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FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE PLAN, INCORPORATING AN ANNUAL REHABILITATION PLAN AND ENVIRONMENTAL RISK ASSESSMENT

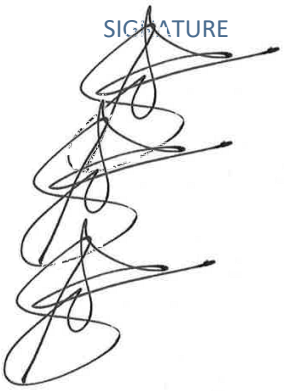
ELOFF PHASE 3

DOCUMENT DETAILS

EIMS REFERENCE: 1245

DOCUMENT TITLE: FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE PLAN, INCORPORATING AN ANNUAL REHABILITATION PLAN AND ENVIRONMENTAL RISK ASSESSMENT- ELOFF PHASE 3

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
COMPILED:	Liam Whitlow		2020/02/10
CHECKED:	Liam Whitlow/ Carl Steyn		2020/02/10
AUTHORIZED:	Liam Whitlow		2020/02/10

REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2020/02/10	ORIGINAL DOCUMENT	

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Rehabilitation:	The re-instatement of a disturbed area into a usable state (not necessarily its pre-mining state) as defined by broad land use and related performance objectives.
Remediation	To assist in the rehabilitation process by enhancing the quality of an area through specific actions to improve especially bio-physical site conditions.
Scheduled closure	Closure that happens at the planned date and/or time horizon.
Unscheduled closure	Immediate closure of a site, representing decommissioning and rehabilitation of the site in its present state.
Decommissioning	This relates to the situation after cessation of operations involving the deconstruction/removal and/or transfer of surface infrastructure and the initiation of general site rehabilitation.
Care and maintenance	This involves the maintaining and corrective action as requires as well as conducting the required inspection and monitoring to demonstrate achievement of success of the implemented measures.
Closure	This involves the application for closure certificate and initiation of transfer of on going care and maintenance to third parties.
Site relinquishment	Receipt of closure certificate and handover to third parties for on-going care and maintenance, if required.
Post-closure	The period of on-going care and maintenance, as per arrangement with third parties.
Preliminary and Generals (P&Gs)	This is a key cost item which is directly related to whether third party contractors are applied for site rehabilitation. This cost item comprises both fixed and time-related charges. The former makes allowance for establishment (and de-establishment) of contractors on site, as well as covering their operational requirements for their offices (electricity/water/communications), latrines, etc. Time-related items make allowance for the running costs of the fixed charged items for the contract period.

Contingencies	This allows for making reasonable allowance for possible oversights/omissions and possible work not foreseen at the time of compilation of the closure costs. Allowance of between 10 percent and 20 percent would usually be made based on the accuracy of the estimations. The South African Department of Mineral Resources Guideline (January 2005) requires an allowance of 10 percent.

EXECUTIVE SUMMARY

Eloff Mining Company (Pty) Ltd (EMC) has lodged an application for Environmental Authorisation (EA) to the Department of Mineral Resources (DMR), in support of plans to mine the Phase 3 Pit within the Eloff Coal Resource – the Eloff Project (MP30/5/1/2/2/10169MR). This Final Rehabilitation, Decommissioning and Closure Plan (FRDCP) aims to meet this requirement and has been prepared in accordance with the requirements of the NEMA Financial Provisioning Regulations (2015) (NEMA GNR 1147)(hereafter referred to as 'the Regulations').

The closure vision for the Eloff Phase 3 Project is, 'to conduct the mining operations and manage the environmental impacts in such a manner that the long term, post closure, land capability and environmental goods and services can continue and be utilised in a sustainable manner'. In support of this closure vision various objectives, targets and actions have been identified. In addition, various alternatives for rehabilitation and closure have been identified and assessed.

Table 1 presents the estimated cost of implementing the defined closure actions, on the basis of scheduled closure and in accordance with the requirements of the regulations (GNR 1147):

Table 1: Summary of estimate closure costs for preferred closure option as at January 2020.

Eloff Phase 3 Final Rehabilitation Decommissioning and Closure Costs, as at January 2020			
Closure components			
1	Infrastructural Areas	R	11 362 933.23
2	Mining Areas	R	295 561 916.49
3	P&Gs, Contingencies and Additional Allowances	R	67 523 466.94
4	Pre-site Relinquishment Monitoring and Aftercare	R	7 491 689.01
5	Post Closure Phase	R	123 060 585.00
Total (Excl VAT)		**R**	**505 000 590.66**

1 INTRODUCTION

Eloff Mining Company (Pty) Ltd (EMC) has lodged an application for Environmental Authorisation (EA) to the Department of Mineral Resources (DMR), in support of plans to mine the Phase 3 Pit within the Eloff Coal Resource – the Eloff Project (MP30/5/1/2/2/10169MR). The proposed Phase 3 Project covers an extent of approximately 251 hectares (ha) over portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR, and is located approximately 7.5km south-east of the town Delmas in Victor Khanye Local Municipality, within the Nkangala District Municipality, Mpumalanga Province. The proposed Phase 3 Project is anticipated to use a standard truck and shovel mining method based on strip mining design and layout. The existing Coal Handling and Processing Plant (CHPP) at the adjacent Kangala Colliery will be utilised, and it is anticipated that no new surface infrastructure such as offices, dams, stores facility, workshops, or change house will be required for the project.

In accordance with Section 24P of the NEMA EMC 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. This Final Rehabilitation, Decommissioning and Closure Plan (FRDCP) aims to meet this requirement and has been prepared in accordance with the requirements of the NEMA Financial Provisioning Regulations (2015) (NEMA GNR 1147)(hereafter referred to as 'the Regulations').

According to the regulations, financial provision must be made for annual rehabilitation, final rehabilitation, decommissioning and closure activities at the end of prospecting, exploration, mining or production operations; and remediation and management of latent or residual environmental impacts which may become known in the future. In order to address these requirements this document includes an annual rehabilitation plan, a final rehabilitation, decommissioning and closure plan, and an environmental risk assessment report.

Table 1 below lists the specific requirements that must be contained in each of the three plans as per the NEMA GNR 1147 Appendices 3, 4 and 5, as well as the associated section in the report where each requirement is addressed.

Table 2: NEMA GNR 1147 Appendix 3, 4 and 5 Requirements and Associated Sections Where they are Addressed

No.	Requirement	Relevant Section
Annual Rehabilitation Plan – Appendix 3		
3 (a)	details of the person or persons that prepared the plan, and timeframes of implementation of the current, and review of the previous rehabilitation activities;	2 No review required as it is a new mine. Time frames are provided in 3.7
3 (b)	the pertinent environmental and project context relating directly to the planned annual rehabilitation and remediation activity;	3.1 and 4.1
3 (c)	results of monitoring of risks identified in the final rehabilitation, decommissioning and mine closure plan with a view to informing rehabilitation and remediation activities;	4.1
3 (d)	an identification of shortcomings experienced in the preceding 12 months;	4.2
3 (e)	details of the planned annual rehabilitation and remediation activities or measures for the forthcoming 12 months;	4.4

No.	Requirement	Relevant Section
3 (f)	a review of the previous year's annual rehabilitation and remediation activities;	4.3
3 (g)	costing;	4.5
Final Rehabilitation, Decommissioning and Mine Closure Plan – Appendix 4		
3 (a)	details of the person or persons that prepared the plan;	2
3 (b)	the context of the project, including material information and issues that have guided the development of the plan, an overview of the environmental context, the social context regarding closure activities and post-mining land use, stakeholder issues and comments, and the mine plan and schedule for operations;	3.1
3 (c)	findings of an environmental risk assessment leading to the most appropriate closure strategy;	3.1.4 and 3.2
3 (d)	design principles, including the legal and governance framework, the closure vision, objectives and targets, alternative closure and post closure options, a motivation for the preferred closure action, details of the closure and post closure period, details associated with any on-going research on closure options, and details of assumptions made to develop closure actions;	3.3
3 (e)	a proposed final post-mining land use;	3.4
3 (f)	closure actions required;	3.5
3 (g)	a schedule of actions for final rehabilitation, decommissioning and closure;	3.6
3 (h)	an indication of the organisational capacity that will be put in place to implement the plan, including the organisational structure;	3.7
3 (i)	an indication of gaps in the plan;	3.8
3 (j)	relinquishment criteria for each activity or infrastructure in relation to environmental aspects with auditable indicators;	3.9
3 (k)	the closure cost estimation procedure;	3.10
3 (l)	monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps;	3.11
3 (m)	motivations for any amendments made to the final rehabilitation, decommissioning and mine closure plan, given the monitoring results in the previous auditing period and the identification of gaps as per 2(i).	n/a
Environmental Risk Assessment – Appendix 5		
3 (a)	details of the person or persons that prepared the plan;	2

No.	Requirement	Relevant Section
3 (b)	details of the assessment process used to identify and quantify the latent risks;	5.1
3 (c)	management activities;	5.2
3 (d)	costing;	5.2.3
3 (e)	monitoring, auditing and reporting requirements.	5.2

2 DETAILS OF THE SPECIALIST

The details of the professionals who contributed to the preparation of the annual rehabilitation plan (ARP), final rehabilitation, decommissioning and mine closure plan (FRDCP) and environmental risk assessment (ERA) are provided in Table 3.

Table 3: Details of Specialist[1]

Name	Role	Qualifications/ Experience	Professional registrations
Liam Whitlow	Environmental Scientist	BSc Hons Environmental Management. ~15 years environmental consulting experience.	South African Council for Natural Scientific Professions- Registered Professional Natural Scientist (Environmental Science)
Johann Le Roux	Environmental Engineer – responsible for cost estimation, and landform analysis.	Btech Civil Eng ~10 years' experience	Registered with Engineering Council of South Africa.
Carl Steyn	Closure, Contaminated Land and Data Specialist – responsible for technical review.	MSc (Agric) Soil Science. ~20 years' experience in Contaminated Land and Closure.	South African Council for Natural Scientific Professions- Registered Professional Natural Scientist.
Douglas Richards	Environmental Engineer – responsible for cost estimation, and landform analysis.	BTech (Civil Engineering). MSc Mining Engineering (current). ~8 years' experience in the field of civil engineering.	

[1] According to the 2015 Financial Provisioning Regulations, "specialist" means an independent person or persons who is qualified by virtue of his or her demonstrable knowledge, qualifications, skills or expertise in the mining, environmental, resource economy and financial fields.

Name	Role	Qualifications/ Experience	Professional registrations
Is-mari Wheeler	Environmental Engineer – responsible for cost estimation, and landform analysis.	BEng (Civil Engineering) ~1 year experience.	Candidate Engineer (No. 2019201592) Associate Member South African Institute of Civil Engineers (MSAICE No 201700292) Member of Geosynthetic Interest Group of South Africa (GIGSA No 13649)
John von Mayer	Environmental Scientist	BSc Environmental Science ~11 years' experience.	South African Council for Natural Scientific Professions- Registered Professional Natural Scientist (Environmental Science)

3 FINAL REHABILITATION, DECOMISSIONING AND MINE CLOSURE PLAN (FRDCP)

According to the NEMA GNR 1147 the objective of the final rehabilitation, decommissioning and closure plan, is to identify a post-mining land use that is feasible through-

- Providing the vision, objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
- Outlining the design principles for closure;
- Explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;
- Detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
- Committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
- Identifying knowledge gaps and how these will be addressed and filled;
- Detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- Outlining monitoring, auditing and reporting requirements.

This section of the report aims to achieve these objectives.

3.1 PROJECT AND ENVIRONMENTAL CONTEXT

This section aims to provide context and focus attention on the material information and issues that have guided the development of this FRDCP. Further details on the project and environmental context can be obtained from the Environmental Impact Assessment (EIA) Report and associated Environmental Management Programme (EMPr).

3.1.1 PROJECT CONTEXT

The planned mining activities, which would require inclusion in the FRDCP are extracted from the EIA report and described below.

3.1.1.1 **LOCATION**

Table 4 indicates the farm portions that fall within the proposed Eloff Phase 3 Project ("Phase 3 Project") including details on the location of the proposed opencast mining pit as well as the distance from the proposed project area to the nearest towns.

Table 4: Locality details

Farm Name	**<u>Mining Right holder</u>** EMC is applying for EA and IWULA for the proposed Phase 3 Project which entails an opencast mining pit and associated facilities (stockpiles etc) located on the following farms: • Portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of farm Strydpan 243 IR.		
Application Area (Ha)	The proposed Phase 3 Project footprint covers an extent of approximately 251 hectares (ha) including the proposed topsoil area to the west of the new mining pit. The total application area (in accordance with the properties listed above) is approximately 584.5ha in extent.		
Magisterial District	Nkangala District Municipality.		
Distance and direction from nearest towns	The proposed project area is located approximately 7.0km south-west of the town Delmas and approximately 6.0km south-east of the town Eloff in the Victor Khanye Local Municipality, within the Nkangala District Municipality, Mpumalanga Province. The geographic coordinates at the centre of the site are approximately: 26°12'35.76" S and 28°38'43.20" E.		
21-digit Surveyor General Code for each Portion	**Farm Name:**	**Portion:**	**21 Digit Surveyor General Code**
	Strydpan 243 IR	14	T0IR00000000024300014
	Strydpan 243 IR	15	T0IR00000000024200015
	Strydpan 243 IR	16	T0IR00000000024300016
	Strydpan 243 IR	18	T0IR00000000024300018
	Strydpan 243 IR	19	T0IR00000000024300019
	Strydpan 243 IR	20	T0IR00000000024300020
	Strydpan 243 IR	22	T0IR00000000024300022
	Strydpan 243 IR	23	T0IR00000000024300023

	Strydpan 243 IR	24	T0IR00000000024300024
	Strydpan 243 IR	59	T0IR00000000024300059

Figure 1 and Figure 2 indicate the locality of the proposed location of the Phase 3 Project and the existing Kangala Coal Mine where the infrastructure (plant etc) is located.

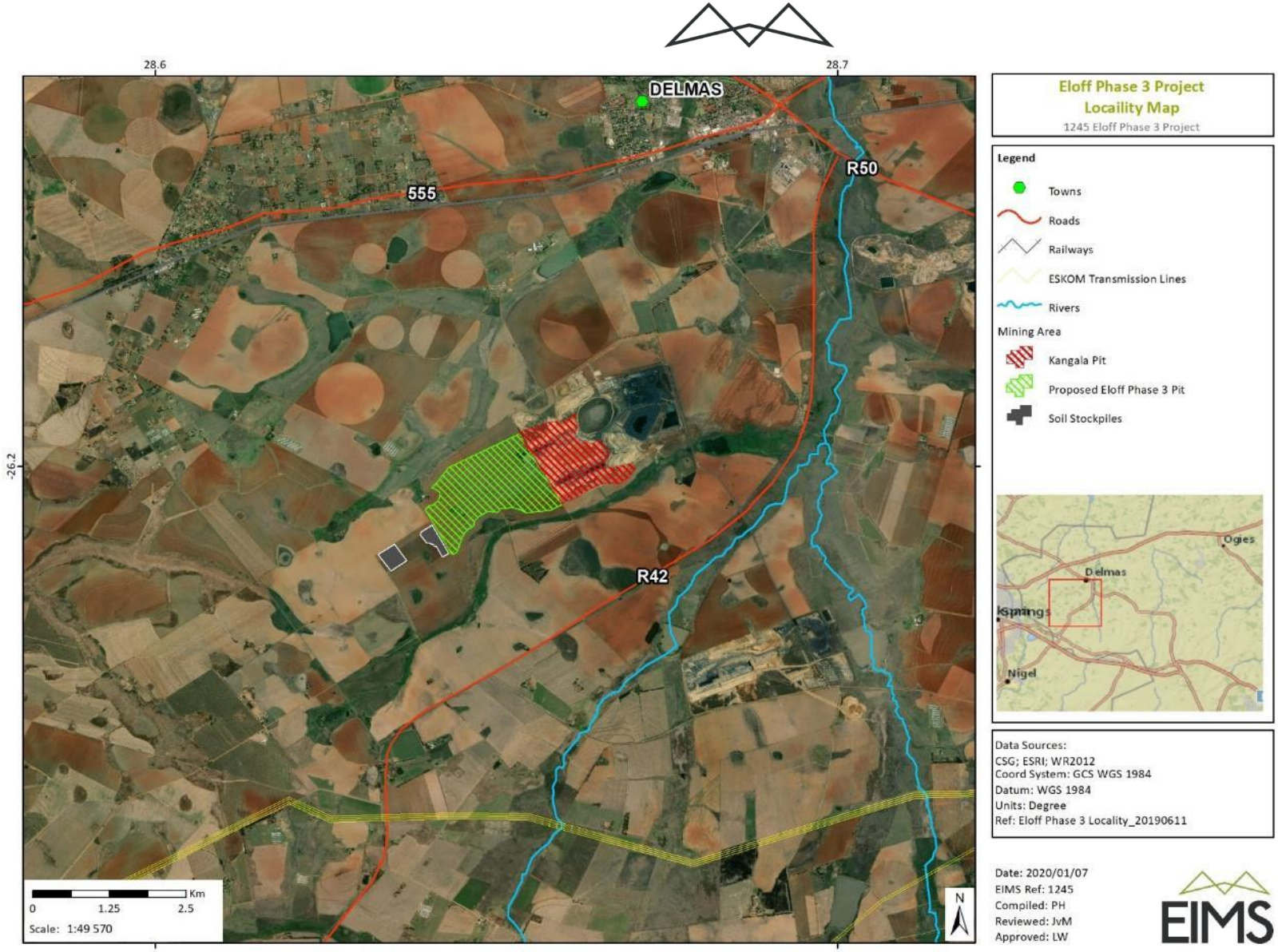


Figure 1: Aerial imagery locality map indicating the existing Kangala Colliery and the proposed Eloff Phase 3 Project

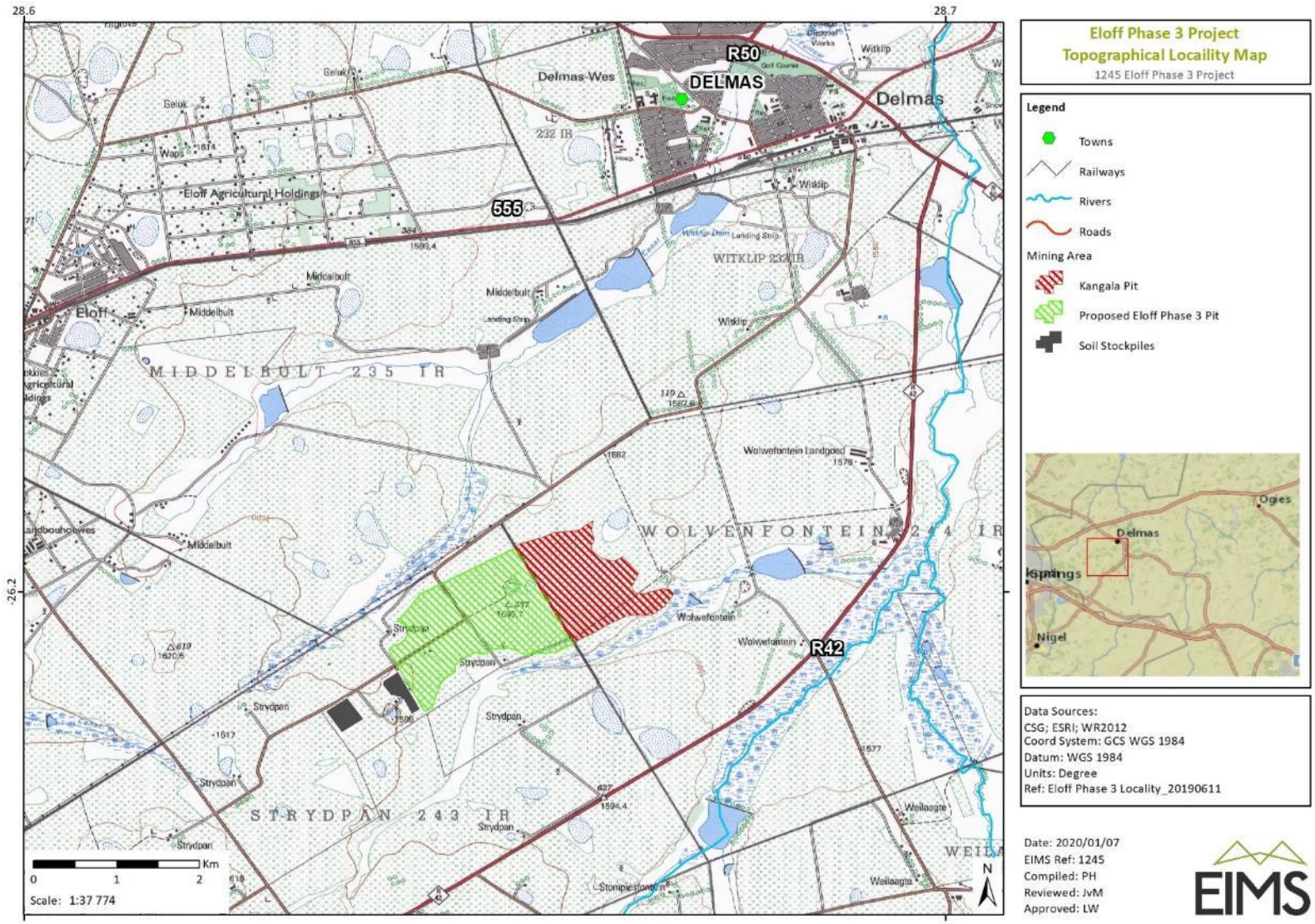


Figure 2: Topographical locality map indicating the existing Kangala Colliery opencast mining pit and the proposed Phase 3 Project.

3.1.1.2 PROPOSED MINING METHOD

The opencast mining pit method proposed for the Eloff Phase 3 Project entails conventional open pit strip mining. Based on the business philosophy of EMC, the opencast mining operations will be outsourced. All opencast mining contractors apply standard truck and shovel mining methods based on a strip mining design and layout.

The mining method that will be applied, and is similar to current operations at the adjacent Kangala Colliery, is standard truck and shovel strip mining, whereby mining and rehabilitation will be undertaken concurrently as follows:

- The topsoil is removed by truck and shovel and stored at the designated area;
- Thereafter, the softs will be removed by truck and shovel and stored at the designated material stockpiles;
- Next, cast blasting of the hard overburden material will be employed;
- Roll-over dozing of the hard overburden material will follow, where practical;
- Truck and shovel mining techniques are then applied to remove the hard overburden material in order to expose the various coal seams;
- Finally, the coal seams will be excavated by truck and shovel mining techniques; and
- Any parting or interburden material between the coal seams will be drilled and blasted before being removed by the truck and shovel technique.

The process is repeated on a strip-by-strip basis. Stockpiled overburden material (apart from the topsoil) will then be rolled-over into the void created by the removal of the waste and coal in the previous bench, with the hard overburden and parting / interburden forming the base, followed by the softs, levelled, and finally topsoil will be placed and seeded.

Figure 3 indicates the typical opencast mining sequence which entails initial removal of the overburden which will then be stockpiled close to the opencast mining pit area to ensure it can be replaced back in the initial box cut. The physical mining of the coal seam follows which is then transported to the crushing and screening facility towards processing.

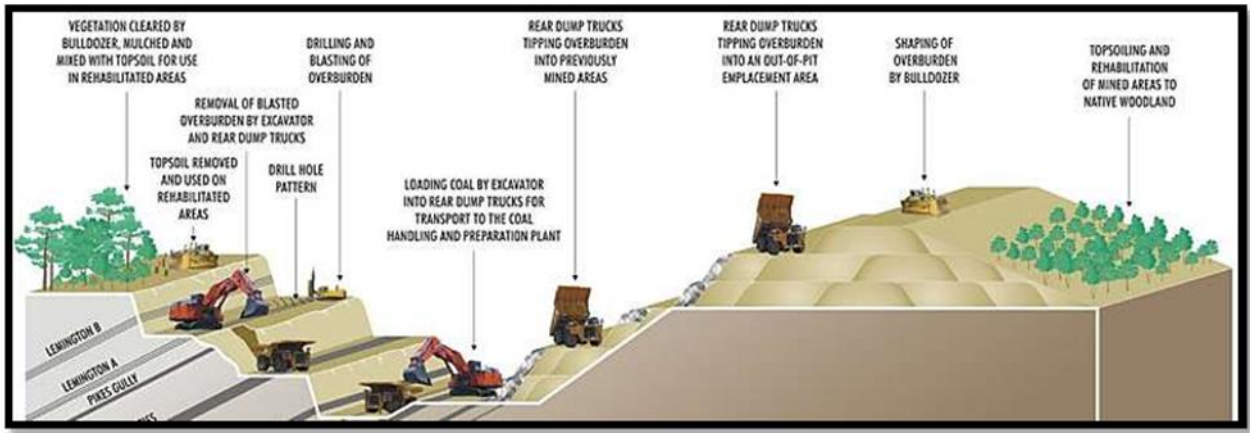


Figure 3: Typical coal surface opencast mining sequence indicating rollover backfill rehabilitation methodology (Surface Mining for Minerals & Metals: gaukartifact).

3.1.1.3 EXISTING MINING INFRASTRUCTURE TO BE UTILISED FOR ELOFF PHASE 3 PROJECT

Mining infrastructure already exists at the neighbouring Kangala Colliery and it is anticipated that the Eloff Phase 3 Project will consist of the opencast mining pit and soil stockpiles only, thereby making use of the existing Kangala Colliery infrastructure and supplies. The following infrastructure has been established for the opencast mining operations at Kangala Colliery:

- Pit access ramps;
- Haul roads, at the existing opencast pit and to the CHPP;
- Waste dump areas for topsoil, soft overburden, and hard overburden (includes interburden);
- ROM stockpiles for each of the seams at the CHPP;
- Clean water cut-off canals around the:
    - ROM stockpile area, including crushing,
    - Contractors laydown area,
    - Along the haul roads,
    - Around the waste dumps;
- Dirty water catchment drains at the:
    - ROM stockpile area, including crushing,
    - Contractors laydown area,
    - Along the haul roads;
- In-pit sumps for water management;
- PCD;
- Piping system for water management;
- Mining contractor's laydown area (compacted pads for the purpose of placing and / or assembling offices, workshops, diesel farm, etc.);
- Waste facility pad;
- Access road from the R42 road to the opencast mining area;
- Weighbridge facility;
- Potable water supply point;
- Bio-disc sewage plant; and
- A power supply point to the opencast contractor's laydown area.

Furthermore, the required surface infrastructure such as offices, stores facility, workshops, and change house also already exists at Kangala and thus does not need to be replicated for the operations at the Eloff Phase 3 Project area. The ROM coal will be transported by either the opencast haul trucks, to the tipping point at the existing CHPP at Kangala Colliery. A surface and mine infrastructure layout at the current Kangala Colliery as well as the proposed Eloff Phase 3 Project is indicated in Figure 4. It should be noted that the Kangala Colliery and its associated infrastructure falls within a separate mining right, and consequently has an obligation to develop and implement a standalone financial provision and associated closure reports for its infrastructure. In this regard the additional capacity and throughput being supplied to the Kangala operations as part of this Eloff Phase 3 Pit must be considered and included in the revised Kangala Financial Provisioning and associated reports.

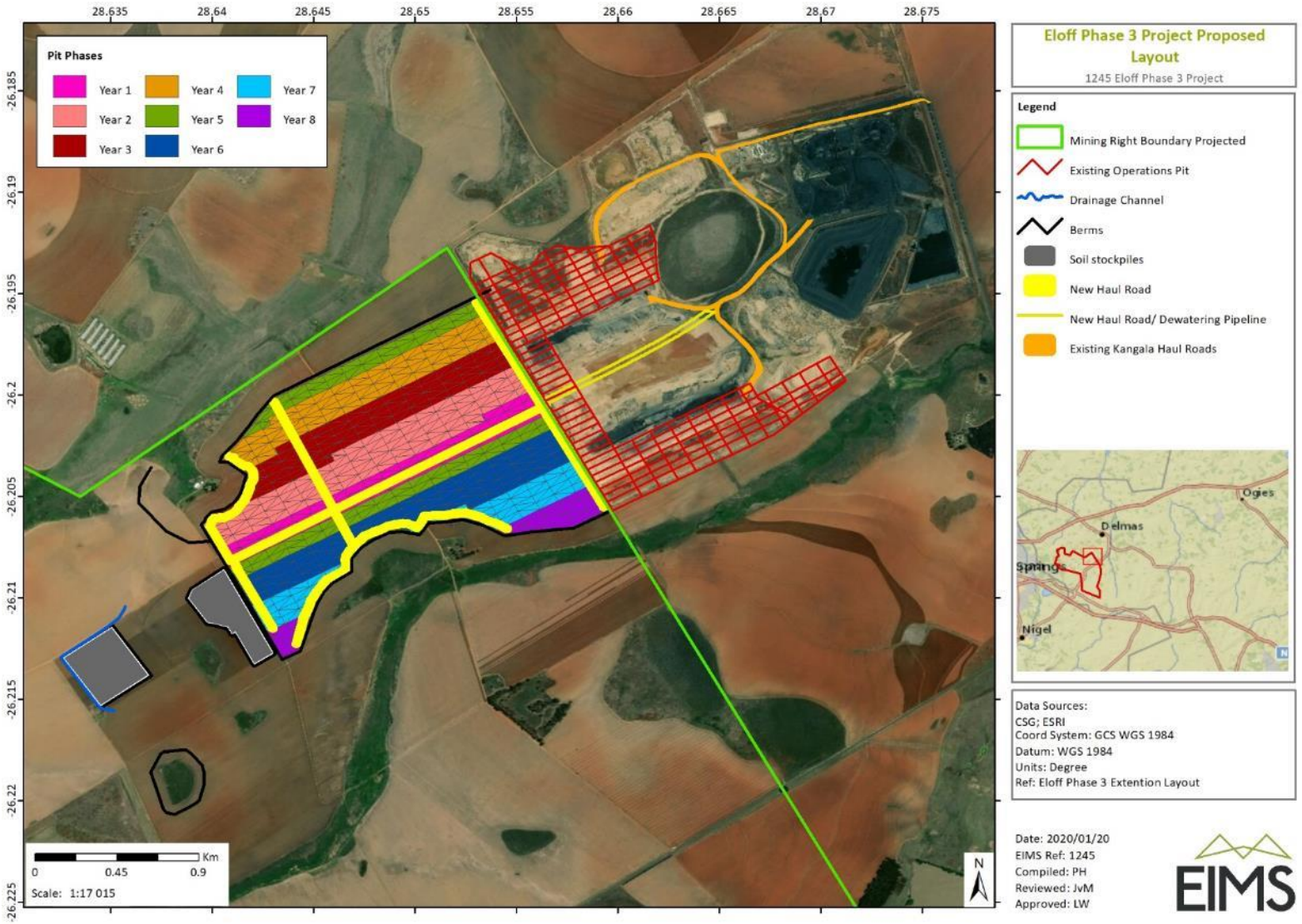


Figure 4: Layout of the current Kangala Colliery infrastructure and the proposed Eloff Phase 3 Project

3.1.1.4 POWER SUPPLY

There is an existing power supply from Eskom at Kangala Colliery. No power supply will be required at the Eloff Phase 3 Project area, as only mining operations will be conducted there. When, and if, pumping of water is required, it will be performed by existing diesel pumps. The existing power supply is adequate for the life of the Eloff Phase 3 Project.

3.1.1.5 WATER SUPPLY

Potable water is also already supplied to the Kangala complex, including the contractors camp, from boreholes and / or the Rand Water Board. The CHPP raw make-up water supply is from the existing PCD, which in turn receives its water from the opencast mine, the co-disposal facility, and dirty run-off water.

3.1.1.6 WATER MANAGEMENT

At the Eloff Phase 3 Project area, canals and / or berms will be constructed to prevent clean run-off water from reaching the areas classified as pollution or dirty areas. The PCD at Kangala Colliery will be utilised to deal with polluted / dirty water from the Eloff Phase 3 Project mining, stockpile dump, and haul road areas. Within each operational area (haul roads, stockpile dump area, contractor's camp, and mining pit), dirty water capturing drains will be constructed that will allow dirty water to be collected in sumps draining into the pit and either gravitated or pumped to the existing PCD.

The proposed project infrastructure is to be positioned such that the upstream clean and dirty water catchment occurs in a south easterly direction. All clean water channels are to be placed upstream of all infrastructure or dirty areas to ensure the runoff collected is diverted to the downstream clean water environment or the nearest watercourse. All dirty water channels are to be placed around the dirty area so that runoff is collected in a sump and then pumped to the existing Kangala Colliery PCD. It is proposed by the project hydrologist that that all clean water channels be unlined vegetated trapezoidal channels, whilst all dirty water channels constructed and be lined .

3.1.1.7 FUEL AND LUBE FACILITIES

At the opencast contractor's laydown area at Kangala Colliery, the following facilities have been established by the contractor:

- Diesel bay area;
- Wash bay area with a silt trap and oil separator;
- Oil, gas, and chemical store; and
- Waste management area/slab for the placing of the necessary waste disposal bins.

Each facility is designed to ensure that water contaminated with hazardous fluids, diesel and other lubricants used on site, is captured and channelled to the oil separation plant for purification prior to being pumped to the PCD. The oil recovered from the purification process will be stored in oil containers and disposed of according to the existing Waste Management Plan. The Eloff Phase 3 Project will utilise the existing fuel and lubrication facilities at Kangala Colliery.

The facilities are maintained within the care and maintenance strategy of the Kangala complex to ensure operational readiness for when the Eloff opencast mining commences. At the CHPP area complex, the fuel and lubrication facilities have also been established.

3.1.1.8 ACCESS ROADS

The Phase 3 Project area is well served by paved provincial roads, as shown in Figure 4. The main road serving the area is the R42 which is paved and runs south-east of the project area. This road links to the towns of Delmas and Nigel and crosses the N17 highway with on and off ramps to this highway. The R42 also links with the N12 Johannesburg to Witbank highway.

With regards to road infrastructure to serve the Eloff Phase 3 Project area, no main access roads need to be constructed except for a new haul road (Figure 4). There is an existing access road to Kangala Colliery and the

existing CHPP area. The existing access road includes secondary roads to the various product stockpiles, the mine office complex, and to the contractors' laydown area. The existing access road is also indicated in Figure 4 and will need to be upgraded. The road weighbridges required for weighing the product coal loaded for road transport to the respective markets have been installed at the main gate leading into the Kangala mine.

3.1.1.9 OFFICES, WORKSHOPS AND CHANGE HOUSES

As set out under Section 3.1.1.3, all the required general administrative buildings and facilities for Kangala Colliery and the CHPP exist at the respective areas. For the opencast laydown area, the mine has constructed the base area and water management facilities. The opencast mining contractor has made use of the existing facilities at Kangala Colliery and established offices, stores, and workshops facilities. The sewage plant on the Kangala mine is operational and serves the Kangala complex as well as the needs of the opencast mining contractor.

3.1.1.10 STOCKPILES

It is anticipated that coal mined (ROM) in the Eloff Phase 3 Project opencast operation will be transported to the existing CHPP at Kangala Colliery via haul trucks, prior to processing and preparation to be transported out of the mine to the end user. It was initially anticipated that hard, soft as well as topsoil material will be stockpiled on site to the west of the proposed Eloff Phase 3 Project opencast mining pit area. However, various other stockpile area alternatives, such as utilising the existing Kangala Colliery stockpile area, have been proposed based on findings of the scoping studies and waste classification investigations. The stripped soils consisting of mainly topsoil will be stockpiled separately from the hard and soft overburden. This will ensure that the characteristics of the topsoil stockpile is suitable for the prevailing landscape and drainage conditions once they are replaced during rehabilitation. The topsoil stockpile will be far removed from mining activities so that it will not be accidentally impacted on or need to be frequently moved.

The overall stockpile area alternatives considered for this project are as follows:

1. Locating the discard stockpiles of hard, soft and topsoil material from the proposed Eloff Phase 3 Project on site to the west of the proposed opencast mining pit;
2. Stockpiling the hards, softs and topsoil from the proposed Eloff Phase 3 Project at the existing Kangala Colliery stockpile area;
3. Using the hard and soft discard from the initial box cut of the proposed Eloff Phase 3 Project to fill the final void at the existing Kangala Colliery pit; and
4. Locating the proposed Eloff Phase 3 Project stockpiles on the rehabilitated Kangala area – this may have long term benefits to the rehabilitation at Kangala Colliery as it will assist in the compacting of the mined out areas, as well as the obvious reduction in greenfield areas.

These stockpile area alternatives are further discussed in the EIA.

3.1.1.11 LIST OF MAIN MINING ACTIONS, ACTIVITIES AND PROCESSES OCCURRING ON SITE

The main mining actions, activities and process that are planned to take place on site are listed in the EIA. All actions, activities and processes have been grouped into each of the relevant project phases namely: pre-construction (planning and design), construction, operation, decommissioning, rehabilitation, closure, and post closure. For the purpose of this EIA Report, the following broad definitions apply:

- Pre-construction refers to the phase in which planning takes place, namely: exploration, environmental studies, finalising designs, etc.;
- Construction refers to the phase in which the site is prepared and infrastructure is established (e.g. vegetation clearance, access road preparation, construction camp establishment, infrastructure placement, etc.);
- Operation refers to the phase in which physical mining and production takes place – this phase will include roll over mining and on-going progressive rehabilitation efforts;

- Decommissioning and rehabilitation refers to the inter-linked phases in which existing infrastructure is removed and final rehabilitation efforts are applied and their success monitored;
- The closure phase commences once the ore-extracting activities of a mine have ceased, and final decommissioning and mine rehabilitation is being completed. This phase usually ceases 3-5 years after physical closure activities and would align with the issuance of a closure certificate; and
- Post-closure refers to the phase in which maintenance and rehabilitation monitoring are undertaken to ensure that the mines closure objectives are met. Post-closure typically commences once a closure certificate has been received. The duration of the post-closure phase is defined by the duration of the applicable residual and latent environmental impacts.

3.1.2 ENVIRONMENTAL AND SOCIAL CONTEXT

The description and definition of the pre-mining environmental context is critical to ensure that the ultimate closure objectives and associated end land-use are achieved. In this regard please refer to the EIA report for a detailed description of the receiving environment applicable to this specific project.

The description of the baseline environment (on site and surrounding) was obtained from the studies undertaken by the specialist team and in conjunction with EIMS. All specialist studies undertaken for the Eloff Phase 3 project are included as supporting technical appendices to the EIR report. The key environmental aspects related to the project area and specifically the closure and rehabilitation strategies are summarised in the remainder of this Section.

3.1.2.1 **CULTURAL AND HERITAGE**

A specialist Heritage Impact Assessment (HIA) was undertaken by PGS Heritage (Pty) Ltd as a component of the EIA. During the field work a total of eight heritage resource were identified (Figure 5). These are listed below:

- KG1: The site consists of an informal cemetery. A number of headstones are present, but most are disturbed by burrowing animal activity. The cemetery is located in the middle of a cultivated maize field. A grave count revealed approximately 10 graves. These were relocated on 11 July 2019.
- KG2: The site is that of a recent historic farmstead. Only the foundations of a stone and brick built main house and some outbuilding are left. Remains of the garden layout can be seen in the planted shrubs and trees.
- KG3: The site is that of a recent historic farmstead. The ruined main house was constructed with fired and unfired clay bricks. The house consisted of three rooms including a kitchen and bathroom. The remains of some outbuildings, sheds and brick farm dam are in ruins.
- KG4: The site is that of a recent historic farmstead. The ruined main house was constructed with fired clay bricks. The house consisted of four rooms including a kitchen and bathroom. The remains of some outbuildings, sheds and brick farm dam are in ruins.
- KG5: The site consists of an informal cemetery. A number of headstones are present, but most are disturbed by burrowing animal activity. The cemetery is located in the middle of a cultivated maize field. A grave count revealed approximately 10 graves.
- KG6: The site is that of a recent historic farmstead. The main house is still inhabited by the current farm manager. house consisted of five rooms including a kitchen and bathroom, some outbuildings, sheds and brick farm dam are different stages of preservation.
- KG7: The site consists of a ruined earth bid dam wall in between eucalyptus trees. The layout of some trenches indicate that it was most probably used to drain a nearby pan.
- KG8: The site consists of an informal cemetery. A number of headstones are present, but most are disturbed by burrowing animal activity. The cemetery is located in the middle of a cultivated maize field. A grave count revealed approximately 3 graves.

- KG9: The site consists of a single formal grave with headstone. Headstone inscription reads, Johanna Mokoena, born 12-12-1922 died 25-03-1977. <u>The grave was relocated on 11 July 2019.</u>

Figure 5: Heritage resources.

3.1.2.2 **SOCIO-ECONOMIC**

The socio-economic environment within which the proposed project would operate is described in terms of the prevailing geography and land-use, the demographics, the economic environment, the institutional context and the associated socio-cultural context. This section presents a description of each of these and has been extracted from the specialist socio-economic assessment undertaken for the EIA.

3.1.2.2.1 GEOGRAPHICAL PROCESSES

Large portions of the land earmarked for the Eloff Project is currently used as agricultural land. The proposed site is surrounded by a number of social sensitive receptors within 5-10 km radius, which includes farmland, towns and individual homesteads.

The Project is situated on agriculture land and the VKLM IDP (2017-2021) states that agricultural land must be protected against urban sprawl and mining activities. The SDF furthermore identifies Delmas as high potential agricultural area and notes the importance to protect the agricultural land. The SDF states as objective the responsible use and management of natural resources and the need to preserve high potential agricultural land for future generations and to enhance eco-tourism development and the food supply in the area. However, while maintaining the need to preserve agricultural land, the SDF in the same breath also recognises the continued growth of mining in the VLKM as well as the "urgent need to establish an equitable and realistic trade-off that maximises provincial benefits from mining and energy sectors while mitigating any environmental impacts" (VKLM, 2018).

There are no local spatial planning restrictions on the proposed project area. It could also be argued that the development is in line with the national Spatial Planning and Land Use Act (SPLUMA) of 2013 that aims for effective and efficient land use planning and land use management. The Project is compatible with other land

uses in the area as there are also a number of other large coal mines in the vicinity – 3.2 km to east and 2.2 km south of extension. The project will furthermore use the existing mining infrastructure at Kangala Colliery. Delmas area became a small frontier for new coal field developments with around 15 new greenfield development joining existing 2 mines in the past 14 years. In the immediate vicinity of the Eloff project there are at least five coal mine operations (e.g. Stuart, Exxaro Leewpan, Mbuyelo, Keaten). The potential cumulative impacts of these mines on the rural character of VKLM, water availability and quality, declining agricultural land and post-closure issues need to be considered for future developments in Delmas.

Non-governmental organisations (NGOs) are increasingly sounding the alarm against the unbridled expansion of mining activities in the province. Between 2004 and 2010 the Department of Mineral Resources (DMR) granted 4 700 prospecting and mining rights in Mpumalanga Province alone. In 2016 there were 122 operating coal mines in the province (Ground Work, 2018). Concerns of NGOs especially centre around the limited arable land available in South Africa (less than 2% of total land area), the high concentration of arable land in Mpumalanga Province (46% of total arable land) and the continued pressure on arable land in Mpumalanga from mining. Close to 26% of South Africa's limited arable land are, according to NGO sources, at risk of being transformed due to mining. Delmas has 5.3% of South Africa's arable land, and this particular area is exceptional due to the fertile land in close proximity to an aquifer (BFAO, 2012).

3.1.2.2.2 DEMOGRAPHIC PROCESSES

The Project is located in Ward 7 of the VKLM. VKLM had an estimated population of 84 150 in 2016. The ward had population of 10 230 people in 2011 and had a negative population growth rate of around 1% between 2001 and 2011. If the trend continued between 2011 and 2019, the current population size is an estimated 9 400 people.

The predominant population group in the ward is Black African (70%), similar to the VKLM's 86%. The largest out-migration between 2001 and 2011 was amongst this population group. The most widely spoken languages in the ward are isiZulu (29%), Afrikaans (27%) and isiNdebele (18%). Most of the ward's inhabitants are native to Mpumalanga (57%). The education levels in the ward are fairly low, with a quarter (24%) of the adult population (aged 20 years and older) having completed their secondary education. A further 33% have completed some secondary education. Close on a fifth (18%) have had no schooling.

3.1.2.2.3 ECONOMIC PROCESSES

The employment rate in ward 7 in 2011 was around 74%, whereas the employment rate in the VKLM was an estimated 66%. The agricultural sector was the biggest employer in the VKLM (46%), followed by private households (16%). Around 44% of the ward's households lived in absolute poverty (i.e. an annual household income of R 19 200 or less for a households of 4 people), with a further 40% in the lower middle-income bracket (i.e. between R 19 201 and R 76 800 p.a. for a household of 4 people). On average, male-headed households earn more than female-headed households.

Land use in the ward changed steadily from being dominated by agriculture to also include coal mining, bring about a change in the local economy. The ward has approximately 660 female-headed households and 18 child-headed households. These households are considered more vulnerable as they often do not have a wide range of resources to buffer change. Neither the VKLM Spatial Development Framework (SDF) nor the Local Economic Development (LED) plan is specific about the particular sector or land-use that should be favoured in the site-specific area. The VKLM LED only has generic objectives in terms of employment generation, SMME development and poverty alleviation through equally vague measures such as infrastructure development as well as the development of a variety of sectors including the tourism, agriculture, mining sectors and the 'green economy'. The strategy does not prioritise any specific economic sector (VKLM, 2018).

3.1.2.2.4 INSTITUTIONAL PROCESSES

VKLM consisted of approximately 24 300 households in 2016. Of these, around 14% (or 3 400 households) formed part of informal settlements. In 2011, Ward 7 consisted of 2 710 households. Of these, approximately 9% (or around 250 households) were considered to be part of informal settlements. Only around 5% of households in VKLM had no access to electricity. Water within the VLKM is obtained from subterranean water

through a number of boreholes and a regional water scheme (Rand Water). Half of the households in ward 7 rely on boreholes and to a lesser extent other water sources (including rivers and streams). This makes households vulnerable to any surface or groundwater contamination.

Around 56% of households have access to sanitation services on par or above RDP standards (a flush toilet, septic tank or VIP-system). Less than half of the households' refuse in the ward is collected on a regular basis by a service provider – likely because of the rural nature of the ward.

The crime rate in the ward appeared to be declining after it reached a peak in 2014/15. In contrast, the crime rate in Delmas appeared to be on the rise with the number of crimes reported at the Delmas police station increasing year on year.

3.1.2.2.5 SOCIO-CULTURAL PROCESSES

The local community consists largely of isiZulu and isiNdebele-speaking Black Africans from Mpumalanga and, to a lesser extent, Gauteng as well as a fairly large group of Afrikaans-speaking Whites. The former group are very supportive of mining developments in the area because of the employment opportunities it offers as well as the fact that mines are required to invest in the development of local mine communities.

The latter group is more cautious about mine developments as it encroaches on agricultural land and poses a risk to the area's water sources. This group does not benefit directly from the mine's social investment in mine communities. The presence of 'othering' was observed at a key stakeholder meeting in July 2019, i.e. there is an apparent division in the two groups mentioned above, based on economic and cultural disparities.

3.1.2.3 **BIODIVERSITY**

The description provided in this section has been extracted from the specialist biodiversity assessment undertaken for the project EIA. Please refer to the EIA and associated Appendix for further detail.

3.1.2.3.1 FLORAL CONTEXT

The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes. Major macroclimatic traits that characterise the grassland biome include:

- Seasonal precipitation; and
- The minimum temperatures in winter.

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level. Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

The grassland biome comprises many different vegetation types. The project area is situated within one vegetation type; namely the Eastern Highveld Grassland (GM12) (Mucina & Rutherford, 2006). This vegetation type occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grass land 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. Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. No serious alien invasions are reported (Mucina & Rutherford, 2006).

According to Mucina and Rutherford (2006), this vegetation type is classified as Endangered. The national target for conservation protection for both these vegetation types is 24%, but only a few patches are statutorily conserved in Nooitgedacht Dam and Jericho Dam Nature Reserves and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% of this vegetation type has however, already been transformed including at the proposed project area 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.

A dry and wet season specialist field surveys were undertaken to confirm the vegetation cover on the site. The findings of this assessment are summarised as follows:

- Four habitat types were identified and mapped according to the field data, namely:
    - Agricultural and mining areas: Significantly degraded. The agricultural areas where mostly cultivated with Maize and Soya. The agricultural area didn't contain a large amount of diverse indigenous vegetation mainly due to the anthropogenic influence. Weeds such as *Bidens pilosa, Conyza bonariensis* and *Tagetes minuta* occurred throughout and the overall state of the area was transformed. This habitat has a low sensitivity.
    - Wetland areas: This area has the greatest species composition in comparison to all the different habitat areas. Patches of *Imperata cylindrica, Leersia hexandra, Setaria sphacelata* as well as *Typha capensis* occurred throughout the wetland. Some areas within the wetland were dominated by *Cosmos bipinnatus*, depending on the degree of the disturbance caused by the surrounding agriculture as well as the grazing of livestock.
    - Degraded grassland habitat only differed from the agricultural habitat in regard to the area not having been ploughed, this habitat has an herbaceous layer of grass and forbs, however dominated by alien invasive plant species. *Eucalyptus camaldulensis* occurs within this habitat with forb species such as *Bidens pilosa, Conyza bonariensis* and *Tagetes minuta*.
    - The degraded wetland habitat are areas that were identified as wetlands; however, these habitats are surrounded by agriculture, which, due to the associated disturbances, result in the degraded state of this habitat. These areas are used for stockpiles of fertiliser and farming implements which adds to the overall degraded state. These areas have a low to moderate sensitivity due to them still being wetlands but from a terrestrial biodiversity point of view, are too fragmented.
- A total of 49 tree, shrub and herbaceous plant species were recorded in the proposed project area during the field assessment. These species ranged from species identified as 'Least Concern' through to listed invader/exotic/ alien species.
- At least five Red Data listed plant species are expected within and/or surrounding the project area. Although care was taken to traverse as much of the suitable habitat during the fieldwork in search for these Species of Special Concern (SCC), the effort failed to record any of these species.

3.1.2.3.2 WETLANDS AND AQUATICS

A specialist Wetland Impact Assessment was undertaken by The Biodiversity Company (TBC) as a component of the EIA. This content of this section has been extracted from this report.

A number of datasets indicated the presence of wetlands in and around the project area, these included the Freshwater Ecological Priority Areas (FEPA), the Mpumalanga Biodiversity Sector Plan (MBSP) for freshwater systems and Mpumalanga Highveld Wetlands Dataset (MPHG) wetlands. The processing of spatial data further supported the expectation for the presence of wetlands within the project and adjacent areas.

The presence of wetlands was confirmed during the fieldwork which was completed during the wet season. A total of three (3) HGM types were identified and delineated for the project. These comprised of 15 separate HGM units which were identified and delineated for the project. For this study, where it was deemed acceptable (and appropriate), HGM units were collectively assessed per the respective HGM type. Based on this, a total of five (5) HGM types were assessed. The two wetland systems located to the north and south of the project area were identified as unchanneled valley bottom systems. The remaining HGM units comprised endorheic pans and seepage areas.

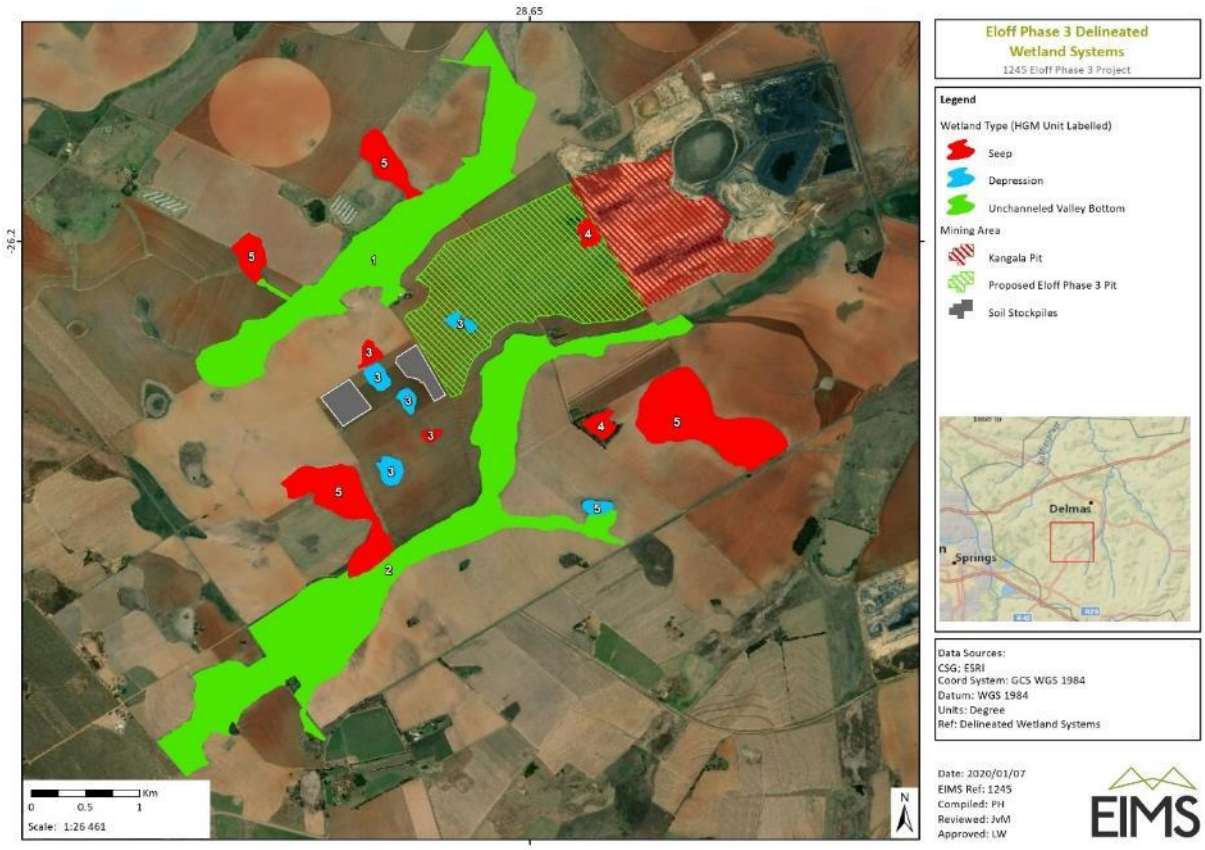


Figure 6: Delineated wetlands.

The overall wetland health for the wetlands varied from Moderately Modified (Class C) to Largely Modified (Class D) systems, with the majority of the wetlands rated a Class C. The two valley bottom wetland types had overall moderately high level of service, with the remaining wetland units displaying an intermediate level of service. All the wetland units contribute considerably (moderately high) to regulating and supporting services, the bulk of which includes the enhancement of water quality. The EIS of the two valley bottom wetland types, and the adjoining seepage systems was rated as high (Class B), with the remaining wetland types being rated as moderate (Class C).

The buffer tool recommends at a desktop level that the required buffer for opencast mining be 180 m. The MPTA will request a minimum buffer width of 100m from the edge of the delineated wetlands.

3.1.2.3.3 FAUNAL CONTEXT

3.1.2.3.3.1 AVIFAUNA

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 288 bird species have the potential to occur within the vicinity of the project area. Of the potential bird species to occur within this region, 24 species (8.3%) are listed as species of special concern (SCC) either on a regional (21) or global scale (15). The potential SCC include the following:

- 3 species that are listed as EN on a regional basis;
- 7 species that are listed as VU on a regional basis; and
- 12 species that are listed as NT on a regional basis.

On a global scale, four species are listed as VU and ten species as NT. The likelihood of occurrence of these species being present on site was determined (prior to site survey) as ranging from Moderate to high.

81 Bird species were recorded in the project area during the August 2018 and March-April 2019 surveys based on either direct observations, or the presence of visual tracks and signs. Two SCCs were observed, namely the Red-footed Falcon (*Falco vespertinus*) and the African Grass-Owl (*Tyto capensis*). Based on the various wetland habitats encountered in the project area, the likelihood that other bird SCC occur there is rated as high.

3.1.2.3.3.2 MAMMALS

Mammal diversity in the project area is high, with 18 mammal species being recorded during the August 2018 and March-April 2019 surveys based on either direct observation, camera trap photographs or the presence of visual tracks and signs. Three mammal SCC were recorded in the project area. Serval (*Leptailurus serval*), Cape Clawless Otters (*Aonyx capensis*) and Vlei rats (*Otomys auratus*) were observed.

3.1.2.3.3.3 HERPETOFAUNA

Seven reptile species were recorded in the project area during the August 2018 and March-April 2019 surveys. Reptile diversity was notably high in the project area considering the extent of agricultural activities which has already transformed some of the natural ecosystems. Four amphibian species were recorded in the project area during the March-April 2019 survey based on visual observations as well as from calls made by various frog species. None of the herpetofauna recorded in the area were regarding as being SSC.

3.1.2.3.4 HABITAT SENSITIVITY

The wetlands habitat was classified with a Very High (+2) sensitivity from an inherent terrestrial sensitivity point of view due to the largely natural state of this habitat, the conservation status of these areas according to the C-plan of Mpumalanga and SCCs that were recorded. This habitat type is critical habitat for the mammal SCC species which are highly dependent on it.

The degraded wetland areas were classified as High (+1) due to the role that the wetlands still play in the water resource scheme and do function as a more natural habitat in relation to the agricultural areas, although fragmented.

The agricultural habitat and degraded grassland were rated Least Concern (-1) because of the transformed nature of these area. The major driving forces of the disturbed and degraded state of these areas are mainly anthropogenic; such as clearing of vegetation, presence of a large amount of alien and invasive plant species, livestock and large amount of dust.

3.1.2.4 **CLIMATE**

The Project area falls within the Eastern Highveld Grassland region (Gm12) (Mucina & Rutherford, 2006). Strongly seasonal summer rainfall, with very dry winters. The mean annual precipitation (MAP) is between 650–900 mm (overall average: 726 mm), whereby the MAP is 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. There is an incidence of frost from 13–42 days, but this is higher at higher elevations. Figure 7 illustrates the climate summary for the Eastern Highveld Grassland.

Based on the fact that the post closure phase of a mining project is likely to extend over decades it is important to consider the likely medium to long term climatic changes that are anticipated. The near-future and far-future climate in Southern Africa was projected and published in a Climate Change Reference Atlas (CCRA) by the South African Weather Service (SAWS) in 2017, based on Global Climate Change Models (GCMs) projections and the Rossby Centre Regional Model (RCA4). Projected

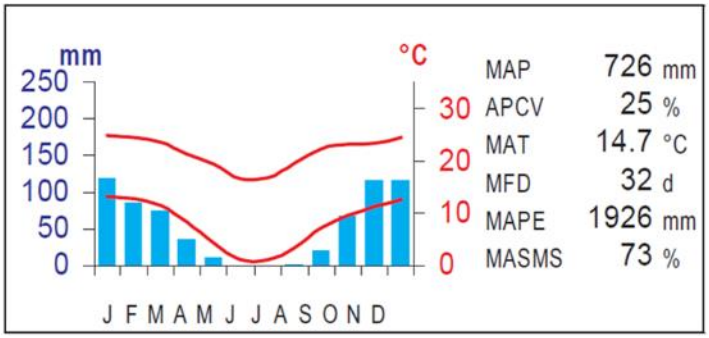


Figure 7: The climate summary for the Eastern Highveld Grassland (Gm 12) region (Mucina & Rutherford, 2006).

changes are defined relative to a historical 30-year period (1976 to 2005) (Airshed Planning Professionals, 2019). Various climate change scenarios are presented. In general, however the local climate is predicted to change as follows:

- Low mitigation scenario (RCP8.5[2]):
    - *Near-future period (2036-2065)* – This period is projected to be significantly warmer than the baseline period of 1976-2005. Most years are projected to be 2°C to 2.5°C warmer than the baseline average temperature. The seasonal average temperatures are expected to increase for all seasons, viz. 2°C to 2.5°C (summer and autumn) and 2.5°C to 3°C (winter and spring). The rainfall climatology is projected to remain variable, with some wet years projected to occur outside of that simulated for the baseline period (median change of 10 to 20mm more rainfall per year). The seasonal average rainfall is expected to increase in summer (10 to 20mm increase in rainfall) and decrease during the other seasons (5-10mm decrease in autumn, winter and spring).
    - *Far-future period (2066-2095)* – Further drastic warming is projected over the Delmas region for this period, with annual median temperature anomalies ranging between 4 and 4.5°C. The seasonal average temperatures are expected to increase for all seasons, viz. 3.5°C to 4°C (summer), 4°C to 4.5°C (autumn), and 4.5°C to 5°C (winter and spring). The region is also projected to become systematically drier (median change of 5 to 10mm less rainfall per year). The drastically higher temperatures may impact negatively on water availability from local dams due to higher evaporation rates. The seasonal average rainfall is expected to increase in summer 20 to 30mm increase in rainfall) and decrease during the other seasons (5-10mm decrease in autumn and winter, and 30 to 50mm decrease in spring).
- Modest to high mitigation scenario (RCP4.5):
    - *Near-future period (2036-2065)* – Similar to that projected for the case of low mitigation in that most years are projected to be 1.5 °C to 2 °C warmer than the baseline average temperature. The seasonal average temperatures are expected to increase for all seasons, viz. 1.5°C to 2°C (summer and autumn) and 2°C to 2.5°C (winter and spring). The climate is projected to become drier (median change of 5 to 10mm less rainfall per year), with likely fewer dry years than projected for the low mitigation scenario. The seasonal average rainfall is expected to increase in summer (5 to 10mm increase in rainfall) and decrease during the other seasons (0-5mm decrease in autumn and winter, and 10 to 20mm decrease in spring).
    - *Far-future period (2066-2095)* – Temperature changes in the Delmas region under modest-high mitigation are projected to range between 2.5°C and 3°C above that of the baseline climatology. The seasonal average temperatures are expected to increase for all seasons, viz. 2°C to 2.5°C (summer and autumn) and 2.5°C to 3°C (winter and spring). The climate is projected to become drier (median change of 0 to 5mm less rainfall per year), but with likely fewer dry years occurring when compared to the case of low mitigation. The seasonal average rainfall is expected to increase in summer (median increase of 20 to 30mm) and decrease during the other seasons (5-10mm decrease in autumn and winter, and 10 to 20mm decrease in spring).

3.1.2.5 TERRAIN AND TOPOGRAPHY

The project area is gently sloping to the north east, with an elevation range from approximately 1570 meter above sea level (masl) to 1620 masl. The slope map (Figure 8) indicates that the project area is dominated by flat/gentle slopes between 0% and 4% without any major height changes within the project boundaries. The northern portion is north facing, with the remainder either being east facing.

[2] Representative Concentration Pathway 8.5 (RCP8.5) (high pathway) is based on if no interventions to reduce GHG emissions are implemented (after 2100 the concentration is expected to continue to increase).

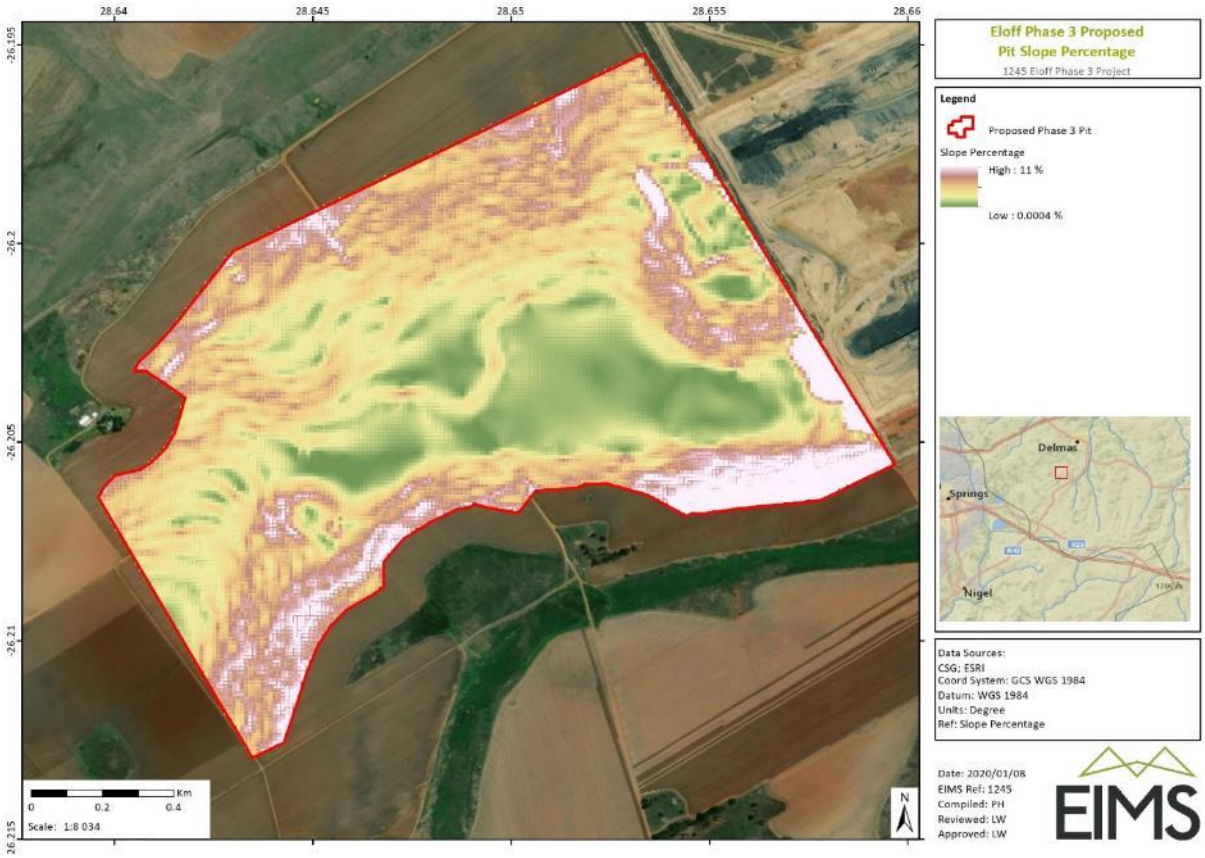


Figure 8: The Slope Percentage map for regional area

3.1.2.6 SOILS AND LAND CAPABILITY

This section has been extracted from the specialist soil assessment conducted for the EIA (The Biodiversity Company; 2019). According to the land type database (Land Type Survey Staff, 1972 - 2006) the project falls within the Bb3 land type. The Bb3 land type is dominated by the crest (1) and midslope (3) terrain units. These landscape positions are dominated by Avalon and Hutton soil forms. The valley bottom positions are dominated by Rensburg, Katspruit, and Willowbrooke soil forms.

The geology is dominated by:

- shale, sandstone, clay, conglomerate, limestone and marl of the Ecca Group;
- shale and tillite of the Dwyka Formation, Karoo Sequence;
- dolerite; occasional Ventersdorp lava, Witwatersrand quartzite and slate; and
- dolomite.

The field soil assessment was conducted by combining inputs from the soil survey completed in April 2019. Additional soil and hydro pedological surveys were conducted during September 2019 to supplement the findings from the previous reports. Soil profiles were studied up to a depth of 1.5 m to identify specific diagnostic horizons which are vital in the soil classification process as well as determining the agricultural potential and land capability. During the site assessment, four major soil forms were identified, namely; The Oakleaf, Tukulu, Westleigh and Katspruit forms. These soil forms have been delineated and is illustrated in Figure 9. The project area is dominated by the Oakleaf and the Tukulu soil forms. The wetland soil forms of the Katspruit and Westleigh forms.

The land capability was determined by using the guidelines described in “The farming handbook” (Smith, 2006). The land capability for the project area is illustrated in Figure 10 and described in Table 5. It is worth noting that the land capability of Tukulu soil form was split into class II and class IV depending on the effective depth of the

soil profile. The project area is dominated by arable land capability classes (class III and Class IV) which accounts for 88.4% (488.03 ha) of the project area. 11.3% (65.52 ha) was classified as wetland type soils.

Table 5: Land capability for the soils within the application area

Land Capability Class	Area (ha)	Percentage Within Project Area	Land Capability Group
III	**382.16**	**69.2**	**Arable**
IV	**105.87**	**19.2**	**Arable**
V	**62.52**	**11.3**	**Grazing**
Disturbed	**1.36**	**0.2**	**N/A**
	551.91	**100**	

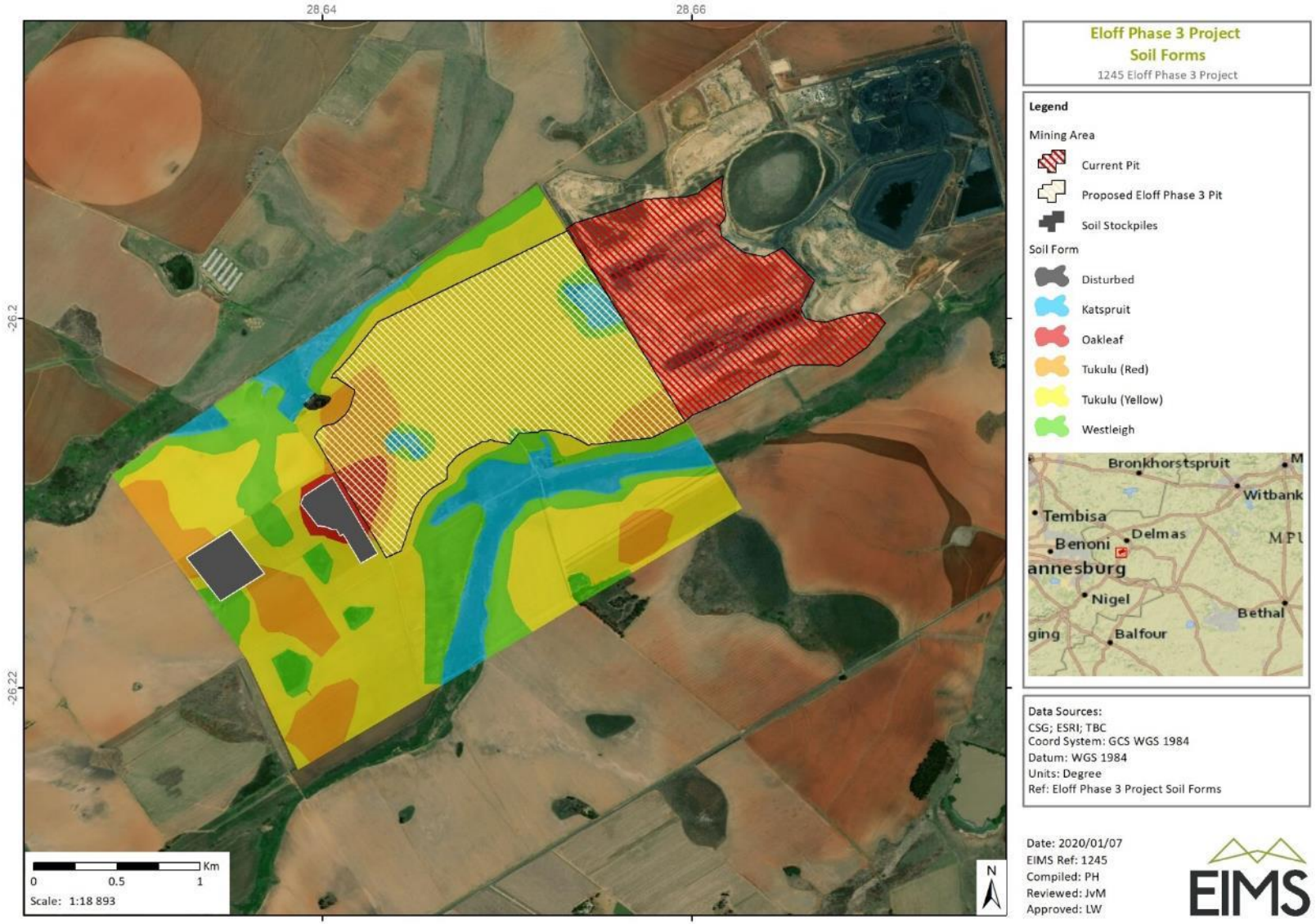


Figure 9: Soil forms for the project area.

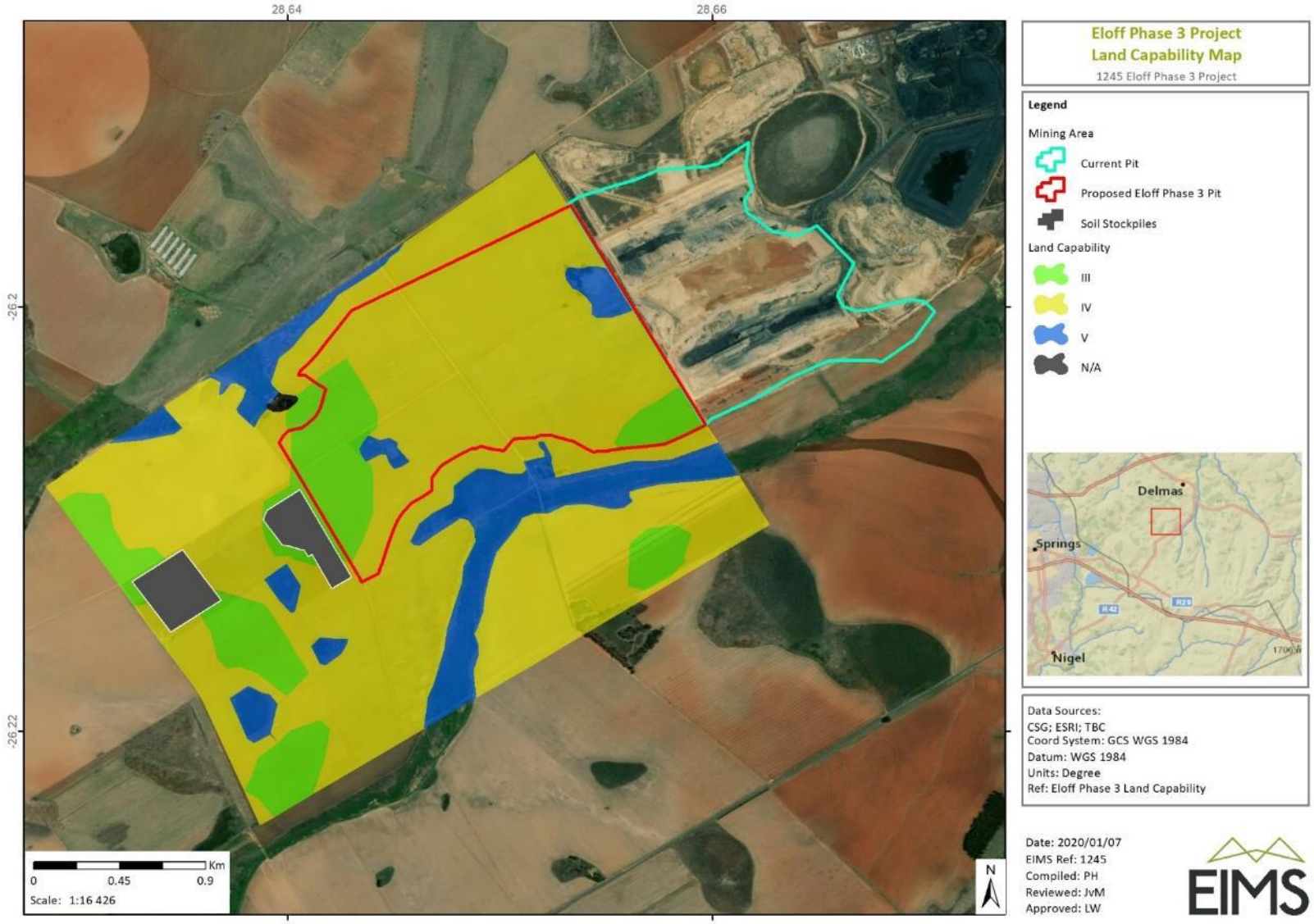


Figure 10: Land capability map for the project area.

The land potential of the project area is illustrated in Figure 11 and described in Table 6. The project area is dominated by L2 and L3 land potential classes which accounts for 69.2% (382.16 ha) and 19.2% (105.87 ha) respectively. 11.3% (65.52 ha) Was classified as wetland type soils.

Table 6: Land potential for the soils within the project area

Land Potential Class	Area (ha)	Percentage Within Project Area	Description
L2	**382.16**	**69.2**	**High Potential**
L3	**105.87**	**19.2**	**Good Potential**
V	**62.52**	**11.3**	**Wetland**
Disturbed	**1.36**	**0.2**	**N/A**
	551.91	**100**	

The project application area is 551.91 ha in size with agriculture taking up approximately 87.9% (478.84 ha) of the project area, disturbed areas covering 0.5% (1.36 ha), and wetland areas covering 11.6% (64.1 ha) (see Table 7). The land use delineation is shown in Figure 12.

Table 7: Land potential for the soils within the project area

Land Potential Class	Area (ha)	Percentage Within Project Area	Description
Agriculture	**478.84**	**87.9**	**High Potential**
Wetland	**64.1**	**11.6**	**Wetland**
Disturbed	**1.36**	**0.5**	**N/A**
	551.91	**100**	

The project area is dominated by crop lands and it is important to quantify the agricultural yields for various crops in the area. The crop yields were reported in the Urban-Econ (2017) report and are shown below.

Table 8: Average crop yields for various crops in the area.

Crop Type	Yield (Tons/ha)
Maize (dry land)	**5 - 8**
Maize (irrigated)	**14**
Soybeans	**2.5 – 3.8**
Dry beans	**2.2 – 2.8**
Wheat	**7**

The erodibility factor for the existing area designated for the open cast was determined using the K values for each soil type and the existing slope %. Please refer to Figure 13.

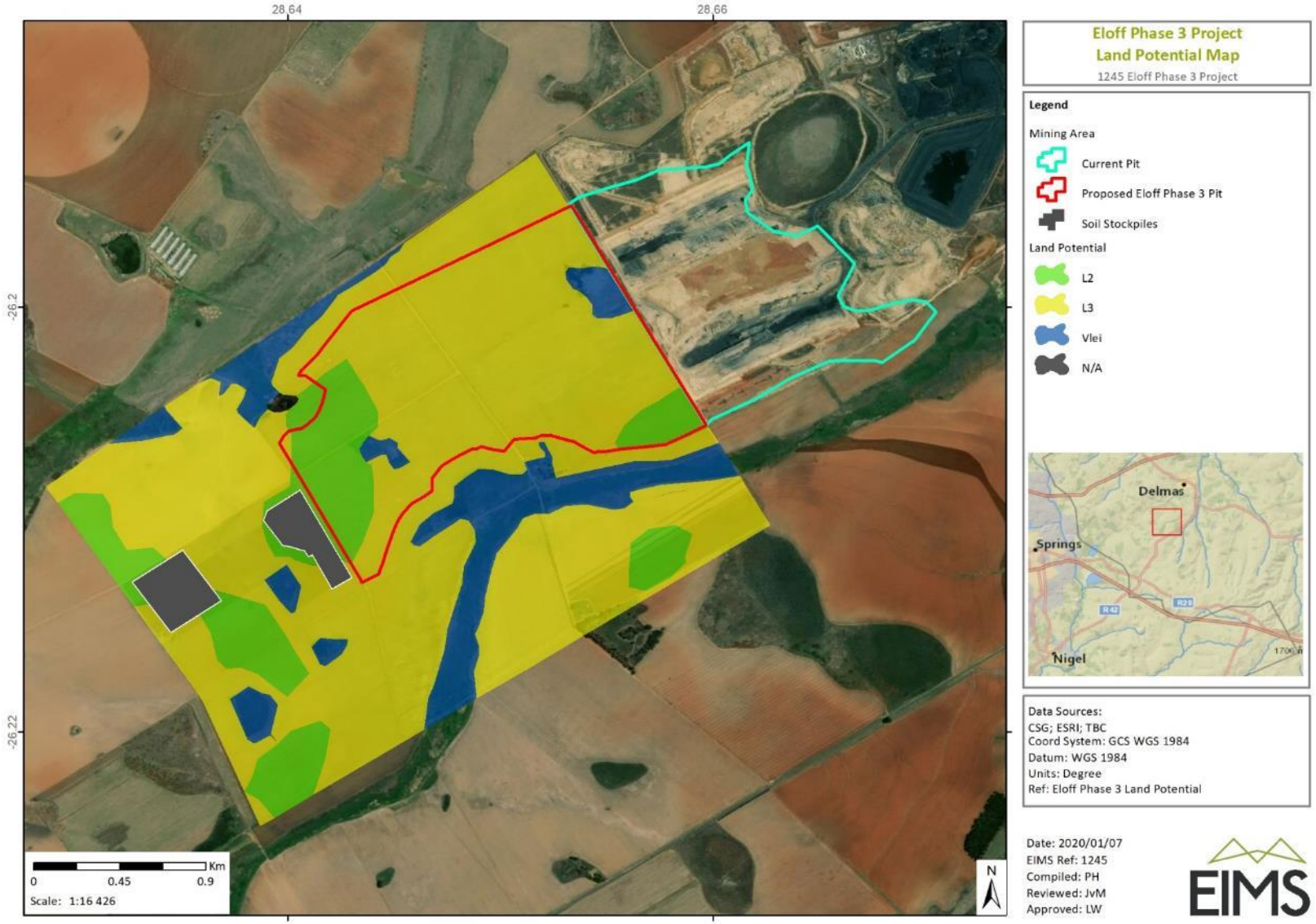


Figure 11: Land potential map for the project area

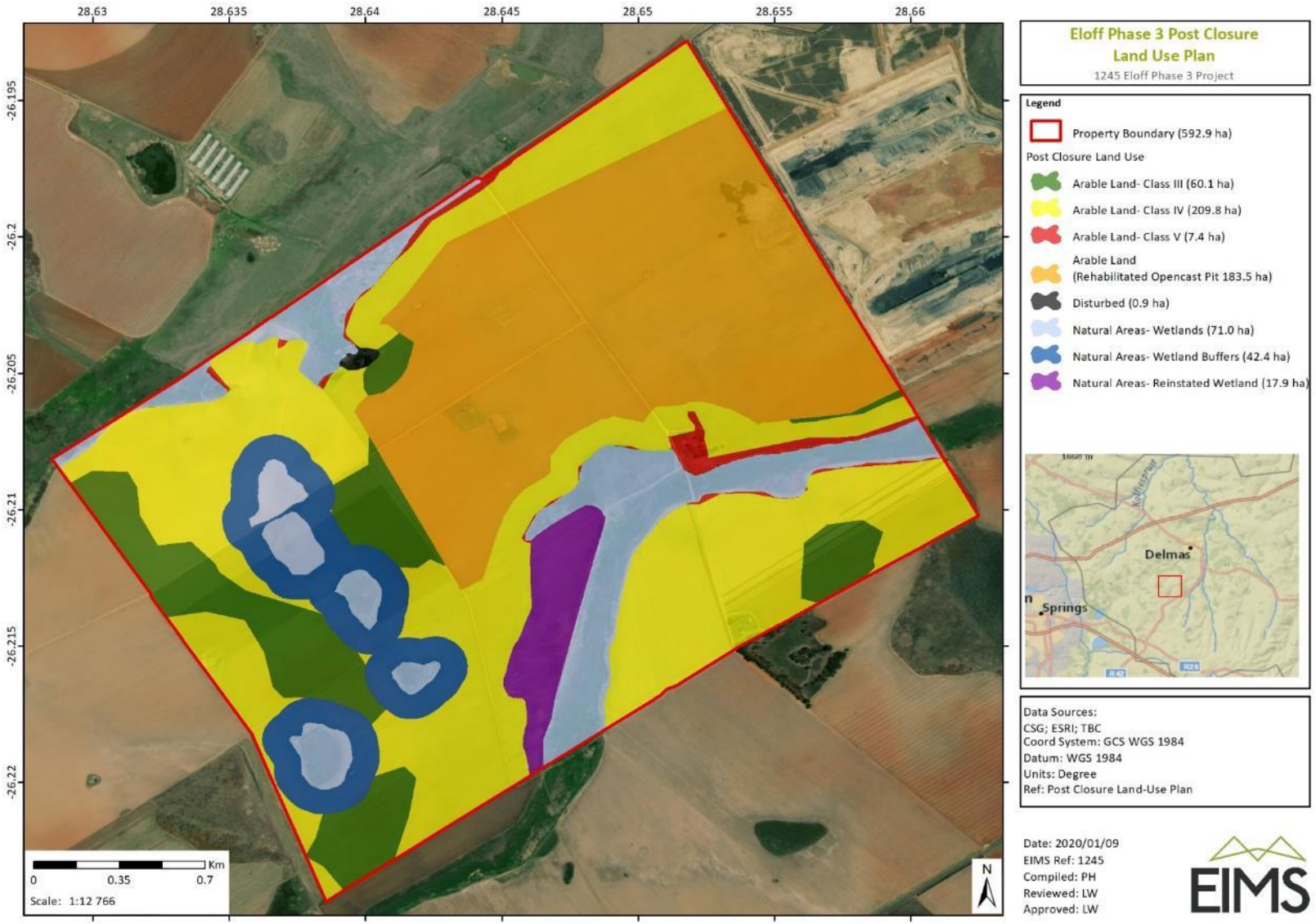


Figure 12: Land use map for the project area.

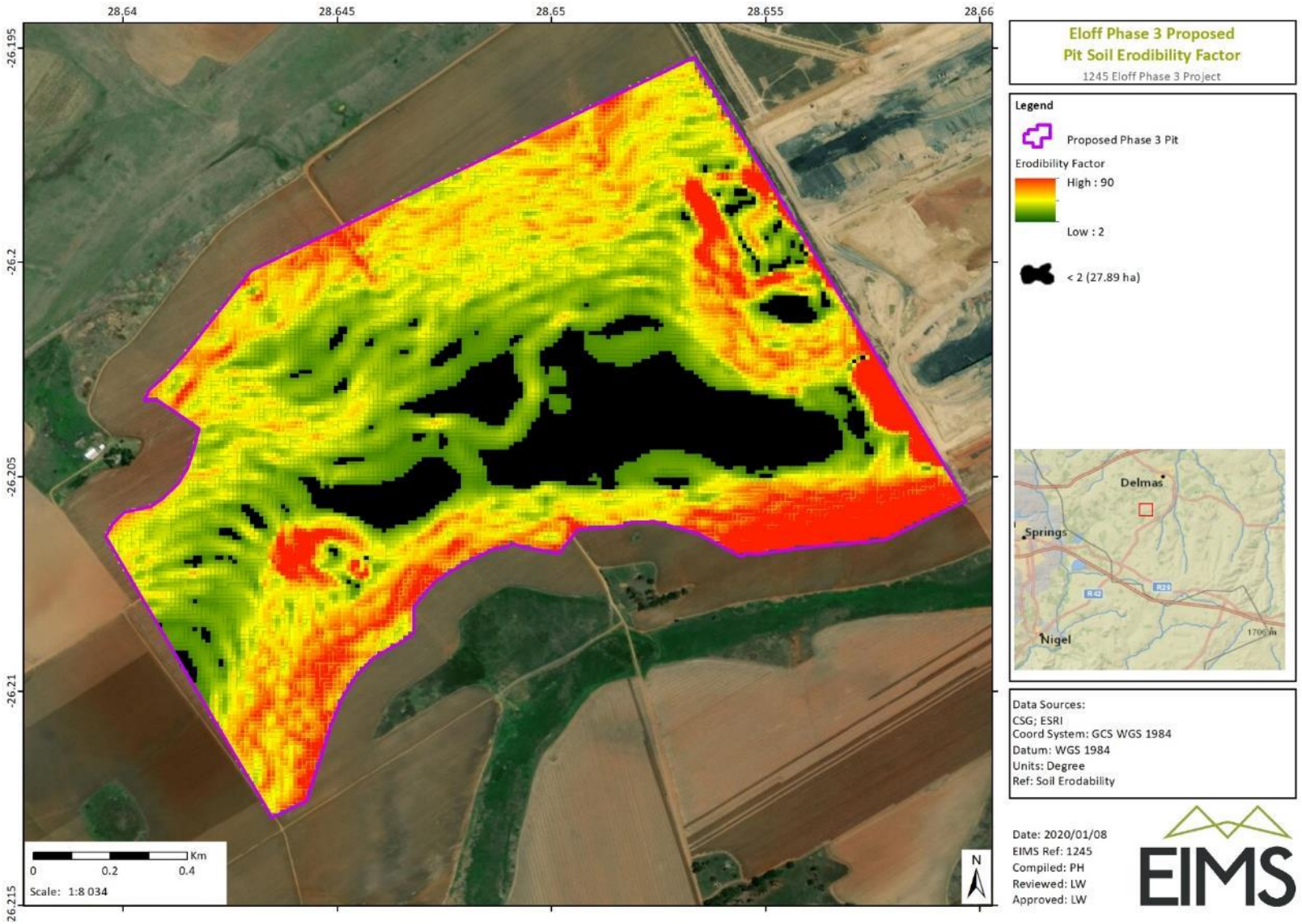


Figure 13: Erodibility factors.

3.1.2.7 **SURFACE WATER**

This section has been extracted from the specialist surface water assessment conducted for the EIA (GCS , 2020). Please refer to the specialist study for further detail.

The Eloff Phase 3 Project and Kangala Colliery are located in a hilly area at an altitude of about 1 500-1 580 metres above mean sea level (mamsl). The site area is in the upper catchment region of the Olifants River, Wilge and Bronkhorstspruit. The main water courses flowing north (Koffiespruit) and south (unnamed tributary) of the mine area are tributaries of the Bronkhorstspruit. Total runoff from natural (unmodified) catchments in this area is being equivalent to 44.6 mm/yr over the surface area, which is approximately 6.6 % of the MAP. Total natural MAR at the most downstream point of quaternary catchment B20A is calculated at 40 million cubic metres (Mm3). The proposed Eloff Phase 3 Project will modify an estimated area of 1.844 square kilometres (km^2) of land, which will become an opencast pit. Total reduction of natural MAR could therefore potentially be 82 262 cubic metres per year (m^3/yr) (0.2% of total quaternary catchment runoff).

Surface water quality is compared to the 2013 amended Universal Coal (UC) Water Use License (WUL), No 04/B20A/ABCGIJ/1506 of 2012, limits for groundwater and the SANS 241-1:2015 Drinking Water Standards for comparative purposes. Water quality in localities INJ02, INJ06, INJ07, INJ08 and INJ10 indicated neutral pH conditions. INJ01 is the most frequently sampled locality and showed, occasionally, elevated iron, manganese and aluminium concentrations exceeding both the WUL limit and the SANS drinking water chronic health limit during January 2019. Time series graphs of INJ01 indicated an increase in sulphate concentration during the January 2019 sampling run. Also, fluctuations in the iron, aluminium and manganese concentrations were observed and are likely the result of upstream activities.

Two (2) additional water quality monitoring localities (INJ11 and INJ12) have been added to the surface water monitoring network plan, which should now include 15 monitoring localities of which 12 are surface water localities and three (3) are process water localities.

The proposed project area was divided into clean and dirty water areas to develop the conceptual stormwater management plant (SWMP). A total number of six (6) sub-catchments were delineated to divert water away from the opencast pit and two (2) topsoil stockpile areas. All delineated sub-catchments were classified as clean and water will be diverted away from encroaching into the dirty water area particularly the opencast pit, which was classified as a dirty area. Rainfall and groundwater ingress into the pit will be pumped into the existing Kangala PCD to ensure that does not mix with clean water areas. Proposed stormwater measures for the Eloff Phase 3 Project include berms around the opencast pit and topsoil stockpile to divert clean water away and a drainage channel along the topsoil stockpile area.

A Process Flow Diagram (PFD) was drafted to provide insight into all water flow processes within the existing Kangala Colliery and the proposed mine infrastructure of the Eloff Phase 3 Project. Three water balances were calculated for the Eloff Phase 3 Project for the operational phase at the beginning of the Life of Mine (LOM) (early mining period (2020)) and at the end of LOM (late mining period (2027)). The early mining period water balance determined the water balance when the opencast pit of the Eloff Phase 3 Project starts and groundwater inflows are calculated at 464 m^3/d. There will be no backfilled and rehabilitated areas at this point of time. No excess water balance and release from dirty water facilities were calculated. The average re-use from the Kangala PCD to the CHPP was determined at 907 m^3/d (CHPP requirement is 1 401 m3/d) and all return water from the opencast pit was able to be re-used for dust suppression and the CHPP. This shows that raw water supply import can be reduced to 495 m^3/d and the spare capacity of the licensed volumes is 808 m^3/d. It is still recommended to maintain current licensed volumes in case of drought.

The late mining period water balance (~2027) was based on groundwater inflows into the opencast pits in 2027, assuming a working area of 10% of the total opencast pit footprint area (+/-25 ha) and rehabilitation performed on the backfilled spoils on 225 ha (recharge assumed at 10% of MAP). An excess water balance was calculated of 97 m^3/d despite water being re- used water for dust suppression and the CHPP at maximum rates. This can be explained due to the high contribution from recharge rates onto backfilled spoils into the opencast pit workings. This low excess water balance can easily be mitigated by concurrent rehabilitation of the backfilled spoils and reduce recharge rates below 10% of annual rainfall.

3.1.2.8 **GROUNDWATER**

This section has been extracted from the specialist hydrogeological assessment conducted for the EIA (GCS (Pty) Ltd, 2019). Please refer to the specialist study for further detail.

Three principal aquifers are identified in the conceptual geohydrological model for the Eloff Coal Resources: the weathered Karoo aquifer, the fractured Karoo aquifer and the underlying Transvaal karst aquifer. The aquifers associated with the proposed mining activities are classified as minor aquifers (low yielding) but of high importance. Transmissivity values are between 0.15 and 1.4 m2/d which is typical of the Karoo type aquifers. The Dwyka Formation is considered a hydraulic barrier between the overlying mining activities and the Malmani dolomite formation.

The weathered layer has a thickness of approximately 17 m and is comprised of residual soils and weathered shales and sandstone with hydraulic conductivity values in the order of 10^{-2} m/d. The underlying fractured units consist of shale, sandstone and coal seams in which groundwater movement is limited to secondary porosity, i.e. fractures. Fracturing mainly occurs in the top of this unit and decreasing with depth. Hydraulic conductivity will therefore decrease with depth and range between 10^{-1} m/d in the upper layers and 10^{-3} m/d for the lower layers.

Groundwater levels generally follow topography and static groundwater levels are mostly within 17 m below ground level (median) with some deeper groundwater levels up 57 m below ground level. Groundwater in the surrounding area is used for domestic, stock watering and / or large-scale irrigation purposes. Groundwater quality is generally of good quality when compared to drinking water standards and there are no indications that historical mining activities (Kangala pit) are impacting on private or third-party groundwater sources.

The geochemical analyses showed some potential of acidic drainage generation. Interstitial water in the oxic zone of the discard dump and backfill will likely be alkaline to neutral within less than 150 days. Based on the geochemical results, the following potential sulphate concentrations can be expected for the discard dump range between 480 to 1,500 mg/l and for the backfill between 100 and 550 mg/l.

3.1.3 STAKEHOLDER ISSUES AND COMMENTS

A public participation process as required by the NEMA EIA regulation (GNR 982) has been undertaken for the proposed exploration. In this regard please refer to Chapter 8 of the EIA Report for a comprehensive record of the process followed and comments received. The comments and issues raised through the public participation have been considered and have, where applicable, informed the compilation of this FRDCP. As per the Financial Provisioning Regulations (2015) this FRDCP forms a component of the EMPr submitted in terms of section 24N of the NEMA and the Environmental Impact Assessment Regulations, 2014 and is subject to stakeholder review and comment.

Table 9 provides extracts from the individual stakeholder's submissions from the Issues and Responses Report (IRR) which relate specifically to final rehabilitation, decommissioning and closure activities. Please note that only the relevant paragraphs from the submissions have been included here. Full details of the stakeholder's submissions are available in the Public Participation Report (PPR).

The main theme of the comments received to date relates to the following:

- Impacts on ground water quality and availability;
- Impacts on surface water quality; and
- Disruption of current land use and capability.

The issues raised are incorporated in the Impact Assessment (IA). The detail is available in the PPR, summarised and appended to the EIA Report. An EIA Report, including an Environmental Management Programme (EMPr),

has been compiled and presented for public comment as part of the EIA phase during which time further stakeholder engagement will take place.

Table 9: Key Stakeholder issues related to closure

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
Muller, Jasper	11/07/2019	The underlying dolomitic aquifer is a regional groundwater resource for Delmas, Eloff, Sundra and the farmers surrounding the proposed mine. The potential impact of the proposed mine on this very important water resource must be investigated properly. In order to achieve this, a detailed site specific geohydrological study, penetrating and quantifying all three aquifer zones and describing their hydraulic inter-relationship must be conducted. · Based upon information obtained from the Council of Geoscience, the Delmas dolomitic compartment is not subdivided, and therefore all groundwater dewatering impacts on this compartment must be prevented as it may result in sinkhole formation and the instability of surface infrastructure located within the bounds of the compartment. · The groundwater study must therefore include a dolomite stability assessment and it is insisted that the Council for Geoscience, as the competent authority for dolomite stability, be consulted in this regard and asked to sign off on the findings of such an assessment. · The groundwater study must include a detailed groundwater use assessment. The Delmas groundwater supply system, the direct use of groundwater by Eloff residents, as well as the use of groundwater by farmers surrounding the mining area, must be included in such an assessment. Without this, any discussion with surrounding groundwater users will be meaningless and will be deemed by I&AP's as a fatal flaw in Stakeholder Engagement. · The post closure mine water quality (proposed geochemical testing of site specific geological materials and geochemical modelling) and the issue of post closure mine water decant (post closure mine water balance), must be properly assessed. The current information in the DSR (numerical model referenced in impact assessment) already indicates that the post closure mine water will be acidic, and that it will decant onto surface at a rate of some 330 m^3/day (119 728	26. The groundwater assessment includes a proper geochemical assessment as well as an assessment on groundwater supply. Post closure mine water quality is also assessed in this report. An assessment of the dolomitic stability will be included in the updated groundwater EIA report as well as detailed information quantifying all three aquifer zones and describing their hydraulic inter-relationship. The dewatering impact of the dolomitic aquifer will also be assessed in the groundwater report. Groundwater influx post closure has been considered in the flow model. The interconnection between the Dolomitic aquifer and the overlying Karoo Aquifers will be investigated in more detail in the EIA report.	Groundwater quantity and quality.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		m^3/year). It is assumed that possible dolomitic water influx post closure has not been considered, which could relate to an order of magnitude increase in the post closure water balance, over and above what was estimated in the report.		
Muller, Jasper	11/07/2019	Geology (section 8.2 – page 109) Now the baseline description approach is different in that the Geology is merely discussed on regional level, whilst the local geological data and information where the Phase 3 open pit will be, is actually required. · The description provided in the scoping report confirms that the geology of the area/reserve is complex in so far as there is a change in complexity from north to south, the depth of the coal is highly variable, the coal seams are displaced by a dolerite sill and some of the coal is de-volatized. · Furthermore, the coal bearing strata is underlain by dolomite of the Malmani Subgroup. · Accurate site specific (for Phase 3 open pit) geological data and information is required to support the geochemical and geohydrological characterization of the Phase 3 Mining site and upon which to base impact assessment and management measures. · The detailed geological data will form the backbone of the geohydrological conceptual model, the geochemical model, the groundwater water and salt balances, as well as the post closure decant assessment, all of which represents critical aspects for impact assessment and management measure design. Without the detailed site-specific geological data and interpretation, none of these critical aspects can be assessed. · Further geological studies are not part of the Plan of Study. We find this unacceptable. We therefore request the Geology - Plan of Study – to inter alia address the following: Surface geophysical mapping to delineate dolerite structures and faults, which according to the regional geological description in the Scoping Report, occurs in the area. These structures could play a very important role in groundwater movement towards and from the open pit and could impact the operational and post	19. The geology baseline information section will be updated in the EIA phase to include detailed site-specific geological data and information. EIMS will also ensure that the groundwater assessment includes the relevant requested geological information and this has been added to the groundwater Plan of Study. This includes surface geophysical mapping to delineate dolerite structures and faults, borehole logs to dolomite depth, floor elevation distribution of open pit, waste classification for overburden, geochemical modelling to assess decant water quality, cross sections of the pit and 3D geological data input into a geohydrology model along with the DTM. The waste classification and analysis for the Eloff Phase 3 Project has been completed and the findings thereof will be included in the EIA Report.	Groundwater quantity and quality.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		closure groundwater balance, the post closure ground water quality as well as post closure pollution plume migration. Site specific stratigraphic information (borehole logs) all the way from surface up until at least the underlying dolomite is required. This information is required for groundwater balance calculations, geochemical modelling and numerical groundwater flow and mass transport modelling. The floor elevation distribution of the open pit is required to assess the possibility for in-pit water management during the operational phase. · Rock samples from all representative geological formations within the pit to support geochemical analyses in support of waste classification for the hard overburden and discard as well as geochemical modelling to assess the post closure and possible decant water quality. For compilation of the geohydrological conceptual model cross sections through the pit will be required to also show the relationship with the underlying dolomitic formations. The numerical geohydrological model will require 3-dimensional geological data together with a surface topographical DTM to assess inter alia the potential for post closure mine water decant.		
Muller, Jasper	11/07/2019	Topography (section 8.1 – page 108) Our main comment relating to the topography baseline description is that the regional topographic setting of the Phase 3 project is not shown. · The intent of the applicant to mine all seven phases of the Eloff Mining coal reserve is clear from the documentation. · The Phase 3 area is also located immediately up-gradient from the Middelbult reserves for which EA has also been applied for. · This larger mining area straddles a regional water divide which has certain implications (and possibly options) for operational and post closure water management. · It is not possible from the information provided to develop this context and therefore when it comes to the assessment of cumulative impacts the topographic information supplied will be insufficient.	18. The specialist surface water hydrology report included in Appendix D of the scoping report includes a regional description of the topography. Please refer to response 2 regarding cumulative impacts.	Surface and ground -water quantity and quality.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		We therefore request the Topography - Plan of Study – to inter alia address the following: · Regional topographic information/map(s) covering at least all Universal Coal and Eloff Mining reserves/rights/applications, as well as the full quaternary catchments associated with this bigger area. · All surface water resources (streams, dams and pans) must also be indicated. This information is also required to support the Surface Water Hydrological Assessment.		
Muller, Jasper	11/07/2019	Description and Assessment of Impacts (section 9.3 – starting page 181) The high negative significance assessed for the dewatering of the Karoo aquifer(s) is noted. However, this assessment did not consider possible dewatering impacts on the underlying dolomitic aquifer. o This is of more concern and relevance than the dewatering of the Karoo aquifers and must be considered during the EIA Phase. o The Council for Geoscience must comment and sign off on the potential impacts related to dolomite aquifer dewatering. o We dispute the benign rating assessed for the decanting of poor-quality water from the rehabilitated pit. The hydrogeological information given in the report indicates that the post closure water quality in the pit will be acidic and of elevated salinity, as well as that this water will decant onto surface at a significant volume. o We therefore insist on proper geochemical and hydrogeological assessments as well as geochemical and numerical groundwater modelling to address this potential impact of undoubted high negative significance. o The EMP must show how this will be managed post closure and the option for water treatment (which is the preferred technology for the DWS) must be investigated from a technical feasibility and financial sustainability perspective. The Financial Provision for Closure (in terms of GNR 1147) must specifically address this post closure management and provide funds for this option.	28. The groundwater report includes a geochemical assessment. No form of geochemical testing was performed at the Eloff Block for this investigation. Numerous geochemical investigations were however performed for the Kangala Colliery and its Middelbult Expansion Project, providing a good understanding of the geochemistry of the underlying geology. The impact of the dewatering of the dolomitic aquifer is listed for assessment in the EIA specifically, in terms of its impact on water availability as well as geological stability.The EMP which will accompany the EIA report will include mitigation and management with regards to these impacts and how this will be managed post closure.The option for water treatment will be assessed and discussed in more detail in the EIA report. The Council for Geoscience has been added to the project database and the EIA report and accompanying specialist reports will be submitted to them for comment.	- Groundwater quantity and quality. -Management and treatment options of mine affected water.
Muller, Jasper	11/07/2019	Closing Remarks:	35. Thank you for the comments and feedback provided on the DSR. As noted in the responses	- Surface and ground - water

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		The current information provided in the DSR, despite the obvious and numerous deficiencies highlighted, already confirms that significant impacts would manifest on the environment as a result of the proposed mining. In this regard the total interception of surface water in the mining area and its downstream effect on Mr du Plessis's farming activities is but one example. Furthermore, the baseline information provided is patently insufficient to use as a basis from which to assess the actual impacts and neither can it be used to devise effective mitigation measures. In this regard the lack of site specific geochemical and geohydrological characterization, which makes accurate modelling and impact assessment impossible, is a good example. The fact that impacts are not assessed cumulatively for the existing Kangala Mine, the proposed Eloff Phase 3 mining, the applied for Middelbult reserves, and the now approved Eloff Phase 1 operations, represents in our view a fatal flaw. Although no attempt was made to quantify the actual impact on Mr Du Plessis surface water resources, the cumulative effect of these mining operations during their operational phases is obvious and will totally wipe out the surface water resource of Mr du Plessis. The post closure impact due to mine water decant will render the surface water unusable unless treated, however, no information is supplied as far as water treatment is concerned. Another good example where cumulative impacts are not considered is for the wetlands in the area. The cumulative impact would be devastating for wetlands in the upper reaches of quaternary catchment B20A. In closing we wish to put on record that it is unfortunate that the so-called focus group meeting scheduled with us for 3 July 2019	above baseline information will be updated where necessary in the EIA report to provide as much detail as possible based on the results of the EIA field investigations and detailed studies. This will include an evaluation of cumulative impacts for projects pending authorization as well as existing mines in the surrounding area. Regarding the focus ground meeting, it is the understanding of EIMS that several members of the affected community were unable to attend the Public Meeting at 16:00, and therefore attended the earlier meeting. A mine representative informed some of the IA&Ps about the 13:00 meeting because he was not aware that the meeting was supposed to be a closed one or for specific people. The reason to share details of the meeting was after some community IAPs had indicated their unavailability to attend the 16:00 meeting. It is the aim of the public participation process to be as inclusive as possible - they were therefore allowed the I&APS to attend the focus group meeting and share their concerns and comments. The intention of the meeting was to provide a further opportunity for comment on the application and the proposed project. It is acknowledged and appreciated that the consultants representing your client were able to raise comments and concerns at the meeting.	quantity and quality. - Impacts on wetlands.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		was turned into an open public meeting, during which it was attempted to intimidate us to not provide any feedback that would not "fast track" the authorization process, by a number of representatives of organizations clearly in favour of the mine going ahead. An ideal opportunity for us to part take in the EIA process and to clarify our concerns, which we believe are valid, and thereby contributing to the EIA process, was lost. The threats made against our client, his family, his property and even directly against us, will no doubt force us to consider our inputs as I&AP's. We are really disappointed in EIMS for allowing this to happen. We nevertheless trust that our comments will be captured and that each of our concerns, suggestions and requests will be dealt with by yourselves and the relevant specialists. We look forward to your response and trust that you will provide us with a copy of the Final Scoping Report when and as submitted to the DMR.		
Muller, Jasper	11/07/2019	Wetlands (section 9.3.5 – page 187) Probably the most severe impact on wetlands is not mentioned/assessed at all. Neither the effect of the actual operational phase mining of the open pit, which will fully intercept any shallow groundwater seepage towards the two hill slope seepage wetlands, and which could fully dry them out, nor the post closure impact of the decant of contaminated mine water, have been considered. o Again also the cumulative impact of the four mining operations listed previously has not been considered. o We therefore insist that the wetland study be revisited and that these impacts, individually for Phase 3, as well as collectively for all the other proposed mining in this catchment, be assessed. o We also insist that the groundwater numerical flow model be used to determine the reduction in groundwater seepage flow towards the wetlands. Remember	30. The impact on the water quality from decant as well as seepage an flow reduction impacts were identified as potential impacts in the scoping report. The EIA report will assess all impacts related to seepage and flow reduction impacts. The specialist hydro pedological study will further inform this impact assessment. This will also include a cumulative impact assessment. The hydro pedological study will be submitted to DWS as part of the EIA report as well as the WULA.	- Groundwater quantity and quality. - Water availability to support wetlands.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		now that the surface water feeding these systems will also be intercepted. o We insist that the DWS sign off on these assessments.		
Muller, Jasper	11/07/2019	The provision of post closure mine water treatment to manage the anticipated decant volume and quality, must be investigated and the proposed outcome must be costed, and funds must be provided for in the Financial Provisioning Quantum as per the requirements of GNR 1147.	A Financial Provisioning Quantum as per the requirements of GNR 1147 will be included in the EIA phase.	Water treatment And associated financial provision.
Muller, Jasper	11/07/2019	The Plan of Study in the DSR for Surface Water is therefore rejected and it is requested that a detailed Plan of Study be developed for inclusion in the DSR. · It should further be noted that the current hydrology base line description does not contain the required information to support the Water Use License application to be lodged, or the IWWMP to be developed. The DWS has formal guidelines detailing the information to be generated. We therefore request the Hydrology - Plan of Study – to inter alia address the following processes to be followed and supporting documents as required by: NEMA, NWA and NEMWA. This report must represent an overall Surface Water Specialist Report covering the entire Kangala/Phase 3 Extension Operational Area and addresses both the existing, as well as the proposed new, Surface Water related activities at the site. · The purpose of this report is that it should support the following Legal Environmental Application processes and therefore the relevant documents that has to be compiled in support of the various applications: The structure and material content of the Surface Water Specialist Study, in so far as it needs to support the above listed application processes, is defined by a combination of the relevant Application Form Requirements, as well as other legal and technical requirements: Appendix 6: NEMA Environmental Impact Assessment Regulations, 2014 (as amended) GNR 982 – Content of a Specialist Report). Appendix 2: NEMA Environmental Impact Assessment Regulations, 2014 (as amended) GNR 982 – Content of a Scoping Report); Appendix	The Plan of Study for the hydrological report has been updated to reflect that all legal and technical requirements in support of the EIA and WUL applications will be included in this report. The Surface Water Report will address all requirements for a report of this nature in terms of NEMA as well as DWS guidelines for reporting.	Financial provisioning.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		3: NEMA Environmental Impact Assessment Regulations, 2014 (as amended) GNR 982 – Content of an Environmental Impact Assessment Report); Appendix 4: NEMA Environmental Impact Assessment Regulations, 2014 (as amended) GNR 982 – Content of an Environmental Management Report); Appendix 5: NEMA Environmental Impact Assessment Regulations, 2014 (as amended) GNR 982 – Content of a Closure Plan); DWS Operational Guideline for the Compilation of an IWWMP (2010); DWS Best Practice Guidelines: H1 – H4 (2006-2008); DWS Best Practice Guidelines: G1 – G5 (2006-2008); DWS Best Practice Guidelines: A1 – A6 (2006-2008); In order to fulfil the above requirements, the Surface Water Report should address at least the following: 1. Introduction 1.1 project background 1.2 project location; 2. Details of specialist ; 3. Declaration of independence ; 4. Relevant legislation AND guidelines 4.1 acts and regulations 4.2 guidelines ; 5. Scope, purpose, approach and methodology 5.1 scope and purpose of report 5.2 approach, methodology and actions performed 5.2.1 Desktop Study/Review Existing Information 5.2.2 Fieldwork and Research 5.2.3 Surface Water Baseline Description 5.2.4 Existing and Proposed New Activity Description 5.2.5 Surface Water Impact and Risk Assessment 5.2.6 Surface Water Management Plan 5.2.7 Surface Water Monitoring Plan 6. Assumptions, uncertainties and knowledge gaps 6.1 assumptions 6.2 uncertainties 6.3 knowledge gaps ; 7. Project aspects relevant to surface water 7.1 site locality 7.2 KANGALA EXISTING INFRASTRUCTURE AND LAYOUT 7.2.1 General Infrastructure 7.2.2 Coal Beneficiation 7.2.5 Waste Management 7.2.5.1 Mine Waste Rock 7.2.5.2 Coal Discard from Plant 7.2.5.3 Sewage Treatment 7.2.6 Water Management 7.2.6.1 Raw Water Supply 7.2.6.2 Groundwater Supply 7.2.6.3 Storage of Water (Open Pit and Reservoirs) 7.2.6.4 Existing Storm Water Diversion Canals and Berms 7.2.6.5 Existing Storm water PCD 7.3 Kangala extension proposed new infrastructure and layout 7.3.1 Open Pit		

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		Mining 7.3.1.1 Mine Plan and Mining Schedule 7.3.2 Water/Waste Management 7.3.2.1 Proposed Storm Water Diversion Canals and Berms 7.3.2.2 Confirmation of Capacity of Storm Water PCD 7.3.2.3 Requirement for Water Treatment 7.3.2.4 Mine Waste Rock (overburden) Management 7.3.2.5 Plant Discard Management 7.4 site sensitivity 7.5 features and buffers for a47 ; 8. Surface water baseline description 8.1 climate 8.1.1 brief regional Climate 8.1.2 Mean Monthly and Annual Rainfall 8.1.3 Maximum Rainfall Intensities 8.1.4 mean monthly evaporation 8.2 topography (hydrological) 8.3 water management area/regulating authority 8.4 surface water quantity 8.4.1 overall Catchment Boundaries 8.4.2 Site Sub-catchments 8.4.3 Receiving Water Body 8.4.4 Mean Annual Runoff (MAR) 8.4.5 Average Dry Weather Flows 8.4.6 Flood Peaks and Volumes for Each Sub-Catchment 8.4.7 Flood Lines 8.4.8 Climatic Water Balance (10 wettest years on record) 8.5 watercourse alterations 8.6 surface water use 8.7 surface water quality ; 9. Water and salt balance (Existing and Proposed New activities to be included) 9.1 water balance 9.2 salt balance ; 10. surface water impact and risk assessment 10.1 identification and description of surface water impacts 10.1.1 relevant project activities 10.1.2 identification of aspects per life cycle phase 10.1.3 Impact Description/Definition per Life Cycle Phase 10.2 evaluation of surface water impacts 10.2.1 impact rating methodology 10.2.2 impact significance rating ; 11. Quantification of surface water impacts ; 12. Technical details of surface water management measures; 13. Surface water relinquishment criteria ; 14. Surface water monitoring plan 14.1 monitoring localities and monitoring procedures 14.1.1 monitoring localities 14.1.2 monitoring procedures 14.2 relevant standards for monitoring 14.3 monitoring frequencies 14.4 data capture protocols 14.4.1 Monitoring/Sampling Technique 14.4.2 Sample Preservation/submission to laboratory 14.4.3 variables to be analysed 14.4.4 data base entry and backup 14.4.5 report		

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		writing 14.5 standard operating procedures for non-compliance ; 15. reasoned opinion authorization ; 16. financial provisioning ; 17. summary of consultation process ; 18. information requested by competent authority; DWS WC/WDM guideline (2018).		
Muller, Jasper	11/07/2019	Power Supply and Water Management (section 3.2.4 and 3.2.6 - page 31). Reference is made to a possibility that the pumping of water from the open pits would be required, and that in the event that it does become necessary, that existing diesel pumps would be utilized. The sources of this water would either be direct rainfall or groundwater flux into the workings. It should be noted that any water generated by or into the open pits will represent contaminated water and that a water use license would be required to authorize the abstraction and re-use or treatment and release thereof. We therefore request that detailed assessments pertaining to the water balance and salt balance of the open pits, for all relevant life cycle phases, including the post closure phase, be conducted site specifically for Phase 3 mining. This would include detailed geophysical/geological, geochemical, geohydrological and hydrological assessments to support calculation/modelling of the water and salt balances. This is a crucial aspect to ensure adequate and legal water management and must be included in the Plan of Study. Without understanding of the water balance, and details of existing pumps, I&AP's will not have the opportunity to assess the feasibility of pumping the water with existing diesel pumps and whether existing water management infrastructure will be sufficient to deal with the pit water make. In the event that the water make exceeds the re-use requirements, water treatment could be required. · The current water balance provided in the Surface Water Hydrology report is insufficient as it makes assumptions on groundwater inputs, whilst no information on groundwater influxes into the open pit is contained in the	11. Refer to sections 3.2.6 in the scoping report as well as section 7 in the hydrology report regarding the water balance. The hydrology specialist will assess this in more detail according lifecycle phases for the EIA phase of the project. The infrastructure required to pump water will be designed according to required specifications at the time. Regarding the details for existing facilities please refer to response to item 7 above. The EIA phase hydrology study will include a water balance update to indicate how much water will discharge to PCD at the time when Eloff is operating and compare this to the capacity of current PCD. The specialist will consider all phases including closure.	Surface and ground -water quantity and quality.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		Groundwater Specialist study. Water Management at Eloff Phase 3 is crucial if the Surface Water and Groundwater Resources are to be effectively protected. Reference is made that existing infrastructure will be used. I&AP's have no way of assessing the technical capabilities, nor the legal compliance of existing water management infrastructure. We therefore repeat our request that we be provided with both the technical design information for the existing facilities, as well as the licenses and compliance audit reports for these facilities. This information should be made available as part of the formal SEIAR process documentation for the benefit of all I&AP's and relevant authorities. We request that it be added to the Project Description in the Scoping Report to facilitate unambiguous assessment.		
Muller, Jasper	11/07/2019	It must therefore be assumed that the fact that the mine pit would be 70 m deep was not considered. It is not clear how for instance the open pit dewatering impact on wetlands can be assessed if this information was not considered. · The maps shown in the specialist report clearly indicated the close proximity of the proposed open pit area to the neighbouring wetlands, confirming that the open pit mining would undoubtedly impact on the water supply to these features. In fact, the maps indicate that mining would occur within delineated wetland areas that have been classified with a High Ecological Importance and Sensitivity, as well as a high Hydrological and Functional Importance. The risk results from the wetland buffer model documented in Table 16 of the report, clearly confirm the threat to surface flow volumes and surface water quality during the operational phase. The proposed mitigation measures will not be possible unless a water treatment facility is provided. The section on impact assessment only deals with the construction and operational phases. This unacceptable. Despite the fact that the wetland specialist study report makes recommendations for further investigation prior to	A hydropedology study has recently been completed and this will form part of the EIA report. The hydropedology study will quantify the groundwater flow losses and resulting impact to wetlands due to the proposed mining operations. The Plan of Study for the EIA phase has been updated to include the Hydropedology study and this study will include the impact on surface flow volume losses for all phases of mining. A cumulative impact assessment will also form part of both the wetland and hydropedology studies.	- Surface and ground -water quantity and quality. - Impact on wetlands.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		the EA being issued, the Plan of Study does not include these recommendations. This is unacceptable. We therefore request the Wetlands - Plan of Study – to inter alia address the following: The impact assessment should quantify the surface flow volume losses as a result of the mining – all life cycle phases. · The impact assessment should quantify the groundwater flow volume losses as a result of the mining – all life cycle phases. The impact assessment should quantify the impact on surface water quality due to mining – all life cycle phases – especially also post closure when poor mine water quality decant onto surface is predicted. · The study should consider the cumulative impacts on wetlands of the proposed mining of not only Phase 3 of Eloff Mining, but indeed also the current Kangala, the proposed Phase 1 of Eloff mining, the proposed Middelbult mining project, as well as any other mining currently happening, or foreseen, for the B20A quaternary catchment. ·		
Nykamp, Tandina	15/07/2019	3.8.3.9 A Rehabilitation Plan and Closure Assessment; and	The EMPR which will accompany the EIA report will include a rehabilitation plan and closure assessment. A Financial Provisioning Quantum as per the requirements of GNR 1147 will be included in the EIA phase.	Financial Provisioning reports
Nykamp, Tandina	15/07/2019	3.7.7 Insofar as the impacts identified are concerned, Table 32 on page 255 identifies the preliminary impacts identified for the proposed Phase 3 project, the negative high significance ratings, post mitigation, of which are as follows: 3.7.7.1 Decline in air quality - Operation; 3.7.7.2 Ground vibration impact on boreholes, heritage sites, powerlines, broilers, houses – Operation; 33.7.7.3 Air blast impact on houses, broilers – Operation; 3.7.7.4 Fly rock impact on roads, boreholes, houses, powerlines; 3.7.7.5 Lowering of local groundwater levels – Operation; 3.7.7.6 Loss of land capability – Construction and Operation; 3.7.7.7 Blasting in and around wetlands – Operation; 3.7.7.8 Soil excavations in and around wetlands – Operation; 3.7.7.9 Forex savings, fiscal income, country and industry	Comment noted – significance ratings will be re-assessed in the EIA phase once detailed site investigations have been completed.	Rehabilitation and closure impacts.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		competitiveness – Decommissioning; 3.7.7.10 Net GGP impact, Net employment impact, Forex savings, fiscal income, economic development per capita, alternative land use, need and desirability – Rehabilitation and closure.		
Muller, Jasper	11/07/2019	Description and Assessment of Impacts (section 9.3 – starting page 181). The high negative significance assessed for the dewatering of the Karoo aquifer(s) is noted. However, this assessment did not consider possible dewatering impacts on the underlying dolomitic aquifer. o This is of more concern and relevance than the dewatering of the Karoo aquifers and must be considered during the EIA Phase. o The Council for Geoscience must comment and sign off on the potential impacts related to dolomite aquifer dewatering. o We dispute the benign rating assessed for the decanting of poor-quality water from the rehabilitated pit. The hydrogeological information given in the report indicates that the post closure water quality in the pit will be acidic and of elevated salinity, as well as that this water will decant onto surface at a significant volume. o We therefore insist on proper geochemical and hydrogeological assessments as well as geochemical and numerical groundwater modelling to address this potential impact of undoubted high negative significance. o The EMP must show how this will be managed post closure and the option for water treatment (which is the preferred technology for the DWS) must be investigated from a technical feasibility and financial sustainability perspective. The Financial Provision for Closure (in terms of GNR 1147) must specifically address this post closure management and provide funds for this option.	28. The groundwater report includes a geochemical assessment. No form of geochemical testing was performed at the Eloff Block for this investigation. Numerous geochemical investigations were however performed for the Kangala Colliery and its Middelbult Expansion Project, providing a good understanding of the geochemistry of the underlying geology. The impact of the dewatering of the dolomitic aquifer is listed for assessment in the EIA specifically, in terms of its impact on water availability as well as geological stability. The EMP which will accompany the EIA report will include mitigation and management with regards to these impacts and how this will be managed post closure. The option for water treatment will be assessed and discussed in more detail in the EIA report. The Council for Geoscience has been added to the project database and the EIA report and accompanying specialist reports will be submitted to them for comment.	- Surface and ground -water quantity and quality. - Water treatment options.
Muller, Jasper	11/07/2019	Activity Alternatives (section 6.4 – page 85) The statement that a mixed land use comprising both mining and continued agriculture is possible, and that current agricultural activities will be able to continue where no mining infrastructure is located, clearly illustrates the poor understanding of the	14. An expanded land use study will be completed in the EIA phase which will include a cumulative impact assessment. The soils study will also investigate the available management and mitigation measures to attempt to reinstate a level of post mining	Post closure land-use.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		economic drivers of, and the mining associated impacts on, commercial farming activities. · The potential impacts on the financial viability of large scale commercial farming due to the fragmentation of land, the impact on scale of economies and then eventually the cumulative impact of the sterilization of 10 000 ha of farming land once the full Eloff Mining Reserve is mined, is clearly not recognized. · In section 6.5 (No-Go-Alternative) the statement made that farming practices are able to commence after the previously mined areas are suitably rehabilitated allowing for the economic benefits from agriculture to continue, speaks to a total lack of understanding of the current benefit of agriculture and how it will be impacted by mining. · We therefore request that a Comparative Land Use Assessment for mining and agriculture, with specific attention also to the site specific Agricultural Land Use of Commercial Farming, covering the full proposed mining reserves of Universal Coal and Eloff Mining, be conducted in support of this alternative's assessment for the EIA phase of the project. The commitment to conduct such a study must be included in the Plan of Study.	agricultural functionality. The predicted outcomes of this will be included in the comparative land use study.	
Nkosi, Phumla	08-09/07/2019	Attached please find the MTPA's comments with regards to the proposed Eloff phase 3 projects. MP30/5/1/2/3/2/1 (10169) EM. Extract from comments received: "The MTPA has no objection to the proposed mining operation but is concerned about the Freshwater assessment findings and recommendations of the Biodiversity Company. Included is the MBSP freshwater assessment map figure 1, that indicated the freshwater sensitives of the proposed open cast mine. The freshwater map indicates the ESA wetlands within the ESA a strategic water source area. It is clear from the scoping EIA that the risks of the opencast operation will be the loss of the ESA wetlands and the altered	Thank you for your correspondence regarding the Scoping Report and IWWMP (attached email) for the Eloff Phase 3 Project. Should you have any further comments or queries please feel free to contact me	- Impact on wetlands. - Wetland offset. - Surface and ground -water quantity and quality. - Treatment of mine affected water.

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
		topography which will have another effect on the hydrology of the catchment. The MTPA requires that the Environmental Authorisation should include a wetland offset strategy for this project. the extent and present ecological status of these wetlands must be quantified in order to determine a meaningful offset. Furthermore, thorough rehabilitation of the current mining operation must take place. A strategy to purify the dirty mine water and possible decanting of AMD water must be investigated in order to provide clean water for the environment and downstream water users"		
Nykamp, Tandina	15/07/2019	3.2.3 It is stated on page 27 that mining and rehabilitation will be undertaken concurrently however on page 28 of the DSR it states that the designated stockpile area in close proximity to the mining pit will be used for rehabilitation at a later stage. Is the rehabilitation concurrent or not? We understand that KCM is required to undertake concurrent rehabilitation however this has not been done; why will this be different?	Section 3.2.1 of the scoping report describes the mining method. The mining method that will be applied is standard truck and shovel strip mining, whereby mining and rehabilitation will be undertaken concurrently.	- Progressive and concurrent rehabilitation.
Nykamp, Tandina	15/07/2019	3.4.3 On page 83 of the DSR is states that progressive and concurrent backfilling and rehabilitation on affected land will be undertaken. As more fully referred to in paragraph 3.2.3 hereinabove, this is contradictory.	Refer to response to item 3.2.3. Response item 3.2.3 reads: "Section 3.2.1 of the scoping report describes the mining method. The mining method that will be applied is standard truck and shovel strip mining, whereby mining and rehabilitation will be undertaken concurrently."	- Progressive and concurrent rehabilitation.
Nykamp, Tandina	15/07/2019	3.8.3.9 A Rehabilitation Plan and Closure Assessment; and	The EMPR which will accompany the EIA report will include a rehabilitation plan and closure assessment. A Financial Provisioning Quantum as per the requirements of GNR 1147 will be included in the EIA phase.	Financial provisioning reports

IAP	Comment Date	Comment	Responses	Rehabilitation and Closure Aspect
Nykamp, Tandina	15/07/2019	3.4.8 Page 86 of the DSR further states that: "farming practises are able to commence after the previously mined areas are suitably rehabilitated in accordance with the relevant legislation thereby allowing for the economic benefits from agriculture to continue." We again reiterate what is stated hereinabove at paragraph 3.4.4 and 3.4.5	An expanded land use study will be completed in the EIA phase which will include a cumulative impact assessment. The soils study will also investigate the available management and mitigation measures to attempt to reinstate a level of post mining agricultural functionality. The predicted outcomes of this will be included in the comparative land use study.	Post closure land use.

3.1.4 ENVIRONMENTAL RISK ASSESSMENT

The EIA Report provides a detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken for the proposed activities. This risk assessment assesses each identified environmental impact by considering the consequence of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood of the impact occurring. The EIA further considers other factors, including cumulative impacts, and potential for irreplaceable loss of resources, to determine a prioritisation factor (PF) which is applied to the Environmental Risk to determine the overall significance.

Table 10 lists the environmental impacts and risks identified and assessed in the EIA, which relate to final rehabilitation, decommissioning and closure. The EMPr addresses the management and mitigation of environmental impacts associated with the construction and operational phases whilst the three reports and plans as prescribed in the Financial Provisioning Regulations, 2015 (to be reviewed annually) will provide for the planning and financial provisioning for the concurrent rehabilitation and final closure of the production activities.

The applicable conceptual closure strategy to avoid, manage and mitigate the impacts and risks are also included in Table 10, together with the reassessment of the environmental risk after mitigation. The environmental risk assessment of the impacts associated with final rehabilitation, decommissioning and closure has informed the most appropriate closure strategy for the project. Impacts that are classified as high risk post-mitigation will be considered as latent environmental impacts and financial provision will be provided to remediate these specific impacts. Please see Section 5 for further details.

The significance scores are defined as Low (<9); Medium (≥9; <17); and High (≥ 17) and are colour-coded as follows: Low – Green, Medium – Orange, and High – Red. Positive impacts have not been colour-coded.

It is important to note that the environmental risk assessment will be revised and updated on an annual basis to ensure that this FRDCP remains applicable to the actual and predicted environmental impacts and risks.

For the purpose of EIA and this Report, the following broad definitions apply:

- Planning/Pre-construction refers to the phase in which planning takes place, namely: exploration, environmental studies, finalising designs, etc.;
- Construction refers to the phase in which the site is prepared and infrastructure is established (e.g. vegetation clearance, access road preparation, construction camp establishment, infrastructure placement, etc.);
- Operation refers to the phase in which physical mining and production takes place – this phase will include roll over mining and on-going progressive rehabilitation efforts;
- Decommissioning and rehabilitation refers to the inter-linked phases in which existing infrastructure is removed and final rehabilitation efforts are applied and their success monitored;
- The closure phase commences once the ore-extracting activities of a mine have ceased, and final decommissioning and mine rehabilitation is being completed. This phase usually ceases 3-5 years after physical closure activities and would align with the issuance of a closure certificate; and
- Post-closure refers to the phase in which maintenance and rehabilitation monitoring are undertaken to ensure that the mines closure objectives are met. Post-closure typically commences once a closure certificate has been received. The duration of the post-closure phase is defined by the duration of the applicable residual and latent environmental impacts.

Table 10: Impact Assessment for Rehabilitation, Decommissioning and Closure[3].

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
Decommissioning and rehabilitation phase					
Water	Water Quality Deterioration – Siltation of water resource.	-12 (medium)	- Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area; - Surface inspection should be continuously undertaken to allow runoff to drain onto the downstream drainage /rivers; and - All rehabilitated areas must be established with vegetation. - It is recommended that both berms and the drainage channels should be grass-lined to reduce erosion potential.	-7.5	Free draining closure/ final landform. Closure phase monitoring and inspection- erosion and vegetation growth. Clearly defined post closure land-use plan, including relevant slope gradients applicable to different land-capabilities.
Water	Alteration to surface runoff flow volumes.	-20.00	- No additional measures, apart from a fully compliant SWMP and water quality monitoring are proposed to mitigate this impact; and - Rehabilitation of all infrastructure will be implemented and will include re-vegetating, capping and shaping. As understood the opencast pit will be backfilled with overburden and topsoil dump material, shaped and rehabilitated to promote clean runoff.	-8.00	Develop a post-closure water balance and SWMP.

[3]The significance scores are defined as Low (<9); Medium (≥9; <17); and High (≥ 17).

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
Air	Decline in air quality	-6.75	- Demolition of infrastructure to have water sprays where vehicle activity is high; and - Rehabilitation and vegetation of mined area.	-6.75	Re-instatement of vegetative cover as far as possible.
Soils/ Social	Permanent loss of agricultural land	-15	- All recommendations in the rehabilitation plan must be adhered to.	-13.00	Clearly defined post closure land-use plan. Implementation of a topsoil management plan including guidelines for: stripping; storage and maintenance; placement; amelioration; long term maintenance.
Soils	Loss of land capability	-20.00	- The rehabilitated area must be assessed once a year for compaction, fertility, and erosion. The soils fertility must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) as to correct any nutrient deficiencies; - Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated; - If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; - If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion;	-8.25	Site specific topsoil stripping guideline to be followed. Soil rehabilitation plan to be implemented. Limit on site vehicle movements (during post operational phases) to defined routes and designated farmland areas.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- Only the designated access routes are to be used to reduce any unnecessary compaction; and - Areas of subsidence must be reported and remediated as soon as possible with the best practises at the time of occurrence.		
Biodiversity	Loss of certain areas regarded as having a Moderate Risk to Mining according to the Mining and Biodiversity Guidelines.	-18.75	- The new mining area must be accessed through the old mining area to decrease the amount of vegetation disturbed outside of the open case area. - It is recommended that areas to be mined be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All working areas inside the new pit must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances. Specifically, for the proposed project, the wetlands to the south and north of the project area along with their buffers should be protected from human interference. - All disturbances must be within the mine footprint area, and all waste rock is taken to the existing Kangala Colliery as to not increase the footprint of the new mine; and - A pre-construction survey of mining footprint should be carried out to identify endangered floral species that will be directly disturbed and to relocate flora (this specifically includes any floral SCC).	-4.00	Ensure protection of identified natural areas.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
Biodiversity	Loss of semi-natural areas.	-20.00	- The new mining area must be accessed through the old mining area to decrease the amount of vegetation disturbed outside of the open case area; - It is recommended that areas to be mined be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All working areas inside the new pit must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances. Specifically, for the proposed project, the wetlands to the south and north of the project area along with their buffers should be protected from human interference. - All disturbances must be within the mine footprint area, and all waste rock is taken to the existing Kangala Colliery as to not increase the footprint of the new mine; - Apart from the pit area to be mined, areas rated as "very high" sensitivity in this report, should be declared as 'no-go' areas during all phases of the project and all efforts must be made to prevent access to this area from construction workers and machinery; - The sensitive areas (very high and high) in the project area that will be mined through must be rehabilitated as soon as the mining has been concluded. As the mining will take place in phases, the rehabilitation needs to commence as soon as	-13.00	Ensure protection of identified natural areas.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			the second phase is to start. Areas that area not directly part of the mining must be avoided to minimise the impact; and - An experienced, qualified environmental control officer must be on site when construction begins to identify floral species that will be directly disturbed and to relocate flora that are found during construction (this specifically includes any floral SCC).		
Biodiversity	Habitat fragmentation and edge effects.	-21.25	- Apart from the pit area to be mined, areas rated as "very high" sensitivity in the biodiversity report, should be declared as 'no-go' areas during all phases of the project and all efforts must be made to prevent access to this area from construction workers and machinery; and - A pre-construction survey of mining footprint should be carried out to identify endangered floral species that will be directly disturbed and to relocate flora (this specifically includes any floral SCC).	-13.00	Ensure protection of identified natural areas.
	Erosion	-17.00	- Voids needs to be backfilled followed by topsoil following the natural topography and must be revegetated with indigenous vegetation; - Alien vegetation plan needs to be kept in place and implemented for rehabilitation to be successful; and	-7.50	Implement topsoil stripping, stockpiling and levelling plan. Develop and implement and alien invasive control and eradication management plan.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- Rehabilitated areas needs to be demarcated to prevent trampling and access to the area and ultimately decrease the likelihood of erosion.		
Biodiversity	Possible re-establishment of indigenous vegetation and return of faunal species	-17.00	- It is recommended that a comprehensive rehabilitation plan, including a comprehensive alien vegetation management plan, be compiled and implemented for the project; - It is recommended that a project area specific but also species-specific biodiversity monitoring and action plan be compiled once the EA is received. The monitoring and action plan must inform and guide the proposed project and prescribed clear goals and objectives that can be practically implemented and easily monitored using appropriate variables. The key aspects must include the following: o The collation and generation of data for selected species, ecosystems and/or habitats; o Assess and determine the conservation status of species within specified ecosystems; o Prescribe aims, objectives and targets for conservation and restoration; and o Establish and assign budgets, timelines, reporting structures and partnerships for implementing the action plan.	-7.50	Develop and implement and alien invasive control and eradication management plan. Develop and implement biodiversity monitoring and action plan.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
Biodiversity	Further impacts due to the continued spread and/or establishment of alien and/or invasive species	-17.00	- Compilation of and implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the wetland areas; - Areas that are denuded during construction and does not form a part of the mining footprint need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species; and - It should be made an offence for any staff to intentionally bring any plant species into any portion of the project area, in order to prevent the spread of exotic or invasive species.	-7.50	Implementation of alien invasive plant management plan. Limit on site vehicle movements (during post operational phases) to defined routes and designated farmland areas.
Biodiversity	Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).	-20.00	- Faunal species should be given the chance to escape or move away from disturbances during construction. If any faunal species do not move off naturally then the ECO should be consulted to identify the correct course of action; o This is particularly relevant to the presence of African Grass Owls (*Tyto capensis*) which were recorded in the project area. If environmental authorisation is granted for the current wetlands to be mined, then the mining of these areas must be done outside of the breeding season of this species;	-6.75	Limit on site vehicle movements (during post operational phases) to defined routes and designated farmland areas. Ensure free movement of small fauna into adjacent wetland/ riparian corridors. Livestock access control.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			○ African Grass Owls chicks' critical fledging period is from March to May and wetlands in the project area should not be mined during this period and/or a relevant specialist should thoroughly inspect any wetlands that are to be mined for the presence of this species; - Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during all the phases going forward. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; and - All livestock must be kept out of the wetland and grassland areas in order to prevent overgrazing of potential SCC avifauna habitat.		
Biodiversity	Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching and litter.	-14.00	- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during all the phases going forward. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; and - All livestock must be kept out of the wetland and grassland areas in order to prevent overgrazing of potential SCC avifauna habitat.	-12.00	Clearly defined post closure land-use plan, including relevant buffers to areas of biodiversity sensitivity. Livestock and pedestrian access control into wetland areas and associated buffers.
Biodiversity	Possible introduction of feral species such as cats.	-13.00	- No domestic animals are to be allowed into the project area under any circumstances, especially any dogs and cats. Any and all feral cats which may	-6.75	Implementation of pest control plan.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			enter the project area must be removed immediately by an appropriate specialist; and - Pest control plan must be put in place and implemented.		
Wetlands	Changes in topography and slope	-11.25	- Separate clean and dirty water. Clean water must be diverted and directed around working areas, and measures or structures created to manage the discharge to avoid scouring and erosion; - Dirty water must be contained in control dams. This water may be recycled through the operation but may not be released into the environment. In the event that water is required to be released, it is advisable that the water quality be within the target requirements for aquatic ecosystems; - The Contractor should inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities. A minimum of one toilet must be provided per 10 persons; - The Contractor should supply sealable and properly marked waste collection bins and all solid waste collected shall be disposed of at a licensed waste disposal facility; - Where a registered waste site is not available close to the project area, the Contractor shall provide a method statement with regard to waste	-9.75	- Develop and implement SWMP. - Implementation of approved EMPr. - Compliance monitoring. -
Wetlands	Impact on wetlands due to spills, leaks and dust precipitation (heavy vehicle)	-5.50		-5.50	
Wetlands	Loss in re-charge to wetlands	-20.00		-20.00	
Wetlands	Impact on wetlands due to haulage of material	-2.25		-2.25	
Wetlands	Impact on wetlands due to ablutions	-2.25		-2.00	
Wetlands	Impact on wetlands due to poor waste management	-3.00		-2.25	
Wetlands	Impact on wetlands due to storage of materials and solutions	-2.50		-2.25	
Wetlands	Impact on wetlands due to spills, leaks and dust precipitation (light vehicle)	-3.00		-2.25	

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
Wetlands	Impact on wetlands due to untreated run-off	-2.75	management. Under no circumstances may solid waste be burned on site; - Refuse bins will be emptied and secured; - Temporary storage of waste shall be in covered waste skips; and - Maximum waste storage period will be 10 days.	-2.75	
Socio-economic	Reduction in visual impacts	+1.00 to +2.00	- General mining activities around the mine extension are unlikely to cause a major change in the current level of impact. Good housekeeping measures will all help to ensure that visual impacts are not exacerbated. These include: o Minimising the disturbed area (i.e. ensuring mining activities are localised or kept together as far as possible) so as to reduce the amount of areas with potential visual obstructions or impacts, o Retention of as much existing vegetation as possible, o Dust suppression, and o Progressive rehabilitation.	+1.00 to +2.00	Clearly defined post closure land-use plan, aiming to align with adjacent and regional land-uses.
Socio-economic	Increase in noise levels at surrounding receptors	-1.75	- All employees and contractors should receive induction that includes an environmental awareness component (noise). This is to allow employees and contractors to realize the potential	-1.75	Continuation of mechanisms for communication and engagement with local farmers/ landowner/ occupiers.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			noise risks that activities (especially night-time activities) pose to the surrounding environment. - Ensure a good working relationship between mine management and all potentially noise-sensitive receptors. Communication channels should be established to ensure prior notice to the sensitive receptor if work is to take place close to them (especially if work is to take place within 300 m from them at night). Information that should be provided to potentially sensitive receptor(s) includes: o Proposed working dates, the duration that work will take place in an area and working times; o The reason why the activity is taking place; o The construction methods that will be used; and o Contact details of a responsible person where any complaints can be lodged should there be an issue of concern. - Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised.		Compliance with EMPr requirements.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- The operation should investigate the use of white-noise alarms instead of tonal reverse alarms on heavy vehicles operating on roads, within the mining area and at stockpile areas. The advantages of white noise alarms above tonal alarms are: o It is as safe as a tonal alarm; o Highly audible close to the alarm (or reversing truck); o It generates a more uniform sound field behind a reversing vehicle; o Greater directional information, workers can locate the source faster; o Significantly less environmental noise and it creates significantly less annoyance far away; and o When properly installed, white noise alarms of a similar sound power emission level are more likely to comply with the ISO 9533 standard.		
Socio-economic	GDP and monetary impacts	-10.00 to -17.50	- No mitigation possible apart from implementing all measures listed in the Rehabilitation and Closure report included as part of the EMPr.	-10.00 to -17.50	Implementation of SLP.
Socio-economic	Net employment impacts	-8.75 to -16.75	- Where possible, the mine needs to engage with stakeholders to ensure the permanently employed farmworkers on the substituted farmland for Eloff Phase 3, be given assistance to travel to the	-8.75 to -16.75	Assistance to previously employed farm workers.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			Department of Labour to register for unemployment, if these workers are to be retrenched; and - It is recommended that the mine facilitates and participates in a formal entity to implement the farming post-mining land uses.		Development of post mining farming entity.
Socio-economic	Need and desirability impacts	+7.5 to + 18.75	- An independent competent person needs to review the mine's bankable feasibility study and sign off on the feasibility.	+7.5 to + 18.75	Development of a CPR.
Socio-economic	Job and income loss	-15.00	- As per SLP requirements, develop mechanisms to assist employees, prior to retrenchment date, in the transition phase after closure of the operations. This includes offering portable skilled development programmes during the operational phase of the mine, providing assistance in accessing available and suitable jobs with other local mines or companies, etc; and - Focus on non-core related local supply links during the operational phases of the mine to facilitate easier transitioning of local suppliers to other industries.	-14.00	Implementation of SLP commitments. Proactive planning in respect of returning land to active farming practices.
Socio-economic	Termination of social funds	-13.00	- Mine community development forms part of the requirements of the SLP and as such, any investment in the local community should be done in agreement with the VKLM and the mine community in question;	-11.00	Implementation of SLP commitments. Focus on development initiatives should focus of activities that can align with the post closure land-use.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- Ensure that all stakeholders are aware of the mine's limitations in terms of funding and that funding will cease upon mine closure; and - Select development projects that can become self-sufficient by generating its own income, e.g. agricultural support programmes that train subsistence farmers in more advance agricultural practices. Investments in infrastructure projects should be done in coordination with the relevant authority, e.g. classrooms at local schools should be undertaken along with the Department of Education who can take over maintenance once the mine ceases to exist.		Proactive planning in respect of returning land to active farming practices.
Closure phase					
Groundwater	Migration of residual contamination after rehabilitation	-12.00	- Dedicated plume monitoring boreholes should be drilled in the down gradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration; and - Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation boreholes may be considered.	-5.50	Management of contamination plume to prevent decant into surface water resources- options include pump and treat/ final void or surface evaporation/ evapotranspiration/ etc. Ensure ongoing monitoring to affirm and refine water management options (including updated conceptual and numerical modelling).

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
					Compensation or alternative provisions for water affected land-users.
Water	Decanting of poor-quality water from rehabilitated pit	-20.00	- Material most likely to generate acidic leachate should be placed in the deepest parts of the pit, or at least below the pre-mining groundwater elevation to minimise the oxidation of metal sulphides (pyrite). - The pit should be flooded as quickly as possible to minimise mineral oxidation (AMD). Once the pit is flooded, surface water should be diverted away from it. - Dedicated plume monitoring boreholes should be drilled in the downgradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration. Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation boreholes may be considered. - A monitoring borehole should be drilled into the rehabilitated opencast pit to monitor the rate at which it fills with water. This same monitoring borehole can also be used to manage the water level and prevent the pit from decanting.	-5.50	Management of contamination plume to prevent decant into surface water resources- options include pump and treat/ final void or surface evaporation/ evapotranspiration/ etc. Ensure ongoing monitoring to affirm and refine water management options (including updated conceptual and numerical modelling). Compensation or alternative provisions for water affected land-users. Provide distinct recharge strategies for the following: • Enhanced recharge until pit is flooded. • Reduced recharge post flooding.
Water	Water Quality Deterioration – Siltation of water resource.	-12.00	- Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area;	-7.50	Design and implement a free draining post mine landform.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- Surface inspection should be continuously undertaken to allow runoff to drain into the downstream drainage /rivers; and - All rehabilitated areas must be established with vegetation.		
Wetlands	AMD impacts on wetlands	-16.00	- Limit the extent (or size) of the void, rehabilitation must be concurrent. All voids must be backfilled as far as practically possible; - Compacted areas which are not going to be utilised in the future must be ripped (perpendicularly) to a depth of 300mm. A seed mix must be applied to rehabilitated and bare areas. Any gullies or dongas must also be backfilled. The area must be shaped to a natural topography. No grazing must be permitted to allow for the recovery of the area; - Determine the likelihood of AMD, and proactively implement measures to prevent or reduce this. Priority would be to ensure the treatment of this water to suitable standards for aquatic ecology; - Rehabilitation of the area and shaping of the topography must minimise the ingress of water into the mining area. Additionally, measures must also be considered to implement constructed wetlands at likely decant areas; - Groundwater models of the mining activities must be updated following the completion of the mining activities;	-15.00	Ripping and rehabilitation of compacted and disturbed areas. Apply final landform design. Review and update groundwater models and residual impact predictions. Review and refine final mine affected water management options. Remove cut-off drains and berms prior to final closure.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- Following the completion of the mining activities, groundwater studies must redetermine whether mine water decant will occur and the quality of the potential decants; - Should groundwater decant occur, the quality of the water should be determined and the effect upon the surface water determined. If the water quality is outside of the parameters stipulated in the resource quality objectives (RQO's) a water management and treatment process should be implemented; and - Decommission cut-off berms and drains last. Debris must be placed in preferential flow paths.		
Biodiversity	Loss of semi-natural areas	-20.00	- The new mining area must be accessed through the old mining area to decrease the amount of vegetation disturbed outside of the open case area; - It is recommended that areas to be mined be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All working areas inside the new pit must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances. Specifically, for the proposed project, the wetlands to the south and north of the project area along with their buffers should be protected from human interference.	-13.00	Ensure protection of identified natural areas.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- All disturbances must be within the mine footprint area, and all waste rock is taken to the existing Kangala Colliery as to not increase the footprint of the new mine; - Apart from the pit area to be mined, areas rated as "very high" sensitivity in this report, should be declared as 'no-go' areas during all phases of the project and all efforts must be made to prevent access to this area from construction workers and machinery; - The sensitive areas (very high and high) in the project area that will be mined through must be rehabilitated as soon as the mining has been concluded. As the mining will take place in phases, the rehabilitation needs to commence as soon as the second phase is to start. Areas that area not directly part of the mining must be avoided to minimise the impact; and - An experienced, qualified environmental control officer must be on site when construction begins to identify floral species that will be directly disturbed and to relocate flora that are found during construction (this specifically includes any floral SCC).		
Biodiversity	Spread and/or establishment of alien invasive plant species.	-17.00	- Compilation of and implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the wetland areas;	-7.50	Implementation of alien invasive plant management plan. Limit on site vehicle movements (during post operational phases)

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- Areas that are denuded during construction and does not form a part of the mining footprint need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species; and - It should be made an offence for any staff to intentionally bring any plant species into any portion of the project area, in order to prevent the spread of exotic or invasive species.		to defined routes and designated farmland areas.
Biodiversity	Infringement by humans into the few remaining natural grassland and wetlands areas.	-14.00	- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during all the phases going forward. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; and - All livestock must be kept out of the wetland and grassland areas in order to prevent overgrazing of potential SCC avifauna habitat.	-12.00	Adequate post closure control of land use.
Biodiversity	Soil erosion.	-17.00	- Voids needs to be backfilled followed by topsoil following the natural topography and must be revegetated with indigenous vegetation; - Alien vegetation plan needs to be kept in place and implemented for rehabilitation to be successful; and	-7.50	Monitor erosion and rectify where applicable. Limit on site vehicle movements (during post operational phases) to defined routes and designated farmland areas.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- Rehabilitated areas needs to be demarcated to prevent trampling and access to the area and ultimately decrease the likelihood of erosion.		
Biodiversity	Possible re-establishment of indigenous vegetation and return of faunal species.	+17.00	- It is recommended that a comprehensive rehabilitation plan, including a comprehensive alien vegetation management plan, be compiled and implemented for the project; - It is recommended that a project area specific but also species-specific biodiversity monitoring and action plan be compiled for consideration prior to the issuing of environmental authorisation. The monitoring and action plan must inform and guide the proposed project and prescribed clear goals and objectives that can be practically implemented and easily monitored using appropriate variables. The key aspects must include the following: o The collation and generation of data for selected species, ecosystems and/or habitats; o Assess and determine the conservation status of species within specified ecosystems; o Prescribe aims, objectives and targets for conservation and restoration; and o Establish and assign budgets, timelines, reporting structures and partnerships for implementing the action plan.	-7.50	Clearly defined post closure land-use plan, including relevant buffers to areas of biodiversity sensitivity. Implement biodiversity monitoring and action plan.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
Biodiversity	Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance	-20.00	- Faunal species should be given the chance to escape or move away from disturbances during construction. If any faunal species do not move off naturally then the ECO should be consulted to identify the correct course of action; o This is particularly relevant to the presence of African Grass Owls (Tyto capensis) which were recorded in the project area. If environmental authorisation is granted for the current wetlands to be mined, then the mining of these areas must be done outside of the breeding season of this species; o African Grass Owls chicks' critical fledging period is from March to May and wetlands in the project area should not be mined during this period and/or a relevant specialist should thoroughly inspect any wetlands that are to be mined for the presence of this species; - Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during all the phases going forward. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; and	-6.75	Develop and implement biodiversity management and action plan.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			- All livestock must be kept out of the wetland and grassland areas in order to prevent overgrazing of potential SCC avifauna habitat.		
Socio-economic	GDP and monetary impacts	-17.50	- No mitigation possible apart from implementing all measures listed in the Rehabilitation and Closure report included as part of the EMPr.	-17.50	Ensure post closure land capability is optimised.
Socio-economic	Net employment impacts	-16.50	- Where possible, the mine needs to engage with stakeholders to ensure the permanently employed farmworkers on the substituted farmland for Eloff Phase 3, be given assistance to travel to the Department of Labour to register for unemployment, if these workers are to be retrenched; and - It is recommended that the mine facilitates and participates in a formal entity to implement the farming post-mining land uses.	-16.50	Assistance to previously employed farm workers. Development of post mining farming entity.
Socio-economic	Need and desirability impacts	+18.75	- An independent competent person needs to review the mine's bankable feasibility study and sign off on the feasibility.	+18.75	Development of a CPR.
Socio-economic	Job and income loss	-15.00	- As per SLP requirements, develop mechanisms to assist employees, prior to retrenchment date, in the transition phase after closure of the operations. This includes offering portable skilled development programmes during the operational phase of the mine, providing assistance in accessing available	-14.00	Implementation of SLP commitments. Proactive planning in respect of returning land to active farming practices.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
			and suitable jobs with other local mines or companies, etc; and - Focus on non-core related local supply links during the operational phases of the mine to facilitate easier transitioning of local suppliers to other industries.		
Socio-economic	Termination of social funds	-13.00	- Mine community development forms part of the requirements of the SLP and as such, any investment in the local community should be done in agreement with the VKLM and the mine community in question; - Ensure that all stakeholders are aware of the mine's limitations in terms of funding and that funding will cease upon mine closure; and - Select development projects that can become self-sufficient by generating its own income, e.g. agricultural support programmes that train subsistence farmers in more advance agricultural practices. Investments in infrastructure projects should be done in coordination with the relevant authority, e.g. classrooms at local schools should be undertaken along with the Department of Education who can take over maintenance once the mine ceases to exist.	-11.00	Implementation of SLP commitments. Focus on development initiatives should focus of activities that can align with the post closure land-use. Proactive planning in respect of returning land to active farming practices.
Post-closure phase					

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
Water	Decanting of poor-quality water from rehabilitated pit Poor agricultural production on the land impacting water ingress into pit.	-20.00	- A monitoring borehole should be drilled into the rehabilitated opencast pit to monitor the rate at which it fills with water; - This same monitoring borehole can also be used to manage the water levels and prevent the pit from decanting; - The pit should be flooded as quickly as possible to minimise the oxidation of metal sulphides (Acid Mine Drainage – AMD). Once the pit is flooded, surface water should be diverted away from it; and - A final void is, however, the preferred method of managing the post-closure decant.	-5.50	Management of contamination plume to prevent decant into surface water resources- options include pump and treat/ final void or surface evaporation/ evapotranspiration. Provision of adequate post closure monitoring and rehabilitation fund. Develop and implement Post Closure Land Management and Monitoring Plan.
Groundwater	Migration of residual contamination after rehabilitation	-12.00	- Dedicated plume monitoring boreholes should be drilled in the down gradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration; and - Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation boreholes may be considered.	-5.50	Management of contamination plume to prevent decant into surface water resources- options include pump and treat/ final void or surface evaporation/ evapotranspiration. Provision of adequate post closure monitoring and rehabilitation fund. Develop and implement Post Closure Land Management and Monitoring Plan.
Surface Water	Impact on surface water quality - contaminated	-20.00	- Recharge from rainfall onto backfilled spoils of the rehabilitated opencast is the main driver of large	-9.00	

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Closure Options/Actions
	runoff and seepage/decant from opencast pit during post-closure.		inflows into the opencast pit working and potential decant post closure. More detailed investigations are recommended to reduce recharge rates below 10% of annual rainfall. - In line with the GCS groundwater assessment (2020), high sulphate generating material should be placed in the deepest parts of the pit, or at least below the pre-mining groundwater elevation to minimise the oxidation of metal sulphides (pyrite). Furthermore, the pit should be flooded as quickly as possible. Once the pit is flooded, surface water should be diverted away from it; and - Treating of decanting mine water to acceptable water quality levels should be achieved by the installation of a treatment plant or alternative treatment solution. Investigations should continue to establish the most effective way to treat water on site if needed at the end of LOM. The level and volume of treatment depends on the use of water after treatment but should be determined in consultation with the Department of Water and Sanitation (DWS).		
Soils and Land Capability	Long term deterioration of cover through erosion and poor agricultural practice.	-10.5	- Maintenance of surface water management structures.	-5.5	Develop and implement Post Closure Land Management and Monitoring Plan.

3.2 ENVIRONMENTAL INDICATORS AND MONITORING

Table 11 provides a list of the environmental impacts identified for the rehabilitation, decommissioning and closure of the project. In addition, environmental indicators are identified for each impact, together with proposed monitoring requirements. The indicators and monitoring will aim to inform ongoing rehabilitation and remediation activities. These indicators will also inform the assessment of whether the closure objectives have been adequately met.

Table 11: Environmental Indicators and Monitoring requirements

Mine Phase	Aspect	Impact	Monitoring Requirements	Indicators	Closure Targets
Decommissioning and rehabilitation	Water Resources	Water Quality Deterioration – Siltation of water resource.	Surface water and groundwater monitoring, water quality trend analysis (monthly). Aquatic and wetland monitoring (bi-annual).	Water quality analysis to compare with target water quality objectives. Aquatic and wetland PES.	Water quality downstream of mining area within water quality objectives. No deterioration of wetland and aquatic PES from pre-mining state or suitable reference site.
	Air	Decline in air quality	Monitor dust fallout and PM10 (if applicable). Complaints register.	Dust fallout. Public Complaints	Compliance with National Dust Control Regulations. No unattended public complaints.
	Soils/ Social	Permanent loss of agricultural land	See 'soils' below.	See 'soils' below.	Reinstatement of agricultural production. Land Capability: - Class III, for defined arable land. - Class V, for defined natural areas.
	Soils	Loss of land capability	Monitoring of soils to be undertaken as specified in the EMPr for construction / operation phase. Monitor topsoil replacement during decommissioning, rehabilitation and closure (frequency as defined in monitoring plan- weekly through to annual).	Soil fertility. Contamination. Compaction. Erosion. Topsoil management and replacement procedures.	Land Capability: - Class III, for defined arable land. - Class V, for defined natural areas.

Mine Phase	Aspect	Impact	Monitoring Requirements	Indicators	Closure Targets
				Land Capability Classifications.	
	Biodiversity	Further impacts due to the continued spread and/or establishment of alien and/or invasive species	Biodiversity monitoring and action plan.	Status of defined natural habitat- indicators to be defined in the Biodiversity Action Plan.	Alien invasive extent does not exceed pre-mining state or state of adjacent comparative land.
	Biodiversity	Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).	Biodiversity monitoring and action plan. Faunal Observation register.	Status of defined natural habitat- indicators to be defined in the Biodiversity Action Plan. #'s and type of faunal observations.	Maintain and sustain defined natural biodiversity within defined natural areas to align with pre-mining state or appropriate reference site.
	Biodiversity	Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching and litter.	Biodiversity monitoring and action plan.	Status of defined natural habitat- indicators to be defined in the Biodiversity Action Plan.	Maintain and sustain defined natural biodiversity within defined natural areas to align with pre-mining state or appropriate reference site.
	Biodiversity	Possible introduction of feral species such as cats.	Biodiversity monitoring and action plan.	Status of defined natural habitat- indicators to be defined in the Biodiversity Action Plan.	No feral species resident within mine area of responsibility.
	Socio-economic	Reduction in visual impacts	N/A	N/A	Land-use to align with pre-mining state or adjacent comparative land.

Mine Phase	Aspect	Impact	Monitoring Requirements	Indicators	Closure Targets
	Socio-economic	Increase in noise levels at surrounding receptors.	Monthly sound level measurements at noise sensitive receptors as defined in the Environmental Noise Impact Assessment (Environmental Acoustic Research, 2019). Complaints register. Attendance at local community forum.	Environmental noise level (L_{Aeq}). Public complaints.	Compliance with noise control regulations for a rural noise district. No unattended public noise complaints.
	Socio-economic	GDP and monetary impacts	Annual Social and Labour Plan Monitoring and Report. Attendance at local community forum.	SLP Compliance scores. Soil fertility and associated crop yields. Land Capability Classifications.	Reinstatement of agricultural production. Land Capability: - Class III, for defined arable land. - Class V, for defined natural areas.
	Socio-economic	Net employment impacts	Annual Social and Labour Plan Monitoring and Report.	Employment/ Unemployment statistics. SLP Compliance scores.	Compliance with SLP requirements.
	Socio-economic	Need and desirability impacts	Annual Social and Labour Plan Monitoring and Report.	SLP Compliance scores. % of SLP spend on Agricultural development projects. Soil fertility and associated crop yields. Land Capability Classifications.	Reinstatement of agricultural production. Land Capability: - Class III, for defined arable land. - Class V, for defined natural areas.

Mine Phase	Aspect	Impact	Monitoring Requirements	Indicators	Closure Targets
	Socio-economic	Job and income loss	Annual Social and Labour Plan Monitoring and Report.	Direct employment. SLP Compliance scores.	Compliance with SLP requirements. Direct employment numbers associated with ongoing agricultural activities to align with pre-mining conditions or appropriate reference site.
	Socio-economic	Termination of social funds	Annual Social and Labour Plan Monitoring and Report. Attendance at local community forum.	SLP Compliance scores.	Compliance with SLP requirements.
Closure	Groundwater	Migration of residual contamination after rehabilitation	Groundwater monitoring, water quality trend analysis (Quarterly). Monitoring network must comply with the risk-based source-pathway - receptor principle.	Water quality parameters as defined in the monitoring plan and the WUL. Groundwater levels.	Compliance with WUL water quality thresholds. No deterioration of water quality upstream to downstream
	Water	Decanting of poor-quality water from rehabilitated pit	Groundwater and surface water monitoring, water quality trend analysis (Quarterly). Monitoring network must comply with the risk-based source-pathway - receptor principle.	Water quality parameters as defined in the monitoring plan and the WUL. Water levels within the rehabilitated mine pit.	Compliance with WUL water quality thresholds. No deterioration of water quality upstream to downstream
	Water	Water Quality Deterioration – Siltation of water resource.	Groundwater and surface water monitoring, water quality trend analysis (Quarterly).	Water quality parameters as defined in the monitoring plan and the WUL.	Compliance with WUL water quality thresholds.

Mine Phase	Aspect	Impact	Monitoring Requirements	Indicators	Closure Targets
			Monitoring network must comply with the risk-based source-pathway - receptor principle.	Water levels within the rehabilitated mine pit.	No deterioration of water quality upstream to downstream
	Biodiversity	Spread and/or establishment of alien invasive plant species.	Biodiversity monitoring and action plan.	Status of defined natural habitat- indicators to be defined in the Biodiversity Action Plan.	Alien invasive extent does not exceed pre-mining state or state of adjacent comparative land.
	Biodiversity	Soil erosion.	Surface water monitoring, water quality trend analysis (Quarterly). Biodiversity monitoring and action plan. Visual inspection (for discrete erosion incidents as well as general soil loss).	Status of defined natural habitat- indicators to be defined in the Biodiversity Action Plan. Soil loss (in m^3/ha/an). Erosion channels, gullies, donga's.	No uncontrolled discrete erosion occurrence. Soil loss rates to align with pre-mining rate or suitable adjacent comparative reference site.
	Biodiversity	Possible re-establishment of indigenous vegetation and return of faunal species.	Biodiversity monitoring and action plan. Faunal Observation register.	Status of defined natural habitat- indicators to be defined in the Biodiversity Action Plan. #'s and type of faunal observations.	Maintain and sustain defined natural biodiversity within defined natural areas to align with pre-mining state or appropriate reference site.
	Socio-economic	GDP and monetary impacts	Annual Social and Labour Plan Monitoring and Report. Attendance at local community forum.	SLP Compliance scores. Soil fertility and associated crop yields. Land Capability Classifications.	Reinstatement of agricultural production. Land Capability: - Class III, for defined arable land.

Mine Phase	Aspect	Impact	Monitoring Requirements	Indicators	Closure Targets
					- Class V, for defined natural areas.
	Socio-economic	Net employment impacts	Annual Social and Labour Plan Monitoring and Report.	Employment/ Unemployment statistics. SLP Compliance scores.	Compliance with SLP requirements.
	Socio-economic	Need and desirability impacts	Annual Social and Labour Plan Monitoring and Report. Attendance at local community forum.	SLP Compliance scores. Soil fertility and associated crop yields. Land Capability Classifications.	Reinstatement of agricultural production. Land Capability: - Class III, for defined arable land. - Class V, for defined natural areas.
	Socio-economic	Job and income loss	Annual Social and Labour Plan Monitoring and Report.	Direct employment. SLP Compliance scores.	Compliance with SLP requirements. Direct employment numbers associated with ongoing agricultural activities to align with pre-mining conditions or appropriate reference site.
	Socio-economic	Termination of social funds	Annual Social and Labour Plan Monitoring and Report. Attendance at local community forum.	SLP Compliance scores.	Compliance with SLP requirements.
Post Closu	Water	Decanting of poor-quality water from rehabilitated pit	Groundwater and surface water monitoring, water quality trend	Water quality parameters as defined in the	Compliance with WUL water quality thresholds.

Mine Phase	Aspect	Impact	Monitoring Requirements	Indicators	Closure Targets
			analysis (frequency to be defined prior to issuance of closure certificate). Monitoring network must comply with the risk-based source-pathway - receptor principle.	monitoring plan and the WUL. Water levels within the rehabilitated mine pit.	Water quality downstream of mining area within water quality objectives.
	Groundwater	Migration of residual contamination after rehabilitation	Groundwater and surface water monitoring, water quality trend analysis (frequency to be defined prior to issuance of closure certificate). Monitoring network must comply with the risk-based source-pathway - receptor principle.	Water quality parameters as defined in the monitoring plan and the WUL.	Compliance with WUL water quality thresholds. No deterioration of water quality upstream to downstream

3.3 DESIGN PRINCIPLES

3.3.1 LEGISLATIVE AND GOVERNANCE FRAMEWORK

The requirement for final rehabilitation, decommissioning and closure stems primarily from the legislative requirements of the MPRDA and the NEMA. The relevant extracts from each of these is presented in this section. Please also refer to the EIA Report for an overview of other enviro-legal requirements which may influence closure planning.

3.3.1.1 MINERALS AND PETROLEUM RESOURCES DEVELOPMENT ACT, ACT 28 OF 2002

The following extracts relate to the principle of closure for any right issued under the MPRDA:

- Section 43(1): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the environmental authorisation and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned.

- Section 43(4): An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.

- Section 43 (5): No closure certificate may be issued unless the Chief Inspector and each government department charged with the administration of any law which relates to any matter affecting the environment have confirmed in writing that the provisions pertaining to health and safety, and management pollution to water resources, the pumping and treatment of extraneous water and compliance to the conditions of the environmental authorisation have been addressed.

- Section 43 (7): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, or the person contemplated in subsection (2), as the case may be, must plan for, manage and implement such procedures and such requirements on mine closure as may be prescribed.

- Section 43 (8): Procedures and requirements on mine closure as it relates to the compliance of the conditions of an environmental authorisation, are prescribed in terms of the National Environmental Management Act, 1998.

3.3.1.2 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT REGULATIONS

The following extracts from the MPRDA Regulations are specifically applicable to the preparation of this FRDCP:

- Regulation 51 (a)(i): An environmental management programme contemplated in section 39(1) of the Act must include the following: A description of the environmental objectives and specific goals for-mine closure;

- Regulation 54: Quantum of financial provision:

    - The quantum of the financial provision as determined in a guideline document published by the Department from time to time, include a detailed itemization of all actual costs required for-

        - premature closure regarding- (i) the rehabilitation of the surface of the area; (ii) the prevention and management of pollution of the atmosphere; and (iii) the prevention and management of pollution of water and the soil; and (iv) the prevention of leakage of water and minerals between subsurface formations and the surface.

        - decommissioning and final closure of the operation; and
        - post closure management of residual and latent environmental impacts.
    - The holder of a prospecting right, mining right or mining permit must annually update and review the quantum of the financial provision –
        - in consultation with a competent person;
        - as required in terms of the approved environmental management programme or environmental management plan; or
        - as requested by the Minister.

- Regulation 56: Principles for mine closure: In accordance with applicable legislative requirements for mine closure, the holder of a prospecting right, mining right, retention permit or mining permit must ensure that -
    - the closure of a prospecting or mining operation incorporates a process which must start at the commencement of the operation and continue throughout the life of the operation;
    - risks pertaining to environmental impacts must be quantified and managed pro-actively, which includes the gathering of relevant information throughout the life of a prospecting or mining operation;
    - the safety and health requirements in terms of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) are complied with;
    - residual and possible latent environmental impacts are identified and quantified;
    - the land is rehabilitated, as far as is practicable, to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development; and
    - prospecting or mining operations are closed efficiently and cost effectively.
- Regulation 61: Closure objectives- Closure objectives form part of the draft environmental management programme or environmental management plan, as the case may be, and must –
    - identify the key objectives for mine closure to guide the project design, development and management of environmental impacts;
    - provide broad future land use objective(s) for the site; and
    - provide proposed closure costs.
- Regulation 62: Contents of closure plan: A closure plan contemplated in section 43(3)(d) of the Act, forms part of the environmental management programme or environmental management plan, as the case may be, and must include -
    - a description of the closure objectives and how these relate to the prospecting or mine operation and its environmental and social setting:
    - a plan contemplated in regulation 2(2), showing the land or area under closure;
    - a summary of the regulatory requirements and conditions for closure negotiated and documented in the environmental management programme or environmental management plan, as the case may be;
    - a summary of the results of the environmental risk report and details of identified residual and latent impacts;

- a summary of the results of progressive rehabilitation undertaken;
- a description of the methods to decommission each prospecting or mining component and the mitigation or management strategy proposed to avoid, minimize and manage residual or latent impacts;
- details of any long-term management and maintenance expected;
- details of a proposed closure cost and financial provision for monitoring, maintenance and post closure management;
- a sketch plan drawn on an appropriate scale describing the final and future land use proposal and arrangements for the site;
- a record of interested and affected persons consulted; and
- technical appendices, if any.

3.3.1.3 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

Prior to 8 December 2014, the environmental aspects of mining activities were regulated in terms of the MPRDA. Recent legislative amendments and the drive towards a 'one environmental system' have resulted in the inclusion of the requirement for rehabilitation, decommissioning and closure planning and associated financial provisions into the NEMA. Specific sections of the Act are extracted below:

- Section 24P: Financial provision for remediation of environmental damage:

(1) An applicant for an environmental authorisation relating to prospecting, exploration, mining or production must, before the Minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.

(2) If any holder or any holder of an old order right fails to rehabilitate or to manage any impact on the environment, or is unable to undertake such rehabilitation or to manage such impact, the Minister responsible for mineral resources may, upon written notice to such holder, use all or part of the financial provision contemplated in subsection (1) to rehabilitate or manage the environmental impact in question.

(3) Every holder must annually-

a. assess his or her environmental liability in a prescribed manner and must increase his or her financial provision to the satisfaction of the Minister responsible for mineral resources; and

b. submit an audit report to the Minister responsible for mineral resources on the adequacy of the financial provision from an independent auditor.

(4) (a) If the Minister responsible for mineral resources is not satisfied with the assessment and financial provision contemplated in this section, the Minister responsible for mineral resources may appoint an independent assessor to conduct the assessment and determine the financial provision. (b) Any cost in respect of such assessment must be borne by the holder in question.

(5) The requirement to maintain and retain the financial provision contemplated in this section remains in force notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002 to the holder or owner concerned and the Minister responsible for mineral resources may retain such portion of the financial provision as may be required to rehabilitate the closed mining or prospecting operation in respect of latent, residual or any other environmental impacts, including the pumping of polluted or extraneous water, for a prescribed period.

(6) The Insolvency Act, 1936 (Act No. 24 of 1936), does not apply to any form of financial provision contemplated in subsection (1) and all amounts arising from that provision.

(7) The Minister, or an MEC in concurrence with the Minister, may in writing make subsections (1) to (6) with the changes required by the context applicable to any other application in terms of this Act.

- Section 24R: Mine closure on environmental authorisation:

(1) Every holder, holder of an old order right and owner of works remain responsible for any environmental liability, pollution or ecological degradation, the pumping and treatment of polluted or extraneous water, the management and sustainable closure thereof notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002, to the holder or owner concerned.

(2) When the Minister responsible for mineral resources issues a closure certificate, he or she must return such portion of the financial provision contemplated in section 24P as the Minister may deem appropriate to the holder concerned, but may retain a portion of such financial provision referred to in subsection (1) for any latent, residual or any other environmental impact, including the pumping of polluted or extraneous water, for a prescribed period after issuing a closure certificate.

(3) Every holder, holder of an old order right or owner of works must plan, manage and implement such procedures and requirements in respect of the closure of a mine as may be prescribed.

(4) The Minister may, in consultation with the Minister responsible for mineral resources and by notice in the Gazette, identify areas where mines are interconnected or their impacts are integrated to such an extent that the interconnection results in a cumulative impact.

(5) The Minister may, by notice in the Gazette, publish strategies in order to facilitate mine closure where mines are interconnected, have an integrated impact or pose a cumulative impact.

3.3.1.4 FINANCIAL PROVISIONING REGULATIONS

On 20th November 2015 the Minister promulgated the Financial Provisioning Regulations under the NEMA (GNR1147). The regulations (as amended) aim to regulate the determining and making of financial provision as contemplated in the NEMA for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future. These regulations provide for, inter alia:

- Determination of financial provision: An applicant or holder of a right or permit must determine and make financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of prospecting, exploration, mining or production operations, as contemplated in the Act and to the satisfaction of the Minister responsible for mineral resources.

- Scope of the financial provision: Rehabilitation and remediation; decommissioning and closure activities at the end of operations; and remediation and management of latent or residual impacts.

- Regulation 6: Method for determining financial provision – An applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for:

    - Annual rehabilitation – annual rehabilitation plan;

    - Final rehabilitation, decommission and closure at end of life of operations – rehabilitation, decommissioning and closure plan; and

- Remediation of latent defects and residual impacts – environmental risk assessment report.

- Regulation 10: An applicant must-
    - ensure that a determination is made of the financial provision and the plans contemplated in regulation 6 are submitted as part of the information submitted for consideration by the Minister responsible for mineral resources of an application for environmental authorisation, the associated environmental management programme and the associated right or permit in terms of the Mineral and Petroleum Resources Development Act, 2002; and
    - Provide proof of payment or arrangements to provide the financial provision prior to commencing with any prospecting, exploration, mining or production operations.
- Regulation 11: Requires annual review, assessment and adjustment of the financial provision. The review of the adequacy of the financial provision including the proof of payment must be independently audited (annually) and included in the audit of the EMPr as required by the EIA regulations.

Appendix 4 of the Financial Provisioning Regulations provides the minimum content of a final rehabilitation, decommissioning and closure plan. This FRDCP has been prepared to align with these requirements. Appendices 3 and 5 of the Financial Provisioning Regulations provide content requirements for the Annual Rehabilitation Plan and Environmental Risk Assessment Report respectively. These requirements are addressed under Section 4 and 5 respectively.

3.3.1.5 OTHER GUIDELINES

The following additional guidelines which relate to financial provisioning and closure have been published in the South African context:

- Best Practice Guideline G5: Water Management Aspects for Mine Closure (Department of Water Affairs and Forestry, 2008): This guideline was prepared by the DWAF (now Department of Human Settlements, Water and Sanitation -DHSWS) and aims to provide a logical and clear process that can be applied by mines and the competent authorities to enable proper mine closure planning that meets the requirements of the relevant authorities. This guideline is aimed primarily at larger scale mine and includes certain principles related to closure and water management. The following technical factors which should be considered during closure, and those which are likely to relate to the opencast mining of coal, have been considered:
    - Broad closure principles:
        - Management measures at closure should primarily be of a passive nature with minimal long-term maintenance and operating costs;
        - The final landform must be sustainable, must be free-draining, must minimise erosion and avoid ponding;
        - Concurrent rehabilitation must be undertaken in a manner that supports the final closure landform in order to ensure/avoid that rehabilitation does not need to be redone at a later stage; and
        - Land use plan which is directly inter-linked with water management issues insofar as water is required to support the intended land use and the land use itself may have an impact on the water
    - Land use plan: directly interlinked with water management issues insofar as water is required to support the intended land use- in this regard the surrounding communities and the land uses implemented rely on available ground and surface water to be sustained. Management of water quality and quantity has been identified as an aspect to be covered in this FRDCP.

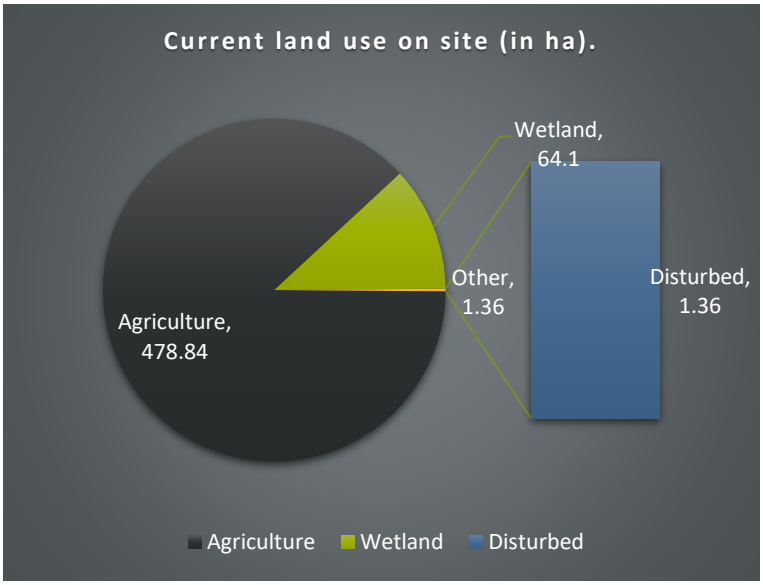
- Biodiversity plan: will address issues that are interrelated with the mine water management plan, particularly with regard to the environmental water balance and the effects that mining may have thereon.
- Social and labour plan: issues may have a bearing on water management insofar as there may be a requirement for water in implementation of these plans, e.g. use of rehabilitated mine land for agriculture.
- Cumulative impacts: from a number of sources within the same zone of impact could be an important consideration within a single mine where it refers to multiple source terms, or alternatively it could apply to the consideration of the cumulative effects of different mines.
- Risk based approach: a risk-based approach will include the risk of failure of systems or management strategies. The consequences of such failure should be taken into account and the necessary contingency and/or emergency measures should be addressed either in the management measures and/or in the financial provisions.
- Long term water quality: For mines that exploit ore bodies containing reactive minerals (such as sulphides), the closure planning and liability assessment should pay particular attention to long-term water quality issues. Closure should not have a negative impact on other water users.
- Public participation and consultation: consultation is fundamental to closure and there is a need for full involvement of stakeholders in the development of the final closure plans, and in the agreement of closure objectives- in this regard this FRDCP has been made available through the EIA public participation process for comment by relevant stakeholders.

- Guideline for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine (Department of Minerals and Energy, 2005): The objectives of the guideline include the need to improve the understanding of the financial and legal aspects pertaining to the costing of remediation measures as a result of mining activities. Whilst this guideline predates the recent NEMA Financial Provisioning Regulations, it does contain certain principles and concepts that remain valid and have been considered in this FRDCP.
- The Land Rehabilitation Guidelines for Surface Coal Mines (LRSSA, 2019): the guideline provide consolidated and up to date descriptions of good rehabilitation practice, and approaches to land rehabilitation specifically related to surface coal mining in Mpumalanga, South Africa. This guideline has been consulted an referenced extensively in the land rehabilitation components of the FRDCP.

3.3.2 CLOSURE VISION, OBJECTIVE AND TARGETS

The vision, and consequent objective and targets for rehabilitation, decommissioning and closure, aim to reflect the local environmental and socio-economic context of the project, and to represent both the corporate requirements and the stakeholder expectations as well as the legislative framework and regulations. The receiving environment within which the mining is proposed to be undertaken include the following key land-uses:

- Agriculture- cultivated fields (typically dry land maize/ soya);
- Natural and disturbed veld; and
- Wetland areas ranging from disturbed wetlands to areas in a largely natural state).



With reference to Section 3.1.3, the stakeholders consulted during the public participation process for the EIA raised rehabilitation and closure concerns regarding, amongst others, the following:

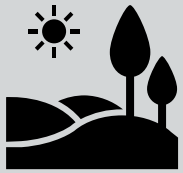
- Impact of mining activities on groundwater and surface water resources;
- Concerns regarding dolomitic stability around the site;
- Social impacts including mining activities impact on landowner and surrounding communities' infrastructure;
- Employment concerns (i.e. loss of employment and job security from the potential loss of viable farming operations);
- Concerns about potential land use impacts and constraints; and
- Concerns about cumulative impacts due to existing mining activities in the area.

With reference to both the environmental context of the project and the feedback from the consultation process the vision for closure is to:

CLOSURE VISION:
To conduct the mining operations and manage the environmental impacts in such a manner that the long term, post closure, land capability and environmental goods and services can continue and be utilised in a sustainable manner.

In support of achieving this post closure vision there are certain key rehabilitation, decommissioning and closure objectives. 'Well-conceptualised rehabilitation objectives will allow assessment of the risks associated with achieving these objectives and guide the setting of suitable rehabilitation actions to be taken to mitigate these risks at every stage of the mine's life. Rehabilitation objectives describe 'what' needs to be achieved to reach the mine's rehabilitation goal. These objectives should be aligned to site-specific characteristics that are within the mine's control. Rehabilitation objectives should be as specific, measurable, achievable and realistic as possible. They should also define a time period against which they can be measured' (LRSSA, 2019). Driven by the closure vision and with due consideration of the project context, the closure objectives for the Eloff Phase 3 Project are presented in Table 12.

Table 12: Closure Objectives, Targets and Criteria for final rehabilitation, decommissioning and closure.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
Landform 	To integrate concurrent rehabilitation designs into life-of-mine plans, encouraging direct soil placement as part of rehabilitation activities, where possible.	Mine closure landform design. Topsoil stripping and placement register- topsoil source, volume, depth, type, stockpile location, placement location.	Relevant and accurate landform design. Achieve steady state roll over rehabilitation as quick as possible.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable).
	To optimise the way material is moved during operations, to ensure that overburden and topsoil stockpiles, and/or other usable materials are placed in suitable locations to minimise handling and to minimum haul distances for rehabilitation and/or closure activities.	Mine closure landform design. Topsoil stripping and placement register- topsoil source, volume, depth, type, stockpile location, placement location.	Minimise handling and minimum haul distances for rehabilitation and/or closure activities.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable).
	To create a planned rehabilitated landscape that meets predefined land capabilities commitments (i.e. 88.4% of arable land capability), and which has: • Suitable slope profiles for the planned land use/s and that limit the potential for erosion; and • Adequate soil cover thickness.	Mine closure landform design. Topsoil stripping and placement register- topsoil source, volume stripped/ placed, depth, type, stockpile location, placement location (incl direct placement). Rehabilitated landscape slope (%). Erodibility factor of rehabilitated soils.	Maximise concave slopes on rehabilitated land as far as practically possible. Rehabilitated Arable land: • Slope % x Erodibility factor (k) of new soil ≤ 2. • Land Capability Class III/IV ≥70% of application area. • Soil depth >400mm.	Arable land capability: Land Capability Class III/IV ≥70% of application area.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
	• No remnant residue deposits post closure.	Topsoil cover thickness of rehabilitated landscape (mm). Land Capability class (Smith, 2006)[4].		
	To recreate a landform that is aligned with the long-term water management requirements, and that: • Limits ingress of water through backfilled open cast spoils that could require ongoing water management in the long-term; and/or • Ensures adequate water availability for post-mining land use/s.	Mine closure landform design.	No unplanned ponding of water. Ensure a suitable soil structure that does not have a high density or excessive blocky structure on rehabilitated pit.	No unplanned ponding. Soil density < 1.55g/cm^3.
	To re-create a free-draining profile across the back-filled pits, having the correct gradient for the planned land capability to support the intended land use (i.e. arable land).	Mine closure landform design. Rehabilitated landscape slope (%). Visual observations (erosion/ ponding)	Concave slopes. Slopes not steeper than 1:14 for arable / farming areas. ≥ Pre-mining drainage density. Limited erosion features (i.e. concentrated flows and unnecessary loss of topsoils). No unplanned ponding of water.	Rehabilitated areas are free draining to controlled containment and discharge points. Limited erosion gullies or features. No unplanned ponding.

[4] The land capability classification used by Smith considers the following aspects: climate; slope; topsoil depth; topsoil texture; topsoil permeability; soil wetness; rockiness; and surface crusting.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
	To ensure that sufficient soil (growth medium) is kept in stockpiles to backfill any areas of settlement (melon holes) so as to keep rehabilitated areas free-draining and to conserve land capability.	Material Balance (maintained). Topsoil and softs contingency stockpile.	Maintain adequate contingency stockpiles (topsoil and softs).	Rehabilitated areas are free draining to controlled containment and discharge points. No erosion gullies or features. No unplanned ponding. Arable land capability: Land Capability Class III/IV ≥70% of application area.
	To provide long-term stabilisation of the geo-technical conditions of the disturbed mining areas.	Mine closure landform design. Slopes	Mine closure landform design to take into account: bulking factors; long term material settlement factors. Alignment with landform design. Stable, vegetated landform slopes.	No unrehabilitated melon holes. No unplanned ponding.
	To limit the need for, or intensity of, long-term care-and-maintenance of recreated landforms.	Mine closure landform design.	Mine closure landform design to take into account: bulking factors; long term material settlement factors. Alignment with landform design.	Alignment with landform design.
Soils and land capability 	Objectives for soil stripping: • To develop a comprehensive understanding of the site's soils to be able to compile an appropriate soil stripping and handling	Pre-mining soil survey. Soil stripping and handling plan- updated and monitored. Topsoil stripping and placement register- topsoil source, soil moisture, volume stripped/ placed, depth, type, stockpile location,	No topsoil stripping and handling when soil is wet. Ensure correlation between available soil and stripped soil. Compliance with soil stripping and handling plan.	Audited compliance with soil stripping and handling plan. Arable land capability: Land Capability Class III/IV ≥70% of application area. ≥85% correlation between available soil and stripped soil.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
	plan for the entire lifecycle of the mine. • To strip demarcated usable soils according to a soil stripping and handling plan. • To live place as much of the stripped soil as possible, to minimise the quantity of usable soil needing to be stockpiled. • To undertake soil stripping in a manner that limits soil loss and compaction and retains as much of the natural seed bank as possible.	placement location (incl direct placement).		
	Objective for soil stockpiling: • To minimise the quantity of soil stockpiled. • To limit the time stripped soils are stockpiled. • To limit the number of times stripped soils are re-handled. • To stockpile soils by end-tipping (and increase stockpile height using shovel, if necessary), to minimise compaction. • To fertilise and revegetate stockpiled soils to maintain soil fertility and	Mine closure landform design. Soil stripping and handling plan- updated and monitored. Topsoil stripping and placement register- topsoil source, soil moisture, volume stripped/ placed, depth, type, stockpile location, placement location (incl direct placement). Stockpile height. Stockpile vegetative cover and presence of invasive species. Topsoil material balance.	Minimise the topsoil stockpile to the volume from initial box cut, operational surface preparation (e.g. roads, infrastructure, etc), and ramp up to steady state progressive rehabilitation. Limit handling of topsoils to a maximum of 2 events (i.e. stripping/stockpiling and placement). No unnecessary of damage/ disruption to stockpiles. Ensure correlation between stockpiled soil and soil available for rehabilitation.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable). ≥85% correlation between available soil and stripped soil. Audited compliance with soil stripping and handling plan.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
	reduce soil loss via erosion.		Stockpile soils separately as defined in the soil stripping and handling plan. No domination of invasive species. Compliance with soil stripping and handling plan.	
	Objectives for soil replacement: • To minimise the loss of replaced soils. • To replace different soils types in their correct catenal position on the recreated land surface. • To minimise compaction during soil replacement. • To replace soils of the right type, to the correct depth, to achieve planned land capability targets. • To ensure sufficient soil is kept in stockpiles for longer term care-and-maintenance activities on rehabilitated land.	Mine closure landform design. Soil stripping and handling plan- updated and monitored. Topsoil material balance. Topsoil stripping and placement register- topsoil source, soil moisture, volume stripped/ placed, depth, type, stockpile location, placement location (incl direct placement). Level of rehabilitated soil compaction. Degree of differential settlement. Quantity of retained topsoil for post rehabilitation repair. Post mining soil survey.	Ensure correlation between stripped, stockpiled and replaced soil. Strip/stockpile and replace topsoils and subsoils separately. Avoid unnecessary mixing of topsoils and subsoils. Handling of soils to be undertaken when soils are dry (i.e. >3-5% below plasticity limit). Compliance with mine closure landform design. Key soil-spoil interface (e.g. scarify compacted spoil surface prior to soil placement). Use suitable equipment for topsoil placement and levelling (e.g. dump truck and dozers). Single topsoil placement and levelling-i.e. ensure accurate topsoil balance and planning.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable). ≥85% correlation between available soil and stripped soil. Bulk density: < 1.55g/cm^3 Available rooting depth: >600mm for class III and > 400mm for Class IV.

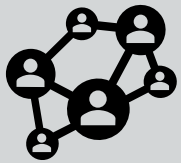
Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
			Retain 1-5% of total soil stripped for future repair work.	
	Objectives for soil amelioration: • To optimise soil conditions conducive to improved soil structure. • To optimise soil conditions that enhance germination, facilitate root development and vegetation growth. • To improve water and nutrient use efficiency of vegetation	Nature of the rehabilitated topsoils, including physical properties, chemical properties, and biological properties. Soil structure.	Alignment of soil condition with that required to meet the defined land capability commitments.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable). Soil Physical parameters: - Rock content: as low as possible (<10 percent by volume of rocks, or pedocrete fragments larger than 100 mm in diameter in the upper 750 mm of soil). - Soil aggregation: Single grained and Granular. - Bulk density: less than 1.55g/cm^3. - Available rooting depth: >600mm for class III and > 400mm for Class IV. Soil Chemistry parameters: - pH (KCl): between 6 and 8. - Salinity (as EC): <400mS/m and exchangeable sodium percentage less than 15.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
				- Fertility: P (Bray 1); and K: Target for P – 10mg/kg to 15 mg/kg; Target for K – 100 mg/kg. - Organic Carbon: > 0.75% through depths of 250 mm. - Major Cations: Ca= between 200-3000mg/kg- recommended ~800mg/kg; Mg= between 50-300mg/kg- recommended 150 mg/kg; Na= between 50-200mg/kg- recommended <100 mg/kg).
	To replace a soil cover of appropriate soils to a depth of between 400 – 600 mm on areas with suitable gradients to achieve an arable land capability over 70% of the application area (full project boundary and not only the rehabilitated pit), in geographically delineated areas.	See indicators listed for soil stripping, stockpiling, replacement and amelioration.	See targets listed for soil stripping, stockpiling, replacement and amelioration.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable). Available rooting depth: >600mm for class III and > 400mm for Class IV.
	Arable land use over the application area classified with arable land capability supports farming.			Arable land capability: Land Capability Class III/IV ≥70% of application area.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
Water resources 	To provide long-term stabilisation of the geochemical conditions of the disturbed mining areas.	- Water quality monitoring locations parameters (as defined in the water monitoring programme-see Section 3.11).	- Limit contribution of contaminated mine water (plume) to local surface water resources.	- Updated numerical groundwater model and water liability assessment. - Updated mine water management plan (for residual and latent impacts). - Updated and secured financial provision for residual and latent impacts. - Comply with WUL requirements. - Compliance with GN704.
	To strive for minimal residual impact on natural water resources.	- Water quality monitoring locations and parameters (as defined in the water monitoring programme-see Section 3.11).	- Limit contribution of contaminated mine water (plume) to local surface water resources. - No uncontrolled and untreated release of contaminated mine decant water.	- Updated numerical groundwater model and water liability assessment. - Updated mine water management plan (for residual and latent impacts). - Compliance with GN704. - Updated and secured financial provision for residual and latent impacts. - Comply with WUL requirements.
Biodiversity	Objectives for revegetation: • To reduce soil loss to a minimum.	Mine closure plan and landform design.		Natural areas vegetation structure and species composition to align with local reference site:

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
	• To optimise the efficient use of water within the rehabilitated landscape. • To enable long-term functionality of the predefined land-use/s- arable land and natural areas (wetlands and transitional zones) as per section 3.4. • To form the building-blocks for a resilient ecological system (with predefined natural coverage areas), so that successional processes lead to the predefined vegetation complex.			- ≥80% of the reference site species richness. - <10% of assessment plots failing to meet species richness target. Alien invasive plants not dominating and presence to align with, and improve on, surrounding local reference sites.
	To maintain a productive and sustainable vegetation cover within defined natural coverage areas (as per the plan in Section 3.4) that align with the surrounding references sites for grassland and wetland.	Vegetation structure and species composition.	Sustainable natural areas.	Natural areas vegetation structure and species composition to align with local reference site. Presence of alien invasive plants to align with and improve on surrounding local reference sites.
	To remediate the impacts to wetlands associated with the proposed mining operation, to the target state and prevent further loss of ecological integrity in future through adaptive management and monitoring.	Wetland Present Ecological Status (PES). Implementation of Wetland Offset Strategy.	Maintain or improve the integrity of HGM 1 and HGM 2-Class C. Improve the integrity of HGM 3 (currently Class D) to a moderately modified (Class C) level.	HGM 1 and 2= Class C PES. HGM 3= Class C PES.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
Infrastructure 	Objectives for surface infrastructure: • To decommission, decontaminate (if necessary), dismantle and remove for safe disposal all identified surface infrastructure that has no beneficial post-mining re-use potential. • Following removal of unwanted infrastructure, to rehabilitate cleared footprint areas. • To stabilise and re-purpose remaining surface infrastructure that has a beneficial post-mining re-use potential-if any. • To identify public-private partnerships and/or new owners for the ongoing, long-term management and ownership of remaining surface infrastructure. • To put in place formal agreements for the 'new owners' for the management and maintenance of remaining infrastructure.	Mine closure plan and landform design. Status of rehabilitated land. Land contamination assessments-if applicable. Conclusion of, and compliance with, post closure land-use agreements. Conclusion of, and compliance with, post closure management and maintenance plan.	Remove all unnecessary infrastructure. Compliance with defined land capability targets.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Signed agreements for ongoing land use and management. No remnant infrastructure or waste materials remaining on surface, unless transferred in writing in the signed agreements.

Aspect	Objective	Indicators	Target	Closure Relinquishment Criteria
Social and economic 	To protect public health.	Public health and safety risk assessment.	Compliance with mine health and safety legislation.	Site is safe for human and animals.
	Return majority of disturbed land to viable agricultural capability	Mine closure plan and landform design.	Compliance with defined land capability targets.	Arable land capability: Land Capability Class III/IV ≥70% of application area.
	To facilitate a transition from mining to viable arable land use through effective agreements (lease/ co-operation/ sale) that promote to reinstatement of the land as a contributor to food crop production.	Conclusion of, and compliance with, post closure land-use agreements. Conclusion of, and compliance with, post closure management and maintenance plan.	Compliance with defined land capability targets. Reinstatement of the arable land to active farmland.	Arable land capability: Land Capability Class III/IV ≥70% of application area. Post closure land-use agreements (covering land use, rehabilitated land management and ongoing maintenance, including where relevant management of residual impacts). No unattended public complaints. Where possible written confirmation from the affected landowner/ complainant must be solicited confirming that outstanding issues have been addressed and closed out.
Climate 	Ensure closure objectives and actions are climate change resilient. Ensure assessment and consideration of long term climate change predictions in the ongoing closure planning and implementation.	Climate change predictive models. Revised and updated closure risk assessment and planning.	Obtain latest climate change predictions and ensure consideration in closure planning, risk assessments and financial provision reporting updates. Regular groundwater model updates to include climate change scenarios.	Apply latest climate change prediction to assessment of residual and latent impacts- provision of reasonable and adequate contingency funding.

3.3.3 ALTERNATIVE CLOSURE AND POST CLOSURE OPTIONS

There are various alternative closure and post closure options available. The identification and consideration of the most suitable alternatives are driven by, inter alia the following considerations:

- The ability of the selected alternative to adequately meet the specified closure vision and objectives.
- The efficiency, viability, and practicality of the selected alternative.
- The preference, where possible, for low maintenance and sustainable options.
- The alignment with the local environmental and socio-economic context and associated opportunities and constraints.

Table 13 presents some available options and alternatives related to the rehabilitation and closure process. The options in the table below that are marked with an "✓" are considered the preferred options for the purpose of this FRDCP. It is important to note that mine rehabilitation research is ongoing and consequently the available and preferred closure strategies, techniques and available technologies are developing on a daily basis which may, in the medium to long term, lead to the identification of further closure alternatives.

Table 13: Closure alternatives

Mine feature	Aspect	Options	Advantages	Disadvantages	Comment
Mine pit	AMD and Decant management	Final void (~12ha of evaporation surface, maintained at a level of at least 2m below predicted decant elevation). PLEASE REFER TO 3.5.4 FOR MORE DETAIL ON THE LANDFORM OPTIONS CONSIDERED.	Reduced cost associated with the handling of box cut spoils to fill the void. Reduced cost in terms of long term decant water management costs. Evaporation facility may create a localised sink which may reduce the plume migration. Additional materials available for reshaping the final landform.	Post mining landscape not optimized- the final void area and associated slopes will not be useable and viable for arable land uses. This will restrict the closure objective of optimising the post closure land capability and associated use to viable farmland. Final void and its associated slope result in additional surface water management concerns and risks (e.g. stormwater management, erosion, slope stability, and public safety). Final void will result in the water from the catchment being evaporated and consequently removed from the broader catchment water balance. Final void may result in increasing salt loads within the void water over time. Retention of a water filled void may pose additional stability and subsidence risks	As a risk averse option, only active water treatment is considered and included in the financial provision. It should be noted that significant efforts are being made to identify suitable passive treatment options. The required review of this FRDCP must consider and assess the available treatment technologies and where relevant amend this FRDCP as the life of mine progresses. The active pump and treat option has been selected as the preferred alternative primarily because of the primary rehabilitation and closure objective to maximise the arable land and farming land use post closure. It is also understood that the DWS does not favour final voids as a management solution for reasons including the loss of water contributions to the local catchment water balance. Pump and treat will allow for discharge of suitable quality water back into the local environment.

Mine feature	Aspect	Options	Advantages	Disadvantages	Comment
				associated with the underlying dolomites. Potential for the need to retain box-cut spoils on surface. This will result in restriction on land use as well as long term management and maintenance costs. Final void may reduce the contribution of the shallow groundwater to the adjacent surface water resources baseflow.	
		Pit borehole pump and treat. PLEASE REFER TO 3.5.4 FOR MORE DETAIL ON THE LANDFORM OPTIONS CONSIDERED. ✓	Allows for maximining the post mining land uses (with due consideration to the constraints discussed in the final land form options and design). Improves the post mining landform and associated impacts (e.g. erosion risks, slope stability, public safety). Backfilling the box-cut is an effective solution to limit the risk of surface subsidence associated with the underlying dolomite. No remnant rock spoils dumps.	The backfilling of the final void results in increased material handling at closure with associated cost increases. The ongoing management and maintenance associated with the pumping and treating of mine affected water results in significant capital cost as well as long term operational cost (effectively 100 years from start of treatment). This option will require long term management.	

Mine feature	Aspect	Options	Advantages	Disadvantages	Comment
			Abstraction may create a localised sink which may reduce the plume migration to the adjacent streams.		
Rehabilitated areas	Final landform	Level- free draining landform with no final void or pit-lake. PLEASE REFER TO 3.5.4 FOR MORE DETAIL ON THE LANDFORM OPTIONS CONSIDERED.	Allows for maximum post closure land use potential and specifically post closure arable land. Slope that minimise erosion potential, maximises slope stability and public safety. Avoidance of standing water may reduce the potential for sub-surface instability (e.g. dolomite sinkholes).	Drainage from the rehabilitated landform to be discharged to natural environment. A complete backfilled and free draining landscape would in most instances mean that a final void or pit lake is not available to manage surface flows on site as well as removes the option of utilising a final void for management of AMD decant.	On the basis of preliminary material balances and landform analyses it is understood that there is likely to be a deficiency of backfill materials to be able to achieve a free draining surface profile that will allow for draining to the surrounding environment. The option of having a free draining landform without a local water collection feature is therefore not possible. There is currently a deficiency of 5 119 314m^3 of backfill material to be able to return the pit to a complete free draining landform. There may be options for supplementing this difference through the input of either discard from the plant or alternatively other available materials- This would however be subject to further studies and a comprehensive cost benefit analysis. On the basis of the material balances and the landform analyses it will be necessary for there to be a designed facility on the rehabilitated landscape to be able to contain surface water draining from the rehabilitated pit. Please refer to Section 3.5.4. There is an option to integrate the final void
		Level- free draining landform with surface water management void/ pit lake. PLEASE REFER TO 3.5.4 FOR MORE DETAIL ON THE LANDFORM OPTIONS CONSIDERED. ✓	Allows for the optimisation of the landform as well as accommodating surface water drainage internally.	The provision of a localised surface water containment feature (pit lake or pan) will reduce the land available for arable uses.	

Mine feature	Aspect	Options	Advantages	Disadvantages	Comment
					option discussed above with the pit lake proposed in this option.
	Revegetation and land use.	Planting non-crop vegetation (e.g. specific cover crop mix) between initial rehabilitation and final decommissioning and closure- i.e. a transitional stabilisation and soil conditioning cover. ✓	Allows for immediate topsoil cover to avoid erosion. Allows for short term vegetative growth which may allow for reinstatement of soil function (incl organic carbon sources; soil structure and stability, and biological activity). Provides base for greater vegetative diversity.	Continued loss of agricultural land use, as active farming would only be applied after 2 seasons of cover crop.	Considering the key closure vision and objective is to return the land to viable and productive farmland, it is suggested that a cover crop be established immediately after soil rehabilitation. This cover crop should be maintained for at least two growth seasons. The arable land can then be returned to production, preferably with soya beans. The soil survey and amelioration activities as provide in the SSSPA must be complied with.
		Planting of food/cash crops immediately following topsoil placement and amelioration.	Immediate re-establishment of agricultural land-use. Allows for gradual re-establishment of agricultural land-use concurrently with progressive rehabilitation. This will allow for early identification of constraints to meeting the closure vision. Planting of certain crops may have an advantage over others in terms of soil conditioning. It is suggested that soya beans be considered as the transition crop as this provides for nitrogen fixation in the soils.	Potential crop failure due to soils being deficient in organic carbon and micro-organisms.	

Mine feature	Aspect	Options	Advantages	Disadvantages	Comment
Rehabilitated areas	Topsoil stockpile placement	Placement of topsoil stockpiles close to final void position.	Topsoil's stockpiles close to final void will reduce closure phase haulage and reduce costs.	Final void is located at a topographical low point. This will introduce additional surface water volumes and likely introduce additional erosion risk. Locating the topsoil stockpiles too close to the active mining areas introduces the risk of unintended and uncontrolled disruption and damage to the topsoils.	Considering the value of topsoils in achieving the final closure vision, the option of placing the stockpiles to the west of the active mining area was selected.
		Placement of topsoil stockpiles to the west of the pit- as depicted in the current mine layout. ✓	Located on a topographical high will reduce the surface water flows/ velocity and allow for free drainage in the area, which will consequently reduce the magnitude of the erosion risk. Separated from the main mining operational areas will reduce the risk of unintended and uncontrolled disruption and damage to the topsoils.	Additional haulage distance to final void location, with consequent cost implications.	
	Topsoil stripping and placement	Utilisation of specific equipment for the stripping and placement of topsoils. Topsoil stripping: shovel (backhoe) (on virgin	Significantly reduced compaction of soils.	Potentially additional costs and need for specific equipment.	The use of shovels (backhoe), haul trucks, and tracked dozer should be implemented to reduce topsoil compaction during stripping, stockpiling and placement. Please

Mine feature	Aspect	Options	Advantages	Disadvantages	Comment
		ground) and truck equipment (on subsoil benches). Topsoil replacement: Single end tip and spread with tracked dozer. ✓			refer to the soils stripping guideline for further details.
		Utilisation of conventional earth moving equipment for topsoil stripping and placement (e.g. bowl scrapers, etc).		Use of conventional mining equipment can result in significant soil compaction which will consequently affect the success of rehabilitation.	
Post closure land-use	Wetland rehabilitation	Retention of existing cultivated land within application areas which falls within delineated wetland boundaries[5].	Increases cultivated land for food production and farming.	It is uncertain whether these areas have the relevant permits, and licences (e.g. water use licences). Should these not be approved then it is likely that these cultivated areas are illegal. Relevant licences and permits would be required. The continuation of farming within the delineated wetland areas is expected to have an impact on the overall	Considering the critical important of wetlands, and the understanding that the current cultivation of crops within the delineated wetlands is not authorised, it is recommended that these areas form part of the designated wetland rehabilitation/ reinstatement plans.

[5] Based on a high-level review of the current google earth imagery, it is expected that there is ~ 50-60 ha of land that is currently, or recently, cultivated, which falls within the areas delineated as wetlands.

Mine feature	Aspect	Options	Advantages	Disadvantages	Comment
				wetland status and functionality.	
		Rehabilitation of cultivated areas within the delineated wetlands to natural condition. ✓	The offset strategy has identified certain wetland areas and their associated buffers within the application area for proactive rehabilitation. The remaining cultivated land which falls within the delineated wetland areas could be included in this rehabilitation process. Further improvement on the affected wetland systems and associated ecosystem functionality.	Further loss of cultivated land. Additional rehabilitation cost.	

3.3.4 MOTIVATION FOR PREFERRED CLOSURE OPTIONS

With reference to Sections 3.3.2 and 3.3.3, the preferred closure option is as follows:

- Ensure that progressive rehabilitation is undertaken throughout the mining operation (once steady state roll over is reached).
- Topsoil stockpiles required for final rehabilitation to be located to the west of the pit area on a local topographical high.
- Use of specific equipment and machinery for topsoil stripping, handling and placement.
- Strict management of topsoils according to the Topsoil stripping, stockpiling and placement plan provided herein.
- The predicted deficit in the material balance for pit backfilling results in the need to create a localised surface water collection and containment feature- see landform option 3 (Section 3.5.4.3).
- The management of mine affected water during closure and post closure will be carried out as follows:
    - Groundwater interception boreholes drilled to monitor the spread of the pollution plume. If required these boreholes to be used to intercept mine affected water and treat, to ensure that the groundwater pollution plume does not intersect the surface water features (i.e. streams to the north and south).
    - Installation of a pit water abstraction borehole to control the backfilled pit water levels below the defined decant elevation. The borehole should be located at the deepest part of the rehabilitated pit, and when necessary, abstract water from it to lower the water level and thus keeping it below the decant elevation. This pumped water will most likely have an unacceptable water quality and will there need to be treated or utilised for other industrial use. At this stage it is assumed that the water will need to be treated and discharged.
- The rehabilitated land (including land progressively rehabilitated) to be planted with a suitable cover crop for the first 2 years, followed by a soil enhancing cash/ food crops and returned to agricultural production. At present it is suggested that soybean crops be established to assist in nitrogen fixation into the rehabilitated soils. The progressively rehabilitated areas to be surveyed and monitored to determine the required soil amelioration.
- The current cultivated areas which fall within delineated wetlands should be removed from cultivation and rehabilitated/ reinstated to natural wetland.

Table 14 provides a list and assessment of threats, opportunities and uncertainties related to the preferred closure option. Where applicable actions to address these uncertainties are presented in section 3.8.

Table 14: Threats, opportunities, and uncertainties associated with preferred closure option.

Item:	Description:
Threats:	Insufficient management commitment to effective rehabilitation SSSPA Plan not adequately implemented: The key driver for ensuring the successful rehabilitation of the area to functional farmland will be the management of the soils. Actual differential settlement ad bulking of the rehabilitated spoils misaligned with the factors used in the landform analysis. Long term climate change may result in threats (or in certain cases opportunities) for the long term closure planning.

Item:	Description:
	It is noted that the Eloff mine will be relying on certain services to be provided by the Kangala Mine. This includes overburden stockpiling, coal handling and processing, discard disposal and management of polluted water. It is critical that the roles and responsibilities in regard to rehabilitation and closure commitments, and associated financial provisions, be clearly defined and allocated to ensure that all collective activities and impacts are adequately manged into closure and post closure.
Opportunities:	NEMA requires annual review of the rehabilitation and closure plans and associated financial provisions- this provides an ideal opportunity to ensure that the rehabilitation process is assessed for relevance on a continual basis. The amelioration of the soils post placement is critical to providing a good base for soil functionality morning forward. The extent of the required amelioration is defined by the condition of the placed soils. Regular soil survey can assist in predicting and providing financially for the required soil amelioration. There is opportunity for the mine to provide access of rehabilitated land to local farmers (or a formal entity) to cultivate. This will provide valuable insight into the adequacy of the current closure plan. Utilisation of a suitable cover crop followed by a suitable cash/food crop for the cultivation of the rehabilitated land could provide an opportunity for increased soil conditioning prior to closure- this report suggests the use of soya beans to facilitate increased nitrogen fixation. The rehabilitation of the currently cultivated land, which is located within delineated wetlands, provides an opportunity to reinstate and enhance the extent and functionality of the existing wetland areas. There is an opportunity to align the mines SLP commitments to the post closure land use through the development of local farming practices and possibly even the establishment of a formal farming entity responsible for farming on the rehabilitated land. Depending on the final water treatment options selected, there may be an opportunity to make treated water available for other uses. This could be combined with the farming land use by increasing current dryland yields through irrigation. There is an opportunity for the long term management of mine affected water for the Eloff project and the Kangala Project to be consolidated/ integrated. This may allow for a more effective, efficient and cost effective water management solution.
Uncertainties:	Due to the fact that this project has not commenced there are certain criteria and parameters which are unknown which are crucial for accurate closure predictions and planning. These include actual settlement, bulking factors, site specific geological features, groundwater characteristics, etc. The recording and monitoring of these criteria based on actual conditions during progressive rehabilitation will be critical to informing and refining the closure plans. The groundwater model should be updated based on monitoring data and the assessment of available water management and treatment options should be reviewed and revised. This report provides a cautious a risk averse approach to the management of the mine affected water and there may be opportunity to provide more refined, efficient and cost effective methods on the basis of detailed cost benefit analysis.

3.3.5 CLOSURE PERIOD AND POST CLOSURE REQUIREMENTS

The closure phase commences once the coal-extracting activities have ceased, and final decommissioning and mine rehabilitation is being completed. This phase usually ceases 3-5 years after physical closure activities are completed and the relevant relinquishment criteria are met. Once relinquishment criteria are met the holder

would typically apply for a closure certificate. With refence to the defined closure vision, objectives and targets presented in Section 3.3.2 it is understood that the following key relinquishment criteria are likely to affect the completion of the closure period:

- Achieve arable land capability (Class III/IV) over ≥70% of application area.
- Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable).
- Achieve farming yields.
- Achieve a stable and free draining landform.
- Natural areas vegetation structure and species composition to align with local reference site.
- Achieve wetland rehabilitation of HGM 3 to a Class C PES.

The relinquishment criteria listed above will assist in defining the timelines for the Closure Phase and the ultimately the aim to achieve a closure certificate. Should the closure actions as stipulated in this report be implemented and the management and mitigation measures contained in the EMPr be complied with, then it is anticipated that the soils may achieve the targeted yields within 5-8 years following cessation of mining. The success of rehabilitation and achievement of these timelines must be monitoring in the implementation of the progressive rehabilitation during the operational phase. There are however certain residual and latent impacts which are predicted to manifest in the post closure phase. These relate primarily to the long term management of mine affected water. The timeframes associated with the management of mine affected water, post closure are predicted as follows (GCS (Pty) Ltd, 2019):

- Period for natural groundwater levels to recover after active dewatering ceases: ~71 years;
- Period for predicted polluted groundwater to intercept the adjacent streams (above background levels): ~75 years.
- Period for predicted decant levels to be reached: ~134 years after mine closure at a surface elevation of 1,589 metres above mean sea level (GCS (Pty) Ltd, 2019).

The management and monitoring associated with these residual and latent risks are addressed in Section 5.

3.4 FINAL POST CLOSURE LAND USE

The current land-use on the site is predominantly agriculture. It is also noted that the site is presently highly suitable and viable as a productive agricultural unit. It is on this basis that it is proposed that all reasonable efforts be taken to return the greater majority of the mine affected land, post closure, to viable and productive farmland.

The proposed mining area will result in the destruction of ~5.9ha of wetlands, namely one seepage wetland, and two small depression wetlands. It is proposed that the loss of these wetlands be offset through the protection, enhancement and rehabilitation of the remaining wetland systems on the site. Please refer to the wetland offset strategy for further detail. The final closure plan has considered these offset areas and indicated such. In order to further enhance the status of the wetlands in the application area, it is proposed that certain portions of the current cultivated land which falls within the defined wetland boundary be reinstated as wetland. The mining area is in closure proximity to other sensitive wetland areas. The mine plan aims to avoid direct impacts on these wetland areas through the establishment and management of effective buffers. These wetland and associated buffers have been retained and incorporated into the proposed final closure plan.

With reference to Section

The final closure plan is presented in Figure 14 and represents the proposed final post closure land use for the area.

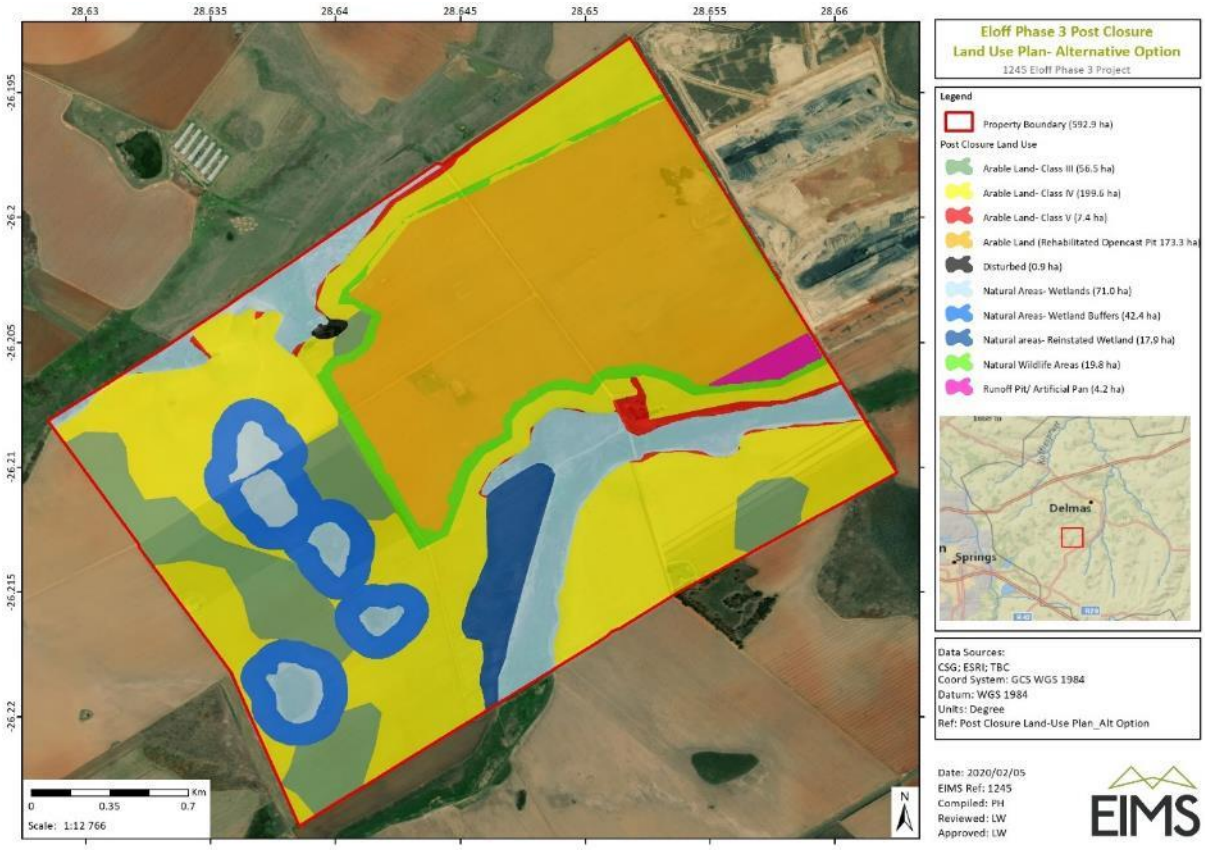


Figure 14: Proposed final post closure land use plan.

3.5 CLOSURE ACTIONS

In order to align with the defined closure plan and final land use objective, the mine will need to implement a series of actions which addresses the mines infrastructure, facilities and rights area, as well as ongoing maintenance and management thereof. These actions and obligations apply to all infrastructure, activities and aspects both within the mine lease area and off the mine lease area which were associated with the mining activities and over which the mine has responsibility. With respect to the Eloff Phase 3 pit and associated mine area, it is understood that the mining activities related to the storage of waste rock, mineral processing, and product storage and distribution fall within the operational control of the existing Kangala Mine. It is understood that the rehabilitation of these Kangala managed facilities fall withing the control of the Kangala Mine and will consequently need to be addressed within the mine closure and rehabilitation provisions of the Kangala Mine. These activities or components would specifically include the following:

- Dismantling of processing plant and related structures which fall within the Kangala Mines area of operational control;
- Demolition of associated buildings, structures, and facilities (including any associated housing and offices, contractors' yards/ facilities, fencing, etc);
- Rehabilitation of access roads;
- Rehabilitation of overburden and spoils;
- Rehabilitation of the Kangala waste facilities (including the discard facility, the PCD's, etc);
- General surface rehabilitation within the Kangala Mine;
- Ongoing water management within the Kangala Mine area (including the Kangala rehabilitated pit and the associated waste facilities); and

- Aftercare of the Kangala Mine area.

The closure components which are applicable to the Eloff Phase 3 Mine include the following:

- Preparation and planning for closure- This includes all of the tasks leading up to the finalisation of the closure plan for implementation.
- Dismantling and removal of any on site infrastructure- It is not at present expected that there will be any significant on-site infrastructure or facilities as the majority will be shared with the Kangala Mine. This component may include small temporary facilities such as site offices (if required), mobile water pumps and surface pipelines, etc.
- Rehabilitation of access roads- the main haul road leading from the Eloff Pit to the Kangala operations, as well as the access route to the soil stockpile areas. It is anticipated that certain of these access roads will be retained as smaller local access to the site to allow for controlled access during closure and post closure monitoring and maintenance.
- Rehabilitation of the open cast area as well as the access ramps and final voids- As mentioned in Section 3.3.3, it is planned at present that a final void will not be retained for post closure. In this regard this component will include the backfilling of the final void as well as the access ramp/s. One of the key components of the rehabilitation of the open cast is to ensure a suitable and sustainable final landform.
- Rehabilitation of the soil stockpile areas.
- General surface rehabilitation- including soil amelioration and planting of vegetative cover for the affected natural areas, and planting of crops on the defined arable land areas.
- Implementation of the wetland offset strategy- this will include:
    - Buffer zone establishment;
    - Alien invasive species removal and control;
    - Revegetation; and
    - Offset protection. .
- Removal of fencing required during the mining operations- it is understood that the mine area, including the soil stockpile areas, will be fenced during operations. This fencing will need to be removed at closure to avoid unnecessary post closure maintenance and management costs.
- Management of water within the mine area- this will include the management and maintenance of surface water controls, as well as ongoing closure phase monitoring of the water resources. The management of polluted mine water into the post-closure phase will be included and dealt with as a residual and latent impact in Section 5.
- Maintenance and aftercare- Maintenance and aftercare is typically applied during the closure period (i.e. once active rehabilitation and closure is completed and ending once a closure certificate is obtained). Typically, aftercare and maintenance includes general maintenance activities including, soil amelioration (incl fertilization), ongoing monitoring, control of alien invasive, and surface stability and settlement actions. It should be noted that for the purposes of this report and the associated financial provisions, that the relevant monitoring and maintenance/ aftercare actions are included in the other closure components listed above.

Table 15 provides a breakdown of the key closure actions applicable to the Eloff Phase 3 mine. It is important to note that the Table also indicates the applicable mine phase in which the actions are required. All actions applicable to the operational phase will be addressed and accommodated as part of the progressive rehabilitation. All actions listed in the post closure phase will be addressed and accommodated as residual and latent impacts. It is also important to note that the actions listed in Table 15 are aimed at achieving the objectives and targets specified in Table 12. It is also critical to reduce the impacts and disturbance to the environment as far as possible by implementing the mines operational EMPr.

NOTE OF ADMINISTERING CLOSURE AT ELOFF

Mine closure planning as required by the MPRDA and NEMA is an integrated process that is required to take into account the physical as well as socio-economic situation on land adjacent to the mine lease area. In the case of Eloff this is particularly relevant as the proposed ownership of Eloff is very likely to ultimately rest with the same entity that controls and/or is the beneficiary owner of the Kangala Colliery. Given the decision to utilise minerals processing infrastructure located at Kangala for the processing of the coal extracted at Eloff, and to locate any carboniferous and non-carboniferous spoils and wastes from Eloff on Kangala spoil heaps, the total closure costs associated with Eloff project is at present potentially incomplete. It will be necessary that once the project has been approved and moved to its operational phase, a formal agreement between Eloff and Kangala must be put into place to ensure that Kangala receives all relevant information required from Eloff that would allow Kangala to update its own mine closure planning based upon the additional liabilities associated with the wastes and impacts on Kangala property arising from the use of Kangala infrastructure to process Eloff material.

Table 15: Key closure actions applicable to the life of mine phases.

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
Planning and preparation for Closure	- Develop FRDCP for consideration in the EA decision making. - Appointment of dedicated rehabilitation specialist to ensure ongoing implementation of rehabilitation and closure actions and plans (incl, ARP and FRDCP). - Ensure that sensitive environmental areas and soil stockpile areas are clearly demarcated to prevent unnecessary disturbance. - Develop a change management procedure to manage the impact of any changes to the mine plan. - Develop a site specific operational stormwater management plan.	- Annual review and update to FRDCP- including review of monitoring data and updated risk assessment. - 3 yearly review and update of hydrogeological model. - Regular consultation with I&AP's on closure planning and rehabilitation progress, and any intrusive activities. - Application for EA, WML and/or WUL (as applicable to implement closure plan) for decommissioning and closure activities (at least 18 months prior to scheduled closure). - Regular awareness training on rehabilitation and closure	- Implementation of final FRDCP. - Develop a post closure water balance and SWMP.	- Implementation of final FRDCP. - Implementation of SWMP.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		commitments to all site staff and contractors- including sensitivity of flora an faunal species, noise control. - Implementation and assessment of environmental monitoring as defined in this FRDCP. - Implement a site specific operational stormwater management plan			
Dismantling and removal of any on site infrastructure	- Conclusion of formal agreement between Kangala and Eloff addressing the allocation of liabilities- and consequent relevant financial provisioning.	Annual assessment of obsolete infrastructure or facilities which can be decommissioned and removed- update annual rehabilitation plan.	- Removal of all services, structures, machinery, and infrastructure unless these are specifically required for post-mining land-use, post-mining SDF projects or have been requested by the post-mining landowner. - Establish formal agreements for any infrastructure handed over for third party use, and management.	Ongoing rehabilitation monitoring and maintenance until relinquishment.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
			- All infrastructure should be broken down to natural ground level. Inert materials to be buried in the final void or at a suitably licenced facility. - Areas where infrastructure was demolished should be assessed through a risk based system to determine if there is any residual contamination of risk and appropriate remediation measures implemented. - Apply SSSPA to areas that are to be rehabilitated. - Implementation of the waste management plan. - A waste and infrastructure hierarchical principal should be applied to all decommissioned infrastructure or wastes, as follows:		

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
			Reduce, re-use, recycle, dispose. - Topsoil rehabilitation as per the SSSPA. - Monitor and manage dust generated from decommissioning activities to relevant standards.		
Rehabilitation of access roads	Develop mine layout plan to utilise existing access routes where possible.	Restrict vehicular movements to designated access and haulage routes to avoid unnecessary soil compaction.	- Conclude final closure layout plan defining access roads required for ongoing monitoring, management and maintenance. - Retained access roads to be designed in accordance with relevant engineering standards and specifications- including specific management of stormwater. - Restrict vehicular movements to designated access and access routes to avoid	- Ongoing rehabilitation monitoring and maintenance until relinquishment. - Restrict vehicular movements to designated access routes to avoid unnecessary soil compaction.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
			unnecessary soil compaction. - Closure, decommissioning, and rehabilitation of all access roads (incl associated structures, signage, culverts, etc) unless these are specifically required for post-mining land-use, post-mining SDF projects or have been requested by the post-mining landowner. - Deep rip all compacted areas prior to rehabilitation. - Topsoil rehabilitation as per the SSSPA. - Revegetation as per the revegetation plan. - Apply dust suppression (e.g. water sprays) where necessary.		

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)

Rehabilitation of the open cast area	Develop a post-mining surface landform design (considering defined objectives and targets) for rehabilitated box-cut, mine pit, and final void. The landform design must consider:
	- Volumes of coal removed.
	- Expected bulking factors.
	- Long term material settlement factors.
	- Land capability commitments:
	  o Slopes not to exceed 18-22 degrees where possible.
	- Water management requirements:
	  o Increased infiltration to pit area up to recovery of natural water level.
		- Progressive backfilling and rehabilitation aligned with the post closure mine plan and landform design.
		- Reduce slope length on rehabilitated areas with excessive slope length by increasing drainage density, where possible.
		- Manage erosion and sedimentation.
		- Manage the effects of surface settlement on the re-profiled landscape.
		- Assess the effects of changes to mine plan on final landform, and where relevant amend landform design to comply with defined objectives.
		- Monitoring, including measurement of real bulking, settlement, assessment of material balances, rehabilitated
			- Reduce slope length on rehabilitated areas with excessive slope length by increasing drainage density, where possible.
			- Manage the effects of surface settlement on the re-profiled landscape.
			- Develop a post mining landform stormwater management plan.
			- Ensure that the final landform is safe for humans and animals.
			- If a final void of pit lake feature is used then the black soils identified in the pre-mining soils assessment should be stockpiled and used in the rehabilitation of this water management feature.
				Ongoing rehabilitation monitoring and maintenance until relinquishment.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
	○ Reduced surface water infiltration to pit area once natural ground water levels have recovered. ○ Post closure stormwater management.	soil surveys, drainage patterns and densities. - Assess findings of monitoring (incl bulking, settlement, and soil surveys) and where relevant amend landform design to comply with defined objectives.			
Rehabilitation of mine affected surfaces	- Develop a soil stripping, stockpiling, placement and amelioration plan (SSSPA). - Soil survey of areas to be disturbed.	- The removal and/or disturbance of topsoil's must be avoided as far as possible and limited to the pre-defined areas of disturbance. - Implement SSSPA. - Annual audit of SSSPA. - Strip a suitable distance ahead of mining, to avoid soil loss and contamination. - Stripped black soils (e.g. Katspuit and Westleigh) should be stockpiled and used for rehabilitation of low-lying areas and/or drainage systems.	- Implement SSSPA. - Annual audit of SSSPA. - Monitoring, including soil surveys. - Soil amelioration activities. - No dust suppression with dirty/ contaminated water.	- Ongoing rehabilitation monitoring (including soil surveys) and maintenance until relinquishment - Soil amelioration activities. - Comply with land capability commitments.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		- Ensure surface stabilization of soil stockpiles to avoid material loss and erosion. - No dust suppression with dirty/ contaminated water. - Monitoring, including review and assessment of soil balances, soil surveys (stripped, stockpiles, and placed). - Stripped soils to be utilised for Eloff Phase 3 rehabilitation only and not pirated for other uses- without specialist assessment and agreement to ensure final land use objective are met. - Monitoring and removal of fly rock/ blast/ throw rock or other contaminants from soil (virgin soils/ placed soils and stockpiles) areas.			

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		- Soil amelioration activities.			
	- Develop final post closure mine plan. - Develop a Biodiversity Monitoring and Action Plan, including revegetation management plan for the rehabilitated areas which are defined as natural areas. - Develop an Invasive Species Control and Eradication Plan.	- Implement SSSPA. - Develop and implement a Biodiversity Monitoring and Action Plan, including revegetation management plan for the rehabilitated areas which are defined as natural areas. Where possible establish suitable indigenous tree species on upper surfaces and slopes. - Develop and implement an Invasive Plant Species Control and Eradication Plan. - Prevent intentional introduction of exotic or invasive species. - Commence with crop cultivation on rehabilitated land as soon as possible- as	- Comply with land capability commitments. - Implement Invasive Plant Species Control and Eradication Plan (mine area as well as adjacent defined natural and wetland areas). - Prevent intentional introduction of exotic or invasive species. - Continue with crop cultivation. - Prevent erosion (wind/water) through implementation of temporary control measures. - Restrict access of livestock to the defined natural areas- unless specifically required for defoliation as	- Comply with land capability commitments. - Implement Invasive Plant Species Control and Eradication Plan. - Continue with crop cultivation. - Ongoing rehabilitation monitoring and maintenance until relinquishment. - Restrict access of livestock to the defined natural areas- unless specifically required for defoliation as instructed by a suitably qualified rehabilitation specialist.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		determined by soil surveys. - Prevent erosion (wind/water) through implementation of temporary control measures. - Restrict access of livestock to the defined natural areas- unless specifically required for defoliation as instructed by a suitably qualified rehabilitation specialist.	instructed by a suitably qualified rehabilitation specialist.		
Rehabilitation of soil stockpile areas	Ensure correct placement of soil stockpiles to: - reduce surface water flows and velocities and associated erosion risks. - Minimise disruption and disturbance by mining or other activities. - Avoid areas of high arable land capability, wetland areas, or high biodiversity value, if feasible.	- Stockpile footprints to be effectively demarcated to restrict activities which may disturb/ contaminate the stockpiles (e.g. vehicular movement). Compaction an contamination of the stockpiles must be prevented. - Once established the soil stockpiles must not be moved until soil placement for	- Stockpile footprints following removal of all soils for rehabilitation, must be landscaped (shaped and levelled) to natural contours, ripped to loosen all soil, and revegetated. - Fertility of the topsoil would need to be assessed and rectified/ ameliorated if required. - The rehabilitated area must be re-vegetated in	- Ongoing rehabilitation monitoring and maintenance until relinquishment. - Manage and remediate surface erosion.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		rehabilitation is undertaken.	accordance with the post closure mine plan and monitored for success. - Manage and remediate surface erosion.		
General surface rehabilitation	- Develop final post closure mine plan. - Develop a soil stripping, stockpiling, placement and amelioration plan (SSSPA). - Develop a post-mining surface landform design. - It is crucial that the current exposed farmland be managed to prevent unnecessary soil loss, contamination or alien invasive infestation.	- Implement SSSPA. - Control of alien invasive species. - Commence with crop cultivation on rehabilitated land as soon as possible- as determined by soil surveys. - Develop and implement a Revegetation management plan for the rehabilitated areas which are defined as natural areas. - Develop and implement an Invasive Plant Species Control and Eradication Plan.	- Implement SSSPA - Implement revegetation plan for natural areas. - Control of alien invasive species. - Continue with crop cultivation on rehabilitated arable. - Soil amelioration activities. - Manage and remediate the effects of surface settlement on the re-profiled landscape- maintain free draining surface. - Manage and remediate surface erosion.	- Ongoing rehabilitation monitoring and maintenance until relinquishment. Including but not limited to: Alien invasive monitoring and management, erosion control and remediation, vegetation growth and supplementation). - No domestic animals are to be allowed into the project area under any circumstances, especially any dogs and cats. Any and all feral cats which may enter the project area must be removed immediately by an	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		- Soil amelioration activities. - Minimise mine disturbed areas and retain as much natural vegetative cover as far as reasonable possible. - Control access and unnecessary disturbance to rehabilitated areas. - Monitoring of progressively rehabilitated areas (i.r.o landform, soils, revegetation) and amend annual and final rehabilitation plan as required. - No domestic animals are to be allowed into the project area under any circumstances, especially any dogs and cats. Any and all feral cats which may enter the project area must be removed immediately by an	- Control access and unnecessary disturbance to rehabilitated areas. - No domestic animals are to be allowed into the project area under any circumstances, especially any dogs and cats. Any and all feral cats which may enter the project area must be removed immediately by an appropriate specialist; and - Pest control plan must be put in place and implemented.	appropriate specialist; and - Pest control plan must be put in place and implemented.	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		appropriate specialist; and - Pest control plan must be put in place and implemented.			
Implementation of wetland offset strategy.	Develop a wetland offset strategy.	Implement wetland offset strategy, including rehabilitation measure listed in Section 3.5.2.	Monitoring and maintenance of wetland offsets.	Monitoring and maintenance of wetland offsets.	
Fencing		Maintenance of fencing to control access to rehabilitated areas including wetland areas and associated buffers (e.g. by grazing animals, or vehicles).	- Removal of all fencing and barrier structures not required for post-closure management. - A waste and infrastructure hierarchical principal should be applied to all decommissioned fencing or materials, as follows: Reduce, re-use, recycle, dispose. - Maintenance of fencing to control access to rehabilitated areas including wetland areas and associated buffers	Maintenance of fencing to control access to rehabilitated areas including wetland areas and associated buffers (e.g. by grazing animals, or vehicles).	

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
			(e.g. by grazing animals, or vehicles).		
Water management	- Develop numerical groundwater model. Utilise model to define and assess: - Extent and timing of groundwater cone of depression. - Extent and timing of mine affected water pollution plume. - Extent and timing of potential decant of mine affected water.	- Continue monitoring including general water quality and water levels in surrounding areas, water inflow volumes to the pit. - Update numerical groundwater model – every 3 years. - Amend the mine closure plan where necessary based on the results. - Material most likely to generate acidic leachate should be placed in the deepest parts of the pit, or at least below the pre-mining groundwater elevation to minimise the oxidation of metal sulphides (pyrite). - Implement and monitor the Groundwater Management Plan.	- Continue monitoring including general water quality and water levels in surrounding areas, water inflow volumes to the pit, and water levels and quality within the rehabilitated pit. - Installation of dedicated plume monitoring boreholes-downgradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration. - Installation and monitoring of an in pit borehole to monitor the rate at which the pit fills with groundwater. - Update numerical groundwater model	- Update and implement groundwater management plan. - Update numerical groundwater model. Specific attention to be placed on long term water liability assessment. - Amend the residual and latent impacts risk assessment and closure plan associated financial provisions. - Implement and monitor the Groundwater Management Plan. - Install plume interception boreholes and/or trenches as required.	- Continue groundwater monitoring. - Installation, operation, and maintenance of groundwater interception trenches or boreholes to prevent polluted baseflow contributions to local streams. - Installation, operation, and maintenance of pit water abstraction borehole. - Installation, operation, and maintenance of water treatment facility for treatment and

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
			(including monitoring results) – every 3 years. - Amend the mine closure plan where necessary based on the results. - The pit should be flooded as quickly as possible to minimise oxidation/ AMD. - Once the pit is flooded, surface water should be diverted away from it. - Implement and monitor the Groundwater Management Plan. - Establishment and monitoring of dedicated plume monitoring boreholes, as well as rehabilitated pit borehole.		discharge of polluted mine water.
	- Develop a post-mining surface landform design to ensure free draining profile, promoting natural	- Implement and monitor post mining landform design. - Surface inspections to ensure runoff to drain	- Continue surface water monitoring programme. - Implement and monitor a post closure phase	- Continue surface water monitoring programme. - Implement and monitor a post closure	- Continue surface water monitoring programme.

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
	runoff and avoidance of ponding. - Develop and implement an operational phase stormwater management plan to comply with the requirements of GN704 of the National Water Act).	onto downstream drainage areas. - Revegetate as soon as reasonably possible. - Continue surface water monitoring programme. - Implement an operational phase stormwater management plan to comply with the requirements of GN704 of the National Water Act). - Develop a post closure phase stormwater management plan to inform the closure planning.	stormwater management plan to comply with the requirements of GN704 of the National Water Act)- where necessary implement crest berms, top surface paddocking, silt traps. - Manage and remediate the effects of surface settlement on the re-profiled landscape- maintain free draining surface. - Manage and remediate surface erosion. - Surface inspections to ensure runoff to drain onto downstream drainage areas. - Revegetate as soon as reasonably possible.	phase stormwater management plan to comply with the requirements of GN704 of the National Water Act). - Manage and remediate the effects of surface settlement on the re-profiled landscape- maintain free draining surface. - Manage and remediate surface erosion. - Surface inspections to ensure runoff to drain onto downstream drainage areas. - Supplement revegetation where necessary.	
Social and economic change management	- Public review and comment on rehabilitation,	- Regular consultation with I&AP's on closure planning and rehabilitation progress,	- Continued implementation of SLP obligations and commitments.		

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
	decommissioning and closure planning. - Develop SLP in accordance with relevant regulations and guidelines, and in consultation with local municipality and other authorities. - Develop a land owner agreement with landowners predicted to be affected by the cone of depression that provides for suitable compensation for loss of water availability.	and any intrusive activities. - Provide clear communication to the stakeholders to ensure awareness of the mine's limitations in terms of funding and that funding will cease upon mine closure. - Develop mechanisms to assist employees during the transition to closure. - Implement SLP obligations including defined skills development programmes focusing on non-mining supply links to facilitate easier transitioning to local suppliers and industries. - Selection of development programmes that can become self-sufficient by generating its own income (e,g, agricultural support programmes, investments in local	- Implement approved retrenchment mechanisms as per the approved SLP. - Assist employees in accessing available and suitable employment opportunities with other mining companies or within the local agricultural sector. - Continue implementation of farming activities and ramp up of farming entity.		

Closure component	Planning (pre-commencement)	Mining/ Progressive Rehabilitation (LOM-~10 years)	Decommissioning and Rehabilitation (1-3 years)	Closure (up to relinquishment (3-5 years)	Post Closure (post closure certificate - ~50-100yrs)
		infrastructure projects, development of classrooms at local schools). A suitable handover protocol must be developed for ongoing maintenance and sustainability of any development projects. - Establish formal entity and associated business plan to implement the farming land uses within the rehabilitated land.			

3.5.1 TOPSOIL STRIPPING, STOCKPILING AND PLACEMENT PLAN

The majority of the content of this section has been extracted from the specialist soils assessment done for the Eloff Phase 3 project (The Biodiversity Company, 2019). Further supplementation has been provided where necessary.

3.5.1.1 **SOIL STRIPPING GUIDE**

The stripping of topsoil and vegetation (and stockpiling) is by far the most important steps to reduce or mitigate some of the impacts associated with the loss of soil as a resource and land capability. The opencast area and the associated soil forms are shown in Figure 15. The project area is dominated by Neocutanic soils with plinthic sub-soils. The plinthic properties of the sub-soils do not make for easy stripping, stockpiling and rehabilitation of the soil profiles. If plinthic soils are mixed with the upper A-horizon soils they will severely affect the fertility and rehabilitation success of the project, and therefore the stripping guideline and management of the soil stockpiles must be strictly adhered too.

The Tukulu soil forms will be split into two groups, with the red and yellow soils being separated. These two groups have different water holding/drainage properties and must be managed accordingly. The Oakleaf soils will be treated in a similar management program as that of the Tukulu, as these soils are deemed similar with possible wetness below the maximum auger depth. The wetland soils will be split into two management groups (if mining these are permissible) namely the Katspruit and the Westleigh soil groups.

The opencast area will be stripped and stockpiled into six separate stockpiles as allocated in Figure 16 and Figure 17. These will be separated according to the topsoil (top 30cm of the soil profile) and the subsoil (the remaining usable soil profile). Handling of soils to be undertaken when soils are dry (i.e. >3-5% below plasticity limit).

Topsoil will be stripped with the current vegetation cover (Table 16 allocations 1 to 3), unless the vegetation is dominated by alien vegetation. The stripping of the vegetation along with the topsoil will ensure that there is organic matter as well as a seed bank carried into stockpiling these soils. this will assist in the soil chemical and biological properties being maintained for a longer period than if the vegetation was removed before stripping. The area to be cleared must be cleared as late as possible to reduce any erosion of the remaining bare area, which could lead to sedimentation into the surrounding environment.

Table 16: The stripping depths, volumes and stockpile area required for each stripping allocation.

Soil Allocation	Depth to be stripped (m)	Area (ha)	Volume (m^3)	Stockpile Area (ha) At 5m height
1	0.3	32.39	91 170	1.82
2	0.3	157.60	472 800	9.46
3	0.3	6.69	20 070	4.01
4	0.5	32.39	161 950	3.24
5	0.3	157.60	472 800	9.46
6	0.3	6.69	20 070	4.01

The stripping of the topsoil must be done by using a bucket excavator (tracked not wheeled excavator to be used) and loaded onto the back of dump trucks to be moved to their allocated stockpile locations. This reduces

the compaction and disturbance of soil profiles (Bulldozers compact and disturb soil profiles) and will assist in the rehabilitation efforts. The soil must also only be moved once to where the stockpile is allocated, and the trucks are to dump the soil to a maximum of 5m high. No driving will be permissible on any topsoil stockpiles as this will compact the topsoil and all efforts to reduce the impacts previously would be rendered null and void.

Any contamination of the topsoil must be avoided by ensuring machinery is well maintained and leak free. If contamination has occurred the area must be ameliorated immediately.

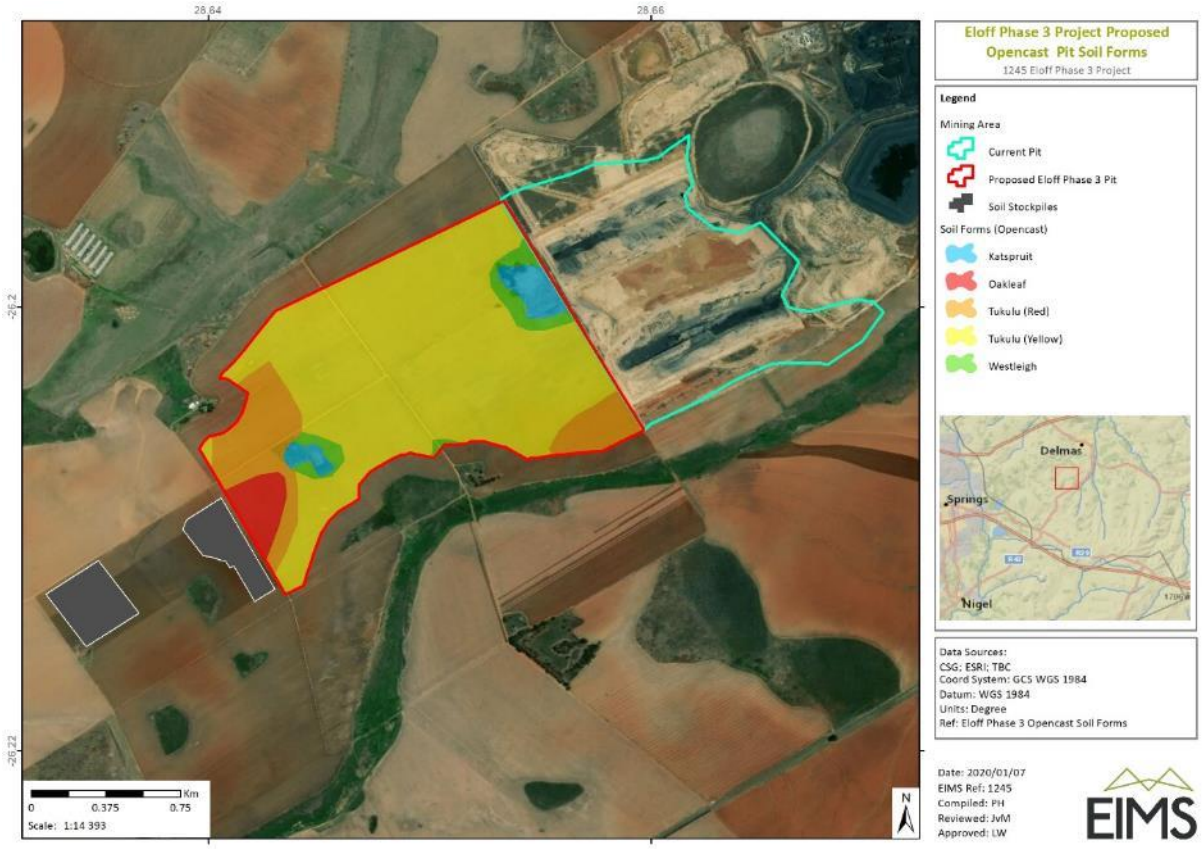


Figure 15: Soil form map for the opencast area

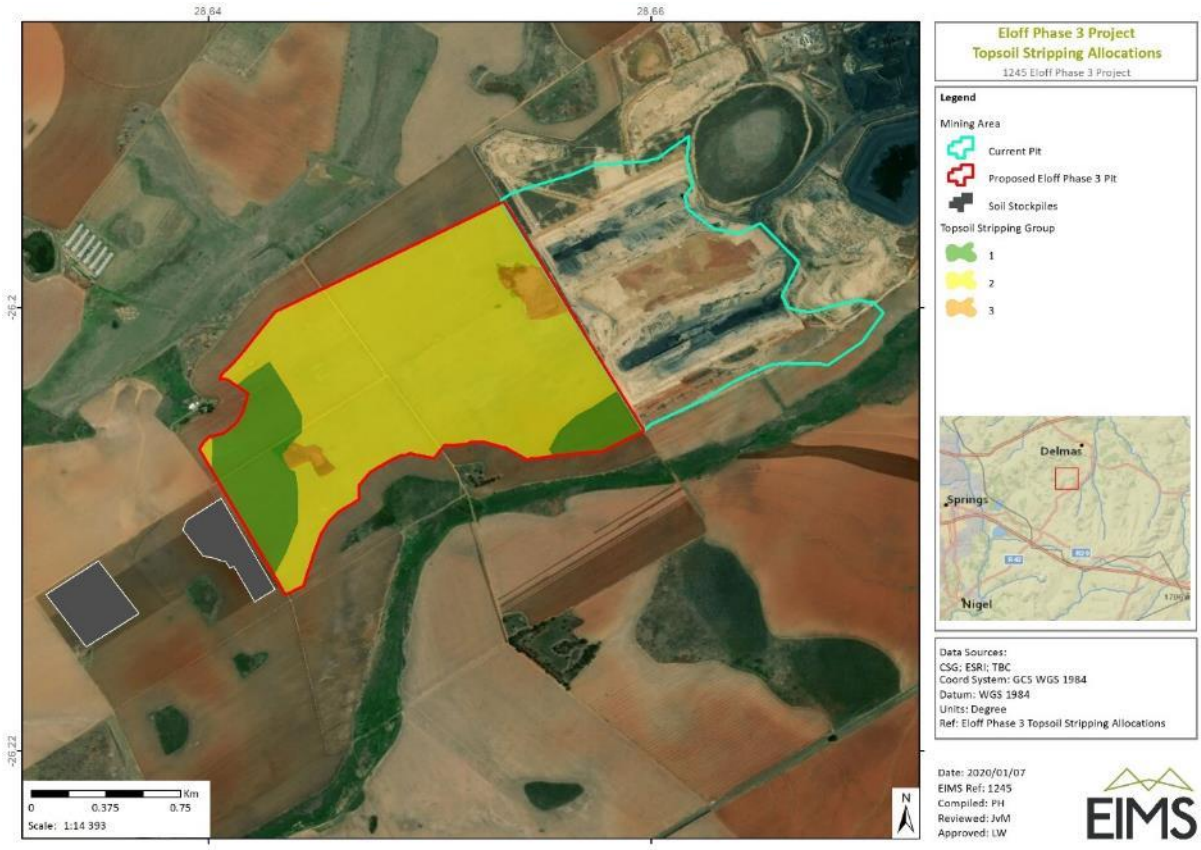


Figure 16: Topsoil stripping allocations

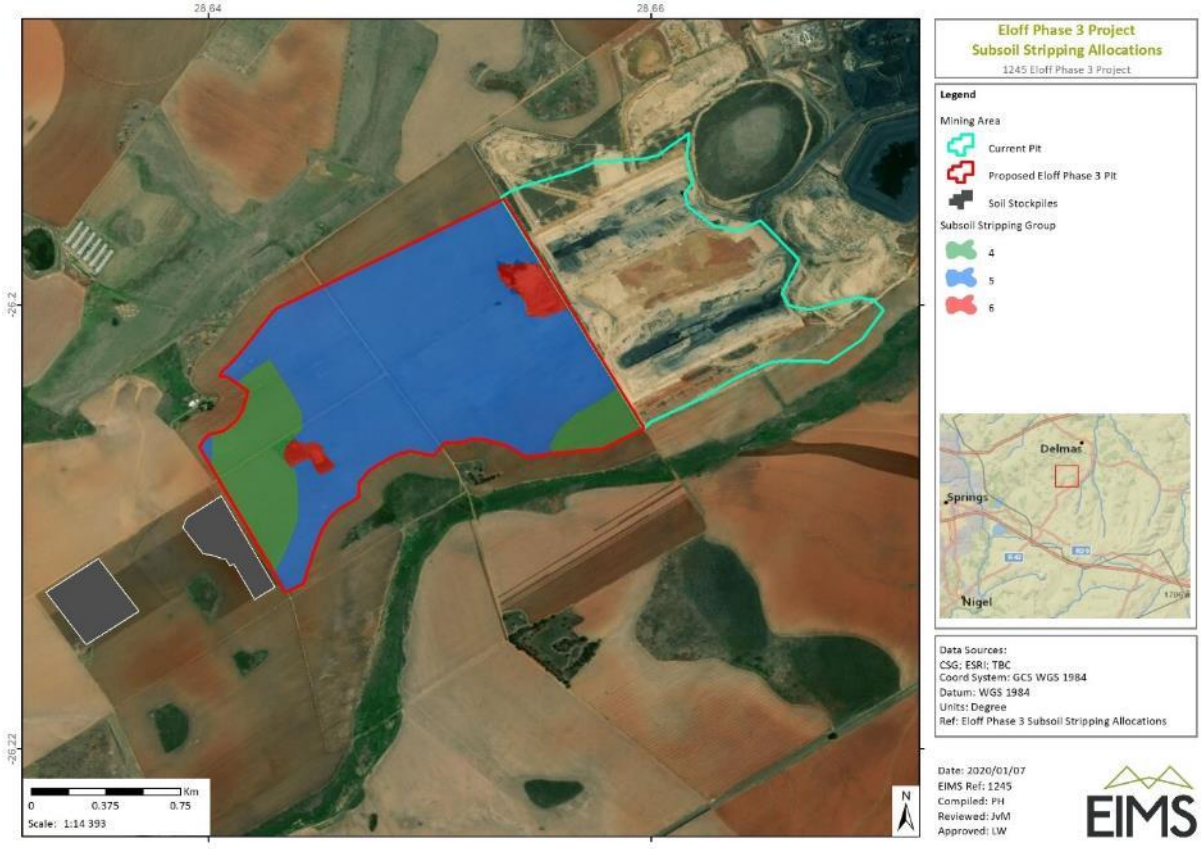


Figure 17: Subsoil stripping allocations.

3.5.1.2 SOIL STOCKPILING

The impacts to consider are those relating to when the soil is stockpiled, the soil's chemical properties will deteriorate unless properly managed. The soil beneath the stockpiles are also impacted through compaction of the soil and also the generation of anaerobic conditions in the soil below the stockpile. This changes soil chemistry altering the soil health. These all lead to the loss of the topsoil layer as a natural resource. Soil is considered a slowly regenerating resource due to the fact that it takes hundreds of years for a soil profile to gain 10cm of additional soil through natural processes. During a single rainfall event on unprotected bare soil, erosion could remove that same amount of soil if not more.

If the topsoil and subsoil are stripped and stockpiled as one unit, the topsoil's seed bank and natural fertility balance is diluted. This will affect the regrowth of vegetation on the stockpiles as well as the regrowth of vegetation when the soils have been replaced during the rehabilitation process, therefore soils should be handled with care from the construction phase through to the decommissioning phase.

The stockpiles themselves must , where possible, be placed in locations of land capability lower than arable (i.e. grazing, wilderness or disturbed land) to reduce the loss of arable land capability. The stockpiles must be placed in their final location and must not be moved until the time comes to use the soil for rehabilitation. The topsoil is to be no higher than 5m and dumped of the back of the dump truck into its final location. No shaping of the topsoil stockpile is allowed, and no vehicles are allowed to drive on top of the stockpiles at any time. This will lead to compaction and hinder the success of rehabilitation. Handling of soils to be undertaken when soils are dry (i.e. >3-5% below plasticity limit). Stockpiles must be phytostabilised and revegetated, and fertility must be monitored and corrected once a year to improve rehabilitation success.

Topsoil stockpile contamination must be prevented by avoiding the dumping of hazardous material next to stockpiles, as well as avoiding any contamination through the pumping of mine water to flow near the stockpiles.

3.5.1.3 EROSION CONTROL DURING STRIPPING AND STOCKPILING

Erosion can remove topsoil which cannot be replaced and therefor erosion must be avoided, controlled and mitigated. The stripping of vegetation and topsoil must be left till as late as possible to reduce the amount of time that the area is bare. The bare area will increase runoff potential and with it there is an increased risk of erosion. Erosion has a direct and indirect impact on the area. The direct impact is the removal of usable soil and the indirect is the sedimentation of water resources downslope.

Topsoil stockpiles must be revegetated as soon as possible and monitored twice a year to assess fertility and erosion risks. Vehicles will be driving around on site and must stay within the designated routes. This will prevent compaction of soils outside of the project area. If areas have been compacted the soil must be ripped to remedy the effects of compaction.

Stormwater management structures must be used to control natural water flows and to reduce flow velocity where possible. Stormwater discharge points must utilise erosion control measures specific to the situation required.

3.5.1.4 TOPSOIL PLACEMENT

The replacement of the topsoil must be done by using a bucket excavator (parked off the topsoil stockpile) and loaded onto the back of dump trucks to be moved to their allocated final rehabilitation locations. This reduces the compaction and disturbance of soil profiles and will assist in the rehabilitation efforts. Placement of soils should be done by direct dumping according to a calculated volume. Topsoils should, as far as possible, be placed on the backfilled areas in the same or similar landscape position to that of the source (i.e. red/yellow soils in high lying landscape positions and black soils on low-lying areas. The placement of topsoils should be planned and executed in consultation with a soil specialist. Dumped soil should be spread by using a tracked dozer. Handling of soils to be undertaken when soils are dry (i.e. >3-5% below plasticity limit). No driving will be permissible on any rehabilitated areas as this will compact the topsoil and all efforts to reduce the impacts previously would be rendered null and void. The topsoil will be ripped and reseeded.

Any contamination of the topsoil must be avoided by ensuring machinery is well maintained and leak free. If contamination has occurred the area must be ameliorated immediately.

Rehabilitation of the opencast would have already been started during the operational phase as per the roll-over method and the rehabilitation would include the following;

- Soil replacement and monitoring;
- Soil amelioration (Section 3.5.1.5); and
- Revegetation and biodiversity re-establishment (Section 3.5.2).

Any other mine impacted areas which have been compacted must be landscaped to natural contours and ripped to loosen all soil. Fertility of the topsoil would need to be assessed and rectified if required. The rehabilitated area must be re-vegetated and monitored for success. The rehabilitated area must be monitored for compaction and erosion and these must be rectified.

3.5.1.5 **SOIL AMELIORATION**

The placed rehabilitated soils are most likely inferior to the natural soil profiles, and consequently are less suitable as a plant growth medium. This section aims to present the plan to attempt to reinstate the greatest possible soil functionality within the rehabilitated soils through effective and targeted soil amelioration. The majority of this section has bene informed by and extracted from the land rehabilitation guidelines (LRSSA, 2019).

A full survey of the nature of the site soils was undertaken during the EIA and is presented in the soil's specialist study (The Biodiversity Company, 2019). This assessment included a presentation of the soil fertility (pH, P, K, Ma, Ca, Mg) and physical properties (texture) of the pre-mining soils.

3.5.1.5.1 SOIL RIPPING

Following soil placement, lime and superphosphate fertiliser should be applied and all the soils ripped to the full depth of the replaced soil layer. The correct ripping depth and spacing between rip lines must be determined in consultation with a soil specialist, prior to commencement of ripping. In general, cross slope ripping of flat surfaces should be carried out. It is necessary that the ripping must penetrate through the soil into the underlying overburden material to ensure free drainage and ensure root penetration. Once the ripping is complete the areas demarcated in the final closure plan as arable -for crop production, must be cleared of large rocks. The bulk density factors of the soils must be determined and acceptable target bulk density values defined in consultation with a soil specialist.

3.5.1.5.2 APPLICATION OF CHEMICAL AMELIORANTS

Once the soil is ripped and uncompacted, the soil must be sampled and submitted for laboratory analysis to determine the current profile of the soil chemistry (referred to as the initial sampling). The following sampling for the post placement event is recommended:

- The initial topsoil samples must be taken after levelling, ripping and prior to basal fertilising and lime application.
- The area to be sampled must first be assessed for its uniformity. If there are obvious differences in replaced soil type, slope or plant growth, the target area should be split into uniform sampling units. This will be guided by the soil placement plan, together with the soils tracking register, and the final land use plan land capability targets.
- Once the uniform units are defined one composite sample (comprised of ~20 individual sub-samples at random locations) must be taken. Obvious atypical situations (e.g. depressions or drainage lines) must be avoided.
- Samples to be taken 0-150mm depth.

- Sub-samples are most conveniently taken by means of a beater sampler, bulked, thoroughly mixed after breaking up clods, spread thinly on clear paper or plastic sheeting and portions scooped representatively from the whole area into a plastic bag, sufficient to give at least 500g of composite sample.
- The composite sample to be labelled and submitted to an accredited laboratory for analysis.
- The range of analysis must align with the pre-mining survey done and should include as a minimum: pH, P, K, Na, Ca, Mg, and sulphur.

Once the soil has been sampled and analysed the suitability and relevant deficiencies must be determined. The target levels of relevant nutrients should be determined in consultation with an agricultural/ soils specialist and will be informed by the following:

- The identified crop to be established on the designated arable land and its growth characteristics.
- The nutrient status of the soils (as determined in the initial sampling event).
- The pH and moisture availability of the soils.
- The manner of vegetation utilisation of the soils.
- The target production level or yield target that has been set, taking into account the soil and climatic potential.

Based on the considerations above a defined fertilizer specification and programme must be implemented. It should be noted that the initial application of fertiliser is likely to be significantly greater that future maintenance applications.

Annual maintenance fertiliser application and amelioration must then be undertaken. An effort must be made to ensure that sampling and subsequent fertiliser applications should be done to align with the same time of year that the initial sample/ application was carried out. The annual maintenance sampling must by, and large, align with the procedure listed above for the initial sample event, except for the following:

- Defining sample areas – each sample area or unit must not exceed 20ha.
- Composite samples will be created from at least 20 sub-samples for each defined unit.
- For sampling in areas where there is natural grass cover, samples should be taken to a depth of 100mm. Sampling in arable cultivated areas should extend to 150mm.

The annual sampling should be undertaken until the required P and K status has been achieved. On the basis of the closure objectives for the Eloff Project it is expected that the land capability will be reinstated to a Arable land capability: Land Capability Class III/IV ≥70% of application area.

It is recommended that annual sampling and amelioration extent up to the point that the soil nutrient supplementation and fertiliser applications align with that typically required for a similar agricultural unit.

3.5.1.5.3 SOIL TILLING

A suitable seedbed tilth will need to be created. Once initial fertilisation has taken place the areas designated for crop cultivation should be tilled using conventional agricultural equipment and methods.

3.5.1.5.4 TOP DRESSING

A nitrogen budget must be determined in consultation with an agricultural/ soil specialist. On the basis of the chemical state of the soils applicable nitrogen supplements must be added to encourage active growth. The nitrogen supplementation should commence approximately 1 month after plant emergence an continue until six weeks prior to the end of the determined growing season.

3.5.1.5.5 ONGOING SOIL FERTILITY ASSESSMENTS

As noted in Section 3.5.1.5.2, there is a need to ensure that the suitability of the replaced soils are monitored and assessed, and where necessary supplemented to achieve the defined closure objectives. In addition to the sampling noted in Section it is further recommended that annual sampling also includes soil compaction testing and any other parameters specifically required to align with the land capability targets and closure objectives, including:

- Physical parameters:
    - Rock content;
    - Soil texture;
    - Soil Aggregation;
    - Bulk Density; and
    - Available rooting depth.
- Soil fertility based on:
    - pH;
    - Salinity;
    - Fertility/ Bray 1;
    - Organic carbon; and
    - Major cations: Ca, Mg and Na.

3.5.2 WETLAND REHABILITATION AND MANAGEMENT PLAN

The planned mine opencast will result in the destruction of 2 small depression wetlands and 1 small seep wetland. On the basis of the sensitivity of wetlands as a landscape unit and the principle of no net loss, and preferably net gain, the EIA has recommended that a wetland offset strategy be developed and implemented for the project. The Biodiversity Company (TBC) has developed a wetland offset strategy to address this need, and the recommended the rehabilitation and management of the wetlands on the application area as presented herein, was extracted from this report (The Biodiversity Company, 2019). Please refer to the full wetland offset strategy report for further detail. In summary the wetland offset strategy recommends the following:

1. The buffer areas surrounding the pans recommended to be included for the offset should be combined, requiring the merger of the two buffer areas displayed in.
2. The buffer areas should be rehabilitated in order to improve connectivity between wetland systems and to provide a buffer from any diffuse source pollutants. This will require the changing of land use from agriculture to indigenous vegetation, and the management of these areas as conservation areas.
3. It is further recommended that the local mining companies must collaborate and work with Victor Khanye Local Municipality to develop and implement a strategic framework for improved wetland management in the region, specifically within the B20A quaternary catchment. These valley bottom systems Figure 18 and Figure 19) and associated seeps / depressions (not pictured) should be delineated into small rehabilitation units and allocated to each mining company for rehabilitation and maintenance. The location and extent of these units can be determined based on associated loss of wetland area stemming from a mine, and also matching wetland attributes.
4. An alien vegetation eradication control and management plan must be implemented for the recommended offset areas.

Figure 18: Recommended buffer zone for wetland offsets (The Biodiversity Company, 2019).

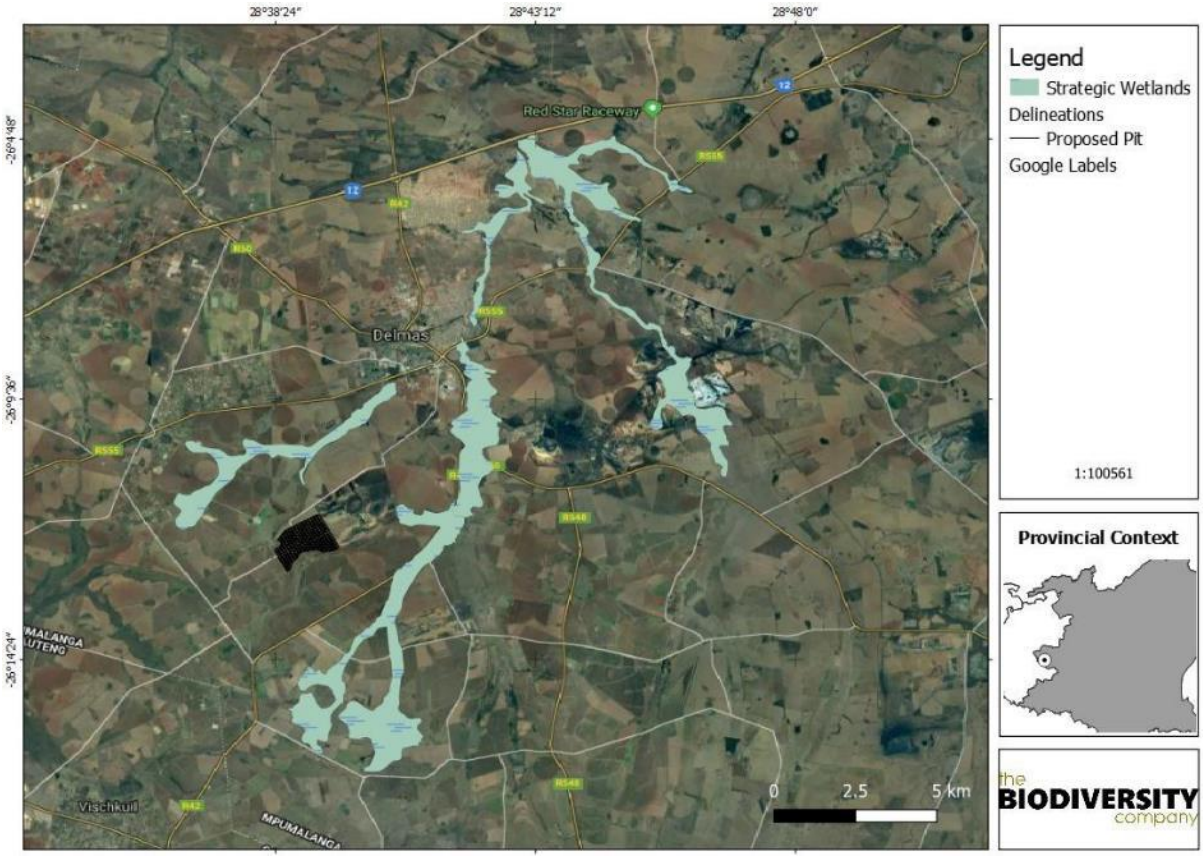


Figure 19: Location and extent of valley bottom wetlands to be considered for a regional wetland offset framework.

The rehabilitation of the wetlands as part of an offset should be registered in a Water Use Authorisation. The following recommendations have been made for the rehabilitation of candidate offset wetlands.

3.5.2.1 BUFFER ZONE RE-ESTABLISHMENT

It is important to re-establish the buffer zones for the identified wetlands. Buffer zones separate the wetland areas from the adjacent land uses and protect the wetland from direct impacts. The current buffer zone of the wetlands is used for crop cultivation. The buffer zone to be established is the 100 m buffer which is presented in Figure 18

The re-establishment of the buffer zone will improve the hydrology of the wetlands and improve the functionality and health of the wetlands. All crops must be removed within the wetland area and the buffer zone area. It is recommended that the buffer zone be visibly demarcated to prevent no undesired impacts to the wetland and buffer zone.

3.5.2.2 ALIEN INVASIVE PLANT SPECIES REMOVAL

Several alien and invasive plants were identified within the wetland areas and adjacent areas. These plant species lower the biodiversity of the wetland, impact on the ability of the wetland to perform services and deplete the water available to the wetland. Furthermore, invasive species often outcompete natural or indigenous species for habitat which results in complete habitat transformation and wetland loss.

Populus alba (NEMBA Cat 2), *Cortaderia selloana, Verbena bonariensis* (NEMBA Cat 1b), *Cirsium vulgare* (NEMBA Cat 1b), *Bidens pilosa, Conyza bonariensis* and *Tagetes minuta* occurred throughout the project area. These plant species must be removed through mechanical removal. Herbicide removal would result in non-selective eradication which could lead to the loss of wetland species. The removal of the alien species must take place immediately with follow up eradications each month.

3.5.2.3 RE-VEGETATION

The current buffer zone area and parts of the wetlands are being utilised for crop production. All crop production activities must be ceased in the wetlands and buffer zones. The revegetation of the buffer zone must seek to re-establish the natural highveld grassland. The establishment of the grassland will aid in the restoration of natural hydrology of the wetlands.

The vegetation within a wetland ecosystem (including the buffer zone) plays various important roles, one of which is to slow water velocities, disperse flows and increase the retention time of water within a wetland. Furthermore, the ground cover protects the wetland from erosion resulting from intense and concentrated flows.

It is imperative that seed be sowed in a mix to avoid oversaturation or monospecificity of species within an area. Seed should be sowed towards the end of the dry season so as to begin vegetation establishment before the heavy rains during the wet season. Only a few species have been recommended to avoid saturation and competition of species; it is expected that the natural seed bank will re-establish itself over time; should it not seed may be dispersed at a later stage to promote diversity. The recommended plant species for the buffer zone and wetland zone are presented in Table 17.

Table 17: Recommended plant species.

Zone	Plant Species
Buffer Zone	• *Cynodon dactylon* • *Themeda triandra* • *Eragrostis gummiflua* • *Eragrostis plana* • *Eragrostis curvula* • *Eragrostis chloromelas* • *Eragrostis lehmaniana*

Zone	Plant Species
Wetland Area	• *Agrostis lachnantha* • *Andropogon appendiculatus* • *Andropogon eucomus* • *Imperata cylindrica* • *Cyperus digitatus* and other *Cyperus spp.* • *Juncus spp.*

3.5.2.4 OFFSET WETLAND PROTECTION

A key component of this strategy would be to ensure the securing of the proposed offset areas by means of proclamation. The proposed offset area/s may not be subjected by mining or any other land use / activity within the foreseeable future. It is further recommended that no environmental authorisation be issued until such a proclamation is confirmed. The offset area/s could be gazetted as a Section 49 area.

3.5.3 GROUNDWATER MANAGEMENT PLAN

This section has been extracted from the specialist groundwater assessment done for the EIA (GCS (Pty) Ltd, 2019). This section provides the proposed actions for the closure and post-closure phases.

3.5.3.1 GENERAL

General ground water management actions required during the post closure phase include:

- Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine.
- The closure water management measures should be implemented which may include a decant management system and water treatment plant.
- All old exploration boreholes must be sealed off after closure.
- The drilling of boreholes into mining areas is recommended so that recovery of water can be monitored.
- Multiple-level monitoring boreholes should be constructed to monitor base-flow quality within sensitive zones.
- The results of the monitoring programme should be used to confirm/validate the predicted impacts on groundwater availability and quality after closure.
- Quarterly groundwater sampling should be done to establish a database of plume movement trends, to aid eventual mine closure.
- The monitoring network should be audited annually by a qualified hydrogeologist.
- The existing predictive tools should be updated to verify long-term impacts on groundwater, if required.
- Surface water monitoring of the tributaries will be essential.

3.5.3.2 MINING AREAS

Ground water management actions related to the mining areas which area required during the post closure phase include:

- All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite.

- During backfill of the opencasts carbonaceous rocks (especially shale) and any discard should be placed in the deepest part of the pit (as far as practical possible) and below the long-term pit water level in order to ensure that it is flooded and that pyrite oxidation is minimized.
- Soft overburden and weathered rock must be placed at the top of the backfill in order to minimize oxygen diffusion into the pit.
- The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas.
- An evapotranspiration cover should be constructed on top of the opencasts. A capillary break should also be constructed between the overburden/clay and topsoil. Root depth of grass is usually 0.4 to 0.6m, therefore the thickness of the top soil should be sufficient to promote root development.
- The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts.
- Intercepting decant by a downstream trench at each decant point is an option to investigate for the site.
- Treating of decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant. Investigations must continue to establish the most effective way to treat water on site if needed at the end of LoM. The installation of a RO plant should be seen as a last option.
- The level to which the decant water is treated depends on the use of the water after treatment but should be determined in consultation with the DWA.
- If a risk of impact on the surface water bodies is established, a remediation action plan should be developed to negate the potential impact.

3.5.4 FINAL LANDFORM DESIGN AND PLAN

Landform re-creation is the process by which the mined overburden materials are placed and moved to create the desired final topography. Considering that roll over mining and progressive rehabilitation is prescribed for this project it is critical that planning of the final post closure landform is undertaken to ensure that the overburden materials are placed in the most appropriate location. The key objective of this landform design process are to:

- To integrate concurrent rehabilitation designs into life-of-mine plans, encouraging direct soil placement as part of rehabilitation activities, where possible.
- To optimise the way material is moved during operations, to ensure that overburden and topsoil stockpiles, and/or other usable materials are placed in suitable locations to minimise handling and to minimum haul distances for rehabilitation and/or closure activities.
- To create a planned rehabilitated landscape that meets predefined land capabilities commitments (i.e. 88.4% of arable land capability), and which has:
    - Suitable slope profiles for the planned land use/s and that limit the potential for erosion; and
    - Adequate soil cover thickness.
    - No remnant residue deposits post closure.
    - To recreate a landform that is aligned with the long-term water management requirements, and that:
    - Limits ingress of water through backfilled open cast spoils that could require ongoing water management in the long-term; and/or

- Ensures adequate water availability for post-mining land use/s.

- To re-create a free-draining profile across the back-filled pits, having the correct gradient for the planned land capability to support the intended land use (i.e. arable land).
- To ensure that sufficient soil (growth medium) is kept in stockpiles to backfill any areas of settlement (melon holes) so as to keep rehabilitated areas free-draining and to conserve land capability.
- To provide long-term stabilisation of the geo-technical conditions of the disturbed mining areas.
- To limit the need for, or intensity of, long-term care-and-maintenance of recreated landforms.

EIMS has commissioned the investigation into three high-level post mining landform options. The piezometric contour map (static water level) was considered in all three options to ensure that the post-mining landform exceeds those elevations. The effect of the three options on the land use (considering a topsoil depth of minimum 600 mm and 150 mm for arable and wilderness respectively) is summarised in the table below:

Table 18: Land cover area predictions per option.

Option	Arable (Ha)	Wilderness (ha)	Volume required (m^3)	Volume available (m^3)
Option 1	175	24	1 086 000	1 238 860
Option 2	157	22	975 000	
Option 3	174	18	107 1000	

For scheduled closure it is assumed that concurrent operational rehabilitation activities will take place during the operational phase. All measurements and calculations were done with Civil3D modelling to ensure realistic values. Refer to Appendix 2 for drawings derived from the modelling.

The reminder of this section presents the description, assumptions, considerations and findings of this study.

3.5.4.1 LANDFORM OPTION 1- FILL TO FREEDRAIN

This landform aims to recreate a final landform that is free draining throughout and discharges the internal catchments to the neighbouring areas under gravity. The key findings and considerations for this landform are as follows:

- A free draining topography with slopes that limit erosion potential and are consistent with the surrounding topography;
- Based on the modelling an additional volume of 5 119 314 m^3 will be required over and above the pit material balance to achieve a free draining topography;
- The topography will drain at the south eastern corner of the pit. However, due to the constraints in elevations, significant cut will have to take place within the wetland buffer zone to ensure that the site is free draining;
- Maximum design slopes are 14.29 % (1 in 7). This takes up ~12 % of the overall slope configuration. Flatter slopes between 1 % (1 in 100) and 0.33 % (1 in 300) takes up the remaining 88 % of the slope configuration;
- No final voids/pit lakes will be left post-closure; and
- The conceptual profile is to pre-topsoil level/top of softs elevations.

The challenge presented with this option is that the predicted material balance results in a deficit of material in the order of ~5 119 314m^3. Available sources for this supplementary material are limited. Options that were considered included the following:

- Surplus materials from the existing Kangala Mining Operations: Through discussions with the mine it is understood that the existing Kangala mine has also conducted a standalone material balance and landform analysis. No surplus backfill material is anticipated to be available from Kangala.
- Placement of discard from the wash plant into the Eloff Phase 3 Pit: The discard material from the Kangala wash plant is currently placed on the Kangala discard facility. The discard from the CHPP originating from the Eloff Phase 3 ROM is also planned to be disposed of on this facility. It is estimated that ~12MT of discard will be generated from the Eloff Phase 3 pit. The placement of this material into the Eloff Phase 3 pit is however not considered a preferable option on the basis that this material will be pollutant generating and is likely to further increases the mine affected water pollution.

The conceptual landform design for Option 1 is included in Figure 20.

Figure 20: Option 1 – Freedrain Topography

3.5.4.2 LANDFORM OPTION 2- EVAPORATION PIT

This landform aims to recreate an evaporation pit to allow for sufficient surface area to allow for evaporation of mine affected pit water and the prevent the water rising above the predicted decant elevation. The remaining areas of the rehabilitated pit will be designed to be free draining to maximise the arable land capability on the residual areas. The key findings and considerations for this landform are as follows:

- A Free draining topography will not be possible due to the shortage in volume. Therefore, a final void/pit lake was considered;
- The size of the pit lake was based on the assumptions made in the geohydrological report (GCS, 2019);
- The topography will drain towards the pit lake on the South Eastern corner of the pit;
- Maximum design slopes are 14.29 % (1 in 7). This takes up a 11 % of the overall slope configuration. Flatter slopes between 1 % (1 in 100) and 0.33 % (1 in 300) takes 79 % of the slope configuration with the remainder being the pit lake; and
- The concept profile is to pre-topsoil level/top of softs elevations.

The conceptual landform design for Option 2 is included in Figure 21: Option 2 – Evaporation final void/pit lake.

Figure 21: Option 2 – Evaporation final void/pit lake

3.5.4.3 LANDFORM OPTION 3- RUNOFF PIT

This landform aims to backfill the pit with available materials and then create a free draining landform for the greater majority of the site. As noted in Option 1 (Section 3.5.4.1) there is currently a predicted material deficit. The implication is that unless additional fill material is sourced for the rehabilitated area, there will be a need to accommodate and manage all of the surface water runoff on the site within the site boundary. In this regard it is proposed to create a small runoff pit which fulfils the runoff containment function and which can be designed to look like a localised pan. The key findings and considerations for this landform are as follows:

- A Free draining topography will not be possible due to the shortage in volume. An option was modelled to capture all the runoff from the post-mining landform. A worst-case scenario was considered, taking the three wettest months in the last ten years and applying a run-off factor of 50% to determine the size. However, it is recommended that a time-step model is done to refine this. It is assumed that the dam will have to be lined to limit additional surface water recharge;

- The topography will drain towards the run-off pit on the South Eastern corner of the pit;
- Maximum design slopes are 14.29 % (1 in 7). This takes up a 9 % of the overall slope configuration. Flatter slopes between 1 % (1 in 100) and 0.33 % (1 in 300) takes 87 % of the slope configuration with the remainder being the run-off pit/dam; and
- The concept profile is to pre-topsoil level/top of softs elevations.

The conceptual landform design for Option 3 is included in Figure 22: Option 3 - Run-off pit.

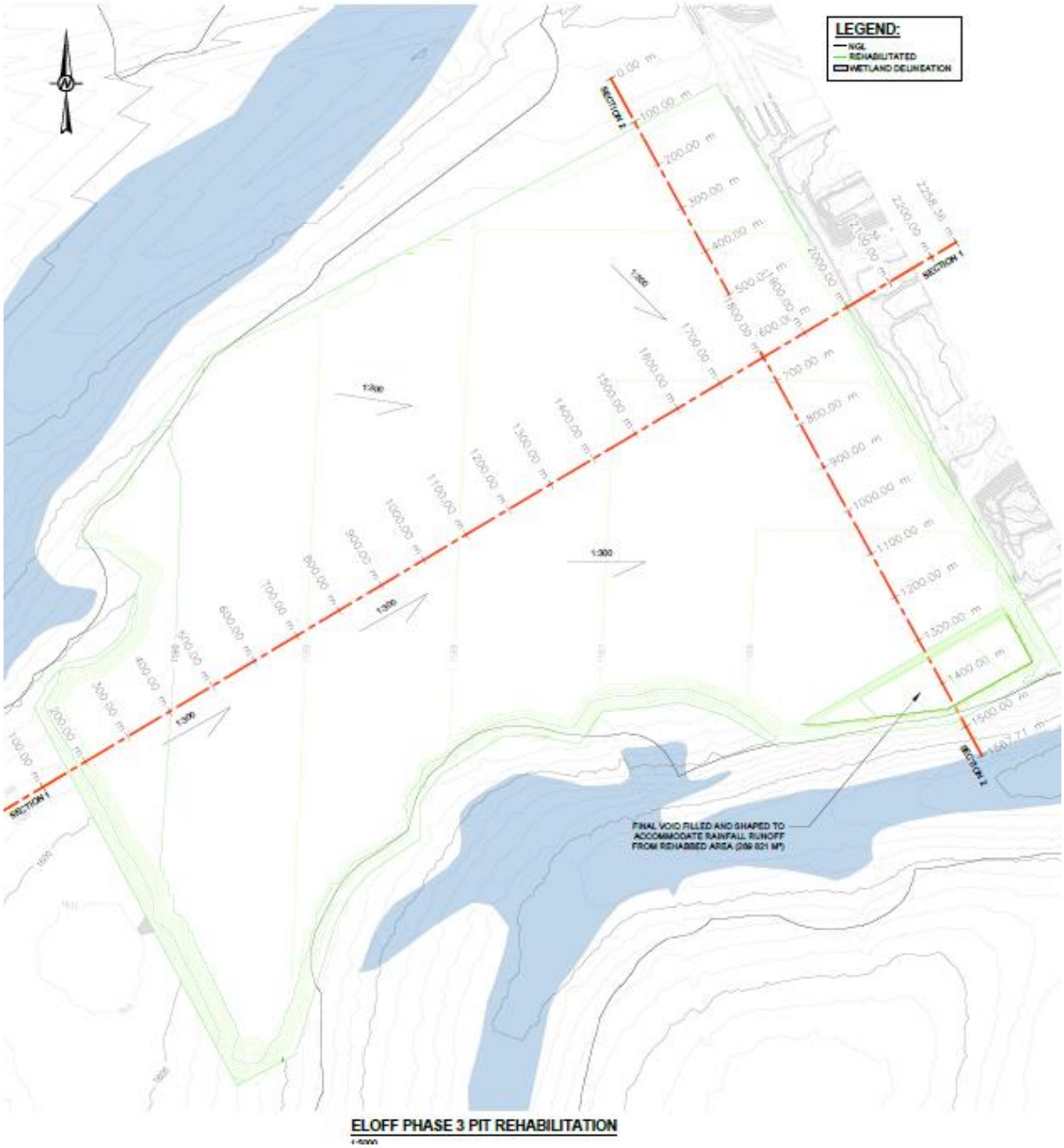


Figure 22: Option 3 - Run-off pit

3.6 FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE SCHEDULE

Figure 23 presents a high level forecast schedule of components and key actions related to the final rehabilitation, decommissioning and closure. This schedule also indicates the following:

- It is anticipated that steady state roll over mining and progressive rehabilitation will commence ~2,5 years from commencement and continue until final void.
- The post-closure phase and management of residual and latent impacts is defined primarily by the timing of the groundwater impacts, namely:
    - The forecast time for the groundwater pollution plume to reach the local surface water features (~75 years from closure); and
    - The forecast time for the rehabilitated pit to flood and decant (~134 years from closure).

As a general principle, closure and decommissioning of specific infrastructure should be initiated as soon as possible following the ceasing of active use.

The key schedule drivers for each activity is presented in Table 19.

Table 19: Closure schedule drivers

Activity	Closure schedule driver
Dismantling and removal of any on site infrastructure.	Progressively as infrastructure is no longer required. Final dismantling of all infrastructure not to be retained at cessation of mining activities.
Rehabilitation of access roads.	Cessation of mining activities
Rehabilitation of the open cast area as well as the access ramps and final voids.	Steady state roll-over mining will control the progressive pit backfilling and rehabilitation. Cessation of mining will control the deposition of the boxcut material and rehabilitation of the final void and access ramps.
Rehabilitation of the soil stockpile areas.	Completion of the removal and placement of topsoils on the backfilled final void.
General surface rehabilitation.	Progressively as disturbed areas are no longer required or on completion of the decommissioning phase.
Implementation of the wetland offset strategy.	Receipt of EA and relevant associated approvals.
Removal of fencing required during the mining operations.	Cessation of mining activities.
Management of water within the mine area.	Groundwater management actions are driven by the actual timelines associated with the impacts-e.g. time for plume to reach surface water features, and time for pit to decant. Surface water controls will be implemented following cessation of mining activities.
Maintenance and aftercare.	Cessation of mining and completion of decommissioning and rehabilitation activities.

Activity	Years																												
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	30	40	50	60	70	80	90	100	>100
PHASES	**OPERATIONAL PHASE**												**DECOM.. AND REHAB**			**CLOSURE**					**POST-CLOSURE**									
Formal agreement between Kangala and Eloff re liability split																														
Commencement of mining																														
Mining operations																														
Initial box cut topsoil stripping/ removal																														
Topsoil Stockpiling																														
Steady state roll over mine progressive rehabilitation (incl topsoil stripping, placement, amelioration, revegetation, etc).																														
Develop Farming strategy and business plan.																														
Commence with farming activities on rehabilitated land.																														
Application for environmental authorisation (for closure)																														

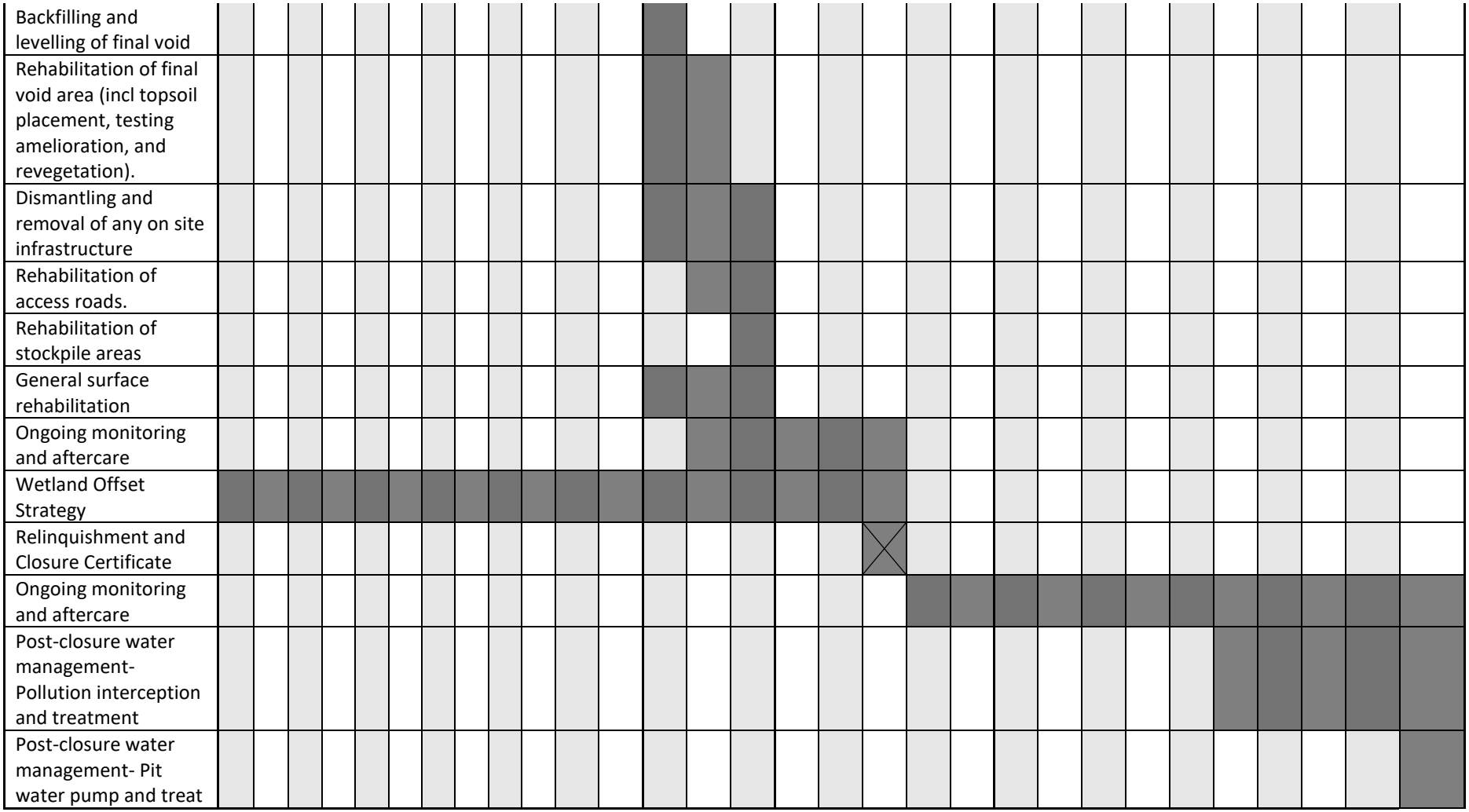


Figure 23: Preliminary Mine Closure and Rehabilitation Forecast Schedule

3.7 ORGANISATIONAL CAPACITY

It is critical that roles and responsibilities for the effective planning, implementation, monitoring and revision of the closure process are clearly defined and provided for. The Holder of the Mining Right is ultimately responsible for ensuring compliance with all the provisions of the Right and associated plans, as well as other relevant legal requirements. The Holder must ensure knowledge and understanding of the applicable legislation, guidelines and industry best practices. The following organisational capacity is required:

- Internal Closure champion: a suitably qualified person(s) who will be accountable for the following:
    - Driving the ongoing development, refinement and implementation of the closure plan;
    - Resourcing and implementing the plan;
    - Ongoing management and monitoring requirements to support the closure plan;
    - To ensure the integration of the rehabilitation and closure activities with general operational activities; and
    - Ensure legal compliance and deliver on commitments.
- Internal Social champion: a suitably qualified person(s) who will be accountable for the following:
    - Develop and implement training strategies for internal training;
    - Develop and implement effective communication with all stakeholders;
    - Develop and implement a stakeholder forum to promote information and idea sharing regarding closure related aspects and/or ensuring meaningful contributions to existing forums; and
    - Continually develop the relationship with I&APs, to promote the social licence to operate and close and decommission.
- Independent Environmental Assessment Practitioner: This individual will be appointed to ensure compliance with the requirements of the FRDCP and specifically to undertake the following tasks:
    - Undertake the prescribed independent auditing; and
    - Undertake period review and assessment of accumulated monitoring data and provide recommendations for review and amendment of the closure planning where applicable.
- Internal or external specialists: The monitoring of the implementation of the closure process and the subsequent revisions, adjustments and alterations will in many cases need to be conducted by suitably qualified specialists (e.g. soils and agricultural specialist, biodiversity and wetland specialist, ground and surface water specialists, engineering and landform design specialists). Relevant specialists should be identified and budgets provided for the scope of work to align with the obligations presented in this closure plan.

Table 20 provides the designated roles and responsibilities contained within the EMPr. It is anticipated that these roles will continue through into the rehabilitation and closure phase of the project.

Table 20: Roles and responsibilities for environmental resources on site

Environmental Resource	Key Responsibility	Tasks	Reporting
Environmental Manager (EM)	Overall responsibility for environmental management at the mine	Develop and implement the ESMS Develop procedures for the ESMS Review compliance monitoring reports and audit reports Assign responsibilities for corrective actions and addressing non-compliance Liaison with authorities Issuance of NCR's Reporting KPI's to mine management Liaison with landowners and Key stakeholders with regards to environmental issues Supervise Environmental Monitoring Programmes	Reports to Mine management
Environmental Control Officer (ECO)	Responsible for compliance monitoring	Review EO reports Conduct inspections and report on environmental compliance Advise EM in corrective actions for non-compliance Recommendations for improvement Environmental training and support	Reports to EM
Environmental Officer (EO)	The EO is responsible for **internal** monitoring compliance against the conditions of the EMPr and other licenses and permits. The EO is only responsible for implementation of management measures that are the responsibility of the Applicant	Undertake regular (at least weekly) site inspections Report on compliance and advise applicant on corrective actions Implement corrective actions where the responsibility lies with Applicant	Reports to EM

Environmental Resource	Key Responsibility	Tasks	Reporting
		Coordinate and Implement Environmental Monitoring Programmes Environmental record keeping	
Independent Environmental Auditor (IEA)	Responsible for external compliance audits and annual Performance Assessments	Conducting Auditing Recommendations for improvement	Reports to authorities

Further education, training and capacity building is critical to ensure that the production activities align with evolving internally accepted best practice and research. In this regard the Applicant must ensure that regular review of international best practice is undertaken and where applicable implemented throughout the project programme. It is recommended that the internal resource responsible for managing and implementing the closure and rehabilitation activities join available peer networks, affiliations and organisations (e.g. LaRSSA, Minerals Council bodies, etc).

It needs to be recognised that closure planning needs to start early within the project lifecycle and continued as an integral component of the operations.

3.8 IDENTIFICATION OF CLOSURE PLAN GAPS

The key gaps applicable to this closure plan are as follows:

- The numerical groundwater model should be updated once every three years or after significant changes in mine schedules or plans by using the measured water ingress and water levels to re-calibrate and refine the impact predictive scenario. Updates to the model should be carried out more frequently if significant changes are made to the mine schedule or plan.
- The first revision of the groundwater model should run a simulation considering the revised and updated predicted climate change predictions- the outcome of this should be included in the risk assessment update.
- Should a final void of any standing water body be identified as the final closure solution then a study must be undertaken to confirm the exact location and a suitable geotechnical investigation undertaken to confirm the impact of this water body on the underlying dolomites specifically in relation to subsidence and sinkhole risk.
- A closure water management plan should be developed. This should assess the managed of decant via channelled decant or the management of a critical water level to minimise contamination of the shallow weathered aquifer. This should all be analysed in a financial model to further inform the most effective closure water management options. The groundwater model should be used as a management tool to inform this process. Options of discharging, treating, storing and/or evaporation of the abstracted groundwater volumes should be studied to indicate the best practical way to deal with these groundwater volumes.
- Treatment options for mine affected water: The groundwater specialist study notes that there is a risk of long term water pollution through both interception of the polluted groundwater plume with local surface water features as well as the potential decant of polluted mine affected water. At present the option of utilising active pump and treat has been recommended, primarily to allow for maximum utilisation and restoration of land use. The treatment technology proposed and included in the financial

provisions is for Reverse Osmosis (refer to Section 5.2.3). The use of active treatment technologies is not preferable for numerous reasons, including the requirement that there is a need for active implementation, management, and supervision which results in potential implementation risk and additional long term cost. Considering the timelines associated with the impact of the polluted groundwater the preference is for low intensity and management treatment technologies. There is significant research on-going into available and commercially viable passive/semi-passive treatment options. It is recommended that prior to the commencement of the decommissioning and closure phase that a comprehensive investigation is undertaken to assess and evaluate the available treatment technologies and determine the best option moving into the post-closure phases. Considering the predicted time scale for the actual need for treatment it is further suggested that another review is scheduled and undertaken during the post closure phase.

- Without kinetic geochemical testing it is not possibly to accurately predict the duration of AMD. For the purposes of this financial provision report 50 years post commencement of plume interception and decant has been assumed. This duration must be reviewed once the requisite kinetic tests are completed.

- The option of integrating the long term groundwater management with the surrounding regional mines (e.g. Kangala, Middelbult, etc) should be investigated.

- The closure vision and related objectives specified in this closure plan revolve principally on returning the mine area to an active agricultural unit. The ability to achieve this will be driven by the correct and dedicated implementation of the actions defined herein. Considering that the primary business of the Applicant/ holder is to mine for coal, there may be a need for a formal entity to be established to implement the farming land uses within the rehabilitated land. This entity could and should be established through consultations with the local communities and integrate with the mines social and labour plan commitments. It is recommended that a feasibility study is undertaken prior to the achievement of steady state roll over mining and progressive rehabilitation to determine the following:

    - The identification and comparative assessment of possible mechanisms for allowing control farming on the rehabilitated areas;

    - The scheduling of such farming activities based on the mine schedule and the forecast timelines for achieving an initial crop unit- based on guidance from a soil and agricultural specialist;

    - The assessment and evaluation of suitable crop types which may be grown on the rehabilitated land; and

    - If necessary identify the required amendments to the closure and rehabilitation plan and /or the social and labour plan.

- The landform design is based on certain forecast input values (including bulking factors, settlement factors, etc). The determination of actual values will be measured and monitored as part of the monitoring requirements listed in Section 3.11, as well as being available for the rehabilitated areas of the adjacent Kangala Colliery. The landform assessment and design must be evaluated every three years or after significant changes in mine schedules or plans by utilising the measured actual input values to obtain a more accurate landform prediction. The mine plan and landform design may require revision or amendment on the basis of this review.

Further the financial provisioning regulations requires that the FRDCP be revisited, assessed, and revised on an annual basis. This annual review must aim to ensure that the gaps identified above are addressed, as applicable, and the relevant financial provisioning updated.

3.9 RELINQUISHMENT CRITERIA

Relinquishment can be defined as the formal approval by the relevant regulating authority indicating that the completion criteria for the production activity have been met to the satisfaction of the authority. In this regard the relinquishment criteria are driven by the objectives of closure and consequently the indicators applicable to each impact associated with the closure and decommissioning. In this regard reference is made to Table 11 and Table 12, which present each identified environmental impact, the associated indicators and proposed closure targets. In summary the proposed relinquishment criteria include:

Aspect	Relinquishment criteria
Final closure landform	- Arable land capability: Land Capability Class III/IV ≥70% of application area[6]. - Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable). - Rehabilitated areas are free draining to controlled containment and discharge points. - Limited erosion gullies or features. - Limited unplanned ponding. - No unrehabilitated melon holes or settlement features.

Soils and land capability	- Arable land capability: Land Capability Class III/IV ≥70% of application area.
	- Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable).
	- ≥85% correlation between available soil and stripped soil.
	- Rehabilitated arable land soil characteristics to align with the following:
	  ○ Physical parameters:
	  ▪ Rock content: as low as possible (<10 percent by volume of rocks, or pedocrete fragments larger than 100 mm in diameter in the upper 750 mm of soil).
	  ▪ Soil Texture: Sandy Clay Loam (20% – 35% Clay).
	  ▪ Soil aggregation: Single grained and Granular.
	  ▪ Bulk density: less than 1.55g/cm^3.
	  ▪ Available rooting depth: >600mm for class III and > 400mm for Class IV.
	  ○ Soil Chemistry:
	  ▪ pH (KCl): between 5.5 and 8.
	  ▪ Salinity (as EC): <400mS/m and exchangeable sodium percentage less than 15.
	  ▪ Fertility: P (Bray 1); and K: Target for P – 10mg/kg to 15 mg/kg; Target for K – 100 mg/kg.
	  ▪ Organic Carbon: > 0.75% through depths of 250 mm.

[6] Please note that the pre-mining land capability assessment was based on the Smith classification system (Smith, 2006). Consequently the post closure land capability should also be based on this system.

Aspect	Relinquishment criteria
	▪ Major Cations: Ca= between 200-3000mg/kg- recommended ~800mg/kg; Mg= between 50-300mg/kg- recommended 150 mg/kg; Na= between 50-200mg/kg- recommended <100 mg/kg). - Farming yields on defined arable land.
Biodiversity	- Natural areas vegetation structure and species composition to align with local reference site: o ≥80% of the reference site species richness. o <10% of assessment plots failing to meet species richness target. - Alien invasive plants not dominating, and presence to align with, and improve on, surrounding local reference sites. - Maintain and improve defined wetland units as follows: o HGM 1 and 2= Class C PES. o HGM 3= Class C PES. - Development of a post-closure biodiversity management and action plan- to be incorporated into long term land-use agreements.
Water Resources	- Updated numerical groundwater model and water liability assessment. - Updated mine water management plan for residual and latent impacts. - Updated and secured financial provision for residual and latent impacts. - Comply with WUL requirements. - Compliance with GN704.
Infrastructure	- Arable land capability: Land Capability Class III/IV ≥70% of application area. - Signed agreements for ongoing land use and management. - No remnant infrastructure or waste materials remaining on surface, unless transferred in writing in the signed agreements.
Social and Economic	- Arable land capability: Land Capability Class III/IV ≥70% of application area. - Post closure land-use agreements (covering land use, rehabilitated land management and ongoing maintenance, including where relevant management of residual impacts). - No unattended public complaints. Where possible written confirmation from the affected landowner/ complainant must be solicited confirming that outstanding issues have been addressed and closed out.
Climate change resilience	- Apply latest climate change prediction to assessment of residual and latent impacts- provision of reasonable and adequate contingency funding.

3.10 CLOSURE COST AND FINANCIAL PROVISION- FRDCP

3.10.1 CLOSURE COST METHODOLOGY

The following approach was applied during Eloff Mine closure costs:

- Background information such as aerial images, layout drawings and specialist studies, etc. were gathered and collated;

- A project initiating meeting between EIMS and BEAL followed by further gathering of supporting information;
- Unit rates were updated to form a dedicated suite of unit rates that reflect site-specific conditions;
- Good practice requirements for key closure measures were confirmed and revised, where required;
- Bill of quantities (BoQs) and detailed costing sheets in a format that complies with the requirements of GN R. 1147 were compiled;
- BEAL's surface profiling team were consulted to confirm scheduled and unscheduled closure costs for the rehabilitation of the planned open pit; and
- The closure costing report, summarising the approach, assumptions and findings applicable to the closure costing was compiled.

The following information was made available and has been utilised, as deemed necessary, in determining the closure costs, is shown in Table 1 below.

Table 21: Available information

Title / description	Format	Author	Date
Eloff Phase 3 Mining Areas • Accuracy Report • ASCII • Tile Layout • Contours • Photos • AutoCad Layers	Excel XYZ File DWG DGN/DWG ECW AutoCad Layer State	Not specified	March, 2018
Coal Seam Data for Eloff Phase 3 Mine	DXF	Universal Coal, Kangala Colliery	Not Specified
Eloff Phase 3 Mining Infrastructure	Shape Files	Not Specified	Not Specified
Eloff Mining Layout	DXF	Not Specified	Not Specified
Eloff Phase 3 Project: Environmental Impact Assessment and Management Plan (Hydrogeological Component)	PDF	GCS Water & Environmental Consultants	January, 2020
Final rehabilitation, decommissioning and closure plan, incorporating an annual rehabilitation plan and environmental risk assessment DRAFT	Word	Environmental Impact Management Services	January, 2020
Piezometric Surface Contour at 10m intervals	Shape Files	Not Specified	Not Specified

The Eloff phase 3 project: Soils rehabilitation and stripping guideline	PDF	The Biodiversity Company	April, 2019

3.10.2 CLOSURE BATTERY LIMITS

The proposed Eloff Phase 3 Project is situated adjacent to the existing Kangala Colliery- refer to Section 3.1.1.1 and Figure 4. The specific mine related components (battery limits) addressed in the closure costing are listed below:

- Infrastructural areas: No infrastructures on site, allowance was made for the removal of planned haul roads; and
- Mining areas: Planned Open pit.

3.10.3 CLOSURE COST ASSUMPTIONS AND QUALIFICATIONS

This section outlines the assumptions, limitations and qualifications made in compiling this closure costing.

3.10.3.1 **LAND USE AND OBJECTIVE**

The vision, and consequent objective and targets for rehabilitation, decommissioning and closure, aim to reflect the local environmental and socio-economic context of the project, and to represent both the corporate requirements and the stakeholder expectations as well as the legislative framework and regulations. The receiving environment within which the mining is proposed to be undertaken include the following key land-uses:

- Agriculture- cultivated fields (typically dry land maize/ soya);
- Natural and disturbed veld; and
- Wetland areas (ranging from disturbed wetlands to areas in a largely natural state).

3.10.3.2 **GENERAL**

The general assumptions and qualifications that were made are listed below:

- The 2019 closure costs have been determined based on the measures as conceptualised in the Final Rehabilitation Plan (EIMS, 2020)
- Costs have been determined within the assumption that an outside (third party) contractor would establish an on-site camp and conduct the rehabilitation-related work;
- The closure costs, as computed, do not cover components such as staffing of the site after decommissioning, the infrastructure and support services (e.g. power supply, etc) for this staff, as well as workforce matters such as separation packages, re- training /re-skilling, etc.
- Fixed ration of preliminary and general (P&Gs) and contingencies for the establishment costs of the dedicated contractors that would be commissioned to conduct the demolition and rehabilitation work on site, have been retained with this cost update, as per the DMR guidelines;
- The cost estimates allow for post-closure care and maintenance work, as well as compliance monitoring by specialist contractors and consultants;
- No cost off-sets due to possible salvage values were considered as this is not in accordance with the DMR guidelines / internationally accepted good practice. Only gross decommissioning and rehabilitation costs are detailed in this report;

- Only the scheduled closure costs have been determined. The scheduled closure takes place at a planned date and / or time, in accordance with overall mine planning. The unscheduled closure entails immediate closure of a site, representing decommissioning and rehabilitation of the site in its present state. Therefore, this was excluded from the costing as no mining has taken place to date;
- The Environmental Impact Assessment and Management Plan (Hydrogeological Component) was the basis for assumptions in the post-mining landform modelling and costing (GCS, 2019).

3.10.3.3 **SITE-SPECIFIC**

The site-specific assumptions and qualifications that were made are as follows:

3.10.3.3.1 INFRASTRUCTURE

The following road widths have been assumed: Haul roads= 46 m.

3.10.3.3.2 PLANNED OPEN PIT AND POST-MINING LANDFORM DESIGN

The following assumption apply:

3.10.3.3.2.1 UPFRONT INFORMATION

During the project kick-off meeting the following was agreed in terms of the landform design that had to be conducted:

- Bulking factors for hards/interburden and softs are 10%; and
- Hards, softs and topsoil stockpiles would be used as backfill material for concurrent rehabilitation.

In addition, the following supporting information was also collected:

- Mining approach;
- Confirmation of the seams to be mined;
- Piezometric contour map;
- Mining schedule and boundaries for each coal seam to be mined as well as the associated softs and hards;
- Boxcut position; and
- Latest available topographical survey (March 2018)

3.10.3.3.2.2 PLANNED PIT

The planned pit is situated to the West of the Kangala open pit and will eventually cover about 197 ha. Mining will start roughly in the middle of the pit and progress towards both the north and south. The boxcut material will be stockpiled and used for final void backfilling at end of life. Based on the planned production rate, the life of mine (LOM) is estimated as 6. The mining method considered was a truck and shovel operation.

3.10.3.3.2.3 PREDICTED PIT SHELL

A predictive pit shell was numerically created by considering the planned “extremities” of the following:

- Topsoil;
- Hards;
- MM;
- MBAB;
- MBC’s (MBC1 & MBC2,); and

- MBD

Predicting the progressive "evolution" of the pit shell allowed the determination of the volumes of the different coal seams still to be mined. The related volumes of over- and inter-burden, remaining softs and topsoil could also be determined. The existing and predicted volumes of the respective materials available for postmining landform creation are presented in Table 22.

Table 22: Available post-mining landform volumes

Source	Bulking Factor	Volume (m^3)
Predictive Stockpiles (Boxcut)		
Topsoil	1	126 920
Boxcut material (excluding topsoil)	1.107	8 164 891
Predicted mining material not available for use		
Coal Seam MM	1	1 018 931
Coal Seam MBAB	1	4 711 123
Coal Seam MBC1	1	6 044 721
Coal Seam MBC2	1	5 323 912
Coal Seam MBD	1	3 879 406
Predicted mining material (overall excluding Boxcut)		
Topsoil	1	1 111 940
Waste material including softs	1.107	59 535 480
Total material available for use		**60 647 420**
Volume required to achieve post-mining landform (pre-topsoil level)		
Boxcut material		8 164 891
Waste Material including softs		59 535 480
Total volume required (Option 1, 2 & 3)		**68 812 311**

3.10.3.3.2.4 POST-MINING LANDFORM

Three high-level options where investigated for the post-mining landform. The assumptions, considerations and findings are listed below.

- Option 1:
    - A Free draining topography with slopes that limit erosion potential and are consistent with the surrounding topography;
    - Based on the modelling an additional volume of 5 119 314 m^3 will be required over and above the pit material balance to achieve a free draining topography;

- The topography will drain at the South Eastern corner of the pit. However, due to the constraints in elevations, significant cut will have to take place within the wetland buffer sone to ensure free draining;
- Maximum design slopes are 14.29 % (1 in 7). This takes up a 12 % of the overall slope configuration. Flatter slopes between 1 % (1 in 100) and 0.33 % (1 in 300) takes up the remaining 88 % of the slope configuration;
- No final voids/pit lakes will be left post-closure; and
- The conceptual profile is to pre-topsoil level/top of softs elevations.

Figure 24: Option 1 – Freedrain Topography

- Option 2:
  - A Free draining topography will not be possible due to the shortage in volume. Therefore, a final void/pit lake was considered;
  - The size of the pit lake was based on the assumptions made in the geohydrological report (GCS, 2019);
  - The topography will drain towards the pit lake on the South Eastern corner of the pit;
  - Maximum design slopes are 14.29 % (1 in 7). This takes up a 11 % of the overall slope configuration. Flatter slopes between 1 % (1 in 100) and 0.33 % (1 in 300) takes 79 % of the slope configuration with the remainder being the pit lake;

- The concept profile is to pre-topsoil level/top of softs elevations;

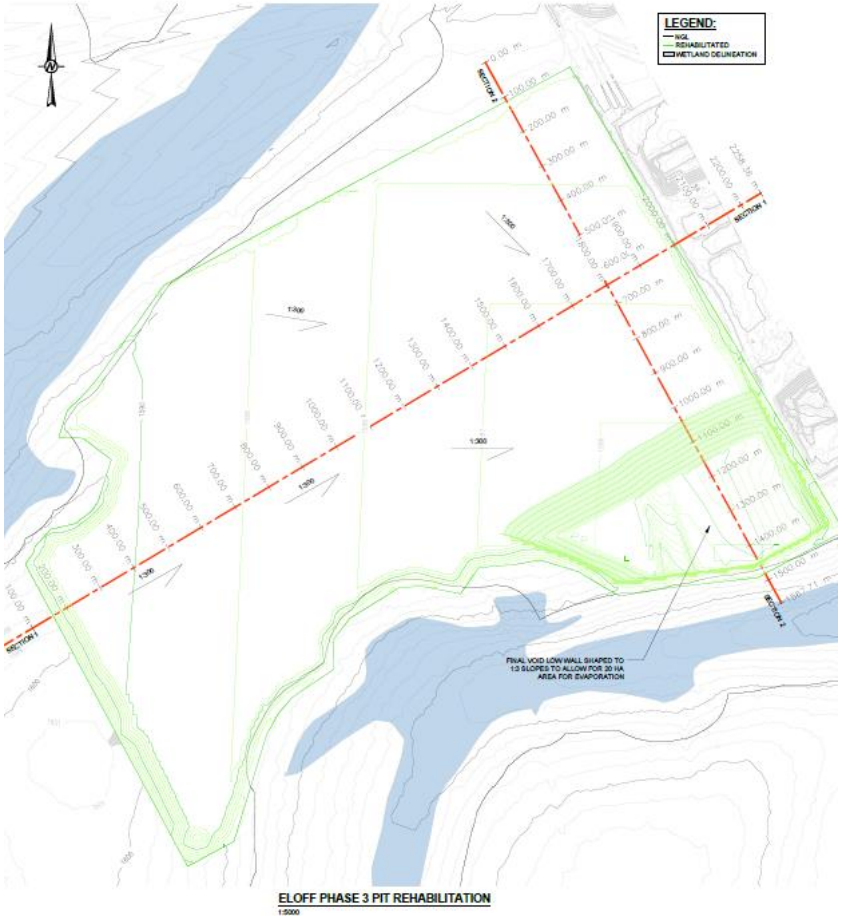


Figure 25: Option 2 – Evaporation final void/pit lake

- Option 3:
    - A Free draining topography will not be possible due to the shortage in volume. An option was modelled to capture all the runoff from the post-mining landform. A worst-case scenario was considered, taking the three wettest months in the last ten years and applying a run-off factor of 50% to determine the size. However, it is recommended that a time-step model is done to refine this. It is assumed that the dam will have to be lined to limit additional surface water recharge;
    - The topography will drain towards the run-off pit on the South Eastern corner of the pit;
    - Maximum design slopes are 14.29 % (1 in 7). This takes up a 9 % of the overall slope configuration. Flatter slopes between 1 % (1 in 100) and 0.33 % (1 in 300) takes 87 % of the slope configuration with the remainder being the run-off pit/dam; and
    - The concept profile is to pre-topsoil level/top of softs elevations.

Figure 26: Option 3 - Run-off pit

The piezometric contour map (static water level) was considered in all three options to ensure that the post-mining landform exceeds those elevations. The effect of the three options on the land use (considering a topsoil depth of minimum 600 mm and 150 mm for arable and wilderness respectively) is summarised in the table below:

Table 23: Land cover area predictions per option.

Option	Arable (Ha)	Wilderness (ha)	Volume required (m^3)	Volume available (m^3)
Option 1	175	24	1 086 000	1 238 860
Option 2	157	22	975 000	
Option 3	174	18	107 1000	

For scheduled closure it is assumed that concurrent operational rehabilitation activities will take place during the operational phase. All measurements and calculations were done with Civil3D modelling to ensure realistic values. Refer to Appendix A for drawings derived from the modelling.

3.10.3.3.2.5 STOCKPILES AND PROCESSING RESIDUES

It is assumed that all stockpiles and residue will be on the Kangala site and is not included in the Eloff costs.

3.10.3.3.2.6 GENERAL SURFACE REHABILITATION

It is assumed that there will be no infrastructure removal at Eloff, therefore no allowance was included in the Eloff costs.

3.10.3.3.3 CLOSURE ASPECTS

Closure monitoring (general / routine rehabilitation, surface water and groundwater) and care and maintenance has been assumed for a period of 5 years following decommissioning and closure of the mine.

3.10.3.3.4 WATER TREATMENT

The water treatment volumes, qualities and timing were obtained from the geohydrological report.

3.10.4 CLOSURE COST ESTIMATION

This section presents the basis of the closure cost component rates and the outcome of the closure cost estimation. Detailed cost estimation spreadsheets are provided in Appendix 1.

3.10.4.1 **COST RATE DESCRIPTION AND ASSUMPTIONS**

3.10.4.1.1 INFRASTRUCTURE AREAS

Closure cost component	Closure cost assessment	
	Unscheduled (2019)	**Scheduled (2040)**
Processing plants, steel structures, reinforced concrete and brick structures, offices, workshops, weigh bridges, stores and related structures and infrastructure.	No allowance was made as this will form part of Kangala's cost.	
Roads	Remove 100 mm from haul roads and rehabilitate; Rip to alleviate compaction; and Prepare for the natural re-establishment by keystone pioneer species.	
Linear infrastructure	*Powerlines*	
	No allowance was made for the removal of powerlines	
	Fences	
	No allowance was made for the removal of fences	
Dirty water impoundments	No allowance was made for the removal for dirty water impoundments, as it assumed that the infrastructure at Kangala will be utilised	
Waste management	*In-pit disposal*	
	No allowance was made as this will form part of Kangala's cost.	

3.10.4.1.2 MINING AREAS

Closure cost component	Closure cost assessment
Open pit	*Option 1*

	• Shaping of the side slopes of the pit (as the post-mining landform will be lower to the original ground) to a 1 in 7 slope; • It is assumed that 30 % will be blasted and 70% dozed to the required elevations; • Allowance was made for the importing of a 150 mm topsoil layer on the side slope to get to a wilderness land use and to revegetate to wilderness specifications; • Allowance was made for all the boxcut material to be imported into the final voids; • A 600 mm topsoil layer has been provided for over the post-mining landform (except side slopes) to achieve a arable land capability and the revegetation of the area to comply to arable land specifications; • Due to the constrains in elevations, allowance was made to cut a valley through the side slope at the south eastern side including a 150 mm topsoil layer and vegetation to comply to wilderness specifications.
	Option 2
	• Shaping of the side slopes of the pit (as the post-mining landform will be lower to the original ground) to a 1 in 7 slope; • It is assumed that 30 % will be blasted and 70% dozed to the required elevations; • Allowance was made for the importing of a 150 mm topsoil layer on the side slope to get to a wilderness land use and to revegetate to wilderness specifications; • Allowance was made for all the boxcut material to be imported into the final voids; • A final void will be left to act as a pit lake. Allowance was made for the shaping of the low wall to a 1 in 3 slope. • A 600 mm topsoil layer has been provided for over the post-mining landform (except side slopes) to achieve an arable land capability and the revegetation of the area to comply to arable land specifications;
	Option 3
	• Shaping of the side slopes of the pit (as the post-mining landform will be lower to the original ground) to a 1 in 7 slope; • It is assumed that 30 % will be blasted and 70% dozed to the required elevations; • Allowance was made for the importing of a 150 mm topsoil layer on the side slope to get to a wilderness land use and to revegetate to wilderness specifications; • Allowance was made for all the boxcut material to be imported into the final voids; • A final cavity/dam will be left to act as a run-off dam to limit surface water recharge. Allowance was made for a liner in the dam to as a zero permeable cover. • A 600 mm topsoil layer has been provided for over the post-mining landform (except side slopes) to achieve an arable land capability and the revegetation of the area to comply to arable land specifications;
Stockpiles	• It is assumed that all stockpiles and residue will be on the Kangala site and is not included in the Eloff costs.

3.10.4.1.3 GENERAL SURFACE REHABILITATION

Closure cost component	Closure cost assessment
General Surface Rehabilitation	It is assumed that there will be no infrastructure removal at Eloff, therefore no allowance was included in the Eloff costs.

3.10.4.1.4 WATER MANAGEMENT

Closure cost component	Closure cost assessment
Re-instatement of drainage lines	• Re-instate natural drainage lines over the site (excluding the areas included under the rehabilitation of final voids, ramps and spoils and residue deposits).

3.10.4.1.5 POST CLOSURE MONITORING AND AFTERCARE

Closure cost component	Closure cost assessment
Surface water and groundwater monitoring	• Quarterly monitoring over a 5-year period at 4 surface water monitoring points, in order to monitor the water quality of the stream; and • Quarterly monitoring over a 5-year period at 10 groundwater monitoring points.
Rehabilitation monitoring	• Assumed over a 5-year period on all areas rehabilitated at scheduled closure.
Care and maintenance	• Assumed over a 5-year period on all areas rehabilitated at scheduled closure.

3.10.4.1.6 ADDITIONAL ALLOWANCES

Closure cost component	Closure cost assessment
Preliminary and general	• Aligned to the DMR guidelines an additional allowance of 12% of the total infrastructural, mining areas and related aspects has been made.
Contingencies	• Aligned to the DMR guidelines an additional allowance of 10% of the total for infrastructure, mining areas and related aspects has been made.

3.10.4.1.7 WATER TREATMENT

Closure cost component	Closure cost assessment
Post-closure water treatment	The following information was gathered from the hydrogeological study and is applicable to option 1 and option 3 **Decant** Volume: 328m³/day Year: 135 - 185 post-closure **Plume migration** Volume: 130m³/day Year: 75 - 134 post-closure A new plant will have to be constructed every 40 years (5 plants combined)

Closure cost component	Closure cost assessment
Contingencies	Aligned to the DMR guidelines an additional allowance of 10% of the total for infrastructure, mining areas and related aspects has been made.

3.10.4.2 CLOSURE COST ESTIMATION SUMMARY- NEMA FINANCIAL PROVISIONS

Notwithstanding the assumptions and limitations presented herein, it is expected that the closure costs documented in this report reflects the real costs for scheduled closure (Option 3). The reflected closure costs objectives provide a good base for future closure costings at Eloff Phase 3. The costing is summarised in Table 24 below.

Table 24: Schedule closure cost estimation summary

Eloff Phase 3 Final Rehabilitation Decommissioning and Closure Costs, as at January 2020		
Closure components		
1	Infrastructural Areas	R 11 762 733.20
2	Mining Areas	R 295 561 916.49
3	P&Gs, Contingencies and Additional Allowances	R 67 611 422.93
4	Pre-site Relinquishment Monitoring and Aftercare	R 7 491 689.01
Total (Excl VAT)		R 381 940 006.00

Please note that the cost estimation above excludes the predicted management of the long term residual and latent environmental impacts. The cost for these impacts are presented in Section 5.2.3.

3.10.4.3 CLOSURE COST ESTIMATION SUMMARY- DMR GUIDELINES

The quantum of financial provisions required for un-scheduled closure using the DMR Master Rates and the Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' provided by a Mine (DMR Guidelines) was also calculated. For the purposes of the quantum using the DMR guidelines it is assumed that un-scheduled closure represents the state of the mine 12 months into commencement. Please refer to Table 25 for a breakdown of the quantum based on the DMR Guidelines.

The following parameters and weighting characteristics were applied:

Project Details:		
Project Risk Class:	A	Coal
Project Area Sensitivity:	High	Located in an area on which the local people make a living.
Weighting Factor 1:	1	Flat topography
Weighting Factor 2:	1.05	Peri-urban: Less than 150 km from a developed urban area

The nature of the closure activities is defined in the DMR Guidelines and excluded specific long term water treatment. The estimated cost for long term water treatment is R 123 060 585.00 (Excl VAT), as per the determination in Section 5.2.3.

Table 25: DMR Master Rates based quantum.

No	Sub-Task	Unit	A. Quantity	B. Master Rate	C. Multiplication factor	D. Weighting Factor 1	E. = A*B*C*D
1	Dismantling of processing plant and related structures (including overland conveyors and power lines).	m3	0	R 15.39	1.00	1.00	R 0.00
2A	Demolition of steel buildings and structures.	m2	0	R 214.39	1.00	1.00	R 0.00
2B	Demolition of reinforced concrete buildings and structures.	m2	0	R 315.95	1.00	1.00	R 0.00
3	Rehabilitation of access roads.	m2	82800	R 38.37	1.00	1.00	R 3 177 036.00
4A	Demolition and rehabilitation of electrified railway lines.	m	0	R 372.37	1.00	1.00	R 0.00
4B	Demolition and rehabilitation of non-electrified railway lines .	m	0	R 203.11	1.00	1.00	R 0.00
5	Demolition of housing and facilities.	m2	0	R 428.79	1.00	1.00	R 0.00
6	Opencast rehabilitation including final voids and ramps .	ha	21	R 218 229.41	1.00	1.00	R 4 582 817.61
7	Sealing of shafts, adits and inclines.	m3	0	R 115.10	1.00	1.00	R 0.00
8A	Rehabilitation of overburden and spoils.	ha	0	R 149 849.36	1.00	1.00	R 0.00
8B	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste).	ha	0	R 186 634.67	1.00	1.00	R 0.00
8C	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste).	ha	0	R 542 075.55	1.00	1.00	R 0.00
9	Rehabilitation of subsided areas .	ha	0	R 125 476.27	1.00	1.00	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas.	ha	21.00	R 118 705.97	1.00	1.00	R 2 492 825.37
11	River diversions .	ha	0	R 118 705.97	1.00	1.00	R 0.00
12	Fencing.	m	0	R 135.41	1.00	1.00	R 0.00

No	Sub-Task	Unit	A. Quantity	B. Master Rate	C. Multiplication factor	D. Weighting Factor 1	E. = A*B*C*D
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required).	ha	21.00	R 45 135.35	1.00	1.00	R 947 842.35
14	Maintenance and Aftercare	Ha	21.00	R 15 797.37	R 1.00	1.00	R 331 744.77
	SUB-TOTAL 1					**1.00**	**R 11 532 266.10**
	Time, Fee and Contingencies						
1	Preliminary and general			Add 12% of Sub-total 1		R 1 383 871.93	
2	Contingencies			Add 10% of Sub-total 1		R 1 153 226.61	
	SUB-TOTAL 2						**R 14 069 364.64**
	VAT			at 15% of Sub-total 3		R 2 110 404.70	
	GRAND TOTAL						**R 16 179 769.34**

3.10.5 ASPECTS REQUIRING FURTHER ATTENTION

Aspects that that require further attention have been identified. These aspects may improve the accuracy of future closure cost estimates:

- A detailed predictive model is suggested to get a better understanding of the steady-state conditions and elevation constrains which will determine if more stockpiling is required during operational phase;
- The treatment volumes were based on the geohydrological report. However, it is highly recommended that an integrated study (hydrology, geohydrological and the effects on the landform study) is done to refine the surface water recharge volumes stated in the report. The report assumes an optimal free-draining topography with ideal run off. However, some of the options explored might have a significant effect on the surface water recharge rates which will influence the water treatment volumes;
- It is recommended that a detailed hydrological assessment is done to refine the details in the options presented in this report; and
- Option 3 assumes a zero-permeability cover for the run-off dam to limit surface water recharge. It is recommended that alternative options are explored (for example a store and a release cover) which will decrease the costs.

3.11 MONITORING, AUDITING AND REPORTING

The requirement to monitor and audit should be carried through all phases of the proposed mine lifecycle. The financial provision regulations require that monitoring, auditing and reporting requirements which relate to the risk assessment (see section 3.1.4), legal requirements (see section 3.3.1) and knowledge gaps (see section 3.8) as a minimum and must include-

(i) a schedule outlining internal, external and legislated audits of the plan for the year, including-

   a. the person responsible for undertaking the audit(s);

   b. the planned date of audit and frequency of audit;

   c. an explanation of the approach that will be taken to address and close out audit results and schedule;

(ii) a schedule of reporting requirements providing an outline of internal and external reporting, including disclosure of updates of the plan to stakeholders;

(iii) a monitoring plan which outlines-

   a. parameters to be monitored, frequency of monitoring and period of monitoring; and

   b. an explanation of the approach that will be taken to analyse monitoring results and how these results will be used to inform adaptive or corrective management and/or risk reduction activities.

This section aims to present the monitoring plan which will need to be implemented in the rehabilitation and decommissioning, and closure phases. For detail on the monitoring requirements during the mining and progressive rehabilitation phase, and the post-closure phase, please refer to Sections 4 and 5 respectively.

For the purposes of this closure plan the monitoring and auditing is separated into two distinct categories namely, compliance monitoring and environmental monitoring. The compliance monitoring will to a large degree align with, and be a continuation of, the requirements of compliance monitoring and reporting as specified in the EMPr.

In accordance with Regulation 11 of the NEMA Financial Provisioning Regulations the Holder must ensure annual review of the annual rehabilitation plan, the final rehabilitation decommissioning and closure plan, as well as the environmental risk assessment. This annual review must be audited by an independent auditor.

It should be noted that there is s requirement for the mine to monitor and report on compliance with the commitments made in the SLP. Regulation 45 of the MPRDA Regulations (GNR527) requires that an annual SLP compliance report is to be submitted.

Table 26 and Table 27 provide the compliance monitoring and reporting plan and the environmental monitoring and reporting plan respectively, applicable to the decommissioning, rehabilitation and closure phase.

In accordance with Regulation 11 of the NEMA Financial Provisioning Regulations the Holder must ensure annual review of the annual rehabilitation plan, the final rehabilitation decommissioning and closure plan, as well as the environmental risk assessment. This annual review must be audited by an independent auditor.

It should be noted that there is s requirement for the mine to monitor and report on compliance with the commitments made in the SLP. Regulation 45 of the MPRDA Regulations (GNR527) requires that an annual SLP compliance report is to be submitted.

Table 26: Compliance monitoring and reporting plan.

Type	Functional Requirement	Responsibility	Frequency	Reporting Mechanism
Daily site inspections	- Undertake site inspections. - Photographic record of site activities. - Data capturing for record and compliance verification purposes. - Daily site inspection diary.	Environmental Officer	Daily	Daily diary.
Weekly Inspection Report	- Ensure compliance with soil stripping, stockpiling and placement plan. - Consolidate daily diary findings. - Verification and update daily diary findings. - Weekly inspection report.	Environmental Officer	Weekly	Weekly inspection report.
Monthly ECO Compliance Report	- Monitor and report on compliance with the requirements of the EA, EMPr, and closure plan and general environmental performance. - Include the results of all relevant environmental monitoring. - Include status of rehabilitation activities. - Include records of: o Waste manifests. o Incident registers.	Environmental Manager/ ECO	Monthly	Monthly compliance report

Type	Functional Requirement	Responsibility	Frequency	Reporting Mechanism
	○ Complaints registers. ○ Site Fauna Observation Register. ○ Topsoil stripping and placement register. ○ Relevant corrective action reports.			
Annual Independent ECO Audit	- Site inspection and photographic record. - Audit and report on compliance with EA, EMPr and FRDCP. - Monitoring compliance with Annual rehabilitation Plan - Alignment with requirements of Appendix 7 of GNR982 (as amended), NEMA.	Independent Environmental Auditor	Annual	Annual Environmental Compliance Audit Report
Annual review of financial provisioning reports in accordance with the requirements of Regulation 11 of the Financial Provision Regulations.	- Review, assess and adjust: ○ Annual Rehabilitation Plan; ○ FRDCP; and - Environmental Risk Assessment. - Ensure on-going compliance with the requirements of the Annual Rehabilitation Plan and the FRDCP.	Independent Specialist.	Annual	Annual Financial Provision Assessment.

Table 27: Monitoring plan- FRDCP

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
Air	- Decommissioning and rehabilitation - Closure	Monitor dust fallout and PM10 if applicable. Standards: National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEMA: AQA): National Dust Control Regulations 2013 (NDCR, 2013). Measured by the ASTM D1739 method. Locations: - Decommissioning and rehabilitation Dust fallout monitoring network as defined for operational phase. - Closure: At receptor or closest boundary point.	The dustfall rates as specified in the NDCR (600 mg/m²/day for residential areas and 1200 mg/m²/day for non-residential areas) are applicable for dust fallout	- Decommissioning and rehabilitation Phase: Monthly - Closure Phase: Initiate monitoring if complaints received and registered. Continue monitoring until at least 2 successive sample events within acceptable limits.	- Monthly dust report. - Ad hoc report (closure phase). - Included in monthly compliance report where applicable.
Groundwater	- Decommissioning and rehabilitation. - Closure	Standards: - SANS 5667-1:2008/ISO 5667-1:2006 Water Quality – Sampling Part 1: Guidance on the design of sampling programmes and sampling techniques. - SANS 5667-3:2006/ISO 5667-3:2003 Water Quality – Sampling Part 3: Guidance	- Monitoring network must comply with the risk-based source-pathway - receptor principle. - Compliance with WUL water quality thresholds. - No deterioration of water quality upstream to downstream.	Quarterly	- Quarterly Monitoring Report- submitted as part of WUL conditions. - Included in monthly compliance report where applicable.

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
		on the preservation and handling of water samples. - SANS 5667-11:2015/ISO 5667-11:2009 Water Quality – Sampling Part 11: Guidance on sampling of groundwater. - Use of SANAS Accredited analytical laboratory. Parameters: - Groundwater level. - Full suite of water quality parameters defined in the EIA Groundwater specialist study. - Volumes of water used for dust suppression (if applicable). Locations: - Existing monitoring boreholes identified in the EIA Groundwater specialist study. - In pit dedicated monitoring borehole (to full depth of backfilled pit). - Dedicated monitoring boreholes down-gradient			

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
		of the potential decant point. - Dedicated plume monitoring boreholes- in the downgradient groundwater flow direction.			
Surface Water	- Decommissioning and rehabilitation. - Closure	Standards: - SANS 5667-1:2008/ISO 5667-1:2006 Water Quality – Sampling Part 1: Guidance on the design of sampling programmes and sampling techniques. - SANS 5667-3:2006/ISO 5667-3:2003 Water Quality – Sampling Part 3: Guidance on the preservation and handling of water samples. - SANS 5667-4:1987/ISO 5667-4:1987 Water Quality – Sampling Part 4: Guidance on sampling of lakes, natural and man-made. - SANS 5667-6:2006/ISO 5667-6:2005 Water Quality – Sampling Part 6: Guidance on sampling of rivers and streams.	- Compliance with defined Resource Water Quality Objectives. - Compliance with WUL water quality thresholds. - No deterioration of water quality upstream to downstream.	Quarterly	- Quarterly Monitoring Report- submitted as part of WUL conditions. - Included in monthly compliance report where applicable.

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
		- Use of SANAS Accredited analytical laboratory Parameters: - Total suspended solids (TSS). - Set of parameters as defined in WUL.			
Wetland and Aquatic	- Decommissioning and rehabilitation. - Closure	Standards: - Standard River Ecosystem Monitoring Programme (Ecostatus) methods. - Wetland WET-Series Parameters: - Monitor for presence of fish. - Overall Aquatic PES. - Wetland PES, functioning and EIS. Locations: - Wetlands: units identified in the EIA Wetland assessment. - Aquatic: alignment with current Kangala Biomonitoring programme.	- SASS5 and ASPT scores should not decrease as and be related to mining activities. - Wetlands: o HGM 1 and 2= Class C PES. o HGM 3= Class C PES.	Bi-annual	Water use licence reporting requirements. Included in monthly compliance report where applicable.

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
Noise (if required)	- Decommissioning and rehabilitation. - Closure	Standards: SANS 10103:2008 for a minimum duration of 10 minutes. Parameters: - LAeq,i (National Noise Control Regulation requirement). - LA90,f (background noise level as used internationally). - LAeq,f (Noise level used to compare with IFC noise limit). Locations: At receptor or closest boundary point.	Compliance with National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008, for rural noise district.	Initiate monitoring if complaints received and registered. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.	- Ad hoc report. - Included in monthly compliance report where applicable.
Biodiversity	- Decommissioning and rehabilitation. - Closure	Standards: - Timed random meander method. - Faunal surveys: camera trapping, visual observation, small mammal trapping. Parameters: - Site Fauna Observation Register (date, time,	- Flora: o Acceptable cover[7] achieved in areas where natural vegetation is being re-established. o Natural areas vegetation structure and species composition to align with local reference	Bi-annual (seasonal)	Included in monthly compliance report where applicable.

[7] Acceptable cover ' means re-establishment of pioneer grass communities over the disturbed areas at a density similar to surrounding undisturbed areas, non-eroding and free of invasive alien plants.

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
		location, description, photo evidence). - Flora and Fauna Surveys: ○ Floristic diversity. ○ Floristic coverage. ○ Faunal diversity. Locations: Random meanders within all defined natural areas.	site: ≥80% of the reference site species richness; <10% of assessment plots failing to meet species richness target. ○ Alien invasive plants not dominating, and presence to align with, and improve on, surrounding local reference sites. - Faunal diversity similar of better than pre-mining surveys.		
Final Landform	- Decommissioning and rehabilitation. - Closure.	Standards: - Land Rehabilitation Guidelines for Surface Coal Mines (LRSSA, 2019). Parameters: - Settlement and subsidence (incl measured settlement factors, settlement in cm/annum, deviation from final post closure land form design, surface water ponding).	Alignment with post closure landform design.	Visual observations for settlement features (ponding, erosion, etc) to be included in ongoing environmental inspections. Annual dedicated survey and measurement to allow for update of landform analysis.	- Included in monthly compliance report where applicable. - Annual landform assessment report to inform and be considered in Annual Independent Environmental Audit and/or annual review of financial provision reports. .

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
		- Material balance (topsoil/overburden/ interburden). - Ha's of corrected/ remediated settlement areas- in order to update financial provisions. - Slope. - Visual observations: Ponding, erosion, Locations: - Settlement: at installed in pit boreholes; annual surface topographical survey of rehabilitated pit.			
Soils	- Progressive rehabilitation during operation. - Decommissioning and rehabilitation. - Closure.	Standards: - Land Rehabilitation Guidelines for Surface Coal Mines (LRSSA, 2019). Parameters: - Soil loss- m^3/ha/annum. - Soil depth. - Topsoil balances from topsoil stripping and placement register- topsoil source, volume, depth, type, stockpile location, placement location.	- Soil loss rates to align with pre-mining rate or suitable local reference site. - Refer to Section 3.9 for the target relinquishment values for the soil survey parameters. - Even topsoil balance (strip/stockpile/place): Ensure at least 85% correlation between soil stockpiled and soil available for rehabilitation.	- Soil survey: Annual - Continuous update of topsoil stripping and placement register.	- Annual soil survey report to inform and be considered in Annual Independent Environmental Audit and/or annual review of financial provision reports. - Topsoil stripping and placement register to be reported together with monthly and

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
		- Soil survey: o Physical parameters: Rock content; Soil Texture; Soil aggregation; Water holding Capacity; Bulk density; Available rooting depth. o Soil Chemistry: pH (KCl); Salinity (as EC); Fertility: P (Bray 1), and K; Organic Carbon; Major Cations (Ca ; Mg ; and Na); and Cation exchange capacity. Locations: - Soil survey locations: o All areas subject to topsoil placement to be split into Sample units <20ha. o Composite samples will be created from at least 20 sub-			annual compliance reporting.

Aspect	Applicable phase	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism
		samples for each defined unit. - Sampling in areas where there is natural grass cover, samples should be taken to a depth of 100mm. Sampling in arable cultivated areas should extend to 150mm.			

4 ANNUAL REHABILITATION PLAN

The annual rehabilitation plan (ARP) aims to:

- review concurrent rehabilitation and remediation activities already implemented;
- establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan;
- establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months;
- identify and address shortcomings experienced in the preceding 12 months of rehabilitation; and
- evaluate and update the cost of rehabilitation for the 12 month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

The purpose of an ARP report is to provide a record containing the relevant information regarding concurrent rehabilitation and remediation activities for the site for the forthcoming 12 months and how these relate to the operation's closure vision, as detailed in the final rehabilitation, decommissioning and mine/production closure plan. The ARP also indicates what closure objectives and criteria are being achieved through the implementation of the plan.

The ARP will be relevant for a period of one year, after which the plan will be updated to reflect progress relating to the rehabilitation and remediation activities in the preceding 12 months and to establish a plan, schedule and budget for the forthcoming 12 months while supplementing the financial provision guarantee or other financial provision instrument if necessary.

4.1 STATUS OF ENVIRONMENTAL MONITORING

The ongoing environmental monitoring as defined in the EMPr and Section 3.11 will inform the success of current rehabilitation and remediation. The results of this monitoring must be considered in the review and update of the ARP, with a view to optimising the progressive rehabilitation activities.

On the basis that the mine has not yet commenced, there is no current monitoring data that can be used. During the annual review and assessment of the financial provisioning reports, the accumulated monitoring data must be consulted.

4.2 SHORTCOMINGS IDENTIFIED DURING THE PRECEDING PERIOD

On the basis that the mine has not yet commenced, no rehabilitation and remediation activities have been implemented. Consequently, no shortcomings have been identified.

4.3 CURRENT REHABILITATION AND REMEDIATION

The aim of this section is to review of the previous year's annual rehabilitation and remediation activities, indicating a comparison between activities planned in the previous year's annual rehabilitation and remediation plan and actual rehabilitation and remediation implemented.

The mine has not commenced and consequently there was no planned, or actual rehabilitation and remediation activities. This section will be populated in the next annual review. Progressive rehabilitation activities will commence once steady state roll over mining is achieved (~2,5 years form commencement).

4.4 PLANNED REHABILITATION AND REMEDIATION

This section aims to present the details of the planned annual rehabilitation and remediation activities or measures for the forthcoming 12 months, including those which will address any shortcomings identified in Section 4.2.

The mine plan will be implemented once all of the relevant approvals and permissions have been received. This FRDCP and associated ARP forms part of the EIA submission to the DMR for consideration in the Environmental Authorisation. On the basis of this EIA process it is expected that a decision (either EA or rejection) is likely to be issued in early-mid July 2020. Assuming that the other relevant approvals are in place it is expected that mining could commence in the fourth quarter of 2020. This ARP is consequently based on rehabilitation and remediation activities which should be implemented for the period October 2020 to July 2021.

It is expected that during the defined period, the following activities may be undertaken:

- Initial pre-mining activities will be undertaken;
- Initial box cut will have started;
- Soils stripped from the box cut will be hauled and stockpiled at the designated stockpile location;
- Management of soil stockpiles will be initiated; and
- Excavation, hauling and placement of overburden at Kangala will commence.

It is understood that at present there is unlikely to be any specific rehabilitation or remediation activities concurrent with mining. Progressing rehabilitation will commence once the mining has reached a steady state of roll over mining. Based on feedback form the mine it is expected that steady state mining is likely to be reached ~2.5 years from commencement.

There are however certain management and mitigation measures associated with the implementation of the EMPr which can be undertaken in the pre-mining phase, which will assist in the effective implementation of the rehabilitation. These include:

- Appointment / assignment of dedicated rehabilitation specialist to ensure ongoing implementation of rehabilitation and closure actions and plans (incl, ARP and FRDCP).
- Ensure that sensitive environmental areas and soil stockpile areas are clearly demarcated to prevent unnecessary disturbance.
- Develop a change management procedure to manage the impact of any changes to the mine plan.
- Conclusion of formal agreement between Kangala and Eloff addressing the allocation of liabilities- and consequent relevant financial provisioning.
- Develop mine layout plan to utilise existing access routes where possible.
- Develop a Biodiversity Monitoring and Action Plan, including revegetation management plan for the rehabilitated areas which are defined as natural areas.
- Develop an Invasive Species Control and Eradication Plan.
- Ensure correct placement of soil stockpiles.
- It is crucial that the current exposed farmland be managed to prevent unnecessary soil loss, contamination or alien invasive infestation.
- Develop and implement an operational phase stormwater management plan to comply with the requirements of GN704 of the National Water Act).
- Develop a landowner agreement with landowners predicted to be affected by the cone of depression that provides for suitable compensation for loss of water availability.

4.5 ANNUAL REHABILITATION COSTING

The aim of this section is to quantify the cost of implementing the planned rehabilitation and remediation activities for the forthcoming 12 month period. This costing section will include:

- an explanation of the closure cost methodology;
- auditable calculations of costs per activity or infrastructure;
- cost assumptions; and
- monitoring and maintenance costs likely to be incurred.

No rehabilitation or remediation activities are planned for this project in the forthcoming 12 month period and consequently no associated costing has been provided. It is anticipated that the annual review of the annual rehabilitation plan, as required under Section 11 of the NEMA GNR 1147, will consider the more detailed works programme at that time and provide for the schedule and budget for rehabilitation for the forthcoming 12 month period – as required.

5 ENVIRONMENTAL RISK ASSESSMENT – LATENT AND RESIDUAL ENVIRONMENTAL IMPACTS

According to the Financial Provisioning Regulations (2015) the objective of the environmental risk assessment report that relates to latent and residual impacts is to:

- ensure timeous risk reduction through appropriate interventions;
- identify and quantify the potential latent environmental risks related to post closure;
- detail the approach to managing the risks;
- quantify the potential liabilities associated with the management of the risks; and
- outline monitoring, auditing and reporting requirements.

This section of the report aims to address these objectives separately in cases where they have not been considered in previous sections.

5.1 THE ASSESSMENT PROCESS USED AND DESCRIPTION OF LATENT ENVIRONMENTAL RISK

The EIA Report provides a detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken for the proposed exploration. Further details of the risk assessment methodology are detailed in the Environmental Risk Assessment (ERA) under Section 3.1.4 of this report. As mentioned under Section 3.1.4, the EIA and EMPr have identified mitigation measures which, once implemented successfully, will result in the avoidance or acceptable reduction of the associated impact. The two latent and residual risks identified are described in further detail in the sub-sections below.

5.1.1 DECANTING OF POOR-QUALITY WATER FROM REHABILITATED PIT

This impact was identified, described and assessed by the EIA groundwater specialist. The description of the impact is extracted from the groundwater specialist report (GCS (Pty) Ltd, 2019). Please refer to this report for further detail.

Decanting of a mine void generally occurs because of an excess volume of water that cannot be “absorbed” by the aquifer system. This excess water is generated by the increase in recharge over the disturbed backfilled mining area and the increase in transmissivity in the pit due to the broken- up rock.

Decanting can however be prevented by simply controlling the water level. This is done by drilling a borehole into the deepest part of the rehabilitated pit, and when necessary, abstracting water from it to lower the water level and thus keeping it below the decant elevation. This pumped water will have to be treated or used in other mining-type applications since it will be of unacceptable quality to release into the environment.

Another method involves leaving a void open at the decant position, which will allow evaporation to keep the water level below the decant elevation. It is recommended that a study be undertaken on the feasibility of a final void to control surface decant. Based on first order calculations and an evaporation rate of ±1,700 mm/a (Water Resources of South Africa, 1990), the size of the void should be in the order of 120,000 m^2.

During decommissioning, and for a certain time after closure, the geohydrological environment will dynamically attain a new equilibrium after the dewatering effects of the opencast workings. Decant predictions in an opencast mining environment is affected by the following:

- The mean annual precipitation (MAP),
- Recharge to the mine void, expressed as a percentage of the MAP. Recharge on the other hand is affected by:
    - The size of the surface area disturbed by mining activities,
    - The permeability of the backfill material,
    - Surface water runoff,
- The overall porosity of the rehabilitated pit area,
- The groundwater contribution to pit water, which is determined by the hydraulic properties of the surrounding aquifer host rock/s.

The groundwater gradient within a rehabilitated opencast pit is generally low because of the high permeability of the backfill material. Decanting of an opencast pit is therefore most likely to occur wherever the pit intersects the lowest surface elevation. The expected time it will take the proposed pit to fill with water after mine closure was calculated with the use of volume/recharge calculations and the results are provided in Table 28. The most probable decant position is also indicated on Figure 27.

Post closure decanting of the rehabilitated pit is expected to occur approximately 134 after mine closure at a surface elevation of 1,589 metres above mean sea level (mamsl) and at an estimated rate of approximately 119,728 m^3/a (~ 328 m3/d or ~ 3.8 l/s).

Table 28: Time to fill calculations.

General information		
Description	Units	Eloff Block
Surface area	m^2	1 847 361
Decant elevation	m amsl	1 594
Total void volume	m^3	94 221 924
Mean annual rainfall	m/a	0.669
Backfilled void volume		
20% Porosity	m^3	18 844 385

General information		
25% Porosity	m^3	23 555 481
30% Porosity	m^3	28 266 577
Rainwater contribution		
6% Recharge	m^3/a	74 153
8% Recharge	m^3/a	98 871
10% Recharge	m^3/a	123 588
Groundwater contribution		
Average	m^3/a	76 650
Time to fill		
Most probable scenario (25% Ø and 8% RCH)	Years	134

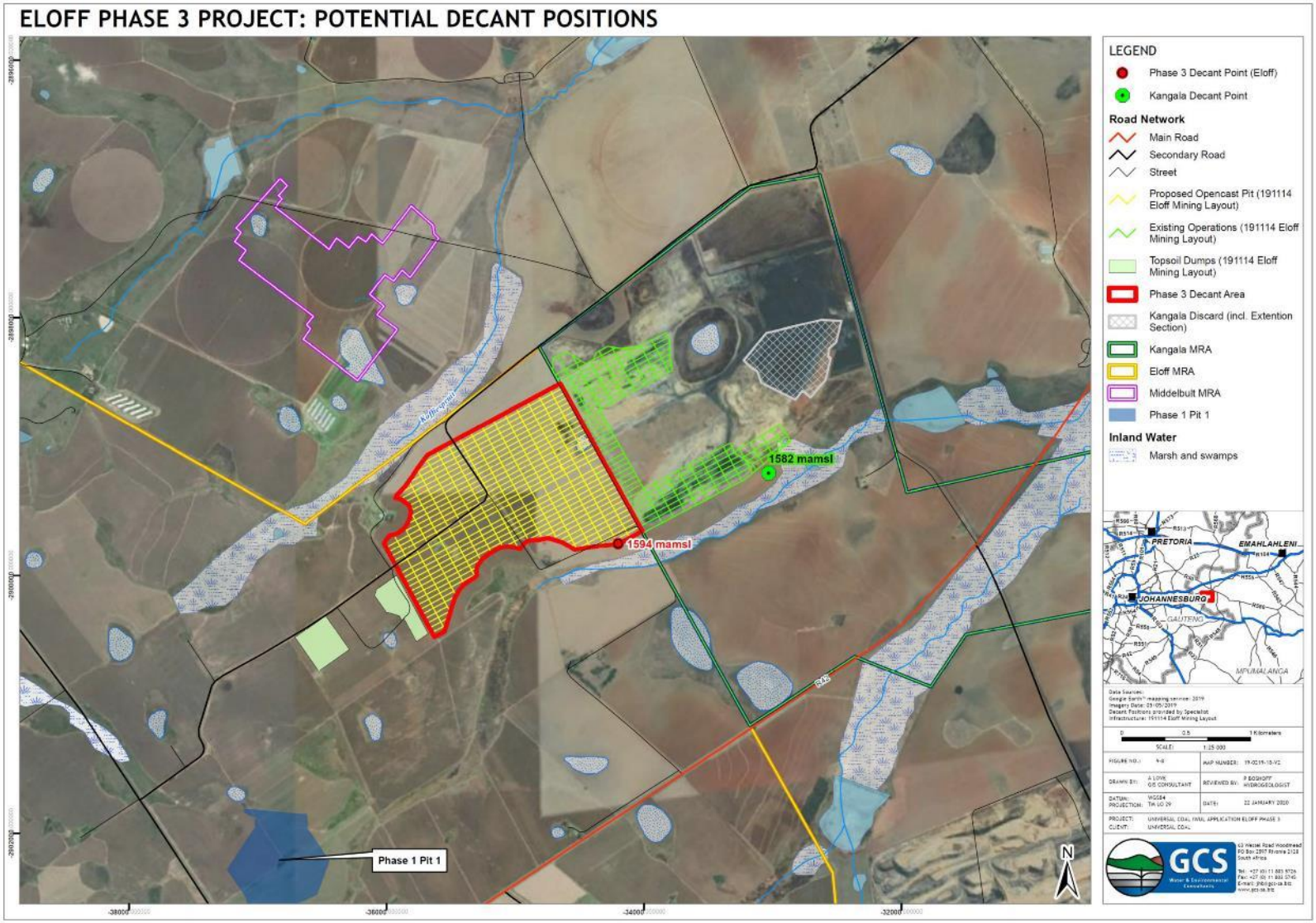


Figure 27: Potential decant positions.

5.1.2 MIGRATION OF RESIDUAL CONTAMINATION AFTER REHABILITATION

This impact was identified, described and assessed by the EIA groundwater specialist. The description of the impact is extracted from the groundwater specialist report (GCS (Pty) Ltd, 2019). Please refer to this report for further detail.

The contaminant transport model was used to simulate/predict the post closure migration of contamination plumes, more specifically 25, 50, and 75 years after closure (see Figure 28 and Figure 29). Groundwater levels were simulated to have largely recovered from the impacts of pit dewatering at ±60 years post closure, resulting in the pit no longer acting as a sink. Contamination was consequently simulated to follow the pre-mining groundwater flow directions/patterns, which because of a local groundwater divide are towards both the north-east and north-west.

Contaminant plume concentrations (TDS) were simulated to increase over time, i.e. ±69% increase from mine closure to 25 years post closure and a further ±36% increase over the next 50 years to reach nearly 1 330 mg/l. At 75 years post closure no user boreholes were simulated to be affected by the contamination. The contamination plume was however simulated to reach the positions of the two Bronkhorstspruit tributaries located to the north and south of the proposed opencast pit at a maximum TDS concentration of around 250 mg/l. The groundwater baseflow volume towards the affected portions of the northern and southern tributaries was simulated with the numerical groundwater flow model to be in the region of 60 m^3/d.

Based on the model simulated plume concentrations at 75 years post closure and above discussed baseflow volume, the total salt load (at times when the tributaries do receive groundwater baseflow) was estimated to be approximately 15 kg/d.

Note of Importance: The contamination plume was simulated to have penetrated the Dwyka aquiclude at 75 years post closure. The maximum plume concentration (TDS) in the dolomite aquifer was however simulated to be less than 1 mg/l. The proposed opencast mining and related activities are therefore not expected to pose any significant threat to the groundwater quality of the underlying dolomite aquifer.

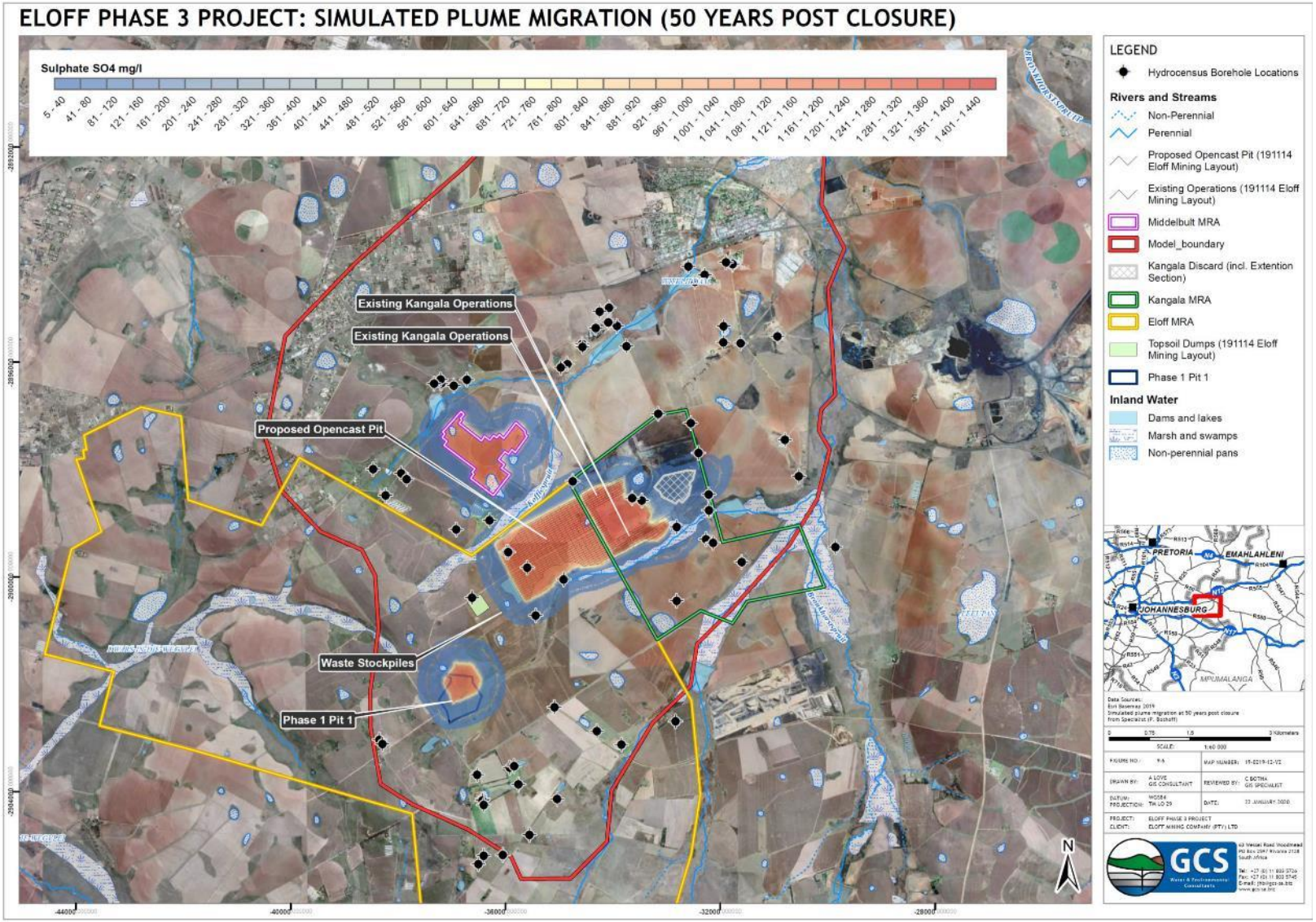


Figure 28: Simulated Plume Migration (50 Years Post Closure).

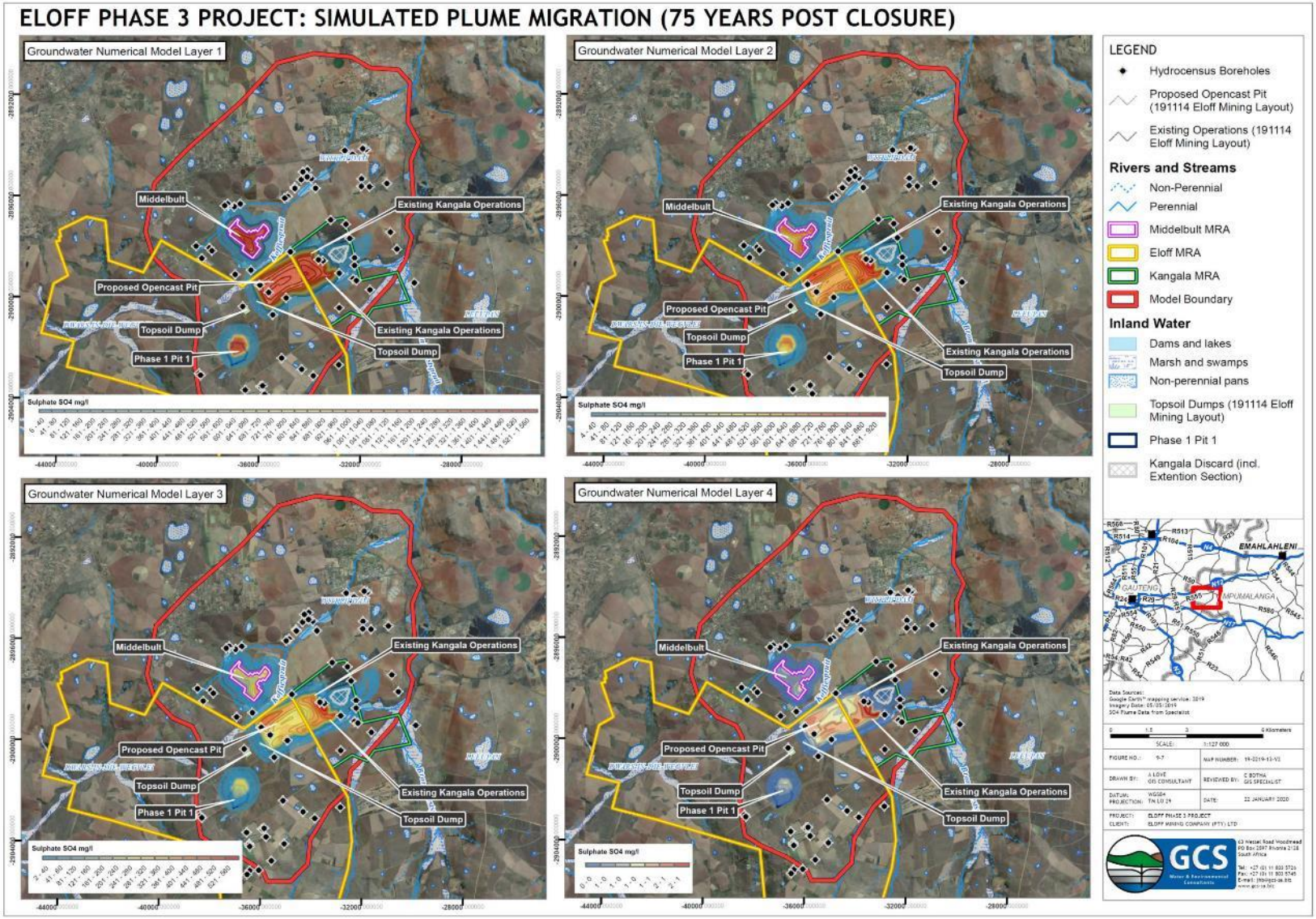


Figure 29: Simulated Plume Migration (75 Years Post Closure).

Table 29: Latent and residual risks.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Impact Drivers	Impact Timeframes	Impact Triggers	Closure Options/Actions
Water	Decanting of poor-quality water from rehabilitated pit.	-20.00	- A monitoring borehole should be drilled into the rehabilitated opencast pit to monitor the rate at which it fills with water; - This same monitoring borehole can also be used to manage the water levels and prevent the pit from decanting; - The pit should be flooded as quickly as possible to minimise the oxidation of metal sulphides (Acid Mine Drainage – AMD). Once the pit is flooded, surface water should be	-5.50	Rate of pit recharge/ flooding. The geochemical characteristics of the pit backfilled material. The site specific geological profile and features.	~134 years following cessation of mining (refer to section 5.1.1). For the purposes of this closure assessment it is assumed that the mine affected water will continue to be of an unacceptable quality for 100 years.	Water level in rehabilitated pit reaches decant elevation- i.e. ~1 589mamsl. The actual quality of the decant water exceeding acceptable limits.	Management of contamination plume to prevent decant into surface water resources- options include pump and treat/ final void or surface evaporation/ evapotranspiration. Provision of adequate post closure monitoring and rehabilitation fund. Develop and implement Post Closure Land Management and Monitoring Plan.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Impact Drivers	Impact Timeframes	Impact Triggers	Closure Options/Actions
			diverted away from it; and - A final void is, however, the preferred method of managing the post-closure decant.					
Groundwater	Migration of residual contamination after rehabilitation	-12.00	- Dedicated plume monitoring boreholes should be drilled in the down gradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration; and - Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation	-5.50	Rate of pit recharge/ flooding. The geochemical characteristics of the pit backfilled material. The site specific geological profile and features. Dilution potential of receiving waterbodies.	~75 years following cessation of mining. For the purposes of this closure assessment it is assumed that the mine affected water will continue to be of an unacceptable quality for 100 years.	Mine affected groundwater plume intersects local surface waters. Plume contribution to baseflow exceeds acceptable levels.	Management of contamination plume to prevent decant into surface water resources- options include pump and treat/ final void or surface evaporation/ evapotranspiration. Provision of adequate post closure monitoring and rehabilitation fund. Develop and implement Post Closure Land Management and Monitoring Plan.

Aspect	Impact	Pre-mitigation risk	Suggested Mitigation Measures	Post-mitigation risk (post-mitigation)	Impact Drivers	Impact Timeframes	Impact Triggers	Closure Options/Actions
			boreholes may be considered.					

5.2 MANAGEMENT ACTIVITIES, COSTING AND MONITORING REQUIREMENTS

Prevention through accuracy of implementation is the key to addressing and reducing possible latent and residual impacts.

5.2.1 MONITORING REQUIREMENTS AND CORRECTIVE MANAGEMENT

Section 3.11 provides a breakdown of the monitoring and auditing requirements for the operation, rehabilitation and decommissioning, and closure phase. Certain of these monitoring requirements will be extended in some form through into the post closure phase. The post closure phase monitoring will aim primarily to monitor key drivers and parameters which directly relate to the predicted latent and residual impacts, and where applicable to trigger management and mitigation activities associated with these.

Table 30 presents the proposed monitoring requirements post closure, as well as the relevant mechanisms for adaptation.

Table 30: Post closure monitoring requirements.

Aspect	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism	Adaptive management action
Groundwater	Standards: - SANS 5667-1:2008/ISO 5667-1:2006 Water Quality – Sampling Part 1: Guidance on the design of sampling programmes and sampling techniques. - SANS 5667-3:2006/ISO 5667-3:2003 Water Quality – Sampling Part 3: Guidance on the preservation and handling of water samples. - SANS 5667-11:2015/ISO 5667-11:2009 Water Quality – Sampling Part 11: Guidance on sampling of groundwater. - Use of SANAS Accredited analytical laboratory. Parameters: - Groundwater level. - Indicator parameters as identified by the groundwater specialist. Locations: - In pit dedicated monitoring borehole (to full depth of backfilled pit). - Dedicated monitoring boreholes up/down-gradient of the potential decant point.	- Monitoring network must comply with the risk-based source-pathway - receptor principle. - Compliance with WUL water quality thresholds. - No deterioration of water quality upstream to downstream. - Trend analysis in relation to identified latent impact trigger.	Biennial	Biennial water quality report.	Undertake a final groundwater model update as and when the following is achieved: - The in-pit groundwater levels reach 80% of the predicted decant elevation. - Indicator parameters reach trigger values at dedicated plume monitoring boreholes (i.e. prior to reaching the surface water features). The revised groundwater model to be used to refine and revise the long term water management/ treatment actions.

Aspect	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism	Adaptive management action
	- Dedicated plume monitoring boreholes- in the downgradient groundwater flow direction.				

5.2.2 MANAGEMENT AND MITIGATION ACTIVITIES

The monitoring plan described above will provide invaluable insight into the likelihood that the risk will materialise and the expected timeframes and durations of the impacts. On the basis of the current risk assessment and predictive methods, it is expected that certain post closure management activities and mitigation measures will be required. Table 31 presents the impacts and associated mitigation measures identified once the impact in manifest. The alternatives considered and the motivation for the proposed alternatives are also presented.

Table 31: Post closure management activities and mitigation measures.

Impact/ risk	Mitigation alternatives	Selected Alternative
Decanting of poor-quality water from rehabilitated pt.	Final void. Pit borehole pump and treat. *please refer to section 3.3.3	Pit borehole. Pump and treat mine affected water.
Migration of residual contamination after rehabilitation.	Installation of interception trenches. Installation of installation boreholes.	On the basis that interception trenches may result in further surface disturbance and impact on the final post closure land use, it is suggested that interception boreholes are sited, drilled, and that once relevant triggers are achieved the water is pumped and treated.

5.2.3 COSTING ESTIMATION

The basis, assumptions and limitations used in the determination of this cost are as follows:

- The following information was gathered from the hydrogeological study and is applicable to option 1 and option 3:
    - Decant Volume: 328m³/day.
    - Duration in year: 135 - 185 post-closure[8].
    - Plume migration: Volume: 130m³/day.
    - Duration in Year: 75 - 134 post-closure.
- Once abstraction from the in-pit boreholes commences this is likely to slow down or remove the plume seepage flows and the treatment volumes after year 134 do not include the plume interception volumes.
- IF an RO plant is installed then a new plant will have to be constructed every 40 years (5 plants combined). If a passive treatment facility is constructed then this plant will most likely require re-construction every 20 years.
- Water qualities and costs were based on an actual coal site in Mpumalanga which will be the most representative values for Eloff as well, as it is a coal mine in the same area.

[8] Without kinetic geochemical testing it is not possibly to accurately predict the duration of AMD. For the purposes of this financial provision report 50 years post commencement of plume interception and decant has been assumed. This duration must be reviewed once the requisite kinetic tests are completed.

Constituent / Indicator	Limit	Actual (95th Percentile)
pH	6.0 – 9.0	3.71
Total Dissolved Solids (TDS)	520mg/l	1845mg/l
Chemical Oxygen Demand	75mg/l	103mg/l
Magnesium (Mg)	70mg/l	92.8mg/l
Aluminium (Al)	0.1mg/l	26.2mg/l
Sulphates (SO_4)	200mg/l	1303mg/l
Manganese (Mn)	0.990mg/l	21.4mg/l
Fluoride (F)	2.5mg/l	8.1mg/l
Iron (Fe)	0.3mg/l	18.8mg/l
Zinc	0.1mg/l	1.88mg/l

- In the actual study several alternative active and passive treatments were considered, but reverse osmosis was most effective with regards to cost and solving the problem at hand.

Process	Reverse Osmosis	SAVMIN	Barium Precipitation	Biosure/ CSIRO-Sure	Bio-reactor
Electricity	R 134 156	R 66 205	R 80 029	R 35 522	R 29 555
Chemicals	R 233 400	R 325 116	R 265 500	R 157 423	R 871 134
Staff Costs	R 80 000	R 80 000	R 110 000	R 60 000	R 60 000
Maintenance	R 13 300	R 9 100	R 10 100	R 11 900	R 4 600
Monthly Operating Cost	**R 460 900**	**R 480 421**	**R 465 629**	**R 264 845**	**R 965 288**
R/m³	R7.50	R7.90	R7.70	R4.40	R15.90

- Reverse osmosis involves the movement of contaminated water through a semi-permeable membrane under high pressure through high pressure pumps. It can therefore treat numerous types of waste water. A disadvantage of the reverse osmosis process is that certain salts will precipitate onto the membrane when their respective solubility limits are exceeded as the brine stream becomes more concentrated. The membrane may be severely affected by fouling or other scaling problems which inhibits permeability. A second disadvantage is the management and treatment of the highly concentrated brine stream.

- Reverse osmosis has been successfully implemented for second stage treatment of AMD where high quality water reclamation is required. Pre-treatment such as neutralization and precipitation is most often necessary to reduce fouling of the membrane. Separate treatment processes is also required to remove iron, manganese and aluminium. Pre-treatment requirements and high energy cost makes this process expensive to operate.

- Process Advantages

    - Process can produce an effluent that will comply with the requirements. Existing plants installed in South Africa confirm the effectiveness.

    - Risk that effluent will not comply with the requirements is small.

    - A modular system can be installed. Large part of the system can be salvaged for re-use elsewhere.

- The process is relatively easy to operate.

- Process Disadvantages
  - Pre-treatment of the mine water is required prior to the RO process.
  - The pre-treatment process requires high quantities of lime.
  - Large volumes of sludge/brine are produced which must be managed and disposed of.
  - Electricity consumption is high.

- The cost for brine management is excluded from this assessment.

Table 32: Post Closure Cost Estimate

Eloff Phase 3 Post Closure Costs, as at January 2020				
Closure components		**Scheduled Closure**		
		Option 1	**Option 2**	**Option 3**
5	Post Closure Phase	R123 060 585.00	R -	R123 060 585.00
	Total Excl. VAT.	**R123 060 585.00**	**R -**	**R123 060 585.00**

Appendix 1: Detailed closure cost estimation

	Closure Component	Scheduled Closure - Option 3			
		Quantity	Unit	Unit rate	Total cost
1	**Infrastructural Areas**				
1.1	**Roads and paved surfaces**				
1.1.1	**Rehabilitation of haul roads**				
	Doze surface area to remove 10cm of contaminated soil	33975	/m3	R22	R737 503
	Load and haul	33975	/m3	R27	R912 569
	Rehabilitation of haul roads	339750	/m2	R29	R9 712 862
	Sub-total for Roads and paved surfaces				**R 11 362 933**
	Sub-total for Infrastructural Areas				**R11 362 933**
2	**Mining Areas**				
2.1	**Open pit rehabilitation including final voids and ramps**				
2.1.1	**Pit side slope shaping to 1 in 7**				
	Dozing of side slopes	212 625.00	/m3	R22	R4 615 497
	Blasting of side slopes	63 787.50	/m3	R21	R1 360 463
	Import 150 mm cover material from topsoil stockpiles for side slopes of rehabbed area for wildlife purposes	18.00	/ha	R152 851	R2 751 319
	Revegetation over the face of side slopes for wildlife purposes	18.00	/ha	R9 217	R165 906
2.1.2	**Final voids rehabilitation**				
	Load and haul for infill of final voids to relevant levels	8 164 891.00	/m3	R27	R219 308 972
	Import 600 mm cover material from topsoil stockpiles for Arable land purposes	169.00	/ha	R254 752	R43 053 046
	Revegetation over the face for Arable area	169.00	/ha	R59 662	R10 082 857
2.1.3	**Run-off dam**				
	Load and haul excavation to pit	289 821.00	/m3	R27	R7 784 592
	Level and shaping of side slopes of run-off dam	9 785.00	/m3	R13	R127 443
	Excavation around circumference of dam for anchor trenches	306.00	/m3	R39	R11 820
	Supply and install 2mm HDPE liner to line run-off dam (includes anchor trench)	70 000.00	/m2	R90	R6 300 000
	Sub-total for Open pit rehabilitation including final voids and ramps				**R 295 561 916**
	Sub-total for Mining Areas				**R 295 561 916**
	Sub-Total 1 (for infrastructure and related aspects)				**R306 924 850**

	Closure Component	Scheduled Closure - Option 3			
		Quantity	Unit	Unit rate	Total cost
3	**P&Gs, Contingencies and Additional Allowances**				
3.1	**Preliminaries and general**	12	/sum	R 36 830 982	R 36 830 982
3.2	**Contingencies**	10	/sum	R 30 692 485	R 30 692 485
	Sub-Total 2 (for Additional Allowances)				**R 67 523 467**
4	**Pre-site Relinquishment Monitoring and Aftercare**				
4.1	**Surface water quality monitoring**	5	/yr	R 113 712	R 568 560
4.2	**Groundwater quality monitoring**	5	/yr	R 277 632	R 1 388 160
4.3	**Rehabilitation monitoring of rehabilitated areas**	720	ha	R 3 000	R 2 160 000
4.4	**Care and maintenance of rehabilitated areas**	350	ha	R 9 643	R 3 374 969
	Sub-Total 3 (for Monitoring and Aftercare aspects)				**R 7 491 689**
5	**Post Closure Phase**				
5.1	**Post-closure water treatment**	1	sum	R 123 060 585	R 123 060 585
	Sub-Total 4 (for Post-Closure aspects)				**R 123 060 585**
"Grand Total Excl. VAT. (for Sub-total 1 +2 +3 +4) "					**R 505 000 591**

Appendix 2: Landform analysis drawings