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OVERLOOKED COLLIERY (PTY) LTD

VOLUME I OF II: EIA AND EMP REPORT

For the Proposed Opencast an Underground Mining of Portions 5, 17, RE of Halfgewonnen 190 IS and a Portion of Portion 0 of Forzando 592 IS

DMR Ref. No.: MP 30/5/1/2/2/10074 MR

NEMA Ref.: 17/2/3 GS-201

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1 INTRODUCTION

Overlooked Colliery (Pty) Ltd (henceforth Overlooked) has submitted a mining right application under the Minerals and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA) for the mining of coal over various portions of the farms Halfgewonnen 190 IS and Forzando 592 IS via opencast and underground methods.

In terms of the MPRDA, the applicant submitted a mining right application in May 2013 and received acceptance of application from the Department of Minerals and Energy (DMR) on 21 June 2013. This was followed by a Scoping Report submitted in July 2013 and an Environmental Impact Assessment (EIA) and this Environmental Management Plan (EMP) which must be submitted by the 19 November 2013. The Department of Mineral Resources (DMR) is the lead authority in mining projects and developments.

The proposed mine will result in the need to undertake various scheduled activities under the National Environmental Management Act (Act 107 of 1998) (NEMA). Therefore the applicant has also submitted an application for environmental authorisation to comply with NEMA. The Scoping Report was submitted in September 2013. The Department of Economic Development, Environment and Tourism (DEDET) will be the lead authority for the NEMA process.

This EIA and EMP report has been compiled to meet the requirements of both the MPRDA and NEMA, and will be submitted to both the DMR and DEDET concurrently.

This report details the various mining-related activities, including the new opencast and underground mine areas, describes the baseline environment of the targeted area, indicates alternative land uses, sites and activities, details the public participation process (PPP) to date, gives an environmental impact assessment which incorporates specialist input as well as valid input from Interested and Affected Parties (I&APs) and details the management and monitoring required on site to prevent and mitigate any potential negative impacts identified.

Overlooked will also submit a water use license application (IWULA) in terms of the National Water Act (Act 36 of 1998) (NWA) for various proposed water uses. This will be submitted with an Integrated Water and Waste Management Plan (IWWMP) to the Department of Water Affairs (DWA) for consideration.

Cabanga Concepts cc have a minor interest in the project and have been contracted as the environmental consultants to conduct the necessary studies and oversee the various processes required in accordance with the various Acts listed above.

2 LEGAL AND POLICY FRAMEWORK

2.1 The Minerals and Petroleum Resources Development Act

In terms of the MPRDA, a mining right can only be granted once a Scoping, Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) have been completed for the proposed operation. Furthermore, this process must include a Public Participation Process (PPP). This report forms the EIA/EMP phase regarding the MPRDA process. PPP has largely been completed as per NEMA requirements, but still requires I&AP review of the final EMP report.

In terms of the MPRDA, the applicant submitted a mining right application (including Mine Works Programme and Social and Labour Plan (SLP)) in May 2013 and received acceptance of application from the Department of Minerals and Energy (DMR) on 21 June 2013. This was followed by a Scoping Report submitted in July 2013. This EIA/EMP report must be submitted on or before 19 November 2013. The Department of Mineral Resources (DMR) is the lead authority in mining projects and developments.

Table 1 below indicates the requirements of the MPRDA for an EIA/EMP report. Table 1 cross references these requirements to the relevant sections in the EIA/EMP report.

Table 1: MPRDA requirements for an EIA/EMP report

Legal and Regulatory Requirement:		Section:
Regulation 50 of the MPRDA – Contents of EIA report		
a	**Assessment of the environment likely to be affected by proposed mining, including cumulative environmental impacts**	**Chapters 6 & 9**
b	**Assessment of the environment likely to be affected by identified alternative land use or developments, including cumulative environmental impacts**	**Chapters 6 & 7**
c	**Assessment of nature, extent, duration, probability and significance of the potential environmental, social and cultural impacts, including cumulative impacts.**	**Chapter 9 & Table 47**
d	**Comparative assessment of identified alternative land use or developments and their potential environmental, social and cultural impacts.**	**Chapter 7**
e	**Determine appropriate mitigation measure for each of the impacts.**	**Chapter 12 Table 47**
f	**Details of the engagement process and indication of how issues raised have been addressed.**	**Chapter 8 & Table 46**
g	Identify knowledge gaps and report on adequacy of data obtained and assumptions made.	Chapter 10
h	Description of arrangements for monitoring and management of impacts.	Chapter 14
i	Inclusion of technical and supporting information if applicable	Appendices
Regulation 51 of the MPRDA – Environmental Management Programme		
a	Description of environmental objectives and specific goals for:	Chapter 11

Legal and Regulatory Requirement:			Section:
	i	Mine closure.	Chapter 11.5
	ii	Management of identified impacts.	Chapter 11.1
	iii	Socio-economic conditions as set out in the SLP.	Chapter 11.3
	iv	Historical and cultural aspects if applicable.	Chapter 11.4
b		An outline of the implementation programme which must include:	
	i	Description of appropriate technical and management options chosen for each environmental impact, socio-economic condition and historical and cultural aspects for each phase of mining.	Chapter 12 & Table 47
	ii	Action plans to achieve objectives and specific goals (51(a)) which must include a time schedule of actions to be undertaken to implement mitigation measures for each phase of mining.	Chapters 12 & 14, Tables 47 & 52
	iii	Procedure for environmental related emergencies and remediation.	Chapter 15
	iv	Planned monitoring and environmental management programme performance assessment.	Chapter 14, specifically 14.7
	v	Financial provision in relation to the execution of the environmental management programme which must include: The determination of the quantum of the financial provision contemplated in regulation 54. Details of the method providing for financial provision.	Chapter 17
	vi	An environmental awareness plan	Chapter 16
	vii	Inclusion of supporting information and specialist reports.	Appendices
c		Undertaking by applicant.	Chapter 19

2.2 The National Environmental Management Act

In addition to the MPRDA, the National Environmental Management Act (no. 107 of 1998 – NEMA) sets out the requirements for the environmental assessment of a range of activities, including mining and related activities. Although the Department of Mineral Resources (DMR) remains the primary decision making authority for the environmental authorisation of mines under the MPRDA, some of the mining-related activities/surface infrastructure will trigger scheduled NEMA activities.

This EIA / EMP report has been compiled as part of the full S&EIR (Scoping and Environmental Impact Report) process for environmental authorisation as required for any development which triggers scheduled NEMA activities listed in GN R545. The application form and scoping report have been submitted to DEDET. This EIA / EMP report has also been compiled to ensure compliance with the requirements of GN R543 of NEMA, which have been listed and cross-referenced to relevant section of the report in Table 2.

Table 2: Requirements for the EIA/EMP phase of NEMA

Legal and Regulatory Requirement:		Cross Reference:
NEMA Regulation 543 Section 31		
1	Conduct PPP and compile an EIA report	Chapter 8 & current report
2	EIA report must contain the following information	
a b c	Details of the: The EAP who compiled the report Expertise of the EAP to carry out EIA	Appendix A Chapter 4.2
d	Detailed description of the activity.	Chapter 5
e	Description of relevant property and location of activity on the property. For linear activities a route must be included.	Chapter 4; Plans 1 & 2
f	Description of the environment and how the environment will be affected by the proposed activity.	Chapter 6 & 9; Table 47
g	Details of PPP undertaken.	Chapter 8
h	Description of the need and desirability of the activity.	Chapter 7 – specifically 7.1
i	Description of the alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment.	Chapter 7
j	Indication of the methodology used in determining significance of impacts.	Chapter 3
k	Description of comparative assessment of all alternatives identified.	Chapter 7 & Table 44
l	Summary of findings and recommendations of any specialist reports.	Chapter 6
m	Description of all environmental issues identified and their significance and the extent to which these can be mitigated.	Chapter 9 & Table 47
n i ii iii iv v vi vii	An assessment of each identified impact including: Cumulative impacts. Nature of impact. Extent and duration of impact; Probability of impact Degree of reversibility of impact Degree to which impact may cause irreplaceable loss of resources. Degree to which the impact can be mitigated.	Chapter 9 & Table 47
o	Description of assumptions, uncertainties and knowledge gaps.	Chapter 10
p	Opinion as to whether the activity should be authorised or not and if yes an opinion on conditions that should be set in the authorisation.	Chapter 18
q r s	An environmental impact statement which contains: Summary of key findings. Comparative assessment of the proposed activity and	Chapter 18

Legal and Regulatory Requirement:			Cross Reference:
		identified alternatives.	
t		Draft EMP	See requirements below
u		Copies of any specialist reports	Appendices
v		Any information that may be required by the competent authority	Noted
NEMA Regulation 543 Section 33: Draft EMP must include			
a		Details of:	Appendix A Chapter 4.2
	i	Person who compiled the EMP.	
	ii	Expertise of that person to prepare an EMP.	
b		Information on the proposed management or mitigation measures that will be taken to address environmental impacts that have been identified during the various phases of the activity.	Chapter 12 & Table 47
c		Detailed description of the aspects of the activity that are covered by the draft EMP.	Chapter 5 – specifically 5.10
d		Identification of persons who will be responsible for implementation of the EMP measures.	Tables 47 & 52
e		Proposed mechanisms for monitoring compliance with the EMP and reporting thereon	Chapter 14 – specifically 14.6
f		Measures to rehabilitate the affected environment affected by the activity to its natural or pre-determined state, or to a generally accepted land use allowing for sustainable development.	Chapter 13
g		Description of the manner in which one intends to:	Chapters 11 & 12 Tables 47 & 52
	i	Modify, remedy, control or stop any action which causes pollution or environmental degradation.	
	ii	Remedy the cause of pollution or degradation and migration of contaminants.	
	iii	Comply with prescribed standards	
	iv	Comply with provisions of the Act regarding closure.	
	v	Comply with the provisions of the Act regarding financial provisions for rehabilitation.	Chapter 17
h		Time period within which the measures in the EMP must be implemented.	Chapters 12 & 14; Tables 47 & 52
i		Process for managing environmental impacts or degradation as a result of the activity.	Chapters 12, 14 & 15; Tables 47 & 52
j		An environmental awareness plan describing the manner in which	Chapters 15 & 16; Table 53
	i	The applicant intends to inform employees of any environmental risk which may result from their work	
	ii	Risks must be dealt with in order to avoid pollution or degradation to the environment.	
k		Where appropriate closure plans and objectives	Chapters 11 & 13

Various scheduled NEMA activities as listed in Government Notice Regulation 544, GN R545 and GN R546 are relevant to the proposed operation (Table 3).

Table 3: Activities listed under NEMA applicable to the mining operation

Reg.:	Activity No.:	Description:
R.544, 18 June 2010	11	**The construction of canals, channels and structures within a watercourse or within 32 meters of a water course.**
R.544, 18 June 2010	12	The construction of pollution control dams with a combined capacity of 50,000m3 or more.
R.544, 18 June 2010	13	The construction of facilities for the storage and handling of a dangerous good with a combined capacity of 80 - 500 cubic metres. Hydrocarbons such as diesel, used oil and oily rags will be stored on site within bunded areas.
R.544, 18 June 2010	18(i)	The dredging and excavation of soil and rock from a water course/wetland through opencast mining.
R.544, 18 June 2010	22	Construction of haul and access roads within the mining area wider than 8m. Haul roads and access roads will be required on site.
R.544, 18 June 2010	26	Any process or activity identified in NEM:BA.
R.545, 18 June 2010	5	Any activity which requires a permit under legislation governing the release of pollutants. Certain water uses on site will trigger the requirement for a water use license in terms of the NWA.
R.545, 18 June 2010	15	Transformation of undeveloped land of 20ha or more to mining.
R.546, 18 June 2010	4(a)(ii) (cc)	Construction of a road in a sensitive area. The 100m buffer zone of the Olifants River will be preserved but drainage areas and wetland areas may be affected. Haul roads and access roads will be required on site.
R.546, 18 June 2010	Activity 10(a)(ii) (cc):	The storage of diesel in a sensitive area. Wetland areas may be affected.
R.546, 18 June 2010	Activity 13(c)(ii) (cc):	Removal of 1ha or more of vegetation where 75% constitutes indigenous vegetation within a watercourse and associated wetland.
R.546, 18 June 2010	Activity 14(a)(i):	Clearance of 5ha or more of vegetation where 75% constitutes indigenous vegetation.
R.546, 18 June 2010	Activity 16(a)(ii) (dd):	Construction of buildings and associated infrastructure of 10m2 or more within a sensitive area, where such construction is within 32m of a watercourse.

2.3 National Water Act

A water use licence application will be submitted according to the requirements of the National Water Act (Act 36 of 1998) (NWA) and its associated Best Practice Guidelines. All

water uses on site will be licensed through this process. All water management and containment features must be designed according to best practice guidelines, relevant water-related regulations and relevant engineering design standards. An application will be made through the Department of Water Affairs (DWA).

2.4 Atmospheric Regulations

The dust fall-out studies will be conducted in accordance with the National Environmental Management: Air Quality Act, 39 of 2004 (as amended) (NEMAQA). No air emissions license application will be required as all coal stockpiles will remain within the mining boundary and are therefore excluded from the scheduled activities listed under the Air Quality Act.

2.4.1 Air Quality Regulations

A four-band scale is used in the evaluation of dust fall (Table 4). Target, alert and action levels are indicated in Table 5. These environmental limits for dust levels were established to minimize effects such as air pollution and to prevent developments that may have a severe impact on the environment or society.

Table 4: Dust fallout guidelines

Band No.	Band Description Label	Dust-Fall Rate (D)	Comment
1	Residential	D < 600	Permissible for residential and light commercial
2	Industrial	600 < D < 1 200	Permissible for heavy commercial and industrial
3	Action	1 200 < D < 2 400	Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year
4	Alert	2 400 < D	Immediate action and remediation required following the first exceedance. Incident report to be submitted to relevant authority.

D - mg/m^2/day, 30-day average

Table 5: Target, alert and actions thresholds

Level	Dust-Fall Rate (D)	Averaging Period	Permitted Frequency of exceedance
Target	300	Annual	-
Action residential	400	30 days	Three within any year, no two sequential months
Action industrial	1200	30 days	Three within any year, not sequential months
Alert threshold	2400	30 days	None. First exceedance requires remediation and compulsory report to authorities.

D - mg/m2/day, 30-day average

2.4.2 Noise Regulations

Environmental limits for noise were established to minimise noise impacts. The SANS limits for ambient noise in different types of districts is given in Table 6 below (SANS Code of Practice 10103:2003). The SANS COP 10103:2003 also stipulates the response related to the degree of difference in levels between the ambient (intrusive) noise and the residual noise (Table 7). For the purpose of the study, areas are classified as “Rural Districts”.

Table 6: Typical rating levels for ambient noise in various districts (SANS COP 10103:2003)

Type of District	Equivalent Continuous Rating Level LReq.T for Noise					
	Outdoor			Indoor: Open Windows		
	Day-night	Day time	Night time	Day-night	Day time	Night time
Residential Districts Rural Districts	45	45	35	35	35	25
Suburban districts with little road traffic	50	50	40	40	40	30
Urban districts	50	55	45	45	45	35
Non Residential Districts Urban districts with some workshops, with business premises and with main roads	60	60	50	50	50	40
Central business districts	65	65	55	55	55	45
Industrial districts	70	70	60	60	60	50
Daytime – 06:00 to 22:00 Night-time – 22:00 to 06:00						

Table 7: Categories of environmental / group response for Rural Districts (SANS COP 10103:2003)

Excess LrdBA	Estimated Community/Group Response	
	Category	Description
0 -5	Little	Sporadic complaints
5-10	Medium	Widespread complaints
10-20	Strong	Threats of community / group action
>15	Very strong	Vigorous community / group action

2.5 National Heritage Resources Act

The heritage impact assessment forms part of the environmental impact assessment as required by the EIA regulations in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The heritage PHASE I impact assessment has been done in accordance with Section 38 of the National Heritage Resources Act, No. 25 of 1999 and has

been submitted to the South African Heritage Resources Agency (SAHRA) as required by the National Heritage Resources Act (NHRA).

2.6 National Waste Management Act

The National Environmental Management: Waste Act, (No. 59 of 2008) (NEM:WA) came into operation on the 1 July 2009. It addresses waste generation, classification and management issues, including recycling of waste. The waste generated from the mining activities will be minimal and predominantly related to mine residue which currently falls within the ambit of the MPRDA and not NEM:WA. It is expected that the volumes of non-mine-residue waste will fall below the thresholds as stipulated by the NEM:WA; however, should any waste-related activities on site trigger the scheduled activities under NEM:WA then the relevant applications under this Act will be made by Overlooked Colliery.

3 METHODOLOGY

The focus of this EIA and EMP is to fully assess the impacts, to rate the impacts according to their significance and to propose mitigation measures to prevent or reduce these significant impacts and formulate an environmental management plan based on these mitigation measures. All comments and concerns raised during the PPP have been included as part of the impact assessment process and environmental management plan. To sufficiently assess and estimate the impacts and benefits associated with the proposed coal mining operation, it is necessary to develop a methodology.

3.1 Environmental, Socio-Economic and Cultural Impact Assessment

Impact assessment methods were developed to: (1) identify the potential impacts of a proposed development on the social and natural environment; (2) predict the probability of these impacts and (3) evaluate the significance of the potential impacts.

The methodology used by Cabanga Concepts is as follows:

The status of the impact		
Status		Description
Positive:		a benefit to the holistic environment
Negative:		a cost to the holistic environment
Neutral:		no cost or benefit
The duration of the impact		
Score	Duration	Description
1	Short term	Less than 2 years
2	Short to medium term	2 – 5 years
3	Medium term	6 – 25 years
4	Long term	26 – 45 years
5	Permanent	46 years or more
The extent of the impact		
Score	Extent	Description
1	Site specific	Within the site boundary
2	Local	Affects immediate surrounding areas
3	Regional	Extends substantially beyond the site boundary
4	Provincial	Extends to almost entire province or larger region
5	National	Affects country or possibly world
The reversibility of the impact		
Score	Reversibility	Description
1	Completely reversible	Reverses with minimal rehabilitation & negligible residual affects
3	Reversible	Requires mitigation and rehabilitation to ensure reversibility
5	Irreversible	Cannot be rehabilitated completely/rehabilitation not viable

The magnitude (severe or beneficial) of the impact		
Score	Severe/beneficial effect	Description
1	Slight	Little effect - negligible disturbance/benefit
2	Slight to moderate	Effects observable - environmental impacts reversible with time
3	Moderate	Effects observable - impacts reversible with rehabilitation
4	Moderate to high	Extensive effects - irreversible alteration to the environment
5	High	Extensive permanent effects with irreversible alteration
The probability of the impact		
Score	Rating	Description
1	Unlikely	Less than 15% sure of an impact occurring
2	Possible	Between 15% and 40% sure of an impact occurring
3	Probable	Between 40% and 60% sure that the impact will occur
4	Highly Probable	Between 60% and 85% sure that the impact will occur
5	Definite	Over 85% sure that the impact will occur
The Consequence		= Magnitude + Spatial Scale + Duration + Reversibility.
The Significance		= Consequence x Probability.

The rating is described as follows:

Score out of 100	Significance
1 to 20	Low
21 to 40	Moderate to Low
41 to 60	Moderate
61 to 80	Moderate to high
81 to 100	High

Will mitigation be possible (yes or no)?

Finally the negative impacts are rated according to the degree of loss of a resource due to the particular impact. This is only assessed from the pre-mitigation perspective of the impact. The degree of loss of a resource is evaluated in terms of:

- Low degree of loss: where the resource will recover on its own with no/limited rehabilitation over an observable period of time;
- Moderate degree of loss: where the resource will recover over extended period or with rehabilitation or remedial measures to assist recovery of resource; and
- High degree of loss: Where the resource cannot be recovered, or the resource will recover over extended time periods.

3.2 Public Participation Process

A full NEMA PPP (GN R543) was followed for the MPRDA, NEMA and IWULA application process. The detailed PPP has been reported further under the relevant chapter, where all PPP conducted to date has been summarised. Any issues or concerns raised during the review of the EIA/EMP report will be passed directly onto the DMR authorities.

3.3 Environmental Management Programme

During the evaluation of impacts, consideration was given to information gained through various specialist investigations and through public interaction. The environmental management plan was formulated by considering the mitigation of each negative impact and consolidating these mitigations measures into a management plan which also highlights inspection and monitoring, frequency of inspections and monitoring, and proposed action plans to any potential issues observed through inspection and monitoring.

3.4 Submission of Information

In terms of the MPRDA, the applicant submitted a mining right application in May 2013 and received acceptance of application from the Department of Minerals and Energy (DMR) on 21 June 2013. The mining right application included the Mine Works Programme and SLP as required by the MPRDA. This was followed by a Scoping Report submitted in July 2013. This EIA/EMP report must be submitted on or before 19 November 2013. The Department of Mineral Resources (DMR) is the lead authority in mining projects and developments.

The application for environmental authorisation in terms of NEMA was received by DEDET on the 30 July 2013. Following which a reference number was received. The scoping report was submitted in September 2013 and this EIA and EMP will be submitted concurrently to the MPRDA EMP.

4 APPLICANT, EAP AND PROPERTY DETAILS

4.1 Details of Applicant and Mineral Rights Holder

Name of Company: Overlooked Colliery (Pty) Ltd

Name of Mine: Overlooked Colliery

Postal Address: Postnet Suite 252, Private Bag x1866, Middelburg, 1050

Telephone: +27 (0)13 246 8555

Fax Number: 013 246 1725

Contact Person: Mathews Ontiretse Senosi

E-mail address: msenosi@gbcoal.co.za

4.2 Environmental Assessment Practitioner

Name of Company: Cabanga Concepts cc (Appendix A: CV & company profile)

Postal Address: Postnet Suite 470, Private Bag X3, Northriding, 2162

Telephone: +27 (0)11 794 7534

Fax Number: +27 (0)11 794 6946

Responsible Person: Barbara Kasl

E-mail: jane@cabangaconcepts.co.za

A summary CV and company profile has been included in Appendix A.

4.3 Owner of the Land

Table 8 shows the surface right ownership.

Table 8: Surface right ownership for properties in the mineral boundary

Description	Area (ha)	Title deed no.	Surface owner	Contact Details
Portion 0 of Forzando 592 IS	Total property: 37.7972 Mining right: 10.9499	T57727/2002	Total Coal South Africa (Pty) Ltd	Karen Ravenscroft PO Box 1746, Witbank, 1035 0136901269 karen.ravenscroft@coal.total.co.za
Portion 5 of Halfgewonnen 190 IS	74.7033	T2945/918	Forzando Coal Mines (Pty) Ltd	
Portion 0 (R/E) of Halfgewonnen 190 IS	72.2273	T71185/94	Joseph Basil Kourie	P. O. Box 20, Bethal, 2310 0832772734

Description	Area (ha)	Title deed no.	Surface owner	Contact Details
Portion 17 of Halfgewonnen 190 IS	7.4740	T71185/94	Joseph Basil Kourie	kourie@jantar.co.za

4.4 Location of Site

4.4.1 Regional Setting (Plan 1)

Overlooked Colliery is situated between the towns of Bethal, 23km south-west, and Hendrina, 21km north-east, within Mpumalanga Province, South Africa. The proposed mine covers an extent of 165.3545 Ha, extending over the full extent of the Portion 0 (Remaining Extent), Portion 5 and Portion 17 of the farm Halfgewonnen 190 IS and a portion of the farm Forzando 592 IS.

4.4.2 Magisterial District and Municipalities

The proposed mine is in the Gert Sibande District Municipality (DC30) and the Govan Mbeki Local Municipality (MP307).

4.4.3 Direction and Distance to Neighbouring Towns

Table 9 shows the nearest towns and distances and direction to these towns.

Table 9: Distances and directions (straight line distance) to neighbouring towns

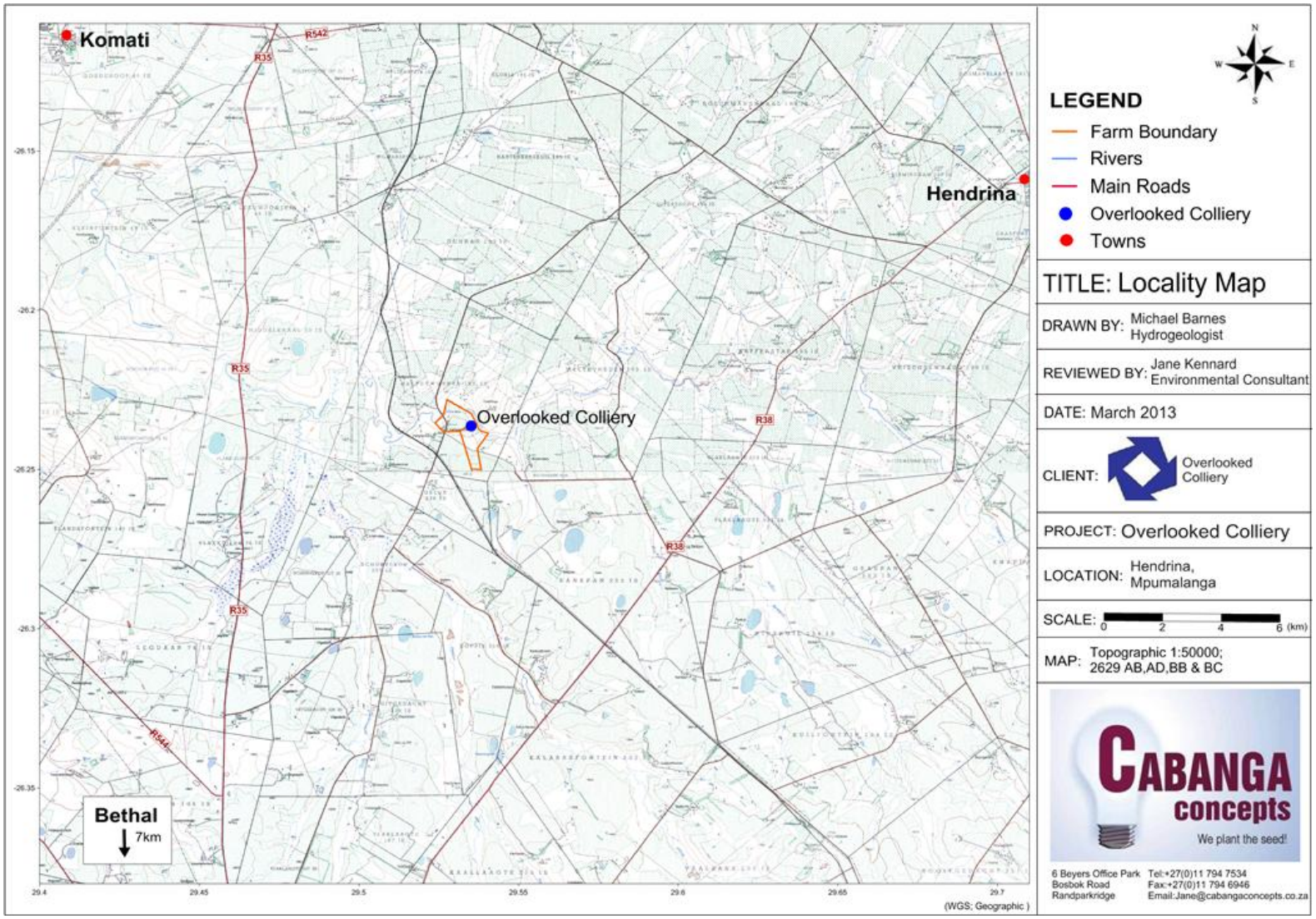
Town	Distance	Direction
Hendrina	21 km	North-east
Middelburg	56 km	North
Ermelo	54 km	South-east
Emalahleni	51 km	South-south-west
Bethal	26 km	South

4.4.4 Local Setting (Plan 2)

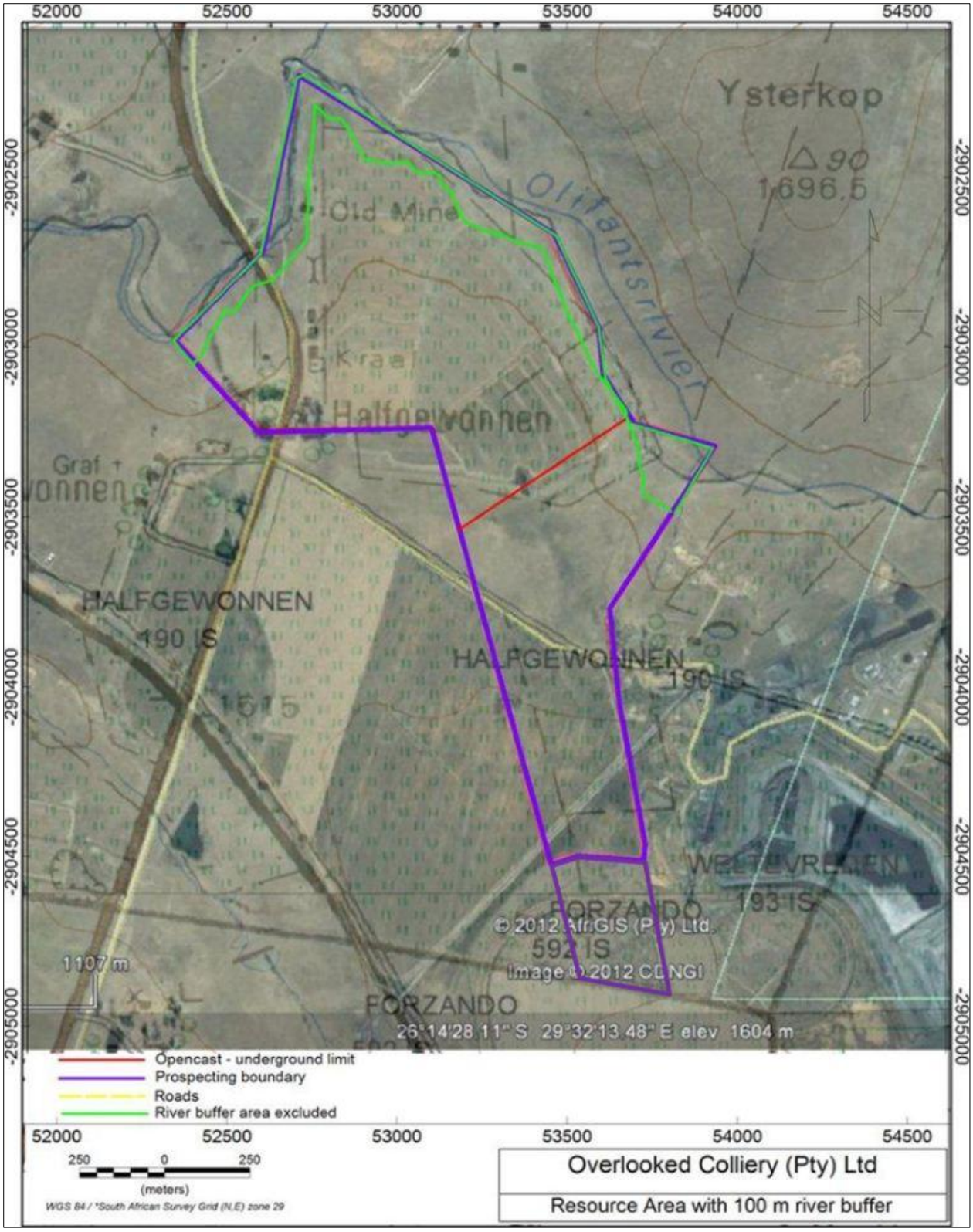
The mine is situated in the quaternary catchment B11A within the Upper Olifants Water Management Area. A minor non-perennial tributary flows through the far eastern boundary from south to north into the Olifants River. The Olifants River forms the northern boundary of the project. No other streams were identified within the area. Wetland areas have been identified in association with the non-perennial stream and Olifants River. The topography in the area changes from around 1600 mamsl (meters above mean sea level) in the north to 1640 mamsl in the south. This indicates a generally flat and shallowly sloped area.

4.4.5 Land Tenure and Use of Adjacent Land

The vast majority of the area has been affected by farming, largely crops and pastures, with the remaining areas utilized for grazing. Surrounding the proposed mine area are also agricultural lands and two active coal mines. The southern area extends into a loop coal siding.



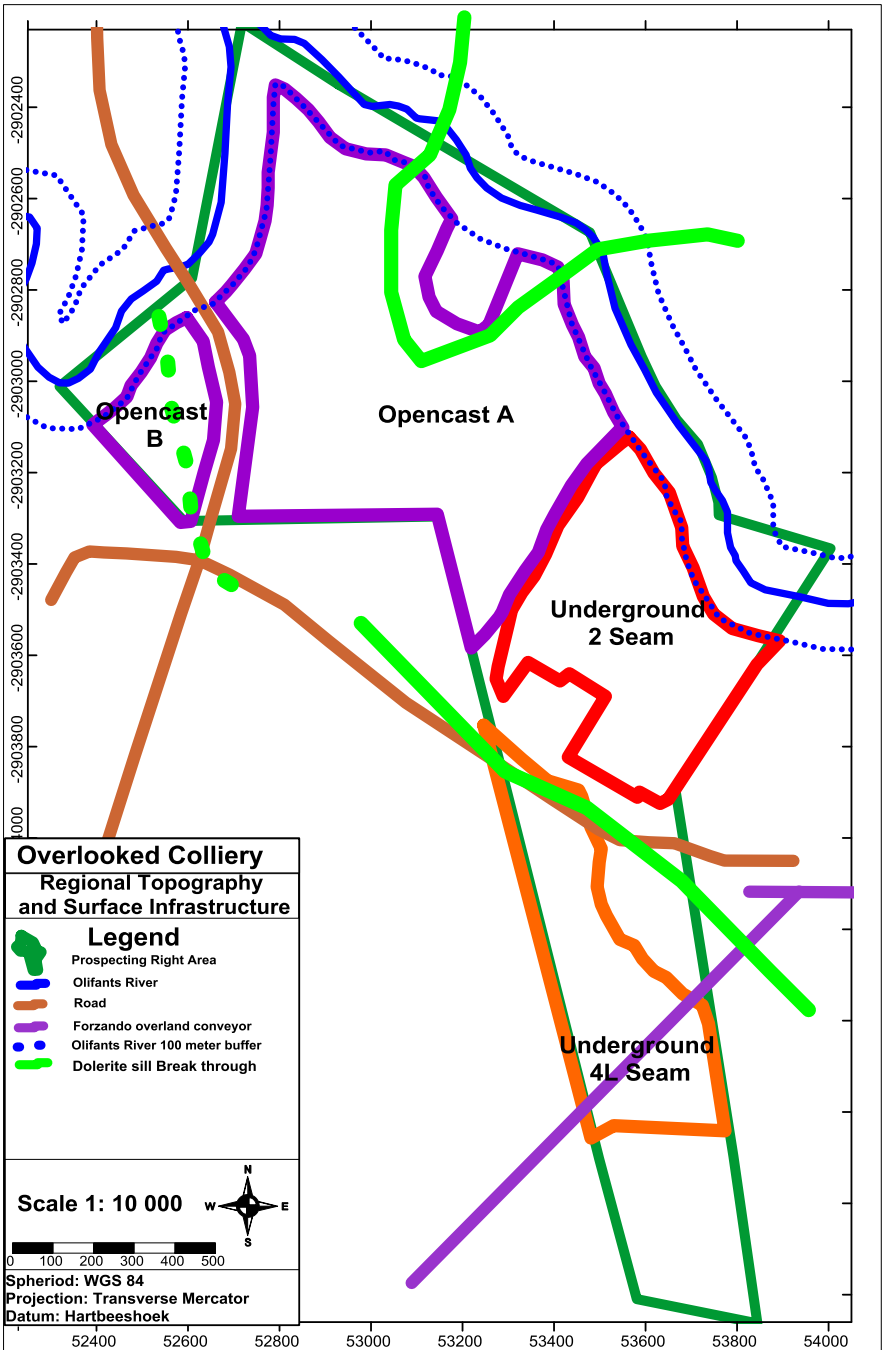
Plan 1: Regional setting



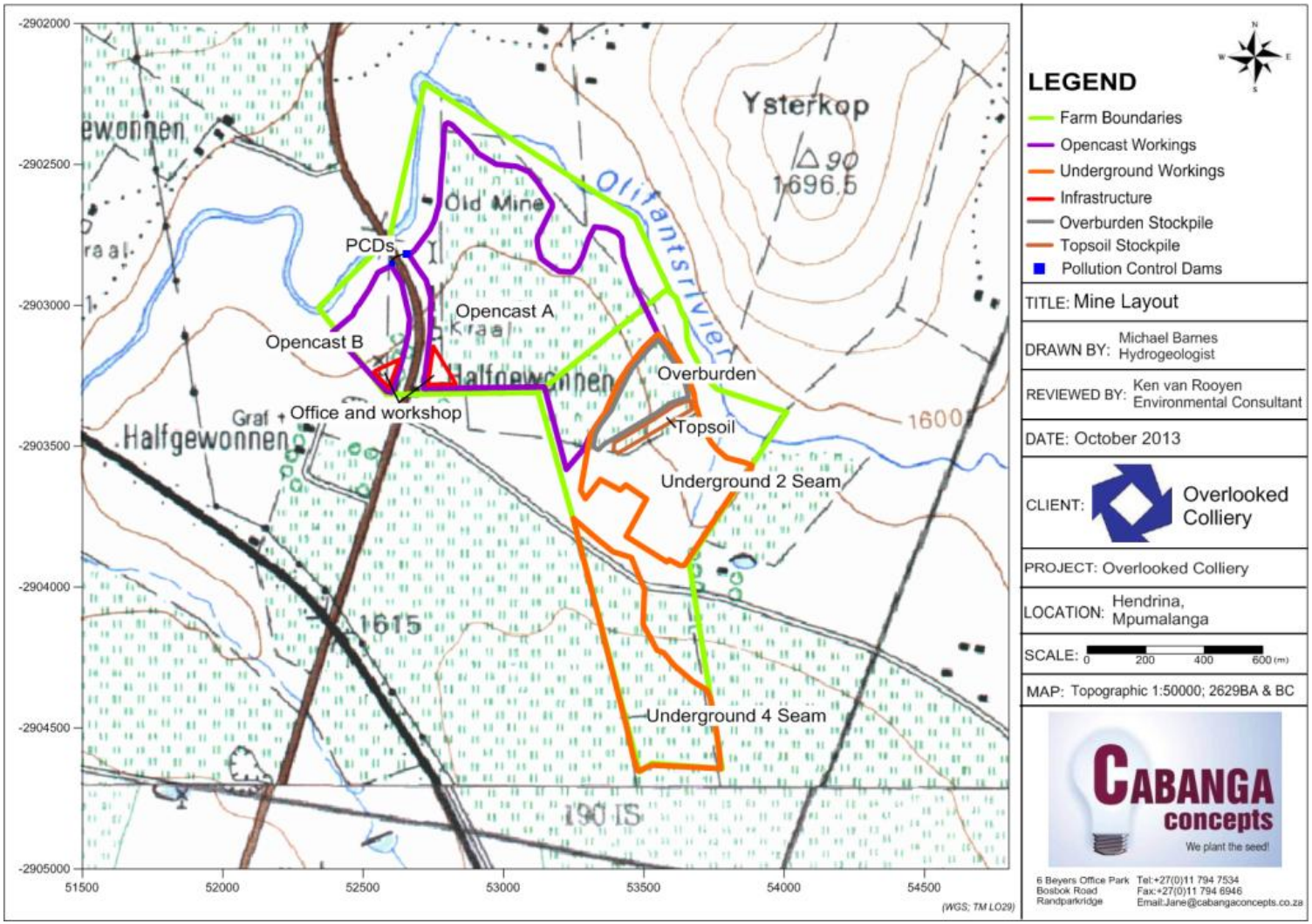
Plan 2: Local setting (RSV Enco, 2013)

4.4.6 Surface Infrastructure and Servitudes (Plan 2 and Plan 4)

A tarred provincial road traverses the far western extent and a secondary road traverses the southern extent of the mineral boundary. The Richards Bay railway line and nearby power lines pass the western and south-western side of the mineral boundary. An existing loop coal siding is located on the southern extent of the mineral boundary. Other nearby infrastructure that is associated with agriculture includes farm roads, houses and sheds and small power lines and telephone lines. Servitudes are associated with the abovementioned road, rail and power lines.



Plan 3: Proposed Mine plan (RSV Enco, 2013)



Plan 4: Proposed infrastructure plan (the crusher and screener will be located at the infrastructure area, along with the offices and workshops)

5 DESCRIPTION OF THE PROPOSED PROJECT

The project description given below entails a full description of operations for the full life of mine.

5.1 Reserve

Prospecting results have indicated that opencast mining is viable in the northern extent of the Colliery and underground mining for the central and southern extent of the property (Plan 3).

It is estimated that 6.504 million tonnes of coal will be mined by opencast and 0.957 million tonnes of coal will be mined by underground mining over a period of 6 years in total (excluding construction and decommissioning time).

5.2 Opencast Mining

Opencast mining will be conducted through roll-over mining with successive cuts opened as old mined cuts are rehabilitated. Access to open pits will be via a low wall ramp. These access ramps will progress with the roll-over mining. The opencast mining sequence will be as follows:

- Remove maximum topsoil and either place directly on levelled spoil from previous mine cuts (steady-state operation) or place on a topsoil stockpile, as close to the final void as possible (applicable to new mining areas).
- Remove soft overburden with excavator and trucks to 2 meters above the hard rock. Place directly on hard overburden in previous mine cuts (steady-state operation) or place onto soft overburden stockpile, as close to the final void as possible (applicable to new mining areas).
- Drill and blast the remaining overburden and remove all but 2.5m to 3m of the overburden with a bulldozer push-over operation. Remove the remaining overburden with an excavator and truck to expose the coal. Place directly into previous mine cuts (steady-state operation) or place onto overburden stockpile, as close to the final void as possible (applicable to new mining areas).
- Exposed coal is drilled and blasted only when necessary and then loaded and hauled to the crusher. It is expected that most of the coal can be excavated without blasting (free digging) which should be prioritised as this will assist in the reduction of fine coal dust emission and blast noise and vibration.
- Bullet 3 and Bullet 4 above is repeated as and if necessary to access the next seam down.

5.3 Underground Mining

Where the coal seams are too deep for opencast mining, these will be mined through underground bord-and-pillar methods (Plan 3). Underground mine reserves will be accessed from the opencast highwall, drilling through to the southern underground reserve (Plan 3).

5.4 Production Rate

Target production rate at steady state is estimated at around 1.15 million tonnes per annum.

5.5 Life of Mine

The overall planned LoM is approximately 8 years (1 year construction, 6 years mining, and 1 year decommissioning), with an additional 3-5 years post-closure monitoring.

5.6 Coal Processing and Mine Residue Handling

Product will be trucked to the on-site crushing and screening plant; no processing will occur on site.

The crushing and screening plant will initially be located on the far western extent of the mine area (Plan 4 - Opencast B as indicated in Plan 3) and will then be re-located into the pit area created for underground access of coal seams in the central area of the property to allow for mining of the Opencast B area. If the road diversion is successful, Block B will be mined continuously from the opencast workings. If not, then Block B will be mined as a separate opencast.

5.7 Associated Activities, Infrastructure and Services

An additional 15 ha will be disturbed by various associated infrastructure.

5.7.1 Coal Transport

Coal from the underground is transported from the face by shuttle cars/battery haulers which have an average capacity of 12 to 20 ton via feeder-breakers to the 1,200 mm section conveyors. The section belts tip the coal onto a ROM stockpile at the adit; from there it will be transported by truck to the crushing and screening plant raw stockpile. Coal from the opencast will be loaded by means of front-end loaders and excavators onto dump trucks and hauled directly from the face to the crushing and screening plant raw stockpile.

5.7.2 Access and Haul Roads

Existing access roads will be utilised and haul roads will be created within opencast pit areas. These will be over disturbed areas and will move as opencast strip mining progresses.

There is a possibility that the public road (Halfgewonnen Road) may be deviated in future to allow for the opencast mining of Block B, but this is still being investigated. In the event that this is undertaken, the necessary authorisations must be obtained in terms of NEMA and the Department of Public Works, Roads and Transport.

5.7.3 Soil stockpiles

Topsoil and subsoil will be stockpiled separately and utilised to construct berms between the operations and the Olifants River; as well as stockpiled at the interface between opencast

mining and underground mining, ensuring that the initially stripped soils are placed near to the final void for use in rehabilitation of the final void. Remaining soils stripped through roll-over opencast mining will be replaced on previously mined cuts to rehabilitate these areas.

5.7.4 Overburden stockpiles

Overburden will be stockpiled separately at the interface between opencast mining and underground mining, ensuring that the overburden is placed near to the final void for use in in-filling of the final void. Remaining overburden removed through roll-over opencast mining will be replaced in previously mined cuts to fill these cuts in preparation for rehabilitation.

5.7.5 ROM stockpiles

Temporary stockpiles will be created within the opencast pits and move as roll-over mining progresses. The coal will then be trucked to the crushing and screening plant where ROM feed stockpiles will also be created.

5.7.6 Crushing and screening

The crushing and screening plant will be constructed initially in the position as indicated by mine infrastructure in Plan 4. However, the crusher and screening plant will be relocated to within the final void of the main opencast block. This will enable the mining of the western reserves (Block B).

5.7.7 Product stockpiles

Crushed and screened coal will be conveyed from the screening plant to product stockpiles. The product will then be trucked to Eskom or a siding for transport to Eskom.

5.7.8 Pollution Control Dams

PCDs will be constructed at the lowest natural point of each activity area but well outside rivers and their 1:100 year flood lines or 100m horizontal distance (whichever is greatest). A PCD is envisaged around opencast block and the crushing and screening plant and the mine infrastructure area.

5.7.9 Ablution facilities

A change house will be established on site. Toilets with septic tanks will be established on site that will be maintained by reputable external contractors.

5.7.10 Administration block

Offices will be in the form of prefabricated structures and limited for administrative functions.

5.7.11 Weighbridge

A weighbridge will be installed at site along the exit route to weigh product coal leaving the site.

5.7.12 Power Supply

Generators will be utilised to provide power at the opencast and underground area. Mining will be done with diesel driven equipment.

Application will be made to connect to the local power grid as this will be required for the crusher and screener. Once this is established, power may also be supplied to other mining areas.

5.7.13 Diesel Supply

Mining equipment, including drills, trucks and shovels, front-end loaders and 30 ton trucks for coal haulage will be diesel operated. Diesel will be supplied from bulk storage facilities near the wash plant. Diesel will be stored and transferred from two 23m3 tanks established in appropriately sized and designed bunded area. These will be established outside any wetland areas and their 100m buffer zones.

5.7.14 Magazine

Drill rods and drill bits will be used to drill the hard overburden above the coal seam. Explosives will be stored in the magazine located.

5.7.15 Workshop & Wash Bay

A full workshop area will be constructed at the wash plant area. The workshop will constitute a concrete floor with appropriate drainage and / or bunding to direct all water runoff from the workshop area to an oil trap. The oil from the oil trap will be dealt with as used hydrocarbon waste further described below. The water component will report to the PCD and be recycled as process water. A full wash bay will also be constructed near the workshop. The wash bay will also have concrete flooring with appropriate bunding/drainage to direct water runoff through an oil trap to the dirty water channel and PCD.

No repairs will take place on open, unprotected ground and all vehicles will be serviced at the workshops.

A small fenced off area adjacent to the workshop will be allocated as a salvage area for temporary storage of recyclable waste further described below under waste handling.

5.7.16 Lighting

Light masts will be erected at various locations to provide lighting at times of poor visibility and during the night as the colliery may be a 24 hour facility.

5.7.17 Security and Access

The site will have access control and dangerous areas will be fenced off. The site will be patrolled on a 24hr basis.

5.8 Water Requirements and Handling

5.8.1 Water Runoff Management

The mine operates in the Olifants River catchment area. All the main infrastructure and shafts will be located away from any rivers, streams and watercourses including the 1:100 year / 100m buffer zone except in cases where applications are successful to mine or conduct activities within these areas. No stream diversions around the adits are planned nor required. All storm water drainage infrastructures will accommodate 1:50 year storm event as required by legislation. Clean and dirty water will be separated and dirty water contained and recycled on site.

Relevant applications are being sought to mine through an identified seepage wetland and within 32m of wetlands.

Berms, and if necessary, trenches will be erected around areas of activity to divert upstream clean water runoff around the activity footprint into natural drainage lines. Flow dissipaters will be constructed where this water flows into wetlands or streams if it is deemed necessary.

Dirty or recycled water from underground and opencast mines will be stored in underground and opencast sumps for future use in the mining operation. Dirty or recycled water on surface will be diverted to pollution control dams on the surface through trenches, berms and pipelines as needed to prevent discharge. Any necessary pipelines will be inspected for leaks and water flow will be recorded by means of flow meters. All the storm water runoff from the infrastructure and mining areas will be diverted via silt traps or oil trap systems, as needed, to the pollution control dams (PCDs).

The conceptual sizing of the PCDs was conducted by the hydrologist (Letsolo, 2013). A pollution control dam (PCD A) is required at the lowest area downstream of Opencast Pit A. A capacity of 14 482 m^3 would be required if the mine was to keep the opencast pit open for the life of mine. Roll over methods will be implemented and it is assumed that the maximum impacted area at any given time during the 6 years of mining will be 30% of the entire area. As indicated in Table 10 below, the required pollution control dam must be able to contain 4 368m^3.

A second PCD (PCD B) will be required if the diversion of the road between the two opencast pits is not approved to contain runoff from Block B area. This dam must be able to contain 1152 m^3. The top width was rounded off to a whole number and this resulted in a design volume of 1161.333m^3 (Table 11).

A berm is recommended on the northern boundary of the Opencast Pits in order to reduce the potential for pollution at the Olifants River.

Table 10: Conceptual Designs (PCD A)

PCD A	Top length (m)	Top Width (m)	Bottom length (m)	Bottom Width (m)	Depth (m)	Volume (m^3)
Design capacity	36.00	36.00	30.00	30.00	4.00	4368.00
Design capacity & Freeboard volume	36.00	36.00	30.00	30.00	4.80	5241.60

Table 11: Conceptual Designs (PCD B)

PCD A	Top length (m)	Top Width (m)	Bottom length (m)	Bottom Width (m)	Depth (m)	Volume (m^3)
Design capacity	19.00	19.00	15.00	15.00	4.00	1161.33
Design capacity & Freeboard volume	19.00	19.00	15.00	15.00	4.80	1393.60

5.8.2 Raw Water Supply

Raw water that is neutral and non-scaling will be obtained from the water management dams (PCDs) to be constructed at Overlooked Colliery and pit/underground mine dewatering. Around $3m^3$ per day will be obtained for potable use from boreholes at Overlooked.

Water within the in-pit sumps and PCD will be utilised for process water and for dust suppression within the mine footprint area only. Any water requirements which may be needed for drilling, crushing and screening or other on-site activities will be sourced from the water within the PCD / in-pit sumps.

5.8.3 Potable Water Supply

Potable water tank will be established at the administrative area to store and supply potable water from a nearby borehole.

5.9 Waste Handling

5.9.1 Gaseous Emission

No scheduled gaseous emissions will take place on site.

Vehicles and machinery will emit fumes, but will be serviced and maintained regularly to keep these emissions within the relevant vehicle/machine's specifications.

Dust will be monitored and managed on site to ensure these are within the standards set by the Department of Environmental Affairs and Tourism (DEAT).

5.9.2 Solid and Liquid Waste

Solid waste will be limited to domestic waste, construction and building waste, old machinery, old tyres and conveyor belts, scrap metal and wood. Table 12 indicates the proposed waste disposal of various wastes on site during the various mine phases.

Table 12: Proposed waste management strategy on site

Waste type	Waste treatment
CONSTRUCTION	
Construction waste	Will be removed from site by contractors.
Domestic waste	Locally collected in bins and transferred to skips for disposal at the municipal waste site by registered contractor. Recycling will be done as far as possible with regards to paper, glass, tins/cans, plastics, batteries and computer equipment, and inflorescent lights which will be placed in specific skips/drums.
Sewage	Septic tanks will be installed at the office and sewage will be removed from site by contractors. Portable toilets will be established at the various mine sites and will be maintained and serviced by the same contractors.
Mine water	Will be contained and managed on site as indicated above.
Used hydrocarbon waste	These will be collected in drums and stored within an adequately sized bunded area, constructed to SABS standards. The waste will be collected and removed from site by a reputable contractor.
OPERATIONS	
Domestic and office waste	Locally collected in bins and transferred to skips for disposal at the municipal waste site by registered contractor. Recycling will be done as far as possible with regards to paper, glass, tins/cans, plastics, batteries and computer equipment, and inflorescent lights which will be placed in specific skips/drums.
Sewage	Septic tanks will be installed at the office and sewage will be removed from site by contractors. Portable toilets will be established at the various mine sites and will be maintained and serviced by the same contractors.
Mine water	Will be contained and managed on site as indicated above in in-pit sumps and may be recycled to the wash plant for process requirements.
Used hydrocarbon waste	These will be collected in drums and stored within an adequately sized bunded area, constructed to SABS standards. The waste will be collected and removed from site by a reputable contractor.
Old tyres, conveyor belts	These will be collected and temporarily stored in an allotted area in the scrap / salvage yard for recycling by a reputable contractor.
Scrap metal	This will be collected and temporarily stored in an allocated area in the scrap / salvage yard for recycling by a reputable contractor.
Old machinery	Due to the short duration of the project, old machinery waste is not expected to be generated on site. Any old machinery will be collected and temporarily stored in an allocated area in the scrap / salvage yard for recycling by a reputable contractor.

Waste type	Waste treatment
DECOMMISSIONING AND CLOSURE	
Building rubble	All building rubble will be removed from site and disposed of by the contractor. Where the material is safe to use for filling of final voids, then this will be done.
Domestic waste	Locally collected in bins and transferred to skips for disposal at the municipal waste site by registered contractor. Recycling will be done as far as possible with regards to paper, glass, tins/cans, plastics, batteries and computer equipment, and inflorescent lights which will be placed in specific skips/drums.
Sewage	Portable toilets will again be utilised as facilities get dismantled and maintained by a reputable contractor.
Used hydrocarbon waste	These will be collected in drums and stored within an adequately sized bunded area, constructed to SABS standards. The waste will be collected and removed from site by a reputable contractor.

5.10 Project Phases

The project can be divided into five phases, namely, the planning and design phase, the construction phase, operational phase, decommissioning phase and the closure phase. The activities associated with these phases are listed below:

Activity	Sub-activity
PLANNING AND DESIGN PHASE	
Site visits and site assessments	Vehicle and foot traffic on site
CONSTRUCTION PHASE	
Construction of water management features, silt trap and PCDs. NEMA: R.544: Activity 12; R.545: Activity 5; R.546: Activity 14(a)(i)	Truck and heavy machinery operation
	Removal of herbaceous material with soil stripping
	Berm and channel construction
	Silt trap construction
	PCD construction
Upgrade & construction of access and main haul roads NEMA: R.544: Activity 22; R.546: Activity 14(a)(i)	Truck and heavy machinery operation
	Removal of herbaceous material with soil stripping
	Berm construction
	Levelling, grading and compacting areas for road development
Preparation of mine infrastructure area NEMA: R.544: Activity 11, 18(i), 26; R.546: Activity 13(c)(ii)(cc), 14(a)(i), 16(a)(ii)(dd)	Truck and heavy machinery operation
	Removal of herbaceous material with soil stripping
	Soil stockpiling & berm and channel construction
	Levelling, grading and compacting areas for development

Activity	Sub-activity
Construction of foundations and construction of various infrastructure and crushing and screening plant	Truck and heavy machinery operation
	Foundation preparation and/or cement pouring
	Construction of various infrastructure for processing, administrative and security duties, ablutions and installation of light masts
Provision of electricity	Erection of bunded areas & installation of generators and substations
	Power supply
Drilling of boreholes for potable water supply	Drilling
	Fitting of and operation of pumps
	Construction and utilisation of water storage tanks
Construction and utilisation of toilets	Construction of bathrooms, septic tanks and change houses
	Utilisation of change houses and bathrooms
Diesel and hydrocarbon storage NEMA: R.544: Activity 13; R.546: Activity 10(a)(ii)(cc)	Construction of bunded areas for hydrocarbon storage
	Handling and initial storage of diesel
Preparation of opencast boxcut area NEMA: R.544: Activity 11, 18(i) and 26; R.546: Activity 13(c)(ii)(cc), 14(a)(i) and 16(iv)(a)(ii)(dd)	Truck and heavy machinery operation
	Removal of herbaceous material with soil stripping
	Topsoil and subsoil stockpiling
	Removal and stockpiling of soft overburden
Blasting of rock for the opencast boxcuts NEMA: R.544: Activity 18(i)	Excavation of box cut and associated blasting
	Removal and stockpiling of hard overburden
Construction of in-pit infrastructure NEMA: R.544: Activity 12; R.545: Activity 5; R.546: Activity 16(iv)(a)(ii)(dd)	Construction and installation of sump and pump
	Pumping of in-pit/mine water and storage in in-pit sump
	Laying down pipelines from the boxcut and mine areas to the PCD
	Periodic pumping and transfer of water from in-pit sumps to PCD and vice versa should it be needed for water management purposes
Waste generation	Domestic and industrial waste generation and handling
General activities	General activities
OPERATION PHASE	
Operation of water management features, silt trap and PCD NEMA: R.544: Activity 12; R.545: Activity 5; R.546: Activity 14(a)(i)	Operation of berms and trenches
	Operation of PCD
	Operation of associated pipelines and pumps
Utilisation of roads NEMA: R.544: Activity 22; R.546: 14(a)(i)	Truck and heavy machinery operation
	Coal Transportation

Activity	Sub-activity
Provision of electricity	Operation of generators
	Power supply
Pumping and conveyance of groundwater for potable use	Operation of pumps
	Groundwater conveyance and temporary storage
Utilisation of change houses and bathrooms	Generation of grey water
Diesel and hydrocarbon storage and handling NEMA: R.544: Activity 13	Storage and handling of diesel and hydrocarbons
Coal quality testing at laboratory	Chemical storage and handling
Opencast mining NEMA: R.544: Activity 12; R.545: Activity 5	Blasting activities and opencast mining
	Removal of coal seams
	Pumping of in-pit water
	Periodic pumping and transfer of water from in-pit sumps to PCD and vice versa should it be needed for water management purposes
Creation of new opencast cuts NEMA: R.544: Activity 11, 18(i) and 26; R.545: Activity 15; R.546: Activity 13(c)(ii)(cc), 14(a)(i) and 16(iv)(a)(ii)(dd)	Truck and heavy machinery operation
	Removal of herbaceous material with soil stripping
	Soil and soft overburden mobilisation through roll over mining
	Blasting of overburden
	Overburden mobilisation through roll over mining
	Removal of coal seams
Rehabilitation from roll-over mining	Mobilisation of overburden and subsoils for filling of mined out voids
	Reprofiling of all disturbed areas
	Application of topsoil
	Amelioration of topsoil
	Construction of contour berms (where necessary)
	Seeding all rehabilitated areas
Moving the crushing and screening plant into the final void in preparation for underground mining	Truck and heavy machinery operation
	Foundation preparation
	Construction of various crusher and screening plant
Underground mining NEMA: R.544: Activity 9 and 12; R.545: Activity 5	Periodic blasting activities if and when required
	Removal and conveyance of coal onto temporary in-pit stockpiles
	Pumping of underground water and storage in in-pit sump
	Periodic pumping and transfer of water from in-

Activity	Sub-activity
	pit sump to PCD and vice versa should it be needed for water management purposes
	Fitting ventilation fans and conveyors to underground areas at the highwall adits
Raw coal handling and processing NEMA: R.545: Activity 5	Coal crushing and screening
	Coal stockpiling and handling
Operation of floodlights	Operation of floodlights
Washing at service station, wash bays, hard park and workshop	Truck and heavy machinery activity
	Water use
	Oil separation and collection into used hydrocarbon drums for disposal
Waste generation	Waste generation
General activities NEMA: R.544: Activity 26	General activities
DECOMMISSIONING PHASE	
Operation of water management features, silt trap and PCD NEMA: R.544: Activity 12; R.545: Activity 5; R.546: Activity 14(a)(i)	Operation of berms and trenches
	Operation of PCD
	Operation of associated pipelines and pumps
Removal of final sewage from septic tanks	Sewage removal
Hazardous substances handling (hydrocarbons and chemicals)	Removal of hydrocarbons and chemicals from site
Dismantling, removal and rehabilitation of unnecessary infrastructure	Truck and heavy machinery operation
	Removal of infrastructure
Borehole water provision	Sealing and closure of boreholes as borehole water requirements cease
Underground mining areas	Sealing and closure of underground mining sections
Filling the final opencast voids	Mobilisation of overburden and subsoil stockpiles for filling of mined out voids
	Reprofiling of all disturbed areas
	Clearing of materials stockpiles
Coal stockpiles	Final removal of coal product
	Clearing of carbonaceous surface material
Removal of roads	Final rehabilitation of roads no longer required
Rehabilitation of unnecessary water management facilities	Mobilisation of soils in berms for infilling of trenches
	Removal of silt trap and infilling with soil
	Levelling and grading areas
Final surface rehabilitation of all disturbed areas	Truck activity and operation of machinery
	Removal of all carbonaceous surface material and deposition onto co disposal facility prior to final capping

Activity	Sub-activity
	Ripping/discing of all levelled or compacted areas where required
	Reprofiling of all disturbed areas
	Application of topsoil
	Amelioration of topsoil
	Construction of contour berms (where necessary)
	Establishment of artificial wetlands (if deemed necessary for water flowing into the natural drainage lines)
	Seeding all rehabilitated areas
Waste generation	Waste generation
General activities	General activities
CLOSURE AND POST CLOSURE PHASES	
Managing and monitoring for all post mining impacts to prevent any further pollution	Monitoring and addressing problem areas

6 DESCRIPTION OF AFFECTED ENVIRONMENT

Where specialist studies have been completed these have been reported on in detail with the specialist reports attached. Where studies are outstanding desktop level details are provided.

6.1 Climate

Climate is characterised by strongly seasonal summer rainfall, with dry winters. Mean Average Precipitation (MAP) for the area is 650 – 900 mm (overall average of 726 mm). MAP is relatively uniform across most of this unit area, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the area, but drops to 21 % in the east and southeast of the climatic region.

Rainfall occurs mainly in the summer months from October to March, almost exclusively as showers and thunderstorms with the highest rainfall occurring in November, December and January (Table 13). The winter months are typically dry, however, periodic thunder showers may occur (South African Weather Bureau, 2009).

Table 13: Rainfall Data (Carolina – South African Weather Bureau).

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2002	108	94	57	13	22	16	1	6	9	75	14	155
2003	153	77	36	28	7	35	0	11	0	35	136	77
2004	181	157	119	24	3	6	30	0	0	142	81	72
2005	206	87	56	34	2	0	0	30	2	57	142	98
2006	375	108	111	46	1	0	0	55	1	11	86	177
2007	122	21	20	23	0	22	0	0	33	311	136	82
2008	249	76	109	5	21	19	0	0	0	37	105	100
2009	151	86	59	3	24	37	0	37	2	96	154	148
2010	208	51	106	94	38	0	0	0	0	56	124	172
2011	49	26	80	39	3	10	11	27	8	127	278	140
2012	113	19	59	19	0	1	0	1	109	105	132	121
Avg	162	81	70	31	14	12	4	14	16	96	100	118

The mean daily maximum temperature in January and July is 24.3°C and 18.8°C respectively. The range in mean daily minimum is from 1.6°C to 13.6°C in July and January respectively. Temperatures don't tend to fall below 0°C very often. Table 14 summarises the mean monthly temperatures for the region.

Table 14: Mean Monthly Temperature taken over 2006 – 2008

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2002	13.8	12.9	11.7	8.6	3.6	1	-1.1	5.8	5.8	9.4	9.8	13
2003	13.4	14.2	10.4	8.8	3	1.5	-0.4	1.8	7.6	10.5	13.1	13.8
2004	14.2	13.1	12.5	8.3	2.5	-0.5	-1.1	4.6	5.6	9.8	12.5	12.9
2005	14.7	13	11	8.8	3.8	2.3	-0.2	5.9	7.1	10.9	12.5	13.1
2006	15.2	14.7	11.7	8.6	2.1	-1	1.9	2.8	6	11.8	12.5	14.7
2007	12.8	13	11.7	8.6	1.9	0.8	-1.3	3	9.4	10.8	13.1	13
2008	14.1	12.9	11.5	6.6	5	1.1	1.2	4	2.9	11.2	13.4	14.5
2009	15.3	14	11.8	7.6	4.3	3.2	-2.4	3.9	10	12	12.4	14.8
2010	16.2	14.9	13.2	13.3	6.1	-0.1	1.3	2.2	9.2	12.1	13.2	14.1
2011	14.7	13.3	12.9	10.7	6.4	0.4	-2.7	1.9	8.1	9.8	12.8	14.6
2012	14.2	14.1	12	7.1	4.3	0	0.3	3.9	7.9	11.1	12.2	13.6
Avg	14.28	13.58	11.83	8.88	3.84	0.75	0.46	3.55	7.14	10.83	12.5	13.78

6.2 Topography

The topography in the area changes from around 1600 mamsl in the north to 1640 mamsl in the south. This indicates a generally flat and shallowly sloped area. The highest point is outside the northern boundary on the opposite side of the Olifants River. Ysterkop is at a height of 1696 mamsl. The southern portion of this reserve is fairly flat with the topography dipping down towards the Olifants River to the north. The northern edge of the property is bound by the Olifants River, which meanders from east to west.

6.3 Geology

6.3.1 Regional Geology

RSV Enco (2013) compiled the geological report. The following information has been extracted from this report.

The Karoo Supergroup host the coal deposits in southern Africa. The Main Karoo Basin of South Africa hosts the complete Carboniferous to Jurassic rock record. This rock record is the result of changing climatic conditions raging from glacial through temperate to dry desert.

The glacial conditions were characterized by denudation and erosion, rather than deposition. This resulted in the sculpturing of a rugged topography by the scouring ice sheets into the pre-Karoo rocks. The pre-Karoo rocks forming the basement consist of Precambrian metamorphic rocks, granites and gneisses. The effect of this scouring is the formation of palaeo valleys and ridges. These ridges crop out in some areas because of modern day erosion. A palaeo ridge occurs in the area and form part of the Smithfield Ridge.

This was followed by progressively warmer climates, which resulted in the gradual north- and north-eastward retreat of the ice cap onto higher terrain. The Dwyka Group was deposited by the scoured debris that formed the base of the ice sheets as well as the clastic material transported within and on top of the melting glaciers. This material was either deposited directly as moraines or was reworked by southward flowing melt-water streams. The Dwyka Group is found at the base of all the southern African Karoo depositional basins and is more or less continuous throughout South Africa's Main Karoo Depositional Basin. The Dwyka sedimentation is followed by deposition of the Ecca Group. The Ecca Group is formed by discharging melt-water that reworked unconsolidated moraines and transported the arenaceous and argillaceous material southwards into the Ecca Sea. The northern part of this Ecca deposition reflects sedimentation on a stable platform presented by the Kaapvaal Craton.

The Ecca Group is sub-divided from the base upwards into the Pietermaritzburg-, Vryheid- and Volksrust Formation. The Pietermaritzburg and Volksrust Formations represent shelf shales. The Vryheid Formation is restricted to the northern part of the Main Karoo Basin. It consists of alternating sandstones conglomerates and shales which host economically exploitable coal seams. The Vryheid Formation represents a regressive deltaic wedge, consisting of fluvial and shallow marine sediments. The coal seams represent accumulations of plant material which thrived on vast bogs on the upper delta plain and fluvial environments during periods of minimal subsidence of the basin. The Ecca sedimentation is concluded with the deposition of the Volksrust Formation, representing a phase of more rapid subsidence of the basin floor.

In the Overlooked vicinity only the Vryheid Formation is present. The Pietermaritzburg and Volksrust Formations are absent; the Pietermaritzburg because it has not been deposited in the area and Volksrust (if deposited) has been removed by the present erosion cycle.

The remainder of the Karoo deposition consists of the Beaufort Group, Molteno Formation, Elliot Formation and Clarence Formation. These units are of no consequence to the coal in the general Overlooked area and are therefore not elaborated on in this document.

The Karoo sedimentation terminated with the Jurassic extrusion of the Drakensberg basalt and the associated intrusion of dolerite dykes and sills. This magmatic event was the immediate pre-cursor to the Cretaceous rifting of the Gondwana Continent. The intrusive phase had a direct impact on the coal seams and this will be elaborated on in the chapters on coal seams and dolerites.

The nature of the coal seams is controlled by the palaeo-topography. There is a palaeo-high and pre-Karoo ridge on the north-eastern boundary of the prospecting area which forms part of the Smithfield Ridge. The Smithfield Ridge forms the divide between the Witbank and Highveld Coalfields. In areas adjacent to these palaeo high areas one can expect thinning of coal seams as well as the increase in joints due to differential compaction.

The prospecting area is to some extent affected by dolerite intrusions as confirmed by a fair number of boreholes with dolerite sill intersections, thin dolerite stringers and devolatilized coal.

A total of 5 coal seams, namely the No. 5, the No.4Upper, the No.4L, the No.3 and the No. 2 are present in the area as can be seen in Figure 1 (Generalized Stratigraphic Column).

6.3.2 Local Geology

The basement roof was modelled as a combination of pre-Karoo basement rocks i.e. felsite or the roof of the Dwyka Group. The Dwyka is poorly developed either thin or not developed at all and hence the use of the combination of the pre-Karoo rocks or Dwyka as the top of the basement. The basement elevation ranges from more than 1560 mamsl in the north west of the Overlooked area where the basement rocks come very close to the current surface as a sub-surface extension of the Smithfield Ridge. The lowest elevation 1497.01 mamsl occurs in the south.

The No. 1 Seam was only intersected sporadically.

The No. 2 Seam is not very well developed towards the south east due to the seam being affected by dolerite intrusions and has been burnt and destroyed by the dolerite sill. The Seam is often split into a No. 2 Lower and a No. 2 Upper Seam. The No. 2 Lower Seam generally is the thicker seam of the two sub-seams; it has better quality coal, and therefore will be mining target. In some areas only the No. 2 Lower Seam is mined, in other areas it might be a combination of the No. 2 Lower, parting and the No 2 Upper Seam that is mined or the entire No. 2 Seam Group is mined. The thickness of the No. 2 Seam ranges from a minimum 0.543 m in the south east to a maximum of 4.99 m. The elevation of the floor of the No. 2 Seam shows a very close correlation with the pre-Karoo topography. The floor elevation ranges from 1507.3 mamsl to 1561.8 mamsl. In the north east the minimum overburden is 22.25 m and is a function of the surface topography where the Olifants River cuts across the area. The maximum depth from surface to the seam, 99.07 m, is found towards the south. This is the result of the combination of the palaeo-topography sloping in that direction and the present day high surface topography.

The No. 3 Seam was only intersected sporadically.

The No. 4 Seam Group is laterally relatively consistent over most of the area. In the east and northeast it is limited by palaeo topographic highs against which it thins or pinches out as well as areas where it has been destroyed by dolerite sill intrusions. The seam thins in a southerly direction. Seam splitting occurs and the seam progressively splits into the No. 4 Upper Seam and No. 4 Lower towards the south. The seam split ranges in thickness from a few centimetres to a few meters. The No. 4 Upper Seam (or the corresponding unit of the No. 4 Seam Group where it is not split) contains numerous centimetre to decimetre thick bands of a shaley to silty nature. It has a high prevalence of dull coal bands, resulting in a marked vertical lithological change within the seam. This higher amount of non-carbonaceous layers in the No. 4 Upper Seam results in a higher ash content and thus a lower calorific value.

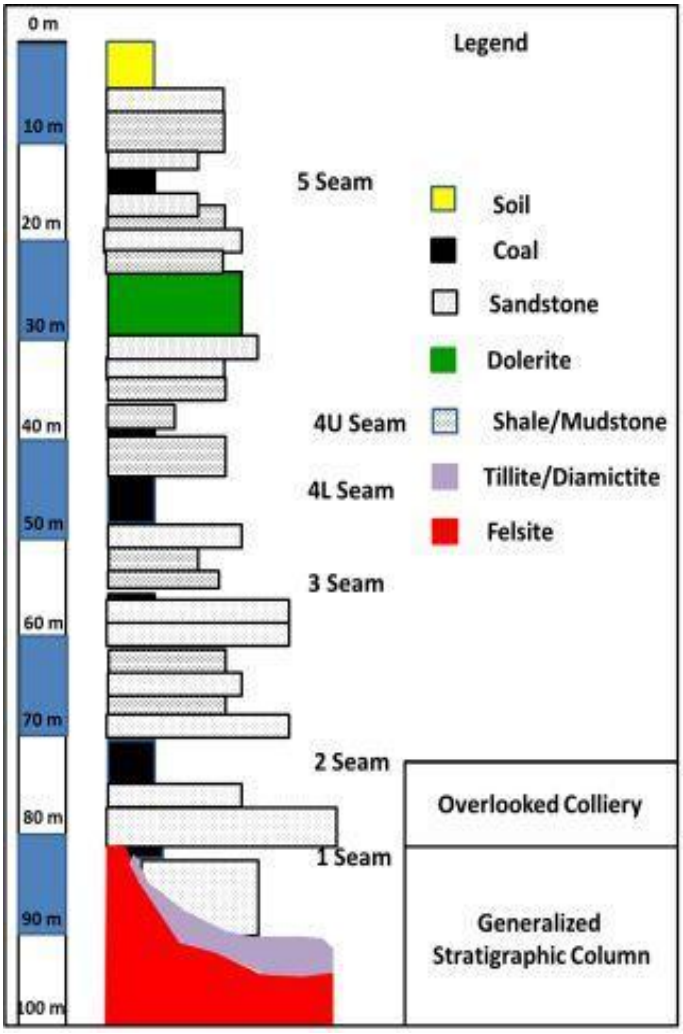


Figure 6-1: Geological stratigraphy of Overlooked area

On the basis of seam thickness and coal quality the No. 4 Lower Seam is the prime exploitation target within the No. 4 Seam Group. The No. 4 Lower Seam comprises of coal and minor in-seam partings. The coal is characteristically banded with alternating dull and bright coal. Pyrite is present in the form of nodules or in disseminated form. The No. 4 Lower Seam contains one in-seam parting of significant thickness and lateral extent. It is referred to as the in-seam top parting. The thickness of this top parting averages 0.15 m, but can reach 0.5 m. It consists of carbonaceous siltstone or shale. Arenaceous lenses are common. Coal thicknesses greater than 5 m occur only in the northern part of the proposed mining right area, where the No.4 lower and No. 4 upper seam is developed on top of each other. The thickness of the seam ranges considerably across the property. Southwards the seam is thinner. The elevation of the seam floor shows correlation with the palaeo-topography of the pre-Karoo basement. The exception is where the No. 4 Lower Seam has been affected by the dolerite sill. The result being that it has pushed the No 4 Lower Seam upwards. The seam elevation ranges from 1546.22 mamsl in the centre to 1577.69 mamsl in the west. The depth to the roof of the seam varies from sub-outcrop to a maximum of 70.81 m.

The No. 4 Upper Seam is very isolated and relatively thin. The No. 5 Seam was only intersected sporadically.

6.3.3 Intrusions

Dolerite sills are present over most parts of the area. The evidence from prospecting suggests that there are two sills, an upper and lower sill but the latter being more pronounced. The upper sill was only encountered in two topographical highs in the southwest corner of the Overlooked area. The thickness of the sill can only be estimated to be in excess of 20 m. The elevation of the floor of the sill ranges between 1600 mamsl and 1630 mamsl. It is at least 60 m above the No. 4 Lower Seam and considered to have no significant effect on the quality or position of the seam. The lower sill ranges between 5 and 30 m in thickness with an average of 14.27 m. Over the Overlooked reserve area the sill is below the No. 4 Lower Seam.

The thicknesses of dykes are likely to be in the range of 1 to 5 m. Dolerite dykes have a tendency to pinch and swell, even over very short distances.

6.4 Soil

A soil, land capability and land use assessment was completed by Cabanga (2013a) and the report is included in Appendix B.

6.4.1 Soils distribution

Five distinct soil forms were identified namely, Avalon, Bainsvlei, Katspruit, Longlands and Mispah. Table 15 and Figure 2 show the soil distribution over the project site. A typical soft B plinthic catena was observed within Portion 5 and RE of Halfgewonnen and Forzando. Average soil depth ranged from 800-1200 mm for the well-drained Avalon and Bainsvlei soils to 100-300mm for the poorly developed Mispah soils.

Table 15: Soil`s distribution of the study area

Portion	Soil name	Soil depth	Soil Code	Area (ha)	Area (%)
Portion 5 of the farm Halfgewonnen 190 IS	Avalon	800-1200mm	Av2	47.5	63.08
	Katspruit	600-1200mm	Ka1	1.76	2.34
	Bainsvlei	600-1000mm	Bv1	8.5	11.29
Portion 17 of the farm Halfgewonnen 190 IS	Avalon	600- 800mm	Av1	0.71	9.39
	Mispah	100-300mm	Co1	3.83	50.66
	Longlands	100-300mm	Lo1	3.07	40.60
R/E of Halfgewonnen 190 IS	Avalon	800-1200mm	Av2	41.43	56.03
	Bainsvlei	600-1000mm	Bv1	15.80	6.33
	Katspruit	600-1200mm	Ka1	17.61	21.34

Portion	Soil name	Soil depth	Soil Code	Area (ha)	Area (%)
Part of Portion 0 of Forzando 595 IS	Avalon	800-1200mm	Av1	10.95	100

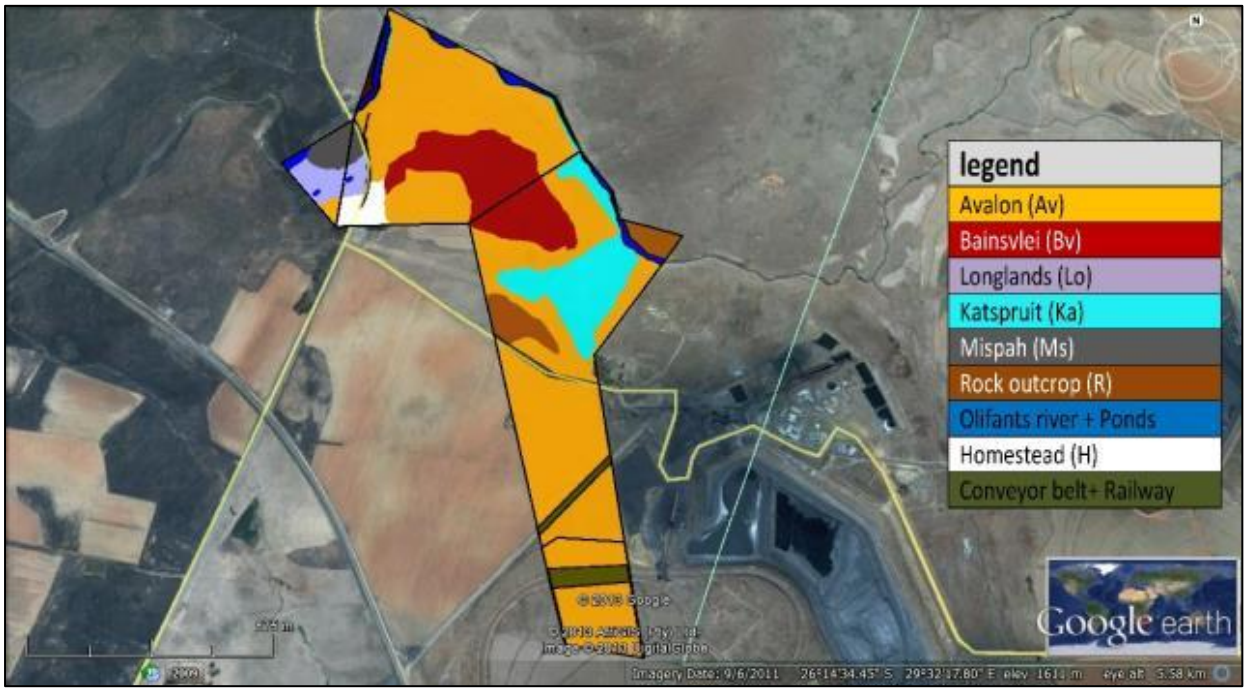


Figure 6-2: Soil distribution map

6.4.1.1 Avalon (Av)

The Avalon Forms mapped fall within the “hydromorphic” category of soils as classified. These soils are generally found associated with, and down slope of the dry, sandy loams and sandy clay loams (Clovelly Form soils), and form the transition zone of the moist grasslands.

Chemically, these soils (characteristics are similar within these same forms) are moderately well leached returning significantly lower amounts of Ca and Mg as well as Na, K and P.

The leaching of the nutrients from these soils is significant, and the pale colours are evidence of the movement of water within the profile.

By definition, these soils vary in the degrees of wetness at the base of their profile i.e. these soils are influenced by a rising and falling water table, hence the mottling within the lower portion of the profile, and the pale background colours. Depths of utilizable agricultural soil (to top of mottled horizon) vary from 400mm to 1 000mm. The deeper rooting depths (>600mm) are considered potentially utilizable soils, with those less than 500mm being considered to have a wilderness capability. In general, these soils are high in transported clay in the lower “B” horizon with highly leached topsoil’s and pale denuded horizons at shallow depths. The nutrient status is generally moderate to low.

Where present, these soils will be more difficult to work due to the wetness factor, both during the mining operation, as well as upon rehabilitation. Compaction is a problem to contend with if these soils are to be worked during the wet months of the year. Stockpiling of these soils should be done separately from the dry soils, and greater care is needed with the management of erosion problems during storage. Any strong structure that develops during the stockpiling stage will need to be dealt with prior to the use of this material for rehabilitation.

6.4.1.2 Bainsvlei (Bv)

Chemically, these soils (characteristics are similar within these same forms) are moderately well leached returning significantly lower amounts of Ca and Mg than the dryer soils, as well as depleted amounts of Na, K and P. The leaching of the nutrients from these soils is significant and the pale colours are evidence of the movement of water within the profile.By definition, these soils vary in the degrees of wetness at the base of their profile. i.e. the soils are influenced by a rising and falling water table, hence the mottling within the lower portion of the profile and the pale background colours.

Depths of utilizable agricultural soil (to top of mottled horizon) vary from 400mm to over 700mm. The deeper rooting depths (>700mm) are considered potentially utilizable soils, with those less than 500mm being considered to have a wetland or wilderness/conservation status. In general, these soils are high in transported clay in the lower “B” horizon with highly leached topsoil’s and pale denuded horizons at shallow depths. The nutrient status is variable, but due to excessive leaching is generally low.

6.4.1.3 Mispah (Ms)

The Mispah form has an Orthic A overlying hard rock. Families are differentiated on the basis of whether the A is bleached, and whether the A is calcareous or not. These soils are generally very shallow, have a variable fertility and water holding capacity depending on the rock type from which they are derived. The mispah soil form has low agricultural potential as a result of having a rooting depth of less than 250 mm

6.4.1.4 Katspruit (Ka) – Hydromorphic soil

Katspruit soil forms are found associated with wetland and vlei areas alongside the rivers and prominent pan features. Katspruit soil have moist Munsell values of 4 or less and chroma values of 1 or less. These soils have a very high organic carbon topsoil content, usually more than 4% throughout the horizon.

There is a significant textural increase (within 50 cm of the soil surface) from the E or overlying horizon to the underlying soft plinthite, G horizon or unspecified material with signs of wetness, such that sandy profile textures in the E (or overlying horizons) become at least sandy clay loam in the underlying hydromorphic horizons.

The hydromorphic nature of these soils renders them highly susceptible to compaction and erosion. Re-working of these soils for rehabilitation purposes will need to be undertaken during the dry months of the year, and will require that the structure is broken down if these soils are to be used for topdressing of areas prior to replanting.

6.4.1.5 Longlands (Lo) – Hydromorphic soil

The Longlands soil forms are all typified by an eluvial (E) horizon over a soft plinthic horizon. The E-horizon is a horizon that has been washed clean by excessive water movement through the horizon and the plinthic horizon has undergone local accumulation of colloidal matter. Leaching within the E-horizon indicates a lack of soil nutrients. The leaching and lack of soil nutrients depicts soils encountered in pans and floodplain areas.

6.4.2 Soil chemistry

Ten representative soil samples (Ov1 – Ov10) were collected, stored in perforated soil sampling plastic bags on site and hand delivered to the Agricultural Research Council for chemical soil analysis. Samples were analysed for pH, phosphorus content, macro nutrients (calcium, magnesium, and potassium), organic carbon and electrical conductivity (resistance). Table 16 contains the soil analytical data of the soil samples analysed by the ARC.

6.4.2.1 pH water

The soil pH is in the order of 4.48 – 6.1. The average pH value of 5.29 indicates fairly acid soil conditions. This pH is indicative of good farming practices and compares well with the natural pH of the soil in the uncultivated Portion 17. Managing soil pH is very important in arable farming operations because plant nutrition, and therefore yield, is influenced by soil pH. A soil pH of 6.5 is considered to be optimal in crop production.

6.4.2.2 Exchangeable Cations (Ca, Na, Mg, K)

The average sodium (Na) content of 6.5 mg/kg is very low, which is positive and indicates an absence of sodic soil conditions. The averages of base cations (K, Ca and Mg) are moderate and reflect a well built-up fertility status considering the general low natural (uncultivated) fertility status of soils on the eastern Highveld.

The lower carbon content of the cultivated soil can possibly be the result of cultivation causing aeration and loss of organic matter through oxidisation. Phosphorus (P) status was low as a result of agricultural activities on the soils. P is an important macro nutrient and can be easily improved by the addition of fertilisers. The P content of 26.5 mg kg-1 in the uncultivated soils is indicative of good P soil status. Levels between 0, 26 – 13.1 were noted to be attributed to maize production on the soils.

6.4.2.3 Cation Exchange Capacity

The Cation Exchange Capacity (CEC) ranges from 8.0 to 11 cmol (+) kg-1 for the soil within the area. The soil cation exchange capacity is an indication of the type of clay mineral present namely kaolinite. Kaolinite is a two layer clay silicate mineral and contains less negative charge than three layer clay minerals. Less charge also indicates lower fertility because fewer nutrients are retained.

The CEC of the uncultivated Katspruit soil is higher than the CEC of the cultivated soil because the uncultivated soil also contains more organic C than the cultivated soil. Organic material also contains negative charges and therefore contributes towards the CEC of soil.

Table 16: Soil laboratory results

Sample	P mg/kg	Ca mg/kg	Mg mg/kg	Na mg/kg	pH Water	R ohms	T Acid cmol(+)/kg	SA / SV %	K %	Ca %	Mg %	Na %	Total CEC cmol(+)/kg
Ov1	0.82	43	14	4.10	4.42	6670	1.15	71.3	7.81	74.2	17.5	0.47	9.56
Ov2	0.36	91	27	6.10	4.15	3900	1.42	60.9	3.55	79.1	16.6	0.79	7.99
Ov3	0.49	31	10	14.3	3.61	2790	1.98	87.0	4.12	77.3	18.2	0.41	11.1
Ov4	0.26	55	20	7.20	4.56	8910	1.02	65.8	5.68	72.4	21.4	0.47	3.96
Ov5	2.5	375	108	5.20	4.62	2340	0.95	24.4	5.71	76.4	17.7	0.24	8.02
Ov6	7.7	542	127	6.60	6.10	2730	0.00		7.81	74.2	17.5	0.47	9.56
Ov6	13.1	311	64	4.70	4.48	3180	1.09	32.4	3.55	79.	16.6	0.79	7.99
Ov7	3.1	284	45.	6.80	5.30	3030	0.25	11.7	4.12	77.3	18.2	0.41	11.1
Ov8	0.35	127	51.0	6.60	4.49	3850	1.06	46.6	5.68	72.4	21.4	0.47	3.96
Ov9	1.2	109.	30.0	6.10	4.54	5200	1.04	53.9	4.12	77.3	18.2	0.41	11.1
Ov10	26.5	513	130	3.20	5.86	2100	0.00		5.68	72.4	21.4	0.47	3.96

6.4.3 Physical analysis

6.4.3.1 Percentage (%) organic matter

The organic matter content of the soils is at best moderate to low, with values ranging from 0.6% – 1.35%. “Normal” productive soils have an organic matter content of 1 – 2%. Within the ranges of 0 – 4% soil erodibility tends to decrease appreciably as organic matter increases. The Organic matter content of a soil is important in determining the soil erodibility factor K and the N mineralisation potential (mineralisation was not assessed as it does not form part of the scope of analysis).

6.4.3.2 Soil Texture

The size limits for sand, silt and clay used in the determination of soil texture classes are: sand: 2, 0 - 0, 05 mm, silt: 0, 05 - 0,002 mm and clay: < 0,002 mm. The clay content ranges from 16 – 22 % in the cultivated soils while the uncultivated Katspruit & Longlands soils have a clay content of up to 26 %.

Sand content ranged from 45 – 66.7 % and silt 15.9 – 28.9. The texture properties of the soils analysed allow the soils to be classed as loam to sandy loam soils (Table 17). Loam and sandy loam soils are easily cultivated using normal agricultural equipment.

Table 17: Soil texture classes

Sample	Soil texture
K1	Loamy sandy
K2	Loamy sandy
K3	Loamy sandy
K4	Sandy loamy
P1	Loamy sandy
P2	Loamy sandy
P3	Loamy sandy
P4	Loamy sandy
P5	Sandy loamy
P6	Loamy sandy
P7	Loamy sandy

6.4.4 Erosion Potential

The erosion potential of the identified soil forms, as expressed by the erodibility factor ("K"), shown in Table 18, showed soils with an erodibility index ranging between low to moderate.

The Katspruit and Longlands soils showed typical high clay values as compared to the Bainsvlei and Avalon soils, resulting in low K values, about 0.05 to 0.15, due to their resistance to detach. Medium textured soils, such as the silt Avalon soils, showed moderate K values, about 0.25 to 0.4, because they are moderately susceptible to detachment and are likely to erode to some extent.

The wet and structured soils are more susceptible to compaction, and generally have a low to moderate erodibility index. These soils will need to be managed extremely well during the stripping operation, during the stockpiling stage and at the time of replacement for rehabilitation.

Table 18: Soil erodibility index

Soil Form	Erodibility Index
Avalon	Low - moderate
Bainsvlei	Low - moderate
Katspruit	Low
Longands	Low
Mispah	Moderate

The concerns around erosion and compaction are directly related to the fact that the protective vegetation cover and topsoil will be disturbed during the construction and

operation phases. Loss of soil (topsoil and subsoil) is extremely costly to any operation, and is generally only evident at closure or when rehabilitation commences and will compromise rehabilitation and long-term land capability.

6.5 Land Capability

The land capability of each soil type based on soil properties as well as agricultural potential is described in this section (Cabanga, 2013a – Appendix B). The extent of land capability classes is shown in the pre-mining capability map Figure 3.

Table 19 shows the soil types grouped into each land capability class, a broad description of the soil group, the number of units per land capability class, and the area and percentage comprised by each land capability class.

6.6 Land Use

The localities and extents of current land uses within the mining right application area are shown in Figure 4 and are summarized in Table 20 (Cabanga, 2013a – Appendix B).

Approximately 46, 01 % of the Overlooked project area is utilised for maize production with soils of moderate to high agricultural potential and 27.52% of the project area is constituted by grazing. Table 4 shows a breakdown of the remainder of land uses.

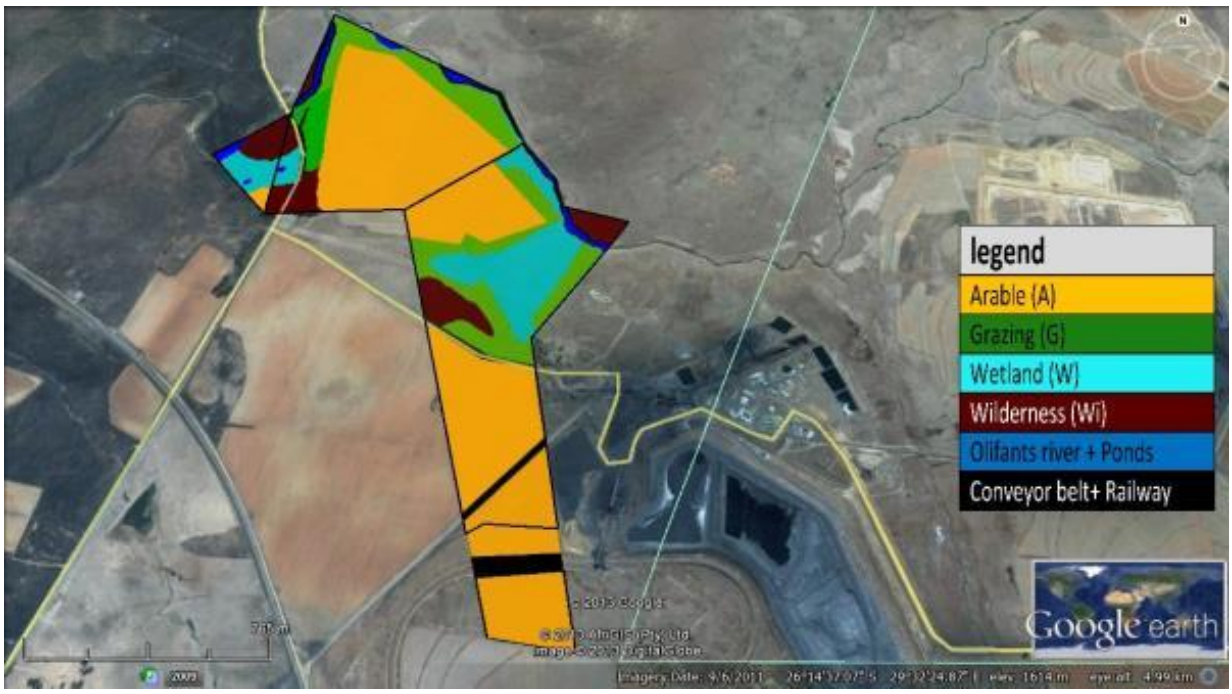


Figure 6-3: Pre-mining land capability of proposed Overlooked project area

Table 19: Pre mining land capability classes

Portion	Land Capability Code	Land Capability Class	Soil type	Broad Soil Description	Area (ha)	Area (%)
Portion 5	A	Arable	Av1 Av2	Brown to yellowish brown, sandy clay loam to clay loam Orthic A-horizons underlain by brownish yellow, clay loam, apedal B1-horizons underlain by soft plinthic B2-horizon.	22.41	30
	W	Wetland	Ka1	Moderately well-drained, yellow brown, loamy sand soils underlain by soft plinthite.	33.16	44.4
	A	Arable	Bv1	Reddish brown to red, sandy loam to sandy clay loam Orthic A-horizons underlain by red, sandy clay loam, apedal B-horizons.	18.67	25.0
	Wi	Wilderness	Ms	Valley bottom area; shallow, imperfectly to poorly drained, with hard hardpan carbonate horizon.	0.4	0.6
Portion 17	A	Arable	Av1	Brown to yellowish brown, sandy clay loam to clay loam Orthic A-horizons underlain by brownish yellow, clay loam, apedal B1-horizons underlain by soft plinthic B2-horizons.	2.47	33.05
	W	Wetland	Lo1	Grey, imperfectly to poorly drained, sandy soils mainly associated with leached E-horizons and percolating water tables in temporary, seasonal and permanent wetland zones.	3.0	40.14
	Wi	Wilderness	Ms	Valley bottom area; shallow, imperfectly to poorly drained, with hard hardpan carbonate horizon.	2.00	26.76
Remaining Extent (RE)	A	Arable	Av1 Av2	Brown to yellowish brown, sandy clay loam to clay loam Orthic A-horizons underlain by brownish yellow, clay loam, apedal B1-horizons underlain by soft plinthic B2-horizon.	41.32	57.21
	A	Arable	Bv1	Reddish brown to red, sandy loam to sandy clay loam Orthic A-horizons underlain by red, sandy clay loam, apedal B-horizons.	5.63	7.78
	W	Wetland	Ka1	Moderately well-drained, yellow brown, loamy sand soils underlain by soft plinthite.	25.27	35.01

Portion	Land Capability Code	Land Capability Class	Soil type	Broad Soil Description	Area (ha)	Area (%)
Forzando No 592-IS	G	Grazing	Av1	Brown to yellowish brown, sandy clay loam to clay loam Orthic A-horizons underlain by brownish yellow, clay loam, apedal B1-horizons underlain by soft plinthic B2-horizon	10.95	100

Table 20: overlooked project area land uses.

Land Use Code	Area (ha)	Area (%)
Maize	76.08	46.01
Conveyor belts	2.35	1.42
Grazing	59.8	27.52
Railway line	4.74	2.87
Ponds	0.18	0.11
Farmstead	3.32	2.01
Tar road	1.07	0.65
Gravel road	1.32	0.80
Rock outcrops	6.85	4.14
River bank	9.61	5.81

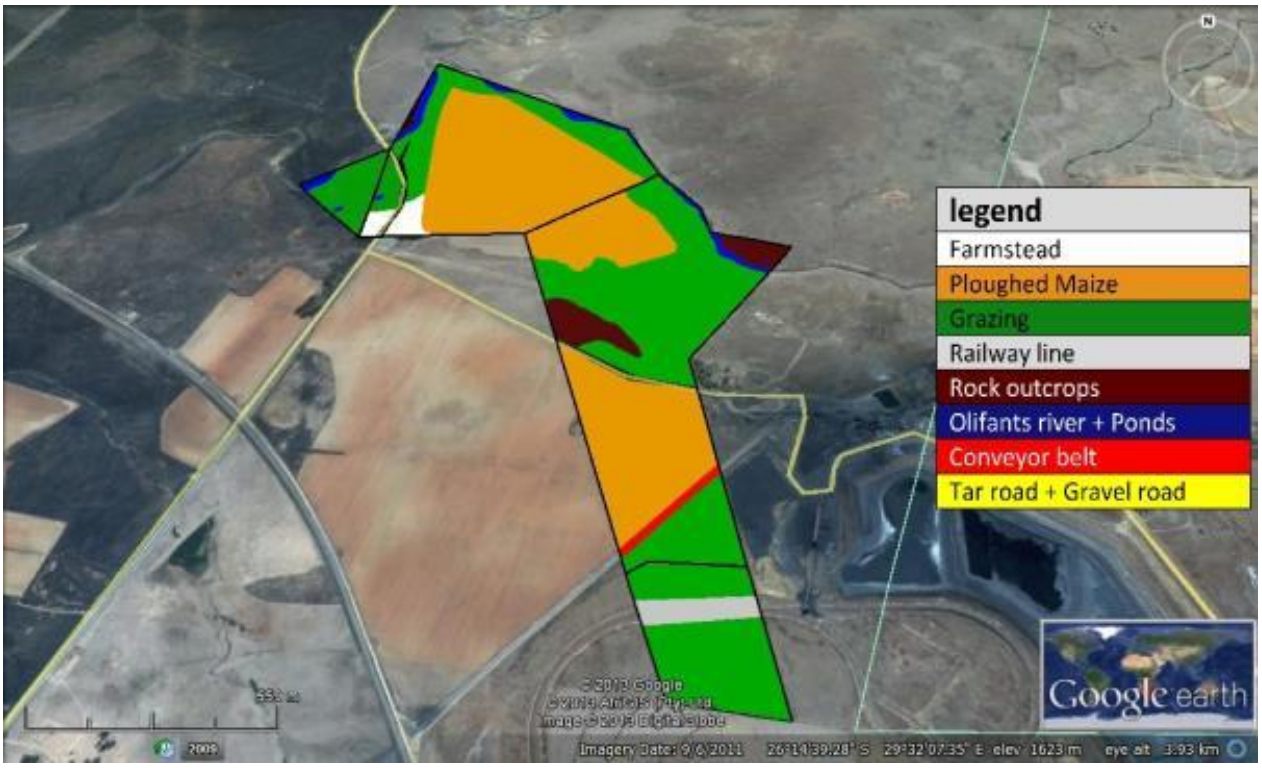


Figure 6-4: Pre-mining land use map

6.7 Surface Water

Below is a general description of the surface water features in and around the area. A detailed surface water assessment was undertaken by Letsolo (2013) to determine the specific characteristics associated with the hydrology of the area. Their detailed report has been attached as Appendix C.

6.7.1 Catchments

The stream of concern for this study is the Olifants River due to its close proximity to the study area. The Olifants River flows in a westerly direction on the northern boundary of the proposed mineral area.

The Olifants River originates approximately 33km upstream of the study area, near Bethal. The river initially flows northwards before curving in an easterly direction through the Kruger National Park and into Mozambique where it joins the Limpopo River before discharging into the Indian Ocean. There is a non-perennial stream of approximately 398m located approximately 170m form the eastern boundary of the study area, on portion 5.

The study area falls within Water Management Area 4 (WMA4), Olifants. The Olifants River is the most significant River in WMA4 and one of the main tributaries of the Limpopo River. The Olifants Catchment covers about 54 570 km^2. The upper reaches of the Olifants River Catchment are characterized mainly by mining, agricultural and conservation activities. The mean annual runoff (MAR) for the WMA4 is 2 042 million m^3/a.

The Upper Olifants Catchment covers an area of 12 250km^2 and incorporates quaternary catchments such as B11A – K, B12A – E, B20A – J, and B32A. The towns of Witbank and Middleburg are in the upper Olifants. MAR for the Upper Olifants Component is 466 million m^3/a. The study area falls within the B11A Catchment.

6.7.2 Mean Annual Runoff (MAR)

Table 21 shows mean annual runoff (MAR) for the various catchment areas and proposed operational areas at Overlooked Colliery.

Table 21: Mean Annual Runoff

Description	Area (km^2)	MAR (m^3/a)
WMA 4	54570.00	2,042,000,000
B11A	948.14	35,479,198
Overlooked Effective Catchment	442.26	16,549,422
Study Area	1.63	61,085
Opencast A	0.69	25,762
Opencast B	0.07	2,669
Underground Seam 2 Area	0.18	6,801
Underground Seam 4 Area	0.20	7,468

6.7.3 Mean Annual Precipitation (MAP) / Mean Annual Evaporation (MAE)

The Mean Annual Rainfall for the study area is 718.1 mm and the Mean Annual Evaporation (Based on S-pan data) is 1934.7mm.

6.7.4 Hydrological Characteristics Relevant to Operational Areas

The details of various hydrological calculations for the various operational areas of Overlooked Colliery are presented in Table 22. From the data obtained, the sizing of PCDs was conducted as reported in the project description.

The pre-development hydrology of the site is characterised with a high time of concentration (1.1 hours) due to vegetation cover. Cultivated areas and grassland are associated with a reduced flow velocity. The peak flow for the 1:50 and 1:100 years storm events (24 hour event) are 16.96m^3/s and 21.74m^3/s respectively.

Post mining hydrological characteristics will change, especially in opencast areas. Opencast A will have a low time of concentration (0.39 hours) due to bare surface. Bare surfaces yield more flood volume than cultivated areas and grasslands. The peak flow for the 1:50 and 1:100 years storm events (24 hour event) are 15.94m^3/s and 20.63m^3/s respectively.

The time of concentration for Opencast B is low (0.23 hours) due to bare surface. Bare surfaces yield more flood volume than Cultivated and grass lands. The peak flow for the 1:50 and 1:100 years storm events (24 hour event) are 2.148m^3/s and 2.783m^3/s respectively.

Table 22: Summary of calculations

Description	Area (km^2)	1 in 50 years Peak flow (m^3/s)	1 in 100 years Peak Flow (m^3/s)	Time of Concentration (hours)	1 in 50 years Peak Volume (m^3)	1 in 100 years Peak Volume (m^3)	Comment
Overlooked Effective Catchment	442.26	16.96	21.74	1.11	33886	43437	Flow to the Olifants River
Opencast A	0.69	15.94	20.63	0.39	11190	14482	Flow to PCD
Opencast B	0.07	2.15	2.78	0.23	889	1152	Flow to PCD
Underground Seam 2 Area	0.18	2.83	3.67	30.20	154056	199501	Flow to the Olifants River
Underground Seam 4 Area	0.20	2.57	3.33	0.68	3144	4073	Flow to the Olifants River

Surface runoff from the 2 Seam Underground will be less affected as the surface will be unaffected. The area must allow water runoff to freely flow to the Olifants River. The time of concentration is low (30.2 minutes). Cultivated and grass land are associated with a reduced

flow velocity. The peak flow for the 1:50 and 1:100 years storm events (24 hour event) are 2.834m^3/s and 3.670m^3/s respectively.

Surface runoff from Seam 4 underground must allow water runoff to freely flow to the Olifants River. The Time of concentration is low (0.68hours). Cultivated and grass land are associated with a reduced flow velocity. The peak flow for the 1:50 and 1:100 years storm events (24 hour event) are 2.569m^3/s and 3.328m^3/s respectively.

6.7.5 Floodlines

The hydrological characteristics were also utilised to determine the flood lines for the Olifants River (Figure 5). Floodlines were delineated for a total length of 3502 km starting approximately 674m upstream of the study area. The worst case scenario was modelled for the Floodline Delineation. Peak Flows of 833.23m^3/s and 1062.21m^3/s for the 1:50 and 1:100 years Storm Events, 24 hour storm event, were used.

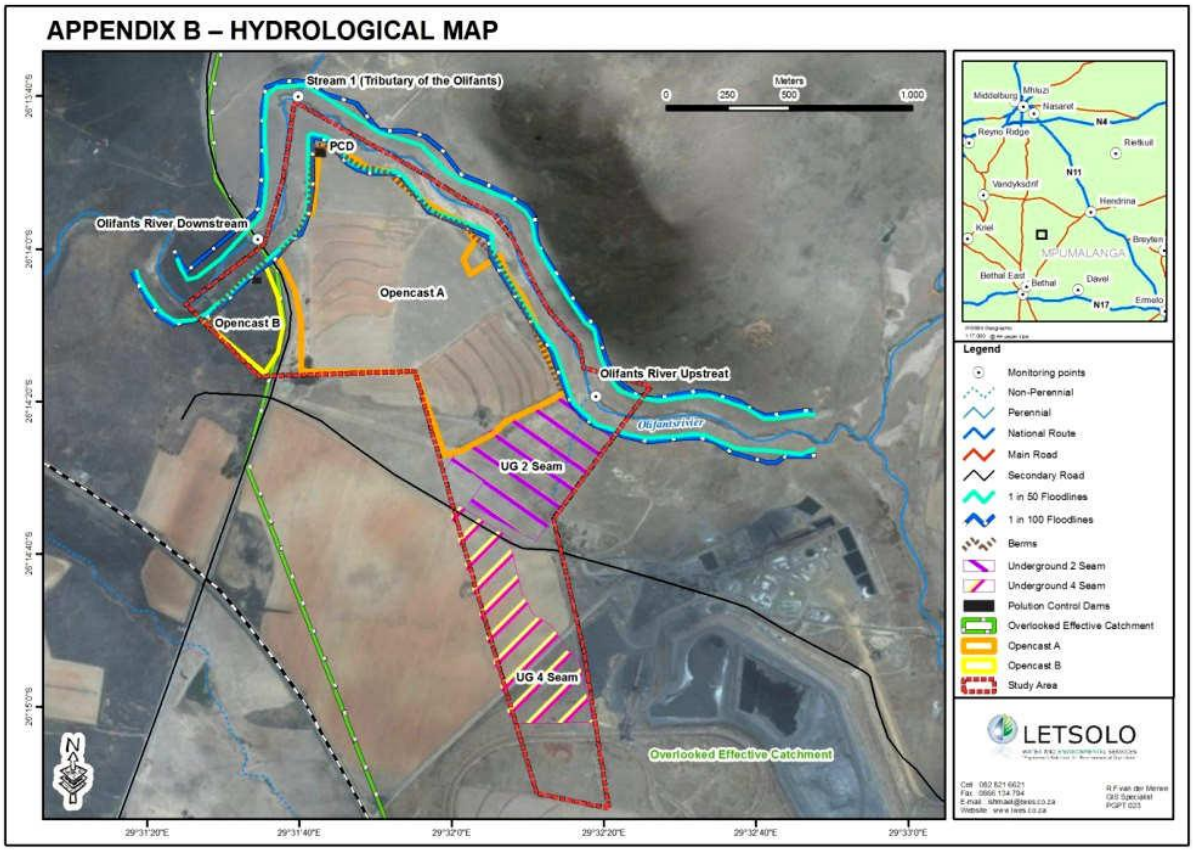


Figure 6-5: Sub-catchments and flood lines associated with the Olifants River

6.7.6 Water Quality

Water quality samples were collected at 3 locations as follows:

- Olifants River Upstream of the Study Area;
- Olifants River at Road Bridge located Downstream of Opencast B; and

- Stream 1 (tributary of the Olifants) located between the upstream and downstream points.

Based on the laboratory results (Table 23), SANS 2011 standards were exceeded only sporadically and:

- All the samples have an elevated pH and Calcium (Ca) content.
- All the samples have concentrations of Total Dissolved Solids that exceed DWA water quality limits for domestic, agricultural and livestock water uses, although with SANS 2011 standards.
- All samples have an Iron (Fe) and Manganese content higher than DWA water quality limits for domestic and agricultural water uses, although almost all samples were with SANS 2011 standards.
- Olifants Downstream (DS) and Stream1 have a high Total Hardness as CaCO3 content and a high Sulphate content.
- Olifants DS and Olifants Up-stream (US) have a high Aluminium (Al) concentration for domestic use.

Table 23: Monitoring data (highlighted values exceed SANS 2011 standards)

Parameter	SANS241 limits (2011)	Olifants Upstream			Olifants Downstream			Stream 1 Olifants Tributary		
		Historical	April	July	Historical	April	July	Historical	April	July
pH-Value at 25 ° C	>5 to <9.7	n/a	7.78	8.3	7.6	7.57	8	7.7	n/a	7.9
Conductivity at 25° C in mS/m	<170 mg/l	n/a	64	73.6	71.1	50.7	112	134	n/a	168
Total Dissolved Solids	<1200 mg/l	n/a	420	468	502	322	830	1070	n/a	1456
Total Alkalinity as $CaCO_3$		n/a	186	44	n/a	180	200	n/a	n/a	264
Total Hardness as $CaCO_3$		n/a	258	192	140	189	513	192	n/a	1000
Calcium Hardness as $CaCO_3$		n/a	123	192	n/a	83	262	n/a	n/a	539
Magnesium Hardness as $CaCO_3$		n/a	135	<5	n/a	106	251	n/a	n/a	461
Chloride as Cl	<300 mg/l	n/a	31	<0.2	19	32	21	9	n/a	9
Sulphate as SO_4	<500 mg/l	n/a	137	45	n/a	71.5	418	n/a	n/a	723
Fluoride as F	<1.5 mg/l	n/a	0.46	32	0.5	0.64	0.3	0.2	n/a	0.2
Nitrate as N*	<11 mg/l	n/a	<0.1	66	0.7	<0.1	<0.2	<0.2	n/a	<0.5
Sodium as Na	<200 mg/l	n/a	54.5	4.3	37	52.1	67	47	n/a	56
Potassium as K		n/a	7.13	0.495	7	6.93	6.2	8.1	n/a	8.2
Calcium as Ca		n/a	49.1	0.878	58	33.4	105	133	n/a	216
Magnesium as Mg		n/a	32.8	0.413	36	25.7	61	86	n/a	112
Aluminium as Al	<0.3 mg/l	n/a	0.22	0.4	n/a	0.22	0.39	n/a	n/a	0.193
Copper as Cu	<2 mg/l	n/a	n/a	30	n/a	n/a	<0.025	n/a	n/a	<0.025
Iron as Fe	<2 mg/l	n/a	0.12	163	1.16	0.18	0.355	0.393	n/a	1.13
Lead as Pb	<0.01 mg/l	n/a	<0.1	<0.025	n/a	<0.01	<0.020		n/a	<0.020
Manganese as Mn	<0.5 mg/l	n/a	0.08	0.02				0.311	n/a	0.525
Zinc as Zn	<5 mg/l	n/a	<0.1	<0.025					n/a	

6.8 Groundwater (Cabanga, 2013e)

6.8.1 Aquifer Description

Two aquifers occur in the area. These two aquifers are associated with a) the upper weathered material, and b) the underlying competent and fractured rock material.

6.8.1.1 Shallow Weathered Aquifer – Unconfined

The upper aquifer forms due to the vertical infiltration of recharging rainfall through the weathered material being retarded by the lower permeability of the underlying competent rock material. Groundwater collecting above the weathered / unweathered material contact migrates down gradient along the contact to lower lying areas. In places where the contact is near surface the groundwater can daylight on surface as seepage into the surface streams, in this case the unnamed non-perennial stream within the study area. Shallow seepage also contributes baseflow to the streams that occur in the area.

Aquifer thickness data was available from boreholes identified in the hydrocensus. The recorded data shows that the upper aquifer has an average thickness of approximately 10.8 m, and can range between 5 and 24 m in thickness

6.8.1.2 Deeper Fractured Aquifers – Confined

Although the lower permeability of the unweathered rock material will retard vertical infiltration of groundwater, a percentage of the water in the upper aquifer will recharge the lower aquifer. Direct recharge from rainfall can occur where the fractured, competent rock outcrops. In areas where the stream bases of the non-perennial rivers are located directly on top of the competent rock the aquifer can be directly recharged from the surface stream.

The competent rock is subjected to fracturing associated with tectonic movements that took place during intrusion of dolerite dykes and sills into the older Karoo aged sandstone and shale. Groundwater flows in the lower aquifer are associated with the secondary fracturing in the competent rock and as such will be along discrete pathways associated with the fractures. Faults and fractures in the sandstone and shale can be a significant source of groundwater depending on whether the fractures have been filled with secondary mineralisation. The coal seams themselves can further be sources of groundwater as these deposits are also subjected to fracturing.

Aquifer thickness data was available from seven boreholes identified in the hydrocensus. The recorded data shows that the fractured rock aquifer has an average thickness of approximately 41 m, and can range between 15 and 69 m in thickness.

6.8.2 Recharge

It is considered that effectively between 1 and 3 % of the mean annual rainfall eventually reaches the groundwater table in the form of recharge to the aquifers.

6.8.3 Aquifer Transmissivity

No aquifer tests were done that specifically targeted the weathered aquifer, however, previous experience in similar environments show that typical transmissivity values for this aquifer range between 0.5 and 2 m^2/day. The results from the aquifer testing, performed on the six newly-drilled monitoring boreholes, show transmissivities ranging between 0.12 and 2.6 m^2/day. These values are typical of the general geology.

6.8.4 Hydrocensus

The hydrocensus was conducted within a 2 km radius of the proposed mining project. During the hydrocensus the water use, water quality and the groundwater depth in the study area was recorded. A total of 50 groundwater points were visited, including boreholes, windmills and springs. The depth and water level at a number of points could not be measured due to the boreholes and windmills being either inaccessible or being utilised.

6.8.5 Groundwater use

Nine hydrocensus points where identified as being sources of water supply (boreholes, windmills, and a spring). The study area is still largely dominated by mining and agricultural activities, and the groundwater supply sources sustain these uses, namely livestock watering and domestic water supply for farmers and farm workers.

Groundwater use volumes are known for the water supply boreholes. The available information shows groundwater use volumes to range between 300 and 10 800 L/day. Based on the number of points in the area that are actively being used (9), it is calculated that around 22.6 m^3 of water is used daily for domestic and stock watering purposes.

The quaternary sub-catchment within which the hydrocensus boreholes fall (B11A) measures approximately 945 km^2. Applying an average rainfall of 718 mm/annum as obtained from the climatic data and an average recharge from rainfall of 3 %, it is calculated that the average annual recharge to the sub-catchments from rainfall is 24.4 Mm^3 per annum (an average of 67 961 m^3/day)

Newly drilled monitoring boreholes from the Overlooked Colliery and surrounding coal mines were also identified during the hydrocensus. In total 31 monitoring boreholes were identified during the hydrocensus investigation.

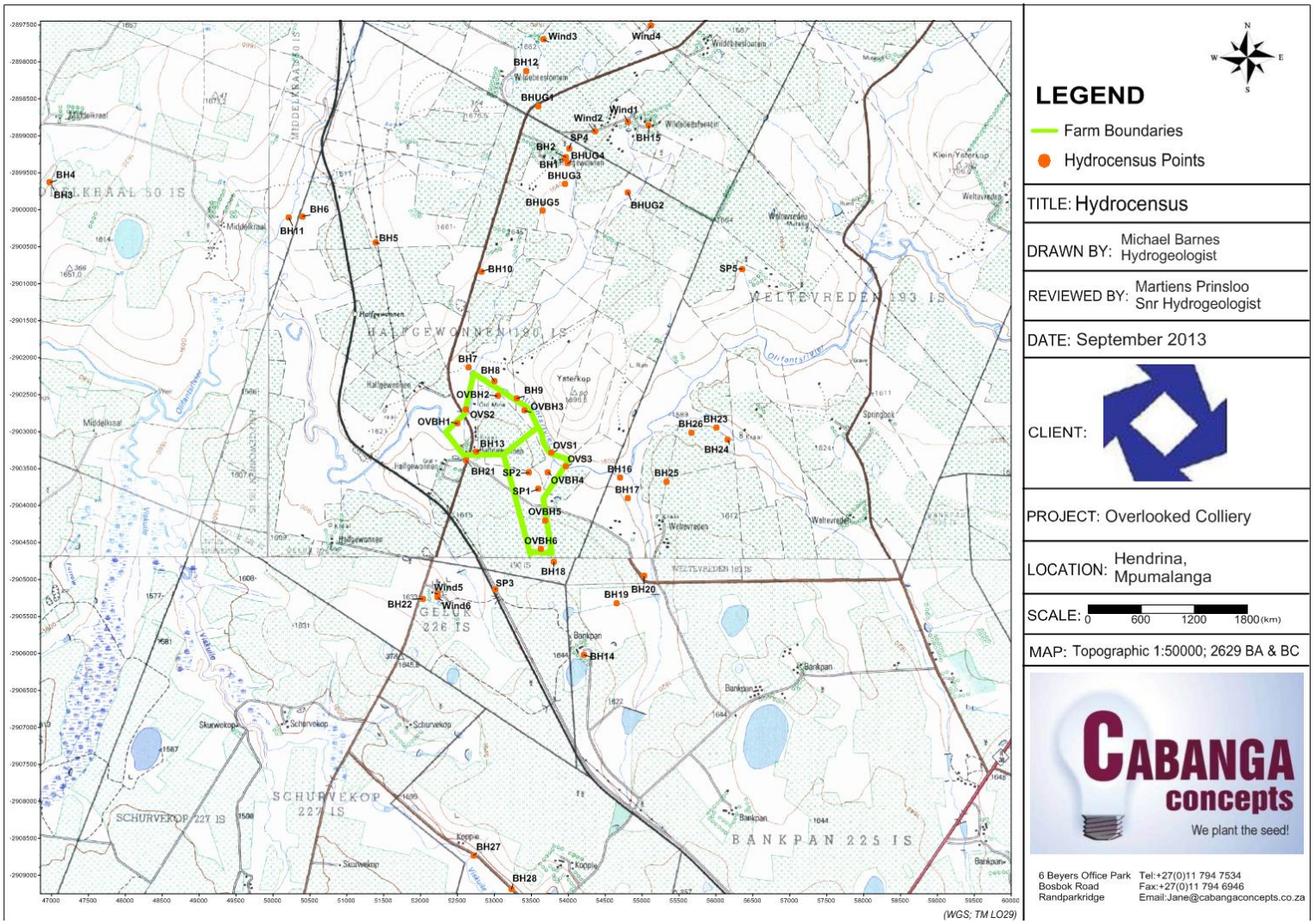


Figure 6-6: Boreholes and springs identified during the hydrocensus

Table 24: Hydrocensus data

BH ID.	Owner	Farm	X	Y	Elevation	SWL		Depth	Sampled	Type	Use	Abstraction
			(LO29, WGS84)		(mamsl)	(mbgl)	(mamsl)	(mbgl)				L/day
OVBH1	Overlooked Colliery (Pty) Ltd	Halfgewonnen 190 IS Ptn RE	52502	-2902892	1592	2.2	1589.8	24	Yes	Borehole	Monitoring	-
OVBH2	Overlooked Colliery (Pty) Ltd	Halfgewonnen 190 IS Ptn RE	53041	-2902518	1594	4.0	1590.0	36	Yes	Borehole	Monitoring	-
OVBH3	Overlooked Colliery (Pty) Ltd	Halfgewonnen 190 IS Ptn RE	53407	-2902717	1593	1.6	1591.5	36	Yes	Borehole	Monitoring	-
OVBH4	Total Coal SA (Pty) Ltd	Halfgewonnen 190 IS Ptn 5	53728	-2903547	1598	4.3	1593.7	59	Yes	Borehole	Monitoring	-
OVBH5	Total Coal SA (Pty) Ltd	Halfgewonnen 190 IS Ptn 5	53687	-2904200	1625	6.0	1619.0	129	Yes	Borehole	Monitoring	-
OVBH6	Total Coal SA (Pty) Ltd	Halfgewonnen 190 IS Ptn 5	53635	-2904592	1634	7.3	1626.8	140	Yes	Borehole	Monitoring	-
BHUG1	Anton Pelser	Dunbar 189 IS Ptn 6	53592	-2898599	1676	14.9	1661.1	84.0	No	Borehole	Monitoring	-
BHUG2	Anton Pelser	Halfgewonnen 190 IS Ptn 15	54808	-2899763	1631	17.8	1613.2	72.0	No	Borehole	Monitoring	-
BHUG3	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 7	53953	-2899656	1641	13.5	1627.5	68.0	No	Borehole	Monitoring	-
BHUG4	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 7	53992	-2899373	1651	46.5	1604.5	59.0	No	Borehole	Monitoring	-
BHUG5	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 9	53657	-2900015	1642	10.2	1631.8	69.0	No	Borehole	Monitoring	-
BH1	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 7	53961	-2899317	1 657	16.9	1640.1	36.0	No	Borehole	None	-
BH2	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 7	53967	-2899288	1 658	26.3	1631.7	32.5	No	Borehole	None	-
BH3	Umcebo Mining (Pty) Ltd	Middelkraal 50 IS Portion 2	46977	-2899633	1 605	3.5	1601.5	12.0	No	Borehole	Monitoring	-
BH4	Umcebo Mining (Pty) Ltd	Middelkraal 50 IS Portion 2	46979	-2899630	1 605	3.5	1601.5	24.4	No	Borehole	Monitoring	-
BH5	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 8	51386	-2900440	1 629	15.9	1613.1	30.9	No	Borehole	Monitoring	-
BH6	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 8	50399	-2900088	1 588	2.1	1585.9	20.0	No	Borehole	Monitoring (in rehabilitated OC area)	-
BH7	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 9	52648	-2902132	1 592	1.7	1590.3	41.0	No	Borehole	Monitoring	-
BH8	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 10	52999	-2902318	1 594	1.3	1592.7	13.3	No	Borehole	Monitoring	-
BH9	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 10	53301	-2902551	1 593	3.3	1589.7	7.2	No	Borehole	Monitoring	-
BH10	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 9	52825	-2900835	1 640	3.5	1636.5	20.5	No	Borehole	None	-
BH11	Jacobus Grobler	Middelkraal 50 IS Ptn 5	50215	-2900109	1 585	1.7	1583.3	31.4	No	Borehole	Monitoring	-
BH12	Anton Pelser	Dunbar 189 IS Ptn 7	53431	-2898120	1 667	1.2	1665.8	14.4	No	Borehole	Domestic (six people)	300
BH13	Joseph Basil Kourie	Halfgewonnen 190 IS Ptn RE	52757	-2903272	1 615	-	-	-	No	Borehole	Domestic (six people) and livestock watering (six sheep and 20 chickens)	339
BH14	Total Coal SA (Pty) Ltd	Bankpan 225 Ptn 15	54208	-2906017	1 649	-	-	-	No	Borehole	Domestic (two households) and livestock watering (5 dogs)	503
BH15	Anton Pelser	Dunbar 189 IS Ptn 3	55091	-2898864	1 663	16.0	1647.0	33.2	No	Borehole	None	
BH16	Total Coal SA (Pty) Ltd	Weltevreden 193 IS Portion 10	54703	-2903623	1 594	3.7	1590.3	-	No	Borehole	Monitoring (December 2012)	-
BH17	Total Coal SA (Pty) Ltd	Weltevreden 193 IS Portion 10	54807	-2903901	1 598	12.7	1585.3	-	No	Borehole	Monitoring (December 2012)	-
BH18	Total Coal SA (Pty) Ltd	Halfgewonnen 190 IS Portion 1	53804	-2904767	1 637	5.3	1631.7	-	No	Borehole	Monitoring (December 2012)	-
BH19	Total Coal SA (Pty) Ltd	Bankpan 225 IS Portion 15	54658	-2905321	1 626	5.0	1621.0	-	No	Borehole	Monitoring (December 2012)	-
BH20	Total Coal SA (Pty) Ltd	Weltevreden 193 IS Portion 3	55025	-2904955	1 610	7.9	1602.1	-	No	Borehole	Monitoring (December 2012)	-
BH21	Total Coal SA (Pty) Ltd	Halfgewonnen 190 IS Portion 2	52613	-2903389	1 617	7.1	1609.9	-	No	Borehole	Monitoring (December 2012)	-
BH22	Total Coal SA (Pty) Ltd	Geluk 226 IS Portion RE	52027	-2905260	1 635	7.3	1627.7	-	No	Borehole	Monitoring (December 2012)	-
BH23	Total Coal SA (Pty) Ltd	Weltevreden 193 IS Portion	56002	-2902947	1 598	2.1	1595.9	-	No	Borehole	Monitoring (December 2012)	-
BH24	Total Coal SA (Pty) Ltd	Weltevreden 193 IS Portion	56164	-2903114	1 600	2.5	1597.5	-	No	Borehole	Monitoring (December 2012)	-
BH25	Total Coal SA (Pty) Ltd	Weltevreden 193 IS Portion 10	55337	-2903675	1 610	4.0	1606.0	-	No	Borehole	Monitoring (December 2012)	-
BH26	Total Coal SA (Pty) Ltd	Weltevreden 193 IS Portion 3	55665	-2903012	1 598	1.8	1596.3	-	No	Borehole	Monitoring (December 2012)	-
BH27	Total Coal SA (Pty) Ltd	Koppie 228 IS Portion 5	52716	-2908733	1 595	1.8	1593.3	-	No	Borehole	Monitoring (December 2012)	-
BH28	Total Coal SA (Pty) Ltd	Koppie 228 IS Portion 1	53229	-2909191	1 597	2.5	1594.5	-	No	Borehole	Monitoring (December 2012)	-

BH ID.	Owner	Farm	X	Y	Elevation	SWL		Depth	Sampled	Type	Use	Abstraction
			(LO29, WGS84)		(mamsl)	(mbgl)	(mamsl)	(mbgl)				L/day
Wind 1	Anton Pelser	Dunbar 189 IS Ptn 3	54811	-2898815	1 659	5.1	1653.9	27.4	No	Windmil	Not operational	-
Wind 2	Anton Pelser	Dunbar 189 IS Ptn 1	54359	-2898945	1 668	-	-	-	Yes	Windmil	Operational	4320
Wind 3	Anton Pelser	Dunbar 189 IS Ptn 7	53666	-2897698	1 668	-	-	-	No	Windmil	Livestock watering (270 cattle)	10800
Wind 4	Anton Pelser	Dunbar 189 IS Ptn 6	55121	-2897510	1 667	-	-	-	No	Windmil	Livestock watering (two troughs)	1500
Wind 5	Total Coal SA (Pty) Ltd	Geluk 226 Ptn RE	52231	-2905194	1 631	-	-	-	No	Windmil	Livestock watering (50 cattle)	2000
Wind 6	Total Coal SA (Pty) Ltd	Geluk 226 Ptn RE	52234	-2905244	1 623	-	-	-	No	Windmil	Livestock watering (50 cattle)	2000
SP 1	Total Coal SA (Pty) Ltd	Halfgewonnen 190 IS Ptn 5	53596	-2903778	1 609	0.0	1609.0	-	Yes	Spring	None	-
SP 2	Total Coal SA (Pty) Ltd	Halfgewonnen 190 IS Ptn 5	53469	-2903555	1 606	0.0	1 606	-	Yes	Spring	None	-
SP 3	Total Coal SA (Pty) Ltd	Geluk 226 Ptn RE	53008	-2905135	1 628	0.0	1628.0	-	No	Spring	None	-
SP 4	Sudor Coal (Pty) Ltd	Halfgewonnen 190 IS Ptn 7	54009	-2899176	1 658	0.0	1658.0	-	Yes	Spring	Domestic (16 people)	800
SP 5	Anton Pelser	Weltevreden 193 IS Portion RE	56361	-2900800	1 647	0.0	1647.0	-	No	Spring	None	-

6.8.6 Groundwater Levels

The depth to groundwater level in the study area was measured during the hydrocensus. A total of 50 groundwater points were visited, including boreholes, windmills and springs.

The depth and water level at a number of points could not be measured due to the boreholes and windmills being either inaccessible or being utilised.

The depth to groundwater level in general ranges between surface and around 17.8 m below surface. Plotting the groundwater level elevation against topographical elevation for the upper weathered material aquifer yielded a 99.3 % correlation, while a similar plot for the fractured rock aquifer yield a 99.0 % correlation (Figure 6-7). From this it is concluded that the groundwater levels for both aquifers generally mimic topography.

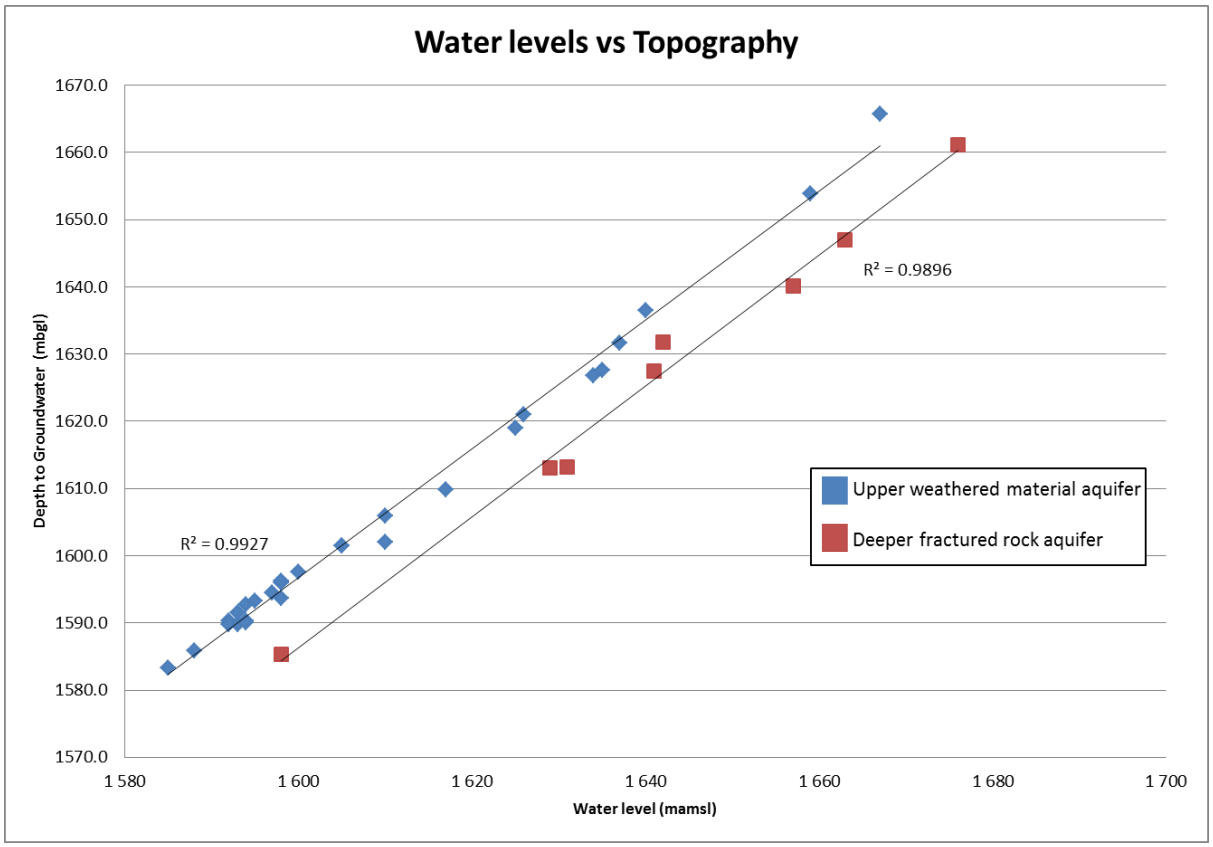


Figure 6-7: Groundwater and topography correlation graph

Based on the slight hydraulic disconnect between the upper weathered and underlying fractured rock aquifers it can be said that the depth to groundwater level in the upper weathered material aquifer ranges between 1.2 and 7.9 mbgl with an average of 3.2 mbgl. The underlying fractured rock aquifer shows depth to groundwater level measurements ranging between 10.2 and 17.8 mbgl, with an average of 14.7 mbgl.

The groundwater flow through the upper weathered and fractured rock aquifers underlying the proposed mining area is from south to north across the site towards the Olifants River as seen in Figure 6-8. Calculations show that the groundwater gradient in the vicinity of the proposed mining area ranges around 1:30 to 1:50 for both the weathered material and the fractured rock aquifers.

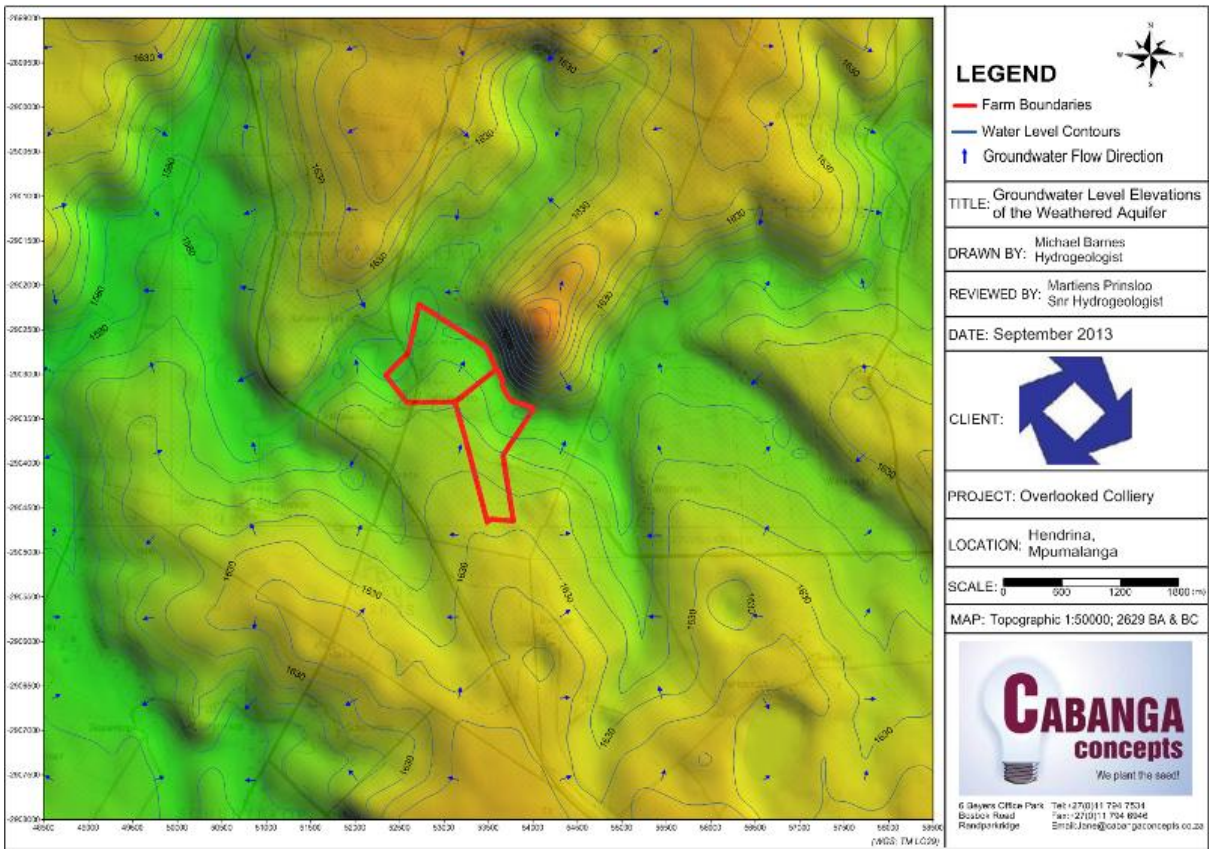


Figure 6-8: Groundwater static levels and flow direction (weathered aquifer)

6.8.7 Aquifer Classification

The general regional aquifer is classified using the Parsons Classification System as a **minor** aquifer, but of **high importance** to the local landowners as it is their only source of water.

6.8.8 Groundwater Quality

Eleven water samples were collected during the hydrocensus investigation including boreholes, a spring, and a windmill. The water quality results are shown Table 25. The results were compared to the SANS 241, 2011: Class 1 Drinking Water (Human) Standards. All elements that exceed the guidelines are highlighted in red.

The majority of the groundwater samples comply with the SANS 241 water quality standards; only fluoride and nitrate exceeded the SANS 241.

The elevated fluoride concentration in the groundwater samples is as a result of the natural water-rock interactions. The fluoride concentration in OVBH5 was 2.43mg/l compared to the

standard of 1.5mg/l. The threshold for marked dental mottling with associated tooth damage due to softening of enamel is 1.5 mg/l. According to the Department of Water Affairs South African Water Quality Guidelines for Domestic Use if this water is consumed mottling and tooth damage will probably be noticeable in most continuous users of the water. No other health effects occur.

Nitrate concentrations in Wind 2 and SP4 are 27 and 35mg/l respectively. According to the Department of Water Affairs South African Water Quality Guidelines for Domestic Use, if this water is consumed it may result in Methaemoglobinaemia (more commonly known as blue baby syndrome) occurring in infants and irritation of the mucous membrane in adults. The elevated nitrate concentrations in these groundwater samples are most likely as a result of the surrounding fields being fertilised and / or as a result of the oxidation of vegetable and animal debris and of animal excrement from the livestock that are kept in close proximity to the groundwater sites.

The Piper diagram in Figure 6-9 shows that the groundwater samples represent four different water types.

OVBH4 and 5 have sodium-bicarbonate water type. The relatively high fluoride in groundwater is mainly associated with a sodium-bicarbonate water type and relatively low calcium and magnesium concentrations. Such water types usually have high pH values, as is the case for water OVBH4 and 5. Fluoride in groundwater derives mainly from dissolution of natural minerals in the rocks and soils with which water interacts. The most common fluorine-bearing minerals are fluorite, apatite and micas.

Spring 4 has a sodium-chloride water type. This can be as a result of natural and/or anthropogenic factors. When analysing the water quality of this sample it is more likely that the source of sodium is as a result of natural factors such as the build-up of salts in the soil/water as a result of chemical weathering of minerals and evaporation.

Spring 3 has a mixed water type and as a result there is no cation/anion exceeding 50%. This water type is representative of water that undergoes varying degrees of mixing and ion exchange.

The remaining groundwater samples have calcium-bicarbonate water. These waters are representative of young (recently recharged) groundwater relative to most other types. Calcium/magnesium-bicarbonate water typically represents water that is unpolluted.

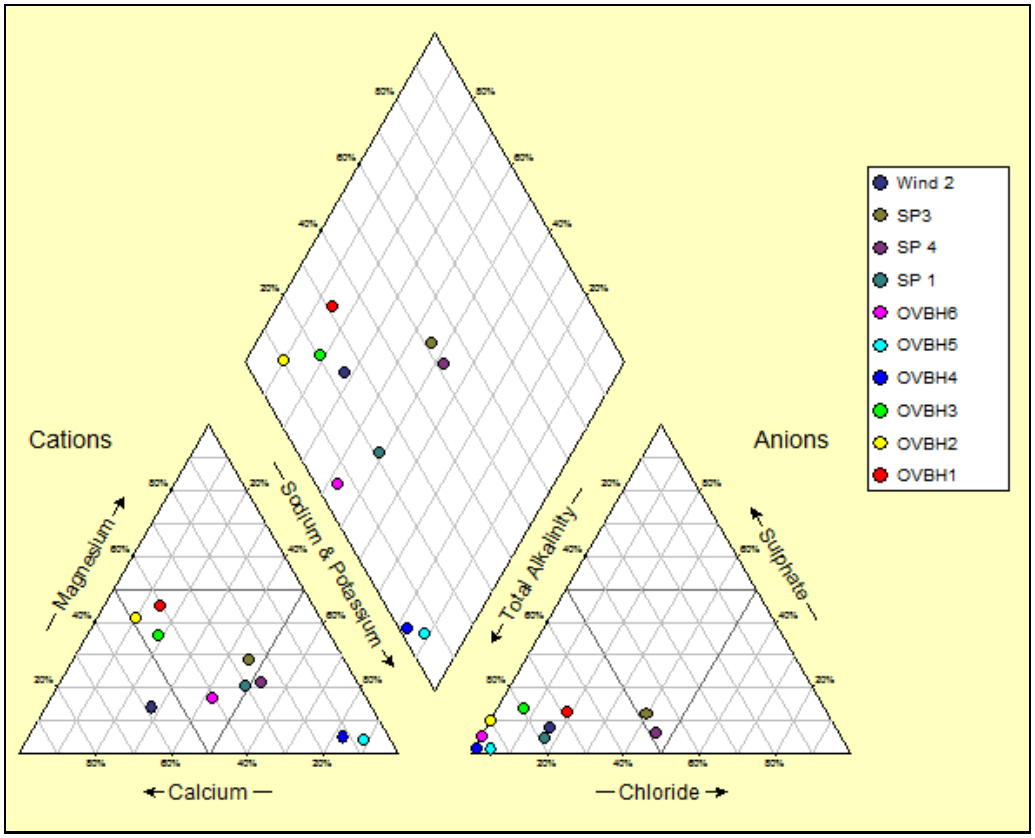


Figure 6-9: Groundwater Piper diagram

Three surface water samples were taken in the study area. These samples were taken along the Olifants River. All the surface water samples were compliant with regards to the SANS 241 water quality standards. Water samples from the tributary show that the tributary has a calcium-bicarbonate water type. Water falling in the calcium-bicarbonate water type represents water that is generally unpolluted.

When comparing the sulphate concentrations, the surface water samples have a higher concentration compared to the groundwater samples.

Table 25: Hydrochemical results in comparison to SANS: 241 Drinking water standards

Parameter	Units	SANS 241 (2011) Drinking Water	OVBH1	OVBH2	OVBH3	OVBH4	OVBH5	OVBH6	Wind 2	SP 1	SP 3	SP 4	OVS 1	OVS 2	OVS 3
Conductivity	mS/m	<170	52.7	33.7	30.6	36.9	52.1	27.1	32.5	17.8	23.0	31.4	50.7	64	52.1
pH		>5 - <9.7	7.62	7.83	7.7	8.25	8.09	8.07	7.08	6.97	6.98	6.7	7.57	7.78	7.65
Total Hardness	mg/L	NS	232	170	127	36	33	85	110	120	66	28	189.2	257.6	191
Calcium	mg/L	NS	43.9	36.7	28.3	10.2	8.35	24	35.8	12.9	12.3	5.91	33.4	49.1	33.9
Magnesium	mg/L	NS	29.7	18.9	13.5	2.5	3.01	6.04	5.19	5.28	8.53	3.07	25.7	32.8	25.8
Sodium	mg/L	<200	17	7.59	11.7	79.7	119	26.3	14.4	20.8	22.0	11.3	52.1	54.5	53.1
Iron	mg/L	<2	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.01	1.84	1.06	<0.01	0.18	0.12	0.1
Manganese	mg/L	<0.5	0.414	0.026	0.23	<0.001	<0.001	<0.001	0.08	0.05	0.07	0.02	0.06	0.08	0.04
Aluminium	mg/L	<0.3	<0.003	<0.003	0.057	<0.003	<0.003	<0.003	0.08	0.13	0.30	0.06	0.22	0.22	0.21
Potassium	mg/L	NS	2.47	1.9	2.4	2.16	3.24	4.7	9.39	5.89	7.00	4.8	6.93	7.13	6.86
MALK	mg/L	NS	199	175	120	207	265	142	81	84	57	14	180	186	177
Sulphate	mg/L	<500	35.1	18.7	20	2.72	3.09	7.57	8.17	4.7	13.8	1.8	71.5	137	68.1
Chlorides	mg/L	<300	39.5	<0.423	7.48	0.999	9.21	<0.423	12.7	13	34	9.45	32	31	32
Fluoride	mg/L	<1.5	0.287	0.172	0.355	1.09	2.43	0.342	0.29	0.25	0.30	<0.20	0.64	0.46	0.48
Nitrate	mg/L	<11	0.468	0.477	4.88	0.328	2.67	0.59	27.9	<0.1	<0.1	35.1	<0.1	<0.1	<0.1
Zinc	mg/L	<5	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	1.29	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

6.8.9 ABA and Leach Testing

Ten rock samples (Sample 1 to 10) where taken during the drilling of the monitoring boreholes. Samples 1-4 are samples from the 4 seam roof and floor. Samples 5 and 6 are samples from the 2 seam roof and floor. Samples 7 and 9 (floor) consist of sandstone extracted during drilling whilst samples 8 and 10 are samples of shale. This represents the typical lithologies encountered in the area. The ABA and Leach Testing can be seen in Appendix D.

The results from the ABA testing were used to determine the potential for acid mine drainage conditions to form. The leach results were used to determine which elements are expected to be present in elevated concentrations in the post-mining environment and what those element concentrations will be.

ABA involves a combined measurement of sulphur contents (total sulphur, sulphuric acid sulphur, and organic sulphur), neutralisation capacity (NP), paste pH and the calculation of acid potential (AP), net neutralisation potential (NNP) and NP/AP ratio (NPR). The assessment obtained by ABA techniques needs to be refined and calibrated with detailed mineralogical characterisation, site-specific observation and kinetic testing. This assessment should be complimented by geochemical modelling in order to increase the reliability of the acid rock drainage prediction study.

It is concluded that it is likely that AMD conditions will form from the coal material and surrounding overburden that will be handled in the area. The high Sulphide – S percentage indicate that the acid conditions will be sustained in the long term.

Leach testing performed on the rock samples described above provides an indication of the expected quality of seepage from the mined-out area in the long term

The results show that in general element concentrations are expected to comply with the SANS 241 standards for domestic use in the post mining environment. This is in contrast to the acid conditions indicated from the ABA testing which would indicate that metal concentrations will be elevated.

6.8.10 Contaminant Transport

The development of the contaminant plume away from the mining area was simulated using the 3-D numerical contaminant transport model. Contaminant transport modelling was performed using the MT3D package. ABA and static leach testing, combined with groundwater chemical analysis results from other groundwater studies in the Witbank/Highveld coal fields are used to determine source concentrations at the potential pollution sources.

For the purpose of this study and within the wider context of sulphate contamination being the main indictor of mining contamination at coal mines a source concentration of 950 mg/l was used.

6.8.10.1 Model Boundaries

The numerical flow model was constructed based on the conceptual groundwater flow model discussed above. The numerical model was constructed using PMWIN 5, which is a MODFLOW based software package.

The numerical model boundaries were selected around natural groundwater flow barriers such as topographical highs and streams that act as groundwater flow divides and barriers. The model areas and boundaries can be seen in Figure 6-10. The model boundaries consisted of:

- The Viskuile River to the west and south-west;
- The Bankspruit River, Unnamed River and topographical highs to the east; and
- Topographical highs to the north and south-east.

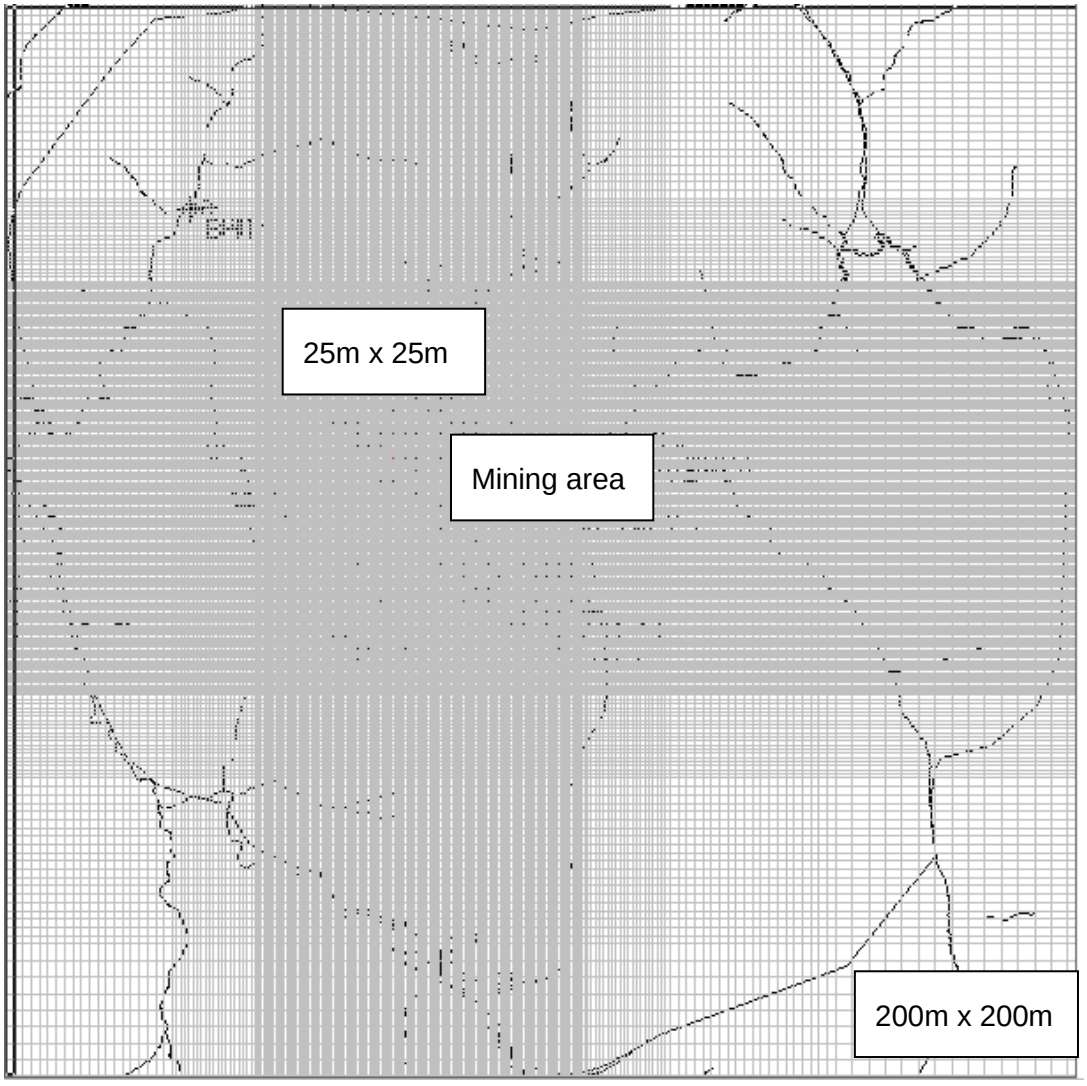


Figure 6-10: Groundwater model boundaries

The model grid was designed around the delineated model boundary and the proposed mine developments. The highest detail points overlay the mine development area; with a coarser

grid on the far reaches of the model (please refer Figure 6-10). At the finest the model grid is 25 m x 25 m, while the coarsest grid size is 200 m x 200 m.

A total of five layers were assigned to the model. Each layer depicted a different aquifer:

- Layer 1: The upper weathered material aquifer;
- Layer 2: The fractured rock aquifer down to the roof elevation of the 4 seam;
- Layer 3: The aquifer associated with the 4 coal seam;
- Layer 4: The fractured rock aquifer associated with the parting; and
- Layer 5: The aquifer associated with the 2 coal seam.

Additional information on the groundwater environment can be attained from (Cabanga, 2013e – Appendix D).

6.9 Air Quality

The dust sampling has been on-going since the prospecting phase. The results are summarised in Table 26 below. Results exceeding the 600 mg/m^2/day have been highlighted. The baseline data indicates dust levels that have exceeded limits on several occasions in the Overlooked area. It can be stated that the baseline conditions are elevated, and dust levels seem to be from existing mines as well as agriculture when considering the location of the sampling points (Figure 11).

6.10 Noise

Only one point has been identified as potential sensitive receptor, a farm house indicated in Figure 12 (Cabanga, 2013b – Appendix E). A brief listing of activities which currently generate noise on and around the proposed site, and those that have the potential to generate noise include:

- Vehicle traffic along road network;
- Mine machinery;
- Blasting and excavation associated with mining in the area,
- Agricultural activities;
- Domestic activities;
- Meteorological conditions (wind, rain etc.); and
- Animal noises (birds, mammals, insects, reptiles etc.).

The general ambience of the surrounding areas is that of natural open space dominated by agriculture with neighbouring mines. In general conditions were good for noise recordings. The results of the noise survey conducted at locations indicated in Figure 11 are presented in Table 27. Noise levels were within acceptable limits when compared to non-residential districts. Levels exceeded rural limits on occasion (highlighted cells in Table 27).

Recorded levels exceeded rural limits of 45dBA by a range of 0.6-12.8dBA falling within the “Little” to “Strong” response categories. The area has existing mines and existing farmsteads and traffic on roads that contribute to elevated noise measurements obtained. In general the baseline noise levels cannot be considered extensive and “Strong” response from community is not expected due to the low density receptors in the area.

Table 26: Dust sampling results to date

Sample point	Co-ordinates	Jun 12	Jul 12	Aug 12	Sep 12	Oct 12	Nov 12	Dec 12	Jan 13	Feb 13	Mar 13	May 13	Jun 13	Jul 13
OC – 1	29°31'44.47"E 26°14'17.40"S	342.04	374.19	1495.64	3097.46	0.00	1467.48	301.26	175.58	176.50	227.27	1135.43	834.67	276.44
OC – 2	29°32'11.41"E 26°14'38.47"S	842.82	2576.01	239.29	423.60	331.41	261.17	829.69	557.10	1005.84	692.38	587.48	1034.42	1027.97
OC – 3	29°31'41.60"E 26°13'46.66"S	381.97	381.99	270.06	489.23	477.22	600.35	549.39	816.29	272.85	268.75	288.87	424.91	587.12

Table 27: Noise readings (dBA) to date (limit is 45 dBA for the area)

Sample point	Location	Sep 12	Oct 12	Nov 12	Dec 12	Jan 13	Feb 13	Mar 13	Apr 13	May 13	Jun 13	Jul 13
OC – 1	29°31'44.47"E 26°14'17.40"S	44.8	40.7	47.9	44.9	43.4	39.1	47.6	45.5	46.0	46.2	46.6
OC – 2	29°32'11.41"E 26°14'38.47"S	35.0	28.0	48.3	50.4	47.6	51.3	55.4	50.7	50.9	57.8	49.8
OC – 3	29°31'41.60"E 26°13'46.66"S	37.5	31.4	51.5	48.7	44.0	45.6	45.9	49.5	44.9	43.4	44.4

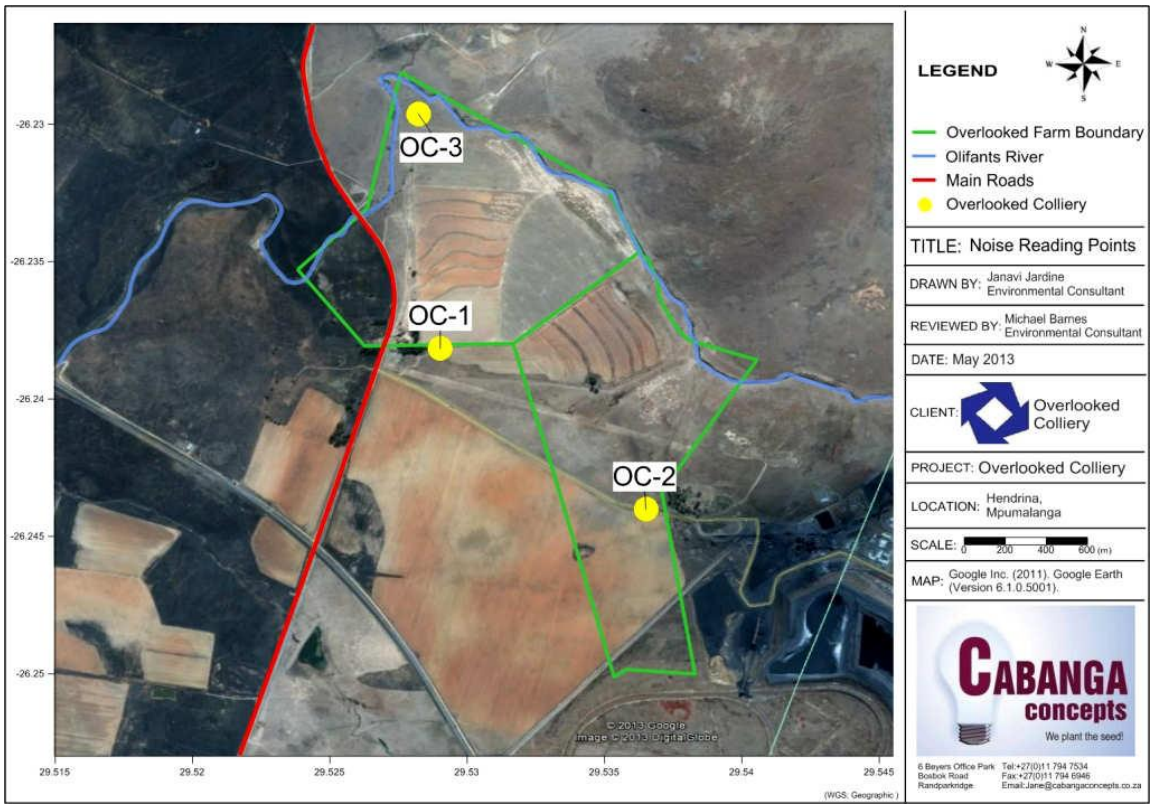


Figure 6-11: Air quality and noise monitoring sites

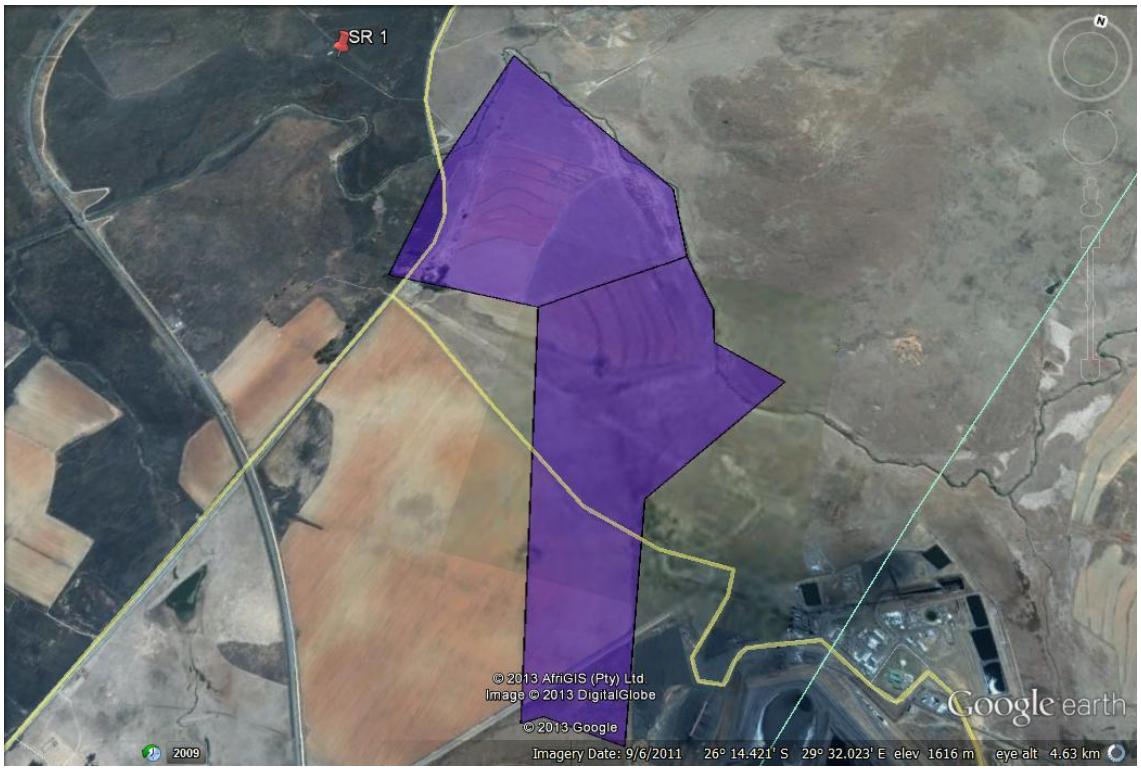


Figure 6-12: Potential sensitive receptor around the proposed Overlooked Colliery

6.11 Flora

The floral survey was completed by Dimela (2013) and there report is attached in Appendix F.

The site is situated within the Eastern Highveld Grassland vegetation type, which is classified as Endangered due to agricultural and mining pressure within these grasslands. As per the National Vegetation Map, the vegetation type that is expected to occur on the study site is classified as Eastern Highveld Grassland (Mucina & Rutherford, 2006). The remaining portions of the Eastern Highveld Grassland are of high conservation value and sensitivity and are thus classified as an endangered vegetation type (Mucina & Rutherford, 2006). The study site was assessed for the presence of intact (undisturbed or untransformed) Eastern Highveld Grassland, as remaining portions should be conserved in order to preserve this vegetation type and protect it from extinction.

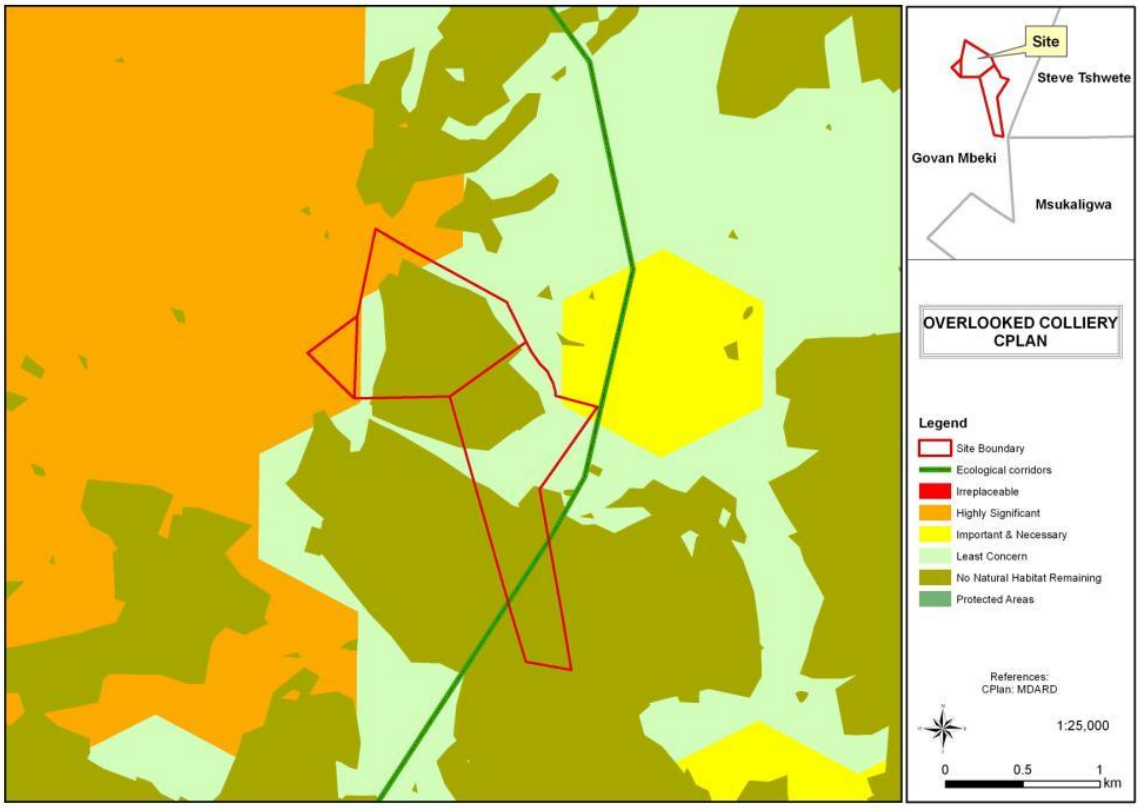


Figure 6-13: Site in relation to the MBCP (Dimela, 2013)

The Mpumalanga Biodiversity Conservation Plan has indicated that the area is largely composed of habitat types of 'least concern' or areas with 'no natural habitat remaining'. The far north western areas are however within highly significant habitat types and the far eastern extent adjacent to the Olifants River is identified as 'important and necessary' habitat type (Figure 13), associated with Ysterkop, a koppie north of the mineral boundary. The flora survey indicated that moist grassland and degraded grasslands were associated with these

areas, indicating that there are potentially wetlands associated with these sites (moist grasslands) and that the terrestrial areas are already impacted (degraded grasslands).

The site comprised mainly of transformed land (planted pasture and cultivated land) and degraded grasslands, and some moist grasslands along the river (Figure 14).

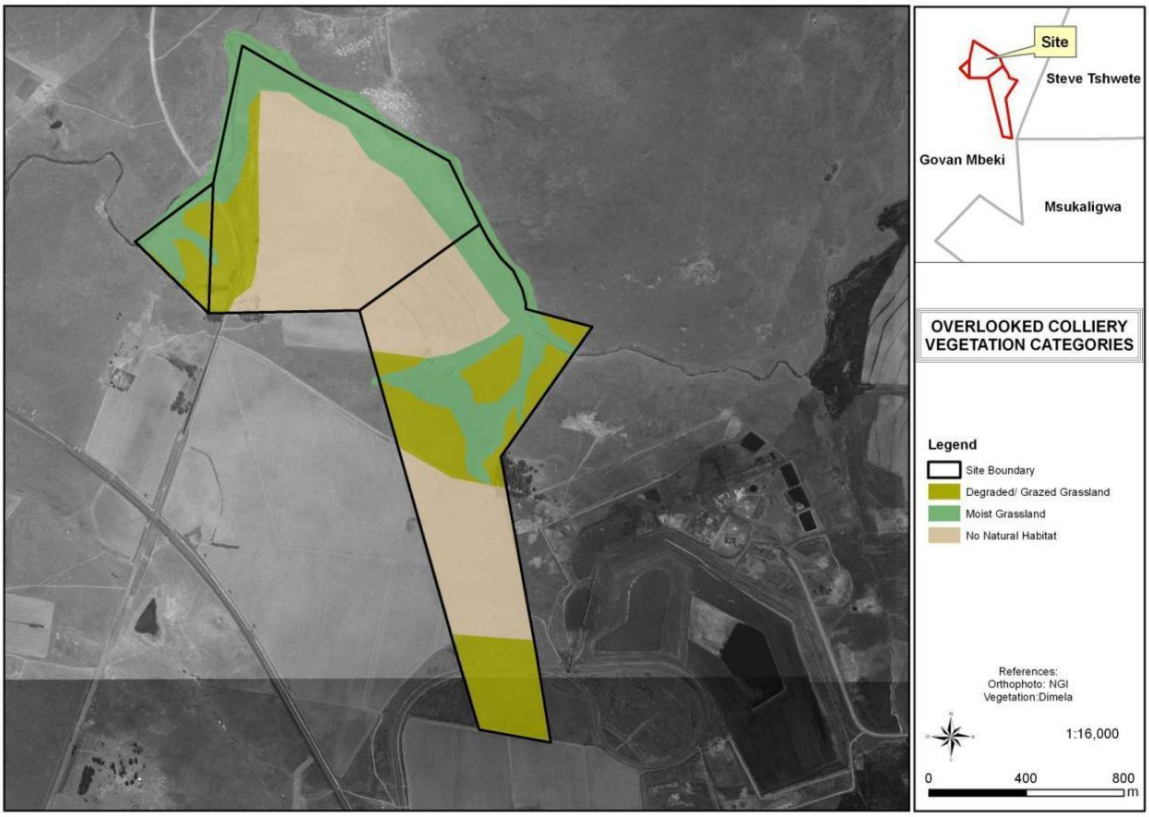


Figure 6-14: Vegetation units identified on site

6.11.1 Transformed land

The transformed grasslands included maize fields on the southern portion of the site, as well as planted pasture and farm buildings on the northern portion of the site. The planted pasture was thought to comprise *Eragrostis curvula* (Weeping Love Grass). At the time of the field survey, the grass was baled. The transformed land was characterised by vegetation that no longer comprise the natural species diversity and included monocultures and or alien invasive plant species.

6.11.2 Degraded grassland

This grassland was characterised by a diversity of Increaser II and III grasses (grass species that increase in over utilised/overgrazed veld) and a high number of the shrub *Seripheum plumosum* (Bankrupt Bush), which is known to increase in overgrazed grassland. Although these areas were not ploughed in the recent past, continuous grazing pressure reduced palatable grasses and subsequently changed the species composition from what is expected

in natural Eastern Highveld Grassland (Mucina & Rutherford, 2006). Eastern Highveld Grassland is species rich grassland with a variety of grass species. Although the degraded grassland included a number of species, these were mostly associated with overgrazing and comprised of a patchy occurrence of *Eragrostis gummiflua* (Gum Grass), *Hyparrhenia hirta* (Common Thatching Grass), *Cynodon dactylon* (Couch Grass), *Eragrostis curvula* (Weeping Love Grass), *Sporobulus pyramidalis* (Catstail Dropseed) and *Aristida congesta* (Tassel Three-awn). The forb layer was limited in species diversity, although this could be attributed to the assessment being undertaken during late summer. Forbs observed included *Kohoutia caespitosa*, *Cleome rubella* (Pretty Lady), *Hermannia depressa* (Creeping Hermannia), *Comelina africana* and *Selago densiflora*.

At the time of this survey,13 grass species, 21 forbs and 8 invasive plant species were noted and no plant species that are known to be of conservation concern was observed within the degraded grasslands.

6.11.3 Moist grassland

The Olifants River forms the northern boundary of the site. The riverbanks were found to be eroded while some intact portions and adjacent land included species adapted to grow in temporary waterlogged conditions. It is thought that the river's edge comprised wetland areas, but that grazing pressure resulted in a low basal cover that eventually contributed to the erosion noted along the Olifants River. The species composition was dominated by grasses such as *Sporobulus pyramidalis*, *Cynodon dactylon*, *Paspalum dilatatum* (Dallis Grass) and *Aristida aequiglumis* (Three-awn). The forb layer included *Pelargonium luridum*, *Centella asiatica* (Marsh Pennywort), *Berkheya* species and *Haplocapra scaposa* (Tonteldoosbossie) as well as the small tree *Erythrina zeheri* (Ploegbreker) and the invasive *Salix babylonica* (Willow tree) and Cotoneaster species.

In addition, drainage lines flowed from the south and south-west of the site towards the Olifants River. These areas are likely wetland areas of which the outer boundaries should be confirmed by a wetland specialist. The moist grasslands were dominated by grasses such as *Eragrostis gummiflua*, *E*. *plana*, *E curvula*, *Agrostis lachnantha* (Bent Grass) *Setaria* species (Bristle Grass), *Paspalum dilatatum* (Dallis Grass) and patches of *Imperata cylindrica* (Cotton Wool Grass) that grew in waterlogged conditions. Sedges were common and included *Cyperus denudatus*, *C*. *congestus* and *C longus*. Forb species within the moist grasslands included *Haplocapra lyrata*, *Berkheya* species, *Monopsis decipiens* (Butterfly Lobelia), *Nidorella anomala*, *Centella asiatica* (Marsh Pennyworth) and *Nerine angustifolia*.

At the time of this survey 17 grass species, 4 sedges, 24 forbs and 9 alien invasive plant species were noted. The moist grassland adjacent to the Olifants River as well as within the northern portion of the drainage line included large populations of a *Crinum* species. Although not in flower at the time of the field survey and mostly grazed by cattle, it is believed that the plant is the Declining *Crinum bulbispermum*.

6.11.4 Plants of Conservation Importance

Eleven plant species of conservation concern could likely occur on the site. Of these, suitable habitat for about four species is present on the site. However, only the Declining

Crinum bulbispermum was identified within the moist grasslands associated with the Olifants River.

6.11.5 Medicinal Plant Species

A minimum of 14 plants known to be used medicinally were recorded on the study site, of which *Crinum bulbispermum* (Orange River Lily) is already 'Declining' due to over utilisation.

6.11.6 Alien Invasive Plant Species

The alien plant species identified are mostly naturalised weeds. However, species such as the *Cotoneaster* species (proposed Category 1b) should be removed from the river's edge to prevent spreading along the watercourse. Aliens identified on site include: *Bidens formosa*, *Bidens pilosa*, *Cotoneaster* species, *Cirsium vulgare*, *Conyza albida*, *Eucalyptus* species, *Plantago major*, *Robinia pseudoacacia*, *Salix babylonica*, *Sonchus* species, *Tagetes minuta*, *Tragopogon dubius* and *Verbena brasiliensis*

6.11.7 Vegetation Sensitivity

Vegetation with low sensitivity is generally degraded and disturbed vegetation with little ecological function and is usually species poor (most species are usually exotic or monocultures e.g. maize). This vegetation has little or no conservation potential.

Vegetation of medium sensitivity comprised slightly modified systems which occur along gradients of disturbances of low to medium intensity with some degree of connectivity with other ecological systems.

Vegetation of high sensitivity (Figure 15) comprised communities with low inherent resistance or resilience towards disturbance factors and vegetation considered important for the maintenance of ecosystem integrity. Moist grassland vegetation, as well as the vegetation along the riparian zone of the Olifants River, plays many essential roles in the functioning of the hydrology of an area:

- Flow regulation: vegetation slows the flow of water, both by physically blocking the passage of water, and by absorbing the water into its root systems. This moderates the impacts of flooding on downstream and surrounding areas.
- Water quality regulation: the vegetation acts as a buffer or filter between nutrients, sediments, contaminants, and bacteria from the surrounding land and air, and the river channel itself. The vegetation therefore prevents soil, pesticides, fertilizers and oil from entering the river and impacting on in-stream communities.
- Habitat provision: wetlands and riparian areas provide important habitat for many plants and animals, because these are areas of transition between the land and the river. These relatively steep environmental gradients (moisture, temperature, topography, and soil) generally support higher levels of biodiversity than more homogeneous areas.
- Corridor functions: because it follows the river or drainage line, the moist grassland and riparian vegetation serves as a corridor, connecting two or more habitats that may otherwise be isolated by land transformation of areas in between. Many species of animals use corridors to disperse, and find food and mates.

In addition, wetlands and rivers are protected by national legislation and are essential to maintain ecological corridors for the movement and survival of species within a landscape fragmented by cultivation and urbanisation. The hydrological processes associated with the wetlands and rivers are closely associated with the intactness of the vegetation within and surrounding these areas. Furthermore, the seasonally water logged soils were confirmed to provide habitat for the Declining *Crinum bulbispermum*. Therefore the vegetation associated with riparian areas and wetlands should be regarded as sensitive.

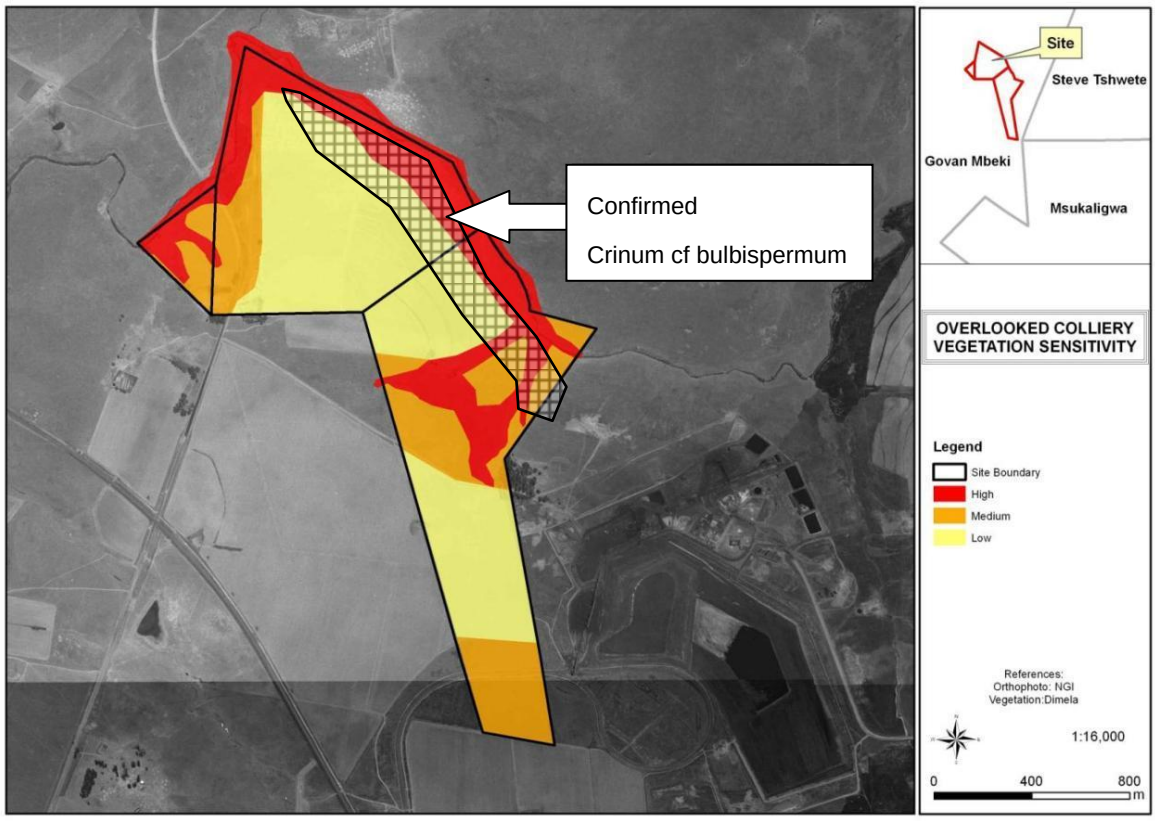


Figure 6-15: Vegetation sensitivity

The observed vegetation sensitivities were compared to the Mpumalanga Biodiversity Conservation Plan (MBCP). The MBCP classified the terrestrial biodiversity of the majority of the site as being of low conservation concern in the province as a whole. However, Ysterkop hill to the north-east of the site classified as Important and Necessary, while the moist grasslands on the site correspond well with the areas indicated by the MBCP as being Highly Significant.

6.12 Fauna

A fauna survey assessment which focused on habitat availability as well as sightings was conducted by Classical Environmental Management Services (C.E.M.S, 2013 – Appendix G). The findings indicate that no protected frogs and reptiles of conservation importance are likely to occur in the area due to lack of habitat for these significant species.

Six birds of conservation importance are likely to occur in the general area, although none were observed during surveys. Of these, the blue korhaan is most likely to occur on site as it will utilize fallow lands and old croplands.

Seven larger mammal species are likely to occur in the area with the Cape Clawless Otter considered likely to be present. This species is protected by Schedule 2 of the Mpumalanga Nature Conservation Act (No 10 of 1997).

In general the Olifants River and associated tributaries and wetlands provide habitat and ecological corridors to faunal species and are considered sensitive faunal environments (Figure 16). The mine plan has established 100m buffer zones from the river.

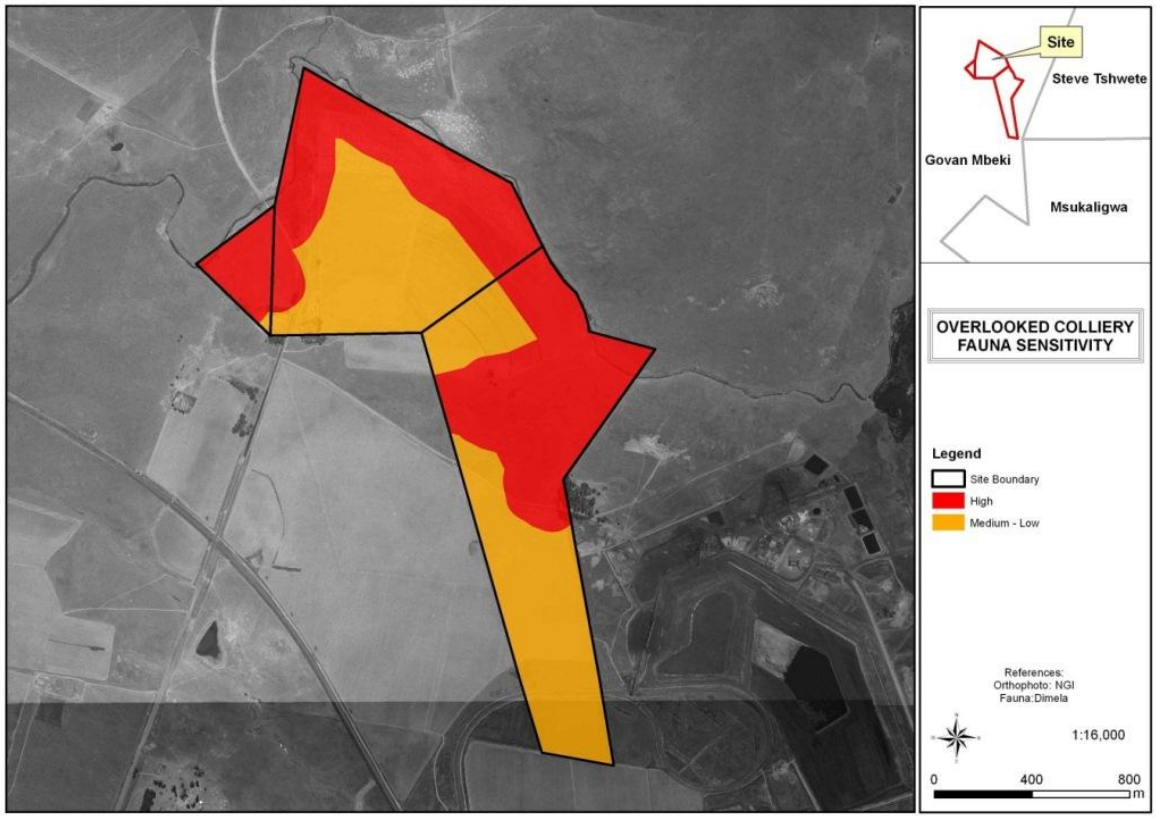


Figure 6-16: Fauna Sensitivity Map

6.13 Aquatic Assessment

A detailed assessment of the aquatic biodiversity indicators was completed by SEF (2013). Their detailed report has been included in Appendix H and a summary of pertinent findings is given below. Figure 17 indicates the location of sampling sites.

There are no river or wetland FEPAs associated with the proposed operation.

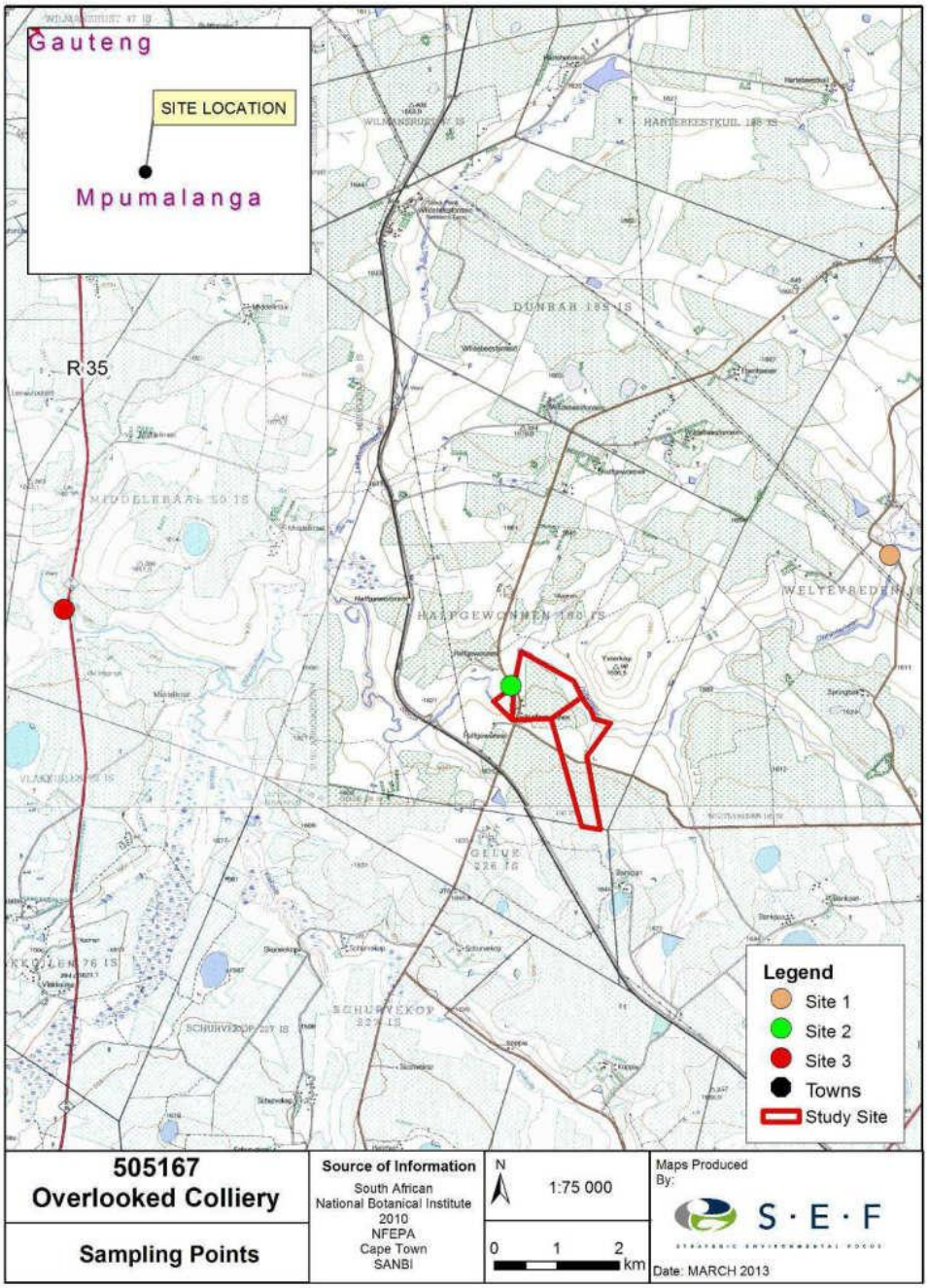


Figure 6-17: Aquatic biomonitoring sampling sites

6.13.1 Water Quality

Water quality is summarised in Table 28. The pH levels at each of the sites were slightly alkaline, but still within the RWQO for the respective Management Unit. Given the natural diurnal fluctuations, these conditions remain at an acceptable level for most aquatic biota occurring in natural South African freshwater systems.

Electrical conductivity (EC) is a measure of the ability of water to conduct an electrical current. This ability is a result of the presence of ions that carry electrical charge, such as

carbonate, bicarbonate, chloride, sulphate, nitrate, sodium, potassium, calcium and magnesium, which dissolve into solution (DWAF, 1996). Total dissolved solids (TDS), which is a measure of the quantity of all compounds dissolved within the water, is also directly proportional to the EC. During the survey, electrical conductivity and TDS values varied between sites, whereby only Site 2 showed values that exceeded the RWQO, most likely as a result of upstream and adjacent mining activities.

Dissolved oxygen concentrations of 80%-120% saturation are considered to protect all life stages of most South African aquatic organisms that are endemic or adapted to aerobic warm water habitats (DWAF, 1996). As a result, the dissolved oxygen availability for the biota at Site 2 and Site 3 were not considered to be a limiting factor for aquatic biota. However, an under-saturated state which also occurred below the RWQO was observed at Site 1. This was likely to be associated with the lack of significant aeration due to the stagnant nature of the pool between the upstream and downstream bedrock outcrops.

Table 28: In situ water quality at sampling sites (highlighted cells exceed RWQO)

	Temp. (°C)	pH	EC* (mS/m)	TDS* (mg/ℓ)	DO* (mg/ ℓ)	DO* (% sat)
RWQO	-	6.5-8.4	<60	440	-	>70
Site 1	19.9	8.19	43.3	281.45	4.73	54.6
Site 2	28.5	8.27	72.1	468.65	6.54	86.3
Site 3	23.5	8.26	31.7	206.05	6.35	77.2

6.13.2 Aquatic Habitat

Sampling habitat values obtained at Site 1 (Fair IHAS score of 64) and Site 2 (Fair IHAS score of 62) reflected adequate to fair habitat condition, whereby all biotopes (stones, vegetation and gravel, sand and mud (GSM)) were present in varying degrees of diversity and quality. Site 1 showed little to no flow due to the position of the pool between bedrock outcrops, and there was a significant presence of algal scum on the surface of the water. Similarly, Site 2 exhibited low water levels, with water flowing over bedrock and through cobbles into an isolated pool with significant algae, limited marginal vegetation and GSM available. Conversely, the adapted IHAS score for Site 3 (Excellent IHAS score of 75) indicated excellent available habitat conditions due to the presence of all three biotopes and hydraulic diversity, created by a previous bridge foundation in the form of short runs and riffles.

6.13.3 Aquatic Macro-Invertebrates

Number of macro invertebrate taxa collected within the study area, ranged between 16 and 24 taxa per site. The SASS Scores ranged between 78 and 112, whilst the associated ASPT values ranged between 4.67 and 4.88. In addition, a number of taxa regarded as moderately sensitive to water quality impairment were collected at several sites, including Aeshnidae (Hawker and Emerald Dragonflies), Atyidae (Freshwater Shrimps), Ecnomidae (Caddisflies), Hydrachnellae (Water Mites), and Tricorythidae (Stout Crawlers).

6.13.3.1 Present Ecological State

Based on the results obtained, both Site 1 and Site 3 were defined to be in a fair condition, but largely modified (PES Category D), indicating an extensive loss of basic ecosystem function has occurred whereby most intolerant aquatic macroinvertebrate taxa were observed to be absent. The A to F scale of PES Categories represents a continuum, and the boundaries between categories are notional, artificially-defined points along the continuum. Therefore, there may be cases where a site may potentially have attributes associated with both Categories, namely a boundary category (Robertson et al., 2004). Site 2 showed the lowest ecological condition of the three sites as a fair to poor state (PES Boundary Category D/E). This was further defined as a seriously impaired system with few aquatic families present, which was most likely attributed to the elevated conductivity associated with the site as a result of upstream and adjacent mining activities.

6.13.4 Ichthyofauna

According to Kleynhans *et al.* (2008), Darwall *et al*. (2009) and professional judgement, a total of ten (10) indigenous fish species and three (3) exotic fish species were likely to be associated with the watercourse within the study area based on the presence of suitable habitat. Five (5) indigenous and two (2) exotic fish species were collected during the survey, with only *Pseudocrenilabrus philander* (Southern Mouthbrooder) and two exotic species collected at all three sites. Site 1 and Site 2 showed a dominance of *Barbus* cf. *anoplus* (Chubbyhead Barb) and *Clarias gariepinus* (Sharptooth Catfish), respectively; whilst Site 3 showed that all collected species were well established and equally prevalent. In addition, *Labeobarbus polylepis* (Bushveld Smallscale Yellowfish) was only observed to occur at Site 3, most likely due to the occurrence of deep pools and small riffles, as well as the occurrence of fewer migratory barriers such as weirs or extended bedrock outcrops.

6.13.4.1 Present Ecological State

It was observed that the PES of the fish assemblage associated with the proposed Overlooked Colliery represented a largely modified state (PES Category D) with an absence of several intolerable species. However, since this assessment was based on a single sampling effort per site, the results may be skewed slightly, whereby some fish species may have been absent due to seasonal movement patterns. Therefore, additional sampling should be performed during various seasons to increase the confidence in the results obtained.

6.14 Wetland Assessment

Cabanga (2013c – Appendix I) completed a wetland delineation assessment. According to the buffer as set out in Figure 18 allowance was made for 100m buffer from the water course as set by GN704 of the NWA. The yellow line is the boundary of the edge of the wetland. Each HGM unit (1 & 2) has a buffer zone imposed of 100m. The buffer zones of these HGM units have been altered by means of agricultural practices as well as a road culvert over Block B of the proposed mining area. Therefore the buffer may still be vulnerable to erosion.

The maximum distance from the river to the edge of the wetland temporary zone to the river is approximately 300m; with the 100m meter buffer from the edge of the temporary zone, the maximum distance will be 400m from the edge of the river. The minimum distance from the edge of the wetland temporary zone to the river is approximately 59m; with the 100m buffer from the edge of the temporary zone the minimum distance from the edge of the river will be 159m.

6.14.1 Wetland Classification

A channelled valley bottom wetland with the associated hillslope seepage was identified. This was delineated and assessed on site by means of a desktop study and field survey. The approximate size of the wetland, including both HGM units, is 35.4 ha (Figure 18).

The Hydrogeomorphic setting of the HGM 1 is illustrated and described in Table 29. This is a valley bottom with a channel, which tends to be narrow with somewhat steeper gradients (Brinson, 1993). The contribution from lateral groundwater input relative to the main stream channel is generally greater. Channelled valley-bottoms tend to contribute less to flood attenuation and sediment trapping, but do supply these benefits to some extent. Some toxicant removal can also be expected in this wetland. However in this particular case, the artificial channelization of this wetland has rendered these functions slightly less effective.

The Hillslope seepage (HGM 2) linked to a stream channel may provide associated benefits such as slowing subsurface movements of water down the gradient, increased storage capacity and prolonged contribution of water to the stream during low flow seasons. They also provide a number of water quality enhancement benefits like removing excess nutrients and inorganic pollutants produced by agriculture, domestic waste or industry (Kotze *et al*., 2008).

Table 29: Wetland HGM types associated with the study area

Wetland Type	Description
Channelled Valley-bottom 	Valley-bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterised by the net accumulation of alluvial deposits or may have steeper slopes and be characterised by the net loss of sediment. Water inputs from the main channel (when channel banks overspill) and from adjacent slopes.
Hillslope Seepage linked to a stream channel 	Slopes on hillside, which are characterised by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.

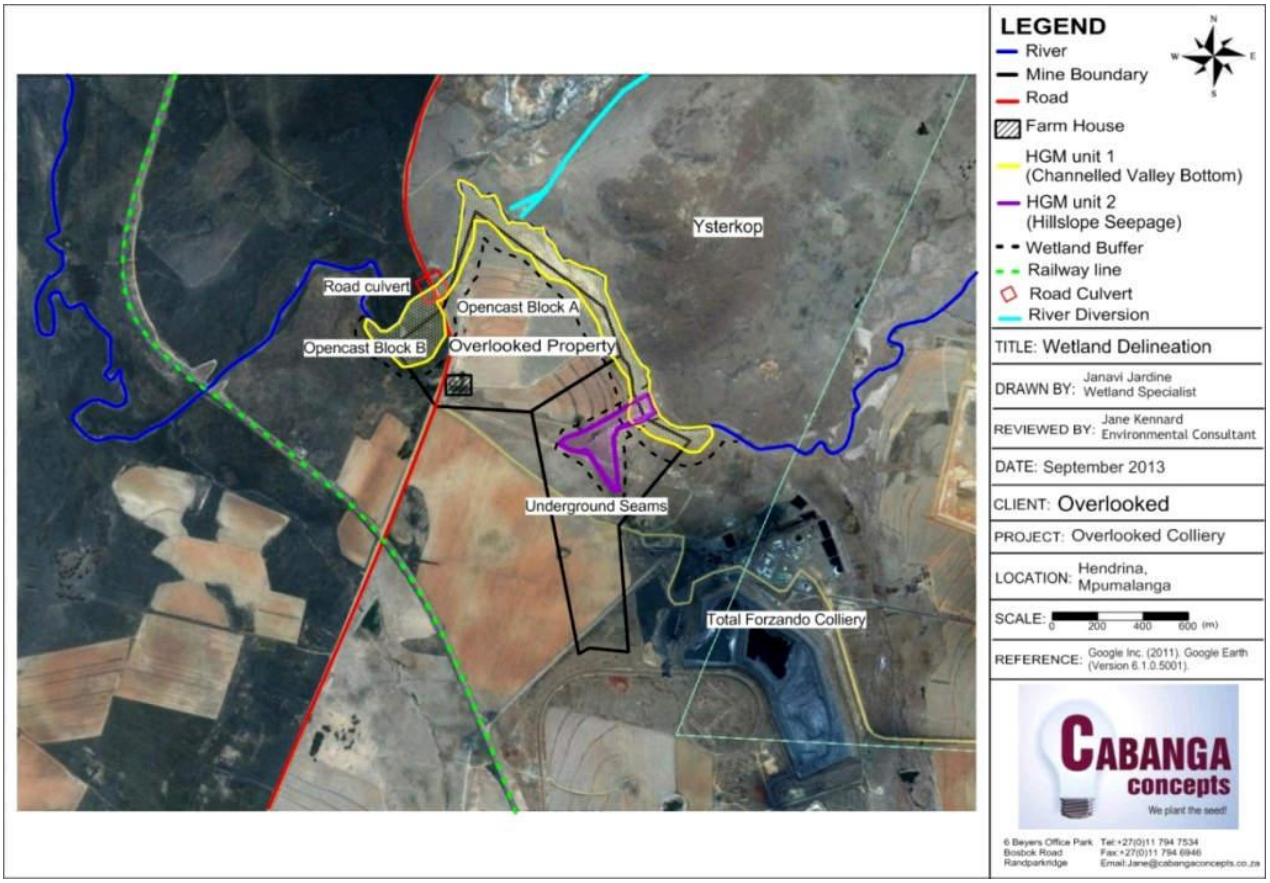


Figure 6-18: Wetland Delineation and Buffer zones

6.14.2 Present Ecological State (PES)

The Present Ecological State for the HGM units within the study area was determined to have been moderately modified with a C score, as a result of current and historic anthropogenic activities. On the catchment scale, land use activities such as agriculture and grazing, roads as well as mining comprise a major portion of the catchment area; this has the largest effect on factors influencing quantity and flow patterns. These create a change in surface roughness in the catchment which resulted in a C score for the PES (Table 30).

According to the level 2 assessment conducted for this wetland, the overall health score, expressed as hectare equivalents is approximately 20.4 ha. The size of the existing wetland including all HGM units is 35.4 ha. This will retain the functionality of the wetland as it exists in its current state would require a wetland of equal functionality.

The wetland vulnerability is considered using the ratio of the size to the slope or roughness of the wetland. This is the wetlands vulnerability to erosion, which for both HGM units classed as vulnerable.

Table 30: Summary of the Present Ecological State categories for wetland units associated with the proposed Overlooked Colliery

HGM Unit	PES Score
Hydrology	E→
Vegetation	C↓
Geomorphology	B→
HGM 1	C↓
HMG 2	C↓

6.14.3 Ecological Importance and Sensitivity (EIS)

The EIS scores for the associated wetlands are represented in Table 31 below.

Table 31: Ecological Importance and Sensitivity scores for associated wetlands

HGM unit		Importance Category	Confidence
HGM 1	Ecological Importance	Low (1.6)	2.8
	Hydrological/Functional Importance	Low (1.5)	3.5
	Direct Human Benefits	Low (1.3)	3.5
HGM 2	Ecological Importance	Low (1.6)	2.7
	Hydrological/Functional Importance	Low (1.75)	3.2
	Direct Human Benefits	None (1.0)	3.5

None (0-1): Rarely Sensitive to changes in water quality/hydrological regime
Low (1-2): one or a few elements sensitive to changes in water quality/hydrological regime.
Moderate (2-3): some elements sensitive to changes in water quality/hydrological regime.
High (3-4): Many elements sensitive to changes in water quality/hydrological regime.
Very high (4): very many elements sensitive to changes in water quality/hydrological regime.

The overall EIS for the wetland is low. HGM 2 comprises of a relatively small percentage of the wetland as a whole and has no sensitivity. This can be attributed to the incidence of farming agricultural practices on site as well as the distance from any residential areas. The existence of mining infrastructure in the immediate vicinity is also evidence of a low tourism value. This lowers the importance in terms of human benefits as the dependence of the surrounding households on the wetland is negligible.

6.14.4 Ecosystem Services supplied by the wetland (WET-EcoServices)

The catchment associated with this wetland and its HGM units is comprised mainly of agricultural, mining and associated infrastructure. These are a source of toxicants in the wetland through storm water runoff inputs as well as mining pollution and agricultural

fertilisers. HGM unit 1 has retained some of the important functions associated with Wet EcoServices (Figure 19).

The HGM 2 has a slightly lower significance in terms of size in the catchment but is functioning on a higher level than that of HGM unit 1 (Figure 20).

The overall EIS for both HGM units is low.

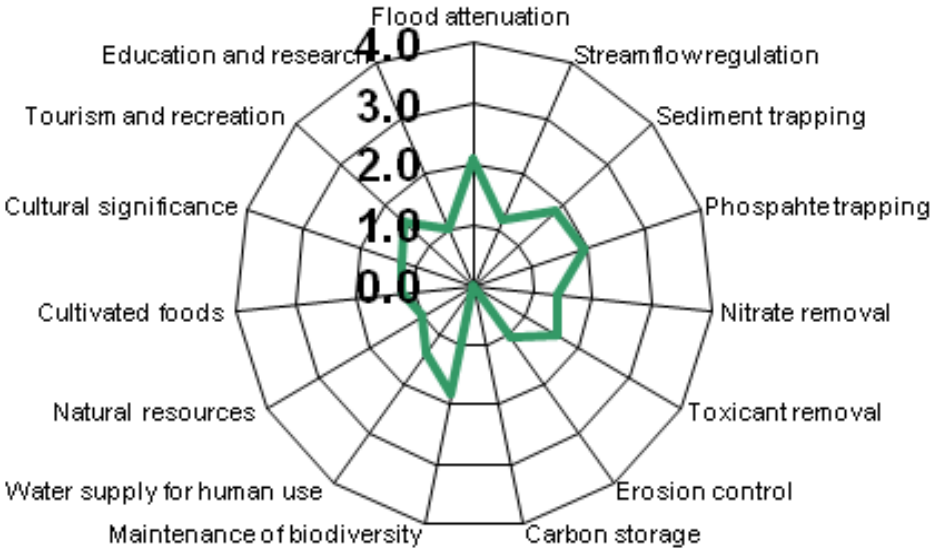


Figure 6-19: Spider Diagram representing indirect services provided by the HGM1

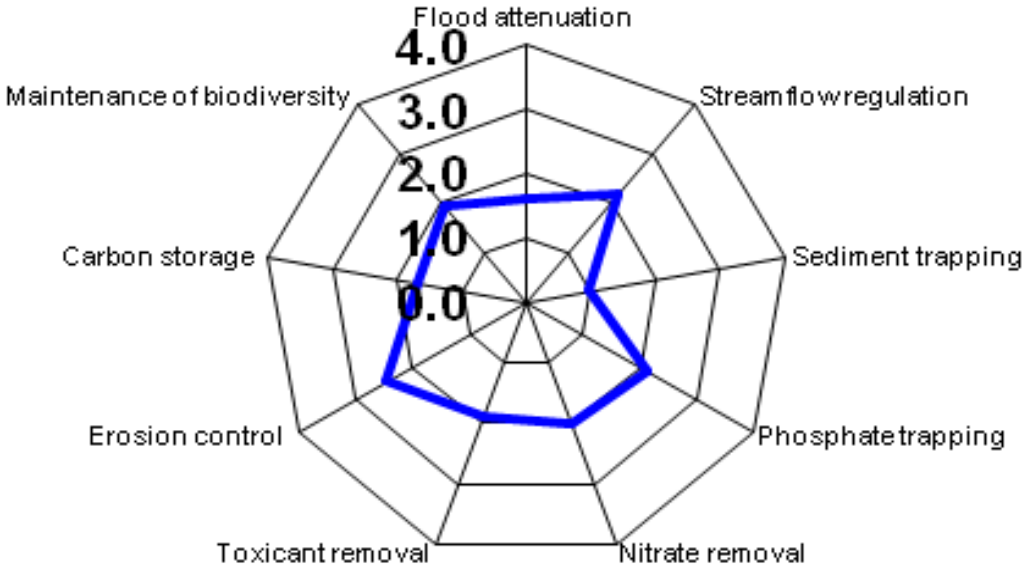


Figure 6-20: Spider Diagram representing indirect services provided by the HGM2

6.15 Sites of Archaeological and Cultural Interest

Archaetnos (2013a – Appendix J) conducted a Phase 1 assessment of the area and identified 2 sites. A management plan was later compiled for the heritage site identified (Archaetnos 2013b). This resulted in a more detail assessment of each site which has been included as Appendix K.

One grave site was observed in the area containing at least 29 graves (Figure 21). The different grave dressings are as follows:

- Stone packed – 17
- Cement border and headstone – 6^
- Cement border and granite headstone – 2**
- Heaps of soil with stone headstone – 2
- Granite border with granite headstone – 1*
- Brick and stone packed without headstone – 1

The following names and dates could be made out:

- Ben July Mahlangu – 1963-1985*
- 1976;
- John Mahlangu 1949;
- Daniel Vilakazi^
- Maria Mahlangu 1983;
- Linah Mahlangu 1959-1983**

The division into the categories of graves (related to date of death) is as follows:

- Heritage graves (older than 60 years): 1
- Unknown (to be handled similarly to heritage graves): 24
- Younger than 60 years: 4

It must be noted that these graves fall within the underground area, and as such it is expected that the potential impact on these will be minimal. The graves will remain in situ, fenced off and a buffer zone of 20m implemented.

A historical farm yard (early 20th century) consisting of at least four important buildings were recorded in the mining right area (Figure 21) (specifically within the area earmarked for opencast mining). The farmyard consisted of two houses, a wagon house and another building which was apparently used as a post office (Personal communication: Alexander Adams). The detailed findings of the four buildings can be seen in Appendix K and their location in Figure 22.

The site has medium cultural significance, largely due to the post office/shop. The other buildings have low significance and may be demolished after the appropriate paperwork is completed and a permit for demolition is obtained from the Provincial Heritage Resources Agency (PHRA) of Mpumalanga. The site is likely to be destroyed as it is within an area earmarked for opencast mining. The post office/shop should be preserved, and as it is very near to the mineral boundary, could be preserved with small impact on reserve loss.

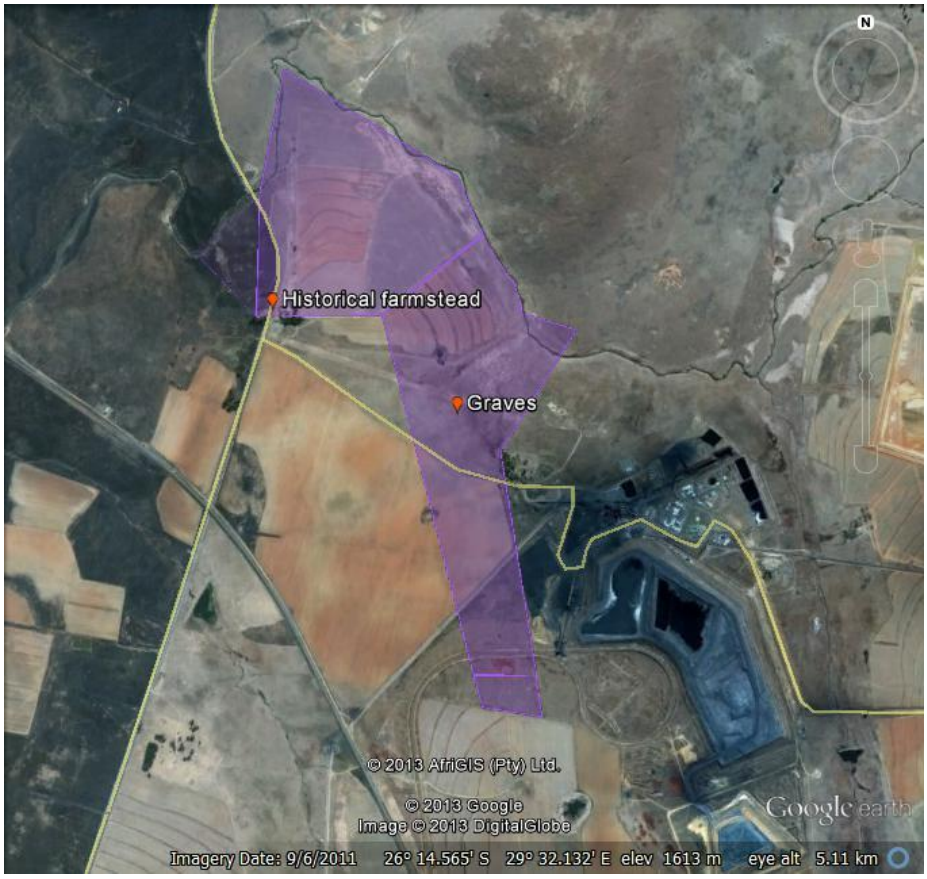


Figure 6-21: Aerial image (Google Earth, 2013) indicating heritage sites (Archaetnos, 2013a)

Figure 6-22: The farm yard indicating the four buildings of relevance (1 – wagon houe; 2 – main house; 3 – post office / shop; 4 – stable) (Archaetnos, 2013b)

6.16 Palaeontological Desktop Assessment

A desktop palaeontological assessment was completed by Dr B.D. Millsteed of BM Geological Services (2013). The detailed report has been attached in Appendix L.

The project area is completely underlain by sediments of the Vryheid Formation, but there may also be a ubiquitous cover of regolith, which will be affected by open cast mining and infrastructure areas.

The Vryheid Formation is fossiliferous elsewhere in the Karoo Basin, but the fossil potential of any possible regolith cover is uncertain. The possibility of palaeontological heritage within the regolith is considered as low due to the extensive ploughing of the land surface. Although the coal seams are predominantly formed of organic plant matter most of the plant material has been rendered unidentifiable due to the coalification process. Plant macrofossils are therefore primarily located within the mudstones and sandstones lying between, and as lithic partings within, the coal seams. Therefore there exists a greater likelihood that fossils will be disturbed in opencast areas where overlying strata will be affected rather than underground mining which selectively targets the non-fossil-rich coal seam.

Plant macrofossils and trace fossil assemblages known to occur within the Vryheid Formation are potentially scientifically significant.

The desktop study has not identified any palaeontological reason to prejudice the progression of this project, subject to adequate mitigation programs being put in place as described in the management plan.

6.17 Visual Aspects

Cabanga (2013d – Appendix M) conducted a visual assessment of the area. The visual characteristics of the area have been summarised in Table 32 below.

6.17.1 Viewpoints and Views

The views from potential sensitive visual receptors were taken to understand the zone of visual influence. These focussed on areas where the highest incidence of viewer is expected, and where viewers have access to the view of the area being altered from their respective locations. Due to the lack of residential dwellings surrounding Overlooked Colliery, the views are not sensitive. The majority of views comprise the Total Forzando Mine and the Sudor Coal Halfgewonnen Colliery as well as their offices. The only other viewpoints are for 2 surrounding farmsteads that are partially screened from the view of the Overlooked Colliery. The sensitive viewers on farmsteads can be shielded by crops at full growth. However these crops will not be in full growth cycle all year round. It is expected that during the crop harvesting time of the year, the view of the mine will be more exposed and may be more visible from these farmsteads. Figure 6-23 indicates a map showing the placement of the viewpoints (Panorama 1 to 5 discussed below).

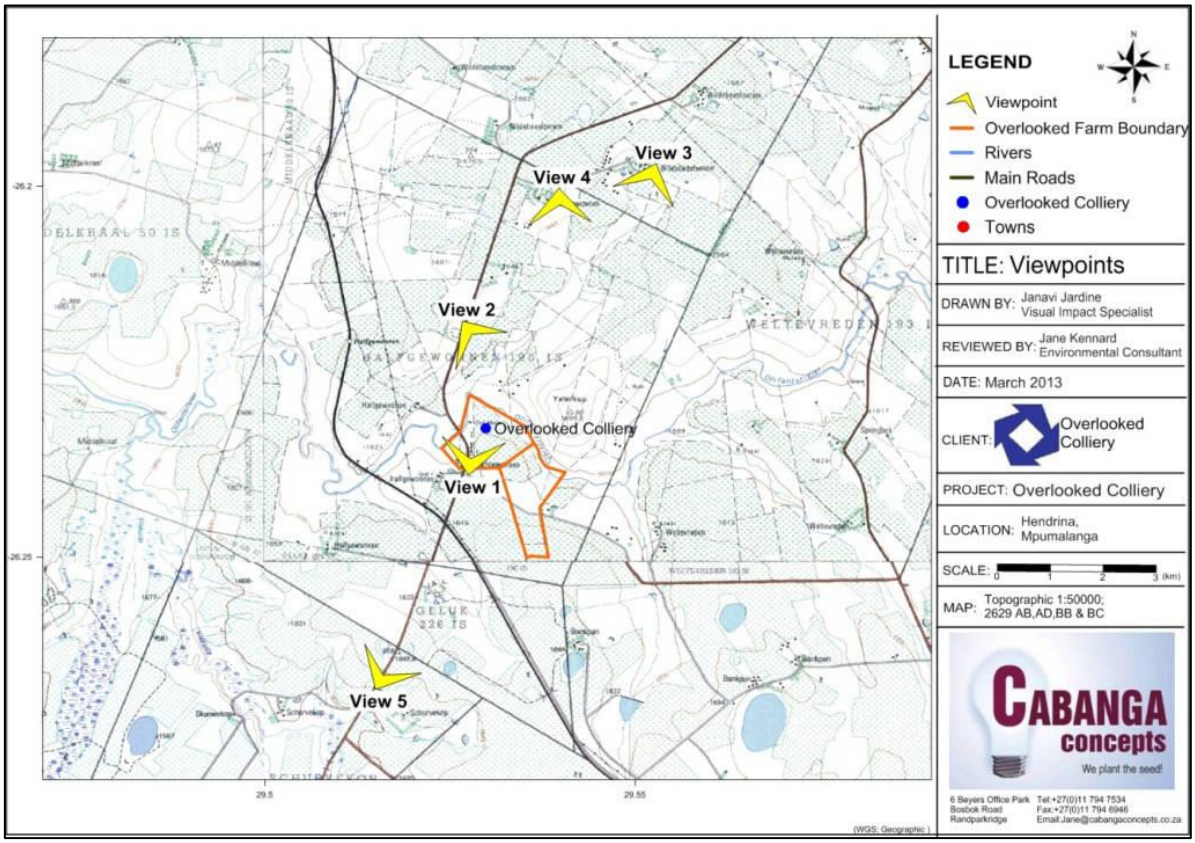


Figure 6-23: Viewpoints of sensitive visual receptors in the area

View 1: the view from the Halfgewonnen road (in front of Meat and Pap farm stall) is exposed and the site of the proposed Overlooked is highly visible from this road. However the majority of road users consist of mine employees and farmers. Therefore the road users on this road are not considered sensitive visual receptors. This means that the viewer sensitivity is considered low – ***low sensitivity***.

Panorama 1: View 1 from the Meat and Pap farm stall at the entrance to the Overlooked property towards the west

View 2: the view from in front of Sudor Coal along the Halfgewonnen road is exposed due to the position of the proposed Overlooked mine in the landscape. This is situated in the apparent valley and is down slope of Sudor Coal, making more of the site visible from this view point. The visual receptors associated with Sudor Coal are not considered sensitive as they are exposed to a mining environment on a daily basis. Therefore viewer sensitivity is ***low*****.** Refer to Panorama 2.

Panorama 2: View 2 from in front of the Sudor Coal Colliery entrance, towards the east

View 3: The visual receptors that have access to this key viewpoint are the people working for Sudor Coal mine at their offices along the Halfgewonnen road. The proposed Overlooked Colliery is mostly hidden from view from this viewpoint by the existing stockpile and Ysterkoppie. Therefore only a small portion of the mine is visible. They are also exposed to the view of Sudor Coal's own mining operation, which is to the right and out of view of this panorama. Therefore the visual receptors of this viewpoint are considered to be of ***low to negligible sensitivity***. Refer to Panorama 3.

Panorama 3: View 3 from the Sudor Coal Offices towards the site, towards south east

View 4: the view is from an informal farmstead to the north west of the proposed Overlooked Colliery behind a stockpile (this stockpile belongs to the adjacent mining operation). This viewpoint is completely screened from any mining activities that may take place on the site. The visual impact for this site is considered ***non-existent*** as the mine is not visible. The sensitivity of the viewers on this property is considered ***negligible***. Refer to Panorama 4.

Panorama 4: View from neighbouring informal farmstead, towards south east

View 5: the view of the site is from south west of the site along the Halfgewonnen road. The view encompasses the existing Sudor Coal mine as well as the proposed Overlooked Colliery. In the right hand side of the view, towards the foreground of the proposed Overlooked Colliery site is the Total Forzando Coal Mine. This mine, in combination with the Sudor Coal Mine has already marred the landscape from this viewpoint. The visual receptor has been relatively desensitised to the views of this site. The visual receptors from this viewpoint are of ***moderate to low sensitivity*** due to the fact that they are currently exposed to a view of mining activities but they also have a larger overall view of open areas and farmlands. Therefore the introduction of the new mining infrastructure on this site may alter this more natural view and create a cumulative impact due to the existence of mines surrounding the site. Refer to Panorama 5.

Panorama 5: View 5 from the south west of the site along the Halfgewonnen road towards the site from a farmstead

Table 32: Visual characteristics and criteria critical to visual impact assessments

Visual Characteristic / Aspect	General Description	Status on Site	Overall Rating for Aspect
Visual Distance/Observer Proximity	Visual exposure reduces over distance. This allows the determination of the core area of visual influence regarding a development. The visual distance and observer's proximity are closely related and are used together when considering visual impact.	Many of the small number of sensitive visual receptors are within 100m from the site. The road users and workers going to Meat and Pap are considered to be of low sensitivity as they are using the road to commute and do not form part of the majority of viewers. The rest of the views are within approximately 2 to 3 km and are mostly screened or marred by existing mining infrastructure surrounding the site.	The visual influence will be moderate for affected visual receptors. This is because most visual receptors are within an average of 2km radius. The visual distance is moderate due to the viewers' exposure to the existing mines in the surrounding area and the smaller number of viewers exposed.
Viewer Incidence/Viewer Perception	Number of observers / viewers and their perceptions of the development are critical to address visual impact. If there are no viewers, there is no impact. If the perception of the structure is neutral or positive, then the impact is neutral and positive.	Due to low density residential dwellings surrounding the site, viewer incidence is low. Area is a mining and agricultural area. This means that the viewer's perception of the area is that of a mining / industrial character mixed with a farming landscape character, and certain amount of de-sensitising to mining would have occurred with viewers.	Viewer incidence combined with the viewer's perception is considered low.
Visual Absorptive Capacity (VAC) of Natural Vegetation	The capacity of the receiving environment to absorb or screen the potential visual impact of the proposed infrastructure is predominantly a function of the vegetation and will be high if the vegetation is tall, dense and continuous and low if the vegetation is patchy, sparse and low growing. VAC increases with distance, where visibility, discernible detail and colour saturation decreases	The site is surrounded by hills as well as the stockpile to the north west of the site. The surrounding landscape is made up of veld grass and open areas and 2 coal mining operations. The Overlooked Colliery will be visible from the adjacent dirt road as well as from the other mines in the immediate area. Majority of visual receptors will be found on the	Elements of the VAC are considered moderate to high. This is due to the fact that most of the view is concealed by the presence of the stockpile and Ysterkoppie and the rest of the view is already

Visual Characteristic / Aspect	General Description	Status on Site	Overall Rating for Aspect
	the further the viewer is from the structure.	surrounding farms.	marred by existing mining activity.
Visual Resource Value / Landscape Quality	Determined by assessing both the objective and subjective factors relating to the landscape such as landscape quality and sense of place (Warnock & Brown, 1998).	Common landscape that has some positive character but which has evidence of alteration / degradation / erosion of features resulting in areas of more mixed character. It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with but the changes that occur may not require particular attention to detail.	The overall visual resource value can be considered as moderate as most of the area is classed as such and the mine areas reduce overall value of moderate visual resource areas.
Landscape Integrity and Sense of Place	According to Lynch (1992), sense of place is defined as “the extent to which a person can recognise or recall a place as being distinct from another place – as having a vivid, unique, or at least particular character of its own”. Areas of low visual quality can have a sense of place if they are seen as unique. The sense of place is attributed to the specific area by the viewers’ experience or perception of it. Some places have viewers that believe in its sense of place, giving it a strong sense of place.	Landscape immediately surrounding the Overlooked Colliery consists of farmsteads, existing mining infrastructure and relatively small natural areas.	There is no specific rating for the sense of place, but it can be considered slightly altered due to the existing mining infrastructure in the area due to nearby collieries.
Scenic Quality	The values assigned to the visual resource are subjective. According to Crawford (1994) studies for perceptual psychology have shown that human preference is for landscapes with higher visual complexity, especially involving water bodies.	The scenic quality of the landscape can be summarised as having low relative relief, smooth and undulating with stream-associated wetlands and the Olifants River bordering the site and the vegetation is degraded grassland with interspersed trees.	There is existing infrastructure on site; therefore the scenic quality of the site in its current state can be viewed as being moderate to low. The combination of mining and natural areas has created the overall scenic quality.

6.18 Traffic and Safety

The roads in the immediate area are currently used predominantly by farmers to access their farms, and by staff and trucks travelling to and from the nearby mines.

The main access road to the area is a tarred provincial road known as the 'Halfgewonnen Road'. A secondary road, being the access road to the adjacent Forzando Colliery, traverses the southern extent of the mineral boundary.

The traffic in the immediate area will increase as haulage trucks transport coal from Overlooked Colliery to Eskom and other consumers. Any intersections that may be required will be developed in accordance with the Department of Public Works, Roads and Transport and will have the necessary signs to ensure other road users are made aware of these intersections. Truck traffic will also affect road surfaces and a road maintenance plan will need to be implemented to ensure the roads remain safe for other road users.

6.19 Regional Socio-Economic Structure

Information below was extracted directly from the Overlooked Colliery Social and Labour Plan (Umsizi, 2013).

6.19.1 Population

In terms of population figures, both the Gert Sibande and Govan Mbeki municipalities are dominated by black South Africans (90.1% and 87.7% respectively), while the white population outweighs the other minor population groups

Table 33: Population distribution within Gert Sibande and Govan Mbeki Municipalities

Group	Gert Sibande		Govan Mbeki	
	Number	% people	Number	% people
Black	874 918	90.1	39 926	87.7
Coloured	9 948	1.0	249	0.5
Indian or Asian	4139	0.4	422	0.9
White	82416	8.5	4 914	10.8
Total	971 421	100	45 511	100

6.19.2 Employment

Within the economically active age group (15 – 64 years), Gert Sibande and Govan Mbeki have an unemployment rate of 21,9% and 26%, respectively. Gert Sibande has an employment rate of 42.3%, while Govern Mbeki has a very similar employment rate of 42.8%.

The number of economically inactive person(s) in the employable age groups is significant in both municipalities. Govan Mbeki has a percentage of 35.8% in that is not economically

active, whereas Gert Sibande has 31.2%. The reason for the extreme difference in this rate is unclear, but the high rate of not economically active individuals should be a concern, as this will put major strain on the employed individuals.

Table 34: Employment levels at Gert Sibande and Govan Mbeki (individuals between ages 15 and 64)

Employment Status	Gert Sibande		Govan Mbeki	
	Number	%	Number	%
Employed	246 966	42.3	11 253	42.8
Unemployed	128 078	21.9	6 840	26.0
Not economically active	208917	35.8	8 198	31.2
Total	583 961	100	26 291	100

Table 35 shows the distribution of the population in the Gert Sibande and Govan Mbeki municipalities by age group. Almost the same percentages of the population in both the Gert Sibande district (39.9%) and the Govan Mbeki (41.1%) municipalities are either young (i.e. below the age of 15 years) or older than 65 years. The percentage of the economically active age group (15 - 64 years) within both the district and local municipalities is 60.1% and 58.0% respectively.

With 40% of both the district and local municipality populations' being economically inactive also implies high dependency ratios and increased pressure on the portion of the population that is employed to support the dependent and unemployed people.

The focus during the implementation of SLP initiatives should thus be on job creation and skills development, in order to absorb the youth finishing school and the economically active but unemployed sector of the population.

Table 35: Age groups of Populations within Gert Sibande and Govan Mbeki

Age (years)	Gert Sibande		Govan Mbeki	
	Number	%	Number	%
0-15 and over-65	387 460	39.9	18 692	41.1
15-65	583 961	60.1	26 819	58.9
Total	971 421	100	45 511	100

6.19.3 Dependency

Age dependency ratios tell us how many young people (under 15 years of age) and older people (over 64 years of age) depend on the people of working age, classified as economically active (15 to 64 years).

The age-dependency ratios (refer to) for Gert Sibande and Govan Mbeki is the same, both being **66.4**. Which means that 66.4 people are dependent on every 100 people classified as

economically active and employed. When combined with unemployment levels, the dependency ratios of Gert Sibande and Govan Mbeki are respectively **293.3** and **299.7** people dependent on every 100 people classified as economically active. These dependency ratios are indicative of poverty and third world conditions amongst more than half of the population. This places a significant burden on job creation and basic service provision to people within Gert Sibande and Govan Mbeki.

6.19.4 Occupation and Industries

In terms of occupations, most industries within the Gert Sibande and Govan Mbeki areas are elementary in nature. Employment is divided between industries such as mining and quarries, wholesale or retail, manual labour and agricultural work (Table 36), which could contribute to an explanation of why so many people in the region are not actively seeking employment, as these sectors do not provide many employment opportunities. Interestingly, the industry which holds most employment within each municipality is within private households or other unspecified industries (54.6% in Gert Sibande and 90.4% for Govan Mbeki municipality). Overlooked Colliery LED initiatives should therefore focus on creating economic developments that will offer employment opportunities in other sectors of the economy.

Table 36: Industries at Gert Sibande and Govan Mbeki

Group	Gert Sibande		Govan Mbeki	
	Number	%	Number	%
Agric related work	12 159	4.9	266	2.4
Mining, Quarrying	13 109	5.3	0	0.0
Manufacturing	15 939	6.5	248	2.2
Electricity, gas, water	1731	0.7	95	0.8
Construction	7 710	3.1	151	1.3
Wholesale, Retail	27 891	11.3	157	1.4
Transport, Communication	5 404	2.2	85	0.8
Business Services	9 725	3.9	52	0.5
Community Services	18 394	7.5	27	0.2
Private households & other	134 827	54.6	10 171	90.4
Total	**246 889**	**100**	**11 252**	**100**

6.19.5 Languages

Within the district and local municipalities, IsiZulu is shown to be the most spoken language with a 60.5% and 54.3% of inhabitants speaking this language at Gert Sibande and Govan Mbeki respectively.

Table 37: Language groups of the Gert Sibande and Govan Mbeki areas

Language	Gert Sibande		Govan Mbeki	
	Number	%	Number	%
Afrikaans	75 499	7.8	3 333	8.0
English	15 604	1.6	647	1.6
IsiNdebele	25 506	2.6	274	0.7
IsiXhosa	22 631	2.3	1 539	3.7
IsiZulu	585 587	60.5	22530	54.3

6.19.6 Transportation

The majority of Gert Sibande (63.7%) and Govan Mbeki (68.9%) residents walk to work or school. The reason is unknown but may be that there is no public transport outside of the urban areas. The distance between urban centres indicates a need for public transport to and from rural areas. The alternate means of transport which are utilized by residents in both municipalities is minibuses or taxis, buses or cars, to travel to town.

Table 38: Means of Transportation within the Gert Sibande and Govan Mbeki areas

Type	Gert Sibande		Govan Mbeki	
	Number	%	Number	%
On foot	285 394	63.7	13 914	68.9
Bicycle	6 294	1.4	347	1.7
Motorcycle	2681	0.6	60	0.3
Car as a driver	32 510	7.3	1 008	5.0
Car passenger	40 994	9.2	1 464	7.2
Minibus/taxi	44 658	10.0	1 789	8.9
Bus	28 957	6.5	1 334	6.6
Train	1048	0.2	62	0.3
Other	5342	1.2	224	1.1
Total	**447 878**	**100**	**20 202**	**100**

6.19.7 Energy

In terms of access to energy, the majority of households within the Gert Sibande (54.2%) and Govan Mbeki (57.1%) areas use electricity for cooking purposes. The second most common fuel for cooking is wood within the Gert Sibande municipality (21.2%) and coal within the Govan Mbeki (24.4%) municipality. A concern is few households of Gert Sibande (8%) and Govan Mbeki (12%) use paraffin for cooking. Electricity provision to these households should be prioritised for the future (Table 39).

Table 39: Energy used for Cooking within Gert Sibande and Govan Mbeki Households

Type	Gert Sibande		Govan Mbeki	
	Number	%	Number	%
Electricity	140 726	54.2	7 745	57.1
Gas	3 504	1.3	85	0.6
Paraffin	20 759	8.0	1 563	12
Wood	55 062	21.2	534	3.9
Coal	35671	13.7	3309	24.4
Animal dung	3530	1.4	243	2
Solar	162	0.1	58	0.4
Other	300	0.1	26	0.2
Total	**259 714**	**100**	**13 563**	**100**

In terms of the use of electricity for lighting, both Gert Sibande (79%) and Govan Mbeki (78.6%) have a high number of households that use electricity (Table 40). Eskom is responsible for the bulk provision of electricity to Govan Mbeki. The second most common fuel for lightening is candles within both the Gert Sibande (18.3%) and Govan Mbeki (19.1%) areas.

Table 40: Energy used for lighting within Gert Sibande and Govan Mbeki

Type	Gert Sibande		Govan Mbeki	
	Number	%	Number	%
Electricity	212 781	79.0	10 614	78.6
Gas	396	0.1	0	0.0
Paraffin	5 766	2.1	256	1.9
Candles	49 308	18.3	2 577	19.1
Solar	205	0.1	36	0.3
Other	746	0.3	21	0.2
Total	**269 202**	**100**	**13 504**	**100**

The relatively high usage of candles for household energy purposes, is indicative of underdevelopment and poverty in the region. Furthermore, this reliance on fossil fuels has significant negative impacts on the health of households, i.e. increased respiratory diseases. The use of these energy sources within the households often causes house fires resulting in hundreds of deaths each year.

The most effective way to reduce reliance on fossil fuels and reduce the harmful health effects of burning these fuels, is to capacitate households with the means to combat their poverty, i.e. through education, skills development and access to proper income-earning opportunities. As people become empowered as potential ‘ratepayers’ or ‘revenue-

generators' for government, the appropriate service infrastructure will be established accordingly to service the demand.

6.19.8 Sanitation and waste removal

The provision of adequate sanitation and formal waste removal is severely lacking and limited to the primary economic centres in the Gert Sibande and Govan Mbeki municipalities. This poses a health risk to people through the spread of diseases such as cholera and other communicable diseases.

In terms of sanitation and waste removal, it can be seen below (Table 41) that 62.3% of households in Govan Mbeki have access to a flushed toilet, and 74.3% of households in Gert Sibande enjoy this privilege.

A number in of residents at Gert Sibande (19.7%) still make use of pit latrines, a sanitation system considered to be below RDP standards, whilst many residents of Govan Mbeki (17.7%) have no sanitation provided.

Table 41: Level of sanitation provision in the Gert Sibande and Govan Mbeki areas

	Gert Sibande		Govan Mbeki	
Type	**Number**	**%**	**Number**	**%**
Flush toilet	167 551	62.3	9 360	74.3
Chemical toilet	539	0.2	0	0.0
Pit latrine	53 003	19.7	0	0.0
Bucket latrine	1702	0.6	588	4.7
Ventilation improves pit	22343	8.3	230	1.8
Dry toilet	5526	2.1	182	1.4
None	18 165	6.8	2 230	17.7
Total	**268 829**	**100**	**12 590**	**100**

The portion of the population that does not have any form of access to a sanitation service and the majority that still make use of the pit latrines, is further indicative of poverty and a low level of access to basic services. This represents a LED need within these areas and a priority area to be addressed for the respective IDPs.

With reference to waste removal within Gert Sibande, 58.1% of residents have their waste removed at least once a week, whilst in Govan Mbeki the majority (77.4%) do. Within Gert Sibande over a quarter of the population (27.4%) have created their own refuse dump. Approximately 9.4% of households in Gert Sibande and 11.2% in Govan Mbeki do not have access to a disposal site (Table 42).

Table 42: Refuse removal at Gert Sibande and Govan Mbeki households

	Gert Sibande		Govan Mbeki	
Type	**Number**	**%**	**Number**	**%**
Removed once week	156 650	58.1	10 449	77.4
Removed less often	2 168	0.8	34	0.3
Communal dump	11 158	4.1	37	0.3
Own refuse dump	73 807	27.4	1 384	10.2
No Disposal	25 299	9.4	1 517	11.2
Other	385	0.1	84	0.6
Total	**269 467**	**100**	**13 505**	**100**

The low level of formal waste dumps is a further indication of the low level of basic service provision and underdevelopment within the Gert Sibande and Govan Mbeki municipalities. This presents another LED opportunity in terms of the IDP, which needs to be addressed.

It can be seen that appropriate sanitation services and access to refuse services in Govan Mbeki and Govan Mbeki are currently lacking. Furthermore, the level of service provision differs greatly from urban areas to rural areas, where it is virtually non-existent. The provision of basic services to rural communities presents an SLP opportunity for Overlooked Colliery involvement.

6.19.9 Water Supply

Legislative standards require that communities have at least 20 – 30 litres of clean safe water per person per day, within 200m of their household. Table 43 reveals that although the majority of households in Gert Sibande (46.0% plus 32.6%) and Govan Mbeki (48.6% plus 32.9%) have access to piped water, either in their dwelling or yard, water provision in both municipalities need to prioritised.

Table 43: Water provision levels within Gert Sibande and Govan Mbeki households

	Gert Sibande		Govan Mbeki	
Type	**Number**	**%**	**Number**	**%**
Pipe water inside dwelling	123 852	46.0	6 564	48.6
Pipe water inside yard	87 958	32.6	4 440	32.9
Piped water outside yard	34 050	12.6	1 896	14.0
Borehole/spring	9 529	3.5	424	3.1
Rain water tank	1667	0.6	0	0.0
Dam/pool/river	8451	3.1	60	0.4
Vendor	1 571	0.6	30	0.2
Other	2 389	0.9	91	0.7
Total	**269 467**	**100**	**13 505**	**100**

The level of access to water by households in Gert Sibande and Govan Mbeki is indicative of the many rural areas that do not have access to potable water. It seems that both the local and the district municipalities require further capacity, resources and support, in order to supply households with improved water supply and other basic services. The need for provision of adequate water supply to communities represents an SLP opportunity for Overlooked Colliery to assist in the regional LED activities.

7 PROJECT AND LAND USE ALTERNATIVES AND ASSOCIATED IMPACTS

7.1 Project Benefits

The major benefits of the project are as follows:

- Provide full time employment for 7 people and contractual employment for 26 people during the initial opencast period and full time employment for 14 people and contractual employment for 75 people when underground mining commences in conjunction with opencast operation in year 4.
- The project will further create indirect employment through hiring of contractors and obtaining supplies. This will primarily be sought locally if available.
- The mine will implement social and local economic development plans as well as training of staff through its S&LP.
- The proposed project will make a significant contribution to the inland coal market as well as the GDP.

7.2 No go alternative

As much as the no-go option results in the protection of the largely disturbed environment *in situ* and the continued use of the land for stock and crop farming, it will result in the sterilisation of the coal resources should no other company mine the area. This would reduce coal resources for power generation which is currently a major issue in South Africa, which currently has no viable economic power generation alternatives. The no-go option would also result in no new employment opportunities.

7.3 Project site and activity alternatives

The project site is determined and delimited by the extent of the coal seam and no further site alternatives have been assessed. The type of mining to take place is also determined by the depth of the seams and no alternatives are proposed to the customary roll-over opencast mining and underground bord-and-pillar methods. Infrastructure location is also limited to areas proposed as most of the area is underlain by coal which will be mined or by 100m buffer zones for the Olifants River.

Project activity alternatives have therefore not been further assessed.

7.4 Land use alternatives

Table 44 lists the three alternative land uses which were considered during land use alternative assessment and the impacts associated with these land uses, in comparison with that of mining. The comparative impact assessment indicates that mining will have the greatest environmental impacts followed by residential development and crop agriculture. Stock farming will have the least impact to the environment. It must be stressed that current land uses are crop and stock farming.

Mining and its associated activities will have the greatest impact on the environment and is the least sustainable but upon completion of mining and with proper rehabilitation other land uses can be considered for the area. Most of the mining impacts will also be for a very limited period restricted to the 6 years for construction and operation. Residual impact extent and severity will still need to be assessed, but in general, responsible mining and rehabilitation from the start of the operation can mitigate a lot of the residual impacts associated with mining. Mining will also have a great positive economic impact, and should be considered a viable land use for the area, especially due to the fact that surrounding areas are already under various mining activities.

Table 44: Comparative impact assessment for alternative land uses

Aspect	Residential/office complex	Agriculture - crops	Agriculture - Stock	Mining
Topography	Residential/office development will result in the complete alteration of the topographic nature of the area. The impact is permanent but considered to be of low significance due to the relatively flat nature of the area and existing topographic impacts on site due to crop agriculture. Status: -ve; Duration: Permanent; Extent: Site specific; Probability: Definite; Severity: Slight to moderate; Significance: Low	Should the area be utilised for crop production, then topographical impacts would be limited to very superficial changes as the area is contoured for preparation of seed. The area is already largely cultivated and topographic impacts have already occurred. Therefore no further impact is expected. Status: neutral; Duration-; Extent: -; Probability: -; Severity: -; Significance: -	The area is currently utilised for stock farming (grazing). Impacts on topography would be limited to erosion and the potential for the formation of erosion gullies. This is, however, considered to have a very low likelihood due to the shallow nature of surrounding slopes and soils. Status: neutral; Duration-; Extent: -; Probability: -; Severity: -; Significance: -	Mining will result in the complete alteration of the topographic nature of the area. For the brief construction and operational period the impact will be severe as soil, overburden and coal stockpiles are created and boxcuts are excavated. During proper rehabilitation of the site, the area will be backfilled to attain similar elevations and be contoured to attain similar topography and catchment dynamics as pre-mining. The topographical impacts remain but will not be as severe. Status: -ve; Duration: Permanent; Extent: Site specific; Probability: Definite; Severity: Slight to moderate; Significance: Moderate to low
Soils and Land Capability	Residential/office development will result in the complete alteration of the soil characteristics and the land capability of the area. The impact is permanent but limited in extent. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Definite; Severity: Moderate to high; Significance: Moderate	The area is already utilised for crop production, and soil characteristics have been modified through various fertiliser applications and possible use of pesticides. This has altered soil characteristics and altered land capability. The soils are also very likely stressed due to cyclic crop production and will require frequent fertilisation regimes to sustain the crop production on the land. This will further alter soil chemical characteristics. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Definite; Severity: Moderate; Significance: Moderate to low	The impacts on soil and land capability through continued use of the land for grazing will be negligible and limited to soil compaction, potential for increased erosion and the nutrient enrichment of soils. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Possible; Severity: Slight; Significance: Low	Mining will result in the complete alteration of the soil characteristics of the area and associated land capability. For the brief construction and operational period the impact will be severe as soil is stripped and stockpiled or stripped and placed onto pre-ceding, recontoured mine cuts. During proper rehabilitation of the site, the area will be backfilled, contoured and soil types replaced in similar topographic locations and sequences to ensure soil characteristics are retained as far as possible. Soil analyses will be conducted by relevant specialists and the correct soil amelioration will be done on all soils over the rehabilitated area to ensure growth of local indigenous flora. The impact on soil remains during rehabilitation, but with proper rehabilitation and amelioration, impact severity can be reduced. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Definite; Severity: Moderate to high; Significance: Moderate to high
Surface water and wetland areas	Residential/office development will result in the complete alteration of the surface water flow dynamics and result in increased water flow to the wetlands increasing water quantity to these systems during the wet season. The impact is permanent. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Definite; Severity: Moderate; Significance: Moderate to low	The excessive use of fertilisers, herbicides and insecticides will affect downstream water bodies as these are washed away through surface water runoff or through upper aquifer flow. Due to the proximity of the wetland areas, there is a high likelihood that these pesticides and inorganic nutrients are likely to end up in these systems and the impact would be severe. The pesticides would impact on natural flora and fauna of the wetlands and excessive fertiliser use will affect water quality and nutrient cycling. Status: -ve; Duration: Long-term; Extent: Local; Probability: Highly probable; Severity: Moderate; Significance: Moderate	The existing impacts are limited to the nutrient enrichment of soils, which could impact on the surrounding water quality through runoff from rainwater. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Highly probable; Severity: Slight; Significance: Low	Several mining aspects will create risks for downstream water bodies and associated wetlands. These include: soil stripping, mobilisation, stockpiling and amelioration which will increase the risk for erosion; spillage or leaks of any hydrocarbon contaminants or “dirty water”; contamination of groundwater which will eventually daylight in nearby streams or possibly decant onto the surface and wash into nearby streams, springs and surface water bodies and impact on these; and the potential for establishment of alien invasive plant species, some of which are known to impact severely on water courses and wetlands. Due to the connectivity of the wetlands the impacts will be considered highly significant, regardless of the modified ecological sate of the wetlands and mitigation measures must be

Aspect	Residential/office complex	Agriculture - crops	Agriculture - Stock	Mining
				implemented to protect these areas as a priority. Status: -ve; Duration: Long-term; Extent: Local; Probability: Highly probable; Severity: High; Significance: High
Groundwater	Impacts to groundwater will largely be limited to the deterioration of the upper weathered aquifer as the area is superficially excavated for development and abstraction of water from boreholes if this should be utilised by residents for potable water supply. Status: -ve; Duration: Permanent; Extent: Local; Probability: Highly probable; Severity: Slight to moderate; Significance: Low	The excessive use of fertilisers, herbicides and insecticides may leach into the upper aquifer and impair water quality within this aquifer. The likelihood is low and with rainfall recharge, the aquifer could recover quickly if the sources of contamination were removed. Status: -ve; Duration: Medium-term; Extent: Local; Probability: Probable; Severity: Slight to moderate; Significance: Moderate to low	No impacts to groundwater expected. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	Several mining aspects will create risks to groundwater. These include: reduction of local groundwater levels as mine areas are dewatered and create a draw-down cone; alteration of the groundwater flow regime as earth strata are blasted and removed to excavate underlying coal; exposure of pyritic material to oxygen and water will result in the formation of AMD which will impair groundwater quality; the potential for groundwater plume migration and decant as mining ceases and groundwater levels rebound; and spillage or leaks of any hydrocarbon contaminants or “dirty water” seeping into the groundwater table. Mitigation will be required. Status: -ve; Duration: Long-term; Extent: Local; Probability: Highly probable; Severity: High; Significance: High
Air quality	Impacts to air quality will largely be limited to the construction phase. Status: -ve; Duration: Short-term; Extent: Local; Probability: Definite; Severity: Slight; Significance: Low	Crop production and associated farming activities will create dust. This is generally seasonal though. Contributions to dust are largely related to the utilisation of dirt roads by farm vehicles and farming vehicles preparing or working in the field when weather is dry and particulate matter is easily distributed into the atmosphere. Status: -ve; Duration: Long-term; Extent: Local; Probability: Definite; Severity: Slight to moderate; Significance: Moderate to low	No significant impacts to air quality expected. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	Opencast mining requires the stripping and mobilisation of soil, the blasting and mobilisation of overburden, extraction and stockpiling of raw coal, haulage of coal along dirt roads and various surface rehabilitation activities, all of which contribute to elevated dust levels in the area. This must be mitigated, especially during the dry winter season which is also associated with windier conditions which will aggravate more dust and distribute dust particles further. Status: -ve; Duration: Medium-term; Extent: Local; Probability: Definite; Severity: Moderate; Significance: Moderate
Noise	Impacts to noise through excessive noise generation will largely be limited to the construction phase. Status: -ve; Duration: Short-term; Extent: Local; Probability: Definite; Severity: Slight; Significance: Low	Crop production and associated farming activities will generate noise which will exceed ambient noise levels. Due to the fact that farming activities are largely conducted during daylight hours, the increased noise levels are unlikely to be a nuisance to surrounding residents, who are often likely to be workers on the farm. The impact of agricultural noise is considered low. Status: -ve; Duration: Long-term; Extent: Local; Probability: Definite; Severity: Slight; Significance: Low	No significant impacts to noise levels expected. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	Mining will contribute to elevated noise levels. The mining noise will become nuisance noise to surrounding residents due to the fact that the noise levels are higher the closer one is and due to the fact that the activity is continuous. Any noise generated during the night can be considered a significant impact on ambient noise as night time noise levels should be lower as fewer activities occur at night and nearby residents will be more aware of excessive noise. Any blasting activities are also considered extreme noise events even though these are brief and periodic. Status: -ve; Duration: Medium-term; Extent: Local;

Aspect	Residential/office complex	Agriculture - crops	Agriculture - Stock	Mining
				Probability: Definite; Severity: Slight to moderate; Significance: Moderate to low
Flora and Fauna	Residential/office development will result in a complete alteration of the biodiversity of the area. The site already shows signs of disturbance and is therefore not considered pristine. Impacts to flora and fauna associated with the wetland areas are considered significant (see Surface water section above). Furthermore, gardening activities are likely to introduce several exotic species to the area and may also inadvertently aggravate the establishment and spread of alien invasive species. Status: -ve; Duration: Permanent; Extent: Site specific; Probability: Definite; Severity: Slight to moderate; Significance: Moderate	Crop production has resulted in a complete alteration of the biodiversity of the area. The site already shows signs of past disturbance and is therefore not considered pristine. Impacts to flora and fauna associated with the wetland areas are considered significant (see Surface water section above). Status: -ve; Duration: Permanent; Extent: Site specific; Probability: Definite; Severity: Slight to moderate; Significance: Moderate to low	Grazing activities could aggravate current impacts on floral composition if not well managed. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Possible; Severity: Slight to moderate; Significance: Low	Opencast mining will result in a complete alteration of the biodiversity of the area. The site already shows signs of past disturbance and is therefore not considered pristine. Impacts to flora and fauna associated with the wetland areas are considered significant (see Surface water section above). Mitigation measures must be applied however to expedite rehabilitation. Status: -ve; Duration: Medium-term; Extent: Site specific; Probability: Definite; Severity: Slight to moderate; Significance: Moderate
Archaeology and heritage	No significant impacts to heritage sites expected, but could damage subterranean sites should such sites exist on the property. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Unlikely; Severity: Slight; Significance: Low	No significant impacts to heritage sites expected, but loss of context of the area may occur if crops are planted over such areas. Ploughing could also damage subterranean sites should such sites exist on the property. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Unlikely; Severity: Slight; Significance: Low	No significant impacts to heritage sites expected. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	Graves have been identified on site and will need to be preserved in situ by applying the appropriate 50 m buffer zone from surface activities and 50m buffer zones from mining. Grave sites are considered sensitive sites and impacts to these can be considered highly significant. No significant impacts to other heritage sites expected, but could damage subterranean sites should such sites exist on the property. Status: -ve; Duration: Long-term; Extent: Site specific; Probability: Unlikely; Severity: Slight; Significance: Low
Visual aspect	An altered visual sense will be created where the lands will move from a more natural scene to one of urban setting. The change of visual aesthetics is not considered highly significant due to the agricultural nature of the area. Status: -ve; Duration: Permanent; Extent: Local; Probability: Definite; Severity: Slight; Significance: Moderate to low	As the area is already one of crop farming, visual impacts are expected to be negligible to low as no change in visual characteristics will occur. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	No impacts to visual aesthetics expected. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	An altered visual sense will be created where the lands will move from a more natural scene to one of mining. After rehabilitation a natural scenic quality can largely be restored with proper rehabilitation of the site. The change of visual aesthetics is not considered highly significant due to the surrounding mining activities and servitudes present in the area. Status: -ve; Duration: Medium-term; Extent: Local; Probability: Definite; Severity: Slight to moderate; Significance: Moderate
Traffic and safety	Only impacts will be the increase in traffic regarding resident/employees in the area and when products or services related to the development are required. This is not considered a significant impact. Status: -ve; Duration: Permanent; Extent: Local; Probability: Definite; Severity: Slight; Significance: Low	As the area is already one of crop farming, significance of the impact and has been rated as neutral. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	No impacts to traffic and associated road safety expected. Status: Neutral; Duration: -; Extent: -; Probability: -; Severity: -; Significance: -	Public roads and associated road safety will only be impacted on with infrastructure and service delivery to site and again during decommissioning as infrastructure is removed with some additional traffic during operations through coal transportation. Public roads will therefore be affected with increased truck activity and higher associated risks of road degradation which will affect other road users. The area already has active mines in the area and the impact is not seen as highly significant.

Aspect	Residential/office complex	Agriculture - crops	Agriculture - Stock	Mining
				Status: -ve; Duration: Medium-term; Extent: Local; Probability: Definite; Severity: Slight to moderate; Significance: Moderate to low
Regional socio-economics	The development will provide brief employment during design and construction, with some minimal creation as people reside or commence working within the development. The impact is positive but has low significance. Status: +ve; Duration: Sort-term to Permanent; Extent: Local; Probability: Definite; Severity: Slight; Significance: Moderate to low	Crop farming will provide permanent employment for a few individuals. The impact is positive but low as the area is already an agricultural area. Status: +ve; Duration: Long-term; Extent: Local; Probability: Definite; Severity: Slight; Significance: Low	Stock farming will provide permanent employment for a few individuals. The impact is positive but low as the area is already an agricultural area. Status: +ve; Duration: Long-term; Extent: Local; Probability: Definite; Severity: Slight; Significance: Low	From a socio-economic perspective the mine will significantly improve livelihood of employees, but also negatively affect those who currently make a livelihood off affected properties and who may reside near to the proposed mine. The activities will be of medium term duration and through rehabilitation will allow other land uses associated with agriculture to continue on site and therefore continued socio-economic benefits associated with that land use. Through SLP initiatives, mine employees will be able to gain training in other sectors and small local businesses will be supported. Status: +ve; Duration: Medium-term; Extent: Local; Probability: Definite; Severity: Slight; Significance: Moderate to high
Cumulative assessment	The main cumulative effects of residential development will be around the permanent alteration of the area to residential. This means a permanent alteration of the soils, land capability, land use, floral and faunal biodiversity and a high risk of exotic species through gardening activities. The cumulative impacts are considered as moderate to high significance due to the permanent nature of the impacts.	Due to the fact that the area is under agriculture cumulative impacts associated with altered chemical characteristics of soils, alteration of floral and faunal biodiversity, continued and cyclic dust generation, the over-use of pesticides and fertilisers are considered existing. Overall cumulative impacts are considered to be of low significance.	The main impact is that of water use for livestock watering and the erosion and floral community alteration that may occur through overgrazing. These impacts are considered low as are cumulative contributions.	The operation of a mine will contribute most significantly to cumulative impacts. The detailed cumulative assessment is detailed later, but the operations will significantly contribute to drops in groundwater levels, severely reduced groundwater quality if poorly managed, which will have dire consequences on the tributaries near the properties if activities are not properly managed, and elevated dust and particulate matter. From a socio-economic perspective it will significantly improve livelihood of the several employees, but also negatively affect those who currently make a livelihood of affected properties and who reside near to the proposed mine.

8 PUBLIC PARTICIPATION PROCESS

Table 45 highlights the requirements for a public participation process as per NEMA. The NEMA Regulations for Public Participation (PPP) have been followed as these are more detailed than those stipulated within the MPRDA.

The PPP aims to involve the authorities and I&APs in the project process, and determines their needs, expectations and perceptions which in turn ensure a complete and comprehensive environmental study. An open and transparent process has and will be followed at all times and will be based on reciprocal dissemination of information. The following table details the PPP requirements as stipulated in NEMA.

This EIA / EMP report has been compiled to meet the requirements of both the MPRDA and the NEMA, and will be submitted to both sets of authorities for review and approval. This integrated approach enables the mine to have one (1) EMP report for the operation, ensuring a homogeneous approach to the environmental management on site throughout the LoM.

However, it must be noted that the timeframes as stipulated by the MPRDA for submission of the Scoping Report and the EIA / EMP Report does not allow for adequate time for the public review of these documents prior to submission to the DMR. Thus, it must be noted that the public review of this report is concurrent to the DMR's review period.

- In terms of the MPRDA, this EIA / EMP Report has been submitted to the DMR for review. The public review for this document will run concurrently, should any additional comments / concerns / changes be raised by the I&APs these will be forwarded to the DMR as an addendum to the EIA / EMP Report.
- In terms of the NEMA, this EIA / EMP Report has been submitted to the various authorities as a "Draft" for review and comment, any comments / concerns / changes raised by the various authorities will be incorporated into the Final EIA / EMP Report for submission to DEDET.
- In terms of the NEMA, this EIA / EMP Report has been made available for public review and comment, any comments / concerns / changes raised by the various authorities will be incorporated into the Final EIA / EMP Report for submission to DEDET.

Table 45: NEMA minimum PPP requirements

Legal and Regulatory Requirement:		Cross Reference:
NEMA Regulation 385, Section 56 – Public participation process		
1	This regulation only applies where specifically required by a provision of these regulations	
2	The person conducting the public participation process must take into account any guideline applicable to public participation and must give notice to all potential interested and affected parties of the application which is subjected to public participation by:	
a	Fixing a notice board at a places conspicuous to the public at the boundary or fence of	8.1.2.2

Legal and Regulatory Requirement:		Cross Reference:
i	The site where the activity to which the application relates is or is to be undertaken	8.1.2.2
ii	An alternative site mentioned	8.1.2.2
b	Giving written notice to	8.1.2
i	the owner or person in control of that land if the applicant is not the owner or person in control of the land	8.1.2.1
ii	the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken	8.1.2.1
iii	owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken	
iv	The municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area	8.1.1
v	The municipality which has jurisdiction in the area	8.1.1
vii	The organ of state having jurisdiction in respect of any aspect of the activity	8.1.1
vii	any other party as required by the competent authority	
c	Placing an advertisement in	8.1.2.3
i	One local newspaper; or	8.1.2.3
ii	Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations	N/A
d	Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or local municipality in which it is or will be undertaken: provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c) (ii)	8.1.2.3
e	using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desiring of but unable to participate in the process due	No instances noted
3	A notice, notice board or advertisement referred to in sub regulation (2) must –	8.1.2.2
a	Give details of the application which is subject to public participation	8.1.2.2
b	State -	
i	That the application has been or is to be submitted to the competent authority in terms of these regulations	8.1.2.2
ii	Whether basic assessment or scoping procedures are being applied to the application, in the case of an application for environmental authorisation	8.1.2.1
iii	The nature and location of the activity to which the application relates	8.1.2.1
iv	Where further information on the application or activity can be obtained	8.1.2.1
v	The manner in which and the person to whom representations in respect	8.1.2.1

Legal and Regulatory Requirement:		Cross Reference:
	of the application may be made	
4	A notice board referred to in sub regulation (2) must -	
a	be of a size at least 60cm by 42 cm	8.1.2.2
b	Display the required information in lettering and in a format as may be determined by the competent authority	8.1.2.2
5	Where deviation from sub regulation (2) may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub regulation to the extent and in the manner as may be agreed to by the competent authority	Noted. Full PPP was conducted
6	Where an environmental report or as contemplated in the NEMA regulations is amended because it has been rejected or because of a request for additional information by the competent authority, and such amended report contains new information, the amended report must be subjected to the PPP processes on the Understanding that the application form need not be resubmitted.	Noted. The final activities list has been included in this EMP
7	When complying with this regulation, the person conducting the public participation process must ensure that -	
a	Information containing all the relevant facts in respect of the application is made available to potential interested and affected parties	8.1.2.1
b	Participation by potential interested and affected parties is facilitated in such a manner that all potential interested and affected parties are provided with a reasonable opportunity to comment on the application.	8.1.3
8	Unless justified by exceptional circumstances, as agreed to by the competent authority, the applicant and EAP managing the environmental assessment process must refrain from conducting any public participation process during the period of 15 December to 2 January.	Noted. No PPP was conducted at this time

8.1 Scoping Phase

During the scoping phase for this particular project, the following steps were initiated and all relevant documents are attached in the PPP report, appended as Appendix N.

8.1.1 Identifying Regulatory Authorities:

The authorities for this project were identified from similar projects in the past. The authorities contacted with regards to this project include:

- The Department of Mineral Resources (DMR);
- The Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET);
- The Department of Water Affairs (DWA);
- Mpumalanga Tourism & Parks Board (MTPB);
- The South African Heritage Resources Agency (SAHRA);

- Govan Mbeki Local Municipality; and
- Gert Sibande District Municipality.

In addition, the following Authorities were informed of the project, and registered as stakeholders / I&APs:

- Land Claims Commissioners Office;
- The Department of Public Works, Roads and Transport;
- The Department of Agriculture, Rural Development and Land Administration;
- Msukaligwa Local Municipality
- Steve Tshwete Local Municipality (STLM); and
- Nkangala District Municipality (NDM).

A copy of the BID that was forwarded to all the authorities listed above is attached in Appendix N -**Annexure II.**

8.1.2 Identifying all Interested and Affected Parties (I&APs):

The public participation process (PPP) for this project was initiated in June 2013. An I&AP database was created using information from similar projects in the past and updated based on the responses received from the press advertisements, notices and the BID's sent out. The (I&APs) include a broad database of farmers, adjacent landowners, communities, local authorities, ward councillors and other interest groups. Please refer to Appendix N - **Annexure I** for a copy of the I&AP register**.**

A process of engagement was followed in order to ensure that all I&APs were given the opportunity to raise concerns regarding the proposed activities. Consultation with I&APs took place by the following means:

8.1.2.1 Background Information Document (BID)

Background Information Documents and Response forms notifying I&APs of the application were compiled in English and Afrikaans and were distributed to the I&APs via e-mail, post and fax. Persons who did not have access to a computer, fax machine or postal service were notified via hand delivered documents where possible, and SMS.

All adjacent landowners/occupiers/users were hand-delivered copies of the BID on the 03-06-2013.

The purpose of the Background Information Document was to:

- Identify I&APs;
- Invite members of the public to register as I&APs;
- Inform them of the current applications/processes;
- Initiate a process of public consultation to record perceptions and issues; and
- Invite I&APs to attend the Public Meeting.

A copy of the BID is attached in Appendix N - **Annexure II**.

8.1.2.2 Notices / Posters

Further to this, A2 posters written in English and Afrikaans were placed at the Govan Mbeki Local Municipality, Bethal Local Municipality, Bethal Local Library, Bethal Post Office, Hendrina Local Municipality and on the property boundary fences (Farm Halfgewonnen 190 IS). These posters informed the public of the proposed activities, invited (I&APs) to attend the public meeting and requested people to register as I&APs.

Copies of the Posters are attached in Appendix N - **Annexure IV.** Proof of consultation is attached in **Annexure VI** and a plan indicating the location of the posters has been included in **Annexure VII.**

8.1.2.3 Adverts

An advertisement, informing people of the proposed activities, the public meeting and requesting readers to register as I&APs, was placed in two (2) local newspapers. An English advertisement was placed in "The Echo Ridge" and an Afrikaans advert was placed in "The Highvelder" both on the 05th July 2013. (Please refer to Appendix N - **Annexure III** for a copy of these advertisements).

8.1.3 Introductory Public Meeting

A Public Meeting was held on the 24th July 2013 at the Bethal Local Library. All registered I&APs were notified of the meetings date through the BID's, posters and adverts. In addition, a reminder SMS was sent to all registered I&APs prior to the meeting. Minutes were taken at the meeting and these have been included in the Issues and Response table. (Please refer to Appendix N - **Annexure V** for a copy of the minutes and presentation)

The public meeting was also video recorded, should the department require a copy of this video, please contact Cabanga and a copy will be made available.

8.1.4 Micro Consultation Meetings

Individual meetings will be scheduled with the relevant land owners/lawful occupiers or any I&AP should they be requested and minutes of these meetings will be forwarded to the Department as soon as they become available.

No such meeting was requested during the Scoping Phase.

8.1.5 Document Review

Section 56(4) of R.543 of NEMA and its EIA Regulations states that a draft version of all environmental reports pertaining to the application be submitted to the competent authority, prior to its availability to I&APs for public review. As such the Scoping report was submitted to MDEDET for review and comment prior to public review.

Following which, the NEMA Scoping Report was made available for public review and comment and all registered I&APs were informed of its availability. I&APs were given forty (40) days to submit their comments to the EAP. The review period ran from the (02nd October – 11th November 2013). A copy of the report was made available at the Bethal Local

Library, Hendrina Local Library and at the Vilakazi Spaza shop on the Farm Halfgewonnen 190 IS. Electronic copies (Adobe PDF) were also made available to I&APs who request a copy in writing.

It should be noted that a separate public review and comment period was conducted for the Scoping report in terms of the MPRDA. Following submission of the Scoping Report to the DMR authorities, registered I&APs were given the opportunity to review and comment on that report over a 40 day period (15th July – 24th August 2013).

I&APs were notified in writing via fax, e-mail, post as well as SMS of the reports availability for public review and comment.

8.2 EIA Phase

During the EIA phase of this project, the following steps were undertaken:

8.2.1 Follow-up Public Meeting

A phase II public meeting was held on the 31st October 2013 at the Bethal Local Library. Invitations were sent out to all I&APs via e-mail, fax and post. In addition two (2) advertisements, inviting I&APs to attend the meeting were placed in two (2) local newspapers. English advertisements were placed in the "Eco Ridge" and "the Highvelder" on the 16th and 18th October 2013 respectively. In addition, a reminder SMS was send to all registered I&APs prior to the meeting. Minutes were taken at the meeting and these have been included in the Issues and Response table. (Please refer to Appendix N - **Annexure V** for a copy of the minutes and presentation)

The public meeting was also video recorded, should the department require a copy of this video, please contact Cabanga and a copy will be made available.

8.2.2 Micro-consultations

The current landowner of Portion RE and 17 of Halfgewonnen 190 IS (Mr B.Kourie) and the land occupiers/farm workers of the same properties (Vilakazi Family) had a meeting with Overlooked to discuss the sale of the property and the relocation of the Vilakazi family. This meeting was held on the 04th November 2013. Cabanga Concepts were not present / involved in this meeting and as such no minutes are attached to this report. It was noted that more meetings would be held as part of the negotiations.

8.2.3 Document Review

Section 56(4) of R.543 of NEMA and its EIA Regulations states that a draft version of all environmental reports pertaining to the application be submitted to the competent authority, prior to its availability to I&APs for public review. As such the EIA / EMP Report has been submitted to MDEDET following which it has been made available for public review. All comments and concerns raised during the public review period will be incorporated into the EIA / EMP document and this will then be re-submitted to MDEDET as a final.

As stated above, this document has also been submitted to the DMR in support of their mining right application, As the MPRDA does not allow for sufficient timeframes for public review prior to submission, the public review in terms of the MPRDA will run concurrently. Any comments and concerns raised during the public review will be incorporated into an updated PPP report and submitted to the DMR as an addendum to the EIA / EMP report.

The EIA / EMP report will be made available to the public for review and comment over a period of forty (40) days. All registered I&APs have / will be informed of the reports availability. A copy of the EIA/EMP report will /has been made available at the Local Library in Bethal and Hendrina, as well as at the Vilakazi Spaza shop on the Halfgewonnen Farm. Electronic copies (Adobe PDF and CD's) will also be made available to I&APs upon written request.

8.3 Issues and Response Summary

Table 46 below summarises the issues raised during the PPP undertaken to date, as well as the relevant responses.

Table 46: Issues and response table

Concern:	Issues Raised:	Response:
Surface Water:	Will the Olifants River be undermined?	No, the mine will not undermine the river; a 100 meter buffer has been left between the workings and the river.
Mining Activities:	Will the mine undermine the railway line or the public road on the southern portion of the mining area?	There are currently no plans to undermine any of these. There is a possibility that the public road may be deviated in future to allow for the opencast mining of Block B, but this is still being investigated.
	When will the project start and how long will it last?	Mining including construction and decommissioning it is roughly eight years. Thereafter rehabilitation and monitoring is an addition three years. The mine can only commence once all licenses have been granted.
	There are farm dwellers living around the site that will be affected by blasting and must be notified prior to a blast.	A seizmograph will be set up at sensitive receptors to monitor the impacts of the blasts. Notifications of blasting eventss will be sent to the surrounding landusers via bulk SMS.
Transportation:	Where will the coal be transported to?	Overlooked needs to approach Eskom and negotiate with them, Eskom will decide on a power station based on quality of the product.
	Will the coal be trucked, put on a railway or conveyor belt?	It is a high probability that it will be trucked, but Eskom will send their trucking contractor.
	Will the mine be hauling material over the main road as it separates the plant from the opencast and underground areas?	Block B opencast is separated by the main road. The main road and bridge over the Olifants are in the process of being upgraded. This may affect the layout of the mine plan. The possibility of diverting the public road is also being investigated.
Land Claims:	Are there any land claims on this property? What will happen in five years the mine receives a letter stating that the land belongs to someone else?	The land claims department has been notified; they will respond if there are any land claims and give the mine the details. To date we have not received anything from the department. The surface rights ownership of a property does not affect the mineral rights, as these are owned by the government.
Land Use	Mining including construction and decommissioning it is	Noted.

Concern:	Issues Raised:	Response:
Application:	roughly eight years. Thereafter rehabilitation and monitoring is an addition three years. The mine can only commence once all licenses have been granted.	An application for change in land use is currently underway.
Heritage:	The area investigated has been previously disturbed by agricultural activities. The likelihood of the development impacting on archaeological material is therefore low.	Noted.
	Site 1 identified is a burial ground containing +-21 burials dated (1949-1983). Underground mining is proposed for this area and therefore limited impact is expected.	Noted. Appendix K includes management measures for the conservation of these graves, these management measures are reiterated in the EMP.
	Site 2 is a historical farm werf consisting of two houses, a wagon shed and a historical post office. This resource has a proposed grading of 3B.	Site 2 falls within the proposed opencast mining area. Should these buildings remain in situ, a large portion of the minable reserves will be sterilised potentially affecting the viability of the project. As per the investigations undertaken by the archaeologist (see Appendix J and Appendix K) the heritage value of these buildings is not high enough to validate the conservation thereof. It is the intention of the mine to apply for a permit from SAHRA to have these buildings demolished.
	Please provide SAHRA with an assessment of the impacts of the proposed development on palaeontological resources.	A desktop palaeontological study has been undertaken by Dr Barry Millsteed. This report was forwarded to SAHRA and is attached as Appendix L .
	Details of the scope, the layout and infrastructure are required in addition to information regarding the extent.	A copy of the Scoping Report including the necessary layout plans was uploaded onto the SAHRA site for review and comment.
	Please note that resources identified must not be disturbed and must remain in situ. The proposed mine plan must take this into account.	Site 2 falls within the proposed opencast mining area. Should these buildings remain in situ, a large portion of the minable reserves will be sterilised potentially affecting the viability of the project. As per the investigations undertaken by the archaeologist (see Appendix J and Appendix K) the heritage value of these buildings is not high enough to validate the conservation thereof. It is the intention of the mine to apply for a permit from SAHRA to have these buildings demolished they will however, temporarily be utilised as

Concern:	Issues Raised:	Response:
		offices until such time that this permit is issued. Appendix K documents the buildings in detail. Site 1, being the graveyard, will remain in situ. This area will be fenced off and a 20m buffer zone implemented as per the recommendations made in the CMP attached as Appendix K.
	A conservation management plan is required for the graves identified in order to ensure their conservation into the future. This must form part of the EMP.	Please refer to Appendix K.
	Will the mine classify grave sites according to the act and move them accordingly or what will be done?	Graves have been classified according to the NHRA. These will be left in situ, fenced off and the necessary buffer zones implemented. It is not expected that any graves will be relocated.
	Following the submission of the palaeontological study, SAHRA has no objection to the proposed development on condition that resources identified at site 2 must not be disturbed and remain *in situ.* If not possible, a full heritage statement is required before comment can be given.	Site 2 falls within the proposed opencast mining area. Should these buildings remain in situ, a large portion of the minable reserves will be sterilised potentially affecting the viability of the project. As per the investigations undertaken by the archaeologist (see Appendix J and Appendix K the heritage value of these buildings is not high enough to validate the conservation thereof. It is the intention of the mine to apply for a permit from SAHRA to have these buildings demolished they will however, temporarily be utilised as offices until such time that this permit is issued. Appendix K documents the buildings in detail.
	A CMP is required for the graves at site 1 for their conservation and must be included in the EMP.	Noted this has been undertaken and is attached as Appendix K, this report will be submitted to SAHRA.
	A thorough site inspection of the outcrops areas to be mined is required prior to mining and must consider the palaeontological resources identified. This report must then be submitted to SAHRA.	The possibility of outcrops is currently being investigated, in the event that these may occur on site, a palaeontologist will be contracted to undertake a surface inspection prior to commencement of mining activities. Copies of all reports in this regard will be forwarded to SAHRA.
	Should any evidence of archaeological sites or remains be found during the operations, SAHRA APM Unit must be alerted and a professional must be contacted. If the findings	Noted.

Concern:	Issues Raised:	Response:
	are regarded as significant a phase 2 rescue operation might be necessary.	
Public Participation:	The BID does not address our security concerns as TCSA also conducts mining activities on Forzando and is the owner of Portion 5 of Halfgewonnen.	The purpose of a BID is to introduce the project to I&APs, not to address concerns. An agreement is in place with TCSA regarding access to site whilst undertaking the necessary studies. A surface rights agreement will be put in place prior to mining taking place on site.
	Stated that the farmers who are leasing the properties in question must be consulted.	All farmers who are leasing the various properties, land owners and occupiers have been consulted to date.
	Numerous I&APs requested to be registered for the project and kept informed.	These I&APs have been registered and will be informed of the projects progress.
	Numerous I&APs requested copies of the MPRDA Scoping Report for review and comment.	Electronic copies of the Scoping Report were posted to each of the I&APs who made the request.
	Has the municipality been notified of this operation?	Yes, the mine has held a meeting with the municipality to discuss the S&LP. The Municipality has been registered as an I&AP.
Social & Labour Plan:	Interested and employment opportunities with the mine.	Umsizi has been contracted to deal with S&LP related issues. Umsizi will be present at the next public meeting to address any comments.
	Will the family living on the farm be moved?	One family has been identified on site, the Vilakazi family. This family will be relocated; this will form part of the negotiations with the surface rights holder.
	Will people with disabilities be considered in employment; in terms of the acts a certain amount of people with disabilities must be considered.	Yes. Umsizi has been contracted to deal with S&LP related issues. Provisions have been made in the S&LP for people with disabilities; a one day workshop will be established by Umsizi to discuss further.
	What is the process of companies registering for construction or for work and employment opportunities?	This will go out on tender and local companies will be given priority. Skills transfer will be done as well as training programs. This all forms part of the LED under the S&LP.
	When will the S&LP be completed and implemented?	The S&LP is complete and was submitted as part of the mining right application as required by the MPRDA. Once all the necessary licenses are approved and mining commences, the

Concern:	Issues Raised:	Response:
		SLP will be initiated.
	The youth need to be trained to be able to work on the mines, how will Overlooked help the youth with training?	Umsizi have been contracted to deal the S&LP related issues. A one day workshop / Forum will be established by Umsizi to discuss further.
	The mine will need laborers, how will they prepare for that and implement the S&LP plan?	Adverts will be placed for specific jobs in a local newspapers, an S&LP forum where these issues can be discussed will be established by Umsizi.
	Whose responsibility will it be to ensure that the S&LP plan is implemented the contractor or the mine?	The S&LP will be approved as part of the mining right, the contractors will be employed by the mine and must adhere to the S&LP. This then has to be audited and the results submitted to DMR.
	What will the impacts of the mine be on the community, how many jobs will be created and what are the proposed S&LP developments?	Umsizi have been contracted to deal the S&LP related issues. The S&LP has been submitted but has not yet been approved; a total of 101 people will be employed by year five when underground mining is expected to start. The LED projects that have been proposed in conjunction with the municipality are the water reserve project in extension 15 and a road upgrade project in Bethal; these projects were insisted by the Municipality. A one day workshop / Forum will be established by Umsizi to discuss further.
	Asked that Umsizi assist with learner ship in the communities. The small companies surrounding the mine must also be considered.	A one day workshop / Forum will be established by Umsizi to discuss further.

9 ENVIRONMENTAL IMPACT ASSESSMENT

Impact assessment methods were developed to: (1) identify the potential impacts of a proposed development on the social and natural environment; (2) predict the probability of these impacts and (3) evaluate the significance of the potential impacts. Please refer to Section 3.1 for further explanation on the methodology on how the risk assessment was compiled.

Table 47 lists the activities of relevance during the different phases of mining and the details of the impacts and mitigation measures.

Table 47: Activity based impact assessment and proposed mitigation and monitoring activities

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
PLANNING AND DESIGN PHASE																							
ACTIVITY: Site visits and site assessments																							
SUB ACTIVITY: Vehicle and foot traffic on site																							
Air quality	Dust generation	Neg	2	1	1	1	5	4	20	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	1	1	1	4	3	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	1	1	1	4	4	16	Y	Low	Vehicles to site must be properly serviced to reduce excessive emissions.	1	1	1	1	4	3	12	Contractor	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	2	2	1	3	8	2	16	Y	Low	Vehicles to site must be adequately serviced to reduce risk of leaks. Leaks should be treated immediately with absorbent material and spill kits.	2	2	1	3	8	1	8	Site manager	-	-	-
Noise	Increased noise levels	Neg	1	1	1	1	4	4	16	N	-	-	1	1	1	1	4	4	16	Site manager	-	-	-
Soils	Potential compaction of soils	Neg	2	1	1	3	7	3	21	Y	Low	Activity should be limited to area of disturbance. Where required the compacted soils should be disked to an adequate depth and re-vegetated with indigenous plants.	2	1	1	3	7	2	14	Site manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	2	2	1	3	8	2	16	Y	Low	Vehicles to site must be adequately serviced to reduce risk of leaks. Leaks should be treated immediately with absorbent material and spill kits.	1	2	1	3	7	1	7	Site manager	-	-	-
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	2	2	1	3	8	2	16	Y	Low	Vehicles to site must be adequately serviced to reduce risk of leaks. Leaks should be treated immediately with absorbent material and spill kits.	1	2	1	3	7	1	7	Site manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Traffic & safety	Increased potential for road incidences	Neg	3	1	1	5	10	2	20	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. All vehicles to site must be in road worthy condition.	3	1	1	5	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	1	3	9	1	9	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	1	3	9	1	9	Site manager	Inspect intersections and roads	Monthly	Running cost

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
CONSTRUCTION PHASE																							
ACTIVITY: Construction of water management features, silt trap and PCDs. NEMA: R.544: Activity 12; R.545: Activity 5; R.546: Activity 14(a)(i)																							
SUB ACTIVITY: Truck and heavy machinery operation																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	2	1	6	4	24	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Low	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	2	1	2	3	8	3	24	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	1	1	1	1	4	2	8	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	3	2	2	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Traffic & safety	Increased potential for road incidences	Neg	4	1	1	5	11	3	33	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	1	5	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	1	3	9	4	36	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	1	3	9	1	9	Site manager	Inspect intersections and roads	Monthly	Running cost

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
SUB ACTIVITY: Removal of herbaceous material with soil stripping																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	3	5	5	5	18	1	18	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Archaeological & cultural sites	Potential disruption to grave sites	Neg	5	3	5	5	18	1	18	Y	High	Should graves be observed on site during activity progress then all activity should ceased and the area demarcated as a no-go zone. A specialists will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Flora	Loss of biodiversity of degraded grassland	Neg	1	1	3	1	6	5	30	N	Mod	Plan activities carefully so that only vegetation that needs to be impacted is impacted. Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. Ensure relevant permits are in place before proceeding with any activities in wetlands. Permanent demarcation of wetland areas that will not be mined must be completed during construction phase.	1	1	3	1	6	5	30	Environmental manager	Inspect progress of construction & ensure activity is in designated areas	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Construct drainage and erosion controls in advance of all activities. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible.	1	1	2	1	5	2	10	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Soils	Loss of fertile topsoil layer	Neg	2	1	1	3	7	5	35	Y	Mod	Remove and store topmost layer (>500 mm) separately. All excavated topsoil will be stored for use during rehabilitation at decommissioning of the mine. Topsoil and underlying material should be stored separately. Topsoil conservation will mitigate impact and provide adequate quality and quantity soil in order to re-established required end land use. The most critical component of the soil, with respect to successful rehabilitation, is the need to restore the soil moisture characteristics, as well as to limit compaction and/or crusting.	1	1	1	3	6	2	12	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
SUB ACTIVITY: Berm and channel construction																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	1	1	5	2	10	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Develop a drainage control system for the mine lease area. Integrate drainage, erosion and sediment control into each stage of the mining operation. Develop a mining and rehabilitation plan prior to initiating mining activities. Construct drainage and erosion controls in advance of mining activities. Divert storm runoff away from areas with high erosion potential. Incorporate measures to reduce the flow velocity of storm water runoff. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible. Maintain drainage and erosion control measures at all times	1	1	2	1	5	2	10	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Alteration of topography	Neg	1	1	3	3	8	5	40	N	-	-	1	1	3	3	8	5	40	Site manager	-	-	-
SUB ACTIVITY: Silt trap construction																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible.	1	1	2	1	5	2	10	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Surface water	Downstream water quantity of catchment reduced	Neg	3	2	2	3	10	5	50	N	Mod	Necessary measure to prevent pollution downstream.	3	2	2	3	10	5	50	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Surface water & associated wetlands	Containment of contaminated water	Pos	5	2	3	1	11	4	44	N	-	-	5	2	3	1	11	4	44	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Topography	Alteration of topography	Neg	1	1	3	3	8	5	40	N	-	-	1	1	3	3	8	5	40	Site manager	-	-	
SUB ACTIVITY: PCD construction																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible.	1	1	2	1	5	2	10	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Surface water	Downstream water quantity of catchment reduced	Neg	3	2	2	3	10	5	50	N	Mod	Necessary measure to prevent pollution downstream.	3	2	2	3	10	5	50	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Surface water & associated wetlands	Containment of contaminated water	Pos	5	2	3	1	11	4	44	N	-	-	5	2	3	1	11	4	44	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Topography	Alteration of topography	Neg	1	1	3	3	8	5	40	N	-	-	1	1	3	3	8	5	40	Site manager	-	-	
ACTIVITY: Upgrade & construction of access and main haul roads NEMA: R.544: Activity 22; R.546: Activity 14(a)(i)																							
SUB ACTIVITY: Truck and heavy machinery operation																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00

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Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	2	1	6	4	24	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Low	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	2	1	2	3	8	3	24	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	1	1	1	1	4	2	8	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	3	2	2	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Traffic & safety	Increased potential for road incidences	Neg	4	1	1	5	11	3	33	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	1	5	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	1	3	9	4	36	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	1	3	9	1	9	Site manager	Inspect intersections and roads	Monthly	Running cost
SUB ACTIVITY: Removal of herbaceous material with soil stripping																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	3	5	5	5	18	1	18	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Archaeological & cultural sites	Potential disruption to grave sites	Neg	5	3	5	5	18	1	18	Y	High	Should graves be observed on site during activity progress then all activity should ceased and the area demarcated as a no-go zone. A specialists will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Flora	Loss of biodiversity of degraded grassland and marginal moist grassland	Neg	3	1	3	3	10	4	40	Y	Mod	Plan activities carefully so that only vegetation that needs to be impacted is impacted. Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. Ensure relevant permits are in place before proceeding with any activities in wetlands. Permanent demarcation of wetland areas that will not be mined must be completed during construction phase.	1	1	3	3	8	2	16	Environmental manager	Inspect progress of construction & ensure activity is in designated areas	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Construct drainage and erosion controls in advance of all activities. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible.	1	1	2	1	5	2	10	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Soils	Loss of fertile topsoil layer	Neg	2	1	1	3	7	5	35	Y	Mod	Remove and store topmost layer (>500 mm) separately. All excavated topsoil will be stored for use during rehabilitation at decommissioning of the mine. Topsoil and underlying material should be stored separately. Topsoil conservation will mitigate impact and provide adequate quality and quantity soil in order to re-established required end land use. The most critical component of the soil, with respect to successful rehabilitation, is the need to restore the soil moisture characteristics, as well as to limit compaction and/or crusting.	1	1	1	3	6	2	12	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
SUB ACTIVITY: Berm construction																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	1	1	5	2	10	Environmental manager	Dust monitoring	Monthly	R 155 000.00

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Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Develop a drainage control system for the mine lease area. Integrate drainage, erosion and sediment control into each stage of the mining operation. Develop a mining and rehabilitation plan prior to initiating mining activities. Construct drainage and erosion controls in advance of mining activities. Divert storm runoff away from areas with high erosion potential. Incorporate measures to reduce the flow velocity of storm water runoff. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible. Maintain drainage and erosion control measures at all times	1	1	2	1	5	2	10	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Alteration of topography	Neg	1	1	3	3	8	5	40	N	-	-	1	1	3	3	8	5	40	Site manager	-	-	-
Air quality	Dust generation	Neg	1	2	2	1	6	3	18	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00

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ACTIVITY: Preparation of mine infrastructure area NEMA: R.544: Activity 11, 18(i), 26; R.546: Activity 13(c)(ii)(cc), 14(a)(i), 16(a)(ii)(dd)																							
SUB ACTIVITY: Truck and heavy machinery operation																							
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	2	1	6	4	24	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Low	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	2	1	2	3	8	3	24	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	1	1	1	1	4	2	8	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	3	2	2	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Traffic & safety	Increased potential for road incidences	Neg	4	1	1	5	11	3	33	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	1	5	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost

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Traffic & safety	Road degradation	Neg	3	2	1	3	9	4	36	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	1	3	9	1	9	Site manager	Inspect intersections and roads	Monthly	Running cost
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	3	5	5	5	18	1	18	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Archaeological & cultural sites	Potential disruption to grave sites	Neg	5	3	5	5	18	1	18	Y	High	Should graves be observed on site during activity progress then all activity should ceased and the area demarcated as a no-go zone. A specialists will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Flora	Loss of biodiversity of degraded grassland	Neg	1	1	3	1	6	5	30	N	Mod	Plan activities carefully so that only vegetation that needs to be impacted is impacted. Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. Ensure relevant permits are in place before proceeding with any activities in wetlands. Permanent demarcation of wetland areas that will not be mined must be completed during construction phase.	1	1	3	1	6	5	30	Environmental manager	Inspect progress of construction & ensure activity is in designated areas	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Construct drainage and erosion controls in advance of all activities. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible.	1	1	2	1	5	2	10	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Soils	Loss of fertile topsoil layer	Neg	2	1	1	3	7	5	35	Y	Mod	Remove and store topmost layer (>500 mm) separately. All excavated topsoil will be stored for use during rehabilitation at decommissioning of the mine. Topsoil and underlying material should be stored separately. Topsoil conservation will mitigate impact and provide adequate quality and quantity soil in order to re-established required end land use. The most critical component of the soil, with respect to successful rehabilitation, is the need to restore the soil moisture characteristics, as well as to limit compaction and/or crusting.	1	1	1	3	6	2	12	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00

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Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Develop a drainage control system for the mine lease area. Integrate drainage, erosion and sediment control into each stage of the mining operation. Develop a mining and rehabilitation plan prior to initiating mining activities. Construct drainage and erosion controls in advance of mining activities. Divert storm runoff away from areas with high erosion potential. Incorporate measures to reduce the flow velocity of storm water runoff. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible. Maintain drainage and erosion control measures at all times	1	1	2	1	5	2	10	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Alteration of topography	Neg	1	1	3	3	8	5	40	N	-	-	1	1	3	3	8	5	40	Site manager	-	-	-
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00

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Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	2	1	6	4	24	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Low	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	2	1	2	3	8	3	24	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	1	1	1	1	4	2	8	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	3	2	2	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Traffic & safety	Increased potential for road incidences	Neg	4	1	1	5	11	3	33	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	1	5	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	1	3	9	4	36	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	1	3	9	1	9	Site manager	Inspect intersections and roads	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00

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Soils	Potential damage to nearby soils if indiscriminate cement mixing and pouring takes place	Neg	3	1	1	3	8	2	16	Y	Low	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated as per the emergency response plan. For large spills Hazmat will called in.	1	1	1	1	4	2	8	Site manager	Inspect areas where construction activities take place	Weekly	Running cost
Wetlands	Potential damage to wetlands if indiscriminate cement mixing and pouring takes place	Neg	4	2	2	3	11	4	44	Y	Mod	Cement should only be handled outside wetland areas and over protected ground, such as appropriate sheeting. Ensure adequate buffers are in place from all wetland areas and designate these as no-go areas unless relevant authorisations are in place. In the event of damage to the wetland, ensure that a suitably qualified rehabilitation specialist is appointed to rectify the impacts. All affected areas will need to be disced and re-vegetated.	2	2	2	3	9	2	18	Site Manager	Inspect areas where construction activities take place	Weekly	Running costs
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	3	27	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Social	Potential danger to surrounding communities	Neg	5	2	5	5	17	3	51	Y	-	Ensure all power lines and pylons are within specifications. Ensure that all power-related structures are adequately marked with relevant signs and warnings and fenced off with access control.	5	2	5	5	17	2	34	Environmental manager	Inspect areas: ensure fences are not damaged & no illegal connections have been added to power-generation infrastructure	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	Rigs will be regularly serviced to reduce risk of leaks. Pans will be placed under potential leak sites. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	5	2	1	3	11	3	33	Y	Low	Rigs will be regularly serviced to reduce risk of leaks. Pans will be placed under potential leak sites. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will called in.	3	2	1	3	9	2	18	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Rigs will be regularly serviced to reduce risk of leaks. Pans will be placed under potential leak sites. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will called in.	3	2	2	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00

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Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Groundwater	Reduction of local groundwater	Neg	2	2	2	3	9	4	36	N	Low	Utilise water on site responsibly. Ensure all pipelines and water containment facilities are adequately sealed to prevent leaks. Record water usage by attaching meters to all pumps. Ensure compensation procedure is in place should registered water users be affected.	2	2	2	3	9	4	36	Environmental manager	Monitor water usage. Inspect all water pipelines and water containment facilities for leaks & groundwater level monitoring.	Continuous, Weekly & Quarterly	Running cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	3	27	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	3	27	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Groundwater	Irresponsible use of water will impact on groundwater quantity	Neg	2	2	2	3	9	4	36	Y	Low	Saving water initiatives will be included in environmental awareness training. Fit potable water areas with meters to record water use.	3	2	1	1	7	2	14	Environmental manager	Inspect all potable water works for leaks. Monitor water use.	Weekly	Running cost
Groundwater	Potential harm through sewage leaks	Neg	3	2	2	1	8	3	24	Y	Mod	Portable toilets will be managed by reputable contractors and inspected for any potential leaks which will be immediately repaired.	3	2	2	1	8	2	16	Environmental manager	Inspect toilets and related piping for leaks & Groundwater monitoring	Weekly & Quarterly	Contractors cost & R 200,000.00
Soils	Potential harm through sewage leaks	Neg	2	1	2	1	6	2	12	Y	Low	Portable toilets will be managed by reputable contractors and inspected for any potential leaks which will be immediately repaired.	2	1	2	1	6	1	6	Environmental manager	Inspect toilets and related piping for leaks	Weekly	Contractors cost
Surface water & associated wetlands	Potential harm through sewage leaks	Neg	3	2	2	1	8	3	24	Y	Mod	Portable toilets will be managed by reputable contractors and inspected for any potential leaks which will be immediately repaired.	3	2	2	1	8	1	8	Environmental manager	Inspect toilets and related piping for leaks & Surface water monitoring	Weekly & Monthly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	3	27	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	Rigs will be regularly serviced to reduce risk of leaks. Pans will be placed under potential leak sites. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will called in.	2	1	3	3	9	2	18	Site & Environmental manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	4	1	2	3	10	3	30	Y	Low	All hydrocarbons will be stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	3	1	2	3	9	2	18	Site & Environmental manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Running cost

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Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	5	13	3	39	Y	Mod	All hydrocarbons will be stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	2	2	2	3	9	2	18	Site & Environmental manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Running cost
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	2	1	6	4	24	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	2	1	2	3	8	3	24	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	1	1	1	1	4	2	8	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	3	2	2	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Traffic & safety	Increased potential for road incidences	Neg	4	1	2	5	12	3	36	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	2	5	11	1	11	Site manager	Inspect intersections and roads	Monthly	Running cost

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Traffic & safety	Road degradation	Neg	3	2	2	3	10	4	40	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	2	3	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	3	5	5	5	18	1	18	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Archaeological & cultural sites	Potential disruption to grave sites	Neg	5	3	5	5	18	1	18	Y	High	Should graves be observed on site during activity progress then all activity should ceased and the area demarcated as a no-go zone. A specialists will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Flora	Loss of biodiversity of degraded grassland and marginal moist grassland	Neg	3	1	3	3	10	4	40	Y	Mod	Plan activities carefully so that only vegetation that needs to be impacted is impacted. Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. Ensure relevant permits are in place before proceeding with any activities in wetlands. Permanent demarcation of wetland areas that will not be mined must be completed during construction phase.	1	3	3	8	2	16	32	Environmental manager	Inspect progress of construction & ensure activity is in designated areas	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Construct drainage and erosion controls in advance of all activities. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible.	1	1	2	1	5	2	10	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Soils	Loss of fertile topsoil layer	Neg	2	1	1	3	7	5	35	Y	Mod	Remove and store topmost layer (>500 mm) separately. All excavated topsoil will be stored for use during rehabilitation at decommissioning of the mine. Topsoil and underlying material should be stored separately. Topsoil conservation will mitigate impact and provide adequate quality and quantity soil in order to re-established required end land use. The most critical component of the soil, with respect to successful rehabilitation, is the need to restore the soil moisture characteristics, as well as to limit compaction and/or crusting.	1	1	1	3	6	2	12	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00

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Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Low	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	1	3	6	2	12	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential for erosion	Neg	3	1	1	3	8	2	16	Y	Low	Minimise the area which is disturbed at any one time. Develop a drainage control system for the mine lease area. Integrate drainage, erosion and sediment control into each stage of the mining operation. Develop a mining and rehabilitation plan prior to initiating mining activities. Construct drainage and erosion controls in advance of mining activities. Divert storm runoff away from areas with high erosion potential. Incorporate measures to reduce the flow velocity of storm water runoff. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible. Maintain drainage and erosion control measures at all times	1	1	2	1	5	2	10	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Alteration of topography	Neg	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Environmental manager	Inspect all water management features on site & Biomonitoring	Weekly & Every 6 months	Running cost & R 110,000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Groundwater	Alteration of weathered aquifer flow dynamics	Neg	2	2	2	3	9	4	36	N	Low	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	2	2	3	9	4	36	Environmental manager	-	-	-
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00

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Soils	Potential for erosion, loss of soil characteristics, compaction of soil & soil degradation through stockpiling	Neg	3	1	1	3	8	2	16	Y	Low	Re-vegetate any bare soil immediately. Herbaceous plant mater should be stockpiled to retain organic content of soil. Stockpiles should be to the specifications of the pedological study.	1	1	2	1	5	2	10	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	3	2	3	3	11	2	22	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Alteration of topography	Neg	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Site manager	-	-	-
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Air quality	Dust generation	Neg	3	2	2	1	8	5	40	Y	Low	A water cart will be used to spray relevant areas when dust levels are high. Alternative blasting methods will be considered to reduce dust generation. Blasting should not be conducted when it is very windy.	2	2	2	2	8	3	24	Site & Environmental manager	Dust monitoring	Monthly	R 155 000.00
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	5	1	5	5	16	2	32	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Geology	Disturbance of geological strata	Neg	5	1	5	5	16	5	80	N	High	-	5	1	5	5	16	5	80	Site manager	-	-	-
Groundwater	Generation of poor quality leachate which may contaminate aquifers	Neg	5	2	5	3	15	1	15	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	5	2	5	3	15	1	15	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Potential damage to groundwater aquifers and alteration of groundwater flow	Neg	2	2	2	3	9	4	36	N	Low	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	2	2	3	9	4	36	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Noise	Increased noise levels	Neg	3	3	1	1	8	5	40	Y	-	Blasting alternatives will be considered to reduce noise and associated vibrations if I&AP complaints are received	2	2	1	1	6	4	24	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Social	Vibrations may damage structures in the area and disturb farm animals	Neg	4	2	3	3	12	4	48	Y	-	Consider blasting procedures that will reduce surface vibrations and blast noise as far as possible. Utilise free-digging as far as possible. Ensure baseline photographs are taken of all structures which may be impacted for photographic evidence prior to any blasting. Ensure procedures in place to compensate for damage.	3	1	3	3	10	4	40	Social Manager	Inspect all complaints received and compare against photographic evidence.	As required	Running costs & dependent on extent of damage.
Topography	Alteration of topography	Neg	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Environmental manager	-	-	-
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00

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Groundwater	Potential for poor quality leachate impacting on groundwater	Neg	5	2	5	3	15	1	15	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	5	2	5	3	15	1	15	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	3	1	3	3	10	5	50	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for poor quality leachate impacting on nearby soil	Neg	3	2	2	3	10	2	20	Y	Low	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Clean out silt build up in trenches over dry season	2	2	2	3	9	2	18	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Potential for poor quality leachate impacting on nearby water bodies	Neg	5	3	3	3	14	3	42	Y	Mod	Ensure adequate buffers are in place from all wetland areas and designate these as no-go areas unless relevant authorisations are in place. Stockpiles must be in designated areas with erosion control measures and water management features in place. In the event of impact to the wetland, ensure that a suitably qualified geohydrologist is appointed to rectify the impacts. Consider construction of cut-off trench to capture poor quality groundwater and direct this to the PCD.	4	2	3	3	12	3	36	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Alteration of topography	Neg	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Site manager	-	-	-
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Groundwater	Reduction of local groundwater	Neg	2	2	2	3	9	4	36	N	Low	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	2	2	3	9	4	36	Site & Environmental manager	Monitor water usage. Inspect all water pipelines and water containment facilities for leaks & groundwater level monitoring.	Continuous, Weekly & Quarterly	Running cost & R 200,000.00
Groundwater	Alteration of groundwater flow	Neg	2	2	2	3	9	4	36	N	Low	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	2	2	3	9	4	36	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00

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Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Groundwater	Reduction of local groundwater	Neg	2	2	2	3	9	4	36	N	Low	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	2	2	3	9	4	36	Site & Environmental manager	Monitor water usage. Inspect all water pipelines and water containment facilities for leaks & groundwater level monitoring.	Continuous, Weekly & Quarterly	Running cost & R 200,000.00
Groundwater	Alteration of groundwater flow	Neg	2	2	2	3	9	4	36	N	Low	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	2	2	3	9	4	36	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Potential for poor quality water impacting on groundwater if pipeline burst or leak	Neg	5	2	5	3	15	1	15	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	5	2	5	3	15	1	15	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Soils	Potential for poor quality water impacting on nearby soils if pipeline burst or leak	Neg	4	2	2	3	11	2	22	Y	Low	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Pipelines should be laid in paddocks which will serve to contain any leaks that may occur. Pipelines should have a series of shut-off valves which can prevent flow of contaminated water should leaks occur. Emergency response procedures will be followed.	2	1	2	3	8	1	8	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Potential for poor quality water impacting on nearby water bodies if pipeline burst or leak	Neg	5	3	3	3	14	3	42	Y	Mod	Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place. Establish diversion berms and silt traps as needed to prevent runoff from construction area flowing into natural water bodies. Pipelines carrying high loads of contaminated water should be placed within actively managed dirty areas and consideration should be given to constructing paddocks to contain spills.	4	2	3	3	12	3	36	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Noise levels in the area are already elevated above 45dBA level for residential but well within 60dBA for the industrial areas as may be associated with mining. Therefore it is expected that additional noise levels contributed by Overlooked will be insignificant. Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Fauna	Potential harm through littering	Neg	3	1	3	3	10	2	20	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	1	1	1	3	6	1	6	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Groundwater	Potential contamination through littering	Neg	3	1	3	3	10	2	20	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	3	1	2	1	7	1	7	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost

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Soils	Potential contamination through littering	Neg	3	1	3	3	10	2	20	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	1	3	3	9	2	18	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Surface water & associated wetlands	Potential contamination through littering	Neg	3	2	3	3	11	2	22	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	3	2	3	1	9	1	9	Site manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Visual Aspect	Loss of aesthetics	Neg	3	1	2	3	9	3	27	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	1	2	3	8	2	16		Inspect area for illegal littering and dumping	Monthly	Running cost
Land Use	Will change to mining and other uses over opencast and infrastructure areas	Neg	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Land Capability	Loss in grazing and arable plant production potential over opencast and infrastructure areas	Neg	3	1	3	3	10	5	50	N	-	No mitigation but apply soil management measures.	3	1	3	3	10	5	50	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Fauna	Loss of habitat, refuge and food for animals and fragmentation and loss of ecological corridors	Neg	3	2	4	3	12	5	60	Y	Low	Ecologically sensitive areas associated with wetlands, which also form ecological corridors, should be avoided and preserved as far as possible until relevant authorisations under DWA and NEMA are obtained. Activity must strictly remain in areas targeted for development and associated access roads and remaining areas should be preserved in situ. To achieve this, areas of activity should be properly demarcated. Relocate larger animals with the aide of specialists if such species are under threat from the development. Ensure relevant permits are in place.	3	2	4	3	12	4	48	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Fauna	Alienation of, and disturbance to, animals	Neg	3	2	3	3	11	5	55	Y	Low	Inform staff, contractors and visitors to not harm fauna in the area. Any fencing or barrier that is established must consider animals that may move through the area and provide the means for animals to do so, such as culverts or open mesh fences.	1	1	3	1	6	3	18	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Fauna	Animal trapping and hunting	Neg	4	2	3	1	10	4	40	Y	Low	Inform staff, contractors and visitors to not harm fauna in the area.	1	1	3	1	6	3	18	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Aquatic ecosystems	Sedimentation of water courses	Neg	3	2	3	3	11	4	44	Y	Mod	Topsoil, leaf and plant litter as well as subsoil must be stockpiled separately in low heaps. Regularly inspect topsoil stockpile for erosion and loss and address. Stockpile any topsoil or any overburden material separately for later rehabilitation. Develop soil management measures for the entire surface area of the mine that will prevent runoff of sediment into the associated water courses. The rollover opencast mining method should be used so as to limit the volume and size of stockpiles during the operational phase of mining. Ensure that potential wetlands are adequately identified and demarcated. No activities are to take place in wetlands until authorisations are in place. Ensure a buffer of at least 100m is maintained from the edge to the active channel of the Olifants River.	2	2	3	3	10	2	20	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00

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Flora	Potential damage to vegetation in associated with the Olifants River and surrounding wetlands through contaminated water runoff and loss of function of ecological corridor	Neg	5	2	2	3	12	3	36	Y	Mod	No activities should be undertaken within the moist area until relevant authorisations are in place. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of earthworks in that area (DWAF, 2005). Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to work areas. Prevent polluted water from reaching the watercourse and surrounding moist grasslands through the water management plan. Contain sediment and turbidity at the open cast and work sites by installing diversion or containment structures. During rehabilitation, colonisation of the disturbed areas by plants species from the surrounding natural vegetation must be monitored to ensure that vegetation cover is sufficient within one growing season. If not, then the areas need to be rehabilitated with a grass seed mix containing species that naturally occur within the study area.	2	1	3	3	9	2	18	Environmental manager	Inspect area for damage to flora species.	Monthly	Running cost
Flora	Direct loss of biodiversity and ecological function of the moist grassland	Neg	5	2	2	5	14	3	42	Y	Mod	Plan activities carefully so that only vegetation that needs to be impacted is impacted. Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. Ensure relevant permits are in place before proceeding with any activities in wetlands. Permanent demarcation of wetland areas that will not be mined must be completed during construction phase.	3	1	3	3	10	4	40	Environmental manager	Inspect progress of construction & ensure activity is in designated areas	Monthly	Running cost
Flora	Destruction of declining plant species	Neg	5	2	2	5	14	3	42	Y	High	Where possible the species should be conserved in situ. Otherwise plants should be removed by a qualified specialist and replanted into suitable conserved areas, or maintained under suitable growing conditions until such time that it can be replanted as part of rehabilitation. Note that these plants may only be removed with the permission of the provincial authority (MTPA). *Crinum bulbispermum* should be removed when dormant (winter months) and relocated prior to first growth in spring. The bulbs should not be watered during winter.	3	1	3	3	10	4	40	Environmental manager	Monitor survival of protected species for duration of LoM and 3 years after operation	Monthly	Running costs
Flora	Potential damage to vegetation in neighbouring areas	Neg	5	2	2	3	12	3	36	Y	Mod	Limit activity to area of disturbance by demarcating these areas appropriately and revegetate impacted areas as soon as possible.	2	2	3	3	10	2	20	Environmental manager	Inspect area for damage to flora species.	Monthly	Running cost
Palaeontology	Destruction of fossils due to surface and excavation activities	Neg	5	1	5	5	16	3	48		High	Conduct a full Palaeontological Heritage Impact Assessment prior to commencement of the project. Should any fossil materials be identified during the construction phase, the excavations should be halted and SAHRA informed of the discovery.	3	1	5	3	12	3	36	Social Manager	Conduct a thorough examination of all excavations as they are being performed.	As required	Dependent on findings
Social	Potential for more employment	Pos	4	2	3	1	10	5	50	Y	-	Labourers should initially be sought locally and only regionally if skills are not available. Employ as per SLP.	4	2	3	1	10	5	50	Social Manager	Ensure employment is in line with SLP initiatives	As required	Running cost
Social	Multiplier effect - improved livelihoods	Pos	4	2	3	1	10	5	50	N	-	Labourers should initially be sought locally and only regionally if skills are not available. Employ as per SLP.	4	2	3	1	10	5	50	Social Manager	-	-	-
Social	Influx of unsuccessful job seekers which may informally settle in area	Neg	4	3	5	3	15	4	60	Y	-	Ensure advertising is limited to local and regional areas, and only specifically advertise for Jobs nationally if skills are not available. Employ as per SLP.	3	2	5	3	13	3	39	Social Manager	Ensure employment is in line with SLP initiatives	As required	Running cost
Social	Potential disruption to local businesses	Neg	5	2	3	1	11	2	22	Y	-	Ensure proper communication channels are in place with local businesses which may be affected by mining. Consider above proposed mitigation measures to reduce impacts which may affect such businesses. Consideration should be given to compensation for loss of business to local businesses.	3	2	5	3	13	1	13	Social Manager	-	-	-
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-

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Wetlands	Erosion and Sedimentation	Neg	4	2	3	3	12	4	48	Y	Mod	All construction must take place outside of wetland boundaries unless the authorisations are obtained through NEMA and NWA. Wetlands must be pegged on site by an environmental practitioner. All excavated material must be stockpiled in a demarcated area outside of wetland areas and these must be no higher than 6m. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used for mining. Vegetation clearing must be limited to the site boundary. This must also be pegged out on site. Vegetative cover must be maintained close to the site boundary to prevent erosion. The site must be monitored for erosion. Berms should be constructed around stock piles in order to intercept sediment and prevent sediment from leaving the site.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Biomonitoring of wetlands.	After rain & Every 6 months	Rehab cost & R110,000.00
Groundwater	Potential infiltration of contaminated water into groundwater table if leaks, spills or seepage occurs	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure water management facilities are operating adequately and trenches are not blocked or eroded. Ensure integrity of any lining is not compromised.	3	2	2	3	10	2	20	Environmental manager	Inspect trenches and lining of trenches/containment facilities. Groundwater monitoring.	Annually & Quarterly	Running cost & R 200,000.00
Soils	Containment of dirty water within dirty footprint area	Pos	4	1	3	1	9	4	36	N	-	-	4	1	3	1	9	4	36	Environmental manager	-	-	-
Soils	Potential contamination of soils if dirty water escapes into environment	Neg	3	2	3	3	11	3	33	Y	Low	Establishment and maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Clean systems will primarily divert water from undisturbed or rehabilitated areas away from disturbed areas. The berms surrounding the opencast and infrastructure areas must effectively divert clean storm water into natural drainage lines. GN704 principles will be applied.	2	2	3	3	10	2	20	Environmental manager	Inspect water management features	Weekly	Running cost
Soils	Degradation of topsoil in berms or heaps	Neg	2	2	3	3	10	3	30	Y	Mod	Ensure regular weed management program and allow for regrowth of natural vegetation to maintain biota levels in the topsoil. Topsoil conservation will mitigate impact and provide adequate quality and quantity soil in order to re-established required end land use. The most critical component of the soil, with respect to successful rehabilitation, is the need to restore the soil moisture characteristics, as well as to limit compaction and/or crusting. Conduct soil analyses in areas where soils have been replaced for rehabilitation to determine amelioration requirements and apply to soils as necessary.	2	2	3	3	10	2	20	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Erosion	Neg	2	1	1	3	7	5	35	Y	Mod	Surface stabilization must be conducted where necessary to reduce erosion until a vegetative cover is established. Mulches and chemical stabilizers can be utilized only to provide short term benefits. Matting and netting is recommended for application in steep sloping areas where there is a severe localized problem. Landscaping and mechanical preparation of a disturbed area is very important in the establishment of a good vegetative cover. Runoff, interception and conveyance of water is also necessary to reduce erosion. Establishment of clean and dirty water drainage systems is essential with consideration of well-placed silt traps and/or flow dissipaters in areas with high sediment transport or high surface water runoff velocity.	2	1	2	3	8	2	16	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Containment of dirty water within dirty footprint area	Pos	5	2	3	1	11	4	44	N	-	-	5	2	3	1	11	4	44	Environmental manager	Surface water monitoring	Monthly	R 200 000.00

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Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	4	48	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures	2	2	3	3	10	3	30	Environmental manager	Inspect water management features, including trenches, berms, dams and pipelines. Surface water monitoring.	Weekly & Monthly	Running cost & R 200,000.00
Surface water	Downstream water quantity of catchment reduced	Neg	3	2	3	3	11	5	55	N	Mod	Necessary measure to prevent pollution downstream.	3	2	3	3	11	5	55	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Groundwater	Potential infiltration of contaminated water into groundwater table if leaks, spills or seepage occurs	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure water management facilities are operating adequately and trenches are not blocked or eroded. Ensure integrity of any lining is not compromised.	2	1	3	3	9	3	27	Environmental manager	Inspect trenches and lining of trenches/containment facilities. Groundwater monitoring.	Annually & Quarterly	Running cost & R 200,000.00
Soils	Containment of dirty water within dirty footprint area	Pos	4	1	3	1	9	4	36	N	-	-	4	1	3	1	9	4	36	Environmental manager	-	-	-
Soils	Potential contamination of soils if dirty water escapes into environment	Neg	3	2	3	3	11	3	33	Y	Low	Establishment and maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Clean systems will primarily divert water from undisturbed or rehabilitated areas away from disturbed areas. The berms surrounding the opencast and infrastructure areas must effectively divert clean storm water into natural drainage lines. GN704 principles will be applied.	2	2	3	3	10	2	20	Environmental manager	Inspect water management features	Weekly	Running cost
Surface water & associated wetlands	Containment of dirty water within dirty footprint area	Pos	5	2	3	1	11	4	44	N	-	-	5	2	3	1	11	4	44	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Surface water & associated wetlands	Potential surface water contamination if leaks escape into the environment	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures.	2	2	3	3	10	2	20	Environmental manager	Inspect water management features, including trenches, berms, dams and pipelines. Surface water monitoring.	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	4	2	3	3	12	4	48	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures	2	2	3	3	10	3	30	Environmental manager	Inspect water management features, including trenches, berms, dams and pipelines. Biomonitoring.	Weekly & Every 6 months	Running cost & R 110,000.00
Surface water	Downstream water quantity of catchment reduced	Neg	3	2	3	3	11	5	55	N	Mod	Necessary measure to prevent pollution downstream.	3	2	3	3	11	5	55	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Groundwater	Potential for poor quality water impacting on groundwater if pipeline burst or leak	Neg	3	2	3	3	11	3	33	N	Mod	Ensure all pipelines are properly fitted and sealed. Consider constructing paddocks for surface pipelines to contain any soils and clear these out as soon as spills occur. Pipelines should be fitted with shut-off valves along its length so that the flow can be stopped if leaks are observed and allow for easier pipeline repair.	2	2	1	3	8	2	16	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00

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Soils	Potential for poor quality water impacting on nearby soils if pipeline burst or leak	Neg	3	2	3	3	11	3	33	Y	Low	Establishment and maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Pipelines should be laid in paddocks which will serve to contain any leaks that may occur. Pipelines should have a series of shut-off valves which can prevent flow of contaminated water should leaks occur. Emergency response procedures will be followed.	2	1	3	3	9	2	18	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Potential for poor quality water impacting on nearby water bodies if pipeline burst or leak	Neg	5	2	3	3	13	3	39	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures	2	2	3	3	10	2	20	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	3	1	7	4	28	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	3	24	Y	Mod	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	2	3	7	2	14	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	3	2	3	3	11	3	33	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost

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Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	3	3	12	3	36	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Traffic & safety	Increased potential for road incidences	Neg	4	1	3	5	13	3	39	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	3	5	12	1	12	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	3	3	11	4	44	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	3	3	11	1	11	Site manager	Inspect intersections and roads	Monthly	Running cost
Groundwater	Potential contamination leeching into the water table if coal dust and spillage not cleared from road	Neg	2	2	3	3	10	2	20	Y	Low	Clean roads utilised for coal transportation.	1	2	3	3	9	1	9	Environmental manager	Inspect roads for spillages	Weekly	Running cost
Soils	Potential contamination of surrounding areas with coal dust	Neg	3	2	3	3	11	3	33	Y	Low	A water cart will be used to spray when dust levels are high. Clean roads utilised for coal transportation.	2	2	3	3	10	2	20	Environmental manager	Dust monitoring & inspect roads	Monthly & Weekly	R155,000.00 & Running cost
Surface water & associated wetlands	Potential contamination of surrounding surface water bodies with coal dust and coal spillage	Neg	3	2	3	3	11	4	44	Y	Mod	Dust management will be applied. Clean roads utilised for coal transportation.	2	2	2	1	7	1	7	Environmental manager	Dust monitoring & inspect roads	Monthly & Weekly	R155,000.00 & Running cost
Groundwater	Potential hydrocarbon contamination leeching into the water table should leaks occur	Neg	4	2	2	3	11	3	33	Y	Mod	Equipment will be regularly serviced to reduce risk of leaks. Generators will be kept in bunded areas erected per SABS standards. Any leakages should be reported and treated immediately in a reputable manner. For large spills Hazmat will called in.	2	2	2	3	9	2	18	Site & Environmental Manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Running cost
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site & Environmental Manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential hydrocarbon contamination to soils	Neg	3	2	3	3	11	3	33	Y	Low	Equipment will be regularly serviced to reduce risk of leaks. Generators will be kept in bunded areas erected per SABS standards. Any leakages should be reported and treated immediately in a reputable manner. For large spills Hazmat will called in.	2	2	3	3	10	2	20	Site & Environmental Manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	2	2	2	3	9	3	27	Y	Low	Equipment will be regularly serviced to reduce risk of leaks. Generators will be kept in bunded areas erected per SABS standards. Any leakages should be reported and treated immediately in a reputable manner. For large spills Hazmat will called in.	2	2	2	3	9	1	9	Site & Environmental Manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Contractors cost
Fauna	Potential risk to avifauna	Neg	4	1	3	3	11	3	33	Y	Mod	Consider the use of bird flappers and balls on the power lines to reduce risk of birds colliding with power lines. This would be relevant in areas of high congregation of birds which is most likely over the moist grassland areas if these are to be affected buy power lines.	2	1	3	3	9	2	18	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost

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Social	Potential danger to surrounding communities	Neg	5	2	5	5	17	3	51	Y	-	Ensure all power lines and pylons are within specifications. Ensure that all power-related structures are adequately marked with relevant signs and warnings and fenced off with access control.	5	2	5	5	17	2	34	Environmental manager	Inspect areas: ensure fences are not damaged & no illegal connections have been added to power-generation infrastructure	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Groundwater	Reduction of local groundwater	Neg	2	2	3	1	8	3	24	Y	Low	Utilise water on site responsibly. Ensure all pipelines and water containment facilities are adequately sealed to prevent leaks. Record water usage by attaching meters to all pumps. Ensure compensation procedure is in place should registered water users be affected.	2	2	3	1	8	2	16	Environmental manager	Monitor water usage. Inspect all water pipelines and water containment facilities for leaks & groundwater level monitoring.	Continuous, Weekly & Quarterly	Running cost & R 200,000.00
Groundwater	Water wastage should leaks occur	Neg	3	2	3	1	9	3	27	Y	Low	Utilise water on site responsibly. Ensure all pipelines and water containment facilities are adequately sealed to prevent leaks. Record water usage by attaching meters to all pumps.	2	2	3	1	8	5	40	Environmental manager	Monitor water usage. Inspect all water pipelines and water containment facilities for leaks & groundwater level monitoring.	Continuous, Weekly & Quarterly	Running cost & R 200,000.00
Groundwater	Reduction of local groundwater	Neg	3	2	3	1	9	4	36	Y	Low	Utilise water on site responsibly. Ensure all pipelines and water containment facilities are adequately sealed to prevent leaks. Record water usage by attaching meters to all pumps. Ensure compensation procedure is in place should registered water users be affected.	2	2	3	1	8	2	16	Environmental manager	Monitor water usage. Inspect all water pipelines and water containment facilities for leaks & groundwater level monitoring.	Continuous, Weekly & Quarterly	Running cost & R 200,000.00
Groundwater	Irresponsible use of water will impact on groundwater quantity	Neg	3	2	3	1	9	2	18	Y	Low	Saving water initiatives will be included in environmental awareness training. Fit potable water areas with meters to record water use.	3	2	1	1	7	2	14	Environmental manager	Inspect all potable water works for leaks. Monitor water use.	Weekly	Running cost
Groundwater	Potential harm through sewage leaks	Neg	2	2	3	1	8	2	16	Y	Mod	Portable toilets will be managed by reputable contractors and inspected for any potential leaks which will be immediately repaired.	2	2	2	1	7	1	7	Environmental manager	Inspect toilets and related piping for leaks & Groundwater monitoring	Weekly & Quarterly	Contractors cost & R 200,000.00
Soils	Potential harm through sewage leaks	Neg	2	1	2	1	6	2	12	Y	Low	Portable toilets will be managed by reputable contractors and inspected for any potential leaks which will be immediately repaired.	2	1	2	1	6	1	6	Environmental manager	Inspect toilets and related piping for leaks	Weekly	Contractors cost
Surface water & associated wetlands	Potential harm through sewage leaks	Neg	3	2	3	1	9	3	27	Y	Mod	Portable toilets will be managed by reputable contractors and inspected for any potential leaks which will be immediately repaired.	3	2	2	1	8	1	8	Environmental manager	Inspect toilets and related piping for leaks & Surface water monitoring	Weekly & Monthly	Contractors cost & R 200,000.00
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	All hydrocarbons will be stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	4	1	2	3	10	2	20	Site & Environmental manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	4	1	2	3	10	3	30	Y	Low	All hydrocarbons will be stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	3	1	2	3	9	2	18	Site & Environmental manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Running cost

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Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	5	2	3	5	15	3	45	Y	Mod	All hydrocarbons will be stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	2	2	3	3	10	2	20	Site & Environmental manager	Inspect bunded areas to ensure taps are closed and bunded areas are not flooded. Inspect integrity of bunding.	Weekly, After rainfalls & Annually	Running cost
Groundwater	Potential chemical contamination leeching into the water table	Neg	5	1	3	5	14	2	28	Y	Mod	All chemicals will be stored as per requirements in the MSDS which will be kept on site in the lab. Wet and dry chemicals will be stored separately, reducing and oxidising agents will be stored separately. Liquid chemicals will be stored in plastic trays which will contain any potential spills.	4	1	2	3	10	2	20	Site & Environmental manager	Inspect drip trays and ensure all chemical spills are cleared and disposed of as per safety sheet recommendations or if uncontaminated replace for re-use.	Daily	Running cost
Soils	Potential chemical contamination of soils	Neg	3	2	3	3	11	3	33	Y	Low	All chemicals will be stored as per requirements in the MSDS which will be kept on site in the lab. Wet and dry chemicals will be stored separately, reducing and oxidising agents will be stored separately. Liquid chemicals will be stored in plastic trays which will contain any potential spills.	1	1	3	3	8	1	8	Site & Environmental manager	Inspect drip trays and ensure all chemical spills are cleared and disposed of as per safety sheet recommendations or if uncontaminated replace for re-use.	Daily	Running cost
Surface water & associated wetlands	Potential chemical contamination which may reach downstream surface water bodies	Neg	5	1	3	5	14	2	28	Y	Mod	All chemicals will be stored as per requirements in the MSDS which will be kept on site in the lab. Wet and dry chemicals will be stored separately, reducing and oxidising agents will be stored separately. Liquid chemicals will be stored in plastic trays which will contain any potential spills.	2	2	3	3	10	2	20	Site & Environmental manager	Inspect drip trays and ensure all chemical spills are cleared and disposed of as per safety sheet recommendations or if uncontaminated replace for re-use.	Daily	Running cost
Air quality	Dust generation	Neg	3	2	3	1	9	5	45	Y	Low	A water cart will be used to spray relevant areas when dust levels are high. Alternative blasting methods will be considered to reduce dust generation. Blasting should not be conducted when it is very windy.	2	2	3	2	9	3	27	Site & Environmental manager	Dust monitoring	Monthly	R 155 000.00
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	5	1	5	5	16	1	16	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	2	1	5	5	13	1	13	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Geology	Disturbance of geological strata	Neg	5	1	5	5	16	5	80	N	High	-	5	1	5	5	16	5	80	Site manager	-	-	-
Groundwater	Generation of poor quality leachate which may contaminate aquifers	Neg	5	2	5	3	15	1	15	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	5	2	5	3	15	1	15	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Potential damage to groundwater aquifers and alteration of groundwater flow	Neg	3	3	3	3	12	5	60	N	High	Minimal mitigation possible. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent. Seal of individual faults as these are encountered.	3	3	3	3	12	4	48	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Noise	Increased noise levels	Neg	3	3	2	1	9	5	45	Y	-	Blasting alternatives will be considered to reduce noise and associated vibrations if I&AP complaints are received	2	2	2	1	7	4	28	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00

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Social	Vibrations may damage structures in the area and disturb farm animals	Neg	4	2	3	3	12	4	48	Y	-	Consider blasting procedures that will reduce surface vibrations and blast noise as far as possible. Utilise free-digging as far as possible. Ensure baseline photographs are taken of all structures which may be impacted for photographic evidence prior to any blasting. Ensure procedures in place to compensate for damage.	3	1	3	3	10	4	40	Social Manager	Inspect all complaints received and compare against photographic evidence.	As required	Running costs & dependent on extent of damage.
Topography	Alteration of topography	Neg	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Environmental manager	-	-	-
Geology	Disturbance of geological strata	Neg	5	1	5	5	16	5	80	N	High	-	5	1	5	5	16	5	80	Site manager	-	-	-
Groundwater	Potential contamination plume of groundwater	Neg	5	2	5	3	15	1	15	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	5	2	5	3	15	1	15	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Groundwater	Reduction of local groundwater	Neg	3	3	3	3	12	5	60	N	High	Minimal mitigation possible. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent. Seal of individual faults as these are encountered.	3	3	3	3	12	4	48	Site & Environmental manager	Monitor water usage & groundwater level monitoring.	Continuous & Quarterly	Running cost & R 200,000.00
Groundwater	Alteration of groundwater flow	Neg	3	3	3	3	12	5	60	N	High	Minimal mitigation possible. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent. Seal of individual faults as these are encountered.	3	3	3	3	12	4	48	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Reduction of local groundwater	Neg	3	3	3	3	12	5	60	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	3	3	3	3	12	5	60	Site & Environmental manager	Monitor water usage & groundwater level monitoring.	Continuous & Quarterly	Running cost & R 200,000.00
Groundwater	Potential for poor quality water impacting on groundwater if pipeline burst or leak	Neg	5	2	5	3	15	2	30	N	Mod	No mitigation possible.	5	2	5	3	15	2	30	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Soils	Potential for poor quality water impacting on nearby soils if pipeline burst or leak	Neg	4	2	3	3	12	3	36	Y	Low	Establishment and maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Pipelines should be laid in paddocks which will serve to contain any leaks that may occur. Pipelines should have a series of shut-off valves which can prevent flow of contaminated water should leaks occur. Emergency response procedures will be followed.	2	1	3	3	9	2	18	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Potential for poor quality water impacting on nearby water bodies if pipeline burst or leak	Neg	5	2	3	3	13	4	52	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures . Pipelines carrying high loads of contaminated water should be placed within actively managed dirty areas and consideration should be given to constructing paddocks to contain spills.	2	2	3	3	10	2	20	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00

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Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	3	1	7	2	14	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	3	1	7	2	14	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	3	1	7	4	28	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	3	1	7	2	14	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Mod	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	2	3	7	2	14	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	3	2	3	3	11	3	33	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	3	3	12	3	36	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Traffic & safety	Increased potential for road incidences	Neg	4	1	3	5	13	3	39	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	3	5	12	1	12	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	3	3	11	4	44	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	3	3	11	1	11	Site manager	Inspect intersections and roads	Monthly	Running cost
Air quality	Dust generation	Neg	1	2	1	1	5	4	20	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	1	1	5	2	10	Environmental manager	Dust monitoring	Monthly	R 155 000.00

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Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	5	3	5	5	18	2	36	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	1	3	5	5	14	2	28	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Archaeological & cultural sites	Potential disruption to grave sites	Neg	5	3	5	5	18	4	72	Y	High	Mining must remain outside 100m buffer zones around existing graves. Graves must be preserved in situ and if these are likely to be affected by blasting or mining then relocation applications must be initiated. Should other graves be observed on site during activity progress then all activity should ceased and the area demarcated as a no-go zone. A specialists will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone.	3	3	5	5	16	3	48	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Flora	Direct loss of biodiversity and ecological function of the moist grassland	Neg	5	1	5	5	16	4	64	Y	Mod	Plan activities carefully so that only vegetation that needs to be impacted is impacted. Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. Ensure relevant permits are in place before proceeding with any activities in wetlands. Permanent demarcation of wetland areas that will not be mined must be completed during construction phase.	3	1	3	3	10	4	40	Environmental manager	Inspect progress of roll-over mining & ensure activity is in designated areas	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion	Neg	2	1	1	3	7	5	35	Y	Mod	Minimise the area which is disturbed at any one time. Construct drainage and erosion controls in advance of all activities. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas no longer required as soon as possible.	2	1	2	3	8	2	16	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Soils	Loss of fertile topsoil layer	Neg	2	1	3	3	9	5	45	Y	Mod	Remove and store topmost layer (>500 mm) separately. All excavated topsoil will be stored for use during rehabilitation at decommissioning of the mine. Topsoil and underlying material should be stored separately. Topsoil conservation will mitigate impact and provide adequate quality and quantity soil in order to re-established required end land use. The most critical component of the soil, with respect to successful rehabilitation, is the need to restore the soil moisture characteristics, as well as to limit compaction and/or crusting.	2	1	3	3	9	4	36	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Wetlands	Destruction of wetland habitat	Neg	4	2	3	3	12	4	48	N	Low	Can only be carried out when authorisations are in place.	4	2	3	3	12	4	48	Environmental manager	Biomonitoring	Every 6 months	R 110 000.00
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	2	2	3	3	10	3	30	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Flora	Destruction of declining plant species	Neg	5	1	5	5	16	4	64	Y	High	Where possible the species should be conserved in situ. Otherwise plants should be removed by a qualified specialist and replanted into suitable conserved areas, or maintained under suitable growing conditions until such time that it can be replanted as part of rehabilitation. Note that these plants may only be removed with the permission of the provincial authority (MTPA). *Crinum bulbispermum* should be removed when dormant (winter months) and relocated prior to first growth in spring. The bulbs should not be watered during winter.	3	1	3	3	10	4	40	Environmental manager	Monitor survival of protected species for duration of LoM and 3 years after operation	Monthly	Running costs

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Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	3	1	7	2	14	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for erosion, loss of soil characteristics, compaction of soil & soil degradation through stockpiling	Neg	2	1	3	3	9	2	18	Y	Mod	Re-vegetate any bare soil immediately. Herbaceous plant mater should be stockpiled to retain organic content of soil. Stockpiles should be to the specifications of the pedological study.	1	1	3	3	8	2	16	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	2	2	3	3	10	3	30	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Alteration of topography	Neg	2	1	3	3	9	4	36	N	-	-	2	1	3	3	9	4	36	Environmental manager	Inspect all water management features on site & Biomonitoring	Weekly & Every 6 months	Running cost & R 110,000.00
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Air quality	Dust generation	Neg	3	2	3	1	9	5	45	Y	Low	A water cart will be used to spray relevant areas when dust levels are high. Alternative blasting methods will be considered to reduce dust generation. Blasting should not be conducted when it is very windy.	2	2	3	2	9	3	27	Site & Environmental manager	Dust monitoring	Monthly	R 155 000.00
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	5	3	5	5	18	2	36	Y	High	Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	1	3	5	5	14	2	28	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Archaeological & cultural sites	Potential disruption to grave sites	Neg	5	3	5	5	18	4	72	Y	High	Mining must remain outside 100m buffer zones around existing graves. Graves must be preserved in situ and if these are likely to be affected by blasting or mining then relocation applications must be initiated.	3	3	5	5	16	3	48	Social Manager	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Prior to disruption of new sites	Dependent on findings
Geology	Disturbance of geological strata	Neg	5	1	5	5	16	5	80	N	High	-	5	1	5	5	16	5	80	Site manager	-	-	-
Groundwater	Generation of poor quality leachate which may contaminate aquifers	Neg	5	2	5	3	15	1	15	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	5	2	5	3	15	1	15	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Potential damage to groundwater aquifers and alteration of groundwater flow	Neg	3	3	3	3	12	5	60	N	High	Minimal mitigation possible. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent. Seal of individual faults as these are encountered.	3	3	3	3	12	4	48	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00

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Noise	Increased noise levels	Neg	3	3	2	1	9	5	45	Y	-	Blasting alternatives will be considered to reduce noise and associated vibrations if I&AP complaints are received	2	2	2	1	7	4	28	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Social	Vibrations may damage structures in the area and disturb farm animals	Neg	4	2	3	3	12	4	48	Y	-	Consider blasting procedures that will reduce surface vibrations and blast noise as far as possible. Utilise free-digging as far as possible. Ensure baseline photographs are taken of all structures which may be impacted for photographic evidence prior to any blasting. Ensure procedures in place to compensate for damage.	3	1	3	3	10	4	40	Social Manager	Inspect all complaints received and compare against photographic evidence.	As required	Running costs & dependent on extent of damage.
Topography	Alteration of topography	Neg	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Environmental manager	-	-	-
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	3	1	7	2	14	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Surface water & associated wetlands	Potential for poor quality water impacting on nearby water bodies if pipeline burst or leak	Neg	5	2	3	3	13	4	52	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Ensure the material with more carbonaceous substances is placed lower in the mined out pits to ensure this is flooded first to reduce risk for AMD formation.	2	2	3	3	10	2	20	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Wetlands	Potential generation of poor quality leachate which may runoff to surface water bodies.	Neg	5	2	1	3	11	4	44	Y	Mod	Place material with higher carbonaceous material lower down in pits to ensure this material is flooded first to reduce potential for AMD. Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements.	3	2	1	3	9	3	27	Environmental manager	Inspect all water management features on site & Biomonitoring	Weekly & Every 6 months	Running cost & R 110,000.00
Topography	Alteration of topography	Neg	2	1	3	3	9	4	36	N	-	-	2	1	3	3	9	4	36	Site manager	-	-	-
Geology	Disturbance of geological strata	Neg	5	1	5	5	16	5	80	N	High	-	5	1	5	5	16	5	80	Site manager	-	-	-
Groundwater	Potential contamination plume of groundwater	Neg	5	2	5	3	15	1	15	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	5	2	5	3	15	1	15	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	3	1	7	2	14	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Topography	Eradication of voids	Pos	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Environmental manager	-	-	-
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	1	3	1	8	4	32	N	-	-	3	1	3	1	8	4	32	Environmental manager	-	-	-

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Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used.	2	2	3	3	10	3	30	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Topography	Re-contouring of area for free surface water drainage	Pos	2	1	3	3	9	4	36	Y	-	Monitor, especially after first heavy rain falls to ensure adequate surface water drainage.	2	1	3	3	9	4	36	Environmental manager	Inspect area for erosion and pooling.	After rain.	Running cost
Surface water & associated wetlands	Free drainage restored to area	Pos	3	2	3	3	11	4	44	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	4	44	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & Monthly	Rehab cost & R200,000.00
Surface water	Large areas of surface water runoff return to catchment	Pos	3	2	3	3	11	4	44	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	4	44	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & Monthly	Rehab cost & R200,000.00
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements are retained on site till area is stable. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas as soon as possible.	2	2	3	3	10	3	30	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Wetlands	Reduced risk of contaminated water entering wetland areas and impairing ecological function.	Pos	4	2	3	3	12	3	36	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	4	2	3	3	12	3	36	Environmental manager	Inspect area for erosion and pooling. Biomonitoring of wetlands.	After rain & Every 6 months	Rehab cost & R110,000.00
Soils	Potential for erosion	Neg	3	1	3	3	10	3	30	Y	Mod	Minimise the area which is worked at any one time. Maintain drainage control system for the mine lease area. Construct drainage and erosion controls in rehabilitated areas, such as contour berms, to reduce risk of erosion. Avoid creation of steep slopes. Limit the handling of spoil and topsoil materials. Rehabilitate any disturbed areas as soon as possible.	2	1	3	3	9	2	18	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements are retained on site till area is stable. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas as soon as possible.	2	2	3	3	10	3	30	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Flora	Create adequate environment for flora to establish	Pos	4	2	3	3	12	4	48	Y	-	Conduct annual soil fertility tests and apply soil amelioration as required to encourage vegetation establishment and growth.	4	2	3	3	12	4	48	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Soils	Soils replaced and ameliorated	Pos	3	1	3	3	10	4	40	Y	-	Ensure soils are replaced to an adequate depth and ensure soil quality is adequate.	3	1	3	3	10	4	40	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Soils	Potential for loss of soil and soil erosion reduced	Pos	3	1	3	3	10	4	40	Y	-	Re-vegetate any bare soil immediately.	3	1	3	3	10	4	40	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Surface water runoff drainage controlled and erosion and associated silt loading of water reduced.	Pos	3	2	3	3	11	3	33	Y	-	Inspect area for erosion and attend to problem areas immediately.	3	2	3	3	11	3	33	Environmental manager	Surface water monitoring	Monthly	R 200 000.00

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Fauna	New habitat available to fauna in the area and reduced activity should result in influx of animals to the area	Pos	3	2	3	3	11	3	33	N	-	Conduct annual surveys to monitor faunal biodiversity.	3	2	3	3	11	3	33	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Flora	Area re-vegetated with indigenous plants	Pos	3	2	3	3	11	4	44	Y	-	Rehabilitate disturbed areas with natural indigenous flora. Monitor for cover abundance.	3	2	3	3	11	4	44	Environmental manager	Floral surveys need to be conducted to monitor cover abundance, plant succession and community structure	Annually	R 80 000.00
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	3	1	7	2	14	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	3	1	7	2	14	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	3	1	7	4	28	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	3	1	7	2	14	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Mod	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	2	3	7	2	14	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	3	2	3	3	11	3	33	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	3	3	12	3	36	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00

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Traffic & safety	Increased potential for road incidences	Neg	4	1	3	5	13	3	39	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	3	5	12	1	12	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	3	3	11	4	44	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	3	3	11	1	11	Site manager	Inspect intersections and roads	Monthly	Running cost
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y		Consider blasting procedures that will reduce blast noise as far as possible. Utilise free-digging as far as possible.	1	1	2	1	5	3	15	Mine Manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Social	Vibrations may damage structures in the area and disturb farm animals	Neg	4	2	3	3	12	4	48	Y	-	Consider blasting procedures that will reduce surface vibrations and blast noise as far as possible. Utilise free-digging as far as possible. Ensure baseline photographs are taken of all structures which may be impacted for photographic evidence prior to any blasting. Ensure procedures in place to compensate for damage.	3	1	3	3	10	4	40	Social Manager	Inspect all complaints received and compare against photographic evidence.	As required	Running costs & dependent on extent of damage.
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y		Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Mine Manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Groundwater	Potential contamination plume of groundwater	Neg	3	2	3	3	11	4	44	N	High	Keep stockpile areas as small as possible and move coal from site regularly. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	1	3	3	9	3	27	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Geology	Disturbance of geological strata	Neg	5	1	5	5	16	5	80	N	High	-	5	1	5	5	16	5	80	Site manager	-	-	-
Groundwater	Reduction of local groundwater	Neg	3	3	3	3	12	5	60	N	High	Minimal mitigation possible. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent. Seal of individual faults as these are encountered.	3	3	3	3	12	4	48	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Alteration of groundwater flow	Neg	3	3	3	3	12	5	60	N	High	Minimal mitigation possible. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent. Seal of individual faults as these are encountered.	3	3	3	3	12	4	48	Site & Environmental manager	Monitor water usage & groundwater level monitoring.	Continuous & Quarterly	Running cost & R 200,000.00
Topography	Potential subsidence of surface layers	Neg	3	1	3	3	10	3	30	Y	-	Ensure adequate safety standards are set with regards to bord-and-pillar mining. Inspect areas of underground mining and rehabilitate any subsidence or sinkholes according to acceptable standards.	3	1	3	3	10	2	20	Mine Manager	Inspect underground mining surface area	Monthly	Running cost
Groundwater	Reduction of local groundwater	Neg	3	3	3	3	12	5	60	N	Mod	No mitigation. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	3	3	3	3	12	5	60	Site & Environmental manager	Monitor water usage & groundwater level monitoring.	Continuous & Quarterly	Running cost & R 200,000.00
Groundwater	Potential for poor quality water impacting on groundwater if pipeline burst or leak	Neg	5	2	5	3	15	2	30	N	Mod	No mitigation possible.	5	2	5	3	15	2	30	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Soils	Potential for poor quality water impacting on nearby soils if pipeline burst or leak	Neg	4	2	3	3	12	3	36	Y	Low	Establishment and maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Pipelines should be laid in paddocks which will serve to contain any leaks that may occur. Pipelines should have a series of shut-off valves which can prevent flow of contaminated water should leaks occur. Emergency response procedures will be followed.	2	1	3	3	9	2	18	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00

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Surface water & associated wetlands	Potential for poor quality water impacting on nearby water bodies if pipeline burst or leak	Neg	5	2	3	3	13	4	52	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements. Establish silt traps as needed to prevent silt-loading. Install flow dissipaters as needed. Clean out silt build up in trenches over dry season. Ensure water management facilities are operating adequately. Test for integrity of lining and management structures . Pipelines carrying high loads of contaminated water should be placed within actively managed dirty areas and consideration should be given to constructing paddocks to contain spills.	2	2	3	3	10	2	20	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	3	1	7	2	14	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential contamination by coal dust	Neg	3	2	3	3	11	3	33	Y	Low	Dust management will be applied.	2	1	3	3	9	2	18	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Surface water & associated wetlands	Potential contamination of surface water runoff which may reach downstream surface water bodies	Neg	4	2	3	3	12	3	36	Y	Mod	Ensure crushing and screening area and stockpile area is well compacted and that area drains to mine water containment facilities. Consider silt traps if needed before PCD. Ensure water management facilities are operating adequately in line with GN704 requirements. Clean out silt build up over dry season.	3	2	2	3	10	2	20	Environmental manager	Surface water monitoring & test integrity of coal stockpile layer	Monthly & Annually	R200,000.00 & Dependent repairs required
Air quality	Dust generation	Neg	1	2	3	1	7	4	28	Y	Low	Dust levels in the area are already elevated for rural areas and in some instances exceeded industrial levels. Overlooked is therefore unlikely to excessively impact on the already affected air quality in the area regarding dust. A water cart will be used to spray relevant areas when dust levels are high.	1	2	3	1	7	2	14	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Groundwater	Ingression of poor quality, low pH leachate into water table	Neg	3	2	3	3	11	4	44	N	High	Keep stockpile areas as small as possible and move coal from site regularly. Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent.	2	1	3	3	9	3	27	Environmental manager	Test integrity of coal stockpile layer & Groundwater monitoring	Annually & Quarterly	Running cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential contamination by coal dust	Neg	3	2	3	3	11	3	33	Y	Low	Dust management will be applied.	2	1	3	3	9	2	18	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Surface water & associated wetlands	Potential contamination of surface water runoff which may reach downstream surface water bodies	Neg	4	2	3	3	12	4	48	Y	Mod	Ensure stockpile area is well compacted and that area drains to mine water containment facilities. Consider silt traps if needed before PCD. Ensure water management facilities are operating adequately in line with GN704 requirements. Clean out silt build up over dry season.	3	2	2	3	10	2	20	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Topography	Alteration of topography	Neg	2	1	3	3	9	5	45	N	-	-	2	1	3	3	9	5	45	Environmental manager	-	-	-

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Fauna	Hindrance to nocturnal animals	Neg	3	2	3	3	11	3	33	Y	Low	Conduct activities during daylight hours as far a possible. When using lighting, ensure directional floodlights are utilised that focus light on the necessary areas and reduce light pollution to surrounding environment. Utilise lights in the orange and yellow light ranges rather than white. This has the added benefit of reducing strong light and dark contrasts which also has safety benefits for staff.	2	2	2	3	9	2	18	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Traffic & safety	Potential distraction to road users	Neg	3	2	3	1	9	3	27	Y	-	Ensure directional floodlights are utilised that focus light on the necessary areas and reduce light pollution to surrounding environment.	2	1	3	1	7	2	14	Environmental manager	-	-	-
Visual Aspect	Increased visibility of the site	Neg	3	1	2	3	9	5	45	Y	Low	Ensure directional floodlights are utilised that focus light on the necessary areas and reduce light pollution to surrounding environment.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	3	5	13	4	52	Y	Mod	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	3	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	2	1	6	4	24	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	2	1	5	3	15	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	5	40	Y	Mod	Minimise operation and machinery movement to stipulated construction area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Artificial drainage can help increase the number of trafficable days on poorly drained soil.	1	1	2	3	7	2	14	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential hydrocarbon contamination to soils	Neg	3	2	3	3	11	3	33	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	3	3	12	3	36	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Surface water monitoring	Monthly	Contractors cost & R 200,000.00
Groundwater	Irresponsible use of water during mining activities will impact on groundwater quantity	Neg	3	2	2	1	8	2	16	Y	mod	Saving water initiatives will be included in environmental awareness training. Utilise water on site responsibly. Ensure all pipelines and water containment facilities are adequately sealed to prevent leaks. Record all water usage on site.	2	2	2	1	7	2	14	Environmental manager	Inspect all water facilities for leaks & groundwater monitoring	Weekly & Quarterly	Running cost & R 200,000.00
Surface water	Irresponsible use of water during mining activities will impact on surface water quantity	Neg	3	2	3	1	9	2	18	Y	Mod	Saving water initiatives will be included in environmental awareness training. Utilise water on site responsibly. Ensure all pipelines and water containment facilities are adequately sealed to prevent leaks. Record all water usage on site.	3	2	3	1	9	2	18	Environmental manager	Inspect all water facilities for leaks & surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	5	2	3	5	15	3	45	Y	Mod	All hydrocarbons from oil traps will be collected in drums and stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	4	1	2	3	10	2	20	Site manager	Inspect oil traps	Weekly	Running cost

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Soils	Potential hydrocarbon contamination to soils	Neg	4	2	3	3	12	3	36	Y	Low	All hydrocarbons from oil traps will be collected in drums and stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	2	1	2	3	8	2	16	Site & Environmental manager	Inspect oil traps	Weekly	Running cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	3	5	14	3	42	Y	Mod	All hydrocarbons from oil traps will be collected in drums and stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.	2	2	3	3	10	2	20	Site manager	Inspect oil traps	Weekly	Running cost
Fauna	Potential harm through littering	Neg	3	1	3	3	10	2	20	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	1	1	3	3	8	1	8	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Groundwater	Potential contamination through littering	Neg	3	1	2	3	9	2	18	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	3	1	2	1	7	1	7	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Soils	Potential contamination through littering	Neg	3	1	3	3	10	2	20	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	1	3	3	9	2	18	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Surface water & associated wetlands	Potential contamination through littering	Neg	3	2	4	3	12	1	12	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	2	4	1	9	1	9	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Visual Aspect	Loss of aesthetics	Neg	3	1	3	3	10	3	30	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	1	2	3	8	2	16	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Fauna	Loss of habitat, refuge and food for animals and fragmentation and loss of ecological corridors	Neg	3	1	4	3	11	5	55	Y	Low	Ecologically sensitive areas associated with wetlands, which also form ecological corridors, should be avoided and preserved as far as possible until relevant authorisations under DWA and NEMA are obtained. Activity must strictly remain in areas targeted for development and associated access roads and remaining areas should be preserved in situ. To achieve this, areas of activity should be properly demarcated. Relocate larger animals with the aide of specialists if such species are under threat from the development. Ensure relevant permits are in place.	3	1	4	3	11	4	44	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Fauna	Alienation of, and disturbance to, animals	Neg	3	2	3	3	11	5	55	Y	Low	Inform staff, contractors and visitors to not harm fauna in the area. Any fencing or barrier that is established must consider animals that may move through the area and provide the means for animals to do so, such as culverts or open mesh fences.	1	1	3	1	6	3	18	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Fauna	Animal trapping and hunting	Neg	4	2	3	1	10	4	40	Y	Low	Inform staff, contractors and visitors to not harm fauna in the area.	1	1	3	1	6	3	18	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost

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Aquatic ecosystems	Sedimentation of water courses	Neg	3	2	3	3	11	4	44	Y	Mod	Topsoil, leaf and plant litter as well as subsoil must be stockpiled separately in low heaps. Regularly inspect topsoil stockpile for erosion and loss and address. Stockpile any topsoil or any overburden material separately for later rehabilitation. Develop soil management measures for the entire surface area of the mine that will prevent runoff of sediment into the associated water courses. The rollover opencast mining method should be used so as to limit the volume and size of stockpiles during the operational phase of mining. Ensure that potential wetlands are adequately identified and demarcated. No activities are to take place in wetlands until authorisations are in place. Ensure a buffer of at least 100m is maintained from the edge to the active channel of the Olifants River.	2	2	3	3	10	2	20	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Aquatic ecosystems	Increased salinity	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure compliance with the Interim Resource Water Quality Objectives, especially with regard to the conductivity and TDS values. Ensure complete separation of clean and dirty water systems. Ensure all water generated from the footprint of the mine is contained within the dirty water system and diverted to the pollution control dams. Pollution control dams should be over-engineered and lined with an impermeable layer so as to ensure no overflow or seepage of water can occur. Do not allow any discharge or seepage from the mined area and/or associated structures to occur within the catchment. Ensure that potential wetlands are adequately identified and demarcated. No activities are to take place in wetlands until authorisations are in place. Ensure a buffer of at least 100m is maintained from the edge to the active channel of the Olifants River.	2	2	3	3	10	2	20	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Flora	Alien invasive encroachment	Neg	3	2	5	3	13	4	52	Y	High	Eradicate and control all alien invasive species on site. When removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation. All alien seedlings and saplings must be removed as they become evident for the duration of mine operation and after closure. Manual / mechanical removal is preferred to chemical control. All vehicles and equipment, as well as material brought to site should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the site. Rehabilitate and revegetate all areas where alien invasive species were removed.	2	2	3	3	10	2	20	Environmental manager	Alien invasive species surveying	Every 6 months depending on species	Running cost
Flora	Potential damage to vegetation in associated with the Olifants River and surrounding wetlands through contaminated water runoff and loss of function of ecological corridor	Neg	5	2	5	3	15	4	60	Y	Mod	No activities should be undertaken within the moist area until relevant authorisations are in place. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of earthworks in that area (DWAF, 2005). Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to work areas. Prevent polluted water from reaching the watercourse and surrounding moist grasslands through the water management plan. Contain sediment and turbidity at the open cast and work sites by installing diversion or containment structures. During rehabilitation, colonisation of the disturbed areas by plants species from the surrounding natural vegetation must be monitored to ensure that vegetation cover is sufficient within one growing season. If not, then the areas need to be rehabilitated with a grass seed mix containing species that naturally occur within the study area.	2	1	3	3	9	2	18	Environmental manager	Inspect area for damage to flora species.	Monthly	Running cost
Palaeontology	Destruction of fossils due to surface and excavation activities	Neg	5	1	5	5	16	3	48		High	Conduct a full Palaeontological Heritage Impact Assessment prior to commencement of the project. Should any fossil materials be identified during the construction phase, the excavations should be halted and SAHRA informed of the discovery.	3	1	5	3	12	3	36	Social Manager	Conduct a thorough examination of all excavations as they are being performed.	As required	Dependent on findings
Social	Potential for more employment	Pos	4	2	3	1	10	5	50	Y	-	Labourers should initially be sought locally and only regionally if skills are not available. Employ as per SLP.	4	2	3	1	10	5	50	Social Manager	Ensure employment is in line with SLP initiatives	As required	Running cost
Social	Multiplier effect - improved livelihoods	Pos	4	2	3	1	10	5	50	N	-	Labourers should initially be sought locally and only regionally if skills are not available. Employ as per SLP.	4	2	3	1	10	5	50	Social Manager	-	-	-

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Social	Influx of unsuccessful job seekers which may informally settle in area	Neg	4	3	5	3	15	4	60	Y	-	Ensure advertising is limited to local and regional areas, and only specifically advertise for Jobs nationally if skills are not available. Employ as per SLP.	3	2	5	3	13	3	39	Social Manager	Ensure employment is in line with SLP initiatives	As required	Running cost
Social	Potential disruption to local businesses	Neg	5	2	3	1	11	2	22	Y	-	Ensure proper communication channels are in place with local businesses which may be affected by mining. Consider above proposed mitigation measures to reduce impacts which may affect such businesses. Consideration should be given to compensation for loss of business to local businesses.	3	2	5	3	13	1	13	Social Manager	-	-	-
Visual aspect	Deterioration in visual aesthetics of the area	Neg	3	1	2	3	9	5	45	Y	Low	Screens will be considered if I&AP complaints are received.	3	1	2	3	9	2	18	Environmental manager	-	-	-
Land Use	Will change to mining and other uses over opencast and infrastructure areas	Neg	1	1	3	3	8	5	40	Y	-	Soil amelioration will be done after replacement of the topsoil according to soil analyses and soil fertility will be maintained by means of an annual fertilizer program until self-sustaining. Re-vegetation of the area with local climax grass species. Correct rehabilitation and soil re-establishment mean that a productive post-mining land use should be possible. With appropriate management, the significance could be reduced to low.	3	1	2	3	9	3	27	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Land Capability	Loss in grazing and arable plant production potential over opencast and infrastructure areas	Neg	1	1	3	3	8	5	40	Y	-	Soil amelioration will be done after replacement of the topsoil according to soil analyses and soil fertility will be maintained by means of an annual fertilizer program until self- sustaining.	3	1	2	3	9	3	27	Environmental manager	Inspect stripping activities and ensure they are to specification of the pedology study.	Weekly	Running cost
Wetlands	Erosion and Sedimentation	Neg	4	2	3	3	12	4	48	Y	Mod	All activities in new areas, such as roll over opencast mining, must take place outside of wetland boundaries unless the authorisations are obtained through NEMA and NWA. Wetlands can only be affected once NEMA and NWA authorisations are in place. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas not being used for mining. Vegetation clearing must be limited to the site boundary. This must be pegged out on site. Vegetative cover must be maintained close to the site boundary to prevent erosion. Berms should be constructed around stock piles in order to intercept sediment and prevent sediment from leaving the site.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Biomonitoring of wetlands.	After rain & Every 6 months	Rehab cost & R110,000.00
Groundwater	Potential infiltration of contaminated water into groundwater table if leaks, spills or seepage occurs	Neg	4	2	1	3	10	3	30	Y	Mod	Ensure water management facilities are operating adequately and trenches are not blocked or eroded. Ensure integrity of any lining is not compromised.	3	2	2	3	10	2	20	Environmental manager	Inspect trenches and lining of trenches/containment facilities. Groundwater monitoring.	Annually & Quarterly	Running cost & R 200,000.00
Soils	Containment of dirty water within dirty footprint area	Pos	4	1	1	1	7	4	28	N	-	-	4	1	1	1	7	4	28	Environmental manager	-	-	-
Soils	Potential contamination of soils if dirty water escapes into environment	Neg	3	2	1	3	9	3	27	Y	Low	Maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Clean systems will primarily divert water from undisturbed or rehabilitated areas away from disturbed areas. The berms surrounding the opencast and infrastructure areas must effectively divert clean storm water into natural drainage lines. GN704 principles will be applied.	2	2	1	3	8	2	16	Environmental manager	Inspect water management features	Weekly	Running cost

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Soils	Degradation of topsoil in berms or heaps	Neg	2	2	1	3	8	3	24	Y	Low	Ensure regular weed management program and allow for regrowth of natural vegetation to maintain biota levels in the topsoil. Topsoil conservation will mitigate impact and provide adequate quality and quantity soil in order to re-established required end land use. The most critical component of the soil, with respect to successful rehabilitation, is the need to restore the soil moisture characteristics, as well as to limit compaction and/or crusting. Conduct soil analyses in areas where soils have been replaced for rehabilitation to determine amelioration requirements and apply to soils as necessary.	2	2	1	3	8	2	16	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Erosion	Neg	3	2	1	3	9	3	27	Y	Low	Surface stabilization must be conducted where necessary to reduce erosion until a vegetative cover is established. Mulches and chemical stabilizers can be utilized only to provide short term benefits. Matting and netting is recommended for application in steep sloping areas where there is a severe localized problem. Landscaping and mechanical preparation of a disturbed area is very important in the establishment of a good vegetative cover. Runoff, interception and conveyance of water is also necessary to reduce erosion. Establishment of clean and dirty water drainage systems is essential with consideration of well-placed silt traps and/or flow dissipaters in areas with high sediment transport or high surface water runoff velocity.	2	1	1	3	7	2	14	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Containment of dirty water within dirty footprint area	Neg	3	2	2	3	10	5	50	Y	Low	Surface stabilization must be conducted where necessary to reduce erosion until a vegetative cover is established. Mulches and chemical stabilizers can be utilized only to provide short term benefits. Matting and netting is recommended for application in steep sloping areas where there is a severe localized problem. Landscaping and mechanical preparation of a disturbed area is very important in the establishment of a good vegetative cover. Runoff, interception and conveyance of water is also necessary to reduce erosion. Establishment of clean and dirty water drainage systems is essential with consideration of well-placed silt traps and/or flow dissipaters in areas with high sediment transport or high surface water runoff velocity.	2	1	2	3	8	2	16	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Surface water & associated wetlands	Potential surface water contamination if leaks escape into the environment	Neg	5	2	2	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable.	2	2	2	3	9	2	18	Environmental manager	Inspect water management features, including trenches, berms, dams and pipelines. Surface water monitoring.	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Potential silt-loading of drainage lines and downstream water bodies	Neg	5	2	2	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable. Establish erosion control measures on rehabilitated areas and seed areas as soon as possible.	2	2	2	3	9	2	18	Environmental manager	Inspect water management features, including trenches, berms, dams and pipelines. Surface water monitoring.	Weekly & Monthly	Running cost & R 200,000.00
Surface water	Downstream water quantity of catchment reduced	Neg	3	2	2	3	10	5	50	N	Mod	Necessary measure to prevent pollution downstream.	3	2	2	3	10	5	50	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Groundwater	Potential infiltration of contaminated water into groundwater table if leaks, spills or seepage occurs	Neg	4	2	1	3	10	4	40	Y	Mod	Ensure water management facilities are operating adequately and trenches are not blocked or eroded. Ensure integrity of any lining is not compromised.	3	2	2	3	10	2	20	Environmental manager	Inspect trenches and lining of trenches/containment facilities. Groundwater monitoring.	Annually & Quarterly	Running cost & R 200,000.00
Soils	Containment of dirty water within dirty footprint area	Pos	4	1	1	1	7	4	28	N	-	-	4	1	1	1	7	4	28	Environmental manager	-	-	-

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
Soils	Potential contamination of soils if dirty water escapes into environment	Neg	3	2	1	3	9	3	27	Y	Low	Maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Clean systems will primarily divert water from undisturbed or rehabilitated areas away from disturbed areas. The berms surrounding the opencast and infrastructure areas must effectively divert clean storm water into natural drainage lines. GN704 principles will be applied.	2	2	1	3	8	2	16	Environmental manager	Inspect water management features	Weekly	Running cost
Surface water & associated wetlands	Containment of dirty water within dirty footprint area	Pos	4	2	2	1	9	4	36	N	-	-	4	2	2	1	9	4	36	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Surface water & associated wetlands	Potential surface water contamination if leaks escape into the environment	Neg	5	2	2	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable.	2	2	2	3	9	2	18	Environmental manager	Inspect water management features, including trenches, berms, dams and pipelines. Surface water monitoring.	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Potential silt-loading of drainage lines and downstream water bodies	Neg	5	2	2	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable. Establish erosion control measures on rehabilitated areas and seed areas as soon as possible.	2	2	2	3	9	2	18	Environmental manager	Inspect water management features, including trenches, berms, dams and pipelines. Biomonitoring.	Weekly & Every 6 months	Running cost & R 110,000.00
Surface water	Downstream water quantity of catchment reduced	Neg	3	2	2	3	10	5	50	N	Mod	Necessary measure to prevent pollution downstream.	3	2	2	3	10	5	50	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Groundwater	Potential for poor quality water impacting on groundwater if pipeline burst or leak	Neg	3	2	3	3	11	3	33	N	Mod	Ensure all pipelines are properly fitted and sealed. Consider constructing paddocks for surface pipelines to contain any soils and clear these out as soon as spills occur. Pipelines should be fitted with shut-off valves along its length so that the flow can be stopped if leaks are observed and allow for easier pipeline repair.	2	2	1	3	8	2	16	Site & Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Soils	Potential for poor quality water impacting on nearby soils if pipeline burst or leak	Neg	3	2	1	3	9	3	27	Y	Low	Maintenance of clean and dirty water drainage systems is essential in mitigation of soil contamination. Polluted water must not be allowed to enter undisturbed areas. Thus the dirty water canals and dirty water dams in the infrastructure area must be well sealed. Dirty water systems will collect water from disturbed areas and convey them to sealed containment facilities. Clean systems will primarily divert water from undisturbed or rehabilitated areas away from disturbed areas. The berms surrounding the opencast and infrastructure areas must effectively divert clean storm water into natural drainage lines. GN704 principles will be applied.	2	1	1	3	7	2	14	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Surface water & associated wetlands	Potential for poor quality water impacting on nearby water bodies if pipeline burst or leak	Neg	5	2	1	3	11	3	33	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable. Pipelines carrying high loads of contaminated water should be placed within actively managed dirty areas and consideration should be given to constructing paddocks to contain spills.	2	2	1	3	8	2	16	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site & Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Groundwater	Reduced risk of contamination by sewage	Pos	3	2	1	1	7	4	28	N	-	-	3	2	1	1	7	4	28	Environmental manager	-	-	-
Soils	Reduced risk of contamination by sewage	Pos	3	1	1	1	6	4	24	N	-	-	3	1	1	1	6	4	24	Environmental manager	-	-	-

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Surface water & associated wetlands	Reduced risk of contamination by sewage	Pos	4	2	2	1	9	4	36	N	-	-	4	2	2	1	9	4	36	Environmental manager	-	-	-
Groundwater	Potential for contamination removed	Pos	3	2	1	3	9	4	36	Y	-	Ensure reputable contractors are utilised for removal of substances from site and that these are adequately transported.	3	2	1	3	9	4	36	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential for contamination removed	Pos	3	1	1	3	8	3	24	Y	-	Ensure reputable contractors are utilised for removal of substances from site and that these are adequately transported.	3	1	1	3	8	3	24	Environmental manager	-	-	-
Surface water & associated wetlands	Potential for contamination removed	Pos	4	2	2	1	9	4	36	N	-	-	4	2	2	1	9	4	36	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	2	1	6	4	24	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	1	5	11	4	44	Y	Mod	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	1	3	7	2	14	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Soils	Potential compaction of soils	Neg	2	1	2	3	8	4	32	Y	Low	Restriction of vehicle movement and good planning of rehabilitation. Minimise operation and machinery movements to stipulated mining area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Compacted soils should be ripped, disced or scarified as needed to rip compacted soil layers.	1	1	2	3	7	2	14	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential contamination of soils if dirty water escapes into environment	Neg	2	2	2	3	9	3	27	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	2	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Biomonitoring	Monthly & Every 6 months	Contractors cost & R 110,000.00

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Traffic & safety	Increased potential for road incidences	Neg	4	1	2	5	12	3	36	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	2	5	11	1	11	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	2	3	10	4	40	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	2	3	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Visual Aspect	Altered aesthetics	Pos	3	2	3	3	11	4	44	N	-	-	3	2	3	3	11	4	44	Environmental manager	-	-	-
Groundwater	Groundwater levels rebound	Pos	2	2	5	5	14	5	70	N	-	-	2	2	5	5	14	5	70	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Rebound of groundwater levels	Pos	2	2	5	5	14	5	70	N	-	-	2	2	5	5	14	5	70	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Reduced risk of contaminated decant	Pos	3	2	3	3	11	3	33	N	-	-	3	2	3	3	11	3	33	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Groundwater	Potential contamination plume and decant from mining areas	Neg	4	3	5	4	16	5	80	N	High	Replace carbonaceous material at the bottom of the pit during rehab to ensure early flooding and oxygen displacement. Compact the carbonaceous material at the base of the pit to further displace air. Seal off individual seepage zones in the fractured rock. Rehabilitated areas must be free draining to prevent ingress of water.	4	3	5	4	16	4	64	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Surface water & associated wetlands	Potential for poor quality leachate impacting on nearby water bodies	Neg	4	2	2	3	11	4	44	Y	Mod	Cut-off trench should be erected to capture any potential seepage. In the event of impact to the wetland, ensure that a suitably qualified geohydrologist is appointed to rectify the impacts. Finalise decant management options as summarises in this EMP.	3	2	2	3	10	3	30	Environmental manager	Inspect all water management features on site & Surface water monitoring	Weekly & Monthly	Running cost & R 200,000.00
Topography	Potential subsidence of surface layers	Neg	3	1	3	3	10	3	30	Y	-	Ensure adequate safety standards are set with regards to bord-and-pillar mining. Inspect areas of underground mining and rehabilitate any subsidence or sinkholes according to acceptable standards.	3	1	3	3	10	2	20	Mine Manager	Inspect underground mining surface area	Monthly	Running cost
Surface water & associated wetlands	Reduces risk of silt loading on downstream water bodies	Pos	3	2	3	3	11	3	33	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & monthly	Rehab cost & R200,000.00
Topography	Re-contouring of area for free surface water drainage	Pos	2	1	3	3	9	4	36	Y	-	Monitor, especially after first heavy rain falls to ensure adequate surface water drainage.	2	1	3	3	9	4	36	Environmental manager	Inspect area for erosion and pooling.	After rain.	Running cost
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Groundwater	Potential contamination plume from mining areas	Neg	4	3	5	4	16	5	80	N	High	Replace carbonaceous material at the bottom of the pit during rehab to ensure early flooding and oxygen displacement. Compact the carbonaceous material at the base of the pit to further displace air. Seal off individual seepage zones in the fractured rock. Rehabilitated areas must be free draining to prevent ingress of water.	4	3	5	4	16	4	64	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Topography	Eradication of voids	Pos	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Site manager	-	-	-
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	2	3	3	11	4	44	N	-	-	3	2	3	3	11	4	44	Environmental manager	-	-	-

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Surface water & associated wetlands	Potential surface water contamination if leaks escape into the environment	Neg	5	2	2	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable.	2	2	2	3	9	2	18	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Surface water & associated wetlands	Potential silt-loading of drainage lines and downstream water bodies	Neg	5	2	2	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable. Establish erosion control measures on rehabilitated areas and seed areas as soon as possible.	2	2	2	3	9	2	18	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Topography	Re-contouring of area for free surface water drainage	Pos	2	1	3	3	9	4	36	Y	-	Monitor, especially after first heavy rain falls to ensure adequate surface water drainage.	2	1	3	3	9	4	36	Environmental manager	Inspect area for erosion and pooling.	After rain.	Running cost
Surface water & associated wetlands	Free drainage restored to area	Pos	3	2	3	3	11	3	33	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & Monthly	Rehab cost & R200,000.00
Surface water	Large areas of surface water runoff return to catchment	Pos	3	2	2	3	10	4	40	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	2	3	10	4	40	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & Monthly	Rehab cost & R200,000.00
Surface water & associated wetlands	Potential silt-loading of drainage lines and downstream water bodies	Neg	5	2	2	3	12	3	36	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements and are maintained on site till areas are stable. Establish erosion control measures on rehabilitated areas and seed areas as soon as possible.	2	2	2	3	9	2	18	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Wetlands	Reduced risk of contaminated water entering wetland areas and impairing ecological function.	Pos	3	2	3	3	11	3	33	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Biomonitoring of wetlands.	After rain & Every 6 months	Rehab cost & R110,000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Topography	Eradication of stockpiles	Pos	3	1	3	3	10	5	50	N	-	-	3	1	3	3	10	5	50	Environmental manager	-	-	
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	2	3	3	11	4	44	N	-	-	3	2	3	3	11	4	44	Environmental manager	-	-	
Groundwater	Potential for contamination reduced	Pos	2	2	3	1	8	3	24	N	-	-	2	2	3	1	8	3	24	Environmental manager			
Surface water & associated wetlands	Reduces risk of silt loading on downstream water bodies	Pos	3	2	3	3	11	4	44	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	4	44	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & monthly	Rehab cost & R200,000.00
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	2	3	3	11	4	44	N	-	-	3	2	3	3	11	4	44	Environmental manager	-	-	-
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	1	5	1	10	3	30	N	-	-	3	1	5	1	10	3	30	Environmental manager	-	-	

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Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Topography	Eradication of trenches and berms	Pos	2	1	3	3	9	4	36	N	-	-	2	1	3	3	9	4	36	Environmental manager	-	-	
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	2	3	3	11	4	44	N	-	-	3	2	3	3	11	4	44	Environmental manager	-	-	
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Topography	Eradication of trenches and berms	Pos	2	1	3	3	9	4	36	N	-	-	2	1	3	3	9	4	36	Environmental manager	-	-	
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	1	5	1	10	3	30	N	-	-	3	1	5	1	10	3	30	Environmental manager	-	-	
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Environmental manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Surface water & associated wetlands	Reduces risk of silt loading on downstream water bodies	Pos	3	2	3	3	11	3	33	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & Monthly	Rehab cost & R200,000.00
Topography	Re-contouring of area for free surface water drainage	Pos	2	1	3	3	9	4	36	Y	-	Monitor, especially after first heavy rain falls to ensure adequate surface water drainage.	2	1	3	3	9	4	36	Environmental manager	Inspect area for erosion and pooling.	After rain.	Running cost
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	1	5	1	10	3	30	N	-	-	3	1	5	1	10	3	30	Environmental manager	-	-	-
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors will enforce speed limits.	1	2	2	1	6	2	12	Site manager	Speed inspections	Sporadically	Running cost
Air quality	Excessive emissions	Neg	1	2	2	1	6	4	24	Y	Low	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	1	2	2	1	6	2	12	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Groundwater	Potential hydrocarbon contamination leeching into the water table	Neg	3	2	1	5	11	4	44	Y	Mod	Truck, machinery and equipment will be regularly serviced to reduce risk of leaks. Spill kits must be available on site and personnel trained on utilising these. Any leakages should be reported and treated immediately. For large spills Hazmat will be called in.	2	1	1	3	7	2	14	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Groundwater monitoring.	Monthly & Quarterly	Contractors cost & R 200,000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00

Impacted Aspect	Impact	Status	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	Mitigation	Degree of irreplaceable loss of resource	Mitigation	Magnitude	Extent	Duration	Reversibility	CONSEQUENCE	PROBABILITY	SIGNIFICANCE (post mitigation)	Responsible person	Monitoring & inspection	Frequency	Cost / annum
Soils	Potential compaction of soils	Neg	2	1	2	3	8	4	32	Y	Low	Restriction of vehicle movement and good planning of rehabilitation. Minimise operation and machinery movements to stipulated mining area only. Fields should not be trafficked if they are at or wetter than the plastic limit. Compacted soils should be ripped, disced or scarified as needed to rip compacted soil layers.	1	1	2	3	7	2	14	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Potential contamination of soils if dirty water escapes into environment	Neg	2	2	2	3	9	3	27	Y	Low	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	3	3	10	2	20	Site manager	Ensure service plans are maintained and inspect log books.	Monthly	Contractors cost
Surface water & associated wetlands	Potential hydrocarbon contamination which may reach downstream surface water bodies	Neg	4	2	2	3	11	3	33	Y	Mod	Minimise direct spillages of oils or diesels as a result of machinery use. Ensure action and emergency response plans are in place for all hydrocarbon spills. Spill kits must be available on site and personnel trained to utilise these. Spills must be reported and attended to immediately. All vehicles and machinery on site will be up-to-date with their service and maintenance plans to reduce risks of hydrocarbon leaks. The use of persistently leaky equipment will be discontinued until such time that repairs are made or if repairs are not possible the equipment will be replaced.	2	2	2	3	9	2	18	Site & Environmental manager	Ensure service plans are maintained and inspect log books. Biomonitoring	Monthly & Every 6 months	Contractors cost & R 110,000.00
Traffic & safety	Increased potential for road incidences	Neg	4	1	2	5	12	3	36	Y	-	All intersections with main tarred roads will be clearly signposted . Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.	3	1	2	5	11	1	11	Site manager	Inspect intersections and roads	Monthly	Running cost
Traffic & safety	Road degradation	Neg	3	2	2	3	10	4	40	Y	-	A fund will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.	3	2	2	3	10	1	10	Site manager	Inspect intersections and roads	Monthly	Running cost
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Groundwater	Potential for contamination reduced	Pos	2	2	3	1	8	3	24	N	-	-	2	2	3	1	8	3	24	Environmental manager			
Surface water & associated wetlands	Reduces risk of silt loading on downstream water bodies	Pos	3	2	3	3	11	3	33	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & monthly	Rehab cost & R200,000.00
Visual Aspect	Improved aesthetics through rehabilitation	Pos	3	1	5	1	10	3	30	N	-	-	3	1	5	1	10	3	30	Environmental manager	-	-	-
Air quality	Dust generation	Neg	1	2	2	1	6	4	24	Y	Low	A water cart will be used to spray relevant areas when dust levels are high.	1	2	2	1	6	2	12	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Noise	Increased noise levels	Neg	1	2	1	1	5	4	20	Y	-	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible. Point sources will be enclosed where possible. Screens will be considered if I&AP complaints are received.	1	1	1	1	4	3	12	Site manager	Environmental noise monitoring.	Quarterly	R 90 000.00
Surface water	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements are retained on site till area is stable. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas as soon as possible.	2	2	3	3	10	3	30	Environmental manager	Inspect area for erosion and pooling.	After rain.	Running cost
Wetlands	Potential silt-loading of drainage lines and downstream water bodies	Neg	3	2	2	3	10	3	30	Y	Mod	Ensure contour berms, erosion control measures and silt traps are established where necessary to reduce silt loading of natural water bodies. These should be removed and rehabilitated where necessary once the rehabilitated areas are stable.	2	2	2	3	9	2	18	Environmental manager	Inspect area for erosion and pooling.	After rain.	Running cost

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Topography	Re-contouring of area for free surface water drainage	Pos	2	1	3	3	9	4	36	Y	-	Monitor, especially after first heavy rain falls to ensure adequate surface water drainage.	2	1	3	3	9	4	36	Environmental manager	Inspect area for erosion and pooling.	After rain.	Running cost
Surface water & associated wetlands	Free drainage restored to area	Pos	3	2	3	3	11	3	33	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & Monthly	Rehab cost & R200,000.00
Wetlands	Free drainage restored to area	Pos	3	2	3	3	11	3	33	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and pooling. Biomonitoring of wetlands.	After rain & Every 6 months	Rehab cost & R110,000.00
Surface water	Large areas of surface water runoff return to catchment	Pos	3	2	2	3	10	4	40	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	3	2	2	3	10	4	40	Environmental manager	Inspect area for erosion and pooling. Surface water monitoring.	After rain & Monthly	Rehab cost & R200,000.00
Wetlands	Reduced risk of contaminated water entering wetland areas and impairing ecological function.	Pos	4	2	3	3	12	4	48	Y	-	Monitor area for erosion and pooling and rehabilitate if necessary. Continue with Surface water monitoring.	4	2	3	3	12	4	48	Environmental manager	Inspect area for erosion and pooling. Biomonitoring of wetlands.	After rain & Every 6 months	Rehab cost & R110,000.00
Soils	Initial increased potential for loss of soil and soil erosion	Neg	3	2	3	3	11	3	33	Y	Low	Re-vegetate any bare soil immediately.	2	2	3	3	10	2	20	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Soils	Soils replaced and ameliorated	Pos	3	1	3	3	10	5	50	Y	-	Ensure soils are replaced to an adequate depth and ensure soil quality is adequate.	3	1	3	3	10	5	50	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Surface water & associated wetlands	Increased runoff and associated potential silt-loading of drainage lines and downstream water bodies and wetlands	Neg	3	2	3	3	11	4	44	Y	Mod	Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements are retained on site till area is stable. Approved erosion control measures must be carried out to minimise erosion and sedimentation downstream in the wetland. These can include gabion baskets, levees and reseeding of areas as soon as possible.	2	2	3	3	10	3	30	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Flora	Create adequate environment for flora to establish	Pos	4	2	3	3	12	4	48	Y	-	Conduct annual soil fertility tests and apply soil amelioration as required to encourage vegetation establishment and growth.	4	2	3	3	12	5	60	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Soils	Soils replaced and ameliorated	Pos	3	1	3	3	10	5	50	Y	-	Ensure soils are replaced to an adequate depth and ensure soil quality is adequate.	3	1	3	3	10	5	50	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Soils	Potential for loss of soil and soil erosion reduced	Pos	3	2	3	3	11	3	33	Y	-	Re-vegetate any bare soil immediately.	3	2	3	3	11	3	33	Environmental manager	Inspect area for erosion and soil compaction	Monthly	Running cost
Surface water & associated wetlands	Surface water runoff drainage controlled and erosion and associated silt loading of water reduced.	Pos	4	2	3	3	12	3	36	Y	-	Inspect area for erosion and attend to problem areas immediately.	4	2	3	3	12	3	36	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Surface water	Surface water runoff drainage captured and treated through artificial wetlands before entering natural drainage lines and tributaries	Pos	2	2	3	3	10	2	20	Y	-	Ensure water stays within artificial wetlands long enough to adequately treat water quality. Continue with surface water monitoring.	2	2	3	3	10	2	20	Environmental manager	Surface water monitoring	Monthly	R 200 000.00

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Wetlands	Reduced risk of silt-loaded/contaminated water entering wetland areas and impairing ecological function. Additional wetland habitat provided for wetland flora and fauna and potential for improved biodiversity	Pos	3	2	3	3	11	4	44	Y	-	Inspect wetlands for vegetation cover and overall biodiversity. Continue with Surface water monitoring.	3	2	3	3	11	4	44	Environmental manager	Biomonitoring	Every 6 months	R 110 000.00
Fauna	New habitat available to fauna in the area and reduced activity should result in influx of animals to the area	Pos	3	2	3	3	11	3	33	N	-	Conduct annual surveys to monitor faunal biodiversity.	3	2	3	3	11	3	33	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Flora	Area re-vegetated with indigenous plants	Pos	3	2	3	3	11	4	44	Y	-	Rehabilitate disturbed areas with natural indigenous flora. Monitor for cover abundance.	3	2	3	3	11	4	44	Environmental manager	Floral surveys need to be conducted to monitor cover abundance, plant succession and community structure	Annually	R 80 000.00
Flora	Alien invasive encroachment	Neg	3	2	5	3	13	3	39	Y	High	Eradicate and control all alien invasive species on site. When removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation. All alien seedlings and saplings must be removed as they become evident for the duration of mine operation and after closure. Manual / mechanical removal is preferred to chemical control. All vehicles and equipment, as well as material brought to site should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the site. Rehabilitate and revegetate all areas where alien invasive species were removed.		2	3	3	8	2	16	Environmental manager	Alien invasive species surveying	Every 6 months depending on species	Running cost
Fauna	Potential harm through littering	Neg	3	1	1	3	8	2	16	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	1	1	1	3	6	1	6	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Groundwater	Potential contamination through littering	Neg	3	1	2	3	9	2	18	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	3	1	2	1	7	1	7	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Soils	Potential contamination through littering	Neg	3	1	3	3	10	2	20	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	1	3	3	9	2	18	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Surface water & associated wetlands	Potential contamination through littering	Neg	3	2	1	3	9	1	9	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	2	1	1	6	1	6	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost
Visual Aspect	Loss of aesthetics	Neg	3	1	1	3	8	3	24	Y	Low	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.	2	1	1	3	7	2	14	Environmental manager	Inspect area for illegal littering and dumping	Monthly	Running cost

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Aquatic ecosystems	Decreased water quality	Neg	3	3	4	3	13	4	52	Y	Mod	Should surface decant potentially occur, then recommendations of the geohydrologist must be applied to contain and / or treat water to a standard that is compliant with the Interim Resource Quality Objective. Ideally, water should be treated to a degree representative of the natural water quality found within the catchment if water is released into the environment.	2	3	2	3	10	2	20	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Aquatic ecosystems	Increased volume of water entering catchment	Neg	3	3	4	3	13	3	39	Y	Mod	Conduct a detailed assessment of the hydrology of the affected sections of the catchment, and ensure that any measures taken support the natural existing hydrological cycle within the catchment, both in terms of volume and timing of natural flows. Investigate the possibility of using the surplus water obtained from the rehabilitated pit for other suitable purposes.	1	3	2	3	9	2	18	Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00
Flora	Alien invasive encroachment	Neg	3	2	5	3	13	3	39	Y	High	Eradicate and control all alien invasive species on site. When removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation. All alien seedlings and saplings must be removed as they become evident for the duration of mine operation and after closure. Manual / mechanical removal is preferred to chemical control. All vehicles and equipment, as well as material brought to site should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the site. Rehabilitate and revegetate all areas where alien invasive species were removed.	2	2	3	3	10	2	20	Environmental manager	Alien invasive species surveying	Every 6 months depending on species	Running cost
Flora	Potential damage to vegetation associated with the Olifants River and surrounding wetlands through contaminated water runoff and possible AMD	Neg	5	2	5	5	17	4	68	Y	Mod	Prevent groundwater recharge and ensure that rehabilitated areas are free draining. Backfill or recontour strip-mined or contour-mined areas with excess excavation material generated during construction. Shafts and boreholes must be sealed to reduce possibility of fires. Divert surface water (clean water) flowing towards the site of pollution. Topsoil should not be compacted during the rehabilitation process. Keep sediment barriers in place until restoration and rehabilitation is complete. Prevent grazing from livestock within the first 2 to 3 years after rehabilitation and prevent access to rehabilitated areas until such time that rehabilitation was successful. Polluted water may not be directed into the Olifants River. If the plants were replanted as part of rehabilitation, the survival of the population of the 'Declining' *Crinum bulbispermum* must be monitored and if the plants are under threat, they should be removed with the permission of the approving authority and transplanted to suitable habitat.	3	2	3	3	11	2	22	Environmental manager	Floral surveys need to be conducted to monitor cover abundance, plant succession and community structure	Annually	R 80 000.00
Flora & fauna	Overall ecosystem degradation through poor rehabilitation completed on site	Neg	5	2	5	3	15	4	60	Y	High	The area should be re-landscaped and resemble the land form prior to the open cast activities. The areas should be planted with indigenous vegetation typical of the area and monitored to ensure that the vegetation progresses through succession stages. Monitoring of the rehabilitation success as well as the survival of *Crinum bulbispermum* on the site should take place for at least five years and include corrective follow-up action. It is recommended that Landscape Functional Analysis (LFA) forms part of the rehabilitation and monitoring process.	2	2	3	3	10	2	20	Environmental manager	Floral surveys need to be conducted to monitor cover abundance, plant succession and community structure	Annually	R 80 000.00
Fauna	Alienation of animals from the area	Neg	3	2	2	1	8	3	24	Y	Low	Inform staff, contractors and visitors to not harm fauna in the area. Any fencing or barrier that is established must consider animals that may move through the area and provide the means for animals to do so, such as culverts or open mesh fences.	2	2	2	3	9	2	18	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Groundwater	Irresponsible use of water will impact on groundwater quantity	Neg	3	2	2	1	8	2	16	Y	Low	Saving water initiatives will be included in environmental awareness training.	2	2	2	1	7	2	14	Environmental manager	Inspect all potable water works for leaks. Monitor water use.	Weekly	Running cost
Groundwater	Rebound of water levels	Pos	3	3	5	3	14	4	56	N	-	-	3	3	5	3	14	4	56	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00

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Groundwater	Flow of contaminated groundwater away from mine into neighbouring areas	Neg	4	3	5	4	16	5	80	N	High	Replace carbonaceous material at the bottom of the pit during rehab to ensure early flooding and oxygen displacement. Compact the carbonaceous material at the base of the pit to further displace air. Seal off individual seepage zones in the fractured rock. Rehabilitated areas must be free draining to prevent ingress of water.	4	3	5	4	16	4	64	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Social	Steady reduction in employment	Neg	4	2	3	1	10	5	50	Y	High	SLP retrenchment plan and training should be followed. Employ staff at other operations if feasible.	3	2	3	1	9	4	36	Environmental manager	Ensure retrenchment is in line with SLP initiatives	As required	Running cost
Soils	Increased soil nutrient pool.	Pos	2	1	2	3	8	3	24	Y	-	A representative sampling of the stripped soils will be analysed to determine the nutrient status of the utilizable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay% and Organic Carbon. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if and as necessary.	2	1	2	3	8	3	24	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Soils	Reduction in area of impact and return of soil utilization potential.	Pos	1	1	3	3	8	5	40	Y	-	Implementation and monitoring of Rehabilitation Plan	1	1	3	3	8	5	40	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Land Use	Land uses will return	Pos	2	1	2	3	8	3	24	Y	-	Implementation and monitoring of Rehabilitation Plan	2	1	2	3	8	3	24	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Land Capability	Land capability will be restored to a large extent	Pos	2	1	2	3	8	2	16	Y	-	Implementation and monitoring of Rehabilitation Plan	2	1	2	3	8	2	16	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Air quality	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Dust monitoring	Monthly	R 155 000.00
Fauna	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Monitor any ecologically sensitive species should they be observed on site	As and when required	Running cost
Flora	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Floral surveys need to be conducted to monitor cover abundance, plant succession and community structure	Annually	R 80 000.00
Groundwater	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Groundwater monitoring	Quarterly	R 200 000.00
Soils	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Soil survey and soil quality and depth monitoring	Annually	R 100 000.00
Surface water	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Surface water monitoring	Monthly	R 200 000.00
Topography	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Survey of mined out areas	Annually	Running cost
Wetlands	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	Environmental manager	Biomonitoring	Every 6 months	R 110 000.00
Aquatic ecosystems												-								Environmental manager	Surface water monitoring & Biomonitoring	Monthly & Every 6 months	R 200,000.00 & R 110,000.00

The table above provides a detailed impact assessment. Some of the site specific issues identified to be of moderate to high significance have been further discussed below.

9.1 Significant Environmental Impacts Identified

9.1.1 Geology

The geology will be permanently altered through the excavation of material to reach the coal seams and through the removal of the coal seams. The permanent geological alteration cannot be mitigated as this is the nature of mining.

9.1.2 Topography

During roll-over opencast mining, the excavation of material and associated stockpiling will alter topography of the area. This is the nature of mining and cannot be mitigated.

9.1.3 Soil

The main significant impact to soil will be loss of physical and chemical characteristics of the topsoil, as well as erosion. Topsoil is critical for closure phase and attaining useable land capabilities and the soil utilisation guide proposed must be strictly enforced.

9.1.4 Groundwater

The major impacts to groundwater will be the alteration of groundwater flow and the deterioration of the surrounding groundwater quality.

The mining areas will have to be actively dewatered to ensure a safe working environment. Pumping groundwater that seeps into the mine area to surface will cause dewatering of the surrounding aquifers and an associated decrease in groundwater level within the zone of influence of the dewatering cone. During the operational phase five privately owned boreholes are expected to be impacted on. BH7, BH8, and BH9 it is expected that the water level will drop between 11-13 m. The water level in BH21 is expected to decrease by 18 m and the water level in BH18 is expected to decrease by 8 m as can be seen in Figure 9-1. The lowering of the water level in the weathered aquifer as a result of dewatering will have a minor impact of the flow velocity of the Olifants water. The resulting cone of depression is expected to reduce flow velocity on the river near the mining site by 0.06%.

Post mining groundwater levels will rebound as dewatering ceases and mine areas fill with water eventually restoring local water levels to a large extent.

Should water within the pits come into contact with pyritic material then water quality will become impaired. As water recharges post mining, a contamination plume will develop. This plume water will begin to flow towards the Olifants River.

This plume is likely to terminate where the groundwater daylights in the region of low lying areas associated with the rivers, wetlands and streams. For the opencast areas decant from the mine workings is expected to start from 15 years respectively. It is expected that decant volumes for the opencast areas will be in the order of 10 and 85 m^3/day.

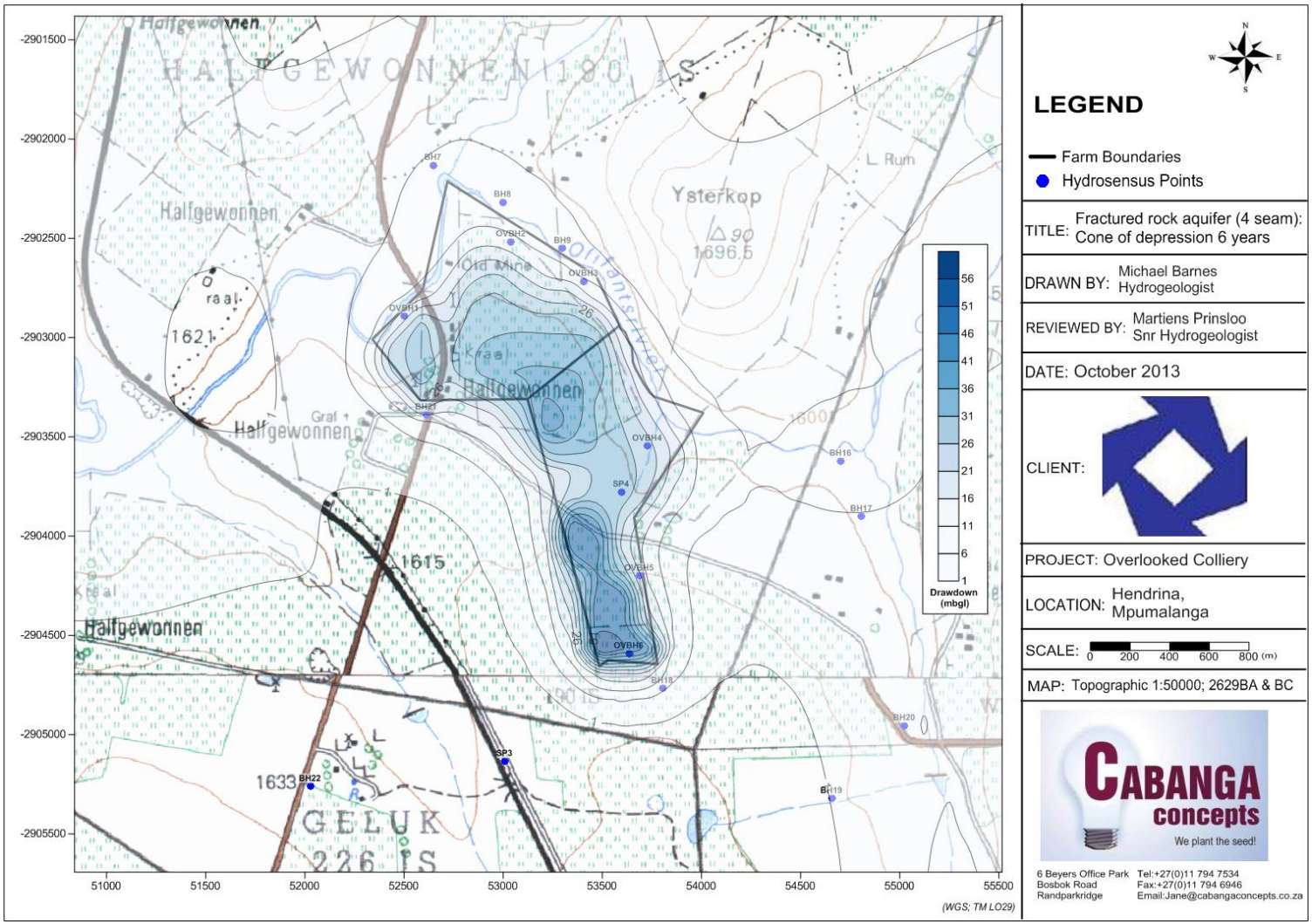

Figure 9-1: Groundwater cone of depression (fractured rock)

Additionally the plume will migrate through the weathered zone into the Olifants River and flood plain area. The sulphate concentrations of the baseflow seepage into the Olifants River were calculated between 200 to 920 mg/l. Peak salt load into the river will also increase. It is expected that a maximum of 1.6 kg/day of salt will enter the river system at 100 years after closure. The peak flow rate of the Olifants was calculated to be in the order of 54 m^3/sec during a 1:2 year flood even (Letsolo, 2013). The average flow rate of the river is expected to be in the order of 0.4 m^3/sec (34 560 m^3/day). It can therefore be expected that the additional salt load will have a low impact of the river systems due to the high dilution potential.

9.1.5 Wetlands and Surface Water

The Olifants River forms the northern boundary and has wetlands associated with it. The main impacts to wetlands that have been identified include erosion of wetland areas and sedimentation of these systems due to erosion of soils in the general area, deterioration of water quality and destruction of wetland habitat. Where activities are required within wetlands and their buffer zones (the opencast Block B) the authorisations from DWA and DEDET must be acquired before any activities proceeding through these areas.

Impacts to water resources and associated wetlands are largely associated with storm water runoff and contaminant transport. The greatest impacts to these systems will be from water coming into contact with coaliferous material associated with a decreased pH and AMD formation. It is therefore critical to ensure separation of clean and dirty water runoff and containment of dirty water runoff, particularly around overburden stockpile areas, coal handling and stockpiling areas.

Containment of dirty water will also result in decreased yield to downstream catchments. The impact is unavoidable and necessary to contain polluted water and protect downstream areas from water quality deterioration. The areas of activity should be kept as small as possible which will require careful planning and proper demarcation of areas targeted for development.

Soil erosion management measures must be applied to reduce risks of silt-loading of water bodies. Steep sloped areas should be properly managed as these will result in higher flow velocities and associated increased erosion and downstream silt loading.

9.1.6 Floral

In general, most of the proposed properties are, or have in the past been, cultivated and the more natural ecosystems are associated with the Olifants River and associated wetlands. Impacts to loss of flora from such sites are considered significant due to the fact that these are the last remnants within the immediate area, because these act as ecological corridors for transfer of genetic material, and provide habitat for most of the red data plant species likely to occur in the area.

Introduction or spread of alien invasive species must be curbed. These species out-compete natural indigenous flora and displace and alter natural biodiversity. Many invasive species are associated with water courses impacting on stream channel dynamics. The introduction

and spread of alien invasive species is a significant impact and mitigation and management measures must be applied on site.

9.1.7 Fauna

The main impacts to fauna include loss of faunal habitat and habitat fragmentation due to vegetation clearance, faunal disturbance through general activities and persecution/ hunting of fauna on site. In general, preservation of natural habitats associated with wetland areas and environmental awareness training would reduce any significant impacts.

9.2 Social Impacts Identified

9.2.1 Atmospheric Conditions

Blasting activities will generate short bursts of noise and result in surface vibrations. This will impact on the local residents, businesses and on any structures within the vibration zone. Mitigation measures for responsible explosives handling must be applied on site. As an off-set approach, investigation into compensation processes must be investigated to assist local communities in loss or damage to property and impacts to local business.

The crusher and screening plant will be a source of noise. This will be a significant impact to nearby sensitive receptors and noise muffling must be considered from the onset of construction. Sensitive receptors nearby are sparse and mostly other mines, but sensitive receptors must be spared nuisance noise from activities by giving consideration to noise screens.

Stripping and stockpiling of soils will largely be targeted for the dry season to reduce impacts to soil characteristics, and reduce disturbances to local fauna which may be breeding in the area. Due to the fact that the dry season should be targeted, dust generation is likely to be excessive and mitigation measures must be applied to reduce dust generation during soil stripping and mobilisation.

9.2.2 Social Impacts

It must be stressed that impacts to the environment will impact people living in the area. Therefore environmental impacts have social implications as well, but have not been further dealt with in this section.

Activities on site must take the safety and health of surrounding residents and land users into account. There are several activities and infrastructure on site which could pose threats to local residents and land users and even result in loss of life. Mitigation measures must be applied to ensure adequate access control and warning of such areas.

Communication channels must be opened with sensitive receptors to determine ways forward that will pose the least amount of disruption. Compensation procedures should be drafted where necessary.

9.2.3 Heritage Sites – Cemeteries

The one grave site occurs within the underground mining area. Graves are of high cultural significance and therefore impacts to graves are of high significance, Mitigation measures must be applied. Any loss of any such sites is considered high.

An historical farmstead was also observed on site, however the record of this site within the heritage report is considered adequate mitigation and impact significance is low for three of the building associated with the site. The impacts significance of the post office / shop is medium and the site should be retained if possible and if no activity is required at the site.

9.2.4 Palaeontological Impact

Many fossil taxa (particularly vertebrate taxa) are known from only a single fossil and, thus, any fossil material is potentially highly significant. Accordingly, the loss or damage to any single fossil can be potentially significant to the understanding of the fossil heritage of South Africa and to the understanding of the evolution of life on Earth in general.

While the probability of a negative impact on the palaeontological heritage contained within the sedimentary strata underlying the project area is categorised as moderate for the opencast areas and low for the remaining sites, the significance of any negative impact is categorised as high within the open cast mining areas and low in the remainder of the project area.

9.2.5 Visual

Visual impacts are elaborated in Table 48 (Cabanga, 2013d). The overall impact on visual aesthetics is rated as moderate.

Table 48: Visual characteristics and potential impact to these

Visual Aspect	Visual Character	Rating
Visual Distance / Observer Proximity	The road users and workers going to Meat and Pap are considered to be of low sensitivity as they are using the road to commute and do not form part of the majority of viewers. The rest of the views are within approximately 2 to 3 km and are mostly screened or marred by existing mining infrastructure surrounding the site.	The visual influence will be moderate for affected visual receptors. The visual distance is moderate due to the existing mines in the surrounding area and the smaller numbers of viewers exposed.
Viewer Incidence / Viewer Perception	Due to low density residential dwellings surrounding the site, viewer incidence is low.	Viewer incidence combined with the viewer's perception is considered low.
Visual Absorptive Capacity (VAC) of Natural	The surrounding landscape is made up of veld grass and open areas and 2 coal mining operations on either side of the property. The Overlooked Colliery will be visible from the adjacent dirt road as well as from the other mines in	Elements of the VAC are considered moderate to high.

Visual Aspect	Visual Character	Rating
Vegetation	the immediate area.	
Visual Resource Value / Landscape Quality	Common landscape that has some positive character but which has evidence of alteration / degradation / erosion of features resulting in areas of more mixed character.	The overall visual resource value can be considered as moderate.
Landscape Integrity and Sense of Place	Landscape immediately surrounding the Overlooked Colliery consists of farmsteads, existing mining infrastructure and relatively small natural areas.	There is no specific rating for the sense of place, but it can be considered slightly altered.
Scenic Quality	The scenic quality of the landscape can be summarised as having low relative relief, smooth and undulating with stream-associated wetlands and the Olifants River bordering the site and the vegetation is degraded grassland with interspersed trees.	The scenic quality of the site in its current state can be viewed as being moderate to low.
Sensitivity of Visual Receptors	Low number of sensitive viewers which include predominantly viewers associated with other mines.	Viewer sensitivity is considered low.
Visual Intrusion	Visual intrusion results from exposure of soils, erosion scars and other disturbances which in this case would be characteristic of the existing landscape.	The visual intrusion is considered moderate.
Visibility	The position and visibility of the Overlooked Colliery has been assessed in terms of a view shed analysis.	Visibility is considered moderate.
Visual Exposure	The site slopes downwards and is positioned at the lowest point in the landscape, surrounded by hilly highs affecting the visual exposure.	Visual exposure can be considered as moderate to low.
Visual Impact Index	The results of the above analyses are incorporated to determine likely areas of visual impact.	Visual impact of the proposed opencast mine can be defined as a moderate to high.

9.3 Residual Impacts Post-Closure

Section 9.1.4, and Appendix D details the outputs of the groundwater model and predicted impacts.

The predicted groundwater levels indicate that decanting will most probably occur in the northern parts of the opencast area (Figure 9-2- red circles).

It can be estimated that:

- The plume will migrate through the weathered zone into the Olifants River. The sulphate concentrations of the baseflow seepage into the Olifants River ranged between 920 to 200 mg/l.
- Peak salt load into the river will also increase. It is expected that a maximum of 1.6 kg/day of salt will enter the river system at 100 years after closure

- For the opencast areas decant from the mine workings is expected to start from 27 to 46 years respectively. It is expected that decant volumes for the opencast areas will be in the order of 100 and 850 m^3/day.

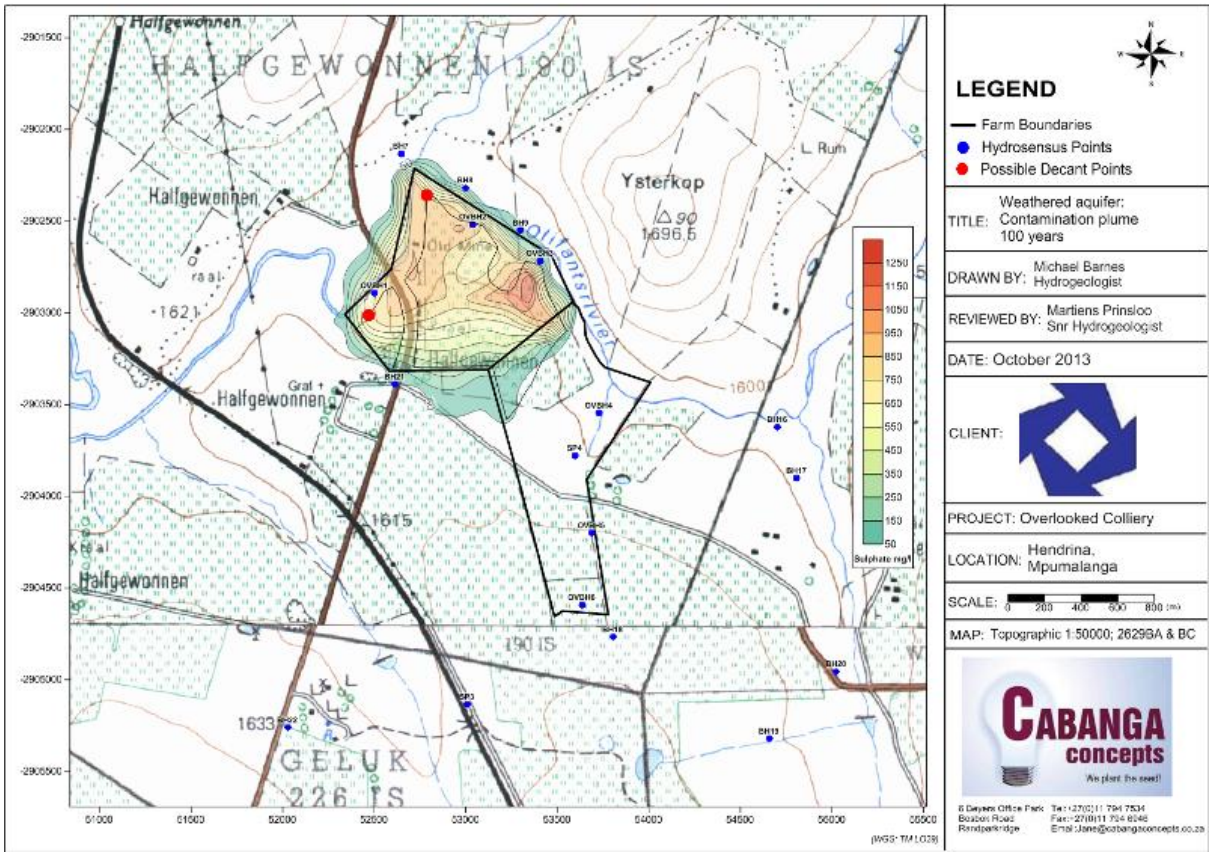

Figure 9-2: Sulphate plume 100 years and decant points (weathered aquifer)

9.4 Impacts Related to Scheduled NEMA Activities

The impact assessment table (Table 47) has cross-referenced relevant scheduled NEMA activities that are triggered by the various activities assessed as part of the impact assessment. The impacts from NEMA scheduled activities have therefore been assessed within the table.

9.5 Cumulative impact Assessment

9.5.1 Topography

Mining, stock farming, crop farming and town development activities associated with Hendrina and Bethal are the main activities in the surrounding area and the topography has already been impacted through these activities. The cumulative effect of the temporary stockpiling of soils, overburden and coal and of the opencast voids and will be minimal and is of low significance. The main reasons are that the stockpiles and the opencast mining

voids will be temporary in nature and the topography will be largely restored after mining. The impact is negative, site specific, definite, of short term duration and of low significance.

9.5.2 Geology

The removal of the coal reserves results in a reduction of the overall coal resources. The cumulative effect is of moderate to high significance, as coal reserves in South Africa are diminishing and are non-renewable. The impact is negative, national, definite, permanent and of moderate to high significance.

9.5.3 Soils and Land Capability

The opencast mining activities will impact on both the soils and the land capability. Opencast mining impacts soil structure and soil chemical properties. Mining, stock farming, crop farming and town development activities have impacted on the soil in the greater area. Soils have therefore been impacted on in the area and in some opencast and surface mining areas the soil profile has been completely altered. The cumulative impacts on soils in the area are therefore moderate to high. The impact is negative, local, definite, of medium term duration and of moderate to high significance.

Soils which are correctly stripped and stockpiled and then re-applied and ameliorated correctly in rehabilitated areas can result in lands that can be utilised for grazing. The cumulative effect on land capability is moderate to low due to the fact that rehabilitation can restore the land to grazing allowing for continued stock farming on the lands post mining. Low productivity could also initially be attained for crop farming which would improve over time as soils are ameliorated. The impact is negative, local, definite, of medium term duration and of moderate to low significance.

9.5.4 Surface Water

9.5.4.1 Surface water quantity

The mine will make use of recycled water as far as possible and will not require large quantities as there will be no wash plant on-site. The main impact on surface water quantity will be the loss of water from the catchment due to confinement of the dirty footprint area. Other plants and mines in the area should all have dirty footprint areas managed as contained systems. As the number of these in the area increases, the surface water runoff into the affected catchments will decrease proportionally, decreasing water quantity to other users. Due to the small area affected at any one time and with proper diversion of upstream runoff, the cumulative effect on surface water quantity is of low significance. The impact is negative, regional, highly probable, of medium term duration and of moderate to low significance.

9.5.4.2 Surface water quality

The mining will impact on surface water quality, but all water within the dirty water footprint will be diverted to and contained in the pollution control dams or in-pit sumps. Contamination of water quality to the surrounding areas will therefore be minimal. Many other activities in

the area including other mining activities, power generation, town development and agriculture all impact on water quality and therefore any contribution to surface water contamination will result in cumulative impacts. The impact is negative, regional, probable, of short to medium term duration and of moderate significance.

9.5.5 Groundwater

9.5.5.1 Groundwater quantity

The proposed mining operation will utilise minimal groundwater, limited to abstraction of water from boreholes for potable use. Groundwater infiltrating the mine workings will be pumped out and diverted to in-pit sumps, which will impact on groundwater quantity in the area as a draw-down cone develops around the mining area. Other mining activities and domestic use in the area contribute to reductions and alteration in groundwater flow and the cumulative impact on groundwater quantity is considered moderate. The impact is negative, local, highly probable, of medium term duration and of moderate significance. It must be stressed that no users were identified within the immediate area and are unlikely to be affected.

9.5.5.2 Groundwater quality

The proposed mining operation will impact on groundwater quality, as contaminated water may ingress into the surrounding groundwater post mining. The water falling within the dirty footprint will be diverted to the pollution control dam. The areas will be contoured to ensure adequate surface water flow and reduce ingression of contaminated water and therefore the impact is to some extent mitigated. Many other activities in the area including mining activities, town development and agriculture, all contribute to impacts on groundwater quality and therefore any contribution to groundwater contamination will result in cumulative impacts of moderate to high significance. The impact is negative, local to regional, highly probable, of long term duration and of moderate to high significance.

9.5.6 Air Quality

Many activities in the area including other mining activities, power generation, town development and agriculture contribute to atmospheric pollution in the area. The dust monitoring indicated that baseline dust levels are already elevated and it is not expected that there will be further major contribution by Overlooked if proper dust suppression is carried out. Coal mining contributes predominantly to elevated dust levels. Without adequate dust suppression on site the cumulative effect on dust levels will increase with increased mining activities in the area. Good dust suppression management practices should keep dust levels low and very localised. The impact is negative, local, definite, of short term duration and of low significance.

9.5.7 Noise

Many activities in the area including mining activities, power generation, town development and agriculture contribute to the increase in ambient noise levels. Due to the high mining

activities and road traffic in the area in general, the cumulative impacts regarding noise can be considered to be of low significance as ambient noise levels are above rural limits (although within industrial levels within residential areas). The impact is negative, local, definite, of short term duration and of low significance. Any blasting will cause nuisance noise and local residents must be alerted to blasting times.

9.5.8 Vegetation and Fauna

The grassland Biome is one of the least preserved and most impacted biomes in South Africa. The grassland area coincides with much of the coal fields and prime agricultural land in South Africa and has therefore been highly impacted on by various activities. The opencast and surface mining activities, town development, and to a limited extent, agriculture have in the past impacted on the flora. Therefore the cumulative impact, should natural areas be affected, is of moderate significance. Most of the natural areas are associated with the Olifants River and Overlooked intend to preserve the 100m buffer zone where most of the natural habitat occurs and mainly impact agricultural land. The impact is negative, local, definite, of long term duration and of moderate to low significance.

Impacts to flora will result in impacts on the fauna dependent on that flora for food and shelter and therefore the impacts extend to fauna. The cumulative impacts on fauna are of low significance; however it must be stressed that more sensitive or specialist species will be more affected than less sensitive or generalist species. The impact is negative, local, highly probable, of medium term duration and of low significance.

9.5.9 Site of Archaeological and Cultural Interest

Past studies have indicated that the sites within the area are limited to historical sites associated with farming and mining. A farmstead more than 60 years and of medium significance and a cemetery of high significance have been identified in the immediate site. The farmstead will be destroyed, but has been adequately recorded. The cemetery will be preserved in situ, but if the mine finds that any activities threaten the site, relocation application procedures will be initiated. Many activities in the area including other mining activities, power generation, town development and agriculture contribute to loss of cultural and archaeological sites. Therefore the cumulative impact on sites of archaeological and cultural interest will be of moderate to high significance for the farmstead in terms of complete loss of the site and of high significance to the cemetery if no mitigation/management is carried out. The impact is negative, site specific, possible, permanent and of moderate to high significance.

9.5.10 Visual aspects

Many activities in the area including mining activities, power generation, town development and limited agriculture contribute to alteration of the visual aesthetics of the area. The proposed mining operation within the disturbed landscape will impact minimally on the overall aesthetics of the area. The cumulative impact is negative, local, definite, of short term duration and of moderate to low significance.

9.5.11 Traffic and Safety

The roads in the area are handling more and more traffic as mines become operational. The proposed operation will result in increased traffic on the roads, but only for the brief period of construction and decommissioning when goods and infrastructure are brought to and taken from site. Increased traffic during operation will be more limited, largely to coal transport. This will result in traffic and safety issues to other road users and increase the risk of road degradation. The cumulative impact on traffic and safety is negative, local, definite, of short term duration and of low significance as the existing two mines in the area already utilise roads for these purposes.

9.5.12 Wetlands

Although this wetland has been assessed in detail in isolation, it has only been assessed cumulatively within the network of wetlands within a 500m radius on a desktop level. In order to accurately identify the cumulative impacts an inventory of the catchment must be taken before and after the commencement of the project. However this is not possible on a project of this scale. The wetlands surrounding the site are represented in Figure 25 below.

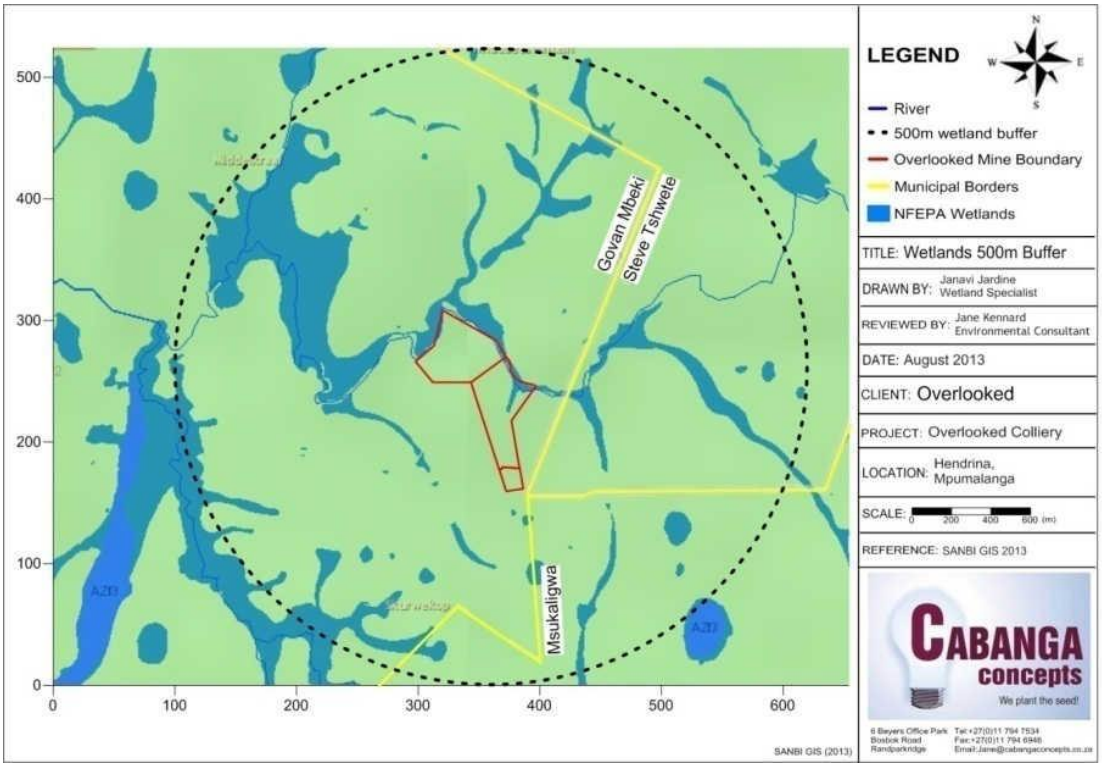

Figure 9-3: 500m radius buffer around the wetland for assessment of cumulative impacts on surrounding wetlands

Cumulative impacts may include the introduction of alien invasive plant species due to disturbance of the site and mobilisation of these downstream. Also, pollutants that may be released into the wetlands on site may be transported downstream and contaminate other downstream (to the west) wetlands in the area which are represented in the figure below.

Other possible cumulative impacts associated with the proposed project are the alteration of the hydrological regime of the wetland and associated HGM units on site. This may cause changes in the wetlands downstream and result in possible flooding, erosion and desiccation of certain areas.

It must also be stressed that upstream activities may impact on the wetland evaluated on site. As much as implementation of the management plan may largely prevent or significantly reduce impacts to the wetland, there can be no guarantee on the degradation of this wetland due to upstream (east) activities.

9.5.13 Regional Socio- Economic structure

The high unemployment and the high multiplier effect in the region means that the financial input of the proposed mining operation has a huge, positive impact on the socio-economic aspect of the area. This will be through direct employment of staff and contractors and indirectly through the use of suppliers. This will feed through to other sectors and other people in the area through the multiplier effect. With the implementation of the SLP, there will also be a direct positive impact on communities in the area with regards to infrastructure, training and small businesses. The cumulative impact is positive, regional, highly probable, of short to medium term duration and of moderate to high significance.

10 KNOWLEDGE GAPS, LIMITATIONS AND ASSUMPTIONS

All specialist studies are conducted to certain levels of confidence, and in all instances known and accepted methodologies have been used and confidence levels are generally high. This means that in most cases the situation described in the pre-mining environment is accurate at high certainty levels, but there exists a low probability that some issues have not been identified during the studies. Such situations cannot be avoided simply due to the nature of field work and have therefore not been further discussed below. Furthermore, statistical analyses and mathematical models are merely tools which assist the researcher in assessing field observations and have innate assumptions which can reduce objectivity of the results obtained. This is not seen as a major flaw but should always be considered when assessing results.

More relevant issues have been highlighted below.

10.1 Groundwater (Cabanga, 2013e)

No specific limitations section was included in the report. Limitation of the groundwater environment and modelling included limitation in knowledge of faults, dykes and surrounding underground mining areas which could affect model findings and the general limitation of assumptions utilised in the model as described in the report.

10.2 Vegetation (Dimela, 2013)

Vegetation studies should be conducted during the growing season of all plant species that may potentially occur. According to the Mpumalanga Minimum Requirements for Biodiversity Assessment (Mpumalanga Tourism and Parks Agency, 2008):

“A floristic (plant) survey must be conducted during the growing season of all species that may potentially occur (this may require more than one season’s survey in order to identify flowering species) with two (2) visits undertaken (November & February). Visits during other seasons will be determined by the flowering and fruiting times of species that do not occur during the summer.”

However, one survey was undertaken during March 2013. Although this assessment was undertaken after sufficient summer rainfall, species flowering in early summer or spring might have been overlooked at the time of this survey.

10.3 Fauna (CEMS, 2013)

Faunal Assessments should be done across seasons or years to obtain an understanding of the community structures as well as the status of the endangered and vulnerable species in the area. Due to time constraints these long term studies are not feasible. This assessment includes only the summer season sampled in 2013 but considering the nature and locality of the site, it is considered unnecessary for the winter assessment to be undertaken.

This Faunal Assessment was conducted mainly during the day. This resulted in less visual confirmations considering most faunal species are nocturnal in nature.

No mammal trapping was undertaken as this method of assessment only caters for mammal assemblages found during that survey period. Rather, vegetation on site and a desktop survey was utilised to provide information into the report with ground truthing exercises done to confirm conditions within the study area.

An invertebrate assessment was not undertaken after considering the site locality.

Every attempt has been made to use the latest information for each faunal grouping however some groupings only have data which is out of date and therefore not as reliable.

10.4 Aquatic Biodiversity (SEF, 2013)

Ecological studies should ideally be conducted during various times of the year so as to account for seasonal variation in aquatic assemblages due to migration, breeding cycles, etc. However, due to time constraints such long term studies were not feasible. Therefore, results obtained within the current report are based solely on a single assessment and inferences based on habitat structure and experience.

10.5 Wetland Assessment (Cabanga, 2013c)

Regarding biodiversity, hydrology and functioning of wetlands, studies should ideally be conducted over a number of seasons and over a number of years. However, this must be condensed into a field visit and the use of the information gained during a field survey conducted during a single season, desktop information for the area, information obtained from provincial conservation authorities and similar organizations. This is due to cost implications and time constraints which prevent such long-term studies. There is also potential for slight error in delineating wetland zone boundaries as it would be impractical and expensive to verify each wetland boundary along its entire course. It is also possible that some isolated seepages exist, which are not connected to a watercourse and could have been overlooked. This has been compensated for by setting intervals of 20m for auguring to attempt to cover as much area as possible and the aerial image and other GIS information available has been used to verify findings on site.

The possible accuracy of the handheld GPS unit used to delineate the wetland in the field cannot be guaranteed beyond an accuracy of about 15m on the ground. Greater accuracy of the wetland boundary mapping may be required; therefore the wetland boundary may need to be pegged and surveyed using conventional survey techniques.

It was noted on the site visit that the project area is highly disturbed and there is evidence of alteration of the wetland due to crop farming practices. Therefore the delineation of the site may not be accurate based on the soil profile. However, vegetation, topography and hydrology of the associated water bodies and wetland have also been considered.

Due to financial and time constraints, only the HGM units on the property have been assessed. A comprehensive regional assessment was not available to accurately identify the cumulative impacts which have been generally discussed in this report.

10.6 Sites of Archaeological and Cultural Interest

The following conditions and assumptions have a direct bearing on the survey and the resulting report (Archaetnos, 2013a and b):

- Cultural Resources are all non-physical and physical man-made occurrences, as well as natural occurrences associated with human activity. These include all sites, structure and artefacts of importance, either individually or in groups, 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.
- Cultural significance is site-specific and relates to the content and context of the site. Sites regarded as having low cultural significance have already been recorded in full and require no further mitigation. Sites with medium cultural significance may or may not require mitigation depending on other factors such as the significance of impact on the site. Sites with a high cultural significance require further mitigation.
- The latitude and longitude of any archaeological or historical site or feature, is to be treated as sensitive information by the developer and should not be disclosed to members of the public.
- All recommendations are made with full cognizance of the relevant legislation.
- It has to be mentioned that it is almost impossible to locate all the cultural resources in a given area, as it will be very time consuming. Developers should however note that the report should make it clear how to handle any other finds that might occur. In this case there were certain areas where the vegetation cover was reasonably dense which had a negative effect on archaeological visibility.

10.7 Palaeontology

The information provided within the report was derived from a desktop study of available maps and scientific literature; no direct observation was made (BM Geological Services, 2013).

10.8 Visual Assessment

Due to the nature of the proposed project, photographic simulations were not necessary as the expected exposure is relatively low and few sensitive visual receptors have been identified. This will only require photographs of the site.

It is also assumed that the colliery will be properly managed according to all environmental legislation.

The nature of a VIA is that it tends to be subjective and can be seen as somewhat dependant on qualitative processes; motivations for any judgements are therefore well substantiated.

10.9 Traffic and Safety

A traffic impact assessment was not completed as part of this process.

10.10 Socio-economic

A socio-economic assessment was not completed as part of this process. If disputes arise between the mine and local businesses regarding any impact to those businesses as a result of the mine operations, the mine will be responsible for conducting a full socio-economic assessment conducted by registered professionals in that field.

11 ENVIRONMENTAL OBJECTIVES

Environmental and social objectives are broad based goals to guide the environmental management plan and ensure mining activities proceeded in an environmentally and socially responsible manner. The objectives take into account legislation regarding both the social and physical environment.

11.1 Mitigation and Management Objectives

The objectives of the mitigation and management plan as set out in the document are to:

- Primarily pre-empt impacts and prevent the realisation of these impacts - PREVENTION.
- To ensure activities that are expected to impact on the environment are undertaken and controlled in such a way so as to minimise their impacts – MODIFY and/or CONTROL.
- To ensure a system is in place for treating and/or rectifying any significant impacts that will occur due to the proposed activity – REMEDY.
- Implement an adequate monitoring programme to:
    - Ensure that mitigation and management measure are effective.
    - Allow quick detection of potential impacts, which in turn will allow for quick response to issue/impacts.
    - Reduce duration of any potential negative impacts.

11.2 Environmental Objectives and Goals

Environmental objectives are:

- Protect the biophysical environment as far as possible
    - Minimise impacts to the biophysical environment.
    - Ensure relevant legislation in National Environmental Management Act and Conservation of Agricultural Resources Act are applied on site including but not limited to alien invasive management and protection of ecologically sensitive species and environments.
- Protect the water resources in the area.
    - Ensure clean and dirty water separation systems are established on site from the onset.
    - Use water responsibly and recycle water as much as possible.
    - Ensure relevant legislation regarding the National Water Act are applied on site.
- Ensure atmospheric pollution is to a minimum:
    - Manage dust generation.
    - Ensure all pollutants are within levels stipulated in the National Air Quality Act.
- Ensure an adequate rehabilitation plan is followed to allow for adequate rehabilitation to a prescribed land use.

11.3 Socio-Economic Objectives and Goals

The social objectives are:

- Ensure the targets and objectives set out in the SLP are followed and adhered to, including but not limited to:
    - Employment strategies and opportunities.
    - Training in basic literacy.
    - Additional skills training.
    - LED strategies.
    - Retrenchment strategies.
- Provide a safe environment for people to work in and:
    - Ensure safety policies are established on site in line with national policy.
    - Ensure adequate PPE for staff, contractors and visitors to the site.
    - Ensure health and environmental policies are established and in line with national policies.
- Provide a safe environment for people to live in.
    - Ensure environmental objectives are followed
- Provide open and transparent communication opportunity with all I&APs.

11.4 Historical and Cultural Aspects

- Ensure all archaeological and cultural artefacts/sites are preserved in situ until such time that authorisation to remove these is obtained.
- Ensure South African Heritage Resources Act principals are applied with regard to all the archaeological and cultural artefacts/sites.
- Ensure any relocation of culturally sensitive sites is done according to SAHRA principals, in a socially sensitive manner and with open and transparent communication with relevant I&APs.

11.5 Closure Objectives

The overall closure objectives are:

- To ensure that all impacts incurred during the operational phase are mitigated and that these are reduced over time, and that these mitigation measures are in line with best practices (existing at the time);
- To minimise the impacts on the local community;
- To ensure that as little poor quality water as possible decants from the mining areas;
- To rehabilitate the areas as soon as possible;
- To return the land to that of at least the pre-mining use which will be agricultural land capability to allow arable and grazing land use;
- To ensure that residual impacts after closure of the mine are minimal; and
- Apply for a closure certificate.

11.6 Action Plans to Minimise Impacts Associated with Closure

- Minimise the areas cleared for mining and associated infrastructure.
- Prepare a rehabilitation plan prior to mining.
- Determine the end land use with the relevant authorities which should be at least grazing but also include some arable land.
- The EIA/EMP will be reviewed in conjunction with the trends observed from the monitoring programmes as set out in this document.
- Remove surface infrastructure, including buildings, plants, and stockpiles on closure that are not required by the land user / owner.
- Clear all coal and carbonaceous material from the site.
- Remove all waste from site.
- Practice continual roll over rehabilitation, so that the rate of rehabilitation is similar to the rate of mining as far as possible.
- Topsoil utilisation will be concurrent with the stripping.
- Ensure adequate topsoil placement on rehabilitated areas.
- Ensure the rehabilitated areas are free draining.
- Revegetate all rehabilitated areas as soon as possible, with area specific vegetation.
- Implement an alien invasive species management programme.
- Rip and disc all compacted surfaces.
- Monitor rehabilitated areas for a period of five years following revegetation of the areas.

12 ENVIRONMENTAL MANAGEMENT PLAN

Table 47 summarises management measures for the various impacts discussed above. A detailed, aspect based management plan is given below which elaborates further on the mitigation measures summarised in Table 47.

12.1 Design and Planning Phase

Impacts during this phase will be minimal and necessary to ensure adequate baseline assessments are undertaken and ensure proper construction design plans are compiled to reduce unnecessary environmental risks. General mitigation measures are discussed below for all aspects. Heritage management measures are discussed separately as per the Conservation Management Plan compiled for these sites (Archaetnos, 2013b).

- Activity should be limited to area of disturbance to reduce risk of compaction to neighbouring soil. Where required, the compacted soils should be disced to an adequate depth and re-vegetated with indigenous plants.
- All vehicles will be regularly serviced to ensure they are in proper working condition to reduce risk of leaks, reduce risk of excessive emissions and reduce nuisance noise. All leaks will be cleaned up immediately using an absorbent material.
- Speed limits will be established on the dirt road to minimise dust generation. All contractors and visitors to site will enforce speed limits.
- All sites identified during the heritage assessment will be cordoned off with a 100m buffer zone and no destructive activities are to take place within this area.
- The necessary applications will be made through relevant authorities to mine/conduct activities through or near to the river / wetland areas and no activities will take place within these areas and relevant buffer zones (100m or 1:100 flood line, whichever is greatest) until such time that the authorisations are in place.

12.1.1 Cultural and Heritage Sites

12.1.1.1 The graves

- The grave site should be left intact and the only change thereto should be the fencing in thereof in order to protect the individual graves.
- The grave yard should be kept clean and the grass short so that visitors may enter it without any concerns.
- A buffer zone should be determined in order to protect the graves. Since it is in an area where underground mining is planned, 20 meters will suffice. However, the mine should regularly inspect the site in order to ensure that blasting and other such activities do not damage the graves.
- Monthly inspections would be needed in order to determine that the condition of the site does not deteriorate.
- Any change in the mine plan, condition of the site and individual graves should immediately be reported to SAHRA for guidance.
- Access to the graves should be allowed to the descendants. However they should adhere to the mine's conditions regarding health and safety.

12.1.1.2 The buildings

- The post office building should be left intact, but its facade should deliberately be restored and the building re-used. This would mean internal adaptions as necessary.
- Only a small part of the other three buildings still seem to be original and in a good condition. Although the same principals for the conservation of the post office can be applied to them, they are not significant enough to be preserved.
- The process of adaptation and rehabilitation will therefore be utilised for these buildings, especially regarding the interiors. The process of preservation will be used when the original fabric is in a good enough state. This is applicable to the original stone structures of each of these buildings.
- The process of reconstruction should for instance be used in the maintenance of the roofs and ceilings of the buildings. By using old and new material it can still look the same, but will be more durable. For the post office one should rather keep the original ceiling.
- The process of restoration should be used for instance on the walls, doors and windows of the buildings. It may be possible to maintain these without using any new materials. However, usually very little remains to be restored in the true sense of the word and reconstruction is more than likely a better and more sustainable option.
- A buffer zone should be determined in order to preserve the post office building, as well as the other buildings, at least until such time as approval for demolishment is given. Since this is close to the opencast mining area, the buffer should at least be 50 metres. Again caution should be taken that blasting activities do not damage the foundations and walls.
- Monthly inspections would be needed in order to determine that the conditions of the buildings do not deteriorate.
- Any change in the mine plan or the condition of the buildings should immediately be reported to SAHRA for guidance.
- All four of the buildings have been documented by making line drawings thereof and taking photographs. These will serve as documentation and are more than enough evidence of the existence of three of these buildings (the wagon house, main house and stable complex). For the shop/post office building it serves as a first step in the preservation thereof.
- A permit from the Mpumalanga PHRA will be needed before any structural changes to any of the buildings can be made.
- It is emphasised that the three afore mentioned buildings do not have enough cultural significance to be maintained in the long run and that it may eventually be demolished. For this purpose destruction permits should also be obtained from the Mpumalanga PHRA.

12.2 Construction Phase

Construction phase activities have been highlighted in Section 5.10. Activity based management plans are indicated in Table 47 and aspect based management plans are discussed below.

12.2.1 Topography

No mitigation can be applied to manage impacts on topography in the area during the construction phase. One should manage soil stockpiles as per the recommendations of the pedology study. Sub-soil and overburden stockpile height should be taken into consideration so as not to become an unnecessary eye-sore. Activities must be properly planned and areas targeted for development clearly demarcated to ensure no disturbance of unnecessary areas.

12.2.2 Geology

Impacts to geology cannot be significantly mitigated as opencast mining and coal extraction permanently alters the geography of the area.

12.2.3 Soils and Land Capability

During construction the main impact to soil will be the stripping and stockpiling of soils, soil erosion and to a limited extent compaction and contamination of soils.

- Develop soil management measures for the entire surface area of the mine that will prevent runoff of sediment into the associated watercourses (SEF, 2013).
- Develop a drainage control system for the construction area. Gravel roads must be well drained in order to limit soil erosion. Incorporate measures to reduce the flow velocity of storm water runoff (Cabanga, 2013a).
- Divert storm runoff away from areas with high erosion potential (Cabanga, 2013a).
- Minimize the area which is disturbed at any one time (Cabanga, 2013a). Activities must be properly planned and areas targeted for development clearly demarcated to ensure no disturbance of unnecessary areas. Activity should be limited to area of disturbance to reduce unnecessary compaction of soil in neighbouring areas.
- All erosion observed on site will be addressed and consideration given to gabion baskets, contour berms, water flow dissipaters and possible downstream silt traps.
- Topsoil and underlying material should be stored separately as per stripping guidelines (Cabanga, 2013a).
- Soil stockpiles must be sampled, ameliorated (if necessary) and re-vegetated as soon after construction as possible (Cabanga, 2013a).
- Stripped soils should be stockpiled as a berm upslope (majority) and surrounding the area to be disturbed (Cabanga, 2013a).
- Regularly inspect topsoil stockpile for erosion and loss (SEF, 2013).
- The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust) (Cabanga, 2013a).
- Rehabilitate any disturbed areas no longer required as soon as possible (Cabanga, 2013a).
- Minimise operation and machinery movement to stipulated construction area only (Cabanga, 2013a).
- Fields should not be trafficked if they are at, or wetter, than the plastic limit (Cabanga, 2013a).

- Where required the compacted soils should be disced to an adequate depth and re-vegetated with indigenous plants.
- Minimise direct spillages of oils or diesels as result of machinery use (Cabanga, 2013a). Hydrocarbons will be handled as follows:
    - Communications network will be established to ensure incidences are reported immediately.
    - Any hydrocarbon leakages or spills should be reported and treated as per the emergency response plan.
    - Truck, machinery and equipment will be regularly serviced to reduce risk of leaks.
    - Generators will be kept in bunded areas erected per SABS standards.
    - Rigs will be regularly serviced to reduce risk of leaks. Pans will be placed under potential leak sites.
    - Spill kits must be available on site and personnel trained on utilising these
    - All hydrocarbons will be stored in concrete bunded areas fitted with taps and oil traps. Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.
    - Bunding / concrete flooring and oil traps must be constructed in areas of hydrocarbon storage and transfer and in workshop areas where diesel-driven equipment is serviced.
    - Taps to bunded areas will remained closed and only opened under controlled circumstances.
    - Bunded areas will be to SABS standards, and bunded area will have adequate capacity to contain leaks.
    - The workshop will be erected on concrete base and the area will drain to sumps and PCD via oil traps erected at the facility.
    - All oil traps will be cleared of excess oil which will be collected in drums for collection by reputable recycling company
- Portable toilets will be managed by reputable contractors and inspected daily for any potential leaks. Leaking facilities will not be used until such time that they are repaired.
- Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduce risk of environmental contamination. Refuse bins will be placed around site to collect all non-recyclable waste for disposal at the municipality.

12.2.4 Surface Water

During construction the main impact on surface water will be the potential of silt loading of surface water bodies as soils are exposed and mobilised. There also exists the potential of surface water contamination from potential hydrocarbon leaks from vehicles and equipment. In general, soil management practices must be adhered to in order to reduce risk of erosion which could lead to siltation of surface water bodies. Only additional measures are discussed below.

- Only environmentally friendly materials must be used during the construction phase, to minimise pollution.

- Clean and dirty water separation facilities and PCDs will be constructed on site to contain all surface water runoff from areas of activity and prevent this water from flowing into the surrounding environment. GN704 principles will be applied at all times unless the relevant exemptions are obtained from DWA.
    - Upstream diversion berms will be constructed with associated trenches if necessary to divert clean water runoff around the activity footprint and into natural water courses.
    - A system of berms and trenches will be developed around site to capture and divert all water runoff on the activity footprint into the in-pit sumps or PCDs.
    - The pollution control dam must be located outside the 1 in 100 year floodline and must be managed and operated in such a way that there is always spare capacity for a 1 in 100 year storm event. A 0.8m freeboard volume must also be reserved (Letsolo, 2013).
    - The PCDs will be lined with at least 2mm HDPE liner, or other as agreed to by the DWA.
    - Silt traps must be constructed at the inlets of the PCDs to ensure that dam capacity is not reduced by silt.
- The dirty water footprint must be managed as small as possible and rehabilitation must be on-going to establish mined out areas as clean water areas as soon as practically possible (Letsolo, 2013).
- Silt/sediment traps will be installed in major flow areas and can include trenches with straw bales or engineered silt traps depending on the water quantities flowing in these areas.
- Flow dissipaters will be considered at discharge points of clean water diversion berms / trenches to reduce risk of erosion as this clean water is released to natural drainage lines / streams.
- Leakages on pipes and concrete channels should be minimized.
- Clean out silt build-up in trenches and silt traps (or replace silt traps if straw bales are used) over dry season.
- Non-mining waste that includes, but not limited to, grease, lubricants, paints, flammable liquids, garbage, abandoned machinery and other combustible materials generated during activities should be placed and stored in a controlled manner in a designated area.
- Recycle water collecting within the PCDs as far as possible.
- Surface water monitoring programme will be initiated and continued on a monthly basis.
- Surface water on site will be utilised responsibly and recycled as far as possible to ensure wastage is minimal.
- Any water released into the surrounding environment will be of adequate quality as stipulated in the water use license.
- Bare surfaces on areas like offices and haul roads must be kept as minimal as possible. All areas disturbed by construction activities and no longer required for operations will be re-vegetated during the operational phase.
- Awareness will be created with all staff, contractors and visitors on responsible water usage.

12.2.5 Groundwater

The major impacts to groundwater will be the alteration of groundwater flow. Groundwater flow directions around the active mine area will be directed towards the mining areas due to constant mine dewatering. Carbonaceous overburden and coal stockpiles may result in additional groundwater contamination. These must be located up gradient of the opencast working so that any contamination plume generated will be directed to the opencast workings or other pollution control facilities.

Additional measures are discussed below.

- Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent to allow them to source water.
- The sizing of the pollution control dams and in-pit sumps must take account of groundwater inflows as reported in the groundwater study.
- Contamination from the overburden stockpile can contaminate the underlying aquifers. The floor material should be compacted where possible to reduce the vertical recharge rates. This area should be managed as a “dirty” area and water from this area should drain into the PCD.
- Conduct groundwater quality monitoring at least quarterly.
- Dirty water management facilities should be compacted and dirty water dams lined. Any trenches carrying high loads of dirty water should also be lined.
- Ensure pumps are of adequate size for volumes which need to be pumped.
- A paddock system should be considered for any pipelines carrying high loads of dirty water, especially the slurry pipelines.
- Long pipelines should have successive valves to allow for closure of sections of pipelines for repairs and maintenance and to seal off sections of pipeline in the event of leaks.
- Any use of groundwater on site will be done responsibly and the water will then be recycled as far as possible, in order to ensure wastage is minimal.
- Record water usage by attaching meters to all pumps.
- Saving water initiatives will be included in environmental awareness training.

12.2.6 Air Quality

- Dust suppression practices should be established on site to reduce dust generation.
- Water carts should spray dirt roads and any areas of high dust generation to reduce dust generation.
- Speed limits will be established on all roads and all drivers should be instructed to keep to these speed limits to reduce dust generation on roads.
- All vehicles, heavy machinery and equipment must be regularly serviced and maintained to reduce excessive emissions.
- Blasting should be conducted during times of low winds.
- Dust monitoring should be established on site and conducted monthly.

12.2.7 Noise and Vibrations

- Blasting alternatives will be considered to reduce noise and associated vibrations (Cabanga, 2013b).

- Vibration impacts on nearby structures must be monitored and compensation options must be in place and available to affected I&APs.
- Sirens should be sounded prior to blasting to give warning to all personnel on site and the neighbouring residents.
- Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded (Cabanga, 2013b).
- Silencers will be utilised where possible (Cabanga, 2013b).
- Point sources will be enclosed where possible (Cabanga, 2013b).
- Screens will be considered if I&AP complaints are received (Cabanga, 2013b):
    - Bushy dense vegetation can also be considered on the mine-side of the berm if noise levels at sensitive receptors are still excessive as this will assist in absorbing noise.
    - Berms can be placed immediately around the crushing and screening plant to dissipate excessive noise.
- Occupational noise levels should be measured and adequate PPE given to staff exposed to high noise levels.
- A noise barrier in the form of a berm should be constructed on the north-western boundary of the proposed opencast area as soon as possible, so that it is situated between the main noise source and potential noise sensitive receptor identified west of the mine (Cabanga, 2013b). This will only be necessary should the occupant remain on site.
- Environmental noise monitoring should be conducted quarterly (Cabanga, 2013b).

12.2.8 Flora & Fauna

- Follow soil and surface water management plan.
- Mining within a wetland area will require a water use license (Dimela, 2013) and relevant authorisation through NEMA.
- An ecologically sound, storm water management plan must be implemented (Dimela, 2013).
- Where the moist grasslands will not be mined e.g. along the Olifants River, a permanent demarcation berm or fence must be erected around these moist grasslands to prevent access into these areas. Cordon off the main mine infrastructures from the surrounding natural vegetation and wetlands to prevent any disturbances into the surrounding areas (Dimela, 2013).
- Fencing should be friendly to faunal species allowing for movement between areas. This can be achieved by applying culverts and an open mesh (CEMS, 2013).
- Prohibit vehicular or pedestrian access beyond the demarcated boundary (Dimela, 2013).
- Planning of the mining phases must incorporate on-going rehabilitation (Dimela, 2013):
    - Stockpile topsoil and organic surface material such as root mats separately from overburden and return it to the surface of the restored site where feasible.
    - Systematically remove vegetation as needed, storing it in a manner to retain viability, and replacing it after operation where feasible.

  - A vegetation rehabilitation plan should be implemented. Grassland can be removed as sods and kept in suitable growing conditions. The sods must preferably be removed during the winter months and latest springtime. Relocation of the sods should be into suitable moist growing conditions. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks. These sods can be used in the eventual rehabilitation of the open cast footprint.
  - Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005).
  - Trucks and equipment should only be washed in dedicated areas and the dirty water is not allowed to discharge into the watercourse or surrounding natural vegetation.
  - During rehabilitation, colonisation of the disturbed areas by plants species from the surrounding natural vegetation must be monitored to ensure that vegetation cover is sufficient within one growing season. If not, then the areas need to be rehabilitated with a grass seed mix containing species that naturally occur within the study area.
- Where possible, the *Crinum bulbispermum* plants should be conserved in situ and their survival monitored during spring and summer for the duration of the operation and at least 3 years after closure (Dimela, 2013).
- Implement a Plant Rescue and Rehabilitation Plan:
  - Where the *Crinum bulbispermum* plants are deemed to be under threat from the open cast footprint, the plants should be removed by a qualified specialist and replanted into suitable conserved areas, or maintained under suitable growing conditions until such time that it can be replanted as part of rehabilitation. The survival of these plants in their new habitat must be monitored for at least 3 years and corrective action taken, when it is found that the plants are not adapting. Note that these plants may only be removed with the permission of the provincial authority (MTPA) (Dimela, 2013).
  - *Crinum bulbispermum* should be removed when dormant (winter months) and relocated prior to first growth in spring. The bulbs should not be watered during winter (Dimela, 2013).
  - It must be noted that plant removal and relocation measures are no substitute for in situ conservation and, although they may appear to be effective in the short term, have a net effect of shrinking the distribution of the species and increasing their vulnerability to extinction (Dimela, 2013).
- Alien invasive species that were identified within the study area should be removed. By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation (Dimela, 2013).
  - All alien seedlings and saplings must be removed as they become evident for the duration of mine operation and after closure (Dimela, 2013).
  - Manual / mechanical removal is preferred to chemical control (Dimela, 2013) l.
  - All construction and operation vehicles and equipment, as well as construction material should be free of plant material. Therefore, all

equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO (Dimela, 2013).

- Construction workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority (Dimela, 2013).
- No natural watercourses, pans, or wetlands should be disturbed by the development with a 500m buffer zone unless otherwise authorised by the Department of Water Affairs (CEMS, 2013).
- Mining activities should be restricted to daylight hours as far as possible to prevent any disturbance such those that may arise due to floodlights (CEMS, 2013). When using lighting, ensure directional floodlights are utilised that focus light on the necessary areas and reduce light pollution to surrounding environment. Utilise lights in the orange and yellow light ranges rather than white. This has the added benefit of reducing strong light and dark contrasts which also has safety benefits for staff.
- Construction personnel should undergo awareness training regarding fauna assemblages and the correct procedures to follow should fauna be found within the site. They should be encouraged not to harm any wildlife. They should also be informed of any policies and procedures applicable to fauna and the environment and be informed of the Animal Protection Act no. 71 of 1962 and encouraged not to harm any wildlife (CEMS, 2013).
- As much of the natural vegetation as possible should be left intact in order to maintain ecological corridors for the movement of faunal species. Ecological corridors should include rivers and wetlands and the associated buffers as per the wetland assessment should remain undisturbed to provide the structural diversity required for safe movement of faunal species and provide migration corridors (CEMS, 2013), unless authorisations are in place to conduct activities in these areas.
- A management plan to prevent the mining staff from harassing or poaching the faunal species should be developed and implemented (CEMS, 2013).
- Should the faunal species need to be removed from the study area, a faunal capture and relocation plan should be developed and implemented (CEMS, 2013).

12.2.9 Aquatic Biodiversity

- Soil, surface water, wetland and flora management measures are applicable.
- Topsoil, leaf and plant litter as well as subsoil must be stockpiled in separate areas and in low heaps (SEF, 2013).
- The rollover opencast mining method should be used so as to limit the volume and size of stockpiles during the operational phase of mining (SEF, 2013).
- Ensure that potential wetlands are adequately identified and are avoided in the placement of all construction material and mining activities (SEF, 2013).
- Ensure a buffer of at least 100m is maintained from the edge to the active channel of the Olifants River (SEF, 2013).

12.2.10 Wetlands

- All soil, surface water, groundwater, floral and aquatic biodiversity management measures must be applied to protect such areas (Cabanga, 2013c).

- All construction must take place outside of wetland boundaries unless the authorisations are obtained through NEMA and NWA. Wetlands must be pegged on site by an environmental practitioner (Cabanga, 2013c).
- All excavated material must be stockpiled in a demarcated area outside of wetland areas and these must be no higher than 6m (Cabanga, 2013c).
- Berms should be constructed around stockpiles in order to intercept sediment and prevent sediment from leaving the site (Cabanga, 2013c).
- Impermeable surfaces and soil compaction must be limited on site (Cabanga, 2013c).
- Storm water flow dissipaters must be used, where clean storm water runoff is diverted into wetland and streams to prevent high velocity water from leaving the site (Cabanga, 2013c).
- All refuelling and changing of fluid for construction equipment must be carried out outside of the wetland boundary. Drip trays must be placed under each construction vehicle when not in use (Cabanga, 2013c).
- Ensure clean and dirty water separation and storm water management systems are established on site prior to other construction activities taking place (Cabanga, 2013c).

12.2.11 Sites of Archaeological and Cultural Interest

- Should artefacts or archaeological items be observed / uncovered, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.
- Should other graves be observed on site during activity progress then all activity should ceased and the area demarcated as a no-go zone. A specialist will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone (100m buffer zone for physical mining activities).
- It should be noted that the presence of subterranean archaeological and/or historical sites, features or artefacts is always a distinct possibility. Care should therefore be taken when development commences. If any of these are discovered, a qualified archaeologist will be called in to investigate the occurrence.

12.2.12 Palaeontology

- Conduct a full Palaeontological Heritage Impact Assessment prior to commencement of the project.
- Conduct a thorough examination of all excavations as they are being performed.
- Should any fossil materials be identified during the construction phase, the excavations should be halted and SAHRA informed of the discovery.

12.2.13 Visual Aspect

- Activity must remain in designated area.
- Good housekeeping practices must be applied in general to keep the operation as neat as possible.
- Vegetate any bare soils with local indigenous species.

- Screens, such as berms, will be considered if complaints are received by nearby residents. Planting of rows of trees may be an effective visual screen at the highly sensitive viewer's sites. This can be done if complaints are received (Cabanga, 2013d).
- The distance from farmsteads and residential areas must be kept at a 500m minimum (Cabanga, 2013d), if these are occupied.
- Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Waste collection receptacles should be erected on site for waste collection. Waste will be separated and managed in accordance with the waste type.
- Recyclable waste should not be stored on site for excessive periods to reduced risk of environmental contamination.

12.2.14 Traffic and Safety

- All intersections with main tarred roads will be clearly signposted.
- Drivers will be enforced to keep to the set speed limits.
- Trucks will be in road-worthy condition with reflective strips.
- Funds will be set aside to maintain the serviceability of the road verge where the trucks approach or depart from the main road.
- Directional floodlighting will be used to focus light on the area of activity only so as not to irritate road users.

12.2.15 Socio-Economics

- Ensure all sewage is contained in septic tanks which are functioning adequately to reduce biological risks and odours to nearby land users.
- Blasting schedules will be clearly communicated with local residents to ensure all residents within the appropriate blast zone are evacuated prior to blasting activities. The blasting schedule should be discussed with I&APs as far as possible to reduce nuisance (although it must be stressed that it will not be completely avoided).
- Overlooked must make sure they have baseline records (photographs) of the condition of structures within the blast zone and ensure they have a compensation system in place to repair or replace any damage done to property belong to nearby residents.
- Ensure all power-generation infrastructure that may be required is within specifications. Ensure that all power-related structures are adequately marked with relevant signs and warnings and fenced off with access control.
- If nearby sensitive I&APs complain about the noise, then action must be taken. This could include organising shifts to ensure minimal activity at night, using quieter equipment, utilising silencers or enclosing point-sources and finally establishing noise screens near the specific affected I&AP.
- For any new employment created, labourers should initially be sought locally and only regionally if skills are not available.
- Conduct employment and any retrenchment as per SLP.
- Compensation systems must also be considered for any I&APs whose business may be affected by mining activities.

- The public participation process should continue throughout the life of mine to allow all interested and affected parties (I&APs) to continue relations with the mine and offer them a platform to raise their issues and concerns.

12.3 Operational Phase

12.3.1 Topography

By rehabilitating opencast mining areas during roll-over mining impacts to topography will be mitigated by the filling in of voids and by the reduction of soil and overburden stockpiles.

- During roll-over opencast mining, mining should progress so that overburden and soils are placed into previously mined areas as far as possible.
- Where overburden and soil has been replaced, the area should be contoured according to the rehabilitation plan and to allow for free surface water drainage.
- Ensure adequate safety standards are set with regards to bord-and-pillar mining to reduce risk of surface subsidence.
- Inspect areas of underground mining and rehabilitate any subsidence or sinkholes according to acceptable standards.

12.3.2 Geology

Impacts to geology cannot be mitigated.

12.3.3 Soils and Land Capability

During operation, soil stripping will continue due to the roll-over mining practices. In conjunction with this, rehabilitation of mined out areas will commence and rehabilitation of soils will commence.

- Where relevant, construction phase mitigation measures must continue into operations and only additional measures are discussed below.
- Roll-over mining and successive rehabilitation will take place to keep directly impacted area as small as possible and ensure least amount of stockpiled material.
- The structures that have served their purpose during construction will be demolished and the footprints thoroughly cleaned as soon as the structures have served their purpose. The footprint will be rehabilitated by replacing the stored subsoil and topsoil in the original sequence. The soil fertility will be ameliorated according to soil analysis after replacing and levelling (before seeding/re-vegetation).
- The surface will be shaped to ensure a free draining surface and a continuation of the pre-mining surface drainage pattern.
- The original soil horizon sequences will be reconstructed as far as possible by stripping and stockpiling the A and B-horizons separately and by replacing them in the same sequence through roll-over rehabilitation.
- Implement surface stabilization to reduce erosion until a vegetative cover is established (Cabanga, 2013a):
    - Mulches and chemical stabilizers can be utilized to provide short term benefits and can be expensive.

    - Matting and netting is recommended for application in steep sloping areas where there is a severe localized problem.
    - Landscaping and mechanical preparation of a disturbed area is very important in the establishment of a good vegetative cover.
    - To prevent over compaction problems it is very important that agricultural equipment be used for rehabilitation activities.
- Initiate and maintain runoff interception and conveyance (Cabanga, 2013a):
    - The effectiveness of drainage control measures will be site specific.
    - Establishment of clean and dirty water drainage systems is essential in mitigation of soil erosion.
    - Silt traps and/or flow dissipaters must be considered in areas with high sediment transport or high surface water runoff velocity.
- Restriction of vehicle movement and good planning of roll-over rehabilitation practices. Rehabilitated areas must be protected from any vehicle/machinery activity once seeded (Cabanga, 2013a).
- Conduct soil analyses in areas where soils have been replaced for rehabilitation to determine amelioration requirements and apply to soils as necessary (Cabanga, 2013a).
- Topsoil will be replaced at adequate depths in order to achieve necessary land capability as per the post-mining land capability plan which will include arable and grazing units (Cabanga, 2013a).
- Soil amelioration will be done after replacement of the topsoil according to soil analyses and soil fertility will be maintained by means of an annual fertilizer program until self-sustaining (Cabanga, 2013a).
- Re-vegetation of the area with local climax grass species (Cabanga, 2013a).
- Correct rehabilitation and soil re-establishment mean that a productive post-mining land capability should be attained allowing for agricultural land uses (Cabanga, 2013a).
- Stockpiling of raw coal should be within designated areas only and any miss-placed coal will be cleared and re-deposited back onto the stockpile area immediately.
- Clean roads utilised for coal transportation of all spilled coal which will be replaced onto stockpiles.
- Trucks must not be over-loaded and must be covered to reduce risk of coal spills.
- All dangerous goods on site will be stored according to legislative requirements to prevent contamination to the surrounding environment.

12.3.4 Surface Water

Soil management measures will apply as reduced erosion and reduced contamination of soils will reduce risk of transported contaminants and silt-loading to surrounding surface water bodies. Only additional measures are discussed below.

- Where relevant, construction phase mitigation measures must continue into operations and only additional measures are discussed below.
- Runoff from the underground mine surface area will be allowed to flow to the Olifants River (Letsolo, 2013).

- Disturbed areas must be rehabilitated in such a way that the topography blends in with the surrounding topography in order to allow for free water flow.
- All water management facilities will cater for a 1:50 year 24 hour storm event and inspected regularly and issues observed addressed immediately.
- Ensure crushing and screening area and stockpile area is well compacted and that area drains to mine water containment facilities.
- Test for integrity of lining and water management structures.
- Surface water monitoring programme will be continued on a monthly basis.
- Monitor area for erosion and pooling and rehabilitate if necessary.

12.3.5 Groundwater

The major impacts to groundwater will be the alteration of groundwater flow. Groundwater flow directions around the active mine area will be directed towards the mining areas due to constant mine dewatering. Therefore no contamination will be able to migrate away from the mining area while active mining is ongoing. In order to minimise the contamination plume as a result of mining it is recommended that:

- Carbonaceous material be placed at the bottom of the pit during backfilling;
- Carbonaceous material is placed in layers and compacted;
- Larger fractures contributing to water flow are sealed to reduce water inflows into the mining area. In addition this will prevent these aquifer systems coming into contact with contaminated water post mining;
- The pit must be kept as dry as possible through dewatering. This will reduce the risk of AMD conditions as exposure of pyritic material to water is reduced;
- Roll-over mining must be concurrent to rehabilitation as this will again assist in reducing exposure of pyritic material with the elements which leads to AMD formation;
- Rehabilitated areas must be designed to be free-draining;
- Rehabilitated areas must be vegetated to prevent erosion and
- Rehabilitated areas must be regularly monitored to assess for differential settlement and surface cracking/rat holing.

Additional measures are discussed below.

- Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent to allow them to source water.
- The sizing of the pollution control dams and in-pit sumps must take account of groundwater inflows as reported in the groundwater study.
- Contamination from the overburden stockpile can contaminate the underlying aquifers. The floor material should be compacted where possible to reduce the vertical recharge rates. This area should be managed as a “dirty” area and water from this area should drain into the PCD.
- Conduct groundwater quality monitoring at least quarterly.
- Dirty water management facilities should be compacted and dirty water dams lined. Any trenches carrying high loads of dirty water should also be lined.
- Ensure pumps are of adequate size for volumes which need to be pumped.

- A paddock system should be considered for any pipelines carrying high loads of dirty water, especially the slurry pipelines.
- Long pipelines should have successive valves to allow for closure of sections of pipelines for repairs and maintenance and to seal off sections of pipeline in the event of leaks.
- Any use of groundwater on site will be done responsibly and the water will then be recycled as far as possible, in order to ensure wastage is minimal.
- Record water usage by attaching meters to all pumps.
- Saving water initiatives will be included in environmental awareness training

12.3.6 Air Quality

- Where relevant, construction phase mitigation measures must continue into operations and only additional measures are discussed below.
- Dust suppression practices must be maintained on site to reduce dust generation.
- Further mitigation of in-pit operations should be done by:
    - Increasing the moisture content of the materials handled;
    - Water sprays installed to achieve 75% control efficiency on unpaved in-pit haul roads; and
    - Water sprays to reduce emissions from drilling.
- Additional measures on roads should include:
    - Prevention of spillages of material from badly loaded or overloaded trucks; and
    - Good housekeeping to prevent accumulation of wind erodible materials on paved road surfaces, such as consideration to road sweepers.
- All rehabilitated areas and areas with exposed soils should be revegetated as soon as possible to ensure that sources for dust generation are limited. Activity in rehabilitated areas should be limited.

12.3.7 Noise and Vibration

- Construction phase mitigation measures are relevant and must continue into operations.

12.3.8 Flora and Fauna

Soil and surface water management measures will apply as reduced erosion and reduced contamination of soils will reduce risks to flora reliant on soil substrate. The construction phase management measures will apply to all new opencast cut areas and have not been further discussed below. Only additional measures are discussed below.

12.3.9 Aquatic Biodiversity

- Soil, surface water, wetland and flora management measures are applicable.
- Where relevant, construction phase mitigation measures must continue into operations and only additional measures are discussed below.

- Pollution control dams should be over-engineered and lined with an impermeable layer so as to ensure no overflow or seepage of water can occur. The inclusion of a back-up system will be greatly beneficial (SEF, 2013).
- Do not allow any discharge or seepage from the mined area and/or associated structures to occur within the catchment (SEF, 2013).

12.3.10 Wetlands

- All soil, surface water, groundwater, floral and aquatic biodiversity management measures must be applied to protect such areas.
- Where relevant, construction phase mitigation measures must continue into operations and only additional measures are discussed below.
- Keep hard surfaces in the area as small as possible and consider using flow dissipaters at outflow points of any hard surface areas (such as the infrastructure footprint area) (Cabanga, 2013c).
- Any berms erected near wetland buffer zones must be revegetated to prevent erosion into wetland areas (Cabanga, 2013c).
- All vehicles being used on site must be parked on impermeable surfaces (Cabanga, 2013c).
- Ensure clean and dirty water separation and storm water management systems are operating as per GN704 requirements (Cabanga, 2013c).
- Silt traps or hay bales must be placed in areas prone to carry high silt load to intercept sediment (Cabanga, 2013c).
- Ensure stockpile area is well compacted and that area drains to mine water containment facilities (Cabanga, 2013c).

12.3.11 Sites of Archaeological and Cultural Interest

- Construction phase mitigation measures are relevant and must continue into operations for any new areas which may be disturbed.

12.3.12 Palaeontology

- Continue with construction phase measures where necessary. .
- A palaeontologist is to conduct regular inspections of the open pit exposures during the life of mining operations. Should any fossil materials be identified by the palaeontologist, the significance of the fossil materials should be evaluated and appropriate damage mitigation processes put into place.

12.3.13 Visual Aspect

- Construction phase mitigation measures must continue into operations.
- Directional floodlighting will be used to focus light on the area of activity only.

12.3.14 Traffic and Safety

- Where relevant, construction phase mitigation measures must continue into operations.

12.3.15 Socio-Economics

- Where relevant, construction phase mitigation measures must continue into operations and only additional measures are discussed below.
- Any retrenchment and employment will be done in accordance with the SLP.

12.4 Decommissioning and Post-Closure Phase

Many of the operation phase management measures will need to be applied during decommissioning as activities are slowly phased out. Only additional measures strictly related to rehabilitation and decommissioning and closure phase are discussed below.

12.4.1 Topography

Overall impacts to topography during decommissioning and closure will be positive.

- All final voids should be filled with remaining overburden and covered with remaining soil stockpiles.
- Adequate overburden material and soil should be available to ensure altitudes and contours stated in the final rehabilitation plan are attained.
- The area should be contoured according to the rehabilitation plan and to allow for free surface water drainage.
- Areas where pooling of water occurs, or where erosion is prevalent should immediately be addressed to ensure that this does not occur.
- General monitoring of surface area especially after rains and attend to any issues observed.
- Topographical surveys need to be conducted on rehabilitated areas to ensure adequate elevations are obtained. Material should be added or removed as needed to obtain elevations as per the rehabilitation plan.

12.4.2 Geology

No impacts are expected on geology during decommissioning and closure phases.

12.4.3 Soils and Land Capability

During decommissioning, soils will still be at risk, due to the increased activity on site. However, during closure and post closure phases the soils should stabilise due to the reduced activity on site.

- Where relevant, construction and operation phase mitigation measures must continue into decommissioning and closure phases and only additional measures are discussed below.
- Maintenance of vehicles and site management and good housekeeping in order to minimise direct spillages of oils or diesels as result of machinery use (Cabanga, 2013a).
- Topography management measures must be applied to ensure proper rehabilitation levels are attained.

- Infrastructure will be demolished and the footprint areas thoroughly cleaned as soon as the structures have been removed.
- Implementation of Rehabilitation Plan in accordance to the post mining land capabilities as prescribed will assist in restoring land and make it available for agricultural land uses (Cabanga, 2013a).
- The utilizable soil (500mm) removed during the construction and operation phases shall be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved post-mining land capability (arable and grazing), and will attain a free draining surface profile (Cabanga, 2013a).
- Fertilization and amelioration of rehabilitated areas (Cabanga, 2013a).
- No borrow pits will be made to obtain topsoil. Relevant permits must be obtained prior to creating borrow pits.
- The area will be re-vegetated with a grass mixture dominated by strong grower and stabilizing grass species.
- Minimise operation and machinery movements to stipulated areas of activity only. Avoid trafficking wet soil (Cabanga, 2013a).
- Leachates and runoff will be channelled via lined trenches to lined pollution control dams.
- Ensure reputable contractors are utilised for removal of all substances from site and that these are adequately transported and where necessary adequately disposed of.
- Soil specialists should be consulted to conduct annual assessments and determine the correct treatment of soils on rehabilitated land (Cabanga, 2013a).
    - A representative sampling of the stripped soils will be analysed to determine the nutrient status of the utilizable materials.
    - As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay% and Organic Carbon. These elements provide the basis for determining the fertility of soil; fertilisers will be applied if and as necessary.

12.4.4 Surface Water

Topography and soil management measures will apply as reduced erosion and reduced contamination of soils will reduce risk of transported contaminants and silt-loading to surrounding surface water bodies. Only additional measures are discussed below:

- Where relevant, construction and operation phase mitigation measures must continue into decommissioning and closure phases and only additional measures are discussed below.
- All water within the area of activity will be contained on site and not released into the environment until such time that rehabilitation is largely completed and water runoff from areas is of adequate quality.
- Pollution control dams will remain on site and to monitor any residual impacts during rehabilitation and closure.
- Monitor area for erosion and pooling and rehabilitate if necessary.
- Continue with monthly surface water monitoring.

- Should artificial wetlands be established then water must stay within artificial wetlands long enough to adequately treat water quality. Consult specialists with regards to the need and design and operation of such systems.

12.4.5 Groundwater

The major impacts to groundwater will be the alteration of groundwater flow and the deterioration of the surrounding groundwater quality. In order to minimise the contamination plume as a result of mining it is recommended that:

- Carbonaceous material be placed at the bottom of the pit during backfilling;
- Carbonaceous material is placed in layers and compacted;
- Larger fractures contributing to water flow are sealed to reduce water inflows into the mining area. In addition this will prevent these aquifer systems coming into contact with contaminated water post mining;
- The pit must be kept as dry as possible through dewatering. This will reduce the risk of AMD conditions as exposure of pyritic material to water is reduced;
- Roll-over mining must be concurrent to rehabilitation as this will again assist in reducing exposure of pyritic material with the elements which leads to AMD formation;
- Rehabilitated areas must be designed to be free-draining;
- Rehabilitated areas must be vegetated to prevent erosion and
- Rehabilitated areas must be regularly monitored to assess for differential settlement and surface cracking/rat holing.

This plume is likely to terminate where the groundwater daylights in the region of low lying areas associated with the rivers, wetlands and streams. With respect to managing decant, there are several scenarios that can be investigated namely:

- A pump-and-treat system can be established to continuously pump the water from the rehabilitated workings. This will keep the water levels below decant level. All the pumped, contaminated water can be sent to active or passive water treatment facilities. This option will have the benefit of reducing plume migration, preventing decant and also reducing seepage to the Olifants River by ensuring water levels are kept low enough to prevent this water from reaching nearby water bodies. The only negative aspect would be the long-term drying up of the affected springs.

- Pollution control facilities such as intersection trenches (which must be excavated until the hard rock is exposed) and associated PCDs can be established to intercept any seepage/decant. Any water arising from the rehabilitated area will then decant into the trench and lead to the PCDs. The consideration of the area required to establish this will need to be properly evaluated.

- Passive treatment can also be investigated and the mine can establish passive water ponds/wetlands. The other option is to set up the successive treatment ponds nearby and pump the decant water to these. This would require some sort of containment dam to be erected to be able to pump the decant water.

- Specific trees could be planted over the opencast workings to keep water levels low and to take up contaminants.

Additional measures are discussed below.

- Ensure registered affected water users are compensated in some way, either with alternative water supply or monetary equivalent to allow them to source water.
- The sizing of the pollution control dams and in-pit sumps must take account of groundwater inflows as reported in the groundwater study.
- Contamination from the overburden stockpile can contaminate the underlying aquifers. The floor material should be compacted where possible to reduce the vertical recharge rates. This area should be managed as a “dirty” area and water from this area should drain into the PCD.
- Conduct groundwater quality monitoring at least quarterly.
- Dirty water management facilities should be compacted and dirty water dams lined. Any trenches carrying high loads of dirty water should also be lined.
- Ensure pumps are of adequate size for volumes which need to be pumped.
- A paddock system should be considered for any pipelines carrying high loads of dirty water, especially the slurry pipelines.
- Long pipelines should have successive valves to allow for closure of sections of pipelines for repairs and maintenance and to seal off sections of pipeline in the event of leaks.
- Any use of groundwater on site will be done responsibly and the water will then be recycled as far as possible, in order to ensure wastage is minimal.
- Record water usage by attaching meters to all pumps.
- Saving water initiatives will be included in environmental awareness training
- At the decommissioning phase it is recommended that two boreholes be installed within the rehabilitated mining areas so the rise in water level and changes to water quality can be assessed.

12.4.6 Air Quality

- Where relevant, construction and operation phase mitigation measures must continue into decommissioning and closure phases.

12.4.7 Noise and Vibration

- Construction and operation phase mitigation measures apply and must continue into decommissioning and closure phases as long as noise impacts are experienced.

12.4.8 Flora and Fauna

Soil, topography and surface water management measures will apply as reduced erosion and reduced contamination of soils will reduce risks to flora reliant on soil substrate. Only additional measures are discussed below.

- Where relevant, construction and operation phase mitigation measures must continue into decommissioning and closure phases and only additional measures are discussed below.

- Continue alien invasive plant monitoring and eradication (Dimela, 2013).
- The area should be re-landscaped and resemble the land form prior to the open cast activities (Dimela, 2013).
- The areas should be planted with indigenous vegetation typical of the area and monitored to ensure that the vegetation progresses through succession stages (Dimela, 2013).
- Monitoring of the rehabilitation success as well as the survival of Crinum bulbispermum on the site should take place for at least five years and include corrective follow-up action (Dimela, 2013).
- It is recommended that Landscape Functional Analysis (LFA) forms part of the rehabilitation and monitoring process. Landscape function analysis is a process-based technique that was developed specifically to track post-disturbance recovery of ecosystems. It aims to restore specific and measurable elements of ecosystem function rather than focusing purely on attaining floristic targets and thresholds e.g. nutrient cycling, increase in vegetation patches and infiltration are measured (Dimela, 2013).
- Rehabilitation and potential erosion problems should be monitored for at least 5 years after closure and necessary corrective action taken immediately (Dimela, 2013).
- Prevent groundwater recharge and ensure that rehabilitated areas are free draining (Dimela, 2013).
- Keep sediment barriers in place until restoration and rehabilitation is complete (Dimela, 2013).
- Prevent grazing from livestock within the first 2 to 3 years after rehabilitation and prevent access to rehabilitated areas until such time that rehabilitation was successful (Dimela, 2013).
- Polluted water may not be directed into the Olifants River (Dimela, 2013).
- If the plants were replanted as part of rehabilitation, the survival of the population of the ‘Declining’ *Crinum bulbispermum* must be monitored and if the plants are under threat, they should be removed with the permission of the approving authority and transplanted to suitable habitat (Dimela, 2013).
- Underground access and boreholes must be sealed to reduce possibility of fires through spontaneous combustion (Dimela, 2013).
- Monitor rehabilitated areas visually for cover abundance and re-seed where necessary.
- Conduct annual floral surveys of rehabilitated areas to monitor community succession and apply specialist botanist’s recommendations.
- Conduct annual faunal surveys during the annual floral surveys.

12.4.9 Aquatic Biodiversity

- Soil, surface water, groundwater, wetland and flora management measures are applicable.
- Where relevant, construction and operation phase mitigation measures must continue into decommissioning and closure phases and only additional measures are discussed below.

- Should surface decant potentially occur, a permanent desalination plant may be required to treat mine water to potable water standards or to a standard that is compliant with the Interim Resource Quality Objective (DWAF, 2009). Ideally, water should be treated to a degree representative of the natural water quality found within the catchment (SEF, 2013).
- Conduct a detailed assessment of the hydrology of the affected sections of the catchment, and ensure that any measures taken, including the potential construction of a desalination plant (see above), support the natural hydrological cycle within the catchment, both in terms of volume and timing of natural flows (SEF, 2013).
- Investigate the possibility of using the surplus treated water obtained from the rehabilitated pit for other purposes, such as the provision of potable water to the surrounding communities (SEF, 2013).

12.4.10 Wetlands

- Soil, surface water, aquatic biodiversity and flora management measures are applicable.
- Where relevant, construction and operation phase mitigation measures must continue into decommissioning and closure phases.
- Eradicate invasive alien plants that may occur or establish within the mineral boundary; and implement a weed management plan as set out by a vegetation expert;
- Monitor the effects of erosion within the mine area;
- Monitor the surface water and groundwater levels and quality upstream, downstream and within the wetland within the mine site;
- Inspect the area quarterly for a period of one and a half years to monitor all erosion and potential sedimentation on site;
- Apply mitigation measures proposed by the groundwater specialist to manage potential decant and plume development; and
- If necessary, appoint a wetland rehabilitation specialist to assist with any rehabilitation and management that may be required regarding the wetlands.

12.4.11 Sites of Archaeological and Cultural Interest

No further management measures will be required during decommissioning and closure.

12.4.12 Palaeontology

No further management measures will be required during decommissioning and closure.

12.4.13 Visual Aspect

- Construction and operation phase mitigation measures apply and must continue into decommissioning and closure phases as long as visual impacts are experienced.
- Rehabilitation plan must be adhered to with regards to in-filling, soil handling and revegetation.

12.4.14 Traffic and Safety

- Construction and operation phase mitigation measures apply and must continue into decommissioning and closure phases as long as traffic-related impacts are experienced.

12.4.15 Socio-Economics

- Should any new employment be created during the decommissioning phase, then local labour should be sought first.
- All SLP initiatives and commitments should be applied particularly with regard to retrenchment.
- Employ staff at other operations if feasible.
- The public participation process should continue throughout decommissioning of the mine to allow all interested and affected parties (I&APs) to continue relations with the mine and offer them a platform to raise their issues and concerns.

13 REHABILITATION PLAN

Proper soil handling forms the initial phases of rehabilitation and specific soil handling as described must be applied together with the general rehabilitation strategy described below. Therefore, this rehabilitation plan starts with soil stripping activities and the soil utilisation guide.

13.1 Soil Utilisation Guide (Cabanga, 2013a)

The primary objectives of the soil management plan are to:

- Devise and maintain a topsoil balance that achieves rehabilitation objectives during the life of mine,
- Ensure effective topsoil removal techniques are employed to maximise volumes of suitable topsoil removed and minimise wastage, and
- Maintain topsoil viability during stripping, stockpiling and spreading through best practice techniques and effective stockpile design and treatment.

Table 49 should be read with the stripping guidelines.

Table 49: Soil stripping guidelines

Soil aspect	Measures to adopt
Strip a suitable distance ahead of the construction (disturbance) at all times	Do not strip too large an area ahead of construction, because this exposes the stripped surface to water and wind erosion, with the associated dust and water sediment problems. However, if the stripping face is too close to the construction activity, it will result in the loss of valuable soil material.
Supervise stripping to ensure soils are stripped correctly	Monitoring requires assessment of the depth stripped, the degree of mixing of soil materials (which must be prevented as far as possible) and the volumes of material replaced directly or placed on stockpiles.
Avoid vegetation clearance and earthworks during the rainy season	Strip soils only when moisture content will minimise compaction risk. Stripping and replacement of soils should be done ideally during the dry season when rainfall is at its lowest and soils are driest.
Minimise compaction during stockpile creation	The degree to which soils become compacted during stripping is largely dependent on the equipment used. The use of heavy equipment over soil stockpiles results in soil structure damage. If directly dumped soil piles are too low, then it is possible to increase stockpile height using a dozer blade or back-actor to raise the materials
Ensure free draining location	Stockpiles should be placed on a topographical crest which provides free drainage in all directions. Alternatively, a side-slope location with suitable cut-off berm construction upslope is acceptable.

The following requirements should be adhered to wherever possible:

- Over areas of OPEN CAST PITS and where the high wall of the final void will form the access to UNDERGROUND workings strip all topsoil (500mm). Alluvial soils should be stockpiled separately from the colluvial (shallower) materials, which in turn should be stored separately from the overburden. At rehabilitation replace soil to appropriate soil depths, and cover areas to achieve an appropriate topographic aspect and attitude to achieve a free draining landscape and, as close as possible, the pre-mining land capability rating.
- Over areas of INFRASTRUCTURE (Offices, Workshops, Crushing and Screening Plant and Haul Roads) and SOFT OVERBURDEN STOCKPILES strip the top 300 mm of topsoil over all affected areas. Store the soil in stockpiles of not more than 1.5 m around infrastructure area for rehabilitation purposes, or utilise for clean water diversion berms where they will not be affected by dirty water. Stockpile hydromorphic soils separately from the dry materials. For rehabilitation replace soil to appropriate soil depths over areas and in appropriate topographic position to achieve, as far as possible, pre-mining land capability and land form.
- Over area of CONSTRUCTION OF PRODUCT, HARD OVERBURDEN STOCKPILES AND ACCESS ROADS strip topsoil to a depth of 750 mm in areas of arable soils and between 300mm and 500mm in areas of soils with grazing land capability. Stockpile hydromorphic soils separately from the dry and friable materials. For rehabilitation replace soil to appropriate soil depths over areas and in appropriate topographic position to achieve, as far as possible, pre-mining land capability and land form.
- Over area of LAY-DOWN PADS AND CONVEYOR SERVITUDES strip the top 150 mm of usable soil over all affected areas and stockpile in longitudinal stockpile within the mining lease area.

13.2 Post-mining land capability requirements

The post-mining land capability class (Figure 26) was determined by the soil type and soil volumes as calculated under the stripping guidelines. Other factors and characteristics that might influence post-mining land capability are slope, compaction and reduction of soil quality due to contamination of soils by subsoil, soft overburden or spoil material.

The proposed post-mining land capabilities of the proposed mining areas should be implemented as follows:

- Portion 5 of the farm Halfgewonnen 190 IS: Grazing – 59.76 ha (80 %), Grazing 14.94 ha, (19.5 %), Wilderness (0, 5% Total = 85.65 Ha.
- Portion 17 of the farm Halfgewonnen 190 IS: Grazing – 7.47 ha (100 %), wilderness 0.1 % Total = 7.47 Ha
- RE of the farm Halfgewonnen 190 IS: Arable 65.00 ha (90 %), Grazing 7.22 (10 %), %), Wilderness (0, 5%) = Total =72.22 Ha.
- Part of Forzando No 595 IS: Grazing – 10.95 ha (95 %). Total = 10.40 Ha.

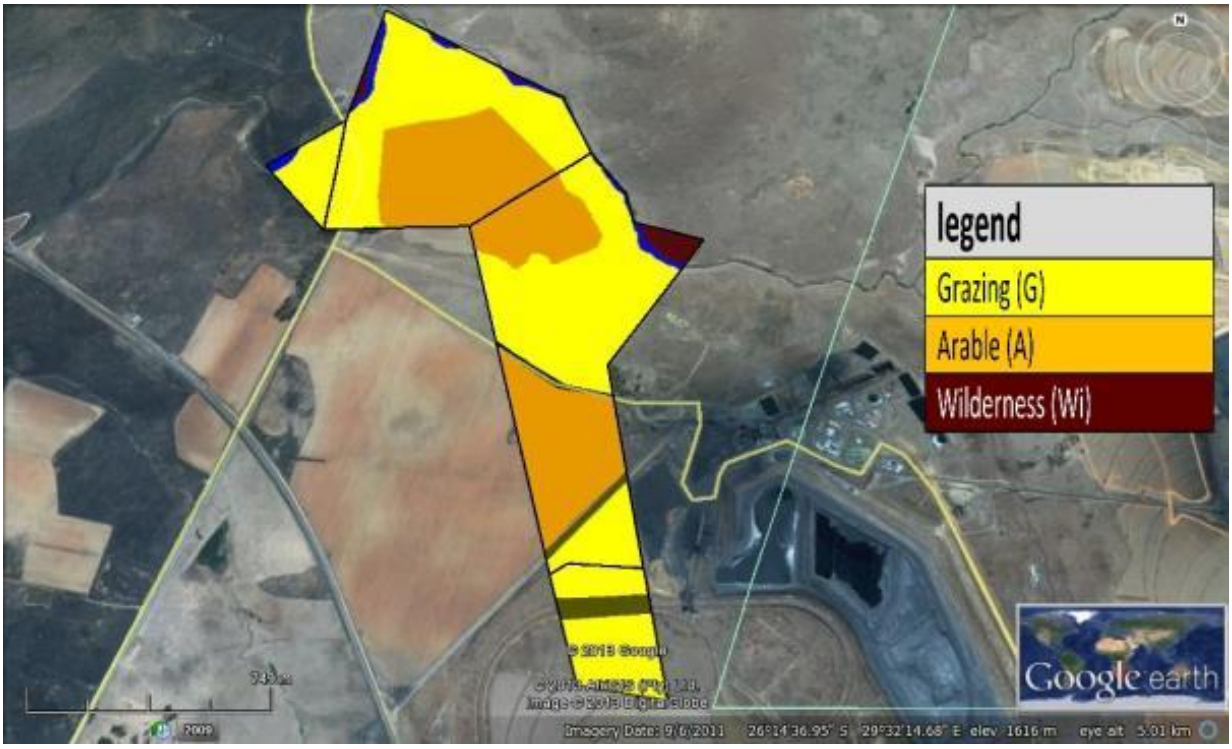

Figure 13-1: Post mining land capability

A final post-mining land capability assessment and post rehabilitation performance assessment should be done progressively (annually) during the operational phase by a soil specialist by means of auger observations at a grid spacing of 100 x 100 with soil analyses.

This will aid in the compilation of a final post-mining land capability map which should be submitted for closure purposes.

13.3 Soil utilization and rehabilitation

Stripping and stockpiling of topsoil will take place during the construction and mostly during the operational phases, mainly at the footprint of opencasts areas. The soil types that should be stripped and stockpiled either separately or together are shown in Figure 27, 28 and 29. These figures should be read together with Table 50 which shows the stripping depths, the areas and the calculated total soil volume per soil type, based on the stripping depth.

The Orthic A horizon of all the Avalon and Bainsvlei soil form will be stripped and stockpiled on one stockpile

Table 51 shows the replacing depth (topsoil thickness) and post-mining land capability class taking into account the bulking factor of each soil form. The replacement depth was determined by calculating the total soil volume per soil group (stockpile), divided by the original area which was stripped. This implies that if more than one soil type, which were stripped at different depths, are stockpiled together, it will be replaced as a single average depth.

The following stripping and stockpiling procedures need to be executed precisely:

- The figure and tables below show the combination (groups) of soil types that need to be stripped and stockpiled on 3 separate stockpiles. The A and B-horizon should be stripped and stockpiled separately and marked with a signboard as specified in the guidelines for the rehabilitation of mined land (Chamber of Mines of South Africa, 2007).

Stockpiles should be based on the soil volume per stockpile as indicated in Table 50. A maximum height of 6m should apply on all stockpiles, unless otherwise stated. Stockpiling should only be conducted at the designated stockpile areas as shown in Figure 29.The boundaries of the soil types that are to be stripped at different depths and/or stockpiled separately, are shown in Figures 27 and 28 should be surveyed and staked by the mine surveyor at 50 m intervals before any soil stripping commences.

Table 50: Pre-mining stripping soil depths

Stockpile No	Soil stripping group and stockpile no.	Horizon	Strip depth (mm)	Total stripping depth(mm)	Area (ha)	Soil volume (m3)
Stockpile 1	Orthic A Horizon Avalon, Bainsvlei	A	300	300	62.85	18.86
Stockpile 2	(Red well-drained soils)	B	900	900	15.74	18.89
Stockpile 3	(Brownish yellow moderately well-drained soils)	B	900	900	47.11	46.21
Stockpile 4	Orthic A (Grey, imperfectly drained, sandy wetland soils)	A	100	100	7.88	079
Stockpile 5	(Grey, imperfectly drained, sandy wetland soils)	B	800	800	7.88	6.30

Table 51: Post-mining replacing depths

Stockpile No	Soil stripping group and stockpile no.	Horizon	Area (ha)	Soil volume (m3)
Stockpile 1	Orthic A Horizon Avalon, Bainsvlei	A	62.85	18.86
Stockpile 2	(Red well-drained soils)	B	15.74	18.89
Stockpile 3	(Brownish yellow moderately well-drained soils)	B	47.11	46.21
Stockpile 4	Orthic A (Grey, imperfectly drained, sandy wetland soils)	A	7.88	079
Stockpile 5	(Grey, imperfectly drained, sandy wetland soils)	B	7.88	6.30

Figure 13-2: Soil stripping map – A Horizon

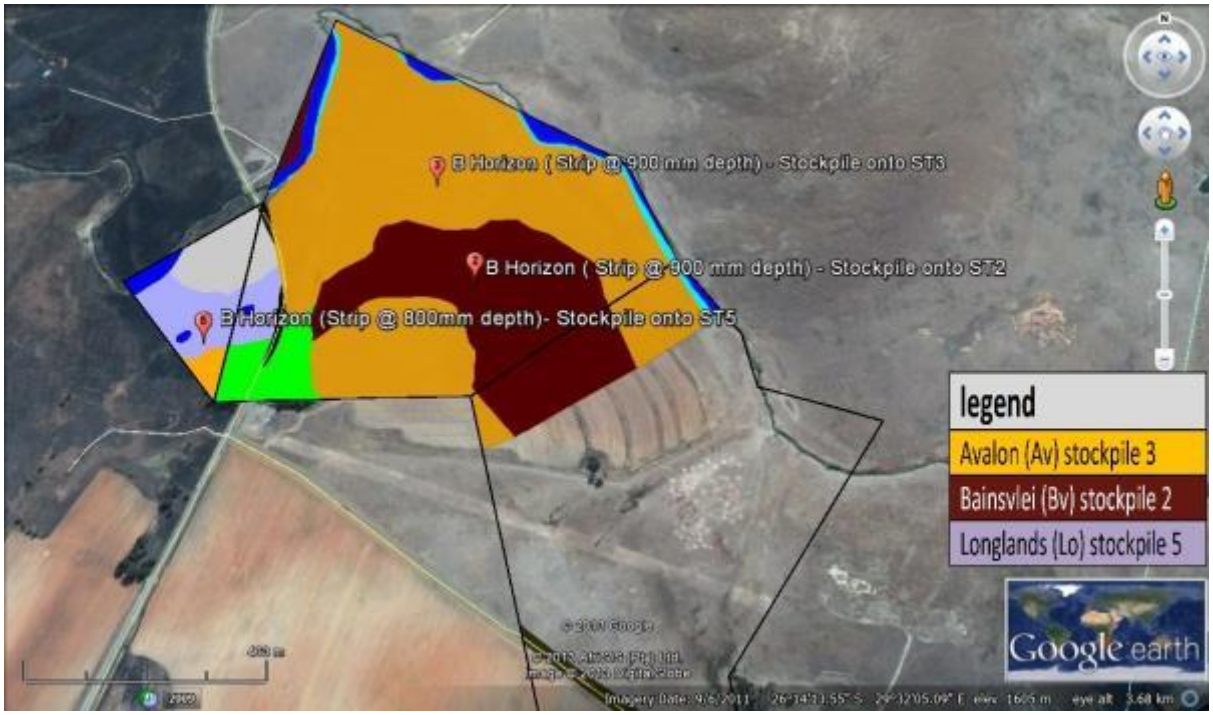

Figure 13-3: Soil stripping map – B Horizon

Figure 13-4: Soil stockpile placement

13.4 Infrastructure Removal

On closure, all scrap metal will be removed and sold where possible, or disposed of at an appropriate site. Offices, administration block and associated buildings will be removed from site. Building rubble and material will be transported to an appropriately licensed disposal site. Where this material is neutral and will not produce leachate harmful to the groundwater environment, it can be utilised as infill material at the base of voids if additional material is required. The footprint should be thoroughly cleaned and all building rubble and waste material should be removed. The footprint should be loosened by ripping or discing the surface soils.

All other waste will be separated and removed from site. It will be recycled where possible or removed by reputable contractors to appropriate waste facilities for that particular waste type.

All chemicals will be removed from site by registered and reputable contractors.

All fences will be dismantled and either disposed of at a permitted disposal site or sold as scrap. Fences erected to cordon off dangerous areas will remain in place and maintained, and will only be removed once such sites are considered safe and stable.

13.5 Roads

Roads or sections of roads no longer required after completion of mining will be identified. These roads will be ripped down as indicated in the soil utilisation and rehabilitation guide above.

13.6 Pollution Control Dam

The pollution control dams will remain on site to ensure the protection of the surrounding environment. This will only be rehabilitated once the area is stable and runoff water from the area is of a quality suitable for discharge into the environment.

13.7 Underground Mining Areas

Underground mining sections will be sealed at the adits. This will further assist in compartmentalising and containing groundwater within mining areas and reduce risk of contamination.

13.8 Opencast Mining Areas

The soil handling through the successive roll-over mining process has been detailed above and must be applied to ensure adequate rehabilitation of the area.

13.9 Soil Amelioration and Re-Vegetation

The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation), and soil amelioration should be done as recommended by a soil specialist, in order to correct the pH and nutritional status before re-vegetation.

The rehabilitated sections should be re-vegetated with a grass mixture dominated by local climax species in early summer to stabilize the soil.

A short term fertilizer program should be based on the soil chemical status after the first year in order to maintain the fertility status for 2 to 3 years after rehabilitation until the area can be declared as self-sustaining.

13.10 Floral Requirements

Once the seed mixture is sown, the land must be rolled using a Cambridge roller to ensure consolidation around the seeds and effective moisture retention. Seeded lands are to be checked after germination has occurred, via soil sample analysis. Following the results of this sampling, post dressing of fertiliser should be considered. Once area has been rehabilitated and seeded, access to the area should be restricted.

14 ENVIRONMENTAL MONITORING PROGRAMMES & PERFORMANCE ASSESSMENTS

Overlooked Colliery is required to conduct regular monitoring and performance assessments at their operations. Frequencies of monitoring has been included for each impact in Table 47 and a detailed monitoring programme has been extracted from this table and expanded were necessary and included in Table 52 below. The following detailed monitoring programmes are proposed for this site:

14.1 Atmospheric Conditions

14.1.1 Air Quality

The following air quality monitoring programme is proposed:

- It is recommended that a dust fallout monitoring network be implemented to monitor trends in particulate air concentrations and dust fallout in the surrounding area due to the proposed mining operations.
- The proposed monitoring network will comprise 3 single dust buckets at monitoring locations indicated in Figure 11.
- Dust monitoring will be conducted on a monthly basis by an independent contractor;
- A report on the air quality measurements collected will be compiled annually. These reports will be in the public domain and are subject to review by the authorities.

14.1.2 Noise

The following noise level monitoring programme is proposed (Cabanga, 2013b):

- Occupational noise will be monitored on a monthly basis.
- Ambient noise will be monitored on a quarterly basis at mine boundaries. Where exceedances are observed at boundaries further assessments will be made at sensitive receptors beyond that boundary to determine if mitigation measures need to be applied regarding noise at these sites.
- Noise level data recorded will be available on site for inspection purposes.

14.2 Hydrological

14.2.1 Surface Water

- The surface water quality will be monitored on a monthly basis.
- This monitoring programme will include a minimum of the three monitoring points as indicated in Figure 5. As the PCDs and in-pit sump start to accumulate water then these will also be included in the surface water quality monitoring programme.
- The following chemical parameters are recommended for the analysis (any additional elements included in the IWUL will also be included):
    - Total Dissolved Solids / Electrical Conductivity;
    - pH level;
    - Alkalinity;

  - Carbonates;
  - Magnesium;
  - Calcium;
  - Sodium;
  - Potassium;
  - Sulphate;
  - Chloride;
  - Fluoride;
  - Iron;
  - Manganese; and
  - Aluminium.
- All samples will be submitted to an accredited laboratory for analysis.
- Quarterly and annual reports will be compiled and submitted to the mine management.
- Reports will be submitted to DWA annually.

14.2.2 Groundwater

- Monitoring boreholes have been sited (Figure 14-1) with the use of ground geophysics.
- In addition to boreholes around the pit area, an additional monitoring borehole should be installed into the mined-out and rehabilitated areas close to the point where decant is expected. The boreholes should be used to monitor the rising groundwater levels and act as an early warning system before decant starts.
- Monitoring boreholes must also be established up- and down-stream of potential pollution sources such as PCDs, stockpile areas, mine pits and co-disposal facility to detect potential seepage and plume movement.
- The groundwater quality will be monitored on a quarterly basis, at which time the levels will also be dipped.
- All monitoring boreholes must be demarcated and protected to prevent damage or tampering.
- All samples will be submitted to an accredited laboratory for analysis.
- The following chemical parameters are recommended for the analysis (any additional elements included in the IWUL will also be included):
  - Total Dissolved Solids / Electrical Conductivity;
  - pH level;
  - Alkalinity;
  - Carbonates;
  - Magnesium;
  - Calcium;
  - Sodium;
  - Potassium;
  - Sulphate;
  - Chloride;
  - Fluoride;
  - Iron;
  - Nitrate;

- Manganese; and
- Aluminium.

- Reports will be submitted to DWA annually.
- The groundwater water model will be updated every two years and the monitoring programme will be reviewed after this period and amended as necessary. Any changes will be submitted to DWA.

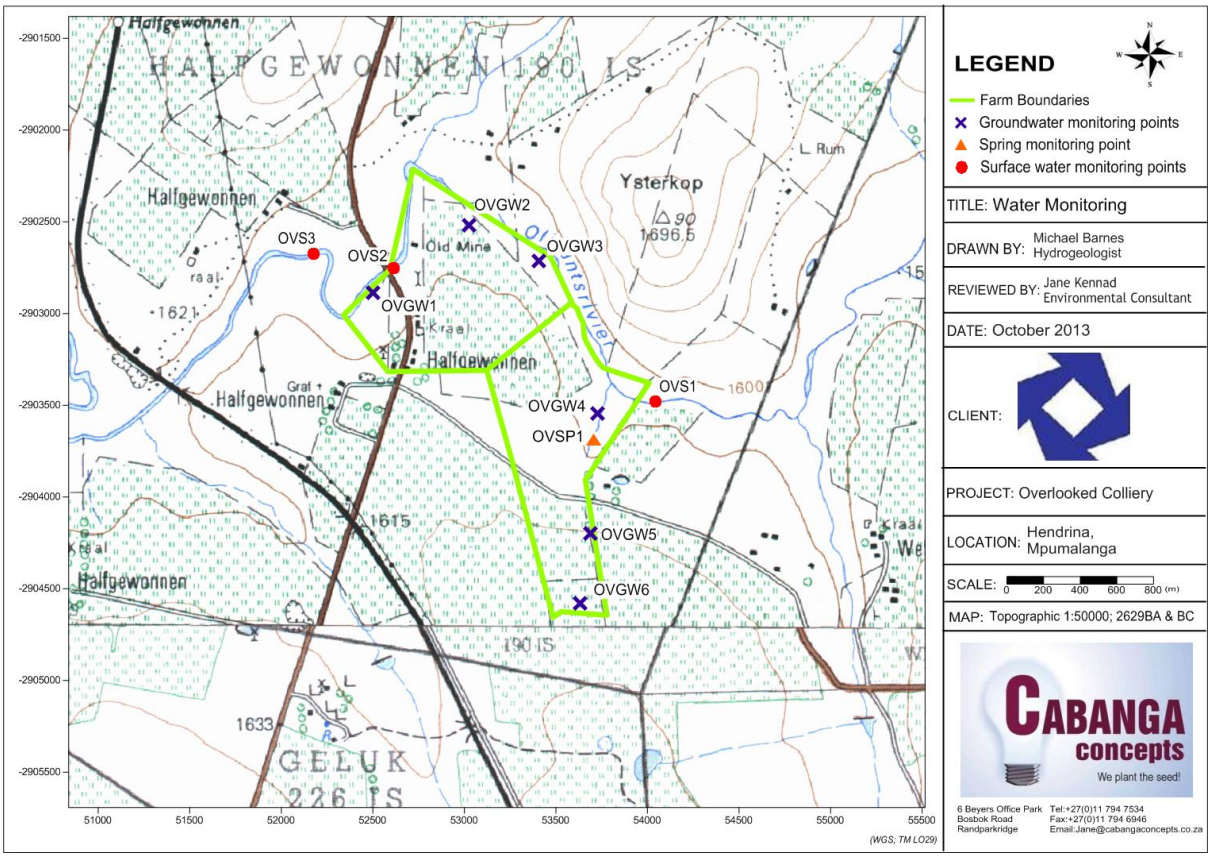

Figure 14-1: Groundwater monitoring plan

14.3 Aquatic Biodiversity

Biomonitoring of the sites surveyed within this report (Figure 17) should continue throughout the life of mine and for a period of 3-5 years after mining. Biomonitoring of these sites should take place every 6 months, once during the rainy season and once during the dry season.

14.4 Noise and Vibration Monitoring

Photographic evidence should be collected of all important structures on site to provide pre-mining data on the condition of structures.

A digital seismograph will need to be established at the sensitive receptors, including the cemetery. The blasting logs should then be compared with the data from the seismographs to determine the effects of blasting on these structures. Blasting methodology will need to be re-evaluated if impacts are observed.

This programme will be continued, and expanded to include any additional locations effected by the proposed operation as necessary.

14.5 Soil Monitoring

A soil monitoring plan should be implemented on site at the project site that will assess the following (Cabanga, 2013a):

- Quality and volume of stockpiles on site.
- Soil acidity and salt pollution analyses (pH., electrical conductivity and sulphate).
- Fertility analysis (exchangeable cations K, Ca, Mg and Na and phosphorus).
- State of erosion site:
    - Erosion prevention and loss of soil can be ensured by not allowing steep slopes during stockpile construction and no unintentional soil removal should be allowed.
- Soil compaction levels as measured with a penetrometer in areas with high traffic such as haul roads as well as in stockpiles.
    - Compaction by vehicle traffic should be avoided when rehabilitation takes place. Soil physical problems are of real concern because impacts on rehabilitated areas regarding vegetation establishment are severe due to restricted root growth, low water penetration and low water holding capacity. Compacted shallow soils are commonly found after opencast rehabilitation resulting in poor vegetation establishment and growth. Ensure drainage erosion and compaction is managed as per the recommendations.
- Assessment of rehabilitated soil thickness and soil characteristics by means of auger observations on a 100 x 100 m grid.
- A post-mining land capability assessment needs to be done progressively (annually) by a soil specialist to evaluate rehabilitation activities. A final post-mining land capability map needs to be compiled and should be submitted for closure purposes.
- Progressive analysis of any hydrocarbon spillages and actions undertaken to remedy these where applicable, especially around areas where machinery is used or where hydrocarbons are stored.
- This monitoring plan as well as the results of monitoring must be evaluated by an annual soil audit conducted by a soil specialist to make recommendations and comment on existing impacts and issues with regards to soil and post mining land capability.

14.6 Vegetation Monitoring

- Any ecologically sensitive or protected species observed on site will be monitored as and when required. If it is noted that mining-related activities may pose a threat to such animals then the relevant specialists will be consulted and if necessary permits will be obtained to relocate these animals or plants.

- Rehabilitated areas will be monitored for soil quality and depth on an annual basis and recommendations made by the specialist pedologist, including the annual fertilization programme, will be implemented on site.
- The site will be monitored for alien invasive species on a 6 monthly basis and an ecologically sensitive alien invasive eradication programme will be implemented on site.
- Rehabilitated areas will be surveyed visually for vegetation cover on a monthly basis and any areas of failed germination will be re-assessed and re-seeded. Consideration will be given to hand planting of seedling plugs if germination continues to be low in an area.
- Annual floral surveys will be conducted to determine the condition of rehabilitated areas regarding floral biodiversity and community structure. Faunal surveys will be conducted at the same time.

14.7 Monitoring of Sites of Cultural and Heritage Importance

14.7.1 The graves

- Monthly inspections would be needed in order to determine that the condition of the site does not deteriorate. Specifically any damages from:
    - Blasting and vibrations or any other mining activities. Consideration can be given to installing a seismometer at site.
- Ensure fencing is maintained.
- Ensure site is clean and tidy, accessible and that the grass short.
- A buffer zone of 20 meters is maintained.

14.7.2 The buildings

- Monthly inspections would be needed in order to determine that the condition of the buildings does not deteriorate. Specifically any damages from:
    - Blasting and vibrations or any other mining activities. Consideration can be given to installing a seismometer at site.
    - Rock fall.
- A buffer zone of 50 meters is maintained.

14.8 Performance Assessments

- Heritage site conservation management plan will be updated every 5 years or earlier should the mine plan change.
- All information as required by the various Government Departments should be captured and be readily available for submission when required.
- A biennial (every two years) performance assessment will be conducted by an external consultant throughout the life of mine as required by the MPRDA. This is conducted to assess the adequacy and compliance of the EIA and EMP, and the relevant legislation.

- This report will comply with the format as set out in regulation 55 (3) of the MPRDA, and will be submitted to the DMR.
- The Quantum of the Financial Provision will be reviewed on an annual basis, and submitted to the DMR.

Table 52: Management and Monitoring Schedule

Frequency	Monitoring & inspection	Mine Phase	Proposed Actions	Responsible person	Cost / annum
Once off	Collect photographic evidence of structures in the nearby area for records of structural damage	Design and Planning	Collect photographs for comparison should complaints be received about blast damages.	Site & Environmental manager	Running cost
Continuous	Monitor water usage	Construction, Operations	Any large spikes on water use must be followed up and source determined. May indicate leaks on site which must be attended to immediately.	Environmental manager	Running cost
Continuous	Blasting and air vibration should be monitored at the grave site and the farmstead should this site remain.	Construction, Operations	A grave site occurs at proposed underground mine and blasting activities from opencast mining could impact the site. Explosive experts should be consulted with regards to blasting procedures which should be adapted to reduce vibrations in the direction of this grave site. .	Environmental & Mine manager	Running cost
Prior to disruption of new sites	Assess areas targeted for development for potential presence of such sites when vegetation has been cleared.	Construction, Operations	Should graves or any other heritage/archaeological sites be observed on site during activity progress then all activity should ceased and the area demarcated as a no-go zone. A specialist will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone (100m buffer zone for mining). Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialists consulted prior to any further activity.	Social manager	Dependent on findings
Daily	Inspect drip trays and ensure all chemical spills are cleared and disposed of as per safety sheet recommendations or if uncontaminated replace for re-use.	Operations	Ensure all chemical spills are cleared and disposed of as per safety sheet recommendations or if uncontaminated replace for re-use.	Site & Environmental manager	Running cost
Weekly	Inspect buffer zones and wetland areas are adequately cordoned off and that no activity is taking place within these.	Construction, Operations	Any activity occurring within this area will cease unless the necessary permits are obtained. The area will be immediately rehabilitated with regards to soil erosion and compaction and revegetated with local indigenous plant species. A specialist will be consulted and recommendations applied where necessary.	Environmental manager	Running cost
Weekly	Inspect bunded areas to ensure taps are closed.	Construction, Operations	Any open valves will be closed immediately. Any leaks will be cleared and disposed of as part of the hydrocarbon waste stream. Leaky containers will be repaired or replaced. See emergency response plan for addressing large leaks.	Site & Environmental manager	Running cost
Weekly	Inspect oil traps	Construction, Operations	Remove oil from oil traps before these are at capacity to prevent overflow and spillage. Oil must be collected in drum which will be temporarily stored in bunded areas for removal from site by a reputable recycling or disposal company. Any spills that occur should be cleared using appropriate absorbent material which will then also be collected in drums and treated as used hydrocarbon waste.	Site & Environmental manager	Running cost
Weekly	Inspect stripping and stockpiling activities and ensure they are to specification of the pedology study.	Construction, Operations	If soil stripping and stockpiling is not conducted to the specification of the pedology study then activities will cease and stripping and stockpiling will then commence as per the study. The soil specialists will be consulted with regards to treatment, storage and handling of any soils incorrectly stripped or stockpiled. Recommendations made by the soil specialists will be applied on site.	Environmental manager	Running cost

Frequency	Monitoring & inspection	Mine Phase	Proposed Actions	Responsible person	Cost / annum
Weekly	Inspect all potable and mine water works, portable toilets, sewage tanks, pipelines and all water-related infrastructure such as berms and trenches for leaks or any other signs of deterioration.	Construction, Operations, Decommissioning	Seal any leaks observed immediately. See emergency response plan for addressing large or hazardous leaks or spills. Clear out any obstructions and silt-build-up. Ensure minimum operational freeboard is maintained. Any damage must be repaired immediately so that integrity of structures is not compromised. If paddocks are erected for surface pipelines, then these should be cleared after leaks or spills have been remedied. Specialists must be consulted if necessary.	Environmental & Mine manager	Running cost
Weekly	Inspect roads for spillages	Operations	Clear all spillages immediately where observed. Material removed should be placed on stockpiles or within the base of mine pits.	Environmental manager	Running cost
Monthly	Ensure service plans are maintained and inspect log books.	Design and Planning, Construction, Operations, Decommissioning	Logs should be maintained daily. Machinery behind on service plans should not be utilised on site until fully serviced. Problem machinery must be removed from site and replaced if repairs are not possible.	Site manager & Contractor	Contractors cost
Monthly	Inspect intersections and roads	Design and Planning, Construction, Operations, Decommissioning, Closure & Post Closure	Repair any damages, clear any spills and ensure all road signs are visible to all road users.	Site manager	Running cost
Monthly	Inspect progress of construction & ensure activity is in designated areas	Construction	Any deviation from plans will be rectified immediately and areas rehabilitated immediately. Specialists will be consulted where needed.	Environmental manager	Running cost
Monthly	Inspect areas: ensure fences are not damaged & no illegal connections have been added to power-generation infrastructure	Construction, Operations	Repair any damage to fences and replace warning signs. Remove illegal connections.	Environmental manager	Running cost
Monthly	Monitor survival of protected species for duration of LoM and 3 years after operation	Construction, Operations	Where the *Crinum bulbispermum* plants are deemed to be under threat from the open cast footprint, the plants should be removed by a qualified specialist and replanted into suitable conserved areas, or maintained under suitable growing conditions until such time that it can be replanted as part of rehabilitation. The survival of these plants in their new habitat must be monitored for at least 3 years and corrective action taken, when it is found that the plants are not adapting. Note that these plants may only be removed with the permission of the provincial authority.	Environmental manager	Running costs
Monthly	Inspect area for damage to flora species.	Construction, Operations, Decommissioning	Seed any areas where vegetation cover is sparse immediately to reduce risk of erosion.	Environmental manager	Running cost
Monthly	Inspect area for erosion and soil compaction	Construction, Operations, Decommissioning	Establish erosion control measures in areas with severe or persistent erosion using gabions, straw bales or vegetating bare soil. Import soil if necessary and rehabilitate. Rip, disc or scarify depending on extent of compaction and rehabilitate.	Environmental manager	Running cost
Monthly	Inspect area for illegal littering and dumping	Construction, Operations, Decommissioning	Any illegally dumped waste will be collected and disposed of in the relevant waste stream.	Environmental manager	Running cost
Monthly	Dust monitoring	Construction, Operations, Decommissioning, Closure & Post	Should thresholds increase past industrial limits (rural limits are already exceeded in the area prior to mine activity), then dust suppression methods must be reassessed. Frequency of spraying	Environmental manager	R155,000.00

Frequency	Monitoring & inspection	Mine Phase	Proposed Actions	Responsible person	Cost / annum
		Closure	can be increased or dust binders can be utilised.		
Monthly	Surface water monitoring	Construction, Operations, Decommissioning, Closure & Post Closure	All water-related issues within this table will apply. Inspections will also include a mini audit on the surface water management plan within this report and ensure all measures are fully applied. Specialists will be consulted and their recommendations applied should issues persist. Affected registered water users will be compensated with alternative water supply of similar quality and quantity or other compensation measures will be discussed with them.	Environmental manager	R200,000.00
Monthly	Inspect progress of roll-over mining & ensure activity is in designated areas	Operations	Any deviation from plans will be rectified immediately and areas rehabilitated immediately. Specialists will be consulted where needed.	Environmental & Mine manager	Running cost
Monthly	Visually monitor vegetation cover	Operations, Decommissioning	Seed any areas where vegetation cover is sparse immediately to reduce risk of erosion.	Environmental manager	Rehab cost
Monthly	Inspect underground mining surface area	Operations, Decommissioning, Closure & Post Closure	Fill in and re-contour all areas where subsidence or sinkholes have developed and rehabilitate these areas.	Environmental & Mine manager	Running cost
Monthly	Heritage sites (graves and post office / shop	Operations, Decommissioning,	Any damage to these sites should be reported to SAHRA and their recommendations followed. A specialist should be consulted.	Environmental and Social Manager	Running costs. Additional costs will depend whether damage occurs and on extent of damage.
Quarterly	Environmental noise monitoring.	Construction, Operations, Decommissioning	Consider use of silencers on noisy equipment, enclosing noise sources where possible, establishing noise screens or utilising quieter equipment. If necessary adjust work schedules where possible with sensitive I&APs.	Site manager	R 90,000.00
Quarterly	Groundwater quality & quantity monitoring.	Construction, Operations, Decommissioning, Closure & Post Closure	All water-related issues within this table will apply. Inspections will also include a mini audit on the groundwater management plan within this report and ensure all measures are fully applied. Specialists will be consulted and their recommendations applied should issues persist. Affected registered water users will be compensated with alternative water supply of similar quality and quantity or other compensation measures will be discussed with them.	Site & Environmental manager	R 200,000.00
Every 6 months	Biomonitoring.	Construction, Operations, Decommissioning, Closure & Post Closure	Specialist recommendations which are made through the monitoring report must be applied on site.	Environmental manager	R 110,000.00
Every 6 months depending on species	Establish and maintain an alien invasive monitoring and eradication programme	Construction, Operations, Decommissioning, Closure & Post Closure	Eradicate and control all alien invasive species on site. Rehabilitate and revegetate all areas where alien invasive species were removed.	Environmental manager	Running cost

Frequency	Monitoring & inspection	Mine Phase	Proposed Actions	Responsible person	Cost / annum
Annually	Inspect integrity of bunding.	Construction, Operations	A specialist engineer will be contracted to conduct these tests. His/her recommendations will be applied on site as necessary.	Site & Environmental manager	Running cost & dependent on extent of repair work required.
Annually	Test integrity of lining of all water management structures & test integrity of coal stockpile layer.	Operations	A specialist engineer will be contracted to conduct these tests. His/her recommendations will be applied on site as necessary.	Site & Environmental manager	Running cost & dependent on extent of repair work required.
Annually	Floral surveys need to be conducted in rehab areas to monitor cover abundance, plant succession and community structure	Operations, Decommissioning, Closure & Post Closure	An ecologist will be contracted to conduct these studies annually and his/her recommendations will be applied on site.	Environmental manager	R 80,000.00
Annually	Soil survey and soil quality and depth monitoring	Operations, Decommissioning, Closure & Post Closure	A soil and rehabilitation specialist will be contracted to conduct these assessments and his/her recommendations will be applied on site.	Environmental manager	R 100,000.00
Annually	Topographical surveys of rehabilitated and mined areas	Operations, Decommissioning, Closure & Post Closure	This should be conducted by the survey department. Any areas where topographical changes have occurred will be rehabilitated by filling and depressions with overburden, subsoils and topsoil as required and such areas seeded.	Survey & Environmental manager	Running cost
After rainfalls	Inspect bunded areas to ensure bunded areas are not flooded.	Construction, Operations	Any accumulated water within the bunded areas should be released to the process water circuit via and oil trap in a controlled manner. The water must not be release to the environment. The oil traps will be regularly checked (weekly) as part of the water management features and accumulated oil will be collected in hydrocarbon drums for removal and disposal by a reputable contractor.	Site & Environmental manager	Running cost
After rainfalls	Inspect rehabilitated areas and the area in general for erosion and pooling.	Construction, Operations, Decommissioning	Area will be recontoured to allow for free-drainage of water. Erosion control measures will be established, import soil if necessary and rehabilitate.	Environmental manager	Running cost
As required	Ensure employment and retrenchment is in line with SLP initiatives	Construction, Operations, Decommissioning	SLP must be monitored and annual audits on the SLP conducted to ensure that Overlooked Colliery is in line with commitments set out in the EMP. Issues must be addressed.	Social Manager	Running cost
As required	Inspect all complaints received and compare against photographic evidence.	Construction, Operations, Decommissioning	Overlooked Colliery must establish a complaints and inspections procedure, and a system of compensation for any potential damage from blasting activities. This could include direct monetary compensation or ensuring damage is repaired or structures are replaced in the event of serious damage.	Social Manager	Running costs & dependent on extent of damage.
As required	Inspect any complaints received in the complaints register	Design and Planning, Construction, Operations, Decommissioning	Must establish a complaints and inspections procedure, and a system of compensation for any potential damage from blasting activities. This could include direct monetary compensation or ensuring damage is repaired or structures are replaced in the event of serious damage. Action should also be taken with any other issues raised, such as screening areas for visual impacts, utilising silencers for noisy equipment. Keep communication system open with all I&APs.	Environmental & Social manager	Running costs & dependent on complaints requiring attention
As required	Monitor any ecologically sensitive species should they be observed on site	Construction, Operations, Decommissioning, Closure & Post Closure	Should species be in danger from activities on site, then the species should be actively relocated with the aid of specialists.	Environmental manager	Running cost

Frequency	Monitoring & inspection	Mine Phase	Proposed Actions	Responsible person	Cost / annum
As required	Conduct regular inspections of the open pit exposures be made by a palaeontologist during the life of those mining operations.	Construction, Operations,	Should any fossil materials be identified by the palaeontologist, Activities will cease and the findings reported to relevant agencies. The significance of the fossil materials should be evaluated and appropriate damage mitigation processes put into place.	Social Manager	Dependent on findings
Sporadically	Speed inspections	Design and Planning, Construction, Operations, Decommissioning	Speed limits will be established on site access roads to minimise dust generation. Fines should be issued and repeat offenders should not be allowed to drive on site.	Site manager	Running cost

15 EMERGENCY RESPONSE PLAN

As part of its management tools, a mine should have an Emergency Response Plan. These plans will be disseminated to all employees and contractors during the induction process for use during emergency situations.

In the case of a medical accident or problem, the mine will have first aid kits available at administration and workshop buildings. A First Aid officer should be on duty at all times. In the event of an emergency the checklist of emergency response units must be consulted and the relevant units notified.

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios, pagers or telephones, must be placed around the mine. Should the emergency have the potential to affect the surrounding communities, they will be alerted via alarm signals or contacted in person.

Emergency services will be sourced from the nearest main town, Bethal, wherever possible. A list of emergency services and their contact numbers will be made available at strategic locations at the mine.

15.1 Environmental Emergencies, Procedures and Remedial Action

The following is a list of the most likely potential environmental emergencies:

- Fires;
- A hydrocarbon/chemical spill or leak;
- Major water leaks or spills;
- Flooding; and
- Explosions.

In the case of environmental emergencies, the remedial measures and actions as listed in the Emergency Response Plan should be followed, in addition the relevant authorities should be contacted; these are listed below:

Dept. of Water Affairs:	013 – 032 2061
Dept. of Mineral Resources:	013 – 653 0500
Dept. of Economic Development, Environment & Tourism:	013 – 692 6300

15.1.1 Fires

Veldt fires and fires resulting from other sources must be handled with extreme caution. Fire extinguishers should be placed around the mine at accessible locations and needs to be frequently inspected and maintained in working condition. The following procedures apply In the event of a fire:

- An alarm should be activated to alert all employees and contractors.

- Identify the type of fire and the appropriate extinguishing material. For example water for a grass fire, and mono ammonium phosphate based fire extinguisher for chemical and electrical fires.
- In the event of a small fire the fire extinguishers placed around the mine should be used to contain and extinguish the fire.
- In the event of a large fire, the fire department will be notified.
- All staff will receive training in response to a fire emergency on site, including evacuation procedures.
- A Fire Association should be set up with the mine and surrounding land owners to facilitate communication during fire events and assist in fighting fires, where necessary. If such an association exists then the mine will join such an association.
- If possible all surrounding drains, such as storm water drains need to be covered and or protected to prevent any contaminated water from entering the drains.
- In case of a chemical or petroleum fire, run-off from the area should be contained as far as possible using the most appropriate measures e.g. spill absorbent cushions, sand or a physical barrier.
- Contaminated run-off must be diverted into an oil sump, or cleaned up.

15.1.2 Hydrocarbon / Chemical Spills

Hydrocarbons such as diesel, petrol, and oil which are used as fuel for mine machinery will be kept on site; therefore there is the possibility that spillage may occur. As this is a coal mine there is also the possibility of a coal spillage occurring. Further, any chemicals contained on site, such as those associated with explosives may also be detrimental to the environment if spills occur. In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment.

The following procedure applies to a hydrocarbon/chemical spill:

- The incident must be reported to the Environmental coordinator immediately.
- The Environmental Coordinator will assess the situation from the information provided, and set up an investigation team. Included in this team could be the Mine Manager, Chief Safety Officer, the employee who reported the incident and any individual responsible for the incident.
- When investigating the incident, priority must be given to safety.
- Once the situation has been assessed, the Environmental Coordinator must report back to the Mine Manager.
- The Mine Manager and the investigation team must make a decision on what measures can be taken to limit the damage caused by the incident, and if possible any remediation measures that can be taken.
- In the event of a small spillage, the soil should be treated in situ, using Hazmat clean up kits.
- Every precaution should be taken to prevent the spill from entering the surface water environment.
- In the event of a large spillage, adequate emergency equipment for spill containment or collection, such as additional supplies of booms and absorbent materials, will be made available and if required, a specialised clean-up crew will be called in to

decontaminate the area. The soil should be removed and treated at a special soil rehabilitation facility.
- Reasonable measures must be taken to stop the spread of spills and secure the area to limit access.
- Dispatch necessary services.

15.1.3 Major Water Leaks or Spills

Dam wall failures and burst high-volume dirty water pipelines have been identified as potential emergency situations. The following steps should be followed:

- Turn off all water supplies to the dam/pipeline.
- Dispatch necessary emergency services.
- Take all reasonable measures to stop the spread of contaminated water. This can be done by placing berms and channels around the spillage area.
- The incident must be reported to the Environmental Coordinator immediately.
- The Environmental Coordinator will assess the situation from the information provided, and set up an investigation team or relevant personnel. Included in this team could be the Mine Manager, Chief Safety Officer, the employee who reported the incident and any individual responsible for the incident.
- When investigating the incident, priority must be given to safety.
- Once the situation has been assessed, the Environmental Officer must report back to the Mine Manager.
- The Mine Manager and the investigating team must take a decision on what measures can be taken to limit the damage caused by the incident, and if possible any remediation measures that can be taken.
- The DWA will be notified of the incidence.

15.1.4 Flooding

There is potential for flooding during the rainy season. This could result in a large volume of water accumulating in a water containment facility and mine pit and could cause major damage to equipment and endanger the lives of employees on site. Procedures must be put in place to ensure that there is a quick response to flood events and damage is kept to a minimum.

The procedure for flooding is as follows:

- DWA's flood warning system should be reviewed annually.
- The use of emergency pumps should occur if the water floods the pit, where it may be exposed to contamination.
- Mine management should be made aware of any such event so they can take appropriate action to ensure production losses are kept to a minimum.
- All dams and water containment facilities should have a 0.8m freeboard and an overflow or outlet to ensure that no damage occurs to the facilities.
- All contaminated water should be contained on site, as far as possible and discharges to the environment should only occur if absolutely necessary in an extreme flood event.

15.1.5 Explosions

Other than explosion incidents related to mining, explosions can occur in the workshop areas when working with gas cylinders and chemicals. These could result in large numbers of employees being injured and requiring medical assistance.

The procedure to be followed is:

- Safe evacuation routes should be devised in the event of an uncontrolled explosion and all staff trained on relevant evacuation routes and assembly points.
- All relevant emergency response units must be notified and hospitals informed of incoming patients. DMR to be notified of the incident.

16 ENVIRONMENTAL AWARENESS PLAN

The purpose of this section is to outline the methodology that will be used to educate the mine's employees and contractors of any environmental risks associated with their work and the manner in which these risks must be dealt with so as to avoid pollution and minimize the degradation of the environment.

Training will also address the specific measures and actions as listed in the EIA and EMP. This Environmental Awareness Plan (EAP) is intended to supplement the Safety, Health and Environmental (SHE) training and awareness requirements.

16.1 Training Needs

A training needs analysis is performed through all levels of the organization including those within the administration, plant and mining worker sectors. Each of the categories / levels of the organization have different responsibilities and roles, accordingly different knowledge requirements are applicable. These are summarised in the Table 53. After the training needs have been identified, it is the responsibility of the SHE Office to ensure that personnel attend the relevant identified training.

16.2 Specialised Skills

The Training Department in conjunction with the SHE Officer are responsible for ensuring job specific training for personnel performing tasks, which can cause significant environmental and social impacts (e.g. receipt of bulk hazardous chemicals/fuel, hazardous materials handling, responding to emergency situations etc.). The Mine Manager with the assistance of the SHE Officer must identify relevant personnel and training courses.

16.3 Review of Training Material

Effectiveness of the environmental management training will be done by the management through task observations and during internal and external audits. All training material for presentation to personnel and contractors will be reviewed annually to ensure consistency with organisational requirements and best practice guidelines. In addition to this, annual monitoring reports, audit results and all incident reports will be reviewed; any short comings and non-compliancy will be highlighted and management measures incorporated or improved upon within the training material.

16.4 Records

Records from the implementation of this EAP will be kept and controlled in accordance with the SHE Management System Control of Records Procedure, which is required to be implemented so as to provide evidence of conformity and effective operation of the relevant requirements of the SHE management system.

Table 53: Environmental Awareness Training Requirements

Occupation Category	Environmental Management Responsibility / Role:	Required Knowledge And Input:	Training Required:	Interval:
Senior Management including Process Managers and Head of Department	Managing the Social & Environmental Assessment & Management System (SEAMS), and the Safety, Health & Environmental (SHE) Management System	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the significant impacts as described in the EIA/EMP during the construction and operational phases Knowledge of the commitments made in the EMP relevant to the construction and operational phases Setting and reviewing the mine's Environmental objectives Directing the SEAMS and SHE management system, and monitoring their progress	General in-house, management training	Once off
		Accessing the legal register and searching for details Emergency preparedness and response	Training on the legal register	Once off
Environmental Management Representative, SHE Officer & Internal Auditor	Managing the SEAMS and the SHE Management System Monitoring and auditing	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the significant impacts as described in the EIA/EMP during the construction and operational phases Knowledge of the commitments made in the EMP relevant to the construction and operational phases Directing the SEAMS and SHE management system, and monitoring their progress	General in-house, management training	Once off
		Current knowledge of South African regulatory requirements, best practice guidelines and applicable legislation	Training on the legal register	Once off
		Emergency preparedness and response Knowledge in spill management, stockpile management, discard management, water management and waste management Knowledge of the relevant Operational procedures, Emergency	Meetings and Talk Topics	Continuous

Occupation Category	Environmental Management Responsibility / Role:	Required Knowledge And Input:	Training Required:	Interval:
		Response Plans and Incident reporting		
		Knowledge of the SABS standards and other relevant legislation regarding the correct storage of chemicals	Training on the SABS standards and other legislation	Annual
		Knowledge of auditing techniques and report writing	Auditor training	Annual
Section Managers & Section Engineers	Implementation and daily management of the SEAMS and the SHE Management System	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.	General in-house, management training	Once off
		Knowledge in stockpile management, discard management, water management and waste management Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting Knowledge in the correct storage of chemicals	Meetings and talk topics	Continuous
Engineering HOD & General Engineering Supervisor	Implementation and daily management of the SEAMS and the SHE Management System	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.	General in-house, management training	Once off
		Knowledge in spill management and waste management Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting	Meetings and talk topics	Continuous

Occupation Category	Environmental Management Responsibility / Role:	Required Knowledge And Input:	Training Required:	Interval:
		Knowledge in the correct storage of chemicals		
Mine Captain & General Engineering Supervisors	Implementation and daily management of the SEAMS and the SHE Management System	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.	General in-house, management training	Once off
		Knowledge in spill management and waste management Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting Knowledge in the correct storage and handling of chemicals Understanding the requirements for not polluting the environment	Meetings and talk topics	Continuous
Supervisors, Shift Boss & Forman	General Environmental Awareness and job specific impacts	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting Knowledge in spill management and waste management Understanding the requirements for not polluting the environment	General in-house, management training	Once off
Operators, tradespersons & Floor Employees	General Environmental Awareness and job specific impacts	General Awareness of aim and purpose of the SEAMS and SHE Management System Understanding the SEAMS Management Plan relevant to their operations Understanding the requirements for not polluting the environment General understanding of the relevant Operational procedures,	Environmental Awareness Training	Annual

Occupation Category	Environmental Management Responsibility / Role:	Required Knowledge And Input:	Training Required:	Interval:
		Emergency Response Plans and Incident reporting		
General Administration Staff	General Environmental Awareness and job specific impacts	General Awareness of aim and purpose of the SEAMS and SHE Management System Understanding the SEAMS Management Plan relevant to their operations Understanding the requirements for not polluting the environment General understanding of the relevant Operational procedures, Emergency Response Plans and Incident reporting	Environmental Awareness Training	Annual
Security	General Environmental Awareness and job specific impacts	General Awareness of aim and purpose of the SEAMS and SHE Management System Understanding the requirements for not polluting the environment General understanding of the relevant Operational procedures, Emergency Response Plans and Incident reporting	Environmental Awareness Training	Annual

17 FINANCIAL PROVISION

The financial provision for closure and rehabilitation has been calculated using the DMR's rules based quantum calculation, 2012.

The estimated liability has been calculated at R2,527,678.56 this amount is applicable to premature as well as final closure, and will be provided for by means of a bank guarantee.

Table 54: Calculation of the Quantum of Financial Provision

Template for Level 2: "Rules-base" assessment of the quantum for financial provision 2013 Rates								
CALCULATION OF THE QUANTUM								
Mine:	**Overlooked Colliery**		**Location:**	Bethal				
Evaluators:	K.C van Rooyen		**Date:**	05 November 2013				
Disclaimer: Calculations are based on survey data and information provided by the client, as well as visual observations on site & previous experience in the field. Rates are based on DMR 2011 rates, with a 6% (CPIX) increase p.a. to account for inflation. Whilst every attempt is made to ensure this information is accurate, these calculations are estimates only and Cabanga Concepts cannot be held liable for any discrepancies.								
No.:	**Description:** **NB The survey for these areas are still required**	**Unit:**	**A** **Quantity**	**B** **Master rate (2013)**		**C** **ultiplicatio factor**	**D** **Weighting factor 1**	**E=A*B*C*D** **Amount (Rands)**
			Step 4.5	**Step 4.3**		**Step 4.3**	**Step 4.4**	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3		R	11.52	1.00	1.10	
2 (A)	Demolition of steel buildings & Structures	m^2		R	160.51	1.00	1.10	
2 (B)	Demolition of reinforced concrete buildings & structures	m^2		R	236.53	1.00	1.10	
3	Rehabilitation of access roads	m^2	6000.00	R	28.73	1.00	1.10	R 189 591.60
4 (A)	Demolition & rehabilitation of electrified railway lines	m		R	278.76	1.00	1.10	
4 (B)	Demolition & rehabilitation of non electrified railway lines	m		R	152.06	1.00	1.10	
5	Demolition of housing &/or administration facilities	m^2		R	321.00	1.00	1.10	
6	Opencast rehabilitation including final voids & ramps	ha	5.400	R	168 272.11	**0.52**	1.10	R 519 758.88
7	Sealing of shafts, adits & inclines	m^3		R	86.17	1.00	1.10	
8 (A)	Rehabilitation of overburden & spoils	ha		R	112 181.40	1.00	1.10	
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha		R	139 719.91	1.00	1.10	
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha		R	405 812.85	**0.76**	1.10	
9	Rehabilitation of subsided areas	ha		R	93 935.03	1.00	1.10	
10	General surface rehabilitation	ha	5.4000	R	88 866.59	1.00	1.10	R 527 867.57
11	River diversions	ha		R	88 866.59	1.00	1.10	
12	Fencing	m	1500.00	R	101.37	1.00	1.10	R 167 256.87
13	Water management	ha	3.2400	R	33 789.58	**0.25**	1.10	R 30 106.51
14	2 to 3 years of maintenance & aftercare	ha	3.2400	R	1 826.36	1.00	1.10	R 6 509.13
15 (A)	Water Treatment	SUM	595.0	R	240.00	**1.00**	1.10	R 157 080.00
15 (B)	Surface management	SUM				**1.00**	1.00	
		Sub Total 1						
		(Sum of items 1 to 15 Above)						**R 1 598 170.57**
1	Preliminary and General	12.5% of Subtotal 1		Weighting factor 2 (step 4.4) According to urban, peri-urban and remote			**1.05**	R 209 759.89
2	Administration & supervision costs	6.0% of Subtotal 1						R 95 890.23
3	Engineering drawings & specifications	2.0% of Subtotal 1						R 31 963.41
4	Engineering & procurement of specialist work	2.5% of Subtotal 1						R 39 954.26
5	Development of a closure plan							
6	Final groundwater modelling	2.5% of Subtotal 1						R 39 954.26
	(Subtotal 1 plus sum of management & administrative items, 1 to 6 above)	**Sub Total 2**						**R 2 015 692.63**
7	Contingency	10% of Subtotal 2						**R 201 569.26**
		VAT (14%)						R 310 416.67
		(Subtotal 3 plus VAT)				**GRAND TOTAL**		**R 2 527 678.56**

18 CONCLUSION

18.1 Environmental Impact Statement

The following sensitive issues and proposed mitigation measures have been identified on site:

- One cemetery was observed on site within the boundary of the proposed underground mine. The cemetery can be preserved if wider pillars are retained beneath the cemetery and a 100m buffer zone implemented for surface infrastructure. If mining or blasting (which must be monitored at the cemetery) indicates impacts to this site, then the relocation process must be initiated and completed prior to further mining or blasting.
- The Olifants River forms the northern boundary and the mine will retain a 100m buffer zone from the river. However, wetland areas related to the river do occur outside this 100m zone. Wetlands are regarded as sensitive and should be preserved where possible. The wetlands have moderate PES, low ecological sensitivity and functioning and are not FEPA wetlands. Applications will be made to impact the wetland areas and no activities are to proceed in these areas until authorization to do so is obtained under NEMA and NWA.
- Declining and protected species were identified within the wetland areas. These need to be monitored and preserved in situ as far as possible. Should authorisations be obtained to proceed with activities through the wetland area, then the 100m buffer zone of the Olifants River must be strictly protected through placement of clean soil berms between the river and areas of activity (outside the 100nm buffer zone). By strictly protecting this area, the species within this zone will be protected and it will also provide habitat for relocation of species within the wetland area that is targeted for development.
- During mining operations groundwater impacts will be limited to dewatering and the associated drawdown cone. Modelling has indicated that five private boreholes, a spring, and the Olifants River will be affected during this time. Larger fractures contributing to water flow must be sealed to reduce water inflows into the mining area. If the impact affects any registered water users (water levels within a 1km radius must be monitored preferably quarterly but at least twice a year in the wet and dry season). In addition these boreholes should be pump tested to determine the borehole yields. Compensation with these water users must be discussed.
- Residual impacts on groundwater will have more significant implications, largely to the Olifants River. As the contamination plume develops, it will affect this river system, as well as the some privately owned boreholes and a spring. Lastly, the groundwater model estimated that a decant points may develop to the northern regions of the proposed opencast mine areas. The following should be considered and finalised during decommissioning regarding the mitigation of decant and associated salt loading through plume development and general day-lighting of contaminated groundwater in the area:
  In order to minimise the contamination plume and potential decant concentrations one can:

  - Place carbonaceous material at the bottom of the pit during backfilling,
  - Carbonaceous material is placed in layers and compacted,
  - The pit must be kept as dry as possible through dewatering. This will reduce the risk of AMD conditions as exposure of pyritic material to water is reduced,
  - Roll-over mining must be concurrent to rehabilitation as this will again assist in reducing exposure of pyritic material with the elements which leads to AMD formation, rehabilitated areas must be designed to be free-draining, and
  - Rehabilitated areas must be vegetated to prevent erosion and rehabilitated areas must be regularly monitored to assess for differential settlement and surface cracking/rat holing.
- With respect to managing decant, there are several scenarios that can be investigated namely:
  - A pump-and-treat system can be established to continuously pump the water from the rehabilitated workings. This will keep the water levels below decant level. All pumped contaminated water can be sent to the passive or active treatment facilities,
  - Reducing the opencast mine pit area to outside the wetland zones, which will then also provide sufficient room between the proposed decant point and wetland area for the installation of treatment ponds or other treatment options,
  - Pollution control facilities such as intersection trenches (which must be excavated until the hard rock is exposed) and associated PCD can be established to intercept any seepage/decant. Trenches must be installed until the hard rock is exposed. Any water arising from the rehabilitated area will then decant into the trench and lead to the PCD,
  - Passive treatment can also be investigated and the mine can establish passive water ponds/wetlands. This would require a fair amount of area which would only be possible if the wetland is excluded from the mining area or water is pumped upstream to successive treatment ponds/wetlands,
  - Specific trees can be planted over the opencast workings to keep water levels low and to take up contaminants and
  - A final void can be maintained to allow evaporation of water and assist in maintaining lower groundwater levels to prevent decant.

18.2 Concluding Remarks

Although some sensitive areas were identified, no fatal flaws are apparent, and implementation of mitigation measures and monitoring plans as proposed should prevent deterioration of sensitive sites and areas.

All the relevant authorisations must be obtained from DWA under NWA and DEDET under NEMA before any activity commences within wetlands and their 100m buffer zone.

Should the cemetery need to be relocated or any of the buildings demolished, then authorisations to conduct this must also be completed prior to any impact to these sites.

The remaining impacts are considered manageable and the project should be allowed to proceed. This EMP must be strictly adhered to and mining proceed in a responsible manner

to firstly prevent impacts and secondly to ensure early detection and appropriate and immediate response to issues identified.

19 UNDERTAKING

I, ……., the undersigned and duly authorised thereto by ..... ……. that Overlooked Colliery will comply with the provisions of the Minerals and Petroleum Resources Development Act (Act 28 of 2002) and its Regulations as set out in Government Gazette no. 26275 (23 April 2004), as well as the National Environmental Management Act (no. 107 of 1998 – NEMA).

I have studied and understand the contents of this document and duly undertake to adhere to the conditions as set out therein, unless specifically or otherwise agreed to in writing.

Signed at …….. on this ……day of ……20……

_____

Name:

Designation:

20 REFERENCES

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Appendix A: Cabanga Concepts Company Profile and EAP CV

Appendix B: Soil and Land Capability Assessment

Appendix C: Surface Water Assessment

Appendix D: Geohydrological Assessment

Appendix E: Noise

Appendix F: Flora Assessment

Appendix G: Fauna Assessment

Appendix H: Aquatic Assessment

Appendix I: Wetland Assessment

Appendix J: Heritage Phase I Assessment

Appendix K: Heritage Conservation Management Plan

Appendix L: Palaeontological Assessment

Appendix M: Visual Assessment

Appendix N: Public Participation Process Report and Related Documents