REHABILITATION, DECOMMISSIONING AND CLOSURE PLAN

FOR

MARULA PLATINUM MINE

(SOLAR PHOTOVOLTAIC FACILITY)

FY2023

[GNR 1147 – APPENDIX 4]

REPORT STATUS: FINAL

REPORT NO: RPT00484/F

7 JULY 2023

DOCUMENT CONTROL

CLIENT:	**SLR Consulting (Africa)(Pty)Ltd**
Contact Person:	Chané Coetzee (Associate Environmental Consultant)
Contact Number:	+27 21 461 1118
Email Address:	ccoetzee@slrconsulting.com
CONSULTANT:	**E-TEK Consulting (Pty) Ltd**
Contact Person:	Leon Koekemoer (Project Director)
Contact Number:	+27 (0)18 294 3652
Email Address:	admin@etekconsulting.co.za
DOCUMENT TITLE:	**Rehabilitation, Decommissioning and Mine Closure Plan for Marula Mine Platinum (GNR1147 – APPENDIX 4)**
Order Number:	JBG.C14-44411.8325064815
Project Number:	PN100461
Report Number:	RPT00484/F
AUTHOR/S:	Closure Plan: Nadine Coetzer – Senior Environmental Consultant Closure Plan: Jacques Potgieter – Junior Environmental Consultant Closure Cost Estimation – Joani Taljaard – Quantity Surveyor
REVIEWER/S:	Jeanette Erasmus – Environmental Manager Leon Koekemoer – Senior Estimator

DOCUMENT DISTRIBUTION:

REVISION	STATUS	ISSUED TO		DATE
		NAME	DESIGNATION	
0	Draft Report	Chané Coetzee	Associate Environmental Consultant	26 June 2023
F	Final Report	Chané Coetzee	Associate Environmental Consultant	07 July 2023

DETAILS OF PRACTITIONERS

NAME	EXPERIENCE / PROFESSIONAL REGISTRATION
Jeanette Erasmus *Director & Environmental Manager* *SACNASP: 126227*	Jeanette obtained her B.Sc. Honours degree in Geography and Environmental studies in 2005, during that time, she worked as a Research Assistant at the Research Focus Area for Environmental Science and Management at the North-West University. She obtained her M.Sc. degree in Environmental Management, Cum Laude, in 2006 while working as an Environmental Consultant. Since then, she is working as an Environmental Manager. Jeanette is a member of the Land Rehabilitation Society of Southern Africa (LaRSSA) and is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP). Her key experience includes the compilation of closure plans, risk assessments and gap analyses for closure planning as well as the project management of projects for mine closure planning, rehabilitation, and remediation of disturbed areas. She also assists clients with the facilitation of onsite workshops and training in understanding the mine closure planning process and management of associated liabilities.
Leon Koekemoer *Director & Senior Estimator* *ASAQS – 29649790*	Leon has a National Diploma in Building (N.Dip. Building) and is an Associate Member of the Association of South African Quantity Surveyors (ASAQS), registration no. 29649790 and a member of the Land Rehabilitation Society of Southern Africa (LaRSSA). He was a Senior Project Manager for Beckers Building Contractors from 2005 – 2011, where his key roles included project management, cost control and quality control. Leon specialises in the development of closure liabilities and models as well as assisting and advising in the closure planning process for mining and industrial sites. His key experience includes the calculation of environmental liabilities and the representation thereof in closure models. His expertise allows him to address all categories associated with liabilities such as closure liability cash flows, rehabilitation cash flows, auditing of liabilities and operational closure costing.
Nadine Coetzer *Environmental Consultant*	Nadine completed her B.Sc degree in Ecology in 2010, her B.Sc Honours degree in Plant Ecology in 2011 and her M.Sc in Environmental Ecology in 2015. Nadine has worked at various environmental and engineering companies specialising in mine closure

NAME	EXPERIENCE / PROFESSIONAL REGISTRATION
SACNASP: 114156	and rehabilitation and have gained valuable experience in this regard. She also has experience with compiling closure plans, risk assessment, gap analyses and calculating costing estimates and liabilities related to closure planning both locally and internationally. She is currently registered as a Candidate Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP), with full professional registration due to follow soon. She is employed by E-TEK Consulting as an Environmental Consultant and assists the Environmental Manager with preparations for onsite workshops and client liaison.
Jacques Potgieter *Junior Environmental Consultant*	Jacques completed his BSc. degree in Geology and Zoology in 2018, his BSc. Honours degree in Biodiversity and Conservation Ecology in 2019, and his Masters degree in Environmental Sciences in 2023. He is in the process of enrolling with the South African Council for Natural Scientific Professions (SACNASP). He is employed by E-TEK Consulting as a Junior Environmental Consultant and assists the Senior Environmental Consultant with the compilation of reports.
Joani Taljaard *Quantity Surveyor* *ASAQS - 59952331*	Joani Taljaard graduated with a B.Sc Quantity Surveying (Hons) (Cum Laude) in 2015 from the University of Pretoria. She is an Associate Member of the Association of South African Quantity Surveyors (ASAQS), registration no. 59952331. She was a student Quantity Surveyor at Matla Quantity Surveyors (Pretoria) from 2014 to 2015, a junior Quantity Surveyor at Tronkon Construction (Potchefstroom) from 2016 to 2018 and a Candidate Quantity Surveyor at QS Africa Construction Consultants (Klerksdorp) from 2018 to 2021 where she managed the Potchefstroom office. She worked on a wide range of projects, including commercial developments, residential dwellings, health facilities, educational facilities, and insurance claims. She obtained experience from a construction and professional perspective in the six stages of a construction process: inception, concept and viability, design development, documentation and procurement, construction, and close out. She was employed by E-TEK Consulting in 2021 where she focusses on the calculation of closure liability estimates for scheduled and unscheduled closures as well as the annual updating of the liability estimates.

NEMA (ACT NO. 107 OF 1998): FINANCIAL PROVISIONING REGULATIONS, 2015 (NO. R. 1147) & REFERENCED IN THIS DOCUMENT

THE REGULATIONS APPENDIX 4	DESCRIPTION OF MINIMUM REQUIRED CONTENT	SECTION IN THIS DOCUMENT
(a)(i)(ii)	Detail of Practitioner/s which compiled the Plan, including Practitioner/s qualifications	Above page
(b)	The context of the project	Section 1 and 2
(b)(i)	Material information and issues that have guided the development of the plan	
(b)(ii)	An overview of (aa) environmental and (bb) social context	Section 4
(b)(iii)	Stakeholder issues and comments that have informed the plan	Section 9
(b)(iv)	The mine plan and schedule for the full approved operations, which includes: (aa) appropriate description of the mine plan; (bb) drawings and figures to indicate how the mine develops; (cc) what areas are disturbed; and (dd) how infrastructure and structures develops during operations	Section 2
(c)	Findings of an environmental risk assessment leading to the most appropriate closure strategy	Section 8
(c)(i)	A description of the risk assessment methodology including risk identification and quantification	
(c)(ii)	An identification of indicators that are most sensitive to potential risks and the monitoring of such risks	
(c)(iii)	An identification of conceptual closure strategies to avoid, manage and mitigate the impacts and risk	

THE REGULATIONS APPENDIX 4	DESCRIPTION OF MINIMUM REQUIRED CONTENT	SECTION IN THIS DOCUMENT
(c)(iv)	Reassessment of the risks to determine whether, after the implementation of the closure strategy, the residual risk has been avoided and / or how it has resulted in avoidance, rehabilitation, and management of impacts and whether this is acceptable to the mining operation and stakeholders;	
(c)(v)	An explanation of changes to the risk assessment results, as applicable in annual updates to the plan	
(d)	Design principles	Section 7
(d)(i)	The legal and governance framework and interpretation of these requirements for the closure design principles;	Section 3
(d)(ii)	Closure vision, objectives, and targets, which must reflect the local environmental and socio-economic context and reflect regulatory and corporate requirements and stakeholder expectations;	Section 5
(d)(iii)	Description and evaluation of alternative closure and post-closure options	Section 7
(d)(iv)	A motivation for the preferred closure action within the context of the risks and impacts that are being mitigated;	
(d)(v)	A definition and motivation of the closure and post-closure period, taking cognisance of the probable need to implement post-closure monitoring and maintenance for a period sufficient to demonstrate that relinquishment criteria have been achieved;	
(d)(vi)	Details associated with any on-going research on closure options;	
(d)(vii)	A detailed description of the assumptions made to develop closure actions	

THE REGULATIONS APPENDIX 4	DESCRIPTION OF MINIMUM REQUIRED CONTENT	SECTION IN THIS DOCUMENT
(e)	A proposed final post-mining land use which is appropriate, feasible and possible of implementation	Section 6
(e)(i)	Descriptions of appropriate and feasible final post-mining land use for the overall project and per infrastructure or activity and a description of the methodology used to identify final post-mining land use, including the requirements of the operations stakeholders;	
(e)(ii)	A map of the proposed final post-mining land use;	
(f)	Closure actions	Section 7
(f)(i)	The development and documenting of a description of specific technical solutions related to infrastructure and facilities for the preferred closure option or options, which must include all areas, infrastructure, activities, and aspects both within the mine lease area and off of the mine lease area associated with mining for which the mine has the responsibility to implement closure actions;	
(f)(ii)	The development and maintenance of a list and assessment of threats and opportunities and any uncertainties associated with the preferred closure option, which list will be used to identify and define any additional work that is needed to reduce the level of uncertainty;	
(g)	A schedule of actions for final rehabilitation, decommissioning, and closure	Section 10
(g)(i)	Scheduled to be linked to the mine works programme, if greenfields, or to the current mine plan, if brownfields;	
(g)(ii)	Schedule to include assumptions and schedule drivers;	
(g)(iii)	Including a spatial map or schedule, showing planned spatial progression throughout operations;	

THE REGULATIONS APPENDIX 4	DESCRIPTION OF MINIMUM REQUIRED CONTENT	SECTION IN THIS DOCUMENT
(h)	An indication of the organisational capacity that will be put in place to implement the plan	
(h)(i)	Organisational structure as it pertains to the plan;	
(h)(ii)	Responsibilities;	
(h)(iii)	Training and capacity building that may be required to build closure competence;	
(i)	An indication of gaps in the plan, including an auditable action plan and schedule to address the gaps;	Section 7
(j)	Relinquishment criteria for each activity or infrastructure in relation to environmental aspects with auditable indicators;	
(k)	Closure cost estimation	Section 11
(k)(i)	Cost estimates for operations, or components of operations that are more than 30 years from closure will be prepared as conceptual estimates with an accuracy of ± 50 per cent. Cost estimates will have an accuracy of ± 70 per cent for operations, or components of operations, 30 or less years (but more than ten years) from closure and ± 80 per cent for operations, or components of operations ten or less years (but more than five years) from closure. Operations with 5 or less years will have an accuracy of ± 90 per cent. Motivation must be provided to indicate the accuracy in the reported number and as accuracy improves, what actions resulted in an improvement in accuracy;	
(k)(ii)	The closure cost estimation must include (aa) an explanation of the closure cost methodology; (bb) auditable calculations of costs per activity or infrastructure; (cc) cost assumptions;	

THE REGULATIONS APPENDIX 4	DESCRIPTION OF MINIMUM REQUIRED CONTENT	SECTION IN THIS DOCUMENT
(k)(iii)	The closure cost estimate must be updated annually during the operation's life to reflect known developments, including changes from the annual review of the closure strategy assumptions and inputs, scope changes, the effect of a further year's inflation, new regulatory requirements, and any other material developments;	
(l)	Monitoring, auditing, and reporting requirements	Section 12
(l)(i)	A schedule outlining internal, external, and legislated audits of the plan for the year, including (aa) the person responsible for undertaking the audit(s); (bb) the planned date of audit and frequency of audit; (cc) an explanation of the approach that will be taken to address and close out audit results and schedule;	
(l)(ii)	A schedule of reporting requirements providing an outline of internal and external reporting, including disclosure of updates of the plan to stakeholders;	
(l)(iii)	A monitoring plan which outlines (aa) parameters to be monitored, frequency of monitoring and period of monitoring; (bb) an explanation of the approach that will be taken to analyse monitoring results and how these results will be used to inform adaptive or corrective management and/or risk reduction activities;	
(m)(i)	Motivations for any amendments made to the final rehabilitation, decommissioning, and mine closure plan, given the monitoring results in the previous auditing period and the identification of gaps as per 2(i).	Section 12

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

TERMS AND ABBREVIATIONS

TERMS & ABBREVIATIONS	DESCRIPTION
ASTM D1739-98	Standard Test Method for Collection and Measurement of Dustfall
AIDS	Acquired Immunodeficiency Syndrome
BPG	Best Practice Guideline
BoE	Basis of Estimate is a document that identifies the logic, data, methodology, assumptions, and calculations used to determine the estimate value. This document detail the thought process and calculations used to arrive at the estimate
BoQ	Bill of Quantities
Closure	This involves the application for closure certificate and initiation of transfer of on-going care and maintenance to third parties
CRD	Coarse Residue Deposit
CSI	Corporate Social Investment
DEA	Department of Environmental Affairs
DMRE	Department of Mineral Resources and Energy
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EMPr	Environmental Management Plan
ERA	Environmental Risk Assessment
E-TEK	E-TEK Consulting (Pty) Ltd
FEPA	Freshwater Ecosystem Priority Areas
FY	Financial Year
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
I&APs	Interested and Affected Parties

TERMS & ABBREVIATIONS	DESCRIPTION
Implats	Impala Platinum Holdings Limited
IWUL	Integrated Water Use Licence
IWWMP	Integrated Water and Waste Management Plan
KPIs	Key Performance Indicators
LoM	Life of Mine or Scheduled closure that happens at the planned date and/or time horizon
Marula	Marula Platinum Mine
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NGDB	National Groundwater Data Bank
OEL	Occupational Exposure Limits
PES	Present Ecological State
PGM	Platinum Group Metals
Post-closure	The period after mine closure
Premature or Un-scheduled Closure	Immediate closure of a site, representing decommissioning and reclamation of the site in its present state
Rehabilitation	The return of a disturbed area to its original state, or as close as possible to this state
RM	Regional Manager
RQO	Resource Quality Objectives
SEP	Stakeholder Engagement Plan
SLP	Social and Labour Plan
SOE	State of Environment
SWMP	Stormwater Management Plan
SWOT Analysis	Strength, Weakness, Opportunity, and Threat Analysis

TERMS & ABBREVIATIONS	DESCRIPTION
The Regulations or referred to as GNR1147	Financial Provisioning Regulations, 2015 published under Government Notice No. R 1147 of 20 November 2015.
TIPS	Trade & Industrial Policy Strategies
TB	Tuberculosis
TSF	Tailings Storage Facility
WHO	World Health Organisation
WRD	Waste Rock Dump
WUL	Water Use License
ZOI	Zones of Influence

EXECUTIVE SUMMARY

Project Description

E-TEK Consulting (Pty) Ltd (E-TEK) was appointed by SLR Consulting (Pty) Ltd (SLR) to assist Marula Platinum Mine (hereafter referred to as Marula Mine) with the necessary documentation to guide their closure planning process for the proposed project and integrate it as part of the future operational and rehabilitation activities at Marula Mine.

Marula Mine is situated in the Limpopo Province, approximately 50 km north-west of Burgersfort and approximately 120 km south-east of Polokwane. This document, including the supporting Appendices, is referred to as the Final Decommissioning, Rehabilitation and Mine Closure Plan for Marula Mine.

This document is referred to as the Final Decommissioning, Rehabilitation and Mine Closure Plan for the proposed project at Marula Mine. This is Appendix 4, as stated in the Financial Provisioning Regulations, 2015 published under Government Notice No. R 1147 of 20 November 2015 (referred to hereafter as GNR 1147) as well as Section 24 of the National Environmental Management Act 107 of 1998.

Purpose and Approach

The purpose of this report is to provide SLR with a Rehabilitation, Decommissioning and Closure Plan for the Marula Solar Photovoltaic Facility hereafter referred to as the Solar PV Facility to act as a guideline document during operational and rehabilitation activities and thereby assist them in its closure planning process and managing the liability estimate.

This document supports the following activities as part of the Environmental Impact Assessment (EIA) and is not to be considered as a site-wide document for Marula Mine:

- Proposed Solar PV Facility.
- Construction of linear items to support the construction of the Solar PV Facility.

The purpose of this report is to provide SLR with a Rehabilitation, Decommissioning and Mine Closure Plan for the Marula Mine to act as a guideline document during operational and rehabilitation activities assisting in its closure planning throughout the remaining life of mine (LoM) and serve the purpose of managing their closure liability estimate.

The development of this document and its supporting documentation were guided by:

- Section 3: Statutory and Corporate related requirements to ensure legal compliance;
- Section 4: The State and context of the surrounding Bio-Physical and Social Environment in which the operations are located;
- Section 5: Closure objectives and targets;
- Section 6: Post-Mining Land use/s;
- Section 7: Design principles, Closure activities and technical solutions (Rehabilitation and Closure criteria);
- Section 8: Closure Risk assessment (following a risk-based approach).

The approach included a comprehensive literature review of all the applicable Marula Mine rehabilitation and closure documentation, onsite investigations conducted by Marula Mine employees for the entire approved operations, as well as discussions, meetings, and workshops with Marula Mine personnel.

Closure Objectives and Post-Mining Land Use

Implats have specific objectives governing their approach to mine closure. These Closure objectives and targets are considered as part of Marula Mine's ongoing Mine Closure planning process and reflects the underlying principles for their Closure vision.

These objectives refer to the local environmental context, socio-economic context, regulatory and corporate requirements as well as stakeholder expectations.

To identify a post-mining land use, the following were considered:

- A proposed final post-mining land use which is appropriate, feasible, and possible of implementation;
- Descriptions of appropriate and feasible final post-mining land use for the overall project as per infrastructure or activity and a description of the methodology used to identify final post-mining land use, including the requirements of the operations stakeholders; and
- A map of the proposed final post-mining land use.

As per the current Environmental Management Plan (EMP) of Marula Mine, grazing and subsistence farming will be utilised for the land use post closure. Specific aspects to consider, includes the fact that that all areas may not be appropriate and feasible for the same grazing capacity and should be managed accordingly. Specific areas for the end land use are indicated on the post-mining land use plan, to ensure long-term sustainability of the rehabilitated mining areas. Refer to Section 6 as well as APPENDIX B for further detail.

Risk Assessment, Rehabilitation and Closure Criteria

All potential risks associated with the closure of the Marula Solar PV Facility operations were identified during review of documentation, were identified during desktop studies of the site, as well as discussions with operational personnel. Rehabilitation and Closure criteria or mitigation measures were established for each of these risks.

All risks were individually evaluated and ranked according to a risk matrix for closure scenarios before and after implementation of the Rehabilitation and Closure criteria / mitigation measures. Refer to Section 7 for the Rehabilitation and Closure criteria sheet (with all the further actions) and Section 8 and APPENDIX B for the detailed Closure Risk Assessment.

All risks identified during the Risk Assessment Process can be mitigated with no associated residual activities or risks, therefore no risks were identified as having a significant or high-risk post-mitigation.

The main potential risks that were evaluated for *Infrastructural aspects* were:

- Local communities could possibly request free power from Marula Solar Facility with the risk of riots.
- Disposing of Electronic Waste in an improper manner.

Any potential closure associated risks for *Bio-physical aspects* as well as *Social aspects*, can be managed through implementation of existing onsite management procedures, ongoing monitoring, and considering the funding of the Social closure planning.

Current and Post-closure Monitoring

There are current Monitoring programmes in place at Marula Mine which were approved as part of previous EMPs, and the closure liability / costs are not included for this document again. Only Care and Maintenance is included for this liability.

Closure Cost Estimation

The financial provision has been evaluated to support the minimum requirements of GNR 1147. This report provides the financial provision required for a closure scenario based on FY2023.

The following table presents a list of all the closure components, and which represent a liability:

Table 1: List of Closure Components

CLOSURE COMPONENTS		APPLICABLE
1	INFRASTRUCTURAL ASPECTS	
1.1	Plant and Related Structures – Solar PV Plant	Yes
1.2	Shafts, Adits and Declines	No
1.3	Supporting Infrastructure	Yes
1.4	Underground Infrastructure	No
1.5	Social Infrastructure	No
1.6	Off-Site Infrastructure	No
1.7	Linear Items	Yes
1.8	Waste Disposal	Yes
1.9	River Diversion	No
2	MINING ASPECTS	
2.1	Opencast / Pit Areas	No
2.2	Waste Rock Dumps - Overburden and Spoils	No
2.3	Coarse Residue Deposits - Processing Waste	No
2.4	Fine Residue Deposits - Processing Waste	No
3	BIO-PHYSICAL CLOSURE ASPECTS	
3.1	Water Resources	No
3.2	Climate Change	No
3.3	Sensitive Habitats and Biodiversity	No
3.4	Land Use and Land Capability	No
3.5	Soil	No
3.6	Other; Air Quality and Topography	No
4	SOCIAL CLOSURE ASPECTS	
4.1	Employees	No
4.2	Interested and Affected Parties	No
4.3	Government	No
5	GENERAL ASPECTS	
5.1	General Surfaces	Yes
5.2	Post-Closure Monitoring and Maintenance	Yes

CLOSURE COMPONENTS		APPLICABLE
5.3	Specialist Studies	No

The following should be noted:

- The mine is currently operational, Marula Mine is in the process to obtain environmental authorization for the Solar PV Facility;
- All latest, available and applicable information was sourced from SLR;
- In the event of the required information not being available, estimates were made based on experience and benchmarked against similar facilities elsewhere;
- The accuracy of a Closure Liability Estimate depends on the quality of information used as well as the amount of assumptions made;
- Rates were updated through E-TEK's existing database and in consultation with demolition and civil contractors, unit rates were also verified with the current onsite demolition contractors conducting reclamation and rehabilitation activities; and
- The closure liability estimate for this plan was based on 2023 rates.

The costing model that has been utilized to calculate the financial provision is aligned to the **closure components** as set out in Table 1.

The financial provision for the Marula Solar PV Facility was calculated based on the requirements of Appendix 4 of GNR 1147. The requirements of GNR 1147 indicates that you should financially provide for the greatest number out of the 10 Year forecast. Table 2 indicates the calculated 1–10-year closure forecast based on the following timelines:

- Year 1 – Premature Closure (FY2023); and
- Year 2 – 10 Closure Forecast (FY2024 – FY2032).

Based on the calculations it was determined that Marula Mine will be required to financially provide for **FY2024 of the closure forecast.** The closure forecast considers the Construction Schedule.

The total **financial provision required** for the Marula Solar PV Facility proposed activities (including P&G's, Contingencies and VAT) has been estimated to be **R 51 604 418,30** (Refer to APPENDIX E for the detail cost breakdown per component and closure forecast).

The following graph present the liability makeup per percentage for the 5 main closure components for the Marula Solar PV Facility for FY2024:

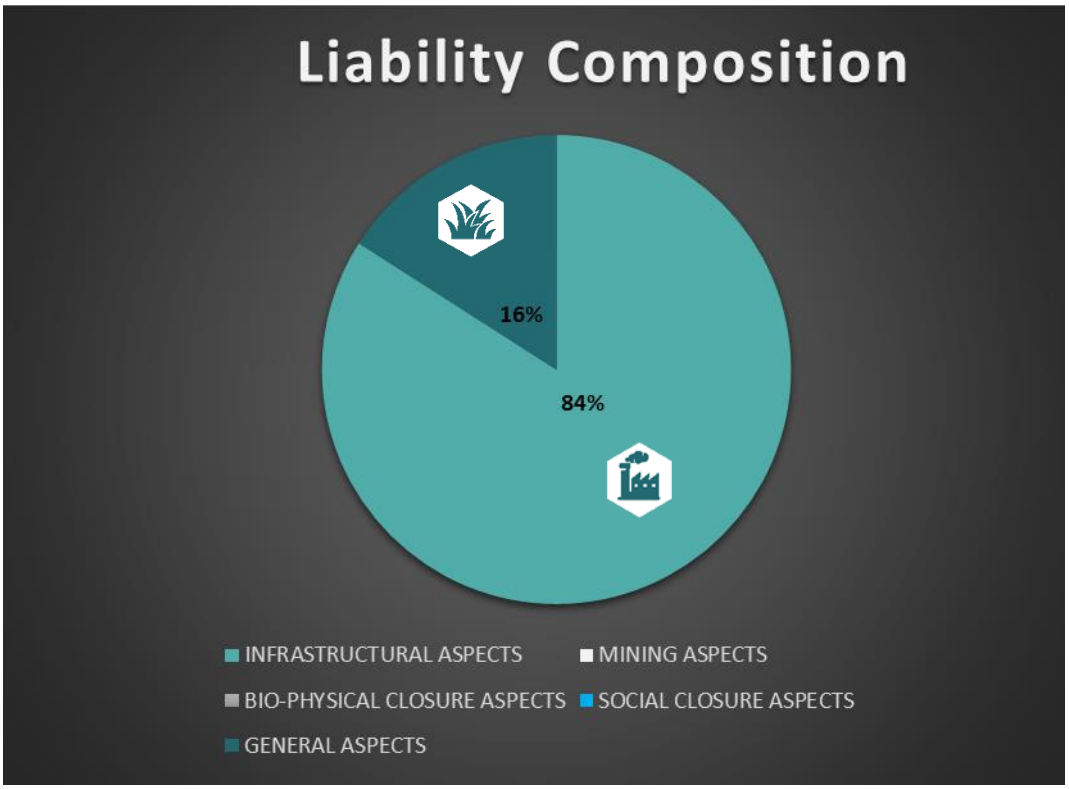

Figure 1: Liability Composition for FY2024

The following table presents the financial provision calculated for the 1–10-year closure forecast. This table illustrates the fluctuation in liability over the required period and provides one with the indication of the financial provision required.

Table 2: Executive Summary for Closure Forecast

MARULA PLATINUM - SOLAR PHOTOVOLTAIC FACILITY - EIA EXECUTIVE SUMMARY													
ESTIMATED CLOSURE COST ESTIMATES (INCLUDES P&G'S, CONTINGENCIES AND VAT AND EXCLUDES ESCALATION)			Closure Forecast	Closure Forecast	Closure Forecast	Closure Forecast	Closure Forecast	Closure Forecast	Closure Forecast	Closure Forecast	Closure Forecast	Closure Forecast
CLOSURE COMPONENTS			2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
1	**INFRASTRUCTURAL ASPECTS**		**R -**	**R 32 563 827,22**	**R 32 563 827,22**	**R 32 563 827,22**	**R 32 563 827,22**	**R 32 563 827,22**	**R 32 563 827,22**	**R 32 563 827,22**	**R 32 563 827,22**	**R 32 563 827,22**
1,1	PLANT AND RELATED STRUCTURES - SOLAR PV PLANT		R -	R 23 472 886,13	R 23 472 886,13	R 23 472 886,13	R 23 472 886,13	R 23 472 886,13	R 23 472 886,13	R 23 472 886,13	R 23 472 886,13	R 23 472 886,13
1,2	SHAFTS, ADITS AND DECLINES		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
1,3	SUPPORTING INFRASTRUCTURE		R -	R 3 092 946,40	R 3 092 946,40	R 3 092 946,40	R 3 092 946,40	R 3 092 946,40	R 3 092 946,40	R 3 092 946,40	R 3 092 946,40	R 3 092 946,40
1,4	UNDERGROUND INFRASTRUCTURE		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
1,5	SOCIAL INFRASTRUCTURE		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
1,6	OFF-SITE INFRASTRUCTURE		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
1,7	LINEAR ITEMS		R -	R 1 076 501,91	R 1 076 501,91	R 1 076 501,91	R 1 076 501,91	R 1 076 501,91	R 1 076 501,91	R 1 076 501,91	R 1 076 501,91	R 1 076 501,91
1,8	WASTE DISPOSAL		R -	R 4 921 492,79	R 4 921 492,79	R 4 921 492,79	R 4 921 492,79	R 4 921 492,79	R 4 921 492,79	R 4 921 492,79	R 4 921 492,79	R 4 921 492,79
1,9	RIVER DIVERSION		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
2	**MINING ASPECTS**		**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**
2,1	OPENCAST / PIT AREAS		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
2,2	WASTE ROCK DUMPS - OVERBURDEN AND SPOILS		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
2,3	COARSE RESIDUE DEPOSITS - PROCESSING WASTE		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
2,4	FINE RESIDUE DEPOSITS - PROCESSING WASTE		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
3	**BIO-PHYSICAL CLOSURE ASPECTS**		**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**
3,1	WATER RESOURCES		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
3,2	CLIMATE CHANGE		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
3,3	SENSITIVE HABITATS AND BIODIVERSITY		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
3,4	LAND USE AND LAND CAPABILITY		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
3,5	SOIL		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
3,6	OTHER; AIR QUALITY AND TOPOGRAPHY		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
4	**SOCIAL CLOSURE ASPECTS**		**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**	**R -**
4,1	EMPLOYEES		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
4,2	INTERESTED AND AFFECTED PARTIES		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
4,3	GOVERNMENT		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
5	**GENERAL ASPECTS**		**R -**	**R 6 176 784,00**	**R 6 176 784,00**	**R 6 176 784,00**	**R 6 176 784,00**	**R 6 176 784,00**	**R 6 176 784,00**	**R 6 176 784,00**	**R 6 176 784,00**	**R 6 176 784,00**
5,1	GENERAL SURFACES		R -	R 5 081 754,00	R 5 081 754,00	R 5 081 754,00	R 5 081 754,00	R 5 081 754,00	R 5 081 754,00	R 5 081 754,00	R 5 081 754,00	R 5 081 754,00
5,2	POST CLOSURE MONITORING AND MAINTENANCE		R -	R 1 095 030,00	R 1 095 030,00	R 1 095 030,00	R 1 095 030,00	R 1 095 030,00	R 1 095 030,00	R 1 095 030,00	R 1 095 030,00	R 1 095 030,00
5,3	SPECIALIST STUDIES		R -	R -	R -	R -	R -	R -	R -	R -	R -	R -
	SUB-TOTAL 1		**R -**	**R 38 740 611,22**	**R 38 740 611,22**	**R 38 740 611,22**	**R 38 740 611,22**	**R 38 740 611,22**	**R 38 740 611,22**	**R 38 740 611,22**	**R 38 740 611,22**	**R 38 740 611,22**
	Weighted Preliminary and General	6%	R -	R 2 258 734,87	R 2 258 734,87	R 2 258 734,87	R 2 258 734,87	R 2 258 734,87	R 2 258 734,87	R 2 258 734,87	R 2 258 734,87	R 2 258 734,87
	Weighted Contingencies	10%	R -	R 3 874 061,12	R 3 874 061,12	R 3 874 061,12	R 3 874 061,12	R 3 874 061,12	R 3 874 061,12	R 3 874 061,12	R 3 874 061,12	R 3 874 061,12
	SUB-TOTAL 2 FOR P&G's AND CONTINGENCIES		**R -**	**R 6 132 796,00**	**R 6 132 796,00**	**R 6 132 796,00**	**R 6 132 796,00**	**R 6 132 796,00**	**R 6 132 796,00**	**R 6 132 796,00**	**R 6 132 796,00**	**R 6 132 796,00**
	SUB-TOTAL 3		**R -**	**R 44 873 407,22**	**R 44 873 407,22**	**R 44 873 407,22**	**R 44 873 407,22**	**R 44 873 407,22**	**R 44 873 407,22**	**R 44 873 407,22**	**R 44 873 407,22**	**R 44 873 407,22**
	VAT	15%	R -	R 6 731 011,08	R 6 731 011,08	R 6 731 011,08	R 6 731 011,08	R 6 731 011,08	R 6 731 011,08	R 6 731 011,08	R 6 731 011,08	R 6 731 011,08
	GRAND-TOTAL		**R -**	**R 51 604 418,30**	**R 51 604 418,30**	**R 51 604 418,30**	**R 51 604 418,30**	**R 51 604 418,30**	**R 51 604 418,30**	**R 51 604 418,30**	**R 51 604 418,30**	**R 51 604 418,30**

Rehabilitation and Closure Plan Overview

It is important to understand that this document and all its supporting documentation is the product of a dynamic approach and should therefore be reviewed regularly to ensure that all aspects and associated costs are taken into consideration. Furthermore, it is important that all the information be incorporated into all mining strategies, planning and operational processes. This will ensure that the objectives set out within the document are reached and will also provide potential opportunities to reduce closure costs.

1. INTRODUCTION

Regulations Reference: (b) & (b)(i)	This Section deals with the context of the project, as well as the material information and issues that have guided the development of the plan.

1.1. PROJECT DESCRIPTION AND CONTEXT

Impala Platinum Holdings Limited (Implats) is a leading producer of platinum and associated Platinum Group Metals (PGMs) and is structured around several mining operations as well as Implats Refining Services. The African operations are located within the Bushveld Igneous Complex in South Africa and the Great Dyke in Zimbabwe, the two most significant PGM-bearing ore bodies in the world (Implats, 2021).

Marula Mine is 73% owned by Implats and is one of the first operations to have been developed on the relatively under-exploited eastern limb of the Bushveld Complex in South Africa. It is located in the Limpopo Province, some 35 km north-west of Burgersfort. The operation comprises two decline shaft systems (Driekop and Clapham) and a concentrator plant.

Marula Mine is proposing to implement a Solar PV Facility west of Driekop Shaft, with a generation capacity of up to 33 Megawatt (MW), and a footprint of 60 hectares (ha) (Refer to APPENDIX A). The Solar PV Facility will constructed within the existing Mining Right Area (MRA) for self-generation only. The proposed Solar PV Facility will be connected through the expansion of the Marula Mine's existing transmission infrastructure and substation.

1.2. APPROACH AND CLOSURE PLANNING

Implats is committed to implementing group standards and statutory requirements pertaining to Mine Closure Planning and the associated Financial Provision. To comply with all the drivers, it is necessary to review the current Rehabilitation and Closure plans for all operations and update it accordingly.

E-TEK Consulting (Pty) Ltd. was requested by SLR Consulting (SLR) to conduct a liability assessment for the new proposed project at the Marula Mine namely the Marula Solar PV Facility. The closure liability assessment needs to comply with the National Environmental Management Act No 107 of 1998 (GNR 1147), previously governed by the Mineral Petroleum Resources Development Act.

The detail of the approach may be different for diverse operations and are most likely influenced by:

- legislative and corporate requirements;
- time remaining to closure (mining phase);
- remoteness of the sites;
- opportunities and constraints; and
- needs and expectations of stakeholders.

Documentation was aligned and compiled toward identifying the appropriate post-mining land uses and closure-related performance objectives. This will guide the transition of operations, within the expanded mining areas, to closure. It needs to ensure compliance with the Legal framework for Mine-closure in South Africa. Refer to the applicable sections in this plan, for the detail information that have guided the development of this plan.

The following are key drivers:

- **Section 3**: Statutory and Corporate related requirements to ensure legal compliance;
- **Section 4**:The State and context of the surrounding Bio-Physical - and Social Environment in which the mine is located;
- **Section 6**: Post-Mining Land uses;
- **Section 7**: Design principles, Closure activities and Technical solutions;
- **Section 8**: Closure Risk assessment

This document is referred to as **Appendix 4: Final Decommissioning, Rehabilitation, and Closure Plan**, as stated in the Financial Provisioning Regulations, 2015 published under Government Notice No. R 1147 of 20 November 2015 (referred to hereafter as GNR1147) as well as Section 24 of the National Environmental Management Act 107 of 1998.

2. MINE SITE CONTEXT

Regulations Reference: (b)(iv)	**This Section describes the regional and local setting of the mine, as well as the site description and mine plan for the full approved operations.**

2.1. REGIONAL AND LOCAL SETTING

Marula Mine is located within the Limpopo Province which is positioned in the northern part of South Africa and shares its border with the North-West, Gauteng and Mpumalanga Provinces. Marula Mine is approximately 50 km north-west of Burgersfort and approximately 120 km south-east of Polokwane (refer to Figure 2 and Figure 3 for the regional and local setting). The mine falls within the Sekhukhune District Municipality and within the Fetakgomo Tubatse Local Municipality (Municipalities of South Africa, 2023).

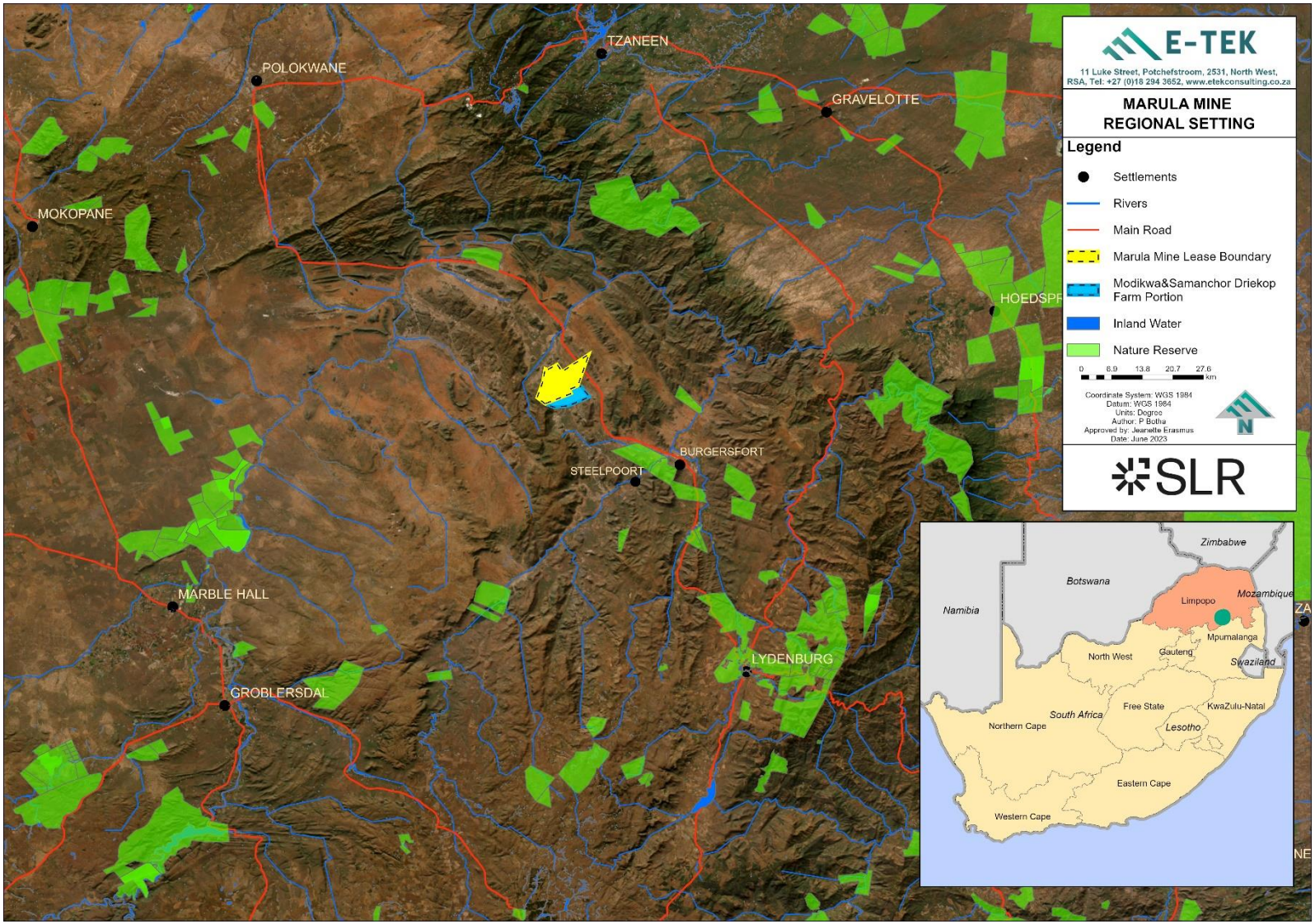

Figure 2: Marula Mine Regional Setting

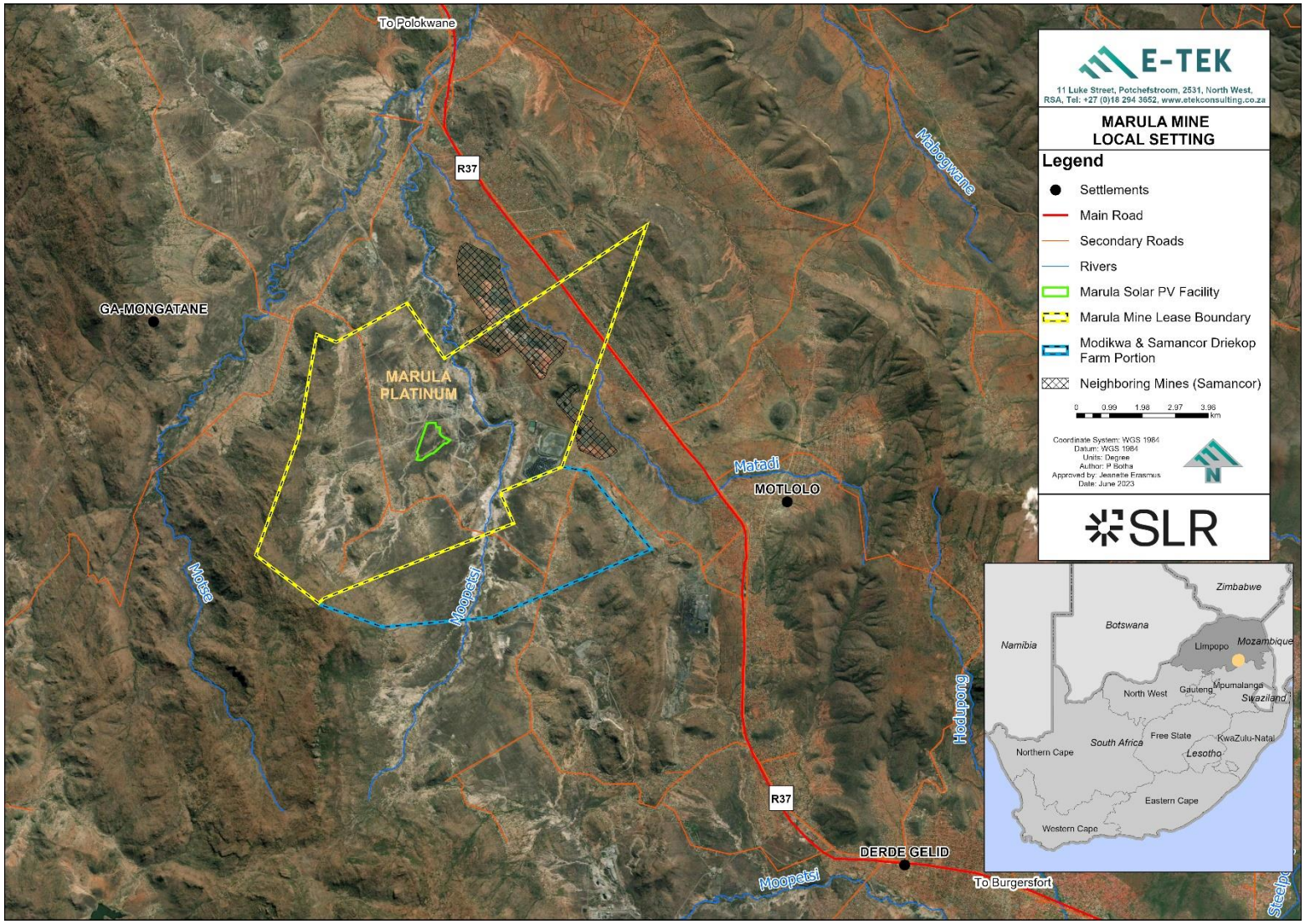

Figure 3: Marula Mine Local Setting

2.2. SITE DESCRIPTION AND MINE PLAN

Refer to the Mine Site Layout plans in APPENDIX A for the detail of the site and future planned activities , if any.

Marula Mine is comprised of various structures including shafts, processing plants tailings facilities and associated infrastructure.

In addition to the structures above the **proposed project includes**:

- Solar PV Facility
    - PV modules;
    - Mounting structures;
    - Inverters;
    - Cabling; and
    - Onsite substation.
- Overhead Transmission Line
- Associated Structures and Infrastructures
    - Operations and control buildings (including Battery energy storage system);
    - Laydown area;
    - Security – Non-electrified boundary fence with permitter lighting and manned controlled access ;
    - Roads – Internal roads will be gravel roads;
    - Stormwater infrastructure – Stormwater runoff from the Solar PV Facility will be collected in an open, V-shaped stormwater drain (within the road servitude);
    - Water storage tank.

No Bio-physical and Socio-economic closure components are currently relevant to Mine Closure Planning for the proposed project at Marula Mine. The State of the Environment (SOE) are however outlined in Section 4.

2.3. DETAIL OF MINE OWNER

- **Mine Owner and Mining Authorisation Holder**

Marula Mine is 73% owned by Implats (Impala Platinum Holdings Limited) and 27% by Tubatse Platinum (Pty) Ltd, Mmakau Mining (Pty) Ltd. and Marula Community Trust (Implats, 2015; Implats, 2020).

Name and Address of Marula Mine:

Postal address:	Marula Platinum (PTY) Ltd
	PO Box 1496
Phone:	+27 13 214 6000
Physical address:	Winnarshoek Stand No. 118 Driekop, 1129,
	Limpopo,
	South Africa

Executive: Marula Operations:

Mr.	Themba Ngobeni
Address:	118 Winnarshoek, Driekop 1129
Phone:	013 214 6000

3. STATUTORY AND CORPORATE RELATED REQUIREMENTS

Regulations Reference: (b), (b)(i) & (d)(i)	**This Section deals with the context of the project, as well as the material information and issues that have guided the development of the plan.** **It outlines the Legal and Governance framework and interpretation of the requirements for the closure design principles.**

3.1. MARULA MINE RELATED CONTEXT

3.1.1. Mine Lease Agreement

Marula Mine falls within land owned by the Republic of South Africa, which holds the land in a trust for various communities as well as the Evangelical Lutheran Church of Southern Africa. A lease agreement was formalised between the Republic of South Africa and the church enabling Marula Mine to mine certain sections of the land The surface lease agreement between the church and Marula Mine has commenced on the 1st day of September 2001 and is valid for 30 years. The surface rights and land tenure of the project area are included in Table 3 (Redco, 2008)

Table 3: Surface rights and land tenure in the project area

PROPERTY DESCRIPTION	TITLE DEED	REGISTERED OWNER	TRIBAL AUTHORITY AND KGOSI
Remaining Extent of Winnaarshoek 250KT	T759/1936	Republic of South Africa	Banareng Ba Mohlala – Mohlala M B (Kgosi)
Portion 1 of Winnaarshoek 250KT	T25571/1978	Evangelical Lutheran Church of Southern Africa (Northern Diocese)	Lutheran Church (Magabaneng settlement) – Bishop Molefe
The farm Driekop 253KT	T16453/1951	Republic of South Africa	Babina-Nare Ba Mohlala – Mohlala W (Kgosi) Banareng Ba Mohlala –

PROPERTY DESCRIPTION	TITLE DEED	REGISTERED OWNER	TRIBAL AUTHORITY AND KGOSI
			Mohlala M B (Kgosi) (Tswako Mohlala) Jack Mahlokwane
The farm Forest Hill 117KT	T8670/1948	Republic of South Africa	Banareng Ba Kgoete – Kgoete S (Kgosigadi) Roka Mashishi – Mashishi M S (Kgosi) Nareng Thokwane
The farm Clapham 118KT	T8670/1948	Republic of South Africa	Babina-Phuthi Ba Manyaka – Manyaka M S (Kgosi) and Manyaka M L (Kgosigadi) Roka Masisi Tribe

The mining rights provided within the EIA and EMPr Report for the Proposed Tailings Scavenger Plant, Two Additional Ventilation Shafts, and the extension of Underground Mining Activities (to include the Farm Hackney 116KT and a portion of the Farm Driekop 253KT) are included in Table 4.

Table 4: Marula Mine Mining Rights

PROPERTY DESCRIPTION	CURRENT MINING RIGHT
Remaining extent of Winnaarshoek 250KT	23/2008MR
Portion 1 of Winnaarshoek 250KT	
Mineral Area 2 (SG Diagram No. 8353 / 2000) on the farm Forest Hill 117KT	
The farm Clapham 118KT	
Mineral Lease Area on Mineral Area 1 (SG Diagram No. 8356 / 2000) on the farm Driekop 253KT	42/2008MR

Marula Mine also has a royalty agreement with Modikwa Platinum Mine allowing limited mining on an area adjacent to the Driekop shaft. (Marula Platinum Mine, 2016). Several communities

are located on the farms of Driekop 253KT, Clapham 118KT, Winnaarshoek 250KT and Forest Hill 117KT (Redco, 2008).

3.1.2. Marula Mine holds the following authorizations.

- A converted Mining Right (MR) 42/2008 (Ref No.: LP 30/5/1/2/2/61 MR), issued by the Department of Mineral Resources [1](DMR) in January 2008.
- A converted Mining Right 23/2008 (/ref: LP 30/5/1/2/2/63 MR), held under Cession 32/2008, issued by the DMR in January 2008.
- An Environmental Authorisation (Ref No.: 16/1/7/2-GS29) issued by the Department of Economic Development, Environment and Tourism on 16 September 2008 and an approved amended Environmental Management Programme report (EMPr) (Ref No.: 6/2/2/649EM) issued by the Department of Minerals and Energy on 24 January 2008 for the extension of the Merensky operations.
- An amended EMPr (Ref No.: LP30/5/1/3/2/1(61) EM and LP30/5/1/3/2/1(63) EM) issued by the DMR on 10 June 2014 for the proposed tailings scavenger plant, two additional ventilation shafts and the extension of underground mining activities.
- An Integrated Water Use License (IWUL) (Ref No.: 06/B71E/GACIJ/8841) issued by the Department of Water and Sanitation on 29 March 2019.
- An Environmental Authorisation (Ref No.: LP30/5/2/3/2/1 (061 & 063) EM) issued by the Department of Minerals and Energy on 11 October 2022 for additional infrastructure at the Marula Mine.

3.1.3. Environmental Management Plan

The approved Marula Mine EMP, in section 19, addresses: construction, operation, decommissioning, and closure (of the mining operations) to achieve the objectives and goals. The EMP throughput does address the potential impacts associated with closure, whilst submitting certain mitigation measures. No clear commitments are provided in terms of closure plans and options, with the statement being made that: “these will be included in the required closure plan being submitted when required”.

[1] Now known as the Department of Mineral Resources and Energy (DMRE).

3.2. SOUTH AFRICAN LAWS AND REGULATIONS

Table 5: South African laws and regulations applicable to mine closure

LEGISLATION	OBJECTIVE AND RELEVANCE TO CLOSURE
Acts of parliament: **Constitution of the Republic of South Africa of 1996**	Provides *inter alia* for the right to an environment that is not harmful to human health or wellbeing, and to secure ecologically sustainable development.
Companies Act 71 of 2008	Deals *inter alia* with registration and liquidation of companies and thus the regulation of mining company rights and liabilities with regards to mine closure.
National Environmental Management Act 107 of 1998	Framework law giving effect to the constitutional environmental right. Provides the framework for regulatory tools in respect of environmental impacts, including mining and mine closure.
Minerals Act 50 of 1991	Repealed by the MPRDA below, however still relevant as holders of old order rights issued in terms of this act are still haled liable for ensuring sustainable mine closure and rehabilitation.
Minerals and Petroleum Resources Development Act 28 of 2002, as amended	Main legislative provision for the granting of mineral rights. Also, the relinquishment of such rights and associated closure liabilities after successful closure and rehabilitation. Introduces the various financial vehicles which may be used to provide for closure and rehabilitation funding.
Mineral and Petroleum Resources Development Act 49 of 2008	Amendment of the above act, which started to align environmental and mining law provisions to avoid duplication and to allow for one system of regulation and authorisation.
Income Tax Act 58 of 1962	Regulates the payment of taxes by *inter alia* mining companies. Relevant in respect of the financial provisions required by the MPRDA above to ensure that sufficient funds are available to rehabilitate and close mining operations as well as providing for certain tax exemptions in respect of funds related to rehabilitation.
National Water Act 36 of 1998	Regulates the protection of the water resources and the use of water on *inter alia* mining areas. Furthermore, contains provisions relevant to mine

LEGISLATION	OBJECTIVE AND RELEVANCE TO CLOSURE
	closure regarding water resource protection form pollution and environmental degradation.
Water Services Act 108 of 1997	Deals with the provision of *inter alia* drinking water services and quality to people, and furthermore regulates the situations where mines have undertaken to provide such services. Relevant in terms of mine closure as such services are often required despite closure of a specific site.
Mine Health and Safety Act 29 of 1996	Deals with the health and safety of employees throughout the entire mining life cycle including closure and rehabilitation operations.
Nuclear Energy Act 46 of 1999	Regulates the management and safety of nuclear or radioactive sources including naturally occurring radioactive matter, e.g. certain tailings facilities as well as contaminated mining plant and equipment.
Hazardous Substances Act of 1973 (Group IV Hazardous Substances)	Regulates the management and safety of sealed nuclear sources throughout the entire mining life cycle, including decommissioning and disposal at the time of closure.
National Environmental Management: Waste Act 59 of 2008 as amended by the	Regulates *inter alia* the generation, storage, management, transport, and disposal of waste including mining waste such as residue deposits and residue stockpiles. Furthermore, regulates the rehabilitation of contaminated land and waste disposal facilities including mining waste facilities.
National Environmental Management Laws Amendment Act 26 of 2014	Introduces amendments in line with the MPRDA amendment act above so as to align the regulation and authorisation of mining activities between different acts and government departments such as the Department of Environmental Affairs and Department Mineral Resources.
National Environmental Management: Biodiversity Act 10 of 2004	Regulates the protection of biodiversity and the use of alien and invasive species on mining sites.
National Environmental Management: Protected Areas Act 57 of 2003	Prohibits mining in certain protected areas.
National Environmental Management: Air Quality Act 39 of 2004	Regulates activities which may have a detrimental effect on ambient air quality including certain processes and dust generating activities such as tailings deposition.

LEGISLATION	OBJECTIVE AND RELEVANCE TO CLOSURE
Conservation of Agricultural Resources Act 43 of 1983	Regulates the eradication of weeds and invader plants on mining sites.
National Heritage Resources Act 25 of 1999	Regulates the protection and conservation of the country's heritage resources, including mining related heritage where applicable.
Other legal measures **Land Use Planning Ordinances (provincial government level).**	Regulates the zoning of land for mining purposes, as well as the re-zoning of mining land post-closure.
Local by-laws (local municipality level).	Regulates a variety of issues on mine sites in terms of local regulations.
Common law/case law.	Regulates issues such as nuisance, neighbour law, and all possible issues which may emanate from mine closure processes.
Regulations **GNR 1147 in GG 39425, 20 November 2015. Regulations pertaining to the financial provision for prospecting, exploration, mining, or production operations.**	The primary regulations pertaining to the provisions of finances for the closure and rehabilitation of mine sites, throughout the lifecycle of the mine.
GNR 982, 983, 984 and 985 in GG 38282 of 4 December 2014. Environmental Impact Regulations and Listed Activities.	Lists certain activities which require an environmental assessment and authorisation before they may be undertaken. Mine closure is specifically listed and is thus subject to an environmental assessment and the issuance of an environmental authorisation with approved closure plan.
GNR 632 in GG 39020 of 24 July 2015. Regulations for the management of residue	Sets out the regulatory framework for the management of residue deposits and stockpiles as well as the closure and rehabilitation of such facilities.

LEGISLATION	OBJECTIVE AND RELEVANCE TO CLOSURE
deposits and residue stockpiles.	
MPRDA: GNR 527 in GG 26275, 23 April 2004. Chapter 2: 'Mineral and Petroleum, Social and Environmental Regulations'.	Provided for the substantive regulations to give effect to the provisions of the Mineral and Petroleum Resources Act. Included several provisions relating to mine closure and rehabilitation.
GNR 704 in GG 20119 of 4 June 1999, "Regulations of Use of Water for Mining and Related Activities aimed at the Protection of Water Resources".	Regulates the use of water on mining areas and introduces controls to prevent and mitigate the pollution of water resources within mining areas. Also regulates the management of residue deposits and residue stockpiles to prevent water resource pollution.
GNR 331 in GG 37603, 2 May 2014 "National Norms and Standards for the Remediation of Contaminated Land and Soil Quality".	Regulates the remediation of contaminated land including land contaminated by mining activities.
Regulations 847, 848 of 1994 of the Nuclear Energy Act 46 of 1999.	To be read with the Nuclear Energy Act above.
Other measures: accords, policies, and strategies: **The 1970 Fanie Botha Accord stated that mines that closed before 1956 are the responsibility of government, with those that closed afterwards**	The accord has for all intents and purposes been negated by the promulgation of the 2008 amendments to the Mineral and Petroleum resources act, which infers liability for closure to historic sites despite the 1956 cut off.

LEGISLATION	OBJECTIVE AND RELEVANCE TO CLOSURE
to be remediated by the responsible company (Johannesburg Inner City Business Coalition (JCBC), undated).	
A Strategic Framework for Implementing Sustainable Development in the South African Minerals Sector: Towards Developing Sustainable Development Policy and Meeting Reporting Commitments (DME, 2007 & DME, 2009).	[Self-explanatory]
White Paper: A Minerals and Mining Policy for South Africa (the Minerals White Paper) N 2359/1998 in Government Gazette No 19344, 20 October 1998).	Sets out government policy for the exploitation of minerals in the country with specific focus on sustainability and equity.
White Paper on Environmental Policy for South Africa (The CONNEP White Paper) (Department of Environment Affairs and Tourism, 1997).	Government policy regarding the achievement of South Africa's environmental right and the regulation of activities which may have a detrimental impact on the environment, which by implication includes mining and mine closure.
White Paper on Integrated Pollution and Waste Management for South Africa: A Policy on Pollution	Commits South Africa to a regulatory approach which implements *inter alia* the waste management hierarchy, and by implication applies to mining waste which includes residue deposits and residue stockpiles.

LEGISLATION	OBJECTIVE AND RELEVANCE TO CLOSURE
Prevention, Waste Minimisation, Impact Management and Remediation March 2000. GN R227 GG 20978 of 17 March 2000 (DEAT, 2000).	
Water Conservation and Water Demand Management Strategy for the Industry, Mining and Power Generation Sector, August 2004.	[Self-explanatory]
National Water Resource Strategy II of 2013.	South Africa's strategy for the integrated management of the country's water resources, including the protection of water resources form pollution sources such as mine sites.

3.3. GOVERNMENT/INDUSTRY GUIDELINES AND PRACTICES

Table 6: Closure specific guidelines, policies, and best practices

DOCUMENT DESCRIPTION	OBJECTIVE AND RELEVANCE TO CLOSURE
Environmental protection and rehabilitation • Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine, • DME Guideline document 2004 available at http://www.dmr.gov.za/publications/summary/21-mineral-policy/588-guideline-document-for-the-evaluation-of-the-quantum-of-closure.html. • Handbook of Guidelines for Environmental Protection, Chamber of Mines (CEM (SA) (Chamber of Mines of South Africa, 1979) Volume 1/1983: The design, operation, and closure of metalliferous and coal residue deposits. • Volume 2/1979: The vegetation of residue deposits against water and wind erosion. • Volume 3/1981: The rehabilitation of land disturbed by surface coal mining in South Africa. • Volume 5/1982: The Chamber of Mines erosion tester (comet) instrument (for determining the erodibility of slime). • Volume 7: Statutory requirements for environmental management. • Guidelines for the Rehabilitation of Mined Land (DMRE: Chamber of Mines and Coaltech Research Association, 2007). • Template guide for: “Environmental Management Plan for Small-Scale Mining”. (DMR, 1998). • Mine Residue – Code of Practice (SABS 0286:1998). • Anglo American Mine Closure Toolbox Version 1 (AAplc) (Botha & Coombes, 2007). • Anglo American Mine Closure Toolbox Version 2 (AAplc) (Anglo American Plc, 2013). • Anglo American Mine Closure Toolbox Version 3 (AAplc) (2019) • International Council on Mining and Metals (ICMM), Good Practice Guide (2nd Edition) (2019). • International Council on Mining and Metals (ICMM), Planning for Integrated Mine Closure: Toolkit.	Several guidelines have been published in South Africa relating to the protection of the environment as well as mine site rehabilitation. Although not being law these guidelines provide for substantive considerations which may be used by either regulators or mines in pursuing sustainable mine closure and rehabilitation.

DOCUMENT DESCRIPTION	OBJECTIVE AND RELEVANCE TO CLOSURE
Soil, waste, and biodiversity • Framework for the Management of Contaminated Land DEA 2010. • Minimum Requirements for Waste Disposal by Landfill; Handling, Classification and Disposal of Hazardous Waste; Water Monitoring at Waste Management Facilities (DWAF, 1998). • Mining and Biodiversity Guideline – Mainstreaming biodiversity into the mining sector of 2013 (DEA, DMRE, CM, South African Mining and Biodiversity Forum and South African National Biodiversity Institute, 2013). • International Council on Mining and Metals (ICMM), Good Practice Guidance for Mining and Biodiversity (2019).	As above, these guidelines pertain to aspects of protection of the environment relevant to mine site rehabilitation.
Water • Water Conservation and Water Demand Management (WC/WDM) Guideline for the Mining Sector in South Africa, June 2011 (DWA, 2011). • Guideline Document for the implementation of Regulations on use of water for Mining and related activities aimed at the protection of Water Resources, Second Edition, May 2000. • Best Practice Guidelines for Water Resource Protection in the South African Mining Industry (Department of Water Affairs, 2006): • Series A: Best Practice (BP) Guideline A1.1: Small Scale Mining Practices, Aug. 2006. • Series A: BP Guideline A1: Small Scale Mining, Aug. 2006. • Series A: BP Guideline A2: Water Management for Mine Residue Deposits, Jul. 2008. • Series A: BP Guideline A3: Hydrometallurgical Plants, Jul. 2007. • Series A: BP Guideline A4: Pollution Control Dams, Aug. 2007. • Series A: BP Guideline A5: Water Management for Surface Mines, Jul. 2008. • Series A: BP Guideline A6: Water Management for Underground Mines, Jul. 2008. • Series G: BP Guideline G1: Storm Water Management, Aug. 2006. • Series G: BP Guideline G2: Water and Salt Balances, Aug. 2006. • Series G: BP Guideline G3: Water Monitoring Systems, Jul. 2007. • Series G: BP Guideline G4: Impact Prediction, Dec. 2008. • Series G: BP Guideline G5: Water Management Aspects for Mine Closure, Dec. 2008. • Series H: BP Guideline H1: Integrated Mine Water Management, Dec. 2008.	A series of guidelines drafted by the Department of Water Affairs with several relating specifically to mining and mine closure activities. The aim behind the guidelines being to ensure practices consistent with the National Water Act and the National Water Resource Strategy discussed above and in so doing ensuring protection of the water resource.

DOCUMENT DESCRIPTION	OBJECTIVE AND RELEVANCE TO CLOSURE
• Series H: BP Guideline H2: Pollution Prevention & Minimization of Impacts, Jul. 2008. • Series H: BP Guideline H3: Water Reuse & Reclamation, Jun. 2006. • Series H: BP Guideline H4: Water Treatment, Sep. 2007. • International Council on Mining and Metals (ICMM), A practical guide to catchment-based water management for the mining and metals industry.	
Socio-economic • Guideline Document for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine (DME/DMR, 2005). • The Socio-Economic Aspects of Mine Closure and Sustainable Development: Guideline for the Socio-Economic Aspects of Closure of 2010 (see Stacey *et al.*, 2010). ○ International Council on Mining and Metals (ICMM), Good practice guide: Indigenous peoples and mining (2nd Edition).	Socio economic guidelines for the closure mines, providing substantive guidance on mine closure costing and socio-economic impact mitigation for closure.

3.4. THE LEGAL FRAMEWORK APPLICABLE TO MINE CLOSURE IN SOUTH AFRICA

Historically, the MPRDA [2] obligated the holder of rights or permits (herein after referred to as the holder) to rehabilitate the environment to its natural state; a predetermined state; or a land use which conforms to the generally accepted principle of sustainable development (Mineral and Petroleum Resources Development Act 28 of 2002; Alberts, et al., 2017).

It also states that 'the holder' is responsible for any environmental damage, pollution or ecological degradation inside and outside of its boundaries.[3] It is required that holders of rights must: 'give effect to the general objectives of integrated environmental management laid down in Chapter 5 of National Environmental Management Act'; and 'must consider, investigate, assess and communicate the impact and sustainability of the mining activity on the environment in terms of NEMA'[4] .

[2] Section 38(d) of the Minerals and Petroleum Resources Development Act 28 of 2002
[3] Section 38(e) of the Minerals and Petroleum Resources Development Act 28 of 2002
[4] Section 38(a)-(b) of the Minerals and Petroleum Resources Development Act 28 of 2002

The relevant provisions of NEMA, mining companies were at the time required by the MPRDA to undertake an Environmental Impact Assessment (EIA) process, and to submit an Environmental Management Plan (EMP) for approval by the DMR.[5] The EMP was required to include the environment, socio-economic conditions and cultural heritage affected by the prospecting or mining operations, as well as baseline information to determine protection and mitigation measures.[6] Additionally, the EMP had to describe "…the manner in which the holder intends to: (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) contain or remedy the cause of pollution or degradation and migration of pollutants; and (iii) comply with any prescribed waste standard or management standards or practices."[7] The EMP furthermore had to include the environmental objectives and goals for mine closure rehabilitation, as well as a closure plan as outlined in Government Notice Regulation 527, Regulation 62;[8] management of identified environmental risks and liabilities and financial provision, i.e. both the methods of determining the provision and the quantum thereof.[9]

In theory, the estimation of financial provisions, as provided for in the MPRDA,[10] should have been in sync with the EMP and may have been based either on rehabilitation and closure cost estimation models developed by the mining concern or the DMRE guidelines (DMRE, 2005). Methods of financial provision for the rehabilitation, management, and remediation of negative environmental impacts included: an approved contribution to a trust fund; a financial guarantee from a South African registered bank, or any other bank, or financial institution approved by the Director-General; a deposit into the account specified by the Director-General; and any other methods as the Director-General may determine.[11] Mining companies were required to annually assess their environmental liability and increase their financial provision in line with such an assessment.[12] Ministerial powers to recover costs in event of urgent remedial measures, and to remedy environmental damage were and are still provided for.[13] Finally, if a permit renewal was needed, the MPRDA[14] obligates the holder to report his or her environmental performance rehabilitation to be completed and estimated cost thereof.

[5] Section 39(1) of the Minerals and Petroleum Resources Development Act 28 of 2002
[6] Section 39(a)-(b) of the Minerals and Petroleum Resources Development Act 28 of 2002
[7] Section 39(3d) of the Minerals and Petroleum Resources Development Act 28 of 2002
[8] Reg 62 in GN R527 in GG 26275 of 1 May 2004
[9] Reg 52 in GN R527 in GG 26275 of 1 May 2004
[10] Section 41 of the Minerals and Petroleum Resources Development Act 28 of 2002
[11] Reg 53(1) in GN R527 in GG 26275 of 1 May 2004
[12] Section 41(3) of the Minerals and Petroleum Resources Development Act 28 of 2002
[13] Section 45-46 of the Minerals and Petroleum Resources Development Act 28 of 2002
[14] Section 24(2) of the Minerals and Petroleum Resources Development Act 28 of 2002

In July 2013 s38-42 was repealed pending the much-anticipated move of the regulation of environmental considerations across to the NEMA dispensation. This created a temporary lacuna in the law, yet these sections were at the time still implemented as if still in force by the regulator. [15] Some months later in 2013 it was revealed that NEMA s24 (discussed below) would cater for these provisions.

At present the application for closure of a mine is regulated by both the provisions contained within the MPRDA s43[16] and those contained in NEMA[17] as discussed below. Mindful of the proposed amendments to s43 as contained within the MPRDA amendment Bill 2013, the current regulation of mine closure is discussed.[18] In terms of the MPRDA mine closure is largely regulated by section 43 as stated above. Section 43 provides an outline of the process which should be followed by regulatory bodies to grant closure certificates. Section 43(1) states that the holder of a mining right remains responsible for any environmental liability, pollution, or ecological degradation and the management thereof until the Minister has issued a closure certificate. Section 43(4) of the MPRDA outlines the requirements that should be adhered to when applying for mine closure and the submission process. Fundamentally, section 43(5) of the MPRDA stipulates that no closure certificate may be issued unless the Chief Inspector and each government department charged with the administration of any law which relates to any matter affecting the environment have confirmed in writing that the provisions pertaining to health and safety and management of potential pollution to water resources, the pumping and treatment of extraneous water and compliance to the conditions of the environmental authorisation have been addressed.

In assisting the Department of Water Affairs (DWA) in reaching such confirmation, the Best Practice (BP) Guidelines, as listed above, have been published (DWA, 2006). Section 43(1) have been extended in terms of scope through the above provisions of the MPRDA as amended. The extended liabilities included in s43(1) now state that the holder of *inter alia* a mining right remains responsible, apart from the original provisions relating to health, safety, and water pollution for any: environmental liability; pollution; ecological degradation; the pumping and treatment of extraneous water; compliance to the conditions of the environmental authorisation, and; the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of the MPRDA. *Inter alia* the Department of Environmental Affairs must be approached for comment as per the dictum of section 43(1).[19] This is a

[15] National Environmental Management Act No 107 of 1998
[16] Section 43 of the Minerals and Petroleum Resources Development Act 28 of 2002
[17] National Environmental Management Act No 107 of 1998
[18] Minerals and Petroleum Resources Development Amendment Bill in GG 36523 of 31 May 2013
[19] Section 43(1) of the Minerals and Petroleum Resources Development Act 28 of 2002

departure from the original prescription that only the DMRE and the DWA be consulted about mine closure. The MPRDA also requires that the Council of Geoscience confirms in writing that all requisite reports in terms of section 21(1) have been compiled and submitted before a closure certificate is issued.[20] As noted above, the 8th of December 2014 saw a shift in terms of the regulation of environmental impacts emanating from mining activities. Accordingly, provisions relating to the closure of mines are now contained within NEMA, specifically section 24 and accompanying regulations. At present, all environmental considerations and impacts on mines are regulated in terms of the NEMA. However, the regulating authority remains DMRE, albeit they now have to apply the NEMA rules. In accordance with section 24 N of NEMA, an Environmental Management Programme (EMPr) is required for any EIA submitted in relation to mining activities 24N(1A). Such an EMPr must contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water, or ecological degradation because of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the operations in question. In effect, giving credence to the requirements of the MPRDA, as discussed above.

Like the provisions contained within the repealed MPRDA sections, these requirements serve to hold mines liable for environmental pollution and degradation emanating from their mining activities. To ensure that such liabilities can be covered by the mine in question, section 24O of NEMA prescribes that when considering an application, the competent authority must consider the applicants ability to comply with the prescribed financial provisions.[21] The financial provision referenced in section 24O is detailed in section 24P of NEMA, which requires that an applicant for an authorisation pertaining to mining or related activities must comply with the prescribed financial provision for the rehabilitation, closure and on-going post decommissioning management of negative environmental impacts. [22] This financial provision must be annually assessed based on the mine's environmental liability to the satisfaction of the minister of mineral resources. An annual independent audit is required to illustrate the adequacy of the financial provision. [23] Such a financial provision must be maintained until such time as the minister issues a mine with a closure certificate. [24] The minister does, however, maintain the prerogative to retain any part of the financial provisions as is deemed fit to rehabilitate the closed mining or prospecting operation in regarding latent or residual

[20] Section 21(1) of the Minerals and Petroleum Resources Development Amendment Act no 49 of 2008. The MPRDAA deals with data in respect of reconnaissance and prospecting, as well as the keeping of records, and submission of information relating thereto to the Council of Geoscience.
[21] Section 24O1(b)(iiiA) of the National Environmental Management Act No 107 of 1998
[22] Section 24P(1) of the National Environmental Management Act No 107 of 1998
[23] Section 24P(3) of the National Environmental Management Act No 107 of 1998
[24] Section 24P(5) of the National Environmental Management Act No 107 of 1998

environmental impacts. Further provisions regarding the financial provisions for mine closure in terms of NEMA are contained within the regulations pertaining to the financial provision for the rehabilitation, closure, and post-closure of prospecting, exploration, and mining or production operations.[25] Section 24R of NEMA deals with environmental liabilities and states that the holder of a right, holder of an old order right, or holder of works (the listing of the different types of rights spanning the history of mining rights in South Africa, thus implying retrospectively of this section) remains responsible for any environmental liability, pollution, or ecological degradation, the pumping and treatment of extraneous water, the management and sustainable closure thereof, until the minister of mineral resources has issued a closure certificate in terms of the MPRDA. In effect, 24R applies a retrospective liability on mines, even those which were closed before the enactment of the MPRDA. This liability is also contained within section 28 of NEMA, albeit indirectly. In gearing up for the implementation of the NEMA provisions in so far as they relate to mining, and particularly mine closure, the DEA[26] have drafted several regulations to flesh out the regulatory provisions as discussed above.

These regulations deal with *inter alia* the financial provision for mine closure, as discussed above, and the management of residue deposits and residue stockpiles. [27] This provision, namely 24R, read in accordance with the proposed perpetual liability amendment provision as contained in section 43 of the MPRDA bill 2013.[28]

One of the most significant changes to the regulatory regime is the requirement as of December 2014 for mines to conduct an EIA for closure. A closure certificate is thus required in terms of s43 of the MPRDA, along with an Environmental Authorisation in terms of s24 of NEMA, before a mine is deemed to have closed. The result being two authorisations issued by the same ministry, along with approval from all other ministries related to the environment, as discussed above. In terms of Section 24 and GNR 983, the required EIA must be accompanied by an approved closure plan in terms of GNR 982, which stipulates which closure activities will be undertaken and how any adverse or adverse or negative environmental impacts will be mitigated. It is against this background that the following closure plan has been drafted in accordance with GNR 1147 and the requirements stipulated therein for closure plans.

[25] GNR 1147 in GG 39425 of 20 November 2015.
[26] Previously Departement of Environmental Affairs (DEA), currently Department of Forestry, Fisheries and the Environment (DFFE).
[27] The Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration or Production Operation were published in GNR 632 of 24 July 2015 in GG 39020.
[28] Section 43 of the Minerals and Petroleum Resources Development Amendment Bill in GG 36523 of 31 May 2013

4. STATE OF THE ENVIRONMENT

Regulations Reference: (b)(ii)	**This Section gives an overview of the environmental and social context that may influence, or be influenced by, the closure activities and post-mining land use.**

4.1. BIO-PHYSICAL ENVIRONMENT

This section of the Rehabilitation and Closure Plan gives a broad description of the regional state of the environment within which the mine has been developed and will be closed. It should therefore be read within the context of mine closure.

The description of environmental and social aspects allows for proactive decisions to be made in line with sustainability principles while keeping closure in mind.

Refer to the 2012 EIA and EMPr for Marula Mine for detailed information on the different components (geology, soils, biodiversity, etc.). The following sections should be updated as more recent information becomes available.

4.1.1. Water Resources

According to the Department of Water Affairs (2012), freshwater is becoming scarcer due to unsustainable use, climate change, resource pollution, increased demand, and wastage. The increase in water abstraction led to a decline in biodiversity and ecosystem productivity in certain areas. Wetland areas are being destroyed and some rivers are drying up, contributing to the increase in endangered fish species. Settlements, mining, agriculture, and industrial activities all have the potential to affect the surface and groundwater quality negatively; it is, therefore, important to monitor and maintain water resources (DWA, 2012).

4.1.1.1. Surface water

According to the Environmental Impact Assessment and Environmental Management Programme (2007), Marula Platinum falls in the Motse River catchment or the quaternary catchment B71E (Figure 4), which feeds into the Olifants River.

The mine lease area drains into the Moopetsi River, which drains into the Matadi River approximately 4km downstream of the mine, which in turn flows into the Motse River, which feeds the Olifants River approximately 25 km downstream of the mine. Several sub-catchments were also identified at the mine lease area, which include:

- Moopetsi catchment – The non-perennial Moopetsi River is a major tributary of the non-perennial Motse River and meanders in a northerly direction, where it feeds into the Motse River.
- Tshwenyane catchment – The non-perennial ephemeral Tshwenyane River is a major tributary of the Moopetsi River and drains northwards towards the Moopetsi River.
- Mogompane catchment – The non-perennial ephemeral Mogompane River is a tributary of the Tshwenyane River. The Mogompane River drains in a north-easterly direction.

The catchment area is sensitive to erosion if vegetation is removed, and certain areas already show gullies and sheet erosion due to the high erodibility index (82 000 t/annum) and overgrazing in the area. The mean annual runoff of the catchment area is 202.34 million cubic meters (m^3) per annum; this should be considered with post-closure rehabilitation techniques (Metago Environmental Engineers , 2007).

Marula Mine has an ongoing monthly surface monitoring programme where the results of the sampling localities are compared to the applicable Integrated Water Use Licence (IWUL) (Licence No. 06/B71E/GACIJ/8841) guidelines as well as the applicable Resource Quality Objectives (B71E) as stipulated in the National Water Act, 1998 (Act no 36 of 1998).

Currently, 14 surface water points are being monitored onsite. These sites allow for a comprehensive coverage of Marula Mine's area of operations. Surface water plays a pivotal role in both the physical landscape of the area, as well as water quality leading to communities and infiltration into the groundwater. Current monitoring results for surface water show exceedances in EC, Ca, Mg, Na, SO_4, Cl, and NO_3-N concentrations when compared to the IWUL regulations from October to December 2022 (Aquatico Scientific, 2022). It is recommended that an additional sampling locality on the Moopetsi River is added just before the confluence with the Tshwenyane River (Aquatico Scientific, 2022). This will ensure a more accurate assessment of the potential impacts of the Clapham and Driekop Operations on the Moopetsi River.

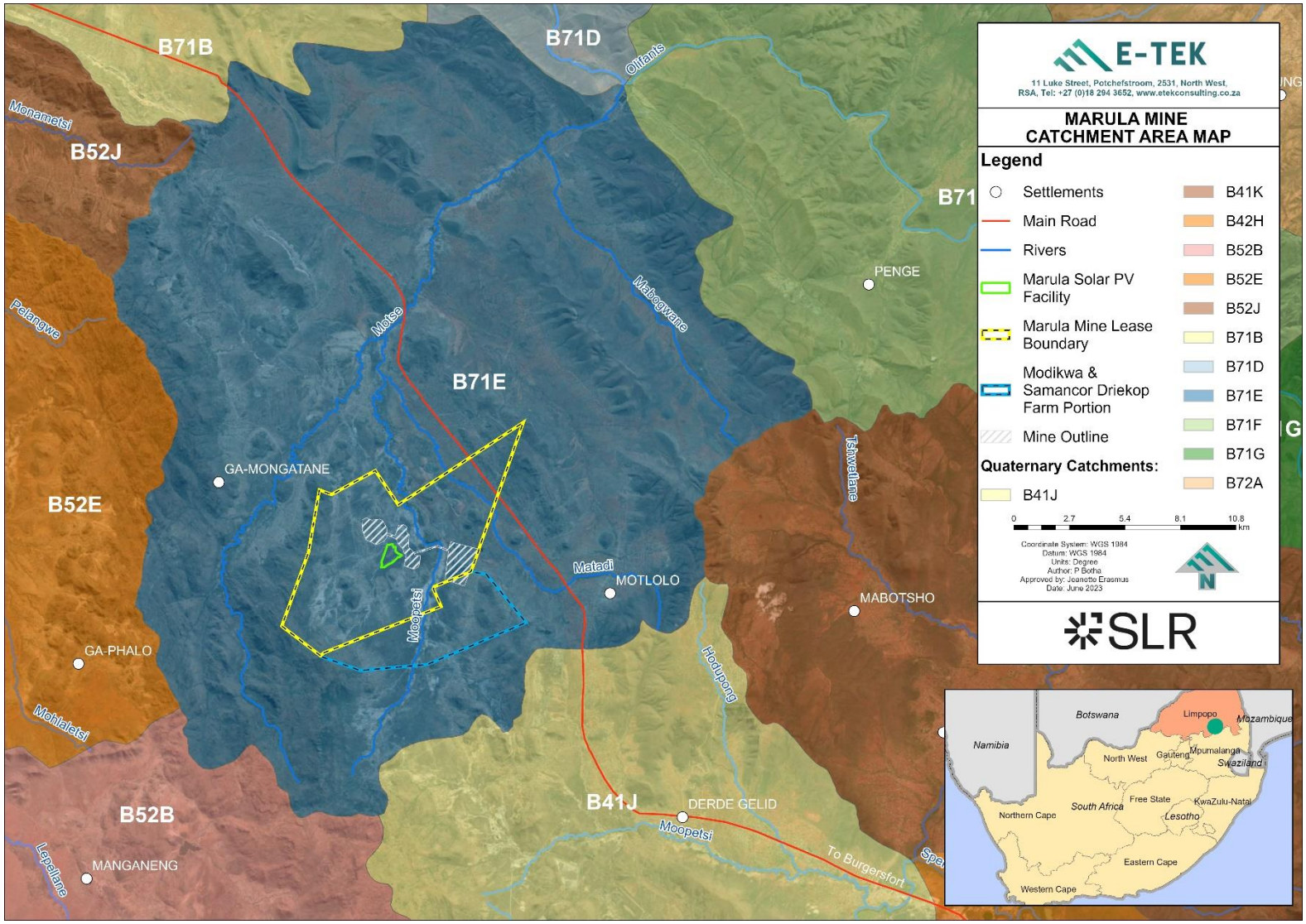

Figure 4: Catchment Areas

4.1.1.2. Groundwater

Recent modelling indicates that shallow groundwater affects the base flow of surface water resources. Groundwater is defined as water found in the pores of rocks and sediments. The permeable layer (including the rock/soil pores and/or fractures), which transports the groundwater are referred to as aquifers (Monroe, Wicander, & Hazlett, 2007).

The surface water is limited in the area due to the riverbeds drying up in winter. Communities, therefore, depend more on groundwater for domestic use. Several studies have been done in the mine lease area with several boreholes onsite as well as in the surrounding communities (Metago Environmental Engineers , 2007; Redco, 2008).

According to the NGDB (National Groundwater Data Bank), the depth of groundwater in the region ranges from 4 m to 40 m, with the average being 21.7 mbgl (meters below ground level). In the mine lease area, the pre-mining groundwater levels ranged between 2 and 20 mbgl, and these levels are related to the topography found in the area with the aquifers being semi- or unconfined. Extensive groundwater uses by communities resulted in localised lowering of the water table and due to boreholes not being equipped or being blocked, information is limited. A lowering of 5 – 10 meters has been observed in the water table at Driekop and Clapham shaft complexes (Metago Environmental Engineers , 2007; Metago Environmental Engineers, 2012).

Groundwater flow from the concentrator plant and Clapham Shaft is towards the north/north-east, while flow occurs in a north/north-westerly direction away from the tailings dam and Driekop Shaft Near the processing plant, the groundwater flow is in an easterly and north-easterly direction, respectively (Groundwater Complete, 2021). The geology in the area indicated that there are two types of aquifers present, namely a deep fractured rock aquifer as well as a shallower weathered aquifer. Sustainable borehole yields are expected to be between 2 and 3 litre per second (l/s) with low yields expected in the shallow aquifer and higher yields in the deeper fractured aquifer (Redco, 2008).

A groundwater pollution plume around the existing tailings storage facility (TSF), which includes the tailings dam as well as a two-compartment return water dam (Groundwater Complete, 2021). The main source of the plume was identified as the unlined return water dam, which was then lined in 2011, and vegetation was established within the TSF footprint. This has led to an improvement in the underlying aquifer with an improvement in water quality in some of the down-gradient boreholes (SRK Consulting, 2018).

Eight (8) new groundwater monitoring boreholes were added to the monitoring programme from December 2021. Groundwater was compared to the water quality limits stipulated in the Water Use Licence (WUL). Due to a lack of specific guidelines in terms groundwater quality stipulated in the IWUL, groundwater quality is compared against the Resource Quality Objectives (RQO) - Olifants River (B71E) for compliance purposes.

4.1.1.3. Bioremediation

Bioremediation is a process that uses mainly microorganisms, plants, or microbial or plant enzymes to detoxify contaminants in the soil and other environments (Gouma *et al*, 2014). Marula Mine has been actively implementing *in-situ* bioremediation strategies since 2022 with the aim of reducing the nitrate concentration within the aquifer. Upon completion of the target selection and drilling phase, the nitrate concentration (NO_3- - N measured in ppm) in the boreholes were tested using a HACH DR900 colorimeter. From this data, drilling targets were selected where a possible contaminated plume movement was identified (Agreenco, 2022).

Follow up infiltration was done on selected boreholes during the month of August 2022. The purpose of the follow up treatment was to increase donor concentrations following the initial monitoring period. Boreholes in close proximity to drinking water abstraction points were infiltrated very conservatively in order to prevent sulphate reduction (and associated aesthetic problems with odour in the water). Monitoring showed that these areas had a reduction in nitrate concentrations (Agreenco, 2022).

Seven months after initial *in-situ* bioremediation implementation, some of the targeted boreholes indicated a deterioration in water quality. This can potentially be attributed to higher hydraulic head and associated higher flows resulting from high rainfall, as well as depletion of the electron donor infiltrated in the boreholes (Agreenco, 2023). This was addressed in March 2023 through bio-augmentation at selected boreholes, which yielded positive results with regard to water quality.

4.1.2. Aquatic Biomonitoring

Aquatic biomonitoring can be defined as biologically orientated measurements to protect, preserve, and correct the biological integrity of natural systems. Biological integrity is, in turn, defined as “the maintenance of community structure and function characteristic of a particular locale” (de Zwart, 1995).

There is an ongoing Aquatic Biomonitoring program conducted both upstream and downstream of the potential pollution sources. Currently, six sites are being sampled, of which

three are in the Moopetsi River and the other three are in the Tshwenyane River (Marine Mountain Environmental Consultants, 2022).

Results indicated critically modified conditions of the aquatic systems within the mine area and, further, largely modified conditions of the existing Freshwater Ecosystem Priority Areas (FEPA) Rivers. The Present Ecological State (PES) of the Moopetsi and Tshwenyane Rivers are classified as poor. The overall *in-situ* water quality reflects poor conditions with high dissolved oxygen and percentage oxygen saturation, pH, electrical conductivity (EC), total dissolved solids (TDS) and turbidity. The exceedances can be attributed to the low flow rate of the rivers and the current low water levels. This situation does not facilitate effective delusion within the system. The riverine system has an increased algal content, salts and turbidity stemming from low dilution factor. The aquatic macroinvertebrate assessments results show Seriously/Critically Modified (E/F categories). Overall, the monitoring points reveal that the site has a general lack of sensitive species. The species that are found onsite are able to tolerate the deterioration of the rivers. (Marine Mountain Environmental Consultants, 2022).

4.1.3. Climate and Climate Change

The climate at Marula Mine is a typical savanna climate with hot and wet summers and cold and dry winters. The mine receives approximately 500 – 600 mm per year with a mean annual evaporation of approximately 1600 mm per annum (Metago Environmental Engineers, 2012).

Different models have been used to predict the increase in temperature, and studies that have used these models have indicated that the annual mean surface temperature could increase by 2 to 6 ºC by 2050. The rise in temperature can lead to changes in the hydrological cycle (thus changes in evapotranspiration, precipitation, soil moisture and runoff) and possibly cause the inland areas of large continents to experience further drying (Ragab & Prudhomme, 2002; Verstraete & Schwartz, 1991).

The above mentioned should be considered as operations move closer to the closure and rehabilitation phase, as this will affect the success of the rehabilitation activities with regard to vegetation establishment, growth, and sustainability thereof.

4.1.4. Geology and Soils

Regional

Marula Mine is situated on the eastern limb of the Bushveld Igneous Complex (Metago Environmental Engineers , 2007). The Bushveld Complex holds most of the world's chromium, platinum (Merensky Reef and UG2 are two layers found in the Bushveld Complex containing

platinum), vanadium and refractory minerals. It has three components, namely the Rustenburg Layered Suite, Lebowa Granite Suite, and the Rooiberg Group. Rocks in the Complex consist of volcanic rocks as well as basaltic magma, which created a large chamber underground. After the intrusion of basalt, another rock intruded the primary rocks, namely granite. The Complex was then covered by sedimentary rocks, which have been eroded to expose the present-day geologic formations of the Complex (McCarthy & Rubidge, 2005).

Local

Chromitite and platinum are located in the Rustenburg Layered Suite, and it has the following sequential fractional crystallization levels according to the EIA and EMPr of 2012 (refer to Figure 5 and Figure 6 for a map of the local geology of the area):

- Marginal Zone – which consists of norites and pyroxenites with no economic potential;
- Lower Zone – which consists of ultramafic rocks, such as harzburgites and pyroxenites, which contain thin, high-grade chromatite layers;
- Critical Zone, which consists out of pyroxenites, norites and anorthosites, that contains the significant platinum group metals chromite deposits;
- Main zone – which consists primarily of homogeneous gabbros and norites, which are exploited as dimension stones; and
- Upper Zone – which consists of gabbros, diorites, and norites, which contain magnetic seams, some of which are exploited for vanadium and iron ore (Metago Environmental Engineers , 2007).

Norite, leuconorite, pyroxenite, and anorthosite mainly underlie Marula Mine, with mountains in the area comprising of norite which weathered into black clays in the plains neighbouring the mountains (Metago Environmental Engineers , 2007).

The Merensky Reef and UG2 layer are both present at Marula Mine, but only UG2 is currently being mined at Marula Mine. UG2 is the main chromatite containing layer, with most of the mineralisation restricted to this unit, followed by a poorly mineralised pegmatoidal footwall. “The Merensky Reef is the upper portion of a pyroxenite layer, with a chromatite stringer close to the hangingwall contact. Mineralisation peaks over the chromatite stringer and decreases into the hangingwall and footwall. Both mineralised horizons sub-outcrop on the Marula Mine mining rights area and dip in a west-southwest direction at 12° to 14°” (Implats, 2022). The height of separation between UG2 and the Merensky Reef is approximately 400 m, with one major dyke in the area and several potholes also found in the formation (Implats, 2022). Basaltic rocks weather into basic (alkaline) soils with a higher clay content, while granite rocks weather into more acidic sandy soils with a low clay content (Van Oudtshoorn, 2015).

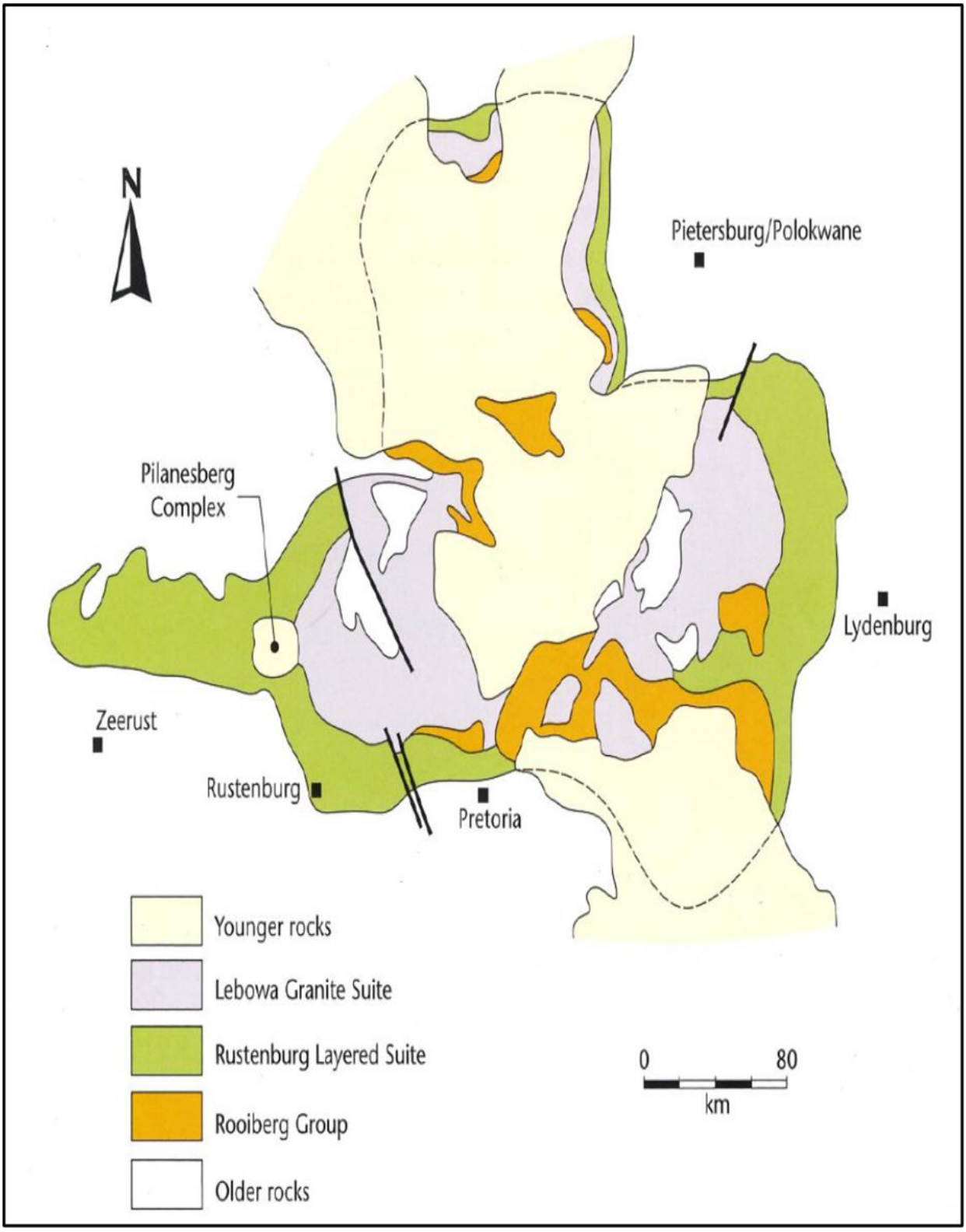

Figure 5: Geological map Illustrating the outcrop of the Bushveld Complex

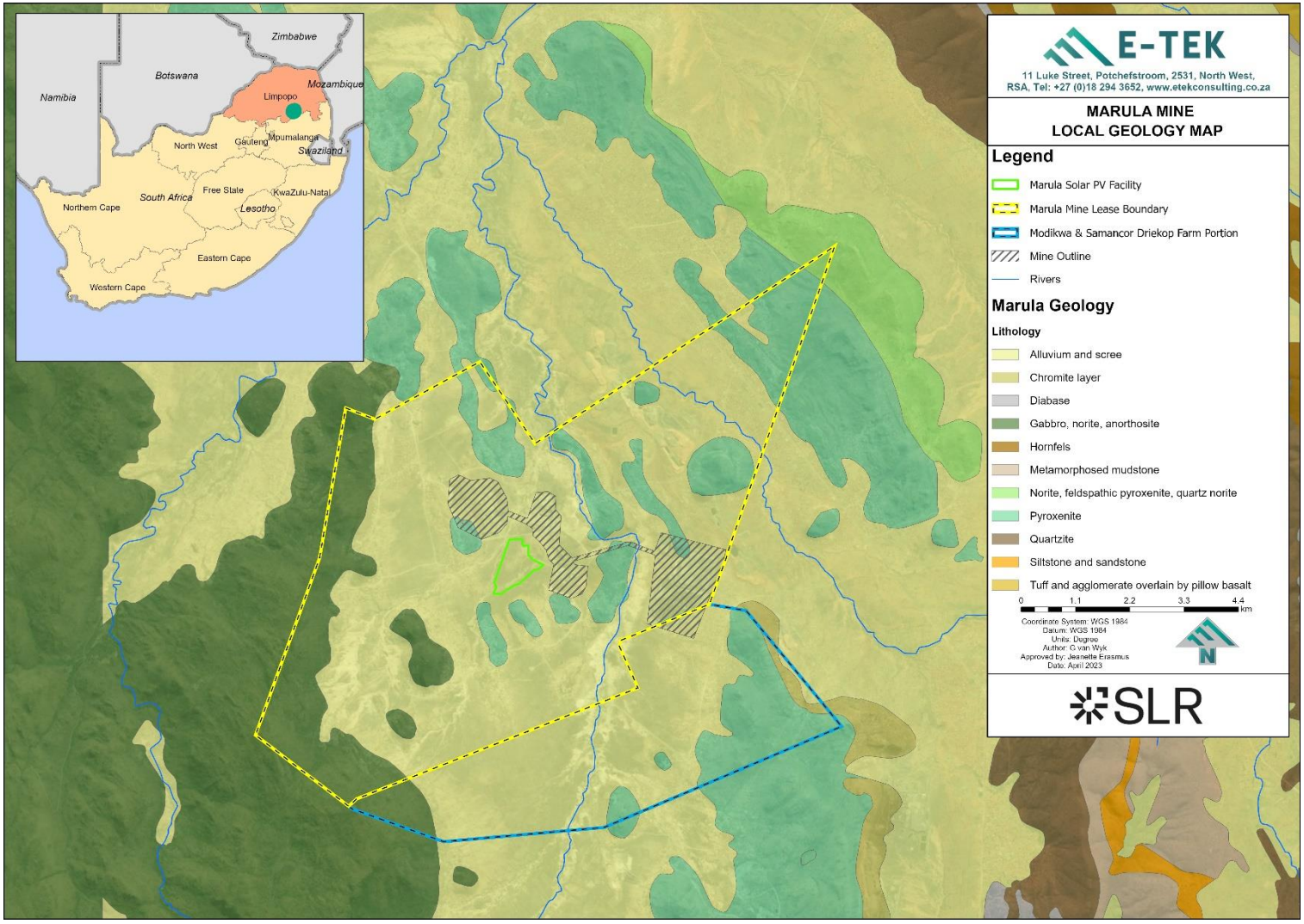

Figure 6: Marula Mine Geology

A soil classification study was conducted in July 2001 by EnviroXcellence Services CC to classify the soils according to the Taxonomic Soil Classification System of South Africa (1991). The soils identified in the area include Willowbrook, Steendal/Immerpan, Arcadia, Milkwood/Mayo/Mispah and Valsrivier/Bonheim. The soil texture is classified as clayey (vertisols and melanic soils), and the colour varies from brownish to black with a depth of approximately 300 mm on the top of the hills to 3 m near streams. The soils are summarized in Table 7 below (Metago Environmental Engineers , 2007).

Table 7: Soils present at Marula Mine

SOIL FORM	DOMINANT SOIL FORM/FAMILY	DESCRIPTION	AVERAGE SOIL DEPTH (MM)
Steendal (Sn)	Brabant 2000	Brown to black; moderate to strong structure; sandy clay to sandy loam; shrink and swell behaviour; water logging is problematic in the wet season.	400-1000
Immerpan (Ip)	Kalkpan 2000	Brown to black and where topsoil is being eroded, calcretes are exposed, moderate to strong structure; sandy clay to sandy loam; shrink and swell behaviour; water logging is problematic in the wet season.	400-600
Willowbrook (Wo)	Kromkalk 2000	Brown to black and white; sandy clay to sand; shrink and swell behaviour; moderate to strong structure; water logging is problematic in the wet season.	600-1500
Milkwood (Mw)/Mayo (My)/Mispah (Ms)	Mpetu 2000 Boyela 220 Myhill 1100	Brown to black and red; sandy loam to loamy sand; shrink and swell behaviour but limited due to depth; moderate to strong structure except for Mispah.	300-600
Arcadia (Ar)	Rustenburg 1200	Brown to black; sandy clay to clay; shrink and swell behaviour; moderate to strong structure; water logging is a problem.	400-600
Valsrivier (Va)/Bonheim (Bo)	Aliwal 1122	Brown to back and red; sandy clay to sandy loam; low shrink and swell behaviour; moderate structure.	500-700

(Metago Environmental Engineers , 2007)

Another soil study was conducted as part of the environmental impact assessment (EIA) and authorisation process. This study indicated that a large area of the proposed new infrastructure is dominated by Spionberg/Valsrivier soil form, followed by Mispah and Brandvlei soil forms (Zimpande Research Collaborative, 2021).

The soils found in the area are erosive, and their soil erodibility indices range from low to high. It should therefore be considered when post-closure rehabilitation is being implemented (Metago Environmental Engineers , 2007). The dominant soil forms are difficult to work on, especially after substantial rains. Although the soils have low agricultural potential, it can sustain subsistence levels of grazing and crop production. Therefore, management will be important post-closure (Metago Environmental Engineers, 2012).

4.1.4.1. Soil Generation Trials

Currently Marula Mine is conducting various rehabilitation trials on the TSF top surface to potentially generate sustainable organic soil. The top surface area of the TSF is considered to be a harsh environment, with adverse environmental effects such as wind speed and high temperatures exceeding 40°C. Three trials have been conducted with varying interim results.

Trial 1 (Soil building project)

The Soil Building Project, which is currently ongoing, aims to generate topsoil within the sterile soil medium found in the tailings dam. This is achieved through the utilization of a diverse mixture of cover crop seeds, organic mulching with hay, and the addition of a microbial bio-compound to enhance soil conditions. These interventions contribute to the accumulation of organic matter, stimulate microbial activity, and facilitate nutrient recycling (van Oudtshoorn, 2023). As the TSF area cannot withstand the capacity of cattle, artificial mimicry is being utilized to mimic the effects of cattle grazing on the TSF. This includes high trampling and high concentration of dung and urine, which will aerate and fertilise the soil.

Trial 2 (Teff grass)

A separate trial, also aimed at enhancing vegetation cover, has been established by another company close to the above-described project. In this trial, only one crop, namely Teff grass, was used in combination with a thin layer of composted sawdust (van Oudtshoorn, 2023). In comparison with the above-described project, this trial was far less effective in reaching the goal of obtaining a good vegetation cover and dense organic mulch. The main differences between the two include the multi-species cover crop mix, dense slow-degrading mulch and addition of microbial bio-compounds to the soil of the first project (van Oudtshoorn, 2023).

Trial 3 (Bana grass)

Another trial was initiated, focusing on planting the resilient perennial grass, Bana grass, along contour banks. The primary objective of this trial is to establish windbreaks that effectively mitigate dust pollution originating from the tailings dam. While the trial holds potential, it is important to note that Bana grass is a perennial grass species characterized by an extensive and deeply rooted system, which requires a considerable amount of time to establish itself (van Oudtshoorn, 2023).

Should the trials prove successful, the closure criteria as well as this closure plan should be updated as the mine moves closer to closure.

4.1.5. Land Capability and Usage

The land capability classes include wetland, grazing, arable land, and wilderness, this is based on the different soil characteristics and the potential of these soils to support the different classes (as defined by the Chamber of Mines Classification System) (Chamber of Mines of South Africa/Coaltech, 2007).

The percentages of different land capability classes that will be disturbed by operations according to the EMPr of 2012 are as follows (Metago Environmental Engineers , 2007):

- Non-arable land: 50%;
- Arable land: 30%;
- Grazing: 20%.

The mine lease and surrounding area mainly categorized as arable (comprising of grazing and subsistence farming) and non-arable with low agricultural potential according to the soils found in the mine lease and surrounding area (Metago Environmental Engineers, 2012).

The soil, land use, land capability and agricultural potential assessment which was done as part of the environmental impact assessment (EIA) and authorisation process for the proposed ventilation shafts also indicated that the dominant land uses within the proposed project area are mining related activities, with residential areas and wilderness/wildlife being the subdominant land uses (Zimpande Research Collaborative, 2021).

The pre-mining land uses included grazing, farming and residential with extensive subsistence farming concentrated in the valleys and residential areas concentrated to the foothills and slopes neighbouring the hills (Metago Environmental Engineers , 2007).

In the areas surrounding the communities, grazing, subsistence farming and other community activities are the primary land uses with facilities such as shops, churches and schools being found in the community areas (Metago Environmental Engineers , 2007).

In the areas surrounding the communities, grazing, subsistence farming and other community activities are the primary land uses with facilities such as shops, churches and schools being found in the community areas (Metago Environmental Engineers , 2007).

4.1.6. Biodiversity

Regional

Two biomes are found within the Limpopo Province, namely the savanna biome and the grassland biome. Bioregions in the area include the Central Bushveld Bioregion, Mopane Bioregion, Lowveld Bioregion, and the Mesic Highveld Grassland Bioregion (Mucina & Rutherford, 2006).

Local

The mine lease area falls within the savanna biome. The vegetation unit where Marula Mine is located, as described by Mucina and Rutherford (2006), is the Sekhukhune Plains Bushveld and Sekhukhune Mountain Bushveld. This Sekhukhune Plains Bushveld vegetation unit was also described as Mixed Bushveld by Acocks (1953) and Low and Rebelo (1996) and as *Acacia tortilis-Dichrostachys cinerea* Northern Dry Mixed Bushveld by Siebert *et al.* (2002a), while the Sekhukhune Mountain Bushveld was described as Sourish Mixed Bushveld by Acocks (1953), Mixed Bushveld by Low and Rebelo (1996) and *Kirkia wilmsii-Terminalia pruniodes* Closed Mountain Bushveld, *Combretum hereroense-Grewia vernicosa* Open Mountain Bushveld, *Hippobromus pauciflorus-Rhoicissus tridentate* Rock Outcrop Vegetation by Siebert *et al.* (2002).

The ecological studies conducted in 2001 and 2007 for Marula Mine's EMP stated that seven **vegetation units** were found in the mine lease area, namely:

- **Unit 1**: Rocky hills – This unit is associated with rocky hills and mountainous terrain and is described as an important plant diversity habitat in the area.
- **Unit 2**: Habitation – The species found in these units is a function of the type of habitation. A high number of alien invader species were also found in these units.
- **Unit 3**: Donga/calcrete – Erosion structures consisting of black turf-like dongas with calcrete outcrops describe this unit. This unit is the most sensitive with regard to erosion and vegetation barrier, and therefore important in these areas.

- **Unit 4**: Wooded areas – These units are smaller, less transformed wooded areas, one of which is associated with a gravesite in the area.
- **Unit 5**: Permanent River course and gully – These units are rare in the mining area but have been transformed by the community.
- **Unit 6:** Transformed area mosaic – This unit covers the largest area and is used for agricultural activities such as grazing. These areas are highly transformed due to grazing and trampling of the area (Metago Environmental Engineers, 2012).

The mining site is fenced to a great extent, preventing people from moving freely through the area. The large human population has a definite impact on the vegetation of the plains, resulting in area becoming degraded and locally transformed (EcoAgent, 2010). Approximately 180 vegetation species were found in the area in the dry season, with 2 Red Data list species found within Unit 1 and Unit 3 and 18 endemic or near-endemic species recorded in the area (Redco, 2008).

Only one biodiversity survey was conducted in 2007 to determine the animal diversity of the mine lease and surrounding area. This indicated that the area was rich in species diversity. However, due to the rapid increase in development, as well as the transformation and over-exploitation of the veld, there has been a loss of habitats and a decline of most of many historically recorded species. Many large mammal species previously recorded in the area are now only found in fenced reserves and conservation areas (Redco, 2008). The full list of species found in the area can be found in the EIA and EMPr Report (2012) (Refer to APPENDIX G).

An Alien and Invasive Plant Assessment was also conducted in 2022, which included the identification of declared invasive species as per the National Environmental Management of Biodiversity Act (NEMBA) of 2004 NEMBA and Conservation of Agriculture Resource Act (CARA), 1983 (No 43 of 1983) for invasive species (Agreenco, 2020; Marine Mountain Environmental Consultants, 2022). The assessment also included a map with distribution and densities of the identified species and a technical note which presents the results of the assessment (Refer to Table 8). During the assessment, 20 declared alien invasive species were identified within the area (Marine Mountain Environmental Consultants, 2022).

Table 8: Declared Invasive Species

NO.	SCIENTIFIC NAME	COMMON NAME	NEMBA Class	CARA class
1	*Agave sisalana*	Sisal	2	2
2	*Argemone ochroleuca*	White-flowered mexican poppy	1b	1
3	*Catharanthus roseus*	Madagascar Periwinkle	1b	-
4	*Datura ferox*	Large thorn apple	1b	1
5	*Datura stramonium*	Common thorn apple	1b	1
6	*Flaveria bidentis*	Smelter bush	1b	-
7	*Ipomoea carnea*	Morning-glory bush	1b	-
8	*Jacaranda mimosifolia*	Jacaranda	1b	3
9	*Leucaena leucocephala*	Leucaena	2	2
10	*Morus alba*	White mulberry	3	3
11	*Nicotiana glauca*	Wild Tabacco	1b	1
12	*Opuntia ficus-indica*	Prickly pear	1b	1
13	*Pennisetum setaceum*	Fountain grass	1b	1
14	*Ricinus communis*	Castor-oil plant	2	2
15	*Senna didymobotrya*	Peanut butter cassia	1b	1
16	*Senna occidentalis*	Coffee senna	1b	-
17	*Solanum elaeagnifolium*	Silver-leaf bitter apple	1b	1
18	*Sorghum halepense*	Johnson grass	2	2
19	*Tecoma stans*	Yellow bells	1b	1
20	*Xanthium strumarium*	Large cocklebur	1b	1

(Agreenco, 2020)

4.1.7. Air Quality

Regional

Particulate matter is the main pollutant of concern which may affect human health negatively. Exposure to elevated levels of particulate matter (PM_{10}) can lead to cardiovascular and respiratory problems and has been correlated with reduced life expectancy (Aneja, Isherwood, & Morgan, 2012).

The total suspended particulate (TSP) matter, as well as "particles with an equivalent aerodynamic diameter less than 10 µm (PM_{10})," can be released into the atmosphere due to mining activities. This can lead to increased mortality rates in addition to decreasing the visibility and impacting plants and animals in the area (Andrade, da Luz, Campos, & de Lima, 2016). It is, therefore, important to monitor the particulate matter being released to be able to make predictions and to mitigate the negative impact (Chaulya, et al., 2003).

Local

Sources of air pollution in the area surrounding the mine lease area include industrial and mining activities, vehicle emissions, domestic fuel burning, agricultural activities, biomass burning as well as wind erosion. The following air pollutants are associated with the mine's operations (Metago Environmental Engineers, 2007):

- PM_{10} pollution – which causes health problems when inhaled;
- (TSP) pollution – which, in high concentrations, negatively impacts visibility;
- Diesel particulate matter (DM) pollution – derived from earthmoving equipment and vehicles;
- Gaseous emissions – derived from blasting and vehicles; and
- Organic compounds – from vehicle exhausts and evaporation.

Diesel particulate matter and gaseous emissions will not pose problems post-closure as these operations cease at closure and after rehabilitation has been implemented. There is an ongoing monthly dust monitoring programme for Marula Mine with 18 bucket stations, numbered 0-17, currently being monitored. Monitoring is undertaken in accordance with the ASTM D-1739 of 1998 and dust fall-out data is evaluated against the four-band scale of the Dust Deposition Limits of the SANS1929:2011 Ambient Air Quality Limits for Common Pollutants (Aquatico Scientific, 2021).

The dust fall-out results indicate that all the sampled residential localities complied with the 'Residential' limit of 600 mg/m2/day during April 2022. The dust fall-out results indicate that all

the sampled non-residential dust monitoring sites complied with the 'Non-residential" limit of 1200 mg/m2/day during April 2022.

4.1.8. Topography and Visual Environment

Mining leads to changes in the topographic character and visual environment, as well as hazardous excavations (e.g. tailings dam height) either temporarily or permanently. Therefore, it is important to understand these effects in order to obtain successful closure.

Marula Mine and the neighbouring areas are situated within a broad, flat valley formed by the Moopetsi River. The valley drains to the north and is bound on the west by the Leolo Mountains and to the south east (approximately 5 km from the mine) by the Lebalelo Mountains, which have elevations of between 1000 m above mean sea level (mamsl) and 1622 mamsl. The plains lie at elevations between 889 mamsl and 1000 mamsl, and the valley basin tends to slope down to the east and north.

The three hills interrupt the valley are known as the three heads of the farm Driekop (Seuwe – 1059 mamsl, Diphalana – 1119 mamsl and Diphale – 1139 mamsl). It should be noted that increased development in the area has had an impact on the natural visual character of the area (Redco, 2008).

4.2. SOCIO-ECONOMIC ENVIRONMENT

All socio-economic aspects should be considered with closure in mind. Marula Mine should be aware of the impacts of closure on the socio-economic environment and should plan ahead, investigate sustainable options post-closure and limit dependency on the mine.

Refer to the 2018 Social and Labour Plan (SLP) for Marula Mine for detailed information on the socio-economic aspects. The following sections should be updated as more recent information becomes available.

4.2.1. Population, Demography & Settlement Patterns

The Limpopo Province population accounts to approximately 9.8% of South Africa's population with an estimated 5.94 million residents (Statistics SA, 2022). This province also has the highest amount of people living in "homeland" areas which poses several problems, such as low income, poor infrastructure, and little employment opportunities. This leads to an out-migration towards other urban areas and other provinces and due to out-migration, Limpopo has seen a negative net migration (EcoAfrica, 2016); (Trade & Industrial Policy Strategies (TIPS), 2016).

The Limpopo Province is considered mostly rural, and many settlements are located in areas with abundant natural resources like rivers, fertile land, and mineral deposits. People in these areas have complex relationships with the environment and rely on it for their livelihoods.These areas can be referred to as “growth centres” and are illustrated in Figure 7 with reference to the specific land cover of the area (EcoAfrica, 2016).

The rate at which urbanization takes place is, however, low at 12% (2015) when compared to the national rate of urbanization at 62% (2012), with the ten growth points identified as Greater Tubatse, Lephalale, Musina, Greater Tzaneen, Makhado, Elias Motsoaledi, Thabazimbi, Ba-Phalaborwa, Mogalakwena and Polokwane. Priorities in these growth points include infrastructure and public housing development programmes, which will also assist with job creation (EcoAfrica, 2016).

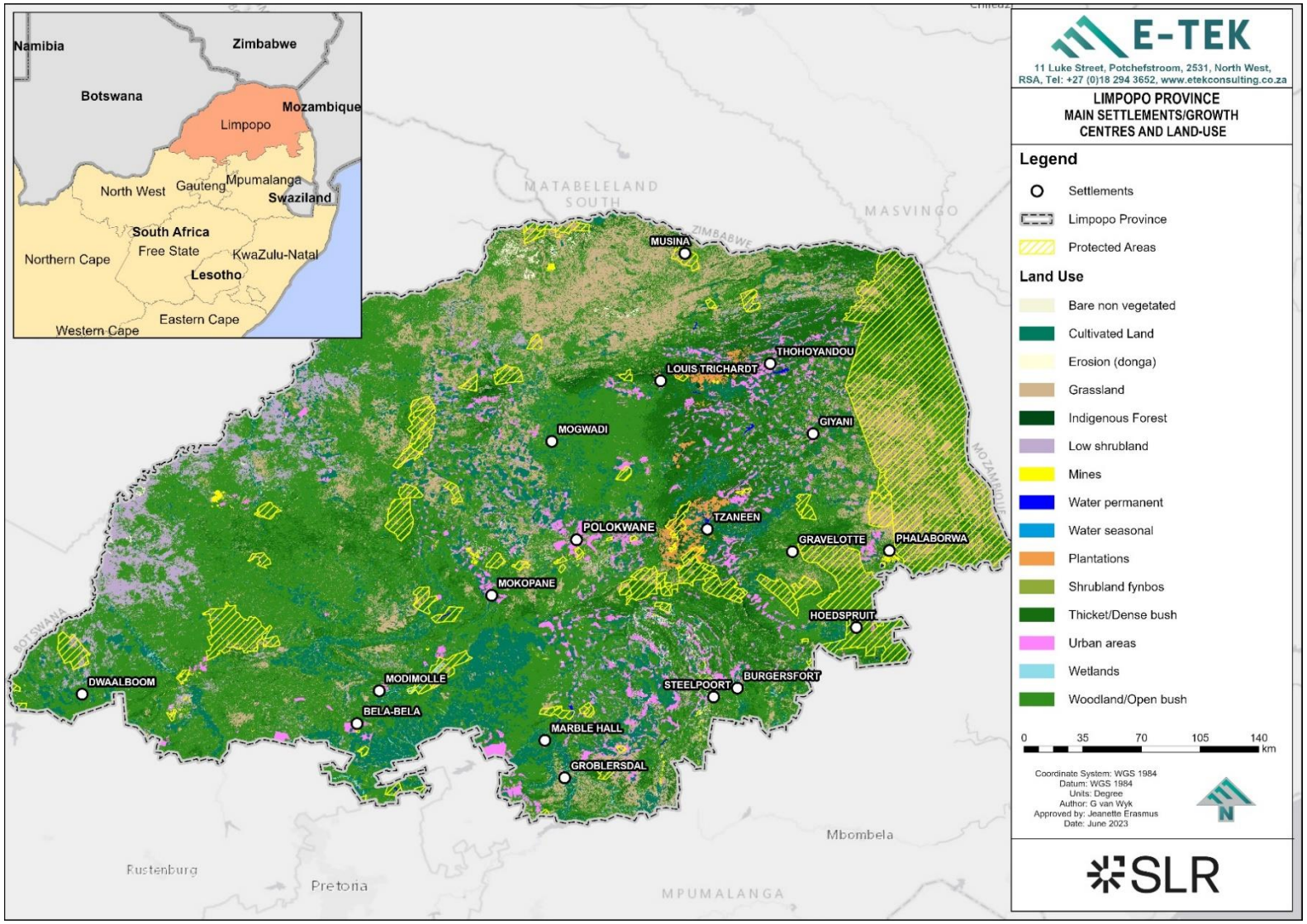

Figure 7: Main settlements/growth centres and land-use in Limpopo

4.2.2. Socio-economics

4.2.2.1. Economy

The South African Gross domestic product increased by 1.2 percent in the second quarter of 2021, following an increase of 1.0 percent in the first quarter of 2021. All other industries contributed positively towards the national GDP except for Manufacturing, construction, finance, real estate, and business services. The industries that contributed positively towards the GDP growth were agriculture, mining, electricity, gas and water, trade, transport, and personal services.

The mining and quarrying industry increased by 1.9 percent, and it has contributed 1.0 percentage point to the GDP growth. The increase in production was reported for platinum group metals (PGMs), gold and coal The Limpopo Gross Domestic Product has been on decline since 2018 where it decreased from 2.1 percent in 2017 to 0.6 percent in 2018. The provincial GDP further declined to negative 0.2 percent in 2019 and to negative 7.2 percent in 2020. It is expected that as the mining and other industries recover the provincial economy will also recover (Treasury, 2022).

4.2.2.2. Social and Labour Plan

Marula Mine's SLP (2018) states that approximately 11.5% have no schooling, 40.69% have secondary education and 3.69% have higher education in Sekhukhune District Municipality in Limpopo. There is thus a shortage of educated labour in the Limpopo Province with. Financial support as well as training and schooling is therefore important to improve the regional economy.

According to Marula Mine's SLP (2018), Marula Mine provides training in portable skills which are not only applicable in mining but also in other sectors, this will assist with skills development and retrenchment management, and which will assist employees to find work elsewhere or become self-sustaining. This, in turn, will assist with unemployment within the region. Marula Mine also aims to minimise the impacts of job losses if job losses are unavoidable and the SLP (2018) states that the relevant processes for effective closure management will be in place 4 to 5 years prior to scheduled closure.

The SLP (2018) also states that ongoing discussions, consultations, and deliberations will be conducted to communicate effectively with the relevant parties with regards to the planning for mine closure and any downscaling of employees. This will assist with better preparations for the socio-economic issues at closure.

4.2.3. Health and Wellness

Life expectancy at birth for males declined from 62,4 in 2020 to 59,3 in 2021 (3,1 year drop) and from 68,4 in 2020 to 64,6 for females (3,8 year drop) (StatsSA, 2022). In South Africa, the overall Human Immunodeficiency Virus (HIV) prevalence rate is estimated at 13.0% of the population, the total number is approximately 7.8 million people in 2020. Adults (aged between 15-49 years) living with HIV is estimated at 18.7% of the population (Statistics SA, 2020).

The Limpopo average total fertility rate decreased from 3.13 between 2011 and 2016 to 2.9 in between 2016 and 2020 with the average life expectancy at birth increasing from 58.8 for men and 64.7 for women between 2011 and 2016 to 62.0 for men and 67.2 for women between 2016 and 2020 (Statistics SA, 2022).

At Marula Mine, the amount of tuberculosis (TB) which were reported reduced from 20 in 2015 to 11 in 2016, this is primarily due to increased levels of testing and surveillance. The amount of people receiving HIV and Acquired Immunodeficiency Syndrome (AIDS) counselling and treatment increased from 698 in 2015 to 1 058 people in 2016, and according to Marula Mine's Operational Review Report (2016), "this is a testament to the success of the occupational and non-occupational health clinic opened in 2012, which continues to benefit the community surrounding Marula Mine" (Implats, 2016).

4.2.3.1. COVID-19 Pandemic

COVID-19 has had an immense impact on the health system of South Africa; however, with the roll-out of the current vaccination program, the number of daily cases has decreased (National Department of Health, 2022).

4.2.4. Corporate Social Investment

According to Marula Mine's SLP (2018), a Functional Literacy and Numeracy Programme, which will consist out of Adult Based Education and Training (ABET), will be implemented to ensure that all employees can read, write, and communicate in English as well as become functionally literate and numerate (to AET Level 4). This will assist employees to successfully compete in the general labour market post-closure.

Marula Mine committed to several projects between 2018 and 2022, these projects were divided into School Infrastructure Development, Community Borehole Water Supplies, Community Access Roads, and Community Access Bridge projects.

Between 2018 and 2022 three projects have been completed: the Legabeng Water Project (Community Bore Water Supply) and the Legabeng 3.2 km and 1.4 km Lesibe road upgrading

projects (Community Access Roads) with 16 more Projects nearing completion or being commenced in 2022 refer to the Summary of 3 Generations of Marula Mine's SLP 2022 for a detailed project progress report.

5. CLOSURE VISION AND UNDERLYING PRINCIPLES

Regulations Reference: (d)(ii)	**This Section describes the Closure vision, objectives, and targets, which take into account the local environmental and socio-economic context, regulatory and corporate requirements as well as stakeholder expectations, where applicable for this plan.**

5.1. METHODOLOGY

"The aim of the closure plan is set out through its underlying vision, principals and objectives" according the ICMM's Integrated Mine Closure Good Practice Guide (2019).

ICMM's Integrated Mine Closure Good Practice Guide states that "while the closure vision provides direction for closure, and the principals offer a general framework, the closure objectives provide concrete, site-specific, and typically measurable statements.

Both the closure vision and closure objectives should be informed by the knowledge base, particularly the mine's zone of influence (ZoI), socio-economic and environmental context, stakeholder relationships, country-specific requirements, and other external drivers. These factors should lead to a closure vision and closure objectives that are aligned with the characteristics of the corporation and the mine and appropriate to the socio-economic setting" (ICMM, 2019).

The aforementioned, together with the existing closure vision for the Marula Solar PV Facility, was therefore considered when formulating the closure vision and closure objectives and targets for Marula Mine at the request of SLR Consulting.

5.2. CLOSURE VISION

By using the outcome of the closure workshops, consultations, applicable guidelines, and policies as well as considering the specific commitments and targets of Implats, the following preliminary Closure Vision was formulated for the Implats group:

''Implats is committed to responsible and sustainable rehabilitation and mine closure, while managing negative impacts through proper action plans, risk based financial provisioning and aiming to ensure that post-closure commitments are met through transparent consultation with relevant stakeholders''

5.3. CLOSURE OBJECTIVES AND TARGETS

5.3.1. NEMA Principles for Sustainable Development

This closure plan is prepared in terms of GNR 1147 of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The following **principles for sustainability** as set out in this Act were considered and can be used as a guideline with mine closure in mind:

(4)(a)(i) “That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

(4)(a)(ii) That pollution and degradation of the environment are avoided or, where these cannot be altogether avoided are minimised and remedied;

(4)(a)(iii) That the disturbance of landscapes and sites that constitute the nation’s cultural heritage is avoided, or when it cannot be altogether avoided; is minimised and remedied;

(4)(a)(iv) That waste is avoided; or, where it cannot be altogether avoided; minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;

(4)(a)(v) That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;

(4)(a)(vi) That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their Integrity is jeopardised;

(4)(a)(vii) That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;

(4)(a)(viii) That negative impact on the environment and on people’s environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied;

(4)(b) Environmental management is integrated acknowledging that all elements of the environment are linked and interrelated, and it takes into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option;

(4)(c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person particularly vulnerable and disadvantaged persons;

(4)(d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination;

(4)(e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle;

(4)(f) The participation of all interested and affected parties in environmental governance must be promoted and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured;

(4)(g) Decisions must take into account the Interests, needs and values of all interested and affected parties, and this includes all forms of knowledge, including traditional and ordinary knowledge;

(4)(h) Community well-being and empowerment. must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means;

(4)(i) The social, economic and environmental impacts of activities, including costs and benefits are considered, assessed and evaluated, and decisions are appropriate in the light of such consideration and assessment;

(4)(j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected;

(4)(k) Decisions are taken in an open and transparent manner, and access is provided to information in accordance with the law;

(4)(l) There is intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment;

(4)(m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures;

(4)(n) Global and international responsibilities relating to the environment must be discharged in the national interest;

(4)(o) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as people's common heritage;

(4)(p) The costs of remedying pollution, environmental degradation and consequent adverse, health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects are paid for by those responsible for harming the environment;

(4)(q) The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted; and

(4)(r) Sensitive, vulnerable, highly dynamic, or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure".

5.3.2. MPRDA Objectives for Closure

It is also important to take section 43(3) (d) of the Mineral and Petroleum Resources Development Act (MPRDA 28 of 2002) into account as it includes the following **objectives for closure:**

- "Rehabilitate disturbed areas, excluding the tailings dam and return water dam, to their pre-mining land capability and use potentials. The rehabilitation of disturbed land will be to the extent that it is within compliance of current national environmental quality objectives;
- Limit the short- and longer-term impacts of pollution on surface and ground water and related biodiversity;
- Control the further generation of dust;
- Minimize the visual impact of the permanent features at the mine e.g. tailings dam;
- Ensure that people and animals are not harmed by falling off or into hazardous excavations or steep slopes. The management objectives for these are to minimize safety risks to the public and livestock;
- Limit the impact on staff whose positions become redundant on closure of the mine;
- Keep relevant authorities informed of the progress of the decommissioning phase;
- Submit monitoring data to the relevant authorities;
- Build and maintain meaningful relations with all stakeholders (I&AP's)".

5.3.3. Implats Environmental Policy Statement

According to the Implats **Environmental Policy Statement**, they are committed to the following (Implats, 2019):

- "Continually improving environmental performance through assessments, the establishment and monitoring of objectives and preventing pollution through the implementation of processes, practices and techniques to avoid, reduce or control the creation, emission or discharge of any type of pollutant or waste and to reduce adverse environmental impacts;
- The integration of environmental management into management practices throughout the Company;
- Minimising the use of consumptive resources and promoting the reduction and recycling of waste products;
- Rehabilitating disturbed land and protecting environmental biodiversity;
- Exercising prudence with ecological resources;
- Managing environmental risk in the workplace and surrounding areas;
- Complying with the applicable environmental obligations to which the Company subscribes;
- Training and educating employees in environmental responsibilities;
- Being transparent and constructive in interactions with stakeholders and;
- Providing leadership and support in achieving these commitments".

5.3.4. Implats Biodiversity, Rehabilitation and Closure Policy Statement

According to Implats' **Biodiversity, Rehabilitation and Closure Policy Statement**, they are committed to (Implats, 2022):

- Implementing the mitigation hierarchy in managing risks and minimizing negative impacts to the biodiversity.
- Engaging external stakeholders to develop tools and guidance to integrate biodiversity management with land use planning.
- Neither exploring nor developing new mines in World Heritage sites.
- Respecting legally designated protected areas.
- Designing and operating any new operations or changes to existing operations to be compatible with the value for which such areas were designated.
- Working towards a net positive impact on biodiversity for new projects, through avoidance, mitigation, and offsets.

- Preparing site-specific biodiversity action plans in line with regulatory, legal, and other requirements.
- Raising awareness among employees, contractors and those entering our operations to the importance of biodiversity protection and management
- Concurrently rehabilitating all impacted land, aiming to restore land to a beneficial state developed in consultation with all relevant stakeholders.
- Integrating closure objectives into the planning, design and operations of projects and mines.
- Developing closure outcomes in consultation with all relevant stakeholders that minimize adverse impacts and maximize post-closure stakeholder value.
- Implementing measures at closure to afford economic opportunities for stakeholders and address closure related environmental and social aspects.
- Providing sufficient financial resources to enable agreed closure and post-closure commitments.
- Continuously Identify, review and update risks, including climate-related, impacting on our biodiversity, rehabilitation, and post-closure management effort.
- Publicly disclosing progress regarding our biodiversity, rehabilitation, and closure management performance.

5.3.5. Implats Community Policy Statements

According to the Implats **Community Policy Statements**, they are committed to the following with regards to the community (Implats, 2017)**:**

- “Continually improving community development and community investment programmes through monitoring, measuring and managing social and economic impacts;
- Developing programmes that promote the sustainable welfare of communities;
- Upholding and promoting the human rights of employees, contractors, suppliers and communities in which we operate;
- Recognising and respecting indigenous people’s culture, heritage and traditional rights and supporting the identification, recording, management and protection of indigenous cultural heritage;
- Building and maintaining stakeholder relationships with people who are directly affected or interested in the Company’s operations; and
- Mitigating the risk posed by public health threats amongst employees, contractors, and local communities”.

6. POST-MINING LAND USE/S

Regulations Reference: (e), (e)(i) & (e)(ii)	**This Section describes the proposed final post-mining land use which is appropriate, feasible and possible of implementation for the overall project and per infrastructure or activity.** **It also gives a description of the methodology used to identify the final post-mining land use, including the requirements of the operations stakeholders, where applicable for this plan.**

6.1. METHODOLOGY

A clear definition of the post-closure land use greatly facilitates closure planning. When the post-closure land use is understood, it aids not only the definition of the closure vision and site-specific closure objectives, but also the selection of closure activities and the definition of success criteria (ICMM, 2019).

The planned post-mining land use has been identified for Marula Mine at the time of compilation of this plan. No formal post-mining land use has been identified for the Solar PV Facility. As the Solar PV Facility falls within Marula's Mine Lease Boundary, the post-mining land use would be the same as the mines post-mining land use. This may change as the mine progresses and should be reviewed with each subsequent update of this plan.

To identify a post-mining land use, NEMA (Act No. 107 of 1998): Financial Provisioning Regulations, 2015 (No. R. 1147), is states that you should have:

- "A proposed final post-mining land use which is appropriate, feasible and possible of implementation;
- Descriptions of appropriate and feasible final post-mining land use for the overall project and per infrastructure or activity and a description of the methodology used to identify final post-mining land use, including the requirements of the operations stakeholders; and
- A map of the proposed final post-mining land use".

The abovementioned post-mining land use will be influenced by a few aspects, as described throughout this plan, and can be improved through a typical tool, such as conducting a SWOT Analysis session (strength, weakness, opportunity, threat) between the mine owner and the landowner. Thereafter they will be better able to work together towards planning for mine closure and post-mining land use. It will assist in understanding both the internal strengths and weaknesses of the mine and the external opportunities and threats posed by the

environment. The closure plan should be directed at exploiting the major strengths and opportunities while avoiding or overcoming the threats and weaknesses.

According to the SOE, the pre-mining land uses included grazing, farming, and residential, with extensive subsistence farming concentrated in the valleys and residential areas concentrated in the foothills and slopes neighbouring the hills. Future thinking should include making land productive post-closure, creating more employment opportunities, and providing input for other industries. This includes the potential beneficial post-closure use of specific infrastructure as well, however, the transfer of liability should be put in writing.

6.2. PROPOSED POST-MINING LAND USE/S

The proposed land use for the Marula Solar PV Facility will be grazing and subsistence farming on the surface rights area (Metago Environmental Engineers, 2007). However, it is important to understand that not all areas will have the same grazing capacity, and certain areas should thus be managed accordingly Figure 8. Specific areas or levels of grazing potential on the surface rights areas are indicated on the post-mining land use plan to ensure long-term sustainability of the rehabilitated mining areas. Refer to APPENDIX B for the Post-mining land use plan.

Definitions or descriptions of these areas are:

- Free range grazing:

Mostly outlying areas which have no or minimal mining-related disturbances (e.g. general surface areas and footprint areas where infrastructure or waste rock dumps will be removed).

- Low intensity:
    - Predominantly on the rehabilitated fine residue deposits or tailings storage facilities (TSFs);
    - Highly transformed mining areas require extensive rehabilitation actions to establish a safe, stable, and non-polluting environment. As a result, these areas are susceptible to environmental disturbances;
    - These areas have the potential to be used for low intensity grazing if managed properly, depending on the success of the rehabilitation efforts and the degree of grazing control which can be enforced;
    - Formal control measures may be needed, depending on the end land users. These areas will need to be fenced off during the maintenance and aftercare period and should be considered sensitive until the rehabilitation can be proven

sustainable and safe, only then can they be incorporated into the other grazing classes.

As this closure plan is a dynamic and live document that is annually updated with the best available information at the time of compilation, the post-mining land use should be continually investigated and refined. As Marula Mine moves closer to closure, the post-mining land use should be refined and updated to reflect what is feasible and realistically possible.

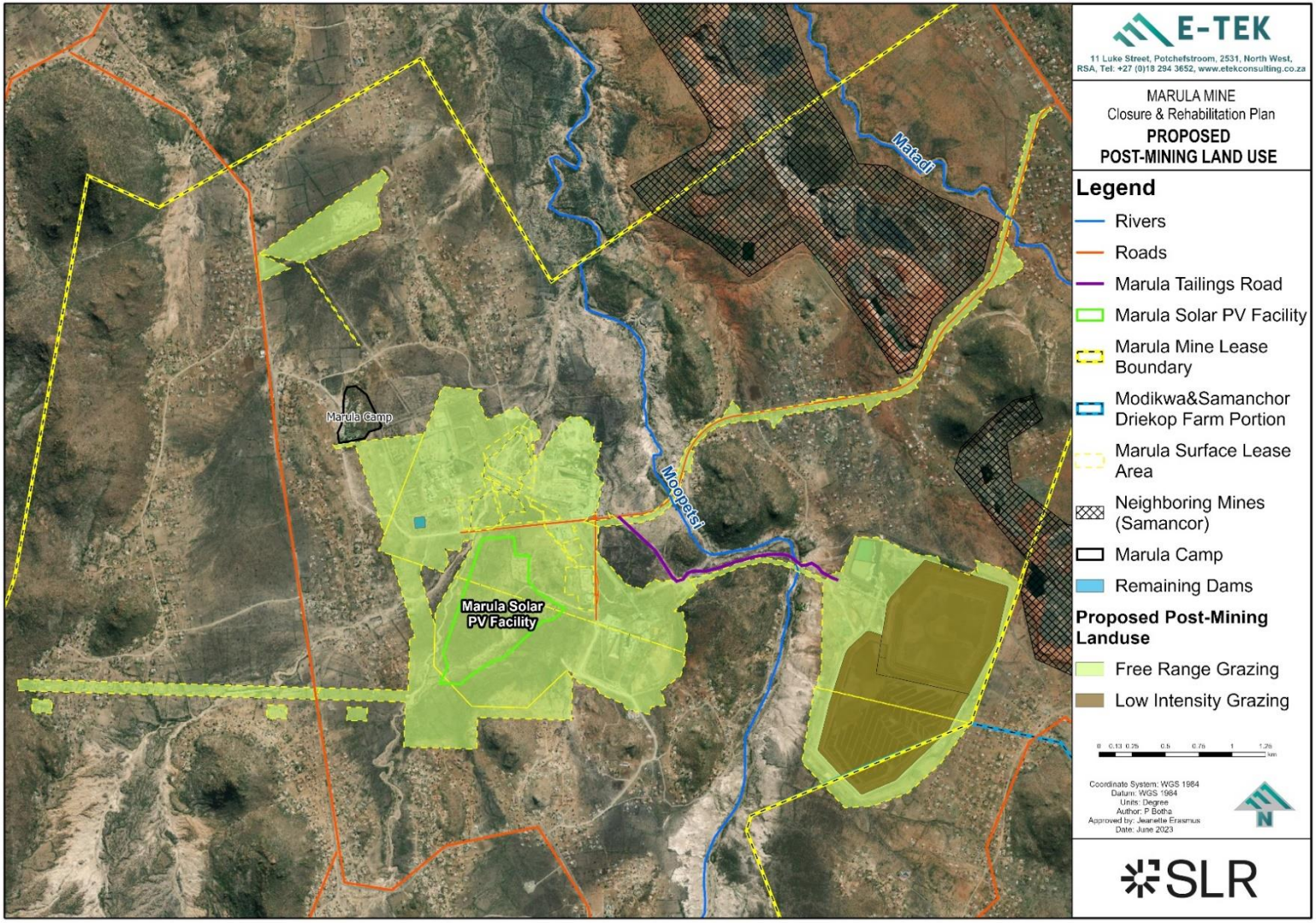

Figure 8: Proposed Post-mining Land Use

7. DESIGN PRINCIPLES, CLOSURE ACTIVITIES AND TECHNICAL SOLUTIONS

Regulations Reference: **(d), (d)(iii), (d)(iv), (d)(v), (d)(vi), (d)(vii)** **&** **(f), (f)(i), (f)(ii)** **&** **(i)** **&** **(j)**	**This Section describes the Design principles, Closure activities and Technical solutions for all areas, infrastructure, activities and aspects both, within the mine lease area and off of the mine lease area associated with mining, for which the mine has the responsibility to implement closure actions.** **Alternative closure and post-closure options are described, where practicable, within which the operation is located, as well as the preferred closure action within the context of the risks and impacts that are being mitigated.** **Any potential gaps in the plan are linked to an auditable action plan and schedule to address the gaps. Therefore, associated ongoing research are highlighted, as well as all assumptions made to develop closure actions (in absence of detailed knowledge on site conditions, potential impacts, material availability, stakeholder requirements and other factors for which information may be lacking). The Gap analysis can be used to identify and define any additional work that is needed to reduce the level of uncertainty for any applicable closure aspect.** **It also deals with the definition and motivation of the closure and post-closure period, taking cognisance of the probable need to implement post-closure monitoring and maintenance for a period sufficient to demonstrate that relinquishment criteria have been achieved.**

7.1. CLOSURE CRITERIA METHODOLOGY

Closure activities are the physical works carried out to close the site to achieve the Success Criteria. These may be done during operations (concurrent rehabilitation) or in the closure and post-closure period. Closure activities are undertaken to achieve specific closure objectives and satisfy success criteria (ICMM, 2019).

Closure Criteria table was compiled to list the Design principles, Closure activities and technical solutions for all closure components. Refer to table XX for the Closure criteria, this should be read in conjunction with the costing sheets.

Proposed project includes:

- Solar PV Facility
    - PV modules;
    - Mounting structures;
    - Inverters;
    - Cabling; and
    - Onsite substation.
- Overhead Transmission Line
- Associated Structures and Infrastructures
    - Battery energy storage System;
    - Operations buildings;
    - Laydown area;
    - Security – Non-electrified boundary fence with permitter lighting and manned controlled access ;
    - Roads – Internal roads will be gravel roads;
    - Stormwater infrastructure – Stormwater runoff from the Solar PV Facility will be collected in an open, V-shaped stormwater drain (within the road servitude);
- Water storage tank.

Separate Rehabilitation plans and/ or Concurrent rehabilitation plans were not compiled, and all assumptions and actions are captured in this section, as well as the applicable appendices.

The **Bio-physical and Socio-economic** aspects do not currently have any possible cost implications, other than that already covered in the Infrastructural and Mining aspects. Should there be any additional cost implications, it should be included in the Closure Criteria sheets in future.

Additional care and maintenance are required in terms of the proposed project for ten years Post-closure. This has been included in the Closure liability.

In order to reduce Socio-economic risks and the impact of closure on local communities, socio-economic aspects and related risks should be managed throughout the operational phase.

The Closure Criteria were based on the following:

- Comprehensive understanding of the site conditions;
- Interactive workshops with mine personnel, external consultants, and specialists;
- Technical reports; and
- Knowledge and experience of similar projects.

7.2. CLOSURE CRITERIA

This section provides a summary of the proposed Rehabilitation and Closure Criteria. The detailed sheets (which includes relevant assumptions for all actions) should be read in conjunction with this Closure Plan to get the full context. Refer to Table 9 for the Closure Criteria and associated assumptions and knowledge gaps.

Table 9: Closure Aspects

INFRASTRUCTURAL ASPECTS		
CLOSURE COMPONENTS	**REHABILITATION AND CLOSURE CRITERIA**	**ASSUMPTIONS / KNOWLEDGE GAPS**

Plant and Related Structures:
• PV Arrays
• Concrete Plinths
	• Removal of salvageable equipment (i.e., steel and re-useable material)
	• All plants and related infrastructure will be dismantled and removed
	• Foundations and sub-surface structures will be removed to 1m below ground level
	• General Surface rehabilitation of infrastructural footprint areas as follows:
	  ○ i. Shape and level area
	  ○ ii. Fill voids and make the area free draining
	  ○ iii. Rip 500 mm deep
	  ○ iv. Establish vegetation (includes amelioration, cultivation and seeding action).
		• Assume two rows of Solar Panels per PV Array.
		• For PV Array & Supporting light steel framework assume 20kg/m² for solar panels & 10kg/m² for the supporting light steel framework.
		• Assume mounting structures - concrete plinths 300 mm x 300 mm x 450 mm deep every 2 m.
		• Assume that only 50% of footprint will require reshaping.

Supporting Infrastructure
• Guard House
• Offices
• Operational and Control Centre
• Warehouse
• Ablution Facilities
• Onsite Substation
• Water Storage Tanks
• Stormwater Drains
• Concrete Floor
• Laydown Area
	• Removal of salvageable equipment (i.e. steel and re-useable material)
	• All supporting infrastructure will be dismantled and removed
	• Foundations and sub-surface structures will be removed to 1m below ground level
	• General Surface rehabilitation of infrastructural footprint areas as follows:
	  ○ i. Shape and level area
	  ○ ii. Fill voids and make the area free draining
	  ○ iii. Rip 500 mm deep
	  ○ iv. Establish vegetation (includes amelioration, cultivation and seeding action).
		• Assume all supporting infrastructure will be completely removed post-mining operations
		• Temporary storage of water onsite with a total capacity up to 2000 m³ = 2 000 000 L, will be sufficient to maintain operational processes
		• Assume that the total Laydown area footprint = 6ha as per SLR Scoping Report. Gravel surface to undergo General Surface Rehabilitation.
		• Assume Stormwater Management would provide adequate drainage of the area.

Linear Infrastructure • Roads • Fences • Overhead Transmission Lines	• All linear items such as pipelines, fences (allowance was made to remove all security fencing), and power lines will be removed • No allowance made for tarred roads beyond the boundaries of the plant or shaft areas	• Assume all roads will be removed post-mining operations • Fencing will be removed once rehabilitation of the area has been signed off by local authorities.

INFRASTRUCTURAL ASPECTS		
CLOSURE COMPONENTS	**REHABILITATION AND CLOSURE CRITERIA**	**ASSUMPTIONS / KNOWLEDGE GAPS**
Waste Disposal	• A 2.5% allowance of the total demolition costs for infrastructural aspects was made for sorting and screening of waste (including unforeseen disposal of hazardous waste) • A 5% allowance of the total demolition costs for infrastructural aspects was made for for the decontamination of equipment. • Domestic and non-hazardous waste are taken to the closest, registered municipal waste sites (Rustenburg) • Disposal of Electronic waste (Solar Panels & Batteries) • Load and haul 122 km to a licenced Facility	• Assumption that all metal and steel waste will be salvaged, but no allowance was made to offset the scrap value of the steel and metal. • Assume that Electronic Waste to be loaded and hauled 122 km from Marula Mine to a licensed Electronic Waste Disposal Facility in Polokwane. • Assume 35 mm thick solar panels. • It was assumed that the solar panels will be disposed of at a zero cost.
General Surfaces	• Shaping, levelling of footprint areas (500 mm) • Rip 500mm deep • Establish vegetation (includes amelioration, cultivation and seeding action).	• Assume that only 50% of footprint will require reshaping. • Assumed footprint will be left shaped and levelled as material is removed.
Monitoring and Maintenance	• Allowance made for ten years post-closure care and maintenance	• Assume that monitoring and maintenance will be conducted in conjunction with Marula Mine monitoring and maintenance strategies.

7.3. ALTERNATIVE CLOSURE AND POST-CLOSURE OPTIONS

The potential alternative closure options are dependent on the applicable Statutory and Corporate related requirements, as outlined in Section 3 of this plan, and include the current Mine lease agreements and expectations from the landowner, as well as the approved closure commitments stipulated in the EMP.

It is important to note that the specific sections below will also influence any closure and post-closure alternatives to be considered:

- Section 4: The environment in which the project is located;
- Section 6: The feasible and practical post-mining land uses;
- Section 8: The risks associated with such an alternative option (a cost-benefit analysis may also be needed in future if there are any alternatives being considered);
- Section 9: The expectations from external stakeholders, if any (other than the land owner or Government).

8. CLOSURE RISK ASSESSMENT

Regulations Reference: (c), (c)(i), (c)(ii), (c)(iii), (c)(iv) & (c)(v)	**This Section describes the findings of the environmental risk assessment, leading to the most appropriate closure strategy.** **It also deals with the risk assessment methodology, identification of indicators that are most sensitive to potential risks and the monitoring of such risks.** **The conceptual closure strategies are described to avoid, manage, and mitigate the impacts and risk. Reassessment of the risks are done to determine whether, after the implementation of the closure strategy, the latent or residual risk has been avoided and / or how it has resulted in avoidance, rehabilitation, and management of impacts and whether this is acceptable to the mining operation and stakeholders.**

8.1. CLOSURE RISK WORKSHOPS

All potential risks, associated with the closure of the Marula Mine Operations with reference to the Marula Solar PV Facility, were identified, only focussing on the proposed project areas.

The following information was reviewed and considered as part of the process to compile the worksheets and prepare for the workshop:

- Legislative/statutory and corporate requirements;
- Existing mine closure objectives, closure visions and land use opportunities post-closure;
- Mine closure options and scenarios;
- The baseline information which describes the current state of the environment (SOE);
- Existing mine closure plans and previously identified impacts; and
- Stakeholder engagement outcomes

8.2. CLOSURE RISK MATRIX

The identified risks were captured in the worksheets, with the format of spreadsheets reflecting all the respective risks for each closure component.

These risks were individually evaluated in terms of a risk matrix and ranked for the closure scenarios before and after implementation of the mitigation measures/rehabilitation and

closure criteria. Refer to APPENDIX D for the Anglo-American Risk Matrix and different criteria used to determine the risks. The following tables explain the risk matrix and methodology used.

The identified risks were rated according to “probability/likelihood” and “consequence of occurrence”, as described in the table below.

Table 10: Criteria to determine probability

PROBABILITY / LIKELIHOOD		
ALMOST CERTAIN 1yr	**5**	• The unwanted event has occurred frequently; • Occurs in order of one or more times per year & is likely to reoccur within 1 year.
LIKELY 3yrs	**4**	• The unwanted event has occurred infrequently; • Occurs in order of less than once per year & is likely to reoccur within 3 years.
POSSIBLE 10yrs	**3**	• The unwanted event has happened at some time; • Or could happen within 10 years.
UNLIKELY 30yrs	**2**	• The unwanted event has happened at some time; • Or could happen within 30 years.
RARE >30yrs	**1**	• The unwanted event has never been known to occur; • Or it is highly unlikely that it will occur within 30 years.

To determine the possible consequence, different criteria were used for each of the following disciplines or areas of responsibility to mitigate risks and impacts:

- Safety;
- Occupational Health;
- Environment;
- Financial;
- Legal and Regulatory;
- Social / Community; and
- Reputation

Table 11: Criteria to determine the consequence of safety impacts

CONSEQUENCE FOR SAFETY	
1 INSIGNIFICANT	First aid case.
2 MINOR	Medical treatment case.
3 MODERATE	Lost time injury.
4 HIGH	Permanent disability or single fatality.
5 MAJOR	Numerous permanent disabilities or multiple fatalities.

Table 12: Criteria to determine the consequence of health impacts

CONSEQUENCE FOR OCCUPATIONAL HEALTH	
1 INSIGNIFICANT	Exposure to health hazard resulting in temporary discomfort.
2 MINOR	Exposure to health hazard resulting in symptoms requiring medical intervention and full recovery (no loss time).
3 MODERATE	Exposure to health hazards/ agents (over the OEL) resulting in reversible impact on health (with lost time) or permanent change with no disability or loss of quality of life.
4 HIGH	Exposure to health hazards/ agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life or single fatality.
5 MAJOR	Exposure to health hazards/ agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life of a numerous group/ population or multiple fatalities.

Table 13: Criteria to determine the consequence of environmental impacts

CONSEQUENCE FOR ENVIRONMENT	
1 INSIGNIFICANT	• Lasting days or less. • Limited to small area (metres). • Receptor of low significance/sensitivity (industrial area).
2 MINOR	• Lasting weeks. • Reduced area (hundreds of metres). • No environmentally sensitive species/ habitat).
3 MODERATE	• Lasting months. • Impact on an extended area (kilometres). • Area with some environmental sensitivity (scarce/ valuable environment).
4 HIGH	• Lasting years. • Impact on sub-basin. • Environmentally sensitive environment/receptor (endangered species/habitats).
5 MAJOR	• Permanent impact. • Effects a whole basin or region. • Highly sensitive environment (endangered species, wetlands, protected habitats).

Table 14: Criteria to determine the consequence of financial impacts

CONSEQUENCE FOR FINANCIAL	
1 INSIGNIFICANT	No disruption to operation/ Less than 1% of current liability estimate.
2 MINOR	Brief disruption to operation - 1% to less than 3% of current liability estimate.
3 MODERATE	Partial shutdown of operation - 3% to less than 10% of current liability estimate.
4 HIGH	Partial loss of operation - 10% to less than 30% of current liability estimate.
5 MAJOR	Substantial or total loss of operation - 30% or higher of current liability estimate.

Table 15: Criteria to determine the consequence of legal and regulatory impacts

CONSEQUENCE FOR LEGAL & REGULATORY	
1 INSIGNIFICANT	• Technical non-compliance. • No warning received. • No regulatory reporting required.
2 MINOR	• Breach of regulatory requirements. • Report/involvement of authority. • Attracts administrative fine.
3 MODERATE	• Minor breach of law. • Report/investigation by authority. • Attracts compensation/ penalties/ enforcement action.
4 HIGH	• Breach of the law. • May attract criminal prosecution, penalties/ enforcement action. • Individual licence temporarily revoked.
5 MAJOR	• Significant breach of the law. • Individual or company lawsuits. • Permit to operate substantially modified or withdrawn.

Table 16: Criteria to determine the consequence of social/community impacts

CONSEQUENCE FOR SOCIAL / COMMUNITY	
1 INSIGNIFICANT	Minor disturbance of culture/social structures.
2 MINOR	• Some impacts on local population, mostly repairable. • Single stakeholder complaint in reporting period.
3 MODERATE	• Ongoing social issues. • Isolated complaints from community members/ stakeholders.
4 HIGH	• Significant social impacts. • Organized community protests threatening continuity of operations.
5 MAJOR	• Major widespread social impacts. • Community reaction affecting business continuity. “License to operate” under jeopardy.

Table 17: Criteria to determine the consequence of reputation

CONSEQUENCE FOR REPUTATION	
1 INSIGNIFICANT	• Minor impact. • Awareness/ concern from specific individuals.
2 MINOR	• Limited impact. • Concern/ complaints from certain groups/ organizations (e.g. NGOs).
3 MODERATE	• Local impact. • Public concern/adverse publicity localised within neighbouring communities.
4 HIGH	• Suspected reputational damage. • Local/ regional public concern and reactions.
5 MAJOR	• Noticeable reputational damage. • National/ international public attention and repercussions.

The risk rating matrix was coupled to the criteria discussed in the above tables for probability and consequence.The matrix was applied, taking into consideration the site-specific risks, in accordance with the area of assessment. The classification of the identified risks was presented in terms of the following risk ratings and risk levels:

Table 18: Risk ratings and levels

RISK RATING	RISK LEVEL
21 to 25	H - High
13 to 20	S - Significant
6 to 12	M - Medium
1 to 5	L - Low

8.3. RISK ASSESSMENT SUMMARY

Refer to APPENDIX D for the comprehensive Risk Assessment sheets, indicating all sensitive receptors and risk specific closure strategies.

Only one risk was indicated as a **significant** ranking post-mitigation, specifically related to Plant and Related Infrastructure as follows:

- Local communities could possibly request free power from Marula Solar Facility with the risk of riots.

The Closure Risk Assessment should be updated with future reviews of the closure plan for the Marula Solar PV Facility.

9. SOCIAL CLOSURE PLANNING AND CLOSURE CONSULTATION

Regulations Reference: (b)(iii)	**This Section describes the Stakeholder issues and comments that have informed the plan, where applicable.**

9.1. SOCIAL TRANSITION PLANNING FOR CLOSURE

As per the Integrated Mine Closure Good Practice Guide, planning for social transition should be an integrated and iterative process involving multiple mine departments and stakeholders. This planning process is incorporated into the overarching mine closure plan, either through a dedicated social transition plan or through planning integrated into the mine's overall closure plan. The iterative nature of planning for social transition is similar to the iterative nature of closure planning as a whole (ICMM, 2019).

In the context of planning for the social transition to closure, the initial 'understand' step links to the knowledge base and understanding the extent to which socio-economic dependence on the mine has developed (or is projected to develop) (Figure 9). In the 'engage' step, communication is undertaken to develop and validate the approach to social transition, while implementation may include actions from securing funding and undertaking trials to full implementation of programmes. In the 'measure' step, results are compared to the goals that were set for implementation. These results are then used in the iterative process to revise and update the approach (ICMM, 2019).

It is good practice for social transition planning to integrate the identification of social risks and their mitigation measures into the earliest phases of mine planning. Incorporating the right specialists and stakeholders early in the selection of objectives can help ensure that the closure plan includes social transition objectives (ICMM, 2019).

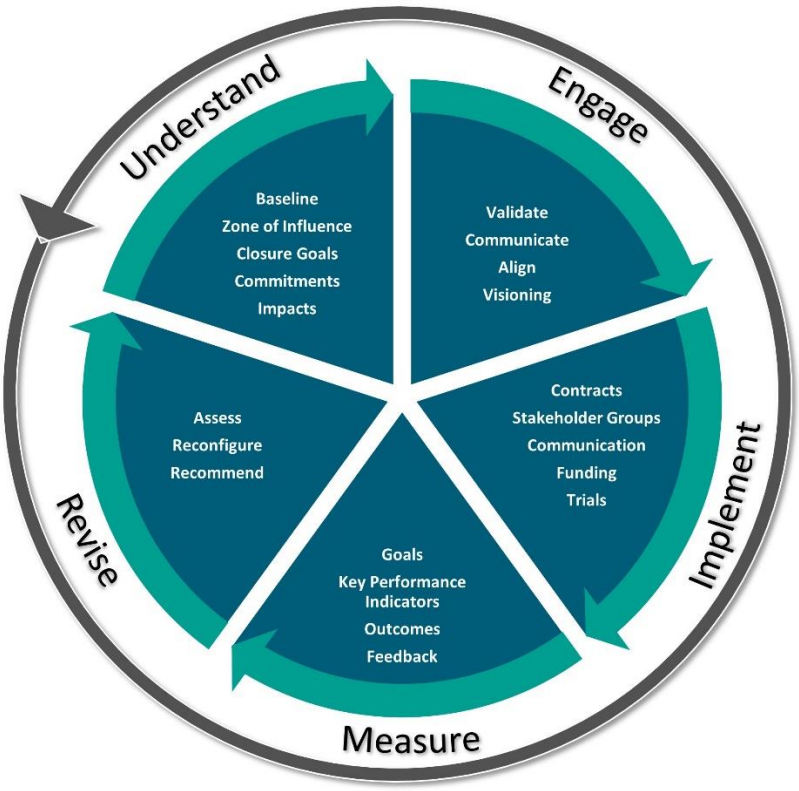

Figure 9: Social Transition Planning and Management for Mine Closure

9.2. STAKEHOLDER ENGAGEMENT PLAN AND APPROACH

Stakeholder engagement aims to achieve comprehensive consideration and understanding of the views of the various stakeholders in the closure planning process. Stakeholder engagement will ensure that the views, concerns, and proposals of those affected by or having an interest in the mining operations of the company are addressed.

The process will ensure that internal Stakeholder issues and comments inform future updates of the plan, reducing any uncertainties and therefore contributing towards the increase in the level of accuracy of the closure plan and its associated liability. It is noted that the following is important in planning the Stakeholder Engagement Plan (SEP):

- Assessment of stakeholder interests (e.g. expectations, benefits, conflict of interest);
- Assess Stakeholder influence and importance (e.g. communities, authorities and informal interested parties).

9.3. SUMMARY OF ISSUES RAISED

All inputs from the internal stakeholder consultation with mine personnel were taken into consideration in this plan and its supporting documentation. All future stakeholder issues, concerns and comments will inform the update of this plan.

10. WORK BREAKDOWN STRUCTURE, CLOSURE SCHEDULE AND GAP ANALYSIS

Regulations Reference: **(g), (g)(i), (g)(ii), (g)(iii)** **&** **(h), (h)(i), (h)(ii), (h)(iii)**	**This section describes the schedule of actions for final rehabilitation, decommissioning and closure and link with the current mine plan where possible. All assumptions and schedule drivers are described.** **The spatial map or schedule is linked with Appendix 3 of GNR1147 and shows the planned spatial progression throughout the operations.** **The organisational capacity, structure, and responsibilities to implement the plan are indicated, where applicable. If necessary to build closure competence, the required training and capacity building are described in this section.**

This section should be updated with future reviews of the closure plan for the Marula Solar PV Facility.

A gap analysis should be done as part of the site wide Closure Criteria. The gap analysis includes an auditable action plan and schedule to address the gaps. These aspects, are linked to a Work Breakdown structure that captures the following:

- The specific **action** requiring additional or further investigation;
- **Priority Level**, indicating the timeframe linked to it (e.g. Immediate, within next financial year or only Long term – 10 years before closure);
- A specific **Responsible Person** is linked to each of these actions (e.g. Environmental Manager or Processing);
- **Completion Status**, e.g. to indicate whether the specific action should still be initiated, if it is in progress or completed.

The Closure schedule should be refined with the update of this closure plan, the inclusion of the mine plan (

APPENDIX A) and the compilation of a site-wide Concurrent Rehabilitation plan.

11. CLOSURE COST ESTIMATION

Regulations Reference: (k), (k)(i), (k)(ii), (k)(iii)	**This Section describes the Closure cost estimation procedure, which ensures that identified rehabilitation, decommissioning, closure, and post-closure costs, whether ongoing or once-off, are realistically estimated and incorporated into the estimates.** **Cost estimates for operations, or components of operations that are more than 30 years from closure will be prepared as conceptual estimates with an accuracy of ± 50%. Cost estimates will have an accuracy of ± 70% for operations, or components of operations, 30 or less years (but more than ten years) from closure and ± 80% for operations, or components of operations ten or less years (but more than five years) from closure. Operations with 5 or less years will have an accuracy of ± 90%. Motivation must be provided to indicate the accuracy in the reported number and as accuracy improves, what actions resulted in an improvement in accuracy.** **The closure cost estimation includes an explanation of the closure cost methodology, auditable calculations of costs per activity or infrastructure and cost assumptions.** **The closure cost estimate must be updated annually during the operation's life to reflect known developments, including changes from the annual review of the closure strategy assumptions and inputs, scope changes, the effect of a further year's inflation, new regulatory requirements, and any other material developments.**

11.1. CLOSURE COST ESTIMATION PROCEDURE AND METHODOLOGY

11.1.1. Liability Model Methodology

The approach followed to determine the financial provision required for APPENDIX E is as follows:

- The costing model used were developed to address all requirements set out in GNR 1147 and is aligned with all closure components identified;
- The costing model provides the following output:

- Executive Summary (Summary of all closure components and associated costs where applicable); and
- Closure Components - The five main closure components have been identified namely:
  - Infrastructural Aspects;
  - Mining Aspects;
  - Biophysical Closure Aspects;
  - Social Closure Aspects; and
  - General Aspects.

- The following information is captured for each closure component where applicable:
  - Reference Map (Reference map number representing the associated closure component);
  - Component Number (Reference number representing the associated closure component);
  - GEO Reference (Reference number for each closure component as represented on the reference map);
  - Year Updated (When each component was captured into the model or updated);
  - Cost Component (Name of closure component captured);
  - Rate Description (Breakdown of the properties per cost component);
  - Liable (Yes or No, indication if the mine is liable for the component or not);
  - Rate Code (Assigned rate code from the rates table);
  - Quantity (Quantity per component captured);
  - Unit (Unit of measurement);
  - Unit Rate (Rate assigned from the rate code aligned to the activity);
  - Unit Total (Total amount for each component);
  - Liable Value (Presentation of the total amount liable for per component); and
  - Notes/Assumption (Captures any notes, assumptions, or dedicated information).

11.1.2. Assessment Methodology

The approach followed with the determination of the closure costs could be summarized as follows:

- Review of available information, identification of infrastructure that would need to be decommissioned at closure;

- Quantification of infrastructural works relating to mining and general surface are measured according to the requirements of:
    - Standard system of measuring building work;
    - SANS 1200; and
    - Industry standards and norms.
- Reference maps included in APPENDIX E were updated of all areas, all infrastructure was numbered and referenced back to the closure costing spreadsheet and forms part of the geographic database;
- Determination of the various components that is demolition or rehabilitation related to each structure and/or area;
- Compilation of a Bill of Quantities (BoQ) capturing the quantities and actions relating to closure of the different closure aspects (Microsoft excel format); and
- Update of unit rates to be aligned with the current market-related conditions were determined through:
    - Consultation with reputable civil and demolition contractors within E-TEK's database;
    - Consultation with external specialists specialising in soil, water treatment and environmental monitoring;
    - Internal calculation models developed by E-TEK;
    - Benchmarking of unit rates whereby activities such as rehabilitation and reclamation is carried out on other mine sites where E-TEK is directly involved;
    - Consultations with current onsite contractors conducting extensive reclamation and rehabilitation activities to confirm applicable unit rates. (Note: these rates refer to closure conditions when the mine is no longer operational).

11.2. AUDITABLE CALCULATIONS OF COSTS

Please refer to APPENDIX E (Closure Liability Estimate Model) for the detail cost breakdown per closure component including unit rates. All relevant items have been itemised and referenced as required by GNR 1147.

11.3. ASSUMPTIONS FOR THE CLOSURE COST ESTIMATION

The following general and site-specific cost assumptions and qualifications are described below:

11.3.1. General Costing Assumptions

The closure costs were determined and presented in terms of E-TEK's understanding of the currently applicable requirements of GNR 1147. Based on the output required a 1–10-year closure forecast was based on the following timelines:

- Year 1 – Premature Closure (FY2023); and
- Year 2 – 10 Closure Forecast (FY2024 – FY2032).

- Currency of estimate: South African Rands (ZAR);
- Costing was based on today's value and no allowance was made for future value (no escalation of unit rates);
- As per GNR 1147 no allowance was made to offset the value of scrap steel and or salvageable equipment to the liability;
- It was accepted that all information used to support the costing supplied by SLR and Specialists were accurate and true; this report only addresses the decommissioning and reclamation costs, equating to an outside (third party) contractor establishing onsite and conducting reclamation-related work. Other components such as staffing of the site after decommissioning, the infrastructure and support services (e.g. power supply, etc.) for this staff as well as workforce matters such as separation packages, re- training /re-skilling, etc. are outside the scope of this report;
- Based on the above, dedicated contractors would be commissioned to conduct the demolition and reclamation work on the site. This would *inter alia* require establishment and overhead costs for the contractors and hence, the allowance for preliminary and general (P&Gs) in the cost estimate;
- Allowance has also been made for third party contractors and consultants to conduct post-closure care and maintenance work as well as compliance monitoring;
- The financial provision calculated represents the financial requirements to implement the closure criteria identified and agreed upon as part of the closure plan; and
- Weighted percentages for P&Gs and Contingencies have been applied, Value-Added Tax (VAT) is also included:
  - P&G's – 6% Overall Allowance
  - Contingencies – 10% Overall Allowance; and

- VAT – 15% Overall Allowance.

- P&G's with regards to post-closure monitoring and maintenance has been excluded as the activity or unit rate already includes P&G's.

11.3.2. Site Specific Costing Assumptions

11.3.2.1. Infrastructural Aspects

Plant & Related Structures

- All areas of the PV Arrays were measured as per the Marula Block Layout_Revised_Version 2.kmz. received.
- Weight of structures:
  - 20 kg/m² for solar panels; and
  - 10 kg/m² for light steel supporting framework.
- Mounting structures:
  - Two rows of Solar Panels per PV Array with concrete plinths 300 mm x 300 mm x 450 mm deep every 2m.

Supporting Infrastructure

- Guard house:
  - Manned controlled access to the Solar PV Facility as per the Scoping Report (SLR, 2023); and
  - Building area were benchmarked and assumptions made.
- Operation & Maintenance Buildings consisting out of offices, operational and control centre, workshops and storerooms, warehouses and ablution facilities:
  - Buildings included as per the Scoping Report (SLR, 2023);
  - Building structures and heights included as per E-TEK's Technical Memo (E-TEK, 2023); and
  - Building areas were benchmarked and assumptions made.
- On-site Substation:
  - 33 kV as per the Scoping Report (SLR, 2023); and
  - Building Structures and heights included as per E-TEK's Technical Memo. (E-TEK, 2023); and

- Building area were benchmarked and assumptions made.

- Water Storage Tanks:
  - An allowance for 22 large steel tanks was made to accommodate the 2 000 m³ (2 000 000 L) for temporary storage of water onsite as per the Scoping Report (SLR, 2023); and
  - The total footprint of the area is 800 m² as per the Scoping Report (SLR, 2023) and an allowance was made for a 150 mm thick concrete slab as per E-TEK's Technical Memo (E-TEK, 2023).

- Laydown Area:
  - Total footprint of the laydown area is 6 ha as per the Scoping Report (SLR, 2023); and
  - Gravel surface finish as per the Scoping Report (SLR, 2023) is included in General Surface Rehabilitation.

- Stormwater Drains:
  - The stormwater management structures will consist out of V-shaped concrete stormwater drains; and
  - Stormwater drains will be 1500 mm wide each and 50 mm thick along all the internal roads as per E-TEK's Technical Memo. (E-TEK, 2023)

Linear Items

- Perimeter Fencing:
  - 2,4 m High, non-electrified, security fence with perimeter lighting as per the Scoping Report (SLR, 2023); and
  - Perimeter fencing was measured as per Marula Block Layout_Revised_Version 2.kmz.

- Main Road:
  - The main access road will be approximately 6m wide and 500m long as per the Scoping Report (SLR, 2023).

- Internal Roads:
  - The internal roads will be approximately 4 m wide and 8800 m long as per Marula Block Layout_Revised_Version 2.kmz.

- Overhead Transmission Lines:
    - Quantities for minor lines was included as per the Scoping Report (SLR, 2023); and
    - Assume Option 1 as per Proposed Solar Plant PV Layout will be used.

Waste Disposal

- An allowance of 5,0% of the total demolition cost was made for the decontamination of waste and salvageable equipment;
- An allowance of 2,5% of the total demolition cost was was made for the sorting and screening of waste;
- An allowance was made for 3 km load and haul of total inert waste and to be dumped into decline shaft onsite;
- An allowance was made to load and transport all solar panels and batteries (electronic waste) to the nearest licensed facility in Polokwane; and
- No allowance was made to recycle the solar panels and it was assumed that the solar panels will be disposed of at a zero cost at the licensed facility in Polokwane.

11.3.2.2. General Aspects

- General surface rehabilitation:
    - Amelioration specifications were adapted to analysis conducted on growth medium soils. Unit rates were adapted to reflect the application requirements; and
    - Assume no topsoil is required.
- Monitoring and Maintenance:
    - Post-closure monitoring requirements were updated as per specified closure criteria;
    - Unit rates for post-closure care and maintenance of rehabilitated areas were updated based on updated criteria.

11.4. FINANCIAL PROVISION MODEL

Refer to APPENDIX E which includes the financial provision and supporting information.

12. MONITORING, AUDITS AND REPORTING

Regulations Reference: **(d)(v)** **&** **(l), (l)(i), (l)(ii), (l)(iii)**	**This Section takes cognisance of the probable need to implement post-closure monitoring and maintenance for a period sufficient to demonstrate that relinquishment criteria have been achieved.** **The Monitoring, auditing, and reporting requirements (which relates to the risk assessment, legal requirements, and knowledge gaps as a minimum) include:** **A schedule outlining internal, external, and legislated audits of the plan for the year, Including the person responsible for undertaking the audit(s); the planned date of audit and frequency of audit as well as an explanation of the approach that will be taken to address and close out audit results and schedule.** • **A schedule of reporting requirements providing an outline of internal and external reporting, including disclosure of updates of the plan to stakeholders, where necessary.** • **A monitoring plan which outlines parameters to be monitored, frequency of monitoring and period of monitoring.** • **An explanation of the approach that will be taken to analyse monitoring results and how these results will be used to inform adaptive or corrective management and/or risk reduction activities.**

The Monitoring plan and applicable Key Performance Indicators (KPIs) should be included in the update of this closure plan and with the compilation and support of the Rehabilitation plan.

12.1. DEMONSTRATION OF REHABILITATION PERFORMANCE

It is envisaged that a ten-year demonstration period will be required to confirm the success of rehabilitation in terms of vegetation, biodiversity, ecological function monitoring, care, and maintenance.

The period of ten years is chosen, according to Best Practice, as the minimum period to allow the herbaceous vegetation to go through all life stages (germination, growth, reproduction, pollination, and seed spreading) and to determine whether rehabilitation has been successful. This can, however, be increased as necessary, as all plants have different growth rates (for example, woody species take longer to mature; however, woody species are not usually used for rehabilitation).

Following the completion of earthworks and vegetation establishment, a visual inspection will be undertaken to inform corrective action if needed. Thereafter ongoing monitoring and corrective actions, as per Table 19, are envisaged at the time of compiling this plan.

Figure 10 illustrates the overview of the process for the Rehabilitation plan roll-out and Performance monitoring, starting with the Baseline site performance assessment towards the final site performance assessment. It is described in the sections below.

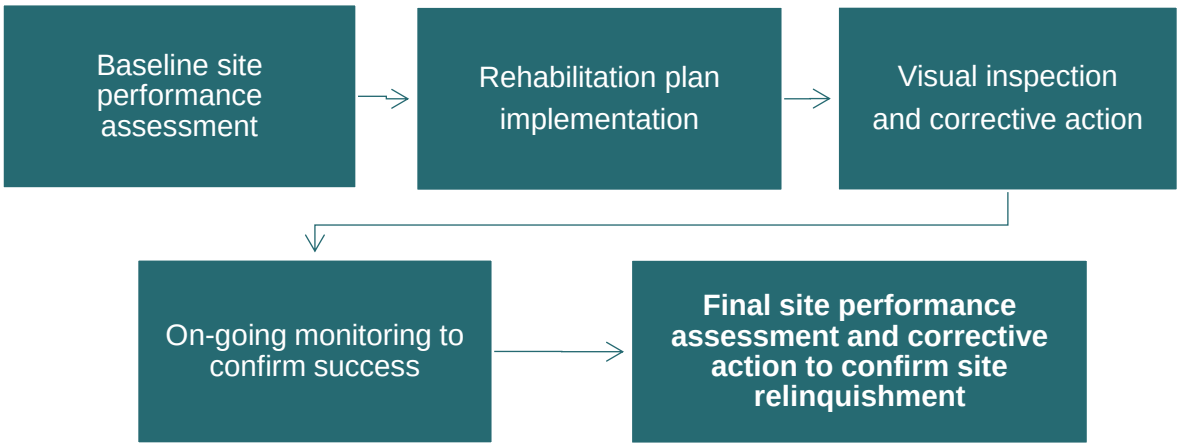

Figure 10: Illustration of the Rehabilitation plan roll out and Performance monitoring

12.1.1. Baseline Environmental Site Performance Assessment

A baseline site performance assessment (largely based on existing information and supplemented by a dedicated site walkover) must be conducted prior to rehabilitation implementation.

The aim of the environmental site performance assessment is to establish the status quo/baseline and knowledge base against which results of monitoring conducted after rehabilitation will be measured. Additionally, this will support the environmental permitting for decommissioning of the site in terms of the provisions of NEMA.

12.1.2. Monitoring and Corrective Action

The rehabilitation performance/progress should be documented in a dedicated bi-annual rehabilitation performance report to be submitted to Implats until relinquishment criteria have been achieved. The report should reflect on the outcome of monitoring undertaken, rehabilitation performance and corrective action required. The monitoring objectives, network, sampling routine and analysis for specific bio-physical closure aspects should always be refined with each updated of this plan.

12.1.3. Final Site Performance Assessment

Following completion of rehabilitation and the demonstration period of ten years (to be confirmed and updated in future and as the mine gets closer to closure) a final performance assessment should be undertaken to document the success of rehabilitation and the corrective action undertaken. The final site performance assessment will be used to document the success of rehabilitation.

Table 19: Rehabilitation Monitoring and Measurement

COMPONENT / ASPECT		MONITORING		PERFORMANCE/SUCCESS CRITERIA	CORRECTIVE ACTION
		METHODOLOGY	FREQUENCY/DURATION		
WATER RESOURCES	Surface water quality (Forms part of ongoing site-wide operational monitoring)	• Undertake monitoring of the surface water quality during the operational period according to existing monitoring programmes.	• During the operational period.	• Acceptable threshold levels of salts, metals and other potential contaminants are maintained; and • The applicable thresholds do not pose a threat to surrounding aquatic ecosystems, land uses or land users.	• As reflected in relevant Integrated Water and Waste Management Plan (IWWMP).
	Groundwater (Forms part of ongoing site-wide operational monitoring)	• Undertake ongoing monitoring of the ground water quality during the operational period according to existing monitoring programmes.	• During the operational period.	• Acceptable threshold levels of salts, metals and other potential contaminants are maintained; and • The applicable thresholds do not pose a threat to surrounding land uses or land users (groundwater users for domestic or agricultural purposes).	• Implement commitments in IWWMP.

COMPONENT / ASPECT		MONITORING		PERFORMANCE/SUCCESS CRITERIA	CORRECTIVE ACTION
		METHODOLOGY	FREQUENCY/DURATION		
SENSITIVE HABITATS & BIODIVERSITY	Vegetation establishment	• Determine whether concurrently established vegetation provides an effective cover and aids in controlling erosion, by undertaking the following: • Inspect rehabilitated areas to assess vegetation establishment and early detection of erosion in recently planted/seeded areas (for 3 months); and • Assess rehabilitated areas by means of field inspections. During these assessments measurement of growth performance should be made of:	• Planting should be undertaken at the start of the rainy season and monitoring undertaken as follows: • After 1 month continue monitoring twice more for first quarter, • Quarterly for the rest of the year and then, • Annually thereafter.	• No evidence of significant erosion is present; • Self-sustaining vegetation establishment occurs; and • Presence of exotic invasive species as well as bush encroachment species is effectively controlled.	• Re-vegetate poorly established rehabilitated areas; • Re-seed bare patches, as required; and • Apply additional fertiliser and/or organic matter, depending on the condition of the vegetation and the initial organic material application.
		○ Species present and abundance; ○ Estimates of average plant basal cover, vegetation canopy and ground cover heights;			

COMPONENT / ASPECT		MONITORING		PERFORMANCE/SUCCESS CRITERIA	CORRECTIVE ACTION
		METHODOLOGY	FREQUENCY/DURATION		
		○ Distribution, densities, growth, and survival of woody species; ○ Dominant plant species (woody and herbaceous); ○ Presence of exotic invasive species; and ○ Occurrence of erosion, noting aspects such as type, severity, degree of sediment build-up.			
	Alien Invasive species	• Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g. eroded/degraded areas, along drainage lines, etc.); and • Undertake surveys on relevant sites where bush encroachment has previously been identified,	• During the operational period.	• Category 1, 2 and 3 invader species brought under control and/or prevented; • Extended threat to ecosystems, habitats or locally occurring species is minimised; and • Increased potential for natural systems to deliver goods and services is maintained.	• Revisit mitigation measures and adjust as required; and • Ensure ongoing control and management program in place.

COMPONENT / ASPECT		MONITORING		PERFORMANCE/SUCCESS CRITERIA	CORRECTIVE ACTION
		METHODOLOGY	FREQUENCY/DURATION		
		to determine the status quo of invasive vegetation.			
OTHER: AIR QUALITY &	Air Quality	• Undertake monthly dust monitoring programme according to ASTM International standard method.	• During the operational period.	• As required by ASTM International standard.	• Review success of rehabilitation techniques • Adjust/improve accordingly.

12.2. MONITORING AND MANAGEMENT OF IMPACTS

No additional monitoring requirements form part of this document, as it has already been covered in the previous EMPs, as well as Current and previous Closure plans of site-wide monitoring done at Marula Mine. For future updates of this closure plan, the updated EMPr with accompanying management plans for the entire site (including the proposed project) should be considered and any additional requirements must be considered.

12.3. CURRENT AND POST-CLOSURE MONITORING PROGRAMMES

The objective of monitoring programmes is to assess to what extent the closure criteria are being achieved during rehabilitation and closure and to identify corrective actions in situations where the closure criteria are not being achieved, or the progress towards achievement is not satisfactory. These programmes are thus directly aligned with the criteria. The programmes shall comprise the following, and it is the responsibility of a suitably qualified and experienced person to ensure that these requirements are adhered to:

- Ensure that relevant financial resources are made available for required monitoring programmes;
- Documented procedures are in place which provide step by step instructions on how monitoring should be undertaken;
- Appoint appropriately qualified specialists to undertake the monitoring in a timeous manner to ensure work can be carried out to acceptable standards;
- Make use of appropriately calibrated equipment, and where samples require analysis, they shall be preserved according to laboratory specifications;
- Make use of an independent and accredited laboratory to analyse samples and internal laboratory results shall periodically be checked by independent and accredited laboratories;
- Interpret monitoring data and trends of the data, and communicate to all relevant internal and external stakeholders, taking into consideration requirements of any licences;
- Maintain monitoring records for at least 50 years post-monitoring events; and
- Monitoring programmes shall be reviewed for applicability post-monitoring events, and this shall be done in consultation with relevant specialists and stakeholders.

Following the completion of closure activities, monitoring should be carried out to document and evaluate the effectiveness of the closure activities at meeting agreed closure objectives and to demonstrate that success criteria are being met, or on a pathway to be met. Monitoring

of sites against success criteria may lead to the identification of maintenance needs. Rehabilitated areas may also need to be managed as part of the broader ecosystem (ICMM, 2019).

13. CONCLUSION

Regulations Reference: (m)(i)	**This Section includes the motivations for any amendments made to the final rehabilitation, decommissioning, and mine closure plan, given the monitoring results in the previous auditing period and the identification of gaps, where applicable.**

Refining the closure planning process for Marula Mine, including the proposed Solar PV Facility, is an ongoing process, and the Rehabilitation, Decommissioning and Mine Closure Plan should be seen as a working document based on the best and most recent available information. Any deviation from the current Rehabilitation and Closure criteria, which is used for costing purposes, may have a significant impact on future liability estimates. Therefore, updating the closure cost estimate should be done in conjunction with the review and update of the Rehabilitation and Closure criteria, as well as the update of the Annual Rehabilitation Plan and the Latent and Residual Risk Assessment.

The Marula Solar PV Facility Rehabilitation, Decommissioning and Mine Closure Plan and all its supporting documentation (Appendices) is the product of a dynamic approach and should be reviewed regularly to ensure that all aspects and associated costs are taken into consideration. It is important that all the information be incorporated into all mining strategies, planning and operational processes. This will ensure that the objectives set out within the plan are reached and provide potential opportunities to reduce closure costs.

Notwithstanding the assumptions made and certain gaps that remain, if the closure measures are implemented as envisaged, the reflected costs provide a good indication of the closure liability estimates and should provide a good basis for making the required financial provision. The biophysical and physical closure costs calculated are applicable to closure situations as well as concurrent rehabilitation during the operational phase (when applicable).

Social closure costs are applicable during the operational phase until closure and post-closure. Social cost estimates are reflective of studies that need to be undertaken to determine actual closure costs as per determined closure criteria. The actual social closure costs, therefore, will be determined by an update of this plan.

14. REFERENCES

(2018). Retrieved from www.implats.co.za.

Acocks, P. H. (1953). Veld Types of South Africa. *In Government Printer Botanical Memoirs*, 13.

Agreenco. (2020). *Marula Platinum, Alien and Invasive Plant Assessment Technical Note: IPM_AIP200403 .*

Agreenco. (2022). *Marula Platinum: Operational Report for TSF Plume in-situ Bioremediation.*

Agreenco. (2023). *Marula Platinum : Operational Report for TSF Plume in-situ Bioremediation.*

Agreenco Environmental Projects. (2016). *Marula Platinum TSF Complex: Ecosystem Function Assessment (EFA) and Invasive Alien Plants Demarcation .* Agreenco Environmental Projects.

Alberts, R., Wessels, J. A., Morrison-Saunders, A., McHenry, M. P., Sequeira, A. R., Mtegha, H., & Doepel, D. (2017). Complexities with extractive industries regulation on the African continent: What has 'best practice'legislation delivered in South Africa? *The Extractive Industries and Society, 4(2)*, 267-277.

Andrade, P., da Luz, J. A., Campos, A. S., & de Lima, H. M. (2016). Cumulative impact assessment on air quality from multiple open pit mines. *Clean Technologies and Environmental Policy, 18(2)*, 483-492.

Aneja, V., Isherwood, A., & Morgan, P. (2012). Characterization of particulate matter (PM10) related to surface coal mining. *Atmospheric Environment*, 496-501.

Aquatico Scientific. (2021). *Marula Platinum Monthly Dust Fall-Out Monitoring: February 2021.*

Aquatico Scientific. (2021). *Marula Platinum Monthly Water Quality Report February 2021.*

Aquatico Scientific. (2022). *Marula Platinum Mine Quarterly Water Quality Report Quarter 3.*

Aquatico Scientific. (2022). *Marula Platinum Quarterly Water Quality Report.*

Aquatico Scientific. (April 2022). *Marula Platinum Monthly Water Quality Report.* Aquatico Scientific.

Chamber of Mines of South Africa/Coaltech. (2007). *Guidelines for the Rehabilitation of Mined Land.* Johannesburg: Chamber of Mines of South Africa/Coaltech.

Chaulya, S. K., Ahmad, M., Singh, R. S., Bandopadhyay, L., Bondyopadhay, C., & Mondal, G. C. (2003). Validation of two air quality models for Indian mining conditions. *Environmental monitoring and assessment, 82(1)*, 23-43.

Chitiga-Mabugu, M., Henseler, M., Mabugu, R., & Maisonnave, H. (2021). Economic and Distributional Impact of COVID-19: Evidence from Macro-Micro Modelling of the South African Economy. *South African Journal of Economics*, 89(1), 82-94.

de Zwart, D. (1995). Monitoring water quality in the future, Volume 3: Biomonitoring.

Department for Rural, Environment and Agricultural Development. (2015). *North West Biodiversity Sector Plan.* Department for Rural, Environment and Agricultural Development, North West Province.

Dix, R. (1961). An Application of the Point-centered Quarter Method to the Sampling of Grassland Vegetation. *Rangeland Ecology & Management/Journal of Range Management Archives, 14(2)* , 63-69.

DMRE. (2005). *Department of Mineral Resources.*

DWA. (2012). *The Annual National State of Water Resources Report.* South Africa: Department of Water Affairs.

EcoAfrica. (2016). *Limpopo Environmental Outlook Report Chapter 6: Human Settlements for the Limpopo Province, South Africa.* EcoAfrica.

EcoAfrica. (2016). *Limpopo Environmental Outlook Report: Chapter 4: Biodiversity and Ecosystem Health for.*

EcoAgent. (2010). *A Biodiversity Action Plan for the Marula Platinum Mine, Burgersfort, Limpopo Province.* EcoAgent.

E-TEK. (2023). *SLR - Marula Solar Plant - EIA - Technical Memorandum.*

Gouma, S., Fragoeiro, S., Bastos, A. C., & Magan, N. (2014). 13 - Bacterial and Fungal Bioremediation Strategies. *Microbial Biodegradation and Bioremediation*, 301-323.

Groundwater Complete. (2021). *Impala Platinum Holdings – Marula Platinum Mine Numerical Groundwater Impact Modelling.*

ICMM. (2019). *Integrated Mine Closure, Good Practice Guide, 2nd Edition.* International Council of Mining and Metals.

Implats . (2015). *Implats Mineral Resources and Mineral Reserves.* Implats.

Implats. (2016). *Operational review - Marula.* Implats.

Implats. (2017). *Group policies and key documents: Implats*. Retrieved from Implats Web site: http://www.implats.co.za/implats/Group-policies-key-documents.asp

Implats. (2019). *Sustainable Key Development Documents: Implats Environmental Policy Statement*. Retrieved from Implats Web site: https://www.implats.co.za/pdf/sustainable-key-development-documents/implats-environmental-policy-statement-final-feb-2019.pdf

Implats. (2020). *June 2020 market update.* Implats.

Implats. (2021). *Implats*. Retrieved from Implats Operations: https://www.implats.co.za/operations.php

Implats. (2022). *Implats Fact Sheet.* Implats.

Implats. (2022). *Sustainable Key Development Documents: Implats Environmental Policy Statement.*

JG Afrika. (2020). *Marula Platinum: FY2021 Aquatic Biomonitoring Report (Wet Season): Low Flow Survey.*

JG Afrika. (2021). *Marula Platinum: FY2021 Aquatic Biomonitoring Report (Wet Season): High Flow Survey.*

Jowitt, S. M. (2020). COVID-19 and the Global Mining Industry. *SEG Discovery*, (122), 33-41.

Limpopo Provincial Treasury. (2019). *Limpopo Socio-Economic Review and Outlook.*

Low, A. B., & Rebelo, A. G. (1996). Vegetation of South Africa, Lesotho and Swaziland. *Department of Environmental Affairs and Tourism*.

Marine Mountain Environmental Consultants. (2022). *Marula Platinum Mine Biomonitoring Report Wet Season.*

Marula Platinum Mine. (2016). *Fact Sheet: Marula.* Marula Platinum Mine.

Marula Platinum Mine. (2018). *Social and Labour Plan.* Implats.

McCarthy, T., & Rubidge, B. (2005). *The Story of Earth & Life: A southern African perspective on a-billion-year journey.* Cape Town: Struik Nature.

Metago Environmental Engineers . (2007). *Environmental Impact Assessment and Environmental Management Programme for Marula Platinum Mine.* Johannesburg: Metago.

Metago Environmental Engineers. (2012). *EIA and EMP Report for the Proposed Tailings Scavenger Plant, Two Additional Ventilation Shafts and the extension of Underground Mining Activities to include the Farm Hackney 116KT and a portion of the Farm Driekop 253KT.*

Metago Environmental Engineers. (2012). *EIA and EMP Report for the Proposed Tailins Scavenger Plant, Two Addiotional Ventilation Shafts and the extension of Underground Mining Activities to include the Farm Hackney 116KT and a portion of the Farm Driekop 253KT.*

Mineral and Petroleum Resources Development Act 28 of 2002. (n.d.).

Monroe, J. S., Wicander, R., & Hazlett, R. (2007). *Physical Geology: Exploring the Earth.* Belmont: Thomson Books/Cole.

Mucina, L., & Rutherford, M. C. (2006). Conservation of Quiver Trees in Namibia and South Africa under a Changing Climate. *Journal of Geoscience and Environment Protection*.

Mucina, L., & Rutherford, M. C. (2006). *The Vegetation of South Africa, Lesotho and Swaziland.* Pretoria: SANBI.

Municipalities of South Africa. (2023). *Provincial Government*. Retrieved from Municipalities of South Africa: https://municipalities.co.za/overview/127/sekhukhune-district-municipality

National Department of Health. (2021). *SA Coronavirus*. Retrieved from Update on Covid-19 (11th May 2021): https://sacoronavirus.co.za/2021/05/11/update-on-covid-19-11th-may-2021/

National Department of Health. (2022). *SA Coronavirus Update on Covid-19 (23 May 2022).*

National Institute for Communicable Diseases. (2021). *National Institute for Communicable Diseases*. Retrieved from COVID-19 Update: https://www.nicd.ac.za/covid-19-update-50/

North West Provincial AIDS Council. (2016). *ANNUAL PROGRESS REPORT 2014/15.* North West Provincial AIDS Council.

Ragab, R., & Prudhomme, C. (2002). Sw—soil and Water: climate change and water resources management in arid and semi-arid regions: prospective and challenges for the 21st century. *Biosystems engineering*.

Redco. (2008). *MARULA PLATINUM MINE.* Potchefstroom: Redco.

Siebert, S. J., van Wyk, A. E., & Bredenkamp, G. J. (2002). The physical environment and major vegetation types of Sekhukhuneland, South Africa. *South African Journal of Botany*, 127 - 142.

SLR. (2023). *Scoping Report for the Proposed Establishment of a Solar PV Plant at Marula Platinum Mine.*

SRK Consulting. (2018). *Memo on Groundwater Status at Marula Platinum Mine.*

SRK Consulting. (2020). *Quarterly Monitoring Report for Marula Mine: Data submission for Quarter 1 (September 2020).*

Statistics SA. (2019). *Mid-year population estimates: 2019.*

Statistics SA. (2020). *Statistics SA*. Retrieved from 2020 Mid-year population estimates: http://www.statssa.gov.za/?p=13453

Statistics SA. (2022). *Mid-year population estimates.*

Statistics South Africa. (2015). *National and provincial labour market: Youth.* Statistics South Africa.

Statistics South Africa. (2016). *Mid-year population estimates .* Statistics South Africa.

Statistics South Africa. (2017). *Mid-year population estimates 2017.* Stats SA.

StatsSA. (2022, June 28). *Covid-19 reduces life expectancy in 2021*. Retrieved from statssa.gov.za: https://www.statssa.gov.za/?p=14519

Tongway, D. J., & Hindley, N. L. (2004). *Landscape Function Analysis: Procedures for monitoring and Assessing Landscapes.* Canberra: CSIRO.

Trade & Industrial Policy Strategies (TIPS). (2016). *Provincial Review 2016: Limpopo.* TIPS. Retrieved from Trade & Industrial Policy Strategies (TIPS) Web site.

Treasury, L. P. (2022). *Quarterly Economic Bulletin.* Provincial Government Republic of South Africa.

Van Oudtshoorn, F. (2015). *Veld Management Principles and Practices.* Pretoria: Briza Publications.

van Oudtshoorn, F. (2023). *Assessment Report Marula Platinum Mine Tailings Dam 1.*

Verstraete, M., & Schwartz, S. (1991). Desertification and global change.In.Henderson-Sellers, A. &Pitnman, A.J. (Ed.). 1991. Vegetation and climate interactions in semi-arid regions. *Vegetation and climate interactions in semi-arid regions*.

Zimpande Research Collaborative. (2021). *Soil, Land Use, Land Capability And Agricultural Potential Assessment As Part Of The Environmental Impact Assessment (EIA) And Authorisation Process For The Proposed Ventilation Shafts At Marula Platinum Mine, Limpopo Province.*

APPENDICES

DOCUMENT SIGN-OFF

CONSULTANT SIGNATORIES:

[INSERT SIGNATURE]

Jeanette Erasmus

Director & Environmental Manager

[INSERT SIGNATURE]

Leon Koekemoer

Director & Senior Estimator

CLIENT SIGNATORIES:

[INSERT SIGNATURE]

Chané Coetzee

Associate Environmental Consultant

E-TEK DOCUMENT PRECINCTS

This Document provided by E-TEK Consulting (the consultant) is subject to the following:

i. This Document has been prepared for the particular purpose outlined in the consultant's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.

ii. The scope and the period of the consultant's Services are as described in the consultant's proposal and are subject to restrictions and limitations. The consultant did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by the consultant regarding it.

iii. Conditions may exist which were undetectable given the limited nature of the enquiry the consultant was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been considered in the Document. Accordingly, additional studies and actions may be required.

iv. In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. The consultants' opinion is based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed the consultant to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

v. Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included; and either expresses or implies that the actual conditions will conform exactly to the assessments contained in this Document.

vi. Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by the consultants for incomplete or inaccurate data supplied by others.

vii. The Client acknowledges that the consultants may have retained sub-consultants affiliated with them to provide Services for the benefit of the consultants. The consultants will be fully responsible to the Client for the Services and work done by all its sub-consultants and subcontractors. The Client agrees that it will only assert claims against and seek to recover losses, damages, or other liabilities from the consultants and not the consultants' affiliated companies. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any legal recourse, and waives any expense, loss, claim, demand, or cause of action, against the consultants' affiliated companies, and their employees, officers, and directors.

viii. This Document is provided for sole use by the Client and is confidential to it and its professional advisers. No responsibility whatsoever for the contents of this Document will be accepted to any person other than the Client. Any use which a third party makes of this Document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. The consultants accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Document.