18 July 2013

SOUTH AFRICAN COAL MINE HOLDINGS LIMITED (PTY) LTD

Proposed construction a new coal processing plant and tailings storage facility on portions 5 and 10 of the Farm Voorslag 274 IS, at the existing Umlabu mine, in the Breyten area of the Mpumalanga Province

Draft Scoping Report

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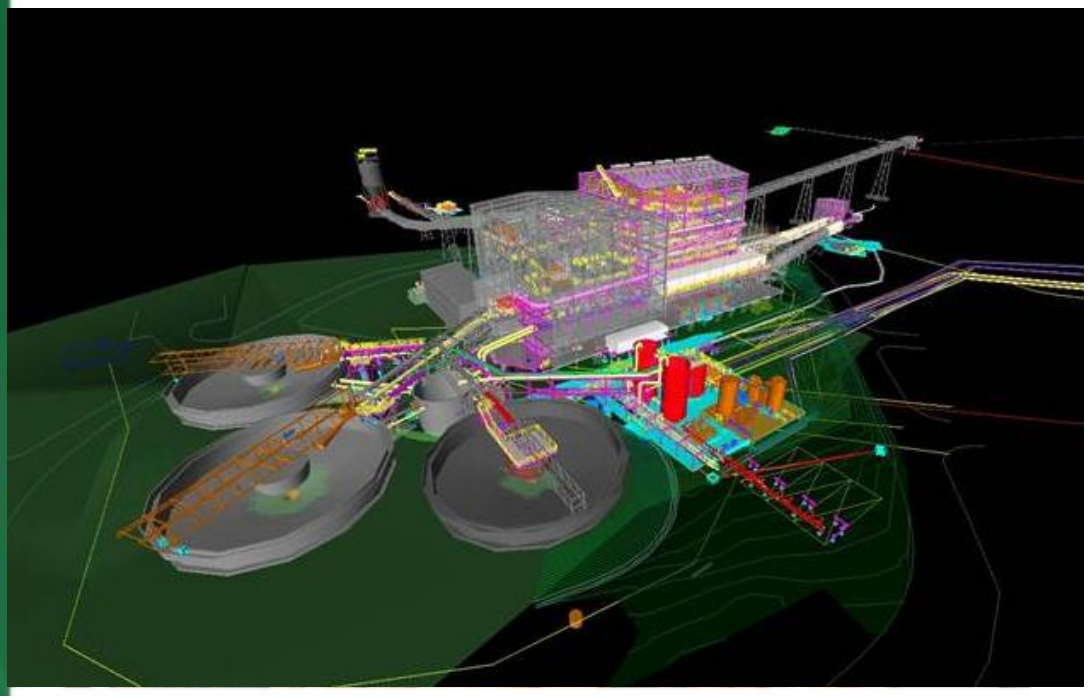

REPORT

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EXECUTIVE SUMMARY

Introduction and project description

The Applicant, South African Coal Mine Holdings Limited (PTY) LTD, is making an application for Environmental Authorisation for the construction a new coal processing plant and tailings storage facility on the Farm Voorslag 274 IS, at the existing Umlabu mine, in the Breyten area of Mpumalanga Province, in terms of the National Environmental Management Act, Act No. 107 of 1998 (as amended). This Application for Environmental Authorisation is being made to the Competent Authority namely the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), and is required since the proposed development includes activities which are listed in terms of the NEMA Environmental Impact Assessment (EIA) Regulations 2010.

Environmental Assurance (Pty) Ltd. (ENVASS) has been appointed by South African Coal Mine Holdings Limited (Pty) Ltd. to undertake the Scoping and Environmental Impact Assessment process which requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) (as amended)

The project proposal entails the following:

1. The construction of a Coal Handling and Preparation Plant (CHPP). A coal handling and preparation plant is a facility that processes coal by washing it of impurities and preparing it for transportation to the end user or market. Coal processing is a vital part of coal handling and preparation plants as it needs to be stored at different stages of the preparation process and conveyed across the CHPP facility.

2. The construction of a tailings storage facility for refused mining tailings where the waterborne refuse material will be pumped into to allow the sedimentation (meaning separation) of solid particles from the water.

Legislative requirements

National Environmental Management Act, 1998 (Act 108 of 1998) [as amended):

The proposed development requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act, Act 107 of 1998 (as amended). The proposed activity requires a Scoping and EIA process as listed activities 11, 13 18, 22 and 28 under Government Notice No R. 544 as well as listed activities 15 and 20 of Government Notice No R. 545 of the EIA 2010 Regulations are triggered.

National Water Act, 1998 (Act 36 of 1998):

The proposed development also requires compliance with the National Water Act, 1998 (Act 36 of 1998). An application for an integrated water use licence in terms of Section 21 to undertake the following activities:

(a) taking water from a water resource;

(b) storing water;
(c) impeding or diverting the flow of water in a watercourse;
(i) altering the bed, banks, course or characteristics of a watercourse;
(g) Disposing of waste in a manner which may detrimentally impact on a water resource;

The requirements of the following legislation have also been considered:

- Constitution of South Africa (Act No. 108 of 1996)
- National Biodiversity Act (Act No.10 of 2004)
- National Environmental Management Air Quality Act (Act No. 39 of 2004)
- National Environmental Waste Management Act (Act No. 59 of 2008)
- Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)
- Occupational Health and Safety Act (Act No. 85 of 1993)

Alternatives

Alternatives are defined in the NEMA EIA Regulations (2010) as *"different means of meeting the general purpose and requirements of the activity, which may include alternatives to: (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; and (e) the operational aspects of the activity and (f) the option of not implementing the activity*".

For the purpose of this application, the following Alternatives are investigated:

- Input alternatives for the construction of the CHPP facility;
- Various location and layout alternatives for the CHPP and tailings storage facilities;
- Technology alternatives for processing and beneficiation of coal ; and
- No-Go / Status Quo alternative.

Potential environmental impacts identified

Key issues and potential impacts, identified during the Scoping phase, will together with potential cumulative impacts, be assessed during the Environmental Impact Assessment phase of the project and appropriate mitigation measures to reduce the identified impacts will be proposed.

Table 1: Key issues and potential impacts have been identified

IMPACT	DESCRIPTION
Water Resources:	• The proposed new plant is not expected to have a significant impact upon water resources at the site.
Air Quality:	• Potential air pollution during the earthworks associated with the construction phase of the project; • During the operational phase windblown fugitive dust is the only significant air quality issue.

Destruction of Sensitive Flora and Fauna:	• The ecological *status quo* of the Farm Voorslag 274 IS will be changed; • Wetlands on site and in the surrounding area could be damaged; and • Spill-over impacts, which may occur on adjacent ecological systems.
Soils and Land-use Capability:	• Loss of soil resources for agricultural land uses; • Soil degradation as a result of beneficiation process and coal handling; and • Storage of topsoil for final rehabilitation of plant area.
Noise vibration and shock:	• Increase in the ambient noise level as a result of the new tertiary crusher; however this will be housed within the coal handling and preparation plant. • The construction of an additional dump hopper will generate noise. • The installation of larger capacity conveyors moving at a lower speed should result in a decrease in noise emissions.
Waste:	• The upgrade result in an increase in course reject production due to the removal of the coarser size fraction by using a new spiral reject dewatering screen and floatation cells. • The proposed new Umlabu plant will enable the removal of all particles greater than 0,5mm from tailings. Hence the proportion of the smallest size fraction (0,063mm) in the tailings reject material will increase. The introduction of floatation devises will recover a greater proportion of the -0.063mm material which will reduce its proportion in the tailings. This will effectively return the proportion of the +0.063mm material to the current level. • The impact of the change to tailings management from the current plant to the new Umlabu plant will be temporary and will not be expected to contribute long term or significant impacts upon the stability of the tailings dam. The impact of the change in particle size due to the new plant construction will be subject to geotechnical investigation that will be submitted as additional information.
Visual:	• Change of the visual character of the area as a result of the establishment of mining infrastructure (The plant will be situated on the watershed which is also the highest

	contour on site).
Traffic:	• The change in the traffic patterns as a result of traffic entering and exiting the South African Coal Holdings Limited (Pty) Ltd coal operations on the Farm Voorslag 274 IS. • No impact on traffic on the surrounding road infrastructure and existing traffic is envisaged.
Job Creation:	• Job creation in an area where the main source of income is generated through primary activities e.g. farming; • Creation of job opportunities during construction, operation, maintenance and decommissioning (rehabilitation and aftercare) phases for residents of the region; • The provision of improved infrastructure and social upliftment by creating short term employment and skills transfer to unskilled and semi-skilled unemployed individuals.

Public Participation

A public participation process was undertaken in accordance with the NEMA EIA (2010) Regulations and in terms of the DEA's Guideline on Public Participation (October 2012):

Initial project notification:

1. Newspaper advertisement

Publication of a media advertisement in the Highvelder was placed on Friday 25 January 2013.

2. Site notice placement

In order to inform surrounding communities and adjacent landowners of the proposed development, four (4) site notices were erected on site and at visible locations close to the site.

3. Written notification

I&AP's and other key stakeholders, who included the abovementioned sectors, were directly informed of the proposed development by e-mail. The Background Information Document (BID) and Registration and Comment sheets were also supplied to all parties. I&APs were given 30 days to comment and / or raise issues of concern regarding the proposed development. The commenting period expired on the 25th of March 2013.

Draft Scoping Report Notification:

The Draft Scoping Report (DSR) and Plan of Study (POS) were submitted to the Competent Authority on 18 July 2013 as per the requirements of Regulation 56 (4). The DSR and supporting documentation were subsequently

released for a period of 40 days from 18 July 2013 to 30 August 2013 for public review and comment. All stakeholders and I&AP's was notified of the DSR availability for comment. Hardcopies of the DSR was submitted to all organs of state and relevant authorities. The Draft Scoping Report and supporting documentation was made available for review at the Gerald Sekoto Community Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314); Ermelo Public Library (017 801 3621); and on Environmental Assurance's website: www.envass.co.za.

Conclusions

A variety of mitigation measures have been identified that will serve to mitigate the scale, intensity, duration or significance of the potential negative impacts identified. These include guidelines to be applied during the construction and operational phases of the project. The Environmental Management Programme (EMPr) will contain more detailed mitigation measures and will be incorporated into the Environmental Impact Report (EIR).

The proposed mitigatory measures, if implemented, will reduce the significance of the majority of the identified impacts to "medium – low. It is therefore the recommendation of Environmental Assurance, based on the assessment of the current available information, is that the Scoping Report for the proposed Umlabu new plant and tailings facility should be accepted by the Competent Authority. This authorisation should be in line with sensitive planning, design and good environmental management. The construction and operation of the Umlabu new plant and tailings facility on the Farm Voorslag 274IS, should take the wetland and sensitive floodplain and ecosystem into account and the identified buffer along this strip must be honoured.

The proposed construction and operation of the Umlabu new plant on the Farm Voorslag 274IS, Mpumalanga Province will have some positive impact as it will allow for employment of individuals during the construction and operational phase in the Breyten area, which is an area where unemployment is rife.

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

Annexure 1: Authority Correspondence
Annexure 2: Public Participation Process
Annexure 3: Plan of Study including Impact Assessment Methodology
Annexure 4: GIS and Maps
Annexure 5: General Plan and CHPP Plant Design

	Originated By:	Reviewed By:	Approved By:
Name:	Rachelle Stofberg	Retha Weir	Henno Engelbrecht
Designation:	Environmental Consultant	Quality Reviewer	Programme Manager
Signature:			
Date:	2013/07/04	2013/07/11	2013/07/17

ABBREVIATIONS

AIA - Archaeological Impact Assessment
ASAPA - Association of South African Professional Archaeologists
BID - Background Information Document
DEA - Department of Environmental Affairs
DEAT - Department of Environmental Affairs and Tourism (currently known as DEA)
DWA - Department of Water Affairs
EIA - Environmental Impact Assessment
EIR - Environmental Impact Report
EMPr - Environmental Management Programme
ENPAT - Environmental Potential Atlas
EP - Equator Principles
EPC – Engineering and Procurement Contract
EPFI - Equator Principles Financial Institutions
ESA - Early Stone Age
FGM - Focus Group Meeting
FSR - Final Scoping Report
GDP - Gross Domestic Product
GGP - Gross Geographic Product
GIS - Geographic Information System
GPS - Global Positioning System
HIA - Heritage Impact Assessment
I&APs - Interested and Affected Parties
IDP - Integrated Development Plan
IUCN - International Union for the Conservation of Nature
KSW - Key Stakeholder Workshop
LSA - Late Stone Age
LIA - Late Iron Age
LTI – Latitude Tilt Irradiation
MDEDET - Mpumalanga Department of Economic Development, Environment and Tourism
MSA - Middle Stone Age
MIA - Middle Iron Age
NEMA - National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA - National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NHRA - National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NSBA - National Spatial Biodiversity Assessment
NWA - National Water Act, 1998 (Act No. 36 of 1998)
O&M - Operations and Maintenance
PHRA - Provincial Heritage Resources Agency
PSSA - Paleontological Society of South Africa
PM - Public Meeting
PPP - Public Participation Process

ROM – Run of Mine
SADC - Southern African Development Community
SAHRA - South African Heritage Resources Agency
SALA – Subdivision of Agricultural Land of 1970
SANBI - South African National Biodiversity Institute
SAWS - South African Weather Service
SDF - Spatial Development Framework
TSF – Tailings Storage Facility
VT - Vegetation Type

GLOSSARY OF TERMS

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Anthropogenic: Change induced by human intervention.

Applicant: Any person who applies for an authorisation to undertake an activity or undertake an Environmental Process in terms of the Environmental Impact Assessment Regulations – National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as contemplated in the scheduled activities listed in Government Notice (GN) No R. 543, 544 and 545.

Arable potential: Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

Archaeological resources: This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

Cultural significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Cumulative impact: In relation to an activity, cumulative impact means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Ecology: The study of the interrelationships between organisms and their environments.

Environment: All physical, chemical and biological factors and conditions that influence an object.

Environmental impact assessment: In relation to an application, to which Scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

Environmental impact report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental management programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

Ephemeral: When referring to a stream or drainage line, it refers to the flow characteristics by which only periodic surface flows typically occur. Similarly when referring to a pan or depression, this would be characterised by only periods of time when surface water occurs within it, usually associated with the rainy season.

ESRI: A software development and services company providing Geographic Information System (GIS) software and geo-database management applications.

Heritage resources: This means any place or object of cultural significance. See also archaeological resources above.

Hyrdomorphic / hydric soil: Soil that in its undrained condition is saturated or flooded long enough during the growing season to develop anaerobic conditions favouring growth and regeneration of hydrophytic vegetation. These soils are found in and associated with wetlands.

Local relief: The difference between the highest and lowest points in a landscape. For this study, it is based on 1:50 000 scale.

Macro-geomorphological: Related to / on the scale of geomorphic provinces. A geomorphic province is a spatial entity with common geomorphic attributes.

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

Red data species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

Scoping report: An "issues-based" report which forms the first phase of an Environmental Impact Assessment process.

Soil compaction: Soil becoming dense by blows, vehicle passage or other type of loading. Wet soils compact easier than moist or dry soils.

1. INTRODUCTION

Environmental Assurance (ENVASS) has been appointed as independent environmental consultants to undertake the Scoping and Environmental Impact Assessment process for the proposed establishment of a new coal processing plant and tailings storage facility on the Farm Voorslag 274 IS, in the Breyten area of Mpumalanga Province. The proposed development requires environmental authorisation from the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), however, the Department of Mineral Resources as well as the Department of Water Affairs have also been consulted in this regard. The development will be carried out in accordance with the Environmental Regulations which were promulgated in June 2010 under the National Environmental Management Act (Act 107 of 1998)[NEMA] as amended. All relevant legislation has been consulted during the EIA process and will be complied with at all times.

The proposed project will entail the construction of a Coal Handling and Preparation Plant (CHPP) and tailings storage facility (TSF). A coal handling and preparation plant is a facility that processes coal by washing it of impurities and preparing it for transportation to the end user or market. Coal preparation is both a science and an art. It deals with the taking of raw coal and producing a saleable product that meets contract specifications by removing the impurities. Coal preparation, as commonly practiced today, is carried out in water based processes, and makes use of slurry transport principles and procedures.

1.1 Details of Applicant

Table 2: Applicant details

NAME OF APPLICANT	South African Coal Holdings Limited (Pty) Ltd
NAME OF MINE	The Umlabu Colliery (The Portion 5 and 10 of the Farm Voorslag 274 IS in Breyten, Mpumalanga Province)
CONTACT PERSON	Roelof Hugo
POSTAL ADDRESS	PO Box 55190, Northlands 2116
PHYSICAL ADDRESS	198 Oxford road, Illovo, Johannesburg 2000
TELEPHONE NUMBER	011 025 3103
FAX NUMBER	086 663 3019
CELL PHONE NUMBER	071 875 5398
EMAIL	Roelof.hugo@sacmh.co.za
LOCATION OF MINE	The mine is situated on the Portion 5 and 10 of the Farm Voorslag 274 IS in Breyten Mpumalanga Province,
MINERAL TYPE	Coal
ESTIMATED LIFE OF MINE	Estimated approximately 30 years

1.2 Details of the Environmental Practitioner and Project Team

Table 3: Details of Environmental Practitioners

NAME	REPSONSBILITY	QUALIFICATIONS	PROFESSIONAL REGISTRATION	EXPERIENCE
Judith Mandla	Project Consultant, Report Compilation and Review. Water Use License Application	M.A (Environment and Society)	Certified EAPSA	Judith has over 7 years of experience and is EAPSA certified and has worked in the consulting industry on public and private sector projects. She has extensive experience and knowledge including but not limited to environmental and social impact assessments integrated water and waste management, environmental auditing and monitoring, carbon management and climate change.
Rachelle Stofberg	Project Consultant, Report Compilation and Public Participation.	BSc.Cons. Ecol. MPhil. Env. Man.	Pri.Sci.Nat / *SAIEES* (in progress)	Rachelle has over 4 years experience in environmental research, fieldwork, public participation, the Environmental Impact Assessment process and in environmental control work and site monitoring for construction works.

Table 4: Details of Project Team

ORGANISATION	SPECIALIST INFORMATION / STUDY
ENVASS	Visual Impact Assessment Baseline Air Quality Assessment
Private	Heritage Impact Assessment
ENVASS	Ecological Assessment
MENCO	Surface water report and Wetland delineation focussing on PES and EIS
Lanteksa	Land Capability Assessment
GPT	Geohydrological Assessment

1.3 Description of the proposed activity and associated infrastructure

Coal preparation is regarded as the processing of raw coal to yield marketable products and waste (refuse) by means that do not destroy the physical and chemical identity of the coal. Coal is a very heterogeneous material made up of different coal types and varying amounts of mineral matter. As mined, it normally contains all the layers of coal and impurities found in the seam, plus portions of the strata above and below the coal seam. The preparation plant sizes, crushes and removes impurities so that the coal may be shipped as a saleable product.

There are four basic types of operations used in the beneficiation of coal. To these may be added a number of auxiliary operations which are not directly involved in the coal cleaning. The four basic operations are comminution, sizing, concentration and dewatering.

Comminution means reduction to a smaller size. Depending on the size involved, the coal is crushed, broken or ground. Breaking is commonly used on the largest sizes, crushing on the mid-range sizes and grinding is used on the very finest sizes. Grinding or pulverizing is normally done just prior to utilisation. There are no hard and fast rules as to what these size ranges are. Adjacent coal preparation facilities may have different size ranges for similar coal.

Sizing is the separation of coal into products characterised by difference in size. This can be accomplished by screening or by classifying, the latter being a sizing method dependent upon the relationship existing between the size of coal particles and their settling velocity in a fluid medium, generally water.

Concentration is the separation of coal into products characterised by some physical difference such as specific gravity. Concentration is the heart of coal preparation, where the actual cleaning occurs and where the refuse is separated from the coal. It is normally accomplished in jigs and dense medium vessels, on tables in dense medium cyclones, water only cyclones or floatation cells. It can also be accomplished during other unit operations, such as sulphur removal by crushing to liberate the sulphur particles (pyrite) and then screening or classifying to achieve separation (pyrite being normally smaller and heavier than coal).

Dewatering is the removal of surface moisture that clings to the coal surface area. The finer the coal, the greater the surface area and surface moisture will be. Dewatering by mechanical means is generally conducted only to the extent of producing a damp cake. If further dewatering is desired, driers requiring fuel for evaporation of moisture are essential. Thermal dryers also produce a large amount of dust that must be scrubbed from the air and then disposed. A common by-product of dewatering is the removal of super fine coal which in most coals is high is ash, sulphur and surface moisture; this is referred to as desliming.

Auxiliary operations are by nature quite diverse. They involve storing (in bins, silos or open piles), material transport (by conveyors, feeders, elevators or pumps), sampling, weighing, chemical reagent feeding, fed distribution and such other operations needed to move or control the coal from one cleaning operation to another.

The terms "*preparation*" and "*cleaning*" are used interchangeably in referring to the processing of the raw "run of mine" (ROM) coal. The "feed" to the cleaning plant or equipment is the material received for processing. "Near gravity" material is that material which is within ± 0.10 specific gravity units of a desired specific gravity. For

example at 1.6 specific gravity, near gravity would be material that sinks at 1.5 Sp.Gr and floats at 1.7Sp.Gr. The products are the concentrate and the tails (a final tailings is called "refuse" if dry and "slurry" if wet and pumpable). If more than two products are made, the other is called a "middlings". To process the coal in a piece of equipment, it is necessary to have the coal moving through the machine. The depth of the coal moving is referred to as the thickness of the "bed". In some processes (notably breaking or screening), the process efficiency can be increased by removing the material which is smaller ("minus") than the product size. This is called "scalping", and on larger sizes is done with a large opening screen ("grizzly").The clean product is referred to as "clean coal" or "washed coal", interchangeably. Material going over or out the top of a machine is called the "overflow". Similarly material coming out the bottom of a machine is called "underflow".

Coal process selection:

The selection of the processing flow sheet is probably the single most important step in the plant design process. Design of physical structures, placement of equipment, etc. will stem from the flow sheet and be influenced by the flow selected. The question "What do the client want to achieve?" must continually be asked, and each answer scrutinized to make sure that basic purposes are not being lost in the enthusiasm of the design.

Prior to selecting the flow sheet, the following questions must be asked in determining the basic purpose of the plant:

i) What characteristics of the raw coal make it necessary to install preparation facilities? Why?
ii) What sizes of raw coal must be cleaned?
iii) To what degree must the percentage of ash and sulphur be reduced to insure a saleable product?
iv) Will further reduction of ash and / or sulphur improve saleability? Utilization?
v) What limit must be placed on preparation cost per clean ton due to reject losses, operations, maintenance and depreciation?

Analysis of the foregoing considerations guides the choice of the best way to clean the specific gravities greater than coal. So the density of a coal particle is a direct measure of its purity; and differences in specific gravity provide the basis for the mechanical separation of coal from non-coal refuse.

Coal preparation processes fall into two general types:

1. Those conducted in water-only medium; and
2. Those conducted in a mixture of water and a high gravity material such as magnetite (dense medium systems).

The general guideline for selecting the applicable process is based on the sink-float data for the coal under question. A dense medium is normally used when the separating gravity is 1.50 or below, or if there is more than 10% near gravity material. Water only processes are normally used when the separating gravity is above 1.60 and there is less than 10% near gravity material.

COARSE COAL

Jigging has been the most widely used means of cleaning coarse coal for more than half a century. The first coal jigs were direct copies of ore jigs, in which a basket loaded with mixed particles was moved up and down in a tank of water. Thus agitated, the particles become re-arranged in layers of increasing density from top to bottom. The same principle is used in modern coal jigs to stratify and separate usable and unusable products. Highly

refined versions exist of the Baum type jig, based on an air impulse concept in which the water is cyclically jigged by air pressure from and adjacent sealed chamber. Jigging is more preferably applied to a wide size-range of particles with a top sizes up to 203 mm than to a closely sized fraction.

Dense medium separation provides more accurate separation and higher recovery of saleable coal than jigging. Coal is slurried in a medium with a specific gravity close to that of the desired separation. The lighter coal tends to float and the refuse to sink. The two fractions are then mechanically separated. While other media have been used, most coal cleaned by the dense medium process is separated in suspensions of magnetite in water. The process is versatile, offering easy changes of specific gravity to meet varying market requirements, and the ability to handle fluctuations in feed in terms of both quantity and quality. In practice, feed sizes may range from a bottom size of 6.3 mm to a top size of approx. 150mm or larger.

FINE COAL

Fine coal concentrating processes generally include those processes which clean 9.652 mm top size coal. This is an arbitrary size which seems most consistent with actual practice, although certainly these processes can effectively clean coarser or finer coal.

The feasibility of cleaning fine coal was enhanced with the development in Europe around 1946 of the first efficient centrifugal (cyclone) cleaners. In the United States, the first cyclone installation was made in 1961. Inclusion of cyclones in coal cleaning circuits has grown in numbers as their profitability in applicable situations was proven.

Essentially the same considerations involved in the selection of means for cleaning coarse coal apply in specifying the proper cyclone cleaner for fine coal. Analysis of adequate washability samples, feed tonnages, size analysis and other data should precede the design of all stages of the coal cleaning circuit. Further specific data needed to select the optimum type and size of cyclone for a given installation includes:

- Type of solids in feed;
- Gallons per minute of feed pulp;
- Size of solids in feed;
- Percent of solids by weight in feed pulp;
- Specific gravity of the solids; and
- Classification desired.

In its operation a slurry of coal and medium (magnetite dispersed in water) is admitted at a tangent near the top of the cylindrical section that is affixed to a cone shape lower vessel. The slurry forms a strong vertical flow; and under gravimetric forces the refuse with its higher specific gravity moves along the wall of the cone and is discharged below at the apex. The coal particles of lesser specific gravity move toward the longitudinal axis of the cyclones and finally through the centrally positioned vortex finder and the upper overflow chamber to the discharge outlet as clean coal. The dense medium cyclone functions efficiently regardless of the amount of near gravity material in the feed.

Original research on cyclones led to the development of the water-only, or hydrocyclone, which performs a specific gravity separation employing only water and centrifugal force. Its design features which permits the use of water only is the wide angle, or angles, in its conical bottom. This promotes the formation of a hindered settling

bed, as the dense particles move down the side wall under the impetus of gravity. Less dense particles cannot penetrate this heavy bed, and move back into the main hydraulic current to be discharged out the top of the unit through the vortex finder. Applied in easier cleaning situations than dense medium devices, water only cyclones have been used to wash coal. Those water only cyclones washing coal are generally specified because of the presence of pyrite or oxidized coal which has proved difficult to wash by other means.

Another commonly used fine coal cleaning device is the concentration table. Tables have been used for cleaning coal for over 70 years. The most generally accepted explanation of the action of a concentrating table is that, as the material to be treated is fanned out over the table deck by the differential motion and gravitational flow, the particles become stratified in layers behind the riffles. This stratification is followed by the removal of successive layers from the top downward by cross-flowing water as the stratified bed travels toward the outer end of the table. The cross flowing water is made up partly of water introduced with the feed and partly of dressing water fed separately through troughs along the upper side of the table. The progressive removal of material from the top toward the bottom of the bed is the result of the taper off of the table riffles toward their outer end, which allows a successively deeper layer of material to be carried away by the cross flowing water as the outer end of the table is approached. By the time the end of the table is reached, only a thin layer, probably not thicker than one or two particles, remains on the surface of the deck, this layer being finally discharged over the end of the table. The above processes are all based on the different specific gravity of coal and refuse. The last process is based on the surface chemistry of the various constituents in the feed stream. Froth flotation is a chemical process that depends on the selective adhesion to air of some solids and the simultaneous adhesion to water of the solids. A separation of coal from coal waste then occurs as a finely disseminated air bubbles are passed through a feed coal slurry. Air adhering particles (usually the coal) are separated from non-adhering particles, floated to the surface of the slurry, and then removed as a concentrate. This process involves the use of suitable reagents to establish a hydrophobic or air-adhering surface on the solid's hydrophilic or water loving surface.

Coal preparation circuits:

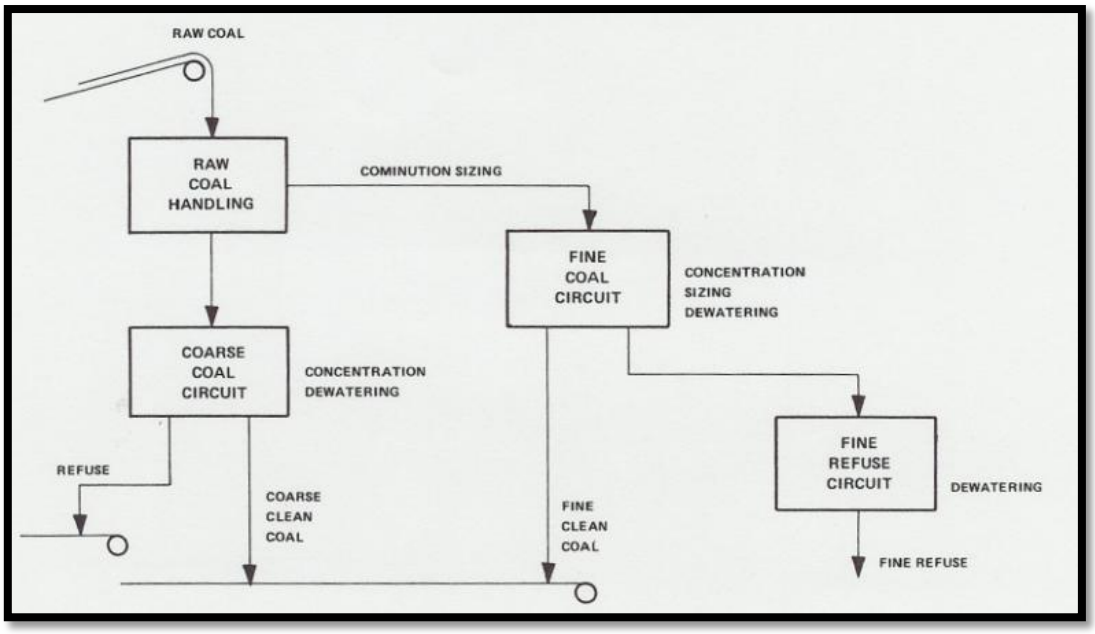


Figure 1: Typical coal preparation plant flow scheme

Each block shown in Figure 1 is composed of several separate pieces of equipment performing the various unit operations required. Often, when coal preparation is discussed, the discussion fixes upon the concentrating equipment, and it is forgotten that none of this equipment can function by itself. This equipment is all interrelated and supported by other equipment.

The raw coal handling is similar to any bulk material process whether it is coal, iron ore, phosphate, wheat, fish etc. There are six basic circuits used in processing coal. They are:

- Jig;
- Dense Medium Vessel;
- Dense Medium Cyclone;
- Water only cyclone;
- Table; and
- Froth floatation.

JIG

The jig circuit is the simplest circuit generally found in a coal preparation plant. Raw coal enters the preparation placed on the plant feed belt conveyor. The raw coal, after discharging from the conveyor, is sluiced into the jig. The jig produces a refuse product, a clean coal product and a middling product. Refuse and middlings are removed from the jig box by means of a bucket elevator, with perforated buckets to allow drainage of the excess water. The middling product is crushed to liberate coal, and is then returned to the jig feed sluice for reprocessing via a sump and pump. The clean coal screen separates the coal from the jig into three size fractions. The top size coal is crushed to size and then placed on the clean coal conveyor. The middle size fraction is dried in a centrifugal dryer and then placed on the clean coal conveyor. The fine coal flows into the sump where it is pumped to further processing as required. Besides the raw coal and electricity for the motors a jig requires a constant makeup water stream and a low pressure air supply to operate. The major portion of the water is added as push water at the head end of the jig, and the rest is added to each cell of the jig. The water is one of the control items in jig operations. Low pressure air from centrifugal blowers is used as the motivating force behind the pulsations in a jig. It is controlled by a series of valves to give a moving pulsation through the jig. The interaction of the raw coal feed and re-circulated middlings, water addition and air pulsations is used to control the jig capacity. Separating specific Specific Gravity is controlled by floats which open and close the refuse and middlings discharge gates.

DENSE MEDIUM VESSEL

Dense medium vessels circuits are used for more difficult to clean coals. Raw coal and pre-wet screens will separate at 30mm. The oversize fraction will flow by gravity to the dense medium vessel to be combined with the media, where separation of clean coal and refuse products will take place. The major quantity of media used in the process will be drained by screens for both clean coal and refuse and will return directly to the recirculation medium sump. The remaining media adhering to the coal and refuse products will be rinsed on the rinse section of the screens and will be treated as dilute media. The top deck product from the clean coal drain and rinse screen will be crushed to desired product size. The second deck product will be dewatered in mechanical centrifuges. Refuse material will only be screened and conveyed to a refuse bin.

The dilute media will be treated in double-drum magnetic separators. The magnetic (most commonly used media) concentrate from the separators will be returned to the dense media circuit. The tailings from the

magnetic separators will go to the raw coal feed as push water. Magnetic makeup will be fed on demand from the magnetic storage bin directly into the heavy media sumps. Also required is a constant supply of fresh water for sprays and makeup. Control circuitry is driven commonly by pneumatic means from a 100+ PSI instrument air compressor.

DENSE MEDIA CYCLONE

Dense media cyclone circuits are used where applicable on the next size range below dense media vessels. Desliming sieve bends and screens will separate at 28 mesh. The oversize fraction will flow by gravity to the dense media cyclone sump to be combined with the media and then pumped to the dense media cyclones, where separation of clean coal and refuse products will take place. The major quantity of media used in the process will be drained by sieve bends and screens for both clean and refuse, and will return directly to the heavy media sump. The remaining media adhering to the coal and refuse products will be rinsed on the rinse section of the screens and will be treated as dilute media. The product from the clean coal drain and rinse screen will be dewatered in mechanical centrifuges. Refuse material will only be screened and conveyed to the refuse bin.

The dilute media will be treated in double-drum magnetic separators. The magnetic concentrate from the separators will be returned to the heavy media circuit. The tailings from the magnetic separators will go to the raw coal distributor. Magnetite makeup will be fed on demand from the magnetite storage bin directly into the heavy media sumps.

WATER ONLY CYCLONE

Water only cyclones (other terms being hydrocyclones or concentrating cyclones) are commonly used for easy to separate coals. The coal in slurry form flows into a sump, where it is pumped to primary water only cyclones. The underflow from these cyclones is collected in a sump and pumped to the secondary water-only cyclones. The overflow from these secondary cyclones is recycled to the primary water-only cyclone sumps. The underflow from the secondaries, which is refuse, is dewatered by a screen and then combined with the other refuse material and is collected by conveyor. The screen underflow is piped to the refuse dewatering circuit. The overflow slurry from the primary water-only cyclone contains clean coal as well as un-cleaned fine material. The two are separated by classifying devices such as VorSivs making the desired size separations. After separation the clean coal is dewatered by centrifugal dryers and then joins the other clean coal on the clean coal conveyor.

TABLES

Concentrating table circuits are used for the same application as water only cyclones. The solids wet-screened from the raw coal feed will be slurried and directed to a sump under the raw coal screens. Each pump will pump this slurry to two VorSivs with ¼mm screen openings. A bypass valve will be provided to bypass a part of the VorSiv feed to each table distributor as desired.

The distributors will split the solids into equal streams. Each of these streams will feed a single deck table where the actual separation of clean coal and refuse products will take place.

The undersize slurry from the raw coal VorSivs will flow by gravity into the refuse sump. The clean coal product, from the tables, will gravity flow via pipes and launders into clean coal VorSivs.

Centrifuge effluent, after passing over tell tale screens and the fine slurry from the clean coal VorSivs will discharge into a fine coal sump for further processing.

FROTH FLOTATION

Fine coal cleaning circuits are becoming increasingly more common as coal product specifications become tighter. One circuit that has been appearing quite frequently is a combination of a single stage water only cyclone and froth flotation. This combination is interactive and requires careful planning as to how they relate to each other.

The desliming underproduct, consisting of fine overflow of the cyclones will be fed to the rapped sieve bends, which will deslime the clean coal products. The oversize coal product from the sieve bends will be fed to the vacuum filters. The sieve bend underflow, which will consist of the fine fraction of the coal, will be fed to the froth flotation circuit. Cyclone underflow will flow by gravity to the flotation circuit to recover any misplaced coal, or it can be bypassed to the flotation tailings.

The flotation circuit will process the undersize of the rapped sieve bend, which consists of the fine size fraction and the water-only cyclone underflow. The float product, together with the coarser water-only cyclone product from the sieve bend, will be fed to the vacuum filter. The filtrate will combine with the floatation cell tails and flow to the refuse thickener.

In addition the flotation also requires a reagent system consisting of storage tanks; reagent feed pumps and a reagent material system. Certain flotation also requires, or is enhanced by, addition of low pressure air. Clean coal handling from the flotation system must also consider that the product is aerated and hard to handle.

REFUSE DEWATERING

Refuse dewatering circuits are used to reclaim water for process use and to dewater the fine refuse prior to disposal. A refuse thickener will be provided to remove most of the fine solids in the process water. Sources of water to the refuse thickener are: tailings from the flotation cells and filtrate from the vacuum filter. Thickener overflow will be pumped back into the plant as raw coal slurry water and spray water. A thickener underflow pump will be provided to pump the slurry to settling ponds or to a vacuum filter or centrifuge for solids dewatering. If the solids are dewatered they are combined with the coarse refuse.

Material handling in a coal preparation plant:

Like any process industry, coal preparation is a group of unit operations interconnected by a materials handling system. The materials handling system involves those dry process steps such as the conveyor system and the slurry process steps, which include the pumping system and the launderers. There are also process steps that are neither dry nor slurry; this last area is normally classed with the slurry handling system, as it usually runs to wet rather than to dry.

In a typical coal preparation plant, most material handling streams are slurry flow, except for the initial feed and the last three products (two clean coal and one dry refuse), which are dry flow. Slurry is either piped or flumed and laundered. Even in those areas such as sieve bend discharge, which are commonly chutes, the material is a very thick slurry.

Coal plant operators' problem with material handling systems fall into five basic and interrelated categories: accessibility, maintainability, availability, corrosion and abrasion. The first three categories are related to plant design and the problems can normally be resolve through the use of good engineering practices. The last two categories (corrosion and abrasion) related to the characteristics of the coal and how they affect the plant operation.

While coal is relatively soft as minerals go, it still can give operators problems in their slurry systems. Problems arise from several factors, one being that while coal is soft and tends to break into fresh surfaces instead of becoming rounded.

Because the coal particles break and do not round this means that the final processing steps are as subject to wear or abrasion as the first steps. Actually, they are subject to higher wear, due to the increase in the number of particles handled. An example of this would be that the fine coal discharge chutes need the same amount of wear protection as the fine coal underflow pans at the raw coal screens. The fine coal discharge chute from the basket centrifuge is usually lined with polished stainless steel, because the product is relatively dry, while the raw coal screen underflow pan is lined with cementations liner, because the product is in a true slurry form. Abrasion appears in the preparation plants as equipment, chutes and pipes wear. Depending on flow conditions, some items have been known to wear out in less than 500 hours.

Corrosion in a preparation plant occurs only on the non-wearing surfaces, as the wearing surfaces do not last very long. Historically, the primary source of corrosion has been from the leaching of sulphur to form sulphuric acid, or "coal mine drainage" water – the typical reddish runoff from old coal wash piles. A fairly new corrosion problem has begun to appear in the coal industry, and this is the build-up of ions in the processing water. This build-up has been occurring as more plants are closing their water circuits and only adding sufficient water for makeup product losses.

1.3.1 Description of operations and infrastructure

Coal is highly variable with respect to the physical and chemical properties that affect its use. Industries that use coal specify a range of properties that are required for their intended process. Coal suppliers try to find coals that most closely match those requirements. Coal is treated in processes called "beneficiation" to prepare a material that meets the customer's needs and is as homogenous as possible. Samples of coal from both cores and mines are taken to determine the treatment that must be performed. Preparation plants that perform specific beneficiation processes are constructed as near as possible to the location where the coal is mined.

Three kinds of processes may be performed at the plants:

- sizing, controlled by a crushing and screening process,
- increasing heating value, by removing non-combustible ash and rock by gravity separation; and
- removing or controlling undesirable mineral and chemical components (sulphur, sodium, and trace elements) by a combination of gravity separation and blending.

Traditionally, most coal preparation was primarily concerned with sulphur and ash reduction. Today, however, much more sophisticated processes have more narrow and complex physical and chemical requirements for coal stock.

Coal beneficiation is the process of removal of the contaminants and the lower grade coal to achieve a product quality which is suitable to the application of the end user - either as an energy source or as a chemical agent or feedstock. A common term for this process is coal "washing" or "cleaning".

Coal washing operation

The washability characteristics of a coal reserve are provided by obtaining liberation data on the raw coal sample. Liberation refers to the amount of physical breakage required to separate material of different material densities. Low density material is clean coal where as high density material is reject (rock). The intermediate density material is called middlings. Liberation data is commonly obtained by float and sink analysis.

Coal processing is a broader term used to describe the complete process of sizing, handling and washing of the run-of-mine coal. While the coal preparation engineer will require a full understanding of all the classification methods and properties of coal, it is mainly the relative density distribution of the mined material and its relationship to ash, volatile matter, moisture content and fixed carbon (collectively known as the proximate analysis) with which he will mostly work. Calorific value and sulphur content are also important parameters which relate to the relative density distribution.

This analytical method is termed "washability analysis" and it describes and quantifies the opportunity to upgrade a particular coal to a desired quality by gravity concentration methods. By study of the washability of the coal the preparation engineer will decide at what specific gravity to separate the product from the discards to obtain the correct specification for the client.

Crushing and screening

Crushing reduces the overall topsize of the ROM coal so that it can be more easily handled and processed within the coal preparation plant. Crushing requirements are an important part of coal preparation plant design and there are a number of different types. Screens are used to group process particles into ranges by size. These size ranges are also called grades. Dewatering screens are used to remove water from the product. Screens can be static, or mechanically vibrated. Screen decks can be made from different materials such as high tensile steel, stainless steel, or polyethylene.

Closure processes

The closure objective is to ensure that all the significant impacts have been mitigated against. All rehabilitated areas will be left in a stable, self sustainable state. Proof of this will be submitted at closure.

The closure objectives for the Umlabu Coal Colliery can be summarised as follows:

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;

- Ensure impact on any water bodies, water courses and catchment areas have been avoided or minimised;
- Rehabilitate disturbed areas as soon as possible; and
- Minimise the impact on the local community.

With specific reference to the ground water environment, the following closure objectives should be pursued:

i. Rehabilitation of the surface infrastructure where necessary to minimize infiltration into the underground water regime (the philosophy of concentration and containment); and
ii. Rehabilitation to minimise contamination of surface water resources (the philosophy of dilution and dispersion).

When and if necessary suitable structures and or systems are to be put, and kept in place to limit contamination of water resources to concentrations in accordance with the Target Water Quality Ranges for human consumption.

The goals upon decommissioning and closing of the coal processing and preparation plant will include that all significant impacts have been mitigated and that there are no alterations to the environment that are apparent as far as is practically possible. All land will be rehabilitated to a state that facilitates compliance with current national environmental quality objectives including air quality objectives and water quality guidelines.

Storage of ore

The Run of Mine (ROM) stockpile will store a maximum of 30 000 ton of ore at any one time, at a steady state in the beginning, a stockpile will be built of up to 30 000 tons so as to start up the contractor.

Discard disposal facility

After the ore is extracted, waste rock will be placed on the waste rock dump by means of a conveyor belt. The waste rock dump will be positioned near the plant area.

1.3.2 Roads

No new haul roads will be required for access the mineral reserves. All current road infrastructure will be utilized.

1.3.3 Loading and hauling

After the mineral resource that has been fragmented through blasting is loaded, using front end loaders, onto haul trucks and transported to the coal processing and preparation plant. Active haul roads are watered to reduce dust generation during haulage. Alternative means of dust suppression on haul roads are intermittently being investigated and viable solutions will be implemented.

Material from the underground workings will be transported to the surface via conveyor belts. Where these belts reach the surface they may decant some raw product into temporary stockpiles or alternatively it can be directly linked with the coal processing and preparation plant.

1.3.4 Fuel depot

Plant vehicles are re-fuelled on a daily basis at the bunded fuelling depot. There will be fuel tanks within the bunded facilities on site.

1.3.5 Vehicle parking

Quarry Plant vehicles are parked adjacent to the quarry offices when not in use.

1.3.6 Mining administration

Plant administration and training of employees is performed within the administrative offices.

1.3.7 Workshop / wash bay

There is a dedicated workshop for the servicing of all mining and plant vehicles. The workshop also services the drilling equipment, compressors and pumps. Associated with the workshop a lubricant store, a store for tyres and store for lead alkaline batteries.

1.3.8 Pollution Control impoundments

During the process of mining and cleaning coal, waste is created and must be permanently disposed of in an impoundment. Preparation of coal, also called washing, is how non-combustible materials are removed from the mine. As the coal is washed, waste is created and classified as either course refuse or fine refuse. Larger materials such as rocks and pieces of coal are defined as course refuse. Slurry, a combination of silt, dust, water, and bits of coal and clay particles is considered fine refuse, and is the most commonly disposed of material held in an impoundment. Between 20 to 50 percent of the material received at a coal preparation plant may be rejected and housed in impoundments. The coarse refuse is used to construct the impoundment dam, which then holds the fine refuse or slurry, along with any chemicals used to wash and treat the coal at the coal preparation plant.

Whenever possible, impoundments are constructed using naturally occurring basins, but are often built up on an embankment at the mouth of a watershed. They are reinforced with course refuse and are characteristic of a typical dam. After the waste is spilled into the basin, the coal particles are allowed to settle, leaving the leftover water on top. This water is often recycled and used once again by the preparation plant. Settling ponds are constructed nearby to catch the runoff of excess water through a pumping system, and excess water from these ponds is discharged into a local waterway.

An impoundment is a system of multiple parts, and thus any weakness in one of these parts affects the others. Therefore, an impoundment can fail in many ways. Embankment failure and dam construction are two major concerns. During the past decade, malfunctions of this nature have fuelled better engineering and design of impoundments, but those built before then are more at risk for failure. Seepage, weakness in the walls, and

undermining (in which an impoundment has been built a few meters above a mine, weakening the ground beneath it and causing it to fall through) are also major risks for failure. Breakthroughs into underground mine workings have been the cause of more recent catastrophic failures.

1.3.8.1 Site selection review criteria

An ad hoc site selection has been undertaken to give an idea on what to consider prior to the construction of the Tailing Storage Facility (TSF). Site specific information, as described below, is vital for the TSF site selection process. In order to ensure that this information is available at the time the final decision needs to be made, included below is a list of typical factors that need to be taken into account to qualitatively or semi qualitatively identify suitable areas for tailing disposal.

1.3.8.2 TSF Volumetric capacity and footprint

Based on a typical design criteria for a TSF site (As per Table 5 below) the TSF must be designed as to accept the given tonnes of tailings, at the given rates of rise, in a safe and environmentally acceptable manner.

Table 5: Typical TSF Design parameters

DESIGN PARAMETERS	DESIGN VALUE
Placed density	m^3
Deposition rate	tpm
Life of mine	years
Total tailings over life of mine	t
Total storage capacity required	m^3
Footprint plan area (excl. infrastructure within starter wall)	m^2
Total affected area	m^2
Final height	m
Total volume	m^3
Total capacity	m^3
Life of facility	years
Side slope angle	H
Side slope area	m^2

1.3.8.4 Topography and drainage

The TSF needs to be located in suitable topography that can accommodate the storage requirements without excessive earthworks and onerous engineering design. A suitable location for the TSF would need to be moved away from the area where the underground mine is situated. A pre-requisite for the design of the TSF is to undertake a Geotechnical Assessment of the site and to ensure the stability of the underlying geology on which the TSF is to be constructed.

Other important reports and documents to consider include:

- Hydrogeology reports, maps and documents;
- Borehole positions and maps;
- Details of groundwater abstraction;
- Conceptual groundwater model;
- Recharge estimation;
- Blast risk assessment information and magnetometry; and
- Groundwater quality information.

1.3.8.5 Government legislation

According to Government Regulation GN R704 of the National Water Act (Act 36 of 1998); no mine residue dam and reservoir may be located within a 1:100 year flood-line or within a horizontal distance of 100m from a water course, estuary or well.

There are two non-perennial rivers that should be considered during the Scoping phase of the project. Although these rivers do not cross the portions to be affected by the proposed construction of the TSF, they are located in close proximity to the mine (See **Error! Reference source not found.**). It would be important during the

identification of environmental issues to note the existence of these rivers as it would have to be evaluated in terms of possible environmental impacts.

1.3.8.7 Distance from blasting area and plant

Generally a TSF should not be located within 500m of a blasting area. DMR approval is required for a TSF located within 500m of a blasting area.

A TSF should ideally be located as close as possible to the plant while at the same time should not have the plant within its zone of influence (failure zone) as describe in the SANS 10286 (code of practice for Mine Residue Deposits). Ideally a TSF should be located within a radius of 5km from the plant but this is not a restriction.

1.3.8.8 Geology and Hydrogeology

A specialist Hydro-geological study is required for the area to identify the water users in the area and to classify the groundwater quality. At this stage it is assumed that the TSF will be a lined TSF i.e. a facility that utilises a geo-membrane to form a barrier between tailings slurry (mine residue) and the natural hydro-geological environment. The primary objective of the liner is to prevent loss of water to the permeable foundation. Water loss must be minimised given the scarcity of water in South Africa.

1.3.8.9 Infrastructure and settlements

As far as possible the TSF should be sited away from high density settlements, commercial areas and regional services (e.g. provincial roads, main power lines, railway lines etc). More particularly as in the case with the plant, the siting of the TSF should be such that infrastructure and settlements are outside its zone of influence. Also proximity to settlements will cause communities discomfort from a dust pollution perspective.

1.3.8.10 Environmental issues

Findings of specialists' studies are required for the completion of the EIA phase of the project.

The primary design objectives outlined should address the following aspects:

- the safe and stable containment of tailings;
- the management of decant and rainfall runoff;
- the minimisation or control of seepage;
- a cost effective storage system; and
- a planned system for effective closure.

The design should be adequate for the proposed use, meet contemporary standards and have identified and addressed all the likely risks associated with the site, the nature of the containment materials, the nature, quantity and treatment of the tailings, construction process and closure.

Good water management is critical to the safety of the TSF and the quality of the final outcome. The design of a TSF should display a quantitative water and salt balance of all gains and losses and satisfy the 'worst case' combination of risk factors (e.g. full TSF, wave action, design storm, breakdown of decant process). Water design requirements for TSFs including freeboard and emergency spillways are specified, these are adapted from criteria outlined by legislation and guidelines for dam design.

TSFs must be designed to ensure that the beneficial uses of groundwater and surface water are protected and to prevent other undesirable impacts such as waterlogging and land salinisation.

Although the permeability of deposited tailings sediment is often low and they may have the capacity to quickly attenuate contaminants, some seepage from TSFs, both during the deposition phase and after decommissioning, is inevitable. Where seepage may contain contaminates it must be minimised to levels that will not cause groundwater or surface water pollution.

Seepage may be controlled by the installation of a liner and/or adequate under drains. Proposed under drainage systems should be subject to appropriate Risk Assessment. In some cases, an external seepage collection system may be required.

Should a liner be required for the TSF, the Risk Assessment process should be used to specify an appropriate design permeability and liner thickness. The Risk Assessment should include consideration of the:

- potential rate of seepage under and through the embankment and the base of the TSF;
- predicted chemical composition of seepage;
- predicted physical and chemical properties of the tailings;
- characteristics of the underlying substrate, and
- potential impacts on the beneficial uses of groundwater and surface water systems.

TSF design proposals incorporating a clay liner should specify a minimum thickness for the liner, taking the following factors into account:

- the thickness required to ensure construction is practicable given the need to compact in layers and minimise the development of preferential pathways;
- the applicability of assumptions about the degree of compaction to be achieved and the extent of homogeneity in the liner material;
- the permeability of the underlying substrate;
- the expected permeability of the emplaced tailings and
- the risk of the liner integrity being compromised by cracking or mechanical damage while tailings are being deposited or prior to commencement of deposition.

1.3.8.11 Design closure and the TSF

Most TSFs require large quantities of cover material for closure. Accordingly, the Environmental Management Programme (EMPr) should describe how the TSF is to be closed and the source of the cover material. A preliminary assessment of the geochemistry of the tailings, to identify any constituents with the potential to have an environmental impact, is fundamental to assessing requirements for closure.

The type and depth of cover are also influenced by the desired re-vegetation outcomes and future activities permitted on the closed TSF. These matters are discussed later in this document.

It is essential that construction of a TSF accords with the approved design and is carried out to a high standard of workmanship. Adequate supervision of the works is essential to ensure relevant factors are addressed.
A suitably qualified and experienced civil engineer should undertake supervision of the construction of the TSFs and those where contaminated tailings are to be stored.

'As Constructed' Reports detailing the construction of each lift should be prepared and retained to assist determination of the overall stability and the future life of the TSF.
The reports should include survey drawings of:

- the original ground surface contours inside and outside the TSF;
- the locations of test boreholes and pits (and details about their backfilling);
- the locations of the drainage system;
- the locations and profiles of any borrow pits inside the facility;
- embankment profiles and
- confirmation that the lining has been constructed to the required specifications.

The retention of Construction Records is essential for the effective monitoring of long term performance. Ground conditions should be properly monitored and appropriate remedial works undertaken where zones of higher permeability or lower structural strength are encountered in the substrate. This information should be included in the 'As Constructed' Report.

The embankment walls should be correctly keyed in. The materials used should be appropriate and compatible with the rest of the design, emplaced to the correct compaction levels and gradient and produce an erosion resistant outer wall. Where it is necessary to vary the design during construction of the TSF, the operator should verify that the changes do not compromise the design objectives. The changes should be reviewed and endorsed by a suitably qualified and experienced person (such as the original designer).

Where a significant change to the design of the TSF is necessary a revised design, prepared and certified by suitably qualified and experienced person, must be submitted to the Department of Water and Environmental Affairs as well as the Department of Mineral Resources for approval.

A significant change in the design is one that would affect the Risk Assessment of the TSF.

1.3.8.12 Pipelines

The TSF will involve pumping and conveying of tailings and decant water by pipeline, discharge spigotting processes. All of these activities introduce a risk of accidental discharge as a result of failure of mechanical systems - such as broken pipelines or faulty control devices - or materials. Appropriate maintenance and replacement schedules for mechanical equipment are necessary for safe operation.

Tailings pipelines may be required to have control systems designed to shut the supply pump down if a no-flow condition is detected at the discharge end. This ensures that the tailings supply is stopped if a catastrophic failure occurs in the pipeline. These systems do not, however, eliminate the risk of a discharge event where a pipeline develops a serious leak but does not fail completely.

Most existing pipelines are constructed in trenches or between parallel bunds so that spillage is directed to dedicated catch dams. Escapes may still occur where liquid under pressure escapes as a jet at an elevated trajectory. Mechanisms to minimise the chance of such events include completely encasing the pipeline in a secondary sleeve or constructing covers over pipe joints.

Although the Department of Water Affairs does not specify particular measures for increased safety for tailings pipelines and other equipment, the proponent and operator should be able to demonstrate that the measures proposed and implemented reduce the risks to an acceptable level.

Procedures for pipeline inspections should form part of the Audit protocol and Environmental Management Programme.

1.3.8.13 Monitoring and auditing

A site specific monitoring program should be developed for the TSF based on the key risks identified in the Risk Assessment process and on other currently known issues.

The monitoring program should ensure early detection of any unexpected impacts. It should also enable validation of the assumptions made in the Risk Assessment and indicate aspects of the operation where further risk analysis is warranted.

A program to monitor the TSF should:

- identify the scope of the program;
- define the objectives of the program;
- determine the indicators to be measured;
- select sample collection sites (for example, for surface and groundwater);
- determine the monitoring frequency (daily, weekly, monthly, etc);
- where necessary, establish a site based laboratory and/or select an appropriate testing laboratory; and
- report results, particularly any which exceed specified limits.

Routine monitoring of the TSF is aimed at avoiding failure by giving early warning of any symptom of trouble so that timely maintenance can be carried out.

Further, the TSF is designed for particular tailings characteristics. Deviations from these particular characteristics (such as grading, density or chemical constituents) could influence the operating procedures and the performance of the facility.

Depending on the facility, features to be included in a safety monitoring program for the TSF may include:

- seepage or leakage through the embankment;
- cracking, slips, movement or deformation of the embankment;
- erosion of the embankment;
- pond level;
- pond location (location of the pond against the embankment may pose particular problems);
- piezometric levels in embankments (to this end, knowing the location of the phreatic surface would assist);
- structural defects or obstruction in infrastructure (outlet pipes, spillway, decant system);
- borehole groundwater elevations;
- under-drain flow rates;
- obstruction or erosion of diversion drains ;and
- characteristics and consolidation behaviour of the tailings (enabling prediction of final settlement and refinement of design to suit the predicted conditions).

In preparing a safety monitoring program, South African Coal Holdings Limited (Pty) Ltd should also consider the provisions of various guidelines on dam safety management.

Environmental aspects that may require monitoring include:

- impacts on surface water;
- impacts on groundwater quality;
- impacts on groundwater level;
- impacts on vegetation;
- impacts on fauna (birds in particular are susceptible to poisoning by drinking tailings supernatant water);
- impacts on aquatic ecosystems;
- generation of dust, noise or odour, and
- spray drift and its effects on the vigour of adjacent vegetation, where aerial sprays are used to enhance evaporation or to reduce dust.

Remedial action should be implemented if conditions are found to be outside the design or predicted parameters. Groundwater is one of the most commonly monitored environmental aspects. A number of boreholes are usually installed at selected locations around a TSF to enable monitoring of both the level and quality of groundwater. A good understanding of the local groundwater environment and chemistry is necessary to ensure that boreholes are located in appropriate places and drilled to the correct depth. In some cases, multiple boreholes are required to intercept different aquifers.

It is also common to install shallow boreholes near dam walls to permit detection of any seepage that might occur. Where a TSF is constructed near surface watercourses it is also good practice to monitor upstream and downstream from the facility. Although, in most cases, no discharge is permitted, monitoring allows the operator to verify compliance and ensure that no contamination has occurred by any pathway associated with the TSF. Samples will need to be collected before, during and after the life of the operation.

Additional parameters to be monitored and the nature and detail of the monitoring would depend on the site-by-site Risk Assessment that would identify the critical hazards.

1.3.8.14 Decommissioning

Tailings material must be securely stored for an indefinite period and present no hazard to public health and safety or the environment. Therefore the closure of a TSF and rehabilitation works must be as inherently stable, as resistant to degradation and as consistent with the surrounding landscape as possible. The design should also seek to minimise maintenance or upkeep.

The nature of the tailings, the process by which they were deposited and the design for water recovery can significantly influence the costs and risks associated with closure of a TSF.

The diversity in materials and objectives makes it impractical to prescribe designs for TSF covers. Operators are encouraged to undertake research into cover designs and to justify the type proposed based on a case by case analysis of the objectives and risks. Proposed designs will be assessed on their merits.

Closure strategy

Early planning for closure of the TSF can reduce risks for both the community and operator and minimise costs at the end of the project's life. Most TSFs require large quantities of cover material for closure. Accordingly, South African Coal Holdings Limited (Pty) Ltd must demonstrate in the initial Environmental Management Programme how the TSF is to be closed and the source of cover material. At the end of the project aspects of the initial Rehabilitation Plan will no longer be appropriate. In this situation a revised closure proposal, submitted, as an Environmental Management Programme Variation may be required.

Closing the TSF can involve a number of processes. In many cases stored tailings must be dried over a long period to enable the passage of earthmoving equipment. In some, significant engineering works may be required, such as the construction of a spillway and alteration of surface drainage, the provision of a layered dry cover or controls to establish a permanent water cover.

The potential environmental impacts of decommissioned TSFs include groundwater contamination, acid drainage and erosion of material by water and wind. While the threat of catastrophic failure is usually reduced due to the de-watered nature of the deposit, under certain circumstances it remains an important consideration.

The final landform design must be compatible with the form of containment or encapsulation of the tailings, the nature of the embankment materials, the needs of the community and the landowner, any legal requirements, climate, local topography and the level of management available after reclamation.

Cover design

The characteristics of the particular tailings and the topographic, hydrogeological, geotechnical and climatic characteristics of the disposal site usually determine the appropriate cover design. Covers range from complex multi-layers of earth and rock to those where only a relatively thin growing medium is required on the surface.

Where the tailings are less reactive, impermeable layers may not be required but it may be necessary to install a layer of broken rock to stop capillary rise or to use a large volume of material in order to provide a sufficient depth of soil for root establishment.

Re-vegetation

The type and depth of cover used in rehabilitation of the TSF are also influenced by the desired re-vegetation outcomes and future activities permitted on the closed facility.

In some cases large depths of soil and rock may be required to ensure adequate resources for tree growth while, where the area is expected to return to pasture, less cover would be required. Caution should be exercised in re-vegetating with trees, however, as the cover or lining may be compromised by roots or when trees fall or are removed.

The potential for erosion of enclosures is also of concern, and the risk increases considerably where the area is used for intensive agriculture (cultivation) and with the steepness of the embankment. Even with less intensive agriculture, such as grazing, potential for erosion exists along frequently used stock routes and during drought.

1.3.9 Solid waste disposal

Waste is generated from the start to the decommissioning of a project. It is proposed that the waste that would be generated on site would be managed by reducing, reusing and recycling as far as possible. The Gert Sibande District Municipality would not be responsible for the solid waste disposal.

The overall aim of the project is to keep the carbon footprint of the entire project as small as possible. This will include the use of “green” products as far as possible as well as the reclamation of all building rubble during the construction phase.

Several waste streams are likely to originate from the activities associated with day to day activities in the workplace. Some of these waste streams may not be hazardous, but the majority may contain a component(s) that may need special treatment. The nature of these waste streams may also vary due to composition and physical form. In order to make informed decisions on determining the appropriate waste management options to handle, treat and dispose of waste, the different waste streams must be identified in terms of hazardous and non-hazardous wastes. Waste streams can be categorised into 6 (six) different streams, based on similar health and environmental concerns namely:

- **Inorganic wastes** – acids, alkalis, cyanide wastes, heavy metal sludges and solutions, asbestos wastes and other solid residues.
- **Oily wastes** – primarily from the processing, storage and use of mineral oils.

- **Organic wastes** – halogenated solvents residues, non-halogenated solvent residues, polycarbon based (PCB) wastes, paint and resin wastes.
- **Putrescible Organic Waste** – wastes from production of edible oils, slaughter houses, tanneries and other animal based products.
- **High Volume/Low Hazard Wastes** – waste based on their intrinsic properties present relatively low hazards but may pose problems due to high volumes such as fly ash from power plants.
- **Miscellaneous Wastes** – infectious waste from diseased human/animal tissue, redundant chemicals, laboratory wastes and explosive wastes from manufacturing operations or redundant munitions.

The following shall apply to the temporary storage of waste at source:

- The employer shall provide adequate and appropriate containers for the temporary storage of waste at source;
- Adequate containers must be available to store different types of waste separately to allow for recycling and disposal according to the IWM Plan;
- Dedicated storage areas for various types of waste must be allocated and clearly marked;
- Waste collected at source shall be collected on a daily basis;
- Waste must be stored in such a manner that it can be safely accessed and loaded;
- Should waste be stored in containers, drums or skips care must be taken that:
    - Waste types (special vs. controlled vs. general waste) are not mixed.
    - Waste is not kept in a corroded or worn container.
    - The container is secure so as to prevent accidental spillage or leakage.
    - All waste skips and containers are labelled with their contents.
    - Skips or containers do not overflow.
    - Skips for special waste is always covered.
    - Skips for controlled waste is covered skips wherever possible.
- Waste must be kept in such a way as to prevent it falling while in storage or while it is being transported;
- Waste must be protected from scavenging by people and animals;
- Do not dispose of (burn, bury or treat) waste on site;
- Collection of waste must be scheduled and the site/location manager must be notified before hand of collection times and type of waste to be collected; and
- Implement dust suppression measures, such as wetting of access routes and accumulated controller waste.

1.3.10 Water supply

Mining and coal beneficiation activities in close proximity to a water resource may undoubtedly contribute towards environmental resource degradation. However if appropriate water resource management principles, strategies and measures are in place, the impact on the resource could potentially be controlled to ensure project sustainability and long-term resource protection. This can be achieved through the issuance of an Integrated Water Use Licence for all water uses linked to the mining activities to be executed by the applicant.

South African Coal Mining Limited (Pty) Ltd will apply for an Integrated Water Use Licence Application (IWULA) for the water use related to its mining and coal beneficiation operations. The IWULA process includes the collation of all the necessary information required by the Department of Water Affairs for the identified Section 21 water uses and motivation for exemption from certain requirements of Government Notice 704 (GN R 704), Gazette 20118, 4 June 1999)).

The water uses for which South African Coal Mining Limited (Pty) Ltd will submit a Water Use Licence Application includes:

21a) Abstraction of water;
21b) Storing of water;
21c) Impeding or diverting the flow of water in a watercourse;
21g) Disposing of waste in a manner which may detrimentally impact on a water resource;
21i) Altering the bed, banks, course or characteristics of a watercourse; and
21j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

This Integrated Water and Waste Management Plan (IWWMP) is compiled in order to promote the environmentally sustainable and equitable use of water in relation to the existing mining operations at the South African Coal Mining Limited (Pty) Ltd operations. The IWWMP is intended to be a simple, feasible, implementable plan for the coal processing and preparation plant based upon site specific programmes, also taking into account the National Water Resource Strategy (NWRS), relevant Catchment Management Strategy (CS), Resource Quality Objectives (RQO) and the sensitivity of the receiving water resources and down-stream water users in the vicinity of the mine.

1.4 Project motivation

Currently the coal processing and preparation plant is located on the Farm Mooifontein 109 IT. This is also the area where most of the current mining activities are undertaken (refer to general plan in Annexure 5). Therefore, it makes sense to locate the processing plant as near as possible to mining activities to limit the environmental impact associated with coal mining and processing.

The block on the Farm Mooifontein 109 IT has been mined and there is currently no opencast table reserves left on the property. The only reserve left is on Farm Voorslag 274 IS. If the mining operations move to that location the existing coal processing and preparation plant will be approximately 2 to 3 kilometres away (further to the south). If the coal processing and preparation plant remain at its current location on the Farm Mooifontein 109 IT, it would entail moving raw coal to the processing plant using heavy vehicles, over treacherous terrain which may ultimately result in unnecessary spillages and incidents.

To limit the environmental impact of the coal mining and processing it is required to relocate and possibly upgrade the existing coal processing and preparation plant to a location closer to the Farm Voorslag 274 IS.

The current plant has historically been located in a sensitive catchment where a stream had to be diverted to accommodate for the plant. The impact on the water resources will be significantly lower should the plant be moved away and the stream rehabilitated.

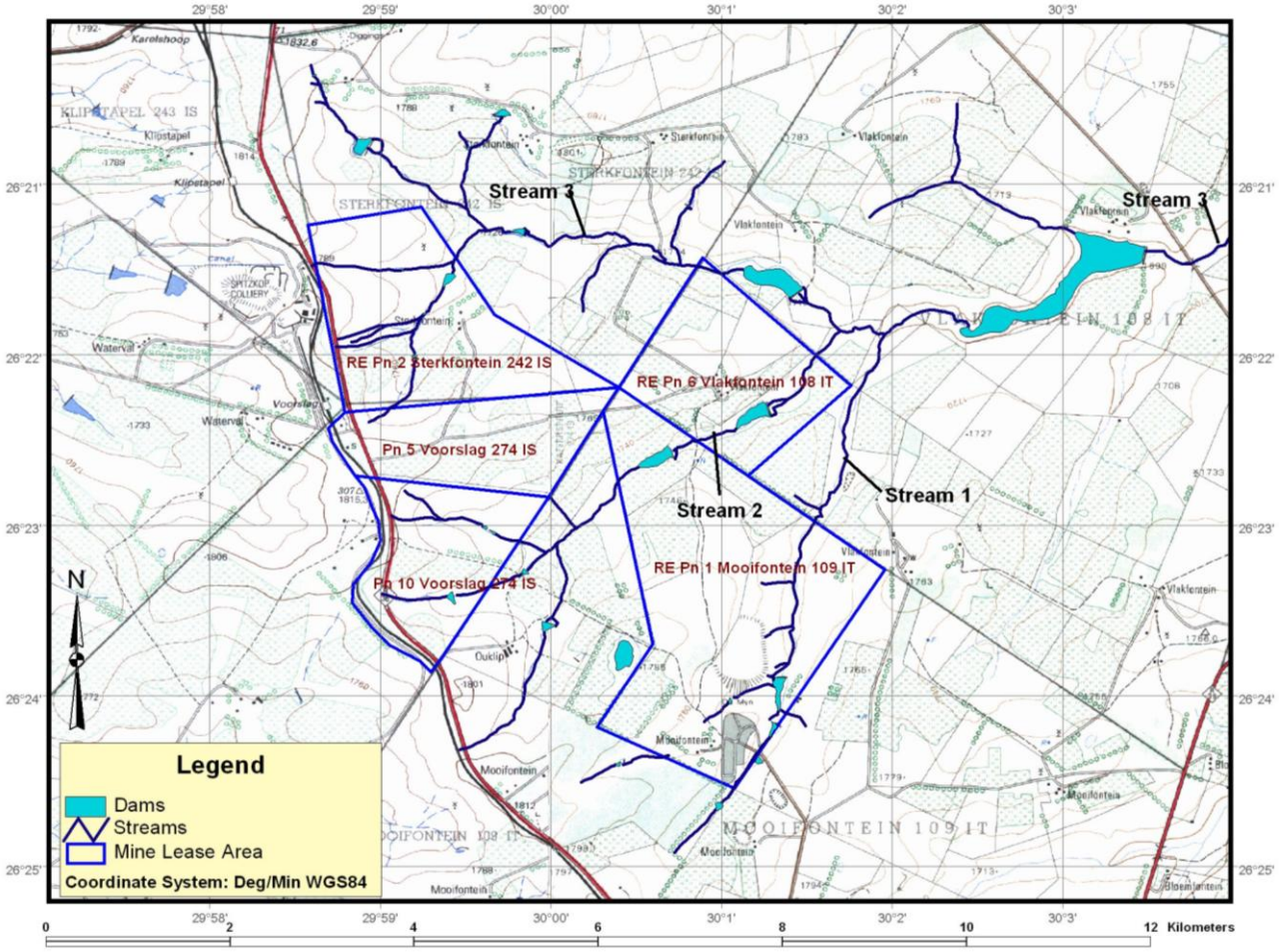


Figure 2: The mining boundaries of the Umlabu Colliery, showing the surface streams and dams

2. LEGAL FRAMEWORK

This section includes a list of Acts and legislative requirements applicable to this project. The aim of this component of the report is to provide a brief overview of the pertinent policies as well as legal and administrative requirements applicable to the proposed development of the coal preparation and processing plant and tailings facility at Umlabu Colliery on the Farm Voorslag 274 IS, Mpumalanga Province.

The legislative motivation for this project is underpinned by the Constitution of South Africa (Act No. 108 of 1996), which states that:

The State must, in compliance with Section 7(2) of the Constitution, respect, protect, promote and fulfil the rights enshrined in the Bill of Rights, which is the cornerstone of democracy in South Africa. Section 24 of the Constitution states:

24. Environment

-Everyone has the right-

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting a justifiable economic and social development.

Section 24 of the Constitution of South Africa (Act No. 108 of 1996) requires that all activities that may significantly affect the environment and require authorisation by law must be assessed prior to approval. In addition, it provides for the Minister of Environmental Affairs and Tourism or the relevant provincial ministers to identify:

- new activities that require approval;
- areas within which activities require approval; and
- existing activities that should be assessed and reported on.

Section 28(1) of the Constitution of South Africa (Act No. 108 of 1996) states that: "every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring". If such pollution or degradation cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution or degradation. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution or degradation; and
- Remedying the effects of the pollution or degradation.

2.1 NEMA and Environmental Impact Assessment Regulations

The National Environmental Management Act, 1998 (Act 107 of 1998) [NEMA] was first enacted in November 1998 and the amended Act came into effect in June 2010. The NEMA strives to legislate National Environmental Management Policy and has repealed a number of the provisions of the Environment

Conservation Act, 1989 (Act 73 of 1989)[ECA]. NEMA is focussed primarily on co-operative governance, public participation and sustainable development.

NEMA makes provisions for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by Organs of the State and to provide for matters connected therewith. Section 2 of the Act establishes a set of principles, which apply to the activities of all organs of state that may significantly affect the environment. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised and positive enhanced; and
- Responsibility for the environmental health and safety consequences of a policy, project, product or service exists throughout its entire life cycle.

These principles are taken into consideration when a Government department exercises its powers, for example, during the granting of permits and the enforcement of existing legislation or conditions of approval.

The authorities may direct an industry to rectify or remedy a potential or actual pollution or degradation problem. If such a directive is not complied with, the authorities may undertake the work and recover the costs from the responsible industry.

The Environmental Impact Assessment (EIA) process followed is in compliance with the National Environmental Management Act, 1998 (Act 107 of 1998) [NEMA], as amended and the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R543, 544 and 545 of 2010). The proposed development involves 'listed activities', as defined by the NEMA. Listed activities are activities, which may have potentially detrimental impacts on the environment and therefore require environmental authorisation from the relevant authorising body. The proposed development occurs in the Mpumalanga Province and the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) is the responsible regulatory authority.

The proposed development includes the development of a coal preparation and processing plant at Umlabu Colliery on the Farm Voorslag 274 IS, Mpumalanga Province, and triggered listed activity, as stipulated in the EIA Regulations of 2010, and as such is required to undergo a Scoping/EIA exercise in support of the application for environmental authorisation from MDEDET (Government Notice No. 544 and 545 of April 2010).

The proposed development includes the following listed activity as stipulated in the EIA Regulations of 2010:

NEMA (Act 107 of 1998) GNR 544 of 2010:

Item 11: The construction of:

i) canals;
ii) channels;

iii) bridges;
iv) dams;
v) weirs;
vi) bulk storm water outlet structures;
vii) marinas;
viii) jetties exceeding 50 square metres in size;
ix) slipways exceeding 50 square metres in size;
x) buildings exceeding 50 square metres in size; or
xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

Item 13: Storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres;

Item 18: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from
i) a watercourse;
ii) the sea;
iii) the seashore;
iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater-
but excluding where such infilling, depositing, dredging, excavation, removal or moving
a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or
b) occurs behind the development setback line.

Item 22: The construction of a road outside urban areas –
i) With a road reserve wider than 13,5 meters; or
ii) Where no reserve exists where the road is wider than 8 meters; or
iii) For which an environmental authorization was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.

Item 28: The expansion of existing facilities for any process or activity where such expansion will result in the need for a new, or amendment to, an existing permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act (Act 59 of 2008) in which case that Act will apply.

NEMA (Act 107 of 1998) GNR 545 of 2010:

Item 15: Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;

Item 20: Any activity which requires a mining right or renewal thereof as contemplated in section 22 and 24 respectively of the Mining and Petroleum Resources Development Act, 2002 (Act 28 of 2002).

2.2 National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

The overarching aim of the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA), within the framework of NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bioprospecting involving indigenous biological resources.

The South African National Biodiversity Institute (SANBI) was established by the NEMBA, its purpose being (inter alia) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 8. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

It is also appropriate to undertake a Fauna and Flora Impact Assessment for developments in an area that is considered ecologically sensitive which require environmental authorisation in terms of NEMA, with such Assessment taking place during the EIA phase.

The NEMBA is relevant to the proposed project as removal of overburden and mining may impact negatively on biodiversity. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite SANBI to provide comments on any documentation resulting from the proposed development.

2.3 National Heritage Resource Act, 1999 (Act No. 25 of 1999)

In terms of the National Heritage Resources Act, 1999 (Act 25 of 1999), a Heritage Impact Assessment have been undertaken for the site since the site is greater than 0,5 hectares (ha) in extent.

The Act makes provision for the destruction of existing sites, pending the archaeologist recommendations through permitting procedures. Permits are administrated by the South African Heritage Resources Agency (SAHRA).

Section 38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50m in length;
(c) any development or other activity which will change the character of a site-
    (i) exceeding 5 000 m^2 in extent; or
    (ii) involving three or more existing erven or subdivisions thereof; or
    (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Archaeological impact assessments (AIAs) are often commissioned as part of the heritage component of an Environmental Impact Assessment (EIA) and are required under Section 38(1) of the National Heritage Resources Act NHRA of 1999 (Act 25 of 1999), Section 38(8) of the National Environmental Management Act (NEMA) and the Mineral and Petroleum Resources Development Act (MPRDA).

The process of archaeological assessment usually takes the form of:

1. A scoping or initial pre-assessment phase where the archaeologist and developer's representative establish the scope of the project and terms of reference for the project;
2. A Phase 1 archaeological impact assessment;
3. A Phase 2 archaeological mitigation; and
4. A Phase 3 heritage site management plan.

Phase 1 archaeological impact assessment

Phase 1 archaeological assessments generally involve the identification and assessment of sites during a field survey of a portion of land that is going to be affected by a potentially destructive or landscape-altering activity.

The locations of the sites are recorded and the sites are described and characterised. The archaeologist assesses the significance of the sites and the potential impact of the development on the sites and makes recommendations.

It is essential that the report supply the heritage authority with sufficient information about the sites to assess, with confidence, whether or not it has any objection to a development, indicate the conditions upon which such development might proceed and assess which sites require permits for destruction, which sites require mitigation and what measures should be put in place to protect sites that should be conserved.

Minimum standards for reports, site documentation and descriptions are clearly set out by the South African Heritage Resources Agency (SAHRA) and supported by ASAPA.

The sustainable conservation of archaeological material (in situ) is always the best option for any sites that are deemed to be of importance. The report needs to indicate which sites these are, explain why they are significant and recommend management measures.

In certain kinds of developments which involve massive intervention (mining, dam construction etc), it is not possible to reach a conservation solution other than to develop a programme of mitigation which is likely to involve the total or partial "rescue" of archaeological material and its indefinite storage in a place of safety.

Phase 2: Archaeological mitigation

If a Phase 1 report finds that certain archaeological sites in a development area are of low significance, it is possible to seek permission from the heritage authority for their destruction. The final decision about this is taken by the heritage resources authority, which should give a permit or a formal letter of permission, or in the case of an EIA (in South Africa) issue a comment allowing destruction.

Phase 2 archaeological projects are primarily based on salvage or mitigation excavations preceding development that will destroy or impact on a site. This may involve collecting of artefacts from the surface, excavation of representative samples of the artefactual material to allow characterisation of the site and the collection of suitable materials for dating the sites. The purpose is to obtain a general idea of the age, significance and meaning of the site that is to be lost and to store a sample that can be consulted at a later date for research purposes. Phase 2 excavations should be done under a permit issued by SAHRA, or other appropriate heritage agency, to the appointed archaeologist. Permit conditions are prescribed by SAHRA, or other appropriate heritage agencies, and include as minimum requirements reporting back strategies to SAHRA, or other appropriate heritage agencies, and deposition of excavated material at an accredited repository.

Should further material be discovered during the course of development, this must be reported to the archaeologist or to the heritage resources authority and it may be necessary to give the archaeologist time to rescue and document the findings. In situations where the area is considered archaeologically sensitive the developer will be asked to have an archaeologist monitor earth-moving.

Phase 3: Management plan for conservation and planning, site museums and displays

On occasion, the Phase 2 may require a Phase 3 programme involving the modification of the site or the incorporation of the site into the development itself as a site museum, a special conservation area or a display. Alternatively it is often possible to re-locate or plan the development in such a way as to conserve the archaeological site or any other special heritage significance the place may have. For example in a wilderness area or open space when sites are of public interest the development of interpretative material is recommended and adds value to the development.

Permission for the development to proceed can be given only once the heritage resources authority is satisfied that measures are in place to ensure that the archaeological sites will not be damaged by the impact of the development or that they have been adequately recorded and sampled. Careful planning can minimise the impact of archaeological surveys on development projects by selecting options that cause the least amount of inconvenience and delay.

The process as explained above allows the rescue and preservation of information relating to our past heritage for future generations. It balances the requirements of developers and the conservation and protection of our cultural heritage as required of SAHRA and the provincial heritage resources authorities.

2.4 National Water Act, 1998 (Act No.36 of 1998)

The National Water Act aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways, which take into account:

- Meeting the basic human needs of present and future generation;
- Promoting equitable access to water;
- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations; and
- Managing floods and droughts.

The project will require the submission of a Water Use License Application (WULA) in terms of Section 21 of the NWA which will include the following activities:

a) Abstraction of water;
b) Storing of water;
c) Impeding or diverting the flow of water in a watercourse;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
i) Altering the bed, banks, course or characteristics of a watercourse; and
j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

The WULA will be undertaken as a separate process and does not fall within the scope of this environmental authorisation process. The public participation process did however make provision for both processes as well as the Section 102 Amendment to the Mining Right application.

2.5 Integrated Environmental Management

Integrated Environmental Management (IEM) is a philosophy, which prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development (Department of Environmental Affairs: DEAT, 1992). The IEM guidelines intend endearing a pro-active approach to sourcing, collating and presenting information at a level that can be interpreted at all levels.

2.6 National Environmental Management: Air Quality Act (Act No 39 of 2004)

The objective of the National Environmental Management: Air Quality Act, 2004 is to regulate air quality in order to protect, restore and enhance the quality of air in the Republic, taking into account the need for sustainable development. Furthermore, the provision of national norms and standards regulating air quality monitoring, management and the control by all spheres of government; for the specific air quality measures should be adhered to.

2.7 Conservation of Agricultural Resources Act (Act 43 of 1983)[CARA]

To provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

2.8 National Environmental Management: Waste Act (Act 59 of 2008)[NEMWA]

The National Environmental Management: Waste Act (Act 59 of 2009) aims to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters. Furthermore this Act aims to provide for national norms and standards for regulating the management of waste by all spheres of government. It provides guidance for the licensing and control of waste management activities and gives regulations for the rehabilitation and remediation of contaminated land.

2.9 Occupational Health and Safety Act (Act 85 of 1993)[OSHAct]

To provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.

In Section 8 General duties of employers and their employees it is stated that:
"Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of the employees."

(2) The matters to those duties refer include in particular:

a. The provision and maintenance of systems of work, plant and machinery that, as far as reasonably practicable, are safe and without risk to health;
b. Taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety and health of employees;
c. Making arrangement for ensuring as far as reasonably practicable, the safety and absence of risks to health in connection with the production. Processing, use, handling, storage and transport of articles or substances;
d. Establishing, as far as reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in his business, and he shall, as far as reasonably practicable, further establish what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety or persons, and he shall provide the necessary means to apply such precautionary measures;
e. Providing such information, instruction, training and supervision as may be necessary to ensure, as far as reasonably practicable, the health and safety of employees;
f. As far as reasonably practicable, not permitting any employee to do any work or to produce, process, use, handle, store, or transport any article or substance or to operate any plant or machinery, unless precautionary measures contemplated in paragraph (b) and (d), or any precautionary measures which may be prescribed, have been taken;
g. Taking all necessary measures to ensure that the requirements of this Act are complied with by every person in his employment or on the premises under his control where plant and machinery is used;
h. Enforcing such measures as may be necessary in the interest of health and safety;
i. Ensuring that work is performed and that plant and machinery is used under the general supervision of a person trained to understand the hazards associated with it and who has the authority to ensure that precautionary measures taken by the employer are implemented; and
j. Causing any employees to be informed regarding the scope of their authority as contemplated in Section 37(1) (b).

3. NATURE AND EXTENT OF THE ENVIRONMENT AFFECTED BY THE ACTIVITY

3.1 Locality

The Portion 5 and 10 of the Farm Voorslag 274 IS (refer to Locality map in Annexure 5) in Breyten area, Mpumalanga Province is situated on the south southeast of Breyten near Ermelo. The property is approximately 600 hectare in size and the resources size is approximately 240 hectare. The mining area will be approximately 50 hectare in size due to mining access constraints to the ore body. The CHHP plant will be approximately 0.5 hectares in size.

3.2 Soils and geology

The geology of the area is dominated by near horizontally bedded and wavy successions of sandstone, mudstone, siltstone and coal layers of the Natal Middle Ecca Stage coal province of the Vryheid Formation. The lower Vryheid Formation is described as upward coarsening shale and sandstone cycles which represent prograding deltaic environments. This in turn is overlain by upward fining sandstone and shale cycles, which are of a fluvial origin. The coal beds, which were deposited in the back swamps of meandering river systems, cap the Lower Vryheid lithologies. The depositional environment is believed to be a dendritic channel system that resulted in the deposition of more arenaceous material in the active channels and mud and coal deposited on their floodplains. Channel closure led to the filling of channels by mud, the establishment of swamps and the deposition of coal beds within them. Similar deltaic and fluvial processes characterise the sediments overlying the coal seams, consisting mainly of alternating sequences of shale and sandstone. The more competent sandstone formations can result in localised hilly terrains. The coal layers form part of the Karoo Sequence of which the Middle Ecca Group contains the coal measures, which are of economic value. The succession of sedimentary rocks generally overlies the well consolidated conglomerates and diamictites and tilite of the Dwyka Formation. The coal seams for the Ermelo sector of the Natal Middle Ecca Stage coal province are alphabetically ordered from E seam at the base through to A seam at the top. In the area under investigation the A seam has been weathered and or eroded away.

The regional geology consists of various groups within the Karoo Supergroup as well as numerous dolerite intrusions, occurring as both dykes and sills. The most relevant Karoo Supergroup unit to this study area is the Permian aged Ecca Group. Although the Ecca Group is defined by 16 formations, only one dominates the immediate study area, namely the Vryheid Formation. Dolerite dykes are therefore present in the area. The dykes serve as a ground water divide. The strata, including the coal seams, generally dip towards the west, displaying a weak undulating attitude. This probably reflects the paleo-topography of the Karoo sediments. Dolerite sill intrusions are found to the west of Umlabu Colliery. The geological map (2630 Mbabane and 2628 East Rand) indicates a definite presence of geological lineaments that are oriented predominantly in a northeast-southwest direction.

3.3 Soils and agricultural potential

The soil potential of the different soil forms within the study area is presented in Table 6 below.

Table 6: Soil potential of the soil forms occurring on the study area

SOIL FORM	SOIL POTENTIAL		
	Dryland	**Irrigation**	**Grazing**
Katspruit	None	None	Medium
Dresden	None	None	Medium
Longlands	Low	None	Medium
Hutton	High	High	High
Avalon	High	None to very low	High
Pinedene	Low	None	Medium
Witbank	None	None	Low to Medium

Of all the soil forms that occur on the study area only the Hutton and Avalon soil Forms are suitable for dryland crop production. The Pinedene soil form although having a low dryland soil potential is disqualified due to water logging during the wet season (summer months).

The Katspruit soil form is disregarded as a potential dry land soil due to it shallow soil depth and position in the valley bottom, terrain unit 5. According to the Conservation of Agricultural Resources Act (Act no. 43 of 1983) no person is allowed to cultivate any area within a terrain unit 5, nor shall any land user utilise the vegetation in a vlei, marsh, or water sponge or within the flood area of a water course or within 10 meters horizontally outside such flood area in a manner that cause the deterioration of or damage to the natural agricultural resources.

Dryland potential to support specific crops

Table 7: Potential crops together with potential crop yields for the different soil forms, indicates cash crops that can be cultivated in the Ermelo area.

Table 7: Potential crops together with potential crop yields for the different soil forms

	Maize Ton/ha	Grain / Sorgum Ton/ha	Beans Ton/ha	Wheat Ton/ha	Sunflower Ton/ha	Peanuts Ton/ha
Katspruit	2,34	2,47	1,04	1,31	1,24	0
Dresden	0	0	0	0	0	0
Longlands	0	0	0	0	0	0
Hutton	4,22	6,24	2,2	2,34	2,49	2,23
Avalon	3,28	4,74	1,82	1,64	2,17	1,63
Pinedene	3,28	4,32	1,82	1,4	2,17	1,63
Witbank	0	0	0	0	0	0

Table 7: Potential crops together with potential crop yields for the different soil forms, indicates that of the seven soil types identified in the study area only three soil forms should be utilised for crop production viz.: Hutton, Avalon and Pinedene.

The chemical properties of the different soil forms and the different horizons are presented in Table 8: Chemical properties of the different soil forms on the study area.

Table 8: Chemical properties of the different soil forms on the study area

SOIL FORM	HORIZON	pH	EC	P	K	Ca	Mg	Na
		KCl	mS/m	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Katspruit	Orthic A	3.8	63.7	11	69	122	45	6
	G Horizon	4.1	37.0	7	44	186	163	6
Dresden	Orthic A	4.3	20.4	6	131	251	120	5
Hutton	Orthic A	4.2	16.67	5	158	368	133	23
	Red Apedal B	4.3	10.88	1	89	478	173	18
Avalon	Orthic A	4.2	14.59	11	144	354	64	5
	Yellow Brown Apedal B	3.9	46.3	6	122	171	31	5
Pinedene	Orthic A	4.1	99.3	3	96	208	123	51
	Yellow Brown Apedal B	4.2	46.6	1	82	50	38	18

The erodibility of the soils occurring in the study area is presented in Table 9: Derived erodibility of the soils occurring in the study area.

Table 9: Derived erodibility of the soils occurring in the study area

SOIL FORM	EROSION SUSCEPTIBILITY INDEX	
	WATER EROSION	WIND EROSION
Katspruit	Moderate	Low
Dresden	Moderate	High
Longlands	Moderate	High
Hutton	Very Low	Moderate to High
Avalon	Moderate	High
Pinedene	Moderate	High
Witbank	Moderate to High	Moderate to High

The land capability classification is done in accordance with the Chamber of Mines Rehabilitation Guidelines. Table 10: The land capability of the different soil forms indicates the land capability of the different soil forms in the study area.

Table 10: The land capability of the different soil forms

SOIL FORM	LAND CAPABILITY CLASS	SOIL DEPTH (cm)	TOPSOIL DEPTH (cm)
Katspruit	Wetland / Grazing	75	35
Dresden	Grazing land	22	22
Longlands	Wetland / Grazing	75	40
Hutton	Cultivated Land	120	30
Avalon	Cultivated Land	85	30
Pinedene	Pastures and Grazing	120	35
Witbank	Grazing	120	10

Seven different soil forms were identified across the study area. Soils identified during the survey can be classified as Orthic soils. The crop production potential of soils is generally low except for the Hutton and Avalon soil forms. Grazing potential for the area is high to moderate on all soil types identified. The susceptibility of the soils to wind erosion is high and to water erosion moderate. The pre-mining land use of the study area was identified as dry land crop production and grazing. Several streams and associated riparian wetlands occur on the study area.

3.4 Topography and hydrology

Pre-mining landuse is agricultural. Agricultural practises include cattle grazing and agronomical cash crop production. Crops planted on the area include maize and dry beans. A farmhouse and associated out-occur on the western portion of the property. The pre-mining landuse on Umlabu Coal Colliery is summarised in

Table 11: Historical agricultural production and evidence of misuse.

Table 11: Historical agricultural production and evidence of misuse

Surface area	1 724 7058 ha
Pre-mining land use	Grazing Maize and dry bean production
Historical Agri. Production	Maize and Dry Beans
Evidence of misuse	Agricultural over grazing Black wattle
Existing structures	Farm house and out buildings

The presence of watercourses, streams, rivers, dams, catchment boundaries and sub-catchments and the associated river water monitoring points are depicted in

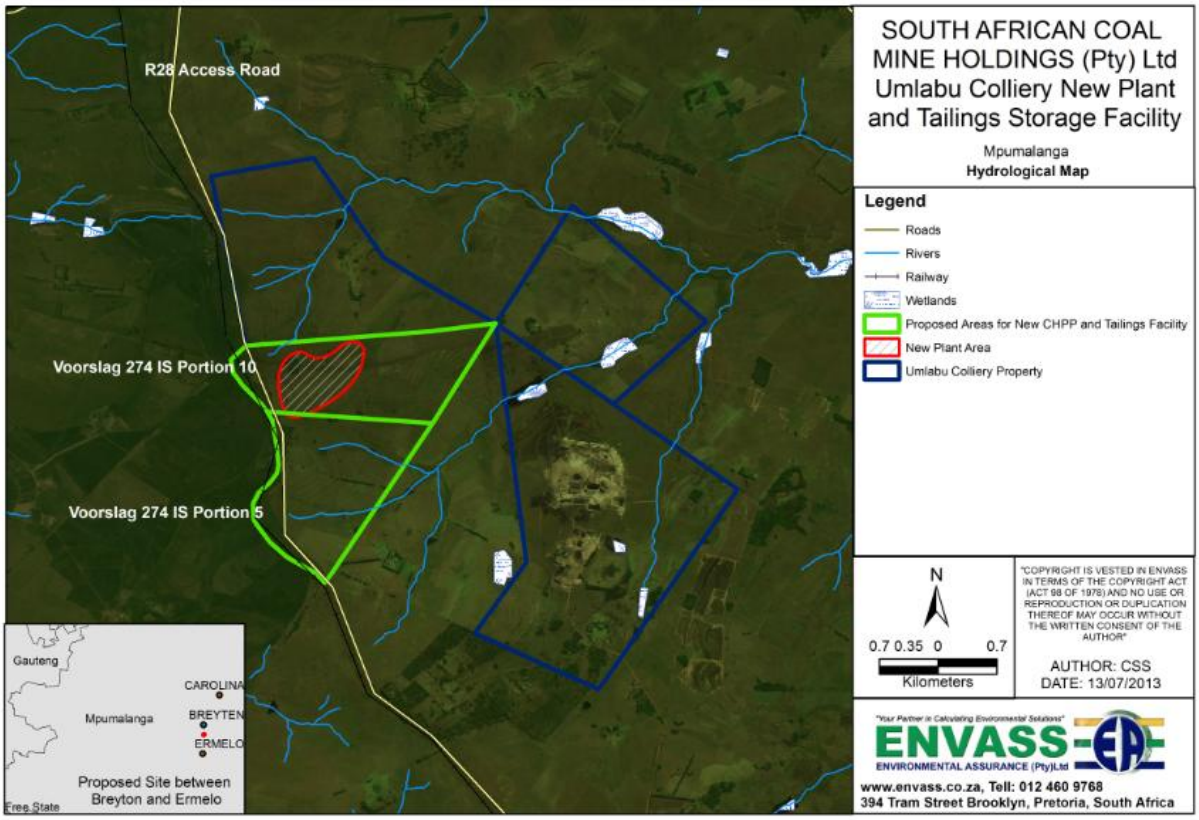


Figure 3: The surface hydrology of the Umlabu mine.

The Mine lease area falls within the Msukaligwa (MP302) local municipal area. The site is located in the quaternary catchment, C11A (Upper Vaal River catchment). Actually, the mine lease area starts right on the watershed between quaternary catchments C11A and C11F, but is located entirely within C11A to the east of the watershed between the two catchments. Quaternary catchment C11A has a mean annual rainfall of 742.71 mm and a mean annual run-off into surface streams of 75.7 mm. (Midgley et. al. 1994).

Several unnamed streams flows across the site towards the Torbanite dam. Three sub-catchments occur within the mining area namely, Upper Torbanite dam, Western and Southern catchments.

Mean annual runoff, as well as flood peak volumes and discharges of the respective catchments are indicated in Table 12: Catchments within Umlabu Colliery.

Table 12: Catchments within Umlabu Colliery

	Size	MAR	Peak Volume (V)			Peak Volume (Q)		
Catchment	Ha	(106m3)	V50	V100	VRMF	Q50	Q100	QRMF
Upper Torbanite Dam catchment	5 116,0	12,0	1,8	2,4	6,5	185,3	227,5	436,5
Western tributary catchment	1 345,2	4,1	0,5	0,9	1,9	47,1	57,6	102,9
Northern tributary catchment	1 155,4	3,7	0,4	0,8	1,6	40,2	49,1	86,1

Note that no mining will occur within 100m of a stream, which is further from the channel than the 1:100 year flood lines, thus no river diversion will occur.

The entire Eastern Highveld is characterised by seep zones, springs and wetlands as well as seasonal pans. Shallow groundwater usually daylights where sandstone or ferricrete outcrops force the groundwater to the surface, forming springs and seep zones. For this reason there are mostly two distinct aquifers in these parts of the land, a shallow weathered aquifer above the sandstone/mudstone/shale layer and a deeper fractured aquifer underlying this layer, usually among or underneath the coal seams, where these occur.

Surface water users in the vicinity of Umlabu Colliery are quite varied. The immediate neighbouring properties are utilized for agricultural purposes mostly. Some farmers' farm commercially while other farm on basic subsidence scale. There are also quite a number of smallholdings. Some members of the Ermelo fishing community enjoy fishing in the first dam downstream from the mine on Mr. Naude's farm. Except for fishing at this dam, there's no other recreational activities practised in close vicinity to the mine utilizing surface water. There has been observation of a house built right next to the water's edge a few kilometres downstream from the mine with a small motorized float. It can be safely assumed that this surface water area serves a recreational purpose to the owner of the land.

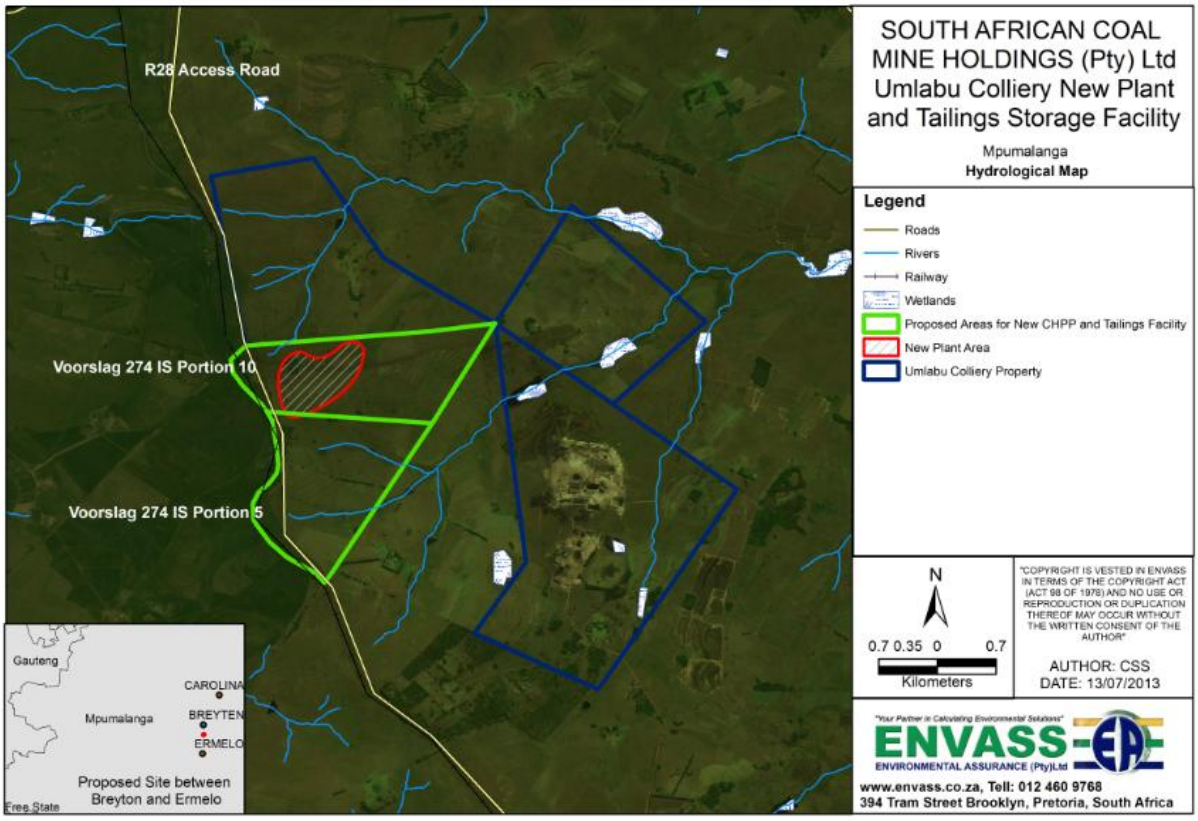


Figure 3: The surface hydrology of the Umlabu mine

3.5 Groundwater

Since mining activities can potentially impact on the groundwater, a description of the current groundwater

conditions is required. The purpose of this section is, therefore to describe the current prevailing groundwater conditions. This will serve as a reference baseline for quantifying potential mining impacts on the existing groundwater regime.

From historical available data it is evident that the groundwater depth varies across the site, mainly due to the topography and heterogeneity of the secondary structures in the bedrock. The heterogeneity of the fractured rock aquifer on such a small scale can be ascribed to the presence of structures such as dykes, fractures, fissures, joints and faults creating secondary pathways for flow. Groundwater levels varying between 2m and 30m below ground level have been determined. There is a poor correlation between static water level and topography. This can be ascribed to current mining activities in the area. Boreholes located on or close to the old Satmar underground mine workings to the south of the site showed deeper water levels to other boreholes in the area.

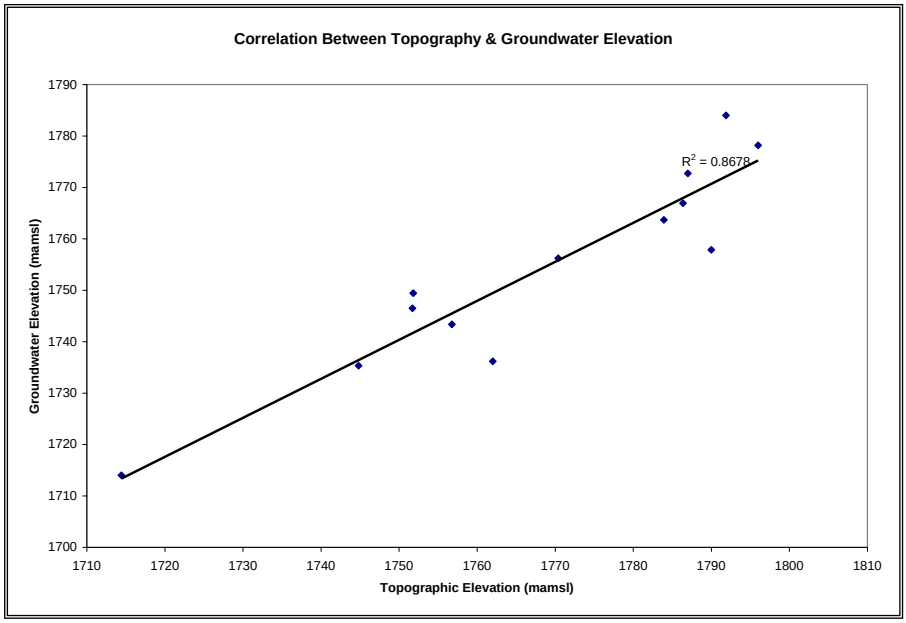


Figure 4: Groundwater levels versus topography (after Rison, August 2008)

The borehole abstraction rates on many of the identified boreholes are unknown as they are largely used for private purposes, consisting largely of domestic usage as can be seen from the table below.

Table 13: Borehole abstraction rates in the Umlabu coal Colliery surrounds

BH	Easting	Northing	Depth	SWL	Use	Owner	Comment
UM4	101205	-2917922	57.72	20.24	Windmill	Umlabu	Planned office use
US3	100879	-2917946	36.28	2.39	None	Leon Naude	Open borehole
US4	101197	-2918505	55.00	13.42	Farm use	Leon Naude	Electric pump
US6	100094	-2921173	100	32.14	Domestic	Johan Swanepoel	Submersible pump
US7	98396	-2919724	100	7.89	Live stock		Wind pump
US8	99415	-2920762	100	19.45	Domestic & live stock		Submersible pump
US9	99099	-2920880	100	17.83	Domestic & live stock		Submersible pump
US10	99285	-2920796	100	14.29	Domestic & live stock		Submersible pump
US11	99370	-2921393	0	0	Bottled water		Natural spring
US13	99588	-2920812	100	25.81	Domestic		Submersible pump

Umlabu Colliery currently abstract groundwater from the old torbanite shaft (OTS) to supply the plant. The exact volumes abstracted are not currently known although a flow meter was installed subsequent to recommendations. The current abstraction estimate is in the region of 35 ℓ/s on a permanent basis.

The Department of Water Affairs an Forestry (DWAF) classify the underlying aquifer as type d2, meaning that groundwater yields are generally between 0.1 – 0.5 ℓ/s and the aquifer is intergranular and fractured.

Further to the east of the mine, the aquifer is classified as type b2, meaning that groundwater yields are generally between 0.1 – 0.5 ℓ/s and the aquifer is fractured.

Pump tests were undertaken on four boreholes, namely US3, US13, UM5 and UM6. Tests on US3, US13 and UM6 consisted of a constant rate test (max. 3 hours) followed by a recovery test (max 3 hour or until 90% was achieved). A pump test of 6 hour duration was undertaken on borehole UM5.

Constant rate as well as recovery data were analysed using the FC program which was designed at the for Groundwater Studies at the University of the Free State. A summary of the pump tests is given in Table 14: Aquifer test summary. Estimated aquifer parameters are summarised in

Table 15: Estimated aquifer parameters.

Table 14: Aquifer test summary

	US3	US13	UM5	UM6
Constant Rate (L/s)	0.80	0.83	0.14	0.48
Constant Rate Duration (min)	12.00	60.00	360.00	180.00
Drawdown (m)	20.09	0.51	27.58	0.95
Recovery Duration (min)	60.00	25.00	360.00	180.00
Recovery Achieved (%)	31.00	99.00	84.00	96.00

Table 15: Estimated aquifer parameters

	Unit	US3	US13	UM5
Transmissivity (Cooper Jacob method)	m^2/day	0.40	44.6	1.5
Transmissivity (Recovery)	m^2/day	1.30	40.6	1.6
Average Transmissivity	m^2/day	0.85	42.6	1.55
Borehole Depth	m	50.00	100	55
Static Water Level (SWL)	mbgl	2.45	25.81	2.88
Saturated Zone	m	47.55	74.19	52.12
Hydraulic Conductivity (k)	m/day	0.02	0.57	0.028

- The plant uses 600 litres of water for every Ton ROM (run-of-mine) processed;
- Process water is pumped from an old flooded shaft;
- The plant currently processes 120 T/hour, (24/7) with 40 hours down time per month, i.e. it currently processes 81 600 T/month (i.e. 48 960 Kℓ/month @ 600 ℓ/T).

An additional investigative measure undertaken with regard to the above issue was to sample groundwater from the surrounding plots and the OTS and to compare the hydrochemical signature by means of a Schoeller plot (Figure 5: Schoeller Diagram for Umlabu coal Colliery).

The Schoeller plot shows that the groundwater sampled at the OTS has a very similar hydrochemical signature to that of the surrounding boreholes, thus strongly suggesting that the groundwater has a similar provenance.

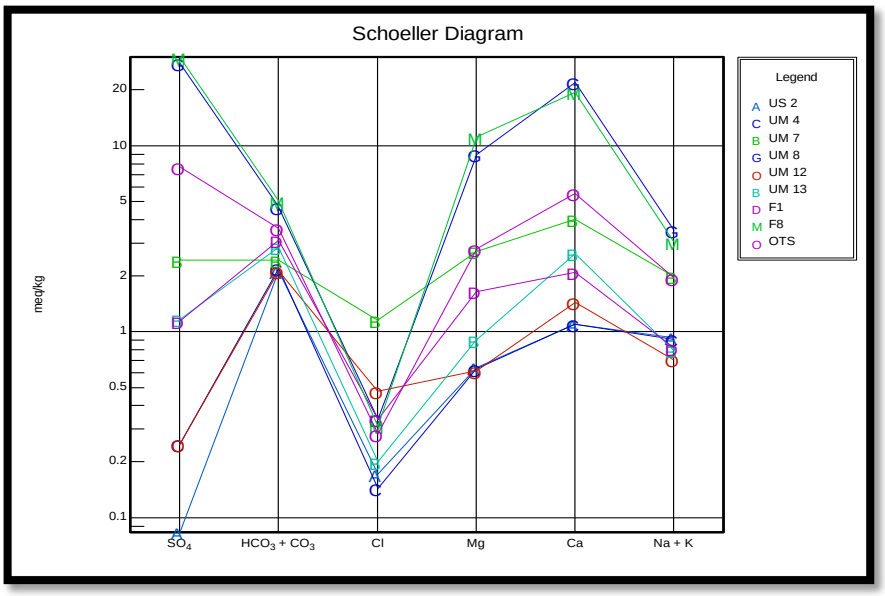


Figure 5: Schoeller Diagram for Umlabu coal Colliery

A static groundwater map of the area was constructed through the utilization of the Bayes interpolation method whereby the topography is used as an intelligent parameter to estimate groundwater levels in areas where data is scarce. Before undertaking a Bayesian interpolation, a correlation between topographic elevation and static water level needed to be determined. Groundwater levels as well as natural spring elevations were used in the correlation. The relationship between these two variables suggests an 87% correlation, meaning that groundwater elevation strongly mimics topographical elevation.

Using average aquifer parameters, gradient of 3% and a porosity of 5%, a flow velocity of 0.126 m per day is

estimated.

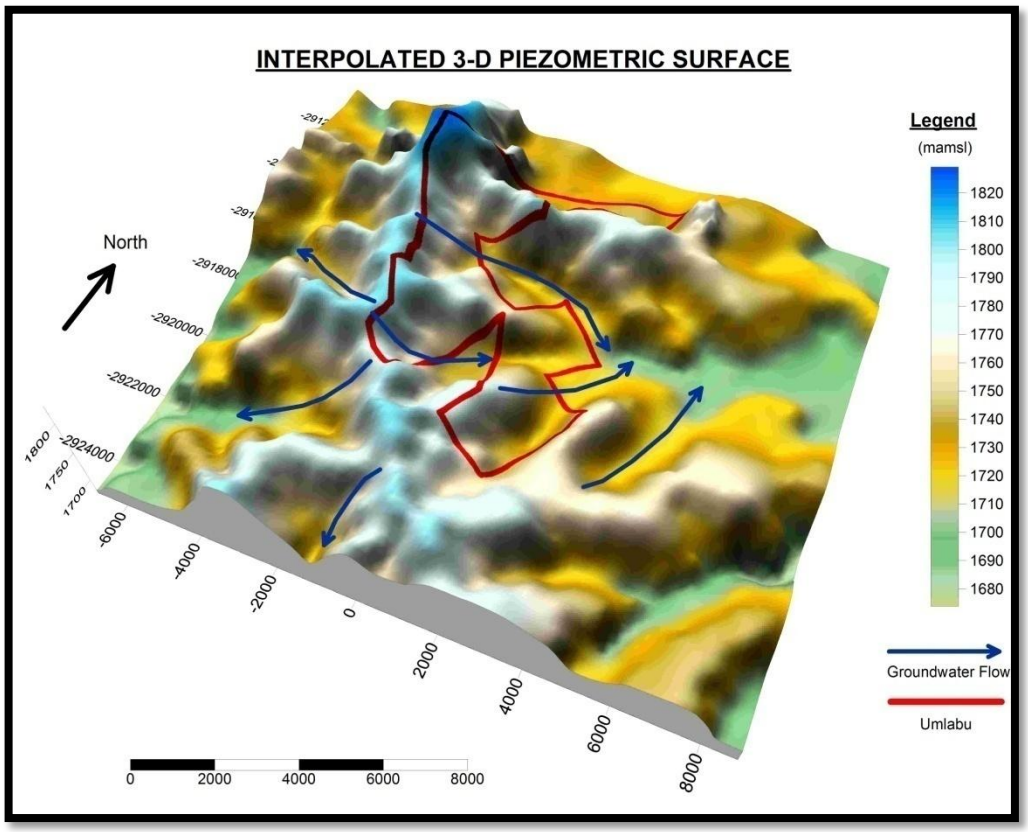


Figure 6: Groundwater flow for the Umlabu coal Colliery

A total of 16 groundwater samples were taken from around the project area and submitted to DD Science which is a SANAS accredited laboratory. Results are presented in 16.

Table 16: Groundwater quality of samples collected during the hydrocensus

PARAMETER	Unit	SABS Guideline			US 2	US 3	US 4	UM 2	UM 4	UM 7	UM 8	UM 9	UM 10	UM 11	UM 12	UM 13	F1	F4	F8	OTS
		Class 0	Class 1	Class 2																
pH	pH units	6 - 9	5 - 9.5	4 - 10	7.60	7.50	7.10	6.30	7.20	5.90	6.10	6.40	6.90	7.60	7.00	7.00	7.30	7.80	7.00	7.00
EC in mS/m	mS/m	<70	70 - 150	150-370	23.00	7.40	14.00	4.40	26.00	77.00	249.00	45.30	40.00	55.00	27.00	39.00	40.80	38.40	241.00	99.50
TDS	mg/L	<450	>450	NS	175.00	67.00	112.00	35.20	175.00	639.00	2330.00	354.00	258.00	498.00	173.00	313.00	276.00	242.00	2320.00	696.00
Alkalinity as CaCO3	mg/L	NS	NS	NS	107.00	21.00	10.00	16.00	110.00	122.00	235.00	40.00	125.00	290.00	107.00	143.00	156.00	200.00	252.00	180.00
Nitrate as N	mg/l N	<6	6 - 10	10 - 20	0.20	0.40	5.80	0.30	1.30	29.00	0.40	-	0.40	0.10	0.20	0.10	-	-	-	-
Chloride as Cl	mg/L	<100	100-200	200-600	6.10	7.80	14.00	<5.0	5.10	41.00	12.00	37.00	49.00	9.20	17.00	7.10	12.00	8.00	11.00	10.00
Sulphate as SO4	mg/L	<200	200-400	400-600	4.00	3.00	3.00	3.00	12.00	117.00	1340.00	29.00	16.00	10.00	12.00	56.00	55.00	9.00	1445.00	371.00
Fluoride as F	mg/L	<0.7	0.7-1	1-1.5	0.40	<0.1	0.10	0.10	0.20	0.20	0.90	<0.2	0.50	2.00	0.10	0.10	<0.2	1.10	0.30	0.30
Sodium as Na	mg/L	<100	100-200	200-400	17.00	12.00	12.00	6.00	18.00	40.00	76.00	24.00	50.00	126.00	15.00	15.00	16.00	74.00	66.00	42.00
Potassium as K	mg/L	<25	25-50	50-100	7.40	3.00	3.70	1.30	5.20	9.90	8.30	6.30	5.30	2.20	2.30	5.50	5.00	1.50	6.10	4.90
Calcium as Ca	mg/L	<80	80-150	150-300	22.00	4.00	7.70	2.40	22.00	81.00	441.00	27.00	27.00	9.70	29.00	53.00	42.00	5.00	388.00	111.00
Magnesium as Mg	mg/L	<30	30-70	70-100	7.80	0.50	3.10	0.40	7.70	33.00	109.00	13.00	9.10	1.20	7.50	11.00	20.00	14.00	136.00	34.00
Iron as Fe	mg/L	<0.01	0.01-0.2	0.2-2	<0.1	0.10	<0.1	<0.1	<0.1	<0.1	0.10	-	0.20	<0.1	0.10	<0.1	-	-	-	-
Manganese as Mn	mg/L	<0.05	0.05-0.1	0.1-1	<0.1	0.90	<0.1	<0.1	3.90	<0.1	1.80	-	0.50	<0.1	<0.1	<0.1	-	-	-	-

3.6 Elevation

The area elevation varies between 1805 masl and 1763 masl. The area where it is proposed to place the new coal processing and preparation plant is near the entrance from the R36 at elevation 1800 masl. Plains generally characterise this region with low and moderate relief but also significant areas of lowlands with low and high relief, open hills with low relief and closed hills with moderate relief.

3.7 Wetlands

The ecology of the study area show a diverse and important ecosystem functioning. Firstly, there are National Freshwater Ecological Priority Areas (NFEPA) recognised wetlands and rivers randomly distributed through the area within and across the mining boundaries. The occurrence of these ecosystems within the proposed mining sites automatically highlights the sensitivity of the area. A diverse array of biodiversity such as plants and fauna depend and interact within these ecosystems.

A detailed wetland delineation including the Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS) will be undertaken as a component of the EIA phase of the study.

3.8 Temperature, Wind and Precipitation

The site is located in the Mpumalanga Province and falls within the summer rainfall region of South Africa. The climate is temperate with characteristically warm summers and cold winters. Frost occurs during the winter months peaking with an average occurrence of nine days in July. Summer precipitation occurs in the form of mist, drizzle, hail and more frequent thunder showers and lightning storms.

The mean annual rainfall is 748mm, 83% of which occur during the months of October to March. The mean rainfall is given in Table 17: Mean rainfall measured over 54 year period at Ermelo weather station.

Table 17: Mean rainfall measured over 54 year period at Ermelo weather station

MONTH	MEAN RAINFALL (mm)
January	126
February	94
March	83
April	35
May	19
June	8
July	9
August	11
September	28
October	87
November	131
December	124
MEAN ANNUAL	**748**

The highest recorded rainfall for periods of between 30 minutes and 24 hours are given in Table 18: Maximum below together with the 1:50 and 1:100 year computed rainfall events for a period of 24 hours.

Table 18: Maximum precipitation

24 hr max recorded	24 hr 50 year recurrence	24 hr 100 year recurrence	24 hr RMF recurrence
79mm	98.8mm	108.1mm	118.1mm

The mean daily maximum exceeds 23˚C between October and March, the hottest months. The daily maximum temperatures in the winter months (May to August) vary between 16˚C and 19˚C. The daily minimum temperatures during the winter months vary between <-11.1˚C and 4˚C.

Table 19: The mean maximum and minimum temperatures

MONTH	MEAN	DAILY MAX	DAILY MIN	EXTREME MAX	EXTREME MIN
January	18.7	25.4	12.1	34.4	3.3
February	18.3	24.9	11.7	35.0	4.4
March	17.2	23.7	10.7	32.8	0.0
April	14.8	22.2	7.4	30.0	-3.3
May	11.8	19.8	3.8	28.3	-6.8
June	8.6	16.4	0.8	25.0	-8.9
July	8.4	16.5	0.4	25.1	-11.1
August	11.2	19.6	2.8	29.4	-11.1
September	14.3	22.4	6.1	33.3	-6.8
October	17.0	24.7	9.4	34.4	-2.2
November	17.5	24.6	10.4	35.6	0.0
December	18.4	25.2	11.7	34.2	3.3
AVERAGE	**14.7**	**22.1**	**7.3**	**30.5**	**-3.2**

Owing to the location of the site, the gentle undulating topography and the non-existing mountain ranges and ridges, no localised wind system will be generated. The wind patterns at the mine will conform to the regional wind patterns. The predominant wind direction is north north-easterly and during the months of May to December, strong west to north-westerly winds also develop.

Thunderstorms occur frequently in summer and are usually accompanied by lightning, heavy rain, strong winds and occasional hail. An average of 3.8 hail incidents per annum can be expected at any particular site. Frost occurs in the winter months, peaking with an average occurrence of nine days in July.

3.9 Flora

The study site is situated on various farms in the Ermelo area, which lies within the summer rainfall area. Bredenkamp and van Rooyen (1995) classified the study site within the Moist Sandy Highveld Grassland biome (refer to Biome Map in Annexure 5), and indicated that it should be dominated by *Erogistis sp.* and *Themeda triandra*. Dicotyledonous forbs although well represented within the biome, should not be abundant. The biome into which Accocks (1988) classified the area is the North eastern sandy Highveld, specifically the Near Bankenveld veldt type occurring in the western side of the Drakensburg. According to Acocks (1988) the area should most likely be dominated by *Graminoid* species, such as *Tristachya leucothrix, T. triandra* and *E.*

racemosa. This biome according to Accocks, is dominated by sourveld species, and while not be considered suitable for grazing as typically utilised for agricultural purposes.

3.10 Fauna

The disturbance of the site due to agricultural and mining activities has resulted in many animal species moving out of the area to lesser disturbed locations. Thus, species that are known to occur within the greater area may not occur on the survey area. Hence, community structure and ecosystem functioning will already have been altered, particularly as a result of noise generation, cultivation and habitation. A baseline ecological assessment will be undertaken as part of the EIA phase.

3.11 Demographics

The site falls within the municipal boundaries (601 566 ha) of the Msukaligwa Local Municipality. According to the Msukaligwa Local Municipality latest Integrated Development Plan (IDP 2007-2012), the local population of the area have the following approximate demographical characteristics:

- A total permanent resident population of 124 319 individuals; with 76 654 individuals (> 65 years) and 48 158 individuals younger than 18 years.
- Approximately 51.8% of the total population comprises of females and 48.2% males.
- The majority ethnic population group comprises of black individuals at 89,2% of the total population, with whites consisting of 9,8%.
- In terms of the economically active population, 28 038 individuals are employed, 17 361 are unemployed and approximately 31 209 individuals not economically active.

In term of mining and quarrying, the Msukaligwa Local Municipality is estimated at producing 242 351 tons of per annum which contributes 5% of the 4 831 979 tons produced within the District. The proposed new Umlabu new coal processing plant and tailings storage facility will therefore have a positive impact on socio-economic development and mining produce produced for the area.

3.12 Visual

It is important to bear in mind that determining a visual resource in absolute terms is not achievable. Evaluating landscape's visual quality is both complex and problematic, as many quality standards apply and it is largely subjective, with individual basing evaluations on experiences, their social level and their cultural background. Furthermore, natural features are inherently variable. Climate, season, atmospheric conditions, region and sub-region all affect the attributes that comprise the landscape. However, in this case the landscape is more uniform because of the extent of the study area. A Visual Impact Study will be undertaken as part of the EIA phase.

3.13 Heritage Resources

Cultural resources are all non-physical and physical man-made occurrences as well as natural occurrences associated with human activity. These include all sites, structures and artefacts of importance; whether individually or in a group, in the history, architecture and archaeology of human (cultural) development. Graves and cemeteries are included in this.

The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects.

Due to the size of the study area a heritage impact assessment will have to be undertaken as a component of the EIA phase of the project and in accordance with the National Heritage Act (Act 25 of 1999). Should any object be identified during this assessment and it is deemed to be of heritage importance, a heritage specialists would be contacted before any mining proceed.

3.14 Noise

Existing noise sources on site and the immediate surrounds include:

- Agricultural activities on surrounding land;
- Processing Plant: Transportation of raw materials to site, product from the site and transport of staff to and from site;
- Mining and mineral processing activities at the mining areas; and
- Vehicles serving the existing mine and farming communities.

In terms of Regulation 66 of the Mineral and Petroleum Resources Act (Act 28 of 2002) Regulations GN R527, a holder of a permit or right in terms of the Act must comply with the provisions of the Mine Health and Safety Act (Act 29 of 1996); as well as other applicable law regarding noise management and control.

Many aspects of mining and coal processing operations lead to an increase in noise levels over the ambient environmental levels. This can be temporarily enhanced or the regional impact increased in any direction under the influence of specific climatic factors such as wind direction, cloud cover and temperature inversion layers.

The impacts of noise levels can be both physical and physiological at the high end of the spectrum but more commonly impact on communication or create psychological effects at the lower level of the spectrum.

The highest magnitude noise impacts are commonly the high intensity, short duration noise levels created by blasting in surface or opencast mines. Blasting should not be carried out under very overcast conditions or low level cloud cover as this increases the noise and vibration transmission. The impact can be reduced through selection of explosives, sequencing the blasts, deflection by structures and timing of the blasts to coincide with periods of high activity or increased ambient noise levels. Drilling and blasting contractors will monitor the blast noise, shock and vibration felt at the boundary of the mine.

In terms of Regulation 67 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) Regulations GN R527, a holder of a permit or right in terms of the Act must comply with the provisions of the Mine Health and Safety Act (Act 29 of 1996) as well as other applicable legislation relating to blasting, vibration and shock control and management.

The repetitive operation of machinery also creates a range of noise levels. Although of low intensity these have an impact due to long periods of operation at the crushing plant and mills. The Mineral and Petroleum Resources Development Act (Act 28 of 2002) requires these areas to be effectively screened to reduce or deflect noise and stipulates that cladding on structures be adequately fastened and separated with soft spacers and washers. Vehicle engines or loading noise and even reverse warning alarms on trucks and loaders can impact on communities near and around the mine. Machinery such as compressors, generators, metal workshops tools such as angle grinders, pneumatic drills and jackhammers create high noise levels that are difficult to screen.

3.15 Air Quality

Dust originating from disturbed areas and mining operations as well as vehicle emissions may contribute to poor air quality.

Air quality monitoring and modelling should for future activities concentrate on dust fallout and ambient PM_{10} and sulphur dioxide monitoring. Dust fallout monitoring will be undertaken to assess compliancy with dust fallout limits and will be reviewed annually.

Monitoring will also be undertaken during the mining phase to assess sulphur dioxide compliancy with the ambient air quality guidelines and standards. The monitoring is conducted according to the main impact zone of the mine operations.

Current sources of pollution (predominantly in the form of dust) in the vicinity of the site include the following:

- Dust from mining;
- The handling of ore,
- Ore processing operations;
- Stockpiled materials;
- Disturbed land or land denuded of any vegetation;
- Vehicle movements on un-surfaced roads; and
- Disposal facilities.

Mining activities in the general region as well as burning of wood and coal by the residents of many of the local communities (due to there being no formal electricity infrastructure), are primary contributors to the air pollution experienced in the region.

Dust suppression

Dust suppression must be undertaken in conjunction with a dust monitoring programme that places dust

deposition gauges or receiving buckets, directional dust collection receptacles, high volume active air samplers or continuous particle monitors or even personal exposure samplers around the proposed mining area as well as adjacent areas.

An Air Quality Management Programme will be implemented to ensure compliance with the National Environmental Management Air Quality Act (Act 39 of 2004). These should be monitored regularly to ascertain the dust load and emission rates as well as particle size and distribution. Mine Health and Safety requirements for the use of dust masks should be followed and compliance audited regularly.

4. PUBLIC PARTICIPATION PROCESS

4.1 Introduction

Guideline 7 on *"Public Participation in the Environmental Impact Assessment Process"*, published by Department of Environmental Affairs (DEA) in October 2012, states that public participation is one of the most important aspects of the environmental authorisation process. This stems from the requirement that people have a right to be informed about potential decisions that may affect them and that they must be afforded an opportunity to influence those decisions. Effective public participation also facilitates informed decision-making by the Competent Authority and may result in better decisions as the views of all parties are considered.

The benefits of public participation include the following:

- *Provides an opportunity for Interested and Affected parties (I&APs), Environmental Assessment Practitioners (EAPs) and the Competent Authority (CA) to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;*
- *Provides I&APs with an opportunity to voice their support, concerns and questions regarding the project, application or decision;*
- *Provides I&APs with the opportunity of suggesting ways of reducing or mitigating negative impacts of an activity and for enhancing positive impacts;*
- *Enables the applicant to incorporate the needs, preferences and values of affected parties into the application;*
- *Provides opportunities for clearing up misunderstandings about technical issues, resolving disputes and reconciling conflicting interests;*
- *It is an important aspect of securing transparency and accountability in decision-making; and*
- *Contributes toward maintaining a healthy, vibrant democracy.*

All PPP undertaken is in accordance with the requirements of the EIA Regulations (2010). Refer to the Public Participation Report (as per Annexure 2).

4.2 Public participation activities undertaken to date

The following PPP tasks were conducted to date for the proposed new plant and tailings facility:

1. Identification of key Interested and Affected Parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties);
2. Formal notification of the application to key Interested and Affected Parties (all adjacent landowners) and other stakeholders;
3. Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments; and
4. Release of the Draft Scoping Report to I&APs and stakeholders for review and comment.

Task 1: I&AP and Stakeholder identification, registration and the creation of an electronic database

Public Participation is the involvement of all parties who are either potentially I&AP by the proposed development. The principle objective of public participation is to inform and enrich decision-making. This is also its key role in this Environmental Impact Assessment (EIA) process.

Interested and Affected parties (I&APs) representing the following sectors of society has been identified:

- National, provincial and local government;
- Agriculture, including local landowners;
- Community Based Organisations;
- Non-Governmental Organisations;
- Water bodies;
- Tourism;
- Industry and mining;
- Commerce; and
- Other stakeholders.

Refer to the PPP Report (Annexure 2) for I&AP and stakeholder database.

Task 2: Formal notification of the application to key Interested and Affected Parties (all adjacent landowners) and other stakeholders

The project was announced as follows:

Newspaper advertisement

Publication of a media advertisement in Highvelder was placed on Friday 25 January 2013. **Refer to the PPP Report (Annexure 2) for proof of placement of the newspaper advert.**

Site notice placement

In order to inform surrounding communities and adjacent landowners of the proposed development, four (4) site notices were erected on site and at visible locations close to the site. **Refer to the PPP Report (Annexure 2) for proof of site notice placement.**

Written notification

I&AP's and other key stakeholders, who included the abovementioned sectors, were directly informed of the proposed development by e-mail. The Background Information Document (BID) and Registration and Comment sheets were also supplied to all parties. I&APs were given 30 days to comment and / or raise issues of concern regarding the proposed development. The commenting period expired on the 25th of March 2013. **Refer to the PPP Report (Annexure 2) for a copy of the BID and proof of email notification.**

Task3: Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments.

I&APs had the opportunity to raise issues either in writing, by telephone, fax and/or email. Concerns raised, as well as responses to these concerns, are detailed in the Comment and Response Report (see **Error! Reference source not found.**).

All the issues raised by I&APs during the EIA process were captured in a Comment and Response Report (see **Error! Reference source not found.**) and I&APs received letters acknowledging their contributions.

Task 4: Release of the Draft Scoping Report to I&AP's and stakeholders for review and comment.

The Draft Scoping Report (DSR) and Plan of Study (POS) were submitted to the Competent Authority on 18 July 2013 as per the requirements of Regulation 56 (4). The DSR and supporting documentation were subsequently released for a period of 40 days from 18 July 2013 to 30 August 2013 for public review and comment. All stakeholders and I&AP's was notified of the DSR availability for comment. Hardcopies of the DSR was submitted to all organs of state and relevant authorities. The Draft Scoping Report and supporting documentation was made available for review at the Gerald Sekoto Community Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314); Ermelo Public Library (017 801 3621); and on Environmental Assurance's website: www.envass.co.za.

4.3 Next phases of the Public Participation Process

All stakeholders and registered I&AP's will have the opportunity to review and comment on all the documents released in the Final Scoping, Draft EIA and Final EIA phases respectively. All final reports will be released for a period of 21 days for review and comment. The draft EIA will be released for 40 days. During all the PPP phases, hardcopies and CD's of all reports and supporting documents will be submitted to the organs of state and relevant authorities. All the reports will also be placed at the Gerald Sekoto Community Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314); Ermelo Public Library (017 801 3621); and on Environmental Assurance's website: (www.envass.co.za).

All comments and responses received and sent throughout the entire process will be updated and included in comments and responses chapter (as attached in Appendix 4). Note that this PPP Report shall be updated at each phase as required.

5. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

An Environmental Impact Assessment (EIA) is a good planning tool. It identifies the environmental impacts of a proposed development and assists in ensuring that a project will be environmentally acceptable and integrated into the surrounding environment in a sustainable way.

Box 1. Definition of the term "environment"

The term "environment" is used in the broadest sense in an environmental impact assessment. It covers the physical, biological, social, economic, cultural, historical, institutional and political environments.

The EIA for this project complies with the National Environmental Management Act (1998) (as amended) and the NEMA EIA Regulations (2010) of the Department of Environmental Affairs (DEA). The guiding principles of an EIA are listed below.

5.2 Guiding principles for an EIA

The EIA must take an open participatory approach throughout. This means that there should be no hidden agendas, no restrictions on the information collected during the process and an open-door policy by the proponent.

Technical information must be communicated to stakeholders in a way that is understood by them and that enables them to meaningfully comment on the project.

There should be ongoing consultation with interested and affected parties representing all walks of life. Sufficient time for comment must be allowed. The opportunity for comment should be announced on an on-going basis. There should be opportunities for input by specialists and members of the public. Their contributions and issues should be considered when technical specialist studies are conducted and when decisions are made (Refer to Figure 7: The four phases of an EIA.)

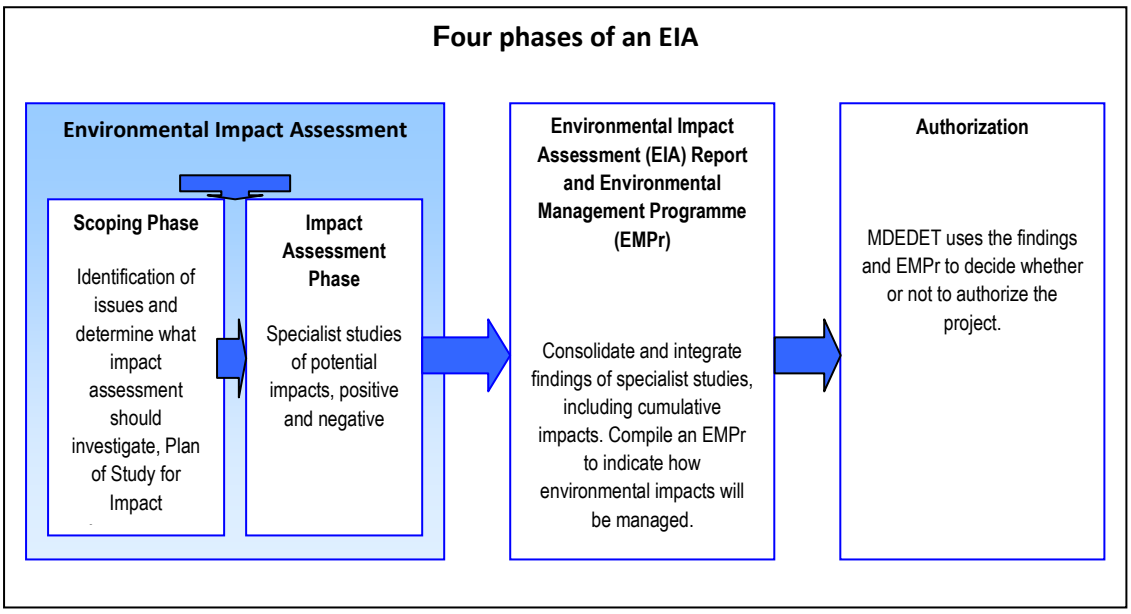


Figure 7: The four phases of an EIA

5.2 Information gathering

Early in the EIA process, the Environmental Practitioner identified the information that would be required for the impact assessment and the relevant data were obtained. In addition, available information about the receiving environment was gathered from reliable sources, interested and affected parties, previous documented studies in the area and previous EIA Reports. The project team then visited the site to gain first-hand information and an understanding of the existing operations and the proposed project.

6. ENVIRONMENTAL IMPACTS

6.1 Potential environmental impacts

Potential impacts resulting from the proposed coal preparation and processing plant were identified using input from the following sectors:

- Views of interested and affected parties;
- Existing information;
- Site visit with the project team; and
- Legislation.

The following potential impacts were identified:

- Ground and Surface Water contamination;
- Geology, Soil and Land Capability;
- Socio-Economic Issues;
- Waste Products;
- Floral and Faunal Displacement;

- Impacts on the wetland and drainage patterns;
- Dust and Noise Impacts; and
- Identified heritage sites.

The impacts can further be summarized as follows:

Environmental impacts – a regional concern
Comments received from I&AP's during the scoping phase reflect concerns about the potential cumulative effects of the proposed coal preparation and processing plant on the biodiversity in the area. Furthermore, it was indicated that the proposed coal preparation and processing plant will affect the farmer's sense of place as well as definite traffic impacts and a deterioration of the public road.

Environmental impacts – Water quality
I&APs are concerned about the cumulative impacts of the proposed coal preparation and processing plant on surface water and groundwater quality of the region. There are concerns that water quality in the Torbanite Dam may deteriorate further as a result of the proposed coal processing. Water pollution may affect recreation activities of the community further downstream. I&APs are also concerned about the possible disruption of the sensitive floodline, riparian section and the wetlands and drainage lines.

The proposed coal preparation and processing plant will take the sensitive unnamed spruit which flows towards the Torbanite Dam with the associated floodline, riparian section and wetland area into consideration. This means that the recommended 100 meter buffer for wetlands will be respected and no development will be allowed in this sensitive area.

Environmental Impacts – Property
I&APs are concerned about the manner in which the coal preparation and processing plant will affect access to and from their properties and how the mining activities will affect any business operations.

Environmental Impacts – Socio-Economic
I&APs have enquired as to whether the proposed coal preparation and processing plant will provide any additional employment opportunities in the area.

Further details associated with the construction and operation of the various activities as listed in the Project Description will be discussed in the EIA Report. The EIA Report will assess the impacts of each of the activities as well as ascertain the cumulative impacts of the development in totality. The EIA Report will outline the necessary mitigation measures and define any issues/areas which could be the cause for concern.

6.2 Proposed specialist studies to assess the environmental impacts

The following specialist studies were identified to be undertaken during the EIA:

- Geohydrological Report;
- Surface water Impact Assessment;
- Visual Impact Assessment;

- Baseline Air Assessment;
- Baseline Noise Assessment;
- Ecological Assessment (including a Fauna and Flora Assessment); and
- Heritage Impact Assessment.

6.3 Impact Assessment Methodology

6.3.1 Introduction

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environment Conservation Act (ECA), 1989 (Act No. 73 of 1989). Although the ECA EIA Regulations have been repealed, the Guideline Document still provides good guidance for significance determination.

The level of detail as depicted in the EIA regulations were fine tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. The impact assessment criteria used to determine the impact of the proposed development are as follows:

- *Nature* of the impact;
- The *Source* of the Impact;
- Affected Stakeholders;
- *Extent* - The physical and spatial scale of the impact;
- *Duration* - The lifetime of the impact, that is measured in relation to the lifetime of the proposed development;
- *Intensity* - The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself;
- *Probability* - This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time;
- *Mitigation*: The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development

considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

- *Determination of Significance – Without Mitigation:* Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required.

- *Determination of Significance – With Mitigation*: Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the identified mitigation measures.

Previous experience has shown that it is often not feasible or practical to only identify and address possible impacts. The rating and ranking of impacts is often a controversial aspect because of the subjectivity involved in attaching values to impacts. Therefore, the assessment will concentrate on addressing key issues.

The methodology employed will involve a circular route, which will allow for the evaluation of the efficiency of the process itself. The project will be divided into three phases in order to assess impacts related to the Pre-construction, Construction and Operational phases. The assessment of actions in each phase will be conducted in the following order:

a) Identification of key issues;

b) Analysis of the activities relating to the proposed development;

c) Assessment of the potential impacts arising from the activities, without mitigation; and

d) Investigation of the relevant mitigation measures, as well as an assessment of their effectiveness in alleviating impacts.

6.3.2 Assessment of Biophysical and Cumulative impacts

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines and in terms of the Environmental Conservation Act, 1989 (Act No 73 of 1989) [ECA]. Although the ECA EIA Regulations have been repealed the Guideline Document still provides good guidance for significance determination.

Activities within the framework of the proposed development and their respective construction and operational phases, give raise to certain impacts. For the purpose of assessing these impacts, the project has been divided into two phases from which impacting activities can be identified, namely:

a) Construction phase: All the construction related activities on site, until the contractor leaves the site.

b) Operational phase: All activities, including the operation and maintenance of the proposed development.

The activities arising from each of these phases have been included in the tables. This is to identify activities that require certain environmental management actions to mitigate the impacts arising from them. The criteria against which the activities were assessed are given in the next section.

6.3.3 Assessment Criteria

Table 20: Assessment Criteria

EXTENT: GEOGRAPHICAL	
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site	The impact could affect the whole, or a significant portion of the site.
Regional	The impact could affect the area including the neighbouring properties, the transport routes and the adjoining towns.
National	The impact could have an effect that expands throughout the country (South Africa).
International	Where the impact has international ramifications that extent beyond the boundaries of South Africa.
DURATION	
Short term	The impact would either disappear with mitigation or will be mitigated through natural processes in a period shorter than that of the construction phase.
Short – Medium term	The impact will be relevant through to the end of the construction phase.
Medium term	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long term	The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be

	considered transient.
INTENSITY	
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
PROBABILITY	
Impossible	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0%).
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.
Highly likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.
Definite	The impacts will take place regardless of any provisional plans, and or mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100%.

6.3.4 Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

Determination of Significance – Without Mitigation

Significance is determined through a synthesis of impacts as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

a) No significance: The impact is not substantial and does not require any mitigation action.

b) Low: The impact is of little importance, but may require limited mitigation.

c) Medium: The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.

d) High: The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

Determination of Significance – With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

a) No significance: The impact will be mitigated to the point where it is regarded as insubstantial.

b) Low: The impact will be mitigated to the point where it is of limited importance.

c) Low to Medium: The impact is of importance however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.

d) Medium: Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.

e) Medium to High: The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.

f) High: The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

Assessment Weighting

Each aspect within the impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it is necessary to weigh and rank all criteria.

Ranking, Weighting and Scaling

For each impact under scrutiny, a scale weighting factor is attached to each respective impact (refer to **Error! Reference source not found.**). The purpose of assigning such weights serve to highlight those aspects considered most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspects criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Significance Following Mitigation (SFM)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

Figure 8: Description of the biophysical assessment parameters with its respective weighting

7. ALTERNATIVES

The IEM procedure stipulates that the environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, a number of possible proposals or alternatives for accomplishing the same objectives should be identified and investigated. The various alternatives are assessed in terms of both environmental acceptability as well as economical feasibility. The preferred option is to be highlighted and presented to the authorities.

Alternatives are defined in the NEMA EIA Regulations (2010) as *"different means of meeting the general purpose and requirements of the activity, which may include alternatives to: (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; and (e) the operational aspects of the activity and (f) the option of not implementing the activity*".

For the purpose of this application, the following Alternatives are investigated:

- Input alternatives for the construction of the CHPP facility;
- Various location alternatives for the CHPP and tailings storage facilities;
- Technology alternatives for processing and beneficiation of coal ;
- Scheduling alternatives; and
- No-Go / Status Quo alternative.

7.1Input alternatives

Various types of material can be used for construction purposes on the proposed processing plant. These include different brick types (face brick, cement brick etc.) roof types (pitched or flat), finishes (paint colour, external lighting, landscape features etc.), road surfacing (asphalt, brick paving) and underground tank types. The proposed development should however be aesthetically pleasing, to adjacent landowners and should blend in with the adjacent developments.

Energy effective building construction and orientation have not been considered to date. However, the following recommendations regarding structural designs are recommended by the environmental consultant:

- Use of building material that requires excessive amounts of energy to manufacture should be minimised;
- Use of building material originating from sensitive or scarce environmental resources should be minimised. E.g. no tropical hardwood may be used;
- Building material should be legally obtained by the supplier, e.g. wood must have been legally harvested, and sand should be obtained only from legal borrow pits and from commercial sources;
- Building material that can be recycled / reused should be used rather than building material that cannot; and
- Use highly durable building material for parts of the building that is unlikely to be changed during the life of the building (unlikely to change due to e.g. renovation, fashion, changes in family life cycle) is highly recommended.

7.2 Location alternatives

The alternative location that has been considered by the proponent would move the existing coal processing plant to an alternative location away from the drainage line of the tributary river to the Torbanite dam. The investigation concluded that the subject location (on the Farm Voorslag 274 IS) is the most suitable due to its ideal location in terms of the requirements for location of a coal handling and preparation plant.

The geotechnical assessment as well as prospecting boreholes indicated that the quality of the coal in the area where the proponent proposes to mine coal underground via an adit; is of the best quality and therefore no alternative site has been investigated. The coal handling and preparation plant would be ideally located in terms of the adit to the underground workings.

Therefore this alternative would see the existing coal handling and preparation plant moving from the Farm Mooifontein 109 IT to the better location Farm Voorslag 274 IS.

7.3 Technology alternatives

Generally coal companies use solid preparation plant waste to build an embankment in a hollow. Then this void is filled with the wet preparation plant waste, or slurry – a mix of coal dust, water and preparation plant chemicals. In the past ultra-fine coal (nominally minus 100 micron) was only beneficiated in the former Natal Province and in the Waterberg coalfield. The coking coals from these areas were amenable to flotation (froth flotation was usually employed on the total minus 0,5mm size fraction). In the Witbank area, the ultra-fine coal was not beneficiated and was disposed of by pumping the coal to slurry ponds or into old underground workings.

In recent studies in the USA (2001) it was found that coal waste: "*disintegrates rapidly, is highly soluble sulphates which reduce bonding strength, are non-cohesive and does not compact uniformly. A safe and economic dam could not be constructed from such material alone.*"

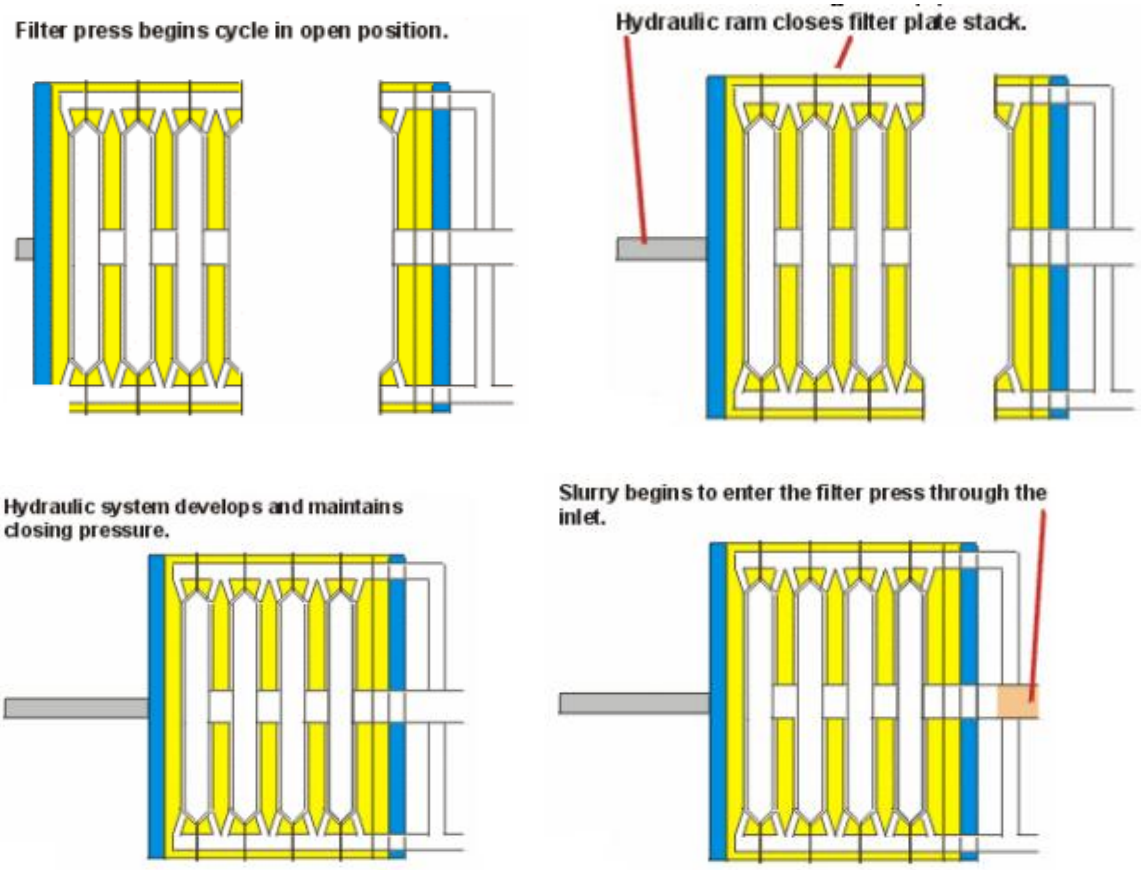
Slurry volumes can be reduced by improving fine coal recovery, minimizing the mass of solids for disposal and dewatering the coal waste using various tools including a filter press. Acceptable alternatives are highly dependent upon regional and site specific conditions.

Froth flotation is still the only beneficiation process for ultra-fine coal and in recent years a number of floatation plants were built in the Witbank area. The main problem with beneficiating the ultra fine coal is not so much the actual processing of the coal – flotation works well enough despite the fact that it is a very expensive process – but the dewatering of the product obtained. The ultra-fine flotation product has high moisture content, even after dewatering, and this increases the moisture content of the product coal railed from the mine – for a mine producing thermal coal this can make it very difficult to meet quality specifications and to economically justify the installation of a froth flotation plant. For this reason, it is important to improve the dewatering of ultra-fine coal and to find better methods to employ for this purpose. One should also keep in mind that, even when a plant has a flotation circuit, there is still the need to dispose of flotation tailings.

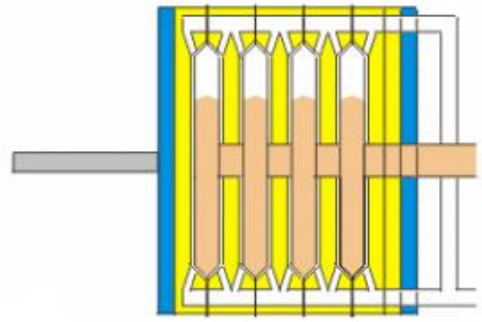
In recent years a number of filter presses were installed in South Africa and these units proved to be the most effective method currently available to dewater ultra-fine coal. Filter presses have the greatest capacity for solid capture and can be used to close a plant's water circuit. The fact that the filtration pressure and the filtration

times can be adjusted allows these units to produce relatively lower product moisture content than the other types of filters available in the past. Filter presses are however, more expensive in terms of capital and operating expenditure than the older filter types.

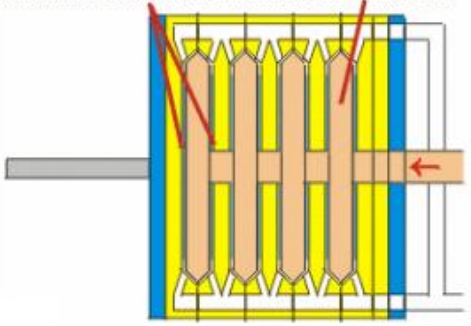
Filter presses operate on a semi batch basis and the filtration cycle consists of a number of steps.



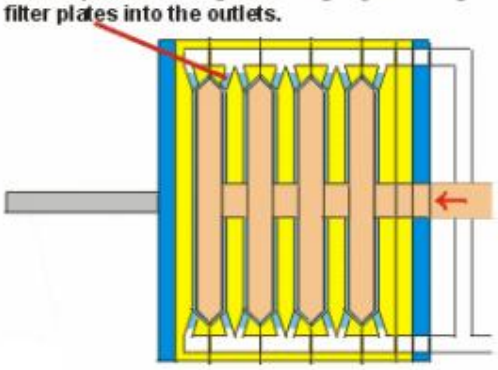
Filter press fills with slurry.



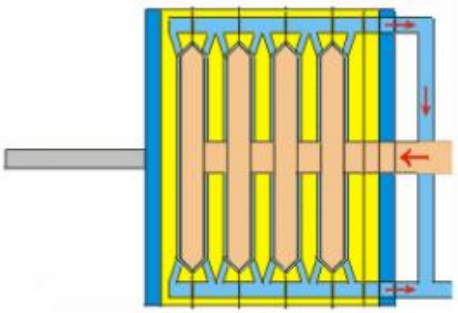
Filtration takes place as filtrate passes through the filter cloth and cake builds in the chambers.



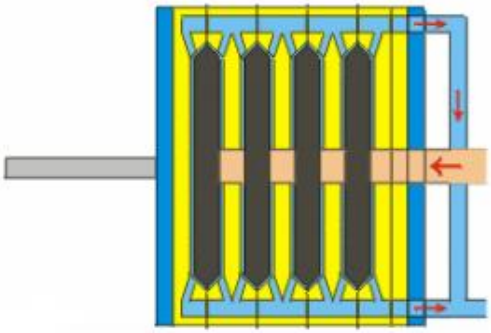
Filtrate passes through discharge eyes at edge of filter plates into the outlets.



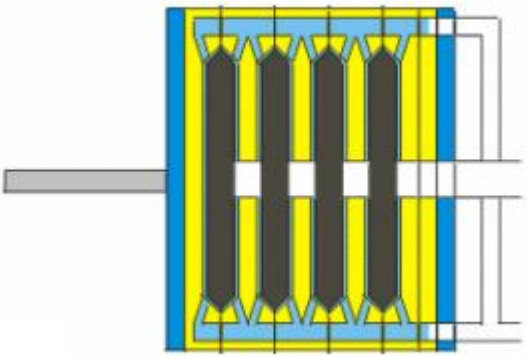
Filtrate exits the filter press through the outlets.



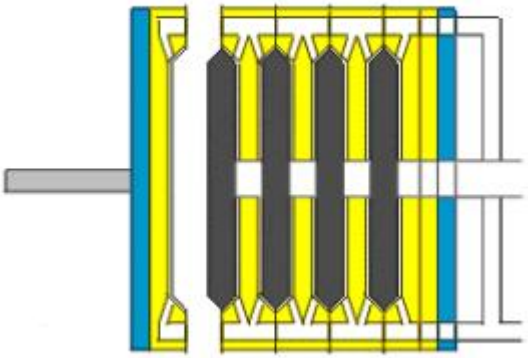
Filter cake builds as slurry continues to dewater.



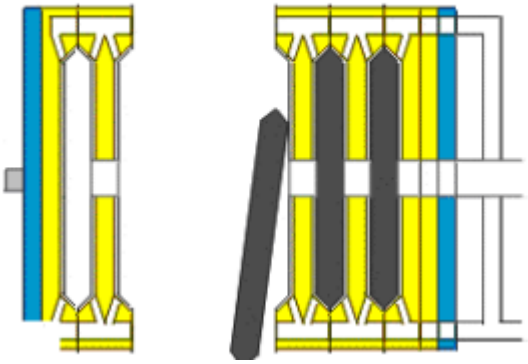
Forward flow is stopped.

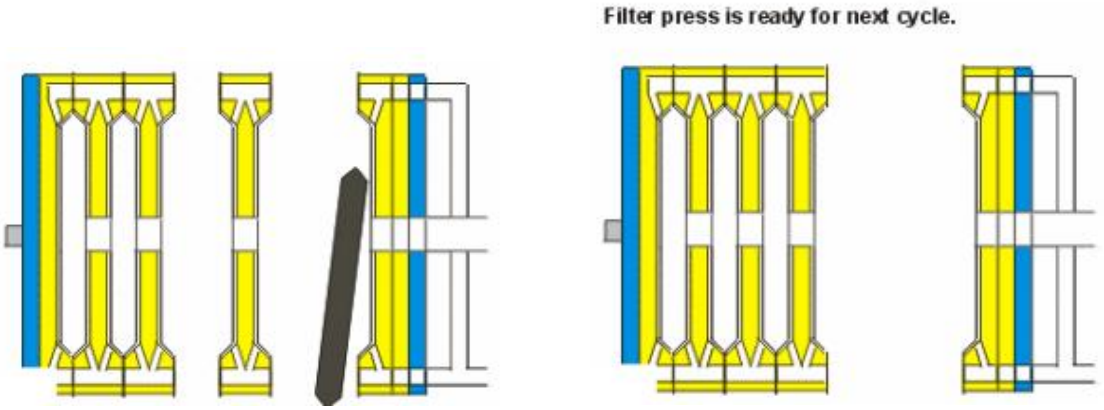


Filter press is opened and plates are shifted one at a time.



Filter cakes drop as each plate is moved.





Filter presses have been proven to be effective in filtering ultra-fine coal to a moisture content which is low enough to render the filter cake transportable on conveyor belts. The filters can recover virtually all the solids in the feed which make it especially suited to closing water circuits in plants.

7.4 Status quo / No-Go alternative

One of the options to be considered for this report is one of no development at all. This will entail leaving the coal handling and preparation plant in its present location. The Farm Voorslag 274 IS is currently vacant. This would result in the site being unattended, uncontrolled and unmanaged which could subject the site to erosion and degradation, as no control mechanisms will be in place to ensure that environmental consequences are kept at a minimum. This would further result in the coal handling and preparation plant remaining on the Farm Mooifontein 109 IT, in the direct line of a tributary of the Torbanite Dam. This situation will result in the possible contamination of the sensitive Upper Vaal River region through activities associated with the coal handling and preparation plant.

Another consideration is that should the adit be moved to mine good quality coal on the Farm Voorslag 274 IS, it would require the movement of the mined coal to the existing coal handling and preparation plant on the Farm Mooifontein 109 IT. The movement of mined coal via heavy vehicles can possibly result in the contamination of the sensitive environment en route to the coal handling and preparation plant.

It makes sense to move the coal handling and preparation plant as close as possible to the adit to minimise further environmental impacts on the surrounding environment. Therefore, the status quo option is not a viable option and with the necessary specialists' studies, it will be proven as an option which should not be further investigated.

7.5 Scheduling alternatives

It is recommended that construction takes place during the drier winter months to avoid any complications in the wet weather. No detailed information regarding the proposed time frame for the project is yet available. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained.

8. EVALUATION AND RECOMMENDATIONS

8.1 Impact identification summary

The purpose of this report is to scope and identify the potential impacts associated with the proposed development. Potential impacts were identified in consultation with I&APs, and through the technical expertise and experience of Environmental Assurance.

The report sought to identify the impacts of the proposed development on the environment, of which we humans are part, and the probability of the impacts occurring.

The proposed tailings storage facility and new coal handling plant can pose various risks to the environment as well as the residents in the vicinity of the development, although these risks is likely to be limited in its extent. The issues related to the development were identified and will be assessed and evaluated during the EIA phase in terms of various criteria such as extent, duration, intensity and significance.

Significant impacts to be considered during the EIA phase includes *inter alia*:

- Contamination of surface and groundwater as a result of deposition of contaminants during the operational phase;
- Air pollution caused by dust and noxious gas emissions;
- Loss of agricultural land;
- Sense of place;
- Socio-economic (positive); and
- Noise impacts from operations.

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8.2 Recommendations

A variety of specialist studies have been identified that will serve to suggest mitigation measures to mitigate the scale, intensity, duration or significance of the impacts associated with the proposed new coal processing plant and tailings storage facility . These include guidelines to be applied during the construction and operational phases of the project. The Environmental Management Programme (EMPr) which will form part of the Environmental Impact Report will contain more detailed mitigation measures.

It is submitted that the proposed specialist studies will provide adequate mitigatory measures and that the scoping phase, together with the detailed Plan of Study, be approved in order for the Applicant to continue with the EIA phase.

Our recommendation, based on the assessment of the available information, is that application for the proposed development should continue, and that the Applicant be allowed to investigate the relocation of the coal processing and preparation plant to the Farm Voorslag 274 IS. This authorisation should be in line with sensitive planning, design and good environmental management. Development of the proposed coal

preparation and processing plant, should take the flood lines, wetland and sensitive riparian ecosystem into account, and the identified buffer along this strip must be honoured. The proponent is responsible for these phases of the development. The results of the various studies and how this influenced the location of the coal processing and preparation plant will be reported on in the Environmental Impact Assessment Report, once authorisation for the Scoping Report has been received.

The proposed development of the coal preparation and processing plant on Portion 5 and 10 of the Farm Voorslag 274 IS in Breyten, Mpumalanga Province forms part of the Msukaligwa Local Municipality. If the concept of sustainable development is considered it is proposed that the coal preparation and processing plant will have a positive impact on the provision of social and economic criteria. With the recommended guidelines which would be provided by the various specialists' studies; the ecological component can also be brought into balance.