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EIA REPORT

PROPOSED HARMONY WEST WITS RECLAMATION AND DEPOSITION PROJECT AND ASSOCIATED INFRASTRUCTURE

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Appendix B: EAP CV

Appendix C: Public Participation

Appendix D: Specialist Reports

Appendix E: Draft Offset strategy

Appendix F: Final Decommissioning, Rehabilitation and Closure Plan

Appendix G: Impact Assessment Matrix

Appendix H: DFFE Screening Tool Reports and Site Sensitivity Verification Report

Appendix I: EMPr

Appendix J: Additional Engineering Information

ACRONYMS AND ABBREVIATIONS

AIP	:	Alien Invasive Plant
AQSR	:	Air Quality Sensitive Receptors
ASTM	:	American Standard Testing Methodology
ATD	:	Alternative Tailings Disposal Methods
CA	:	Competent Authority
CARA	:	Conservation of Agricultural Resources Act, 1983
CBA	:	Critical Biodiversity Area
CLO	:	Community Liaison Officer
CMA	:	Catchment Management Agency
CMS	:	Catchment Management Strategy
CN	:	Free Cyanide
CR	:	Critically Endangered
CWAC	:	Coordinated Waterbird Counts
DFFE	:	Department of Forestry, Fisheries and the Environment (previously DEA)
DMRE	:	Former Department of Mineral Resources and Energy (now DMPR)
DMPR	:	Department of Mineral and Petroleum Resources
DMP	:	Dust Management Plan
DWS	:	Department of Water and Sanitation
EA	:	Environmental Authorisation
ECA	:	Environmental Conservation Act
EAP	:	Environmental Assessment Practitioner
EIA	:	Environmental Impact Assessment
EIMS	:	Environmental Impact Management Services (Pty) Ltd
EN	:	Endangered
ESHIA	:	Environmental, Social, and Health Impact Assessment
EMPr	:	Environmental Management Programme
ERP	:	Emergency Response Plan
ESA	:	Ecological Support Area
FPA	:	Fire Protection Agency
GA	:	General Authorisation
Ga	:	Giga-annum
GBIF	:	Global Biodiversity Information Facility
GDARDE	:	Gauteng Department of Agriculture, Rural Development and Environment
GDENV	:	Gauteng Department of Environment
GHG	:	Greenhouse Gas

GIS	:	Geographic Information System
GISTM	:	Global Industry Standard for Tailings Management
GN	:	Government Notice
HDPE	:	High Density Polyethylene
HIA	:	Heritage Impact Assessment
I&AP	:	Interested and Affected Party
IAEA	:	International Atomic Energy Agency
IDP	:	Integrated Development Plan
IEM	:	Integrated Environmental Management
IFC	:	International Finance Corporation
IUCN	:	International Union for Conservation of Nature
IWULA	:	Integrated Water Use License Application
K	:	Hydraulic Conductivity
LC	:	Leachable Concentration / Least Concern
LED	:	Local Economic Development
LM	:	Local Municipality
LOM	:	Life of Mine
MAE	:	Mean Annual Evaporation
MAP	:	Mean Annual Precipitation
mbc	:	Meters Below Casing
MAR	:	Mean Annual Runoff
MHI	:	Major Hazard Installation
MISS	:	Microbially Induced Sedimentary Structures
ML	:	Megalitre
MPRDA	:	Minerals and Petroleum Resources Development Act, 2002
MP	:	Moderately Protected
MR	:	Mining Right
MSDF	:	The Merafong Municipal Spatial Development Framework
MT	:	Megatonnes
NAAQS	:	National Ambient Air Quality Standards
NB	:	Nominal Bore
NCR	:	Noise Control Regulations
NAEIS	:	National Atmospheric Emissions Inventory System
NDP	:	National Development Plan
NEM:AQA		National Environmental Management: Air Quality Act, 2004
NEM:WA	:	National Environmental Management: Waste Amendment Act, 2008

NEMA	:	National Environmental Management Act, 1998
NEMBA	:	National Environmental Management: Biodiversity Act, 2004
NFEPA	:	National Freshwater Priority Areas
NGO	:	Non-Governmental Organization
NHRA	:	National Heritage Resources Act, 1999
NORM	:	Naturally Occurring Radioactive Material
NNR	:	National Nuclear Regulator
NRWMP	:	National Radioactive Waste Management Policy
NT	:	Near Threatened
NWA	:	National Water Act, 1998
PA	:	Protected Area
PAOI	:	Project Area of Influence
PHRA	:	Provincial Heritage Resources Authority
PIA	:	Palaeontological Impact Assessment
POI	:	Point of Interest
PPP	:	Public Participation Process
PP	:	Poorly Protected
Ptn	:	(Farm) Portion
RE	:	Remaining Extent
REC	:	Recommended Ecological Category
RWD	:	Return Water Dam
S	:	Storativity
SAPS	:	South African Police Services
SAHRA	:	South African Heritage Resources Agency
SANS	:	South African National Standards
SCC	:	Species of Conservation Concern
SDF	:	Spatial Development Framework
SIA	:	Social Impact Assessment
SLP	:	Social & Labour Plan
SO_4	:	Sulphate
SSVR	:	Site Sensitivity Verification Report
SPLUMA	:	Spatial Planning and Land Use Management Act
SWMP	:	Stormwater Management Plan
SWSA	:	Strategic Water Source Areas
T	:	Transmissivity
TC	:	Total concentration

TDS	:	Total Dissolved Solids
TIA	:	Traffic Impact Assessment
TSF	:	Tailings Storage Facility
U	:	Uranium
VIA	:	Visual Impact Assessment
VU	:	Vulnerable
WMA	:	Water Management Area
WML	:	Waste Management License
WP	:	Well-Protected
WRD	:	Waste Rock Dump
WRDM	:	West Rand District Municipality
WULA	:	Water Use License Application
WUL	:	Water Use License

EXECUTIVE SUMMARY

Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as the applicant) has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to assist with undertaking the required authorisation processes (including the statutory public participation), and to compile and submit the required documentation in support of an application for a proposed new West Wits Reclamation and Deposition Project. The West Wits project consists of the proposed Deelkraal II Tailings Storage Facility (TSF) and associated infrastructure on a site located approximately 13km southwest of Carletonville in the Merafong City Local Municipality, West Rand District Municipality, Gauteng Province.

The Applicant requires additional deposition capacity for West Wits region's operations. The applicant plans on constructing the Deelkraal II Tailings Storage Facility (TSF) to cater for the additional future capacity. The proposed Deelkraal II TSF will cover an area of approximately 430 ha. This TSF will receive residue from Kusasalethu, and Savuka plants and will also assist in returning process water for reclaiming the existing Deelkraal I TSF and Kusasalethu TSF for processing at Kusasalethu plant and returning process water to Savuka Gold Plant. Additional planned infrastructure includes various slurry, potable, process and return water pipelines, access roads, power lines, pump stations and new return water dams. Proposed upgrades to the existing Kusasalethu plant are also proposed as part of the project.

EIMS will compile and submit the required documentation in support of an application for:

- Environmental Authorisation (EA) and Waste Management License (WML) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998)- Listed activity: Listing Notice 2, Activity 6 and 15 and various Listing Notice 1 and 3 activities as well as the National Environmental Management: Waste Act – NEMWA (Act 59 of 2008)- Activity B7, B10 and B11;
- Water Use License (WUL) in accordance with the National Water Act – NWA (Act 36 of 1998). Water uses: Section 21 (c), Section 21 (i) and Section 21 (g). A separate application for a Water Use License (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers; and
- An Air Emissions License (AEL) in Accordance with the National Environmental Management: Air Quality Act, 2004 will be lodged for the planned plant upgrades.

PURPOSE OF THE EIA REPORT

The purpose of the EIA process is to:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Scoping report;
- Identify the location of the development footprint within the approved site as contemplated in the accepted Scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- Determine nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives and the degree to which these impacts can be reversed, may cause irreplaceable loss of resources and can be avoided, managed or mitigated;
- identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted Scoping report based on the lowest level of environmental sensitivity identified during the assessment;

- identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted Scoping report through the life of the activity;
- identify suitable measures to avoid, manage or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

PUBLIC PARTICIPATION PROCESS

The Public Participation Process (PPP) for the proposed project has been, and will continue to be, undertaken in accordance with the requirements of the National Environmental Management Act (NEMA) in line with the principles of Integrated Environmental Management (IEM). The PPP commenced on 6 February 2026 with an initial notification and call to register as interested and affected parties (I&APs). The comments received from I&APs during the initial call to register and commenting period so far have been captured in Public Participation Report in Appendix C.

Comments received during this EIA Report review period will also be collated and added to the Public participation report submitted to the Competent Authority (CA) with the Final EIA Report, including an EMPr, for decision-making.

This EIA Report is being made available for public review and comment for a period of 30 days.

PROJECT ALTERNATIVES

The TSF site selection demonstrated application of the mitigation hierarchy, with clear evidence of avoidance, minimization, and rehabilitation measures being prioritized and integrated into project planning. No other reasonable or feasible site alternatives could be identified due to space constraints and sensitivities identified around the site. The current Deelkraal II site is therefore considered the only suitable site for the TSF, given the volumes and space requirements within Harmony land and the disadvantages of the alternative sites.

Currently cyclone deposition is the vastly preferred method of deposition for the majority of Harmony's current TSF operations due to the reasons described above. The environmental impacts associated with each deposition method are similar however cyclone deposition has higher water recovery rates and is also preferred from a geotechnical perspective. The Deelkraal II TSF will be designed to utilize cyclone deposition.

From the outcomes of the specialist assessments Pipeline and Powerline Corridor 1 (southern corridor) is preferred due to lower impacts on wetlands and terrestrial biodiversity aspects. Corridor 1 is also preferred from a technical feasibility perspective and to avoid going through earmarked private solar development planned for adjacent Corridor 2. No preferences were presented in any of the specialist studies for Corridor 2. Corridor 1 (southern piping and powerline corridor) is therefore nominated as the preferred alternative.

It is expected that a liner such as the inverted barrier system will be suitable to prevent any potential contaminant impact on the groundwater in the immediate area. Based on the significant benefits as a result of lining the TSF the lined option is preferred.

Various iterations have been undertaken subsequent to the original layout provided for assessment in the EIA phase. All topsoil stockpiles, construction laydown areas and the Kusasalethu TSF reclamation pump station have been relocated from the original layout provided to avoid the wetlands and high sensitivity SEI areas as far as possible. The final layout presented in **Figure 70** and **Figure 71** of this report presents the most suitable layout for the project based on all identified technical and environmental constraints.

Deelkraal II TSF will also cater for reworking of multiple TSFs across the West Wits area which would have a significant positive impact. TSFs will be reworked and processed at Kusasalethu and Savuka plants. These TSFs will be fully reclaimed and then fully rehabilitated in the future. This will also allow Harmony to manage a single large TSF rather than having to deal with numerous smaller TSF sites, which should also improve the management related to the various environmental and social issues of the existing TSFs in the region. These opportunities will be lost if the project does not proceed. As such, the no go alternative is not considered feasible or reasonable.

ENVIRONMENTAL IMPACT ASSESSMENT

Each of the identified risks and impacts at the various project phases were assessed. The assessment criteria include the nature, extent, duration, magnitude / intensity, reversibility, probability, cumulative impact, and irreplaceable loss of resources.

The key negative and positive impacts have been assessed in this EIA report. Potential mitigation measures have been identified and have been refined based on input from the Environmental Assessment Practitioner (EAP), public consultation, and specialist assessments during the EIA phase of the project. The associated EMPr identifies appropriate mitigation mechanisms for avoidance, minimisation and / or management of the negative impacts and enhancement of the positive aspects.

The most significant risks and impacts identified were those that remain high or moderately high in terms of significance even post mitigation measures being considered. The following identified impacts were determined to have a potentially moderate - high final significance:

- Surface water impacts from potential pollutants during closure;
- Decreased runoff during construction and operation;
- Degradation and demolition of wetlands due to TSF and intersecting infrastructure during construction and operation;
- Climate change impacts during operation;
- Destruction, further loss and fragmentation of the habitats and loss of SCC during construction;
- Destruction of non-resilient habitats during construction;
- TSF breaking the dam wall, resulting in massive sudden uncontrolled flood of liquid sludge;
- Employment, skills development and procurement opportunities during construction;
- Safety, Crime and theft during construction phase;
- Displacement and loss of livelihoods during construction phase; and
- Fear of failure during operation phase.

There are certain impacts, with respect to terrestrial biodiversity specifically, which retain a high residual impact after applying all reasonable and feasible mitigation. This implies or introduces the need for an offset to cater for these key residual impacts. Avoidance of certain sensitive areas has taken place with subsequent refinements to the project layout however complete avoidance of certain sensitive areas is not possible and an offset for these specific aspects will be required.

CONCLUSIONS AND RECOMMENDATIONS

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that all the recommended mitigation and management measures are implemented and resolution and agreement on any required biodiversity offsets are in place prior to construction commencing. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the findings of the EIA studies, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Despite the negative impacts caused by the TSF, it must be considered that there are positive impacts through tailings reclamation and rehabilitation employment opportunities and Social & Labour Plan (SLP) initiatives. Based on the nature and extent of the proposed project and the predicted impacts as a result of the construction, operation and closure of the facility, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential environmental impacts, it is the opinion of the EIA project team



that the environmental impacts associated with the application for the proposed West Wits Reclamation and Deposition project can be mitigated to an acceptable level and the project should be authorized.

1 INTRODUCTION

Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as the applicant) has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to assist with undertaking the required authorisation processes (including the statutory public participation), and to compile and submit the required documentation in support of an application for a proposed new West Wits Reclamation and Deposition Project. The West Wits project consists of the proposed Deelkraal II Tailings Storage Facility (TSF) and associated infrastructure on a site located approximately 13km southwest of Carletonville in the Merafong City Local Municipality, West Rand District Municipality, Gauteng Province.

The Applicant requires additional deposition capacity for West Wits region's operations. The applicant plans on constructing the Deelkraal II Tailings Storage Facility (TSF) to cater for the additional future capacity. This TSF will receive residue from Kusasalethu, and Savuka plants and will also assist in returning process water for reclaiming the existing Deelkraal I TSF and Kusasalethu TSF for processing at Kusasalethu and Savuka plants. Additional planned infrastructure includes various slurry, potable, process and return water pipelines, access roads, power lines, two new reclamation pump stations, a new main return water dam to the northeast of the Deelkraal II TSF as well as two smaller return water dams adjacent to Deelkraal II TSF to the east and south. Proposed upgrades to the existing Kusasalethu plant (currently under care and maintenance) are also proposed as part of the project.

The proposed TSF will cover an area of approximately 430 ha as shown in **Figure 1**. The proposed slurry and process water / potable water pipelines will be flanged steel pipelines installed above-ground on pre-cast concrete plinths and two 3.5m wide access roads (double road), adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections (in areas where no access road is already in place).

In addition to the Deelkraal II TSF, additional infrastructure is also proposed, as follows:

- A new main Return Water Dam (RWD) in the vicinity of the Deelkraal II TSF;
- Two smaller RWDs due to topography in the vicinity of the Deelkraal II TSF;
- Upgrades to the existing Kusasalethu plant including new/upgrade of gold and new uranium sections;
- Slurry pipelines:
    - Reclaimed Slurry from Deelkraal I to Kusasalethu plant (~10,6km);
    - Kusasalethu Barren Tailings to Deelkraal II (~10,2km);
    - Reclaimed Slurry from Kusasalethu TSF to Kusasalethu Plant (~2km);
    - Slurry pipeline from Kusasalethu Plant to Savuka TSF (~4,97km) enabling treatment of either the Deelkraal 1 or Kusasalethu TSF's; and
    - Slurry pipeline from Savuka plant to DF5 TSF (~2,9km).
- Process Water Pipelines:
    - Process Water Feed from Kusasalethu Plant to Deelkraal I Reclamation (~9.54km)
    - Return Water Feed to Deelkraal I TSF Reclamation station and Kusasalethu Process Water Tank (~9,58km);
    - Driefontein DP3 Pump Station to North Boundary Dam (~4,78km);
    - DP3 feed to Tau Tona Reverse Osmosis Plant (~0,1km);
    - Nursery Pumpstation #3 to Kusasalethu Process Water Tank (~9km); and
    - 2 Process Water pipelines from Kusasalethu Plant to Savuka White Tanks (~8km).

- Powerlines (all proposed powerlines will be 22kV or lower):
    - Powerline from Kusasalethu Plant to the existing Deelkraal I and II TSF (~9.2km);
    - Powerline from Kusasalethu Plant to the Kusasalethu TSF (~1.8km); and
    - Powerline from Savuka shaft to Kusasalethu (~8.1km) and or tie into powerline from Kusasalethu Plant to the existing Deelkraal I and II TSF.
- Potable Water pipeline from Rand Water supply point to the Deelkraal TSF (~8.52km).
- Deelkraal I TSF Reclamation Pump Station and Kusasalethu TSF Reclamation Pump Station.
- New Access Roads (2x3,5m double road) adjacent to pipeline routes/OH lines and around Deelkraal II TSF (where no access road is already in place).
- Topsoil Stockpiles and overburden stockpiles.
- Ancillary construction infrastructure including ablutions, workshops and laydown areas, most of which would be temporary and removed at the end of construction.

EIMS will compile and submit the required documentation in support of an application for:

- Environmental Authorisation (EA) and Waste Management License (WML) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998) for various triggered waste activities.
- Water Use License (WUL) in accordance with the National Water Act – NWA (Act 36 of 1998). A separate application for a Water Use License (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers.
- An Air Emissions license in Accordance with the National Environmental Management: Air Quality Act, 2004 will be lodged for the planned plant upgrades.

Refer to Section 4 of this report for further details with respect to specific and listed activities being applied for.

The following details are relevant to the current application:

- Infrastructure will include the TSF and associated infrastructure as indicated above.
- The TSF itself will cover a total area of up to 430 ha;
- Tailing deposition method to be used: cyclone deposition.
- The current design scope of the TSF is based on a height of 65m.
- The TSF barrier system is determined in consultation with the authorities and will follow relevant norms and standards for determination of liner requirements. An inverted barrier system is proposed.

1.1 REPORT STRUCTURE

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

Table 1: Report structure

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 3(a):	Details of – i. The EAP who prepared the report; and ii. The expertise of the EAP, including a curriculum vitae;	1
Appendix 3(b):	The location of the activity, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties on which the activity is to be undertaken; Se	2
Appendix 3(c):	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is - (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	3
Appendix 3(d):	A description of the scope of the proposed activity, including (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	3
Appendix 3(e):	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	4
Appendix 3(f):	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;	5
Appendix 3(g):	A motivation for the preferred development footprint within the approved site;	6
Appendix 3(h):	A full description of the process followed to reach the proposed development footprint within the approved site, including: (i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts	6



Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
	(aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the preferred alternative development location within the approved site;	
Appendix 3(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	9.1
Appendix 3(j)	An assessment of each identified potentially significant impact and risk, including (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated;	9.3
Appendix 3(k):	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	12.1
Appendix 3(l):	An environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment:	12.3



Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	
Appendix 3(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	9.3
Appendix 3(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	12.2
Appendix 3(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	12.4
Appendix 3(p)	Description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	13
Appendix 3(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	12.3 and 12.4
Appendix 3(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	N/A – activity includes operational aspects
Appendix 3(s)	An undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	14
Appendix 3(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	11
Appendix 3(u)	An indication of any deviation from the approved scoping report, including the plan of study, including (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	N/A – no deviation from PoS

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 3(v)	Any specific information that may be required by the competent authority; and	N/A – no additional information requested
Appendix 3(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act	N/A – none required

1.2 DETAILS OF THE EAP

EIMS is appointed by the applicant as the independent EAP and to assist in preparing and submitting the EA&WML application, Scoping and EIA Reports, and undertaking a Public Participation Process (PPP) in support of the proposed tailings storage facility. The contact details of the EIMS consultant and EAP who compiled this Report are as follows:

Name: John von Mayer

Tel No: +27 11 789 7170

Fax No: +27 86 571 9047

Project E-mail address: westwits@eims.co.za

In terms of Regulation 13 of the EIA Regulations (GN R. 982) as amended, an independent EAP, must be appointed by the applicant to manage the application. EIMS is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations, as well as Section 1 of the NEMA. This includes, inter alia, the requirement that EIMS is:

- Objective and independent;
- Has expertise in conducting EIAs;
- Comply with the NEMA, the environmental regulations and all other applicable legislation;
- Considers all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

EIMS is a private and independent environmental management consulting firm that was founded in 1993. EIMS has in excess of 32 years' experience in conducting EIAs, including many EIAs for mines and mining related projects. Please refer to the EIMS website (www.eims.co.za) for company details and examples of EIA documentation currently available.

John von Mayer is a principal consultant at EIMS and has been involved in numerous large projects the past 16 years. He has experience in Project Management, small to large scale Environmental Impact Assessments, Environmental Auditing, Water Use Licensing, and Public Participation. He is a Registered Professional Natural Scientist (400336/11) with the South African Council Natural and Scientific Professions (SACNASP) as well as a registered Environmental Assessment Practitioners Association of south Africa (EAPASA) Environmental Practitioner (2019/1247). The Curriculum Vitae of the EAP that is responsible for the compilation of this Report is included in Appendix B.

1.3 SPECIALIST CONSULTANTS

Specialist studies have been undertaken to address the key impacts that require further investigation and these include:

- Biodiversity (Terrestrial);
- Aquatic and Wetland;
- Heritage;
- Palaeontology;
- Agriculture Potential, Soils and Land capability;
- Geohydrology;
- Climate Change;



- Air quality;
- Noise;
- Visual;
- Hydrological;
- Social;
- Health Risk and Radiological; and
- Closure Costing.

Engineering inputs have been obtained to inform the design of the TSF. A closure assessment including a cost assessment is also included as part of the studies conducted during the EIA phase.

The specialist studies listed above involved the gathering of data relevant to identifying and assessing environmental impacts that may occur because of the proposed project. These impacts were assessed according to pre-defined impact rating methodology (Section 9.1).

2 DESCRIPTION OF THE PROPERTY

Table 2 indicates the farm portions that fall within the proposed project including details on the project location as well as the distance from the proposed project area to the nearest towns.

Table 2: Locality details

<table>
<tr><td>Application Area (Ha) and Infrastructure extent</td><td colspan="3">The following areas / footprints and distances are relevant:
Approximately 430 ha for the TSF footprint.
Approximately 13 ha for new main Return Water Dam.
Approximately 3 hectares combined area for two smaller Return Water Dams.
Approximately 30 km of new slurry pipelines (with a 4 m wide servitude)
Approximately 25 km of new process and potable water pipelines (with a 4 m wide servitude)
Approximately 15 km of new 7,5m wide access roads
Approximately 18 km of new powerlines.
Approximately 4 ha combined area for new reclamation pump stations.
Approximately 65 ha for new topsoil / overburden stockpiles.
Approximately 35 ha total for the various associated construction laydown areas.
Planned upgrades to the Kusasalethu plant will all be within the existing plant or shaft footprint.</td></tr>
<tr><td>Magisterial District</td><td colspan="3">Merafong City Local Municipality within the West Rand District Municipality (Gauteng Province).</td></tr>
<tr><td>Distance and direction from nearest towns</td><td colspan="3">The site is approximately 13km southwest of Carletonville. The geographic coordinates at the centre of the proposed Deelkraal II TSF site are 26°28'10.51"S, 27°16'56.07"E.</td></tr>
<tr><td rowspan="11">Property Details</td><td>Farm Name:</td><td>Portion:</td><td>21 Digit Surveyor General Code</td></tr>
<tr><td colspan="3">Deelkraal II TSF and associated reclamation pump station, RWDs and associated laydown areas and roads around TSF
Centre point: 26°27'58.21"S, 27°17'32.72"E.</td></tr>
<tr><td>Kleinfontein 141 IQ</td><td>2</td><td>T0IQ00000000014100002</td></tr>
<tr><td>Kleinfontein 141 IQ</td><td>4</td><td>T0IQ00000000014100004</td></tr>
<tr><td>Kleinfontein 141 IQ</td><td>5</td><td>T0IQ00000000014100005</td></tr>
<tr><td>Kleinfontein 141 IQ</td><td>6</td><td>T0IQ00000000014100006</td></tr>
<tr><td>Deelkraal 142 IQ</td><td>3</td><td>T0IQ00000000014200003</td></tr>
<tr><td>Deelkraal 142 IQ</td><td>23</td><td>T0IQ00000000014200023</td></tr>
<tr><td>Deelkraal 142 IQ</td><td>59</td><td>T0IQ00000000014200059</td></tr>
<tr><td>Deelkraal 142 IQ</td><td>60</td><td>T0IQ00000000014200060</td></tr>
<tr><td colspan="3">Additional Associated Infrastructure: pipelines & powerlines, access roads, topsoil stockpiles, additional laydown areas and pump stations

New Process Water Pipelines:
Process Water Feed to Deelkraal Reclamation
Start: 26°27'22.37"S, 27°21'26.43"E
Middle: 26°26'37.70"S, 27°19'45.69"E</td></tr>
</table>

End: 26°27'29.40"S, 27°16'38.62"E

Process Water Feed to Kusasalethu Process Water Tank
Start: 26°27'30.82"S, 27°16'47.64"E
Middle: 26°26'55.21"S, 27°19'34.04"E
End: 26°27'22.29"S, 27°21'25.89"E

DP3 to North Boundary Dam
Start: 26°23'49.17"S, 27°25'58.07"E
Middle: 26°24'52.03"S, 27°25'40.75"E
End: 26°24'45.98"S, 27°24'25.98"E

DP3 feed to Tau Tona RO Plant
Start: 26°24'47.62"S, 27°25'44.70"E
Middle: 26°24'48.26"S, 27°25'45.71"E
End: 26°24'49.05"S, 27°25'46.90"E

Nursery Pumpstation #3 to Kusasalethu Process Water Tank
Start: 26°24'50.97"S, 27°24'25.62"E
Middle: 26°25'41.64"S, 27°22'16.40"E
End: 26°27'22.29"S, 27°21'26.33"E

2 x Process Water Pipelines from Kusasalethu to Savuka White Tanks
Start: 26°27'22.27"S, 27°21'26.09"E
Middle: 26°26'4.20"S, 27°21'56.26"E
End: 26°25'24.05"S, 27°23'59.57"E

New Slurry Pipelines:
Reclaimed Slurry from Deelkraal I to Kusasalethu
Start: 26°27'29.83"S, 27°16'39.32"E
Middle: 26°26'48.69"S, 27°19'7.82"E
End: 26°27'25.95"S, 27°21'37.98"E

Kusasalethu Barren Tailings to Deelkraal II
Start: 26°27'24.44"S, 27°21'29.53"E
Middle: 26°26'48.69"S, 27°19'7.82"E
End: 26°27'51.94"S, 27°17'20.31"E

Reclaimed Slurry Kusasalethu TSF - Kusasalethu Plant
Start: 26°28'12.30"S, 27°21'45.85"E
Middle: 26°27'44.69"S, 27°21'46.67"E
End: 26°27'22.17"S, 27°21'39.17"E

Savuka Plant to DF5 TSF
Start: 26°25'17.30"S, 27°23'51.83"E
Middle: 26°24'56.58"S, 27°24'13.22"E
End: 26°24'12.61"S, 27°24'28.45"E

Slurry pipeline from Kusasalethu Plant to Savuka TSF
Start: 26°27'21.89"S, 27°21'29.50"E
Middle: 26°26'46.51"S, 27°21'29.25"E
End: 26°26'10.81"S, 27°20'56.45"E

New Potable Water Pipeline:
Start: 26°26'58.81"S, 27°21'15.10"E
Middle: 26°26'51.58"S ,27°19'0.95"E
End: 26°27'28.87"S, 27°16'38.14"E

New Powerlines:
Kusasalethu Plant to Deelkraal
Start: 26°27'23.38"S, 27°21'33.53"E
Middle: 26°26'50.14"S, 27°19'9.04"E
End: 26°27'29.55"S, 27°16'38.94"E

Kusasalethu plant - Kusasalethu TSF
Start: 26°27'23.38"S, 27°21'33.53"E
Middle: 26°27'47.43"S, 27°21'50.11"E
End: 26°28'12.37"S, 27°21'44.23"E

Savuka shaft – Kusasalethu Plant
Start: 26°25'27.70"S, 27°24'14.77"E
Middle: 26°25'47.77"S, 27°22'7.33"E
End: 26°27'27.58"S, 27°21'27.59"E

Deelkraal 142 IQ	22	T0IQ00000000014200022
Doornfontein 118 IQ	1	T0IQ00000000011800001
Doornfontein 118 IQ	2	T0IQ00000000011800002
Doornfontein 118 IQ	11	T0IQ00000000011800011
Doornfontein 118 IQ	12	T0IQ00000000011800012
Doornfontein 118 IQ	13	T0IQ00000000011800013
Doornfontein 118 IQ	14	T0IQ00000000011800014
Doornfontein 118 IQ	25	T0IQ00000000011800025
Doornfontein 118 IQ	27	T0IQ00000000011800027
Doornfontein 118 IQ	28	T0IQ00000000011800028
Buffelsdoorn 143 IQ	1	T0IQ00000000014300001
Buffelsdoorn 143 IQ	7	T0IQ00000000014300007
Buffelsdoorn 143 IQ	9	T0IQ00000000014300009
Buffelsdoorn 143 IQ	13	T0IQ00000000014300013
Buffelsdoorn 143 IQ	31	T0IQ00000000014300031

	Buffelsdoorn 143 IQ	34	T0IQ00000000014300034
	Buffelsdoorn 143 IQ	35	T0IQ00000000014300035
	Blyvooruitzicht 116 IQ	3	T0IQ00000000011600003
	Blyvooruitzicht 116 IQ	4	T0IQ00000000011600004
	Blyvooruitzicht 116 IQ	5	T0IQ00000000011600005
	Blyvooruitzicht 116 IQ	6	T0IQ00000000011600006
	Blyvooruitzicht 116 IQ	62	T0IQ00000000011600062
	Blyvooruitzicht 116 IQ	93	T0IQ00000000011600093
	Blyvooruitzicht 116 IQ	100	T0IQ00000000011600100
	Blyvooruitzicht 116 IQ	107	T0IQ00000000011600107
	Driefontein 113 IQ	1	T0IQ00000000011300001
Existing Kusasalethu Plant (to be upgraded) Centre point: 26°27'26.75"S, 27°21'30.90"E			
	Buffelsdoorn 143 IQ	9	T0IQ00000000014300009
	Buffelsdoorn 143 IQ	35	T0IQ00000000014300035

The locality and extent of the proposed TSF and associated infrastructure is shown in **Figure 1**, and the proposed tailings storage facility and associated pipelines are also shown.

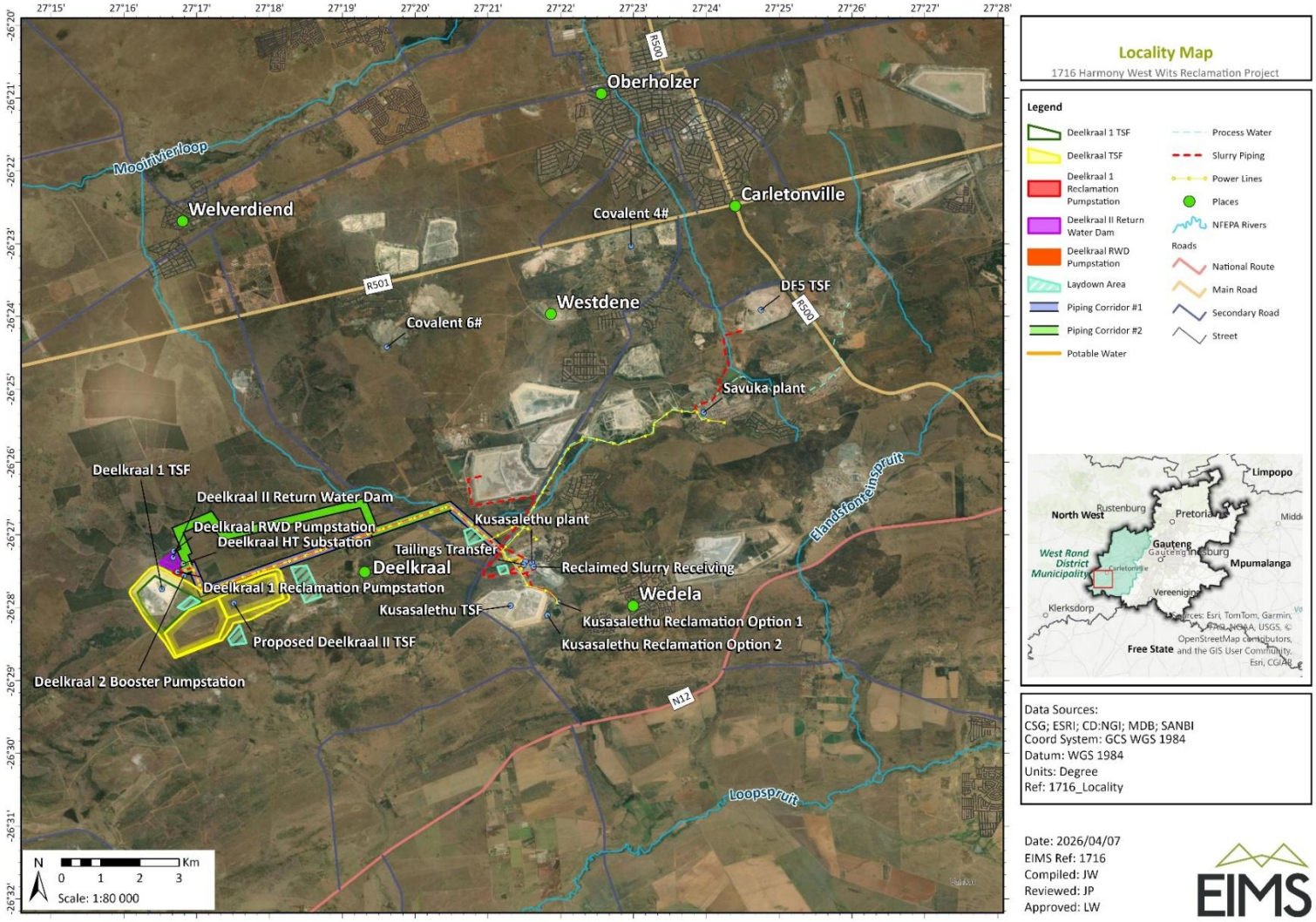


Figure 1: Aerial imagery locality map indicating the location of the proposed new Tailings Storage Facility and associated infrastructure. [1]

[1] This layout is the original layout provided for assessment. Subsequent layout refinements have been made and the updated layout is presented in Section 10 of this report.

3 DESCRIPTION AND SCOPE OF THE PROPOSED ACTIVITY

Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as the applicant) has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to assist with undertaking the required authorisation processes and to compile and submit the required documentation in support of application for the proposed new Deelkraal II Tailings Storage Facility (TSF) project and associated infrastructure on a site located approximately 13km southwest of Carletonville in the Merafong City Local Municipality, West Rand District Municipality, Gauteng Province (i.e. the Proposed Harmony West Wits Reclamation and Deposition Project).

The Applicant requires additional deposition capacity for West Wits region's operations. The applicant plans on constructing the Deelkraal II Tailings Storage Facility (TSF) to cater for the additional future capacity. This TSF will receive residue from Kusasalethu, and Savuka plants and will also assist in returning process water for reclaiming the existing Deelkraal I TSF and Kusasalethu TSF for processing at Kusasalethu and Savuka plants. Additional planned infrastructure includes slurry, potable, process and return water pipelines, access roads, pump stations, return water dams and a power line. Proposed upgrades to the existing Kusasalethu plant are also proposed as part of the project.

The Savuka Plant treats tailings from the Savuka Dormant TSFs (Old North TSFs) at a rate of 330 000 tpm and deposits the subsequent tailings on Savuka 5 & 7 TSFs. Harmony plans on remining Deelkraal I Dormant TSF and Kusasalethu TSF amongst other potential future sources. These TSFs will be processed through the Kusasalethu Plant at 500 000 tpm. The planned Life of Mine (LOM) for the West Wits region exceed the available deposition capacity of the existing TSFs. Therefore additional deposition capacity is required.

The Kusasalethu Plant will accommodate future reclamation operations (specifically Kusasalethu and Deelkraal I TSF will be reclaimed and deposited on Deelkraal II) and will therefore need site/s to deposit the tailings. Harmony owns ground, located adjacent to the Deelkraal I Dormant TSF, that can be used i.e. for the proposed Deelkraal II TSF. The Deelkraal I Dormant TSF and adjacent footprint combined geometry will accommodate the future reclamation operations deposition rate and capacity. The proposed TSF will cover an area of approximately 430 ha as shown in **Figure 1**.

The West Wits Reclamation (WWR) Concept Study explores ways to unlock the potential of recycling historic gold tailings using the existing Kusasalethu and Savuka process plants and infrastructure. The Concept Study (SGS Bateman, 2024) evaluated different options for the treatment of the Deelkraal I and Kusasalethu Tailings Storage Facilities (TSF) at the existing processing plants. The reworked tailings will be deposited on a new TSF, referred to as Deelkraal II, assumed to be constructed on a site adjacent to the existing Deelkraal TSF. While reviewing the preliminary metallurgy testwork results it became evident that the Deelkraal TSF contained higher grades of accessible gold and it was agreed that Deelkraal II TSF would be reclaimed first, with the Kusasalethu TSF being reclaimed thereafter (SGS Bateman, 2024).

In addition to the Deelkraal II TSF, additional infrastructure is also proposed, as follows

- A new main Return Water Dam (RWD) in the vicinity of the Deelkraal II TSF;
- Two smaller RWDs due to topography in the vicinity of the Deelkraal II TSF;
- Upgrades to the existing Kusasalethu plant including new/upgrade of gold and new uranium sections;
- Slurry pipelines:
    - Reclaimed Slurry from Deelkraal I to Kusasalethu plant (~10,6km);
    - Kusasalethu Barren Tailings to Deelkraal II (~10,2km);
    - Reclaimed Slurry from Kusasalethu TSF to Kusasalethu Plant (~2km);
    - Slurry pipeline from Kusasalethu Plant to Savuka TSF (~4,97km) enabling treatment of either the Deelkraal 1 or Kusasalethu TSF's; and
    - Slurry pipeline from Savuka plant to DF5 TSF (~2,9km).

- Process Water Pipelines:
- Process Water Feed from Kusasalethu Plant to Deelkraal I Reclamation (~9.54km)
- Return Water Feed to Deelkraal I TSF Reclamation station and Kusasalethu Process Water Tank (~9,58km);
- Driefontein DP3 Pump Station to North Boundary Dam (~4,78km);
- DP3 feed to Tau Tona Reverse Osmosis Plant (~0,1km);
- Nursery Pumpstation #3 to Kusasalethu Process Water Tank (~9km); and
- 2 Process Water pipelines from Kusasalethu Plant to Savuka White Tanks (~8km).
- Powerlines (all proposed powerlines will be 22kV or lower):
    - Powerline from Kusasalethu Plant to the existing Deelkraal I and II TSF (~9.2km);
    - Powerline from Kusasalethu Plant to the Kusasalethu TSF (~1.8km); and
    - Powerline from Savuka shaft to Kusasalethu (~8.1km) and or tie into powerline from Kusasalethu Plant to the existing Deelkraal I and II TSF.
- Potable Water pipeline from Rand Water supply point to the Deelkraal TSF (~8.52km).
- Deelkraal I TSF Reclamation Pump Station and Kusasalethu TSF Reclamation Pump Station.
- New Access Roads (2x3,5m double road) adjacent to pipeline routes/OH lines and around Deelkraal II TSF (where no access road is already in place).
- Topsoil Stockpiles and overburden stockpiles.
- Ancillary construction infrastructure including ablutions, workshops and laydown areas, most of which would be temporary and removed at the end of construction.

All pipelines listed above will be flanged steel pipelines installed above-ground on pre-cast concrete plinths (**Figure 4**) and two 3.5m wide access roads, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections (for areas where no access road is already in place).

EIMS will compile and submit the required documentation in support of applications for:

- Environmental Authorisation (EA) and Waste Management License (WML) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998)- Listed activity: Listing Notice 2, Activity 6 and 15 as well as various Listing Notice 1 and 3 activities and also the National Environmental Management: Waste Act – NEMWA (Act 59 of 2008)- Activity B7, B10 and B11; and
- Water Use License (WUL) in accordance with the National Water Act – NWA (Act 36 of 1998). Water uses: Section 21 (c), Section 21 (i) and Section 21 (g). A separate application for a Water Use License (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers.
- An Air Emissions License (AEL) in Accordance with the National Environmental Management: Air Quality Act, 2004 will be lodged for the planned plant upgrades.

A Tailings Storage Facility (TSF) is an engineered structure designed to safely contain and manage mining waste, known as tailings. It's not just a simple dam; it's a complex system that includes embankments, associated works, and procedures for managing the tailings and the water they contain. The primary goals of a TSF are to permanently store tailings and reclaim water for reuse in mining operations.

Key aspects related to tailings storage facilities are presented below

1. Tailings Transportation and Deposition:

- Tailings, a slurry of fine rock particles and water, are transported from the processing plant to the TSF, typically via pipelines.
- The tailings are then deposited within the TSF, usually in a controlled manner to allow for the separation of solids and water.

2. Separation of Water and Solids:

- TSFs are designed to facilitate the settling and consolidation of the tailing's solids, allowing water to separate and be reclaimed.
- This separation can occur naturally through gravity or through mechanical processes.
- The reclaimed water is often recycled back into the mining process, reducing water consumption.

3. Embankment Construction and Maintenance:

- TSFs often feature embankments, or "tailings dams," constructed from locally sourced materials, including the tailings themselves.
- These embankments are designed to withstand the weight and pressure of the stored tailings and to prevent leakage or breaches.
- The embankments are typically raised progressively as the TSF fills with tailings.

4. Water Management:

- TSFs must also have systems in place to manage surface water runoff and groundwater infiltration.
- This may involve the use of drainage systems, seepage collection systems, and other measures to prevent uncontrolled water discharge.

5. Monitoring and Closure:

- TSFs are subject to ongoing monitoring to ensure their stability and safety.
- This monitoring may involve remote sensing, on-site inspections, and other techniques.
- At the end of the mine's life, the TSF is decommissioned, and the tailings are typically covered and revegetated to minimize environmental impacts.

Figure 2 below shows a simplified cross-sectional diagram indicating the relevant design features typically associated with a TSF. A technical note regarding the stability of the proposed TSF from the design engineers is included in Appendix J.

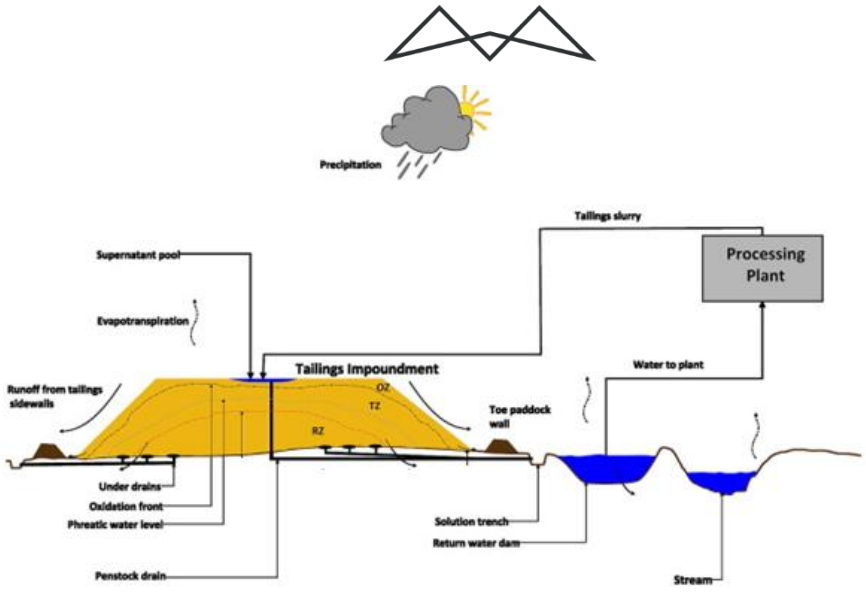


Figure 2: Cross section through a typical TSF

The construction phase of the project will consist of site establishment, site clearance, excavation, topsoil stockpiling, layering and compacting, prior to deposition of tailings at the site. Additional infrastructure such as construction camps, access roads, temporary laydown areas and other associated infrastructure such as pump stations is also required.

The TSF will be constructed in three separate compartments as indicated in the figure below.

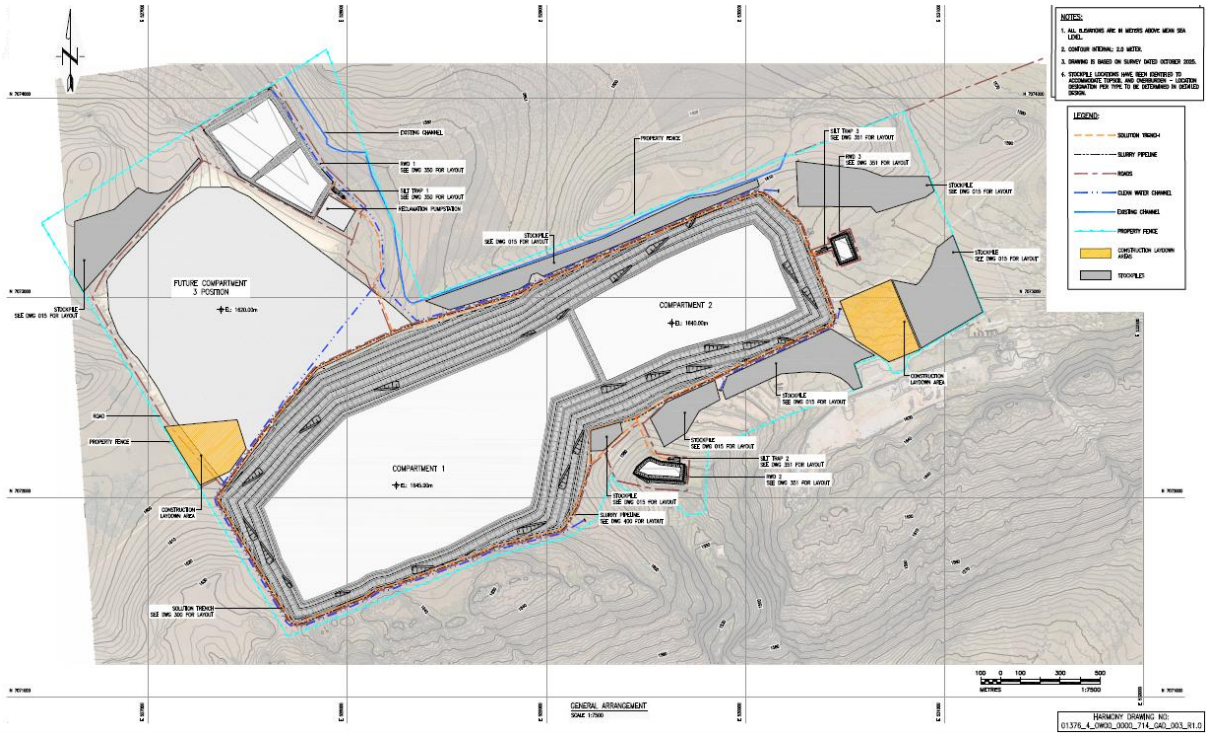


Figure 3: Deelkraal II TSF compartments



Figure 4: Representative image of above-ground pipelines and overhead power lines

Key parameters of the Deelkraal II TSF design are as follows:

- Maximum final height: 65m.
- Footprint area: Up to 430 Ha (combined total area for all three compartments).
- Total capacity: 192.35 MT
    - Compartment 1 – 80.85 MT
    - Compartment 2 – 53.9 MT
    - Compartment 3 – 57.6 MT (conceptual)
- Total deposition period at 330 000 tonnes per month for compartment 1[1]: 2028 to 2048 (20 years)
- Total deposition period at 220 000 tonnes per month for compartment 2: 2028 to 2048 (20 years)
- Total deposition period at 300 000 tonnes per month for compartment 3: 2036 to 2039 (4 years)
- Total deposition period at 400 000 tonnes per month for compartment 3: 2040 to 2048 (9 years)
- Maximum rate of rise: 4.98m/year.
- Deposition method: Cyclone.

The following operational activity details are relevant to the current application:

An underdrainage system is provided beneath the RWD basin. Tailings material will be delivered to the site using new proposed slurry pipelines and deposition infrastructure.

TSF barrier system will be determined in consultation with the authorities and in compliance with relevant norms and standards for determination of liner requirements in terms of the NEM:WA (GN R. 636). The waste material solutes classify as a Type 3 waste. This requires a Class C liner system. An inverted barrier system is

recommended. It is a cost-effective alternative and has superior performance to a Class C barrier (**Figure 5**). Further design information and reports are included in Appendix J of this EIA report.

With respect to water use, existing licenced water sources will be used and recirculated through the proposed Deelkraal II facility.

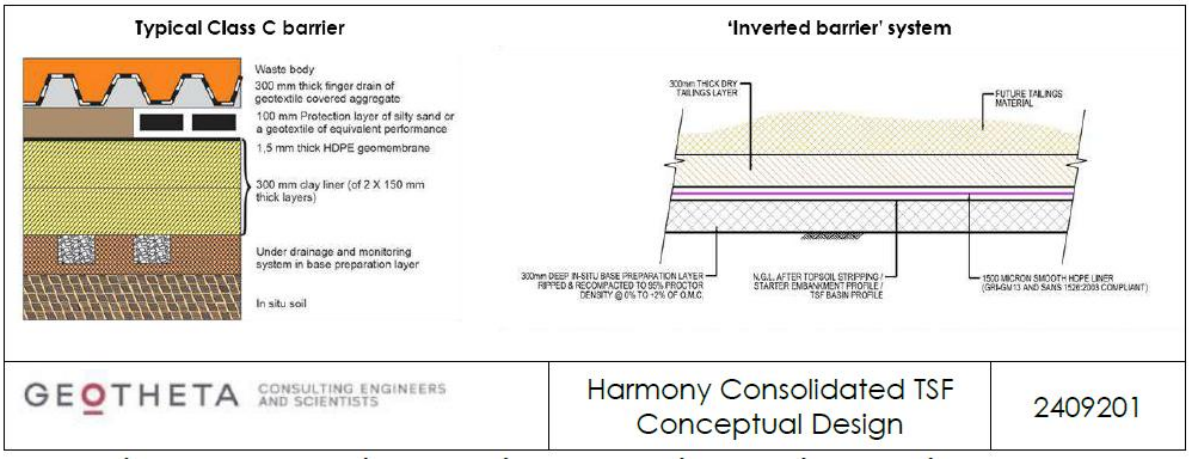


Figure 5: Comparison of typical Class C liner and inverted liner system

The construction timeline is estimated at 564 days (including timeframes for tender evaluations). This extended construction period will require further rigorous timeline and deposition access planning which will need to be confirmed with the construction contractor(s). Construction is expected to commence in 2027 if all approvals are in place. A detailed closure plan will be developed during the life of the TSF. The main objectives for the closure and rehabilitation of the TSF are to prevent pollution to the surrounding environment and ensure a stable facility is maintained.

4 POLICY AND LEGISLATIVE CONTEXT

This section provides an overview of the governing legislation identified which relates to the proposed project.

4.1.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

The constitution of any country is the supreme law of that country. The Bill of Rights in chapter 2 section 24 of the Constitution of South Africa Act (Act No. 108 of 1996) makes provisions for environmental issues and declares that: "Everyone has the right -

a) to an environment that is not harmful to their health or well-being; and

b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

i. prevent pollution and ecological degradation;

ii. promote conservation; and

iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

The EIA and associated impact mitigation actions are conducted to fulfil the requirement of the Bill of Rights.

4.1.2 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (MPRDA)

The MPRDA aims to make provision for equitable access to, and sustainable development of, the nation's mineral and petroleum resources. The MPRDA outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa. The MPRDA further governs the sustainable utilisation of South Africa's mineral resources.

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment to Section 102 which concerns the amendment of rights, permits, programmes and plans, to requiring the written permission from the Minister for any amendment or alteration; and the Section 5A(c) requirement that landowners or land occupiers receive twenty-one (21) days' written notice prior to any activities taking place on their properties. One of the most recent amendments requires all mining related activities to follow the full NEMA process as per the 2014 EIA Regulations, which came into effect on 4 December 2014 as was last amended in June 2021.

In support of the separate WML application specifically, the applicant is required to conduct an EIA process comprising of the preparation of environmental Scoping and EIA Reports, an EMPr, as well as Interested and Affected Party (I&AP) consultations, all of which must be submitted to the DMPR for adjudication. This report has been compiled in accordance with Regulation 49 of the MPRDA and Regulation 23 and Appendix 3 of the EIA Regulations (2014, as amended) in order to satisfy the criteria for an EIA Report. This EIA Report pertains to both the NEMA and the WML application for the proposed West Wits Reclamation and Deposition Project.

4.1.3 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA)

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998 – NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA EIA Regulations, the applicant is required to appoint an EAP to undertake the EIA process, as well as conduct the public participation process towards an application for EA/WML. In South Africa, EIAs became a legal requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant EA. On 21 April 2006, the Minister of Environmental Affairs and Tourism (now DFFE) promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were amended in June 2010 and again in December 2014 as well as April 2017 and June 2021. The 2014 NEMA EIA Regulations (as amended) are applicable to this project. Mining activities, including activities such as the proposed TSF officially became governable under the NEMA EIA

Regulations (as amended) in December 2014 with the competent authority identified as the DMPR for the waste listed activities and for the NEMA listed activities.

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

In accordance with the provisions of Sections 24(5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIAs in order to apply for, and be considered for, the issuing of an EA/WML. These EIA Regulations provide a detailed description of the EIA process to be followed when applying for EA/WML for any listed activity.

An environmental Scoping and Impact Assessment process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and Impact Assessment studies accordingly provide a mechanism for the comprehensive assessment of activities that are likely to have more significant environmental impacts. Figure 6 below provides a graphic representation of all the components of a full EIA process.

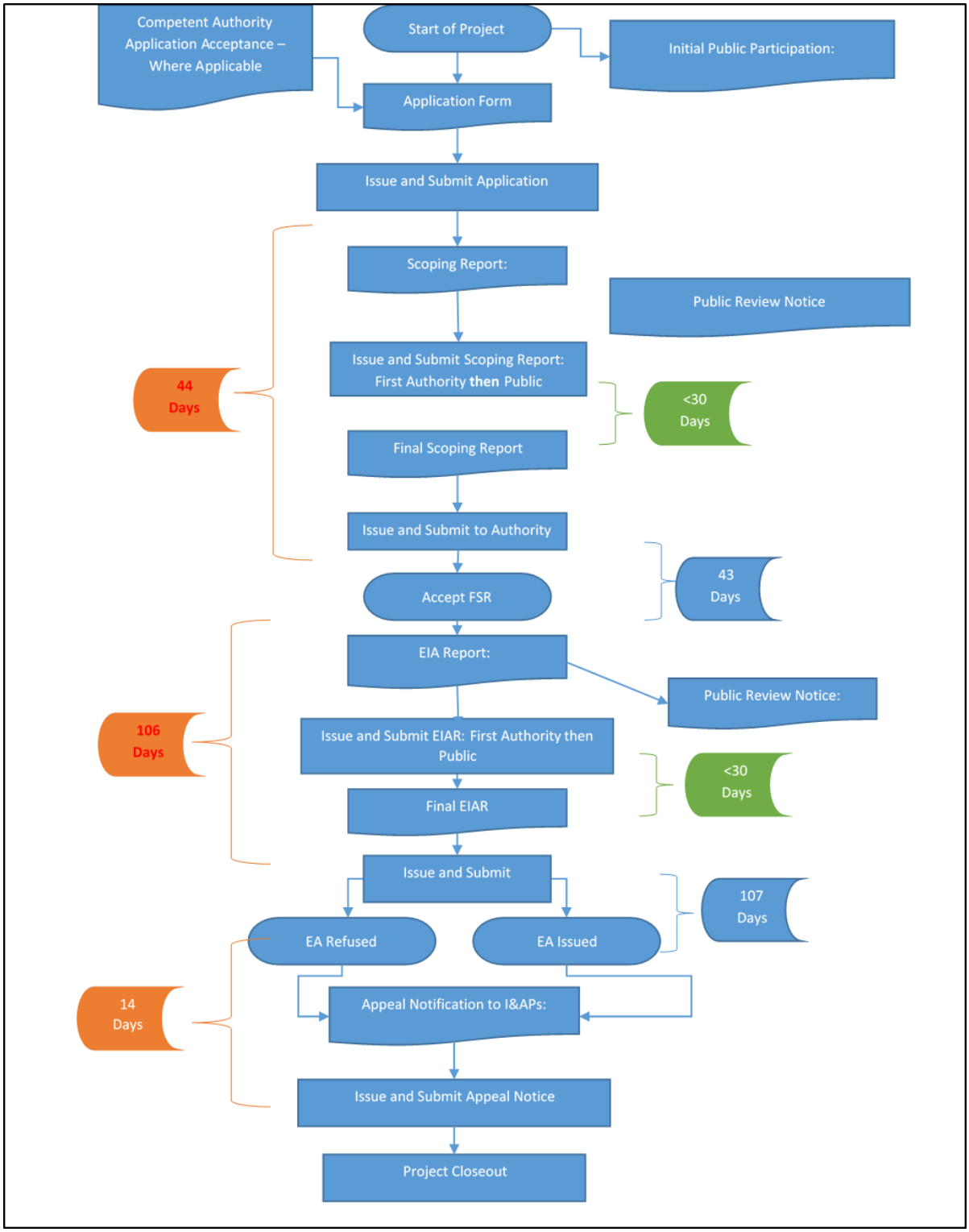


Figure 6: EIA process diagram

NEMA sets out the general objectives of IEM in South Africa, including to (section 23(2)), of which the following two are of relevance for this report:

- Identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities. This is to be done with a view to minimising negative impacts, maximising benefits and promoting compliance with the principles of environmental management set out in section 2 (of NEMA).

- Ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them

Section 24P of the NEMA requires that an applicant for an environmental authorisation relating to prospecting, mining or production must, before the Minister responsible for mineral resources issues the EA, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts. Therefore, the potential environmental liabilities associated with the proposed activity must be quantified and the method of financial provision indicated in line with the NEMA Financial Provision Regulations (2015). The financial provision costs are presented in this EIA Report in Section 11.

4.1.3.1 LISTED ACTIVITIES

In accordance with the provisions of Sections 24(5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIAs in order to apply for, and be considered for, the issuing of an EA. These EIA Regulations provide a detailed description of the process to be followed when applying for EA for any listed activity.

The proposed TSF and associated infrastructure requires both an EA and a WML to operate, this will be undertaken as an integrated application. The listed activities that are triggered by the project in terms of the 2014 EIA Regulations GN983, 984 and 985 promulgated under the National Environmental Management Act (Act 107 of 1998 - NEMA) are specified in Table 3 below:

Table 3: Relevant NEMA listed activities

Name of activity	Aerial extent of the activity	Listed Activity	Applicable listing notice
Pipelines: *The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes-* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more.'* ***In order to deposit on the TSF, slurry and return water pipelines will need to be constructed. The residue deposition pipelines will have a NB diameter of more than 0.36m with a peak throughput of more than 120 ℓ/s.*** **The diameter of the new slurry and process water pipelines will be up to 0,56m with lengths exceeding 1000m and peak throughputs exceeding 120 litres per second.**	~55 km total length for all associated new pipeline routes	Activity 10	GN983

Name of activity	Aerial extent of the activity	Listed Activity	Applicable listing notice
Pipelines for TSF and Maintenance Road *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.* **The proposed pipelines and maintenance road will intersect wetlands and may require infilling of more than 10m³ to ensure structural integrity.**	~25 km total length for all associated new pipeline routes	Activity 19	GN983
Tailings Storage Facility – Mining Right variation *Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment.* **The project is proposed on an area with an existing mining right ((GP) 30/5/1/1/2 (07) MR) and may require amendment of the approved EMPr through a MPRDA Section 102 application.**	430ha	Activity 21D	GN983
Tailings Storage Facility *The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.* **The proposed TSF and pipelines will require a Water Use License in terms of Section 21(g) and 21(c) and (i) water uses. An Air Emissions License will also be required for the Kusasalethu Plant.**	430ha	Activity 6	GN984
Tailings Storage Facility and associated infrastructure	430ha	Activity 15	GN984

Name of activity	Aerial extent of the activity	Listed Activity	Applicable listing notice
The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.* **The TSF and proposed infrastructure will result in clearance of over 20ha of indigenous vegetation.**			
Access Roads *The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *(ii) National Protected Area Expansion Strategy Focus Areas;* *(iv) Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* **The access roads required will be 2 x 3,5, wide roads and some roads will be situated within CBA areas and NPAES focus areas**	~10 ha	Activity 4	GN985
Tailings Storage Facility and associated infrastructure *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *c. Gauteng* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;*	430ha	Activity 12	GN985

Name of activity	Aerial extent of the activity	Listed Activity	Applicable listing notice
ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans. **Clearance of vegetation in the preparation of the construction footprint will result in a potential impact on listed endangered ecosystem and critical biodiversity areas. The project site covers various ESA and CBA areas.**			
Tailings Storage Facility and associated infrastructure **"***The development of-* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs-* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.* *c. Gauteng* *i. A protected area identified in terms of NEMPAA, excluding conservancies;* *ii. National Protected Area Expansion Strategy Focus Areas;* *iii. Gauteng Protected Area Expansion Priority Areas;* *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* *v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004);* *vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority.*	93ha	Activity 14	GN985

Name of activity	Aerial extent of the activity	Listed Activity	Applicable listing notice
The proposed footprint for the TSF, pipelines and access roads are located within 32m of wetlands, will exceed 10 square metres and will result in a potential impact on listed endangered ecosystem and critical biodiversity areas.			

4.1.3.2 THE NATIONAL WEB-BASED ENVIRONMENT SCREENING TOOL, 2019

On the 5th of July 2019, the Department of Forestry, Fisheries and the Environment (DFFE) issued a Notice of the requirement to submit a report generated by the National Web-based Environmental Screening Tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and Regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended. The submission of this report is compulsory when applying for environmental authorisation in terms of Regulation 19 and Regulation 21 of the Environmental Impact Assessment Regulations, 2014 effective from the 4th of October 2019. The Screening reports for the various project components are provided in Appendix H of this report. The main findings to be discussed from the screening report are listed below.

The following summary of the study area's environmental sensitivities were identified in the Environmental Screening Report. The environmental sensitivities for the various proposed development footprints are indicated on Table 4.

Table 4: Environmental Sensitivity of Project Area.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme		X		
Animal Species Theme			X	
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation (Solar PV) Theme		X		
Defence Theme				X
Palaeontology Theme		X		
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

The information collected by the specialists and EAP's assessment may be used to confirm or dispute (as may be applicable) the environmental sensitivity ratings identified by the National Screening Tool. The EAP has undertaken a site sensitivity verification (Appendix H) and EAP's assessments/theme and sensitivity ratings identified by the Screening Tool are summarized in Table 5 below. Table 6 presents these Specialist Assessments/Studies as well as the motivations behind the EAP's decision of recommending or not recommending the undertaking of certain Specialist Assessments.

The project location in relation to various desktop sensitivities and applicable NEMA Listing Notice 3 areas is presented in **Figure 7** below.

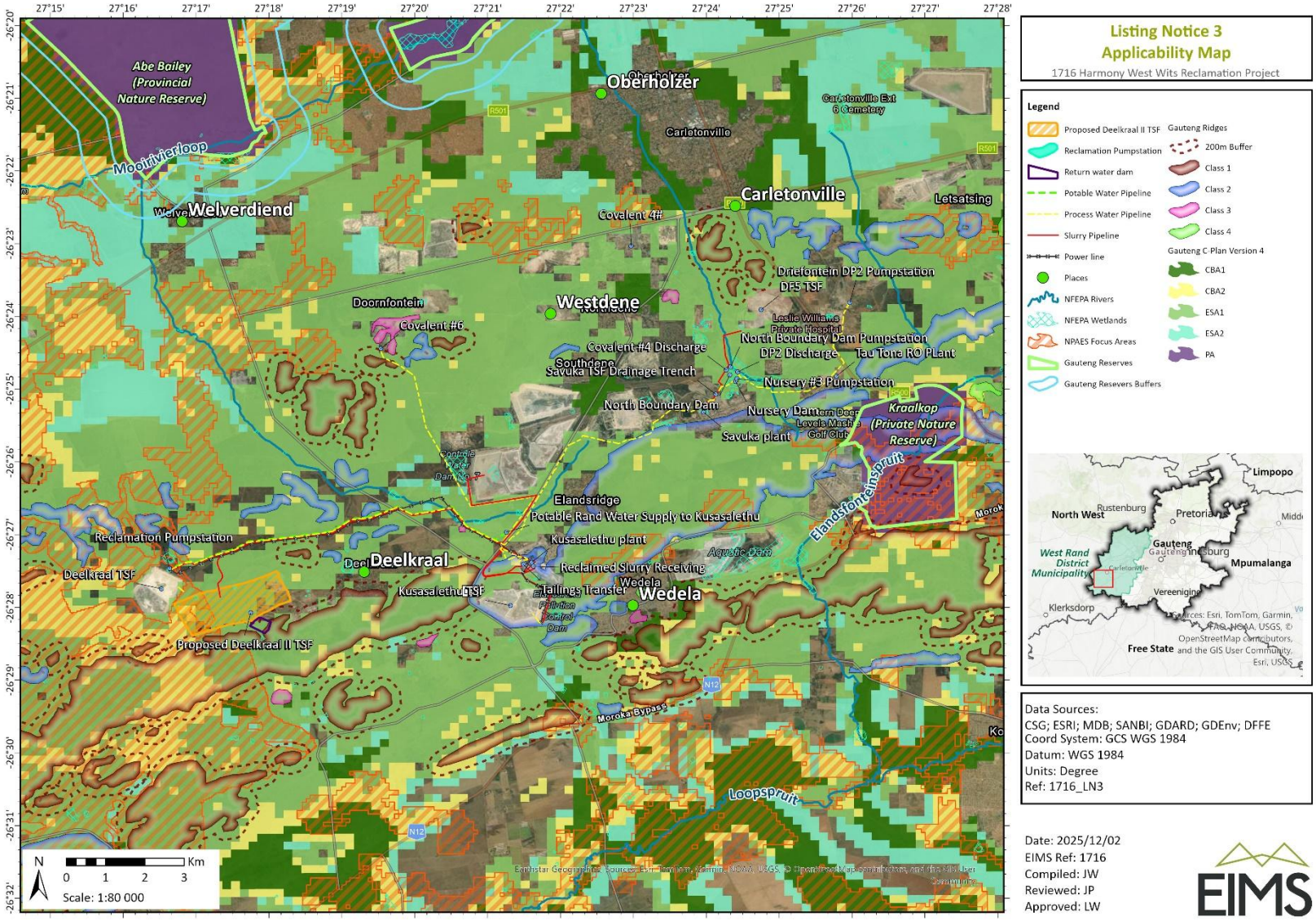


Figure 7: Project location in relation to various desktop sensitivities and Listing Notice 3 areas

Table 5: Specialist Assessments/themes and Sensitivity Ratings identified by DFFE's Web-based Screening Tool.

Assessment Theme	Sensitivity Rating (Screening Report)	Sensitivity Rating (Site Verification)	Response
Agriculture Theme	High	Medium	Relative Agricultural Sensitivity was assessed to be medium by the Site Sensitivity Verification Report (SSVR) included in Appendix H. The SSVR found that there are some agricultural activities within the study area. Based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low - moderate impacts on the agricultural potential. A medium sensitivity is suggested.
Animal Species Theme	Medium	Medium	The proposed development site has been transformed mainly due to the mining and agricultural activities which have disturbed the fauna habitats. Although the study area falls within Critical Biodiversity Area (CBA) 1 and CBA 2 areas and various ESA areas, the mining activities have significantly disturbed the natural ecosystem and therefore, there is a low likelihood of vulnerable, species of conservation concern (SCC) and/or protected fauna present within the area. However, even though the impacts on animal life is anticipated to be relatively low, the extent of the site and potential presence of important biodiversity cannot be excluded.
Aquatic Biodiversity Theme	Very High	High	Relative Aquatic Biodiversity Theme Sensitivity was assessed to be High-Sensitive for TSF and pipeline infrastructure. Based on review of desktop information as well as site verification, it was found that there are several pre-identified wetlands in and around the proposed development footprint. A high sensitivity is suggested.
Archaeological and Cultural Heritage Theme	Low	Medium	Relative Archaeological and Cultural Heritage Theme Sensitivity was assessed to be Medium Sensitive for the TSF and pipeline infrastructure. Potential heritage features may exist on the site and a medium sensitivity is therefore recommended.
Civil Aviation Theme	High	Low	The proposed development blends in with the existing land uses in the area and there is no anticipated impacts on civil aviation emanating from the project. The proposed development does not entail the establishment of high-rise structures, use of high frequency electromagnetic radiation nor reflecting infrastructure. Therefore, based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on Civil Aviation.
Defence Theme	Low	Low	Relative Defence Theme Sensitivity was confirmed as Low there are no military bases / facilities present within the vicinity of the project site. Therefore, based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on defence facilities.
Palaeontology Theme	High	High	Based on the PalaeoMap from SAHRIS, the Palaeontological Sensitivity of the proposed area of the project footprint occurs in an area with high palaeo-sensitivity. The geology of the development indicates that fossils may be present in the development footprint which could be affected during certain construction activities. A high sensitivity is therefore confirmed.
Plant Species Theme	Medium	Medium	Relative Plant Species Sensitivity was assessed to be moderate as the proposed development site has been transformed mainly due to the mining and agricultural activities which have disturbed the plant habitats. Based on the aspects of the proposed development and

Assessment Theme	Sensitivity Rating (Screening Report)	Sensitivity Rating (Site Verification)	Response
			current environmental conditions on site, it is anticipated that there will be moderate impacts on the plant species and a medium sensitivity is confirmed.
Terrestrial Biodiversity Theme	Very High	Medium	Relative Terrestrial Biodiversity Sensitivity was assessed to be Medium Sensitive as the SSVR found that the proposed development site has been transformed mainly due to the mining and agricultural activities which have disturbed the natural habitats and ecosystems.

Table 6: Summary of discussions regarding the undertaking of specialist Assessments.

SPECIALIST ASSESSMENT	DISCUSSION AND MOTIVATION
Agricultural Impact Assessment	The SSVR found that there are some agricultural activities within the study area. Although it is anticipated that there will be minimal impact on agricultural activities and/or land and as such, **an Agricultural Impact Assessment is recommended by the EAP** to confirm the potential impacts and outline the necessary mitigation measures.
Archaeological and Cultural Heritage Impact Assessment	Based on the potential sensitivities, a **Heritage Impact Assessment (HIA) is recommended** by the EAP to identify the heritage features and provide mitigation measures.
Palaeontology Impact Assessment	Based on the 1:250 000 SAHRIS PalaeoMap and the National Web-Based Screening Tool Report, the study area is located within a High Palaeo-Sensitivity area. The study area is located on an area which has been transformed. Based on the high palaeo-sensitivity rating in the screening tool report, consequently the EAPs **recommendation that a Palaeontological Impact Assessment be undertaken** for the project as there may be impacts on palaeontology.
Terrestrial Biodiversity Impact Assessment	The National Web-Based Screening Tool Report found that the Relative Terrestrial Biodiversity Impact Assessment Theme Sensitivity is Very High-Sensitive. Based on desktop datasets and site sensitivity verification, the pipeline section consists of largely intact pristine vegetation. The area is considered to fall within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA). Therefore, **a Terrestrial Biodiversity Impact Assessment is recommended** by the EAP and must be undertaken in line with the Protocol for The Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN 320, 2020 as amended) to confirm presence of Flora or Fauna, Avifauna, SCC, or protected species within the development site, verify site terrestrial biodiversity sensitivity and provide necessary mitigation measures.
Plant Species Assessment	Similarly, to the rationale above, the EAP recommends that a Terrestrial Biodiversity Assessment be undertaken to confirm if there are no Flora or Fauna SCC, or protected species within the development site. The **Plant Species Assessment will be covered by the Terrestrial Biodiversity Impact Assessment**.
Animal Species Assessment	Similarly, to the rationale above for Terrestrial Biodiversity Impact Assessment, the EAP recommends that a Terrestrial Biodiversity Assessment be undertaken to confirm protected species within the development site. The **Animal Species Assessment will be covered by the Terrestrial Biodiversity Impact Assessment**.
Aquatic Biodiversity Impact Assessment	Based on review of desktop information and site verification, it was found that there are pre-identified wetlands around the proposed development footprint. Even though these wetlands were noted to have been already impacted upon by the mining activities and therefore not in their natural state, their Present Ecological State (PES) and Site Ecological Importance (SEI) cannot be undermined. Therefore, the EAP **recommends that an Aquatic Biodiversity Assessment be undertaken** to assess the PES, SEI, risk matrix and provide necessary mitigation measures.



SPECIALIST ASSESSMENT	DISCUSSION AND MOTIVATION
Hydrology Assessment	The proposed development entails the establishment of a medium-high hazardous waste facility which its integrity can be influenced by hydrological conditions and inversely, it can impact the hydrological conditions. Provided that hydrological analysis can assist in analysing the scope of the flood, position the runoff pollution sources, and predict geomorphological change on runoff, the **EAP recommends a Hydrology Assessment be undertaken for the project**.
Noise Impact Assessment	A Noise Impact Assessment (NIA) predicts the impact that noise, from a proposed development, is likely to have on the surrounding area. An NIA is usually associated with large industries or developments with excessive noise generation such engineering companies, printing presses, textile mills, and metal works which immensely generate noise pollution. The noise from the machine's mechanical pneumatic drills, saws, and rotating belts usually produces intolerable sounds and are a nuisance to the public. Considering that the proposed development is for a TSF within an area used for similar activities, the EAP **recommend a Noise Impact Compliance Statement** is sufficient for the project.
Health Impact Assessment	Health impact assessment (HIA) is a tool that can help communities, decision makers, and practitioners make choices that improve public health. A health impact assessment can be used to evaluate objectively the potential health effects of a project or policy before it is built or implemented. HIA is usually undertaken for projects which can have health impacts on the surrounding communities. Based on the proposed project description, the establishment of the TSF can be associated with health impacts especially cumulative health impacts considering the existing TSFs in the area. Therefore, the EAP **recommends a Health Risk and Radiological Assessment be undertaken for the project.**
Socio-Economic Assessment	The overarching aim of undertaking a Socio-Economic Assessment of a project is to develop an understanding of the current social and economic environment and aims to assess or assesses the potential impact of the project on the socio-economic environment. Socio-Economic Assessment are usually undertaken for projects which have an impact and/or affect the social and/or economic structures such as low-cost housing projects, mixed-use developments, upgrading of informal settlements, linear projects transecting different communities, etc. Based on the project information and the purpose of the development largely relating to the nature of the project being the same activity already undertaken on the site, minimal socio-economic influence / change is anticipated. However, the EAP **recommends a Socio-Economic Assessment** for the project due to the surrounding social structures and potential cumulative socio-economic impacts which may emerge from the project.
Ambient Air Quality Impact Assessment	Air Quality Impact Assessment (AQIA) is an evaluation, using approved computer models, of the ambient air quality impacts that the public may be expected to be exposed to due to air pollution emissions from one or more facilities. AQIA is an important technique for determining the relative contribution to ground level pollutant concentrations of specific current or future source emissions at receptor sites. AIQA is usually undertaken is for projects which will potentially emit and/or increase pollutant concentrations during construction and/or operational phases. Based on the project information, the EAP **recommends an Air Quality Impact Assessment** for the project as it will TSF processes will potentially emit and/or increase pollutant concentrations, especially dust from the TSF and emissions associated with the Kusasalethu plant upgrades.
Additional Specialist Assessments Identified by the EAP	
Geohydrology Assessment	Hydrogeological assessments consider how proposed developments may be affected by groundwater and nearby surface water, in terms of potential flood risk and impact on structural foundations. Provided that the nature of the proposed development is a hazardous waste facility and it may affected and/or be affected by groundwater and the pre-identified nearby wetlands, the **EAP recommends a Geohydrology Assessment be undertaken for the project**.
Landscape/Visual Impact Assessment	Although the development is a TSF proposed within an area used for similar land uses however based on the proposed height of the TSF a **Landscape / Visual Impact Assessment is recommended** by the EAP.

SPECIALIST ASSESSMENT	DISCUSSION AND MOTIVATION
Financial Provisions: Closure Costing	Financial provision plan is a form of security assessment. Before mining companies undertake mining activities, mining companies must assess what it will cost to rehabilitate the impact of their operations on the environment, and then they must set aside and secure the amount of money needed to cover that cost until the money is needed for rehabilitation. Therefore, a **Financial Provisions Closure costing is recommended** by the EAP.
Climate Change Impact Assessment	Climate change impact assessments seek to characterize, diagnose, and project risks or impacts of environmental change on people, communities, economic activities, infrastructure, ecosystems, or valued natural resource. The need to undertake Climate Change Impact Assessments as part of EIA Projects which may influence climate change has been on the rise as competent authorities seek to assess how the project has considered climate change. The EAP **recommends that a Climate Change Impact Assessment be undertaken** to evaluate how the TSF will impact on climate change and also how future climate change could affect the project.

4.1.4 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT (NEMBA)

The National Environmental Management Biodiversity Act (Act No. 10 of 2004 – NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA as well as the protection of species and ecosystems that warrant national protection. Within the framework of this act, various regulations are promulgated which provide specific requirements and management measures relating to protecting threatened ecosystems, threatened or protected species as well as the control of alien and invasive species. A summary of these regulations is presented below.

The National List of Ecosystems that are Threatened and Need of Protection (GN 1002 of 2011) are promulgated under the NEMBA and these Regulations provide for listing of threatened or protected ecosystems in one of the following categories:

Critically Endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;

Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;

Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and

Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

Further regulations published under the NEMBA are the threatened or protected Species Regulations (GN R 152 OF 2007) which aims to:

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

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

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

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

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

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

The Alien and Invasive Species Lists are promulgated under the NEMBA with the aim of protecting the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;

Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;

Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and

Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

In giving effect to the above, the Alien and Invasive Species Regulations (GNR 1020 of 2020) provide for amongst others, the prevention of the spread or allowing the spread of, any specimen of a listed invasive species.

4.1.5 NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT

The National Environmental Management Protected Areas Act (Act No. 57 of 2003 – NEMPAA) is intended to *"provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes"* and creating a *"national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity".*

The NEMPAA defines various kinds of protected areas, namely: *"special nature reserves, national parks, nature reserves (including wilderness areas) and protected environments; world heritage sites; marine protected areas; specially protected forest areas, forest nature reserves and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act 84 of 1998); and mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act 63 of 1970)".*

The project area marginally overlaps with a NPAES Priority Focus Areas to the west (**Figure 7**).

4.1.6 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT (NEMAQA)

The National Environmental Management: Air Quality Act (Act No. 39 of 2004 as amended – NEMAQA) is the main legislative tool for the management of air pollution and related activities. The Object of the Act is:

To protect the environment by providing reasonable measures for –

i. the protection and enhancement of the quality of air in the republic;

ii. the prevention of air pollution and ecological degradation; and

iii. securing ecologically sustainable development while promoting justifiable economic and social development; and

- Generally, to give effect to Section 24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people.

4.1.6.1 **LISTED ACTIVITIES AND ASSOCIATED MINIMUM EMISSIONS STANDARDS**

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

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

The National Pollution Prevention Plans Regulations were published in March 2014 (Government Gazette 37421) and tie in with the National Greenhouse Gas (GHG) Emission Reporting Regulations which took effect on 3 April 2017. In summary, the Regulations aim to prescribe the requirements that pollution prevention plans of greenhouse gases declared as priority air pollutants, need to comply with in terms of the NEMAQA. The

Regulations specify who needs to comply, and by when, as well as prescribing the content requirements. Mines do have an obligation to report on the GHG emissions under these Regulations. In addition, the Kusasalethu plant requires an Air Emissions License for various activities triggered under the NEMAQA.

4.1.6.2 NATIONAL DUST CONTROL REGULATIONS

Dustfall is assessed for nuisance impact and not for inhalation health impact. The National Dust Control Regulations (Department of Environmental Affairs, March 2026) prescribes measures for the control of dust in residential and non-residential areas. Acceptable dust fall rates are measured (using American Standard Testing Methodology) at and beyond the boundary of the premises where dust originates. In addition to the dust fall limits, the National Dust Control Regulations prescribe monitoring procedures and reporting requirements. Dust that may be created from the proposed TSF will be managed in accordance with these Regulations.

4.1.7 THE NATIONAL WATER ACT (NWA)

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

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

These water use processes are described in Figure 8.

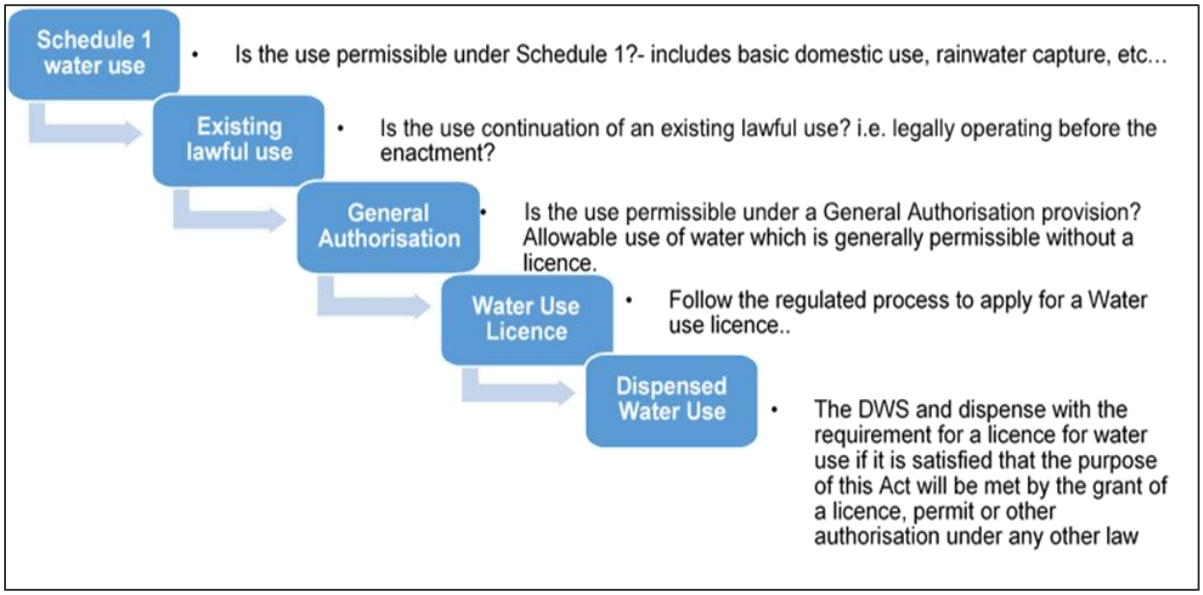


Figure 8: Authorisation processes for new water uses.

The NWA defines 11 water uses. A water use may only be undertaken if authorised by the Department of Water and Sanitation (DWS). The water uses for which an authorisation or license can be issued include:

- 21(a) Taking water from a water resource;
- 21 (b) Storing water;
- 21 (c) Impeding or diverting the flow of water in a watercourse;



- 21 (d) Engaging in a stream flow reduction activity contemplated in section 36;
- 21 (e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- 21 (f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;
- 21 (g) Disposing of waste in a manner which may detrimentally impact on a water resource;
- 21 (h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- 21 (i) Altering the bed, banks, course or characteristics of a watercourse;
- 21 (j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- 21 (k) Using water for recreational purposes.

Various Section 21 (c), Section 21 (i) and Section 21 (g) water uses are triggered by the project. A separate application for a Water Use License (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers.

4.1.7.1 REGULATIONS REGARDING THE SAFETY OF DAMS IN TERMS OF SECTION 123(1) OF THE NATIONAL WATER ACT, 1998

In South Africa, dam safety regulations are governed by the Dam Safety Office (DSO) under the Department of Water and Sanitation (DWS). These regulations apply to dams with a safety risk, which are generally those with a wall height exceeding 5 meters and a storage capacity greater than 50,000 cubic meters. The regulations mandate registration, classification, licensing, and adherence to specific procedures for construction, operation, maintenance, and decommissioning. The TSF itself will constitute a dam with a safety risk in terms of these regulations. Dams with a safety risk must be classified in terms of the regulations and registered with the DSO.

4.1.7.2 NWA GOVERNMENT NOTICE 704 (GN 704)

GN 704 (Government Gazette 20118 of June 1999) was established to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. The five main principal conditions of GN 704 applicable to this project are:

- Condition 4 – which defines the area in which, mine workings or associated structures may be located, with reference to a watercourse and associated flooding. Any residue deposit, dam, reservoir together with any associated structure or any other facility should be situated outside the 1:100 year flood-line. Any underground or opencast mining, prospecting or any other operation or activity should be situated or undertaken outside of the 1:50 year flood-line. Where the flood-line is less than 100 metres away from the watercourse, then a minimum watercourse buffer distance of 100 metres is required for infrastructure and activities;
- Condition 5 – which indicates that no residue or substance which causes or is likely to cause pollution of a water resource may be used in the construction of any dams, impoundments or embankments or any other infrastructure which may cause pollution of a water resource;
- Condition 6 – which describes the capacity requirements of clean and dirty water systems. Clean and dirty water systems must be kept separate and must be designed, constructed, maintained and operated to ensure conveyance the 1:50 year peak flow. Clean and dirty water systems should not spill into each other more frequently than once in 50 years. Any dirty water dams should have a minimum freeboard of 0.8m above full supply level;

- Condition 7 – which describes the measures which must be taken to protect water resources. All dirty water or substances which may cause pollution should be prevented from entering a water resource (by spillage, seepage, erosion, etc.) and ensure that water used in any process is recycled as far as practicable; and

- Condition 10 – which describes the requirements for operations involving extraction of material from the channel of a watercourse. Measures should be taken to prevent impacts on the stability of the watercourse, prevent scour and erosion resulting from operations, prevent damage to in-stream habitat through erosion, sedimentation, alteration of vegetation and flow characteristics, construct treatment facilities to treat water before returning it to the watercourse, and implement control measures to prevent pollution by oil, grease, fuel and chemicals.

Harmony will be required to obtain exemption in terms of GN704 for various mining activities in these areas and ensure all existing infrastructure has a stormwater management plan that is sufficient and maintained per GN 704 and any applicable TSF specific requirements, and that all proposed infrastructure, including new TSFs, pipelines, pump stations, and associated facilities, is designed and constructed in accordance with GN 704.

4.1.7.3 CATCHMENT MANAGEMENT STRATEGIES

South Africa is divided into nineteen Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level is achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA progressively develops a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a WMA is the Catchment Management Strategy (CMS) which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources.

The proposed development site is situated within the Upper Vaal Water Management Area (WMA 8). The TSF and associated infrastructure is all located within quaternary catchment C23E. The Upper Vaal WMA is responsible for assessing the availability of local surface water and groundwater resources. It is responsible for managing water quality, including long-term trends and short-term impacts. It is responsible for managing water supply to local authorities and district councils. The Upper Vaal WMA is used for industrial, mining, power generation, commercial agriculture, nature conservation, and urban and rural human settlements The main watercourses in these quaternary catchments include the Mooirivierloop (C23E) and the Loopspruit (C23E), with several non-perennial drainages in both quaternaries. Water quality at sampling point SW06, which is a downstream point on the Loopspruit (C23J) indicate elevated concentrations of Nitrate, Chloride, Electrical Conductivity, Fluoride and Sulfate that exceeds the In-Stream Water Quality Guidelines for the Vaal Barrage subcatchment. Elevated concentration of Nitrate, Chloride, Electrical Conductivity and Sulfate that exceeds the In-Stream Water Quality Guidelines for the Vaal Barrage sub-catchment was observed in the unnamed river which is a tributary of the Mooirivierloop.

The nearest River to the study area is the Elandsfonteinspruit River to the south-east of the site, however, this river is only labelled in the 1:500,000 river dataset for South Africa. The NGI's 1:50,000 topographical map data illustrates numerous non-perennial river systems to the north and south, both of which converge to the south east of the site. The northern system feeds the Elandsfonteinspruit, enabling perennial flows (per the NGI's classification). The northern and southern system are associated with a vlei to the east and dams both north and south to the site. The applicant is required to apply for a Water Use License to ensure that any water resources (surface and groundwater as well as wetlands) affected by the proposed project activities are licensed and managed in accordance with the relevant water and environmental legislation.

The broad management objectives for the Upper Vaal WMA focus on supporting socio-economic development while protecting water resources. Key objectives include ensuring water supports growth, equity, and job creation; allocating water for urban, industrial, and mining needs; and managing water quality and quantity to

protect aquatic ecosystems. Achieving these goals involves strategies like demand management, improving water infrastructure, and protecting ecological systems.

Harmony will submit an IWULA to ensure that any water resources (surface and groundwater as well as wetlands) affected by the proposed project activities are licensed and managed in accordance with the relevant water and environmental legislation.

4.1.8 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (NEMWA)

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

The objectives of this Act are:

a) to protect health, well-being and the environment by providing reasonable measures for-

   i. minimising the consumption of natural resources;

   ii. avoiding and minimising the generation of waste;

   iii. reducing, re-using, recycling and recovering waste;

   iv. treating and safely disposing of waste as a last resort;

   v. preventing pollution and ecological degradation;

   vi. securing ecologically sustainable development while promoting justifiable economic and social development;

   vii. promoting and ensuring the effective delivery of waste services;

   viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and

   ix. achieving integrated waste management reporting and planning;

b) to ensure that people are aware of the impact of waste on their health, well-being and the environment;

c) to provide for compliance with the measures set out in paragraph (a); and

d) generally, to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being.

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

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

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

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

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

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

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

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



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

Waste can be defined as either hazardous or general in accordance with Schedule 3 of the NEMWA (2014) as amended. "Schedule 3: Defined Wastes" has been broken down into two categories – Category A being hazardous waste; and Category B being general waste.

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

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

Furthermore, the NEMWA provides for specific waste management measures to be implemented, as well as providing for the licensing and control of waste management activities. The proposed new TSF waste management activities in terms of Category B of GN R. 921 which states that "*a person who wishes to commence, undertake or conduct an activity listed under this Category, must conduct an environmental impact assessment process, as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as part of a waste management license application*."

4.1.8.1 **WASTE MANAGEMENT ACTIVITIES**

The listed activities that are triggered by the project in terms of GN921 promulgated under the National Environmental Management Waste Act (Act 59 of 2008 - NEMWA) are specified in Table 7 below:

Table 7: Applicable NEMWA Activities

Activity No(s):	Activity	Portion of the proposed project to which the applicable listed activity relates.
Category A, Activity 14	The decommissioning of a facility for a waste management activity listed in Category A or B of this Schedule.	The current licensed Landfill Site located on the Deelkraal II TSF site needs to be decommissioned
Category B, Activity B7	The disposal of any quantity of hazardous waste to land.	TSF operation
Category B, Activity B10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	TSF construction
Category B, Activity B11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and	TSF establishment for mining activities. Reclamation of Deelkraal I and Kusasalethu TSFs also form part of the application.

	Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	

The Department of Mineral and Petroleum Resources (DMPR) has been identified as the CA for both the NEMA and NEM:WA activities listed activities triggered by the project. A separate application for a Water Use License (WUL) has also been lodged with the Department of, Water and Sanitation (DWS) for the water use triggers

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

These regulations pertain to waste classification and management, including the management and control of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation which is relevant to the proposed project. The purpose of these Regulations is to –

- Regulate the classification and management of waste in a manner which supports and implements the provisions of the Act;
- Establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management License;
- Prescribe requirements for the disposal of waste to landfill;
- Prescribe requirements and timeframes for the management of certain wastes; and
- Prescribe general duties of waste generators, transporters and managers.

Waste classification, as presented in Chapter 4 of these regulations, entails the following:

- Wastes listed in Annexure 1 of these Regulations do not require classification in terms of SANS 10234;
- Subject to sub regulation (1), all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation;
- Waste must be kept separate for the purposes of classification in terms of sub regulation (2), and must not be mixed prior to classification;
- Waste-must be re-classified in terms of sub regulation (2) every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors;
- Waste that has been subjected to any form of treatment must be re-classified in terms of sub regulation (2), including any waste from the treatment process; and
- If the Minister reasonably believes that a waste has not been classified correctly in terms of sub regulation (2), he or she may require the waste generator to have the classification peer reviewed to confirm the classification.

Furthermore, Chapter 8 of the Regulations stipulates that unless otherwise directed by the Minister to ensure a better environmental outcome, or in response to an emergency so as to protect human health, property or the environment –

- Waste generators must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Act prior to the disposal of the waste to landfill;
- Waste generators must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Act; and
- Waste managers disposing of waste to landfill must only do so in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7 (1) of the Act.



The TSF barrier system will be determined in consultation with the authorities and will be in compliance with these norms and standards. An inverted barrier system is currently proposed.

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

Once the waste has been assessed and waste type determined, these Norms and Standards can be used to determine the minimum requirements for the landfill and containment barrier design. This will distinguish between Class A, Class B, Class C, or Class D landfills and the associated containment barrier requirements. Although these Norms and Standards prescribe the containment barrier or liner design for each determined waste type, the recent amendments in chapter 3 of the regulations to the planning and management of residue stockpiles and residue deposits, a competent person must recommend the pollution control measures suitable for a specific residue stockpile or residue deposit on the basis of a risk analysis as contemplated in regulations 4 and 5 of the regulations. The recommendation should be founded on a risk analysis based on the characteristics and classification in regulation 4 and 5 of these Regulations, towards determining the appropriate mitigation and management measures.

4.1.8.4 THE REGULATIONS REGARDING THE PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS AND ASSOCIATED AMENDMENT

These Regulations promulgated under the waste act, which pertain to the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation, were published in 2015 and were amended in 2018. The Regulations and associated amendment relate to the assessment of impacts and the analyses of risks relating to the management of residue stockpiles and residue deposits, and involve the following:

- The identification and assessment of environmental impacts arising from the establishment of residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- A risk analysis based on the characteristics and the classification set out in regulation 4 (characterisation of residue stockpiles and residue deposits) and 5 (classification of residue stockpiles and residue deposits) of these regulations must be used to determine the appropriate mitigation and management measures; and
- A competent person must recommend the pollution control measures suitable for a specific residue stockpile or residue deposit on the basis of a risk analysis as contemplated in regulations 4 and 5 of these Regulations.

As stated in Section 4.1.8.3, the proposed new TSF will be subject to these regulations. In this regard, the containment barrier design (including requirements for a liner and nature of the liner), will be addressed in accordance with chapter 3 of these Regulations and their associated amendments.

4.1.9 THE NATIONAL HERITAGE RESOURCES ACT (NHRA)

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



The NEMA 23(2)(b) states that an integrated environmental management plan should, "*…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*". A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken into account of in the EIA Regulations under the NEMA relates to the Specialist Report requirements (Appendix 6 of EIA Regulations 2014, as amended).

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

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

4.1.10 ENVIRONMENT CONSERVATION ACT (ECA) AND ASSOCIATED NOISE CONTROL REGULATIONS

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

In terms of section 25 of the ECA, the National Noise Control Regulations (GN R. 154 – NCRs) published in Government Gazette No. 13717 dated 10 January 1992, were promulgated. The NCRs were revised under GN R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Provincial noise control regulations have been promulgated in Gauteng, Free State and Western Cape Provinces. The project falls in Gauteng and therefore will need to comply with the Gauteng NCR's.

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

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

Section 5 of the NCRs in essence prohibits the creation of a noise nuisance. A noise nuisance is defined as "*any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person".* The South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these Regulations.

4.1.11 THE CONSERVATION OF AGRICULTURAL RESOURCES ACT (CARA)

The law on Conservation of Agricultural Resources (Act 43 of 1983) aims to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection

of the vegetation and the combating of weeds and invader plants. In order to achieve the objectives of this Act, control measures related to the following may be prescribed to land users to whom they apply:

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

Further, different control measures may be prescribed in respect of different classes of land users or different areas or in such other respects as the Minister may determine. Impacts on the soil, biodiversity and water resources have been identified with regards to the proposed West Wits Reclamation and Deposition Project, and mitigation and management measures recommended. These will be updated during the EIA phase of this project as and where necessary.

4.1.12 CLIMATE CHANGE ACT 22, 2024

The Climate Change Act sets out the functions of the Presidential Climate Commission, which includes providing advice on the Republic's climate change response to ensure the realisation of the vision for effective climate change response and the long-term just transition to a climate-resilient and low-carbon economy and society.

The Climate Change Act 22 of 2024 intends to enable the development of an effective climate change response and a long-term, just transition to a low-carbon and climate-resilient economy and society for South Africa in the context of sustainable development; and to provide for matters connected therewith. Harmony will be required to comply with greenhouse gas reporting requirements.

4.1.13 CARBON TAX ACT 15 OF 2019

The Carbon Tax Act 15 of 2019 is a South African law that places a financial levy on greenhouse gas emissions to reduce global warming and hold polluters accountable under the "polluter-pays" principle. Mining operations are heavily affected because they consume large amounts of electricity (sourced largely from coal-heavy national grids like Eskom), run heavy-duty diesel machinery, and generate fugitive emissions. The applicant (Harmony / Randfontein Estates) is legally required to follow exact measurement and financial tracking systems as required by the act.

4.1.14 NATIONAL VELD AND FOREST FIRE ACT

The National Veld and Forest Fire Act 101 of 1998 is a key piece of legislation in South Africa aimed at reforming the legal framework surrounding veld and forest fires. Its primary purpose is to prevent and manage wildfires through coordinated efforts, particularly in rural and fire-prone areas. The Act encourages the formation of Fire Protection Associations (FPAs), which are legally recognized bodies that facilitate local collaboration among landowners, municipalities, and other stakeholders to predict, prevent, and suppress veldfires. These associations play a vital role in fire management by offering training, support, and technical expertise to their members.

For private developers and landowners, the Act imposes several important obligations. They are legally required to take reasonable precautions to prevent fires from starting or spreading from their property. This includes maintaining firebreaks, ensuring that controlled burns are conducted safely and in accordance with regulations, and joining or cooperating with local FPAs. Failure to meet these responsibilities can result in legal liability, especially if negligence leads to damage or loss caused by a fire. In such cases, landowners may face civil claims for damages, making it essential for them to understand and comply with the Act's provisions.

In essence, the Act not only promotes proactive fire management but also establishes a framework for accountability. Private developers and landowners must be vigilant and informed, as their actions—or lack thereof—can have significant legal and financial consequences. By participating in FPAs and adhering to fire safety regulations, they contribute to a safer and more resilient environment for their communities and the broader ecosystem.

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

The Spatial Planning and Land Use Management (Act 16 of 2013 – SPLUMA) is set to aid effective and efficient planning and land use management, as well as to promote optimal exploitation of minerals and mineral resources. The SPLUMA was developed to legislate for a single, integrated planning system for the entire country. Therefore, the Act provides a framework for a planning system for the country and introduces provisions to cater for development principles; norms and standards; inter-governmental support; Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas; Land Use Schemes; and municipal planning tribunals. Furthermore, the SPLUMA strengthens the position of mining right holders when land needs to be rezoned for mining purposes. No rezoning applications will be required for the West Wits Reclamation and Deposition project as all properties fall within the existing mining right and are zoned for mining use.

4.1.16 OCCUPATIONAL HEALTH AND SAFETY ACT

The Occupational Health and Safety Act (Act 85 of 1993 - OHSA) provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith. Worker safety will form part of the contractor's safety requirements and be guided by the OHSA. This would entail a full health and safety file including but not limited to pre-mobilization medical assessments, work environment and task specific risk assessments and method statements etc. The project will be required to comply with the OHSA and or Mine Health and Safety Act (dependent on the specific aspect of the production operations). Therefore, safety of all personnel will be guided by overarching South African legislation.

The Major Hazard Installation Regulations (GNR 692 of 30 July 2001) are promulgated under the OHSA and apply to employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a major hazard installation or a quantity of a substance which may pose a risk that could affect the health and safety of employees and the public.

A "major hazard installation" (MHI) means an installation-

a) where more than the prescribed quantity of any substance is or may be kept, whether permanently or temporarily; or

b) where any substance is produced, processed, used, handled or stored in such a form and quantity that it has the potential to cause a major incident.

No MHI assessment is required for the West Wits Reclamation and Deposition project in terms of this Act.

4.1.17 NATIONAL RADIOACTIVE WASTE DISPOSAL INSTITUTE ACT 53 OF 2008

In terms of this Act the generators of radioactive waste are responsible for technical, financial and administrative management of such waste within the national regulatory framework at their premises and when such waste is transported to an authorised waste disposal facility.

Generators of radioactive waste must:

A) develop and implement site-specific waste management plans based on national policy;

B) provide all relevant information on radioactive waste as required by the chief executive officer;

C) demonstrate compliance with any conditions of a radioactive waste disposal certificate;

D) provide site access to staff of the Institute for inspection against any conditions of the radioactive waste disposal certificate.

The TSF slurry is considered radioactive waste. Generators of radioactive waste remain responsible for all liabilities in connection with such radioactive waste under their control.

4.1.18 THE HAZARDOUS SUBSTANCES ACT, 1973 (ACT NO. 15 OF 1973)

The Hazardous Substances Act, 1973 (Act No. 15 of 1973) in South Africa regulates substances that can cause harm to human health. It categorizes these substances based on their risk level and controls their manufacture, sale, use, and disposal. The Act also provides for inspections, enforcement measures, and penalties for violations. The Act defines hazardous substances as materials or mixtures that can cause harm to human health, ranging from mild irritation to severe illness or death.

The Act addresses the control of substances that can cause injury, ill-health, or death due to their hazardous properties. This includes substances found in mine tailings, which often contain heavy metals like arsenic, lead, and mercury. The Act aims to regulate the handling, use, and disposal of these substances to protect human health and the environment.

4.2 OTHER APPLICABLE ACTS AND GUIDELINES

Other applicable acts and guidelines include various provincial and local guidelines and plans which are further described below.

4.2.1 NATIONAL POLICY AND PLANNING CONTEXT

4.2.1.1 **INTERIM GUIDANCE ON THE MANAGEMENT OF NORM TAILINGS AND WASTE ROCK**

The National Nuclear Regulator (NNR) exercises regulatory control related to nuclear safety and security for all the activities and facilities as defined in the NNR Act. The process waste generated at a mining and minerals processing facility, also known as slurry, is naturally radioactive because of the associated radionuclides in the uranium and thorium decay series that accompany the metals that are mined. The slurry, also referred to as Naturally Occurring Radioactive Material (NORM) residue, is pumped to containment areas for permanent or temporary storage and thus qualifies as radioactive waste facilities named NORM tailings dams, also interchangeably referred to as Tailings Storage Facilities (TSF).

This document provides guidance for the implementation of the requirements as set out in the draft General Nuclear Safety Regulations on the management of NORM tailings and waste rock. Due to the lengthy promulgation process for regulations, and the fact that the guidance provided is based on draft regulations, the

Executive has resolved to issue this document as interim guidance. This document will be revised once the regulations in question have been promulgated.

The guidance is applicable to all NORM facilities which carry out activities and operations involving NORM tailings and waste rock containing uranium, thorium and their progeny. This guide extends to both authorised facilities regulated by the NNR and prospective applicants who wish to handle, process and dispose of NORM tailings and waste rock in terms of the provisions of the NNR Act and associated regulations.

This guideline contains information that provide guidance in terms of best practice in terms of EIA aspects that is related to mining and specifically mineral processing. While the best practice guidance must be taken into account, this document does not take the place of legal advice in a specific situation governed by legislation.

Key aspects of an NNR-approved Closure Plan include:

- Decommissioning Strategy: The plan specifies the methods for dismantling the facility, removing or treating radioactive materials, and decontaminating equipment and site surfaces.
- Environmental Protection: It includes measures to prevent or mitigate environmental damage from decommissioning activities, such as controlling dust, managing waste, and protecting water resources.
- Public and Worker Safety: The plan outlines procedures for protecting the health and safety of workers involved in decommissioning and the public who may be affected by the process.
- Long-Term Stewardship: The plan addresses the long-term management of any residual risks or contamination, ensuring that the site remains safe for the future.
- Financial Assurance: It demonstrates that sufficient financial resources are available to implement the closure plan and manage any long-term liabilities.
- Regulatory Compliance: The plan must be developed in accordance with the NNR's regulations and guidance documents.

4.2.1.2 NATIONAL RADIOACTIVE WASTE MANAGEMENT POLICY AND STRATEGY

The purpose of the National Radioactive Waste Management Policy and Strategy (NRWMP) published in 2005 is: *To ensure the establishment of a comprehensive radioactive waste governance framework by formulating, in addition to nuclear and other applicable legislation, a policy, and implementation strategy in consultation with all stakeholders.*

Within the national framework, the NRWMP is viewed as the starting point for the definition and selection of an appropriate solution for the management of radioactive waste. The NRWMP also addresses options for managing radioactive waste generated through the nuclear industry, as well as waste containing un-concentrated naturally occurring radioactive materials from the mining and minerals processing industries. In consideration of options for radioactive waste management, the document takes cognisance of the International Atomic Energy Agency (IAEA) radioactive waste management principles (IAEA, 1995). In guiding the national strategy for radioactive waste management, several strategic points of reference in dealing with radioactive waste are defined. Two of the guiding principles that are of importance in terms of managing NORM are Principle No. 4 and Principle No. 13:

The aim (of a radioactive waste management strategy) shall be to achieve a maximum degree of passive safety in storage and disposal (Principle No. 4). The deliberate dilution of radioactive waste is not acceptable, however, in the case of NORM waste, the dilution of higher concentration material with lower concentration material will be considered if all relevant regulatory concerns are addressed (Principle No. 13).

In implementing the NRWMP, South Africa followed the IAEA guidelines regarding the definition and classification of radioactive waste as presented in IAEA.

4.2.1.3 THE NATIONAL BIODIVERSITY OFFSET GUIDELINE, JUNE 2023

South Africa's first National Environmental Management: National Biodiversity Offset Guideline, published by the Department of Forestry, Fisheries and the Environment (DFFE) on June 23, 2023, standardizes how biodiversity offsets are used during environmental authorization processes under NEMA.

It aims to slow down ecosystem degradation by providing a consistent, evidence-based way to counterbalance the residual negative impacts of development.

Developers must strictly follow the mitigation order of avoid, minimize, and rehabilitate damage before a biodiversity offset can even be considered for medium-to-high significance impacts. It applies to terrestrial and freshwater systems, though marine and estuarine ecosystems are currently excluded (though offsets can still be requested there).

Offsets must deliver long-term, measurable conservation results through either "like-for-like" (ecological equivalence) or "trading-up" approaches. Ratios are calculated using ecosystem extent, threat status, and protection level. Implementation involves environmental impact assessments, dedicated Biodiversity Offset Reports, site selection, securing land tenure, management plans, and formal agreements.

Based on the currently available terrestrial biodiversity information, the revised development layout will result in impact to approximately 70 ha, overlapping CBA 2: Optimal, EN Gauteng Shale Mountain Bushveld remnants, High SEI areas and Gauteng Ridges. On this basis, terrestrial biodiversity offsets are relevant to the project as residual biodiversity impacts remain high. The Gauteng Department of Environment (GDEnv) must be consulted to determine offset requirements and agree on an appropriate approach in this regard. A draft offset strategy is included in Appendix E.

4.2.1.4 THE MINING AND BIODIVERSITY GUIDELINES, 2013

The Mining and Biodiversity Guidelines (2013) was developed by the Department of Mineral Resources, the Chamber of Mines, the SANBI and the South African Mining and Biodiversity Forum, with the intention to find a balance between economic growth and environmental sustainability. The Guideline is envisioned as a tool to "foster a strong relationship between biodiversity and mining, which will eventually translate into best practice within the mining sector. It provides a tool to facilitate the sustainable development of South Africa's mineral resources, in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user- friendly manual for integrating biodiversity considerations into the planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. The Guideline provides explicit direction in terms of where: mining-related impacts are legally prohibited; biodiversity priority areas may present high risks for mining projects; and biodiversity may limit the potential for mining.

In identifying biodiversity priority areas, which have different levels of risk against mining, the Guideline categorises biodiversity priority areas into four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas:

A) Legally protected areas, where mining is prohibited;

B) Areas of highest biodiversity importance, which are at the highest risk for mining;

C) Areas of high biodiversity importance, which are at a high risk for mining; and

D) Areas of moderate biodiversity importance, which are at a moderate risk for mining.

The study area location is assessed against the Mining and Biodiversity Guidelines (2013) spatial dataset to determine which categories it falls within. Based on review of available information the project appears to be located within Category C and D due to the existing mining activities in the area (**Figure 36**).

4.2.1.5 NOISE STANDARDS

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



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

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

4.2.2 PROVINCIAL POLICY AND PLANNING CONTEXT

4.2.2.1 GAUTENG NATURE CONSERVATION BILL, 2014

The Gauteng Nature Conservation Bill, 2014 provides for the sustainable use and protection of biodiversity in Gauteng. Key provisions included regulations for professional hunting, the preservation of caves, the establishment of zoos, and the appointment of nature conservators). The Gauteng Nature Conservation Bill, 2014 is still in draft form and was never passed into law. Consequently, Gauteng nature conservation is still regulated by the outdated Transvaal Nature Conservation Ordinance 12 of 1983.

4.2.2.2 TRANSVAAL NATURE CONSERVATION ORDINANCE 12 OF 1983

The Transvaal Nature Conservation Ordinance regulates activities related to nature conservation within the former Transvaal province. The ordinance makes provisions for the hunting, catching, and sale of different types of animals, including protected and exotic species. It required written permission to hunt or catch certain animals and set out procedures for the issuance of licenses for landowners. It also provided for the establishment of nature reserves and other conservation areas. The ordinance defined offenses and penalties for contravening its provisions. The ordinance will be applicable to the West Wits Reclamation and Deposition project as there were protected species identified on site during the detailed specialist assessments.

4.2.2.3 PROVINCIAL CONSERVATION PLAN – THE GAUTENG CONSERVATION PLAN

Bioregional plans are one of a range of decision support tools provided for in the Biodiversity Act that can be used to enable biodiversity conservation in priority areas. The purpose of a bioregional plan is to inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity (Desmet et al., 2013). The purpose of the conservation plans is to inform land-use planning and development on a provincial scale and to aid in natural resource management, with one of the outputs being a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely Protected Areas, CBA1 areas, CBA2 areas, ESA1 areas, ESA2 areas, Other Natural Areas (ONAs) and areas with No Natural Habitat Remaining (NNR) based on biodiversity characteristics, spatial configuration and requirements for meeting targets for both biodiversity patterns and ecological processes.

Critical Biodiversity Areas (CBAs) – Areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. Ecological Support Areas (ESAs) - Areas are required to support and sustain the ecological functioning of Critical Biodiversity Areas (CBAs). For terrestrial and aquatic environments, these areas are functional but are not necessarily pristine natural areas. They are however required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, and which also contributes significantly to the maintenance of Ecological Infrastructure.

The Gauteng C-Plan focuses on the mapping of biodiversity priority areas within the Gauteng Province, as compiled by the Gauteng Department of Agriculture, Rural Development and the Environment GDARDE. The C-Plan was consulted in order to determine the location of areas of increased ecological or conservation importance and sensitivity within the vicinity of the study area. This is done by providing a map of biodiversity priority areas, referred to as CBAs and ESAs. According to information obtained from SANBI, CBAs are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services. The primary purpose of a map of CBAs and ESAs is to guide decision-making about where best to locate development. It should inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity. It is the biodiversity sector's input into multi-sectoral planning and decision-making processes.

The key output of a systematic biodiversity plan is a map of biodiversity priority areas. The Conservation plan delineates CBAs, Ecological Support Areas (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and areas that have been irreversibly modified from their natural state. The conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017). According to the latest Gauteng Conservation Plan (C-Plan v4), the project site falls within areas of CBA 1 and CBA 2 as well as ESA 1 and ESA 2 (**Figure 7**).

4.2.2.4 THE GAUTENG ENVIRONMENTAL MANAGEMENT FRAMEWORK TOOL

The Gauteng Department of Agriculture and Rural Development have developed an *Environmental Management Framework Tool* to streamline the requirements for an environmental impact assessment (EIA) (reduce EIA requirements), reduce timeframes for approvals and to contribute towards reducing the cost of doing business in Gauteng. In this tool, a number of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) listed activities are excluded from the requirement to obtain an environmental authorisation (EA). This exclusion is currently only applicable to activities that fall within Environmental Management *Zones 1 and 5* of the Gauteng Provincial Environmental Management Framework Zones (GPEMF). **Table 8** indicates the various zones of the GPEMF including Zones 1 and 5.

Table 8: Gauteng Provincial Environmental Management Framework Zones

Zone	Intention
Zone 1: Urban development zone	The intention with this zone is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development, in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas.
Zone 2: High control zone (within the urban development zone)	This zone is sensitive to development activities. Only conservation should be allowed in this zone. Related tourism and recreation activities must be accommodated in areas surrounding this zone.
Zone 3: High control zone (outside the urban development zone)	This zone is sensitive to development activities and in several cases also have specific values that need to be protected. Conservation and related tourism and recreation activities should dominate development in this zone.
Zone 4: Normal control zone	This zone is dominated by agricultural uses outside the urban development zone. Agricultural and rural development that support agriculture should be promoted.

Zone	Intention
Zone 5: Industrial and large commercial focus zone Intention	The intention with Zone 5 is to streamline non-polluting industrial and large-scale commercial (warehouses etc.) activities in areas that are already used for such purposes and areas that are severely degraded but in proximity to required infrastructure.

Review of the latest GPEMF v12 (GDARD, 2022), the study area falls within Zones 1, 3 and 4 of the GPEMF. Considering that Site falls within Zones 1, 3 and 4, the site is not exempted from the process of an EA through the GPEMF (**Figure 9**). In addition, the study area is located within CBA 1 and 2 and ESA 1 and 2 area which triggers Listing Notices 3 which are activities not exempted from an EA process through the GPEMF. Therefore, an EA application will be required.

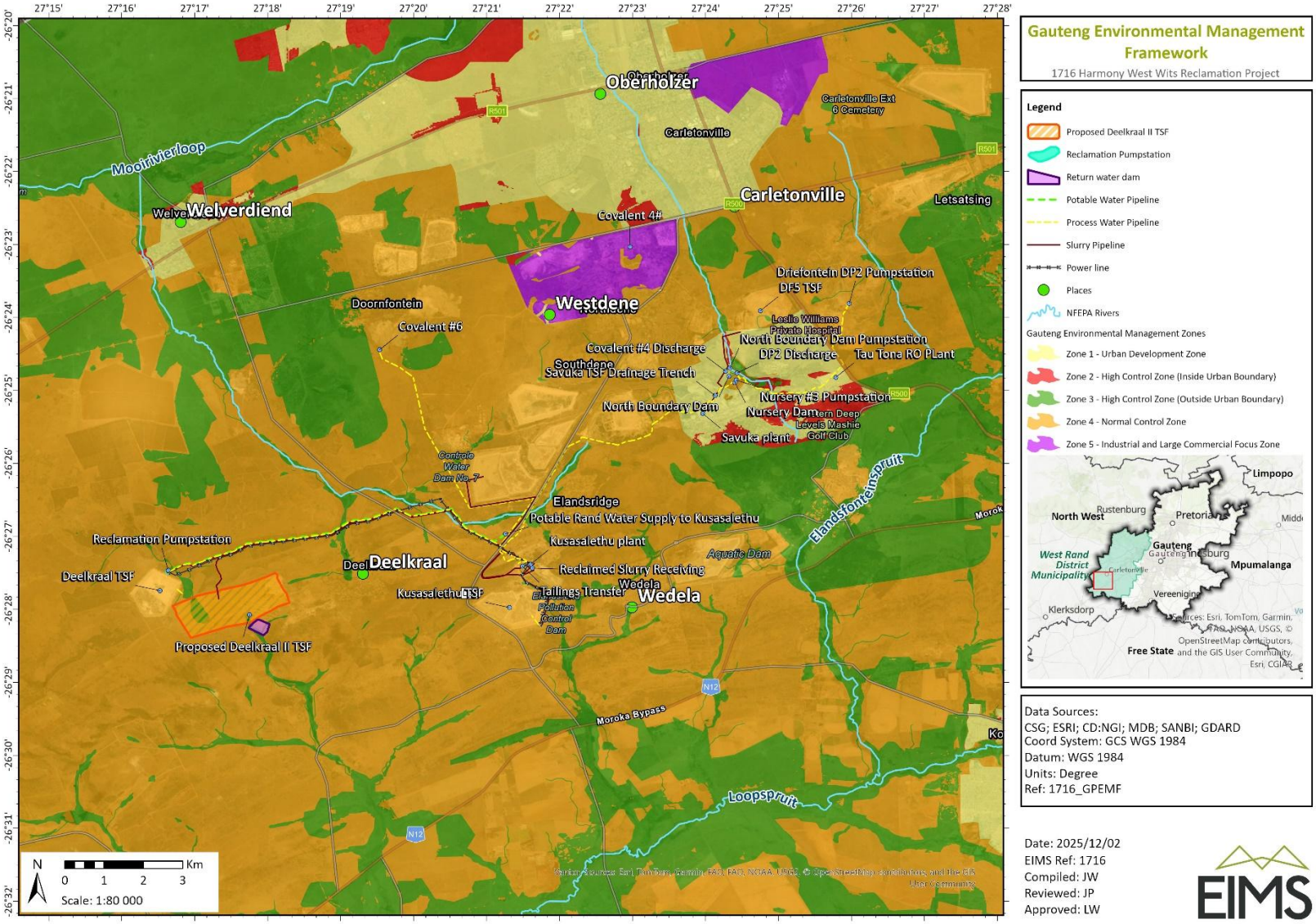


Figure 9: Location of the project in relation to GPEMF zones

4.2.2.5 THE GAUTENG RIDGES GUIDELINE, 2025

The quartzite ridges of Gauteng are one of the most important natural assets in the northern provinces of South Africa. This is because these ridges, and the area immediately surrounding the ridges, provide habitat for a wide variety of fauna and flora, some of which are Red List, rare or endemic species or, in the case of certain of the plant species, are found nowhere else in South Africa or the world. The ridges also fulfil functions that are necessary for the sustainability of ecosystems such as the recharging of groundwater, wetlands and rivers, wildlife dispersal and providing essential habitat for pollinators. Ridges also have a socio-cultural role in that they provide aesthetically pleasing environments that are valued by residents, tourists and recreational users. Human activities such as urbanization, mining and the planting of alien vegetation may undermine the contribution that ridges make to the environment.

The environmental right, which is set out in section 24 of the Constitution, requires government to take - "….reasonable legislative and other measures that –

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

The conservation of ridges therefore falls within the ambit an environmental right. The guidelines were first promulgated in 2001, updated in 2019 and recently in June 2025. The guideline applies to all ridges in Gauteng. For the purposes of the report, a ridge includes hills, koppies, mountains, kloofs and gorges and/or a landscape type or topographic feature that is characterized by two or more of the following features - a crest, plateau, cliff or footslope. In addition, ridges are characterized by slopes of 5° or more (that is equivalent to slopes of > 8.8% or > 1: 11 gradient) when modelled in a Geographic Information System digital elevation model that is based on 20m contour intervals at a scale of 1:50 000.

The general objective of GDARDE is that the ecological and socio-cultural value of ridges must be conserved. The ridges have, however, undergone different degrees of habitat loss due to human activities such as urban development and quarrying. The approach which the Department has adopted to realizing its general objective is to provide for the maximum feasible conservation of a ridge within the existing constraints of the habitat loss that has already taken place. To give practical effect to this policy, the Department has classified all ridges in Gauteng into one of four classes, based on the existing extent and percentage of area converted to urban development or other human activities. The classes are as follows -

a) Class 1 ridges include ridges of which 5% or less of their surface area has been converted to urban development, quarries and/or alien vegetation. (Approximately 58% of ridges currently fall within Class 1, including the Suikerbosrand and parts of the Magaliesberg.)

b) Class 2 ridges are those in respect of which 5-34% of the ridge area has been irreversibly transformed by human activity. (Approximately 23% of ridges currently fall within Class 2, including parts of the Magaliesberg, ridges falling within the Cradle of Humankind World Heritage Site, the Klipriviersberg, the Bronberg and the Skurweberg).

c) Class 3 ridges are those that have been transformed by 35-65%, as a result of human activity (Approximately 8% of ridges currently fall within Class 3, including the Northcliff, Roodepoort and Krugersdorp ridges).

d) Class 4 are those that have been transformed as a result of human activity by 65% or more. (Approximately 11% of ridges currently fall within Class 4, including the Melville Koppies and the Linksfield Ridge).

A review of the latest Gauteng Ridges dataset from GDARDE indicated that the study area is located within a Class 1 Ridge Buffer Zone and a Class 2 Ridge (**Figure 34**). **It should be noted that portions of the TSF are located within a Class 1 Ridge area and associated 200m buffer zone. Portions of the pipelines / powerline corridors and associated infrastructure such as the Kusasalethu plant upgrades are located within areas identified as**

Class 2 Ridges. Based on the Sensitive Ridge datasets from GDARDE, there are Class 1 and Class 2 sensitive ridges and associated buffer areas within the study area. There are several class 4 Ridges as well. The guidelines which are applicable to the use and development of the Class 2 and Class 4 ridges are set out below:

a) Class 2 ridges:

   Development activities and uses that have significant environmental impact on a Class 2 ridge will not be permitted. Only low impact activities might be permitted. Low impact development activities, such as tourism facilities, which comprise of an ecological footprint of 5% or less of the property may be supported. (The ecological footprint includes all areas directly impacted on by a development activity, including all paved surfaces, landscaping, property access and service provision). Low impact development activities on a ridge will not be supported where it is feasible to undertake the development on a portion of the property abutting the ridge.

b) Class 4 ridges:

   Further development activities will not be supported in areas of the ridge where the remaining contiguous extent of natural habitat is 4ha or more.

Considering that the proposed development within these sensitive ridges are pipelines and access roads along an already disturbed area with existing pipelines and access roads, the potential impact is anticipated to be low and as such, the activities are likely to be supported by the relevant department (GDARDE). The following requirements for applications that must follow an environmental impact assessment process will apply:

a) Applications involving activities on a ridge that must be subjected to an environmental impact assessment in any form must, in addition to any other requirements of law, be supported by a study or studies which, as a minimum, describe –

   i. the ecological conditions – including the functional, hydrological and compositional aspects – of the ridge,

   ii. flora and fauna – including any mammals, birds, reptiles, amphibians and invertebrates - that are present on the ridge,

   iii. the impacts of the proposed activity on ecology conditions, flora and fauna,

   iv. the stability of the slope and any implications thereof for the application, and

   v. the cultural, historical, open space and visual value aspects as well as the current use and value of the ridge for social purposes and the extent to which the proposed activity will impact on these uses or values

b) **Applications involving developments on a ridge falling within Class 1, 2 or 3 must also be supported by a study on service provision and access. The study on service provision and access must, as a minimum, describe the location of access roads to the site; what services are available; and - if no services are available - how the site will be serviced and the impact that any new infrastructure contemplated may have on the ridge**.

Complete avoidance of the ridge areas is not possible. GDEnv has and will be further consulted during this application process in order to determine the best practical solution. A draft offset strategy is included in Appendix E of this report. GDEnv will be asked to comment on the proposed offset requirements during the public review period of this EIA report.

4.2.2.6 GAUTENG BIODIVERSITY OFFSETS IMPLEMENTATION GUIDELINE. AUGUST 2024.

The Gauteng Biodiversity Offsets Implementation Guideline (August 2024) serves as a standardized provincial framework aligned with South Africa's National Environmental Management Act (NEMA) and the Gauteng Conservation Plan (C-Plan v4.0) to regulate the counterbalancing of environmental degradation caused by development. It enforces a strict mitigation hierarchy, dictating that developers must first attempt to avoid, minimize, and rehabilitate ecological impacts, treating biodiversity offsetting strictly as a last resort for managing significant residual impacts. The guideline outlines the specific processes for compiling specialist Biodiversity



Offset Reports, establishing long-term conservation outcomes, and calculating appropriate offset ratios based on ecosystem threat status, while explicitly designating irreplaceable ecosystems as "no-go" zones where offsets cannot be applied.

4.2.3 LOCAL POLICY AND PLANNING CONTEXT

4.2.3.1 WEST RAND DISTRICT MUNICIPALITY REGIONAL GROWTH AND DEVELOPMENT STRATEGY

The vision of the West Rand District Municipality Regional Growth and Development Strategy is to “develop and sustain an integrated, socio-economically and economically thriving and green environment with a unified society”. In order to achieve the above Vision, the Regional Growth and Development Strategy identified the following critical requirements:

- Ensure the WRDM is connected – with more people enjoying the benefits of flourishing activity centres where shops, jobs, services and recreation are within walking and travelling distance of their homes, with fast and reliable travel to and from local centres and regional opportunities, with a comprehensive, efficient and networked public transport system and pedestrian routes and access to rural and tourism areas.
- Ensure the WRDM is attractive – with quality urban and rural areas that are well-maintained, new developments which comply with high design standards, clean and safe environments and well-preserved heritage and natural areas.
- Ensure the WRDM is sustainable – with resources well managed and planned for, viable and cost-effective service provision; and where the environment is valued as a vital resource and meaningful open space is provided for all.
- Ensure the WRDM is well managed – where development decisions are predictable, fair and cost-effective, partnerships are developed, planning takes place on a continuous basis, formal systems for data collections are in place, and data is used to support and improve planning.

The WRDM Green IQ was compiled in (2012) and is a commitment to make the West Rand District the greenest district in South Africa and an African example of how sustainable development should be conducted. The Green IQ is a comprehensive strategy, built on 5 pillars, namely:

- PEOPLE: To create a place where people come first, a place characterized by equity, dignity and possibility; where everyone has the opportunity to build a better life for themselves, their children.
- ECONOMY: To restructure the economy to seize future development opportunities; to foster local resilience; to serve the people of the West Rand and to be an example of participatory prosperity.
- ENVIRONMENT: To make the precious natural resources available for future generations; create a low-carbon built environment dedicated to quality of life; and regenerate rural areas with a new sense of purpose.
- ENERGY: To facilitate the creation of new independent power producers to generate renewable, affordable and reliable energy to power new industries and create competitive advantages.
- INNOVATION: To establish itself as a centre of excellence in green technology and green living; attract the best minds; and encourage and support the industries of the future.

The West Rand Municipality's Green IQ goals related to mining focus on mitigating environmental impacts, such as addressing pollution from mining activities, and diversifying the economy to reduce reliance on mining.

4.2.3.2 MERAFONG MUNICIPAL SPATIAL DEVELOPMENT FRAMEWORK

In terms of chapter 5 of the Municipal Systems Act, 2000 (Act 32 of 2000), the municipality’s Integrated Development Plan “…must reflect a Spatial Development Framework which must include the provision for basic guidelines for a Land Use Management System for the municipality”. The Merafong Municipal Spatial Development Framework (MSDF), forms part of a hierarchy of plans feeding into the Integrated Development Plan (IDP). The Spatial Development Framework serves as an input into the IDP and concentrates on the spatial

aspects of development planning, whereas the IDP focuses on broader developmental issues. Following the SDF in the hierarchy are Sector Plans.

The MSDF aims to guide the future spatial development of the Merafong City municipality by focusing on integrating segregated urban areas, restructuring the urban form for efficiency, and prioritizing the development of a connected network of towns while considering factors like infrastructure provision, mobility, and settlement viability, particularly within mining communities, to create a more accessible and business-friendly environment for residents and businesses alike; essentially aiming to achieve a balanced and sustainable urban landscape through strategic land use planning. Overall, the Merafong MSDF serves as a roadmap for the municipality's future development, aiming to create a more inclusive, efficient, and sustainable urban environment by strategically managing land use and infrastructure investments. The study area is located in area identified / earmarked for mining in the MSDF.

4.2.3.3 **INTEGRATED WASTE MINIMISATION PLANS**

The West Rand District Municipality's Integrated Waste Minimisation Plan is a strategy designed to reduce the amount of waste generated within the district by promoting waste reduction, reuse, and recycling initiatives, aiming to achieve sustainable solid waste management practices across the municipalities of Randfontein, Mogale City, Westonaria, and Merafong City, all while adhering to national environmental legislation and minimizing environmental impact; key aspects include community awareness campaigns, improved waste collection systems, and collaborating with businesses and industries to minimize waste at its source.

The Merafong City Local Municipality Solid Waste Management Plan aims to address the issue of waste disposal in the area by implementing a comprehensive strategy that includes waste reduction, recycling initiatives, proper collection systems, and a designated landfill site, with a strong focus on community engagement to promote sustainable waste management practices, while also considering the unique challenges posed by the region's mining history and potential environmental impacts. Waste management for project shall align with these Integrated Waste Minimisation Plans.

4.2.4 INTERNATIONAL LEGISLATION AND STANDARDS

4.2.4.1 **GLOBAL INDUSTRY STANDARD ON TAILINGS MANAGEMENT (GISTM) AND SOCIAL PERFORMANCE**

The Global Industry Standard on Tailings Management (GISTM) was established to improve the safety and environmental integrity of tailings facilities worldwide. The GISTM is organised around six Topic areas, 15 Principles and 77 auditable Requirements. The aim of the standard is to adopt an integrated approach to tailings management. Social performance spans all six Topic Areas of the Standard, with specialist components defined in 14 (18 %) of the Standard’s 77 Requirements, with a further 18 Requirements (23 % of the Standard) requiring operators to integrate social performance inputs into processes, systems, and decisions about tailings facility management (Joyce & Kemp, 2020).

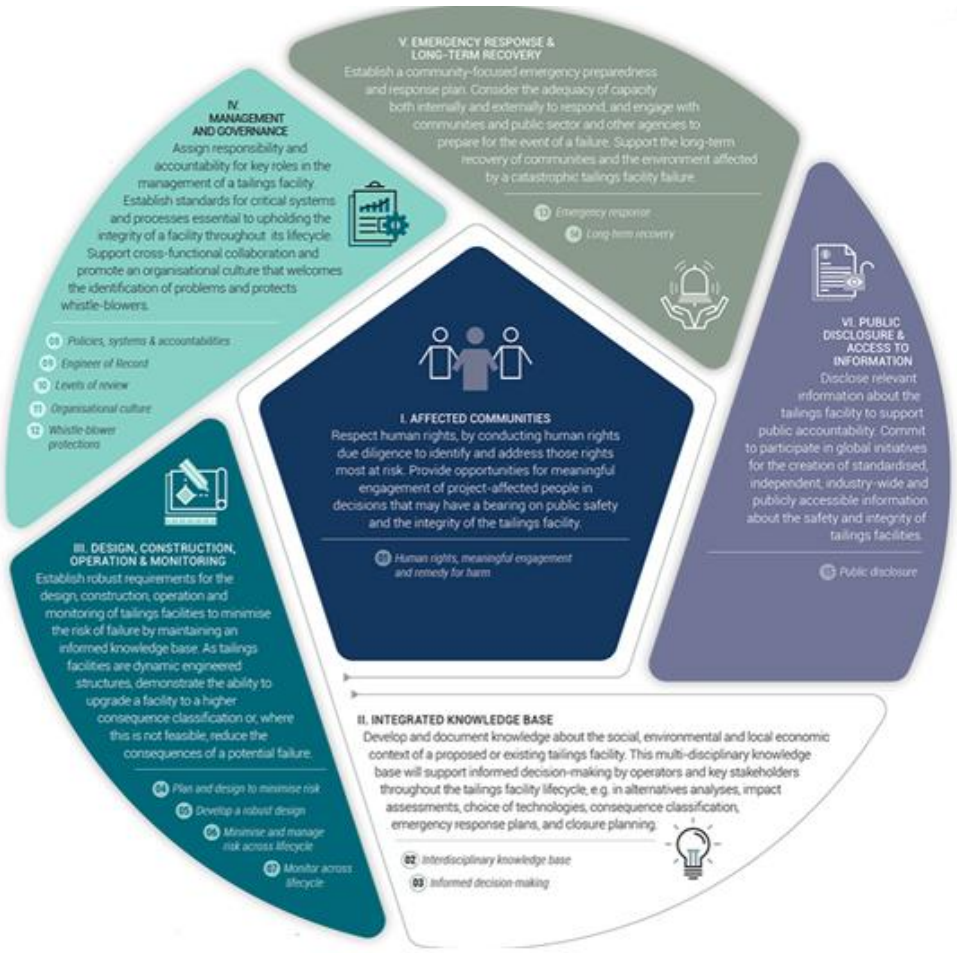


Figure 10: Summary of GISTM

Under Topic I, Affected Communities, there are four explicit social performance requirements namely: consideration of human rights throughout the lifecycle of the TSF; Free, prior, informed consent of indigenous and tribal people; meaningful engagement; and a grievance mechanism.

Topic II, Integrated Knowledge Base, package social, environmental, and local economic conditions together. Understanding of local context, human exposure and vulnerability is important in this topic. Impact assessment and mitigation plans fall under this topic.

Although Topic III, Design, Construction, Operation and Monitoring deals mainly with technical aspects, social requirements are included when additional steps to minimise consequences are considered, and in the mention that international standards should be followed if involuntary resettlement is required.

Topic IV, Management and Governance requires the establishment of a tailings governance framework and confirms the Environmental and Social Management System (ESMS) as an integral component. This topic nominates one or more Accountable Executive(s) as responsible for, amongst other matters, avoiding or minimising the consequences of a tailings facility failure for local people. Other requirements include multi-disciplinary risk assessments, and the review and audit of the ESMS as it relates to the tailings facility.

Topic V, Emergency Preparedness and Recovery, is critically important from a social performance perspective. It requires meaningful engagement with employees and contractors in the development of Emergency Preparedness and Response Plans, and 'locks in' the role of project-affected people in the co-development of community-focused emergency preparedness measures. Topic V also cover the long-term recovery of people and the environment in the event of a catastrophic failure event – a topic that is not covered in any other tailings or social performance standard. Requirement 14.1 asks operators to take reasonable steps, before a failure



event, to meaningfully engage with public sector agencies and other organisations that would participate in medium- and long-term social and environmental post-failure response strategies. These agencies are likely to be quite different to the first responder groups engaged. Topic V would involve post hoc impact assessments, and stakeholder engagement to develop and implement plans that enable the participation of affected people in restoration and recovery works and ongoing monitoring activities.

The documents listed under Topic VI, Public Disclosure and Access to Information, will likely be in the hands of other functions, such as external affairs and legal, many of these concerns fall within the purview of social performance. Regularly publishing and updating information and responding to reasonable requests for additional information is fundamental to meaningful engagement at the local-level, and for generating trust across the stakeholder spectrum (Joyce & Kemp, 2020). Harmony aims to align their operations with the requirements of the GISTM.

5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

The applicant owns and operates a number of Gold Mines and plants in the Carletonville Region of Gauteng and requires additional deposition capacity for West Wits region's operations. The applicant plans on constructing the Deelkraal II Tailings Storage Facility (TSF) to cater for the additional future capacity. This TSF will receive residue from Kusasalethu, and Savuka plants and will also assist in returning process water for reclaiming the existing Deelkraal I TSF and Kusasalethu TSF for processing at Kusasalethu plant. The West Wits Reclamation and Deposition project will allow for the continuation of jobs and investment into the area. Further thereto, the reclamation will result in the removal and cleaning of old historic tailings facilities in accordance too the new waste legislation and regulations, thereby removing potential sources of pollution from the old areas and allowing Harmony to rehabilitate these old footprints and open them to other land uses. This will create substantial investment in the area and ensure Harmony is able to keep mining activities ongoing into the future.

The needs and desirability analysis component of the "Guideline on need and desirability in terms of the EIA Regulations (Notice 819 of 2014)" includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, opportunity costs, etc.). **Table 9** present the needs and desirability analysis undertaken for the project based on the guideline on need and desirability in terms of the EIA regulations.

Table 9: Needs and desirability analysis for the proposed project.

Ref No.	Question	Answer
1	Securing ecological sustainable development and use of natural resources	
1.1	How were the ecological integrity considerations taken into account in terms of: Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities.	A number of specialist studies inform this application and include: • Biodiversity (Terrestrial) • Heritage • Agriculture Potential, Soils and Land capability • Geohydrology • Aquatic and Wetland • Air quality • Hydrology • Palaeontology • Noise (compliance statement) • Social • Visual • Health Risk and Radiological • Closure Costing The conclusions of these studies are included in this EIA report. Further, the mitigations and mitigations stemming from the specialist assessments are included in the attached EMPr for implementation.
1.2	How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to baseline ecological statement in Section 8.13 and the impact assessment in Section 9 of this report.
1.3	How will this development pollute and / or degrade the biophysical environment? What measures were explored to either avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	



Ref No.	Question	Answer
1.4	What waste will be generated by this development? What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	Significant amounts of waste will not be generated during the operational phase, apart from the tailings material itself. During construction the types of waste generated include sewage waste, biodegradable wastes, and non-biodegradable solid waste as well as general construction waste. Waste has been identified as an impact and assessed in Section 9. However, it is anticipated that the following measures can be utilised to reduce the impact of the waste on the receiving environment: • Waste must be stored correctly. • All hazardous waste such as oil must be stored separately and disposed of at a registered facility. • Proof of disposal must be kept by the Applicant.
1.5	How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	A heritage impact assessment is being conducted as part of the EIA. Refer to sections 8.4 and for further information as well as the impact assessment in Section 9 of this report.
1.6	How will this project use and / or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the impact assessment in Section 9 of this report. As a result of the fact that this project entails only a new TSF and pipelines, it is anticipated that this project will not lead to a significant impact or depletion of non-renewable resources.
1.7	How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	Refer to the impact assessment in Section 9 of this report.The project will have a moderate impact on the localised ecology.



Ref No.	Question	Answer
1.7.1	Does the proposed project exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)?	The proposed project is only for additional deposition space required for Harmony's Wet Wits operations.
1.7.2	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used?	The proposed project will not, at this stage, involve the use of the natural resources apart from the TSF and associated infrastructure area to be cleared.
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The proposed project is only for additional deposition space required for Harmony's West Wits operations.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts:	
1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	The limitations and/or gaps in knowledge are presented in Section 13.
1.8.2	What is the level of risk associated with the limits of current knowledge?	The level of risk is considered low at this stage.
1.8.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	At this stage it is anticipated that this project will not lead to a significant impact on the receiving environment. Refer to the impact assessment in Section 9 of this report.
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following?	
1.9.1	Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	The proposed activities are anticipated to have low negative ecological impacts. Refer to the impact assessment in Section 9 in this report.
1.9.2	Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	A medium to low impact on third party wellbeing, livelihoods and ecosystem services is currently foreseen. Refer to the impact assessment in Section 9 of this report.

Ref No.	Question	Answer
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	The proposed activities are anticipated to have generally low negative ecological impacts. Refer to the impact assessment in Section 9 in this report.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Refer to Section 6 – where details of the alternatives are given and considered.
1.13	Describe the positive and negative cumulative ecological / biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Refer to Section 9 of this report.
2	Promoting justifiable economic and social development	
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following:	
2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks or policies applicable to the area	Refer to Section 8.13 of this report for a breakdown of the demographics and social environment in the project area. The Merafong City Local Municipality IDP and West Rand District Municipality IDP identifies Economic infrastructure and development as one of the key mayoral strategic priorities (IDP Merafong Municipality 2023/24 IDP and West Rand Municipality 2024/25 Reviewed IDP).
2.1.2	Spatial priorities and desired spatial patterns (e.g. need for integration of segregated communities, need to upgrade informal settlements, need for densification, etc.),	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Wadela, Fochville and Carletonville.
2.1.3	Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	Refer to the baseline environment in Section 8 of this report. The TSF is located in a mining area and is surrounded by existing mining infrastructure.
2.1.4	Municipal Economic Development Strategy ("LED Strategy").	Considering the location and type of the activities, it is not anticipated to significantly promote or facilitate spatial transformation and sustainable urban development.

Ref No.	Question	Answer
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	Refer to the impact assessment in Section 9 in this report.
2.2.1	Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas. In addition, Harmony has various social and LED initiatives required under their Social & Labour Plan (SLP) commitments.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Refer to the public participation process and feedback contained in Appendix C.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	Refer to the impact assessment and mitigation measures in Section 9 of this report. The TSF construction and operation will create employment and ensure Harmony can continue to employ current employees at their West Wits operations.
2.5	In terms of location, describe how the placement of the proposed development will:	
2.5.1	Result in the creation of residential and employment opportunities in close proximity to or integrated with each other.	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Wadela, Fochville and Carletonville
2.5.2	Reduce the need for transport of people and goods.	The activities are not anticipated to have an impact on the transportation of goods and people.
2.5.3	Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms of public transport),	The activities are not anticipated to have any significant impact on the public transport.
2.5.4	Compliment other uses in the area,	The site for the Deelkraal II TSF is mostly greenfields with a partial brownfields intake. The surrounding area is impacted by existing TSF facilities and associated mining infrastructure.
2.5.5	Be in line with the planning for the area.	Refer to item 2.1.1 of this table (above).
2.5.6	For urban related development, make use of underutilised land available with the urban edge.	Not applicable. The proposed project is not located in an urban area.

Ref No.	Question	Answer
2.5.7	Optimise the use of existing resources and infrastructure,	Refer to Section 3 of this report.
2.5.8	Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	
2.5.9	Discourage "urban sprawl" and contribute to compaction / densification.	Not applicable. The proposed project is not located within an urban area and will not contribute to urban sprawl.
2.5.10	Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	Refer to items 2.5.7 – 2.5.9 of this table (above).
2.5.11	Encourage environmentally sustainable land development practices and processes	Refer to impact assessment in Section 9 of this report.
2.5.12	Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	Refer to alternative analysis in Section 6.
2.5.13	The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential).	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Wadela, Fochville and Carletonville. In addition, Harmony has various social and LED initiatives required under their various SLP commitments. A social impact assessment is included in Appendix D of the EIA report.
2.5.14	Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	Refer to impact assessment in Section 9 of this report.
2.5.15	In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	Given the scale of the development it is not anticipated that the activities will contribute significantly to settlements or areas in terms of direct socio-economic returns however the development will allow operations at the Harmony's West Wits operations to continue.
2.6	How was a risk-averse and cautious approach applied in terms of socio-economic impacts:	



Ref No.	Question	Answer
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Refer to Section 13 of this report.
2.6.2	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions.
2.6.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions.
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.7.1	Negative impacts: e.g. health (e.g. HIV-AIDS), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Refer to the impact assessment in Section 9 of this report. A health a radiation assessment is being conducted as part of the EIA.
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	Refer to the impact assessment in Section 9 of this report.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Refer to the impact assessment in Section 9 of this report.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Refer to the impact assessment in Section 9 of this report.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to the impact assessment in Section 9 of this report.



Ref No.	Question	Answer
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	By conducting an EIA Process, the applicant ensures that equitable access has been considered. Refer to the impact assessment in Section 9 of this report.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Refer to the impact assessment in Section 9 of this report. The EMPr included as part of this EIA report specifies timeframes within which mitigation measures must be implemented.
2.13	What measures were taken to:	
2.13.1	Ensure the participation of all interested and affected parties.	Refer to Section 7 of this report, describing the public participation process undertaken for the proposed project.
2.13.2	Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	Refer to Section 7 of this report, describing the public participation process undertaken for the proposed project. advertisement, notification letter and site notice have been made available in English, Afrikaans and Setswana to assist in understanding of the project. Further public consultation will be held during the review period of the Scoping / EIA reports for the project.
2.13.3	Ensure participation by vulnerable and disadvantaged persons,	
2.13.4	Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	
2.13.5	Ensure openness and transparency, and access to information in terms of the process,	
2.13.6	Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7	Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted?	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the	Refer to Section 7 of this report, describing the public participation process undertaken for the proposed project.



Ref No.	Question	Answer
	segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	
2.15	What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Potential future workers will have to be educated on a regular basis as to the environmental and safety risks that may occur within their work environment. Furthermore, adequate measures will have to be taken to ensure that the appropriate personal protective equipment is issued to workers based on the conditions that they work in and the requirements of their job.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1	The number of temporary versus permanent jobs that will be created.	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Wadela, Fochville and Carletonville. Details in terms of job figures and employment opportunities will be made available for the EIA-phase report.
2.16.2	Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area).	
2.16.3	The distance from where labourers will have to travel.	
2.16.4	The location of jobs opportunities versus the location of impacts.	
2.16.5	The opportunity costs in terms of job creation.	
2.17	What measures were taken to ensure:	
2.17.1	That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.	The EIA Process requires governmental departments to communicate regarding any application. In addition, all relevant departments are notified at various phases of the project by the EAP.
2.17.2	That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures.	
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Refer to Section 7 of this report, describing the public participation process implemented for the application, as well Section 8, the impact on any national estate.

Ref No.	Question	Answer
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the impact assessment and mitigation measures in Section 9 of this report. All mitigation measures are considered to the realistic and implementable.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	At this stage the proposed activities are not anticipated to produce significant pollution, environmental damage or adverse health effects in the long term as long as the proposed mitigation measures are implemented.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Refer to Section 6, description of the process followed to reach the proposed preferred site.
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to the impact assessment and mitigation measures in Section 9.

6 PROJECT ALTERNATIVES

As this application relates only to a new TSF and associated pipelines and infrastructure, there are limited feasible and/or reasonable alternatives that can be considered and which are described and motivated below.

6.1 LOCATION ALTERNATIVES

The assessment of location alternatives is limited due to the available open space in close proximity to the mining activities (and especially the gold processing plant). Several alternative disposal options are being assessed as part of a Harmony's trade-off assessment. Two other options were considered in a high-level trade-off are:

- Old Savuka TSF footprints; and
- Old DF5 footprint

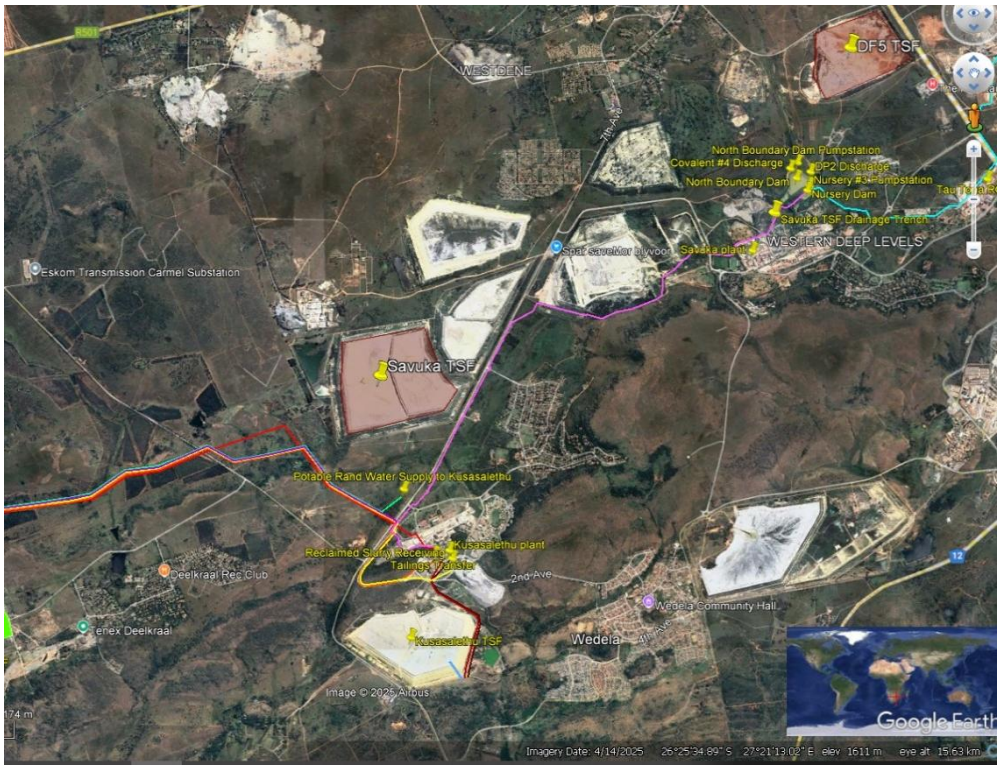


Figure 11: Other potential site options (dark red polygons) considered in trade-off study

Due to limited deposition capacity on these existing footprints, it is unlikely that either of these sites could, on their own, cater for the required tonnages of tailings material, however it is possible that one or both of these sites could be used in conjunction with the proposed Deelkraal II TSF, thereby potentially reducing the footprint of the Deelkraal II TSF. A trade-off was undertaken by Harmony in order to determine the feasibility of utilizing these other two existing footprints and a Concept Study (SGS Bateman, 2024) evaluated different options for the treatment of the Deelkraal and Kusasalethu Tailings Storage Facilities (TSF) at the existing processing plants. The trade-off study shortlisted three options which allow for the present reclamation operations to seamlessly continue and for future operations to be scheduled. The trade-off study considers timelines for the design, environmental approval and construction of the TSFs. This was done to determine the most feasible options to allow for present reclamation operations to continue and for future reclamation operations to be scheduled. The trade-off study identified three viable options that will need to be taken to feasibility level study.

- The first option considers extending Deelkraal Dormant TSF as a buffer TSF and utilizes DRD TSF for present reclamation operations to follow through. DRD TSF is not owned by Harmony and negotiations will need to be held with DRD.

- The second option considers Blyvoor Gold TSF 6 (cyclone converted) as a buffer TSF and utilizes DRD TSF for present reclamation operations to follow through.
- The third option considers extending Deelkraal Dormant TSF and Blyvoor Gold TSF 6 as buffer TSFs for present reclamation operations.

For all three options, future reclamation operations are catered for by utilizing the Deelkraal II TSF and the Savuka Dormant TSFs as deposition sites. The viability of each of the options will need to be further evaluated at a feasibility level however the proposed Deelkraal II TSF will still be required, no matter which of the above options is selected. Due to the limited deposition capacity when considering these other site options, none of them satisfy the requirement for consideration as a true alternative site and these have therefore not been considered further as part of this EIA.

Available space for alternative site options for the Deelkraal II TSF is constrained by various factors. The properties to the north are earmarked for Solar PV development by Independent Power Producers and as such this land is not available to the applicant. To the south lies the Class 1 ridge area which cannot be utilized for construction of the TSF due to its sensitivity and geotechnical / engineering constraints. The land to the west is not owned by Harmony. To the east of the proposed site existing infrastructure and communities exist which makes this a no-go area for alternative TSF site placement. These site location constraints are shown in **Figure 12**.

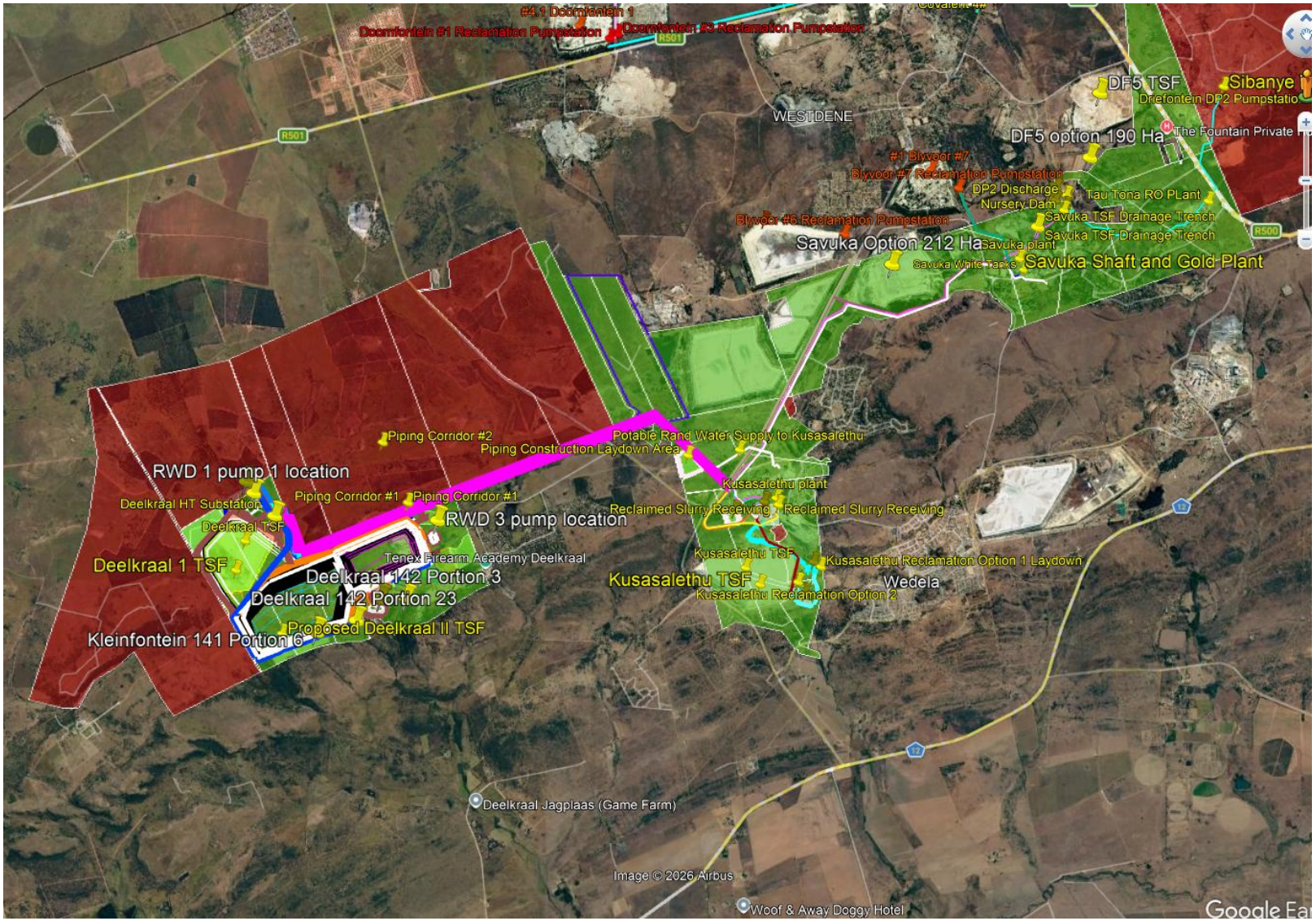


Figure 12: Site location constraints – Harmony owned land in green

6.2 LAYOUT AND DESIGN ALTERNATIVES

6.2.1 TSF DESIGN

The total volume of material to be deposited of on the TSF is based on the forecast gold reserves to be processed at the existing plants. The potential to reduce the footprint of the new TSF would require altering the dimensions of the facility by making it either higher with steeper side slopes or lower with a greater footprint area. Increasing the height would result in greater visual impacts and possibly increasing the secondary impacts such as fugitive dust generation and erosion of the steeper side slopes. This would also lead to increasing the stability risks as well as more complex final closure requirements. Alternatively, reducing the height of the facility would result in a larger footprint however there is insufficient available space to do so in the proposed location. The TSF will be 65m in height based on the current design.

The EIA process being undertaken includes the assessment of potential impacts and the identification of environmental sensitivities within, and in, the vicinity of the proposed project area, thereby allowing for the recommendation of mitigation measures towards the avoidance, minimisation and / or management of the anticipated impacts. The layout will be planned to avoid any no-go areas identified from the various specialist studies, if required, otherwise no additional layout or design alternatives are considered applicable to this application. Various design alternatives have been investigated as part of the TSF design which has already undergone several design iterations.

Part of TSF footprint encroaches into Class 1 Ridge area (14ha) and 200m buffer zone (35ha). It is not possible for the TSF to completely avoid the Class 1 Ridge area, avoiding the Class 1 Ridge area would result in a less favourable design, reduced throughput, and an increased rate of rise. This, in turn, would necessitate potentially a higher starter wall than in the current design, which is one of the primary cost drivers of the overall design. If this option were to be pursued, operational complexity would also increase. Furthermore, the elongated shape of the facility would require an additional compartment, together with extra decant infrastructure. The reduced footprint would necessitate significant redesign and could result in project delays and may render project overall not feasible. Avoidance of the 200m ridge buffer area would further reduce the footprint, resulting in an even smaller throughput. The complete avoidance of the ridge is therefore not considered

feasible however the current design avoids the ridge and associated buffer zone as far as possible.

6.2.2 LOCATION OF KEY INFRASTRUCTURE COMPONENTS

Various areas were investigated from a feasibility perspective for the location of the new main RWD for the Deelkraal II TSF. The location of the **return water dam** (RWD) is dependent on various geotechnical factors and is also constrained by area as it needs to be located in the immediate vicinity of the new Deelkraal II TSF. The original proposed location for the main RWD was to the immediate south of the Deelkraal II TSF. This has now moved to the north of the TSF (**Figure 1**) and will be constructed over the footprint of an existing unlined RWD. The new lined facility will be an improvement over the current conditions. Similarly, the existing unlined TSF will be reclaimed and replaced with a new lined TSF, which would also constitute an improvement on the current conditions. This location is therefore considered the only suitable location for the RWD.

The two **smaller return water dams** are also location constrained by engineering constraints as they need to be located in the lowest lying areas within the perimeter of the TSF. These two RWDs would have to remain within the wetland, as these are required to be located at the lowest elevation, on a flat area and within the Harmony property.

The alignments of the **clean water diversion channel and solution trenches** (dirty water channels) are fixed to enable gravity drainage from the Deelkraal II TSF. In addition, the reclamation station must be located adjacent to the existing Deelkraal I TSF, at the lowest point to facilitate gravity flow of slurry in the hydro-mining process planned for implantation of the remining of Deelkraal I. Given the spatial constraints of the site, the current layout represents the most suitable configuration.

All topsoil stockpiles, construction laydown areas and the Kusasalethu TSF reclamation pump station have been relocated from the original layout provided to avoid the wetlands and high sensitivity SEI areas as far as possible. An existing storage area adjacent to Kusasalethu plant has been identified as the preferred area for the plant upgrade laydown area, avoiding the need for a new laydown area in this location (**Figure 13**).



Figure 13: Storage area adjacent to plant that will be made use of as a laydown area for planned plant upgrades

Figure 14 and **Figure 15** below show the locations of this infrastructure before and after infrastructure relocation and optimisation in order to avoid the identified wetland and terrestrial biodiversity high sensitivity areas.

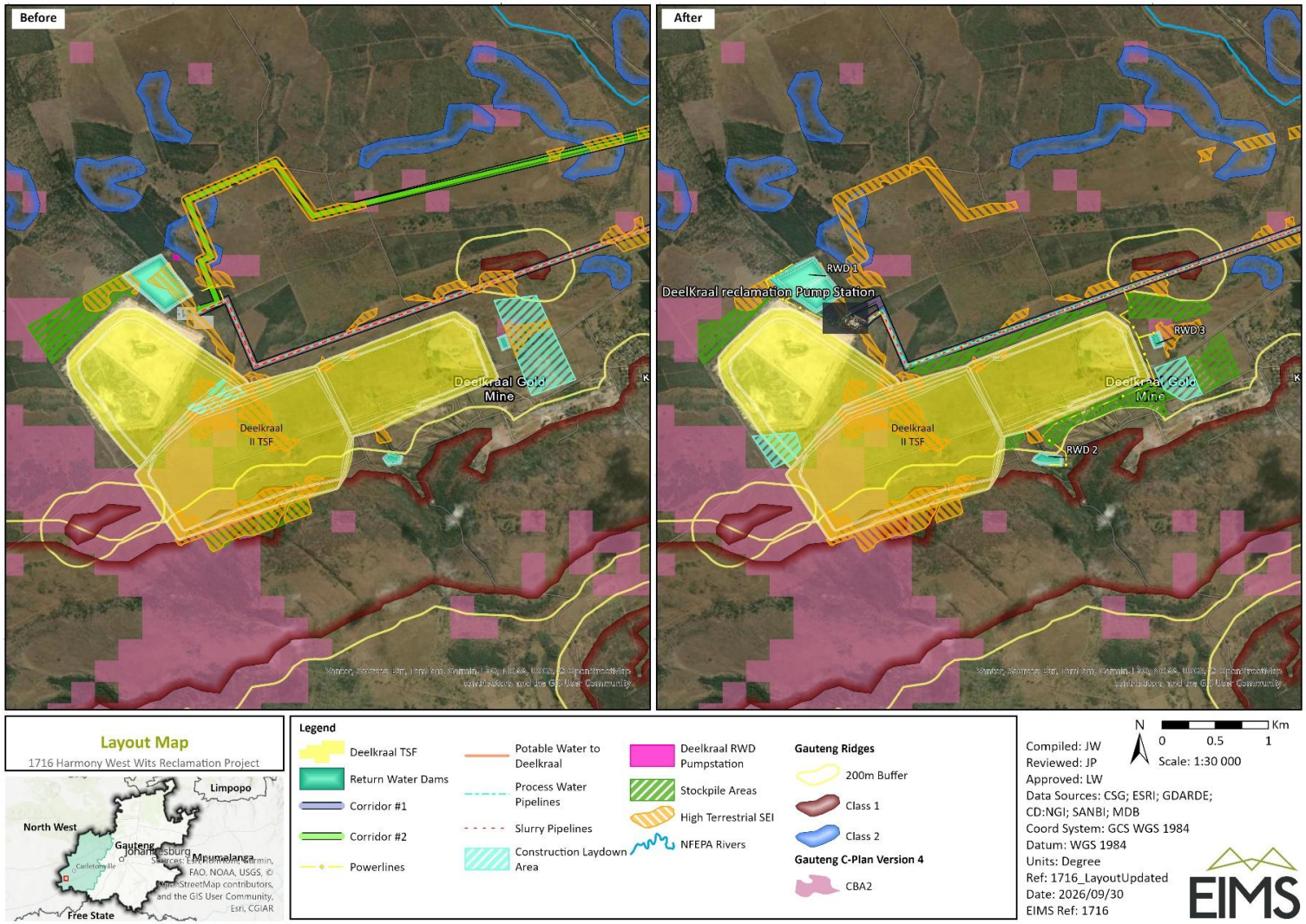


Figure 14: Map showing layout changes based on identified sensitivities (eastern section)

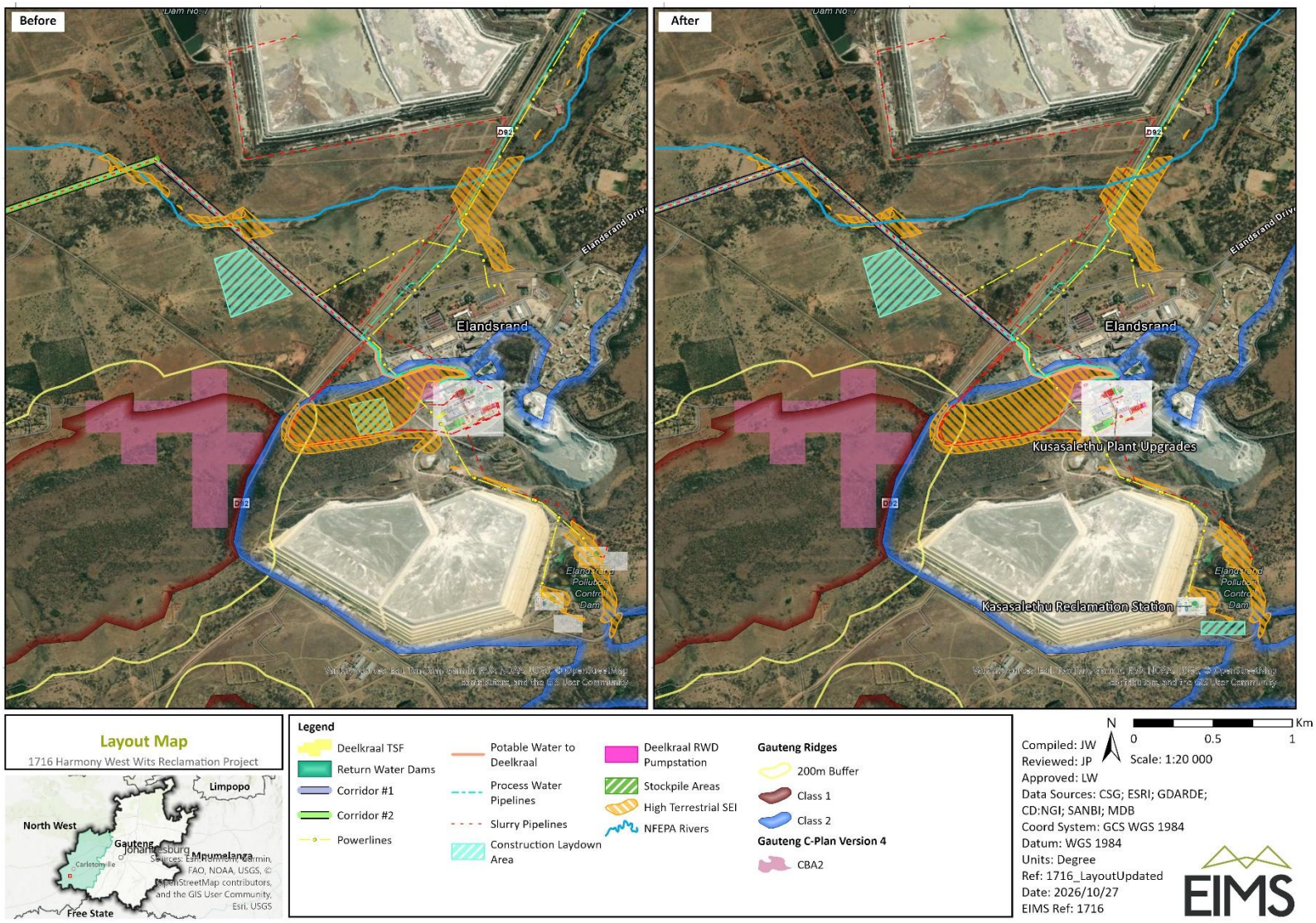


Figure 15: Map showing layout changes based on identified sensitivities (western section)

6.2.3 PIPELINE AND POWERLINE ROUTES

Two alternative routes are proposed for the pipeline and powerline corridor in the vicinity of the proposed Deelkraal II TSF. Both options are presented in the figure below and both options are assessed in this EIA report. Pipeline Corridor Alternative 1 follows a northern alignment. Pipeline Corridor Alternative 2 runs to the south.

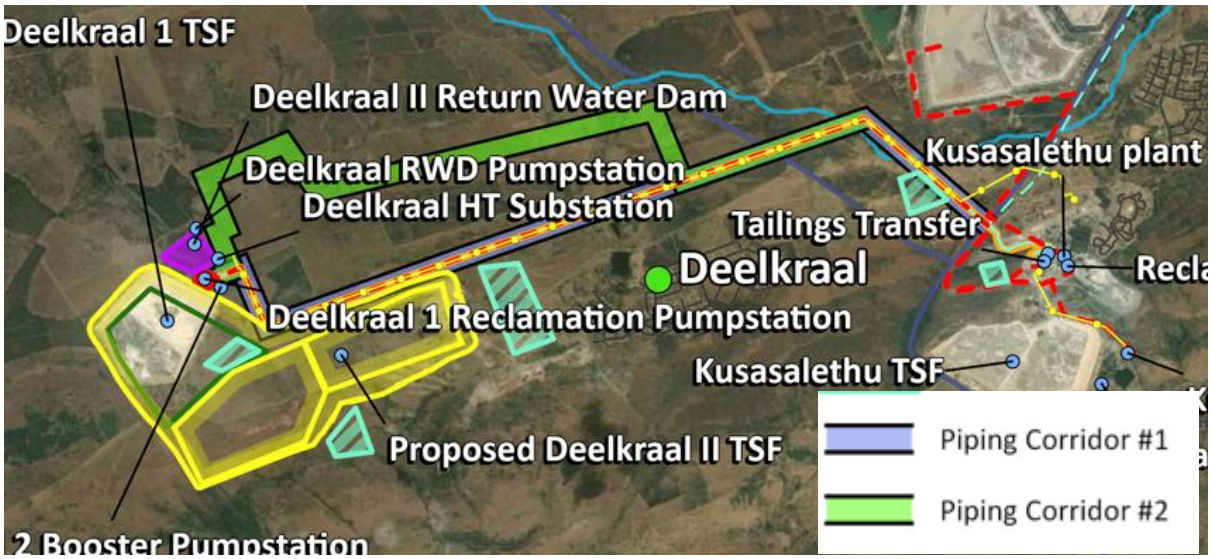


Figure 16: Pipeline alternatives

From the outcomes of the specialist assessments Corridor 1 (southern corridor) is preferred due to lower impacts on wetlands and terrestrial biodiversity aspects. Corridor 1 is also preferred from a technical feasibility perspective. No preferences were presented in any of the specialist studies for Corridor 2. **Corridor 1 (southern piping and powerline corridor) is therefore nominated as the preferred alternative.**

6.2.4 ADDITIONAL DESIGN ALTERNATIVES

6.2.4.1 UNLINED VS LINED TAILINGS STORAGE FACILITY

Under current environmental legislation in South Africa, tailings are viewed as potentially hazardous waste that needs to be disposed of in compliance with the appropriate minimum requirements. Traditionally, tailings in South Africa have been built on top of the *in-situ* soils. The use of composite liners is relatively new in tailings dam construction in South Africa and brings with it its own set of challenges. The requirement for a barrier system in South Africa regulations was promulgated under the National Environmental Management Act - Regulations 632, 634, 635 and 636. These are currently administered by the Department of Water and Sanitation (DWS). Under these regulations waste, including tailings, is assessed under Waste Acceptance Criteria for Disposal to Landfill, which determines the requirements for disposal of different types of waste. Under these regulations, many mineral residue deposits are found to require a barrier system, which typically includes a geomembrane.

The Department (DWS) no longer condones South Africa's philosophy of the past 20 years, in terms of which dilution of water contamination and dispersion relying on attenuation was regarded as acceptable (Legge, 2019). Protection of water resources, and prevention of contamination in the first place (source) is now being sought in preference to mitigating contamination spread (pathway) and pollution cleanup (receptor). Apart from preventing polluted leachate from seeping into the groundwater, an additional benefit of lining a tailings dam is that more water in the tailings system can be captured and returned to the plant. This is useful in a water-scarce country such as South Africa. Since the tailings industry has not always included barrier systems in design or construction, there are learnings to be acquired, even by seasoned tailings consultants and contractors, on how to work with these systems. A proposed amendment to Regulation 632 (2016) has been drafted whereby there could in future be a relaxation of the regulations on a case-by-case basis, following a risk-based approach. However, such regulations have yet to be promulgated into law. In the meantime, the current regulations apply to the disposal of tailings in the same way they apply to the disposal of any other waste to landfill.

The alternatives relate to the liner design for the TSF. The liner requirements are based on the waste classification of the material, geohydrological modelling and risk assessment. Tailings use liners to prevent the release of concentrated mine chemicals into the environment. Many regulatory agencies request lined Tailings Storage Facilities in hopes of better protecting groundwater resources. Liners are not always necessary; however, tailings solution containment is critical to meeting environmental requirements and the necessary assessments and measures must be undertaken to ensure best environmental practices. The necessity of liners for TSF (and/or RWDs) are subject to the type, nature and surrounding geohydrological conditions in consultation with the 2013 regulations published in terms of the National Environmental Management: Waste Act, notably GN R. 634 to GN R. 636 relevant to Waste Classification and Management, National Norms and Standards for the Assessment of Waste for Landfill Disposal and National Norms and Standards for Disposal of Waste to Landfill.

For important reasons, hazardous waste landfills are the most closely regulated and structured landfills. They are specifically designed to hold hazardous wastes in a way that virtually eliminates the chance of it being released into the environment. In addition to these design requirements, hazardous waste landfills are often inspected multiple times a year to make sure that the facility is up to code and the standards are top-notch. Some of the design requirements for hazardous waste landfills include:

- Double liners;
- Double leachate collection and removal systems;
- Leak detection systems;
- Run on, runoff and wind dispersal controls; and
- Construction quality assurance programs.

An inverted barrier system with equivalent performance to a Class C barrier can be motivated for implementation if the TSF needs to be lined. **The Deelkraal II TSF will be a lined facility**. The inverted barrier system substantially reduces the seepage areas as well as the seepage rate by changing the seepage flow from orifice flow to Darcian flow. This is achieved by placing the geomembrane on top of a SANS 10409 (2020) compliant receiving face of reworked foundation soil (consisting of existing tailings) instead of a clay layer and sliming fine tailings over the geomembrane. A Class C performance barrier system has been opted for the RWD. The geomembrane was changed from a general Class C 1.5 mm HDPE to a 2 mm HDPE to improve the liner performance as well as to negate the use of a clay layer below. Seepage losses through a traditional Class C barrier is primarily determined based on the number of holes intersecting wrinkles as reflected in the Casagrande lecture 2012 by RK Rowe. For the inverted barrier, seepage losses change from orifice flow controlled by the Bernoulli equation at wrinkles (with Darcian flow through the area beneath the wrinkle) to Darcian flow through the tailings at the discontinuity in the geomembrane. Furthermore, this barrier system substantially reduces the risk of damage to the liner when placing above liner ballast and gravel by mechanical means and increases stability by eliminating the low strength expansive clay and its interface with the geomembrane in the outer wall zone between the toe wall and starter wall (Eco Elementum, 2025). The advantages and disadvantages of lined, unlined TSFs and unlined TSF with Phytoremediation are indicated in **Table 10.**

Table 10: Advantages and disadvantages Lined & Unlined TSF

ADVANTAGE	DISADVANTAGE
Lined TSF	
A geomembrane liner, such as high-density polyethylene (HDPE), prevents leachate (polluted liquid) from seeping into the groundwater and surrounding soils	Liners need to be properly installed for maximum pollution prevention.

ADVANTAGE	DISADVANTAGE
By containing contaminated liquids, liners protect both the environment and local water resources from pollution	Requires artificial drainage systems and rigorous monitoring for stability and performance.
Aligned with the current DWS requirement for the use of liners for the safe disposal of tailings	Prone to damage and localized leakage, necessitating strict quality control during installation.
	The introduction of a liner can alter the interface between the tailings and the underlying materials, requiring new methods to assess and ensure the stability of the facility.
Unlined TSF	
Unlined facilities require less initial investment as they don't involve the cost of lining materials or the increased complexity of a lined system, which can also make them easier to operate and maintain	No pollution prevention. May pose significant environmental risks due to potential seepage of toxic contaminants into groundwater and soil.
The absence of liners and associated complex systems simplifies the design and construction process, making them quicker to build and deploy.	Water use inefficiency - No recycling of water. More water in the tailings system escapes and not returned to the plant for reuse.
	Seepage through unlined facilities can lead to the contamination of aquifers and soil, affecting water sources for communities and ecosystems downstream of the mine site
	Without a liner, there is a greater risk of uncontrolled leakage or, in the worst case, a complete failure of the facility, which could release vast quantities of toxic slurry and debris into the surrounding environment
	Closing and rehabilitating an unlined facility presents significant challenges, as long-term containment of potential contaminants in the natural environment is more difficult to achieve and can be very expensive.

It is expected that a liner such as the inverted barrier system will be suitable to prevent any potential contaminant impact on the groundwater in the immediate area. **Based on the above significant benefits as a result of lining the TSF the lined option is preferred.**

6.2.4.2 LINED VS UNLINED RETURN WATER DAMS

The same general principals noted above will also apply to lining of the RWDs. Although not as significant as the lining of the TSF, the lining of the RWDs would slightly reduce long-term potential contamination of groundwater resources. **A lined RWD is therefore preferred from an environmental perspective and the recommendation is that all three RWDs should be lined.**

6.2.4.3 PIPELINE DESIGNS

In order to allow for slurry deposition on the Deelkraal II TSF new residue deposition pipelines will be required. The residue deposition pipelines will have a diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. The pipelines will be flanged steel pipelines and installed above-ground on pre-cast concrete plinths. Slurry pipelines can be made of many different materials such as carbon steel, alloy steel, hardened steel, stainless steel, abrasion resistant lined pipes, and non-ferrous pipes, HDPE etc. The material of the pipeline is generally selected based on the application, material being pumped, and cost. The assessment of slurry pipelines design alternative on this report is based on relative location to the ground; aboveground and underground. Based on the analysis of the same type of pipelines proposed for the project, the advantages and disadvantages of the pipeline in relation to the ground is provided in **Table 11**.

Table 11: Advantages and disadvantages Pipelines Design

ADVANTAGE	DISADVANTAGE
Above-Ground Pipelines	
Above-ground pipelines are much easier and cheaper to build and install.	Can be easily damaged, requires constant monitoring and maintenance.
Above-ground pipelines are much easier and cheaper to monitor and maintain.	Generally, have a shorter lifespan.
Above-ground pipelines allow for quicker and effective repairs, reducing the amount of pollution	Easily accessible, there is also the concern of vandalism and the chance that damage may lead to leaks and impacts on the environment.
Above-ground pipelines have lesser environmental impacts as there are shallow distal excavations and no deep excavations or blasting requirements.	
Below-Ground Pipelines	
Security: Below-ground pipelines are less likely to be affected by weather phenomenon and/or vandalism.	Pipelines are more difficult and expensive to build and install.
Below-ground pipelines generally require less frequent monitoring and maintenance.	Pipelines are more difficult and expensive to maintain.
The land above the pipeline can be rehabilitated to blend in with the surrounding landscape / land use.	Pipelines have more environmental impacts as there is a need for excavations and/or blasting requirements. Any leak directly contaminates the environment and may be only recognized after a period of time.

Based on the advantages and disadvantages indicated in **Table 11** above, it is the EAP's opinion that **above-ground pipelines are the more favourable designs.**

6.3 TECHNOLOGY ALTERNATIVES

The only available technology alternatives relate to the liner design for the TSF and the specific deposition method. The liner requirements and ultimate solution is based on the waste classification of the material and geohydrological modelling and risk assessment. Liner requirements and alternatives are discussed in the preceding sections. No additional technology alternatives are considered applicable.

There are various deposition techniques which are applicable to tailings storage facilities. Once the tailings slurry (dilute or paste consistency) has arrived at the tailings storage area, there are several possible ways it can be deposited. These include the spigotting method, cyclone deposition and the paddocking method. Eash alternative is described below:

Spigots are multiple outlets along a delivery pipeline. This technology is only used when it is easily possible to cause a gravitational grading split between the coarse and the tailings' fine fractions.



Figure 17: Example of spigot deposition (source: www.researchgate.net)

Paddock deposition requires construction of small impoundments or containment berms with dried-out tailings borrowed from the previous layer deposited around the perimeter or edge of the paddock. These shallow paddocks are then filled with dilute slurry.



Figure 18: Example of paddock deposition

In **cyclone deposition** is a cyclone deposition device consisting of conical housing equipped with a feed pipe that enters the cone at its larger diameter closed end. A second pipe enters the cone and intrudes into the body of the cone. The slurry feed enters under pressure and is forced to swirl with a spiral motion towards the smaller end. In the process, centrifugal forces cause the larger particles in the slurry to move down and away from the axis, towards the narrow exit of the cone. The net effect is that the finer particles and most of the water leave

the cyclone through the vortex finder and form the "overflow," while the partially dewatered larger particles leave at the opposite end as the coarser "underflow. The purpose of using a cyclone is to create underflow material that has good geotechnical characteristics, i.e., high permeability, fast consolidation and strength gain rate than the original tailings so that the underflow can be used to form an impoundment wall to the tailings storage facility. Effective operations of a cyclone TSF can also result in high water recoveries.



Figure 19: Example of cyclone deposition

Currently cyclone deposition is the vastly preferred method of deposition for the majority of Harmony's current TSF operations due to the reasons described above. The environmental impacts associated with each deposition method are similar however cyclone deposition has higher water recovery rates and is also preferred from a geotechnical perspective. The Deelkraal II TSF is designed to utilize Cyclone deposition.

Despite technological advances in mineral processing, mining companies still face challenges in how to best manage tailings materials. In addition, mining of lower grades of ore has resulted in increased water use per unit of production; at certain sites, water availability is the single greatest constraint on mine development. In some cases, alternative tailings disposal (ATD) has been viewed as a 'silver bullet' that will address all tailings management issues, especially water concerns. In addition, in some cases ATD technologies also promise a smaller footprint and reduced environmental impact and risks. Examples include dry stacking, paste backfill, in-pit disposal and reuse of tailings material for road and brick construction. Despite the perceived advantages, there are a number of factors that determine whether an ATD technology including:

- Energy supply: removing water from a slurry requires significant energy, with increased energy, expenditure comes with additional costs;
- Production rates: conventional tailings deposition remains the only proven technology at mines with high production rates;
- Project economics: a reduced footprint and less water used come at the expense of higher initial capital;
- Operational predictability: mines operating under narrow production constraints may be prohibited from employing ATD technologies because of the possibility of operational instability;
- Topography: some ATD technologies lend themselves to flat topographies and are usually not feasible (without embankment support) at sites with even moderately steep terrain; and
- Water: in many cases, the water saved by the ATD technology is only marginally better than conventional disposal methods.

Based on the above listed challenges, Conventional Disposal Methods (specifically Cyclone Deposition) are preferable over the available Alternative Tailings Disposal methods.

6.4 PROCESS AND ACTIVITY ALTERNATIVES

Process or activity alternatives imply the investigation of alternative processes, methods or activities to achieve the same goal for the proposed TSF. The current planned LoM of the West Wits operations exceed the available deposition capacity of these TSFs and the applicant is therefore proposing to construct the proposed West Wits Reclamation and Deposition Project, including the Deelkraal II TSF, to cater for this additional capacity and for future reclamation operations. For this there are no feasible or applicable activity alternatives that have been identified. Additional deposition space will be required for the tailings material.

Process alternatives identified for consideration include **dry stacking** vs **wet stacking** of tailings material. Dry stacking dewaters tailings to a solid-like state, increasing safety and stability while reducing water use, but has higher initial costs. Wet stacking involves storing tailings in large ponds, which is less expensive initially but has significant risks of dam failure, water contamination, and requires ongoing water treatment.

Current Harmony operations are already geared to wet slurry operations and deposition and the costs to change from wet to dry stacking lead to dry stacking not being considered a feasible process alternative. The slurry TSF also provides a water buffer storage for winter (as water drains out and is returned) while using a dry filter option would require very large storage of water at plant or elsewhere (pipeline considerations if far from plant) and there is no room around the existing plants for such large storage facilities. **Based on the above listed challenges wet stacking is considered the only viable process alternative.**

6.5 NO GO ALTERNATIVE

The no go alternative would imply that no TSF is constructed for the safe deposition of new mine tailings from Harmony's West Wits operations. The current planned LOM of the Harmony's West Wits operations exceed the available deposition capacity of these TSFs and the applicant is therefore proposing to construct the proposed Deelkraal II TSF to cater for this additional capacity. The no go option would mean that the new TSF project and associated infrastructure would not proceed and this would therefore negatively affect the future viability of Harmony's West Wits mining operations due to lack of deposition space. This would have a significant financial impact on Harmony as well as a direct negative impact on the workforce on the mine and surrounding businesses and communities that are directly or indirectly linked to the operations.

The Deelkraal II TSF will also cater for reworking of multiple TSFs across the West Wits area which would have a significant positive impact. TSFs will be reworked and processed at Kusasalethu and Savuka plants. These TSFs will be fully reclaimed and then fully rehabilitated in the future. This will also allow Harmony to manage a single large TSF rather than having to deal with numerous smaller TSF sites, which should also improve the management related to the various environmental and social issues of the existing TSFs in the region. These opportunities will be lost if the project does not proceed. **As such, the no go alternative is not considered feasible or reasonable.**

7 STAKEHOLDER ENGAGEMENT

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

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.
- As such, the purpose of the PPP and stakeholder engagement process is to:
- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

7.1 GENERAL APPROACH TO SCOPING AND PUBLIC PARTICIPATION

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

An initial I&AP database has been compiled based on known key I&AP's, Windeed searches, and stakeholder databases provided by the mine. The I&AP database includes amongst others, landowners, communities, regulatory authorities and other special interest groups. Harmony (the applicant) is the current landowner for all properties on which infrastructure is proposed.

7.1.1 LIST OF PRE-IDENTIFIED ORGANS OF STATE/ KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

Government Authorities and key stakeholders that were notified of the proposed project and include:

- Gauteng Department of Agriculture and Rural Development (GDARD)
- Gauteng Department of Corporate Governance and Traditional Affairs (CoGTA)

- Gauteng Department of Health
- Gauteng Department of Human Settlements
- Gauteng Department of Infrastructure Development
- Gauteng Department of Mineral Resources and Energy
- Gauteng Department of Roads and Transport
- Merafong City Local Municipality
- Mine Health and Safety Council (MHSC)
- National Energy Regulators of South Africa (NERSA)
- National Department of Agriculture
- National Department of Forestry, Fisheries and Environment (DFFE)
- National Department of Human Settlements
- National Department of Mineral and Petroleum Resources (DMPR)
- National Department of Treasury
- Endangered Wildlife Trust (EWT)
- Federation for a Sustainable Environment
- Gauteng Water Sector Forum
- GroundWork South Africa
- Lawyers for Human Rights
- Mining Affected Communities United in Action (MACUA)
- Mining and Environmental Justice Community Network of South Africa (MEJCONSA)
- Natural Justice
- Wildlife and Environment Society of South Africa (WESSA)
- Wildtrust
- World Wildlife Fund (WWF)
- National Department of Water and Sanitation (DWS)
- Petroleum Agency of South Africa (PASA)
- South African Heritage Resources Agency (SAHRA)
- The Fountain Private Hospital
- West Rand District Municipality
- Pre-identified and registered landowners and surrounding landowners.
- Agri South Africa
- Anglo American
- Atlantic Energy Solar
- Blyvoor Community Forum
- Botanical Society
- Carpe Diem Solar Development
- Centre for Environmental Rights (CER)
- Council for Geoscience

7.1.2 INITIAL NOTIFICATION

The PPP commenced on the 6 February 2026 with an initial notification and call to register. Interested and Affected Parties are welcome to register via email, direct letter, fax or by contacting EIMS telephonically. The initial notification was given in the following manner:

7.1.2.1 REGISTERED LETTERS, FAXES AND EMAILS

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

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

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

7.1.2.2 NEWSPAPER ADVERTISEMENTS / GOVERNMENT GAZETTE

Advertisements (in English and Setswana) describing the proposed project and Environmental Impact Assessment (EIA) process were placed in the Carletonville Herald with circulation in the vicinity of the study area on the 12th of February 2026. The Gazette Notice was placed in the Gauteng Provincial Gazette on the 25th of March 2026. Newspaper adverts included the following information:

- Project name;
- Applicant name;
- Project location;
- Nature of the activity and application; and
- Relevant EIMS contact person for the project.

7.1.2.3 SITE NOTICE PLACEMENT

A1 Correx site notices in English and Afrikaans and Setswana were placed at ten locations within the local project area on the 6 February 2026. The on-site notices included the following information:

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

7.1.2.4 **POSTER PLACEMENT**

A3 posters in English and Afrikaans and Setswana were placed at local public gathering places in the project area namely the Post Office and the Municipal Offices.

The notices and written notification afforded all pre-identified I&APs the opportunity to register for the project as well as to submit their issues/queries/concerns and indicate the contact details of any other potential I&APs that should be contacted. The contact person at EIMS, contact number, email and faxes were stated on the posters. Comments/concerns and queries were encouraged to be submitted in either of the following manners:

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

7.1.3 AVAILABILITY OF SCOPING REPORT AND PUBLIC MEETING

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

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

The scoping report was made available for public review for a period of 30 days from 23 April 2026 to 25 May 2026. A Scoping Phase Public Meeting took place during the review period of the scoping report on 7 May 2026 at the Kusasalethu Mine Elandsridge Hall. The purpose of the meeting was to present and discuss the findings of this Scoping Report with Interested and Affected Parties.

Executive summaries of the report in English, Afrikaans and Setswana were provided on the EIMS website and at the same venues where the report is available for public review.

7.1.4 AVAILABILITY OF EIA REPORT AND PUBLIC MEETING

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

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

This EIA report will be made available for public review for a period of 30 days and a Public Meeting will take place during the review period of the EIA report. Executive summaries of this report in English, Afrikaans and Setswana will also be provided on the EIMS website and at the same venues where the report is available for public review.

7.2 PUBLIC PARTICIPATION PROGRESS

Comments raised to date have been addressed in a transparent manner and included in the Public Participation Report (Appendix C). Specialist input into the EIA /EMPr phase will investigate and address any relevant I&AP concerns in more detail. To date, the following key comments have been received:

- I&AP registration
- The National Department of Forestry, Fisheries and the Environment:



- Allocated case officers for the proposed project.
- Requested project documents.

- An I&AP requested for a virtual public participation engagement.
- A request from an I&AP for special attention to be given to the ground water and avoid contamination.
- A request for a comprehensive Air Quality and Biodiversity Assessments to be conducted.
- A suggestion from an I&AP that PP events be held at a reasonable location and time, including accessible reports.
- An I&AP enquired about languages used in the notification documents and a possible inclusion of other languages.
- I&APs requested for a virtual meeting.
- SANRAL indicated that they have no objections to the proposed project.
- An I&AP lodged an objection on the basis that they are property owners for certain properties where the TSF is located and do not wish activities to occur on their property.
- Sibanye shared comments regarding the fact that agreements would need to be in place for areas where the infrastructure is located on Sibanye-owned land.
- Concerns that there will be pollution since there is a water course along the proposed project area.
- Concerns regarding dust fallout.
- Requests from various I&APs that the Deelkraal community and other surrounding communities are prioritized with respect to employment opportunities.

8 ENVIRONMENTAL ATTRIBUTES AND BASELINE ENVIRONMENT

This section of the EIA Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area and baseline information received from certain specialists. The studies however have been further refined in the EIA phase of the project and the full assessments are included as Appendix D. The DFFE screening tool was also used to inform this section, and a copy of the screening report is included in Appendix H. Various terminology is used in this section of the report referring to the project location, which are described below:

- **Site**: Refers to the immediate site(s) / footprints and areas where the infrastructure is proposed to be located;
- **Project Area / Study Area / Region**: Refers to both the site and the general regional area and surrounds where the project is located; and
- **Project Area of Influence**: The total area / region where the project's direct and indirect impacts—both positive and negative—are likely to be felt, related to a particular project aspect or impact.

8.1 TOPOGRAPHY

The topography changes rapidly over short distances from 1600 metres above sea level (mamsl) at the top of the ridge to 1 560 mamsl at the Varkenslaagte Spruit and 1 420 mamsl in the Loopspruit. Refer to **Figure 20** for a topographical map of the project area.

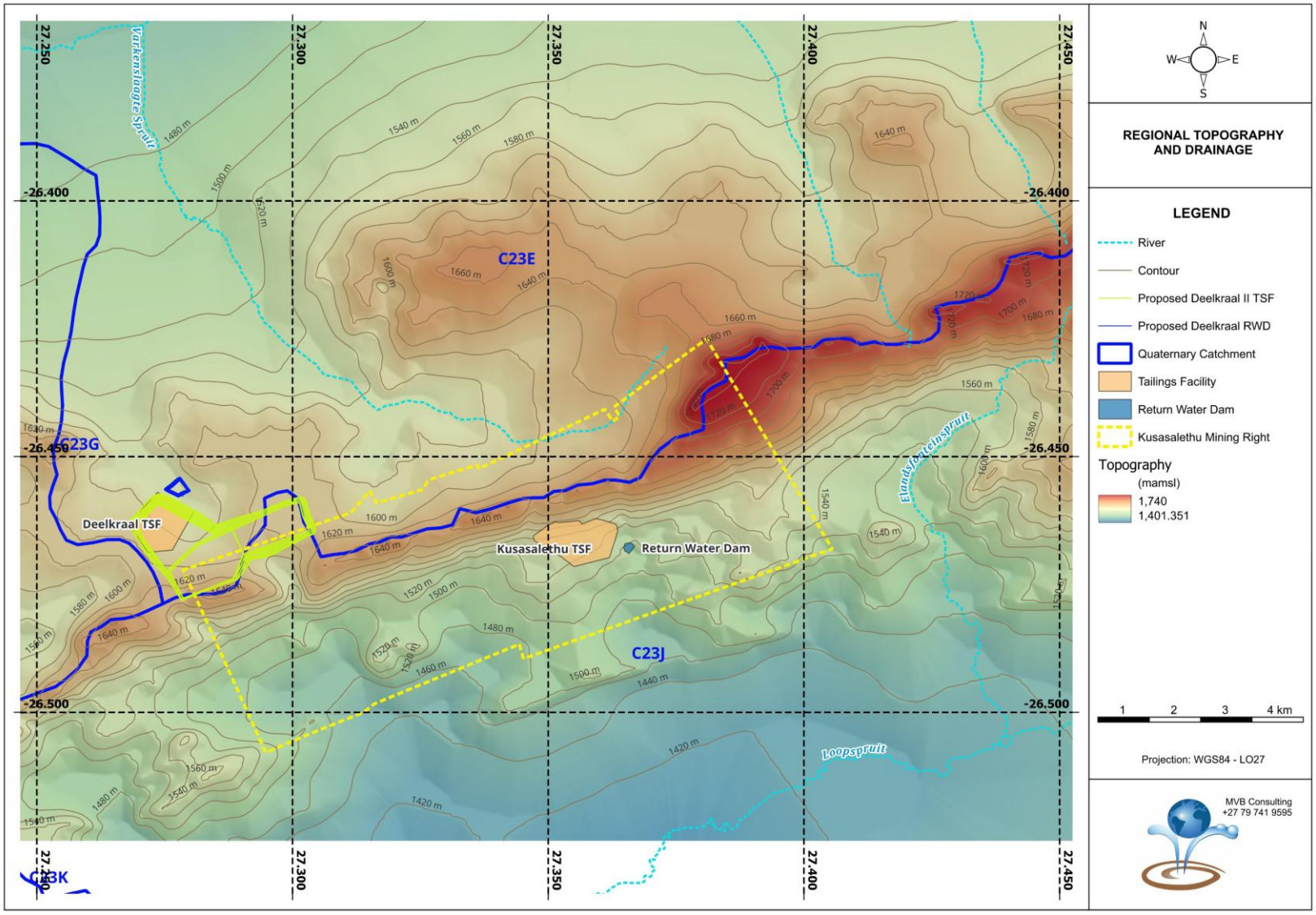


Figure 20: Topographical map of study area

8.2 GEOLOGY

The geology of the region is the controlling agent for aquifer development. The regional surface geology over the study area is presented as **Figure 21** and the general stratigraphy as described as follows:

- Witwatersrand Supergroup.
- Ventersdorp Supergroup.
- Transvaal Supergroup.
- Karoo Supergroup.

8.2.1 WITWATERSRAND SUPERGROUP

The geology of the Witwatersrand Supergroup is well understood and documented as a result of extensive mining and exploratory drilling. Truswell, 1977 describes the geology in the region of the study area.

The development and preservation of the Witwatersrand basin is structurally controlled. The structural patterns control the influx of groundwater into the underground workings and as a result it is important to understand which features act as conduits and which features act as flow barriers. Dykes and sills of at least four different ages have also intruded the Witwatersrand strata. The intrusion of the dykes has often taken place along fault planes. The oldest dykes are usually diabase, representing feeder dykes to the overlying Ventersdorp lavas. There are intrusions of pyroxenite, gabbro and dolerite probably of Bushveld age. A third group belongs to the basic or alkaline dyke swarm related to the Pilanesberg alkaline complex. Finally, the youngest intrusions are of Karoo dolerite.

The Witwatersrand basin is a thick sequence of shale, quartzite and conglomerate. The average dip of the strata is 30° south. There are two main divisions, a lower predominantly argillaceous unit, known as the West Rand Group and an upper unit, composed almost entirely of quartzite and conglomerates, known as the Central Rand Group.

The West Rand Group is divided into three subgroups namely the Hospital Hill, Government Reef and Jeppestown. These rocks comprise mainly shale, but quartzite, banded ironstones, tillite and intercalated lava flows are also present. The rocks were subjected to low - grade metamorphism causing the shale to become more indurated and slaty. The original sandstone was recrystallised to quartzite.

The Central Rand Group is divided into the Johannesburg and Turffontein Subgroups and is composed largely of quartzites, within which there are numerous conglomerate zones. The conglomerate zones may contain any number of conglomerate bands, with individual bands interbedded with quartzite. The upper conglomerates are usually thicker with coarser fragments. An argillaceous zone known as the Booysens Shale (also known as the Kimberley Shale) separates the Johannesburg and Turffontein Subgroups. The economic gold deposits (reefs) are contained within the Central Rand Group.

8.2.2 VENTERSDORP SUPERGROUP

The younger Ventersdorp Supergroup overlies the Witwatersrand rocks. Although acid lavas and sedimentary intercalations occur, the Ventersdorp is composed largely of andesitic lavas and related pyroclastics. The Ventersdorp Supergroup consists of the Platberg Group and the Klipriviersberg Group. The Klipriviersberg Group consists of the Alberton and Westonaria Formations.

The Alberton Formation is composed of green – grey amygdaloidal andesitic lavas, agglomerates and tuffs. The thickness amounts to 1500m. The lack of sediments in this sequence indicates a rapid succession of lava flows, which probably came from fissure eruptions. Material of similar composition forms the oldest dykes that have intruded the Witwatersrand rocks. The abundant agglomerates provide indications of periodic explosive activity. The removal of huge volumes of volcanic material from an underlying magma chamber gave rise to tensional conditions and as a result a number of faulted structures, horst and grabens, were formed.

8.2.3 TRANSVAAL SUPERGROUP

Overlying the Ventersdorp Lavas are the Black Reef quartzite and dolomite of the Transvaal Supergroup. The Black Reef quartzite comprises coarse to gritty quartzite with occasional economically exploitable conglomerates (reefs). The entire area was peneplained in post-Ventersdorp time and it was on this surface that the Transvaal Supergroup was deposited, some 2200 million years ago. The deposition commenced with the Kromdraai Member with the Black Reef at its base. The occurrence of the gold is not as widespread as in the Witwatersrand and mainly restricted to north-south trending channels. The Black Reef is overlain by a dark, siliceous quartzite with occasional grits or small pebble bands. The quartzite grades into black carbonaceous shale. The shale then grades into the overlying dolomite through a transition zone of approximately 10m thick.

Overlying the Kromdraai Member is the dolomite of the Malmani Subgroup of the Chuniespoort Group. The dolomites are present on surface just 500m north of the Deelkraal TSF. About 1300 Ma ago the region was subjected to tension resulting in the formation of a number of large north to north-easterly striking faults. Many of the faults penetrated the full Transvaal sequence as well as the underlying Ventersdorp and Witwatersrand Supergroups. Some of the faults were filled by Pilansberg age dykes, which subdivided the dolomite into watertight groundwater compartments. The Wonderfonteinspruit tributary flows across the non-dewatered Bosbok – Turffontein dolomitic groundwater compartment. This is a sensitive aquifer that needs to be protected against impacts from the mines and other contaminant sources.

The dolomites are overlain in the south by the Pretoria Group rocks. The Rooihoogte Formation forms the basal member of the Pretoria Group, consisting of the Bevets conglomerate, shale and quartzite. The Bevets conglomerate varies in thickness between 3m and 60m (Parsons and Killick, 1985). Overlying the Bevets conglomerate is shale and sporadically developed quartzite, referred to as the Pologround quartzite. Where developed the Pologround quartzite is overlain by 150m – 200m of pink to purple shales, forming the basis of the Timeball Hill Formation. The shale is overlain by quartzite, which forms the linear north-easterly trending ridges in the south of the study area.

The Kusasalethu surface lease area is predominantly underlain by the sediments of the Pretoria Group. **Figure 22** shows the near surface relationship between the Pretoria sediments and the Malmani dolomite, particularly as it relates to the localities of the Kusasalethu waste facilities (AGES, 2013).

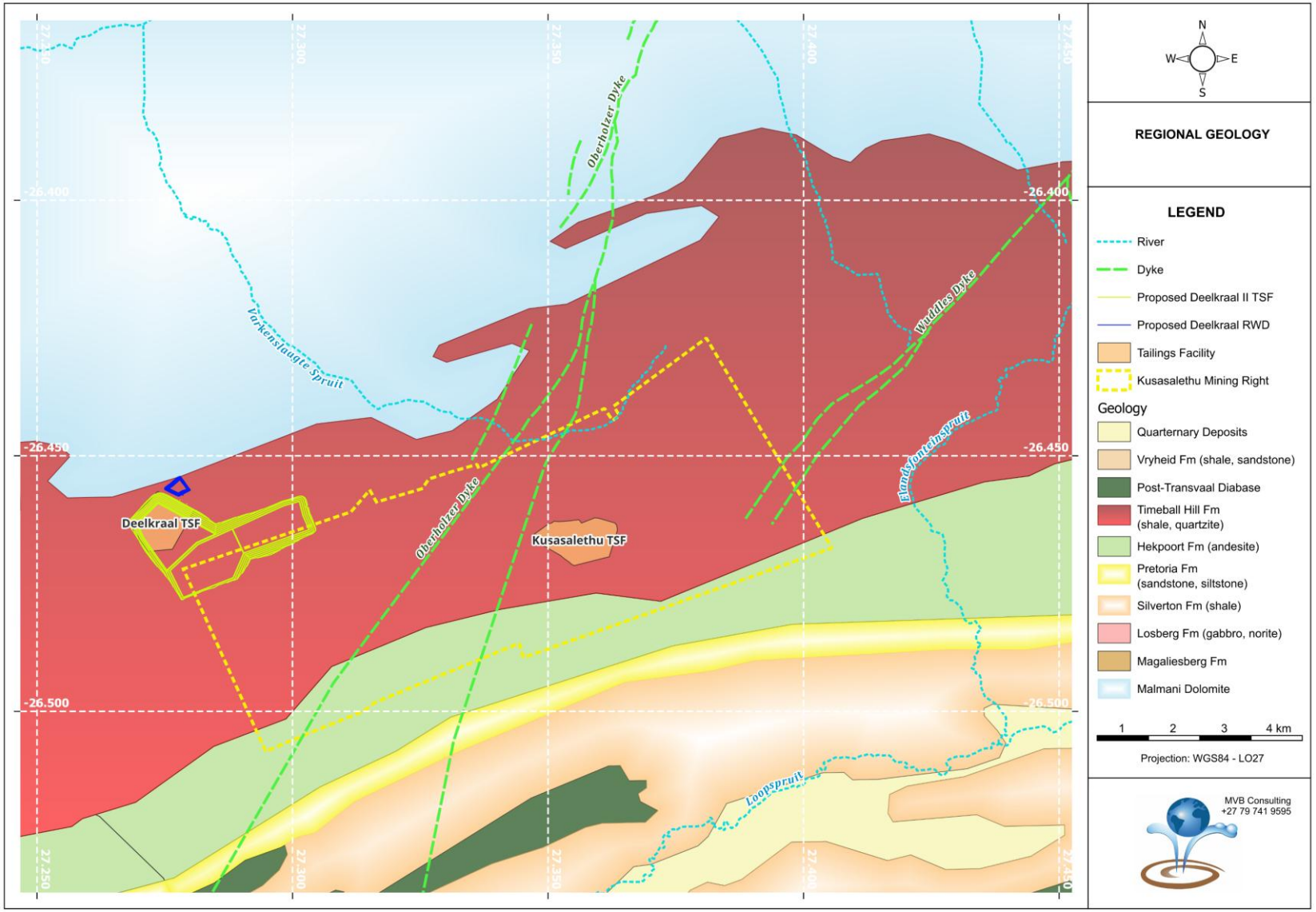


Figure 21: Regional surface geology

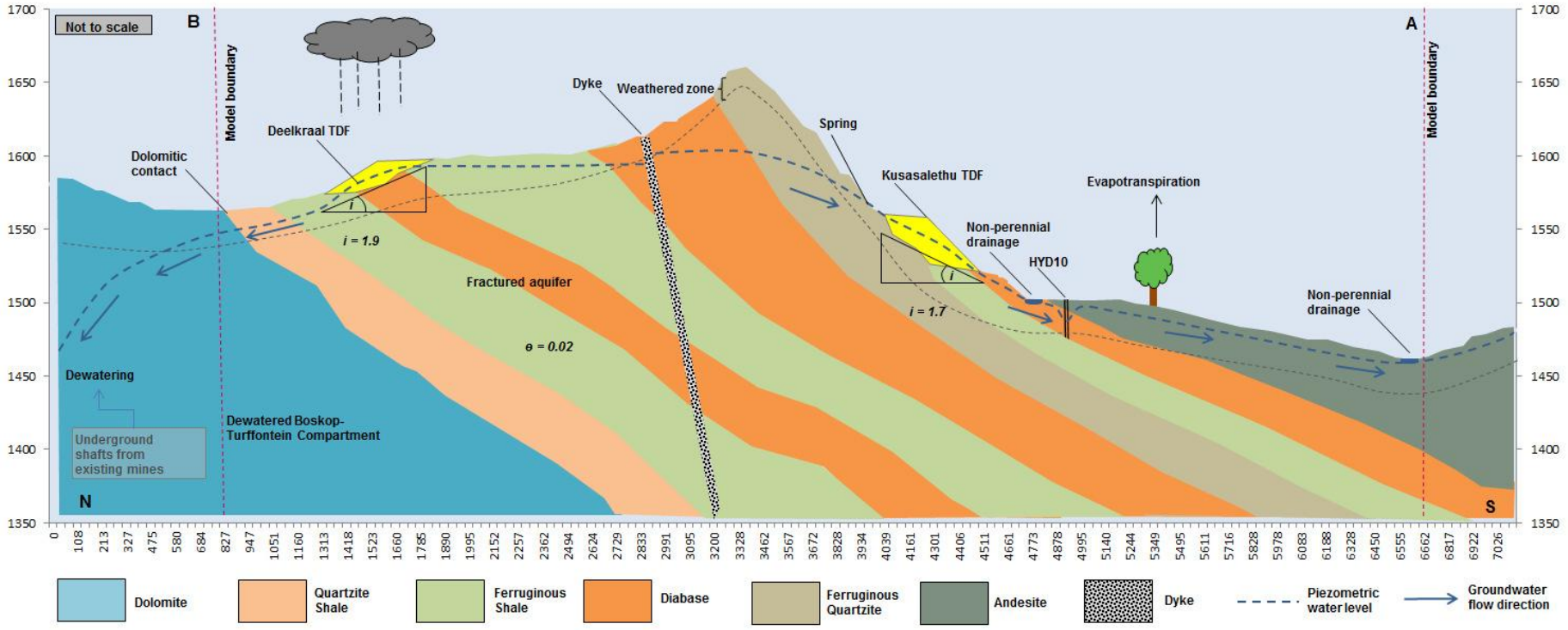


Figure 22: North-south geological section (AGES, 2013)

8.3 CLIMATE AND RAINFALL

The study area near Carletonville is classified as a Cwb climate under the Köppen-Geiger classification system (Peel, 2007), indicating a temperate climate with a Dry Winter. This classification is based on specific temperature and precipitation thresholds. The thermal regime requires the average temperature of the coldest month to exceed 0˚C, with all months averaging below 22˚C, while maintaining at least four months with an average temperature above 10˚C (Peel, 2007).

The climate is a typical Southern African Highveld climate with warm to hot summers and warm sunny winter days with frosty nights. Rainfall occurs predominantly during the summer months because of thunderstorm activity. The mean annual precipitation ranges from 565 mm to 697 mm per annum depending on the location of the weather station. Rainfall data was obtained from several sources, including mine data and data from the South African Weather Service. Climatic information relevant to the site is presented in **Figure 23 - Figure 25** below.

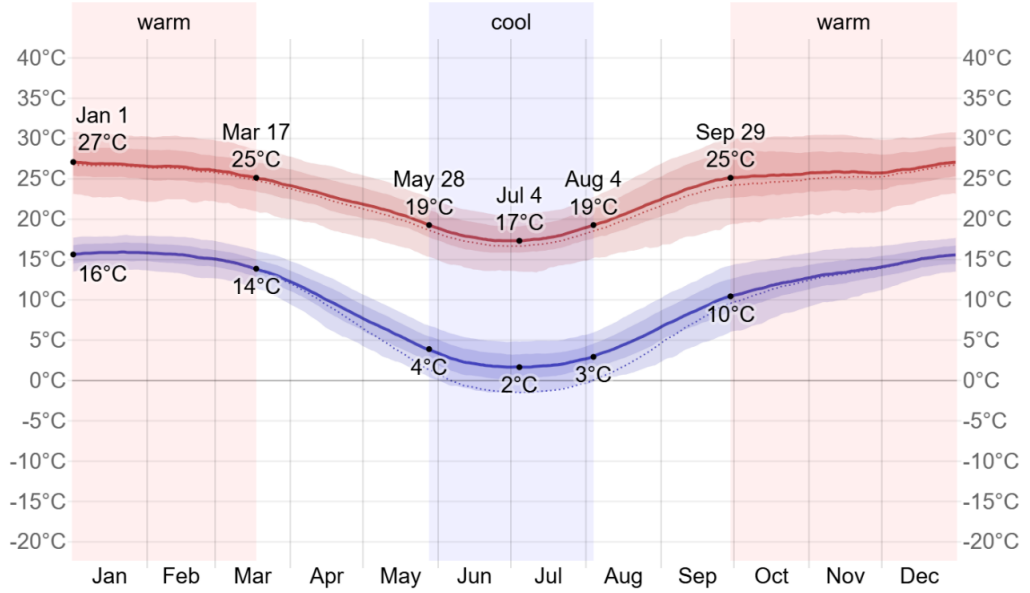


Figure 23: Average high and low temperature in Carletonville (Weather Spark, 2025).

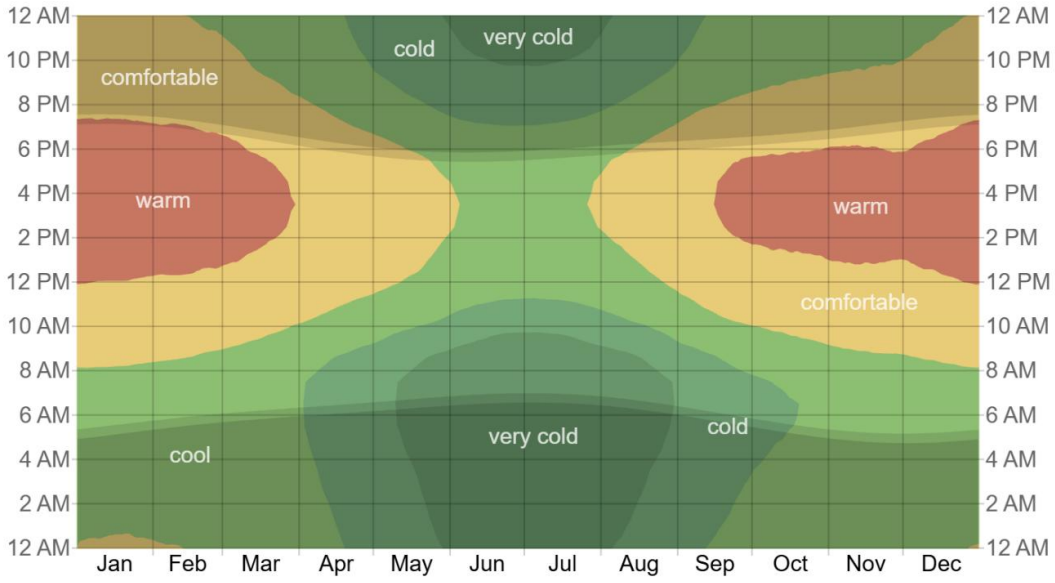


Figure 24: Average Hourly Temperature in Carletonville (Weather Spark, 2025).

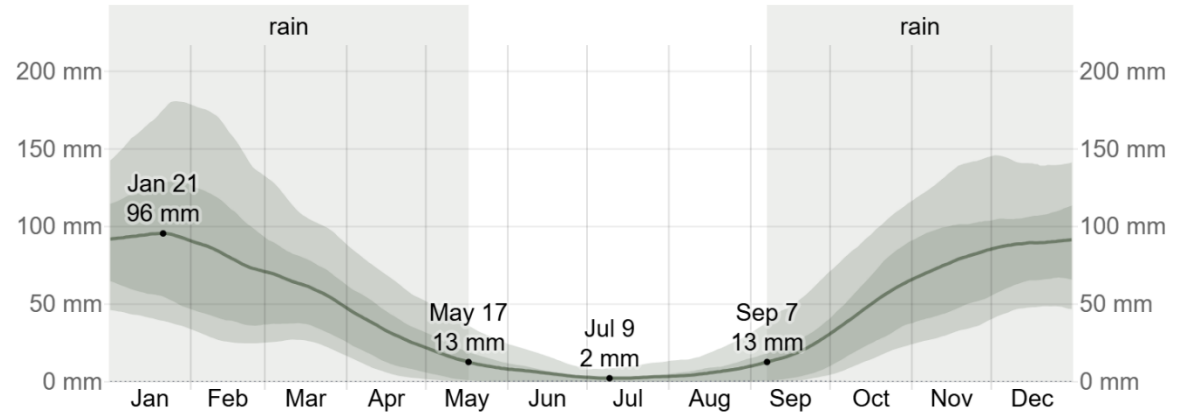


Figure 25: Average Monthly Rainfall in Carletonville (Weather Spark, 2025).

The climate in the project area, characteristic of the Southern African Highveld, exerts a dominant and dual influence on local pedogenesis (soil formation) by controlling the seasonal moisture and temperature regimes. The concentration of 565 mm to 697 mm of mean annual precipitation during the warm, hot summers is the primary driver of potential accelerated chemical weathering and deep soil profile development. The combination of high temperature and high moisture maximises the rate of mineral breakdown, particularly in the iron-rich parent material of the Timeball Hill Formation. This intense summer rainfall also facilitates severe leaching (eluviation), stripping soluble bases and fine clay particles from the upper horizons, leading to nutrient depletion and increased acidity in the topsoil over time (Weil, 2017). Information regarding predicted climate change for the area will be provided in the EIR once the climate change assessment has been completed.

8.4 CULTURAL, HERITAGE AND FOSSIL RESOURCES

Heritage and paleontological baseline information was provided by EIMS and Banzai Environmental respectively and the relevant information from those reports is presented in this section.

8.4.1 ARCHAEOLOGICAL CONTEXT

The Gauteng Province is associated with a long archaeological record that spans across pre-colonial and colonial periods. Most notable is the region's significant role in terms of the development of the mining industry of South Africa. The closest town to the site in question being Carletonville, is specifically important in this regard.

The site, as well as the associated mining operations are ~50kms south of the World Heritage Site, Cradle of Humankind. The Cradle of Humankind is globally recognised for its palaeontological value and contribution to our understandings of Human Evolution. Key fossils found in the area include examples of early hominid species such as Mrs. Ples, Little Foot, and the newly discovered fossils of Homo Naledi. While these fossils have mainly been associated with cave systems, the site's proximity to the heritage site must be acknowledged.

Like other small towns of the Far West Rand of Johannesburg, Carletonville was founded and defined by the growing mining industry of the Gauteng Province. (Van Eeden, 1998). While the town was established and further developed through the mining industry, the area was previously inhabited by groups including the Le Ghoya who were later affected by the events related to Mzilikazi's capture and domination of the area.

Following these early occupations of the region, the region became the settlement of farmers of the Zuid-Afrikaansche Republiek from as early as 1836. The area was later involved in the South African War between 1899-1902. The redevelopment of the town following the war gave rise to its establishment as a key gold mining town of the region. Apart from Carletonville, several other towns were established in the West Rand or West-Wits Line area. From between the 1930s to 1990s, Carletonville continued to develop with different groups settling in the town, stimulating its growing economy and adding new facets to Carletonville's overall cultural heritage. In the 1990s, Carletonville's gold mines contributed as much as 23% towards South Africa's overall gold production (Van Eeden, 1998).

Carletonville since became a melting pot of different cultures, with different people contributing to the continued economic development of the town and associated mining companies. Several church presences were associated with the population of Carletonville. Further, several community groups were formed, adding to the nature of cultural activities of the town as it developed.

8.4.2 POTENTIAL SITE HERITAGE FEATURES

A comprehensive assessment was conducted to evaluate potential impacts on archaeological and heritage resources. The study included a literature review, desktop assessment, and a two-day field survey.

A total of 10 distinct heritage features were identified, of which 3 may potentially be impacted by the proposed development. These included a single stone tool (WWR020), and two structures or complexes older than 60 years (WWR001 and WWR021). All other heritage features identified will not be affected by the development, however, buffers have been recommended to protect these features.

Heritage resources were identified and these features need to be avoided, specifically the netball stadium (WWR001). features. A total of 21 observations were made, of which 10 were confirmed to be of heritage significance. The following is a categorised description of the different potential heritage features identified:

- WWR012, WWR016 – Potential grave sites
- WWR001, WWR002, WWR007, WWR011, WWR014, WWR018, WWR021 – Structures, Abandoned buildings, mining, and farming infrastructure.
- WWR020 – Stone Age find
- WWR013 – Stone Wall Structure site

Figure 26 presents a visual summary of the different findings and their locations. **Table 12** provides a summary of the different features identified, a description of the feature, as well as the coordinates of where the feature are located or associated relative central points. Highlighted in yellow are observations identified as heritage features which may be affected by the development.

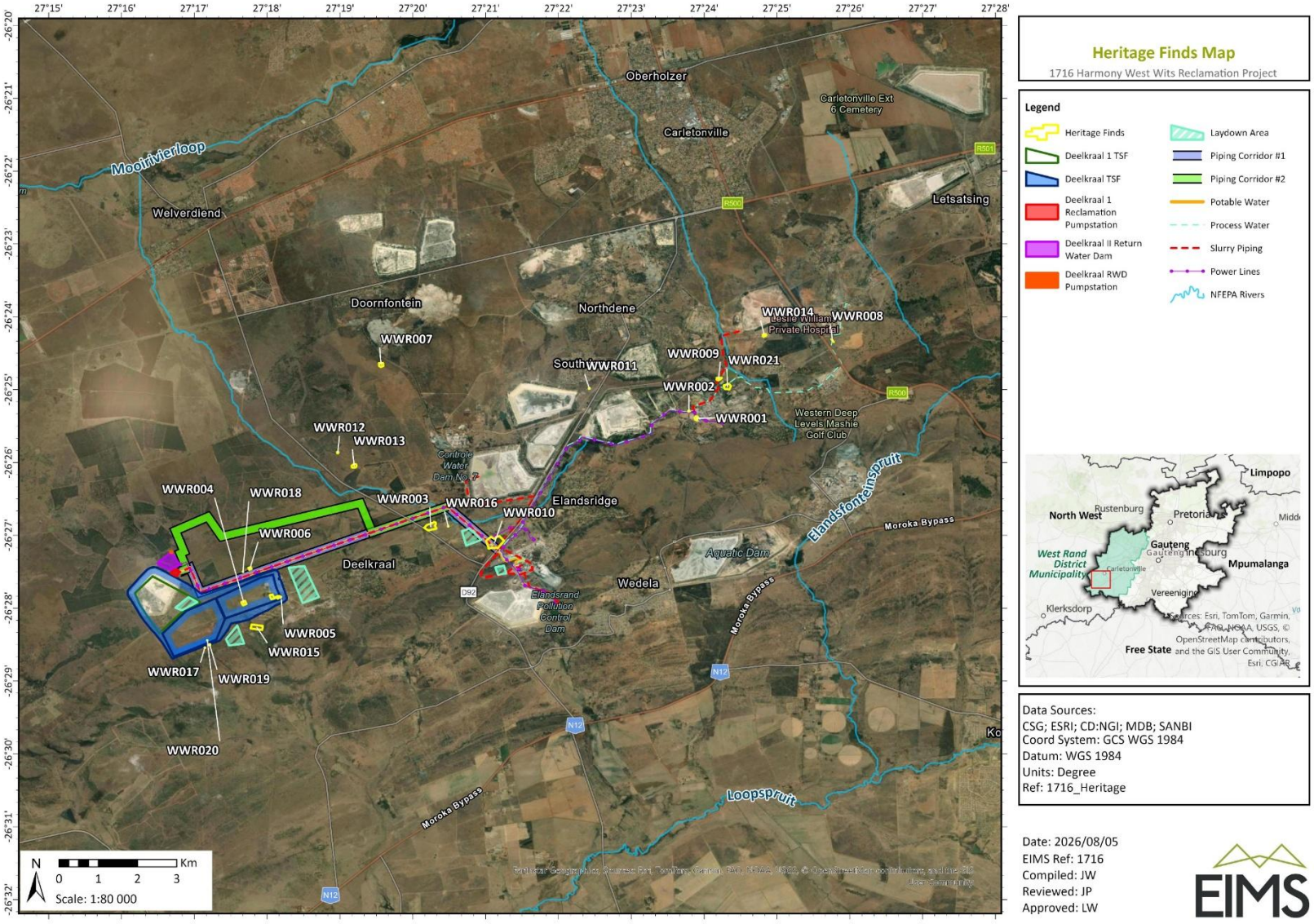


Figure 26: heritage sites of interest identified during the field survey

Table 12: Summary of different finds and sites identified.

Feature No.	Description	Rating and Significance	Coordinate
WWR001	Abandoned netball stadium – constructed in the 1950s – feature confirmed to be older than 60 years.	Grade III A High	26°25’22.75”S 27°23’54.54”E
WWR002	Foundation associated with demolished/decommissioned mining infrastructure. **No features of heritage significance.**	N/A	26°25’17.64”S 27°23’47.58”E
WWR003	Ruins of a mining village. Site has since been cleared. **Not affected by development.**	N/A	26°26’54.37”S 27°20’13.68”E
WWR004	Ruin associated with demolished/decommissioned mining infrastructure. The feature is not older than 60 years. **No features of heritage significance confirmed.**	N/A	26°27'55.36"S 27°17'39.70"E
WWR005	Ruin associated with demolished/decommissioned mining infrastructure. The feature is not older than 60 years. **No features of heritage significance confirmed.**	N/A	26°27'49.96"S 27°18'3.30"E
WWR006	Diggings or excavations associated with surrounding mining activities. **No features of heritage significance confirmed.**	N/A	26°27'27.28"S 27°17'46.00"E
WWR007	Demolished house and other structures associated with the original Doornfontein Gold Mine – Confirmed older than 60 years. **Not affected by development.**	Grade III C Medium	26°24'39.19"S 27°19'34.11"E
WWR008	Train track plinths identified through desktop assessment. Age of feature not confirmed. Verified on site to not be of heritage significance.	N/A	26°24'19.52"S 27°25'45.72"E
WWR009	Abandoned firing range. Not older than 60 years.	N/A	26°24'51.11"S 27°24'11.89"E
WWR010	Site identified through desktop assessment. Verified on site to not be of heritage significance.	N/A	26°27'6.08"S 27°21'11.86"E
WWR011	Reservoir associated with mining or farming activities – feature older than 60 years. **Not affected by development.**	Grade III C Medium	26°24'59.24"S 27°22'25.46"E
WWR012	Confirmed and previously identified grave site – including the graves of 10 or more individual. **Not affected by development.**	Grade III A High	26°25'51.48"S 27°18'58.23"E
WWR013	Previously identified SWS. **Not affected by development.**	Grade III A High	26°26'2.46"S 27°19'12.02"E
WWR014	Farm dams and other structures associated with farming activities – Structures may be older than 60 years. **Not affected by development.**	Grade III C Medium	26°24'15.42"S 27°24'49.16"E



Feature No.	Description	Rating and Significance	Coordinate
WWR015	Abandoned sports field and associated grandstand – constructed between 1977 and 1979 – feature is not older than 60 years but will carry heritage value at a later period. **Not affected by development.**	N/A	26°28'14.44"S 27°17'53.70"E
WWR016	Graveyard identified including at least 12 individual graves.	Grade III A High	26°26'52.54"S 27°20'29.20"E
WWR017	Guy stay anchor and other material evidence. **No features of heritage significance confirmed.**	N/A	26°28'32.62"S 27°17'8.69"E
WWR018	Trigonometrical Station or Beacon constructed for land surveying purposes between 1920-1930s – Older than 60 years. **Not affected by development.**	Grade III A High	26°27'29.96"S 27°17'39.94"E
WWR019	Rubble Midden including buttons and burnt materials. Potentially a dumping spot of occupants of the area. **No features of heritage significance confirmed.**	N/A	26°28'30.16"S 27°17'12.70"E
WWR020	Singular stone core including at least 4 flake removals. Find is not associated with any other surface finds.	NCW	26°28'26.37"S 27°17'10.65"E
WWR021	Abandoned Nursery complex. Some associated buildings older than 60 years.	NCW	26°24'57.35"S 27°24'19.62"E

8.4.3 PALAEONTOLOGY

The West Wits Reclamation study area, situated near Carletonville in the Gauteng Province, is mapped on the 1:250 000 West Rand 2626 (1986) geological sheet (Council for Geoscience, Pretoria). The local geology comprises sedimentary and volcanic strata of the Pretoria Group, namely the Rooihoogte, Timeball Hill (Vt), and Hekpoort Formations (Vh), which form part of the Transvaal Supergroup, as well as post-depositional diabase (di) intrusions. According to the SAHRIS Palaeosensitivity map (**Figure 27** and **Table 13**), the Rooihoogte and Timeball Hill Formations are classified as High sensitivity (orange), the Hekpoort Formation has a Moderate sensitivity (green), and the diabase is rated as having Zero palaeontological sensitivity (grey) (Almond et al., 2013; SAHRIS website, **Figure 28**). In alignment with these sensitivities, the Department of Forestry, Fisheries and the Environment (DFFE) screening tool identifies the broader study area as falling within a High (red) palaeontological sensitivity zone (**Figure 28**).

The Rooihoogte Formation is the earliest stratigraphic unit in the study area and is part of the Pretoria Group's lowermost succession. It is predominantly composed of reddish-brown to greenish-grey shales, ferruginous mudstones, and subordinate siltstones and sandstones, which were deposited in fluvial and deltaic environments. The preservation of palaeobiological structures, particularly Microbially Induced Sedimentary Structures (MISS) and rare stromatolitic horizons, has been facilitated by the fine-grained nature of these sediments. These structures represent some of the oldest preserved evidence of life on the Kaapvaal Craton (Altermann & Nelson, 1998; Button, 1986).

The Timeball Hill Formation, which is situated above the Rooihoogte Formation, is composed of well-bedded shales, mudstones, and characteristic banded iron formations (BIFs). These formations were deposited under low-energy, prodelta to distal marine shelf conditions. The unit is known for its preservation of rare acritarchs, stromatolites, and laminated organic-rich shales, which are microscopic organic-walled microfossils that are considered among the earliest indicators of eukaryotic life (Eriksson & Catuneanu, 2004; Altermann, 2001).

The Hekpoort Formation is primarily composed of subaerial basaltic and andesitic lava flows, with infrequent volcaniclastic interbeds, and it conformably overlies the Timeball Hill Formation. This formation, which dates back to approximately 2.05 billion years ago, documents a substantial volcanic event in the Pretoria Basin. The Hekpoort Formation is primarily unfossiliferous due to its status as an igneous unit. Nevertheless, rare instances of weathered interflow sedimentary horizons may contain microbial textures or MISS, which offer substantial but limited insights into the evolution of the terrestrial biosphere during the Paleoproterozoic (Eriksson et al., 2001). This limited but scientifically pertinent potential is reflected in its Moderate palaeontological sensitivity rating.

The diabase intrusions in the study area are Jurassic in age and generally newer than the sedimentary and volcanic strata they cut. They were emplaced during later tectono-thermal events associated with Gondwana rifting. The sills and dykes formed by these medium-grained, mafic intrusive rocks are exclusively igneous in origin and, as a result, are considered palaeontologically sterile in nature. Furthermore, the placement of diabase may result in the local thermal alteration or obliteration of fossil preservation in the host rocks in the vicinity (Johnson et al., 2006).

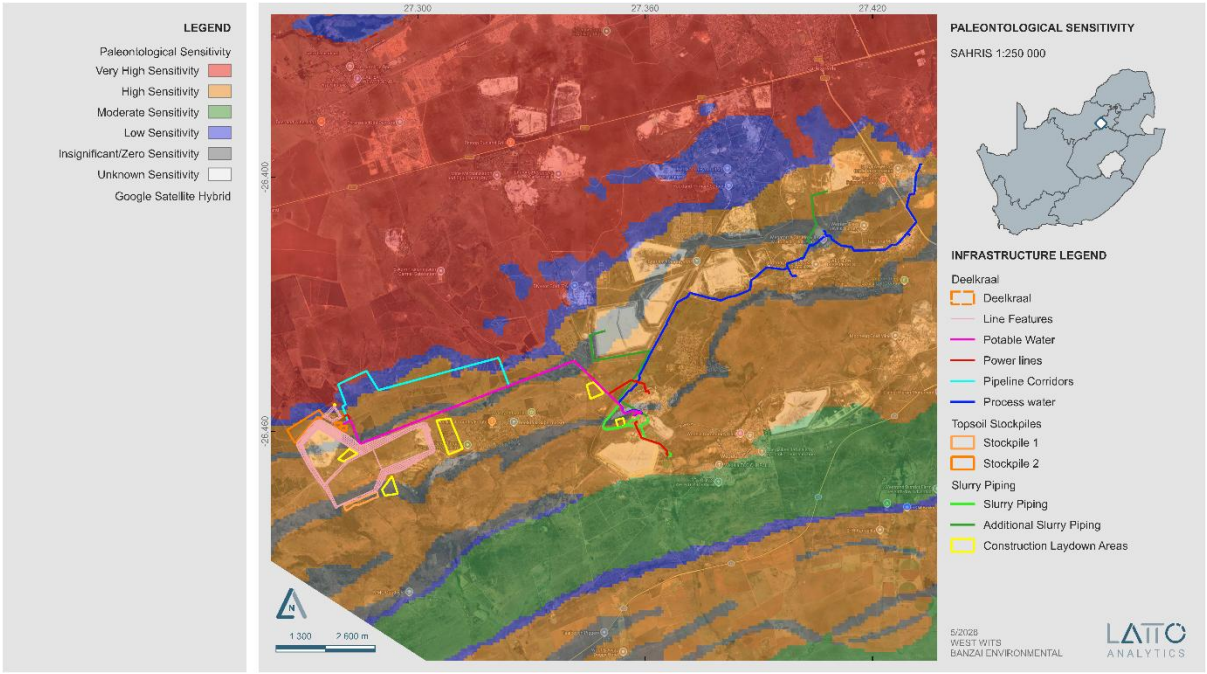


Figure 27: Extract of the SAHRIS PalaeoMap (Council of Geosciences) indicating the High (orange), and Zero (grey) Palaeontological Sensitivity of the proposed study area.

Table 13: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required

GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

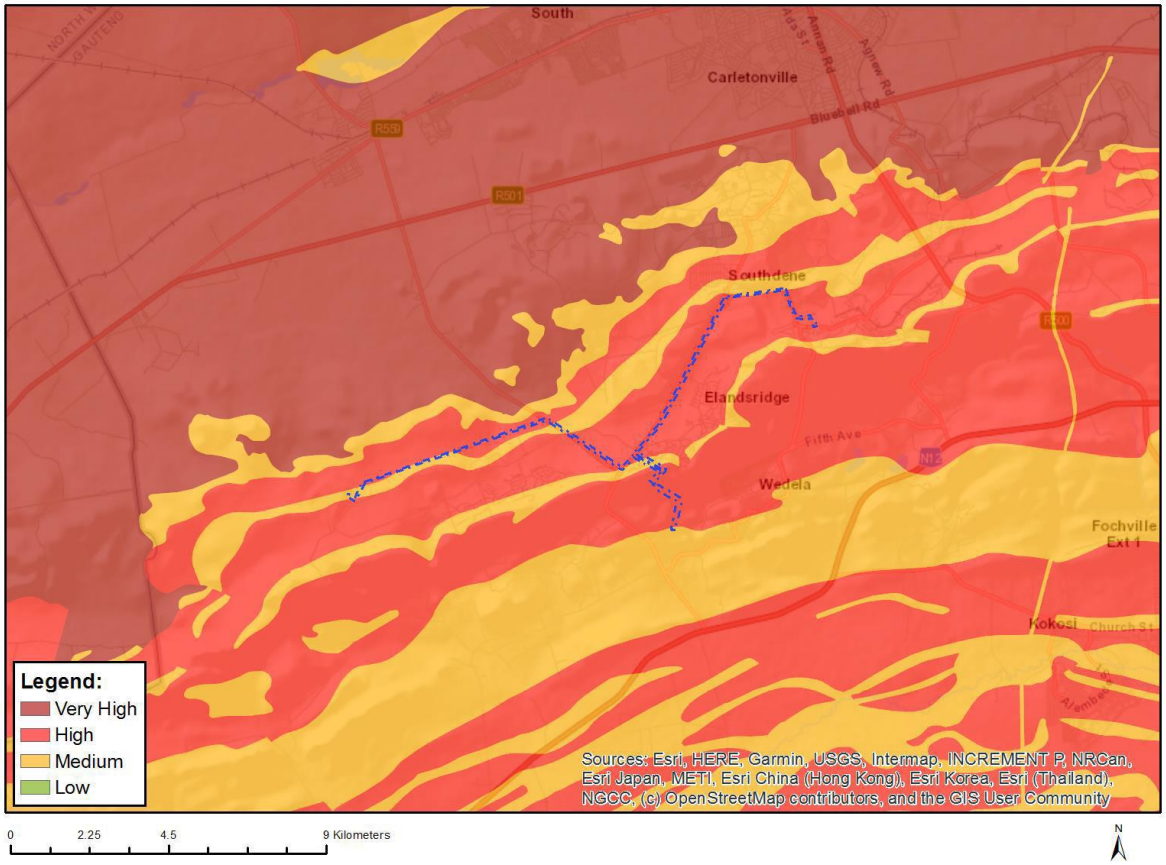


Figure 28: Palaeontological Sensitivity of the study sites in Gauteng Province by the National Environmental Web-based Screening Tool indicates a High (red) and Medium (yellow) Palaeontological Sensitivity.

The SAHRIS PalaeoMap indicates a Very High (red) Palaeontological Sensitivity for the study area, consistent with the DFFE Screening Tool (However, this elevated sensitivity rating is attributable primarily to the presence of microbially induced sedimentary structures (MISS) and stromatolitic horizons within the Rooihoogte and Timeball Hill Formations, features that are microscopic to mesoscopic in nature and are not recoverable as discrete macrofossils during a standard field-based site investigation. Similarly, the Very High sensitivity assigned to the Malmani Subgroup relates to its stromatolite assemblage, which, while scientifically significant, does not constitute visible, collectable fossil material in the conventional sense.

Given that the palaeontological sensitivity of the study area is driven by microbial structures rather than macrofossils, and that the proposed pipeline will be constructed above ground with ground disturbance limited to localised, shallow footings, a formal palaeontological site investigation was not considered necessary. The likelihood of encountering significant, recoverable fossil material during construction is considered negligible.

8.5 SOILS

Soils and agricultural potential baseline information was provided by EIMS' soil scientist and the relevant information is presented below.

8.5.1 SOIL TYPES

The study area is predominantly characterized by land types Fb5 and Fb15. Morphologically, these units are described as shallow, rocky, and often steep environments that are moderately leached, with calcareous deposits (lime) generally restricted to valley features. In terms of pedological distribution, the Glenrosa and Mispah soil-rock complexes are the dominant formations, collectively encompassing approximately 38% of the total area. Secondary to these complexes, a cumulative 35% of the study site is comprised of the Hutton, Oakleaf, Dundee, Arcadia, and Rensburg soil series (Land Type Survey Staff, 1972 – 2006).

The area is characterized primarily by shallow soils overlying hard, fractured, or weathering rock. While calcareous deposits (lime) are generally rare or absent in upland soils, they are frequently observed in lower landscape positions. The pedological profile is dominated by soil-rock complexes, with the Mispah and Glenrosa forms being the most prevalent. Secondary to these complexes, the Hutton, Oakleaf, Dundee, Arcadia, and Rensburg series are common, while the Clovelly, Shortlands, and Avalon forms, along with streambeds, constitute less than 10% of the total surface area (Land Type Survey Staff, 1972 – 2006).

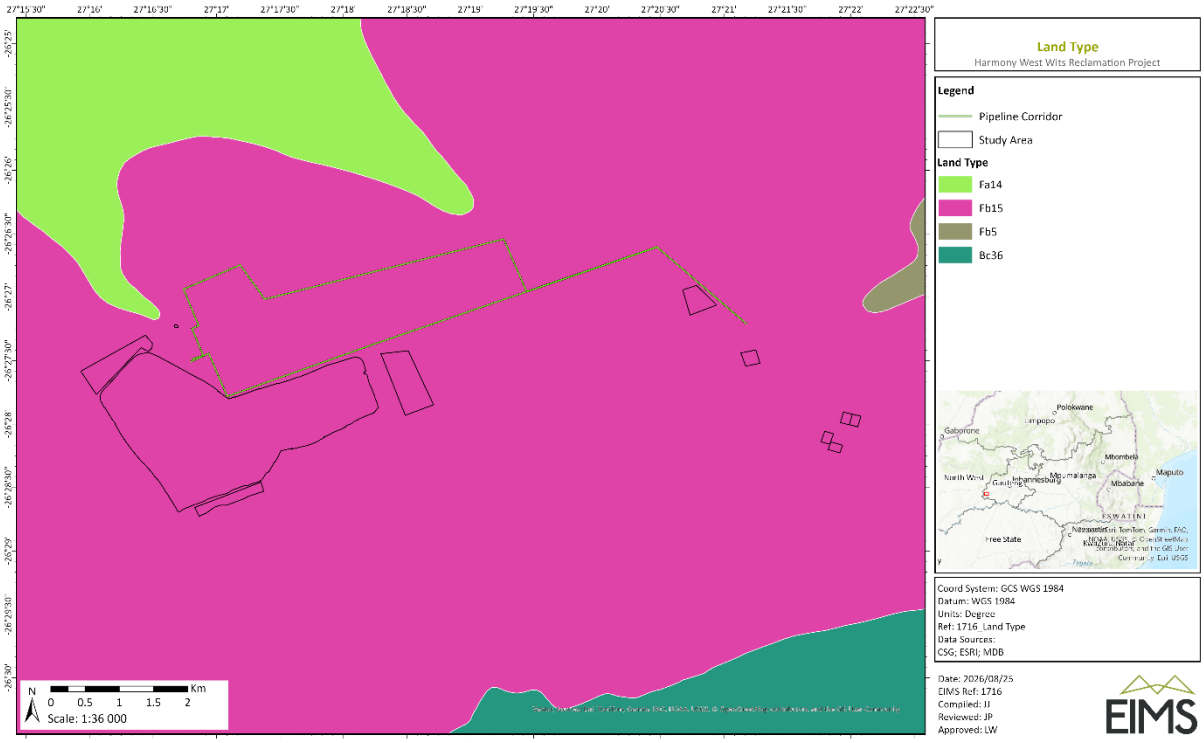


Figure 29: Land types in study area

8.5.2 AGRICULTURE POTENTIAL

A significant portion of the project area comprises mine dumps, excavations, and slimes dams; consequently, these anthropogenic features are excluded from the agricultural potential assessment. The remaining study area is dominated by Lithosols, specifically the Glenrosa and Mispah soil forms. The Glenrosa form is characterized by an orthic A-horizon overlying a lithocutanic B-horizon on hard rock, while the Mispah form consists of an orthic A-horizon directly underlain by rock. Due to effective depth limitations, the agricultural potential of these soils is classified as low. Conversely, soils identified with moderate agricultural potential include the Dundee (Du10), Avalon (Av26), and Shortlands (Sd11) forms (Land Type Survey Staff, 1972 – 2006).

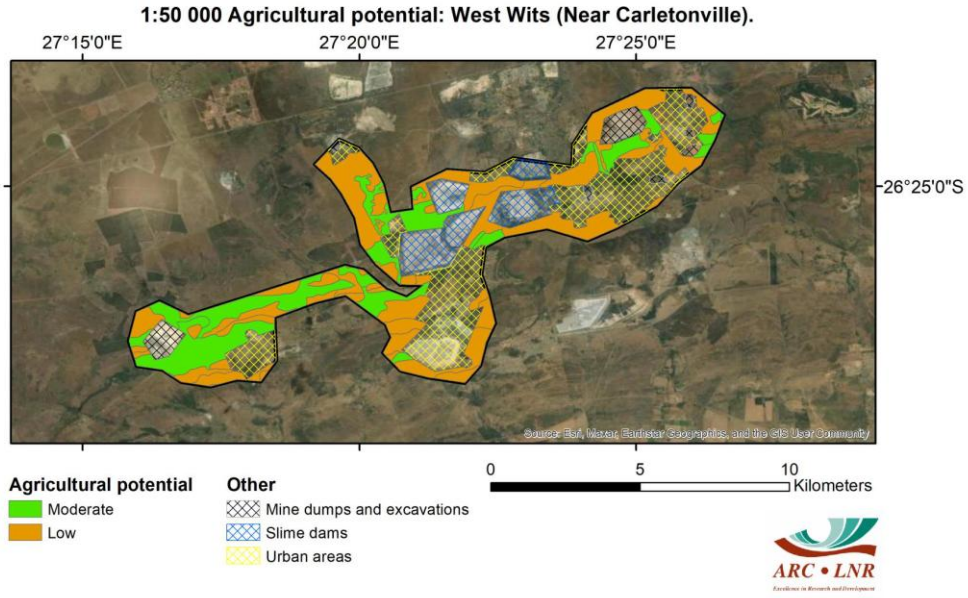


Figure 30: Agriculture Potential map of study area.

8.6 FLORA AND FAUNA

Flora and fauna baseline information was provided by the Biodiversity Company and the relevant information from those reports is presented in this section.

8.6.1 ECOLOGICALLY IMPORTANT INFORMATION AND LANDSCAPE FEATURES

8.6.1.1 **ECOSYSTEM THREAT STATUS**

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset, the Project Area of Influence (PAOI) overlaps with an LC ecosystem (**Figure 31**).

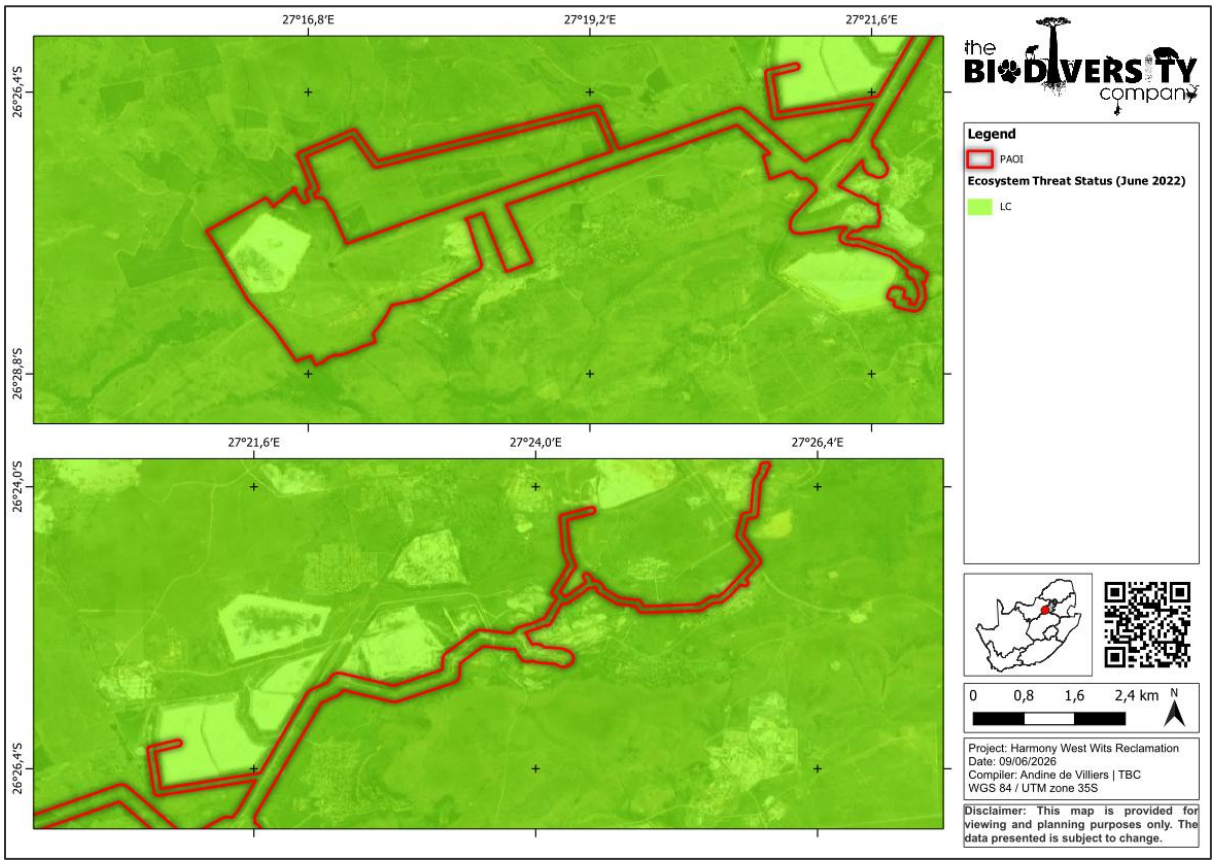


Figure 31: Map illustrating the ecosystem threat status associated with the PAOI.

8.6.1.2 **ECOSYSTEM PROTECTION LEVEL**

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with a PP ecosystem (**Figure 32**).

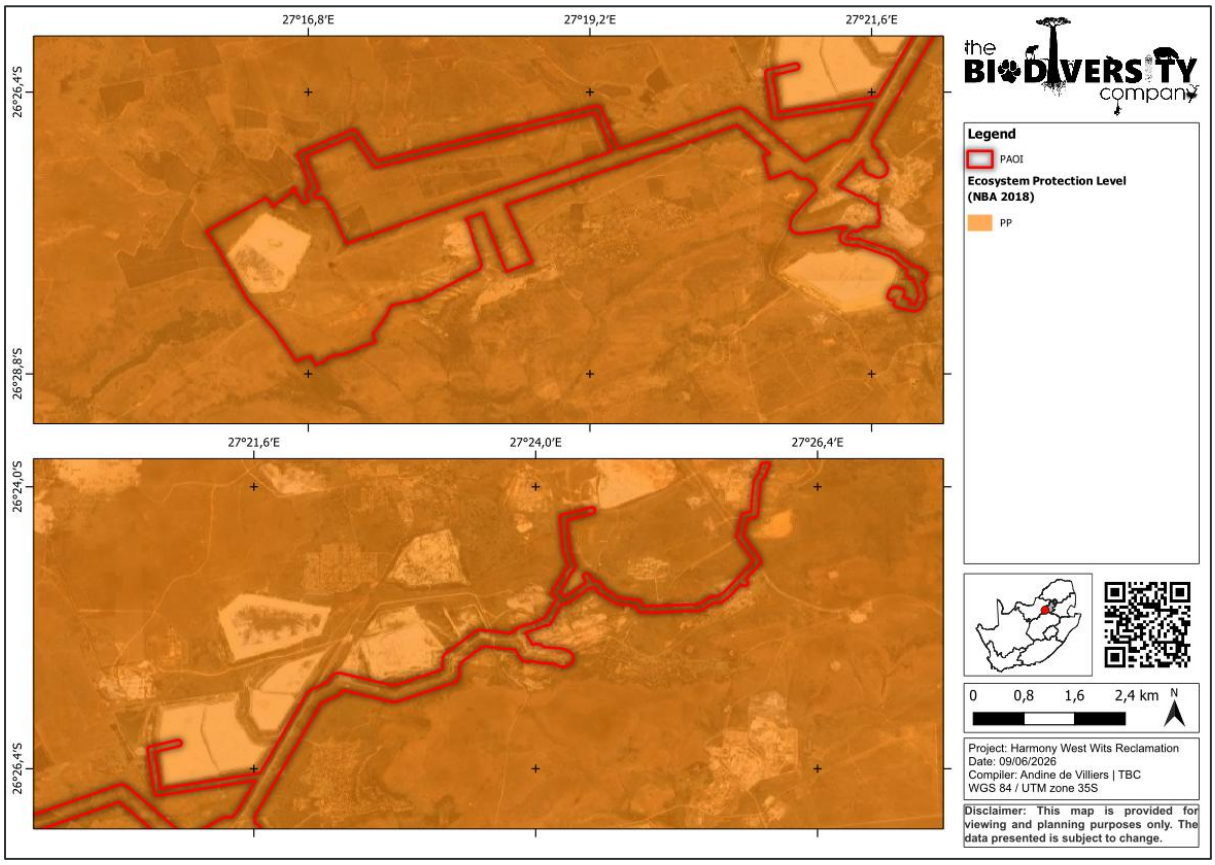


Figure 32: Map illustrating the ecosystem protection level associated with the PAOI.

8.6.1.3 CRITICAL BIODIVERSITY AREAS AND ECOLOGICAL SUPPORT AREAS

The Gauteng Conservation Plan identify areas as either Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA) and Protected Areas (PA). CBAs include natural or near-natural terrestrial and aquatic features that were selected based on an area's biodiversity characteristics, spatial configuration and requirement for meeting both biodiversity pattern and ecological process targets. CBAs include irreplaceable sites where no other options exist for meeting targets for biodiversity features (CBA 1), as well as best-design sites which represent an efficient configuration of sites to meet targets in an ecologically sustainable way that is least conflicting with other land uses and activities (CBA 2). ESAs include natural, near-natural, degraded or heavily modified areas required to be maintained in an ecologically functional state to support CBAs and/or Protected Areas. Protected Areas (PA) are areas which have legal protection under relevant legislation or which are managed with a primary conservation objective. **Figure 33** shows the PAOI superimposed on the Gauteng Conservation Plan dataset. According to the Gauteng Conservation Plan dataset, the PAOI overlaps with CBA 1, ESA 1 and ESA 2 (marginally).

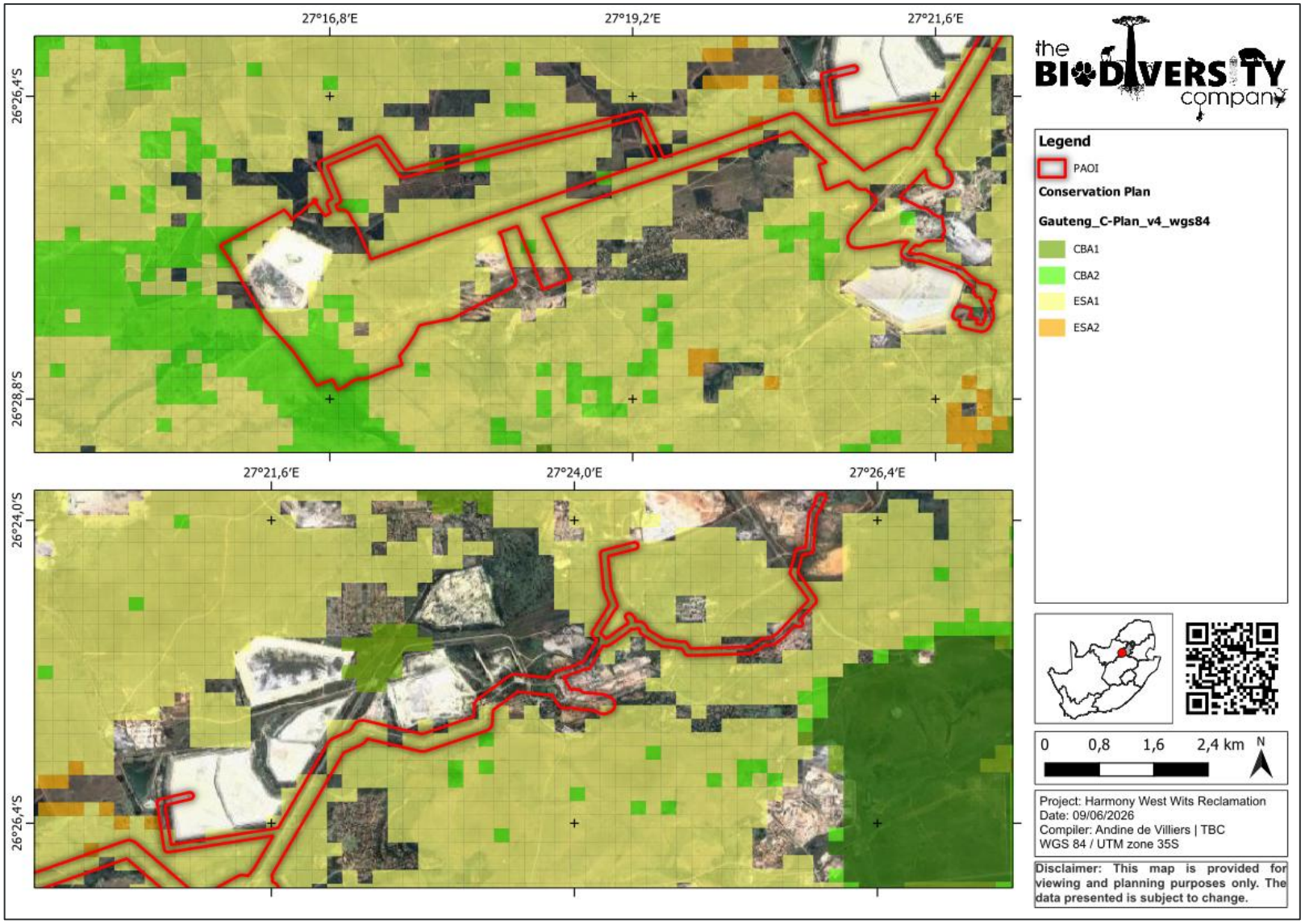


Figure 33: Map illustrating the project area in relation to the provincial conservation plan

8.6.1.4 **GAUTENG RIDGES**

The quartzite ridges of Gauteng are one of the most important natural assets in the northern province of South Africa. This is because these ridges, and the area immediately surrounding the ridges, provide habitat for a wide variety of fauna and flora, some of which are Red List, rare or endemic species or, in the case of certain of the plant species, are found nowhere else in South Africa or the world (GDARD, 2019). The PAOI overlaps with Class 1 Ridges and their associated 200 m buffer zones, and Class 2 Ridges (**Figure 34**).

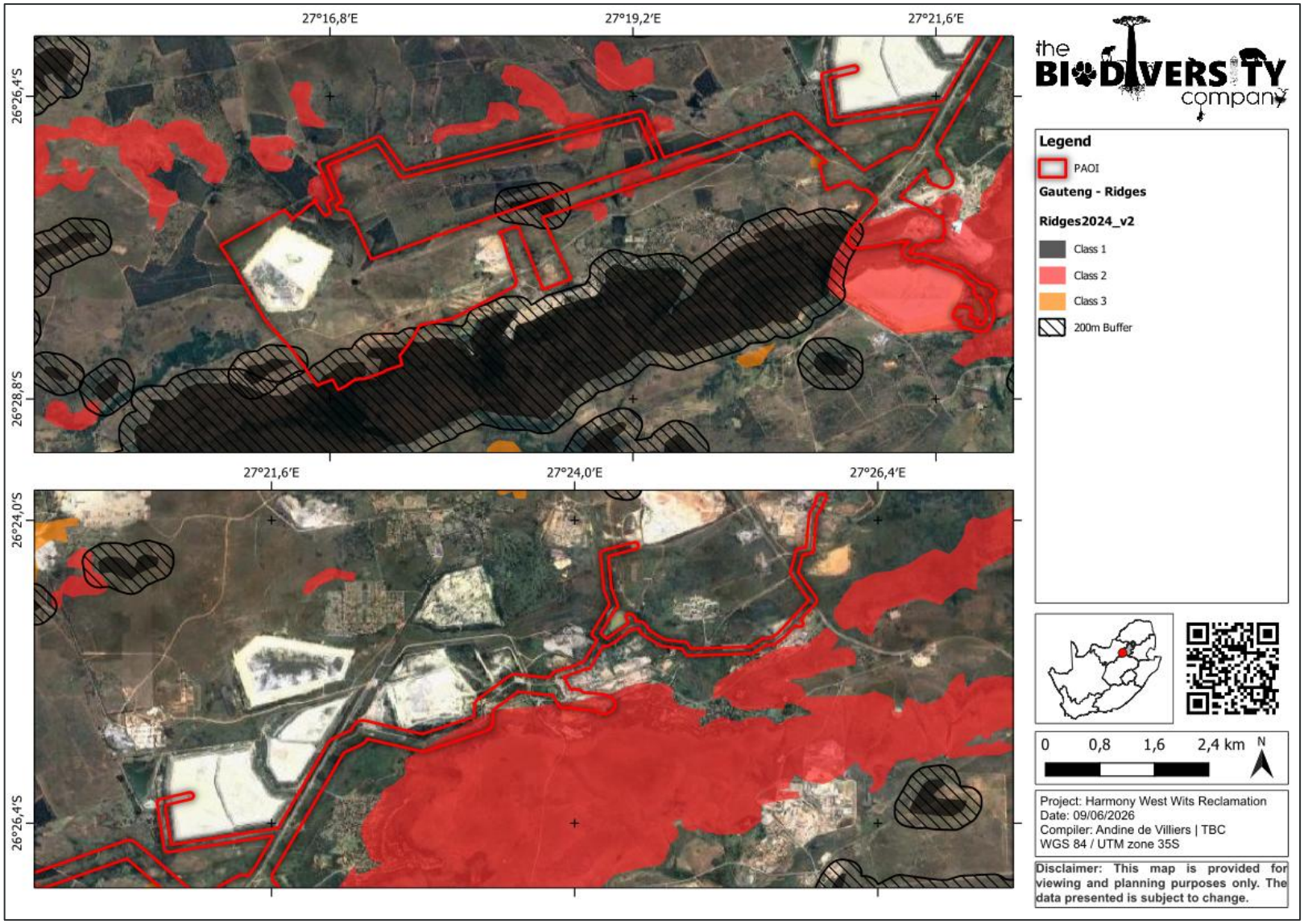


Figure 34: Map illustrating the project area in relation to the Gauteng Ridges

8.6.1.5 NATIONAL PROTECTED AREA EXPANSION STRATEGY

National Protected Area Expansion Strategy 2010 (NPAES) were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2010).

South Africa's protected area network currently falls far short of representing all ecosystems and maintaining healthy functioning ecological processes. In this context, the goal of the NPAES is to achieve cost effective protected area expansion, thus enabling better ecosystem representation, ecological sustainability, and resilience to climate change. A comprehensive set of priority areas was compiled based on the priorities identified by provincial and other agencies in their respective protected area expansion strategies. These focus areas are generally large, intact and unfragmented and are, therefore, of high importance for biodiversity, climate resilience and freshwater protection (DFFE, 2022b). The PAOI overlaps with NPAES Priority Focus Areas in the west (**Figure 35**).

8.6.1.6 MINING AND BIODIVERSITY GUIDELINES

According to the Mining and Biodiversity Guidelines spatial dataset (2013) the PAOI overlaps with moderate, high and highest biodiversity importance, which correlates to a moderate, high and highest risk for mining (**Figure 36**).

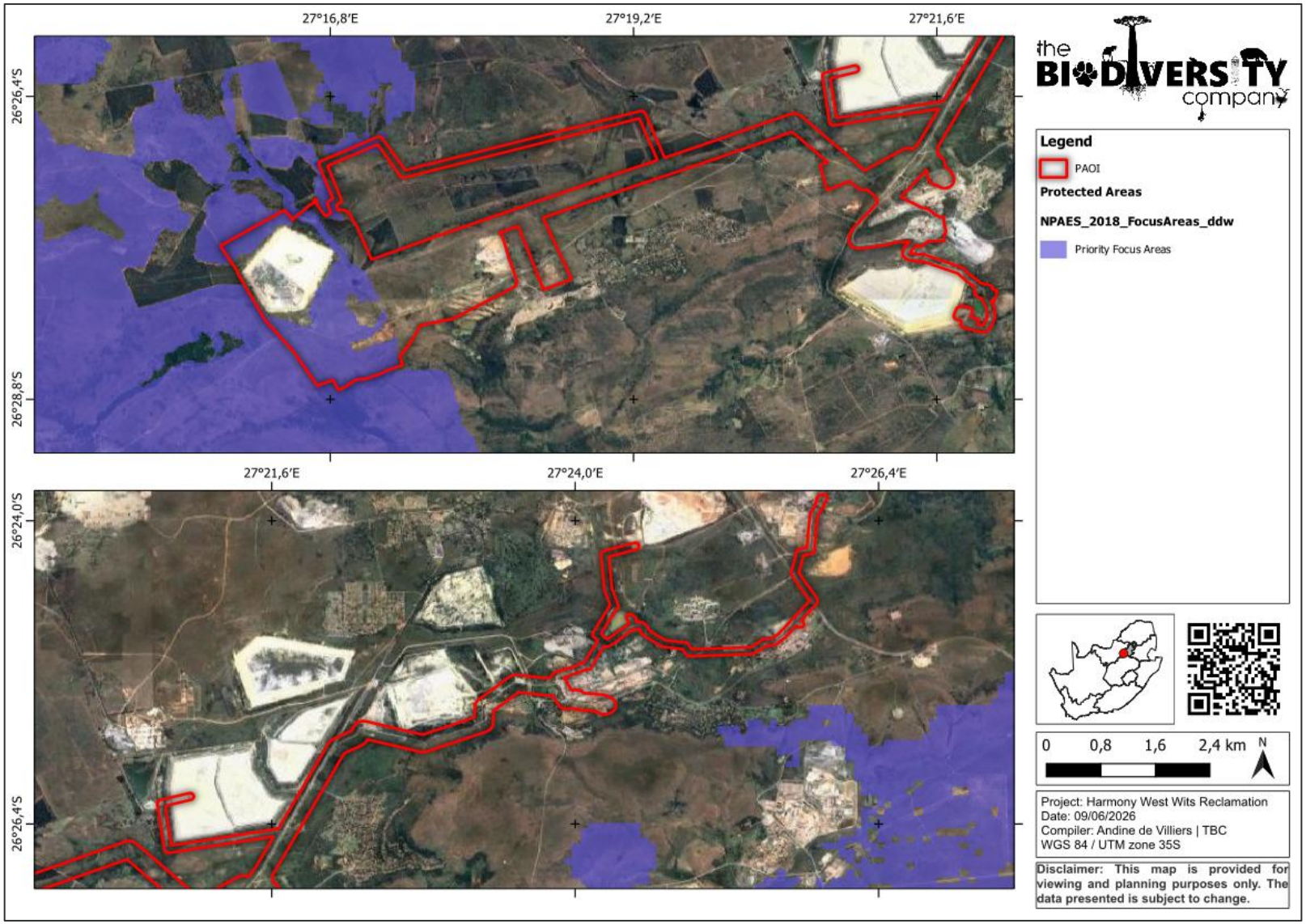


Figure 35: The project area in relation to the NPAES dataset

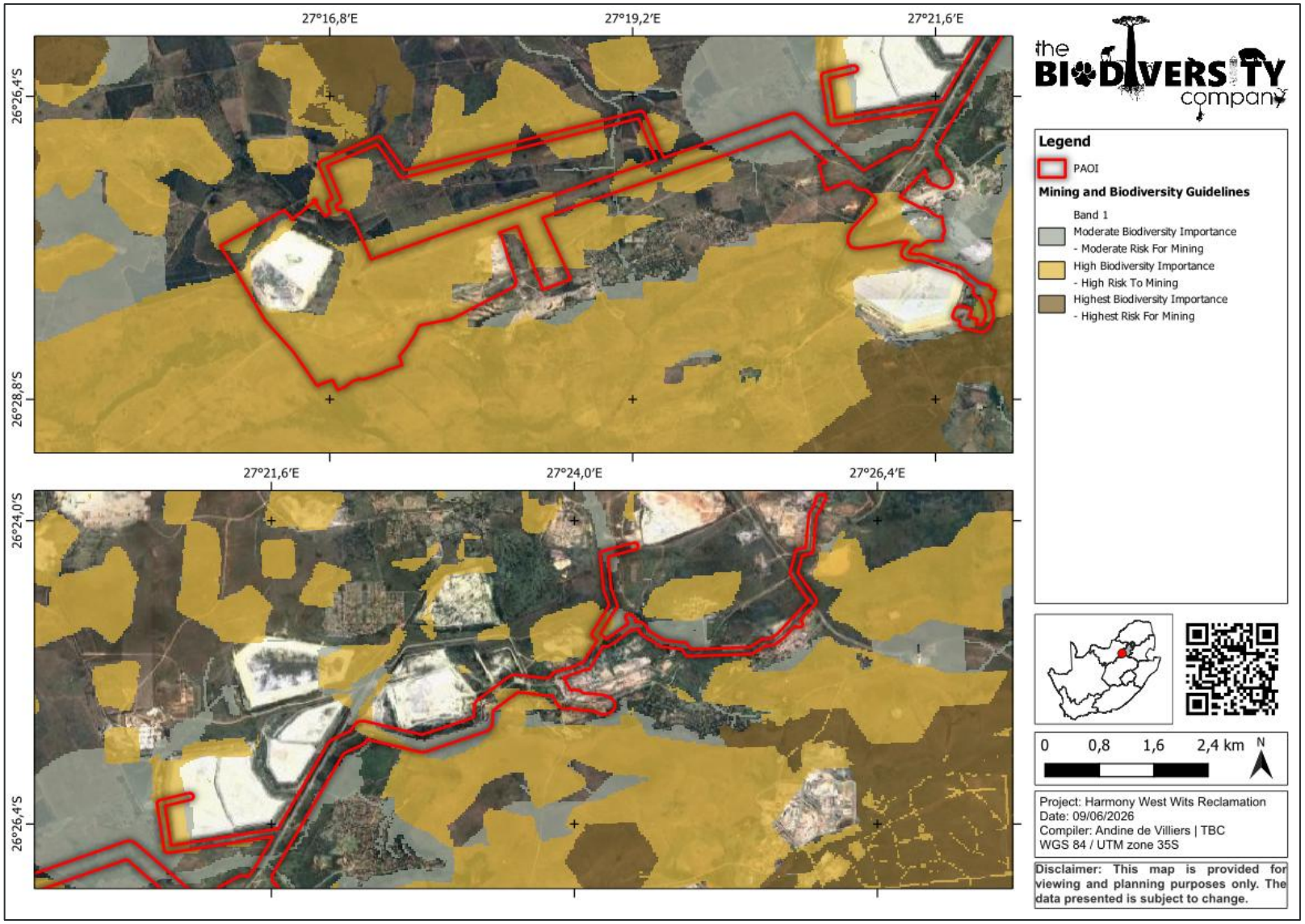


Figure 36: The project area in relation to the Mining Biodiversity Guidelines dataset

8.6.1.7 **HABITATS**

Habitats observed are described in **Table 14** and shown in **Figure 37**.

Table 14: Sensitivity summary of the habitat types delineated within the project area

Habitat	Description and Condition	Ecosystem Processes and Services
Rocky Gauteng Shale Mountain Bushveld **91,5 ha**	This habitat is characterized by a high proportion of exposed surface rock and supports a semi-open thicket, dominated by a variety of woody species including *Senegalia afra, Searsia leptodictya, Searsia magalismontanum, Protea caffra caffra, Vachellia karoo* and *Vangueria infausta*. Other indigenous species observed within this habitat include *Macledium zeyheri, Aloe davyana, Gymnosporia buxifolia,* and *Cussonia paniculata.* No flora SCC were observed, but *Adromischus umbraticola* subsp. u*mbraticola* is expected and was observed nearby. Moreover, fauna SCC, such as *Crocidura maquassiensis,* could occur in this habitat. This habitat is representative of the Gauteng Shale Mountain Bushveld. This habitat overlaps with CBA 2 and ESA 1, and importantly, with a Class 1 Gauteng Ridge. Current impacts are limited but include edge effects from nearby activities and small-scale illegal mining and associated ingress. Fences and historical prospecting evidence are also present. Minimal AIPs exist.	This habitat provides ecological functions by offering structurally diverse habitat and refugia for multiple faunal species, while supporting pollination and seed dispersal through its flowering forbs and shrubs. The extensive rock cover allows for a suitable microclimate to be present for the survival of A. umbraticola subsp. umbraticola, providing neighboring ridge habitat with plant recruitment. This habitat provides erosion control and nutrient cycling. Carbon sequestration and nectar resources for pollinators is also provided. This habitat is of high ecological importance. Offset mitigation may be required for high impact activities within these areas.
  26°26'57.31"S 27°17'0.81"E		

Habitat	Description and Condition	Ecosystem Processes and Services
  26°28'34.04"S 27°17'9.62"E		
Degraded Gauteng Shale Mountain Bushveld **171 ha**	This habitat is comprised of areas that have undergone constant degradation, in some cases land clearance. The plant species abundance and structure has changed as a result of this degradation, leaving some areas with an increase grass and decrease in tree cover in comparison to the natural bushveld areas. Indigenous species observed within this habitat include *Vachellia karoo, Hyparrhenia hirta, Ehretia rigida* and *Senegalia afra*. The floral species richness within this habitat type is diminished due to anthropogenic influences. Current impacts include AIP invasion, vehicle ingress, and edge effects from neighbouring ongoing activities. Existing infrastructure, such as pipelines and powerlines, exist here. AIP species observed within this habitat include *Tagetes minuta, Acacia melanoxylon, Lantana camara* and *Solanum mauritianum*. No floral SCC were observed within this habitat and none are expected. Fauna SCC could occur. Overlaps with ESA 1. Some areas overlap with Class 1 and Class 2 Gauteng Ridges.	The ecosystem functioning and services provided by this habitat has been severely diminished due to anthropogenic influences. This habitat still provides areas for faunal species to forage and still acts as a movement corridor for various faunal species.

Habitat	Description and Condition	Ecosystem Processes and Services
  26°27'54.54"S 27°21'59.31"E   26°24'28.48"S 27°24'14.81"E		
Irreversibly Modified **365 ha**	Irreversibly Modified habitats, in this instance, include, roads, houses, lawns/gardens, and infrastructure associated with the mining operations (TSF and processing plants). They are largely ecologically dysfunctional and have plant species that are characteristic of disturbance. Moreover, multiple AIPs occur within this habitat. No SCC were observed and none are expected.	The ecosystem functions and services of this habitat have been severely compromised due to modification. However, it still offers some benefits, particularly by supporting the dispersal of wind-borne indigenous plant seeds, which aids in plant recruitment in surrounding areas.

Habitat	Description and Condition	Ecosystem Processes and Services
 26°25'22.36"S 27°24'0.67"E  26°27'24.28"S 27°21'28.83"E  26°24'6.54"S 27°25'52.49"E  26°27'45.79"S 27°18'7.86"E		
Severely Modified: Alien Stand **120 ha**	Severely Modified habitats, in this instance, consist of dense AIP stands, especially characterised by *Eucalyptus camaldulensis* stands in the western section of the project area, and mixed-species infestations in the eastern section. No SCC were observed. No flora SCC are expected. Fauna SCC (especially avifauna) could forage in the habitat.	The ecosystem functions have been greatly reduced from natural conditions; however, the vegetation that remains in this habitat may provide foraging, movement, and refuge opportunity to fauna species, as well as aiding in ground stabilisation and erosion prevention.

Habitat	Description and Condition	Ecosystem Processes and Services
  26°27'13.31"S 27°16'40.79"E   26°25'25.52"S 27°23'19.59"E		
Degraded Carletonville Dolomite Grassland **248,9 ha**	This habitat is representative of Carletonville Dolomite Grassland, but in a degraded state. Overgrazing and mismanagement have led to the grass layer being reduced to short tufts with sparse vegetation in between. *Seriphium vulgaris* has invaded these areas due to overgrazing. Indigenous species observed within this habitat include *Helichrysum nudifolium, Hyparrhenia hirta, Felicia muricata,* and *Helichrysum setosum.* The floral species richness within this habitat type is diminished due to anthropogenic influences. Current impacts include overgrazing, vehicle ingress and edge effects from the surrounding anthropogenic activities. This habitat is no longer representative of the Carletonville Dolomite Grassland vegetation type. However, it must be noted that this habitat overlaps with CBA 2 and ESA 1 according to the provincial conservation plan. No floral SCC were observed within this habitat, and none are expected. Fauna SCC could occur within the area.	The ecosystem functioning and services of this habitat has been hindered due to the anthropogenic disturbances. This disturbed habitat still however provides important ecosystem services, including soil stabilisation through remaining grass and shrub cover, which helps reduce wind and water erosion. The habitat offers movement corridors for a variety of fauna.

Habitat	Description and Condition	Ecosystem Processes and Services
  26°27'31.05"S 27°17'46.65"E   26°27'55.18"S 27°16'48.66"E		
Carletonville Dolomite Grassland **103 ha**	Even though the vegetation map has classed the whole project area as Gauteng Shale Mountain Bushveld, certain portions of the project area were identified as Carletonville Dolomite Grassland based on plant species characteristic of that vegetation type and landscape features. The vegetation type consists of undulating plains with chert ridges (rocky outcrops), with a species-rich composition. In this habitat, rocky features are absent. Dominant species observed include *Aristida congesta, Cynodon dactylon, Eragrostis racemosa, Heteropogon contortus,* and *Sporobolus pectinatus.* Moreover, *Helichrysum chionosphaerum, Parinari capensis,* and *Hypoxis hemerocallidea* were observed. Current impacts to this habitat type include grazing, roads, vehicle ingress and other existing linear infrastructure (powerlines and pipelines). The main determining factor between the Rocky Carletonville Dolomite Grassland and the Carletonville Dolomite Grassland is the presence of rocky outcrops. Moreover, the Degraded Carletonville	This habitat supports primary production, soil stabilization, nutrient cycling, and water regulation, enhanced by its substantial vegetation cover. This habitat provides ecological functions by offering structurally diverse habitat and refugia for multiple faunal species, while supporting pollination and seed dispersal through its flowering forbs and shrubs. The mix of grasses and shrubs provides forage, and plant clumps offer shade and shelter, helping small mammals, reptiles, and ground-dwelling birds survive.

Habitat	Description and Condition	Ecosystem Processes and Services
	Dolomite Grassland differs in the level of grazing pressure and historical (2013) disturbance. No flora SCC were observed and none are expected. No fauna SCC were observed, but some could use the area for foraging and movement. This habitat overlaps with CBA 2 and ESA 1.	
  26°27'36.02"S 27°16'5.34"E		
Rocky Carletonville Dolomite Grassland **21,9 ha**	Even though the vegetation map has classed the whole project area as Gauteng Shale Mountain Bushveld, certain portions of the project area were identified as Carletonville Dolomite Grassland based on plant species characteristic of that vegetation type and landscape features. The vegetation type consists of undulating plains with chert ridges (rocky outcrops), with a species-rich composition. In this habitat, rocky features are present. Dominant species observed include *Aristida congesta, Cynodon dactylon, Eragrostis racemosa, Heteropogon contortus,* and *Sporobolus pectinatus.* Moreover, *Helichrysum chionosphaerum, Parinari capensis,* and *Hypoxis hemerocallidea* were observed. Current impacts to this habitat type include grazing, roads, vehicle ingress and other existing linear infrastructure (powerlines and pipelines). The main determining factor between the Rocky Carletonville Dolomite Grassland and the Carletonville Dolomite Grassland is the presence of rocky outcrops. Moreover, the Degraded Carletonville	This habitat supports primary production, soil stabilization, nutrient cycling, and water regulation, enhanced by its substantial vegetation cover. This habitat provides ecological functions by offering structurally diverse habitat and refugia for multiple faunal species, while supporting pollination and seed dispersal through its flowering forbs and shrubs. The mix of grasses and shrubs provides forage, and plant clumps offer shade and shelter, helping small mammals, reptiles, and ground-dwelling birds survive. The potential presence of SCC and protected plant species further underscores this habitat's importance in maintaining ecosystem functioning. It also facilitates the recruitment and dispersal of SCC into surrounding areas, supporting the persistence of these species and strengthening their population numbers.

Habitat	Description and Condition	Ecosystem Processes and Services
	Dolomite Grassland differs in the level of grazing pressure and historical (2013) disturbance. No flora SCC were observed, however, three are expected (based on desktop data, suitable habitat, and confirmed nearby occurrence), namely *Khadia beswickii, Cleome conrathii* and *Adromischus umbraticola* subsp. *umbraticola*). No fauna SCC were observed, but some could use the area for foraging and movement. This habitat overlaps with ESA 1.	This vegetation type is of high ecological importance: Offset mitigation may be required for high impact activities.
  26°27'27.74"S 27°16'19.14"E		
Freshwater Features: (Split into) **Wetlands and in-stream dams (101,3 ha)** **and** **Artificial, off-stream dams, rock quarry, and non-perennial drainage (110,3 ha)**	This habitat type consists of wet portions of land as delineated by the aquatic specialists. Additional information regarding this habitat unit may be found in the accompanying Aquatics Report (TBC, 2026). These features consist of wetlands, in-stream dams, off-stream dams, a rocky quarry, non-perennial drainage features, and artificial features. The wetlands and in-stream dams are predominantly more natural, and as such, provides potential foraging habitat (and free water) for indigenous fauna and potential SCC. The off-stream dams, rock quarry, non-perennial drainage features and artificial features provide limited potential habitat.	This habitat provides water to faunal species and aids in water purification, flood regulation, groundwater recharge, and erosion control. These features are of high ecological importance. Offset mitigation may be required for these areas.

Habitat	Description and Condition	Ecosystem Processes and Services
  26°27'43.48"S 27°18'3.08"E   26°28'1.77"S 27°21'59.60"E		

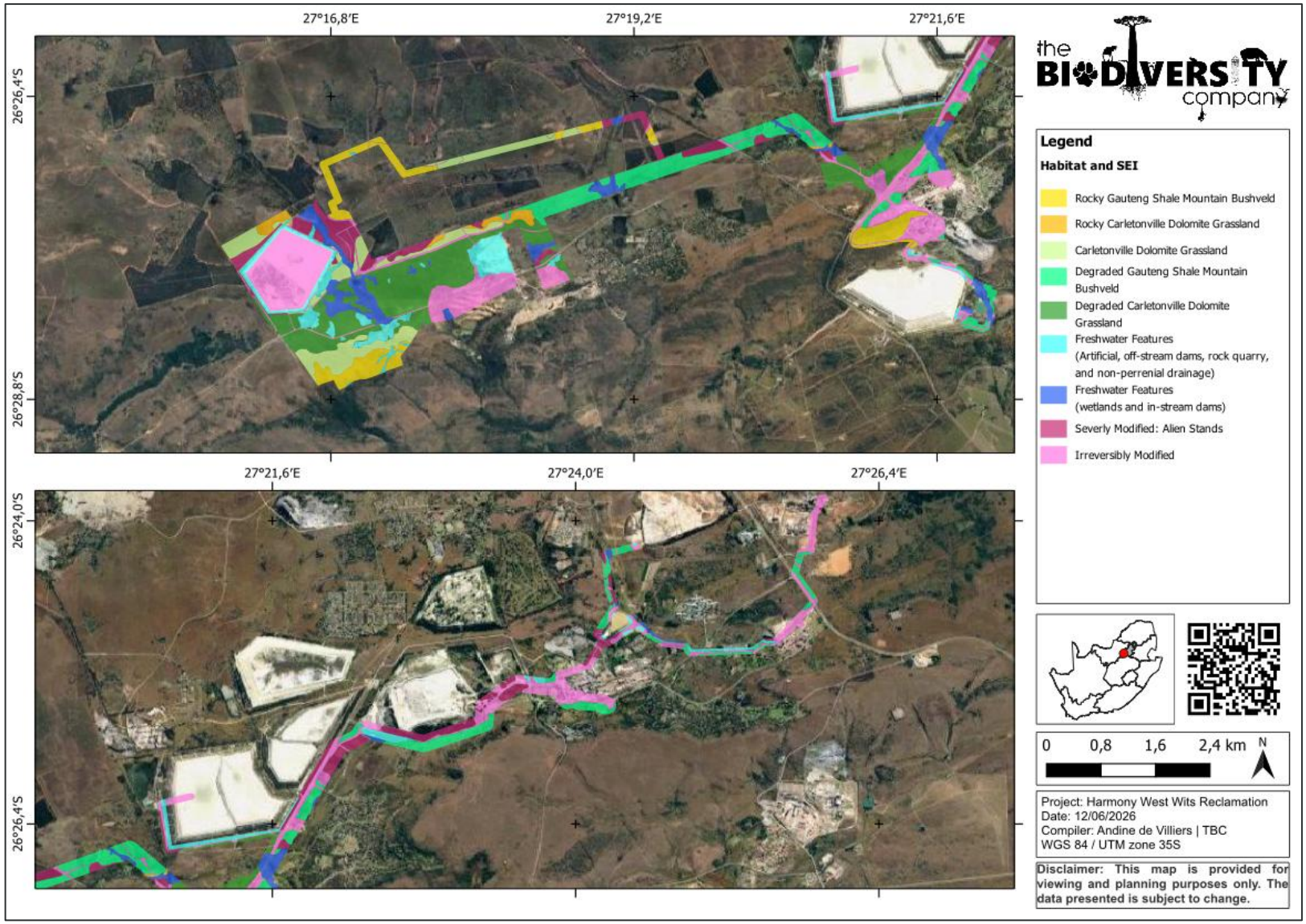


Figure 37: Identified habitats

8.6.2 FLORA

The project area is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include Acacia and Albizia) and a generally dense herbaceous layer (Scholes & Walker, 1993).

The project area largely overlaps with the Gauteng Shale Mountain Bushveld vegetation type. There is a marginal overlap with the Andesite Mountain Bushveld vegetation type in the west of the project area (**Figure 38**). It must be noted that although the project area is situated in the savanna biome, it is located near the grassland biome, specifically, the Carletonville Dolomite Vegetation Type (to the north).

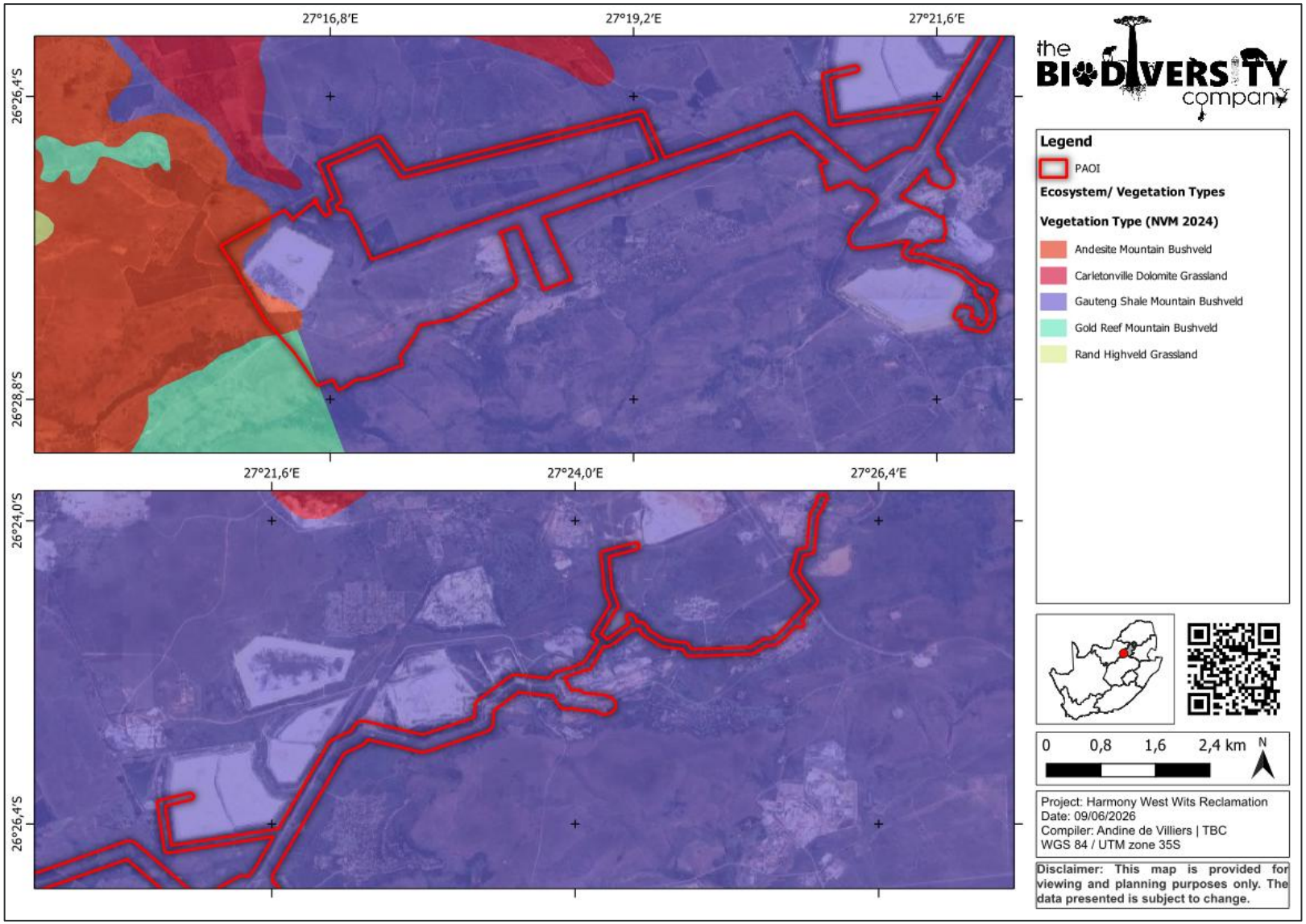


Figure 38: Map illustrating the vegetation types associated with the project area.

8.6.2.1 GAUTENG SHALE MOUNTAIN BUSHVELD

This vegetation unit occurs mainly on the ridge of the Gatsrand south of Carletonville-Westonaria-Lenasia. It also occurs as a narrow band along the ridge that runs form a point between Tarlton and Magaliesberg in the west, through Sterkfontein, Pelindaba, Atteridgeville to Klapperkop and southeastern Pretoria in the east. The altitude ranges between 1300 to 1 750 m. It consists of low, broken ridges varying in steepness and with high surface rock cover. Vegetation is a short, semi-open thicket dominated by a variety of woody species. The understorey is dominated by a variety of grasses. Some of the ridges form plateaus above the northern slopes that carry scrubby grassland with high surface rock cover.

Important Taxa (d = dominant)

Small Trees: *Senegalia affra* (d), *Dombeya rotundifolia* (d), *Vachellia karroo, Celtis africana, Combretum molle, Cussonia spicata, Englerophytum magalismontanum, Protea affra, Searsia leptodictya, Vangueria infausta, Zanthoxylum capense, Ziziphus mucronata.*

Tall Shrubs: *Asparagus laricinus, Canthium gilfillanii, Chrysanthemoides monilifera, Dichrostachys cinerea, Diospyros austro-africana, D. lycioides* subsp. *lycioides, Ehretia rigida* subsp. *rigida, Euclea crispa* subsp. *crispa, Grewia occidentalis, Gymnosporia polyacantha, Olea europaea* subsp. *africana, Tephrosia capensis, T. longipes*.

Low Shrubs: *Acalypha angustata, Asparagus suaveolens, Athrixia elata, Felicia muricata, Indigofera comosa, Rhus magalismontana subsp. magalismontana.*

Geoxylic Suffrutex: *Elephantorrhiza elephantina.*

Succulent Shrub: *Kalanchoe rotundifolia.*

Woody Climber: *Ancylobotrys capensis.*

Graminoids: *Hyparrhenia dregeana* (d), *Cymbopogon caesius, C. pospischilii, Digitaria eriantha subsp. eriantha, Eragrostis curvula.*

Herbs: *Dicoma zeyheri, Helichrysum nudifolium, H. rugulosum, Hermannia lancifolia, Hibiscus pusillus, Selaginella dregei, Senecio venosus, Vernonia natalensis, V. oligocephala.*

Geophytic Herbs: *Cheilanthes hirta, Pellaea calomelanos, Scadoxus puniceus.*

Conservation Status: This vegetation type is classified as Least Concern (RLE, 2022) The national target for conservation protection for this vegetation type is 24%. Less than 1% is statutorily conserved, for example, the Skanskop and Hartbeesthoek Nature Reserves, Magaliesberg Nature Area and Groenkloof National Park. Additionally, over 1% conserved in other reserves including the John Nash Nature Reserve, Cheetah Park and Hartbeesthoek Radio Astronomy Observatory. About 21% transformed mainly by urban and built-up areas, mines and quarries, cultivation and plantations. Wattles a common invasive plant in places.

8.6.2.2 ANDESITE MOUNTAIN BUSHVELD

The Andesite Mountain Bushveld vegetation type occurs in several separate patches across Gauteng, North-west, Mpumalanga and the Free State Provinces (Mucina & Rutherford, 2006). Several separate occurrences of which the main are: the Bronberg Ridge in eastern Pretoria extending to Welbekend; from Hartebeesthoek in the west along the valley between the two parallel ranges of hills to Atteridgeville; hills in southern Johannesburg; several hills encompassing Nigel, Willemsdal, Coalbrook and Suikerbosrand (in part); and the outer ring of ridges of the Vredefort Dome and some hills to the northwest around Potchefstroom. This vegetation type occurs at an altitude of about 1 350–1 800m. This vegetation type is characterized by dense, medium-tall thorny bushveld with a well-developed grass layer on hill slopes and some valleys with undulating landscape.

Important Plant Taxa (d = dominant)

Small Trees: *Senegalia affra* (d), *Vachellia karroo* (d), *Celtis africana*, *Protea affra*, *Zanthoxylum capense*, *Ziziphus mucronata*.

Tall Shrubs: *Asparagus laricinus* (d), *Euclea crispa* subsp. *crispa* (d), *Rhus pyroides* var. *pyroides* (d), *Diospyros lycioides* subsp. *lycioides*, *Gymnosporia polyacantha*, *Lippia javanica*, *Rhamnus prinoides*.

Low Shrubs: *Asparagus suaveolens* (d), *Rhus rigida* var. *margaretae*, *Teucrium trifidum*.

Soft Shrub: *Isoglossa grantii*.

Woody Climber: *Rhoicissus tridentata*.

Graminoids: *Eragrostis curvula* (d), *Hyparrhenia hirta* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Cymbopogon pospischilii*, *Digitaria eriantha* subsp. *eriantha*, *Elionurus muticus*, *Eragrostis racemosa*, *E. superba*, *Panicum maximum*.

Succulent Herb*: Aloe greatheadii* var. *davyana*; and

Herbs: *Commelina africana*, *Vernonia galpinii*, *V. oligocephala*.

Conservation Status of the Vegetation Type : This vegetation type is classified as Least Concern (RLE, 2022). The national target for conservation protection is 24%. About 7% are statutorily conserved mainly in the Suikerbosrand Nature Reserve and Magaliesberg Nature Area. An additional 1–2% conserved in other reserves mainly in the Hartbeesthoek Radio Astronomy Observatory. Some 15% have already transformed, mainly by cultivation and some urban and built-up areas.

8.6.2.3 GOLD REEF MOUNTAIN BUSHVELD

Gold Reef Mountain Bushveld vegetation type is found in the North-West, Gauteng, Free State and Mpumalanga Provinces. This vegetation type typically comprises of Rocky hills and ridges often west-east trending with more dense woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of *Senegalia caffra* on the southern slopes). Tree cover elsewhere is variable while the tree and shrub layers are often continuous.

Important Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are important in the Soweto Highveld Grassland.

Small Trees: *Senegalia caffra* (d), *Combretum molle* (d), *Protea caffra* (d), *Celtis africana*, *Dombeya rotundifolia*, *Englerophytum magalismontanum*, *Ochna pretoriensis*, *Searsia leptodictya*, *Vangueria infausta*, *V. parvifolia*, *Ziziphus mucronata*.

Tall Shrubs: *Canthium gilfillanii*, *Ehretia rigida* subsp. *rigida*, *Grewia occidentalis*, *Gymnosporia buxifolia*, *Mystroxylon aethiopicum* subsp. *burkeanum*.

Low Shrubs: *Athrixia elata*, *Pearsonia cajanifolia*, *Rhus magalismontana* subsp. *magalismontana*, *R. rigida* var. *rigida*.

Woody Climber: *Ancylobotrys capensis*.

Graminoids: *Loudetia simplex* (d), *Panicum natalense* (d), *Schizachyrium sanguineum* (d), *Trachypogon spicatus* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Bewsia biflora*, *Digitaria tricholaenoides*, *Diheteropogon amplectens*, *Sporobolus pectinatus*, *Tristachya biseriata*, *T. leucothrix*.

Herbs: *Helichrysum nudifolium*, *H. rugulosum*, *Pentanisia angustifolia*, *Senecio venosus*, *Xerophyta retinervis*.

Geophytic Herbs: *Cheilanthes hirta*, *Hypoxis hemerocallidea*, *Pellaea calomelanos*.

Endemic Taxa

Succulent Shrub: *Aloe peglerae.*

Succulent Herb: *Frithia pulchra*.

Conservation Status: According to the Red List of Ecosystems (June 2022), this vegetation type is classified as Least Concern. The national target for conservation protection for both these vegetation types is 24%, with 22% statutorily conserved mainly in the Magaliesberg Nature Area and much smaller proportions in the Rustenberg, Wonderboom and Suikerbosrand Nature Reserves. At least an additional 1% of this vegetation type is conserved in other reserves which brings the total area conserved very close to target. About 15% has been transformed mainly by cultivation and urban and built-up areas and some areas with dense stands of the alien *Melia azedarach* are embedded within this unit.

8.6.2.4 FLORA DESCRIPTION

The GBIF (Global Biodiversity Information Facility - www.gbif.org) database indicates that 356 species of plants are expected to occur within the PAOI and surrounding area. The full list of species will be provided in the final report. The GBIF database lists four (4) sensitive species that could occur within the PAOI. The DFFE screening tool lists two (2) sensitive species which could occur within the PAOI (five in total) (Table 15).

Please note that the Screening Tool report includes lists of bird, mammal, reptile, amphibian, butterfly, and plant species of conservation concern known or expected to occur on the proposed development footprint. Some of these SCC are sensitive to illegal harvesting. Such species have had their names obscured and are listed as sensitive plant unique number / sensitive animal unique number. As per the best practise guideline that accompanies the protocol and screening tool, please, the name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain. It should be referred to as sensitive plant or sensitive animal and its threat status may be included, e.g. critically endangered sensitive plant or endangered sensitive animal.

Table 15: Threatened flora species that are expected to occur within the PAOI; VU = Vulnerable; LC = Least Concern; CR = Critically Endangered; EN = Endangered; NE = Not Evaluated.

Family Name	Scientific Name	Regional (SANBI)	Global (IUCN)	Screening Tool Sensitivity	Habitat	Likelihood of Occurrence	Reason
Aizoaceae	*Khadia beswickii*	VU	CR	Medium	Open shallow soil over rocks in grassland.	Medium	Suitable habitat in project area
Aizoaceae	*Delosperma purpureum*	EN	Not listed		South-facing slopes, in shallow soils among crystalline or conglomerate quartzitic rocks, in sun or in partial shade, rarely in shade, in grassland with some trees	Medium	Suitable habitat in project area
Crassulaceae	*Adromischus umbraticola*	NT	NE	Plants grow on south-facing rock crevices on ridges	-	High	Suitable habitat, confirmed nearby

8.6.3 FAUNA

This section of the report describes the fauna species that are expected to occur on site.

8.6.3.1 AMPHIBIANS AND REPTILES

Based on the GBIF database, two (2) amphibian and twenty (20) reptile species are expected to occur within the area, none of which are classified as SCC (Full list in Appendix C). No species are listed by the DFFE Screening Tool. No reptile or amphibian species were recorded for the PAOI. This is attributed to the secretive nature of these species and common reptile and amphibian species are expected.

8.6.3.2 INSECTS AND INVERTEBRATES

The DFFE screening tool lists 2 insect SCCs and 1 invertebrate SCC for the PAOI (**Table 16**).

Table 16: Threatened insect and invertebrate species that are expected to occur within the PAOI NT = Near threatened; VU = Vulnerable; LC = Least Concern.

Family Name	Scientific Name	Common Name	Regional (SANBI)	Global (IUCN)	Screening Tool Sensitivity	Habitat	Likelihood of Occurrence	Reason
Insect								
Lycaenidae	*Lepidochrysops praeterita*	Highveld Blue	EN	EN	Medium	Confined to grassy, rocky, typically south-facing slopes, where its host plant (*Ocimum obovatum*) and, presumably, its host ant occur.	Medium	Known to inhabit areas with dense human habitation and intensive land use. Suitable habitat in project area
Lycaenidae	*Lepidochrysops procera*	Grassveld Nimble Blue	Rare	LC	Medium	Rocky areas in grassland (and grassy areas in savanna), where its larval host plant, *Ocimum obovatum*, occurs.	Medium	Suitable habitat in project area
Invertebrate								
Tettigoniidae	*Clonia uvarovi*	Uvarov's Clonia	VU	VU	Medium	Woodland savannah.	Medium	Suitable habitat in project area

8.6.3.3 MAMMALS

Based on the GBIF (www.gbif.org) database, 12 mammal species could be expected to occur within the area of which 3 are an SCC (**Table 17**).

Table 17: Threatened mammal species that are expected to occur within the PAOI; NT = Near threatened; VU = Vulnerable; LC = Least Concern.

Family Name	Scientific Name	Common Name	Regional (SANBI)	Global (IUCN)	Screening Tool Sensitivity	Habitat	Likelihood of Occurrence	Reason
Giraffidae	*Giraffa camelopardalis*	Giraffe	-	LC	VU	Savanna/woodland habitats, but range widely	Low	Restricted to game reserves
Soricidae	*Crocidura maquassiensis*	Makwassie Musk Shrew	VU	LC	Medium	Found in rocky, mountain and grassland habitat.	Medium	May tolerate a wide range of habitats. Suitable habitat in project area
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	VU	NT	Medium	Inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes	Medium	Wetlands and rivers occur within project area. Suitable habitat in project area.

8.6.3.4 **AVIFAUNA**

SABAP2 data indicate that 354 avifauna species are expected for the PAOI and surrounding areas. The Avifauna list was generated from the SABAP2. Of these 348 avifauna species, 40 are considered SCC (Table 18). The likelihood of occurrence within the PAOI is included here. The DFFE screening tool lists two (2) high-sensitivity species and four (4) medium-sensitivity species (41 in total). The likelihood of occurrence of these species will be determined following the site visit.

Table 18: Threatened avifauna species that are expected to occur within the PAOI; LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered

Common Name	Scientific Name	Regional	Global	Screening Tool	Likelihood of Occurrence
Half-collared Kingfisher	*Alcedo semitorquata*	VU	LC		Low
Red-billed Teal	*Anas erythrorhyncha*	NT	LC		High
Yellow-billed Duck	*Anas undulata*	NT	LC		High
African Darter	*Anhinga rufa*	NT	LC		High
Blue Crane	*Anthropoides paradiseus*	VU	VU		Low
Verreaux's Eagle	*Aquila verreauxii*	VU	LC		High
Great Egret	*Ardea alba*	NT	LC		High
Marsh Owl	*Asio capensis*	NT	LC		High
Curlew Sandpiper	*Calidris ferruginea*	VU	VU		Medium
Kittlitz's Plover	*Charadrius pecuarius*	NT	LC		High

Common Name	Scientific Name	Regional	Global	Screening Tool	Likelihood of Occurrence
Black Stork	*Ciconia nigra*	EN	LC		Low
Pallid Harrier	*Circus macrourus*	NA	NT		Medium
Black Harrier	*Circus maurus*	EN	EN		Low
African Marsh Harrier	*Circus ranivorus*	VU	LC	High/Medium	High
European Roller	*Coracias garrulus*	NT	LC		Medium
Fulvous Whistling Duck	*Dendrocygna bicolor*	NT	LC		High
Black-winged Kite	*Elanus caeruleus*	NT	LC		High
White-bellied Bustard	*Eupodotis senegalensis*	VU	LC	Medium	Medium
Lanner Falcon	*Falco biarmicus*	NT	LC		Medium
Lesser Kestrel	*Falco naumanni*	VU	LC		Medium
Red-footed Falcon	*Falco vespertinus*	VU	VU		Low
Black-winged Pratincole	*Glareola nordmanni*	LC	NT		Low
White-backed Vulture	*Gyps africanus*	CR	CR		Low
Cape Vulture	*Gyps coprotheres*	VU	VU		High
Caspian Tern	*Hydropogne caspia*	VU	LC	High/Medium	Medium
Lesser Jacana	*Microparra capensis*	NA	LC		Low
Melodious Lark	*Mirafra cheniana*	NT	LC		Medium
Sentinel Rock Thrush	*Monticola explorator*	LC	NT		Low
Yellow-billed Stork	*Mycteria ibis*	VU	LC		High
Southern Pochard	*Netta erythrophthalma*	NT	LC		High
Black-crowned Night Heron	*Nycticorax nycticorax*	NT	LC		High
Maccoa Duck	*Oxyura maccoa*	VU	EN		Medium
Lesser Flamingo	*Phoeniconaias minor*	VU	NT		High
Greater Flamingo	*Phoenicopterus roseus*	NT	LC		High
Great Crested Grebe	*Podiceps cristatus*	VU	LC		High
Secretarybird	*Sagittarius serpentarius*	VU	EN		Medium
Knob-billed Duck	*Sarkidiornis melanotos*	NT	LC		Medium
Hamerkop	*Scopus umbretta*	NT	LC		High
Cape Shoveler	*Spatula smithii*	NT	LC		High
White-backed Duck	*Thalassornis leuconotus*	NT	LC		High
African Grass Owl	*Tyto capensis*	VU	LC	Medium	Low

8.7 WETLANDS

Sixteen (16) HGM types were identified within the 500 m PAOI (Figure 39), namely, three (3) channelled valley-bottom (CVB) wetlands, five (5) unchannelled valley-bottom (UVB) wetlands and eight (8) seep wetlands. All identified wetlands intersect with the proposed project site, except for three seep wetlands, namely, HGM 9, HGM 13, and HGM 14. Additionally, non-perennial drainage features, dams, and other artificial features were also identified within the PAOI.

All identified natural freshwater features within the assessment area were delineated as part of this assessment. Areas associated with existing TSFs and other mining-related disturbance are largely artificial or highly modified and were therefore assessed and delineated only insofar as necessary to inform the specialist findings. This limitation does not materially affect the outcome of the assessment, and the available information is considered sufficient for impact assessment and decision-making.



A functional description and assessment have been provided for all the identified natural wetland systems located within and/or proximal to the proposed project site and within the PAOI. Representative photographs of the water features within the project footprint are included as **Figure 40**.

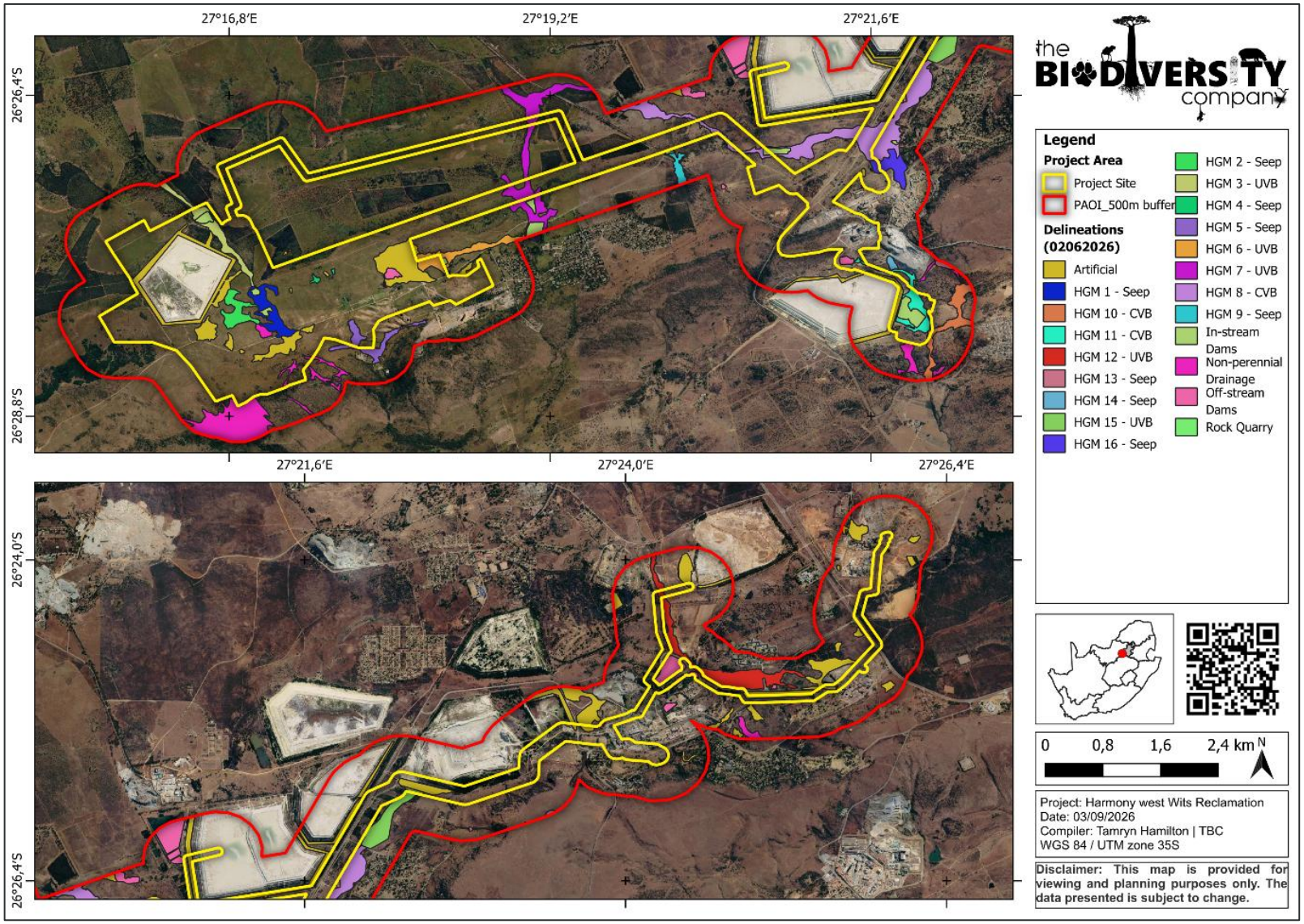


Figure 39: Delineation of wetlands and artificial features within the project footprint and 500 m project area of influence

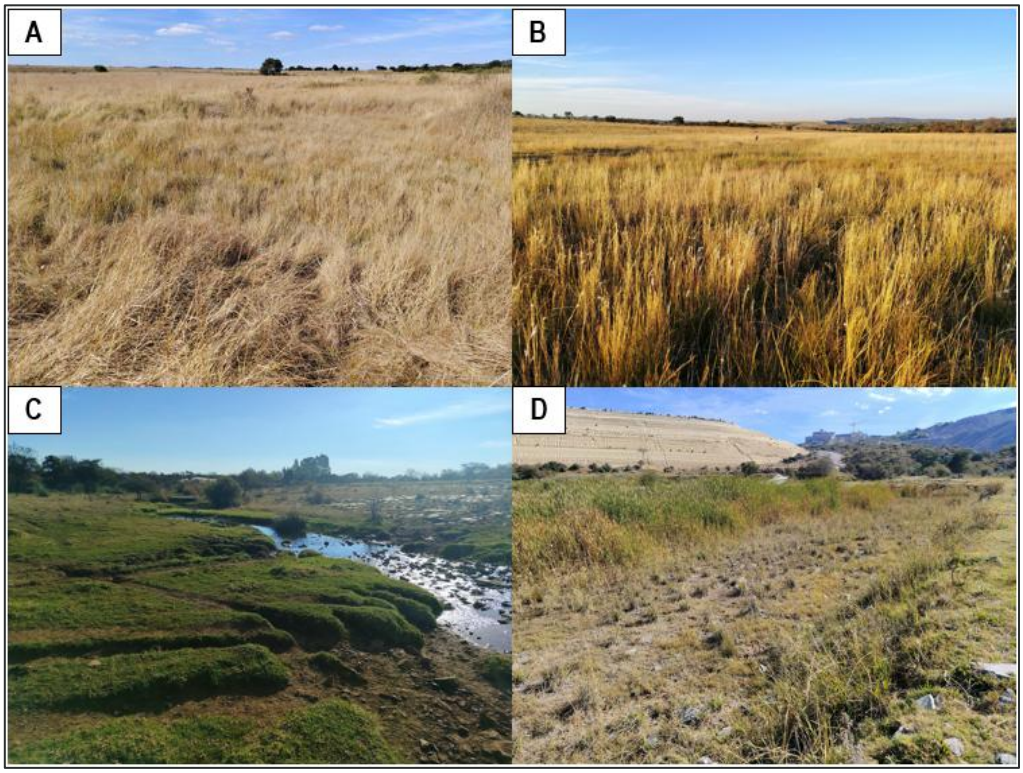


Figure 40: Representative photographs of the water features within the project footprint. A) HGM 1 Seep; B) HGM 6 UVB; C) HGM 8 CVB; and D) HGM 11 CVB

8.7.1 CLASSIFICATION AND DESCRIPTION

The wetland classification as per SANBI guidelines (Ollis *et al.,* 2013) is presented in Table 19.

Table 19: Wetland classification as per SANBI guideline (Ollis et al., 2013)

Wetland Unit	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1 – 2 HGM 4 – 5 HGM 9 HGM 13 – 14 HGM 16	Inland	Highveld	Central Bushveld Group 1	Hillslope	Seep	With Channelled Outflow	N/A
						Without Channelled Outflow	
HGM 3 HGM 6 – 7 HGM 12 HGM 15				Valley floor	Unchannelled Valley-bottom	N/A	N/A
HGM 8 HGM 10 – 11					Channelled Valley-bottom	N/A	N/A

A seep wetland is typically located on gently to steeply sloping land and is characterised by the colluvial, unidirectional movement of water and material down-slope (Ollis *et al.,* 2013). Seeps are often found on the side-slopes of a valley but do not usually extend onto the valley floor. The primary water inputs for seeps are subsurface flows from an up-slope direction, with water movement through the seep mainly occurring as interflow. During and after rainfall events, diffuse overland flow, known as sheetwash, can also be significant. Seeps are associated with geological formations and topographic positions that either cause groundwater to



discharge to the land surface or rain-derived water to seep down-slope as subsurface interflow. This unique hydrological setting allows seeps to support specific vegetation adapted to these conditions, contributing to their ecological significance in the landscape.

An unchannelled valley-bottom wetland, is a wetland located on a valley floor, characterised by the absence of a distinct river channel (Ollis et al., 2013). These wetlands are defined by their diffuse water flows, which are not confined within channel banks, allowing water to spread across the valley floor. The primary water inputs for unchannelled valley-bottom wetlands include diffuse surface and subsurface flows from upstream channels that lose confinement, as well as seepage from adjacent valley side-slopes. The hydrodynamics of these wetlands are dominated by horizontal, unidirectional, diffuse surface flow, although infiltration and evapotranspiration can also be significant. This setting allows unchannelled valley-bottom wetlands to function as important sites for sediment deposition, water filtration, and habitat provision, supporting a diverse range of plant and animal species. Their unique hydrological and geomorphological characteristics make them vital components of the landscape, contributing to the overall ecological health of the valley systems in which they occur.

A channelled valley-bottom wetland, is a wetland ecosystem located along a valley floor, characterised by the presence of a river channel running through it (Ollis *et al.,* 2013). These wetlands are distinct from floodplain wetlands due to the absence of characteristic floodplain features and the presence of a defined river channel. The landscape setting of a channelled valley-bottom wetland typically involves a valley floor where the wetland receives water inputs from the river channel, either as surface flow during flooding or as subsurface flow, and from adjacent valley side-slopes through overland flow or interflow. The hydrodynamics of these wetlands are influenced by the river channel, which provides a concentrated flow of water, contributing to the wetland's ecological functions such as sediment trapping, nutrient cycling, and habitat provision. This setting makes channelled valley-bottom wetlands crucial for maintaining the ecological integrity of riverine systems and supporting biodiversity.

8.7.2 WETLAND FUNCTIONAL AND ECOLOGICAL ASSESSMENT

Only natural systems were considered for further assessments; therefore, any artificial features do not form part of the assessments presented below. In-stream dams associated with wetlands were regarded as components of the broader natural systems within which they occur, rather than being assessed as separate systems.

The assessment of non-perennial drainage features usually focuses on their role in landscape connectivity, sediment transport, and their potential to convey water and pollutants during episodic flow events. While they are considered as watercourses and should be managed to prevent degradation, the detailed ecological assessments (EIS, PES, REC) are not undertaken because these tools are not designed for, nor do they yield relevant results for, features that lack persistent aquatic ecosystem attributes. Wetlands on the other hand have semi-permanent or permanent aquatic ecosystem attributes which makes these assessments relevant.

8.7.3 FUNCTIONAL ASSESSMENT

Hillslope seep wetlands are typically found on hillsides where water emerges from subsurface flows, creating a diffuse downslope movement. These wetlands are primarily fed by groundwater discharges, although surface water contributions can also supplement flows. Hillslope seeps are particularly effective in water quality enhancement, notably in the removal of excess nutrients and pollutants such as nitrates, through processes like denitrification. This is facilitated by the wetland's vegetation, which provides organic carbon necessary for microbial processes that assimilate these nutrients. The vegetation also plays a critical role in stabilizing the soil, thereby reducing erosion risks, although the generally steep slopes of hillslope seeps can increase erosion susceptibility if vegetation cover is compromised. Additionally, these wetlands contribute to streamflow regulation by slowing down subsurface water movement, which prolongs water contribution to stream systems during low flow periods, although their flood attenuation capacity is limited once the soils are saturated (Kotze et al., 2009).

Unchannelled valley-bottom wetlands are characterised by their location in valley bottoms without a distinct stream channel, resulting in diffuse water flow across the wetland. These wetlands are highly effective in sediment trapping due to their gentle gradients and the extensive areas that remain permanently saturated,

which promote the deposition of sediments carried by runoff waters. The high levels of soil organic matter in these wetlands enhance their capacity for nitrate and toxicant removal, as the prolonged contact with runoff waters facilitates these processes. However, phosphate retention may be lower compared to other wetland types due to potential remobilization under prolonged anaerobic conditions. Unchannelled valley-bottom wetlands also contribute to streamflow regulation to some extent, although this is influenced by factors such as vegetation transpiration and soil characteristics. These wetlands play a crucial role in maintaining water quality and providing habitat for diverse species, making them vital components of the landscape (Kotze et al., 2009).

Channelled valley-bottom wetlands are characterised by their location in valley bottoms with a well-defined stream channel. These wetlands play a crucial role in hydrological processes, particularly in flood attenuation and sediment trapping. The presence of a channel allows for the movement of water, which can contribute to the regulation of streamflow, especially during periods of low flow. The vegetation in these wetlands provides resistance to water flow, thereby slowing down the movement of water and allowing for the deposition of sediments. This process not only helps in maintaining water quality by trapping sediments and associated nutrients but also supports the wetland's role in flood attenuation by spreading out and slowing down floodwaters. Additionally, channelled valley-bottom wetlands can contribute to the removal of nitrates and toxicants from the water, enhancing the overall water quality in the catchment area. These wetlands are integral to maintaining the ecological balance and providing essential ecosystem services, such as water purification and habitat provision for various species (Kotze et al., 2009).

Non-perennial rivers and drainages, as documented by Kotze et al. (2009), are characterised by their intermittent flow patterns, which are not sustained throughout the year. These systems are crucial for flood attenuation, particularly during periods of flow, as their channels allow for the temporary storage and slow release of water. This attenuation is most effective when the riverbed and surrounding soils are not fully saturated. The deposition of sediments and organic material within these systems contributes to the retention of water, thereby enhancing the capacity to moderate flow variability. Non-perennial drainages also play a role in nutrient cycling, particularly in the assimilation of nitrates through processes such as denitrification, facilitated by the organic matter present. These features improve water quality by trapping sediments and assimilating excess nutrients and pollutants from agricultural and industrial sources. Although their capacity for erosion control is limited due to their intermittent nature, non-perennial systems provide ecosystem services by connecting various aquatic habitats and supporting biodiversity during wet periods.

It should be noted that these characteristics are representative of ideal wetland features and may not necessarily represent the characteristics of all wetlands. The functionality of wetlands and the provision of benefits is largely dependent on wetland size and influence from abiotic drivers.

The ecosystem services provided by the relevant wetland units on site were assessed and rated using the WET-EcoServices method (Kotze et al., 2020). The results of the assessment are presented in **Table 20**. The average ecosystem services scores fall within the range of “Moderately-Low” to “Moderately-High”. Ecosystem services contributing to these scores include flood attenuation, streamflow regulation, sediment trapping, erosion control, phosphate assimilation, nitrate assimilation and toxicant assimilation.

Table 20: Summary of the average ecosystem scores for the assessed systems

Moderately-Low	Moderate	Moderately High
HGM 2	HGM 1	HGM 7
HGM 4	HGM 3	HGM 8
HGM 14	HGM 5	HGM 10
	HGM 6	
	HGM 9	
	HGM 11	
	HGM 12	
	HGM 13	
	HGM 15	
	HGM 16	



Wetlands in the Moderately-Low category are primarily seep systems that have been substantially transformed by surrounding mining-related disturbance. Their compromised ecological condition, limited wetland vegetation cover, and reduced natural hydrological functioning constrain their ability to provide ecosystem services. As a result, their capacity to support regulating services such as sediment trapping, water quality enhancement, erosion control, and carbon storage, as well as habitat-related functions, is limited. These systems also show partial to negligible connectivity with larger wetland or drainage networks, further restricting their contribution to broader functions such as streamflow regulation, flood attenuation, and biodiversity support. Where connectivity does occur, it is often influenced by artificial runoff and other mining-related inputs, which further reduce the naturalness of hydrological linkages. Collectively, these factors indicate a limited ecosystem service supply relative to more intact wetland systems.

Wetlands in the Moderate category comprise a mix of seeps, unchannelled valley-bottoms (UVBs), and channelled valley-bottoms (CVBs). These systems generally display greater hydrological connectivity, more wetland vegetation, and more evident hydrological functioning than the Moderately-Low group, enabling a broader range of services to be delivered. In particular, they retain a moderate capacity to support streamflow regulation, flood attenuation, sediment retention, water quality improvement, and habitat support. Despite this, these wetlands remain heavily compromised by surrounding mining activities, which have altered their natural state, reduced ecological integrity, and weakened overall service delivery. Mining-related disturbance and associated artificial inputs have modified hydrological pathways and reduced naturalness, with the result that, although these systems remain more functional than the more degraded seep systems, their ecological capability is still materially reduced relative to wetlands in a more natural condition.

Wetlands in the Moderately-High category comprise predominantly channelled valley-bottoms (CVBs) and one unchannelled valley-bottom (UVB) system. These wetlands are relatively more intact than the other assessed systems, with greater wetland vegetation cover, stronger hydrological connectivity, and closer association with larger wetland systems. Consequently, they retain a comparatively stronger capacity to provide ecosystem services, particularly streamflow regulation, flood attenuation, sediment trapping, water quality improvement, carbon sequestration, and biodiversity support. Their improved vegetation structure and hydrological functioning also indicate a greater ability to sustain regulating and supporting services at a broader landscape scale. Nevertheless, these systems are still located within a mining-influenced landscape and are therefore not fully intact. Even so, relative to the Moderately-Low and Moderate groups, they represent the better-functioning wetlands within the study area, with a higher capacity for ecosystem service delivery and ecological resilience.

8.7.4 PRESENT ECOLOGICAL STATE

The wetlands exhibited different degrees of modification resulting from natural physical changes as well as anthropogenically induced impacts at both the local and catchment level. As a result, the wetlands have an average Present Ecological State (PES) score within the “E – Seriously Modified” and “D – Largely Modified” PES classes. The results of the wetland health and integrity assessment is provided in the table below.

Table 21: Average Present Ecological State scores for the assessed wetlands

E – Seriously Modified	D – Largely Modified
HGM 1	HGM 4
HGM 2	HGM 7
HGM 3	HGM 9
HGM 5	HGM 10
HGM 6	HGM 13
HGM 8	
HGM 11	
HGM 12	
HGM 14	
HGM 15	
HGM 16	

8.7.5 ECOLOGICAL IMPORTANCE AND SENSITIVITY

The Ecological Importance and Sensitivity (EIS) assessment was applied to the HGM units in conjunction with the ecosystem service scores in the preceding sections, to assess the levels of sensitivity and ecological importance of the wetland. The results indicate that the wetlands occur within the "High" EIS classes as noted in the table below.

Table 22: Summary of the Ecological Importance and Sensitivity assessment

HGM	NFEPA Wet Veg			NBA Wetlands			SWSA (Y/N)	CBA / ESA (Y/N)	EIS Rating
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018	Ecosystem Protection Level			
HGM 1 HGM 2 HGM 5 HGM 14 HGM 16	Central Bushveld Group 1	Endangered	Poorly Protected	E (Field Visit)	Critically Endangered	Not Protected	N	Y	B – High
HGM 4 HGM 9 HGM 13				D (Field Visit)			N	Y	B – High
HGM 3 HGM 6 HGM 8 HGM 11 HGM 12 HGM 15		Critically Endangered	Not Protected	E (Field Visit)			N	Y	B – High
HGM 7 HGM 10				D (Field Visit)			N N	Y	B – High

8.7.6 RECOMMENDED ECOLOGICAL CATEGORY AND RECOMMENDED MANAGEMENT OBJECTIVE

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) for the wetland areas was determined from the results of the PES and EIS assessments. These assessments indicated that the wetland feature within the site, had underwent transformation as a result of historical and current impacts. Nevertheless, despite the altered ecological integrity of the systems, they are considered to provide ecological services.

The results of the assessment are presented in the table below. The objective for the wetlands is to improve the current PES of all wetlands.

Table 23: Recommended Ecological Category and Management Objective

HGM No.	Recommended Ecological Category	Recommended Management Objective
HGM 1 HGM 2 HGM 3 HGM 5 HGM 6 HGM 8 HGM 11 HGM 12	E/F	Improve

HGM 14 HGM 15 HGM 16		
HGM 4 HGM 7 HGM 9 HGM 10 HGM 13	C/D	Improve

The buffer requirements for the wetlands were calculated using the Site-Based Tool: Determination of buffer zone requirements for wetland ecosystems (Macfarlane et al., 2014). The recommended buffer zones are presented in

Figure **41**. The recommended post-mitigation buffers for the construction and operational phase of the development are 25 m for the floodplain wetlands and 15 m for the non-perennial watershed features as presented in Table 24.

Table 24: Recommended buffers for the proposed development

Features	Pre-Mitigation	Post-Mitigation
Wetlands	50	25
Non-perennial Watershed features	30	15

As the proposed project layout overlaps with multiple wetlands and their recommended buffer, the buffer must be used as a key constraint to guide the detailed layout design and micro-siting of infrastructure. Where avoidance is not feasible, any encroachment into the buffer should be specifically motivated, minimised, and supported by appropriate mitigation and rehabilitation measures to maintain wetland functionality and reduce risk to the receiving environment.

Furthermore, according to the GDARDE requirements for Biodiversity (GDARDE, 2012), buffers are typically prescribed to protect aquatic ecosystems from the impacts of adjacent land uses. The standard guideline recommends a minimum buffer of 50 metres from the edge of a wetland or watercourse in rural settings and a minimum buffer of 30 m metres from the edge of a wetland or watercourse in urban settings measured from the delineated boundary of the feature.

The specialist-assigned 25 m buffer is deemed suitable and sufficient for the proposed development in accordance with the Buffer Zone Guidelines (Macfarlane and Bredin, 2017). However, any relaxation on the GDARDE buffers must be approved by the Competent Authority.

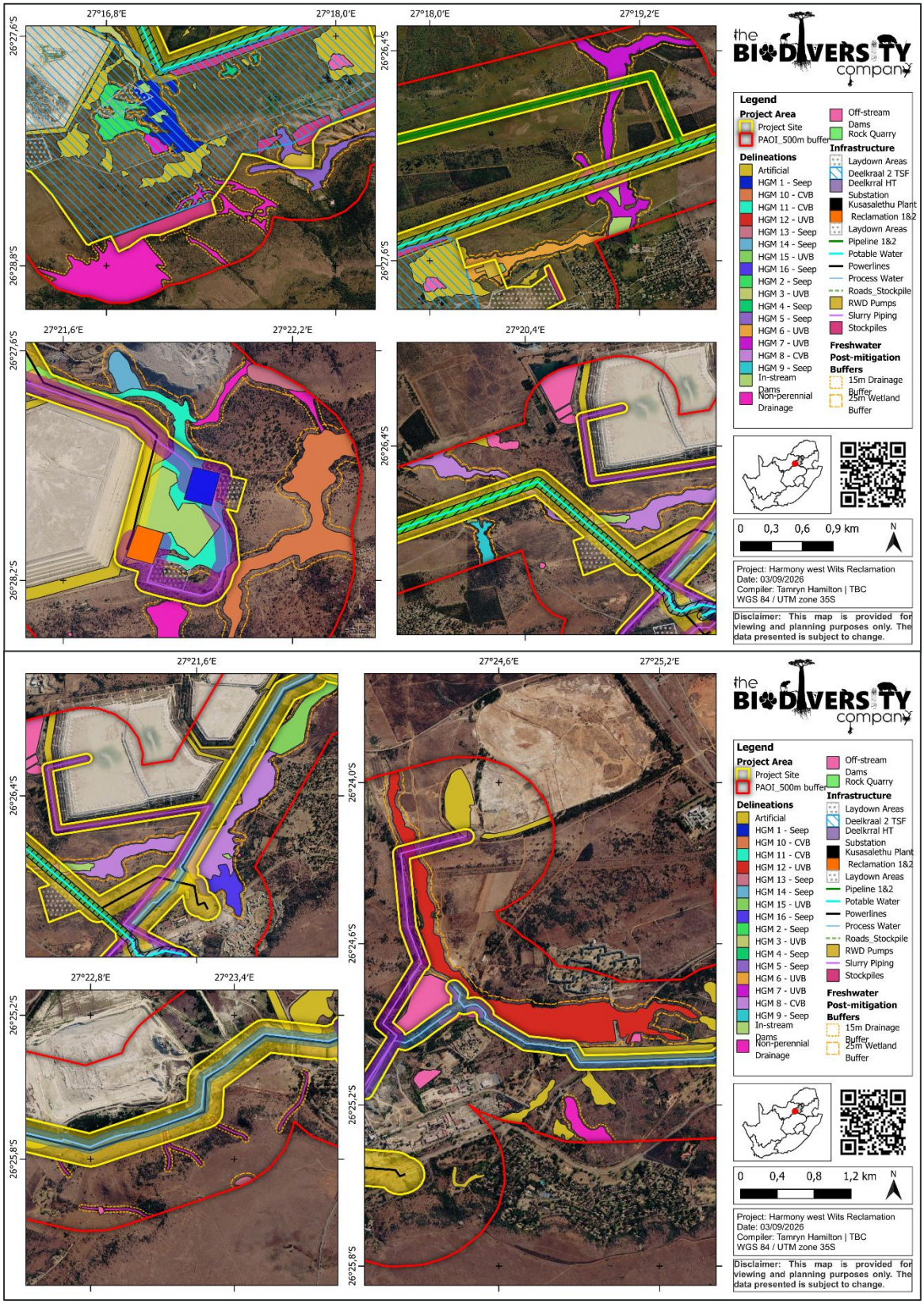


Figure 41: Recommended post-mitigation buffers for the identified wetlands in relation to the proposed project footprint.

8.8 HYDROLOGY

The Mooirivierloop is a perennial river situated north-east of the study area in quaternary catchment C23E which approximates 850 km2 in area. The Loopspruit River is also a perennial river, it is situated to the south of the study area in quaternary catchment C23J which approximates 890 km^2 in area. The contributing catchment of the Loopspruit River was derived from the 30m DSM. **Figure 42** illustrates the hydrological setting of the site.

The site is positioned primarily within quaternary catchments C23E and C23J however, the area of hydrological relevance encroaches on catchment C23G. The nearest rivers are the Mooirivierloop River to the north-east of the site, and the Loopspruit River situated to the south. According to the NGI's 1:50,000 topographical map data; water drains from the site to both rivers through channels and non-perennial rivers. The NGI's 1:50,000 topographical map data illustrates numerous non-perennial river systems to the north and south, both of which converge to the southwest of the site into the Mooirivier.

The northern system is associated with multiple vleis along the Mooirivierloop channel to the north and dams both north and south of the site. There are upstream furrows directing runoff from part of the greater Mponeng Operation (south of the Old North Complex TSF) and along the Mponeng TSF trenches draining to the non-perennial rivers to the west. The southern system is characterised by two larger dams, one of which is listed as the proposed return water dam for the Mponeng TSF. There are two dams to the west, one that connects to the Mooirivierloop network and is the proposed alternative location for the Return Water Dam to the south of the proposed Deelkraal TSF. This proposed return water dam sits at the headwaters of the non-perennial tributary connecting to the Loopspruit river.

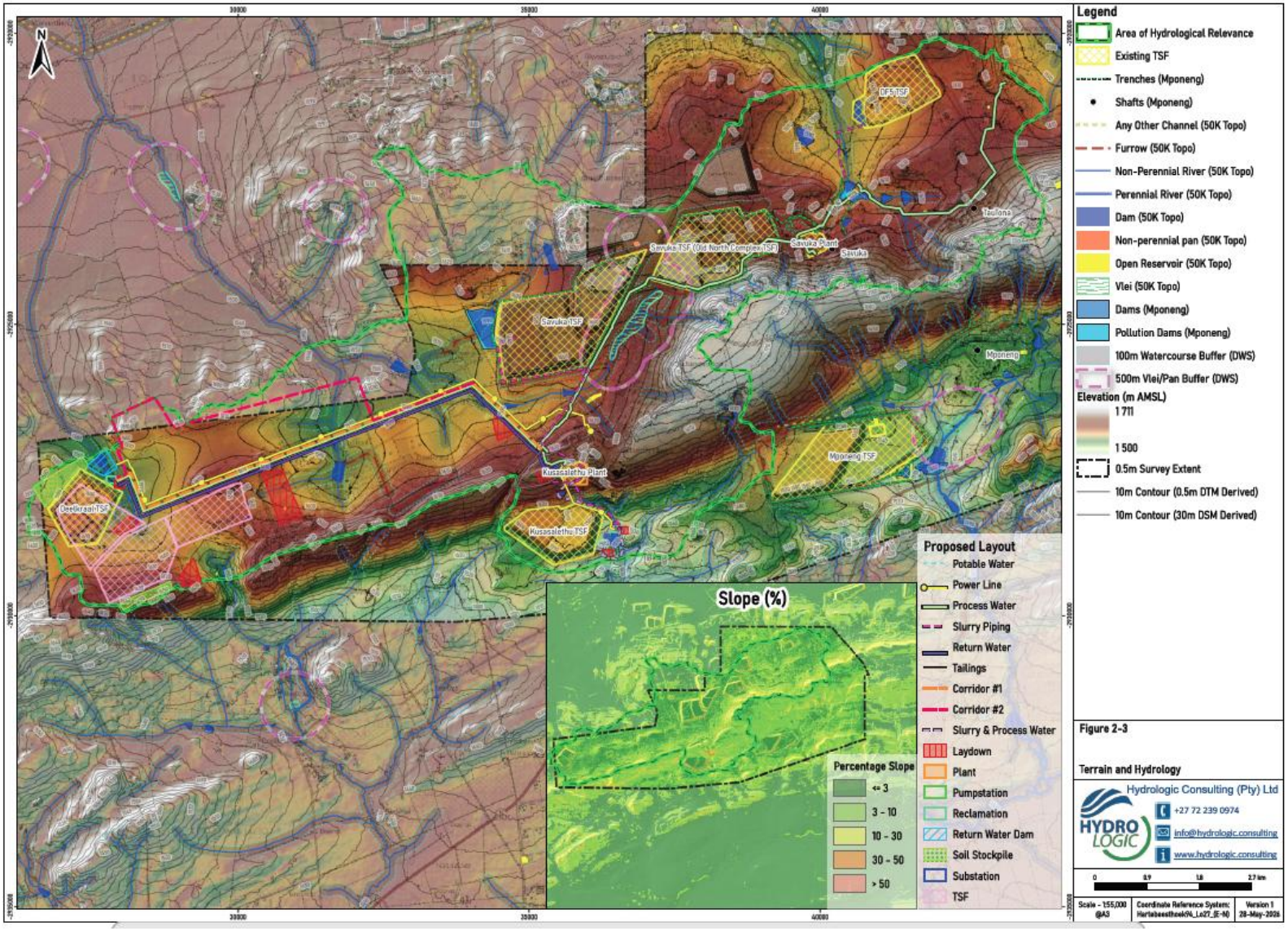


Figure 42: Terrain and Hydrology

Sensitivity mapping was undertaken to identify sensitive features relating to the hydrological (surface water) environment within the study area. A 1000 m buffer of the proposed Harmony West Wits Reclamation and Deposition Project was used as the area under consideration.

The trenches provided by the client for the layout indicate that a trench is situated along the original furrow line, which connects the non-perennial river system. In accordance with the topographic 1:50,000 map, this required the use of the aerial imagery, which provided clarification on this. 'Any other channels' and 'furrows' that appeared not to have a hydrological upstream connection were included only when draining to a natural dam, as indicated by the 1:50,000 dam dataset DWS.

The Department of Water Affairs and Forestry (now the Department of Water and Sanitation) established GN 704 to provide regulations on the use of water for mining and related activities aimed at protecting water resources. This includes the following condition:

Condition 4 – Restrictions on locality – No person in control of a mine or activity may:

(e) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked;

The 100 m watercourse buffer is consequently one of the main guiding aspects in the assessment of site sensitivities given its relevance to GN 704, and its applicability to both flooding and the potential for contaminants to enter a watercourse (i.e., a wider river buffer is more likely to keep infrastructure/works outside of areas prone to regular or irregular flooding while enabling more time for containments within runoff, to settle out before entering the watercourse). A 100 m watercourse buffer distance is, however, limited in its application since the proposed works/infrastructure will either fall within or outside of the buffer distance, with no grading in site sensitivity possible. An expanded approach to the 100 m river buffer was consequently adopted, utilising a variation in buffer distances modelled by flooding and contour analysis.

Buffers have been derived from the 1:50,000 topographical map watercourse features. Open and closed reservoirs have been excluded on the basis that inflows are managed (and that there is no significant upslope catchment area of relevance). Watercourse buffers are technically applicable from the edge (top of bank) of the watercourse and not from the centreline (as in the case of rivers, drainage canals, and furrows). The absence of a channel survey means that the river/furrow centreline has nevertheless been used to define buffers.

The following sensitivity bands were classified:

- Prevent Development[2]
    - A 32 m watercourse buffer (also applicable to NEMA activities) was used to define the functional area of the watercourse.
    - This 32 m buffer factors in the potential error in the 1:50,000 topographical map dataset.
    - All development should be prevented in this area unless water-compatible or otherwise crossing over a watercourse (with flood risk factored in).
- High
    - o The 1:100 RI defined flood-line (Project EIM-021) applies to both GN 704's and DWS Notice 4167 of 2023. The 1:100 RI event is a conservative estimate (where more flooding is conservative).
    - A 100m buffer distance matches GN 704's and DWS Notice 4167 of 2023 prescribed buffer distance and is the minimum distance to a watercourse requiring motivation if

[2] Please note that these are not considered no-go areas for development by the hydrologist. The hydrological features have been defined according to the NGI's 1:50,000 topographical map data, and the hydrology report does not intend to alter their classification, however the recommended mitigation measures must be implemented if development is to take place in these areas.

works/infrastructure are going to be permitted, including a written exemption from the Minister of the Department of Water and Sanitation.

  - There is a strong disincentive towards development within this area.

- Medium
  - The 1:50 RI defined flood-line4 GN 704's and DWS Notice 4167 of 2023. The 1:50 RI event is moderately conservative (where more flooding is conservative).
  - A 200m buffer distance was included as an intermediate buffer distance between the 100m buffer distance above and the 500m buffer distance below.
  - There is a medium disincentive towards development within this area.
- Low
  - A 500 m buffer distance is a reasoned maximum distance from a watercourse, which in most instances will reflect the largest distance over which flooding would need to be considered.
  - DWS Notice 4167 of 2023 also outlines how a 500 m buffer distance applies to wetlands (which includes pans and vleis as present in this study area). This report, however, does not focus on wetlands and only considers the 1:50,000 topographical map of rivers.
  - There is a low disincentive towards development within this area.
- Remainder (Unclassified):
  - o There is no sensitivity classification for the remainder of the site.
  - GN 704 restricts development within 100 m of a watercourse (e.g., dam or river), and the above outline does not attempt to remove this restriction but is instead a high-level 'scaled' version of this buffer distance.

Refer to **Figure 43** - **Figure 45** for identified site sensitivities relating to the surface water environment.



Figure 43: Identified site sensitivities relating to the surface water environment (southwestern section)

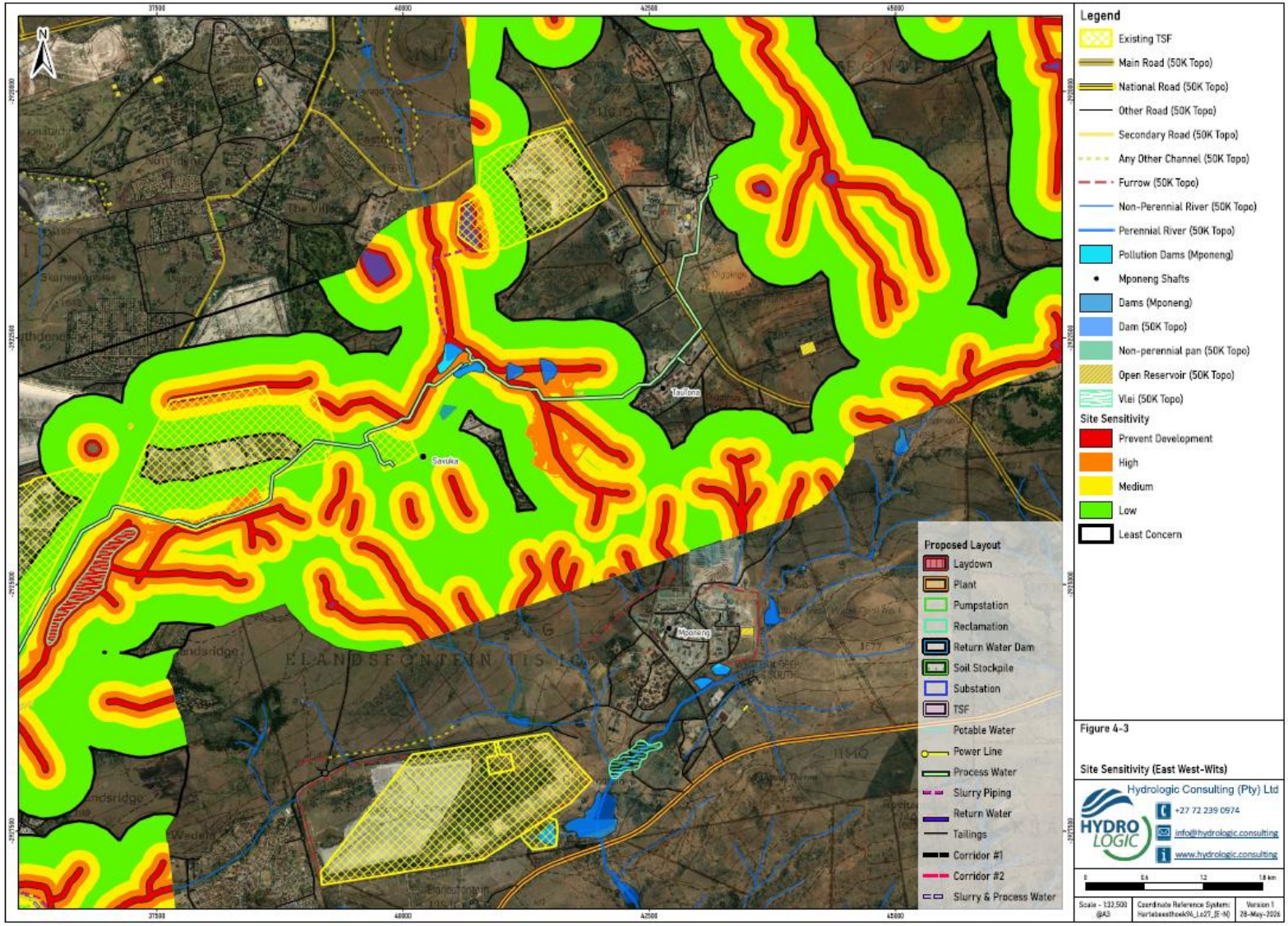


Figure 44: Identified site sensitivities relating to the surface water environment (middle section)

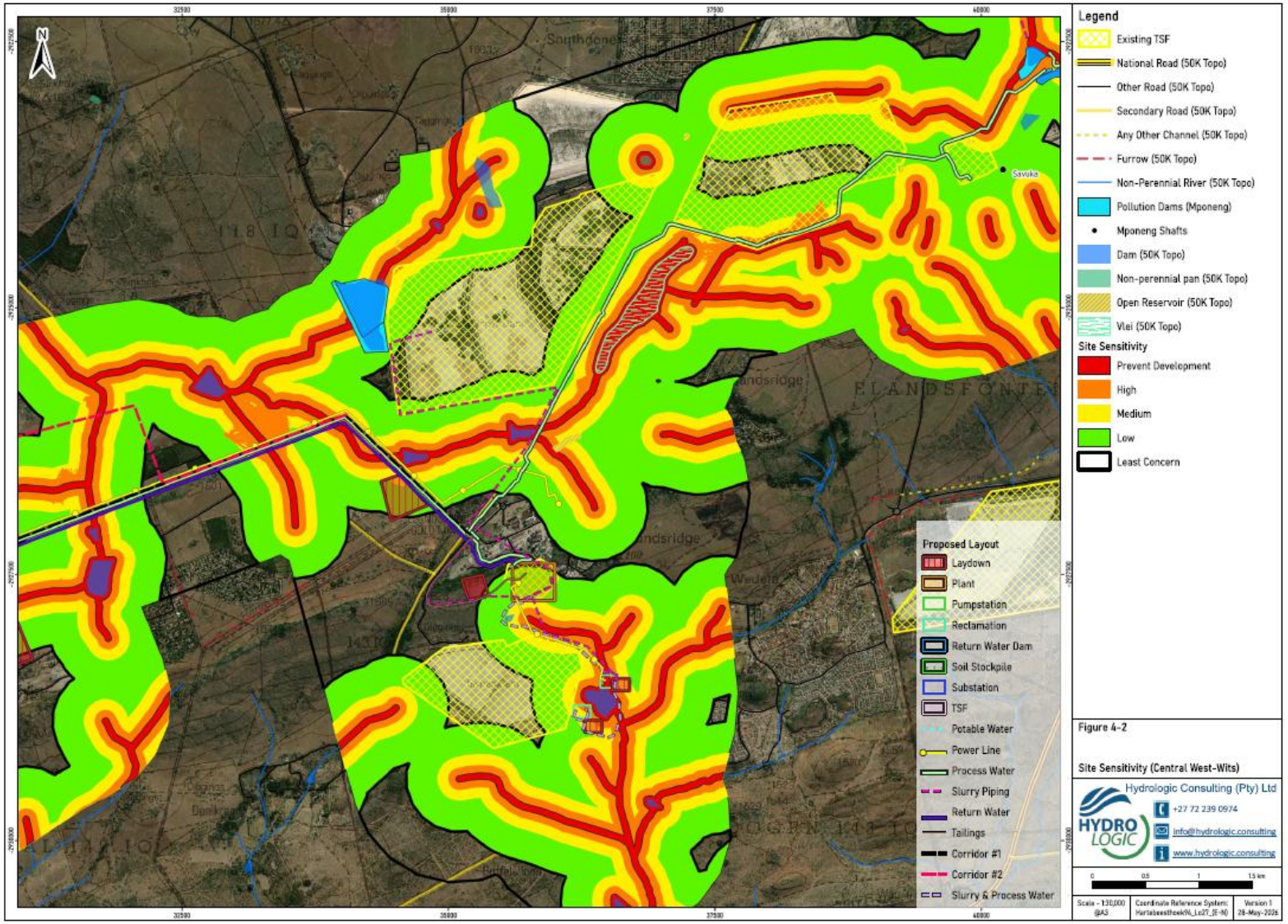


Figure 45: Identified site sensitivities relating to the surface water environment (northeastern section)

8.9 GROUNDWATER

Groundwater baseline information was provided by Marius van Biljon (geohydrologist) and the relevant information is presented in this section. A key aspect of any groundwater assessment is a thorough understanding of the groundwater resource. The groundwater resource is described according to the following criteria:

- Aquifer boundaries;
- Aquifer type;
- Aquifer parameters;
- Hydrochemistry;
- Aquifer recharge; and
- Aquifer classification.

8.9.1 HYDROCENSUS AND BOREHOLE INFORMATION

Auctus Consulting (Van Biljon, 2011) conducted a hydrocensus within a 2km radius of the Kusasalethu and Deelkraal TSFs in 2011. Several privately owned boreholes were identified in the southern catchment (C23J), but no privately owned boreholes were found in the northern catchment (C23E).

The hydrocensus points in relation to the Kusasalethu TSF are shown in **Figure 46** and the hydrocensus information is summarised in **Table 25**. Although the hydrocensus was conducted in 2011 the mine has continued to monitor these boreholes. The hydrocensus boreholes are sampled bi-annually. The average 2024 groundwater chemistry is presented in **Table 26** (Groundwater Complete, 2025).

The following is concluded in terms of the hydrocensus groundwater quality:

- Ten of the original hydrocensus boreholes are still actively monitored.
- Monitoring information shows that overall good groundwater quality conditions prevailed if compared with drinking water standards (SANS 241:2015).
- In terms of the WUL standards, groundwater qualities are mostly compliant.
- Most of the macro cations and anions occurred in higher concentrations in groundwater from the hydrocensus boreholes, which may be a result of aquifer heterogeneity and natural occurring interaction between the aquifer host rock/s and groundwater, or low-level impacts from the mining areas since the boreholes are located in the general downgradient groundwater flow directions.
- Groundwater is dominated by magnesium on the cation side, while bicarbonate alkalinity, sulphate and chloride dominate the anion content.
- Unacceptably high levels of bacteriological contamination were encountered in monitoring boreholes HYD2, HYD3, HYD11, HYD12, HYD13 and HYD14, rendering the groundwater unsafe for human consumption.



Figure 46: Hydrocensus borehole localities

Table 25: Hydrocensus boreholes

BH ID	Longitude	Latitude	Z	SWL (mbc)	BH Depth (m)	BH Use	Volume Abstracted (Lit/day)	Comments	Current Monitoring
HYD1	27.37586	-26.491	1453	No access	Unknown	Domestic	Unknown	Electric pump	**Yes**
HYD2	27.36794	-26.4834	1462	5.46	18	Domestic	2500	Electric pump.	**Yes**
HYD3	27.36665	-26.4807	1473	3.92	50	Domestic / Livestock	5000	Electric pump.	**Yes**
HYD4	27.3649	-26.4809	1481	9.92	48.15	Not used	0	Open BH.	**Blocked**
HYD5	27.36752	-26.4844	1477	5.21	39.52	Not used	0	Open BH.	**Demolished**
HYD6	27.36194	-26.4809	1489	19.69	Unknown	Not used	0	Electric pump, broken.	**Damaged**
HYD7	27.36213	-26.4802	1488	18.85	Unknown	Not used	0	Windmill, broken.	**Yes**
HYD8	27.36399	-26.4777	1490	11.57	Unknown	Not used	0	Electric pump, broken.	**Yes**
HYD9	27.36358	-26.4815	1479	17.29	40.93	Not used	0	Open BH.	**Blocked**
HYD10	27.36283	-26.4819	1479	18.62	Unknown	Domestic / Livestock	Unknown	Electric pump.	**Demolished**
HYD11	27.33925	-26.476	1515	No access	70	Domestic / Livestock	5000	Mono pump	**Yes**
HYD12	27.33791	-26.4753	1504	1.68	28.71	Not used	0	Open BH.	**Yes**
HYD13	27.33738	-26.4748	1507	17.28	30	Domestic / Livestock	5000	Electric pump	**Yes**
HYD14	27.34026	-26.4743	1524	9.97	17.84	Not used	0	Windmill, broken.	**Yes**

Table 26: Hydrocensus groundwater chemistry (Groundwater Complete, 2025)

BH	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	MALK CaCO3/l	Cl mg/l	SO4 mg/l	NO3 mg/l	F mg/l	Al mg/l	Fe mg/l	Mn mg/l
HYD1	7.9	75.3	554.0	65.3	37.1	52.1	0.7	240.4	65.8	69.8	0.9	<0.466	<0.002	<0.009	0.016
HYD2	7.6	71.8	522.0	71.1	41.0	16.7	1.0	111.8	59.3	157.9	5.1	0.427	<0.002	<0.009	0.008
HYD3	8.2	76.0	646.0	81.3	49.8	28.0	0.4	160.7	83.4	174.0	1.9	<0.466	<0.002	<0.009	0.001
HYD7	7.9	53.4	420.0	49.3	32.2	26.5	1.5	168.8	47.9	56.3	1.1	<0.466	<0.002	<0.009	<0.001
HYD8	8.2	82.1	594.0	88.2	49.8	27.3	0.9	289.6	48.2	81.7	3.6	<0.466	<0.002	<0.009	<0.001
HYD11	7.1	38.0	300.0	31.3	14.3	19.7	1.6	34.2	79.1	33.1	<0.194	0.446	0.213	<0.009	<0.001
HYD12	6.6	23.1	158.0	15.4	13.9	7.4	0.3	26.1	54.2	0.2	0.5	0.252	<0.002	<0.009	0.282
HYD13	6.5	3.8	18.0	3.5	2.3	1.1	0.1	16.6	0.7	<0.452	0.5	<0.466	0.004	<0.009	0.007
HYD14	8.0	45.2	298.0	66.9	14.4	11.3	0.9	161.5	30.7	27.6	0.5	0.285	<0.002	<0.009	0.057

BH	NH4 mg/l	Thard mg/l	B mg/l	Ba mg/l	Cd mg/l	Co mg/l	Cr mg/l	Cu mg/l	Ni mg/l	Pb mg/l	U mg/l	V mg/l	Zn mg/l	T.coli/ 100ml	E.coli/ 100ml
HYD1	0.036	315.9	0.047	0.035	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.045	<0.005	3	0
HYD2	<0.008	346.1	<0.013	<0.002	<0.002	0.016	<0.007	0.020	<0.005	<0.009	<0.015	<0.002	0.024	**47000**	**11000**
HYD3	0.071	408.0	<0.013	0.004	<0.002	0.018	<0.007	<0.005	<0.005	<0.009	<0.015	0.002	0.028	**13**	0
HYD7	0.169	255.8	<0.013	<0.002	<0.002	<0.003	<0.007	0.012	<0.005	<0.009	<0.015	0.025	<0.005	0	0
HYD8	0.028	425.5	-	-	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	-	0.039	0	0
HYD11	0.099	137.3	<0.013	0.064	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.020	<0.005	**370**	**170**
HYD12	0.015	95.7	<0.013	0.004	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.021	0.013	**61**	**8**
HYD13	0.025	18.2	<0.013	<0.002	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.004	0.014	1	**1**
HYD14	0.067	226.6	<0.013	0.010	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.022	0.003	**244**	**9**

- *Red – Value exceeds SANS 241 drinking water limit.*
- *Maximum Total Coliform (T. coli) count allowed in drinking water is 10 per 100 ml (SANS 241:2015).*
- *No E. coli should be present in drinking water (SANS 241:2015).*

The mine has an extensive groundwater monitoring network and no additional boreholes were drilled during 4this investigation. The mine monitoring borehole localities are summarised in **Table 27** and shown in **Figure 47**Error! Reference source not found. and **Figure 48**. The localities for the boreholes were carefully selected to monitor the seepage from the waste facilities.

Table 27: Mine monitoring boreholes

Monitoring Point	Longitude	Latitude
Deelkraal TSF, RWD and WRD		
DKTSF(S)	27.27727	-26.4585
DKTSF(D)	27.27716	-26.4585
DKRWD(S)	27.27411	-26.4545
DKRWD(D)	27.27449	-26.4544
DKWRD(S)	27.30397	-26.4600
DKWRD(D)	27.30398	-26.4600
DK BH 2(S)	27.27344	-26.47165
DK BH 2(D)	27.27343	-26.47162
DK BH 4(S)	27.26806	-26.46283
DK BH 4(D)	27.26798	-26.46287
BH4	27.27662	-26.4552
BH5	27.30096	-26.46557
Kusasalethu TSF, RWD and WRD		
MBH14	27.36583	-26.4653
MBH15	27.36688	-26.4706
MBH16	27.36178	-26.4715
MBH17	27.35275	-26.4698
BH6	27.35982	-26.4599
BH7	27.36519	-26.4625
BH 8(S)	27.3664	-26.4756
BH 8(D)	27.3664	-26.4765
BH9	27.348	-26.467

Note: (S) denotes a shallow borehole monitoring the weathered aquifer

(D) denotes a deep borehole monitoring the fractured aquifer

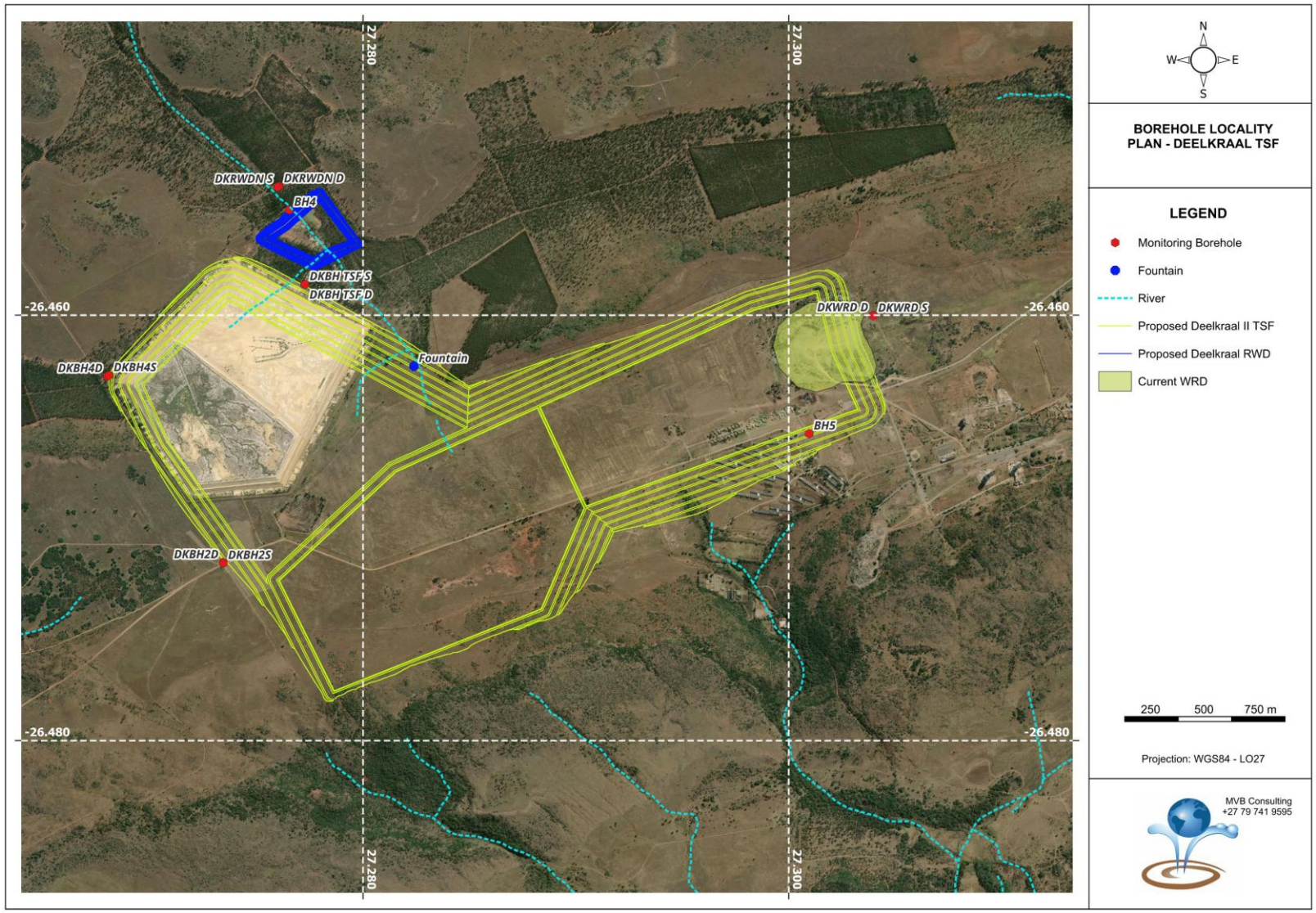


Figure 47: Deelkraal TSF monitoring boreholes



Figure 48: Kusasalethu Boreholes



8.9.2 AQUIFER TYPE

The geology of the region, apart from the Transvaal dolomite, is known to contain significant aquifers. Most groundwater occurrences are restricted to the upper weathered formations and fractures. These formations are not considered to contain economic and sustainable aquifers, but localised high yielding boreholes may, however, exist where significant fractures are intersected. Malmani dolomite is located north of the Kusasalethu mining area, these dolomites are known to contain significant groundwater. There are three distinct aquifers in the study area:

- Weathered Aquifer: The first is a shallow weathered aquifer, mainly restricted to the weathered shale and quartzite of the Witwatersrand rocks. The base of the aquifer is the impermeable quartzite and shale formations, whereas the top of the aquifer would be the surface topography. The groundwater table is affected by seasonal and atmospheric variations and generally mimics the topography. These aquifers are classified as semi-confined. The most consistent water strike is located at the fresh bedrock / weathering interface. Groundwater elevations vary between 0.5m and 14m below surface.
- Fractured Aquifer: The second is the deeper fractured rock aquifer. The deeper, fresh shale/quartzite aquifer where fracture flow dominates. Groundwater migration within the upper portion of the aquifer appears to be governed by jointing while major faults and intrusions form the significant conduits at depth. The depth to groundwater in this aquifer ranges from artesian to 38m below the surface. The two aquifers (weathered and fractured) are mostly hydraulically connected but confining layers such as clay and shale often separate the two. In the latter instance the fractured aquifer is classified as confined.
- Dolomitic Karst Aquifer: Carbonate rocks are practically impermeable and therefore devoid of any effective primary porosity. During its geological history, however, the dolomite is subjected to karstification and erosion. During this dissolution processes, the carbonate is removed from the dolomite and residual products such as silica, iron and manganese oxides and hydroxides (wad) are left behind. The residual mass spongy, compressible, of low density and has a high void volume. Fissures and caves also develop. Fault zones are preferential zones of weathering and are transformed into ground water conduits. The potential for large-scale ground water exploitation depends solely on the extent to which the dolomite has been leached by percolating rainfall and groundwater drainage, as well as the degree to which it has been transformed into aquifers capable of yielding significant quantities of water and sustaining high abstraction capacities.

The dolomite aquifer is unlikely to be impacted on by the activities at Kusasalethu, but it is near the Deelkraal TSF. The weathered and fractured aquifers are present beneath the entire Kusasalethu infrastructure, although the weathered aquifer may not always be well developed.

8.9.3 AQUIFER CLASSIFICATION

An aquifer classification system provides a framework and objective basis for identifying and setting appropriate levels of groundwater resource protection. This would facilitate the adoption of a policy of differentiated groundwater protection.

Other uses could include:

- Defining levels of investigation required for decision making.
- Setting of monitoring requirements.
- Allocation of manpower resources for contamination control functions.

The aquifer classification system used to classify the aquifers is the proposed National Aquifer Classification System of Parsons (1995). This system has a certain amount of flexibility and can be linked to second classifications such as a vulnerability or usage classification. Parsons suggests that aquifer classification forms a very useful planning tool that can be used to guide the management of groundwater issues. He also suggests that some level of flexibility should be incorporated when using such a classification system.

The South African Aquifer System Management Classification is presented by five major classes:

- Sole Source Aquifer System.
- Major Aquifer System.
- Minor Aquifer System.
- Non-Aquifer System.
- Special Aquifer System.

The following definitions apply to the aquifer classification system:

- Sole source aquifer system: “An aquifer that is used to supply 50 % or more of domestic water for a given area, and for which there are no reasonable alternative sources should the aquifer become depleted or impacted upon. Aquifer yields and natural water quality are immaterial”.
- Major aquifer system: “Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good”.
- Minor aquifer system: “These can be fractured or potentially fractured rocks that do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although this aquifer seldom produces large quantities of water, they are both important for local supplies and in supplying base flow for rivers”.
- Non-aquifer system: “These are formations with negligible permeability that are generally regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks does occur, although imperceptible, and needs to be considered when assessing risk associated with persistent pollutants”.
- Special aquifer system: “An aquifer designated as such by the Minister of Water Affairs, after due process”.

A second variable classification is needed for sound decision making, as the ability of an aquifer to yield water to a particular user is not adequately stated. In this case it was decided to use the vulnerability of the aquifer to contamination as a second parameter (**Table 28**). A weighting and rating approach is then used to decide on the appropriate level of groundwater protection (**Table 29**).

Table 28: Ratings for the aquifer quality management classification system

Class	Points	Class	Points
Sole Source Aquifer System	6	**High**	3
Major Aquifer System	4	**Medium**	2
Minor Aquifer System	2	**Low**	1
Non-Aquifer System	0		
Special Aquifer System	0-6		

Table 29: Appropriate level of groundwater protection required

GQM Index	**Level of Protection**
<1	Limited Protection

1 – 3	Low Level Protection
3 – 6	Medium Level Protection
6 – 10	High Level Protection
>10	Strictly Non-degradation

After rating the aquifer system management and the aquifer vulnerability, the points are multiplied to obtain a Groundwater Quality Management (GQM) index.

Based on the above, the aquifers in the study area are classified as follows:

Description	Aquifer	Vulnerability	Rating	Protection
Weathered Aquifer	Minor (2)	1	2	Low
Fractured Aquifer	Minor (2)	1	2	Low

8.9.4 AQUIFER PARAMETERS

Important aquifer parameters are obtained from borehole or test pumping and include Hydraulic Conductivity (K), Transmissivity (T) and Storativity (S). These parameters are defined as follows (Krusemann and De Ridder, 1991):

- Hydraulic Conductivity (K): This is the volume of water that will move through a porous medium in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. It is normally expressed in metres per day (m/day).
- Transmissivity (T): This is the rate of flow under a unit hydraulic gradient through a cross-section of unit width over the full, saturated thickness of the aquifer. Transmissivity is the product of the average hydraulic conductivity and the saturated thickness of the aquifer. Transmissivity is expressed in metres squared per day (m2/day).
- Storativity (S): The storativity of a saturated confined aquifer is the volume of water released from storage per unit surface area of the aquifer per unit decline in the component of hydraulic head normal to that surface. Storativity is a dimensionless quantity.

The calculated aquifer on previous investigations are presented in **Table 30**.

Table 30: Summarised aquifer parameters obtained from pump tests

Borehole	**Transmissivity (m2/d)**			**Hydraulic Conductivity (m/d)**		
	Kusasalethu TSF Boreholes					
	Constant Rate	**Recovery**	**Average**	**Constant Rate**	**Recovery**	**Average**
BH6	7.94 x 10-1	3.46 x 10-1	**5.70 x 10-1**	2.83 x 10-2	1.24 x 10-2	**2 x 10-2**
BH7	9.93 X 10-1	1.99 x 100	**1.49 x 100**	4.15 X 10-2	8.35 x 10-2	**6 x 10-2**
BH8D	4.32 x 10-1	1.33 x 10-1	**2.80 x 10-1**	1.56 x 10-2	4.78 x 10-3	**1 x 10-2**
BH8S	1.77 x 100	5.63 x 10-1	**1.17 x 100**	1.15 x 10-1	3.67 x 10-2	**9 x 10-2**
BH9	7.18 x 10-1	5.02 x 10-1	**6.10 x 10-1**	2.42 x 10-2	1.69 x 10-2	**2 x 10-2**
MBH14	9.93 x 10-1	1.01 x 10-1	**5.50 x 10-1**	5.02 x 10-2	5.12 x 10-3	**3 x 10-2**

Deelkraal TSF Boreholes						
KBH1	2.8 x 10-1	1.49 x 10-1	**2.15 x 10-1**	7.99 x 10-3	4.24 x 10-3	**6.12 x 10-3**
DKBH 1S	Pumped dry	1.79 x 10-1	**1.79 x 10-1**	Pumped dry	1.89 x 10-2	**1.89 x 10-2**
DKBH 1D	4.42 x 100	2.95 x 100	**3.69 x 100**	1.47 x 10-1	9.84 x 10-2	**1.23 x 10-1**
DKBH 2S	Pumped dry	8.71 x 10-1	**8.71 x 10-1**	Pumped dry	1.45 x 10-1	**1.45 x 10-1**

Note: (S) denotes a shallow borehole monitoring the weathered aquifer, (D) denotes a deep borehole monitoring the fractured aquifer

The calculated parameters for the weathered and fractured aquifers are indicative of poorly developed aquifers that underlie the study area. These aquifers do not constitute economically sustainable and exploitable hydrological units. It is, however, important to note that individual fractures may yield higher volumes of water and flow rates may be faster within these features as seen in borehole DKBH1D.

8.9.5 GROUNDWATER GRADIENTS AND FLOW

Figure 49 depicts the groundwater level elevations which, as expected, mimic the surface contours. Groundwater flow is perpendicular to the groundwater contours and flows predominantly towards the south.

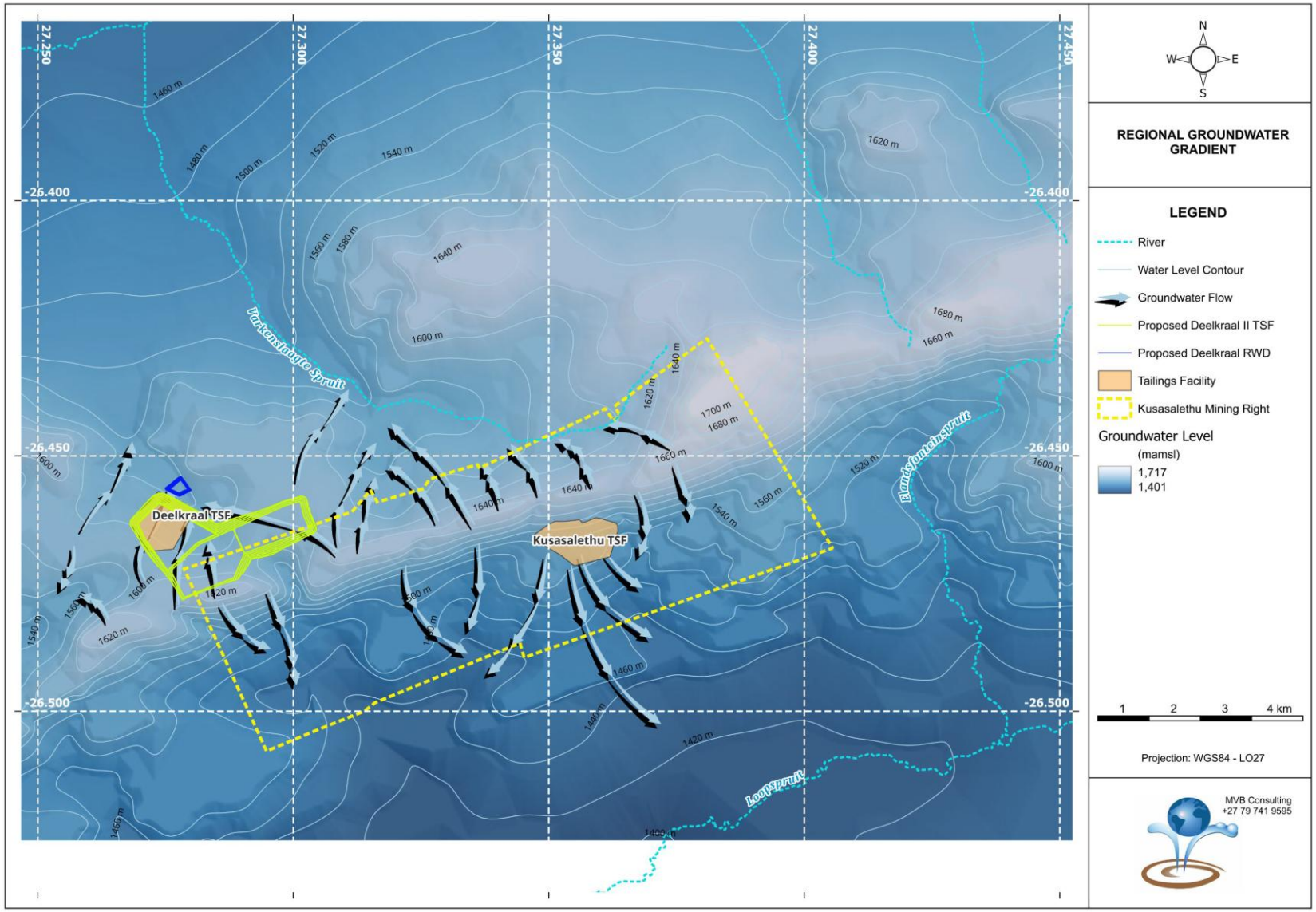


Figure 49: Regional groundwater gradient

8.9.6 GROUNDWATER QUALITY

Aquatico Scientific (Pty) Ltd routinely monitors the groundwater quality in the vicinity of the Kusasalethu and Deelkraal TSFs. The latest available data (September 2025) was made available and is used to assess the current impacts from the TSFs.

The groundwater quality is compared against the specified qualities in the Kusasalethu and Deelkraal Water Use License (WUL). The SANS 241 (2015) Drinking Water Guidelines is also included for comparative purposes. The SANS 241 Drinking Water Specification is the definitive reference on acceptable limits for drinking water quality parameters in South Africa and provides guideline levels for a range of water quality characteristics. The SANS 241 (2015) Drinking-Water Specification effectively summarises the suitability of water for drinking water purposes for lifetime consumption.

The chemistry of the groundwater is presented in **Table 31** (Catchment C23E – Deelkraal TSF)) and **Table 32** (Catchment C23J – Kusasalethu TSF). Values exceeding the WUL limits are highlighted in pink. The distribution of the sulphate (SO4) concentrations provides an aerial view of the impacted areas, which is as expected downgradient from the TSFs (**Table 31** and **Table 32**).

Table 31: Groundwater chemistry (Deelkraal TSF)

Parameters	Units	Guidelines		Sampled Boreholes				
		WUL	SANS 241	DK BH TSF S	DK BH TSF D	DKRWDN S	DKWRD S	KL BH
pH @ 25°C	pH	5-9.7	≥5 to ≤9.7	8.29	7.14	6.24	8.53	6.06
Electrical conductivity (EC) @ 25°C	mS/m	<200	≤170	257	516	26	37	5
Total Dissolved solids @ 180°C	mg/l	<1200	≤1200	1 806	5 000	164	346	40
Turbidity	NTU	-	≤5	106.00	84.40	11.00	8.23	2.18
Total Alkalinity	mg $CaCO_3$/l	-	-	718	589	55	55	18
Calcium (Ca)	mg/l	<200	-	108.00	474.00	17.60	35.80	2.68
Magnesium (Mg)	mg/l	<100	-	207.00	605.00	8.22	18.20	2.54
Sodium (Na)	mg/l	<200	≤200	71.90	185.00	18.20	12.80	3.67
Potassium (K)	mg/l	-	-	28.60	16.10	3.45	3.29	1.12
Chloride (Cl)	mg/l	<300	≤300	80.30	158.00	21.10	22.60	3.37
Sulphate (SO4)	mg/l	<600	≤500	554.00	3 101.00	51.20	91.80	1.22
Fluoride (F)	mg/l	<1	≤1.5	1.650	<0.263	<0.263	<0.263	0.474
Nitrate (NO3) as N	mg/l	<10	≤11	<0.194	0.261	0.202	0.242	0.368
Nitrite (NO2) as N	mg/l	-	≤0.9	<0.065	<0.065	<0.065	<0.065	<0.065
Ammonium (NH4) as N	mg/l	-	≤1.5	1.180	0.291	0.057	0.544	0.078
Aluminium (Al)	mg/l	<0.5	≤0.3	0.074	0.084	0.010	0.016	<0.002
Iron (Fe)	mg/l	<3	≤2	0.090	<0.004	0.071	<0.004	<0.004
Manganese (Mn)	mg/l	<0.5	≤0.4	7.400	44.800	2.320	0.076	0.021
Chromium (Cr)	mg/l	-	≤0.05	<0.003	<0.003	<0.003	<0.003	<0.003

Parameters	Units	Guidelines		Sampled Boreholes				
		WUL	SANS 241	DK BH TSF S	DK BH TSF D	DKRWDN S	DKWRD S	KL BH
Copper (Cu)	mg/l	-	≤2	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium (Cd)	mg/l	-	≤0.003	<0.002	0.002	<0.002	<0.002	<0.002
Lead (Pb)	mg/l	-	≤0.01	<0.004	<0.004	<0.004	<0.004	<0.004
Nickel (Ni)	mg/l	-	≤0.07	<0.002	0.002	0.010	<0.002	<0.002
Cobalt (Co)	mg/l	-	-	0.020	<0.003	0.017	<0.003	<0.003
Zinc (Zn)	mg/l	-	≤5	0.003	0.009	<0.002	<0.002	<0.002
Dissolved Uranium (U)	mg/l	<0.03	≤0.03	<0.015	<0.015	<0.015	<0.015	<0.015
Free Cyanide (CN)	mg/l	-	≤0.2	<0.008	<0.008	<0.008	<0.008	<0.008
Cyanide WAD	mg/l	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
Total Cyanide (CN)	mg/l	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Total coliform	CFU/100ml	-	≤10	102 000	190	0	18	4
E.coli	CFU/100ml	-	0	0	0	0	0	0

Table 32: Groundwater quality in catchment C23J (Kusasalethu TSF)

Parameters	Units	Guidelines		Sampled Boreholes							
		WUL	SANS 241	MBH14	MBH15	MBH16	MBH17	BH6	BH8 (Deep)	BH8 (Shallow)	BH9
pH @ 25°C	pH	5-9.7	≥5 to ≤9.7	6.83	7.23	7.30	5.32	5.26	6.47	7.82	5.62
Electrical conductivity (EC) @ 25°C	mS/m	<200	≤170	134	123	244	70	120	308	214	297
Total Dissolved solids @ 180°C	mg/l	<1200	≤1200	974	1 038	2 230	642	908	2 672	1 854	2 286
Turbidity	NTU	-	≤5	35.40	7.84	4.52	1.00	0.96	2.95	0.32	3.86
Total Alkalinity	mg $CaCO_3$/l	-	-	103	73	53	30	8	77	125	26
Calcium (Ca)	mg/l	<200	-	157.00	175.00	286.00	40.20	110.00	425.00	269.00	188.00
Magnesium (Mg)	mg/l	<100	-	30.70	47.70	150.00	56.00	11.40	236.00	157.00	75.30
Sodium (Na)	mg/l	<200	≤200	108.00	31.40	122.00	22.20	137.00	83.10	55.60	359.00
Potassium (K)	mg/l	-	-	9.79	13.60	7.67	3.26	22.10	8.37	8.91	12.90
Chloride (Cl)	mg/l	<300	≤300	112	99	211	14	137	314	188	292
Sulphate (SO_4)	mg/l	<600	≤500	447	470	1 152	303	335	1 491	888	1 091
Fluoride (F)	mg/l	<1	≤1.5	<0.263	<0.263	<0.263	<0.263	<0.263	<0.263	0.593	0.367
Nitrate (NO_3) as N	mg/l	<10	≤11	0.391	1.570	1.930	3.940	14.400	0.515	0.657	<0.194
Nitrite (NO_2) as N	mg/l	-	≤0.9	<0.065	<0.065	<0.065	2.980	<0.065	<0.065	<0.065	<0.065
Ammonium (NH_4) as N	mg/l	-	≤1.5	0.560	0.056	0.063	6.390	0.254	0.100	0.065	17.300
Aluminium (Al)	mg/l	<0.5	≤0.3	0.026	0.028	0.030	0.309	0.478	0.062	0.042	0.082
Iron (Fe)	mg/l	<3	≤2	0.183	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Manganese (Mn)	mg/l	<0.5	≤0.4	1.600	0.069	3.320	1.160	0.266	0.101	0.091	42.600

Parameters	Units	Guidelines		Sampled Boreholes							
		WUL	SANS 241	MBH14	MBH15	MBH16	MBH17	BH6	BH8 (Deep)	BH8 (Shallow)	BH9
Chromium (Cr)	mg/l	-	≤0.05	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Copper (Cu)	mg/l	-	≤2	<0.002	<0.002	<0.002	0.013	<0.002	<0.002	<0.002	<0.002
Cadmium (Cd)	mg/l	-	≤0.003	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002
Lead (Pb)	mg/l	-	≤0.01	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Nickel (Ni)	mg/l	-	≤0.07	<0.002	<0.002	0.064	0.192	0.008	0.005	<0.002	0.050
Cobalt (Co)	mg/l	-	-	0.016	<0.003	0.061	0.093	0.072	0.106	0.058	0.530
Zinc (Zn)	mg/l	-	≤5	<0.002	<0.002	0.016	0.295	0.015	0.007	0.006	0.130
Dissolved Uranium (U)	mg/l	<0.03	≤0.03	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Free Cyanide (CN)	mg/l	-	≤0.2	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Cyanide WAD	mg/l	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Cyanide (CN)	mg/l	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total coliform	CFU/100ml	-	≤10	720	630	99	1	6	300	107	0
E.coli	CFU/100ml	-	0	240	200	11	0	0	10	0	0

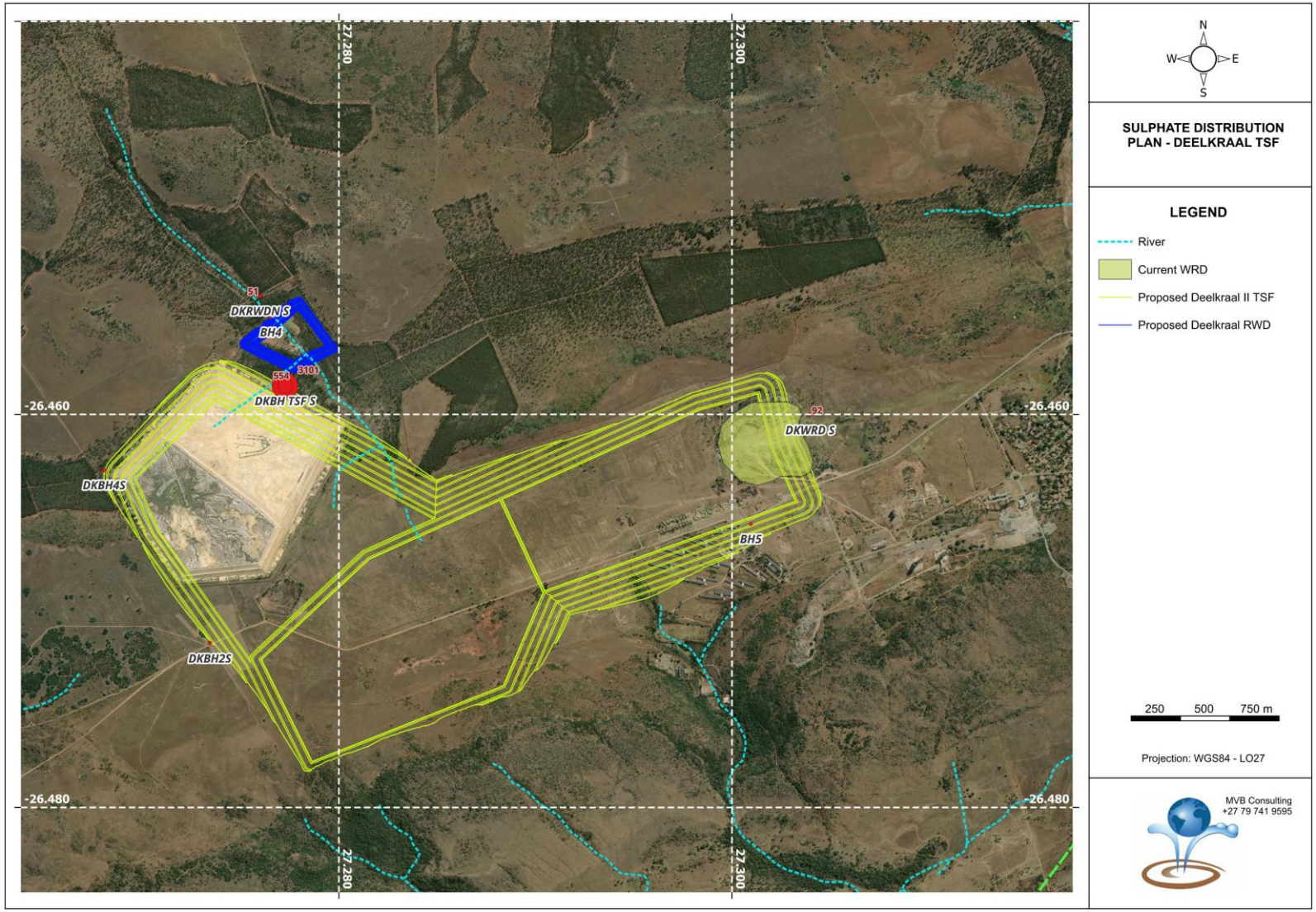


Figure 50: Sulphate concentration distribution in the Deelkraal TSF boreholes



Figure 51: Sulphate concentration distribution in the Kusasalethu TSF boreholes

8.9.7 OVERALL SITE HYDROGEOLOGY

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Weathered and fractured rock aquifer in the Transvaal Formations.
- Dolomitic and Karst Aquifers.

Although the dolomite aquifer is the most prominent aquifer in the region, it does not play any role in the activities at the Deelkraal and Kusasalethu TS's. The dolomite is ±100 - 400m below surface at the two TSF sites. Evidence has shown that there is no connectivity between the weathered / fractured aquifer and the underlying dolomite aquifer. Even in compartments where the dolomite aquifer is dewatered the groundwater levels in the weathered / fractured aquifer remains unaffected.

Groundwater occurs in the near-surface geology in the weathered and fractured sedimentary deposits (quartzite and shale) of the Transvaal strata. The lava of the Hekpoort Formation has similar weathering characteristics to that of the shale and is therefore deemed as the same aquifer. These formations are not considered to contain economic and sustainable aquifers, but localised high yielding boreholes may, however, exist where significant fractures are intersected.

Groundwater recharge in the fractured aquifer is estimated at 22 mm / annum with water occurring in the shallow weathered zone and water bearing fractures only. This is equal to approximately 3.7% of mean annual precipitation. The average rainfall in the area is approximately 600 mm / annum.

In most geological terrains, the groundwater mimics the topography and at the tailings facilities there is a good correlation between the topography and the groundwater level, which suggests that groundwater flow will follow the topographical gradient. The groundwater flow at the Deelkraal TSF is to the north and at the Kusasalethu TSF it is to the south-west and south-east.

There are some private groundwater users in the vicinity of the Kusasalethu TSF, but the mine has included these boreholes in their monitoring programme. Aquatico Scientific (Pty) Ltd routinely monitors the groundwater quality in the mine monitoring boreholes at Kusasalethu and Deelkraal TSFs. The latest available data (September 2025) was made available and is used to assess the current impacts from the TSFs.

The following is concluded in terms of the groundwater quality at the Deelkraal TSF:

- The general physical water quality of the C23E (Deelkraal TSF) groundwater monitoring localities can be described as neutral and alkaline (DKWRD S), non-saline (DKRWDN S, DKWRD S and KL BH), very saline (DK BH TSF S) to extremely saline (DK BH TSF D).
- None of the monitoring boreholes recorded dissolved U or CN (all analysed forms) concentrations above the detection limit. Exceeding variable concentrations (including values) were observed in terms of pH, Electrical conductivity, calcium, magnesium, sodium, Total Alkalinity, chloride, fluoride and sulphate were recorded at majority of the C23E boreholes.
- The biggest impact is directly to the north of the TSF, which corresponds with the groundwater flow direction. Very high sulphate concentration in borehole DK BH TSF D is indicative of seepage from the TSF.
- High bacterial counts in terms of E. coli and (or) Total coliforms were recorded at some of the groundwater localities.

The general physical water quality of the C23J (Kusasalethu TSF) groundwater monitoring localities of this section can be described as neutral to acidic (MBH17, BH6 & BH9), saline (MBH14, MBH17 & BH6), very saline (MBH15, MBH16, BH8 (Shallow) & BH9) and extremely saline (BH8 (Deep)). None of the monitored localities for this section recorded CN or dissolved U concentrations above detection limit. Exceeding SANS Electrical conductivity values and concentrations of calcium, magnesium, sodium, chloride and sulphate were detected at all the sampling localities.

8.10 AIR QUALITY

The information in this section was provided by Airshed Planning Professionals (Air Quality Specialist). The wind field is dominated by winds from the northerly sector. The strongest winds (>6 m/s) occurred mostly from the north-northeasterly sector. Calm conditions occurred 3.5% of the time, with the average wind speed over the period of 3.63 m/s. Both daytime and night-time show dominant northerly wind fields, with calm conditions 4.4% during the day, and 2.52% during the night (**Figure 52** and **Figure 53**).

Dust fallout sampling has been undertaken around the Kusasalethu operations since January 2019 by Aquatico Scientific and includes a network comprising of 7 single Dustfall Monitoring Units (DMU) in accordance with ASTM D1739 (1970). Five (5) of these DMUs are screened against the NDCR non-residential limit of 1 200 mg/m²/day, with the remaining two (2) units regarded as residential (screened against the NDCR residential limit of 600 mg/m²/day).Existing Sources of pollution

The current air quality in the study area is mostly influenced by mining, deposition and reclamation activities at Deelkraal, Kusasalethu and Savuka and other companies' mining operations, as well as farming activities, domestic fires, vehicle exhaust emissions and dust entrained by vehicles. These emission sources vary from activities that generate relatively course airborne particulates (such as farmland preparation, dust from paved and unpaved roads, and the mine sites) to fine PM such as that emitted by vehicle exhausts, diesel power generators and processing operations.

Domestic households are known to have the potential to be one the most significant sources that contribute to poor air quality within residential areas. Individual households are low volume emitters, but their cumulative impact is significant. It is likely that households within the local communities or settlements utilize coal, paraffin and/or wood for cooking and/or space heating (mainly during winter) purposes. Pollutants arising from the combustion of wood include respirable particulates, CO and SO2 with trace amounts of polycyclic aromatic hydrocarbons (PAHs), in particular benzo(a)pyrene and formaldehyde. Particulate emissions from wood burning have been found to contain about 50% elemental carbon and about 50% condensed hydrocarbons.

Biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands. Within the project vicinity, crop-residue burning and wildfires (locally known as veld fires) may represent significant sources of combustion-related emissions. The frequency of wildfires in the grasslands varies between annual and triennial. Biomass burning is an incomplete combustion process (Cachier, 1992), with carbon monoxide, methane and nitrogen dioxide gases being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% is left in the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds (Held, et al., 1996). The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content.

Emissions from unpaved roads constitute a major source of emissions to the atmosphere in the South African context. When a vehicle travels on an unpaved road the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong turbulent air shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Dust emissions from unpaved roads vary in relation to the vehicle traffic and the silt loading on the roads. Unpaved roads in the region are mainly haul and access roads. Emissions from paved roads are significantly less than those originating from unpaved roads, however they do contribute to the particulate load of the atmosphere. Particulate emissions occur whenever vehicles travel over a paved surface. The fugitive dust emissions are due to the re-suspension of loose material on the road surface.

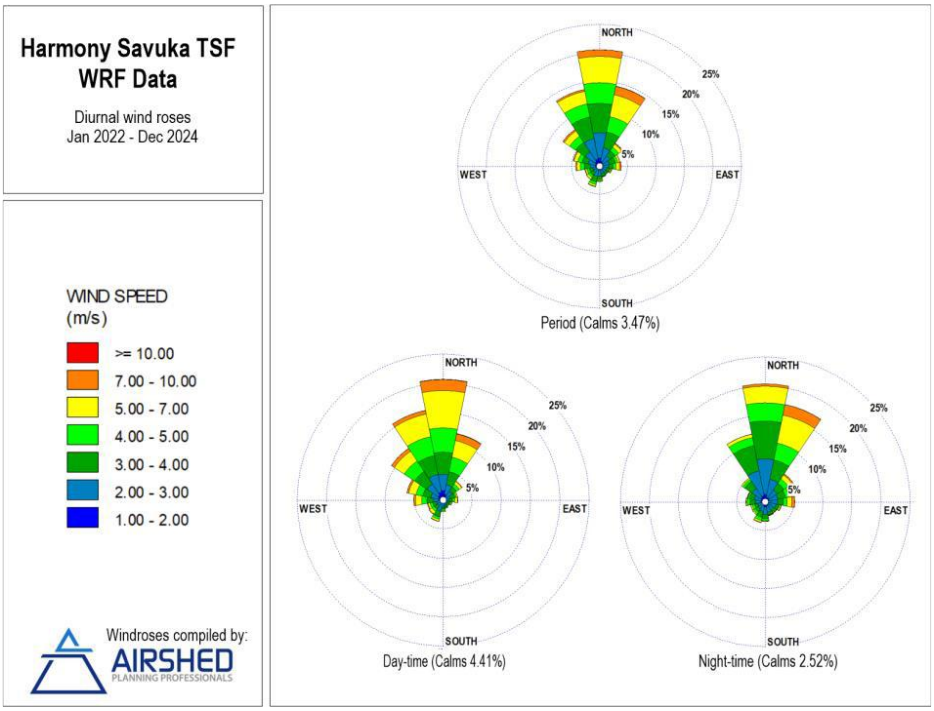


Figure 52: Period, day- and night-time wind roses (WRF data, January 2022 to December 2024).

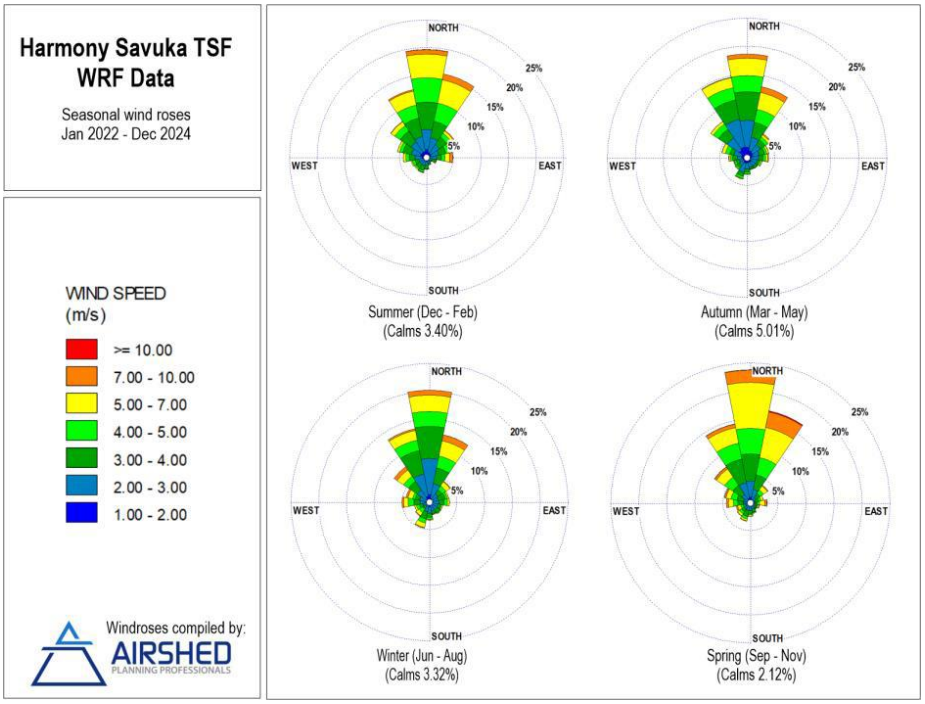


Figure 53: Seasonal wind roses (WRF data, January 2022 to December 2024).

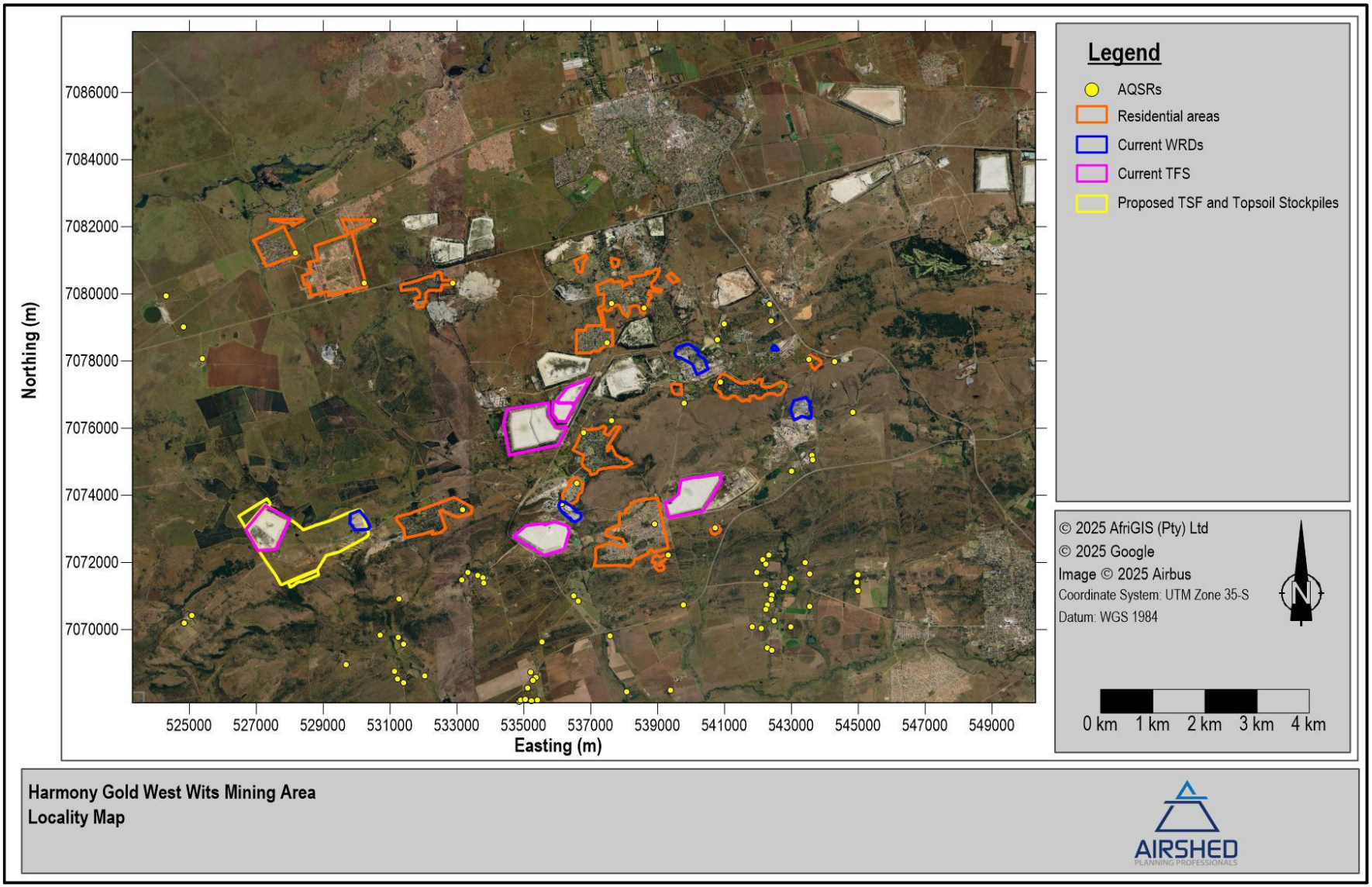


Figure 54: Location of sensitive receptors relative to the Project Area of Influence.

8.11 TRAFFIC

A review of historical traffic volumes within the study area was undertaken using data obtained from the SANRAL Yearbook (2019 & 2023) for national roads and the Gauteng Provincial Department of Roads and Transport Road Asset Management System (GPDRTRAMS, 2025) for provincial roads.

The adjoining road network experiences Average Daily Traffic (ADT) volumes ranging between 992 to 11103 vehicles per day. Of this, 269 to 500 vehicles per day comprise Average Daily Truck Traffic (ADTT), suggesting that heavy vehicles constitute a notable share of total traffic, with potential implications for pavement loading and road performance.

Based on the available ADT data, generally, peak hour traffic volumes constitute approximately 13% of the Average Daily Traffic (ADT) volumes. Accordingly, for the study area, the expected peak hour traffic volumes have been estimated based on the available ADT data, applying a peak hour factor of 13%. This approach provides a practical basis for assessing traffic conditions during the most critical operating period of the road network, typically corresponding to the morning or afternoon peaks. **Figure 55** shows the estimated peak hour link volumes within the study area (white numbers). The estimated peak hour volumes are used to support the evaluation of intersection performance, level of service, and lane capacity requirements within the study area. Given the relatively low peak hour volumes observed, the base year hourly link volumes are not expected to be sufficient to justify the need for a roadway cross-section with substantially higher capacity than the existing available capacity.

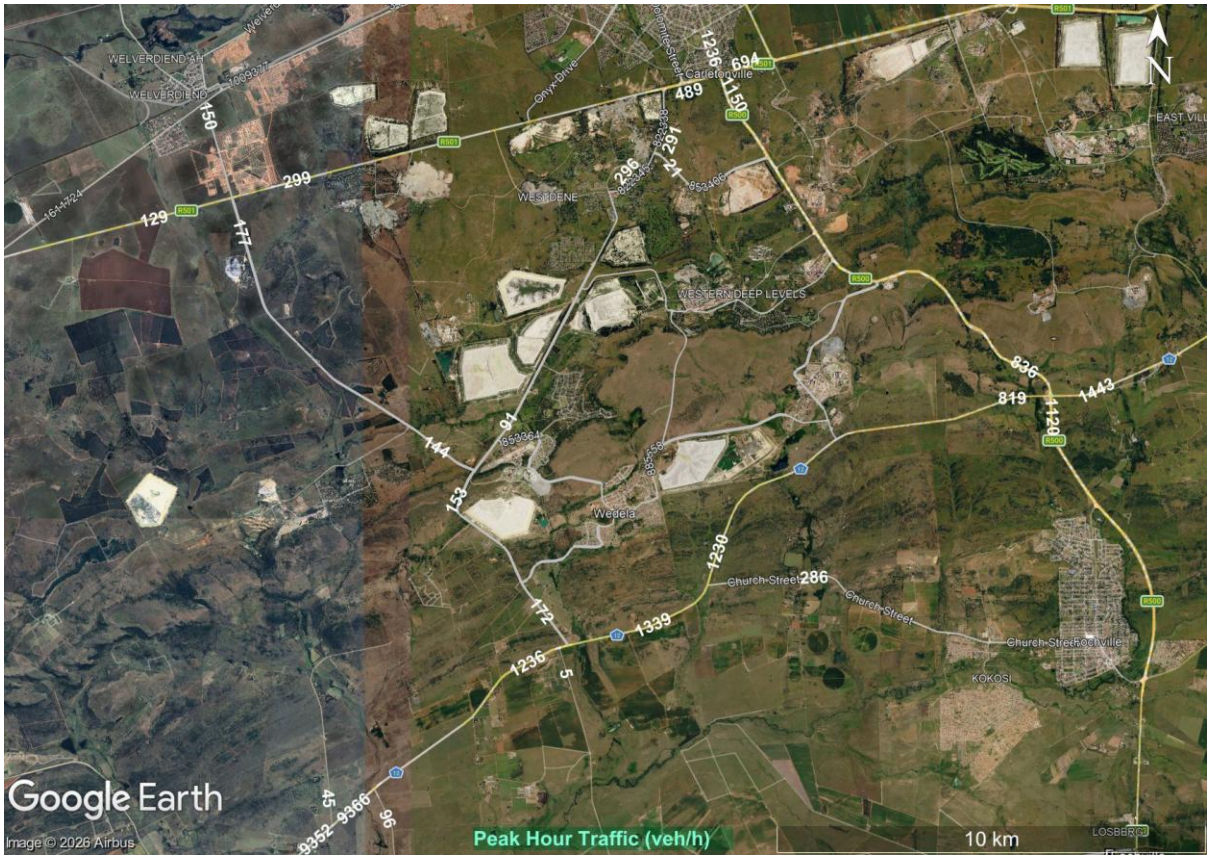


Figure 55: Peak hour traffic volumes (vehicles per hour)

8.12 VISUAL RECEPTORS AND LANDSCAPE CHARACTER

The study area comprises a combination of landscape character types including open grassland with some pans, agricultural lands, urbanisation and settlements, and mining and associated infrastructure. The following Landscape Character Areas (LCAs) were identified:

- The area of east / west aligned ridgelines and valleys within which the proposed project is located that includes the following landscape characteristic;
    - Valley slopes and ridgelines that are steep relative to areas directly to the north and south;\
    - A mix of alien trees including plantations within indigenous grassland areas;
    - Mining areas including infrastructure, waste and extraction sites; and
    - Formal housing areas that are largely associated with mining operations.
- The area to the north of the ridgelines that includes the following landscape characteristics;
    - Relatively flat topography;
    - Areas of housing development that are largely high density housing and medium rise blocks that appear relatively new and under development and
    - Areas of commercial cultivation and grazing within a matrix of natural grassland and stands of alien trees.
- The area to the south of the east / west aligned ridgelines and valleys that includes the following landscape characteristics;
    - Relatively flat topography;
    - Residential settlement largely in the form of individual homesteads; and
    - Areas of commercial cultivation and grazing within a matrix of natural grassland and stands of alien trees.

There is only one protected area, the Boskopdam Nature Reserve that is located approximately 16km west of the proposed project. The assessment indicates that whilst a small upper section of the Deelkraal II TSF may be visible, it is unlikely to be visually discernible from adjacent ridgelines and hillsides.

Deelkraal, Elandsridge and Wedelia are small mining settlement that is located within the area of ridgelines and valleys and within 1km of the proposed Deelkraal II TSF. Elandsridge is located in the vicinity of proposed pipeline and overhead power line routes and is approximately 6.2km from the proposed Deelkraal TSF;. The Boskop Dam Nature Reserve that is located approximately 16km to the west of the proposed project. A Passive Recreation Area immediately north of Deelkraal.

In terms of linear receptor, the R501 which is the main road running through the area to the north of the proposed project. This road connects Carletonville to the north-east with Potchesfstroom to the south-west; and the N12 which runs through the area to the south of the proposed project. This road connects Potchesftroom to the south-west with Soweto and the greater Johannesburg area to the east. Minor roads run through the area of ridgelines and valleys within which the proposed project is located. These roads are largely used by local people and for mine access



8.13 SOCIO-ECONOMIC

The socio-economic baseline conditions relevant to the Project area was provided by Equispectives (Social Specialist). The baseline socio-economic information was updated in 2022 through the 2022 South African Census (https://census.statssa.gov.za/#/province/7/2). The Draft Integrated Development Plan (IDP) for Merafong City 2025-26 best describes the socio-economic conditions for the Municipality (https://merafong.gov.za/wp-content/uploads/2025/04/Draft-IDP-Document-March-2025-2026.pdf).

8.13.1 MUNICIPAL PROFILE

According to the Draft Integrated Development Plan (IDP) for Merafong City 2025-26, Merafong City Local Municipality (MCLM) is a Category B municipality with an Executive Mayor Governance system. A Category B municipality, also known as a local municipality, is a type of local government in South Africa that shares executive and legislative authority with a Category C (district) municipality. These municipalities are the primary providers of local services, such as refuse removal, sewage, and water supply, operating within a broader district municipality framework for more regional functions like bulk water infrastructure and integrated development planning.

The Speaker is the Chairperson of Council and is responsible for overseeing the functioning of Council and its committees. The office of the Speaker is further responsible for the establishment and functioning of ward committees. The Chief Whip is responsible for ensuring compliance to the code of conduct by Councillors. MCLM covers an area of 1631.7km² and it comprises of twenty-eight (28) wards in terms of Section 18 (3) of the local government: Municipal Structures Act, 1998 (Act 117 of 1998) which constitutes 28 Ward Councillors and 24 Proportional Representative Councillors. MCLM is situated in the South-western part of Gauteng Province and form a part of West Rand District Municipality which consists of four local municipalities namely: Mogale City, Rand West Municipality and Merafong City. MCLM incorporates the following areas:

- Carletonville;
- Khutsong;
- Fochville;
- Kokosi;
- Greenspark;
- Welverdiend;
- Wedela;
- Blybank; and
- Mining Towns.

8.13.2 DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

Population statistics are normally collected by way of a Census, however because Censuses are usually a huge logistical exercise, many Countries conduct a Census once every 5 to ten years. Between Censuses administrative data is collected by various agencies about population, events such as births, deaths and cross-border migration and these agencies are allowed to produce and use this data. It has been about 12 years since the 2011 Census has taken place, therefore the available data has become old and unreliable. In 2016 Statistics South Africa conducted a Community Survey to supplement the 2011 Census and the municipality has in the past used those figures complemented by data released by other sources such as Quantec Survey of 2017. The most recent Census was undertaken in 2022 and some of the results have been released by Statistics South Africa.

8.13.2.1 **POPULATION DYNAMICS**

The West Rand population increased by 21,6% from 821 191 in 2011 to 998 466 in 2022 whereas Merafong population increased by 14,2% from 2011 to 2022 rising from 197 520 to 225 476. The West Rand is the least populated District in Gauteng with 0,9 million (988 466) people while Merafong City is the least populated

Municipality in West Rand with 225 476 people. The research also shows that in most Wards, the majority of the population belongs to the Black population group. In Ward 12 more than half of the population belonged to the White population group, while in Ward 14 just over a third of the population belonged to the White population group. Ward 12 includes Deelkraal as well as Welverdiend (which is located outside the 5 km radius). Ward 14 includes West Wits Village, a portion of Fochville, the Numba Wani Residence and the Mohaleshoek Informal Settlement. At 85,5% the Black African population group constitutes the largest proportion of West Rand's population, followed by White (10,3%) and Coloured (2,8%). At 89,4% the Black African population group constitutes the largest proportion of Merafong's population, followed by White (8,8%) and Coloured (1,3%). Refer to **Figure 56** for the population by race dynamics.

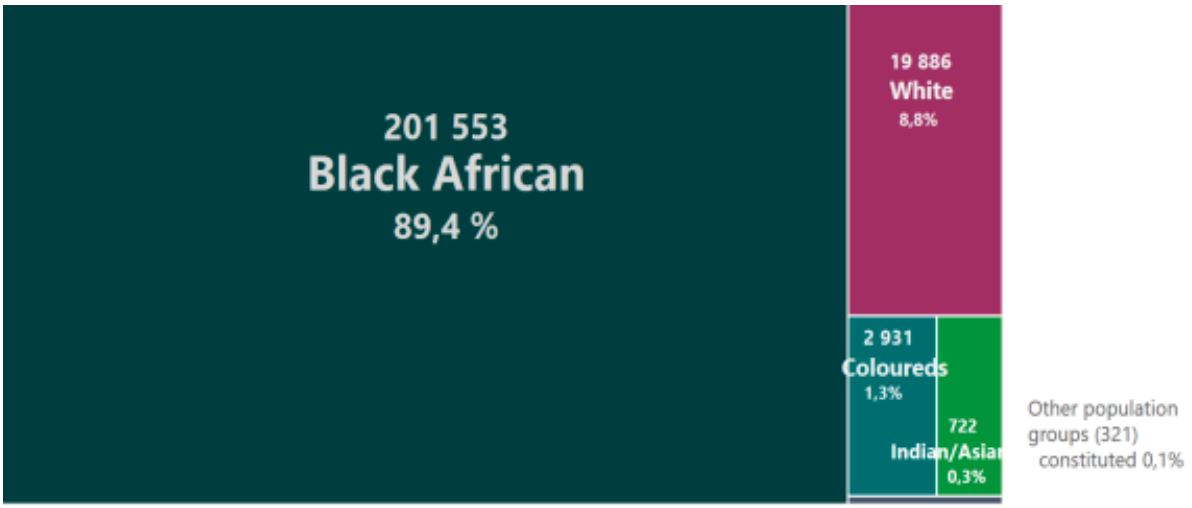


Figure 56: Merafong population groups (Statssa, Census 2022)

8.13.2.2 **HOUSING DYNAMICS**

Gauteng Households increased from 2,1 million in 1996 to 5,3 million in 2022. There were about 357 thousand households in West Rand 2022 with 77 599 thousand households located within Merafong City in 2022. The number of households in Merafong City increased by 16.5% from 66 624 in 2011. West Rand's average household size slightly decreased from 3,1 in 2011 to 2,8 in 2022 while the average household size in Merafong City also decreased slightly by 0.1 between 2011 and 2022. Households that resided in formal dwellings increased by 13,6 percentage points from 74,9% in 1996 to 88,5% in 2022 in Gauteng. There were more households that resided in formal dwellings in Merafong City in 2022 as compared to other municipalities in West Rand. Households that resided in formal dwellings increased from 60,4% in 1996 to 91,6% in 2022 in Merafong City.

8.13.2.3 **SOCIO-ECONOMIC CONDITIONS**

Gauteng is the economic hub of the country, with over 35% of the economic activity taking place in the province. However, Gauteng continues to bear the brunt of high poverty, inequality, and unemployment levels. At the centre of the development of the Growing Gauteng Together 2030 (GGT2030) strategy, which is the provincial expression of the National Development Plan (NDP), the provincial government aims to address the challenges noted above. The GGT2030 goal is to reduce poverty to about 16 per cent of the total population by 2030 from 25.3 per cent in 2019. The plan also aims to reduce income inequality levels (as measured by the Gini coefficient) to 62 per cent in Gauteng. Since the dawn of democracy, significant progress has been made to reduce the high levels of poverty and inequality. However, the deterioration in economic performance in recent years due to domestic and external factors has regressed some of the progress made, with levels of inequality being more prevalent within population groups.

Table 33 shows different measures of poverty for the West Rand district and the local regions. In 2020, over 50 per cent of the districts were living below the UBPL. With economic activity in negative territory in the district before the pandemic and the unemployment rate at its highest level, these did not favour the initiatives targeted

at reducing poverty in the district. The Upper-Bound Poverty Line (UBPL) was the highest in Rand West City at 54.2% in 2020, followed by Merafong City at 53.1%. Refer to **Table 33** for the poverty and inequality trends.

Table 33: Selected Poverty Indicators (source: Draft IDP Merafong City 2025-26)

Regions	2010	2012	2014	2016	2018	2020
Food Poverty Line (ZAR 624)						
West Rand	16,7%	14,8%	16,0%	19,2%	21,0%	24,3%
Mogale City	16,9%	14,6%	15,7%	18,7%	20,6%	24,0%
Merafong City	15,0%	14,0%	15,2%	18,6%	20,3%	23,2%
Rand West City	17,6%	15,6%	16,9%	20,2%	22,0%	25,3%
Lower Poverty Line (ZAR 890)						
West Rand	28,6%	26,4%	28,1%	31,5%	33,9%	37,6%
Mogale City	28,8%	26,1%	27,6%	30,7%	33,1%	36,9%
Merafong City	26,4%	25,3%	27,1%	31,1%	33,5%	36,9%
Rand West City	30,0%	27,6%	29,4%	32,9%	35,2%	38,9%
Upper Poverty Line (ZAR1 335)						
West Rand	45,0%	42,7%	44,0%	46,6%	49,0%	52,7%
Mogale City	44,5%	41,7%	42,9%	45,2%	47,6%	51,4%
Merafong City	43,8%	42,7%	44,0%	47,2%	49,5%	53,1%
Rand West City	46,7%	44,1%	45,5%	48,3%	50,6%	54,2%
Poverty Gap Rate						
West Rand	31,4%	30,4%	30,4%	30,7%	31,1%	31,8%
Mogale City	31,4%	30,4%	30,5%	30,8%	31,1%	31,8%
Merafong City	31,5%	30,4%	30,5%	30,9%	31,2%	32,0%
Rand West City	31,2%	30,2%	30,3%	30,6%	31,0%	31,7%

Based on the income inequality as measured by the Gini coefficient for the West Rand district and its local regions, over the period of 2012 to 2020, not much change or movement happened in all the regions, as the increases in later years were marginal. However, the numbers have maintained a level just above 0.6. Much of the inequality is in Mogale City, the region with relatively high activity in the whole district. The Gini coefficient in the region increased from 0.642 in 2012 to 0.644 in 2020.

The better-than-expected recovery in the first half of 2021 improved business activity in municipalities, amid a strong rebound in global demand and higher commodity prices. Going forward, the recovery in economic activity is dependent on various factors, including effective vaccination rollout and sustained provision of energy to all the sectors of the economy. Similarly, in the West Rand, like other regions, economic output has declined for several years, with negative growth rates going back to the start of the review period. The decline in the mining activity of the district over the years has resulted in reduced total output. Mining accounted for 31% of the West Rand's economic output in 1996; it shrunk to an estimated 19.5% by 2021. However, the sector still accounts for the second highest share of economic activity in the region (refer to **Figure 57**).

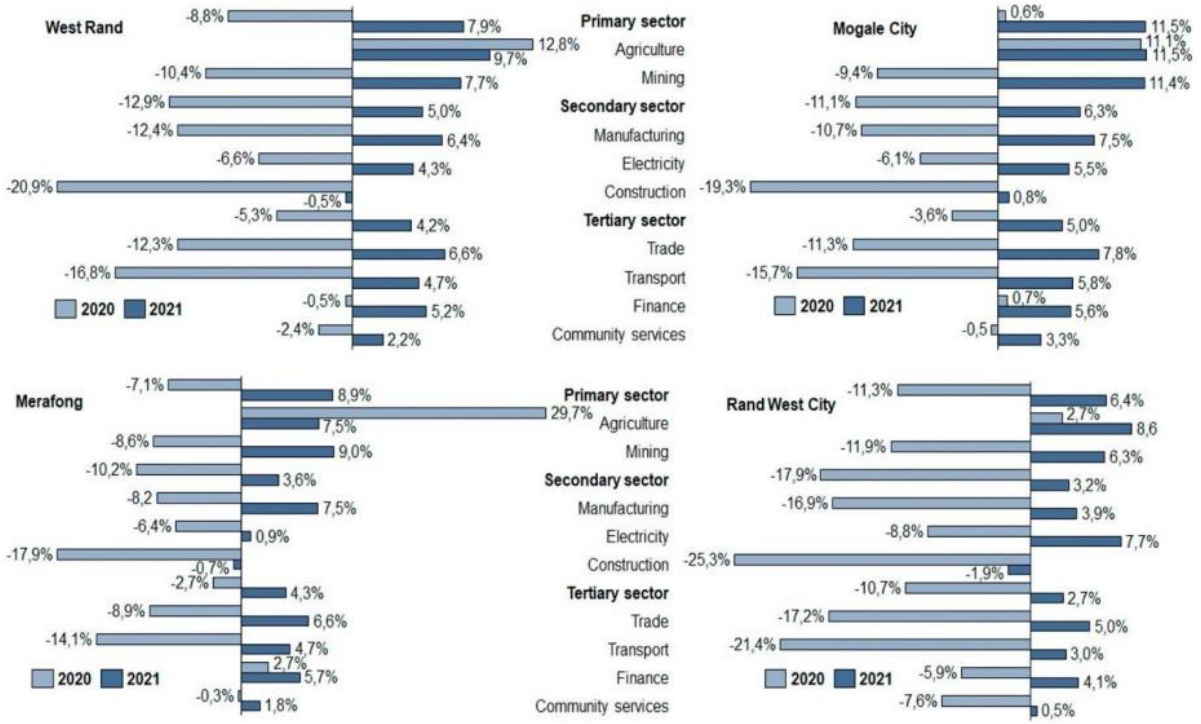


Figure 57: Sector Output Growth (IHS Markit, 2022; Draft IDP Merafong City 2025-26)

The district has also seen the highest contractions in the construction sector, recording a decline of 20.9 per cent in 2020 before a relative improvement however, still negative at 0.5 per cent. In Mogale City, construction decreased by 19.3 per cent, while it declined by 25.2 per cent in Rand West city and by 17.9 per cent in Merafong in the same period. The restriction of mobility of people and the halt of existing and planned projects affected the sector across regions. The agriculture sector has recorded growth for 2020 and is expected to record positive growth for 2021. Mining activity in the district region grew by 7.7 per cent, following a decrease of 10.4 per cent in 2020.

8.13.2.4 **SERVICE DELIVERY**

All Municipalities in West Rand had more than 90% of households having access to electricity for lighting in 2022. Merafong City had an increase from 82,8% in 2011 to 98,1% in 2022. West Rand District had the third highest (76,7%) proportion of households with access to piped water inside dwelling. Merafong City had the highest (81,9%) proportion of households with access to piped water inside the dwelling. While households using flush toilets only increased by 4,3 percentage points between 2011 and 2022 in Gauteng, households using flush toilets increased by 10 percentage points between 2011 and 2022 in West Rand. Households in Merafong City (94,1%) had the highest access to flush toilets than other municipalities. Approximately 84,3% of households in West Rand had their refuse removed by a local authority once a week. Refuse removal by local authority at least once a week increased from 77,7% in 1996 to 84,3% in 2022 in West Rand. Merafong City had the lowest percentage (81.9%) of refuse removal by local authority at least once a week as compared to other municipalities. Households with no access to internet declined by 40 percentage points, from 53,6% in 2011 to only 13,6% in 2022 in Gauteng Province.



8.13.2.5 SITE-SPECIFIC CONDITIONS (FIELDWORK FINDINGS)

Fieldwork in the project area revealed a receiving environment under significant social and economic stress, in which the legacy of mine decline, service-delivery failure, crime and tenure insecurity strongly shape how communities are likely to experience the project. The following site-specific conditions were recorded and form an important part of the social baseline.

Deelkraal Village

- Deelkraal Village is a self-contained former mine village with its own water and refuse arrangements, a clinic operating from a privately owned house, a club and a library; children attend school in Elandsrand, Fochville and Carletonville.
- The village has experienced a prolonged loss of electricity supply (reported as several months at the time of fieldwork) following the switching-off of power and the plundering and burning of the local power station and the theft of power-line towers. As a consequence, sewage can no longer be pumped, and the village has relied on water tankering over an extended period.
- The resident population includes a significant number of elderly and vulnerable people, including persons dependent on oxygen. Rentals are comparatively low, and a number of houses (reported as around 38) stand vacant and are subject to vandalism and cable theft.
- There is internal social tension associated with rent and service-payment disputes, and the village is subject to a court-supervised arrangement. Ownership and rental arrangements are contested (see the land-ownership dispute in the stakeholder analysis).
- Despite these pressures, residents described the village as relatively safe internally, with controlled (boom-gate) access and good inter-group relations, and noted aspirations to develop a retirement village and other facilities.
- Residents expressed specific concerns about dust from the proposed TSF, about construction and operational traffic passing through or near the village to reach the TSF, about the condition and maintenance of the private access road, and about the consequences of a potential TSF failure given that the local stream flows towards Potchefstroom.

Farms and smallholdings

- Farming in the area includes cattle and game; for some farms an on-farm dam and stream are the only water source for livestock, game and people, and these depend in part on runoff water associated with the mine.
- Landowners reported persistent theft (including the theft of Eskom infrastructure and the loss of livestock to theft and slaughter), and emphasised that during construction gates must be kept closed and fences kept intact to prevent livestock loss and straying.
- Open excavations and trenches pose a hazard to livestock, as does construction litter (for example plastic and safety tape) which animals may ingest.
- Residents reported seismic tremors and cracking of houses, variously attributed to mining-related seismicity and to dolomitic ground movement.

Informal occupiers and artisanal miners (zama-zamas)

- A small settlement of informal occupiers, reported as a group of men, many said to be foreign nationals, is present in the area, with some having lived there since around 2009 and artisanal mining activity reported from around 2016. Occupants include cattle herders and artisanal miners; family members reportedly do not live on site.



- The occupiers keep livestock (a reported 200–400 cattle, together with goats, pigs and poultry) which graze in the area and are sold at auction, and they cultivate crops including maize, spinach, peppers and chillies. This is reportedly the only cattle kraal in the immediate area, and the occupiers indicated they do not know where they would graze their livestock if they could not remain.
- Occupants were reported to be largely illiterate and to have limited English, which has implications for the accessibility of engagement. Medicinal plants were observed in the area.
- Cultivation and a kraal were observed on the proposed TSF footprint. The occupiers are not present with formal legal authority; nonetheless, their presence raises livelihood, vulnerability and potential-displacement considerations that must be managed in line with international standards, irrespective of tenure status. While the occupiers may not have legal rights to the land, international human rights standards recognise that all persons are rights-holders, regardless of tenure status. As such, any impacts on their livelihoods, shelter, access to resources or well-being should be identified and managed in a manner consistent with good international industry practice.

Broader settlement conditions

Across the surrounding settlements, fieldwork and consultation recorded very high local unemployment, widespread dependence on social grants, deteriorating municipal services and roads (with some areas only accessible by four-wheel-drive vehicle), substance-abuse and crime problems (including drug dealing and stock theft), insecure tenure and the absence of title deeds for some occupiers, and a strong reluctance among some residents to relocate from mine-linked settlements that are bound up with severance arrangements and a sense of place. Mistrust of both the municipality and mining operators was a recurring theme, and the presence of artisanal mining and infrastructure theft is a pervasive feature of the operating environment. These conditions form the backdrop against which the project's social impacts will be experienced.

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 IMPACT ASSESSMENT METHODOLOGY

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for impacts identified.

9.1.1 DETERMINATION OF ENVIRONMENTAL RISK

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

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

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 34** below.

Table 34: Criteria for Determining Impact Consequence.

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. Highly localised, limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property or site boundary, or the area within a few hundred meters of the site)
	3	Local (i.e. beyond the site boundary within the Local administrative boundary (e.g. Local Municipality) or within consistent local geographical features, or the area within 5 km of the site)
	4	Regional (i.e. Far beyond the site boundary, beyond the Local administrative boundaries within the Regional administrative boundaries (e.g. District Municipality), or extends into different distinct geographical features, or extends between 5 and 50 km from the site).
	5	Provincial / National / International (i.e. extends into numerous distinct geographical features, or extends beyond 50 km from the site).
Duration	1	Immediate (<1 year, quickly reversible)
	2	Short term (1-5 years, less than project lifespan)
	3	Medium term (6-15 years)

	4	Long term (15-65 years, the impact will cease after the operational life span of the project)
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction/ operation/ decommissioning).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected, or affected environmental components are already degraded)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; moderate improvement for +ve impacts; or where change affects area of potential conservation or other value, or use of resources).
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease; high improvement for +ve impacts; or where change affects high conservation value areas or species of conservation concern)
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts; or disturbance to pristine areas of critical conservation value or critically endangered species)
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring very high time and cost.
	5	Irreversible Impact.

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per **Table 35**.

Table 35: Probability Scoring.

Probability	1	Improbable (Rare, the event may occur only in exceptional circumstances, the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <5% chance).
	2	Low probability (Unlikely, impact could occur but not realistically expected; >5% and <20% chance).
	3	Medium probability (Possible, the impact may occur; >20% and <50% chance).
	4	High probability (Likely, it is most probable that the impact will occur- > 50 and <90% chance).
	5	Definite (Almost certain, the impact is expected to, or will, occur, >90% chance).



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

ER= C x P

Table 36: Determination of Environmental Risk.

Consequence	5- Very High[3]	**5**	10	15	20	25
	4- High	4	8	12	16	20
	3- Medium	3	6	9	12	15
	2- Low	2	4	6	8	10
	1- Very low	1	2	3	4	5
		1- Improbable	2- Low	3- Medium/ Possible	4- High/ Probable	5- Highly likely/ Definite
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 37**.

Table 37: Significance Classes.

S Score	Description
≤4.25	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
>4,25, ≤8.5	Low-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>8.5, ≤13.75	High-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>13.75	High (i.e. where the impact will have a significant environmental risk/ reward).

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

9.1.2 IMPACT PRIORITISATION

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

1. Cumulative impacts; and

[3] In the event that an impact or risk has very high or catastrophic consequences, but the likelihood/ probability is low, then the resultant significance would be Low-medium. This does in certain instances detract from the relative important of this impact or risk and must consequently be flagged for further specific consideration, management, mitigation, or contingency planning.

2. The degree to which the impact may cause irreplaceable loss of resources.

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

Table 38: Criteria for Determining Prioritisation.

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

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in **Table 38**. The impact priority is therefore determined as follows:

Priority = CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 1.5 (Refer to **Table 39**).

Table 39: Determination of Prioritisation Factor.

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after

the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 40: Final Environmental Significance Rating.

Significance Rating	Description
<-25	**Very High (Impacts in this class are extremely significant and pose a very high environmental risk. In certain instances these may represent a fatal flaw. They are likely to have a major influence on the decision and may be difficult or impossible to mitigate. Offset's may be necessary.**
<-13.75 to -25	High negative (These impacts are significant and must be carefully considered in the decision-making process. They have a high environmental risk or impact and require extensive mitigation measures).
-8.5 to -13.75	Medium-High negative (i.e. Impacts in this class are more substantial and could have a significant environmental risk. They may influence the decision to develop in the area and require more robust mitigation measures).
<-4.25 to <-8.5	Medium- Low negative (i.e. These impacts are slightly more significant than low impacts but still do not pose a major environmental risk. They might require some mitigation measures but are generally manageable).
-1 to -4.25	Low negative (i.e. Impacts in this class are minor and unlikely to have a significant environmental risk. They do not influence the decision to develop in the area and are typically easily mitigated.
0	No impact
1 to 4.25	Low positive
>4.25 to <8.5	Medium-Low positive
8.5 to 13.75	Medium-High positive
>13.75	High positive

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

9.2 IMPACTS IDENTIFIED

This Section presents the potential impacts that have been identified during the EIA phase assessment. It should be noted that this report will be made available to I&AP's for review and comment and their comments and concerns will be addressed in the final EIA report submitted to the CA for adjudication. The results of the public consultation will be used to update the identified potential impacts which will be further refined during the course of the EIA assessment and consultation process.

Potential environmental impacts identified during the scoping process and have been revised in the EIA Phase. These potential impacts identified by the EAP and the appointed specialists will take into consideration of other potential impacts identified by the public. **Table 41** provides the list of potential impacts identified. Without proper mitigation measures (proposed measures which will be further refined in EIA phase once detailed assessments are included) and continual environmental management, most of the identified impacts may

potentially become cumulative, affecting areas outside of their originally identified zone of impact. The potential cumulative impacts have been identified, evaluated, and mitigation measures suggested which will be updated during the detailed EIA level investigation.

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

Table 41: Identified potential environmental impacts

Main Activity / Action / Process	Ancillary Activity	Geo-physical (geology, topography, air, water)	Biological	Socio-economic	Heritage and cultural
Site preparation (Planning)	Vegetation clearance for pipelines, return water dam, TSF stabilization, access roads Planned placement of infrastructure Stabilization of TSF material Topsoil stripping for pipelines and access roads	○ Surface water contamination	○ Temporary disturbance of wildlife	○ Employment opportunities	○ Disturbance / destruction of archaeological sites or historic structures ○ Disturbance/ destruction of fossils
Human resources management (Planning)	Employment/recruitment I&AP consultations Environmental awareness training Integration with Municipalities' strategic long-term planning			○ Employment opportunities	
Earthworks (Construction)	Stripping and stockpiling of soils Levelling, grubbing and bulldozing Removal of waste and cleared vegetation Preparing trenches and foundations Establishing storm water management measures Establishment of firebreak	○ Erosion due to storm water runoff ○ Impact due to topsoil stripping ○ Surface water contamination ○ Loss of fertility ○ Loss of flow paths ○ Emissions and dust ○ Impacts on wetlands	○ Loss/ destruction of natural habitat ○ Introduction/ Invasion by Alien Species ○ Displacement of faunal species	○ Visual impact and impact on sense of place ○ Nuisance and impact on sense of place (i.e., noise, dust, etc.). ○ Health and safety aspects related to radiation and health as well as TSF stability ○ Impact on existing infrastructure (i.e., roads, fences, etc.) ○ Perceptions and expectations ○ Employment opportunities	○ Disturbance/ destruction of archaeological sites or historic structures ○ Disturbance/ destruction of fossils
Civil Works (Construction)	Establishment of infrastructure and services Mixing of concrete and concrete works Establishment of surface and sub-surface dirty water systems Temporary sewage and sanitation Establishment of waste area Construction of crossings if required for pipelines	○ Erosion due to storm water runoff ○ Impact due to topsoil stripping ○ Surface water contamination ○ Ground water contamination ○ Cone of depression	○ Loss/ destruction of natural habitat ○ Introduction/ Invasion by Alien Species ○ Displacement of faunal species	○ Visual impact and impact on sense of place ○ Nuisance and impact on sense of place (i.e., noise, dust, etc.). ○ Health and safety aspects related to radiation and health as well as TSF stability	○ Disturbance/ destruction of archaeological sites or historic structures ○ Disturbance/ destruction of fossils

Main Activity / Action / Process	Ancillary Activity	Geo-physical (geology, topography, air, water)	Biological	Socio-economic	Heritage and cultural
	General site management	○ Loss of flow paths ○ Emissions and dust ○ Impacts on wetlands		○ Impact on existing infrastructure (i.e., roads, fences, etc.) ○ Perceptions and expectations ○ Employment opportunities	
Deposition at TSF (Operation)	Deposition of tailings Maintenance and management of stormwater system Plant operations Water management	○ Cone of depression ○ Impacts on surface water quality due to leachate ○ Impacts on groundwater quality due to leachate ○ Loss of flow paths ○ Emissions and dust ○ Potential subsidence or sinkhole formation or loss of containment from TSF		○ Visual impact and impact on sense of place ○ Nuisance and impact on sense of place (i.e., noise, dust, etc.) ○ Health and safety aspects related to radiation and health as well as TSF stability	
Closure and Rehabilitation of TSF (Decommissioning and Closure)	Revegetation Slope stabilisation Erosion control	○ Emissions and dust	○ Alien and invasive species	○ Safety and security (i.e., access to properties, theft, fire hazards, etc.) ○ Visual and dust	
Maintenance (Post closure)	Initiate maintenance and aftercare program Environmental aspect monitoring	○ Surface and groundwater quality ○ Potential subsidence or sinkhole formation or loss of containment from TSF	○ Alien and invasive species	○ Visual ○ Site security and access control ○ Health and safety aspects related to radiation and health as well as TSF stability	

9.3 DESCRIPTION AND ASSESSMENT OF IMPACTS

The following potential impacts were identified during the EIA phase assessment and were assessed in terms of nature, significance, consequence, extent, duration and probability.

9.3.1 GROUNDWATER (GEOHYDROLOGICAL) IMPACTS

This section presents the identified geohydrological impacts as per the Geohydrological Impact Assessment undertaken by MvB Consulting (2026).

The primary risk from a geohydrological point is that the proposed project poses is the seepage of contaminants from the TSF into the aquifer, and the migration of these contaminants into downgradient receptors. It was established that there is a risk of contaminants from the TSF and RWD seeping into the groundwater. The TSFs are potentially impacting on the down-gradient groundwater regime. A numerical groundwater model was developed for the study area to simulate the long-term impacts from the waste facilities. The modelling area was selected based on a combination of topographical and drainage control and covers an area of approximately 655 km^2. A finite element network (grid) was designed to provide a high resolution of the numerical solution, while at the same time, accommodating the large model area. The finite element grid was compiled using the FEFLOW pre-processing software, which facilitated the construction of 6-noded triangular prism elements over the area of investigation.

The calibration process was done by changing the model parameters for transmissivity and recharge. Forty-one boreholes were used to calibrate the steady state groundwater flow model. The calibration objective was reached when an acceptable correlation was obtained between the observed and simulated piezometric heads. Input concentrations in the model were specified at cells over the areas where contamination is expected. Sulphate (SO4) is considered a conservative parameter, associated with gold mining impact, and was used as a tracer to simulate the migration of the contaminant plume.

The current contaminant plume from the Kusasalethu TSF reflects the sulphate concentrations measured in the monitoring boreholes. The plume is primarily migrating to the south, but a smaller plume has also developed towards the south-west. The plumes do not impact on any private groundwater users, but do impact on two small streams in both areas.

The Kusaslethu TSF is also earmarked to be remined and the source will therefore effectively be removed. The current impacted aquifer underneath the TSF will dissipate over time through natural attenuation. This is a slow process due to the low aquifer parameters and low groundwater flow rate. The plume will, however, largely dissipate over the next 50 years to concentrations below the WUL limits. It is assumed that the existing WRD will remain, but it does not pose a significant risk to the groundwater environment.

The current contaminant plume from the Deelkraal I TSF, as represented by the sulphate concentrations, is primarily migrating at a slow rate towards the north. A small plume has also developed in an easterly direction. The current plume is contained within Harmony property and is not impacting on any downgradient receptors. There is no significant impact from the WRD.

The Deelkraal I TSF will be remined and the processed tailings will be deposited on a new facility to the east of the current TSF. The following scenarios were modelled to illustrate the future impact from the proposed operations:

Scenario 1: The Deelkraal I TSF will be removed (remined) and the source will therefore be removed. The current impacted aquifer underneath the TSF will dissipate over time through natural attenuation. The new TSF and RWD are unlined and the contaminant plumes will move in a north-westerly direction as well as to the south. The contamination is not expected to impact on any downgradient receptors during this time (see **Figure 58** for the modelled results for this scenario).

Scenario 2: For this simulation it was assumed that both the new TSF and the RWD will be lined. The gold tailings are typically classified as a Type 3 waste in terms of the NEMWA Regulations 2013 requiring a Class C containment barrier performance. The Class C single composite barrier system comprises of underdrainage; a base preparation layer; a 300mm thick compacted clay liner (CCL); a 1.5mm thick geomembrane; a dual-purpose

ballast and protection layer of at least 100mm thickness, and above liner drainage system. The performance of such a barrier is largely influenced by the design specifications and associated Construction Quality Assurance (CQA). The nature and extent of wrinkles influence the containment performance, with an expected seepage rate to be in the order of 140 litres / hectare / day (Legge, 2024). See **Figure 59** for modelling results for this scenario.

For the inverted barrier system, assuming 3 holes per hectare with a diameter of 10mm, using a 1.5mm thick double textured Geomembrane, considering a 1m thick layer of compacted tailings with an hydraulic conductivity of 8E-08m/s placed over the Geomembrane and a collection drainage layer above it, the expected leakage rate is in the order of 6 litres / hectare / day, which is one order of magnitude less than a traditional Class C barrier system.

The simulation for this scenario shows very little movement away from the waste facilities. It is concluded that the remining of the Deelkraal and Kusasalethu TSFs will have a positive impact on the groundwater regime in the long run. The current impacts are not affecting any private groundwater users and the situation will improve further over time.

The impact from the proposed new TSF and RWD is expected to be significantly less than the older TSFs due to improved metallurgical processes and reduced sulfide content. It may, nevertheless, have some impact on the underlying aquifer, but the simulations have shown this impact to be minimal. Down-gradient receptors will not be impacted over the next 50 years and the facilities will be rehabilitated during this time. The installation of a liner will further improve the situation and lower the risk to the environment even further, although not considered a prerequisite. It is evident that lining the TSF is the best option from an environmental perspective.

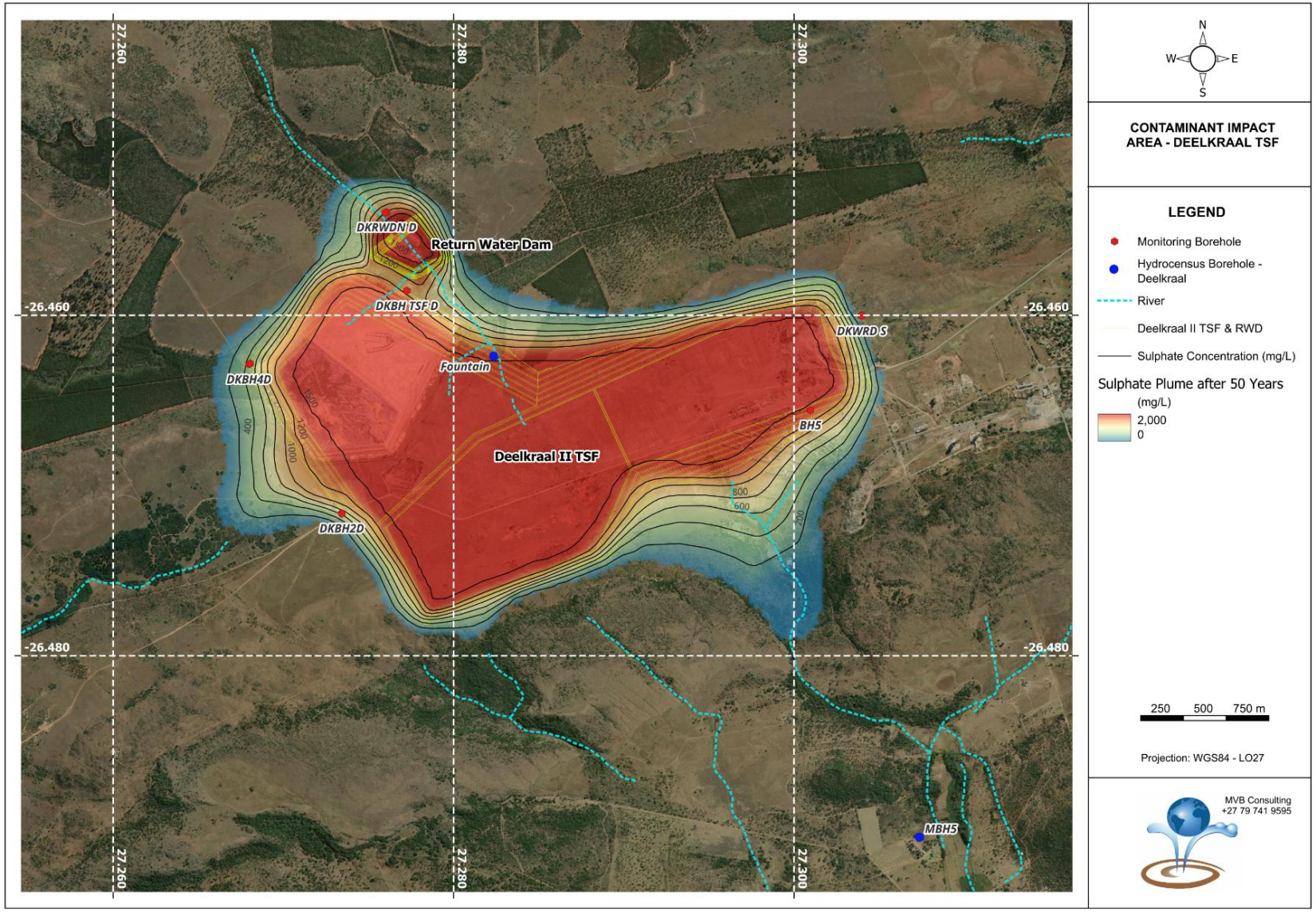


Figure 58: Plume migration by 2060 for Scenario 1 – No Mitigation (MvB, 2026)

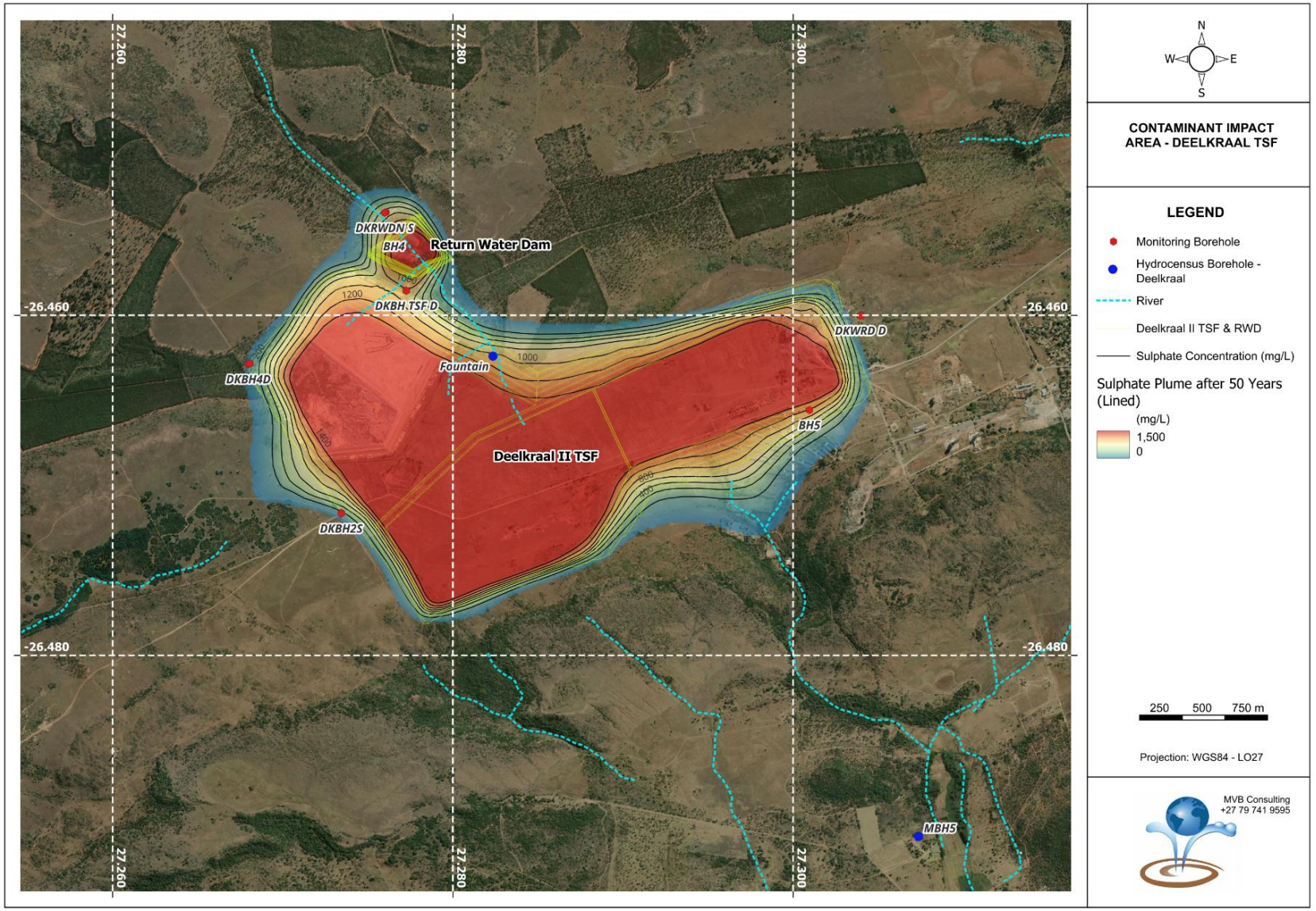


Figure 59: Plume migration by 2060 for Scenario 2 – Liner installation (MvB, 2026)



9.3.1.1 IMPACT RATING

The impact ratings are provided in **Table 42**.

Table 42: Groundwater impact assessment table.

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Groundwater contamination from remining of existing TSFs	Construction	Low Negative	Low Negative	Low Negative
Groundwater contamination from new TSF & RWD	Construction	Low Negative	Low Negative	Low Negative
Groundwater contamination from remining of existing TSFs	Operation	Medium to High Negative	Low Negative	Low Negative
Groundwater contamination from new TSF & RWD	Operation	Medium to High Negative	Low Negative	Low Negative
Groundwater contamination from remining of existing TSFs	Decommissioning	Medium to Low Negative	Low Negative	Low Negative
Groundwater contamination from new TSF and RWD	Decommissioning	Medium to High Negative	Low Negative	Low Negative

It is important to note that a numerical groundwater model is a representation of the real system. It is therefore at most an approximation, and the level of accuracy depends on the quality of the data that is available. This implies that there are always errors associated with groundwater models due to uncertainty in the data and the capability of numerical methods to describe natural physical processes.

9.3.1.2 CUMULATIVE IMPACT

The cumulative groundwater impact is rated as medium-low, which means considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change. It is important to note that the impact simulations assume a constant source, without any remediation. In other words, a worst-case scenario. The reality is that the source will become depleted over time and the source concentration will improve. This, together with a rehabilitation plan will greatly improve the situation and lessen the impact.

9.3.1.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- The TSF and RWD should both be lined.
- The findings of the modelling should be verified and continued monitoring is recommended. Additional monitoring boreholes are recommended. A minimum of two borehole pairs is recommended north of the new TSF and another two south of the TSF (dependent on the accessibility of the terrain).
- The numerical model should be updated if any deviations from the predicted contaminant migration are noticed. Alternative remedial options such as cut-off trenches can be considered to contain any contamination, if detected.

9.3.2 SURFACE WATER (HYDROLOGICAL) IMPACTS

This section presents the identified hydrological impacts as per the Hydrological Impact Assessment undertaken by Hydrologic Consulting (2026).

9.3.2.1 **EROSION OF SOILS**

Disturbed soils have the potential to generate surface runoff and cause sedimentation in downstream watercourses. The construction, operation, and decommissioning of all proposed infrastructure will result in areas of ground disturbance, creating conditions conducive to soil erosion during rainfall events or through persistent streamflow. The rehabilitation/closure phase carries a similar erosion risk to the construction phase. The moderately high runoff potential of the soils across the study area exacerbates this risk, as a higher proportion of rainfall is converted to runoff, increasing its erosivity. It is noted that not all soils are inherently prone to erosion; erosion potential is further governed by soil texture, structure, cohesion, and organic matter content, all of which influence the erodibility of a given soil.

If not adequately mitigated, erosion could persist into the operational phase; however, it is expected that disturbed soils will consolidate over time, progressively reducing the volume of material mobilised per rainfall event.

The construction of the Deelkraal II TSF and associated Return Water Dam (RWD) will involve the largest areas of ground disturbance within the project footprint and consequently carry the highest potential for soil erosion and sediment mobilisation. These facilities will be designed with engineered containment systems, including toe paddocks, diversion drains, and the RWD itself, to intercept and retain runoff and sediment during and after construction. Topsoil stripped during construction should be stockpiled separately and retained for use in rehabilitation, with stockpile areas themselves stabilised to prevent secondary erosion.

Pipeline, power line, and access road corridors will result in elongated strips of ground disturbance. The linear nature of these corridors increases the likelihood of intersecting drainage lines, river channels, and other natural flow paths, which represent points of elevated erosion risk. Infrastructure should not be placed within river channels, furrows, or trenches unless essential; where crossings are unavoidable, enhanced erosion protection measures must be implemented. Following installation, all disturbed surfaces within the pipeline and access road corridors should be stabilised promptly and revegetated as part of the rehabilitation programme. The defined and relatively narrow footprint of these corridors will limit the total surface area of disturbance.

Ground disturbance associated with the Kusasalethu Plant Upgrades, pump stations, and ancillary construction infrastructure (workshops and laydown areas) will be localised and confined to existing disturbed or operational footprints where possible. Erosion risks are therefore comparatively lower for this group, provided that drainage from these areas is directed away from sensitive receptors and that disturbed surfaces are stabilised upon completion of construction activities. Across all infrastructure groups, disturbed areas should be stabilised as soon as practicable, with erosion and sediment control measures implemented where immediate stabilisation is not possible. Rehabilitation should incorporate topsoil replacement and revegetation of all disturbed areas. With the consistent application of these measures, erosion risks associated with the proposed infrastructure are expected to be effectively managed across all project phases.

9.3.2.1.1 IMPACT RATING

The impact ratings are provided in **Table 43**.

Table 43: Impact on surface water from soil erosion.

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Erosion of Soils	Construction	High Negative	Medium to Low Negative	Medium to Low Negative
	Operation and Decommissioning	Medium to High Negative	Low Negative	Medium to Low Negative



9.3.2.1.2 CUMULATIVE IMPACT

The cumulative impact on surface water from erosion of soils from the additional deposition of gold tailings on the TSF involves an increase in the long-term risk of contamination. However, the current conditions and the additional deposition would likely result in moderate additional impacts on surface water from the TSF project. Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change of medium-low significance.

9.3.2.1.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Ensure all existing infrastructure has a stormwater management plan that is sufficient per GN 704 and any applicable TSF-specific requirements, and that all proposed infrastructure — including new TSFs, pipelines, power lines, access roads, and associated facilities — is designed and constructed in accordance with GN 704.
- Limit the extent of clearing and earthworks to approved construction footprints across all infrastructure components as far as possible.
- Appropriate erosion and sediment control measures must be implemented for all construction activities, scaled to the nature and footprint of the infrastructure being constructed.
- Where possible, construction activities across all infrastructure components should be scheduled outside of peak rainfall periods. For construction periods exceeding six months, activities should be phased such that soil exposure (prior to the addition of hardstanding or rehabilitation) occurs predominantly within the dry season.
- Clearing of vegetation and associated excavation should be kept to a minimum across all infrastructure corridors and footprints, particularly in areas where soils are identified as unstable or erosion prone.
- All construction activities should be monitored to ensure that areas of potential erosion are identified early and managed appropriately, including along pipeline and power line corridors where linear disturbance increases drainage line crossing risks.
- Where erosion cannot be avoided, settling facilities or silt fences should be installed to capture mobilised sediment before it reaches downstream watercourses.
- Pipeline stability must be maintained by ensuring that the integrity of pre-cast concrete plinths and other pipeline support structures is not compromised by erosion of surrounding soils.
- All disturbed areas, including those associated with all infrastructure construction zones, must be rehabilitated as soon as practically possible to restore pre-disturbance conditions in terms of soil profile, land cover, and slope.
- Rehabilitated and disturbed areas must be stabilised promptly using vegetation (such as grass cover) or mechanical methods such as slope profiling or erosion control blankets.
- Monitor the TSFs to ensure areas of potential erosion are identified and managed appropriately.
- Monitor pipeline corridors throughout the operational phase, with particular attention to drainage line and watercourse crossings where scour and undermining of pipe support structures, including pre-cast concrete plinths, present a persistent erosion risk. Erosion protection at crossing points must be maintained and repaired where necessary.
- Maintain road drainage structures, including culverts, cut-off drains, and road camber, associated with access roads to prevent road-related erosion and sediment runoff during the operational phase. Road verges and disturbed shoulders should be monitored and stabilised where erosion is identified.
- Vegetation cover within power line servitudes should be maintained where practicable to limit erosion of exposed soils in areas subject to periodic clearing.

- Rehabilitation should include topsoil replacement, revegetation, and maintenance and aftercare for all disturbed areas across all infrastructure components, including pipeline corridors, access road verges, pump station areas, and plant upgrade footprints, and should not be limited to TSF footprints alone.
- Concurrent rehabilitation of the TSFs should ideally occur during the operational life of the TSFs, including cladding of side slopes and subsequent revegetation, with final rehabilitation resulting in a fully vegetated site.
- A rehabilitation plan should be developed for linear infrastructure, covering topsoil replacement, re-grading of trenches to restore natural slope and drainage patterns, and revegetation of all disturbed corridors following decommissioning.
- Rehabilitated areas across all infrastructure components must be monitored post-closure and corrective actions implemented where erosion persists, with sign-off only once erosion has demonstrably stabilised.

9.3.2.2 POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT

Potential pollutants are already limited by the design of the project, given the containing nature of the existing TSFs. Uncontrolled release of tailings or contaminated return water is possible and would be considered a residual risk (post-mitigation). A TSF failure, while a highly unlikely event, has the potential to cause severe pollution of the downstream environment, while poor operation of the TSF and RWD could see an unplanned spill from the RW Dam. Adequate engineering and operation of the TSF would mitigate these two potential impacts.

Operation of earthmoving machinery or maintenance of vehicles on-site during construction, operation, decommissioning, and rehab/closure (including the possible storage or handling of hydrocarbons) poses a potential source of hydrocarbon contamination regarding the surface water environment. Vehicles and machinery should consequently be well maintained and stored/parked with drip trays and with an emergency response strategy for unforeseen hydrocarbon spills. With regards to the TSF, potential pollutants are already limited by the design of the project, given the containment nature of the TSF.

The Kusasalethu Plant Upgrades, including the new gold / uranium processing section, pump stations, and ancillary construction infrastructure, present localised risks of pollutant entry into surface waters through stormwater runoff from operational areas, chemical spills, or inadequate containment of process-affected water. These risks are confined to the immediate footprints of these facilities and are expected to be managed through site-specific containment and drainage controls.

Following the implementation of mitigation measures across all infrastructure groups, the risk of pollutants entering surface waters is expected to be significantly reduced through effective design, monitoring, and operational controls. However, the residual risk associated with a TSF failure, while low in probability, warrants ongoing recognition given the severity of potential downstream consequences.

9.3.2.2.1 IMPACT RATING

The impact ratings are provided in **Table 44.**

Table 44: Impact on surface water from potential pollutants (Hydrologic, 2026)

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Surface water impacts from potential pollutants	Construction	Medium – High Negative	Low Negative	Low Negative
	Operation	Medium – High Negative	Medium – Low Negative	Low Negative
	Decommissioning	Medium – High Negative	Medium – Low Negative	Medium – High Negative

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
	Rehab and closure	High Negative	Low Negative	Medium to Low Negative

9.3.2.2.2 CUMULATIVE IMPACT

The cumulative impact on surface water from erosion of soils from the additional deposition of gold tailings on existing TSF involves an increase in the long-term risk of contamination, primarily through enhanced seepage and surface water runoff. However, the current conditions and the additional deposition would likely result in moderate additional impacts on surface water from the TSF project provided that the project aspects such as clean and dirty water diversion systems, liner etc. It is highly probable that the impact will result in spatial and temporal cumulative change of medium-low significance.

9.3.2.2.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Ensure all existing infrastructure has a stormwater management plan that is sufficient and maintained per GN 704 and any applicable TSF specific requirements, and that all proposed infrastructure, including new TSFs, pipelines, pump stations, and associated facilities, is designed and constructed in accordance with GN 704.
- Pollution potential to watercourses must be considered in the designs of all infrastructure components to prevent uncontrolled releases resulting from an unforeseen leak, rupture, or structural failure.
- Develop the TSFs using sound engineering principles to limit the likelihood of failure and ensure structural integrity throughout the operational life of the facilities.
- Ensure RWDs or temporary containment facilities are operational prior to major earthworks commencing on TSF and associated infrastructure.
- All slurry and process water pipelines must be pressure tested before commissioning to confirm structural integrity before introduction of process-affected water or slurry. Desilting of pipelines must take place when deemed necessary.
- Install flow monitoring and leak detection measures along pipeline routes, with particular attention to watercourse crossings and pump station connection points and establish emergency isolation and shut-off procedures in the event of a pipeline rupture or leak.
- Provide secondary containment or bunding at pump stations and pipeline connection points where process-affected water or slurry is handled.
- Inspect pipeline corridors and watercourse crossings regularly during construction for signs of seepage or uncontrolled discharge into the surrounding environment.
- Chemical and reagent storage areas associated with plant upgrades, including the new uranium processing section, must be bunded and all drainage from these areas directed to a contained dirty water management system. A chemical spill response procedure specific to plant upgrade areas must be established.
- Restrict all activities to within designated dirty water management areas wherever possible.
- Implement spill prevention and response procedures across all infrastructure components, including the availability of spill kits at all active construction areas.
- Ensure that concrete washout water and other construction wastewater generated across all infrastructure components are contained and not discharged to watercourses or drainage lines.
- Ensure vehicles and plant are regularly serviced to limit the risk of hydrocarbon leaks. Remove any soil contaminated by hydrocarbon spillage from the site promptly.



- All construction personnel must be trained on spill prevention and response procedures applicable to their work area and infrastructure component.
- Undertake surface water monitoring throughout the construction phase to enable change detection through regular data review relative to contaminants originating from the site.
- Develop and implement a maintenance plan to monitor the integrity of all infrastructure components and prevent leaks or ruptures during construction and into the operational phase.
- Monitor TSFs regularly to detect any signs of instability, slumping, or unusual movement, and ensure that any remedial actions are implemented promptly.
- Maintain all engineered containment systems, including toe paddocks, underdrainage, seepage collection systems, and RWDs, in good working order throughout the operational and decommissioning phases.
- Maintain adequate freeboard and stormwater diversion capacity across all water management infrastructure for extreme rainfall events.
- Maintain the integrity of all slurry and process water pipelines through a scheduled inspection and maintenance programme, with emergency isolation and shut-off procedures in place and readily accessible in the event of a rupture or leak.
- Inspect pipeline corridors and watercourse crossings regularly during operation and decommissioning for signs of leakage or seepage, and implement repairs promptly where uncontrolled discharge is identified.
- Maintain secondary containment and bunding at pump stations and pipeline connection points throughout the operational phase, and ensure these are decommissioned in a controlled manner that prevents residual contamination from entering the surrounding environment.
- Ensure that bunding and contained drainage systems associated with plant upgrade areas, including the uranium processing section, are maintained and inspected regularly throughout operation and remain functional until decommissioning is complete.
- Establish and maintain buffer zones between all infrastructure and natural watercourses throughout the operational and decommissioning phases.
- Store hydrocarbons off-site where possible, or otherwise in bunded storage facilities. Handle hydrocarbons carefully to limit spillage, designate a single location for refuelling and maintenance where possible, and use drip trays for stationary vehicles or park over areas fitted with oil interceptors.
- Ensure vehicles and plant are regularly serviced to limit the risk of hydrocarbon leaks. Remove any soil contaminated by hydrocarbon spillage from the site promptly.
- Spill kits must be maintained and readily accessible at all operational areas across all infrastructure components. Spill kits must also be maintained and readily accessible at all active rehabilitation and closure work areas.
- During decommissioning, ensure that all residual process-affected water, slurry, and chemical inventories are removed and disposed of in a controlled manner prior to dismantling of containment infrastructure.
- Undertake surface water monitoring throughout the operational and decommissioning phases to enable change detection through regular data review relative to contaminants originating from the site.
- Develop and implement a decommissioning water management plan that addresses the controlled removal of all process-affected water and the progressive rehabilitation of dirty water management areas to prevent post-closure pollutant releases.



- Ensure the stormwater management plan remains sufficient and maintained per GN 704 and any applicable TSF-specific requirements throughout the rehabilitation and closure phase, and that drainage associated with all rehabilitated infrastructure footprints, including pipeline corridors, and plant areas, is managed accordingly.
- Maintain and operate TSFs and associated RWDs to prevent overtopping, seepage, or uncontrolled releases until such time as they are fully rehabilitated and closed.
- Monitor TSFs regularly throughout the rehabilitation and closure phase to detect any signs of instability, slumping, or unusual movement, and implement remedial actions promptly where required.
- Ensure that all residual slurry, process-affected water, and chemical inventories within pipelines, pump stations, and plant upgrade areas are removed and disposed of in a controlled manner before dismantling or abandonment of these structures.
- Decommission pipeline infrastructure in a controlled manner, ensuring that all pipeline corridors are cleared of residual fluids and that watercourse crossings are reinstated to prevent ongoing pollutant pathways.
- Avoid rehabilitation and closure activities during periods of high rainfall where practical, to limit the risk of pollutant mobilisation from exposed areas.
- Restrict all activities to within designated dirty water management areas wherever possible.
- Undertake surface water monitoring throughout the rehabilitation and closure phase to enable change detection through regular data review relative to contaminants originating from the site, and continue post-closure monitoring until background water quality conditions are demonstrably restored.

9.3.2.3 DECREASE IN RUNOFF

The proposed construction of new infrastructure will alter natural runoff patterns across the project area. During construction, decommissioning, and rehabilitation/closure, temporary alterations to runoff patterns may occur due to earthworks, infrastructure placement, and dewatering activities. These impacts are expected to be localised, short-term, and manageable through staged construction, diversion channels, and temporary containment measures.

The proposed construction of the Deelkraal II TSF and associated RWD will increase impermeable hardstanding within the project footprint; however, existing TSFs operate under a containment philosophy, incorporating selfcontained basins, toe paddocks, and associated RWDs. These systems capture and retain surface runoff within the TSF footprints, resulting in minimal discharge to the surrounding environment under normal conditions. The proposed location of the Deelkraal II TSF would additionally result in the removal of the upstream catchment contributing to the area. The proposed Deelkraal II TSF and RWD will continue this approach through the implementation of similar containment and water management infrastructure, with runoff from TSF areas expected to remain significantly reduced compared to natural pre-development conditions.

Pipeline corridors, power line servitudes, and access roads will introduce localised areas of compaction and reduced infiltration along their routes. While the individual footprint of each corridor is relatively narrow, the cumulative length of linear infrastructure across the project area means that alterations to natural drainage patterns may occur at multiple points, particularly where corridors traverse or cross natural drainage lines. These impacts are expected to be managed through the reinstatement of natural drainage patterns following pipeline installation and the maintenance of road drainage structures to prevent prolonged ponding or flow diversion.

The Kusasalethu Plant Upgrades, pump stations, and ancillary construction infrastructure will introduce additional hardstanding within largely already disturbed operational footprints. The incremental increase in impermeable surfaces associated with these facilities is expected to be limited and confined to existing disturbed areas, with a correspondingly minor effect on local runoff patterns.

A decrease in runoff is a typical impact associated with the containment of dirty areas on mines, and the mitigation of this impact is often not practical or possible, with a reduction in mean annual runoff being an



expected outcome. Overall, while the total volume of runoff leaving the site will be reduced relative to pre-development conditions, the potential environmental consequences are limited and effectively managed through robust containment, stormwater management, and adaptive operational practices across all project phases. Pre-mitigation and post-mitigation significance scores are therefore considered equivalent except for the rehabilitation.

9.3.2.3.1 IMPACT RATING

The impact ratings are provided in **Table 45**.

Table 45: Impact ratings for decreased runoff

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Decreased runoff	Construction, Operation, & Decommissioning Phase	High Negative	High Negative	High Negative
	Rehab and Closure	High Negative	Low Negative	Low Negative

9.3.2.3.2 CUMULATIVE IMPACT

The cumulative impact involves an increase in the long-term risk of contamination, primarily through enhanced seepage and surface water runoff. However, the current conditions and the additional deposition would likely result in moderate-low additional impacts on surface water from the project provided that the project aspects such as clean and dirty water diversion systems and liner installation. It is highly probable/definite that the impact will result in spatial and temporal cumulative change of potentially high significance.

9.3.2.3.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Limiting the time and area over which machinery operates will limit the compaction of soils on the site.
- Divert clean water run-on away from the TSF.
- Undertaking the activities preferably in dry conditions. Avoid construction activities during wet / rainy days or implement adequate additional controls.

9.3.2.4 **FLOOD RISK**

Flood risk is both an impact on the proposed infrastructure (flooding originating beyond the infrastructure) and on the environment (flooding originating from the infrastructure). This risk is present across all project phases, with flooding originating beyond the infrastructure relevant during construction, operational, decommissioning, and rehabilitation/closure phases, and flooding originating from the infrastructure relevant during the operational, decommissioning, and rehabilitation/closure phases.

Flood risk associated with the TSFs and RWDs manifests in two directions. Flooding originating beyond the TSFs, from either the river systems to the north or south or through surface water run-on, has the potential to compromise toe paddock and RWD storage capacity, leading to an uncontrolled spill of pollutants. This risk is expected to be mitigated to at least a degree through the addition of stormwater toe paddocks and associated bunding that hydraulically separates the TSFs from the adjacent environment. The proposed recommissioning and construction of TSFs and RWDs may influence the overall flood risk profile, with the potential for increased TSF volume to elevate the consequence of a failure event.

Flooding originating from the TSFs, resulting from a structural failure, while highly unlikely to occur, carries both flooding and pollutant implications as discussed in Section 5.3.2. The consequence of such an event is potentially severe, and it is important to recognise that the low probability of occurrence may cause the overall significance score to appear lower than the potential consequence alone would suggest.

Pipeline infrastructure introduces an additional flood risk pathway. Flooding originating beyond the TSFs, particularly from surface water run-on or river system inundation, could cause a rupture of proposed pipelines, resulting in an uncontrolled release of slurry or process-affected water into the surrounding environment. This represents feedback to Section 5.3.2 (pollutants entering the surface water environment) and should be considered in pipeline route design and flood risk assessments, particularly where pipelines are located within or adjacent to floodplains or drainage lines. Access road corridors and power line servitudes present a comparatively lower flood risk, primarily related to the potential for flow obstruction at drainage line crossings during high rainfall events.

The Kusasalethu Plant Upgrades and pump stations present a localised flood risk where these facilities are situated within or adjacent to areas of surface water run-on or natural drainage. Inundation of pump stations could interrupt the operation of water management infrastructure, with potential knock-on effects for TSF and RWD management during flood events. Ancillary construction infrastructure, including workshops and laydown areas, should be sited outside of flood-prone areas wherever possible.

The consequence of flooding is potentially severe across all infrastructure groups, particularly where a flood event triggers secondary impacts such as pollutant releases or pipeline ruptures. Pre-mitigation and postmitigation significance scores reflect the implementation of robust containment, hydraulic separation, and flood management measures across all project phases.

Important: It should be noted that the potentially severe impact of flood risk is not adequately conveyed by the impact table below since the probability of extreme flooding is low, resulting in the impact appearing less significant than may be warranted

9.3.2.4.1 IMPACT RATING

The impact ratings are provided in **Table 46**.

Table 46: River and surface water flood risk (Hydrologic, 2026)

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Flood Risk	Construction, Operational, Decommissioning, and Rehabilitation/Closure	Medium to Low Negative	Low Negative	Low Negative

9.3.2.4.2 CUMULATIVE IMPACT

The cumulative impact is primarily characterized by increased potential for overtopping, higher erosion rates, and greater magnitude of contamination during flooding events. Because gold tailings are fine-grained (silt) and often uncompacted, they are highly vulnerable to water erosion, which can lead to structural failure and the release of contaminated sediments into nearby water bodies. Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change of potentially high cumulative impact of flood risk on the surface water bodies in the. However, it should be noted that engineering designs and proper implementation of a stormwater management plan should sufficiently mitigate the cumulative flood risk impacts.

9.3.2.4.3 PROPOSED MITIGATION MEASURES

The following mitigation measures are proposed

- Ensure the stormwater management plan is sufficient and maintained per GN 704 and any applicable TSF-specific requirements across all project phases, including adequate capacity and a clear distinction between clean and dirty water diversion channels. Consider flood protection berms around the TSF and RWD where necessary.



- Ensure that flood protection of the TSFs and RWDs is sufficient to manage flood risk from both adjacent river systems to the north and south and from surface water run-on, including provision for extreme rainfall events.
- Develop the TSF, RWD, and all associated infrastructure using sound engineering principles to limit the likelihood of failure, ensuring that containment structures, spillways, and pipelines are designed with sufficient capacity for design flood events.
- Works should, where possible, not take place nor infrastructure be placed within 100 m of any defined watercourse or within the 1:100 year flood line, given the applicability of GN 704. The linear nature of pipeline infrastructure means that some watercourse crossings, proximity to watercourses, or intersection with flood lines are expected; in these instances, enhanced flood protection and crossing design measures must be applied.
- All pipeline watercourse crossings must be designed to accommodate the 1:100-year flood event, including appropriate pipe sizing, elevation above flood level, and scour protection at crossing points. Above-ground pipelines installed on pre-cast concrete plinths must make adequate allowance for flooding, whether from a river, drainage canal, furrow, or surface water runoff.
- Inspect pipeline crossings, plinth integrity, and scour protection following significant flood or rainfall events, and implement repairs promptly where damage or undermining is identified. Emergency isolation and shut-off procedures must be in place and readily accessible if a flood event causes a pipeline rupture.
- Design and maintain road drainage structures, including culverts and cut-off drains, at all watercourse crossings along access road corridors to prevent flow obstruction during flood events. Restrict access road construction within floodplains where alternative routes are available.
- Ensure pump stations are designed and located to remain operational during flood events, or that documented backup procedures exist should a pump station be inundated, to prevent disruption to TSF and RWD water management during high rainfall periods.
- Ensure plant upgrade areas, including pump stations, are protected from surface water run-on through adequate site drainage design, with drainage directed away from sensitive infrastructure and into appropriate containment.
- Monitor the TSFs and RWDs regularly to identify any signs of potential failure, slumping, or compromised flood protection capacity, and implement remedial actions promptly.
- Monitor and maintain the capacity of culverts, channels, and diversion structures across all infrastructure components to ensure the unobstructed drainage and downstream movement of water to natural watercourses.
- Progressively rehabilitate all disturbed areas to restore vegetation cover and natural runoff patterns, reducing the volume and velocity of surface water run-on towards infrastructure during rainfall events.
- Undertake post-closure monitoring of all rehabilitated infrastructure footprints and drainage structures to confirm that flood risk remains low and that natural drainage patterns have been successfully restored.

9.3.3 IMPACTS ON FRESHWATER AND WETLANDS

This section presents the identified impacts on freshwater and wetlands features as per the Aquatics and Wetlands Impact Assessment undertaken by The Biodiversity Company (TBC) (2026).

The proposed development has the potential to result in localised, and in some instances significant, disturbance to freshwater habitat, particularly within wetlands HGM 1–8 and HGM 10–12, as well as non-perennial drainage, where these features are intersected by the current project layout.



The proposed pipeline and powerline components do not require extensive direct infrastructure placement within delineated wetland footprints and, in some areas, follow existing road corridors. These components may nevertheless result in indirect impacts if not appropriately managed. Such impacts can largely be reduced through the micro-siting of linear infrastructure outside wetland buffers and, where crossings are unavoidable, by spanning wetland buffer areas or otherwise minimising the disturbance footprint.

By contrast, the proposed reclamation areas, laydown areas, stockpile areas and associated plant infrastructure, including the pump station, intersect wetlands, the non-perennial drainage line and their associated buffers, and would therefore require repositioning to avoid these sensitive areas. Most notably, the current TSF footprint would result in the complete loss of HGM 1, HGM 2 and HGM 4, and substantial loss of HGM 3, HGM 5 and HGM 6, as well as sections of non-perennial drainage. The TSF layout should therefore be redesigned to avoid these freshwater features as far as practicable; where such avoidance is not achievable, priority should be given to the rehabilitation of the remaining intact and connected freshwater systems affected by the development, with offsetting considered only as a last resort for unavoidable residual impacts.

The impacts associated with the proposed activities were assessed using the EIMS impact matrix. The assessment considers the anticipated impacts associated with the construction, operational and decommissioning phases of the proposed project. The findings indicate that impacts associated with the linear infrastructure and mining plant infrastructure components are generally of low to moderate significance prior to mitigation and can be reduced to low significance post-mitigation, provided that the recommended mitigation measures and prescribed buffer requirements are implemented. In contrast, impacts associated with the TSF development are of high significance prior to mitigation and, even with mitigation, are anticipated to remain of medium to high significance unless the layout is redesigned to avoid sensitive freshwater features as far as practicable and, where residual impacts cannot be avoided, priority is given to the rehabilitation of the remaining intact and connected freshwater systems, with offset measures considered only as a last resort.

The key management focus areas specific to the identified impacts include:

- Minimise direct disturbance to and encroachment into wetlands, drainage features and their buffers where practicable by refining the layout and micro-siting those components for which some flexibility remains, including the reclamation pump station, access arrangements, stockpile areas and other ancillary infrastructure where feasible, while recognising that certain infrastructure elements are location-constrained. Where impacts cannot be avoided, the disturbance footprint should be kept to the minimum practicable extent and supported by targeted rehabilitation of the residual and connected wetland systems, particularly HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas;
- Recognise that certain major components, including the TSF footprint and the existing return water dam to be upgraded and lined, have limited scope for relocation, and therefore require robust containment, stormwater and pollution control measures;
- Prioritise the rehabilitation of remaining impacted and hydrologically connected wetland systems, drainage features and buffer areas in order to improve ecological function and reduce cumulative degradation;
- Manage the return water dam, which is an existing facility to be upgraded and lined, as a contained system with appropriate seepage control, clean and dirty water separation, stormwater management and erosion protection;
- Limit the disturbance footprint and phase the reclamation works so that the minimum practicable area is exposed at any one time. Reclamation, construction and ancillary works must be sequenced to reduce bare ground, erosion risk and prolonged habitat disturbance.
- Maintain hydrological and geomorphological continuity at all drainage and wetland crossings by using appropriately designed crossings, above-ground pipeline supports outside active flow paths where feasible, and immediate reinstatement of bed and bank form where disturbance cannot be avoided.



- Implement strict stormwater, erosion, and sediment control measures around the TSF footprint, return water dam, pipeline corridors, roads, stockpiles, and plant upgrade areas so that sediment-laden runoff does not enter wetlands or downstream drainage lines.
- Separate clean and dirty water systems and ensure that slurry, return water and other contaminated water are fully contained within the designed system. No dirty water, seepage, sewage, hydrocarbons or waste may be allowed to enter wetlands or drainage features.
- Manage topsoil and wetland-related soils carefully by stripping separately, stockpiling outside sensitive areas, preventing compaction and contamination, and replacing soils in the correct order during rehabilitation.
- Restrict vehicles, plant and personnel to demarcated work areas and approved access routes only, with no ad hoc tracks, turning areas, laydown areas or stockpiles in wetland buffers.
- Implement progressive rehabilitation of completed sections of disturbance as soon as they become available, including regrading, decompaction, topsoil replacement, revegetation with indigenous species and alien invasive plant control.
- Control indirect ecological disturbance by limiting unnecessary vegetation clearing, managing dust, preventing fauna entrapment in excavations, limiting lighting spill into wetland areas and maintaining good housekeeping throughout all phases.
- Monitor, audit and adapt the mitigation measures throughout construction, operation and decommissioning so that any erosion, pollution, hydrological alteration or rehabilitation failure is corrected early.

9.3.3.1 INDIRECT LOSS, DISTURBANCE AND DEGRADATION OF WETLANDS

Indirect loss, disturbance, and degradation of wetlands stems from altered hydrological regimes, chronic toxic seepage, dust fallout, and runoff, progressively reducing ecosystem services and biodiversity.

9.3.3.1.1 IMPACT RATING

The impact ratings are provided in **Table 47.**

Table 47: Impacts on indirect loss and disturbance of wetlands

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Indirect loss, disturbance and degradation of wetlands	Construction	Medium to Low Negative	Low Negative	Low Negative

9.3.3.1.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.1.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Refine the layout of those project components for which some flexibility remains to minimise direct disturbance to wetlands, drainage features and their buffers as far as practicable, while recognising that major infrastructure components such as the TSF footprint and return water dam are location-constrained. Peg and demarcate all approved disturbance footprints, no-go areas and retained wetland/buffer areas before site establishment. Where impacts cannot be avoided, limit the disturbance footprint to the minimum practicable extent and implement targeted rehabilitation of the residual and hydrologically connected wetland systems, particularly HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas.
- Design and construct all crossings of drainage features and wetland margins to maintain surface and shallow subsurface flow. Use above-ground pipelines on pre-cast plinths outside wetland beds and

banks as far as practicable; span drainage lines where feasible; place supports outside active flow paths; size culverts and crossings to pass storm flows; and - reinstate bed and bank profiles immediately after installation or maintenance works.

- Sequence reclamation and associated works so that the minimum practicable area of Deelkraal I, Kusasalethu and the Deelkraal II construction footprint is disturbed at any one time. Confine vehicles, laydown areas, workshops, material storage and staff movement to approved footprints and existing or demarcated routes only. No ad hoc tracks, turning areas or stockpiles are permitted within wetland buffers. Apply speed limits near wetlands, manage dust on roads without causing runoff, and inspect open excavations daily with escape ramps where required.
- Maintain roads, culverts, stormwater outlets and access routes so that runoff is dispersed and not concentrated into wetlands or drainage lines. Use existing access routes for inspection and maintenance as far as possible; do not blade material into drainage features; avoid maintenance works during saturated conditions; and reinstate any disturbed verges, side-cast or borrow areas immediately.
- Implement progressive rehabilitation of completed sections of the TSF footprint, pipeline corridors, temporary work areas, laydown areas and decommissioned infrastructure as soon as they become available. Rip compacted surfaces, regrade to stable contours, replace topsoil, re-establish indigenous vegetation appropriate to the receiving habitat, and implement an alien invasive species control programme until acceptable cover is achieved.
- Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.

9.3.3.2 INCREASED BARE SURFACES, RUNOFF AND POTENTIAL FOR EROSION

Clearing vegetation for a Tailings Storage Facility (TSF) creates bare surfaces that drastically increase surface runoff volumes and velocities during rainstorms. This accelerates soil erosion, causing high sediment loads and contaminated chemical runoff to smother, clog, and degrade downstream wetland and aquatic ecosystems.

9.3.3.2.1 IMPACT RATING

The impact ratings are provided in **Table 48Table 47.**

Table 48: Impacts of increased bare surfaces

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Increased bare surfaces, runoff and potential for erosion	Construction	Medium to Low Negative	Low Negative	Medium to Low Negative

9.3.3.2.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.2.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Implement a stormwater, erosion and sediment control plan for the TSF footprint, return water dam, road verges, pipeline corridors, stockpiles and plant upgrade areas. Install cut-off drains, berms, silt traps, sediment barriers and energy dissipaters before major earthworks commence. Stabilise exposed

slopes, protect stockpiles, prevent concentrated runoff, and repair erosion features immediately when they develop.

- Sequence reclamation and associated works so that the minimum practicable area of Deelkraal I, Kusasalethu and the Deelkraal II construction footprint is disturbed at any one time. Confine vehicles, laydown areas, workshops, material storage and staff movement to approved footprints and existing or demarcated routes only. No ad hoc tracks, turning areas or stockpiles are permitted within wetland buffers. Apply speed limits near wetlands, manage dust on roads without causing runoff, and inspect open excavations daily with escape ramps where required.
- Maintain roads, culverts, stormwater outlets and access routes so that runoff is dispersed and not concentrated into wetlands or drainage lines. Use existing access routes for inspection and maintenance as far as possible; do not blade material into drainage features; avoid maintenance works during saturated conditions; and reinstate any disturbed verges, side-cast or borrow areas immediately.
- Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.

9.3.3.3 DEGREDATION OF WETLAND VEGETATION AND PROLIFERATION OF ALIEN SPECIES

Degradation of wetland vegetation and the spread of alien plants around a Tailings Storage Facility (TSF) cause environmental harm. These impacts reduce biodiversity, alter natural water flow, and weaken wetland structures, which can lead to toxic acid mine drainage or heavy metal pollution leaking into local water sources.

9.3.3.3.1 IMPACT RATING

The impact ratings are provided in **Table 49 Table 47.**

Table 49: Impacts of degradation of wetland vegetation

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Construction	Medium to Low Negative	Low Negative	Medium to Low Negative
	Operation	Medium to Low Negative	Low Negative	Medium to Low Negative

9.3.3.3.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.3.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Strip topsoil separately from subsoil in dry conditions, keep wetland-related soils separate from general fill, and stockpile all soils outside wetlands and approved buffers. Protect stockpiles from erosion, compaction and contamination. Replace soils in the correct order during rehabilitation and do not use wetland soils for berms, access roads or general fill.
- Sequence reclamation and associated works so that the minimum practicable area of Deelkraal I, Kusasalethu and the Deelkraal II construction footprint is disturbed at any one time. Confine vehicles, laydown areas, workshops, material storage and staff movement to approved footprints and existing or demarcated routes only. No ad hoc tracks, turning areas or stockpiles are permitted within wetland

buffers. Apply speed limits near wetlands, manage dust on roads without causing runoff, and inspect open excavations daily with escape ramps where required.

- Implement progressive rehabilitation of completed sections of the TSF footprint, pipeline corridors, temporary work areas, laydown areas and decommissioned infrastructure as soon as they become available. Rip compacted surfaces, regrade to stable contours, replace topsoil, re-establish indigenous vegetation appropriate to the receiving habitat, and implement an alien invasive species control programme until acceptable cover is achieved.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.

9.3.3.4 INCREASED SEDIMENT LOADS TO DOWNSTREAM REACHES

Increased sediment loads downstream of a TSF can cause physical, chemical, and ecological degradation. Runoff from unmanaged slopes or minor operational spills elevates turbidity, smothers aquatic habitats, and transports heavy metals into local wetland systems.

9.3.3.4.1 IMPACT RATING

The impact ratings are provided in **Table 50.**

Table 50: Impacts of increased sediment loads

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Increased sediment loads to downstream reaches	Construction and decommissioning	Medium to Low Negative	Low Negative	Medium to Low Negative

9.3.3.4.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.4.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Implement a stormwater, erosion and sediment control plan for the TSF footprint, return water dam, road verges, pipeline corridors, stockpiles and plant upgrade areas. Install cut-off drains, berms, silt traps, sediment barriers and energy dissipaters before major earthworks commence. Stabilise exposed slopes, protect stockpiles, prevent concentrated runoff, and repair erosion features immediately when they develop.
- Sequence reclamation and associated works so that the minimum practicable area of Deelkraal I, Kusasalethu and the Deelkraal II construction footprint is disturbed at any one time. Confine vehicles, laydown areas, workshops, material storage and staff movement to approved footprints and existing or demarcated routes only. No ad hoc tracks, turning areas or stockpiles are permitted within wetland buffers. Apply speed limits near wetlands, manage dust on roads without causing runoff, and inspect open excavations daily with escape ramps where required.
- Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of

all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.

- Refine the layout of those project components for which some flexibility remains to minimise direct disturbance to wetlands, drainage features and their buffers as far as practicable, while recognising that major infrastructure components such as the TSF footprint and return water dam are location-constrained. Peg and demarcate all approved disturbance footprints, no-go areas and retained wetland/buffer areas before site establishment. Where impacts cannot be avoided, limit the disturbance footprint to the minimum practicable extent and implement targeted rehabilitation of the residual and hydrologically connected wetland systems, particularly HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas.
- Design and construct all crossings of drainage features and wetland margins to maintain surface and shallow subsurface flow. Use above-ground pipelines on pre-cast plinths outside wetland beds and banks as far as practicable; span drainage lines where feasible; place supports outside active flow paths; size culverts and crossings to pass storm flows; and - reinstate bed and bank profiles immediately after installation or maintenance works.
- Strip topsoil separately from subsoil in dry conditions, keep wetland-related soils separate from general fill, and stockpile all soils outside wetlands and approved buffers. Protect stockpiles from erosion, compaction and contamination. Replace soils in the correct order during rehabilitation and do not use wetland soils for berms, access roads or general fill.

9.3.3.5 CONTAMINATION OF WETLANDS WITH HYDROCARBONS DUE TO MACHINERY LEAKS AND EUTROPHICATION OF WETLAND SYSTEMS WITH HUMAN SEWERAGE AND OTHER WASTE

Contamination of wetlands by hydrocarbons near a TSF typically originates from operational machinery leaks, fuel storage, or transport vehicle spills. This causes water quality degradation, suffocates wetland flora and fauna, and disrupts delicate hydrologic and soil functions.

9.3.3.5.1 IMPACT RATING

The impact ratings are provided in **Table 51**

Table 51: Impacts of Wetland Contamination

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Wetland Contamination	Construction	Medium to Low Negative	Low Negative	Medium to Low Negative

NOTE: Final score is higher that post mitigation score due to potential cumulative and residual impacts.

9.3.3.5.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.5.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Store fuels, oils and chemicals in bunded areas outside wetland buffers; refuel and service plant only at designated areas on impermeable surfaces; provide drip trays and spill kits on mobile plant; collect sewage in sealed systems; remove waste regularly; and implement a spill response procedure that prevents contaminated water, hydrocarbons, sewage or waste from entering wetlands or drainage lines.
- Maintain the TSF, return water dam and associated slurry and return water pipelines as contained systems. Inspect pipe joints, supports, valves and plinths; maintain freeboard and stormwater capacity; repair leaks immediately; keep return water infrastructure operational; and implement isolation and emergency shutdown procedures where pipelines approach wetlands or drainage features. No overtopping, seepage breakout or dirty water discharge is permitted to wetland systems.



- Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.

9.3.3.6 ALTERATION OF HYDROLOGICAL REGIME

Altering natural surface and groundwater regimes changes local water flows, volumes, and quality, which can cause downstream erosion, reduced river baseflows, and aquatic habitat loss.

9.3.3.6.1 IMPACT RATING

The impact ratings are provided in **Table 52**

Table 52: Impacts of altered hydrological regime

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Altered hydrological regime	Construction	Medium to Low Negative	Low Negative	Low Negative
	Operations	Medium to Low Negative	Low Negative	Medium to Low Negative

NOTE: Final score is higher that post mitigation score due to potential cumulative and residual impacts.

9.3.3.6.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.6.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Refine the layout of those project components for which some flexibility remains to minimise direct disturbance to wetlands, drainage features and their buffers as far as practicable, while recognising that major infrastructure components such as the TSF footprint and return water dam are location-constrained. Peg and demarcate all approved disturbance footprints, no-go areas and retained wetland/buffer areas before site establishment. Where impacts cannot be avoided, limit the disturbance footprint to the minimum practicable extent and implement targeted rehabilitation of the residual and hydrologically connected wetland systems, particularly HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas.
- Design and construct all crossings of drainage features and wetland margins to maintain surface and shallow subsurface flow. Use above-ground pipelines on pre-cast plinths outside wetland beds and banks as far as practicable; span drainage lines where feasible; place supports outside active flow paths; size culverts and crossings to pass storm flows; and - reinstate bed and bank profiles immediately after installation or maintenance works.
- Maintain the TSF, return water dam and associated slurry and return water pipelines as contained systems. Inspect pipe joints, supports, valves and plinths; maintain freeboard and stormwater capacity; repair leaks immediately; keep return water infrastructure operational; and implement isolation and emergency shutdown procedures where pipelines approach wetlands or drainage features. No overtopping, seepage breakout or dirty water discharge is permitted to wetland systems.
- Maintain roads, culverts, stormwater outlets and access routes so that runoff is dispersed and not concentrated into wetlands or drainage lines. Use existing access routes for inspection and

maintenance as far as possible; do not blade material into drainage features; avoid maintenance works during saturated conditions; and reinstate any disturbed verges, side-cast or borrow areas immediately.

- Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.
- Implement a stormwater, erosion and sediment control plan for the TSF footprint, return water dam, road verges, pipeline corridors, stockpiles and plant upgrade areas. Install cut-off drains, berms, silt traps, sediment barriers and energy dissipaters before major earthworks commence. Stabilise exposed slopes, protect stockpiles, prevent concentrated runoff, and repair erosion features immediately when they develop.

9.3.3.7 DEGRADATION AND DEMOLITION OF WETLANDS DUE TO TSF AND INTERSECTING INFRASTRUCTURE

Wetland degradation and loss caused by direct footprints, pollution seepage, and intersecting infrastructure like pipelines, roads, and powerlines can alter local hydrology, fragment aquatic habitats, and introduce heavy metals or acidic runoff.

9.3.3.7.1 IMPACT RATING

The impact ratings are provided in **Table 53**

Table 53: Impacts of degradation and demolition of wetlands due to TSF and intersecting infrastructure

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Degradation and demolition of wetlands due to TSF and intersecting infrastructure	Construction and Operations	High Negative	Medium to High Negative	High Negative
	Decommissioning	Medium to Low Negative	Low Negative	Medium to Low Negative

9.3.3.7.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.7.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Refine the layout of those project components for which some flexibility remains to minimise direct disturbance to wetlands, drainage features and their buffers as far as practicable, while recognising that major infrastructure components such as the TSF footprint and return water dam are location-constrained. Peg and demarcate all approved disturbance footprints, no-go areas and retained wetland/buffer areas before site establishment. Where impacts cannot be avoided, limit the disturbance footprint to the minimum practicable extent and implement targeted rehabilitation of the residual and hydrologically connected wetland systems, particularly HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns,

stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.

9.3.3.8 INCREASED WATER AND POLLUTANT INPUTS TO WETLANDS

Increased water and pollutant inputs to adjacent wetlands cause severe hydrological disruption and chemical toxicity. Runoff and seepage introduce heavy metals, high salinity, elevated sulphates, and sediments, resulting in soil acidification, loss of native flora and fauna, and the collapse of wetland filtering capacity.

9.3.3.8.1 IMPACT RATING

The impact ratings are provided in **Table 54**

Table 54: Impacts of water and pollutant inputs to wetlands

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Increased water and pollutant inputs to wetlands	Operations	Medium to Low Negative	Low Negative	Medium to Low Negative

9.3.3.8.2 CUMULATIVE IMPACT

Cumulative wetlands impacts are described in Section 9.3.3.9 below.

9.3.3.8.3 PROPOSED MITIGATION MEASURES

The following mitigation measures have been recommended:

- Store fuels, oils and chemicals in bunded areas outside wetland buffers; refuel and service plant only at designated areas on impermeable surfaces; provide drip trays and spill kits on mobile plant; collect sewage in sealed systems; remove waste regularly; and implement a spill response procedure that prevents contaminated water, hydrocarbons, sewage or waste from entering wetlands or drainage lines.
- Maintain the TSF, return water dam and associated slurry and return water pipelines as contained systems. Inspect pipe joints, supports, valves and plinths; maintain freeboard and stormwater capacity; repair leaks immediately; keep return water infrastructure operational; and implement isolation and emergency shutdown procedures where pipelines approach wetlands or drainage features. No overtopping, seepage breakout or dirty water discharge is permitted to wetland systems.
- Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.
- Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.

9.3.3.9 CUMULATIVE WETLANDS IMPACTS

The cumulative impact on wetlands from is generally characterized as a long-term, compounding degradation of water quality and ecosystem health with a potentially high significance. Because majority of the gold TSFs are unlined or poorly lined, increased deposition amplifies the volume of contaminants, leading to severe, persistent pollution of surrounding wetlands for decades. Therefore, the cumulative impact on freshwater and wetlands is anticipated to be moderate-high. However, as per the proposed project aspects including lining of the RWD,

lining of the TSF, clean and dirty water separations, it is anticipated that the cumulative impact will be reduced to mostly moderate negative significance.

9.3.4 AIR QUALITY IMPACTS

This section presents the identified air quality impacts as per the Air Quality Impact Assessment undertaken by Airshed Planning Professionals (Airshed) (2026).

The main pollutant of concern from construction operations is particulate matter, including PM10, PM2.5 and TSP. PM10 and PM2.5 concentrations are associated with potential health impacts due to the size of the particulates being small enough to be inhaled. Nuisance effects are caused by the TSP fraction (20 µm to 75 µm in diameter) resulting in soiling of materials and visibility reductions. This could in effect also have financial implications due to the requirement for more cleaning materials.

All activities associated with the construction phase of the have their own duration and potential for dust generation. It is therefore often necessary to estimate area wide construction emissions, without regard to the actual plans of individual construction process. Dispersion simulation was not undertaken for construction emissions since a construction schedule was not known. Impacts from construction operations are usually lower than operational phase due to their temporary nature and duration, and the likelihood that these activities will not occur concurrently at all portions of the site.

Sources of emissions for the current operations at Deelkraal and Kusasalethu Mines include wind erosion of the existing Deelkraal and Kusasalethu WRDs and TSFs. The proposed operations include two new stacks at the Kusasalethu plant, and wind erosion from the existing Kusasalethu TSF and WRD and the proposed Deelkraal II TSF including two new Topsoil dumps. Sources of emissions for the cumulative scenario include the active ventilation shafts, materials handling points, crushing and screening, vehicle entrainment on unpaved roads, and windblown dust from the TSFs and Marginal Ore Dumps (MODs) from the existing Savuka and Mponeng mines. These sources were identified from a previous West Wits Study and Google Earth locations provided by EIMS. The total emissions from current and future scenarios operations are provided in **Table 55**. The addition of the Deelkraal II TSF and the two process stacks will have an increase in PM emissions of 82% (PM2.5), 77% (PM10) and 87% (TSP). Cumulatively, including the Savuka and Mponeng mining and processing operations, the increase in PM emissions will be less at 37% (PM2.5), 44% (PM10) and 54% (TSP).

Table 55: Emissions in tonnes per annum (tpa) for the various scenarios

Scenarios	PM2.5 (tpa)	PM10 (tpa)	TSP (tpa)
Current – West Wits Operations	37.54	166.22	394.18
Future – Proposed Operations West Wits	209.92	730.05	2 984.26
Future Cumulative – Proposed Operations West Wits and Existing Savuka & Mponeng Operations	562.98	1 664.12	5 542.44

The simulated PM2.5 24-hour concentrations are within compliance with the National Ambient Air Quality Standards (AAQS) - 4 days of exceedance of 40 µg/m3 - at all the AQSRs, for both current and future operations (). The annual PM2.5 concentrations for current (**Figure 61**) and future (**Figure 62**) operations are also within compliance with the NAAQS.

The additional emissions due to the Deelkraal II TSF and Kusasalethu plant would result on average in a 29% increase in daily GLCs at the various AQSRs, and a 14% increase annually when taking existing sources from Savuka and Mponeng into account but still falling within compliance with the NAAQS.

The simulated daily average dustfall rates with the current operations does not exceed the NDCR limit for residential areas (600 mg/m²-day). The limit for agricultural areas is exceeded for up to 1.7 km to the south-southwest from the existing dormant TSF at Deelkraal and up to 1.95 km south-southwest from the inactive TSF at Kusasalethu (**Figure 63**). The simulated daily average dustfall rates for the future operations show similar impact areas to the current operations but with exceedance of the agricultural limit for up to 4.7 km from the proposed Deelkraal II TSF, and average increase of 56% when taking exiting sources from Savuka and Mponeng into account. (**Figure 64**).

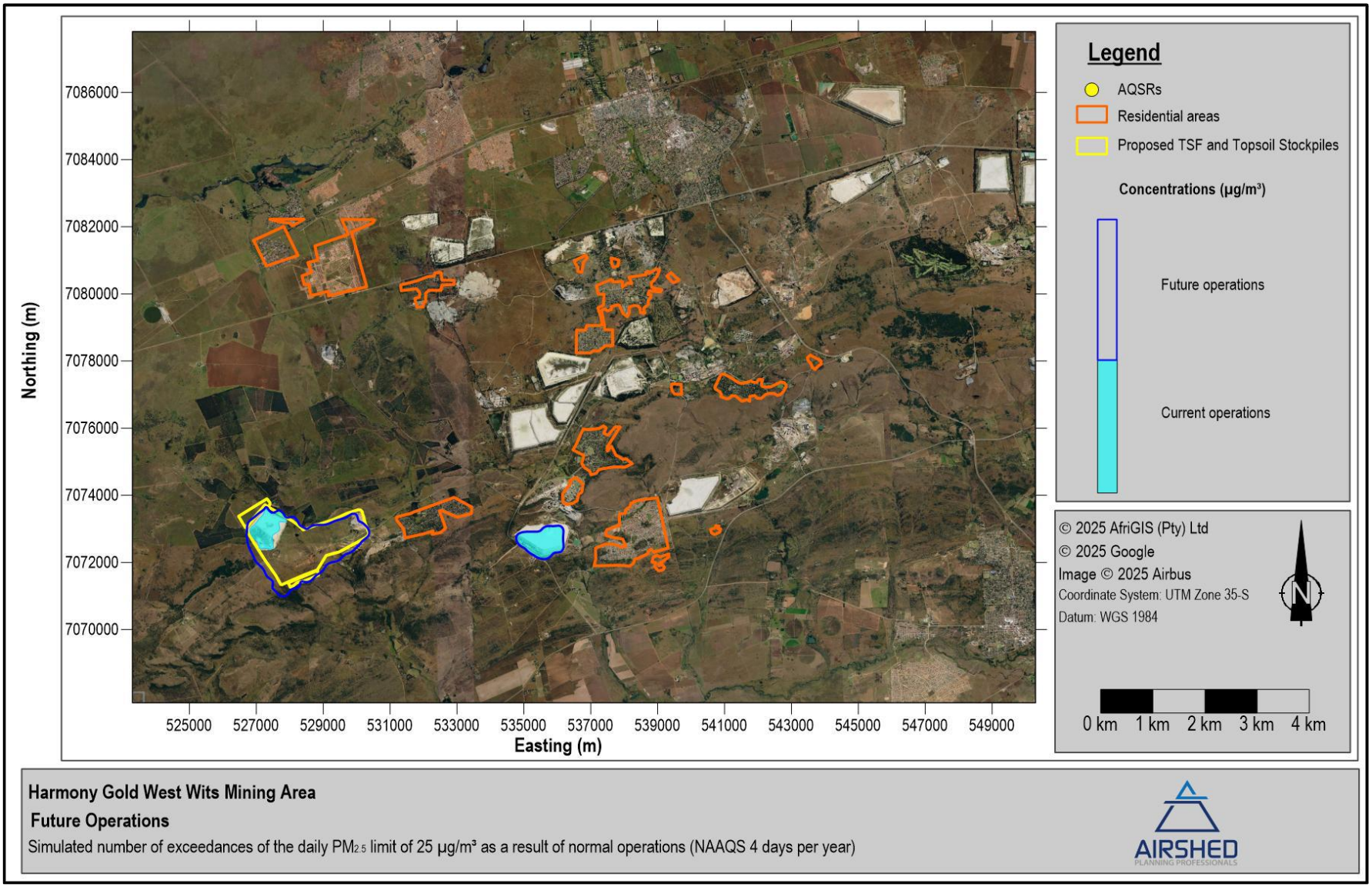


Figure 60: Simulated area of exceedance of the 24-hour PM2.5 NAAQS as a result of current and future operations with mitigation measures applied

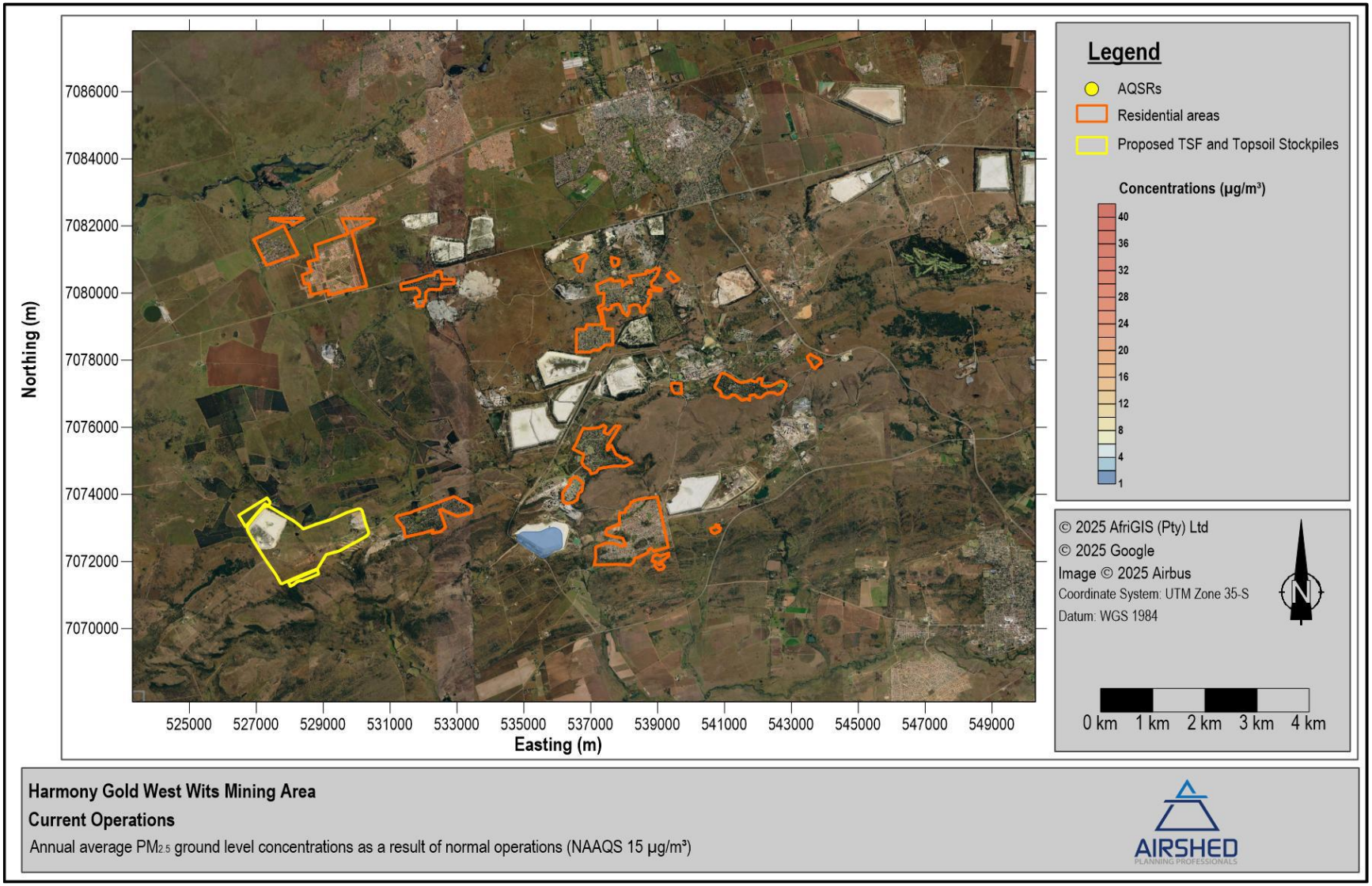


Figure 61: Simulated annual average PM2.5 concentrations as a result of current operations

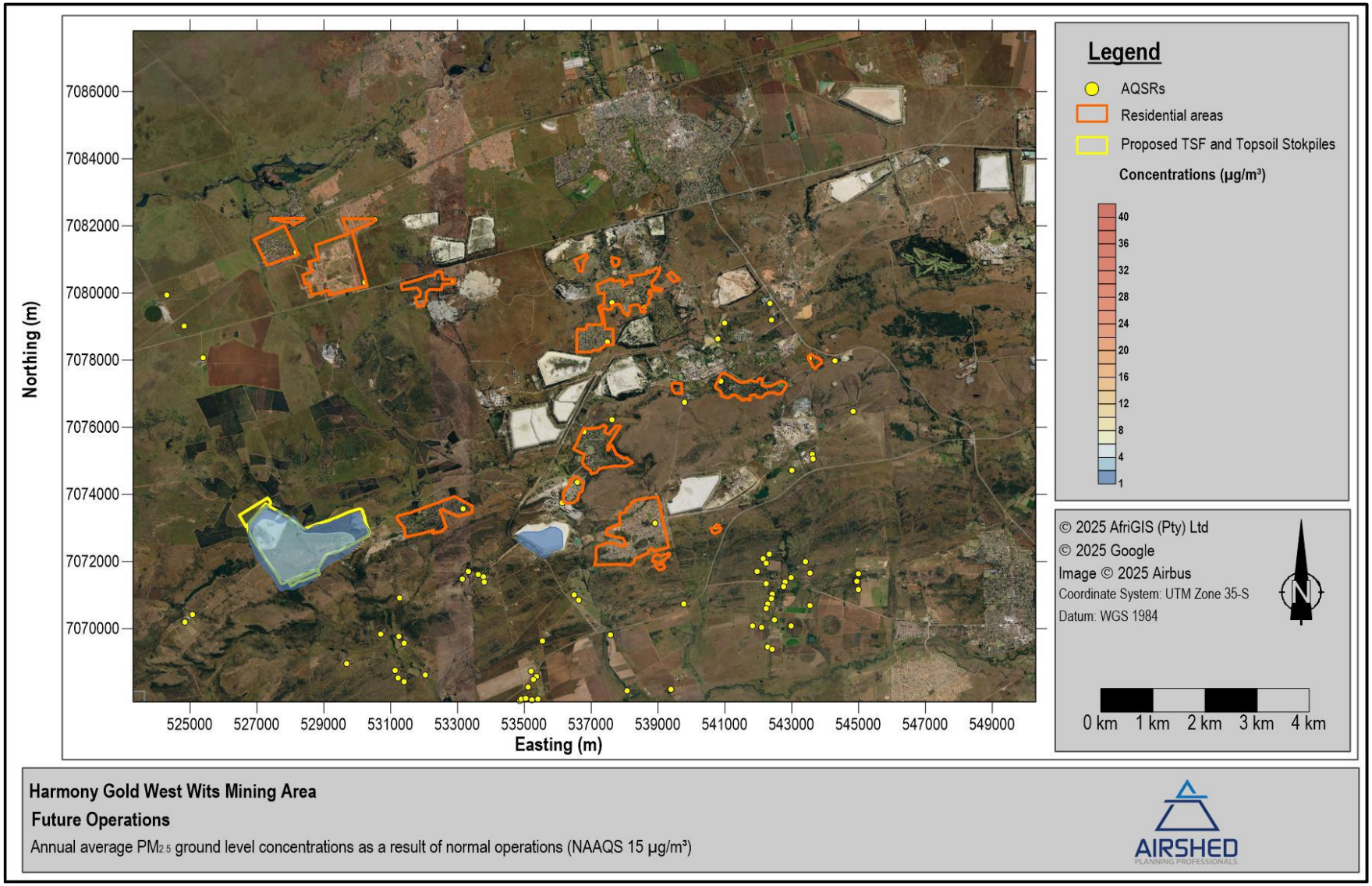


Figure 62: Simulated annual average PM2.5 concentrations as a result of future operations

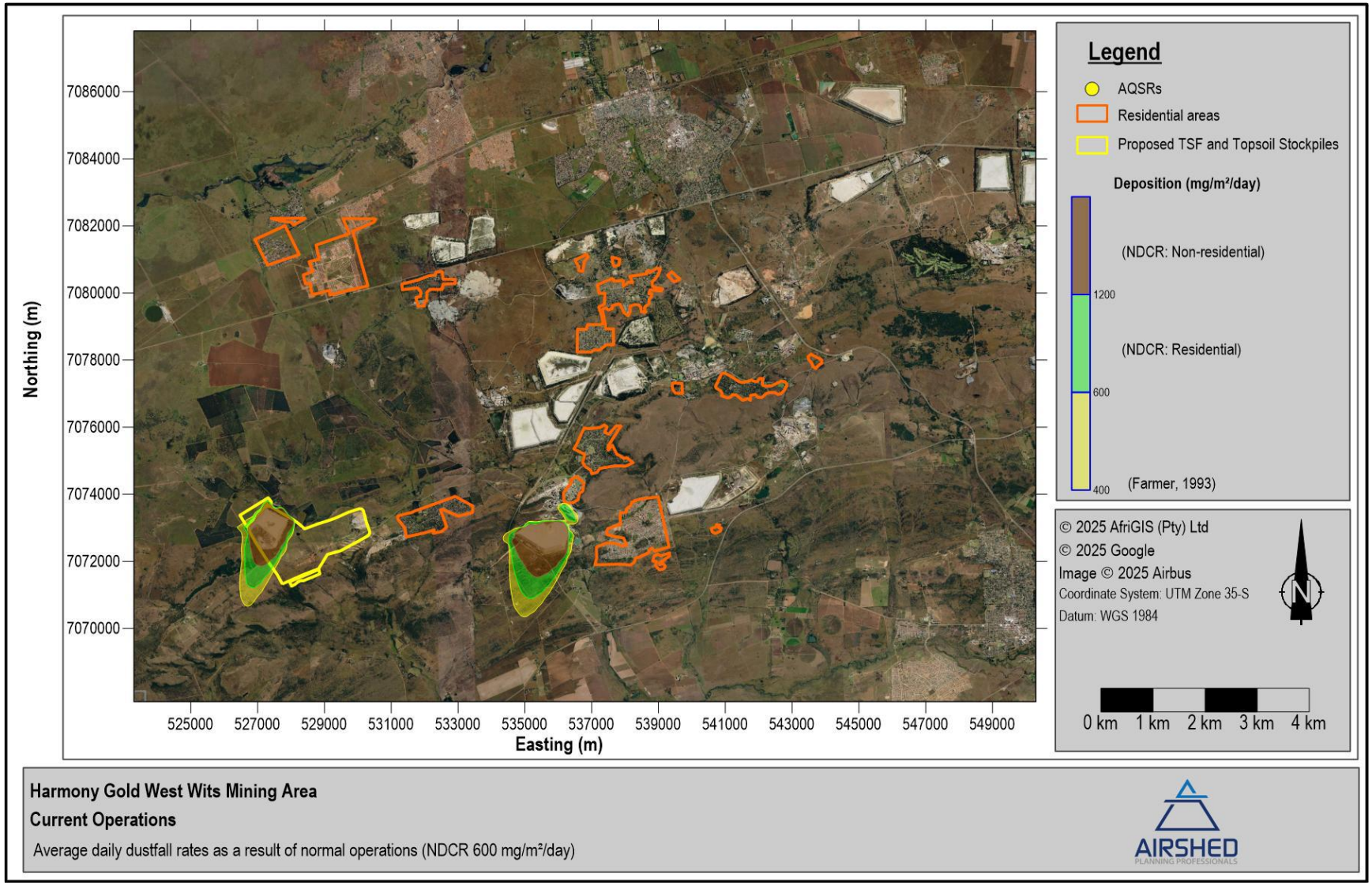


Figure 63: Simulated average daily dustfall rates as a result of current operations

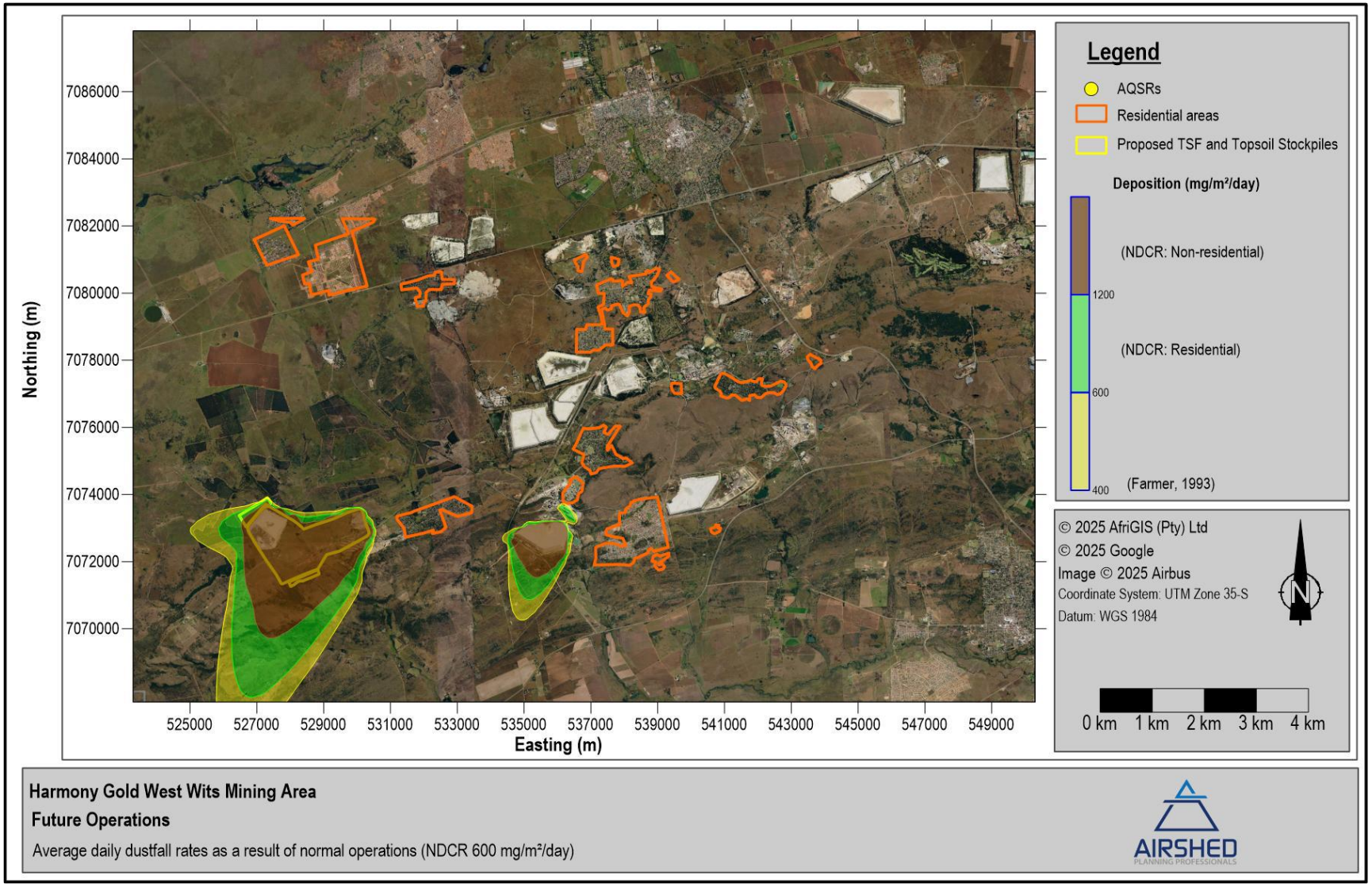


Figure 64: Simulated average daily dustfall rates as a result of future operations

9.3.4.1 **IMPACT RATING**

The impact ratings are provided in **Table 56**.

Table 56: Air quality impact assessment table.

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Increase in air quality impacts due to upgrades at Kusasalethu and deposition on Deelkraal II TSF	Operation	Medium to High Negative	Low Negative	Low Negative

In assessing the mitigated impact, it is assumed that the slopes of the TSF will be vegetated, and a control efficiency of 40% can be achieved. It is assumed that the deposition process will be wet (slurry) and 50% control efficiency for water sprays keeping ore wet at the secondary rushing and screening.

9.3.4.1.1 CUMULATIVE IMPACT

Air quality impacts are cumulative by nature. The current mining and processing operations at Mponeng and Savuka mines and operations were modelled to reflect the cumulative PM concentrations in the area, specifically at the nearby receptors.

9.3.4.1.2 PROPOSED MITIGATION MEASURES

With the potential impacts from windblown dust from the active TSFs, especially for the proposed Deelkraal II TSF, the following recommendations are proposed:

- Dustfall monitoring should continue to ensure dustfall rates comply with the NDCR limits;
- Dust fallout monitor unit DK 1 should be moved to the south-western boundary of the nearby Deelkraal town.
- A new dust fallout monitor unit be placed on the south-western boundary of the proposed Deelkraal II TSF.
- Grassing of TSF side slopes will be required.

9.3.5 CLIMATE CHANGE IMPACTS

A Climate Change Assessment (CCA) was conducted to determine the potential long term climate change impacts as a result of the Current-, Construction- and Project operations. Greenhouse gas (GHG) emissions for the project were calculated based on the Department of Forestry, Fisheries and Environment (DFFE) 2022 Methodological guidelines for quantification of GHG emissions which are based on the Intergovernmental Panel on Climate Change (IPCC) emission factors. This study considered Scope1, Scope 2 and Scope 3 emissions, where Scope 1 are the emissions directly attributable to the project and Scope 2 emissions are the emissions associated with bought-in electricity. Scope 3 emissions consider the “embedded” carbon in bought-in materials and transport as well as the use of exported materials.

The findings of the assessment are summarised below:

- The region around Carletonville, where the project will be developed, is likely to experience increased temperatures and extreme weather-related events in the future. Climate change impacts will disproportionately affect underdeveloped communities that lack the physical and financial resources to cope with the physical effects of climate change, such as droughts, floods and increases in diseases.
- Scope- 1, 2 and 3 emissions were estimated based on emission factors and expected construction activities, and production rates or raw material use. The main construction activities attributed to GHG

emissions are the development of the new Deelkraal II TSF and the refurbishment of the Kusasalethu Gold plant.

- The Kusasalethu processing plant is currently under care and maintenance and activities are limited to asset preservation, preventative maintenance and operation of essential services. Quantified greenhouse gas (GHG) emissions from the current operations are mainly Scope 2 emissions (95%) with little contribution from Scope 1 (1%) and Scope 3 (4%).
- Construction operations would only result in Scope 3 emissions with all Scope 1 and Scope 2 falling under current operations. Scope 3 emissions from the Construction of the proposed Deelkraal II TSF would result in 131 085 t CO2e per annum while 21 149 t CO2e per annum will result from the refurbishment of the Kusasalethu Gold plant.
- During future operations, the electricity bought from ESKOM (Scope 2) is the main source, followed by Scope 3 emissions (which is 2% more than Scope 1 emissions). The main source of Scope 3 GHG emissions would be upstream transportation (63% of Scope 3 emissions), followed by Capital goods/ assets (incoming) at 15% and Employee commuting (13%).
- Construction of the proposed project in combination with the current operational-related GHG emissions will have a Very Low negative risk.

Based on information provided, the project is likely to result in an estimated total of 9 557 t CO2e per annum direct emissions (Scope 1) and 162 249 t CO2e per annum indirect emissions (Scope 2) due to operational activities, with 9 749 t CO2e per annum indirect (Scope 3) emissions. The GHG emissions from the project for the operation was calculated to represent 0.054% of the remaining South African annual budget for 2035.

9.3.5.1 IMPACT RATING

The impact ratings are provided in **Table 57**.

Table 57: Climate Change impact assessment table.

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Impact of climate change as a result of the project	Construction	Low Negative	Low Negative	Low Negative
	Operation	Medium to High Negative	Medium to High Negative	Medium to High Negative

9.3.5.2 CUMULATIVE IMPACT

Climate change impacts are by their nature cumulative. The overall cumulative impact is expected to be low negative during construction and medium negative during operation.

9.3.5.3 PROPOSED MITIGATION MEASURES

The following mitigation is proposed:

- The project will be required to report CO2e emissions annually via the NAEIS.
- The projected increase in rainfall should be considered in the TSF design which may pose a risk to the structural stability in future.
- Contingencies for very hot days and extreme rainfall days should be built into emergency response plans and EMP for the mine.

9.3.6 HEALTH AND RADIATION IMPACTS

The main objective of the radiological public safety assessment is to assess the potential impact on members of the public that may occur during the operational phase of the Project, with due consideration of the impact that may occur during the post-closure phase. How members of the public are exposed to ionising radiation induced



by the Project may be different depending on the operational conditions and the specific point in time (either present or future).

Sources of radiation exposure to members of the public associated with mining and mineral processing facilities are often advertently induced. Although the key elements responsible for radiation exposure are naturally occurring radionuclides, human-induced conditions and activities may enhance concentrations of naturally occurring radionuclides in the accessible environment. Alternatively, the potential for human exposure to naturally occurring radionuclides in products, by-products, residues, and other wastes may be enhanced by moving these radionuclides from inaccessible locations to locations where humans can be subject to radiation exposure.

To pose a radiological risk to members of the public and the environment, the naturally occurring radionuclides must first be released from the sources of radiation exposure into the environment. As used here, sources refer to any entity that contains radioactivity and has the potential to release radioactivity into the environment. Release mechanisms can be generalised into the following natural and human-induced conditions:

- The release of radionuclides through natural conditions:
    - Solid release (e.g., windblown dust);
    - Water-mediated release (e.g., leaching through tailings storage facility); and
    - Gas-mediated release (e.g., radon gas exhalation).
- Direct gamma radiation; and
- Controlled or uncontrolled releases of radionuclides as solids or liquids into the environment.

Controlled releases are human-induced as part of the normal operating conditions, while uncontrolled releases are associated with accidents and incidents that are outside the scope of normal operating conditions (e.g., excessive water erosion, pipeline bursts, releases from storage dams overflowing their capacity, or the breaking of dam walls).

A distinction can be made between primary and secondary sources of radiation exposure. The primary sources are associated with physical features or entities at a mining and mineral processing operation, with the potential of naturally occurring radionuclides to be released into the environment. Examples of primary sources that are generally associated with mining and mineral processing operations include:

- Tailings Storage Facilities (TSFs), Waste Rock Dumps (WRDs) or any other stockpile facility used to store waste or other residue material on the surface, from which naturally occurring radionuclides may be dispersed in solid (dust), liquid (seepage), or gaseous (radon gas) form;
- Open pits that developed following open cast mining to extract rock or minerals from the orebody, from which naturally occurring radionuclides may be dispersed in solid (dust), liquid (seepage), or gaseous (radon gas) form;
- Mineral processing activities, where radioactive gasses and dust may be released from the commination (e.g., crushing, milling, and screening) and beneficiation of ore containing radionuclides;
- Water management facilities (e.g., return water dams, process control dams, and evaporation ponds), used to manage excess water generated through mining, mineral processing, and residue disposal activities, and where water may be released to the environment;
- Materials handling activities (e.g., the transfer of material containing naturally occurring radionuclides from one point or facility to another), during which radioactive dust may be released to the environment; and
- Mine ventilation shafts increase airflow in underground workings, where gasses and dust generated underground may be released with the outflowing air.



Radioactivity released from the primary sources into the environment may accumulate in the physical compartments of the environmental system (e.g., groundwater, surface water bodies, surface soils, sediments, etc.), potentially resulting in what can be termed secondary sources of radiation exposure. The following serve as examples of secondary radiation sources:

- Continuous deposition and accumulation of naturally occurring radionuclides associated with airborne dust or contaminated irrigation water on surface soils, resulting in the development of a secondary source at the soil surface;
- Continuous deposition of naturally occurring radionuclides associated with airborne dust in a surface water body, resulting in the development of a secondary source in the sediments and surface water body;
- Uncontrolled release of contaminated mine residue (e.g., tailings material) through surface water erosion of existing TSFs or other stockpile facilities;
- Uncontrolled release (e.g., spillage) of contaminated mine residue (e.g., tailings material) or water on surface soils from pipelines or storage dams, resulting in the development of a secondary source at the soil surface; or
- Uncontrolled release (e.g., spillage) of contaminated mine residue (e.g., tailings material) or water in a surface water body from pipelines or storage dams (as appropriate), resulting in the development of a secondary source in the sediments and surface water body.

Members of the public may potentially be subject to radiation exposure from both primary and secondary sources at a mining and mineral processing operation, with expected differences in modes and duration of exposure.

Given the nature of a mining and mineral processing operation, the definition of an exposure condition depends on several factors, such as:

- Different exposure conditions may be of importance during different phases of the mining and mineral processing operation;
- Exposure conditions may vary depending on variations in the operational conditions on a site-specific basis;
- Different sources of radiation exposure (e.g., a point or diffuse sources) may result in different exposure conditions to receptors;
- The importance of environmental (e.g., atmospheric, surface water or groundwater) or direct exposure pathways depends on the characteristics of sources and human behavioural characteristics; or
- Variations in human behavioural conditions near the mining and mineral processing operation may result in different exposure conditions of concern.

With due consideration of the sources, pathways and receptors and consistent with the exposure groups defined for the Free State Operations RPSA, the following two public exposure conditions can be defined to evaluate the potential radiological impact of the Projects to members of the public under normal operating conditions:

- Residential Area Exposure Condition; and
- Commercial Agricultural Exposure Condition.

More exposure conditions can be defined that would be relevant to the area. The key point of judgment on whether the discrete set of exposure conditions is representative of the radiological public safety assessment is whether potential receptors of radiation exposure can relate to at least one of these exposure conditions. The potential radiation exposure to nearby industry workers, for example, will be less than those members of the public residing in residential areas. Similarly, the potential radiation exposure to small-scale agricultural farmers

on smallholdings, for example, would be less than a conservatively defined Commercial Agricultural Exposure Condition.

Residential Area Exposure Condition

Figure 65 presents the total effective dose isopleths for the 0 to 2 years age group, which receives the highest total effective dose of the 5 age categories. The approximate locations of the closest residential receptors are indicated on the maps with blue and white dots. The figure shows that the distribution of the total effective dose across the affected areas is consistent with contributions from the atmospheric pathway (i.e., PM10, TSP, and radon), with ingestion being the dominant contributor, followed by radon inhalation.

Commercial Agricultural Exposure Condition

As seen from the available results, dose concentrations decrease significantly with increasing distance from the associated facilities. A comparison of assessment results in **Figure 66** shows that at the 11 receptor locations, ingestion is the major contributor to the total effective dose, followed by external exposure. This could be attributed directly to the high TSP deposition rate associated with the Deelkraal II TSF. In fact, the maximum total effective doses outside the footprint of the Deelkraal II TSF are as high as 850 µSv.year-1, which is considerably higher than the dose constraint of 250 µSv.year-1. The contributions from all remaining routes are considered low to insignificant.

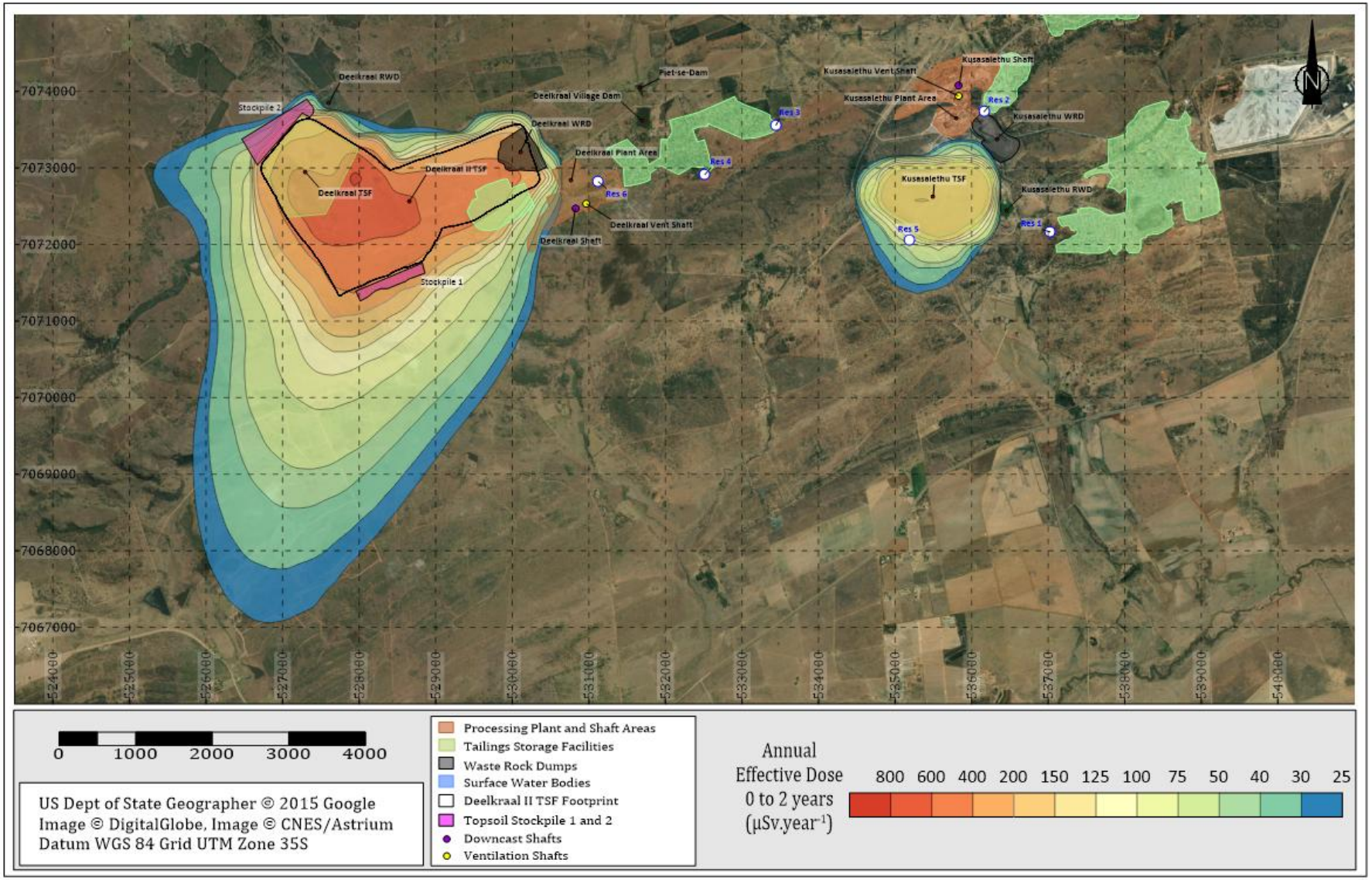


Figure 65: Dose isopleths for the 0 to 2 years age group depicting the contribution of the Project to a Residential Area Exposure Condition

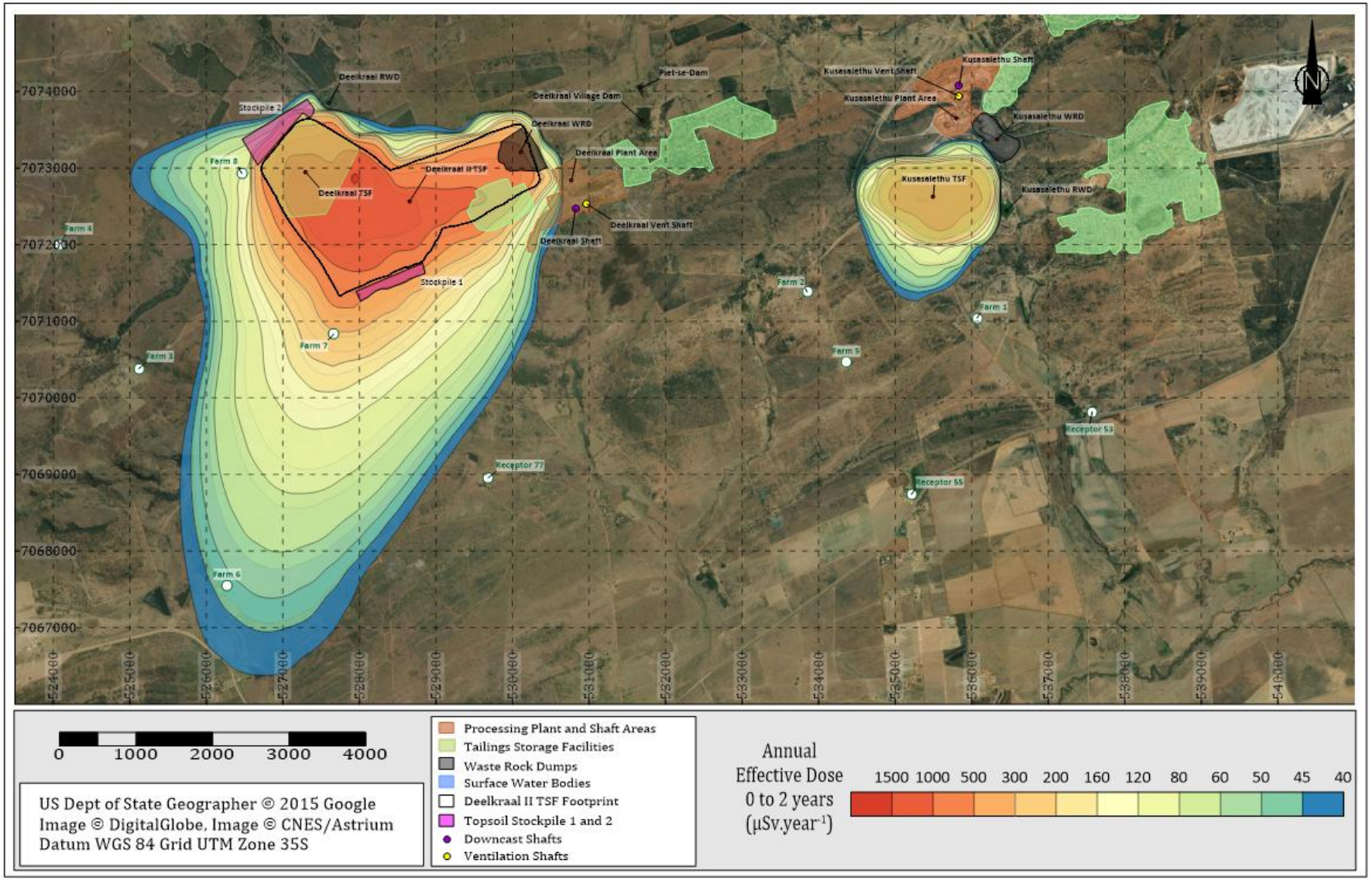


Figure 66: Dose isopleths for the adult age group depicting the contribution of the Project to a Commercial Agricultural Exposure Condition



9.3.6.1 CONSTRUCTION PHASE RADIOLOGICAL IMPACTS

Activities performed in these areas during the construction phase will not induce a potential radiological impact on members of the public since the activities do not involve the handling, processing, or releasing of radioactive material to the environment per se. This means that the potential radiological impact on members of the public through the relevant pathway during the construction phase is negligible.

9.3.6.2 OPERATIONAL PHASE RADIOLOGICAL IMPACTS

The radiological impact assessment for the operational phase considers the potential contribution through all three environmental pathways (i.e., surface water, groundwater and atmospheric). However, due to the slow-moving nature of any radionuclide contaminant plume that originates from the facilities through the groundwater system, the potential radiological impact through the groundwater pathway will only occur during the post-closure.

During the operational phase, the following activities were identified that may result in a radiological impact on members of the public:

- Emission and dispersion of particulate matter containing radionuclides from the existing and proposed TSFs: During the operational phase wind erosion will serve as a source of windblown dust (i.e., wind erosion) to the atmosphere for the duration of the operational period. These particulate matter containing radionuclides are dispersed into the environment through the atmospheric pathways. The emission and subsequent dispersion of the particulate matter into the atmosphere results in an airborne radionuclides concentration associated with the PM10, and a soil radionuclides concentration following the deposition of the TSP. Through secondary pathways, the radionuclides in the soil may be transferred to crops and animal products. Contributions to the total effective dose to receptors identified for the Projects include inhalation of airborne dust, ingestion of contaminated soil, crops and animal products, and external gamma radiation through cloud shine and ground shine; and
- Exhalation and dispersion of radon gas from the existing and proposed TSF: During the operational phase, radon gases are generated in the tailings material at the TSF areas due to the presence of Ra-226. This means that these gases are exhaled continuously from this facility into the atmosphere.

9.3.6.3 POST-CLOSURE RADIOLOGICAL IMPACTS

Before the actual closure of the proposed project and as part of the anticipated licensing conditions and requirements, a decommissioning and closure plan will be prepared for submission and approval by the regulatory authorities. Amongst others, this plan will define in detail all the activities that will be performed and how the associated radiological impact during the decommissioning and closure phase will be managed.

The following activities were identified that may result in a radiological impact on the receptors during the post-closure phase:

- Implementation of the approved decommissioning plan;
- Exhalation of radon gas and the emission of particulates matter (PM10 and TSP) that contain radionuclides from the remaining facilities (e.g., TSF); and
- Leaching and migration of radionuclides from the remaining facilities (e.g., TSF).

The implementation of the National Nuclear Regulator (NNR)-approved decommissioning plan will result in a positive impact (relative to the operating scenario) in the sense that all surface infrastructure that contained or that is contaminated with radionuclides is demolished, decontaminated (to the extent possible) and removed from the site and compliance with clearance criteria has been demonstrated.

A gamma radiation survey supplemented with full-spectrum radioanalysis of soil samples will be performed at the infrastructure sites, followed by appropriate rehabilitation and clean-up operations for conditional or unconditional clearance from the regulatory authority. In addition, any area that may have become

contaminated during or because of operational activities will also be rehabilitation and clean-up for conditional or unconditional clearance.

During the post-closure phase, some of the facilities (e.g., TSF) will remain at the surface and continue to serve as sources of radiation exposure to members of the public. These facilities will serve as a source of windblown dust (i.e., wind erosion) to the atmosphere during the post-closure period. During the same period, radon gas generated in the tailings material due to the presence of Ra-226 will continue to be exhaled into the atmosphere.

The emission and subsequent dispersion of the particulate matter into the atmosphere results in an airborne radionuclides concentration associated with the PM10, and a soil radionuclides concentration following the deposition of the TSP. Through secondary pathways, the radionuclides in the soil may be transferred to crops and animal products. Contributions to the total effective dose to receptors include inhalation of airborne dust, ingestion of contaminated soil, crops and animal products, and external gamma radiation through cloud shine and ground shine. Following the exhalation and subsequent dispersion of the radon gas into the atmosphere, inhalation of the airborne gas contributes to the total effective dose to receptors.

From the commissioning of a TSF, radionuclides contained in the tailings material leach from the TSF to the underlying strata. The rate of leaching is controlled by complex geochemical and hydrological processes but generally is a slow process. Once in the underlying strata, migration of these radionuclides is equally slow along the groundwater flow path. Abstraction of groundwater for personal or agricultural purposes may result in a radiological impact on receptors through direct ingestion of water or the ingestion of crops and animal products as secondary pathways. The radiological impact along the groundwater pathway only manifests itself during the post-closure period hundreds to thousands of years after closure.

9.3.6.4 IMPACT RATING

Impact	Phase	Pre-mitigation Impact	Post-mitigation Impact	Final Significance
Exhalation and dispersion of radon gas.	Operation and Post Closure	Low Negative	Low Negative	Low Negative
Particulate matter emission and dispersion that contains radionuclides	Operation and Post Closure	Low Negative	Low Negative	Low Negative
Implementation of the NNR-approved decommissioning plan	Rehab and closure	Medium Positive	Medium Positive	Medium Positive
Retreatment of the existing TSFs during the operational phase of the Project	Operation	Medium Positive	Medium Positive	Medium Positive
Leaching and migration of radionuclides from the TSFs during	Post Closure	Low Negative	Low Negative	Low Negative

9.3.6.5 CUMULATIVE IMPACT

On a local scale, it can be noted that theRPSA calculated the total effective dose to members of the public from all relevant exposure pathways included in the public radiation exposure conditions defined for the assessment. To the extent justified, the results, therefore, include the cumulative contribution from all exposure routes (e.g., inhalation, ingestion, and external gamma radiation).

On a regional scale, it can be noted that the results represent only the contribution from the R to the total effective dose to members of the public. The national safety standards and associated regulatory compliance criteria make it clear that members of the public should be protected from all contributing sources or operations. In terms of national and international regulations, the total effective dose from all contributing sources should be below 1 mSv.year-1 (or 1,000 µSv.year-1). The national safety standards also make provision for the application of a dose constraint of 0.25 mSv.year-1 (or 250 µSv.year-1) for each CoR holder.

Therefore, for the cumulative contribution from other authorised facilities and operations, the public dose limit applies, whereas for facility-specific assessments the dose constraint is more applicable, especially to address multiple contributions. Based on the results presented in the Project Radiation Assessment it was argued that it is unlikely that the public dose limit would be exceeded in areas where more than one authorised facility or operation is present.

9.3.6.6 **PROPOSED MITIGATION MEASURES**

The following mitigation is recommended:

9.3.6.6.1 EXHALATION AND DISPERSION OF RADON GASES AND PARTICULATE MATTER

For Exhalation and Dispersion of Radon Gases, the management objective would be to first ensure that radiation exposure is below the regulatory compliance criteria (i.e., the dose constraint), and secondly to optimise the radiation protection by applying the ALARA principle (As Low As Reasonable Achievable - economic and social factors taken into consideration).

The area around the proposed site for the construction of the concrete water tanks (low pressure water supply system) is probability already a mining-related impacted area. However, it is recommended that, before construction commences, the current radiation levels on the site be determined through a site-wide gamma radiation survey. The radiation and dose rate levels would provide a reference point for the rehabilitation of the area at the end of the operational life of the proposed infrastructure.

Key mitigations are provided below:

- Vegetation of exposed areas of the TSF and wind barriers to reduce wind erosion and/or the application of dust suppressants.
- Implementation of a passive groundwater remediation system downstream of the TSF to capture the contaminant plume.
- Implement an approved decommissioning plan; and
- Implement radiation monitoring programme as described in Section 7.3.3 of the EMPr.

For Emission and Dispersion of Particulate Matter, the management objective would be to first ensure that radiation exposure is below the regulatory compliance criteria (i.e., the dose constraint), and secondly to optimise the radiation protection by applying the ALARA principle.

From a dose optimisation perspective, the following mitigation measures can be applied. These measures, which are in line with the measures proposed in the air quality impact assessment (Airshed, 2026), will contribute to a reduction in the total effective dose if applied for the duration of the operational period:

- Develop an air quality management plan for the proposed TSF, including air quality monitoring to ensure compliance at upwind and downwind locations; and
- Application of dust suppressants, i.e., Dust-A-Side, on exposed areas of the TSFs.
- Grassing of TSF side slopes and wet slurry deposition.

9.3.6.6.2 POST CLOSURE MITIGATION

For Post-Closure impacts, the management objective would be to first ensure that radiation exposure is below the regulatory compliance criteria (i.e., the dose constraint), and secondly to optimise the radiation protection by applying the ALARA principle.

From a dose optimisation perspective, the following mitigation measures that are in line with the measures proposed by the air quality impact assessment (Airshed, 2026) can be applied for the post-closure phase:

- Vegetation of exposed areas of the TSF and wind barriers to reduce wind erosion and/or the application of dust suppressants;
- Clean-up and rehabilitation of contaminated footprint areas.
- Implementation of a passive groundwater remediation system downstream of the TSF to capture the contaminant plume.

9.3.7 ARCHAEOLOGICAL AND CULTURAL HERITAGE IMPACTS

This section presents the identified archaeological and cultural heritage impacts as per the Heritage Impact Assessment undertaken by EIMS (2026).

9.3.7.1 **DESCRIPTION OF IMPACTS**

Three features confirmed to be of heritage significance will be affected by the proposed development. WWR020, which was identified as a single stone tool, will be disturbed or destroyed by the proposed TSF. As no associated site was identified, the disturbance of the single stone tool, being rated as a feature NCW, will have a Low impact on the heritage significance of the overall landscape. WWR001 and WWR021 were both identified as structures initially part of the early development and evolution of the West Wits gold mining industry. Both structures are in proximity of proposed pipelines and may be affected. While WWR021 or the old nursery was rated as being NCW, the well-preserved integrity of WWR001, the netball stadium, holds heritage value related to the nearby demolished mining village. As a feature rated as Grade III A, or being of High heritage significance, mitigations must be considered.

Considering other features of High heritage significance which may be in proximity of the proposed activities, it is here proposed that buffers be placed around each of these features, with proposed activities not taking place within 30 meters of the buildings or structures, and 50 meters of the grave sites. It is here argued that the features should be avoided. The impact assessment methodology has therefore been applied considering scenarios where the proposed activities would impact identified features.

While the features identified represent markers of heritage significance (in particular, ruins and graves), the occurrence of below-ground heritage finds may be possible. For this reason, as a mitigation measure proposed, a Heritage Finds or Chance Find Procedure for addressing heritage finds must be adopted as part of construction processes. Should finds of an alarming significance, for example, a grave or high density of small finds be discovered during construction, this procedure will inform the next steps taken to ensure the documentation of these finds, and further action to be taken should a heritage professional deem necessary.

Altogether, post-mitigation of the identified heritage impacts is rated a Medium to Low Negative, given that the impacts can be avoided, and the potential for a heritage procedure to allow for the documentation, recording, and further assessment of undiscovered finds and sites. A heritage procedure can present opportunity to limit the impact of development on heritage finds to construction activities, with the potential to document and further assess finds should they be related to broader sites. This ultimately presents opportunity to reverse the adverse effects of development of heritage finds, given that their value can be evaluated through documentation. This also presents opportunity to better understand the heritage significance of the area to be developed.

9.3.7.1.1 IMPACT RATING

The impact ratings are provided in **Table 58.**

Table 58: Impact on archaeological and cultural heritage features

Impact	Phase	Pre-Mitigation	Post Mitigation	Final score
Destruction or disturbance of single stone tool	Construction	Medium to Low Negative	Medium to Low Negative	Medium to Low Negative
Destruction of disturbance of structures older than 60 years	Construction	Medium to Low Negative	Low Negative	Low Negative
Destruction or disturbance of undiscovered below-ground heritage features.	Construction	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

9.3.7.1.2 CUMULATIVE IMPACT

The landscape holds heritage particularly in relation to the development of the West Wits gold mining industry. Cumulative impacts on heritage resources are considered of potentially moderate significance, however this will be reduced to a low significance following implementation of the recommended mitigation measures.

9.3.7.1.3 PROPOSED MITIGATION MEASURES

The following mitigation measures are recommended:

- Identified heritage sites must be avoided considering a buffer of 30 meters.
- Graves must be avoided considering a buffer of 50 meters.
- Existing pipeline routes should be used where possible
- Chance Find Procedure is advised to be followed should additional heritage finds or sites be encountered.

9.3.8 PALAEONTOLOGY IMPACTS

This section presents the identified palaeontological heritage impacts as per the Palaeontological Impact Assessment undertaken by Banzai Environmental (2026).

9.3.8.1 **DESCRIPTION OF IMPACT**

The elevated sensitivity is driven primarily by microbially induced sedimentary structures, stromatolitic horizons, and carbonate-hosted microbial assemblages, not by discrete, recoverable macrofossils. Where the pipeline corridor approaches the Malmani Subgroup, construction will be undertaken above ground on surface-mounted supports, with ground disturbance confined to localised, shallow footings. Taken together, the microscopic nature of the palaeontological material and the minimal subsurface disturbance anticipated meant that a formal site investigation was not considered necessary.

Threats to palaeontological resources are earth moving equipment/machinery (for example haul trucks, front end loaders, excavators, graders, dozers) during construction activities. In terms of palaeontological impact, the construction phase is the only development phase with the potential to affect palaeontological heritage. No significant palaeontological impacts are anticipated during the operational or decommissioning phases.

9.3.8.1.1 IMPACT RATING

The impact ratings are provided in **Table 59.**

Table 59: Summary of impacts related to palaeontological heritage

Impact	Project Phase	Significance Without Mitigation	Significance With Mitigation	Final Significance Score
Impacts on fossils	Construction	Medium to High Negative	Medium to High Negative	Medium to Low Negative

9.3.8.1.2 CUMULATIVE IMPACT

Cumulative impacts on palaeontology are considered Low both pre- and post-mitigation, falling within acceptable limits.

9.3.8.1.3 PROPOSED MITIGATION MEASURES

The proposed mitigation measures to avoid adverse impacts on palaeontological heritage features due to the proposed activities are provided below:

- An independent and suitably qualified ECO must be appointed and must train the Contractor to recognise potential palaeontological features; and
- If any fossils are detected, the Chance Find Protocol must be implemented and adhered to throughout all phases of construction. Should fossil remains or trace fossils be encountered at any stage, whether on the surface or exposed by excavation, the Environmental Control Officer (ECO) or site manager must immediately halt activities in the affected area, preserve the material in situ where feasible, and notify SAHRA: (111 Harrington Street, Cape Town; PO Box 4637, Cape Town, 8000 Tel: 021 462 4502; Fax: +27 (0)21 462 4509; www.sahra.org.za).
- Any fossil material recovered from the site requires a collection permit from SAHRA prior to removal, and must ultimately be housed in an accredited institution, a recognised museum or university collection. All reporting and fieldwork must meet the minimum standards for palaeontological impact studies as set out by SAHRA (2012).

9.3.9 SOILS AND AGRICULTURAL IMPACTS

This section presents the identified soils and agricultural potential impacts as per the Soils Assessment undertaken by EIMS (2026).

9.3.9.1 **DESCRIPTION OF IMPACTS**

Table 60 provides the identified impacts which contributed to the loss of land capability:

Table 60: Anticipated impacts for the proposed support infrastructure on agricultural resources

Main Impact	Project activities that can cause loss/impacts to Soils (especially regarding the proposed infrastructure areas)	Description of Impact
Permanent loss of agricultural land use	Site selection and layout; land clearing, excavation and earthworks; establishment of the TSF, return water dam, roads, pipelines and ancillary infrastructure; and deposition of tailings (permanent land occupation).	Permanent loss of the affected land to agricultural use, including the informal free-range livestock grazing currently practised by local communities. Because the land is of moderate potential and partly already disturbed, the loss is locally real but of limited regional agricultural value.
Loss or degradation of topsoil resource	Topsoil stripping, handling and stockpiling during planning and construction.	Loss or degradation of the available topsoil resource required for rehabilitation, reducing the quality of the growth medium for re-establishing post-closure grazing.



Main Impact	Project activities that can cause loss/impacts to Soils (especially regarding the proposed infrastructure areas)	Description of Impact
Reduction in future land capability	Excavation, earthworks, embankment construction, shaping and levelling.	Localised permanent alteration of natural soil profiles reduces future land capability in earthworks areas; the effect is tempered by the moderate baseline potential and existing disturbance.
Reduced infiltration, aeration and root penetration in compacted areas	Movement of construction vehicles and heavy machinery; operational maintenance traffic and access-road use.	Reduced infiltration, aeration and root penetration in compacted areas, temporarily lowering grazing and soil productivity until ripped and rehabilitated.
Erosion and sediment loss	Site clearance and exposure of soils; stormwater and dirty-water management; alteration of natural drainage and runoff patterns.	Erosion and sediment loss from exposed areas and altered drainage can degrade surrounding soils and downslope grazing land if left uncontrolled.
Soil contamination	Storage and handling of fuels, oils and chemicals; operation of the return water dam, slurry pipelines and process-water infrastructure.	Localised soil contamination may alter soil chemistry and reduce fertility, constraining future agricultural or grazing use in affected areas.
Dust Deposition	Dust generation from exposed embankments, road surfaces and operational areas	Dust deposition may reduce vegetation performance and grazing quality on nearby land and marginally reduce the condition of the soil surface.
Short-term soil disturbance	Decommissioning of infrastructure and final reshaping of disturbed areas.	Short-term additional soil disturbance during closure; readily managed and outweighed by the stabilisation benefits of correct reshaping
Restoration of soil stability and re-establishment of grazing potential – positive impact	Replacement of topsoil, rehabilitation cover placement, revegetation and erosion control of the TSF and disturbed areas.	Well-managed rehabilitation restores soil stability and re-establishes limited grazing potential on disturbed land; poor rehabilitation would leave low capability and ongoing erosion. (Positive impact where managed correctly.)

9.3.9.1.1 IMPACT RATING

The impacts ratings are provided in **Table 61**.

Table 61: Summary of Soils Impacts

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Permanent loss of agricultural land use	Construction	High Negative	High Negative	High Negative
Loss or degradation of topsoil resource	Construction	Medium to High Negative	Low Negative	Low Negative
Reduction in future land capability	Construction	Medium to High Negative	Medium to Low Negative	Medium to Low Negative
Reduced infiltration, aeration and root penetration in compacted areas	Construction	Medium to High Negative	Low Negative	Low Negative
Erosion and sediment loss	Operation	Medium to High Negative	Medium to Low Negative	Medium to Low Negative
Soil contamination	Operation	Medium to Low Negative	Low Negative	Low Negative

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Dust Deposition	Operation	Medium to Low Negative	Low Negative	Low Negative
Short-term soil disturbance	Rehab and Closure	Medium to Low Negative	Low Negative	Low Negative
Restoration of soil stability and re-establishment of grazing potential	Rehab and Closure	Medium to Low Negative	Low to Medium Positive	Medium to High Positive

9.3.9.1.2 CUMULATIVE IMPACT

It is anticipated that there will be minimal impact on soil and agricultural potential. Considering the rocky habitat units of the intact vegetation areas and the current minimal agricultural activities within the area, the proposed activities and associated infrastructure will not result in the segregation of any high production agricultural land. Therefore, the cumulative impact on soil and agricultural potential is low subject to adherence of the mitigation measures.

9.3.9.1.3 PROPOSED MITIGATION MEASURES

To ensure the integrity of the soil resources is maintained throughout the project lifecycle, the following conditions must be explicitly integrated into the final EMPr and/or EA:

- Topsoil management: Prior to the commencement of site clearance, a formal Topsoil Salvage and Stockpiling Plan must be fully implemented across all active construction zones, including the Tailings Storage Facility (TSF) footprint, dams, and access roads. Unless explicitly instructed otherwise by the geotechnical or project engineer, excavation must adhere to the following depths:
    - Topsoil: 300 mm
    - Subsoil: 1,000 mm
    - Total Excavation Depth: 1,300 mm
- To preserve soil fertility, biological activity, and structural integrity for future rehabilitation:
    - Material Separation: Topsoil and subsoil must be stripped, transported, and stockpiled in strictly separate locations to prevent cross-contamination.
    - Height Restrictions: All stockpiles must be configured as low-profile mounds with a maximum height limit of 2.0 metres.
- Linear Infrastructure soil decompaction: Following the completion of construction activities, all linear servitudes affected by soil compaction must undergo mechanical subsoiling (ripping). This post-construction remediation process is required to break up compacted subsoil layers, thereby restoring the natural permeability and hydrological function of the soil profile.
- Containment and Seepage Control: The Tailings Storage Facility (TSF) and Return Water Dam barrier system must be installed in accordance with approved engineering specifications to mitigate any operational risk of chemical seepage or toxic solute contamination to adjacent agricultural soils
- Erosion Monitoring: A storm-water management plan featuring active energy-dissipating structures must be maintained along graded access roads and pipeline corridors to prevent subsequent erosion and downstream sedimentation.

9.3.10 TERRESTRIAL BIODIVERSITY IMPACTS

This section presents the identified terrestrial biodiversity impacts as per the Terrestrial Biodiversity Impact Assessment undertaken by The Biodiversity Company (2026).

9.3.10.1 **DESCRIPTION OF IMPACTS**

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the project area (**Figure 67**). These include:

- Existing mining and associated infrastructure (including TSFs);
- Edge effects associated with mining activities;
- Human and vehicle ingress;
- Illegal small-scale mining (Zama Zama);
- Invasions by alien and invasive plants;
- Erosion;
- Grazing by livestock; and
- Linear infrastructure (roads, fences, pipelines, and powerlines).



Figure 67: Some of the identified impacts within the study area: A, D and E) Mining and associated infrastructure, B) Roads and powerlines, C) Alien and invasive flora species, and F) Pipelines.

The impacts anticipated for the proposed activities are considered in order to predict and quantify these impacts and assess & evaluate the magnitude on the identified terrestrial biodiversity (**Table 62**).

Table 62: Anticipated impacts for the proposed activities on terrestrial biodiversity (The Biodiversity Company, 2026)

Main Impact	Project activities	Secondary impacts anticipated
1. Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation	Displacement/loss of flora & fauna (including SCC) Increased potential for soil erosion Habitat fragmentation Increased potential for establishment of alien & invasive vegetation
	Access roads and servitudes	
	Soil dust precipitation	
	Dumping of waste products	
	Random events such as fire (cooking fires or cigarettes)	

Main Impact	Project activities	Secondary impacts anticipated
2. Spread and/or establishment of alien and/or invasive species	Vegetation removal	Habitat loss for native flora & fauna (including SCC) Spreading of potentially dangerous diseases due to invasive and pest species Alteration of fauna assemblages due to habitat modification
	Vehicles potentially spreading seed	
	Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents	
	Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	
3. Direct mortality of fauna	Clearing of vegetation	Loss of ecosystem services Increase in rodent populations and associated disease risk
	Roadkill due to vehicle collision	
	Pollution of Freshwater Features due to dust effects, chemical spills or sewage leakages	
4.. Reduced dispersal/migration of fauna	Loss of landscape used as corridor	Loss of ecosystem services Reduced plant seed dispersal
	Compacted roads	
	Removal of vegetation	
	Light, noise and dust disturbance	
5. Environmental pollution due to water/ Acid Mine Drainage (AMD) runoff	Chemical (organic/inorganic) spills	Faunal mortality (direct and indirectly) Groundwater pollution Loss of ecosystem services
	Leaking of pollutants (pipelines)	
	Erosion	
6.Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and light pollution.	Operation of machinery (Large earth moving machinery, generators)	Loss of ecosystem services
	Vehicles	
7. Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	All unregulated/supervised activities outdoors	Harm to fauna and/or staff

9.3.10.2 **CONSTRUCTION PHASE IMPACTS ON TERRESTRIAL BIODIVERSITY**

The following potential impacts on the biodiversity were considered for the construction phase of the project. This phase refers to the period during construction when the proposed infrastructure is constructed. This phase usually has the largest direct impact on biodiversity. The following potential impacts to terrestrial biodiversity were considered.

a) Pipeline impacts (pipeline routes).

- Destruction, further loss and fragmentation of the habitats, ecosystems vegetation community, and the loss of floral SCC.
- Introduction of invasive and alien species, especially plants.
- Direct loss and displacement of faunal community (including SCC) due to habitat loss, mortality and disturbance (noise, dust, vibration), including the reduced dispersal/migration of fauna.
- Destruction of non-resilient habitats (Rocky Outcrops).
- Increased risk of contamination (soil and water resource) from fuel spills, construction waste, and hazardous materials.
- Clearing of vegetation leading to soil erosion and loss of topsoil.

b) TSF Impacts (Deelkraal II TSF and Return Water Dam)

- Destruction, further loss and fragmentation of the habitats, ecosystems vegetation community.



- Introduction of invasive and alien species, especially plants.
- Direct loss and displacement of faunal community due to habitat loss, mortality and disturbance (road collisions, noise, dust, vibration), including the reduced dispersal/migration of fauna.
- Increased risk of contamination (soil and water resource) from fuel spills, construction waste, and hazardous materials.
- Clearing of vegetation leading to soil erosion and loss of topsoil.

9.3.10.2.1 IMPACT RATING

Table 63 shows the significance of potential construction phase impacts on biodiversity before and after the implementation of mitigation measures.

Table 63: Summary of construction phase impacts on biodiversity

Impact	Phase	Pre-Mitigation	Post-Mitigation	Final Significance
Linear Infrastructure: Destruction, further loss and fragmentation of the habitats and loss of SCC	Construction	High Negative	Medium - High Negative	Medium - High Negative
TSF: Destruction, further loss and fragmentation of the habitats and loss of SCC	Construction	Medium to Low Negative	Medium to Low Negative	Medium to Low Negative
Linear Infrastructure: Destruction of non-resilient habitats (Rocky Outcrops)	Construction	High Negative	Medium - High Negative	High Negative
Linear Infrastructure: Direct loss and displacement of faunal community due to habitat loss, mortality and disturbance (noise, dust, vibration), including the reduced dispersal/migration of fauna	Construction	Medium to High Negative	Medium to Low Negative	Medium to Low Negative
TSF: Direct loss and displacement of faunal community due to habitat loss, mortality and disturbance (noise, dust, vibration), including the reduced dispersal/migration of fauna	Construction	Medium to High Negative	Medium to Low Negative	Medium to Low Negative
Linear Infrastructure and TSF: Clearing of vegetation leading to soil erosion and loss of topsoil.	Construction	Medium to High Negative	Medium to Low Negative	Medium to Low Negative
Linear Infrastructure and TSF: Increased risk of contamination (soil and water resource) from fuel spills, construction waste, and hazardous materials.	Construction	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

Linear Infrastructure: Introduction of alien species, especially plants	Construction	Medium to High Negative	Low Negative	Medium to Low Negative
TSF: Introduction of alien species, especially plants	Construction	Medium to High Negative	Low Negative	Low Negative

9.3.10.2.2 CUMULATVE IMPACT

Multiple flora SCC and some fauna SCC are expected within the study area. Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change. The impact is likely to result in irreplaceable loss of resources over along both the proposed linear infrastructure routes. However. Considering the proposed mitigation measures, the cumulative impact can be reduced to moderate-low provided the mitigations are adhered to.

9.3.10.2.3 PROPOSED MITIGATION MEASURES

- Linear infrastructure (powerlines and pipelines), with an associated lower impact, are permitted within the high SEI areas, provided that these developments are minimised as far as possible, and that these areas are spanned (powerlines) and avoided as far as feasible.
- Ancillary infrastructure, such as stockpiles and laydown areas must avoid high SEI areas (Rocky Gauteng Shale Mountain Bushveld and Rocky Carletonville Dolomite Grassland). Where avoidance is impossible, the footprint must be minimised.
- The Class 1 Gauteng Ridge, including the 200 m buffer, must be avoided as far as possible. The TSF must be redesigned to avoid the high SEI Rocky Gauteng Shale Mountain Bushveld (ridges) and Rocky Carletonville Dolomite Grassland. The footprint must avoid the Gauteng Class 1 Ridge and Rocky Gauteng Shale Mountain Bushveld habitat. If complete avoidance is impossible, minimisation must be adhered to. Limited ingress into the 200 m buffer zone may be allowed within the medium and low SEI areas, at the discretion of the relevant authorities[4].
- The High SEI Freshwater Features must be avoided as far as possible. Ingress may be permitted, as a last resort, in line with recommendations in the associated freshwater assessment.
- A pre-construction wet season (October to March, following good rains) walkdown of the high SEI areas within development footprint must be conducted to locate and identify any protected flora or flora SCC.[5]
- The development areas and access roads should be specifically demarcated so that during the construction phase, only the demarcated areas may be impacted upon.
- Areas of indigenous vegetation, even secondary communities outside of the direct pylon and servitude road footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimised and avoided where possible.
- Any individual of any protected plant species that is present needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. High visibility flags must be placed near any threatened/protected plants in order to avoid any damage or destruction of the species. If left undisturbed, the sensitivity and importance of these species needs to be part of the environmental awareness programme. Infrastructure, development areas and routes where

[4] Due to engineering and design constraints it is not possible to completely avoid the Class 1 ridge area. An offset strategy is proposed with respect to areas within the Class 1 ridge in order to mitigate any residual impacts.
[5] The outstanding walkdown is an operational tool designed for plant rescue planning and the EIA report has already applied the mitigation hierarchy. The requirement for the wet-season walkdown is explicitly captured as a mandatory pre-construction condition within the Environmental Management Programme and should not prevent the Competent Authority from making an informed decision on the project.



protected plants cannot be avoided should be removed from the soil and relocated/ re-planted in similar habitats. Vegetation clearing commences only after the necessary permits have been obtained.

- Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.
- Compilation and implementation of an alien vegetation management plan. An acceptable plan must be in place prior to the commencement of construction activities.
- Inspect vehicles and machinery on a daily basis for fuel and oil leakages and repair such.
- Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures, apart from approved structures, must be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated areas.
- It must be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area apart from rehabilitation purposes. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.
- The high SEI Rocky Gauteng Shale Mountain Bushveld and Rocky Carletonville Dolomite Grassland habitats must be avoided as far as possible. Pipeline footprints must be reduced as far as possible.
- Pylon placement for powerlines must consider the High SEI areas. Pylons must not be placed within these areas. Powerlines may span these areas.
- It is recommended that the routes avoid Class 1 and Class 2 Gauteng Ridges as far as possible. Development within these areas is at the discretion of the relevant authority.
- Existing access roads must be made use of within the High SEI areas. Construction of new roads must be avoided as far as possible in the High SEI areas (and areas overlapping with ridges). Existing access roads must be used within the Medium and Low SEI areas, as far as practical. The development areas and access roads should be specifically demarcated so that during the construction phase, only the demarcated areas may be impacted upon.
- A qualified environmental control officer must be appointed before construction begins.
- No trapping, killing, or poisoning of any wildlife is to be permitted. This should be included in Environmental Awareness Training and signs must be put up to enforce this.
- Outside lighting, if used, should be designed and limited to minimise impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (green/red) lights should be used wherever possible.
- Where possible, work should be restricted to one area at a time and be systematic. This is to reduce the number and extent of on-site activities, allowing fauna to move off as the Project progresses. This will give the smaller birds, mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.
- Any holes/deep excavations must be dug in a progressive manner and shouldn't be left open overnight. If any excavations are to be dug these must not be left open for more than a few hours without ramps for trapped fauna to leave and must be filled at night. Holes must be subsequently inspected for fauna prior to backfilling.
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.

- All vehicles should adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.
- Environmental Awareness Training discussions/training must include (but not limited to): Speed limits, General rules of road use, not limited to Avoiding the widening of the road and Environmental sensitivity of surrounding habitat.
- The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.
- The duration of the activities should be minimised to as short a term as possible, to reduce the period of disturbance on fauna.
- A habitat rehabilitation and revegetation plan must be developed and implemented to reduce the occurrence of bare soil areas and the associated damage due excessive erosion.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat.
- Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds where relevant.
- Existing access roads must be made use of as far as possible, especially within the High SEI areas. The development areas and access roads should be specifically demarcated so that during the construction phase, only the demarcated areas may be impacted upon.
- A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. The Freshwater Features must be protected and all activities that could result in a spill should occur away from them.
- Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.
- No servicing of equipment on site.
- All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.
- Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.
- All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.
- All construction waste must be removed from site at the closure of the construction phase.
- Cement mixing may not be performed on the ground. It is recommended that only closed side drum or pan type concrete mixers be utilised. Any spills must be immediately contained and isolated from the natural environment, before being removed from site.
- An Alien Invasive Plant Management Plan must be compiled and implemented. This should be regularly updated to reflect the annual changes in AIP composition.
- It must be made an offence for any staff member to remove any indigenous plant species from the project area or bring any alien species in. This is to prevent the spread of exotic or alien species or the illegal collection of plants.



- A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.
- Only existing access routes and walking paths may be made use of.
- It must be made an offence for any staff member to remove any indigenous plant species (especially SCC) from the project area.
- Restrict all activities to authorised footprint areas only.
- Implement stormwater management plan.
- Address any observed erosion promptly using suitable erosion control structures and revegetation methods.
- Pipelines should be raised above the ground to allow for faunal species to pass beneath to reduce the impact on migration.
- To mitigate potential impacts on faunal species it is recommended that vehicle movements are avoided at night. If night driving is unavoidable, vehicle speed should be reduced to a maximum of 20 km/h to minimise the risk of harm to wildlife.
- No trapping, killing, or poisoning of any wildlife is to be permitted and must be made a punishable offense.
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.
- Litter, spills, fuels, chemical and human waste in and around the project area must be minimised and controlled according to the waste management plan.
- An Alien Invasive Plant Management Plan must be compiled and implemented. This should be regularly updated to reflect the annual change in AIP composition.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by alien invasive plant species.
- It must be made an offence for any staff member to remove any indigenous plant species from the project area or bring any alien species in. This is to prevent the spread of exotic or alien species or the illegal collection of plants.
- A stormwater management plan must be compiled and implemented.
- Inspect vehicles and machinery on a daily basis for fuel and oil leakages and repair such, although no servicing of equipment on site.
- Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.
- Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.
- Address any observed erosion promptly using suitable erosion control structures and revegetation methods.
- Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all areas of construction or bare ground. This includes wetting of exposed soft soil surfaces.

- Prevent the creation of preferential surface flow paths (e.g., straight, unvegetated channels) that could accelerate runoff and increase erosion or pollution risk.
- Cut-off trenches must be incorporated into the design to decrease contamination of watercourses via runoff.
- Construct cut-off berms downslope of working areas. Construct engineered cut-off berms (compacted earth embankments or similar structures) along the downslope perimeter of all active TSF construction and working areas. Ensure berms are designed to intercept and divert surface water runoff, including potential acid mine drainage, away from undisturbed areas and sensitive receptors (e.g., wetlands, streams, natural drainage lines). Specify minimum berm height and width based on site hydrology and expected runoff volumes, as determined by a qualified engineer (e.g., typically ≥0.5 m high and ≥1 m wide, but site-specific). Ensure berms are continuous, with no gaps, and maintained throughout the construction phase. Remove or rehabilitate berms after construction, unless required for ongoing operational control.
- Use compacted, low-permeability material (such as clay or suitable soil) for berm construction to minimise seepage.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by alien invasive plant species. All structure footprints are to be rehabilitated and landscaped after installation is complete. Rehabilitation of the disturbed areas existing in the proposed development area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type. Conduct follow-up rehabilitation and re-vegetation of any bare areas with local indigenous grasses, shrubs, and trees.

9.3.10.3 **OPERATIONAL PHASE IMPACTS ON TERRESTRIAL BIODIVERSITY**

The operational phase impacts of daily activities are anticipated to result in the further spreading of the AIP, as well as the deterioration of the habitats due to the increase of dust and edge effect impacts. Dust reduces the ability of plants to photosynthesize and thus leads to degradation/retrogression of the veld. Moving maintenance vehicles don't only cause sensory disturbances to fauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions.

a) Pipeline Impacts

- Continued destruction, further loss and fragmentation of the habitats, ecosystems and vegetation community.
- Continued encroachment by alien and invasive plant species.
- Ongoing loss and displacement of faunal community due to habitat loss, mortality and disturbance (road collisions, noise, dust, vibration), including the reduced dispersal/migration of fauna. and
- Environmental pollution due to pipe leakage.

b) TSF Impacts (Deelkraal II TSF and Return Water Dam)

- Continued destruction, further loss and fragmentation of the habitats, ecosystems and vegetation community.
- Continued encroachment by alien and invasive plant species.
- Ongoing loss and displacement of faunal community due to habitat loss, mortality and disturbance (road collisions, noise, dust, vibration), including the reduced dispersal/migration of fauna.
- Continued risk of contamination (soil and water resource) from fuel spills and hazardous materials.

- Continuous stripping of topsoil, leading to ongoing land degradation, including erosion.
- Environmental pollution due to water/ Acid Mine drainage runoff.

9.3.10.3.1 IMPACT RATING

The impact ratings are provided in **Table 64**.

Table 64: Summary assessment of significance of potential operational phase impacts on terrestrial biodiversity

Impact	Phase	Pre-Mitigation	Post-Mitigation	Final Significance
Linear Infrastructure: Continued destruction, further loss and fragmentation of the habitats, ecosystems and vegetation community.	Operation	Medium to High Negative	Medium to low Negative	Medium to low Negative
Linear Infrastructure: Ongoing loss and displacement of faunal community due to habitat loss, mortality and disturbance (road collisions, noise, dust, vibration), including the reduced dispersal/migration of fauna	Operation	Medium to High Negative	Medium to High Negative	Medium to High Negative
Linear Infrastructure: Continued encroachment by alien and invasive plant species	Operation	Medium to High Negative	Low Negative	Low Negative
Linear Infrastructure: Environmental pollution due to pipe leakage	Operation	Medium to High Negative	Medium to low Negative	Medium to low Negative
TSF: Continued risk of contamination (soil and water resource) from fuel spills and hazardous materials	Operation	Medium to High Negative	Low Negative	Low Negative
TSF: Continuous stripping of topsoil, leading to ongoing land degradation, including erosion	Operation	Medium to High Negative	Low Negative	Low Negative
TSF: Environmental pollution due to water/ Acid Mine drainage runoff.	Operation	Medium to High Negative	Low Negative	Low Negative



9.3.10.3.2 CUMULATVE IMPACT

Multiple flora SCC and some fauna SCC are expected within the study area. Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change. The impact is likely to result in irreplaceable loss of resources for operational phase impacts. However. Considering the proposed mitigation measures, the cumulative impact can be reduced to moderate-low provided the mitigations are adhered to.

9.3.10.3.3 PROPOSED MITIGATION MEASURES

- All structure footprints are to be rehabilitated and landscaped after construction is complete. Rehabilitation of the disturbed areas existing in the proposed development area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type. Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat.
- There should be follow-up rehabilitation and re-vegetation of any remaining denuded areas with local indigenous plants from the area. Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and bare (unvegetated) areas.
- A habitat rehabilitation and revegetation plan must be developed and implemented to reduce the occurrence of bare soil areas and the associated damage due excessive erosion.
- Servicing of the pipelines and powerlines should only be done with minimal impact on vegetation to prevent the destruction of potential SCC and indigenous vegetation within the project area and to prevent the further fragmentation of habitat.
- An Alien Invasive Plant Management Plan must be compiled and implemented. This should be regularly updated to reflect the annual changes in AIP composition. It must be made an offence for any staff member to remove any indigenous plant species from the project area or bring any alien species in. This is to prevent the spread of exotic or alien species or the illegal collection of plants.
- It must be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area apart from rehabilitation purposes. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.
- Outside lighting, if used, should be designed and limited to minimise impacts on fauna. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (green/red) lights should be used wherever possible.
- A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.
- No trapping, killing, or poisoning of any wildlife is to be permitted and must be made a punishable offense.
- All maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.
- All vehicles accessing the site should adhere to a max 40 km/h max to avoid collisions. Vehicles and machinery should only utilise authorized access roads.
- Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds where relevant.



- Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures, apart from approved structures, must be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated areas.
- Compile and implement a Solid Waste Management Plan. Waste management must be a priority, and all waste must be collected, stored and disposed of adequately. It is recommended that all waste be removed from site on a weekly basis as a minimum.
- Litter, spills, fuels, chemical and human waste in and around the project area must be minimised and controlled according to the waste management plan.
- All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area. No servicing of machines, vehicles and equipment on site. Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.
- A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. The Freshwater Features must to be protected and all activities that could result in a spill should occur away from them.
- Storage of potential contaminants to be in bunded areas.
- No non-environmentally friendly suppressants may be used as this could result in pollution of water sources and the ecosystem.
- A suitable stormwater plan must be compiled for the development footprint. This plan should include mitigation measures for the construction as well as the operational phase. This plan must attempt to displace and divert stormwater from the road network and construction areas and discharge the water into adjacent areas without eroding the receiving areas. It is preferable that run-off velocities be reduced with energy dissipaters and flows discharged into the local watercourses.
- Keep the surface & sub-surface water and storm water away that may run off from the dumps from the low laying areas, such as wetlands, as well as the surrounding areas, from leaving the project area in an uncontrolled manner.
- Prevent uncontrolled runoff from entering natural watercourses or adjacent land by directing collected runoff to designated containment or treatment facilities (e.g., pollution control dams, sumps, or water treatment plants).
- Incorporate green or soft engineering stormwater management measures, such as vegetated swales, bio-retention areas, grassed waterways, and infiltration basins, to slow down, filter, and absorb stormwater runoff. Design stormwater controls to maximise infiltration and natural attenuation of runoff, reducing peak flows and improving water quality.
- Regularly inspect and maintain green stormwater infrastructure to ensure continued effectiveness (e.g., remove sediment, repair erosion, replace dead plants).
- Conduct regular inspections (at least weekly and after rainfall events) to check for breaches, erosion, or overtopping.
- Storm Water run-off & Discharge Water Quality monitoring needs to be implemented.
- Aquatic monitoring must be done. Monitoring of adjacent watercourses must be undertaken to assess the impact of runoff to these systems.



- Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses. All released water must be within DWAF (1996) water quality standards for aquatic ecosystems, and discharge must be managed to avoid scouring and erosion of the receiving systems.
- Clean and dirty water must be separated. This water should be looked at for treatment and then re-introduced, to mitigate losses to the catchment water hydrodynamics.
- To at least minimise impacts to water quality, a treatment strategy is required, and the Groundwater report needs to be considered.
- An emergency preparedness plan that incorporates a detailed pipe leak spill management plan must be put in place to ensure that should there be any pipe leaks, bursts or overflow that it does not run into the surrounding areas. This includes the installation of leak warning and detection systems. Precautions must be taken against the erosion damage that would be caused by unplanned pipe leaks, such as the planting of dense indigenous pioneer grass seeds across all bare earth areas surrounding the pipes. Monitoring of the pipeline must be undertaken to detect leaks and monitoring should be undertaken at least once a week. Water monitoring must also be undertaken to ensure that there has been no runoff into the nearby water sources.
- Repair any damaged pipeline sections within 24 hours of detection.

9.3.10.4 **OFFSET REQUIREMENTS**

Based on the currently available terrestrial biodiversity information, the revised development layout will result in impact to approximately 70 ha, overlapping CBA 2: Optimal, EN Gauteng Shale Mountain Bushveld remnants, High SEI areas and Gauteng Ridges.

The draft desktop offset assessment (Appendix E) provides an initial indication of potential ecological equivalence and spatial suitability. It does not confirm the presence, extent or condition of the relevant biodiversity features, the additionality of the proposed conservation outcome, landowner willingness, legal security, management feasibility or acceptance by GDEnv

The potential offset sites are therefore considered potentially suitable only, subject to field-based ecological assessment, verification of ecological condition and habitat extent, confirmation of landowner consent, property and legal due diligence, assessment of long-term management feasibility and GDEnv review and acceptance. The investigations undertaken to date are preliminary, and the proposed options remain subject to several potential constraints, including the financial implications of acquiring or securing the required land, uncertainty regarding the ecological condition and availability of suitable like-for-like habitat, and the possibility that the properties may not contain sufficient qualifying areas to meet the final offset requirement.

Additional potential offset sites may be identified as the offset process progresses, and the proposed options may be refined, replaced or combined. The current objective is to secure the required offset area, or a combination of suitable offset areas, through land acquisition, stewardship arrangements or another legally enforceable mechanism agreed with the relevant landowners and accepted by GDEnv.

Due to the fact that residual terrestrial biodiversity impacts for the project remain high GDEnv and DFFE must be further consulted to determine the details with respect to the offset requirements. The offset site must be finalised, and implementation should commence when required. It is important that any offset be properly managed according to an Offset Management Plan and the biodiversity monitored through a Monitoring Plan.

9.3.11 VISUAL IMPACTS

This section presents the identified visual impacts as per the Visual Impact Assessment undertaken by G Environmental Planning and Design (2026 .

Initial construction is unlikely to have a significant visual impact. Initially work will take place around each tower. Activities will be obvious over limited areas only. The most obvious elements are likely to include;

- Storage of poles / pylons for tower construction.



- Trucks and mobile cranes

As work progresses, poles / pylons will become obvious in the landscape. Work is likely to take place on a limited number of towers at any one time which means that during construction, poles / pylons will gradually appear in the landscape on a progressive basis.

By the end of the construction process, when cables have been strung between poles / pylons, the full visual impact of the project will be experienced. The operational phase is highly unlikely to result in any significant additional impact. It is possible however, that crews will be visible from time to time undertaking maintenance on individual towers.

TSFs vary in design but typically consist of embankments made of earth and rock materials. Over time the TSF wall is raised to accommodate increasing volume of tailings. A TSF is therefore constructed in stages. The initial stage will include the initial TSF wall, pump facilities, outfall, lining, and facilities to treat water that drains from the facility. Subsequent wall construction periodically increases the TSF height until it reaches its designed capacity. The proposed TSF will therefore grow over time.

From the review of the proposed project and the nature of the affected landscape, the following possible landscape and visual impacts were identified:

- Landscape change due to the proposed project;
- Change in the character of views as experienced by travellers on main roads including the N12 and the R501;
- Change in the character of views as experienced by travellers on local mine roads in close proximity to the proposed project;
- Change in the character of views as experienced by residents of local mine villages including Elandsridge, Deelkraal and Wedelia;
- Change in the character of views as experienced by visitors to the Deelkraal passive recreation area;
- Change in the character of views as experienced by residents of homesteads within the areas to the north and south of the area of ridgelines and valleys; and
- Lighting impacts.

The assessment of site sensitivity within the potentially affected area seeks to both maintain key landscape features and minimise potential impacts for receptors. Potential receptors include motorists on local roads and residents of mining villages. The main element that could result in modification of landscape features is the proposed Deelkraal II TSF. It is noted that this will largely be within a valley system that is likely to largely screen the facility from surrounding areas.

It is also likely that more minor elements including powerlines and pipelines that will largely run beside existing minor roads are likely to be visible to motorists. Whilst most residential areas are relatively enclosed and inward looking, it is likely that these elements could also be visible to residents entering and leaving residential areas. Views of these elements are likely to be a minor concern for residents given the extent of existing views of such features. What may be of greater concern, however, could be the location of large storage areas, temporary spoil heaps and contractors compounds located in the vicinity of residential areas.

Given the topography within which the project is set and the extent of mining infrastructure within the area, it is not surprising that the proposed development area is not likely to be overly visually sensitive to the proposed development a large proportion of which includes relatively small scale infrastructure.

Zones of Theoretical Visibility (ZTV) are defined as “a map usually digitally produced showing areas of land within which a development is theoretically visible ”. ZTV s of the proposed development have been assessed using a GIS viewshed tool. Whilst the ZTV has been calculated from terrain data only, existing vegetation and development could have a modifying effect on the areas indicated, however, given the nature of the landscape

this is likely to be minimal. Zones of Theoretical Visibility analysis overlaid onto landcover are presented in **Figure 68** for the TSF itself and **Figure 69** for the linear infrastructure (pipelines and powerlines).

The ZTV analysis indicates that:

- Due to its height and adjacent valley lines, views of the proposed Deelkraal II TSF may be visible over flat areas to the north and south of the valley system in which it is located. The view corridors are likely to extent approximately 10km to the north and 5km south of the TSF. From these distances the view cone expands as the land rises and views become possible over the ridgelines enclosing the TSF.
- The Deelkraal II TSF could be visible to the Boskopdam Nature Reserve from a distance in excess of 17km. From this distance and particularly with rehabilitation, the top section of the proposed TSF may be visible but is unlikely to be discernible from surrounding hillsides.
- The Deelkraal II TSF could be visible from approximately 9km of the R501 to the north from a minimum distance of approximately 7.6km. From this distance and particularly with rehabilitation, the top section of the proposed TSF may be visible but is unlikely to be discernible from surrounding hillsides.
- The Deelkraal II TSF could be visible from approximately 15km of the N12 to the south from a minimum distance of approximately 6.5km. From this distance and particularly with rehabilitation, the top section of the proposed TSF may be visible but is unlikely to be discernible from surrounding hillsides.
- The Deelkraal II TSF could be visible from the mining villages of Deelkraal, Elandsridge and Wedelia. However, the extent of vegetation on the edges and within these settlement areas is likely to mean that views of the TSF from within the settlement areas are unlikely.
- The Deelkraal II TSF will be visible from the majority of internal mining roads within its limit of visibility. However, mine dumps are a common sight within this area.
- The proposed overhead powerline is likely to be visible to its approximate limit of visibility (2.5km) but is highly unlikely to be visible outside the valley system in which it is located.
- The proposed overhead powerline is likely to be visible to the entire area of the mining villages of Deelkraal, Elandsridge and Wedelia. However, the extent of vegetation on the edges and within these settlement areas is likely to mean that views of the powerline from within the settlement areas are unlikely.
- The proposed overhead powerline will be visible from all internal mining roads that it runs beside. However, medium voltage overhead powerlines are a common sight adjacent to these roads.
- The proposed pipelines are only likely to be visible from the roads that they run beside. The sight of similar pipelines is a common sight beside roads within the mine area.

A mathematical calculation has been used to indicate the Approximate Visual Horizon of the proposed Deelkraal II TSF. This indicates that the most obvious project elements are likely to have the be Approximate Limit of Visibility (ALV) indicated below.

ELEMENT	APPROXIMATE EXTENT OF VISIBILITY (ALV)
Deelkraal 2 TSF, up to 65m high	28.8km
Overhead power line, up to 20m high	2.5km

It should be noted that in reality the visibility of the proposed TSF is likely to be reduced by:

- Weather conditions that limit visibility. This could include hazy conditions during fine weather as well as mist and rain;
- Scale and colour of individual elements making it difficult to differentiate structures from the background;



- The fact that as the viewer gets further away, the apparent height of visible elements reduces. At the limit of visibility it will only be possible that the very tip of an object may be visible. This reducing scale means that an object will become increasingly more difficult to see as the distance from it increases; and
- Likely rehabilitation of the slopes over time making it difficult to differentiate from surrounding areas.

The following visual impacts are expected to occur as a result of the project:

9.3.11.1 **LANDSCAPE CHANGE DUE TO THE PROPOSED PROJECT**

Construction works are likely to largely affect views from local mining roads.

During the Operational Phase, the proposed Deelkraal II TSF is likely to be visible to rural areas to the north and south of the series of ridgelines and valleys within which mining operations are focused. However, it is unlikely to be highly obvious due to the distance of views and the fact that only the top of the TSF is likely to be visible which is unlikely to be visually discernible from surrounding ridgelines.

The proposed overhead powerlines and pipelines are only likely to be visible from within the mining area within which these infrastructure elements are a relatively common sight.

It also needs to be stated that even outside the project area and within the rural areas to the north and south of the proposed project, mining operations including spoil heaps are a relatively common sight.

With mitigation measures Landscape Impacts were assessed as likely to have an impact of Low Negative significance during Construction and an impact of Medium Low Negative significance during the Operational Phase. The difference is due to the likelihood that the Deelkraal II TSF is ultimately likely to be visible from areas outside the series of ridgelines within which the project is located.

9.3.11.1.1 IMPACT RATING

The potential visual impact ratings are based on the worst-case scenario when considering all aspects of the project together. It is expected that visual impacts could occur from activities and infrastructure throughout all project phases, including construction and decommissioning, however the main impact would be the visual impact of the TSF and associated infrastructure during its operational phase.

The impacts ratings are provided in **Table 65**.

Table 65: Summary of visual impacts relating to landscape change

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Change to the landscape characteristics and key views	Construction	Low Negative	Low Negative	Low Negative
	Operation	Medium to Low Negative	Medium to Low Negative	Medium to Low Negative

9.3.11.1.2 CUMULATIVE IMPACT

The proposed project will add to disturbance and the sight of mining infrastructure within the mining area, however the cumulative impact is expected to be low as much of the surrounding area is already impacted on by existing mining infrastructure.

9.3.11.1.3 PROPOSED MITIGATION MEASURES

- Locate storage areas and contractor's camps away from medium sensitive areas including entrances of residential areas, the Deelkraal passive recreation area and ridgelines;
- Control site access particularly during construction in order to minimise areas of disturbance particularly to areas of vegetation;

- Undertake waste management in order to minimise the spread of waste from the site;
- Reinstate, augment and maintain retained natural vegetation;
- Remove all temporary works;
- Minimise disturbance and maintain existing vegetation and newly planted vegetation as far as is possible both within and surrounding the development area.

9.3.11.2 CHANGE IN THE CHARACTER OF THE LANDSCAPE AS VIEWED FROM MAIN ROADS (N12 AND R501)

During the operational phase, the proposed Deelkraal II TSF is likely to be become visible to rural areas to the north and south of the series of ridgelines and valleys within which mining operations are focused. However, it is unlikely to be highly obvious due to the distance of views and the fact that only the top of the TSF is likely to be visible which is unlikely to be visually discernible from surrounding ridgelines.

The proposed overhead powerlines and pipelines are only likely to be visible from within the mining area within which these infrastructure elements are a relatively common sight. It also needs to be stated that even outside the project area and within the rural areas to the north and south of the proposed project, mining operations including spoil heaps are a relatively common sight.

The visual impact was assessed as likely to have No Impact during construction and a Medium-Low significance during the operational phase of the project.

The proposed TSF, overhead powerlines and pipelines are likely to be visible from within the mining area within which these infrastructure elements are a relatively common sight. The proposed project will add to disturbance and the sight of mining infrastructure within the mining area.

The visual impact was assessed as likely to have and impact of Low Significance during construction and a Medium-Low Significance during the operational phase of the project.

9.3.11.2.1 IMPACT RATING

The impacts ratings are provided in **Table 66**.

Table 66: Summary of impacts related to visual impacts from roads

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Change to the landscape as viewed from main roads	Construction	Medium to Low Negative	Medium to Low Negative	Low Negative
	Operation	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

9.3.11.2.2 CUMULATIVE IMPACT

Cumulative impacts are expected to be of moderate significance. The proposed project will add to mining infrastructure that is visible within the mining area. It will also marginally add to views of tailings storage facilities that could be visible from rural areas to the north and south of the mining area.

9.3.11.2.3 PROPOSED MITIGATION MEASURES

- Reinstate, augment and maintain retained natural vegetation ;
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Undertake rehabilitation of the TSF on an incremental basis in order to help the side slopes of the facility blend visually with the surrounding landform; and
- Maintain existing vegetation and newly planted vegetation as far as is possible both within and surrounding the development area.

9.3.11.3 CHANGE IN THE CHARACTER OF THE LANDSCAPE FROM THE BOSKOPDAM NATURE RESERVE

During construction the proposed project will not be visible from the Boskopdam Nature Reserve. During the operational phase, the proposed Deelkraal II TSF is likely to be become visible as the facility nears its ultimate height. However, it is unlikely to be highly obvious due to the distance of views and the fact that only the top of the TSF is unlikely to be visually discernible from surrounding ridgelines within which it may be seen.

The visual impact was assessed as likely to have No Impact during construction and a Medium-Low Significance during the operational phase of the project.

9.3.11.3.1 IMPACT RATING

The impacts ratings are provided in **Table 67** .

Table 67: Summary of impacts related to visual impacts at Boskop Dam

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Change to the landscape characteristics from Boskop Dam	Operation	Medium to Low Negative	Medium to Low Negative	Medium to Low Negative

9.3.11.3.2 CUMULATIVE IMPACT

The proposed project will mainly add to mining infrastructure that is visible within the mining area. The TSF is unlikely to be visually obvious from the Reserve and is unlikely to increase the extent of mining operations that are visible. Overall low cumulative impacts are expected.

9.3.11.3.3 PROPOSED MITIGATION MEASURES

Undertake rehabilitation of the TSF on an incremental basis in order to help the side slopes of the facility blend visually with the surrounding landform.

9.3.11.4 CHANGE IN THE CHARACTER OF THE LANDSCAPE FROM THE DEELKRAAL PASSIVE RECREATION AREA

During construction the proposed project will not be visible from the Boskopdam Nature Reserve. The proposed project will add to disturbance and the sight of mining infrastructure from the recreation area during the Construction Phase.

During the Operational Phase, the proposed TSF, overhead powerlines and pipelines are likely to be visible from within the recreation area however these infrastructure elements are a relatively common sight in the vicinity. The visual impact was assessed as likely to have a significance of Low Negative Significance during construction and a Medium-Low Significance during the Operational Phase of the project.

9.3.11.4.1 IMPACT RATING

The impacts ratings are provided in **Table 68.**

Table 68: Summary of impacts related to visual impacts

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Change to the landscape characteristics and key views from Deelkraal recreation area	Construction	Medium to Low Negative	Low Negative	Low Negative
	Operation	Medium to High Negative	Medium to Low Negative	Medium to Low Negative



9.3.11.4.2 CUMULATIVE IMPACT

The proposed project will add to disturbance and the sight of mining infrastructure from the recreation area. Overall low cumulative impacts are expected as the surrounding area is already impacted on by existing mining activities.

9.3.11.4.3 PROPOSED MITIGATION MEASURES

Construction Phase Mitigation:

- Locate storage areas and contractor's camps away from medium sensitive areas including entrances of residential areas, the Deelkraal passive recreation area and ridgelines;
- Control site access particularly during construction in order to minimise areas of disturbance particularly to areas of vegetation;
- Undertake waste management in order to minimise the spread of waste from the site; and
- Minimise disturbance, maintain and augment existing vegetation and maintain newly planted vegetation as far as is possible both within and surrounding the development area.

Operational Phase Mitigation:

- Reinstate, augment and maintain retained natural vegetation;
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Undertake rehabilitation of the TSF on an incremental basis in order to help the side slopes of the facility blend visually with the surrounding landform; and
- Maintain existing vegetation and newly planted vegetation as far as is possible both within and surrounding the development area.

9.3.11.5 **CHANGE IN THE CHARACTER OF THE LANDSCAPE BY RESIDENTS OF THE LOCAL MINE VILLAGES**

It is unlikely that extensive views of construction any of the project elements will be possible from within the residential villages. It is possible however, that small views could be possible from the residences on the edges facing towards the proposed project.

During the Operational Phase it is also unlikely that extensive views of any of the project elements will be possible from within the residential mine villages. It is possible however, that small views could be possible from the residences on the edges facing towards the proposed project.

The visual impact was assessed as likely to have a significance of Low Negative Significance both during the construction and the Operational Phase of the project.

9.3.11.5.1 IMPACT RATING

The impacts ratings are provided in **Table 69**.

Table 69: Summary of impacts related to visual impacts on local mine villages

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Change to the landscape characteristics and key views for mine villages	Construction and Operation	Low Negative	Low Negative	Low Negative

9.3.11.5.2 CUMULATIVE IMPACT

Minor intensification of views of mining infrastructure and disturbance will result in an overall low cumulative impact.

9.3.11.5.3 PROPOSED MITIGATION MEASURES

Construction Phase Mitigation:

- Minimise disturbance;
- Retain and augment existing vegetation;
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Maintain existing vegetation and newly planted vegetation as far as is possible both within and surrounding the development area; and
- Locate storage areas and contractor's camps outside areas with medium sensitivity and away from mine villages.
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Undertake rehabilitation of the TSF on an incremental basis in order to help the side slopes of the facility blend visually with the surrounding landform; and
- Locate storage areas and contractor's camps outside areas with medium sensitivity and away from mine villages.

Operational Phase Mitigation:

- Monitor rehabilitated areas post-construction and implement remedial actions;
- Undertake rehabilitation of the TSF on an incremental basis in order to help the side slopes of the facility blend visually with the surrounding landform; and
- Locate storage areas and contractor's camps outside areas with medium sensitivity and away from mine villages.

9.3.11.6 CHANGE IN THE CHARACTER OF VIEWS AS EXPERIENCED BY RESIDENTS OF HOMESTEADS WITHIN THE AREAS TO THE NORTH AND SOUTH OF THE AREA OF RIDGELINES AND VALLEYS.

During construction the proposed project will not be visible from these homesteads. During the Operational Phase, the proposed Deelkraal II TSF is likely to be visible but is unlikely to be visually obvious. It is possible to be visible to greater numbers of homesteads as it nears its final height.

The degree to which this will be obvious may be mitigated by undertaking early rehabilitation of side slopes helping them blend visually with the surrounding landform. There will be no impact during the Construction Phase. During the Operational Phase the assessment indicates that the proposed project is likely to have an impact with a Medium Low Significance.

9.3.11.6.1 IMPACT RATING

The impacts ratings are provided in **Table 70.**

Table 70: Summary of impacts related to visual impacts on ridgelines and valleys

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Change to the landscape characteristics and key	Operation	Medium to Low Negative	Medium to Low Negative	Medium to Low Negative

views within the areas to the north and south of the area of ridgelines and valleys				

9.3.11.6.2 CUMULATIVE IMPACT

The proposed project will mainly add to mining infrastructure that is visible within the mining area. The TSF may be visible from these roads which could increase the extent of similar facilities that are visible. An overall moderate cumulative impact is expected.

9.3.11.6.3 PROPOSED MITIGATION MEASURES

Undertake rehabilitation of the TSF on an incremental basis in order to help the side slopes of the facility blend visually with the surrounding landform.

9.3.11.7 LIGHTING IMPACTS

Lighting impacts during both the construction and operational phases of the proposed project was assessed as likely to have a Low Negative visual impacts. The environment surrounding the proposed facility is not dark at night. Existing lighting is typically comprised of

- Low intensity lighting associated with individual dwellings;
- Bright lighting associated with mining operations; and
- Vehicle lights that may be driving through the area.

Lighting associated with the proposed construction phase could include temporary security and safety lighting. If this is not designed appropriately, it is possible that lighting could create nuisance for local people.

9.3.11.7.1 IMPACT RATING

The impacts ratings are provided in **Table 71**.

Table 71: Summary of impacts related to visual impacts for lighting

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Change to the landscape characteristics and key views	Construction and Operation	Low Negative	Low Negative	Low Negative

9.3.11.7.2 CUMULATIVE IMPACT

Construction and operational lighting is likely to marginally intensify the existing impact of lighting within its vicinity. However, this will be a localised and is unlikely to extend the cumulative effect of lighting. Overall low cumulative impacts are expected.

9.3.11.7.3 PROPOSED MITIGATION MEASURES

The proposed mitigation measures are provided below:

- Careful design of security and operational lighting to minimise impacts on surrounding areas and receptors;
- High mast lighting should not be used.
- Ensure that the intention of the original lighting design is maintained throughout the construction phase.

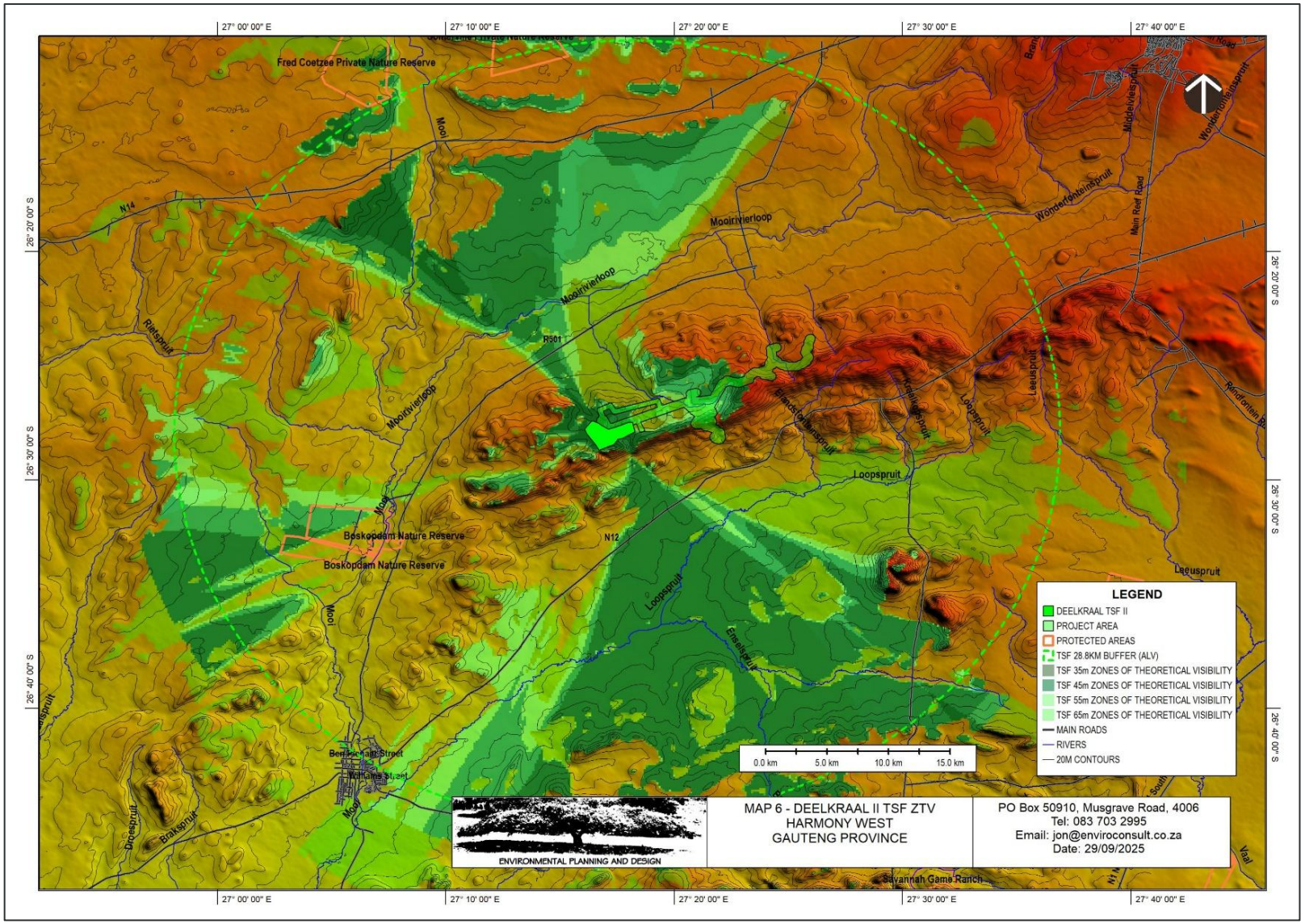


Figure 68: Zones of Theoretical Visibility analysis for TSF

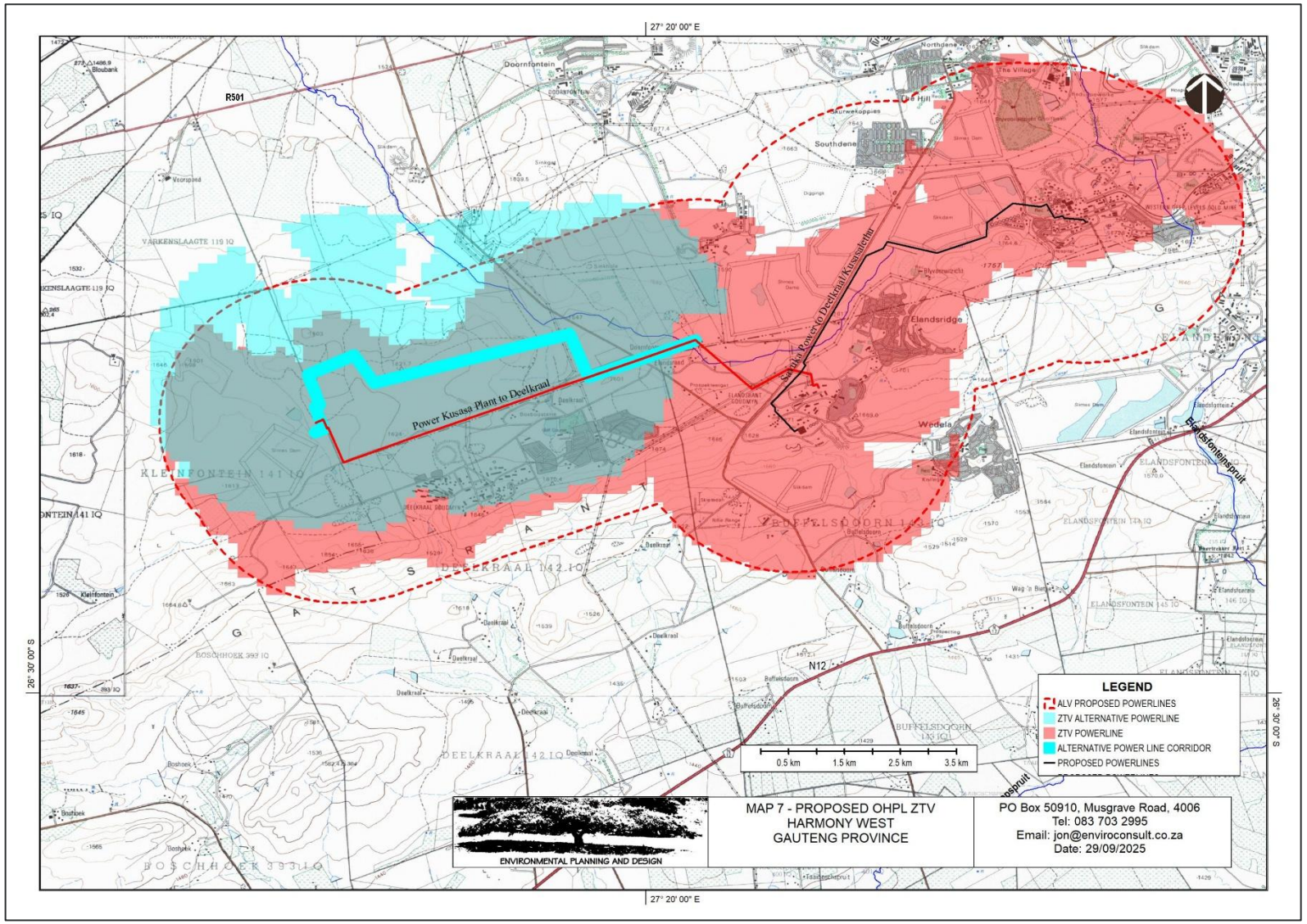


Figure 69: Zones of Theoretical Visibility analysis for linear infrastructure

9.3.12 TRAFFIC RELATED IMPACTS

This section presents the identified traffic impacts as per the Traffic Impact Statement undertaken by SMEC (2026).

During the implementation of the project, the construction activities related to the installation of the necessary infrastructure and equipment is undertaken. Access to the mine during construction will be gained via internal mine dirt roads and construction roads from the existing public roads mainly via the following intersections:

1. Existing D92 and Access Road to Deelkraal;

2. Existing D92 and D1648

3. Existing D1648 and Kusasalethu Main Entrance;

4. Existing D1648 and Mponeeng operations (Savuka) - informal access;

5. Existing D1648 and Elandsridge;

6. Existing R500 and Access Road to Mponeng Operations (Surface Ops Entrance);

7. Existing N12 and D92

8. D92 and proposed site access road.

This proposed site access road will need to be consolidated with the nearest existing intersection to the north to illuminate substandard access spacing along Class 2 provincial road (D92). All informal and proposed private accesses off provincial roads to the mine will require approval from the affected road authority.

Operational Phase Traffic Impacts include traffic related operational activities associated with the maintenance and control of the mining operations. During Decommissioning Traffic Impacts include traffic related activities associated with complying with the prevailing regulatory requirements, rehabilitation and managing environmental impacts to render the affected area suitable for future desirable use.

The potential impact is expected to be minimal or insignificant during the planning, and the rehabilitation phase. This is due to low volumes of traffic expected to be generated by the two phases. Considering this, only the Construction, Operational and Decommissioning phases are anticipated to require investigation during the Impact Assessment Phase of the EIA process for the selected site.

9.3.12.1 **DETERIORATION OF ROAD NETWORK CONDITIONS**

Deterioration of local road networks during construction stems from heavy vehicle loads, dust, material spillage, and unpaved haul routes.

9.3.12.1.1 IMPACT RATING

The impacts ratings are provided in **Table 72**.

Table 72: Summary of impacts related to road network deterioration

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Deterioration of Road Network	Construction and Operational Phase	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

9.3.12.1.2 CUMULATIVE IMPACT

Traffic related impacts are by their nature cumulative with existing traffic related impacts. Existing traffic related impacts, road conditions and traffic volumes have already been taken into account in the assessment of traffic impacts. Overall low cumulative traffic impacts are expected.

9.3.12.1.3 PROPOSED MITIGATION MEASURES

The flowing mitigation is proposed:

- Conduct regular inspections of all access and haul roads to identify signs of deterioration such as potholes, rutting, erosion, dust generation, inadequate drainage, or surface damage. Record inspection findings, implement routine maintenance, and assess whether road improvements, strengthening, widening, resurfacing, or drainage upgrades are necessary to ensure safe and efficient vehicle movement.
- Ensure vehicles are not overloaded. Ensure that all vehicles operate within their legally permitted gross vehicle mass (GVM) and axle load limits.

9.3.12.2 IMPACT OF DUST ALONG GRAVEL ACCESS ROADS

Dust generated from gravel access roads during construction and operation causes severe air pollution, health risks from fine particulate and potential heavy metal inhalation, reduced driver visibility, vehicle wear, and ecological damage to nearby vegetation and water sources

9.3.12.2.1 IMPACT RATING

The impacts ratings are provided in **Table 73**

Table 73: Traffic Dust Impacts

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Traffic Dust	Construction and Operational Phase	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

9.3.12.2.2 CUMULATIVE IMPACT

Traffic related impacts are by their nature cumulative with existing traffic related impacts. Existing traffic related impacts, road conditions and traffic volumes have already been taken into account in the assessment of traffic impacts. Overall low cumulative traffic impacts are expected.

9.3.12.2.3 PROPOSED MITIGATION MEASURES

Regular wet grading and wetting for dust suppression and limiting of dust generating activities during strong wind periods.

9.3.12.3 ADDITIONAL TRAFFIC VOLUMES ON ROAD SECTIONS, INTERSECTION CAPACITY AND TRAFFIC SAFETY

Additional traffic volumes can degrade road section performance, decrease intersection Level of Service, and increase conflict points, raising crash risks

9.3.12.3.1 IMPACT RATING

The impacts ratings are provided in **Table 74**.

Table 74: Traffic volume and safety impacts

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Additional Traffic Volumes	Construction and Operational Phase	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

9.3.12.3.2 CUMULATIVE IMPACT

Traffic related impacts are by their nature cumulative with existing traffic related impacts. Existing traffic related impacts, road conditions and traffic volumes have already been taken into account in the assessment of traffic impacts. Overall low cumulative traffic impacts are expected.

9.3.12.3.3 PROPOSED MITIGATION MEASURES

Scheduling development traffic movement to not coincide with existing peaks where possible and encourage use of public transportation for workers.

9.3.12.4 **IMPACT OF ABNORMAL LOADS**

Abnormal loads can cause severe structural stress, deep rutting, and fatigue cracking on asphalt surface.

9.3.12.4.1 IMPACT RATING

The impacts ratings are provided in **Table 75.**

Table 75: Impact of abnormal loads

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Abnormal Loads	Construction and Operational Phase	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

9.3.12.4.2 CUMULATIVE IMPACT

Traffic related impacts are by their nature cumulative with existing traffic related impacts. Existing traffic related impacts, road conditions and traffic volumes have already been taken into account in the assessment of traffic impacts. Overall low cumulative traffic impacts are expected.

9.3.12.4.3 PROPOSED MITIGATION MEASURES

Implementation of traffic management strategies during construction - temporal road signs, use of flagmen, reduced temporary speed limits will be required to be implemented.

9.3.13 NOISE RELATED IMPACTS

The propagation of noise generated during the construction and operational phases for the project was estimated using the CadnaA model in accordance with ISO 9613. The attenuation of noise was conservatively assumed by not taking any terrain features into account.

For a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level is not detectable. According to SANS 10103 (2008); the predicted increase in noise levels from the current baseline (assuming baseline levels to be typical of urban areas) is expected to result in the following community reaction due to project activities:

- Day-time construction activities:
  - ‘Strong’ reaction with threats of community action up to 50 m from activities.
  - ‘Medium’ reaction with widespread complaints up to 150 m from the activities.
  - ‘Little’ reaction with sporadic complaints up to 300 m from activities.
- Day-time operations at the upgraded gold plant:
  - ‘Strong’ reaction with threats of community action up to 20 m from activities.
  - ‘Medium’ reaction with widespread complaints up to 50 m from the activities.
  - ‘Little’ reaction with sporadic complaints up to 150 m from activities.
- Night-time operations at the upgraded gold plant:
  - ‘Strong’ reaction with threats of community action up to 150 m from activities.
  - ‘Medium’ reaction with widespread complaints up to 300 m from the activities.
  - ‘Little’ reaction with sporadic complaints up to 600 m from activities.

Given the distances of potential exceedances of noise criteria, the only sensitive receptor that may be impacted is Elandsrand ~160 m to the northeast of the upgraded gold plant.



9.3.13.1.1 IMPACT RATING

The impacts ratings are provided in **Table 73**

Table 76: Noise Impacts

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Incremental increase in noise levels exceeding noise criteria at potential sensitive receptors (i.e. residential areas and individual dwellings)	Construction and Decommissioning	Medium to Low Negative	Medium to Low Negative	Medium to Low Negative
	Operation	Medium to High Negative	Medium to Low Negative	Medium to Low Negative

9.3.13.1.2 CUMULATIVE IMPACT

The rating levels for urban districts were used to estimate background day- and night-time noise levels in the study area. These levels were used to estimate cumulative impacts and the predicted increase in noise levels due to the project operations. The noise related impacts discussed are by their nature cumulative with other noise sources in the area. Cumulative noise impacts are therefore expected to the Medium to Low negative.

9.3.13.1.3 PROPOSED MITIGATION MEASURES

To reduce the nuisance effects of the proposed construction and decommissioning on the community, the following mitigation actions are recommended:

- Construction staff need to be trained on noise control plan during health & safety briefings;
- 'Low noise' equipment, or methods of work is to be selected;
- Avoid clustering of mobile plant near receptors and enforce rest periods for unavoidable maximum noise events;
- Regular inspection and maintenance of all equipment is to be established;
- Avoid unnecessary equipment idling;
- Limit activities to day-time working hours (06:00 – 18:00); and
- Establish community engagement and ensure all affected persons have been consulted with prior to the commencement of and during activities.

To reduce the nuisance effects of the proposed gold plant operation on the community, the following mitigation actions are to be applied:

- Routine monitoring of ambient noise at Elandsrand;
- Train operational staff on noise control plan during health & safety briefings;
- Regular inspection and maintenance of all equipment;
- Enclosure of noisy equipment (>85 dBA);
- A noise complaints register must be kept; and
- If complaints are received, noise sampling should be undertaken at the NSRs and source of noise should be investigated.

9.3.14 DAM / STRUCTURAL SAFETY IMPACTS

This section presents the identified potential safety impacts which may emanate from the proposed activities.



9.3.14.1 **DESCRIPTION OF IMPACTS**

Unstable and/or unsafe TSF practices can result in failure of the TSF containment structure, resulting in a sudden, uncontrolled release of liquid tailings. Fears of such an event occurring remains high especially amongst communities living within proximity of TSFs as result of the Jagersfontein TSF Dam Wall Collapse in September 2022. The surrounding communities may have negative perceptions relating to the risk of TSF failure which should addressed.

9.3.14.1.1 IMPACT RATING

The impact ratings associated with the proposed activities related to dam safety are indicated in **Table 77**.

Table 77: Summary of impacts related to dam safety

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
TSF breaking the dam wall, resulting in massive sudden uncontrolled flood of liquid sludge	Construction Phase	Medium to High Negative	Low Negative	Low Negative
	Operation Phase	Very High Negative	Medium to High Negative	Medium to High Negative
	Post-closure and Rehabilitation	High Negative	Medium to High Negative	Medium to High Negative

9.3.14.1.2 CUMULATIVE IMPACT

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is likely that the impact will result in spatial and temporal cumulative change of high to very high negative significance without mitigation and medium-high negative with mitigation.

9.3.14.1.3 PROPOSED MITIGATION MEASURES

The proposed mitigation measures to avoid adverse impacts on dam / structural safety due to the proposed activities are provided below:

- Developer must undertake the Dam Safety Technical Assessment and register with the DWS Dam Safety Office;
- There must be focus on maintaining geotechnical stability, controlling water, and ensuring structural integrity, as outlined in the Global Industry Standard on Tailings Management (GISTM).
- Limiting the rate of rise must be implemented to allow for adequate consolidation and prevent pore pressure buildup, particularly when placing fresh tailings over older, softer materials.
- Constructing of robust spillways and emergency containment ponds to manage extreme weather events and/or emergency situations.
- Robust emergency preparedness plan inclusive of dam / structural failure must be compiled and must form part emergency drills and environmental awareness training.
- Potential affected groups / communities must be made aware of the emergency plan and how they should react to emergency situations.
- Dam / structural failure sirens must be permanently installed to warn the community in the unfortunate event of a dam / structural failure of the TSF.
- Developer should make the reports relating to structural monitoring and integrity of the TSF available the I&APs to address the negative perceptions relating to the risk of TSF failure.
- Ground improvement, such as dynamic compaction, is recommended to densify the underlying landfill material, reduce voids, and improve uniformity in stiffness and bearing capacity across the area.

- All measures in the EMPr, conditions of the Environmental Authorisation and Water Use License should be implemented especially those related to structural integrity and safety.
- Install the liner / membrane according to design specifications and industry best practice to prevent UV exposure and degradation.

9.3.15 SOCIAL IMPACTS

This section presents the identified potential socio-economic impacts which may emanate from the proposed activities. The principal social change processes that the project is likely to set in motion include: demographic processes (a potential influx of jobseekers); economic processes (employment, procurement and income, and competition for these); geographic processes (changes in land use and access along the TSF footprint and pipeline corridors); institutional and legal processes (the land-ownership dispute, engagement and grievance handling, and regulatory interactions); and socio-cultural processes (changes in sense of place and perceptions of risk). Whether these processes result in social impacts, and how severe those impacts are, depends on the characteristics of the host communities and on the extent and success of mitigation.

9.3.15.1 **HEIGHTENED COMMUNITY EXPECTATIONS (EMPLOYMENT AND PROCUREMENT)**

The announcement of the project has raised expectations of employment, procurement and beneficiation in an area of very high unemployment and acute need. If expectations are not transparently managed, the result can be frustration, disappointment, conflict between beneficiaries and non-beneficiaries, and damage to community relations and the social licence. This is a negative impact that begins in the planning phase and that can largely be mitigated through transparent, multilingual communication about the type, number and timing of opportunities and the recruitment and procurement processes.

9.3.15.1.1 IMPACT RATING

The impacts ratings are provided in **Table 78**

Table 78: Summary of impacts related to community expectations

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Community Expectations	Planning & Construction	Medium to High Negative	Low Negative	Low Negative

9.3.15.1.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.1.3 PROPOSED MITIGATION MEASURES

The proposed mitigation measures are provided below:

- Maintain and adequately resource a Stakeholder Relations function, including a Stakeholder Relations Manager and a Community Liaison Officer (CLO) who is trusted by, and accessible to, affected communities.
- Operate a community-friendly grievance mechanism developed with communities and landowners; maintain a grievance register; check it regularly; and provide regular feedback to communities.
- Develop and implement a transparent communication and expectation-management strategy covering the type, number and timing of opportunities and the recruitment and procurement processes, in Setswana, isiXhosa and Sesotho, supported by Afrikaans and English.

9.3.15.2 **EMPLOYMENT, SKILLS DEVELOPMENT AND PROCUREMENT OPPORTUNITIES**

The project will create temporary employment during construction and a smaller number of longer-term opportunities during operation, together with procurement and SMME opportunities and the potential for skills development. These are positive impacts. They can be enhanced by prioritising host and neighbouring

communities, maintaining transparent local labour desks, procuring goods and services locally as far as reasonably possible, and supporting capacity-building and supplier development. Barriers to entry for local SMMEs (certification, capacity and capital) should be actively addressed.

9.3.15.2.1 IMPACT RATING

The impacts ratings are provided in **Table 79**.

Table 79: Summary of impacts related to employment and skill development

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Employment, skills development and procurement opportunities	Construction and Operation	Medium to High Positive	Medium to High Positive	Medium to High Positive

9.3.15.2.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.2.3 PROPOSED MITIGATION MEASURES

The proposed mitigation measures to avoid adverse impacts on socioeconomic aspects of the community due to the proposed activities are provided below:

- Developer must allow for a transparent employment opportunity for locals.
- Local suppliers and workers must be prioritised as far as possible for economic and professional growth.
- Implement a grievance mechanism and ensure that it is community friendly. There must be a record of community grievances and actions undertaken to address the grievances.
- Maximise local employment and procurement within realistic skill constraints; operate local labour desks; support SMME participation and capacity building; and prioritise host and neighbouring communities.

9.3.15.3 **INFLUX OF JOBSEEKERS**

The prospect of employment may attract jobseekers and opportunistic settlers, placing pressure on already-stressed housing, services and social systems and potentially encouraging informal settlement. Given the existing skills base in this mining region, a large influx is not inevitable, but the risk is real and should be managed through an Influx Management Plan developed with local authorities, clear communication that recruitment will prioritise local people, and discouragement of spontaneous settlement near the TSF and servitudes.

9.3.15.3.1 IMPACT RATING

The impact ratings are provided in **Table 80.**

Table 80: Summary of impacts related to influx of jobseekers

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Influx of jobseekers	Construction	Medium to High Negative	Low Negative	Low Negative

9.3.15.3.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.3.3 PROPOSED MITIGATION MEASURES

Develop and implement an Influx Management Plan and a Community Safety Plan with local authorities and community-security initiatives, and secure project infrastructure.

9.3.15.4 **NUISANCE IMPACTS: DUST, NOISE, TRAFFIC AND VISUAL INTRUSION**

Construction and operational activities, heavy-vehicle movement and the TSF itself will generate dust, noise, traffic and visual intrusion, affecting nearby settlements (notably Deelkraal Village and Blyvooruitzicht) and farms. Dust is already a significant concern in the area. These impacts can be reduced through dust suppression, progressive vegetation of completed TSF sections, scheduling and management of vehicle movements, adherence to speed limits near settlements, and a monitoring programme with results communicated to communities. Visual and sense-of-place impacts are more difficult to mitigate fully and require early, honest communication about the footprint, design and timing.

9.3.15.4.1 IMPACT RATING

The impacts ratings are provided in **Table 81.**

Table 81: Summary of nuisance impacts

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Nuisance impacts	Construction and Operation	Medium to High Negative	Low Negative	Low Negative

9.3.15.4.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.4.3 PROPOSED MITIGATION MEASURES

- Agree farm-access, fencing, communication and compensation protocols with affected landowners before construction, and protect shared water sources.
- Implement the dust, noise and visual mitigation measures recommended in the specialist studies, with a monitoring programme and results communicated to communities.

9.3.15.5 **COMMUNITY SAFETY, CRIME AND INFRASTRUCTURE THEFT**

The area experiences high levels of crime, including stock theft, the theft of Eskom and other infrastructure, and artisanal mining, and the destruction of the local power station illustrates the scale of the risk. New pipelines and infrastructure may be targeted (including in the mistaken belief that pipelines carry gold), and the influx of workers and vehicles can increase petty crime and affect community safety. A Community Safety Plan should be developed with local law enforcement and existing community security initiatives; infrastructure should be secured; and a Code of Conduct, identification of all project personnel, and induction training should be enforced. The interface between project activities and artisanal mining requires specific, carefully managed attention.

9.3.15.5.1 IMPACT RATING

The impacts ratings are provided in **Table 82.**

Table 82: Summary of impacts related to safety and crime

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Safety, Crime and theft	Construction	High Negative	Medium to High Negative	Medium to High Negative

9.3.15.5.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.5.3 PROPOSED MITIGATION MEASURES

Develop and implement a Community Safety Plan with local law enforcement and existing community-security initiatives; secure project infrastructure against theft; and manage the interface with artisanal mining.

9.3.15.6 IMPACTS ON FARMING LIVELIHOODS AND SHARED WATER SOURCES

Construction along pipeline corridors and around the TSF may disturb farming operations, damage fences, leave gates open or create open excavations that endanger livestock, and generate litter that animals may ingest. Some farms depend on shared water sources (an on-farm dam, a stream and mine-associated runoff) for livestock, game and domestic use, and disruption of these would have serious consequences. Farm-access, fencing, communication and compensation protocols should be agreed with affected landowners before construction; productive and occupied land should be avoided where possible; shared water sources should be protected; and disturbed areas should be restored.

9.3.15.6.1 IMPACT RATING

The impacts ratings are provided in **Table 83.**

Table 83: Summary of impacts related to impact on farming

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Impact on livelihoods	Construction	Medium to High Negative	Low Negative	Low Negative

9.3.15.6.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.6.3 PROPOSED MITIGATION MEASURES

Agree farm-access, gate-and-fence, communication and compensation protocols with affected landowners before construction; avoid productive and occupied land where possible; protect shared water sources; and restore disturbed areas.

Ensure that social requirements in the mitigation measures are included in contracts with contractors and sub-contractors.

9.3.15.7 ACCESS AND DISTURBANCE ASSOCIATED WITH DEELKRAAL VILLAGE

Routing construction and operational access through or past Deelkraal Village would expose a settlement with a vulnerable population to additional traffic, dust, noise and safety risk, and residents have expressed a clear preference that access not pass through the village. Access should be routed away from the village where feasible; where the private access road is used, it should be maintained; and the village should be engaged on access arrangements.

9.3.15.7.1 IMPACT RATING

The impacts ratings are provided in **Table 82**.

Table 84: Summary of impacts related to access and disturbance

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Access and disturbance	Construction	Medium to High Negative	Low Negative	Low Negative

9.3.15.7.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.7.3 PROPOSED MITIGATION MEASURES

Route access away from Deelkraal Village where feasible and maintain any access road used by the project.

9.3.15.8 POTENTIAL DISPLACEMENT AND LOSS OF LIVELIHOOD OF INFORMAL OCCUPIERS

The proposed footprint is used by informal occupiers for grazing (the only kraal in the area) and cultivation. Although these occupiers are not present with formal legal authority, their potential physical and economic displacement raises livelihood and vulnerability impacts that must be managed in line with international standards on involuntary resettlement and livelihood restoration. Engagement must be accessible given limited literacy and English; alternatives for grazing and cultivation should be considered; and vulnerability should be recognised irrespective of tenure status. The interface with artisanal mining must be managed in a manner that protects safety and human rights.

9.3.15.8.1 IMPACT RATING

The impacts ratings are provided in **Table 85**.

Table 85: Summary of impacts related to displacement

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Displacement and loss of livelihoods	Construction	High Negative	Medium to High Negative	Medium to High Negative

9.3.15.8.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.8.3 PROPOSED MITIGATION MEASURES

Address the situation of informal occupiers and artisanal land users in line with international standards on involuntary resettlement and livelihood restoration; engage accessibly given limited literacy and English; and recognise vulnerability irrespective of tenure status.

9.3.15.9 FEAR OF TSF OR PIPELINE FAILURE AND WATER CONTAMINATION (GISTM)

This is the most significant subjective impact and the one most directly engaged by the GISTM. Communities living close to TSFs carry a persistent fear of failure, reinforced by the memory of past South African and international tailings disasters, and this fear is heightened where local drainage reports towards downstream water users – here, towards the Mooi River system and the Boskop and Potchefstroom dams. Concerns about seepage, acid mine drainage and cumulative contamination compound this fear. The proposed lined TSF design reduces seepage and groundwater-contamination risk, and detailed surface- and groundwater and dam-break modelling will be undertaken; from a social perspective, the operator must meaningfully engage affected people and downstream users in emergency-preparedness and response planning, give specific consideration to vulnerable residents, communicate design and monitoring information accessibly, operate a grievance mechanism, and comply fully with the GISTM throughout the life of the facility.

9.3.15.9.1 IMPACT RATING

The impacts ratings are provided in **Table 86**

Table 86: Summary of impacts related to fear of failure of TSF

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Fear of failure	Operation	High Negative	Medium to High Negative	Medium to High Negative

9.3.15.9.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.9.3 PROPOSED MITIGATION MEASURES

Fully implement the social-performance requirements of the GISTM for the existing and new TSF, including emergency preparedness co-developed with affected people and downstream users, and public disclosure.

Co-develop Emergency Preparedness and Response Plans with employees, contractors and affected people (including downstream users and vulnerable residents), and engage public-sector agencies on medium- and long-term recovery.

9.3.15.10 DECOMMISSIONING AND CLOSURE SOCIAL IMPACTS

At decommissioning and closure, the loss of project-related employment and income, and post-closure uncertainty regarding TSF stability and land use, are negative impacts. These should be managed through early closure planning, retrenchment procedures and portable-skills training, progressive rehabilitation and long-term stability monitoring, clear communication of closure timelines and safety measures, and the continued application of the GISTM and a closure-stage grievance mechanism.

9.3.15.10.1 IMPACT RATING

The impact ratings are provided in **Table 87.**

Table 87: Summary of impacts related to closure impacts

Impact	Phase	Pre-Mitigation	Post-mitigation	Final Significance
Loss of Employment opportunities and livelihood	Decommissioning	Medium to High Negative	Low Negative	Low Negative

9.3.15.10.2 CUMULATIVE IMPACT

Cumulative social impacts are described in Section 9.3.15.10 below.

9.3.15.10.3 PROPOSED MITIGATION MEASURES

Plan for closure early, including retrenchment procedures, portable-skills training, progressive rehabilitation, long-term stability monitoring, and clear communication of closure timelines and safety measures.

9.3.15.11 CUMULATIVE IMPACTS

The project must be assessed against a baseline that is already shaped by extensive mining, multiple tailings facilities, service-delivery failure and socio-economic decline, rather than on a clean slate. The cumulative effect of adding a further facility to an already-stressed environment – in terms of dust, water, perceived risk and pressure on services – is a material consideration. Equally, the project's re-use of historical tailings and recycling of process water, and the avoidance of new greenfield mining disturbance, are cumulative benefits. Active, adaptive management and credible monitoring are essential to managing cumulative perceptions and trust.

9.3.15.11.1 IMPACT RATING

The impact rating for cumulative social impacts has already been taken into account in the final significance scoring for each of the social impacts noted above. Cumulative social impacts are expected to be low – medium significance overall.

9.3.15.11.2 PROPOSED MITIGATION MEASURES

Implement the dust, noise and visual mitigation measures recommended in the specialist studies, with a monitoring programme and results communicated to communities.



9.3.16 OVERALL CUMULATIVE IMPACTS

A cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area. Several tailings storage facilities already exist in the project area, which is mostly already heavily modified due to existing mining infrastructure. The potential direct cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

- Visual impact on the surrounding area.

The potential indirect cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

- Flora, fauna and ecological processes – at a regional level and driven primarily by the on-going negative effects of mining activities in the area.
- Groundwater and air quality impacts – at a local level driven by the large number of existing TSFs in the area.
- Impacts on health and wellbeing are cumulative with other social pressures in the area.
- Increased pressure on road and other infrastructure.

It should be noted however that Deelkraal II TSF will cater for reworking of multiple TSFs across the West Wits area. TSFs will be reworked and processed. These TSFs (the existing Deelkraal I TSF and Kusasalethu TS) will be reclaimed for processing at Kusasalethu plant and then fully rehabilitated in the future. This will also allow Harmony to manage a single large TSF rather than having to deal with numerous smaller TSF sites, which should also improve the management related to the various environmental and social issues of the existing TSFs in the region.

This reclamation and rehabilitation of existing Harmony TSFs will significantly reduce the following cumulative impacts associated with the existing unlined Harmony TSFs in the area:

- Cumulative groundwater contamination impacts from existing Harmony TSFs in the region;
- Cumulative health and radiation impacts from existing Harmony TSFs in the region;
- Cumulative air quality and dust / nuisance issues from the existing Harmony TSFs in the region; and
- Safety impacts and risks associated with the existing TSFs.

In addition, the project will have a significant positive social impact relating to the continued employment and continuation of mining (reclamation) at Harmony's various West Wits operations. Cumulatively this is considered a significant positive environmental impact (and social benefit) for the entire Harmony West Wits operation area into the future.

9.3.17 IMPACTS SUMMARY

An EIA impact assessment matrix for all identified impacts (including pre- and post-mitigation assessment) and taking into account the cumulative potential for each impact is included in Appendix G.

10 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets in a region. The sensitivity mapping technique integrates numerous datasets (basemaps and shapefiles) into a single consolidated layer making use of Geographic Information System (GIS) software and analysis tools. Environmental sensitivity mapping is a rapid and objective method applied to identify areas which may be particularly sensitive to development based on environmental, cultural and social sensitivity weightings – which is determined by specialist input within each respective field based on aerial or ground-surveys. Therefore, the sensitivity mapping exercise assists in the identification of low, medium and highly sensitive areas within the study area, towards selecting the preferred location, design and layout, and process or technology alternatives for the proposed activities and infrastructure. This sensitivity mapping approach allows for the proposed activities to be undertaken whilst protecting identified sensitive environmental areas / features. Furthermore, environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes. **Table 88** below provides a breakdown of the sensitivity rating and weightings applied to determine the sensitivity score of each aspect. **Figure 70** presents the final optimised layout which avoids key sensitive areas while **Figure 71** presents the same layout overlaid onto the combined sensitivities identified for the project.

Key Sensitive areas identified to date relate to the presence of ridges and other potential terrestrial biodiversity sensitive areas, wetlands and aquatic areas, as well as potential heritage sites and potential sensitive air quality and noise receptors. This layout has been further refined from the layout presented in the preceding sections of the report to avoid as many identified sensitivities as possible whilst at the same time adhering to identified technical and engineering feasibility constraints. Some topsoil stockpile locations and pipelines have been removed from the application and the location of certain other infrastructure components have been shifted in order to avoid identified sensitive areas.

Table 88: Sensitivity rating and weighting

Sensitivity Rating	Description	Weighting
Least concern	The inherent feature status and sensitivity is already degraded or contain no inherent sensitivities. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement.	-1
Low/Poor	The proposed development will not have a significant effect on the inherent feature status and sensitivity.	0
Medium	The proposed development will moderately negatively influence the current status of the feature.	1
High	The proposed development will have a significantly negative influence on the current status of the feature.	2
Very High	The proposed development will have a very high significant negative influence on the current status of the feature.	3

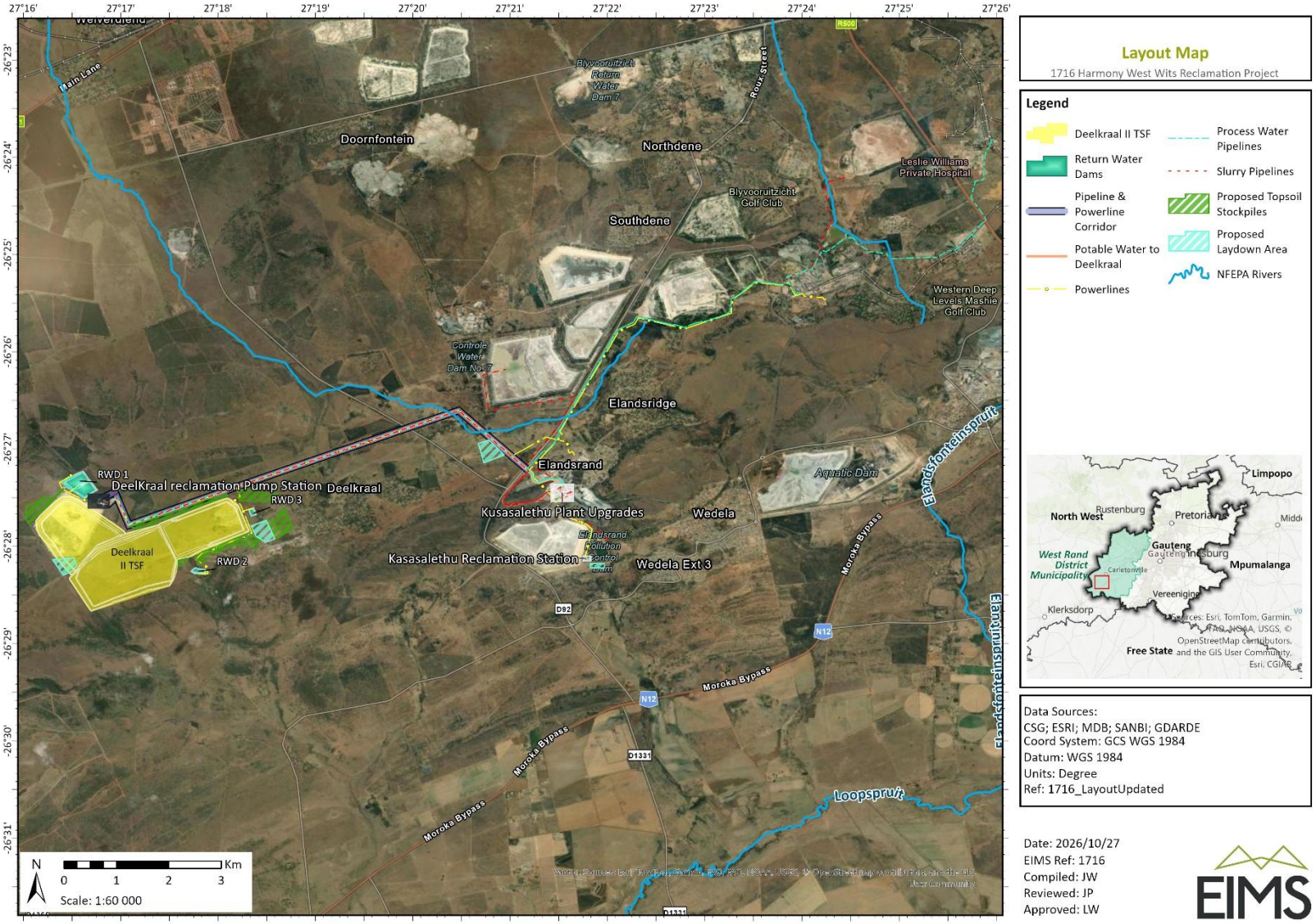


Figure 70: Final Layout Map

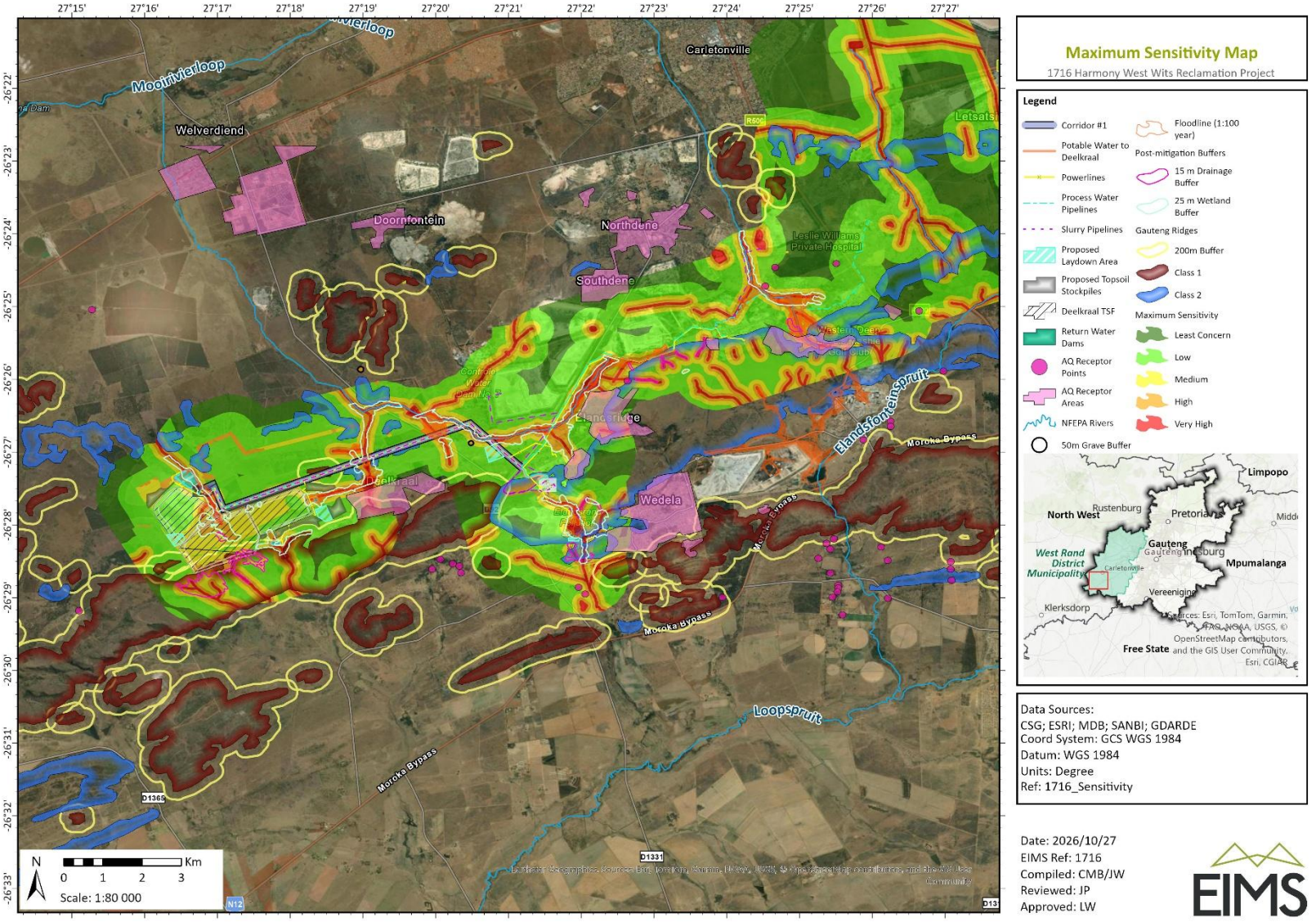


Figure 71: Combined sensitivity map including final layout and identified sensitivities

11 CLOSURE COSTING

A determination of the cost associated with final rehabilitation, decommissioning and closure was carried out. This assessment was done using both the DMPR Guidelines since the Mining Right was granted prior to 2015 Financial Provisions regulations coming into effect and the findings of these are presented in the subsequent sub-sections. Please refer to Appendix F for the full report.

The quantum of financial provisions required for un-scheduled using the DMPR Master Rates and the Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' provided by a Mine (DMPR Guidelines) was calculated.

The total unscheduled DMR Master Rates based quantum based on unscheduled closure after the first year of construction was calculated as R 52 645 985.49 (Excluding VAT). To ensure that the financial provision is up-to-date and in accordance with the NEMA requirements, annual revision of closure costing is recommended. This will also assist in accommodating changes in the closure costing due to any facilities that were constructed or demolished as well as any changes in the closure approach.

A detailed Final Rehabilitation and Closure Plan is included as Appendix F. The plan outlines how the infrastructure will be decommissioned and the environment rehabilitated and restored when operations come to an end.

12 CONCLUSIONS AND RECOMMENDATIONS

The Scoping Phase of the EIA process pre-identified potential issues and impacts associated with the proposed project and following this consultation process, valuable comments were received from various I&APs which the EAP and specialist team considered carefully in the drafting of this EIA phase reports. The EIA Phase addressed those identified potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with applicable phases of the project and recommendations made of appropriate mitigation measures for potentially significant environmental impacts. The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised through the EIA process had been captured and adequately considered.

The EIA Phase aimed to achieve the following:

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

12.1 CONCLUSIONS FROM SPECIALIST STUDIES

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

12.1.1 GROUNDWATER STUDY CONCLUSIONS

Based on the findings of this hydrogeological assessment, it is my reasoned opinion that the proposed Reclamation Project may be authorised from a groundwater perspective, provided that the recommended avoidance, management, mitigation and monitoring measures are implemented through the Environmental Management Programme and, where applicable, incorporated into the closure plan.

The hydrogeological findings support further development of a contained, monitored reclamation and deposition scheme. They do not support an unlined facility or an unconditional assurance of no receptor impact. Final design and authorisation decisions should be based on verified source terms, an approved containment design and a monitoring programme capable of detecting migration before sensitive receptors are affected.

12.1.2 HYDROLOGY STUDY CONCLUSIONS

Flooding and pollutants entering the surface water environment are the two primary impacts, whether or not indicated by the impact assessment. Both impacts are poorly represented in the impact assessment due to their probability of occurrence (improbable). In the case of flooding, there is flooding originating beyond the TSFs (from the northern and southern river systems and surface water run-on) and flooding originating from the TSFs (due to a TSF failure). The latter presents the largest risk to this study (that of flood risk and pollutants entering the surface water environment). A secondary pollutant risk is poor management of the TSFs (and by association the RWD and pipelines), resulting in a spill. Regular surface water quality monitoring is required to enable change detection, concerning the potential contamination of surface water by any pipeline leaks.

The proposed construction of the Deelkraal II TSF and associated infrastructure can be authorised concerning the hydrological (surface water) environment, inclusive of the recommended mitigation measures presented in the hydrology report. A review of the Proposed Harmony West Wits Reclamation and Deposition Project surface



water monitoring plan will also be required to ensure that the TSFs are adequately considered (as it relates to monitoring positions).

The development of a stormwater management plan to better control the runoff of 'clean' water diversion is required.

12.1.3 WETLANDS STUDY CONCLUSIONS

A risk assessment was conducted for the proposed Harmony West Wits Reclamation Project. The risks to freshwater features associated with the linear infrastructure and associated plant components are generally anticipated to be low to moderate after mitigation, provided that disturbance is limited to the minimum practicable extent, crossings are carefully controlled, hydrological and geomorphological continuity is maintained, and the prescribed stormwater, erosion, sediment and pollution controls are fully implemented.

The proposed TSF component, however, remains associated with a substantial residual freshwater impact due to the extent of direct wetland loss and disturbance within the footprint, notwithstanding that the affected wetlands are already modified by existing mining-related disturbance. Given the limited scope to materially shift major infrastructure components, mitigation should focus on minimising the disturbance footprint as far as practicable, protecting retained wetland and buffer areas, and rehabilitating the remaining impacted and hydrologically connected wetland systems within the broader development area, particularly the residual and adjoining portions of HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas. Where residual wetland loss remains unavoidable after minimisation and rehabilitation measures have been applied, offsetting may be considered only as a measure of last resort.

Provided that the recommended mitigation, rehabilitation and monitoring measures are strictly implemented, the residual risks are considered manageable, and the proposed development may be regarded as acceptable for consideration by the competent authorities on a strictly conditional basis. Considering the assessment findings and the assumption that the recommended mitigation measures will be fully implemented, no fatal flaws are evident for the proposed project at this stage.

An updated project layout was provided to the wetland specialist which avoids direct impacts on certain key wetland features, although some wetlands, such as those within the TSF footprint, cannot be avoided. In the opinion of the wetland specialist, the current (revised) layout is acceptable and can be considered for authorisation provided the mitigation measures of the EMPr are implemented. In the opinion of the specialist, and subject to strict adherence to the recommended mitigation measures, the project may be favourably considered for authorisation.

12.1.4 AIR QUALITY STUDY CONCLUSIONS

The simulated PM2.5 24-hour concentrations are within compliance with the NAAQS at all the AQSRs, for both current and future operations. The annual PM2.5 concentrations for current and future operations are also within compliance with the NAAQS. The additional emission due to the Deelkraal II TSF and Kusasalethu plant would result on average in a 29% increase in daily GLCs at the various AQSRs, and a 14% increase annually when taking existing sources from Savuka and Mponeng into account.

The simulated PM10 24-hour GLCs are within compliance with the NAAQS all the AQSRs, for both current and future operations. The annual PM10 concentrations for current and future operations are also within compliance with the NAAQS. The additional emission due to the Deelkraal II TSF and Kusasalethu plant would result on average in a 29% increase in daily GLCs at the various AQSRs, and a 14 % increase annually when taking exiting sources from Savuka and Mponeng into account but still within compliance with the NAAQS.

The simulated daily average dustfall rates with the current operations does not exceed the NDCR limit for residential areas (600 mg/m²-day). The limit for agricultural areas is exceeded up to 1.7 km to the south-southwest from the existing dormant TSF at Deelkraal and up to 1.95 km south-southwest from the inactive TSF at Kusasalethu. The simulated daily average dustfall rates for the future operations show similar impact areas to the current operations but with exceedance of the agricultural limit for up to 4.7 km from the proposed Deelkraal II TSF, and average increase of 56% when taking exiting sources from Savuka and Mponeng into account.



The environmental risk due to unmitigated future operations is classified as Medium based om the Deelkraal and Kusasalethu operations, with minor spatial and temporal cumulative change. With mitigation (80% CE through grassing of TSF side slopes and wet slurry deposition) the risk is classified as Low.

It is the specialist opinion that the project may be authorised provided that the recommended air quality management measures are implemented.

12.1.5 CLIMATE CHANGE STUDY CONCLUSIONS

Based on information provided, the project is likely to result in an estimated total of 9 557 t CO2e per annum direct emissions (Scope 1) and 162 249 t CO2e per annum indirect emissions (Scope 2) due to operational activities, with 9 749 t CO2e per annum indirect (Scope 3) emissions. The GHG emissions from the project for the operation was calculated to represent 0.054% of the remaining South African annual budget for 2035. The impact of the project on climate change was assessed to have a Medium negative risk rating.

12.1.6 RADIATION STUDY CONCLUSIONS

Following a systematic Source-Pathway-Receptor analysis, two public exposure conditions were derived for the area: a Residential Area Exposure Condition and a Commercial Agricultural Exposure Condition. The atmospheric pathway was explicitly included in the definition of the exposure conditions, whereas the surface water and groundwater pathways were treated through sensitivity and uncertainty analysis. It was argued that the public exposure condition is broadly representative of the human behavioural conditions near the Project. In addition, other potential exposure conditions may result in lower radiation exposure levels.

Given the pre-operational status of the Project, the radiological assessment is prospective, based on available information and reports generated as part of the Environmental, Social, and Health Impact Assessment (ESHIA) process. The results and conclusion are presented here; therefore, the conditions and parameter values assumed for the assessment are presented. These may change in future iterations as site-specific data and information become available and are used.

The following was concluded from the total effective dose assessment results:

- The most significant contributions to the atmospheric pathway are ingestion, due to high TSP deposition rates, and radon inhalation.
- The contribution from the groundwater pathway was evaluated, with the Deelkraal II TSF as the primary source. It was illustrated that the potential radiological impact is only visible over thousands of years at maximum total effective doses of less than 200 µSv.year-1, indicating that it cannot be considered a contributing pathway for the Commercial Agricultural Exposure Condition during the operational phase of the Project.

The results for the two public exposure conditions were presented as dose isopleths for the most affected age group, with more detailed exposure route-specific results at receptor locations conservatively selected to be close to the infrastructure of the Project. The results show that, for almost all selected receptor locations, the doses remain below the dose constraint for all age groups, with a maximum contribution from the atmospheric pathway of less than 250 µSv.year-1. The exception is the Farm 7 receptor location, which could receive total doses of up to 280 µSv.year-1, slightly above the dose constraint. Note that this applies only to the 0 to 2 year age group, with all other age groups having effective doses below 250 µSv.year-1.

It can, therefore, be concluded with a reasonable level of assurance that members of the public who can associate themselves with one of the exposure conditions will not be subject to a total effective dose of more than the public dose constraint of 250 µSv.year-1. Only the Farm 7 location for the Commercial Agricultural Exposure Condition is slightly above the dose constraint. This means that from a regulatory compliance perspective, no additional management or mitigation measures are required for any of the dust inhalation, external gamma radiation or ingestion pathways.



12.1.7 HERITAGE STUDY CONCLUSIONS

Through the methodology adopted as part of the assessment, heritage features were identified which can all be avoided during the implementation of the proposed activities. Apart from unassessed chance finds, a Medium to Low impact on heritage features can be expected should the proposed mitigation measures be followed. Therefore, from an Archaeological perspective, the development will not have any significant foreseeable impacts and can proceed as long as the recommended mitigation measures are implemented.

12.1.8 PALAEONTOLOGY STUDY CONCLUSIONS

In terms of palaeontological impact, the construction phase is the only development phase with the potential to affect palaeontological heritage. Pre-mitigation, construction-phase impacts are rated Medium to High; with appropriate mitigation in place, residual impacts are reduced to Medium to Low. No significant palaeontological impacts are anticipated during the operational or decommissioning phases. The No-Go Alternative would result in a Neutral impact on palaeontological heritage, while cumulative impacts are considered Low both pre- and post-mitigation, falling within acceptable limits. On this basis, the proposed development is not considered sensitive in terms of palaeontological resources, and no further studies, ground-truthing, or specialist mitigation are recommended. That said, the unexpected is always possible. A Chance Find Protocol must be implemented and adhered to throughout all phases of construction.

12.1.9 SOILS AND AGRICULTURE CONCLUSIONS

While the DFFE National Web-Based Environmental Screening Tool pre-allocated a High agricultural sensitivity rating to the site, field verification, comprising a site inspection, twenty-four soil auger observation points and comparison against the 1:50 000 ARC PWV soil survey, confirmed a substantially lower on-the-ground sensitivity and disputes the High rating in terms of the Specialist Protocol. The development footprint falls entirely within land type Fb15, dominated by shallow, rocky Glenrosa and Mispah lithosols and rock outcrop, which together constitute approximately 57.3% of the land type. No soil observation point returned a profile of High agricultural potential. The single largest soil unit is the Avalon series (mAv26, 244.50 ha), which together with Hutton (Hu26) and Shortlands (Sd11) soils forms 268.44 ha of Moderate agricultural potential, the best agricultural land within the footprint. A further 120.52 ha is of Low agricultural potential, and 256.83 ha, some 39.8% of the footprint, is already transformed by existing tailings storage facilities and mine dumps and retains no agricultural potential. The footprint is not, and has not within the past five years been, under formal cultivation, and supports no formal agricultural production or employment; existing land use is limited to informal, unconfined livestock grazing (cattle, pigs and goats) and small-scale subsistence cultivation within adjacent settlements.

The principal identified impact is the permanent loss of agricultural land use, primarily informal grazing, over the Moderate- and Low-potential soils within the footprint (High- significance, pre- and post-mitigation). Secondary construction-phase impacts, comprising topsoil loss, reduced land capability, compaction, erosion and contamination risk, reduce to Low to Medium-low significance with standard topsoil management, stormwater control and rehabilitation measures. Progressive rehabilitation of the TSF and other disturbed areas is assessed as a Medium to High positive impact, restoring soil stability and grazing potential to land, more than a third of the footprint, that currently has none.

On the basis of these findings, it is the specialist's opinion that the proposed Deelkraal II TSF and associated infrastructure should be granted Environmental Authorisation, subject to the implementation of the topsoil management, erosion control, containment and rehabilitation measures set out in the report and secured through the Environmental Management Programme.

12.1.10 TERRESTRIAL BIODIVERSITY CONCLUSIONS

The impact assessment indicates that, without mitigation, the proposed development would result in medium to high negative impacts on biodiversity, primarily through habitat loss, fragmentation, direct mortality of fauna, spread of alien invasive species, and potential pollution of water resources. However, no fatal flaws were identified that would preclude development, provided that all recommended mitigation measures are strictly

implemented. With these measures in place, the residual impacts are expected to be reduced to medium or low significance.

Pipeline Corridor 1 (the southern option) is preferred as this route consolidates with the other proposed infrastructure, and it is located within predominantly very low and low sensitivity areas, with existing roads along parts of the route. Finally, it is important to note that additional conservation actions, such as the management of adjacent natural areas for biodiversity, invasive species control, or ecological restoration, may provide further positive outcomes.

An updated layout was provided to the specialist representing avoidance of key sensitive areas. It is the opinion of the terrestrial specialist that the provided layout is acceptable and can be considered for authorisation provided that the mitigation measures of the EMPr are implemented. Based on the currently available terrestrial biodiversity information, the revised development layout will result in impact to approximately 70 ha, overlapping CBA 2: Optimal, EN Gauteng Shale Mountain Bushveld remnants, High SEI areas and Gauteng Ridges. On this basis, terrestrial biodiversity offsets remain relevant to the revised site layout. Any required biodiversity offsets must be agreed to with the relevant authorities and implemented prior to construction commencing

12.1.11 VISUAL STUDY CONCLUSIONS

As long as the identified mitigation measures are used, due to the likely relatively low levels of landscape and visual impact and the degraded nature of the affected landscape, there is no reason from a landscape and visual impact perspective why the proposed development should not be authorised.

12.1.12 TRAFFIC STATEMENT CONCLUSIONS

Based on the nature and extent of the proposed Deelkraal II TSF, some level of disturbance can be expected on the immediate road network and regionally because of the construction and operational phases. The overall potential impact is expected to be moderate to low during both the construction phase and operational phase, respectively.

The Provincial Road D92 providing site access carries substantially lower traffic volumes than the N12, R500, R501 which already carry a high proportion of trucks including abnormal vehicles. There is sufficient capacity on the N12, R500, R501, D92, D1648, and existing intersections to accommodate the traffic generated by the proposed Deelkraal II TSF mine during both construction and operation. This is subject to the implementation of appropriate traffic management strategies and mitigation measures where necessary to address potential negative impacts.

12.1.13 NOISE STATEMENT CONCLUSIONS

Based on the findings of the environmental noise assessment, it is the specialist's opinion that the project can be authorised, provided that the recommendations are taken into account.

12.1.14 SOCIAL STUDY CONCLUSIONS

The proposed Deelkraal II TSF and associated infrastructure are located in a long-established mining landscape characterised by mine decline, high unemployment, poverty, service-delivery failure, crime, tenure insecurity and the presence of artisanal mining. Against this backdrop, many of the project's social impacts represent the continuation or intensification of existing impacts rather than entirely new ones, and many of the underlying problems have historic and structural roots that lie beyond the project's control.

From a social perspective, no fatal flaw was identified. The project carries genuine potential for positive impacts – employment and skills development, local procurement, the productive re-use of historical tailings, the recycling of process water, and the avoidance of new greenfield mining disturbance – and these benefits would fall away if the project did not proceed. At the same time, the project carries material negative impacts, of which community safety and infrastructure theft, the potential displacement and livelihood loss of informal occupiers, and the fear of and exposure to a TSF or pipeline failure are the most significant. These can be reduced to manageable levels, but only through the sustained, adaptive implementation of the management measures included in the SIA report.

12.2 CONCLUSIONS FROM ALTERNATIVE ASSESSMENT

This section of the EIA report describes the preferred alternatives from the alternative assessment provided in Section 6.

12.2.1 SITE ALTERNATIVES:

The TSF site selection demonstrated application of the mitigation hierarchy, with clear evidence of avoidance, minimization, and rehabilitation measures being prioritized and integrated into project planning. No other reasonable or feasible site alternatives could be identified due to space constraints and sensitivities identified around the site. The current Deelkraal II site is therefore considered the only suitable site for the TSF, given the volumes and space requirements and the disadvantages of the alternative sites.

12.2.2 DEPOSITION METHOD

Currently cyclone deposition is the vastly preferred method of deposition for the majority of Harmony's current TSF operations due to the reasons described above. The environmental impacts associated with each deposition method are similar however cyclone deposition has higher water recovery rates and is also preferred from a geotechnical perspective. The Deelkraal II TSF will be designed to utilize cyclone deposition.

12.2.3 TSF DESIGN AND LAYOUT OPTIONS

From the outcomes of the specialist assessments Corridor 1 (southern corridor) is preferred due to lower impacts on wetlands and terrestrial biodiversity aspects. Corridor 1 is also preferred from a technical feasibility perspective. No preferences were presented in any of the specialist studies for Corridor 2**. Corridor 1 (southern piping and powerline corridor) is therefore nominated as the preferred alternative.**

It is expected that a liner such as the inverted barrier system will be suitable to prevent any potential contaminant impact on the groundwater in the immediate area. **Based on the significant benefits as a result of lining the TSF the lined option is preferred.**

Various iterations have been undertaken subsequent to the original layout provided for assessment in the EIA phase. All topsoil stockpiles, construction laydown areas and the Kusasalethu TSF reclamation pump station have been relocated from the original layout provided to avoid the wetlands and high sensitivity SEI areas as far as possible. The final layout presented in **Figure 71** presents the most suitable layout for the project based on all identified technical and environmental constraints.

There are certain impacts, with respect to terrestrial biodiversity specifically, which retain a high residual impact after applying all reasonable and feasible mitigation. This implies or introduces the need for an offset to cater for these key residual impacts. Avoidance of certain sensitive areas has taken place with subsequent refinements to the project layout however complete avoidance of certain sensitive areas is not possible and an offset for these specific aspects will be required.

12.2.4 NO-GO OPTION

The no go alternative would imply that no TSF is constructed for the safe deposition of new mine tailings from Harmony's West Wits operations. The current planned LOM of the Harmony's West Wits operations exceed the available deposition capacity of these TSFs and the applicant is therefore proposing to construct the proposed Deelkraal II TSF to cater for this additional capacity. The no go option would mean that the new TSF project and associated infrastructure would not proceed and this would therefore negatively affect the future viability of Harmony's West Wits mining operations due to lack of deposition space. This would have a significant financial impact on Harmony as well as a direct negative impact on the workforce on the mine and surrounding businesses and communities that are directly or indirectly linked to the operations.

The Deelkraal II TSF will also cater for reworking of multiple TSFs across the West Wits area which would have a significant positive impact. TSFs will be reworked and processed at Kusasalethu and Savuka plants. These TSFs will be fully reclaimed and then fully rehabilitated in the future. This will also allow Harmony to manage a single large TSF rather than having to deal with numerous smaller TSF sites, which should also improve the



management related to the various environmental and social issues of the existing TSFs in the region. These opportunities will be lost if the project does not proceed. As such, the no go alternative is not considered feasible or reasonable.

12.3 ENVIRONMENTAL IMPACT STATEMENT

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that all the recommended mitigation and management measures are implemented and resolution and agreement on any required biodiversity offsets are in place prior to construction commencing. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the findings of the EIA studies, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Despite the negative impacts caused by the TSF, it must be considered that there are positive impacts as well, mostly based on the employment opportunities and SLP initiatives. Based on the nature and extent of the proposed project and the predicted impacts as a result of the construction, operation and closure of the facility, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential environmental impacts, it is the opinion of the EIA project team that the environmental impacts associated with the application for the proposed West Wits Reclamation and Deposition project can be mitigated to an acceptable level and the project should be authorized.

12.4 RECOMMENDATIONS FOR INCLUSION IN ENVIRONMENTAL AUTHORIZATION

The following key specialist recommendations are made for inclusion in the EA for the project:

- All mitigation measures included in the attached EMPr must be implemented.
- The design of the facility and liner must be in line with the accompanying design report.
- The TSF and RWDs must all be lined.
- GDEnv must be consulted with respect to any potential offset requirements for the project with respect to ridges and other key sensitive areas and a subsequent detailed terrestrial biodiversity offset plan must be prepared and implemented in line with the department's requirements prior to commencement of construction activities.
- A pre-construction wet season (October to March, following good rains) walkdown of the high SEI areas within development footprint must be conducted to locate and identify any protected flora or flora SCC.
- It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon.
- All structure footprints are to be rehabilitated and landscaped after installation is complete. Rehabilitation of the disturbed areas existing in the proposed development area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.
- Vegetation clearing commences only after the necessary permits have been obtained. Vegetation
- A qualified environmental control officer must be appointed before construction begins.
- An Alien Invasive Plant Management Plan must be compiled and implemented. This should be regularly updated to reflect the annual changes in AIP composition.



- Monitor the TSFs and RWDs regularly to identify any signs of potential failure, slumping, or compromised flood protection capacity, and implement remedial actions promptly.
- Ensure all existing infrastructure has a stormwater management plan that is sufficient per GN 704 and any applicable TSF-specific requirements, and that all proposed infrastructure — including new TSFs, pipelines, power lines, access roads, and associated facilities — is designed and constructed in accordance with GN 704.
- All disturbed areas, including those associated with all infrastructure construction zones, must be rehabilitated as soon as practically possible to restore pre-disturbance conditions in terms of soil profile, land cover, and slope.
- Rehabilitated and disturbed areas must be stabilised promptly using vegetation (such as grass cover) or mechanical methods such as slope profiling or erosion control blankets.
- Design and construct all crossings of drainage features and wetland margins to maintain surface and shallow subsurface flow. Use above-ground pipelines on pre-cast plinths outside wetland beds and banks as far as practicable; span drainage lines where feasible; place supports outside active flow paths; size culverts and crossings to pass storm flows; and - reinstate bed and bank profiles immediately after installation or maintenance works.
- Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.
- Strip topsoil separately from subsoil in dry conditions, keep wetland-related soils separate from general fill, and stockpile all soils outside wetlands and approved buffers. Protect stockpiles from erosion, compaction and contamination. Replace soils in the correct order during rehabilitation and do not use wetland soils for berms, access roads or general fill.
- Implement progressive rehabilitation of completed sections of the TSF footprint, pipeline corridors, temporary work areas, laydown areas and decommissioned infrastructure as soon as they become available. Rip compacted surfaces, regrade to stable contours, replace topsoil, re-establish indigenous vegetation appropriate to the receiving habitat, and implement an alien invasive species control programme until acceptable cover is achieved.
- Develop an air quality management plan for the proposed TSF, including air quality monitoring to ensure compliance at upwind and downwind locations; and
- Topsoil management: Prior to the commencement of site clearance, a formal Topsoil Salvage and Stockpiling Plan must be fully implemented across all active construction zones, including the Tailings Storage Facility (TSF) footprint, dams, and access roads.
- Vegetation of exposed areas of the TSF must be implemented. Wind barriers to reduce wind erosion and/or the application of dust suppressants must also take place.
- Implement of a passive groundwater remediation system downstream of the TSF to capture the contaminant plume.
- Robust emergency preparedness plan inclusive of dam / structural failure must be compiled and must form part emergency drills and environmental awareness training.
- Maintain and adequately resource a Stakeholder Relations function, including a Stakeholder Relations Manager and a Community Liaison Officer who is trusted by, and accessible to, affected communities.

- Operate a community-friendly grievance mechanism developed with communities and landowners; maintain a grievance register; check it regularly; and provide regular feedback to communities.
- Develop and implement a transparent communication and expectation-management strategy covering the type, number and timing of opportunities and the recruitment and procurement processes, in Setswana, isiXhosa and Sesotho, supported by Afrikaans and English. Local suppliers and workers must be prioritised as far as possible for economic and professional growth.

13 ASSUMPTIONS AND LIMITATIONS

Various assumptions and limitations relating to this EIA phase assessment should be noted. In determining the significance of impacts, with mitigation, it is assumed that mitigation measures proposed in the report are correctly and effectively implemented and managed throughout the life of the project. Detailed Assumptions and Limitations for each specialist study completed are presented below.

13.1 GEOHYDROLOGY ASSUMPTIONS AND LIMITATIONS

The following conditions typically need to be described in a model:

- Geological and geohydrological features.
- Boundary conditions of the study area (based on the geology and geohydrology).
- Initial groundwater levels of the study area.
- The processes governing groundwater flow.
- Assumptions for the selection of the most appropriate numerical code.

The conceptual model and parameter estimates draw on available geological and hydrogeological information. Important limitations are:

- The upper model surface follows topography, while simulated hydraulic heads define the groundwater surface.
- Available geological mapping and borehole records simplify a heterogeneous system. Preferential flow through fractures, dykes and karst features may not be fully represented.
- Many aquifer parameters have not been determined in the field and therefore have to be estimated.

To develop a model of an aquifer system, certain assumptions have to be made. The following assumptions were made:

- The initial flow solution assumes steady conditions, although existing mining and seasonal recharge have disturbed the natural system.
- No abstraction boreholes were included in the initial model.
- The assigned boundary conditions approximate the regional flow system; their influence on predicted migration requires sensitivity testing.
- The impacts of other activities (e.g. agriculture) have not been considered.

Model predictions are conditional on the conceptualisation, source history, hydraulic properties, effective porosity and barrier leakage assumptions. The 50-year results are scenario forecasts and do not establish the absence of impacts beyond that period or along unresolved preferential pathways.

13.2 HYDROLOGY ASSUMPTIONS AND LIMITATIONS

Various assumptions were required in the development of the site sensitivity analysis, with resultant limitations in the accuracy of the site assessment. They included the following:

- Climatic Inputs – rainfall, evaporation, and temperature are based on regional long-term datasets, not continuous site-specific monitoring.
- Rainfall distribution – the rainfall distribution used is hypothetical, with a symmetrical S-curve approach adopted (centred at the 12-hour mark). Extreme rainfall may occur differently with greater spatial variability from this, which may affect predicted volumes.



- Rainfall depth – DRESSA rainfall depths are assumed to be accurate, with normal DRESSA values applied to this study. DRESSA also includes upper values representative of upper confidence limits. In addition, rainfall duration up to the 24-hour event has been considered. Longer event rainfall could exacerbate flooding; however, this may be limited due to the balance of infiltration loss compared to longer-duration rainfall.
- Site Sensitivity Grading – grading of the surface water environment is based on buffers applied to mapped rivers, drainage lines, and other hydrological features from regional topographic datasets. Unless specified, the inclusion of 'Any other channels' and 'furrows' that appeared not to have a hydrological upstream connection were included only when draining to a natural dam, as indicated by the 1:50,000 dam dataset DWS.
- Buffer Distances – are applied uniformly from mapped feature centre-lines or indicative edges; actual top-of-bank positions and riparian extents may differ locally.
- *Sensitivity Classes* – reflect relative hydrological and regulatory considerations at the scale of the project; they are intended as a planning tool and do not determine legal compliance or authorisation outcomes.
- *Sensitivity mapping* – focuses on rivers and artificial drainage features; it does not include a detailed assessment of wetlands, vleis or pans, which would require separate specialist investigation and may change the perceived sensitivity in certain areas.
- *Sensitivity Bands* – defined with reference to the current project layout and infrastructure footprints; any substantial changes in the positioning, elevation, or design of TSFs, RWDS, pipelines, or roads may alter the distribution and interpretation of sensitivities.
- *Flood Lines* – the 1:100 and 1:50-year flood lines used in this assessment were adopted from the previous flood line assessment (Project EIM-021) and are not recalculated here; all conclusions about flood risk are contingent on the assumptions and methods used in that original study.
- *Wetlands, pans and vleis* – these were not delineated in detail; only their indicative presence from national mapping is shown. A dedicated wetland study is required to define wetland extents, buffers and functional importance.
- *Water Quality* – No quantitative water quality modelling was undertaken; pollutant impacts are assessed qualitatively based on generalised tailings and process water characteristics from mining operations in the area.
- *Impact Assessment* – The impact assessment uses a risk-based significance methodology combining consequence and probability; numerical scores are based on professional judgement given the available data. The scores are based on proposed impact as it is assumed that existing footprints have already been assessed.

13.3 WETLANDS ASSUMPTIONS AND LIMITATIONS

The following aspects were considered to be limitations of the assessment:

- It has been assumed that the spatial data provided to the specialist are accurate and suitable for the purposes of this assessment;
- Where inaccessible, freshwater features within the broader 500 m project area were delineated and assessed using desktop information and remote interpretation;
- The assessment focused on areas exhibiting external wetland indicators, with wetland presence thereafter confirmed through the identification of relevant soil form indicators;
- Only natural features were considered in the ecological component of this assessment;

- The GPS used for water resource delineation is accurate to within approximately five metres. As such, the digitally plotted wetland boundaries may be offset by up to five metres on either side;
- The field assessment was constrained by the time available for verification, as well as by access, safety and security limitations, including the presence of illegal miners and limited security escort capacity. Accordingly, representative sampling was undertaken and some portions of the site could not be assessed on foot, requiring greater reliance on observations from accessible areas and desktop interpretation. While the data obtained are considered sufficient to inform a meaningful freshwater ecological baseline for the study area, an additional site survey of the under-surveyed areas, particularly the alternative pipeline corridor, is recommended to verify and refine the assessment findings[6].

13.4 AIR QUALITY ASSUMPTIONS AND LIMITATIONS

Data limitations and assumptions associated with this project are as follows:

- Use was made of simulated WRF data for a point at the Savuka site, and this was regarded as representative of the project area for Deelkraal II TSF and Kusasalethu Gold plant.
- The quantification of sources of emission was restricted to the project activities and operations within the study domain only. Although other background sources were identified, such sources could not be quantified. The current mining and processing operations at Mponeng and Savuka mines and operations were modelled to reflect the cumulative PM concentrations in the area, specifically at the nearby receptors.
- Information required for the calculation of emissions from dust sources for the project operations was supplied by EIMS with the baseline activities taken from a previous study conducted for West Wits operations. The assumption was made that this information was accurate and correct.
- Routine emissions from the operations were estimated and modelled.
- Emissions from the Construction phase were estimated as area wide construction emissions and could not be modelled since detailed plans and schedules of individual construction processes were not available. Impacts from construction operations are however usually lower than operational phase due to their temporary nature and duration, and the likelihood that these activities will not occur concurrently at all portions of the site.

13.5 CLIMATE CHANGE ASSUMPTIONS AND LIMITATIONS

Refer to attached climate change assessment included in Appendix D. A summary of the current operations with the estimated GHG emissions are provided in Table 4-1 of the attached Climate Change assessment. The raw data with associated assumptions is provided in Appendix D of the same report.

13.6 RADIATION ASSUMPTIONS AND LIMITATIONS

There are numerous assumptions and limitations built into the radiation modelling and assessment. Section 2 of the radiation assessment (Appendix D) presents an overview of the assessment context, which defines the high-level assumptions and constraints imposed on the assessment.

13.7 HERITAGE ASSUMPTIONS AND LIMITATIONS

Several limitations were expected and encountered while implementing the above-described methodology. Some of these limitations relate to the project itself, while some are more general, relating to the implementation of the methodology.

Firstly, such investigations are limited to desktop observations from which findings are drawn. In this regard, the findings presented here are limited to surface observations. Below-ground archaeological contexts would only

[6] Note the Alternative Pipeline corridor is not preferred and as such this recommendation is no longer applicable.

apply in cases where the methodology includes components involving excavations and test pits. To mitigate this limitation, this report advises the application of heritage procedures considering what has been noted or already disturbed on site.

Although an extensive methodology was adopted to address the desktop and baseline assessment, one must remain cognisant of the fact that this assessment may not identify all heritage features possibly existing. For this reason, mitigation measures have been proposed to accommodate for chance finds as well as features that may not have been encountered and identified through the implementation of this study's methodology.

As a key limitation, it is understood that the landscape had been extensively disturbed by mining and agricultural activities. As a desktop and baseline study, this report draws from available information to provide an overview of the heritage significance of the area which will form the foundation and guide the approach of the pending field survey.

13.8 PALAEONTOLOGY ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are applicable for this assessment:

- The geology of the area is the focal point of geological maps, and the sheet explanations of the Geological Maps were not intended to focus on palaeontological heritage. Many inaccessible areas of South Africa have never been examined by palaeontologists, and data is typically dependent solely on aerial pictures. Locality and geological information in museums and university databases is out of date, and data acquired in the past is not always adequately documented.

- Comparable Assemblage Zones in other places are also used to provide information on the existence of fossils in areas that have not before been recorded. When similar Assemblage Zones and geological formations are used for Impact studies, it is commonly assumed that exposed fossil exists within the footprint.

13.9 SOILS ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations relating to this desktop assessment should be noted:

- The information provided by the applicant is considered accurate, adequate, unbiased, and no information that could change the outcome of the scoping process has been withheld;

- It is assumed that the preliminary DFFE Screening Tool Report and all existing desktop data are sufficient for baseline determination, and that the information gathered during the Scoping Phase will be accurate, objective, and adequate to accurately determine the required level of assessment for the subsequent EIA Phase;

- It is assumed that the spatial data (e.g., shapefiles, site plans, cadastral boundaries) provided for the facility footprint and surrounding infrastructure accurately reflect their real-world positions;

- In determining the significance of impacts, with mitigation, it is assumed that mitigation measures proposed in the report are correctly and effectively implemented and managed throughout the life of the project;

- Due to data limitations with regards to production figures on the agricultural lands, regional production benchmarks for Land Type Fb15 were utilised to model annual productivity units. Large-scale commercial farming does not occur within the project area. On-site observations indicate that agricultural activities are limited to small-scale, subsistence farming, comprising local crop cultivation and livestock rearing for surrounding communities.

- All reasonable measures have been considered in the micro- siting of the proposed development to minimise fragmentation and disturbance of agricultural activities.

13.10 TERRESTRIAL BIODIVERSITY ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are applicable for this assessment:

- It is assumed that all information received from the client/developer is accurate;
- The specialist was not provided with an architectural plan or any engineering drawings with regard to the planned development activities and, as such, the potential impacts arising from these activities may only be assumed based on previous experience;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- Insects and invertebrates do not form part of the scope. The likelihood of occurrence was assessed from a desktop perspective only;
- The assessment area was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- A single early dry season site assessment was conducted. It is recommended that a protected and SCC flora species walkdown is completed during the wet season (October to March) for the development footprint;
- This assessment does not consider temporal trends (note that the data collected is, however, considered sufficient to derive a meaningful baseline);
- Whilst every effort was made to cover as much of the project area as possible, it is possible that some plant and animal species that are present within the project area were not recorded during the field investigations. However, it is the opinion of the specialist that an accurate representative sample of the ecological components considered within this assessment was collected; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by up to 5 m.

13.11 NOISE STATEMENT ASSUMPTIONS AND LIMITATIONS

The following limitations and assumptions should be noted:

- The quantification of sources of noise was limited to the construction and operation phases of the proposed project only. Closure phase activities are expected to be similar or less significant and its impacts only assessed qualitatively. Noise impacts will cease post-closure.
- The mitigating effect of buildings and topography acting as acoustic barriers were not taken into account providing a conservative assessment of the noise impacts off-site.
- The attenuation modelling was conservatively undertaken assuming equal distribution of wind in all directions to assess the maximum potential noise impact.
- All project construction activities were assumed from 06:00 to 18:00.
- All project operation activities were assumed for a 24-hour period.
- No measured baseline noise levels were available for the assessment. It was assumed that the baseline noise levels would be similar to urban districts as defined in the draft Environmental Noise Standards.
- The environmental noise assessment focussed on the evaluation of impacts for humans.

13.12 VISUAL ASSUMPTIONS AND LIMITATIONS

The following limitations and assumptions should be noted:

- In the assessment tables the subjective judgement as to whether an impact is negative or positive is based on the assumption that the majority of people are likely to prefer to view a natural or a rural landscape than an industrial landscape.
- A site visit was undertaken on the 3rd September 2025 to verify the current landscape characteristics, potential receptors and potential impacts.
- The site visit was planned to ensure that weather conditions were clear ensuring reasonable visibility.
- The timing of photography was planned to ensure that the sun was as far as possible behind the photographer. This was to ensure that as much detail as possible was recorded in the photographs.
- Visibility of the proposed facility has been assessed using the Global Mapper Viewshed tool.
- The visibility assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground-truthed using a GPS as well as online mapping.
- Calculation of visibility is based purely on the Digital Elevation Model and does not take into account the screening potential of vegetation or other development.

13.13 SOCIAL ASSUMPTIONS AND LIMITATIONS

The following limitations and assumptions should be noted:

- Not all community members could be consulted directly; the views recorded reflect those of the stakeholders engaged and the secondary data reviewed.
- The social environment is dynamic and is influenced by external processes (political, economic and institutional) that are independent of the project and that can alter the social context and the predicted impacts over time.
- Impacts may be both actual and perceived, and different groups may experience the same change differently.
- Census 2022 data are subject to a very high reported undercount and, at the time of assessment, were released only to local-municipal level; ward-level analysis therefore relies on Census 2011 (2016 ward delineation) supplemented by later data, and the figures should be read as indicative rather than absolute.
- Certain matters raised during consultation – in particular a property-ownership dispute – are subject to documentary evidence that had not been received or independently verified by the SIA team at the time of writing; these are recorded as stakeholder positions, not as findings of fact, and the SIA does not determine their legal merits.

14 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION AND LEVEL OF AGREEMENT

I **John von Mayer** herewith undertake that the information provided in the foregoing report is correct to the best of my knowledge, and that the comments and inputs and the level of agreement from stakeholders and Interested and Affected Parties has been correctly recorded in the report where applicable.



Signature of the EAP

Date: 2026/10/30

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APPENDICES

Appendix A: Copy of Application Form

Appendix B: EAP CV

Appendix C: Public Participation

Appendix D: Specialist Reports

Appendix E: Draft Offset strategy

Appendix F: Final Decommissioning, Rehabilitation and Closure Plan

Appendix G: Impact Assessment Matrix

Appendix H: DFFE Screening Tool Reports and Site Sensitivity Verification Report

Appendix I: EMPr

Appendix J: Additional Engineering Information