.46	24.55	15.1	5.1	29.3	50.5	3.82
MW33	388247.8	7338305.9	1016.1	MW33_A	1.79	R.C.	1.52	23.31	17.5	5.6	26.7	50.2	4.30
MW34	388530.0	7338648.2	1016.5	MW34_A	1.75	R.C.	1.42	25.83	12.9	5.3	29	52.9	1.68
MW35	387767.4	7339018.6	1024.4	MW35_A	1.75	R.C.	1.45	24.31	16	5.7	26.2	52.1	0.56
MW36	382895.6	7338221.9	1027.4	MW36_A	1.65	R.C.	1.71	15.72	43.8	3.5	20.8	31.9	1.04
MW37	388105.5	7339795.9	1025.3	MW37_A	1.70	R.C.	1.49	24.09	16.9	5.4	26.4	51.4	0.40
MW38	387418.4	7338689.9	1020.9	MW38_A	1.17	R.C.	1.46	24.40	16.8	3.7	29.6	49.9	3.18
MW39	386783.8	7339400.4	1025.4	MW39_A	1.50	R.C.	1.59	20.24	29.3	4.3	25.7	40.7	3.31
MW40	387415.4	7339391.8	1027.1	MW40_A	1.42	R.C.	1.50	22.13	23.1	4.6	27.7	44.6	3.16
MW41	382277.8	7338336.3	1028.9	MW41_A	1.72	R.C.	1.65	18.20	34.9	4.5	22.6	38	2.69
MW42	386971.5	7338472.2	1009.5	MW42_A	1.44	R.C.	1.63	20.11	28	3.9	27.2	40.9	3.84
MW43	387783.8	7340099.0	1027.9	MW43_A	1.23	R.C.	1.45	24.42	16.6	5.4	28.9	49.2	1.12
MW44	381653.1	7338412.7	1031.2	MW44_A	0.82	R.C.	1.58	19.70	32.2	3.7	24.3	39.8	0.49
MW45	386748.3	7338708.2	1017.5	MW45_A	1.30	R.C.	1.53	21.50	24.2	4.8	29	42	0.77
MW46	387334.0	7340371.7	1031.4	MW46_A	1.07	R.C.	1.62	20.13	26.2	4.4	30.8	38.6	2.35
MW47	387064.8	7339750.7	1028.9	MW47_A	1.17	R.C.	1.58	20.16	27.5	4.5	28	40	2.05
MW48	387215.8	7340091.5	1029.6	MW48_A	1.35	R.C.	1.52	22.18	22.7	4.8	27.3	45.1	4.47
MW49	386387.4	7338696.1	1017.4	MW49_A	1.52	R.C.	1.68	17.03	38.4	3.5	24.5	33.6	0.73
MW50	387045.0	7339063.0	1023.3	MW50_A	1.28	R.C.	1.44	25.05	15.8	4.5	29.6	50.1	1.29
MW51	386994.2	7337682.9	1016.5	MW51_A	1.35	R.C.	1.63	19.66	28.8	3.6	31.5	36.1	1.31
MW52	381389.0	7338969.3	1029.5	MW52_A	1.54	R.C.	1.57	19.94	29.7	4.3	26.3	39.7	0.73
MW53	388515.7	7339379.0	1023.0	MW53_A	1.65	R.C.	1.53	24.71	15.3	5.3	28.4	51	3.14
MW54R	387110.0	7341283.1	1035.3	MW54R_A	1.28	R.C.	1.46	15.84	44.3	1.9	21.1	32.7	3.21
MW55	389627.1	7337722.8	1017.5	MW55_A	1.40	R.C.	1.42	26.45	12.3	4.1	28.6	55	1.26
MW56	389900.7	7338711.1	1021.1	MW56_A	1.35	R.C.	1.41	26.74	11.8	4.1	30.3	53.7	1.32
MW57	381022.0	7339458.1	1037.7	MW57_A	1.40	R.C.	1.58	20.58	30.6	2.7	25.8	41	1.08
MW58	391366.0	7338854.8	1019.7	MW58_A	1.58	R.C.	1.42	27.26	11.6	2.8	29.8	55.8	2.19
MW59	388105.7	7336967.5	1013.0	Borehole terminated above coal seams		R.C.							
MW60	381702.6	7339587.0	1035.6	MW60_A	1.25	R.C.	1.67	17.88	37.4	2.6	22.5	37.5	2.10
MW61	391994.3	7337062.8	1014.8	MW61_A	1.42	R.C.	1.54	23.34	21	2	32.8	44.3	1.13
MW62	381637.6	7340140.7	1035.7	MW62_A	1.35	R.C.	1.69	17.31	36.5	2.9	23.5	37.1	3.55
MW63	389729.8	7340313.5	1024.8	MW63_A	1.54	R.C.	1.47	24.29	17.2	3.8	29.1	50	4.38
MW64	380933.0	7340654.3	1038.2	MW64_A	1.60	R.C.	1.55	21.19	24.4	5.4	25.5	44.7	2.79
MW65R	380905.1	7339969.1	1037.8	MW65R_A	1.53	R.C.	1.55	19.86	28.2	5.2	24.5	42.1	2.12
MW66	380676.7	7341183.2	1042.5	MW66_A	1.70	R.C.	1.54	20.54	26.7	4.9	25.3	43.2	2.15
MW67	381530.8	7341060.4	1039.3	MW67_A	1.72	R.C.	1.58	18.83	32.4	4.9	23.5	39.2	2.14
MW68	381216.3	7341678.6	1042.0	MW68_A	1.38	R.C.	1.56	25.58	11.4	6.7	30.1	51.9	1.65
MC01	403737.0	7345351.0	1013.0	MC01 - A	0.38	R.C.	1.56	20.65	25.1	4.5	31.5	38.9	2.93
MC02	407001.8	7346006.5	1004.9	MC02 - A	2.03	R.C.	1.46	24.25	17.1	5.1	27.5	50.3	3.43
MC03	410000.4	7344003.1	991.7	No Coal Borehole		R.C.							
MC04	413000.0	7345000.0	983.0	Borehole intersecting G & K seams		R.C.							
S2	398820.6	7355432.8	1096.5	No Coal Borehole		R.C.							
S3	405519.4	7355304.0	1045.9	No Coal Borehole		R.C.							
S4	398792.4	7345816.6	1028.0	No Qualities available	1.70	R.C.							
S5	398703.1	7351378.1	1040.5	No Coal Borehole		R.C.							
S9	407948.6	7361539.9	1061.7	E Seam not developed		R.C.							

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

E SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS			SAMPLE ID.	SEAM THICKN	RAW COAL							
	EASTING	NORTHING	ELEVATION			RAW COAL	LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
S15	391927.8	7345761.3	1052.9	S15/E SEAM/11 (Samples missing/not taken)	1.98	R.C.	1.75	16.39	34.9	6.0	17.0	42.1	0.16
S23	382868.0	7349149.0	1074.9	S23/E SEAM/7 (Samples missing/not taken)	1.36	R.C.	1.67	15.88	41.2	4.2	18.7	35.9	0.24
S27	374969.0	7345664.0	1070.6	No Qualities available	0.40	R.C.							
S31	385561.7	7342674.3	1038.2	No Qualities available	1.68	R.C.							
S103	396355.5	7343235.4	1030.0	S103/E SEAM/1	1.70	R.C.	1.48	26.28	9.4	7.5	27.3	55.8	0.64
S105	401197.6	7345823.1	1023.0	S105/E SEAM/20	1.92	R.C.	1.46	24.96	14.0	6.2	26.6	53.2	4.24
S106	396273.8	7345770.0	1039.5	No Coal Borehole		R.C.							
S107	398810.8	7343232.5	1024.7	No Coal Borehole		R.C.							
S108	398835.3	7348327.5	1037.6	S108/E SEAM/20	1.82	R.C.	1.37	25.45	8.8	7.7	27.5	56.0	0.24
S109	396382.6	7340721.0	1018.7	No Coal Borehole		R.C.							
S110	391368.0	7340696.0	1028.9	S110/E SEAM/4	1.58	R.C.	1.40	25.13	12.9	6.8	27	53.3	1.79
S111	403734.0	7348386.9	1024.9	No Qualities available	2.20	R.C.							
S112	393939.4	7343248.5	1037.4	S112/E SEAM/4	1.44	R.C.	1.44	24.40	15.9	6.5	25.6	52.0	2.44
S113	393854.2	7340702.5	1023.7	No Coal Borehole		R.C.							
S114	393956.4	7345755.9	1047.3	No Qualities available	1.24	R.C.							
S120	391347.8	7343239.4	1039.2	S120/E SEAM/1	1.90	R.C.	1.44	25.58	12.5	4.9	27.6	55.0	1.18
S121	395239.4	7344643.7	1038.0	No data, No Geophysics available		R.C.							
S122	395279.9	7341934.4	1030.4	No data, No Geophysics available		R.C.							
S123	395273.2	7347086.7	1046.3		1.80	R.C.	1.43	24.49	14.04	6.4	26.49	47.1	3.59
S124	393874.8	7342139.6	1033.4	No data		R.C.							
S125	396362.4	7348335.5	1047.7		1.48	R.C.	1.51	25.40	13.44	6.0	27.73	47.2	5.32
S126	392735.1	7340665.5	1027.6		1.83	R.C.	1.37	26.05	11.09	6.0	27.64	49.6	1.54
S127	392772.2	7339165.1	1020.7	No data		R.C.							
S128	390419.1	7339126.7	1021.7		1.51	R.C.	1.40	26.95	11.50	5.0	28.3	50.5	1.51
S129	401230.9	7348292.9	1025.0		2.15	R.C.	1.40	26.32	10.25	6.0	27.6	50.5	1.04
S130	391369.4	7337729.5	1014.9		1.77	R.C.	1.51	23.39	18.14	6.0	29.7	40.5	2.41
S132	389092.4	7340642.8	1026.8		1.22	R.C.	1.68	21.98	20.77	6.0	32.3	35.3	0.91
S133	389094.0	7345765.3	1052.3		1.52	R.C.	1.68	20.78	24.82	6.0	26.6	36.9	2.20
S134	405658.3	7348579.3	1020.0		2.03	R.C.	1.42	25.92	10.81	6.0	28.3	49.3	1.03
S135	389118.9	7343222.3	1036.1		2.11	R.C.	1.58	22.11	22.28	6.0	28.8	37.3	2.61
S136	403773.5	7345779.0	1014.0		1.99	R.C.	1.52	24.68	15.13	6.0	25.9	47.4	4.38
S137	392665.8	7348359.7	1064.9		1.53	R.C.	1.84	14.05	41.45	6.0	24.7	22.2	1.35
S138	401267.3	7343259.9	1009.0	No data		R.C.							
S139	397780.0	7344467.1	1026.4	No data		R.C.							
S140	395280.6	7343248.1	1032.7	No data		R.C.							
S141	400241.7	7344476.9	1017.1	No data		R.C.							
S142	395286.7	7339738.0	1018.0	No data		R.C.							
S143	397791.1	7345801.4	1030.7	No data		R.C.							
S144	402925.5	7344469.6	1013.0		1.85	R.C.	1.45	26.71	10.2	6.0	27.7	50.48	0.73
S255	392727.8	7345772.0	1051.6	No Qualities available	1.68	R.C.							
S256	394013.3	7345743.0	1046.8	No Qualities available	1.10	R.C.							
S257	395241.5	7345773.0	1040.4	No Coal Borehole		R.C.							
S262	401280.0	7345846.0	1023.3	No Qualities available	1.60	R.C.							
S272	392726.9	7344514.9	1045.3		2.12	R.C.	1.53	20.75	21.1	6.0	24.4	42.86	0.63
S273	393939.7	7344521.0	1043.0	No Qualities available	1.50	R.C.							
S275	396364.5	7344652.0	1031.9	No Coal Borehole		R.C.							
S277	398791.6	7344464.0	1024.2	No Coal Borehole		R.C.							
S279	401299.9	7344461.0	1015.8	No Qualities available	1.60	R.C.							
S281	382782.1	7343131.0	1048.0	No Qualities available	1.90	R.C.							
S282	383994.9	7343128.0	1047.3		2.40	R.C.	1.57	18.88	30.4	6.0	25.7	32.34	1.48
S289	392721.2	7343209.0	1039.8	No Qualities available	1.60	R.C.							
S293	397789.1	7343205.0	1029.5	No Coal Borehole		R.C.							
S295	400256.1	7343202.0	1013.9	No Coal Borehole		R.C.							
S297	381554.0	7341858.0	1041.4		1.50	R.C.	1.51	22.94	20.1	5.0	25.1	45.0	
S298	382792.0	7341881.0	1041.1		2.00	R.C.	1.63	18.69	30.7	5.0	23.9	35.7	
S299	384041.0	7341878.0	1041.1		1.50	R.C.	1.55	22.33	21.7	5.0	23.2	45.4	
S300	385305.0	7341922.0	1037.8	No Qualities available	1.75	R.C.							
S301	386549.0	7341868.0	1036.2	No Qualities available	1.80	R.C.							
S302	387803.0	7341921.0	1035.4		1.70	R.C.	1.66	17.27	36.8	5.0	23.5	30.0	0.46
S305	392008.2	7341943.0	1031.2		1.56	R.C.	1.43	24.65	16.5	5.0	26.2	47.5	1.28
S306	392741.1	7341936.0	1032.1		1.50	R.C.	1.40	26.60	11.1	5.0	27.0	52.2	
S307	393886.9	7341893.0	1032.2	No Coal Borehole		R.C.							
S309	396342.8	7341952.0	1028.4	No Coal Borehole		R.C.							
S310	397787.6	7341953.0	1028.6	No Coal Borehole		R.C.							
S311	398788.7	7341949.0	1025.6	No Coal Borehole		R.C.							
S312	400306.1	7341950.0	1014.0	No Coal Borehole		R.C.							
S313	380295.0	7340626.0	1037.7		1.90	R.C.	1.47	24.28	16.8	5.00	26.1	47.3	
S314	381549.0	7340634.0	1036.3		2.15	R.C.	1.64	16.77	37.7	5.00	20.6	31.9	2.39
S315	382803.0	7340616.0	1038.1	No Qualities available	1.60	R.C.							
S316	384020.0	7340644.0	1039.2		1.40	R.C.	1.58	20.70	25.8	5.0	23.7	40.9	
S317	385290.0	7340647.0	1038.2	No Coal Borehole		R.C.							
S318	386559.0	7340657.0	1030.0	No Coal Borehole	1.80	R.C.							
S319	387818.0	7340667.0	1029.4		1.30	R.C.	1.43	25.50	13.9	5.0	27.6	48.8	
S320	389170.0	7340646.0	1026.5	No Qualities available	1.55	R.C.							
S321	390403.0	7340663.0	1027.7		1.75	R.C.	1.46	24.33	17.6	5.0	27.8	44.8	0.55
S325	395278.4	7340703.0	1024.3	No Coal Borehole		R.C.							
S327	397765.6	7340710.0	1022.3	No Coal Borehole		R.C.							
S328	398808.1	7340687.0	1019.1	No Coal Borehole		R.C.							
S329	380295.0	7339376.0	1034.4		1.15	R.C.	1.49	21.64	23.9	5.0	27.3	39.1	1.50
S330	381552.0	7339384.0	1033.1		1.40	R.C.	1.50	23.51	18.7	5.0	25.0	46.6	
S331	382787.0	7339397.0	1026.5		1.80	R.C.	1.49	22.52	21.0	7.0	25.4	40.1	3.03
S332	384019.0	7339384.0	1024.4		2.80	R.C.	1.59	19.74	30.7	6.0	22.4	35.3	
S333	385288.0	7339384.0	1022.6	No Coal Borehole		R.C.							
S334	386568.0	7339415.0	1023.1		2.00	R.C.	1.50	23.07	19.1	6.0	25.5	43.8	
S335	387817.0	7339411.0	1023.0		1.60	R.C.	1.48	23.41	16.6	6.0	24.5	47.2	1.55
S336	389055.0	7339414.0	1019.5		1.80	R.C.	1.50	22.97	19.3	6.0	25.9	42.3	
S337	390402.0	7339421.0	1023.4		1.80	R.C.	1.38	26.48	9.8	7.0	27.3	49.5	
S338	391356.0	7339444.0	1022.0		1.75	R.C.	1.39	25.99	13.4	7.0	28.0	45.1	1.00

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

E SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS EASTING	NORTHING	ELEVATION	SAMPLE ID.	SEAM THICKN	RAW COAL	LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
S339	392749.0	7339449.0	1022.4		1.90	R.C.	1.44	25.18	12.9	7.0	24.9	49.6	
S340	393853.4	7339461.0	1020.3	No Coal Borehole		R.C.							
S341	395298.1	7339451.0	1016.3	No Coal Borehole		R.C.							
S342	396360.9	7339458.0	1011.7	No Coal Borehole		R.C.							
S343	397764.3	7339448.0	1008.8	No Coal Borehole		R.C.							
S344	384041.0	7338129.0	1025.0	No Qualities available	2.60	R.C.							
S345	385278.0	7338132.0	1021.3		2.40	R.C.	1.58	19.95	26.8	6.0	23.8	36.9	
S346	386563.0	7338154.0	1011.6		1.50	R.C.	1.59	19.59	26.9	7.0	28.6	31.0	1.50
S347	387836.0	7338183.0	1011.3		1.60	R.C.	1.42		11.8				
S348	389049.0	7338220.0	1008.2		1.45	R.C.	1.44	24.85	14.0	7.0	26.4	46.1	2.55
S349	390416.0	7338141.0	1016.5		1.75	R.C.	1.38	26.52	9.7	7.0	27.3	49.6	
S350	391361.0	7338202.0	1015.0		1.60	R.C.	1.38	25.52	12.2	7.0	28.2	46.1	0.82
S351	392759.0	7338169.0	1015.8		2.10	R.C.	1.51	23.20	17.9	7.0	23.2	45.5	
S352	393842.0	7338179.0	1012.0		2.10	R.C.	1.37	25.76	12.3	7.0	26.0	48.2	0.91
S353	395313.0	7338175.0	1009.2		1.60	R.C.	1.46	25.11	13.9	7.0	26.1	46.5	2.86
S354	389053.0	7336961.0	997.6		1.80	R.C.	1.42	25.56	12.1	7.0	26.0	48.5	
S355	390421.0	7336942.0	1002.1		1.25	R.C.	1.41	25.69	12.4	7.0	27.3	46.9	0.54
S356	391365.0	7336927.0	1010.8		1.60	R.C.	1.38	26.57	9.6	7.0	27.7	49.2	
S357	392758.0	7336929.0	1011.2	Borehole blocked		R.C.							
S358	393841.0	7336936.0	1010.0		1.85	R.C.	1.48	23.69	16.7	7.0	24.7	45.2	

				LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
AVERAGE				1.52	22.64	20.99	5.31	26.42	44.80	1.89
MINIMUM				1.37	14.05	8.80	1.90	17.00	22.18	0.16
MAXIMUM				1.90	27.26	44.30	7.70	32.80	56.00	5.32

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

A SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS EASTING	UTM 35S WGS NORTHING	UTM 35S WGS ELEVATION	SAMPLE ID.	SEAM THICKN	RAW COAL: RAW COAL	RAW COAL: LAB. R.D.	RAW COAL: C.V. MJ/kg	RAW COAL: ASH %	RAW COAL: MOIST %	RAW COAL: VOL %	RAW COAL: F.C. %	RAW COAL: SULF %
MW01	390386.5	7336956.4	1006.3	MW01 - D+C+B	5.00	R.C.	1.51	22.78	20.9	4.6	26.1	48.3	2.63
MW02	392726.1	7338195.3	1019.8	MW02 - D+C+B	4.71	R.C.	1.48	23.19	18.6	5.5	25.1	50.8	2.83
MW03	391336.9	7340666.6	1032.2	MW03 - D+C+B	4.48	R.C.	1.49	22.58	19.1	5.3	24.7	50.8	1.91
MW04	392233.0	7342679.6	1040.6	MW04 - D+C+B	6.24	R.C.	1.60	19.24	28.4	4.7	23.2	43.7	2.30
MW05r	387762.9	7339406.9	1028.3	MW05R - D+C+B	4.93	R.C.	1.48	22.95	17.8	5.7	26.9	49.5	2.55
MW06	387745.3	7341898.5	1039.0	MW06 - D+C+B	5.13	R.C.	1.50	22.16	20.3	5.5	25.3	49.0	2.02
MW07	385273.2	7338480.1	1023.4	MW07 - D+C+B	5.93	R.C.	1.54	21.18	23.5	5.3	24.6	46.7	2.74
MW08	387341.5	7336282.5	1021.3	MW08 - D+C+B	4.93	R.C.	1.56	21.18	25.1	4.0	23.9	47.1	1.83
MW09	384457.3	7341231.5	1042.5	E Seam Only		R.C.							
MW10	391999.0	7334988.4	1007.1	No Coal Borehole		R.C.							
MW11	382158.5	7341439.9	1043.4	E Seam Only		R.C.							
MW12	382372.9	7338832.2	1025.4	MW12 - E+D+C+B	5.57	R.C.	1.52	21.65	17.2	5.2	24.9	48.2	2.60
MW13	379503.5	7340213.6	1037.7	MW13 - D+C+B	4.91	R.C.	1.60	18.82	28.3	5.3	22.9	43.5	0.84
MW14	394747.9	7336666.3	1008.0	Abandond		R.C.							
MW15	376444.1	7340452.5	1040.0	MW15 - D+C+B	6.24	R.C.	1.62	17.80	30.4	5.0	22.8	41.8	1.79
MW16r	387409.7	7339047.0	1021.9	MW16r/A Seam/4+3+2+1	4.86	R.C.	1.48	22.31	18.6	6.5	25.2	49.7	0.78
MW17	387058.8	7339412.0	1023.9	MW17/A Seam/4+3+2+1	4.72	R.C.	1.47	22.81	18.3	6.4	24.9	50.3	
MW18	387060.1	7338701.8	1015.8	MW18/A Seam/4+3+2+1	4.55	R.C.	1.48	22.73	19.0	6.4	25.3	49.3	1.12
MW19	382861.7	7338707.4	1020.9	MW19/A Seam/4+3+2+1	5.48	R.C.	1.48	22.13	18.9	6.7	23.9	50.5	0.56
MW20	383219.5	7339118.2	1020.4	No Coal Borehole		R.C.							
MW21	386709.0	7339053.3	1020.9	No Coal Borehole		R.C.							
MW22	387412.6	7339757.0	1026.2	MW22/A Seam/4+3+2+1	4.45	R.C.	1.55	22.29	19.3	6.8	24.9	48.9	2.15
MW23	382370.9	7339332.8	1028.0	No Coal Borehole		R.C.							
MW24	381961.5	7339112.4	1029.3	MW24/A Seam/4+3+2+1	5.39	R.C.	1.56	21.24	20.9	7.6	23.5	48.0	1.39
MW25	382110.3	7339765.8	1030.9	MW25/A Seam/4+3+2+2	5.26	R.C.	1.57	21.22	21.1	7.2	24.2	47.5	1.97
MW26	387403.5	7338354.8	1012.7	MW26_D+C+B	4.71	R.C.	1.52	22.39	19.2	5.7	25.5	49.5	2.66
MW27	387835.0	7338629.4	1019.7	MW27_D+C+B	5.04	R.C.	1.57	21.56	21.9	4.9	25.7	47.5	3.76
MW28	388112.3	7338978.0	1021.3	MW28_D+C+B	4.61	R.C.	1.54	22.43	20	5.2	25.3	49.5	2.15
MW29R	388862.8	7339016.0	1018.4	MW29_D+C+B	4.95	R.C.	1.54	22.50	19.6	5.4	25.3	49.8	2.69
MW30	389211.6	7339325.5	1019.9	MW30_D+C+B	5.31	R.C.	1.53	22.20	20.4	5.8	24.5	49.3	1.66
MW31	387952.0	7337959.9	1007.6	MW31_D+C+B	4.70	R.C.	1.54	22.25	20.2	5.6	25	49.2	1.93
MW32	388855.3	7339739.8	1024.9	MW32_D+C+B	4.72	R.C.	1.51	22.96	17.8	6	25.9	50.3	1.26
MW33	388247.8	7338305.9	1016.1	MW33_D+C+B	5.14	R.C.	1.54	22.26	19.7	6.1	24.9	49.3	2.73
MW34	388530.0	7338648.2	1016.5	MW34_D+C+B	4.79	R.C.	1.52	22.29	19.7	5.5	25.6	49.1	1.62
MW35	387767.4	7339018.6	1024.4	MW35_D+C+B	4.71	R.C.	1.50	22.72	18.4	6.1	25.3	50.1	2.41
MW36	382895.6	7338221.9	1027.4	MW36_D+C+B	5.03	R.C.	1.55	21.07	22.5	5.9	24.1	47.5	2.30
MW37	388105.5	7339795.9	1025.3	MW37_D+C+B	4.91	R.C.	1.51	22.63	19.5	5.2	25.5	49.8	2.09
MW38	387418.4	7338689.9	1020.9	MW38_D+C+B	4.96	R.C.	1.52	22.51	20.1	4.8	25.1	50	2.40
MW39	386783.8	7339400.4	1025.4	MW39_A SEAM	3.87	R.C.	1.50	22.99	16.9	6.4	24.1	52.6	1.43
MW40	387415.4	7339391.8	1027.1	MW40_D+C+B	4.88	R.C.	1.51	22.49	19.2	5.3	25.5	50	2.39
MW41	382277.8	7338336.3	1028.9	MW41_D+C+B	5.51	R.C.	1.57	21.47	21.7	5.6	23.5	49.1	2.74
MW42	386971.5	7338472.2	1009.5	MW42_D+C+B	4.83	R.C.	1.51	22.84	18.8	5.4	25.6	50.2	1.44
MW43	387783.8	7340099.0	1027.9	MW43_D+C+B	4.79	R.C.	1.54	21.78	21	5.4	25.3	48.3	2.88
MW44	381653.1	7338412.7	1031.2	MW44_D+C+B	5.20	R.C.	1.55	21.91	20.8	5.1	24.8	49.4	2.08
MW45	386748.3	7338708.2	1017.5	MW45_D+C+B	4.61	R.C.	1.52	22.44	19.6	5.3	26	49.1	1.85
MW46	387334.0	7340371.7	1031.4	MW46_D+C+B	4.81	R.C.	1.50	22.82	18.3	5.9	25.6	50.1	1.80
MW47	387064.8	7339750.7	1028.9	MW47_D+C+B	4.97	R.C.	1.52	22.47	19.2	5.6	26	49.3	2.27
MW48	387215.8	7340091.5	1029.6	MW48_D+C+B	5.05	R.C.	1.50	22.95	18.1	5.5	25.9	50.6	2.24
MW49	386387.4	7338696.1	1017.4	No. A Seam not present		R.C.							
MW50	387045.0	7339063.0	1023.3	No. A Seam not present		R.C.							
MW51	386994.2	7337682.9	1016.5	MW51_D+C+B	4.70	R.C.	1.54	22.53	20.4	4.7	25.5	49.4	2.69
MW52	381389.0	7338969.3	1029.5	MW52_D+C+B	5.30	R.C.	1.56	21.26	22.1	5.4	24.4	48.1	1.85
MW53	388515.7	7339379.0	1023.0	MW53_D+C+B	4.90	R.C.	1.50	22.94	19.1	4.9	25.4	50.7	2.03
MW54R	387110.0	7341283.1	1035.3	MW54R_D+C+B	4.91	R.C.	1.61	23.37	19	3.6	26	51.5	1.73
MW55	389627.1	7337722.8	1017.5	MW55_D+C+B	4.65	R.C.	1.53	22.96	19.4	4.4	25.6	50.6	1.99
MW56	389900.7	7338711.1	1021.1	MW56_D+C+B	4.57	R.C.	1.52	23.12	19	4.4	25.6	50.9	2.08
MW57	381022.0	7339458.1	1037.7	MW57_D+C+B	5.31	R.C.	1.62	22.62	20.2	3.4	25.7	50.7	1.39
MW58	391366.0	7338854.8	1019.7	MW58_D+C+B	4.77	R.C.	1.60	23.98	18.1	3.5	26.2	52.3	1.52
MW59	388105.7	7336967.5	1013.0	Borehole terminated above coal seams		R.C.							
MW60	381702.6	7339587.0	1035.6	MW60_D+C+B	5.16	R.C.	1.62	22.59	20.1	3.8	25.1	51.1	1.72
MW61	391994.3	7337062.8	1014.8	MW61_D+C+B	4.72	R.C.	1.61	23.72	19	2.6	26.7	51.7	1.40
MW62	381637.6	7340140.7	1035.7	MW62_D+C+B	5.48	R.C.	1.63	21.77	20.8	5.3	25	48.8	1.70
MW63	389729.8	7340313.5	1024.8	MW63_D+C+B	4.75	R.C.	1.51	22.60	20	5.1	25.5	49.4	1.67
MW64	380933.0	7340654.3	1038.2	MW64_D+C+B	5.33	R.C.	1.64	21.49	20.8	5.9	24.8	48.4	2.81
MW65R	380905.1	7339969.1	1037.8	MW65R_D+C+B	4.90	R.C.	1.52	22.05	19.6	6.3	24.8	49.4	1.12
MW66	380676.7	7341183.2	1042.5	MW66_D+C+B	4.92	R.C.	1.66	20.86	23.2	5.7	23.5	47.5	1.29
MW67	381530.8	7341060.4	1039.3	MW67_D+C+B	4.63	R.C.	1.54	21.79	19.9	6	25.1	48.9	1.26
MW68	381216.3	7341678.6	1042.0	MW68_D+C+B	5.38	R.C.	1.67	20.48	23.4	5.6	24.9	46.1	2.00
MC01	403737.0	7345351.0	1013.0	MC01/A Seam/B+C+D	7.24	R.C.	1.69	16.09	35.5	4.5	21.2	38.8	0.87
MC02	407001.8	7346006.5	1004.9	MC02/A Seam/B+C+D	7.80	R.C.	1.74	14.13	40.2	4.5	21.2	34.1	0.91
MC03	410000.4	7344003.1	991.7	No Coal Borehole		R.C.							
MC04	413000.0	7345000.0	983.0	Borehole intersecting G & K seams only		R.C.							
S2	398820.6	7355432.8	1096.5	No Coal Borehole		R.C.							
S3	405519.4	7355304.0	1045.9	No Coal Borehole		R.C.							
S4	398792.4	7345816.6	1028.0	S4/A SEAM/1+2+3	5.68	R.C.	1.72	15.81	37.6	4.8	20.2	37.4	1.08
S5	398703.1	7351378.1	1040.5	No Coal Borehole		R.C.							

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

A SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS			SAMPLE ID.	SEAM THICKN	RAW COAL							
	EASTING	NORTHING	ELEVATION			RAW COAL	LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
S9	407948.6	7361539.9	1061.7	No Qualities available	5.50	R.C.							
S15	391927.8	7345761.3	1052.9	S15/A SEAM/7+8 (Samples missing/not taken)	7.40	R.C.	1.58	19.17	28.6	6.1	21.2	44.1	0.38
S23	382868.0	7349149.0	1074.9	S23/A SEAM/6 (Samples missing/not taken)	4.32	R.C.	1.83	12.10	49.3	4.7	17.0	29.0	0.53
S27	374969.0	7345664.0	1070.6	S27/A SEAM/6+9 (Float @ 1.70 only)	5.24	R.C.							
S31	385561.7	7342674.3	1038.2	S31/A SEAM/4-7	4.56	R.C.	1.49	22.00	18.9	7.1	23.2	50.9	1.30
S103	396355.5	7343235.4	1030.0	E Seam Only		R.C.							
S105	401197.6	7345823.1	1023.0	S105/A SEAM/15-19	7.46	R.C.	1.67	17.54	32.9	5.5	21.7	39.9	1.19
S106	396273.8	7345770.0	1039.5	No Coal Borehole		R.C.							
S107	398810.8	7343232.5	1024.7	No Coal Borehole		R.C.							
S108	398835.3	7348327.5	1037.6	S108/A SEAM/5+6 (Total seam not sampled)	4.31	R.C.	1.74	14.77	36.7	5.5	21.3	36.5	0.78
S109	396382.6	7340721.0	1018.7	No Coal Borehole		R.C.							
S110	391367.5	7340696.2	1028.9	S110/A SEAM/3	4.32	R.C.	1.50	22.30	18.0	6.9	24.0	51.1	1.99
S111	403734.0	7348386.9	1024.9	No Qualities available	9.50	R.C.							
S112	393939.4	7343248.5	1037.4	S112/A SEAM/1+3 (Sample 2 not available)	3.70	R.C.	1.45	23.43	15.0	7.6	22.6	54.8	0.89
S113	393854.2	7340702.5	1023.7	No Coal Borehole		R.C.							
S114	393956.4	7345755.9	1047.3	No Qualities available	5.06	R.C.							
S120	391347.8	7343239.4	1039.2	S120/A SEAM/2 (Samples missing/not taken)	4.77	R.C.	1.60	21.33	22.9	5.5	22.9	48.7	1.38
S121	395239.4	7344643.7	1038.0	No data		R.C.							
S122	395279.9	7341934.4	1030.4	No data		R.C.							
S123	395273.2	7347086.7	1046.3	Only E Seam recorded		R.C.							
S124	393874.8	7342139.6	1033.4	No data		R.C.							
S125	396362.4	7348335.5	1047.7	Only E Seam recorded		R.C.							
S126	392735.1	7340665.5	1027.6	Only E Seam recorded		R.C.							
S127	392772.2	7339165.1	1020.7	No data		R.C.							
S128	390419.1	7339126.7	1021.7	Only E Seam recorded		R.C.							
S129	401230.9	7348292.9	1025.0	Only E Seam recorded		R.C.							
S130	391369.4	7337729.5	1014.9	Only E Seam recorded		R.C.							
S131	394951.5	7337468.9	1009.5	No data		R.C.							
S132	389092.4	7340642.8	1026.8	Only E Seam recorded		R.C.							
S133	389094.0	7345765.3	1052.3	Only E Seam recorded		R.C.							
S134	405658.3	7348579.3	1020.0	Only E Seam recorded		R.C.							
S135	389118.9	7343222.3	1036.1	Only E Seam recorded		R.C.							
S136	403773.5	7345779.0	1014.0	Only E Seam recorded		R.C.							
S137	392665.8	7348359.7	1064.9	Only E Seam recorded		R.C.							
S138	401267.3	7343259.9	1009.0	No data		R.C.							
S139	397780.0	7344467.1	1026.4	No data		R.C.							
S140	395280.6	7343248.1	1032.7	No data		R.C.							
S141	400241.7	7344476.9	1017.1	No data		R.C.							
S142	395286.7	7339738.0	1018.0	No data		R.C.							
S143	397791.1	7345801.4	1030.7	No data		R.C.							
S144	402925.5	7344469.6	1013.0	Only E Seam recorded		R.C.							
S255	392727.8	7345772.0	1051.6	No Qualities available		R.C.							
S256	394013.3	7345743.0	1046.8	No Qualities available		R.C.							
S257	395241.5	7345773.0	1040.4	No Coal Borehole		R.C.							
S262	401280.0	7345846.0	1023.3	No Qualities available		R.C.							
S272	392726.9	7344514.9	1045.3	No Qualities available		R.C.							
S273	393939.7	7344521.0	1043.0	No Qualities available		R.C.							
S275	396364.5	7344652.0	1031.9	No Coal Borehole		R.C.							
S277	398791.6	7344464.0	1024.2	No Coal Borehole		R.C.							
S279	401299.9	7344461.0	1015.8	E Seam Only		R.C.							
S281	382782.1	7343131.0	1048.0	No Qualities available		R.C.							
S282	383994.9	7343128.0	1047.3	No Qualities available		R.C.							
S289	392721.2	7343209.0	1039.8	No Qualities available		R.C.							
S293	397789.1	7343205.0	1029.5	No Coal Borehole		R.C.							
S295	400256.1	7343202.0	1013.9	No Coal Borehole		R.C.							
S297	381554.0	7341858.0	1041.4	No Qualities available		R.C.							
S298	382792.0	7341881.0	1041.1	No Qualities available		R.C.							
S299	384041.0	7341878.0	1041.1	E Seam Only		R.C.							
S300	385305.0	7341922.0	1037.8	No Qualities available		R.C.							
S301	386549.0	7341868.0	1036.2	No Qualities available		R.C.							
S302	387803.0	7341921.0	1035.4	No Qualities available		R.C.							
S305	392008.2	7341943.0	1031.2	E Seam Only		R.C.							
S306	392741.1	7341936.0	1032.1	E Seam Only		R.C.							
S307	393886.9	7341893.0	1032.2	No Coal Borehole		R.C.							
S309	396342.8	7341952.0	1028.4	No Coal Borehole		R.C.							
S310	397787.6	7341953.0	1028.6	No Coal Borehole		R.C.							
S311	398788.7	7341949.0	1025.6	No Coal Borehole		R.C.							
S312	400306.1	7341950.0	1014.0	No Coal Borehole		R.C.							
S313	380295.0	7340626.0	1037.7	No Qualities available		R.C.							
S314	381549.0	7340634.0	1036.3	No Qualities available		R.C.							
S315	382803.0	7340616.0	1038.1	No Qualities available		R.C.							
S316	384020.0	7340644.0	1039.2	E Seam Only		R.C.							
S317	385290.0	7340647.0	1038.2	No Coal Borehole		R.C.							
S318	386559.0	7340657.0	1030.0	No Coal Borehole		R.C.							
S319	387818.0	7340667.0	1029.4	No Qualities available		R.C.							
S320	389170.0	7340646.0	1026.5	No Qualities available		R.C.							
S321	390403.0	7340663.0	1027.7	No Qualities available		R.C.							
S325	395278.4	7340703.0	1024.3	No Coal Borehole		R.C.							
S327	397765.6	7340710.0	1022.3	No Coal Borehole		R.C.							
S328	398808.1	7340687.0	1019.1	No Coal Borehole		R.C.							
S329	380295.0	7339376.0	1034.4	No Qualities available		R.C.							
S330	381552.0	7339384.0	1033.1	No Qualities available		R.C.							
S331	382787.0	7339397.0	1026.5	No Qualities available		R.C.							
S332	384019.0	7339384.0	1024.4	No Qualities available		R.C.							
S333	385288.0	7339384.0	1022.6	No Coal Borehole		R.C.							
S334	386568.0	7339415.0	1023.1	No Qualities available		R.C.							
S335	387817.0	7339411.0	1023.0	No Qualities available		R.C.							
S336	389055.0	7339414.0	1019.5	No Qualities available		R.C.							

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

A SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS			SAMPLE ID.	SEAM THICKN	RAW COAL (RAW COAL)	LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
	EASTING	NORTHING	ELEVATION										
S337	390402.0	7339421.0	1023.4	No Qualities available		R.C.							
S338	391356.0	7339444.0	1022.0	No Qualities available		R.C.							
S339	392749.0	7339449.0	1022.4	E Seam Only		R.C.							
S340	393853.4	7339461.0	1020.3	No Coal Borehole		R.C.							
S341	395298.1	7339451.0	1016.3	No Coal Borehole		R.C.							
S342	396360.9	7339458.0	1011.7	No Coal Borehole		R.C.							
S343	397764.3	7339448.0	1008.8	No Coal Borehole		R.C.							
S344	384041.0	7338129.0	1025.0	No Qualities available		R.C.							
S345	385278.0	7338132.0	1021.3	No Qualities available		R.C.							
S346	386563.0	7338154.0	1011.6	No Qualities available		R.C.							
S347	387836.0	7338183.0	1011.3	No Qualities available		R.C.							
S348	389049.0	7338220.0	1008.2	No Qualities available		R.C.							
S349	390416.0	7338141.0	1016.5	No Qualities available		R.C.							
S350	391361.0	7338202.0	1015.0	No Qualities available		R.C.							
S351	392759.0	7338169.0	1015.8	No Qualities available		R.C.							
S352	393842.0	7338179.0	1012.0	No Qualities available		R.C.							
S353	395313.0	7338175.0	1009.2	No Qualities available		R.C.							
S354	389053.0	7336961.0	997.6	No Qualities available		R.C.							
S355	390421.0	7336942.0	1002.1	No Qualities available		R.C.							
S356	391365.0	7336927.0	1010.8	No Qualities available		R.C.							
S357	392758.0	7336929.0	1011.2	Borehole blocked		R.C.							
S358	393841.0	7336936.0	1010.0	No Qualities available		R.C.							
AVERAGE							1.56	21.46	22.00	5.43	24.47	48.03	1.83
MINIMUM							1.45	12.10	15.00	2.60	17.00	29.00	0.38
MAXIMUM							1.83	23.98	49.30	7.60	26.90	54.80	3.76

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

A UPPER SEAM RAW COAL QUALITY DATABASE

						RAW COAL							
BH ID	UTM 35S WGS			SAMPLE ID.	SEAM THICKN	RAW COAL	LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
	EASTING	NORTHING	ELEVATION										
MW01	390386.5	7336956.4	1006.3	No. A Upper Seam not present		R.C.							
MW02	392726.1	7338195.3	1019.8	MW02_J	1.13	R.C.	1.62	19.40	29.6	4.4	31.8	34.1	1.82
MW03	391336.9	7340666.6	1032.2	MW03_J	1.33	R.C.	1.67	18.12	33.8	4.3	23	38.9	1.82
MW04	392233.0	7342679.6	1040.6	MW04_J	1.34	R.C.	1.62	19.50	29.7	5.0	24.6	40.7	4.85
MW05r	387762.9	7339406.9	1028.3	MW05R_J	1.69	R.C.	1.61	18.92	29.6	5.3	22.8	42.4	1.82
MW06	387745.3	7341898.5	1039.0	MW06_J	1.77	R.C.	1.62	19.63	30.1	4.4	24.1	41.4	3.04
MW07	385273.2	7338480.1	1023.4	No. A Upper Seam not present		R.C.							
MW08	387341.5	7336282.5	1021.3	MW08_J	1.66	R.C.	1.66	18.56	33.3	4.2	23.5	39	3.26
MW09	384457.3	7341231.5	1042.5	E Seam Only		R.C.							
MW10	391999.0	7334988.4	1007.1	No Coal Borehole		R.C.							
MW11	382158.5	7341439.9	1043.4	E Seam Only		R.C.							
MW12	382372.9	7338832.2	1025.4	MW12_J	1.95	R.C.	1.86	12.23	49.6	3.7	19.4	27.3	0.48
MW13	379503.5	7340213.6	1037.7	No. A Upper Seam not present		R.C.							
MW14	394747.9	7336666.3	1008.0	Abandond		R.C.							
MW15	376444.1	7340452.5	1040.0	MW15_J	2.12	R.C.	1.71	17.13	37.2	4.3	21.8	36.7	4.39
MW16r	387409.7	7339047.0	1021.9	No. A Upper Seam not present		R.C.							
MW17	387058.8	7339412.0	1023.9	No. A Upper Seam not present		R.C.							
MW18	387060.1	7338701.8	1015.8	No. A Upper Seam not present		R.C.							
MW19	382861.7	7338707.4	1020.9	No. A Upper Seam not present		R.C.							
MW20	383219.5	7339118.2	1020.4	No Coal Borehole		R.C.							
MW21	386709.0	7339053.3	1020.9	No Coal Borehole		R.C.							
MW22	387412.6	7339757.0	1026.2	No. A Upper Seam not present		R.C.							
MW23	382370.9	7339332.8	1028.0	No Coal Borehole		R.C.							
MW24	381961.5	7339112.4	1029.3	No. A Upper Seam not present		R.C.							
MW25	382110.3	7339765.8	1030.9	No. A Upper Seam not present		R.C.							
MW26	387403.5	7338354.8	1012.7	No. A Upper Seam not present		R.C.							
MW27	387835.0	7338629.4	1019.7	No. A Upper Seam not present		R.C.							
MW28	388112.3	7338978.0	1021.3	No. A Upper Seam not present		R.C.							
MW29R	388862.8	7339016.0	1018.4	No. A Upper Seam not present		R.C.							
MW30	389211.6	7339325.5	1019.9	No. A Upper Seam not present		R.C.							
MW31	387952.0	7337959.9	1007.6	No. A Upper Seam not present		R.C.							
MW32	388855.3	7339739.8	1024.9	MW32_J	1.25	R.C.	1.63	18.19	33.7	5	21.5	39.8	1.61
MW33	388247.8	7338305.9	1016.1	No. A Upper Seam not present		R.C.							
MW34	388530.0	7338648.2	1016.5	No. A Upper Seam not present		R.C.							
MW35	387767.4	7339018.6	1024.4	No. A Upper Seam not present		R.C.							
MW36	382895.6	7338221.9	1027.4	MW36_J	1.79	R.C.	1.63	18.53	32.6	5.2	21.5	40.7	1.86
MW37	388105.5	7339795.9	1025.3	No. A Upper Seam not present		R.C.							
MW38	387418.4	7338689.9	1020.9	No. A Upper Seam not present		R.C.							
MW39	386783.8	7339400.4	1025.4	No. A Upper Seam not present		R.C.							
MW40	387415.4	7339391.8	1027.1	MW40_J	1.95	R.C.	1.59	18.96	31	4.5	21.2	43.3	1.71
MW41	382277.8	7338336.3	1028.9	MW41_J	1.75	R.C.	1.66	18.50	32.5	4.9	21.5	41.1	1.90
MW42	386971.5	7338472.2	1009.5	No. A Upper Seam not present		R.C.							
MW43	387783.8	7340099.0	1027.9	No. A Upper Seam not present		R.C.							
MW44	381653.1	7338412.7	1031.2	MW44_J	1.76	R.C.	1.68	17.49	35.8	4.4	21.9	37.9	2.29
MW45	386748.3	7338708.2	1017.5	No. A Upper Seam not present		R.C.							
MW46	387334.0	7340371.7	1031.4	MW46_J	1.46	R.C.	1.57	18.58	33.3	4.7	22.8	39.2	1.00
MW47	387064.8	7339750.7	1028.9	No. A Upper Seam not present		R.C.							
MW48	387215.8	7340091.5	1029.6	MW48_J	2.33	R.C.	1.62	18.22	32.7	5.1	21.6	40.6	2.76
MW49	386387.4	7338696.1	1017.4	No. A Seam not present		R.C.							
MW50	387045.0	7339063.0	1023.3	No. A Seam not present		R.C.							
MW51	386994.2	7337682.9	1016.5	MW51_J	1.90	R.C.	1.65	18.31	34.2	3.9	22	39.9	0.96
MW52	381389.0	7338969.3	1029.5	No. A Upper Seam not present		R.C.							
MW53	388515.7	7339379.0	1023.0	MW53_J	1.78	R.C.	1.62	19.00	31.8	4.4	22.9	40.9	2.07
MW54R	387110.0	7341283.1	1035.3	No. A Upper Seam not present		R.C.							
MW55	389627.1	7337722.8	1017.5	MW55_J	1.97	R.C.	1.62	19.15	31.7	4.1	22.7	41.5	1.52
MW56	389900.7	7338711.1	1021.1	MW56_J	1.72	R.C.	1.65	18.52	33.2	4	22.2	40.7	3.22
MW57	381022.0	7339458.1	1037.7	No. A Upper Seam not present		R.C.							
MW58	391366.0	7338854.8	1019.7	MW58_J	1.63	R.C.	1.81	17.99	35.7	2.6	22.8	38.9	4.27
MW59	388105.7	7336967.5	1013.0	Borehole terminated above coal seams		R.C.							
MW60	381702.6	7339587.0	1035.6	No. A Upper Seam not present		R.C.							
MW61	391994.3	7337062.8	1014.8	MW61_J	1.87	R.C.	1.75	19.02	33.6	2.5	23.2	40.7	2.08
MW62	381637.6	7340140.7	1035.7	MW62_J	1.45	R.C.	1.75	18.91	32.4	3.5	22.5	41.5	1.25
MW63	389729.8	7340313.5	1024.8	MW63_J	1.40	R.C.	1.68	17.73	36.1	3.9	22.1	37.9	1.88
MW64	380933.0	7340654.3	1038.2	No. A Upper Seam not present		R.C.							
MW65R	380905.1	7339969.1	1037.8	MW65R_J	2.10	R.C.	1.65	15.78	36.4	5.7	21.4	36.5	0.90
MW66	380676.7	7341183.2	1042.5	MW66_J	1.55	R.C.	1.77	17.88	34.6	4.6	22.4	38.3	2.44
MW67	381530.8	7341060.4	1039.3	No. A Upper Seam not present		R.C.							
MW68	381216.3	7341678.6	1042.0	No. A Upper Seam not present		R.C.							
MC01	403737.0	7345351.0	1013.0			R.C.							
MC02	407001.8	7346006.5	1004.9			R.C.							
MC03	410000.4	7344003.1	991.7	No Coal Borehole		R.C.							
MC04	413000.0	7345000.0	983.0	Borehole intersecting G & K seams only		R.C.							
S2	398820.6	7355432.8	1096.5	No Coal Borehole		R.C.							
S3	405519.4	7355304.0	1045.9	No Coal Borehole		R.C.							
S4	398792.4	7345816.6	1028.0			R.C.							
S5	398703.1	7351378.1	1040.5	No Coal Borehole		R.C.							
S9	407948.6	7361539.9	1061.7			R.C.							

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

A UPPER SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS			SAMPLE ID.	SEAM THICKN	RAW COAL							
	EASTING	NORTHING	ELEVATION			RAW COAL	LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
S15	391927.8	7345761.3	1052.9			R.C.							
S23	382868.0	7349149.0	1074.9			R.C.							
S27	374969.0	7345664.0	1070.6			R.C.							
S31	385561.7	7342674.3	1038.2			R.C.							
S103	396355.5	7343235.4	1030.0	E Seam Only		R.C.							
S105	401197.6	7345823.1	1023.0			R.C.							
S106	396273.8	7345770.0	1039.5	No Coal Borehole		R.C.							
S107	398810.8	7343232.5	1024.7	No Coal Borehole		R.C.							
S108	398835.3	7348327.5	1037.6			R.C.							
S109	396382.6	7340721.0	1018.7	No Coal Borehole		R.C.							
S110	391367.5	7340696.2	1028.9			R.C.							
S111	403734.0	7348386.9	1024.9			R.C.							
S112	393939.4	7343248.5	1037.4			R.C.							
S113	393854.2	7340702.5	1023.7	No Coal Borehole		R.C.							
S114	393956.4	7345755.9	1047.3			R.C.							
S120	391347.8	7343239.4	1039.2			R.C.							
S121	395239.4	7344643.7	1038.0	No data		R.C.							
S122	395279.9	7341934.4	1030.4	No data		R.C.							
S123	395273.2	7347086.7	1046.3	Only E Seam Data recorded		R.C.							
S124	393874.8	7342139.6	1033.4	No data		R.C.							
S125	396362.4	7348335.5	1047.7	Only E Seam Data recorded		R.C.							
S126	392735.1	7340665.5	1027.6	Only E Seam Data recorded		R.C.							
S127	392772.2	7339165.1	1020.7	No data		R.C.							
S128	390419.1	7339126.7	1021.7	Only E Seam Data recorded		R.C.							
S129	401230.9	7348292.9	1025.0	Only E Seam Data recorded		R.C.							
S130	391369.4	7337729.5	1014.9	Only E Seam Data recorded		R.C.							
S131	394951.5	7337468.9	1009.5	No data		R.C.							
S132	389092.4	7340642.8	1026.8	Only E Seam Data recorded		R.C.							
S133	389094.0	7345765.3	1052.3	Only E Seam Data recorded		R.C.							
S134	405658.3	7348579.3	1020.0	Only E Seam Data recorded		R.C.							
S135	389118.9	7343222.3	1036.1	Only E Seam Data recorded		R.C.							
S136	403773.5	7345779.0	1014.0	Only E Seam Data recorded		R.C.							
S137	392665.8	7348359.7	1064.9	Only E Seam Data recorded		R.C.							
S138	401267.3	7343259.9	1009.0	No data		R.C.							
S139	397780.0	7344467.1	1026.4	No data		R.C.							
S140	395280.6	7343248.1	1032.7	No data		R.C.							
S141	400241.7	7344476.9	1017.1	No data		R.C.							
S142	395286.7	7339738.0	1018.0	No data		R.C.							
S143	397791.1	7345801.4	1030.7	No data		R.C.							
S144	402925.5	7344469.6	1013.0	Only E Seam Data recorded		R.C.							
S255	392727.8	7345772.0	1051.6			R.C.							
S256	394013.3	7345743.0	1046.8			R.C.							
S257	395241.5	7345773.0	1040.4	No Coal Borehole		R.C.							
S262	401280.0	7345846.0	1023.3			R.C.							
S272	392726.9	7344514.9	1045.3			R.C.							
S273	393939.7	7344521.0	1043.0			R.C.							
S275	396364.5	7344652.0	1031.9	No Coal Borehole		R.C.							
S277	398791.6	7344464.0	1024.2	No Coal Borehole		R.C.							
S279	401299.9	7344461.0	1015.8	E Seam Only		R.C.							
S281	382782.1	7343131.0	1048.0			R.C.							
S282	383994.9	7343128.0	1047.3			R.C.							
S289	392721.2	7343209.0	1039.8			R.C.							
S293	397789.1	7343205.0	1029.5	No Coal Borehole		R.C.							
S295	400256.1	7343202.0	1013.9	No Coal Borehole		R.C.							
S297	381554.0	7341858.0	1041.4			R.C.							
S298	382792.0	7341881.0	1041.1			R.C.							
S299	384041.0	7341878.0	1041.1	E Seam Only		R.C.							
S300	385305.0	7341922.0	1037.8			R.C.							
S301	386549.0	7341868.0	1036.2			R.C.							
S302	387803.0	7341921.0	1035.4			R.C.							
S305	392008.2	7341943.0	1031.2			R.C.							
S306	392741.1	7341936.0	1032.1			R.C.							
S307	393886.9	7341893.0	1032.2	No Coal Borehole		R.C.							
S309	396342.8	7341952.0	1028.4	No Coal Borehole		R.C.							
S310	397787.6	7341953.0	1028.6	No Coal Borehole		R.C.							
S311	398788.7	7341949.0	1025.6	No Coal Borehole		R.C.							
S312	400306.1	7341950.0	1014.0	No Coal Borehole		R.C.							
S313	380295.0	7340626.0	1037.7			R.C.							
S314	381549.0	7340634.0	1036.3			R.C.							
S315	382803.0	7340616.0	1038.1			R.C.							
S316	384020.0	7340644.0	1039.2	E Seam Only		R.C.							
S317	385290.0	7340647.0	1038.2	No Coal Borehole		R.C.							
S318	386559.0	7340657.0	1030.0	E Seam Only		R.C.							
S319	387818.0	7340667.0	1029.4			R.C.							
S320	389170.0	7340646.0	1026.5			R.C.							
S321	390403.0	7340663.0	1027.7			R.C.							
S325	395278.4	7340703.0	1024.3	No Coal Borehole		R.C.							
S327	397765.6	7340710.0	1022.3	No Coal Borehole		R.C.							
S328	398808.1	7340687.0	1019.1	No Coal Borehole		R.C.							
S329	380295.0	7339376.0	1034.4			R.C.							
S330	381552.0	7339384.0	1033.1			R.C.							
S331	382787.0	7339397.0	1026.5			R.C.							
S332	384019.0	7339384.0	1024.4			R.C.							
S333	385288.0	7339384.0	1022.6	No Coal Borehole		R.C.							
S334	386568.0	7339415.0	1023.1			R.C.							
S335	387817.0	7339411.0	1023.0			R.C.							
S336	389055.0	7339414.0	1019.5			R.C.							
S337	390402.0	7339421.0	1023.4			R.C.							
S338	391356.0	7339444.0	1022.0			R.C.							

APPENDIX 7: Coal Qualities - Summary of Raw Coal Qualities for the E; A and A Upper Coal Seam Intersections

A UPPER SEAM RAW COAL QUALITY DATABASE

BH ID	UTM 35S WGS EASTING	NORTHING	ELEVATION	SAMPLE ID.	SEAM THICKN	RAW COAL	RAW COAL LAB. R.D.	C.V. MJ/kg	ASH %	MOIST %	VOL %	F.C. %	SULF %
S339	392749.0	7339449.0	1022.4	E Seam Only		R.C.							
S340	393853.4	7339461.0	1020.3	No Coal Borehole		R.C.							
S341	395298.1	7339451.0	1016.3	No Coal Borehole		R.C.							
S342	396360.9	7339458.0	1011.7	No Coal Borehole		R.C.							
S343	397764.3	7339448.0	1008.8	No Coal Borehole		R.C.							
S344	384041.0	7338129.0	1025.0			R.C.							
S345	385278.0	7338132.0	1021.3			R.C.							
S346	386563.0	7338154.0	1011.6			R.C.							
S347	387836.0	7338183.0	1011.3			R.C.							
S348	389049.0	7338220.0	1008.2			R.C.							
S349	390416.0	7338141.0	1016.5			R.C.							
S350	391361.0	7338202.0	1015.0			R.C.							
S351	392759.0	7338169.0	1015.8			R.C.							
S352	393842.0	7338179.0	1012.0			R.C.							
S353	395313.0	7338175.0	1009.2			R.C.							
S354	389053.0	7336961.0	997.6			R.C.							
S355	390421.0	7336942.0	1002.1			R.C.							
S356	391365.0	7336927.0	1010.8			R.C.							
S357	392758.0	7336929.0	1011.2	Borehole Blocked		R.C.							
S358	393841.0	7336936.0	1010.0			R.C.							

				LAB. R.D.	C.V.	ASH	MOIST	VOL	F.C.	SULF
AVERAGE				1.67	18.17	33.77	4.34	22.69	39.20	2.21
MINIMUM				1.57	12.23	29.60	2.50	19.40	27.30	0.48
MAXIMUM				1.86	19.63	49.60	5.70	31.80	43.30	4.85

Logistics Report

Wireline Logging Survey

For

Minergy Coal Ltd

Masama Project Area

Botswana

Prospecting Licence 278/2012

June 2017

Poseidon Geophysics

Logistics Report

Wireline Logging

Masama Project Area

For

Minergy Coal

INTRODUCTION

The logistics report gives an account of the wireline logging which was completed by Poseidon Geophysics (Pty) Ltd for Minergy Coal Ltd within prospecting licence 278/2012 called the Masama Project Area.

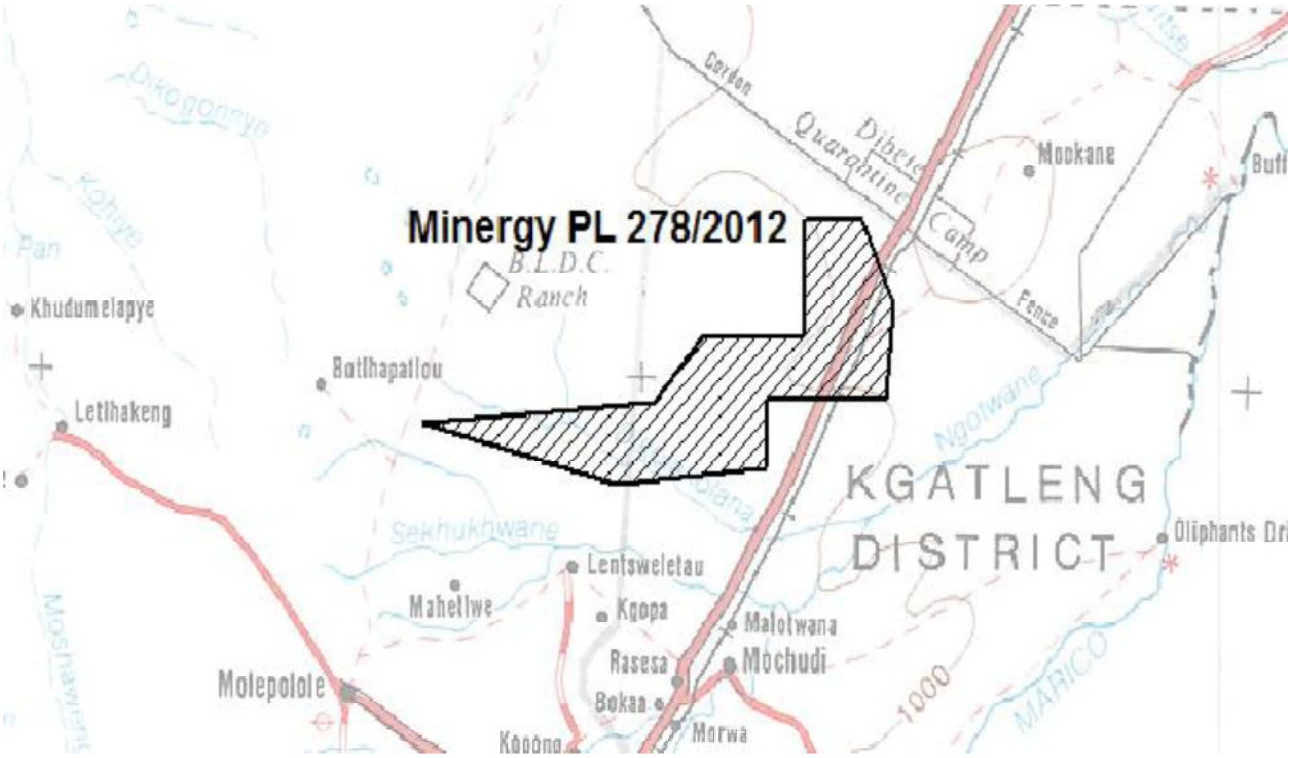

Figure 1: Location of Prospecting Licence 278/2012

Poseidon Geophysics (Pty) Ltd was contracted to undertake wireline logging of boreholes, drilled within the above Prospecting Licence areas. To this end Poseidon provided an Auslog logging unit comprising of a DLS5, 600m single conductor winch with a dual density, natural gamma, and single arm sonde.

Drilling was completed using coring rigs owned and operated by Diabor from South Africa. A total of 62 boreholes, comprising of some 4 875.34 logged metres, were logged between the

3rd March and 29th May 2017 within this licence area. Fieldwork was completed on a call-out basis from Gaborone.

Three boreholes, namely MW 38, 40 and 43 were also logged with a ALT Acoustic Televiewer tool. An Auslog Full-wave Sonic tool was also attempted on one of these holes, however, the tool was not synchronising with the data logger, and thus surveying with this tool was abandoned. The report on the Acoustic Televiewer interpretation will be presented as a separate report.

SURVEY PERSONNEL

The following Poseidon Geophysics crew carried out the survey;

Table 1 : Survey Personnel

NAME	*POSITION*	*DUTIES*
Bill McLellan	Manager	Client Liaison, Reporting, Quality Control
Irikidzai Sigauke	Senior Geophysicist	Wireline Data Acquisition and Processing
George Baleseng	Geophysicist	Wireline Data Acquisition
Ofentse Moletlanyi	Technician	Wireline Data Acquisition
Alex Mokwatso	Technician	Wireline Data Acquisition

The project diary which lists the boreholes logged, and the logging dates, is tabulated in Appendix I. In Appendix II are the boreholes logged, tabulated in date order.

SURVEY EQUIPMENT, METHODOLOGY AND DATA PROCESSING

The wireline logging was undertaken using an Auslog Logging System, the specifications for the instruments are appended to this report as Appendix III. Only four parameters were recorded, namely natural gamma, single-arm, long and short spaced density in all the holes. The sonde was calibrated prior to and upon completion of the project.

The Auslog system collects data directly from the winch using Windows based programmes called WellVision and AusWin. The sonde parameters are set within the software and thus all the shifts for the instrument offsets are completed automatically. Plotting of the data was completed using WellCAD, as per the geologists' requirements. Final plots of the data at 1:100 scale were produced for each hole. Holes where coal was intersected, additional plots at a scale of 1:50 were produced.

Accompanying this report are the digital archives of the logs in WellCAD and LAS format, On the CD-ROM is the WellCAD reader software which makes it possible to review these logs, change scales and layouts by the user, if so required.

Respectfully submitted,

26 June 2017

William H. McLellan
Managing Director

For

Poseidon Geophysics (Pty) Ltd
Private Bag X018
The Village
Gaborone

APPENDIX I – SURVEY DIARY

Date	Activity	Boreholes logged	Operators
3-Mar-17	Density logging	MW27, MW28, MW29	George Baleseng & Ofentse Moletlanyi
15-Mar-17	Density logging	MW29R, MW30, MW31, MW26	Irikidzai Siguake, George Baleseng & Ofentse Moletlanyi
23-Mar-17	Density logging	MW32, MW33, MW35	William McLellan & Kedibonye Mokwatso
27-Mar-17	Density logging	MW34, MW36, MW37	William McLellan & Kedibonye Mokwatso
30-Mar-17	Density logging	MW38, MW39, MW40	William McLellan & Kedibonye Mokwatso
5-Apr-17	ATV logging	MW38, MW40, MW43	Irikidzai Siguake & Kedibonye Mokwatso
6-Apr-17	Density logging	MW41, MW42, MW43, MW46	Irikidzai Siguake & Kedibonye Mokwatso
12-Apr-17	Density logging	MW44, MW45, MW47, MW48	William McLellan & Kedibonye Mokwatso
29-Apr-17	Density logging	MW50, MW51, MW52, MW53	Kedibonye Mokwatso & Ofentse Moletlanyi
5-May-17	Density logging	MW55, PA05, PA06, PA07, PA11, PA14, PA17	Kedibonye Mokwatso & Ofentse Moletlanyi
10-May-17	Density logging	MW56, PA16, PA01, PA02, PA03,PA15	Kedibonye Mokwatso & Ofentse Moletlanyi
12-May-17	Density logging	PA09, PA12, PB08, PB02, PB05, PB06, PB07	Kedibonye Mokwatso & Ofentse Moletlanyi
18-May-17	Density logging	MW57, MW58, MW60, PA04, PA08, PA10, PA18	Kedibonye Mokwatso & Ofentse Moletlanyi
23-May-17	Density logging	MW62, MW64, MW66	Kedibonye Mokwatso & Ofentse Moletlanyi
25-May-17	Density logging	MW54R; MW67; MW68	Kedibonye Mokwatso & Ofentse Moletlanyi
29-May-17	Density logging	MW63; MW65R	Kedibonye Mokwatso & Ofentse Moletlanyi

APPENDIX II – BOREHOLES LOGGED

Date	Borehole	Drilled Depth	Logged Depth
03-Mar-17	MW27	50.39	50.26
03-Mar-17	MW27R	50.39	50.22
03-Mar-17	MW28	50.75	49.73
03-Mar-17	MW28R	50.75	49.73
15-Mar-17	MW26	48.00	47.82
15-Mar-17	MW26R	48.00	47.86
15-Mar-17	MW29	44.00	39.09
15-Mar-17	MW29A	56.81	56.75
15-Mar-17	MW29AR	56.81	56.71
15-Mar-17	MW30	54.20	53.20
15-Mar-17	MW30R	54.20	53.22
15-Mar-17	MW31	54.20	43.76
15-Mar-17	MW31R	54.20	43.76
23-Mar-17	MW32	59.64	59.71
23-Mar-17	MW32R	59.64	57.30
23-Mar-17	MW33	62.90	61.79
24-Mar-17	MW33R	62.90	61.51
24-Mar-17	MW35	59.60	52.29
24-Mar-17	MW35R	59.60	52.43
27-Mar-17	MW34	58.32	58.51
27-Mar-17	MW34R	58.32	58.58
27-Mar-17	MW37	56.54	55.58
27-Mar-17	MW37R	56.54	55.03
28-Mar-17	MW36	74.71	74.10
28-Mar-17	MW36R	74.71	74.11
30-Mar-17	MW38	49.60	48.89
30-Mar-17	MW38R	49.60	48.94
30-Mar-17	MW40	56.54	56.32
30-Mar-17	MW40R	56.54	56.32
31-Mar-17	MW39	39.32	38.52
31-Mar-17	MW39R	39.32	38.18
06-Apr-17	MW41	83.79	83.78
06-Apr-17	MW41R	83.79	83.67
06-Apr-17	MW42	46.63	46.34
06-Apr-17	MW42R	46.63	46.16
06-Apr-17	MW43	55.19	49.50
06-Apr-17	MW43R	55.19	49.51
06-Apr-17	MW46	63.89	62.89
06-Apr-17	MW46R	63.89	62.76
12-Apr-17	MW44	73.52	73.76

Date	*Borehole*	*Drilled Depth*	*Logged Depth*
12-Apr-17	MW44R	73.52	73.76
12-Apr-17	MW45	45.46	46.31
12-Apr-17	MW45R	45.46	46.35
12-Apr-17	MW47	53.05	53.35
12-Apr-17	MW47R	53.05	53.48
12-Apr-17	MW48	56.44	56.33
12-Apr-17	MW48R	56.44	56.43
29-Apr-17	MW50	47.54	47.53
29-Apr-17	MW50R	47.54	47.49
29-Apr-17	MW51	70.40	70.41
29-Apr-17	MW51R	70.40	70.50
29-Apr-17	MW52	59.64	59.36
29-Apr-17	MW52R	59.64	59.35
29-Apr-17	MW53	59.58	57.80
29-Apr-17	MW53R	59.58	58.60
05-May-17	MW55	88.42	82.41
05-May-17	MW55R	88.42	82.19
05-May-17	PA05	40.00	39.47
05-May-17	PA06	27.00	26.56
05-May-17	PA07	33.00	32.63
05-May-17	PA11	37.00	36.51
05-May-17	PA14	32.00	31.33
05-May-17	PA17	36.00	31.03
10-May-17	MW56	87.27	85.90
10-May-17	PA01	30.00	27.54
10-May-17	PA02	24.00	21.68
10-May-17	PA03	29.00	26.74
10-May-17	PA15	31.00	27.84
10-May-17	PA16	30.00	27.53
12-May-17	PA09	27.00	25.79
12-May-17	PA12	25.00	21.77
12-May-17	PB02	30.00	27.79
12-May-17	PB05	33.00	30.26
12-May-17	PB06	40.00	37.66
12-May-17	PB07	37.00	34.50
12-May-17	PB08	30.00	27.73
18-May-17	MW57	68.59	68.15
18-May-17	MW58	100.46	99.78
18-May-17	MW60	62.12	62.21
18-May-17	PA04	43.00	42.68
18-May-17	PA08	25.00	24.44
18-May-17	PA10	25.00	24.40
18-May-17	PA18	37.00	36.15

Date	*Borehole*	*Drilled Depth*	*Logged Depth*
23-May-17	MW62	62.74	62.50
23-May-17	MW64	64.22	63.94
23-May-17	MW66	76.37	76.14
25-May-17	MW54	72.16	72.07
25-May-17	MW54R	72.16	72.04
25-May-17	MW67	42.00	41.78
25-May-17	MW68	67.22	66.89
25-May-17	MW68R	67.22	67.22
29-May-17	MW63	78.76	77.34
29-May-17	MW65R	67.37	67.08
	Total	***3 161.98***	***4 875.34***

APPENDIX III – INSTRUMENT SPECIFICATIONS

Auslog Logging System

W600-1 Winch

DLS5 Logging System

A605 Dual Density, Single Arm Calliper, Natural Gamma

WellCAD Software

The Winch is the work horse in your system!

Geophysical Logging Winches

W450-1

W300-4

W1000-4

W3000-4

Selecting the right Winch

Auslog manufacture a wide range of winches, from small hand-portable 450 metre through to 3000 capacity models. Our winches are widely recognised for their exceptional quality of construction, advanced design and proven reliability.
The winch system is often given less consideration than the data acquisition system or the logging tools, however it is usually the winch that fails. With this in mind Auslog provides a large range of rugged, reliable and trouble free winch systems.

Auslog manufacture a range of winches suitable for all types of geophysical logging cable. The standard range include the W450-1, W600-1 and W800-1 single conductor models, and W300-4, W600-4, W1000-4, W1500-4, W2000-4 and W3000-4 models.

Auslog Winches include the following features:

- Durable construction of aluminium and stainless steel.
- Compact, low maintenance light weight designs.
- Powered by hand crank of 12VDC, 115/240VAC motor drives.
- Electronic sensing of cable depth and logging direction.
- Mechanical odometer counter
- Remote Speed Controller for added convenience
- Automatic cable spooling with precision cable laying mechanism.
- Manual hand crank always supplied in case of power failure.
- Standard logging speeds, 1 to 30 metres per minute.
- A clutch is fitted so that the drive motor may be disengaged as required.

No other winch on the market today has such a proved record for reliability and value.

Technical Notes

Nonmagnetic Construction: Winching systems are of a strong nonmagnetic construction, using mainly aluminium and stainless steel. This is done to reduce interference particularly in electric logging tools. A secondary benefit is a significant reduction in weight.

Motor Drive Power: Optional motor drive power of 12vdc, suitable for all single conductor models and the W300-4) 115 and 230 vac or vdc is available. A remote contol is supplied with all models. It is recommended that power be selected that conforms to local area power requirements. This is particularly useful for connection directly to mains power during times of training, testing and repairing.

Logging Speed: The speed control for the winching system is variable between 0 and 30 metres per minute (0 and 100 feet) with accurate logging speeds between 0.5 and 30 metres per minute (2 and 100 feet). If special speeds less than 0.5 or more than 30 metres per minute are required consult the factory so appropriate gear ratios can be fitted.

Brake System: This winching system is provided with a disc brake system for maximum operator control and safety. The manual disc brake is a locking brake for holding the winch stationary or can be used for emergency stopping or for control when lowering tools into the borehole, a second hydroloc activated brake is fitted to most of the largher models.

Speed Control: The winching system when used with a motor drive includes solid state variable speed controller with remote control. This can be mounted near the winch in a self contained box or can be remotely installed in a cabinet with the other logging instruments. For cabinet mounting the controller unit is Euro construction and a Euro bin is required.

Depth Counter: The mechanical counter is mounted on all winch's in a convenient location. It provides a reading in metres and tenths of a metre. For depth measurement in feet the reading is in feet and tenths of a foot. the counter is spring loaded and can be easily reset to 0 or other predetermined depth.

Measuring Wheel: The precision measuring wheel is made from stainless steel and allows for accurate measurement of tool depth. Depth measurement accuracy better than 0.01% is standard.

Depth Encoder: A unique electronic depth sensor mounted in the measuring wheel assembly provides an accurate pulse signal used for driving chart recorders, digital readout display, or for storage of log tool data on magnetic tape or disk. The interval between depth pulses is 10 mm which allow for very accurate recording of depth and log date.

Cable Spooling: An automatic cable level wind system is incorporated with the measuring wheel assembly. The measuring wheel tracks across the cable drum to provide a neat consistent cable lay. A manual adjustment capability is included.

Model	Cable	Capacity	Net Weight (with cable)	Shipping Weight	Dimensions
W450-1 Hand wind	1/10" 2.54mm Single conductor	450 metres (1500 feet)	22.7 kg (50 lb)	35.2 kg (77.6 lb)	Width 330mm (13in) Depth 280mm (11in) Height400mm (15.7in)
.					
	1/10"				Width 520mm (20.5in)

W450-1 with motor drive	2.54mm Single conductor	450 metres (1500 feet)	43.7 kg (96 lb)	56.2 kg (124 lb)	Depth 420mm (16.5in) Height 400mm (15.7in)
.					
W600-1 with motor drive	1/10" 2.54mm Single conductor	600 metres (1968 feet)	48 kg (106 lb)	60.5 kg (133 lb)	Width 520mm (20.5in) Depth 420mm (16.5in) Height 430mm (16.9in)
.					
W800-1 with motor drive	1/10" 2.54mm Single conductor	800 metres (3280 feet)	53.2 kg (120 lb)	66 kg (145 lb)	Width 520mm (20.5in) Depth 280mm (11in) Height 430mm (16.9in)

LOGGING CABLE DETAILS				
P0435 Logging cable	Single conductor	Diameter 1/10" 2.54mm	Breaking Strain 450kg (1000lb)	Weight in Air 2.9 kg per 100m 17.4 lb per 1000ft

Remember, the winch is the heart of the logging system

Model	Cable	Capacity	Net Weight (with cable)	Shipping Weight	Dimensions
W300-4 (motor drive)	3/16" 4.76mm Four conductor	300 metres (984 feet)	92.8 kg (204.2 lb)	99.3 kg (281.2 lb)	Width 710mm (28in) Depth 580mm (22.9in) Height 445mm (17.5in)
.					
W600-4 (motor drive)	3/16" 4.76mm Four conductor	600 metres (1968 feet)	128 kg (282 lb)	134.6 kg (296 lb)	Width 710mm (28in) Depth 580mm (22.9in) Height 445mm (17.5in)
.					
W1000-4 (motor drive)	3/16" 4.76mm Four conductor	1000 metres (3280 feet)	222 kg (489 lb)	247 kg (545 lb)	Width 900mm (35.4in) Depth 780mm (31.7in) Height 600mm (23.6in)
.					
W1500-4 (motor drive)	3/16" 4.76mm Four conductor	1500 metres (4920 feet)	222 kg (489 lb)	247 kg (545 lb)	Width 900mm (35.4in) Depth 780mm (31.7in) Height 600mm (23.6in)
.					
W2000-4 (motor drive)	3/16" 4.76mm Four conductor	2000 metres (6560 feet)	327 kg (721 lb)	355 kg (783 lb)	Width 900mm (35.4in) Depth 780mm (31.7in) Height 600mm (23.6in)
.					
W3000-4 (motor drive)	3/16" 4.76mm Four conductor	3000 metres (9840 feet)	420 kg (924 lb)	480 kg (1056 lb)	Width 1110 mm (43.7in) Depth 1200 mm (47.3in) Height 875 mm (34.5 in)

LOGGING CABLE SPECIFICATION				
P1265 Logging cable	Four conductor	Diameter 3/16" 4.76mm	Breaking Strain 1360kg (3000lb)	Weight in Air 9.1 kg per 100m 61 lb per 1000ft

Digital Logging Systems

Auslog

Auslog provide some of the most advanced Digital Logging Systems in the world, available configurations to suit every requirement, small portable units through to systems suitable for vehicle installation. Systems feature high speed multiplexed data transmission that allows large numbers of parameters to be measured simultaneously. Auslog systems still retain compatibility with conventional pulsed and analogue tools.

Auslog offers two Digital Loggings Systems:

1. DLS Plus, which incorporates a single processor and accommodates digital multiplex probe by incorporating a telemetry system. This system enables bi-directional communication with th intelligent downhole electronics, while still maintaining compatibility with conventional pulse ar analogue type probes.

2. DLS 5, which has the same capabilities as the DLS Plus, with the added advantage of:

- Dual processors
- RS485 interface
- Up to 115KB data communication
- Software programmable power supply
- Plus other features

Both the DLS's are available in four convenient configurations:

1. Portable, in a heavy duty moulded instrument case that provides for the convenient inclusion of a laptop computer.

   Perfectly suited for the field environment.

2. Mobile unit, designed to be used as either a portable stand alone unit or mounted into a logging vehicle.

3. 19" Rack, for permanent inclusion into a console.

4. Master Logger, this system is most suited to vehicle mounted applications. The Master Logger comes complete with a comprehensive range of built-in peripherals including:

   - Colour monitor for real time display of geophysical logs.
   - High resolution and high speed printer / plotter, capable of producing high quality hard copies in the field.
   - Standard 101 key keyboard for operator input.
   - High speed IBM compatible computer for gathering and processing of data.

Portable

Mobile Unit

19" Rack

Master Logger

Each system includes the logging system electronics, computer interface, tool power and a software needed to record and replay logs (see Auslog Software). The DLS uses an IB compatible PC to record and display logging data, and all functions are controlled via th keyboard. Software for acquisition, logging, display, plotting and interpretation of data ar provided as standard.

A605 Dual Density / Caliper / Gamma Tool

Back to catalogue

Tool Description

Density/Gamma

The density tool or gamma-gamma log contains both a source of gamma radiation, and a gamma detector.The proportion of gamma rays emitted by the source and back-scattered to the detector is a measure of the density of the formation in the vicinity of the source/detector combination.

Different source-detector spacing may be used, for example to maximise thin bed resolution, or to improve the accuracy of the density calibration.

Gamma information is available by viewing A631 & A675.

Caliper

The caliper provides quantitative information about hole-diameter. The caliper is an electromechanical unit that, by use of a spring-loaded arm, gives a measurement of borehole diameter. Knowledge of borehole diameter can be used to correct the response of the density log that is sensitive to borehole diameter. It can also provide an indication of the mechanical properties of the rocks by showing areas of caving.

Applications

- **Coal**

  The unusually low density of coal means that it may be identified readily by the density tool. The actual value of the density is an indication of the ash content. Thin ash bands and seam splits may be easily discerned

- **Iron ore**

  In iron ore exploration, ore density is a useful measure of iron content.

- **Groundwater exploration**

  For groundwater exploration strata density can be related to porosity. Legislative requirements may preclude the operation of conventional density logs water bores.

- **Engineering**

  Engineering applications use the density log as a reliable indicator of rock strength. Factors such as weathering, fracturing and porosity can be evaluated - these seriously affect mining and excavation characteristics. Quantitatively, density can be allied to such strength parameters as Poisson’s ration. Generally thin but often critically important strata such as volcanic ash and carbonates, can be identified.

- **Mineral related exploration**

  Quantitatively, density can be allied to such strength parameters as Poisson’s ratio. Generally thin but often critically important strata such as volcanic ash and carbonates can be identified.
  Contact Auslog for further information.

FEATURES

Density output in g/cc

Short Spaced and Long Spaced Dual Dectors

Strong Caliper Arm for borehole contact

High Quality Collimation

Natural Gamma Included

MEASUREMENTS

SSD, LSD, Caliper, Natural Gamma

APPLICATIONS

Water	Location of Aquifiers and indications of porosity + others
Engineering	Ground Compaction, weathered zone detection, rock strength + others
Minerals	Bed Thickness, Ash content of coal, density units, correlation + others

OPERATING CONDITIONS

Borehole type	Open-hole, Water Filled, potential in some cased hole/ airsituations

SPECIFICATIONS

Diameter	50 mm / 1.96 in
Length	2300 mm / 90.55 in
Weight	15 kg / 33.06 lb
Shipping Weight	18 kg / 39.68 lb
Max. temperature	70ºC / 158ºF
Max. pressure	21000 kPa / 3000 PSI
Tool Voltage Required	40 VDC
Tool Current Required	170 mA
Tool Power Required	7 W
Communications	RS232
Cable Conductors Required	1 or 4

SENSORS

DENSITY

LSD	NaI scintillation crystal

SSD	SSD NaI scintillation crystal
Range	1 - 3 g/cc
Calibration	Calibration Block
Radioactive Source	127 mCi
NATURAL GAMMA	NaI scintillation crystal
Crystal Size	1 x 3 in
Calibration	API Jig
CALIPER	
Arm Range	50 to 250mm
Calibration	Calibration plate

MODELS

A605	
A605B	
A605C	
A605D	Current Model

SALES INFORMATION

Click here to contact sales for more information

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WellCad

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BOREHOLE IMAGE ANALYSIS
SONIC PROCESSING
MULTIWELL
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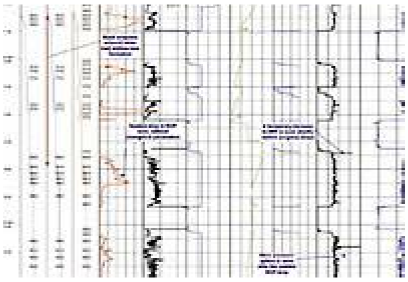
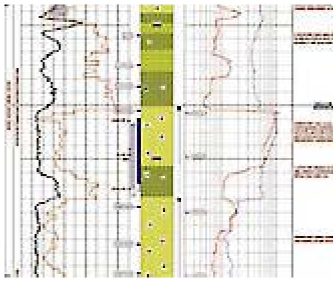
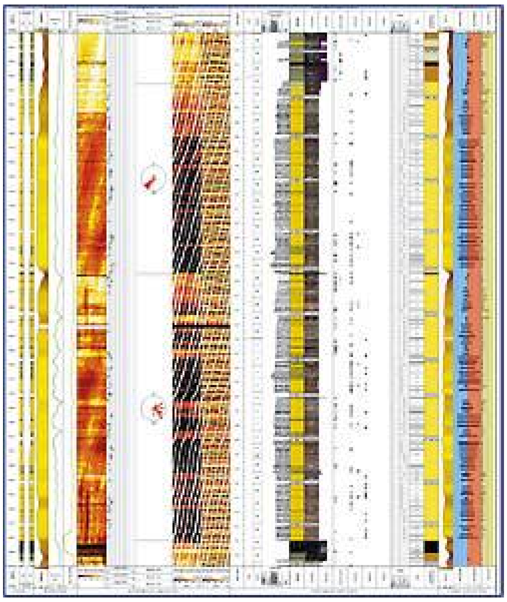
WELLCAD

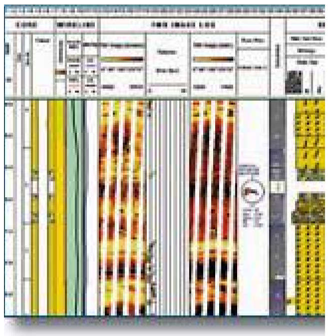
WellCAD is PC based composite log package, which combines comprehensive graph mechanisms and data processing tools.





Combining technically excellent display, editing and analysis capabilities for well dat become the standard log composite software in the Mining, Oil&Gas and Geotechnic used in a wide range of applications.
The basic module incorporates all features and tools necessary to import, edit, proc your Well data. The software is delivered with a set Templates, Header, Dictionaries specific application. You can of course easily modify existing ones or create you owr





WellCAD software outlines (PDF)
WellCAD brochure (PDF)

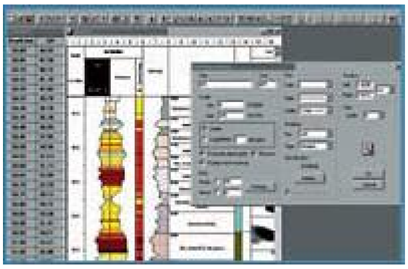
DATA IMPORT/EXPORT

ASCII, CSV, TXT files, ASCII,
Bitmap files (*.bmp, *tif)
Many 3rd party proprietary files - contact support@alt.lu to have the latest updated
LIS/DLIS (optional)

DATA PRESENTATION

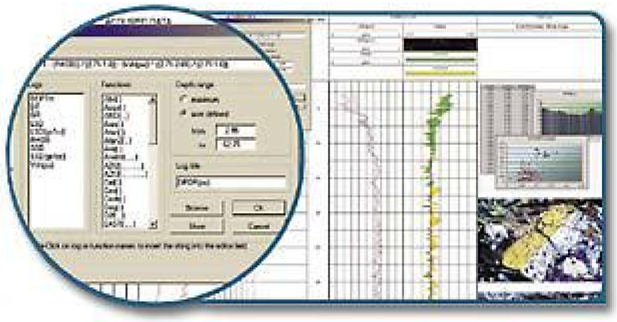
WellCAD handles a wide range of data type from wire line data, core data, images,

many more. All data are numerical and can be edited in a separate spread sheet vie
Do not hesitate to ask support@alt.lu if you can' t find the appropriate log type to h
data.



DEPTH MANAGEMENT
Multiple depth management (time, depth, TVD)
Advanced depth matching tool

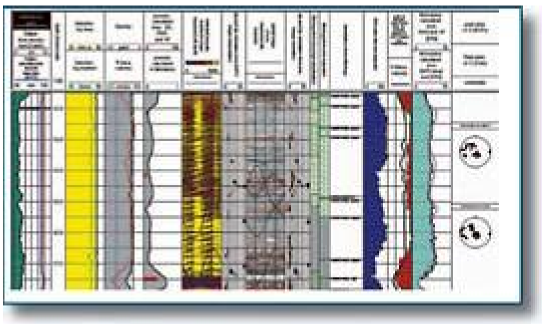
EDITING
Slice, shift, merge, resample, filter curves with results display alongside the origina

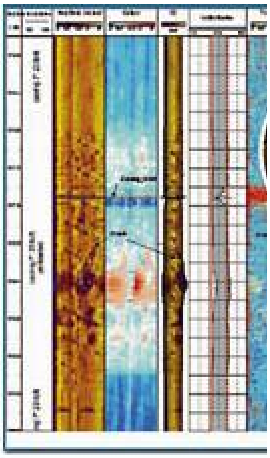


COMPUTATIONS
Formula parser (curve calculator with multiple discriminators)

USER PROGRAMMING/BATCH PROCESSING
Add your own process routine and specialised task using Visual Basic and/or OLE au

OUTPUT
Copy/paste to any windows application
Export document as BMP/EMF
Output to any Windows-supported printer
Distribute the document with free WellCAD reader





Logistics Report

Wireline Logging Survey

For

Barkarama (Pty) Ltd

Masama Project Area

Botswana

Prospecting Licence 278/2012

May 2016

Poseidon Geophysics

Logistics Report

Wireline Logging

Masama Project Area

For

Barkarama

INTRODUCTION

The logistics report gives an account of the wireline logging which was completed by Poseidon Geophysics (Pty) Ltd for Barkarama (Pty) Ltd within prospecting licence 278/2012 called the Masama Project Area.

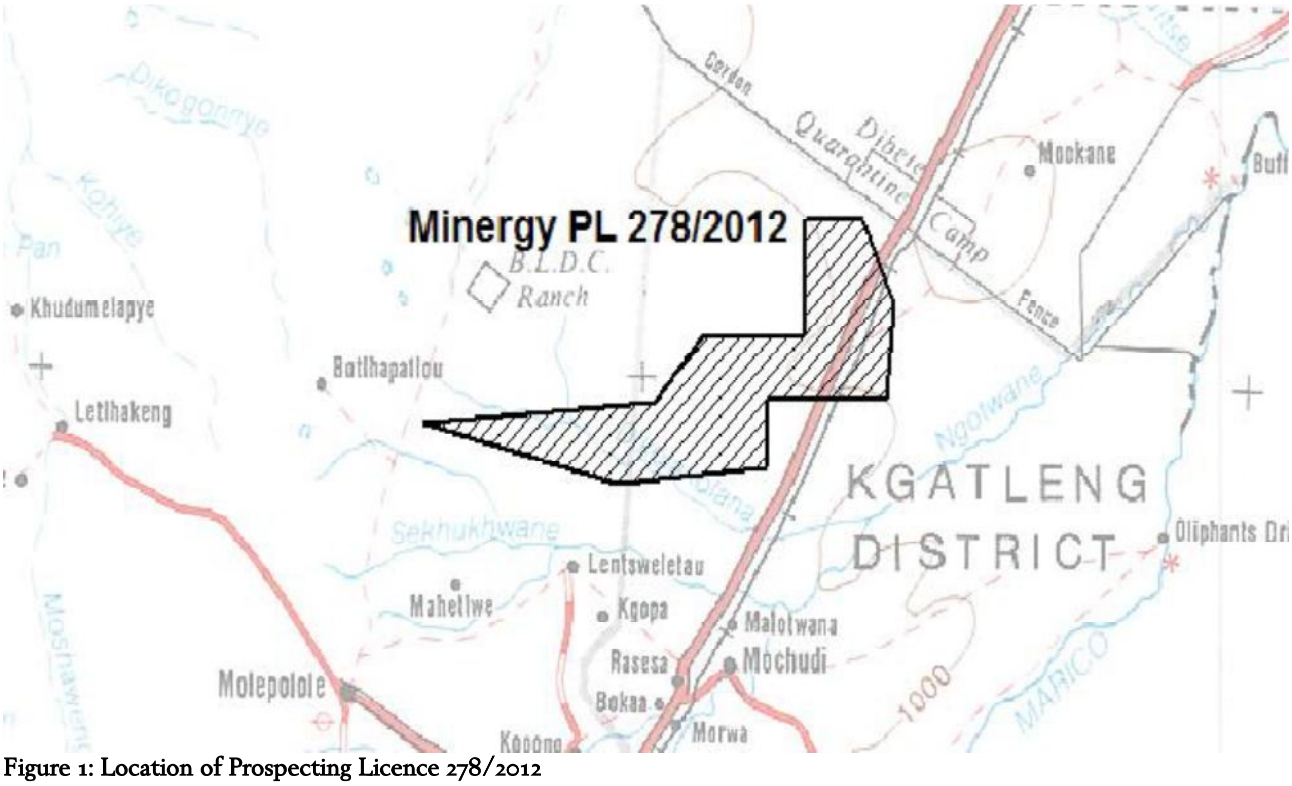


Figure 1: Location of Prospecting Licence 278/2012

Poseidon Geophysics (Pty) Ltd was contracted to undertake wireline logging of boreholes, drilled within the above Prospecting Licence areas. To this end Poseidon provided an Auslog logging unit comprising of a DLS5, 600m single conductor winch and a dual density and tool.

Drilling was completed using coring rigs owned and operated by Diabor from South Africa. A total of nine boreholes, comprising of some 300.27 logged metres, were logged on the 29th April and 7th May 2016 within this licence area. Fieldwork was completed on a call-out basis from Gaborone.

SURVEY PERSONNEL

The following Poseidon Geophysics crew carried out the survey;

Table 1 : Survey Personnel

NAME	*POSITION*	*DUTIES*
Bill McLellan	Manager	Client Liaison, Reporting, Quality Control
Irikidzai Sigauke	Senior Geophysicist	Wireline Data Acquisition and Processing
Nliki Buchena	Geophysicist	Wireline Data Acquisition

The project diary which lists the boreholes logged and the logging dates is tabulated in Appendix I.

SURVEY EQUIPMENT, METHODOLOGY AND DATA PROCESSING

The wireline logging was undertaken using an Auslog Logging System, the specifications for the instruments are appended to this report as Appendix II. Only four parameters were recorded, namely natural gamma, single-arm, long and short spaced density in all the holes. The sonde was calibrated prior to and upon completion of the project.

The Auslog system collects data directly from the winch using Windows based programmes called WellVision and AusWin. The sonde parameters are set within the software and thus all the shifts for the instrument offsets are completed automatically. Plotting of the data was completed using WellCAD, as per the geologists' requirements. Final plots of the data at 1:100 scale were produced for each hole. Holes where coal was intersected, additional plots at a scale of 1:50 were produced.

Accompanying this report are the digital archives of the logs in WellCAD and LAS format, On the CD-ROM is the WellCAD reader software which makes it possible to review these logs, change scales and layouts by the user, if so required.

Respectfully submitted,

11 May 2016

William H. McLellan
Managing Director

For

Poseidon Geophysics (Pty) Ltd
Private Bag X018
The Village
Gaborone

APPENDIX I – SURVEY DIARY

Date	*Borehole ID*	*Drilled Depth*	*Logged Depth*
29-Apr-16	MW16	34.61	34.45
29-Apr-16	MW16 Re-drill	37.60	36.90
29-Apr-16	MW17	34.59	34.35
29-Apr-16	MW18	31.46	31.40
29-Apr-16	MW19	37.50	37.30
7-May-16	MW20	25.59	25.65
7-May-16	MW21	31.41	31.35
7-May-16	MW22	34.49	34.45
7-May-16	MW23	34.54	34.42
	Total	***301.79***	***300.27***

APPENDIX II – INSTRUMENT SPECIFICATIONS

Auslog Logging System

W600-1 Winch

DLS5 Logging System

A605 Dual Density, Single Arm Calliper, Natural Gamma

WellCAD Software

Logistics Report

Wireline Logging Survey

For

Barkarama (Pty) Ltd

Masama Project Area

Botswana

Prospecting Licence 278/2012

January 2013

Poseidon Geophysics

Logistics Report

Wireline Logging

Masama Project Area

For

Barkarama

INTRODUCTION

The logistics report gives an account of the wireline logging which was completed by Poseidon Geophysics (Pty) Ltd for Barkarama (Pty) Ltd within prospecting licence 278/2012 called the Masama Project Area.

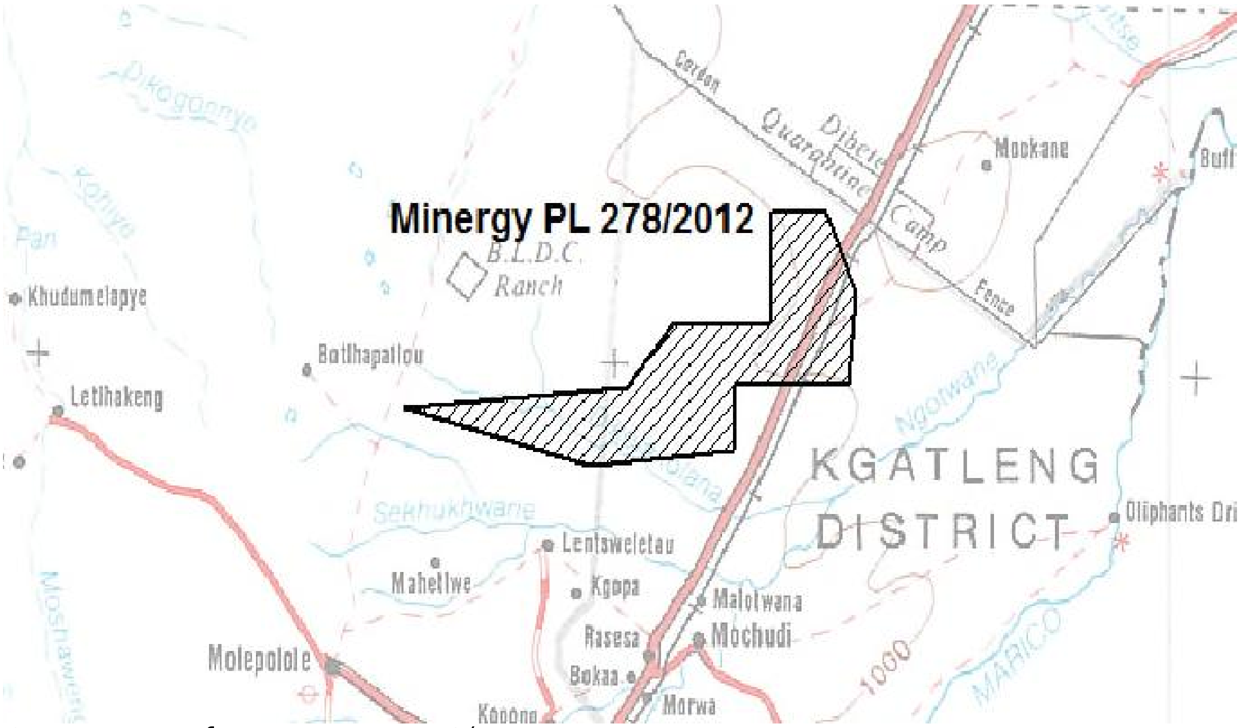


Figure 1: Location of Prospecting Licence 278/2012

Poseidon Geophysics (Pty) Ltd was contracted to undertake wireline logging of boreholes, drilled within the above Prospecting Licence areas. To this end Poseidon provided an Auslog logging unit comprising of a DLS5, 600m single conductor winch, dual density and deviation tools. Only MW 01 and MW 02 were logged with the deviation tool.

Drilling was completed using coring rigs owned and operated by Diabor from South Africa. A total of eighteen boreholes, comprising of some 1 920.7 logged metres, were logged between the 26th

October and 15th December 2012 within this licence area. Fieldwork was completed on a call-out basis from Gaborone.

SURVEY PERSONNEL

The following Poseidon Geophysics crew carried out the survey with the help of one locally hired labourer;

Table 1 : Survey Personnel

NAME	*POSITION*	*DUTIES*
Bill McLellan	Manager	Client Liaison, Reporting, Quality Control
Morris Nyamandi	Geophysicist	Wireline Data Acquisition and Processing
Duncan Sejoe	Technician	Wireline Data Acquisition
Theo Leesemane	Technician	Wireline Data Acquisition

The project diary which lists the boreholes logged and the logging dates is tabulated in Appendix I.

SURVEY EQUIPMENT, METHODOLOGY AND DATA PROCESSING

The wireline logging was undertaken using an Auslog Logging System, the specifications for the instruments are appended to this report as Appendix II. Only five parameters were recorded, namely natural gamma, single-arm and three-arm calliper, long and short spaced density in all the holes. MW 01, MW 02 were surveyed as well with the deviation tool to determine the orientation of these holes and the deviation with depth.

The sondes were calibrated prior to and upon completion of the project. On site daily checks were made of the equipment to ensure that the operation was within manufacturer's specification.

The Auslog system collects data directly from the winch using Windows based programmes called WellVision and AusWin. The sonde parameters are set within the software and thus all the shifts for the instrument offsets are completed automatically. Plotting of the data was completed using WellCAD, as per the geologists' requirements. Final plots of the data at 1:20 scale were produced on site to assist the geologists in their core logging. Two sets of logs were produced, one for the consultant's representative, the other for the client's representative.

Accompanying this report are the digital archives of the logs in WellCAD and LAS format, On the CD-ROM is the WellCAD reader software which makes it possible to review these logs, change scales and layouts by the user, if so required.

Respectfully submitted,

14th January 2013

William H. McLellan
Managing Director

For

Poseidon Geophysics (Pty) Ltd
Private Bag X018
The Village
Gaborone

APPENDIX I – SURVEY DIARY

Date	Activity	Borehole Identity	Logged Depth (m)	Tools Logged
26-Oct-12	Logging	MW01	69.4	Deviation, Dual Density
		MW02	128.2	
10-Nov-12	Logging	MW03	90.6	Dual Density
		MW04	84.7	
		MW05	48.7	
19-Nov-12	Logging	MW05R	72.5	Dual Density
		MW06	116.8	
		MW07	69.4	
24-Nov-12	Logging	MW08	99.5	Dual Density
		MW09	68.9	
		MW07R	69.5	
4-Dec-12	Logging	MC 01	126.7	Dual Density
		MW 11	63.8	
		MW 12	68.4	
10-Dec-12	Logging	MW 13	62.5	Dual Density - Depth Counter Inaccurate - Re-log Required
		MC 02	155.7	
12-Dec-12	Logging	MW 13	62.5	Dual Density
		MW 15	93.0	
13-Dec-12	Logging	MC 02	155.7	Dual Density
		MC 03	118.1	
15-Dec-12	Logging	MC04	96.4	Dual Density
	Total		***1920.7***	

APPENDIX II – INSTRUMENT SPECIFICATIONS

Auslog Logging System

WellCAD Software