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Enviro INSIGHT
environmental impact assessments

Appendix G:

Rehabilitation, Decommissioning and Closure Plan

ENVIRONMENTAL & ENGINEERING

REPORT

VANDABYTE (PTY) LTD

FINAL REHABILITATION, DECOMISSIONING AND MINE CLOSURE PLAN: ANNUAL REHABILITATION

DMR REF: MP30/5/1/2/2/10237MR

PORTIONS 1, 2 AND THE REMAINING EXTENT OF THE FARM DUNBAR 189 IS, PORTION 1 OF THE FARM MIDDELKRAAL 50 IS, PORTION 6 OF THE FARM HALFGEWONNEN 190 IS. - MPUMALANGA PROVINCE.

2019/09/30

VER 0.2

Document and Quality Control:

Document No:	19-728-MCQ (Rehabilitation, decommissioning and closure plan)			
AA – draft	2019/09/30	Henno Engelbrecht		First draft for review / comments
BB – draft	2019/09/30	Vernon Siemelink		Technical Review
CC– draft	2019/10/01	Leoni le Roux		Quality review
DD– draft	Reviewed	Client	Signed	Client review
Approved for Distribution:				
0.2	2019/10/07	Henno Engelbrecht		Final report

Quality Control BY:

Nature of Signoff:	Responsible Person:	Role / Responsibility	Qualification
Author	Henno Engelbrecht	Environmental Assessment Practitioner Rehabilitation, Decommissioning and Mine Closure Specialist	B.Sc. Hons Env Mgmt and Analysis M.Sc. Project Mgmt
Quality Reviewer	Leoni le Roux	Administrator	Professional Secretary and Personal Assistant
Reviewer	Vernon Siemelink	Senior Environmental Consultant ISO 14001:2004 Auditor	M(EnvMan) Environmental Management UP

DISCLAIMER:

This is a legally binding document and many of the actions and recommendations remain the responsibility of the client (as the owner/lessee of the property).

EAP - was independent and performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application; have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity; ensure compliance with these Regulations;

Take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

The findings, results, observations, conclusions and recommendations provided in this report are based solely on the information provided to Eco Elementum (Pty) Ltd by the Client and other external sources (including previous site investigation data and external scientific studies). The opinions expressed herein apply to the site conditions and features which existed at the time of commencement of the investigations and production of this report.

The author has utilised his/her best scientific and professional knowledge in preparing this report and the content herein contained is and remains confidential in nature, save where otherwise ordered by a Court of law.

Whilst Eco Elementum (Pty) Ltd exercises due care and diligence in rendering the services and preparing this report, the accuracy of the content herein contained is reliant on the accuracy, correctness and completeness of information and/or data supplied to it by the Client. In this regard, Eco Elementum (Pty) Ltd accepts no liability for any loss and/or damages arising out of the inaccuracy of this report in instances where the information and/or data provided to it by the Client is found to be inaccurate, incorrect and/or incomplete.

DECLARATION OF INDEPENDENCE

I, Henno Engelbrecht, declare that;

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing:
    - any decision to be taken with respect to the application by the competent authority; and
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

2019/10/07

Signature **Date**

Mr. Henno Engelbrecht
B.Sc. Hons Env Mgmt and Analysis
M.Sc. Project Mgmt

EXPERIENCE OF THE SPECIALIST THAT PREPARED THE PLAN

Name	Henno
Surname	Engelbrecht
Company	Eco Elementum (Pty) Ltd
Position	Director – Environmental Assessment Practitioner
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Telephone Number	082 690 9105 / 012 348 5214
Education	- B.Sc. Geography (Cum Laude) (University of Pretoria). - BSc Honors Environmental Management and Analysis (Cum Laude) (University of Pretoria). - MSc Project Management (Thesis Cum Laude) (University of Pretoria).
Professional summary	Mr. Henno Engelbrecht has 10 years working experience as an Environmental Consultant and he has specialized in Environmental Management and Analysis. Mr. Henno Engelbrecht has worked for Environmental Assurance Pty (Ltd) as an environmental consultant since completing his studies until mid-2013 and has served an array of clients in various fields of environmental practice. He also has vast environmental monitoring and measurement, environmental authorisations, mine closure, and environmental impact assessment experience and has worked with in various project teams, up unto the level of Programme Manager where he was responsible for all the projects which fell within the Environmental Assurance (Pty) Ltd programme. His expertise has led to his specialist inputs and studies to be used in several Environmental Impact Assessments, Water Use License Applications, Waste License Applications, Air Emission License Applications and Mine Closure/Rehabilitation Planning Activities. Henno also holds the MSc Project Management degree at the Engineering Faculty at the University of Pretoria. He has worked in mining, industrial, natural and construction environments but his expertise lies mainly within the mining sector and currently holds the position of Director at Eco Elementum (Pty) Ltd.
Skills	- Mine Closure financial quantum determination, mine closure planning and reporting. - Rehabilitation planning, reporting, management and coordination of opencast and underground mining. - Ambient air quality monitoring, measurement and implementation (passive and active) in accordance to the National Environmental Management: Air Quality Act 39 of 2004, Government Notice 248 NEM: AQA (39/2004) which contains the Listed Activities, and the National Ambient Air Quality Standards (SANS 1929: 2005). - Noise monitoring and measurement according to SANS 10103:2008, the measurement and rating of environmental noise with respect to annoyance and to speech communication and SANS 10328:2008, Methods for environmental noise impact assessment. - Water quality monitoring, measurement, reporting and data analyses including surface water, ground water, process water, sewage water and biological indicators. - Groundwater hydrocensus studies – borehole surface water depth monitoring, measurement, transections and analysis. - ISO 14001 Environmental Management Systems auditing, system implementation, training and environmental analysis (creation of aspect/impact registers, contractor training, general environmental awareness training, legal compliance audits, GAP analysis, documentation reviews, roles and authority allocations etc.) - Legal compliance auditing and reporting in accordance with the National Environmental Management Acts and other associated environmental related (NEMA listed activities, Air Quality Act listed activities, Water Use Licensing, Waste Licensing, Air Emissions Licensing etc.) - Environmental training (various – contractor training, monitoring and measurement training, awareness training). - Environmental impact assessments and Integrated Water Use License Applications. - Environmental Management Plan development, monitoring, compliance auditing etc. - Environmental Control Officer Site inspections- non-conformance reporting (NCR), corrective action request (CAR) and preventative action request (PAR).

EXECUTIVE SUMMARY

Vandabyte (Pty) Ltd (hereafter the applicant) has appointed Enviro-Insight CC as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations (EAs) associated with the proposed Dunbar Coal Mine. The applicant has obtained a Prospecting Right (reference number MP 30/5/1/1/2/10737 PR) on 22 May 2014 from the Mpumalanga Department of Mineral Resources (DMR) to prospect for coal in an area of 1 797 ha on a Portion of Portion 1, Portion 2 and the remaining extent of the Farm Dunbar 189 IS, Portion 1 of the Farm Middelkraal 50 IS and Portion 6 of the Farm Halfgewonnen 190 IS located in Mpumalanga Province. The mining right application lodged on 9 May 2019 to the DMR (reference number MP30/5/1/2/2/10237MR) includes the abovementioned properties and extent. The proposed Project triggers the requirement for an environmental authorisation in terms of section 24 N of the National Environmental Management Act (Act 107of 1998) (NEMA) and has followed a Scoping and Environmental Impact Report (S&EIR) process in terms of NEMA Regulation 982, 2014. This report addresses the National Environmental Management Act (Act No. 107 of 1998): Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations Government Gazette Notice No. 1147 issued on 20 November 2015. The following table summarize the references to the specific chapters and sections where the requirements of the aforesaid legislation have been dealt with in the report.

The scope and objectives of this report aims to ensure the Department of Mineral Resources (DMR) is presented with a document that addresses all the legal requirements as presented the previous section while ensuring it's presented in a format that can be measured and audited in due course while giving effect to the post-mining end land use of the disturbed footprint as a result of the mining activities. The annual rehabilitation plan will form a component of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 and will be subjected to the same requirements of the environmental management programme with regards opportunities for stakeholder review and comment as well as auditing.

The Dunbar Colliery is a Greenfields project that has not yet been started. Concurrent rehabilitation forms part of their final landform design and mine plan. Landform design is required to include, a final topography that coincides with all the surface drainage areas of the site. The best result of a final topography can be achieved when the landform is designed during the early stages of the operation. The aim of the final landform is to ensure that the topography blends into the surrounding landscape. The landform redesign will encourage the flow of site runoff to bypass the discard areas in order to aid in the prevention of further contamination of water.

Concurrent rehabilitation will include: Concurrent backfilling sequence and removal of salvageable equipment; Removal, decommissioning and demolition of infrastructure not required for ongoing mining; Hydrocarbons – Removal of fuel storage and refueling bays; and Chemical – contaminated plant & equipment removal.

At this point of the Greenfield project no gaps and shortcoming are identified and cost of concurrent rehabilitation is estimated to be **R13 330 768.07 (Excl. VAT).**

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PROJECT INFORMATION

Table 1: Applicant Details

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File Reference Number DMR:	MP 30/5/1/12/2/ 10237MR

Table 2: EAP Details

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Contact Number:	012 807 0637
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Table 3: Specialist Details

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Website:	www.ecoelementum.co.za

1. INTRODUCTION AND BACKGROUND

Vandabyte (Pty) Ltd (hereafter the applicant) has appointed Enviro-Insight CC as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations (EAs) associated with the proposed Dunbar Coal Mine. The applicant has obtained a Prospecting Right (reference number MP 30/5/1/1/2/10737 PR) on 22 May 2014 from the Mpumalanga Department of Mineral Resources (DMR) to prospect for coal in an area of 1797 ha on a Portion of Portion 1, Portion 2 and the remaining extent of the Farm Dunbar 189 IS, Portion 1 of the Farm Middelkraal 50 IS and Portion 6 of the Farm Halfgewonnen 190 IS located in Mpumalanga Province. The mining right application lodged on 9 May 2019 to the DMR (reference number MP30/5/1/2/2/10237MR) includes the abovementioned properties and extent.

Enviro-Insight appointed Eco-Elementum to undertake the Final Rehabilitation, Mine Closure and Decommissioning Plan for the Dunbar Coal project.

The Integrated Environmental Authorisation (IEA) application includes the above-mentioned properties where the proposed mining blocks identified, and associated infrastructure will be located on Portion 2 of the Farm Dunbar 189 IS.

There is enough data available for Dunbar West to make an initial assessment of its potential. Both Seams 4 and 2 occur on the PR area with Seam 4 reaching a maximum thickness of 5.89 m and Seam 2 a maximum of 9.95 m. In the shallowest parts, Seam 4 starts at a depth of 2.45 m and goes as deep as 100.9 m with Seam 2 at depths from 29.80 to 122.70 m. Seam 5 is thin and not regarded as economical. A low-quality thermal coal will be produced from the different coal seams that are proposed to be mined. Open cast coal mining is the preferred method in this case from an economical view as it will recover a greater proportion of the coal deposit than underground methods, as more of the coal seams in the strata may be exploited

The proposed project involves the development of two new open pit coal mines and the associated supporting infrastructure. The coal resource will be mined using open pit methods due to the seemly depth of the coal reserve. For this specific project the mining of coal by means of surface mining methods are viable since the resource is situated close enough to the surface to make it economically mineable. Typical surface mining methods include strip mining and open pit mining, as well as dredge, placer and hydraulic mining in riverbeds, terraces and beaches. These activities always disrupt the surface and this, in turn, affects soils, surface water and near-surface ground water, fauna, flora and all alternative types of land-use.

The generally low strip ratios and wide surface area of the project area makes it ideal for the opencast truck and shovel mining method. Also, the mining method applicability is driven by technical applicability, economic viability, safety, equipment and infrastructure.

The proposed mining method and sequence comprised of the following main mining activities for both waste and coal:

- Initial topsoil and soft overburden removal which will be stockpiled to ensure it can be replaced back in the initial box cut;
- The physical mining of the coal seam which includes drilling of hard overburden material, charging and blasting;
- The coal is loaded into trucks and hauled to the crushing and screening facility;
- Discard coal will be extracted and replaced in the bottom of the opencast pit, while the product will be taken to the weighbridge via trucks and then removed off site;
- The overburden is replaced back into the pit as mining progresses leaving a minimum area open at a single time;
- The topsoil which was stripped and stockpiled separately before mining commenced is then replaced. The findings of the land capability study will determine the optimal composition to ensure pre-mining conditions for utilisation.

The proposed mining layout is based on a 100 m x 50 m mining block size. The purpose of a square mining layout is to increase the ease of strategic mine scheduling. The start of the mining block layout was based on the mining boundary. The size and scale of the open pit mine entails that small and conventional truck and shovel mining equipment is used to mine both waste material and coal.

Key infrastructure includes:

- Access & Haul roads (with necessary security) including the upgrading of the access point to the gravel road;
- Contractor's Yard with septic/chemical ablution facilities;
- Offices;
- Weighbridge, workshop and stores (with septic/chemical ablution facilities);
- Rail Siding;

- Diesel facilities and a hardstand;
- Power and Water;
- Box cut;
- Stockpiles (topsoil, overburden, subsoil/softs, ROM);
- Surface water management measures (stormwater diversion berms and trenches, pollution control dams etc.); and
- Crushing, screening and coal washing facility.

This report has been compiled in accordance with latest NEMA Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations published in Government Notice Regulation R1147 (GNR1147) in Government Gazette 39425. The regulation requires that a final rehabilitation, decommission and mine closure plan is developed which includes the determination of financial provision to guarantee the availability of enough funds to undertake rehabilitation and remediation of the adverse environmental impacts of mining.

The following document therefore offers the Annual Rehabilitation plan for the proposed Mining Project of the proposed mining operations. The study plan is limited to the footprint of disturbance of the proposed activities and is limited to the mining right area applied for as illustrated in the following map sequence.

Table 4: Project Locality

Farm Name:	**PORTIONS 1, 2 AND THE REMAINING EXTENT OF THE FARM DUNBAR 189 IS PORTION 1 OF THE FARM MIDDELKRAAL 50 IS PORTION 6 OF THE FARM HALFGEWONNEN 190 IS MPUMALANGA PROVINCE**
Application Area:	1 797 ha for the mining right of which approximately 200 ha identified for current mining operations
Magisterial District:	Nkangala District Municipality, Steve Tshwete Local Municipality, Gert Sibande District Municipality, Govan Mbeki Local Municipality, Mpumalanga Province South Africa
Distance and direction from nearest town:	The Project Area is ~ 4 km south of Meerlus, ~ 9 km south-east of Komati and ~ 13 km west of Hendrina.

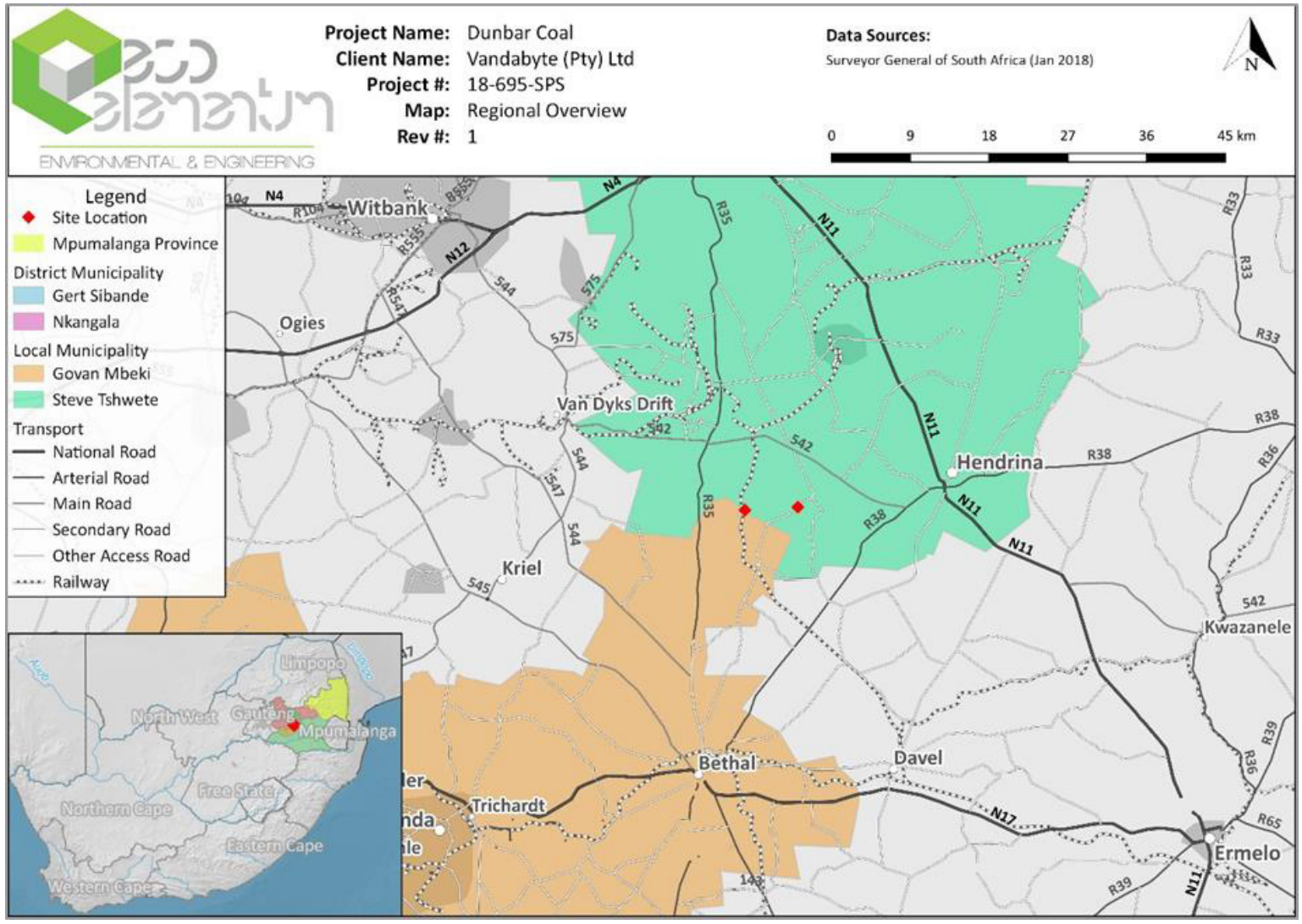

Figure 1: Map indicating the regional overview of the project

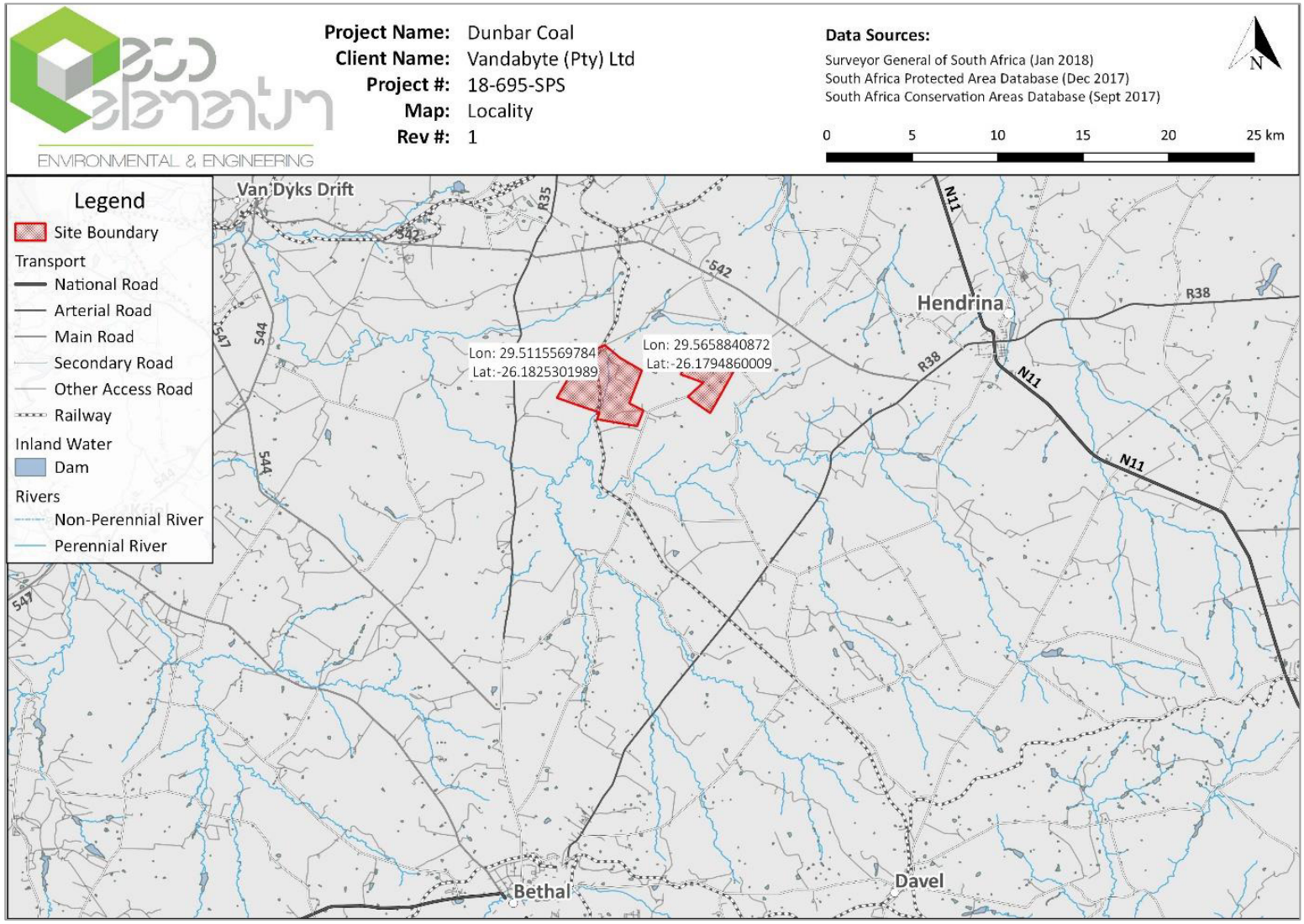

Figure 2: Locality map of the project

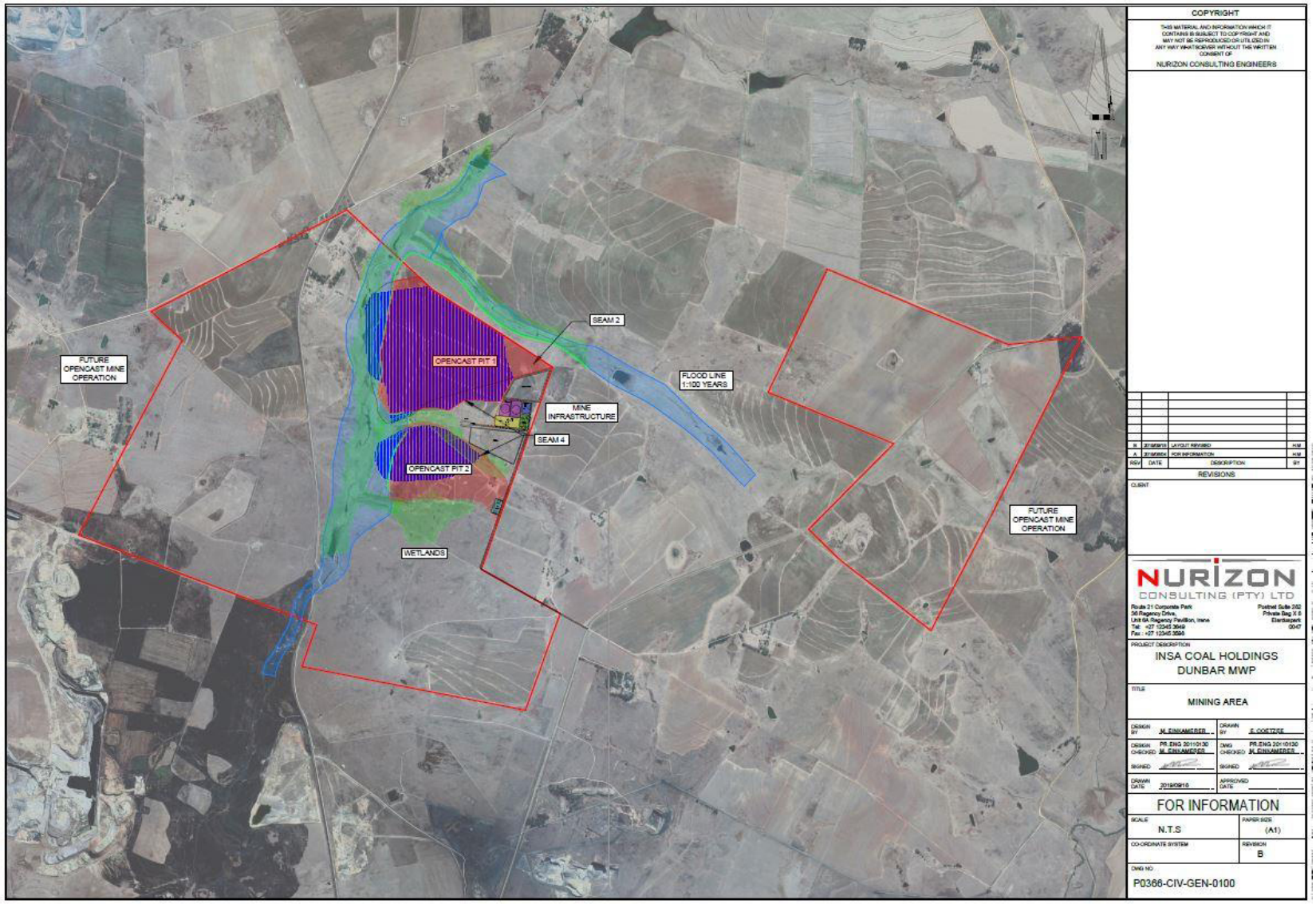

Figure 3: Proposed Mining Site Layout

2. ANNUAL REHABILIATION PLAN

The scope and objectives of this report aims to ensure the Department of Mineral Resources (DMR) is presented with a document that addresses all the legal requirements as presented the previous section while ensuring it's presented in a format that can be measured and audited in due course while giving effect to the post-mining end land use of the disturbed footprint as a result of the mining activities.

The annual rehabilitation plan will form a component of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 and will be subjected to the same requirements of the environmental management programme with regards opportunities for stakeholder review and comment as well as auditing. The scope of the annual rehabilitation plan is 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.

3. CONCURRENT REHABILITATION AND REMEDIATION ACTIVITIES

The Dunbar Colliery is a Greenfields project that has not yet been started. Concurrent rehabilitation forms part of their final landform design and mine plan.

Landform design is required to include, a final topography that coincides with all the surface drainage areas of the site. The best result of a final topography can be achieved when the landform is designed during the early stages of the operation. The aim of the final landform is to ensure that the topography blends into the surrounding landscape. The landform redesign should encourage the flow of site runoff to bypass the discard areas in order to aid in the prevention of further contamination of water.

The following aspects were considered with the implementation of concurrent rehabilitation:

- The rehabilitation plan must be followed unless further studies are required;
- The new information such as water quality, will inform the rehabilitation programme and plan;
- A rehabilitation team must be appointed to oversee and give guidance during the concurrent rehabilitation process;
- A health and safety and environmental officer will guide contractors during the process;
- Ensure that rehabilitation personnel restrict their activities to the areas that need to be rehabilitated; and
- Continuous management and monitoring are required to ensure personnel keep to the rehabilitation plan and schedule.

4. CONCURRENT REHABILITATION

4.1 REHABILITATION SCHEDULING

The scheduling of actions for concurrent rehabilitation which will ensure avoidance, rehabilitation and management of impacts is presented in the table below. As the disturbance after construction occurs on surface, rehabilitation will star taking effect.

Table 5: Concurrent Rehabilitation

Aspect	Scheduling	
	Year 1	Continuous
Opencast workings	Concurrent backfilling sequence and removal of salvageable equipment.	Topsoil stripping, handling, stockpiling, preservation and replacement in line with the general surface rehabilitation and revegetation actions prescribed in this report as land becomes available for rehabilitation.
Surface Infrastructure related to mining operations (including plant)	Removal, decommissioning and demolition of infrastructure not required for ongoing mining.	
Contaminated land remediation	Hydrocarbons – Removal of fuel storage and refuelling bays. Chemical – contaminated plant & equipment removal.	

4.2 TOPSOIL REPLACEMENT

When replacing the soils, the sub-soil layer will be replaced first, the underlying topsoil next and lastly the 300mm topsoil in which the seeds will germinate. The risk of replacing soil in this fashion is that it enhances the compaction of the soil, which is one of the critical areas of hard setting. Typical actions of soil replacing include:

- Not all soil must be replaced, and a reserve of soil is required to repair areas that failed during the rehabilitation process;
- Compaction by heavy equipment must be minimised as far as possible;
- Compaction can be limited when soils are dry. Wet soil adds to the compaction;
- When soils are replaced, it must be ripped to full rooting depth; and
- In places where revegetation is difficult the vegetation can be tiled.

4.3 TRAINING AND CAPACITY BUILDING

Historic practices at many mining, industrial and even local authority facilities are causing the contamination of land and the pollution of surface and groundwater resources. Remediation, including industrial land rehabilitation and mine closure, has become an important requirement of South African environmental legislation. The failure to timeously implement reasonable measures for remediation not only carries legal liabilities but also poses a risk to share prices and the public image of a company. It has therefore become essential to determine and implement rehabilitation measures that will successfully address potential pollution problems in a sustainable manner.

The mine will commit to sending the persons responsible for rehabilitation, decommissioning and mine closure on the course on the Basic Principles of Ecological Rehabilitation and Mine Closure which is presented by the Centre for Environmental Management.

The aim of this course is to offer managers and operational personnel the opportunity to become acquainted with the principles, legal requirements and implications, relevant technical aspects, approaches, plans, problems and solutions related to rehabilitation and mine closure. A practical programme forms an integral part of the course and consists of a site visit, case studies and a panel discussion with recognised experts and representatives of the relevant government departments, as well as the submission of a practical assignment. After completion of the course, the delegate will demonstrate the following in order to propose solutions to rehabilitation-related challenges:

Table 6: Training and Capacity Building Course Objectives and Outcomes

NQF level descriptor	Course outcome	Assessment criteria
1. Scope of knowledge and knowledge literacy	A detailed knowledge and understanding of - • key terminologies, concepts, principles and technical aspects of the basic sciences relevant to ecological rehabilitation, including geochemistry, soil science, vegetation dynamics etc. • the concepts, contents and practical implications of statutory requirements related to rehabilitation and mine closure, as well as the associated liabilities, including the legal and financial implications of such requirements, • problems and approaches related to ecological rehabilitation; and • how knowledge of ecological rehabilitation relate to applicable knowledge within the fields of Environmental Management;	Demonstrated ability to: • use and explain key terminologies, concepts, principles and technical aspects, of the basic sciences relevant to ecological rehabilitation, including geochemistry, soil science, vegetation dynamics, etc. correctly; • use and explain the concepts, contents and practical implications of statutory requirements related to rehabilitation and mine closure, as well as the associated liabilities, including the legal and financial implications of such requirements; • identify and discuss problems and approaches related to ecological rehabilitation; and • indicate how ecological rehabilitation relates to Environmental Management in general and mine closure specifically.
2. Method and procedure	The ability to correctly select, evaluate and effectively implement and apply rehabilitation options, with recommended methodologies and approaches;	Demonstrated ability to actively design, develop and/or propose rehabilitation methods, techniques or approaches to ecological rehabilitation.
3. Problem solving	The ability to identify rehabilitation related problems in unfamiliar contexts and propose holistic solutions in order to address the challenges of ecological rehabilitation;	Demonstrated ability to, within an unfamiliar context: • identify and discuss the problems that can be expected during rehabilitation; and • propose holistic solutions to address the challenges of ecological rehabilitation.
4. Ethics and professional practice	An understanding of the ethical implications of decisions, actions and practices specifically relevant to Environmental Management, in accordance with the principles of sustainable development;	Demonstrated ability to formulate own ethical perspectives on selected environmental scenarios.
5. Accessing, processing and managing information	The basic research skills, such as gathering and verifying information from various sources provided, analysing and summarising key aspects and using the information to implement recommended methodologies and approaches;	Demonstrated ability to utilise the resources provided to extract, analyse, summarise and/or apply the relevant information to solve the problems posed in the practical exercises.

6. Producing and communicating information	The ability to develop and present accurate and coherent written and verbal information as a portfolio of evidence;	Demonstrated ability to effectively record and present diverse information generated as part of practical exercises in a written and verbal format.
7. Context and systems / processes	The ability to understand how the learning material offered in this course relate to contexts, other systems and/or processes and the interactions between these, to make decisions and act appropriately in familiar and new contexts;	Demonstrated ability to indicate how ecological rehabilitation relates to mine closure; and Demonstrated understanding of how ecological rehabilitation and mine closure supports sustainable development.
8. Management of learning	The ability to act as group member and/or a group leader to successfully complete the practical exercises and taking co-responsibility for learning progress and outcome realisation of the group; and	Demonstrated ability to actively participate in group work and contribute to successfully completing practical exercises.
9. Accountability	The ability to monitor own learning progress, and apply relevant learning strategies and resources to successfully realise all outcomes of this course.	Demonstrated ability to achieve the learning objectives in an effective and expeditious manner.

5. CLOSURE COST BUDGET

The methodology, assumptions and costs calculated are detailed as follows:

5.1 METHODOLOGY

The NEMA regulations require that the closure costs be calculated according to real rates. These rates were sourced from a third-party contractor, specialising in demolition and rehabilitation

5.2 ASSUMPTIONS

The following assumptions were made if the mine were to undergo sudden closure:

- Third party contractor rates from a demolition and rehabilitation company were used to calculate the costs;
- The measurements were based on GIS BOQ;
- It assumed that concurrent rehabilitation will be conducted, that hard and soft sub-soil/discard and topsoil will be backfilled during the operation cycle on the mine. Concurrent rehabilitation will ensure that the final void will be shaped and secured during the final rehabilitation of the mine;
- Costs were included for groundwater, surface water and biodiversity monitoring for a baseline closure assessment and assessment to determine performance of rehabilitation; and
- No water treatment was added and will be developed in year 1 and no salvage value was added;

Table 7: Annual rehabilitation budget provisioning

Number	Description	Budget
1.	Replacement of sub soils and finally topsoil	R
2.	Introduction of fertilizer into topsoil layer	R
3.	Revegetation of topsoil	R
4.	Continuous removal of contaminated soil	R
5.	Monitoring and monitoring	R
Total		R

6. SHORTCOMINGS OF PRECEDING 12 MONTHS

No gaps and shortcomings have been identified as the mine is a Greenfields project.

7. CONCLUSION AND RECOMMENDATIONS

The following recommendations should be adhered to;

- Compliance with Rehabilitation Plan
  - The closure objectives can only be achieved by adhering to the responsibilities as set out in the concurrent rehabilitation plan.
  - Closure objectives cannot be achieved if the actions of the rehabilitation plan are not complied with resulting in an unsuccessful closure plan.
- Annual update requirements of the plan
  - The rehabilitation plan must be reviewed annually and updated as and when major changes are effected to the Prospecting Works Programme.
- On-site documentation requirement
  - The rehabilitation plan must be available onsite as per the requirements of Regulation 26 (h) of NEMA EIA Regulations of 2014.

This financial provision is based on the Regulations applicable as at 1 December 2014. The financial provision for concurrent rehabilitation 2018/2019 period for the planned activities is **R13 330 768.07 (Excl. VAT).** The financial provision calculation should be re-evaluated during the start of the operation and the new Financial Provision Regulations of 2015 should be followed.

ENVIRONMENTAL & ENGINEERING

REPORT

VANDABYTE (PTY) LTD

FINAL REHABILITATION, DECOMISSIONING AND MINE CLOSURE PLAN: DECOMMISIONING, CLOSURE, REHABILITATION AND CLOSURE LIABILITY REPORT

DMR REF: MP30/5/1/2/2/10237MR

PORTIONS 1, 2 AND THE REMAINING EXTENT OF THE FARM DUNBAR 189 IS, PORTION 1 OF THE FARM MIDDELKRAAL 50 IS, PORTION 6 OF THE FARM HALFGEWONNEN 190 IS. - MPUMALANGA PROVINCE.

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0.2	2019/10/07	Henno Engelbrecht		Final report

Quality Control BY:

Nature of Signoff:	Responsible Person:	Role / Responsibility	Qualification
Author	Henno Engelbrecht	Environmental Assessment Practitioner Rehabilitation, Decommissioning and Mine Closure Specialist	B.Sc. Hons Env Mgmt and Analysis M.Sc. Project Mgmt
Quality Reviewer	Leoni le Roux	Administrator	Professional Secretary and Personal Assistant
Reviewer	Vernon Siemelink	Senior Environmental Consultant ISO 14001:2004 Auditor	M(EnvMan) Environmental Management UP

DISCLAIMER:

This is a legally binding document and many of the actions and recommendations remain the responsibility of the client (as the owner/lessee of the property).

EAP - was independent and performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application; have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity; ensure compliance with these Regulations;

Take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

The findings, results, observations, conclusions and recommendations provided in this report are based solely on the information provided to Eco Elementum (Pty) Ltd by the Client and other external sources (including previous site investigation data and external scientific studies). The opinions expressed herein apply to the site conditions and features which existed at the time of commencement of the investigations and production of this report.

The author has utilised his/her best scientific and professional knowledge in preparing this report and the content herein contained is and remains confidential in nature, save where otherwise ordered by a Court of law.

Whilst Eco Elementum (Pty) Ltd exercises due care and diligence in rendering the services and preparing this report, the accuracy of the content herein contained is reliant on the accuracy, correctness and completeness of information and/or data supplied to it by the Client. In this regard, Eco Elementum (Pty) Ltd accepts no liability for any loss and/or damages arising out of the inaccuracy of this report in instances where the information and/or data provided to it by the Client is found to be inaccurate, incorrect and/or incomplete.

DECLARATION OF INDEPENDENCE

I, Henno Engelbrecht, declare that;

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing:
    - any decision to be taken with respect to the application by the competent authority; and
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

2019/10/07

Signature **Date**

Mr. Henno Engelbrecht
B.Sc. Hons Env Mgmt and Analysis
M.Sc. Project Mgmt

EXPERIENCE OF THE SPECIALIST THAT PREPARED THE PLAN

Name	Henno
Surname	Engelbrecht
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Position	Director – Environmental Assessment Practitioner
Location	442 Rodericks Road, Menlo Park, Pretoria
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Telephone Number	082 690 9105 / 012 348 5214
Education	- B.Sc. Geography (Cum Laude) (University of Pretoria). - BSc Honors Environmental Management and Analysis (Cum Laude) (University of Pretoria). - MSc Project Management (Thesis Cum Laude) (University of Pretoria).
Professional summary	Mr. Henno Engelbrecht has 10 years working experience as an Environmental Consultant and he has specialized in Environmental Management and Analysis. Mr. Henno Engelbrecht has worked for Environmental Assurance Pty (Ltd) as an environmental consultant since completing his studies until mid-2013 and has served an array of clients in various fields of environmental practice. He also has vast environmental monitoring and measurement, environmental authorisations, mine closure, and environmental impact assessment experience and has worked with in various project teams, up unto the level of Programme Manager where he was responsible for all the projects which fell within the Environmental Assurance (Pty) Ltd programme. His expertise has led to his specialist inputs and studies to be used in several Environmental Impact Assessments, Water Use License Applications, Waste License Applications, Air Emission License Applications and Mine Closure/Rehabilitation Planning Activities. Henno also holds the MSc Project Management degree at the Engineering Faculty at the University of Pretoria. He has worked in mining, industrial, natural and construction environments but his expertise lies mainly within the mining sector and currently holds the position of Director at Eco Elementum (Pty) Ltd.
Skills	- Mine Closure financial quantum determination, mine closure planning and reporting. - Rehabilitation planning, reporting, management and coordination of opencast and underground mining. - Ambient air quality monitoring, measurement and implementation (passive and active) in accordance to the National Environmental Management: Air Quality Act 39 of 2004, Government Notice 248 NEM: AQA (39/2004) which contains the Listed Activities, and the National Ambient Air Quality Standards (SANS 1929: 2005). - Noise monitoring and measurement according to SANS 10103:2008, the measurement and rating of environmental noise with respect to annoyance and to speech communication and SANS 10328:2008, Methods for environmental noise impact assessment. - Water quality monitoring, measurement, reporting and data analyses including surface water, ground water, process water, sewage water and biological indicators. - Groundwater hydrocensus studies – borehole surface water depth monitoring, measurement, transections and analysis. - ISO 14001 Environmental Management Systems auditing, system implementation, training and environmental analysis (creation of aspect/impact registers, contractor training, general environmental awareness training, legal compliance audits, GAP analysis, documentation reviews, roles and authority allocations etc.) - Legal compliance auditing and reporting in accordance with the National Environmental Management Acts and other associated environmental related (NEMA listed activities, Air Quality Act listed activities, Water Use Licensing, Waste Licensing, Air Emissions Licensing etc.) - Environmental training (various – contractor training, monitoring and measurement training, awareness training). - Environmental impact assessments and Integrated Water Use License Applications. - Environmental Management Plan development, monitoring, compliance auditing etc. - Environmental Control Officer Site inspections- non-conformance reporting (NCR), corrective action request (CAR) and preventative action request (PAR).

EXECUTIVE SUMMARY

Vandabyte (Pty) Ltd (hereafter the applicant) has appointed Enviro-Insight CC as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations (EAs) associated with the proposed Dunbar Coal Mine. The applicant has obtained a Prospecting Right (reference number MP 30/5/1/1/2/10737 PR) on 22 May 2014 from the Mpumalanga Department of Mineral Resources (DMR) to prospect for coal in an area of 1 797 ha on a Portion of Portion 1, Portion 2 and the remaining extent of the Farm Dunbar 189 IS, Portion 1 of the Farm Middelkraal 50 IS and Portion 6 of the Farm Halfgewonnen 190 IS located in Mpumalanga Province. The mining right application lodged on 9 May 2019 to the DMR (reference number MP30/5/1/2/2/10237MR) includes the abovementioned properties and extent.

In accordance with the provisions of Sections 24 (5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIA's in order to apply for, and be considered for, the issuing of an Environmental Authorisation (EA). These Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GN R. 983 and 985) and a more complete EIA process (activities listed in GN R. 984). In the case of this project there are activities triggered under GN R. 984 and as such a full EIA process is necessary. On 7 April 2017, the NEMA 2014 regulations were amended, and accordingly the activities triggered under GN R. 324, 325 and 327 are applicable to this application.

This report addresses the National Environmental Management Act (Act No. 107 of 1998): Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations Government Gazette Notice No. 1147 issued on 20 November 2015.

The proposed project involves the development of two new open pit coal mines and the associated supporting infrastructure. The coal resource will be mined using open pit methods due to the seemly depth of the coal reserve. For this specific project the mining of coal by means of surface mining methods are viable due to the fact that the resource is situated close enough to the surface to make it economically mineable. Typical surface mining methods include: strip mining and open pit mining, as well as dredge, placer and hydraulic mining in riverbeds, terraces and beaches. These activities always disrupt the surface and this, in turn, affects soils, surface water and near-surface ground water, fauna, flora and all alternative types of land-use.

The generally low strip ratios and wide surface area of the project area makes it ideal for the opencast truck and shovel mining method. Also, the mining method applicability is driven by technical applicability, economic viability, safety, equipment and infrastructure.

The proposed mining method and sequence comprised of the following main mining activities for both waste and coal:

1. Initial topsoil and soft overburden removal which will be stockpiled to ensure it can be replaced back in the initial box cut;
2. The physical mining of the coal seam which includes drilling of hard overburden material, charging and blasting;
3. The coal is loaded into trucks and hauled to the crushing and screening facility;
4. Discard coal will be extracted and replaced in the bottom of the opencast pit, while the product will be taken to the weighbridge via trucks and then removed off site;
5. The overburden is replaced back into the pit as mining progresses leaving a minimum area open at a single time;
6. The topsoil which was stripped and stockpiled separately before mining commenced is then replaced. The findings of the land capability study will determine the optimal composition to ensure pre-mining conditions for utilisation.

The proposed mining layout is based on a 100 m x 50 m mining block size. The purpose of a square mining layout is to increase the ease of strategic mine scheduling. The start of the mining block layout was based on the mining boundary. The size and scale of the open-pit mine entails that small and conventional truck and shovel mining equipment is used to mine both waste material and coal.

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PROJECT INFORMATION

Table 1: Applicant Details

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File Reference Number DMR:	MP 30/5/1/12/2/ 10237MR

Table 2: EAP Details

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Table 3: Specialist Details

Specialist Company:	Eco Elementum (Pty) Ltd
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1. INTRODUCTION AND BACKGROUND

Vandabyte (Pty) Ltd (hereafter the applicant) has appointed Enviro-Insight CC as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations (EAs) associated with the proposed Dunbar Coal Mine. The applicant has obtained a Prospecting Right (reference number MP 30/5/1/1/2/10737 PR) on 22 May 2014 from the Mpumalanga Department of Mineral Resources (DMR) to prospect for coal in an area of 1797 ha on a Portion of Portion 1, Portion 2 and the remaining extent of the Farm Dunbar 189 IS, Portion 1 of the Farm Middelkraal 50 IS and Portion 6 of the Farm Halfgewonnen 190 IS located in Mpumalanga Province. The mining right application lodged on 9 May 2019 to the DMR (reference number MP30/5/1/2/2/10237MR) includes the abovementioned properties and extent.

Enviro-Insight appointed Eco-Elementum to undertake the Final Rehabilitation, Mine Closure and Decommissioning Plan for the Dunbar Coal project.

The Integrated Environmental Authorisation (IEA) application includes the above-mentioned properties where the proposed mining blocks identified, and associated infrastructure will be located on Portion 2 of the Farm Dunbar 189 IS.

There is enough data available for Dunbar West to make an initial assessment of its potential. Both Seams 4 and 2 occur on the PR area with Seam 4 reaching a maximum thickness of 5.89 m and Seam 2 a maximum of 9.95 m. In the shallowest parts, Seam 4 starts at a depth of 2.45 m and goes as deep as 100.9 m with Seam 2 at depths from 29.80 to 122.70 m. Seam 5 is thin and not regarded as economical. A low-quality thermal coal will be produced from the different coal seams that are proposed to be mined. Open cast coal mining is the preferred method in this case from an economical view as it will recover a greater proportion of the coal deposit than underground methods, as more of the coal seams in the strata may be exploited

The proposed project involves the development of two new open pit coal mines and the associated supporting infrastructure. The coal resource will be mined using open pit methods due to the seemly depth of the coal reserve. For this specific project the mining of coal by means of surface mining methods are viable since the resource is situated close enough to the surface to make it economically mineable. Typical surface mining methods include strip mining and open pit mining, as well as dredge, placer and hydraulic mining in riverbeds, terraces and beaches. These activities always disrupt the surface and this, in turn, affects soils, surface water and near-surface ground water, fauna, flora and all alternative types of land-use.

The generally low strip ratios and wide surface area of the project area makes it ideal for the opencast truck and shovel mining method. Also, the mining method applicability is driven by technical applicability, economic viability, safety, equipment and infrastructure.

The proposed mining method and sequence comprised of the following main mining activities for both waste and coal:

- Initial topsoil and soft overburden removal which will be stockpiled to ensure it can be replaced back in the initial box cut;
- The physical mining of the coal seam which includes drilling of hard overburden material, charging and blasting;
- The coal is loaded into trucks and hauled to the crushing and screening facility;
- Discard coal will be extracted and replaced in the bottom of the opencast pit, while the product will be taken to the weighbridge via trucks and then removed off site;
- The overburden is replaced back into the pit as mining progresses leaving a minimum area open at a single time;
- The topsoil which was stripped and stockpiled separately before mining commenced is then replaced. The findings of the land capability study will determine the optimal composition to ensure pre-mining conditions for utilisation.

The proposed mining layout is based on a 100 m x 50 m mining block size. The purpose of a square mining layout is to increase the ease of strategic mine scheduling. The start of the mining block layout was based on the mining boundary. The size and scale of the open pit mine entails that small and conventional truck and shovel mining equipment is used to mine both waste material and coal.

Key infrastructure includes:

- Access & Haul roads (with necessary security) including the upgrading of the access point to the gravel road;
- Contractor's Yard with septic/chemical ablution facilities;
- Offices;
- Weighbridge, workshop and stores (with septic/chemical ablution facilities);
- Rail Siding;

- Diesel facilities and a hardstand;
- Power and Water;
- Box cut;
- Stockpiles (topsoil, overburden, subsoil/softs, ROM);
- Surface water management measures (stormwater diversion berms and trenches, pollution control dams etc.); and
- Crushing, screening and coal washing facility.

This report has been compiled in accordance with latest NEMA Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations published in Government Notice Regulation R1147 (GNR1147) in Government Gazette 39425. The regulation requires that a final rehabilitation, decommission and mine closure plan is developed which includes the determination of financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of mining.

The following document therefore offers the final rehabilitation, decommission and mine closure plan for the proposed Mining Project with specific emphasis on the decommissioning and closure of the proposed mining operations. The study plan is limited to the footprint of disturbance of the proposed activities and is limited to the mining right area applied for as illustrated in the following map sequence.

Table 4: Project Locality

Farm Name:	**PORTIONS 1, 2 AND THE REMAINING EXTENT OF THE FARM DUNBAR 189 IS PORTION 1 OF THE FARM MIDDELKRAAL 50 IS PORTION 6 OF THE FARM HALFGEWONNEN 190 IS MPUMALANGA PROVINCE**
Application Area:	1 797 ha for the mining right of which approximately 200 ha identified for current mining operations
Magisterial District:	Nkangala District Municipality, Steve Tshwete Local Municipality, Gert Sibande District Municipality, Govan Mbeki Local Municipality, Mpumalanga Province South Africa
Distance and direction from nearest town:	The Project Area is ~ 4 km south of Meerlus, ~ 9 km south-east of Komati and ~ 13 km west of Hendrina.

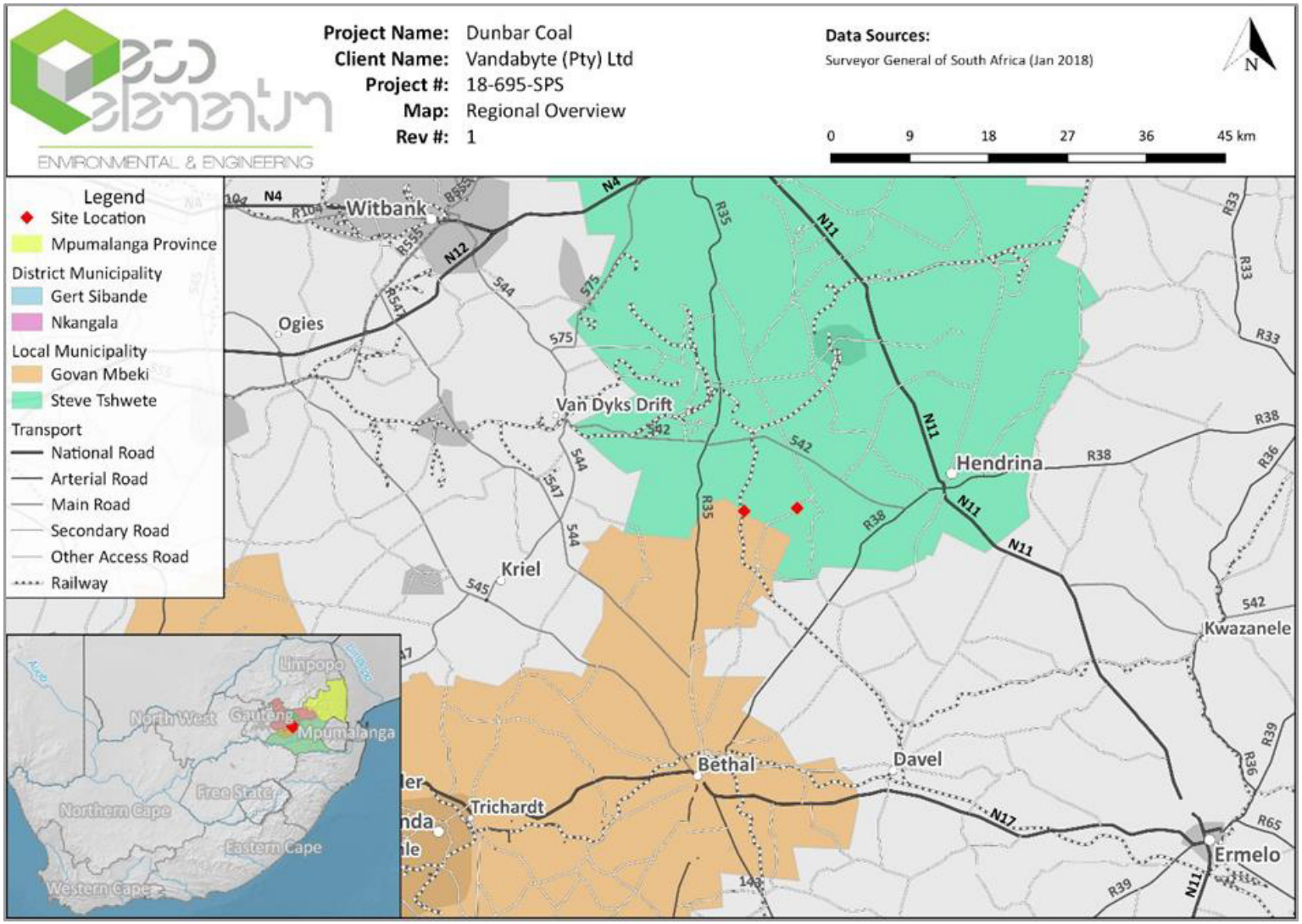

Figure 1: Map indicating the regional overview of the project

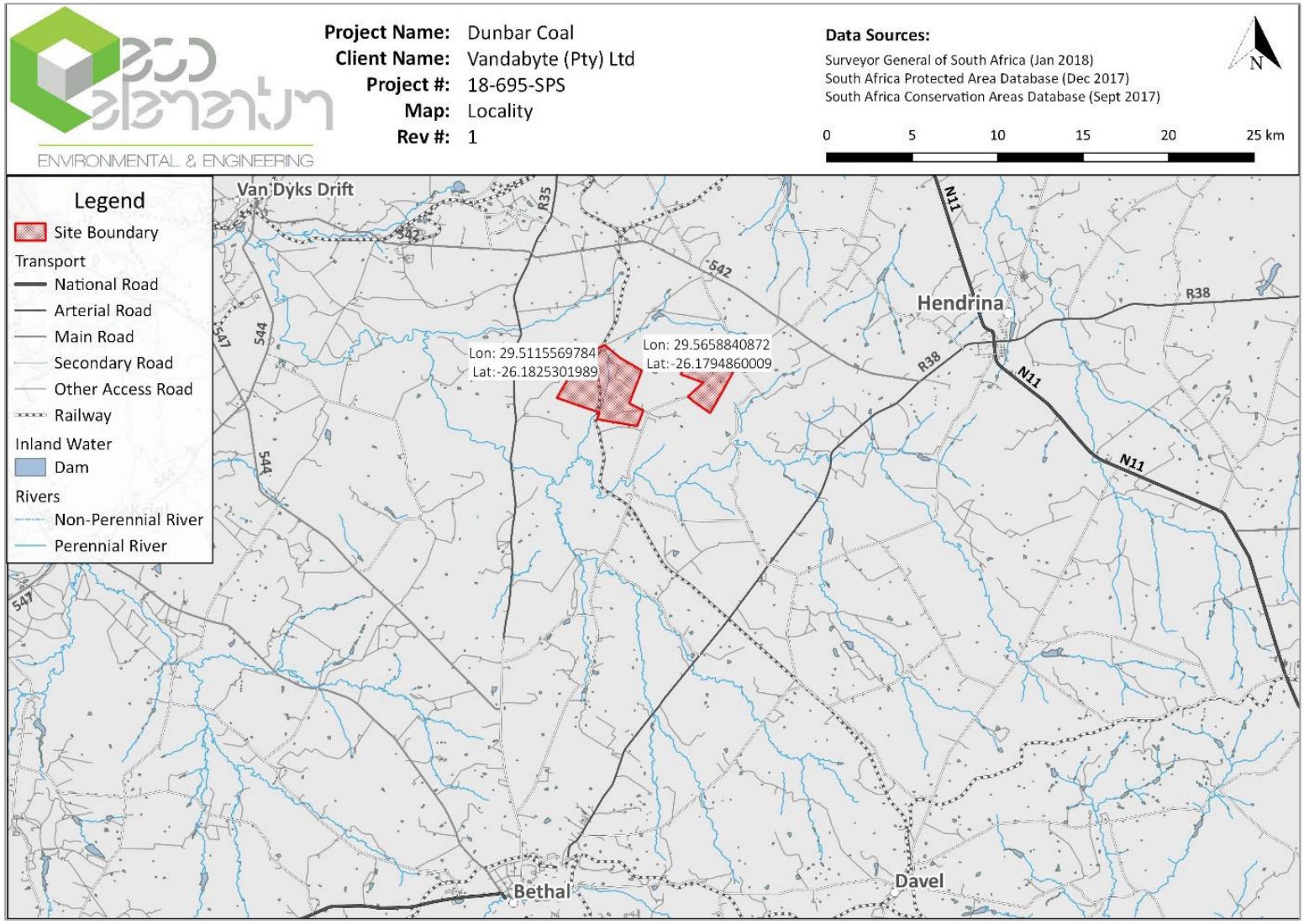

Figure 2: Locality map of the project

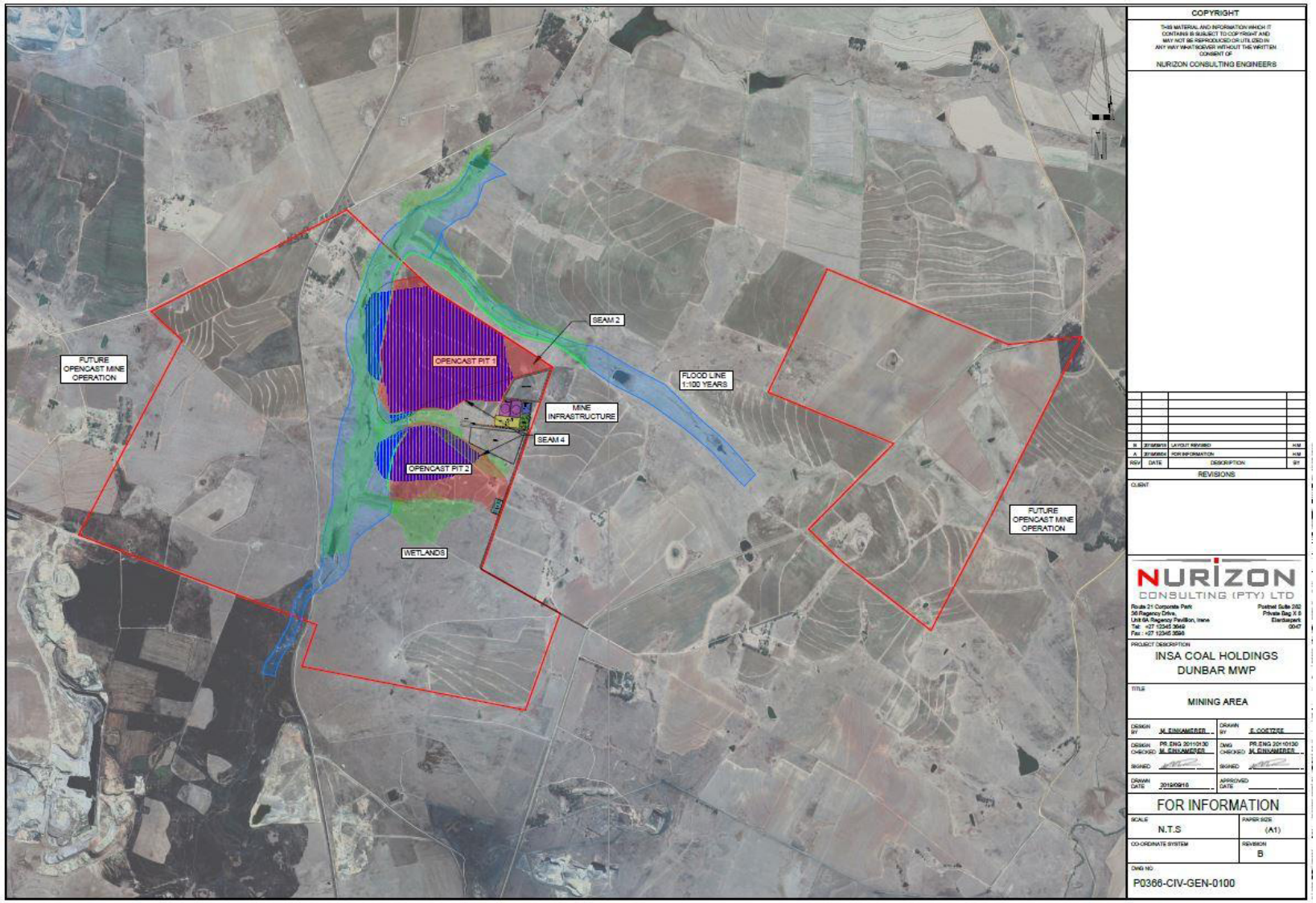

Figure 3: Proposed Mining Site Layout

2. FINAL REHABILIATION, DECOMISSIONING AND CLOSURE PLAN

2.1 LEGISLATIVE REQUIREMENTS

The intent to mine requires the following applications and subsequent approvals prior to commencement:

2.1.1 Prospecting to Mining Right Conversion (MPRDA Regulations):

The applicant has obtained a Prospecting Right (reference number MP 30/5/1/1/2/10737 PR) on 22 May 2014 from the Mpumalanga Department of Mineral Resources (DMR) to prospect for coal in an area of 1797 ha on a Portion of Portion 1, Portion 2 and the remaining extent of the Farm Dunbar 189 IS, Portion 1 of the Farm Middelkraal 50 IS and Portion 6 of the Farm Halfgewonnen 190 IS located in Mpumalanga Province. The mining right application lodged on 9 May 2019 to the DMR (reference number MP30/5/1/2/2/10237MR) includes the abovementioned properties and extent.

2.1.2 Environmental Authorisation (NEMA and EIA Regulations namely):

An integrated environmental application process will be followed by means of a Scoping & EIA Process. In accordance with the provisions of Sections 24 (5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIA's in order to apply for, and be considered for, the issuing of an Environmental Authorisation (EA). These Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GN R. 983 and 985) and a more complete EIA process (activities listed in GN R. 984). In the case of this project there are activities triggered under GN R. 984 and as such a full EIA process is necessary. On 7 April 2017, the NEMA 2014 regulations were amended, and accordingly the activities triggered under GN R. 324, 325 and 327 are applicable to this application.

2.1.3 Water Use License (National Water Act)

The National Water Act (NWA), 1998 (Act No. 36 of 1998) also has a role to play in regulating mining. Mining almost always uses water and/or has an impact on a water resource such as a stream, wetland or river. The NWA is administered by the Department of Water and Sanitation (DWS). An application for an Integrated Water Use License is also being undertaken.

2.2 SCOPE AND OBJECTIVES OF THE REPORT

The scope and objectives of this report aims to ensure the Department of Mineral Resources (DMR) is presented with a document that addresses all the legal requirements as presented the previous section while ensuring it's presented in a format that can be measured and audited in due course while giving effect to the post-mining end land use of the disturbed footprint as a result of the mining activities.

As per Annexure 4 of the GNR 1147 regulations, "The minimum content of a final rehabilitation, decommissioning and mine closure plan", the objective of the final rehabilitation, decommissioning and mine closure plan, which must be measureable and auditable, 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 was 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 was 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; and

- outlining monitoring, auditing and reporting requirements.

3. DESCRIPTION OF THE PROJECT

3.1 MINING OPERATIONS

3.1.1 Mining Methodology

Basic overview of the mining method

The generally low strip ratios and wide surface area of the project area makes it ideal for the opencast truck and shovel mining method. Also, the mining method applicability is driven by technical applicability, economic viability, safety, equipment and infrastructure.

The mining method comprised of the following main mining activities for both waste and coal:

- Topsoil and soft overburden removal;
- Drilling of hard overburden material;
- Charging and Blasting;
- Loading and Hauling; and
- Tipping or Dumping.

The operational phase, known as steady state, will commence after the completion of the box cut. A conventional strip mining [roll-over] method will be employed. Material from the box cut phase will be stored per overburden classification, with the bulk of the material placed in a position alongside the final strip, to facilitate filling of the final void. Steady-state mining includes the following processes and equipment.

Mining Sequence

The volumes in the LOM production schedule are expected to include:

- Topsoil -Thickness of the topsoil is assumed to be 1.0 m. Loading and hauling to topsoil stockpile by truck and shovel.
- Soft overburden - Loading and hauling to waste stockpile or in-pit backfill by truck and shovel.
- Hard overburden - This material lies just below the weathered material and above the coal seam and will require drilling and blasting. Loading and hauling to waste stockpile or in-pit backfill by truck and shovel.
- The coal seams are expected to be drilled and blasted. Loading and hauling to ROM Tip by truck and shovel.

The size and scale of the open pit mine entails that small and conventional truck and shovel mining equipment is used to mine both waste material and coal.

The following equipment was selected for this study:

- 120t Backhoe hydraulic excavators on coal and overburden material.
- Articulated dump trucks (“ADT”).

Hauler selection is based on the optimal fit and number of passes with excavators and loaders with standardization if appropriate.

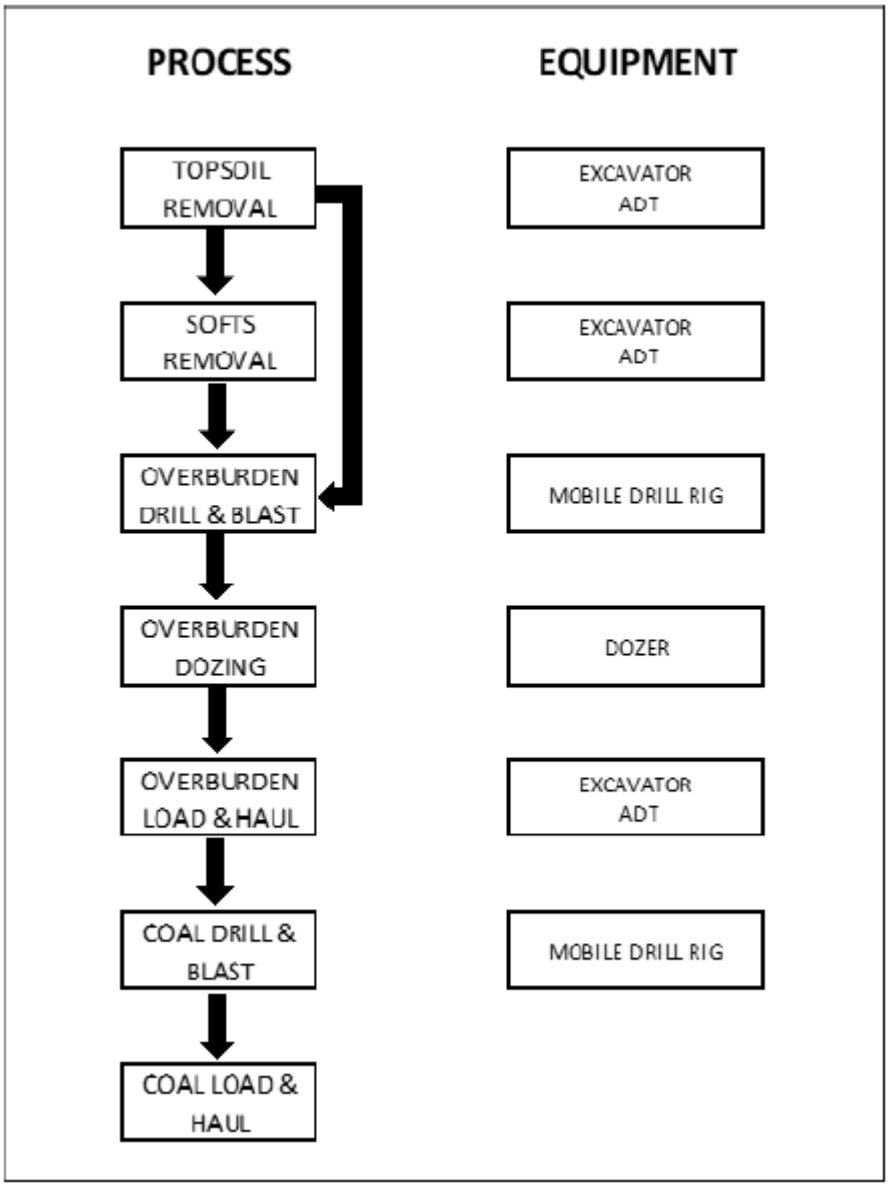

Figure 4: Coal Mining Sequence Flow-Diagram

To conduct the above-mentioned process, the planned mining equipment to be utilized is as follows:

- Contractor 1: (mining – equipment per team);
- 2 x CAT Bulldozer;
- 3 x Bell Hydraulic Excavators;
- 12 x Bell B40 Articulated 6X6 Dump trucks;
- 1 x CAT 140 Motor Grader;
- 1 x 10 000 litre Water Bowser;
- 1 x 4 000 litre Diesel Bowser;
- 2 x Mobile Percussion Drill Rig;
- 4 x Service Truck;
- Support equipment (transport / material handling – Diesel); and
- Contractor 4 (beneficiation / crushing).

The above equipment will be supplied by the mining contractor and the costing thereof will be included in the contractor's unit rates.

High level description of the processing plant

The actual operational time frame is calculated from the date of granting of a mining right. The operational period has been subdivided into a construction and implementation phase and a production phase.

Construction Phase

The construction phase will commence immediately upon granting of a mining right and will include the following items and expected timeframes:

- Preparation of Access Roads (3 Weeks);
- Construction of contractor's yard (1 Week);
- Workshop Construction (3 Weeks);
- Fencing and trenching of Mining Area (4 Weeks);
- Construction of Security (Boom Gates, Security house) (4 Weeks);
- Installation of Weighbridge (3 Weeks);
- Construction of Ablutions (5 Weeks);
- Construction of Diesel bunds and Installation of Tanks (2 Weeks);
- Construction of Mine haul roads (4 Weeks);
- Development of trenches and pollution control facilities (8 Weeks);
- Setting up crushing, screening and washing plant (8 weeks);
- Box cut development (9 Weeks).

INFRASTRUCTURE REQUIREMENTS

- Access & Haul roads (with necessary security) including the upgrading of the access point to mining area;
- Contractor's Yard with septic / chemical ablution facilities;
- Offices;
- Weighbridge, workshop and stores (with septic / chemical ablution facilities);
- Rail Siding (possible future expansion);
- Diesel facilities and a hardstand;
- Power and Water;
- Box cut;
- Stockpiles (topsoil, overburden, subsoil / softs, ROM);
- Crushing & screening facility; and
- Surface water management measures (stormwater diversion berms and trenches; pollution control dams etc.).

The preliminary mining layout including infrastructure and the opencast pits is indicated below. This is a preliminary layout and will likely change as specialist investigations are completed. The final layout design indicating all infrastructure will be provided in the EIA phase of the project.

4. STUDY AREA ENVIRONMENTAL DESCRIPTION

This section of the report outlines a high-level description of the study area and is derived from the information available at the time of reporting. The overall environmental context of this report is described in terms of the environmental attributes associated with the site and support the report in providing an understanding of the main issues and aspects that needs to be addressed during mine rehabilitation, decommissioning and closure.

4.1 Environmental Context

4.1.1 Geology

South Africa's Coal Resources are restricted to the area east of the longitude 26° E and are hosted by the Late Carboniferous to middle Jurassic sedimentary deposits of the Karoo Supergroup (320-180 Ma). Within the main Karoo Basin, coal is hosted in the Vryheid Formation of the Ecca Group, where rank increases eastwards, as well as in the Emakwezini Formation of the Beaufort Group. In the Eastern Cape, the Molteno Formation hosts coal deposits, with rank increasing to the southeast.

South Africa is host to 19 coalfields which encompass a total area of about 9.7 million hectares. The largest of these coalfields by coal reserves are the Highveld and Witbank coalfields, followed by Ermelo and Waterberg where bituminous coal dominates. South Africa's coal seams are characteristically thin and are found at relatively shallow depths and extraction is thus easier and often more economical.

South Africa's coal deposits form part of the Permian age Karoo Supergroup which was deposited on the Gondwanaland Supercontinent. The Main Karoo basin is underlain by the Kaapvaal Craton in the north and the Namaqua-Natal Metamorphic Belt in the south. The Karoo Supergroup from the base upwards is sub-divided into the following subgroups from bottom to top as:

- Dwyka Group
- Ecca Group
- Beaufort Group
  - Molteno Formation
  - Elliot Formation
  - Clarens Formation
- The volcanic rocks of the Stormberg Group

Most coal beds occur in the Ecca Group with some minor coal seams in the Beaufort Group and the Molteno Formation as well.

During coal deposition, fluvio-deltaic complexes prograde in a southerly direction across an epicontinental platform, resulting in the infilling of pre-existing glacial valleys. These glacial valleys controlled the flow of water during deposition as well as the extent and position of the swamps and resultant coal development. Present day coal beds are restricted to some of these valleys.

The 19 coalfields of South Africa are mainly concentrated in the north-eastern parts of the country in the provinces of KwaZulu-Natal, Mpumalanga, Limpopo and the Free State with lesser deposits in Gauteng and the Eastern Cape.

The Witbank / Highveld Coalfields are currently the most important coalfields in the RSA. There are normally four major coal seams developed, namely:

- Seam 5,
- Seam 4,
- Seam 2, and
- Seam 1.

Basement topography and the present-day erosional surface control the distribution of the coal seams and not all the seams may be present at any one locality. Seams 5 and 1 are usually thin to absent over much of the coalfield. The Seams 4 and 2 are most widely developed, and often achieve mineable thicknesses in the coalfield. Seam 4 usually splits into the 4 Upper ("4U") and 4 Lower ("4L") Seams, and similar Seam 2 into a 2 Upper ("2U") and 2 Lower ("2L"). The 5 Seam has, over large areas of the northern and central areas of the coalfield, been removed by erosion.

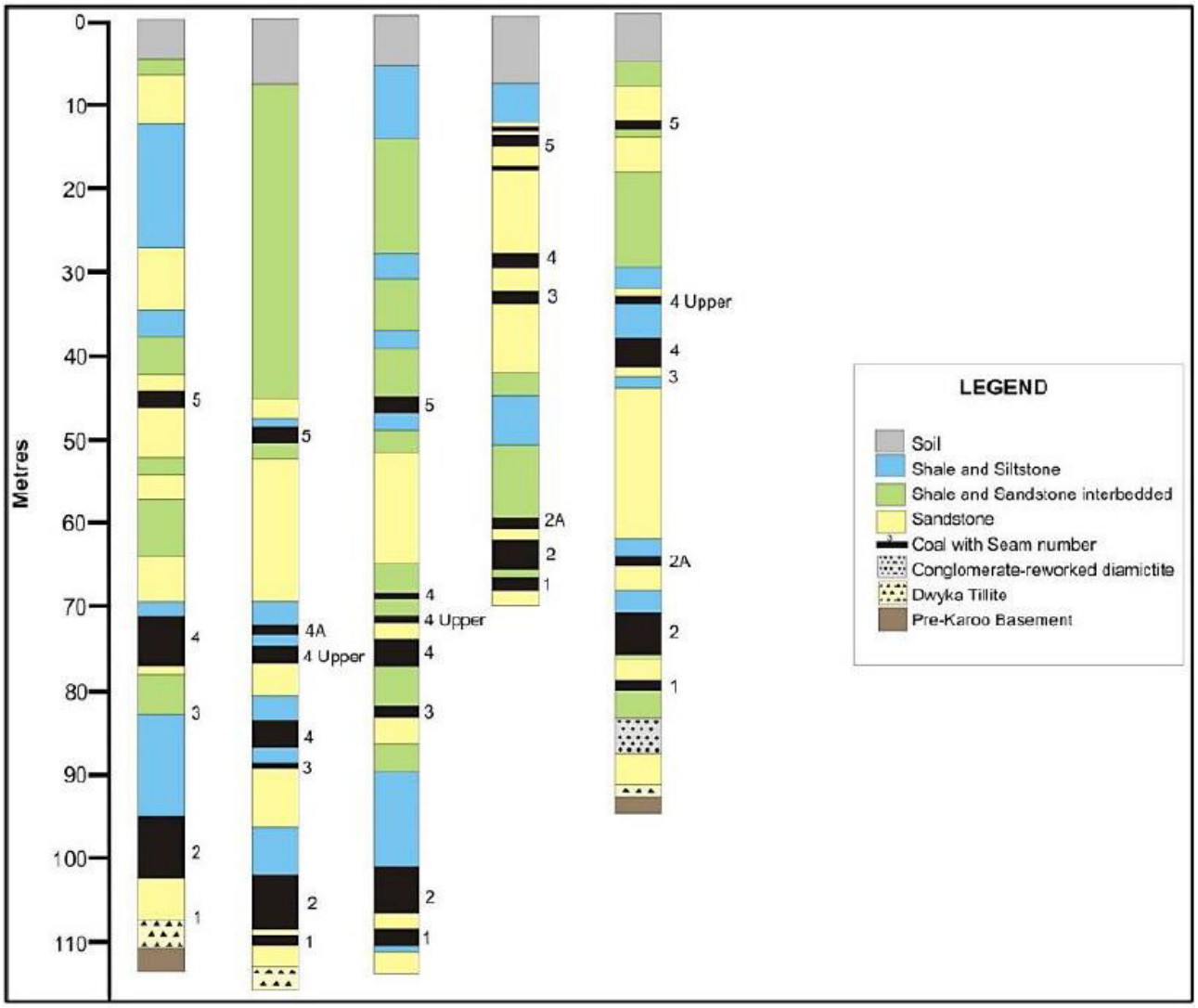

Figure 5: Regional Geological Stratigraphy

4.1.2 Regional Climate

Precipitation

This area normally receives approximately 482 mm of rain per year, with most rainfall occurring during the summer months (Oct - Mar). The least amount of rainfall occurs in July and the greatest amount of precipitation occurs in December, with an average of 93 mm. The chart below shows the average rainfall values for Hendrina per month.

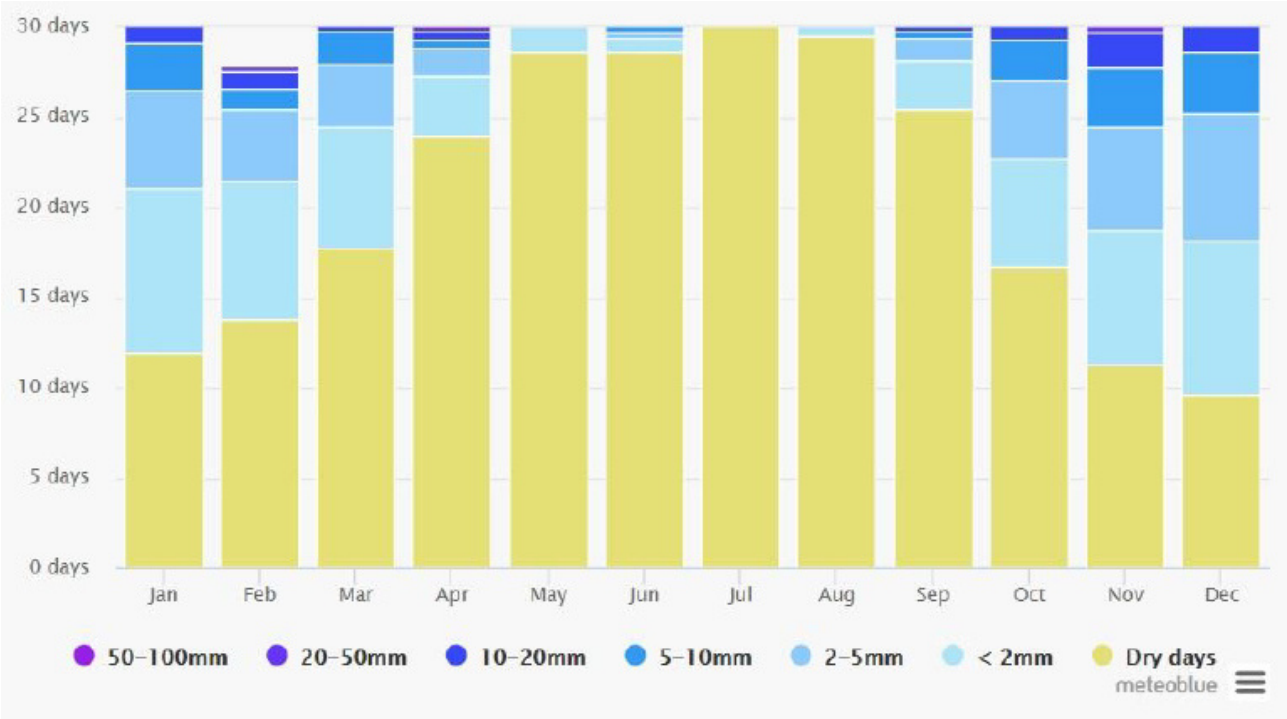

Figure 6: Monthly Precipitation for the study area

Temperature

The temperatures are highest on average in October where temperatures rise above 30°C from September until February. The coldest months in the year are in June and July (>5°C) where the number of frost days are the highest.

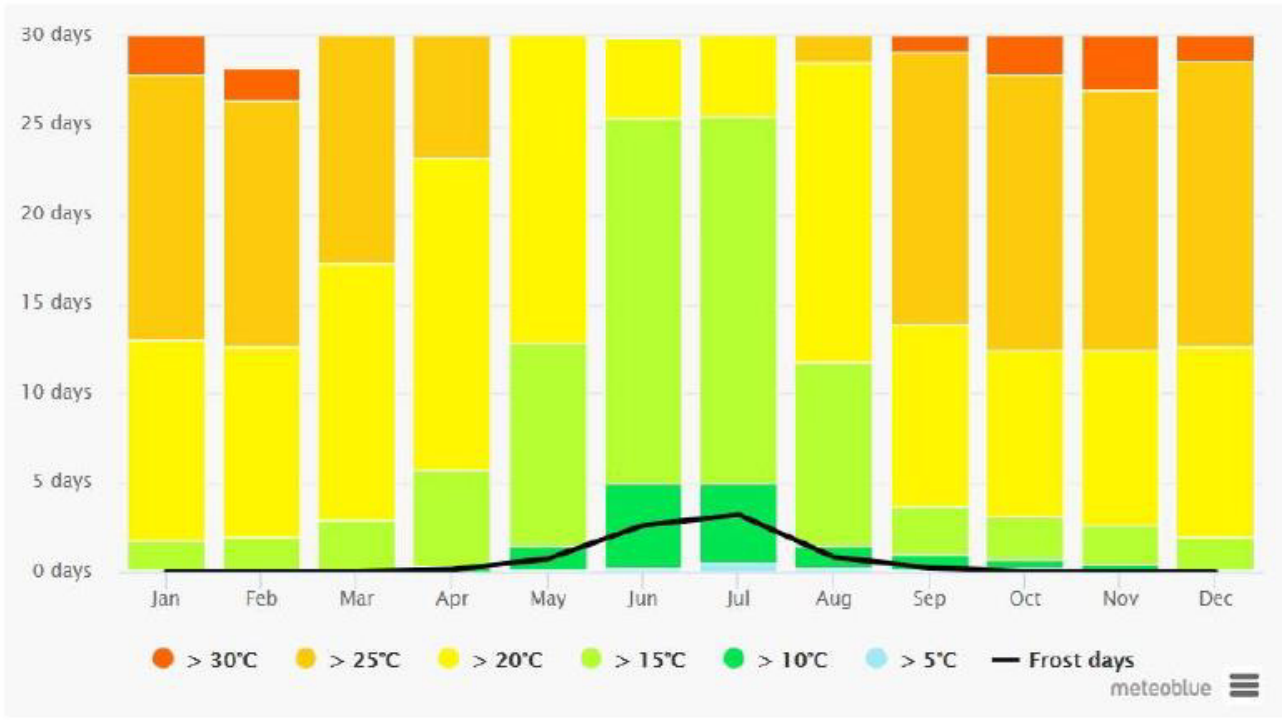

Figure 7: Monthly Temperatures for the study area

Wind speed

The average wind speed ranges from >1 km/h to >38 km/h throughout the year. Wind speed is high during the months of August, September and October, reaching speeds of more than >38 km/h on some days. From February to June, average wind speed is approximately 12 km/h per day.

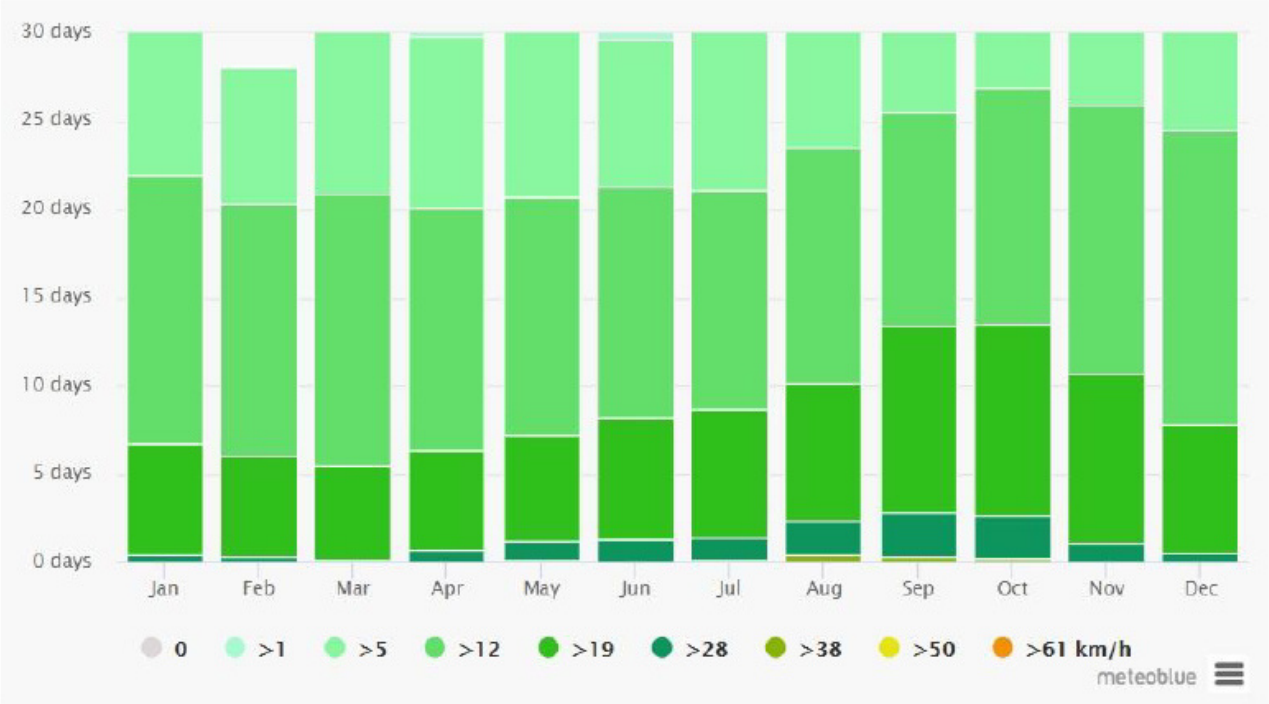

Figure 8: Monthly Wind Speed for the study area

4.1.3 Surface Hydrology

Regional Hydrology

South Africa is divided into 9 Water Management Areas (WMAs) which have been published in the Government gazette number 40279 of 19/09/16 (Notice no 1056, DWS, 2016), managed by their own water boards. Each of the WMAs is made up of quaternary catchments which relate to the drainage regions of South Africa. The project area falls mostly within quaternary catchments B11A and a small section towards the east in B11B.

Local Hydrology: Mpumalanga Highveld Wetlands (MHW, 2014)

Regulatory decision-making involving freshwater ecosystems is particularly relevant for the mining sector. In areas like Mpumalanga, with conflicting land uses and trade-offs between mining, food and water security, generating a clear and accurate picture of the extent, distribution, condition and type of freshwater ecosystems is an essential prerequisite to informed and consistent decision-making by regulators. This project thus presented a timely opportunity to develop standardised methods for ground-truthing and refining the NFEPA data, and to apply these methods in an area where the trade-offs between mining and wetlands are highly contested.

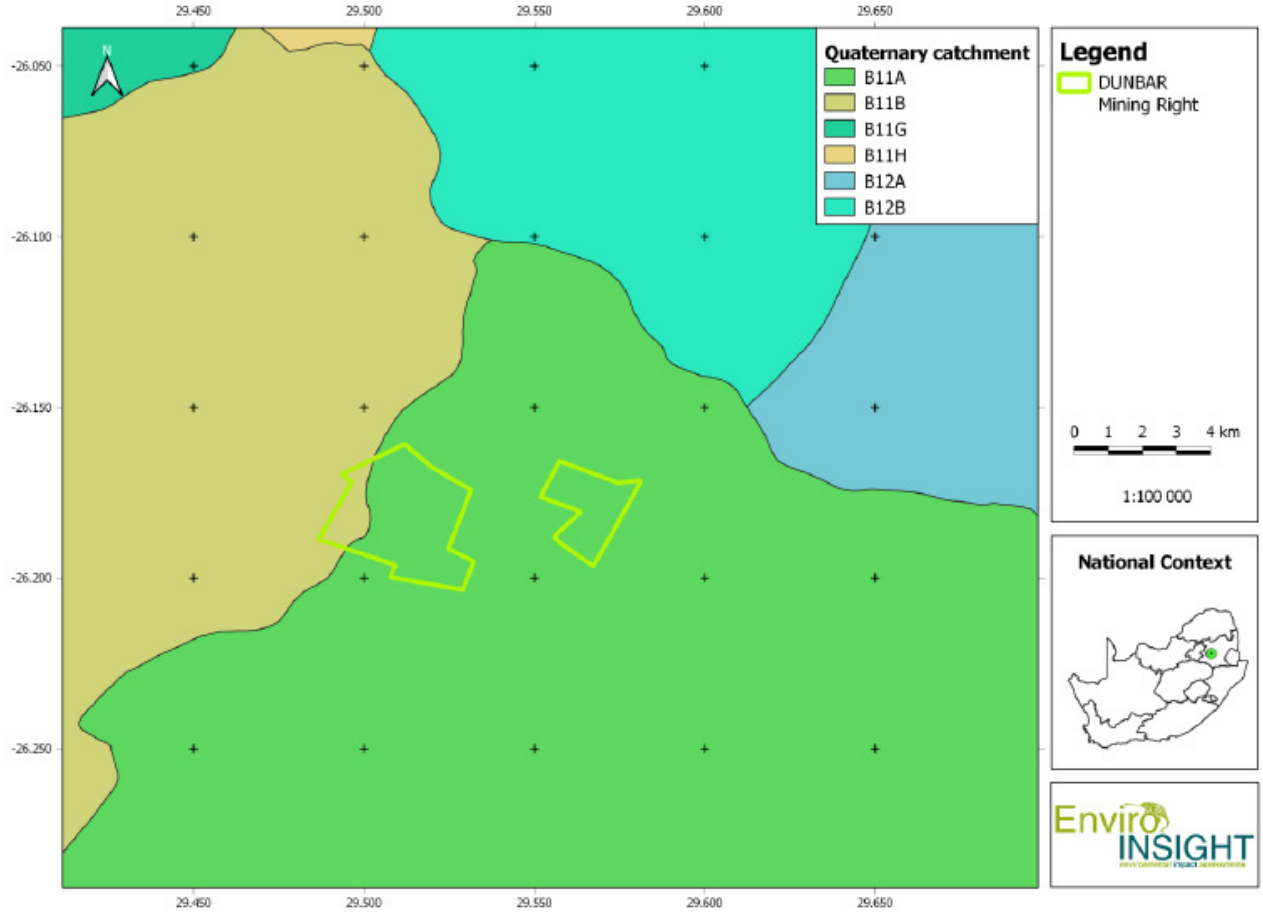

Figure 9: Catchment Scale Map of the study area indicating Quaternary Catchments

This project maps the extent, distribution, condition and type of freshwater ecosystems in the Mpumalanga Highveld coal belt. These refined layers will eventually be incorporated into the atlas of high-risk freshwater ecosystems and guidelines for wetland offsets, currently being developed by SANBI, in order to improve the scientific robustness of these tools.

Based on the MHW, the study area intersects a channelled valley-bottom wetland. This will be further assessed and discussed in the wetland assessment during the EIA phase of the project.

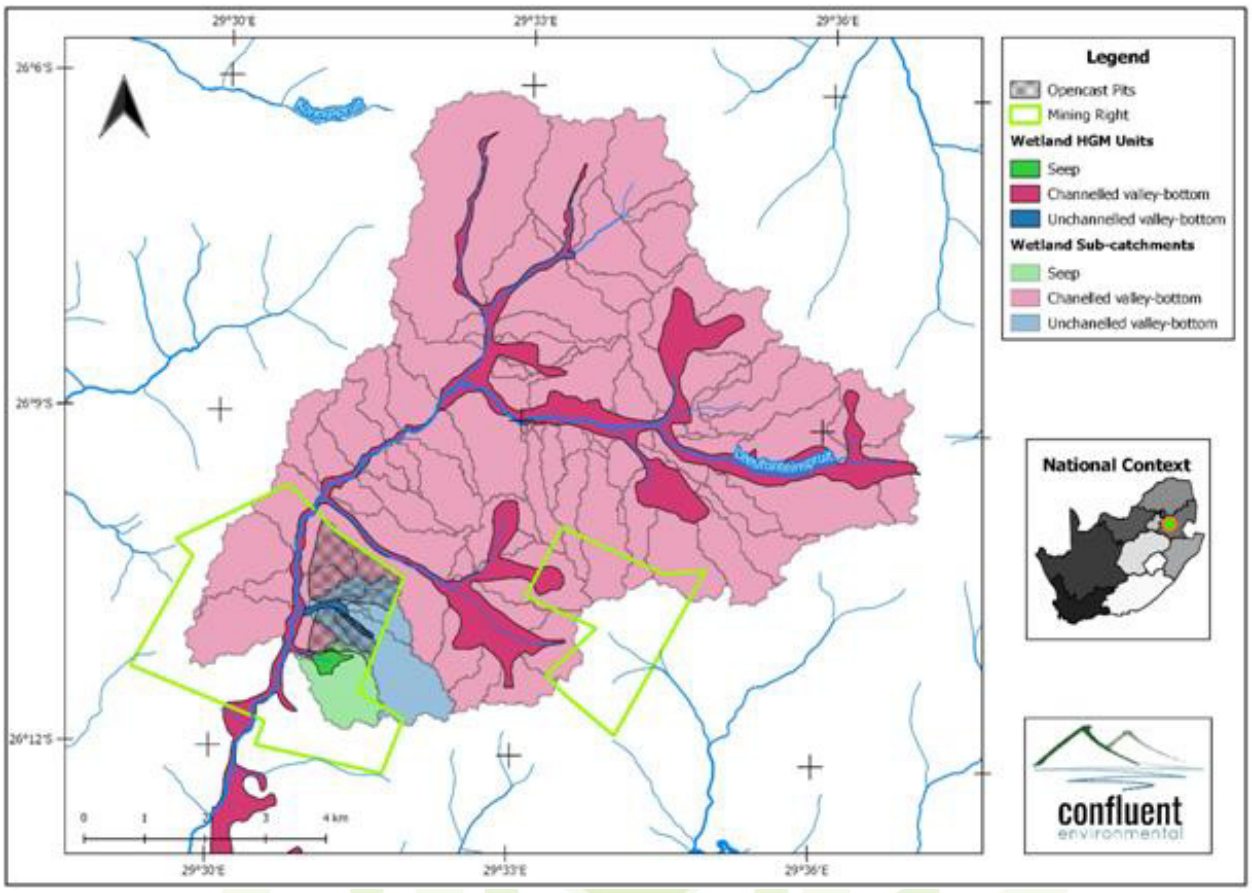

Figure 10: Study Area in relation to the Mpumalanga Highveld Wetlands

4.1.4 Terrestrial Ecology

Regional Vegetation

The Eastern Highveld Grassland (Gm12) occurs on plains in the Mpumalanga and Gauteng Provinces. This vegetation type extends from Johannesburg in the west to Belfast in the east and Bethal and Ermelo in the south. This vegetation type is classified as Endangered (EN) with a conservation target of 24%, while only a small fraction conserved on statutory (Nooitgedacht Dam Nature Reserve and Jericho Dam Nature Reserves) and private reserves (Holkranse, Kransbank and Morgenstond). In 2010, approximately 44% of this vegetation type was classified as transformed primarily by cultivation (most extensive impact), plantations, mining, urbanisation and by building of dams (Mucina & Rutherford, 2010).

The landscape features consist of slightly to moderately undulating plains with some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual Highveld grass composition, including species from the genera *Aristida, Digitaria, Eragrostis, Themeda* and *Tristachya*, with small, scattered rocky outcrops of wiry, sour grasses and some woody species such as *Senegalia caffra, Celtis Africana, Diospyros lycioides* subs *lycioides, Parinari capensis, Protea caffra, P. welwitschii* and *Englerophytum magalismontanum* (Mucina & Rutherford, 2010).

Important plant taxa in the Eastern Highveld Grassland include:

Low shrubs: *Anthospermum rigidum subs. pumilum, Seriphium plumosum;*

Graminoids: *Aristida aequiglumis, A. congesta, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. curvula, E. plana, E. racemosa, Heteropogon contortus, Loudetia simplex, Microchloa caffra, Setaria sphacelata, Sporobolus africanus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix and T. rehmannii.*

Herbs: *Acalypha angustata, Berkheya setifera, Dicoma anomala, Euryops gilfillanii, Haplocarpha scaposa, Helichrysum oreophilum, H. rugulosum, Hilliardiella oligocephala, Ipomoea crassipes, Justicia anagalloides, Pelargonium luridum, Pentanisia prunelloides, Senecio coronatus and Wahlenbergia undulata.*

Geophytic herbs: *Gladiolus crassifolius, Haemanthus humilis, Hypoxis rigidula, Ledebouria ovatifolia.*

Succulent herb: *Aloe ecklonis.*

The Eastern Highveld Grassland has also been listed as a threatened ecosystem (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, G 34809, GoN 1002, 9 December 2011) with a status of Vulnerable.

Two highly localized and threatened forbs, *Gladiolus robertsoniae* (Near Threatened) and *Nerine gracilis* (Vulnerable), are found in the remaining grassland patches.

Important Bird Areas

Amersfoort-Bethel-Carolina Important Bird Area. This area is bounded by the main roads between the following towns: Ermelo, Amersfoort, Bethal, Hendrina and Carolina. It consists mostly of flat to undulating farmland between 1,650 and 1,832 m. In a landscape dominated by maize, several remnant patches of moist clay Highveld grassland are scattered throughout the district, growing on black vertical clays. The grasslands hold several streams and pans, as well as the Willem-Brummer Dam near Ermelo. Rocky slopes, gullies and ravines favour the development of thicket, dominated by *Leucosidea*, *Buddleja* and *Rhamnus*. In the deeper, fire-protected gullies, secondary forest occasionally develops, with trees of *Euclea*, *Diospyros*, *Myrsine* and *Searsia*.

This site holds a large proportion of the global population of *Spizocorys fringillaris*. The grassland areas also hold *Neotis denhami, Eupodotis senegalensis, Saxicola bifasciata, Monticola explorator and Geronticus calvus. Falco naumanni, Glareola nordmanni and (less frequently) Circus macrourus can be seen quartering the grasslands. Occasionally, all of South Africa's crane species can be found in the grasslands or cropfields within the site.*

4.1.5 Hydrogeology

The Site falls primarily within B11A with the western portion of the Site section falling within B11B, which are situated within the Highveld region of South Africa, with a dry winter season and wet, high intensity rainfall summer season (Nurizon, 2019). The majority of rainfall occurs between October and March, with a mean annual precipitation (MAP) of 620 mm and mean annual evaporation (MAE) of 1'972 mm. Site surface elevations range between 1'600 and 1'700 m amsl, sloping gently towards the perennial Leeuwfonteinspruit at the centre of the Site and various non-perennial channels and wetland/pan features situated across the Site region.

Coal will be extracted from the upper Seam 4 and bottom Seam 2 resources at two (2) opencast areas (i.e. Opencast 1 and Opencast 2) at the Site using conventional truck-and-shovel opencast mining methods, the planned life of mine (LoM) for Opencast 1 is ten (10) years and five (5) years for Opencast 2, with an average production rate of 1.5 Mtpa and mining to depths of 60 m on average for both pit areas.

Geochemical samples were taken at the Site and were representative of overburden material (samples 'DRB Carb Shl' and 'DC-OVB'), as well as the 4 seam coal resource at the Site (sample 'INDB08/4L/2') and were geochemical testing, including ABA and NAG testing.

The mineralogical compositions of the samples were determined using XRD, with the following observations made:

- Organic carbon (%C) was highest in the coal sample (INDB08/4L/2) (45.49 weight %), followed by carbonaceous shale (5.59 weight %). No organic carbon was present in the overburden sample;
- Pyrite was present in small amounts in the coal sample, with no pyrite noted in the carbonaceous shale or overburden samples;
- Quartz content increased from the coal sample to carbonaceous shale with the overburden sample showing the highest quartz value; and
- Dolomite was present in the coal sample, with calcite values in the overburden and coal samples being similar.

Based on the Miller *et al*. (1997) screening criteria for NAG testing results, all of the samples collected at the Site were rock type IV (non-acid forming). Based on ABA test results the carbonaceous shale and coal samples both showed potential for acid generation (Rock Type II), while the overburden sample showed no acid generation potential (Rock Type IV). Sulphur speciation of the samples showed

the coal sample to have the highest percentage of sulphur as S and sulphide sulphur, with the overburden sample showing sulphur as S to be dominant while the carbonaceous shale sample showed sulphide sulphur as dominant.

No kinetic leach testing was completed for the Site, however Mokoena (2012) performed kinetic testing on representative samples from the Site region, which were considered representative of the Site materials. Contaminants of concern for the Site were sulphate (SO4), aluminium, manganese and iron, with the cumulative concentrations after twenty (20) weeks of testing by Mokoena (2012) for similar sample material to that found at the Site showing sulphate values ranged between ~150 and 1'850 mg/l and an average of ~670 mg/l. Aluminium, manganese and iron values were generally 0 mg/l, with non-zero value samples showing an average of 5.10 mg/l, 1.06 mg/l and 98.28 mg/l, respectively.

A Hydrocensus investigation was conducted within a 5-km radius of the Site and within the Site boundaries, during which a total of 22 boreholes were identified. A total of 9 boreholes were in use as either domestic or livestock water supply, with the remaining 13 boreholes being either monitoring boreholes or not in use. The average borehole depth was ~28 m, ranging between 8 and 53 m, with the borehole abstraction rates (based on communications with users) ranging between ~100 and 1'000 litres per day. Regional groundwater levels ranged between 3 and 15 m bgl, up to 30 m bgl locally, with an average water level of 10 m bgl, with groundwater levels at the Site and immediate surroundings between 3 and 10 m bgl, with an average groundwater level of 4.7 m bgl. Both regional and Site groundwater levels showed strong correlation to surface elevation, suggesting groundwater flow takes place under semi-confined conditions, generally, and mimics surface topography.

A total of twelve (12) geophysical lines were completed using a combination of electromagnetics (EM-34) (8 lines) and magnetics (4 lines) geophysical methods, with a total of 4'850 m of survey completed. A total of twelve (12) potential drilling targets were identified based on the geophysical survey results.

Three (3) hydrogeological boreholes were installed at the Site based on the results of the geophysical investigation, as well as previous investigations, and installed at the site to act as aquifer characterisation boreholes. The boreholes were installed to depths of 33 to 66 m using conventional air percussion drilling methods to a final diameter of 200 mm and 165 mm diameter solid steel casing installed up to the end of the weathered zone (i.e. 13-18 m below ground level (bgl)).

Water strikes in the boreholes were associated with contact zones between weathered and competent rock units, with borehole DBR-01 showing a final blow yield of 1 l/s, DBR-02 being 0.2 l/s and DBR-03 showing a seepage water intersection.

Each of the newly installed borehole underwent constant rate aquifer testing, where water was removed from the borehole at a constant rate for periods between 25 and 195 minutes and the response in water level measured. Following the constant rate test the water level recovery was measured until the water level had recovered to 90% of the original water level. The results of the aquifer tests were interpreted using the Cooper-Jacob and Theis residual straight-line fitting methods.

Borehole **DBR-01** showed an average transmissivity of 6.6 m^2/day, ranging between 6.1 and 7.1 m^2/day, with analysis of the resultant drawdown curve at the borehole showed the borehole to be situated in a semi-confined aquifer, with a potential recharge boundary (most likely the river channel located north of the borehole). Borehole **DBR-02** had an average transmissivity of 0.13 m^2/day, ranging between 0.11 and 0.14 m^2/day. Analysis of the resultant drawdown curve at the borehole showed the borehole to be situated in a confined aquifer, with no boundary conditions identified from pump testing data. Borehole **DBR-03** showed an average transmissivity of 0.49 m^2/day, ranging between 0.19 and 0.79 m^2/day. Analysis of the resultant drawdown curve at the borehole showed the borehole to be situated in a fractured, semi-confined aquifer, with an impermeable flow boundary condition located near to the borehole.

The Site groundwater system is comprised of three (3) hydraulically connected hydrogeological units, namely:

- A shallow, weathered zone hydrogeological unit;
- A deeper, fractured rock hydrogeological unit; and
- A basement hydrogeological unit.

The upper, weathered hydrogeological unit is typically found between 5 and 12 m depths, with the dominant recharge mechanism being infiltration of rainwater (1-5% of MAP) and secondary interactions with surface water bodies, locally. The average transmissivity of the weathered zone is 1-3 m^2/day, depending on the clay content of the weathered material, up to ~5-10 m^2/day at alluvial zones near to perennial rivers. The movement of groundwater in the upper weathered unit is controlled by the lower permeability shale or dolerite layers and typically mimics surface topography.

The fractured rock hydrogeological unit is found at depths ranging between 15 and 50 m with water strike intersections decreasing with depth. The matrix of the Vryheid formation geology is well-cemented, thus lowering groundwater potential in the matrix and leading to almost all economic water strikes being associated with secondary geological features such as faults, fracture zones and intrusive contact zones (e.g. contact zones at dolerite sills or dykes). Recharge to the fractured rock unit is mainly as a result of storage water released from the upper weathered unit, with outcrop zones being recharged from rainfall infiltration (<1-2% MAP). Transmissivity values for the fractured rock unit ranged between 0.5 and 7 m^2/day, with fracture zones showing transmissivities of ~0.5-1.5 m^2/day and contact zones between lithology units having transmissivity values of ~3-7 m^2/day.

The basement hydrogeological unit is generally regarded as insignificant due to its low yielding nature, great depth (>100 m) and limited recharge potential due to the overlying Dwyka tillite or felsite units. The transmissivity values of the basement unit are expected to be in the order of 0.05 and 0.1 m^2/day.

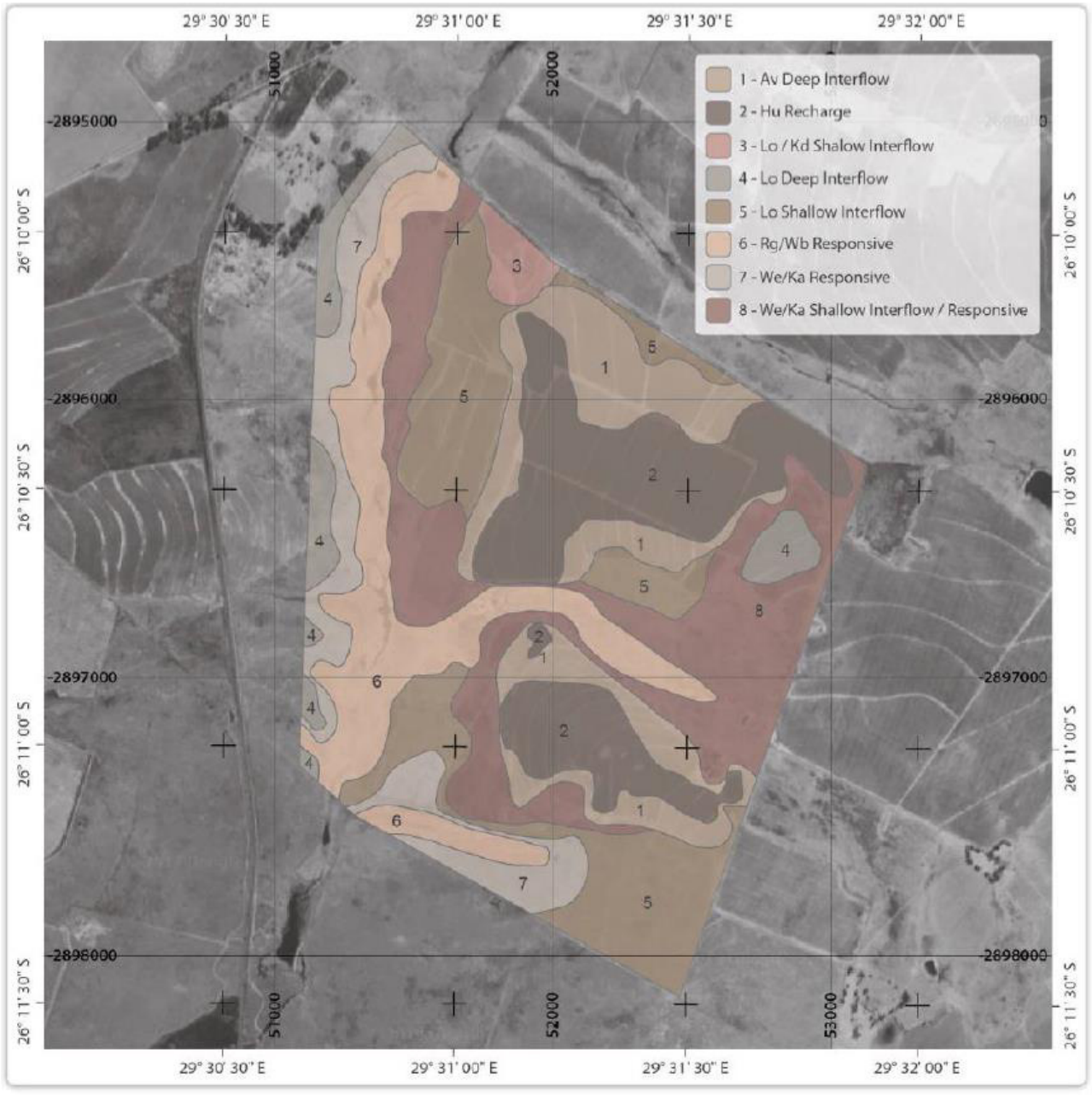

Figure 11: Generalised Soil Map of the Study Area

4.2 SOCIAL CONTEXT

4.2.1 Govan Mbeki Local Municipality (GMLM)

GMLM is situated in Gert Sibande District Municipality (GSDM) in Mpumalanga Province. It is one of the 7 local municipalities under the jurisdiction of GSDM and one of the 18 local municipalities within Mpumalanga. GMLM has the most diversified economy within the GSDM, dominated by the petrochemical industry (the SASOL II and III complexes) and coal and gold mining. GMLM has the largest underground coal mining complex in the world which makes it an important strategic area within the national context.

The information was obtained from Statistics South Africa (Census, 2011).

Demographics

The GMLM population grew from 294 538 people in 2011 to 340 091 people in 2016. This represent 108 894 households, at an average of 3.3 people per household and a population growth rate of 3.1%. Of this population, 66% of the population is black (the majority of households speaking Isizulu), 27.3% is white and 6.7% coloured, Indian, Asian or other. The gender ratio indicates that there are more males than females in GMLM.

Households

The distribution of household income in the period 2001 to 2011 reveals that:

- The households with no income declined from 30.5% to 13.5%;
- The households receiving an income received less than R 19 200 per annum decreased from 52% to 46.4%;
- The households between R 19 200 and R 76 800 per annum increased from 13.4% to 29.6%;
- The group earning more than R 76 800 per annum increased from 4.1% to 10.4%; and
- The average household income is R 29 400.

Approximately 21.5% of the population of GMLM is economically active, with 33.7% employed and 12% of the 21.5% economically active population is unemployed implying that dependency and unemployment rate is moderate

Economics

About 48.5% of the population is employed, of which 77% is employed in the formal sector, while only 17% is unemployed. Over the period 2001-2011, the economically active age group (15-65) increased. The size of this group (69.4% of the population) puts pressure on the local economy to provide jobs. There was also an increase in the percentage of elderly, putting pressure on the provision of care for the elderly

Education

Forty-seven point one percent (47.1%) completed matric or higher, of which 8% have achieved higher qualifications. Seven percent of the population has no formal education while about 8% has some primary education.

Service Delivery

Water supply

Ninety-seven point seven percent (97.7%) of residents are getting water from a regional or local service provider which is about 10% higher than the rate in GSDM at 88.84%. The largest majority (49%) of households has piped water inside their yards and a large number of households piped water inside their house. A few people are still reliant on a public or communal tap or piped water.

Power supply

Only 4.3% have no access to electricity compared to the 9.59% of the GSDM. 76% of households that do have electricity have in-house prepaid meters installed.

Toilet facilities

Ninety-five point five percent (95.5%) of people have access to flush or chemical toilets, about 4% make use of pit toilets or other means, while only 0.5% has no access to toilet facilities.

Refuse disposal

Eighty-six point four percent (86.4%) are getting refuse disposal from a local authority, private company or community members.

4.2.2 Steve Tshwete Local Municipality (STLM)

STLM is situated in the Nkangala District Municipality (NDM) in Mpumalanga. It is one of the 6 local municipalities under the jurisdiction of NDM and one of the 18 local municipalities within Mpumalanga.

Demographics

The population grew from 229 831 to 278 749 between 2011 and 2016. This represents 86 715 households where 70% have men as their head. 234 **h**ouseholds have heads under the age of 18 years old. Eighty-two percent (82%) of the population is black (the majority of households speaking Isizulu), 14% is white and 3% coloured, Indian, Asian or other. The gender ratio indicates that there are more males (52%) than females in STLM.

Economics

Fifty-two point nine percent (52.9%) of people are employed while 13% of the population are unemployed. The formal sector employed the most people (73%) while the informal sector employed 12%.

Education

Fifty point eight percent (50.8%) of the population completed matric or higher of which only 7% obtained higher qualifications.

The Social Impact Assessment will assess the social impacts during the EIA phase of the project.

5. PUBLIC PARTICIPATION AND STAKEHOLDER ENGAGEMENT

Consultation meetings have taken place in May 2019 with most landowners and will continue throughout the process.

A public meeting was scheduled for 24 June 2019. All registered I&APs were notified of the date, time and venue of the meeting, yet not a single person attended the meeting. Enviro-Insight waited for 35 minutes and after no one arrived, packed up and left. No I&AP indicated that they will be late or made an attempt to excuse themselves for not attending. Accordingly, no minutes of the meeting are available, but the PowerPoint presentation is included in the EIA as well as photographic proof of non-attendance.

Refer to the Final EIA Report for the detailed Public Participation Report.

6. ENVIRONMENTAL RISK ASSESSMENT FINDINGS

6.1 Risk Assessment Methodology

According to the Mineral and Petroleum Resources Development Regulations, 2004 (Published under Government Notice R527 in Government Gazette 26275 of 23 April 2004) (GN R527) latent and residual impacts are defined as follows:

- "latent environmental impact means any environmental impact that may result from natural events or disasters after a closure certificate has been issued" (own emphasis); and
- "residual environmental impact means the environmental impact remaining after a closure certificate has been issued" (own emphasis).

Latent and residual risks are specifically related to post mining impacts that occur at the site once rehabilitation post mining has been completed.

As this is the first iteration of the report for the new development, future information will, over time, inform the extent of the risks to the surrounding environment.

6.2 Residual Risks

The following residual risks were identified from specialist reports:

- According to the Hydrogeology report simulated groundwater rebound at the Site indicated that decant is possible, although limited, at the central region of Opencast 1, with no decant expected at Opencast 2. The predicted decant volume at Opencast 1 was in the order of 250-300 m3/day, with expected sulphate concentrations of ~400-500 mg/l. The constructed wetland treatment solution would be the preferred solution at the site, offering benefits such as wetland reclamation and low operational costs. However, the final solution for the management of AMD (if any) at the Site will be determined, designed and implemented (where possible) during the operational phase of the LoM following further geochemical testing and numerical groundwater modelling refinement at the Site.; and
- Workforce will be made redundant after mining has ceased and social behaviour could have adverse effects.

6.3 Latent Risks

The following latent risk could possibly pose risks to direct surroundings:

- Natural disasters could have a detrimental effect on the final rehabilitation of the mining site. Failures in berms, gabions rehabilitated dumps require careful final designs on a site.

7. DESIGN PRINCIPLES

7.1 LEGAL AND GOVERNANCE FRAMEWORK

7.1.1 Statutory requirements and interpretation thereof

Various legal and regulatory frameworks exist that should be complied with; however only the main legislative aspects related to rehabilitation, decommissioning and closure has been considered for this section of the report. The main legislation be listed as;

- Constitution of the Republic of South Africa (Act 108 of 1996) (The Constitution);
- Mineral and Petroleum Resources Development Act (Act 68 of 2002) (MPRDA);
- National Water Act (Act 36 of 1998) (NWA);
- Mine Health and Safety Act (Act 29 of 1996) (MHSA).
- National Environmental Management Act (Act 107 of 1998) (NEMA);
- National Environmental Management Amendment Act (Act 62 of 2008) (NEMAA);
- National Environmental Management Act (Act 107 of 1998) (NEMA) EIA Regulations promulgated under Chapter 5 of the NEMA published in GN R327, R326, R325 and R324, dated 7 April 2017;
- National Environmental Management Act: Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations (GN 1147);
- National Environmental Management: Air Quality Act (Act 39of 2004) (NEMAQA), associated Listed Activities and National Dust Control Regulations;
- National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA);
- National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEMPAA);
- National Environmental Management: Waste Act (59 of 2008) (NEMWA) and associated supporting regulations.

The following table summarises a short description of the aforementioned legislation as it pertains to rehabilitation, decommissioning and mine closure.

Table 5: Legislation as it pertains to Rehabilitation, Decommissioning and Mine Closure.

Legislation	Rehabilitation, decommissioning and closure relevance
Constitution of the Republic of South Africa (Act 108 of 1996) (The Constitution); In terms of Section 24 of the Constitution "Everyone has the right to an environment that is not harmful to their health or well-being; and to have the environment protected for the benefit of present and future generations."	In terms of the Constitution there's a requirement to ensure that this plan includes measures that protect the rights of people to ensure an environment that is not harmful to health or well-being post rehabilitation, decommissioning and closure of the project.
Mineral and Petroleum Resources Development Act (Act 28 of 2002) The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA require that the environmental management principles set out in NEMA apply to all mining operations and serve as guideline for interpretation, administration and implementation of environmental requirements of NEMA.	In the past requirements relating to closure planning and provisioning were included in the MPRDA alone. These have been replaced by those in the Financial Provision Regulations under NEMA in terms of the National Environmental Management Act: Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining / Production Operations (GN 1147)
National Water Act (Act 36 of 1998) (NWA);	The National Water Act places the obligation to mitigate any aspects that cause or have caused pollution as well as

Section 19 of the NWA sets out the principles for "an owner of land, a person in control of land or a person who occupies or uses land" to: **Cease, modify or control any act or process causing pollution;** - Comply with any prescribed waste standard or management practice; - Contain or prevent the movement of pollutants; - Eliminate any source of pollution; - Remedy the effects of the pollution; and - Remedy the effects of any disturbance to the bed and banks of a watercourse.	to remediate any residual contaminated water at closure on the owner of the land, person in control or occupier of the land.
Mine Health and Safety Act (Act 29 of 1996) (MHSA). This Act deals with the protection of the health and safety of persons in the mining industry but has some implications for environmental issues due to the need for environmental monitoring within mine operations and maintenance of mine residue deposits.	All closure and closure related activities will have to be undertaken in a safe manner where the Health and Safety of all workers and contractors involved in closure activities is protected.
National Environmental Management Act (Act 107 of 1998) (NEMA) Sections 28 (1) and (3) of NEMA set out the duty of care principle, which is applicable to all types of pollution and must be taken into account in considering any aspects of potential environmental degradation. Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.	Potential measures required in terms of subsection (1) may include measures to - • Investigate, assess and evaluate the impact on the environment; • Inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed to avoid causing significant pollution or degradation of the environment; • Cease, modify or control any act, activity or process causing the pollution or degradation; • Contain or prevent the movement of pollutants or the causes of degradation; • Eliminate any source of pollution or degradation; or Remedy the effects of the pollution or degradation.
NEMA Environmental Impacts Assessment Regulations, 2017 This set of regulations was developed for the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations.	All new Environmental Impact Assessments or Basic Assessments relating to mining was required to consider closure during planning and to include a closure plan and closure cost estimate in support of an application for authorisation.
National Environmental Management Act: Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations (GN 1147) The purpose of these Regulations is to regulate the determine and making of financial provision as contemplated in the Act 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. The Regulations also include detailed descriptions of the wording required in the documentation to support the provisioning for liability using Bank Guarantees and Trust Funds. Finally, the legislation also provides detailed on the information to be contained in the following plans: • Annual rehabilitation plan;	Current rehabilitation, decommissioning and closure planning process will need to be expanded to include; • An Annual rehabilitation plan; • A Final rehabilitation; decommissioning and mine closure plan • Environmental risk assessment report; and • Care and maintenance plan.

• Final rehabilitation, decommissioning and mine closure plan; • Environmental risk assessment report; • Care and maintenance plan.	
The National Environment Management: Air Quality Act, 2004 The National Environmental Management: Air Quality Act 39 of 2004 shifted the approach of air quality management from source-based control to receptor-based control. The Act made provision for National ambient air quality standards; however, it is generally accepted that more stringent standards can be established at the Provincial and Local levels. Emissions are controlled through the listing of activities that are sources of emission and the issuing of emission licenses for these listed activities. Atmospheric emission standards have been established for each of these activities and an atmospheric license is now required to operate. The National Dust Control Regulations were published on 1 November 2013, in terms of the National Environmental Management Air Quality Act, which prescribes general measures for the control of dust.	NEMAQA relating activities such as monitoring, and application of management/mitigation measures may apply during closure where air quality could potentially be affected. According to the National Dust Control Regulations, any person conducting any activity in such a way that would give rise to dust in quantities and concentrations that exceeded the dustfall standard set out in the regulation was impelled to, upon receipt of a notice from an air quality officer, implement a dustfall monitoring programme.
The National Environmental Management: Biodiversity Act, 2004: The Act seeks amongst other things, to manage and conserve biological diversity, to protect certain species and ecosystems, to ensure the sustainable use of biological resources and to promote the fair and equitable sharing of benefits arising from bioprospecting involving those resources. The NEM: BA includes a Regulation related to the management of threatened and protected species. A similar Regulation is applied to Threatened Ecosystems. NEM: BA has a set of norms and standards for the development of management plans for both species (e.g. Threatened or Migratory Species) and ecosystems (Endangered or Critically Endangered). **The National Environmental Management: Protected Areas Act, 2003:** Protected areas such as nature reserves and special nature reserves are declared and managed in terms of this Act. Depending on the nature of the protected area, certain activities (such as mining) may require Ministerial consent or be prohibited outright. The Act also aims to promote the sustainable use of protected areas and the participation of local communities in such areas. In addition, it provides for the continued existence of the South African National Parks.	In the event where relevant species or threatened ecosystems are present as identified by an ecologist or listed in the available national Geographic Information Systems Datasets a management plan must be developed in alignment with these norms and standards to feed into the rehabilitation, decommissioning and closure plan.
National Environmental Management: Waste Act (59 of 2008) Section 8 of Chapter 4 of the Act indicates the requirement to identify the status and risk of contaminated sites and provides a legal mechanism for remediation activities to be instigated and controlled. In addition to this, the **Waste Classification and Management Regulations** The Waste Classification and Management Regulations require that (Chapter 2, 4(2)) all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within 180 days of generation and if the waste is to be disposed of to landfill that (Chapter 2 (8)1) (a) the waste	Contamination because of the project activities will require remediation, with the final soil quality having to meet the requirements as specified in the Regulations. The Waste Classification and Management Regulations and the supporting Norms and Standards as well as Regulations regarding the Planning and Management of Residue Deposits and Residue Stockpile do not contain specifications around rehabilitation, decommissioning and closure, other than the requirements in Regulations itself regarding the Planning and Management of Residue Deposits and Residue Stockpile - stockpiles and deposits be closed according to the relevant provisions in the

is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal. **Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits** The regulations specify design approach and considerations for Residue Stockpiles and Residue Deposit (RSRD), but more importantly specify that these facilities must comply with the National Norms and Standards for Waste.	environmental authorisations, an Environmental Management Plan/Programme and any other applicable legislation (such as the National Water Act for instance).

7.1.2 Best Practice Guidelines

Post-closure impacts associated with mining operations generally include significant impacts on the water resource and therefore the Department of Water and Sanitation (DWS) has a particular interest in the water management aspects associated with mine closure and include management and mitigation measures associated with rehabilitation, decommissioning and closure in the Water Use Licenses issued to mines as a departure point. Further to this, recognising the potential mining impact on water, the DWS formerly known as the Department of Water Affairs and Forestry (DWAF) and Department of Water Affairs (DWA) thereafter – issued a series of Best Practice Guidelines (BPG) to assist with aspects of DWAF's water management hierarchy. Included in this series of guidelines is BPG5: Water Management Aspects for Mine Closure. The principles in the BPG5 that are appropriate and that have been used to formulate the rehabilitation strategy are:

- 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 that rehabilitation does not need to be redone at a later stage.
- Land use plan which is directly interlinked 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 resource;
- 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.

7.2 Closure Vision, Objectives and Targets

The closure vision for the project is intended to inform the closure objectives outlined in this document. The closure vision is supported by the objectives as listed below;

- Create a safe, physically stable rehabilitated landscape that limits long-term erosion potential and environmental degradation;
- Sustain the long-term catchment water yield and ensure suitable water quality;
- Rehabilitation of the surface infrastructure where necessary to minimize infiltration into the underground water regime (the philosophy of concentration and containment);
- Rehabilitation to minimise contamination of surface water resources (the philosophy of dilution and dispersion);
- Focus on establishing a functional post-mining landscape that would ensure self-sustaining agricultural practices post mine closure where possible;
- Ensure interconnectivity between the rehabilitated landscapes with surrounding regionally biologically diverse areas;
- Encourage, if and where required, the re-instatement of terrestrial and aquatic wetland biodiversity over time; and
- Create opportunities for alternative post-mining livelihoods by aligning to the regional planning;
- Meet with prevailing environmental legal requirements outlined in this report; and
- Prevent / Minimise negative impacts and risks as identified in this report.

7.3 Evaluation of Alternative Closure and Post Closure Options

The project is not entirely unique and therefore not extremely technical in nature as the impacts and risks are well understood and outlined in various specialist impact studies undertaken on site and in the region.

The nature of opencast mining operations results in the main disturbances that has taken place on surface. There are limited options and alternatives available for the rehabilitation, decommissioning and closure of such underground operations and therefore alternatives selected are based on past similar projects and global best practice methods and solutions.

Table 6: Alternative Closure and Post Closure Options

Closure Aspect	Alternatives
Final void	**Alternative 1:** Backfilling the final void with demolition material, stockpiled overburden and covering with topsoil while establishing vegetation **Alternative 2:** Leave the final void open to ensure opencast contaminated water can daylight and evaporate from this area to limit the potential of water reaching a decanting level. The stockpiled overburden and topsoil will then remain above surface. **Alternative 3:** Sealing the final void left after life of mine with a concrete mixture to ensure complete sealing of the area and no further interaction between the surface and opencast water from this area.
Potential future decant	**Alternative 1:** Leave the final void open after life of mine based on the assumption that evaporation from this area will ensure water remain in equilibrium and therefore limit potential future decant. **Alternative 2:** Backfilling of the final void while installing the necessary abstraction boreholes and pumps to remove water to be treated to a suitable standard from this feature. **Alternative 3:** Allow the decant to reach surface and by means of dispersion and dilution discharge into the environment while installing calcitic lime trenches and passive treatment wetland systems at these discharge points.
Surface Infrastructure	**Alternative 1:** Backfilling the final void with building rubble arising from the demolition practice composed of all types of wastes generated during this stage. **Alternative 2:** Removal of surface infrastructure, waste separation according to classification and optimal reuse, recycling, remediation and disposal thereof.

7.4 Preferred Closure Action Motivation

The risk and impact assessment in conjunction with the conceptual closure strategies were employed to identify the suitable preferred closure alternatives for the aspects considered above. The motivation for the selection of the preferred closure action alternatives have been presented in the table below.

Table 7: Preferred Closure Action Alternatives

Closure Aspect	Preferred Alternatives	Motivation
Phase 1 - Final void	**Alternative 1:** Backfilling the final void with demolition material, stockpiled overburden and covering with topsoil while establishing vegetation.	From the risk assessment it can be concluded that that alternative 1 would be preferred as mitigation is not feasible by leaving the final void open as it will cause further safety issues, not ensure enough evaporation to keep the water level in equilibrium and lower the potential decant potential, while also leaving additional surface stockpiles prone to further future risk. Alternative 3 is also not feasible as the associated cost would be extremely high while creating hard engineered features would not be a suitable solution to reach the closure objectives. Water will not be able to flow freely through the impermeable structure resulting in erosion and gully formation at the edge of the concrete feature where it meets the natural landscape.
Potential future decant	**Alternative 1:** Allow decant to reach surface and by means of dispersion and dilution discharge into the environment while installing calcitic lime trenches and passive treatment wetland systems at discharge points.	As discussed for the final voids, not backfilling these features does not appropriately address closure risk and has the potential to result in the development of future risks that does not exist at closure, therefore option 1 is not a suitable alternative. In the case of alternative 2 future risks relating to the sustainability of active water treatment, ownership of the water treatment plant, availability of resources to support the method and continuous abstraction could also pose further future risks. Alternative 3 is therefore the best option at this stage to ensure sustainable long term post closure water management is ensured.
Surface Infrastructure	**Alternative 2:** Removal of surface infrastructure, waste separation according to classification and optimal recycling and disposal thereof.	The first alternative can be considered if the waste is inert and does not pose the potential to cause future risks developing and would require proposer waste classification of all elements to be backfilled during. Alternative 2 however would be in line with the requirements of the waste management hierarchy to ensure optimal post closure reuse, recycling and remediation of the surface infrastructure. The operation would be utilising mobile infrastructure where possible while a value also exists in terms of recycling. Concrete and inert waste however would be considered for backfilling of the decline shaft and would be minimal and not affect the material balance of the overburden that would also need to be backfilled. Based on the bulking factor of the backfilled material a suitable final landscape with gentle acceptable slopes would be created directing water away from the void.

7.5 Closure and Post Closure Period Definition and Motivation

The purpose of the implementation of the closure actions would be to reduce and eliminate where possible the risks, impacts and residual impacts resulting from the implementation of the project and what would exist at final rehabilitation, decommissioning and closure stage. Given the assessment undertaken the backfilling and sealing of the final void would take the longest and would be implemented over a one-year period.

As soon as all rehabilitation, decommissioning and closure activities have been completed, an additional five-year period would be required for the post closure aftercare and maintenance period. Activities associated with this phase would typically be:

- Monitoring and auditing of the various environmental attributes and indicators;
- Continuous erosion management until a stable landform has been achieved;
- Soil amelioration and field management to facilitate continuous improvement in rehabilitation and revegetation practices;
- Alien invasive species eradication and control;
- Ensuring vegetation cover is established and biological processes are reinstated;
- Assess progressive changes to flora and fauna species assemblages;
- Ensure the ecological integrity/function of the rehabilitated landscape;

- Data collection to inform further required management and interventions as it would arise; and
- Data collection to demonstrate that the achievement of the specific relinquishment criteria complies with the trend for the biophysical category under consideration.

7.6 On-Going Research on Closure

Mining involves a full life cycle, from exploration through production to closure with provisions for potential post mining land use. Research on the development of new technologies has benefits for the mineral industries throughout this full life cycle and for every major component of the mineral industries: exploration, mining (physical extraction of the material from the Earth), processing, associated health and safety issues, and environmental issues. The recommended research and development should be focused on technology areas critical for exploration, mining, in-situ mining, processing, health and safety, and environmental protection.

The mining industries are constantly undergoing incremental or evolutionary changes as uses are found for new technologies developed for other applications. Occasionally, revolutionary changes occur when new technologies, developed either inside or outside the industry, take hold. The need for a better understanding of the scientific underpinnings of the environmental issues and for more effective technologies to address them cannot be overemphasized. Technologies that attempt to predict, prevent, mitigate, or treat environmental problems was increasingly important to the economic viability of the mining industry. Improved environmental technologies related to mine closures present the greatest opportunity for increasing productivity, saving energy and addressing the future rehabilitation, decommissioning and closure risks, impacts and residual impacts.

Research would mainly be focussed on water-quality issues related to mine closures, which are often challenging and costly to address for all types of mining. On-going research and investigations on closure options was focussed on the various treatment options for the accumulation of underground water which may decant to surface in the future, passive treatment systems specifically focussing on addressing potential acid mine water.

7.7 Closure Actions Development Assumptions

This closure plan has been based on the information available at the time and include previous studies and the specialist studies undertaken specifically for this project. Several assumptions were made about general prevailing conditions during mining, and closure and rehabilitation of the facilities at the specific site to develop the closure actions presented in this report. As additional information is collected during operations, these assumptions was reviewed and revised as appropriate. The information available will therefore be supplemented by new information gathered and generated on an annual basis during the operation phase especially as more monitoring data becomes available to inform the management and mitigation measures.

The assumptions used to prepare this plan include the following:

- The closure period will commence once the last coal has been extracted from the mining operations;
- The mine plan, design and layout have been adhered to, in particular section, pillar and long wall design is as per specification required to minimise the potential of subsidence;
- Vegetation establishment was in line with a project specific Biodiversity Action Plan (BAP) that is expected to develop during the mining operations in order to manage its impacts on biodiversity;
- Closure water quality resource objectives and specific compliance criteria was governed by the Water Use Licence as it was prescribed in this document;
- Water management infrastructure developed for the operational phase such as pollution control dams, appropriately designed engineered linings and supporting clean and dirty water separation structures was constructed prior to mining and retained for closure at the end of the life of the project as and if necessary;
- Limited opportunities exist for post closure infrastructure for community uses and therefore complete removal and demolishment of infrastructure would be required.
- Demolition and building rubble is considered General Waste as per the definition of Demolition waste in Category B of Schedule 3 of the National Environmental Management Waste Amendment Act (NEMWAA) and based on the classification as General can therefore be incorporated into the backfill during the closure of the declines;

- A post closure land capability of grazing and wilderness was established which implies that growth medium of a minimum average specification would be adhered to and placed as the last layer of earthworks in any rehabilitation activity;
- Topsoil stripping, handling, storage and preservation would be adequate to ensure it can be replaced during final closure and by means of amelioration remain;
- Hazardous and domestic waste was transported offsite for disposal in licenced landfills, while temporary storage would be in line with the requirements of the Waste Act specifically adhering to the waste classification and the requirements thereof; and
- The roads constructed to access the site will not be required for post closure monitoring and can be rehabilitated as part of normal closure actions.

8. FINAL POST MINING LAND USE

Post closure land use (PCLU) is determined in consultation with stakeholders so that the PCLU meets the requirements of the stakeholders, within the context of this rehabilitation, decommissioning and closure plan. This activity is undertaken for the extent of the mining right area affected by mining activities and integrates stakeholder requirements while taking cognisance of risk mitigation.

As specific consultation regarding PCLU has not been undertaken at this stage of the closure process, for purposes of current planning and liability costing, the assumption is made that post rehabilitation and closure, the land capability developed on the footprints where covers are placed and vegetation established will be a land capability defined as grazing by the Chamber of Mines. This implies a growth medium cover of a minimum of 250 mm on average across the footprints rehabilitated. The final land use plan after closure will still be developed.

9. CLOSURE ACTIONS

9.1 Itemized Closure Actions and Descriptions

9.1.1 General Surface Infrastructure and Processing Plant

The common method of closure for processing plants is that:

- Removal of all fencing not required after mining (farm boundary fences to remain in place);
- All infrastructure and concrete buildings should be broken down to natural ground;
- Buildings, structures and conveyors should be broken down to natural ground level;
- All structures should be demolished to 500 mm below ground level;
- Silos should be imploded and disposed of in the voids,
- The concrete hardstand is the area between buildings such as workshops, offices, etc. which must be demolished to 500 mm below ground level;
- Power lines and water service infrastructure to be disconnected and certified as safe prior to commencement of any demolition works;
- All remaining inert equipment and demolition debris will be placed in the base of the voids;
- Salvageable equipment, mobile equipment and plant will be removed and transported offsite prior to the commencement of demolition;
- All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary disposal yards or reused and recycled at alternative facilities;
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residue remains;
- All above ground electrical, water and other service infrastructure and equipment to be removed and placed in declines or the designated temporary salvage yards;
- All liners to be removed for disposal in designated landfills;
- Electrical, water and other services that are more than 500 mm below ground surface will remain;
- All pipes and structures deeper than 500 mm need to be sealed to prevent possible ingress and ponding of water;
- The areas are to be covered with 1,0m subsoil, top soiled with 250 mm of topsoil and vegetation established;
- Top soiling and vegetation for the areas are included under general surface rehabilitation;
- No credits are allowed for scrap steel and equipment that can be re-used or sold;
- Demolition and building rubble is considered General Waste as per the definition of Demolition waste in Category B of Schedule 3 of the National Environmental Management Waste Amendment Act (NEMWAA) and based on the classification as General can therefore be incorporated into the backfill during the closure of the declines; and
- Hazardous and domestic waste will be transported offsite for disposal in licenced landfills.

9.1.2 Fuel Storage and Refuelling Stations

It should be noted that the remaining fuel in the storage facilities would also be used during closure for plant and equipment related to this function. Near the end of the closure period, after the primary earthwork is complete, the fuel storage and refuelling facilities will be decommissioned.

Closure of the fuel storage and refuelling facilities will focus on physical closure and investigation of potential subsurface contamination from petroleum products. Closure of these facilities will include:

- Removing the remaining fuel in the storage tanks;
- Decontaminating equipment including tanks, piping, and dispensing equipment, as needed;
- Removing the remaining surface or open cast equipment;
- Demolishing all storage tanks and buildings;
- Removing supporting infrastructure relating to these facilities including piping and electrical;
- Breaking walls and foundations to 500 mm below surface level;

- Sampling soils beneath and surrounding the facility;
- Classifying and removing any contaminated soils identified and treating them on site to acceptable standards or disposing of them to a licensed facility if hazardous;
- Re-grading the final landscape and footprints in line with adjacent landscape profile
- Demolition and building rubble are considered General Waste as per the definition of Demolition waste in Category B of Schedule 3 of the National Environmental Management Waste Amendment Act (NEMWAA) and based on the classification as General can therefore be incorporated into the backfill during the closure of the declines; and
- Hazardous and domestic waste will be transported offsite for disposal in licenced landfills.

9.1.3 Sealing of Shafts, Adits and Declines

The sealing of vertical and incline shafts is primarily a safety consideration, and this should be conducted in such a manner that potential safety risks are largely obviated. Normally, inert building rubble arising from the demolition of surface infrastructure should be deposited into the shafts. A mass concrete cap of 1 000 mm thickness is placed onto the building rubble deposited into the shaft. It should be noted that, in specific circumstances, dedicated engineering design and specification of these caps could be required.

Closure will entail the backfilling of the declines with overburden stripped and stockpiled during the construction of these features. It is likely that with the bulking of the overburden as it is excavated, the "bulked" volume available for backfill will exceed the volume of the mining void. However, all overburden will be replaced into the void and the final surface reshaped to simulate surrounding topography while ensuring that the surface is free draining.

Once backfilling is complete a growth medium cover (topsoil) will be placed to a depth of 250mm and vegetation will be established. There may be a requirement to include sacrificial erosion protection measures on the surface while vegetation is being established such as coir fibre netting or hydro-mulching alternatives

Allowance should also be made for methane venting of the open cast mine workings with a methane formation potential by means of strategically placed venting boreholes if required.

9.1.4 Opencast Mine Workings and Voids

Some form of beneficial land use is desirable after mining. Hence, in-filling of opencast pits is advocated in order to facilitate post-mining beneficial land use.

In-filling normally constitutes the following modes of action:

- Concurrent in-filling and subsequent spoils rehabilitation as routinely conducted for opencast pits on collieries.
- In-filling by obtaining material from adjacent opencast pits and/or other parts of the same opencast pit as routinely conducted on iron ore mines.

Difficulties could be experienced with concurrent in-filling in those cases where the ore body is limited to a single opencast pit and various grades of ore need to be sourced from the pit. This requires access to the full pit and in-filling could sterilise ore reserves. In these cases, rehabilitation should be facilitated as follows:

- Excess material from the opencast pit is deposited near the pit for in-filling of the opencast pit once the ore body has been removed.
- Excess material is deposited in such a manner in relation to the opencast pit that mine residue deposit rehabilitation as outlined under component 8 can be conducted with respect to this material. In this case the opencast pit perimeter walls must still be rendered safe for humans and domestic animals.

This is normally achieved by means of the following:

- Sloping the perimeter walls of the opencast pit at 1:3 (18°) to the pit floor or to the stable groundwater level that could establish within a reasonable period within the opencast pit.
- Providing enviro berms and ditches along the opencast pit perimeter when perimeter wall flattening is not feasible as in those cases where opencast mining has been conducted on steep mountainsides.

Notwithstanding the above, owing to removal of the mined product off-site, notably less material remains on site for pit in-filling than was originally removed from the opencast pit. This could be despite bulking of the removed material. Hence final voids with respect to most opencast pits would be unavoidable. These voids should be addressed in the same manner as making the opencast pit safe and pollution free.

Unit cost determination for the Master Rate is based on making the opencast pit safe for humans and domestic animals. For calculation purposes, the Master Rate is based on an opencast pit having a surface area of about 150 ha and is 30 m deep to the pit floor. A typical opencast dimension of 2 500 m length and 600 m width has been assumed. Mining has been conducted in relatively stable/hard rock material, resulting in steep (near vertical) opencast perimeter walls.

It should be noted that the above does not apply for an opencast pit that has already been in-filled, but only for the remaining final voids. The Master Rate was determined for the closure situation of sloping the opencast perimeter walls, assumed to be 3:1 (70°), to 1:3 and shaping and grassing the sloped area. A 1:1 cut to fill ratio was assumed. In this case the sectional cut-and-fill volume to reduce this slope to 18° would equate to approximately 300 m^3/m.

9.1.5 Roads and Parking Facilities

Access and hauls roads that are not required to remain in place for closure and post-closure uses at the site (e.g. security, monitoring, auditing, maintenance and aftercare) will be demolished and rehabilitated. Typical closure actions will include:

- Removal of all signage, fencing, shade and carport structures, traffic barriers and berms, etc.;
- All compacted surfaces to be ripped and artificial surfaces (concrete, paving, bitumen or polymer hardening agents) to be removed along with any culverts and concrete structures;
- All concrete lined drainage channels and sumps will be broken up and removed;
- All potentially contaminated soils are to be identified and demarcated for future remediation;
- Roads that have been treated with dust suppression water containing waste or artificial dust suppressant additives need to be treated as “sealed” roads with the upper surface ripped and removed to designated contaminant disposal areas;
- Demolition and building rubble are considered General Waste as per the definition of Demolition waste in Category B of Schedule 3 of the National Environmental Management Waste Amendment Act (NEMWAA) and based on the classification as General can therefore be incorporated into the backfill during the closure of the declines; and
- Hazardous and domestic waste will be transported offsite for disposal in licenced landfills.

9.1.6 Pollution Control Dams and Associated Infrastructure

Current generally accepted closure methods indicate that operational pollution control dams are properly lined to prevent the migration of the contaminated water impounded in the dam to the shallow groundwater or the nearby receiving surface water environment. Mostly, synthetic (HDPE) liners are provided for this purpose. However, these liners have a finite life and eventual failure of these liners would result in the salts and other contaminants that accumulated in the pollution control dam(s) over the years to be dissipated into the receiving water environment.

Hence, from a holistic view the provision of a pollution control dam served a limited function, only postponing the release of contaminants into the receiving water environment. However, contaminant release has been spread-out over a period of about 50 years, starting from mine residue deposit rehabilitation to final disintegration of the liner in the pollution control dam(s). This situation would most likely allow for an acceptable residual impact, with salt/contaminant release into the receiving water environment at a rate that does not exceed the “natural” assimilative capacity of the receiving water resource. The only exception could be extremely sensitive water resources.

The pollution control dams will be reclaimed, and the area shaped to form a stable landform adhering to the surrounding landscape. The Pollution Control Dams will be required to remain in place during the majority of the closure period to provide water for closure activities as well as to capture any residual seepage and contact water which may be generated on the site and could potentially be polluted. The expectation is that as rehabilitation, decommissioning and closure of the disturbed mining footprint progress, the size of the potential contact water catchment reduces to the point where the need for containment doesn’t exist. During the reduction in catchment size, the contained contact water will be evaporated as runoff and seepage to the

dams reduces. The result would therefore be that there will no longer be a need and requirement to manage excess water in the dams at closure. Closure actions related to the pollution control dams will include:

- Demolish all concrete structures to a level of 500 mm below surface level;
- Remove all fencing and signage;
- Remove any potentially contaminated silt that accumulated at the base of the dam or in the silt traps in line with the Hazardous waste management strategy for the operation;
- Remove engineering liners and following waste classification dispose appropriately;
- Backfill remaining voids as a result of the dam excavations with stockpiled material removed during construction which will be located adjacent to the dams;
- Profile the final landscape footprint to be free draining to ensure no water accumulation and surface ponding;
- Demolition and building rubble is considered General Waste as per the definition of Demolition waste in Category B of Schedule 3 of the National Environmental Management Waste Amendment Act (NEMWAA) and based on the classification as General can therefore be incorporated into the backfill during the closure of the declines; and
- Hazardous and domestic waste will be transported offsite for disposal in licenced landfills.

9.1.7 Water Management

Opencast mine workings have the potential to eventually fill up with water and decant. Depending on the decant mode and the type of product mined, this water could be of a poor quality. Hence provision should be made to collect and handle this water to limit degradation of water resources in the vicinity of potential decant. Collection and neutralisation (with associated metal removal) is an established management practice to deal with this water. However, the elevated salt content normally associated with this water is still a matter of concern.

As indicated in the risk and impact assessment there is the potential that acidic, saline water may be generated in the opencast workings as a result of the chemical interaction between water and the mineral mined. However, the topography of the area around the proposed site is such that there is a low likelihood that there will be acid mine drainage will decant to surface. There may, however, be the lateral movement of groundwater from the workings and the backfilled decline and voids as the groundwater table recovers and water levels rebound to the natural state prior to mining. As the decline voids and opencast workings have filled, the rate of acid generation may diminish as the oxygen available for pyrite oxidation and Acid formation generation is depleted.

As numerical models have an inherent associated uncertainty, the closure action will be to utilise operational ground and surface water monitoring data to determine whether there will be a post closure requirement to install a mechanism to maintain water levels and to treat these before discharge to the environment. As the potential to affect the aquifer after closure is expected to 30 - 50 years after closure, no abstraction or treatment technology is included in this specific closure plan, if indeed required, as there is currently no indication of what this technology will be at end of life. Actions that will be implemented will include:

- Monitoring of the surface and groundwater quality and levels in backfilled and mined areas;
- Optimize storage and flooding of mine water in mined out opencast sections to reduce oxygen;
- Monitor the flooding of the opencast workings;
- If required, abstraction of seepage can be collected in a cut-of drain by means of pumps at predetermined spacing; and
- The collected seepage must be routed to a pollution control dam for disposal.

Prior to closure a water management plan will be prepared to identify which structures are required at closure and which can be decommissioned. Voids and artificial surfaces decommissioned will be closed by backfilling the excavations with the material removed, and placed adjacent to the structures, during construction. Bunds and trenches not required will be flattened by redistributing the material across the footprint used to borrow the material for construction.

In very sensitive environmental situations and/or where the seepage from remaining residue deposits could be highly contaminated, a dedicated footprint liner system in addition to the dedicated cover could also be required for the residue deposit. This could be required that the residue deposit or portion thereof be relocated onto the footprint liner. As in the case of the dedicated cover, these liner systems could also vary in nature and be constructed from natural and synthetic material. Current

practice would require at least the provision of 3 x 150 mm thick clay layers with an associated drainage layer. A synthetic layer with associated bed and protection layers could be used as an alternative. The relocation of the residue deposit onto a dedicated liner system most likely represents an extreme situation. In most cases the relocation of the residue deposit onto the above liner systems could be avoided by the provision of a cut-off drain around the perimeter of the residue deposit.

In the event where residue deposits will remain after closure, the storm water runoff arising from the upper and outer slopes of any rehabilitated residue deposits should be managed for the following primary reasons:

- Prevention of uncontrolled runoff from the residue deposit, thereby creating surface erosion and resultant damage to the cover and under extreme cases exposing the deposited material;
- Routing of the runoff arising from the rehabilitated residue deposit into the surrounding surface water drainage regime in a manner that would limit the creation of secondary erosion in the receiving surface water environment and/or possible damage to downstream surface infrastructure; and
- Allowing for the control routing of the runoff collected on the rehabilitated residue deposit across cut-off, seepage or solution trenches provided to handle excess contaminated seepage from the residue deposit.

In addition to the above, upslope storm water diversion measures could also be required to route upslope runoff past the residue deposit to prevent possible cover damage and other specific local drainage requirements. Toe paddocks could also be required along the outer perimeter toe of the rehabilitated residue deposit to capture sediment arising from the cover material whilst vegetation on the cover is still in the process of establishment.

Current practice allows for two broad approaches to handle runoff arising from the rehabilitated residue deposit. These are as follows:

- Collection of the runoff arising from the benches in chutes to route this water to the toe of the residue deposit. Chutes must be constructed from concrete or other suitable material to cater for the high flow velocities that could be encountered.
- Collection of runoffs arising from the modified outer slopes on the benches itself and allowing this water to evaporate on the benches. Under these circumstances bench width could be wider than the normal 5 m width, with parapet walls provided on the outer edges of the benches. These walls must be designed for at least the 1:200 year rainfall events. The residue deposit material must also be suitable for this type of storm water contaminant and must not be susceptible to slumping under saturated conditions.

9.1.8 Waste Management

Closure related waste management activities will include:

- Demolition and building rubble is considered General Waste as per the definition of Demolition waste in Category B of Schedule 3 of the National Environmental Management Waste Amendment Act (NEMWAA) and based on the classification as General can therefore be incorporated into the backfill during the closure of the declines;
- Hazardous and domestic waste will be transported offsite for disposal in licenced landfills and will be managed as per the operational Waste Management Plan with proper record keeping;
- The waste and scrap yard will be retained for the disposal of mobile equipment, structural steel and mechanical equipment. Only once this material has been taken out of the storage yard will the yard be demolished; and
- It may be necessary to fence temporary salvage yards for security reasons, particularly where these are located close to public roads.

9.1.9 Contaminated Land Remediation

Hydrocarbon Contamination

- All soil, contaminated with hydrocarbons, will be identified, excavated, if possible, to at least 200 mm below the contaminated zone and then treated;
- All tanks, pipes and sumps containing hydrocarbons will be flushed or emptied; and
- Excavated contaminated soils will be managed as determined by the nature and extent of the contamination.

Chemical Contamination

- Flush or empty all tanks, sumps and pipes containing non-biodegradable chemicals (liquid solid or gas) to ensure that chemical residues are removed from the site;
- Liquid storage tanks (including septic tanks) will be emptied, the structure demolished, and sub-surface voids back filled;
- Equipment and plant in which chemicals have been stored or transported will be cleaned and disposed of in a suitable disposal facility; and
- All soil, contaminated with hydrocarbons, will be identified, excavated, if possible, to at least 200 mm below the contaminated zone and then treated.

9.1.10 General Surface Rehabilitation and Revegetation

Global agriculture is facing a trend in yield decline for most crops. This is specifically applicable to crops that are practised under a mono-cropping system. It is a well-known scientific fact that monoculture has a negative impact on soil fertility and potential. With mono cropping and overuse of land, it has become necessary for farmers to resort to more drastic measures to maintain yields. One such practise is to increase N, P and K chemical fertilisers at ever increasing costs, because the perception is that the higher the fertiliser levels the higher the yield.

This same mind-set is prevalent with the rehabilitation of mining areas. The impact of mining operations is just so much amplified as the whole soil profile with all the integrated soil physical, chemical and biological processes is destroyed. This is often the result of a lack of understanding that soil is a living eco-system and that there is a difference between soil fertility and plant nutrition. There is also a difference in understanding the term topsoil from a soil science and mining perspective. Soil is an open living ecosystem and can therefore be defined as a function of physical, chemical and biological processes.

Fertility refers to the inherent capacity of a soil to supply nutrients to plants in adequate amounts and in suitable proportions as well as oxygen and moisture to maintain a healthy soil biodiversity (active micro-biology, immune system). The focus here is soil health. Plant nutrition refers to the soils ability to supply nutrients to the plant so it can complete its reproductive cycle. The nutrient status of the soil can be manipulated by adding organic and inorganic fertilisers according to the crop's need. The focus here is on the crop's needs. It can now be summarised that different soils have different levels of soil fertility according to the combination of the soil forming factors and soil processes involved under specific conditions. All these factors and processes are interlinked, and no single soil type has all these factors in the ideal combination, therefore the yield potential and use of soils varies.

Unfortunately, soil fertility and nutrition was relegated to a simple recipe of four elements provided through chemical fertilisers e.g. Nitrogen (N), Phosphorous (P), Potassium (K) and Zinc (Zn) to meet only the crop needs at the expense of soil fertility. Very little attention was given to the important role of biodiversity and active microbiology in plant nutrition. It is only in the last couple of years that there is a serious interest on this matter.

Active and healthy soil microbiology can:

- Mineralise nitrogen, phosphorous and sulphur;
- Suppress nematodes, bacterial and fungal diseases;
- Actively decompose organic material;
- Improve root development with the result of better nutrient and water uptake;
- Recycle and keep nutrients available for plants, especially micro-nutrients;
- Improve soil physical and chemical conditions by increasing the humus content;
- Improve water holding capacity of soil; and
- Less KWa power needed for soil tillage.

A distinction must be made between restoring soils to previous inherent potential for crop production and sustainable rehabilitation. As previously mentioned, soils form over a long period of time with various processes involved. The mining operations totally disturb these process and soil forming factors. It is not possible to restore the soil potential and initial characteristics to its original state, but huge improvements can be made in the methodology of stripping and re-dressing of soil

material to ensure sustainability of rehabilitation. Over time these soils can produce proper vegetation and grazing of cattle and arable crop production at lower yields than the initial soil potential.

Various mining practises could potentially contribute to the destruction of soil fertility and loss of biodiversity and should be understood to be able to restore the landscape at closure;

- Incorrect stripping of topsoil. Various soil horizons with different properties are stripped together and stockpiled;
- Stockpiling of proper topsoil with sterile or acidic subsoil (plinthic or grey clay material);
- Long periods of stockpiling kills of soil biology or changes biodiversity due to anaerobic conditions. Soils are nutritionally stripped, and low microbial activity occurs;
- Long fallow periods are as detrimental to soil health as no fallowing;
- Incorrect soil placement with rehabilitation (plinthic and grey clay material on the soil surface), causes slaking, increasing crust formation, and compaction resulting in poor infiltration, aeration and increased run-off and erosion. These plinthic and grey clay materials are also basically sterile in terms of microbial activity;
- Poor irrigation practises. Over irrigation causes leaching of nutrients;
- Decline in water quality in major river systems is causing a gradual build-up of salinity and sodicity; and
- In most cases poor seed germination or die-back of seeded grass occur because of a combination of these factors mentioned.

There is no quick fix solution to the negative impact of mining on high potential soils, but the following actions should be implemented during and post mining;

- Proper stripping and replacement of soils is imperative for any proper redressing and seeding with grass species to take place;
- A holistic long term, staged approach is necessary to restore physical, chemical and biological processes in the growth medium;
- Long term monitoring and relevant adjustments must be made to restore the soils to some sort of arable crop production potential to ensure future food security problems that might loom**;**
- Sequential stripping of soil horizons must take place. In some cases, the A and B Horizons can be stripped together. This has a huge practical, logistics and cost implication, but until such time that it is implemented, no improvement in sustainability of rehabilitation will occur;
- Ensure smaller topsoil stockpiles and seeding of stockpiles with grass
- It is imperative to reshape the landscape as close as possible to its original topographic features (e.g. slope and drainage lines, wetlands). Various surveying and GIS software can be used to achieve this goal;
- Where possible use the “freshest” stripped soils for redressing, as this will alleviate the soils becoming sterile or lose microbial activity;
- Place the plinthic and grey clay material in the sub-soils and the original A and B horizon material on top; and
- Create an environment where the topsoil is at least 250mm deep for proper aeration water-holding capacity and drainage, resulting in proper root development
- A three-stage approach can be implemented where pioneer species is planted to create a soil environment for sub-climax species. After some time, climax species can be introduced. There are many case studies where reseeding is necessary because the sub-climax and climax grass species die back after the first or second season;
- Legume crops like soya, cow peas, Dolichos, or Lucerne can be introduced to improve the soils microbial activity and soil structure;
- Compost and other organic humic substances can be used to speed up the process of restoring soil biodiversity; and
- Finally, an appropriate seed mixture should be introduced.

Detailed description of actions related to amelioration, application volumes, grassing and seeding of topsoiled surfaces;

1. Stone Picking (larger than 50 mm)
2. Contouring 35 m spacing (3/ha – 5 m wide x 0.5 m deep/high x 100 m)
3. Introduce Dolomitic Lime (5 t/ha)
4. Introduce Phosphate Fertilizer (Mono ammonium phosphate) (1 t/ha)
5. Rip Lime and Phosphate (1 m depth)

6. Application of NPK (2:3:2: (36) (1 t/ha)
7. Disc Fertilize (20 cm deep)
8. Plant seed to in the Diced Surface
    a. Teff (Erogrotis Teff) (4 kg/ha)
    b. Cynondon Dactylon (Kweek/Bermuda) (4 kg/ha)
    c. Chloris Gayana (Rhodes Grass) (6 kg/ha)
    d. Digitaria Eriantha (Smuts Finger) (6 kg/ha)
9. Lightly roll the surface
10. Mulching with organics (cured cattle manure compost) or bale spreading
11. Landscape Maintenance & Aftercare - L.A.N (300 kg/ha)

9.1.11 Maintenance and Aftercare

Maintenance and aftercare are planned for 5 years after mine production ceases, and includes:

- Annually amelioration and fertilising of rehabilitated areas;
- Monitoring of surface and subsurface water quality;
- Control of wattle and all other alien plants, and
- General maintenance, including rehabilitation of cracks, erosion and subsidence.

9.2 Threats, Opportunities and Uncertainties

As the closure plan is living document that is currently in the development phase early in the mine life cycle and the plan is based on predicted risks and impacts rather than actual impacts measured during operations, there are a number of assumptions that have been made around the biophysical, biochemical and socio economic environment that will exist at the end of the life of operations.

These assumptions could potentially lead to uncertainties, but also represent areas where there may be threats and opportunities that cannot at this early stage be adequately defined. The guideline in the regulations requires that a list of these uncertainties and threats and opportunities be identified and maintained during subsequent revisions of the closure plan. The applicant understands that the purpose of this list is to inform future revisions of the plan relating to the focus of resource. During these revisions, it is expected that resources can be focused to determine whether either the threats or opportunities are realised and whether uncertainties are addressed.

The uncertainties, threats and opportunities have been listed in the table below;

Aspects	Threats	Opportunities
Biophysical	• Overgrazing leading to land degradation, increased erosion and gully formation. • Stooping at end of life of mine leading to surface subsidence. • Detailed complicated rehabilitation implementation practices. • Lack of knowledge relating to rehabilitation and implementation of actions required. • Potential future decant estimations based on modelling estimations. • Climate change.	• Contain the disturbed footprint to a minimum. • Implement continuous rehabilitation practices throughout the life of mine. • Proper topsoil stripping, handling, stockpiling and preservation practices. • Continuous investigation of new technologies. • Installation of passive treatment systems at decant points such as constructed wetlands. • Training and capacity building in the organisational structure and local community. • Annual update of the Geohydrological model and water balance.

Social	• Inadequate community involvement • Limited stakeholder consultation and engagement • Low skills level in community • Land redistribution.	• Continuous stakeholder engagement throughout life of mine • Social and labour plan development and implementation in consultation with communities • Community involvement in the rehabilitation, aftercare and maintenance. • Training and capacity building in the organisational structure and local community.
Economic	• Ever changing and evolving political environment. • Various landowners. • High dependency on mining. • Final rehabilitation cost higher than estimated.	• Align the end land use to create viable sustainable business opportunities from the rehabilitated end landform (for e.g. farming) • Reuse recycle and reclamation of infrastructure at end of life of mine. • Annual assessment of rehabilitation costs and variance simulations on the costs to simulate economic changes and ensure the necessary contingencies are in place. • Annual update of the discounted cash flow model relating to the end land use economic viability.
1. Technology to be applied in the event of acid mine drainage decanting		
2. Final detailed mine planning and scheduling		
3. Final stakeholder requirements for rehabilitation, decommissioning and closure		

10. FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE ACTIONS SCHEDULING

10.1 CLOSURE SCHEDULING

The scheduling of actions for final rehabilitation, decommissioning and closure which will ensure avoidance, rehabilitation and management of impacts is presented in the table below. As the disturbance after construction occurs on surface, linking the rehabilitation plan to the mine works program is not meaningful. Rather, the schedule is linked to applicant's intention to undertake rehabilitation activities over a five-year closure period at the end of the Life of Mine. The perceived schedule drivers of this plan are also indicated in the table. This schedule is based on implementing the actions described in this report and relates to the aspects considered in this section.

Table 8: Rehabilitation, Decommissioning and Closure Actions

Aspect	Scheduling	
	Year 1	**Continuous**
Opencast workings	Concurrent backfilling sequence and removal of salvageable equipment.	Topsoil stripping, handling, stockpiling, preservation and replacement in line with the general surface rehabilitation and revegetation actions prescribed in this report as land becomes available for rehabilitation.
Surface Infrastructure related to mining operations (including plant)	Removal, decommissioning and demolition of infrastructure.	
Final void	Backfilling and sealing.	
Contaminated land remediation	Hydrocarbons – Removal of fuel storage and refuelling bays. Chemical – contaminated plant & equipment removal.	
	Year 2	
Pollution Control Dams	Management of stormwater in closure period, but capacity requirements can be assessed to remove upon closure.	
Waste Management Facilities	Removal, decommissioning and demolition of infrastructure.	
Roads and parking areas	Only roads required after closure to remain in place.	
Fencing and walling	Only fences required to remain after closure to stay in place.	
	Year 3 - 5	
Water Management	Monitoring, measurement and management where required.	
Maintenance and aftercare	All rehabilitated areas.	

Appendix 4 requires that a spatial map or schedule, showing planned spatial progression throughout operations be included in the plan. However, as the spatial progression is limited to the mining footprint and the mine haul route, the inclusion of a plan showing the spatial progression will not add any further information than that included in the table above.

10.2 ORGANISATIONAL CAPACITY

The Board of Directors was responsible for the company and financial management of the Mine, including the Social and Labour Plan, Rehabilitation, Decommissioning and Closure with the associated Financial Provisions thereof.

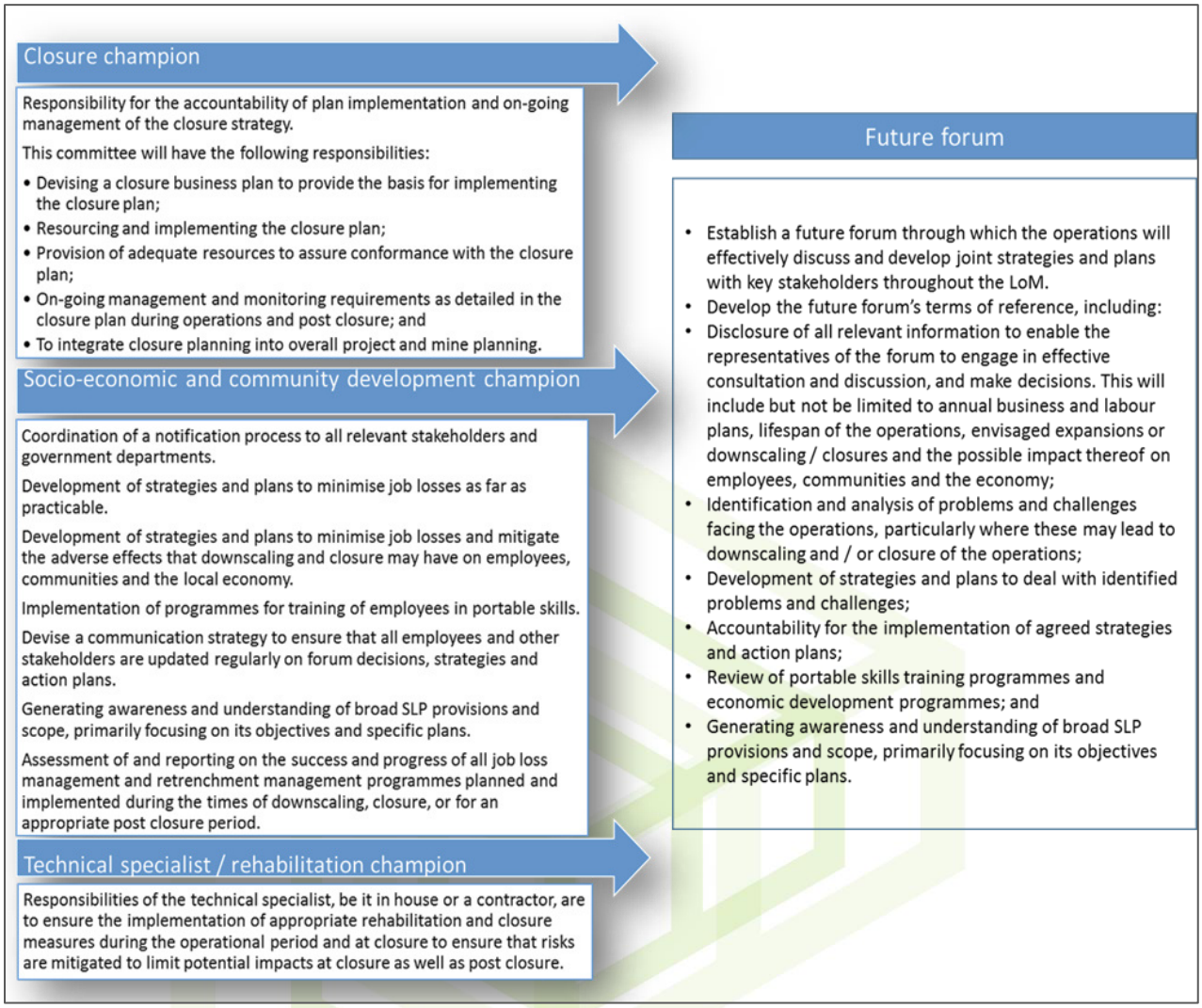

Figure 12: Organisational Capacity

10.3 Training and Capacity Building

Historic practices at many mining, industrial and even local authority facilities are causing the contamination of land and the pollution of surface and groundwater resources. Remediation, including industrial land rehabilitation and mine closure, has become an important requirement of South African environmental legislation. The failure to timeously implement reasonable measures for remediation not only carries legal liabilities but also poses a risk to share prices and the public image of a company. It has therefore become essential to determine and implement rehabilitation measures that will successfully address potential pollution problems in a sustainable manner.

The mine will commit to sending the persons responsible for rehabilitation, decommissioning and mine closure on the course on the Basic Principles of Ecological Rehabilitation and Mine Closure which is presented by the Centre for Environmental Management.

The aim of this course is to offer managers and operational personnel the opportunity to become acquainted with the principles, legal requirements and implications, relevant technical aspects, approaches, plans, problems and solutions related to rehabilitation and mine closure. A practical programme forms an integral part of the course and consists of a site visit, case studies and a panel discussion with recognised experts and representatives of the relevant government departments, as well as the submission of a practical assignment. After completion of the course, the delegate will demonstrate the following in order to propose solutions to rehabilitation-related challenges:

Table 9: Training and Capacity Building Course Objectives and Outcomes

NQF level descriptor	Course outcome	Assessment criteria
1. Scope of knowledge and knowledge literacy	A detailed knowledge and understanding of - • key terminologies, concepts, principles and technical aspects of the basic sciences relevant to ecological rehabilitation, including geochemistry, soil science, vegetation dynamics etc. • the concepts, contents and practical implications of statutory requirements related to rehabilitation and mine closure, as well as the associated liabilities, including the legal and financial implications of such requirements, • problems and approaches related to ecological rehabilitation; and • how knowledge of ecological rehabilitation relate to applicable knowledge within the fields of Environmental Management;	Demonstrated ability to: • use and explain key terminologies, concepts, principles and technical aspects, of the basic sciences relevant to ecological rehabilitation, including geochemistry, soil science, vegetation dynamics, etc. correctly; • use and explain the concepts, contents and practical implications of statutory requirements related to rehabilitation and mine closure, as well as the associated liabilities, including the legal and financial implications of such requirements; • identify and discuss problems and approaches related to ecological rehabilitation; and • indicate how ecological rehabilitation relates to Environmental Management in general and mine closure specifically.
2. Method and procedure	The ability to correctly select, evaluate and effectively implement and apply rehabilitation options, with recommended methodologies and approaches;	Demonstrated ability to actively design, develop and/or propose rehabilitation methods, techniques or approaches to ecological rehabilitation.
3. Problem solving	The ability to identify rehabilitation related problems in unfamiliar contexts and propose holistic solutions in order to address the challenges of ecological rehabilitation;	Demonstrated ability to, within an unfamiliar context: • identify and discuss the problems that can be expected during rehabilitation; and • propose holistic solutions to address the challenges of ecological rehabilitation.
4. Ethics and professional practice	An understanding of the ethical implications of decisions, actions and practices specifically relevant to Environmental Management, in accordance with the principles of sustainable development;	Demonstrated ability to formulate own ethical perspectives on selected environmental scenarios.
5. Accessing, processing and managing information	The basic research skills, such as gathering and verifying information from various sources provided, analysing and summarising key aspects and using the information to implement recommended methodologies and approaches;	Demonstrated ability to utilise the resources provided to extract, analyse, summarise and/or apply the relevant information to solve the problems posed in the practical exercises.
6. Producing and communicating information	The ability to develop and present accurate and coherent written and verbal information as a portfolio of evidence;	Demonstrated ability to effectively record and present diverse information generated as part of practical exercises in a written and verbal format.

7. Context and systems / processes	The ability to understand how the learning material offered in this course relate to contexts, other systems and/or processes and the interactions between these, to make decisions and act appropriately in familiar and new contexts;	Demonstrated ability to indicate how ecological rehabilitation relates to mine closure; and Demonstrated understanding of how ecological rehabilitation and mine closure supports sustainable development.
8. Management of learning	The ability to act as group member and/or a group leader to successfully complete the practical exercises and taking co-responsibility for learning progress and outcome realisation of the group; and	Demonstrated ability to actively participate in group work and contribute to successfully completing practical exercises.
9. Accountability	The ability to monitor own learning progress, and apply relevant learning strategies and resources to successfully realise all outcomes of this course.	Demonstrated ability to achieve the learning objectives in an effective and expeditious manner.

11. RELINQUISHMENT CRITERIA

Following the implementation of the closure actions described in this report, it is necessary to have measurable criteria against which to assess the effectiveness of the plan and its implementation. These criteria will assist in identifying when the standard of closure achieved is enough to relinquish responsibility for a specific area of responsibility or aspect.

Site-specific relinquishment criteria for the project has been outlined in the table below. Also included in the table are the indicators required to demonstrate achievement with the relinquishment criteria and the reporting requirements thereof. The reporting requirements are those that are required to fulfil the monitoring requirements set out by legislation, required in terms of any authorisations obtained for the project, or committed to in this plan and supporting Environmental Management Plan and Integrated Water and Waste Management Plan which are also a legally binding documents.

Table 10: Site-specific relinquishment criteria

Category	Closure criteria	Indicators	Reporting requirements
Ground and Surface water	Compliance with the IWUL and supporting IWWMP.	Upstream vs Downstream/gradient water quality and biomonitoring.	Monthly Monitoring report.
Air	Compliance with the standards as per the National Environmental Management: Air. Quality (Act 39 of 2004) and Dust Control Regulations.	Records of air quality measurements for gravimetric dust fallout, PM2.5 and PM10 particulate matter dust.	Monthly Monitoring report.
Soil quality	Soil quality as assessed against the Norms and Standards to support Chapter 8 of NEM: WA.	Soil quality records from samples taken in areas where contamination is identified	Report on soil quality measurements and risk assessment thereof.
Land capability	Land capability and productivity similar to or enhanced from that which existed prior to mining.	Land capability and productivity.	Comparison to reference sites, regional trends and pre-mining aerial photographs or satellite imagery.
Erosion	Implementation or construction of erosion control measures.	Stormwater management and establishment of vegetation on disturbed surfaces.	Monthly ECO inspection and reporting.
Safety / stability	The site is safe for use by humans and animals, also focusing on the foreseeable future.	Geotechnical and hydrological studies of existing structures and aspects.	Appropriate risk assessment report with relevant effective control measures outlined
Aquatic ecosystem	Wetland and aquatic macro invertebrate populations at predefined locations using appropriate biomonitoring techniques.	Biomonitoring of species and composition.	Bi-annual seasonal monitoring reports.
Vegetation	Establishment of self-sustaining vegetation populations which stabilizes soils and is not invasive to the region.	Species cover and composition.	Annual monitoring report

12. CLOSURE COST ESTIMATION

The required closure costs should the mine undergo sudden closure were calculated using the above closure actions. The methodology, assumptions and costs calculated are detailed as follows.

12.1 METHODOLOGY

The NEMA regulations require that the closure costs be calculated according to real rates. These rates were sourced from a third-party contractor, specialising in demolition and rehabilitation. In order to calculate the closure cost using the third-party contractor rates, each of the closure actions from the report were broken down into specific sub-sections (i.e. roads, power lines, buildings, plant equipment etc.). A BOQ was determined for each of the sub-sections and applied to the third-party contractor rates to determine a closure cost per unit. The addition of these costs represents the Subtotal 1 of the financial liability. An additional cost for site establishment and contractor project management is included to determine a subtotal 2 and a 10% contingency is calculated on subtotal 2 to obtain a subtotal 3 (cost excluding VAT). Subtotal 3 is seen by the Department of Environmental Affairs as the Financial Closure Liability of the mine.

The sudden closure cost (assuming the mine were to close tomorrow) was based on quantities from the GIS department. The major rehabilitation measures that would need to take place should the mine undergo sudden closure would include:

- The dismantling of all surface infrastructure;
- The backfilling and shaping of all voids;
- The ripping and vegetating of the remaining disturbed areas; and
- The aftercare and maintenance measure which would include monitoring.

12.2 ASSUMPTIONS

12.2.1 Sudden Closure Assumptions

The following assumptions were made if the mine were to undergo sudden closure:

- Third party contractor rates from a demolition and rehabilitation company were used to calculate the costs;
- The measurements were based on GIS BOQ;
- All buildings were assumed to be single story brick building;
- All surface infrastructure would be demolished and removed to a depth of 500 mm. Any infrastructure below 500 mm will be sealed, made safe and left in situ;
- As there are currently no agreements in place for the handover of infrastructure to a third party, the costs assumed all infrastructure would be demolished;
- It assumed that concurrent rehabilitation will be conducted, that hard and soft sub-soil/discard and topsoil will be backfilled during the operation cycle on the mine. Concurrent rehabilitation will ensure that the final void will be shaped and secured during the final rehabilitation of the mine;
- Costs were included for groundwater, surface water and biodiversity monitoring for a baseline closure assessment and assessment to determine performance of rehabilitation;
- Costs for care and maintenance of the site as well as water management for a period of three years were included;
- No water treatment was added and will be developed in year 1 and no salvage value was added;
- Contractor site establishment and project management were included; and
- A 10% contingency was added to the subtotal to account for any unforeseen shortfalls.

Table 11: Closure cost calculations

	Dunbar Colliery Closure	Final Closure Cost
	Mine Closure Costs 2019	
1	**Surface Infrastructure**	**R4 640 829.23**
1	Dismantling of processing plant and associated structures (including associated conveyors & power lines)	R1 601 284.48
2(A)	Demolition of steel buildings and structures (including floor slabs)	R47 158.50
2(B)	Demolition of reinforced concrete buildings and structures	R746 100.38
3	Rehabilitation of access roads	R1 206 530.81
4(A)	Demolition of electrified railway lines	R0.00
4(B)	Demolition and rehabilitation of non-electrified railway lines	R0.00
5	Demolition of housing and facilities (including floor slabs)	R940 008.79
12	Fencing	R99 746.26
2	**Mining Areas & Waste Sites**	**R1 274 580.00**
6	Opencast rehabilitation (including final voids and ramps)	R1 274 580.00
7	Sealing of shafts, adits and inclines (including concrete cap)	R0.00
3	**Mine Residue Sites**	**R1 756 386.75**
8(A)	Rehabilitation of overburden and spoils	R0.00
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	R0.00
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	R931 709.10
9	Rehabilitation of subsided areas	R0.00
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	R824 677.65
4	**General Rehabilitation**	**R1 455 718.19**
10	General surface rehabilitation, including of all denuded areas	R1 455 718.19
5	**Aftercare & Maintenance**	**R1 692 914.46**
13	Monitoring	R870 000.00
14	Maintenance	R822 914.46
15	Water Facility	R0.00
	Sub Total 1	**R10 820 428.63**
	Site establishment and project Management	**R1 298 451.44**
	Sub Total 2	**R12 118 880.06**
	Contingency (10% of subtotal 2)	**R1 211 888.01**
	Sub Total 3	**R13 330 768.07**
	VAT (14% of subtotal 3)	**R1 866 307.53**
	Total	**R15 197 075.60**

The contribution of activities is depicted in the figure below.

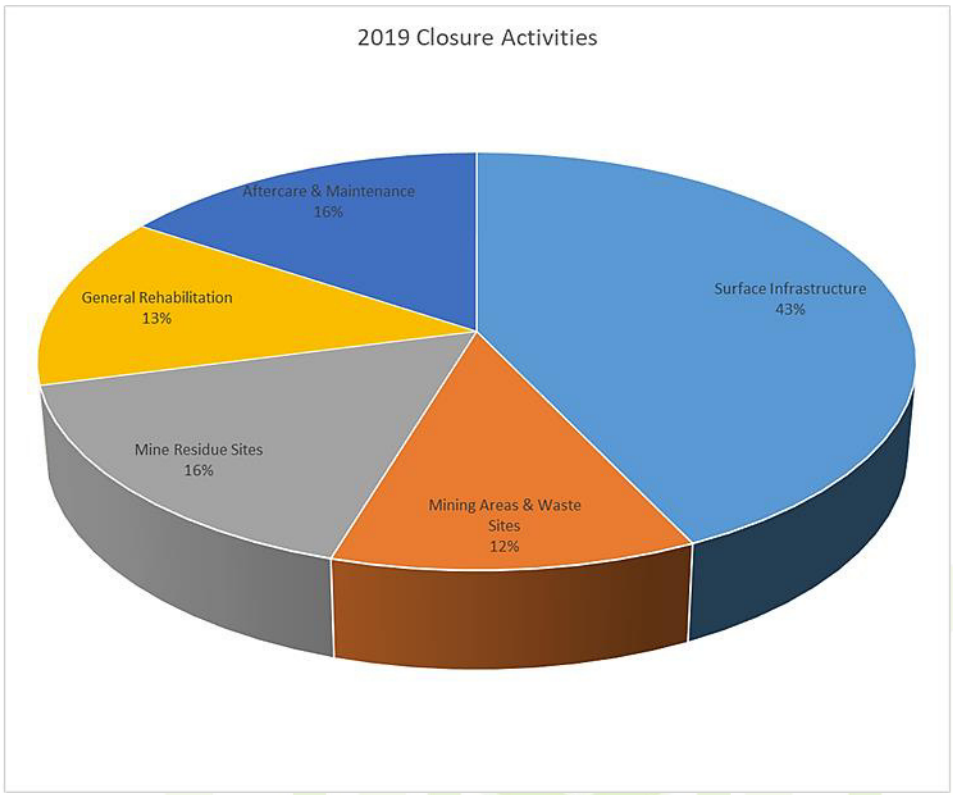

Figure 13: Closure items relative contribution

13. MONITORING, MEASUREMENT, AUDITING AND REPORTING

Information obtained from the regulations indicate that there are two requirements under this category. The first relates to monitoring, auditing and reporting on future revisions to this Rehabilitation, Decommissioning and Closure Plan, which is required annually and the second monitoring and reporting on the monitoring environmental indicators required achieving relinquishment criteria.

13.1 MONITORING, MEASUREMENT, AUDITING AND REPORTING ON THE MINE CLOSURE PLAN

Interpretation of the regulation is that there are three sets of reviews to which the Rehabilitation, Decommissioning and Closure Plan must be subjected to on an annual basis.

Table 12: Three different Rehabilitation, Decommissioning and Closure Plan reviews required

Requirement	Specifications
Internal	Monitoring, measurement, auditing and reporting – a review undertaken by an appointed consultant to update the plan to account for changes to the environment and risk profile and to update the liability assessment to reflect liability at that point in time
External	Monitoring, auditing and reporting – a review undertaken by the financial auditors as part of the annual financial/accounting audit to determine that the plan is appropriate and that the quantum of the liability is included in the operations provisions
Legislated	These are the auditing requirements of the Act, Regulation, EIA/EMP, IWWMP, IWUL and RoD. Pertinent aspects relating to closure, such as changes to the risk assessment, changes in closure options and changes in the quantum of the liability will be reported.

The current planning for these audits is presented in the table below. It is currently envisaged that findings of the audit will be reported on within one month of finalisation of the audit.

Audit	Responsibility	Frequency	Proposed Date
Internal	Mine manager to appoint external consultant	Annual	Quarter 3 of each year
External	Financial manager	Annual	Quarter 4 of each year in support of financial statements
Legislated	Mine manager to appoint external consultant	Annual	Quarter 1 of each year

The findings from the various audits required as listed above will be recorded in the operations Environmental Management System (EMS) while responsibilities and timelines allocated to the rectification of the findings will be assigned. Once addressed, these findings will be closed out in a manner similar to the other findings captured in the EMS, and will not be closed out until an independent second party has assessed that the finding is appropriately addressed.

13.2 MONITORING, MEASUREMENT, AUDITING AND REPORTING TO TRACK RELINQUISHMENT PROGRESS

The objective of the monitoring programme will be to track the recovery, reclamation and rehabilitation of the disturbed areas towards the long-term post-closure land capability goals, in accordance with the overall closure objectives set out in this report. The monitoring programme will be designed to collect information to demonstrate that the Relinquishment criteria have been achieved. The proposed monitoring has been summarised in the table below.

Table 13: Proposed Monitoring Requirements

Aspect	Requirement
Surface Water	Quality monitoring against parameters as required by the IWUL. Sampled monthly for a five-year post-closure period.
Groundwater	Quality and depth monitoring of both the shallow and deep aquifers against the parameters required by the IWUL. Sampled quarterly for a five-year post-closure period.
Erosion	This will take the form of developing a representative reference site on the disturbed footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken twice a year during the wet and dry season for a five-year post-closure period.
Vegetation	Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference site established in a similar ecotype, conducted annually for a five year post-closure period.
Biomonitoring	Upstream and downstream of the mining activities. A long-term bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area. Appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity, with monitoring being undertaken bi-annually to also consider seasonal variations.
Visual	Photographic records should be maintained together with findings, follow up actions and close out records as part of the Environmental Management System.

Annual reports will be prepared to document the results of the monitoring during the rehabilitation, decommissioning, closure and post-closure phases. These reports will provide important information required to manage the on-going closure activities, with the data and reports being used to:

- Provide recommendations for improving subsequent rehabilitation activities;
- Indicate where rehabilitation and closure activities have not been successful, requiring a potential change in design criteria or alternative interventions;
- Provide information where aftercare and maintenance is required during the post-closure period; and
- Indicate if relinquishment criteria have been met.

14. AMENDMENTS TO THE PLAN AS A RESULT OF MONITORING GAPS

This report is the first Rehabilitation, Decommissioning and Mine Closure Plan to be compiled, an explanation of motivations for any amendments required, and made to it, given the monitoring results in the previous auditing period and the identification of gaps will only become applicable in subsequent updates.

15. CONCLUSION AND RECOMMENDATIONS

The following recommendations should be adhered to;

- Compliance with Closure Plan
  - The closure objectives can only be achieved by adhering to the responsibilities as set out in the rehabilitation plan.
  - Closure objectives cannot be achieved if the actions of the rehabilitation plan are not complied with resulting in an unsuccessful closure plan.
- Annual update requirements of the plan
  - The closure plan must be reviewed annually and updated as and when major changes are affected to the Prospecting Works Programme.
- On-site documentation requirement
  - The closure plan must be available onsite as per the requirements of Regulation 26 (h) of NEMA EIA Regulations of 2014.

According to Regulation 34 of the NEMA EIA Regulations of 2014, the holder of an environmental authorisation must for the period during which the environmental authorisation, EMPR and Closure Plan remain valid:

- Ensure compliance with the conditions of the environmental authorisation and the EMPR and where applicable the closure plan, is audited and;
- Submit an environmental audit report to the relevant competent authority

The Regulations which apply to the holder under the MPRDA, regulates the „method for determining and making financial provision for the costs associated with the management of environmental impacts" caused by mining activities and operations.

The Regulations require holders to make financial provision for:

- Annual rehabilitation
- Final Rehabilitation, decommissioning and closure at the end of the prospecting / mining operations;
- Remediation and management of latent or residual environmental impacts, which become known in future.

This financial provision is based on the Regulations applicable as at 1 December 2014. The financial provision for 2018/2019 period for the planned activities is **R13 330 768.07 (Excl. VAT).**

ENVIRONMENTAL & ENGINEERING

REPORT

VANDABYTE (PTY) LTD

FINAL REHABILITATION, DECOMISSIONING AND MINE CLOSURE PLAN: RISK ASSESSMENT

DMR REF: MP30/5/1/2/2/10237MR

PORTIONS 1, 2 AND THE REMAINING EXTENT OF THE FARM DUNBAR 189 IS, PORTION 1 OF THE FARM MIDDELKRAAL 50 IS, PORTION 6 OF THE FARM HALFGEWONNEN 190 IS. - MPUMALANGA PROVINCE.

2019/09/30

VER 0.2

Document and Quality Control:

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AA – draft	2019/09/30	Henno Engelbrecht		First draft for review / comments
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CC– draft	2019/10/01	Leoni le Roux		Quality review
DD– draft	Reviewed	Client	Signed	Client review
Approved for Distribution:				
0.2	2019/10/07	Henno Engelbrecht		Final report

Quality Control BY:

Nature of Signoff:	Responsible Person:	Role / Responsibility	Qualification
Author	Henno Engelbrecht	Environmental Assessment Practitioner Rehabilitation, Decommissioning and Mine Closure Specialist	B.Sc. Hons Env Mgmt and Analysis M.Sc. Project Mgmt
Quality Reviewer	Leoni le Roux	Administrator	Professional Secretary and Personal Assistant
Reviewer	Vernon Siemelink	Senior Environmental Consultant ISO 14001:2004 Auditor	M(EnvMan) Environmental Management UP

DISCLAIMER:

This is a legally binding document and many of the actions and recommendations remain the responsibility of the client (as the owner/lessee of the property).

EAP - was independent and performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application; have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity; ensure compliance with these Regulations;

Take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

The findings, results, observations, conclusions and recommendations provided in this report are based solely on the information provided to Eco Elementum (Pty) Ltd by the Client and other external sources (including previous site investigation data and external scientific studies). The opinions expressed herein apply to the site conditions and features which existed at the time of commencement of the investigations and production of this report.

The author has utilised his/her best scientific and professional knowledge in preparing this report and the content herein contained is and remains confidential in nature, save where otherwise ordered by a Court of law.

Whilst Eco Elementum (Pty) Ltd exercises due care and diligence in rendering the services and preparing this report, the accuracy of the content herein contained is reliant on the accuracy, correctness and completeness of information and/or data supplied to it by the Client. In this regard, Eco Elementum (Pty) Ltd accepts no liability for any loss and/or damages arising out of the inaccuracy of this report in instances where the information and/or data provided to it by the Client is found to be inaccurate, incorrect and/or incomplete.

DECLARATION OF INDEPENDENCE

I, Henno Engelbrecht, declare that;

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing:
    - any decision to be taken with respect to the application by the competent authority; and
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

2019/10/07

Signature **Date**

Mr. Henno Engelbrecht
B.Sc. Hons Env Mgmt and Analysis
M.Sc. Project Mgmt

EXPERIENCE OF THE SPECIALIST THAT PREPARED THE PLAN

Name	Henno
Surname	Engelbrecht
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Position	Director – Environmental Assessment Practitioner
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Telephone Number	082 690 9105 / 012 348 5214
Education	- B.Sc. Geography (Cum Laude) (University of Pretoria). - BSc Honors Environmental Management and Analysis (Cum Laude) (University of Pretoria). - MSc Project Management (Thesis Cum Laude) (University of Pretoria).
Professional summary	Mr. Henno Engelbrecht has 10 years working experience as an Environmental Consultant and he has specialized in Environmental Management and Analysis. Mr. Henno Engelbrecht has worked for Environmental Assurance Pty (Ltd) as an environmental consultant since completing his studies until mid-2013 and has served an array of clients in various fields of environmental practice. He also has vast environmental monitoring and measurement, environmental authorisations, mine closure, and environmental impact assessment experience and has worked with in various project teams, up unto the level of Programme Manager where he was responsible for all the projects which fell within the Environmental Assurance (Pty) Ltd programme. His expertise has led to his specialist inputs and studies to be used in several Environmental Impact Assessments, Water Use License Applications, Waste License Applications, Air Emission License Applications and Mine Closure/Rehabilitation Planning Activities. Henno also holds the MSc Project Management degree at the Engineering Faculty at the University of Pretoria. He has worked in mining, industrial, natural and construction environments but his expertise lies mainly within the mining sector and currently holds the position of Director at Eco Elementum (Pty) Ltd.
Skills	- Mine Closure financial quantum determination, mine closure planning and reporting. - Rehabilitation planning, reporting, management and coordination of opencast and underground mining. - Ambient air quality monitoring, measurement and implementation (passive and active) in accordance to the National Environmental Management: Air Quality Act 39 of 2004, Government Notice 248 NEM: AQA (39/2004) which contains the Listed Activities, and the National Ambient Air Quality Standards (SANS 1929: 2005). - Noise monitoring and measurement according to SANS 10103:2008, the measurement and rating of environmental noise with respect to annoyance and to speech communication and SANS 10328:2008, Methods for environmental noise impact assessment. - Water quality monitoring, measurement, reporting and data analyses including surface water, ground water, process water, sewage water and biological indicators. - Groundwater hydrocensus studies – borehole surface water depth monitoring, measurement, transections and analysis. - ISO 14001 Environmental Management Systems auditing, system implementation, training and environmental analysis (creation of aspect/impact registers, contractor training, general environmental awareness training, legal compliance audits, GAP analysis, documentation reviews, roles and authority allocations etc.) - Legal compliance auditing and reporting in accordance with the National Environmental Management Acts and other associated environmental related (NEMA listed activities, Air Quality Act listed activities, Water Use Licensing, Waste Licensing, Air Emissions Licensing etc.) - Environmental training (various – contractor training, monitoring and measurement training, awareness training). - Environmental impact assessments and Integrated Water Use License Applications. - Environmental Management Plan development, monitoring, compliance auditing etc. - Environmental Control Officer Site inspections- non-conformance reporting (NCR), corrective action request (CAR) and preventative action request (PAR).

EXECUTIVE SUMMARY

Vandabyte (Pty) Ltd (hereafter the applicant) has appointed Enviro-Insight CC as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations (EAs) associated with the proposed Dunbar Coal Mine. The applicant has obtained a Prospecting Right (reference number MP 30/5/1/1/2/10737 PR) on 22 May 2014 from the Mpumalanga Department of Mineral Resources (DMR) to prospect for coal in an area of 1797 ha on a Portion of Portion 1, Portion 2 and the remaining extent of the Farm Dunbar 189 IS, Portion 1 of the Farm Middelkraal 50 IS and Portion 6 of the Farm Halfgewonnen 190 IS located in Mpumalanga Province. The mining right application lodged on 9 May 2019 to the DMR (reference number MP30/5/1/2/2/10237MR) includes the abovementioned properties and extent. Enviro-Insight appointed Eco-Elementum to undertake the Final Rehabilitation, Mine Closure and Decommissioning Plan for the Dunbar Coal project.

The scope and objectives of the "The minimum content of the Risk Assessment Report" aims to ensure the Department of Mineral Resources (DMR) is presented with a document that addresses all the legal requirements as presented in GNR1147, while ensuring it's presented in a format that can be measured and audited in due course while giving effect to the post-mining end land use of the disturbed footprint as a result of the mining activities.

Risk is a measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule and performance constraints. Risk can be associated with all aspects of a program (e.g. threat, technology, supplier capability, design maturation, performance against plan, etc.). Risk addresses the potential variation in the planned approach and its expected outcome. Ecoelementum believes that they used a sound risk assessment approach to identify all risks, and provided mitigating measures relevant to the final design of the mine.

Several risks were identified as potential aspects that could pose a risk during the closure and rehabilitation process of the mine. These risks were mitigated, but careful attention to mitigation measure need to intrenched during the operational life cycle of the mine. Risk include:

- Extreme
  - Redundancy of workers at the mine could pose a risk during the negotiations for closure
- Extreme to high
  - The control of underground water could pose a risk to the volume of possible polluted water entering the environment and affecting downstream farmers and communities
  - The deterioration of groundwater quality down gradient of the mining operations due to plume movement and entering the environment and affecting downstream farmers and communities
  - Insufficient topsoil to cover all disturbed areas (e.g. Dumps) during rehabilitation
  - Loss of revenue to surrounding communities as a result of the closure and rehabilitation of the mining operation

The following residual risks were identified from specialist reports:

- According to the Hydrogeology report simulated groundwater rebound at the Site indicated that decant is possible, although limited, at the central region of Opencast 1, with no decant expected at Opencast 2. The predicted decant volume at Opencast 1 was in the order of 250-300 m3/day, with expected sulphate concentrations of ~400-500 mg/l. The constructed wetland treatment solution would be the preferred solution at the Site, offering benefits such as wetland reclamation and low operational costs. However, the final solution for the management of AMD (if any) at the Site will be determined, designed and implemented (where possible) during the operational phase of the LoM following further geochemical testing and numerical groundwater modelling refinement at the Site.; and
- Workforce will be made redundant after mining has ceased and social behaviour could have adverse effects.

The following latent risk could possibly pose risks to direct surroundings:

- Natural disasters could have a detrimental effect on the final rehabilitation of the mining site. Failures in berms, gabions rehabilitated dumps require careful final designs on a site.

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PROJECT INFORMATION

Table 1: Applicant Details

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File Reference Number DMR:	MP 30/5/1/12/2/ 10237MR

Table 2: EAP Details

EAP Company:	Enviro Insight (Pty) Ltd
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Email:	corne@enviro-insight.co.za
Website:	www.enviro-insight.co.za

Table 3: Specialist Details

Specialist Company:	Eco Elementum (Pty) Ltd
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Email:	henno@ecoe.co.za info@ecoe.co.za
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1. INTRODUCTION AND BACKGROUND

Vandabyte (Pty) Ltd (hereafter the applicant) has appointed Enviro-Insight CC as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations (EAs) associated with the proposed Dunbar Coal Mine. The applicant has obtained a Prospecting Right (reference number MP 30/5/1/1/2/10737 PR) on 22 May 2014 from the Mpumalanga Department of Mineral Resources (DMR) to prospect for coal in an area of 1797 ha on a Portion of Portion 1, Portion 2 and the remaining extent of the Farm Dunbar 189 IS, Portion 1 of the Farm Middelkraal 50 IS and Portion 6 of the Farm Halfgewonnen 190 IS located in Mpumalanga Province. The mining right application lodged on 9 May 2019 to the DMR (reference number MP30/5/1/2/2/10237MR) includes the abovementioned properties and extent.

Enviro-Insight appointed Eco-Elementum to undertake the Final Rehabilitation, Mine Closure and Decommissioning Plan for the Dunbar Coal project.

The Integrated Environmental Authorisation (IEA) application includes the above-mentioned properties where the proposed mining blocks identified, and associated infrastructure will be located on Portion 2 of the Farm Dunbar 189 IS.

There is enough data available for Dunbar West to make an initial assessment of its potential. Both Seams 4 and 2 occur on the PR area with Seam 4 reaching a maximum thickness of 5.89 m and Seam 2 a maximum of 9.95 m. In the shallowest parts, Seam 4 starts at a depth of 2.45 m and goes as deep as 100.9 m with Seam 2 at depths from 29.80 to 122.70 m. Seam 5 is thin and not regarded as economical. A low-quality thermal coal will be produced from the different coal seams that are proposed to be mined. Open cast coal mining is the preferred method in this case from an economical view as it will recover a greater proportion of the coal deposit than underground methods, as more of the coal seams in the strata may be exploited

The proposed project involves the development of two new open pit coal mines and the associated supporting infrastructure. The coal resource will be mined using open pit methods due to the seemly depth of the coal reserve. For this specific project the mining of coal by means of surface mining methods are viable since the resource is situated close enough to the surface to make it economically mineable. Typical surface mining methods include strip mining and open pit mining, as well as dredge, placer and hydraulic mining in riverbeds, terraces and beaches. These activities always disrupt the surface and this, in turn, affects soils, surface water and near-surface ground water, fauna, flora and all alternative types of land-use.

The generally low strip ratios and wide surface area of the project area makes it ideal for the opencast truck and shovel mining method. Also, the mining method applicability is driven by technical applicability, economic viability, safety, equipment and infrastructure.

The proposed mining method and sequence comprised of the following main mining activities for both waste and coal:

- Initial topsoil and soft overburden removal which will be stockpiled to ensure it can be replaced back in the initial box cut;
- The physical mining of the coal seam which includes drilling of hard overburden material, charging and blasting;
- The coal is loaded into trucks and hauled to the crushing and screening facility;
- Discard coal will be extracted and replaced in the bottom of the opencast pit, while the product will be taken to the weighbridge via trucks and then removed off site;
- The overburden is replaced back into the pit as mining progresses leaving a minimum area open at a single time;
- The topsoil which was stripped and stockpiled separately before mining commenced is then replaced. The findings of the land capability study will determine the optimal composition to ensure pre-mining conditions for utilisation.

The proposed mining layout is based on a 100 m x 50 m mining block size. The purpose of a square mining layout is to increase the ease of strategic mine scheduling. The start of the mining block layout was based on the mining boundary. The size and scale of the open pit mine entails that small and conventional truck and shovel mining equipment is used to mine both waste material and coal.

Key infrastructure includes:

- Access & Haul roads (with necessary security) including the upgrading of the access point to the gravel road;
- Contractor's Yard with septic/chemical ablution facilities;
- Offices;
- Weighbridge, workshop and stores (with septic/chemical ablution facilities);
- Rail Siding;

- Diesel facilities and a hardstand;
- Power and Water;
- Box cut;
- Stockpiles (topsoil, overburden, subsoil/softs, ROM);
- Surface water management measures (stormwater diversion berms and trenches, pollution control dams etc.); and
- Crushing, screening and coal washing facility.

This report has been compiled in accordance with latest NEMA Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations published in Government Notice Regulation R1147 (GNR1147) in Government Gazette 39425. The regulation requires that a final rehabilitation, decommission and mine closure plan is developed which includes the determination of financial provision to guarantee the availability of enough funds to undertake rehabilitation and remediation of the adverse environmental impacts of mining.

The following document therefore offers the Risk Assessment for the proposed Mining Project with specific emphasis on the decommissioning and closure of the proposed mining operations. The study plan is limited to the footprint of disturbance of the proposed activities and is limited to the mining right area applied for as illustrated in the following map sequence.

Table 4: Project Locality

Farm Name:	**PORTIONS 1, 2 AND THE REMAINING EXTENT OF THE FARM DUNBAR 189 IS PORTION 1 OF THE FARM MIDDELKRAAL 50 IS PORTION 6 OF THE FARM HALFGEWONNEN 190 IS MPUMALANGA PROVINCE**
Application Area:	1 797 ha for the mining right of which approximately 200 ha identified for current mining operations
Magisterial District:	Nkangala District Municipality, Steve Tshwete Local Municipality, Gert Sibande District Municipality, Govan Mbeki Local Municipality, Mpumalanga Province South Africa
Distance and direction from nearest town:	The Project Area is ~ 4 km south of Meerlus, ~ 9 km south-east of Komati and ~ 13 km west of Hendrina.

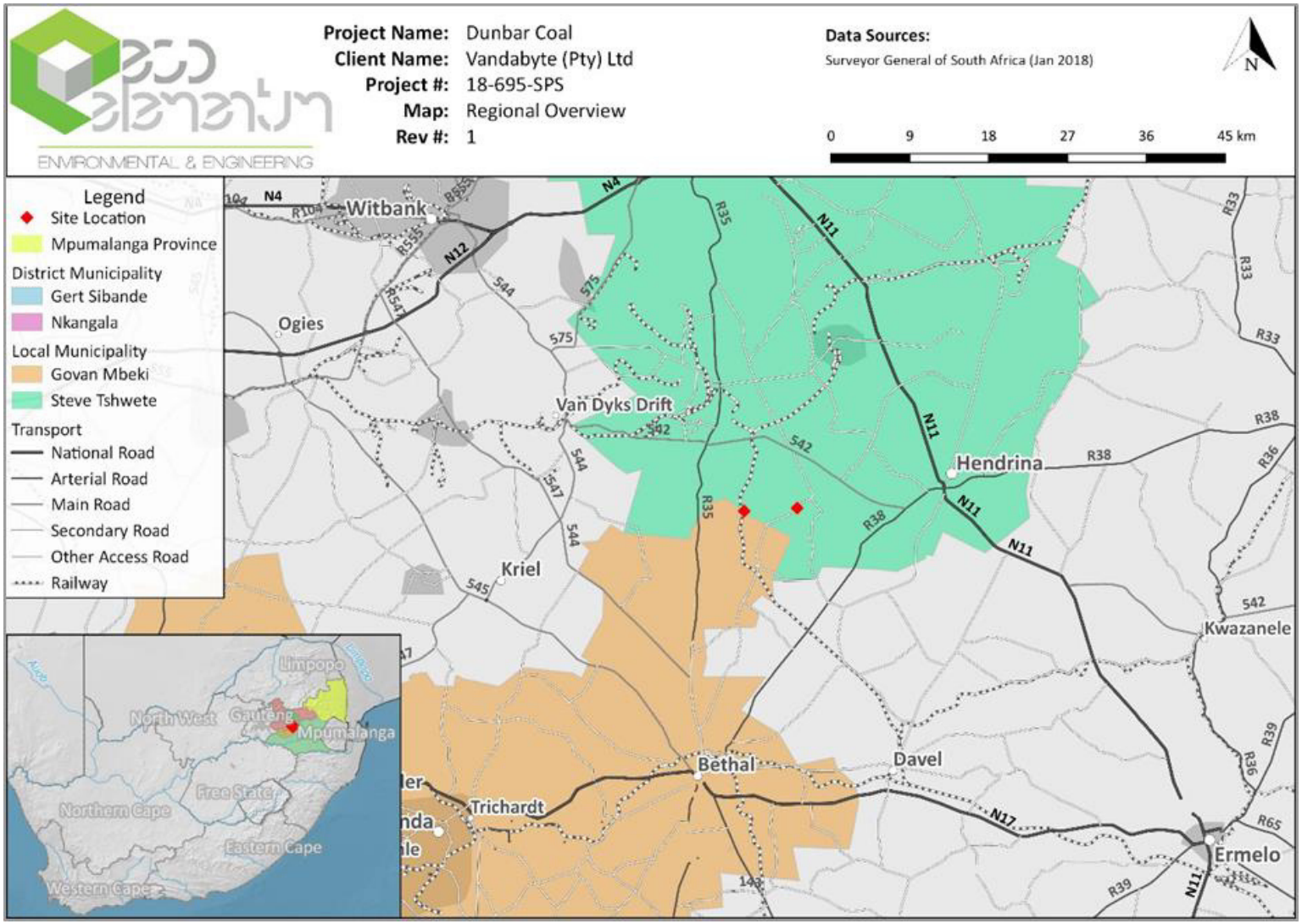

Figure 1: Map indicating the regional overview of the project

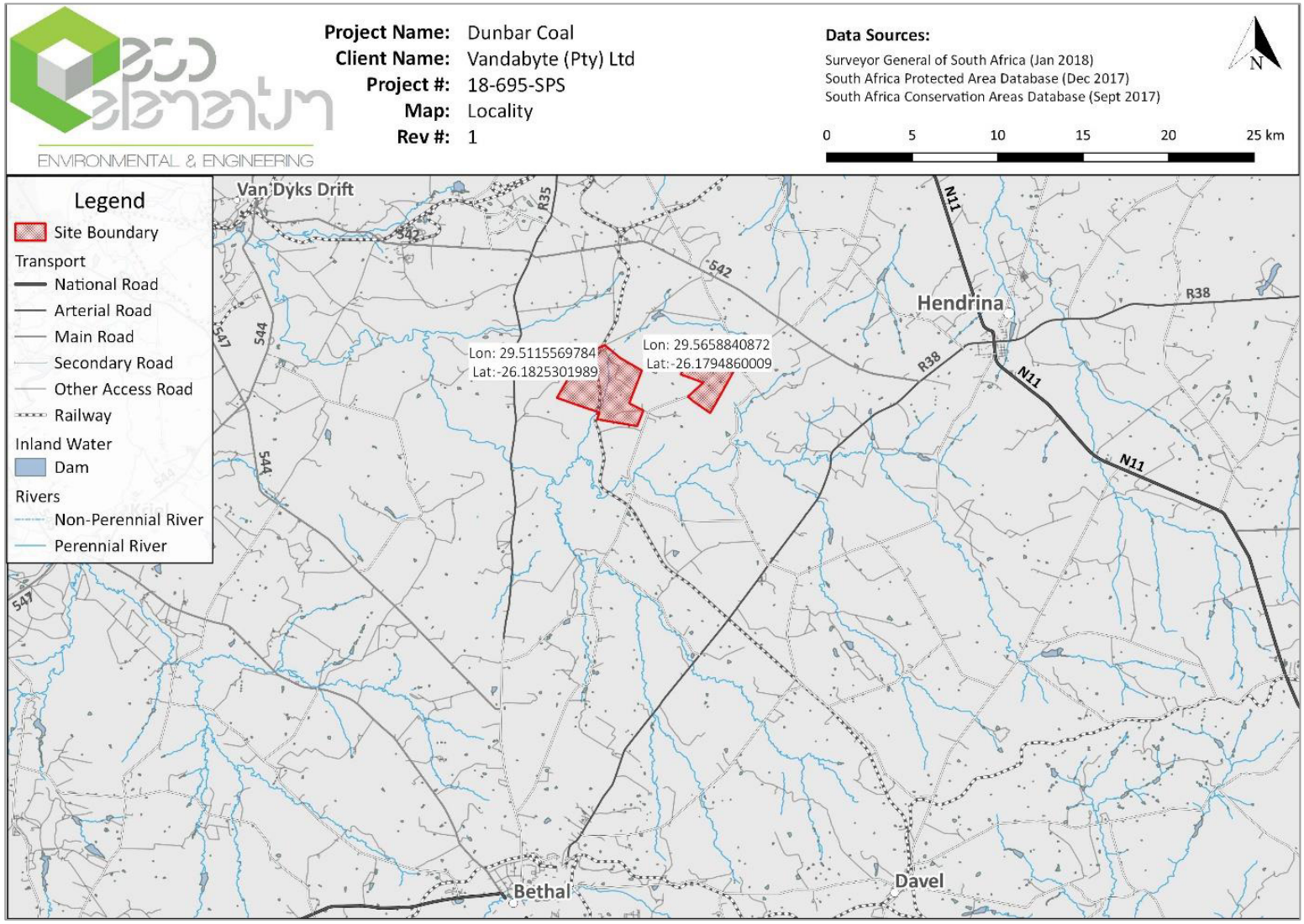

Figure 2: Locality map of the project

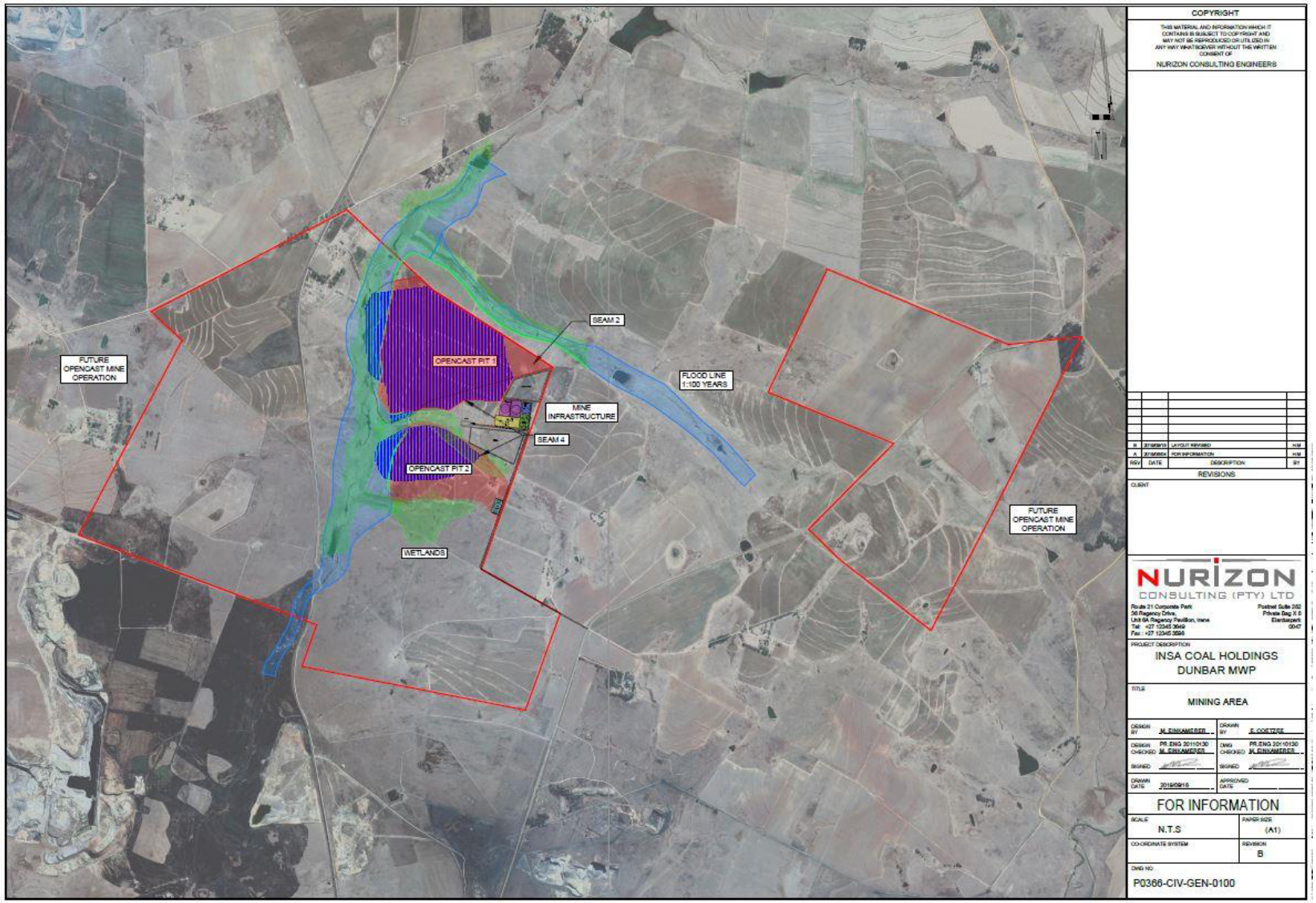

Figure 3: Proposed Mining Site Layout

2. RISK ASSESSMENT REPORT

2.1 SCOPE AND OBJECTIVES OF THE REPORT

The scope and objectives of this report aims to ensure the Department of Mineral Resources (DMR) is presented with a document that addresses all the legal requirements as presented the previous section while ensuring it's presented in a format that can be measured and audited in due course while giving effect to the post-mining end land use of the disturbed footprint as a result of the mining activities.

As per Annexure 5 of the GNR 1147 regulations, "The minimum content of the Risk Assessment Report, include:

- 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.

3. ENVIRONMENTAL RISK ASSESSMENT METHODOLOGY

3.1 Risk Assessment Methodology

Risk is a measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule and performance constraints. Risk can be associated with all aspects of a program (e.g. threat, technology, supplier capability, design maturation, performance against plan, etc.). Risk addresses the potential variation in the planned approach and its expected outcome.

A risk assessment process comprises identification of the following three components:

- A future root cause (yet to happen), which, if eliminated or corrected, would prevent a potential consequence from occurring;
- A probability (or likelihood) assessed at the present time of that future root cause occurring; and
- The consequence (or effect) of that future occurrence.

A future root cause is the most basic reason for the presence of a risk. Accordingly, risks should be tied to future root causes and their effects or consequences.

3.1.1 Risk Management Objective

The objective of a well-managed risk management program is to provide a reputable process for balancing cost, schedule, and performance goals within program funding.

Successful risk management depends on the knowledge assessments of all aspects of the program coupled with appropriate mitigations applied to the specific root causes and consequences.

3.1.2 The Risk Management Process

Risk management is a continual process, performed throughout the life cycle of a system or project. It is an organised methodology for continuously identifying and measuring the unknowns; developing mitigation options; selecting, planning, and implementing appropriate risk mitigations; and tracking the implementation to ensure successful risk reduction. Effective risk management depends on risk management planning; early identification and analysis of risks; early implementation of corrective actions; continuous monitoring and reassessment; and communication, documentation, and coordination.

Planning a good risk management program is integral to the overall program management process that ensures risks are handled at the appropriate management level.

3.1.3 The Risk Management Process Model

The risk management process model (below) includes the following key activities, performed on a continuous basis:

- Risk Identification;
- Risk Analysis;
- Risk Mitigation Planning;

- Risk Mitigation Plan Implementation; and
- Risk Tracking.

Effective risk management approaches generally have consistent characteristics and follow common guidelines regardless of program size.

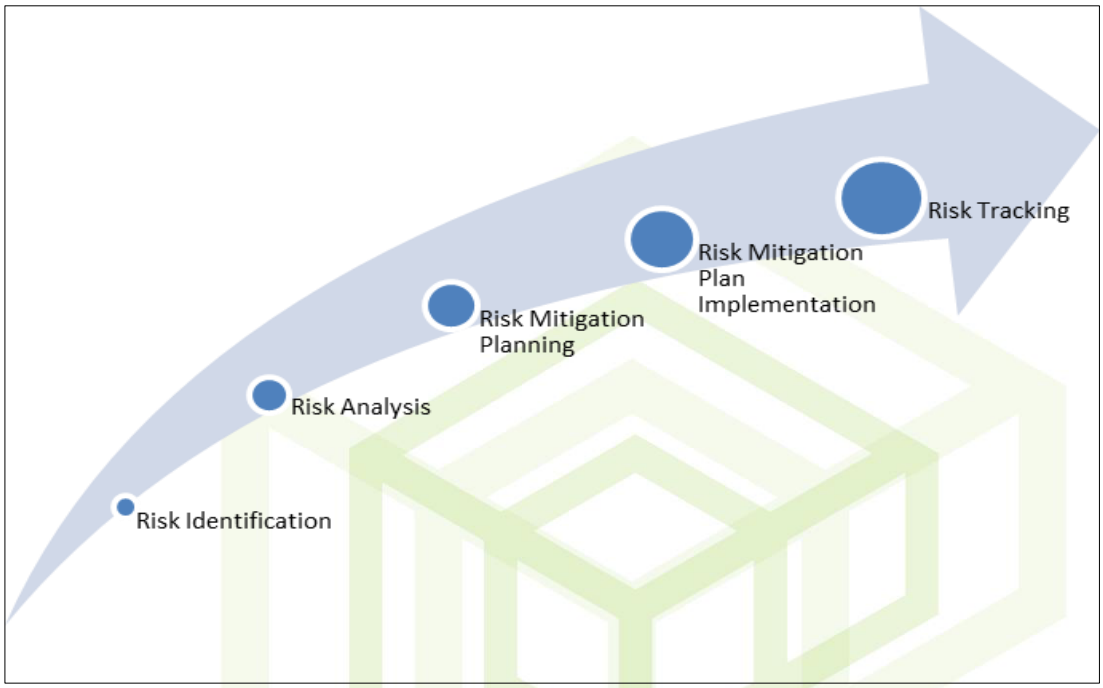

Figure 4: Risk Management Process

3.2 Risk Identification

The first key activity in the risk management process is Risk Identification. The intent of risk identification is to answer the question "What can go wrong?" by:

- Looking at current and proposed staffing, process, design, supplier, operational employment, resources, dependencies etc.;
- Monitoring test results especially test failures (readiness results and readiness problems for the sustainment phase);
- Reviewing potential shortfalls against expectations; and
- Analysing negative trends.

Risk identification is the activity that examines each element of the program to identify associated root causes, begin their documentation, and set the stage for their successful management. Risk identification begins as early as possible in successful programs and continues throughout the program with regular reviews and analysis.

3.2.1 Identification of Root Causes

The risk manager should examine the programs and identify root causes by reducing program elements to a level of detail that permits an evaluator to understand the significance of any risk and identify its causes. This is a practical way of addressing the large

and diverse number of risks associated with a project or program. Root causes are identified by examining each product and process element in terms of the sources or areas of risk. Root causes are those potential events that evaluators determine would adversely affect the program at any time in its life cycle.

An approach for identifying and compiling a list of root causes is to:

- List product or process elements;
- Examine each in terms of risk sources or areas;
- Determine what could go wrong; and
- Ask “why” multiple times until the source(s) is discovered.

3.2.2 Risk Analysis

The intent of risk analysis is to answer the question “How big is the risk?” by:

- Considering the likelihood of the root cause occurrence;
- Identifying the possible consequences in terms of performance, schedule, and cost; and
- Identifying the risk level using the Risk Reporting Matrix shown in the figure below.

Risk analysis is the activity of examining each identified risk to refine the description of the risk, isolate the cause, determine the effects, and aid in setting risk mitigation priorities and strategies. It refines each risk in terms of its likelihood, its consequence, and its relationship to other risk areas or processes. Analysis begins with a detailed study of the risks that have been identified. The objective is to gather sufficient information about future risks to judge the root causes, the likelihood, and the consequence/s of the risk should it occur. The frequently used term “risk assessment” includes the distinct activities of risk identification and risk analysis.

Risk analysis sequence of tasks includes:

- Develop likelihood and consequence scales;
- Assign a probability of occurrence to each risk appropriate criteria;
- Determine consequence; and
- Document the results in the program risk database.

3.2.3 Risk Reporting Matrix

The Risk Reporting Matrix (Figure 5), should be aligned with the mine’s risk rating matrix' and is typically used to determine the level of risks identified and associated with a project or within a program. The level of risk for each root cause is reported as low (green), low moderate (yellow), high moderate (purple) or high (red). The purpose of a risk assessment process is to move risks from the top right to the bottom left as reflected in the risk map.

Figure 5: Illustrative risk map

The level of likelihood of each root cause is established utilising specified criteria (Table 5). For example, if the root cause has an estimated five per cent probability of occurring, the corresponding likelihood is Rare (Level E).

Table 5: Risk Likelihood

Likelihood Category				
E	**D**	**C**	**B**	**A**
Rare	**Unlikely**	**Moderate**	**Likely**	**Almost Certain**
Highly unlikely to occur on this project	Given current practices and procedures, this incident is unlikely to occur on this project	Incident has occurred on a similar project	Incident is likely to occur on this project	Incident is very likely to occur on this project, possibly several times

The level and types of consequences of each risk are established utilising criteria such as those described in Table 6. For each type of consequence there is a description that relates to a specific consequence value.

Table 6: Risk Consequence

	Consequences				
	1 - Insignificant	2 - Minor	3 - Moderate	4 - Major	5 - Catastrophic
Safety and Health	First Aid Case	Minor Injury, Medical Treatment Case with/or Restricted Work Case.	Serious Injury or Lost Work Case	Major or Multiple Injuries - permanent injury or disability	Single or Multiple Fatalities
Environment	No impact on baseline environment. Localized to point source. No recovery required	Localized within site boundaries. Recovery measurable within 1 month of impact	Moderate harm with possible wider effect. Recovery in 1 year	Significant harm with local effect. Recovery longer than 1 year.	Significant harm with widespread effect. Recovery longer than 1 year. Limited prospect of full recovery
Reputation	Localised temporary impact	Localised, short term impact	Localised, long term impact but manageable	Localised, long term impact with unmanageable outcomes	Long term regional impact
Business Impact	Impact can be absorbed through normal activity	An adverse event which can be absorbed with some management effort	A serious event which requires additional management effort	A critical event which requires extraordinary management effort	Disaster with potential to lead to collapse of the project

The results for each risk are then plotted in the corresponding single square on the Risk Reporting Matrix. In this example, since the level of likelihood and consequence of risk 36 were both "3 and C", the corresponding schedule risk is reported as "purple" as shown in Figure 6.

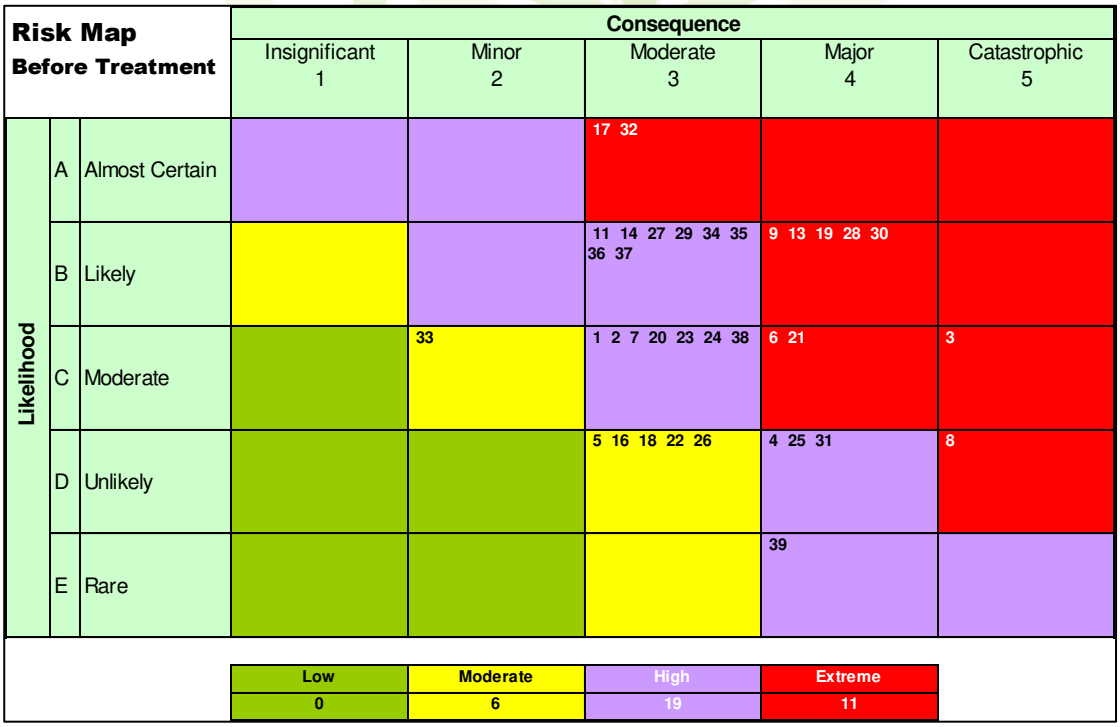

Figure 6: Illustrative Risk Map before treatment

3.3 MITIGATION IDENTIFICATION

The intent of risk mitigation identification is to answer the question "What is the project or program approach for addressing this potential unfavourable consequence?"

Risk mitigation identification is the activity that identifies, evaluates, and selects options to set risk at acceptable levels given program constraints and objectives. Risk mitigation planning is intended to enable program success. It includes the specifics of what should be done, when it should be accomplished, who is responsible, and the funding required to implement the risk mitigation plan. The most appropriate program approach is selected from the mitigation options listed below and documented in a risk mitigation plan. One or more of these mitigation options may apply:

- Avoiding risk by eliminating the root cause and/ or the consequence;
- Controlling the cause or consequence;
- Transferring the risk; and/ or
- Assuming the level of risk and continuing the current program plan.

For each root cause or risk, the type of mitigation must be determined, and the details of the mitigation described.

3.3.1 Mitigation Analysis

The intent of mitigating analysis is to answer the question "How does the mitigation identification affect the risk?" by:

- Considering the likelihood of the root cause after mitigation;
- Identifying the possible consequences after mitigation; and
- Identifying the change in risk level using the Risk Reporting Matrix.

Once alternatives have been analysed, the selected mitigation option should be incorporated into the risk analysis, either into existing program plans or documented separately as a risk mitigation plan (not to be confused with the risk management plan). The tasks are like the Risk Analysis described in section 4 of the Report. By mitigating a risk, the report will illustrate a shift to a lower left level as indicated in Figure 7.

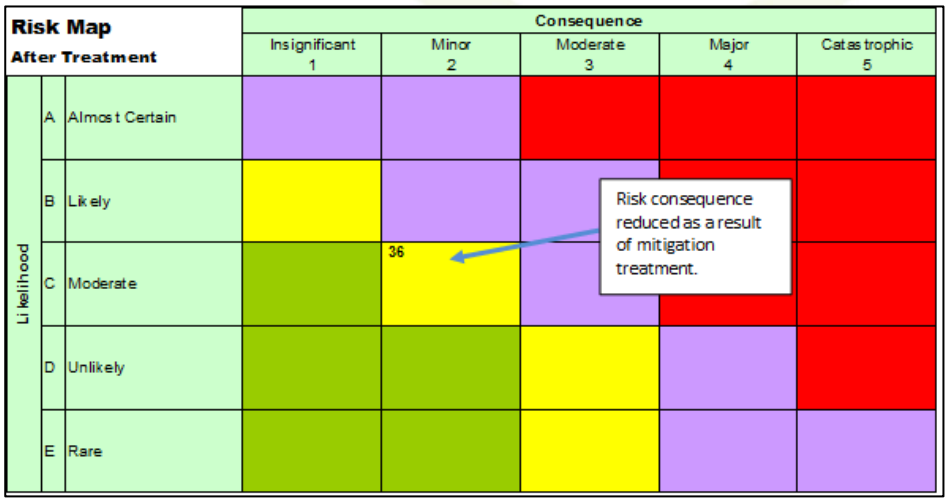

Figure 7: Illustrative risk map after treatment

3.3.2 Mitigation Planning

The intent of risk mitigation (plan) execution is to ensure successful risk mitigation occurs. It answers the question "How can the planned risk mitigation be implemented?" it:

- Determines what planning, budget, requirements and contractual changes are needed;
- Provides a coordination vehicle with management and other stakeholders;
- Directs the teams to execute the defined and approved risk mitigation plans;
- Outlines the risk reporting requirements for on-going monitoring; and
- Documents the change history.

Once alternatives have been analysed, the selected mitigation option should be incorporated into program planning, either into existing program plans or documented separately as a risk mitigation plan (not to be confused with the risk management plan). The risk mitigation plan needs to be realistic, achievable, measurable, and documented and address the following topics:

- A descriptive title for the identified risk;
- The date of the plan;
- The point of contact responsible for controlling the identified root cause;
- A short description of the risk (including a summary of the performance, schedule, and resource impacts, likelihood of occurrence, consequence, whether the risk is within the control of the project or program);
- Why the risk exists (root causes leading to the risk);
- The options for mitigation (possible alternatives to alleviate the risk);
- Definition of events and activities intended to reduce the risk, success criteria for each plan event, and subsequent "risk level if successful" values;
- Risk status (discuss briefly);
- The fall-back approach (describe the approach and expected decision date for considering implementation);
- A management recommendation (whether budget or time is to be allocated, and whether or not the risk mitigation is incorporated in the estimate at completion or in other program plans);
- Appropriate approval levels; and
- Identified resource needs.

4. RISK ASSESSMENT ANALYSIS

4.1 MINE CLOSURE RISKS IDENTIFIED AND QUANTIFIED

Table 7: Risk quantification

Risk Description (Event and Consequence OR Cause)	Category	Existing Controls and Measures	Risk Severity Before Treatment				
				Consequence		Likelihood	Risk Level Before Treatment
The Impact on workers at the mine could pose a risk during the negotiations for closure	Staff	Studies	**4**	Major	**A**	Almost Certain	*Extreme*
The control of underground water could pose a risk to the volume of possible polluted water entering the environment and affecting downstream farmers and communities	Ground Water	Studies	**4**	Major	**B**	Likely	*Extreme*
The deterioration of groundwater quality down gradient of the mining operations due to plume movement and entering the environment and affecting downstream farmers and communities	Ground Water	Studies	**4**	Major	**B**	Likely	*Extreme*
Insufficient topsoil to cover all disturbed areas (e.g. Dumps) during rehabilitation	Soils	Studies	**4**	Major	**B**	Likely	*Extreme*
Loss of revenue to surrounding communities as a result of the closure and rehabilitation of the mining operation	Social Impact	Studies	**4**	Major	**B**	Likely	*Extreme*
Reduction of natural run-off volumes entering wetland areas as a result of the mining area and waste rock dumps / stockpiles	Sensitive Landscapes	Studies	**3**	Moderate	**B**	Likely	*High*
Acid Mine drainage could pose a health risk to surrounding communities	Health	Studies	**3**	Moderate	**B**	Likely	*High*
The increased sediment generation could enhance degradation of surrounding environment	Surface Water	Studies	**3**	Moderate	**C**	Moderate	*High*

Surface water pollution of stream will degrade the water resources of surrounding environment.	Surface Water	Studies	**3**	Moderate	**C**	Moderate	*High*
Surface water damage to riparian vegetation will have a localised effect on the direct surroundings	Surface Water	Studies	**3**	Moderate	**C**	Moderate	*High*
Degradation of riparian areas by constructing and operation of the mine has a risk localised to the mine	Surface Water	Studies	**3**	Moderate	**C**	Moderate	*High*
The impacts on the natural environment will have an impact on fauna behaviour	Sensitive Landscapes	Studies	**3**	Moderate	**C**	Moderate	*High*
The impacts on the plant species will pose a risk to the surrounding ecology	Flora	Studies	**3**	Moderate	**C**	Moderate	*High*
The impacts on the animal species will pose a risk to the surrounding ecology	Fauna	Studies	**3**	Moderate	**C**	Moderate	*High*
Insufficient profiling of the topography of the mining area during rehabilitation may lead to erosion	Erosion	Studies	**3**	Moderate	**C**	Moderate	*High*
Discard dump at closure is a potential safety risk to human and animal injury	Safety	Studies	**2**	Minor	**B**	Likely	*High*
Opencast pit at closure is potential safety risk to human and animals	Safety	Studies	**2**	Minor	**B**	Likely	*High*
Dust pollution from discard dump and waste rock dumps influencing surrounding communities	Air Quality	Studies	**3**	Moderate	**D**	Unlikely	*Moderate*
Mine vehicles increase air/dust pollution driving mining areas	Air Quality	Studies	**2**	Minor	**D**	Unlikely	*Low*
Noise pollution created during decommissioning	Noise	Studies	**2**	Minor	**D**	Unlikely	*Low*
Visual impact of discard dump not rehabilitated properly	Visual	Studies	**2**	Minor	**D**	Unlikely	*Low*

4.2 MINE CLOSURE RISKS MITIGATED AND QUANTIFIED

Table 8: Mitigation quantification

Risk Description (Event and Consequence OR Cause)	Risk Treatment Plan	Ability to Influence	Action Plan Type	Risk Severity After Treatment				
					Consequence		Likelihood	Risk Level After Treatment
The Impact on workers at the mine could pose a risk during the negotiations for closure	• All workers must be given enough notice to allow them to plan for the immediate future. • Adequate and reasonable severance packages must be provided to all workers to be retrenched.	Low / None	Reduce likelihood and consequence	**3**	Moderate	**A**	Almost Certain	*Extreme*
The control of underground water could pose a risk to the volume of possible polluted water entering the environment and affecting downstream farmers and communities	• All sulphate containing waste material should be stored at the base of the mine and flooded as soon as possible to exclude oxygen. • Major underground fractures encountered while mining must be sealed by grouting, both on inflow and outflow areas	Low / None	Reduce consequence	**3**	Moderate	**B**	Likely	*High*

The deterioration of groundwater quality down gradient of the mining operations due to plume movement and entering the environment and affecting downstream farmers and communities	• Pollution control dams should be maintained to intercept polluted seepage water. This is necessary even after mine closure to ensure the wetland is not negatively affected by pollution. Regular sampling of streams and wetland is essential to determine the efficiency of this action. • 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. • All mined areas should be flooded as soon as possible to minimise oxygen from reacting with the remaining pyrite. • Mining should separate acid forming and non-acid forming material. Deposit acid forming material at the base of the mine. • The final backfilled topography should be engineered such that runoff is directed away from the void areas. • The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the voids. • Quarterly groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends. • Audit the monitoring network annually. • Remove / remediate areas of hydrocarbon contaminated soils by following a risk-based approach, act if a negative risk is found.	Low / None	Reduce consequence	**3**	Moderate	**B**	Likely	*High*

Insufficient topsoil to cover all disturbed areas (e.g. Dumps) during rehabilitation	• Loss of topsoil and usable soil. • Strip all usable soil and stockpile. • Vegetate long-term soil stockpiles. • Contamination of topsoil and stockpiled soil. • Prevent contamination of topsoil and stockpiled soil. • Site all soil stockpiles upslope from any mining / development activities. • Position stockpiles upslope of mining areas, or as screens to restrict visibility of the mining operation provided that in doing so, the stockpile is not exposed to the risk of seepage or dirty water contamination. • Erosion of stockpiled soil. • Ensure that all stockpiles have a storm water diversion berm for protection against erosion and contamination by dirty water.	Moderate	Reduce consequence	**3**	Moderate	**B**	Likely	*High*
Loss of revenue to surrounding communities as a result of the closure and rehabilitation of the mining operation	• Communities must be given enough notice to allow them to plan for the immediate future • The social and labour plan must be updated annually to ensure changes are mitigated	Moderate	Reduce consequence	**3**	Moderate	**B**	Likely	*High*
Reduction of natural run-off volumes entering wetland areas as a result of the mining area and waste rock dumps / stockpiles	A comprehensive Rehabilitation plan is required to protect wetlands in the surrounding areas	Moderate	Reduce likelihood and consequence	**2**	Minor	**C**	Moderate	*Moderate*
Acid Mine drainage could pose a health risk to surrounding communities	The development of a specific Water Treatment process need to be developed to reduce risk of contamination	Moderate	Reduce consequence	**2**	Minor	**B**	Likely	*High*
The increased sediment generation could enhance degradation of surrounding environment	• Strict erosion control. • No development within riparian zone. • Access roads to be well maintained. • Streambank at dam spillway and downstream of dam to be well protected against flood damage and erosion.	Moderate	Reduce consequence	**2**	Minor	**C**	Moderate	*Moderate*
Surface water pollution of stream will degrade the water resources of surrounding environment.	• Zero effluent discharge policy (no discharge to dam or stream). • Strict regulatory control on all water containing waste generated and disposal of effluent (WWTW).	Moderate	Reduce consequence	**2**	Minor	**C**	Moderate	*Moderate*

Surface water damage to riparian vegetation will have a localised effect on the direct surroundings	• Introduce strict rehabilitation programme with erosion control and re-vegetation of disturbed areas using indigenous plants and shrubs. • Disturbed footprint and rehabilitated areas to be monitored throughout life of mine. • Compliance with all environmental legislation.	Moderate	Reduce likelihood and consequence	**2**	Minor	**D**	Unlikely	*Low*
Degradation of riparian areas by constructing and operation of the mine has a risk localised to the mine	• Activities secondary to mine construction and operation to be located out of riparian zone as far as possible. • All work areas including access road and mining complex to be rehabilitated on completion. • Strict control measures to be implemented in terms of impact minimisation on the in-stream habitat.	High	Reduce likelihood and consequence	**2**	Minor	**D**	Unlikely	*Low*
The impacts on the natural environment will have an impact on fauna behaviour	• Pathways should be clearly demarcated and be kept to. It is important that animals (wildlife and domestic animals) are not handled, removed, killed or interfered with. • Activities must comply with the regulations of the Animal Protection Act 1962 (Act No. 71 of 1962). • Rehabilitation of degraded areas is a must.	Moderate	Reduce consequence	**2**	Minor	**C**	Moderate	*Moderate*

The impacts on the plant species will pose a risk to the surrounding ecology	• A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase. The mine will be held accountable in this regard. • Rehabilitation plan should be implemented. This includes the return of the topsoil and the process of replanting the vegetation. The replacement of the topsoil should be done with the assistance of a soil scientist. Topsoil should be tested closer to the rehabilitation phase to ensure that the soil is of an adequate quality. The post-closure rehabilitation plans should be adopted according to the necessary actions needed during the final stage of the life of mine. • The use of the farm post-closure should be grazing. The veld management plant that was created by the veld management expert should be thoroughly implemented. • Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted every six months by the environmental practitioner. A report should be written and stored to be made available and should be available at all times.	Moderate	Reduce consequence	**2**	Minor	**C**	Moderate	*Moderate*
The impacts on the animal species will pose a risk to the surrounding ecology	• To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees. • Activities on site must comply with the regulations of the Animal Protection Act 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act. • Ensure that an acceptable aesthetic scenario is created post closure. This will be reached through adequate rehabilitation practices by restoring damaged and degraded habitat areas. • When closure is considered successful and rehabilitation complete, unnecessary fences should be	High	Reduce likelihood and consequence	**2**	Minor	**D**	Unlikely	*Low*

	lifted to restore larger foraging areas, especially for larger mammalian species within the area.							
Insufficient profiling of the topography of the mining area during rehabilitation may lead to erosion	• Position stockpiles upslope of mining areas, or as screens to restrict visibility of the mining operation provided that in doing so, the stockpile is not exposed to the risk of seepage or dirty water contamination. • Erosion of stockpiled soil. • Ensure that all stockpiles have a storm water diversion berm for protection against erosion and contamination by dirty water.	High	Reduce likelihood and consequence	**2**	Minor	**D**	Unlikely	*Low*
Discard dump at closure is a potential safety risk to human and animal injury	A comprehensive closure plan and sufficient signage	Moderate	Reduce likelihood	**2**	Minor	**C**	Moderate	*Moderate*
Pit D East at closure is potential safety risk to human and animals	A comprehensive closure plan and sufficient signage	Moderate	Reduce likelihood	**2**	Minor	**C**	Moderate	*Moderate*
Dust pollution from discard dump and waste rock dumps influencing surrounding communities	A comprehensive Rehabilitation plan	High	Reduce consequence	**2**	Minor	**D**	Unlikely	*Low*
Mine vehicles increase air/dust pollution driving mining areas	A comprehensive Rehabilitation plan	High	Accept	**2**	Minor	**D**	Unlikely	*Low*
Noise pollution created during decommissioning	A comprehensive Rehabilitation plan	High	Accept	**2**	Minor	**D**	Unlikely	*Low*
Visual impact of discard dump not rehabilitated properly	A comprehensive Rehabilitation plan	High	Accept	**2**	Minor	**D**	Unlikely	*Low*

4.3 MINE CLOSURE RISKS MATRIX

4.3.1 Risk matrix before treatment

Risk Map Before Treatment			Consequence				
			Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	A	Almost Certain				1	
	B	Likely		16 17	6 7	2 3 4 5	
	C	Moderate			8 9 10 11 12 13 14 15		
	D	Unlikely		19 20 21	18		
	E	Rare					

Low	Moderate	High	Extreme
3	1	12	5

Figure 8: Risk Matrix before treatment

4.3.2 Risk matrix after treatment

Risk Map After Treatment			Consequence				
			Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	A	Almost Certain			1		
	B	Likely		7	2 3 4 5		
	C	Moderate		6 8 9 12 13 16 17			
	D	Unlikely		10 11 14 15 18 19 20 21			
	E	Rare					

Low	Moderate	High	Extreme
8	7	5	1

Figure 9: Risk Matrix after treatment

4.3.3 Risk result

Several risks were identified as potential aspects that could pose a risk during the closure and rehabilitation process of the mine. These risks were mitigated, but careful attention to mitigation measure need to intrenched during the operational life cycle of the mine. Risk include:

- Extreme
    - Redundancy of workers at the mine could pose a risk during the negotiations for closure

- Extreme to high
    - The control of underground water could pose a risk to the volume of possible polluted water entering the environment and affecting downstream farmers and communities
    - The deterioration of groundwater quality down gradient of the mining operations due to plume movement and entering the environment and affecting downstream farmers and communities
    - Insufficient topsoil to cover all disturbed areas (e.g. Dumps) during rehabilitation
    - Loss of revenue to surrounding communities as a result of the closure and rehabilitation of the mining operation

5. LATENT AND RESIDUAL RISKS

According to the Mineral and Petroleum Resources Development Regulations, 2004 (Published under Government Notice R527 in Government Gazette 26275 of 23 April 2004) (GN R527) latent and residual impacts are defined as follows:

- "latent environmental impact means any environmental impact that may result from natural events or disasters after a closure certificate has been issued" (own emphasis); and
- "residual environmental impact means the environmental impact remaining after a closure certificate has been issued" (own emphasis).

Latent and residual risks are specifically related to post mining impacts that occur at the site once rehabilitation post mining has been completed.

As this is the first iteration of the report for the new development, future information will, over time, inform the extent of the risks to the surrounding environment.

5.1 RESIDUAL RISKS

The following residual risks were identified from specialist reports:

- According to the Hydrogeology report simulated groundwater rebound at the Site indicated that decant is possible, although limited, at the central region of Opencast 1, with no decant expected at Opencast 2. The predicted decant volume at Opencast 1 was in the order of 250-300 m3/day, with expected sulphate concentrations of ~400-500 mg/l. The constructed wetland treatment solution would be the preferred solution at the Site, offering benefits such as wetland reclamation and low operational costs. However, the final solution for the management of AMD (if any) at the Site will be determined, designed and implemented (where possible) during the operational phase of the LoM following further geochemical testing and numerical groundwater modelling refinement at the Site.; and
- Workforce will be made redundant after mining has ceased and social behaviour could have adverse effects.

5.2 LATENT RISKS

The following latent risk could possibly pose risks to direct surroundings:

- Natural disasters could have a detrimental effect on the final rehabilitation of the mining site. Failures in berms, gabions rehabilitated dumps require careful final designs on a site.

6. FINANCIAL LIABILITY FOR KEY LATENT AND RESIDUAL RISKS

Although latent and residual risks were identified throughout the project it will be difficult to quantify as no work or construction has taken place on site. Quantification will become more relevant within the operational phase water monitoring regime.

7. MONITORING, MEASUREMENT, AUDITING AND REPORTING

Information obtained from the regulations indicate that there are two requirements under this category. The first relates to monitoring, auditing and reporting on future revisions to this Rehabilitation, Decommissioning and Closure Plan, which is required annually and the second monitoring and reporting on the monitoring environmental indicators required achieving relinquishment criteria.

7.1 MONITORING, MEASUREMENT, AUDITING AND REPORTING ON THE MINE CLOSURE PLAN

Interpretation of the regulation is that there are three sets of reviews to which the Rehabilitation, Decommissioning and Closure Plan must be subjected to on an annual basis.

Table 9: Three different Rehabilitation, Decommissioning and Closure Plan reviews required

Requirement	Specifications
Internal	Monitoring, measurement, auditing and reporting – a review undertaken by an appointed consultant to update the plan to account for changes to the environment and risk profile and to update the liability assessment to reflect liability at that point in time
External	Monitoring, auditing and reporting – a review undertaken by the financial auditors as part of the annual financial/accounting audit to determine that the plan is appropriate and that the quantum of the liability is included in the operations provisions
Legislated	These are the auditing requirements of the Act, Regulation, EIA/EMP, IWWMP, IWUL and RoD. Pertinent aspects relating to closure, such as changes to the risk assessment, changes in closure options and changes in the quantum of the liability will be reported.

The current planning for these audits is presented in the table below. It is currently envisaged that findings of the audit will be reported on within one month of finalisation of the audit.

Audit	Responsibility	Frequency	Proposed Date
Internal	Mine manager to appoint external consultant	Annual	Quarter 3 of each year
External	Financial manager	Annual	Quarter 4 of each year in support of financial statements
Legislated	Mine manager to appoint external consultant	Annual	Quarter 1 of each year

The findings from the various audits required as listed above will be recorded in the operations Environmental Management System (EMS) while responsibilities and timelines allocated to the rectification of the findings will be assigned. Once addressed, these findings will be closed out in a manner similar to the other findings captured in the EMS, and will not be closed out until an independent second party has assessed that the finding is appropriately addressed.

7.2 MONITORING, MEASUREMENT, AUDITING AND REPORTING TO TRACK RELINQUISHMENT PROGRESS

The objective of the monitoring programme will be to track the recovery, reclamation and rehabilitation of the disturbed areas towards the long-term post-closure land capability goals, in accordance with the overall closure objectives set out in this report. The monitoring programme will be designed to collect information to demonstrate that the Relinquishment criteria have been achieved. The proposed monitoring has been summarised in the table below.

Table 10: Proposed Monitoring Requirements

Aspect	Requirement
Surface Water	Quality monitoring against parameters as required by the IWUL. Sampled monthly for a five-year post-closure period.
Groundwater	Quality and depth monitoring of both the shallow and deep aquifers against the parameters required by the IWUL. Sampled quarterly for a five year post-closure period.
Erosion	This will take the form of developing a representative reference site on the disturbed footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken twice a year during the wet and dry season for a five-year post-closure period.
Vegetation	Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference site established in a similar ecotype, conducted annually for a five year post-closure period.
Bio-monitoring	Upstream and downstream of the mining activities. A long-term bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area. Appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity, with monitoring being undertaken bi-annually to also consider seasonal variations.
Visual	Photographic records should be maintained together with findings, follow up actions and close out records as part of the Environmental Management System.

Annual reports will be prepared to document the results of the monitoring during the rehabilitation, decommissioning, closure and post-closure phases. These reports will provide important information required to manage the on-going closure activities, with the data and reports being used to:

- Provide recommendations for improving subsequent rehabilitation activities;
- Indicate where rehabilitation and closure activities have not been successful, requiring a potential change in design criteria or alternative interventions;
- Provide information where aftercare and maintenance is required during the post-closure period; and
- Indicate if relinquishment criteria have been met.

8. AMENDMENTS TO THE PLAN AS A RESULT OF MONITORING GAPS

This report is the first Rehabilitation, Decommissioning and Mine Closure Plan to be compiled, an explanation of motivations for any amendments required, and made to it, given the monitoring results in the previous auditing period and the identification of gaps will only become applicable in subsequent updates.

9. CONCLUSION AND RECOMMENDATIONS

The following recommendations should be adhered to;

- Compliance with Mitigation aspects of the Risk Assessment
  - Mitigations measures requires annual updates and improvements to reduce the effect of risks on the environment.
  - Latent and residual risks are difficult to quantify as no work or construction has taken place on site. Quantification will become more relevant within the operational phase water monitoring regime.
- Compliance with Closure Plan
  - The closure objectives can only be achieved by adhering to the responsibilities as set out in the rehabilitation plan.
  - Closure objectives cannot be achieved if the actions of the rehabilitation plan are not complied with resulting in an unsuccessful closure plan.
- Annual update requirements of the plan
  - The closure plan must be reviewed annually and updated as and when major changes are effected to the Prospecting Works Programme.
- On-site documentation requirement
  - The closure plan must be available onsite as per the requirements of Regulation 26 (h) of NEMA EIA Regulations of 2014.

According to Regulation 34 of the NEMA EIA Regulations of 2014, the holder of an environmental authorisation must for the period during which the environmental authorisation, EMPR and Closure Plan remain valid:

- Ensure compliance with the conditions of the environmental authorisation and the EMPR and where applicable the closure plan, is audited and;
- Submit an environmental audit report to the relevant competent authority

The Regulations which apply to the holder under the MPRDA, regulates the „method for determining and making financial provision for the costs associated with the management of environmental impacts" caused by mining activities and operations.

The Regulations require holders to make financial provision for:

- Annual rehabilitation
- Final Rehabilitation, decommissioning and closure at the end of the prospecting / mining operations;
- Remediation and management of latent or residual environmental impacts, which become known in future.