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T 011 789 7170 E info@eims.co.za W www.eims.co.za

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ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR PUBLIC REVIEW

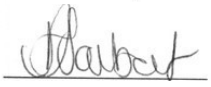
MANUNGU COLLIERY EXTENSION, ASSOCIATED INFRASTRUCTURE AND AMENDMENTS TO EXISTING LICENCE CONDITIONS

DMR Ref: MP 30/5/1/2/2/297 MR

DOCUMENT DETAILS

GSW REFERENCE:	1177
DOCUMENT TITLE:	MANUNGU COLLIERY EXTENSION, ASSOCIATED INFRASTRUCTURE AND AMENDMENTS TO EXISTING LICENCE CONDITIONS
COMPANY	TSHEDZA MINING RESOURCES (PTY) LTD.
MINING RIGHT	MP 30/5/1/2/2/297 MR

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
COMPILED:	Sikhumbuzo Mahlangu	pp. 	2020/01/15
CHECKED:	Brian Whitfield / Adri Joubert		2020/01/17
AUTHORIZED:	Adri Joubert		2020/01/17

REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2020/01/17	ORIGINAL DOCUMENT	EIAR for Public Review

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LIST OF ABBREVIATIONS

AMD	:	Acid Mine Drainage
CMA	:	Catchment Management Agency
DEA	:	Department of Environmental Affairs[1]
DMR	:	Department of Mineral Resources[2]
DWS	:	Department of Water and Sanitation[3]
EIA	:	Environmental Impact Assessment
EIMS	:	Environmental Impact Management Services (Pty) Ltd
ELWU	:	Existing Lawful Water Use
EMPr	:	Environmental Management Programme
ESA	:	Early Stone Age
GA	:	General Authorisation
GHG	:	Greenhouse Gas
GN	:	Government Notice
GNR	:	Government Notice Regulation
GSW	:	Geo Soil & Water cc
HIA	:	Heritage Impact Assessment
I&AP	:	Interested & Affected Party
IBA	:	Important Bird Area
LoM	:	Life of Mine
MAE	:	Mean Annual Evaporation
mamsl	:	Metres Above Mean Sea Level
MAP	:	Mean Annual Precipitation
MAR	:	Mean Annual Runoff
MCM	:	Million Cubic Metres
MPRDA	:	Minerals and Petroleum Resources Development Act
NEMA	:	National Environmental Management Act
NEMAQA	:	National Environmental Management Air Quality Act
NEMWA	:	National Environmental Management Waste Act
NGDB	:	National Groundwater Database
NHRA	:	National Heritage Resources Act
NWA	:	National Water Act

[1] This Ministry was recently renamed as Department of Environment Forestry and Fisheries (DEFF). All reference in this report to DEA should be read synonymously with DEFF.

[2] This Ministry was recently renamed as Department of Mineral Resources and Energy (DMRE). All reference in this report to DMR should be read synonymously with DMRE.

[3] This Ministry was recently renamed as Department of Human Settlements Water and Sanitation (DHSWS). All reference in this report to DWS should be read synonymously with DHSWS.

PHRA	:	Provincial Heritage Resources Authority
RoM	:	Run of Mine
SAHRA	:	South African Heritage Resources Agency
WMA	:	Water Management Area
WUL	:	Water Use Licence

EXECUTIVE SUMMARY

Tshedza Mining Resources (Pty) Ltd (Tshedza) a subsidiary of Mbuyelo Coal (Pty) Ltd has an approved Mining Right (MR) (Ref No: MP 30/5/1/2/2/297 MR) and Environmental Management Programme (EMPr), in terms of the Minerals and Petroleum Resources Development Act (Act 28 of 2002, as amended) (MPRDA), for the mining of coal at Manungu Colliery. The current mining operations are situated on portions 5, 6, 7, 8 and 9 of the farms Weilaagte 271 IR, situated in the Victor Khanye Local Municipality within the Nkangala District Municipality (Mpumalanga Province). The Colliery is situated ~60 km southwest of Witbank, ~10 km south of Delmas and ~16 km north-west of Devon. Access to the mine is via the R42 from the N12 National road (Witbank – JHB). The mine has been in operation since mid-2015. Tshedza wishes to expand the mining operations to extend the life of mine (LoM) until approximately 2041. A Detailed LoM plan is done only for the current opencast and future Underground operations until 2041. A small opencast resource block "OC2" or "OCEAST" form part of the application even though it is not scheduled in detail at this stage. Mining of resources under the current boxcut dumps and OC2 will last another 3-5 years which takes the minimum LoM until 2044/46. Much of the other resources are not drilled to sufficient detail to facilitate detail mine planning but it is possible that mining can take place on this mining right for at least 31 years or until about 2050. The proposed areas within which the expansion of mining operations would take place, are all within the existing approved mining right boundary, however these areas were not specifically included and assessed in the previous Environmental Impact Assessment (EIA) and Water Use Licence Application (WULA) and hence these new applications.

The proposed new mining operations will necessitate additional infrastructure establishment including Pollution Control Dams (PCD), internal haul roads, stockpiles, etc. Furthermore, the current contractors camp area would require relocation at a later stage in order to mine the resource below the current camp area. It is also proposed to establish a coal processing plant (wash plant) to beneficiate the Run of Mine (RoM) coal. The wash plant would be constructed at the current RoM area where the crushing and screening plant is current located. Water for the washing plant is anticipated to be obtained from the existing PCD.

In addition to these new activities, Tshedza wishes to amend certain existing conditions of their current Environmental Authorisation (EA) and Environmental Management Plan (EMPr) in order to align these conditions with current and future mining practices. This amendment application process is incorporated into this EIA process.

An application for the amendment to the existing Mine Works Programme (MWP), Social and Labour Plan (SLP) and EMPr, through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is therefore required to support an application for environmental authorisation (EA) / waste management licence (WML) as applicable. The new water uses triggered by the extended mining operations will be applied for through a new Water Use Licence Application (WULA).

PURPOSE OF THE EIA REPORT

The Scoping Phase of the EIA process investigated the baseline environment and identified potential impacts associated with the proposed project and defined the extent of the studies required within the EIA Phase. The Scoping Phase also identified potentially sensitive areas within the study site.

The EIA Phase addresses those identified potential environmental impacts and benefits (direct, indirect, and cumulative impacts) associated with all phases of the project including design, construction, operation, decommissioning and closure. Within this EIA Phase Report, recommendations are put forward to appropriately mitigate potentially significant environmental impacts for both positive and negative impacts.

The EIA Phase achieves the following:

- Provide an overall description and assessment of the social and biophysical environments affected by the proposed alternatives put forward as identified by the various specialist studies;
- Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed project;

- Comparatively assess identified feasible alternatives put forward as part of the project;
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
- Undertake a fully inclusive public involvement process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

PUBLIC PARTICIPATION PROCESS

The Public Participation Process (PPP) for the proposed project has been undertaken in accordance with the requirements of the MPRDA, and NEMA in line with the principles of Integrated Environmental Management (IEM). The PPP commenced on the 20th of July 2018 with an initial notification and call to register for a minimum period of 30 days. The scoping report was made available for public review and comment for a period of 30 days in line with the legislative timeframes (13 July 2019 to 14 August 2019[4]). A public meeting was held on 7th of August 2019 at the Delmas Country Club. The comments received from I&AP's to date have been captured in a Public Participation summary table included in this report and appended in detail in the Public Participation Report. This draft EIA report will be made available for public review and comment for a 30-day comment period commencing 17 January 2020 to 17 February 2020. Comments received during the EIA review period will be addressed within the report and added to the Public Participation summary of the Final EIA Report to be submitted to DMR.

ENVIRONMENTAL IMPACT ASSESSMENT

A detailed assessment was undertaken to identify all the potential risks and impacts associated with each phase of the mining operations. Each of the identified risks and impacts for these phases was assessed using the impact assessment methodology described in the body of the report. The assessment criteria include the nature, extent, duration, magnitude/intensity, reversibility, probability, public response, cumulative impact, and irreplaceable loss of resources.

The following impacts were determined to be most significant and to have a potentially moderate - high negative final significance:

- Groundwater contamination;
- Acid Mine Drainage;
- Habitat fragmentation and edge effects;
- Loss of fertility;
- Pollution of habitats;
- Altered hydrological regime;
- Impacts on wetlands/drainage lines;
- Emissions, and
- Blasting and vibration impacts.

Both the positive and negative impacts are assessed in this EIA report. Mitigation measures have been identified and refined based on input from the EAP, public consultation, and specialist assessments. The Environmental

[4] Due to the Department of Mineral Resources (DMR) Mpumalanga offices being officially shut down on 3 September 2018, the Environmental Authorisation application was only accepted by the DMR on 17 July 2019. This resulted in a year's delay between the initial public consultation and the Scoping Report availability.

Management Programme Report (EMPr) details the appropriate mechanisms for avoidance and mitigation of the negative impacts and enhancing the positive impacts.

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the conclusion of this study is that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Similarly, the positive impacts can be enhanced by implementing the recommended mitigation measures.

1 INTRODUCTION

Tshedza Mining Resources (Pty) Ltd, a subsidiary of Mbuyelo Coal (Pty) Ltd has appointed Geo Soil and Water cc (GSW) as the Environmental Assessment Practitioner (EAP) to assist with undertaking the necessary authorisation and amendment processes for Manungu Colliery. In turn GSW has appointed EIMS as well as various specialist sub-consultants to assist with compiling the necessary reports and undertaking the statutory consultation processes, in support of proposed new infrastructure and facilities as well as the proposed amendments to existing licences as described herein.

A Mining Right (MP 30/5/1/1/2/297MR) was granted to Tshedza Mining Resources (Pty) Ltd on the 4th of May 2009 for the mining of coal on all portions of the farms Weilaagte 271 IR and Welgevonden 272 IR. Tshedza Mining Resources (Pty) Ltd was issued an Environmental Authorisation (EA), Licence No 17/2/2N-266, in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and the Environmental Impact Assessment Regulations (2010 Regulations), on the 19th of March 2014. An Integrated Water Use Licence (IWUL) for Section 21 (a), (c), (g), (i) and (j) water uses in terms of chapter 4 of the National Water Act (Act 36 of 1998) (NWA) was granted for water uses associated with opencast mining on the 23rd of February 2015 (License No 04/B20A/ACGIJ/2621). The existing approved EA and IWUL only covers portions 5, 6, 7, 8 and 9 of the farm Weilaagte 271 IR over which the current mining operations are nearing completion.

The current Manungu Colliery operations are situated in the Victor Khanye Local Municipality within the Nkangala District Municipality (Mpumalanga Province) and approximately 60 km southwest of Witbank, ~10 km south of Delmas and ~16 km north-west of Devon. Access to the mine is via the R42 from the N12 National road (Witbank – JHB). The mine has been in operation since mid-2015 and Tshedza wishes to expand the mining operations to extend the life of mine (LoM) until approximately 2041. To extend the mining operations outside of the current approved EA and IWUL areas (i.e.: outside of the approved portions of land), additional approvals are required (i.e.: the current applications). In addition to the expansion of the mining operations, amendments to certain existing conditions are being applied for to align the conditions with the current and proposed future works.

The current land use of the proposed mine expansion area consists of arable and grazing land. Several roads and power lines run through the area. The region has been largely affected by historical mining, with sand and coal mining activities dating from the 1940's to present.

Manungu Colliery falls within the Witbank Coal Field and the mining method used is conventional truck and shovel opencast mining, utilising the roll-over method for rehabilitation. Coal is stockpiled in Run of Mine (RoM) stockpiles where it is then processed at the existing crushing and screening yard. The processed coal is stockpiled within the coal stockyards from where it is transported to clients using trucks. To enhance the quality of the coal product (beneficiation of product), Manungu wishes to incorporate a wash plant into their current crushing and screening plant. The inclusion of the wash plant will necessitate an amendment to the existing Mine Works Programme (MWP) as well as an amendment to the existing approved EMPr which is undertaken through this EIA application process. The proposed processing facility (wash plant) and associated infrastructure will be located within the mining right boundary, and within the current active plant area and will make use of the water contained in the existing pollution control dam (PCD).

1.1 REPORT STRUCTURE

This EIA report has been compiled in accordance with the 2014 NEMA EIA Regulations (as amended). A summary of the reports specific sections that correspond to the applicable regulations, is provided in Table 1 below.

Table 1: Report sections corresponding to GNR 982 Appendix 3.

Reference	Description	Section in Report
Appendix 3(a):	Details of- (iii) the EAP who prepared the report; and (iv) the expertise of the EAP, including a curriculum vitae;	Section 1.2 Section 1.3
Appendix 3(b):	The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 2 Table 3 Figure 1
Appendix 3(c):	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Figure 4 Figure 20 Section 3
Appendix 3(d):	A description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Table 9 Section 3
Appendix 3(e):	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 4

Appendix 3(f):	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5
Appendix 3(g):	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 9.5
Appendix 3(h):	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: (i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Section 9 Section 6 Section 6.4 Section 7 Section 8 Section 8.1 Section 9 Section 8 Section 9.6 Section 10.2

Appendix 3(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 8.1 Section 8.3
Appendix 3(j)	An assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated;	Section 8.3
Appendix 3(k):	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 10
Appendix 3(l):	An environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 10.2
Appendix 3(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 11

Appendix 3(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 12
Appendix 3(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 10.2 Section 11
Appendix 3(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 12
Appendix 3(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 10 Section 11
Appendix 3(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Proposed activity is mining related and therefore includes operational aspects
Appendix 3(s)	An undertaking under oath or affirmation by the EAP in relation to- (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Section 13 Section 14
Appendix 3(t)	Where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Section 3.2.18
Appendix 3(u)	An indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	N/A

Appendix 3(v)	Any specific information that may be required by the competent authority; and	<u>DMR SR Acceptance Letter requires the following:</u> Proof of correspondence with I&AP's – Refer to Appendix B A3 Maps – Refer to Appendix S Financial Provision Calculations – Refer to Appendix P Traffic Impact Assessment – Refer to Appendix O
Appendix 3(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A

1.2 DETAILS OF THE EAP

GSW was founded in 2008 and has steadily grown to be a significant player in the Environmental Management Consulting industry in South Africa. GSW and its resources have been involved with many EIA projects and offers access to a broad body of knowledge and experience with the various Integrated Environmental Management tools (EIA; EMPr; EMP; SEA; EMF; etc.). GSW is responsible for project management and the oversight and guidance of the relevant reports for the Manungu project. Details of the EAP are provided below:

- EAP Name: Adri Joubert
- SACNASP Registration Number: 400058/01
- Contact no: 082 926 8460
- Email address: adri@geosoilwater.co.za

1.3 EXPERTISE OF THE EAP

1.3.1 QUALIFICATIONS OF THE EAP

In terms of Regulation 13 of the EIA Regulations (Government Notice R. 982), an independent Environmental Assessment Practitioner (EAP), must be appointed by the applicant to manage the application. GSW has been appointed by the Applicant as the EAP and is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations and Section 1 of the NEMA. This includes, *inter alia*, the requirement that GSW is:

1) Objective and independent;
2) Has expertise in conducting EIA's;
3) Comply with the NEMA, the Regulations and all other applicable legislation;
4) Takes into account all relevant factors relating to the application; and
5) Provides full disclosure to the applicant and the relevant environmental authority.

The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with environmental impact assessments and relevant application processes) are attached as **APPENDICES:**

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1.3.2 SUMMARY OF THE EAP'S PAST EXPERIENCE

GSW is a private and independent environmental management-consulting firm that was founded in 2008. GSW has significant experience in conducting EIAs, including many EIA's for mines and mining related projects. Please refer to the GSW website (www.geosoilwater.co.za) for examples.

Adri Joubert is the sole owner and project manager at GSW and has been involved in numerous significant projects over the past 20 years. She has extensive experience in Project Management as well as with undertaking Environmental Impact Assessments and Environmental Auditing. Adri has acted as Project Manager and Quality Reviewer for several mining related projects for clients including but not limited to Mashala Resources, Continental Coal and Pembani Coal Carolina.

1.3.3 SPECIALIST CONSULTANTS

Specialist studies have been undertaken to address the key issues that require further investigation, namely the impact on biodiversity, groundwater, heritage resources, palaeontology, rock stability, soils, aquatics & wetlands and air quality. The specialist studies involve the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed project. These impacts were then be assessed according to pre-defined rating scales (refer to Section 8.1). The specialists also recommended appropriate mitigation / control or optimisation measures to minimise potential negative impacts or enhance potential

benefits, respectively. The specialist studies conducted as part of the EIA for the Manungu Coal Mine Extension Project are presented in Table 2 below.

Table 2: List of specialist studies

Specialist Discipline	Author Name and Company
Groundwater Assessment	Louis Botha of Groundwater Squared
Surface Water Assessment	Bruce Randell of BEAL Consulting Engineering and Project Management
Water Resource and Aquatic Ecology Assessment	Dale Kindler and Andrew Husted of The Biodiversity Company
Biodiversity Assessment	Michael Adams and Martinus Erasmus of The Biodiversity Company
Soils Assessment	Ivan Baker of The Biodiversity Company
Hydropedological Assessment	Ivan Baker of The Biodiversity Company
Heritage Impact Assessment	Jessica Angel of PGS
Geotechnical Stability Assessment	Alex Mkhwanazi of Umnotho Consulting (Pty) Ltd
Palaeontology Assessment	Elize Butler of Banzai Environmental (Pty) Ltd
Air Quality Assessment	Renee von Gruenewaldt of Airshed
Closure Costing	Riaan de Beer of BEAL Consulting Engineering and Project Management
Stormwater Management Plan and Water Balance	Bruce Randell of BEAL Consulting Engineering and Project Management
Waste Classification	Adam Sanderson of WSP

In line with NEMA GNR 982 Appendix 6, the details of the relevant specialists, a summary of their expertise as well as their declarations of independence are included in their respective reports that are appended to this EIA Report.

2 DESCRIPTION OF THE PROPERTY

Table 3 provides a summary of the properties that fall within the mining right area and those affected by this application.

Table 3: Property description

<table>
<tr><td>Farm Name</td><td colspan="5">Tshedza Mining Resources (Pty) Ltd. is the holder of a Mining Right in respect of the following properties:
Weilaagte 271 IR: all Portions.
Welgevonden 272 IR: all Portions.
The current Manungu Colliery operations are situation on portions 5, 6, 7, 8 and 9 of the farm Weilaagte 271 IR. The current approved EA and IWUL only covers portions 5, 6, 7, 8 and 9 of the farm Weilaagte 271 IR and as such, the proposed future mining operations outside of these properties (but within the mining right area) require environmental, waste as well as water use authorisation.</td></tr>
<tr><td>Application Area (Ha)</td><td colspan="5">The full extent of the Mining Right covers ~5007 hectares (ha). The properties affected by the current application area cover ~2 287 ha. The mining footprint, existing and future infrastructure cover an area ~1 481 ha.</td></tr>
<tr><td>Magisterial District</td><td colspan="5">The Manungu Colliery is situated in the Victor Khanye Local Municipality, situated in the Nkangala District Municipality.</td></tr>
<tr><td>Distance and direction from nearest town</td><td colspan="5">Manungu Colliery is situated approximately 60 km southwest of Witbank, ~10 km south of Delmas and ~16 km north-west of Devon.</td></tr>
<tr><td rowspan="2">21-digit Surveyor General Code for each Portion</td><td colspan="3">Properties <u>within approved Mining Right area</u></td><td colspan="3">Properties <u>affected by this Application</u></td></tr>
<tr><td>Farm Name:</td><td>Portion:</td><td>SG Codes:</td><td>Farm Name:</td><td>Portion:</td><td>SG Codes:</td></tr>
</table>

	Weilaagte 271 IR	271 (RE)	T0IR000000000027100000	**Weilaagte 271 IR**	**Portion 1**	**T0IR000000000027100001**
	Weilaagte 271 IR	Portion 1	T0IR000000000027100001	**Weilaagte 271 IR**	**Portion 3**	**T0IR000000000027100003**
	Weilaagte 271 IR	Portion 2	T0IR000000000027100002	**Weilaagte 271 IR**	**Portion 4**	**T0IR000000000027100004**
	Weilaagte 271 IR	Portion 3	T0IR000000000027100003	**Weilaagte 271 IR**	**Portion 5**	**T0IR000000000027100005**
	Weilaagte 271 IR	Portion 4	T0IR000000000027100004	**Weilaagte 271 IR**	**Portion 6**	**T0IR000000000027100006**
	Weilaagte 271 IR	Portion 5	T0IR000000000027100005	**Weilaagte 271 IR**	**Portion 7**	**T0IR000000000027100007**
	Weilaagte 271 IR	Portion 6	T0IR000000000027100006	**Weilaagte 271 IR**	**Portion 8**	**T0IR000000000027100008**
	Weilaagte 271 IR	Portion 7	T0IR000000000027100007	**Weilaagte 271 IR**	**Portion 9**	**T0IR000000000027100009**
	Weilaagte 271 IR	Portion 8	T0IR000000000027100008	**Weilaagte 271 IR**	**Portion 12**	**T0IR000000000027100012**
	Weilaagte 271 IR	Portion 9	T0IR000000000027100009	**Welgevonden 272 IR**	**Portion 1**	**T0IR000000000027200001**
	Weilaagte 271 IR	Portion 10	T0IR000000000027100010	**Welgevonden 272 IR**	**Portion 2**	**T0IR000000000027200002**
	Weilaagte 271 IR	Portion 11	T0IR000000000027100011	**Welgevonden 272 IR**	**Portion 3**	**T0IR000000000027200003**
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	Welgevonden 272 IR	Portion 4	T0IR000000000027200004	**Welgevonden 272 IR**	**Portion 16**	**T0IR000000000027200016**
	Welgevonden 272 IR	Portion 5	T0IR000000000027200005	**Welgevonden 272 IR**	**Portion 17**	**T0IR000000000027200017**
	Welgevonden 272 IR	Portion 6	T0IR000000000027200006	**Welgevonden 272 IR**	**Portion 18**	**T0IR000000000027200018**
	Welgevonden 272 IR	Portion 7	T0IR000000000027200007	**Welgevonden 272 IR**	**Portion 19**	**T0IR000000000027200019**

	Welgevonden 272 IR	Portion 8	T0IR000000000027200008			
	Welgevonden 272 IR	Portion 9	T0IR000000000027200009			
	Welgevonden 272 IR	Portion 10	T0IR000000000027200010			
	Welgevonden 272 IR	Portion 11	T0IR000000000027200011			
	Welgevonden 272 IR	Portion 12	T0IR000000000027200012			
	Welgevonden 272 IR	Portion 13	T0IR000000000027200013			
	Welgevonden 272 IR	Portion 14	T0IR000000000027200014			
	Welgevonden 272 IR	Portion 15	T0IR000000000027200015			
	Welgevonden 272 IR	Portion 16	T0IR000000000027200016			
	Welgevonden 272 IR	Portion 17	T0IR000000000027200017			
	Welgevonden 272 IR	Portion 18	T0IR000000000027200018			
	Welgevonden 272 IR	Portion 19	T0IR000000000027200019			
	Welgevonden 272 IR	Portion 20	T0IR000000000027200020			
	Welgevonden 272 IR	Portion 21	T0IR000000000027200021			

2.1 LOCALITY MAP

Figure 1 below illustrates the existing NEMA/WUL approved mining areas in relation to the approved mining right area as well as the proposed future mining areas which form the basis of this integrated EIA application.

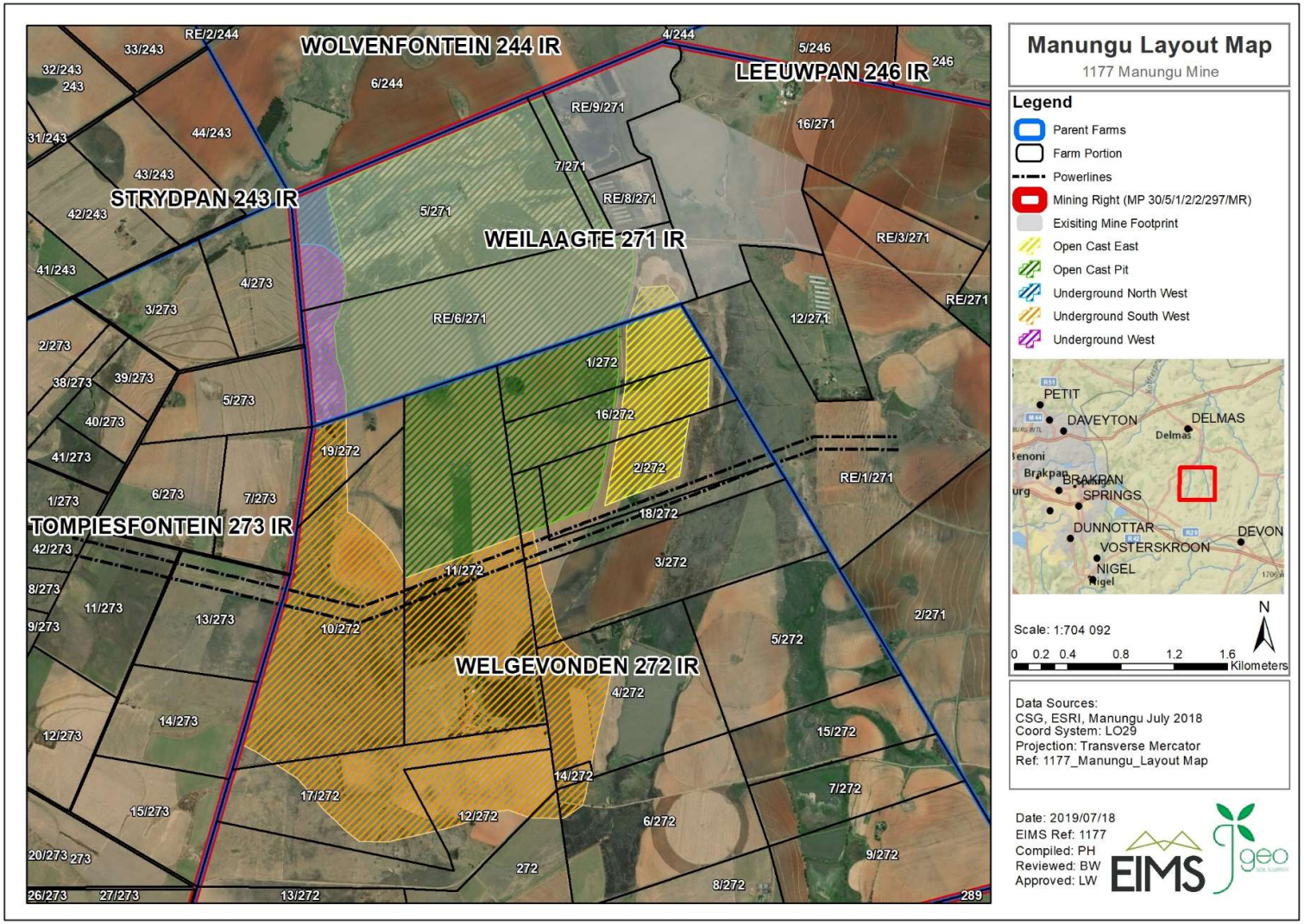


Figure 1: Locality map of Manungu Colliery and relevant existing and future mining areas.

3 DESCRIPTION AND SCOPE OF THE PROPOSED ACTIVITY

This section provides a detailed project description. Much of the key information presented in this Section was obtained from personal communication with the mine engineer for Manungu Colliery. The aim of the project description is to indicate the activities that are planned to take place at the current Manungu Operation with the addition of a wash plant as well as the proposed future activities and amendments that are being applied for in this application. Furthermore, the detailed mine/project description is designed to facilitate the understanding of the project related activities which result in the impacts identified and assessed and for which management measures have been put forward.

3.1 MINING OPERATIONS OVERVIEW

Manungu Colliery is owned by Tshedza Mining Resources (Pty) Ltd which is a subsidiary of Mbuyelo Coal and this mine has been in operation and producing coal since early 2015. A view of the current opencast pit is shown in Figure 2. The Manungu Colliery is situated 10km to the south of the town Delmas and will deliver most of its coal to the Kusile Power Station by 34 tonne side tipping coal trucks.

Figure 2: Panoramic view of existing opencast pit.

Tshedza is planning to extend their opencast and underground mining area to the south of the current operations and within the existing mining right area to extend the life-of-mine (LoM). As such an MPRDA S102 amendment process is being undertaken by the mine, supported by the integrated EIA/WML and WULA applications. The EIA process will result in a consolidation of the numerous authorisation processes that have been undertaken to date to produce a single overarching EMPr for holistic management of the Colliery going forward. Tshedza will be applying for the relevant approvals to cover their extended LoM which will include future opencast and underground mining operations and associated infrastructure. This additional scope will ensure that the EIA process considers the cumulative impacts of the mining operations. Furthermore, Tshedza wishes to establish a coal processing facility at Manungu Colliery to complement the existing beneficiation facility (crushing and screening plant). The proposed new processing facility will include a coal wash plant with associated residue discard and water management infrastructure. The proposed processing facility and discard will be located within the mining right boundary and at the existing RoM processing area. During these application processes, Tshedza wishes to include licensing of new boreholes for domestic consumption as well as a french drain system to complement the existing septic tank systems for ablution grey water. Furthermore, various options have been considered to manage excess mine water volumes within the existing and proposed PCDs.

Figure 3 indicates the typical mining sequence and can be summarized as initial topsoil removal with subsequent removal of the overburden which will then be stockpiled behind the mining area to ensure it can be replaced back in the initial box cut. The physical mining of the coal seam follows, which is then placed into trucks to be taken to the processing facility. From here discard coal will be extracted and replaced in the bottom of the opencast pit, while the product will be taken to the weighbridge via trucks and then removed off site. The overburden is replaced back into the pit as mining progresses leaving a minimum area open at any one time. The topsoil which was stripped and stockpiled separately before mining commenced is then replaced over the backfilled areas and revegetated to ensure the environment can be restored to grazing land or similar land use potential.

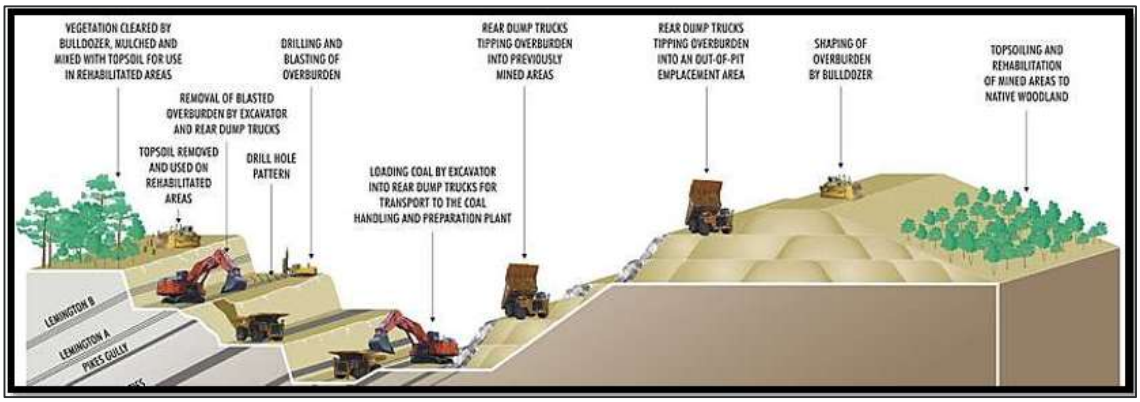


Figure 3: Typical coal surface mining opencast sequence indicating rollover backfill rehabilitation methodology.

The following rights, authorisations and approvals are currently in place and have been considered in the compilation of the report:

- Mining Right (MR) MP 30/5/1/2/2/297 MR, granted to Tshedza Mining Resources (Pty) Ltd, in terms of Section 23 (1) of the MPRDA on 4 May 2009 which covers all portions of the farms Weilaagte 271 IR and Welgevonden 272 IR;
- An approved EMPr dated June 2008 and approved on 24 February 2011;
- NEMA EA, NEAS Ref No: MPP/EIA/0000665/2012 granted on 19 March 2014, (Ref: 17/2/3N-266) which covers Portions 5, 6, 7, 8 and 9 of the farm Weilaagte 271 IR; and
- NWA IWUL application, File No. 27/2/2/B120/6/4 granted on 23 February 2015, (Licence No. 04/B20A/ACGIJ/2621) which covers Portions 5, 6, 7, 8 and 9 of the farm Weilaagte 271 IR.

The existing infrastructure at Manungu Colliery (refer to Figure 4) consists of the following:

- Opencast pit;
- Stockpiles;
- Offices;
- Plant area (crushing and screening);
- Contractors yard;
- Weighbridge;
- Access and haul roads;
- Security point and fencing;
- Pumps and sumps;
- Clean water trenches;
- Dirty water trenches;
- PCD; and
- Storm water control trenches.

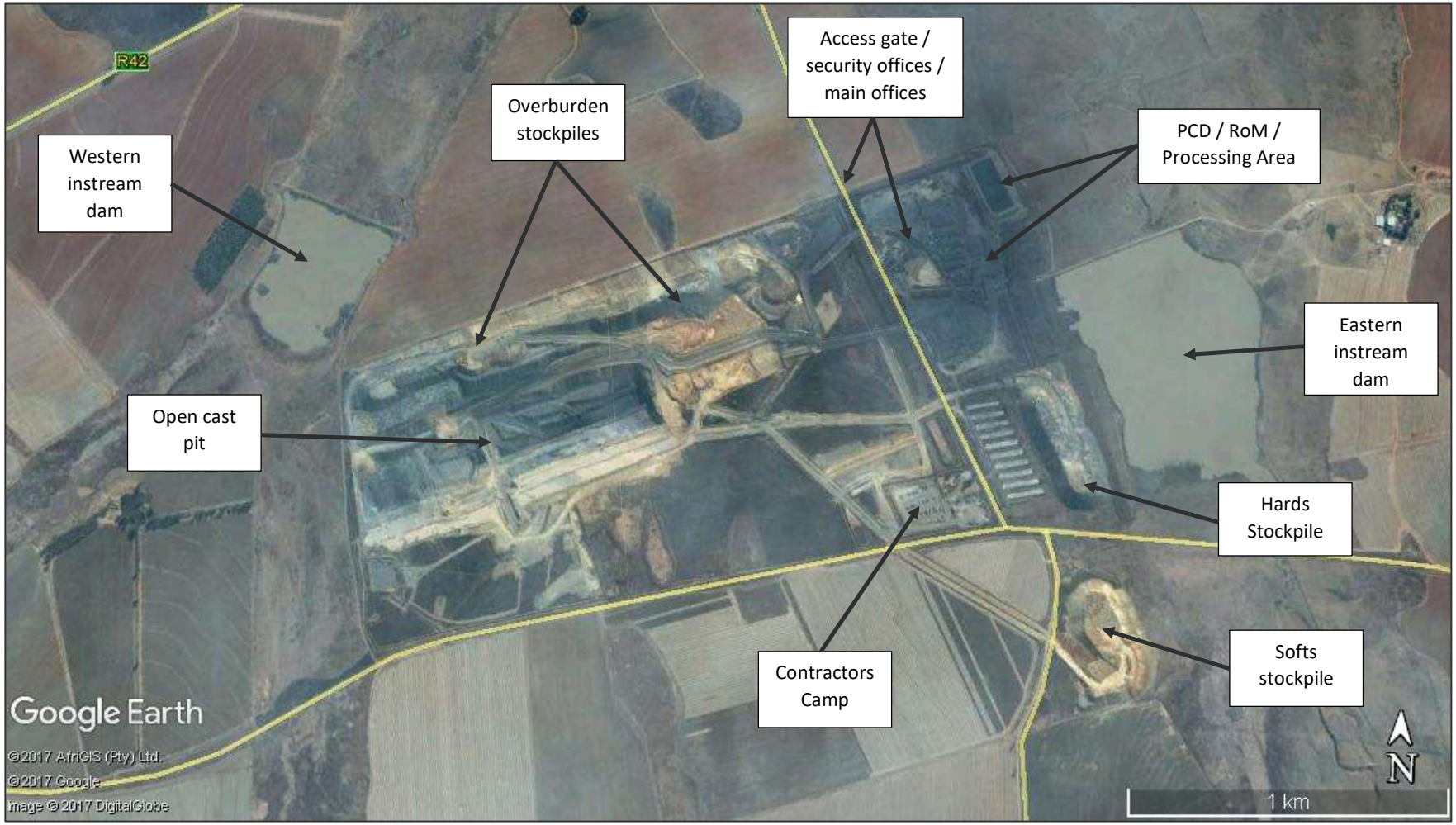


Figure 4: Manungu Colliery overview (Google Earth 2017 imagery).

3.2 DESCRIPTION OF ACTIVITIES TO BE UNDERTAKEN

It is the intention of this EIA Report to provide the necessary information regarding the proposed extension of the mining areas (opencast and underground) as well as to address the proposed amendments to certain existing conditions contained in the EA/EMPr/WUL. Following consultation with the Department of Water and Sanitation (DWS), it was decided to remove the proposed amendments to the existing WUL from this application process as was previously specified in the Scoping Report. The proposed project includes *inter alia* the following application processes with associated activities:

- New Integrated Environmental Authorisation (Scoping and Environmental Impact Report (S&EIR)) for:
    - Construction and operation of a wash plant and associated infrastructure to complement the existing coal beneficiation plant;
    - Disposal of processing plant waste (requiring Waste Management Licence);
    - New residue deposits and/or residue stockpiles (requiring Waste Management Licence); and
    - Various activities including the primary processing of a mineral resource related to the extended LoM.
- New Integrated Water Use Licence (IWUL) for:
    - Residue stockpiles/deposits;
    - Discard (wash plant waste) disposal;
    - Abstraction boreholes;
    - Dewatering of pits and underground;
    - A new French drain system; and
    - PCD's and stormwater management infrastructure.
- Amendments to existing EA and EMPr for *inter alia*:
    - Stockpile height amendments (from existing 6m restriction to 60m in line with typical coal mining activities as well as current situation);
    - Stockpile vegetation requirements (removal of requirement to vegetate overburden stockpiles due to lack of growing medium); and
    - Tree screen requirements (removal of requirement to plant a tree screen around the mining right area due to limitations in undertaking this as well as lack of perceived benefits).
- Section 102 Amendment:
    - Revised Mine Works Programme; and
    - Updated EMPr.

3.2.1 THE MINERAL RESOURCES

At Manungu Colliery, the preserved coal sequence is typical of the Witbank coal seams, with mainly the No.'s 4, 3, 2, and 1 coal seams present, with some slight lateral variations. The present-day surface topography is of typical Highveld grassland with small undulations of hills and valleys. These valleys are mainly responsible for the erosion of the upper seams, and the relative sub outcrop positions of the upper seams are controlled by the present-day topography. The upper seams, i.e.: No.5 and No.4 seams have been negatively affected by weathering in some areas. No No.5 seam is present in the planned mining area, and limited intersections of No.4 seam is present. Dolerite sill intrusions towards the upper part of the coal sequence have a negative impact on

especially the No.4 coal seam. The seam is either not present or devolatilized as a result. The No.3 seam is well developed, but thickness is generally marginal for economic extraction. It is however largely unaffected by the dolerite sill intrusions. The No.1 coal seam has an erratic distribution, both in terms of thickness and occurrence, and is mainly due to the undulating pre-Karoo basement underlying the coal seams. Locally some intersections of the No.1A coal seam is recorded below the No.1 seam, but this is limited to small areas and not continuous across the project. The No.1 seams deposition is interpreted to be located only within pre-Karoo basement valley areas.

The No.2 seam is the main economical coal seam in the area due to its thickness and quality across the project area. The thickness and occurrence of the No.2 seam is however also affected by the basement pre-Karoo topography, as well as weathering along these basement highs. There is a variation of 70m from west to east in the Dwyka floor elevation, causing the No.2 seam to have a very thick distribution towards the west in the basement valley (around 12m), and a thinner (<5m) or even weathered distribution to the east where the basement reaches its highest elevation. A dolerite sill present across the area, has a very minor impact on the No.2 seam in the planned mining area, but elsewhere it can negative influence the occurrence and quality of the coal seam.

The top portion of the No.2 seam, is typically of a poor coal quality with interbedded shales. From a coal quality perspective, this poor coal zone has been identified and separated from the No.2 coal seam selection and is locally renamed to the No.2T (Top) coal seam. This No.2T coal varies in thickness across the property, and is mainly absent towards the east, but increase in thickness to the west whereby it can reach a thickness of over 4m. A general stratigraphic coal seam sequence is presented in Figure 5.

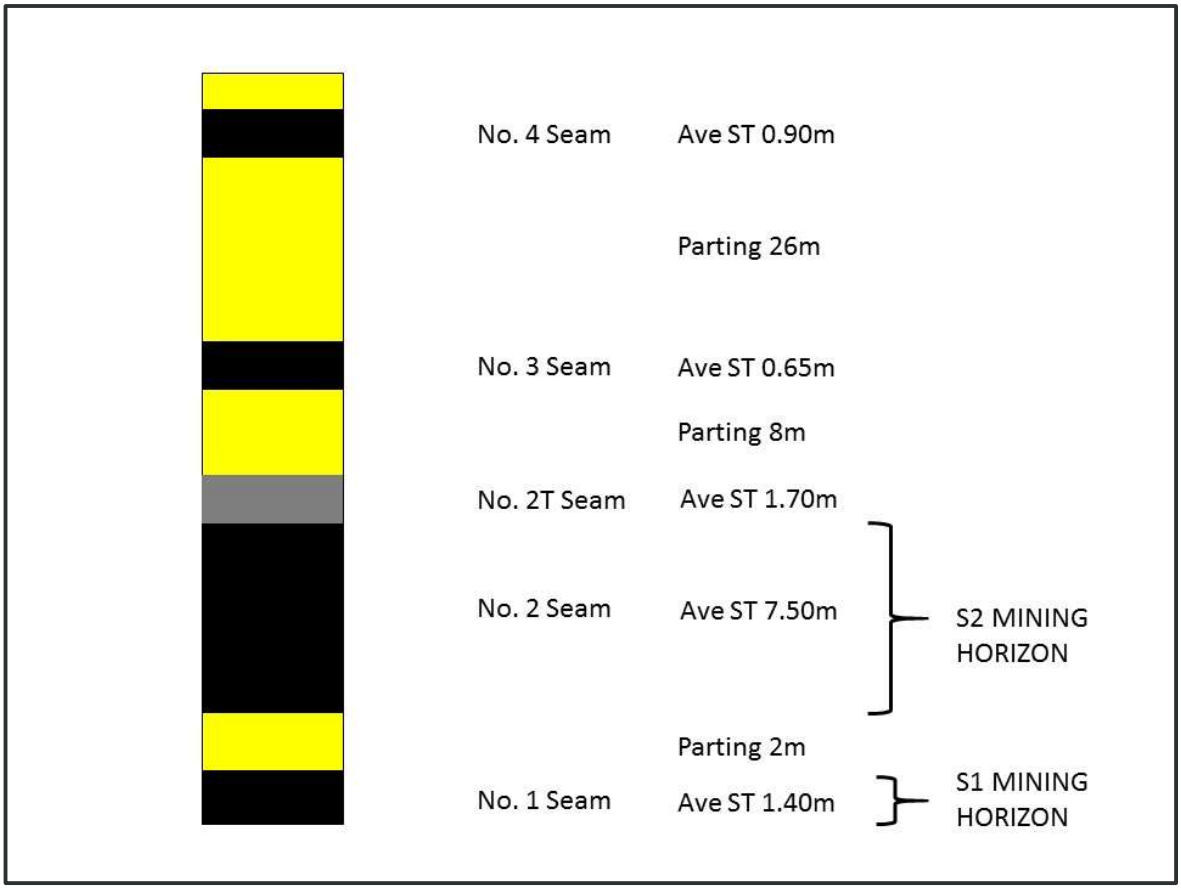


Figure 5: Typical stratigraphic sequence at the Manungu project.

Borehole values of the various seam intersections, as well as associated interburdens are summarised in Table 4.

Table 4: Seam statistics from borehole intersections.

Seam	Number Intersections	Average thickness (m)	Minimum Thickness (m)	Maximum Thickness (m)
S4	28	0.86	0.22	1.43
Interburden		21.7		
S3	77	0.52	0.08	3.37
Interburden		6.7		
S2T	56	2.15	0.23	4.85
Interburden		0		
S2	98	6.80	0.70	12.95
Interburden		1.9		
S1	61	1.08	0.10	2.80
Interburden		1.1		
S1A	21	0.85	0.06	2.01

Dolerite sill intrusions are known to occur in the area. Evidence for this is clear from the geological map (Figure 6) as well as borehole intersections. A high resolution aeromagnetic and radiometric survey was flown over the project area in June 2014. The survey was flown by XCalibur. Survey commissioning, airborne data acquisition and processing quality control and final data interpretation were managed by GAP Geophysics. Results of this survey are presented in a separate report: "Interpretation of High Resolution Aeromagnetic and Radiometric Survey Data Over the Welgevonden and Weilaagte Prospect Area, Mpumalanga Province, on Behalf of Tshedza Mining Resources (Pty) Ltd", August 2014. This survey confirmed the dolerite sill intrusions and show that no other disruptive features (dykes and faults) are present in the resource area.

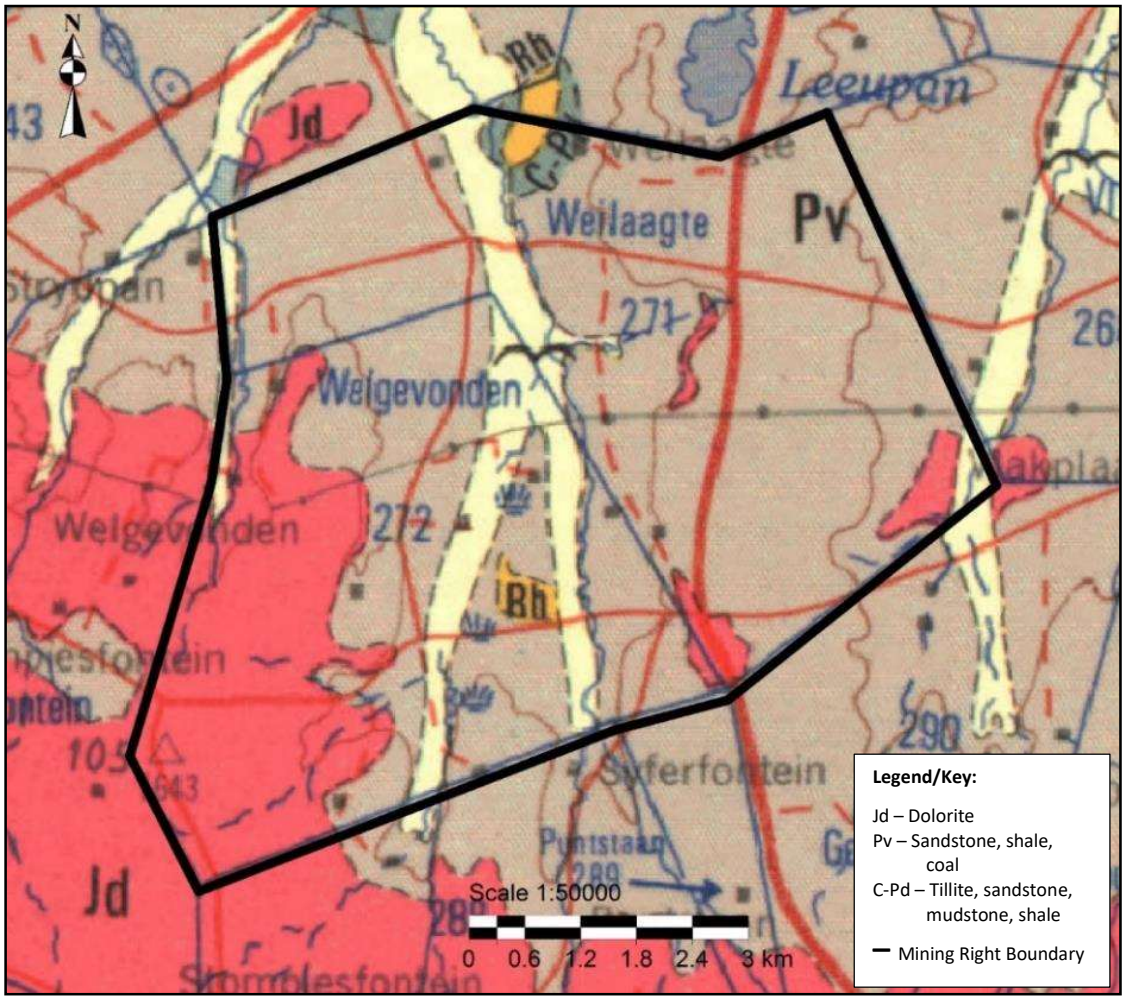


Figure 6: Surface mapped dolerite sills from geological map with mining right boundary.

Plans from the report, summarising the interpretation, are presented in Figure 7 and Figure 8. Structural alignments as shown in green in Figure 7 to the east, are pre-Karoo features, and do not impact on the coal structure. Figure 8 presents the different sill elevations across the project area. Generally, these sill positions are above the No.2 coal seam, and largely impact the upper coal seams. Towards the central and south of the project area, there are some sills interpreted to be lower in elevation (S10, S12 & S04) that can locally have a negative influence on the No.2 coal seam. Sill S13 to the west is below the No.2 coal seam, and some loss in ground can be expected where the sill transgresses from above to below the coal seam. The typical west-east and north-south cross section are shown in Figure 9 and Figure 10 respectively, and illustrate the coal seams and dolerite sill.

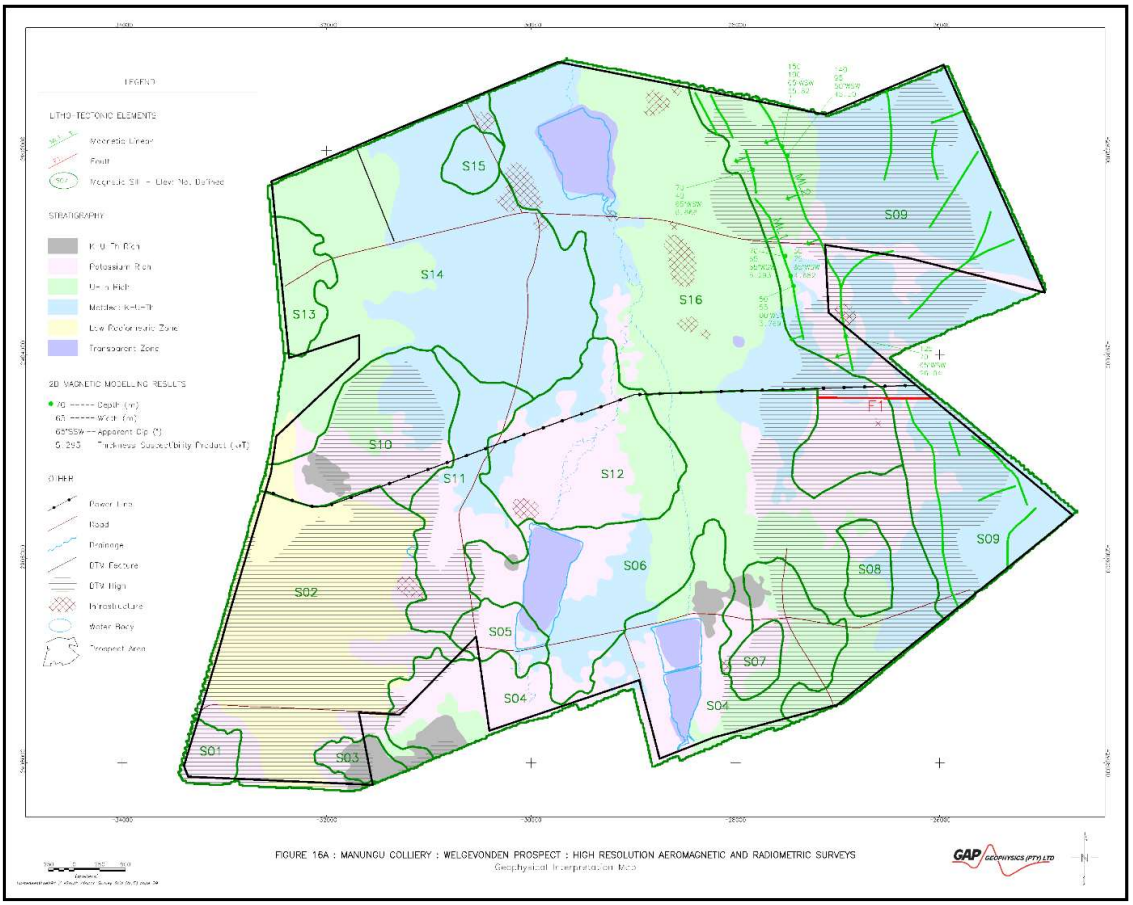


Figure 7: High resolution aeromagnetic and radiometric survey – geophysical interpretation map (GAP Geophysics).

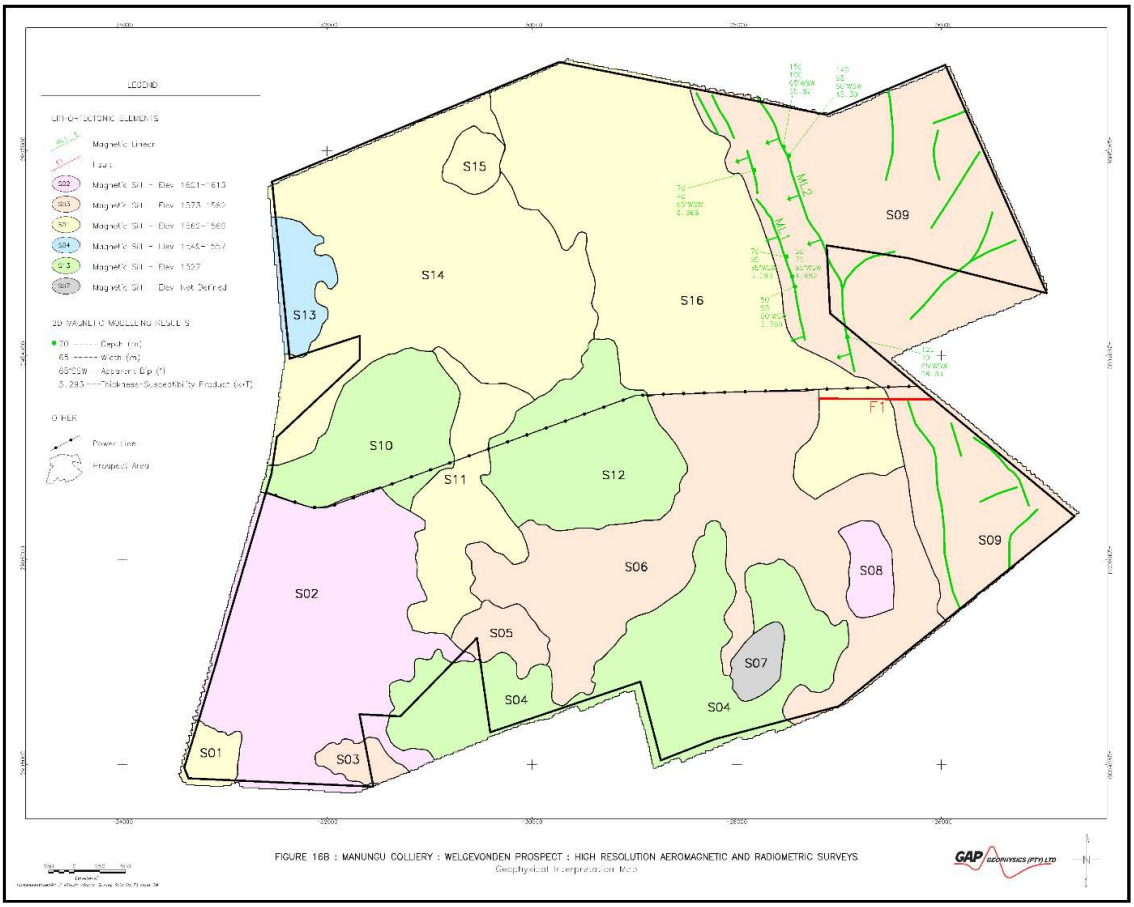


Figure 8: Dolerite sill interpretation map (GAP Geophysics).

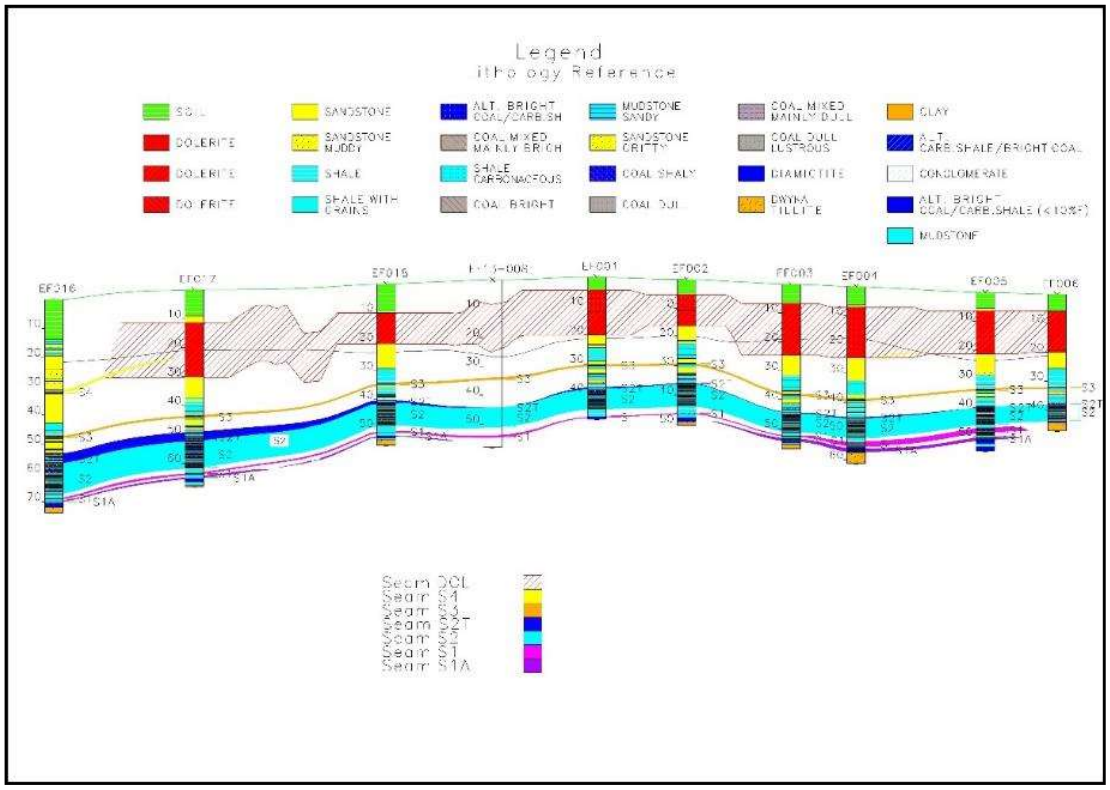


Figure 9: Typical west-east cross section to illustrate the coal seams and dolerite sill across the MR area. Vertical exaggeration 5 times.

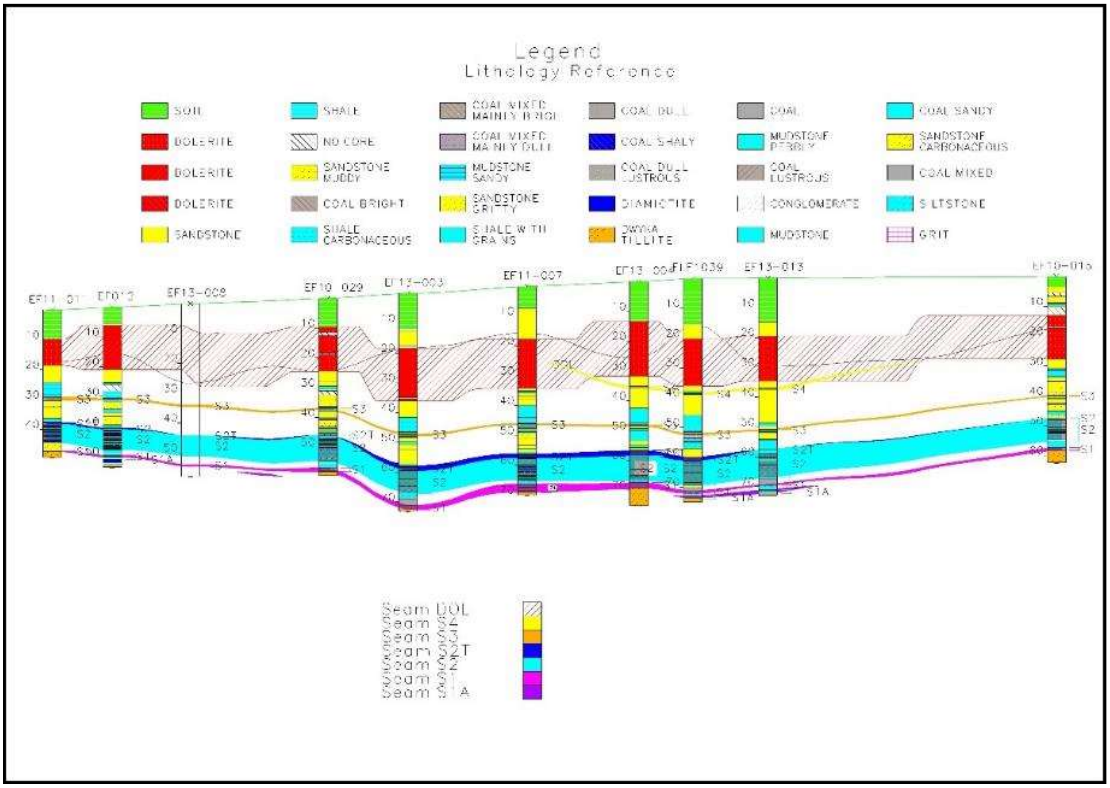


Figure 10: Typical north-south cross section to illustrate coal seams and dolerite sill. Vertical exaggeration 5 times.

3.2.2 MINING METHOD TO BE EMPLOYED

The 2 seam is the predominant targeted seam with up to 13m in thickness with a maximum depth of 70m while the 1 seam is also planned to be mined in some areas where it occurs at a thickness of more than 1m at a maximum depth of 80m. The maximum stripping ratio (SR) (bulk cubic meters of waste rock to be removed to recover one tonne of coal) for this resource/reserve is less than 4:1 (Cookie cut method applied) which makes this an ideal opencast mining operation. The deeper 2 seam resources to the west and south of the planned opencast mining area will be mined by means of underground mining methods in later years. The proposed underground accesses will be connected by means of a network of overland conveyer belts which will transport the mined coal from the underground workings to the processing plant facility.

The remaining resources on the Manungu Mining Right area are either of a poor quality or sterilised by wetlands and is not currently planned to be mined in the near future. Economical opencast coal mining for this Manungu quality of coal can be done up to a SR of almost 6:1.

3.2.3 OPENCAST AND UNDERGROUND MINING

Manungu Colliery produced and sold its first coal in July 2015. Operations started with a 400m box-cut in the north west of the resource and advanced to the south with box-cut extensions to the east regularly adding to the pit length. Raw RoM Coal that is achieving the minimum Eskom specification requirements was the reason for the exploitation of the coal resource in this manner. This portion or section of the mine was planned and indicated in the previous MWP and original Mining Right Application. Additional Opencast resources are now also planned to be mined in the east and south of the current planned mining area. The new additional open-cast operation will be a continuation of the current operations and dedicated new box-cuts are not required. The anticipated strip ratio of the entire mine will be less than 4:1. When production levels reduce in the opencast mining area due to a reduction in pit length, underground operations will commence to exploit the deeper 2 seam resources to the west and south. Production levels will be maintained with the addition of the UG production. The annual estimated production rate of the open-cast is estimated at 250ktpm from 2018 with a maximum of 300ktpm. Refer to the production schedules in Section 3.2.5 below.

3.2.4 MINE PRODUCTION RATE

Manungu Colliery is an operating opencast coal mine practising a drill and blast, load and haul mining method with concurrent roll over rehabilitation. This mine has been in operation since early 2015 and is selling the select seams on a RAW crush and screen basis to Eskom at a rate of 160ktpm, building up to 250ktpm in 2018 and even as much as 300ktpm when the Eskom demand is high. A Coal Handling and Processing Plant (CHPP) may be built in the next 24-36months. A maximum of 30% of the RAW coal will be washed and blended back with the balance of the RAW RoM coal to ensure the sulphur level is below 1%. The contract with Eskom stipulates minimum qualities and tonnes to be delivered – 250ktpm product is required from April 2018 to be used mainly in the Kusile Power Station. The non-select lower quality coal is currently sold on a cost recovery basis and may be washed in future if the yield justifies it.

3.2.5 MINING SCHEDULE

The production schedule is presented in Table 5, this indicates all material types and coal seams to be mined. A Detailed LoM plan is done only for the current opencast and future Underground operations until 2041. A small opencast resource block “OC2” or “OCEAST” form part of the application even though it is not scheduled in detail at this stage. Mining of resources under the current boxcut dumps and OC2 will last another 3-5 years which takes the minimum LoM until 2044/46. Much of the other resources are not drilled to sufficient detail to facilitate detail mine planning but it is possible that mining can take place on this mining right for at least 31 years or until about 2050. Figure 11 illustrates the layout and the LoM progressive plot.

Table 5: Production Schedule for current LoM Opencast and Underground Operation (Excluding Underground EAST).

PERIOD NAME		JUN18-FEB19	FY19-20	FY20-21	FY21-22	FY22-23	FY23-24	FY24-25	FY25-26	FY26-27	FY27-28	FY28-29	FY29-30	FY30-31	FY31-32	FY32-33	FY33-34	FY34-35	FY35-36	FY36-37	FY37-38	FY38-39	FY39-40	FY40-41	FY41-42	TOTAL	OC2/EAST
PERIOD START		2018/06/25	2018/07/25	2019/07/25	2020/07/25	2021/07/25	2022/07/25	2023/07/25	2024/07/25	2025/07/25	2026/07/25	2027/07/25	2028/07/25	2029/07/25	2030/07/25	2031/07/25	2032/07/25	2033/07/25	2034/07/25	2035/07/25	2036/07/25	2037/07/25	2038/07/25	2039/07/25	2040/07/25	2041/07/25		
TOTAL OPENCAST 01	unit																										
TOPSOIL DUMP	bcm	315 155	90 588	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	405 742	-
TOPSOIL INSITU	bcm	301 881	216 550	312 251	215 671	245 448	209 518	229 552	179 295	178 859	148 358	150 472	149 034	188 395	236 743	270 882	209 385	209 919	208 647	209 818	208 435	158 855	-	-	-	4 418 673	-
SOFTS	bcm	1 384 522	1 317 888	1 428 528	1 214 864	1 216 442	1 023 688	1 132 338	879 305	836 990	694 875	740 607	743 451	839 197	1 176 800	1 361 955	1 014 258	1 041 033	1 021 834	1 047 044	1 038 297	796 265	-	-	-	21 930 261	-
HARD BENCH01	bcm	3 210 853	5 372 661	4 580 851	4 142 758	4 166 601	3 403 012	3 702 826	2 855 005	2 855 247	2 534 574	2 617 140	2 300 845	2 489 994	3 212 631	3 691 955	2 865 254	3 044 099	3 145 323	3 236 189	3 329 350	3 404 453	474 674	-	-	70 656 275	-
HARD BENCH02	bcm	3 555 570	5 778 160	4 537 843	4 804 747	3 826 311	4 408 976	3 846 807	3 747 804	3 701 608	2 862 505	2 789 101	2 042 179	2 580 322	3 095 287	3 664 467	3 193 753	2 413 012	3 104 238	3 184 549	3 358 222	3 279 437	3 622 536	-	-	76 461 334	-
HARD BENCH03	bcm	1 477 281	1 979 239	1 550 825	1 934 591	1 810 823	1 875 320	1 638 385	1 377 784	1 432 924	1 353 734	1 386 451	979 957	904 372	535 572	699 179	1 050 652	1 178 310	1 240 090	1 371 407	1 382 054	1 704 287	1 837 669	-	-	29 761 910	-
NONSELECT S2T	rcmt	525 104	653 971	430 204	613 058	519 883	437 707	404 313	289 650	288 178	255 483	301 930	170 341	113 329	97 015	40 038	13 336	69 178	82 349	120 150	349 215	715 073	850 843	-	-	7 272 418	1 466 958
SELECT S2	rcmt	2 250 000	3 000 000	3 000 000	2 790 000	2 700 000	2 700 000	2 745 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 697 705	1 680 000	1 680 000	1 680 000	1 680 000	531 978	-	44 934 683	2 849 457
TOTAL WASTE (excl Remandle)	bcm	10 225 661	14 755 066	12 410 299	12 311 931	11 065 623	10 920 834	10 549 909	8 533 994	8 515 428	7 595 145	7 683 770	5 815 476	6 702 280	8 265 033	9 688 238	8 333 304	7 886 333	8 722 133	9 043 107	9 316 358	9 293 294	9 994 878	-	-	203 634 195	-
TOTAL COAL	rcmt	2 775 104	3 653 971	3 430 204	3 403 058	3 219 883	3 137 707	3 149 313	1 969 650	1 968 178	1 935 483	1 981 930	1 790 341	1 793 329	1 777 015	1 720 038	1 693 336	1 741 178	1 780 054	1 800 150	2 029 219	2 395 073	2 530 843	531 978	-	52 207 101	4 316 415
TOTAL SELECT	rcmt	*2 250 000*	*3 000 000*	*3 000 000*	*2 790 000*	*2 700 000*	*2 700 000*	*2 745 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*1 697 705*	*1 680 000*	*1 680 000*	*1 680 000*	*1 680 000*	*531 978*	-	*44 934 683*	*2 849 457*
STRIP RATIO ON SELECT	bcm/rcmt	4,54	4,92	4,14	4,41	4,10	4,04	3,84	5,08	5,07	4,52	4,57	3,46	3,99	4,92	5,77	4,96	4,69	5,14	5,39	5,55	5,53	3,67			4,53	
STRIP RATIO ON TOTAL COAL	bcm/rcmt	3,68	4,04	3,62	3,62	3,44	3,48	3,35	4,33	4,33	3,92	3,88	3,25	3,74	4,65	5,63	4,92	4,53	4,90	5,03	4,59	3,88	2,37	-	-	3,90	-
STRIP RATIO ON S2 ONLY	bcm/rcmt	4,54	4,92	4,14	4,41	4,10	4,04	3,84	5,08	5,07	4,52	4,57	3,46	3,99	4,92	5,77	4,96	4,69	5,14	5,39	5,55	5,53	3,67	-	-	4,53	
TOTAL UG																											
TOP CUT	rcmt	-	-	-	304 088	449 731	133 869	479 624	1 276 742	888 002	774 801	896 376	669 238	1 242 670	881 536	663 256	957 726	900 798	222 685	883 616	362 173	-	-	-	-	11 992 980	
BOTTOM CUT	rcmt	-	-	-	195 912	150 269	466 131	75 376	343 258	791 998	865 199	723 624	950 712	377 330	738 464	956 744	662 274	719 202	1 379 610	316 384	837 827	955 227	-	-	-	11 419 542	
TOTAL UG	rcmt	-	-	-	**500 000**	**600 000**	**600 000**	**555 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 620 000**	**1 602 295**	**1 200 000**	**1 200 000**	**955 227**	-	-	-	**23 412 521**	
TOTAL OC and UG																										-	
OC01	rcmt	2 250 000	3 000 000	3 000 000	2 790 000	2 700 000	2 700 000	2 745 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 680 000	1 697 705	1 680 000	1 680 000	1 680 000	1 680 000	531 978	-	44 934 683	2 849 457
UG	rcmt	-	-	-	500 000	600 000	600 000	555 000	1 620 000	1 620 000	1 620 000	1 620 000	1 620 000	1 620 000	1 620 000	1 620 000	1 620 000	1 620 000	1 602 295	1 200 000	1 200 000	955 227	-	-	-	23 412 521	-
TOTAL SELECT	rcmt	**2 250 000**	**3 000 000**	**3 000 000**	**3 290 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**3 300 000**	**2 880 000**	**2 880 000**	**2 635 227**	**1 680 000**	**531 978**	-	**68 347 205**	**2 849 457**

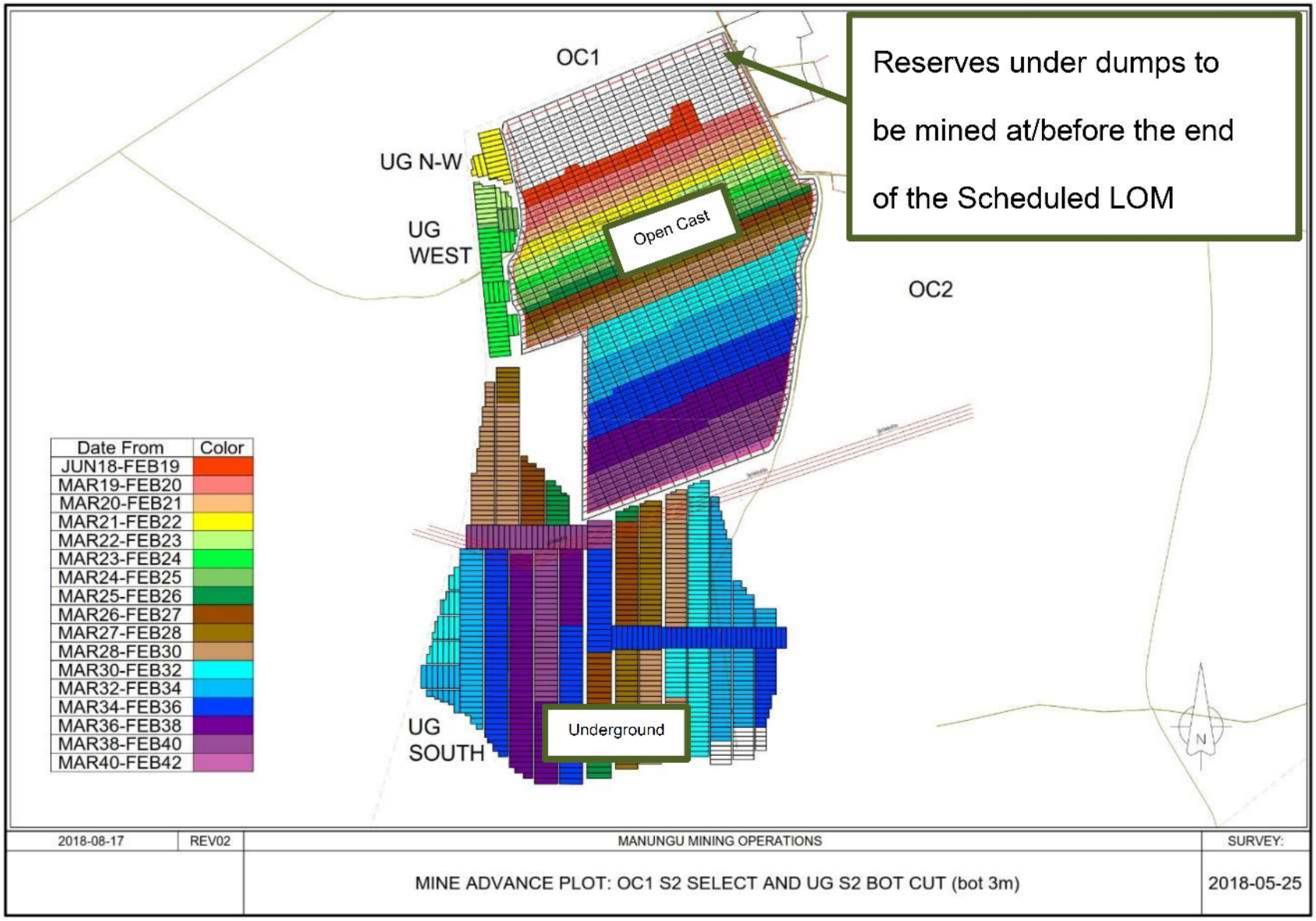


Figure 11: Two Seam–Select progress plot for LoM – OC1 S2 and UG S2 Bottom cut.

3.2.6 MINERALS PROCESSING

Only the 2 seam select and 1 seam are sold from the resource on a crushed and screened RAW basis to Eskom. A jaw crushing plant is currently used for this processing where 100% of the product is sold. Product qualities are marginally achieving the minimum qualities required.

A new processing facility (CHPP – Coal Handling and Processing Plant) will be built to wash a portion (Max 30% or 75ktpm RoM feed) of the RoM to be mined in future. The washed product will be blended with the majority of select product that was only crushed. The current crushing plant will still be utilised to crush all the RoM. The coarse waste will be dumped either on a discard dump on surface or in the pit if permission is obtained from the relevant authorities. The fines will be dried in a filter press and the filter cake may either be blended with the product or also dumped on the discard dump pending the qualities.

A new coal processing facility (example shown in Figure 12) is proposed to be built next to the current crushing plant to have the ability to manipulate the product qualities of coal delivered to Eskom.

Figure 12: Example of a wash plant.

The wash plant will consist of the following aspects:

- Dry fines screening circuit;
- Dense Medium Separation (DMS) module;
- Feed desliming;
- Circulating medium circuit;
- Dilute medium circuit;
- Grits dewatering circuit;
- Tailings thickener circuit;
- Tailings filter circuit;
- Product handling circuit;
- Plant services circuit;
- Raw and potable water system; and
- Process water circuit.

3.2.7 RESIDUE STOCKPILES

The existing residue stockpiles (hards and softs) are located within the mining areas (refer to Figure 4 earlier in this report). One of the proposed amendments to the current EA condition (Condition 3.31) is the requirement that stockpiles are not higher than 6m. This condition is considered impractical and therefore not preferable in that coal mines typically have stockpiles in the order of ~60m high. As such, one of the proposed alternatives to be assessed in this EIA is the location and extent of the stockpile heights. Stockpiles will be located within the extent of the rehabilitated mining areas as far as possible during rollover mining.

3.2.7.1 RUN OF MINE STOCKPILES

Coal mined in the opencast operation will be stored on run of mine (RoM) stockpiles adjacent to the current crushing plant (Figure 13). Crushed and screened, as well as the washed product, will be blended onto 3000t - 5000t Eskom Stockpiles where it will await laboratory results, where after it will be transported to various Eskom power stations when approved. The majority of Manungu's coal is intended to be delivered to Kusile Power Station once Kusile it is operating at full capacity.

The entire plant, RoM stockpiles as well as product stockpiles and temporary/permanent discard dump (if not disposed into the pit), will be within a bunded or trenched areas as per the infrastructure layout in Figure 21 and all contaminated water will be free draining to the PCD's. Water from the PCD will be used as top-up water to the plant as well as for dust suppression on the haul roads.

Figure 13: Existing Plant and product stockpiles on Manungu Colliery.

3.2.7.2 NON-CARBONACEOUS STOCKPILES

Overburden stockpiles comprising of both hards and softs will be stockpiled in the north, mostly on top of backfilled, mined out areas. This stockpiling will continue until the face length comprises the entire resource width from east to west and all waste material can be rolled over back into the pit as part of the normal mining

operation. Hards will additionally be stockpiled adjacent to, and South of, the RoM area. This area currently contains a hards stockpile which would be expanded upon.

3.2.7.3 CARBONACEOUS STOCKPILES

Surface carbonaceous stockpiles will be minimised as far as possible, and the aim will be to place such waste directly back into the pit below the post mining final water table to prevent oxidation. This will additionally contribute toward the bulking factor during final profiling to ensure that the final topography is as close as possible to the original topographical profile.

3.2.7.4 SOIL STOCKPILES

Stripped soils – topsoil and sub soil will be stockpiled separately in the north east until the roll over mining method is in equilibrium. Separation of topsoil and subsoil will ensure that the characteristics of soil stockpiles are suitable for the prevailing landscape and drainage conditions once they are replaced. Stockpiles are also being placed in areas far removed from mining activities where they will not be accidentally impacted on or where they will need to be frequently moved.

3.2.8 WASTE

Domestic, hazardous, industrial/mining and sewerage waste streams are currently, and will continue to be generated at Manungu Colliery. These waste streams are discussed in more detail in the subsections below.

3.2.8.1 DOMESTIC WASTE STREAMS

Domestic waste generated will be collected and stored onsite in clearly marked skips. All domestic waste skips will be transported offsite by a registered waste removal contractor for final disposal at a registered facility. Waste disposal certificates will be required from contractors to ensure appropriate waste disposal.

3.2.8.2 HAZARDOUS WASTE STREAMS

Hydrocarbon and other dangerous good and/or contaminated wastes generated (including used oil, diesel, grease, lubricants and explosive emulsions) will be stored in clearly marked skips for solid hazardous waste and containers for liquid waste. Hazardous waste will be stored in bunded areas or on hard, impervious surfaces. When full, the containers will be collected and transported offsite by a registered waste removal contractor for final disposal at a registered facility. Waste disposal certificates will be required from contractors to ensure appropriate waste disposal.

3.2.8.3 INDUSTRIAL AND MINING WASTE STREAMS

Industrial wastes (including metals, rubber, tyres and conveyor belt sheets) will be separated and stored in clearly marked skips. Materials may occasionally be salvaged for re-use but will generally be traded to registered recycling companies who will collect and transport material offsite for re-use or final disposal at a registered facility. Waste disposal certificates will be required from contractors to ensure appropriate waste disposal.

Two general forms of mineralised waste are currently, and will be, generated at Manungu Colliery namely plant discards and coal falling of articulated dump trucks on the way to the RoM stockpile. Coal falling from trucks will be periodically collected and transported to the wash plant. Fines will be channelled to the PCD where water will be recycled, and the fines eventually cleared from a silt trap and transported to in pit disposal.

3.2.8.4 SEWAGE WASTE INCLUDING PROPOSED FRENCH DRAINS

The sewage waste from the main offices and safety department offices is currently collected in septic tanks and the mine proposes the installation of two (2) French drains for the onsite disposal of liquid effluent. The solid waste collected in the septic tanks is collected by a registered waste operator and disposed of at a licenced sewerage treatment works. The location of the proposed French drains to service the main offices and safety department offices is shown in Figure 14 below.

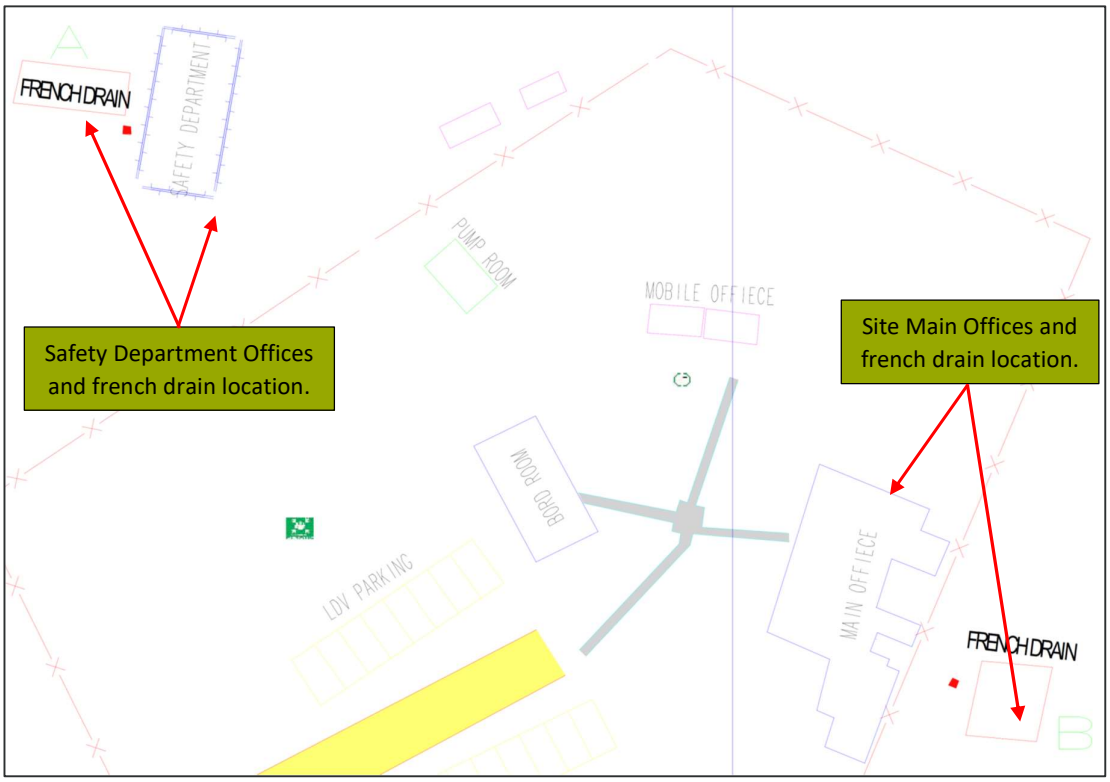


Figure 14: Layout and location of proposed french drains.

3.2.8.5 MINE RESIDUE

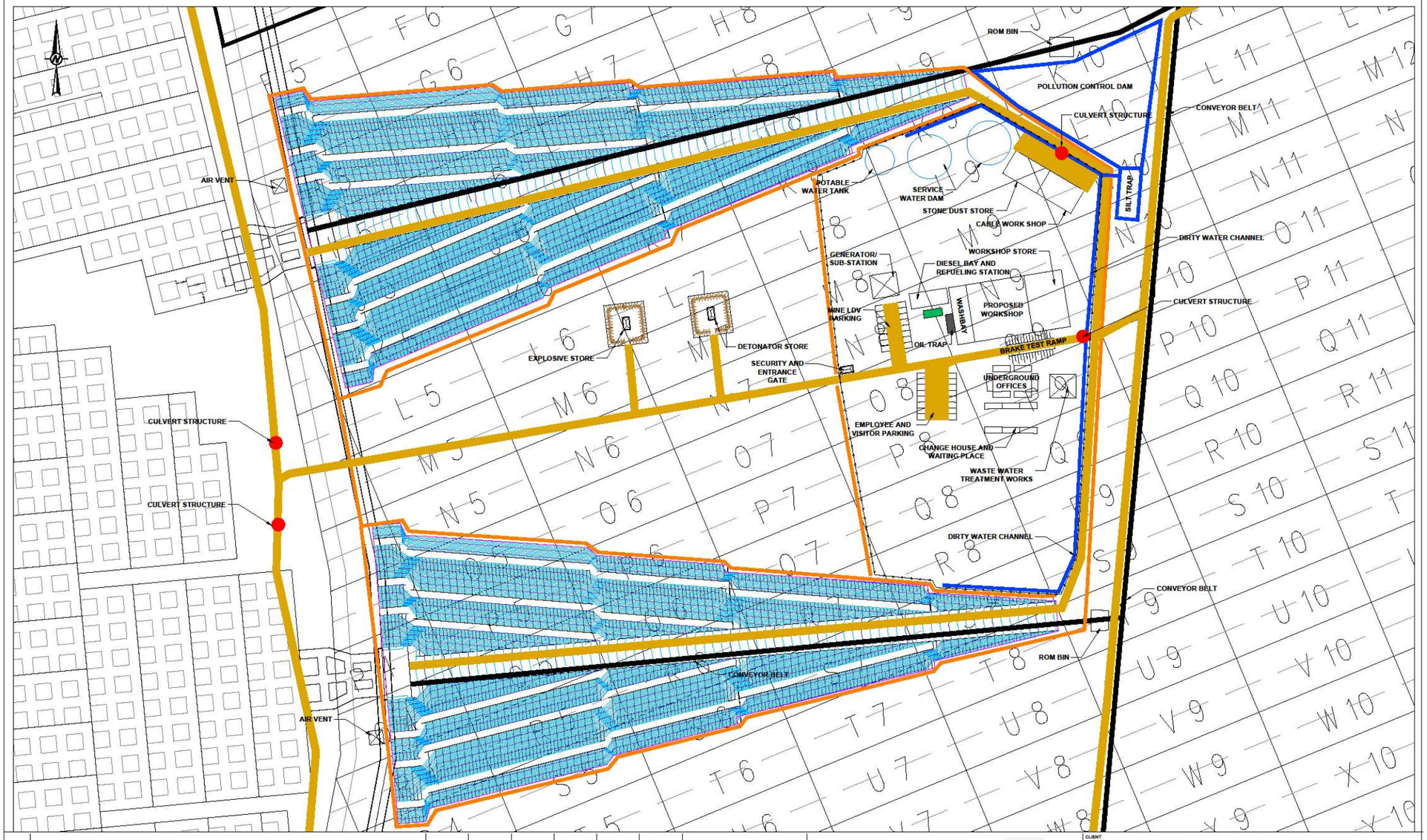
Mine residue (slurry and discard) will be generated at the proposed Wash Plant area. Slurry will be routed to a filter press, where the slurry will be dried to a filter cake before being added to the saleable product or alternatively the filter cake will be disposed of to pit or to residue deposit. Wastewater from the filter press will be channelled back to the PCD for reuse.

3.2.9 SURFACE INFRASTRUCTURE

The current mine infrastructure will remain as it currently is except that a CHPP will be built directly next to the crushing plant, the weighbridges may have to move and a new PCD dam and discard dump facility will be required depending on whether coarse discard is placed back into the pit. The mining contractor's offices, contractors hard-park and diesel storage facilities will have to relocate to a position unaffected by the proposed open cast mining, most likely in the south west by ~2021.

Two underground accesses will be constructed into the western high wall of the open cast pit with associated infrastructure in this relative position for the future underground mining contractor. An additional underground access to the south is also proposed for future underground mining. The three proposed underground accesses will be connected by means of a network of overland conveyer belts which will transport the mined coal from the underground workings to the processing plant facility. New PCD's will be required at these locations. The access to future underground workings may be changed slightly pending a full underground assessment and revised plan to be completed after more prospecting drilling. The proposed north western underground infrastructure layout is shown in Figure 15 while the proposed southern underground infrastructure layout is shown in Figure 16.

Where relevant, further information related surface infrastructure requirements is provided in detail below.



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ECMA CONSULTING (PTY) LTD.

CLIENT: TSHEDZA MINING (Pty) Ltd.

PROJECT: MANUNGU MINE INFRASTRUCTURE EXPANSION PROJECT

DRAWING TITLE: NORTH WESTERN UNDERGROUND INFRASTRUCTURE LAYOUT DRAWING

LEAD PROJECT DRAFTER	PROJECT MANAGER	SCALE	SHEET SIZE	PROJECT No	DOC No	DOC TYPE	DRAWING No	REVISION
RDB	JLR	N.T.S	A1	E014	001	CON	002	00

Figure 15: Proposed north western underground infrastructure layout.

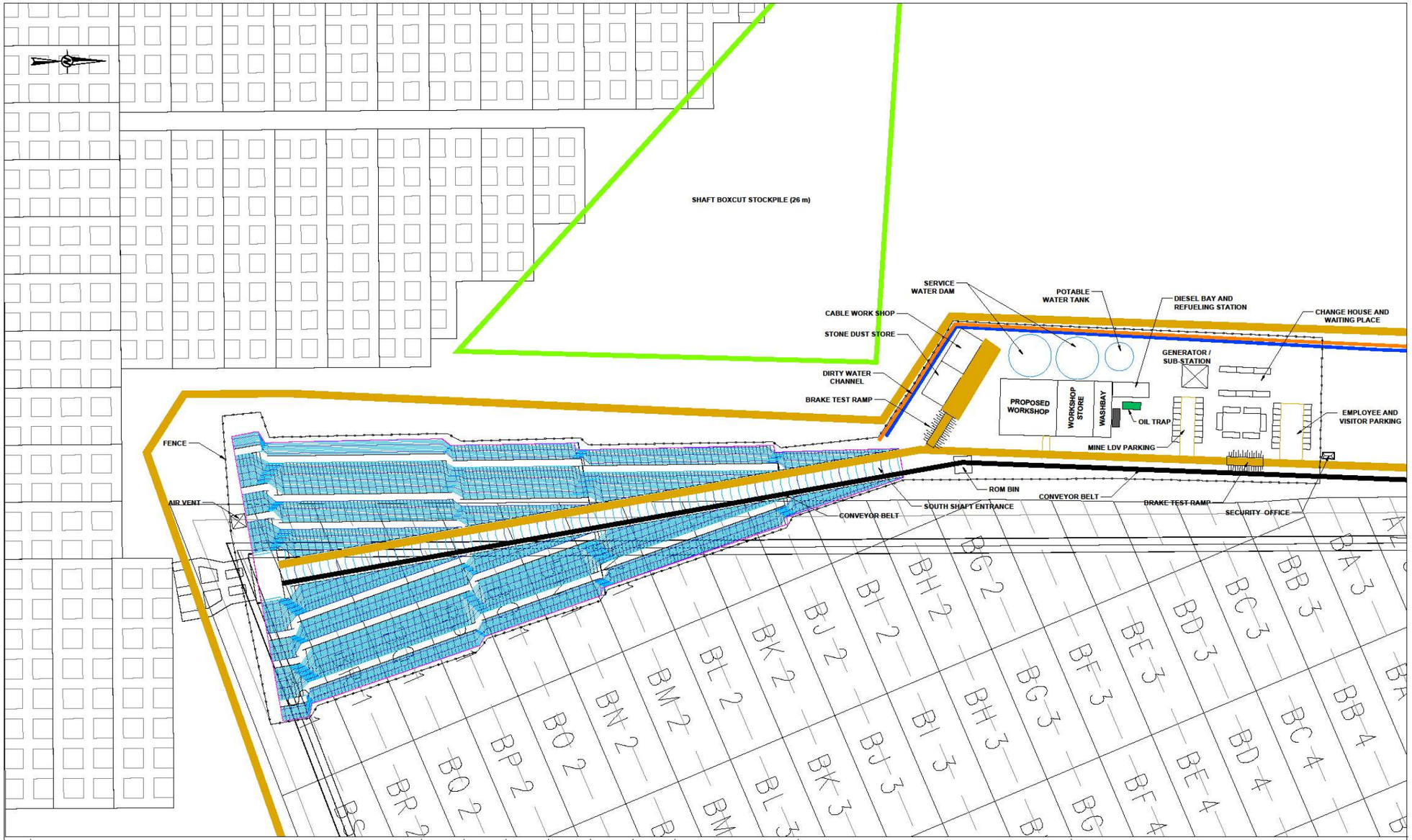


Figure 16: Proposed southern underground infrastructure layout.

3.2.9.1 ADMINISTRATION BUILDINGS, ENGINEERING BAYS, WORKSHOPS AND OTHER BUILDINGS

The surface infrastructure utilised by the mine is mostly old farmhouse facilities and sheds which were converted into offices and workshops. The mining contractor is using another old farmhouse facility, but this will have to relocate in about one or two years in ~2020/2021. The mining contractor erected their own workshops and spares containers which can also be relocated. The new offices change house and ablution facilities can be of the prefabricated "Kwick Space" type facilities. See the proposed layout of the current and future OC and UG contractor operation in Figure 20.

3.2.9.2 HAZARDOUS GOODS STORAGE

Existing diesel storage represents the largest volume of hazardous material on site (>80m^3) and it is adequately bunded according to regulatory requirements. Explosives are currently delivered as and when required from offsite locations. Manungu intends to construct explosives magazines (stores) on site. In this regard, a licence would have to be applied for in writing to the chief inspector as per the OHS Act regulations (No. R109 of 2003). Oils and other lubricants and/or chemicals are also stored in approved bunded areas for use in the maintenance of plant and machinery. The relevant Health and Safety Standards for the handling and storage of these goods will be strictly adhered to.

3.2.9.3 MODULAR WATER TREATMENT PLANT

A water treatment plant may be constructed and operated near the existing PCD. It is highly unlikely that this mine will be a positive water producer once the CHPP (wash plant) is in operation since no significant aquifers have been intersected during mining or prospecting activities however should this materialise in future, treatment of excess water will be a viable option. Treated water should meet the SANS 241 compliance specification for discharge. Another important aspect is the Sodium Adsorption Ratio (SAR) of the discharge water quality and as such, the most appropriate technology to treat this contaminated water is reverse osmosis (RO) due to the high salt and sulphate load.

The proposed water treatment plant will produce a maximum flow of 0.42 MLD permeate water from RO, blend in a portion of the feed water and discharge a total volume of 0.5 MLD. The plant will be built in a modular manner. If such a plant is required, then water will be released in a controlled and monitored manner back into the nearby stream and a portion of the treated water may also be used as process water where necessary. The plant will consist of the following unit operations as shown in Figure 17:

- Sand filter system;
- Cartridge filter system;
- 2-stage reverse osmosis system; and
- Clean-in-place (CIP) circuit for cleaning of membranes.

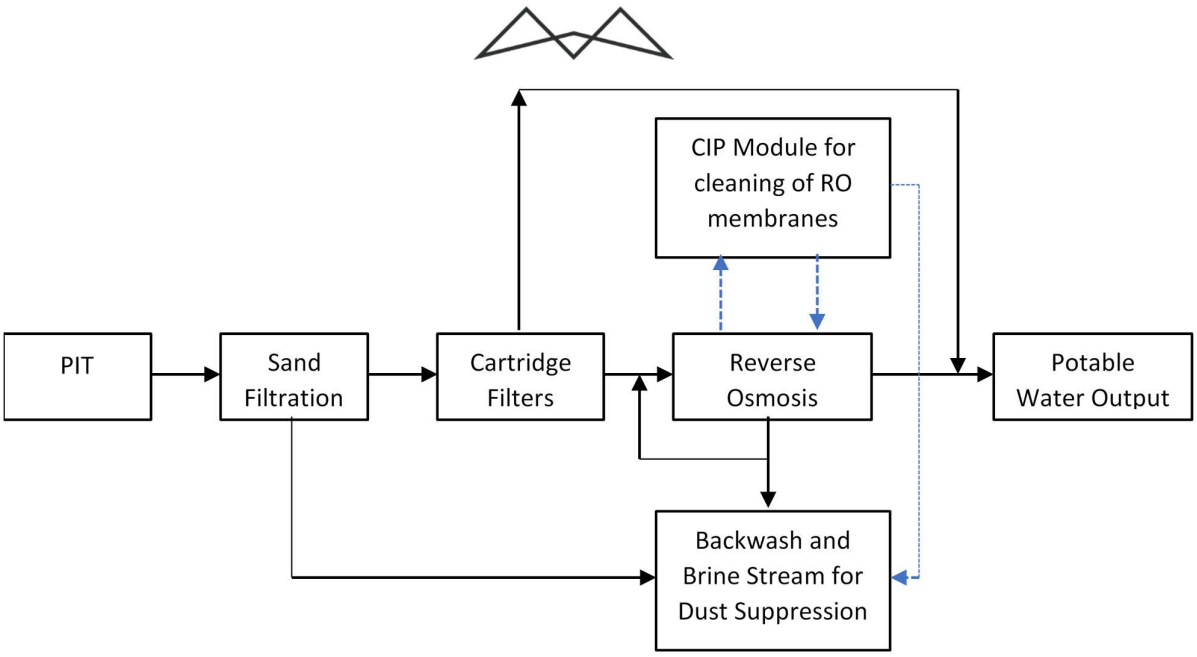


Figure 17: Basic flow diagram of the water treatment plant.

3.2.9.4 MODULAR SEWERAGE TREATMENT PLANT

A similar sewerage handle/treatment facility currently in operation will be constructed when the contractor's offices are relocated to the south west of the property in later years.

The general principle of the proposed sewage treatment plant system is as follows:

- Sewage will be collected through a network of sewage pipes.
- The sewage will then be routed to the Waste Water Treatment Plant (WWTP) for treatment.
- The treatment system comprises 5 phases namely:
    - First Phase:
        - Screening takes place at the point of entrance in the WWTP.
        - This can be done manually or automatically.
    - Second Phase:
        - There are two anaerobic tanks. The first tank allows for digestion of sewage and the separation of solids i.e. those that settle and those that float. The middle cut of the effluent then flows through to the second tank.
        - The second tank breaks down the fine sewage particles and alters to carbon dioxide and water. This effluent then passes into the aerobic chamber for polishing.
        - The de-nitrification cycle takes place in this phase. This function is responsible for the breaking down of nitrates to nitrogen gas.
    - Third Phase:
        - In this phase the digestion takes place in an aerated environment. This phase is called aerobic digestion.
        - This phase takes the smaller solids and bio-degrade them further. This phase is also called the "polishing phase".

- The type of bacteria that operates in this environment is called aerobic bacteria. It is very important to aerate this phase to enrich the liquid with oxygen. The bacteria perform at their optimum in an oxygen enriched environment.
- In the aerobic phase the nitrification takes place. This process breaks down the ammonia to nitrites and the nitrites to nitrates.

- Fourth Phase:
  - Secondary settling takes place in the fourth phase.
  - The cell material and settle able solids settle in this phase and form the so-called "sludge blanket".
  - The sludge blanket is very important for the process. When the blanket matures it is re-circulated to the primary settling tank in phase one to "seed" or inoculate the raw sewerage entering the plant and to alter the nitrates to nitrogen gas.
  - This cycle is called the re-activated sludge cycle. This technology improves the efficiency of the process and the plant.
- Fifth Phase:
  - In the fifth and final phase the final effluent is prepared for final discharge or use which will be in line with the applicable wastewater limit values.
  - The effluent is disinfected or sterilized to prevent any dangerous or harmful bacteria from entering our environment. This is achieved by Ozone Systems.

3.2.9.5 OIL AND WATER SEPARATOR

The current oil and water separators at the wash bay will be decommissioned and new oil and water separator constructed at the new contractors' offices, workshops and wash bay in ~2020/2021.

3.2.9.6 WASHBAY

A wash bay utilising a high-pressure washer and complete with effluent separation, silt trap as well as an oil and water separation system will be relocated to the new designated site in ~2020/2021 (Refer to Figure 18). All effluent will be collected in a sediment trap and effluent separation system to allow for the efficient collection of fines and solids as well as hydrocarbon separation. A wash bay near the workshops will be utilised for all RoM and product stockpile handling mobile equipment such as front-end loaders and dump trucks.

3.2.9.7 WEIGH BRIDGE

A double weigh bridge is currently in operation between the product stockpiles and the security gate and may be relocated slightly closer to the gate and rotated east west from a current north south orientation. This short distance relocation will create more product stockpile area if required and can be done when required after the CHPP is in operation.

3.2.9.8 SITE ACCESS AND CONTROL

Access to the mine is controlled through four entrances and exit points. One to the mine's offices, one to the contractor's offices another to the product loading area and another to the RoM stockpile and plant area. This is due to the layout of the mine in relation to public roads. A combination of trenches and 1.8 m high fencing is utilised to ring fence the offices and the operational area including water dams. Strict access control is employed to optimise control over the flow of contractors and mine personnel to the operations area as well as product out of the mine. All visitors to the mine are required to sign in at the security checkpoint at the mine's offices. A third-party security company is utilised to ensure site access control. Another new access point is to be established for the future OC infrastructure and UG contractor site.

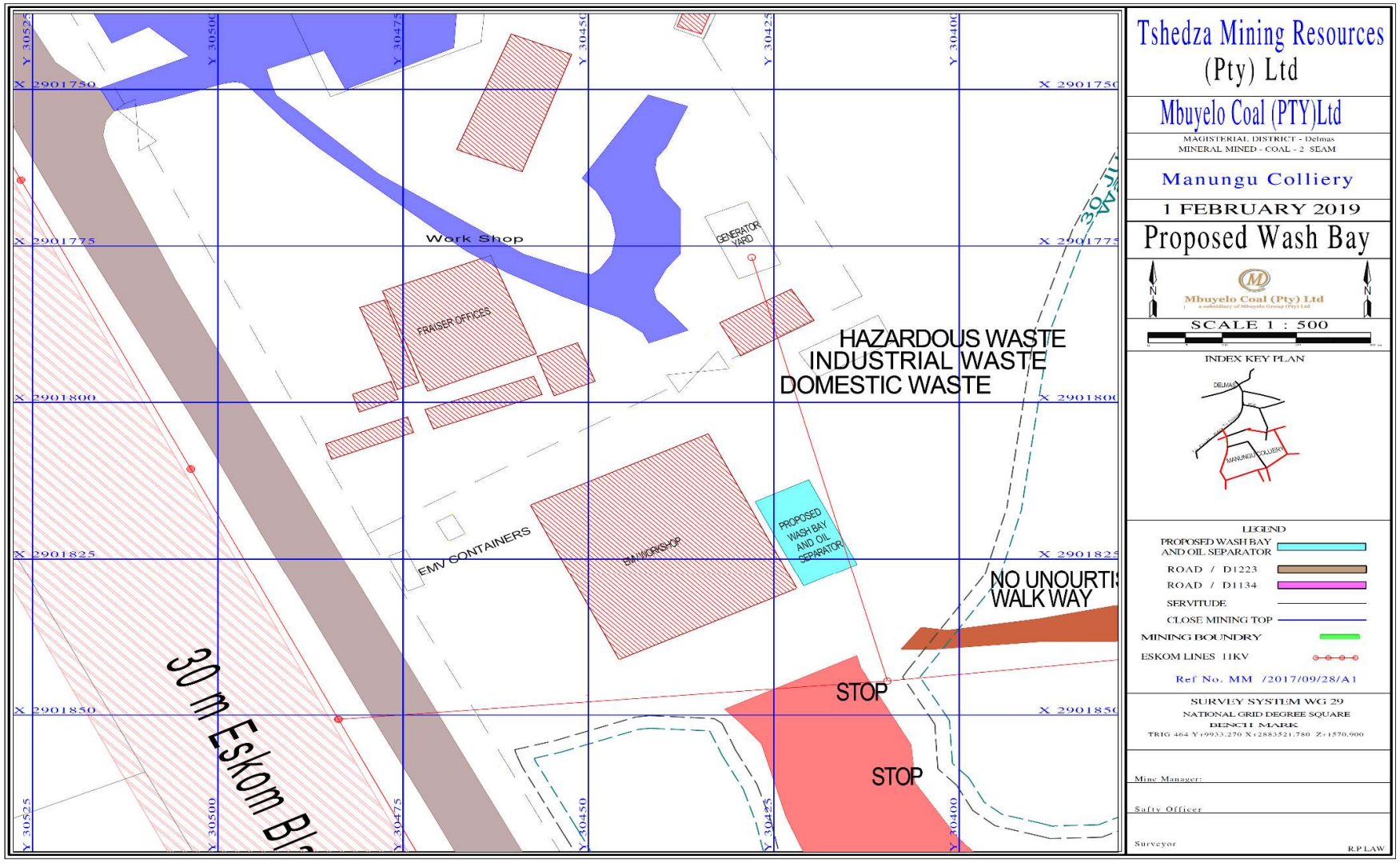


Figure 18: Proposed wash bay location.

3.2.10 HAUL ROADS

The planned haul road network for the future mining areas within Manungu Colliery can be seen on the Mining and Surface Infrastructure Plan in Figure 21.

3.2.11 WATER SUPPLY

Manungu Colliery will continue to require water in the form of both potable and bulk water for the wash plant, dust suppression, wash bays, domestic use (toilets, showers, drinking), etc. The bulk of the mine water is currently obtained from pit dewatering however at times, additional water may be required. Based on the predictive water balance, the required water will be obtained from a combination of rainfall (on dirty areas), boreholes and underground water.

3.2.11.1 POTABLE WATER SUPPLY

Potable water will be made available for the required 500 people on site at a rate of 50 litres per person per day or 25 kl per day. The various options presented above for providing potable water were investigated in more detail and the proposed abstraction from boreholes within the permissible Schedule 1 water use for domestic use was the preferred option.

3.2.11.2 PROCESS WATER

The mining activities require water for dust suppression as well as for the processing plant, wash bays, etc. Water directly from the pit or PCD is proposed to be used for dust suppression and an offtake (Goosneck) facility will be situated at the PCD. Water will be pumped to the processing plant's process water tank from where it will be utilized at a rate of 150l/t of RoM feed or maximum 12000 kl per month. Process water will be further used for wash bay consumption.

An updated water balance is included as part of the Stormwater Management Plan in Appendix Q, which indicates the specific volumes relating to the use of process water.

3.2.12 CLEAN AND DIRTY WATER SYSTEMS

Management of clean and dirty water systems is required for effective pollution control. Pollution control will be maximised through facilitating the following:

- Controlling run-off and seepage entering the mining area;
- Controlling run-off emanating from stockpiles; and
- Controlling and separating the mixing of clean water and polluted water which is contained in the pollution control dam (PCD).

Clean and dirty areas have been determined and mapped out based on topography of the planned mine surface infrastructure (refer to the stormwater management plan including design drawings in Appendix Q).

The collection of dirty water and diversion of clean water would typically be achieved with earthen channels and berms. These systems would be designed so that clean water is effectively diverted from dirty water and allowed to pass through to other downstream users. Figure 19 below indicates a cross section of a typical earthen channel.

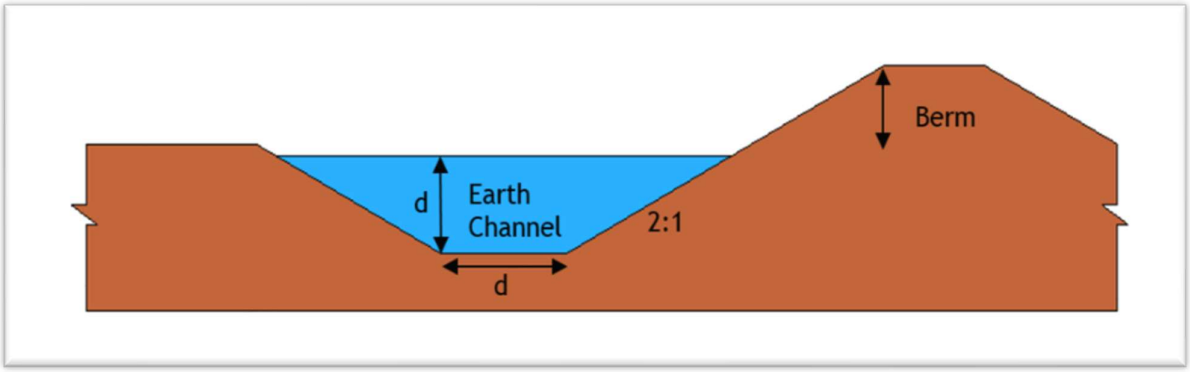


Figure 19: Cross section of typical earthen channel.

As the clean water from the area is expected to be carrying sediments, the channel for clean water diversion will include a gravel bed and sediment traps at discharge points into the natural environment.

3.2.12.1 POLLUTION CONTROL DAMS AND ASSOCIATED DIRTY WATER MANAGEMENT

An HDPE lined PCD and a sump that catch dirty water from the workshops and current dirty coal stockpile areas is in use and new PCDs will be constructed as mining operations expand. The 3 new PCD's will have a height not exceeding 5m and a combined capacity as determined by the hydrological specialist study of 64 000m^3. A new sump will immediately be constructed with the new CHPP to catch any dirty water from the plant, RoM and Product stockpiles, as well as from the coarse discard dump if authorisation to dispose discard in the pit is not granted. Dirty water from the sump will be pumped to the current PCD until the new PCD is built in the north east. The purpose of the sump and dam is to collect water diverted by the clean and dirty water separation system where it can be treated and re-used for mining activities. In addition, water from the opencast operations will also be pumped via pipe to the PCD. The dams will be maintained and operated to not spill any dirty water into a clean water system more than once in 50 years and a minimum freeboard of 0.8 m above the fully supply level will be maintained.

3.2.13 INFRASTRUCTURE PLANS

The current and future mine infrastructure is shown in Figure 20 while the proposed new wash plant in relation to the run of mine is shown in Figure 21. The opencast contractors camp high level infrastructure layout is shown in Figure 22.

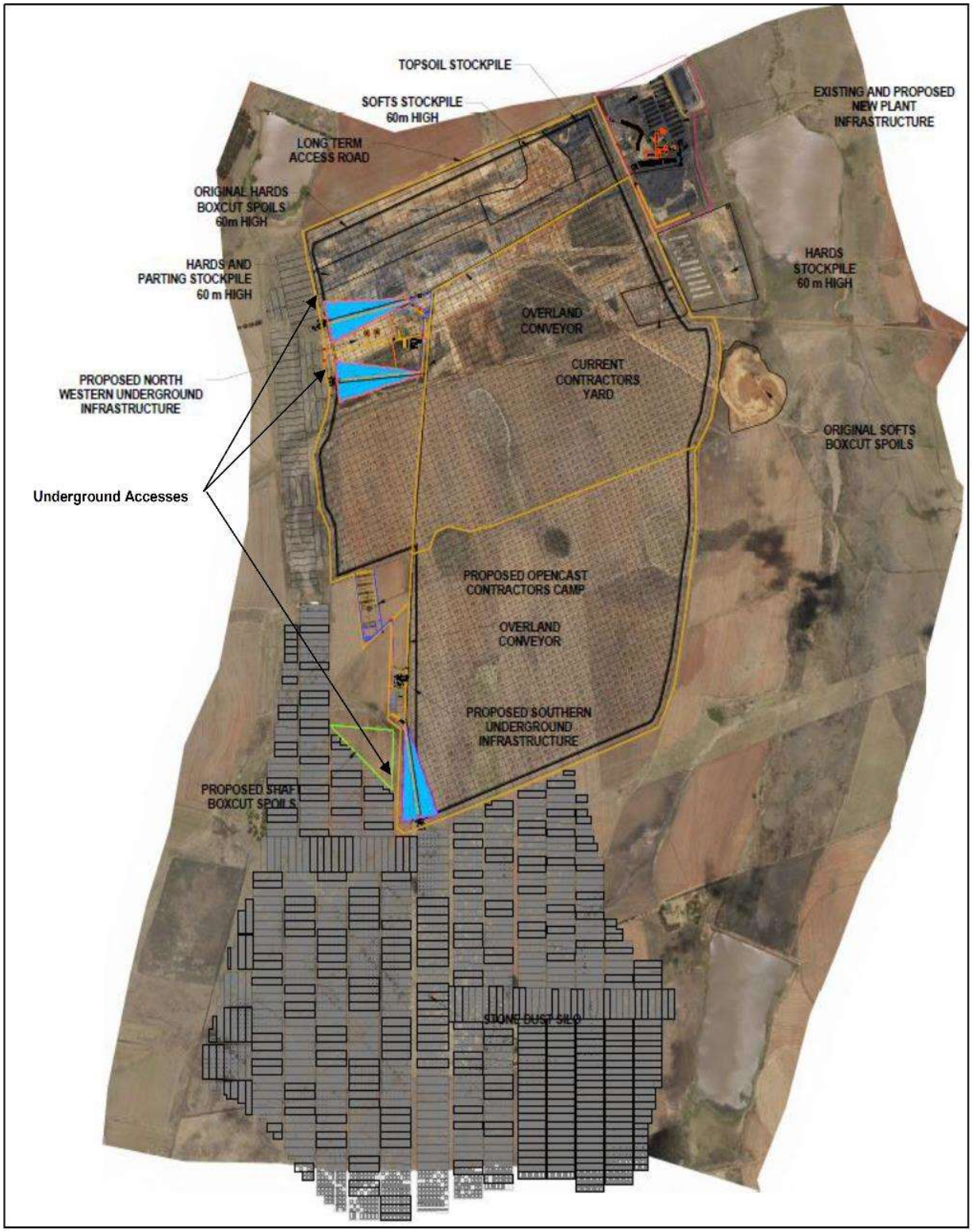
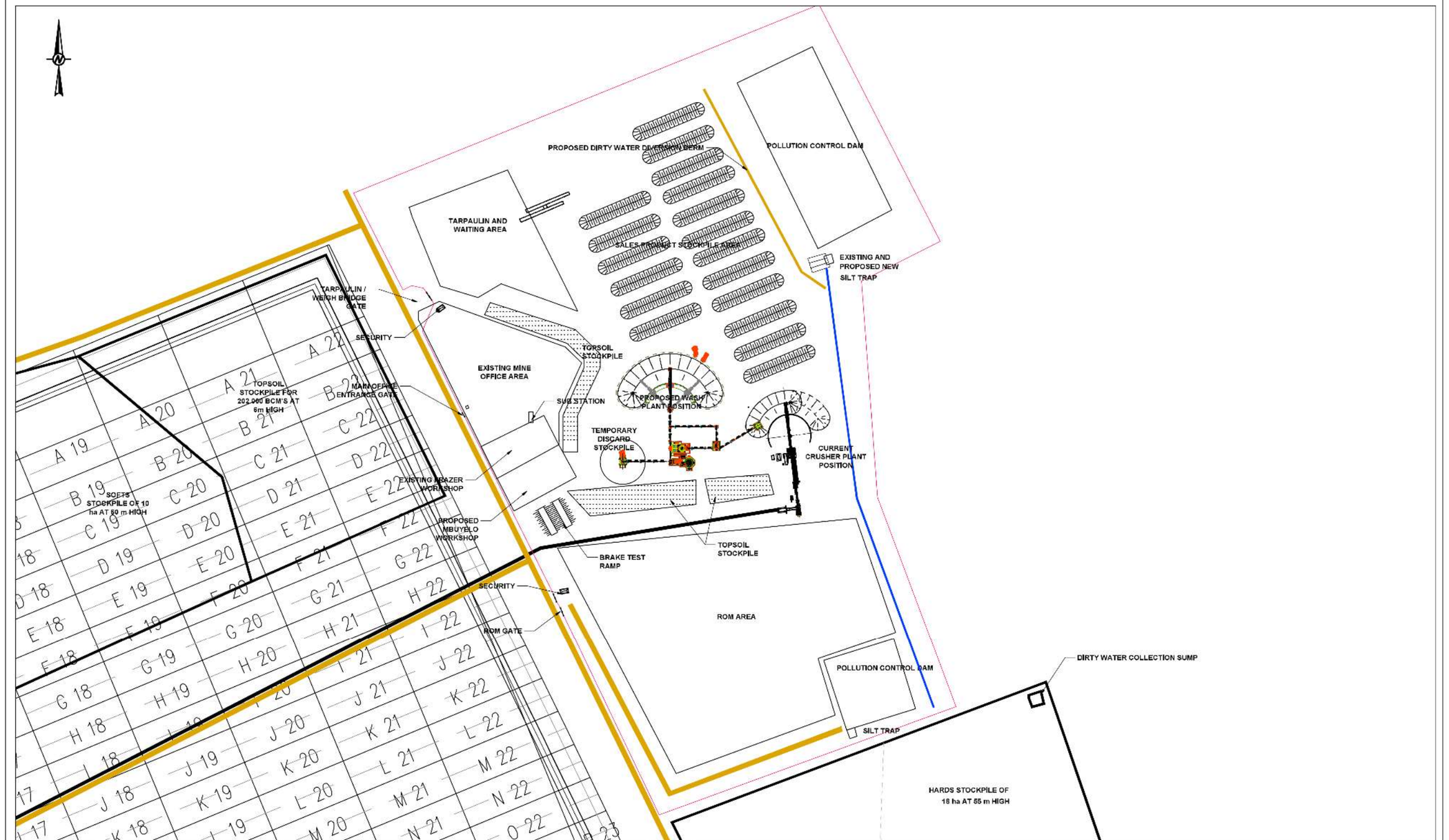


Figure 20: Overview of current and future mine infrastructure.



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ECMA CONSULTING (PTY) LTD.

CLIENT: TSHEDZA MINING (Pty) Ltd.

PROJECT: MANUNGU MINE INFRASTRUCTURE EXPANSION PROJECT

DRAWING TITLE: EXISTING AND PROPOSED NEW INFRASTRUCTURE LAYOUT DRAWING

LEAD PROJECT DRAFTER	PROJECT MANAGER	SCALE	SHEET SIZE	PROJECT No	DOC No	DOC TYPE	DRAWING No	REVISION
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Figure 21: Proposed new wash plant in relation to the run of mine (RoM) layout.

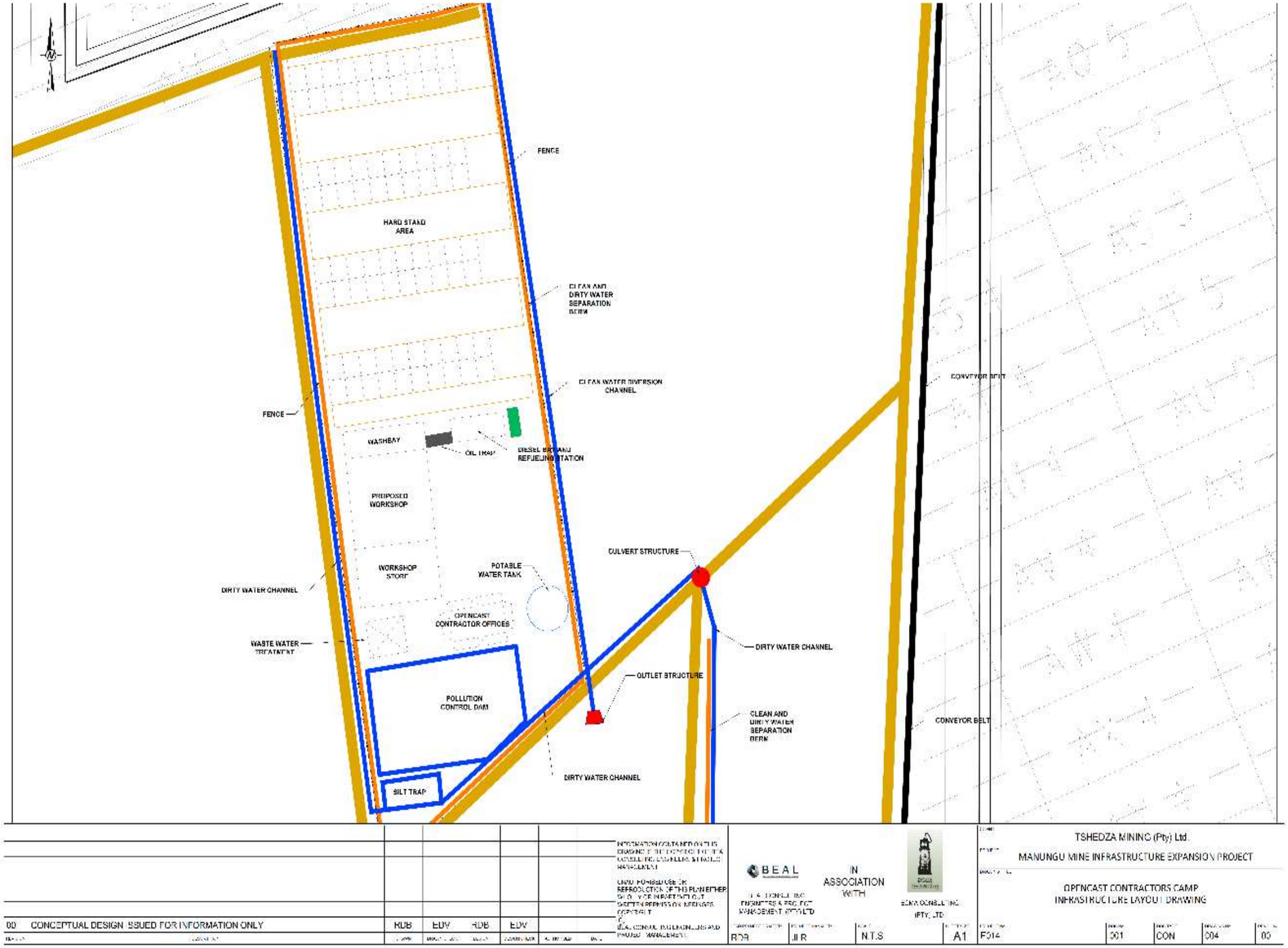

Figure 22: Opencast contractors camp infrastructure layout.

3.2.14 BULK POWER SUPPLY

The current "farm" lines with estimated- 60KVA capacity, supply the offices and plant workshops as well as the current contractor facility with power. The crushing plant makes use of a diesel generator for supply. Additional power lines and substations will have to be constructed and routed to the new CHPP and the future UG operation. Both operations will require in the order of a 2MVA connection. It is envisaged that diesel generators will be used for the CHPP until Eskom construct and supply a line from a few km's south of the mine. A dedicated substation will be required at the plant and UG workings if an Eskom connection can be secured. The connection point, substation and routes will be determined after further investigations are undertaken and concluded.

3.2.15 LOGISTICS

Manungu Colliery is in operation since 2015 and all access routes are used by coal haul trucks and other vehicles to access the mine. See Figure 23 for access routes to the Manungu Colliery and Figure 24 for major roads in the area. All coal is transported by 34tonne coal haulers/side tippers to various power stations and sidings.

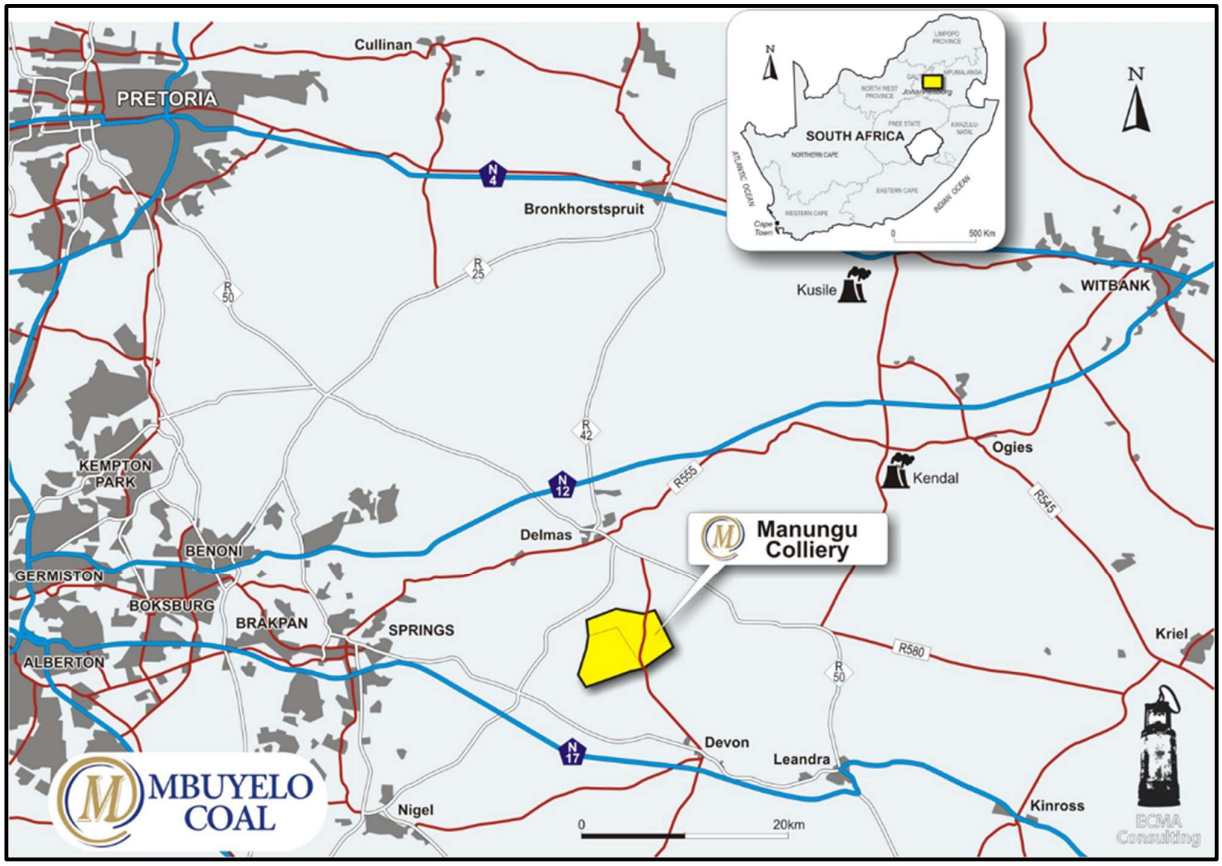

Figure 23: Access routes N12 and R42

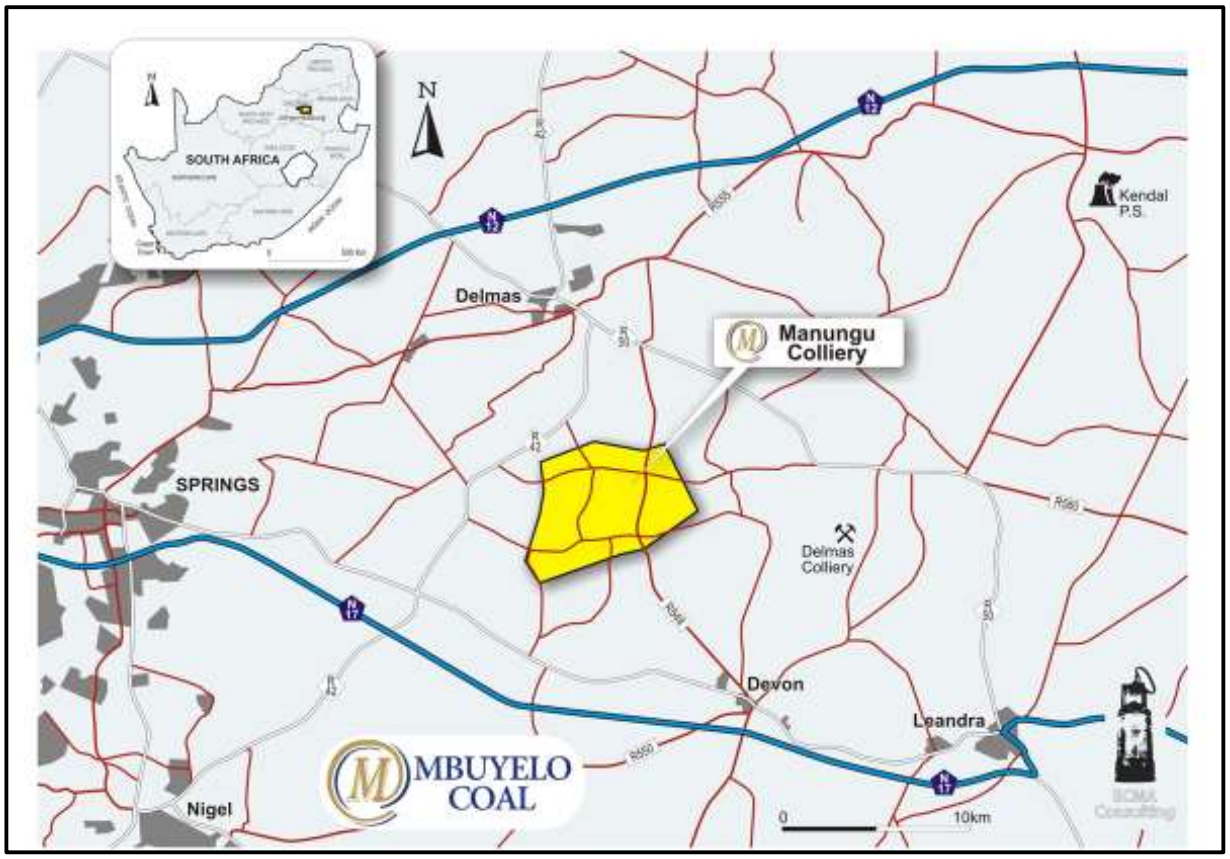

Figure 24: Detailed Roads around Manungu Colliery

3.2.16 LIST OF MAIN MINING ACTIONS, ACTIVITIES AND PROCESSES OCCURRING OR TO OCCUR ON SITE

The main mining actions, activities and process that are planned to take place on site are listed in the Table 6. All actions, activities and processes have been grouped into each of the relevant project phases namely: pre-construction, construction, operation, decommissioning, rehabilitation and closure. It is important to bear in mind that Manungu Colliery is an existing mining operation and as such, certain of these activities/phases have already commenced (i.e.: operational phase is currently underway in certain areas). For this report, the following broad definitions apply:

- Pre-construction refers to the phase in which planning takes place;
- Construction refers to the phase in which the site is prepared, and infrastructure is established;
- Operation refers to the phase in which physical mining and production takes place;
- Decommissioning refers to the phase in which infrastructure is removed and rehabilitation efforts are applied, and their success monitored; and
- Closure refers to the phase in which maintenance and rehabilitation monitoring are undertaken to ensure that the mines closure objectives are met.

Table 6: List of main action, activities or processes on site and per phase

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
Site preparation	Vegetation clearance		As required	As required	As required	
	Removal of infrastructure		As required	As required	As required	
	Planned placement of infrastructure		At start of phase	As required		
	Relocation of contractor camp area		At start of phase	As required		
Human resources management	Employment/recruitment		At start of phase	As required	As required	As required
	I&AP consultations		At start of phase	On-going	On-going	On-going
	CSI initiatives		At start of phase	On-going	On-going	On-going
	Skills development programmes	At start of phase	On-going	On-going	On-going	On-going
	Environmental awareness training		At start of phase	On-going	On-going	As required
	HIV/AIDS Awareness programmes		At start of phase	On-going	On-going	
	Integration with Municipalities' strategic long-term planning	At start of phase	On-going	On-going	On-going	
Earthworks	Stripping and stockpiling of soils		At start of phase	As required	As required	
	Cleaning, grubbing and bulldozing		At start of phase	As required	As required	
	Removal of building waste and cleared vegetation		At start of phase	As required		
	Digging trenches and foundations		At start of phase	As required	As required	
	Blasting		As required	As required	As required	
	Establishing storm water management measures		At start of phase	As required	As required	
	Establishment of firebreak		At start of phase	As required	As required	
Civil Works	Establishment of infrastructure and services		At start of phase	As required		
	Mixing of concrete and concrete works		As required	As required		
	Establishment of PCD and storm water/return water dam		At start of phase	As required	On-going	

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	Establishment of dewatering pipelines		At start of phase	As required		
	Establishment of mobile office and ablution block		At start of phase	As required	As required	
	Sewage and sanitation		At start of phase	On-going	On-going	
	Establishment of fuel storage area		At start of phase			
	Establishment of chemical storage area		At start of phase			
	Establishment of general waste area		At start of phase	On-going		
	Access control and security		At start of phase	As required	As required	
	General site management		On-going	On-going	On-going	On-going
Open-cast and Underground Mining	Drilling		As required	As required		
	Blasting		As required	As required		
	Excavations		As required	As required		
	Removal of overburden by dozing and load haul			As required		
	Establishment of internal haul roads			As required	As required	
	Removal of ore			On-going		
	Establishment of RoM stockpiles			As required	As required	
	Establishment of Product Stockpiles			On-going	On-going	
	De-watering of old underground workings			On-going	On-going	
	Pumping of water to PCD			On-going	On-going	
	Waste rock dumps for backfilling			On-going	On-going	
	Soil management		On-going	On-going	On-going	On-going
	Water management		On-going	On-going	On-going	On-going
	Concurrent rehabilitation			On-going	On-going	On-going
	Water treatment			On-going	On-going	On-going

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
Infrastructure removal	Dismantling and demolition of infrastructure				As required	
	Blasting				As required	
	Safety control				On-going	On-going
Rehabilitation	Backfilling of pits and voids			On-going	On-going	
	Slope stabilisation			On-going	On-going	On-going
	Erosion control			On-going	On-going	On-going
	Landscaping			On-going	On-going	On-going
	Replacing topsoil			On-going	On-going	On-going
	Removal of alien/invasive vegetation			On-going	On-going	On-going
	Re-vegetation			On-going	On-going	On-going
	Restoration of natural drainage patterns				On-going	On-going
	Remediation of ground and surface water			On-going	On-going	On-going
	Rehabilitation of external roads				On-going	On-going
Maintenance	Initiate maintenance and aftercare program				At end of phase	On-going
	Environmental aspect monitoring			On-going	On-going	On-going
	Monitoring of rehabilitation					On-going

3.2.17 ALTERNATIVES CONSIDERED

A detailed assessment of various Activity alternatives, Process alternatives and Technology alternatives were provided in the scoping report. Based on the outcome of the alternative assessment various alternatives were selected for detailed assessment in the EIA phase and specialist studies. The following is relevant to the alternatives for consideration in this EIA report:

- Regarding the filter cake, both the option to stockpile for use as non-select product (**Alternative P1a**) as well as the option for disposal (**Alternative P1b**) were assessed.
- For the disposal of carboniferous wastes (wash plant waste rock and possibly filter cake), the option of disposal of discard and filter cake to pit (**Alternative P2d**) was assessed. Disposal to a surface waste disposal facility located on old rehabilitated mine area (**Alternative P2a**) was also considered.
- In terms of the wash plant water supply, the option to obtain water from dirty water containment facilities (**Alternative P3a**) was assessed.
- For coal beneficiation, only the wet washing option (**Alternative T1b**) was considered.
- For the coal product transportation, transportation by road (**Alternative T2a**) was considered.
- Regarding land use alternatives, both the land use for mining (**Alternative A1**) as well as the no go alternative (**Alternative A2**) were considered.
- Regarding micro sitting alternatives, both the maximum mining over entire area (**Alternative S1a**) as well as the sensitivity-based approach (avoid / buffer sensitive areas) (**Alternative S1b**) were considered.
- In terms of stockpile height, both the option of stockpile height no greater than 6m in height (**Alternative S2a**) and the stockpile height no greater than 60m in height (**Alternative S2b**) were assessed.
- In terms of vegetating stockpiles, both the vegetated stockpiles (**Alternative S3a**) and the unvegetated stockpiles (**Alternative S3b**) were considered.
- In terms of tree screening, both the tree screen around the mining right area (**Alternative S4a**) as well as no tree screen around the mining right area (**Alternative S4b**) were considered.

Alternatives are discussed further in Section 9.

3.2.18 CLOSURE COSTING

Beal Consulting Engineering and Project Management (Beal) was commissioned to review and update the scheduled and unscheduled closure costs for the Manungu Colliery as at end of September 2018. The cost estimate quantities were derived from available plans and maps supplied by Manungu Colliery and augmented by dedicated site visits. The unit rates to determine the closure costs were sourced from BEAL's data base and in consultation with demolition practitioners.

3.2.18.1 GENERAL SURFACE SHAPING

It has been assumed that general surface shaping would be required over most of the areas where surface infrastructure has been removed, as part of the overall surface rehabilitation. This includes the stockpiling of building/demolition rubble to be removed for disposal, as well as the subsequent shaping and profiling of these surfaces. It has been assumed that shaping and profiling would involve the dozing of material at a 500 to 750 mm average thickness. With an adopted dozing rate of R 21.00/m^3, this equates to R 105 000 to R 157 500/ha.

3.2.18.2 ROADS

It has been assumed that the gravel haul roads have an average width of 46m. Allowance has been made to remove 100mm of contaminated soil from the haul road at a rate of R 21/m^3. The contaminated soil will be loaded and hauled to the pit at a rate of R18/m^3 for unscheduled closure and R 34/m^3 for the scheduled closure case. The rehabilitation of the haul roads includes ripping, dozing, shaping/ levelling, vegetation and amounts to R27/m^2. Gravel roads will be ripped, profiled and vegetated and amounts to R11/m^2. The roads with an engineered surface will be ripped, profiled and vegetated at a cost of R53/m^2.

3.2.18.3 COMPACTION ALLEVIATION

Allowance has been made for a mid-sized dozer equipped with 3 ripper tines, ripping to a depth of approximately 500 mm for compaction alleviation. An average unit rate of R 5477/ha was estimated based on a wet rate of R 2 740/h at a rate 0.5 ha/h.

3.2.18.4 VEGETATION ESTABLISHMENT

If vegetation has to be established on uncompact growth medium/topsoil, soil amelioration will most likely be required. This will depend on the nature of the soil, whether the topsoil was stockpiled and the period of stockpiling. In order to determine a unit rate for re-vegetation, allowance has been made to apply 0.5 ton/ha fertiliser, 5 ton/ha lime and 15 ton/ha organic material such as well-cured cattle manure. If cultivation and seeding are also included, but ripping to alleviate compaction excluded, this rate equates to R 56 495/ha.

3.2.18.5 SURFACE WATER MONITORING

Allowance has been made to conduct surface water monitoring at four monitoring points. If assumed that it would take at least one man-day of an independent specialist (including the preparation of the sampling equipment) to conduct the sampling at these points, this would equate to about R 7200 per sampling event for professional fees and associated disbursements. If an additional allowance is made for sample analysis of R 4000 per sample, this equates to an additional amount of R 16 000, totalling to R 23 200 per event. Taking other disbursements (15 percent) into account this amount could be rounded to R 26 680 per sampling event, or R 106 720 per year for each of the above mining areas. It has been assumed that surface water monitoring will have to continue for 5 years mine post-closure on a quarterly basis.

3.2.18.6 GROUNDWATER MONITORING

It has been assumed that at least 10 groundwater monitoring boreholes would be required to reflect post closure groundwater quality. If it is assumed that two man-days would be required to conduct a monitoring event (including preparation) this would equate to about R 7 200/day. Allowance has also been made to conduct chemical sample analysis at R 4000/ sample. Hence, these costs amount to about R 40 000 per sampling event. Taking other disbursements (20 percent) into account this amount could be rounded to R 65 280 per sampling event. If sampling has to be conducted at least four times a year, the annual costs are R 261 120/yr. It has been assumed that groundwater monitoring will have to continue for 5 years post-closure.

3.2.18.7 REHABILITATION MONITORING

It has been assumed that two consultants would be required for seventeen man-days to conduct the rehabilitation monitoring over a 720ha area. Assuming a consultant rate of R600/hr, this would equate to R 163 200 per event. If it is assumed that this has to be conducted twice a year, the annual costs would amount to R326 400 or roughly R454/ha. If an additional R 129/ha is added for travelling and accommodation, the overall rate is R583/ha/year, or R 3 000/ha for five years.

3.2.18.8 REHABILITATION AFTERCARE AND MAINTENANCE

It is assumed that this would require 6 weeks per year of a team of 10 workers and 1 TLB as supporting equipment to conduct the corrective measures over 20 ha. It has been assumed that the hourly rate of the workers is R 25 and the equipment R 3 821/d (per machine). If accommodation and travelling of R 400/ha is also added, the overall rate is about R 9131/ha/year. It has been assumed that the workers and equipment could be sourced locally.

The following aspects requiring further attention, which may improve the accuracy of future closure costs estimates, have been identified:

- To ensure that the financial provision is up-to-date and in accordance to the DMR requirements, annual revision of closure costing is recommended. This will also assist in accommodating changes in the closure costing due to any facilities that was constructed or demolished as well as any changes in the closure approach;

- With the determination of the closure costing it has been assumed that going forward the concurrent in-pit rehabilitation would remain up to date and that at the conclusion of mining only the final void would require rehabilitation. It has to be confirmed that this would be the case, since if not, this could have a significant effect on the computed closure costs;
- A predicative post- mining landform design is required to determine the final void size and location. This will increase the accuracy of the scheduled closure costing.
- On-going attention must be given to the predicted excess mine water make after closure. It is recommended that dedicated work be conducted to determine the liability associated with post-closure treatment of water, as excess water is, may decant at Manungu mine and treatment could be required soon. The on-going handling and treatment of this water is a costly closure cost component and refinement/improvement of the predicted rate of excess water requiring attention could have a notable effect on the computed closure costs; and
- It is recommended that detailed surface profile modelling be conducted for the open pit so that these costs, which contribute significantly to the overall costs, can be verified.

The closure costing report is included in Appendix P and a summary of closure costs is presented in Table 7.

Table 7: Scheduled and unscheduled closure costs for Manungu Colliery:

Closure Components	Unscheduled Closure (2018)	Scheduled Closure (2040)
Infrastructure aspects	R 15 935 358.83	R 165 026 577.75
Mining aspects	R 206 795 858.99	R 116 699 020.89
Surface Rehabilitation	R 24 832 263.39	R 24 249 425.45
Water Management	R 110 996.08	R 192 701.53
Sub-Total 1	R 247 674 477.28	R 306 167 725.62
Post Closure Aspects	Unscheduled Closure (2018)	Scheduled Closure (2040)
Surface Water Monitoring	R 533 600.00	R 533 600.00
Groundwater Monitoring	R 1 305 600.00	R 1 305 600.00
Rehabilitation Monitoring	R 870 000.00	R 2 160 000.00
Care and Maintenance	R 913 085.48	R 3 195 799.17
Sub-Total 2	R 3 622 285.48	R 7 194 999.17
Additional Allowances	Unscheduled Closure (2018)	Scheduled Closure (2040)
Preliminary and general	R 29 720 937.27	R 36 740 127.07
Contingencies	R 24 767 447.73	R 30 616 772,56
Sub-Total 3	R 54 488 385.00	R 67 356 899,64
Grand Total (Excl VAT)	R 305 785 147,76	R 380 719 624.42

4 POLICY AND LEGISLATIVE CONTEXT

This section provides an overview of the governing legislation identified which may relate to the proposed project. A summary of the applicable legislation is provided in Table 8 below. The primary legal requirement for this project stems from the need for an EA to be granted by the competent authority, which is the DMR, in accordance with the requirements of both the NEMA and MPRDA. In addition, there are numerous other pieces of legislation governed by many acts, regulations, standards, guidelines and treaties on an international, national, provincial and local level, which should be considered to assess the potential applicability of these for the proposed activity. More detail on the legislative framework is presented in Section 4.1 below.

Table 8: Applicable Legislation and guidelines overview

Applicable Legislation and Guidelines	Reference Where Applied
APPLICABLE LEGISLATION	
Constitution of the Republic of South Africa, Act 108 of 1996 The constitution of any country is the supreme law of that country. The Bill of Rights in chapter 2 section 24 of the Constitution of South Africa Act (Act 108 of 1996) makes provisions for environmental issues and declares that: "Everyone has the right - (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development" Therefore, the EIA is conducted to fulfill the requirement of the Bill of Rights.	Throughout the SR and EIR process
National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) and the EIA Regulations (2014 as amended) thereunder: The NEMA (1998) requires that a project of this nature (inclusive of a Mining Right) must undergo a Scoping and Environmental Impact Assessment; an Environmental Management Programme must also be compiled. Regulations applicable to this project include the following: EIA Regulations R.982 (2014) in terms of NEMA. Listing Notice 1: R.983 (2014) in terms of NEMA. Listing Notice 2: R.984 (2014) in terms of NEMA. Listing Notice 3: R.985 (2014) in terms of NEMA.	Throughout the SR and EIR process
Minerals and Petroleum Resources Development Act (MPRDA) (Act no 28 of 2002), as amended and Mineral and Petroleum Resource Development Regulations, 2004 as amended: The MPRDA (2002) requires an applicant who wishes to proceed with a mining project to obtain a Mining Right, part of which requires the applicant to obtain Environmental Authorisation in terms of the NEMA (1998).	Throughout the SR and EIR process

Applicable Legislation and Guidelines	Reference Where Applied
National Water Act (NWA) (Act 36 of 1998): The NWA recognizes that water is a scarce and unevenly distributed national resource which must managed encompassing all aspects of water resources. In terms of Chapter 4 of the NWA, activities and processes associated with the proposed mine extension and associated infrastructure, are required to be licensed by the Department of Water and Sanitation (DWS). An Integrated Water Use Licence Application (IWULA) will be lodged with the DWS in terms of Section 21 of the NWA, which lists several water uses requiring authorisation. Furthermore, an amended Integrated Water and Waste Management Plan (IWWMP) will be compiled and submitted in support of the IWULA.	Throughout the process – all water related aspects
National Heritage Resources Act, 1999 (Act no 25 of 1999): The National Heritage Resources Act aims to promote good management of cultural heritage resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations. Due to the extent of the project, it is likely that some heritage resources and palaeontological features are likely to occur within the project boundary area.	Heritage specialist study and Palaeontological, EIA, EMP.
Occupational Health and Safety Act, 1993 (Act no 85 of 1993): The Occupational Health and Safety Act aims to provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work. Regulations applicable to this project include the following: **Explosives Regulations R.109 (2003) in terms of the OHS Act.**	Throughout the process – all blasting and explosives management related aspects
Specific Environmental Management Acts (SEMAs): The SEMAs refer to specific portions of the environment where additional legislation over and above the NEMA (1998) is applicable. SEMAs relevant to this application include the following: National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004). National Environmental Management: Air Quality Act, 2004 (Act no 39 of 2004). National Environmental Management: Waste Act, 2008 (Section 4.1.4) (Act no 59 of 2008).	Specialist studies, Baseline description and EMPr. Permits to be applied for if any protected tree species are to be removed from the site.
APPLICABLE GUIDELINES	
Integrated Environmental Management Information Guidelines series: This series of guidelines was published by the Department of Environmental Affairs (DEA), and refers to various environmental aspects. Applicable guidelines in the series include: Guidelines 5: Companion to NEMA EIA Regulations of 2010.	The guidelines will be used throughout the Scoping and Environmental Impact Report process.

Applicable Legislation and Guidelines	Reference Where Applied
Guideline 7: Public Participation. Guideline 9: Need and desirability. Additional guidelines published in terms of the NEMA EIA Regulations, in particular: Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006. Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006. Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006.	
Best Practice Guideline (BPG) series: The BPG series is a series of publications by the then Department of Water Affair and Forestry (now DWS – Department of Water and Sanitation) providing best practice principles and guidelines relevant to certain aspects of water management. Best practice guidelines relevant to this project include the following: BPG A4: Pollution Control Dams. BPG H1: Integrated Mine Water Management. BPG H2: Pollution Prevention and Minimisation of Impacts. BPG H3: Water Reuse and Reclamation. BPG H4: Water treatment. BPG G1: Storm Water Management. BPG G2: Water and Salt balances. BPG G3: Water Monitoring Systems. BPG G4: Impact Prediction	Surface water and groundwater specialist studies, EIA and EMP.

4.1 APPLICABLE NATIONAL LEGISLATION

The legal framework within which the Manungu Colliery operates is governed by many Acts, Regulations, Standards and Guidelines on an international, national, provincial and local level. Legislation applicable to the project includes (but is not limited to):

4.1.1 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT

The MPRDA aims to "make provision for equitable access to, and sustainable development of, the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa. The MPRDA governs the sustainable utilisation of South Africa's mineral resources. The MPRDA aims to "make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and hydrocarbon rights in South Africa. The MPRDA also requires adherence with related legislation, chief amongst them is the National Environmental Management Act (Act No. 107 of 1998, NEMA) and the National Water Act (Act No. 36 of 1998, NWA).

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment of Section 102, concerning amendment of rights, permits, programmes and plans, to requiring the written permission of the Minister for any amendment or alteration; and the section 5A(c) requirement that landowners

or land occupiers receive twenty-one (21) days' written notice prior to any activities taking place on their properties. One of the most recent amendments requires all mining related activities to follow the full NEMA process as per the 2014 EIA Regulations, which came into effect on 4 December 2014. Section 102 applications for amendment of both the existing EMPr, MWP and SLP for Manungu Colliery will be completed as part of the project.

4.1.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA Environmental Impact Assessment (EIA) regulations, the applicant is required to appoint an environmental assessment practitioner (EAP) to undertake the EIA, as well as conduct the public participation process. In South Africa, EIA became a legal requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant environmental authorisation. On 21 April 2006 the Minister of Environmental Affairs and Tourism promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were amended in June 2010 and again in December 2014. The December 2014 NEMA regulations are applicable to this project. Mining Activities officially became governable under the NEMA EIA in December 2014.

The objective of the Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the activities that have been identified. The purpose of these procedures is to provide the competent authority with adequate information to make decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorized, and that activities which are authorized are undertaken in such a manner that the environmental impacts are managed to acceptable levels.

In accordance with the provisions of Sections 24 (5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIA's to apply for, and be considered for, the issuing of an EA. These Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GN R. 983 and 985) and a more complete EIA process (activities listed in GN R. 984). In the case of this project there are activities triggered under GN R. 983, 984 and 985 and as such a full EIA process is necessary. Table 11 presents all the anticipated listed activities under the NEMA EIA Regulations (2014) that are applicable to this project.

Approval is sought for the following activities:

- Construction of pollution control dams and dirty water storage reservoirs with a combined capacity of 50 000m^3 or more. The dam wall height falls below 5m;
- Construction of access roads and haul roads where the road is wider than 8m;
- Extending of existing farm roads/ haul roads by more than 1km;
- Physical alteration of vacant agricultural land for mining. The total area to be transformed exceeds 20 hectares;
- Construction of a fuel storage facility; and
- Construction of clean and dirty water canals in and around the mining areas with a width of more than 36 cm.

In addition to the above approvals being sought for the extended mining areas, amendments to the existing Environmental Authorisation and Environmental Management Programme conditions will be sought in terms of NEMA GNR 982 Regulation 31 for the following aspects:

- Stockpile height amendments (from current 6m limitation to 60m);
- Stockpile vegetation requirements (removal of condition as rock stockpiles contain no topsoil); and
- Tree screen requirements around mining areas (removal of condition).

The application for the amendment was submitted to the competent authority prior to making the EIR/EMPr report available for review. The EIR/EMPr report (including details on, and assessment of the amendments) will be made available for a period of 30 days, in line with the required NEMA commenting period for the EIR/EMPr.

A Scoping and EIA process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and EIA accordingly provides a mechanism for the comprehensive assessment of activities that are likely to have more significant environmental impacts. Figure 25 below provides a graphic representation of all the components of a full EIA process.

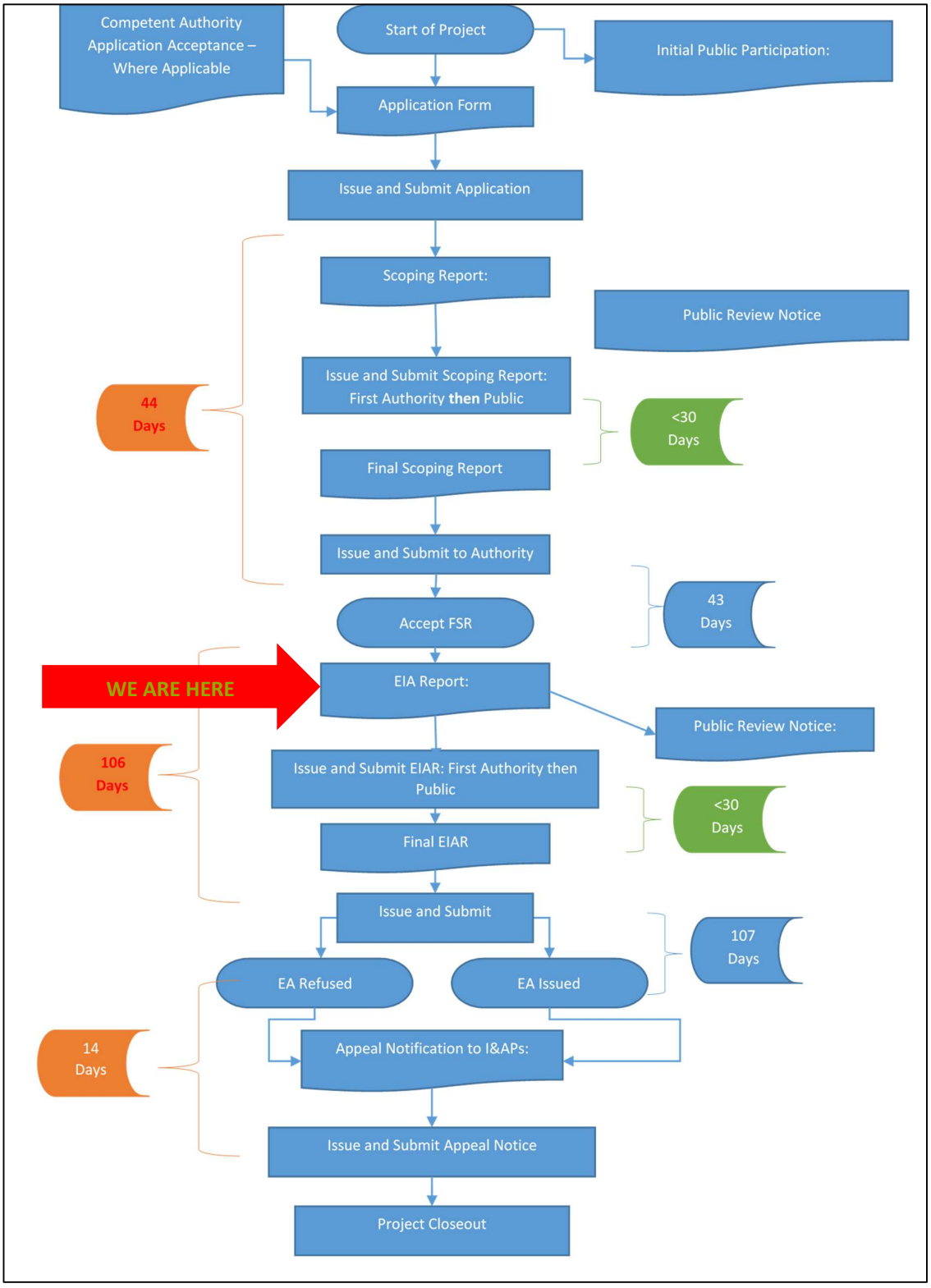

Figure 25: EIA process diagram.

Section 24 P of the NEMA requires that an applicant for an environmental authorisation relating to prospecting, mining or production must, before the Minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post

decommissioning management of negative environmental impacts. Therefore, the potential environmental liabilities associated with the proposed activity must be quantified and indicate the method of financial provision in line with the National Environmental Management Act (1998): Regulations pertaining to the financial provision for prospecting exploration, mining and production, (2015). The requirement for existing mining operations to comply with the NEMA financial provisioning regulations becomes effective as from February 2020 (as per the extension of the transitional period dated 21 September 2018). As such, the update of Manungu's closure costing as per the DMR guidelines will be presented in this EIA report.

Table 9 below indicates the listed activities in terms of the NEMA Regulations that are applicable to the proposed extension of the Manungu Colliery.

Table 9: Listed activities in terms of the NEMA Regulations

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		Activities in terms of NEMA (1998)	
GNR 983	9	*The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.*	Proposed Water Treatment Plant / water pipelines
GNR 983	12	*"The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —* *excluding—* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;*	PCD

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared. "*	
R 983	13	*The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.*	PCD -the exact size and capacity of the dam will be determined in the EIA phase
R 983	14	*The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.*	Diesel storage on site up to 100 cubic meters
R 983	19	*"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving—* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or*	Infilling/deposition during future mining activities (expanded LoM areas)

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies."	
GNR 983	24	*"The development of a road—* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* *but excluding a road—* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometer or shorter."*	Internal haul roads for transportation of coal
GN983	25	*The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres.*	PCD
GNR 983	27	*"The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan."*	Open cast and underground expansions
GN983	28	*Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;*	Mining (industrial) development

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	
GN983	31	*The decommissioning of existing facilities, structures or infrastructure for—* *(i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014;* *(ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014;* *(iii) …….* *(iv) any phased activity or activities for development and related operation activity or expansion or related operation activities listed in this Notice or Listing Notice 3 of 2014; or* *(v) any activity regardless the time the activity was commenced with, where such activity:* *(a) is similarly listed to an activity in (i) or (ii) above; and* *(b) is still in operation or development is still in progress;* *excluding where—* *(aa) activity 22 of this notice applies; or* *(bb) the decommissioning is covered by part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies.*	Decommissioning & relocation of existing facilities
GN983	45	*The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure—* *(i) has an internal diameter of 0,36 metres or more; or* *(ii) has a peak throughput of 120 litres per second or more; and* *(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or* *(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;*	Utilization of existing pipelines

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		excluding where such expansion— *(aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or* *(bb) will occur within an urban area.*	
GNR 983	46	*The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure—* *(i) has an internal diameter of 0,36 metres or more; or* *(ii) has a peak throughput of 120 litres per second or more; and* *(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or* *(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;* *excluding where such expansion—* *(aa) relates to the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve or railway line reserve; or* *(bb) will occur within an urban area.*	Possible utilization of existing pipelines
GNR 983	48	*The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding—*	Possible utilization / expansion of existing infrastructure

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; *(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such expansion occurs within an urban area; or* *(ee) where such expansion occurs within existing roads, road reserves or railway line reserves.*	
GNR 983	50	*The expansion of facilities or infrastructure for the off- stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more*	Possible expansion of the existing PCD
GNR 983	51	*The expansion and related operation of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such storage facility will be expanded by more than 80 cubic metres*	Existing diesel storage may be expanded
GNR 983	56	*"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas."*	Internal haul roads for transportation of coal
GNR 983	57	*The expansion and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage where the capacity will be increased by 15000 cubic metres or more per day and the development footprint will increase by 1000 square meters or more.*	Possible expansion of existing PCD
GNR 983	67	*Phased activities for all activities—* *(i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;*	General mining activities

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		excluding the following activities listed in this Notice- *17(i)(a-d); 17(ii)(a-d); 17(iii)(a-d); 17(iv)(a-d); 17(v)(a-d); 20; 21; 22; 24(i); 29; 30; 31; 32;* *34; 54(i)(a-d); 54(ii)(a-d); 54(iii)(a-d); 54(iv)(a-d); 54(v)(a-d); 55; 61; 64; and 65; or* *(ii) listed as activities 5, 7, 8(ii), 11, 13, 16, 27(i) or 27(ii) in Listing Notice 2 of 2014 or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;* *where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold."*	
GNR 984	6	*"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding–* *(i) activities which are identified and included in Listing Notice 1 of 2014;* *(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or* *(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day. "*	Possibly triggered if new PCD inflow exceeds 2000 cubic meters / day
GN984	7	*The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods-* *(i) in gas form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 700 tons per day;* *(ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or*	Underground water from mine workings

GNR #	Activity Number	Description of the applicable listed activity	Trigger
		(iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.	
GNR 984	15	*"The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan."*	The extension of the mining area.
GNR 984	16	*The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more."*	A PCD will be constructed. The exact size and capacity of the dam will be determined in the EIA phase.
GN 984	17	*"Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including—* *(a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or* *(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing;* *but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.*	Mining Activities
GN 984	24	*The extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils, but excluding where such extraction or removal is for the rehabilitation of wetlands in accordance with a maintenance management plan.*	Unlikely but to be confirmed by soils study if peat occurs in the area.

GNR #	Activity Number	Description of the applicable listed activity	Trigger
GN985	12	*The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004*	All infrastructure and open cast / underground extensions – the specific endangered status of the site will be determined by the biodiversity specialist and presented during the EIA phase

4.1.3 THE NATIONAL WATER ACT

The National Water Act, 1998 (Act 36 of 1998) (NWA) makes provision for two types of applications for water use licences, namely individual applications and compulsory applications. The NWA also provides that the responsible authority may require an assessment by the applicant of the likely effect of the proposed licence on the resource quality, and that such assessment be subject to the EIA regulations. A person may use water, if the use is-

- Permissible as a continuation of an existing lawful water use (ELWU);
- Permissible in terms of a general authorisation (GA);
- Permissible under Schedule 1; or
- Authorised by a licence.

These processes are described in Figure 26.

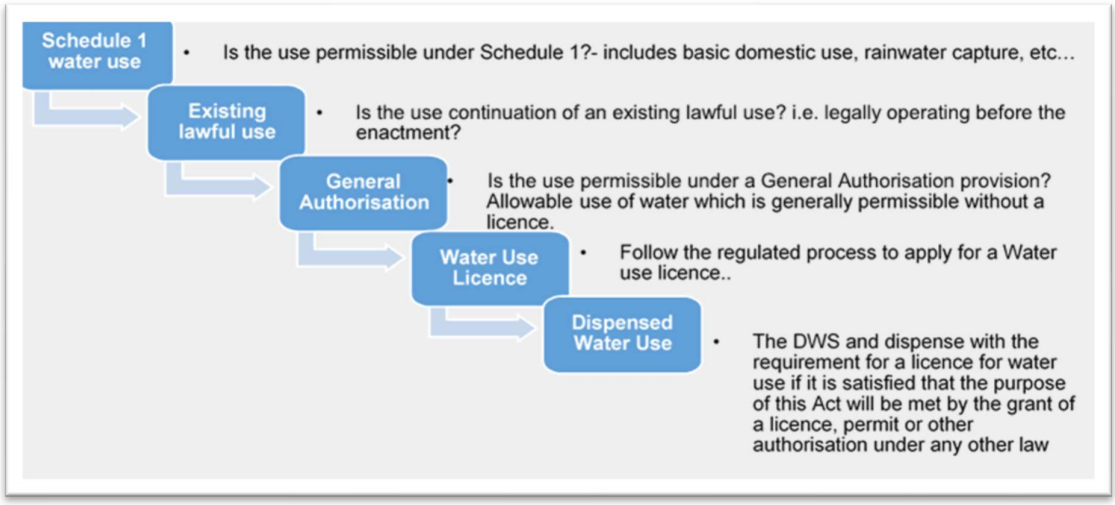

Figure 26: Authorization Process for new water uses

The NWA defines 11 water uses. A water use may only be undertaken if authorised by the DWS. Water users are required to register certain water uses that took place on the date of registration, irrespective of whether the use was lawful or not. The water uses for which an authorisation issued can be issued includes:

a) taking water from a water resource;

b) storing water;

c) impeding or diverting the flow of water in a watercourse;

d) engaging in a stream flow reduction activity contemplated in section 36;

e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;

g) disposing of waste in a manner which may detrimentally impact on a water resource;

h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

i) altering the bed, banks, course or characteristics of a watercourse;

j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

k) using water for recreational purposes.

Tshedza was granted an Integrated Water Use Licence (IWUL) in terms of Chapter 4 of the NWA, Licence No: 04/B20A/ACGIJ/2621 and File No: 27/2/2/B120/6/4, dated 23 February 2015, for the following water uses:

- Section 21(a): Taking of water from a water resource;
- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource;
- Section 21(i): altering the bed, banks, course or characteristics of a watercourse; and
- Section 21(j): Removing, discharging or disposing of water found underground.

The mine will apply for an amended IWUL to incorporate the proposed changes to the MWP and associated new water uses. The possible water uses that could be triggered are presented in Table 10 and these will be confirmed following the specialist studies and finalisation of the project proposal in the EIA phase.

Table 10: Water uses that may be applicable to mine expansion

Activity #	Listed Activity Description	Reason for Inclusion
NWA Activities		
Section 21(a)	Taking water from a water resource	Potable water purposes from borehole(s) for use as drinking water.
Section 21(b)	Storing water	There may be a requirement to store water for use during the winter months.
Section 21(e)	Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1)	Depending on the disposal options to be considered (e.g.: mist sprays to remove excess water from PCD's).
Section 21(g)	Disposing of waste in a manner which may detrimentally impact on a water resource; and	PCD, waste stockpiles (discard dumps, filter cake and possibly waste rock dumps), dust suppression, wash bay consumption.
Section 21(j)	Removing, discharging or disposing of water found underground.	Dewatering of opencast and underground mining areas
Section 21 (c) and 21 (i)	21(c) Impeding or diverting the flow of water in a watercourse; and 21(i) Altering the Bed, Banks, Course or Characteristics of a Water Course	Watercourse crossings

An important regulation under NWA is the GN704 (1999). This is a guideline document for the implementation of regulations on use of water for mining and related activities aimed at the protection of water resources.

4.1.3.1 MINE WATER MANAGEMENT POLICY POSITION (DRAFT - 2017)

Acid Mine Drainage (AMD) and related mine water impacts have in the past decade evolved to become a major environmental challenge. Whilst the challenge is limited to the mining sector during operations, it eventually becomes externalised during mining downturn, and is especially pertinent post-mining closure, especially if mine closure does not proceed according to regulatory-approved recommendations.

To deal with this challenge at a very high level, an Inter-Ministerial Committee (IMC) comprising the Ministers of Mineral Resources, Water and Environmental Affairs, Science and Technology, and the Minister in the Presidency: National Planning Commission was established. Mine water impacts, including AMD, are phenomena that plague all countries with rich mineral deposits. Depending on the geology/ mineralogy of a region, the terms Acid Rock Drainage (ARD), Acid Mine Drainage (AMD), Neutral Mine Drainage (NMD), and Saline Drainage (SD) are the characteristic nomenclature for reporting different mine water types. Given the long history of mining in south Africa, and the mineral wealth still locked across various parts of South Africa, and the potential this deposit has for local economic development and attracting foreign investment, it is prudent that the DWS formulates a policy principle to support its response to mine water challenges.

The draft policy document's purpose is to provide the position of the DWS on mine water management, including AMD. Furthermore, it aims to provide measures on protection of water resources from prospective, operational and historical mine activities that have negative water quality impacts. Based on the formulation of this policy document, it is clear that the DWS intends to focus more heavily on ensuring that the mining sector in particular, undertakes every possible action to prevent the deterioration of the surrounding water quality.

4.1.3.2 CATCHMENT MANAGEMENT STRATEGIES

Catchment Management Agencies (CMAs) are tasked with coordinating the water demands, interests and responsibilities of all relevant government departments, institutions and water users within a specific CMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a CMA is the Catchment Management Strategy (CMS) which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources. According to DWS' water management areas delineations, the Manungu Colliery mining right area falls within the Olifants Water Management Area, delineated as water management area No, 4, which subsequently falls under the B Primary drainage area.

4.1.4 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT

The applicable waste act is no. 59 of 2008: National Environmental Management: Waste Act, 2008 (NEMWA). On 2 June 2014 the National Environmental Management: Waste Amendment Act came into force. Waste is accordingly no longer governed by the MPRDA but is subject to all the provisions of the National Environmental Management: Waste Act, 2008 (NEMWA).

Section 16 of the NEMWA must also be considered which states as follows:

1. A holder of waste must, within the holder's power, take all reasonable measures to-

    a) "Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;

    b) Reduce, re-use, recycle and recover waste;

    c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;

e) Prevent any employee or any person under his or her supervision from contravening the Act; and

f) Prevent the waste from being used for unauthorised purposes."

These general principles of responsible waste management will be incorporated into the requirements in the EMPr to be implemented for this project.

Waste can be defined as either hazardous or general in accordance to Schedule 3 of the NEMWA (2014) as amended. "Schedule 3: Defined Wastes" has been broken down into two categories – Category A being hazardous waste; and Category B being general waste. Under Category A (hazardous waste), the act makes allowance for, but not limited to, "wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal; Oil wastes and wastes of liquid fuels; and Construction wastes".

In order to attempt to understand the implications of these waste groups, it is important to ensure that the definitions of all the relevant terminologies are defined:

- Hazardous waste: means "any waste that contains organic or inorganic elements or compounds that may, owning to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles."
- Residue deposits: means "any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right."
- Residue stockpile: means "any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act."
- General waste: means "waste that does not pose an immediate hazard or threat to health or to the environment, and includes – domestic waste; building and demolition waste; business waste; inert waste; or any waste classified as non-hazardous waste in terms of the regulations made under Section 69."

Table 11 below presents the anticipated NEMWA listed activities for the mine extension project which require authorisation.

Table 11: Anticipated NEMWA Listed Activities requiring authorisation.

Activity	Listed Activity Description	Reason for Inclusion
NEMWA listed activities - Government Notice R921		
B1	The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.	PCD's
B2	The reuse or recycling of hazardous waste in excess of 1 ton per day, excluding reuse or recycling that takes place as an integral part of an internal manufacturing process within the same premises.	Processing plant and filter cake. Filter cake may be blended into product.
B3	The recovery of waste including the refining, utilisation, or co-processing of the waste at a facility that processes in excess of 100	PCD's

	tons of general waste per day or in excess of 1 ton of hazardous waste per day, excluding recovery that takes place as an integral part of an internal manufacturing process within the same premises.	
B7	The disposal of any quantity of hazardous waste to land.	Residue deposits / carbonaceous material back to pit.
B10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	The construction of PCD's and possible water treatment plant.
B11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	Dumps & stockpiles are residue deposits resulting from activities which require a mining right.

4.1.4.1 NEMWA PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS REGULATIONS, 2015 (GN R 632)

The purpose of these Regulations is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation. The identification and assessment of environmental impacts arising from residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the NEMA. A risk analysis based on the characteristics and the classification set out in Regulation 4 and 5 must be used to determine the appropriate mitigation and management measures. The pollution control barrier system shall be informed by the-

- National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013; and
- National Norms and Standards for Disposal of Waste to Landfill, 2013.

In terms of the amended regulations (21 September 2018), a competent person must recommend the pollution control measures suitable for a specific residue stockpile or residue deposit on the basis of a risk analysis. The planning, management and reporting of residue stockpiles and residue deposits is shown schematically in Figure 27 below.

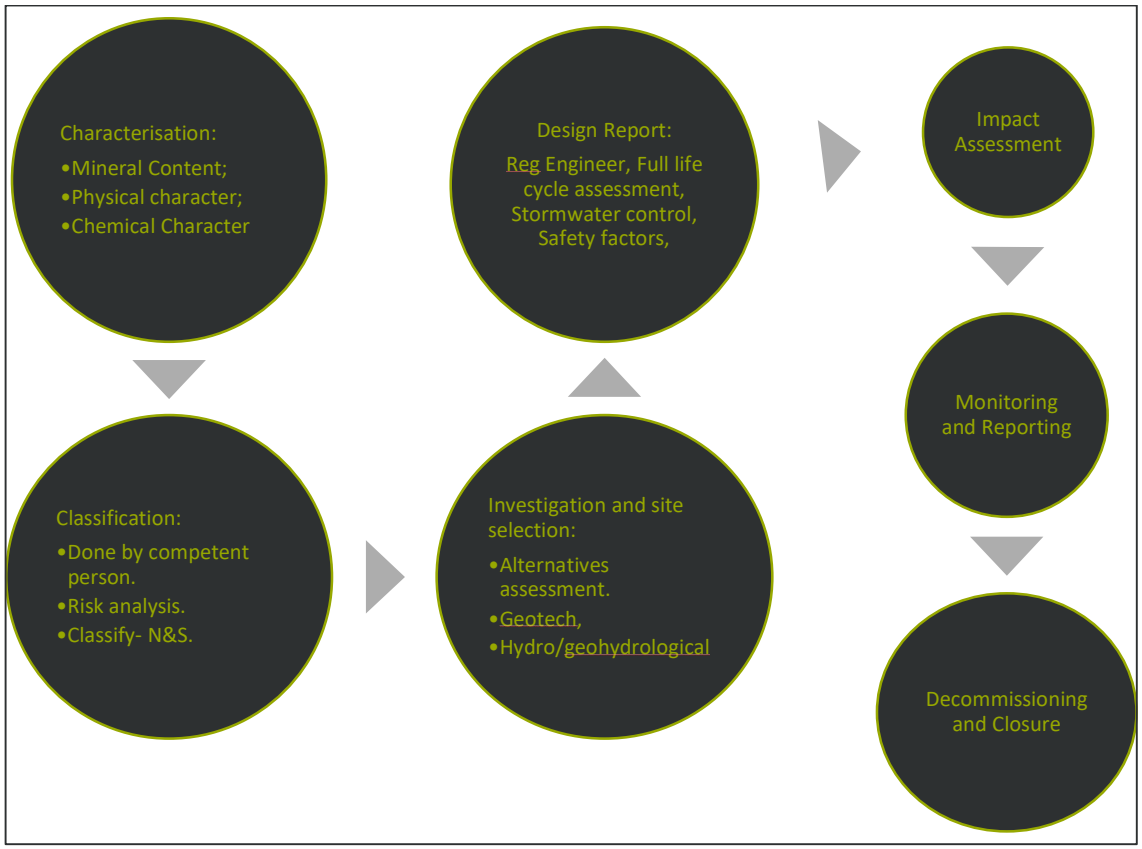

Figure 27: Overview of the planning and management of residue stockpiles and residue deposits regulations.

4.1.4.2 NEMWA NATIONAL NORMS AND STANDARDS FOR THE ASSESSMENT OF WASTE FOR LANDFILL DISPOSAL, 2013 (GN R. 635)

These norms and standards prescribe the requirements for the assessment of waste prior to disposal to landfill under section 7(1)(c) of NEMWA as well as prescribing the analysis methodology and Total Concentration and Leachable Concentration Limits. The aim of the waste assessment tests is to characterise the material to be deposited or stored in terms of the above-mentioned waste assessment guidelines set by the DEA.

4.1.4.3 NEMWA WASTE CLASSIFICATION AND MANAGEMENT REGULATIONS, 2013 (GN R. 634)

Chapter 9 of the Waste Classification and Management Regulations stipulates the requirements for a motivation for and consideration of listed Waste Management Activities that do not require a Waste Management License. The motivation must:

- Demonstrate that the waste management activity can be implemented without unacceptable impacts on, or risk to, the environment or health;
- Must provide a description of the waste;
- Description of waste minimisation or waste management plans; and
- Description of potential impacts, etc.

The transitional provisions under Chapter 6 of this Regulation prescribes timeframes in which all waste must be classified within 18 months from the date of commencement of these regulations (23 August 2013). Waste streams generated from mine activities will, where applicable, be classified accordingly to determine their nature (i.e. general or hazardous), and subsequently managed and disposed of in accordance with the relevant

legislative requirements. A waste classification was completed for the Manungu mine extension and is included as Appendix RAppendix R: Waste Classification.

4.1.4.4 NEMWA NATIONAL NORMS AND STANDARDS FOR DISPOSAL OF WASTE TO LANDFILL, 2013 (GN R. 636)

The waste has been assessed and classification of the waste type identified. The guidelines in this Regulation can were used to determine the minimum requirements for the landfill and containment barrier design. This will distinguish between Class A, Class B, Class C, or Class D landfills (where relevant) and the associated requirements (as presented in Figure 28).

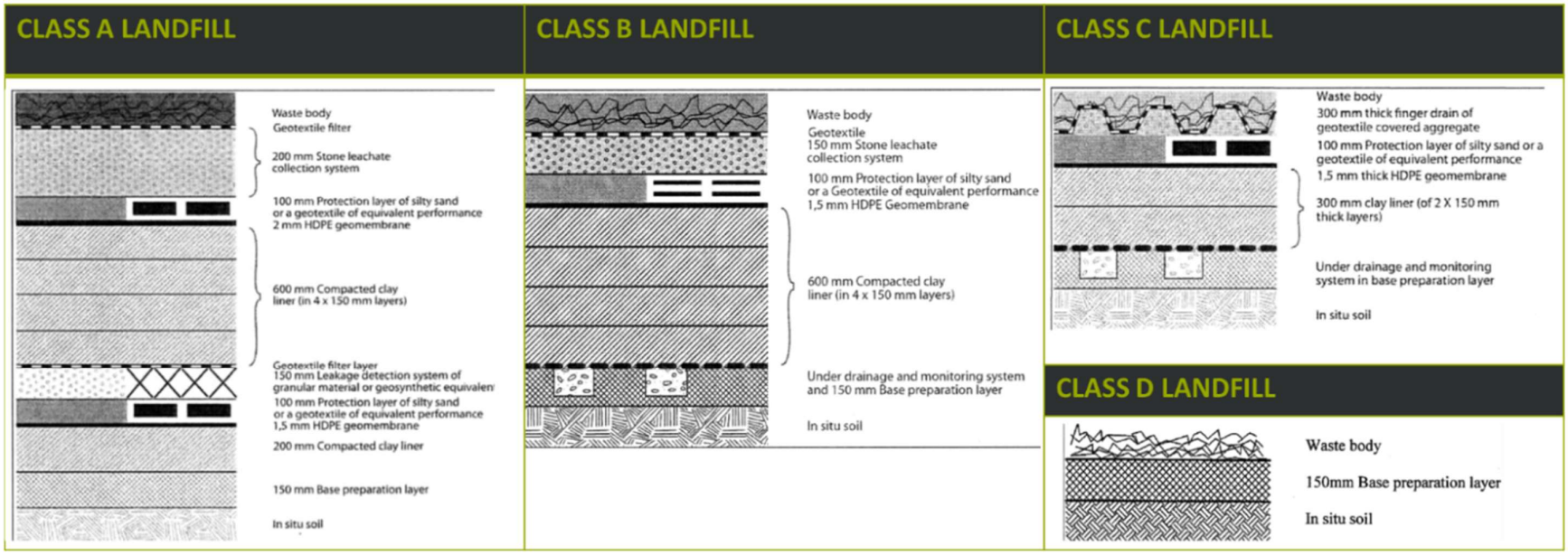

Figure 28: Overview of NEMWA Class A to D landfill containment barrier designs.

4.1.5 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT

The National Environmental Management: Air Quality Act (NEMAQA) is the main legislative tool for the management of air pollution and related activities. The Object of the Act is:

- To protect the environment by providing reasonable measures for-
    i. the protection and enhancement of the quality of air in the republic;
    ii. the prevention of air pollution and ecological degradation; and
    iii. securing ecologically sustainable development while promoting justifiable economic and social development; and
    iv. Generally, to give effect to Section 24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and wellbeing of people.

The NEMAQA (Act No. 39 of 2004 as amended) mandates the Minister of Environment to publish a list of activities which result in atmospheric emissions and consequently cause significant detrimental effects on the environment, human health and social welfare. All scheduled processes as previously stipulated under the Air Pollution Prevention Act (APPA) are included as listed activities with additional activities being added to the list. The updated Listed Activities and Minimum National Emission Standards were published on the 22nd November 2013 (Government Gazette No. 37054).

According to the Air Quality Act, air quality management control and enforcement is in the hands of local government with District and Metropolitan Municipalities as the licensing authorities. Provincial government is primarily responsible for ambient monitoring and ensuring municipalities fulfil their legal obligations, with national government primarily as policy maker and co-ordinator. Each sphere of government must appoint an Air Quality Officer responsible for co-ordinating matters pertaining to air quality management. Given that air quality management under the old Act was the sole responsibility of national government, local authorities have in the past only been responsible for smoke and vehicle tailpipe emission control.

The National Pollution Prevention Plans Regulations were published in March 2014 (Government Gazette 37421) and tie in with the National Greenhouse Gas Emission Reporting Regulations which took effect on 3 April 2017. In summary the regulations aim to prescribe the requirements that pollution prevention plans of greenhouse gases, declared as priority air pollutants, need to comply with in terms of the NEMAQA. The regulations specify who needs to comply, and by when, as well as prescribing the content requirements. Mines do have an obligation to report on the GHG emissions under these regulations. A greenhouse gas quantification for the Manungu mine extension is included in the Air Quality Assessment (Appendix N).

The National Dust Control Regulations 2013 (NDCR, 2013) are promulgated under the NEMAQA and within these regulations, the standard for the acceptable dust fall rate for residential and non-residential areas is presented in Table 12.

Table 12: Acceptable dust fall rates (National Dust Control Regulations 2013).

Restriction Areas	Dust fall rate (D) (mg/m^2/day, 30-days average)	Permitted frequency of exceeding dust fall rate
Residential area	D < 600	Two within a year, not sequential months
Non-residential area	600 < D < 1200	Two within a year, not sequential months

4.1.6 THE HIGHVELD PRIORITY AREA

The Highveld Airshed Priority Area (HPA) was declared by the Minister of Environmental Affairs at the end of 2007, requiring the development of an Air Quality Management Plan for the area. The plan (HPA, 2011) includes the establishment of emissions reduction strategies and intervention programmes based on the findings of a baseline characterisation of the area. The implication of this is that all contributing sources in the area will be assessed to determine the emission reduction targets to be achieved over the following few years.

The project is within the footprint of the Highveld Priority Area. Emission reduction strategies are included for the numerous operations in the area with specific associated targets. Included in this management plan are seven goals, each of which has a further list of objectives that has to be met.

4.1.7 THE NATIONAL HERITAGE RESOURCES ACT

The National Heritage Resources Act (NHRA) (Act 25 of 1999) stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…". The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008b):

- The NEMA 23(2)(b) states that an integrated environmental management plan should, "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".

- A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 (Fourie, 2008b).

- The MPRDA defines 'environment' as it is in the NEMA and, therefore, acknowledges cultural resources as part of the environment. Section 39(3)(b) of this Act specifically refers to the evaluation, assessment and identification of impacts on all heritage resources as identified in Section 3(2) of the National Heritage Resources Act that are to be impacted on by activities governed by the MPRDA. Section 40 of the same Act requires the consultation with any State Department administering any law that has relevance on such an application through Section 39 of the MPRDA. This implies the evaluation of Heritage Assessment Reports in Environmental Management Plans or Programmes by the relevant heritage authorities (Fourie, 2008b).

In accordance with the legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive and legally compatible Heritage Specialist Report is compiled.

4.1.8 THE NATIONAL FORESTS ACT

According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that "*no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister*."

The Manungu expansion project area is situated within the grassland biome. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

4.1.9 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT

The National Environmental Management Biodiversity Act (NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA as well as the protection of species and ecosystems that warrant national protection. Within the framework of this act, various regulations are promulgated which provide specific requirements and management measures relating to protecting threatened ecosystems, threatened or protected species as well as the control of alien and invasive species.

This Act is applicable since is protects the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;
- Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;
- Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and
- Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

The provisions of this Act have been considered and where relevant incorporated into the proposed mitigation measures and requirements of the EMPr.

4.1.9.1 NATIONAL LIST OF ECOSYSTEMS THAT ARE THREATENED AND NEED OF PROTECTION (GN 1002 OF 2011)

The NEMBA provides for listing of threatened or protected ecosystems in one of the following categories:

- Critically Endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;
- Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;
- Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and
- Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

The grassland biome comprises many different vegetation types. The Project area is situated across two different vegetation types; the Eastern Highveld Grassland (GM12) and the Soweto Highveld Grassland (GM8) vegetation types, according to Mucina & Rutherford (2006). According to Mucina & Rutherford (2006), both these vegetation types are classified as Endangered. Recommendations and mitigations measures have been proposed in the specialist report which is included as Appendix H.

4.1.9.2 THREATENED OR PROTECTED SPECIES REGULATIONS (GNR 152 OF 2007)

The purpose of these regulations is to -

(a) further regulate the permit system set out in Chapter 7 of the Biodiversity Act insofar as that system applies to restricted activities involving specimens of listed threatened or protected species;

(b) provide for the registration of captive breeding operations, commercial exhibition facilities, game farms, nurseries, scientific institutions, sanctuaries and rehabilitation facilities and wildlife traders;

(c) provide for the regulation of the carrying out of a specific restricted activity, namely hunting;

(d) provide for the prohibition of specific restricted activities involving specific listed threatened or protected species;

(e) provide for the protection of wild populations of listed threatened species; and

(f) provide for the composition and operating procedure of the Scientific Authority.

4.1.9.3 ALIEN AND INVASIVE SPECIES LIST

This Act is applicable since it protects the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;
- Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;
- Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and
- Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

The provisions of this Act have been considered and where relevant incorporated into the proposed mitigation measures and requirements of the EMPr.

4.1.10 THE SUB-DIVISION OF AGRICULTURAL LAND ACT

In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970), any application for change of land use must be approved by the Minister of Agriculture, while under the Conservation of Agricultural Resources Act (Act 43 of 1983) no degradation of natural land is permitted.

4.1.11 THE CONSERVATION OF AGRICULTURAL RESOURCES ACT

The Conservation of Agricultural Resources Act (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal. The Conservation of Agriculture Resources Act (Act 43 of 1983) requires the protection of land against soil erosion and the prevention of water logging and salinization of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.

4.1.12 THE SUB-DIVISION OF AGRICULTURAL LAND ACT

The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) promotes optimal exploitation of minerals and mineral resources. The act provides a framework for a planning system for the country. The Act introduces provisions to cater for development principles; norms and standards; inter-governmental support;

Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas; Land Use Schemes and municipal planning tribunals.

4.1.13 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT

The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) promotes optimal exploitation of minerals and mineral resources. The act provides a framework for a planning system for the country. The Act introduces provisions to cater for development principles; norms and standards; inter-governmental support; Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas; Land Use Schemes (LUS); and municipal planning tribunals.

4.1.14 NOISE CONTROL REGULATIONS

In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under GN R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. The Free State Province did promulgate provincial regulations (PN 24) in 1998.

The noise control regulations will need to be considered in relation to the potential noise that may be generated mainly during the construction and decommissioning phases of the proposed project. The two key aspects of the noise control regulations relate to disturbing noise and noise nuisance.

Section 4 of the regulations prohibits a person from making, producing or causing a disturbing noise, or allowing it to be made produced or caused by any person, machine, device or apparatus or any combination thereof. A disturbing noise is defined in the regulations as 'a noise level which exceeds the zone sound level or if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

Section 5 of the noise control regulations in essence prohibits the creation of a noise nuisance. A noise nuisance is defined as 'any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person'. Noise nuisance is anticipated from the proposed project particularly to those residents that are situated in close proximity to the project sites.

South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these regulations.

4.1.15 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

- South African National Standard (SANS) 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method';
- SANS 10181:2003. 'The Measurement of Noise Emitted by Road Vehicles when Stationary'; and
- SANS 10205:2003. 'The Measurement of Noise Emitted by Motor Vehicles in Motion'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful per se.

4.1.16 ENVIRONMENT CONSERVATION ACT

The Environment Conservation Act (Act 73 of 1989) (ECA) was, prior to the promulgation of the NEMA, the backbone of environmental legislation in South Africa. To date the majority of the ECA has been repealed by various other Acts, however Section 25 of the Act and the Noise Regulations (GNR 154 of 1992) promulgated under this section are still in effect. These regulations serve to control noise and general prohibitions relating to noise impact and nuisance.

5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

This section will examine the need and desirability of the proposed Manungu expansion project and will examine the importance of coal as a resource as well as the desirability of continuing coal mining operations at the mine.

5.1 THE IMPORTANCE OF COAL AS A RESOURCE

Coal, because of its strategic importance is one of the five minerals selected by the DMR for local beneficiation as it is considered critical to the on-going development of South Africa (Beneficiation Strategy for the Minerals Industry, June 2011). The driving force behind the emphasis of the importance of coal, coal mining and local beneficiation is primarily due to concerns voiced by Eskom over the future security of supply in both the medium and long term of the mineral to its coal fired electricity generating power stations.

South Africa's energy is predominately coal fuelled. Eskom's existing coal fired power stations are critical in terms of electricity production and in meeting the growing energy requirements of South Africa as a whole. Coal and coal supply are consequently seen as critical and its importance is detailed in the Eskom Transmission Ten Year Development Plan 2011 to 2020 (Eskom, 2011). Without steady, secure supply of the mineral, it is unlikely that Eskom will be able to meet the energy demands of the country. As a result, coal mining, beneficiation and supply is of paramount importance to South Africa for continued electricity generation in order to meet the energy demands of the country in the short, medium and long term.

Coal produced is used locally within the region and is also exported. Eskom is the largest local buyer while China is the major export buyer. Demand for coal is generally very high for both market segments. Selling prices are generally regarded as stable both currently and in the foreseeable future. Manungu Colliery's coal is currently transported by 34tonne coal haulers/side tippers to various power stations and sidings. As per Eskom's prerogative, the future coal from Manungu Colliery is intended to be delivered to Kusile Power Station once the power station is operating at full capacity.

The South African Integrated Energy Plan highlights that coal should continue to play a role in electricity generation. In addition to this, the Integrated Resource Plan (IRP2019) states that "beyond Medupi and Kusile coal will continue to play a significant role in electricity generation in South Africa in the foreseeable future as it is the largest base of the installed generation capacity and it makes up the largest share of energy generated".

5.2 MANUNGU OPEN CAST AND UNDERGROUND EXTENSION

Manungu Colliery's coal is currently transported by 34tonne coal haulers/side tippers to various power stations and sidings. As per Eskom's prerogative, the future coal from Manungu Colliery is intended to be delivered to Kusile Power Station once the power station is operating at full capacity. The extension of the mining operations at Manungu Colliery, will allow the continued contribution of the mine to favourable economic impacts on both the local and regional economies. The current approved mining area will be depleted by around 2022-2024, which will result in a loss of jobs and economic drivers in the region. Therefore, the mine extension will extend the profitability and life of the mining operation until 2042, and potentially secure the jobs of the current employees for the foreseeable future. If the Manungu mining operations were not to be extended beyond 2022-2024, the additional economic activity, skills development and available jobs would not be created and/or maintained, and the coal reserves would remain unutilised. If Tshedza were not to proceed with the proposed extension of mining, mining of these coal reserves will not necessarily be avoided, as another application in terms of the MPRDA, Act 28 of 2002 can be made by another company. Unless the government declares the area "off limits" to mining, or the demand for coal subsides, mining houses will continue to attempt to mine the

coal reserves in the area. In summary, the proposed Manungu mine project will allow the applicant to continue producing a secure, steady supply of coal until 2042 for use by Eskom's Kusile Power Station.

The needs and desirability analysis component of the "Guideline on need and desirability in terms of the EIA Regulations (Notice 819 of 2014)" includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.). Table 13 present the needs and desirability analysis undertaken for the Manungu extension project.

Table 13: Needs and desirability analysis for the Manungu project

Ref No.	Question	Answer / Reference
1	Securing ecological sustainable development and use of natural resources	
1.1	How were the ecological integrity considerations taken into account in terms of: Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities.	The following specialist studies were conducted in support of this application and investigated the ecological integrity: • Biodiversity and Wetland Study; • Hydrological Study; • Hydrogeological Study; • Hydropedological Study; • Soils and Land Use Study. The conclusions of these studies, and the identified impacts and mitigation measures are included in the EIA and EMPr. The need of the project in terms of the Nkangala District Municipal (NDM) SDF has also been considered. As per the NDM SDF, the District has considerable mining potential and mining activities should be enhanced, to contribute to job creation for poor, unskilled workers. It is further noted in the NDM SDF that a new power station in the Victor Khanye area could serve as catalyst to increased demand for coal reserves in the NDM area.
1.2	How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Biodiversity and wetland studies were conducted during both the scoping and EIA processed, refer to baseline ecological information in Section 7, and the impact assessment and mitigation measures in Section 8 of this EIA Report. Where negative impacts were identified, various mitigation measures were put forward to reduce the severity of these impacts to acceptable levels.
1.3	How will this development pollute and / or degrade the biophysical environment? What measures were explored to either avoid these impacts, and where impacts could not be avoided altogether, what	

Ref No.	Question	Answer / Reference
	measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	
1.4	What waste will be generated by this development? What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	Refer to waste generation and disposal in Section 3.2.8 of this EIA Report. Various types of waste will be generated by the mining activities including both hazardous and non-hazardous waste streams. The hierarchy of waste management has been put forward as a fundamental practice to reduce the volume of waste to landfill.
1.5	How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to baseline ecological and heritage information in Section 7, and the impact assessment and mitigation measures in Section 8 of this EIA Report. All identified sites of cultural heritage such as graves or structures, have been identified, mapped and mitigation measures put forward.
1.6	How will this project use and / or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the impact assessment and mitigation methods in Section 8 of this EIA Report. It is noted that due to the nature of this project (mining of coal), a non-renewable resource will be depleted. However in line with the Integrated Resource Plan (IRP2019) coal mining will continue to contribute significantly to the country's economy and power generation needs in the future.
1.7	How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	Refer to the impact assessment and mitigation methods in Section 8 of this EIA Report. As mentioned above, the IRP2019 has identified coal as an important resource for future energy demand. This being said, numerous mitigation measures and rehabilitation actions have been put forward to ensure that the post-mining land use will still provide economic benefits to future owners.

Ref No.	Question	Answer / Reference
1.7.1	Does the proposed project exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)?	The proposed project will rely on / depend on the extraction of a natural, non-renewable resource (coal) for selling to Eskom.
1.7.2	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used?	The proposed project will extend the life of the mine in an area where coal reserves have already been identified and are already being mined.
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The Manungu Mine is already an existing mine and the proposed project will be an extension of the existing mine partially utilising existing infrastructure. Additional / new infrastructure will be required to mine the additional coal and to enhance the quality of the product.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts:	
1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Refer to Assumptions and Limitations in Section 12.
1.8.2	What is the level of risk associated with the limits of current knowledge?	The level of risk is low - specialist studies have been conducted and all relevant information such as mitigation measures are included in this EIA report.
1.8.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Sufficient information was gathered prior to the onset of this process to indicate that the potential mining of additional coal is feasible. In addition, it is noted that this project extends a current mining operation.
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following?	
1.9.1	Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Refer to the impact assessment and mitigation measures in Section 8 in this EIA Report as well as the EMPr in Appendix T.

Ref No.	Question	Answer / Reference
1.9.2	Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Refer to Section 7 and the impact assessment and mitigation measures in Section 8 in this EIA Report.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	Refer to the impact assessment and mitigation measures in Section 8 in this EIA Report. During the operational phase of the mining operation, a negative impact on the ecological integrity of the immediate areas will occur however through the implementation of the decommissioning and rehabilitation objectives and mitigation measures, the ecological integrity will be reintroduced into the disturbed areas.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Refer to Section 9, details of the alternatives considered, and Section 5 the advantages and disadvantages of the proposed activity, of this EIA Report.
1.13	Describe the positive and negative cumulative ecological / biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Refer to Section 8 of this EIA Report.
2	Promoting justifiable economic and social development	
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following:	

Ref No.	Question	Answer / Reference
2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks or policies applicable to the area,	The Victor Khanye Local Municipality Integrated Development Plan (IDP) for the period of 2017 – 2018 details an unemployment rate of 21.6%. According to the IDP, the Municipality is highly dependent on the neighbouring Ekurhuleni Metro for job opportunities. It is noted that the land uses adjacent to the N12 Corridor should be developed as economic concentrations, capitalizing off the passers-by and the linkage it provides to regional markets. The local economy is relatively diversified with the largest sector, in terms of output as well as proportional contribution being the trade sector. The growing sector is trade sector followed by the agriculture sector and the mining sector. During recent years the total output of the agriculture sector experienced significant levels of growth while the mining and minerals sector declined. The proposed LoM extension will allow the mine to continue providing coal to industry for an extended period of time. The surrounding communities will also continue to benefit through direct and indirect income; as well as the mine's use of local contractors and suppliers.
2.1.2	Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	The mine will make use of labourers from the local community as far as possible.
2.1.3	Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	Refer to the baseline environment in Section 7 of this EIA Report.
2.1.4	Municipal Economic Development Strategy ("LED Strategy").	The proposed project will promote and support the sustainability of existing business; and assist in increasing local beneficiation and shared economic growth, through extending the life of the mine.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	Refer to the impact assessment and mitigation measures in Section 8 in this EIA Report.
2.2.1	Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	The proposed project will increase the life of mine, which will ensure that the community projects initiated by the mine will have an increased life. This will complement the local socio-economic initiatives identified for the area.

Ref No.	Question	Answer / Reference
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Refer to the proposed public participation process in Section 6 of this EIA Report.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report.
2.5	In terms of location, describe how the placement of the proposed development will:	
2.5.1	Result in the creation of residential and employment opportunities in close proximity to or integrated with each other.	Refer to Section 9, details of alternatives considered and nominated preferred alternatives.
2.5.2	Reduce the need for transport of people and goods.	
2.5.3	Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms of public transport),	
2.5.4	Compliment other uses in the area,	Refer to item 1.3 of this table (above). The proposed project entails the mining of additional areas to be accessed within an approved mining area. The existing land use and mining of coal will therefore be complimented by the continuation of the project.
2.5.5	Be in line with the planning for the area.	Refer to item 2.2.1 of this table (above).
2.5.6	For urban related development, make use of underutilised land available with the urban edge.	Not applicable. The proposed project is not located in an urban area.
2.5.7	Optimise the use of existing resources and infrastructure,	Refer to Section 3 of this EIA Report.
2.5.8	Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for	

Ref No.	Question	Answer / Reference
	the settlement that reflects the spatial reconstruction priorities of the settlement),	
2.5.9	Discourage "urban sprawl" and contribute to compaction / densification.	The proposed project will result in the continued employment of workers. Therefore, the influx of additional workers to the area as a direct result of the proposed project is not anticipated.
2.5.10	Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	Refer to items 2.5.7 – 2.5.9 of this table (above).
2.5.11	Encourage environmentally sustainable land development practices and processes	The proposed end land use will be developed in order to be environmentally sustainable in the long term.
2.5.12	Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	Refer to item 1.7.3 of this table (above). The proposed project is associated with a portion of a strategic mineral resource (coal reserve).
2.5.13	The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential).	The proposed project will allow the mine to continue contributing to the local, regional and national Gross Domestic Product (GDPs), and also on the local communities through continued employment of employees and local contractors, as well as other influences that the mine has in the community, such as contributions to community upliftment programmes that are undertaken by the mine through their SLP.
2.5.14	Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	A heritage impact assessment was conducted, refer to impact assessment in Section 8 of this EIA Report.
2.5.15	In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	The proposed project will ensure continued employment in the region, as well as projects implemented from the mine's SLP.
2.6	How was a risk-averse and cautious approach applied in terms of socio-economic impacts:	

Ref No.	Question	Answer / Reference
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	The gaps, uncertainties and assumptions are presented in Section 12.
2.6.2	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions. In fact, the extended LoM would have a positive impact in terms of employment security for the years to come.
2.6.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	As this project extends a current mining operation, and does not constitute a new mine, a cautious approach has been implemented.
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.7.1	Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report.
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report.

Ref No.	Question	Answer / Reference
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report. The mine will be in line with the regulatory requirements, provide financial provision to ensure that the mitigation measures proposed can be carried out.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	By conducting a Scoping and Environmental Impact Assessment Process, the applicant ensures that equitable access has been considered. Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Refer to the impact assessment and mitigation measures in Section 8 of this EIA Report. The timeframes within which mitigation measures must be implemented are included in the attached EMPr.
2.13	What measures were taken to:	
2.13.1	Ensure the participation of all interested and affected parties.	Refer to Section 6 of this EIA Report, describing the public participation process undertaken for the proposed project.
2.13.2	Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	Refer to Section 6 of this EIA Report, describing the public participation process implemented for the proposed project. The advertisement and site notice have been made available in English and Afrikaans to assist in understanding of the project.
2.13.3	Ensure participation by vulnerable and disadvantaged persons,	

Ref No.	Question	Answer / Reference
2.13.4	Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	A public meeting was held in the scoping phase and another will be held during EIA phase of the project. Translators will be available at the public meetings to be held to ensure that all participants can participate in a language they are able to understand (English/Afrikaans).
2.13.5	Ensure openness and transparency, and access to information in terms of the process,	
2.13.6	Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7	Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted?	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Refer to Section 6 of this EIA Report, describing the public participation process to be implemented for the proposed project.
2.15	What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Workers are educated on a regular basis as to the environmental and safety risks that may occur within their work environment, adequate measures have been taken to ensure that the appropriate personal protective equipment is issued to workers based on the areas that they work and the requirements of their job.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1	The number of temporary versus permanent jobs that will be created.	

Ref No.	Question	Answer / Reference
2.16.2	Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area).	It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period of time.
2.16.3	The distance from where labourers will have to travel.	The current workers travel from the local area to the mine and back and as such, this item is an existing aspect with no new impacts.
2.16.4	The location of jobs opportunities versus the location of impacts.	It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period.
2.16.5	The opportunity costs in terms of job creation.	
2.17	What measures were taken to ensure:	
2.17.1	That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.	The Scoping and EIA Process requires governmental departments to communicate regarding any application. In addition, all relevant departments are notified at various phases of the project by the EAP.
2.17.2	That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures.	
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Refer to Section 6 of this EIA Report, describing the public participation process to be implemented for the proposed project, as well Section 7, the impact on any national estate, in the Report.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the impact assessment and mitigation measures in Section 8 of the EIA Report.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	Manungu will provide a Bank guarantee to DMR. The amount will be calculated using the published DMR guideline document as required by section 54 (1) of the regulations *"Guideline Document for the evaluation of Quantum of Closure Related Financial Provision Provided by a Mine"*

Ref No.	Question	Answer / Reference
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Refer to Section 9, detailing the assessment of alternatives.
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to Section 8 of this EIA Report.

6 STAKEHOLDER ENGAGEMENT

The Public Participation Process (PPP) is a requirement of several pieces of South African legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their comments are considered, and a record included in the reports submitted to the Authorities. The process ensures that all stakeholders are provided this opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises to ensure and promote:

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

6.1 GENERAL APPROACH TO PUBLIC PARTICIPATION

The PPP for the proposed project has been undertaken in accordance with the requirements of the MPRDA and NEMA EIA Regulations (2014), and in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project and have their views considered and included as part of project planning.

An initial I&AP database has been compiled based on known key I&AP's, Windeed searches and stakeholder databases provided by the mine. The I&AP database includes amongst others, landowners, communities, regulatory authorities and other special interest groups.

6.1.1 LIST OF ORGANS OF STATE/ AUTHORITIES IDENTIFIED AND NOTIFIED

The following, but not limited to, Government Authorities were notified of the proposed project:

- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
- Mpumalanga Department of Economic Development and Tourism
- Mpumalanga Department of Health
- Mpumalanga Department of Human Settlement
- Mpumalanga Department of Mineral Resources
- Mpumalanga Department of Public Works, Roads and Transport
- Mpumalanga Department of Social Development
- Mpumalanga Department of Water and Sanitation
- Mpumalanga Lakes District Protection Group
- Mpumalanga Tourism and Parks Agency
- National Department of Agriculture, Forestry and Fisheries
- National Department of Environmental Affairs
- National Department of Mineral Resources
- National Department of Rural Development and Land Reform
- National Department of Water and Sanitation
- Nkangala District Municipality
- South African National Roads Agency Limited (SANRAL)
- South African Heritage Resources Agency (SAHRA)
- Eskom Holdings SOC Limited
- Transnet SOC Limited
- Victor Khanye Local Municipality

6.1.2 OTHER KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

- Birdlife South Africa
- Wildlife & Environmental Society of South Africa (WESSA)
- AFGRI
- Agri SA Mpumalanga
- Federation for a Sustainable Environment
- South African National Biodiversity Institute (SANBI)
- Homeland Mining & Energy SA (HMESA)
- Endangered Wildlife Trust

6.1.3 INITIAL NOTIFICATION (NOTICES, ADVERTISEMENTS, AND BACKGROUND INFORMATION DOCUMENT)

The PPP commenced on the 20th of July 2018 with an initial notification and call to register for a period of 30 days, ending on the 20th of August 2018. The initial notification was given in the following manner:

6.1.4 REGISTERED LETTERS, FAXES AND EMAILS

Notification letters (English and Afrikaans), faxes, and emails were distributed to all pre-identified key I&APs including government organisations, NGOs, relevant municipalities, ward councillors, landowners and other organisations that might be affected.

The notification letters included the following information to I&APs:

- List of anticipated activities to be authorised;
- Scale and extent of activities to be authorised;
- Information on the intended mining operation to enable I&APs to assess/surmise what impact the activities will have on them or on the use of their land;
- The purpose of the proposed project;
- Details of the affected properties (including details of where a BID and locality map could be obtained);
- Details of the relevant MPRDA and NEMA Regulations;
- Initial registration period timeframes; and
- Contact details of the EAP.

6.1.5 BACKGROUND INFORMATION DOCUMENT (BID)

A BID in English was prepared and distributed by post e-mails and made available on the EIMS website (www.eims.co.za). The BID contains the following information:

- Project name;
- Applicant name;
- Project location (including map of study area);
- Description of the EA application process, EIA flow chart, and public participation process;
- Information on future document review opportunities;
- A detailed questionnaire/I&AP registration form; and
- Relevant EIMS contact person for the project.

6.1.6 NEWSPAPER ADVERTISEMENTS / GOVERNMENT GAZETTE

Advertisements describing the proposed project and EIA process were placed in newspapers with circulation in the vicinity of the study area. The initial advertisements were placed in the Mpumalanga Provincial Gazette (in English) on the 20th July 2018 and in the Streeknuus (in English and Afrikaans) on the 20th of July 2018. The newspaper adverts included the following information:

- Project name;
- Applicant name;
- Project location;

- Nature of the activity; and
- Relevant EIMS contact person for the project.

6.1.7 SITE NOTICE PLACEMENT

Six (6) A2 Correx site notices in English and Afrikaans were placed at 6 locations along and within the perimeter of the proposed project area on the 17th of July 2018 during the initial notification. The on-site notices included the following information:

- Project name;
- Applicant name;
- Project location;
- Map of proposed project area;
- Project description;
- Legislative requirements; and
- Relevant EIMS contact person for the project.

6.1.8 POSTER PLACEMENT

A3 posters in English and Afrikaans were placed local public gathering places in town near the study area (Delmas). The notices and written notification afforded all pre-identified I&APs the opportunity to register for the project as well as to submit their issues/queries/concerns and indicate the contact details of any other potential I&APs that should be contacted. The contact person at EIMS, contact number, email and faxes were stated on the posters. Comments/concerns and queries were encouraged to be submitted in either of the following manners:

- Electronically (fax, email);
- Telephonically; and/or
- Written letters.

6.2 AVAILABILITY OF SCOPING AND EIA REPORT NOTIFICATION

Notification regarding the availability of the Scoping and EIA Reports for public review was given in the following manner to all registered I&APs (which includes key stakeholders and landowners):

- Registered letters with details on where the scoping report could be obtained and/or reviewed, notification of the public meeting as well as the public review comment period;
- Facsimile notifications with information similar to that in the registered letter described above; and/or
- Email notifications with a letter attachment containing the information described above.

The scoping report was made available for public review from the 13 July 2019 until of 14 August 2019 for a period of 30 days. A public meeting was held during the scoping report review period and took place at the Delmas Country Club from 16H00-18H00 on the 7th of August 2019.

The EIA report will be made available for a 30-day review period from 17 January 2020 to 17 February 2020.

6.3 PUBLIC MEETING

A scoping phase public meeting was held on 7th of August 2019. The main objectives of the meeting were to share available information with the I&APs, and to provide the I&APs with the opportunity to ask questions,

raise potential issues and concerns, and make comments on the proposed project. Meeting notes are presented in Appendix B. Notifications regarding the public meeting were sent out via email, registered mail and SMS. A second public meeting will be scheduled during the review period of the EIA report.

6.4 PUBLIC PARTICIPATION

Comments raised to date have been addressed in a transparent manner and included in the Public Participation Report (Appendix B). The main comments to date are with respect to impact of blasting and vibration, groundwater impacts, dust and impacts on the receiving natural environment.

7 ENVIRONMENTAL ATTRIBUTES AND BASELINE ENVIRONMENT

This section of the EIA Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area as well as previous specialist reports undertaken for the Manungu Colliery. EIA specialist studies have been completed and their respective reports are included as appendices to this report. Use of baseline information from the EMPr compiled by Geovicon Environmental (Pty) Ltd is also acknowledged as well as baseline information provided in the mine's current IWWMP compiled by Geo Soil and Water. Additional information is sourced from recent water and dust monitoring reports completed by Geo Soil and Water and The Biodiversity Company as well as the 2018 heritage survey completed for the mining right area by PGS Heritage.

7.1 LOCATION

Manungu Colliery is situated approximately 10km south of Delmas off the R42 road in the Victor Khanye Local Municipality which is situated in the Nkangala District Municipality (Mpumalanga Province, South Africa). The current Manungu Colliery operations are situated on portions of the farms Weilaagte 271 IR and Welgevonden 272 IR. The mine has been in operation and producing coal since early 2015.

7.2 TOPOGRAPHY

The proposed project area is located in the Victor Khanye Local Municipality whose landscape is characterised by flat to gentle topography of grassland and cultivated land. Steeper slopes are found to the north of Delmas in the direction of the Bronkhorstspruit Dam. The most prominent natural feature of the Victor Khanye Local Municipality is the Skurweberg Mountain, so named for the ancient seabed from the Godwana period. The topography of the area does not pose any significant obstacles to development. A number of rivers/ spruits transverse the municipal area with the Koffiespruit, Wilge, and Kromdraaispruit being the most prominent. These generally drain in a northerly direction. Regionally, Delmas sits within the sub-water management area of the Upper Olifant's (IDP, 2017).

Slopes in the area are more or less 1:1000 throughout the site. A perennial stream flows through the mining right area in a northern direction towards the town Delmas situated approximately 10km from the site. The perennial stream eventually flows into the Bronkhorstspuit River approximately 8 km from Delmas. A wetland is situated in the central part of the mining right area, forming part of the stream system flowing through the site. Regional drainage occurs in a northerly direction. A topographical map is included as Figure 29.

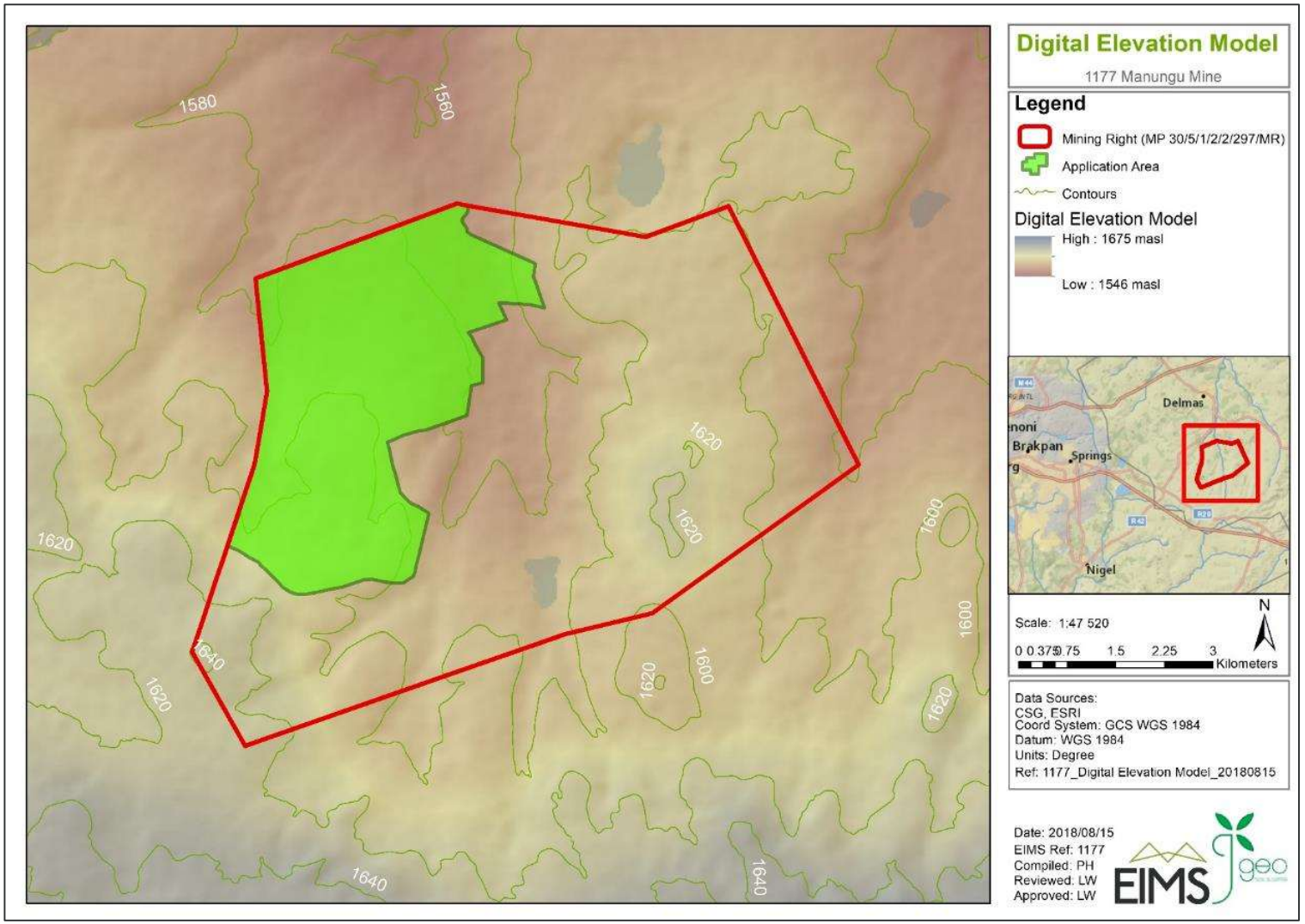

Figure 29: Topography / digital elevation model.

7.3 GEOLOGY

Information in this section was sourced from the 2007 Geohydrological Assessment Report compiled by GEO Pollution Technologies (Pty) Ltd (GPT).

The study area falls within the 2628 East Rand 1:250 000 geology series map and is situated in the Highveld Coalfield, approximately 10km south of the town of Delmas, Mpumalanga Province. The area is characterised by consolidated sedimentary layers of the Karoo Supergroup, consisting mainly of sandstone, shale and coal beds of the Vryheid Formation of the Ecca Group, with minor outcrops of the Dwyka Group occurring in the north. The Karoo sedimentary layers in the area are underlain by dolomite rocks and weathered soil derivates of the Malmani Subgroup of the Chuniespoort Group, which forms part of the Transvaal Supergroup. Minor outcrops of the Hospital Hill Subgroup are also present in the area. Deposits of alluvial sands are found in low laying areas in the central part of the study area. Jurassic dolerite intrusions occur throughout the area in the form of dykes and sills.

The Malmani Subgroup consist of chert-bearing dolomite alternating with chert-free dolomite formations. These materials result in development of karst subsurfaces landscapes, associated with a highly irregular and voided bedrock profiles, as well as heterogenic soil conditions. The soil cover often comprises horizons of highly erodible soils, which can easily erode by downward percolating water to create leached or voided zones, which may result in the formation of sinkholes or dolines (Brink, 1979).

The Ecca Group, which forms part of the Karoo Supergroup, comprises of sediments deposited in shallow marine and fluvio-deltaic environments with coal accumulated as peat in swamps and marches associated with these environments. The sandstone and coal layers are normally reasonable aquifers, while the shale serves as aquitards. Several layered aquifers perched on the relative impermeable shale are common in such sequences.

The generally horizontally disposed sediments of the Karoo Subgroup are typically undulating with a gentle regional dip to the south. The extent of the coal is largely controlled by the pre-Karoo topography. Steep dips can be experienced where the coal buts against the pre-Karoo hills. Displacement, resulting from intrusion of dolerite sills, are common. Abundant dolerite intrusions are present in the Ecca sediments. These intrusions comprise sills, which vary from being concordant to transgressive in structure, and feeder dykes. Although these structures serve as aquitards and tend to compartmetalise the groudwater regime, the contact zone with the pre-existing geological formations also serve as groundwater conduits. There are common occurances of minor slips or faults, particularly in close proximity to the dolerite intrusives. Within the coalfield, these minor slips, displacing the coal seam by a matter of 1 to 2 metres, are likely to be commonplace.

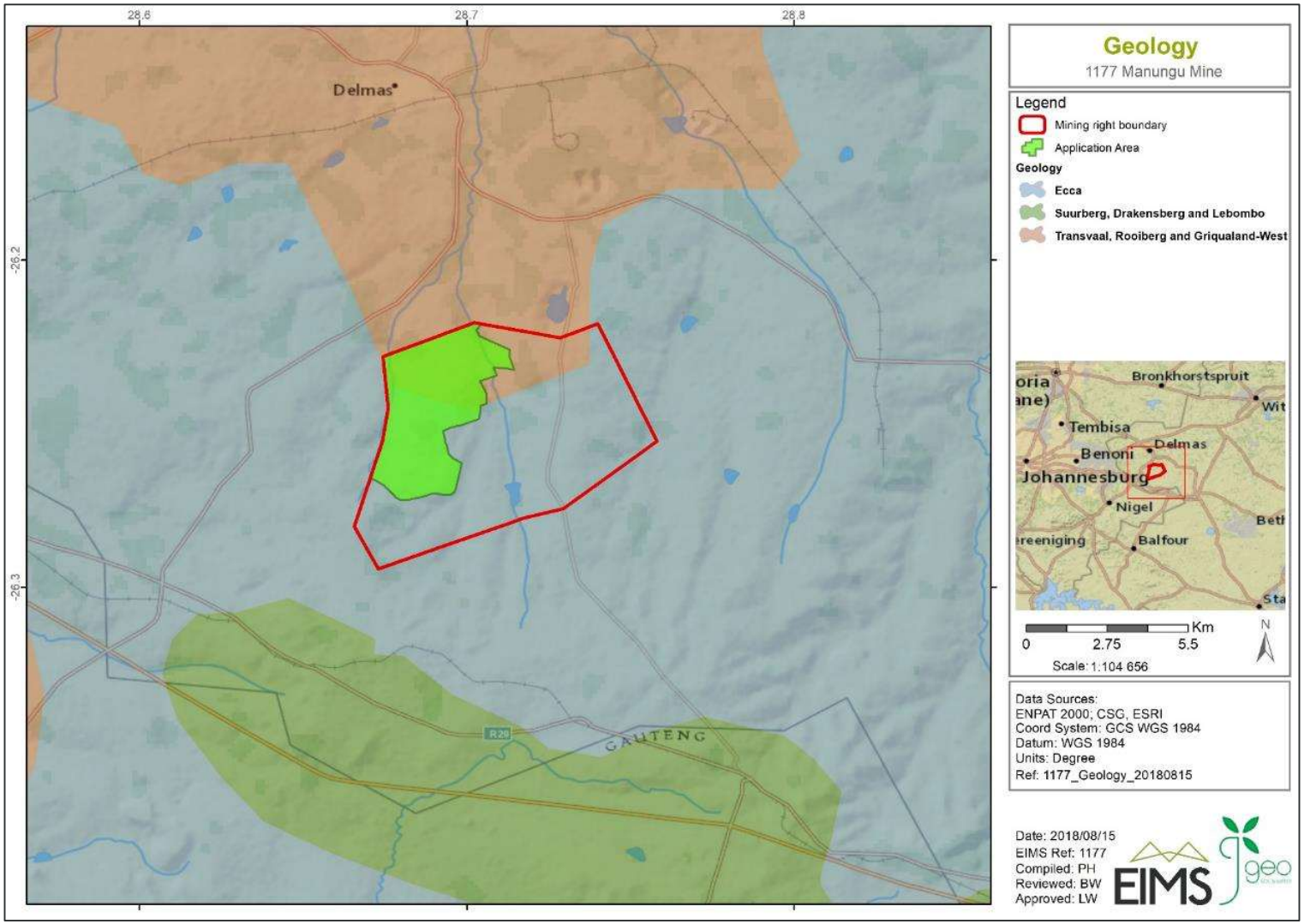

Figure 30: Regional geological map.

7.4 CLIMATE

The climate is typical Highveld with a mean annual rainfall of between 600 and 800 mm. Average maximum temperature ranges between 25°C and 29°C and the mean minimal temperature between -1.9°C and 2.0°C. It is also stated in the IDP (2017) that, global climate change will impact upon the province, specifically on agriculture, water resources, biodiversity, forestry and human health. Nearly 9% of the province's ecosystems are endangered, some critically so. 9% of land in the province is degraded; 35.8% of land has been transformed, primarily within the grassland biome; and 33% of the provincial river types are critically endangered. Hence, responsible and sustainable development, as well as proper environmental management and conservation is paramount.

7.5 SOCIO-ECONOMIC

The following section provides a summary of the social and economic environment that may be influenced by the proposed project. Information in this section was sourced from Stats SA and the Integrated Development Plans (IDP's) for the Victor Khanye Local Municipality as well as the Nkangala District Municipality. The information provided in the IDP's and the Stats SA website are based on a 2011 National census[5].

According to the National Environmental Management Act (NEMA, 1998) environment refers to the surroundings in which humans exist. When viewing the environment from a socio-economic perspective the question can be asked what exactly the social environment is. Different definitions for social environment exist, but a clear and comprehensive definition that is widely accepted remains elusive. Barnett & Casper (2001) offers the following definition of human social environment:

> *"Human social environments encompass the immediate physical surroundings, social relationships, and cultural milieus within which defined groups of people function and interact. Components of the social environment include built infrastructure; industrial and occupational structure; labour markets; social and economic processes; wealth; social, human, and health services; power relations; government; race relations; social inequality; cultural practices; the arts; religious institutions and practices; and beliefs about place and community. The social environment subsumes many aspects of the physical environment, given that contemporary landscapes, water resources, and other natural resources have been at least partially configured by human social processes. Embedded within contemporary social environments are historical social and power relations that have become institutionalized over time. Social environments can be experienced at multiple scales, often simultaneously, including households, kin networks, neighbourhoods, towns and cities, and regions. Social environments are dynamic and change over time as the result of both internal and external forces. There are relationships of dependency among the social environments of different local areas, because these areas are connected through larger regional, national, and international social and economic processes and power relations."*

The environment influences and constrains behaviour, but behaviour also leads to changes in the environment. The impacts of a project on people can only be truly understood if their environmental context is understood. The baseline description of the social environment will include a description of the area within a provincial, district and local context that will focus on the identity and history of the area as well as a description of the population of the area based on a number of demographic, social and economic variables.

The following, Table 14, presents a summary of the socio-economic aspects which may have a bearing on the proposed project (source: Victor Khanye Local Municipality IDP).

Table 14: Summary of the socio-economic aspects

Aspect	Victor Khanye Local Municipality
District Municipality	Nkangala District Municipality
Province	Mpumalanga Province

[5] It is acknowledged that this data may be outdated as no more recent census has been undertaken (Stats SA) and in addition, the municipal IDP (reviewed in 2015/2016) is informed by the 2011 census data.

Aspect	Victor Khanye Local Municipality
Municipal Area Size	1 567km^2
Number of Wards	9 Wards
Population Size	75 452 individuals
Number of households	20 548
Estimated growth/change in population size from 2001	33.9% increase
Population composition	82% of the population is made up of African black people, followed by 16% of white people, 1% colored people and 1% Asia or other cultures.
Languages	The most prevalent language spoken is IsiNdebele, spoken by approximately (57%) of the population, followed by IsiZulu (33%) and Afrikaans (2%).
Age	The highest percentage of the population (67%) is in the economically active group of 15-64 years old category, with the majority which are under 35 years of age.
Gender	The ratio-percentage of males to females is 51:49, thus currently marginally in favor of males.
Education	Statistics show that 25% of the population above 15 years of age has had no schooling or did not complete primary school. Approximately 5 528 individuals are illiterate, and a further 4% of the population did not complete the schooling curriculum or matriculated.
Land use	The dominant land use is commercial agriculture and mining activities.
Housing	According to the most recent statistics, 79.2% of the households within the Victor Khanye Local Municipality live in formal dwellings/structures, 15.4% in informal dwellings, and the remainder in other forms of housing (e.g. flatlets/rooms or caravans).
Urban development	78.3% of the municipal area comprises of urban area, 21.7% of farmlands and 21.7% of rural areas.
Energy	<u>Lighting:</u> 84.9% Electricity; 13.1% Candles; 0.7% Gas/Paraffin; 0.3% Solar Energy; 0.3% None <u>Heat:</u> 43.9% Electricity; 31.6% Coal; 6.9% Wood;

Aspect	Victor Khanye Local Municipality
	2.7% Gas; 2.3% Paraffin; 0.2% Solar Energy; 0.1% Other sources of energy; and 12.2% None. <u>Cooking:</u> 63.5% Electricity; 18.7% Coal; 8.2% Paraffin; 5.6% Wood; 3.4% Gas; 0.3 % Other; and 0.4% None
Access to water	Most households in the municipality (48.4%) have access to piped water in their dwellings, with 34.8% of the households having access to piped water in their yards. Only 4.3% of the households do not have access to piped water.
Nearby towns	Abor, Argent, Delmas and Brakfontein. The municipal area is also located close to metropolitan areas of Tshwane and Ekurhuleni to the west.
Percentage employment	28.9% of households receive income.
Percentage unemployment	11.4% of the population is unemployed; 3.3% of the population are considered discouraged work seekers; and 25.7% of the population are not economically active.
Largest Employing sector	Trade (18.7%); Agriculture (18.2%); and Community Services (14.3%).
Largest economic contribution	Agriculture, transport, community services, finance and mining are the main contributors to the Victor Khanye Local Municipality economic growth. As per the statistics reflected in the IDP, the annual maize production is calculated between 230 000 and 250 000 metric tons. Mining activities are concentrated in coal and silica. About 3 million metric tons of coal and 2 million metric tons of silica are mined annually within the municipal area.
Tourism	The Victor Khanye Local Municipality is a point of entry into the Mpumalanga province from Gauteng. The province of Mpumalanga comprises of unique scenery, and is home to the world-renowned Kruger National Park and many others. Mpumalanga is the only province of South Africa which borders 2 provinces of Mozambique and all 4 districts of Swaziland.

7.6 CULTURAL AND HERITAGE RESOURCES

PGS Heritage (Pty) Ltd (PGS) was contracted to undertake a cultural heritage impact assessment for the Manungu Colliery in 2018. The fieldwork was conducted from the 10th – 11th of January 2018. During the field assessment, a total of 12 heritage sites of significance were identified in the mining right area. These include 7 burial grounds (MN001, MN002, MN003, MN005, MN007, MN008 and MN012) and 5 structures (MN004, MN006, MN009, MN010 and MN011) (refer to Figure 31).

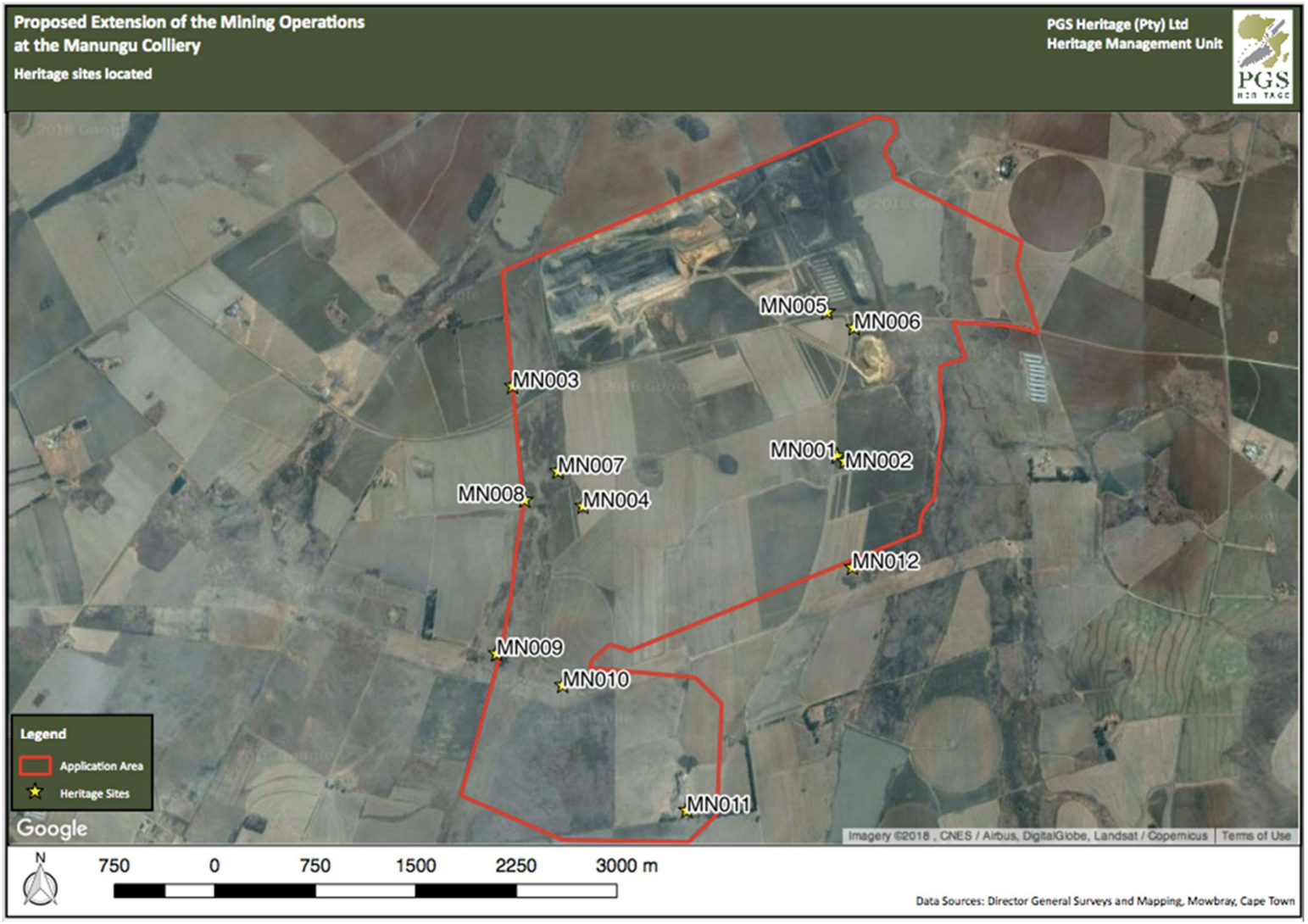

Figure 31: Heritage sites based on 2018 survey

7.7 PALAEONTOLOGICAL RESOURCES

Information in this section was sourced from the 2018 Palaeontological Impact Assessment undertaken by Banzai Environmental (Pty) Ltd on behalf of PGS for the Manungu Colliery. The proposed development footprint of the Manungu Colliery is entirely underlain by sedimentary rocks of the Permo-Carboniferous Dwyka Group; Permian aged Vryheid Formation, (Ecca Group, Karoo Supergroup); Jurassic aged Dolerite (Karoo Supergroup) and Quaternary superficial deposits. The Permo-Carboniferous Dwyka Group forms is the oldest deposits in the Karoo Supergroup. This Group is characterized by the presence of trace fossils (track ways, coprolites), body fossils of marine fish, gastropods and invertebrates as well as fossil plants. The rocks of the Dwyka are of low palaeontological sensitivity. The Vryheid Formation of the Ecca Group is world renowned for the presence of coal beds which has been formed due to the accumulation of plant material over long periods of time. The sedimentary rocks of the Vryheid Formation have a very high palaeontological sensitivity.

Coal is formed from ancient compressed and altered plant material so coal itself is of little interest palaeobotanically, but well-preserved plant material is commonly found in the shales associated with the coal seams. From the palaeontological perspective there is little chance of finding good fossils in the surface deposits because they would be badly weathered if present. During a thorough field survey of the proposed development footprint no fossils were found. Mining thus far, has also not recovered any fossils. For this reason, a moderate palaeontological sensitivity is allocated to the development footprint. However, although fossils occurrences are generally uncommon, a single fossil may scientifically be very important as many fossil taxa are known from a single fossil. Furthermore, it was found that the area has been disturbed by agricultural activities. There were no records of fossil plants from this area. Published books, papers and reports and unpublished records housed at the Bernard Price Institute for Palaeontological Research, University of the Witwatersrand, were previously consulted. Fossil plants will be associated with the coal, but it is unlikely that they are of great importance.

7.8 SOILS

Mucina *et al.* (2005) describe the general soils of the area (Eastern Highveld Grassland) as red to yellow soils that are associated with the Ba (30%) and Bb (65%) land types. These land types are found on shale's and sandstones of the Madzaringwe Formation of the Karoo Supergroup. According to Schulze (1997) the sandy-clay-loam soils of higher lying areas are mostly deep, ranging between 750 to 1000 mm, and these are mostly ploughed. The dominant soils forms are Hutton, Avalon, Mispah and Clovelly (Schulze 1997). The clay and sandy-clay soils of lower-lying areas along water courses are mostly between 800 to 1200 mm deep (Schulze 1997). The dominant soils forms are Arcadia, Mayo and Swartland. The dominant soils in the area in terms of the Environmental Potential Atlas (ENPAT 2000) are shown in Figure 32.

The Biodiversity Company was commissioned to conduct a comprehensive soil assessment for the Manungu Colliery. An assessment of the agricultural potential of the soil was conducted from the 15th – 22nd of January 2018. During the survey, six (6) dominant soil forms were identified, namely Katspruit, Tukulu, Milkwood, and Bonheim which makes up the bulk of the wetlands within 500m from the project boundaries. Soil forms outside of the delineated wetland areas include Oakleaf and Inhoek as well as areas characterised by disturbed land (areas influenced by current and historic impacts originating from mine related activities).

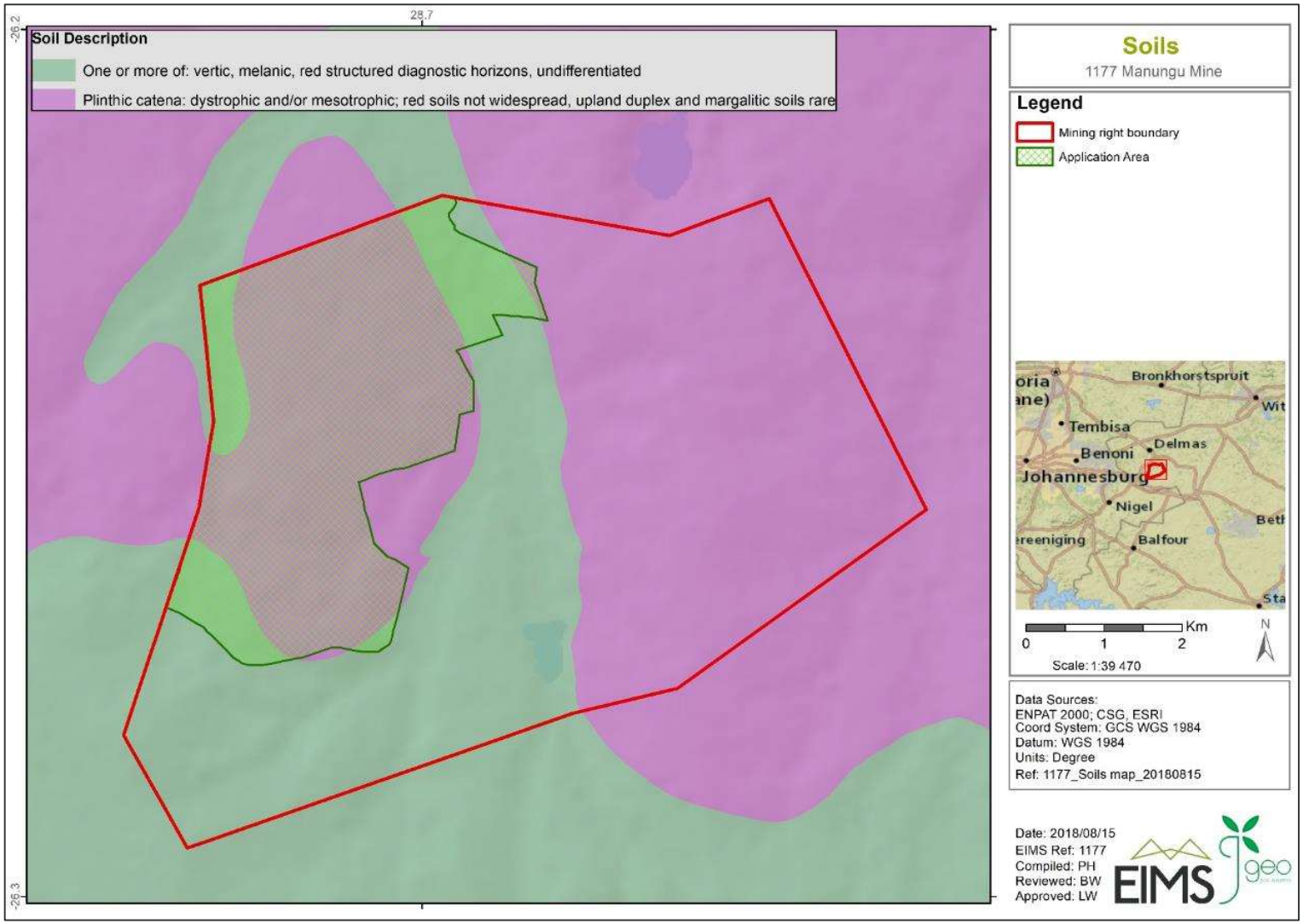

Figure 32: Soils map (ENPAT 2000).

7.9 LAND CAPABILITY

A study undertaken by The Biodiversity Company in 2018 on the land capability found that all of the soils within wetland areas have been rated a land capability score of “V” (Vlei) except for Tukulu “wet” and Bonheim which has been rated a land capability of class “IV” (Light Cultivation/ Intensive Grazing). The Mispah soil form has been rated a score of “VI” (Moderate Grazing). The non-wetland areas however have been scored a land capability rating of “III” (Moderate Cultivation) due to the lack of clay within the topsoil and the depth of the soil profile.

7.10 LAND USE / LAND COVER

The project area is approximately 500ha in size with agriculture taking up approximately 25% of the space and wetlands taking up the other half. The dominant land use within the study area is agricultural use in the form of dry land maize productions. Other land uses include current mining, small scale industrial (including the Fournel Factory – I&AP) as well as stock farming (refer to Figure 33)..

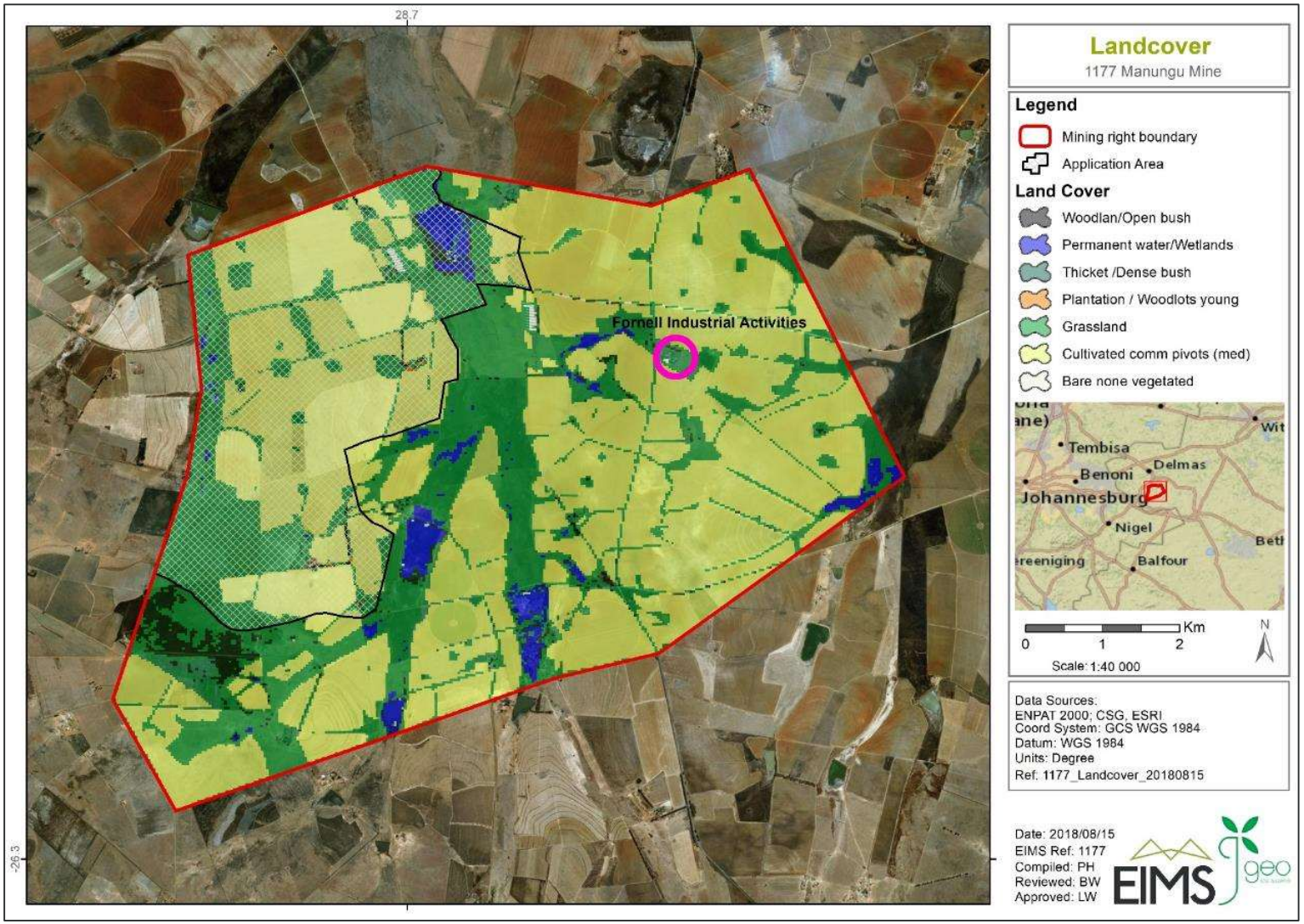

Figure 33: Land use / land cover map.

7.11 FLORA

The information in this section was sourced from the updated biodiversity assessment which was conducted by The Biodiversity Company in 2018. It is widely recognised that to conserve natural resources it is of the utmost importance to maintain ecological processes and life support systems for plants, animals and humans. To ensure that sustainable development takes place, it is therefore important that possible impacts on the environment are considered before relevant authorities approve any development.

The mining right area is situated within the Themeda Veld type, as described by Acocks (1988), or the Moist Clay Highveld Grassland of Low & Rebelo (1996). According to the vegetation map of South Africa, the area falls within the Soweto Highveld Grassland and Eastern Highveld Grassland vegetation types. The conservation statuses of both the Soweto Highveld Grassland and Eastern Highveld Grassland are described as endangered with a conservation target of 24%. A significant portion of the vegetation type has been transformed to cultivated lands, urban areas or plantations. Intensive grazing and the use of freshwater pans as drinking pools for livestock cause major damage to the wetland vegetation (Mucina & Rutherford 2006). The vegetation distribution of the site and surrounding areas is shown in Figure 34.

A large area within the proposed project site has been ploughed for mainly maize agriculture. Five plant communities / habitat types were identified, namely: Moist Grassland, Disturbed Moist Grassland, Wetland and Spruits, Pans and Agriculture. Of these the Moist Grassland, Wetlands and Spruits and Pans have a high ecological sensitivity. Natural vegetation that remains on the site can be related to wetlands, with high sensitivity. A map showing all Critical Biodiversity Areas (CBAs) is included in Figure 35.

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 393 plant species are expected to occur in the area. Of the 393-plant species, five (5) species are listed as being SCC namely: *Khadia beswickii, Indigofera hybrida, Pachycarpus suaveolens, Delosperma leendertziae* and *Habenaria bicolor*.

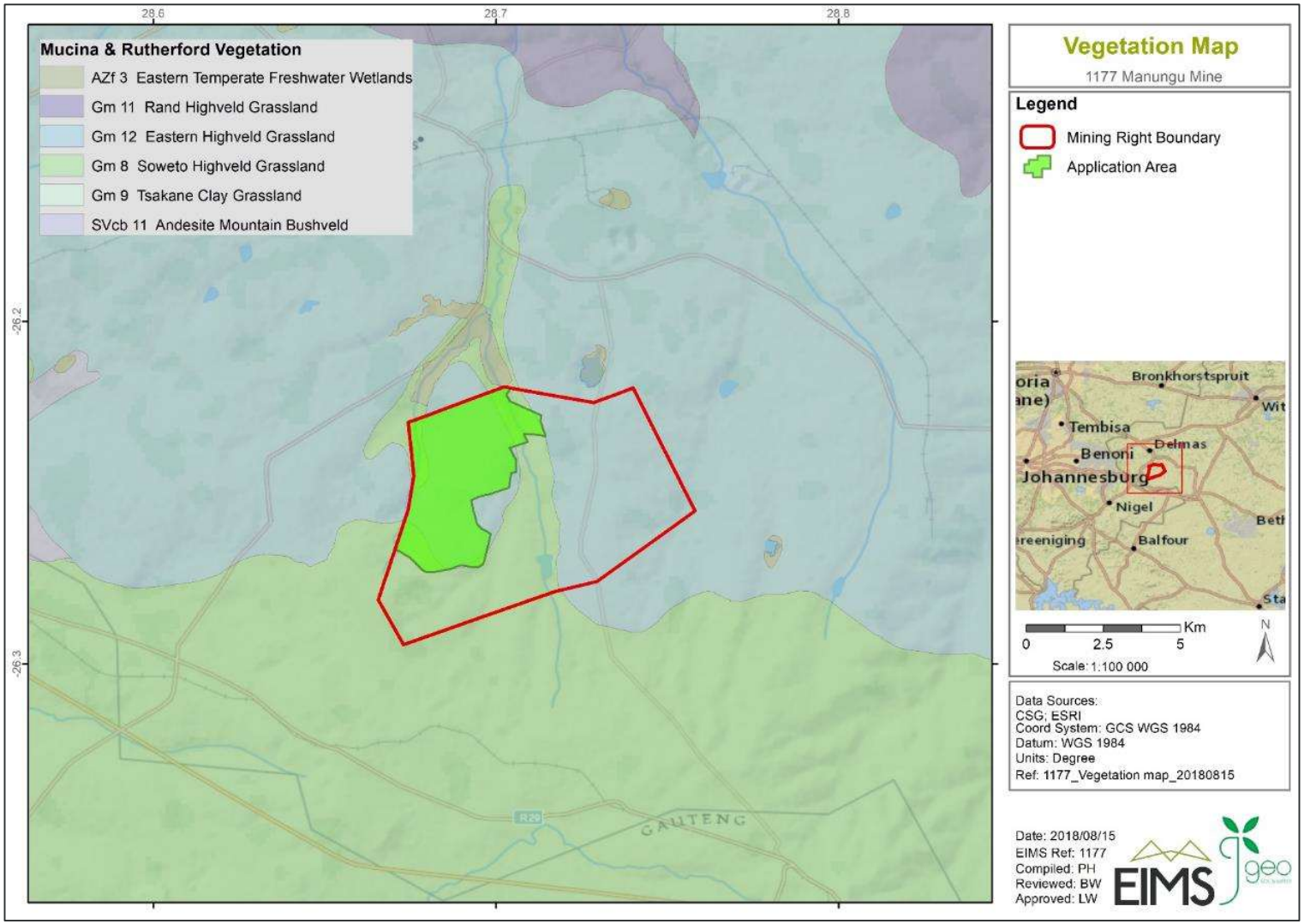

Figure 34: Vegetation map.

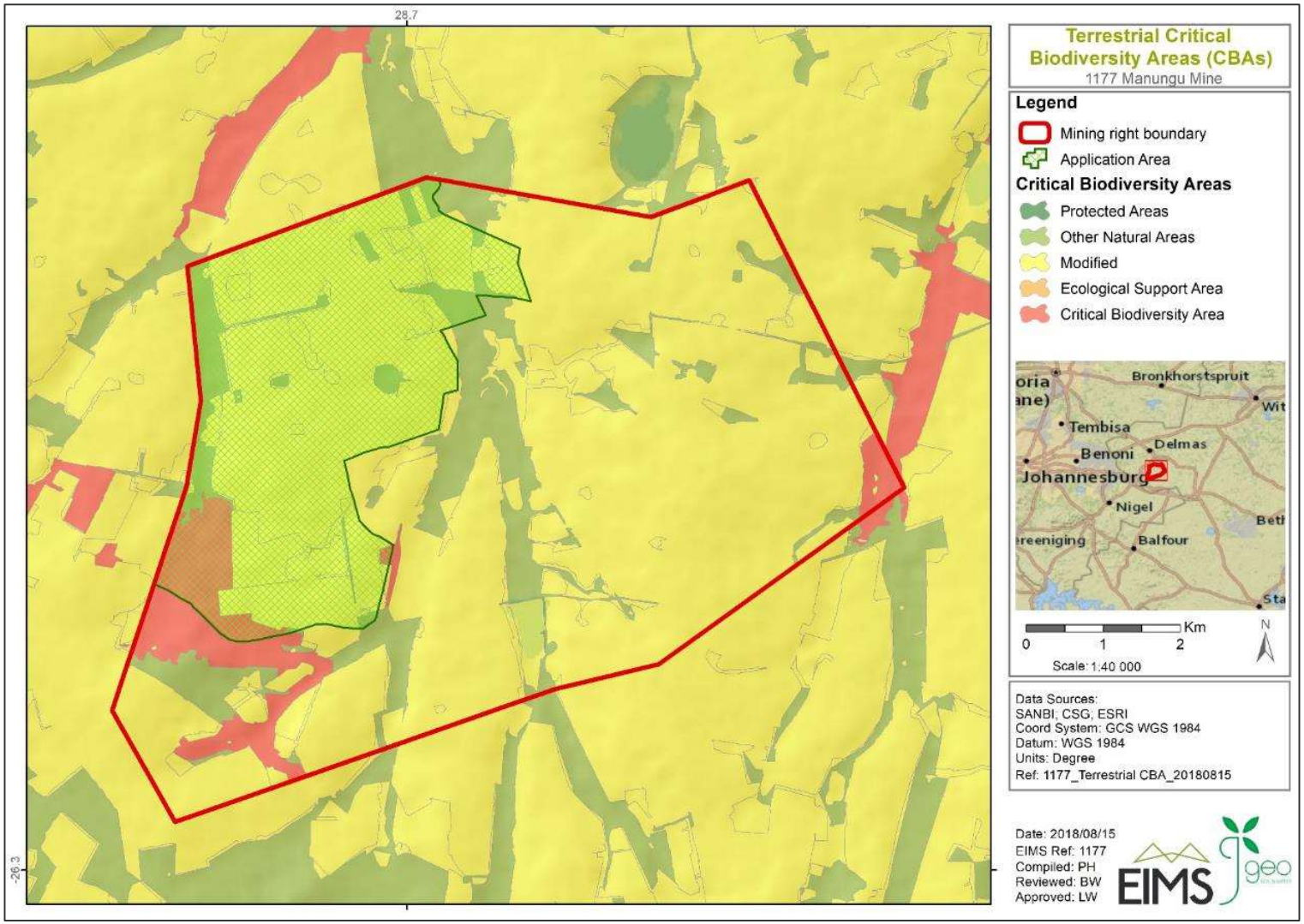

Figure 35: Terrestrial Critical Biodiversity Areas (CBA) map.

7.12 FAUNA

Based on a previous Biodiversity Assessment undertaken within the mining right area (Ferguson, Bredenkamp, Jacobs & Verburgt, 2008), the Manungu mining area is predominantly a maize farming area and as such limited habitat exist for wildlife. The flat highveld grassland terrain causes the mammal diversity to be rather low in the area, with most of the noteworthy mammals being found around the wetlands. An updated Biodiversity Impact Assessment study was undertaken by The Biodiversity Company in 2018. Much of the Project area is identified as being heavily modified, although a portion of the south-western Project area overlaps with a CBA: Optimal and a few other areas area classified as other natural areas. Overall, mammal diversity in the project area was considered high, with 18 mammal species being recorded during the January 2018 survey based on either direct observation, camera trap photographs or the presence of visual tracks & signs. Three mammal Species of Conservation Concern (SCC) were recorded in the project area. Serval (*Leptailurus serval*) were encountered on a number of occasions during the survey, and it appears that a healthy population of these threatened mammals occur within the project area. Similarly, there seems to be healthy populations of Cape Clawless Otters (*Aonyx capensis*) and Vlei Rat (*Otomys auratus*) along the wetland areas and in the dams within the project area and adjacent to it. Six reptile species were recorded in the project area during the January 2018 survey. One near-endemic snake and one endemic snake species were recorded in the project area.

The bird life within the Manungu mining area is rather low when compared to the area involved. This is mainly due to a lack of any woodland vegetation and a large proportion of the bird species encountered are associated with water and wetlands. A total of 173 bird species are regularly found within the area, with 76 bird species recorded in the project area during the January 2018 survey based on either direct observations, or the presence of visual tracks & signs. No bird SCC were recorded during the survey, although based on the various wetland habitats encountered in the project area, the likelihood that bird SCC occur there is rated as high. Many important roosting and nesting sites were noted during the survey around wetland and marsh areas.

7.13 SURFACE WATER

An updated surface water assessment was undertaken by BEAL in 2018 as part of the EIA phase of this application. The project site is located within the B20A sub-catchment (Figure 36), which is part of the head waters of the Olifants River. The main perennial stream flows through the middle of the mining right area in a northerly direction and is a tributary of the Bronkhorstspruit. The main disturbances within the stream include two large farm dams, as well as two large bridges. Agriculture and mining currently are the main impacts on the aquatic environment. The Western and Eastern stream catchments are undeveloped and consists mostly of impacted grasslands and dry land agriculture. The two catchments are not impacted by mining upstream of Manungu Colliery. The surface water attributes within and surrounding the study area are depicted in Figure 37.

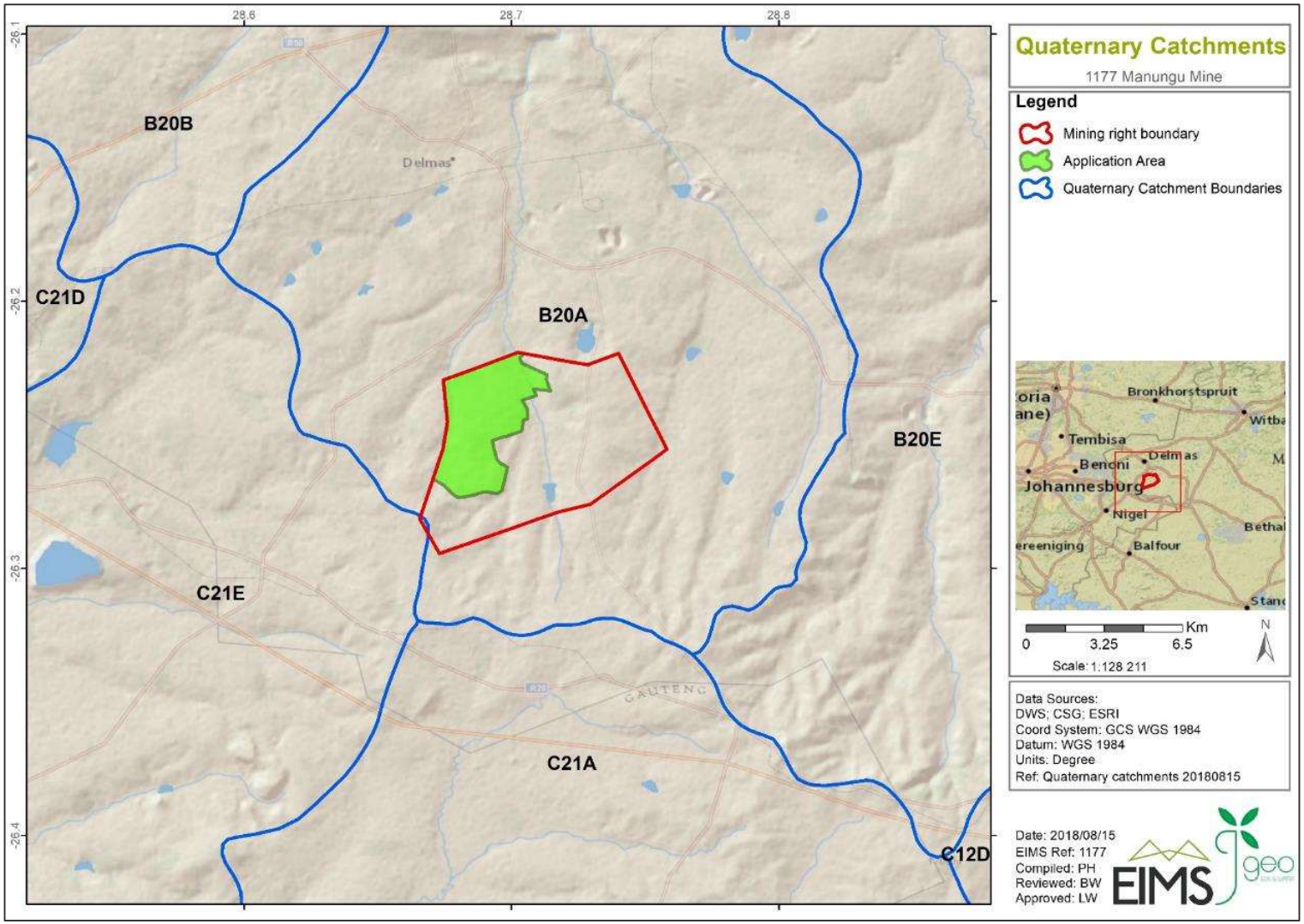

Figure 36: Quaternary catchments in relation to the mining right area.

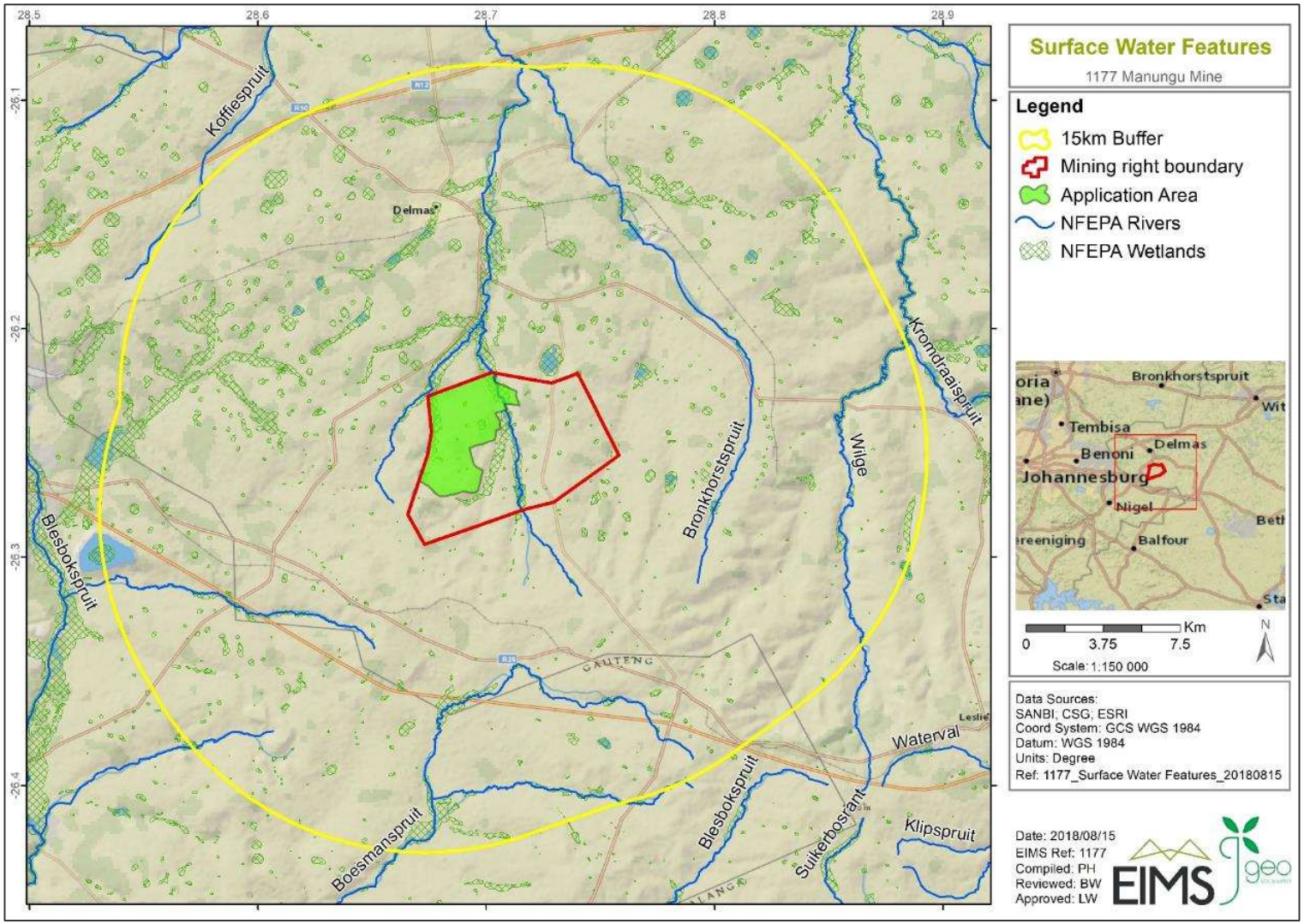

Figure 37: Surface water attributes.

7.13.1 WATER MANAGEMENT AREA

Manungu Colliery is located within the Olifants water management area which falls within three provinces, namely: Gauteng, Mpumalanga and the Limpopo provinces. The Olifants River originates in the Highveld of Mpumalanga and initially flows northwards before curving in an easterly direction through the Kruger National Park and into Mozambique. The Olifants water management area is divided into four major river catchments i.e. the Elands River, Wilge River, Steelpoort River and Olifants River catchments. Manungu Colliery falls within the Wilge River sub-catchment. Within the Wilge River catchment, Manungu Colliery occurs within the B20 tertiary drainage region and B20A quaternary drainage region, which falls within Management Unit 23. The receiving water body of this region is the Bronkhorstspruit that feeds the Olifants River.

7.13.1.1 MEAN ANNUAL RUNOFF

Mean annual runoff (MAR) for this sub-catchment is estimated at 2.5 million m^3/a, or an annualised average flow of approximately 80l/s, using the MAR reported for the B20A sub-catchment (Midgley *et al,* 1994). It should be noted that the MAR was calculated using an average figure of 37.9 mm as reported for the B20A sub-catchment. The two large in-stream dams will impact on this runoff, and due to the increased evaporation, it can be expected to be much smaller.

7.13.1.2 NORMAL DRY FLOW

Due to the presence of the two large instream dams, the normal dry weather flow is 0. It should be approximately 80l/s (based on the Surface Water Assessment undertaken in 2007). Due to the small catchment sizes, dry weather flows are likely to be very low and will often be limited to sub-surface flow only. Average dry weather flows appear high, but these are influenced by storm flow from occasional winter rainfall events and unseen subsurface flow

7.13.1.3 SURFACE WATER QUALITY

The Surface Water Assessment undertaken in 2018 put forward the expectation that the surface water quality would be relatively good due to the area being situated within the headwaters of the Bronkhorstspruit. As there are relatively few anthropogenic activities expected in headwaters, the surface water should be similar to the groundwater qualities in the area. Monthly water quality sampling is done by Philo Environmental Management CC (Philo Environmental) at 8 locations. The results show poor water quality in the pit and PCD. This is consistent with normal coal mining operations. The upstream water quality monitoring points show no coal mining related impacts but do show agriculture related impacts. This is consistent with the land use patterns.

7.13.2 SURFACE WATER USE

Surface water users in the Wilge River sub-catchment are mainly domestic and agriculture in the form of irrigation and livestock watering. Water uses also take place in the form of impoundments such as farm dams. The main perennial stream which flows through the middle of the mining right area lies on the eastern side of the proposed future mining areas. Several perennial and non-perennial pans also occur within the sub-catchment in and around the study site. It can thus be concluded that surface water within the sub-catchment especially within the mining right area is used primarily for agricultural purposes (irrigation and livestock watering).

Based on an updated Water Balance undertaken by Beal Consulting Engineering & Project Management (report dated 28 September 2018), the following conclusions were drawn based on this desktop assessment:

- The water balance appears to currently be positive during the wet season. During the dry season, dust suppression demands are likely to exceed available water.
- As the pit development increases, the water balance could become more positive during the wet season with maximum dust suppression demands being less than groundwater and storm water availability. This must be monitored.

7.14 WETLANDS

Numerous wetlands are evident within the mining right area. A number of these wetlands are associated with the perennial and non-perennial streams, associated riparian area and drainage channels within and adjacent to the mining right area. Permanent wetlands are predominantly associated with incised stream channels, farm dams or drainage channels. Seasonal wetlands found in higher grounds are associated predominantly with shallow channels (i.e. such as non-perennial streams) and pans caused by seasonal surface water accumulation and poor drainage. Many of the pan systems have been largely transformed by historical and current agricultural activities. The extent of their downslope hydrological contributions is expected to be overland flow during periods of soil saturation. The extent of this hydrological contribution is not expected to be significant due to the respective sizes of the valley bottom catchments, however water quality issues are considered more serious and should receive due attention during design and operational phases, especially with regards to potential sub-surface movement of contaminated water into downslope wetlands.

Wetland health may be seen as the degree of similarity between reference conditions and the Present Ecological State (PES). Two large valley bottom systems are located to the west and to the east of the proposed mining area. According to the 2017 Manungu aquatic biomonitoring survey results, the PES assessment derived a largely modified ecological category (class D) for the Bronkhorstspruit. This PES is below the attainable ecological management class (class C). The modified status can be attributed to a combination of flow modification, habitat and water quality related drivers and riparian areas associated with the Bronkhorstspruit and each associated tributary system. The overlying influence of low water levels in the project area with no river flow between sites has impacted aquatic macroinvertebrate and fish communities. The modification stems from a combination of agricultural and mining activities present within Bronkhorstspruit catchment and cannot be directly attributed to mining related activities at Manungu Colliery.

A total of five (5) Hydrogeomorphic (HGM) types were identified and delineated for the project. A total of 16 HGM units were identified for the project. The overall wetland health for the wetlands varied from Moderately Modified (Class C) to Largely Modified (Class D) system, with the majority of the wetlands rated a Class D. The Ecological Importance and Sensitivity of the two valley bottom wetland types was rated as high (Class B), with the remaining wetland types being rated as moderate (Class C).

The hydrology within the catchment of the two valley bottom systems has been impacted on due to the placement of dams and access route crossings. The extent of commercial agriculture has caused the loss of groundcover which has resulted in increased run-off volumes and velocities across the catchment area. Run-off from the mining area has diverted and increased the volume of stormwater to the adjacent wetland systems. These increases have resulted in changes to the floodpeaks and hydrological regimes of the valley bottom wetlands. The changes in the upper catchment area, notably commercial farming and mining (to a lesser extent) have impacted on the hydrological inputs of the depression systems, due to the vulnerability of these systems to changes in water quantity.

7.15 GROUNDWATER

Information in this section was sourced from the 2007 Geohydrological Assessment Report compiled by GEO Pollution Technologies (Pty) Ltd (GPT) as well as the water quality report compiled in 2016. Most mines and mining related activities impact on groundwater quality and quantity. A qualification of such impacts on the groundwater regime requires knowledge of the pre-mining environment. A description of the current groundwater conditions is therefore required. The purpose of this section is, therefore, to describe the prevailing groundwater conditions. This will serve as a reference baseline for quantifying potential mining impacts on the existing groundwater regime.

Depth of the groundwater table in the study area was determined by means of a hydrocensus. Water levels were measured in several boreholes during the hydrocensus conducted on the site and in the surrounding area. Groundwater levels varying between 0m and 45m below ground level were measured in the surrounding area during the survey undertaken. Most of the boreholes used in the survey are located within the mining right area with some boreholes surrounding the area also visited to attain regional groundwater levels. Groundwater use in the area was found to be mainly domestic and stock watering.

The relationship between the topography and static groundwater level can be used to distinguish between boreholes with water levels at rest and boreholes with anomalous groundwater levels due to disturbances such as pumping or local geohydrological heterogeneities. Groundwater flow should be perpendicular to contours and inversely proportional to the distance between contours. Groundwater flow is mainly from topographically high to low areas, eventually draining to local streams.

The difference between the static water levels and the ground elevations were also used to calculate the thickness of the unsaturated zone by subtracting groundwater levels from the topography. The average depth of groundwater level in the fractured aquifer in the proposed mining area is anticipated to be 5 – 10 meters.

7.15.1 AQUIFER CHARACTERISATION

Hydrogeology can be described in terms of saturated and unsaturated zones, discussed below:

7.15.1.1 SATURATED ZONES

In the saturated zone, at least five aquifer types may be inferred from the knowledge of the regional geology:

- A shallow aquifer formed in the weathered zone, perched on the fresh bedrock;
- An intermediate aquifer formed by fracturing of the Karoo sediments;
- A deep aquifer formed in the dolomite by dissolution of the dolomitic rock;
- Aquifers formed within the more permeabe coal seams and sandstone layers; and
- Aquifers associated with the contact zones of the dolerite intrusives.

Of the above-mentioned aquifers, the dolomitic aquifer is by far the most important in terms of a source of groundwater. Although these aquifers vary considerably regarding geohydrological characteristics, they are seldom observed as isolated units. Usually they would be highly interconnected by means of fractures and intrusions. Groundwater will thus flow through the system by menas of the path of least resistance in a complicated manner that might include any of these components.

7.15.1.2 SHALLOW PERCHED AQUIFER

A near surface weathered zone comprise of transported colluvium and in-situ weathered sediments, underlain by consolidated sedimentary rocks such as sandstock, shale and coal. Groundwater flow patterns generally follow the topography, often coming very close to the surface in topographic lows, often leading to the formation of natural springs. Experience of Karoo geohydrology indicates that recharge to the perched groundwater aquifer is relatively high, up to 3% of the Mean Annual Precipitation (MAP).

7.15.1.3 FRACTURED KAROO ROCK AQUIFERS

The host geology of the area consist of consolidated sediments of the Karoo Supergroup and consists mainly of sandstone, shale and coal beds of the Vryheid Formation of the Ecca Group. Most of the groundwater flow will be along the fracture zones that occur in the relatively competent host rock. The geology map does not indicate any major fracture zones in this area, but from experience it can be assumed that numerous major and minor fractures do exisit in the host rock. These conductive zones effectively interconnect the strata of the Karoo sediments, both vertically and horizontally into a sigle, but highly heterogenic and anisotropic unit.

7.15.1.4 DEEP AQUIFER FORMED IN THE DOLOMITE ROCKS

Dolomite is readily dissolved in slightly acidic groundwater, and extensive undegrorund solution cavities are formed with time as infiltrating rainwater seeps through cracks and fissure. Dolomitic aquifers are thus vasly different from fractured aquifers in that the groundwater flows through open conduits to other aquifers where flow is through miniscule cracks and fissured in rocks and voids. While some filtration and absorption of pollutants can be expected in other aquifers, dolomite does not offer such advantage and pollution can be transported without attenuation over vast distances. The aquifer is therefore very vulnerable to pollution.

Dolomitic aquifers are rated as very important aquifers as sources of groundwater in Gauteng, used extensively for irrigation of crops and human consumption.

7.15.1.5 AQUIFERS ASSOCIATED WITH COAL SEAMS

Coal seams form a layered sequence within hard rock sedimentary units. The margins of coal partings within coal seams are often associated with groundwater. Coal itself can act as an aquitard, allowing flow of groundwater at the seam margins.

7.15.1.6 AQUIFERS ASSOCIATED WITH DOLERITE INTRUSIVES

Dolerite intrusion in the form of dykes and sills, occur commonly within the Karoo Supergroup and are often encountered in the study area. Dolerite intrusions can act as both aquifers and aquicludes. Thick, unbroken dykes inhibit the flow of water, while the cracked contact zones can be highly conductive. These conductive zones effectively interconnect the strata of the Ecca sediments both vertically and horizontally into a highly heterogenous and anisotropic units, however their location and properties are rather unpredictable.

7.15.2 GROUNDWATER QUALITY

Eco-gain consulting undertakes regular surface and groundwater monitoring within and surrounding the mining area. The information contained in this Section has been sourced from the 2016 monitoring report.

The groundwater monitoring localities are sampled on a monthly and quarterly basis. Ten groundwater monitoring points are included of which seven are done on a quarterly basis and the remainder on a monthly basis. Water levels are monitored on a quarterly basis. The water for the groundwater can mostly be described as neutral, non-saline and soft to moderately soft. Only drinking water sampling is done on a monthly basis. There are a few instances where the groundwater qualities exceeded the limits as prescribed in the approved IWUL.

7.15.3 HYDROCENSUS / GROUNDWATER USE

The 2007 hydrocensus, within a 1km radius of the larger Manungu reserve area across Weilaagte 271 IR and Welgevonden 272 IR, performed by Geo Pollution Technologies as part of the original groundwater impact study was revisited and updated during March 2017. A number of boreholes within and around the existing mining right area were identified during a previous hydrocensus. Several boreholes were identified within the vicinity of the mining activities. It was determined during the hydrocensus that most of the identified boreholes are in use. The identified groundwater uses were domestic and stock watering.

The survey of 59 points included four of the Department Water and Sanitation's (DWS) hydrostatic monitoring stations. Thirty-five boreholes were found to be in use for water supply. Water level measurements were recorded (28) ranging between 1m and 80m deep. The reported yielding capacities ranged between 0.11L/s and 40L/s. Borehole depths (48) were recorded ranging between 20m and 240m below surface (median of 80m). The average yielding capacity for the boreholes <80m in depth was 1.3L/s, while the average for the boreholes deeper than 80m was 8.5L/s.

7.16 HYDROPEDOLOGY

The information in this section was sourced from a hydropedological assessment which was conducted by The Biodiversity Company in 2019. The hydropedological site assessment was conducted from the 23rd to the 25th of July 2019 and a level three hydropedological assessment was undertaken. The soil morphological interpretations were supplemented by measurements of hydraulic properties and simulations of key hydrological processes through the hillslopes. In general, the measurements and simulations are in agreement with the conceptual understanding based on morphological interpretations. The depth of the planned underground mining activities and impermeability of the bedrock suggest that this activity will not have any significant impact on vadose zone processes.

The hydropedological modelling focussed on three of the four transects (only those impacted by open-cast mining). Simulations focussed on the contribution of lateral flows through the transects following a very wet period to illustrate the maximum impact of the development on lateral outflows. Under these conditions the

development could result in up to 67% reduction in lateral contributions to flow. The difference in the lateral contributions is large due to the difference in water regimes of the soils in the valley bottom. Under natural conditions these soils will be fed by a larger contribution area than under 'developed' conditions and will consequently remain wetter for longer and also 'wet-up' quicker following rain events. This will result in more lateral drainage from the natural than the 'developed' state.

Under normal (drier) conditions, the low hydraulic conductivity of the soils together with the low relief of the landscape, suggest that lateral flows through the soils are limited. This is supported by the precipitation of lime in Steendal soils on mid slope positions (limited leaching or lateral flows).

7.17 AIR QUALITY

Dust concerns have been raised during the initial call to register and as such, an Air Quality Impact Assessment was undertaken by Airshed Planning Professionals (Pty) Ltd in 2018. Mining operations like drilling, blasting, hauling, and transportation are the most prevalent sources of emissions and air pollution. Emissions of particulate matter and nuisance dust will result from mineral plant operations such as crushing, screening and processing for final transportation. Fugitive emissions are also possible from roads and open stockpiles. As part of the commitments made in the approved EMP, dust fallout monitoring has been implemented at the Manungu Colliery.

Nuisance dust can reduce visibility and/or damage buildings and other materials and increase costs due to the need for washing, cleaning and repainting. Plants can be affected by dust fallout through reduced light transmission which affects photosynthesis and can result in decreased growth. Fallout dust can also collect in watercourse causing sedimentation and a reduction in the water quality and can also affect aquatic life through the smothering of riverine habitat and fish gill clogging. Coarse dust particles are produced during mining operations which can lead to an increase in fallout dust.

The main findings from the impact assessment due to project operations were as follows:

- Vehicle entrainment on unpaved surfaces and, to a lesser extent, crushing activities represented the highest impacting particulate sources from the current and proposed project operations.
- The highest simulated ground level PM_{10} concentrations due to current unmitigated project operations were in non-compliance with daily National Ambient Air Quality Standards (NAAQS) at sensitive receptors within the study area. When activities were mitigated (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities), the impacts reduced significantly with no exceedances of the NAAQS at the closest sensitive receptors. The extent of the PM_{10} impacts increase with proposed operations with exceedances of the NAAQS (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities) at individual homesteads to the west of the mine.
- The highest simulated $PM_{2.5}$ concentrations due to current unmitigated project operations were in non-compliance with daily NAAQS at the closest sensitive receptor to the north of operations. When activities were mitigated (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities), the impacts reduced significantly with no exceedances of the NAAQS at the closest sensitive receptors. The extent of the $PM_{2.5}$ impacts increase with proposed operations but are within NAAQS at the closest sensitive receptors with mitigated operations (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities).
- Maximum daily dust deposition due to proposed unmitigated operations exceeded the National Dust Control Regulations (NDCR) for the closest sensitive receptor to the west of the mine.

7.18 BLASTING AND VIBRATION

Blasting is common in the coal mine industry to remove overburden so that the exposed coal can be mechanically excavated. The ground vibrations produced by blasting are often felt by residents surrounding the mines. The impacts related to blasting induced vibration, such as air blast, fly rock, dust, and fumes need to be evaluated. Their impact on structures, people and animals also need to be evaluated. Conventional blasting is

undertaken at the Manungu colliery and as such mitigation measures will be needed due to its proximity to neighbouring farms.

The following mitigating measures are currently being implemented to minimise impacts associated with blasting and vibrations:

- A drilling and blasting standard operating procedure (SOP) has been developed for the mine;
- A 20-m cut depth in the pit is mined so as to reduce the amount of explosives used at any one time;
- A pre-and post-blast checklist is completed by the responsible blaster and signed off by the responsible managers;
- Only single hole blasts are undertaken to reduce air blast and vibrations;
- Pre-spilt blasts are utilised to ensure the primary blast energy is contained within the blast area therefore reducing ground vibrations;
- Only a trained and certified blaster with certified blasting assistants are used;
- Blast designs are continuously re-evaluated according to prevailing conditions and geological conditions; and
- Climatic conditions and time of day are considered before a blast is undertaken.

8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 THE IMPACT ASSESSMENT METHODOLOGY

The impact significance rating methodology is guided by the requirements of the NEMA EIA Regulations. The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S).

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$\boldsymbol{C = \frac{E + D + M + R}{4} \times N}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 15.

Table 15: Criteria for determination of impact consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),

Aspect	Score	Definition
Intensity	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 16.

Table 16: Probability scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER= C x P

Table 17: Determination of environmental risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10

	1	1	2	3	4	5
		1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described Table 18.

Table 18: Significance classes

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥ 9; < 17	Medium (i.e. where the impact could have a significant environmental risk),
≥17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition, it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision-making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority / significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/ mitigation impacts are implemented.

Table 19: Criteria for the determination of prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.

	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented Table 19. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (refer to Table 20).

Table 20: Determination of prioritisation factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance). The environmental significance rating is presented in Table 21.

Table 21: Environmental Significance Rating

Value	Description
< -10	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥ -10 < -20	Medium negative (i.e. where the impact could influence the decision to develop in the area).
≥ -20	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
0	No impact
< 10	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥ 10 < 20	Medium positive (i.e. where the impact could influence the decision to develop in the area).
≥ 20	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

8.2 IMPACTS IDENTIFIED

Potential environmental impacts were identified during the EIA process. These impacts were identified by the EAP, the appointed specialists, as well as the public. Table 22 provides the list of potential impacts identified in the various specialist studies.

Without proper mitigation measures and continual environmental management, most of the identified impacts may potentially become cumulative, affecting areas outside of their originally identified zone of impact. The potential cumulative impacts have been identified, evaluated, and mitigation measures suggested.

When considering cumulative impacts, it is vitally important to bear in mind the scale at which different impacts occur. There is potential for a cumulative effect at a broad scale, such as regional deterioration of air quality, as well as finer scale effects occurring in the area surrounding the activity. The main impacts which have a cumulative effect on a regional scale are related to the transportation vectors that they act upon. For example, air movement patterns result in localised air quality impacts having a cumulative effect on air quality in the region. Similarly, water acts as a vector for distribution of impacts such as contamination across a much wider area than the localised extent of the impacts source. At a finer scale, there are also impacts that have the potential to result in a cumulative effect, although due to the smaller scale at which these operate, the significance of the cumulative impact is lower in the broader context.

Table 22: Identified Environmental Impacts.

Main Activity / Action / Process	Ancillary Activity	Geo-physical (geology, topography, air, water)	Biological	Socio-economic	Heritage and cultural
Site preparation (Planning)	Vegetation clearance Removal of infrastructure Planned placement of infrastructure Re-establishment of construction contractor area		• Removal of threatened and protected species • Loss/ Destruction of Natural Habitat • Displacement of Faunal Species • Flora Direct and Indirect Mortality • Fauna Direct and Indirect Mortality	• Dust (health and nuisance impact) • Safety and Security (i.e. access to properties, theft, fire hazards, etc.). • Damage/ Disruption of services (i.e. water, electricity, etc.). • Impact on Existing Infrastructure (i.e. roads, fences, etc.).	• Disturbance/Destruction of Archaeological Sites • Disturbance/Destruction of Historic Buildings or Structures • Disturbance/ Destruction of Graves and Cemeteries • Disturbance/ Destruction of Unmarked Graves
Human resources management (Planning)	Employment/recruitment I&AP consultations CSI initiatives Skills development programmes Environmental awareness training HIV/AIDS Awareness programmes Integration with Municipalities' strategic long-term planning			• Perceptions and expectations. • Employment opportunities. • Inability of the community to capture economic benefits & managing expectations.	
Earthworks (Construction)	Stripping and stockpiling of soils Cleaning, grubbing and bulldozing Removal of building waste and cleared vegetation	• Loss/ Disturbance of Topsoil (including contamination, erosion and compaction)	• Pollution of habitats • Removal of threatened and protected species • Loss/ Destruction of Natural Habit	• Loss of agricultural resource • Visual impacts • Noise impacts • Damage to property and infrastructure due	• Disturbance/ Destruction of fossils • Disturbance/Destruction of Archaeological Sites

	Digging trenches and foundations Blasting Establishing storm water management measures Establishment of firebreak	• Gaseous and particulate emissions; fugitive dust • Deterioration of water quality • Increase in the occurrence of alien invasive vegetation • Decline in habitat integrity • Loss of species sensitive to changes in water quality • Altered hydrological regimes • Contamination of Groundwater • Surface Water Contamination • Damage to Wetlands/ Drainage Lines	• Habitat Fragmentation and Edge Effects • Displacement of Faunal Species • Blockage of Seasonal and Dispersal Movements • Flora Direct and Indirect Mortality • Fauna Direct and Indirect Mortality	to blasting, as well as safety as a result of fly rock	• Disturbance/Destruction of Historic Buildings or Structures • Disturbance/ Destruction of Graves and Cemeteries. • Disturbance/ Destruction of Unmarked Graves
Civil Works (Construction)	Establishment of infrastructure and services Mixing of concrete and concrete works Establishment of PCD and storm water/return water dam Establishment of dewatering pipelines Establishment of mobile office and ablution block Sewage and sanitation Establishment of fuel storage area	• Gaseous and particulate emissions; fugitive dust • Generation of $PM_{2.5}$ and PM_{10} • Gaseous and particulate emissions; fugitive dust. • Deterioration of water quality • Decline in habitat integrity	• Loss of primary vegetation communities. • Removal of threatened and protected species. • Loss/ Destruction of Natural Habitat. • Habitat Fragmentation and Edge Effects. • Displacement of Faunal Species.	• Loss of agricultural resource	• Disturbance/Destruction of Archaeological Sites • Disturbance/Destruction of Historic Buildings or Structures • Disturbance/ Destruction of Graves and Cemeteries • Disturbance/ Destruction of Unmarked Graves

	Establishment of chemical storage area Establishment of general waste area Access control and security General site management	• Loss of species sensitive to changes in water quality • Altered hydrological regimes • Decline in aquatic habitat integrity • Impacts on wetlands • Surface water contamination	• Blockage of Seasonal and Dispersal Movements. • Flora Direct and Indirect Mortality. • Fauna Direct and Indirect Mortality. • Contamination of Groundwater. • Altered Hydrological Regime. • Loss of species sensitive to changes in water quality • Surface Water Contamination. • Damage to Wetland/ Drainage Line. • Increase in the occurrence of alien invasive vegetation		
Open-cast Mining (Operation)	Drilling Blasting Excavations Removal of overburden by dozing and load haul Establishment of internal haul roads Removal of coal Establishment of RoM stockpiles	• Gaseous and particulate emissions; fugitive dust • Greenhouse gas emissions • Generation of $PM_{2.5}$ and PM_{10} • Gaseous and particulate emissions; fugitive dust.	• Loss of primary vegetation communities. • Removal of threatened and protected species. • Loss/ Destruction of Natural Habitat. • Habitat Fragmentation and Edge Effects.	• Reduction in Quantity of Water (i.e. water consumption). • Interference with Existing Land Uses. • Nuisance and Impact on Sense of Place • Damage/ Disruption of services (i.e. water, electricity, etc.). • Noise impacts	• Disturbance/ Destruction of fossils. • Disturbance/Destruction of Archaeological Sites. • Disturbance/Destruction of Historic Buildings or Structures. • Disturbance/ Destruction of Graves and Cemeteries.

	Establishment of Product Stockpiles Pumping of water to PCD Waste rock dumps for backfilling Soil management Water management Concurrent rehabilitation Water treatment	• Deterioration of water quality • Increase in the occurrence of alien invasive vegetation • Decline in habitat integrity • Loss of species sensitive to changes in water quality • Altered hydrological regimes • Impacts on wetlands • Contamination of Groundwater • Damage to Wetland/ Drainage Line • Surface water contamination and soil contamination	• Displacement of Faunal Species. • Blockage of Seasonal and Dispersal Movements. • Flora Direct and Indirect Mortality. • Fauna Direct and Indirect Mortality. • Decline in aquatic habitat integrity • Loss of species sensitive to changes in water quality • Spontaneous combustion of carboniferous stockpiles.	• Dust impacts • Impact on Existing Infrastructure (i.e. roads, fences, etc.). • Employment Opportunities. • Visual impacts. • Vibration and blasting • Coal supply for energy security.	• Disturbance/ Destruction of Unmarked Graves.
Infrastructure removal (Decommissioning)	Dismantling and demolition of infrastructure Safety control	• Gaseous and particulate emissions; fugitive dust • Generation of $PM_{2.5}$ and PM_{10} • Contamination of Groundwater. • Damage to Wetland/ Drainage Lines	• Fragmentation and Edge Effects. • Displacement of Faunal Species.	• Safety and Security (i.e. access to properties, theft, fire hazards, etc.)	
Rehabilitation (Closure)	Backfilling of pits and voids Slope stabilisation Erosion control Landscaping	• Contamination of Groundwater. • Acid Mine Drainage	• Fragmentation and Edge Effects. • Displacement of Faunal Species.	• Reduction in future land capability. • Safety risk to public	

	Replacing topsoil Removal of alien/invasive vegetation Re-vegetation Restoration of natural drainage patterns Remediation of ground and surface water Rehabilitation of external roads	• Damage to Wetland/ Drainage Lines	• Fuel, waste, sedimentation.		
Maintenance (Post closure)	Initiate maintenance and aftercare program Environmental aspect monitoring Monitoring of rehabilitation	• Fugitive dust • Damage to Wetland/ Drainage Lines • Treatment of extraneous water and long terms pollution potential • Potential impacts associated with residue stockpiles in the long term.			

8.3 DESCRIPTION AND ASSESSMENT OF IMPACTS

The following potential impacts were identified during the EIA assessment. The impact assessment matrix is included in Appendix D and the below subsections describe each impact in more detail. Note the following alternatives were considered in this section and are referenced in the tables below (more detail on these various alternatives is provided in the Alterative Section of this report in Section 9):

- Disposal of Filter Cake:
  - Process Alternative P1a – stockpile for use as non-select product; and
  - Process Alternative P1b – disposal.
- Disposal of Wash Plant Waste Rock (and possibly filter cake):
  - Process Alternative P2a – disposal of plant waste rock to surface facility located on old rehabilitated area; and
  - Process Alternative P2d – disposal of plant waste rocks and filter cake to pit.
- Wash plant water supply:
  - Process Alternative P3a – obtain water from dirty water containment facilities (PCDs).
- Coal beneficiation:
  - Technology Alternative T1b – wet washing.
- Coal product transportation:
  - Technology Alternative T2a – transportation by road.
- Stockpile Height:
  - Layout Alternative S2a – stockpile height no greater than 6m in height; and
  - Layout Alternative S2b – stockpile height no greater than 6m in height.
- Vegetating Stockpiles:
  - Layout Alternative S3a – vegetated stockpiles; and
  - Layout Alternative S3b – unvegetated stockpiles.
- Tree Screening:
  - Layout Alternative S4a – tree screen around the mining right area; and
  - Layout Alternative S4b – no tree screen around the mining right area.
- Land Use:
  - Alternative A1 – land use for mining; and
  - Alternative A2 – no go alternative.
- Micro Sitting:
  - Location Alternative S1a – maximum mining over entire area; and
  - Location Alternative S1b – sensitivity-based approach.

8.3.1 IMPACTS ON HERITAGE AND PALAEONTOLOGICAL RESOURCES

This section presents the potential impacts identified with regard to heritage resources. While several project phases exist, only impacts associated with the Site Establishment and Earthworks/Construction Phase are included here. The reason for this is that no impacts are anticipated on the identified heritage resources during

the other phases of the project. A heritage and palaeontological specialist study was undertaken and used to inform this EIA report.

The following construction phase impacts (as well as their impact rating) on heritage resources were identified during the EIA phase:

8.3.1.1 DISTURBANCE/ DESTRUCTION OF ARCHAEOLOGICAL SITES OR HISTORIC BUILDINGS

Unidentified archaeological sites can seriously hamper construction and development activities and timelines. Destruction/damage or disturbance of such sites requires a permit from the responsible heritage authority. A total of five recent historic structures were identified of which one has no heritage significance. The remaining four historic heritage resources are all rated as having a medium to high heritage significance.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Disturbance/ destruction of archeological sites or historic structures	All	Construction	-11.25	-6.00	-10.00	Low	Yes

Proposed Mitigation:

The sites should be avoided with at least a 20 m buffer if activities should occur near them. If the sites will be affected directly, the sites will need to be documented before a destruction permit can be applied for at the provincial heritage authority (Mpumalanga). In the event that any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on mitigation.

8.3.1.2 DISTURBANCE/ DESTRUCTION OF GRAVES

Seven burial grounds in total have been identified during the field work. Due to the social and cultural significance of burial grounds and graves a high heritage significance is given to these sites. Of the seven burial grounds, six are informal, with no fences demarcating the sites. Only one has been officially demarcated.

The impact of the proposed project on the burial grounds is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance. In addition to the known graves, there is a possibility that unidentified graves may be located within the study/application area. Should graves and other heritage features be confirmed on site and in particular within the preferred footprint, impact on these features will trigger various pieces of legislation that protect them.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Disturbance/ Destruction of Unmarked Graves	All	Construction	-20.00	-6.00	-9.00	Low	Yes

Proposed Mitigation:

Cemeteries and grave sites are protected by various legislation and the best option would be the in-situ preservation of the sites. Where possible a 50-meter buffer must be maintained around the graves to protect them. Should this not be possible, a standard grave relocation process (including a detailed social consultation process) must be undertaken.

In addition to the known archaeological sites, any new sites identified by the Heritage Specialist Study in support of this application, must be afforded protection as per the above mitigation.

8.3.1.3 DISTURBANCE/ DESTRUCTION OF FOSSIL MATERIAL

During a thorough field survey of the proposed development footprint no fossils were found. Mining thus far, has also not recovered any fossils. There is a possibility that fossils could be encountered during excavation of bedrock within the development footprint. Unidentified paleontological resources and the discovery of such resources can seriously hamper construction and development timelines. Damage, destruction or removal of such sites requires a permit from the responsible heritage authority.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Disturbance/ destruction of fossils	All	Construction Operation	-9.00	-2.50	-2.92	Low	Yes

Proposed Mitigation:

The paleontological study undertaken in 2013 found little chance of finding good fossils in the surface deposits because they would be badly weathered if present. Furthermore, the area had been disturbed by agricultural activities. It also found that no records of fossil plants from this area existed at the time and that fossil plants will be associated with the coal, but it is unlikely that they are of great importance.

In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations or removal of vegetation, the ECO in charge for the developments ought to be informed immediately. These finds must be protected (if possible, *in situ*) and the ECO must alert SAHRA (South African Heritage Research Agency) to make sure that mitigation (e.g. recording, sampling or collection) can be undertaken by a professional paleontologist.

8.3.2 IMPACTS ON ECOLOGY

This section provides impacts on the ecological resources within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). No impacts on the ecological receiving environment have been identified that will occur during the Planning and Design Phase, Decommissioning Phase, and the Rehabilitation and Closure Phase. The removal of the vegetation cover on site and other disturbances may increase the erosion potential of the site. Since a large portion of the site is already disturbed by agricultural activities, the erosion potential for these areas may increase moderately. The erosion potential for the rest of the site, including primary, secondary and wetland vegetation will however have a more significant increase with mining and construction activities. This impact can be mitigated. Below are the construction and operational phase preliminary impacts on ecological resources identified, as well as their impact rating.

8.3.2.1 LOSS/ DESTRUCTION OF NATURAL HABITAT AND REMOVAL OF PROTECTED SPECIES

The proposed activities on site will lead to localised damage to the open cast areas as well as areas containing infrastructure. Several species listed as threatened under NEMBA and the South African Red Data list could potentially occur on site. Should any of these species be found on site no mining activities may take place in or close to the habitat of the species until a permit is obtained for their removal. This may potentially have a moderate to high impact on the overall species numbers and distribution. There is, however, potential to mitigate this impact, through search and rescue operations and good soil rehabilitation practices. The loss of natural habitat is considered irreplaceable. Minimal public response was received regarding ecological issues, although the impacts are expected to be cumulative.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss/ destruction of natural habitat	All	Construction	-18.75	-6.00	-8.00	Moderate	Yes

Proposed Mitigation:

Undertake activities in previously disturbed places and/or habitats with a lower sensitivity score. Rehabilitate disturbed areas as soon as possible and control alien plants; and undertake search and rescue for protected plant and animal species prior to construction commencing.

8.3.2.2 HABITAT FRAGMENTATION AND EDGE EFFECTS

Due to the existing fragmentation of natural habitat, the proposed mining extension will contribute to this impact however to a lesser degree than if the entire study area was pristine. Habitat fragmentation is considered as an irreplaceable loss. Minimal public response was received regarding ecological issues, although the impacts are expected to be cumulative with other ecological impacts.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Habitat fragmentation and edge effects	All	Construction	-15.00	-8.25	-11.00	Moderate	Yes

Proposed Mitigation:

Undertake activities in previously disturbed areas and/or habitats with lower sensitivity. Where possible locate activities on the boundaries of existing disturbance. Use existing access roads as much as possible and rehabilitate disturbed areas as soon as possible.

8.3.2.3 DISPLACEMENT OF FAUNAL SPECIES

The proposed activities on site will lead to localised damage to the environment and possibly also damage to habitats associated with travelling along access routes. This impact would be temporary, as upon completion of mining activities, the disturbed areas would be rehabilitated which would stimulate the migration of faunal species back to these areas. Loss of faunal habitat may be of moderate significance and is considered an irreplaceable resource.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Displacement of faunal species	All	Construction Operation	-10.50	-5.00	-6.67	Moderate	Yes

Proposed Mitigation:

Where possible undertake activities in previously disturbed places and/or habitats with a lower sensitivity; limit effects on surrounding areas and rehabilitate disturbed areas as soon as possible to promote habitat availability for faunal species.

8.3.2.4 BLOCKAGE OF SEASONAL AND DISPERSAL MOVEMENTS

Proposed activities will result in some loss of habitat, especially migration corridors. Some habitat fragmentation is also expected.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Blockage of seasonal and dispersal movements	All	Construction Operation	-12.00	-6.00	-8.00	Moderate	Yes

Proposed Mitigation:

Where possible undertake activities in previously disturbed areas and/or habitats with lower sensitivity. Where possible locate activities on the boundaries of existing disturbance. Use existing access roads as much as possible and rehabilitate disturbed areas as soon as possible.

8.3.2.5 FLORA DIRECT AND INDIRECT MORTALITY

There are various plant species of concern that could potentially be affected by the proposed activities on site. There will also be other flora species that would be impacted during the construction phase. The loss of flora is considered irreplaceable. Although public response on ecological issues was low the impacts are considered cumulative with other direct and indirect impacts.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Flora Direct and Indirect Mortality	All	Construction	-18.75	-6.50	-7.58	Moderate	Yes

Proposed Mitigation:

Where possible, walk-through survey of local site prior to construction commencing. Search and rescue of species of concern (if any). Obtain permits for any listed/protected species found on site. Where possible undertake activities in previously disturbed areas and/or habitats with lower sensitivity. Where possible locate activities on the boundaries of existing disturbance and use existing access roads as much as possible.

8.3.2.6 FAUNA DIRECT AND INDIRECT MORTALITY

There are risks to fauna, for example illegal hunting/poaching as well as threats from movement of machinery. During construction, relatively sedentary species may suffer direct mortality. The assessment is based on a worst-case scenario affecting species of the highest conservation status. The mortality of fauna is considered irreplaceable. Although public response on ecological issues was low the impacts are considered cumulative with other direct and indirect impacts.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Fauna direct and	All	Construction	-15.00	-6.50	-8.67	Moderate	Yes

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
indirect mortality							

Proposed Mitigation:

Where possible undertake site-specific walk-through surveys for potential species of concern. Where possible undertake activities in previously disturbed areas and/or habitats with lower sensitivity; locate activities on the boundaries of existing disturbance; and use existing access roads as much as possible. Educate construction crews on the types of species that may be encountered and ensure that workers report any species located for active relocation.

8.3.2.7 POLLUTION OF HABITATS

There is a possibility that mining activities could result in pollution being introduced into natural habitats.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Pollution of Habitats	All	Construction Operation	-15.00	-8.25	-11.00	High	Yes

Proposed Mitigation:

Manage all waste sources emanating from proposed activities in line with legal requirements. Maintain minimum distances from aquatic and wetland habitats as per legal requirements and where possible undertake activities in previously disturbed areas and/or habitats with lower sensitivity.

8.3.2.8 INTRODUCTION/ INVASION BY ALIEN SPECIES

Disturbing activities on site will favour alien plants in places.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Introduction/ Invasion by Alien Species	All	Operation	-13.00	-7.50	-8.75	High	Unlikely

Proposed Mitigation:

Where possible undertake activities in previously disturbed areas and/or habitats with lower sensitivity. Where possible locate activities on the boundaries of existing disturbance. Use existing access roads as much as possible and rehabilitate disturbed areas as soon as possible. Manage alien plants within close proximity to activities; and compile an alien plant management plan.

8.3.3 IMPACTS ON GEOHYDROLOGY

This section provides impacts on the geohydrological resources within the study area. Below are the identified impacts on geohydrological resources for the construction, operational, and rehabilitation and closure phases identified during the EIA, as well as their impact rating according to the methodology described above.

Manungu Colliery may potentially impact on the surrounding groundwater systems in terms of groundwater volumes, levels and quality. During the operational phase, groundwater is pumped from the mine, and the local groundwater levels are being impacted. During this operational phase period, groundwater contamination is

primarily restricted to the pit. During the post-mining phase, groundwater levels may remain lower than the pre-mining situation in certain areas, while a rise in the groundwater table is expected near the decant zones. A groundwater contamination plume will also manifest during the post-mining phase.

During the construction phase the following potential impacts may result from the on-site activities:

- Potential site contamination of groundwater due to hydrocarbon spillages and leaks from construction vehicles; and
- Slight reduction of recharge to groundwater due to the compaction of the ground surface.

These activities pose site specific groundwater risks.

During the operational phase of the mine the following potential impacts may result from the on-site activities:

- Reduction of groundwater reserves due to mine dewatering. This will result in the lowering of the surrounding groundwater levels and aquifer yield;
- Mine dewatering may result in the reduction of stream baseflow; and
- Contamination of the groundwater within the mine voids and as a result of seepage from overburden, discard material and coal stockpiles. Contaminated groundwater impact on the stream water quality on nearby streams. This impact could have a cumulative impact based on the numerous coal mines in the region.

During the rehabilitation and closure phase of the mine the following potential impacts may result from the on-site activities:

- Contamination of groundwater due to continued oxidation of coal material in the mine void and the waste material on site; and
- Contamination of surface water due to decant from the mine void after rebound of the water levels.

8.3.3.1 CONTAMINATION OF GROUNDWATER (I.E. CHEMICALS, FUEL, WASTES, SEDIMENTATION)

Most groundwater contamination and related impacts will occur during operation, decommissioning and closure phases. Groundwater quality impacts are considered cumulative with other groundwater quality issues due to several mine developments in the area.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Contamination of Groundwater (e.g.: chemicals, fuel, waste, sedimentation)	All	Construction Operation Rehabilitation and Closure	-16.00	-9.00	-10.50	Moderate	Yes

Proposed Mitigation:

During the operational phase the most-important mitigation measures relate to:

- Groundwater monitoring;
- The placement of discard material:
    - If discard is placed on undisturbed/uncontaminated ground, a liner system will be required to prevent the contamination of the local groundwater system, and toe seepages should be collected:

- Any seepages and rainfall runoff originating from stockpiles should be identified and captured/diverted to the dirty water system; and
- Dirty water should be removed as quickly as possible to reduce the driving mechanism for contaminant migration.

- If the dump is placed on rehabilitated mining areas without a liner system, the discard seepage water will mix with pit water and be pumped out if necessary; and
- If the discard is placed in mined-out areas – the preferred option – it should be placed sufficiently deep below the long-term decant elevation (e.g. 10m below surface).

- In line with pollution prevention and minimisation strategies, the following principles should apply if filter cake material is stored on-site as non-select product:
  - Source reduction through general site maintenance:
    - Product should be moved off-site as quickly to prevent continuous seepages from occurring;
    - The site should be maintained to be free draining. Where relevant, areas should be compacted/shaped;
    - Rainfall runoff should be separated into clean and dirty water (rainfall falling on the site should be allowed to drain quickly/freely, and contaminated water should then be captured in the mine dirty water system and re-used where possible); and
    - Clean upstream rainfall water runoff should be diverted around the site;
  - Treatment:
    - Unless monitoring indicates otherwise, treatment is not required/recommended at this stage;
  - Secure disposal:
    - All dirty water collected on the site should be re-used or stored during operation;
- The preparation of the in-pit overburden-backfill material to limit the post-mining impact (i.e. adhering to the principles of source reduction, treatment and secure disposal):
  - The geochemical assessment indicated that the addition of lime in the backfill will reduce the long-term postmining groundwater quality impact, though improving the anticipated low-pH conditions and lowering sulphate and metal concentrations.

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8.3.3.2 REDUCTION OF STREAM BASEFLOW

Mine dewatering may result in the reduction of stream baseflow.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Stream baseflow reduction due to dewatering	All	Operation	-12.00	-6.00	-7.00	Moderate	Yes

Proposed Mitigation:

It is not possible to prevent the dewatering of the aquifers surrounding the proposed opencast mining. As soon as ground and surface water monitoring indicate a dewatered state of boreholes and streams which supply

external, an alternative water source should be provided. It is important that an alternative water supply has to be identified prior to the occurrence of such an event.

8.3.3.3 REDUCTION OF GROUNDWATER RESERVES

Reduction of groundwater reserves due to mine dewatering. This will result in the lowering of the surrounding groundwater levels and aquifer yield.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Reduction of groundwater reserves	All	Construction Operation Rehabilitation and Closure	-14.00	-9.00	-9.00	Moderate	Yes

Proposed Mitigation:

It is not possible to prevent the dewatering of the aquifers surrounding the proposed opencast mining, as soon as groundwater monitoring indicates a dewatered state of boreholes which supply external groundwater users (e.g. the local farmers), an alternative water source should be provided. It is important that an alternative water supply has to be identified prior to the occurrence of such an event.

8.3.3.4 ACID MINE DRAINAGE

Acid mine drainage, acid and metalliferous drainage (AMD), or acid rock drainage (ARD) is the outflow of acidic water from metal mines or coal mines. Acid rock drainage occurs naturally within some environments as part of the rock weathering process but is exacerbated by large-scale earth disturbances characteristic of mining and other large construction activities, usually within rocks containing an abundance of sulphide minerals. Areas where the earth has been disturbed (e.g. construction sites and transportation corridors) may create acid rock drainage. In many localities, the liquid that drains from coal stockpiles, coal handling facilities, coal washing, and coal waste tips can be highly acidic. The cumulative effects of AMD pollution are well known and are a result of historically bad practices within the mining industry.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
AMD	All	Rehabilitation and Closure	-17.00	-7.50	-8.75	High	Yes

Proposed Mitigation:

During the operational phase the most-important mitigation measures relate to:

- Groundwater monitoring;
- The placement of discard material:
    - If discard is placed on undisturbed/uncontaminated ground, a liner system will be required to prevent the contamination of the local groundwater system, and toe seepages should be collected:
        - Any seepages and rainfall runoff originating from stockpiles should be identified and captured/diverted to the dirty water system; and
        - Dirty water should be removed as quickly as possible to reduce the driving mechanism for contaminant migration.

- If the dump is placed on rehabilitated mining areas without a liner system, the discard seepage water will mix with pit water and be pumped out if necessary; and
- If the discard is placed in mined-out areas – the preferred option – it should be placed sufficiently deep below the long-term decant elevation (e.g. 10m below surface).

- In line with pollution prevention and minimisation strategies, the following principles should apply if filter cake material is stored on-site as non-select product:
  - Source reduction through general site maintenance:
    - Product should be moved off-site as quickly to prevent continuous seepages from occurring;
    - The site should be maintained to be free draining. Where relevant, areas should be compacted/shaped;
    - Rainfall runoff should be separated into clean and dirty water (rainfall falling on the site should be allowed to drain quickly/freely, and contaminated water should then be captured in the mine dirty water system and re-used where possible); and
    - Clean upstream rainfall water runoff should be diverted around the site;
  - Treatment:
    - Unless monitoring indicates otherwise, treatment is not required/recommended at this stage;
  - Secure disposal:
    - All dirty water collected on the site should be re-used or stored during operation;
- The preparation of the in-pit overburden-backfill material to limit the post-mining impact (i.e. adhering to the principles of source reduction, treatment and secure disposal):
  - The geochemical assessment indicated that the addition of lime in the backfill will reduce the long-term postmining groundwater quality impact, though improving the anticipated low-pH conditions and lowering sulphate and metal concentrations.

AMD Prevention Mitigation

AMD can be reduced through the addition of calcitic lime to the backfill material (to buffer pH) or treating decant water. In terms of cost and volume, the required tonnage of calcitic lime to be added to the entire pit would be impracticable in terms of cost and volume. Target areas may include where discard is placed in the pits.

One option that should be pursued, is the placement of coal-fire station fly ash on top of the backfilled opencast. However, detailed research is required to investigate, especially, the geochemistry and water balance of such a scenario. Due to the long-term benefits of flushing acid-generating minerals from backfill material, this option should be carefully evaluated in terms of the potential impact on the local surface water environment and ecosystem. One aspect to consider is that water should first flow through the ash (e.g. rainfall recharge) before entering acid generating material, such as backfill. If decant water is treated in this way, it is advisable not to use ash, unless properly researched, but rather add calcitic lime.

8.3.4 PRELIMINARY IMPACTS ON HYDROLOGY

The following preliminary impacts on the hydrological resources within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). No impacts on hydrology have been identified that will occur during the Planning and Design Phase and the Decommissioning Phase.

Below are the preliminary impacts on hydrological resources for the construction, operation, and rehabilitation and closure phases, as well as their impact rating.

8.3.4.1 ALTERED HYDROLOGICAL REGIME

Surface clearing may impact on the local hydrological regime. During operation the exclusion of dirty water areas and interception of run-off from these areas will decrease catchment yield. Post mining increased ingress to groundwater will result in decreased surface water available for wetland and surface water resources support.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Altered hydrological regime	All	Operation Closure	-18.75	-12.00	-14.00	Moderate	No

Proposed Mitigation:

Impact is associated with construction and should recover after construction phase when construction ceases.

- Compile a suitable stormwater management plan. The stormwater management plan should incorporate "soft" engineering measures as much as possible, limiting the use of artificial materials. These measures may include grassy swales, bio-retention ponds / depressions filled with aquatic vegetation or the use of vegetation to dissipate flows at discharge locations;
- Stormwater channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion; and
- Stockpiles must be sloped to limit the run-off velocity of the area as far as possible.

8.3.4.2 SURFACE WATER CONTAMINATION

If poor storm water management is undertaken during the construction and operational phases, contamination of surface water can occur.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Surface water contamination	All	Construction Operation	-15.00	-8.25	-9.63	Moderate	Yes

Proposed Mitigation:

Mitigation of the impacts should include the following:

- All construction vehicles should be well maintained and inspected for hydrocarbon leaks weekly. Leaks must be repaired as a matter of urgency;
- Wash bay discharge water should flow through an oil separator;
- Fuel depots and fuel storage areas should be bunded (110% capacity);
- Hazardous chemicals should be stored in a central, secure, and bunded (110% capacity) area; and
- Regular toolbox talks on the responsible handling of chemicals should be undertaken.

8.3.4.3 IMPACT ON WETLANDS/ DRAINAGE LINES

There are numerous wetland and drainage systems within the study area, the mining may impact on several wetlands and drainage lines.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impact on Wetlands/ Drainage Lines	All	Construction Operation	-16.00	-10.50	-14.00	Moderate	Yes

Proposed Mitigation:

- Where possible, highly sensitivity areas identified in surface water assessment should be avoided;
- Separate clean and dirty water, continue with surface water and biomonitoring programmes;
- Compile a suitable stormwater management plan;
- All chemicals and toxicants during construction must be stored in bunded areas;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site or at on on-site service yard;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area, have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems; and
- All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported.

8.3.4.4 INCREASED SEDIMENT MOVEMENT OFF SITE

The potential for increased sediment movement off site is possible during the construction phase and also from any dumps and stockpile areas during the operational phase if not adequately managed. Increased sediment deposition within the wetlands and water courses will lead to changes in benthic habitats and establishment of reed beds in areas of sediment deposition.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Sedimentation	All	Construction Operation	-13.00	-7.50	-7.50	Low	No

Proposed Mitigation:

- Proper storm water management should be implemented, and proper management of stockpile and erosion control should be implemented.
- Compile a suitable stormwater management plan;
- Construct cut-off berms downslope of working areas, demarcate footprint areas to be cleared to avoid unnecessary clearing;
- Exposed areas must be ripped and vegetated as soon as it is feasible to do so in order to increase surface roughness and create energy dissipation at discharge areas to prevent scouring;

- Temporary and permanent erosion control methods may include silt fences, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed areas, erosion mats, and mulching;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area, Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems; and
- All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported.

8.3.5 IMPACTS ON SOILS AND AGRICULTURAL POTENTIAL

The major soils and agricultural potential impacts associated with mining are the disturbance of natural occurring soil profiles consisting of layers or soil horizons. Rehabilitation of disturbed areas aims to restore land capability, but the South African experience is that post mining land capability usually decreases compared to pre-mining land capability. Soil formation is determined by a combination of five interacting main soil formation factors. These factors are time, climate, slope, organisms and parent material. Soil formation is an extremely slow process and soil can therefore be considered as a non-renewable resource. Soil quality deteriorates during stockpiling and replacement of these soil materials into soil profiles during rehabilitation cannot imitate pre-mining soil quality properties. Depth however can be imitated but the combined soil quality deterioration and resultant compaction by the machines used in rehabilitation, leads to a net loss of land capability. A change in land capability may then force a change in land use. The impact on soil is high because natural soil layers will be stripped and stockpiled for later use in rehabilitation. In addition, soil fertility is impacted because stripped soil layers are usually thicker than the defined topsoil layer.

8.3.5.1 REDUCTION IN AGRICULTURAL POTENTIAL AND LOSS OF FERTILITY/LAND CAPABILITY

Reduction in natural soil fertility may be caused by removal, storage (stockpiling) and replacement of the soil profile. Aspects such as acidification, loss of nutrients and organic matter could apply. Such an impact will probably become greater, the longer such conditions apply however active rehabilitation would mitigate this situation to a degree.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss of fertility/land capability	All (Opencast)	Planning	-17.50	-4.00	-6.00	Low	No
		Construction and operational phase	-20.00	-15.00	-27.50	Moderate	No
		Decommissioning	-20.00	-8.25	-15.13	Moderate	No
		Rehab and closure	-12.00	8.25	12.38	Moderate	No
	All (Underground)	Planning	-14.00	-4.00	-5.33	Low	No
		Construction and operational phase	-14.00	-9.00	-15.00	Moderate	No
		Decommissioning	-18.75	-7.50	-11.25	Moderate	No
		Rehabilitation and closure	-9.75	4.00	5.33	Moderate	No

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
	Stockpiles and discard dump	Planning	-13.00	-4.00	-6.00	Low	No
		Construction and operational phase	-14.00	-8.25	-15.13	Moderate	No
		Decommissioning	-14.00	-5.00	-8.33	Moderate	No
		Rehab and closure	-12.00	4.00	6.00	Moderate	No
	All (Wash plant)	Planning	-14.00	-6.75	-10.13	Moderate	No
		Construction and operational phase	-15.00	-9.00	-16.50	Moderate	No
		Decommissioning	-16.00	-8.25	-15.13	Moderate	No
		Rehab and closure	-12.00	6.00	8.00	Moderate	No

Proposed Mitigation:

- Bush clearing of all bushes and trees taller than one meter that may be obstacles to the operational efforts. The remaining vegetation is then stripped with the topsoil to retain a more effective seed-bank as well as giving the stockpiles soil better organic matter content and chance to re-vegetate itself;
- Ensure proper storm water management designs are in place;
- If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place;
- If erosion has occurred, for areas where topsoil hasn't been stripped, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion;
- Only the designated access routes are to be used to reduce any unnecessary compaction and areas not designated as operational areas must be regarded as no go areas to prevent unnecessary disturbance to the soils;
- Compacted areas are to be ripped to loosen the soil structure;
- Topsoil stockpiles are to be kept separate from subsoils and kept to a maximum height of 4m;
- Topsoil is to be stripped when the soil is dry, as to reduce compaction;
- Bush clearing contractors will only clear bushes and trees larger than 1m the remaining vegetation will be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible;
- The subsoil will then be stripped and stockpiled separately;
- The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly;
- Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles;
- Stockpiles should only be used for their designated final purposes and topsoil and subsoil should be stockpiled separately;

- Place the above cleared vegetation were the topsoil stockpiles are to be placed. Cleared trees could be placed in separate stockpiles and allowed to decompose, these could then be used later as a type of compost to assist in the rehabilitation effort. Using the vegetation as cover on the stockpiles is also an acceptable option only if there is no alien vegetation present. However, if the grass is stripped with the topsoil layer there will be an increase organic matter content and seed bank reserve within the topsoil layer, which will dramatically improve rehabilitation efforts and possible save on re-seeding and lengthy monitoring programs; and

- Strip the topsoil and the remaining vegetation as per the rehabilitation guideline in EMPr (included in Appendix T) and place in the allocated locations for the various soil types, on top of the previously cleared bushes and trees.

8.3.5.2 LOSS/ DISTURBANCE OF TOPSOIL (INCLUDING CONTAMINATION, EROSION AND COMPACTION)

During construction compaction of soil from heavy vehicles and machinery travelling off-road as well as operation on site may occur. Erosion from disturbances to soil structure and vegetation cover is also likely. Contamination of soil could also result from hydrocarbon or chemical spillages. Furthermore, the current requirement in the authorised EMP to vegetate the stockpiles (including rock stockpiles) would likely result in a loss of topsoil (in order to provide the growing medium on the stockpiles) which could have been used for rehabilitation post mining.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss/ disturbance of topsoil (including contamination, erosion and compaction).	All	Construction	-14.00	-5.50	-7.33	Low	No

Proposed Mitigation:

Waste, hydrocarbons, and other chemicals should be handled and disposed of adequately to avoid contamination of soil. Erosion control measures should be implemented, and compaction of soil avoided where possible.

8.3.6 IMPACTS ON AIR QUALITY

Although there are a number of ambient air pollutants in the vicinity of the proposed Manungu Colliery, the pollutants of concern due to the mining activities will consist primarily of particulate matter. In addition to particulate matter (dust), greenhouse gases will also be released. Dust impacts (including the cumulative impact of dust) has been raised as a concern during the initial notification period and specifically during the focus group meeting held at the Fournel factory.

The proposed operations at Manungu Colliery will comprise of underground and opencast mining operations, road transportation and materials handling. Air quality is noted as being of particular concern due to the location of the farm properties in close proximity to the mine. Particulates present the main pollutant of concern from mining operations.

The highest simulated ground level PM_{10} concentrations due to proposed unmitigated project operations are in non-compliance with daily NAAQS at sensitive receptors within the study area extending ~7.5km north and ~6km southeast. When activities are mitigated (assuming 50% control efficiency on crushing activities and 75% control efficiency on unpaved roads) the PM_{10} concentrations reduce notably in magnitude and spatial distribution with exceedances of daily NAAQS at the closest sensitive receptors surrounding the mine. When further mitigation is

applied (90% control efficiency on unpaved roads), the impacts reduce further with exceedances of the NAAQS only at the closest sensitive receptors directly west of the mine.

The highest $PM_{2.5}$ concentrations due to proposed unmitigated project operations are in non-compliance with daily NAAQS at sensitive receptors west of the mine and east of the mine. When activities are mitigated (assuming 50% control efficiency on crushing activities and 75% control efficiency on unpaved roads) the $PM_{2.5}$ concentrations reduce notably in magnitude and spatial distribution with exceedances of daily NAAQS at the closest sensitive receptors to the west of the mine. When further mitigation is applied (90% control efficiency on unpaved roads), the impacts reduce further with no exceedances of the NAAQS at the closest sensitive receptors within the study area.

Area of non-compliance of PM_{10} NAAQS are indicated in Figure 38 while areas of non-compliance of PM2.5 NAAQS are indicated in Figure 39.

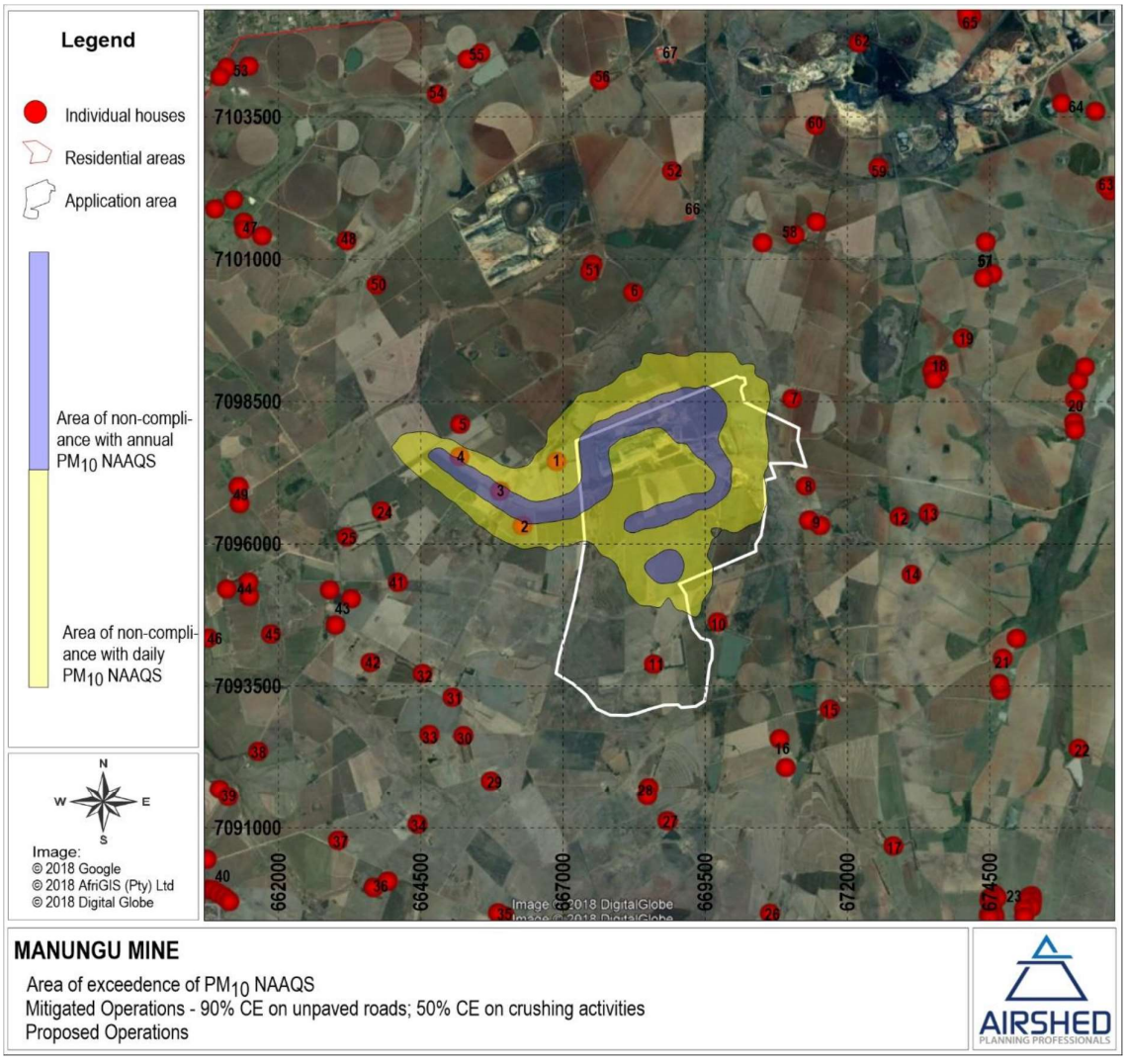


Figure 38: Area of non-compliance of PM10 NAAQS due to proposed mitigated project operations (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities).

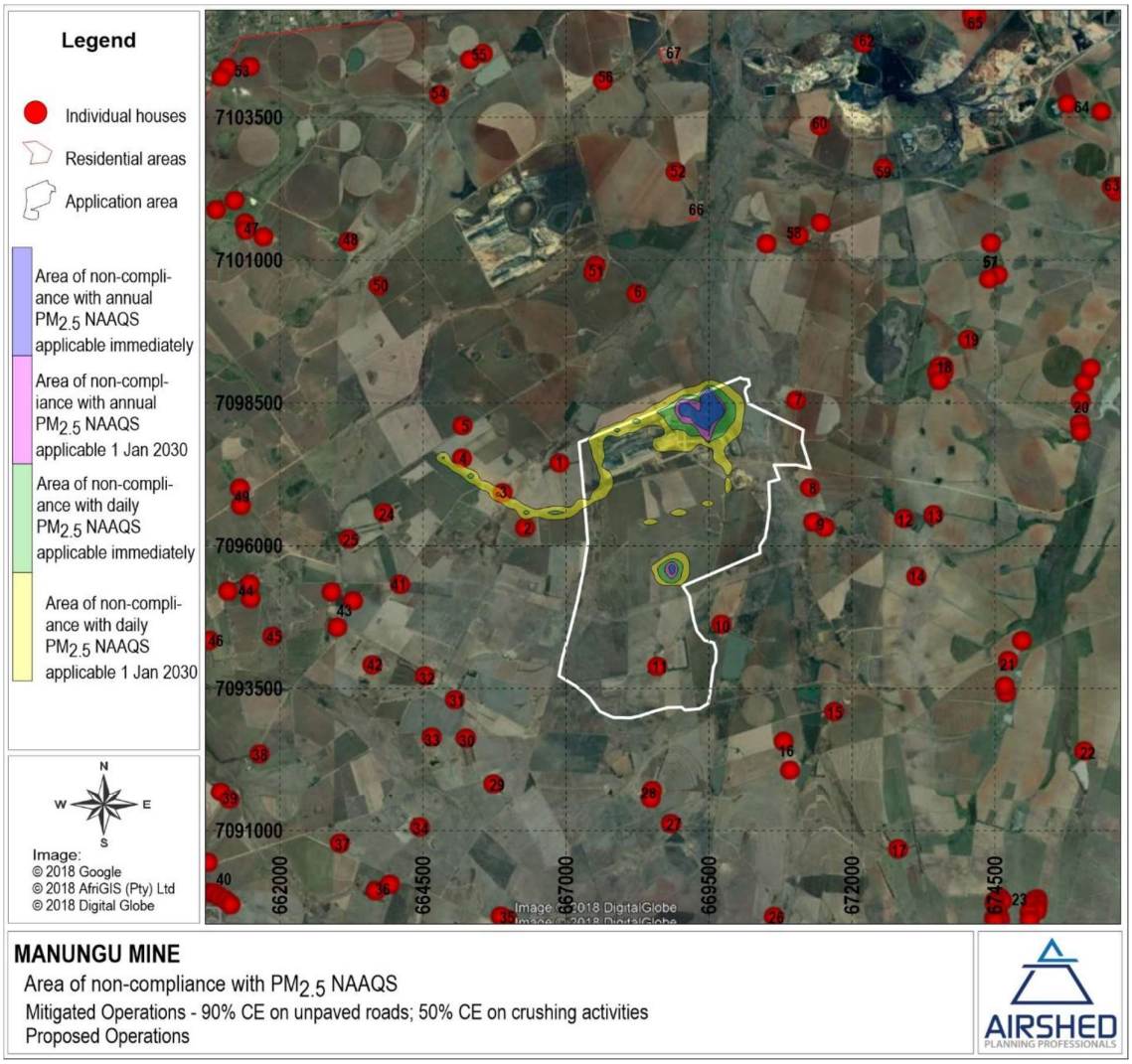


Figure 39: Area of non-compliance of $PM_{2.5}$ NAAQS due to proposed mitigated project operations (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities).

8.3.6.1 GASEOUS AND PARTICULATE EMISSIONS (INCLUDING DUST)

Mining activities have a high potential to cause dust in the immediate and surrounding areas if not adequately managed. Due to the number of mines in the local and regional areas surrounding Manungu Colliery as well as the agricultural activities in the region, there is a cumulative impact of dust generated in the area.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Emissions and dust	All	Construction	-9.00	-8.00	-10.67	Moderate	No
	All	Operation	-14.00	-11.00	-16.50	Moderate	No
	All	Decommissioning	-11.00	-8.00	-9.33	Low	No

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
	All	Rehab and closure	-10.00	-8.00	-9.33	Low	No

Proposed Mitigation:

Proper dust monitoring and management measures must be implemented including the development of a dust management plan. Stockpile management measures will also be important in order to reduce these impacts. Wet suppression where feasible on stockpiles and materials handling activities must be implemented. Other mitigation measures include the minimising the extent of disturbed areas, reduction in the frequency of disturbance, early re-vegetation and stabilisation (chemical, rock cladding or vegetative) of disturbed soil. Complaints received from the public regarding dust should be suitably investigated and mitigated where relevant.

8.3.7 VISUAL IMPACTS

Visual impacts would result from the construction, operation and decommissioning phase of the Manungu mine extension project. Specifically, impacts would result from the overburden stockpiles and the mining activities being seen from sensitive viewpoints. People working within the mine would be regarded as having a lower sensitivity as they would be focused on their work activities. Permanent views would be those from the farmsteads and residences within the area as well as from the nearby communities.

The height of the stockpiles contributes to the visual impact however the option of lowering the stockpiles to 6m high or less results in subsequent impacts such as larger surface disturbance or alternatively increasing the surface area of the stockpiled material which could result in greater dust and erosion impacts. The Air Quality Specialist Assessment will assess the height of the stockpiles in relation to the potential for dust generation and the results of this assessment will be presented in the EIR/EMPr.

8.3.7.1 VISUAL IMPACTS

Mining has known visual impacts such as the stockpiles, activities, etc. Manungu Colliery is located in a mining rich area and as such, the general landscape is scattered with mines and stockpiles.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Visual impact and impact on sense of place	All	Construction Operation	-11.00	-5.00	-5.00	Low	No

Proposed Mitigation:

Construction areas must be kept clean and tidy and adequate dust suppression must be undertaken. Stockpiles should be constructed in designated areas to limit the number of stockpiles required at any one time.

8.3.8 VIBRATION AND BLASTING IMPACTS

The potential impacts investigated due to blasting operations are ground vibration, air blast and fly rock. There are no densely populated areas within close proximity to the proposed mining areas and as such, this impact is considered to be adequately managed through the mines current blasting controls.

8.3.8.1 BLASTING AND VIBRATION IMPACTS

During blasting events, receptors close to the blast area may experience vibrations as well as perceive the audible blast. Safety and security around the blast site is strictly controlled due to the possibility of blast fly rock. Manungu Colliery is located in a sparsely populated area with minimal receptors within close proximity to blasting.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Blasting and vibration impacts	All	Operation	-17.50	-9.00	-10.50	Moderate	No

Proposed Preliminary Mitigation:

Mitigation will be based on what is considered safe blasting criteria with regards to structures and what is considered as an acceptable level with regards to human perception. Compliance with the relevant legislation as well as the current mine blasting procedure must be adhered to.

8.3.9 SOCIO-ECONOMIC IMPACTS

The following preliminary impacts on the socio-economic environment within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). No impacts on socio-economics have been identified that will occur during the Planning and Design Phase, Decommissioning Phase, and the Rehabilitation and Closure Phase.

Below are the construction and operational phase preliminary impacts on socio-economic environment, as well as their impact rating.

8.3.9.1 REDUCTION IN QUANTITY OF WATER (I.E. WATER CONSUMPTION)

The utilisation of groundwater for any purpose may result in the alteration/ reduction of groundwater levels on site thereby affecting local users.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Reduction in quantity of water (i.e. water consumption)	All	Construction Operation Closure	-13.00	-5.00	-6.67	Low	Yes

Proposed Mitigation:

Pre-construction water levels should be recorded for the water sources and should be monitored regularly to ascertain if the water levels are dropping drastically. Should a negative impact be recorded on a water users water availability, this should be compensated proportionally.

8.3.9.2 INTERFERENCE WITH EXISTING LAND USES

Existing land uses would be affected during construction and operation as land affected by the development footprint can no longer be used for other purposes.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Interference with Existing Land Uses	All	Construction Operation	-14.00	-5.50	-7.33	Low	Yes

Proposed Mitigation:

Where relevant, directly affected landowners must be engaged and agreements must be reached on compensation for any loss of use of the land. There must be a formal procedure in place on how to report incidents to ensure records of all grievances are kept, and responses are given within a certain time. As far as possible interference with existing land uses/livelihoods of those surrounding the mining area should be avoided. If any interference takes place, the landowner should be compensated for their losses following suitable investigations.

8.3.9.3 NUISANCE AND IMPACT ON SENSE OF PLACE (I.E. NOISE, DUST, ETC.)

The proposed mine extension project will impact on the established sense of place of a particular property. Additional vehicles, increased noise and dust, the removal of vegetation, and presence of workers will all contribute to the alteration of the sense of place as well as creating a possible nuisance.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Nuisance and Impact on Sense of Place (i.e. noise, dust, etc.).	All	Construction Operation	-12.00	-5.00	-5.83	Moderate	No

Proposed Mitigation:

Adequate dust suppression measures should be utilized to minimize dust production. There must be a formal procedure in place on how to report incidents to ensure records of all grievances are kept, and responses are given within a certain time.

Sense of place is defined as an individual's personal relationship with their local environment, both social and natural, which the individual experiences in their daily life. It is therefore difficult to mitigate the impact as it is experienced on a personal level.

8.3.9.4 SAFETY AND SECURITY (I.E. ACCESS TO PROPERTIES, THEFT, FIRE HAZARDS, SPONTANEOUS COMBUSTION OF COAL STOCKPILES ETC.)

Future mining activities may result in a risk to the safety and security of landowners, lawful occupiers, and community members in close proximity to the mining areas due to the increase in number of unfamiliar people in the area. Furthermore, any spontaneous combustion of carbonaceous material could cause fires if not adequately controlled.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Safety and security (i.e. access	All	Construction Operation	-10.50	-5.50	-5.50	Low	No

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
to properties, theft, fire hazards, etc.).		Decommissioning					

Proposed Mitigation:

All mining contractors and employees should wear appropriate identification. Vehicles should be clearly marked for ease of identification. Entry and exit points at the mine should also be controlled. Coal stockpiles should be kept for limited time on site and adequate control of any combustion of coal stockpiles must immediately be initiated.

8.3.9.5 DAMAGE/ DISRUPTION OF SERVICES (I.E. WATER, ELECTRICITY, SEWAGE, ETC.)

Mining operations have the potential to disrupt or damage services such as water supply, electricity supply or sewage collection pipes if not situated correctly within the study area.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Damage / disruption of services (i.e. water, electricity, sewage, etc.).	All	Construction Operation	-13.00	-5.00	-5.83	Low	No

Proposed Mitigation:

Before the project commences, an asset and services baseline of services/assets that may be affected must be compiled. A copy of the baseline records should be given to each landowner/service provider, and a master document kept by the applicant. If any damage occurs it should be reinstated to its pre-project status on conclusion of investigations into the cause. Furthermore, compliance with the Eskom requirements must be adhered to for any activities within close proximity to the Eskom transmission powerlines.

8.3.9.6 IMPACT ON EXISTING INFRASTRUCTURE (I.E. ROADS, FENCES, ETC.)

Activities may impact on existing infrastructure such as increased traffic on the adjacent road network, damage to fences and other local infrastructure.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impact on existing infrastructure (i.e. roads, fences, etc.)	All	Construction Operation Decommissioning	-13.00	-5.00	-5.83	Low	No

Proposed Mitigation:

An asset and infrastructure baseline of any new public and/or private infrastructure that may be affected by mining activities must be compiled. A copy of the baseline records should be given to the relevant landowner/s

or service providers, and a master document kept by the applicant. If any damage occurs it should be reinstated to its pre-project status on conclusion of investigations into the cause.

8.3.9.7 PERCEPTIONS AND EXPECTATIONS

The proposed mine extension is likely to create great interest, particularly with regards to the potential for employment, perceived safety and security risks, and the exact nature of the proposed project. It must be born in mind that the mine is already in operation and the proposed extension of the life of mine will largely only result in ongoing employment, etc. The scale of the mining operation is not anticipated to be ramped up to such a degree that the current impacts would be greatly exacerbated.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Perceptions and Expectations	All	Construction Operation	-12.00	-6.75	-6.75	Low	No

Proposed Mitigation:

Perceptions and expectations must be managed through ongoing, open and transparent communication with affected stakeholders, communities, landowners and occupiers.

8.3.9.8 EMPLOYMENT OPPORTUNITIES

Minor employment opportunities for some unskilled, skilled labour as well as providing services during construction (e.g. accommodation, transportation, etc.) may arise from this project. It is important to note that the project is an extension of the existing mining operations to extend the life of mine and therefore new job opportunities may be limited.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Employment Opportunities	All	Construction Operation Decommissioning	2.25	6.00	6.00	Low	No

Proposed Mitigation:

Recruitment for any additional labour or services should be focused in the local area and preference given to the local communities if possible.

8.3.9.9 COAL SUPPLY FOR ENERGY SECURITY

The continued supply of coal to Eskom will aid in energy security for the country.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Coal supply	All	Operation	15.00	15.00	15.00	Moderate	No

Proposed Mitigation:

No mitigation required.

9 PROJECT ALTERNATIVES

The identification of alternatives is a key aspect of the success of the scoping and EIA process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider and assess. There are however some significant constraints that must be taken into account when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which will be discussed in the evaluation of the alternatives. Alternatives can typically be identified according to:

- Location alternatives;
- Process alternatives;
- Technological alternatives; and
- Activity alternatives (including the no-go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. As mentioned in Section 5, the need for the proposed project includes the following key drivers:

- The importance and demand of coal as a resource; and
- The continued employment of workers on the mine.

The alternatives are described, and the advantages and disadvantages are presented. It is further indicated which alternatives are considered feasible from a technical as well as environmental perspective. The no-go option is also assessed herein (Section 9.4).

9.1 DETAILS OF LOCATION ALTERNATIVES

The section below describes the site / location alternatives considered as part of the project. As indicated above, Manungu Colliery is an existing operational mine, and has been subject to previous environmental processes, which considered alternatives in the form of both development and land use alternatives prior to approval.

9.1.1 DETAILS OF DEVELOPMENT PROPERTY

The land use of the extension area consists predominantly of agricultural land (grazing and crop land) which is adjacent to the current mining and related activities. Tshedza is a mining company holding a mining right over the proposed extension area and therefore, there is no practical development alternative for the future mining area. The proposed extension of the current mining area has taken into consideration economic viability and practicality as well as the location of the coal resource.

9.1.2 CONSIDERATION OF PROPERTY

The proposed amendment of the existing MWP includes areas that are already included in the existing Mining Right of Manungu Colliery. Therefore, no other alternatives were considered with regards to the consideration of property.

9.1.3 LOCATION, LAYOUT OR DESIGN OF THE ACTIVITY

Numerous alternatives were evaluated with regard to the extent of the area to be mined, mostly linked to the presence of surface infrastructure within and adjacent to the target coal resource. The relocation of the existing infrastructure will enable the underlying coal to be accessed, thereby increasing the total coal resources that would be available for extraction over the LoM.

Layout options have been investigated with regards to the placement of the infrastructure at the site including positioning of various aspects of the mine infrastructure including the opencast vs underground mining, stockpiles (location and height options), roads, power line, PCD and contractors camp relocation. The updated MWP includes preliminary positions for various aspects of the mine infrastructure.

The location alternatives investigated in the EIA phase are described below

- **Location Alternative S1a -** *Maximum mining over entire area*: This alternative involves mining over the entire proposed open cast and underground areas. This option can only be considered if no high sensitivity "No-Go" areas are identified in these areas. In this development alternative, the mining and economically efficient production of coal is emphasised. Less restrictive mitigation measures will be used to protect the environmental features, thus allowing for maximum coal production. This approach has the potential to increase the financial viability of the mine at the expense of any identified environmental features on site.

- **Location Alternative S1b -** *Sensitivity-based approach:* This alternative avoids no go areas and considers specialist recommendations regarding buffer distances from important features. In this development alternative environmental resource protection is emphasised and relies on the use and implementation of stringent mitigation measures to minimise identified adverse impacts. This development alternative will use environmental specialist planning and evaluation of mining methodologies (opencast vs. underground), mining footprint alteration, and infrastructure placement and logistic options to avoid consolidated sensitive environmental features and locate the operation in the least (relative) to site, sensitive location.

Amendments to certain conditions in the current EA and associated EMP are proposed in order to align certain conditions with the current mining practices. Condition 3.31 of the EA states: "Subsoil and hard overburden stockpiles must not exceed a height of 6m". This condition is not considered practical by the mine and is in fact not consistent with standard coal mining practices. As such, the layout alternatives for the stockpile height are described below:

- **Layout Alternative S2a** – *Stockpile height no greater than 6m high*: This would entail subsoil and overburden stockpiles being no more than 6m in height.

- **Layout Alternative S2b** – *Stockpile height no greater than 60m high*: This would entail subsoil and overburden stockpiles being no more than 60m in height.

The EMP condition requires all stockpiles to be vegetated to limit dust production. This condition is not considered practical by the mine and is in fact not consistent with standard coal mining practices. As such, the layout alternatives for the vegetating of stockpiles are described below:

- **Layout Alternative S3a** – *Vegetated stockpiles*: This would entail subsoil and overburden stockpiles being actively vegetated which is not the preferred alternative due to the impracticability of achieving vegetation establishment on most stockpiles.

- **Layout Alternative S3b** – *Unvegetated stockpiles*: This would entail subsoil and overburden stockpiles remaining unvegetated.

The EMP condition requires the planting of a tree screen around the mining right boundary to reduce the visual impact of the mine. This condition is not considered practical by the mine as the mining right boundary encompasses a large area compared to the current and proposed future mining areas. As such, the layout alternatives for the tree screening options are described below:

- **Layout Alternative S4a** – *Tree screen around mining right boundary*: This would entail planting a tree screen around the entire mining right boundary which is impractical on farmers properties and would provide minimal visual screening to coal mining activities.

- **Layout Alternative S4b** – *No tree screen around mining right boundary*: This alternative would consider no tree screen around the mining right boundary.

9.2 DETAILS OF PROCESS ALTERNATIVES

The subsections below describe the various process alternatives considered in this EIA report.

9.2.1 MINING METHOD

Both opencast and underground mining methods are proposed within the proposed extension areas due to the depth of the coal resource in the area. As such, alternative mining methods in terms of open cast vs underground mining in the respective areas will not be considered.

9.2.2 DISPOSAL OF WASTES

Two main options, with additional sub-options, have been identified and investigated for disposal of the filter cake, the fine coal refuse material from the processing plant. These include:

- **Process Alternative P1a -** *Stockpile for use as non-select product***:** This option involves temporarily stockpiling the filter cake on site and selling it off at a later stage.
- **Process Alternative P1b -** *Disposal:* This option involves disposal of discard to a surface disposal site or into the pit during backfill operations.

Several options were investigated for the disposal of carboniferous wastes (wash plant waste rock and possibly filter cake)

- **Process Alternative P2a -** *Disposal to surface waste disposal facility - located on old rehabilitated mine area*. This option would involve the discarding of coal waste to an open ground/surface co-disposal facility located in the old mine area which has been rehabilitated. This option would involve the creation of a new co-disposal coal discard dump at the site.
- **Process Alternative P2b** - *Disposal to surface waste disposal facility - located on un-mined area:* This option would involve the discarding of coal waste to an open ground/surface co-disposal facility located on an unmined area.
- **Process Alternative P2c** - *Disposal of wash plant waste rock (discard) to pit and filter cake to surface disposal site:* This option would involve the discarding of coal waste to pit and the filter cake to an open ground co-disposal facility.
- **Process Alternative P2d** - *Disposal of discard and filter cake to pit:* This option would involve the discarding of all coal waste to the pit during rollover rehabilitation.

9.2.3 WATER SUPPLY

Two alternatives for the supply of water to the wash plant were identified, namely:

- **Process Alternative P3a -** *Water obtained from dirty water containment facilities*: Water would be obtained from dirty water containment facilities (i.e.: PCD's).
- **Process Alternative P3b** - *Water from natural ground or surface water resources*: For this alternative water for the wash plant would be abstracted from boreholes.

9.3 DETAILS OF TECHNOLOGY ALTERNATIVES

The subsections below describe the technological alternatives considered in this report.

9.3.1 PROCESSING TECHNOLOGY TO BE USED IN THE ACTIVITY

There are two main types of washing processing technology which could be used for coal beneficiation, namely:

- **Technology Alternative T1a** - *Dry processing:* A dry coal separator uses less water than a conventional wet processing alternative. The main and most obvious advantage of dry processing of coal is that no water is required. Dry processing is, however, not applicable on all mines and with all coal types and quantities.

- **Technology Alternative T1b** - *Wet washing:* This is the conventional processing alternative employed at most processing facilities.

9.3.2 TRANSPORT OPTIONS

There are several coal product transport options. The feasibility of these options would hinge on the final market for the coal, as well as the proximity of available transport infrastructure. The following alternatives have been considered:

- **Technology Alternative T2a –** *Road:* This would involve the transport of the product by existing road networks to the respective buyer. This is the alternative currently used to transport the coal.
- **Technology Alternative T2a** – *Rail:* This option would involve transport of the coal by rail utilizing a railway siding.
- **Technology Alternative T2a -** *Use of conveyor:* This option would involve transport of the coal by conveyor to the buyer. There is no existing coal conveyor network within close proximity to the mine.

9.4 DETAILS OF ACTIVITY ALTERNATIVES

Open cast and underground mining have been put forward within the proposed extension areas due to the varying depth of the coal resource. The proposed extension areas are currently under agricultural land use (e.g.: grazing and crop lands). Two activity alternatives are considered in this EIA report (activity alternatives A1 and A2).

- **Activity Alternative A1 –** *Mining*: The land would be purchased from the current landowners (where necessary) and transformed into mining areas.
- **Activity Alternative A2** – *No-go option.* The 'no-go' or 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

The implication of not amending the existing MWP (within the approved mining right boundary) to include the mining of additional coal resources, as indicated in the MWP, includes a reduction in the existing mining operations overall LoM, as well as compromising the ability of Manungu Colliery to ensure consistent coal supply to Eskom for electricity generation and extended local and regional economic benefits. The area is included in the mining right boundary and if the no-go option is opted for, then most likely the mine will cease to operate soon and the known coal reserves would remain available for future extraction. An opportunity will then be provided for a future mine applicant to apply for rights to access the coal reserves remaining and thereby possibly re-activate mining at a later stage.

- The no-go alternative means that the benefits of local and regional employment at the mine would not be realized in the long term. The proposed extension project would increase the LoM by approximately 12 years. The potential employment and economic benefits will therefore be foregone. The no-go alternative would therefore maintain the current environmental status quo at the site but would reduce the potential LoM by approximately 12 years.

9.5 PREFERRED ALTERNATIVES

Based on the findings from the scoping study several of the alternatives presented in Section 9.1 to 9.4 were deemed unfeasible and were not carried through for assessment into this EIA report. The Alternatives which were nominated for consideration and comparative assessment in this EIA are indicated in Table 23. Note that the "do-nothing" alternative (Alternative A2) is assessed in Section 9.4 above and is not considered to be preferred or discussed further. Table 23 shows the other alternatives considered in this EIA report:

Table 23: Alternatives for Consideration in EIA

Alternatives Considered in the EIA	
Filter Cake	**P1a** - stockpile for use as non-select product
	P1b - disposal
Disposal of Wash Plant Waste Rock (and possibly filter cake)	**P2a** - disposal of plant waste rock to surface facility located on old rehabilitated area
	P2d – disposal of plant waste rocks and filter cake to pit
Wash plant water supply	**P3a** - obtain water from dirty water containment facilities
Coal beneficiation	**T1b –** wet washing
Coal product transportation	**T2a –** transportation by road
Land use alternatives	**A1 –** land use for mining
	A2 – no go alternative
Location/Micro sitting Alternatives	**S1a –** Maximum mining over entire area: This alternative involves mining over the entire proposed open cast area.
	S1b – Sensitivity-based approach (avoid/buffer sensitive areas)
Stockpile height	**S2a –** stockpile height no greater than 6m in height
	S2b – stockpile height no greater than 60m in height
Vegetating stockpiles	**S3a** – Vegetated stockpiles
	S3b – Unvegetated stockpiles
Tree screening	**S4a** – tree screen around the mining right area
	S4b – no tree screen around the mining right area

9.6 FINAL ALTERNATIVE SELECTION

This section describes the pros and cons of various alternatives described above. Input from specialists was obtained to complete this section. The findings are presented here in Table 24 including recommendations regarding the preferred alternatives.

Table 24: Summary of alternative options assessment

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
P1a – Stockpile filter cake for use as non-select product.	Possible revenue stream, and possibility to blend with product, as necessary. Less carboniferous waste disposed of on site.	Contaminated runoff from the filter cake stockpiles may contaminate water resources. Potential combustion hazard.	The surrounding aquifers are not expected to be impacted in terms of groundwater quality during the mining phase, due to groundwater flowing toward the dewatered mining area. This will also be the case if filter cake is disposed of in-pit. Both P1a and P1b are acceptable in terms of their potential environmental impacts and neither alternative is favoured from an environmental impact perspective. None of the specialist studies have a significant preference for either option. Both alternatives are considered acceptable from an environmental perspective.
P1b – Disposal of filter cake	Limited handling of filter cake, thereby reducing contamination risk during transport.	Disposal will create long term source of contamination for water resources. Inefficient use of potentially valuable resource.	
P2a – Disposal of carboniferous wastes (wash plant waste rock and possibly filter cake) to surface waste disposal facility- located on old rehabilitated mine area.	Area already disturbed- i.e. brownfields. Carboniferous material easily accessible should there be a future change in technologies and mineral demands.	Future permanent dump on surface. Differential settling on rehabilitated surface may compromise any foundation liner/barrier (if required). AMD seepage if not lined. Potential long-term runoff of contaminated water as well as contaminated seepage emanating from the disposal facility.	According to the Geohydrology specialist report there is a clear advantage in placing coal discard into the Manungu extension area pit below the long-term in-pit mine water level (i.e.: >10m below post mining groundwater level). If a discard dump is placed on surface, it would require decant management

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
		Long term – permanent environmental risk/liability associated with future dump integrity (e.g. erosion of cap, illegal mining).	measures, including engineered liner and capping systems. Furthermore, the disposal of discard to pit would decrease the material deficit (i.e.: final landform) while a surface disposal facility would result in a long-term sterilization of land (i.e.: land not available for future use).
P2d – Disposal of discard and filter cake to pit.	Reduce final void size. Limited addition to pit salt load if disposed below pit water level. Rehabilitation of the pit to ground level thereby reducing hydrological and soil impacts.	Leaching to water resources (if disposed above groundwater level). Potential groundwater contamination and seepage emanating from the pit subsequently resulting in surface and ground water contamination. Limitations and technical challenges related to options for barrier layers.	
P3a – Wash plant water supply obtained from dirty water containment facilities (i.e.: PCD's).	Assist to reduce water to be treated. Reduced use of clean water thus reducing overall water impact. This will reduce the risk of surface water discharge.	Lead to further deterioration of water quality within the dirty water containment facilities.	This is the best and preferred method as it will make use of already contaminated/dirty water thus reducing the overall impact on clean water resources.
T1b – Coal Beneficiation (Wet washing processing technology)	Can control separation at specific densities. Well controlled process. Can be used to offset a positive water balance if one does exist.	Requires additional water volumes which is undesirable if a negative water balance is identified. Increased risk for water contamination arising from the storage, usage and conveyance of contaminated water. Can result in a negative water balance requiring significant make-up water.	This is the best method to control the products required to meet the required specification of Eskom Power Stations.

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
T2a – Transport coal product by Road	Flexible to deliver to any market (e.g. power stations). Limited anticipated soil, aquatic and wetland impacts- existing road network. Current method employed on the mine for transportation of product.	Dust impacts due to vehicle entrainment will be higher than conveyor and rail option. Road safety and traffic impacts. Damage to local and regional road infrastructure.	This is the preferred alternative as coal is currently transported by road. Due to the proximity of the mine to power stations and rail sidings, the construction of a conveyer belt is not feasible as it would need to cross numerous farms and other services.
A1 – Land used for mining	Economic advantages: continued employment for mine workers.	Potential for hydrological and chemical modification in local soils, wetlands and aquatic ecosystems.	The Manungu Colliery is an existing operational mine. Continued mining within the existing approved Mining Right is considered a feasible land use going forward and is in line with the development plans contained in the IDP.
A2 – No-go alternative	Reduced risk for water contamination and subsequent wetland and aquatic ecological degradation. Reduced risk to the health and safety of the local communities.	Agricultural activities will likely continue to take place if the no-go alternative is followed. This would result in continued impacts to soils, wetlands and aquatic ecology.	
S1a – Maximum mining over entire area	Refer to Section 10.4 (Sensitivity mapping) for discussion on site sensitivity and "sensitivity based" approach vs "maximum mining" approach. The sensitivity based approach has been deemed the most suitable alternative moving forward.		
S1b – Sensitivity-based approach (avoid / buffer sensitive areas).			
S2a – Stockpile height no greater than 6m in height	Lower visual impact. Perceived contribution to lower dust impacts.	Greater surface area of disturbance. Existing stockpiles would require double handling.	Not common or best practice in the mining industry to limit stockpile height to 6m as this would lead to

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
S2b – Stockpile height no greater than 60m in height	Maintain current mining status quo (i.e.: no double handling). Smaller footprint of stockpiles.	Potentially contribute to greater dust impacts. Greater visual impact.	the need for a large surface area for stockpiling. There is a clear advantage in higher stockpiles as these would require a much lesser area and as per the findings of the Air Quality study, the surface area of the stockpiles has a direct bearing on the dust generated. As such, higher stockpiles have a lower surface area and therefore produce less dust.
S3a - Vegetated stockpiles	Perceived contribution to lower dust impacts.	Use of topsoil to vegetate stockpiles would result in loss of topsoil for rehabilitation purposes.	Unvegetated stockpiles (S3b) are preferred as topsoil removed during stripping operations would be used during rehabilitation purposes instead of vegetating stockpiles. In order to vegetate a rock or overburden stockpile, a suitable growing medium would be required (i.e. topsoil). By spreading topsoil over stockpiles this would result in dilution of the topsoil during backfilling operations and ultimately a loss of topsoil. As such, unvegetated stockpiles is the preferred alternative.
S3b – Unvegetated stockpiles	Topsoil conservation as topsoil removed during stripping operations would be used during rehabilitation.	Potentially contribute to greater dust impacts.	
S4a – Tree screen around mining right area	Perception of lower visual and dust impacts.	Costly to implement and maintain. Would require landowner agreements with numerous landowners.	The use of tree screening around the mining right area is considered to be a historic mitigation measure

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
		May not provide any benefit in terms of visual and dust impacts.	in the previous EIA study to lower visual and dust impacts. However, disadvantages of this measure far outweigh the advantages as this would impact on numerous farms far from the actual mining activities and would not provide any substantial benefit in terms of visual and dust impacts. Therefore, the no tree screen around mining right area alternative (S4b) is the preferred alternative moving forward.
S4b – No tree screen around mining right area	No cost and maintenance inputs.	Perception of higher visual and dust impacts.	

10 CONCLUSIONS AND RECOMMENDATIONS

The Scoping Phase of the EIA process identified potential issues associated with the proposed project and defined the extent of the studies required within the EIA Phase. The EIA Phase assessed those identified potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report provides sufficient information regarding the potential impacts and the acceptability of these impacts in order for the Competent Authority to make an informed decision regarding the proposed project. The release of a draft EIA Report will provide stakeholders with an opportunity to verify that the issues they have raised through the EIA process have been captured and adequately considered.

The EIA Phase aimed to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project.
- Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed coal mine extension project and associated infrastructure.
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
- Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

10.1 CONCLUSIONS FROM SPECIALIST STUDIES

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive, and every effort has been made to include representatives of all stakeholders in the study area. The main conclusions from each of the specialist studies are presented below.

10.1.1 GROUNDWATER IMPACTS

The opencast is not expected to decant during the Life-of-Mine (LoM). Although the maximum extent of the dewatering cone (impact on groundwater quantity) should generally not exceed 350m from the pit perimeter in the Karoo rock environment, various indicators (including numerical modelling) suggests a much wider impact zone of generally 400m-500m wide, but up to 800m to the south (it is important that groundwater monitoring confirms this).

The impacts identified on groundwater quality indicate that groundwater flow into the opencast workings is expected to be of similar quality than the background groundwater (to be evaluated for the final impact assessment report). Once in contact with the various materials within the Mine, the water quality will deteriorate over time. Currently, mine water quality SO_4 concentrations range between 150mg/L and 400mg/L. If all in-pit water is pumped out within a relatively short period (<3months), the water will not acidify and SO_4 concentrations should not exceed 800mg/L. If in-pit water is allowed to collect in the lowest regions for longer periods, it may eventually deteriorate, depending on the oxygen-water-rock (carbonaceous material) interaction. Isolated “hot-spots” of higher concentrations and lower pH may exist. The surrounding aquifers are not expected to be impacted in terms of groundwater quality during the Operational Phase. This is due to groundwater flow being toward the dewatered mining areas. Numerical geochemical modelling confirmed that in-pit storage of discard will have an insignificant effect on the long-term Pit mine water quality.

Operational Phase groundwater management measures include the following:

- Boreholes intersected by underground mining should be sealed to prevent drainage into the mine. Impacted external users’ boreholes need to be replaced if impacted upon;

- Unstable geological conditions and problematic water makes (structural related) in the underground sections should be sealed off;
-
- Excess water in the mine must be used in the mine or pumped to pollution control facilities for re-use e.g. coal wash plant;
    - Water containment pollution control facilities must be lined;
    - All mine water pumpage and uses are to be metered and recorded;
    - Discharge water quality to rivers must comply with DWS standards;
- The mine water (monthly), groundwater, including external users' boreholes within a 1km radius (quarterly and selective monthly) and surface water (monthly) quality must be monitored on a regular basis;
- Water level measurements should be taken on a monthly basis in the monitoring boreholes, while the external users' boreholes within a 1km radius are to be monitored quarterly with some selected for monthly monitoring;
- All groundwater abstractions are to be metered and recorded;
- Selected surface water monitoring localities (rivers & streams) are to be monitored for stream flow on a monthly basis;
- Monthly rainfall records should be kept in aid of the mine water balance as well as impact disputes.

It is anticipated that decant will occur between 20years (earliest) and 30years after mining ceases for the main opencast if the underground is sealed off, and a few years longer if the underground is not sealed. In addition to the decant at the opencast pit perimeter (i.e. decant that will flow to surface at the pit perimeter), a small volume of sub-surface decant will most-likely occur as contaminated base-flow to low-lying areas downstream/north of the pit perimeter (i.e. groundwater will flow below surface to a point further downstream where this water may decant to surface). Sub-surface decant can be expected in the form of a contamination plume developing in the direction of groundwater flow. The decant elevation is estimated at 1579mamsl, which will result in 75% of the opencast being flooded eventually; with small volumes of sub-surface decant potentially directly downstream/east of the pit perimeter. Within 10years after the cessation of mining, SO_4 concentrations are likely to increase to 3500mg/L, where after concentrations will gradually improve over many decades. Provided that decant water is captured, the surrounding rivers/streams, wetlands and pans are not expected to be impacted in terms of groundwater quality.

The Geohydrology report evaluated one management measure to reduce the mine water quality impact on the local groundwater setting. During the Phase-1 assessment, a modelling scenario was carried out to evaluate the effect of artificially lowering the in-pit level by 14m below the decant elevation to 1565mamsl. On average, ±50% more that the natural decant volume will have to be removed to keep the in-pit level at this elevation. In pit manipulation can be achieved through evaporation or pumping, in the latter case this water will have to be treated before discharging to the surface water environment at a quality acceptable to the DWS. Further modelling is required to find an optimum management level to limit the water that has to be treated as well as limit the movement of groundwater contamination.

10.1.2 SURFACE WATER IMPACTS

During the construction phase, topsoil from all facility footprints will be stripped and stockpiled for future use. Areas that have been stripped of vegetation and topsoil will be prone to erosion. This could lead to increased suspended solids being deposited into the local streams. It is unlikely that impacts will extend beyond the Western and Eastern streams. The affected areas will be relatively small. Erosion impacts will be short term and will cease once the facilities are constructed and the topsoil stockpile is vegetated.

During the operational phase, some of the study area would be considered as dirty areas. These areas include the opencast operations, the hards and RoM stockpiles, and any pollution control dams. Storm water and seepage generated from these dirty areas will likely be contaminated and have a detrimental effect on the water quality in the local streams and the Western and Eastern streams. These impacts will be most acute during the dry season when stream flows are low. The stormwater management plan and associated designs must be implemented in order to maintain separation of clean and dirty water during the operational phase of the mine.

During the decommissioning phase, most impacts will be associated with the removal of surface infrastructure, final pit closure and removal and rehabilitation of the RoM stockpiles and the hards dump. Haul roads will be removed, as will berms and diversion trenches. During this process, short-term impacts will be moderate, as heavy earth-moving machinery will disturb large areas. Previously vegetated areas may be disturbed which will increase erosion potential. These short-term impacts will give way to long term benefits once the full rehabilitation of mining areas has been completed.

10.1.3 HYDROPEDOLOGY

The hydropedological modelling focussed on three of the four transects (only those impacted by open-cast mining). Simulations focussed on the contribution of lateral flows through the transects following a very wet period to illustrate the maximum impact of the development on lateral outflows. Under these conditions the development could result in up to 67% reduction in lateral contributions to flow. The difference in the lateral contributions is large due to the difference in water regimes of the soils in the valley bottom. Under natural conditions these soils will be fed by a larger contribution area than under 'developed' conditions and will consequently remain wetter for longer and also 'wet-up' quicker following rain events. This will result in more lateral drainage from the natural than the 'developed' state.

Under normal (drier) conditions, the low hydraulic conductivity of the soils together with the low relief of the landscape, suggest that lateral flows through the soils are limited. This is supported by the precipitation of lime in Steendal soils on mid slope positions (limited leaching or lateral flows). To summarise, a significant loss of interflow is expected during extreme rainfall events (1:10 or 1:25-year flooding events) with very little to no loss of interflow expected during an average rainfall year.

A wetland offset strategy is recommended given the fact that the responsive hydropedological forms are the only sections of the hillslopes that will remain intact, with the rest of the hillslopes (recharge and interflow hydropedological forms) being removed during the proposed activities. This strategy has been considered as a last resort according to the mitigation hierarchy due to the irrelevance of "avoidance", "decreasing impacts" and "rehabilitation" options.

10.1.4 SOIL

The major impacts associated with mining are the disturbance of natural occurring soil profiles consisting of layers or soil horizons. Rehabilitation of disturbed areas aims to restore land capability, however, the norm in South Africa is that post mining land capability usually decreases compared to pre-mining land capability. Soil formation is determined by a combination of five interacting main soil formation factors. These factors are time, climate, slope, organisms and parent material. Soil formation is an extremely slow process and soil can therefore be considered as a non-renewable resource.

Soil quality deteriorates during stockpiling and replacement of these soil materials into soil profiles during rehabilitation cannot imitate pre-mining soil quality properties. Depth however can be imitated but the combined soil quality deterioration and resultant compaction by the machines used in rehabilitation leads to a net loss of land capability. A change in land capability then forces a change in land use. The impact on soil is high because natural soil layers will be stripped and stockpiled for later use in rehabilitation. In addition, soil fertility is impacted because stripped soil layers are usually thicker than the defined topsoil layer. Mitigations and recommendations are included in the soil assessment (Appendix I) and Section 8.3.5 of this report.

10.1.5 BIODIVERSITY

It is clear from the regional ecological overview, as well as the baseline data collected to date that the Project area has been altered (historically and currently) predominantly by agricultural land use. It is further evident that the remaining natural habitats have been impacted on as a result of poor grazing practices. The development of the general area, and the increase in mining operations and supporting activities have also contributed to the altered ecological status and functioning of the systems.

The ecological integrity, importance and functioning of the natural grassland and wetland systems within the larger Project area is furthermore reflected in the diverse community structures. This diversity is indicative of the importance of these systems to collectively provide refugia, food and corridors for dispersal in and through the Project area. The preservation of these systems, albeit the majority are modified to some extent, is the most important aspect to consider for the consideration of the proposed mining project.

The impacts associated with the proposed underground mining method are considerably less significant when compared to the proposed opencast mining methods. This compounded with the placement of new infrastructure, access routes and mining activities will have a significant impact on the local environment and ecological processes. Careful consideration must be afforded each of the recommendations provided herein. In the event that environmental authorisation is issued for this project, proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework. It is strongly recommended that a comprehensive biodiversity action plan be compiled.

10.1.6 WETLANDS

A total of five (5) HGM types were identified and delineated for the project. A total of 16 HGM units were identified for the project. The overall wetland health for the wetlands varied from Moderately Modified (Class C) to Largely Modified (Class D) system, with the majority of the wetlands rated a Class D. The Ecological Importance and Sensitivity of the two valley bottom wetland types was rated as high (Class B), with the remaining wetland types being rated as moderate (Class C).

All of the wetland types had overall moderately low level of service, with the exception of the unchanneled valley bottom system which had an intermediate level of service. It is evident from the study that the most benefits are associated with the indirect benefits, which includes the enhancement of water quality. The level of indirect benefits for all the systems ranged from low to moderately low. The hydrological / functional importance was rated as Moderate (Class C) for all the wetland systems. The direct human benefits were rated as low (Class D) for all the wetland systems. The proposed project could result in the loss and modifications of water resources, notably the loss of selected pans (and associated seeps) and portions of the unchanneled valley bottom system to the east of the project area. It is permissible that the proposed opencast mining area result in the mining of the depressions within this area, but the mine plan must be amended to avoid the eastern valley bottom wetland and the associated buffer. The loss of wetlands is expected for the mining of the opencast area, and it is possible that underground mining may also result in the loss of wetland systems. The significance of the loss if regarded as high, and because avoidance is not possible for this project, mitigation has not been considered and the significance remains high for the systems proposed to be mined by opencast methods.

The impacts associated with the proposed underground mining method are considerably less significant when compared to the proposed opencast mining methods. This compounded with the placement of new infrastructure, access routes and mining activities will have a significant impact on the local environment and ecological processes. Careful consideration must be afforded each of the recommendations provided herein. In the event that environmental authorisation is issued for this project, proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework. Various mitigations and recommendations are included in the wetland assessment (Appendix G) and Section 8.3.4.3 of this report.

10.1.7 AIR QUALITY

Vehicle entrainment on unpaved surfaces and, to a lesser extent, crushing activities represented the highest impacting particulate sources from the current and proposed project operations. The highest simulated ground

level PM_{10} concentrations due to current unmitigated project operations were in non-compliance with daily NAAQS at sensitive receptors within the study area. When activities were mitigated (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities), the impacts reduced significantly with no exceedances of the NAAQS at the closest sensitive receptors. The extent of the PM_{10} impacts increase with proposed operations with exceedances of the NAAQS (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities) at individual homesteads to the west of the mine. The highest simulated $PM_{2.5}$ concentrations due to current unmitigated project operations were in non-compliance with daily NAAQS at the closest sensitive receptor to the north of operations. When activities were mitigated (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities), the impacts reduced significantly with no exceedances of the NAAQS at the closest sensitive receptors. The extent of the $PM_{2.5}$ impacts increase with proposed operations but are within NAAQS at the closest sensitive receptors with mitigated operations (assuming 90% control efficiency on unpaved roads and 50% control efficiency on crushing activities). Maximum daily dust deposition due to proposed unmitigated operations exceeded the NDCR for the closest sensitive receptor to the west of the mine. Various recommendations for dust monitoring and mitigation of dust fallout are included in the air quality specialist study (Appendix N) and repeated in Section 8.3.6 of this EIA report. Based on the proposed amendment of the stockpile heights from 6m to 60m, from an air quality perspective, impacts due to windblown dust will be lower for a smaller footprint stockpile with a higher height than for a larger footprint stockpile with a lower height.

10.1.8 HERITAGE

During the field assessment, a total of 12 heritage sites were located. These include 7 burial grounds (MN001, MN002, MN003, MN005, MN007, MN008 and MN012) and 5 structures MN004, MN006, MN009, MN010 and MN011. The management and mitigation measures as described in this report have been developed to minimise the project impact on heritage resources. Impacts on historic or recent structures are rated as a MEDIUM NEGATIVE before mitigation and a LOW NEGATIVE after mitigation measures are implemented. Impacts on Burial grounds and Graves are rated as having a HIGH NEGATIVE before mitigation and a LOW NEGATIVE after mitigation measures are implemented. Impacts on Palaeontological resources are rated as a LOW NEGATIVE before and after mitigation measures are implemented. Various recommendations for heritage resource management and mitigation measures are proposed in the heritage impact assessment specialist study (Appendix K) and Section 8.3.1 of the EIA report.

10.1.9 PALAEONTOLOGY

During a thorough field survey of the proposed development footprint no fossils were found. Mining thus far, has also not recovered any fossils. For this reason, a moderate palaeontological sensitivity is allocated to the development footprint. However, although fossils occurrences are generally uncommon, a single fossil may scientifically be very important as many fossil taxa are known from a single fossil.

In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations and removal of vegetation, the ECO in charge of these developments should be informed immediately. These discoveries must be protected (preferably in situ) and the ECO must alert SAHRA (South African Heritage Research Agency) to ensure that mitigation (e.g. recording, sampling or collection) can be undertaken by a professional palaeontologist.

Preceding any excavations of fossils, a collection permit from SAHRA must be obtained. Fossil material ought to be curated in an accredited collection (e.g. museum or university collection) and all fieldwork and reports must comply with the minimum standards for palaeontological impact studies developed by SAHRA.

10.2 ENVIRONMENTAL IMPACT STATEMENT

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the findings of the EIA studies, and the

understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Despite the negative impacts caused by the mine, it must be considered that there are positive impacts as well, mostly based on the economic contributions, skills development and SLP initiatives. The mine employs a number of people in the local area, and the mine closure would result in them losing their jobs.

Based on the nature and extent of the impacts as a result of the construction, operation and closure of the facility, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential environmental impacts, it is the opinion of the EIA project team that the environmental impacts associated with the application for the proposed Manungu extension can be mitigated to an acceptable level and therefore the project should be considered favourably by the Competent Authority. It is important however that the recommendations for inclusion in the Environmental Authorisation (Section 11) be carried through by the Competent Authority.

10.3 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets, opportunities, and constraints in a defined spatial context. The sensitivity mapping technique integrates numerous datasets (base maps and shapefiles) into a single consolidated layer making use of Geographic Information System (GIS) software and analysis tools. Environmental sensitivity mapping is a rapid and objective method applied to identify areas which may be particularly sensitive to development based on environmental, cultural and social sensitivity weightings – which is determined by specialists input within each respective field based on aerial or ground-surveys. Environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes. Table 25 below provides a breakdown of the sensitivity rating and weightings applied to determine the sensitivity score of each aspect. Figure 40 provides a graphical illustration of the sensitivity mapping exercise applied to determine the overall environmental sensitivity within the study area. The consolidated sensitivity map, taking into account the findings from specialist studies is depicted in Figure 41. As shown, the majority of the surface disturbances occur within least concern and followed by low sensitive areas. The minor peripheral impacts that occur in high sensitive areas are addressed in the recommendations contained in this section above as week as in Section 11.

Table 25: Sensitivity rating and weighting

Sensitivity Rating	Description	Weighting
Least concern	The inherent feature status and sensitivity is already degraded or contain no inherent sensitivities. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement.	-1
Low/Poor	The proposed development will not have a significant effect on the inherent feature status and sensitivity.	0
High	The proposed development will moderately negatively influence the current status of the feature.	1

Very high	The proposed development will have a significantly negative influence on the current status of the feature.	2

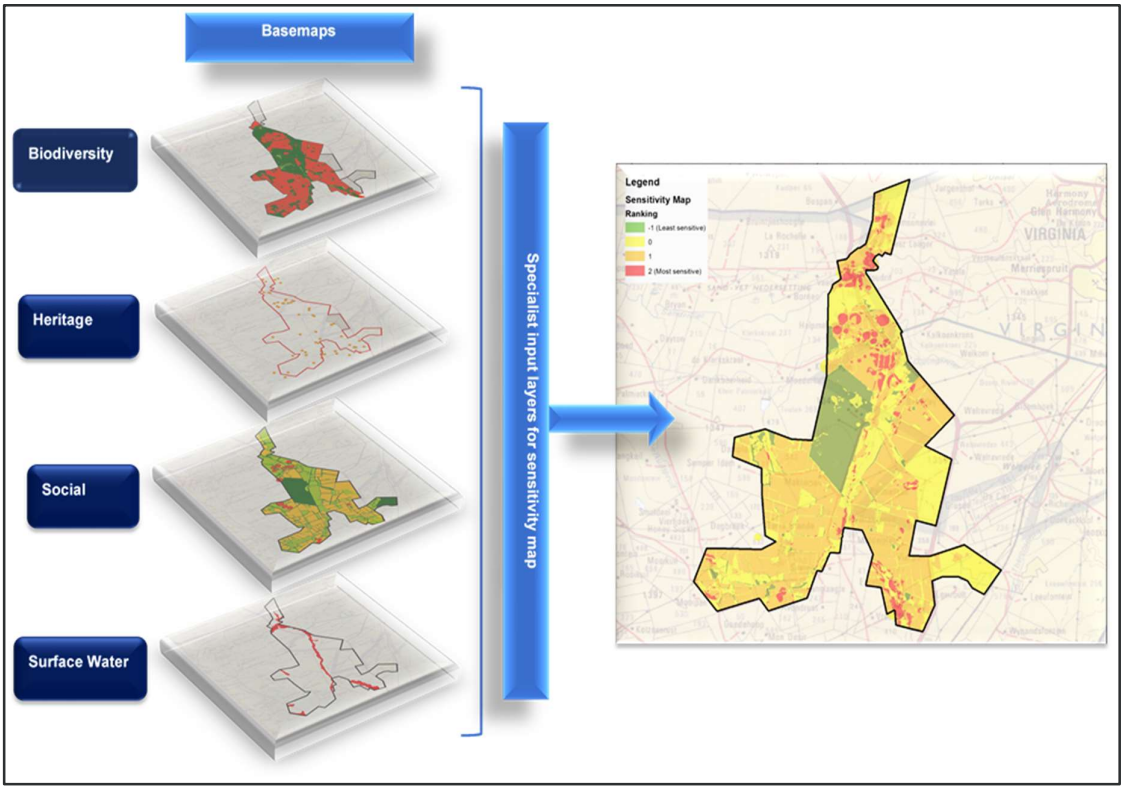


Figure 40: Sensitivity mapping approach.

Figure 41: Consolidated sensitivity map.

11 RECOMMENDATIONS FOR INCLUSION IN ENVIRONMENTAL AUTHORISATION

The following key recommendations are made and should be included in the Environmental Authorisation:

- Noise monitoring must be undertaken when mining activities take place within 500m from the closest potential noise-sensitive receptors.
- Blast monitoring must be undertaken during each blast by a suitably qualified blast manager employed by the Mine. Each blast should be monitored with acoustic and seismic measurements at sensitive receptors within 1km from blast site, and a report compiled by a qualified blasting expert.
- An alien invasive plant management plan must be implemented to control and prevent the spread of invasive aliens.
- The mine should create a labour desk that can communicate any available positions to the local communities.
- The procurement policy for the mine should focus on utilising service providers from the local area to encourage the growth of businesses.
- A detailed post mining decant treatment option should be investigated and put forward within a period of 3 years from date of authorisation.
- A wetland offset strategy must be developed given the fact that the responsive hydropedological forms are the only sections of the hillslopes that will remain intact, with the rest of the hillslopes (recharge and interflow hydropedological forms) being removed during the proposed activities. This strategy has been considered as a last resort according to the mitigation hierarchy due to the irrelevance of "avoidance", "decreasing impacts" and "rehabilitation" options.
- Groundwater and surface water monitoring should be ongoing, and the recommendations made in the EMPr and specialist studies must be implemented.
- The Environmental Management Programme (EMPr) and all mitigation measures therein are an extension of the Environmental Authorisation and must be complied with at all times.
- Should artefacts or archaeological/palaeontological items be observed in the area of disturbance, then all activity in this area should cease immediately, the area marked off and a specialist consulted prior to any further activity.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- The discard material (including wash plant waste if not reused) must be placed in mined-out areas, sufficiently deep below the long-term decant elevation (10m below surface).
- A maximum in-pit storage level of 1525mamsl in current pit is recommended to prevent decant during the operational phase.
- The potential for AMD should be reduced through the addition of calcitic lime (or fly ash if proven to be suitable) to the backfill material to buffer the pH or alternatively treating decant water through suitable active or passive treatment options.
- Rainfall runoff should be separated into clean and dirty water (rainfall falling on the site should be allowed to drain quickly/freely, and contaminated water should then be captured in the mine dirty water system and re-used where possible).
- All dirty water collected on the site should be re-used or stored during operation where required.

- The mine must investigate any reasonable and valid noise complaint or structural damage if registered by a receptor staying within 1,000m from any mining activities.
- If night-time construction activities are required, do not operate closer than 200m from any receptors (prevent a noise level exceeding 47 dBA at receptors).
- Topsoil stockpiles should be separate from overburden stockpiles. Topsoil stockpiles should be kept to a maximum height of 4m while all other residue stockpiles must not exceed 60m in height.
- Dust monitoring in and around the mine must be undertaken. If dust levels exceed the specified thresholds in terms of the dust control regulations, the Applicant shall appoint a suitably qualified specialist to identify sources of the excessive dust levels and to suggest suitable and reasonable mitigation measures.
- Groundwater and surface water should be continuously monitored after operation ceases until a definite trend is established and understood.

12 ASSUMPTIONS, LIMITATIONS, AND UNCERTAINTIES

This report is based on information that is currently available and, as a result, the following assumptions and limitations are applicable:

- The report is based on project information provided by the client (i.e.: mine works programme, etc.).
- The description of the baseline environment has been obtained from various sources including recent monitoring reports and specialist studies commissioned for the purposes of this EIA. Every effort was made to find the most recent applicable data. Where possible up-to-date information was obtained from development plans or online portals (SANBI, SAHRA etc).
- In determining the significance of impacts, with mitigation, it is assumed that mitigation measures proposed in the report will be correctly and effectively implemented and managed throughout the life of the project.

Additional assumptions and limitations applicable to each specialist study are included in Table 26.

Table 26: Assumptions and Limitations from Specialist Reports.

Assumptions and Limitations	
Specialist Study	Description
Groundwater	The numerical groundwater flow and transport model is believed to be sufficiently representative of the local aquifers and groundwater conditions, to predict the post-mining decant situation to a sufficient level of accuracy. The following main assumptions applied to this study: • Data and information were presumed sufficiently accurate: o Where relevant, datasets (e.g. hydraulic testing, water monitoring, surface topography and aquifer geometry); o The basis of the impact assessments, were field studies (e.g. hydrocensus, hydrogeological drilling, geophysical surveys, pump testing and groundwater monitoring) by Groundwater Square over the past 5years, and the collection of various water/geochemical samples; o Project consultants ECMA, GeoSoilWater, GEMECS, CCIC, and EIMS supplied the following information (through discussions, spreadsheets, presentations and electronic CAD drawings): ▪ Latest mining scheduling and life-of-mine plans; ▪ Infrastructure layout and design; ▪ Geological model of coal seams; ▪ Groundwater monitoring database; ▪ Bulking factor of rehabilitated backfill material;

	○ During several visits to the Manungu Colliery, the current water situation was discussed with Mine Personal and mentioned project consultants; providing valuable insight into the future mine water balance; • Inter-mine flow calculations are not relevant to the project; • Aquifer parameters of geological units: ○ Although aquifer parameters vary over orders of magnitude over short distances (e.g. fracture flow compared to flow through the solid portions of the rock matrix), the values utilised in the groundwater model for similar geological units of similar depths, will be representative of groundwater flow over distances applicable to typical mining impacts; ○ Where aquifer information was not to the same level of detail as the Karoo aquifers (i.e. hydraulic aquifer parameters of geological units within the numerical groundwater model domain, other than Karoo Ecca rock, within which coal mining is taking place), pumping test information, and anecdotal information on farmers' boreholes and knowledge of these rock type aquifers were considered; ○ The dolerite sills in the area probably has a major impact of groundwater recharge to the deeper aquifers; • The existing and proposed pit areas are devoid of major vertical geological structures, which can create preferential flow zones, but horizontal aquifer zones and are believed relevant to the deeper aquifers below coal bearing rocks; • Conceptually, the groundwater flow field is well understood; • The current interaction of mining with the surrounding aquifers will continue as the opencast mine expands to the south and underground areas; • Geochemical evaluation: ○ Geochemical samples were representative of the backfilled spoils, mined coal seams and the complete litho-stratigraphical profile; ○ Discard samples were created from coal, based on the Plant design criteria to perform geochemical testing; ○ Given the scientific integrity of the geochemical modelling considerations and technique, geochemical trend predictions are therefore within an acceptable range of accuracy. The following limitations applied to the study: • Rainfall seasonality will influence the mine water balance, and the compounding effect of sequential wet or dry rainfall periods may result in much larger than average decant for such extreme wet periods, and zero decant during extreme droughts. An indication of "relatively" wet and dry cycles was provided in the report, but it is not possible to provide for extreme events, such as 100/1000year extremes • The sequence of mining will affect the mine water balance; especially relevant with regard to the storage of mine water from the historical underground workings; • It is very important to perform groundwater level and groundwater quality monitoring, to verify modelling predictions, and timeously correct assumptions in the unlikely event that the groundwater system behaves differently to expectations.
Heritage and Palaeontology	• Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover in some areas.

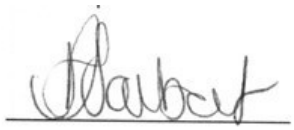
	• As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must be contacted immediately. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.
Soils	• The information provided in the specialist report is based on information gathered from site visits undertaken from the 15th of January until the 22nd of January 2018. • The information contained in this report is based on auger points taken and observations on site. There may be variations in terms of the delineation of the soil forms presented compared to when stripping of soil is undertaken. If this is encountered the soil stripping plan may need to be updated to reflect these variations in terms of how soil is stripped and stockpiled; • Soil samples for fertility have been taken and sent away for fertility tests; and • The area surveyed was based on the mining layout presented by the Applicant.
Wetlands and Aquatic Ecology	• The information considered for the aquatic ecology component of the study is part of the biomonitoring programme (2017). • The GPS used for wetland delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side. • Wetland systems identified at desktop level within 500 m of the project area were considered for the identification and desktop delineation, with wetland areas within the project area being the focus for ground truthing.
Biodiversity	• As per the scope of work, the fieldwork component of the assessment comprised one assessment only, that was conducted during the wet season. This study has not assessed any temporal trends for the respective seasons; • The scope of work for the project did not include blasting as a potential impact during the construction or operational phase. However, if such action is to be taken the authors of this report must be contacted in order to consult on further mitigation measures which will need to be taken to prevent undue disturbance to fauna in the area; • The assessments were conducted on those portions of the Project area as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report; • No detailed activity list for the proposed project was provided and therefore the risk assessment has been completed based on presumptions for standard mining operations; • Wetland systems identified at desktop level within 500 m of the Project area were considered for the identification and desktop delineation, with wetland areas within the Project area being the focus for ground truthing;

	• The impact assessment was completed for the proposed mining areas and supporting infrastructure for the Project area. The impact assessment has considered these layouts to be final, and have not considered the No Go alternative; and • Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.
Water resource	• The information considered for the aquatic ecology component of the study is part of the biomonitoring programme (2017). • The GPS used for wetland delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side. • Wetland systems identified at desktop level within 500 m of the project area were considered for the identification and desktop delineation, with wetland areas within the project area being the focus for ground truthing.
Air Quality	• Meteorological data: As no onsite meteorological data was available, use was made of the Weather Research and Forecasting mesoscale model (known as WRF) for the period 2013 to 2015. An evaluation of the WRF data was undertaken and is provided in Section 3.2. From the evaluation it is concluded that the wind direction may be out by as much as 35°. • Emissions: o The quantification of sources of emission was restricted to the project activities only. Although other background sources were identified in the study area, such sources were not quantified as this did not form part of the scope of this assessment. o Information required for the calculation of emissions from fugitive dust sources for the proposed project operations was provided by the client. The assumption was made that this information was accurate and correct. o Routine emissions from the proposed operations were estimated and modelled. Atmospheric releases occurring as a result of non-routine operations or accidents were not accounted for. o Vehicle exhaust emissions were not quantified as the impacts from these sources are localized and will not exceed NAAQS offsite. o Vehicle capacity for hauling was assumed to be 60 t. The capacity for the transport of the product was assumed to be 34 t. o Primary and secondary crushing activities were assumed for the current assessment. o The access routes for current operations (to the north of the project area) and proposed operations (to the west of the project area) were assumed based on site layouts provided. • Impact assessment: o The simulated impacts are screened against NAAQS and NDCR and is not a health risk assessment. o The impact assessment is confined to the quantification of impacts on human health due to exposures via the inhalation pathway only and not through the ingestion and dermal absorption pathways for humans and animals. o The construction and closure phases were assessed qualitatively due to the lack of detailed information available for these phases and the temporary nature of these operations, whilst the operational phase was assessed quantitatively.

	○ The assessment is based on current operations as provided. Operations prior to this assessment has not been accounted for as this is not a retrospective assessment.
Waste classification	• Acute Toxicity Estimates (ATE) have not been derived from LD50 data or conversion factors presented in SANS 10234; classification has been based on generic screening thresholds. Where more detailed assessment is recommended appropriate LD50 should be sourced based on current available data. • Ecotoxicity for Category 1 Acute and Chronic Hazards have assumed 1% threshold and additive compounds rather than utilisation of Modification Factors presented in SANS 10234. Where more detailed assessment is recommended, this should follow the mixture-specific principles defined in SANS 10234. • Classification does not include European Union (EU), or other territory-specific, Hazard Statement Codes that may be applicable outside of the Republic of South Africa. • Only where data is presented, or where laboratory analysis has resulted in positive identification of compounds (i.e. above laboratory limits of detection), have the applicable Hazard Statement Codes been appraised (i.e. substances determined to be at concentrations less than laboratory limits of detection have been assumed to be absent). • Unless exact speciation has been established through detailed analysis classification has been based on reasonable assumptions of substances most-likely present based on expected behaviour within the material. It is recognised that this may not be applicable in all instances and, for clarity, a list of the individual substances appraised where assumptions have been made are listed below. • Where laboratory analysis has reported concentrations on a dry weight basis these have been converted to take account of sample moisture content using the formula: Wet Weight Concentration = Dry Weight Concentration x ((100 - %moisture content)/100). • Where assessment has been undertaken on liquids, it has been assumed that 1-litre (volume) is equivalent to 1-kg (mass). • For additional details in respect of the individual substances that may render any given material type as hazardous, reference should be made to the appropriate Safety Data Sheet (SDS) which takes account of this classification or, if the SDS has not been prepared, the Waste Management Summary Report relevant for this classification.
Hydropedology	• Only the slopes affected by the proposed mining areas have been assessed; • No surface impacts (i.e. haul roads, infrastructure, adits, evaporation ponds etc) have been included into this report given the irrelevance of these components to a level 3 assessment; • It has been assumed that the extent of the underground areas and the opencast mining areas provided to the consultant are correct; • The GPS used for ground truthing is accurate to within five meters. Therefore, the wetland and the observation site's delineation plotted digitally may be offset by at up to five meters to either side; and • Geohydrological modelling was not part of the hydropedological assessments.

13 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I **Adri Joubert** herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected Parties has been correctly recorded in the report.

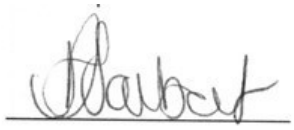


Signature of the EAP

Date: 2019/11/25

14 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I **Adri Joubert** herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with Interested and Affected Parties and stakeholders has been correctly recorded and reported herein.



Signature of the EAP

Date: 2019/11/25

15 REFERENCES

- A vegetation and Flora Diversity Assessment for the Proposed Development of Manungu Colliery on Certain Portions of the Farms Weilaagte 271 IR and Welgevonden 272 IR, Mpumalanga. Dated December 2013.
- Acocks, J.P.H. 1988. Veld Types of South Africa.
- Archaetnos Culture & Cultural Resource Consulting – A Report on a Cultural Heritage Impact Assessment for the Proposed Manungu Colliery, Close to Delmas, Mpumalanga Province. Report No: AE01364V. Dated October 2013.
- Department of Water Affairs (DWA), Integrated Water Use Licence (IWUL) for Tshedza Mining Resources (Pty) Ltd. Manungu Colliery Licence No: 04/B20A/ACGIJ/2621 File No: 27/2/2/B120/6/4.
- Ecotone Freshwater Consultants - Wetland Specialist Study. Dated June 2013.
- Environmental Authorisation for the Proposed EIA Listed Activities within Manungu Colliery, Victor Khanye Local Municipality, Mpumalanga Province. Reference: 17/2/3N-266. NEAS Ref No: MPP/EIA/0000665/2012. Dated 19 March 2014.
- Environmental Impact Assessment and Environmental Management Plan for the planned coal mining operation on the Farms Weilaagte 271 IR and Welgevonden 272 IR, Delmas, Mpumalanga. Reference Number: MP 30/5/1/1/2/297 MR for Tshedza Mining Resources (Pty) Limited. Dated June 2008 and approved 24 February 2011.
- Ferguson JWH, Bredenkamp GJ, Jacobs DJ and Verburgt L. Biodiversity impact assessment of parts of the farms Weilaagte 271 IR and Welgevonden 272 IR, Mpumalanga, comprising the area of coal mining application for Eloff Collieries. 2008.
- Geo Pollution Technologies Gauteng – Geohydrological Report for the Proposed Eloff Mining Area. Report No: FeElo/07/247. Dated June 2007.
- Government Gazette No. 32689, (2009). Dep. of Env. Affairs. National Environmental Management Act, 2004. (Act No. 10 of 2004), Draft National List of Threatened Ecosystems.
- Integrated Energy Plan for South Africa (2016).
- Integrated Resource Plan for Electricity (IRP) 2010-2030 (2013 updated report).
- Low, AB and Rebelo, AG (eds) 1996. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs and Tourism, Pretoria.
- M2 Environmental Connections – Surface Water Assessment for Mining of Coal Near Eloff. Report No: Eloff/Surface-Rev2. Dated June 2007.
- Manungu Colliery Water Balance Report. Beal Consulting Engineering and Project Management. 5 May 2016.
- Mpumalanga Biodiversity Conservation Plan
- Mucina, L. and Rutherford, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. Strelitzia 19, South African National Biodiversity Institute, Pretoria.
- Mucina, L. and Rutherford, M.C. 2006: The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- Nkangala District Municipality Integrated Development Plan (IDP) 2017.

- Palaeontological Impact Assessment for Proposed Manungu Colliery, Delmas, Mpumalanga (Desktop Study) on behalf of Eco-gain Consulting (Pty) Ltd. for Tshedza Mining Resources (Pty) Ltd. Dated 21 October 2013.
- Soil, Land Capability and Land Use Assessment of the Eloff Mining Application Area Situated on the farms Weilaagte 271 IR and Welgevonden 272 IR – Rehab Green Environmental and Rehabilitation Monitoring Consultants cc. Report No: RG/2008/04/12/2. Dated May 2008.
- Victor Khanye Local Municipality Integrated Development Plan (IDP) 2011/12 to 2016/17.

APPENDICES: