ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

PREPARED FOR MOOIPLAATS COLLIERY

AUGUST 2020

MP 30/5/1/2/68MR

1299: EIA Report - Mooiplaats Colliery

DOCUMENT CONTROL

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REVISION AND AMENDMENTS

Date	No.	Description of Revision or Amendment
2020/08/03	0	EIA Report for Review and Comment

EXECUTIVE SUMMARY

Langcarel Rf (Pty) Ltd has a mining right (MP 30/5/1/2/68MR) in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (Act of 2002) for the Mooiplaats Colliery. Mooiplaats Colliery (hereafter referred to as the "Applicant"), has submitted a Section 102 application in terms of the requirements of the MPRDA to include two additional areas from the Vunene Mining Right into the Mooiplaats Colliery Mining Right.

Mooiplaats Colliery has previously concluded a Section 102 Application in terms of the MPRDA to include the two prospecting right areas, known as Mooiplaats South, into the existing Mining Right. Mooiplaats Colliery is now in the process of including two areas that were originally part of the Vunene Mining Right, into the Mooiplaats Colliery Mining Right.

Mooiplaats Colliery requires a new Environmental Authorisation (EA) in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R. 982), as amended by GN 326 of 2017, promulgated under the National Environmental Management Act (Act 107 of 1998) (NEMA), to extend its mining activities to include the Vunene areas. As part of the application processes, the Environmental Management Programme Report (EMPr) will be consolidated to include the existing Mooiplaats Colliery, the additional Mooiplaats South area and the new Vunene areas, in terms of Regulation 37 of the EIA Regulations, as amended and Section 102 of the MPRDA. Furthermore, an updated Mine Works Programme (MWP) to include the additional Vunene areas, a Regulation 2.2 Plan and an updated Social Labour Plan (SLP), will be submitted to the Department of Mineral Resources and Energy (DMRE) in terms of Section 102 of the MPRDA.

The Mooiplaats Colliery is located approximately 18km outside of the town of Ermelo, between the N2 and N11, and lies to the south of the Eskom Camden Power Station which falls within the municipal boundaries of the Gert Sibande District Municipality, Mpumalanga Province. The mine has an existing Water Use Licence (WUL) (Ref #; 08/C11B/AGJ/2141), which will be amended to correct the existing water uses and to apply for all new water uses triggered by the Mooiplaats Colliery Vunene project.

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 was 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 16th of May 2019 with an initial notification and call to register for a period of 30 days. The scoping report was made available for public review and comment for a period of 30 days, from the 31st of August 2019 to 2nd of October 2019, in line with the legislative timeframes. The comments received from I&AP's during these commenting periods have been captured and summarised in this report and appended in detail in the Public Participation Report. Comments received during the review period were addressed and included in the PPR. This EIA report has made available for public review and comment for a 30-day comment period from the 07th of August 2020 to 08th of September 2020. Comments received during the EIA review period will be addressed within the final EIA report and added to the PPR to be submitted to the Competent Authority for decision making.

ENVIRONMENTAL IMPACT ASSESSMENT

A detailed assessment was undertaken to identify all the potential risks and impacts associated with each phase of the mining operations. The background information from existing EIA and specialist studies undertaken for the site were consulted as well as a screening of all the activities underway and planned for the mine to ensure that all the potential impacts have been identified. 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 have a potentially moderate-high negative final significance:

Aspect / Discipline	Impact
Heritage and Palaeontological resources	▪ Disturbance/Destruction of Archaeological Sites ▪ Disturbance/Destruction of Historic Buildings or Structures ▪ Disturbance/ Destruction of Graves and Cemeteries ▪ Disturbance/ Destruction of Unmarked Graves ▪ Potential damage of Palaeontological material
Ecology	▪ Removal of threatened and protected species ▪ Loss/ Destruction of Natural Habitats ▪ Displacement of Faunal Species ▪ Flora Direct and Indirect Mortality ▪ Fauna Direct and Indirect Mortality ▪ Pollution of habitats

	▪ Habitat Fragmentation and Edge Effects ▪ Blockage of Seasonal and Dispersal Movements ▪ Loss of primary vegetation communities ▪ Loss of species sensitive to changes in water quality ▪ Increase in the occurrence of alien invasive vegetation
Geohydrology	▪ Reduction in recharge to groundwater due to surface compaction ▪ Reduction of ground water reserves due to mine dewatering ▪ Potential risk of subsidence ▪ Contamination of Groundwater ▪ Altered Hydrological Regime ▪ Acid Mine Drainage
Hydrology	▪ Reduction in stream flow ▪ Deterioration of water quality ▪ Altered hydrological regimes ▪ Potential for flood lines to negatively affect the surface area of the mine ▪ Decreased infiltration and increased run-off may occur due to soil compaction ▪ Damage to Wetland/ Drainage Lines ▪ Impacts on wetlands ▪ Surface water pollution or contamination
Soils and Geology	▪ Loss/ Disturbance of Topsoil (including contamination, erosion and compaction) ▪ Depletion of a mineral resource
Air Quality	▪ Gaseous and particulate emissions; fugitive dust ▪ Generation of $PM_{2.5}$ and PM_{10}
Socio-economy	▪ 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.); ▪ Perceptions and Expectations; ▪ Employment Opportunities; ▪ Inability of the community to capture economic benefits & managing expectation; ▪ Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock; ▪ Loss of agricultural resource; ▪ Increase traffic incidences due to additional haulage; and

	▪ Increase in traffic on adjacent road network resulting in additional damage to the roads.

In terms of positive impacts, the following key benefits have been identified:

- Coal supply for international markets; and
- Continued economic growth.

Both the positive and negative impacts were assessed in this EIA report. Mitigation measures have been identified and refined based on input from the EAP, public consultation, and specialist assessments. The EMPr details the appropriate mechanisms for avoidance and mitigation of the negative impacts and enhancing the positive impacts.

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 have to 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 that were assessed for this project can typically be identified according to:

- Location/layout/design alternatives;
- Process alternatives;
- Technological alternatives; and
- Activity alternatives (including the No-go option).

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.

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APPENDICES

ABBREVIATIONS AND DEFINITIONS

AMD	:	Acid Mine Drainage
CM	:	Continuous Miner
CMA	:	Catchment Management Agency
CMS	:	Catchment Management Strategy
DEA	:	Department of Environmental Affairs
DEFF	:	Department of Environment Forestry and Fisheries (previously DEA)
DMRE	:	Department of Mineral Resources and Energy (previously DMR)
DMS	:	Dense Media Separation Plant
DHSWS	:	Department of Human Settlements Water and Sanitation (previously DWS)
EIA	:	Environmental Impact Assessment
EIMS	:	Environmental Impact Management Services
ELWU	:	Existing Lawful Water Use
EMPR	:	Environmental Management Programme Report
GA	:	General Authorisation
GDP	:	Gross Domestic Product
GHG	:	Greenhouse Gas
GN	:	Government Notice
GSW	:	Geo Soil and Water cc
HIA	:	Heritage Impact Assessment
HMS	:	Heavy Medium Settlers
I&AP	:	Interested & Affected Party
IBA	:	Important Bird Area
IEM	:	Integrated Environmental Management
IMC	:	Inter-Ministerial Committee
LOM	:	Life of Mine
MA	:	Mineral Area
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, 2002
NEMWA	:	National Environmental Management: Waste Act, 2008
NEMA	:	National Environmental Management Act, 1998
NGDB	:	National Groundwater Database
NHRA	:	National Heritage Resources Act, 1999
NWA	:	National Water Act, 1998
PHRA	:	Provincial Heritage Resources Authority
PCD	:	Pollution Control Dam
PES	:	Present Ecological State
RE	:	Remaining Extent
RoM	:	Run of Mine
SAHRA	:	South African Heritage Resources Agency
WMA	:	Water Management Area
WUL	:	Water Use Licence

1 INTRODUCTION

Geo Soil and Water CC. has been appointed to assist Langcarel Rf (Pty) Ltd with a Section 102 application in terms of the requirements of the MPRDA to include two additional areas from the Vunene Mining Right into the Mooiplaats Colliery Mining Right (MP 30/5/1/2/68MR). Environmental Impact Management Services (EIMS) (Pty) Ltd has been appointed by Geo Soil and Water CC (GSW) to assist with undertaking the necessary Public Participation Process (PPP).

Mooiplaats Colliery, has recently concluded a Section 102 Application in terms of the MPRDA to include the two prospecting right areas, known as Mooiplaats South, into the existing Mining Right. Mooiplaats Colliery is also in the process of including two areas that were originally part of the Vunene Mining Right, into the Mooiplaats Colliery Mining Right.

Mooiplaats Colliery requires a new EA in terms of the EIA Regulations, 2014 (GN R. 982), as amended by GN 326 of 2017, promulgated under the NEMA, to extend its mining activities to include the Vunene areas into the Mooiplaats Colliery Mining Right. As part of the application processes, the EMPr will be consolidated to include the existing Mooiplaats Colliery, the additional Mooiplaats South area and the new Vunene areas, in terms of Regulation 37 of the EIA Regulations, as amended and in terms of Section 102 of the MPRDA. Furthermore, an updated MWP, to include the additional Vunene areas, a Regulation 2.2 Plan and an updated SLP, will be submitted to the DMRE in terms of Section 102 of the MPRDA.

The Mooiplaats Colliery is located approximately 18km outside of the town of Ermelo, between the N2 and N11, and lies to the south of the Eskom Camden Power Station which falls within the municipal boundaries of the Gert Sibande District Municipality, Mpumalanga Province. The mine has an existing WUL (Ref #; 08/C11B/AGJ/2141), which will be amended to correct the existing water uses and to apply for all new water uses triggered by the Mooiplaats Colliery Vunene project. Table 1 below provides the details of the applicant.

Table 1: Details of the Applicant

	Details
Company	Langcarel Rf (Pty) Ltd.
Name	Louis Loubser
Telephone	010 0038075
E-mail Address	louis.loubser@mooiplaatscoal.co.za
Physical Address	4 Sederberg Road Alrode South Gauteng 1451

1.1 REPORT STRUCTURE

This EIA report has been compiled in accordance with the 2014 NEMA EIA Regulations, as amended. A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 2 below.

Table 2: 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 and 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 1 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 2 Appendix 9
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;	Section 3 Table 8 Section 3.4
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 8.6
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: (aa) (i) details of the development footprint alternatives considered; (bb) (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (cc) (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; (dd) (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (ee) (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) (aa) can be reversed; (bb) (bb) may cause irreplaceable loss of resources; and (cc) (cc) can be avoided, managed or mitigated; (ff) (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (gg) (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; (hh) (viii) the possible mitigation measures that could be applied and level of residual risk; (ii) (ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and (jj) (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 8 Section 6 Section 7 Section 9 Section 9.1 Section 9.3 Section 8
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 9.1 Section 9.3
Appendix 3(j)	An assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts;	Section 9.3

	(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;	
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 11
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 11.2
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 0
Appendix 3(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 8.7
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 11.2 Section 0
Appendix 3(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 13
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 11.2 Section 0

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 14
Appendix 3(t)	Where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Appendix 11
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>All documents required in the DMR SR Acceptance Letter to be attached in the report.</u>
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

The Environmental Assessment Practitioner (EAP) responsible for this study is:

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 EAP REQUIREMENTS AND QUALIFICATIONS

In terms of Regulation 13 of the EIA Regulations (GN R. 982) as amended, an independent EAP, must be appointed by the applicant to manage the application. Geo Soil and Water (GSW) has been appointed by the Applicant as the EAP to assist with compiling the necessary reports and undertaking the statutory consultation processes, in support of the proposed Mooiplaats Colliery Extension Project. GSW is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations, as well as Section 1 of the NEMA. This includes, *inter alia*, the requirement that GSW is:

- Objective and independent;
- Has expertise in conducting EIA's;
- Comply with the NEMA, the environmental regulations and all other applicable legislation;
- Takes into account all relevant factors relating to the application; and
- 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 assessment and relevant application processes are attached as Appendix 1.

1.3.2 SUMMARY OF THE EAP'S PAST EXPERIENCE

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.

Adri has 20 years' experience in the Environmental and Mining fields. Her expertise is to embed a culture of environmental excellence, through the implementation of environmental management systems, cost effective measures and compliance with legal, corporate and interested and affected party's requirements. She also has extensive experience in Environmental Consulting and ISO 14001:2004/OHSAS 18001 auditing and training. Adri is a registered Professional Scientist (SACNASP) in the fields of Environmental Science, Geological Science and Geographical Information Systems.

1.3.3 SPECIALIST CONSULTANTS

Specialist studies were undertaken to address the key issues that required further investigation and these include the impact on wetlands, hydrology, hydrogeology, as well as subsidence. The specialist studies involve the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed extension of the Mooiplaats Colliery Mining Right. These impacts were assessed according to pre-defined impact rating methodology (Section 9.1).

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

The Mooiplaats Colliery is located approximately 18 km outside of the town of Ermelo, between the N2 and N11, and lies to the south of the Eskom Camden Power Station (refer to Figure 1 below). Mooiplaats Colliery falls within the municipal boundaries of the Gert Sibande District Municipality, Mpumalanga Province. It was reported that the mine has been in Care and Maintenance since 30 September 2013 and that no mining activities were taking place until January 2018.

Table 3 indicates the farm portions that fall within the Mooiplaats Colliery Mining Right as well as the Vunene area extensions, including details of the mine to the nearest towns. Figure 2 provides the infrastructure structure layout overview map for the Mooiplaats Colliery, also indicating the farms and portions of land on which the activities fall. Figure 3 to Figure 11 provide the inset maps of the overview plan.

Table 3: Locality Details

Farm Name	**Mining Right holder**	
Application Area (Ha)	4823,96 Ha	
Magisterial District	Mooiplaats Colliery is situated in the magisterial district of Ermelo and falls under the Msukaligwa Local Municipality which is situated in the Gert Sibande District Municipality.	
Distance and direction from nearest towns	Mooiplaats Colliery is situated approximately 18km south-east of, on the outskirts of the town Ermelo alongside the N2 national road to Piet Retief. The mine lies situated 2km south of the Camden Power station.	
21-digit Surveyor General Code for each Portion	**Farm Name and Portion:**	**21 Digit Surveyor General Code**
	Portion 1 of Mooiplaats 290 IT	T0IT00000000029000001
	Portion 9 of Mooiplaats 290 IT	T0IT00000000029000009
	Remainder Portion of Portion 2 of Mooiplaats 290 IT	T0IT00000000029000002

	Portion 7 of Mooiplaats 290 IT	T0IT00000000029000007
	Portion 8 of Mooiplaats 290 IT	T0IT00000000029000008
	Portion 0 (Re) of Klipbank 295 IT	T0IT00000000029500000
	Portion 2 of Klipbank 295 IT	T0IT00000000029500002
	Portion 3 of Klipbank 295 IT	T0IT00000000029500003
	Portion 0 (Re) of Adrianople 296 IT	T0IT00000000029600000
	Portion 1of Adrianople 296 IT	T0IT00000000029500001
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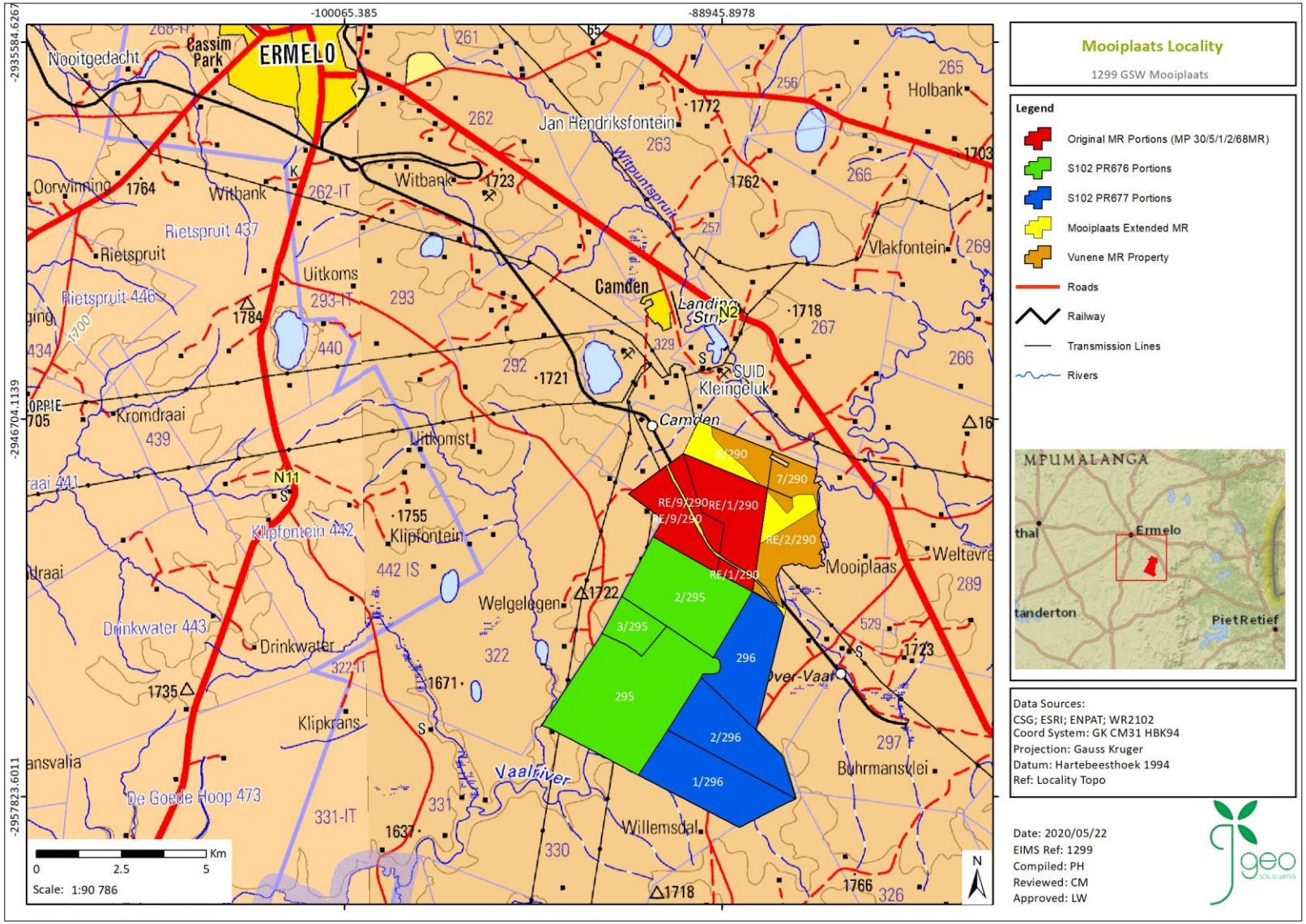


Figure 1: The locality of the Mooiplaats Colliery

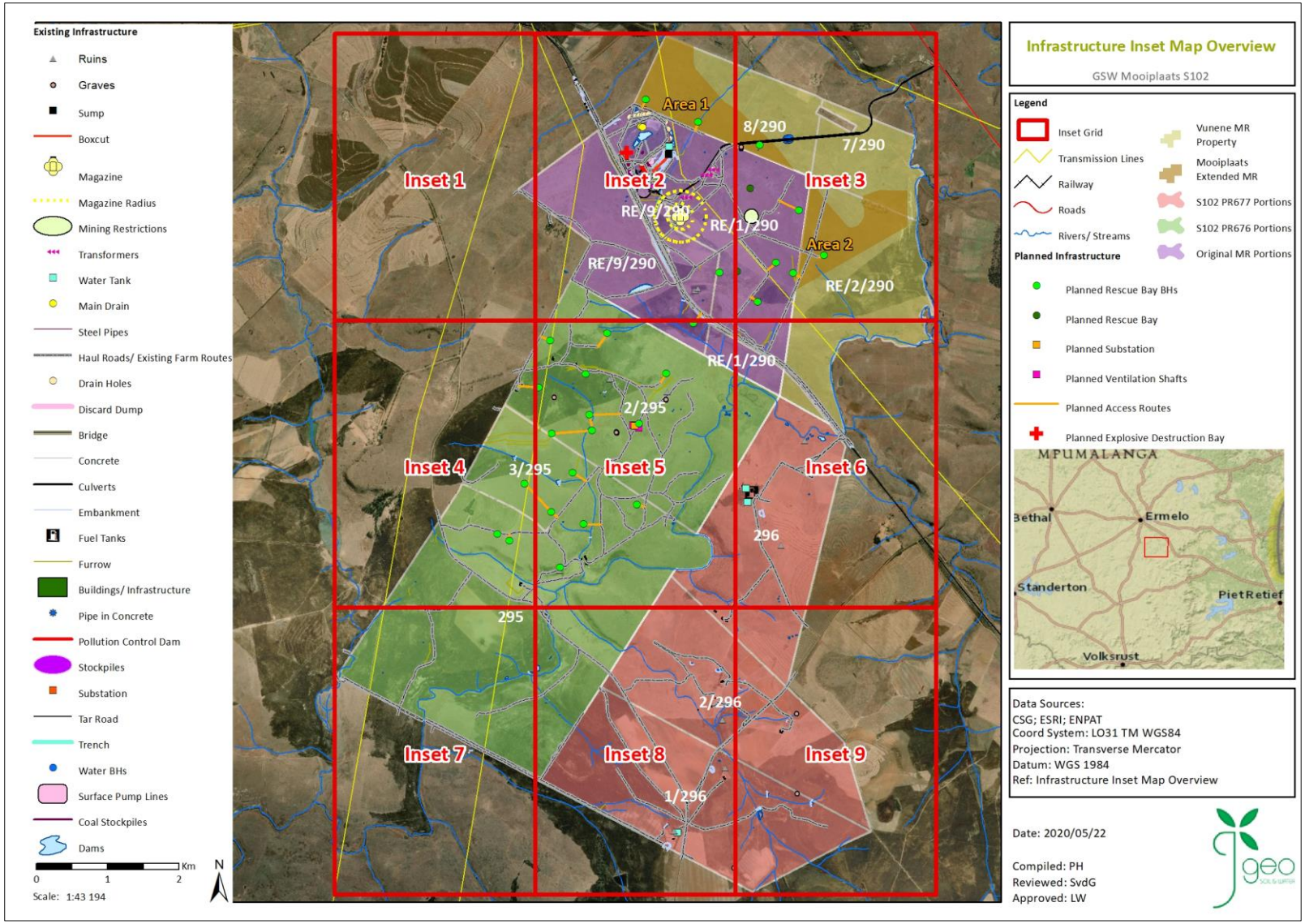


Figure 2: Infrastructure layout inset overview map for the Mooiplaats Colliery

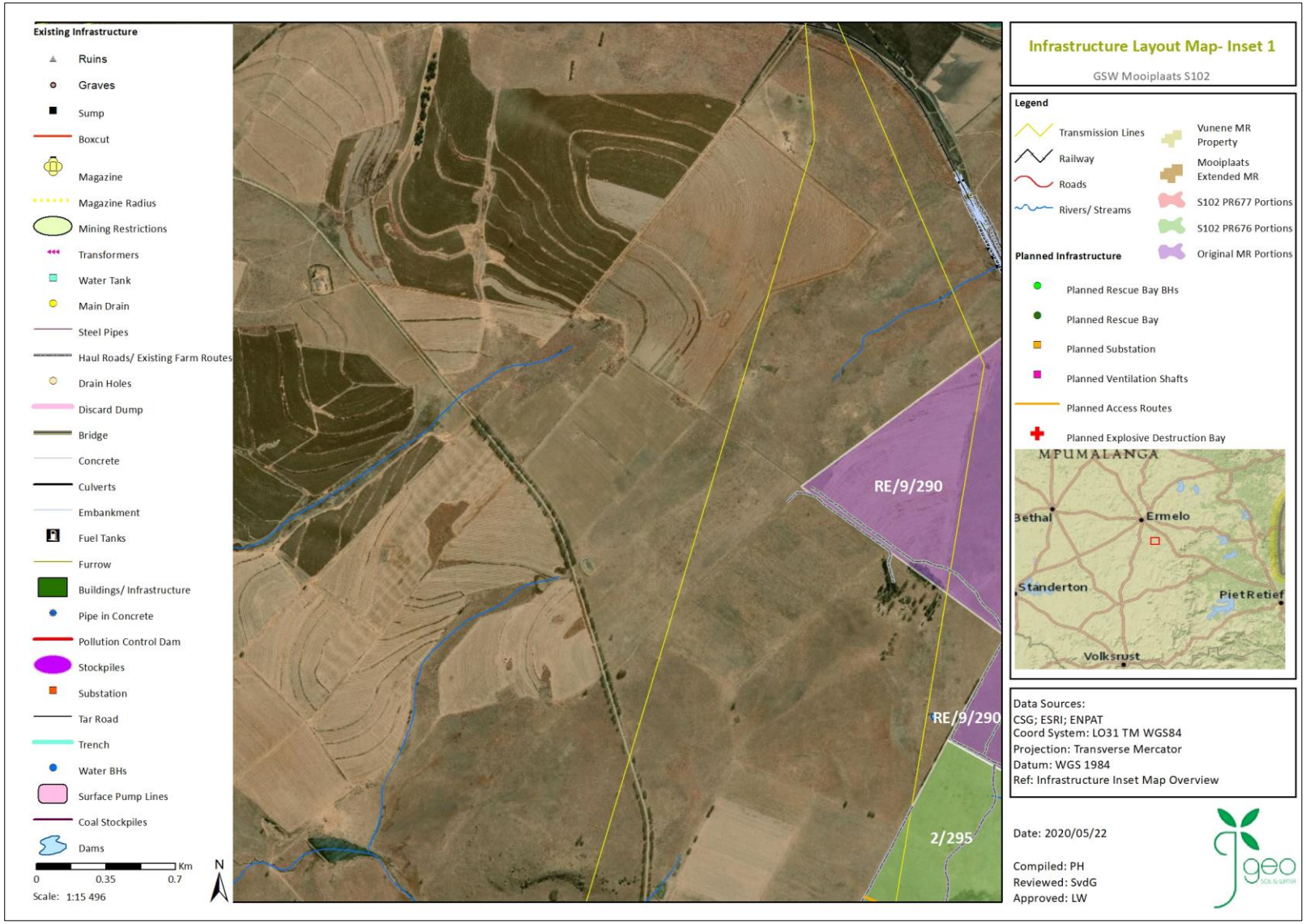


Figure 3: Inset 1 infrastructure layout

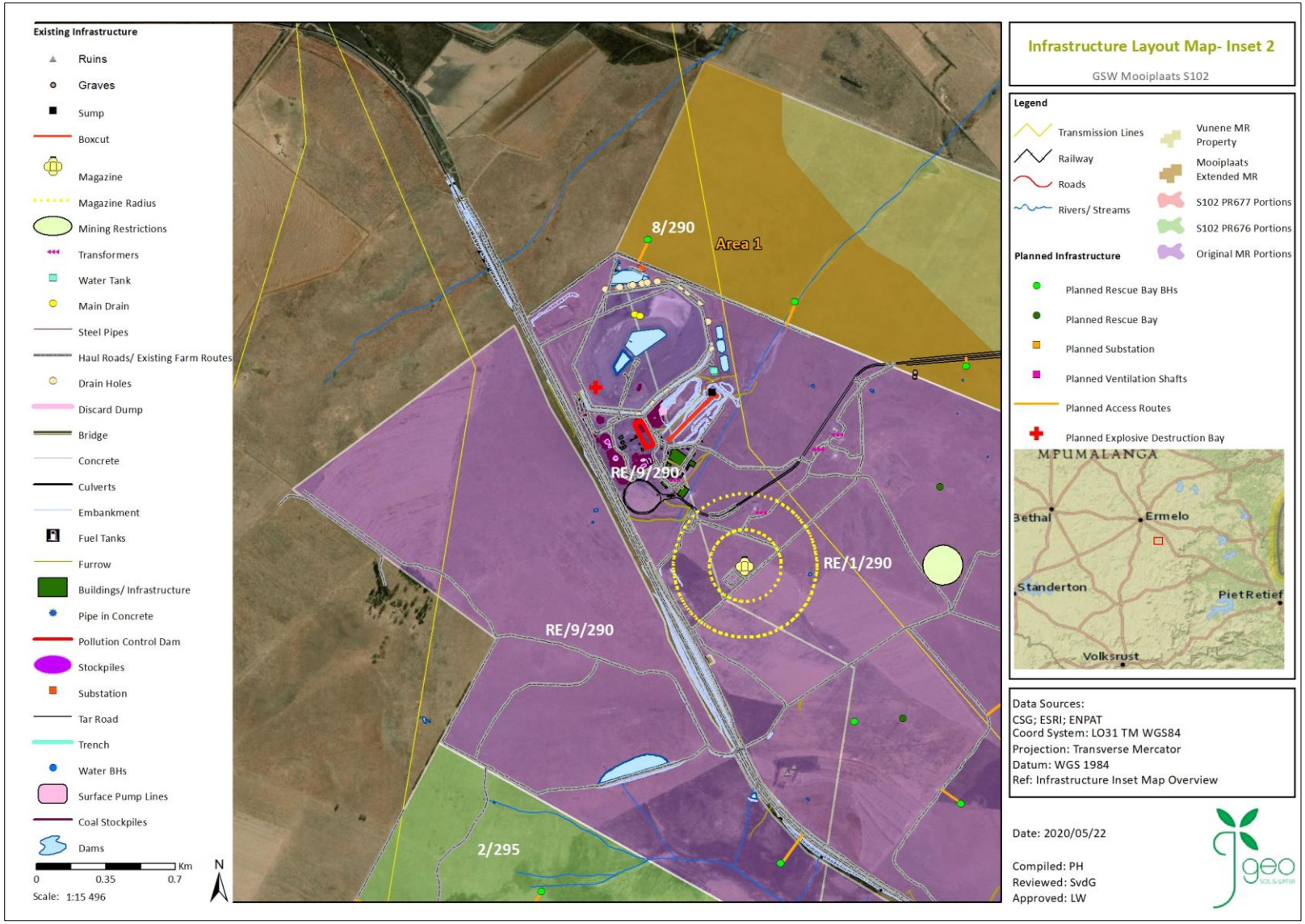


Figure 4: Inset 2 infrastructure layout

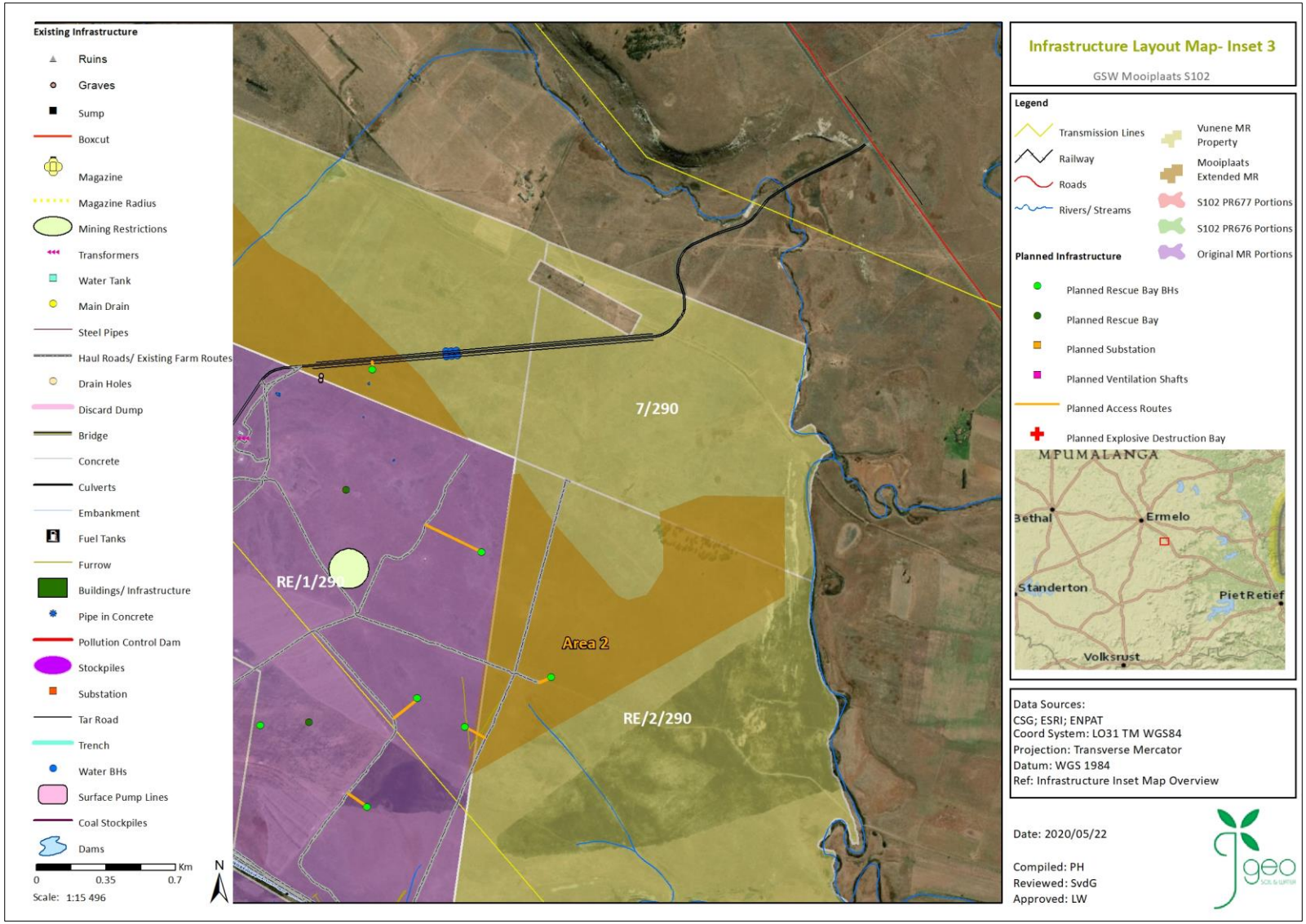


Figure 5: Inset 3 infrastructure layout

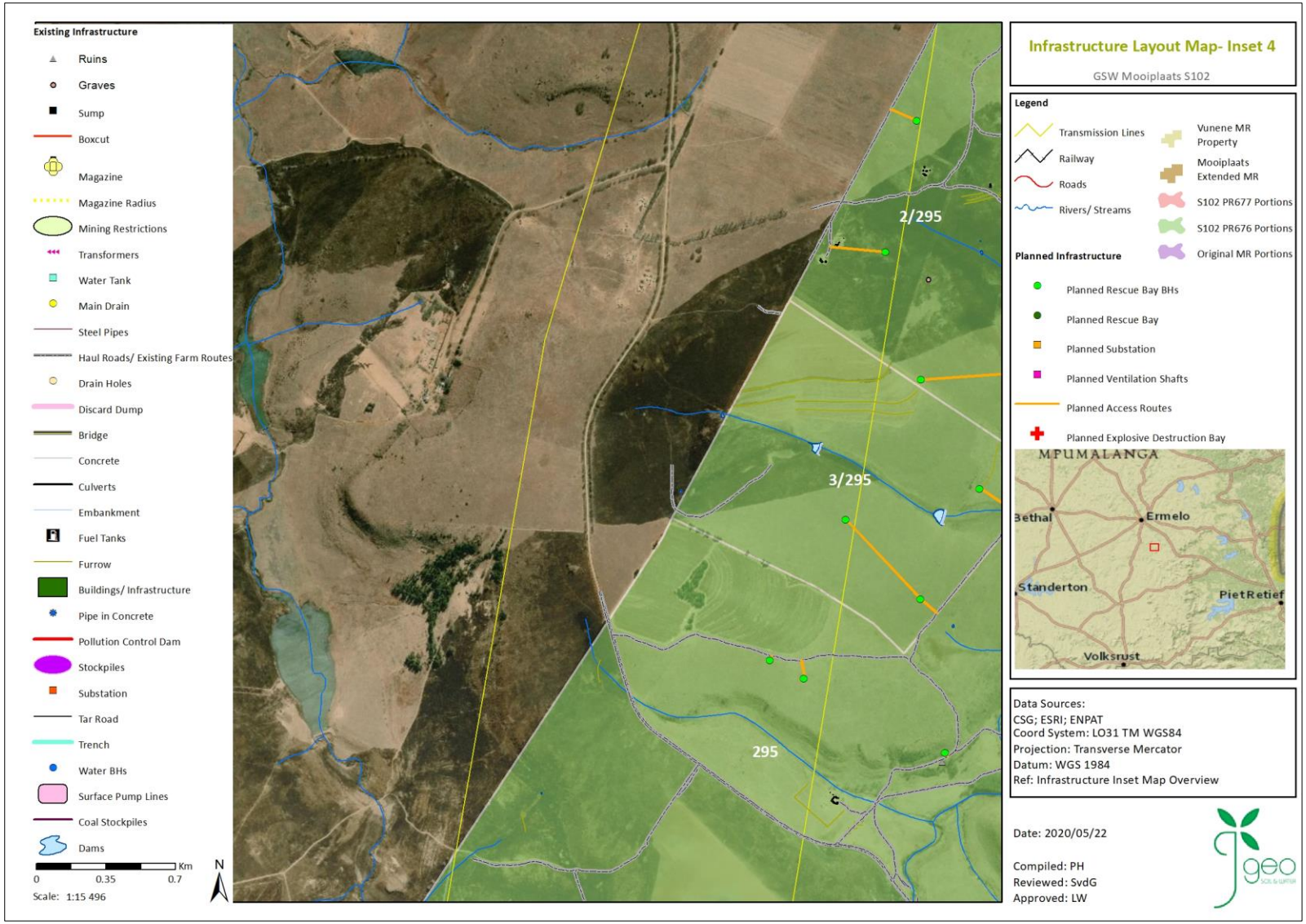


Figure 6: Inset 4 infrastructure layout

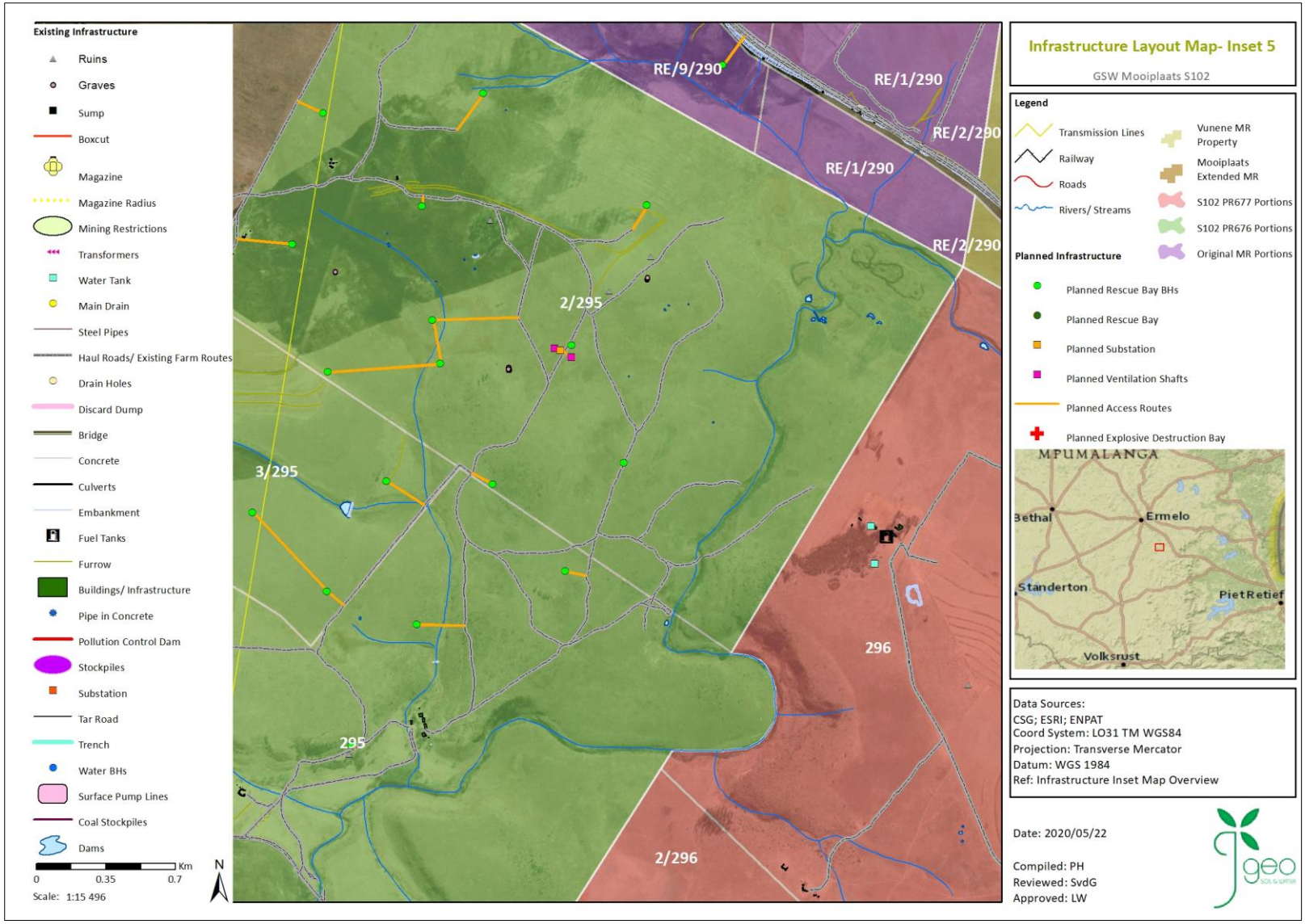


Figure 7: Inset 5 infrastructure layout

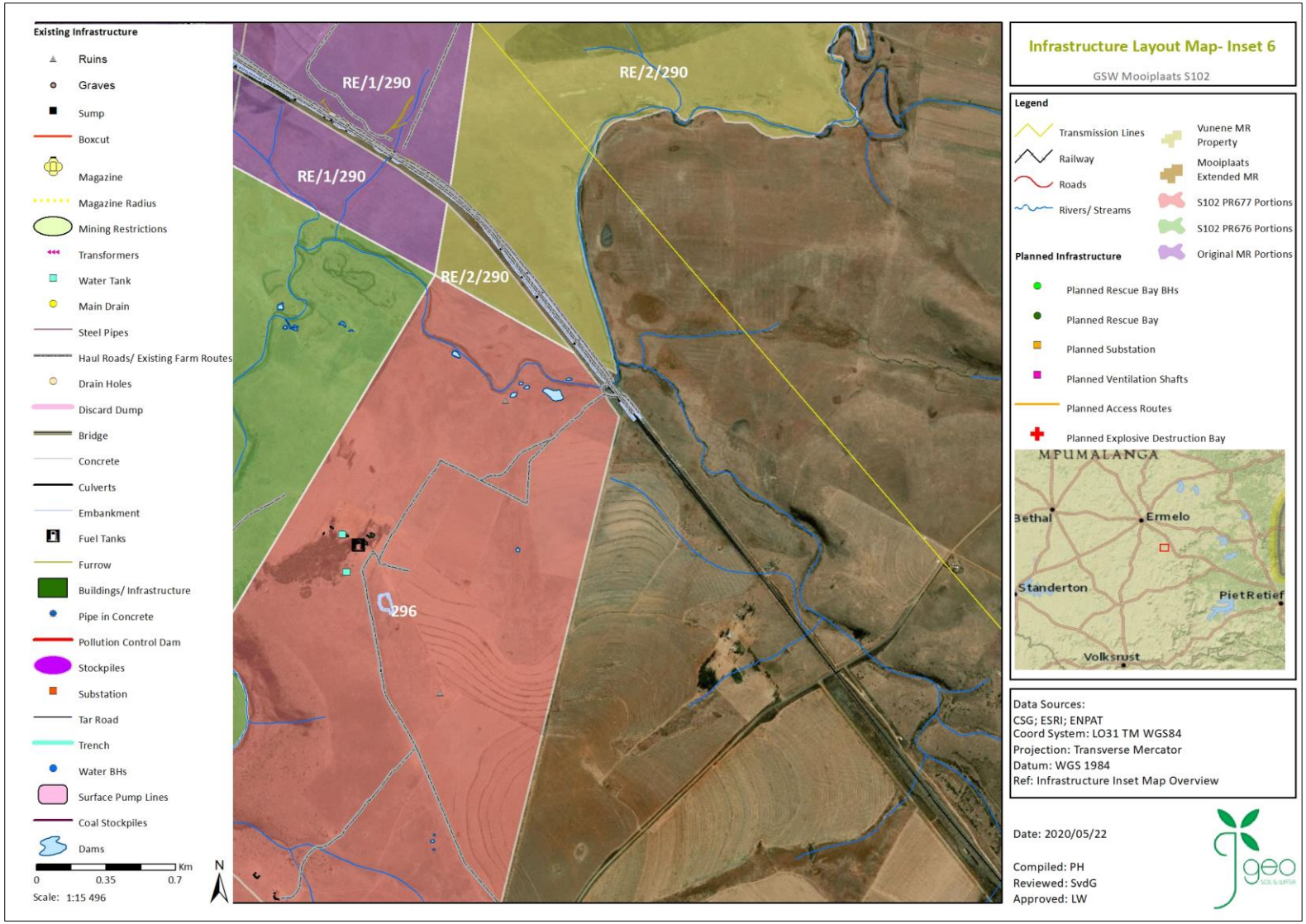


Figure 8: Inset 6 infrastructure layout

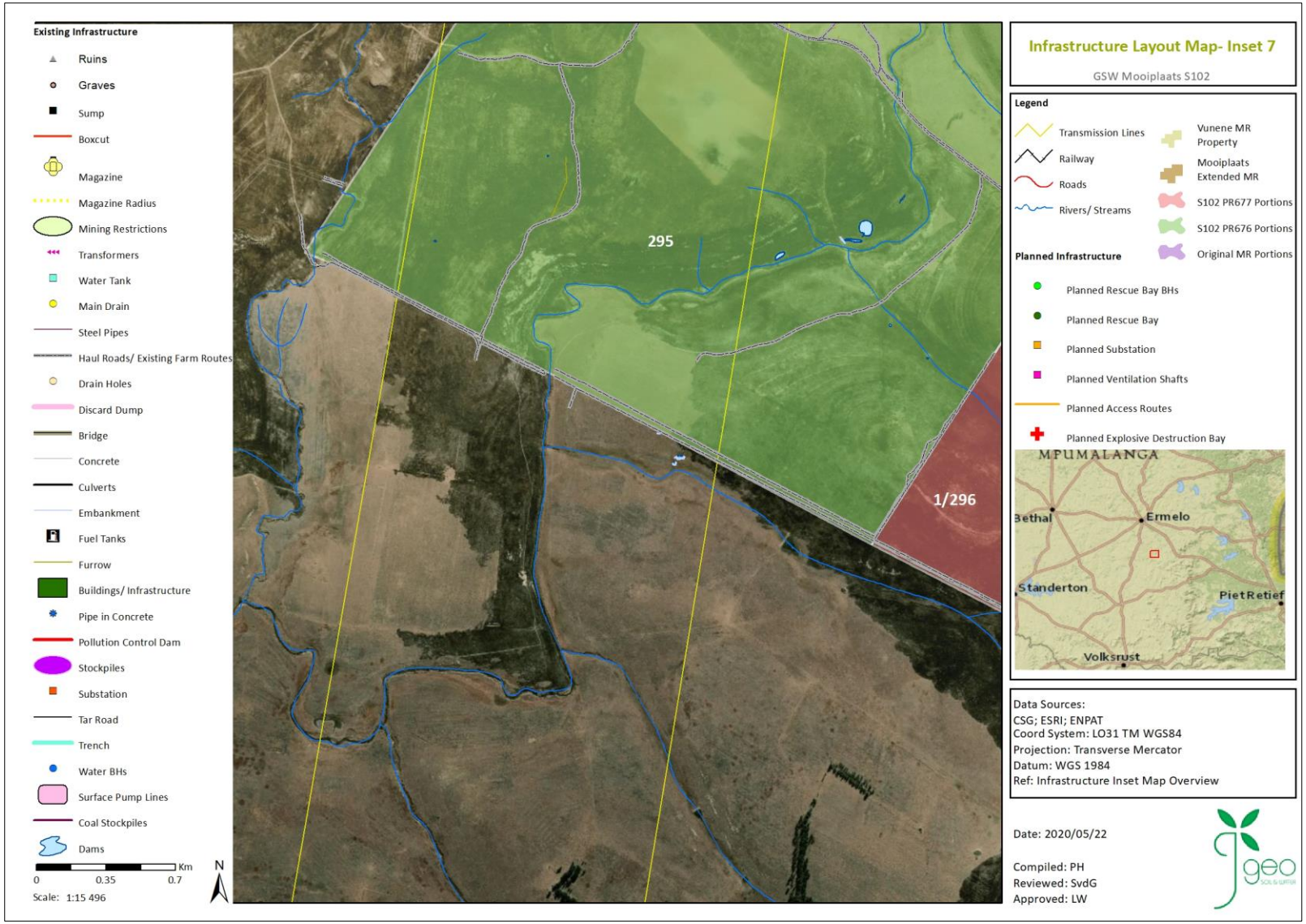


Figure 9: Inset 7 infrastructure layout

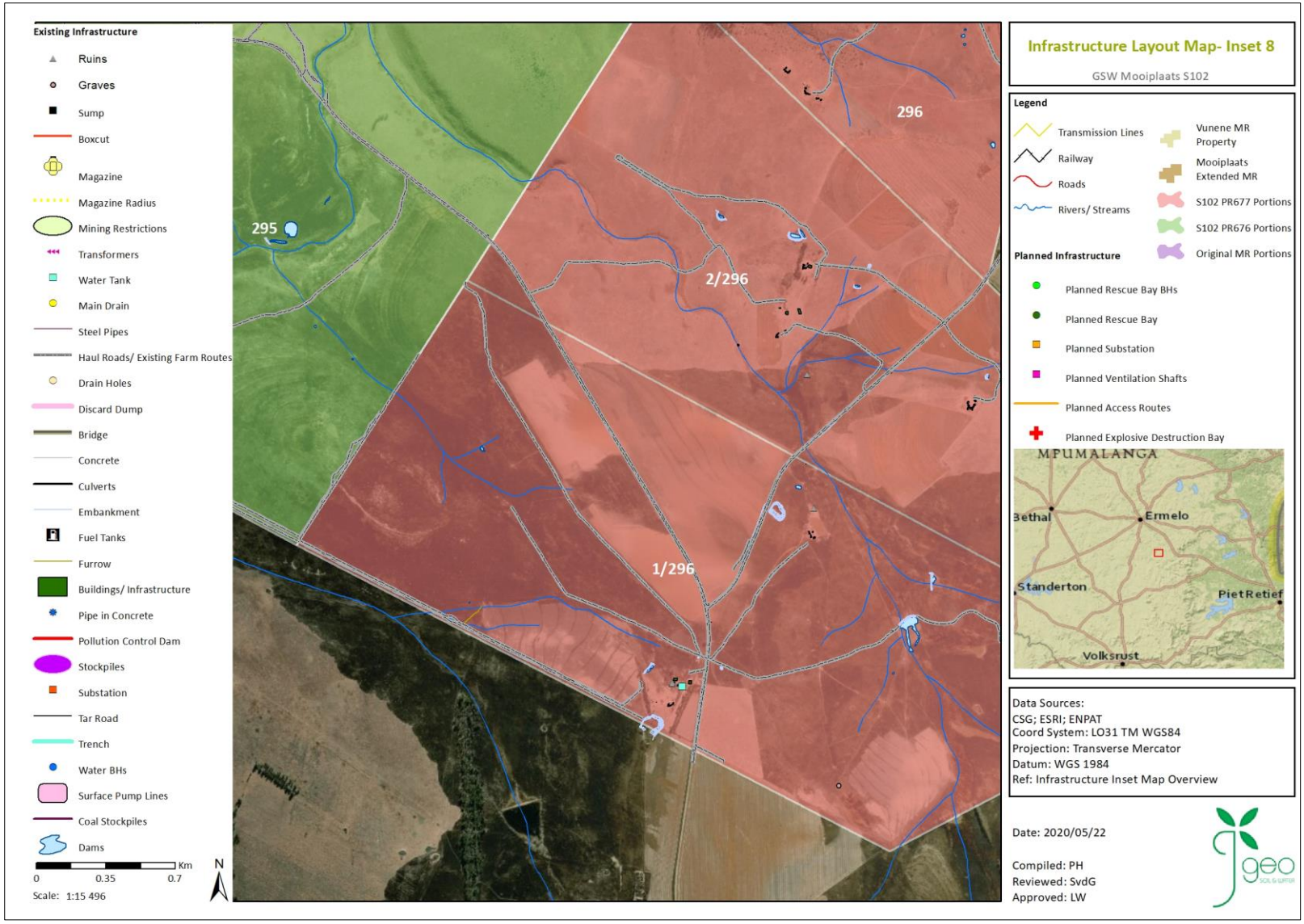


Figure 10: Inset 8 infrastructure layout

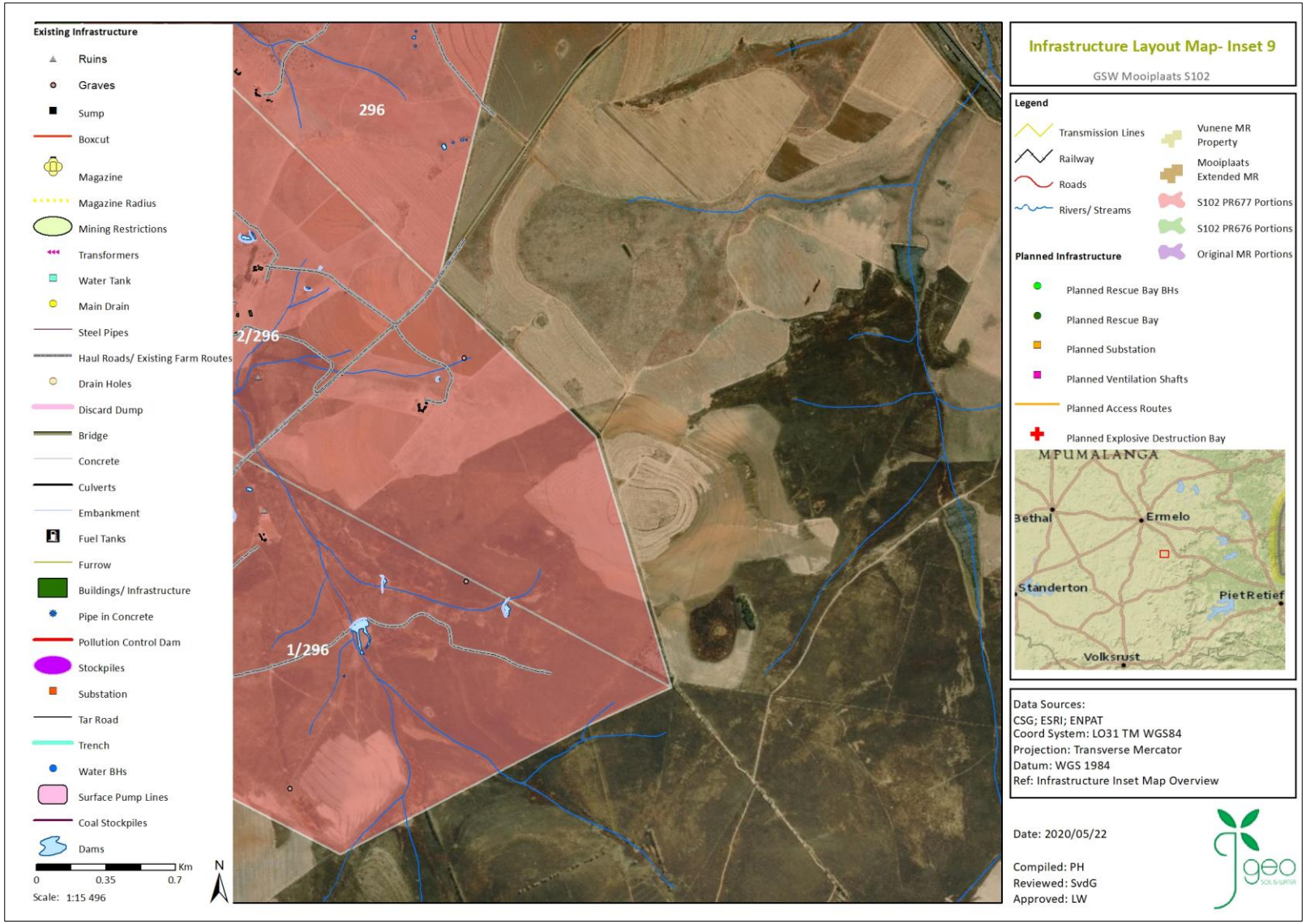


Figure 11: Inset 9 infrastructure layout

2.1 SURROUNDING LAND USES

The surrounding land uses around the Mooiplaats Colliery is mainly agriculture, including grazing, pasture and fodder production. A railway line runs through the mining right boundary of the Mooiplaats Colliery and the N2 highway runs on the north and western side of the Mooiplaats Colliery, while the N11 lies on the eastern side. The Camden Power station lies north of the Mooiplaats Colliery.

2.2 PROPERTY OWNERSHIP

The owners of the various farm portions over which the Mooiplaats Colliery Mining Right and the proposed Vunene project area lie, is indicated in Table 4.

Table 4: Property Ownership

Farm Description	Owner	Tittle Deed
Portion 1 of Mooiplaats 290 IT	Eglin Investments No. 44 (Pty) Ltd.	T13234/79
Portion 9 of Mooiplaats 290 IT	Eglin Investments No. 44 (Pty) Ltd.	T13234/79
Remainder Portion of Portion 2 of Mooiplaats 290 IT	Eglin Investments No. 44 (Pty) Ltd.	T84901/2002
Portion 7 of Mooiplaats 290 IT	National Government of South Africa	T2301/2008
Portion 8 of Mooiplaats 290 IT	National Government of South Africa	T2301/2008
Portion 0 (Re) of Klipbank 295 IT	Madevu Farming Inv (Pty) Ltd.	T16190/2018
Portion 2 of Klipbank 295 IT	Madevu Farming Inv (Pty) Ltd.	T16190/2018
Portion 3 of Klipbank 295 IT	Mr. Hendrik Reyneke	T135860/1999
Portion 0 (Re) of Adrianople 296 IT	Rassie Saaiman Trust	T14247/2018
Portion 1of Adrianople 296 IT	Lood De Jager Trust	T138998/1997
Portion 2 of Adrianople 296 IT	Willem Smuts	T5414/2008

3 DESCRIPTION AND SCOPE OF THE PROJECT

3.1 DESCRIPTION OF THE ACTIVITY

Mooiplaats Colliery is an underground coal mine that utilise the board and pillar mining method, using continuous miners. Access to the underground workings is obtained through a decline box cut which is situated near the northern

boundary of the Mooiplaats property. The mining area lies within the Ermelo Coalfield. Three coal seams occur on the target properties and can be identified from top to bottom as A, B and C respectively. The A and C seams are poorly developed with an average width of less than 40cm and have been excluded as viable entities for the purposes of this project. Only the B Upper seam is sufficiently developed to form a viable economic entity and because of the depth of this reserve (>100m below surface). For the Mooiplaats Colliery it is anticipated that the total mineable amount will be 12 853 796 tons. The total Life of Mine will be approximately 15 years.

3.2 EXTENT OF ACTIVITY AND KEY ACTIVITITIES

The Mooiplaats Colliery lies within the Ermelo Coalfield, three coal seams occur in the area of interest. The upper A, C and Lower B coal seams are poorly developed and not economically viable to mine. The B Upper seam is sufficiently developed and is the target seam for underground mining. Access to the underground workings is obtained through a T-shaped box cut. Mining is taking place in approximately 100m below ground level. The Life of Mine (LOM) is indicated in Figure 12.

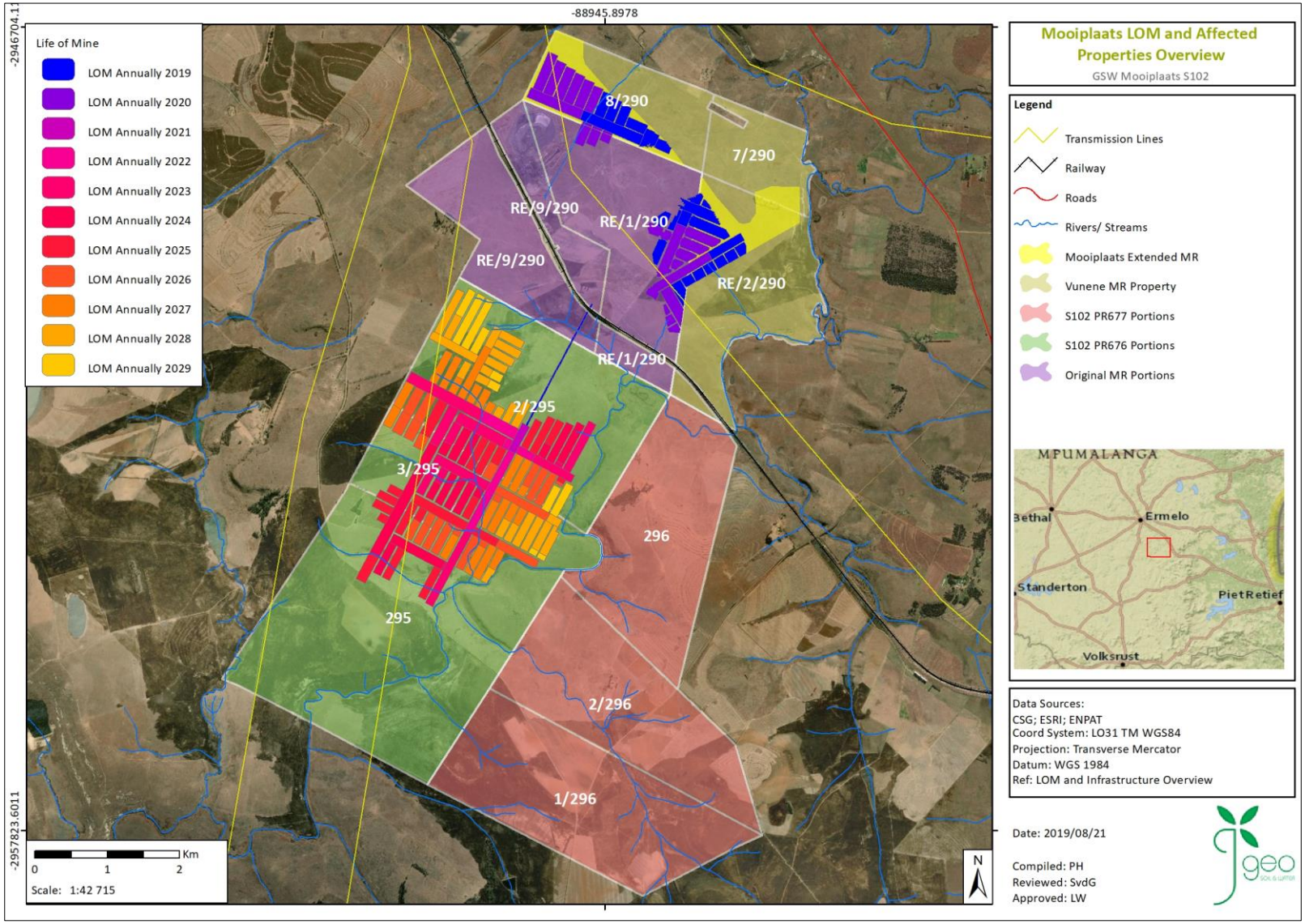


Figure 12: The Life of Mine for the Mooiplaats Colliery including the Mooiplaats Colliery Vunene Project area

3.3 ACTIVITY LIFE DESCRIPTION

The mining method employed at the Mooiplaats Colliery comprises the mechanised board and pillar mining method, using continuous miners in some sections and the drill and blast method in other sections, depending on mining conditions.

3.4 ACTIVITY INFRASTRUCTURE DESCRIPTION

Surface infrastructure associated with the existing Mooiplaats Colliery includes the following:

- Upslope diversion berms;
- Mining area:
    - T-shaped box-cut for the underground access for equipment and staff access;
    - Diversion berms and channels;
    - Overburden and soil stockpiles;
    - Conveyors for coal transports;
    - Co-disposal Facility
    - Return Water Dam
    - Three settling dams; and
    - Two pairs of Erikson dams/tanks.
- Office and admin area:
    - Potable water tank;
    - Change house;
    - Sewage treatment plant;
    - Reverse Osmosis Plant
    - Sump to collect run-off from office area fitted with a pump;
    - Office and administrative buildings;
    - Workshop;
    - Washbay;
    - Salvage yard;
    - Substation;
    - Generators;
    - Diesel storage;

- Powerlines;
- Parkade;
- Stores;
- First aid room; and
- Lamp room.

- Plant area:
  - Workshop;
  - Laboratory;
  - Processing plant and control room;
  - Coal stockpiling area;
  - Conveyors;
  - Substation;
  - Power lines; and
  - Erikson dams/tanks.
- Mine residue:
  - Co-disposal facility; and
  - Return water dams;
- General:
  - Clean water storage tanks;
  - Pollution control dam;
  - Helipad;
  - Access road and secured access control;
  - Weighbridge and haul roads; and
  - Boreholes.

The proposed Mooiplaaits Colliery Vunene project area will require two ventilation shafts and access roads, as well as additional rescue borehole with associated access roads. No further infrastructure is forseen at this time. Figure 13 below indicates the infrastructure on the original Mooiplaats Colliery section, and Figure 14 provides the infrastructure layout for the original Mooiplaats Colliery section, the Mooiplaats Colliery South section and the proposed Vunene project area to be included into the mooiplaats Colliery mining right. Also refer to Figure 2 to Figure 11 for the infrastructure inset plans.

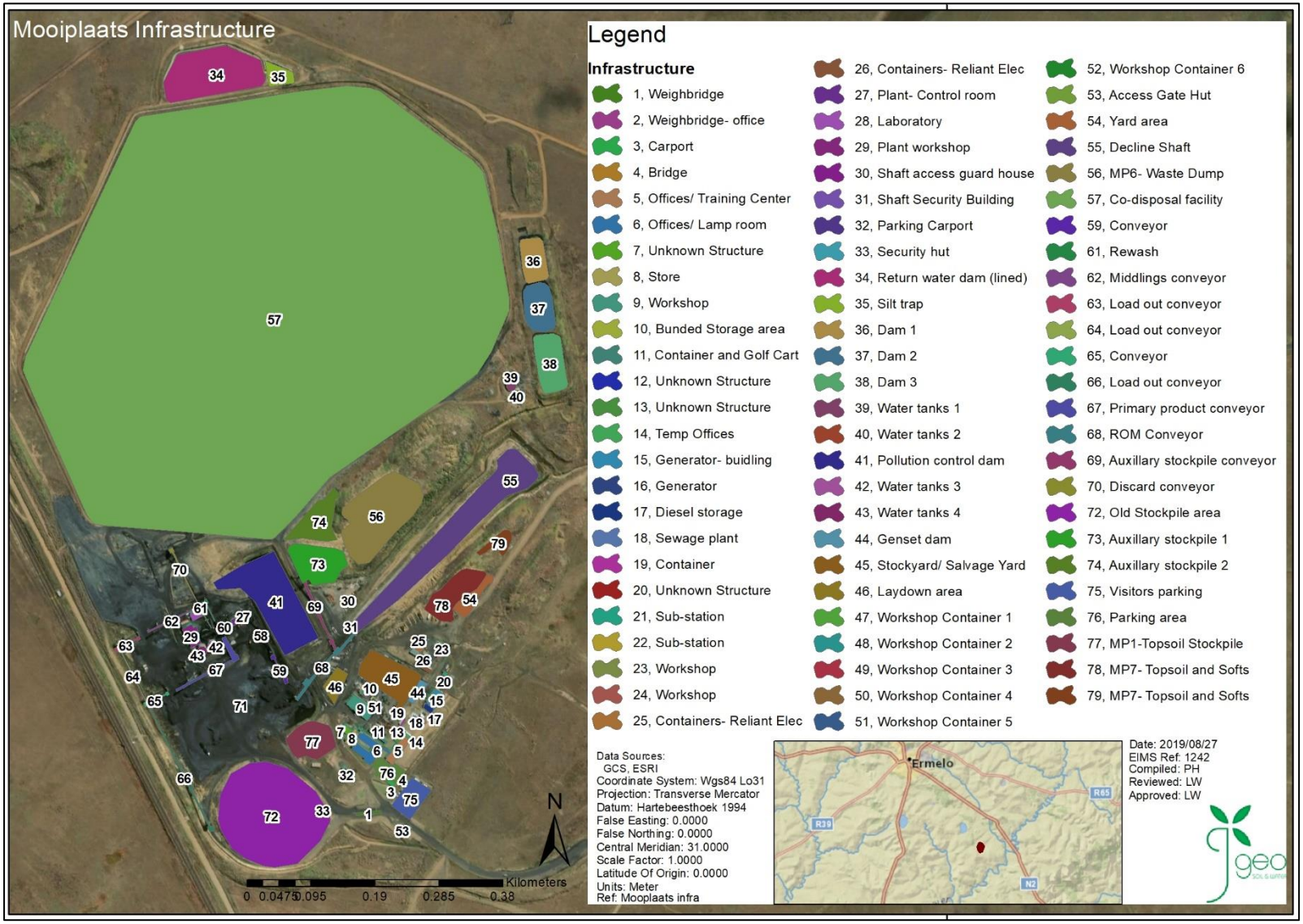


Figure 13: Existing infrastructure layout at the Mooiplaats Colliery.

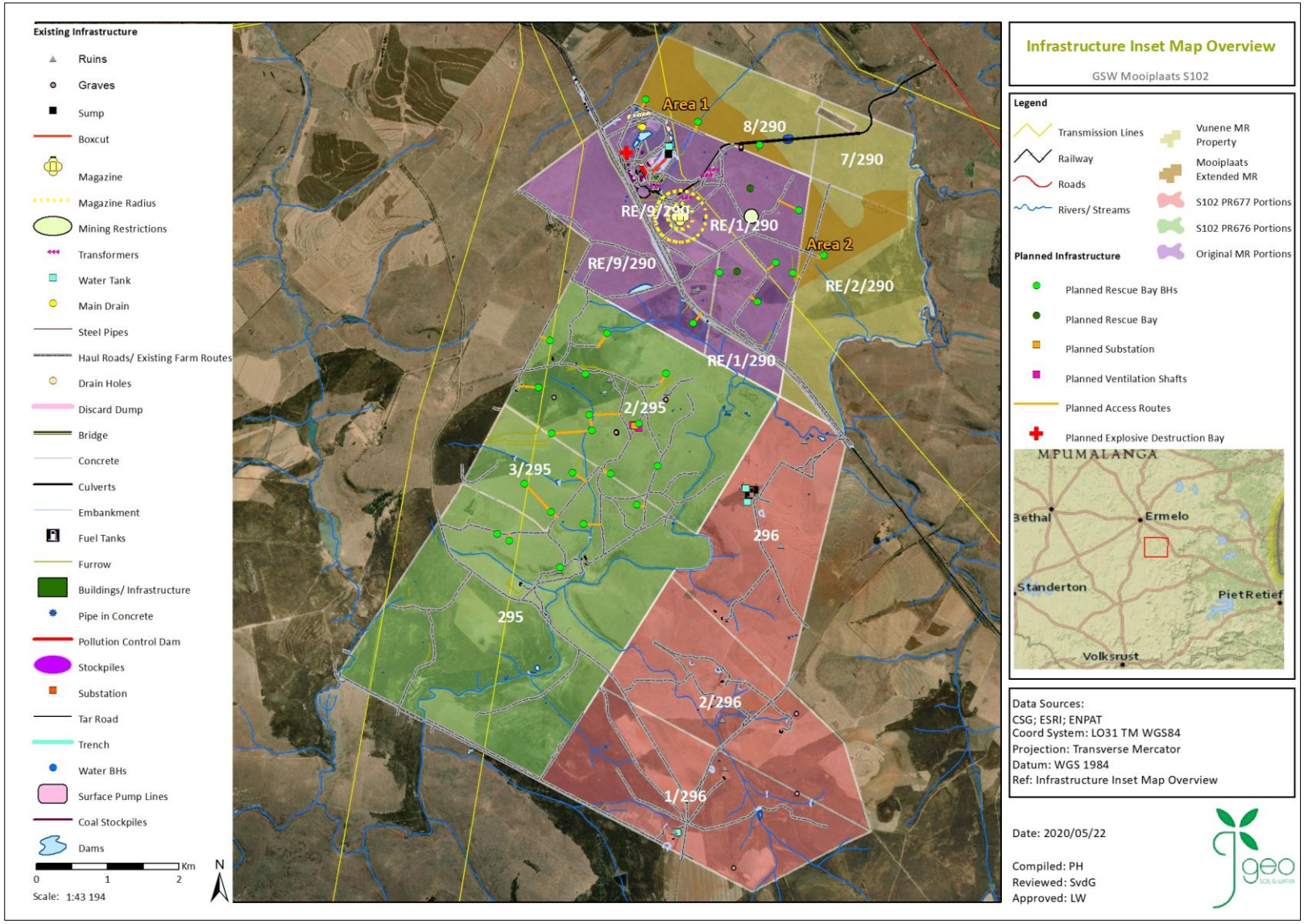


Figure 14: Mine and infrastructure layout of the Mooiplaats Colliery including the Vunene project area

3.4.1 MINERAL DEPOSIT

The mining area lies within the Ermelo Coalfield and 3 coal seams occur on the target with the upper A and C seams being poorly developed and not economically viable to mine. The B Upper seam is developed sufficienty and is the target seam for underground mining methods (> than 100 m below ground level). The B lower level is also not economically viable.

3.4.2 MINE PRODUCTS

The design allows for the processing of 220 000 tons per month nominal feed through the DMS plant and with a yield of 65% will result in 14 300 tons per month of washed product. The bitumunious or lean coal crusher is capable of crushing 220 000 tons per month which provides flexibility to Mooiplaats Colliery to ensure there is sufficient stockpile capacity of the bituminious / lean coal. The Run of Mine (ROM) production will be approximately 190 000 tons per month, with infrastructure design allowing for extraction at any given time of either anthracite or bituminous coal.

3.4.3 ACCESS TO THE WORKINGS

Access to the underground workings is via a T-shaped box cut. The box cut has one roadway from the surface into the coal at a depth of approximately 44 m. The first level is a separate haul way of 167 m each and 6.8 m wide at a slope of 15° and carries a single conveyor system. The second level is the central paved access roadway, approximately 220 m long and 6.8 m wide at a slope angle of 12°, used for the transport of staff and mining material in and put of the mine.

3.4.4 THE MINERAL PROCESSING PLANT

Feed material is deposited on the ROM stockpile. The material is fed with a front-end loader into the feeders. The feed material is extracted from the stockpile with 5 feed gates and vibrating feeders situated inside the ROM tunnel discharging material onto the reclaim conveyer. Three of the vibrating feeders are connected direct on line, which means that the throughput cannot be adjusted. Two of these feeders are fitted with variable speed drives (vsd) which is connected to the weight-meter and controls the feed at the desired rate. The feed rate is controlled at an average of 400tph to ensure the surge bin is kept full at all times.

A belt magnet is situated just outside the ROM tunnel running over the reclaim conveyer. The purpose of this magnet is to remove the scrap material from the material. The plant attendants make sure that the magnet is kept clear of tramp iron by running the magnet belt. The reclaim conveyer transfers the feed material onto a static grizzly, which is situated above the primary roll crusher. The static grizzly bars are set 90mm apart. The undersize material (-85mm) falls directly onto the scalping screen feed conveyer, while the oversize (-300mm +85mm) passes through the primary roll crusher, set at 80mm. The discharge of the primary crusher also falls onto the scalping screen feed conveyer.

The scalping screen is fitted with 55mm panels. The oversize (-100mm + 50mm) of the scalping screen falls onto the secondary crusher feed conveyer, while the undersize (-50mm) discharges onto the surge bin feed conveyer, which feeds into the surge bin.

The secondary roll crusher feed conveyer feeds the secondary roll crusher, which is set at 45mm. The secondary crusher discharge falls on the scalping screen feed conveyer, where the material is again sized as oversized and correct sized material.

The crushing section concrete slabs and the ROM tunnel is kept clean by the crushing section Attendants. Drums are placed outside to throw away all the papers and plastic from underground.

The plant feeder is a vibrating feeder, fitted with a variable speed drive, discharging material onto the primary plant feed conveyor. This conveyor is fitted with a weight-meter, which is linked to the feeder's variable speed drive, controlling the feed to the plant per module at 200 ton per hour (tph).

The primary plant feed conveyor discharges onto a sieve bend (0.8mm slots across flow) onto the primary de-sliming screen. The primary de-sliming screen is fitted with 1x13 mm slotted panels. The slimes are pumped to the spiral dewatering cyclones in the spiral plant.

The primary de-sliming screen discharges in the mixing box feeding the 80 mm cyclone fitted with a 280 mm spigot. The pressure of the cyclone is 110 – 150 kPs, which gives a head of 9-12D. The density at the mixing box is checked by hand every hour and recorded in the book. This will ensure that the automatic density is correct and problems can be identified as soon as possible.

The primary cyclone discharges over the sieve bends onto the primary drain and rinse screen. The primary drain and rinse screen is fitted with 0.5mm slotted panels to recycle the correct medium and wash the material to remove the rest of the magnetite adhering to the particles on the washing section. The float discharge section of screen is fitted with 20mm square panels. Material larger than 20mm is discharged onto the product conveyor, while material smaller than 20mm discharges onto the centrifuge feed conveyor. The sinks/discard section discharges onto the rewash feed conveyor.

The cement area and sumps around the primary and secondary cyclone plant are kept clean at all times. The primary fines pump feeds the dewatering cyclones above the 4 x 3 start spirals. The spiral discard is pumped to the discard dewatering cyclone, from where the underflow discharges onto the spiral product dewatering cyclone from where the underflow discharges onto the product dewatering screen and discharges then onto the product conveyor. The dewatering cyclones are fitted with 55mm HDPE discard screen and is then discharged onto the discard conveyor. The spiral product pump feeds the spigots. The overflow from the dewatering cyclones feeds to the thickener. If there are any large pieces of material found in the spirals, a sieve bend is holed. The centrifuge feed conveyor discharges into the centrifuge where water is removed and pumped back to the spiral discard sump. The centrifuge product discharges onto the Export stockpile conveyor. The product conveyor also discharges onto the Export stockpile.

The rewash feed conveyor discharges into the mixing box of the rewash cyclone feed pump feeding the 800 mm rewash cyclone fitted with a 265 mm spigot. The pressure of the cyclone should be between 90 -130 kPa, which will give a head of 9-12D. The density at the mixing box will be checked every hour by hand and recorded in the book. This will ensure that the automatic density is correct and problems can be identified as soon as possible.

The rewash cyclone discharges over the sieve bends onto the rewash drain and rinse screen. The rewash drain and rinse screen is fitted with 0.5 mm slotted panels to recycle the correct medium and wash the material to remove the rest of the magnetite adhering to the particles on the washing section. The float discharge onto the Eskom stockpiles conveyor while the sinks/discard section discharge onto the discard conveyor. The discard conveyor discharge into the discard bin, from where the discard is trucked to the co-disposal dump.

All the slurry (-0.5 mm) from the plats is pumped to the thickener. Flocculant is added continuously to the thickener feed launder through the automatic flocculant plant of MC process. The flocculant is made up of clean water and the auto dilution takes place with process water. Flocculant is pumped on a continuous tempo into the thickener to ensure that the overflow is clean.

The overflow from the thickener is recycled back to the plant while the underflow is pumped to the settling dam on the co-disposal dump. The density of the thickener underflow is measured every hour and the density measured should not be more

than 1.1 S.G to prevent blockages in the line. The beaching of the slurry dam is checked on a regular basis and the discharge pipes are changed when it is necessary.

The primary and middlings product is dispatched through the load out section. Only one product at a time can be extracted from the two stockpiles and loaded onto the load out conveyor. The product is extracted with 6 vibrating feeders in every tunnel. The operator should utilize all 6 feeders ensuring that product is extracted throughout the stockpiles. The product conveyors discharge onto the load out conveyor from where the product is discharged into the load out bin. The trucks are loaded by opening the gate below the load out bin. The load out bin Attendants ensure that product tunnels as well as the load out section are kept clean.

3.4.5 TRANSPORT

The coal is transported from the underground mining area to the surface near the wash plant via the conveyor system. The coal is trucked from the mine to Delta Siding for railway transportation to various local and international markets and to the Camden Power Station.

3.4.6 ESTIMATED COAL RESERVES

The total mineable amount in of coal reserves is 12 853 796 ROM tons.

3.4.7 PLANNED LIFE OF MINE

Mining commenced in 2009 with a Life of Mine of around 10 Years. The revised MWP indicates that the mining of the new areas (Area 1& 2) and the Vunene areas will extend the LOM by 15 years, until 2034.

3.4.8 WATER REQUIREMENTS

Potable water is obtained from 3 boreholes on site, each supplying an average of around 4000 m^3/annum.

Process water is obtained from 4 boreholes drilled to access water from the old Usutu underground working, with an average abstraction rate of 76 000m^3/annum for all the four boreholes. Make-up water is obtained from the various pollution control facilities on site and dewatering of the active underground sections of the Mooiplaats Colliery. Water used for dust suppression is obtained from dirty runoff water collecting in various pollution control facilities on site. As the Vunene Extention Project includes underground mining only, there is not likely to be a change in the use of process water.

3.4.9 WASTE MANAGEMENT

3.4.9.1 GENERAL AND DOMESTIC WASTE

A central waste collection area is established and demarcated at the plant area. The waste collection area is situated on an impermeable layer, within the dirty water area. Waste skip bins of different colours are provided for the different waste types generated.

A waste contractor is utilised for the collection of general waste and is disposed of at a nearby general, licensed landfill site. A recycling station is set up at the Mooiplaats Colliery for the recycling of scrap metal, glass, paper, cans and used lubricants. Contractors specialising in the recycling of these materials are utilised for the recycling of the materials. Waste training is provided to employees in order to ensure that correct waste separation and recycling is conducted at source. An inventory is kept of all waste types and volumes generated and disposed of or recycled.

3.4.9.2 WASTE ROCK MATERIAL

Drilling for the two vent shafts will be through the raise bore drilling method therefore none of the waste rock material will be stockpiled on the surface directly adjacent to the vent shafts. All waste rock will be stockpiled on existing waste rock dumps.

3.4.10 HAZARDOUS WASTE MANAGEMENT

The hazardous waste that is generated is collected in a designated area and is disposed of by an authorised contractor at a registered H:H waste disposal facility. Used oil is collected in either the oil separator at the workshop or collected in a specialised used oil container located at the waste collection area. Used oil is collected by a registered recycling contractor. Fluorescent tubes are crushed in a specialised 210L crushing drum, which is disposed of along with the other hazardous waste. A waste inventory is kept of all waste types and volumes generated and disposed of or recycled (GCS, 2010).

3.4.11 LIQUID EFFLUENT MANAGEMENT

3.4.11.1 SHAFT AREA WATER MANAGEMENT

Upslope diversion berms direct clean run-off around and away from the site of Mooiplaats Colliery. All water falling on and around the shaft area is deemed dirty water and is collected in the Pollution Control Dam (PCD). Water produced as part of the underground mining, either from dewatering or as part of the mining process is pumped to settling dams via the silt trap. Settled water is transferred into the Erikson dams from where it is reticulated back underground allowing majority of the water being used to be recycled (GCS, 2010).

3.4.11.2 SEWAGE

A biological sewage treatment facility has been constructed next to the office and administration buildings. The capacity of the sewage treatment plant is 30 750L / 3.075 m^3 per day. The system is gravity fed. The sewage is collected through a network of sewage pipes which is then routed to the wastewater treatment plant for treatment. The certificate issued for the sewage treatment plant classifies the plant as a Class C facility in terms of Section 26 of the NWA and it was registered on the 15th of May 2013.

3.4.11.3 WATER POLLUTION MANAGEMENT

Diversion berms are in place upslope of the shaft area to ensure that all clean run-off water is diverted around and away from the shaft area. All rain water and other dirty water in the shaft area is captured and stored on site in the PCD. Dirty water is not permitted to enter the receiving environment and all dirty water is kept in the close loop dirty water system from where it is reused. The PCD is designed correctly according to Dam Safety Regulations to store a 1:50 year 24 hour storm event and maintain a 0.8m freeboard.

3.5 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 5. 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 Mooiplaats 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 5: 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 for ventilation shaft		As required	As required	As required	
	Planned placement of infrastructure		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 topsoils (Ventilation shaft)		At start of phase	As required	As required	
	Cleaning, grubbing and bulldozing (Ventilation shaft)		At start of phase	As required	As required	

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	Removal of 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	
	Maintenance of storm water management measures		At start of phase	As required	As required	
	Maintenance of firebreak		At start of phase	As required	As required	
Civil Works	Maintenance of infrastructure and services		At start of phase	As required		
	Mixing of concrete and concrete works		As required	As required		
	PCD and storm water/return water dam		At start of phase	As required	On-going	
	Establishment of dewatering pipelines		At start of phase	As required		
	Sewage and sanitation		At start of phase	On-going	On-going	
	Existing fuel storage area		Ongoing			
	Existing chemical storage area		Ongoing			
	Existing general waste area		Ongoing	On-going		
	Access control and security		Ongoing	As required	As required	

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	General site management		On-going	On-going	On-going	On-going
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		
	Continued use of existing RoM stockpiles		Ongoing	As required	As required	
	Continued use of existing Product Stockpiles			On-going	On-going	
	De-watering of 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

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	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
Infrastructure removal	Dismantling and demolition of relevant infrastructure				As required	
	Blasting				As required	
	Safety control				On-going	On-going
Rehabilitation	Backfilling of pits and voids {underground mine and ventilation shaft)			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

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	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

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 6 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 DMRE, 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 in order to assess the potential applicability of these for the proposed activity. More detail on the legislative framework is presented below.

Table 6: Applicable legislation and guidelines overview.

Applicable Legislation and Guidelines	Reference Where Applied
(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process).	
APPLICABLE LEGISLATION	
<u>Constitution of the Republic of South Africa (Act 108 of 1996)</u>: 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 - o to an environment that is not harmful to their health or well-being; and o to have the environment protected, for the benefit of present and future o generations, through reasonable legislative and other measures that: o prevent pollution and ecological degradation; o promote conservation; and o secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development" Therefore, the EIA is conducted to fulfil the requirement of the Bill of Rights.	Throughout the environmental Scoping and Impact Assessment process.

Applicable Legislation and Guidelines	Reference Where Applied
National Environmental Management Act (Act 107 of 1998 – NEMA); and the EIA Regulations (2014, as amended): The NEMA (1998) requires that a project of this nature (inclusive of a Mining Right) must undergo a Scoping and Environmental Impact Assessment (EIA); an Environmental Management Programme (EMPR) must also be compiled. Regulations applicable to this project include the following: o EIA Regulations GN R. 982 (2014, as amended) in terms of the NEMA; o EIA Regulations GN R. 983 (2014, as amended) in terms of the NEMA; o EIA Regulations GN R. 984 (2014, as amended) in terms of the NEMA; and o EIA Regulations GN R. 985 (2014, as amended) in terms of the NEMA.	Throughout the environmental Scoping and Impact Assessment process.
Minerals and Petroleum Resources Development Act (Act 28 of 2002 – MPRDA) as amended; and the Mineral and Petroleum Resources 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.	Throughout the environmental Scoping and Impact Assessment process.
National Water Act (Act 36 of 1998 – NWA): The NWA recognises 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 Mooiplaats Colliery and the extension including the Vunene areas and associated infrastructure, are required to be licensed by the Department of Human Settlement Water and Sanitation (DHSWS). An Integrated Water Use Licence Application (IWULA) will be lodged with the DHSWS in terms of Section 21 of the NWA and is currently in process. The water uses that will be applied for that require authorisation are as follows: o Section 21 (a); o Section 21 (c) and (i); o Section 21 (g); and o Section 21 (j).	An IWULA for the applicable water uses is underway by GSW.

Applicable Legislation and Guidelines	Reference Where Applied
Furthermore, an Integrated Water and Waste Management Plan (IWWMP) is being compiled and will be submitted in support of the IWULA after being made available to the public for comment.	
National Heritage Resources Act (Act 25 of 1999 – NHRA): The NHRA 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, some heritage resources and palaeontological features are likely to occur within the Mooiplaats Colliery boundary area, particularly the following: o Section 34(1); and o Section 38. 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 utilised 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, and MPRDA legislation.	Heritage and Palaeontology specialist studies, the environmental Scoping and Impact Assessment Reports, and the EMPR.
Specific Environmental Management Acts (SEMAs): The SEMAs refer to specific portions of the environment where additional legislation over and above the NEMA (1998) as amended, is applicable. SEMAs likely to be relevant to this application include the following: o National Environmental Management: Biodiversity Act (Act 10 of 2004); o National Environmental Management: Air Quality Act (Act 39 of 2004); and o National Environmental Management: Waste Act (Act 59 of 2008). SEMAs likely to be applicable in this regard (if any) include the Threatened Or Protected Species (TOPS) permit for the removal of any protected tree species from site, and Waste Management related licencing or registration.	Specialist studies, baseline description for the environmental Scoping and Impact Assessment process, as well as the EMPR.
APPLICABLE GUIDELINES	
Integrated Environmental Management Information Guidelines Series:	The guidelines will be used throughout the environmental

Applicable Legislation and Guidelines	Reference Where Applied
This series of guidelines was published by the Department of Environmental Affairs (DEA), and refers to various environmental aspects. Applicable guidelines in the series for the Mooiplaats Colliery Vunene project area include: o Guideline 5: Companion to NEMA EIA Regulations, 2010; o Guideline 7: Public participation; and o Guideline 9: Need and desirability. o Additional guidelines published in terms of the NEMA EIA Regulations, 2014 (as amended), in particular: o Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006; o Guideline 4: Public Participation in support of the EIA Regulations, 2006; and o Guideline 5: Assessment of alternatives and impacts in support of the EIA Regulations, 2006.	Scoping and Impact Assessment process.
Best Practise Guideline (BPG) Series: The BPG series refers to publications by the then Department of Water Affair and Forestry (now Department of Water and Sanitation – DHSWS) providing best practice principles and guidelines relevant to certain aspects of water management. Best practice guidelines relevant to the Mooiplaats Colliery Vunene project area include the following: o BPG A4: Pollution Control Dams; o BPG H1: Integrated Mine Water Management; o BPG H2: Pollution Prevention and Minimisation of Impacts; o BPG H3: Water Reuse and Reclamation; o BPG H4: Water treatment; o BPG G1: Storm Water Management; o BPG G2: Water and Salt balances; o BPG G3: Water Monitoring Systems; and o BPG G4: Impact Prediction.	Surface water and groundwater specialist studies, as well as the environmental Scoping and Impact Assessment process.

4.1.1 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 further governs the sustainable utilisation of South Africa's mineral resources. In the event that the proposed activities require material (e.g. sand, gravel, aggregate) for the purposes of construction then the provisions of the MPRDA may apply.

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment to Section 102 which concerns the amendment of rights, permits, programmes and plans, to requiring the written permission from 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 as was amended in April 2017. This EIA Report pertains to an EA application for the proposed inclusion of the Mooiplaats Colliery Vunene Project area and the development of the underground mining into the Mooiplaats Colliery mining right area. Therefore, a Section 102 application, for the amendment of the Mooiplaats Colliery MWP and approved EMPR to include the activities pertaining to the proposed Mooiplaats Colliery Vunene Project area, has been completed.

4.1.2 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 EIA Regulations, the applicant is required to appoint an EAP to undertake the EIA process, as well as conduct the public participation process towards an application for EA. In South Africa, EIA's 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 EA. On 21 April 2006, the Minister of Environmental Affairs and Tourism (now DEA) 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 as well as April 2017. The 2014 NEMA EIA Regulations (as amended) are applicable to this project. Mining activities, including activities such as the proposed Mooiplaats Colliery Vunene Project area, officially became governable under the NEMA EIA Regulations (as amended) in December 2014.

The objective of the EIA Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the listed activities that have been identified to be triggered by the proposed development/ mining activity. 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 authorised, and that activities which are authorised 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 in order to apply for, and be considered for, the issuing of an EA. These EIA 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 GN R. 985) and a more complete EIA process (activities listed in GN R. 984). In the case of the Mooiplaats Colliery Vunene Project area, there are activities triggered under GN R. 984 and as such a full EIA process is necessary. Table 8 presents all the anticipated listed activities under the NEMA EIA Regulations (2014, as amended) that are applicable to this project.

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 15 below provides a graphic representation of all the components of a full EIA process.

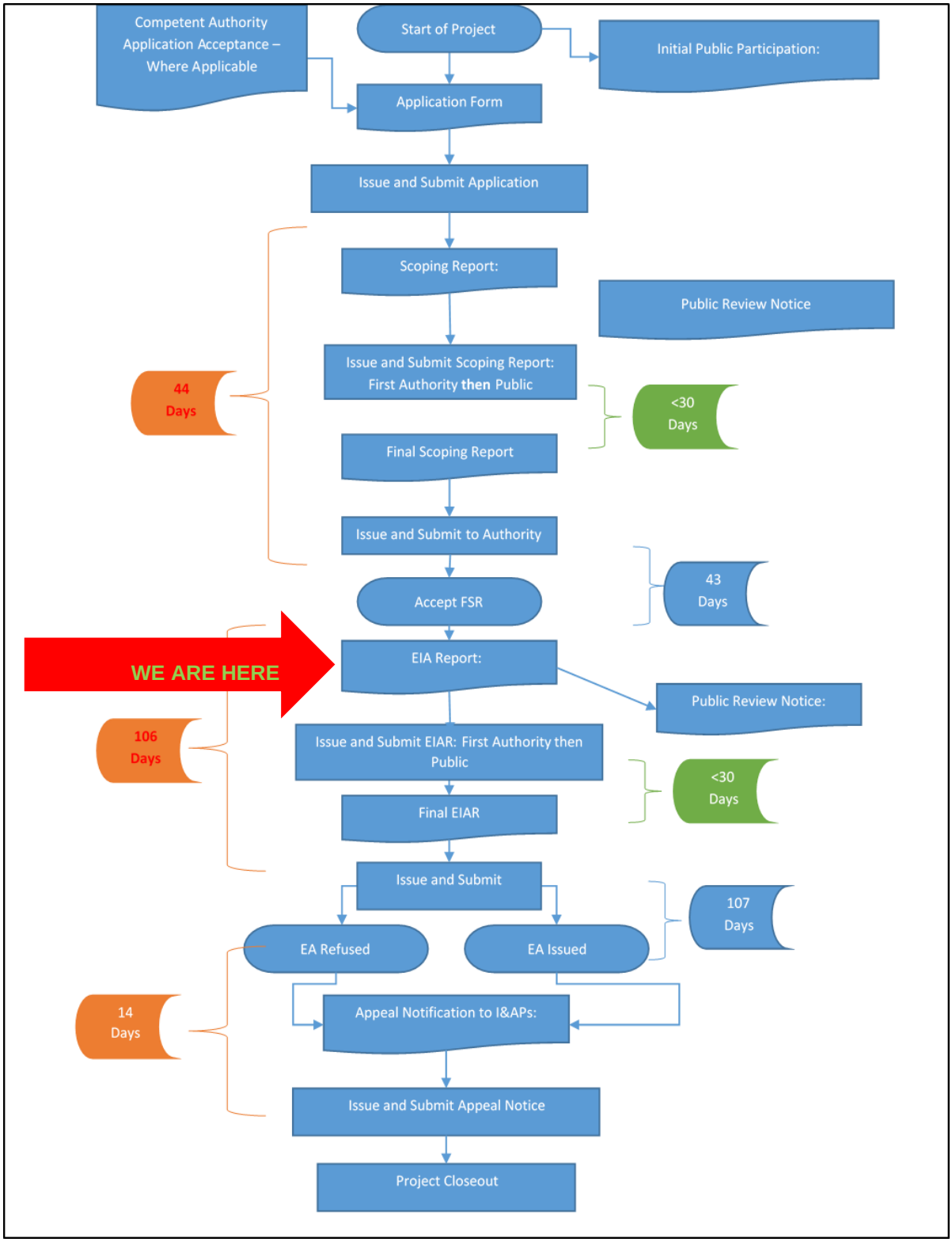


Figure 15: EIA process diagram

The Mooiplaats Colliery has existing environmental authorisations in place. The existing environmental authorisation area indicated in Table 7.

Table 7: Existing Environmental Authorisations for Mooiplaats Colliery

Reference	Date	Description	Holder	Authority	Activities Authorized
17/2/1/18 MP - 29	2009/11/27	Construction of a helicopter pad on Portion 1 of the Farm Mooiplaats IT.	Langcarel (Pty) Ltd	MDEDET (Now DARDLEA)	GNR 386, Listed Activity 1 (q) (i)
17/2/3 GS-58	2012/05/17	Construction of the Pollution Control Dam and associated water management facilities on Portions 1 & 9 of the Farm Mooiplaats 209 IT	Langcarel (Pty) Ltd	MDEDET (Now DARDLEA)	GNR 544, Listed Activity 12 and GNR 545, Listed Activity 5
17/2/4/G (GS) - 36	2013/04/29	Undertaking of mining infrastructure on portion 1 & 9 of the Farm Mooiplaats 290 IT	Langcarel (Pty) Ltd	MDEDET (Now DARDLEA)	GNR 544 Listed Activities 11 (x), 12, 11 (iii), 18; GNR 545, Listed Activity 5; GNR 546, Listed Activity 4 (ii) (cc).

Section 24P 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 EA, 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 NEMA Financial Provision Regulations (2015) pertaining to the financial provision for prospecting exploration, mining and production. The Mooiplaats Colliery Vunene Project has provided a suitable financial vehicle to the DMRE to cater for the financial provisioning (Refer to Appendix 11). The NEMA requirement for Financial Provisioning must be updated by June next year (2021) and the findings of the Groundwater study must be taken into consideration when the NEMA update is undertaken. Table 8 below indicates the Listed Activities in terms of the NEMA Regulations that have been applied for in terms of the proposed Mooiplaats Colliery Vunene project.

Table 8: Listed activities in terms of the NEMA Regulations

Name of activity	Aerial extent of the activity	Applicable listing notice
Water pipelines "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."	Variable	Activity 9 of GN983
Water Pipelines for Process Water or Wastewater for Mining The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes – (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 the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	Variable	Activity 10 of GN983
Infrastructure within proximity to a watercourse The development of—	The infrastructure footprint within 32m of a watercourse (Topo rivers and NFEPA wetlands were used as watercourse indicators) is approximately 1531.35m^2.	Activity 12 of GN983

Name of activity	Aerial extent of the activity	Applicable listing notice
(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; (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.		
Roads crossing watercourses or underground mining may result in excavation or infilling of more than 10 cubic metres of soils and rock from watercourse 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;	Approximately 1531.35m^2	Activity 19 of GN983

Name of activity	Aerial extent of the activity	Applicable listing notice
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 (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.		
Internal roads to vent shaft or escape shafts "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 kilometre or shorter."	The total length of the access routes to rescue bay boreholes and vent shafts is approximately 4865.16m	Activity 24 of GN983
All surface infrastructure (ventilation shafts or escape shafts) The clearance of an area of 1 hectare 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.	The total proposed surface infrastructure size including access roads is approximately 1.516491ha	Activity 27 of GN983

Name of activity	Aerial extent of the activity	Applicable listing notice
Mining (industrial) development on land previously used for agriculture 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; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	The total proposed surface infrastructure size including access roads is approximately 1.516491ha	Activity 28 of GN983
Possible existing infrastructure expansion (e.g. PCDs) and use of water for Dust Suppression (i.e.: amendments to existing Water Use Licence) The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.	Possible existing infrastructure expansion (e.g. PCDs) and use of water for Dust Suppression (i.e.: amendments to existing Water Use Licence)	Activity 34 of GN983
Possibility of utilization of existing pipelines 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	There is a possibility of utilization of existing pipelines and thus the extension of the existing pipelines to new areas may be necessary.	Activity 45 of GN983

Name of activity	Aerial extent of the activity	Applicable listing notice
(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 transportation of water or storm water within a road reserve or railway line reserve; or (bb) will occur within an urban area.		
Possibility of utilization of existing pipelines The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, wastewater, 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, wastewater, return water, industrial discharge or slimes within a road reserve or railway line reserve; or (bb) will occur within an urban area.	There is a possibility of utilization of existing pipelines and thus the extension of the existing pipelines to new areas may be necessary.	Activity 46 of GN983
Internal roads - Upgrades to existing roads "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;	It is unlikely that the roads will be widened by more than 6 metres, but the lengthening of the roads may be by more than 1 kilometre.	Activity 56 of GN983

Name of activity	Aerial extent of the activity	Applicable listing notice
excluding where widening or lengthening occur inside urban areas."		
Transfer of Process Water The expansion of facilities or -infrastructure for the transfer of water from and to or between any combination of the following- (i) water catchments; (ii) water treatment works; or (iii) impoundments; where the capacity will be increased by 50 000 cubic metres or more per day, but excluding water treatment works where water is treated for drinking purposes.	Possible but currently not confirmed	Activity 63 of GN983
General mining activities (roads, shafts, etc.) 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; 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."*	Variable	Activity 67 of GN983

Name of activity	Aerial extent of the activity	Applicable listing notice
Expanded mining areas triggers water uses under the National Water Act 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.	Expanded mining areas triggers water uses under the National Water Act	Activity 6 of GN984
Mine water management infrastructure The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following. (i) water catchments; (ii) water treatment works; or (iii) impoundments; excluding treatment works where water is to be treated for drinking purposes.	Water transfer from underground mining to PCD's.	Activity 11 of GN984
All infrastructure for underground mining extension "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	The total proposed infrastructure size including access roads on the two Vunene proposed mining areas is approximately 1.516491ha. As such, this listed activity is not anticipated to be triggered.	Activity 15 of GN984

Name of activity	Aerial extent of the activity	Applicable listing notice
(ii) maintenance purposes undertaken in accordance with a maintenance management plan."		
Vunene extension underground mining and minimal surface infrastructure (shafts and roads) "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.	245 ha UG mining in the Vunene extension area Note: UG mining in remainder of the MR area is already approved through previous applications. Surface infrastructure under this application (Shafts and Roads) – The total proposed infrastructure size including access roads is approximately 1.516491ha.	Activity 17 of GN984
Roads The development of a road wider than 4 meters with a reserve less than 13.5 meters.	Access roads to escape shafts.	Activity 4 of GN985
Shafts 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	The total proposed infrastructure size including access roads is approximately 1.516491ha.	Activity 12 of GN985
Infrastructure (shafts, roads) The development of—	The total proposed infrastructure size including access roads is approximately 1.516491ha.	Activity 14 of GN985

Name of activity	Aerial extent of the activity	Applicable listing notice
(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 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 has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.		
Internal / Access Roads The widening of a road by more than 4 meters; or the lengthening of a road by more than 1 kilometre.	Access roads to escape shafts.	Activity 18 of GN985

Table 9: Extent of activities and applicable listing notice.

Name of activity	Aerial extent of the activity	Listed Activity	Applicable listing notice	Waste management authorisation
Stormwater Infrastructure.	<10 000 m^2	X	GNR 983: Activity 9	N/A
Upgrading of road within the 100 m buffer of a watercourse.	3620 m (length) x 10 m (width). Total extent of 36200 m^2	X	GNR 983: Activity 19	N/A
Internal haul roads.	3620 m (length) x 10 m (width). Total extent of 36200 m^2	X	GNR 983: Activity 24	N/A
Change in land use.	Approximately 200 ha	X	GNR 983: Activity 28	N/A
Utilisation of existing pipelines for stormwater transportation.	Approximately 200 mm in diameter and no longer than 1 km	X	GNR 983: Activity 45	N/A
Upgrading of existing internal road for the transportation of RoM.	3620 m (length) x 10 m (width). Total extent of 36200 m^2	X	GNR 983: Activity 56	N/A
Clearance of vegetation.	<50 ha of vegetation to be removed	X	GNR 984: Activity 15	N/A
General mining activities.	Approximately 200 ha	X	GNR 984: Activity 17	N/A

4.1.3 THE NATIONAL WATER ACT

The National Water Act (NWA) (Act 36 of 1998) 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 NEMA 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 water use processes are described in Figure 16.

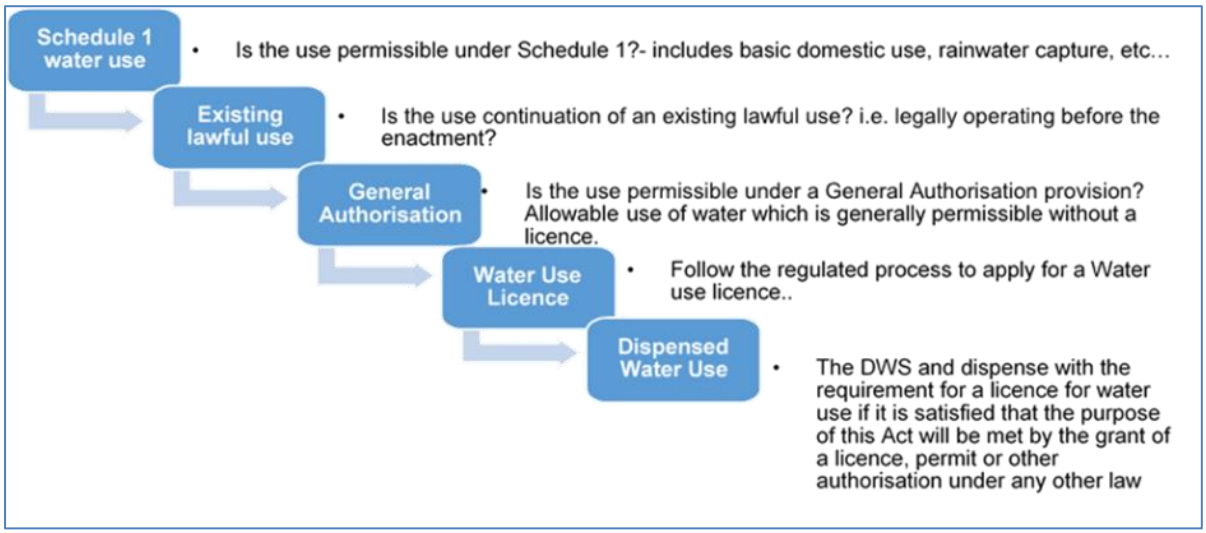


Figure 16: Authorisation processes for new water uses

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

- Section 21(a): Taking water from a water resource;
- Section 21(b): Storing water;
- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(d): Engaging in a stream flow reduction activity contemplated in section 36;
- Section 21(e): Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- Section 21(f): Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;

- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource;
- Section 21(h): Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse;
- Section 21(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
- Section 21(k): Using water for recreational purposes.

The Mooiplaats Colliery has an existing WUL (Licence No: 08/C11B/AGJ/2141) issued on 5 May 2013 for the following water uses.

- Section 21(a) Taking water from a water resource;
- Section 21(g) Disposing of waste or water containing waste in a manner that may detrimentally impact on a water resource;
- Section 21(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

The mine will apply for an amended of the existing WUL and associated new water uses. The water uses that could be triggered are presented in Table 10.

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

Activity #	Listed Activity Description	Reason for Inclusion
Section 21(a)	Taking water from a water resource	Industrial water is sourced from underground workings. Water may also abstracted for domestic use.
Section 21(b)	Storing water	Water storage facilities
Section 21(g)	Disposing of waste in a manner which may detrimentally impact on a water resource; and	PCD, dust suppression.
Section 21(j)	Removing, discharging or disposing of water found underground.	Dewatering 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	Dependent on the outcome of the wetland study and the proximity of the project to the regulated area of a watercourse/ wetland.

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 DHSWS 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 DHSWS 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 DHSWS 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

The country has been divided into nine Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level will be achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA will progressively develop a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. 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 WMA 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. The Mooiplaats Colliery and the Vunene Project area are located in the C11B (located in the Upper Vaal Catchment Management Area, located in the Vaal Management Area WMA) quaternary catchment area and is situated on a slope that drains directly into the Witpuntspruit and Vaal River.

4.1.4 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (NEMWA)

Although none of the listed activities detailed in National Environmental Management: Waste Act, 2008 (NEMWA) regulations are applicable to the Mooiplaats Colliery Vunene project, the requirements of this act must be taken into consideration. The National Environmental Management: Waste Amendment Act came into force on 2 June 2014. 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 holders 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."

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 defined 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 17 below.

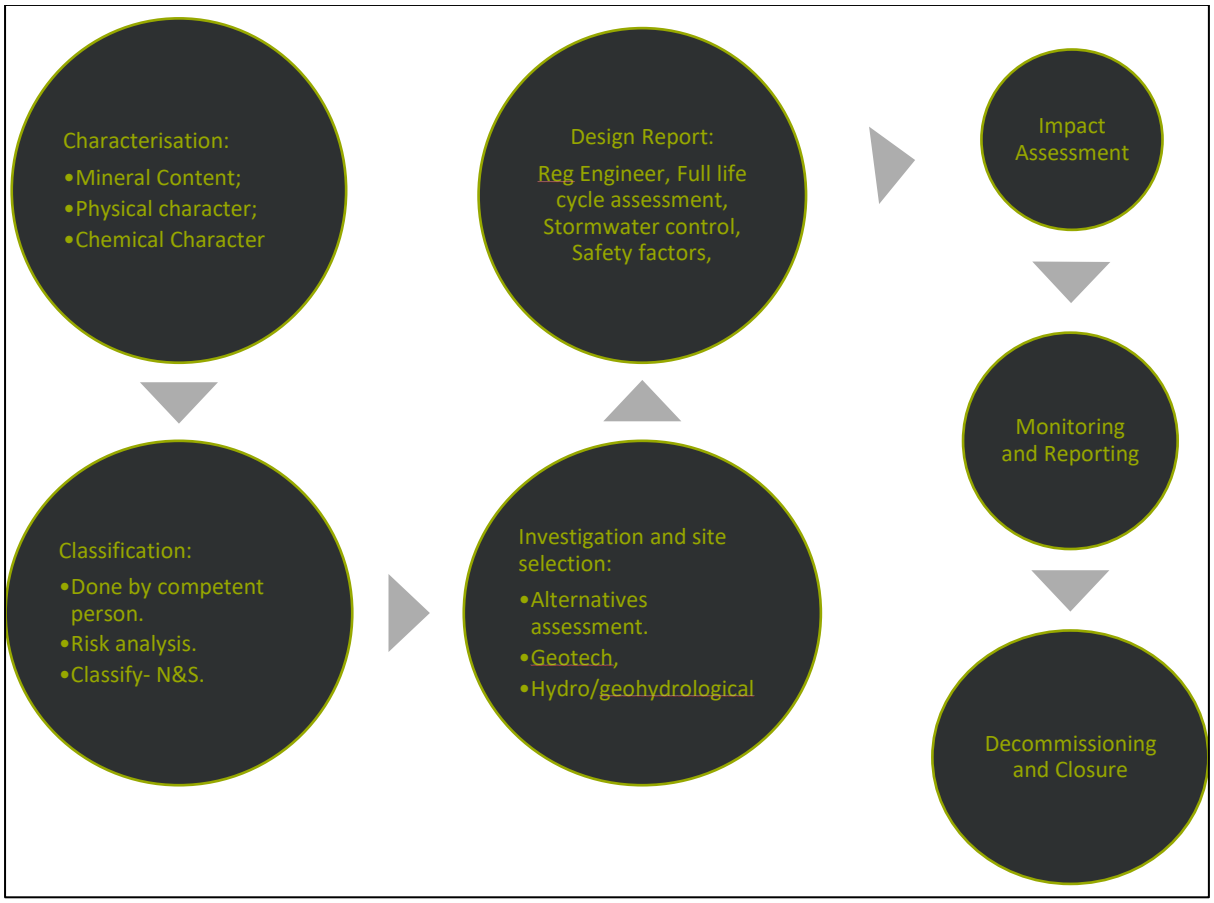


Figure 17: Overview of the planning and management of residue stockpiles and residue deposits regulations.

It is anticipated that existing stockpiling areas will be used for the proposed Mooiplaats Colliery Vunene project area and, therefore, there will be no requirement to identify new stockpile areas.

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. 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.

4.1.5 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT (NEMAQA)

The National Environmental Management: Air Quality Act (Act No. 39 of 2004 as amended – 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 well-being of people.

The NEMAQA 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 of November 2013 (Government Gazette No. 37054).

According to the NEMAQA, 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 (GHG) 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. All coal mines are required to account for the amount of

pollutants discharged into the atmosphere (total emissions for one or more specific GHG pollutants) by 31 March each year.

The findings from the Greenhouse Gas Report for the Mooiplaats Colliery are discussed in Section 7.16 below.

Moreover, a draft carbon tax bill was introduced for a further round of public consultation. The Carbon Tax Policy Paper (CTPP) (Department of National Treasury, 2013) stated consideration will be given to sectors where the potential for emissions reduction is limited. Certain production processes indicated in Annexure A of the notice (Government Gazette No. 40996 dated 21 July 2017) with GHG in excess of 0.1 Mt, measured as CO^2-eq, are required to submit a pollution prevention plan to the Minister for approval. The Mooiplaats Colliery Vunene Project operations fall under "coal mining" production processes specified in Annexure A (Department Environmental Affairs, 2017b).

4.1.6 NATIONAL DUST CONTROL REGULATIONS

Dust fall is assessed for nuisance impact and not for inhalation health impact. The National Dust Control Regulations (Department of Environmental Affairs, 2013) prescribes measures for the control of dust in residential and non-residential areas. Acceptable dust fall rates are measured (using American Standard Testing Methodology (ASTM) D1739:1970 or equivalent) at and beyond the boundary of the premises where dust originates. In addition to the dust fallout limits, the National Dust Control Regulations prescribe monitoring procedures and reporting requirements. Dust will be created from the proposed Mooiplaats Colliery Vunene Project area and will be managed in accordance with these Regulations.

4.1.7 THE NATIONAL HERITAGE RESOURCES ACT (NHRA)

The National Heritage Resources Act (Act 25 of 1999 – NHRA) stipulates that cultural heritage resources may not be disturbed without authorisation 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 utilised as the basis for the identification, evaluation and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through the NEMA, MPRDA and the Development Facilitation Act (FDA) 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 authorisations are granted for a development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impact Processes required by the 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 into account of in the EIA Regulations under the NEMA relates to the Specialist Report requirements (Appendix 6 of EIA Regulations 2014, as amended).

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 NHRA 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 Report is compiled.

4.1.8 THE NATIONAL FORESTS ACT (NFA)

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*."

As the Mooiplaats Colliery Vunene Extension project includes mainly underground mining, it is unlikely that protected species will be impacted on.

4.1.9 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT (NEMBA) – ALIEN AND INVASIVE SPECIES LIST

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 will be 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, and 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 law on Conservation of Agricultural Resources (Act 43 of 1983) aims to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants. In order to achieve the objectives of this Act, control measures related to the following may be prescribed to land users to whom they apply:

- The cultivation of virgin soil;
- The utilisation and protection of land which is cultivated;
- The irrigation of land;
- The prevention or control of waterlogging or salination of land;
- The utilisation and protection of vleis, marshes, water sponges, water courses and water sources;
- The regulating of the flow pattern of run-off water;
- The utilisation and protection of the vegetation;
- The grazing capacity of veld, expressed as an area of veld per large stock unit;
- The maximum number and the kind of animals which may be kept on veld; The prevention and control of veld fires;
- The utilisation and protection of veld which has burned;
- The control of weeds and invader plants;
- The restoration or reclamation of eroded land or land which is otherwise disturbed or denuded;
- The protection of water sources against pollution on account of farming practices;
- The construction, maintenance, alteration or removal of soil conservation works or other structures on land; and
- Any other matter which the Minister may deem necessary or expedient in order that the objects of this Act may be achieved.

Further, different control measures may be prescribed in respect of different classes of land users or different areas or in such other respects as the Minister may determine. Preliminary impacts on the soil, biodiversity and water resources have been identified with regards to the proposed Mooiplaats Colliery Vunene Project, and mitigation and management measures recommended.

4.1.12 THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (SPLUMA)

The Spatial Planning and Land Use Management (Act 16 of 2013 – SPLUMA) is set to aid effective and efficient planning and land use management, as well as to promote optimal exploitation of minerals and mineral resources. The SPLUMA was developed to legislate for a single, integrated planning system for the entire country. Therefore, the Act provides a framework for a planning system for the country and 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. Furthermore, the SPLUMA strengthens the position of mining right holders when land needs to be re-zoned for mining purposes.

4.1.13 NOISE CONTROL REGULATIONS, 1992 (GN R.154)

In terms of Section 25 of the ECA, the National Noise Control Regulations (GN R. 154 – NCRs) published 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 further promulgated Provincial Regulations (PN 24) in 1998.

The NCRs 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 NCRs 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 NCRs 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 area.

The South African National Standards, 10103:2008 and 10083:2013 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these Regulations. As the Mooiplaats Colliery Vunene Project includes underground mining and will make use of the existing infrastructure the current noise levels will most likely remain unchanged.

4.1.14 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'.
- SANS 10083:2013 – The measurement and assessment of occupational noise for hearing conservation purposes.

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.

4.1.15 ENVIRONMENT CONSERVATION ACT (ECA)

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 (GN R. 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.

4.2 PERIOD FOR WHICH AUTHORIZATION IS REQUIRED

The authorisation will be required for the duration of the Mining Right.

5 NEED AND DESIRABILITY OF THE PROPOSED PROJECT

This section will examine the need and desirability of the proposed Mooiplaats Colliery Vunene Project. This section will examine the role of coal as a resource and coal mines as a source of employment particularly with regards to the benefits of continuing and expanding on coal mining operations at the existing Mooiplaats Colliery, whilst taking environmental aspects into consideration.

5.1 COAL AS A RESOURCE

Coal, because of its strategic importance is one of the five minerals selected by the DMRE 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.

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 (2010-2030) identifies new coal fired power stations as a means to meet the future energy demands. These plans are in the process of being revisited however, in the absence of revised plans, the base case for energy from coal as it currently stands provides further impetus for planning for future coal production.

5.2 MOOIPLAATS COLLIERY EXTENSION PROJECT BENEFITS

The mine extension will extend the profitability and life of the mining operation until 2034 and secure the 287 jobs of the current employees for the foreseeable future. If the Mooiplaats Colliery operations were not to be extended, the additional economic activity, skills development and available jobs would not be created and/or maintained, and the coal reserves would remain unutilised. If Mooiplaats 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 mine project will allow the applicant to continue producing a secure, steady supply of coal until 2034.

5.3 NEED AND DESIRABILITY ANALYSIS

The needs and desirability analysis component of the "*Guideline on need and desirability in terms of the Environmental Impact 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 sites, opportunity costs, etc.). Table 11 below presents the needs and desirability analysis undertaken for the Mooiplaats Colliery Vunene project.

Table 11: Needs and desirability analysis for the Mooiplaats Colliery Vunene project

Ref No.	Question	Answer
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 for the proposed Mooiplaats Colliery Vunene project area: • Wetlands; • Hydrology; • Hydrogeology; and • Subsidence. The conclusions of these studies, and the identified impacts and associated mitigation measures are included in the EIA and EMPr.
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?	Refer to baseline ecological information in Section 7, and the impact assessment and mitigation measures in Section 9 of this EIA Report. Efforts will be made to avoid disturbance to sensitive biodiversity.
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 measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the alternatives considered for this project in Section 8, the baseline ecological information in Section 7, and the impact assessment and mitigation measures in Section 9 of this EIA Report.

Ref No.	Question	Answer
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 Sections 3.4.9 to 3.4.11.3 of this EIA Report. These sections discuss the proposed methods to handle and manage wastewater as well as the waste rock or discard stockpile dumping areas.
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 the alternatives considered for this project in Section 8, the baseline ecological information in Section 7, and the impact assessment and mitigation measures in Section 9 of this EIA Report.
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?	It is noted that due to the nature of this project (mining of coal), a non-renewable resource will be depleted. Coal mining does, however, contribute significantly to the country's economy and power generation needs, and therefore, at the current stage mining of coal is still needed within South Africa. Moreover, as mentioned above, the location of the Mooiplaats Colliery Vunene Project area adjacent to the existing Mooiplaats Colliery, allows for the utilisation of existing mining infrastructure thereby reducing the disturbance footprint of the project on the receiving environment. Impacts from the proposed project have been identified and mitigation measures aimed at avoiding, reducing and / or managing the negative impacts as well as enhancing the positive impacts have been recommended (Section 9).
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	Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report. As mentioned above, the IRP (2010-2030) has identified coal as an important resource for future energy demand. This being said, numerous

Ref No.	Question	Answer
	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?	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.
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 Mooiplaats Colliery Vunene project will rely on / depend on the extraction of a natural, non-renewable resource (coal) for selling to Eskom. This will contribute to the current coal resource dependency that the current energy policy is based on.
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. Refer to Section 8 for the alternatives considered in this EIA Report.
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The Mooiplaats Colliery is an existing mine and the proposed project will be an extension of the existing mine utilising mostly existing infrastructure.
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 Section 13 of this EIA Report.
1.8.2	What is the level of risk associated with the limits of current knowledge?	The level of risk is low as previous specialist studies have been conducted in the areas surrounding the proposed project location, and therefore some information is already available.
1.8.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-	Sufficient information was gathered prior to the onset of this process to indicate that the potential mining of

Ref No.	Question	Answer
	averse and cautious approach applied to the development?	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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report.
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?	Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report.
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 baseline ecological information in Section 7, and the impact assessment and mitigation measures in Section 9 of 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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report.
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 8 for details of the alternatives considered, as well as this section of the EIA Report for the advantages and disadvantages of the proposed activity.

Ref No.	Question	Answer
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 the identified impacts, their assessment and recommended mitigation measures in Section 9 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:	
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 unemployment rate within the Gert Sibande District Municipality is 26.8%. The proposed Mooiplaats Colliery Vunene Project will extend the Life of Mine of the Mooiplaats Colliery coal mine by 10 years, therefore, allowing the mine to continue supplying jobs at that mine for a longer time period. 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. According to the District Municipality Spatial Development Framework (SDF), the existing mining activities are located in the region which should be enhanced, to contribute to job creation for poor, unskilled workers.
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 Report.
2.1.4	Municipal Economic Development Strategy ("LED Strategy").	The proposed project will promote and support the sustainability of existing business, as well as assist in increasing local beneficiation and shared economic growth, through extending the LOM by 10 years. Furthermore, the mine's Social Labour Plan (SLP)will add to the development in the municipality.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate	Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report.

Ref No.	Question	Answer
	elements/aspects), and specifically also on the socio-economic objectives of the area?	
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 of Mooiplaats Colliery coal 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.
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 public participation process undertaken in Section 6 of this EIA Report. Public participation and consultation will continue during all phases of the EIA. Furthermore, refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this 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 identified impacts, their assessment and recommended mitigation measures Section 9 of this 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 8 for details of alternatives considered in this Report.
2.5.2	Reduce the need for transport of people and goods.	Refer to Section 8 for details of alternatives considered in this Report.
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 public transport),	Refer to Section 8 for details of alternatives considered in this Report.
2.5.4	Compliment other uses in the area,	Refer to item 1.3 of this table (above). The proposed Mooiplaats Colliery Vunene Project entails the mining of additional underground areas in the vicinity of the existing Mooiplaats Colliery. Therefore, both

Ref No.	Question	Answer
		underground mining and agricultural activities will be able to continue as land uses in the area.
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 under utilised land available with the urban edge.	Not applicable. The proposed Mooiplaats Colliery Vunene Project area is outside an urban area.
2.5.7	Optimise the use of existing resources and infrastructure.	Refer to Section 3 of this 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 the settlement that reflects the spatial reconstruction priorities of the settlement).	
2.5.9	Discourage "urban sprawl" and contribute to compaction / densification.	The proposed Mooiplaats Colliery Vunene Project will result in the continued employment of 287 the current employees. In the case new jobs are created, employment from the surrounding communities will be recommended where possible, such that there will be no significant influx of additional workers to the area as a direct result of the proposed project.
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 to 2.5.9 of this table (above).
2.5.11	Encourage environmentally sustainable land development practices and processes.	The proposed land use for the Mooiplaats Colliery Vunene Project will be developed with effort made towards being environmentally sustainable in the long term. One of the key aspects to ensuring long terms land sustainability will be to ensure successful rehabilitation and post mining land-use capability.
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 Mooiplaats Colliery Vunene Project is associated with a portion of a strategic mineral resource (coal reserve).

Ref No.	Question	Answer
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 to the local communities through continued employment of workers and local contractors, as well as other influences and 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.	Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 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 area, as well as programmes implemented from the mine's SLP.
2.6	How was a risk-averse and cautious approach applied in terms of socio-economic impacts	
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	In terms of the socio-economic impacts, the current knowledge gaps include: • It was assumed that the motivation for, and the ensuing planning and feasibility studies of the Mooiplaats Colliery Extension Project were done with integrity, and that the information provided to date by the independent EAP was accurate. The gaps, uncertainties and assumptions are presented in Section 13.
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 impacts on socio-economic conditions should the recommended mitigation and management measures be implemented and adhered to.
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 applied.
2.7	How will the socio-economic impacts resulting from this development, impact on people's environmental right in terms following:	

Ref No.	Question	Answer
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 identified impacts, their assessment and recommended mitigation measures Section 9 of this Report.
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	Refer to the identified impacts, their assessment and recommended mitigation measures Section 9 of this 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 identified impacts, their assessment and recommended mitigation measures Section 9 of this 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 identified impacts, their assessment and recommended mitigation measures Section 9 of this Report.
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 identified impacts, their assessment and recommended mitigation measures Section 9 of this Report. Moreover, Mooiplaats Colliery has, in line with the regulatory requirements, provided financial provision to ensure that the mitigation measures proposed can be carried out (Refer to Appendix 11).
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	By conducting a Scoping and EIA process, the applicant ensures that equitable access to the environment has been considered. Refer to the identified impacts, their assessment and

Ref No.	Question	Answer
	special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	recommended mitigation measures in Section 9 of this 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 identified impacts, their assessment and recommended mitigation measures Section 9 of this Report.
2.13	What measures were taken to:	
2.13.1	Ensure the participation of all interested and affected parties.	Refer to the public participation process undertaken to date in Section 6 of this Report. Public participation and consultation will continue until the EIA process is finalised.
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 the public participation process undertaken to date in Section 6 of this Report. Public participation and consultation will continue until the EIA process is finalised. Advertisements as well as site notices were distributed in and around the project area in English and Afrikaans to assist in understanding the project. Both the Scoping Report and the EIA and EMPr were made available to the public for review and comments.
2.13.3	Ensure participation by vulnerable and disadvantaged persons,	
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,	
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	

Ref No.	Question	Answer
	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 the public participation process undertaken to date in Section 6 of this Report. Public participation and consultation will continue until the EIA process is finalised. Furthermore, refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this Report. Moreover, the current SLP is due for an update, as part of a separate undertaking.
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 at the mine are educated on a regular basis through toolbox talks on the environmental risks that may occur within their work environment, and adequate measures have been taken to ensure that the appropriate personal protective equipment is issued to workers based on the areas that they work in as well as 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.	The existing 287 jobs will be maintained for a longer period of time in view of the extended Life of Mine. There will be no additional jobs created as the LOM extension will not necessitate more workers to achieve the extended lifespan of the mine. During the construction phase of new infrastructure (refuge bays, ventilation shafts, access roads, etc) additional temporary jobs will be created.
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).	
2.16.3	The distance from where labourers will have to travel.	
2.16.4	The location of jobs opportunities versus the location of impacts.	
2.16.5	The opportunity costs in terms of job creation.	
2.17	What measures were taken to ensure:	

Ref No.	Question	Answer
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 and key stakeholders have been notified about the project by the EAP and registered as Interested and Affected Parties and will continue to be notified and engaged with regarding the project throughout the EIA process.
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 the public participation process undertaken to date in Section 6 of this EIA Report. Public participation and consultation will continue until the EIA process is finalized. Furthermore, refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this Report.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this 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?	Moreover, Mooiplaats Colliery has, in line with the regulatory requirements, provided financial provision to ensure that the mitigation measures proposed can be carried out (Refer to Appendix 11).
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 8 for details of alternatives considered in this Report.

Ref No.	Question	Answer
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 the identified impacts, their assessment and recommended mitigation measures in Section 9 of this 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 opinions are taken into account, and a record included in the reports submitted to relevant authorities. The process aims to ensure that all stakeholders are provided an 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 in order to ensure and promote:

- Compliance with international best practise options;
- Compliance with national legislation;
- Establish and manage relationships with key stakeholder groups; and
- Encourage involvement and participation in the environmental study and authorisation / approval process.

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

- Provide an opportunity for I&APs to obtain clear, accurate and comprehensible information about the proposed activity, its alternatives or the decision and the environmental impacts thereof;
- Provide I&APs with an opportunity to indicate their view-points, issues and concerns regarding the activity, alternatives and / or the decision;
- Provide I&APs with the opportunity to suggest ways of avoiding, reducing or mitigating negative impacts of an activity and enhancing positive impacts;
- Enable the applicant to incorporate the needs, preferences and values of I&APs into the activity;
- Provide opportunities to avoid and resolve disputes and reconcile conflicting interests;
- Enhance transparency and accountability in decision-making;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and / or prevent environmental impacts associated with the project.

6.1 LEGAL COMPLIANCE

The PPP must comply with several important sets of legislation that require public participation as part of an application for authorisation or approval, namely:

- The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002 – MPRDA);
- The National Environmental Management Act (Act No. 107 of 1998 – NEMA);
- The National Environmental Management Waste Act (Act No. 59 of 2008 – NEMWA); and

- The National Water Act (Act No. 36 o1998 – NWA).

Adherence to the requirements of the above-mentioned Acts will allow for an Integrated PPP to be conducted, and in so doing, satisfy the requirement for public participation referenced in the Acts. The details of the Integrated PPP followed are provided below.

6.2 GENERAL APPROACH TO PUBLIC PARTICIPATION

The PPP for the proposed Mooiplaats Colliery Vunene project has been undertaken in accordance with the requirements of the MPRDA, NWA and NEMA, as well as 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. The PPP for the proposed Mooiplaats Colliery Vunene project is being undertaken in accordance with Chapter 6 of the NEMA EIA Regulations (2014, as amended).

6.3 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

The I&AP databases compiled for various past environmental authorisation processes in the vicinity of the proposed Mooiplaats Colliery Vunene project have been utilised towards compiling a pre-notification register of key I&APs to be notified of the Environmental Authorisation Application. The I&AP database includes amongst others: landowners, communities, regulatory authorities and other specialist interest groups. Additional I&APs have been registered during the initial notification and call to register period. The I&APs database will continue to be updated throughout the duration of the EIA process. A full list of I&APs is attached in Appendix 2.

6.3.1 LIST OF AUTHORITIES IDENTIFIED AND NOTIFIED

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

- Mpumalanga Department of Agriculture, Rural Development, and Land Administration
- Mpumalanga Department of Economic Development and Tourism
- Mpumalanga Department of Health
- Mpumalanga Department of Human Settlement
- 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 Environmental Fisheries and Forestry
- National Department of Mineral Resources
- National Department of Agriculture, Land Reform and Rural Development
- National Department of Water and Sanitation

- Cooperative Governance and Traditional Affairs (COGTA)
- Gert Sibande District Municipality
- Msukaligwa Local Municipality
- South African National Roads Agency Limited (SANRAL)
- Eskom Holdings SOC Limited
- Transnet SOC Limited
- South African National Parks (SanParks)
- South African Heritage Resources Agency (SAHRA)

6.3.2 OTHER KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

The following key stakeholders have been identified and notified of the proposed project:

- Mpumalanga Landbou / Agriculture
- Delmas Agricultural Council
- Birdlife South Africa
- Wildlife & Environmental Society of South Africa (WESSA)
- AFGRI
- Agri Mpumalanga
- South African National Biodiversity Institute (SANBI)
- Mpumalanga Wetland Forum
- Endangered Wildlife Trust
- Adjacent landowners

6.4 INITIAL NOTIFICATION OF I&APS

The PPP commenced on the 16th of May 2019 with an initial notification and call to register for a period of 30 days, ending on the 18th of June 2019. Initial call to register notifications were conducted as presented below.

6.4.1 REGISTERED LETTERS, FAXES AND EMAILS

Registered letters, emails and facsimiles (faxes) were prepared and distributed to the identified relevant authorities, affected and adjacent landowners and legal occupiers, ward councillors and other pre-identified key stakeholders. The notification documents included the following information:

- The purpose of the proposed project;
- Details of the MPRDA, NEMA and NWA Regulations that are anticipated to be applicable and must be adhered to;
- List of anticipated activities to be authorised;
- Location and extent of activities to be authorised;
- Details of the affected properties (including a locality map or an indication of where the locality map may be viewed or obtained);
- Brief but sufficient detail of the intended operation to enable I&APs to assess / surmise what impact the project will have on them or on the use of their land (if any);
- Initial call to register duration; and
- Contact details of the EAP.

In addition, a registration form was included in the registered letters, emails and facsimiles distributed to I&APs and it included a request for the following information from I&APs:

- Provide information on current land uses and their location within the area under consideration;
- Provide information on the location of environmental features on site,
- State how and to what standard or extent they perceive these identified features are likely to be impacted upon by the proposed project;
- Provide information on how they consider that the proposed Mooiplaats Colliery Vunene project will impact on them or their socio-economic conditions;
- Make proposals as to how the potential impacts on identified environmental features, their infrastructure, and socio-economic concerns may be managed, avoided or mitigated;
- Details of the landowner and information on lawful occupiers;
- Details of any communities existing within the area;
- Details of any Tribal Authorities within the area;
- Details of any other I&APs that need to be notified;
- Details on any land developments proposed; and

- Any specific comments or concerns regarding the proposed Mooiplaat Colliery Vunene project application for environmental authorisation.

Proof of the registered letters, emails and facsimiles that were distributed during the initial notification and call to register period are attached in Appendix 2.

6.4.2 SITE NOTICES AND POSTERS

8 Site notices were placed along the perimeter of the proposed project area and its surroundings on 16th of May 2019. Furthermore, A3 posters (English and Afrikaans) were placed at public areas / venues in the vicinity of the proposed project area. The on-site notices and posters included the following information:

- Project name;
- Applicant name;
- Project location;
- Description of the environmental authorisation application process;
- Legislative requirements; and
- Relevant EAP contact person details for the project.

Please refer Appendix 2 for proof of site notice and poster placement.

6.4.3 ONE-ON-ONE CONSULTATION

Further to the site notices and A3 poster placement, one-on-one consultations with the community were conducted where possible, whereby the EAP endeavoured to consult with as many I&APs (affected and surrounding landowners, farm workers and land occupiers within and adjacent to the proposed project area, as well as the community at large) during the site notice and poster placement site visit. Encountered I&APs were presented with an A4 size notification as well as a verbal explanation of the project and the EIA and public participation processes. Furthermore, the community members were given an opportunity to provide comment and / or express their concerns regarding the proposed project, as well as to sign the initial notification register towards being included in the I&AP database for future consultation. All comments received to date were recorded and are included in the Issues and Responses Report (Appendix 2).

6.4.4 NEWSPAPER ADVERTISEMENT

Two advertisements (English and Afrikaans) were placed on the 16th of May 2019 in the Highvelder Newspaper which was indicated to have the widest reach within the project area and its vicinity towards notifying the public regarding the proposed Mooiplaats Colliery Vunene project extension. The details of the advertisements are presented in Table 12 below.

Table 12: Details of initial notification and call to registered advertisements

Newspaper	Language(s)	Date/ Issue
The Highvelder	English and Afrikaans	16 May 2019

The newspaper advertisements and the provincial e-gazette included the following information:

- Project name;
- Applicant name;
- Project location;
- Description of the environmental authorisation application process;
- Legislative requirements; and
- Relevant EAP contact person details for the project.

As stated above, I&APs were provided a period from 16th May 2019 to 18th June 2019, to register for the proposed project. It is important to note however, that I&AP registration is on-going and will continue through the EIA process.

6.5 NOTIFICATION OF AVAILABILITY OF SCOPING AND EIA REPORT

Notification regarding the availability of the Scoping and EIA Reports for public review has been given in the following manner:

- Registered letters with details on where the Scoping and EIA Reports are available from, as well as the duration of the public review comment period, were distributed to all registered I&APs (which includes key stakeholders, affected and surrounding landowners, and registered occupiers);
- Facsimile notifications with information similar to that in the registered letter described above, were distributed to all registered I&APs; and
- Email notifications with a letter attachment containing the information described above were also distributed to all registered I&APs.

The Scoping Report was made available for public review at the Ermelo Public Library as well as electronically on the EIMS website from the 7th of September 2019 to 9th of October 2019, for a period of 30 days. The EIA report was made available for a 30-day review period from the 07th of August 2020 to 08th of September 2020.

6.6 ISSUES AND REPONSES

Issues raised were addressed in a transparent manner and the full details (such as the comment received, the name of the I&AP who commented, the issue raised and the main aspect of the raised issue, as well as the response provided to the I&AP) are included in the Public Participation Report (Appendix 2).

7 ENVIRONMENTAL ATTRIBUTES AND BASELINE

This section of the EIA Report provides a description of the environment that may be affected by the proposed Mooiplaats Colliery Vunene project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed extension have been described. Baseline information sourced from the various scoping phase specialist studies has been utilised to prepare the environmental attributes baseline below.

7.1 TOPOGRAPHY

The topography of the greater study area is strongly undulating with surrounding hills and plains. Topographically high areas are usually shaped by more resistant post-Karoo dolerite intrusions while valleys are underlain by Karoo sediments cut by local drainage patterns as evident at the study area. The regional landscape gradually flattens out towards the lower laying drainage system to the eastern perimeter, also forming the groundwater and surface water divide of this catchment area. According to the Geohydrological Baseline study undertaken by Gradient Consulting (2019), the highest topographical elevation on-site is 1724.0 mamsl to the northern boundary of the mine lease area while other topographical high areas also exist to the northwest and south-eastern perimeters (1714.0 mamsl). The lowest topographical elevation within the study area is at 1587.0 mamsl forming part of the lower laying drainage system towards the southwestern part of the mine lease area. The baseline study also indicates that on-site gradients are relatively gentle to moderate with the average slope calculated at 3.0% and –3.10% respectively. The Vaal River drainage system enters the project area at an approximate elevation of 1626.0 mamsl and exists at 1598.0 mamsl, an elevation loss of 28.0 m over a lateral distance of ~6.50 km. respectively with an elevation loss of 129.0 m over a lateral distance of 2.70 km.

7.2 GEOLOGY

The Mooiplaats Colliery is situated in the Ermelo Coalfield.

The baseline Geohydrological report (Gradient Consulting, 2019) has provided background to the geology of the study area. The greater study area falls within the Ecca Group of the Karoo Supergroup, which consists of a sequence of units, mostly of nonmarine origin, deposited between the Late Carboniferous and Early Jurassic (Schlüter and Thomas, 2008). The Permian Ecca Group follows conformably after the Dwyka Group in certain sections, however in some localities overlies unconformably over older basement rocks. The Ecca Group underlies the Beaufort Group in all known outcrops and exposures and comprises a total of 16 formations consisting largely of shales and sandstones. The latter can be grouped in three geographical areas i.e. southern, western/north-western as well as north-eastern areas.

In the Baseline study, Gradient Consulting (2019) details that according to the geological map (2630, Mbabane), the study area falls within the Vryheid Formation (Pv) which is covered in various areas throughout the mine lease area by dolerite of the Karoo Dolerite Suite (Jd). The Vryheid Formation consists mainly of fine-grained mudstone, carbonaceous shale with alternating layers of bituminous coal seams, and coarse-grained, bioturbated immature sandstones respectively (arenaceous and argillaceous strata). The uneven pre-Karoo topography along the northern and north-western margins of the basin, where the formation rests directly on pre-Karoo rocks or the Dwyka Group, which gives rise to marked variations in thickness. The different lithofacies of the Vryheid Formation

are mainly arranged in upward coarsening cycles which are deltaic in origin (Johnson et al, 2009). The Karoo Basin is characterised by a vast network of intrusive dolerite sills and dykes that rapidly intruded at 183.0 to 182.3Ma (Svensen et al., 2012). The intrusive Karoo dolerite suite represents a shallow feeder system which occurs as an interconnected network of dykes, sills as well as sheets which typically form resistant caps of hills compromising softer sedimentary strata (Chevallier and Woodford, 1999). Isolated patches within the study area are covered by aeolian sand (Qw) of the period.

Furthermore, the baseline report details that on a regional scale, various southwest-northeast striking geological lineaments occur throughout the larger study area. A geological lineament and inferred dyke structure transect the northern footprint of the proposed underground workings striking in a general southwest-northeast direction. The latter may play a major role in aquifer compartmentalisation as they can act as semi- to impermeable barriers to the movement of groundwater. The number of spring localities observed during the hydrocensus user survey may confirm this assumption (this will be confirmed during the impact assessment stage). Dolerite dykes are vertical to sub-vertical discontinuities which represent linear zones of relatively higher permeability which may act as conduits for groundwater flow within the aquifer. According to the geological map no major faults in the direct vicinity of the project area are evident.

The coal seams are named sequentially from the surface to the pre-Karoo basement in alphabetical order, A-F. Depending on the locality within the Ermelo Basin, the coal seams can vary from a simple single coal ply through to complex multiple coal with inorganic partings.

7.3 CLIMATE

The Mooiplaats Colliery is situated within the Highveld climatic zone of South Africa. The Mpumalanga province experiences a sub-tropical climate with hot summers and mild to cool winters. The average midday temperatures for Ermelo range from 24 to 27°C in January and 15 to 17°C in June. The region is the coldest during June when temperature drops to 0.2°C on average at night. Ermelo normally receives about 749mm of rainfall per annum according to South African Weather service., with most rainfall during summer. It receives the lowest rainfall (below 5mm) in June, July, August and the highest 158mm in December and 126mm in January. The average sunshine duration is 60% in summer and 80% in winter and winds tend to be very light. (GCS, 2010).

7.3.1 TEMPERATURE AND RAINFALL

The study area receives approximately 625mm of rain per year with most of the rainfall during summer periods. The minimum temperatures in the winter months can be very low, especially over June and July, however the average maximum temperatures remain mild (GCS, 2010). The rainfall for 2018 - 2019 is presented in Table 13 and Figure 18 below.

Table 13: Ermelo rainfall data (South African Weather Services)

Daily Rainfall Data - Ermelo (mm)												
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	16.8											
2	5.8											
3	0.2	1.2	2.6									
4		2.2										
5	9.4											
6												
7												
8	4.0		4.4									
9												
10	22.0											
11		3.6										
12		0.8										
13												

Daily Rainfall Data - Ermelo (mm)												
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
14												
15	3.6	1.8										
16		4.8										
17	6.8	0.2										
18												
19												
20	0.4											
21		1.6										
22		20.0										
23		7.2										
24	0.4											
25	5.6	3.4	0.4									
26	42.2											

Daily Rainfall Data - Ermelo (mm)												
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
27	22.6											
28	13.6											
29	0.2											
30												
31	1.4											
2019 Monthly Totals	**155**	**47**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018 Monthly Totals	**10**	**61**	**136**	**30**	**24**	**0**	**1**	**25**	**33**	**91**	**57**	**72**
2017 Monthly Totals	**107**	**214**	**10**	**110**	**48**	**0**	**0**	**4**	**5**	**90**	**177**	**187**
2016 Monthly Totals	**175**	**73**	**168**	**2**	**6**	**4**	**1**	**1**	**6**	**32**	**217**	**98**
2015 Monthly Totals	**78**	**30**	**77**	**59**	**14**	**3**	**9**	**9**	**26**	**56**	**27**	**172**
2014 Monthly Totals	**48**	**75**	**212**	**36**	**0**	**4**	**0**	**6**	**3**	**50**	**166**	**179**
2013 Monthly Totals	**192**	**82**	**106**	**108**	**42**	**11**	**12**	**17**	**32**	**81**	**156**	**229**
Ermelo 100 Y Average	126	85	80	44	14	2	3	4	33	97	103	158

Daily Rainfall Data - Ermelo (mm)												
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ermelo last 6-year Ave	**102**	**89**	**118**	**57**	**22**	**4**	**4**	**10**	**17**	**67**	**133**	**156**

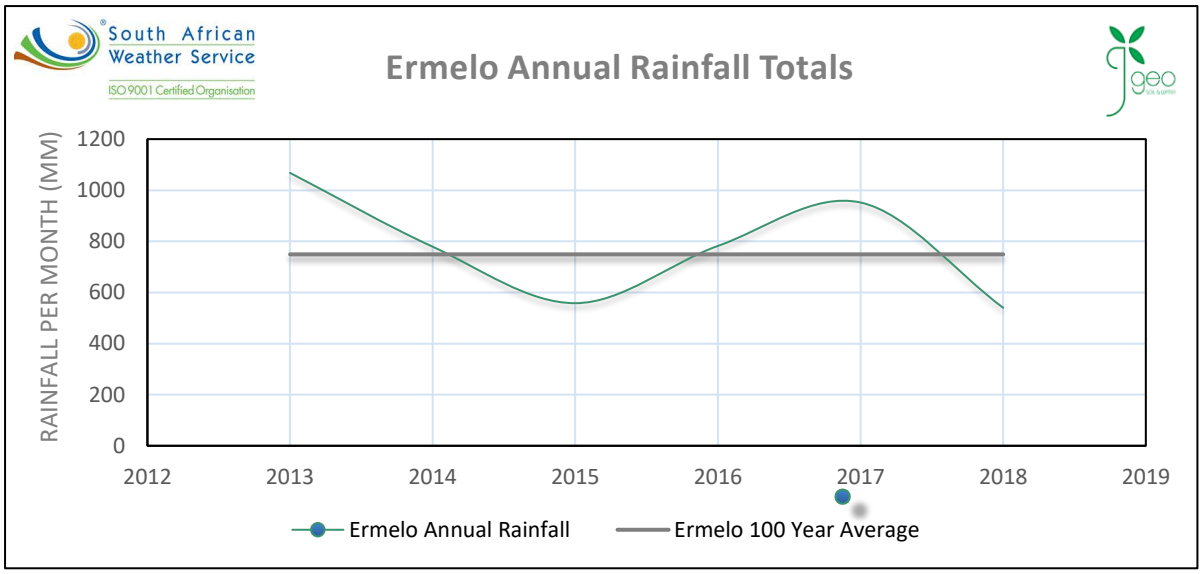
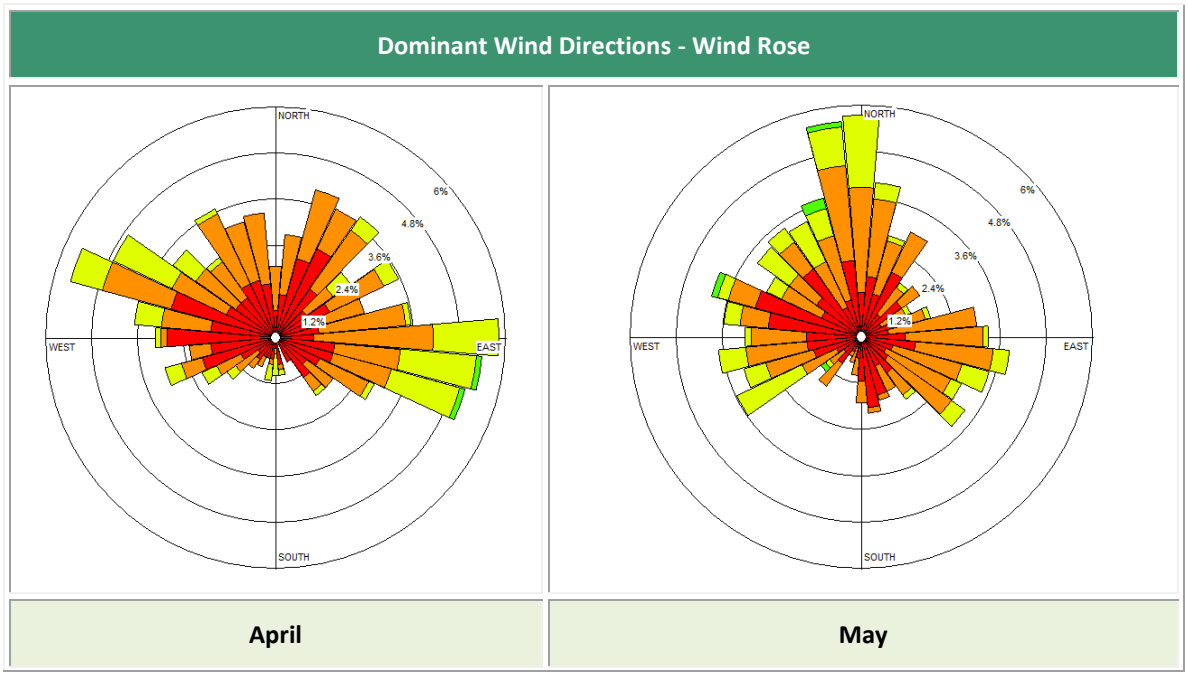


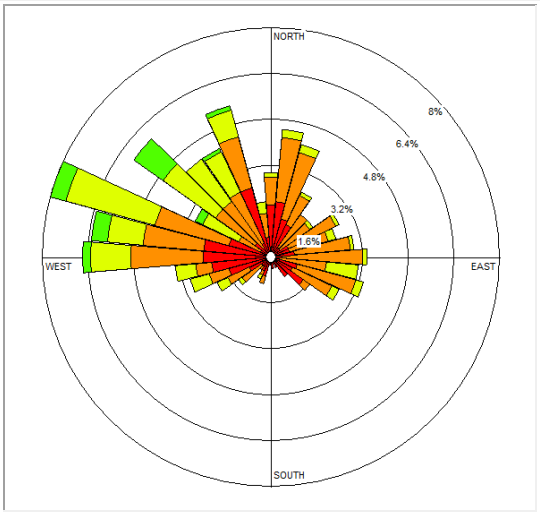
Figure 18: Ermelo Annual Rainfall Totals

7.3.2 WIND AND EVAPORATION

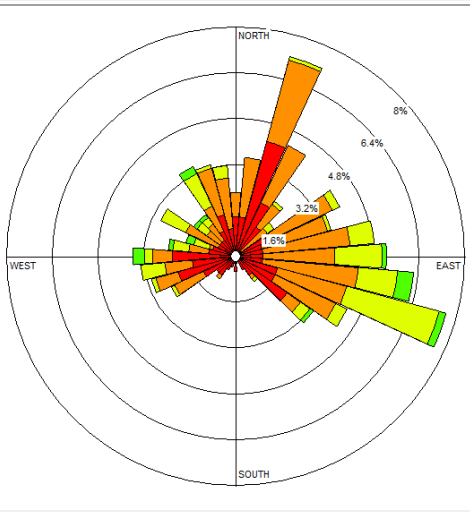
Prevailing spring daytime wind direction in the proximity of the site are north and east (refer to Table 14). Prevailing summer daytime wind direction in the proximity of the site is east and north-east, with a few milder winds coming from the north. The autumn months are very windy, with wind coming from all directions. Prevailing winter daytime wind direction in the proximity of the site is mainly from the west; west-northwest; northwest; north-northwest and north. The Mean Annual Evaporation (MAE) at this station is 1 518mm, while interpolation of evaporation data from WR90 indicates a value between 1 550mm and 1 600mm per annum. Evaporation is much less variable, both in terms of seasonal and annual, than the rainfall. Annual totals vary between 1 350 and 1 800mm (GCS, 2010).

Table 14: Wind rose for Ermelo which indicate dominant wind directions

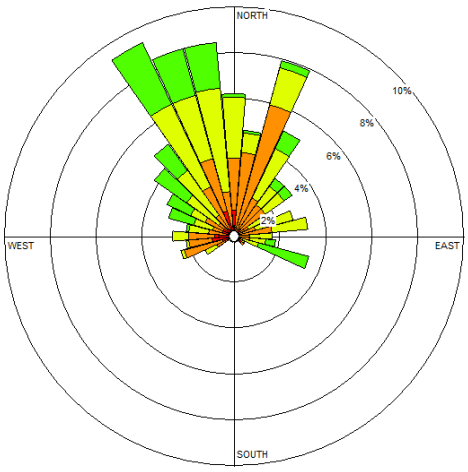




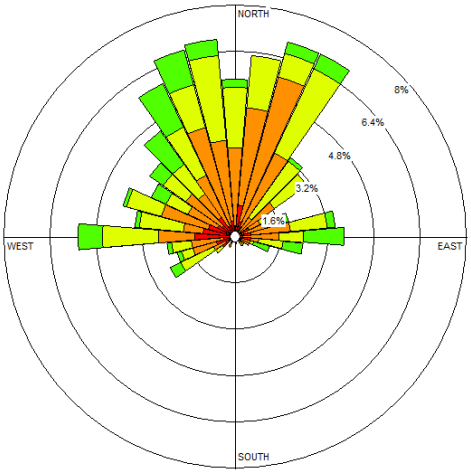
June



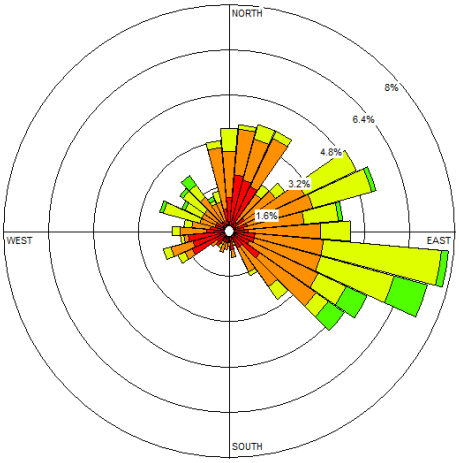
July



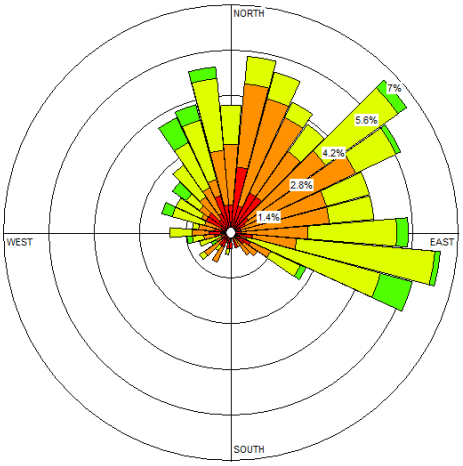
August



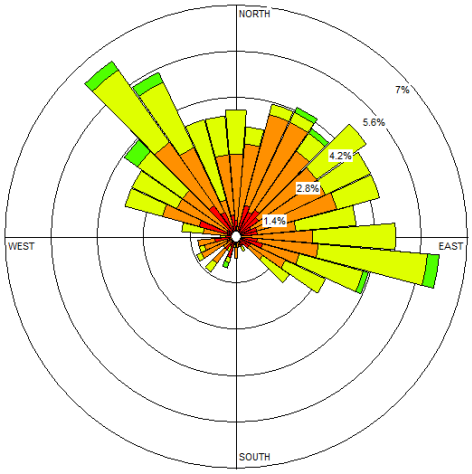
September



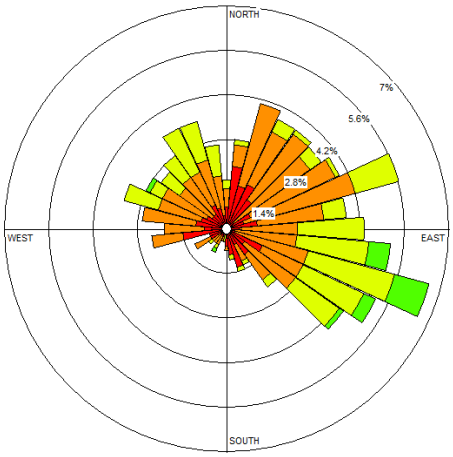
October



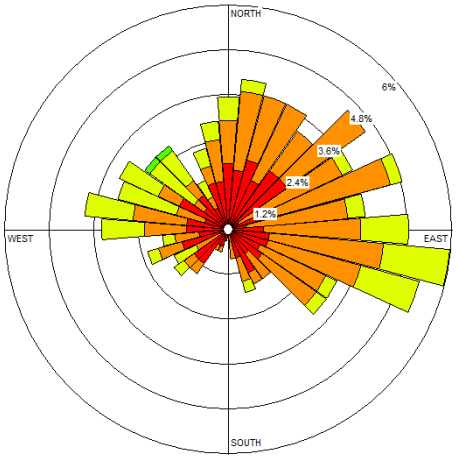
November



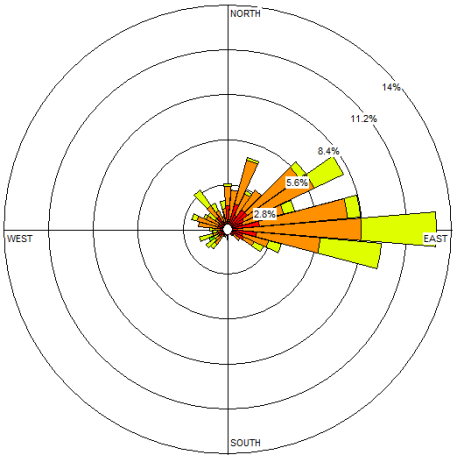
December



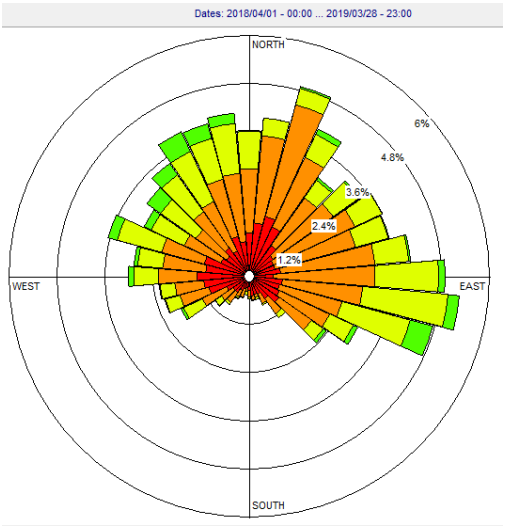
January



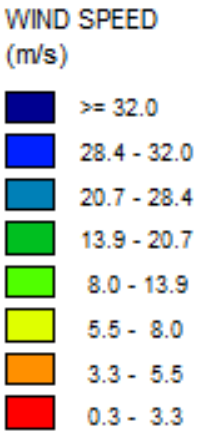
February



March



April 2018 to March 2019



Legend

7.3.3 EXTREME WEATHER

In terms of extreme weather conditions Ermelo hardly ever experiences snow, and the incidences of hail are also limited. However, the trend of hail follows the trend of thunderstorms, which occur in the summer months between October and March. There is a very high incidence of fog in the area, especially during autumn and winter, and sometimes experienced during the summer months (GCS, 2010).

7.4 LAND CAPABILITY

The soils on site consist predominantly of soils of the Highveld catena, dominated by Avelon, Hutton and Bainsvlei. Figure 19 below indicates the soil types found within the project area, which provides the land capability.

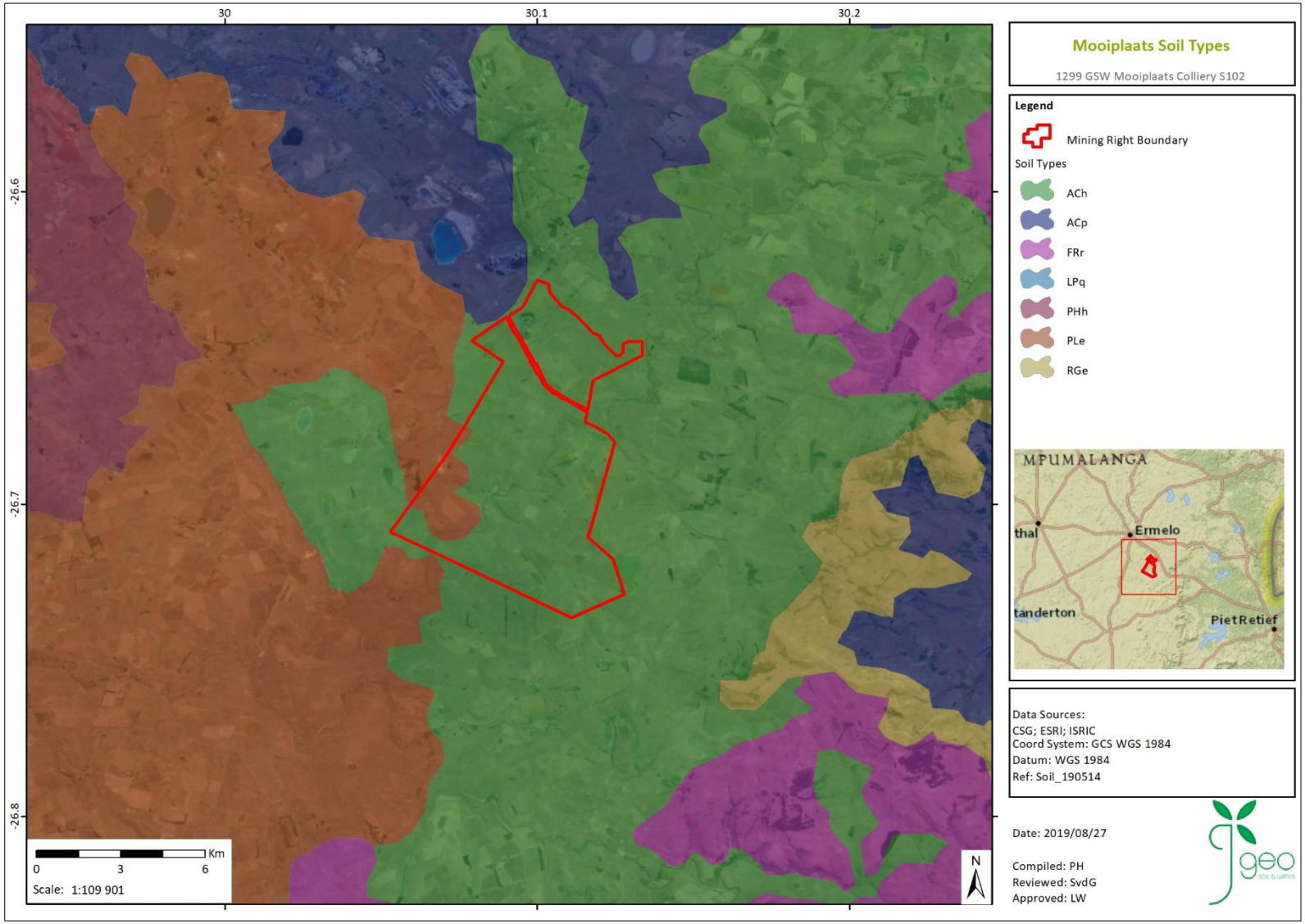


Figure 19: Soil types for the Mooiplaats Colliery

7.5 LAND USES

The predominant land uses in the immediate surroundings are agricultural (grazing, pasture and fodder production). A small portion of the land use is the existing Mooiplaats Colliery. Refer to Figure 20 below for the land cover which provide the land uses within the mining right boundary.

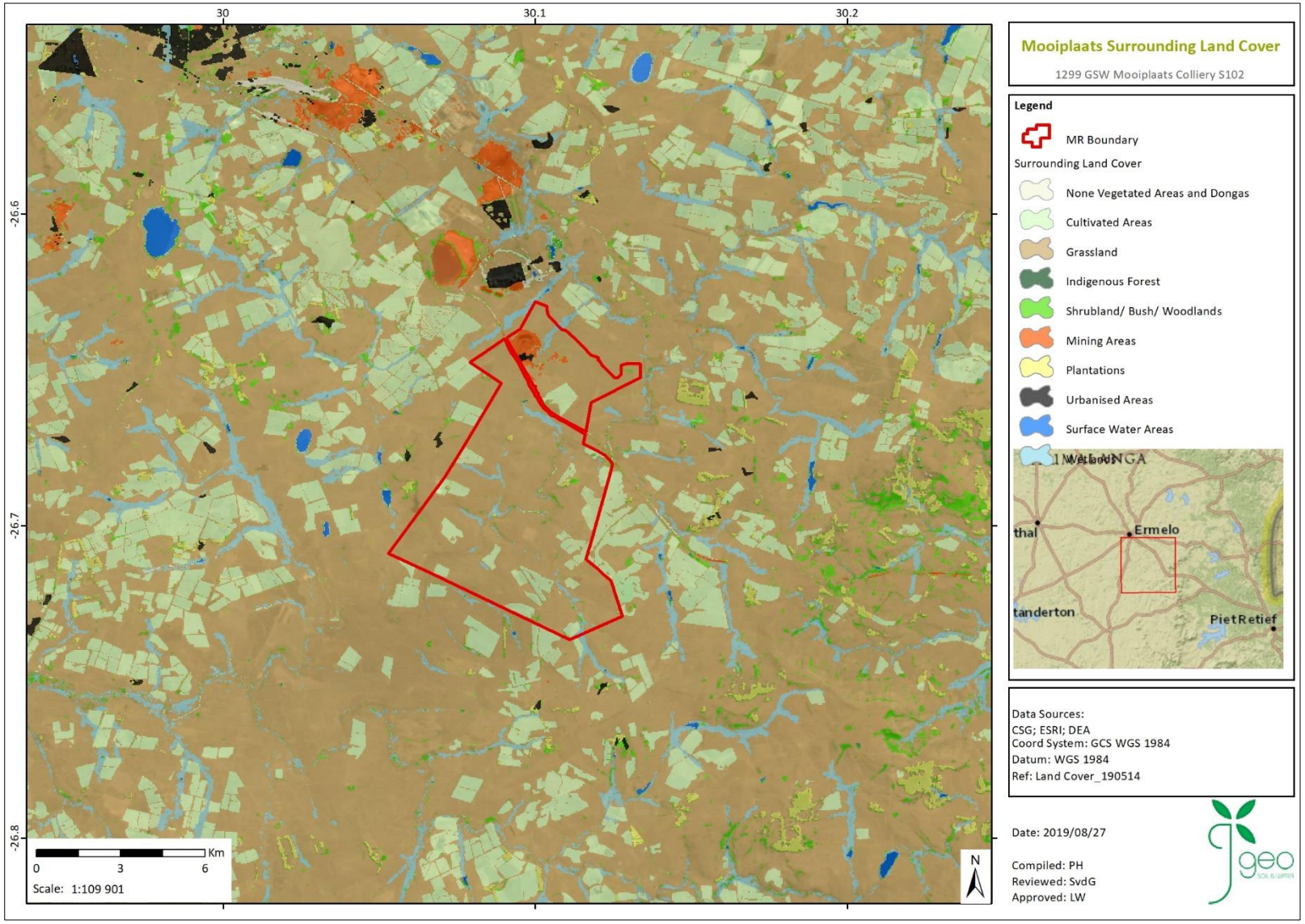


Figure 20: Land uses and land cover within the Mooiplaats Colliery Mining Right boundary including the Vunene project area

7.6 CULTURAL AND HERITAGE RESOURCES

As can be seen in Figure 21 below, the proposed Mooiplaats Colliery Vunene project area is mostly located in an area of insignificant palaeontological sensitivity. The different colours on the map represent different levels of estimated palaeontological sensitivity. The key below is provided by SAHRA to determine sensitivity:

- **RED, VERY HIGH**: field assessment and protocol for finds is required;
- **ORANGE/YELLOW, HIGH**: desktop study is required and based on the outcome of the desktop study, a field assessment is likely;
- **GREEN, MODERATE**: desktop study is required;
- **BLUE, LOW**: no palaeontological studies are required however a protocol for finds is required;
- **GREY, INSIGNIFICANT/ZERO**: no palaeontological studies are required; and
- **WHITE/CLEAR, UNKNOWN**: these areas will require a minimum of a desktop study.

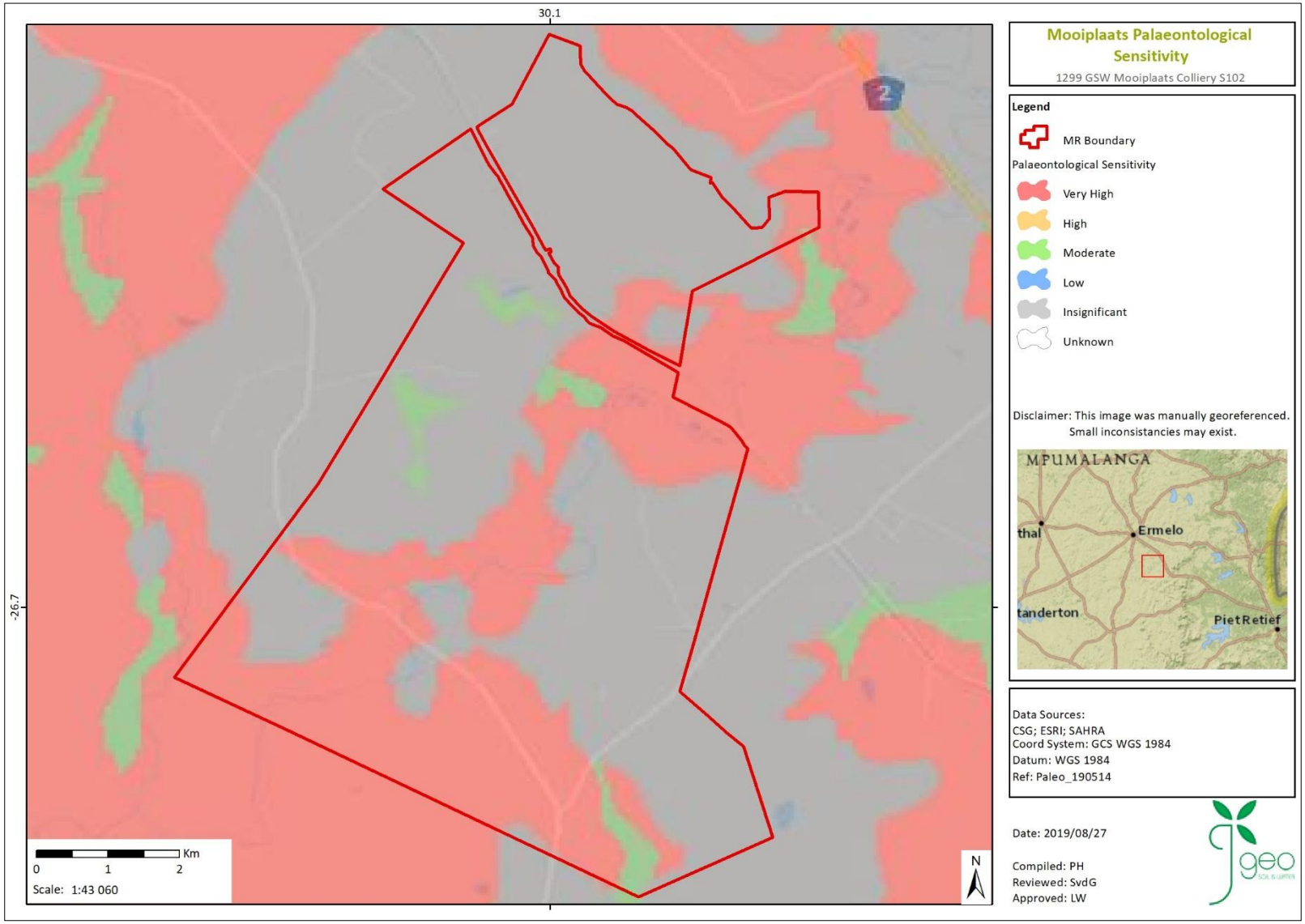


Figure 21: Paleontological sensitivity for the Mooiplaats Colliery including the Vunene project area

7.7 FLORA

The study area falls within the Grassland Biome that is further divided into vegetation types. One dominant vegetation type occurs within the study site namely the Eastern Highveld Grassland. Although not present on the study site, another vegetation type, the Eastern Temperate Freshwater Wetlands occur in the area (Refer to Figure 22).

Both vegetation types are classified as endangered. Furthermore, both vegetation types are listed as vulnerable ecosystems in terms of Section 52 of the National Environmental Biodiversity Act (Act 10 of 2004) (Government Gazette, 2009).

7.7.1 EASTERN HIGHVELD GRASSLAND

Distribution Mpumalanga and Gauteng Provinces: Plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief. Altitude 1 520–1 780 m, but also as low as 1 300 m.

Vegetation & Landscape Features Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra*, *Celtis africana*, *Diospyros lycioides* subsp *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Rhus magalismontanum*).

Geology & Soils Red to yellow sandy soils of the Ba and Bb land types found on shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). Land types Bb (65%) and Ba (30%).

Climate Strongly seasonal summer rainfall, with very dry winters. MAP 650–900 mm (overall average: 726 mm), MAP relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit but drops to 21% in the east and southeast. Incidence of frost from 13–42 days, but higher at higher elevations.

Important Taxa Graminoids: *Aristida aequiglumis* (d), *A. congesta* (d), *A. junciformis* subsp. *galpinii* (d), *Brachiaria serrata* (d), *Cynodon dactylon* (d), *Digitaria monodactyla* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. racemosa* (d), *E. sclerantha* (d), *Heteropogon contortus* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rehmannii* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon appendiculatus*, *A. schirensis*, *Bewsia biflora*, *Ctenium concinnum*, *Diheteropogon amplectens*, *Eragrostis capensis*, *E. gummiflua*, *E. patentissima*, *Harpochloa falx*, *Panicum natalense*, *Rendlia altera*, *Schizachyrium sanguineum*, *Setaria nigrirostris*, *Urelytrum agropyroides*. Herbs: *Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Pelargonium luridum* (d), *Acalypha angustata*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens*, *H. caespititium*, *H. callicomum*, *H. oreophilum*, *H. rugulosum*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata*. Geophytic Herbs: *Gladiolus crassifolius*, *Haemanthus humilis* subsp. *hirsutus*, *Hypoxis rigidula* var. *pilosissima*, *Ledebouria ovatifolia*. Succulent Herb: *Aloe ecklonis*. Low Shrubs: *Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumosa*.

Conservation Endangered. Target 24%. Only very small fraction conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed sites. Erosion is very low.

7.8 FAUNA

From a faunal perspective, the study site provides suitable habitat to numerous species. Previous ecological studies have indicated that the habitat present on the study site suggests that a number of other species of conservation concern may be encountered here.

Desktop analysis of IUCN data revealed that there are no faunal habitats of threatened or rare species within 5km of the proposed project area. However, the following mammal species were identified as having a probability of occurring on site:

- Vulpez chama (Cape fox) LC
- Tatera brantsii (Highveld Gerbil) LC
- Rhabdomis pumilio (Four striped grass rat) LC
- Otomys angoniensis (Angoni Vlei Rate) LC
- Lepus capensis (Cape Hare) LC
- Cynictis penicillata (Yellow Mongoose) LC
- Atelerix frontalis (Southern African Hedgehog) LC

The conservation status of all the faunal species listed above is Least Concern (LC) (International Union for Conservation of Nature and Natural Resources, 2018). The Mooiplaats Colliery Vunene project area falls within mainly heavily modified areas and part of the critical biodiversity area (refer to Figure 23). It must however be noted that analysis of the Mpumalanga Biodiversity Sector Plan (MBSP) spatial data reveals that a portion of the project area (Portion 3 of the farm Klipbank 295 IT) is zoned as a protected area. The proposed mine expansion area however falls outside of the protected area and only entails underground mining. Impacts on the protected areas are therefore expected to be minimal in nature.

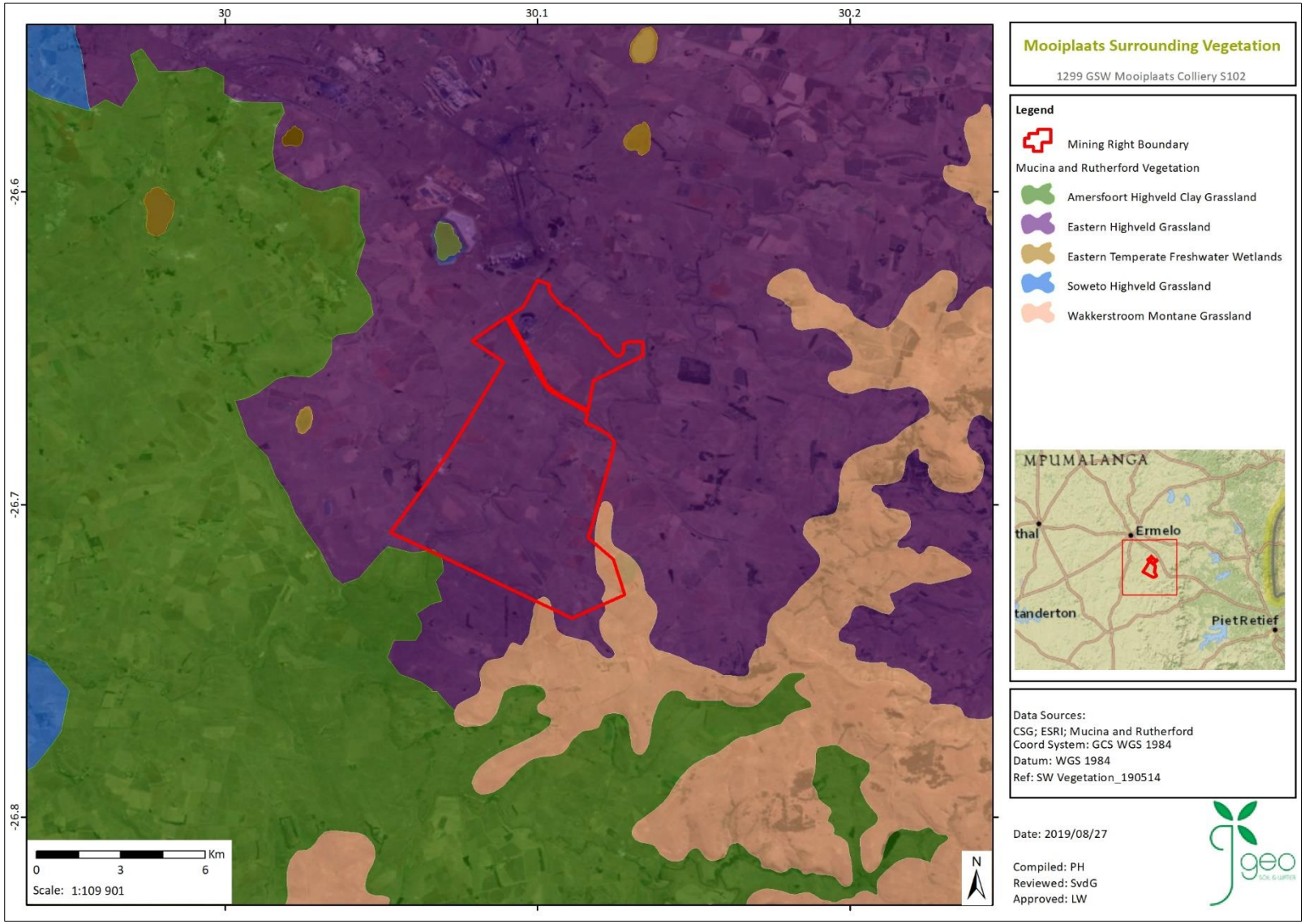


Figure 22: Mooiplaats Colliery vegetation

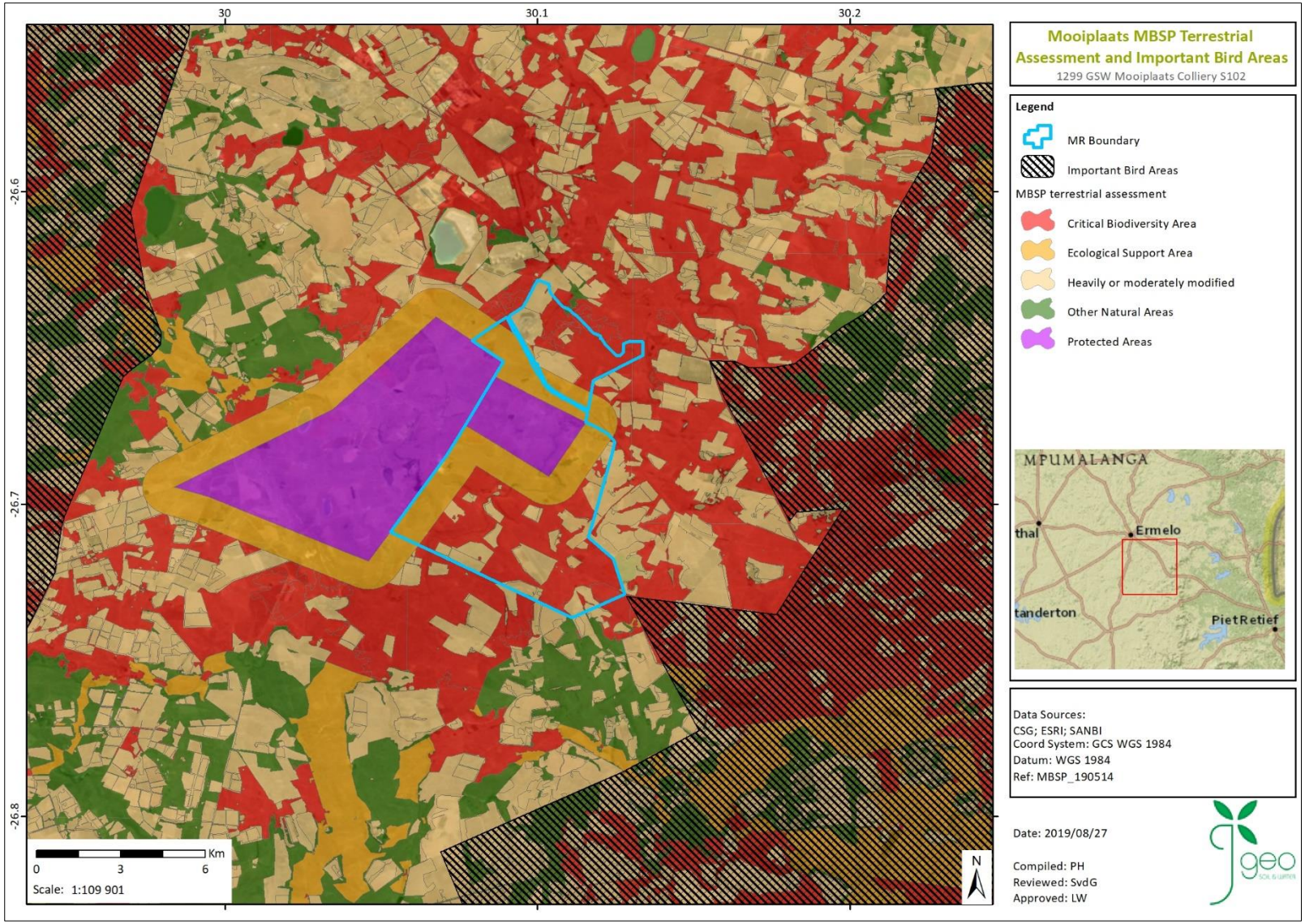


Figure 23: The Mpumalanga Areas of Biodiversity Concern in relation to the Mooiplaats Colliery

7.9 HYDROLOGY

A surface water assessment was undertaken by WSP Environmental (Pty) Ltd (WSP) in 2019 as part of the EIA phase of this application. The study states that the Upper Vaal water management area lies in the eastern interior of South Africa. Large quantities of water are transferred into the area from two neighbouring areas, as well as water sourced from the Upper Orange River via Lesotho. Similarly, large quantities of water are transferred out to three other water management areas, which are dependent on water from the Upper Vaal water management area to meet much of their requirements. The following river channels are found within the proximity and interconnected to the study site: The Vaal River, which is the third largest river in South Africa, runs north-east of the Mooiplaats colliery boundaries; The Vaal River running along the site is fed by an unnamed tributary, and the Witpunt Spruit. The Vaal River is the largest tributary of the Orange River, which runs westward through South Africa before reaching the Atlantic Ocean. In addition, several streams, wetlands and springs are located in the area which drains south and east towards the Witpuntspruit and Vaal River in the Grootdraai Dam, located within the Upper Vaal Catchment.

7.9.1 WATER MANAGEMENT AREA

The Mooiplaats Colliery is situated in the Upper Vaal Water Management Area (WMA 8). The study area falls in a section of the C11B Vaal River quaternary catchment (Figure 24) area and is situated on a slope that drains directly into the Vaal River. The local slope length is approximately 2km long with the shaft area located approximately 700m away from the Vaal River right flank floodplain. The C11A catchment also drains into the Vaal River via the C11B catchment. The Vaal River is the main tributary within the area flowing in a north south direction towards the Vaal Dam. Other tributaries include the Witpunspruit, Sterkspruit and Wolwespruit, which drain to the Vaal River.

7.9.2 MEAN ANNUAL RUNOFF

The larger catchment, in which the project area is situated, consists of quaternary catchment C11A and part of C11B. The Mean Annual Runoff (MAR) is calculated as 79 million cubic meters per annum. The seasonal distribution is very similar to the rainfall distribution. The Water Research Commission (WRC) Report indicates that the C11B quaternary has a typical runoff response represented by the rainfall/runoff curve. This is particularly helpful for distributing runoff in areas smaller than quaternary level. Surface watercourses near Mooiplaats Colliery

The aquifer boundaries for the shallow weathered aquifer in the study area can be seen in and are as follows:

- The Sterkspruit on the north-eastern and eastern side for about 5.5km;
- The Wolwespruit on the south-eastern side for about 3.7km;
- The Witpunt Spruit located approximately 2.2km north-east of the study area boundary for about 8km and
- The Vaal River and its tributaries on the southern, south-western and northern side for about 19km.

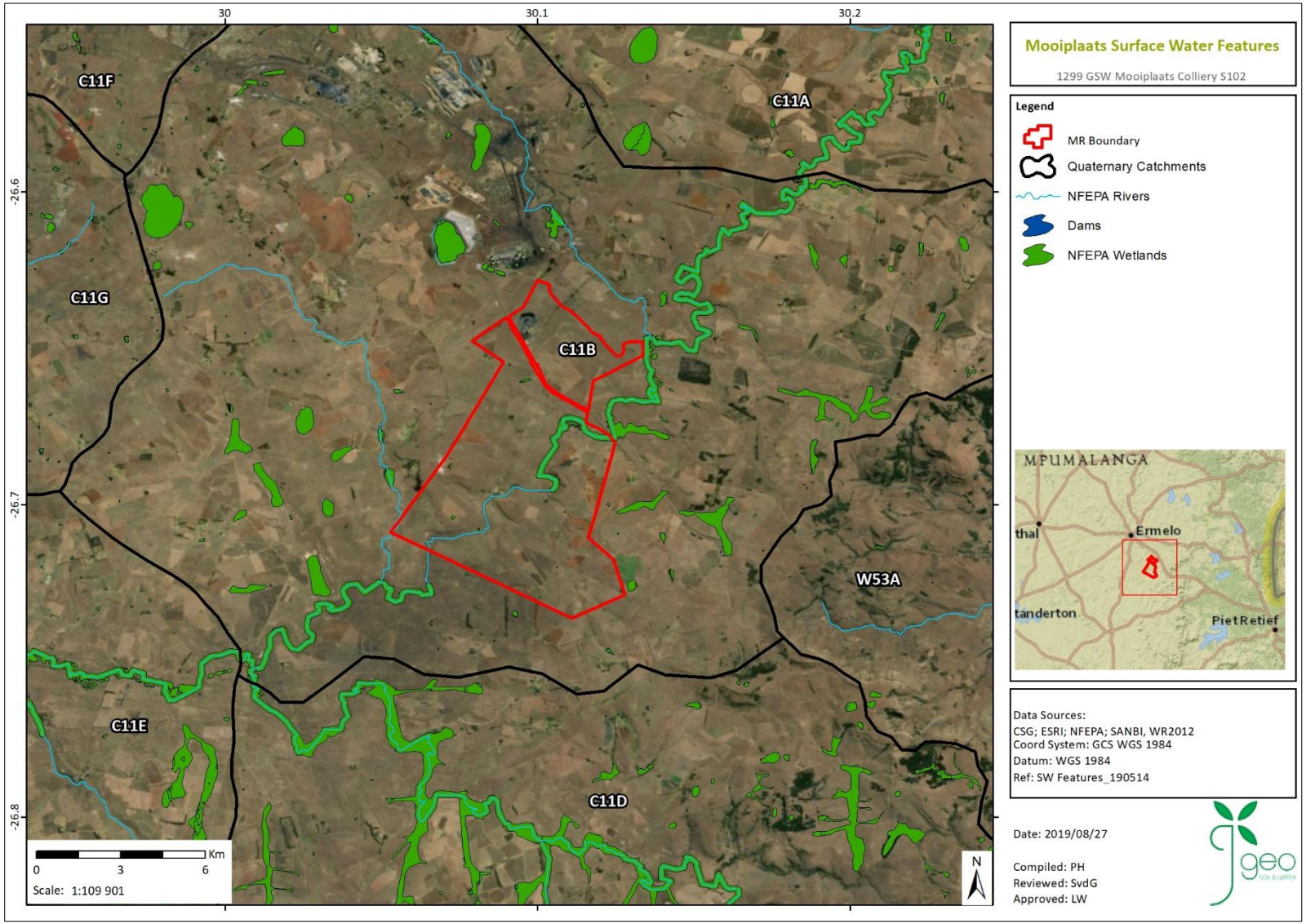


Figure 24: Mooiplaats Colliery surface water features

7.9.3 SURFACE WATER QUALITY

As Mooiplaats Colliery is an existing mine, there is an existing IWUL (Licence no. 08/C11B/AGJ/2141), dated 02 May 2013. As per the conditions of the IWUL, Mooiplaats Colliery is required to conduct monthly surface water monitoring to determine if the chemical water quality and the levels are in line as prescribed in the IWUL. As per the IWUL, there are ten (10) surface water monitoring and fifteen (15) additional surface water monitoring points that are included in the surface water monitoring programme. Refer to Figure 25 for the location of the surface water monitoring points.

Monthly surface water samples are analysed for:

- pH
- Electrical Conductivity (EC) mS/m
- Total Dissolved Salts (TDS) mg/L
- Total Hardness mg/L
- Alkalinity $CaCO_3$/L
- Calcium (Ca) mg/L
- Magnesium (Mg) mg/L
- Sodium (Na) mg/L
- Potassium (K) mg/L
- Fluoride (F) mg/L
- Chloride (Cl) mg/L
- Sulphate (SO_4) mg/L
- Nitrate (NO_3) mg/L
- Aluminium (Al) mg/L
- Iron (Fe) mg/L
- Manganese (Mn) mg/L
- Ammonia (NH_3) mg/L

Water qualities are compared to the IWUL Limits and the In-stream Water Quality Guidelines for the Grootdraai Dam Catchment - Vaal origin. The DHSWS Water Quality Guidelines (second edition). Volume 5: Agricultural Use: Livestock Watering and the South African National Standard, Drinking Water Standard (Edition 2) (SANS 241:2015) were included as supplementary comparative guidelines and not for compliance purposes.

The monitoring network provides information for risk-based decision making to Mooiplaats management with regard to effectiveness of pollution prevention measures and areas requiring management attention. The results for the surface water monitoring are provided in Table 16 to Table 20.

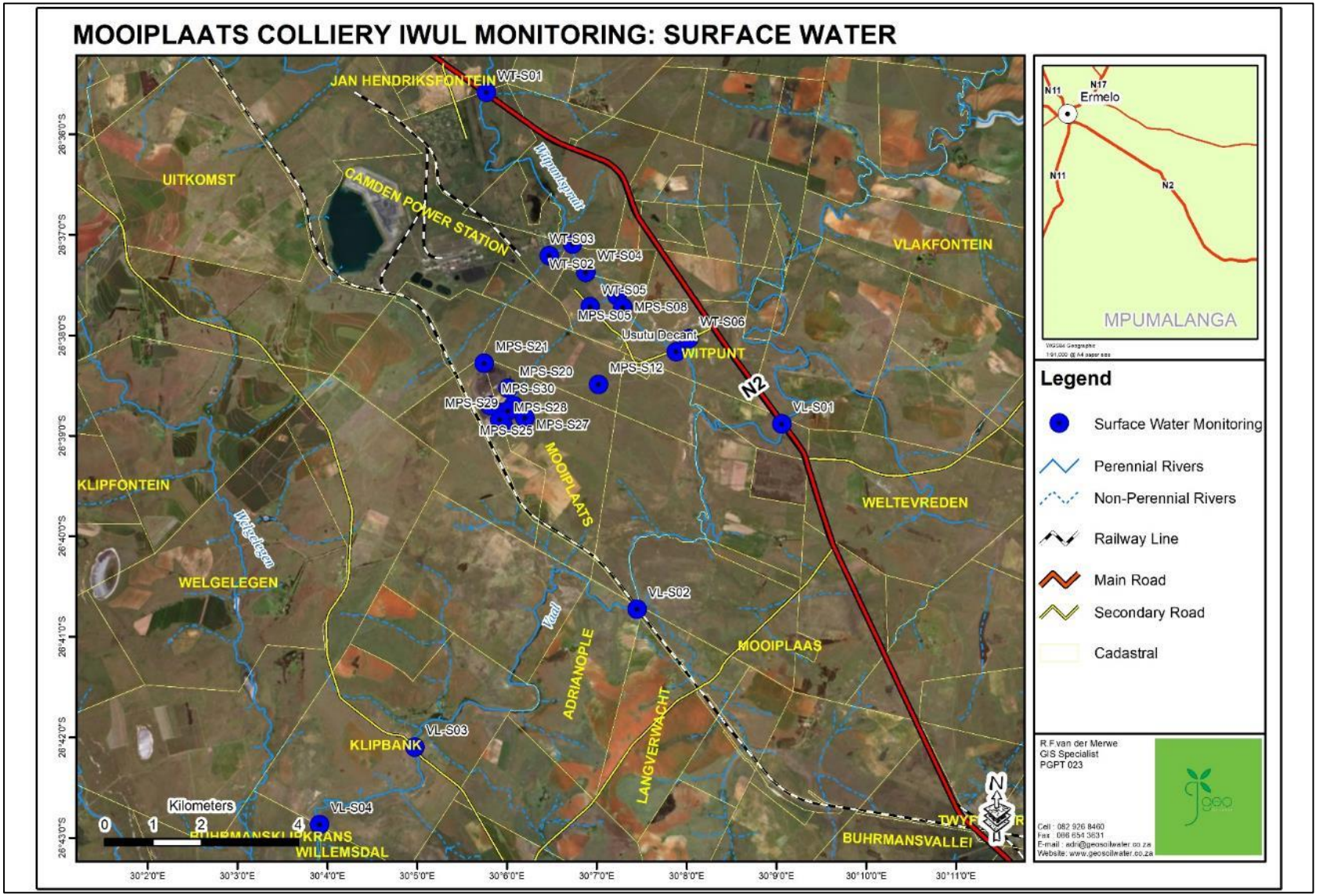


Figure 25: Location of the surface water monitoring points

Table 15: Summary of surface water monitoring points

Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
VL-S01	Vaal River 1 Upstream	S26.64616° E30.09890°	Monthly
VL-S02	Vaal River 2 Downstream 1	S26.64804° E30.15098°	Monthly
VL-S03	Vaal River 3 Downstream 2	S26.67879° E30.12411°	Monthly
VL-S04	Vaal River 4 Downstream 3	S26.70167° E30.08288°	Monthly
WT-S01	Witpuntspruit 1 Upstream	S26.71447° E30.06519°	Monthly
WT-S02	Witpuntspruit 2 Midstream	S26.59307° E30.09617°	Monthly
WT-S03	Witpuntspruit Tributary North DS 1	S26.61826° E30.11211°	Monthly
WT-S04	Witpuntspruit 3 Midstream	S26.62014° E30.10781°	Monthly
WT-S05	Witpuntspruit Tributary South DS 2	S26.62294° E30.11463°	Monthly
WT-S06	Witpuntspruit 6 Downstream	S26.62863° E30.11539°	Monthly
MPS-S08	Witpuntspruit 5 MS	S26.62873° E30.12149°	Monthly
MPS-S12	Witpuntspruit Tributary @ Access Road	S26.64150° E30.11697°	Monthly
MPS-S13	Runoff from Loading Area	S26.64837° E30.09888°	Monthly

Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
MPS-S14	Gen-sub PCD	S26.64616° E30.09890°	Monthly
MPS-S15	Stormwater trench @ Security	S26.64837° E30.09888°	Monthly
MPS-S16	DS Area of Erikson's + Settling Dams	S26.64505° E30.10121°	Monthly
MPS-S20	Erickson Dams	S26.64505° E30.10121°	Monthly
MPS-S21	Main Holdings Dam	S26.64198° E30.10059°	Monthly
MPS-S25	Workshop Trench DS of Workshop	S26.63826° E30.09506°	Monthly
MPS-S27	Witpuntspruit Tributary entering MP	S26.64716° E30.10336°	Monthly
MPS-S28	Confluence of MPS-S13 and MPS-S15	S26.64808° E30.09925°	Monthly
MPS-S29	Storm water @ Offices	S26.64743° E30.09802	Monthly
MPS-S30	Plant PCD	S26.64508° E30.09674°	Monthly
MPS-S31	Decant from Old Usutu Workings decanting into the Witpuntspruit Upstream of WT-06 – via surface.	S26.63611°E30.13139°	Monthly
MPS-S32	Decant from Old Usutu Workings decanting into the Witpuntspruit Upstream of WT-06 – in cement sumps	S26.63611°E30.13139°	Monthly

Table 16: Average water quality for waste water monitoring points.

Average Wastewater Quality for Mooiplaats April 2019 - June 2019									
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**MPS-S14**	**MPS-S20**	**MPS-S21**	**MPS-S30**
pH	**-**	**3.5 – 8.5**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	8.05	7.41	7.94	8.21
EC	**mS/m**	**150**	**25**	**170**	**500**	* 433.00	* 436.00	* 451.00	* 395.33
TDS	**mg/L**	**1288**	**-**	**1200**	**3000**	3662	3638	3765	3186
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	1327	1302	1275	1178
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	128.000	71.467	123.067	112.333
Ca	**mg/L**	**87**	**-**	**-**	**1000**	261.000	253.333	260.306	240.792
Mg	**mg/L**	**51.40**	**-**	**-**	**500**	164.000	162.667	151.894	140.019
Na	**mg/L**	**725**	**-**	**200**	**200**	646.000	621.188	681.504	555.903
K	**mg/L**	**-**	**-**	**-**	**-**	18.500	16.533	18.552	12.054
F	**mg/L**	**3.23**	**0.4**	**1.5**	**2**	1.070	1.013	1.087	0.943

Cl	**mg/L**	**116.66**	**20**	**300**	**3000**	58.300	55.600	51.167	43.300
SO_4	**mg/L**	**740**	**30**	**500**	**1000**	* 2429.000	* 2476.333	* 2522.667	* 2119.897
NO_3	**mg/L**	**-**	**0.5**	**11**	**-**	0.580	0.550	0.880	0.623
NH_3	**mg/L**	**0.24**	**-**	**1.5**	**-**	0.930	-0.450	-0.450	0.327
Al	**mg/L**	**0.09**	**-**	**0.3**	**5**	0.150	0.093	-0.010	-0.010
Fe	**mg/L**	**0.001**	**-**	**0.3**	**10**	0.130	0.185	0.123	0.050
Mn	**mg/L**	**0.15**	**-**	**0.1**	**10**	3.180	6.103	0.350	1.797

- **Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.**
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- **"-"Indicate values below laboratory detection limit.**
- **"*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.**

Table 17: Average water quality for surface and storm water runoff monitoring points.

Average Storm and Surface Water Quality for Mooiplaats Colliery April 2019 - June 2019												
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241: 2011**	**DHSWS Livestock Watering**	**MPS-S13**	**MPS-S15**	**MPS-S16**	**MPS-S25**	**MPS-S27**	**MPS-S28**	**MPS-S29**
pH	-	**3.5 – 8.5**	**6.4 – 8.5**	**5.0 - 9.5**	-	8.15	8.36	5.02	Dry for duration of quarter	6.55	7.94	7.52
EC	**mS/m**	**150**	**25**	**170**	**500**	90.20	63.20	* 803.67		24.00	58.20	112.00
TDS	**mg/L**	**1288**	-	**1200**	**3000**	582	372	9411		164	358	787
Total Hardness	**mg/L**	-	-	-	-	309	225	4248		77	219	453
Alkalinity	**$CaCO_3$/L**	-	**75**	-	-	110.467	131.000	0.000		7.600	126.000	53.600
Ca	**mg/L**	**87**	-	-	**1000**	59.633	43.900	364.667		19.600	45.300	105.000
Mg	**mg/L**	**51.40**	-	-	**500**	38.867	27.900	810.333		6.704	25.800	46.400
Na	**mg/L**	**725**	-	**200**	**200**	74.200	41.100	567.667		15.500	36.900	70.100
K	**mg/L**	-	-	-	-	4.807	2.780	26.133		10.605	4.890	2.750
F	**mg/L**	**3.23**	**0.4**	**1.5**	**2**	0.180	-0.090	* 13.973		0.100	-0.090	-0.090

Cl	**mg/L**	**116.66**	**20**	**300**	**3000**	28.467	24.700	44.067	6.500	21.300	7.100
SO_4	**mg/L**	**740**	**30**	**500**	**1000**	307.667	146.000	* 6953.333	100.000	148.000	522.000
NO_3	**mg/L**	**-**	**0.5**	**11**	**-**	-0.350	-0.350	-0.350	-0.350	-0.350	0.390
NH_3	**mg/L**	**0.24**	**-**	**1.5**	**-**	-0.450	-0.450	2.347	-0.450	-0.450	-0.450
Al	**mg/L**	**0.09**	**-**	**0.3**	**5**	0.027	0.070	154.000	0.082	0.080	0.020
Fe	**mg/L**	**0.001**	**-**	**0.3**	**10**	0.047	0.130	215.000	0.076	0.080	0.030
Mn	**mg/L**	**0.15**	**-**	**0.1**	**10**	-0.010	-0.010	254.333	0.027	-0.010	0.010

- **Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.**
- **Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin**
- **"-"Indicate values below laboratory detection limit. "*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.**
- **"*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.**

Table 18: Average water quality for the Witpuntspruit and its tributaries surface water monitoring points.

Average Witpuntspruit Water Quality for Mooiplaats Colliery April 2019 - June 2019										
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**WT-S01**	**WT-S03**	**WT-S02**	**WT-S04**	**WT-S05**
pH	**-**	**3.5 – 8.5**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	3.57	7.69	7.27	7.26	3.73
EC	**mS/m**	**150**	**25**	**170**	**500**	139.00	72.07	88.23	98.33	* 159.67
TDS	**mg/L**	**1288**	**-**	**1200**	**3000**	984	454	587	658	1135
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	574	189	290	340	512
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	0.000	108.133	69.733	62.133	0.000
Ca	**mg/L**	**87**	**-**	**-**	**1000**	109.133	38.400	59.500	68.633	93.233
Mg	**mg/L**	**51.40**	**-**	**-**	**500**	73.200	22.600	34.233	40.900	67.733
Na	**mg/L**	**725**	**-**	**200**	**200**	49.433	75.267	71.400	80.667	124.933
K	**mg/L**	**-**	**-**	**-**	**-**	8.923	5.383	4.687	6.020	14.340
F	**mg/L**	**3.23**	**0.4**	**1.5**	**2**	0.377	0.170	0.217	0.252	0.570

Cl	**mg/L**	**116.66**	**20**	**300**	**3000**	24.967	18.400	26.667	30.400	17.700
SO_4	**mg/L**	**740**	**30**	**500**	**1000**	699.543	228.667	346.000	392.667	* 800.000
NO_3	**mg/L**	**-**	**0.5**	**11**	**-**	-0.350	-0.350	-0.047	-0.350	-0.350
NH_3	**mg/L**	**0.24**	**-**	**1.5**	**-**	-0.450	-0.450	-0.450	-0.450	5.670
Al	**mg/L**	**0.09**	**-**	**0.3**	**5**	11.043	0.017	0.067	0.077	3.163
Fe	**mg/L**	**0.001**	**-**	**0.3**	**10**	0.653	0.173	0.103	0.090	0.343
Mn	**mg/L**	**0.15**	**-**	**0.1**	**10**	6.093	0.003	0.953	1.070	5.907

- **Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.**
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- **"*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.**

Table 19: Average water quality for the Witpuntspruit and its tributaries surface water monitoring points continued.

Average Witpuntspruit Water Quality for Mooiplaats Colliery April 2019 - June 2019									
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**MPS-S08**	**MPS-S31**	**MPS-S32**	**WT-S06**

pH	-	**3.5 – 8.5**	**6.4 – 8.5**	**5.0 - 9.5**	-	7.39	* 8.79	7.63	7.99
EC	**mS/m**	**150**	**25**	**170**	**500**	96.97	* 464.00	125.33	* 164.00
TDS	**mg/L**	**1288**	-	**1200**	**3000**	639	3275	780	1027
Total Hardness	**mg/L**	-	-	-	-	326	84	224	247
Alkalinity	**$CaCO_3$/L**	-	**75**	-	-	50.400	1112.667	370.667	384.000
Ca	**mg/L**	**87**	-	-	**1000**	64.167	13.478	53.945	48.600
Mg	**mg/L**	**51.40**	-	-	**500**	40.167	12.313	21.583	30.567
Na	**mg/L**	**725**	-	**200**	**200**	77.200	1175.663	191.783	267.166
K	**mg/L**	-	-	-	-	5.817	10.313	8.430	5.623
F	**mg/L**	**3.23**	**0.4**	**1.5**	**2**	0.360	* 3.603	0.377	1.360
Cl	**mg/L**	**116.66**	**20**	**300**	**3000**	30.533	94.933	35.767	50.267
SO_4	**mg/L**	**740**	**30**	**500**	**1000**	390.333	* 1235.879	241.333	393.000
NO_3	**mg/L**	-	**0.5**	**11**	-	-0.350	-0.350	0.770	-0.350
NH_3	**mg/L**	**0.24**	-	**1.5**	-	-0.450	-0.450	-0.097	-0.450
Al	**mg/L**	**0.09**	-	**0.3**	**5**	0.027	1.113	0.000	0.013

Fe	**mg/L**	**0.001**	**-**	**0.3**	**10**	0.110	0.703	0.010	0.020
Mn	**mg/L**	**0.15**	**-**	**0.1**	**10**	0.523	0.050	-0.010	0.130

- **Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.**
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- **"*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.**

Table 20: Average water quality for the Vaal River surface water monitoring points.

Average Vaal River Water Quality for Mooiplaats April 2019 - June 2019									
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**VL-S01**	**VL-S02**	**VL-S03**	**VL-S04**
pH	**-**	**3.5 – 8.5**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	7.52	7.67	7.82	7.97
EC	**mS/m**	**150**	**25**	**170**	**500**	16.90	30.50	26.77	28.70
TDS	**mg/L**	**1288**	**-**	**1200**	**3000**	82	167	146	152
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	57	83	80	94
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	58.333	75.400	68.667	70.600

Ca	**mg/L**	**87**	**-**	**-**	**1000**	9.053	14.433	14.167	17.100
Mg	**mg/L**	**51.40**	**-**	**-**	**500**	8.355	11.313	10.843	12.400
Na	**mg/L**	**725**	**-**	**200**	**200**	7.988	26.867	21.400	18.300
K	**mg/L**	**-**	**-**	**-**	**-**	2.028	3.760	3.323	2.350
F	**mg/L**	**3.23**	**0.4**	**1.5**	**2**	0.143	0.217	0.170	0.170
Cl	**mg/L**	**116.66**	**20**	**300**	**3000**	10.900	16.233	14.733	14.500
SO_4	**mg/L**	**740**	**30**	**500**	**1000**	7.742	47.500	39.767	44.600
NO_3	**mg/L**	**-**	**0.5**	**11**	**-**	-0.350	-0.067	-0.350	-0.350
NH_3	**mg/L**	**0.24**	**-**	**1.5**	**-**	-0.450	-0.450	-0.450	-0.450
Al	**mg/L**	**0.09**	**-**	**0.3**	**5**	0.060	0.110	0.070	0.050
Fe	**mg/L**	**0.001**	**-**	**0.3**	**10**	0.350	0.460	0.240	0.280
Mn	**mg/L**	**0.15**	**-**	**0.1**	**10**	0.000	0.007	-0.003	-0.010

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- **Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin**
- **"-"Indicate values below laboratory detection limit.**
- **"*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.**

The following is a summary of the results: (April 2019 – June 2019)

- **Wastewater** - Water quality from the mine water/pollution control dams monitoring points exceeded limits in terms of EC, TDS, $CaCO_3$, Ca, Mg, Cl, SO_4, NH_3, Al, Fe and Mn. These results are typical of water associated with coal washing/mining activities. It should be noted that although these monitoring points recorded elevated variable concentrations, the water is being contained in appropriate wastewater storage facilities and circulated in a closed circuit i.e. dirty water circuit and no water are being released into the receiving environment.

- **Storm and Surface Water Runoff** - It is evident that surface runoff water quality in close proximity of Mooiplaats Colliery recorded signs of coal mine pollution but is of relatively good quality (in comparison with the Witpuntspruit) with the exception of **MPS-S16**. Although sighs of coal mine pollution were recorded, these signs were recorded at up and downstream monitoring points. All possible seepage reports to **MPS-S16** and is pumped into the process water system. The effect (from the care and maintenance phase) from **MPS-S16** can still be observed at **WT-S05**, downstream in a Witpuntspruit tributary. Water from **MPS-S16** did not reach the Witpuntspruit tributary during the reporting period and evidently the improvement in water quality at **WT-S05**.

- Water Quality from the **Witpuntspruit** is highly impacted **upstream** of Mooiplaats Colliery indicating a serious pollution source. Although a decrease in several variable concentrations from **WT-S01** (upstream) to **WT-S06** (downstream) were recorded, an increase from **WT-S01** to **WT-S06** was recorded in terms of EC, Alkalinity, Cl and SO_4. This increase can possibly be ascribed to water from the Usutu decant, **MPS-S31** and **MPS-S32. MPS-S31** (Usutu surface decant) enters the Witpuntspruit via surface between **MPS-S08** and **WT-S06** where **MPS-S32** (Usutu Underground groundwater plume) enters the Witpuntspruit possibly as far upstream as **WT-S04** (possibly impacting the water at **WT-S04**). Elevated variable concentrations (EC, TDS, $CaCO_3$, Na, K, F, Cl, SO_4 and Fe) which were recorded at **MPS-S31** and **MPS-S32** were recorded at **WT-S06** in higher concentrations than at **MPS-S08** and **WT-S04**.

- **Vaal River** – Although fewer water quality limits were exceeded in the Vaal river (**VL-S02** to **VL-S04**) after the confluence of the Witpuntspruit, the change in composition and the deterioration in water quality is evident. Seasonal changes in the Vaal river water quality are evident as trends indicate deterioration during the dry season and improvement during the wet season. From **VL-S01** to **VL-S02** a definite change in quality can be observed as the Witpuntspruit enters the Vaal River where the quality remains relative stable from **VL-S02** to **VL-S04** with no indication of severe change downstream are observed.

- The upstream pollution source of the Witpuntspruit pollution should be addressed to prevent constant degradation (build-up of contaminants) in the Vaal River system and a complete collapse of the aquatic functions in the long term.

7.10 HYDROGEOLOGY

The Geohydrological Baseline Study (Gradient Consulting, 2019) outlines that the DHSWS has characterised South African aquifers based on host-rock formations in which it occurs together with its capacity to transmit water to boreholes drilled into relative formations. The water bearing properties of respective formations can be classified into four aquifer classes defined as:

Class A: Intergranular Aquifers associated either with loose and unconsolidated formations such as sands and gravels or with rock that has weathered to only partially consolidated material.

Class B: Fractured Aquifers associated with hard and compact rock formations in which fractures, fissures and/or joints occur that are capable of both storing and transmitting water in useful quantities.

Class C: Karst Aquifers associated with carbonate rocks such as limestone and dolomite in which groundwater is predominantly stored in and transmitted through cavities that can develop in these rocks.

Class D: Intergranular and fractured Aquifers that represent a combination of Class A and B aquifer types. This is a common characteristic of South African aquifers. Substantial quantities of water are stored in the intergranular voids of weathered rock but can only be tapped via fractures penetrated by boreholes drilled into it. Each of these classes is further subdivided into groups relating to the capacity of an aquifer to transmit water to boreholes, typically measured in l/s. The groups therefore represent various ranges of borehole yields (Figure 26 Below).

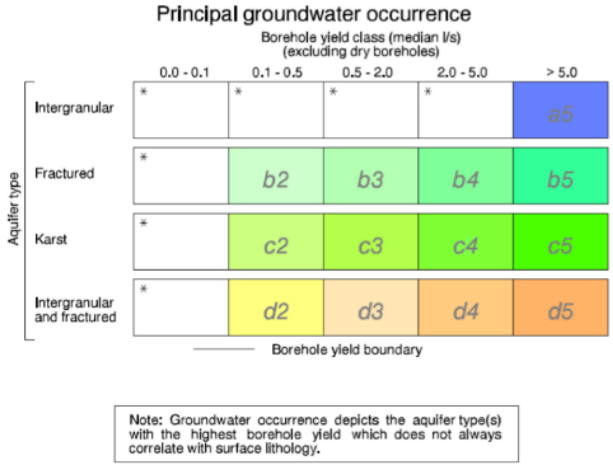

Figure 26: Principal groundwater occurrences in South Africa (Source: Gradient Consulting, 2019).

The baseline report indicated that according to the DHSWS Hydrogeological map (DHSWS Hydrogeological map series 2530 Nelspruit), the site is predominantly underlain by an intergranular and fractured aquifer system (d3) comprising mostly arenaceous rock of the Ecca Formation with a compact nature. Karoo sediments of the Ecca and Beaufort Groups, which consist of mainly sandstones, mudstones and shales, cover a large portion of the WMA. The aquifers are secondary aquifers with water associated with fracturing. Natural springs and seepages, although their flows are markedly seasonally affected, are extensively exploited as domestic water supply sources in the rural residential and agricultural portions of the WMA (DHSWS ISP, 2004). The aquifer has an extremely low to medium development potential (DWA, 2008) with borehole yields ranging from 0.5 – 2.0 l/s, while higher yielding boreholes (> 5.0 l/s) may occur along intruding dyke contact zones and other structural features i.e. fault zones etc (Barnard, 2000). Faults, joints and intrusive Karoo dolerite contacts in the regional 'hard rocks', are zones usually of increased groundwater presence (DHSWS ISP, 2004). The maximum aquifer depth (i.e. shallow/weathered aquifer system) ranges between 30.0 – 50.0 mbgl with water stored mainly in decomposed/partly decomposed rock and water bearing fractures principally restricted to a shallow

zone below the static groundwater level. The aquifer media consist mainly of fractured and weathered compact sedimentary rock.

7.10.1 GROUNDWATER QUALITY

Monitoring occurs at thirty-three (33) groundwater monitoring points. Thirteen (13) IWUL groundwater points on a monthly basis and the additional twenty (20) groundwater points on a biannual basis depending on environmental conditions and access.

Groundwater samples are analysed for:

- pH
- EC mS/m
- TDS mg/L
- Total Hardness mg/L
- Alkalinity $CaCO_3$/L
- Ca mg/L
- Mg mg/L
- Na mg/L
- K mg/L
- F mg/L
- Cl mg/L
- SO_4 mg/L
- NO_3 mg/L
- Al mg/L
- Fe mg/L
- Mn mg/L
- NH_3 mg/L

Figure 27 below indicates the location of the groundwater monitoring points. Table 21 provides a summary of the location of the groundwater monitoring points. Table 22 provides the average water quality for the Mooiplaats Colliery groundwater monitoring points for April to June 2019, while the groundwater levels are presented in Table 23.

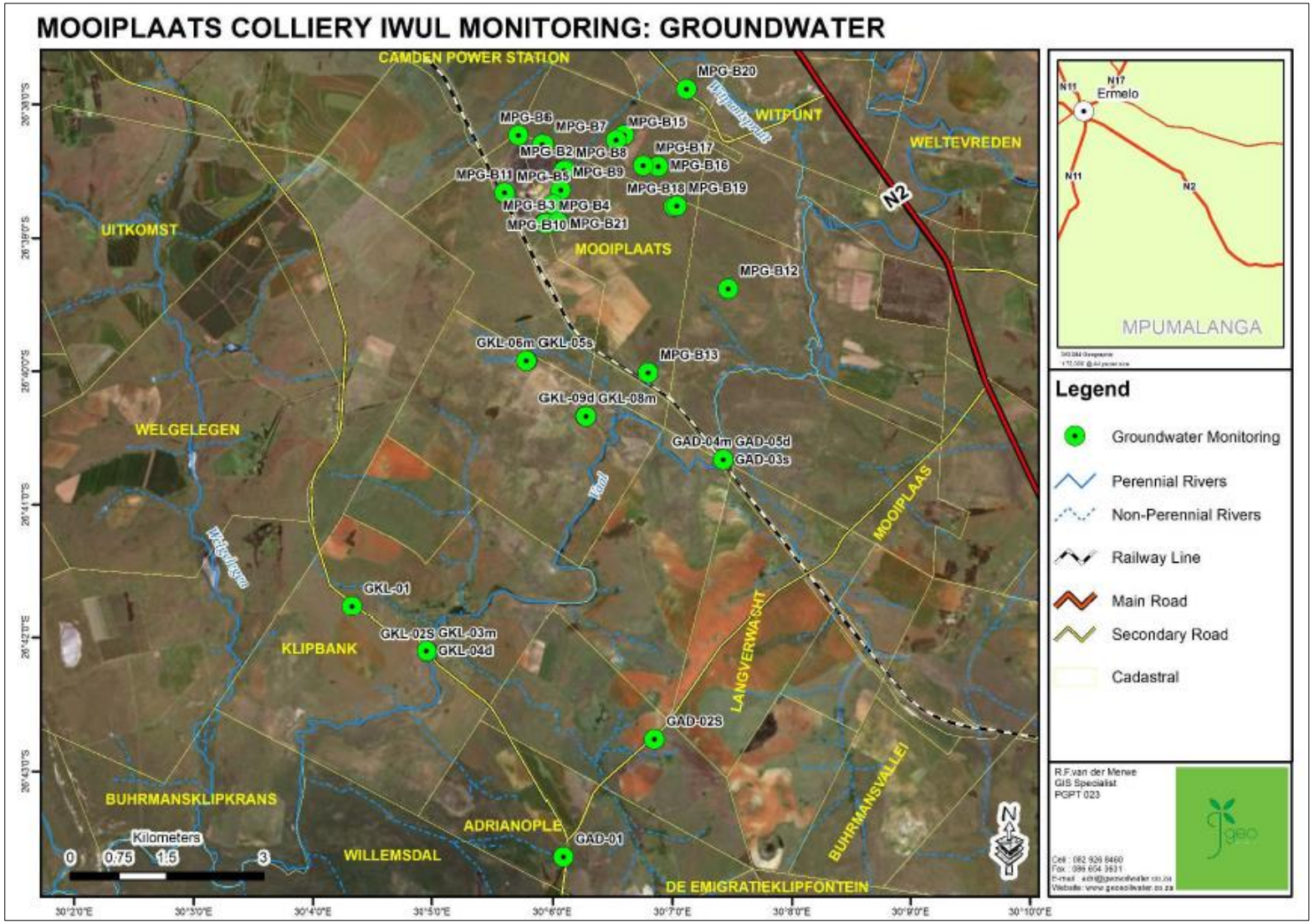

Figure 27: Location of groundwater monitoring reports

Table 21: Summary of groundwater monitoring points

Mooiplaats Colliery Groundwater Monitoring Programme			
Groundwater Monitoring Points			
Locality	**Locality Description**	**Coordinates** **WGS 84 ddd.ddddd**	**Monitoring Frequency**
GKL-1	IWUL Borehole	S26.69603° E30.07208°	Monthly
GKL-4d	IWUL Borehole	S26.70167° E30.08253°	Monthly
GKL-3m	Borehole	S26.70178° E30.08269°	Monthly
GKL-2s	IWUL Borehole	S26.70178° E30.08269°	Monthly
GAD-2s	IWUL Borehole	S26.71269° E30.11414°	Monthly
GAD-1	IWUL Borehole	S26.72733° E30.10144°	Monthly
GKL-9D	IWUL Borehole	S26.67231° E30.10450°	Monthly
GKL-8M	IWUL Borehole	S26.67233° E30.10464°	Monthly
GKL-5S	IWUL Borehole	S26.66542° E30.09647°	Monthly
GKL-6M	IWUL Borehole	S26.66542° E30.09658°	Monthly
GAD-3s	Borehole	S26.67772° E30.12374°	Monthly
GAD-4m	Borehole	S26.67772° E30.12374°	Monthly
GAD-5d	Borehole	S26.67772° E30.12374°	Monthly
MPG-B1	Down gradient (north) of the co-disposal facility.	S26.63843° E30.09878°	Biannually
MPG-B2	Down gradient (east) of the lined Settling Dams and co-disposal.	S26.64143° E30.10175°	Biannually
MPG-B3	Near the security gate.	S26.64816° E30.09905°	Biannually

MPG-B4	Near the security gate.	S26.64819° E30.09910°	Biannually
MPG-B5	Up-gradient (south-west) of the plant area next to the railway line.	S26.64457° E30.09363°	Biannually
MPG-B6	Adjacent to the return water dam.	S26.63719° E30.09540°	Biannually
MPG-B7	Down gradient (north) of the co-disposal facility.	S26.63832° E30.09870°	Biannually
MPG-B8	Down gradient (east) of the lined Settling Dams.	S26.64160° E30.10155°	Biannually
MPG-B9	Down gradient (east) of the plant area.	S26.64403° E30.10107°	Biannually
MPG-B10	Down gradient (east) of the plant area.	S26.64581° E30.10007°	Biannually
MPG-B11	Up-gradient (south-west) of the plant area next to the railway line.	S26.64435° E30.09344°	Biannually
MPG-B12	At MPN Vunene extension	S26.65633° E30.12443°	Biannually
MPG-B13	South of the mine next to the railway line.	S26.66689° E30.11329°	Biannually
MPG-B14	Between Usutu/MPN	S26.63716° E30.10992°	Biannually
MPG-B15	Between Usutu/MPN	S26.63778° E30.10881°	Biannually
MPG-B16	Between Usutu/MPN	S26.64106° E30.11469°	Biannually
MPG-B17	Between Usutu/MPN	S26.64095° E30.11259°	Biannually
MPG-B18	Between Usutu/MPN	S26.64608° E30.11685°	Biannually
MPG-B19	Between Usutu/MPN	S26.64600° E30.11725°	Biannually
MPG-B20	Usutu UG. Borehole intersecting mine at 90 m	S26.63144° E30.11860°	Biannually

Table 22: Average water quality for Mooiplaats IWUL groundwater monitoring points for the reporting period.

Average Groundwater Quality for Mooiplaats April 2019 - June 2019										
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**GAD-1**	**GAD-2S**	**GAD-3S**	**GAD-4M**	**GAD-5D**
pH	**-**	**8.78**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	7.18	7.22	* 8.96	6.85	8.59
EC	**mS/m**	**150**	**25**	**170**	**500**	30.00	14.27	69.00	59.50	* 306.00
TDS	**mg/L**	**-**	**-**	**1200**	**3000**	151	73	412	360	1857
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	128	51	147	225	35
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	145.500	41.000	142.000	111.000	1394.000
Ca	**mg/L**	**15.18**	**-**	**-**	**1000**	31.600	9.412	4.660	39.200	1.230
Mg	**mg/L**	**6.96**	**-**	**-**	**500**	11.900	6.679	32.800	30.900	7.696
Na	**mg/L**	**61.55**	**-**	**200**	**200**	9.995	6.019	92.700	32.800	750.015
K	**mg/L**	**-**	**-**	**-**	**-**	2.050	0.820	0.530	0.880	5.430
F	**mg/L**	**0.30**	**0.4**	**1.5**	**2**	-0.090	-0.090	0.150	* 0.400	* 9.300

Cl	**mg/L**	**19.97**	**20**	**300**	**3000**	5.215	9.237	* 20.600	12.500	* 205.000
SO_4	**mg/L**	**0.25**	**30**	**500**	**1000**	2.250	2.188	* 161.000	* 173.000	4.800
NO_3	**mg/L**	**0.07**	**0.5**	**11**	**-**	-0.350	* 3.120	-0.350	-0.350	-0.350
NH_3	**mg/L**	**-**	**-**	**1.5**	**-**	-0.450	-0.450	-0.450	0.550	1.920
Al	**mg/L**	**-**	**-**	**0.3**	**5**	-0.010	-0.010	0.040	-0.010	-0.010
Fe	**mg/L**	**-**	**-**	**0.3**	**10**	0.935	0.213	0.090	1.590	0.070
Mn	**mg/L**	**-**	**-**	**0.1**	**10**	0.190	-0.010	-0.010	1.630	-0.010

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- **"*"Indicate variables exceeding the IWUL limits and GD-VO Guidelines.**

Average Groundwater Quality for Mooiplaats April 2019 - June 2019										
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**GKL-1**	**GKL-2S**	**GKL-3m**	**GKL-4D**	**GKL-5s**
pH	**-**	**8.78**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	7.30	7.24	* 8.86	8.37	8.14

EC	**mS/m**	**150**	**25**	**170**	**500**	36.73	38.00	72.60	* 268.67	33.40
TDS	**mg/L**	**-**	**-**	**1200**	**3000**	195	207	414	1501	185
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	159	168	10	16	41
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	191.333	166.333	352.067	737.267	154.000
Ca	**mg/L**	**15.18**	**-**	**-**	**1000**	40.267	43.700	1.893	3.053	7.290
Mg	**mg/L**	**6.96**	**-**	**-**	**500**	14.167	14.267	1.290	2.125	5.590
Na	**mg/L**	**61.55**	**-**	**200**	**200**	17.900	15.467	170.460	602.990	61.400
K	**mg/L**	**-**	**-**	**-**	**-**	1.247	0.923	1.337	5.261	1.900
F	**mg/L**	**0.30**	**0.4**	**1.5**	**2**	-0.090	-0.090	* 1.637	* 4.067	0.230
Cl	**mg/L**	**19.97**	**20**	**300**	**3000**	1.717	7.383	12.067	* 433.367	3.620
SO_4	**mg/L**	**0.25**	**30**	**500**	**1000**	4.173	24.667	1.333	-0.500	12.400
NO_3	**mg/L**	**0.07**	**0.5**	**11**	**-**	0.017	-0.350	-0.350	-0.350	-0.350
NH_3	**mg/L**	**-**	**-**	**1.5**	**-**	-0.450	-0.450	-0.450	1.107	-0.450
Al	**mg/L**	**-**	**-**	**0.3**	**5**	0.000	0.037	0.007	0.050	-0.010
Fe	**mg/L**	**-**	**-**	**0.3**	**10**	0.033	0.953	0.143	1.943	-0.010

Mn	**mg/L**	**-**	**-**	**0.1**	**10**	-0.010	0.187	-0.010	0.017	-0.010

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Average Groundwater Quality for Mooiplaats April 2019 - June 2019									
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**GKL-6m**	**GKL-7d**	**GKL-8m**	**GKL-9d**
pH	**-**	**8.78**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	7.54	* 8.96	8.06	8.06
EC	**mS/m**	**150**	**25**	**170**	**500**	26.50	54.00	18.80	20.80
TDS	**mg/L**	**-**	**-**	**1200**	**3000**	138	285	93	103
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	60	1	56	50
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	126.000	224.000	81.600	98.600
Ca	**mg/L**	**15.18**	**-**	**-**	**1000**	16.500	0.220	12.900	11.000
Mg	**mg/L**	**6.96**	**-**	**-**	**500**	4.630	0.100	5.860	5.480

Na	**mg/L**	**61.55**	**-**	**200**	**200**	30.900	121.000	15.000	20.800
K	**mg/L**	**-**	**-**	**-**	**-**	1.170	0.590	1.760	2.220
F	**mg/L**	**0.30**	**0.4**	**1.5**	**2**	* 0.400	* 4.270	0.120	0.090
Cl	**mg/L**	**19.97**	**20**	**300**	**3000**	4.860	9.270	7.920	3.900
SO_4	**mg/L**	**0.25**	**30**	**500**	**1000**	2.680	-0.500	-0.500	-0.500
NO_3	**mg/L**	**0.07**	**0.5**	**11**	**-**	-0.350	-0.350	-0.350	-0.350
NH_3	**mg/L**	**-**	**-**	**1.5**	**-**	-0.450	-0.450	-0.450	-0.450
Al	**mg/L**	**-**	**-**	**0.3**	**5**	-0.010	0.050	-0.010	-0.010
Fe	**mg/L**	**-**	**-**	**0.3**	**10**	0.850	0.580	0.080	0.050
Mn	**mg/L**	**-**	**-**	**0.1**	**10**	0.060	-0.010	0.020	0.020

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Average Groundwater Quality for Mooiplaats April 2019 - June 2019											
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**MPG-B1**	**MPG-B2**	**MPG-B3**	**MPG-B4**	**MPG-B5**	**MPG-B6**
pH	**-**	**8.78**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	6.88	6.42	8.34	7.90	7.68	7.62
EC	**mS/m**	**150**	**25**	**170**	**500**	14.60	102.00	25.80	31.40	25.80	18.50
TDS	**mg/L**	**-**	**-**	**1200**	**3000**	75	695	136	168	126	92
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	35	412	51	79	100	30
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	73.800	42.600	124.400	150.000	124.000	81.800
Ca	**mg/L**	**15.18**	**-**	**-**	**1000**	7.401	78.400	6.530	19.000	25.100	6.520
Mg	**mg/L**	**6.96**	**-**	**-**	**500**	3.980	52.400	8.450	7.600	9.090	3.230
Na	**mg/L**	**61.55**	**-**	**200**	**200**	12.800	61.300	34.300	34.800	10.900	23.300
K	**mg/L**	**-**	**-**	**-**	**-**	3.460	9.750	1.230	1.250	3.110	2.320
F	**mg/L**	**0.30**	**0.4**	**1.5**	**2**	0.220	0.240	0.140	0.150	0.210	0.180
Cl	**mg/L**	**19.97**	**20**	**300**	**3000**	0.870	4.790	3.510	4.230	2.070	5.470

SO_4	**mg/L**	**0.25**	**30**	**500**	**1000**	0.608	* 462.000	2.830	10.400	-0.500	-0.500
NO_3	**mg/L**	**0.07**	**0.5**	**11**	**-**	-0.350	-0.350	-0.350	-0.350	-0.350	-0.350
NH_3	**mg/L**	**-**	**-**	**1.5**	**-**	-0.450	-0.450	-0.450	-0.450	-0.450	-0.450
Al	**mg/L**	**-**	**-**	**0.3**	**5**	-0.010	-0.010	0.050	-0.010	-0.010	0.030
Fe	**mg/L**	**-**	**-**	**0.3**	**10**	1.650	0.980	0.920	0.890	0.810	1.760
Mn	**mg/L**	**-**	**-**	**0.1**	**10**	0.040	-0.010	-0.010	0.040	0.020	0.030

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Average Groundwater Quality for Mooiplaats April 2019 - June 2019											
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**MPG-B7**	**MPG-B8**	**MPG-B9**	**MPG-B11**	**MPG-B13**	**MPG-B14**
pH	**-**	**8.78**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	6.39	* 9.30	8.05	8.04	7.15	* 9.41

EC	**mS/m**	**150**	**25**	**170**	**500**	44.40	107.00	36.50	18.00	6.21	35.50
TDS	**mg/L**	**-**	**-**	**1200**	**3000**	271	657	195	88	28	177
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	140	81	54	58	16	3
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	29.000	39.000	162.000	78.200	25.000	132.400
Ca	**mg/L**	**15.18**	**-**	**-**	**1000**	32.500	6.220	10.300	12.900	3.550	0.500
Mg	**mg/L**	**6.96**	**-**	**-**	**500**	14.300	15.800	6.850	6.210	1.850	0.400
Na	**mg/L**	**61.55**	**-**	**200**	**200**	28.800	175.000	56.200	9.310	3.920	71.300
K	**mg/L**	**-**	**-**	**-**	**-**	3.830	7.750	1.810	2.930	0.840	1.450
F	**mg/L**	**0.30**	**0.4**	**1.5**	**2**	-0.090	0.110	0.170	-0.090	-0.090	0.280
Cl	**mg/L**	**19.97**	**20**	**300**	**3000**	10.600	11.000	7.320	3.120	2.330	3.590
SO_4	**mg/L**	**0.25**	**30**	**500**	**1000**	* 161.000	* 405.000	15.000	3.780	-0.500	-0.500
NO_3	**mg/L**	**0.07**	**0.5**	**11**	**-**	0.370	-0.350	-0.350	-0.350	-0.350	-0.350
NH_3	**mg/L**	**-**	**-**	**1.5**	**-**	-0.450	-0.450	-0.450	-0.450	-0.450	0.680
Al	**mg/L**	**-**	**-**	**0.3**	**5**	-0.010	0.020	-0.010	-0.010	0.030	0.030
Fe	**mg/L**	**-**	**-**	**0.3**	**10**	1.350	0.080	0.100	2.640	0.500	0.200

Mn	**mg/L**	**-**	**-**	**0.1**	**10**	0.040	-0.010	-0.010	0.040	-0.010	-0.010

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Average Groundwater Quality for Mooiplaats April 2019 - June 2019											
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DHSWS Livestock Watering**	**MPG-B15**	**MPG-B16**	**MPG-B17**	**MPG-B18**	**MPG-B19**	**MPG-B20**
pH	**-**	**8.78**	**6.4 – 8.5**	**5.0 - 9.5**	**-**	7.12	8.15	7.38	7.91	7.10	8.36
EC	**mS/m**	**150**	**25**	**170**	**500**	26.80	23.20	18.20	19.80	17.40	* 230.00
TDS	**mg/L**	**-**	**-**	**1200**	**3000**	137	122	87	96	82	1415
Total Hardness	**mg/L**	**-**	**-**	**-**	**-**	95	33	74	72	63	36
Alkalinity	**$CaCO_3$/L**	**-**	**75**	**-**	**-**	97.600	116.000	81.200	89.800	76.000	925.000
Ca	**mg/L**	**15.18**	**-**	**-**	**1000**	18.700	6.592	15.600	17.900	13.700	6.240
Mg	**mg/L**	**6.96**	**-**	**-**	**500**	11.700	4.000	8.430	6.620	7.040	4.930

Na	**mg/L**	**61.55**	**-**	**200**	**200**	15.800	36.200	5.810	8.790	6.740	565.906
K	**mg/L**	**-**	**-**	**-**	**-**	1.380	1.300	0.830	2.560	2.010	4.530
F	**mg/L**	**0.30**	**0.4**	**1.5**	**2**	-0.090	0.120	-0.090	-0.090	0.220	* 10.500
Cl	**mg/L**	**19.97**	**20**	**300**	**3000**	12.200	2.480	5.530	2.630	3.800	69.700
SO_4	**mg/L**	**0.25**	**30**	**500**	**1000**	19.100	-0.500	0.830	3.480	1.050	* 187.00
NO_3	**mg/L**	**0.07**	**0.5**	**11**	**-**	-0.350	-0.350	-0.350	-0.350	0.400	-0.350
NH_3	**mg/L**	**-**	**-**	**1.5**	**-**	-0.450	0.720	-0.450	-0.450	-0.450	1.800
Al	**mg/L**	**-**	**-**	**0.3**	**5**	-0.010	0.130	-0.010	-0.010	-0.010	-0.010
Fe	**mg/L**	**-**	**-**	**0.3**	**10**	-0.010	0.530	1.270	0.270	-0.010	0.060
Mn	**mg/L**	**-**	**-**	**0.1**	**10**	0.050	0.010	0.040	-0.010	-0.010	0.020

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Groundwater in the Mooiplaats area is of relatively good quality. Groundwater in the greater Mooiplaats Colliery area (outside the mining right) remains generally stable with slight seasonal fluctuations and is of relatively good quality accompanied by high pH values and Alkalinity (CaCO3) concentrations (indicating geological conditions).

Although elevated EC and SO_4 concentrations were observed at the groundwater monitoring point towards the Vaal river, **GAD-3s** and **GAD-4m** was unlikely impacted by Mooiplaats Colliery (distance from Mooiplaats and topography).

GKL-4d, **GAD-5d** and **GKL-7d** are boreholes drilled to a depth of 80 meters. The $CaCO_3$, Na and Cl concentrations elevate the pH and EC concentrations, leading to IWUL Limit exceedances. Elevated $CaCO_3$, Na and Cl can most likely be ascribed to geological conditions and not mining pollution.

MPG-B2 and **MPG-B7** located directly east of co-disposal and settling dams recorded increased concentrations where the remainder of groundwater monitoring points recorded stable concentrations and decreases. The water quality will be monitored and investigated to determine if this is a seasonal occurrence.

The water quality will be monitored and investigated to determine the possible source.

Groundwater levels - Monthly groundwater - During the reporting period (April to June 2019) the start of groundwater lowering can be observed from June as groundwater levels reached an overall high during May 2019. The lowering is expected to continue until the commencement of the wet season (December) where after the seasonal trend should continue.

Biannual groundwater – higher levels were observed which can be ascribed to the recharge after seasonal rains. It is expected that seasonal trends (lowering towards November) will continue and irregular levels will be identified. The percentage in groundwater level change can be ascribed to the geology and soil composition at different areas.

Table 23a: Mooiplaats groundwater levels for IWUL monitoring boreholes

Mooiplaats IWUL Groundwater Levels											
Date	**GAD-1**	**GAD-2S**	**GKL-1**	**GKL-2S**	**GKL-3m**	**GKL-4D**	**GKL-5s**	**GKL-6m**	**GKL-7d**	**GKL-8m**	**GKL-9d**
May-18	-4.82	-8.99	-	-4.21	-4.72	-4.65	Not Monitored / No Access				
Jun-18	-4.95	-9.23	-26.44	-4.24	-4.72	-4.68					
Jul-18	-5.07	-9.50	-26.46	-4.29	-4.80	-4.75					
Aug-18	-5.145	-9.66	-26.40	-4.31	-4.83	-4.71					
Sep-18	-5.33	-9.88	-26.48	-4.37	-4.87	-4.74					
Oct-18	-5.48	-10.04	-26.51	-4.43	-4.83	-4.78					
Nov-18	-5.44	-10.18	-26.51	-4.31	-4.68	-3.27					
Dec-18	-5.48	-10.08	-26.51	-4.46	-4.81	-2.73					

Jan-19	-5.26	-9.52	-26.49	-3.82	-4.17	-2.68					
Feb-19	-3.94	-6.57	-26.5	-3.81	-4.61	-2.91					
Mar-19	-5.6	-7.44	-26.47	-3.88	-4.46	-4.34					
Apr-19	-5.6	-7.44	-26.47	-3.88	-4.46	-4.34					
May-19		-6.51	-26.46	-2.85	-3.63	-1.76					
Jun-19	-3.09	-6.93	-26.49	-2.87	-3.7	-2.02	-1.81	-1.41	-9.64	-4.61	-12.38

Evident from Table 23a, all groundwater levels (except **GKL-4d**) showed a slight but continuous lowering in level. all groundwater levels fluctuate according to drilled depth and season.

During the reporting period (April to June 2019) the start of groundwater lowering can be observed from June as groundwater levels reached an overall high during May 2019. The lowering is expected to continue until the commencement of the wet season (December) where after the seasonal trend should continue.

The increase in level at **GKL-4d** can possibly be ascribed to late recharge due to the depth of the borehole (80 meters) or the possible collapse of the borehole casing. The water level will be continuously monitored.

Table 25b: Mooiplaats inner perimeter groundwater levels for additional monitoring boreholes

Mooiplaats Additional Groundwater Levels							
Date	**MPG-B1**	**MPG-B2**	**MPG-B3**	**MPG-B4**	**MPG-B5**	**MPG-B6**	**MPG-B7**
May-18	-1.36	-1.9	-12.15	-12.79	-6.18	-4.67	-1.48
Nov-18	-1.57	-2.32	-12.25	-13.02	-6.58	-4.78	-1.54
Jun-19	-1.73	-1.97	-11.33	-12.12	-5.44	-3.87	-1.69
Date	**MPG-B8**	**MPG-B9**	**MPG-B11**	**MPG-B13**	**MPG-B14**	**MPG-B15**	**MPG-B16**
May-18	-3.08	-11.53	-5.08		-16.61	-4.66	-29.34
Nov-18	-3.46	-12.26	-5.48	-4.94	-18.29	-11.08	-30.73
Jun-19	-2.11	-11.55	-4.4	-3.62	-17.12	-9.56	-29.56
Date	**MPG-B17**	**MPG-B18**	**MPG-B19**	**MPG-B20**	**GAD-3S**	**GAD-4M**	**GAD-5D**
May-18	-5.28	-24.72	-21.27	-2.7	-2.52	-2.62	0
Nov-18	-7.5	-28.74	-25.5	-4.11	-2.605	-2.68	0
Jun-19	-6.31	-27.23	-23.89	-2.73	-1.67	-1.76	0

Evident from Table 25b is the increase in all groundwater levels which can be ascribed to the recharge after seasonal rains. It is expected that seasonal trends (lowering towards November) will continue and irregular levels

will be identified. The percentage difference in groundwater level change can be ascribed to the geology and soil composition at different areas.

7.11 WETLANDS

The project area and associated wetlands are situated in the upper reaches of the Vaal River catchment. These systems form part of the Upper Vaal Water Management Area and are zoned under Quaternary catchment C11B. In the north (existing mining area) water drains in a north-easterly direction towards the Witpuntspruit. This river runs to the north of the project area before merging with the Vaal while in the south, a network of seeps and valley-bottom wetlands direct water towards the Vaal River Floodplain. This large, well developed floodplain flows in a south-westerly direction, effectively bisecting the expansion area. A further 6.5 km downstream it is joined by the Klein Vaal. The deeply incised topography of the expansion area has likely aided in the protection of its wetland systems which remain, for the most part, in a relatively intact state. Baseline Studies by Gradient Consulting, (2019) suggest that the overall ground and surface water quality is good with most analysed parameters falling below the SANS 241:2015 limits with exception of a few locations where fluoride, nitrate as well as heavy metals i.e. manganese and iron are elevated.

Four main hydrogeomorphic types namely floodplains, channelled and unchanneled valley bottoms, seeps and depressions were identified and delineated by a Wetland and Aquatic Assessment study (The Biodiversity Company, 2019) undertaken for the project. A total of 9 HGM units were identified for the project. Wetland systems were grouped and assessed per drainage areas associated with the main watercourses into which they drain, namely the Vaal (located centrally), Witpuntspruit (situated in the north) and Vaal Southern Tributary (located in the south-west). The largest grouping of HGM units is associated with the Vaal River Floodplain which effectively bisects the expansion area. In total over 68 discrete wetland areas were delineated during the survey within the project area and surrounding 500 m regulated area.

Desktop information indicates that the Witpuntspruit is largely modified, and that the Vaal River reach considered in this study is moderately modified. The Ecostatus determination indicated that the Witpuntspruit was in a moderately modified state. This was attributed to serious water quality and flow modifications to the reach, furthermore, the presence of a largely intact macroinvertebrate and fish communities indicated stable, but modified conditions. Overall, the Vaal River Floodplain provides by far the highest ecosystem services and was assigned a rating of High. All other HGM units provide Moderately High levels of ecosystem services. Most of the wetland systems associated with the Vaal are in a relatively good state and were assessed as Moderately Modified (C). The two northern HGM units associated with the Witpuntspruit (within the existing mine area) are impacted by the presence of the mine and were rated as Seriously (E) and Moderately Modified respectively.

The study found that the Vaal River reach assessed was in a moderately modified state. This was attributed to habitat modifications within the reach, as aquatic biota was found to be largely natural to moderately modified. Several key macroinvertebrate taxa were absent from the system, indicating moderate to long term impacts. Spatial and temporal trends of the study indicated that a deterioration of water quality was observed between the up and downstream sites on the Witpuntspruit, indicating an influx of pollutants from the Mooiplaats Colliery as observed by elevated dissolved solids at one of the sites.

The proposed mining operations will be underground with no surface access points. It has been assumed that the mining depths and board & pillar sizes will be adequate to mitigate any expected risks to wetlands. Further to

this, the implementation of the proposed mitigation measures will reduce the level of risk to a Low Risk level post mitigation for all phases of the project.

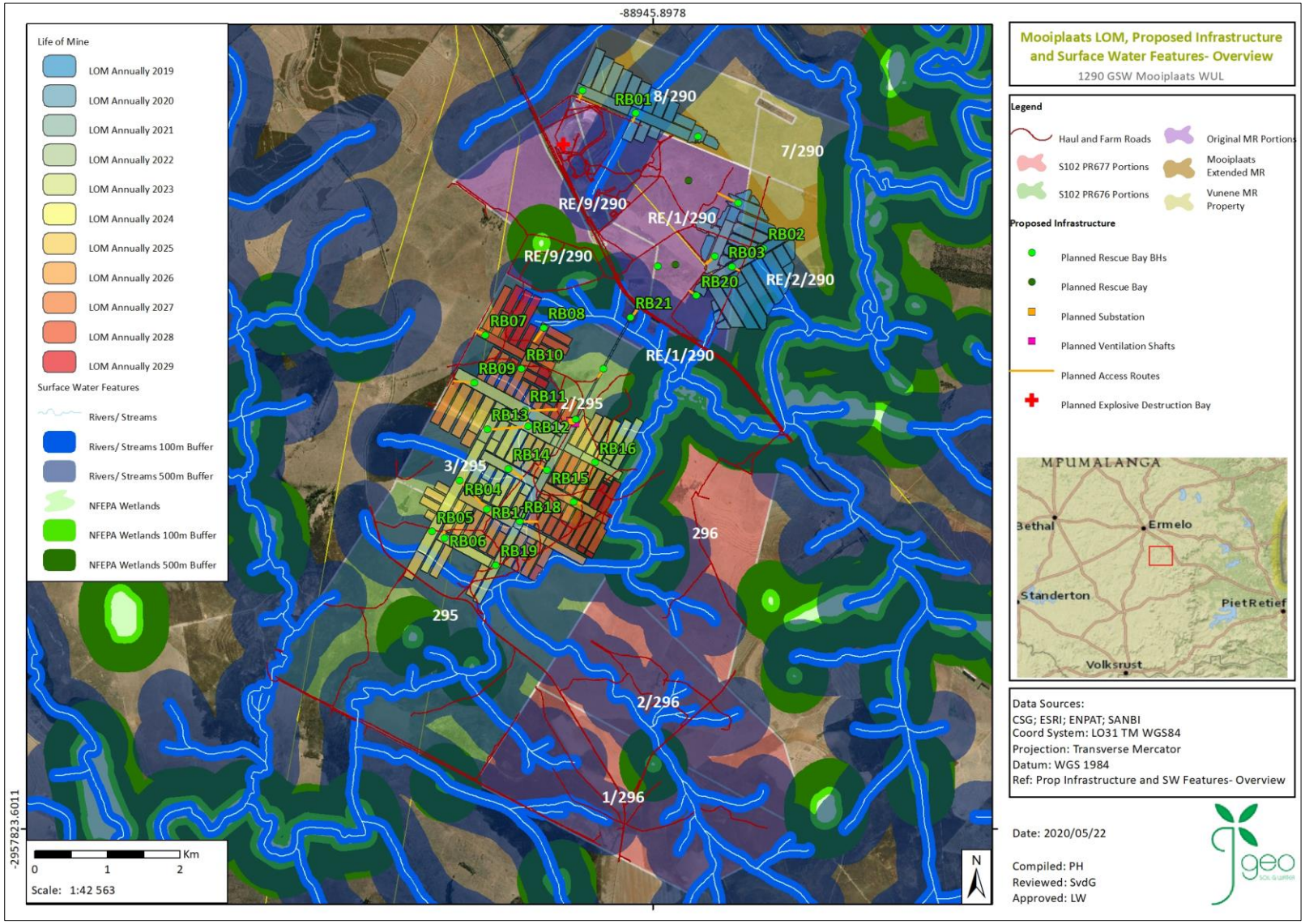


Figure 28: NFEPA wetlands within the mining right boundary of the Mooiplaats Colliery and the Vunene project area

7.12 VISUAL

At present the visual character of the area is dominated by agricultural activities (maize cultivation and grazing of cattle), as well as mining related infrastructures such as the existing plant area and existing coal discard facilities. As the Mooiplaats Colliery Vunene project includes underground mining only, limited deterioration in aesthetic quality will be witnessed by the persons located in close proximity of the mine site. The visual impact of the proposed project is relatively low.

The visual appearance of the towns in the area, particularly as viewed from the main roads through them, is often unattractive, due to litter and poor solid waste management, lack of landscaping, urban decay and poor-quality, uncontrolled development.

7.13 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 vibrations need to be evaluated. Their impact on structures, people and animals also need to be evaluated. A concern on the impacts of blasting was raised by AFGRI as they have a silo located approximately 2.73 km east of the Mooiplaats mine (see Figure 29). A blast specialist study was undertaken at the Manungu Colliery which concluded that no ground vibrations generated at the mine are not capable of causing damage to buildings at a distance of more than 2 km.

The following mitigating measures should be implemented to minimise impacts associated with blasting and vibrations:

- The use of a continuous miner will reduce the need to blast however should blasting be required, a drilling and blasting standard operating procedure (SOP) will need to be developed for the mine;
- A pre-and post-blast checklist must be completed in by the responsible blaster and signed off by the responsible managers.
- 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 must be used;
- Blast designs should be continuously re-evaluated according to prevailing conditions and geological conditions; and
- Climatic conditions and time of day must be considered before a blast is undertaken

7.14 NOISE

The area is uniformly rural with the processing plant at the Mooiplaats North Shaft Complex being the most significant noise source in the area. Other noise sources include the Camden Power Station, the railways line running through the study area and the N2 highway. The proposed Mooiplaats Colliery Vunene Project will not result in increased noise levels, due to the underground mining activities making use of the existing infrastructure at the Mooiplaqts Colliery.

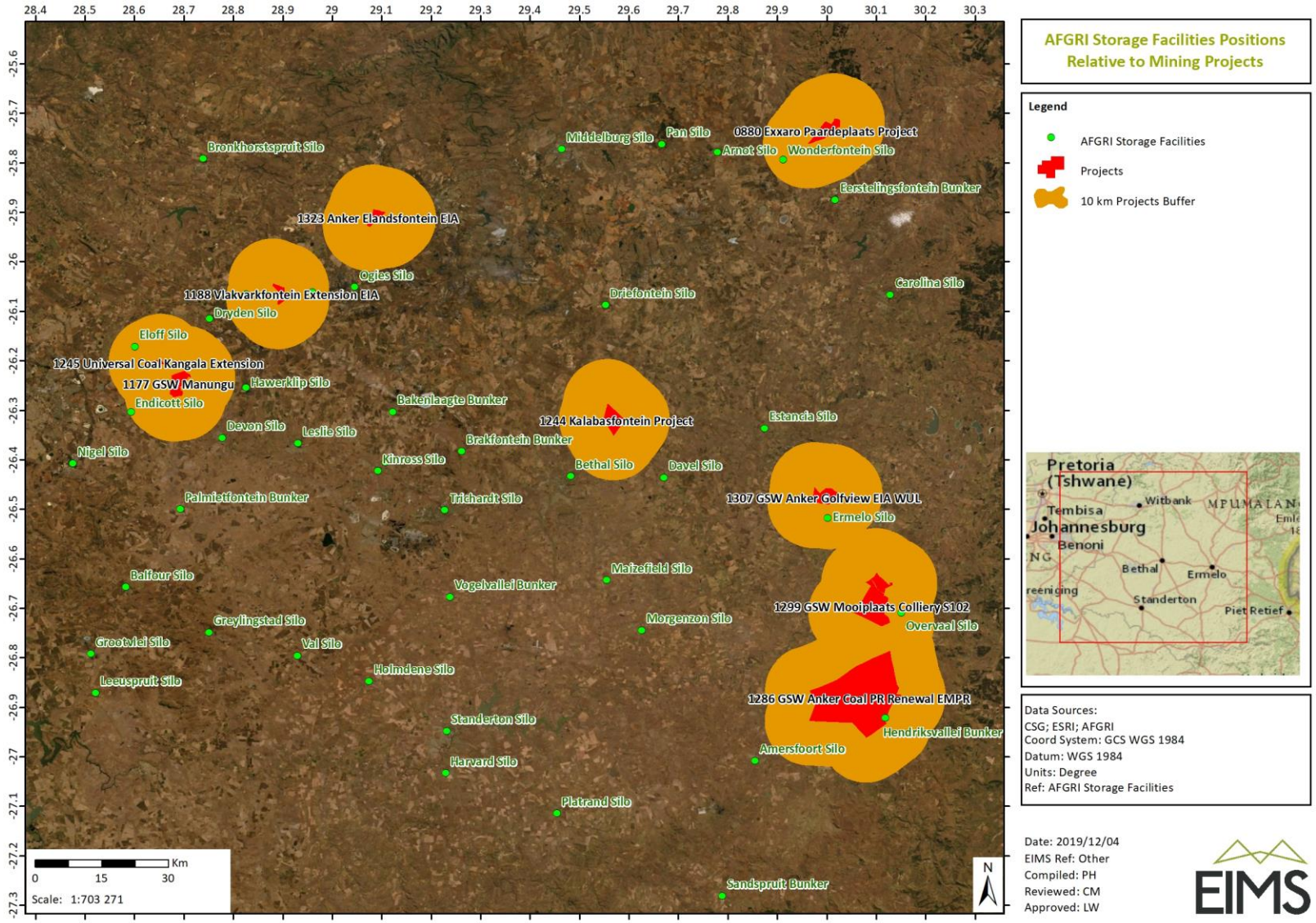


Figure 29: Location of AFGRI Silos in relation to adjacent mining projects.

7.15 AIR QUALITY

Mining operations like drilling, blasting, hauling, and transportation are the major 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.

Nuisance dust can reduce visibility; soil 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.

As Mooiplaats Colliery is an existing mine, dust monitoring is conducted on a monthly basis. Figure 30 below indicated the dust monitoring points on the Mooiplaats Colliery, while Table 24 provides a 30-Day Average Dust Fallout Rates for the reporting period April 2018 to March 2019.

Figure 30: Location and compliance of dust fallout monitoring sites relative to Mooiplaats Colliery

Table 24: Mooiplaats Colliery: 30 Day Average Dust Fallout Rates for the reporting period April 2018 to March 2019

Mooiplaats Colliery Dust Fallout Monitoring 2018/19											
Period	**NDCR, 2013Residential: 600 mg/m²/day**	**NDCR, 2013Non-residential: 1200 mg/m²/day**	**East**	**West**	**Office**	**Weigh-bridge**	**Shaft**	**South**	**North**	**East PCD**	**Monthly Average**
Apr-2018			265.0	495.0	116.0	124.0	109.0				**221.8**
May-2018			76.0	136.0	60.0	245.0	70.0				**117.4**
Jun-2018			55.8	214.6	167.4	262.2	150.1	Not Included in Monitoring Plan			**170.0**
Jul-2018			74.2	100.8	122.2	NR	144.3				**110.4**
Aug-2018			214.1	594.4	287.6	750.0	248.6				**419.0**
Sep-2018			137.1	352.0	479.4	NR	278.6	141.7	36.1	48.9	**210.5**
Oct-2018			334.9	411.9	526.5	366.1	427.1	101.7	107.4	101.7	**297.2**
Nov-2018			102.1	322.5	833.6	806.8	318.5	73.3	64.3	79.2	**325.0**
Dec-2018			220.8	225.3	42.4	151.2	506.1	131.6	170.4	209.2	**207.1**
Jan-2019			503.7	130.2	113.3	226.8	87.2	51.1	463.9	4.7	**197.6**
Feb-2019			728.9	130.9	127.3	239.7	282.3	5.1	16.0	3.8	**191.7**
Mar-2019			76.2	323.7	12.3	78.1	16.4	14.1	27.7	3.9	**69.1**
Annual Average			**232.4**	**286.4**	**240.7**	**325.0**	**219.8**	**74.1**	**126.5**	**64.5**	**196.2**

*** NDCR, 2013- National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004). National Dust Control Regulations 2013.**

**** Values highlighted in yellow exceeded the NEMA: AQA Residential Standards.**
***** Values highlighted in red exceeded the NEMA: AQA Industrial Standards.**
NR – No Result due to theft of the dust bucket, or the contents of the dust bucket has been compromised by foreign objects.

None of the dust monitoring points exceeded the NDCR, 2013 Non-residential limit in terms of individual results or annual averages.

All annual dust fallout averages remained below the NDCR, 2013 Non-residential and Residential Limits. The Residential Limit was exceeded only five percent (four occasions) of monitoring occasions. Once at **East** (Feb-19), once at **Office** (Nov-18) and twice at the **Weighbridge** (Aug-18 and Nov-19).

Evident from the results, dust fallout and the intensity thereof are directly ascribed to environmental conditions (season, vegetation type and coverage, terrain, etc.) and human activities (mining, industry, farming, etc).

The **Weighbridge** and **Offices** are located within 100 and 200 meters south and east of the plant and shaft area (high activity zones) and are expected to receive the highest dust fall due to its locations. Large herds of Cattle are grazing the camp in the area of the **East** monitoring point. The dust monitoring points on the perimeter recorded the lowest dust fallout where dust monitoring points closer to mining activities recorded higher dust fallout.

The highest monthly dust fallout was recorded between August and November, in line with the dry season, highest average wind speeds, highest wind gusts and lower than expected rainfall (also leading to low vegetation growth) during October and November. On annual average, **28%** winds had the potential to raise dust spontaneously (>5m/s) with highs reached in August, September and November of **53.3%, 44.4%** and **40.1%** respectively.

The average annual wind speed was **4.43 m/s** with highs reached in August, September and November of **5.89 m/s, 5.36 m/s** and **4.85 m/s** respectively. The highest/fastest wind gusts were **27.2 m/s** (April), **23.1 m/s** (September) and **22.4 m/s** (November).

The average wind direction fluctuated between northwest to north to northeast to east with **east** being the most dominant during the annual reporting period.

7.16 CLIMATE CHANGE

A Greenhouse Gas (GHG's) emissions report for the period ending 31 December 2018 was compiled by GSW. This report aimed to comply with the requirements of the National Greenhouse Gas Emission Reporting Regulations (GNR 275), by reporting on the greenhouse gas emissions and activity data for each of the relevant greenhouse gases and IPCC emission sources for all of its facilities.

As previously discussed, Mooiplaats Colliery is an underground coal mine that utilises the board and pillar mining method. Access to the underground workings is obtained through a decline box cut that is situated near the northern boundary of the Mooiplaats property.

Sources of GHGs at the Mooiplaats Colliery include the liberation of carbon dioxide (CO_2) during fossil fuel combustion; as well as fugitive methane (CH_4) emissions from coal mining. The use of explosives in mining also leads to the release of GHGs. It should however be noted that emissions from explosives are not specifically identified as a reportable source in the GHG Regulations and associated Guidelines. Consequently, the emissions related to explosive use were excluded from this annual 2018 report.

Table 2 presents the relevant GHG emissions expected from the mining operation. The emissions are presented for the relevant greenhouse gasses. In order to obtain a consolidated and uniform measure of the GHG contributions it is necessary to report on total GHG emissions as a measure of CO_2 equivalent (CO_2e). In this respect the GHG emissions are converted into CO_2e by using the IPCC 3rd Assessment Reports Global Warming Potential values. In relation to the gases reported on for this project the respective values are presented in Table 25.

Table 25: Global warming potential values.

Greenhouse gas		Global warming potential (over 100 year time horizon)
Carbon Dioxide	CO_2	1
Methane	CH_4	23
Nitrous oxide	N_2O	296

Using the GWP values presented in Table 25, the total GHG emissions in CO_2e are:

- Fuel used for coal mining: 432.39 tons CO_2e.
- Coal mining: 4909.11 tons CO_2e.
- **Total GHG emissions: 5341.49 tons CO_2e**

Table 26: GHG Regulations Annexure 3 reporting

IPCC Code	Sub-category	Activity data:			Emissions (Tonnes / year)								
		Name	Value	Units	GHG 1- CO2			GHG 2- CH4			GHG 3- N2O		
					Value	Tier	Ref	Value	Tier	Ref	Value	Tier	Ref
1A1cii	Fuel used for coal mining	Diesel usage	152646.00	litres	430.95	1	IPCC	0.02	1	IPCC	0.003489488	1	IPCC
1B1ai1	Fugitive emissions from underground coal mining - Coal mining	RoM Coal production	331079.00	tonnes	50.48	1	IPCC	170.80	1	IPCC	0	N/A	
1B1ai2	Fugitive emissions from underground coal mining - Post mining (handling, processing, storage, transport)	RoM Coal production	331079.00	tonnes	11.80	1	IPCC	39.93	1	IPCC	0	N/A	

Table 26 above indicates the GHG Regulations Annexure 3 reporting.

The carbon tax formula, as presented in the Carbon Tax Bill is as follows:

$$X = \{(E - D - S) \times (1 - C) \times R\} + \{P \times (1 - J) \times R\} + \{F \times (1 - K) \times R\}$$

Where the following applies:

"X" represents the amount to be determined that must not be less than zero.

"E" represents the number in respect of the total fuel combustion related greenhouse gas emissions of the taxpayer in respect of that tax period expressed as a carbon dioxide equivalent determined in terms of section 4(1)(a).

"D" represents the number in respect of the petrol and diesel related greenhouse gas emissions of that taxpayer in respect of that tax period expressed as a carbon dioxide equivalent, determined in terms of section 4(1)(a).

"S" represents the number in respect of greenhouse gas emissions, expressed in terms of carbon dioxide equivalent that were sequestrated in respect of that tax period as verified and certified by the Department of Environmental Affairs.

"C" represents the sum of percentages of allowances determined in terms of sections 7, 10, 11, 12, and 13 in respect of that tax period subject to section 14.

"R" represents the rate of tax prescribed under section 5.

"P" represents the number in respect of the total industrial process related greenhouse gas emissions of the taxpayer in respect of that tax period expressed as a carbon dioxide equivalent determined in terms of section 4(1)(c).

"J" represents the sum of the percentages of the allowances determined in terms of sections 8, 10, 11, 12 and 13 in respect of that tax period, subject to section 14.

"F" represents the number in respect of the total fugitive greenhouse gas emissions of the taxpayer in respect of that tax period expressed as a carbon dioxide equivalent determined in terms of section 4(1)(b).

"K" represents the sum of the percentages of the allowances determined in terms of sections 7, 9, 10, 11, 12 and 13 in respect of that tax period, subject to section 14.

On the basis of this the tax calculation for Mooiplaats Colliery is as follows:

$$X = \{(0 - 432.385893 - 0^{1}) \times (1 - 0.6) \times 120\} + \{0 \times (1 - 0) \times 120\} + \{4909.10698 \times (1 - 0.1) \times 120\}$$

This tax calculation includes the basic tax-free allowances of 60% and 10% applicable to fossil fuel combustion emissions and fugitive emissions respectively. Depending on the applicability of the other tax-free allowances the mine can achieve up to a maximum allowance of 35%. Table 27 represents the estimated carbon tax for the Mooiplaats Colliery.

[1] In accordance with Section 6(1) of the Carbon Tax Bill, where E-D-S<0, the number must be 0.

Table 27: Estimated Carbon Tax.

Tax range	Applicable allowances	Calculated tax
Maximum	60% on fossil fuel combustion emissions. 10% on fugitive emissions. Total Allowance 70%	R530 183.55
Minimum	10% on fugitive emissions. 10% trade exposure allowance. 5% performance allowance. 5% carbon budget allowance. 5% offset allowance. Total allowance: 35%	R382 910.34

This calculation represents an estimation based on the GHG emissions presented in this report. It is recommended that these calculations are reviewed and verified by a qualified tax practitioner prior to making reliance on these.

7.17 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 Msukaligwa Local Municipality as well as the Gert Sibande District Municipality. The information provided in the IDP's and the Stats SA website are based on a 2011 National census and well as the 2016 Community Survey[2].

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*

[2] 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 2017-2022 is still in draft mode and may be updated after review.

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. Table 28, presents a summary of the socio-economic aspects which may have a bearing on the proposed project.

Table 28: Summary of the socio-economic aspects (Msukaligwa Local Municipality, 2017)

Aspect	Local Municipality		
District Municipality	Gert Sibande District Municipality		
Province	Mpumalanga Province		
Municipal Area Size	6016 km^2		
Number of Wards	19 wards		
Population Size	164 608		
Number of households	51 809		
Estimated growth/change in population size from 2001	~31.9%		
Population composition	Black African (91.7%), White (6.7%), Colored (0.6%), Indian or Asian (0.9%)		
Languages	Main languages spoken are isiZulu, Afrikaans, SiSwati and English		
Age	Age group 0 – 14 comprising 28% of the total population and 15 – 34 comprising of 41%, while 26% is between 35 and 64 years and 5% is 65 years and above		
Gender	50.39% female, 49.61% male		
Education	Education Indicators	2001	2011

Aspect	Local Municipality		
	Number of people 15+ with no schooling	18 125	12 213
	% Population 15+ with no schooling	21.7%	8.2%
	% Population 15+ with matric and post matric qualification (%)	20.5%	23.6%
	% Functional Literacy rate (%)	58.1%	51.4%
Land use			
Housing	The predominant settlement type is a house or brick structure on a sepatate stand, followed by traditional dwelling/hut structure, flats, townhouse, backyard room or house then informal settlements. Overall, it is estimated that the housing is 75% formal and 26% informal dwelling type.		
Urban development	According to the SDF as well as previous plans of the municipality, the area South to South West of Ermelo town between and along the N11 and R36 roads is a land earmarked for future urban development. Also East of Ermelo town along the N2 Piet Retief Road the area is earmarked for urban housing development. Currently there are number of vacant stands for residential and business development besides the proposed land for future development. Wesselton as a dormitory township for Ermelo, there is also land earmarked for future urban development bounded by N11, Hendrina Road on the West. The said land is owned the municipality and a portion further to the East of this land is privately owned.		
Energy	By February 2017, nearly seven million households had been connected to the grid and now have electricity. The successful execution of Eskom's Build and Maintenance programmes helped to ensure stability and an end to load-shedding. Work is continuing to ensure energy security. Renewable energy forms an important part of the energy mix, which also includes electricity generation from gas, nuclear, solar, wind, hydro and coal. Government is committed to the overall Independent Power Producer Programme and is expanding the programme to other sources of energy, including coal and gas, in addition to renewable energy. Eskom will sign the outstanding power purchase agreements for renewable energy in line with the procured rounds.		

Aspect	Local Municipality
Access to water	The municipality had over the past years through the District and in partnership with relevant spheres of government strived to meet the millennium target in ensuring access to water for all by 2015. In striving to achieve this target, the municipality has managed to reduce the water backlog to 9%. Though the 9% reflect as a backlog, these affect communities at the farms/rural areas of the municipality where water has been provided through boreholes but below the RDP level. Provision of clean drinking water (potable water) is almost addressed with few challenges more especially at rural / farmlands within the municipality. In providing Water, the Municipality shall ensure that water is provided to schools, clinics and all other social amenities. It is therefore ensured that prior to approval of construction of clinics and schools there is water provided to such amenities more especially ensuring that farm schools have water where the farm owners cannot provide. The municipality is a water services authority and therefore responsible for supply of water within its area of jurisdiction.
Nearby towns	Breyton, Camden, Davel, Wesselton, Ermelo, Phumula, KwaZanele
Percentage employment	41,698 in 2011
Percentage unemployment	Unemployment rate stood at 26.8% in 2011 which has decreased by 4.4% to 22.4% in 2016
Largest Employing sector	Agriculture
Largest economic contribution	Transport
Tourism	Government has identified tourism as a key job driver. Tourist arrival numbers for January to November 2016 increased to nine million, an increase of just over a million arrivals from 2015. This represents a 13% growth in tourist arrivals

8 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 are 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 5.3, the need for the proposed project includes the following key drivers:

- The importance of coal as a resource; and
- The continued livelihood of community members working at 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 8.5.1).

8.1 DETAILS OF LOCATION ALTERNATIVES

The section below describes the site / location alternatives considered as part of the project. As indicated above, Mooiplaats 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.

8.1.1 CONSIDERATION OF PROPERTY

No alternative properties were considered for this mining right application as the Vunene area lie adjacent to the Mooiplaats Colliery.

8.1.2 LOCATION, LAYOUT OR DESIGN OF THE ACTIVITY

As can be seen in Figure 31, the purple area is the existing Mining Right under ownership of Langcarel, while the light-green and red indicate the PR right areas, now known as Mooiplaats South. The Vunene areas lie adjacent to the Mooiplaats Colliery and due to the location of the N2 highway will be able to be easily accessed by the Mooiplaats Colliery.

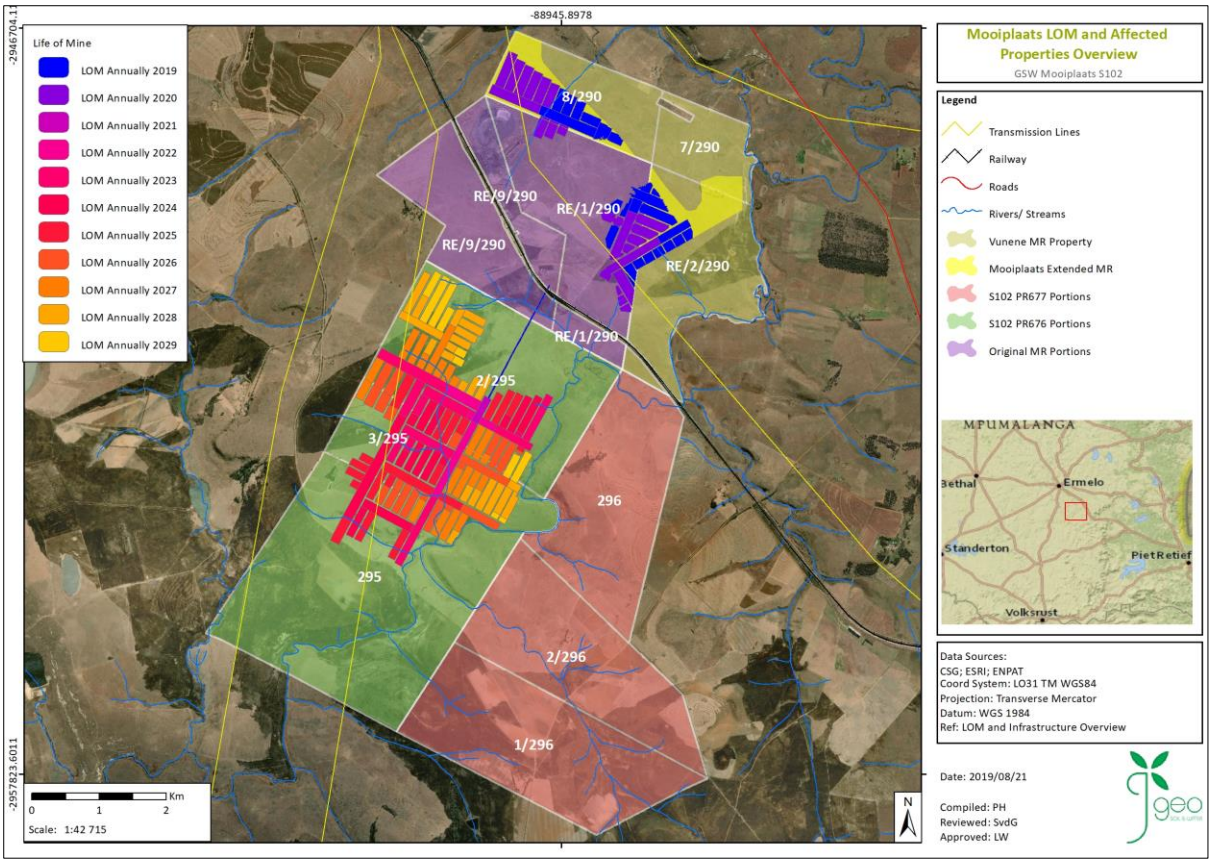


Figure 31: LoM of Mooiplaats Colliery indicating the location of the underground resources

8.2 LAND USE ALTERNATIVES

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. Vunene currently holds a mining right over the proposed extension area of the Mooiplaats Colliery, however, due to the difficulty of accessing the resources from Vunene Colliery, it is a practical development alternative for the future mining for the Mooiplaats Colliery. 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.

8.2.1 MINING

Mining is one of the predominant land uses within the surrounding area. Several active mines, predominantly coal mines, are located within 60 km of the project area. The mining operations located in the surrounding area can be categorised as open cast and underground operations with surface access nodes. Additional supporting infrastructure is also present and includes mineral processing plants, slurry and co-disposal facilities, conveyor routes, haul roads, offices, pipelines and powerlines. Furthermore, the proposed application area has been impacted by historic prospecting operations. The Mooiplaats Colliery Vunene Project will allow for the optimum mining and usage of mineral resources which still remain in the vicinity of the Mooiplaats Colliery and supply coal to the Camden Power Station, as well as the international market. As such, mining can be considered a feasible land use alternative within both the application area and surrounding area.

8.2.2 MIXED LAND USE (MINING AND AGRICULTURE)

Mining and agriculture have been identified as the predominant land uses within the immediate and surrounding area. The character of the application area confirms this finding, with agriculture being the dominant land use on site and historic mining also having been undertaken by Mooiplaats Colliery. As a land use, mining is often viewed as directly competing and eventually replacing existing land uses. However, the nature of the proposed Mooiplaats Colliery Vunene project (underground) provides an opportunity in which both feasible land uses, namely agriculture and mining can potentially be conducted concurrently. The proposed Mooiplaats Colliery Vunene project already has existing access into the mine and the underground coal seams will be extracted at a depth of 100m. Due to the existing infrastructure on Mooiplaats Colliery and with the vast majority of mining taking place deep underground, relatively little surface disturbance is expected to take place which will allow for the potential continuation of agriculture as a land use while mining activities are underway. Furthermore, due to the expected depth of mining the risk of subsidence is also greatly reduced. The surface area required for mine infrastructure is also greatly reduced as there will be no mineral processing facilities or Tailings Dam on the site. The practicalities of undertaking two concurrent, demanding land uses such as agriculture and mining are likely to require detailed management of operations to ensure the feasibility of both land uses, but it is potentially possible. As such, a mixed land use of mining and forestry can be considered a feasible land use alternative within both the application area and, possibly, the surrounding area.

8.3 DETAILS OF MINING METHOD ALTERNATIVES

Longwall mining and bord-and-pillar mining are two of the basic methods of mining coal underground and both methods are well suited to extracting the relatively flat coalbeds (or coal seams). These two mining methods were considered and assessed for the underground mining at the Mooiplaats Colliery Vunene project. Due to the high capital cost and its suitability for much deeper coal fields, longwall mining has not been considered and assessed further in the EIA Phase. Board and pillar mining was found to currently be the most reasonable and feasible alternative.

8.4 TECHNOLOGY ALTERNATIVES

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.
- **Technology Alternative T2b** – *Rail:* This option would involve transport of the coal by rail utilizing a railway siding.
- **Technology Alternative T2c -** *Use of conveyor:* This option would involve transport of the coal by conveyor to the buyer. There is an existing coal conveyor network within close proximity to the mine.

The coal from Mooiplaats Colliery is currently transported from the underground mining area to the surface near the wash plant via the conveyor system. The coal is trucked from the mine to Delta Siding for railway transportation

to various local and international markets. The Mooiplaats Colliery Vunene Project will therefore make use of all three of these alternatives.

8.5 ACTIVITY ALTERNATIVES

The following activity alternatives have been considered in the EIA phase.

8.5.1 ALTERNATIVE 1: NO GO ALTERNATIVE

This alternative will imply that no development takes place and that the environment remains unchanged and unaltered. The proposed development site for the Mooiplaats Colliery Vunene project area comprises a mixture of "undisturbed" natural vegetation and land used for cultivation. It is worth noting that other than the isolated wetland and grassland areas, the proposed project area is located in areas dominated by agriculture with consequently low overall biodiversity. If the development should not take place, no additional socio-economic benefits will be created by mining activities in the area, the mineral resource will be lost, and the additional GDP from the coal export will be compromised. Further implications of the No-Go alternative include the loss of economic input into the area and a loss of regional socio-economic benefit.

8.5.2 ALTERNATIVE 2: MAXIMUM MINE PRODUCTION

In this alternative, the mining and production of coal is emphasised, and mining is considered to have replaced the dominant agriculture land use. Less restrictive mitigation measures will be used to protect the environmental features, thus allowing for maximum coal production and promotion of economic aspects. This approach will increase the financial viability of the proposed Mooiplaats Colliery Vunene project at the potential cost of impacting more severely on environmental features. This alternative is likely to impact more on aspects such as hydrology, air quality and the isolated pockets of biodiversity, as mining operations will likely move through these sensitive environmental features.

8.5.3 ALTERNATIVE 3: SENSITIVITY PLANNING APPROACH

This alternative will emphasise resource protection and use stringent mitigation measures to minimise identified adverse impacts. This alternative will use specialist planning and evaluation of the following in order to avoid impacting on consolidated sensitive environmental features:

- Mining footprint;
- Mining methodology (Long Wall Mining vs Bord and Pillar Mining);
- Pipeline placement;
- Pollution control dam and return water dam placement;
- Bulk water supply requirements;
- Transport; and
- General infrastructure requirements.

This alternative will allow for the proposed development of the Mooiplaats Colliery Vunene project whilst protecting identified consolidated sensitive environmental features as indicated in the consolidated sensitivity map. The concept of *in-situ* conservation and biodiversity off-sets to account for significant residual impacts may also be explored. In

addition, this alternative will consider the continuation of agricultural activities (grazing and cultivation) on the surface and use the consolidated sensitivity map to assist in the design, layout, and planning of the proposed Mooiplaats Colliery Vunene project.

8.6 PREFERRED ALTERNATIVES

Based on the findings from the scoping study several of the alternatives presented in Section 8.1 to Section 8.5 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 29: Alternatives Considered in EIA. Note that the "do-nothing" alternative is assessed in Section 8.5.1 above and is not considered to be preferred or discussed further. Table 29 shows the other alternatives considered in this EIA report:

Table 29: Alternatives Considered in EIA

Alternatives Considered in the EIA	
Land Use Alternatives	Alternative A1 – Mining
	Alternative A2 – Mixed Land Use (Mining And Agriculture)
Technology Alternatives	Alternative T2a – Road
	Alternative T2b – Rail
	Alternative T2c - Use of conveyor
Activity Alternatives	Alternative 1: No Go Alternative.
	Alternative 2: Maximum Mine Production.
	Alternative 3: Sensitivity Planning Approach.

8.7 FINAL ALTERNATIVE SELECTION

This section describes the advantages and disadvantages of various alternatives described above. Input from specialists was obtained to complete this section. The findings are presented here in Table 30 including recommendations regarding the preferred alternatives.

Table 30: Summary of alternative options assessment

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
Alternative A1 – Mining	Economic advantages: continued employment for mine workers. Additional GDP from the coal export. Contribution to power supply industry.	Potential for geohydrological and chemical modification in local aquifers. Contamination of groundwater resource Temporary reduction in groundwater quantities.	The practicalities of undertaking two concurrent, demanding land uses such as agriculture and mining are likely to require detailed management of operations to ensure the feasibility and sustainability of both land uses, but it is potentially possible. As such, a mixed land use of mining and agriculture can be considered a feasible land use alternative within both the application area and, possibly, the surrounding area.
Alternative A2 – Mixed Land Use (Mining And Agriculture)	Economic advantages: concurrent production and employment in mining and agriculture for local workers.	Increased risk for water contamination and subsequent wetland and aquatic ecological degradation Potential for geohydrological and chemical modification in local aquifers. Contamination of groundwater resource Temporary reduction in groundwater quantities.	
Alternative T2a – Road	Flexible to deliver to any market (e.g. power stations). Limited anticipated soil, aquatic and wetland impacts - existing road network.	Dust impacts due to vehicle entrainment will be higher than conveyor and rail option. Road safety and traffic impacts.	The coal from Mooiplaats Colliery is currently transported from the underground mining area to the surface near the wash plant via the conveyor

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
	Current method employed on portions of the mine for transportation of product.	Damage to local and regional road infrastructure.	system. The coal is trucked from the mine to Delta Siding for railway transportation to various local and international markets. The Mooiplaats Colliery Vunene Project will therefore make use of all three of these alternatives.
Alternative T2b – Rail	Current method employed on portions of the mine for transportation of product. Limited to no dust impacts due to vehicle entrainment.	Rigid/inflexibility of rail routes. Intermediate loading and/or unloading involves greater cost and time.	
Alternative T2c - Use of conveyor	Current method employed on portions of the mine for transportation of product. Limited to no dust impacts due to vehicle entrainment	Water consumption and contamination due to dust suppression	
Alternative 1: 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.	If the development should not take place, no additional socio-economic benefits will be created by mining activities in the area, the mineral resource will be lost, and the additional GDP from the coal export will be compromised. Further implications of the No-Go alternative include the loss of economic input into the area and a loss of regional socio-economic benefit.	The most appropriate development alternative is considered to be Alternative 3: Sensitivity Planning Approach which utilises the Consolidated Sensitivity Map generated with both specialist and EIMS input as a planning tool. The sensitivity map is based on a desktop assessment as well as specialist input.

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
Alternative 3: Sensitivity Planning Approach.	A commercial mining operation with a sustainable life of mine; Provision of sustainable employment and employment retention; On-going economic input into the immediate and surrounding area; Improvement of existing infrastructure; Local economic development through the implementation of the SLP; Economic injection into the region in terms of small business enterprise development; and On-going supply of both export quality coal and coal for the domestic South African market.	Numerous potential significant negative social and environmental impacts; Limited duration of socio-economic benefits; Additional water use requirements; Rezoning of land required; Changes to existing land use and land character; Long-term environmental liability; and Residual/latent environmental impacts that require management and monitoring post mining.	

9 ENVIRONMENTAL IMPACT RISK ASSESSMENT

The following potential impacts were identified during the scoping and impact assessment phases. The impact assessment matrix is included in Appendix 4 and the below subsections describe each impact in more detail. Alternative 1 is the no-go alternative and hence the impact associated with this alternative are rated as zero.

9.1 APPROACH AND METHODOLOGY

This section presents the proposed approach to assessing the identified potential environmental impacts with the aim of determining the relevant environmental significance.

9.1.1 METHODOLOGY

The impact assessment 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:

$$\mathbf{C= \frac{(E+D+M+R)}{4} \times N}$$

Describing the impacts in terms of the above criteria, provides a consistent and systematic basis for the comparison and application of scoring impacts. The rating for each criterion is provided in Table 31.

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 31.

Table 31: Criteria for determining 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),

Aspect	Score	Definition
	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 or natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	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 32.

Table 32: Probability scoring

Aspect	Score	Definition
Probability	1	Improbable (the possibility of the impact materializing 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 33: 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 in Table 34.

Table 34: 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.

9.1.2 IMPACT PRIORITISATION

In accordance with the requirements of Appendix 3(3)(j) of the NEMA 2014 EIA Regulations (GN R. 982), as amended, and further to the assessment criteria presented in the Section 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 35: Criteria for determining 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.
	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.

Irreplaceable loss of resources (LR)	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 in Table 36. 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 (Table 36).

Table 36: 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).

Table 37: Final environmental significance rating

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).

9.2 IDENTIFICATION OF IMPACTS

This section presents the potential impacts that have been identified during the EIA Process. It should be noted that this report will be made available to I&AP's for review and comment and their comments and concerns will be addressed in the final EIA Report submitted to the DMRE for adjudication. These impacts were identified by the EAP, the appointed specialists, as well as the public. Table 38 provides the list of potential impacts identified.

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 38: 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 for ventilation shaft Planned placement of infrastructure Ventilation shaft		• 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			• Perceptions and Expectations. • Employment Opportunities. • Inability of the community to capture economic benefits & managing expectations.	

	Integration with Municipalities' strategic long-term planning				
Earthworks (Construction)	Stripping and stockpiling of soils (Ventilation shaft) Cleaning, grubbing and bulldozing (Ventilation shaft) Removal of cleared vegetation Digging trenches and foundations Blasting Maintenance of storm water management measures Maintenance of firebreak	• Loss/ Disturbance of Topsoil (including contamination, erosion and compaction) • 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 • Alteration of the topography during excavation	• Pollution of habitats • Removal of threatened and protected species • Loss/ Destruction of Natural Habit • 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	• Loss of agricultural resource • Visual impacts • Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock	• Disturbance/ Destruction of fossils • Disturbance/Destruction of Archaeological Sites • Disturbance/Destruction of Historic Buildings or Structures • Disturbance/ Destruction of Graves and Cemeteries. • Disturbance/ Destruction of Unmarked Graves

	Ventilation shaft				
Civil Works (Construction)	Maintenance of infrastructure and services Mixing of concrete and concrete works Establishment of PCD and storm water/return water dam Establishment of dewatering pipelines Existing Mobile office and ablution block Sewage and sanitation Existing fuel storage area Existing Chemical 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 species sensitive to changes in water quality • Altered hydrological regimes • Decline in aquatic habitat integrity • Impacts on wetlands • Surface water contamination	• 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. • 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	• 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

	Existing General waste area Access control and security General site management		• Surface Water Contamination. • Damage to Wetland/ Drainage Line. • Increase in the occurrence of alien invasive vegetation		
Underground Mining (Operation)	• Drilling • Blasting • Excavations • Removal of overburden by dozing and load haul • Upgrade of internal haul roads • Removal of coal • Continued use of existing RoM stockpiles • Continued use of existing Product Stockpiles • Pumping of water to PCD • Waste rock dumps for backfilling • Soil management • Water management • Concurrent rehabilitation • Water treatment	• Potential risk of subsidence • Ground water pollution or contamination due to spillage of chemicals, hydrocarbons, or contaminated water during mining activities; • A reduction in recharge to groundwater due to surface compaction; • Reduction of ground water reserves due to mine dewatering; • Reduction of stream baseflow, surrounding ground water levels, and aquifer levels as a result of mine dewatering; and • The potential contamination of groundwater due to the continued oxidation of coal material in the mine	• Displacement of Faunal Species	• Change of land use from agriculture to mining • Sustainable employment for current mine employees • Increase traffic incidences due to additional haulage • Increase in traffic on adjacent road network resulting in additional damage to the roads	• Disturbance of graves/ burial sites • Potential damage of Palaeontological material

		void and the waste material on-site.		
Infrastructure removal (Decommissioning)	Dismantling and demolition of relevant infrastructure Safety control	• Gaseous and particulate emissions; fugitive dust • Generation of PM2.5 and PM10 • 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 stabilization Erosion control Landscaping Replacing topsoil Removal of alien/invasive vegetation	• Contamination of Groundwater. • Acid Mine Drainage • Damage to Wetland/ Drainage Lines	• Fragmentation and Edge Effects. • Displacement of Faunal Species. • Fuel, waste, sedimentation.	• Reduction in future land capability. • Safety risk to public

	Re-vegetation	
	Restoration of natural drainage patterns	
	Remediation of ground and surface water	
	Rehabilitation of external roads	
Maintenance (Post closure)	Initiate maintenance and aftercare program	• 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.
	Environmental aspect monitoring	
	Monitoring of rehabilitation	

9.3 DESCRIPTION AND ASSESSMENT OF IMPACTS

The following potential impacts were identified during the EIA assessment. The impact assessment matrix is included in Appendix 4 and the below subsections describe each impact in more detail. Alternative 1 is the no-go alternative and hence the impacts associated with this alternative are all rated as zero.

9.3.1 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 and operation are included here. The reason for this is that no impacts are anticipated on heritage resources during the other phases of the project. The following impacts (as well as their impact rating) on heritage resources were identified:

- Disturbance/Destruction of Archaeological Sites
- Disturbance/Destruction of Historic Buildings or Structures
- Disturbance/ Destruction of Graves and Cemeteries
- Disturbance/ Destruction of Unmarked Graves
- Potential damage of Palaeontological material

The proposed project will entail mainly underground mining and therefore, minimal surface impacts are expected. 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. There is a possibility that unidentified graves may be located within the study/application area. Should graves and other heritage and palaeontological features be confirmed on site, impact on these features will trigger various pieces of legislation that protect them.

Table 39: Impacts on Heritage and Palaeontological Resources

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Disturbance/Destruction of Archaeological Sites	Alternative 3	Construction	-13	-5,5	-5,50
Disturbance/Destruction of Historic Buildings or Structures	Alternative 3	Construction	-13	-5,5	-5,50
Disturbance/ Destruction of Graves and Cemeteries	Alternative 3	Construction	-14	-6	-6,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Disturbance/ Destruction of Unmarked Graves	Alternative 3	Construction	-13	-5,5	-5,50
Potential damage of Palaeontological material	Alternative 3	Construction	-15	-6	-6,00
Disturbance/Destruction of Archaeological Sites	Alternative 3	Operation	-13	-5,5	-5,50
Disturbance/Destruction of Historic Buildings or Structures	Alternative 3	Operation	-13	-5,5	-5,50
Disturbance/ Destruction of Graves and Cemeteries	Alternative 3	Operation	-14	-6	-6,00
Disturbance/ Destruction of Unmarked Graves	Alternative 3	Operation	-13	-5,5	-5,50
Potential damage of Palaeontological material	Alternative 3	Operation	-15	-6	-6,00
Disturbance/Destruction of Archaeological Sites	Alternative 2	Construction	-20	-12,5	-12,50
Disturbance/Destruction of Historic Buildings or Structures	Alternative 2	Construction	-17,5	-10,00	-10,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Disturbance/ Destruction of Graves and Cemeteries	Alternative 2	Construction	-17,5	-16,25	-16,25
Disturbance/ Destruction of Unmarked Graves	Alternative 2	Construction	-17,5	-10	-10,00
Potential damage of Palaeontological material	Alternative 2	Construction	-20	-17,5	-17,50
Disturbance/Destruction of Archaeological Sites	Alternative 2	Operation	-20	-12,5	-12,50
Disturbance/Destruction of Historic Buildings or Structures	Alternative 2	Operation	-17,5	-10	-10,00
Disturbance/ Destruction of Graves and Cemeteries	Alternative 2	Operation	-17,5	-16,25	-16,25
Disturbance/ Destruction of Unmarked Graves	Alternative 2	Operation	-17,5	-10	-10,00
Potential damage of Palaeontological material	Alternative 2	Operation	-20	-17,5	-17,50

Proposed Mitigation:

Archaeological 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. Cemeteries and grave sites are also 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 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.

9.3.2 IMPACTS ON ECOLOGY

The following 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). Although limited to the ventilation shaft areas, 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, however, this impact can be mitigated. Below are the impacts on ecological resources identified during the EIA for the construction, operation and rehabilitation phases of the Mooiplaats Colliery Vunene project area as well as their impact ratings. The reason for assessment of only these three phases is that no impacts on ecology are anticipated to take place during the other phases of the project. The following impacts (as well as their impact rating) on ecological resources were identified:

- 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
- Pollution of habitats
- Habitat Fragmentation and Edge Effects
- Blockage of Seasonal and Dispersal Movements
- Loss of primary vegetation communities
- Loss of species sensitive to changes in water quality
- Increase in the occurrence of alien invasive vegetation

Table 40: Impacts on Ecology

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Removal of threatened and protected species	Alternative 3	Construction	-15	-4,5	-4,50
Loss/ Destruction of Natural Habitats	Alternative 3	Construction	-12	-4,5	-4,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Displacement of Faunal Species	Alternative 3	Construction	-12	-4,5	-4,50
Flora Direct and Indirect Mortality	Alternative 3	Construction	-12	-4,5	-4,50
Fauna Direct and Indirect Mortality	Alternative 3	Construction	-12	-4,5	-4,50
Pollution of habitats	Alternative 3	Construction	-12	-4,5	-4,50
Habitat Fragmentation and Edge Effects	Alternative 3	Construction	-12	-4,5	-4,50
Blockage of Seasonal and Dispersal Movements	Alternative 3	Construction	-12	-4,5	-4,50
Loss of primary vegetation communities	Alternative 3	Construction	-12	-4,5	-4,50
Loss of species sensitive to changes in water quality	Alternative 3	Construction	-12	-4,5	-4,50
Increase in the occurrence of alien invasive vegetation	Alternative 3	Construction	-12	-4,5	-4,50
Removal of threatened and protected species	Alternative 3	Operation	-12	-4,5	-4,50
Loss/ Destruction of Natural Habitats	Alternative 3	Operation	-12	-4,5	-4,50
Displacement of Faunal Species	Alternative 3	Operation	-12	-4,5	-4,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Flora Direct and Indirect Mortality	Alternative 3	Operation	-12	-4,5	-4,50
Fauna Direct and Indirect Mortality	Alternative 3	Operation	-12	-4,5	-4,50
Pollution of habitats	Alternative 3	Operation	-12	-4,5	-4,50
Habitat Fragmentation and Edge Effects	Alternative 3	Operation	-12	-4,5	-4,50
Blockage of Seasonal and Dispersal Movements	Alternative 3	Operation	-12	-4,5	-4,50
Loss of primary vegetation communities	Alternative 3	Operation	-12	-4,5	-4,50
Loss of species sensitive to changes in water quality	Alternative 3	Operation	-12	-4,5	-4,50
Increase in the occurrence of alien invasive vegetation	Alternative 3	Operation	-12	-4,5	-4,50
Loss/ Destruction of Natural Habitats	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Displacement of Faunal Species	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Flora Direct and Indirect Mortality	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Fauna Direct and Indirect Mortality	Alternative 3	Rehab and closure	-12	-4,5	-4,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Pollution of habitats	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Habitat Fragmentation and Edge Effects	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Blockage of Seasonal and Dispersal Movements	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Loss of primary vegetation communities	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Loss of species sensitive to changes in water quality	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Increase in the occurrence of alien invasive vegetation	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Removal of threatened and protected species	Alternative 2	Construction	-18,75	-14	-14,00
Loss/ Destruction of Natural Habitats	Alternative 2	Construction	-18,75	-14	-14,00
Displacement of Faunal Species	Alternative 2	Construction	-18,75	-14	-14,00
Flora Direct and Indirect Mortality	Alternative 2	Construction	-18,75	-14	-14,00
Fauna Direct and Indirect Mortality	Alternative 2	Construction	-18,75	-14	-14,00
Pollution of habitats	Alternative 2	Construction	-18,75	-14	-14,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Habitat Fragmentation and Edge Effects	Alternative 2	Construction	-18,75	-14	-14,00
Blockage of Seasonal and Dispersal Movements	Alternative 2	Construction	-18,75	-14	-14,00
Loss of primary vegetation communities	Alternative 2	Construction	-18,75	-14	-14,00
Loss of species sensitive to changes in water quality	Alternative 2	Construction	-18,75	-14	-14,00
Increase in the occurrence of alien invasive vegetation	Alternative 2	Construction	-18,75	-14	-14,00
Removal of threatened and protected species	Alternative 2	Operation	-18,75	-14	-14,00
Loss/ Destruction of Natural Habitats	Alternative 2	Operation	-18,75	-14	-14,00
Displacement of Faunal Species	Alternative 2	Operation	-18,75	-14	-14,00
Flora Direct and Indirect Mortality	Alternative 2	Operation	-18,75	-14	-14,00
Fauna Direct and Indirect Mortality	Alternative 2	Operation	-18,75	-14	-14,00
Pollution of habitats	Alternative 2	Operation	-18,75	-14	-14,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Habitat Fragmentation and Edge Effects	Alternative 2	Operation	-18,75	-14	-14,00
Blockage of Seasonal and Dispersal Movements	Alternative 2	Operation	-18,75	-14	-14,00
Loss of primary vegetation communities	Alternative 2	Operation	-18,75	-14	-14,00
Loss of species sensitive to changes in water quality	Alternative 2	Operation	-18,75	-14	-14,00
Increase in the occurrence of alien invasive vegetation	Alternative 2	Operation	-18,75	-14	-14,00
Loss/ Destruction of Natural Habitats	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Displacement of Faunal Species	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Flora Direct and Indirect Mortality	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Fauna Direct and Indirect Mortality	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Pollution of habitats	Alternative 2	Rehab and closure	-18,75	-14	-14,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Habitat Fragmentation and Edge Effects	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Blockage of Seasonal and Dispersal Movements	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Loss of primary vegetation communities	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Loss of species sensitive to changes in water quality	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Increase in the occurrence of alien invasive vegetation	Alternative 2	Rehab and closure	-18,75	-14	-14,00

Proposed Mitigation:

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. Where possible, a walk-through survey of local site should be undertaken prior to construction commencing as well as a search and rescue of species of concern (if any). Educate construction crews on the types of species that may be encountered and ensure that workers report any species located for active relocation. 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. Use existing access roads as much as possible and avoid creating new access road if possible. 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. Manage alien plants within close proximity to activities; and compile an alien plant management plan.

9.3.3 IMPACTS ON GEOHYDROLOGY

The following impacts on the geohydrological 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 geohydrological receiving environment have been identified that will occur during the Planning and Design Phase and the Decommissioning Phase. Below are the impacts on geohydrological resources for the construction, operational, and rehabilitation and closure phases identified as well as their impact rating according to the methodology described above.

- A reduction in recharge to groundwater due to surface compaction;
- Reduction of ground water reserves due to mine dewatering;
- Potential risk of subsidence;
- Contamination of Groundwater;
- Altered Hydrological Regime;
- Acid Mine Drainage

Table 41: Preliminary Impacts on geohydrology

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Reduction in recharge to groundwater due to surface compaction	Alternative 3	Construction	-10,5	-5,5	-5,50
Reduction of ground water reserves due to mine dewatering	Alternative 3	Construction	-10,5	-5,5	-5,50
Potential risk of subsidence	Alternative 3	Construction	-10,5	-5,5	-5,50
Contamination of Groundwater	Alternative 3	Construction	-10,5	-5,5	-5,50
Altered Hydrological Regime	Alternative 3	Construction	-10,5	-5,5	-5,50
Acid Mine Drainage	Alternative 3	Construction	-10,5	-6	-6,00
Reduction in recharge to groundwater due to surface compaction	Alternative 3	Operation	-20	-14	-14,00
Reduction of ground water reserves due to mine dewatering	Alternative 3	Operation	-20	-14	-14,00
Potential risk of subsidence	Alternative 3	Operation	-20	-14	-14,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Contamination of Groundwater	Alternative 3	Operation	-20	-14	-14,00
Altered Hydrological Regime	Alternative 3	Operation	-20	-14	-14,00
Acid Mine Drainage	Alternative 3	Operation	-20	-13	-13,00
Reduction in recharge to groundwater due to surface compaction	Alternative 3	Rehab and closure	-13	-9	-9,00
Reduction of ground water reserves due to mine dewatering	Alternative 3	Rehab and closure	-13	-9	-9,00
Potential risk of subsidence	Alternative 3	Rehab and closure	-13	-9	-9,00
Contamination of Groundwater	Alternative 3	Rehab and closure	-13	-9	-9,00
Altered Hydrological Regime	Alternative 3	Rehab and closure	-13	-9	-9,00
Acid Mine Drainage	Alternative 3	Rehab and closure	-12	-4,5	-4,50
Reduction in recharge to groundwater due to surface compaction	Alternative 2	Construction	-18,75	-13	-13,00
Reduction of ground water reserves due to mine dewatering	Alternative 2	Construction	-18,75	-13	-13,00
Potential risk of subsidence	Alternative 2	Construction	-17,5	-13	-13,00
Contamination of Groundwater	Alternative 2	Construction	-18,75	-13	-13,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Altered Hydrological Regime	Alternative 2	Construction	-18,75	-13	-13,00
Acid Mine Drainage	Alternative 2	Construction	-18,75	-13	-13,00
Reduction in recharge to groundwater due to surface compaction	Alternative 2	Operation	-20	-14	-14,00
Reduction of ground water reserves due to mine dewatering	Alternative 2	Operation	-20	-14	-14,00
Potential risk of subsidence	Alternative 2	Operation	-20	-14	-14,00
Contamination of Groundwater	Alternative 2	Operation	-20	-14	-14,00
Altered Hydrological Regime	Alternative 2	Operation	-20	-14	-14,00
Acid Mine Drainage	Alternative 2	Operation	-20	-14	-14,00
Reduction in recharge to groundwater due to surface compaction	Alternative 2	Rehab and closure	-13	-9	-9,00
Reduction of ground water reserves due to mine dewatering	Alternative 2	Rehab and closure	-13	-9	-9,00
Potential risk of subsidence	Alternative 2	Rehab and closure	-13	-9	-9,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Contamination of Groundwater	Alternative 2	Rehab and closure	-13	-9	-9,00
Altered Hydrological Regime	Alternative 2	Rehab and closure	-13	-9	-9,00
Acid Mine Drainage	Alternative 2	Rehab and closure	-13	-9	-9,00

Proposed mitigation:

Minimise the footprint of dirty areas like coal stockpiles, workshops, oil and diesel storage areas. Proper storm water management should be implemented. Berms should be constructed to ensure separation of clean water and dirty water areas. Interception of contaminated groundwater may be required where seepage is observed, and saline drainage enters surface water bodies. Normal pump and treat / re-use applications will be required. Due to mine inflow and dewatering anticipated, depletion of groundwater in storage is inevitable. Static groundwater levels should be monitored monthly to ensure that any deviation of the groundwater flow patterns and water levels from the idealised predictions is detected in time.

Mining vehicles and machinery must be serviced and maintained regularly in order to ensure that oil spillages are limited. Spill trays must be provided if refuelling of operational vehicles is done on site. Further to this spill kits must be readily available in case of accidental spillages with regular spot checks to be conducted.

9.3.4 IMPACTS ON HYDROLOGY

The following 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 identified during scoping, as well as their impact rating.

- Reduction in stream flow;
- Deterioration of water quality;
- Altered hydrological regimes;
- There is the potential for flood lines to negatively affect the surface area of the mine;
- Decreased infiltration and increased run-off may occur due to soil compaction;
- Damage to Wetland/ Drainage Lines;
- Impacts on wetlands; and

- Surface water pollution or contamination due to acid mine drainage, spillage of chemicals, hydrocarbons, or contaminated water during mining activities.

Table 42: Impacts on Hydrology

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Reduction in stream flow	Alternative 3	Construction	-18,75	-9	-9,00
Deterioration of water quality	Alternative 3	Construction	-18,75	-9	-9,00
Altered hydrological regimes	Alternative 3	Construction	-18,75	-9	-9,00
Potential for flood lines to negatively affect the surface area of the mine	Alternative 3	Construction	-18,75	-9	-9,00
Decreased infiltration and increased run-off may occur due to soil compaction	Alternative 3	Construction	-18,75	-9	-9,00
Damage to Wetland/ Drainage Lines	Alternative 3	Construction	-18,75	-9	-9,00
Impacts on wetlands	Alternative 3	Construction	-15	-8,25	-8,25
Surface water pollution or contamination	Alternative 3	Construction	-12	-8,25	-8,25
Reduction in stream flow	Alternative 3	Operation	-12	-7,5	-7,50
Deterioration of water quality	Alternative 3	Operation	-12	-7,5	-7,50
Altered hydrological regimes	Alternative 3	Operation	-12	-7,5	-7,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Potential for flood lines to negatively affect the surface area of the mine	Alternative 3	Operation	-12	-7,5	-7,50
Decreased infiltration and increased run-off may occur due to soil compaction	Alternative 3	Operation	-12	-7,5	-7,50
Damage to Wetland/ Drainage Lines	Alternative 3	Operation	-12	-7,5	-7,50
Impacts on wetlands	Alternative 3	Operation	-12	-7,5	-7,50
Surface water pollution or contamination	Alternative 3	Operation	-12	-7,5	-7,50
Reduction in stream flow	Alternative 3	Rehab and closure	-12	-7,5	-7,50
Deterioration of water quality	Alternative 3	Rehab and closure	-12	-7,5	-7,50
Altered hydrological regimes	Alternative 3	Rehab and closure	-12	-7,5	-7,50
Potential for flood lines to negatively affect the surface area of the mine	Alternative 3	Rehab and closure	-12	-7,5	-7,50
Decreased infiltration and increased run-off may occur due to soil compaction	Alternative 3	Rehab and closure	-12	-7,5	-7,50
Damage to Wetland/ Drainage Lines	Alternative 3	Rehab and closure	-12	-7,5	-7,50
Impacts on wetlands	Alternative 3	Rehab and closure	-12	-7,5	-7,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Surface water pollution or contamination	Alternative 3	Rehab and closure	-12	-7,5	-7,50
Reduction in stream flow	Alternative 2	Construction	-14	-9,75	-9,75
Deterioration of water quality	Alternative 2	Construction	-14	-9,75	-9,75
Altered hydrological regimes	Alternative 2	Construction	-14	-9,75	-9,75
Potential for flood lines to negatively affect the surface area of the mine	Alternative 2	Construction	-14	-9,75	-9,75
Decreased infiltration and increased run-off may occur due to soil compaction	Alternative 2	Construction	-14	-9,75	-9,75
Damage to Wetland/ Drainage Lines	Alternative 2	Construction	-14	-9,75	-9,75
Impacts on wetlands	Alternative 2	Construction	-14	-9,75	-9,75
Surface water pollution or contamination	Alternative 2	Construction	-14	-9,75	-9,75
Reduction in stream flow	Alternative 2	Operation	-21,25	-15	-15,00
Deterioration of water quality	Alternative 2	Operation	-21,25	-15	-15,00
Altered hydrological regimes	Alternative 2	Operation	-21,25	-15	-15,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Potential for flood lines to negatively affect the surface area of the mine	Alternative 2	Operation	-18,75	-15	-15,00
Decreased infiltration and increased run-off may occur due to soil compaction	Alternative 2	Operation	-21,25	-15	-15,00
Damage to Wetland/ Drainage Lines	Alternative 2	Operation	-21,25	-15	-15,00
Impacts on wetlands	Alternative 2	Operation	-21,25	-15	-15,00
Surface water pollution or contamination	Alternative 2	Operation	-18,75	-15	-15,00
Reduction in stream flow	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Deterioration of water quality	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Altered hydrological regimes	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Potential for flood lines to negatively affect the surface area of the mine	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Decreased infiltration and increased run-off may occur due to soil compaction	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Damage to Wetland/ Drainage Lines	Alternative 2	Rehab and closure	-18,75	-14	-14,00
Impacts on wetlands	Alternative 2	Rehab and closure	-18,75	-14	-14,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Surface water pollution or contamination	Alternative 2	Rehab and closure	-18,75	-14	-14,00

Proposed mitigation:

- Undertake construction activities during the dry season;
- Demarcate sensitive areas, as no go zones;
- Dust Suppression through the use of water tankers and dust monitoring;
- Adherence to the relevant Storm Water Management Plan;
- Erosion control measures should be put in place in order to minimise the transport of sediment;
- Stabilisation of impacted soils and restricting vehicle movement to designated access roads;
- Drip trays should be placed under machinery. Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling;
- Continuous surface water and groundwater quality monitoring is essential to keep track of water quality issues that may arise for early detection purposes;
- Provision of adequate sanitation and waste disposal facilities at the basecamp;
- Toolbox talks with specific consideration to be given to waste disposal;
- Avoid the placement of construction equipment and materials within the calculated flood lines;
- Flood control measures such as the construction of berms and channels should be implemented to minimise the risks of flooding where work within the flood lines is essential.
- Use existing routes and already disturbed areas;
- Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff;
- Development of vegetation rehabilitation plan. The plan should factor in new drainage patterns and comprise of methods to promote surface water infiltration through the use of vegetation and geotextiles.

9.3.5 IMPACTS ON SOILS AND GEOLOGY

Impacts on the soils and geology 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 soils and geology have been identified for the Planning and Design Phase and Decommissioning Phase.

- Potential risk of subsidence
- Loss/ Disturbance of Topsoil (including contamination, erosion and compaction); and
- Depletion of a mineral resource.

Table 43: Impacts on Soils and Geology

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Loss/ Disturbance of Topsoil (including contamination, erosion and compaction)	Alternative 3	Construction	-16,25	-15	-15,00
Depletion of a mineral resource	Alternative 3	Construction	-18,75	-13	-13,00
Loss/ Disturbance of Topsoil (including contamination, erosion and compaction)	Alternative 3	Operation	-18,75	-14	-14,00
Depletion of a mineral resource	Alternative 3	Operation	-17	-16	-16,00
Loss/ Disturbance of Topsoil (including contamination , erosion and compaction)	Alternative 3	Decommissioning	-17,5	-13	-13,00
Depletion of a mineral resource	Alternative 3	Decommissioning	-17,5	-13	-13,00
Potential Risk of subsidence	Alternative 3	Construction	-8,25	-4,5	-4,50
Potential Risk of subsidence	Alternative 3	Operation	-8,25	-4,5	-4,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Potential Risk of subsidence	Alternative 3	Decommissioning	-8,25	-4,5	-4,50
Loss/ Disturbance of Topsoil (including contamination, erosion and compaction)	Alternative 2	Construction	-17,5	-15	-15,00
Depletion of a mineral resource	Alternative 2	Construction	-17,5	-13	-13,00
Loss/ Disturbance of Topsoil (including contamination, erosion and compaction)	Alternative 2	Operation	-18,75	-14	-14,00
Depletion of a mineral resource	Alternative 2	Operation	-22,5	-17,00	-17,00
Loss/ Disturbance of Topsoil (including contamination, erosion and compaction)	Alternative 2	Decommissioning	-17,5	-13	-13,00
Depletion of a mineral resource	Alternative 2	Decommissioning	-17,5	-13	-13,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Potential Risk of subsidence	Alternative 2	Construction	-13	-8,25	-8,25
Potential Risk of subsidence	Alternative 2	Operation	-13	-8,25	-8,25
Potential Risk of subsidence	Alternative 2	Decommissioning	-13	-8,25	-8,25

Proposed mitigation:

The vegetation is must be 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. 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.

A proper industry accepted pillar design developed by a rock engineering practitioner must be accepted and followed at the mine to mitigate risk of subsidence. Barrier pillars must be included into the pillar design of the mining area and panel widths should be limited with respect to the critical mining span. Underground assessments to monitor adherence to designed dimensions. The Mine Manager must implement disciplinary measures in cases where the mine dimensions are not adhered to. Mining in areas less than 40m deep should not be attempted beneath areas where subsidence is unwanted, such as below critical surface structures. In areas where subsidence is likely backfilling methods can be implemented to decrease the effect of subsidence. Site specific recommendations must be conducted by the rock engineering practitioner in such an event.

9.3.6 IMPACTS ON AIR QUALITY

Mooiplaats Colliery has been undertaking a dust monitoring programme within the existing coal mine areas and it is anticipated that this monitoring will be extended to the Mooiplaats Vunene project area.

- Gaseous and particulate emissions (fugitive dust); and
- Generation of PM2.5 and PM10.

Table 44: Impacts on Air Quality

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Gaseous and particulate emissions; fugitive dust	Alternative 3	Construction	-16	-11	-11,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Generation of PM2.5 and PM10	Alternative 3	Construction	-16	-11	-11,00
Gaseous and particulate emissions; fugitive dust	Alternative 3	Operation	-16	-12	-12,00
Generation of PM2.5 and PM10	Alternative 3	Operation	-16	-13	-13,00
Gaseous and particulate emissions; fugitive dust	Alternative 3	Decommissioning	-14	-12	-12,00
Generation of PM2.5 and PM10	Alternative 3	Decommissioning	-14	-12	-12,00
Gaseous and particulate emissions; fugitive dust	Alternative 2	Construction	-16	-12	-12,00
Generation of PM2.5 and PM10	Alternative 2	Construction	-16	-12	-12,00
Gaseous and particulate emissions; fugitive dust	Alternative 2	Operation	-20	-13	-13,00
Generation of PM2.5 and PM10	Alternative 2	Operation	-20	-15	-15,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Gaseous and particulate emissions; fugitive dust	Alternative 2	Decommissioning	-17,5	-13	-13,00
Generation of PM2.5 and PM10	Alternative 2	Decommissioning	-17,5	-13	-13,00

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 access roads, 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.

9.3.7 VISUAL IMPACTS

Considering that the majority of the mining activities will take place underground it is anticipated that the impact of the surrounding visual receptors (if any) will be minimal.

- Alteration of natural topography;
- Sense of place; and
- Surface subsidence.

Table 45: Visual Impacts

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Alteration of natural topography	Alternative 3	Construction	-7,5	-4,5	-4,50
Sense of place	Alternative 3	Construction	-7,5	-4,5	-4,50
Surface subsidence	Alternative 3	Construction	-7,5	-4,5	-4,50
Alteration of natural topography	Alternative 3	Operation	-7,5	-4,5	-4,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Sense of place	Alternative 3	Operation	-7,5	-4,5	-4,50
Surface subsidence	Alternative 3	Operation	-7,5	-4,5	-4,50
Alteration of natural topography	Alternative 3	Decommissioning	-6,75	-4,5	-4,50
Sense of place	Alternative 3	Decommissioning	-6,75	-4,5	-4,50
Surface subsidence	Alternative 3	Decommissioning	-6,75	-4,5	-4,50
Alteration of natural topography	Alternative 3	Rehab and closure	-6,75	-4,5	-4,50
Sense of place	Alternative 3	Rehab and closure	-6,75	-4,5	-4,50
Surface subsidence	Alternative 3	Rehab and closure	-6,75	-4,5	-4,50
Alteration of natural topography	Alternative 2	Construction	-7,5	-5	-5,00
Sense of place	Alternative 2	Construction	-7,5	-5	-5,00
Surface subsidence	Alternative 2	Construction	-7,5	-5	-5,00
Alteration of natural topography	Alternative 2	Operation	-7,5	-5	-5,00
Sense of place	Alternative 2	Operation	-7,5	-5	-5,00
Surface subsidence	Alternative 2	Operation	-7,5	-5	-5,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Alteration of natural topography	Alternative 2	Decommissioning	-6,75	-4,5	-4,50
Sense of place	Alternative 2	Decommissioning	-6,75	-4,5	-4,50
Surface subsidence	Alternative 2	Decommissioning	-6,75	-4,5	-4,50
Alteration of natural topography	Alternative 2	Rehab and closure	-6,75	-4,5	-4,50
Sense of place	Alternative 2	Rehab and closure	-6,75	-4,5	-4,50
Surface subsidence	Alternative 2	Rehab and closure	-6,75	-4,5	-4,50

Proposed mitigation:

The proposed project entails underground mining with limited surface activities and structures, as such limited alterations of the natural topography are expected. 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. 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.

A proper industry accepted pillar design developed by a rock engineering practitioner must be accepted and followed at the mine to mitigate risk of subsidence. In areas where subsidence is likely backfilling methods can be implemented to decrease the effect of subsidence. Site specific recommendations must be conducted by the rock engineering practitioner in such an event.

9.3.8 VIBRATION AND BLASTING IMPACTS

The potential impacts investigated due to blasting operations are ground vibrations, displacement of faunal species due to noise and vibrations and damage to property and infrastructure due to blasting. There are no densely populated areas within close proximity to the proposed mining areas. There is an AFGRI Silo located approximately 2km east of the mine which is considered too far away to be negatively impacted by the blasting operations of the Mooiplaats mine and as such, this impact is considered to be adequately managed through the mines current blasting controls.

- Displacement of Faunal Species due to noise and vibrations; and

- Damage to property and infrastructure due to blasting.

Table 46: Blasting and vibration impacts

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Displacement of Faunal Species due to noise and vibrations	Alternative 3	Construction	-7,5	-4,5	-4,50
Damage to property and infrastructure due to blasting	Alternative 3	Construction	-7,5	-4,5	-4,50
Displacement of Faunal Species due to noise and vibrations	Alternative 3	Operation	-7,5	-4,5	-4,50
Damage to property and infrastructure due to blasting	Alternative 3	Operation	-7,5	-4,5	-4,50
Displacement of Faunal Species due to noise and vibrations	Alternative 3	Decommissioning	-6,75	-4,5	-4,50
Damage to property and infrastructure due to blasting	Alternative 3	Decommissioning	-6,75	-4,5	-4,50
Displacement of Faunal Species due to noise and vibrations	Alternative 2	Construction	-7,5	-5	-5,00
Damage to property and infrastructure due to blasting	Alternative 2	Construction	-7,5	-5	-5,00
Displacement of Faunal Species due to noise and vibrations	Alternative 2	Operation	-7,5	-5	-5,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Damage to property and infrastructure due to blasting	Alternative 2	Operation	-7,5	-5	-5,00
Safety risk as a result of fly rock	Alternative 2	Operation	-7,5	-5	-5,00
Displacement of Faunal Species due to noise and vibrations	Alternative 2	Decommissioning	-6,75	-4,5	-4,50
Damage to property and infrastructure due to blasting	Alternative 2	Decommissioning	-6,75	-4,5	-4,50
Safety risk as a result of fly rock	Alternative 2	Decommissioning	-6,75	-4,5	-4,50

Proposed 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.

9.3.9 SOCIO-ECONOMIC IMPACTS

The following 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 impacts on socio-economic environment identified, as well as their impact rating.

- 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.);
- Perceptions and Expectations;
- Employment Opportunities;
- Inability of the community to capture economic benefits & managing expectation;

- Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock;
- Loss of agricultural resource;
- Increase traffic incidences due to additional haulage; and
- Increase in traffic on adjacent road network resulting in additional damage to the roads.

Table 47: Socio-economic Impacts

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Dust (health and nuisance impact)	Alternative 2	Construction	-17,5	-14	-14,00
Safety and Security (i.e. access to properties, theft, fire hazards, etc.	Alternative 2	Construction	-17,5	-14	-14,00
Damage/ Disruption of services (i.e. water, electricity)	Alternative 2	Construction	-17,5	-14	-14,00
Impact on Existing Infrastructure (i.e. roads, fences, etc.)	Alternative 2	Construction	-17,5	-14	-14,00
Perceptions and Expectations	Alternative 2	Construction	-17,5	-14	-14,00
Employment Opportunities	Alternative 2	Construction	17,5	14	14,00
Inability of the community to capture economic benefits & managing expectation	Alternative 2	Construction	-17,5	-14	-14,00
Loss of agricultural resource	Alternative 2	Construction	-17,5	-14	-14,00
Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock	Alternative 2	Construction	-17,5	-14	-14,00
Increase in traffic on adjacent road network resulting in	Alternative 2	Construction	-17,5	-14	-14,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
additional damage to the roads					
Increase traffic incidences due to additional haulage	Alternative 2	Construction	-17,5	-14	-14,00
Dust (health and nuisance impact)	Alternative 2	Operation	-17,5	-14	-14,00
Safety and Security (i.e. access to properties, theft, fire hazards, etc.	Alternative 2	Operation	-17,5	-14	-14,00
Damage/ Disruption of services (i.e. water, electricity)	Alternative 2	Operation	-17,5	-14	-14,00
Impact on Existing Infrastructure (i.e. roads, fences, etc.)	Alternative 2	Operation	-17,5	-14	-14,00
Perceptions and Expectations	Alternative 2	Operation	-17,5	-14	-14,00
Employment Opportunities	Alternative 2	Operation	17,5	14	14,00
Inability of the community to capture economic benefits & managing expectation	Alternative 2	Operation	-17,5	-14	-14,00
Loss of agricultural resource	Alternative 2	Operation	-17,5	-14	-14,00
Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock	Alternative 2	Operation	-17,5	-14	-14,00
Increase in traffic on adjacent road network resulting in additional damage to the roads	Alternative 2	Operation	-17,5	-14	-14,00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Increase traffic incidences due to additional haulage	Alternative 2	Operation	-17,5	-14	-14,00
Dust (health and nuisance impact)	Alternative 3	Construction	-12	-4,5	-4,50
Safety and Security (i.e. access to properties, theft, fire hazards, etc	Alternative 3	Construction	-12	-4,5	-4,50
Damage/ Disruption of services (i.e. water, electricity)	Alternative 3	Construction	-12	-4,5	-4,50
Impact on Existing Infrastructure (i.e. roads, fences, etc.)	Alternative 3	Construction	-12	-4,5	-4,50
Perceptions and Expectations	Alternative 3	Construction	-12	-4,5	-4,50
Employment Opportunities	Alternative 3	Construction	12	4,5	4,50
Inability of the community to capture economic benefits & managing expectation	Alternative 3	Construction	-12	-4,5	-4,50
Loss of agricultural resource	Alternative 3	Construction	-12	-4,5	-4,50
Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock	Alternative 3	Construction	-12	-4,5	-4,50
Increase in traffic on adjacent road network resulting in additional damage to the roads	Alternative 3	Construction	-12	-4,5	-4,50
Increase traffic incidences due to additional haulage	Alternative 3	Construction	-12	-4,5	-4,50

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Dust (health and nuisance impact)	Alternative 3	Operation	-12	-4,5	-4,50
Safety and Security (i.e. access to properties, theft, fire hazards, etc	Alternative 3	Operation	-12	-4,5	-4,50
Damage/ Disruption of services (i.e. water, electricity)	Alternative 3	Operation	-12	-4,5	-4,50
Impact on Existing Infrastructure (i.e. roads, fences, etc.)	Alternative 3	Operation	-12	-4,5	-4,50
Perceptions and Expectations	Alternative 3	Operation	-12	-4,5	-4,50
Employment Opportunities	Alternative 3	Operation	-12	-4,5	-4,50
Inability of the community to capture economic benefits & managing expectation	Alternative 3	Operation	-12	-4,5	-4,50
Loss of agricultural resource	Alternative 3	Operation	-12	-4,5	-4,50
Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock	Alternative 3	Operation	-12	-4,5	-4,50
Increase in traffic on adjacent road network resulting in additional damage to the roads	Alternative 3	Operation	-12	-4,5	-4,50
Increase traffic incidences due to additional haulage	Alternative 3	Operation	-12	-4,5	-4,50

Proposed mitigation:

Dust (health and nuisance impact)

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.

Safety and Security (i.e. access to properties, theft, fire hazards, etc.)

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.

Damage/ Disruption of services (i.e. water, electricity, etc.)

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.

Impact on Existing Infrastructure (i.e. roads, fences, etc.)

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.

Perceptions and Expectations

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

Employment Opportunities

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

Inability of the community to capture economic benefits & managing expectation

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

Damage to property and infrastructure due to blasting, as well as safety as a result of fly rock

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.

Loss of agricultural resource

The proposed project entails underground mining with limited surface activities and structures, as such limited impacts on agricultural resources are expected. The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly.

9.3.10 POTENTIAL CUMULATIVE IMPACTS

Without proper mitigation measures and continual environmental management, most of the identified impacts identified above may potentially become cumulative, affecting areas outside of their originally identified zone of

impact. The following is a list of some of the key potential impacts that may result in a significant cumulative impact as a result of the project.

- Contribution to losses of potentially productive agricultural land, along with a reduction in land capability as a result of site sterilisation due to mining activities;
- Contribution to air quality impacts, specifically relating to increased suspended particulate matter (dust);
- Contribution to reduction in surface water quality;
- Increase in traffic;
- Disturbance of fauna;
- Invasion of alien plant species;
- Increase in ambient noise levels and potential adverse effect of noise sensitive receptors;
- Disturbance, damage or destruction of heritage features;
- Increased vulnerability and community safety-related risks and impacts; and
- Localised areas of acid mine drainage and groundwater contamination.

Table 48: Cumulative impacts

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Contribution to losses of potentially productive agricultural land	Alternative 2	Rehab and closure	-5,5	-4,5	-5,25
Air quality impacts	Alternative 2	Rehab and closure	-5,5	-5	-5,83
Reduction in surface water quality	Alternative 2	Rehab and closure	-5,5	-5	-5,83
Increase in traffic	Alternative 2	Rehab and closure	-5,5	-4,5	-5,25
Disturbance of fauna	Alternative 2	Rehab and closure	-5,5	-4,5	-5,25

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Invasion of alien plant species	Alternative 2	Rehab and closure	-5	-4,5	-5,25
Noise	Alternative 2	Rehab and closure	-5	-4,5	-5,25
Disturbance, damage or destruction of heritage features	Alternative 2	Rehab and closure	-5,5	-4,5	-5,25
Increased vulnerability and community safety-related risks and impacts	Alternative 2	Rehab and closure	-5	-4,5	-5,25
Localized areas of acid mine drainage and groundwater contaminatio n	Alternative 2	Rehab and closure	-8,25	-7,5	-8,75
Contribution to losses of potentially productive agricultural land	Alternative 3	Rehab and closure	-5,5	-4,5	-5,25
Air quality impacts	Alternative 3	Rehab and closure	-5,5	-4,5	-5,25

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Reduction in surface water quality	Alternative 3	Rehab and closure	*-5,5*	*-4,5*	*-5,25*
Increase in traffic	Alternative 3	Rehab and closure	*-5*	*-5*	*-5,83*
Disturbance of fauna	Alternative 3	Rehab and closure	*-5*	*-4,5*	*-5,25*
Invasion of alien plant species	Alternative 3	Rehab and closure	*-5*	*-4,5*	*-5,25*
Noise	Alternative 3	Rehab and closure	*-5*	*-4,5*	*-5,25*
Disturbance, damage or destruction of heritage features	Alternative 3	Rehab and closure	*-5*	*-4,5*	*-5,25*
Increased vulnerability and community safety-related risks and impacts	Alternative 3	Rehab and closure	*-5*	*-4,5*	*-5,25*
Localized areas of acid mine drainage and groundwater contaminatio n	Alternative 3	Rehab and closure	*-5,5*	*-5*	*-5,83*

Proposed mitigation:

Refer to the impact identification and mitigation section above for detailed mitigation measures.

9.3.11 POTENTIAL FOR ACID MINE DRAINAGE

Acid Mine Drainage (AMD) can be defined as the outflow or seepage of acidic water from old metal or coal mine areas. AMD is comprised of a low pH, iron and sulphate water and it usually occurs when water is exposed to the atmosphere via outflow or seepage, thus oxidising.

The oxidation of the pyrite present in the coal seam and the roof and the floor of the underground mine workings will lead to the formation of acid mine drainage (AMD) and an increase in total dissolved solids (TDS) as the acidification is countered by the neutralising potential of the local geology. Previous ABA results indicate that the floor and roof material could leach contaminants. It is anticipated that flooding of the back areas will, however, continue until total flooding of the workings has occurred after closure. The significance of the impact during the operational phase will be low. The decommissioning will result in the potential generation of acid mine water within the mine workings, which will gradually reduce as oxidation of the pyrite is inhibited by the flooding. Owing to the general dip of the coal seam away from the sub-outcrop, flooding will occur progressively back from the deeper sections of the mined-out area.

10 CLOSURE OBJECTIVES

The goals and objectives for closure are determined based on the baseline environment and the land uses that will be established post mining. The initial overarching closure objectives include the following:

- To ensure that as little water as possible seeps out of the various sections of the mine and where this is unavoidable, to ensure that the water is contained, if the volume is significant and if it does not meet the statutory water quality requirements;
- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Any residue deposits must be stable in the long term to prevent erosion, subsidence or collapse. These facilities must also be closed in such a way that they do not continue to contribute to long term water quality problems from leachates which spread in an uncontrolled fashion;
- Remove all relevant infrastructure other than the residue deposits/discard dumps and other waste disposal facilities unless alternative users can be found;
- Dispose of all rubble and waste at approved sites;
- Rehabilitate areas as soon as possible;
- Return rehabilitated land to the pre-mining environment where possible;
- Minimise the impact on the local and surrounding communities;
- Ensure that the areas mined by underground methods do not subside and that it will be safe to conduct normal activities above these workings by using appropriate safety factors and mine design; and
- Seal off all entries to the underground workings so that the water table will be restored thereby preventing the ingress of air and preventing spontaneous combustion of the pillars. Any access to the working will also be restricted in accordance with the MPRDA.

11 CONCLUSIONS AND RECOMMENDATIONS

The Scoping Phase of the EIA process identified potential impacts 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.

11.1 CONCLUSIONS FROM THE 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.

11.1.1 HYDROGEOLOGY

The following conclusions were derived from the outcomes of the hydrogeological investigation:

- The site is predominantly underlain by an intergranular and fractured aquifer system comprising mostly fractured and weathered compact sedimentary/ arenaceous rocks. It should be noted that the Ecca Group consists mainly of sandstones, mudstones and shales that are very dense with permeability usually very sluggish due to poorly sorted matrices.
- On a local scale, three potential aquifer units can be inferred in the saturated zone:
    - A shallow, weathered zone aquifer occurring in the transitional soil and weathered bedrock formations underlain by more consolidated bedrock. Due to higher effective porosity (n) this aquifer is most susceptible to impacts from contaminant sources.
    - An intermediate/deeper fractured where the underground mine void is situated.

  - Shallow quaternary and recent types of sediments (perched, unconfined) are characteristically a primary porosity aquifer.

- Various neighbouring boreholes in close proximity (< 500 m) to the mining operations are utilized for domestic purposes and livestock watering.
- The unsaturated/ vadose zone within the study area is limited (< 5.0 mbgl) with shallow water levels of the weathered aquifer posing a risk to groundwater contamination.
- Analysed data indicate that the regional groundwater elevation correlates well to the topographical elevation and it can be inferred that groundwater flow direction of the shallow aquifer mimics topography. The regional groundwater flow direction is towards the lower laying drainage system of the Vaal River transecting the project area and will flow in a general southern to south-eastern direction.
- The relatively low standard deviation compared to the mean depth to groundwater i.e. Coefficient of Variation (CV) < 100%, suggest a relative steady state groundwater environment as confirmed by the monitoring data water levels analysed.
- The groundwater gradient increases towards the east while a gentler gradient exists to the south. The existing mine waste facilities is located towards the north with moderate gradients to influence seepage rates.
- The regional ambient groundwater quality of the shallow aquifer is good and suggest an unimpacted groundwater system with water indicative of recently recharged groundwater. It should however also be noted that isolated monitoring localities down gradient of the existing discard dump and stockpile areas indicate slight impacts from mining activities.
- It is evident that both discard as well as coal product material analysed have a likely acid generation capacity, and due to the relatively high sulphide concentrations observed, there is enough oxidizable sulphides to sustain long term acid generation.
- The groundwater flow model simulations suggest that the average groundwater ingress and underground dewatering volume for the LOM will be relatively low at approximately 5.10E+02 m^3/d. It is expected that the groundwater drawdown will range from 2.0 m to ~ 7.0 m below the static water level (mbsl) i.e. pre-mining water levels covering an estimated area of approximately 13.0 km^2, propagating towards a western as well as north-eastern direction, reaching a maximum distance of ~750 m to the west and 1050 m to the northeast. It is noted that there is not a significant influence on water levels of neighbouring boreholes for the duration of the proposed mining operation.
- It should be noted that no substantial decreases in groundwater levels have been observed since commencement of mining activities in 2018 and it can be assumed that, to date, there has been no significant of observable impact on groundwater levels. It is expected that dewatering of the underground workings will have a slight impact on the weathered aquifer system, but the extent of the dolerite sills observed on site will play a remedial role in the remainder of the site by creating a confining layer and compartment.

- Baseflow discharges to the Vaal Rivers and Witpuntspruit accounts to approximately 1 326.0 m^3/d during pre-mining conditions, whereas baseflow discharge during the operational life of mine period decreases to ~ 1 117.0 m^3/d. This accounts for an average loss of ~16.0%.
- It is estimated that under average rainfall conditions (MAP) the underground void will be flooded in approximately 34 years after ceasing of mining activities. The proposed depth and geometry of the underground operations allows for the entire footprint to be flooded without any decant expected.
- The simulated sulphate pollution plume extend emanating from the discard dump as well as coal stockpile dumps covers an area of approximately 0.72 km^2, reaching a maximum distance of 180.0 m in a general eastern to north-eastern direction and suggest that no neighbouring boreholes as identified during the hydrocensus user survey are impacted on during the operational life of mine. Monitoring locality MPG-BH01 exceeds (modelled exceedance) the SANS 241:2015 threshold for sulphate after a period of approximately eight years, reaching a maximum concentration of 560.0 mg/l.
- The expected pollution plume migration potentially emanating from the underground mined out faces does not migrate more than ~100.0 m – 150.0 m from the mining footprint for the operational life of mine.
- The preferred mitigation scenario i.e. implementation of a cut-off trench down-gradient of waste facilities reduces the plume extend to 0.57 km^2, with an effective footprint reduction of >20.0 %.
- It should be noted that post-closure the pollution plume migration stretches beyond the mine lease area to the north. The plume still does not reach any neighbouring boreholes, however two drainages and tributaries of the Witpuntspruit towards the northern and eastern border can potentially be affected post-closure.
- The model results were incorporated into a risk rating matrix to determine the significance of potential groundwater related impacts as discussed below:
    - During the operational phase the environmental significance rating of groundwater yield (dewatering) impacts on down-gradient receptors are rated as medium negative whereas the groundwater quality related impacts are rated as low negative. Groundwater quality impacts from the discard dump and coal stockpile areas are rated as medium negative without implementation of remedial measures and low negative with implementation of mitigation measures.
    - Post closure phase impacts resulting from seepage and leachate from mine waste facilities on down-gradient receptors are rated as medium negative without the implementation of remedial measures and low negative with implementation of mitigation measures.

The following recommendations are proposed following the hydrogeological investigation:

- It is recommended that mitigation and management measures as set out in the groundwater report should be implemented as far as practically possible.
- Furthermore, it is recommended that a monitoring program should be implemented and adhered to. It is imperative that monitoring be initiated at least 12 months prior to any operational activities commence in

order to establish a site background benchmark to be applied to serve as an early warning and detection system.

- Monitoring results should be evaluated and reviewed on a bi-annual basis by a registered hydrogeologist for interpretation and trend analysis and submitted to the Regional Head: Department of Water and Sanitation.
- Groundwater flow modelling assumptions should be verified and confirmed. The calibrated groundwater flow model should be updated on a biennial basis as newly gathered monitoring results become available in order to be applied as groundwater management tool for future scenario predictions.
- It is imperative that the water level recovery of the underground void should be monitored on a continual basis. Stage re-watering curves should be evaluated in order to aid in the management of the mine post-closure phase.
- Alternative remedial options, as suggested in the specialist report, should form part of the mine closure and rehabilitation strategy.

11.1.2 HYDROLOGY

Based on observations made during the desktop study, site walkover and development of the SWMP for the Mooiplaats Colliery, the following recommendations are proposed:

- The SWMP should be revisited after any major changes to the current operations.
- To prevent cross-contamination, it must be ensured that there is no handling and disposal of substances that may give rise to pollution within designated 'clean' areas.
- It is recommended that gabion 'sieves' are placed at the outlet of coal stockpile areas and up-gradient of the pipes/channels. The intention of the gabions will be to prevent large debris from leaving the facilities during storm events and potentially resulting in a backlog of associated infrastructure. These will need to be actively managed to prevent clogging of the gabion baskets.
- The pipes, channels and PCDs need to be constructed to facilitate routine maintenance (i.e. simple, effectual housekeeping).
- It is recommended that stone pitching channels and concrete pipes are used to transfer runoff. Stone pitching is recommended to reduce high runoff velocities in channels and sulphate-resistant concrete to reduce sulphate content generated in 'dirty' areas with sulphate contaminants.
- To prevent clogging of the grated channel covers and maintain channel capacity, best practice and proper housekeeping practices must be ensured.
- To prevent subsurface contamination migration, hardstanding is proposed for the storage areas.
- All pipes and channels must be checked after any major rainfall events to ensure that there are no blockages and that the water flow will not be restricted in any way.
- Sediment that accumulates within pipes, channels and retention facilities needs to be removed directly after the storm events and appropriately disposed of to ensure design capacity is maintained.

- Erosion protection will be required at the outlet of the 'clean' water pipes discharging to the environment. Erosion protection can take the form of gabions or geotextiles.
- To prevent subsurface contamination, it is recommended that the PCDs be lined. The type of lining to be used will need to consider the quality of effluent contained within the facility and the hydrogeological environmental setting associated with the PCD. It is recommended that the Colliery personnel engage the DHSWS to establish their requirements in this regard.
- It is recommended that the PCDs be operated empty or at a storage level low enough to accommodate storm water inflows, whilst meeting the required spillage frequency and freeboard requirements.

11.1.3 WETLAND AND AQUATIC ASSESSMENTS

The proposed mining operations will be underground with no new surface access points (shafts). It has been assumed that the mining depths and board & pillar sizes will be adequate to mitigate any expected risks to wetlands.

Preliminary investigations based on field observations and analysis of Google Earth imagery suggests that contaminated water may be entering the valley-bottom wetland and associated seeps and through five potential sources. It is recommended that point source inputs be dealt with by effectively re-diverting flows into the existing stormwater system and ultimately the PCDs. This will require engineered hard interventions such as appropriately engineered and lined v-drains. It is recommended that the colliery consider the feasibility of creating a contingency dam at the main outlet point south of the small PCDs (26°38'33.38"S; 30°6'3.74"E) where a man-made depression of the sort already exists.

Re-vegetation should follow landscaping activities in a phased approach over two consecutive growing seasons. This approach ensures that the entire system is not denuded of vegetation all at once any that any challenges / short comings identified in the first phase to be rectified in the second phase. The unchanneled valley bottom wetland to the east of the mining activities provides a relatively good example of the vegetation structure and species composition that should be aimed for in the rehabilitated wetland. Rehabilitation should seek to re-establish a wetland vegetation comprised of short, dense hydromorphic grasses in the temporary to seasonal zone with slightly taller sedges becoming more prevalent in the permanent zones along the flow path.

Considering the status wetland and aquatic ecosystems and the nature of the project in respect to the watercourses, the proposed project has the potential to negatively affect local ecology. No fatal flaws were identified for the proposed underground mining activities. Environmental authorisation must take into consideration the specialist recommendations prescribed for this assessment.

11.1.4 SUBSIDENCE

The rock engineering report concluded that the mining method followed at Mooiplaats Colliery is not likely to cause subsidence as mining is conducted according to an acceptable pillar design and is relatively deep. Some areas within the mining area are more prone to subsidence although subsidence is not expected to occur at Mooiplaats Colliery. Although subsidence is unlikely to occur it cannot be excluded over the long term. Should any form of secondary extraction of pillars be planned in the future, subsidence will be more likely to occur.

11.2 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 Mooiplaats Colliery 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.

11.3 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets in a region. 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. Therefore, the sensitivity mapping exercise assists in the identification of low, medium and highly sensitive areas within the Mooiplaats Colliery Vunene project area, towards selecting the preferred location, design and layout, and process or technology alternatives for the proposed activities and infrastructure.

This sensitivity mapping approach allows for the proposed Mooiplaats Colliery Vunene project activities to be undertaken whilst protecting identified sensitive environmental areas / features. Furthermore, environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes. Table 49 below provides a breakdown of the sensitivity rating and weightings applied to determine the sensitivity score of each aspect.

Table 49: 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

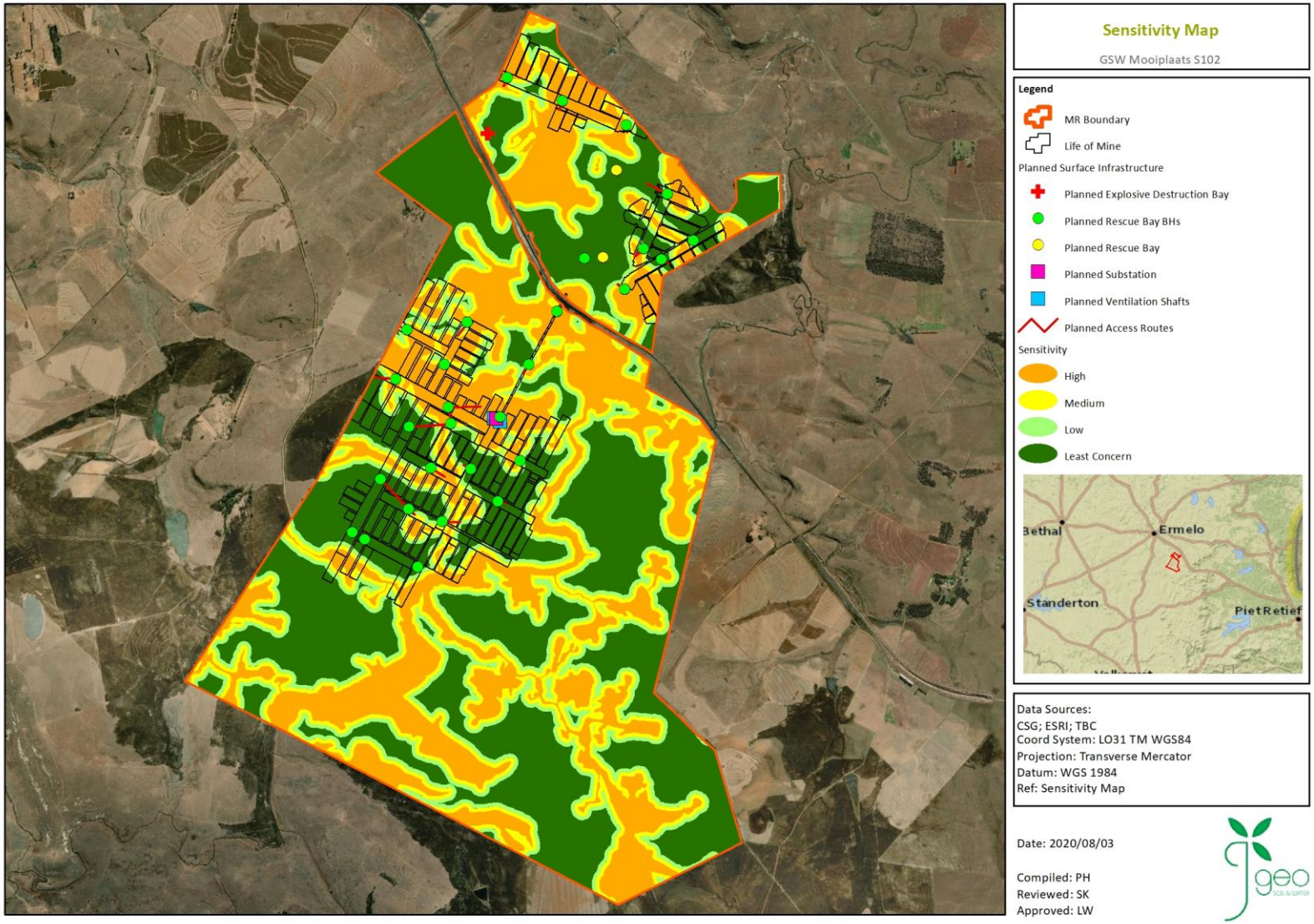


Figure 32: Sensitivity map

12 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.
- 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 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.
- The calibrated groundwater flow model should be updated on a biennial basis as newly gathered monitoring results become available in order to be applied as groundwater management tool for future scenario predictions.

13 ASSUMPTIONS, LIMITATIONS AND UNCERTAINTIES

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

- The report is based on project information and project plan provided by the client;
- 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.
- Furthermore, certain assumptions, limitations, and uncertainties are associated with the specialist studies and these are detailed for each aspect below.

Table 50: Assumptions and Limitations from Specialist Reports.

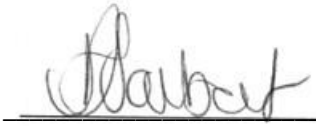
Aspect	Scope of Work for EIA
Hydrology (surface water)	The following assumptions were made during the calculation of the annual average water balance: • It was assumed that plant water supply is equal to 48l/s. This was based on the water balance diagram received from the client. • It was assumed that groundwater ingress to the North Shaft is equal to 50l/s. This was based on the water balance diagram from the client. • Water usage data was obtained for three months only (August-October 2018). These values were extrapolated were possible for an annual average water balance. • It was assumed that borehole abstraction would be equal to the maximum limit within the water use licence application. • It was assumed that 40% of the water loss would occur within the change house. This was based on the water balance calculations from the client.
Hydrogeology (groundwater)	Data limitations were addressed by following a conservative approach and assumptions include the following: • The scale of the investigation was set at 1:50 000 resolutions in terms of topographic and spatial data, a lower resolution of 1:250 000 scale for geological data and a 1: 500 000 scale resolution for hydrogeological information. • The Digital Elevation Model (DEM) data was interpolated with a USGS grid spacing of 25 m intervals.

Aspect	Scope of Work for EIA
	• Rainfall data and other climatic information was sourced from the WR2012 database. • Water management and catchment-based information was sourced from the GRDM and Aquiworx databases. • The concept of representative elementary volumes (REV) have been applied i.e. a scale has been assumed so that heterogeneity within a system becomes negligible and thus can then be treated as a homogeneous system. The accuracy and scale of the assessment will result in deviations at point e.g. individual boreholes. • No site characterisation boreholes were drilled as part of this investigation and aquifer parameters as well as hydrostratigraphic units were assumed based on historical investigation and similar studies conducted. • The investigation relied on data collected as a snapshot of field surveys and existing monitoring data. Further trends should be verified by continued monitoring as set out in the monitoring program. • Groundwater divides have been assumed to align with surface water divides and it is assumed that groundwater cannot flow across this type of boundaries. • Model calibration was achieved by assigning a ratio of 1:1 for Hydraulic Conductivity (K) in x and y directions, with a ratio of 1:10 in the z direction i.e. anisotropic aquifer. • Perennial rivers within the model domain have been treated as gaining type streams. As such groundwater is lost from the system via baseflow to local drainages. • The numerical groundwater flow model was developed considering site specific information. It should be stated that influences from neighbouring mining developments were not taken into consideration as part of this investigation. • Prior to development of the groundwater model, the system is in equilibrium and therefore in steady state i.e. quasi steady state. • Where data was absent or insufficient, values were assumed based on literature studies and referenced accordingly.
Wetlands	The following aspects were considered as limitations: • The use of two of the main wetland indicators namely hydromorphic soils and hydrophytic vegetation was somewhat limited in some of the seep areas that

Aspect	Scope of Work for EIA
	have been extensively transformed through commercial crop cultivation practices; • Whilst every effort is made to ground truth and assess all wetland systems, it is not possible assess the entire extent of the project area. A combination of professional experience, desktop data and survey findings are used to reduce this limitation as much as possible, and extrapolation of data and satellite imagery is used for delineations in these areas; • Wetlands within the 500 m regulated area were considered but not explicitly sampled and delineated in-field, wetland delineations within these areas should be considered desktop; • The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side; • A wetland buffer zone was not determined for the proposed underground mining areas, but a recommended buffer area has been determined for the proposed ventilation shafts; • The information provided herein for the aquatic assessment was incorporated from the ongoing biomonitoring being undertaken for Mooiplaats Colliery. Information herein is incorporated from the 2018 aquatic biomonitoring programme. This report should be read on conjunction with the biomonitoring report; and • Aquatic sampling points are located in the vicinity of the active mining area and are associated with the Vaal and Witpuntspruit systems.

14 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I 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.

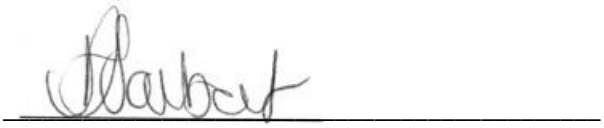


Signature of the EAP

Date: 31 July 2020

15 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I 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: 31 July 2020

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Appendix 1: EAP CV and Declaration

Appendix 2: Public Participation Information

Appendix 3: Copy of Application Form

Appendix 4: Impact Assessment Matrix

Appendix 5: Groundwater Impact Assessment

Appendix 6: Surface Water Impact Assessment

Appendix 7: Aquatic and Wetland Impact Assessment

Appendix 8: Subsidence Risk Assessment

Appendix 9: A3 Layout Maps

Appendix 10: Environmental Management Programme (EMPr)

Appendix 11: Financial Provisions